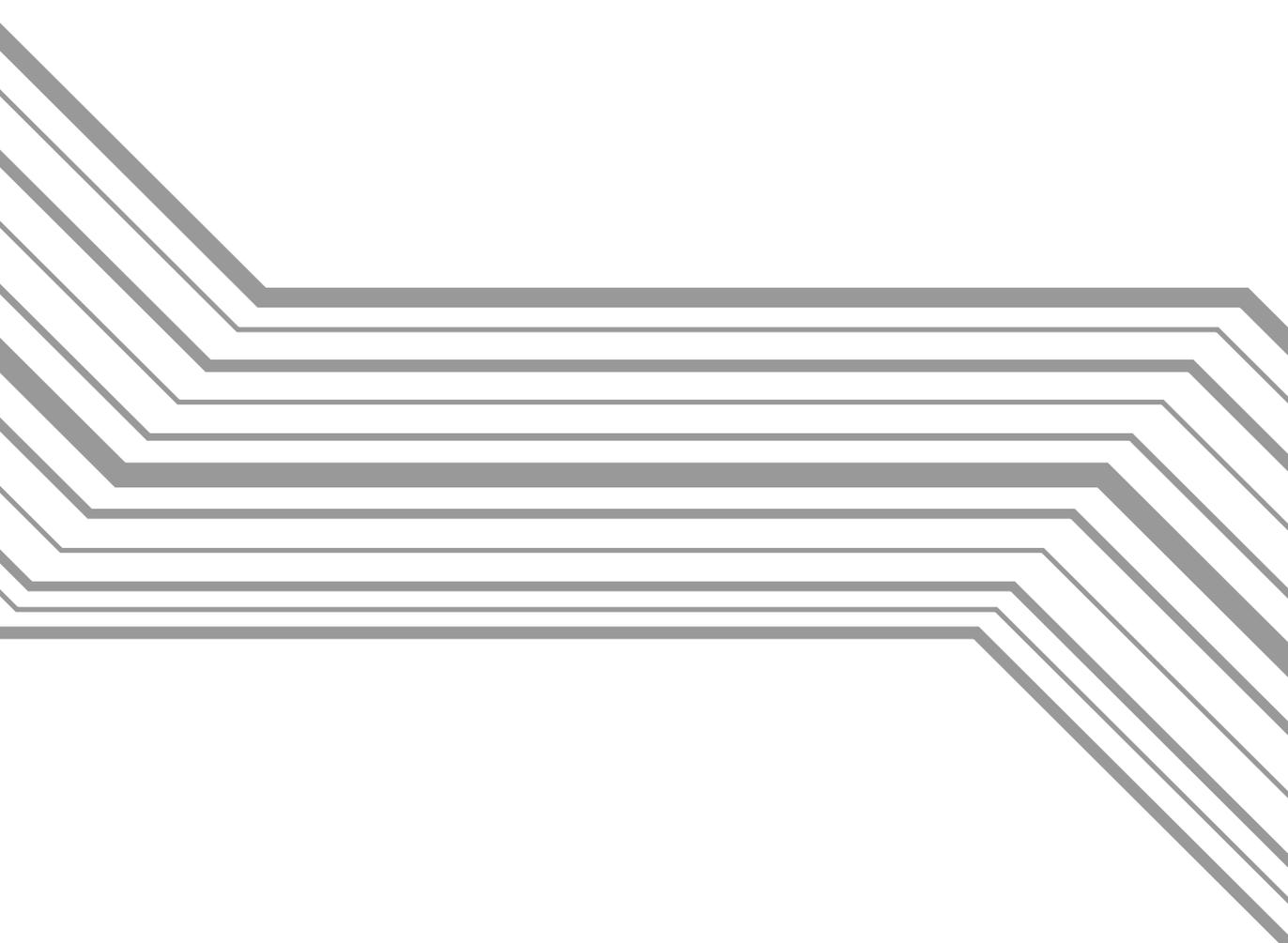


DENSO



Bar Code Handy Terminal

BHT-8000

User's Manual

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Preface

Please READ through these operating instructions carefully. It will enable you to operate your BHT-8000 correctly.

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

How this book is organized

This manual is made up of five chapters and appendices.

Chapter 1. Quick Guide

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

Chapter 2. Getting Started the BHT and System Mode

Summarizes the BHT 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

Describes the communications operations of the BHT—the IR communication, RS-232C interface specifications, basic communications specifications, and the communications protocols—for data transfer with the host computer or other devices.

Chapter 4. Error Messages

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

Chapter 5. Handling the CU-8000 (Option)

Describes the handling procedure of the CU-8000, the interfacing with the host computer, and the charging of the rechargeable battery cartridge.

Appendix A: Specifications

Appendix B: Communications Protocol Details

Appendix C: A Typical Basic Operation

■ Technical Terms Used in This Manual

Source Program and Object Program (User Program)

Generally, a source program is translated into an object program by a compiler. This manual calls an object program a user program.

BHT-BASIC

This manual expresses BHT-BASIC3.0 and BHT-BASIC3.5 as BHT-BASIC.

■ Related Publications

BHT-BASIC Programmer's Manual
Transfer Utility Guide
Ir-Transfer Utility C Guide
Ir-Transfer Utility E Guide

■ Screen Indication

The lettering in the screens in this manual is a little different from that in the actual screens. File names used are only for description purpose, so they will not appear if you have not set files having those names.

SAFETY PRECAUTIONS

Be sure to observe all these safety precautions.

- Please READ through this manual carefully. It will enable you to use the BHT and CU correctly.
- Always keep this manual nearby for speedy reference.

Strict observance of these warning and caution indications are a **MUST** for preventing accidents which could result in bodily injury and substantial property damage. Make sure you fully understand all definitions of these terms and related symbols given below, before you proceed on to the text itself.



WARNING

Alerts you to those conditions which could cause serious bodily injury or death if the instructions are not followed correctly.



CAUTION

Alerts you to those conditions which could cause minor bodily injury or substantial property damage if the instructions are not followed correctly.

Meaning of Symbols



A triangle (Δ) with a picture inside alerts you to a warning of danger. Here you see the warning for electrical shock.



A diagonal line through a circle (\odot) alerts you to something you should not do; it may or may not have a picture inside. Here you see a screwdriver inside the circle, meaning that you should not disassemble.



A black circle (\bullet) with a picture inside alerts you to something you **MUST** do. This example shows that you **MUST** unplug the power cord.

WARNING

Handling the battery cartridge

- Never disassemble or heat the battery cartridge, nor put it into fire or water; doing so could cause battery-rupture or leakage of battery fluid, resulting in a fire or bodily injury. 
- Do not carry or store the battery cartridge together with metallic ball-point pens, necklaces, coins, hairpins, etc.
Doing so could short-circuit the terminal pins, causing the batteries to rupture or the battery fluid to leak, resulting in a fire or bodily injury. 
- Avoid dropping the battery cartridge or letting it undergo any shock or impact.
Doing so could cause the batteries to break, generate heat, rupture or burn. 
- Only use the dedicated charger for charging the battery cartridge.
Using a different type of charger could cause battery-rupture or leakage of battery fluid and result in a fire, bodily injury, or serious damage to property. 
- Never charge the Ni-MH battery cartridge where any inflammable gases may be emitted; doing so could cause fire. 

Handling the CU-8000

- If smoke, abnormal odors or noises come from the CU, immediately unplug the AC adapter from the wall socket and contact your nearest dealer.
Failure to do so could cause fire or electrical shock. 

- If foreign material or water gets into the CU, immediately unplug the AC adapter from the wall socket or CU and contact your nearest dealer.
Failure to do so could cause fire or electrical shock. 

- If you drop the CU so as to damage its housing, immediately unplug the AC adapter from the wall socket or CU and contact your nearest dealer.
Failure to do so could cause fire or electrical shock. 

- Never use the CU for charging anything other than the specified battery cartridges.
Doing so could cause heat, battery-rupture, or fire. 
- Never bring any metals into contact with the output terminals.
Doing so could produce a large current through the CU, resulting in heat or fire, as well as damage to the CU. 
- Use the dedicated AC adapter only.
Failure to do so could result in fire. 

WARNING

- Never use the CU on the line voltage other than the specified level.
Doing so could cause the CU to break or burn.



- If the power cord of the AC adapter is damaged (e.g., exposed or broken lead wires), stop using it and contact your nearest dealer.
Failure to do so could result in a fire or electrical shock.



CAUTION

Handling the battery cartridge

- Never charge a wet or damp rechargeable battery cartridge.
Doing so could cause the batteries to break, generate heat, rupture or burn.



Handling the BHT

- Never put the BHT in places where there are excessively high temperatures, such as inside closed-up automobiles, or in places exposed to direct sunlight.
Doing so could affect the housing or parts, resulting in a fire.



- Avoid using the BHT in extremely humid or dusty areas, or where there are drastic temperature changes.
Moisture or dust will get into the BHT, resulting in malfunction, fire or electrical shock.



- Never disassemble or modify the BHT; doing so could result in an accident such as break or fire.



Never
disas-
semble

- If smoke, abnormal odors or noises come from the BHT, immediately turn off the power, pull out the battery cartridge, and contact your nearest dealer.
Failure to do so could cause smoke or fire.



- If foreign material or water gets into the BHT, immediately turn off the power, pull out the battery cartridge, and contact your nearest dealer.
Failure to do so could cause smoke or fire.



- If you drop the BHT so as to damage its housing, immediately turn off the power, pull out the battery cartridge, and contact your nearest dealer.
Failure to do so could cause smoke or fire.



- For those machines using dry cells, do not mistake the plus and minus marks when loading them into the cartridge.
Failure to do so could cause battery-rupture or leakage of battery fluid, resulting in bodily injury, fire, or property damage.



CAUTION

- For those machines using dry cells, do not use anything other than the specified type of dry cells, nor use new and old ones together.
Doing so could cause battery-rupture or leakage of battery fluid, resulting in bodily injury, fire, or property damage. 
- Do not use batteries or power sources other than the specified ones; doing so could generate heat or cause malfunction. 
- In environments where static electricity can build into significant charges (e.g., if you wipe off the plastic plate with a dry cloth), do not operate the BHT. Doing so will result in malfunction or machine failure. 
- When connecting or disconnecting the direct-connect interface cable to/from the BHT, do not plug or unplug at an angle and do not pull the cable strongly. Doing so will result in a machine failure. 
- If the BHT has been stored in a hot (50°C to 60°C, 122°F to 140°F) and humid place, allow it to sit at room temperature and humidity for at least one day before use. Using the BHT with its inside being hot will fail to scan or result in a machine failure. 

Handling the CU-8000

- Never put the CU in places where there are excessively high temperatures, such as inside closed-up automobiles, or in places exposed to direct sunlight.
Doing so could affect the housing or parts, resulting in a fire. 
- Avoid using the CU in extremely humid or dusty areas, or where there are drastic temperature changes.
Moisture or dust will get into the CU, resulting in malfunction, fire or electrical shock. 
- Never disassemble or modify the CU; doing so could result in an accident such as fire or malfunction. 
- If you are not using the CU for a long time, be sure to unplug the AC adapter from the wall socket for safety.
Failure to do so could result in a fire. 
- When caring for the CU, unplug the AC adapter from the wall socket for safety.
Failure to do so could result in an electrical shock. 
- Never cover or wrap up the CU or AC adapter in a cloth or blanket.
Doing so could cause the unit to heat up inside, deforming its housing, resulting in a fire. Always use the CU and AC adapter in a well-ventilated area. 
- Do not place the CU anywhere where it may be subjected to oily smoke or steam, e.g., near a cooking range or humidifier.
Doing so could result in a fire or electrical shock. 

 **CAUTION**

- Keep the power cord away from any heating equipment.
Failure to do so could melt the sheathing, resulting in a fire or electrical shock.
- Do not insert or drop foreign materials such as metals or anything inflammable through the openings or vents into the CU.
Doing so could result in a fire or electrical shock.



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■ Proper Care of the BHT and CU

Wipe the BHT's charge terminals and battery cartridge terminals with a cotton swab or the like periodically. Clean the BHT housing with a dry, soft cloth. Before cleaning, be sure to turn the BHT off.

- Never use benzene, alcohol, or other organic solvents. The housing may be marred or the paint may come off.
- Never rub or strike the liquid crystal display (LCD) with anything hard. The LCD surface will be easily scratched or broken.
- When cleaning the keypad, do not scrub the surface too hard or pull on the keys. Doing so may break the keys.



- If the BHT becomes smudged, moisten a soft cloth with neutral detergent and wring it out thoroughly. Wipe the BHT with the cloth and then go over it again with a dry cloth.

Dust or dirt accumulating on the clear plate of the bar-code reading window will affect reading performance. If you use the BHT in dusty areas, therefore, periodically check the clear plate of the bar-code reading window and clean it if dusty.

- To clean the plate, first blow the dust away with an air brush. Then wipe the plate with a cotton swab or the similar soft one gently.
- If sand or hard particles have accumulated, never rub the plate; doing so will scratch or damage it. Blow the particles away with an air brush or a soft brush.

■ Limited Warranty on Software Products

In no event will DENSO WAVE be liable for direct, indirect, special, incidental, or consequential damages (including imaginary profits or damages resulting from interruption of operation or loss of business information) resulting from any defect in the software or its documentation or resulting from inability to apply the software or its documentation.

FCC Regulations

This Device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC WARNING: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Content Overviews

Preface	i
How this book is organized	ii
SAFETY PRECAUTIONS	iv
Content Overviews	xi
Chapter 1 Quick Guide	1
1.1 Reading Bar Codes	2
1.2 Setting and Using the Hand Strap	3
1.3 Setting the Backlight.....	4
1.4 Using the Keypad	5
1.5 Transferring Data	6
Chapter 2 Getting Started the BHT and System Mode	7
2.1 BHT System Configuration	9
2.2 Components and Functions.....	14
2.3 Preparation.....	16
2.3.1 Setting-up 1: Loading Dry Cells or Rechargeable Battery Cartridge.....	16
2.3.2 Setting-up 2: Setting the Calendar Clock.....	21
2.3.3 Adjusting the LCD Contrast & Beeper Volume and Switching the Beeper & Vibrator.....	23
2.3.4 Displaying the Battery Voltage Level and System Status	25
2.3.5 Battery Replacement Notes.....	26
2.3.6 BHT Turning-off Notes.....	28
2.4 Initializing the BHT System.....	32
2.5 Operating in System Mode	36
2.5.1 Starting System Mode	36
2.5.2 Operating in System Mode	40
2.5.3 Detailed Description of the Functions in System Mode.....	42
2.6 Starting Up User Programs	88
Chapter 3 Communications Operations of BHT	91
3.1 Infrared Communication	92
3.2 RS-232C Interface Specifications.....	93
3.3 Basic Communications Specifications and Parameters.....	95
3.3.1 Basic Communications Specifications	95
3.3.2 Communications Parameters	97
3.4 Communications Protocols.....	98
3.4.1 BHT-protocol	98
3.4.2 BHT-Ir Protocol.....	103
Chapter 4 Error Messages	109
4.1 System Errors.....	110
4.2 Errors in System Mode.....	115

Chapter 5 Handling the CU-8000 (Option)	119
5.1 Functions of the CU-8000.....	120
5.2 Components and Functions.....	121
5.3 Applying Power to the CU-8001	122
5.4 Communicating with the Host Computer	123
5.4.1 Setting the Transmission Speed of the CU-8000.....	123
5.4.2 Interface Cable Connection	124
5.4.3 Interfacing with the Host Computer.....	125
5.5 Charging the Rechargeable Battery Cartridge (using the CU-8001)	126
5.5.1 Rechargeable Battery Cartridge Loaded in the BHT.....	126
5.5.2 Rechargeable Battery Cartridge Alone	128
5.6 RS-232C Interface Specifications.....	131
Appendices	133
Appendix A. Specifications	134
A.1 BHT-8000	134
A.2 CU-8000	140
Appendix B. Communications Protocol Details	142
B.1 BHT-protocol	142
B.2 BHT-Ir protocol	151
Appendix C. A Typical Basic Operation.....	162
Index	163

Chapter 1. Quick Guide



Chapter 2. Getting Started the BHT and System Mode



Chapter 3. Communications Operations of BHT



Chapter 4. Error Messages



Chapter 5. Handling the CU-8000 (Option)



Appendices



Chapter 1

Quick Guide

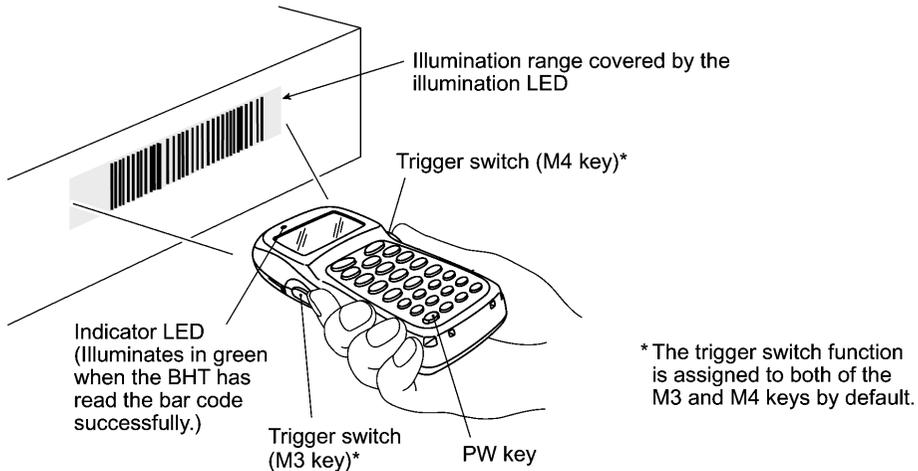
This chapter describes the basic operating method of the BHT and the related notes.

