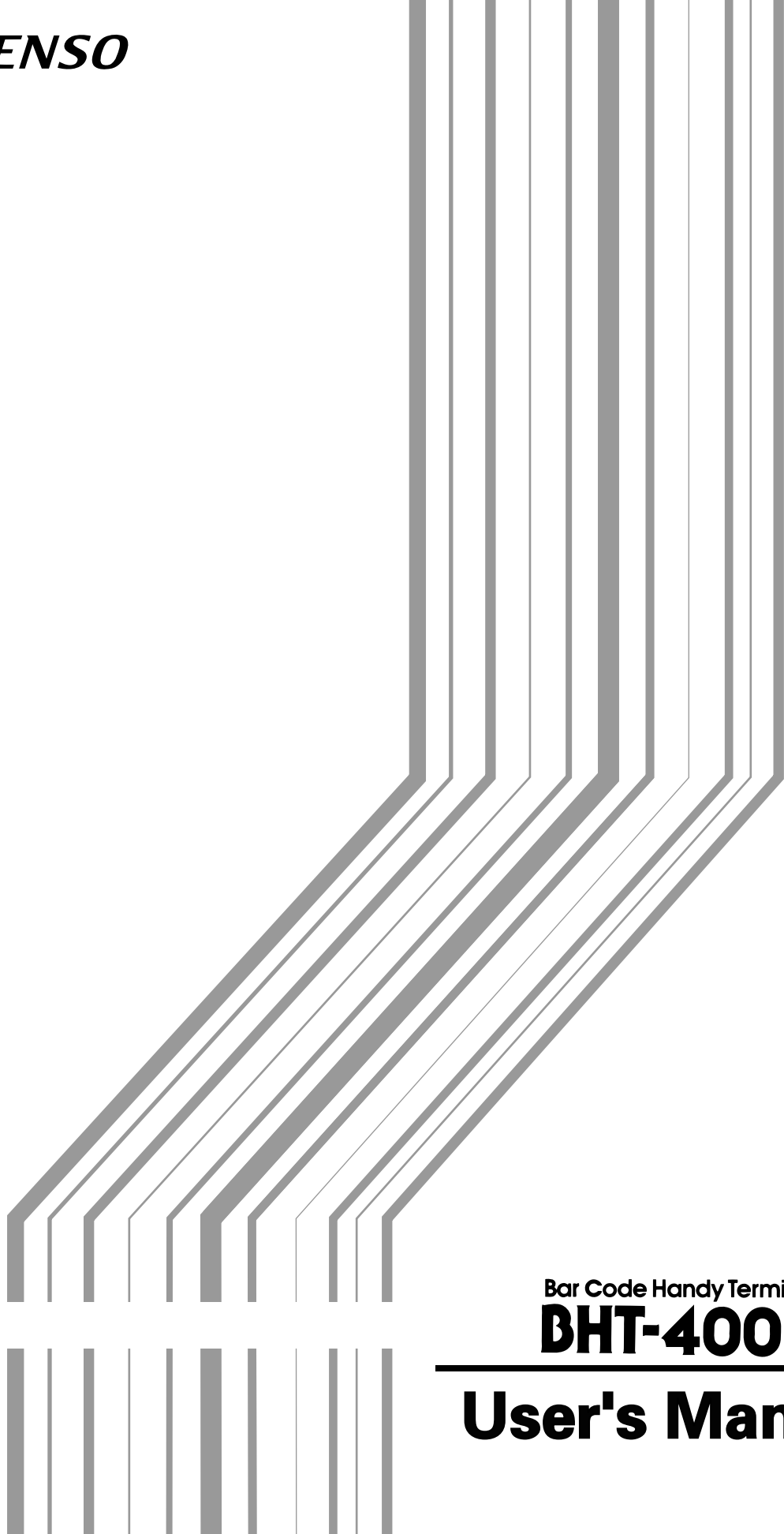


DENSO



Bar Code Handy Terminal

BHT-4000

User's Manual

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Preface

Please READ through these operating instructions carefully. It will enable you to operate your BHT-4000 correctly.

After you have finished reading the instructions, keep this manual handy for speedy reference.



Ni-Cd

The product that you have purchased contains a rechargeable battery. The battery is recyclable. At the end of its useful life, under various state and local laws, it may be illegal to dispose of this battery into the municipal waste stream. Check with your local solid waste officials for details in your area for recycling options or proper disposal.

How this book is organized

This manual is made up of six chapters and appendices.

Chapter 1. Quick Guide

Describes the basic operating method of the BHT-4000 and the related notes.

Chapter 2. Getting Started the BHT-4000 and System Mode

Summarizes the BHT-4000 system configuration and describes the operation including preparation and System Mode (which is required for the efficient use of application programs).

Chapter 3. Communications Operations of BHT-4000

Describes the communications operations of the BHT-4000--the RS-232C interface specifications, the basic communications specifications, and the BHT-protocol--for data transmission with the host computer or other devices.

Chapter 4. Easy Pack 4.2

Describes Easy Pack 4.2 which is an application program provided in the "BHT-BASIC 3.0 System Pack." Easy Pack 4.2 is suitable for data collection which allows bar code reading or data entry from the keypad.

Chapter 5. Error Messages

Lists the error messages which will appear on the LCD if some error occurs in the BHT-4000.

Chapter 6. Handling the CU-4000

Describes the handling procedure of the CU-4000, the interfacing with the host computer, and the charging of the battery cartridge.

Appendix A: Specifications

Appendix B: A Typical Basic Operation

■ Icons Used in This Book

This manual uses the following icons for greater ease in handling:



Precautions which require you to take special care in order to prevent the BHT-4000 and programs from becoming damaged.



Notes which will help you understand the BHT-4000 and BHT-BASIC 3.0.

■ Related Publications

BHT-BASIC 3.0 Programmer's Manual

(For the differences of the BHT-4000 from other BHT series in the BHT-3.0 syntax and applications programming, refer to the "BHTC3.MAN" text file in the "BHT-BASIC 3.0 Compiler" floppy disk.)

Transfer Utility Guide

(For the detailed operating procedure, refer to the "TU3.MAN" text file in the "Transfer Utility" floppy disk.)

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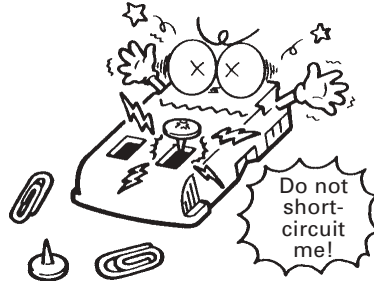
■ BE SURE TO OBSERVE THE FOLLOWING PRECAUTIONS:

● AVOID SHOCK OR IMPACT!



Avoid shock or impact; otherwise, the terminal will be broken.

● AVOID SHORT-CIRCUITS!



Short-circuiting the battery cartridge is dangerous.

● AVOID ROUGH TREATMENT!



Do not punch the keys too hard.

● NEVER DISASSEMBLE!



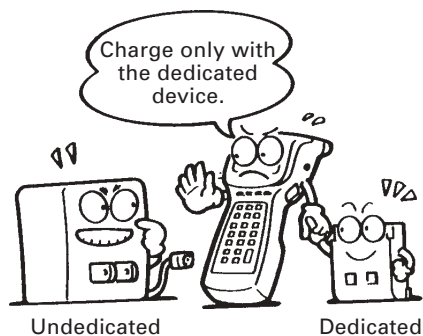
Never put the battery cartridge into fire or attempt to disassemble it.

● AVOID WATER!



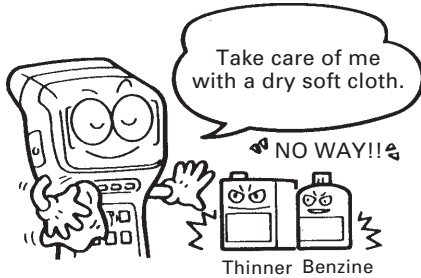
Do not get water on the terminal, and never operate it with wet hands, or wipe it with a damp cloth.

● NEVER USE UNDEDICATED CHARGERS!



Do not charge the battery cartridge with any charger other than the dedicated one.

● AVOID THINNER!



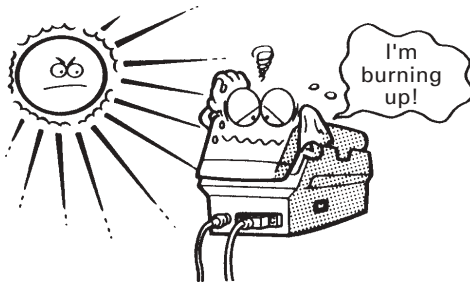
Never use thinner, benzene, or other organic solvents to clean the terminal. Those fluids will mar or discolor the surfaces of the cases and keys.

● AVOID DUST OR DIRT!

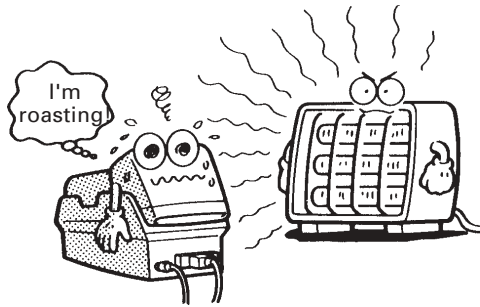


Do not operate the terminal with gloves contaminated with dust, dirt, or iron filings. They will result in malfunction.

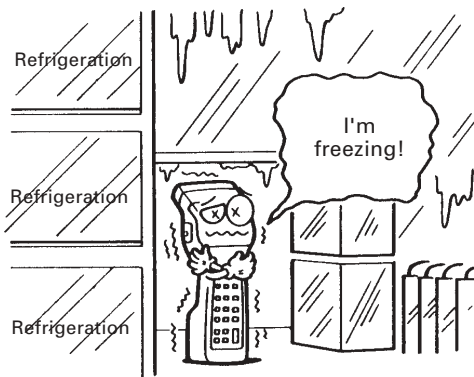
● NEVER PUT ME IN THESE PLACES:



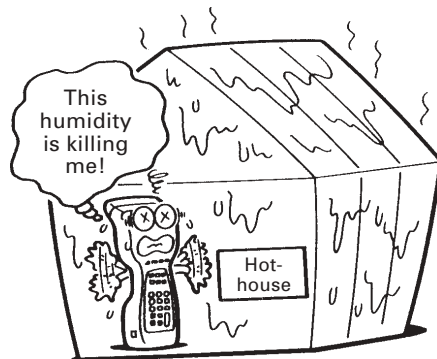
[In direct sunshine]



[Next to heating equipment]



[Rapid temperature changes]



[Humid places]

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Chapter 3. Communications Operations of BHT-4000

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Chapter 5. Error Messages

Chapter 6. Handling the CU-4000

Chapter 1

Quick Guide

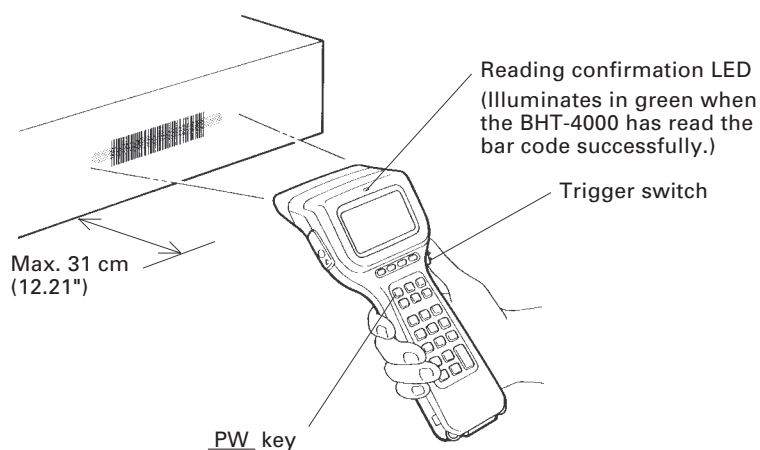
This chapter describes the basic operating method of the BHT-4000 and the related notes

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1.1 Reading Bar Codes

Turn on the terminal power, bring the bar-code reading window to a bar code to be scanned, and press the trigger switch. The BHT-4000 lights the illumination LED and reads the bar code.


When the BHT-4000 has read the bar code successfully, the reading confirmation LED will illuminate in green.



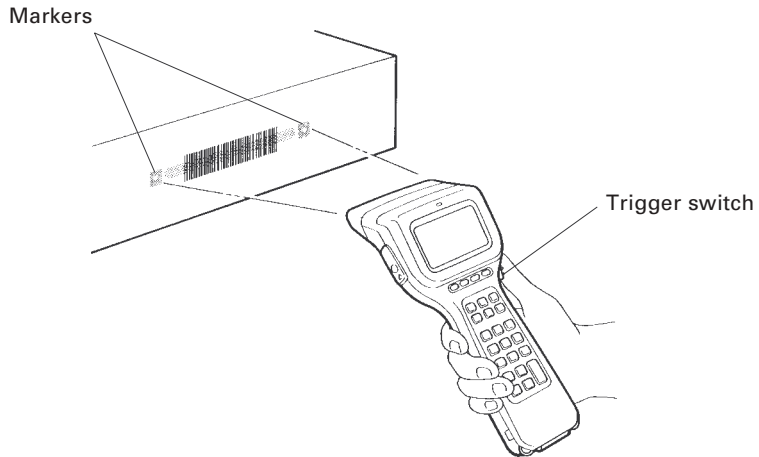
- If the BHT-4000 fails to read, change the reading angle of the bar-code reading window or the distance from bar codes, and try it again.
- To read bar codes wider than the readable area of the bar-code reading window, pull the bar-code reading window away from bar codes for long-range scanning so that the entire bar code comes into the illumination range covered by the illumination LED. The BHT-4000 can read bar codes at a maximum distance of 31 cm (12.21")* from the bar-code reading window.

* Under the following conditions:

- Ambient illuminance: 500 lux (fluorescent lamp)
- ITF conforming to the UPC Shipping Container Code
- PCS value: 0.9 or more
- Minimum narrow bar width: 1.4 mm min. (55.1 mils min.)

- If you cannot distinguish the illumination range covered by the illumination LED when reading bar codes at distances from the bar-code reading window, you may turn on the marker LEDs to show the markers  on the object to be scanned, indicating the readable area as shown below.

The marker LED indication function may be activated or deactivated (default) in System Mode. (Refer to Subsection 2.4.3, [4] Setting.)



NOTE

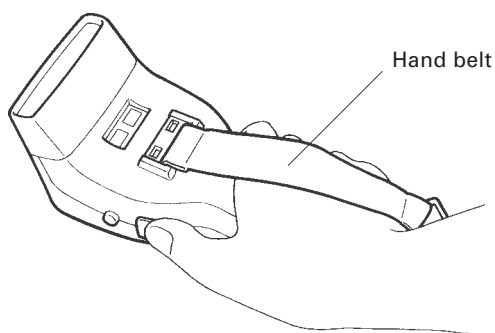
- Before reading labels, clean them if stained.
- Avoid using the BHT-4000 under direct sunshine. The BHT-4000 might fail to read.
- To read bar codes on curved surfaces, apply the bar-code reading window to the center of each bar code at a right angle.

1.2 Using the Hand Belt and Neck Strap

■ Using the Hand Belt

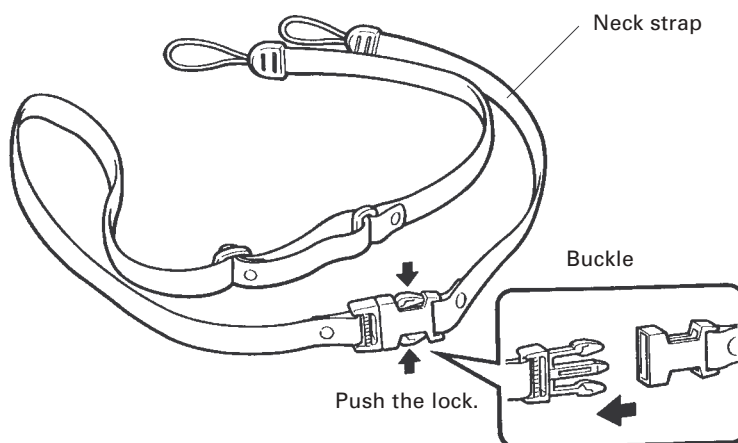
The BHT-4000 is equipped with a hand belt to prevent you from dropping the terminal accidentally.

Hold the BHT-4000 as shown below.

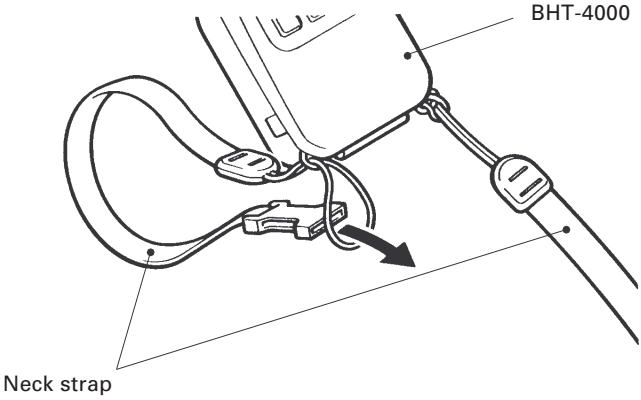


■ Using the Optional Neck Strap

(1) Push the lock of the buckle to release it, as illustrated below.



- (2) Set each loop of the neck strap to the BHT-4000 as shown below and then fasten the buckle.

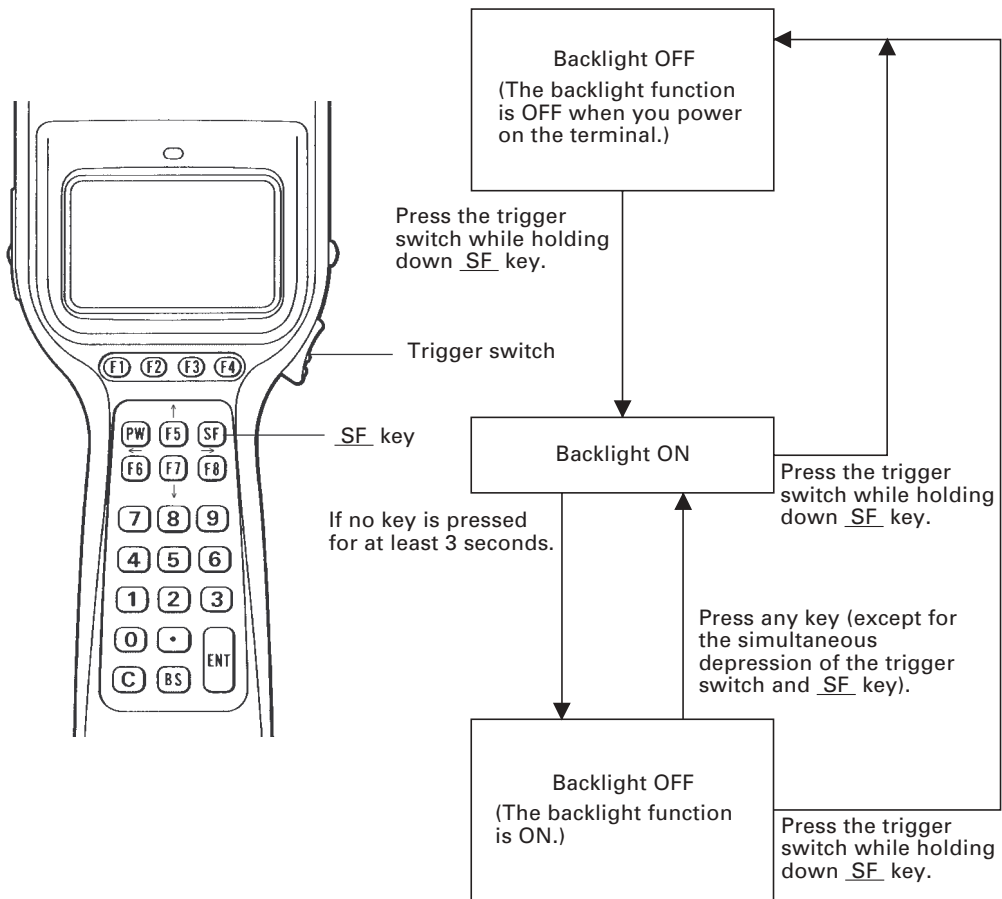


- (3) Hang the neck strap over your neck when using the BHT-4000.



1.3 Setting the Backlight

Pressing the trigger switch while holding down **SF** (Shift) key activates or deactivates the backlight function.



NOTE

In user programs, you can select the key to be used for activating or deactivating the backlight function (instead of the default: combination of the **SF** key and trigger switch), as well as modifying the ON-duration of the backlight before the automatic turning-off.

1.4 Using the Keypad

■ Entering Numerical Data

To enter numerical data e.g. the quantity of goods, use the ten numerical keys and **ENT** key.

For example, to enter the number "120", press **1**, **2**, and **0** keys and then press **ENT** key.

If you key in any wrong value, press **C** or **BS** key and then enter the correct one.

■ Selecting Tasks

If the LCD shows the selection items (xxx) prefixed by numerals (e.g., 1: xxx, 2: xxx), use the numerical keys to select a desired one and press **ENT** key to execute.

If a YES/NO screen (e.g. 1: YES, 2: NO) appears, press **1** key for YES response; **2** key for NO response.

Chapter 2

Getting Started the BHT-4000 and System Mode

This chapter summarizes the BHT-4000 system configuration and describes the operation including preparation and System Mode (which is required for the efficient use of application programs).

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2.1 BHT-4000 System Configuration

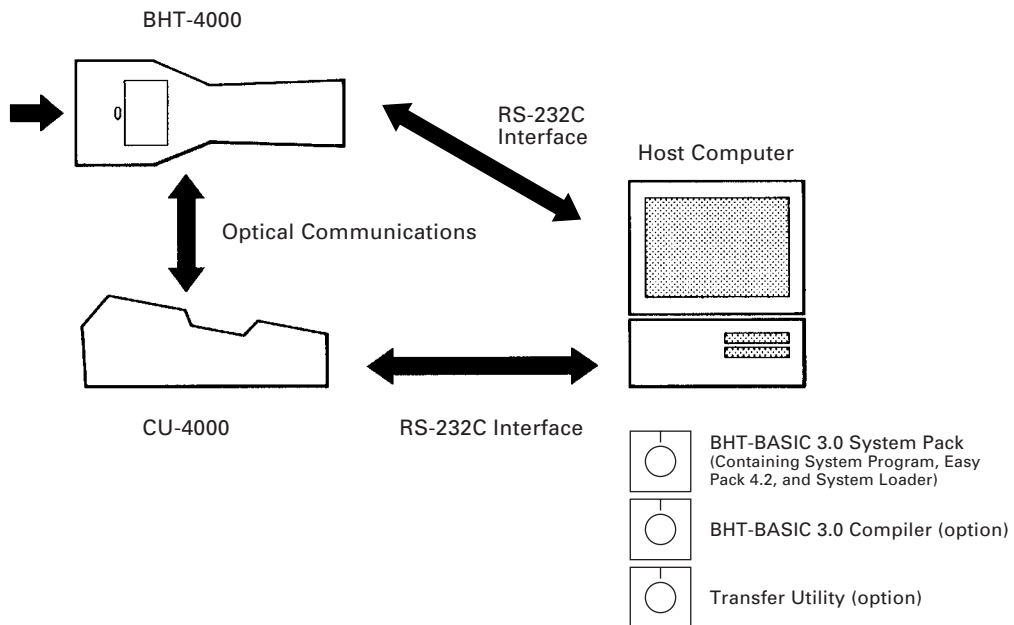
As shown in the system configuration below, it is necessary to prepare not only the BHT-4000 Bar Code Handy Terminal (which reads bar codes and accepts keypad entry) but also the following hardware:

- Host computer: Allows you to download programs and data or edit/ manage them.
- CU-4000: Exchanges programs and data with the BHT-4000 optically and with the host computer via the RS-232C interface.
- RS-232C interface cable: Connects the CU-4000 and the host computer.

The basic software required for operating the BHT-4000 is "System Program" which is contained in the "BHT-BASIC 3.0 System Pack." (The BHT-BASIC 3.0 System Pack is provided in a 3.5" floppy disk.)

Optional software includes the BHT-BASIC 3.0 Compiler and Transfer Utility. (Each software is provided in a 3.5" floppy disk.)

System Configuration



■ Host Computer

- OS: MS-DOS Ver. 3.1 or a later version.
- RAM: 640 kilobytes. At least 400-kilobyte area should be reserved as a work area.
- Models: IBM PC-AT, PS/2
Toshiba T-3100 series

■ CU-4000 and RS-232C Interface Cable

The CU-4000 is an optical communications unit which exchanges data and programs with the BHT-4000 optically and with the host computer via the RS-232C interface cable.

You may directly connect two BHT-4000 terminals with each other by using a QM connector cable. Joining a QM connector cable to an interface cable compatible with the target host computer or modem makes it possible to directly connect the BHT-4000 with it. (NOTE: The direct-connect interface port of the BHT-4000 is not designed to stand frequent connecting/disconnecting. It is, therefore, recommended to use the CU-4000 when connecting the BHT-4000 to a host computer.)

■ BHT-BASIC 3.0 System Pack

The System Pack contains:

- System Program (Drivers, BHT-BASIC 3.0 Interpreter, and System Mode) : `_ _SYSPG0 . SY3`
- Easy Pack 4.2 : `EASYPACK . PD3`
- System Loader : `TS3 . EXE`

System Program is essential for the BHT-4000. Easy Pack 4.2 is an application program designed by the manufacture for general bar-code data collection and data entry from the keypad. System Loader allows you to download System Program and Easy Pack 4.2 into the BHT-4000.

■ BHT-BASIC 3.0 Compiler (option)

The compiler compiles a source program written in BHT-BASIC 3.0 by an editor of the host computer running the MS-DOS, into the object program (user program) which can be used in the BHT-4000. The compiled program file is named "XXX.PD3". You should download it to the BHT-4000 by using Transfer Utility.

■ Transfer Utility (option)

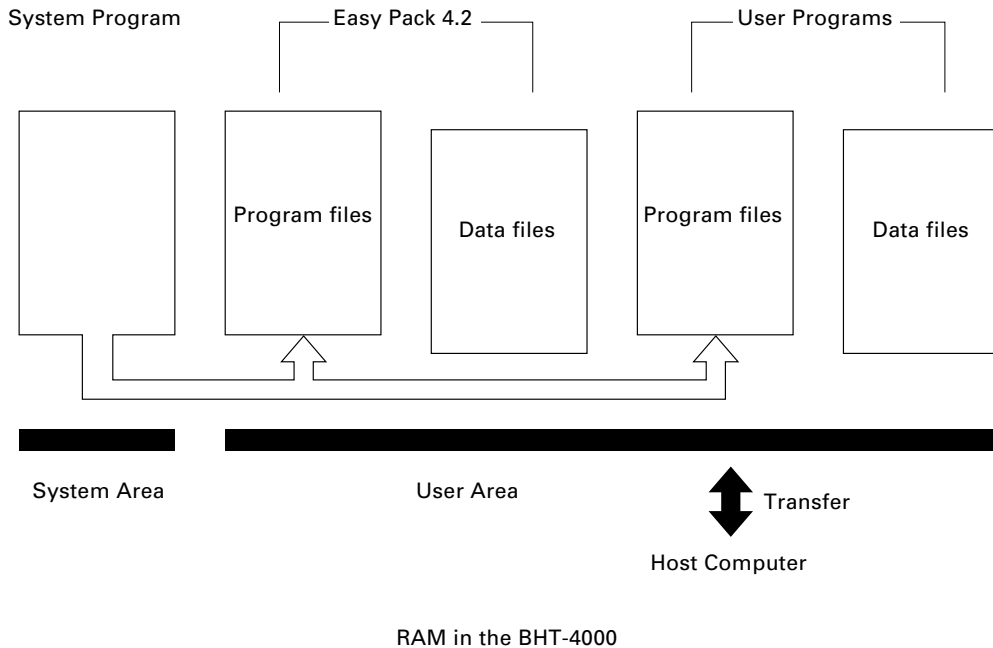
The utility transfers files between the BHT-4000 and the host computer. For details, refer to the "Transfer Utility Guide" issued separately.

Software Structure

Before your first use of the BHT-4000, you should download System Program provided in the BHT-BASIC 3.0 System Pack from the host computer to the BHT-4000. Also, you should download Easy Pack 4.2 if necessary in the same manner. System Program and Easy Pack 4.2 will be stored in the system area and user area of the RAM, respectively. For detailed procedure, refer to Subsection 2.3.2 [1] Downloading System Program and Subsection 2.3.2 [4] Downloading User programs or Easy Pack 4.2.

To use user programs, you should download the program files into the RAM (user area).

Prior to executing Easy Pack 4.2 or user programs, it is necessary to prepare a data file for each of those programs before running the program. The data files will be stored also in the user area of the RAM.



■ System Program

System Program is essential for the BHT-4000. Prior to the first use of the BHT-4000, they should be downloaded from the host computer to the BHT-4000. For the downloading procedure, refer to Subsection 2.3.2, [1] Downloading System Program.

System Program consists of the following three sets of programs:

Drivers

Drivers is a set of programs that directly controls the BHT-4000 hardware. It may be called by the BHT-BASIC 3.0 Interpreter or System Mode.

BHT-BASIC3.0 Interpreter

The interpreter interprets and executes instructions in user programs or Easy Pack 4.2, which are written in BHT-BASIC 3.0.

