[redacted]
PC-4600

SHARP SERVICE MANUAL

CODE: 00ZPC4600DIGE

SERVICE-MAN DIAGNOSTIC FOR PC-4600 SERIES (UKOGC3045CSZZ)

CONTENTS

SHARP CORPORATION

1. Introduction

This diagnostics is used to check the operating state of the system unit, keyboard, and peripheral units, when an option device is interfaced to the PC-4600 or when there is a state of error.

The following four kinds of diagnostics are provided to trace the exact cause.

Individual device diagnostics

Used to test the real time clock, setup RAM, memory module, keyboard, speaker, monochrome adapter, color/graphics adapter, coprocessor printer, serial I/O, modem, and liquid crystal display.

When an error is found, the failure is reported with the error status.

Floppy disk diagnostics

This test program performs tests in more details than the test by the individual device diagnostic and may also be used to perform aging test of the floppy disk.

Hard disk diagnostics

This test program performs tests in more details than the test by the individual device diagnostic and may also be used to perform aging test of the hard disk.

ROM disk diagnostics

Used to test the ROM disk board option (CE-452B).

The diagnostic program disk comes supplied on a 3.5" MD-DOS diskette with the above diagnostic programs and the program loader.

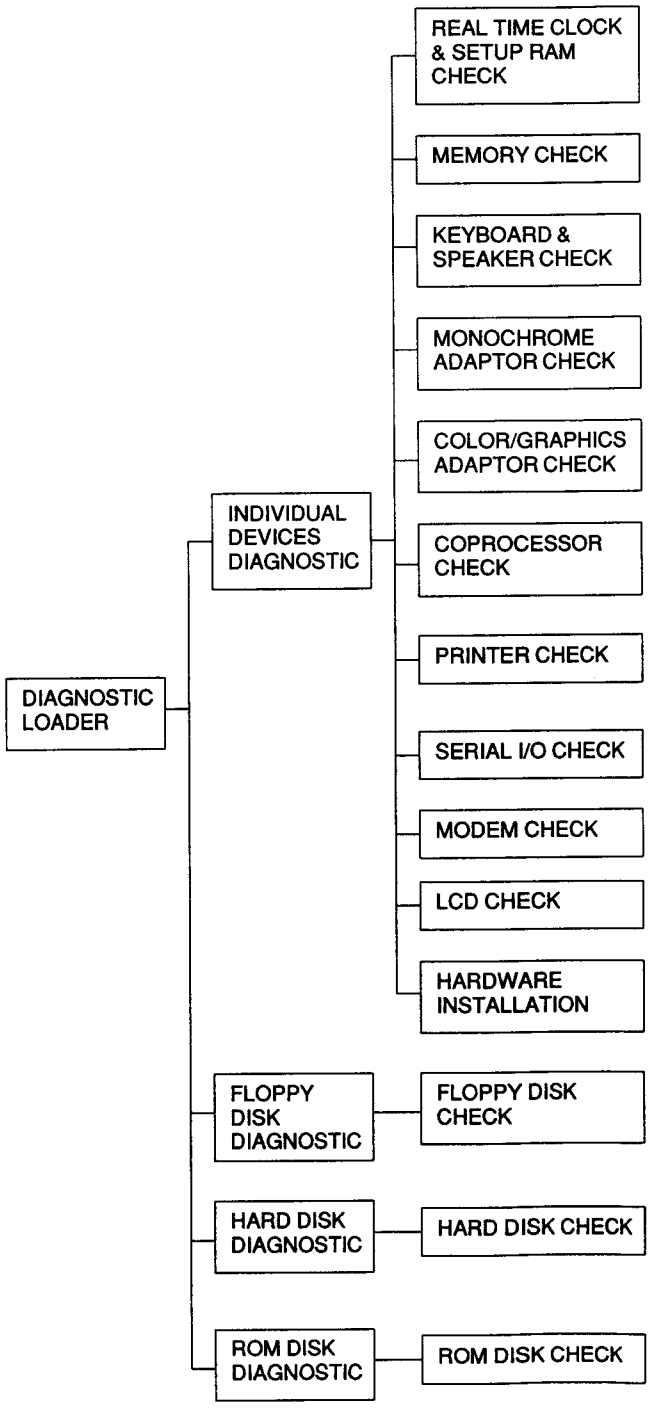
It has been designed to test almost any PC-4600 function and its peripherals.

2. Diagnostic program structure

The following figure shows the configuration of the programs stored on the diagnostic program diskette.

Any of four diagnostics can be chosen by typing the number indicated by the diagnostic program.

When an individual device diagnostic is chosen, a sub-menu is displayed to make choice in the same manner.



3. Starting up the diagnostic program

The following procedure is required to start the diagnostic program.

1. Insert the diagnostic program disk in the drive A and turn power on to the PC-4600.
2. When the MS-DOS prompt appears, type the command shown below and press the ENTER key.

```
A> DIAG46S [ENTER]
```

3. The diagnostic program menu shown below will appear within a few seconds.

Type a number to choose the program.

```
DIAGNOSTIC PROGRAM MENU
  1. Individual Devices Diagnostic
  2. Floppy Disk Diagnostic
  3. Hard Disk Diagnostic
  4. ROM Disk Diagnostic
Enter your selected number:_
```

Diagnostic Program Menu

4. Diagnostic program loader

This diagnostic program loader is used to select and execute the individual device diagnostic program, floppy disk diagnostic program, hard disk diagnostic program, and ROM disk diagnostic program.

Upon the start of the program loader, the diagnostic program menu is displayed. When one of four choice is typed, the respective diagnostic program is loaded from the floppy disk onto the main memory area. After it has been completed, the control moves to the diagnostic program to execute.

When the ESC key is pushed in the diagnostic program menu, the program terminates and the control returns to the MS-DOS.

5. Check program

All check programs are stored on the diagnostic program disk and used to check the state of a device after it has been installed or a specific device is tested when an error is reported.

5-1. Individual devices diagnostics

The desired check item must be chosen and typed in the menu followed by the depression of the ENTER key.

To cancel the choice, simply push the ESC key. The control will return to the diagnostic loader.

When changing the setting contents with the set-up menu during each device check, return fromt he device check menu to this individual devices diagnostic menu in advance.

```
Individual Devices Diagnostic V-X.XX
   1 --- Real Time Clock & Setup RAM
   2 --- Memory
   3 --- Keyboard & Speaker
   4 --- Monochrome Adaptor
   5 --- Color/Graphics Adaptor
   6 --- Coprocessor
   7 --- Printer
   8 --- Serial I/O Adaptor
   9 --- Modem Adaptor
  10 --- Liquid Crystal Display
   0 --- Hardware Installation
Enter your selected number: _
```

Individual Devices Diagnostic Menu

• Outline of each device check

* Real time clock & setup RAM
  Tests the real time clock and the setup RAM in the read/write mode.
* Memory
  Tests the main memory, video memory and EMS memory in the read/write mode.
* Keyboard & speaker
  Tests the keyboard and the speaker.
* Monochrome Adapter
  Tests the LCD and CRT functions in the monochrome mode.
* Color/graphics adapter
  Tests the LCD and CRT functions in the color/graphics mode.
* Coprocessor
  Tests the coprocessor by carring out initialize and arithmetic operation.
* Printer
  Tests the printer.
* Serial I/O adapter
  Tests the RS-232C functions using the loopback connector.
* Modem adapter
  Tests the modem functions in the loopback mode.
* Liquid crystal display
  Tests the LCD by means of the display pattern.
* Hardware installation
  Displays the device names interfaced to the PC-4600.

• Setting parameter option

After the real time clock & setup RAM or memory was selected, the program prompts for entry of a parameter option shown below before starting the test.

```
Error stop? (Y/N) (default response is Y)
Loop counter (1-9999) (default response is 1)
```

If the ENTER key was depressed instead of Y, N or a number, the default will be chosen.

After completing the parameter entry, the program starts.

The following is reported in a course of the real time clock & setup RAM or memory check.

```
Success -- xx
Failure -- yy
```

where, xx represents the number of times the program passed successfully, and yy represents how many times the test failed, when any continuous test was specified in the initial setup.

If the ESC key is depressed when the test is being performed, the program execution terminates.

5-1-1. Real Time Clock & Setup RAM Check

This program tests the real time clock and the setup RAM within the sub-CPU.

When this test item is chosen, the sub-menu shown below appears. The desired test item must be chosen by typing the number in the menu. If 0 is typed, the control returns to the individual devices diagnostic menu.

```
Real Time Clock & Setup RAM Check
  1 --- Real time clock check
  2 --- Setup RAM check
  0 --- Exit
Enter your selected number: _
```

Real Time Clock & Setup RAM Check Menu

After a test item was chosen, the control comes asking for a parameter option entry before going into the test. And the test will start after this. If no error was encountered, test repetitions are continued to count.

Depression of the ESC key terminates the test.

When an error was encountered, the error message is produced.

• Real time clock check

This test item tests the real time clock within the sub-CPU for a period of one second while communicating with the sub-CPU by means of the V40 timer interrupt (18.2Hz).

• Setup RAM check

Except for the RAM area within the sub-CPU where the date and time are stored, this test program communicates with the sub-CPU and tests the setup RAM area in the read/write mode in the following manner:

1. Data "5" is written in the setup RAM check area.
2. This data "5" stored in the setup RAM is read one digit at a time, then the data "A" is written in every area until the entire area is written with "A".
3. This test data "A" is read one digit at a time, then the data "5" is written in every area until the entire area is written with "5".

The contents of the setup RAM are saved prior to initiation of the test and restored after completion of the test.

• Error message

* REAL TIME CLOCK ERROR
  The real time clock in the sub-CPU or the V-40 timer is not working properly.
* SETUP RAM READ/WRITE ERROR
  The test data written in the setup RAM within the sub-CPU does not coincide with the data written.
* INTERPROCESSOR COMMUNICATION ERROR
  Communication is not done properly with the sub-CPU.
* SETUP RAM BROKEN ERROR
  The contents of the setup RAM are destroyed as a result of a communication failure with the sub-CPU during the test of the setup RAM.

5-1-2. Memory Check

This program tests the standard memory and the video memory on the board.

The following menu appears when this test program is selected.

One of two test items must be chosen after typing the desired number.

Typing 0 will cause the control to return to the individual devices diagnostic menu.

```
Memory Check
  1 --- Main memory check
  2 --- Video memory check
  0 --- Exit
Enter your selected number: _
```

Memory Check Menu

After a test item was chosen, the control comes asking for a parameter option entry before going into the test, as discussed in Paragraph 5-1.