1.1	Reading Bar Codes	2
1.2	Setting and Using the Hand Strap	3
1.3	Setting the Backlight.....	4
1.4	Using the Keypad	5
1.5	Transferring Data.....	6

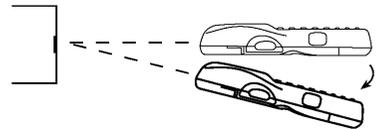
1.1 Reading Bar Codes

Turn the BHT on, bring the bar-code reading window to the bar code to be scanned, and press the trigger switch. The BHT turns on the illumination LED to scan the bar code.

When the BHT has read the bar code successfully, the indicator LED will illuminate in green.



- If the BHT fails to read due to specular effects or other factors, change the scanning angle of the bar-code reading window or the distance from codes as shown at right, and try it again. (Specular effects occur when the reflection of the light from the bar code becomes excessively strong. This can easily happen when the reflecting surface is polished or covered with vinyl.)



- 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. The BHT can read bar codes at a maximum distance of 29 cm (11.4")** from the bar-code reading window.

**For the detailed scanning conditions, refer to Appendix A.

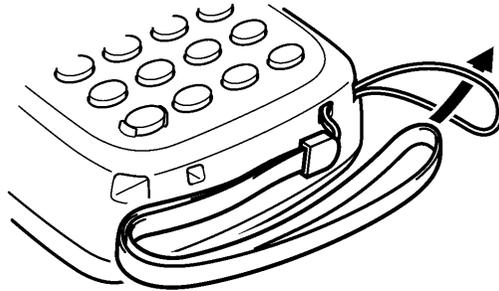
- The bar code reading procedure may differ depending upon the application used, so follow the application's manual.

NOTE

- Before reading labels, clean them if stained.
- Avoid using the BHT in direct sunlight. The BHT might fail to read correctly.
- To read bar codes on curved surfaces, apply the bar-code reading window to the center of each bar code at a right angle.
- If you pull the bar-code reading window away from bar codes, the actual scanning range will become narrower than the range covered by the illumination LED.
- The light intensity of the illumination LED will vary depending upon the scanning conditions and variation of its elements.

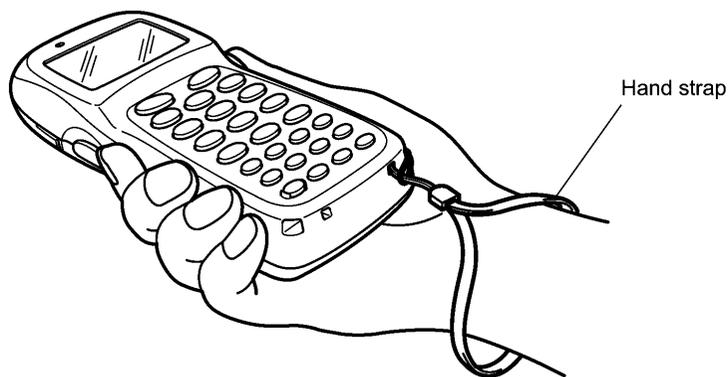
1.2 Setting and Using the Hand Strap

■ Setting the hand strap



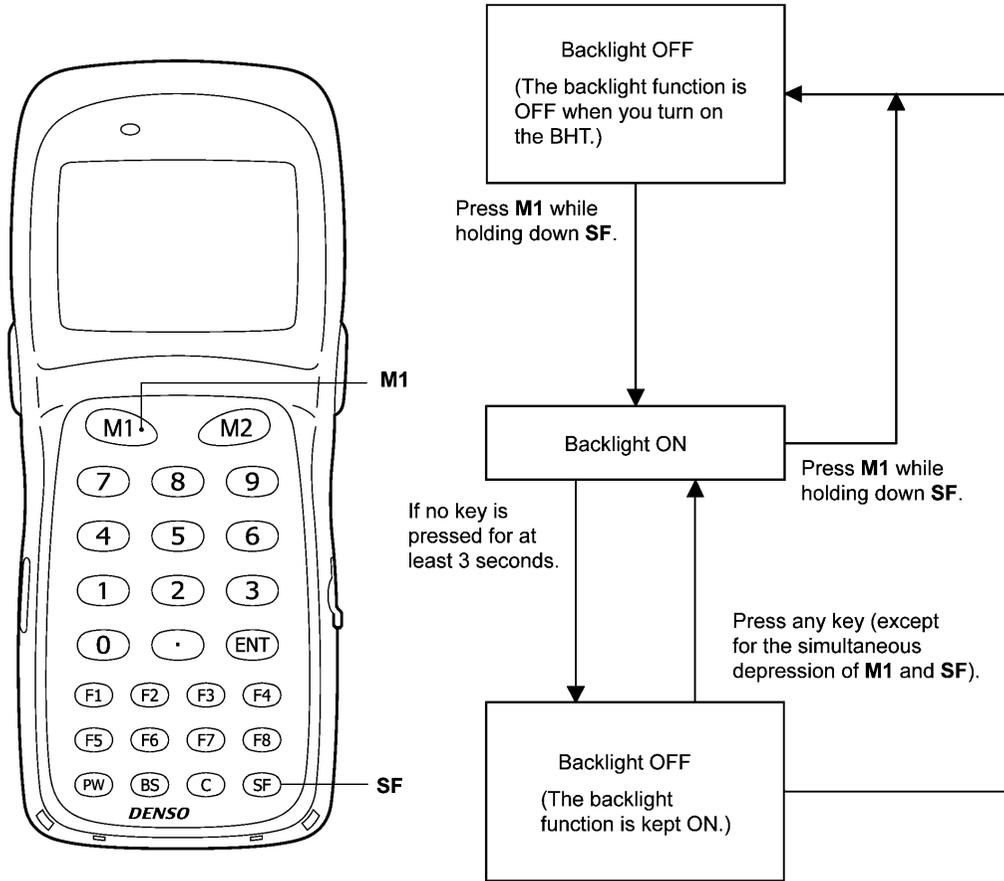
■ Using the hand strap

Put your hand through the hand strap and hold the BHT as shown below. This will prevent you from dropping the BHT accidentally.



1.3 Setting the Backlight

Pressing the **M1** key 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 initial setting: combination of **SF** and **M1**), 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 numerical keys and the **ENT** key.

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

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

■ Selecting Tasks

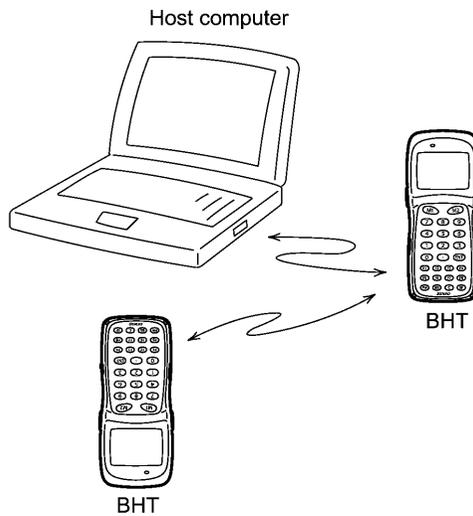
If the LCD shows the selection items (xxx) prefixed by numerals (e.g., 1: xxx, 2: xxx), use the numerical keys to select a desired item and press the **ENT** key to execute. If a YES/NO screen (e.g., 1: YES, 2: NO) appears, press the **1** key for YES response and **2** key for NO response.

1.5 Transferring Data

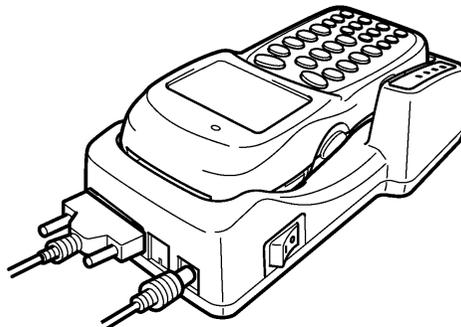
■ Using infrared link

Using infrared rays, the BHT may transfer data directly to the host computer equipped with an IrDA interface port and other IrDA-compliant devices.

- NOTE**
- Make sure that there is no obstruction in the light path between the BHT and any target stations. In infrared communication, you need to keep the BHT and any target stations within the effective infrared radiation range, usually 15 cm (5.91") or less.
 - Shield the IrDA interface from direct sunlight, ambient intense lighting (inverter-driven fluorescent lighting, in particular), and other potential sources of infrared radiation. Sources to watch out for include remote control units for television sets and the like.



For a host computer having no IrDA interface port, use the optical communication unit CU-8000 (option) connected to the host via an RS-232C interface cable. Put the BHT on the CU-8000 as shown below.



Chapter 2

Getting Started the BHT and System Mode

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

2.1	BHT System Configuration	9
2.2	Components and Functions	14
2.3	Preparation	16
2.3.1	Setting-up 1: Loading Dry Cells or Rechargeable Battery Cartridge	16
2.3.2	Setting-up 2: Setting the Calendar Clock	21
2.3.3	Adjusting the LCD Contrast & Beeper Volume and Switching the Beeper & Vibrator	23
2.3.4	Displaying the Battery Voltage Level and System Status	25
[1]	Displaying the Battery Voltage Level	25
[2]	Displaying the System Status	25
2.3.5	Battery Replacement Notes	26
2.3.6	BHT Turning-off Notes	28
[1]	"Shutdown in progress" message	28
[2]	If the BHT is shut down abnormally	28
[3]	About "\$\$BRKLST.SYS"	30
[4]	If invalid files are found	31
2.4	Initializing the BHT System	32
2.5	Operating in System Mode	36
2.5.1	Starting System Mode	36
2.5.2	Operating in System Mode	40
[1]	Calling up the desired set screen	40
[2]	Selecting a desired setting	41
2.5.3	Detailed Description of the Functions in System Mode	42
[1]	Program Execution	42
[2]	Downloading	43

[3]	Uploading	47
[4]	System Environment Setting	50
[5]	Testing.....	63
[6]	System Information.....	74
[7]	Deleting Files.....	75
[8]	Deleting Font Files.....	76
[9]	Downloading/Uploading the BHT System Parameter File.....	77
[10]	Setting the Remote Wakeup.....	82
[11]	Downloading/Uploading the System Message File	83
2.6	Starting Up User Programs	88

2.1 BHT System Configuration

The BHT barcode data collection system requires the following hardware as well as the BHT Bar Code Handy Terminal (which reads bar codes and accepts keypad entry) as illustrated below:

- Host computer: Allows you to edit, manage and download user programs and data, as well as downloading system programs.

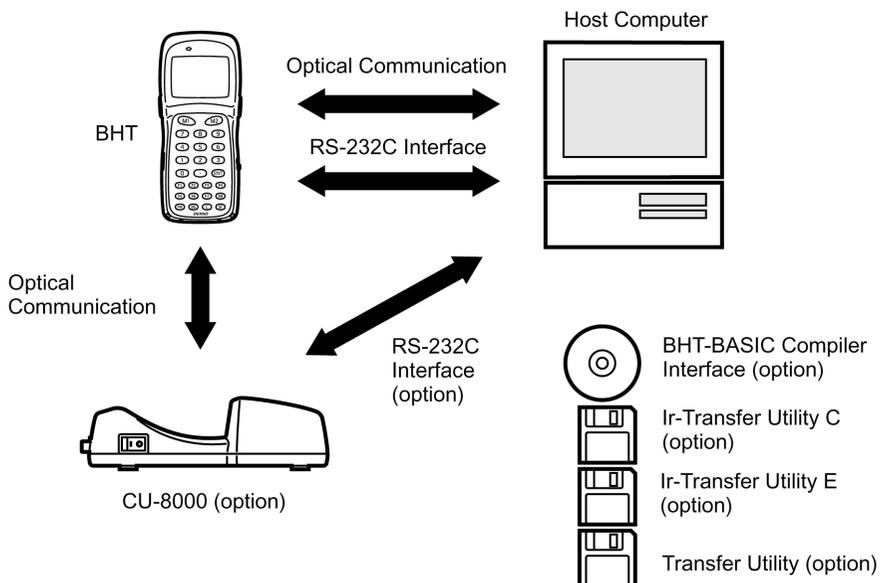
For host computers having no IrDA interface ports, the optical communication unit CU-8000 (option) and RS-232C interface cable are available.

- CU-8000 (option): Exchanges programs and data with the BHT via the IrDA interface and with the host computer via the RS-232C interface.
- RS-232C interface cable (option): Connects the CU-8000 and the host computer with each other.

Direct cable connection between the BHT and host computer is also possible.

Optional software includes the BHT-BASIC Extension Library, BHT-BASIC Compiler, Ir-Transfer Utility C, Ir-Transfer Utility E, and Transfer Utility.

System Configuration



■ Host Computer

Models: PC/AT, PS/2

Optional application programs and OSes

OS	MS-DOS	Win3.1	Win95	Win98	WinNT3.5/4.0	Win2000 Professional
BHT-BASIC Compiler	BHT-BASIC3.0 (MS-DOS-based)	BHT-BASIC3.0 (Windows3.1-based)	BHT-BASIC3.5			
Ir-Transfer Utility C	MS-DOS-based	–	Win95-/NT-based			
Ir-Transfer Utility E	–	–	Win95-/NT-based	Win95-/NT-based*	Win95-/NT-based	Win95-/NT-based*
Transfer Utility	MS-DOS-based	Windows3.1-based	Win95-/NT-based			

*This application does not activate any built-in IrDA interface port.

■ CU-8000 and RS-232C Interface Cable (option)

The CU-8000 is an IrDA-compliant communications unit which is required when your host computer is not equipped with an IrDA interface port. The CU-8000 exchanges data and programs with the BHT optically, and with the host computer via the RS-232C interface cable.

You may directly connect two BHTs with each other by using a commercially available metal cable having 3-pole mini stereo plugs (as a direct-connect interface cable). You also connect the BHT directly with the host computer or with the modem by using the direct-connect interface cable compatible with the target equipment. (NOTE: The direct-connect interface port of the BHT is not designed to stand frequent connecting/disconnecting. You are, therefore, recommended to use the CU-8000 where you expect to do a lot of connecting and disconnecting of the BHT to/from a host computer.)

■ BHT-BASIC Compiler (option)

This Compiler compiles a source program written in BHT-BASIC by an editor of the host computer running the MS-DOS, into the object program (user program) which can be used in the BHT. The compiled and linked program file is named "XXX.PD3."(XXX: File name you can set arbitrarily under the MS-DOS rules) You should download it to the BHT by using Ir-Transfer Utility C/Ir-Transfer Utility E/Transfer Utility.

■ Ir-Transfer Utility C (option)

Running on the host computer, this utility transfers files between the BHT and the host computer. For its file transfer control procedure, the utility uses the BHT-Ir protocol. (For the details about the BHT-Ir protocol, refer to Chapter 3, Subsection 3.4.2.)

To transfer files under any of the following conditions, use Ir-Transfer Utility C:

- At transmission speeds of 115200 or 57600 bps (This may be impossible depending upon the host computer type.)
- When the BHT is placed on the CU-8000
- When transferring via the direct-connect interface of the BHT

■ Ir-Transfer Utility E (option)

Running on the host computer, this utility transfers files between the BHT and the host computer. For its file transfer control procedure, the utility uses the BHT-Ir protocol. (For the details about the BHT-Ir protocol, refer to Chapter 3, Subsection 3.4.2.)

To transfer files under any of the following conditions, use Ir-Transfer Utility E:

- Via an external IR transceiver
- Via an IrDA interface port integrated in a computer

■ Transfer Utility (option)

Running on the host computer, this utility transfers files between the BHT and the host computer. It uses the BHT-protocol as a file transfer control procedure. (For the details about the BHT-protocol, refer to Chapter 3, Subsection 3.4.1.)

To transfer files under any of the following conditions, use Transfer Utility:

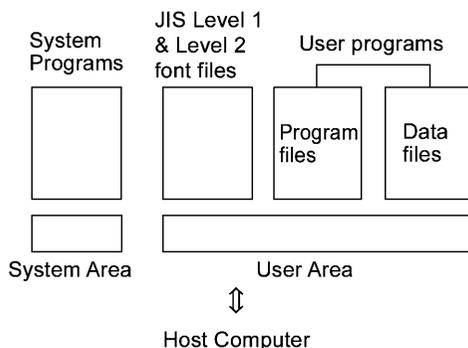
- When the BHT is placed on the CU-8000
- Via the direct-connect interface of the BHT

Software Structure

System Program and JIS Level 1 & Level 2 fonts are resident in the system area and user area, respectively.

To use extension programs and user programs, you should download the program files into the user area.

To use data files (e.g., good master files) required for execution of user programs, you should download those data files before execution of user programs. Those files will be stored in the user area.



■ System Programs

The system programs include the following three sets of programs:

Drivers

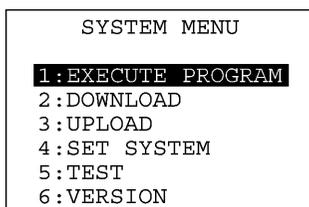
Drivers is a set of programs that directly controls the BHT hardware. It may be called up by the BHT-BASIC Interpreter or System Mode.