System Mode

System Mode is a system program exclusively designed for the effective use of Easy Pack 4.2 and user programs in the BHT-4000. It sets up the execution environments for those programs; e.g., it prepares downloading conditions, sets the calendar clock, and tests the BHT-4000 components including the LCD, beeper, and keypad. Shown below is the System Mode menu.

```
SYSTEM MENU
1:Execute  2:Download
3:Upload   4:Set mode
5:Test     6:Version
```

■ Easy Pack 4.2

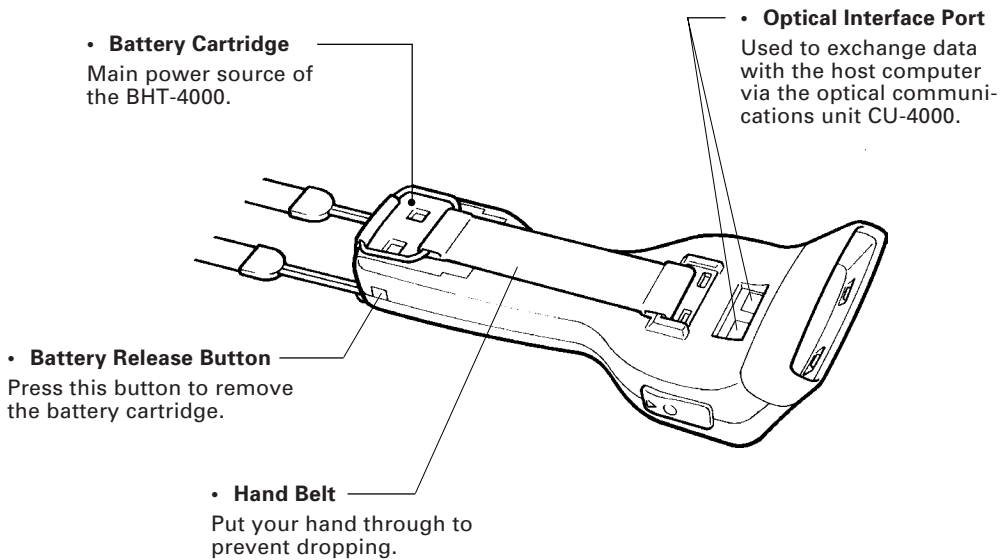
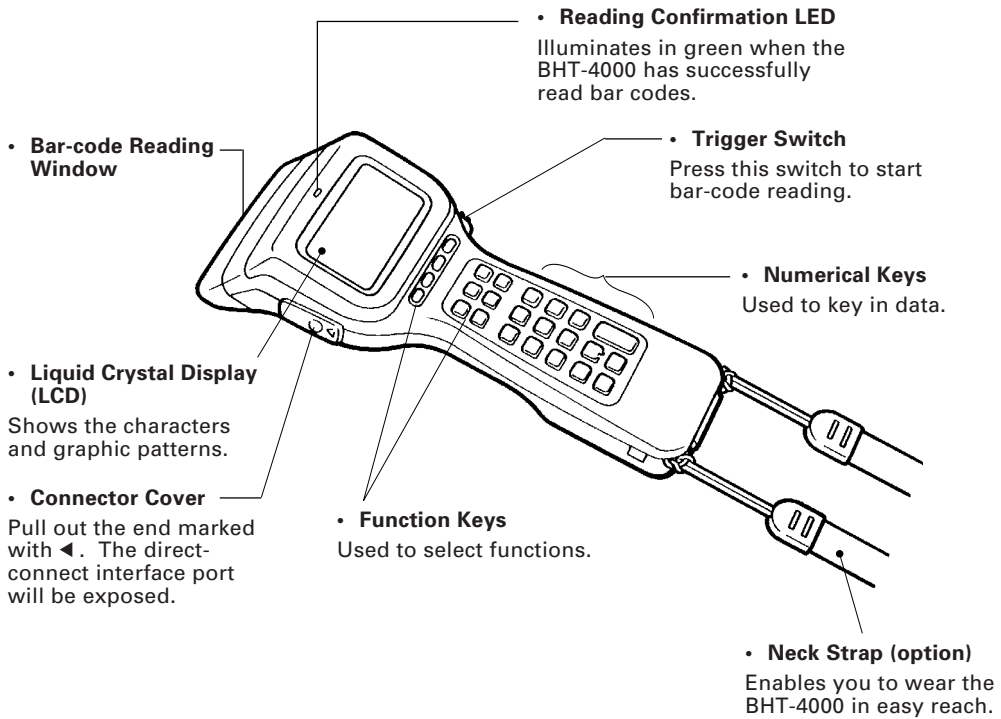
Easy Pack 4.2 is an easy-to-use application program designed for general bar-code data collection and data entry from the keypad. You can easily and directly apply this program in your business. What you have to do is merely to make a data file (up to four) matching your applications, collect bar-code data, and transfer the data file to the host computer.

In System Mode, Easy Pack 4.2 is treated as one of user programs.

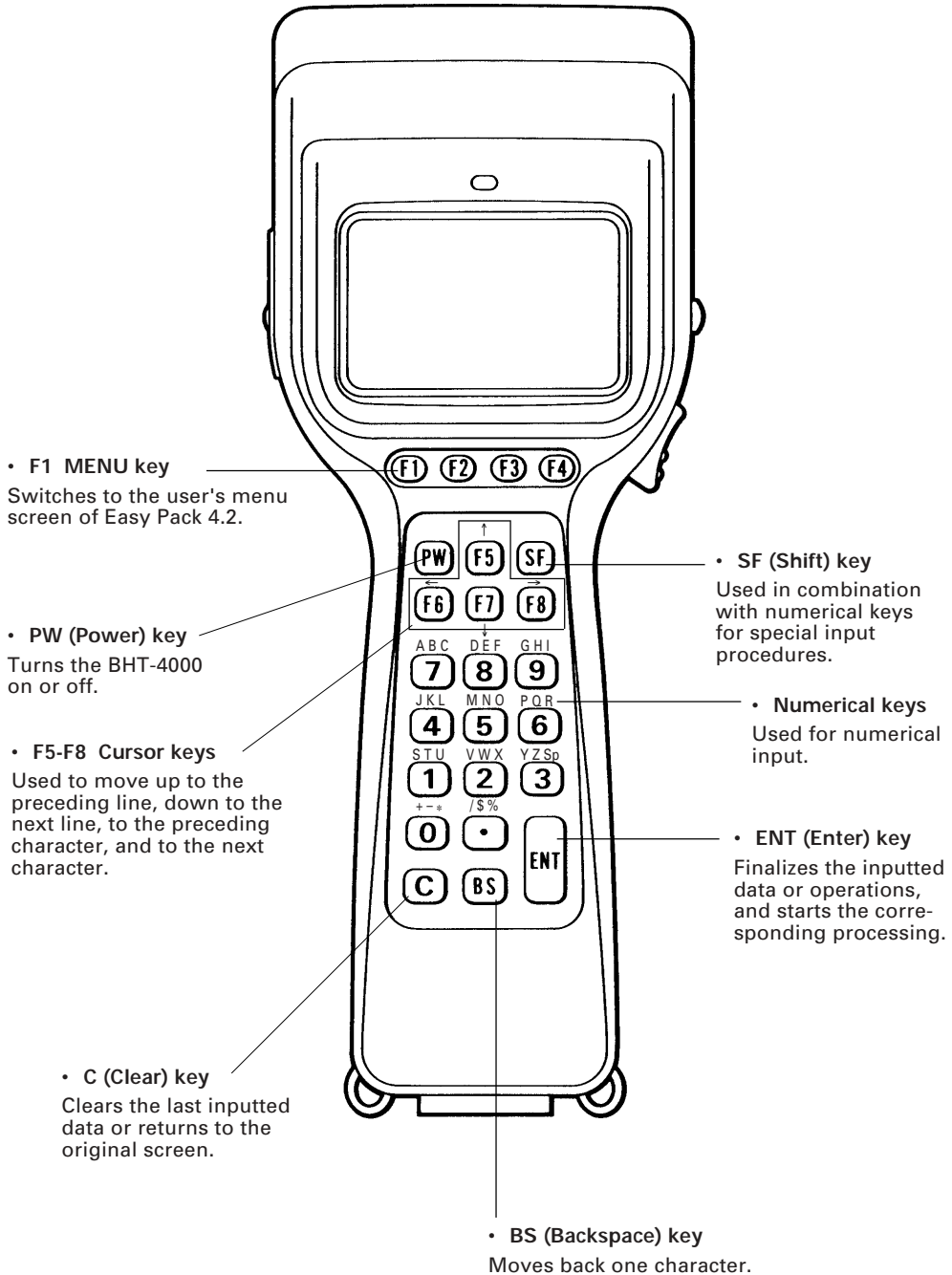
■ User Programs

You can develop application programs to meet individual job requirements by using the BHT-BASIC 3.0 Compiler. To download those user programs to the BHT-4000, use Transfer Utility (option).

2.2 Components and Functions



The functions of the keys may be set by user programs. What follows is a set of sample functions when the BHT-4000 is used with Easy Pack 4.2.

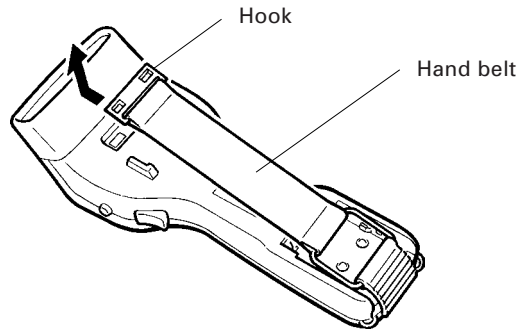


2.3 Preparation

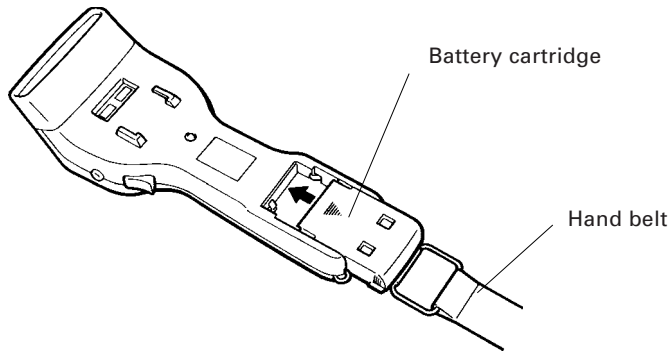
2.3.1 Setting-up 1: Loading the Battery Cartridge

Before starting the BHT-4000, be sure to load the furnished battery cartridge according to the steps below.

- (1) Turn the BHT-4000 upside down.
- (2) Release the hook of the hand belt by pulling it in the direction of the arrow as shown below.



- (3) Push the battery cartridge into the BHT-4000 until it clicks into place.



- (4) Set the hook of the hand belt back to the original position.

NOTE

- When you first load the battery cartridge after purchase or you load it after leaving the BHT-4000 unused for a long time, do not remove the battery cartridge within 24 hours after that loading.
- To remove the battery cartridge, press the battery release button and slide out the cartridge.
- Do not leave the BHT-4000 loaded with no battery cartridge for a long time. Otherwise, the contents of the memory may be lost, causing a system error while showing the message "Report to the personnel in charge!!".

Reference: The BHT-4000 integrates a lithium battery which backs up the memory in the BHT-4000 when no battery cartridge is loaded or the voltage level of the battery cartridge drops below the specified level. The lithium battery is automatically charged by the battery cartridge.

Checking the Battery Voltage Level

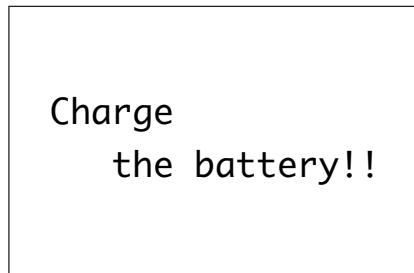
You may check the current voltage level of the battery cartridge on the LCD which is displayed either as an icon or a bar indicator.

The icon is displayed on the bottom of the LCD while the BHT-4000 is in operation (except in System Mode) as default. You may erase the icon by turning off the STATUS setting in System Mode. Refer to Subsection 2.4.3, [4.2] Setting the message version and the system status indication.

The bar indicator will temporarily appear, by turning on the power while holding down the trigger switch. For details, refer to Subsection 2.3.3 Adjusting the LCD Contrast & Beeper Volume, and Displaying the Battery Voltage Level.

Low Battery Indication

If the battery voltage level drops below the specified level while the BHT-4000 is in operation, the BHT-4000 displays the following message on the LCD, beeps five times, and goes off automatically. Charge the battery cartridge (see the "Charging the Battery Cartridge" below) or replace the current battery cartridge with a fully-charged one.

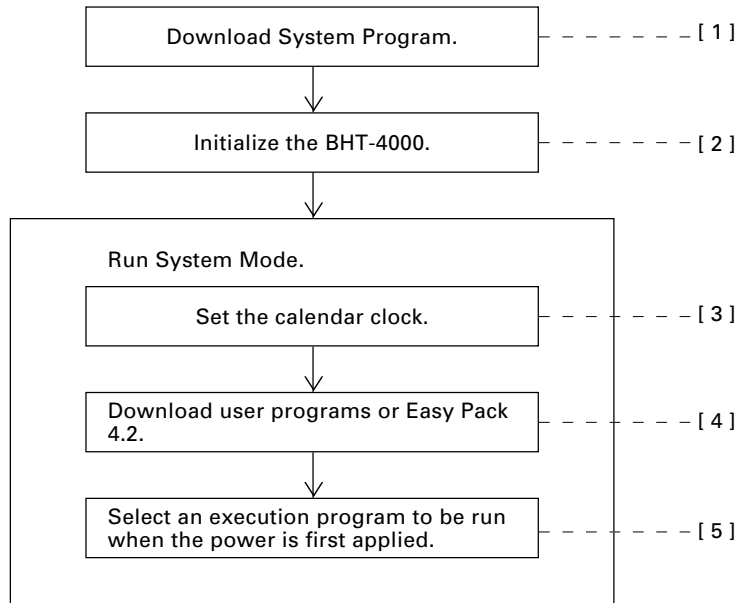


Charging the Battery Cartridge

You may charge the battery cartridge with the optical communications unit CU-4000 or the quick charger C-200 (option). For the charging procedure with the CU-4000, refer to Chapter 6. For the charging procedure by the C-200, refer to the "C-200 User's Manual."

2.3.2 Setting-up 2: Installing System Program and User Programs

Install System Program provided in the "BHT-BASIC 3.0 System Pack" and user programs according to the procedure given below.



[1] Downloading System Program

System Program (which consists of Drivers, BHT-BASIC 3.0 Interpreter, and System Mode) is provided in the "BHT-BASIC 3.0 System Pack" floppy disk together with System Loader and Easy Pack 4.2. You should download System Program using the System Loader.

This section describes the downloading procedure on the BHT-4000 and the host computer, as well as the related setting-up work.

■ Preparation before Downloading

Make the following setting-up according to the interface to be selected:

To use the optical interface:

- (1) Make sure that both the CU-4000 and the host computer are powered off. Then, connect them with each other using the RS-232C interface cable. (For the interface port Dsub-25S on the CU-4000 and its pin assignment, refer to Chapter 3, Subsection 3.1.1.)
- (2) Turn on the host computer and start the MS-DOS.
- (3) Turn on the CU-4000.
- (4) Make sure that the BHT-4000 is powered off. Then, put it on the CU-4000.

To use the direct-connect interface:

- (1) Make sure that the BHT-4000 and the host computer are powered off. Then, connect them with each other using the RS-232C interface cable. (For the direct-connect interface port on the BHT-4000 and its pin assignment, refer to Chapter 3, Subsection 3.1.2.)
- (2) Turn on the host computer to start the MS-DOS.

■ Operating the BHT-4000

```

DOWNLOAD SYSTEM
 1:Optical
 2:Connector

RAM Size XXXXX
ROM Ver. X.XXX

```

```

DOWNLOAD SYSTEM
Optical Speed

1:2400    2: 4800
3:9600    4:19200

```

```

DOWNLOAD SYSTEM
I/F Connector Speed

1:2400    2: 4800
3:9600    4:19200
5:38400

```

```

DOWNLOAD SYSTEM

** Waiting **

```

- (1) Press **PW** key while holding down the trigger switch, **F1** key, and **C** key.

The DOWNLOAD SYSTEM menu screen shown at left will appear.

- (2) To use the optical interface, press **1** and **ENT** keys; to use the direct-connect interface, press **2** and **ENT** keys.

(To return to the DOWNLOAD SYSTEM menu, press **C** key.)

Selecting the optical interface displays the screen shown at left.

Selecting the direct-connect interface displays the screen shown at left.

- (3) Select the transmission speed by using the numerical keys and press **ENT** key. (The transmission speed should be the same as the speed to be specified in the host computer.)

(To return to the previous screen, press **C** key.)

The screen shown at left will appear, showing that the BHT-4000 is waiting for a file to be downloaded.

- (4) Proceed to the ■ Operating the Host Computer.

(To return to the previous screen, press **C** key.)

■ Operating the Host Computer

- (1) Load the "BHT-BASIC 3.0 System Pack" floppy disk into the drive of the host computer.
- (2) Enter the following at the MS-DOS command line to initiate System Loader contained in the floppy disk, and the host computer will start downloading System Program.

```
X>TS3 __SYSPG0.SY3 option
```

Where, "X" denotes the name of the drive in which you loaded the floppy disk. The "TS3" is the program file name of System Loader. The "__ SYSPG0.SY3" is the file name of System Program to be downloaded. For the options, see below.

Option List

You may specify the options listed below for downloading System Program. If no option is specified, the defaults will apply.

Options	Function	Default
+B <i>transmissionspeed</i>	Sets the transmission speed. *1 +Bn n: 2400, 4800, 9600, 19200, or 38400*2 (bps)	+B19200
+?	Displays the help screen. Specifying this option displays only the help screen without downloading.	(No help screen)

*1 The transmission speed should be the same as specified on the BHT-4000.

*2 The "+B38400" is available only when you have selected the direct-connect interface of the BHT-4000.

- More than one option should be delimited with spaces.
- System Loader makes no distinction between the uppercase and lowercase letters.
- Options may be specified following "TS3".

NOTE

- System Loader can download System Program and Easy Pack 4.2 only. It cannot download other program files or data files. Neither can it upload System Program or Easy Pack 4.2.
- The communications parameters in System Loader are fixed except for the transmission speed.

■ Downloading

If downloading starts:

[BHT-4000]

```
DOWNLOAD SYSTEM

** Loading **

XXX/YYY
```

The BHT-4000 displays the screen shown at left.

The "XXX" indicates the number of received sectors; the "YYY", the total number of sectors of System Program.

[Host computer]

The host computer displays the screen given below.

```
System Loader 3 VX.XX
Copyright (C) DENSO CORPORATION. 1993 all rights reserved
```

If downloading is completed normally:

[BHT-4000]

```
DOWNLOAD SYSTEM

** Completed **
```

The BHT-4000 displays the screen shown at left, beeps once, and goes off automatically.

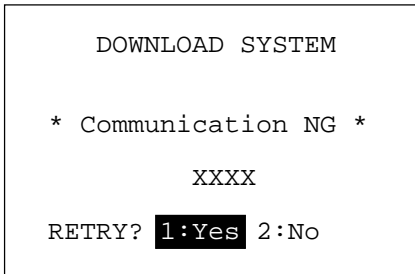
[Host computer]

```
00 : Normal end.
```

The host computer displays the screen shown at left.

If an error occurs during downloading:

[BHT-4000]



The BHT-4000 displays the screen shown at left and beeps three times.

Check the error code & message shown on the display of the host computer and take the necessary recovery action according to the table given below. (The "XXXX" shown on the LCD of the BHT-4000 indicates the internal status.)

To retry downloading, press **1** and **ENT** keys on the BHT-4000 and initiate System Loader on the host computer again. To cancel downloading, press **2** and **ENT** keys, and the screen will return to the DOWNLOAD SYSTEM menu.

[Host computer]

The host computer displays one of the following error codes & messages.

Error codes & messages	Actions to be taken
01 Designated file not found.	Check the name of the file to be downloaded and then retry downloading.
02 File name entered in wrong format.	Check the name of the file to be downloaded and then retry downloading.
09 Option mismatch.	Check the options which you specified at the MS-DOS command line when initiating System Loader, and retry downloading.
51 Communication error.	Check that: <ul style="list-style-type: none"> the RS-232C interface cable is connected correctly, the transmission speed specified on the BHT-4000 and that on the host computer are the same, and the interface (optical or direct-connect interface) selected on the BHT-4000 and that on the host computer are the same, then, retry downloading.
52 Communication error.	Retry downloading. (This error will occur if the BHT-4000 is powered down during downloading.)
53 Cancel received.	Retry downloading. (This error will occur if the C key of the BHT-4000 is pressed during downloading.)
71 File read error.	Retry downloading. If the same error persists, check the "BHT-BASIC 3.0 System Pack" floppy disk for defective, using the CHKDSK.
90 Aborted by break key.	If necessary, retry downloading.
99 General failure.	Retry downloading.

■ To Abort Downloading

To abort downloading in progress, press key on the BHT-4000 or press the specified abort keys (BREAK and ALT keys, or their equivalent) on the host computer.

If key is pressed on the BHT-4000:

[BHT-4000]

```
      DOWNLOAD SYSTEM
      Optical Speed

1:2400      2: 4800
3:9600      4:19200
```

The screen returns to the transmission selection screen shown at left and the beeper beeps three times.

To retry downloading, select a desired transmission speed by numerical keys and press key.

[Host computer]

```
53 : Cancel received.
```

The host computer displays the error code & message shown at left.

To retry downloading, initiate System Loader again.

If the abort keys are pressed on the host computer:

[BHT-4000]

```
      DOWNLOAD SYSTEM

* Communication NG *

      XXXX

RETRY? 1:Yes 2:No
```

The BHT-4000 displays the screen shown at left and beeps three times. (The "XXXX" shown on the LCD indicates the internal status.)

To retry downloading, press and keys on the BHT-4000 and initiate System Loader on the host computer. To cancel downloading, press and keys, and the screen will return to the DOWNLOAD SYSTEM menu.

[Host computer]

```
90 : Aborted by break key.
```

The host computer displays the error code & message shown at left.

To retry downloading, initiate System Loader again.

NOTE

After completion of downloading, be sure to initialize the BHT-4000 according to the procedure given in [2] Initializing the BHT-4000. Powering on the BHT-4000 without initialization will display the message shown below either in English or Japanese.

Report to
the personnel
in charge!!

(S)

管理者に
連絡してください!!

(S)

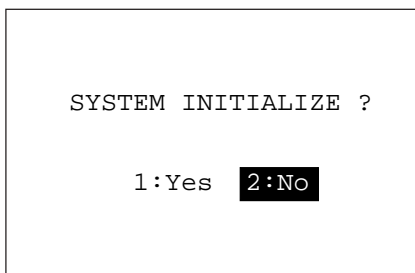
[2] Initializing the BHT-4000

Be sure to initialize the BHT-4000 according to the steps below.

The initialization operation will initialize the user area and the system work area (used for storing system parameters and file directories) of the RAM, but not initialize the system program area of the RAM. Therefore, System Program already downloaded will not be affected by the initialization.

- (1) Press the **PW** key while holding down the trigger switch, **0** and **SF** keys.

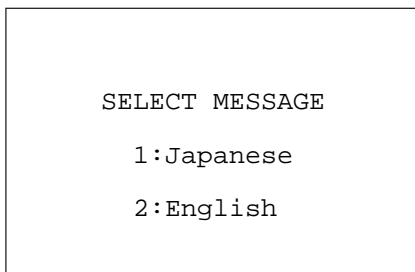
The YES/NO screen will appear on the LCD as shown below .



If the cursor is placed at NO, press **1** key to move the cursor to YES.

- (2) Press **ENT** key.

The message version selection screen will appear as shown below.



- (3) Select the Japanese or English message version (for Easy Pack 4.2 and System Mode) by pressing **1** or **2** key, respectively.

- (4) Press **ENT** key.

The BHT-4000 starts initialization operation.

Upon completion of the initialization, it displays the following message and goes off automatically.

```
SYSTEM INITIALIZE

** Completed **
```

NOTE

If the message "Report to the personnel in charge!! (S)" appears as shown on page 27 although the initialization has completed, initialize the BHT-4000 again.



If you initialize the BHT-4000 after downloading user programs or data, all of those programs or data stored in the user area of the RAM will be lost. Download them again if necessary.

In addition, the LCD contrast level (refer to Subsection 2.3.3), communications conditions and other settings (refer to Section 2.4) will be restored to the default values, so modify them if necessary. After initialization, be sure to set the calendar clock (refer to [3]).

[3] Setting the Calendar Clock (date and time)

(1) While holding down **SF** and **1** keys, press **PW** key to start System Mode.

The following SYSTEM MENU screen will appear.

```
SYSTEM MENU
1:Execute  2:Download
3:Upload   4:Set mode
5:Test     6:Version
```

(2) Press **4** key to select the "Set mode".

Press **ENT** key, and the following SET SYSTEM screen will appear.

```
SET SYSTEM
1:Execute  2:Display
3:Date/Time 4:Barcode
5:Com      6:Switch
7:Others
```

(To return to the immediately preceding screen during this setting operation, press **C** key.)

(3) Press **3** key on the SET SYSTEM screen to select "Date/Time".

Press **ENT** key, and the following screen will appear.

```
SET DATE/TIME

00/01/01 00:00
_ / /      :
```

(4) Use the numerical keys to enter the year (only the last two digits), month, day, hour, and minute in this order. If the data is in one digit, add 0 (zero) preceding the data.

If you make a wrong entry, press **BS** key to delete it and enter the correct data.

[Example] To set 1993, October 20, at 2:00 p.m.

Press **9**, **3**, **1**, **0**, **2**, **0**, **1**, **4**, **0**, and **0** keys.

```
SET DATE/TIME

00/01/01 00:00
93/10/20 14:00
```

NOTE

- For the year, be sure to enter the last two digits of the year. For the hour, enter it in the 24-hour format.
- If any of the year, month, day, hour, and minute is not entered, the **ENT** key becomes inoperable.

(5) Press **ENT** key to register the above setting.

```
SET DATE/TIME

93/10/20 14:00
_ / /      :
```

(6) Press **C** key to return to the SET SYSTEM screen.

[4] Downloading User Programs or Easy Pack 4.2

Download user programs or Easy Pack 4.2.

This section describes the downloading procedure of Easy Pack 4.2 by using System Loader provided in the "BHT-BASIC 3.0 System Pack" floppy disk.

For the downloading procedure of user programs, refer to the "Transfer Utility Guide" separately issued.

■ Operating the BHT-4000

Make sure that the BHT-4000 is operating with System Mode while showing the SET SYSTEM screen. If any other screen is displayed, start System Mode by referring to [3] Setting the Calendar Clock, steps (1) and (2).

• Setting the communications parameters and interface

The communications parameters values for System Mode should be identical with those specified for System Loader. Since those default values for System Mode and System Loader are designed to be identical, you may skip the communications parameters setting procedure unless you have modified any of those default values.

Listed below are the communications parameters of System Loader, where those parameters values are fixed except for the transmission speed. The default transmission speed is 19200 bps. If you have modified the default transmission speed by specifying option at the MS-DOS command line, you should set that modified value also in System Mode (refer to Subsection 2.4.3, [4.5] Setting the communications parameters and interface port).

If you have modified any of the default values of the communications parameters in System Mode, it is necessary to check the communications parameters values of System Loader and set the identical values in System Mode.

Communications parameters	System Loader
Transmission speed	19200 bps (may be modified by specifying option at the MS-DOS command line)
Character length	8 bits
Parity	None
Stop bits	1 bit
Protocol	Serial number ON: Adds serial numbers to data blocks. Horizontal parity ON: Enables horizontal parity checking. RS/CS control OFF: Disables the RS/CS control.

```

SET COM DEFAULT
BASIC
 1:Optical 2:Connector
SYSTEM MODE
 3:Optical 4:Connector

```

Set a desired interface (optical or direct-connect interface) to be used for SYSTEM MODE on the screen shown at left. Refer to Subsection 2.4.3, [4.5] Setting the communications parameters and interface port.

• Starting downloading

```

SYSTEM MENU
1:Execute  2:Download
3:Upload   4:Set mode
5:Test     6:Version

```

- (1) Press **C** key on the SET SYSTEM screen to return to the SYSTEM MENU screen shown at left.
- (2) Press **2** and **ENT** keys to display the DOWNLOAD menu.

```

DOWNLOAD
1:Program File
2:Data File

```

- (3) Press **1** and **ENT** keys.
(To return to the SYSTEM MENU screen, press **C** key.)

```

DOWNLOAD PROGRAM FILE

** Waiting **

```

The screen shown at left will appear, showing that the BHT-4000 is waiting for a file to be downloaded from the host computer.

- (4) Proceed to the ■ Operating the Host Computer.
(To return to the previous screen, press **C** key.)

■ Operating the Host Computer

- (1) Load the "BHT-BASIC 3.0 System Pack" floppy disk into the drive of the host computer.
- (2) Enter the following at the MS-DOS command line to initiate System Loader contained in the floppy disk, and the host computer will start downloading Easy Pack 4.2.

```
X>TS3 EASYPACK.PD3 Option
```

Where, "X" denotes the name of the drive in which you loaded the floppy disk. The "TS3" is the program file name of System Loader. The "EASYPACK.PD3" is the file name of Easy Pack 4.2 to be downloaded. For the options, refer to Subsection 2.3.2 [1] Downloading System Program.