And the test will start after this.

If no error was encountered, test repetitions are continued to count.

Depression of the ESC key terminates the test.

When an error was encountered, the error message is produced.

• Main memory check

This program tests in the read/write mode the standard memory.

1. The standard memory area after the address 30000H is read/write tested using the marching test mode in an increment of 64KB.
2. If not error was encountered after checking the area after the address 20000H, the data in the address 00000H through 2FFFFH are copied onto the area after the address 30000H, then the address 00000H through 2FFFFH is tested in the marching test mode in an increment of 64KB.

• Video memory

This program tests for 128KB of the video memory.

The video memory area is read/write tested using the marching test for four video DRAM bank (32KB).

Note that care was taken by the program not to destruct the video memory contents.

NOTE: The marching test for the main memory check and the video memory check is carried out in the following manner:
1. Test data 5555H are written in the area to be checked.
2. The test data are read at every word and the test data AAAAH are written. This is done for all the areas.
3. The data AAAAH are read at every word and the test data 5555H are written. This is done for all the areas.
4. The entire area to be tested is written with 0000H.
5. The data 0000H are read at every word and the test data FFFFH are written. This is done for all the areas.
6. The data FFFFH are read at every word and the test data 0000H are written. This is done for all the areas.

• Error message

* 640KB MAIN MEMORY R/W ERROR – address: X000H, data: yyyyH During test of 640KB main memory area, the test data stored in the segment address X000H did not coincide with read data in a yyyyH bit pattern.

* 128KB VIDEO MEMORY R/W ERROR – bank: x, data: yyyyH
During test of 128KB video memory area, the test data stored in the bank X did not coincide with read data in a yyyyH bit pattern.

5-1-3. Keyboard & Speaker Check

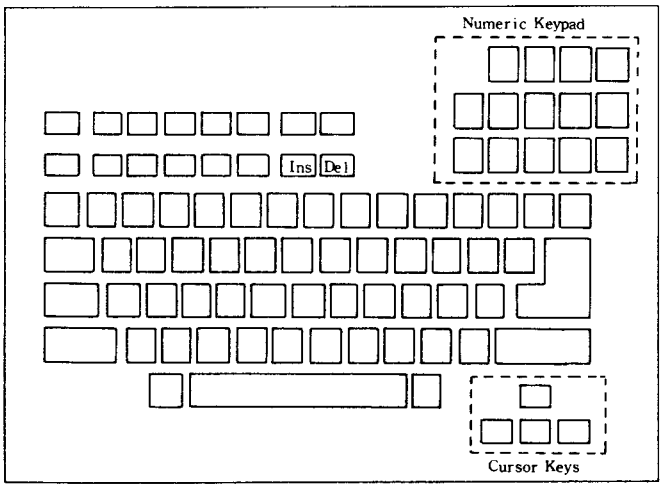
This program test the keyboard and speaker functions. When this test program is chosen, the sub-menu shown below appears. You may choose the desired test item by typing the respective number. Depression of 0 causes the control to return to the individual devices diagnostic menu.

```
Keyboard & Speaker Check
   1 --- US English keyboard
   2 --- Other keyboards
   0 --- Exit
Enter selected number: _
```

Keyboard & Speaker Check Menu

• Keyboard check

When this test starts, the keyboard layout appears in the display except the numeric keypad. Depressing any key makes it emphasized with all toned to indicate that the key has been pushed. The numeric keypad is displayed when the INS, DEL, and four cursor control keys are depressed and the test can take place in the same manner. The test terminates when the ESC key is depressed twice and the control return to the keyboard & speaker check menu.



PC-4602/4641 keyboard layout screen

The speaker can be tested using the function keys F1 through F10. The F1 key issues the lowest beeping tone and the F10 key the highest tone, while F2 through F9 issues the tone incremental.

• Error message

* ILLEGAL KEY ERROR
An illegal key code is found.

* INTERPROCESSOR COMMUNICATION ERROR
Communication has not been successful with the sub-CPU.

5-1-4. Monochrome Adapter Check

This program tests the internal LCD controller, LCD unit, color/monochrome CRT adapter option (CE-451A) and the monochrome CRT interfaced to it.

The following is prompted if the system console was not set up to the MDA when this test program is chosen.

```
Set Display Mode to Monochrome and Console to MDA.
```

In this case, set the display (LCD) or CRT adapter display mode to monochrome with the set-up menu and the system console needs to be updated to MDA with the individual devices diagnostic menu displayed. If the system console has already been set to MDA, the following sub-menu appears. You can now choose the desired item number 1 to 5.

When 0 is chosen, the control returns to the individual devices diagnostic menu.

```
Monochrome Adaptor Check
   1 --- Monochrome display buffer check
   2 --- Attribute check
   3 --- Character set check
   4 --- B/W mode check
   5 --- Run all above checks
   0 --- Exit
Enter your selected number: _
```

Monochrome Adaptor Check Menu

• Monochrome display buffer check

The program tests the video RAM (VRAM) in the monochrome display adapter by writing and reading the test data in the VRAM.

• Attribute check

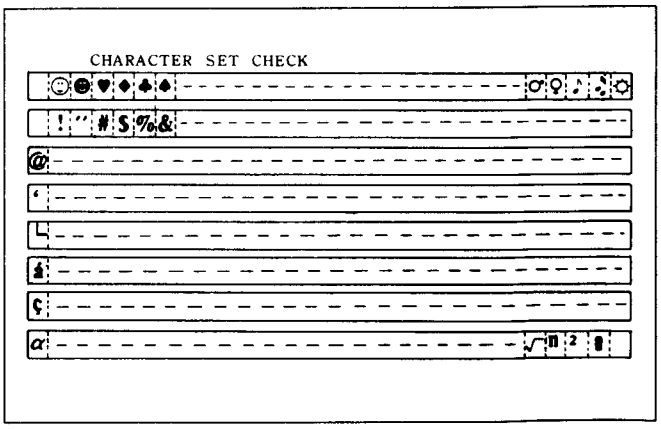
All the attributes of the monochrome display adapter are tested which includes the normal, intensity, reverse video, blinking and underlined characters. Now you can visually check the information appeared in the screen, referring to the following:

```
ATTRIBUTE CHECK
     NORMAL
     INTENSITY
     REVERSE
     BLINK
     UNDERLINE
```

Attribute Check Display

• Character set check

All fonts contained in the character generator are displayed. In the first place, characters of the normal attribute are displayed. When any key is depressed next, characters with intensity attribute are displayed. Now, you can visually check the information appeared in the screen, referring to the following:



Character Set Check Display

* See the Character Format on the upper right of this page.

• B/W mode check

A black and white screen is displayed. Now, you can visually check it while adjusting the LCD or CRT monitor.

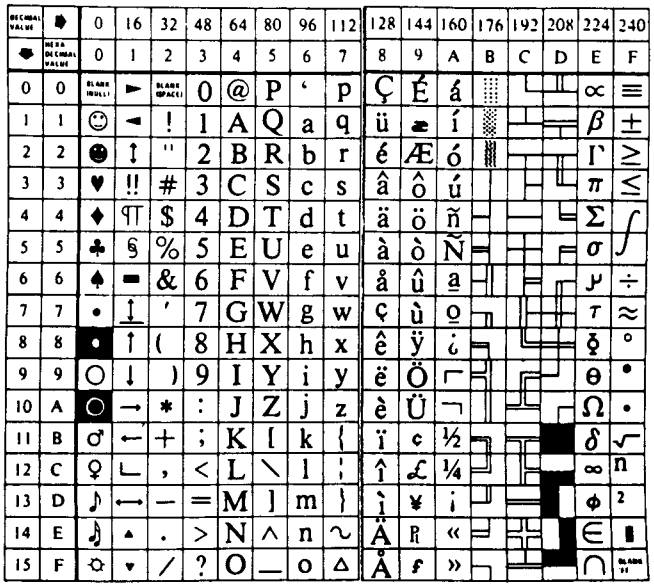
• Run all above checks

You can check items 1 through 4.

• Error message

* VRAM ERROR - data xxH

The test data written in the monochrome display buffer did not coincide with the data read in a bit pattern of xxH (where, the bit 1 is in xxH is an unmatch).



5-1-5. Color Graphics Adapter Check

This program is used to test the internal LCD controller, LD display unit, color/monochrome CRT adapter (CE-451A) and the color CRT monitor interfaced to it.

If the system console was not set up to CGA when this program is chosen, the following message is displayed.

```
Set Display Mode to Color/Graphics and Console to CGA.
```

In this event, the choice must be revised through the setup menu to change the display (LCD) or CRT adapter display mode to graphics and color and the system console to CGA with the individual devices diagnostic menu displayed. The following sub-menu appears if the system console has been set to CGA. You may now choose the item by typing the item number 1 to 9. Depression of 0 causes the control to return to the individual devices diagnostics menu.

```
Color/Graphics Adapter Check
    1 --- Color/graphics display buffer check
    2 --- Attribute check
    3 --- 80 x 25 alphanumeric mode check
    4 --- 40 x 25 alphanumeric mode check
    5 --- 320 x 200 graphics mode check
    6 --- 640 x 200 graphics mode check
    7 --- Screen paging check
    8 --- Color CRT check
    9 --- Run all above checks
    0 --- Exit
Enter your selected number: _
```

Color/Graphics Adapter Check Menu

• Color/graphics display buffer check

The program checks the viode-RAM (VRAM) on the color/graphics display adapter, writing certain data into the VRAM and reading it back.

• Attribute check

All the attributes modes of the color/graphics display adapter are checked. They are all the intensity, blinking, reverse video, and foreground/background color. Visually check the information displayed on the screen referring to the following.

```
ATTRIBUTE CHECK
BLACK                          BLACK
BLLUE                          BLUE
GREEN                          GREEN
CYAN                           CYAN
RED                            RED
MAGENTA                        MAGENTA
BROWN                          BROWN
LIGHT GRAY      (A)            LIGHT GRAY      (C)
DARK GRAY                      BLINK
LIGHT BLUE                     BLINK
LIGHT GREEN                    BLINK
LIGHT CYAN                     BLINK
LIGHT RED                      BLINK
LIGHT MAGENTA                  BLINK
YELLOW                         BLINK
WHITE           (B)            BLINK           (D)
```

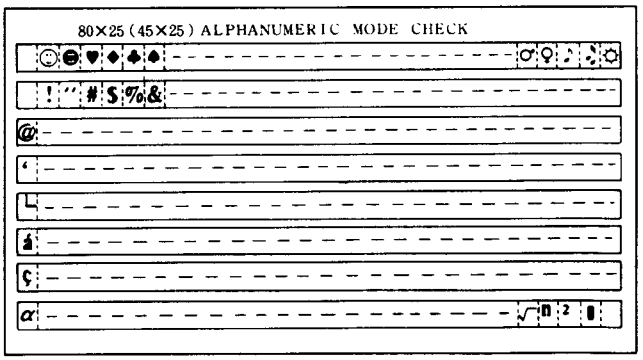
Attribute Check Display

When the color monitor is used, the portions (A) and (B) show the color of display characters and the portion (C) the color of background.