BHT-BASIC Interpreter

The interpreter interprets and executes instructions in user programs written in BHT-BASIC.

System Mode

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



■ JIS Level 1 and Level 2 Font Files

These files contain font data required for displaying Kanji characters on the LCD.

The BHT can display the Kanji characters not only in the conventional standard-size font (16 dots wide by 16 dots high) but also in the small-size font (12 dots wide by 12 dots high) in application programs. It can also display the double-width Kanji characters of those 16-dot and 12-dot fonts in application programs.

TIP If you do not need to display Kanji characters, you may delete these JIS font files. After deletion, the memory area which was occupied by these files can be used as a user area. For the deleting procedure, refer to Section 2.4, "Initializing the BHT System" or Subsection 2.5.3, "[8] Deleting Font Files."

The names of the JIS font files are:

FNT16J1.FN3 (JIS Level 1 font, 16-dot)

FNT16J2.FN3 (JIS Level 2 font, 16-dot)

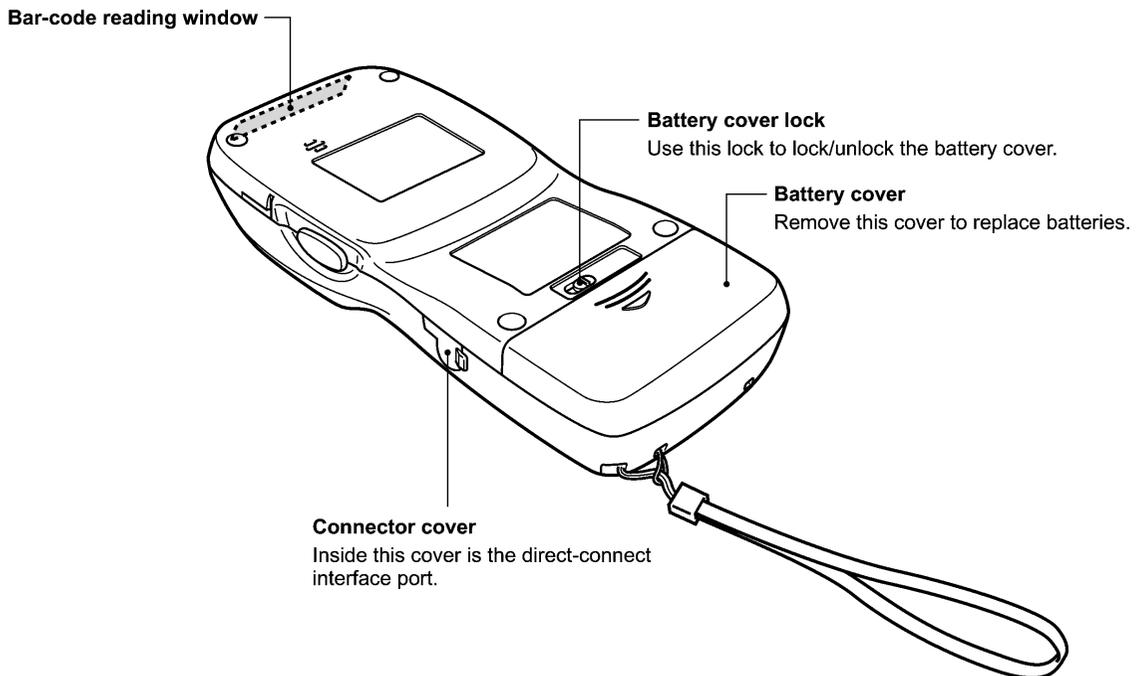
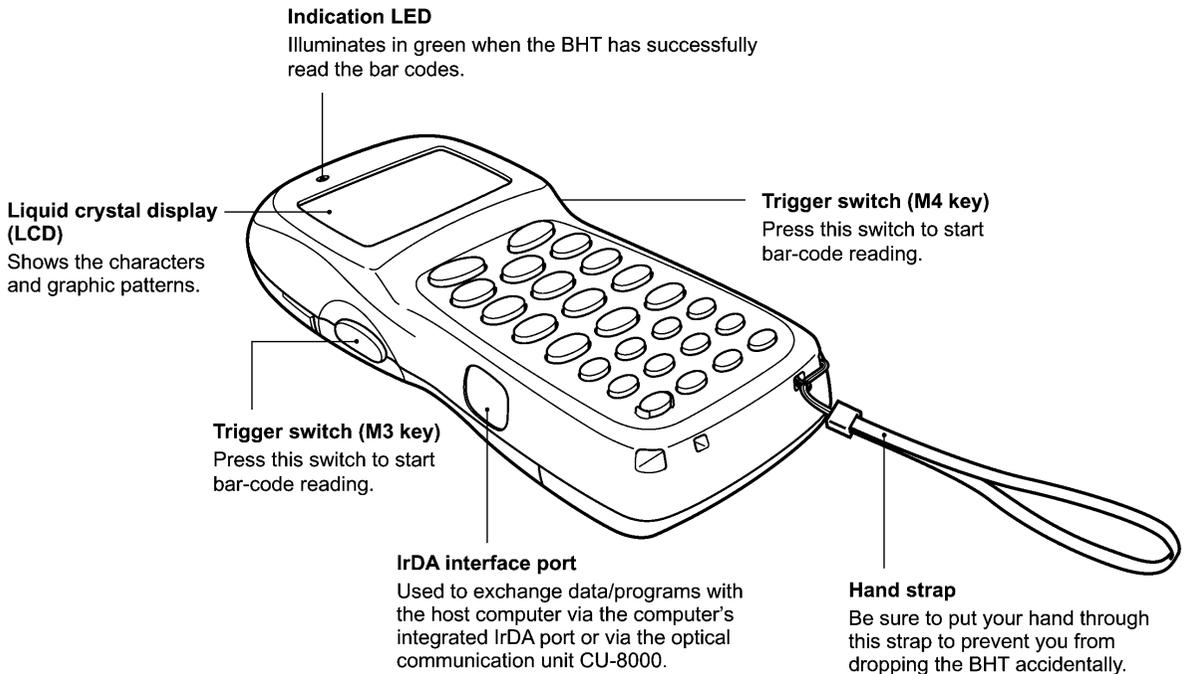
FNT12J1.FN3 (JIS Level 1 font, 12-dot)

FNT12J2.FN3 (JIS Level 2 font, 12-dot)

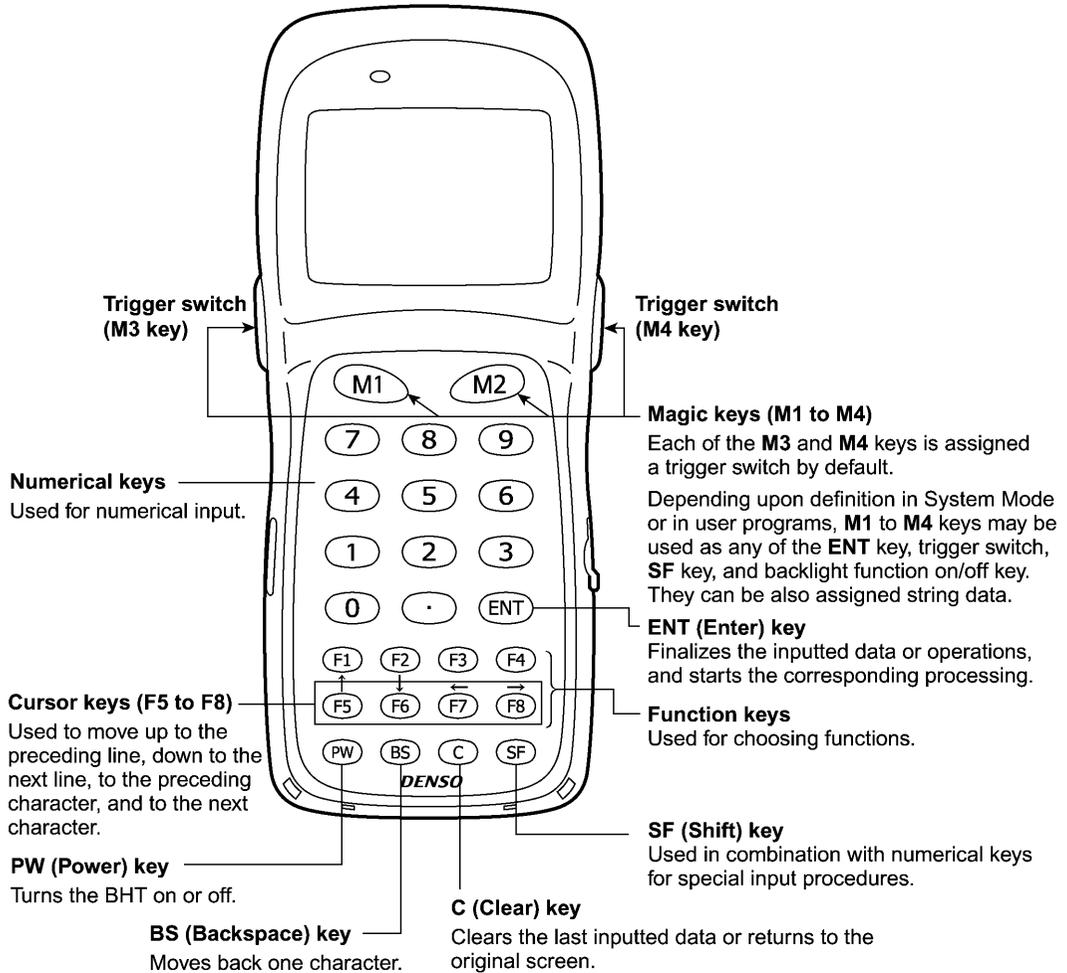
■ User Programs

You can develop application programs to meet individual job requirements by using the BHT-BASIC Compiler. To download those user programs to the BHT, use Ir-Transfer Utility C/Ir-Transfer Utility E/Transfer Utility.

2.2 Components and Functions



The functions of the keys may be set by user programs. Shown below is a set of sample functions.



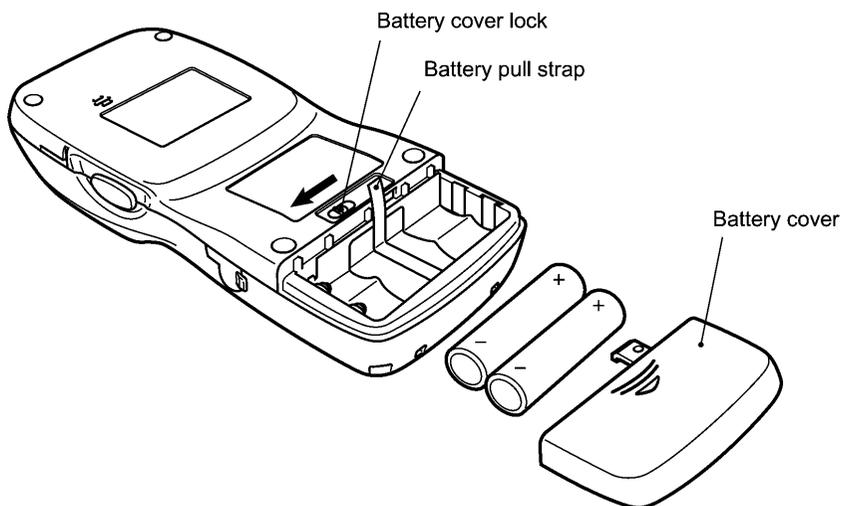
2.3 Preparation

2.3.1 Setting-up 1: Loading Dry Cells or Rechargeable Battery Cartridge

Before the first use of the BHT, be sure to load dry cells or rechargeable battery cartridge as shown below. Dry cells or battery cartridge is not loaded in the BHT when shipped from the factory.

Loading dry cells

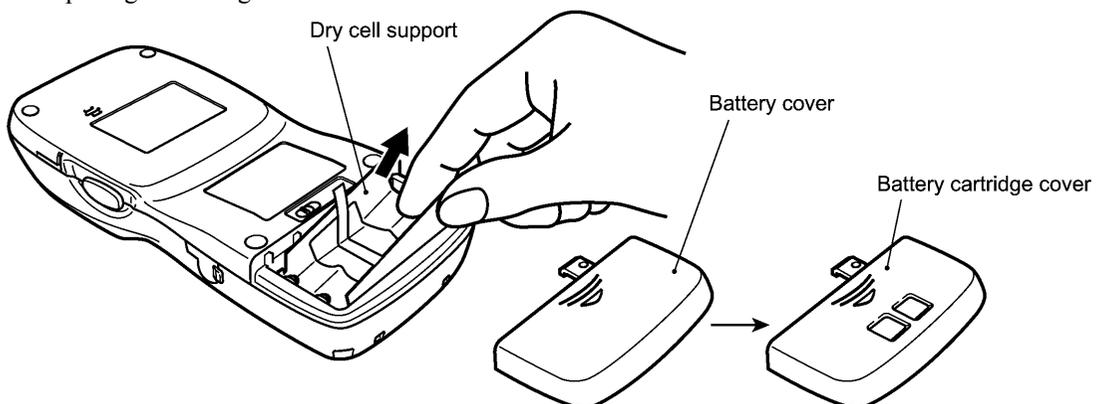
- (1) Turn the BHT upside down.
- (2) As shown below, slide the battery cover lock in the direction of the arrow and remove the battery cover.
- (3) Check the polarity (positive and negative) of two new LR03 batteries and load them.
- (4) Put the battery cover back into place taking care not to pinch the battery pull strap between its cover and the bottom cover. Then, return the battery cover lock to its original position.



Loading the battery cartridge

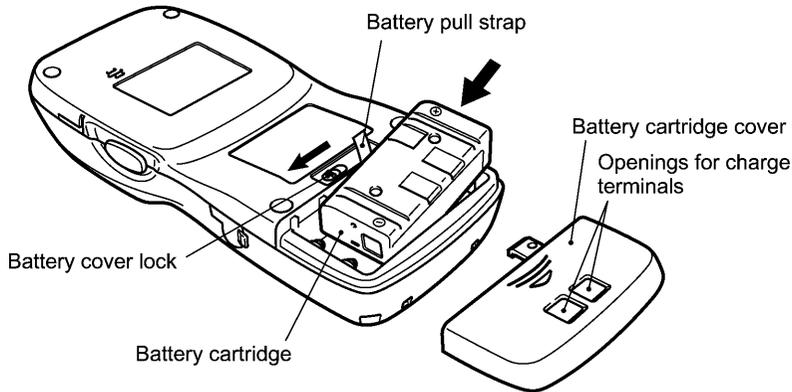
NOTE

To use the battery cartridge, you need to remove the dry cell support from the BHT and replace the battery cover with the battery cartridge cover (sold separately). The battery cartridge cover has openings for charge terminals.



- (1) Charge the battery cartridge, referring to Section 5.5, "Charging the Ni-MH Battery Cartridge."

- (2) Turn the BHT upside down.
- (3) As shown below, slide the battery cover lock in the direction of the arrow and remove the battery cartridge cover.
- (4) Check the polarity (positive and negative) of the battery cartridge. Then, load it so that the end of the battery pull strap appears above the battery cartridge as shown below. This facilitates easy removal of the battery cartridge.
- (5) Put the battery cartridge cover back into place taking care not to pinch the battery pull strap between its cover and the bottom cover. Then, return the battery cover lock to its original position.

**NOTE**

The Ni-MH battery cartridge is sold either in a set with its cover or by itself. Purchase the set with the cover if this is the first time the battery is being used.

⚠ WARNING

- Never disassemble or heat the battery cartridge, nor put it into fire or water; doing so could cause battery-rupture or leakage of battery fluid, resulting in a fire or bodily injury.
- Do not carry or store the battery cartridge together with metallic ball-point pens, necklaces, coins, hairpins, etc. Doing so could short-circuit the terminal pins, causing the batteries to rupture or the battery fluid to leak, resulting in a fire or bodily injury.
- Avoid dropping the battery cartridge or letting it undergo any shock or impact. Doing so could cause the batteries to break, generate heat, rupture or burn.
- Never charge the Ni-MH battery cartridge where any inflammable gases may be emitted; doing so could cause fire.



CAUTION

- Do not use batteries or power sources other than the specified ones; doing so could generate heat or cause malfunction.

**NOTE**

- The BHT has an integrated rechargeable backup power source which backs up the memory and calendar clock in the BHT when no dry cells or battery cartridge is loaded or the voltage level drops below the specified level. The backup power source is automatically charged by the dry cells or battery cartridge.

When you first load dry cells or battery cartridge after purchase or you load them (it) after leaving the BHT unused for a long time, do not remove the dry cells or battery cartridge for 10 minutes or more after that loading. This is for charging the memory backup source integrated in the BHT.

- If you leave the BHT without dry cells or battery cartridge loaded for a long time, the memory contents will no longer be backed up so that the message "Contact your administrator. Note the error number. (XXXX)" or "Set the current date and time." may appear on the LCD.
- If you will not be using the BHT for a long time, follow the instructions given in Subsection 2.3.5, "Battery Replacement Notes."
- Avoid storing the rechargeable battery cartridge in a hot place. The battery capacity may be decreased.
- Do not touch the terminals of dry cells or rechargeable battery cartridge or stain them. Doing so could result in a BHT failure or cartridge charging failure. It is recommended that you wipe those terminals with a dry, soft cloth periodically.
- When a rechargeable battery cartridge is first used or has been left unused for a long time, it may be inactive and may not output sufficient power. You need to charge and discharge such a battery cartridge several times to make it active, by inserting it into the battery cartridge slot of the CU-8001 or by using the C-600.