■ Downloading

If downloading starts:

[BHT-4000]

```
DOWNLOAD PROGRAM FILE
```

```
** Loading **
```

The BHT-4000 displays the screen shown at left.

```
DOWNLOAD PROGRAM FILE
```

```
EASYPACK.PD3
```

```
** Loading **
```

```
XXXXX/YYYYY
```

While the downloading operation is in progress, the screen shown at left is displayed indicating the program file name (EASYPACK.PD3 on this screen) and the number of received sectors/the total number of sectors.

[Host computer]

The host computer displays the screen given below.

```
System Loader 3 VX.XX
```

```
Copyright (C) DENSO CORPORATION. 1993 all rights reserved
```

If downloading is completed normally:

[BHT-4000]

```
DOWNLOAD PROGRAM FILE
      EASYPACK.PD3
** Completed **
      YYYYY/YYYYY
```

The BHT-4000 displays the screen shown at left and beeps once. (The EASYPACK.PD3 on the screen shown at left is the program name of Easy Pack 4.2.)

[Host computer]

```
00 : Normal end.
```

The host computer displays the screen shown at left.

If an error occurs during downloading:

[BHT-4000]

The BHT-4000 beeps three times while showing the error message (refer to Subsection 2.4.3, [2] Downloading).

To retry downloading, press and keys; to abort it, press and keys.

[Host computer]

The host computer displays the error code and message.

For the details about the error codes & messages which may appear during downloading of Easy Pack 4.2 with System Loader (TS3), refer to Subsection 2.3.2, [1] Downloading System Program.

To retry downloading, initiate System Loader (or Transfer Utility) at the MS-DOS command line again.

■ To Abort Downloading

To abort downloading in progress, press key on the BHT-4000 or press the specified abort keys (BREAK and ALT keys, or their equivalent) on the host computer.

If key is pressed on the BHT-4000:

[BHT-4000]

```
DOWNLOAD
1:Program File
2:Data File
```

The screen returns to the DOWNLOAD screen shown at left.

To retry downloading, press and keys.

[Host computer]

```
53 : Cancel received.
```

The host computer displays the error code & message shown at left.

To retry downloading, initiate System Loader (or Transfer Utility) again.

If the abort keys are pressed on the host computer:

[BHT-4000]

```
DOWNLOAD PROGRAM FILE
Communication error !!
RETRY? 1:Yes 2:No
```

The BHT-4000 displays the error message screen as shown at left.

To retry downloading, press and keys.

[Host computer]

```
90 : Aborted by break key.
```

The host computer displays the error code & message shown at left.

To retry downloading, initiate System Loader (or Transfer Utility) again.

[5] Selecting an Execution Program to be Run when the Power is First Applied

- (1) After completion of downloading, press **C** key twice to return to the SYSTEM MENU screen shown below.

```

SYSTEM MENU
1:Execute  2:Download
3:Upload   4:Set mode
5:Test     6:Version

```

- (2) Press **4** key to select "Set mode".

Press **ENT** key, and the following SET SYSTEM screen will appear.

```

SET SYSTEM
1:Execute  2:Display
3:Date/Time 4:Barcode
5:Com      6:Switch
7:Others

```

- (3) Press **1** key to select "Execute".

Press **ENT** key, and the following screen will appear. (The `EASYPACK.PD3` is the program file name of Easy Pack 4.2. To run Easy Pack 4.2 practically, it is necessary to create a file matching the job content in advance by referring to Chapter 4, Sub-section 4.3.2.)

```

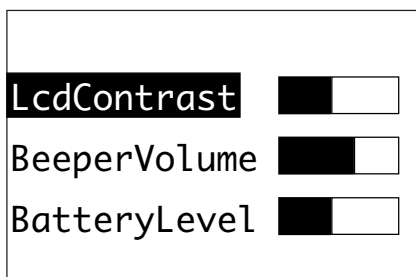
SET EXECUTE PROGRAM
EASYPACK.PD3
SAMPLE1.PD3
SAMPLE2.PD3
SAMPLE3.PD3

```

- (4) By using **F5** and **F7** keys, move the cursor to a desired program (Easy Pack or User Program) to be run when the power is first applied. Then press **ENT** key.
- (5) Press **PW** key to turn off the BHT-4000.

2.3.3 Adjusting the LCD Contrast & Beeper Volume, and Displaying the Battery Voltage Level

You can adjust the LCD contrast and beeper volume or check the battery voltage level on the LCD. While holding down the trigger switch, turn the **[PW]** key on, and the following screen will appear on the LCD. This screen will disappear if no keys are pressed for five seconds.



(The current selection is reverse-displayed.)

■ Adjusting the LCD Contrast

You can adjust the LCD brightness to eight contrast levels.

- 1) Use **[F5]** and **[F7]** keys to select the LcdContrast line.
- 2) To decrease the contrast, press **[F6]** key; to increase it, press **[F8]** key.

■ Adjusting the Beeper Volume

You can adjust the beeper volume to four levels from OFF to MAX.

- 1) Use **[F5]** and **[F7]** keys to select the BeeperVolume line.
- 2) To turn down the volume, press **[F6]** key; to turn it up, press **[F8]** key.

■ Displaying the Battery Voltage Level

You can check the battery voltage level by displaying the screen shown above. When the remaining voltage level has decreased to only one quarter of the bar on the LCD, it is recommended to charge or replace the battery cartridge.

(You can not only check the battery voltage level temporarily as described above but also monitor it by a visible voltage level icon while the BHT-4000 is in operation. You may erase the icon by turning off the STATUS setting in System Mode. Refer to Subsection 2.4.3, [4.2] Setting the message version and the system status indication.)

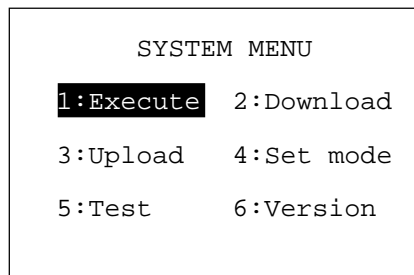
After making the above setting, press the **[ENT]** key or press no keys for five seconds, and the new setting will be set and the above screen will disappear.

2.4 Operating in System Mode

System Mode is an operating software exclusively designed for the effective use of the BHT-4000, which includes various functions as shown on the next page.

2.4.1 Starting System Mode

To start up System Mode, power on the BHT-4000 while holding down **SF** and **1** keys. This operation displays the SYSTEM MENU on the LCD as shown below.

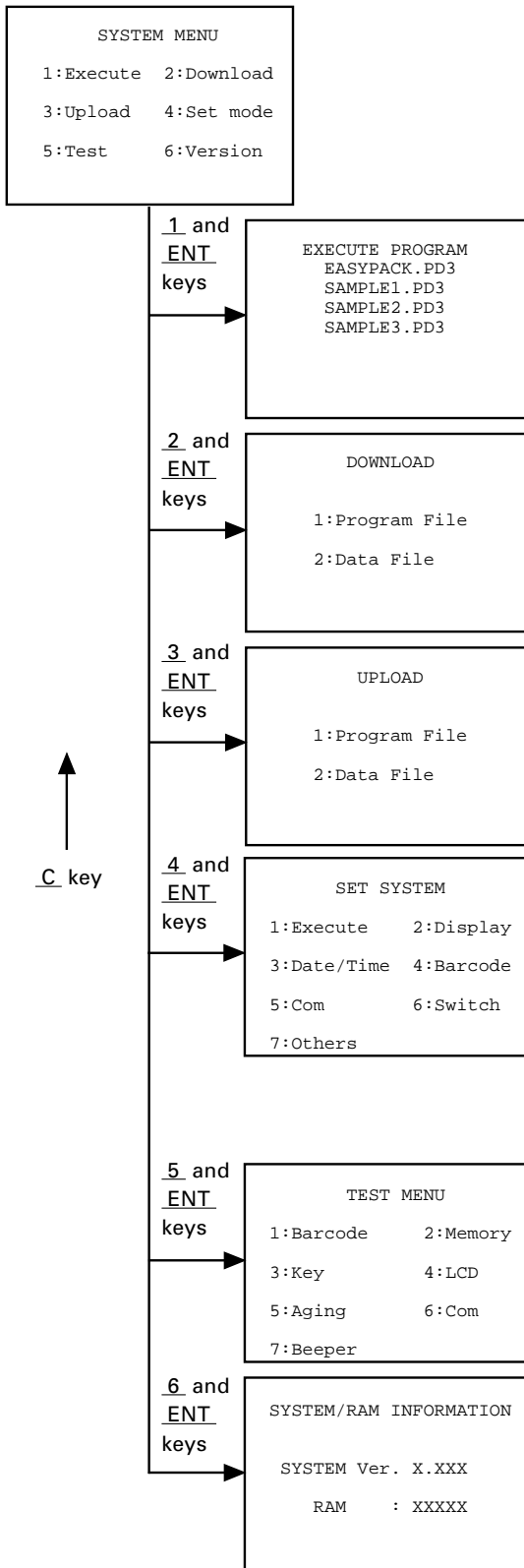


The function selected is reverse-displayed (white-on-black) with the cursor. To select a desired item in System Mode, press the corresponding numerical key and then press **ENT** key. The keys have the same functions as listed below after the screen has shifted to the selected next screen.

Numerical keys	Press a numerical key corresponding with a desired menu number to select the desired item displayed on the screen.
ENT	Press this key to register the selected item and execute the corresponding function.
C	Press this key to return to the immediately preceding screen.

The power-on default is "Execute" which is reverse-displayed. Once any other item is selected, the selected item will be reversed with the cursor when you turn back to the SYSTEM MENU screen.

■ Structure of System Mode



Program Execution

Allows you to select a desired user program (including Easy Pack 4.2) to be executed immediately.) (Refer to Subsection 2.4.3, [1].)

Downloading

Transfers user program files (including Easy Pack 4.2) or data files from the host computer to the BHT-4000. (Refer to Subsection 2.4.3, [2].)

Uploading

Transfers user program files (including Easy Pack 4.2) or data files from the BHT-4000 to the host computer. (Refer to Subsection 2.4.3, [3].)

Setting

Sets a variety of environmental conditions including the execution software, message version (Japanese or English), system status indication (voltage level icon and shift-key icon), calendar clock, special bar-code scanning parameters, and communications parameters (Transmission speed, character length, parity, stop bits, and communications protocol), resume function, and shift-key function.

NOTE Pressing **[SF]** and **[0]** keys on the SET SYSTEM shifts to the Delete screen where you can delete program files and data files.

(Refer to Subsection 2.4.3, [4].)

Testing

Used for the bar-code reading test, memory test, key-entry test, beeper test, LCD indication test, reading confirmation LED test, marker LED test, aging test, and communications test. (Refer to Subsection 2.4.3, [5].)

System Program Version & RAM Capacity

Displays the version of the System Program resident in the system program area of the integrated RAM and the capacity of the RAM. (Refer to Subsection 2.4.3, [6].)

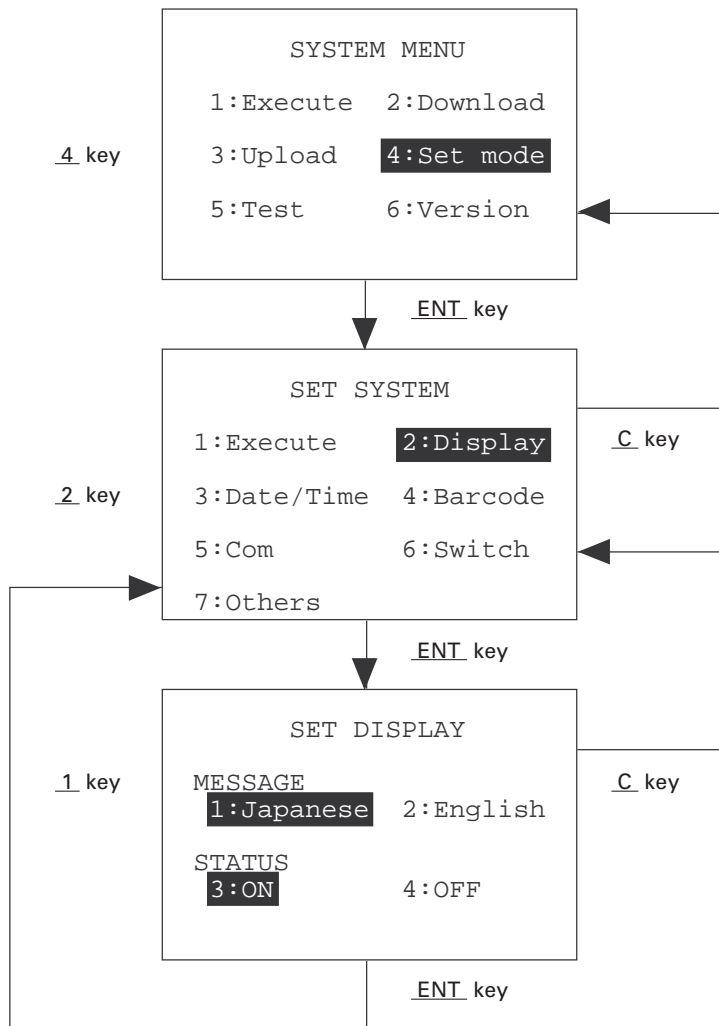
2.4.2 Operating in System Mode

Some functions in System Mode have several screens to be shifted, as shown in the example below.

To select a desired item on the current screen, use the numerical key, and the selected item will be reverse-displayed (white-on-black). To establish it and proceed to the subsequent screen, press **ENT** key.

To return to the preceding screen, press **C** key.

When you complete setting on the last screen, the screen will automatically return to the preceding screen. Each time the **C** key is pressed, the screen goes back to the preceding screen.



2.4.3 Detailed Description of the Functions in System Mode

[1] Program Execution

```
EXECUTE PROGRAM
EASYPACK . PD3
SAMPLE1 . PD3
SAMPLE2 . PD3
SAMPLE3 . PD3
```

Selecting "Execute" on the SYSTEM MENU displays the screen shown at left.

The EASYPACK . PD3 is the program file name of Easy Pack 4.2.

```
EXECUTE PROGRAM
EASYPACK . PD3
SAMPLE1 . PD3
SAMPLE2 . PD3
SAMPLE3 . PD3
SAMPLE4 . PD3
SAMPLE5 . PD3
SAMPLE6 . PD3
SAMPLE7 . PD3
```

If more than one program (Easy Pack 4.2 and user programs) has been downloaded to the user area of the RAM, use **F5** and **F7** keys to move the cursor to a desired program, and then press **ENT** key.



```
EXECUTE PROGRAM
EASYPACK . PD3
SAMPLE1 . PD3
SAMPLE2 . PD3
SAMPLE3 . PD3
SAMPLE4 . PD3
SAMPLE5 . PD3
SAMPLE6 . PD3
SAMPLE7 . PD3
```

If more than eight programs have been downloaded, it will be necessary to scroll the screen with **F7** key.



```
EXECUTE PROGRAM
SAMPLE4 . PD3
SAMPLE5 . PD3
SAMPLE6 . PD3
SAMPLE7 . PD3
SAMPLE8 . PD3
SAMPLE9 . PD3
SAMPLE10 . PD3
SAMPLE11 . PD3
```

In the sample shown at left, twelve programs (including Easy Pack 4.2) are downloaded.

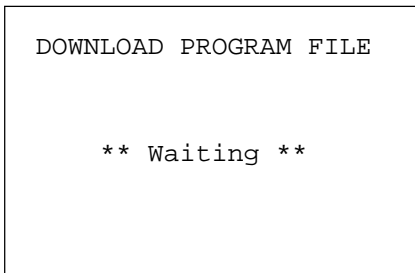
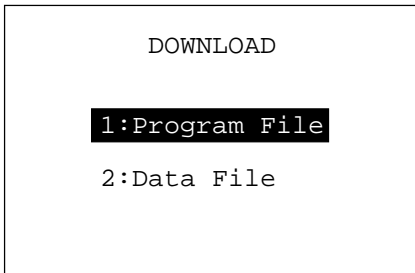
[2] Downloading



If you download a file having the same name as that already used in the user area of the RAM in the BHT-4000, the newly downloaded file replaces the old one.



For downloading to the BHT-4000 from another BHT-4000 without routing the CU-4000, first select the direct-connect interface port in System Mode (refer to [4.5] in this subsection) at each BHT-4000. Next, pull out the connector cover on each BHT-4000 so that the direct-connect interface port will be exposed, and then use the QM connector cable to connect them directly. (For details about the interface cable, refer to Subsection 3.1.2.)



Selecting "Download" on the SYSTEM MENU displays the screen shown at left.

- 1 Program File : Downloads a user program file or Easy Pack 4.2 (compiled by the BHT-BASIC 3.0 Compiler), to the user area of the RAM integrated in the BHT-4000.
- 2 Data file : Downloads a data file to be used by a user program, to the user area of the RAM.

Select a desired file by using the numerical keys, then press **ENT** key.

In the center of the top line appears the selected file--PROGRAM or DATA. The screen shown at left selects PROGRAM file.

The BHT-4000 is waiting for a program file (or a data file) to be downloaded.



For downloading to the BHT-4000 from another BHT-4000, it is also necessary to select a program file or data file on the UPLOAD menu at the sending BHT-4000.

The extension of program files to be downloaded should be one of .PD3, .EX3, and .FN3. (The .EX3 and .FN3 are reserved for future functional expansion.) The extension of data files should be other than .PD3, .EX3, and .FN3.

```
DOWNLOAD PROGRAM FILE

** Loading **
```



```
DOWNLOAD PROGRAM FILE
SAMPLE3.PD3
** Loading **
XXXXX/YYYYY
```



```
DOWNLOAD PROGRAM FILE
SAMPLE3.PD3
** Completed **
YYYYY/YYYYY
```

Upon start of optional Transfer Utility or its equivalent program (upon receipt of an ENQ code from the host computer), the BHT-4000 displays the screen shown at left.

(Refer to the "Transfer Utility Guide.")

While the downloading operation is in progress, the screen shown at left is displayed indicating the file name (on the 4th line) and the number of received records/ the total number of records (on the 8th line).

To abort the downloading operation, press C key. The screen will shift back to the DOWNLOAD menu.

Upon completion of downloading, the number of received records becomes equal to the total number of records and the beeper beeps for one second. Pressing C key will shift back to the DOWNLOAD menu.

If an error occurs during downloading

If some error occurs during downloading, one of the following screens will appear depending upon the error type. In any case, the beeper beeps three times and the prompt "RETRY?" appears. For the probable causes and recovery actions to be taken, refer to Chapter 5, Section 5.2.

To retry the downloading operation, press and keys; to abort it, press and keys.

```
DOWNLOAD PROGRAM FILE

Out of memory !!

RETRY?   2:No
```

The memory capacity is insufficient.

```
DOWNLOAD PROGRAM

Too many files !!

RETRY?   2:No
```

Forty files are already stored.

```
DOWNLOAD DATA FILE

File mismatch !!

RETRY?   2:No
```

The file type--program or data file (identified by the extension)--fails to match the destination file.

```
DOWNLOAD PROGRAM FILE

Communication error !!

RETRY?   2:No
```

A communications error has occurred.

[3] Uploading

NOTE

For uploading from the BHT-4000 to another BHT-4000, first select the direct-connect interface port in System Mode (refer to [4.5] in this subsection) at each BHT-4000. Next, pull out the connector cover on each BHT-4000 so that the direct-connect interface port will be exposed, and then use the QM connector cable to connect them directly. (For details about the interface cable, refer to Subsection 3.1.2.)

```
      UPLOAD
      1:Program File
      2:Data File
```



```
  UPLOAD PROGRAM FILE
  EASYPACK.PD3
  SAMPLE1.PD3
```



```
  UPLOAD PROGRAM FILE
  ** Waiting **
```



Selecting "Upload " on the SYSTEM MENU displays the screen shown at left.

- 1 Program File : Uploads a user program or Easy Pack 4.2 stored in the user area of the RAM, to the host computer.
- 2 Data File : Uploads a data file stored in the user area of the RAM, to the host computer.

Select a desired file by using the numerical keys, then press **ENT** key. If more than one file has been stored in the user area of the RAM, use **F5** and **F7** keys to move the cursor to the desired one and then press **ENT** key.

In the center of the top line appears the selected file--PROGRAM or DATA. The screen shown at left selects PROGRAM file.

The BHT-4000 is waiting for a program file (or a data file) to be uploaded.



For uploading from the BHT-4000 to another BHT-4000, it is also necessary to select a program file or data file on the DOWNLOAD menu at the receiving BHT-4000.


```

UPLOAD PROGRAM FILE

** Loading **
    
```



```

UPLOAD PROGRAM FILE

SAMPLE3.PD3

** Loading **

XXXXX/YYYYY
    
```



```

UPLOAD PROGRAM FILE

SAMPLE3.PD3

** Completed **

YYYYY/YYYYY
    
```

Upon start of optional Transfer Utility or its equivalent program (upon receipt of an ACK code from the host computer), the BHT-4000 shows the screen shown at left.

(Refer to the "Transfer Utility Guide.")

While the uploading operation is in progress, the screen shown at left is displayed indicating the file name (on the 4th line) and the number of sent records/the total number of records (on the 8th line).

To abort the uploading operation, press key. The screen will shift back to the UPLOAD menu.

Upon completion of uploading, the number of sent records becomes equal to the total number of records and the beeper beeps for one second. Pressing key will shift back to the UPLOAD menu.

If an error occurs during uploading

If an error occurs during downloading, the following screen will appear with the prompt "RETRY?" and the beeper beeps three times. For the probable causes and recovery actions to be taken, refer to Chapter 5, Section 5.2.

To retry the uploading operation, press and keys; to abort it, press and keys.

```

UPLOAD PROGRAM FILE

Communication error !!

RETRY?  :Yes  :No
    
```

A communications error has occurred.

[4] Setting

SET SYSTEM	
1:Execute	2:Display
3:Date/Time	4:Barcode
5:Com	6:Switch
7:Others	

Selecting "Set mode" on the SYSTEM MENU displays the screen shown at left.

- 1 Execute : Sets an execution program to be run when the power is first applied.
- 2 Display : Sets the message version (English or Japanese) and the system status indication (voltage level icon and shift-key icon).
- 3 Date/Time : Sets the calendar clock (date and time).
- 4 Barcode : Sets special bar-code scanning parameters (the black-and-white inverted label reading, the touch scanning/long-range scanning, the marker indication, the bar-code scanning status indication, and the decoding level).
- 5 Com : Sets the communications parameters and interface port.
- 6 Switch : (Reserved for future functional expansion. Do not disturb the defaults "OFF"; otherwise, the BHT-4000 operation will not be assured.)
- 7 Others : Sets the resume function and shift-key function.

Select a desired item by using the numerical keys, then press **ENT** key.

- 0 with **SF** : Deletes a user program held down file or data file.

[4.1] Setting an execution program

```

SET EXECUTE PROGRAM
  EASYPACK.PD3
  SAMPLE1.PD3
  SAMPLE2.PD3
  SAMPLE3.PD3

```

Selecting "Execute" on the SET SYSTEM menu displays the screen shown at left.

If more than one program (Easy Pack 4.2 and user programs) has been downloaded to the user area of the RAM, use **[F5]** and **[F7]** keys to move the cursor to a desired execution program to be run when the power is first applied, and then press **[ENT]** key.

The EASYPACK.PD3 is the program file name of Easy Pack 4.2

To return to the SET SYSTEM menu, press **[C]** key.

NOTE You cannot select System Mode as an execution program in the BHT-4000.

[4.2] Setting the message version (English or Japanese) and the system status indication (battery voltage level icon and shift-key icon)

```

SET DISPLAY
MESSAGE
  1:Japanese  2:English
STATUS
  3:ON       4:OFF

```

Selecting "Display" on the SET SYSTEM menu displays the screen shown at left.

MESSAGE : Switches the message version to English or Japanese, for the indications and messages on the self diagnosis, LCD contrast, beeper volume, battery voltage level screens.

Depending upon this selection, also Easy Pack 4.2 and System Mode are expressed in English or Japanese.

STATUS : Turns on or off the system status indication. If it is set to on, the battery voltage level icon and shift-key icon appear on the bottom of the LCD as shown on the next page.

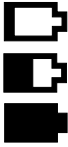

Select a desired setting by using the numerical keys, then press **[ENT]** key.

To return to the SET SYSTEM menu, press **[C]** key.

Reference: You may turn on or off the system status indication also by using the OUT statement in user programs. Refer to the "BHT-BASIC 3.0 Programmer's Manual."

- System Status Indication

Turning on the system status indication displays the following icons:

Indication	Icons	Description
Voltage level of the battery cartridge		Displays the battery voltage level at three levels.
Shift state of the keys on the keypad		Appears when the keys on the keypad are shifted.

[4.3] Setting the calendar clock (date and time)

```

SET DATE/TIME

00/01/01 00:00
_ / /      :
  
```

Selecting "Date/Time" on the SET SYSTEM menu displays the screen shown at left.

Use the numerical keys to enter the year (only the last lower two digits), month, day, hour, and minute in this order. If the data is in one digit, add 0 (zero) preceding the data.

If you make a wrong entry, press **[BS]** key to delete it and enter the correct data.

```

SET DATE/TIME

00/01/01 00:00
93/10/20 14:00_
  
```

[Example] To set 1993, October 20, at 2:00 p.m.

Press **[9]**, **[3]**, **[1]**, **[0]**, **[2]**, **[0]**, **[1]**, **[4]**, **[0]**, and **[0]** keys.

Press **[ENT]** key to register the above setting.

NOTE

- For the year, be sure to enter only the last two digits of the year. For the hour, enter it in the 24-hour format.
- If any of the year, month, day, hour, and minute is not entered, the **[ENT]** key becomes inoperable.

↓

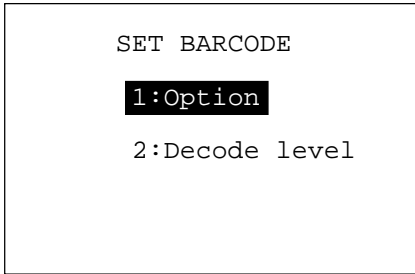
```

SET DATE/TIME

93/10/20 14:00
_ / /      :
  
```

To return to the SET SYSTEM menu, press **[C]** key.

[4.4] Setting the special bar-code scanning parameters



Selecting "Barcode" on the SET SYSTEM menu displays the screen shown at left.

1 Option : Shifts to the BARCODE OPTION screen where you may set the black-and-white inverted label reading function, touch scanning/long-range scanning, marker indication, and bar-code scanning status indication. (For detailed description of these functions, see below.)

2 Decode level : Shifts to the DECODE LEVEL setting screen.

Select a desired setting by using the numerical keys, then press **ENT** key.

To return to the SET SYSTEM menu, press **C** key.

Black-and-white inverted label reading function (Invert)

This function makes it possible to read white bars on a black background.

Touch scanning/long-range scanning (Touch Read)

You may select touch scanning or long-range scanning. The touch scanning is a method in which you bring the bar-code reading window to a bar code to be scanned. The long-range scanning allows you to read bar codes wider than the readable area of the bar-code reading window by pulling the bar-code reading window away from bar codes. (The BHT-4000 can read bar codes at a maximum distance of 31 cm (12.21") from the bar-code reading window.)

If "Touch Read" is set to ON on the BARCODE OPTION screen, the reading speed increases in touch scanning. In long-range scanning, however, this setting may decrease the reading speed and efficiency when the ambient illuminance is low or too high.

If "Touch Read" is set to OFF, the BHT-4000 can scan bar codes irrespective of the ambient illuminance. This setting, therefore, is suitable for long-range scanning. Note that the scanning speed will slightly decrease.

Marker indication (Marker)

Setting the "Marker" to ON turns on the marker LEDs when you press the trigger switch, showing the markers on the object to be scanned. The markers help you distinguish the readable range or the illumination range covered by the illumination LED in long-range scanning.

Bar-code scanning status indication (Viewfinder)

You may display the scanning status of the CCD sensor when you press the trigger switch. When the CCD sensor is scanning, the vertical bars flicker across the bottom of the screen.



Decode level

You may set the recognition level. Decreasing the level value increases the bar-code reading efficiency, but the BHT-4000 might misread low-quality bar codes (split or stained). To the contrary, increasing the level value decreases the bar-code reading efficiency, but it preclude almost all possibilities of misreading.

The default "2" is recommended.

BARCODE OPTION		
Invert	1:ON	<input type="checkbox"/>
Touch Read	3:ON	<input checked="" type="checkbox"/> 4:OFF
Marker	5:ON	<input checked="" type="checkbox"/> 6:OFF
Viewfinder	7:ON	<input checked="" type="checkbox"/> 8:OFF

Selecting "Option" on the SET BARCODE menu displays the screen shown at left. Reversed are the current settings. (The defaults are "OFF".)

Invert : Activates or deactivates the black-and-white inverted label reading function.

Touch Read : Switches to the touch scanning (ON) or long-range scanning (OFF).

Marker : Turns on or off the marker indication on the object to be scanned.

Viewfinder : Turns on or off the barcode scanning status indication. This setting takes effect only when the system status indication is set to ON (refer to [4.2]).

Select a desired setting by using the numerical keys, then press key.

To return to the SET BARCODE menu, press key.