Because it is not possible to display color with the LCD, the portion (A) is displayed by the normal characters (except black which is displayed in reverse video) and the portion (B) is displayed in highlight. The portion (D) is displayed blinking for both the color monitor and the LCD.

• 80 x 25 alphanumeric mode check

All characters are displayed in the 80 x 25, alphanumeric mode. First, the characters of normal attribute are displayed. As any key is depressed next, the characters with the intensity attribute are displayed. Visually check the characters displayed on the screen, referring to the following.



80 x 25 (40 x 25) Alphanumeric Mode Check Display

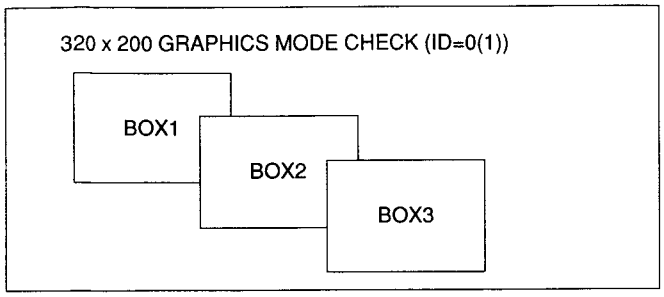
* See the character format on the upper right of page 5.

• 40 x 25 alphanumeric mode check

All characters are displayed in the 40 x 25 alphanumeric mode. First, the characters of normal attribute are displayed. As any key is depressed next, the characters with the intensity attribute are displayed. Visually check the characters displayed on the screen, referring to the above.

• 320 x 200 graphics mode check

Three dialog boxes come displayed in the 320 x 200 graphics mode. First, the color set-1 (ID=0) is displayed in the dialog box. Any key depression displays the color set-2 (ID=1) in the dialog box. Visually check the dialog boxes displayed on the screen, referring to the following.



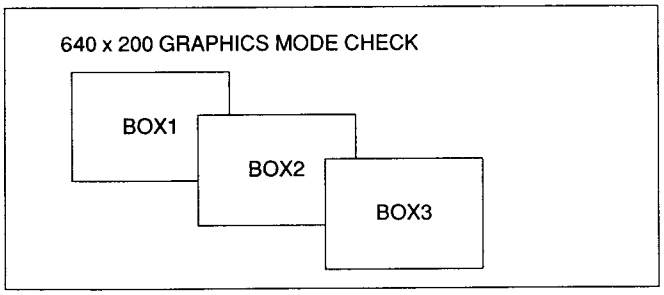
320 x 200 Graphics Mode Check Display

The following applies to the color monitor and LCD display.

	ID = 0 (Color Set 1)				ID = 1 (Color Set 2)			
	BOX1	BOX2	BOX3	Back-ground	BOX1	BOX2	BOX3	Back-ground
Color CRT monitor	Green	Red	Brown	Blue	Cyan	Magenta	White	Red
LCD	Vertical stripes	Vertical stripes	All toned	Null	Vertical stripes	Vertical stripes	All toned	Null

• 640 x 200 graphics mode check

Three dialog boxes are displayed in the 640 x 200, graphics mode. Visually check the boxes displayed on the screen, referring to the following.



640 x 200 Graphics Mode Check Display

The following is displayed for the color monitor and the LCD.

	BOX1	BOX2	BOX3	Background
Color CRT monitor	Horizontal stripes (B/W)	Lightly all toned (B/W)	Darkly all toned (B/W)	Null
LCD	Horizontal stripes	Vertical stripes	All toned	Null

• Screen paging check

The memory in the VRAM can be divided into eight different areas in 40 x 25 alphanumeric mode by the program. These areas are called display pages. Any key depression displays eight display pages numbered from 0 to 7 sequentially. Visually check the display pages on the screen.

• Color CRT check

Sixteen different color screens are displayed sequentially. They are:

1. Black
2. Blue
3. Green
4. Cyan
5. Red
6. Magenta
7. Brown
8. Light gray
9. Dark gray
10. Light blue
11. Light green
12. Light cyan
13. Light red
14. Light magenta
15. Yellow
16. White

Press any key to display the next color screen. Visually check to see if the actually displayed color is correct.

• Run all above checks

Checks all the items from 1 to 9 in sequence.

• Error message

* VRAM ERROR - data xxH
Data written in the color/graphics display buffer do not coincide with the data read in a bit pattern of xxH (where, the bit 1 in xxH is an unmatch).

5-1-6. Coprocessor check

This program tests the co-processor by carring out initialize and arithmetic operation.

When this test item is chosen, the sub-menu shown below appears. The desired test item must be chosen by typing the number in the menu. If 0 is typed, the control returns to the individual devices diagnostic menu.

```
Coprocessor Check
  1 --- Initialize check
  2 --- Arithmetic check
  0 --- Exit
Enter your selected number: _
```

After a test item was chosen, the control comes asking for a parameter option entry before going into the test. And the test will start after this. If no error was encountered, test repetitions are continued to count.

Depression of the ESC key terminates the test.

When an error was encountered, the error message is produced.

• Initialize check

This test item tests the initialize function by issuing the initialize command.

• Arithmetic check

This test item tests the arithmetic function by issuing the arithmetic command.

5-1-7. Printer check

This program tests the printer interface and the printer connected with it.

The following sub-menu is displayed when this test program is selected.

Type the desired test item.

Depression of 0 causes the control to return to the individual device diagnostic menu.

```
Printer Check
  1 --- Printer status check
  2 --- Character set check
  0 --- Exit
Enter your selected number: -
```

Printer Check Menu

• Printer status check

With this test program the printer status is read and displayed as in the figure shown below. If all status are asterisk attached, the test has been normally completed. In this case, it shows that it is ready to printer. The item "Sel" may not change when the CE-700P is in connection.

```
PRINTER STATUS CHECK
Bsy Ack Pe Sel Ioe --- --- Toe
 *   *   *   *   *   *   *   *
```

The signal is OK if the symbol * is displayed.

• Character set check

With this test program code 20H thru 7FH and A0H thru FFH are printed to check with.

Before running the test, the prompt below will appear:

```
Are you ready ? (Y/N)_
```

Enter Y if preparations for this printer are completed.

The result on the paper looks similar to the example shown in the following.

```
 !"#$%&' () *+,-./
0123456789:;<=>?
@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\] ^_
`abcdefghijklmno
pqrstuvwxyz{|}~
```

Printout on Paper

* In the case of printed out by CE700P.

• Error message

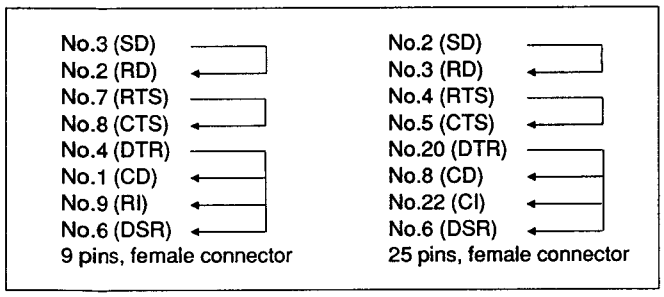
* PRINTER NOT AVAILABLE
Displayed when the printer adapter is in trouble.

* PRINTER STATUS ERROR
Appears if the printer is not connected, not turned on, or not in the on-line state. At the same time, the printer status at the error is displayed.

5-1-8. Serial I/O Check

This program tests the RS-232C line of the standard serial I/O and the internal serial I/O (CE-451B, CE-451M) with the loopback connector in use.

The following shows how wires are connected.



Oraganization of Loopback Connector

If the serial port adapter (RS-232C or modem) was not istalled when this test program is chosen, the following message is produced.

```
Serial Port Adapter is not installed.
```

The following is displayed if the mode is not in the SIO mode, even if the modem card (CE-451M) is installed.

```
Set Communication Mode to SIO.
```

In this event, the mode must be set to SIO through the setup menu with the individual devices diagnostic menu displayed.

The sub-menu shown next will appear if the serial I/O adapter (RS-232C) is installed.

Type the desired test item.

Depression of 0 causes the control to return to the individual devices diagnostic menu.

```
Serial I/O Check
  1 --- Parameters check
  2 --- Character transport check
  0 --- Exit
Enter your selected number:_
```

Serial I/O Check Menu

• Parameters check

This program tests the parameters such as the baud rate, parity check, stop bit, and word length.

If the internal serial I/O is connected, the following message appears:

```
  1 --- Standard serial I/O
  2 --- Internal serial I/O
  0 --- Exit
Enter your selected number:_
```

Select a serial I/O which is to be tested.

Parameters are checked automatically in the following order.

1. Checks the baud rate, 110 to 9600 baud, with the parity check set to none, stop bit to 1, and word length to 8 bits.
2. Checks the word length 7 bits and 8 bits with the parity check set to none and the stop bit to 1. Next, the same check is done with the stop bits at two (fixed to the 9600 baud).
3. Checks the word length 7 bits and 8 bits with the parity check set to odd and the stop bit to 1. Next, the same check is done with the stop bits at two (fixed to the 9600 baud).
4. Checks the word length 7 bits and 8 bits with the parity check set to even and the stop bit to 1. Next, the same check is done with the stop bits at two (fixed to the 9600 baud).

NOTE: Test data 0 to 7FH is used for the word length 7 bits and 0 to FFH for the word length 8 bits.

• Character transport check

This program tests the character data entered on the keyboard are sent and received via the loopback connector and the received data are displayed on the screen.

If the serial I/O is connected, the following message appears:

```
  1 --- Standard serial I/O
  2 --- Internal serial I/O
  0 --- Exit
Enter your selected number:_
```

Select a serial I/O which is to be tested.

Communication parameter must be entered first in the setup menu.