■ Checking the Battery Voltage Level

Pressing the **ENT** key while holding down the **SF** key may display the current voltage level of the power source (dry cells or battery cartridge) as a bar indicator. (Releasing those keys will erase the indication.)

For details, refer to Subsection 2.3.4, "Displaying the Battery Voltage Level and System Status."

■ Low Battery Indication

Low battery warning

If the output voltage (of the dry cells or battery cartridge) drops below a specified lower level while the BHT is in operation, the BHT displays the following warning message for approx. 2 seconds and beeps three times. After that, it will resume previous regular operation.

```
Battery voltage
  has lowered.
```

The service life of the dry cells or the rechargeable battery cartridge will expire soon, requiring replacement or recharge. If the BHT is driven by dry cells, replace them; if driven by the battery cartridge, recharge or replace it.

Shutdown due to low battery

If you continue to use the BHT without replacement of the dry cells or recharge of the battery cartridge after the low battery warning message appears, then the BHT displays the following message, beeps five times, and then turns itself off. Depending upon the battery level, the beeper may not sound five times.

(When driven by the dry cells)

```
Replace the
  batteries!
```

(When driven by the battery cartridge)

```
Charge the
  battery!
```

If the BHT is driven by dry cells, replace them; if driven by the battery cartridge, recharge or replace it.

NOTE

- When replacing dry cells, always replace both of them with new alkaline manganese batteries (LR03).
- You may charge the rechargeable battery cartridge with the optional CU-8001 communication unit or optional C-600 charger. For the charging procedure using the CU-8001, refer to Chapter 5. For that using the C-600, refer to the "C-600 User's Manual."
- If the "Replace the batteries!" or "Charge the battery!" message appears after the BHT undergoes any shock or impact, turn the BHT off and on and then check the battery output level. The battery may not have run out.

 WARNING	Only use the dedicated charger (CU-8001 or C-600) for charging the rechargeable battery cartridge. Using a different type of charger could cause battery-rupture or leakage of battery fluid and result in a fire, bodily injury, or serious damage to property.	
--	---	---

 CAUTION	Never charge a wet or damp battery cartridge. Doing so could cause the batteries to break, generate heat, rupture or burn.	
--	---	---

2.3.2 Setting-up 2: Setting the Calendar Clock

Press the **PW** key to turn the BHT on.

The following message will appear.

```

Set the current
date and time.

00/01/01 00:00

_ / /      :
  
```

In the following cases, the above message will appear. In such instances, it is necessary to set the date and time. (The indication "00/01/01 00:00" will differ depending upon the calendar clock state.)

- The BHT is first turned on from the time of purchase.
- The BHT is turned on after the memory back up power source is completely discharged.

NOTE

It is recommended that you upload font files beforehand for such cases that you would mistakenly delete font files or a memory storage error would cause font files to be erased.

```

SYSTEM MENU

1:EXECUTE PROGRAM
2:DOWNLOAD
3:UPLOAD
4:SET SYSTEM
5:TEST
6:VERSION
  
```

- (1) While holding down the **SF** and **1** keys, press the **PW** key to start System Mode. The SYSTEM MENU shown at left will appear.

```

SET SYSTEM

1:EXECUTE PROGRAM
2:DISPLAY
3:DATE/TIME
4:BARCODE
5:COMMUNICATION
6:KEY      7:RESUME
8:DEFRAG
  
```

- (2) Press the **4** key to select the "SET SYSTEM" on the SYSTEM MENU and then press the **ENT** key. The screen shown at left will appear. (To return to the immediately preceding screen during this setting procedure, press the **C** key.)

```

SET DATE/TIME

00/01/01 00:00

_ / /      :
  
```

- (3) Press the **3** key on the SET SYSTEM screen to select the "DATE/TIME" and then press the **ENT** key, and the screen shown at left will appear.
- (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 a 0 (zero) preceding the data.

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 will be deactivated.

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

[Example] To set 2002, January 19, at 4:00 p.m.

Press **0 , 2 , 0 , 1 , 1 , 9 , 1 , 6 , 0 ,** and **0** .

```
SET DATE/TIME  
  
00/01/01 00:00  
02/01/19 16:00_
```

```
SET DATE/TIME  
  
02/01/19 16:00  
_ / / :
```

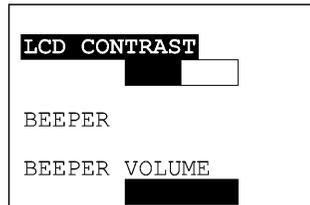
(5) Press the **ENT** key to register the above setting.

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

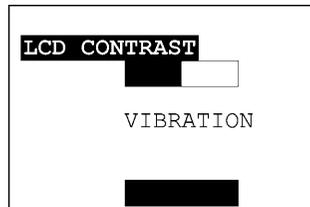
2.3.3 Adjusting the LCD Contrast & Beeper Volume and Switching the Beeper & Vibrator

While holding down the **M1** or **M4** key (right-hand trigger switch), press the **PW** key, and any of the following screens will appear on the LCD. This screen will disappear if you press the **ENT** key or no keys for five seconds.

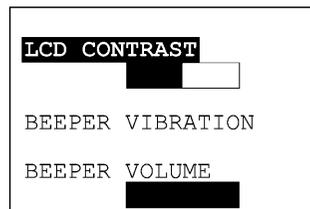
When the beeper is selected (default)



When the vibrator is selected



When both the beeper and vibrator are selected



(The current selection is highlighted.)

Adjusting the LCD contrast

You can adjust the LCD brightness to eight contrast levels.

- (1) Use the **F5** or **F6** keys to select the LCD CONTRAST line.
- (2) To decrease the contrast, press the **F7** key; to increase it, press the **F8** key.

Switching the beeper & vibrator

You may choose any of three ways—beeping only, vibrating only, or beeping & vibrating as a confirmation of completion of code reading.

- (1) Use the **F5** or **F6** key to select the BEEPER VIBRATION line that will be highlighted in any one of the following three states:



- (2) Highlight the desired way(s) by using the **F7** or **F8** key.

Adjusting the beeper volume

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

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

After making the above setting, press the **ENT** key or no key for five seconds. The new setting will be fixed and the above screen will disappear.

2.3.4 Displaying the Battery Voltage Level and System Status

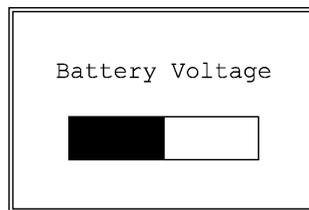
[1] Displaying the Battery Voltage Level

On the SYSTEM MENU or during execution of user programs, pressing the **ENT** key while holding down the **SF** key will display the battery voltage level.

As long as you hold down those keys, the following screen is displayed.

NOTE

- If the BHT is placed in the alphanumeric entry system in user programs, the combination of the **SF** and **ENT** keys cannot be used for displaying the battery voltage level. This is because in the alphanumeric entry system the **SF** key is used for switching between the numeric and alphabet entry modes as described in [2] below.

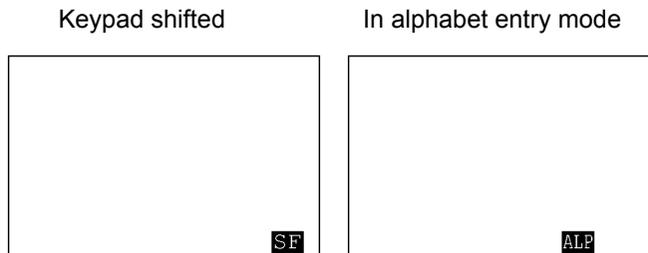


TIP

- In user programs, you may select the key to be used for displaying the battery voltage level (instead of the default: combination of **SF** and **ENT** keys).
- The displayed battery level shows the terminal voltage of the battery, not how much power is left. The actual voltage level varies depending upon the operation of the BHT, so the displayed level also may vary.

[2] Displaying the System Status

Pressing the **SF** key will shift the keypad and show the icon **SF** in the right bottom corner of the LCD. If the alphanumeric entry system has been selected in user programs, pressing the **SF** key will switch from the numeric entry mode to alphabet entry mode and show the icon **ALP**.



TIP

You may select whether the system status will be displayed or not, in SYSTEM MENU (refer to Subsection 2.5.3, [4.2]) or in user programs. The default is to display the system status.

2.3.5 Battery Replacement Notes

■ When is battery replacement needed?

If the "Replace the batteries!" or "Charge the battery!" appears on the LCD, replace the dry cells with new ones or replace the battery cartridge with a fully charged one, respectively.

If you leave the BHT without replacing dry cells or battery cartridge, the integrated calendar clock or data will no longer be backed up so that the calendar clock will stop or the "Contact your administrator. Note the error number. (XXXX)" will appear on the LCD.

NOTE

Be sure to turn the BHT off before replacing the dry cells or battery cartridge.

Replace the dry cells or battery cartridge quickly. Load new dry cells or charged battery cartridge within 3 minutes after the removal in order to avoid data loss.

After replacement, be sure to turn the BHT on and check its operation.

■ If you will use the BHT more than one time per month:

Keep the dry cells or battery cartridge loaded in the BHT.

■ If you will not be using the BHT for more than one month:

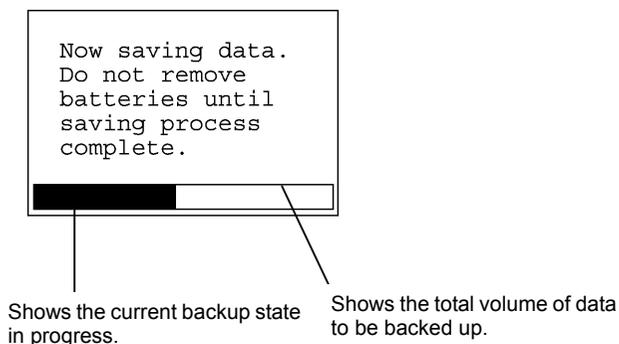
Remove the dry cells or battery cartridge from the BHT and then store the BHT. When doing so, be sure to follow the procedure given below.

(1) When removing the dry cells or battery cartridge:

Hold down the **PW** key for more than 3 seconds to turn the BHT off.

The following message will appear on the LCD and the BHT will start backing up data. After completion of the backup operation so that the message disappears, remove the dry cells or battery cartridge.

(The backup operation may take several tens of seconds depending upon the volume of data to be backed up.)



(2) When turning the BHT on after storage without dry cells or battery cartridge loaded:

Even after the removal of dry cells or battery cartridge, the calendar clock will work with the backup power source for a while.

If the calendar clock backup has stopped, loading dry cells or battery cartridge and turning the BHT on will display the following message, prompting you to set the current date and time.

Set the calendar clock according to the procedure given in Subsection 2.3.2.

(The indication "00/01/01 00:00" will vary depending upon the calendar clock state.)

```

Set the current
date and time.

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

```

NOTE

- The rechargeable battery cartridge can be recharged hundreds of times, but it will eventually wear out. If the operation time of the fully recharged battery cartridge is noticeably shorter than normal, replace the battery cartridge with a new one.
- Use only DENSO WAVE-authorized battery cartridges and chargers.
- Never dispose of dry cells or battery cartridges into a fire.
- Dry cells or battery cartridges should be recycled properly. Do not throw them in a trash.
- When disposing of dry cells or battery cartridges for recycling, cover their terminal pins with vinyl tape to prevent short-circuits.

2.3.6 BHT Turning-off Notes

[1] "Shutdown in progress" message

When the BHT is turned off by pressing the **PW** key or by the auto power-off feature, it displays the following message and starts preparation for shutdown.

```
Shutdown
in progress.

Do not remove the
battery.
```

When the above message is displayed, do not remove the dry cells or battery cartridge.

If you do so and leave the BHT without dry cells or battery cartridge loaded for one hour or more, then the error message "Contact your administrator. Note the error number. (20XX)" may appear when turning the BHT on at the next time.

[2] If the BHT is shut down abnormally

If the BHT is shut down abnormally* and is left without dry cells or battery cartridge loaded or with dead dry cells or discharged battery cartridge loaded, then unsaved data may be lost.

(*"Normally shut down" refers to "turned off with the **PW** key or by the auto power-off feature.")

If the above problem has arisen, the following message will appear when you load new dry cells or fully charged battery and turn the BHT on.

```
Your terminal was
not shut down
properly the last
time it was used.

[SF+2]
```

(1) Press the **2** key while holding down the **SF** key. The screen will switch to the following:

```
Unsaved data
was lost.

[SF+2]
```

(2) Press the **2** key while holding down the **SF** key again. The screen will switch to the following:

```
Do you want to
run Scandisk?

1.Yes  2.No
```

[1] YES: Run Scandisk and start the System.

[2] NO: Turn the BHT off.

(3) Choose YES or NO with the numerical keys and press the **ENT** key.

When Scandisk is in progress, the following message is displayed:

```
Scandisk is
checking your
drive for errors.
```

If Scandisk finds an invalid file(s), the following screen will appear. As long as an invalid file exists, that screen displays every time the BHT System is started up.

```
Scandisk found
invalid files.

[SF+2]
```

(4) Press the **2** key while holding down the **SF** key. The screen will switch to the following:

```
Refer to the file
"$§BRKLS.TSYS" for
more information.
```

(5) Press the **ENT** key to start up the BHT System.

■ Scandisk when the resume function is enabled

If Scandisk runs when the resume function is enabled, the screen given below may appear. The screen may also appear when the calendar clock built in the BHT stops, even without running Scandisk.

The BHT displays the screen for three seconds and then automatically runs the execution program from the beginning.

```
No resume info.  
has been retained.  
Program restarts  
automatically.
```

[3] About "\$\$BRKLST.SYS"

If Scandisk finds an invalid file(s), it will automatically create the "\$\$BRKLST.SYS" file. To check the contents of the file, upload the file in System Mode to the host computer. (Refer to Subsection 2.5.3, "[3] Uploading.")

Contents of the "\$\$BRKLST.SYS" file

- Records (1) File name
(2) Error factor + (Broken since the BHT has not been turned off normally)
* (Broken due to any other causes)
(3) Broken records e.g. 01000-01200 (Data in records numbered 1000 to 1200 is lost)

(Example)

SAMPLE1.DAT + 01000-01050	}	If more than one sequence of records is broken in a same file, they will be written into the subsequent records in the "\$\$BRKLST.SYS."
SAMPLE1.DAT + 01200-01250		
SAMPLE1.DAT + 01600-01650		
SAMPLE2.DAT * 00250-00275		
SAMPLE3.DAT * 00100-00150		
↑	↑	↑
(1)	(2)	(3)

[4] If invalid files are found

Even invalid, files may be uploaded, so upload them to the host computer according to your needs.

After uploading,

- Delete those invalid files. (Refer to Subsection 2.5.3, "[7] Deleting Files.")
or
- Download valid files having the same names as invalid files. (Refer to Subsection 2.5.3, "[2] Downloading.")

2.4 Initializing the BHT System

Initializing the system will lose program files and data files stored in the user area and make system settings revert to the factory defaults.

TIP You may delete font files by selecting the whole user area to be initialized.

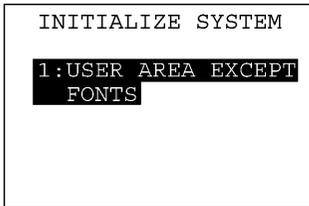
You need to initialize the system if:

- (1) You want to delete all of the program files and data files.
- (2) The following message appears when the BHT is turned on.

Contact your
administrator.
Note the error
number.
(2XXX)

On the following pages is an initialization procedure.

(1) Selecting the memory area to be initialized



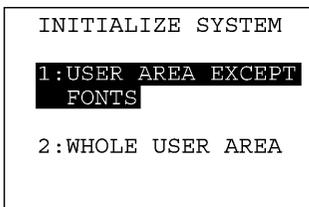
Press the **PW** key while holding down the **SF**, **M1** and **0** keys together.

The screen shown at left will appear.

To initialize the user area except for the font file area, press the **ENT** key. The screen switches to the confirmation display given in step (3) below.

To initialize the whole user area including the font file area, press the **2** key while holding down the **SF** key. The "2:WHOLE USER AREA" item will appear.

(Area selection screen)



[1] USER AREA EXCEPT FONTS:

Initializes the user area except for the font file area.

[2] WHOLE USER AREA:

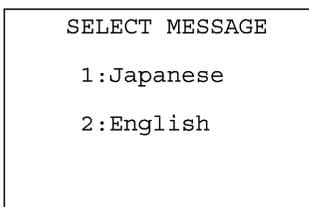
Initializes the whole user area including the font file area.

TIP

If the message "Contact your administrator. Note the error number. (2XXX)" appears on the LCD, you need to select "2:WHOLE USER AREA" to initialize the whole user area.

Select an area to be initialized by using the numerical keys, then press the **ENT** key. The screen switches to the SELECT MESSAGE display given in step (2).

(2) Selecting the English or Japanese message version



Preceding the execution of initialization, the message version selection screen will appear as shown at left.

[1] Japanese: Switches the message version to Japanese.

[2] English: Switches the message version to English.

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

(3) Confirming the memory area selected for initialization

```
INITIALIZE SYSTEM

      OK?
    1:Yes  2:No
```

Selecting the "USER AREA EXCEPT FONTS" in step (1) above will call up the confirmation screen shown at left.

[1] Yes: Starts initialization.

[2] No: Cancels initialization and turns the power off.