DECODE LEVEL	
Count	<input type="text" value="2"/>

Selecting "Decode level" on the SET BARCODE menu displays the screen shown at left. Reversed is the current setting. (The default is "2".)

To increase the decode level, press key; to decrease it, press key. The setting range is from 1 to 9.

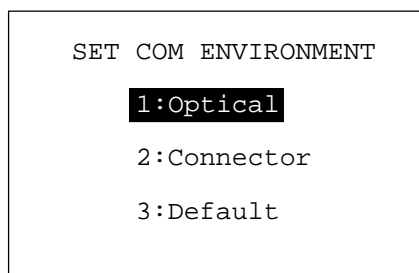
After selecting the level value, press key.

To return to the SET BARCODE menu, press key.

[4.5] Setting the communications parameters and interface port

When the BHT-4000 is initialized, the communications parameters and the interface port to be used are set as listed in the default table below. Do not access unless necessary.

Communications parameters	
Transmission speed (Bit rate)	19,200 bps
Character length	8 bits
Parity	None
Stop bits	1 bit
Protocol	Serial number ON: Adds serial numbers to data blocks. Horizontal parity ON: Enables horizontal parity cheking. RS/CS control OFF: Disables the RS/CS control.
Interface port	Optical interface port



Selecting "Com" on the SET SYSTEM menu displays the screen shown at left.

- 1** Optical : Shifts to the communications parameter menu screen for the optical interface. (The CU-4000 is required.)
- 2** Connector: Shifts to the communications parameter menu screen for the direct-connect interface.
- 3** Default : Shifts to the interface port setting screen.

Select a desired item by using the numerical keys and then press **ENT** key to shift to the selected setting screen.

To return to the SET SYSTEM menu, press **C** key.

Setting the communications parameters

```

SET COM OPTICAL
1:Speed      2:Data
3:Parity     4:Stop bit
5:Protocol

```

Selecting "Optical" or "Connector" on the SET COM ENVIRONMENT menu displays the corresponding screen shown at left. The selected interface port (OPTICAL or CONNECTOR) is shown on the 2nd line of the LCD.

```

SET COM CONNECTOR
1:Speed      2:Data
3:Parity     4:Stop bit
5:Protocol

```

- 1** Speed : Shifts to the speed setting screen where you may select the transmission speed: 300, 1200, 2400, 4800, 9600, 19200, 38400* bps, or High Speed.**
- (*38400 bps is available only when the direct-connect interface port has been selected.)
- (**The "High Speed" is available only in Transfer Utility, provided that the RS-232C interface cable is specially connected. Refer to Chapter 3, Subsection 3.1.2.)
- 2** Data : Shifts to the character length setting screen where you may select 7 or 8 bits.
- 3** Parity : Shifts to the parity setting screen where you may select none, even, or odd parity.
- 4** Stop bit : Shifts to the stop bit setting screen where you may select 1 or 2 bits.
- 5** Protocol : Shifts to the protocol setting screen where you may set the following:
- Serial On/Off: Selects whether or not the system should add serial numbers to data blocks.
 - Parity On/Off: Selects whether or not the system should add a horizontal parity.
 - RS/CS Control On/Off: Selects whether or not the system should control the RS/CS signal.

Select a desired item by using the numerical keys and press **ENT** key to shift to the corresponding setting screen.

To return to the previous screen, press **C** key.

Setting the interface port

```
SET COM DEFAULT
BASIC
 1:Optical 2:Connector
SYSTEM MODE
 3:Optical 4:Connector
```

Selecting "Default" on the SET COM ENVIRONMENT menu displays the screen shown at left.

BASIC : Selects the optical or direct-connect interface port to be used for user programs written in BHT-BASIC 3.0 ("COM." or XFILE statements) or for Easy Pack 4.2.

SYSTEM MODE : Selects the optical or direct-connect interface port to be used for downloading and uploading files in System Mode.

Select a desired setting by using the numerical keys and press **ENT**.

To return to the SET COM ENVIRONMENT menu screen, press **C** key.

[4.6] Setting the resume function and shift-key function

```

SET OTHERS

Resume
 1:ON      2:OFF

[SF]key
 3:NonLock 4:OneTime

```

Selecting "Others" on the SET SYSTEM menu displays the screen shown at left. Reversed are the current settings.

Resume : Activates or deactivates the resume function which resumes the display shown before the power was turned off, when the BHT-4000 is powered up.

[SF] key : Switches the function of SF key.

NonLock: The keypad will be shifted only when the SF key is held down.

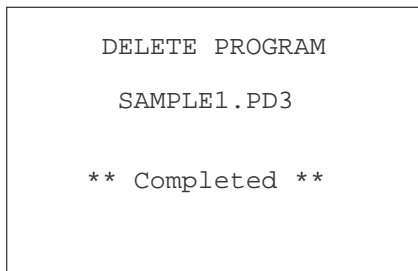
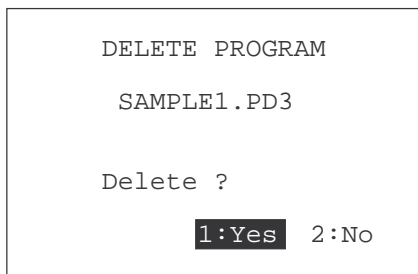
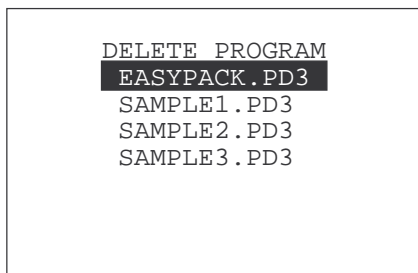
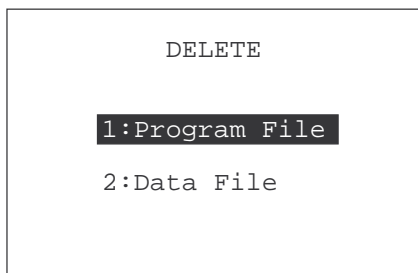
OneTime: Once the SF key is pressed, the next one key pressed will be shifted and the following keys will not be shifted.

Select a desired setting by using the numerical keys, then press ENT key.

To return to the SET SYSTEM menu, press C key.

Reference: The BHT-4000 automatically displays the shift-key icon SF on the bottom of the LCD (as default) when the keys are shifted. You may erase it by modifying the system status indication setting on the SET DISPLAY menu (refer to [4.2]) or by using the OUT statement in user programs (refer to the "BHT-BASIC 3.0 Programmer's Manual").

[4.7] Deleting a user program file or data file



Pressing **[SF]** and **[0]** keys on the SET SYSTEM menu screen displays the screen shown at left.

- [1]** Program File : Deletes a user program file (including Easy Pack 4.2).
- [2]** Data File : Deletes a data file.

Select the file to be deleted by using the numerical keys and press **[ENT]** key.

To return to the SET SYSTEM menu, press **[C]** key.

The selected file type (PROGRAM or DATA) is shown on the 2nd line of the LCD. In the screen shown at left, the PROGRAM file is selected.

If more than one program file is stored in the user area of the RAM as shown at left, use **[F5]** and **[F7]** keys to move the cursor to the program to be deleted and then press **[ENT]** key.

The screen shown at left will appear.

To delete the program, press **[1]** key; to cancel, press **[2]** key.

When the designated file is deleted, the screen shown at left appears.

To return to the SYSTEM MENU screen, press **[C]** key two times.

[5] Testing

TEST MENU	
1:Barcode	2:Memory
3:Key	4:LCD
5:Aging	6:Com
7:Beeper	

Selecting "Test" on the SYSTEM MENU displays the screen shown at left.

- 1 Barcode : Selects the bar-code reading test.
- 2 Memory : Selects the ROM and RAM tests.
- 3 Key : Selects the key entry test.
- 4 LCD : Selects the LCD, reading confirmation LED, and marker LEDs tests.
- 5 Aging : Selects the aging test.
- 6 Com : Selects the communications test.
- 7 Beeper : Selects the beeper test.

Select a desired item by using the numerical keys, then press **ENT** key.

To return to the SYSTEM MENU screen, press **C** key.



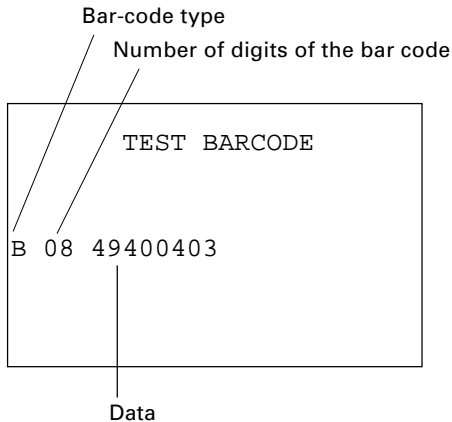
If an error occurs in any of the above tests, contact your nearest dealer.

[5.1] Bar-code reading test

TEST BARCODE

Selecting "Barcode" on the TEST MENU displays the screen shown at left.

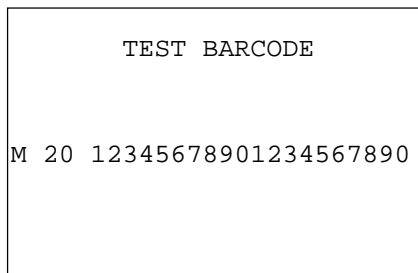
Actually read bar codes with the BHT-4000 and check the read data displayed on the LCD.



Upon completion of bar-code reading, the BHT-4000 beeps, turns on the reading confirmation LED in green, and displays the read data together with the bar-code type and the number of data digits.

Listed below is a table showing the relationship between the bar-code types and the identifier letters to be displayed on the LCD.

(CODE39 sample)



Bar-code Type	ID Letters
EAN-13, UPC-A	A
EAN-8	B
UPC-E	C
Standard 2 of 5 (STF)	H
Interleaved 2 of 5 (ITF)*	I
CODABAR (NW7)	N
CODE39	M
CODE93	L
CODE128	K

* The BHT-4000 can read only those ITF bar codes having 4 digits or more in length.

To return to the TEST MENU screen, press key.

[5.2] ROM and RAM tests

```

TEST MEMORY
ROM Testing
    
```

Selecting "Memory" on the TEST MENU displays the screen shown at left and starts testing the ROM and RAM.

```

TEST MEMORY
ROM Test OK
RAM Testing  xxxx/yyyy
    
```

Upon normal completion of the ROM test, the BHT-4000 automatically starts testing the RAM.

The screen shows the "tested RAM capacity/total RAM capacity" in kilobytes.

```

TEST MEMORY
ROM Test OK
RAM Test NG  XXXX/YYYY
Address  : hhmlll
Write   : AA
Read    : BB
    
```

If any error is detected, the BHT-4000 beeps, shows the message as shown at left, and terminates the test. (This example indicates that an error has occurred in the RAM.)

Where,

hhmlll: Address where an error has occurred.

AA: Data to write

BB: Data read out from the RAM

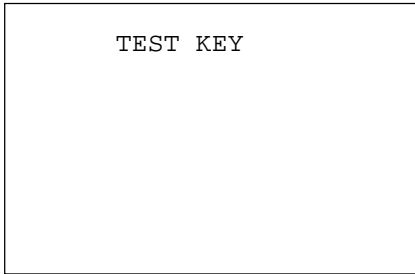
To return to the TEST MENU screen, press C key.

```

TEST MEMORY
ROM test OK
RAM Test OK  yyyy/yyyy
    
```

Upon normal completion of the ROM and RAM tests, the BHT-4000 beeps, shows the message as shown at left, and returns to the TEST MENU screen.

[5.3] Key entry test



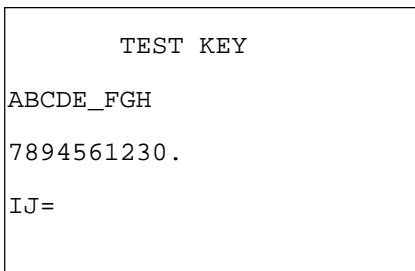
Selecting "Key" on the TEST MENU displays the screen shown at left and makes the BHT-4000 ready for entry from the keypad.

Pressing individual keys displays the identifier letters in the positions preassigned to those keys on the LCD and sounds the beeper. (While the individual key is held down, the beeper continues beeping.)

Pressing the same key again erases the displayed letter.

The table below shows the relationship among the keys, the identifier letters to be displayed on the LCD, and the frequencies (Hz) of the beeper.

Key	Letter	Beeper (Hz)	Key	Letter	Beeper (Hz)	Key	Letter	Beeper (Hz)
F1	A	261	F8	H	587	2	2	1318
F2	B	293	7	7	659	3	3	1396
F3	C	329	8	8	698	0	0	1567
F4	D	349	9	9	783	.	.	1760
F5	E	391	4	4	880	C	I	1975
SF	_	440	5	5	987	BS	J	2093
F6	F	493	6	6	1046	ENT	=	2349
F7	G	523	1	1	1174			



After all keys are pressed and displayed on the LCD, this test automatically ends and the screen returns to the TEST MENU screen.

To stop this test in progress, turn the power off and on.

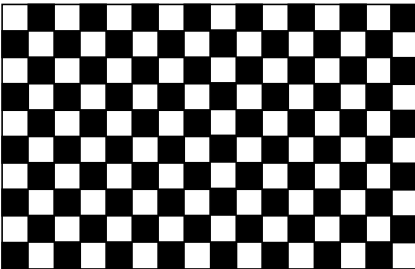
[5.4] LCD, reading confirmation LED, and marker LEDs tests



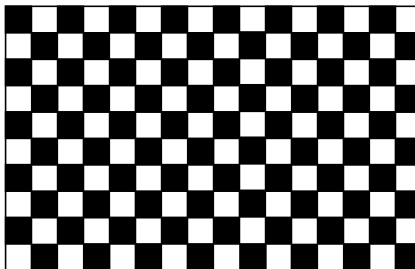
⇓ ENT key



⇓ ENT key



⇓ ENT key



⇓ ENT key

Selecting "LCD" on the TEST MENU displays the test pattern shown at left on the LCD and turns on the reading confirmation LED in green.

Each time ENT key is pressed, the screen shifts to the next test pattern.

To stop this test in progress, press C key.

The screen shown at left appears and the reading confirmation LED lights in red.

The checker pattern shown at left appears, the reading confirmation LED goes off, and the marker LEDs come on to display the markers.

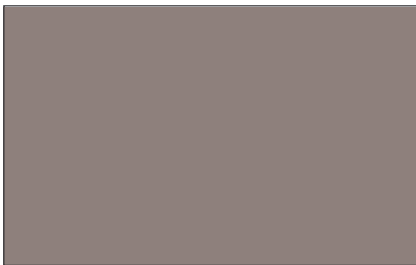
The checker pattern is reversed and the marker LEDs go off.



⇓ ENT key



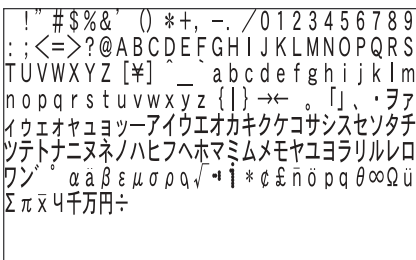
⇓ ENT key



⇓ ENT key



⇓ ENT key



The fine checker pattern shown at left appears.

The fine checker pattern is reversed.

After showing all of the test patterns, the screen automatically displays symbols, and alphanumeric.

Upon completion of this test, the BHT-4000 beeps once and returns to the TEST MENU screen.

[5.5] Aging test

```

TEST AGING

DATE  93/10/20
TIME  15:00:00
    
```

Selecting "Aging" on the TEST MENU proceeds to the aging test while showing the current date and time on the LCD. (This test is intended for personnel which check the BHT-4000 in the factory.)

To return to the TEST MENU screen, press key.



Once this test is selected, the automatic powering-off function becomes disabled. Be sure to turn the power off or press key to return to the TEST MENU screen.

[5.6] Communications test

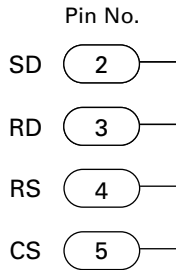
Before starting the communications test in System Mode, it is necessary to jump back the RS-232C interface ports on the CU-4000 and on the BHT-4000 with the testing connectors arranged as shown on the next page.

Interface port	Testing connectors required
Optical interface port on the CU-4000	25-pin D-sub connector (DB-25P)
Direct-connect interface port on the BHT-4000	QM connector

Preparation for the communications test

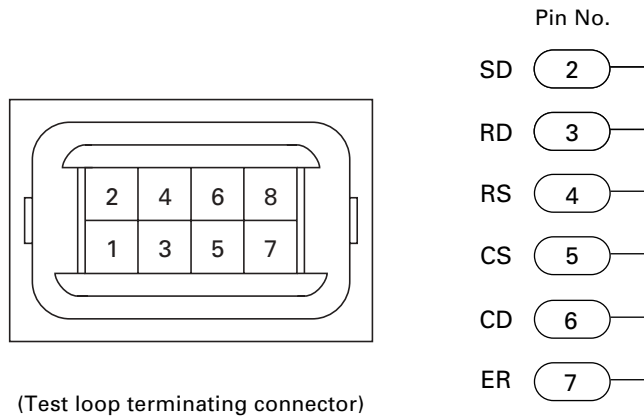
(1) Jump back the optical interface port on the CU-4000

Arrange the Dsub-25P (DB-25P) connector as illustrated below and connect it to the interface port on the CU-4000.



(2) Jump back the direct-connect interface port on the BHT-4000

Arrange the QM connector as illustrated below, then connect it to the direct-connect interface port on the BHT-4000.



(3) Place the BHT-4000 on the CU-4000.

```
TEST COMMUNICATION

1:Optical
2:Connector
```

Selecting "Com" on the TEST MENU displays the screen shown at left.

- 1 Optical : Tests the optical interface port.
- 2 Connector : Tests the direct-connect interface port.

Select the interface port to be tested by using the numerical keys, then press **ENT** key.

```
TEST COMMUNICATION

< Optical >
** Testing **
```

During the test, the screen shown at left is displayed, showing the selected interface port (optical or direct-connect interface) in the center of the LCD. (This example is testing the optical interface port.)

```
TEST COMMUNICATION

< Optical >
** Test NG **
```

If an error occurs, the beeper beeps three times and the error message shown at left appears. Press **C** key to return to the TEST MENU screen.

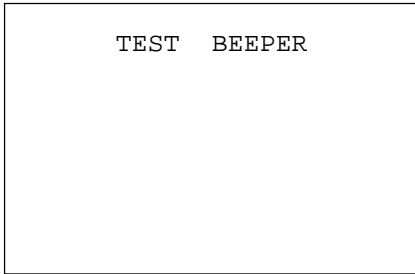
```
TEST COMMUNICATION

< Optical >
** Test OK **
```

Upon normal completion of the test, the BHT-4000 beeps once and displays the screen shown at left.

Press **C** key to return to the TEST MENU screen.

[5.7] Beeper test



Selecting "Beeper" on the TEST MENU displays the screen shown at left and makes the beeper sound at three octaves.

Upon completion of this test, the BHT-4000 automatically returns to the TEST MENU screen.

To stop this test in progress, turn the power off and on.

[6] System Program Version & RAM Capacity

```
SYSTEM/RAM INFORMATION

SYSTEM Ver. X.XXX

RAM      : XXXXKB
```

Selecting "Version" on the SYSTEM MENU displays the screen shown at left, indicating the System Program version and the RAM capacity.

Press key to return to the SYSTEM MENU screen.

Chapter 3

Communications Operations of BHT-4000

This chapter describes the communications operations of the BHT-4000--the RS-232C interface specifications, the basic communications specifications, and the BHT-protocol--for data transmission with the host computer or other devices.

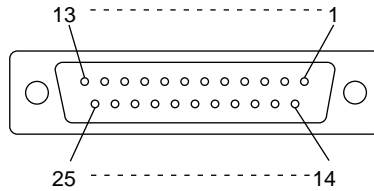
3.1	RS-232C Interface Specifications	72
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3.1 RS-232C Interface Specifications

3.1.1 For CU-4000

[1] Interface Connector and Pin Assignment

The CU-4000 has an RS-232C interface port (Dsub-25S).



RS-232C interface port (Dsub-25S) on the CU-4000

Pin No.	Signal	Functions	Signal Input/Output	
			CU-4000	External device
2	SD	Send data		→
3	RD	Receive data		←
4	RS	Request to send		→
5	CS	Ready to send		←
7	SG	Signal ground		—
20	ER	Data terminal equipment ready		→

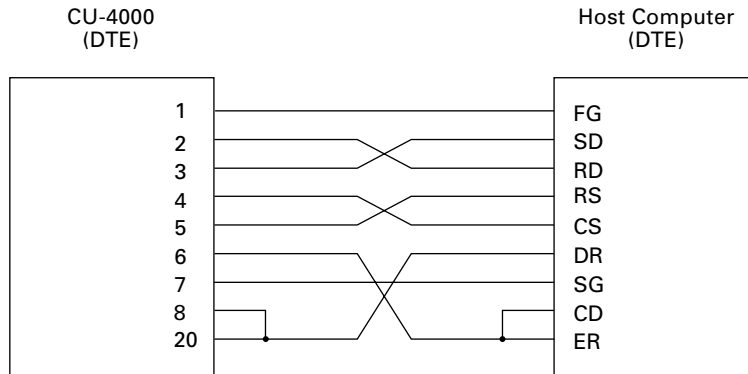
Pins 1 (FG), 6 (DR), and 8 (CD) are not connected.

The input/output voltage threshold for the logical valued signal is listed below.

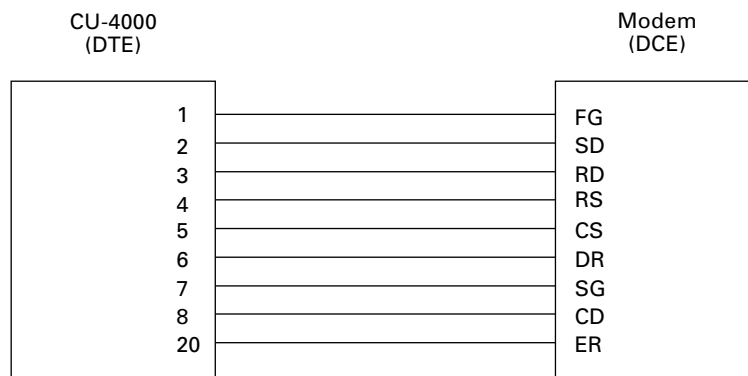
Logical Value	Input Voltage Threshold	Output Voltage Threshold
0	3V min.	5V min.
1	-3V max.	-5V max.

[2] Interface Cable Connection

As illustrated below, connect the CU-4000 (which is joined with the BHT-4000) to a host computer with a cross-mode cable. To connect it to a modem, use a straight-mode cable.



Cable Connection between CU-4000 and Host Computer



Cable Connection between CU-4000 and Modem

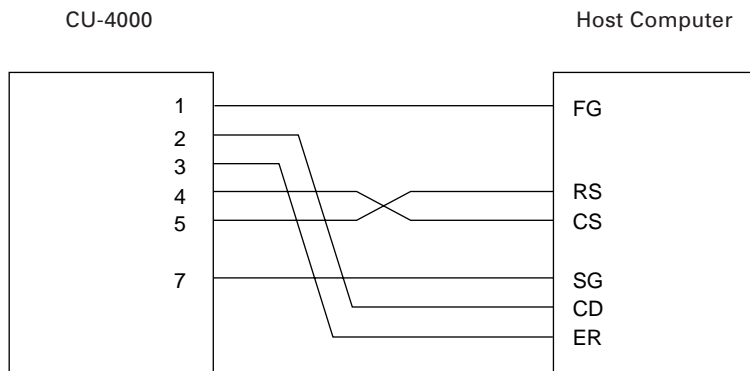
DTE and DCE

In the RS-232C interface specifications, the DTEs (Data Terminal Equipment) shall be generally connected with each other by a cross-mode cable; the DTE and DCE (Data Circuit-terminating Equipment) shall be connected with each other by a straight-mode cable.

The DTE is one piece of equipment connected at both ends of a communications line as a sender or receiver of data (such as CU-4000 joined with the BHT-4000 and a host computer).

The DCE is one piece of equipment connected to the intermediate point between the DTE and the communications line. It terminates communications lines and exchanges information between those lines without any change in contents (such as modem).

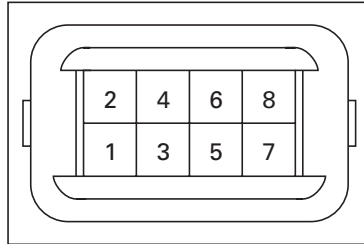
To transfer files at High Speed in Transfer Utility, connect the CU-4000 to a host computer as illustrated below.



3.1.2 For BHT-4000

[1] Interface Connector and Pin Assignment

The BHT-4000 has a direct-connect interface port (QM connector) as shown below, which allows you to directly connect the BHT-4000 to a host computer or modem (or another BHT-4000) without any routing through the CU-4000. It supports a subset of the RS-232C interface.



Direct-connect Interface Port (QM connector) on the BHT-4000

The connector to be joined to the above port should be the Hirose QM connector (without locking, with hood).

Pin No.	Signal	Functions	Signal Input/Output	
			BHT-4000	External device
1	SD (GND)	Ground for signals and charging pin	—	—
2	SD	Send data	→	→
3	RD	Receive data	←	←
4	RS	Request to send	→	→
5	CS	Ready to send	←	←
6	CD	Carrier detect	←	←
7	ER	Data terminal equipment ready	→	→
8	CHG	Charging pin	←	←

The input/output voltage threshold for the logical valued signal is listed below.

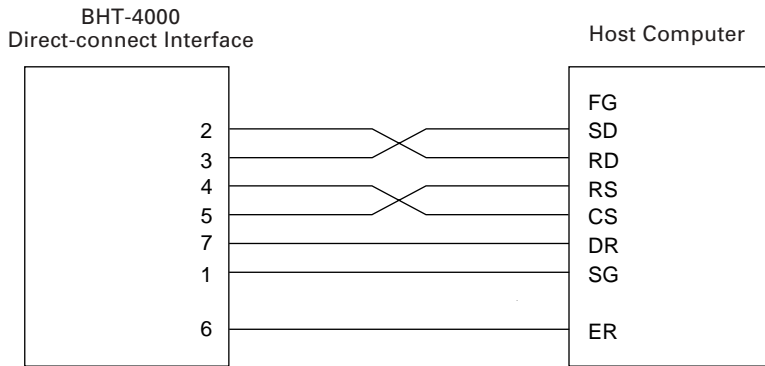
Logical Value	Input Voltage Threshold	Output Voltage Threshold
	(RD)	(SD)
0	3V min.	5V min.
1	-3V max.	-5V max.

NOTE

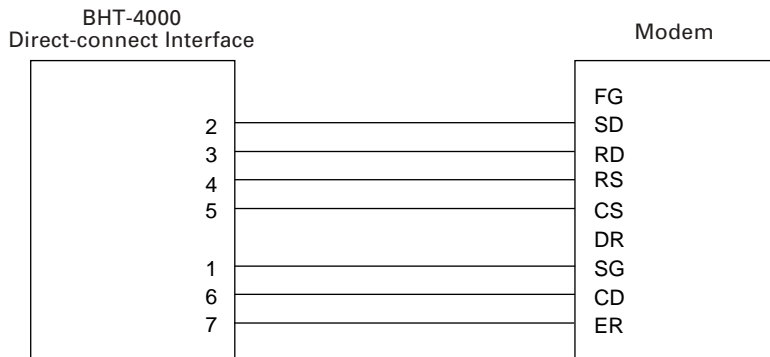
The direct-connect interface port is not designed to stand frequent connecting/disconnecting. Do not plug and unplug basically more than one time a day; otherwise, the service life of the interface port will shorten. To connect the BHT-4000 to a host computer frequently, use the CU-4000.

[2] Interface Cable Connection

Connect the BHT-4000 directly to a host computer, a modem, or a printer with a direct-connect interface cable as illustrated below.

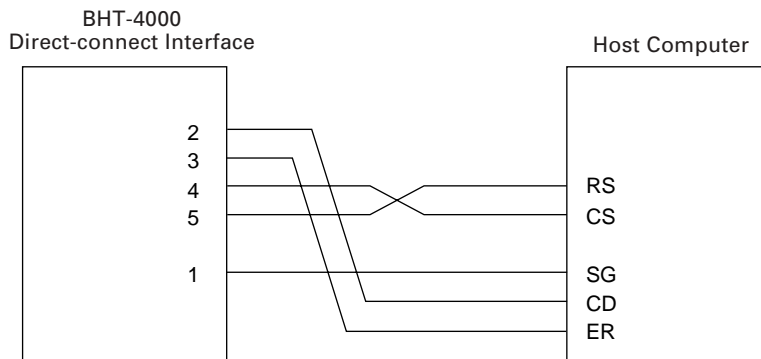


Cable Connection between BHT-4000 and Host Computer



Cable Connection between BHT-4000 and Modem

To transfer files at High Speed in Transfer Utility, connect the CU-4000 to a host computer as illustrated below.



3.2 Basic Communications Specifications and Parameters

3.2.1 Basic Communications Specifications

Listed below are the communications specifications when the BHT-4000 transacts data with a host computer through the optical interface (CU-4000) or direct-connect interface.