As entry of characters to be transmitted will be prompted after the program started, you may enter 60 strokes of any character at a maximum. Depression of the ENTER key starts the test and transmission takes place according to the parameter programmed in the setup menu. The received data are displayed.

The test terminates when the ESC key is depressed and the control returns to the serial I/O check menu.

• Error message

* COMMUNICATION MODE ERROR
SIQ test is made with the modem card (CE-451M) communication mode set to Modem mode.
* COM1 (or 2): BAUD RATE = xxx0bps - <Error kind>
During COM1 (or 2) baud rate parameter check, the error displayed in <Error kind> occurs.
* COM1 (or 2): PARITY, STOP BIT, WORD LENGTH = x, y, z - <Error kind>
During COM1 (or 2) parameter check, when parity, stop bit, and word length are respectively x (= none, odd, or even), y (= 0 or 1), z (= 7 or 8), the error displayed in <Error kind> occurs.
* COM1 (or 2): CHARACTER TRANSPORT - <Error kind>
During COM1 (or 2) character transport check, the error displayed in <Error kind> occurs.

<Error kind>

- SD TIMEOUT
Response to the transmit data is not found within the prescribed time.
- RD TIMEOUT
Response to the receive data is not found within the prescribed time.
- TRANS REG NOT EMPTY
The transmitter shift register failed to go empty.
- OVERRUN ERROR
Character is received when the receive buffer is fully occupied with characters.
- FRAMING ERROR
0 is found for the stop bit.
- PARITY ERROR
A parity error is met.
- DATA COMPARE ERROR
Received data did not match with the transmit data.

5-1-9. Modem Check

With this test program the modem (CE-451M) is tested after setting the modem interface to the loopback test mode.

If the serial port adapter (RC-232C or modem) was not installed when this program is chosen, the following message is displayed.

```
Serial Port Adapter is not installed.
```

If the serial I/O card (CE-451B) was installed, the following message is displayed.

```
Modem Adapter is not installed.
```

If the mode is not for the modem even though the modem card (CE-451M) was installed, the following message is displayed.

```
Set Communication Mode to Modem.
```

In this event, the mode must be set to the modem at the setup menu with the individual devices diagnostic menu displayed.

The following sub-menu is displayed when the modem adapter is installed. Depression of 1 starts to test the modem. Depression of 0 causes the control to return to the individual devices diagnostic menu.

```
Modem Check
   1 --- Loop back check
   0 --- Exit
Enter your selected number:_
```

Modem Check Menu

• Loopback check

This program is used to test the modem by sending and receiving the data with the modem interface set in the loopback test mode.

First, the communication parameter must be set at the setup menu.

The modem is tested in the following order after the test is started.

1. The modem interface is set in the loopback test mode.
2. Using the parameter chosen in the setup menu, the test data 0 thru 7FH are sent and received to verify.
3. The control returns to the command mode to be ready for the initial setup.

• Error message

- COMMUNICATION MODE ERROR
Modem test is made with the modem card (CE-451M) communication mode set to Modem mode.
- COM1 (or 2): LOOP BACK - <Error kind>

<Error kind>

- SD TIMEOUT
Response to the transmit data is not found within the prescribed time.
- RD TIMEOUT
Response to the receive data is not found within the prescribed time.
- TRANS REG NOT EMPTY
The transmitter shift register failed to go empty.
- OVERRUN ERROR
Character is received when the receive buffer is fully occupied with characters.
- FRAMING ERROR
0 is found for the stop bit.
- PARITY ERROR
A parity error is met.
- DATA COMPARE ERROR
Received data did not match with the transmit data.

5-1-10. Liquid Crystal Display Check

This program tests the LC display function by displaying the LCD test pattern on the screen. If the display mode and the system console are not set up to CGA, the following message is displayed.

```
Set Display Mode to Graphics and Console to CGA.
```

In this event, set the display mode to graphics and the system console to CGA at the setup menu with the individual devices diagnostic menu displayed. If the display mode has been set to graphics and the system console to CGA, the following sub-menu is displayed.

Choose and type the desired item number.

Depression of 0 causes the control to return to the individual devices diagnostic menu.

```
Liquid Crystal Display Check
   1 --- Check pattern
   2 --- Line move
   3 --- Stripe
   0 --- Exit
Enter your selected number: _
```

Liquid Crystal Display Check Menu

• Check pattern

This program displays the check pattern on the display.

First, all display dots are displayed. Next, the test patterns of single dot, two dots, four dots, and eight dots intervals are displayed and their reverse videos. The above procedure is repeated again.

- **Stripe**

With this test program stripe is displayed vertical and horizontal stripes are displayed including reverse video (four patterns).

Visually check the pattern displayed on the screen.

When the SPACE bar is pushed in a middle of the test, the test execution suspends. With the depression of the SPACE bar again, the test resumes. The test terminates by the depression of the ESC key and the control returns to the liquid crystal display check menu.

5-1-11. Hardware Installation

With this program the devices connected to the PC-4500 are checked for installation.

When this item is selected, all the installed devices appear on the screen.

The following are the names of possible devices:

```
Hardware installation
  System Board
  Real Time Clock & Setup RAM
  Main Memory (indicated by kilobytes)
  Keyboard
  Liquid Crystal Display
  Monochrome CRT Adapter
  Color/Graphics CRT Adapter
  1, 2, or 3 Floppy Disk Drive(s), Adapter
  Printer Adapter
  Serial I/O Card
  Modem Card
  Co-processor
  Hard Disk Drive, Adapter
  ROM Disk Board
  EMS Card
```

Hardware Installation Display

5-2. FLOPPY DISK DIAGNOSTICS

(1) Outline

The FLOPPY DISK DIAGNOSTICS program serves to test the function of the floppy disk drive(s), which is referred to as FDD, hereinafter. The internal 3-1/2" FDD and the external 5-1/4" FDD can be tested.

The capacity of diskette, drive number, cylinder number, and sector number on the display may be varied according to the drive and diskette under test.

(1.1) Test Menu Display

When this program is started up, the system displays the title and the floppy disk program test menu as shown in Fig.FDD-1.

This display is referred to as the FDD test menu.

```
Floppy Disk Diagnostics
  (0) Read drive status
  (1) FDD Write, read & compare
  (2) FDD Read only
  (3) 00 Track sensor adjustment
  (4) Tracking adjustment
Enter your selected number: ▩
```

Fig. FDD-1 FDD Test Menu

(1.2) Selection of Test Menu

Enter the required test number on the test menu as follows:

[[0]] to [[4]] (1 digit).

(1.3) Exiting Test Menu

When [[ESC]] is entered before entering [[↵]], control exits to the DIAG LOADER.

(1.4) Inserting Test Disk

When selecting one diagnostic program except for (0) Read drive status, the system displays the following message. At the time, insert the test disk in the FDD to be tested. When testing two FD drives, insert the two test disks.

```
Please set testing media.
```

When inserting the test disk(s) into the FD drive(s) and pressing [[↵]], the system starts testing the FD drive(s). While the system is testing the FD drive(s) under this status, if [ESC]] is pressed, control exits to the FDD test menu (Fig.FDD-1).

Capacity and number of Sector in the Both Drive A, Drive B, and Drive C will be indicated on the Display as shown below, then each menu will start.

```
Drive A: 720KB  Drive B: 720KB  Drive C: 360KB
```

(1.5) Others

Parameters of each test program are entered through numeric key + [[↵]]. When each test program is called, by pressing the [ESC]], control exits to the FDD test menu (fig.FDD-1).

(2) Description of Program

(2.1) Read Drive Status

(2.1.1) Outline

This program serves to display the status of the FDD on the screen.

(2.1.2) Operation

When specifying this test, the system displays the current status of the FD drive. While this program is executing, the system periodically detect some status change, it causes the buzzer to sound and displays the new status on the screen.

With this test, the status of the FDD is displayed. When [[ESC]] or [[↵]] is entered, control exits to the FDD test menu (Fig.FDD-1).

(2.2) FDD Write, Read, and Compare

(2.2.1) Outline

This test serves to check that the write/read operation is properly perform in such a manner that the system writes data to the floppy disk, reads the same data from the floppy disk, and then compares them. (The data to be written is 00 to FF increment pattern when the number of times test pass is 000; otherwise the data is 4-byte repetitive pattern of "EB6DB6DB".

The program causes all cylinders from 01 to 79 to be tested.

```
When this test is conducted, all the contents stored in the
disk are destroyed. So be very careful with this test.
In addition, it is necessary to release "Write Protect",
when execute this test.
```

(2.2.2) Operation

(a) Specification of Device

(a.1) Specification of Test Drive

```
Drive A test ? [0:Yes, 1:No] = ▩
Drive B test ? [0:Yes, 1:No] = ▩
Drive C test ? [0:Yes, 1:No] = ▩
```

Specify the FDD name to be tested.

If A and B were both chosen, A will be tested first, then B. And, the same will be repeated without testing C. If only C is chosen, test will be repeated for C only.

If the FD drive being specified is in the Not ready state, the system displays the following message on the lower screen and stops testing the FD drive.

```
"Drive not ready"
```

At the time, by pressing [[ESC]], control exits to the FDD test menu (Fig.FDD-1).

(a.2) Specification of Range of Cylinders to Be Tested

```
Cylinder scope ?
[01 <—> 79] = ▒▒ - ▒▒
```

Specify the range (scope) of the cylinder to be tested by entering the first cylinder number and the last cylinder number. For example, when entering "10 - 12" if the test disk is the 09 sectors/track format, the test range from 10.0.01 to 12.1.09 is specified.

When entering both cylinder number are [[↵]] only or [[0]] + [[↵]], the entire range of cylinders is specified. In this case, if a 09 sectors/track format disk is used, cylinders from 01.0.01 to 79.1.09 are specified.

(a.3) Specification of Counting Sectors

Specify the number of counting sectors capable of being processed by one instruction.

This counting value depends on the disk format for use. For example, when a 09 sectors/track format disk is used, the system displays the following message.

```
Sector count ?
[1, 3, 9] = ▒
```

If other value which is not displayed is entered, the system does not accept such a value and requires proper data entry once again.

When entering [[0]] to [[↵]] or only [[↵]], assuming that the maximum value of the sector count is specified, the system executes the next program.

(a.4) Specification of Read after Write

```
Read after write ?
[0: Yes, 1: No] = ▒
```

Specify whether to perform the read-after-write procedure. To perform the read-after-write procedure, press [[0]]. Otherwise, press [[1]].