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

Pressing the **C** key will switch the screen back to the area selection screen.

```
INITIALIZE SYSTEM

      OK?
    1:Yes  2:No
Warning
Initializing the
whole user area will
lose the font files.
```

Selecting the "WHOLE USER AREA" in step (1) above will call up the screen shown at left.

[1] Yes : Starts initialization.

[2] No : Cancels initialization and turns the power off.

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

Pressing the **C** key will switch the screen back to the area selection screen.

(4) During initialization

```
INITIALIZE SYSTEM

** Initializing **

████████████████████
```

During initialization, the screen shown at left is displayed.

(5) Completion of initialization

```
INITIALIZE SYSTEM
```

```
** Completed **
```

Upon completion of the initialization, the BHT displays the screen shown at left for a second and turns itself off automatically.

NOTE

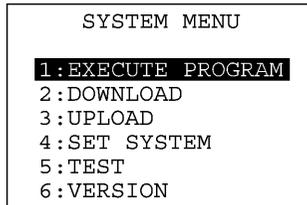
- Do not turn the BHT off until the above initialization completion screen appears. A too-early turning-off will interrupt initialization, requiring you to initialize the BHT again.
- If the message "Contact your administrator. Note the error number. (2XXX)" appears although the initialization has completed, you need to initialize the BHT again.
- If you initialize the BHT after downloading user programs and data, all of those programs and data stored in the target memory area will be lost. Download them again if necessary.
- Initialization will restore the LCD contrast level (refer to Subsection 2.3.3), communications conditions and other settings to the default values, so modify them if necessary. After initialization, be sure to set the calendar clock (refer to Subsection 2.3.2).

2.5 Operating in System Mode

System Mode is an operating software exclusively designed for the effective use of the BHT, which includes various functions as shown on the following pages.

2.5.1 Starting System Mode

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



The function selected is highlighted (white-on-black) with the cursor. To select a desired item in System Mode, press the corresponding numerical key and then press the **ENT** key.

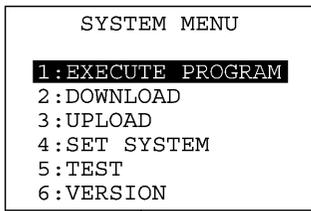
The keys below are so designed that the function of each key is consistent in every screen.

Numerical keys	Pressing a numerical key corresponding with a desired menu number selects the desired item displayed on the screen.
ENT key	Pressing this key registers the selected item and executes the corresponding function.
F5 and F6 keys	Pressing the F5 and F6 keys moves the cursor up and down, respectively, to select a desired item.
F7 and F8 keys	Pressing the F7 and F8 keys moves the cursor to the left and right, respectively, to select a desired setting.

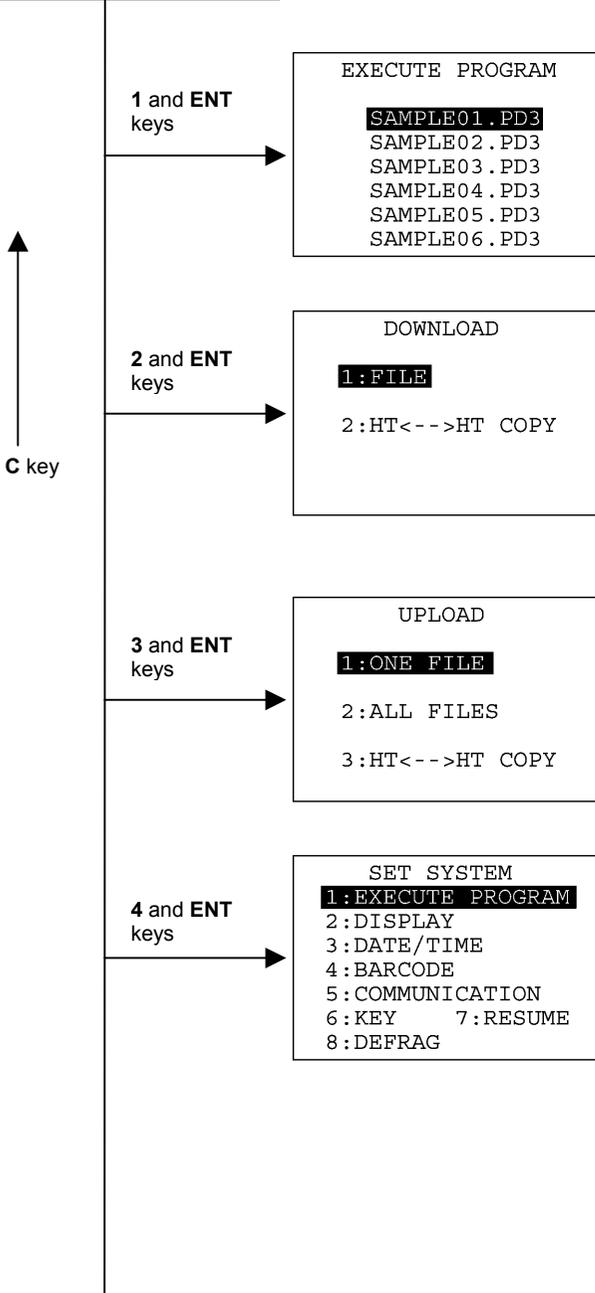
The **C** key is inoperative on the SYSTEM MENU. On other screens, pressing the **C** key returns to the immediately preceding screen.

The power-on default is "EXECUTE PROGRAM" which is highlighted. Once any other item is selected, the selected item will become highlighted with the cursor when you turn back to the SYSTEM MENU.

■ Structure of System Mode



SYSTEM MENU ← Press the **PW** key while holding down the **SF** and **1** keys.



Program Execution

Allows you to select a desired user program to be executed immediately.

(Refer to Subsection 2.5.3, [1].)

Downloading

Transfers user program files or data files from the host computer to the memory integrated in the BHT. Downloading between the BHTs is also possible.

(Refer to Subsection 2.5.3, [2].)

Uploading

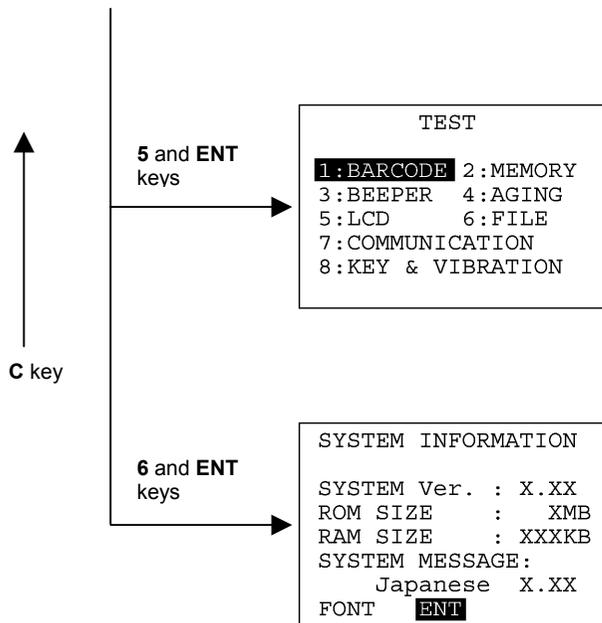
Transfers user program files and data files stored in the memory of the BHT to the host computer.

(Refer to Subsection 2.5.3, [3].)

System Environment Setting

Sets a variety of environmental conditions – an execution program, message version (English or Japanese), system status indication, calendar clock, special barcode scanning parameters, interface port, communications parameters, shift key & magic key functions, resume function, and drive defragmentation.

(Refer to Subsection 2.5.3, [4].)



Testing

Used for the bar-code reading test, memory test, beeper test, aging test, LCD indication test, indicator LED test, file test, communications test, key-entry test, and vibrator test.

(Refer to Subsection 2.5.3, [5].)

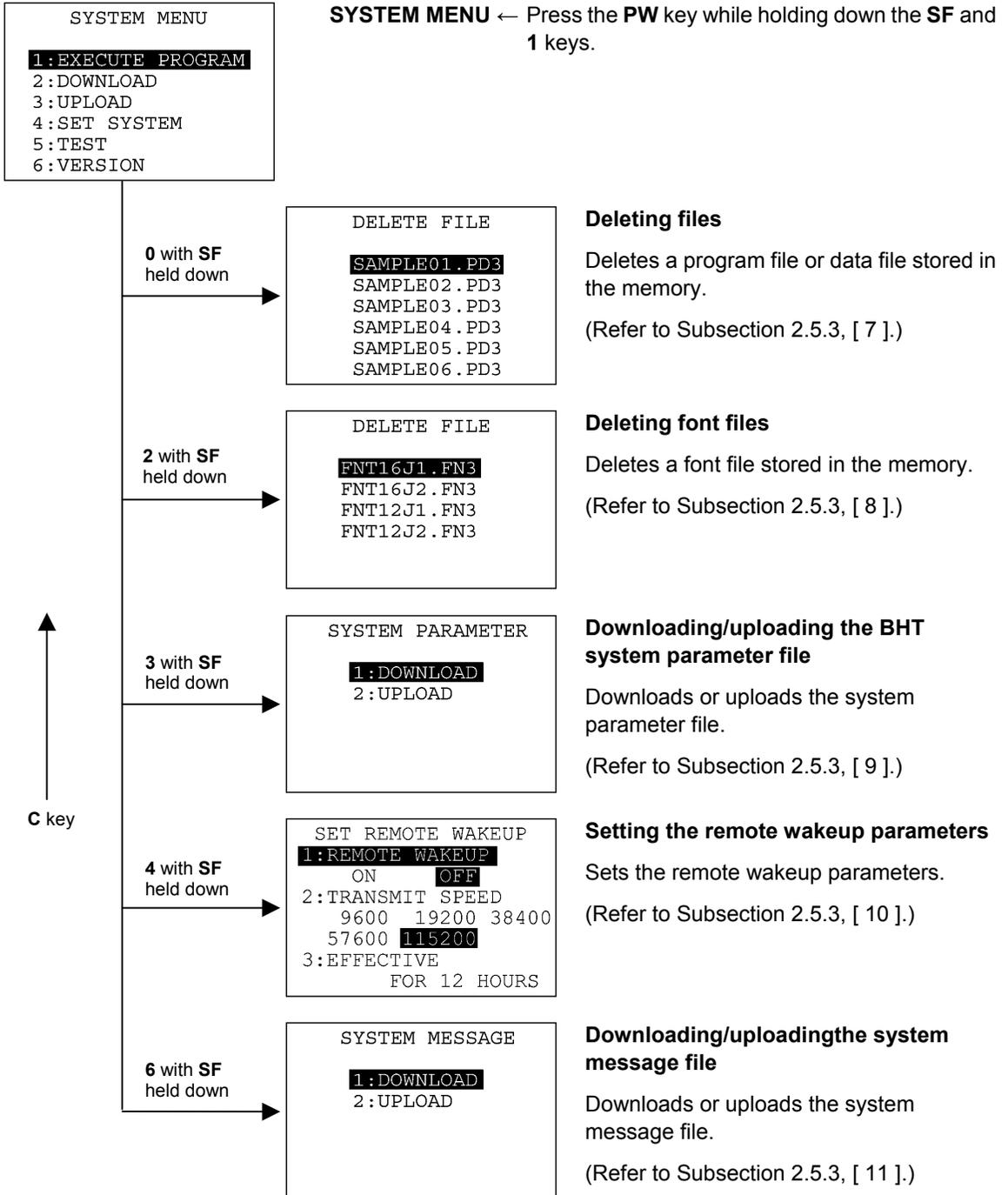
System Information

Shows the system program version, memory size, system message version, and font type and version

(Refer to Subsection 2.5.3, [6].)

In addition to the functions given on the preceding pages, System Mode has these five functions: Deleting program/data files, Deleting font files, Downloading/uploading the BHT system parameter file, Setting the remote wakeup parameters, and Downloading/uploading the system message file.

To call up these functions, press the **0**, **2**, **3**, **4** or **6** key, respectively, while holding down the **SF** key when the SYSTEM MENU is displayed.



2.5.2 Operating in System Mode

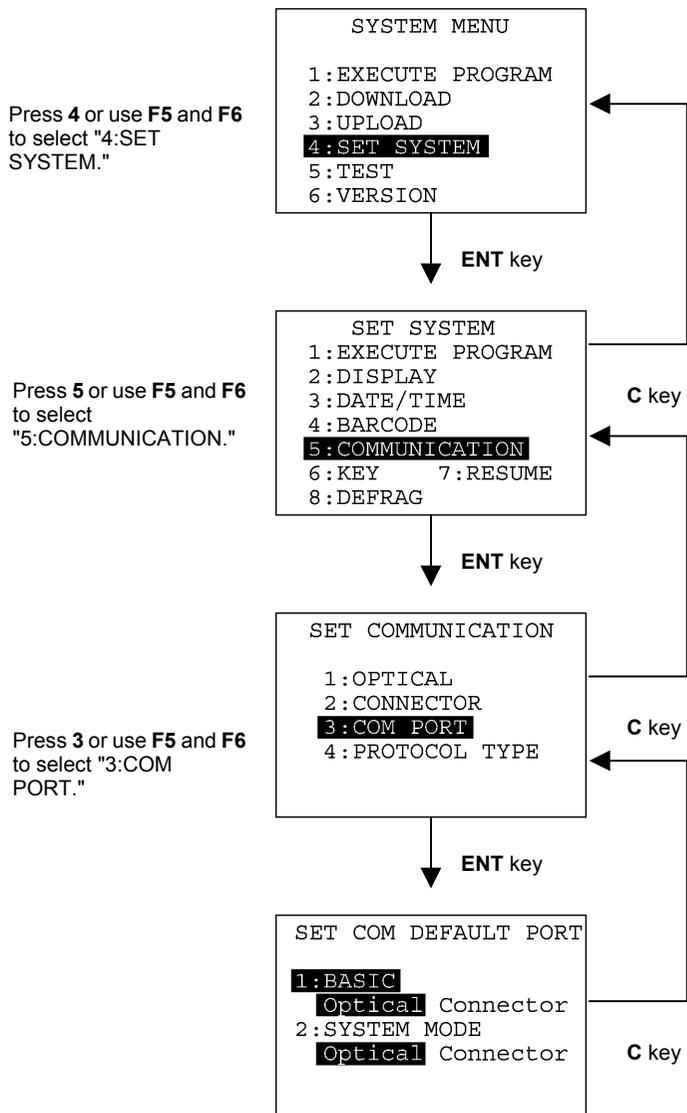
Some functions in System Mode require several screens to be shifted, as shown in the example below.

[1] Calling up the desired set screen

First, select a desired item on the current screen by using the numerical key or the cursor keys (**F5** and **F6**) so as to highlight the desired item.

Press the **ENT** key to establish the selected item and proceed to the subsequent screen.

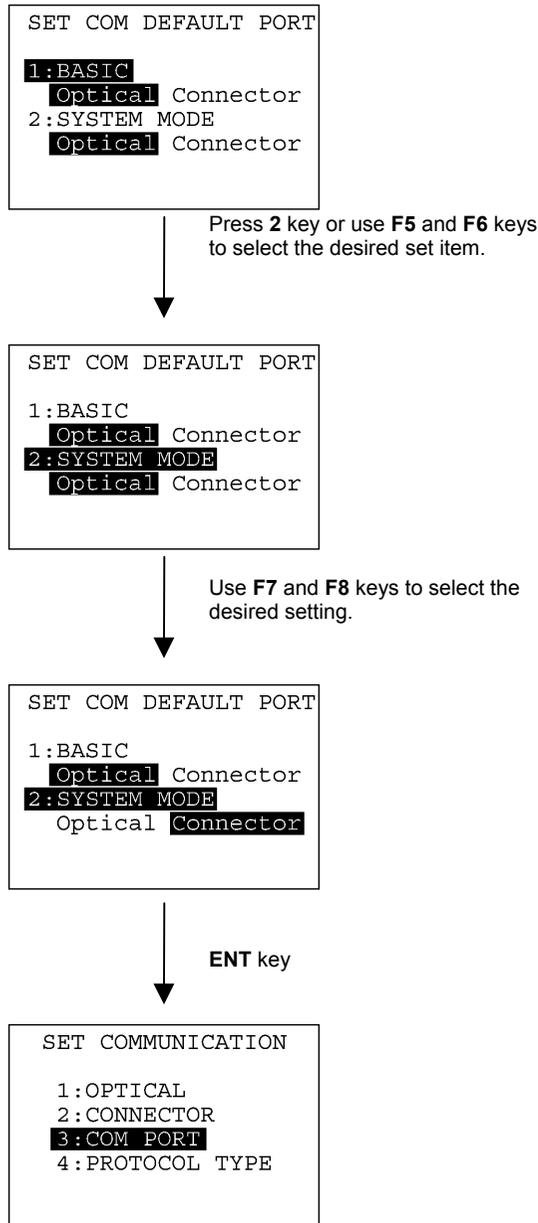
To return to the preceding screen, press the **C** key.



[2] Selecting a desired setting

First, select a desired item on the current screen by using the numerical key or the cursor keys (**F5** and **F6**) so as to highlight the desired item.

Use the **F7** and **F8** keys to select a desired setting and then press the **ENT** key. The screen returns to the previous selection screen.



2.5.3 Detailed Description of the Functions in System Mode

[1] Program Execution

```
EXECUTE PROGRAM
SAMPLE01.PD3
SAMPLE02.PD3
SAMPLE03.PD3
SAMPLE04.PD3
SAMPLE05.PD3
SAMPLE06.PD3
```

Selecting "1:EXECUTE PROGRAM" on the SYSTEM MENU shows the screen shown at left.