Synchronization	Start-stop
Transmission Speed	300, 600, 1200, 2400, 4800, 9600, 19200, 38400* bps, or High Speed**
Transmission Code	JIS 7-bit/8-bit codes***
Transmission Bit Order	LSB (Least significant bit) first
Response Method	ACK/NAK response
Vertical Parity	Even, odd, or none
Transparency	Non-transparent mode
RS/CS Control	Enabled or disabled

* Available only when the direct-connect interface port (QM connector) has been selected.

** Available only in Transfer Utility.

*** Including 7-bit/8-bit ASCII codes

■ Synchronization

For accurate data transaction, it is very important to synchronize the transmission between the sender and receiver. To do this, it is required to previously define the bit order and position, the character length, and the beginning and end of the character to be transmitted.

The start-stop synchronization is an asynchronous system which synchronizes each character as a unit; that is, it externally adds start and stop bits to the leading and trailing bit positions of the character to be transmitted, respectively. A clock starts counting on receiving the start bit and it falls into a non-communication state on receiving the stop bit. The number of the stop bits is selectable (1 or 2 bits).

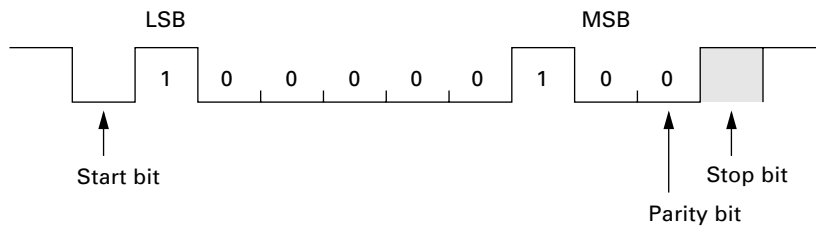
■ Transmission Speed

Maximum number of bits to be transmitted per second. Expressed in bps (bits per second).

■ Transmission Code and Bit Order

All characters should be coded to 7- or 8-bit code for data transmission. The standard data exchange code of the BHT-4000 is JIS 7- or 8-bit code. The transmission bit order is LSB (Least significant bit) first.

What follows is an example for transmitting character A (41h, 01000001b) coded to JIS 8-bit code with an even parity and a single bit each for start and stop bits.



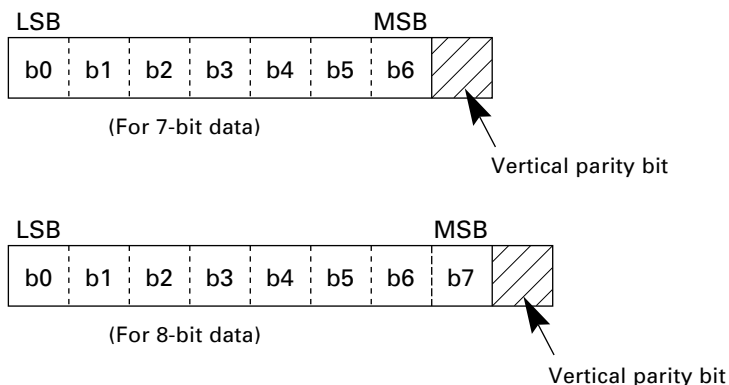
■ Response Method

When two devices initiate communications, they exchange signals for correct data transmission. This procedure is called "handshaking." The sender sends a control code ENQ (05h) to the receiver meaning "Are you ready to receive data?", and the receiver replies to it with a control code ACK (06h) or NAK (15h) meaning "Positive" or "Negative" for starting data transmission, respectively. This sequence is also called "data link establishment phase."

■ Vertical Parity

A vertical parity bit is a redundancy bit which is added to every character to be transmitted in order to check that data has been transmitted accurately. The parity bit should be set to "1" or "0" depending upon the parity parameter setting, to make the number of set bits in the character even or odd. The receiver counts the number of set bits in the transmitted character code to make sure that it has the selected number (even or odd) of set bits.

The vertical parity bit is positioned immediately following the MSB (Most significant bit) as shown below.



■ Transparency

The BHT-4000 uses the non-transparent mode which handles the control characters and codes (e.g. STX, ETX, and SOH) as starting or ending markers and does not allow them to be transmitted as normal data in the transmission texts.

■ RS/CS Control

Depending upon whether the RS/CS control is enabled or disabled in System Mode, the BHT-4000 operation will differ as follows:

RS/CS Control	BHT-4000 Operation
Enabled (ON)	<p>If the CS signal is ON when the BHT-4000 is ready to send, the BHT-4000 will send data. If it is OFF, the BHT-4000 will wait for the CS signal to go ON until the timeout occurs.</p> <p>When the BHT-4000 becomes ready to receive data, it will turn the RS signal ON.</p>
Disabled (OFF)	<p>The BHT-4000 does not check the CS signal when starting data transmission.</p> <p>The RS signal is always ON.</p>

NOTE

The timeout length is fixed to three seconds in System Mode or Easy Pack 4.2. In user programs written in BHT-BASIC 3.0, the timeout length is programmable. If not designated in programming, it becomes three seconds.

For the RS/CS control in user programs written in BHT-BASIC 3.0, refer to the "BHT-BASIC 3.0 Programmer's Manual."

3.2.2 Communications Parameters

In each of System Mode, Easy Pack 4.2, and user programs written in BHT-BASIC 3.0, you may set the communications parameters listed below.

Communications Port	Optical interface or direct-connect interface
Transmission Speed	300, 600*, 1200, 2400, 4800, 9600, 19200, 38400** bps, or High Speed***
Character Length	7 or 8 bits
Vertical Parity	Odd, even, or none
Stop Bits	1 or 2 bits
RS/CS Control	Enable or disable

* Not available in System Mode.

** Available only when the direct-connect interface port (QM connector) has been selected.

*** Available only in Transfer Utility.

In System Mode

Refer to Chapter 2, Subsection 2.4.3 Detailed Description of the Functions in System Mode, [4.5] Setting the communications parameters and interface port.

In Easy Pack 4.2

Refer to Chapter 4, Subsection 4.3.2 Manager Menu, [3] "Set Condition" Mode.

In BHT-BASIC 3.0

To set the transmission speed, character length, and the number of stop bits, use the OPEN "COM:" statement in BHT-BASIC 3.0.

OPEN "COM: ... " Opens the interface port selected in System Mode.

OPEN "COM1: ..." Opens the optical interface port for data transmission routing through the CU-4000, irrespective of the setting in System Mode.

OPEN "COM2: ..." Opens the direct-connect interface port for direct data transmission, irrespective of the setting in System Mode.

Note that it is impossible to open both the optical interface port and the direct-connect interface port concurrently.

Through the interface port opened by the OPEN "COM:" statement, the XFILE statement transmits a designated file.

3.3 BHT-Protocol

3.3.1 Overview

The BHT-protocol is the communications procedure used to transmit files between the BHT-4000 and a host (or between the BHT-4000 terminals). It adopts the response method using ACK/NAK codes.

The BHT-protocol is composed of a defined set of the control character sequences including the following three phases:

Phase 1: Establishment of data link

The sending station confirms that the receiving station is ready to receive data.

Phase 2: Data transmission

The sending station transmits data to the target receiving station.

Phase 3: Release of data link

The sending station confirms whether or not all of the transmitted data has been correctly received by the receiving station. If yes, the sending station terminates the data transmission and releases the data link.

3.3.2 Control Characters

The control characters are classified into two groups: transmission control characters and text control characters.

(1) Transmission control characters

The transmission control characters listed below are used to compose transmission control sequences in phases 1 through 3.

Symbol	Value	Meaning	Function
EOT	04h	End Of Transmission	Releases a data link (Phase 3). Requests abort of transmission (Phase 2).
ENQ	05h	Enquiry	Requests establishment of a data link (Phase 1). Prompts the receiver to respond to the sent text (Phase 2).
ACK	06h	Acknowledge	Acknowledgment response to ENQ (Phase 1). Acknowledgment response to text (Phase 2). Acknowledgment response to EOT (Phase 3).
NAK	15h	Negative Acknowledge	Negative acknowledgment response to ENQ (Phase 1). Negative acknowledgment response to text (Phase 2).

(2) Text control characters

The text control characters are used to format transmission text. In the BHT-protocol, they include the following headers and a terminator.

Symbol	Value	Meaning	Function
SOH	01h	Start Of Heading	Indicates the start of heading text (Phase 2).
STX	02h	Start Of Text	Indicates the start of data text (Phase 2).
ETX	03h	End Of Text	Indicates the end of data text (Phase 2).

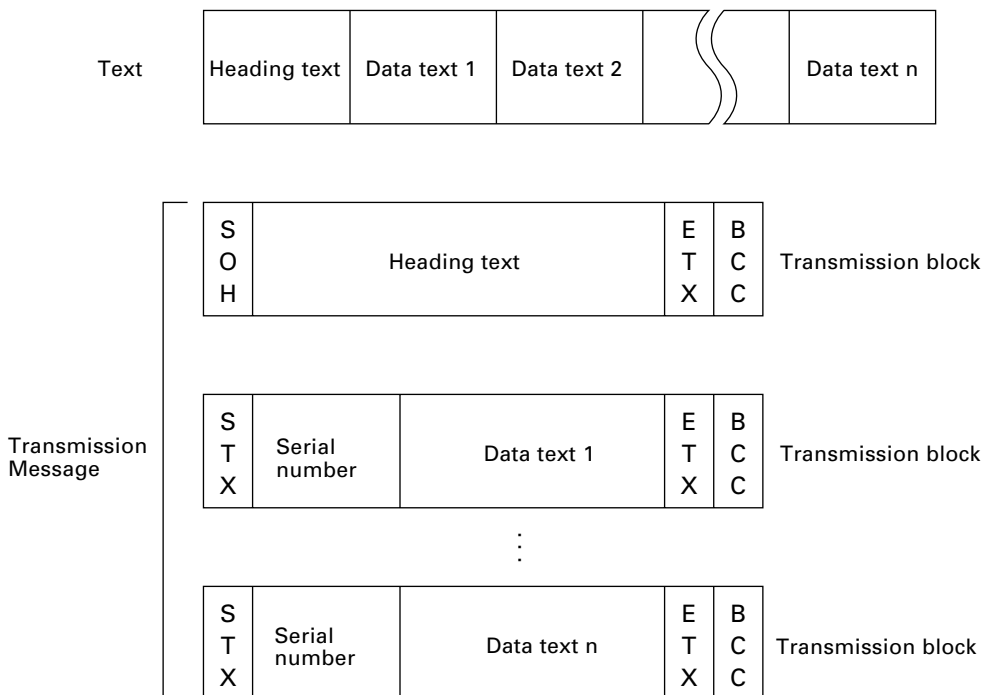
You may designate headers and a terminator by the protocol functions in BHT-BASIC 3.0. If you designate none of them in a user program, the BHT-4000 may apply those as listed above. Refer to the "BHT-BASIC 3.0 Programmer's Manual."

3.3.3 Basic Format of Transmission Messages

Basically, the BHT-4000 transmits data as a unit of a file. First, it transmits a heading text which includes the attribute information of a file (e.g. file name and the number of data texts) to be transmitted. Following the heading text, it transmits the data text in the file. A heading text and data text comprise a text.

In actual text transmission, the text is divided into several blocks, and a header and terminator are added to each block. If the serial number management or error checking by BCC (Block Check Character) are required, the serial number and BCC are also added to each block. This procedure forms a transmission block. A set of transmission blocks comprises a transmission message.

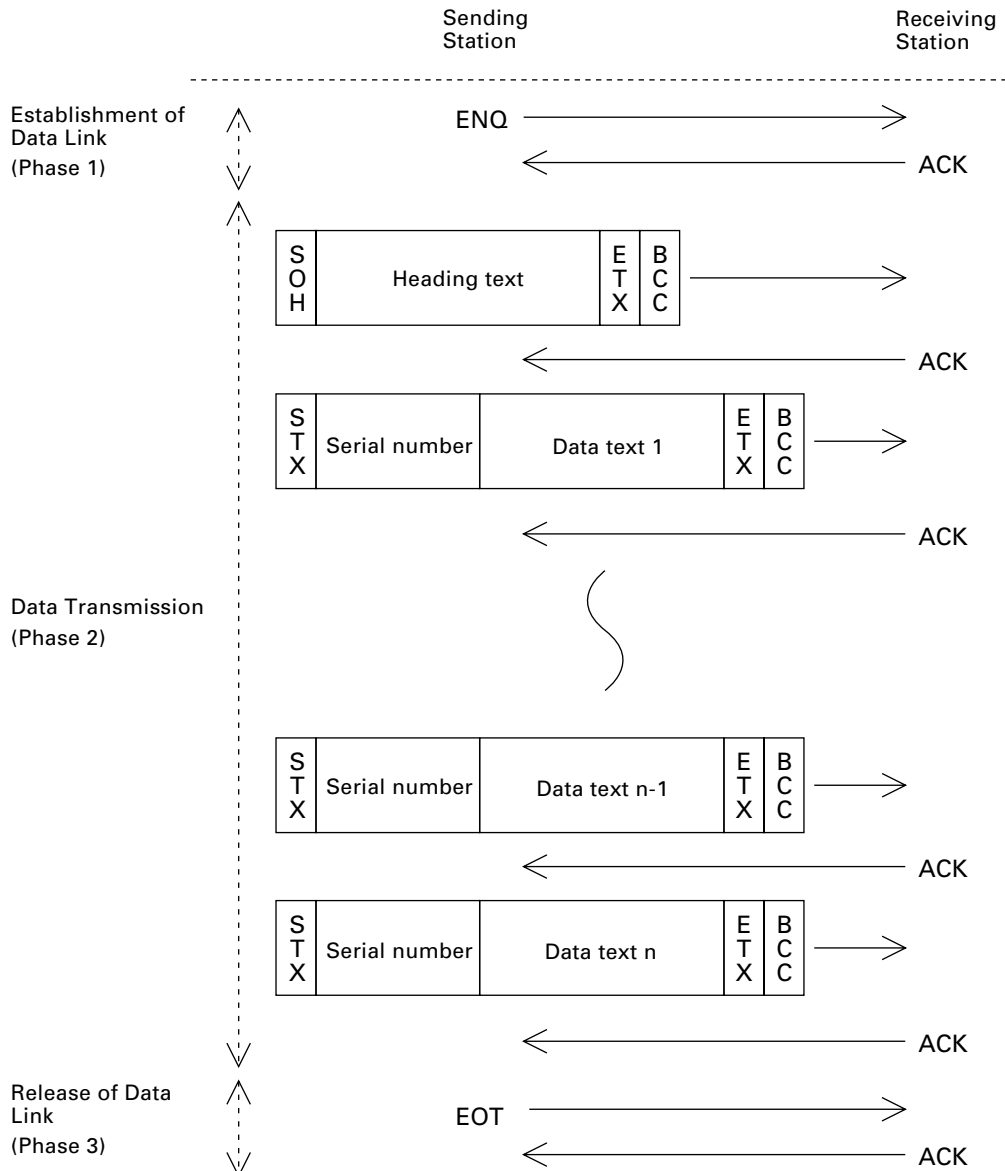
Shown below is an example of a transmission message formed with the BHT-protocol.



In the above figure, SOH, STX, and ETX are text control characters as described in Subsection 3.3.2. The serial number is added to every data text in order to identify those texts. For BCC, refer to Subsection 3.3.6.

3.3.4 Transmission Control Sequences

Shown below is a typical message transmission sequence supported by the BHT-protocol. This sequence does not include transmission errors or negative responses.

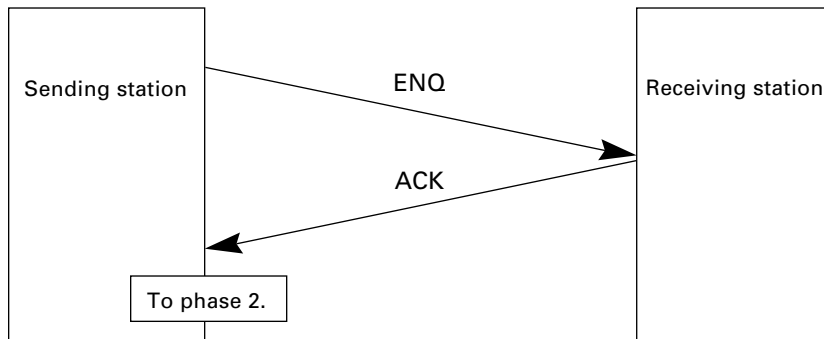


Data transmission may accidentally involve various types of errors. The BHT-protocol is designed to recover from those errors as frequently as possible. What follows is the BHT-protocol for phases 1 through 3.

Phase 1: Establishment of Data Link

■ Normal phase 1

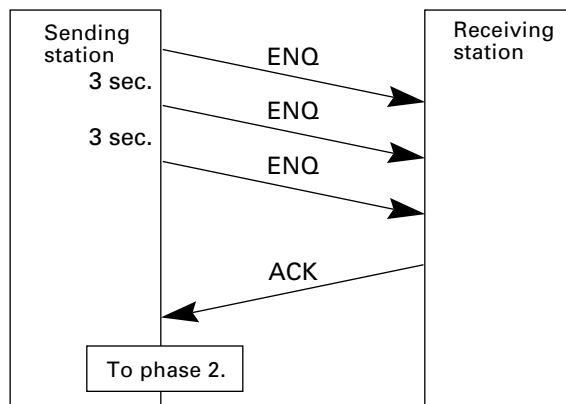
The sending station transmits an ENQ to the receiving station. Upon receipt of an ACK from the receiving station, the sending station shifts to phase 2.



■ Phase 1 with no response or invalid response

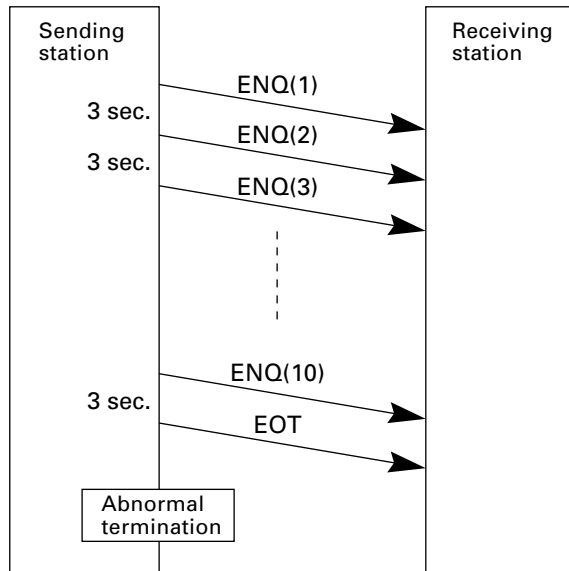
If the sending station receives no response or any invalid response from the receiving station in response to the ENQ sent, it iterates sending of an ENQ at three-second intervals up to 10 times.

If the sending station receives an ACK before sending an ENQ ten times, it shifts to phase 2.



■ **Abnormal termination of phase 1 (Abort of phase 1)**

If the sending station receives no ACK from the receiving station after sending an ENQ 10 times in succession, it sends an EOT to the receiving station after three seconds from the 10th ENQ to terminate the message transmission abnormally.

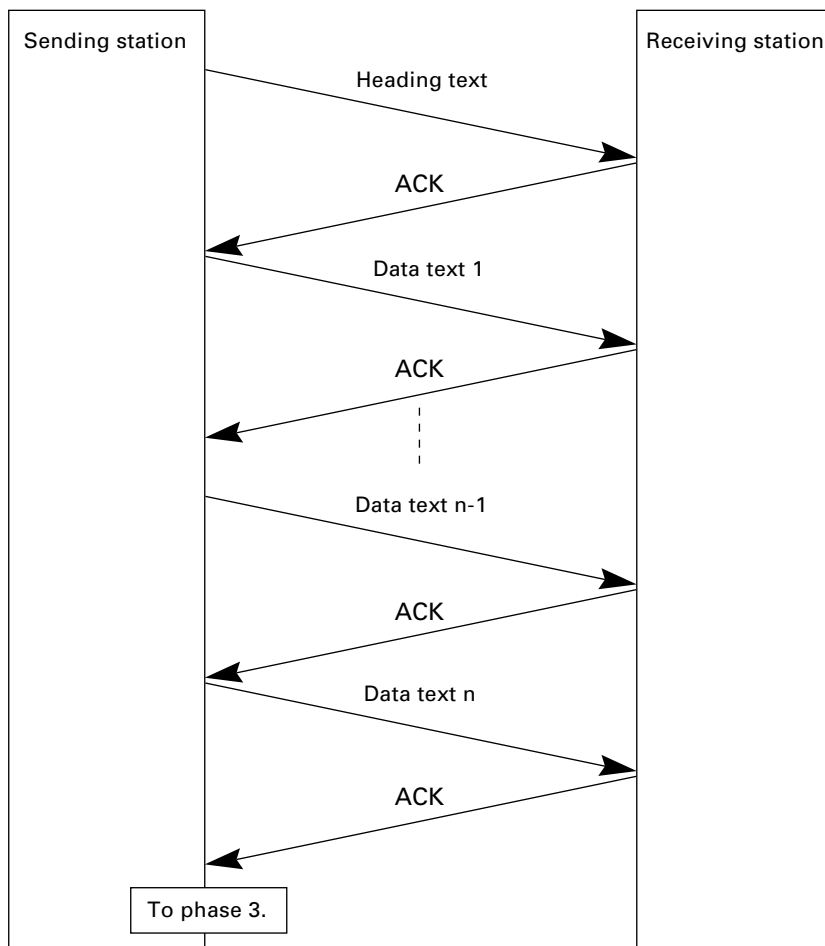


Phase 2: Data Transmission

■ Normal phase 2

The sending station first sends a transmission block containing the heading text. Each time the sending station receives an ACK from the receiving station, it sends a transmission block containing the data texts as shown below. Upon receipt of an ACK in response to the last transmission block (data text n), the sending station shifts to phase 3.

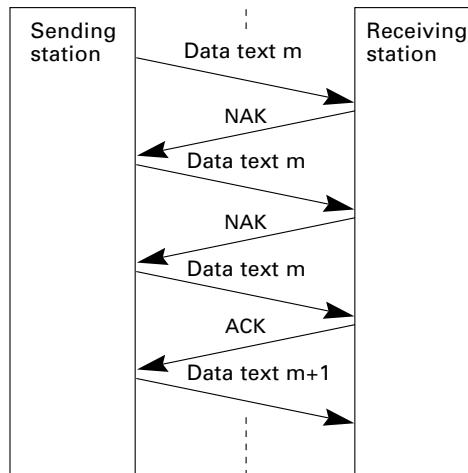
If a transmission message contains no data text, the sending station transmits the heading text only.



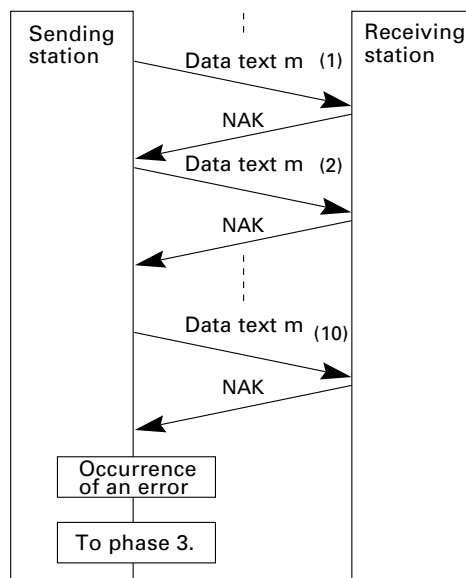
■ **Phase 2 with NAK**

If the sending station receives a NAK from the receiving station in response to a transmission block containing text data m , it sends that transmission block again immediately as shown below.

If the sending station receives an ACK before receiving a NAK 10 times in succession, it continues the subsequent message transmission.

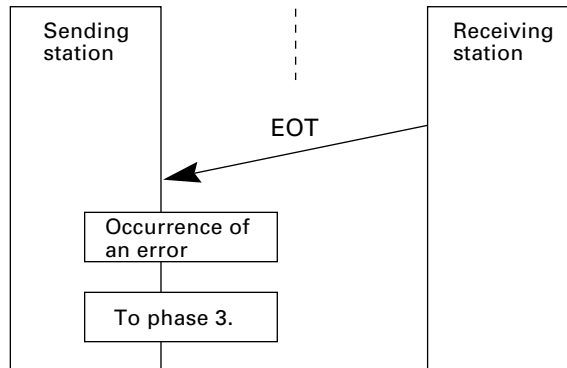


If the sending station receives a NAK 10 times in succession or it fails to send a same transmission block, it shifts to phase 3 to terminate the message transmission abnormally. Even if the phase 3 terminates normally, the transmission results in an abnormal end.



■ Phase 2 with EOT

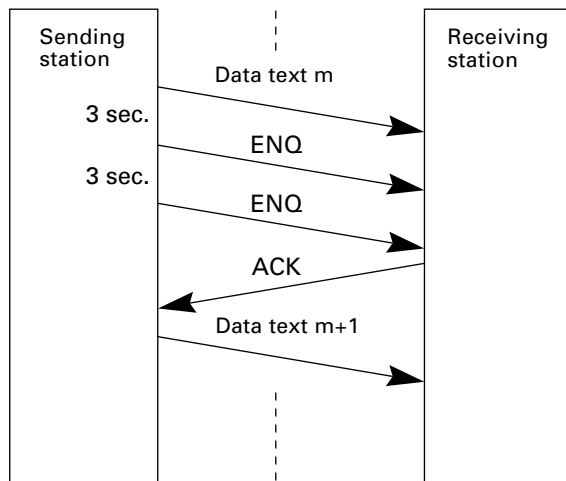
If the sending station receives an EOT anytime during phase 2, it shifts to phase 3 to terminate the message transmission abnormally. Even if the phase 3 terminates normally, the transmission results in an abnormal end.



■ Phase 2 with no response or invalid response

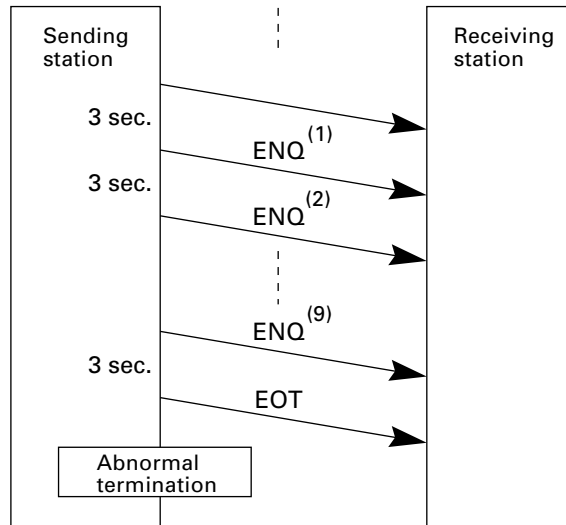
If the sending station receives no response or any invalid response from the receiving station in response to the transmission block sent, it iterates sending of an ENQ at three-second intervals up to nine times.

If the sending station receives an ACK before sending an ENQ nine times, it continues the subsequent message transmission.



■ **Abnormal termination of phase 2 (Abort of phase 2)**

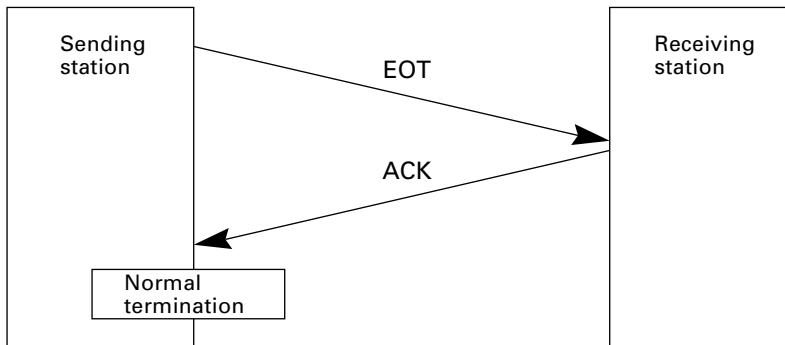
If the sending station receives no ACK from the receiving station after sending an ENQ nine times in succession, it sends an EOT to the receiving station after 3 seconds from the 9th ENQ to terminate this transmission sequence abnormally.



Phase 3: Release of Data Link

■ **Normal phase 3**

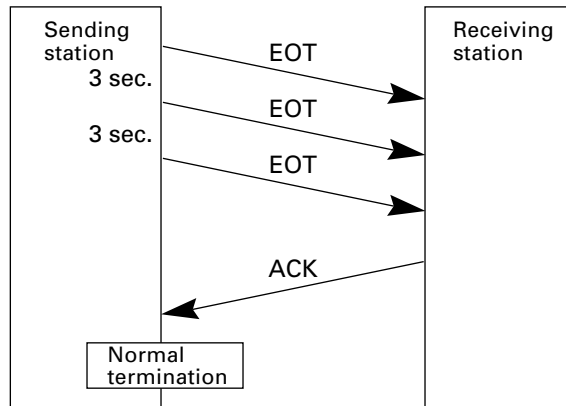
The sending station transmits an EOT to the receiving station. Upon receipt of an ACK from the receiving station, the sending station terminates the message transmission normally and releases the data link.