(b) Test

(b.1) Specification of Number of Times Retry

```
Retry count ? [0 <—> 4] = ▒
```

Specify the number of times retry.

While the system reads/writes data from/to the disk, if it detects an error (including an error caused in the read-after-write test), it tries to perform the same operation for the number of times specified.

(b.2) Specification of Error Stop

```
Error stop ? [0: Yes, 1: No] = ▒
```

If an error occurs while conducting the test, specify whether to abort or continue the test.

(b.3) Confirmation of Test Execution

```
Test start ? [0: Yes, 1: No] = ▒
```

Confirm whether to execute the test or not.

When entering [[1]], control exits to (a.1) "Specification of Test Drive" mentioned in (a.1). On the other hand, when entering [[0]], starts the test.

The lower left screen shows the number of times test pass and physical address "TTHSS".

```
Pass count =▒▒▒▒▒  Test mode: Write Test drive: Drive A
TTHSS =    ▒▒▒▒▒
```

In addition, the right end of the screen shows the number of occurrence of errors in each type.

(b.4) Abortion and Completion of Test

By pressing [[ESC]] while the system executes the test, control exits to the FDD test menu (Fig.FDD-1); by pressing [[SPACE]], the system displays the following message on the lower left screen and aborts the test.

```
"Test stopped by user."
```

At the time, by pressing [[SPACE]], the system continues the test; by pressing [[ESC]], control exits to the FDD test menu (Fig.FDD-1).

(c) Error Processing

(c.1) Read/Write Error

If the system detects an error after it conducts the test until it starts the seek operation, it stops the test irrespective of "Yes" or "No" of the error stop described in (b.2). At the time; by pressing [[ESC]], control exits to the FDD test menu (Fig.FDD-1).

If the system detects an error while it conducts the read/write check test, it displays the kind of error and where the error occurs and increments the right-hand error counter. If the error stop is set to "No", the system updates the error counter every time an error occurs and continues to conduct the test (the system only displays the newest error information).

On the other hand, if the error stop is set to "Yes", the system stops the test if an error occurs. At the time, by pressing [[↵]], the system continues the test.

On the other hand, by pressing [[ESC]], control exits to the FDD test menu (Fig.FDD-1).

For details of error message, see (3).

(c.2) Compare Error

If the system detects an error when it writes data in the write mode, reads the data, and compares them, it displays the error on the lower right screen.

```
Compare error
Adrs [0x] = ▒▒▒▒
Data [0x] = DBB6 <—> ▒▒▒▒
```

When the error stop is set to "No", the system updates the error message whenever it detects an error. (The screen shows the newest error information.)

The system updates the error counter whenever it detects an error. Therefore, it displays the number of occurrences of errors in the unit of 4 bytes.

While the Error Stop is set to "Yes", the system stops the test when it detects an error. In this state, when pressing [[ENTER]], the system compares the next data. If the system does not detect an error, it continues the test. On the other hand, when pressing [[ESC]], control exits to the FDD test menu (Fig.FDD-1).

Data comparison is conducted every 4 bytes. In the following the meaning of the display is described.

Adrs [0x] = 0004 ... Top address at which the system detects a comparison error.

Data = DBB6 <-> D8B6

Write data Read data

In the preceding example, the data includes an error at the second byte. This address becomes address 0005.

(2.3) FDD Read Only

(2.3.1) Outline

This program serves to check that data is properly read from the floppy disk.

The system tests the entire area of cylinders from 01 to 39.

(2.3.2) Operation

(a) Specification of Device

(a.1) Specification of Test Drive

```
Drive A test ? [0:Yes, 1:No] = X
Drive B test ? [0:Yes, 1:No] = X
Drive C test ? [0:Yes, 1:No] = X
```

Specify the FDD name to be tested.

If A and B were both chosen, A will be tested first, then B. And, the same will be repeated without testing C. If only C is chosen, test will be repeated for C only.

If the FD drive being specified is in the Not ready state, the system displays the following message on the lower screen and stops testing the FD drive.

```
"Drive not ready"
```

At the time, by pressing [[ESC]], control exits to the FDD test menu (Fig.FDD-1).

(a.2) Specification of Range of Cylinders to Be Tested

```
Cylinder scope ?
[01 <—> 79] = XX - XX
```

Specify the range (scope) of the cylinder to be tested by entering the first cylinder number and the last cylinder number. For example, when entering "10 - 12" if the test disk is the 09 sectors/track format, the test range from 10.0.01 to 12.1.09 is specified.

When entering both cylinder number are [[↵]] only or [[0]] + [[↵]], the entire range of cylinders is specified. In this case, if a 09 sectors/track format disk is used, cylinders from 01.0.01 to 79.1.09 are specified.

(a.3) Specification of Counting Sectors

Specify the number of counting sectors capable of being processed by one instruction.

This counting value depends on the disk format for use. For example, when a 09 sectors/track format disk is used,

```
Sector count ?
[1, 3, 9] = X
```

If other value which is not displayed is entered, the system does not accept such a value and requires proper data entry once again.

When entering [[0]] to [[↵]] or only [[↵]], assuming that the maximum value of the sector count is specified, the system executes the next program.

(b) Test

(b.1) Specification of Number of Times Retry

```
Retry count ? [0 <—> 4] = X
```

Specify the number of times retry.

While the system reads data from the disk, if it detects an error (including an error caused in the read-after-write test), it tries to perform the same operation for the number of times specified.

(b.2) Specification of Error Stop

```
Error stop ? [0: Yes, 1: No] = X
```

If an error occurs while conducting the test, specify whether to abort or continue the test.

(b.3) Confirmation of Test Execution

```
Test start ? [0: Yes, 1: No] = X
```

Confirm whether to execute the test or not.

When entering [[1]], control exits to (a.1) "Specification of Test Drive" mentioned in (a.1). On the other hand, when entering [[0]], starts the test.

The lower left screen shows the number of times test pass and physical address "TTHSS".

```
Pass count = XXXXX   Test mode: Write Test drive: Drive A
TTHSS =      XXXXX
```

In addition, the right end of the screen shows the number of occurrence of errors in each type.

(b.4) Abortion and Completion of Test

By pressing [[ESC]] while the system executes the test, control exits to the FDD test menu (Fig.FDD-1); by pressing [[SPACE]], the system displays the following message on the lower left screen and stops the test.

```
"Test stopped by user."
```

At the time, by pressing [[SPACE]], the system continues the test. Whereas, by pressing [[ESC]], control exits to the FDD test menu (Fig.FDD-1).

(c) Error Processing

If the system detects an error after it conducts the test until it starts the seek operation, it stops the test irrespective of "Yes" or "No" of the error stop described in (b.2). At the time; when pressing [[ESC]], control exits to the FDD test menu (Fig.FDD-1).

If the system detects an error while it conducts the read check test, it displays the kind of error and where the error occurs and increments the right-hand error counter. If the error stop is set to "No", the system updates the error counter every time an error occurs and continues to conduct the test (the system only displays the newest error information).

On the other hand, if the error stop is set to "Yes", the system stops the test if an error occurs. At the time, when pressing [[ENTER]], the system continues to conduct the test. Whereas, pressing [[ESC]], control exits to the FDD test menu (Fig.FDD-1).

For details of error message, see paragraph (3).

(2.4) 00 Track Sensor Adjustment

(2.4.1) Outline

This program serves to check that the 00 track sensor which detects the cylinder 0 by seeking the head positioned at the cylinder 0 to cylinder 4 and by returning the head back to the cylinder 0.

(2.4.2) Operation

When specifying this test, enter the proper data to prompts displayed sequentially.

(a) Specification of Device

(a.1) Specification of Test Drive

```
Test drive ? [0: Drive A, 1: Drive B, 2: Drive C] = ▒
```

Specify the FD drive name to be tested.

Press [[0]] to test the Drive A; press [[1]] to test the Drive B. At the time, by pressing [[ESC]], control exits to the FDD test menu (Fig.FDD-1).

(a.2) Specification of Aging Mode

```
Aging mode? [0: Yes, 1: No] = ▒
```

When [0] is entered, test will continue to repeat. If [1] is entered, the test will be done only once.

(a.3) Confirmation of Test Execution

```
Test start ? [0; Yes, 1: No] = ▒
```

Confirm whether to execute the test or not.

When entering [[1]], control exits to (a.1) "Specification of Test Drive" mentioned in (a.1). On the other hand, when entering [[0]], the system starts the test.

(b) Test

(b.1) Moving Head

The system moves the head from the cylinder 0 to cylinder 4 and returns the head to the cylinder 0. With such an operation, the system can observe a signal from the 00 track sensor as a pulse.

(b.2) Abortion and Completion Test

In the aging mode by pressing [[ESC]], control exits to the FDD test menu (Fig.FDD-1).

Otherwise, the system displays the following message and stops testing the FD drive.

```
ESC: end, Enter: continue?
```

ESC: represents [[ESC]]. By pressing this key, control exits to the FDD test menu (Fig.FDD-1).

Enter: represents [[↵]]. By pressing this key, control proceeds to Paragraph (b.1).

(c) Error Processing

While the FDD is operating or while the system executes the program, if an error occurs, the system displays the kind of error where the error took place.

```
(error message)
```

In this state, by pressing [[ESC]], control exits to the FDD test menu (Fig.FDD-1).

For details of error messages, see (3).

(2.5) Target sector read

(2.5.1) Outline

This program is used to continue reading the specific sector for checking a trouble in the media or drive unit.

(2.5.2) Operation

When specifying this test, enter the proper data to prompts displayed sequentially.

(a) Specification of Device

(a.1) Specification of Test Disk

```
What kind of the testing disk do you use ?
[Alignment disk: 0, Formatted disk: 1] = ▒
```

Specify the disk to be tested.

Push "0" to use the alignment disk.

Push "1" to use the format disk.

When the alignment disk is selected, "a.5" Specification of sector range is not displayed.

(a.2) Specification of Test Drive

```
Test drive ? [0: Drive A, 1: Drive B, 2: Drive C] = ▒
```

Specify the FD drive name to be tested.

Press [[0]] to test the Drive A; press [[1]] to test the Drive B. If the FD drive being specified is in the Not ready state, the system displays the following message on the lower screen and stops testing the FD drive.

```
"Drive not ready."
```

At the time, by pressing [[ESC]], control exits to the FDD test menu (Fig.FDD-1).