If more than one program has been downloaded to the user area of the target memory, use the **F5** and **F6** keys to move the cursor to a target program, and then press the **ENT** key.

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

```
EXECUTE PROGRAM
SAMPLE01.PD3
SAMPLE02.PD3
SAMPLE03.PD3
SAMPLE04.PD3
SAMPLE05.PD3
SAMPLE06.PD3
```

If more than six programs have been downloaded, you may need to scroll the screen with the **F6** key.



```
EXECUTE PROGRAM
SAMPLE02.PD3
SAMPLE03.PD3
SAMPLE04.PD3
SAMPLE05.PD3
SAMPLE06.PD3
SAMPLE07.PD3
```



```
EXECUTE PROGRAM
SAMPLE18.PD3
SAMPLE19.PD3
SAMPLE20.PD3
SAMPLE21.PD3
SAMPLE22.PD3
SAMPLE23.PD3
```

In the example shown at left, 23 programs are downloaded.

```
EXECUTE PROGRAM
*****
* NO FILE EXISTS *
*****
```

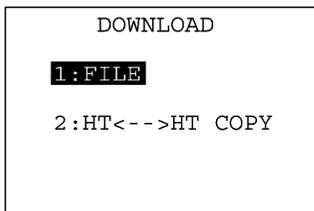
If no program file is downloaded, the message shown at left will appear.

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

[2] Downloading

NOTE If you download a file having the same name as one already used in the user area of the target memory in the BHT, then the newly downloaded file replaces the old one.

NOTE If no auto-start execution program has been specified (refer to Subsection 2.5.3, [4.1]), turning the BHT on will cause the directory manager to start the first registered one out of user programs (.PD3) downloaded in the BHT--a program that appears on the top of the EXECUTE PROGRAM menu shown on the previous page. Taking this into account, determine the file downloading order. For details, refer to Section 2.6, "Starting Up User Programs."



Selecting "2: DOWNLOAD" on the SYSTEM MENU calls up the screen shown at left.

[1] FILE: Downloads a user program file or data file to the user area of the BHT.

[2] HT<-->HT COPY: Downloads all of the files, system parameters, and calendar clock data stored in the connected BHT.

This function enables copying between the BHTs.

For the preparation to be made preceding the start of this function, refer to **NOTE** below.

Select a desired item by using the numerical keys or **F5** and **F6** keys, and the selected item becomes highlighted. Then press the **ENT** key.

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

NOTE Preparation for Copying between the BHTs

Before downloading to the BHT from another BHT, make the following preparation:

- At each BHT, set the interface port. The default is an IrDA interface (Optical).

Interface setting procedure: Starting on the SYSTEM MENU, select "4:SET SYSTEM," "5:COMMUNICATION," and "3:COM PORT." On the SET COM DEFAULT PORT screen, select the IrDA interface (Optical) or direct-connect interface (Connector) of "2:SYSTEM MODE."

- When using the direct-connect interface, pull out the connector cover on each BHT to expose the direct-connect interface port. Connect the BHTs via those ports with the direct-connect interface cable (having 3-pole mini stereo plugs). For the details about the cable, refer to Chapter 3, Section 3.2.
- On the uploading BHT, run System Mode and select "3:UPLOAD" and "3:HT<-->HT COPY."

Download screens

```
DOWNLOAD FILE

** Waiting **
```



```
DOWNLOAD FILE

** Loading **
```



```
DOWNLOAD FILE

XXXXXXXX.XXX
** Loading **

XXXXX/YYYYY
```



```
DOWNLOAD FILE

XXXXXXXX.XXX
** Completed **
```

With this screen displayed, the BHT waits for a file to be downloaded.

If you select "2:HT<-->HT" on the DOWNLOAD menu, the "HT<-->HT" will appear in the center of the 2nd line. If you select "1:FILE," nothing will appear on the 2nd line.

The screen at left shows that "1:FILE" has been selected.

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

(Refer to the "Ir-Transfer Utility C Guide"/"Ir-Transfer Utility E Guide"/"Transfer Utility Guide.")

While the downloading operation is in progress, the screen shown at left is displayed indicating the file name and the number of received records/the total number of records.

To abort the downloading operation, press the **C** key. The screen will switch 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 once. Press the **C** key to return to the DOWNLOAD menu.

If the host computer downloads another new file (if the BHT receives an ENQ code) when this screen is displayed, the BHT starts receiving it.

(Refer to the "Ir-Transfer Utility C Guide"/"Ir-Transfer Utility E Guide"/"Transfer Utility Guide.")

If you have selected "2: HT<-->HT COPY" on the DOWNLOAD menu, a sequence of the above screens will be repeated by the number of files to be downloaded.

If an error occurs during downloading

If some error occurs during downloading, the BHT beeps three times and shows one of the following screens with the prompt "Retry?":

To retry the download, press the **1** and **ENT** keys; to abort it, press the **2** and **ENT** keys.

```

DOWNLOAD FILE

XXXXXXXXX.XXX
Out of memory!!

Retry?
  1:Yes 2:No

```

■ Problem

The memory is insufficient for storing files to be downloaded.

■ Solution

Press the **2** key to return to the SYSTEM MENU, then delete unnecessary files in the memory or decrease the size of the file to be downloaded. (Refer to Subsection 2.5.3, [7] and [2].)

```

DOWNLOAD FILE

XXXXXXXXX.XXX
Too many files!!

Retry?
  1:Yes 2:No

```

■ Problem

The current download will exceed the maximum of 80 files in the memory.

■ Solution

Press the **2** key to return to the SYSTEM MENU. Delete unnecessary files in memory or decrease the number of files to be downloaded if you attempted to download more than one file (Refer to Subsection 2.5.3, [7] and [2].)

```

DOWNLOAD FILE

XXXXXXXXX.XXX
Communication error!!

Retry?
  1:Yes 2:No

```

■ Problem

Downloading has failed.

■ Solution

To retry downloading, press the **1** key.

To return to the SYSTEM MENU, press the **2** key. Check the interface port and communications parameters in the SET SYSTEM menu or perform the communications test in the TEST menu. (Refer to Subsection 2.5.3, [4.5] and [5.7].)

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

```
DOWNLOAD FILE
XXXXXXXXX.XXX
Program file error!!

Retry?
  1:Yes 2:No
```

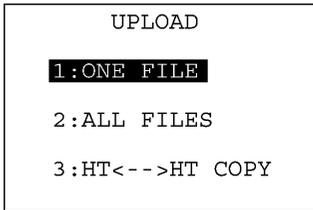
■ **Problem**

You attempted to download an invalid program file.

■ **Solution**

Check whether the program file you attempted to download is available to your BHT model. If it is not available, download the appropriate program.

[3] Uploading



Selecting "3: UPLOAD" on the SYSTEM MENU calls up the screen shown at left.

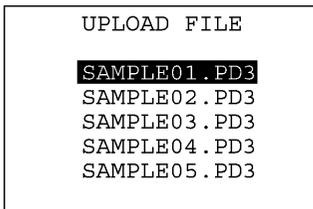
- [1] ONE FILE: Uploads a user program file or data file stored in the memory.
- [2] ALL FILES: Uploads all of user program files (object programs) and data files stored in the memory.
- [3] HT<-->HT COPY: Uploads all of the files, system parameters, and calendar clock data stored in the BHT, to another BHT.

This function enables copying between the BHTs. At the receiving BHT, select "2: DOWNLOAD" and "2: HT<-->HT COPY" in System Mode.

For the preparation to be made preceding the start of this function, refer to NOTE given on page 43.

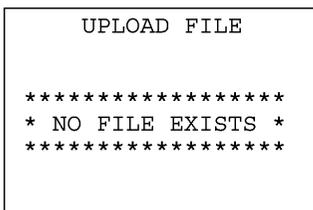
Select a desired item by using the numerical keys or **F5** and **F6** keys, and the selected item becomes highlighted. Then press the **ENT** key.

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



If you select "1:ONE FILE" on the UPLOAD menu, the file selection screen as shown at left will appear, listing all of the program files and data files stored in the memory. Select a file(s) you want to upload and press the **ENT** key.

If you select "2:ALL FILES" or "3:HT<-->HT COPY" on the UPLOAD menu, the "ALL" or "HT<-->HT" will appear in the center of the 2nd line, respectively.



If you select "1:ONE FILE" or "2:ALL FILES" on the UPLOAD menu when no files are stored in the memory, then the message shown at left will appear.

Pressing the **C** key returns to the UPLOAD menu.

Upload screens

```
UPLOAD FILE

** Waiting **
```



```
UPLOAD FILE

** Loading **
```



```
UPLOAD FILE

SAMPLE01.PD3
** Loading **

XXXXX/YYYYY
```



```
UPLOAD FILE

SAMPLE01.PD3
** Completed **
```

If you select "1:ONE FILE" and choose a file to be uploaded or if you select the "2:ALL FILES" or "3:HT<-->HT COPY" on the UPLOAD menu, then the screen shown at left will appear.

If you select "2:ALL FILES" or "3:HT<-->HT COPY," the "ALL" or "HT<-->HT" will appear in the center of the 2nd line, respectively.

Showing this screen, the BHT waits for a file(s) to be uploaded.

Upon start of optional Ir-Transfer Utility C/Ir-Transfer Utility E/Transfer Utility or equivalent program (upon receipt of an ACK code from the host computer), the BHT displays the screen shown at left.

(Refer to the "Ir-Transfer Utility C Guide"/"Ir-Transfer Utility E Guide"/"Transfer Utility Guide.")

While the uploading operation is in progress, the screen shown at left is displayed indicating the file name and the number of sent records/the total number of records.

To abort the uploading operation, press the **C** key. The screen will switch 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 once. Press the **C** key to return to the UPLOAD menu.

If you have selected "2:ALL FILES" or "3:HT<-->HT COPY" on the UPLOAD menu, a sequence of the above screens will be repeated by the number of files to be uploaded.

If an error occurs during uploading

If some error occurs during uploading, one of the following screens will appear and the beeper beeps three times.

To retry the uploading operation, press the **1** and **ENT** keys; to abort it, press the **2** and **ENT** keys.

```

UPLOAD FILE

File error!!

Upload?
  1:Yes 2:No
  
```

■ Problem

The file you attempted to upload is damaged.

■ Solution

To upload the damaged file as is, press the **1** key.

```

UPLOAD FILE

XXXXXXXX.XXX
Communication error!!

Retry?
  1:Yes 2:No
  
```

■ Problem

Uploading has failed.

■ Solution

To retry uploading, press the **1** key.

To return to the SYSTEM MENU, press the **2** key. Check the interface port and communications parameters in the SET SYSTEM menu or perform the communications test in the TEST menu. (Refer to Subsection 2.5.3, [4.5] and [5.7].)

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

[4] System Environment Setting

```
SET SYSTEM
1:EXECUTE PROGRAM
2:DISPLAY
3:DATE/TIME
4:BARCODE
5:COMMUNICATION
6:KEY      7:RESUME
8:DEFRAG
```

Selecting "4: SET SYSTEM" on the SYSTEM MENU calls up the screen shown at left.

- [1] EXECUTE PROGRAM: Sets an execution program to be run when the power is turned on.
- [2] DISPLAY: Sets the message version (English or Japanese).
- [3] DATE/TIME: Sets the calendar clock (date and time).
- [4] BARCODE: Sets the special barcode scanning parameters (the black-and-white inverted label reading and the decoding level) and the minimum number of digits to be read for bar codes (ITF, STF and Codabar).
- [5] COMMUNICATION: Sets the communications environments (interface port and communications parameters).
- [6] KEY: Defines the functions of the shift key and magic keys.
- [7] RESUME: Sets the resume function.
- [8] DEFRAG: Defragments the drive.

Select a desired item by using the numerical keys or **F5** and **F6** keys, and the selected item becomes highlighted. Then press the **ENT** key.

Press the **C** key to return to the SYSTEM MENU.

[4.1] Setting an execution program

```

SET EXECUTE PROGRAM
  SAMPLE01.PD3
  SAMPLE02.PD3
  SAMPLE03.PD3
  SAMPLE04.PD3

```

Selecting "1: EXECUTE PROGRAM" on the SET SYSTEM menu calls up the screen shown at left.

Highlighted is the current setting.

Use the **F5** and **F6** keys to move the cursor to a desired execution program to be run automatically when the power is applied, and then press the **ENT** key.

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

```

SET EXECUTE PROGRAM
*****
* NO FILE EXISTS *
*****

```

If no program files are stored in the memories, the screen shown at left will appear.

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

[4.2] Setting the message version and system status indication

```

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

```

Selecting "2: DISPLAY" on the SET SYSTEM menu calls up the screen shown at left.

Highlighted is the current setting.

[1] MESSAGE: Switches the message version to English or Japanese for system error messages and indications on the LCD contrast, beeper volume, beeper & vibrator switching, and battery voltage level screens. (The default is the message version that you selected in the initializing sequence.)

[2] STATUS: Turns the system status indication on or off. If it is set to on, the shift key icon and alphabet entry mode icon may appear as shown on the next page.

Select a desired item by using the numerical keys or **F5** and **F6** keys, then select a desired setting by using the **F7** and **F8** keys.

Press the **ENT** key.

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

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

System Status Indication

Turning on the system status indication displays the following icons in the bottom line of the LCD:

Indication	Icon	Description
Shift state of the keys	SF	Appears when the keys on the keypad are shifted.
Alphabet entry mode	ALP	Appears when the BHT is placed in the alphabet entry mode. (If the alphanumeric entry system has been selected in user programs, pressing the SF key will switch from the numeric entry mode to alphabet entry mode.)

[4.3] Setting the calendar clock

```

SET DATE/TIME

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

```

Selecting "3: DATE/TIME" on the SET SYSTEM menu calls up the screen shown at left.

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

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 will be deactivated.

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

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

⇓

```

SET DATE/TIME

00/01/01 00:00
02/01/19 16:00_

```

[Example] To set 2002, January 19, at 4:00 p.m.

Press **0, 2, 0, 1, 1, 9, 1, 6, 0**, and **0**.

⇓

```

SET DATE/TIME

02/01/19 16:00
_ / /      :

```

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

[4.4] Setting the special bar-code scanning parameters

SET BARCODE	
1: INVERT	ON OFF
2: DECODE LEVEL	X
MINIMUM DIGITS	
3: ITF	XX
4: STF	XX
5: CODABAR	XX

Selecting "4: BARCODE" on the SET SYSTEM menu calls up the screen shown at left.

Highlighted is the current setting.

- [1] INVERT: Activates or deactivates the black-and-white inverted label reading function.
- [2] DECODE LEVEL: Sets the decode level.
- [3] ITF: Sets the minimum number of digits to be read for ITF.
- [4] STF: Sets the minimum number of digits to be read for STF.
- [5] CODABAR: Sets the minimum number of digits to be read for Codabar.

Select a desired item by using the numerical keys or **F5** and **F6** keys, and then select a desired setting by using the **F7** and **F8** keys.

To increase the decode level, press the **F8** key; to decrease it, press the **F7** key.

To increase the number of digits to be read for ITF, STF or Codabar, press the **F8** key; to decrease it, press the **F7** key.

Press the **ENT** key.

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

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

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

NOTE Activating this function might increase the frequency of bar-code reading errors. This function can usually be set to OFF.

DECODE LEVEL

You may set the decode level. Decreasing the level value increases the bar-code reading efficiency, but the BHT might misread low-quality bar codes (split or stained). To the contrary, increasing the level value decreases the bar-code reading efficiency, but it will diminish the possibility of misreading.

The entry range of the level value is from 1 to 9 and the default is 4.

Minimum number of digits to be read for ITF, STF, or Codabar (MINIMUM DIGITS)

You may determine the minimum number of digits to be read for ITF, STF, and Codabar. Setting a small number of digits increases the frequency of digit-missing reading or misreading depending upon how to scan bar codes or the quality of bar codes. On the other hand, setting a large number will diminish the possibility of those errors.

The entry range is from 2 to 20 for ITF, from 1 to 20 for STF, and from 3 to 20 for Codabar. The default is 4 for ITF and Codabar, and 2 for STF.

[4.5] Setting the communications environments

After the BHT is initialized, the interface port and communications parameters are set as listed in the default table below. Do not access them unless necessary.

Interface port	Optical (IrDA interface port)
Communications protocol	BHT-protocol
Communications parameters for the IrDA interface port	Defaults
TRANSMIT SPEED	115200 bps
PROTOCOL (Protocol options)	SERIAL No.: ON (Adds serial numbers to data blocks.)
	H. PARITY: ON (Adds a horizontal parity.)
	LINKUP TIME: 30 seconds
	FIELD SPACE: Ignore (Trim)

Listed below are the default communications parameters for the direct-connect interface.

Communications parameters for the direct-connect interface port	Defaults
TRANSMIT SPEED	115200 bps
PARITY BIT (Vertical parity)	None
DATA BIT (Character length)	8 bits
STOP BIT (Stop bit length)	1 bit
PROTOCOL (Protocol options)	SERIAL No.: ON (Adds serial numbers to data blocks.)
	H. PARITY: ON (Adds a horizontal parity.)
	LINKUP TIME: 30 seconds
	FIELD SPACE: Ignore (Trim)

SET COMMUNICATION

```

1: OPTICAL
2: CONNECTOR
3: COM PORT
4: PROTOCOL TYPE

```

Selecting the "5: COMMUNICATION" on the SET SYSTEM menu calls up the screen shown at left.