■ Phase 3 with no response or invalid response

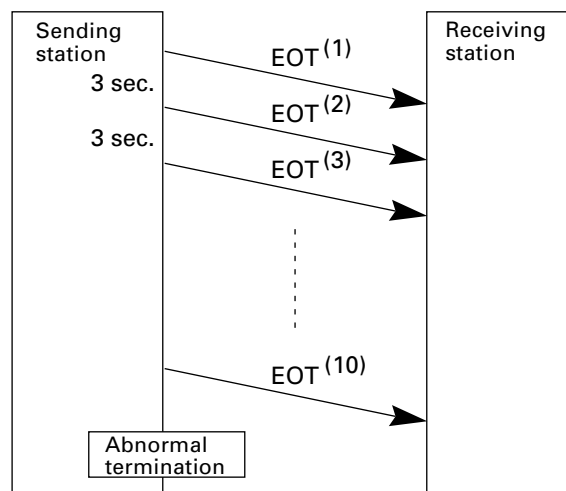
If the sending station receives no response or any invalid response from the receiving station in response to the EOT sent, it iterates sending of an EOT at three-second intervals up to ten times.

If the sending station receives an ACK before sending an EOT ten times, it terminates the message transmission normally and releases the data link.



■ Abnormal termination of phase 3

If the sending station receives no ACK from the receiving station within three seconds from the 10th EOT, it terminates the message transmission abnormally and releases the data link.



3.3.5 Aborting Data Transmission

Pressing C key aborts data transmission.

If C key is pressed during downloading, the BHT-4000 transmits an EOT and aborts the file transmission.

If it is pressed during uploading, the BHT-4000 completes the block transmission and then aborts the file transmission.

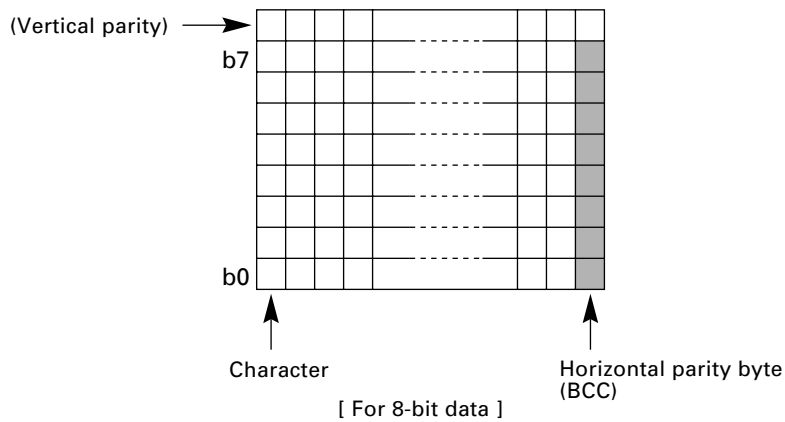
3.3.6 BCC for Horizontal Parity Checking

To check that data has been transmitted accurately, the BHT-4000 supports horizontal parity checking for every transmission block.

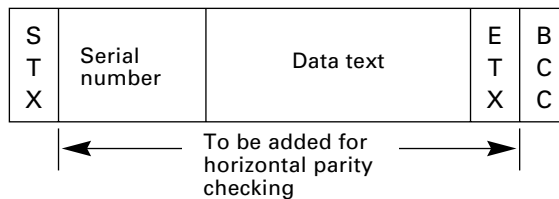
In horizontal parity checking, a horizontal parity byte so called BCC (Block Check Character) is suffixed to an ETX of every transmission block.

In the BHT-protocol, every parity bit of BCC is set so that all set bits at the same bit level (including a parity bit) in the characters contained in the transmission block have an even number by binary addition, except for SOH, STX, and functions SOH\$ and STX\$.

(For details about SOH\$ and STX\$ which are protocol functions unique to BHT-BASIC 3.0, refer to the "BHT-BASIC 3.0 Programmer's Manual.")



Shown below is a data text block in Easy Pack 4.2 indicating the bits to be added for horizontal parity checking.

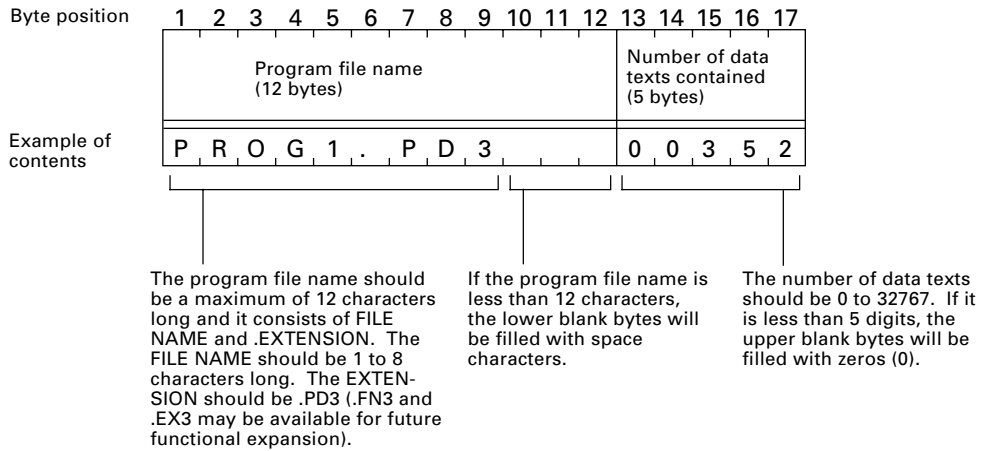


3.3.7 Text Format

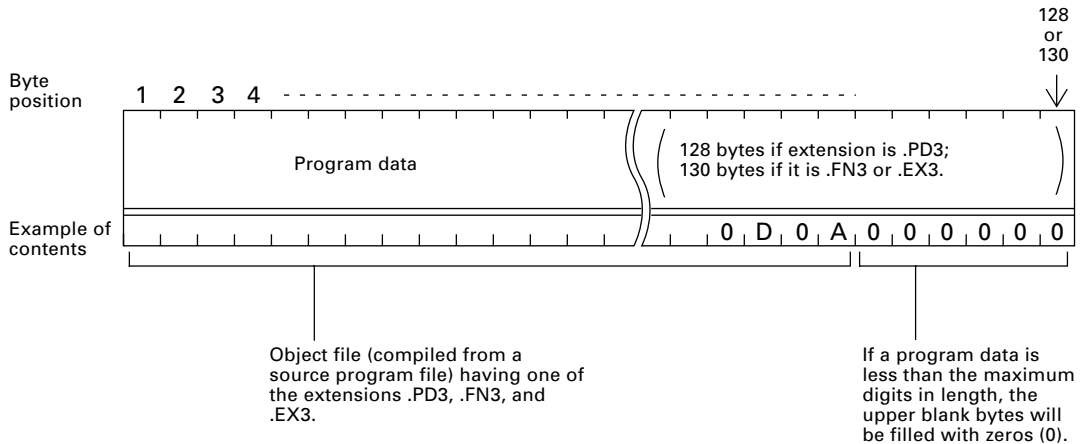
Text should be formatted according to the standard of the BHT-protocol before transmission. What follows are two types of the standard text formats for program and data files.

■ Program Text Format

(1) Heading text

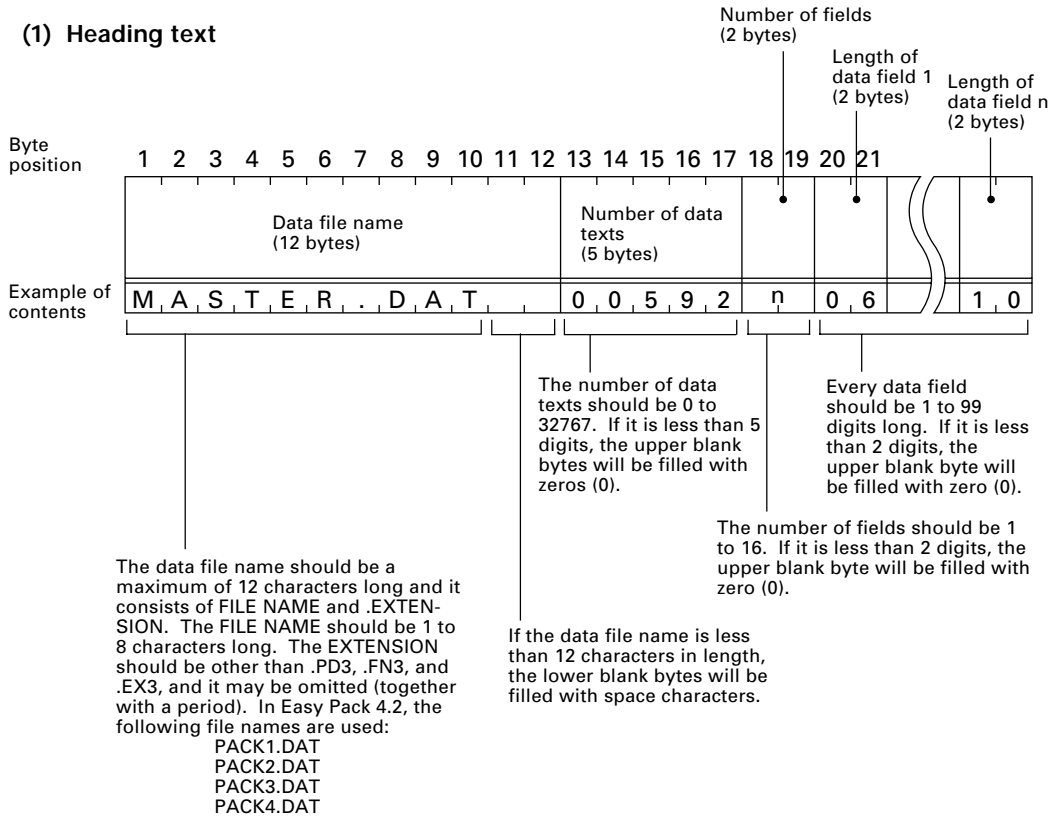


(2) Data text

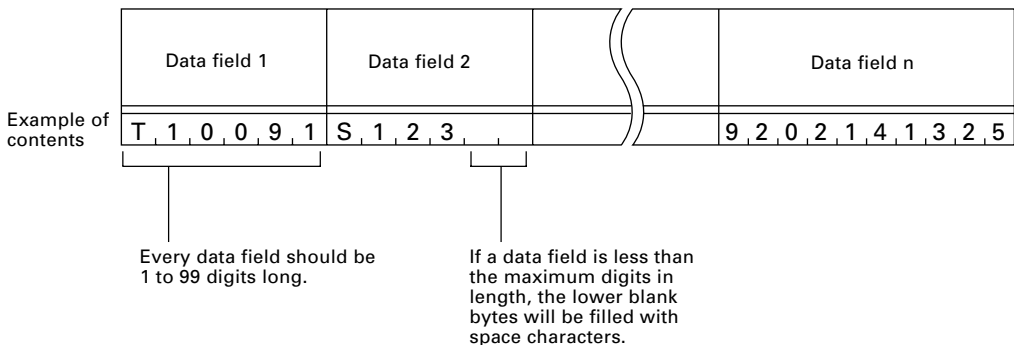


■ Data Text Format

(1) Heading text



(2) Data text



NOTE

The total length of all data fields plus the number of the character count bytes* (= the number of the fields) should be 255 bytes or less. (* When transferring data files, the BHT-protocol automatically prefixes a character count byte in binary format to each data field.) When you transfer five 50-digit (50-byte) fields, for example, the total length of all data fields is 250 (50 x 5) bytes and the number of the character count bytes is 5. Accordingly, the total is 255, so you can transfer the file.

This chapter describes Easy Pack 4.2 which is a standard application program provided in the "BHT-BASIC 3.0 System Pack." Easy Pack 4.2 is suitable for data collection which allows bar code reading or data entry from the keypad.

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[2]	"Select File" Mode	110
[3]	"Transmit File" Mode	111
[4]	"Delete Data" Mode	112
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[1]	"Create File" Mode	114
[2]	"Delete File" Mode	120
[3]	"Set Condition" Mode	120

Chapter 4

Easy Pack 4.2

4.1 Overview of Easy Pack 4.2

4.1.1 Features

- **Starts the BHT-4000 system operation from that day when you introduce the BHT-4000.**

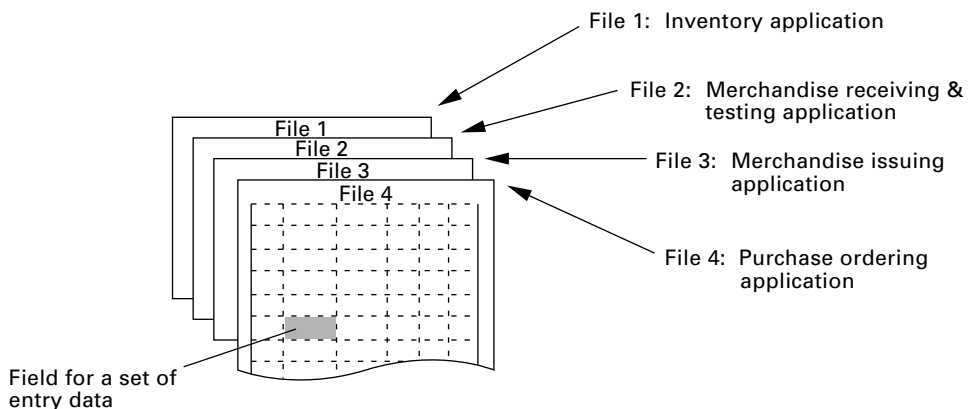
Easy Pack 4.2 is a standard application program provided in the "BHT-BASIC 3.0 System Pack." By merely downloading it, you may start bar code data collection in your business without program development. This general-purpose program is designed to meet a variety of customer's applications.

- **User-friendly procedure.**

Just by interactive key operations following the menus and guidances displayed on the LCD screen, you can easily handle Easy Pack 4.2 without programming skill.

- **Handles up to four data files.**

Easy Pack 4.2 can handle up to four types of bar code data collection applications. Collected data in each of the applications will be written in the assigned file. Shown below is a sample application assignment to those data files.



NOTE

Easy Pack 4.2 cannot support the following applications: retrieval or display of product names or prices from the master file, calculation, and other applications requiring MODEM telecommunications. For those applications, it is necessary to develop the user programs in BHT-BASIC 3.0. (Refer to the "BHT-BASIC 3.0 Programmer's Manual.")

Bar Code Types Allowable in Easy Pack 4.2

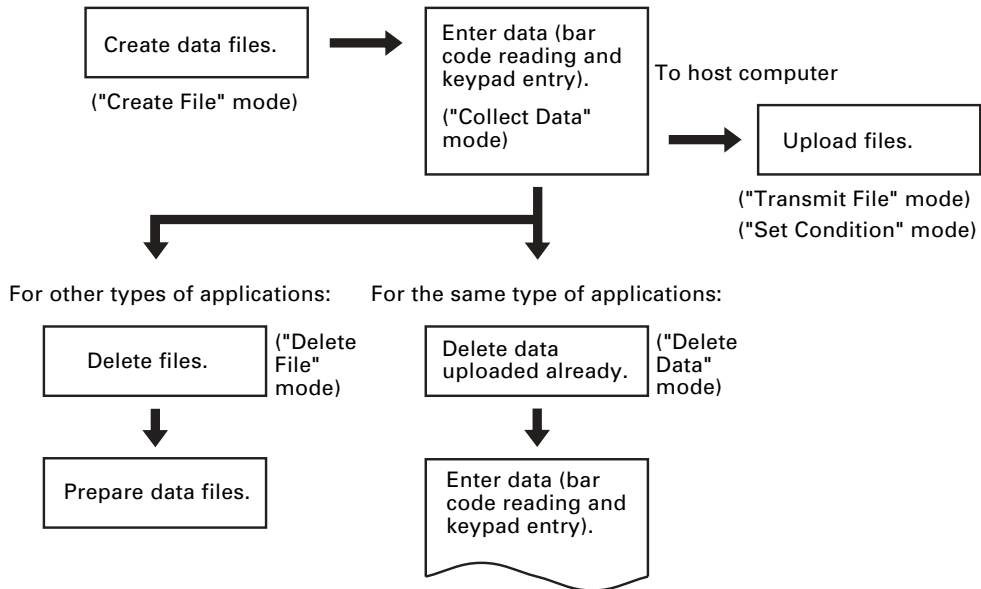
Listed below are bar code types which can be read in Easy Pack 4.2. For the detailed specifications including the bar code label specifications, refer to Appendix A.

Bar Code Type	Symbol Appearing on the LCD	Conditions
Universal product codes	EAN	EAN-13, EAN-8, UPC-A, and UPC-E
Interleaved 2 of 5*	ITF	Within the number of digits registered in preparing files.
CODABAR	NW7	
CODE39	CODE39	
CODE93	CODE93	
CODE128	CODE128	
Multi-codes	MULTI	The above six types of bar codes can be read.

* Only ITF bar codes having 4 digits or more in length can be read.

4.1.2 Program Structure

■ Application Flow Outline



■ User's Menu and Manager's Menu

For more efficient data collection and simpler operation, Easy Pack 4.2 provides two menus--user's menu and manager's menu. All of the applications available in Easy Pack 4.2 start from either the user's menu or manager's menu.

The user's menu, which is intended for users or operators who collect data in practice, has the four modes listed below.

User's Menu

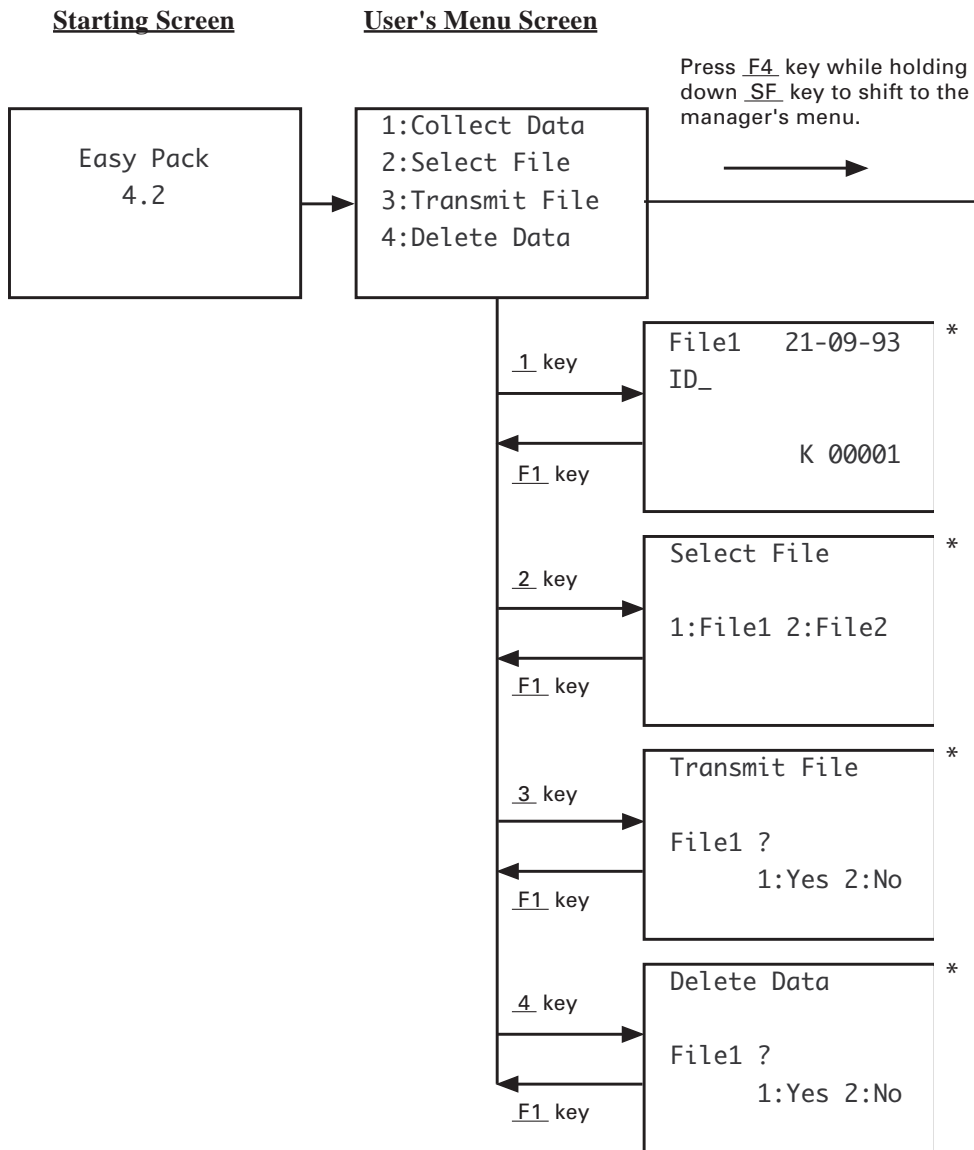
1	Collect Data mode	Collects data by reading a bar code or entering it from the keypad.
2	Select File mode	Selects the data file already created, according to the applications.
3	Transmit File mode	Transmits data files to the host computer.
4	Delete Data mode	Deletes collected data.

The manager's menu, which is intended for system supervisors who manage the BHT-4000 system, has the three modes listed below.

Manager's Menu

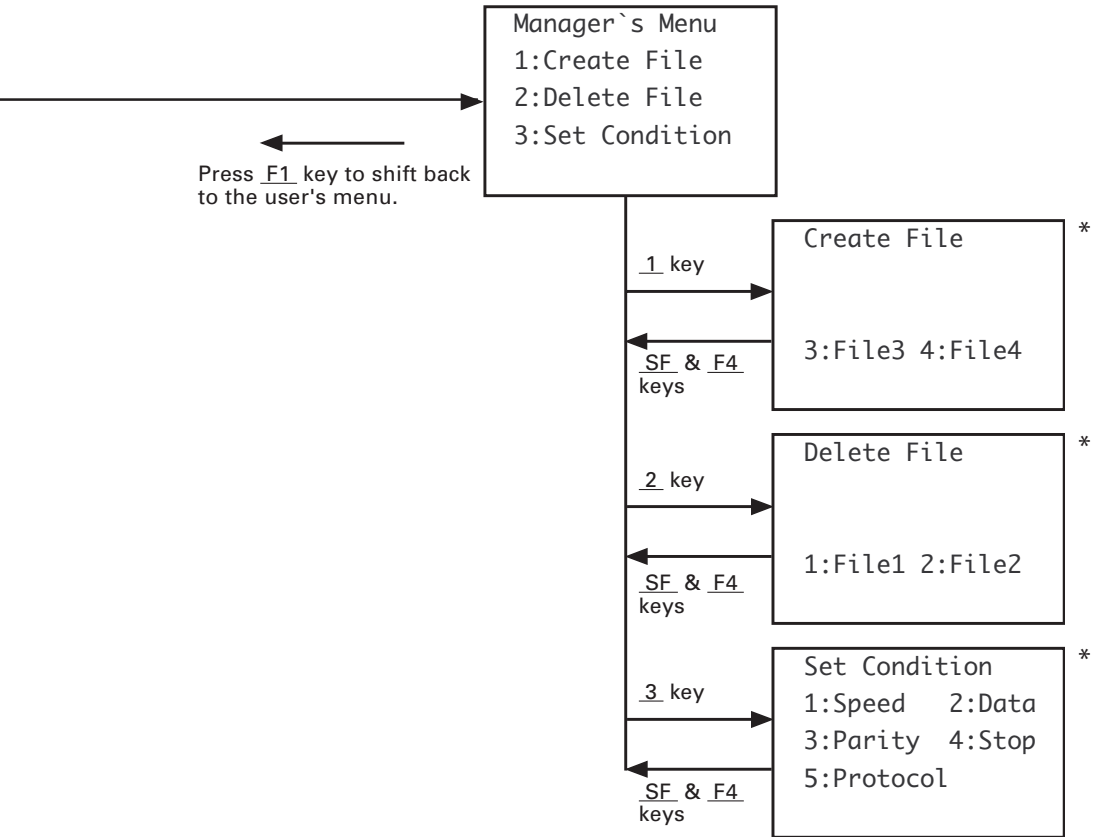
1	Create File mode	Creates new data files.
2	Delete File mode	Deletes data files.
3	Set Condition mode	Sets the communications parameters.

■ Screen Transition in Easy Pack 4.2



* To shift to the manager's menu screen, press F4 key while holding down SF key.

Manager's Menu Screen



* To shift to the user's menu screen, press F1 key.

4.2 Starting Easy Pack 4.2

NOTE

To run Easy Pack 4.2 in the BHT-4000, it is required to download Easy Pack 4.2 from the host computer in advance. Refer to Subsection 2.3.2 Setting-up 2: Installing System Program and User Programs, [4].

■ Initiating Easy Pack 4.2

To initiate Easy Pack 4.2, follow the steps given below.

- (1) To call System Mode, power on the BHT-4000 while holding down **SF** and **1** keys. (Refer to Subsection 2.4.)

Select Easy Pack 4.2 (Program file name: EASYPACK.PD3) as an execution program on the "Set" menu in System Mode. (Refer to Subsection 2.4.3, [4].)

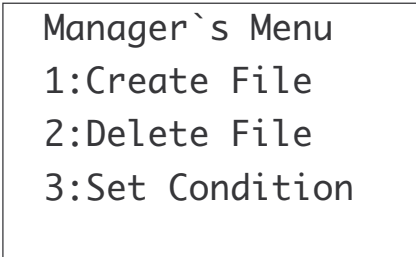
- (2) Power the BHT-4000 off and on again.

The following screen will appear.



File not found!!

- (3) While holding down **SF** key, press **F4** key to shift to the manager's menu screen.



Manager`s Menu
1:Create File
2:Delete File
3:Set Condition

Select the "Create File" mode and prepare data files according to the necessary applications. (Refer to Subsection 4.3.2, [1].)

- (4) Press **F1** key to shift the screen back to the user's menu.

1:Collect Data 2:Select File 3:Transmit File 4>Delete Data

■ Starting Easy Pack 4.2 for the 2nd and subsequent times after initialization

If Easy Pack 4.2 has been selected on the "Set" menu in System Mode, powering on the BHT-4000 automatically displays the Easy Pack screen.

Functions of Keys in Easy Pack 4.2

Keys	Functions
PW	Turns on and off the BHT-4000 power.
F1	Shifts the current screen to the user's menu screen.
F5 and F7	Refers to the data entered previously (in "Collect Data" mode).
Numerical keys	Used to enter 0 to 9 and a period.
ENT	Registers data entered from the keypad (in "Collect Data" mode).
F4 with SF held down	Shifts the current screen to the manager's menu screen.
C	Aborts file transmission in progress (in "Transmit File" mode) or erases data entered into the current field (in "Collect Data" mode).

4.3 Operating in Easy Pack 4.2

4.3.1 User's Menu

The user's menu is designed for applications to be handled by users or operators. The user's menu screen displays the four modes as shown below.

Press any of to keys to select a desired mode.

To return to the user's menu screen from each mode, press key.

To shift to the manager's menu screen, press while holding down key.

User's Menu Screen

```
1:Collect Data
2:Select File
3:Transmit File
4>Delete Data
```

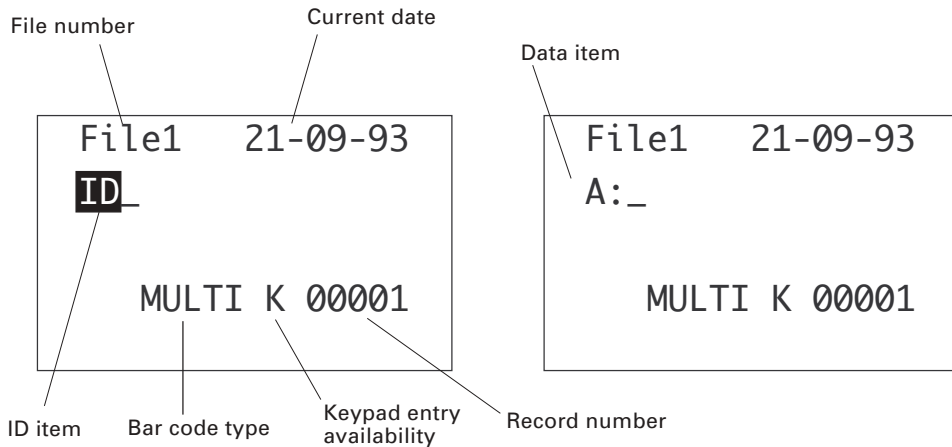
- "Collect Data" mode : Collects data by reading a bar code or entering it from the keypad.
- "Select File" mode : Selects the data file already prepared, according to the applications.
- "Transmit File" mode: Transmits data files to the host computer.
- "Delete Data" mode : Deletes collected data.

[1] "Collect Data" Mode

In this mode, you can read bar codes and enter data from the keypad. You can also refer to or modify the ID code and data entered previously.

Before accessing this mode, it is necessary to prepare a data file in the "Create File" mode of the manager's menu (refer to Subsection 4.3.2, [1]). Also, you should select a desired file number in the "Select File" mode of the user's menu.

Pressing **[1]** key on the user's menu displays either of the following screens, depending upon whether the ID code entry has been selected or not in the "Create File" mode of the manager's menu.



[When the ID code entry has been selected]

[When the ID code entry has not been selected]

File number	1 to 4	File number selected in the "Select File" mode
Current date	DD-MM-YY	Day, month, and year
Item designation	ID item Data item	ID code Data item codes A to D (Up to 4 data items are available.)
Bar code type	EAN ITF NW7 CODE39 CODE93 CODE128 MULTI (No indication)	EAN-13, EAN-8, UPC-A, or UPC-E Interleaved 2 of 5 CODABAR (NW7) CODE39 CODE93 CODE128 Multi-code reading Bar code entry not available
Keypad entry	K (No indication)	Keypad entry available Keypad entry not available
Record number	00001-32767	

If the ID code entry has been selected in the "Create File" mode, enter a desired ID code (by bar code entry or keypad entry). Next, read bar codes or enter data from the keypad according to the preset conditions.