(a.3) Specification of Cylinder to be Tested

```
Cylinder No. ? [01 <—> 79] = ▒▒
```

Specify the cylinder number to be tested in the range of 00 to 79. The system does not accept other cylinder numbers and required re-entry.

(a.4) Specification of Head

```
Head select ? [0: Side 0, 1:Side 1] = ▒
```

Specify which head is tested.

When testing the side 0, enter [0] when testing side 1, enter [1].

(a.5) Specification of Sector Range

```
Sec. scope ? [1 <—> 9] = ▒ - ▒
```

Specify the range of the sectors to be read, namely the first sector number and the last sector number. For example, when entering "5-7", data is read from the sector 5 to the sector 7.

(a.6) Specification of Error Stop

```
Error stop? [0: Yes, 1: No] = ▒
```

If an error occurs while conducting the test, specify whether to abort or continue the test. When the alignment disk is used, input [1].

(b) Test

(b.1) Confirmation of Test Execution

```
Test start ? [0: Yes, 1: No] = X
```

Confirm whether to execute the test or not.

When entering [[1]], control exits to "Specification of Test Drive" mentioned in (a.1). On the other hand when entering [[0]], the system starts the test.

(b.1.1)

The lower left screen shows the number of times test pass and physical address "TTHSS".

```
Pass count = XXXXX
TTHSS = XXXXX    Test mode: Write Test drive: Drive A
```

In addition, the right end of the screen shows the number of occurrence of errors in each type.

(b.2) Abortion and Completion of Test

By pressing [[ESC]] while the system executes the test, control exits to the FDD test menu (Fig.FDD-1); by pressing [[SPACE]], the system displays the following message on the lower left screen and stops the test.

```
"Test stopped by user."
```

At the time, by pressing [[SPACE]], the system continues the test. Whereas, by pressing [[ESC]], control exits to the FDD test menu (Fig.FDD-1).

(c) Error Processing

If the system detects an error after it conducts the test until it starts the seek operation, it stops the test. At the time, when pressing [ESC], control exists to the FDD test menu (Fig. FDD-1).

If the system detects an error while it conducts the test, it displays the kind of error and where the error occurs. (the system only displays the newest error information).

If an error occurs, the system stops the test. At the time, when pressing [ENTER], the system continues to conduct the test. Whereas, pressing [ESC], control exits to the FDD test menu (Fig. FDD-1).

For details of error messages, see the following paragraph (3).

(2.6) Error table dispaly

(2.6.1) General

All error kinds, error locations, and error counts are displayed for (1) Write, read, compare and (2) Read only. However, error information is limited to 44 locations.

(2.6.2) Operation

The test starts immediately without any key operation.

(a) Error information are displayed.

When no error is occurred, the error message will not be displayed.

(2.6.3) Termination

Depression of the [ESC] or [ENTER] key causes the control to return to the DSK test menu (Fig. FDD 1).

(3) Error Messages

(3-1) Error during the execution of test

The following is displayed on the lower side of the screen when an error is occured during the executing of the task.

This indicates the location of error found and the kind of error.

```
Error occurred
drive: X, track: XX, head: X, sector: XX
(error message)
```

(3-2) Error messages

- FDC busy
  Aread or write command is in process.
- FDC seek error
  The system received a FAULT signal from the device or the seek operation was abnormally completed.
- Communication error
  Handshake error occurred between the CPU and FDC.
- Equipment check
  The system received a FAULT signal from a device or did not detect a track 00 signal in the specified time period while the recalibrate operated.
- Missing address mark
  The address mark in the ID section was not detected.
- FDC no data
  The ID without CRC error was not detected.
- FDC invalid command
  A command written to the FDC was invalid.
- Drive not ready
  The device being specified was in the not ready state.
- Record not found
  The sector specified in the ID field could not be detected in the track.
- DMA boundary error
  DMA error across 64KB boundary.
- Write protected error
  The system detected write protection.
- Seek error
  Shows the occurrence of a error during seek.
- Bad controller
  Shows the occurrence of any abnormality in the controller.
- Bad address mark
  Shows the occurrence of an address mark read error.
- Bad CRC error
  Shows the occurrence of an CRC error during data error.
- Bad command error
  A command was specified which was not in BIOS.
- Compare error
  Data being written did not accord with data being read.
- Other error
  Shows the occurrence of other errors not described above.

5-3. Hard disk diagnostics

(1) General

The Hard Disk diagnostics are the program used to test functions of this computer hard disk.

(1-1) Test menu display

When the program is started, the hard disk test menu is displayed along with the caption (Fig.DSK-1). This display message is called "DSK test menu".

```
Hard Disk Diagnostics
  (0) Read drive type
  (1) Write, read & compare
  (2) Read only
  (3) Hard initializer
  (4) Bad initializer
  (5) Random seek
  (6) Ascii/Head dump
  (7) Dump and Patch
  (8) Check Sector buffer & Disk controller
  (9) Error table display
Enter your selected number: X
```

Fig. DSK-1 DSK test menu

(1-2) Test menu choice

Enter the desired test item number in the following manner:

Single digit of [0] thru [9].

Depression of the [ESC] key before the depression of the numeric key causes the control to return to the DIAG LOADER program.

(1-3) Others

Parameters for the test menu must be done with a numeric key + [ENTER].

The control will return to Fig.DSK-1 with depression of the [ESC] key when the test program is on.

(2) Test item description

(2-1) Read drive type

(2-1-1) General

This test item checks the hard disk drive and interrogates the disk type.

(2-1-2) Operational procedure

When this test item is chosen, it checks if the disk drive is ready.

The disk capacity, cylinder numbers, head numbers, and sector numbers are displayed.

With this program, the hard disk drive information are obtained.

Depression of the [ESC] or [ENTER] key causes the control to return to the DISK test menu (Fig.DSK-1).

(2-2) Write, read, & compare

(2-2-1) General

After writing the test data on the hard disk, the data are then read and compared if the write and read have been conducted successfully.

Incremental pattern of 00 thru FF is used for the test data when the test count is "0000", then two bytes of "CB33" are used thereafter.

All cylinders from the cylinder 000 thru 613 can be tested.

The test required time may vary depending on the type of the drive unit.

> Pay attention before the execution of this task, as it destructs an entire contents of the hard disk once the test is done.

(2-2-2) Operational procedure

Normally, the test will be carried out for cylinder range 0 thru 613, sector count at 17, single retrial, and without an error stop (1: No).

(a) Test

(a-1) Cylinder test range

```
Cylinder scope ?
[000 -- 613] = XXX - XXX
```

The cylinder testing range must be specified.

The test takes place from the beginning of the first specified cylinder number to the end of the second specified cylinder number.

(a-2) Sector count

```
Sector count ?
[01 <—> 17] = XX
```

Enter the sector testing range to be tested with a single command.

Depression of the [0] key with the [ENTER] or mere depression of the [ENTER] key will assume the maximum range which is "16".

(a-3) Retrials

```
Retry count ? [0 <—> 7] = X
```

The number of retrials must be specified.

When an error has been encountered during the read/writer test, retrials will be conducted as many times as specified here.

(a-4) Error stop choice

```
Error stop ? [0: Yes, 1: No] = X
```

It must be specified whether the test is to be interrupted or not when an error is encountered in a middle of the read/write test.

(a-5) Start

```
Test start ? [0: Yes, 1: No] = X
```

Start of the test must be acknowledged.

Entry of [1] causes the control to return to (a-1) for an entry again.

Entry of [0] starts the test.

Test pass count and physical address [CCCHHSS] are displayed on the lower left side of the screen with the test to the right of it.

A hexadecimal number is used to represent the pass count and the binary address, and an octal number is used to represents the physical address.

```
Pass count = XXXXX                    Test mode: Write
CCC.HH.SS = XXX.XX.XX
```

On the right side of the screen is displayed the number of errors by error kinds using hexadecimal figure.

(a-6) Termination

Depression of the [ESC] key causes the control to return to the DSK test menu (Fig.DSK-1).

Depression of the [SPACE] key interrupts the test with the following message on display.

```
"Test stopped by user."
```

If the [SPACE] key is pressed while the above message is on, the test resumes.

If the [ESC] key is pressed, the control returns to the DSK test menu (Fig.DSK-1).

(b) Error processing

(b-1) Read/write related error

If an error occurred before the seek operation after the test started, the test will be terminated irrespective of (a-4) "Error stop choice".

Depression of the [ESC] key causes the control to return to the DSK test menu (Fig.DSK-1).

When an error was met during the read/write test, the command parameter and the status of the error are displayed and the error count displayed to the right is then incremented. If the error stop choice is "No", the test continues after revising the display every time an error occurred. (In this case, only the currently encountered error is displayed.)

If the error stop choice is "Yes", the test is interrupted immediately upon occurrence of an error. In this case, the test can be resumed with the depression of the [ENTER] key. If the [ESC] key is pressed, the control then returns to the DSK test menu (Fig.DSK-1).

See the error message list which is attached to this text.

(b-2) Compare related error

When an unmatch is encountered in verifying the test data, the location and the unmatch data are displayed.

```
Compare error
Adrs [0x] = XXXX
Data [0x] = 33CB - XXXX
```

If the error stop choice is "No", the test continues after revising the display every time an error occurred. (In this case, only the currently encountered error is displayed.)

The error count is revised every time an error is met, whose count is in terms of two bytes.

If the error stop choice is "Yes", the test is interrupted immediately upon occurrence of an error. In this case, the test can be resumed with the depression of the [ENTER] key. If the [ESC] key is pressed, the control then returns to the DSK test menu (Fig.DSK-1).

As verification is done in terms of two bytes, the significance is explained below for an example above.

Adrs [0x] = 0004

The top address where the unmatch is met.

Data [0x] = 33CB — 37CB

Write data Read data

In this example, it indicates there is an unmatch in the high order bytes in the address "0005".

(2-3) Read only

(2-3-1) General

By reading the data on the hard disk, test is conducted to check if the reading operation is normal.

The test can be done to all cylinders 000 thru 613.

(2-3-2) Operational procedure

Normally, the test will be carried out for cylinder range 0 thru 613, sector count at 17, single retrial, and without an error stop choice (1: No).

(a) Test

(a-1) Cylinder test range

```
Cylinder scope ?
[000 <—> 613] = XXX - XXX
```

The cylinder testing range must be specified.

The test takes place from the beginning of the first specified cylinder number to the end of the second specified cylinder number.

(a-2) Sector count

```
Sector count ?
[01 <—> 17] = XX
```

Enter the sector testing range to be tested with a single command.