- [1] OPTICAL: Switches to the communications parameters setting screen for the IrDA interface.
- [2] CONNECTOR: Switches to the communications parameters setting screen for the direct-connect interface.
- [3] COM PORT: Switches to the interface port setting screen.
- [4] PROTOCOL TYPE: Switches to the communications protocol type setting screen.

Select a desired screen by using the numerical keys or **F5** and **F6** keys, and then press the **ENT** key.

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

Setting the communications parameters for the IrDA interface

```
SET OPTICAL
 1:PARAMETER
 2:PROTOCOL
```

Selecting "1:OPTICAL" on the SET COMMUNICATION menu calls up the screen shown at left.

- [1] PARAMETER: Switches to the communications parameters setting screen.
- [2] PROTOCOL: Switches to the communications protocol option screen.

Select a desired screen by using the numerical keys or **F5** and **F6**, and then press the **ENT** key.

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

(1) Communications parameters setting screen

```
SET PARAMETER
< OPTICAL >
1:TRANSMIT SPEED:
 2400  9600  19200
38400 57600 115200
```

Selecting "1:PARAMETER" on the SET OPTICAL screen calls up the screen shown at left.

Highlighted is the current setting.

Select the desired transmission speed by using the numerical keys or **F7** and **F8**, and then press the **ENT** key.

To return to the SET OPTICAL screen, press the **C** key.

(2) Communications protocol option screen

```
SET PROTOCOL
< OPTICAL >
1:SERIAL No. : ON OFF
2:H. PARITY  : ON OFF
3:LINKUP TIME:
  None 30 60 90 120
4:FIELD SPACE:
  Ignore Data
```

Selecting "2: PROTOCOL" on the SET OPTICAL screen calls up the screen shown at left.

Highlighted is the current setting.

- [1] SERIAL No.: Selects whether or not the system will add serial numbers to data blocks.
- [2] H. PARITY: Selects whether or not the system will add a horizontal parity.
- [3] LINKUP TIME: Selects the timeout length (in seconds) to be applied when a link is to be established.
- [4] FIELD SPACE: Selects whether trailing spaces in data fields will be trimmed (Ignore) or retained (Data).

Select a desired item by using the numerical keys or **F5** and **F6**. Then select a desired setting by using the **F7** and **F8**.

To return to the SET OPTICAL screen, press the **C** key.

NOTE If the BHT-Ir protocol has been selected, the serial number and horizontal parity settings will be ignored.

Setting the communications parameters for the direct-connect interface

```

SET CONNECTOR
  1:PARAMETER
  2:PROTOCOL

```

Selecting "2:CONNECTOR" on the SET COMMUNICATION menu calls up the screen shown at left.

[1] PARAMETER: Switches to the communications parameters setting screen.

[2] PROTOCOL: Switches to the communications protocol screen.

Select a desired screen by using the numerical keys or **F5** and **F6**, and then press the **ENT** key.

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

(1) Communications parameters setting screen

```

SET PARAMETER
< CONNECTOR >
1:TRANSMIT SPEED:
 300 600 1200 2400
 4800 9600 19200
38400 57600 115200
2:PARITY BIT : N O E
3:DATA:7 8 4:STOP:1 2

```

Selecting "1:PARAMETER" on the SET CONNECTOR screen calls up the screen shown at left.

Highlighted is the current setting.

[1] TRANSMIT SPEED: Sets the transmission speed.

[2] PARITY BIT: Sets the vertical parity: none, odd, or even.

[3] DATA: Sets the character length.

[4] STOP: Sets the stop bit length.

Select a desired item by using the numerical keys or **F5** and **F6**. Then select a desired setting by using the **F7** and **F8**.

To return to the SET CONNECTOR screen, press the **C** key.

NOTE If the BHT-Ir protocol has been selected, the parity bit, character length, and stop bit length settings will be ignored.

(2) Communications protocol option menu

```
SET PROTOCOL
< CONNECTOR >
1:SERIAL No. : ON OFF
2:H.PARITY   : ON OFF
3:LINKUP TIME :
  None 30 60 90 120
4:FIELD SPACE:
  Ignore Data
```

Selecting "2:PROTOCOL" on the SET CONNECTOR screen calls up the screen shown at left.

Highlighted is the current setting.

- [1] SERIAL No.: Selects whether or not the system will add serial numbers to data blocks.
- [2] H. PARITY: Selects whether or not the system will add a horizontal parity.
- [3] LINKUP TIME: Selects the timeout length (in seconds) to be applied when a link is to be established.
- [4] FIELD SPACE: Selects whether trailing spaces in data fields will be trimmed (Ignore) or retained (Data).

Select a desired item by using the numerical keys or **F5** and **F6**. Then select a desired setting by using the **F7** and **F8**.

To return to the SET CONNECTOR screen, press the **C** key.

NOTE

If the BHT-Ir protocol has been selected, the serial number and horizontal parity settings will be ignored.

Setting the interface port

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

Selecting the "3:COM PORT" on the SET COMMUNICATION menu calls up the screen shown at left.

Highlighted is the current setting.

- [1] BASIC: Selects the IrDA or direct-connect interface port to be used *for user programs written in BHT-BASIC (OPEN "COM:").*
- [2] SYSTEM MODE: Selects the IrDA or direct-connect interface port to be used *for downloading or uploading files in System Mode.*

Select a desired item by using the numerical keys or **F5** and **F6**, and then select a desired setting by using the **F7** and **F8**.

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

Setting the communications protocol type

```

PROTOCOL TYPE
1:BHT Protocol
2:BHT-Ir Protocol

```

Selecting the "4:PROTOCOL TYPE" on the SET COMMUNICATION menu calls up the screen shown at left.

Highlighted is the current setting.

[1] BHT Protocol: Selects the BHT-protocol for downloading or uploading files in System Mode or for the execution of XFILE statement in BHT-BASIC.

This protocol should be selected for file transmission with Transfer Utility.

[2] BHT-Ir Protocol: Selects the BHT-Ir protocol for downloading or uploading files in System Mode or for the execution of XFILE statement in BHT-BASIC.

This protocol should be selected for file transmission with Ir-Transfer Utility C or Ir-Transfer Utility E.

Select a desired item by using the numerical keys or **F5** and **F6**, and then press the **ENT** key.

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

```

SET ID
00001 >> _

```

Selecting the "2:BHT-Ir Protocol" on the PROTOCOL TYPE screen calls up the screen shown at left.

Enter the ID number of the BHT by using the numerical keys, and then press the **ENT** key. If you do not need to modify the current setting, press the **ENT** key only.

NOTE An ID number should be five-digit decimal character string. The entry range is from 00001 to 65535. If the entry value is less than five digits, the **ENT** key will be deactivated.

```

SET ID
00001 >> 65535_

```

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

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

[4.6] Defining the functions of the shift key and magic keys

```
SET KEY
1:SHIFT KEY
2:M1 KEY
3:M2 KEY
4:M3 KEY
5:M4 KEY
```

Selecting the "6:KEY" on the SET SYSTEM menu calls up the screen shown at left.

Highlighted is the current setting.

- [1] SHIFT KEY: Switches to the shift key definition screen.
- [2] M1 KEY: Switches to the **M1** key definition screen.
- [3] M2 KEY: Switches to the **M2** key definition screen.
- [4] M3 KEY: Switches to the **M3** (left-hand trigger switch) key definition screen.
- [5] M4 KEY: Switches to the **M4** (right-hand trigger switch) key definition screen.

Select a desired screen by using the numerical keys or **F5** and **F6**, and then press the **ENT** key.

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

Defining the function of the shift key

```
SET SHIFT KEY
1:Nonlock
2:Onetime
```

Selecting the "1:SHIFT KEY" on the SET KEY menu calls up the screen shown at left.

Highlighted is the current setting.

- [1] Nonlock: Shifts the keypad only when the **SF** key is held down.
- [2] Onetime: Shifts only one key pressed immediately after the **SF** key is pressed. (The following keys will not be shifted.)

Select a desired setting by using the numerical keys or **F5** and **F6**, and then press the **ENT** key. The screen returns to the SET KEY menu.

Defining the function of M1 , M2 , M3 (left-hand trigger switch), or M4 (right-hand trigger switch) key

```

SET M3 KEY
1:None
2:Trigger Switch
3:Shift Key
4:Enter Key
5:Backlight Key

```

Selecting the "2:M1 KEY," "3:M2 KEY," "4:M3 KEY" or "5:M4 KEY" on the SET KEY menu calls up the screen as shown at left. (This example appears when the "4:M3 KEY" is selected.)

Highlighted is the current setting.

The **M1** , **M2** , **M3** or **M4** key can function as listed below.

[1] None: The key entry will be ignored.

[2] Trigger Switch: As a trigger switch.

[3] Shift Key: As a **SF** key.

[4] Enter Key: As an **ENT** key.

[5] Backlight Key: As a backlight function on/off key.

Select a desired setting by using the numerical keys or **F5** and **F6**, and then press the **ENT** key. The screen returns to the SET KEY menu.

Magic keys (M1 through M4)

The **M3** and **M4** keys are assigned the trigger switch function by default. You can make them function as a **SF** key, **ENT** key, or backlight function on/off key.

If you define the **M1** key as a backlight function on/off key, pressing the **M1** key activates or deactivates the backlight function.

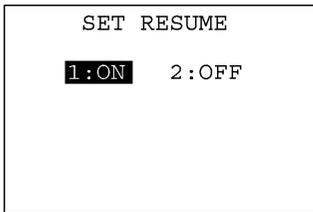
In user programs, a string data can be also assigned to these magic keys.

NOTE

The backlight function on/off key can be assigned only to any one of **M1** through **M4** keys. The key defined more recently will act as a backlight function on/off key and one defined earlier will be ignored.

That is, if you define the **M1** and **M2** keys as a backlight function on/off key in this order, the **M2** key will work as a backlight function on/off key and the **M1** key's entry will be ignored.

[4.7] Setting the resume function



Selecting "7:RESUME" on the SET SYSTEM menu calls up the screen shown at left.

Highlighted is the current setting.

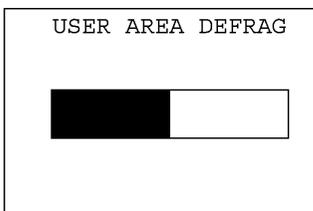
[1] ON: Activates the resume function that resumes the current BHT status when the BHT is turned off, when the BHT is turned on.

[2] OFF: Deactivates the resume function.

Select a desired item by using the numerical keys or **F5** and **F6**, and then press the **ENT** key.

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

[4.8] Defragmenting the drive



Selecting "8:DEFRAG" on the SET SYSTEM menu will start defragmenting the whole user area of the drive.

Defragmentation will reorganize the user area so that it may increase the empty space.

If defragmented, the BHT may download files more efficiently than before execution of defragmentation.

During defragmentation, a bar graph will appear indicating the defragmentation progress.

Upon completion of defragmentation, the screen will automatically return to the SET SYSTEM menu.

[5] Testing

TEST	
1 : BARCODE	2 : MEMORY
3 : BEEPER	4 : AGING
5 : LCD	6 : FILE
7 : COMMUNICATION	
8 : KEY & VIBRATION	

Selecting "5:TEST" on the SYSTEM MENU calls up the screen shown at left.

- | | |
|----------------------|---|
| [1] BARCODE: | Selects the bar-code reading test. |
| [2] MEMORY: | Selects the RAM read/write test. |
| [3] BEEPER: | Selects the beeper scale test. |
| [4] AGING: | Selects the aging test. |
| [5] LCD: | Selects the LCD and indicator LED tests. |
| [6] FILE: | Selects the file checksum test. |
| [7] COMMUNICATION: | Selects the communications test. |
| [8] KEY & VIBRATION: | Selects the key entry, beeper and vibrator tests. |

Select a desired setting by using the numerical keys or **F5** and **F6**, and then press the **ENT** key. The selected test will start.

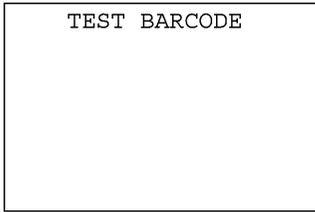
Highlighted is the currently selected item.

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

NOTE

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

[5.1] Bar-code reading test

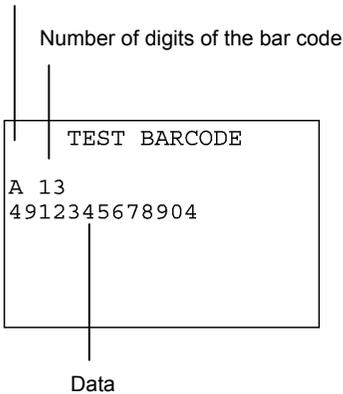


Selecting "1:BARCODE" on the TEST menu calls up the screen shown at left.

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



Bar-code type



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

To return to the TEST menu, press the **C** key.

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

Bar-code Type	ID Letters
EAN-13, UPC-A	A
EAN-8	B
UPC-E	C
Standard 2of5 (STF)	H
Interleaved 2of5 (ITF)*	I
Codabar (NW-7)	N
Code 39	M
Code 93	L
Code 128	K
EAN-128	W

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

[5.2] Memory test

```
TEST MEMORY
```

```
** Testing **
XXXXX/YYYYY
```

Selecting "2:MEMORY" on the TEST menu calls up the screen shown at left and starts writing and reading onto/from all areas of the RAM as well as checking the address.

XXXXX: Tested RAM capacity (unit: kilobytes)

YYYYY: Total RAM capacity (unit: kilobytes)

```
TEST MEMORY
```

```
** Test NG **
XXXXX/YYYYY
```

```
Address : ZZZZZZZZ
Write   : AAAAAAAAAA
Read    : BBBBBBBBB
```

If any error is detected, the BHT beeps three times, shows the message as shown at left, and terminates the test.

Where,

ZZZZZZZZ: Address where an error has occurred.

AAAAAAAA: Data to write.

BBBBBBBB: Data read out from the RAM.

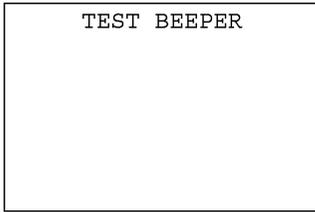
To return to the TEST menu, press the **C** key.

```
TEST MEMORY
```

```
** Test OK **
YYYYY/YYYYY
```

Upon normal completion of the RAM test, the BHT beeps once, shows the message as shown at left, and returns to the TEST menu.

[5.3] Beeper scale test



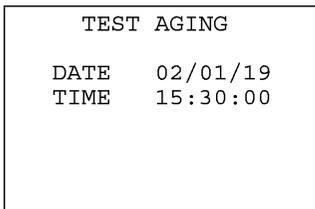
Selecting "3:BEEPER" on the TEST menu calls up the screen shown at left and makes the beeper sound at three octaves listed below.

Upon completion of this test, the BHT automatically returns to the TEST menu.

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

Scale	Frequency (Hz)			
do	523	1046	2093	4186
re	587	1174	2349	-
mi	659	1318	2637	-
fa	698	1396	2793	-
sol	783	1567	3135	-
la	880	1760	3520	-
ti	987	1975	3951	-

[5.4] Aging test



Selecting "4: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 in the factory.)

NOTE Once this test is selected, the automatic powering-off function becomes disabled. Be sure to turn the BHT off or press the C key to return to the TEST menu.

[5.5] LCD and indicator LED tests

```

123456789 .+-*/=\ () []
123456789 .+-*/=\ () []
ABCDEFGHIJKLMN OPQRSTU
ABCDEFGHIJKLMN OPQRSTU
abcdefghijklmnopqrstu
abcdefghijklmnopqrstu
vwxyzVWXYZ #$$%&! ?<>"
vwxyzVWXYZ #$$%&! ?<>"

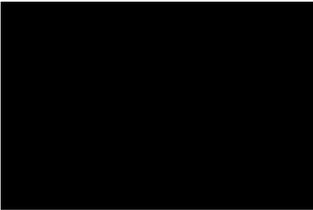
```

Selecting "5:LCD" on the TEST menu calls up the test pattern shown at left on the LCD. The indicator LED is off.

Each time the **ENT** key is pressed, the screen shifts to the next test pattern. To return to the previous screen, press the **BS** key.

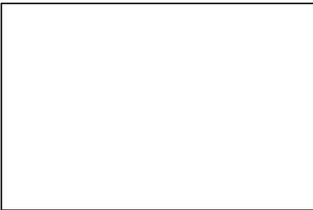
To stop this test while in progress, press the **C** key.

BS key ↑ ↓ **ENT** key



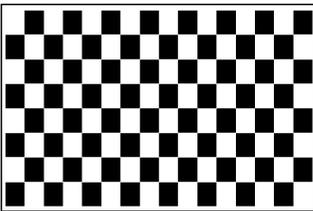
As shown at left, the entire screen turns black. The indicator LED lights in green.

BS key ↑ ↓ **ENT** key



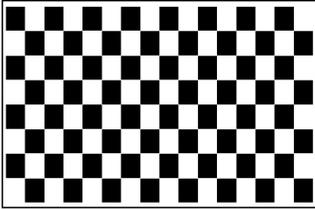
As shown at left, everything disappears and the indicator LED lights in red.

BS key ↑ ↓ **ENT** key



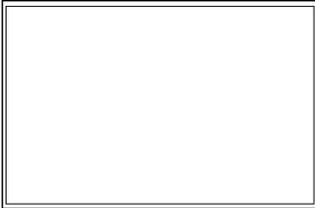
The checker pattern shown at left appears and the indicator LED goes off.