When the BHT-4000 shifts to this "Collect Data" mode at the second use of this mode or later, it becomes ready to accept data at the record area immediately following the last record previously collected.

How to Collect Data

Supposing that a data file has been prepared in the "Create File" mode according to the conditions listed below, the data collecting procedure is described below.

File number	1
ID code to be registered (from keypad)	2 digits
Number of data items (Number of fields)	2
Data item A (bar code entry)	8 digits
Data item B (keypad entry)	2 digits
Number of entered records	10

File1 21-09-93
ID23_

K 00011

Enter the ID code. If the ID code is 23, for example, press 2, 3, and ENT keys.



A:12345678
B:_

K 00011

Scan a bar code to be entered to data item A.

If a CODE39 bar code whose value is 12345678 is read, for example, the value appears on the LCD as shown at left, the beeper beeps, and the reading confirmation LED illuminates in green.



Then, the screen becomes ready to accept data from the keypad for data item B.



At this stage, the read data appears in data item "A" but it is not yet registered into the data file. To register the data, be sure to enter data for all of the specified data items of the record and then press **ENT** key.

If data entry (either with keypad or bar codes) is not necessary, skip the data item by pressing **ENT** key.

If you turn off the power without completing the entry for all data items of the record and pressing **ENT** key, the read data for data item A will be lost when the resume function is deactivated in System Mode (refer to Subsection 2.4.3 [4.6] Setting the resume function and shift-key function.)

```

B:12
A:_

MULTI 00012

```

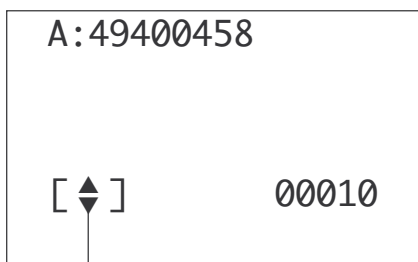
Enter data for data item B from the keypad, and then press **ENT** key. The entered data appears in data item B and the beeper beeps.

If you press **1** and **2** keys and then **ENT** key, for example, Easy Pack starts registering the entered ID code, data for data items A and B, and the current date into the data file as a unit of record.

Repeating the above operation accumulates records in the data file.

How to Review and Modify Data

You can review the previously entered data, by using **F5** and **F7** keys. While the data is being reviewed, the reference mark shown below appears on the screen. On this screen, you may modify the displayed data.



Reference mark

Each time you press **F5** key, the screen scrolls up so as to show data entered to the preceding data items starting from the last data; each time you press **F7** key, the screen scrolls down.

To return to the screen ready for data entry, press **ENT** key.

When the screen shows the data to be modified, press **C** key to erase the old data and enter the new in the same way as for normal data collection.

Upon completion of new data entry, the new data will be automatically registered into the data file.

To return to the screen ready for data entry, press **ENT** key.

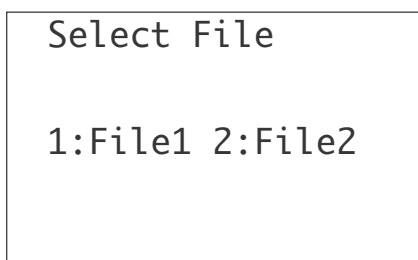
NOTE

If any modification is made, the date will be automatically updated to that day.

[2] "Select File" Mode

In this mode, you can select a desired data file suitable to the specific application from the previously defined files, just by pressing the corresponding numerical key.

Pressing **2** key on the user's menu displays the screen showing only the previously prepared files. The screen example shown below indicates that file 1 and file 2 have been defined.



Use any of the **1** to **4** keys to select a desired data file, and the screen automatically shifts to the user's menu screen.

In this example, press **1** or **2** key.

[3] "Transmit File" Mode

This mode allows you to transmit (upload) the currently selected data file to the host computer.

Pressing **[3]** key on the user's menu displays the screen as shown below.

What follows is a typical procedure for uploading file 1.

```

Transmit File

File1 ?
      1:Yes 2:No
  
```



```

Transmit File

File1 being sent
      00123/00500
  
```

Current record
number being
transmitted

Total number of records
to be transmitted



```

Transmit OK !

Delete File1 ?
      1:Yes 2:No
  
```

```

Transmit error!!

Retry File1 ?
      1:Yes 2:No
  
```

Press **[1]** key to start transmitting data file 1. (To return to the user's menu, press **[2]** key.)

While the file transmission is in progress, the communications monitor function displays the current record number (serial number) being transmitted and the total number of the records to be transmitted on the LCD, making it easy to check the file transmission status.

To abort the file transmission in progress, press **[C]** key.

Upon normal end of file transmission, the BHT-4000 beeps and displays the message asking whether or not the data in the transmitted data file should be deleted.

To delete the data, press **[1]** key. The beeper beeps and the screen shifts to the user's menu.

To retain the data, press **[2]** key. The screen shifts to the user's menu.

NOTE

If a communications error occurs during file transmission or you abort the file transmission by pressing **[C]** key, the BHT-4000 displays the error message shown at left and beeps three times. To retry file transmission, press **[1]** key; to cancel it and return to the user's menu screen, press **[2]** key.

[4] "Delete Data" Mode

You can delete current data collected in the "Collect Data" mode and registered in the selected data file, without erasing the file conditions prepared in the "Create File" mode of the manager's menu.

Pressing key on the user's menu displays the screen as shown below.

```
Delete Data

File1 ?
      1:Yes 2:No
```

To delete data, press key. The beeper beeps and the screen shifts to the user's menu.

To cancel this operation, press key. The data remains as it is and the screen shifts to the user's menu.

NOTE

Difference between the "Delete Data" mode in the user's menu and the "Delete File" mode in the manager's menu is the following: The "Delete Data" mode erases only the data in the file; the "Delete File" mode erases the file itself. For data files which are unnecessary, use the "Delete File" mode.

4.3.2 Manager's Menu

The manager's menu is designed for applications to be managed by system supervisors. The manager's menu screen displays the three modes as shown below.

Press any of **1** to **3** keys to select a desired mode.

To return to the manager's menu screen from each mode, press **F4** key while holding down **SF** key.

To shift to the user's menu screen, press **F1** key.

Manager's Menu Screen

```

Manager`s Menu
1:Create File
2>Delete File
3:Set Condition
  
```

Manager's menu

- 1** "Create File" mode : Creates new data files.
- 2** "Delete File" mode : Deletes data files.
- 3** "Set Condition" mode : Sets the communications parameters.

[1] "Create File" Mode

What you should do first before starting data collection in Easy Pack 4.2 is to select this "Create File" mode and create a data file where the collected data is to be stored.

This mode allows you to create data files matching the practical data collection applications by interactive key operations.

In this mode, you should set the ID-related conditions and data-related conditions.

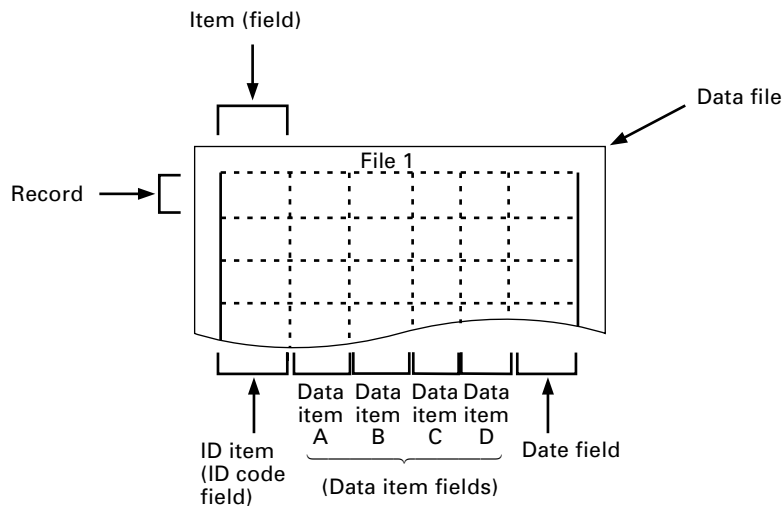
■ Data File Structure

Generally a data file is made of one or more records having the same data type. A record consists of one or more fields.

In Easy Pack 4.2, a data file is made of a maximum of 32767 records and a record consists of a maximum of six fields, as illustrated below.

The six fields are used for four data items (4 fields), ID item (1 field), and date (1 field). The data items are called data items A, B, C, and D in the order of entry. Each item field will be occupied by one operator entry job. The date field, which is automatically assigned in a record, contains 10-digit character string (two digits each for year, month, day, hour, and minute).

In the inventory application, for example, a record is a set of data consisting of the merchandise name (data item A) field and quantity (data item B) field.



■ File Setting Conditions to be Registered

Enter the following conditions from the keypad according to the messages shown on the LCD:

(1) File number	Select a file number from 1 to 4 (PACK1.DAT to PACK4.DAT).
-----------------	--

(2) ID-related conditions:	
ID entry	Select Yes or No.
ID entry method	Select "Barcode & Key", "Barcode", or "Key".
Bar code type	Select a desired bar code type from the seven types given below.
EAN	Universal product codes: EAN-13, EAN-8, UPC-A, and UPC-E
ITF (Interleaved 2 of 5)	<ul style="list-style-type: none"> - Select whether the check digit should be enabled or disabled. - Designate the minimum and maximum numbers of digits for an ID-code field.*
NW7 (CODABAR)	<ul style="list-style-type: none"> - Select whether the check digit should be enabled or disabled. - Designate the minimum and maximum numbers of digits for an ID-code field.*
CODE39	<ul style="list-style-type: none"> - Select whether the check digit should be enabled or disabled. - Designate the minimum and maximum numbers of digits for an ID-code field.*
CODE93	- Designate the minimum and maximum numbers of digits for an ID-code field.*
CODE128	- Designate the minimum and maximum numbers of digits for an ID-code field.*
MULTI (Multi-code reading)**	<p>All of the above 6 types of bar codes can be read.</p> <ul style="list-style-type: none"> - Select whether the check digit should be enabled or disabled. - Designate the minimum and maximum numbers of digits for an ID-code field.*

* The number of digits should be within the range from 1 to 40.
Once the maximum number of digits for an item field is registered, any data exceeding it cannot be entered in both keypad entry and bar code entry.

** To read EAN-13 or UPC-A bar codes when you have selected multi-code reading, it is necessary to set at least 13 digits each for an ID-code field and data item field.
If you have selected multi-code reading, ITF bar codes having less than 4 digits cannot be read.

(3) Data-related conditions:

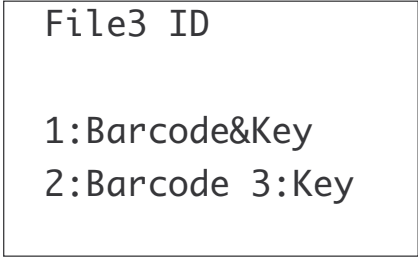
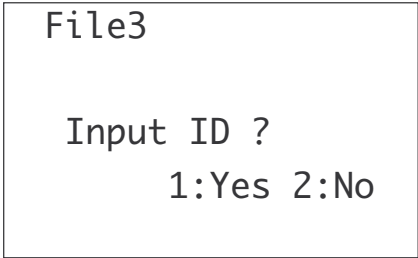
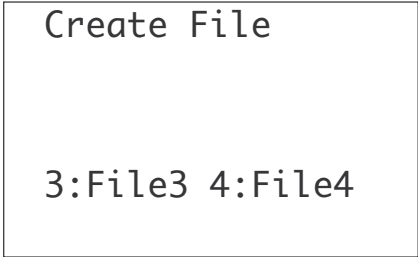
Number of items	Set 1 to 4 items.
Data entry method	Select "Barcode & Key", "Barcode", or "Key."
Bar code type	Select a desired bar code type from the seven types given below.
EAN	Universal product codes: EAN-13, EAN-8, UPC-A, and UPC-E
ITF (Interleaved 2 of 5)	<ul style="list-style-type: none">- Select whether the check digit should be enabled or disabled.- Designate the minimum and maximum numbers of digits for a data item field.*
NW7 (CODABAR)	<ul style="list-style-type: none">- Select whether the check digit should be enabled or disabled.- Designate the minimum and maximum numbers of digits for a data item field.*
CODE39	<ul style="list-style-type: none">- Select whether the check digit should be enabled or disabled.- Designate the minimum and maximum numbers of digits for a data item field.*
CODE93	<ul style="list-style-type: none">- Designate the minimum and maximum numbers of digits for a data item field.*
CODE128	<ul style="list-style-type: none">- Designate the minimum and maximum numbers of digits for a data item field.*
MULTI (Multi-code reading)**	<p>All of the above 6 types of bar codes can be read.</p> <ul style="list-style-type: none">- Select whether the check digit should be enabled or disabled.- Designate the minimum and maximum numbers of digits for a data item field.*

* The number of digits should be within the range from 1 to 40.
Once the maximum number of digits for an item field is registered, any data exceeding it cannot be entered in both keypad entry and bar code entry.

** To read EAN-13 or UPC-A bar codes when you have selected multi-code reading, it is necessary to set at least 13 digits each for an ID-code field and data item field.
If you have selected multi-code reading, ITF bar codes having less than 4 digits cannot be read.

How to Create Data Files

Pressing **1** key on the manager's menu displays the start screen to create files. If no data files have been created, four files should appear on the LCD. In the typical operation flow given below, files 1 and 2 have been created so that files 3 and 4 appear.



● **Selecting a file number**

Select a file number for a data file to be created. In this sample, press **3** key.

● **Designating ID-related conditions**

Select whether or not it is necessary to set the ID-related conditions. If necessary, press **1** key; if not necessary, press **2** key.

If **2** key is pressed, the screen skips to another screen for setting the data-related conditions.

If **1** key is pressed on the previous screen, the screen shown at left appears, prompting you to select the ID code entry method.

To use both the bar code entry and keypad entry, press **1** key.

To use only the bar code entry, press **2** key.

To use only the keypad entry, press **3** key.

If **3** key is pressed, the screen skips to another screen for designating the number of digits for a field.

ID	4:CODE39
1:EAN	5:CODE93
2:ITF	6:CODE128
3:NW7	7:MULTI



Check Digit	
1:Enable	
2:Disable	



File3 ID
Min= <u>1</u>



File3 ID
Min=1
Max= <u> </u>



If or key is pressed on the previous screen, the screen shown at left appears, prompting you to select the bar code type.

Select a desired bar code type by pressing the corresponding numerical key.

If key is pressed, the screen shifts to the next field setting screen.

If or key is pressed, the screen skips to another screen for designating the minimum number of digits for an ID code field.

If , , , or key is pressed on the previous screen, the screen shown at left appears, prompting you to select whether the check digit should be enabled or disabled.

To enable it, press key; to disable it, press key.

Designate the minimum number of digits for an ID-code field by using the numerical keys. Then, press key.



When you have selected the EAN bar code for ID entry, the number of digits for an ID code field is automatically set to 13.

When you have selected the MULTI-code reading and you are to read EAN-13 or UPC-A, it is necessary to set the number of digits to at least 13.

Designate the maximum number of digits for an ID-code field by using the numerical keys. Then, press key. This completes setting the ID-related conditions.



Once the maximum number of digits is registered, any data exceeding it cannot be entered in both keypad entry and bar code entry.

File3:No.of
items
=_ (Max.4)



File3:Item A
1:Barcode&Key
2:Barcode 3:Key



File3:Item B
1:Barcode&Key
2:Barcode 3:Key

● Designating data-related conditions

Enter the number of data items for a record by using the numerical keys. (Up to four data items can be set.)

Press key.

Like the setting of the ID-related conditions, set the data-related conditions including the data entry method, the bar code type, and the minimum and maximum numbers of digits for a data item field.



When you have selected the EAN bar code for data entry, the number of digits for a data item field is automatically set to 13.

When you have selected the MULTI-code reading and you are to read EAN-13 or UPC-A, it is necessary to set the number of digits to at least 13.

If the registered number of data items is one, the screen will automatically return to the manager's menu.

If the registered number of data items is more than one, repeat the above data-related condition setting procedure by the registered number.

Upon completion of setting for all data items, the screen will automatically return to the manager's menu.

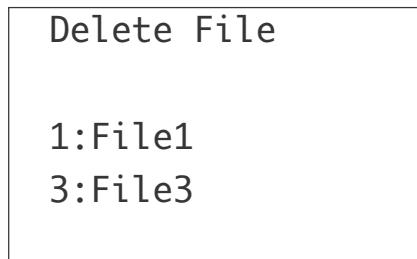
[2] "Delete File" Mode

You can delete files containing both data collected in the "Collect Data" mode of the user's menu and the file conditions created in the "Create File" mode of the manager's menu.

NOTE The "Delete Data" mode of the user's menu erases only the data in the desired file.

The file number of a file deleted in this mode reappears on the "Create File" mode screen, allowing you to use it for other applications.

Pressing **[2]** key on the manager's menu displays the screen showing the existing file numbers.



In the sample shown at left appear files 1 and 3 which exist.

Select the file to be deleted by using the numerical keys.

Upon completion of deletion, the screen will automatically return to the manager's menu.

NOTE If the above operation results in no file existing in the RAM, the message "File not found!!" appears and the beeper beeps three times.

[3] "Set Condition" Mode

You can modify the communications parameters in this mode. Listed below are the communications parameter defaults in Easy Pack 4.2.

Communications Parameters	Defaults
Transmission speed (Bit rate)	19200 bps
Character length	8 bits
Parity	None
Stop bits	1 bit
Protocol	
Serial number	Enabled
Horizontal parity (BCC)	Enabled
RS/CS control	OFF

Pressing **3** key on the manager's menu displays the screen as shown below.

```

Set Condition
1:Speed   2:Data
3:Parity  4:Stop
5:Protocol
  
```

Press each of **1** through **5** keys to shift to a desired setting screen.

- 1** : Transmission speed setting
- 2** : Character length setting
- 3** : Parity setting
- 4** : Stop bit setting
- 5** : Protocol setting

- **Setting the transmission speed, character length, parity, and stop bits**

Pressing **1** key on the above screen displays the screen shown at left.

```

Speed   1: 300
        2: 600   3: 1200
        4: 2400  5: 4800
        6: 9600  7: 19200
  
```

The current setting is reverse-displayed. In this sample, the transmission speed (bit rate) is set to 19200 bps.

Select a desired speed by pressing the corresponding numerical key, and your selection is registered and the screen automatically returns to the "Set Condition" menu.

```

Data

1:7bits  2:8bits
  
```

Pressing **2** key on the "Set Condition" menu displays the screen shown at left.

Select a desired character length by pressing the corresponding numerical key, and your selection is registered and the screen automatically returns to the "Set Condition" menu.

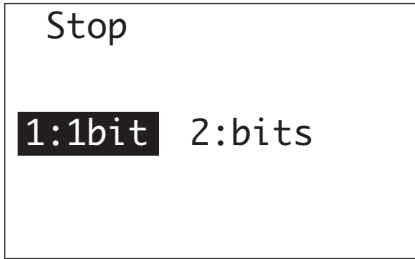
```

Parity

1:None   2:Odd
3:Even
  
```

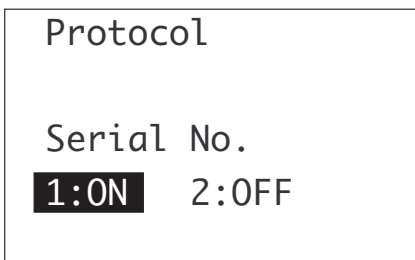
Pressing **3** key on the "Set Condition" menu displays the screen shown at left.

Select a desired parity condition by pressing the corresponding numerical key, and your selection is registered and the screen automatically returns to the "Set Condition" menu.



Pressing 4 key on the "Set Condition" menu displays the screen shown at left.

Select a desired stop bit length by pressing the corresponding numerical key, and your selection is registered and the screen automatically returns to the "Set Condition" menu.



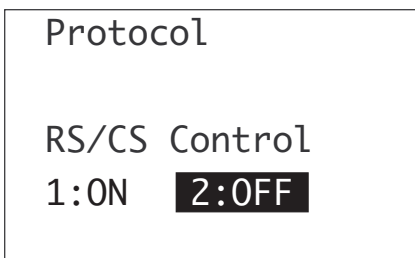
● Setting the protocol

Pressing 5 key on the "Set Condition" menu displays the screen shown at left.

First, select whether or not the data block serial number should be added by pressing the corresponding numerical key.



Next, select whether or not the horizontal parity should be added by pressing the corresponding numerical key.



Select whether or not the RS/CS control should be done by pressing the corresponding numerical key, and your selections above are registered and the screen automatically returns to the "Set Condition" menu.

This chapter lists the error messages which will appear on the LCD if some error occurs in the BHT-4000.

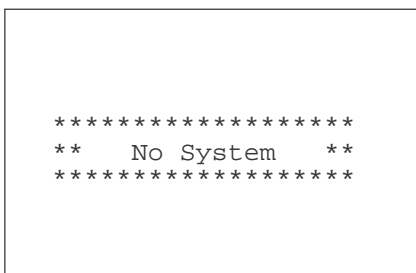
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Chapter 5

Error Messages

5.1 System Errors

If some error occurs when the power is turned on or during program execution, one of the following error messages will appear on the LCD.



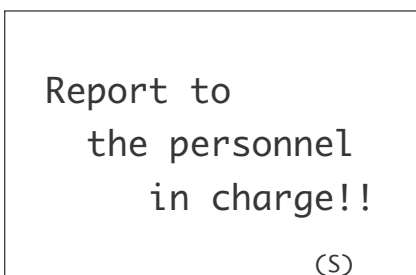
System Program not downloaded

■ Problem

System Program has not been downloaded.

■ Solution

Download System Program provided in the "BHT-BASIC 3.0 System Pack". (For the downloading procedure, refer to Chapter 2, Subsection 2.3.2, [1].)



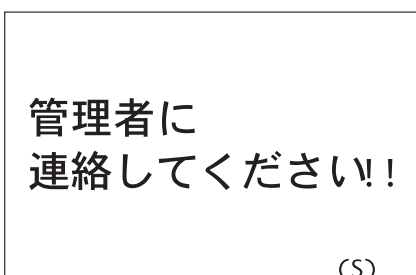
Memory backup test 1

■ Problem

An error is found in the system area of the RAM during the memory backup test activated when the power is turned on.

(This error message will appear also when the power is turned on without initialization after downloading of System Program.)

NOTE This error message will appear either in English or Japanese.



■ Solution

Initialize the BHT-4000. (Refer to Chapter 2, Subsection 2.3.2, [2].)

If the error persists, contact your nearest dealer.

Report to
the personnel
in charge!!

(A)

管理者に
連絡してください!!

(A)

Charge
the battery!!

電池を
充電してください!!

Memory backup test 2

■ Problem

An error is found in the user area of the RAM during the memory backup test activated when an application program is initiated.

(This error message will appear also when the power is turned on without initialization after downloading of System Program.)

NOTE This error message will appear either in English or Japanese.

■ Solution

Initialize the BHT-4000. (Refer to Chapter 2, Subsection 2.3.2, [2].)

If the error persists, contact your nearest dealer.

Low battery indication

■ Problem

When the power is turned on or an application program is initiated, the battery voltage level has lowered.

NOTE If the battery output voltage level lowers during program execution, the BHT-4000 beeps five times (for 0.1 second per beep).

■ Solution

Immediately turn off the power, then replace or charge the battery cartridge. (For the charging procedure, refer to Chapter 6, Section 6.5.)

No execute
software exists!!

実行するソフトウェアが
ありません!!

Execution program not selected

■ Problem

No user program (including Easy Pack 4.2) has been selected as an execution program to be run when the power is turned on.

■ Solution

Operate the BHT-4000 in System Mode and select an execution program in the "Set" menu. (Refer to Chapter 2, Subsection 2.4.3, [4.1].)

5.2 Errors in System Mode

If some error occurs during operation in System Mode, one of the following error messages will appear on the LCD.

```

EXECUTE PROGRAM

*****
* NO FILE EXISTS *
*****

```

```

SET EXECUTE PROGRAM

*****
* NO FILE EXISTS *
*****

```

```

UPLOAD DATA FILE

*****
* NO FILE EXISTS *
*****

```

```

UPLOAD PROGRAM FILE

*****
* NO FILE EXISTS *
*****

```

When selecting a program file or data file

■ Problem

You attempted to execute a user program in the "Execute" menu although no user program files (including Easy Pack 4.2) had been stored in the RAM.

■ Solution

Press **[C]** key to return to the SYSTEM MENU screen, then download user programs. (Refer to Chapter 2, Subsection 2.4.3, [2].)

■ Problem

In the "Set mode" menu, you attempted to select a user program file (including Easy Pack 4.2) as an execution program to be run when the power is first applied, although no user program files had been stored in the RAM.

■ Solution

Press **[C]** key to return to the SYSTEM MENU screen, then download user programs. (Refer to Chapter 2, Subsection 2.4.3, [2].)

■ Problem

You attempted to select a data file for uploading in the "Upload" menu although no data files had been stored in the RAM.

■ Solution

Press **[C]** key to return to the SYSTEM MENU screen.

```
DELETE PROGRAM

*****
* NO FILE EXISTS *
*****
```

```
DELETE DATA

*****
* NO FILE EXISTS *
*****
```

```
DOWNLOAD PROGRAM FILE

Out of memory !!

RETRY? 1:Yes 2:No
```

```
DOWNLOAD PROGRAM

Too many files !!

RETRY? 1:Yes 2:No
```

■ Problem

You have deleted all of the files stored in the RAM in the "Set mode" menu.

■ Solution

Press key to return to the SYSTEM MENU screen.

During downloading

■ Problem

The size of the file designated for downloading exceeds the memory capacity in the BHT-4000.

■ Solution

Press key to return to the SYSTEM MENU screen, then delete unnecessary files in the RAM or decrease the size of the file to be downloaded.

(Refer to Chapter 2, Subsection 2.4.3, [4.7] and [2].)

■ Problem

Forty files are already resident in the RAM.

■ Solution

Press key to return to the SYSTEM MENU screen, then delete unnecessary files in the RAM or decrease the number of files to be downloaded if attempting to download more than one file.

(Refer to Chapter 2, Subsections 2.4.3, [4.7] and [2].)

```

DOWNLOAD DATA FILE

File mismatch !!

RETRY?  1:Yes  2:No

```

■ Problem

The file type--program or data file (identified by the extension)--fails to match the destination file. The names of program files to be downloaded should have one of the extensions .PD3, .EX3, and .FN3. The names of data files should have extensions other than .PD3, .EX3, and .FN3.

■ Solution

Check the file extension and retry downloading.

```

DOWNLOAD PROGRAM

Communication error !!

RETRY?  1:Yes  2:No

```

■ Problem

Downloading fails. (Communications error)

■ Solution

To retry downloading, press key.

To return to the SYSTEM MENU screen, press key. Check the communications parameters and interface port in the "Set mode" menu or perform the communication test in the "Test" menu.

(Refer to Chapter 2, Subsection 2.4.3, [4.5] and [5.6].)

It is also necessary to check the communications parameters setup of the host computer.

```
UPLOAD PROGRAM

Communication error !!

RETRY?  1:Yes  2:No
```

During uploading

■ **Error Status**

Uploading fails. (Communications error)

■ **Solution**

To retry uploading, press key.

To return to the SYSTEM MENU screen, press key. Check the communications parameters and interface port in the "Set mode" menu or perform the communication test in the "Test" menu.

(Refer to Chapter 2, Subsection 2.4.3, [4.5] and [5.6].)

It is also necessary to check the communications parameters setup of the host computer.

5.3 Errors in Easy Pack 4.2

If some error occurs during execution of Easy Pack 4.2, one of the following error messages will appear on the LCD.

File not found!!

■ Problem

No data file is stored in the RAM

- when Easy Pack is initiated or
- when the manager's menu shifts to the user's menu.

Or the "Delete File" operation results in no file existing in the RAM.

■ Solution

Press **[F4]** key while holding down **[SF]** key to shift to the manager's menu, then create one or more data files in the "Create File" mode.

(Refer to Chapter 4, Subsection 4.3.2, [1].)

Memory full!!

■ Problem

The memory runs out during data collection in the "Collect Data" mode of the user's menu or during file creation in the "Create File" mode of the manager's menu.

■ Solution

After two seconds, the screen if in the "Collect Data" mode automatically returns to the user's menu screen; the screen if in the "Create File" mode, to the manager's menu screen. Upload the file being accessed and delete the data in the "Delete Data" mode of the user's menu, or delete unnecessary files in the "Delete File" mode of the manager's menu.

(Refer to Chapter 4, Subsection 4.3.1, [4] and Subsection 4.3.2, [2].)

File overflow !!
No open files

■ Problem

You attempted to create a data file in the "Create File" mode of the manager's menu, although four files had been already stored in the RAM.

■ Solution

After two seconds, the screen automatically returns to the manger's menu screen. Upload the files stored in the RAM, then delete them or delete the unnecessary files.

(Refer to Chapter 4, Subsection 4.3.2, [2].)

Transmit error!!

Retry File1 ?
1:Yes 2:No

■ Problem

A communications error has occurred during file transmission. Or the C key was pressed during file transmission.

■ Solution

To retry file transmission, press 1 key.

To cancel it and return to the user's menu screen, press 2 key.