Depression of the [0] key with the [ENTER] or mere depression of the [CR] key will assume the maximum range which is "17".

(a-3) Retrials

```
Retry count ? [0 <—> 4] = X
```

The number of retrials must be specified.

When an error has been encountered in reading the data, retrials will be conducted as many times as specified here.

(a-4) Error stop choice

```
Error stop ? [0: Yes, 1: No] = X
```

It must be specified whether the test is to be interrupted or not when an error is encountered in a middle of the read/write test.

(a-5) Start

```
Test start ? [0: Yes, 1: No] = X
```

Start of the test must be acknowledged.

Entry of [1] causes the control return to (a-1) for an entry again.

Entry of [0] starts the test.

Test pass count and physical address [CCCHHSS] are displayed on the lower left side of the screen with the test to the right of it.

A hexadecimal number is used to represent the pass count and the binary address and an octal number is used to represent the physical address.

```
Pass count = XXXX
                                Test mode: Read
CCC.HH.SS = XXX . XX . XX
```

On the right side of the screen is displayed the number of errors by error kinds using hexadecimal figure.

(a-6) Termination

Depression of the [ESC] key causes the control to return to the DSK test menu (Fig.DSK-1).

Depression of the [SPACE] key interrupts the test with the following message on display.

```
"Test stopped by user."
```

If the [SPACE] key is pressed while the above message is on, the test resumes.

If the [ESC] key is pressed, the control returns to the DSK test menu (Fig.DKS-1).

(b) Error processing

If an error occurred before the seek operation after the test started, the test will be terminated irrespective of (a-4) "Error stop choice".

Depression of the [ESC] key causes the control to return to the DSK test menu (Fig.DSK-1).

When an error was met during the read test, the command parameter and the status of the error are displayed and the error count displayed to the right is then incremented. If the error stop choice is "No", the test continues after revising the display every time an error occurred. (In this case, only the currently encountered error is displayed.)

If the error stop choice is "Yes", the test is interrupted immediately upon occurrence of an error. In this case, the test can be resumed with the depression of the [ENTER] key. If the [ESC] key is pressed, the control then returns to the DSK test menu (Fig.DSK-1).

See the error message list which is attached to this text.

(2-4) Hard initializer
(2-4-1) General

This item is used to initialize the hard disk

> Pay attention before the execution of this task, as it destructs an entire contents of the hard disk once the test is done.
> Because the initialization was done at the factory under the severe control, the quality will not be assured once it has been field initialized.

(2-4-2) Operational procedure

(a) Initialization
(a-1) Interleaving

```
Interleave factor ? [01 - 16] = XX
```

Enter the interleave factor with a number of 01 to 16.

Normally, enter 01.

(a-2) Start of initialization

```
Initialize start ? [0: Yes, 1: No] = X
```

Start of the test must be acknowledged.

Entry of [1] will cause the control to return to (a-1) "Interleaving" for an entry all over again.

Entry of [0] starts the initialization with the following message on display.

```
"Initialize start."
```

(a-3) Termination

While the initialization is under way, the [ESC] key depression is not accepted.

If the initialization has ended successfully, the following is displayed.

```
"Initialize successful."
```

Depression of the [ESC] or [ENTER] key in this stage causes the control to return to the DSK test menu (Fig.DSK-1).

(b) Error processing

If an error is met during the initialization, the following is displayed in a middle of the screen.

```
"Initialize error."
```

And the command parameter and the status of the error are displayed.

Depression of the [ESC] or [ENTER] key causes the control to return to the DSK test menu (Fig.DSK-1).

See the error message list which is attached to this text.

(2-5) Bad initializer
(2-5-1) General

With this item is set the flat in the bad sector to prohibit it from being used.

This operation is applicable to a track.

> Pay attention before the execution of this task, as it destructs an entire contents of the hard disk once the test is done.

(2-5-2) Operational procedure

(a) Bad initialize
(a-1) Cylinder

```
Cylinder ?
[000 <—> 613] = XXX
```

The cylinder number in which the bad sector exists must be specified with a number 000 to 613.

(a-2) Head

```
Head ? [0 <—> ?] = X
```

The head number must be specified.

(a.3) Interleaving

```
Interleave factor ? [01-16] = XX
```

Enter the interleave factor with a number of 01 to 16.

Normally, enter 01

(a-4) Start of the operation

```
Start ? [0: Yes, 1: No] = X
```

Start of the task must be acknowledged.

Entry of [1] causes the control to return to (a-1) for an entry again.

Entry of [0] starts the task.

(a-5) Termination

The task is conducted to a track. After the task has been done, accessing of the track is prohibited thereafter.

If the task has ended successfully, the following is displayed.

```
"Bad initialize complete."
```

Depression of the [ESC] or [ENTER] key in this stage causes the control to return to the DSK test menu (Fig.DSK-1).

(b) Error processing

If an error is met during the task, the following is displayed in a middle of the screen.

```
"Bad initialize error."
```

And the command parameter and the status of the error are displayed.

Depression of the [ESC] or [ENTER] key causes the control to return to the DSK test menu (Fig.DSK-1).

See the error message list which is attached to this text.

(2-6) Random seek
(2-6-1) General

The head seeks sectors at random to check proper seek and read operations of the sectors.

(2-6-2) Operational procedure

(a) Test

(a-1) Error stop choice

```
Error stop ? [0: Yes, 1: No] = X
```

It must be specified whether the test is to be interrupted or not when an error is encountered in a middle of the read/write test.

(a-2) Start

```
Test start ? [0: Yes, 1: No] = X
```

Start of the test must be acknowledged.

Entry of [1] causes the control to return to (a-1) for an entry again.

Entry of [0] starts the test with Fig.DSK-2 on display.

Physical address [CCCHHSS] and error counter are displayed on the middle of the screen.

A hexadecimal number is used to represent the binary address and error count, and an octal number is used to represent the physical address.

```
CCC.HH.SS =  XXX.XX.XX
Error count =XXXXX
```

(a-3) Termination

Depression of the [ESC] key in a middle of the operation causes the control to return to the DSK test menu (Fig.DSK-1).

Depression of the [SPACE] key interrupts the test with the following message on display.

```
"Test stopped by user."
```

If the [SPACE] key is pressed while the above message is on, the test resumes.

If the [ESC] key is pressed, the control returns to the DSK test menu (Fig.DKS-1).

(b) Error processing

If an error occurred before the seek operation after the test started, the test will be terminated irrespective of (a-1) "Error stop choice".

Depression of the [ESC] key causes the control to return to the DSK test menu (Fig.DSK-1).

When an error was met during the read or seek operation, the command parameter and the status of the error are displayed.

If the error stop choice is "Yes", the test resumes after incrementing the error count.

If it is "No", the test is interrupted, immediately upon occurrence of an error. In this case, the test can be resumed with the depression of the [ENTER] key. If the [ESC] key is pressed, the control then returns to the DSK test menu (Fig.DSK-1).

See the error message list which is attached to this text.

(2-7) Ascii/Hexa dump

(2-7-1) General

The contents of the disk are displayed (dumped) on the screen.

The contents of a sector (512KB) is displayed in two parts; the first half (256KB) and the second half (256KB).

On the left of the screen is displayed in the hexadecimal figure with the character itself to right of it.

(2-7-2) Operational procedure

(a) Dump

(a-1) Choice of dump address

```
Physical address [CCC.HH.SS] =  XXX . XX . XX
```

Enter the dumping disk address in terms of the physical address.

Depression of the [ESC] key causes the control to return to the DSK test menu (Fig.DSK-1).

When the entry has been complete, the screen appears with the data of the specified sector on the screen.

(a-2) Termination

The following is displayed on the lower left of the screen, when the task is complete.

```
ESC: end, Enter: next half, Space: start ?
```

Or,

```
ESC: end, Enter: next sector, Space: start ?
```

ESC: indicates the [ESC] key which causes the task terminated when depressed and the control then returns to the DSK test menu (Fig.DSK-1).

Enter: indicates that the [ENTER] key which brings on the screen a next sector or a second half of the sector now on display.

Space: indicates the [SPACE] key which permits to start the entry from (a-1) all over again.

(b) Error processing

The task terminates unconditionally when an error is met, and the command parameter and the error status are displayed on the lower right of the screen.

Depression of the [ENTER] key in this stage resumes the test.

Depression of the [ESC] key causes the control to return to the DSK text menu (Fig.DKS-1).

See the error message list which is attached to this text.

(2-8) Dump and patch

(2-8-1) General

With this task, the contents of the disk are displayed on the screen to be patched up.

The contents of a sector (512KB) are displayed in the hexadecimal figure in two parts: the first half (256KB) on the left side of the screen and the second half (256KB) on the right side.

(2-8-2) Operational procedure

(a) Patch

(a-1) Choice of patch address

```
Physical address [CCC.HH.SS] =  XXX . XX . XX
```

Enter the disk address in which patchup is required in terms of the physical address.

Depression of the [ESC] key causes the control to return to the DSK test menu (Fig.DKS-1).

When the entry has been complete, the screen appears with the dump data on display.

(a-2) Termination

The following is displayed on the lower left of the screen, when the task is complete.

```
Write address [0x] = XXX ESC: end, Space: write
```

And the control now awaits for an entry of the write address. Function keys displayed on the right are valid.

ESC: indicates the [ESC] key which causes the task terminated when depressed and the control then returns to the DSK test menu (Fig.DSK-1).

Space: indicates the [SPACE] key which writes the data currently on display, after which time the control moves to (a-4).

(a-3) Data write mode

As it is repetitive in the data write mode, continuous entry becomes possible if the data address is consecutive.

To change the data in "0x145", enter [1], [4], and [ENTER]. With this, the part of the respective ASCII screen is erased and the entry is then requested.

For the data are still remaining even after the erasure of the ASCII screen, it permits to restore the previous data with the depression of the [SPACE] key.

The following message appears in the lower right side of the screen when the entry is complete.

```
ESC: end, Enter: store, Space: exit
```

ESC: indicates the [ESC] key which causes the task terminated when depressed and the control then returns to the DSK test menu (Fig.dsk-1).

Enter: indicates the [CR] key which completes the entry.

Space: indicates the [SPACE] key which permits to exit from the data write mode and control returns to (a-2).

(a-4) Patch termination and write to disk

When write is commanded to the disk with the [SPACE] key, the following screen is displayed.

```
Write start ? [0: Yes, 1: No] = X
```

Depression of [0] brings the following message displayed after writing data onto the disk.