This chapter describes the handling procedure of the CU-4000, the interfacing with the host computer, and the charging of the battery cartridge.

6.1	Functions of the CU-4000	134
6.2	Components and Functions	134
6.3	Applying Power to the CU-4000	136
6.4	Communications with the Host Computer	137
6.5	Charging the Battery Cartridge	139
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	[2] Charging Only	143

Chapter 6

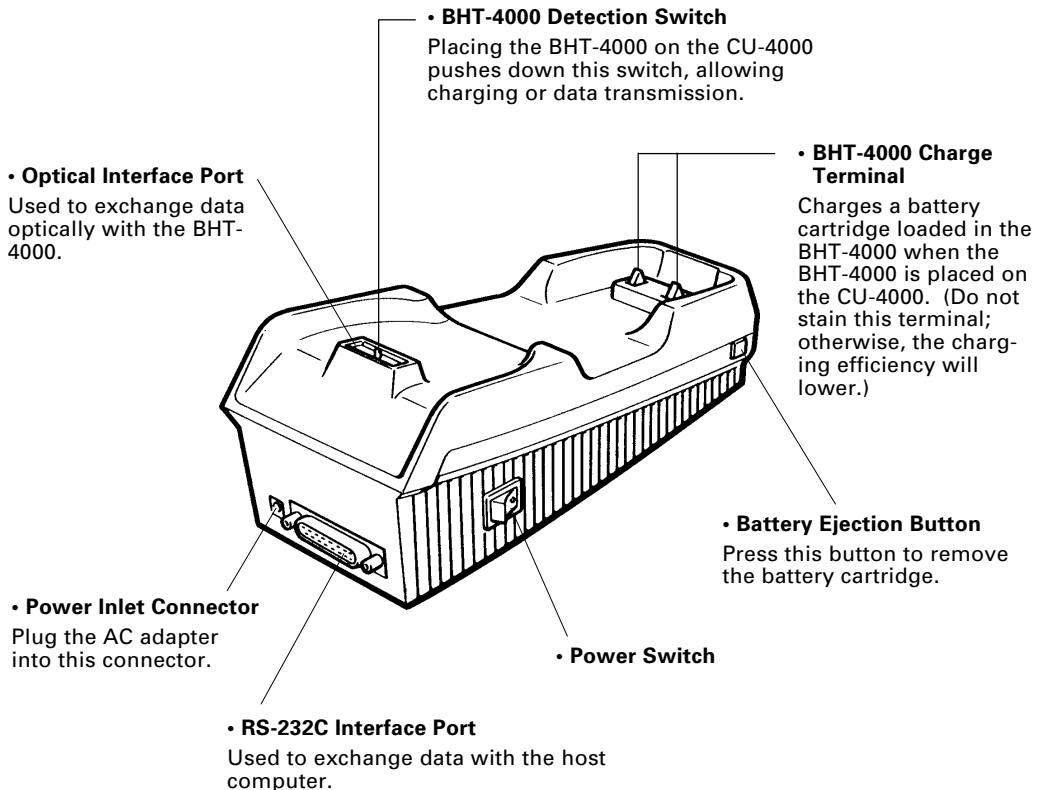
Handling the CU-4000

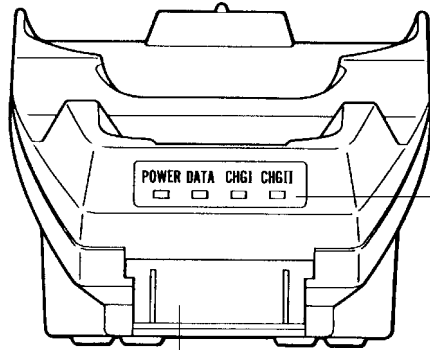
6.1 Functions of the CU-4000

The optical communications unit CU-4000 has the following two functions:

- (1) The CU-4000 exchanges data and programs between the BHT-4000 and the host computer. It interfaces with the BHT-4000 via the optical interface and with the host computer via the RS-232C interface.
- (2) The CU-4000 charges the battery cartridge.

6.2 Components and Functions



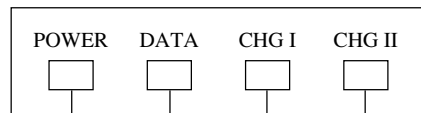


• **Battery Cartridge Slot**

To charge a battery cartridge all by itself, load it into this slot.

• **Status Indicator**

Shows the status of the CU-4000.



• **POWER LED**

Lights when the power is applied to the CU-4000.

• **DATA Communications LED**

Lights when the BHT-4000 is communicating with the host computer.

• **CHG I LED (BHT-4000 charge lamp)**

Lights when the CU-4000 is charging a battery cartridge loaded in the BHT-4000. Upon completion of charging, this LED flashes every two seconds.

• **CHG II LED (Battery cartridge charge lamp)**

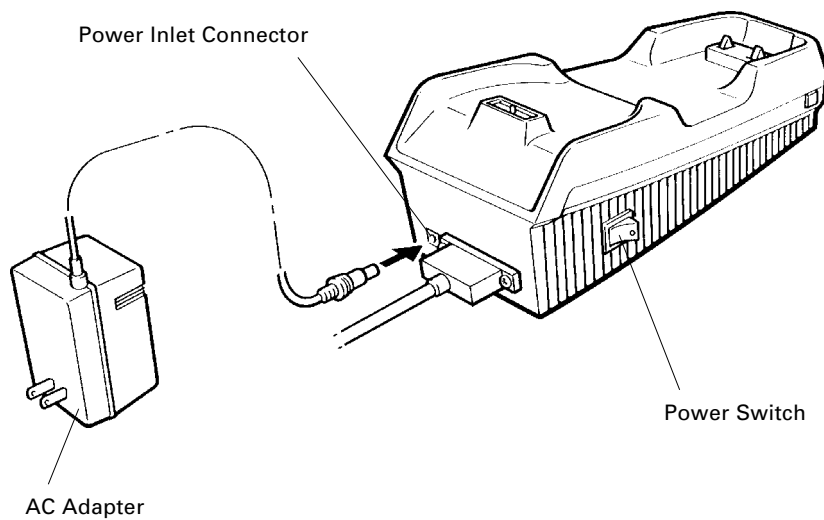
Lights when the CU-4000 is charging a battery cartridge all by itself. Upon completion of charging, this LED flashes every two seconds.

During discharging of a battery cartridge, this LED flashes every 0.5 second.

6.3 Applying Power to the CU-4000

Apply power to the CU-4000 by connecting it to the wall socket via the attached AC adapter according to the steps given below.

- (1) Make sure that the CU-4000 is turned off.
- (2) Connect the outlet plug of the AC adapter to the power inlet connector of the CU-4000, then plug the other end of the AC adapter into the wall socket.

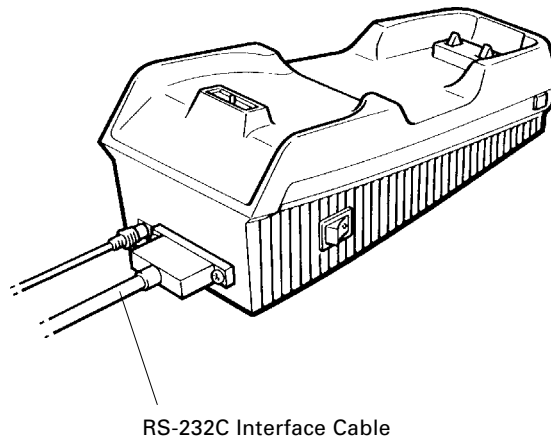


- (3) Power on the CU-4000.

6.4 Communications with the Host Computer

6.4.1 Interface Cable Connection

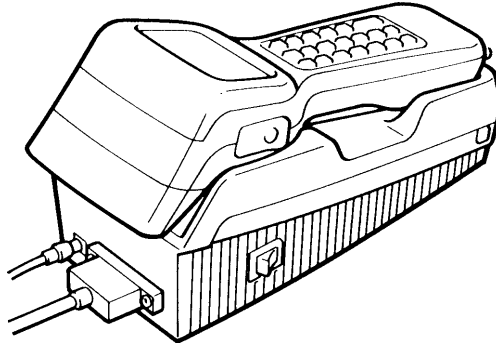
- (1) Make sure that both the CU-4000 and the host computer are turned off.
- (2) Connect the 25-pin plug (Dsub-25P) of the interface cable to the RS-232C interface port of the CU-4000.



- (3) Connect the other end of the interface cable to the host computer.

6.4.2 Interfacing with the Host Computer

- (1) Power on the host computer and start up the MS-DOS.
- (2) Turn on the power switch of the CU-4000.
- (3) Make sure that the BHT-4000 is turned off, then put it on the CU-4000.



- (4) Power on the BHT-4000 and start System Mode.
- (5) Initiate a communications program (e.g. Transfer Utility and System Loader) in the host computer.
- (6) To transfer data stored in the BHT-4000 to the host computer, select Uploading on the SYSTEM MENU in System Mode. To transfer data from the host computer to the BHT-4000, select Downloading on the SYSTEM MENU. (For details, refer to Chapter 2, Section 2.4.)

The BHT-4000 and the host computer will start communications with each other via the CU-4000. Upon start of communications, the DATA LED of the CU-4000 will come on.

After completion of communications, the DATA LED will go off.

- (7) Power off the BHT-4000, CU-4000, and the host computer.

6.5 Charging the Battery Cartridge

You may charge battery cartridges either loaded in the BHT-4000 or all by themselves.

NOTE

Service Life of Battery Cartridge:

A Ni-Cd battery used in the battery cartridge will gradually deteriorate during the repeated cycles of charging and discharging due to its properties, even under normal use. When the battery service period becomes shortened due to its deterioration even if it has been charged for the specified hours, replace the battery cartridge with a new one. Generally, it is necessary to replace the battery cartridge after it has undergone 300 cycles of charging and discharging operation.

Memory Effect:

If a Ni-Cd battery undergoes many cycles of imperfect charging and discharging (e.g. short-time charge followed by one-hour use), the service period will become abnormally shortened before the service life is really expired, just as the battery memorizes the use conditions. It is called "Memory Effect."

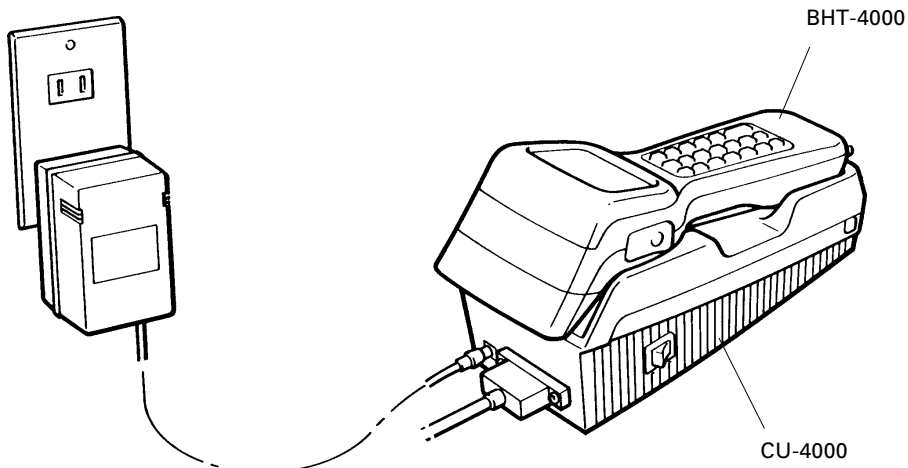
The memory effect can be avoided by discharging a Ni-Cd battery fully before charging with the CU-4000 or C-200.

6.5.1 Battery Cartridge Loaded in the BHT-4000

- (1) Turn on the CU-4000.
- (2) Place the BHT-4000 loaded with a battery cartridge onto the CU-4000.

The CU-4000 lights the CHGI LED and starts charging.

After approx. eight hours of charging, the CHGI LED starts flashing, indicating that charging is completed.

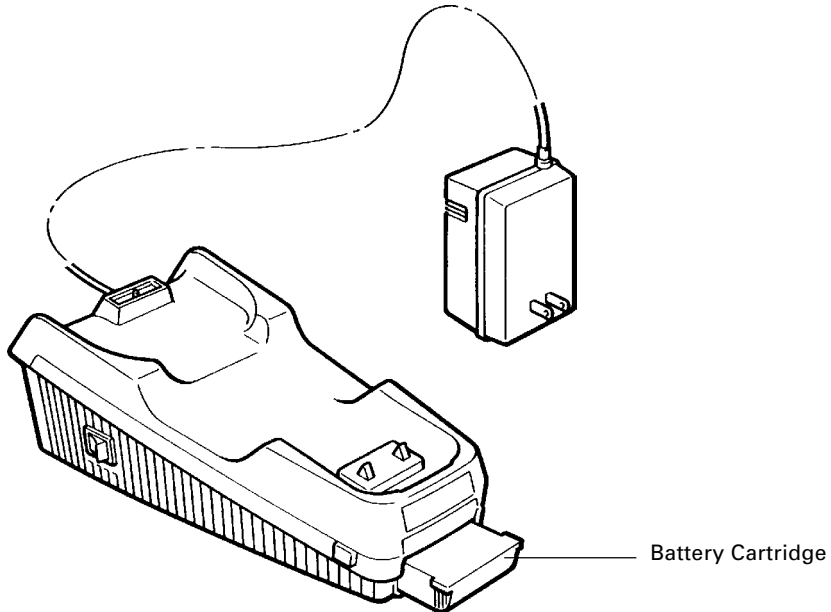


■ Charging Operation and LED Indication

Operator's Action	CU-4000 Status	LED Indication
Power on the CU-4000.	On standby	<p>POWER DATA CHG I CHG II</p> <p>■ □ □ □</p> <p>ON</p>
↓	↓	
Place the BHT-4000 on the CU-4000.	Ordinary charging	<p>POWER DATA CHG I CHG II</p> <p>■ □ ■ □</p> <p>ON ON</p>
↓	↓	
(Approx. 8 hours)	Trickle charging*	<p>POWER DATA CHG I CHG II</p> <p>■ □ ■ □</p> <p>ON Flashing</p>
↓	↓	
Remove the BHT-4000.	On standby	<p>POWER DATA CHG I CHG II</p> <p>■ □ □ □</p> <p>ON OFF</p>

* "Trickle charging" is a slow continuous charge for a battery, which compensates for the amount of discharge slightly happening even if batteries are not in use.

6.5.2 Battery Cartridge Alone



The CU-4000 can charge battery cartridges in either of the following two ways:

- Fully discharging and then charging* [1]
- Charging only [2]

* Fully discharging and then charging batteries can prevent "Memory Effect" as described at the beginning of this section.

To select [1], first power on the CU-4000 and then load a battery cartridge into it. To select [2], first load a battery cartridge into the CU-4000 and then power it on.

[1] Fully Discharging and then Charging

- (1) Power on the CU-4000.
- (2) Load a battery cartridge into the CU-4000.

The CU-4000 flashes the CHGII LED (every two seconds) and starts discharging the cartridge. The discharging time differs depending upon the battery condition, but never more than two hours.

Upon completion of discharging, the CHGII LED comes to stay on and the CU-4000 starts charging.

After approx. eight hours of charging, the CHGII LED flashes (every 0.5 second), indicating that the charging operation is completed.

- (3) Press the battery ejection button to take out the battery cartridge.

■ Charging Operation and LED Indication

Operator's Action	CU-4000 Status	LED Indication
Power on the CU-4000.	On standby	<p>POWER: ON, DATA: OFF, CHG I: OFF, CHG II: OFF</p>
⇓	⇓	
Load a battery cartridge into the CU-4000.	Discharging	<p>POWER: ON, DATA: OFF, CHG I: OFF, CHG II: Flashing every 2 seconds</p>
⇓	⇓	
(After discharging)	Ordinary charging	<p>POWER: ON, DATA: OFF, CHG I: OFF, CHG II: ON</p>
⇓	⇓	
(After approx. 8 hours)	Trickle charging	<p>POWER: ON, DATA: OFF, CHG I: OFF, CHG II: Flashing every 0.5 second</p>
⇓	⇓	
Take out the battery cartridge.	On standby	<p>POWER: ON, DATA: OFF, CHG I: OFF, CHG II: OFF</p>

[2] Charging Only

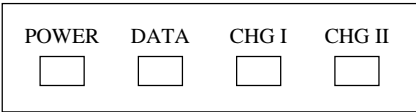
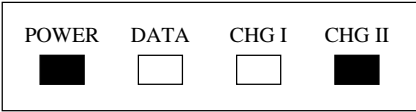
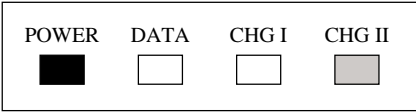
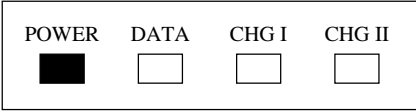
- (1) Load a battery cartridge into the CU-4000.
- (2) Power on the CU-4000.

The CU-4000 turns on the CHGII LED and starts charging the cartridge. The charging time differs depending upon the battery condition, but never more than eight hours.

Upon completion of charging, the CHGII LED flashes, indicating that the charging operation is completed.

- (3) Press the battery ejection button to take out the battery cartridge.

■ Charging Operation and LED Indication

Operator's Action	CU-4000 Status	LED Indication
Load a battery cartridge into the CU-4000.	Powered OFF	
⇓	⇓	
Power on the CU-4000.	Ordinary charging	
⇓	⇓	
(After approx. 8 hours)	Trickle charging	
⇓	⇓	
Take out the battery cartridge.	On standby	

Appendices

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Appendix A. Specifications

A.1 BHT-4000

[1] Product Specifications

Power Source	Main power Backup power	Rechargeable Ni-Cd battery, 4.8 VDC Integrated lithium battery, 3 VDC												
Dimensions (W) x (L) x (H)		93 x 235 x 67 mm (3.66 x 9.25 x 2.64 inches)												
Weight		Approx. 380 g (Approx. 13.4 oz.) including the battery cartridge												
Operating Ambient Temperature		0°C to 40°C (32°F to 104°F)												
Operating Humidity		10% to 90% (with no dew condensation)												
Ambient Illuminance		<ul style="list-style-type: none"> • 3000 lux max. (Depth of field: 0 mm, PCS value: 0.45 max., Minimum narrow bar width: 0.17 mm min.) • 200 to 20,000 lux. (Depth of field: 100 mm, ITF: 1.0 magnification, PCS value: 0.9 min., Reflection intensity: 0.85 min. for white and 0.05 min. for black) 												
Controller		CPU: 16-bit CMOS RAM: 256KB/768KB/2MB ROM: 16KB for system use												
Keypad		Function keys: 8 Numerical keys and others: 16												
Display		Type: Dot-matrix, FSTN liquid crystal display (LCD) with backlight Formation: 160 dots wide by 80 dots high Characters: <table border="1" style="margin-left: 20px; border-collapse: collapse; width: 100%;"> <thead> <tr> <th></th> <th>Chars x lines</th> <th>Dots (W x H)</th> </tr> </thead> <tbody> <tr> <td>Alphanumerics</td> <td>26 x 10</td> <td>5 x 7</td> </tr> <tr> <td>Half-width</td> <td>20 x 5</td> <td>8 x 16</td> </tr> <tr> <td>Full-width</td> <td>10 x 5</td> <td>16 x 16</td> </tr> </tbody> </table>		Chars x lines	Dots (W x H)	Alphanumerics	26 x 10	5 x 7	Half-width	20 x 5	8 x 16	Full-width	10 x 5	16 x 16
	Chars x lines	Dots (W x H)												
Alphanumerics	26 x 10	5 x 7												
Half-width	20 x 5	8 x 16												
Full-width	10 x 5	16 x 16												
Calendar Clock		Year, month, day, hour, minute, and second with compensation for leap years												
Reading Confirmation LED		Colors: Red and green												

[2] Bar Code Specifications

(1) Available Bar Code Types

Bar Code Type	Readable Range	Bar Dimension
Universal product codes		
EAN-13 EAN-8 UPC-A UPC-E	0.8-2.0 magnifications	0.26-0.66 mm (10.24-25.98 mils)
EAN-13 with supplemental codes		
2-digit add-on	0.8-1.6 magnifications	0.26-0.55 mm (10.24-21.65 mils)
5-digit add-on	0.8-1.4 magnifications	0.26-0.46 mm (10.24-18.11 mils)
EAN-8 with supplemental codes		
2-digit add-on	0.8-2.0 magnifications	0.26-0.66 mm (10.24-25.98 mils)
5-digit add-on	0.8-1.7 magnifications	0.26-0.57 mm (10.24-22.44 mils)
UPC-A with supplemental codes		
2-digit add-on	0.8-1.6 magnifications	0.26-0.55 mm (10.24-21.65 mils)
5-digit add-on	0.8-1.4 magnifications	0.26-0.46 mm (10.24-18.11 mils)
UPC-E with supplemental codes		
2-digit add-on	0.8-2.0 magnifications	0.26-0.66 mm (10.24-25.98 mils)
5-digit add-on	0.8-1.9 magnifications	0.26-0.63 mm (10.24-24.80 mils)
Interleaved 2 of 5 (ITF)	2 to 56 digits*	0.17 mm min. (6.69 mils min.)
Standard 2 of 5 (STF)	1 to 32 digits	
CODABAR (NW7)	3 to 36 digits	
CODE39	1 to 29 digits	
CODE93	1 to 42 digits	
CODE128	1 to 35 digits	

* Only even-numbered digits

(2) Optical Properties Required for Bar Code Labels

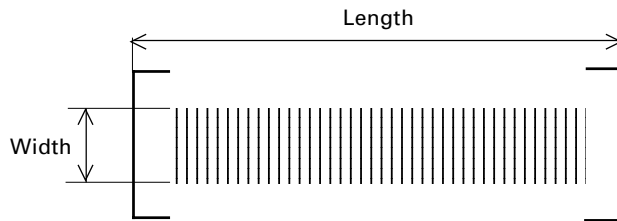
White bars: Reflection intensity	0.45 min.
Black bars: Reflection intensity	0.25 max.
PCS value	0.45 min.

(3) Bar Code Label Size

Width : 15 mm min. (0.59 inch)

(recommended)

Length :	Depth of field (Distance from bar codes to the bar-code reading window)	Length of labels (including margins)
	0 mm	80 mm max. (3.15 inches max.) (Minimum narrow bar width: 0.17 mm min.*)
	310 mm (12.21")	400 mm max. (15.75 inches max.) (Minimum narrow bar width: 1.4 mm min.**)



(4) Thickness of Bars and Depth of Field

Minimum narrow bar width	Depth of field
0.17 mm (6.69 mils)	10 mm (0.39 in.)*
0.25 mm (9.84 mils)	45 mm (1.77 in.)*
0.6 mm (23.62 mils)	130 mm (5.12 in.)**
1.0 mm (39.37 mils)	220 mm (8.66 in.)**
1.2 mm (47.24 mils)	260 mm (10.24 in.)**

* Under the following conditions:

- Ambient illuminance: 500 lux. (fluorescent lamp)
- 20-digit ITF
- PCS value: 0.9 min.

** Under the following conditions:

- Ambient illuminance: 500 lux. (fluorescent lamp)
- ITF conforming to the UPC Shipping Container Code
- PCS value: 0.9 min.

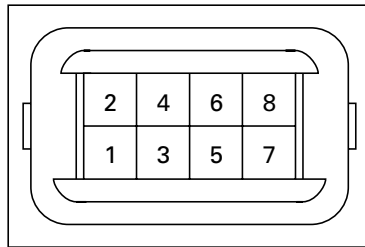
[3] Interface Specifications

Optical Interface

Synchronization:	Start-stop
Input signals:	RD and CS
Output signals:	SD and RS
Transmission speed:	19200 bps max.

Direct-connect interface

Synchronization:	Start-stop
Transmission speed:	38400 bps max.
Signal level:	Conforms to RS-232C interface
Pin assignment:	As shown below.



Direct-connect Interface Port (QM connector) on the BHT-4000

Pin No.	Signal	Functions	Signal Input/Output
1	SD (GND)	Ground for signals and charging pin	—
2	SD	Send data	→
3	RD	Receive data	←
4	RS	Request to send	→
5	CS	Ready to send	←
6	CD	Carrier detect	←
7	ER	Data terminal equipment ready	→
8	CHG	Charging pin	←

A.2 CU-4000

[1] Product Specifications

Power Source	12 VCD (via the AC adapter)
Power Consumption	2W
Dimensions (W) x (L) x (H)	106 x 236 x 89 mm (4.17 x 9.29 x 3.50 inches)
Weight	Approx. 420 g (Approx. 14.8 oz.)
Operating Ambient Temperature	0°C to 40°C (32°F to 104°F)
Operating Humidity	10% to 90% (with no dew condensation)

[2] Charging/Discharging Requirements

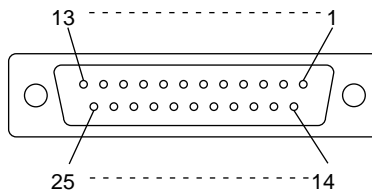
For charging a battery cartridge loaded in the BHT-4000

Charge current:	80 mA
Charge time:	Approx. 8 hours

For charging a battery cartridge all by itself

Charge current:	80 mA
Charge time:	Approx. 8 hours
Discharge current:	180 mA
Discharge time:	Approx. 2 hours

[3] Interface Specifications



RS-232C interface port (Dsub-25S) on the CU-4000

Pin No.	Signal	Functions	Signal Input/Output	
			CU-4000	External device
2	SD	Send data		→
3	RD	Receive data		←
4	RS	Request to send		→
5	CS	Ready to send		←
7	SG	Signal ground		—
20	ER	Data terminal equipment ready		→

Pins 1 (FG), 6 (DR), and 8 (CD) are not connected.

Appendix B.

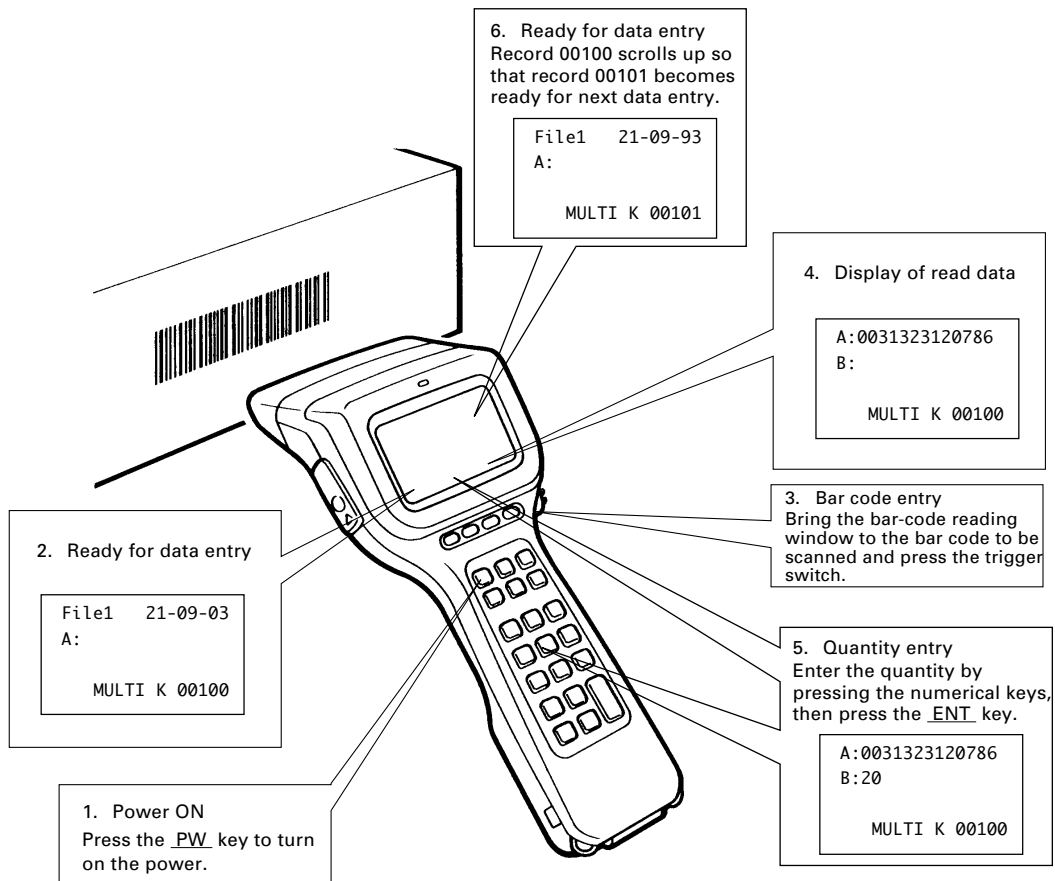
A Typical Basic Operation

What follows is a typical basic operation which helps you instruct the hands-on user in practical bar-code reading operation.

Application type: Inventory

Operation: Power ON Read the bar code on stock (A). Key in the quantity.
Read the bar code on stock (B). Key in the quantity.
⋮
Repeat the above operation.

Execution program: Easy Pack 4.2



Bar Code Handy Terminal BHT-4000

User's Manual

First Edition, October 1993

DENSO WAVE INCORPORATED

The purpose of this manual is to provide accurate information in the handling and operating of the BHT-4000. Please feel free to send your comments regarding any errors or omissions you may have found, or any suggestions you may have for generally improving the manual.

In no event will DENSO WAVE be liable for any direct or indirect damages resulting from the application of the information in this manual.