Depression of [1] the same is displayed without any action.

```
ESC: end, Enter: next, Space: start ?
```

ESC: indicates the [ESC] key which causes the task terminated when depressed and the control then returns to the DSK test menu (Fig.DSK-1).

Enter: indicates the [ENTER] key which comes to dump a next data on the screen for patchup, then it moves to (a-2).

Space: indicates the [SPACE] key which causes the control to return to (a-1) for an entry again from the address entry.

(b) Error processing

The task terminates unconditionally when an error is met, and the command parameter and the error status are displayed on the lower right of the screen.

Depression of the [ENTER] key in this stage resumes the test.

Depression of the [ESC] key causes the control to return to the DSK test menu (Fig.DKS-1).

See the error message list which is attached to this text.

(2-9) Check sector buffer and disk and controller

(2-9-1) General

This task checks the sector buffer and the disk controller.

(2-9-2) Operational procedure

(a) Test

(a-1) Start

```
Aging mode ? [0: Yes, 1: No] = X
```

If [0] + [ENTER] or simply [ENTER] is depressed, the test will repeat until the [ESC] key is depressed.

For single test execution, type [1] + [ENTER].

(a-2) Termination

The following displayed after successful termination of the test.

```
Sector buffer ... OK !!
Controller ... OK !!
```

If it is not in the aging mode, the test is terminates after the following was displayed. But, if in the aging mode, the test will be repeated until the [ESC] key is depressed.

```
ESC: end, ENTER: retry ?
```

Depression of the [ESC] key causes the control to return to the DSK test menu (Fig.DSK-1).

Depression of the [ENTER] key causes the control proceeds to paragraph (a-2).

If an error was met, it will be alerted with "Compare error!" or "Error !", instead of "OK !!".

(b) Description

(b-1) Sector buffer

The sector buffer (512KB) is checked by comparing the test data written and read.

The test data of an incremental pattern of "00" to "FF" are used for the first time, "55" for the second time, and "AA" for the third time.

(b-2) Disk controller

Register within the disk controller is checked.

(2-10) Error table display

(2-10-1) General

All error kinds, error locations, and error counts are displayed for (1) Write, read, compare, (2) Read only, and (5) Random seek tests. However, error information is limited to 44 locations.

(2-10-2) Operation

The test starts immediately without any key operation.

(a) Error information are displayed.

When no error is occurred, the error message will not be displayed.

(2-10-3) Termination

Depression of the [ESC] or [ENTER] key causes the control to return to the DSK test menu (Fig.DSK-1).

(3) Error message

(3-1) Error before the start of the task

If the hard disk unit were not ready in executing a task thereafter will not be executed with the following message on the lower left side of the screen.

```
"Drive not ready."
```

(3-2) Error during the execution of test

The following is displayed on the lower side of the screen when an error is occurred during the execution of the task.

This indicates the location of error found and the kind of error.

```
Error occurred.
track: XXX, head: X, sector: XX
(error message)
```

(3-3) Error message

Bad command
Shows that an invalid command is received.

Bad address mark
Shows the occurrence of an address mark read error.

Record not found
Shows that the specified record is not found.

DMA boundary error
Shows the DMA error across 64KB boundary.

Bad track
Shows that a bad track is found.

Bad ECC on disk read
Shows the occurrence of an ECC error during data read.

Date corrected
A error occured but shows that the error was corrected by ECC.

Seek error
Shows the occurrence of a error during seek.

Bad controller
Shows the occurrence of any abnormality in the controller.

Timeout error
Shows that an interrupt response from the controller was not received in the prescribed time.

Compare error
Shows an unmatch of the write data with the read data.

Others error
Shows the occurrence of other errors not described above.

5-4. ROM DISK DIAGNOSTICS

(1) Outline

The ROM disk diagnostics program serves to test the function of the ROM disk board.

The capacity and cylinder number on the display may be varied according to the ROM.

(1.1) Test Menu Display

When this program is started up, the system displays the title and the ROM disk program test menu as shown in Fig.ROM-1. This display is referred to as the ROM test menu.

```
ROM Disk Diagnostics
  (0) Read & compare
  (1) ASCII/Hexa dump
Enter your selected number: X
```

Fig. ROM-1

(1.2) Selection of Test Menu

Enter the required test number as follows: [[0]] to [[1]] (1 digit).

The selected test item will be started immediately.

(1.3) Exiting Test Menu

When [[ESC]] is entered before entering the test number, control exits to the DIAG LOADER.

(1.4) Others

Parameters of each test program are entered numeric key + [[ENTER]].

When each test program is called, by pressing the [[ESC]], control exits to the ROM test menu (Fig.ROM-1).

(2) Description of Program

(2.1) Read & compare

(2.1.1) Outline

This program is to read any sectors twice to compare the first-read data and the second-read data.

(2-3-2) Operation

(a) Test

(a-1) Specification of Cylinder test range

```
Cylinder scope ?
[00 <—> 79] = XX - XX
```

Specify the range (scope) of the cylinder to be tested by entering the first cylinder number and the last cylinder number. For example, when entering "10 - 12" if the test disk is the 09 sector/track format, the test range from 10.0.01 to 12.1.09 is specified.

It may be possible that the actual ROM capacity is 360KB (00 <—> 39), even though the cylinder test area on display is [00 <—> 79] (720KB). If area after the cylinder number 40 were read in this case, an error may be evoked. Therefore, the range of the testing cylinders must match to the capacity of the ROM disk used.

(a-2) Specification of Error Stop

```
Error stop ? [0: Yes, 1: No] = X
```

If an error occurs while conducting the test, specify whether to abort or continue the test.

(a-3) Confirmation of Test Execution

```
Test start ? [0: Yes, 1: No] = X
```

Confirm whether to execute the test or not.

When entering [[1]], control exits to (2-1). On the other hand, when entering [[0]], the system displays the screen as shown in Fig.ROM-2 and starts the test.

The lower left screen shows the number of times test pass and physical address "TTHSS".

```
Pass count = XXXXX
TTHSS      = XXXXX
```

Fig. ROM-2

In addition, the right end of the screen shows the number of occurrences of error in each type.

(a-4) Abortion and Completion of Test

By pressing [[ESC]] while the system executes the test, control exits to the ROM test menu (Fig.ROM-1); by pressing [[SPACE]], the system displays the following message on the lower left screen and stops the test.

```
Test stopped by user.
```

At the time, by pressing A[[SPACE]], the system continues the test. Whereas, by pressing [[ESC]], control exits the ROM test menu (Fig.ROM-1).

(a-5) Error processing
(a-5-1) Read related error

If the system detects an error after it conducts the test until it starts the seek operation, it stops the test irrespective of "Yes" or "No" of the error stop described in (2-3). At the time, when pressing [[ESC]], control exits to the ROM test menu (Fig.ROM-1).

If the system detects an error while it conducts the test, it displays the kind of error and where the error occurred and increments the right hand error counter. If the Error Stop is set to "No", the system updates the error counter every time an error occurs and continues the test (the system only displays the newest error information).

On the other hand, while the error stop is set to "Yes", the system stops the test if an error occurs. At the time, when pressing [[ESC]], the system continues to conduct the test. Whereas, pressing [[ESC]], control exits to the ROM test menu (fig.ROM-1)

For details to error messages, see paragraph (3).

(a-5-2) Compare related error

If the system detects an error when it compares read data, it displays the error on the lower right screen.

```
Compare error ... ROM number: X
Adrs [0x] = XXXX
Data [0x] =     XXXX <—> XXXX
```

When the error stop is set to "No", the system updates the error message whenever it detects an error. (The screen shows the newest error information.)

The system updates the error counter whenever it detects an error. Therefore, it displays the number of occurrences of errors in the unit of 4 bytes.

While the Error Stop is set to "Yes", the system stops the test when it detects an error. In this state, when pressing [[ENTER]], the system compares the next data. If the system does not detect an error, it continues the test. On the other hand, when pressing [[ESC]], control exits to the ROM test menu (Fig. ROM-1).

Data comparison is conducted every 4 bytes. In the following the meaning of the display is described.

```
Adrs [0x] = 0004 ...    Top address at which the system
                        detects a comparison error.
Data = DBB6 <-> D8B6
       |        |
   First data  Second data
```

In the preceding example, the data includes an error at the second byte. This address becomes address 0005.

(2-2) Ascii/Hexa dump
(2-2-1) General

The contents of the disk are displayed (dumped) on the screen.

The contents of a sector (512KB) is displayed in two parts; the first half (256KB) and the second half (256KB).

On the left of the screen is displayed in the hexadecimal figure with the character itself to right of it.

(a-1) Choice of dump address

```
Physical address [CCC.HH.SS] = XXX . XX . XX
```

Enter the dumping disk address in terms of the physical address.

Depression of the [ESC] key causes the control to return to the ROM test menu (Fig.ROM-1).

When the entry has been complete, the screen appears with the data of the specified sector on the screen.

(a-2) Termination

The following is displayed on the lower left of the screen, when the task is complete.

```
ESC: end, Enter: next half, Space: start ?
```

Or,

```
ESC: end, Enter: next sector, Space: start ?
```

ESC: indicates the [ESC] key which causes the task terminated when depressed and the control then returns to the DSK test menu (Fig.ROM-1).

Enter: indicates that the [ENTER] key which brings on the screen a next sector or a second half of the sector now on display.

Space: indicates the [SPACE] key which permits to start the entry from (a-1) all over again.

(b) Error processing

The task terminates unconditionally when an error is met, and the command parameter and the error status are displayed on the lower right of the screen.

Depression of the [ENTER] key in this stage resumes the test.

Depression of the [ESC] key causes the control to return to the ROM text menu (Fig. ROM-1).

For detail to error messages, see paragraph (3).

(3) Error message
(3-1) Error during the execution of test

The following is displayed on the lower side of the screen when an error is occureed during the execution of the task.

This indicates the location of error found and the kind of error.

```
Error occurred ... ROM number: X
drive: X, track: XX, head: X, sector: XX
(error message)
```

This error message shows that an error occurs in the ROM which is specified by ROM number displayed on the screen.

If the number of ROM's which are loaded is smaller the displayed number of ROM's, it is not an error.

This is caused by making format over the actual capacity of ROM.

- Bad command
  Shows that an invalid command is received.
- Write protected error
  The system detected write protection.
- Compare error
  Shows an unmatch of the write data with the read data.
- Others error
  Shows the ocurrence of other errors not described above.