BS key ↑ ↓ **ENT** key



The checker pattern is reversed.

BS key ↑ ↓ **ENT** key



An outline with a width of one dot appears.

Press the **ENT** key, and the BHT beeps once and returns to the TEST menu.

[5.6] File test

```

TEST FILE
SAMPLE01.PD3
*SAMPLE02.PD3
SAMPLE03.PD3
+SAMPLE04.PD3
SIZE:XXXXX
FREE:YYYYY

```

Selecting "6:FILE" on the TEST menu calls up the screen shown at left.

If any of the files stored in the memories is defective, an asterisk (*) or plus sign (+) will be prefixed to the name of the defective file(s). For details about the (*) and (+), refer to Subsection 2.3.6, "[3] About "\$\$BRKLST.SYS."

Selecting a particular file on this screen will show the file size and the test result.

To select a file, use the **F5** and **F6** keys to move the cursor to the desired file. If there are more than four files, the screen will scroll.

Highlighted is the currently selected file.

Press the **C** key to return to the TEST menu.

If you select a file on this screen by using the F5 and F6, the file size and the test result will appear. If there are more than four files, the screen will scroll.

Highlighted is the currently selected file.

Press the **C** key to return to the TEST menu.

```

TEST FILE
SAMPLE01.PD3
00004096 bytes
OK
SIZE:XXXXX
FREE:YYYYY

```

The file name, file size, and test result (OK or NG) appear as shown at left.

```

TEST FILE
SAMPLE01.PD3
00004096 bytes
NG
SIZE:XXXXX
FREE:YYYYY

```

Press the **C** key to return to the file selection screen.

NOTE If a defective file is found, delete it or overwrite it with the same name file.

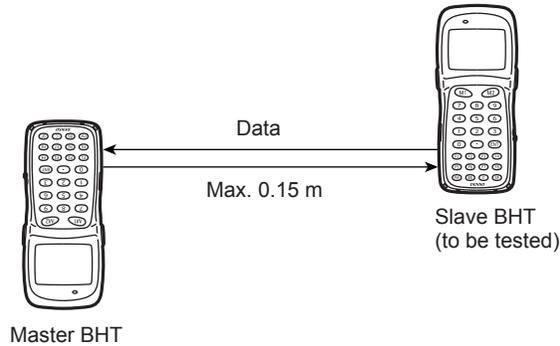
Even defective, the file can be uploaded on the UPLOAD menu. It is, therefore, recommended that important files be uploaded before deleted.

[5.7] Communications test

In System Mode, you may test the IrDA interface port and direct-connect interface port.

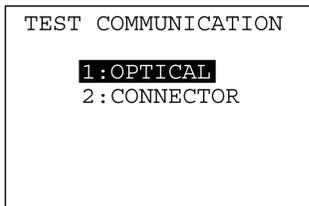
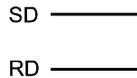
■ Preparation for the IrDA interface test

Arrange two BHTs, one as a master station and the other as a slave station (to be tested) with their IrDA interface ports facing each other as illustrated below. In this test, the slave BHT transmits data to the master BHT and receives the data sent back from the master BHT.



■ Preparation for the direct-connect interface test

Arrange the 3-pole mini stereo plug as illustrated below and connect it to the direct-connect interface port on the BHT.



Selecting the "7:COMMUNICATION" on the TEST menu calls up the screen shown at left.

[1] OPTICAL: Switches to the MASTER/SLAVE selection screen for the IrDA interface test.

[2] CONNECTOR: Tests the direct-connect interface port.

Select a desired item by using the numerical keys or **F5** and **F6**, then press the **ENT** key.

Testing the IrDA interface port

```

TEST COMMUNICATION
< OPTICAL >

1:SLAVE
2:MASTER

```

Selecting the "1:OPTICAL" on the TEST COMMUNICATION menu calls up the screen shown at left.

At the slave BHT to be tested, select the "1:SLAVE" and at the master BHT, select the "2:MASTER."

```

TEST COMMUNICATION
< OPTICAL >

** Testing **

```

During the test, the screen shown at left is displayed.

```

TEST COMMUNICATION
< OPTICAL >

** Test NG **
(XX)

```

If any error occurs, the tested slave BHT beeps three times and shows the screen at left.

In parentheses are error codes which have the following meanings:

(X X)

- 1: The received data is different from the sent data.
- 2: A timeout has occurred during standby for data reception.

1: 2400 bps
 2: 9600 bps
 3: 115200 bps

Press the **C** key to return to the TEST COMMUNICATION menu.

The master BHT will automatically return to the TEST COMMUNICATION menu after 10 seconds from the occurrence of an error.

```

TEST COMMUNICATION
< OPTICAL >

** Test OK **

```

Upon normal completion of the test, the tested slave BHT beeps once and shows the screen at left.

Press the **C** key to return to the TEST COMMUNICATION menu.

The master BHT will automatically return to the TEST COMMUNICATION menu.

Testing the direct-connect interface port

```
TEST COMMUNICATION
< CONNECTOR >

** Testing **
```

Selecting the "2:CONNECTOR" on the TEST COMMUNICATION menu displays the screen shown at left and then starts testing the direct-connect interface port.

```
TEST COMMUNICATION
< CONNECTOR >

** Test NG **
  (XX)
```

If any error occurs, the BHT beeps three times and shows the screen at left.

In parentheses are error codes which have the following meanings:

(X X)

- 1: The received data is different from the sent data.
- 2: A timeout has occurred during standby for data reception.

- 1: 300 bps
- 2: 115200 bps

```
TEST COMMUNICATION
< CONNECTOR >

** Test OK **
```

Upon normal completion of the test, the BHT beeps once and shows the screen at left.

Press the **C** key to return to the TEST COMMUNICATION menu.

[5.8] Key-entry, beeper, and vibrator test

TEST KEY & BEEPER
& VIBRATION

Selecting "8:KEY & VIBRATION" on the TEST menu calls up the screen shown at left and makes the BHT ready for entry from the keypad.

Pressing individual keys displays the identifier letters in the positions pre-assigned to those keys on the LCD as well as sounding the beeper or running the vibrator. (As long as the individual key is held down, the BHT continues beeping or vibrating.)

Pressing the same key again erases the displayed letter.

The table below shows the relationship between 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)
M3	N	(Note)	6	6	659	F3	C	1567
M1	L	293	1	1	698	F4	D	1760
M2	M	329	2	2	783	F5	E	1975
M4	O	(Note)	3	3	880	F6	F	2093
7	7	391	0	0	987	F7	G	2349
8	8	440	.	.	1046	F8	H	2637
9	9	493	ENT	=	1174	BS	I	2793
4	4	523	F1	A	1318	C	J	3135
5	5	587	F2	B	1396	SF	K	3520

(Note) Only when the **M3** (left-hand trigger switch) or **M4** key (right-hand trigger switch) is pressed, the vibrator works.

TEST KEY & BEEPER
& VIBRATION

NLMO
7894561230.=
ABCDEFGH
IJK

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

To stop this test, turn the power off.

[6] System Information

```
SYSTEM INFORMATION
SYSTEM Ver.  : X.XX
ROM SIZE    : XMB
RAM SIZE    : XXXKB
SYSTEM MESSAGE:
             Japanese X.XX
FONT        ENT
```

Selecting the "6:VERSION" on the SYSTEM MENU calls up the screen shown at left, displaying the system program version, ROM and RAM sizes, system message version, and font types and their versions.

Press the **C** key to return to the SYSTEM MENU.

BS key ↑ ↓ **ENT** key

```
SYSTEM INFORMATION
FONT          :
  JIS1 (16)   X.XX
  JIS2 (16)   X.XX
  JIS1 (12)   X.XX
  JIS2 (12)   X.XX
```

The following font types are displayed:

JIS1 (16): JIS Level 1 font, 16-dot

JIS2 (16): JIS Level 2 font, 16-dot

JIS1 (12): JIS Level 1 font, 12-dot

JIS2 (12): JIS Level 2 font, 12-dot

[7] Deleting Files

You may delete a program file or data file stored in the flash memory.

```

DELETE FILE
SAMPLE01.PD3
SAMPLE02.PD3
SAMPLE03.PD3
SAMPLE04.PD3
SAMPLE05.PD3
SAMPLE06.PD3

```

Pressing the **0** key while holding down the **SF** key on the SYSTEM MENU calls up the screen shown at left.

Use the **F5** and **F6** to move the cursor to the file to be deleted, then press the **ENT** key.

Press the **C** key to return to the SYSTEM MENU.

```

DELETE FILE

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

```

If no file is resident in the memory, the message shown at left appears.

Press the **C** key to return to the file deletion menu.

Deletion confirmation screen

```

DELETE FILE

SAMPLE01.PD3

Delete?
  1:Yes 2:No

```

Selecting a file and pressing the **ENT** key calls up the confirmation screen shown at left.

[1] Yes : Deletes the selected file.

[2] No : Cancels deletion and returns to the previous file selection screen.

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

Deletion completion screen

```

DELETE FILE

** Completed **

```

Upon completion of deletion, the screen shown at left appears.

Press the **C** key to return to the file selection screen.

[8] Deleting Font Files

You may delete font files stored in the flash ROM if you do not need to display Japanese fonts (16-dot and/or 12-dot fonts) and the user area is insufficient. Deleting those font files allows the memory area which was occupied by those files to be used as a user area.

Before deleting font files, be sure to upload it to the host computer to save it for the future use.

```
DELETE FILE
FNT16J1.FN3
FNT16J2.FN3
FNT12J2.FN3
FNT12J2.FN3
```

Pressing the **2** key while holding down the **SF** key on the SYSTEM MENU calls up the screen shown at left.

Use the **F5** and **F6** to move the cursor to the font file to be deleted, then press the **ENT** key.

Press the **C** key to return to the SYSTEM MENU.

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

If no font file is resident in the memory, the message shown at left appears.

Press the **C** key to return to the file deletion menu.

```
DELETE FILE
FNT16J1.FN3
Delete?
  1:Yes 2:No
```

Selecting a font file and pressing the **ENT** key calls up the confirmation screen shown at left.

[1] Yes : Deletes the selected font file.

[2] No : Cancels deletion and returns to the previous file selection screen.

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

```
DELETE FILE
** Completed **
```

Upon completion of deletion, the screen shown at left appears.

Press the **C** key to return to the file selection screen.

[9] Downloading/Uploading the BHT System Parameter File

The BHT system parameter file (named "_BHT.SYS") stores system environment settings specified in the SET SYSTEM menu (in Subsection 2.5.3, [4]) and other settings such as the LCD contrast and beeper volume.

The SYSTEM PARAMETER transfer menu allows you to upload or download the BHT system parameter file to/from the host computer. This helps you make the same settings for the BHTs as those made in a single BHT.

First, make settings in a particular BHT and upload the BHT system parameter file to the host computer by using this menu ("2:UPLOAD"). Next let other BHTs download the file from the host computer by using this menu ("1:DOWNLOAD").

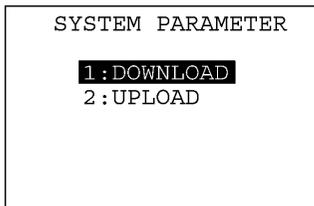
TIP Without the host computer, you may directly copy the BHT system parameter file between two BHTs (one BHT runs UPLOAD and the other, DOWNLOAD). For the preparation to be made beforehand, refer to **NOTE** on page 43.

If you select the "2:UPLOAD," the system will set up the BHT system parameter file based on the current settings and upload it to the host computer. After that, the created file will be deleted.

If you select the "1:DOWNLOAD," the BHT will receive the BHT system parameter file from the host computer and apply the stored values. After that, the received file will be deleted.

For uploading/downloading, the BHT will use the communications parameters, communications protocol, and interface port specified in Subsection 2.5.3, "[4.5] Setting the communications environments."

SYSTEM PARAMETER transfer menu



Pressing the **3** key while holding down the **SF** key on the SYSTEM MENU calls up the screen shown at left.

[1] DOWNLOAD: Downloads the BHT system parameter file to the user area of the BHT.

[2] UPLOAD: Uploads the BHT system parameter file stored in the BHT.

Select a desired item by using the numerical keys or **F5** and **F6**, then press the **ENT** key.

Press the **C** key to return to the SYSTEM MENU.

[9.1] Downloading the BHT system parameter file

```
DOWNLOAD

** Waiting **
```

Selecting "1:DOWNLOAD" on the SYSTEM PARAMETER transfer menu calls up the screen shown at left. With this screen displayed, the BHT waits for the BHT system parameter file to be downloaded.



```
DOWNLOAD

  BHT.SYS
** Loading **

XXXXX/YYYYY
```

While the downloading operation is in progress, the screen shown at left is displayed indicating the file name and the number of received records/the total number of records.

To abort the downloading operation, press the **C** key. The screen will switch back to the SYSTEM PARAMETER transfer menu.



```
DOWNLOAD

  BHT.SYS
** Completed **
```

Upon completion of downloading, the BHT displayed the screen shown at left and beeps once.

Press the **C** key to return to the SYSTEM PARAMETER transfer menu.

If an error occurs during downloading

If some error occurs during downloading, the BHT beeps three times and shows one of the following screens with the prompt "Retry?"

To retry the download, press the **1** and **ENT** keys; to abort it, press the **2** and **ENT** keys.

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

```
DOWNLOAD

Out of memory!!

Retry?
  1:Yes 2:No
```

■ Problem

The memory is insufficient for storing the BHT system parameter file to be downloaded.

■ Solution

Press the **2** key to return to the SYSTEM MENU, then delete unnecessary files in the memory. (Refer to Subsection 2.5.3, [7].)

```

DOWNLOAD

File mismatch!!

Retry?
  1:Yes 2:No

```

■ Problem

You attempted to download a file other than the BHT system parameter file.

■ Solution

Check whether the file you attempted to download is the BHT system parameter file.

```

DOWNLOAD

Too many files!!

Retry?
  1:Yes 2:No

```

■ Problem

The current download will exceed the maximum of 80 files in the memory.

■ Solution

Press the **2** key to return to the SYSTEM MENU, then delete unnecessary files in the memory. (Refer to Subsection 2.5.3, [7].)

```

DOWNLOAD

  BHT.SYS
Communication error!!

Retry?
  1:Yes 2:No

```

■ Problem

Downloading has failed.

■ Solution

To retry downloading, press the **1** key.

To return to the SYSTEM MENU, press the **2** key. Check the interface port and communications parameters in the SET SYSTEM menu or perform the communications test in the TEST menu. (Refer to Subsection 2.5.3, [4.5] and [5.7].)

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

[9.2] Uploading the BHT system parameter file

```
UPLOAD
** Waiting **
```

Selecting "2:UPLOAD" on the SYSTEM PARAMETER menu calls up the screen shown at left. With this screen displayed, the BHT waits for the BHT system parameter file to be uploaded.



```
UPLOAD
  BHT.SYS
** Loading **
XXXXX/YYYYY
```

While the uploading operation is in progress, the screen shown at left is displayed indicating the file name and the number of sent records/the total number of records.

To abort the uploading operation, press the **C** key. The screen will switch back to the SYSTEM PARAMETER transfer menu.



```
UPLOAD
  BHT.SYS
** Completed **
```

Upon completion of uploading, the BHT displayed the screen shown at left and beeps once.

Press the **C** key to return to the SYSTEM PARAMETER transfer menu.

If an error occurs during uploading

If some error occurs during uploading, one of the following screens will appear and the beeper beeps three times.

To retry the uploading operation, press the **1** and **ENT** keys; to abort it, press the **2** and **ENT** keys.

Press the **C** key to return to the SYSTEM PARAMETER transfer menu.

```
UPLOAD
Out of memory!!
```

■ Problem

The memory is insufficient for setting up the BHT system parameter file to be uploaded.

■ Solution

Press the **C** key to return to the SYSTEM MENU, then delete unnecessary files in the memory. (Refer to Subsection 2.5.3, [7].

```

UPLOAD

Too many files!!

```

■ Problem

The memory has already contained 80 files, so the BHT system parameter file cannot be set up.

■ Solution

Press the **C** key to return to the SYSTEM MENU, then delete unnecessary files in the memory. (Refer to Subsection 2.5.3, [7].)

```

UPLOAD

  _BHT.SYS
Communication error!!

Retry?
  1:Yes 2:No

```

■ Problem

Uploading has failed.

■ Solution

To retry uploading, press the **1** key.

To return to the SYSTEM MENU, press the **2** key. Check the interface port and communications parameters in the SET SYSTEM menu or perform the communications test in the TEST menu. (Refer to Subsection 2.5.3, [4.5] and [5.7].)

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

```

UPLOAD

  _BHT.SYS
File error!!

Upload?
  1:Yes 2:No

```

■ Problem

The file you attempted to upload is broken.

■ Solution

To upload the broken file as is, press the **1** key.

[10] Setting the Remote Wakeup

```
SET REMOTE WAKEUP
1: REMOTE WAKEUP
   ON      OFF
2: TRANSMIT SPEED
   9600  19200 38400
   57600 115200
3: EFFECTIVE
   FOR 12 HOURS
```

Pressing the **4** key while holding down the **SF** key on the SYSTEM MENU calls up the screen shown at left.

[1] REMOTE WAKEUP: Activates or deactivates the remote wakeup function.

[2] TRANSMIT SPEED: Sets the transmission speed for the remote wakeup.

[3] EFFECTIVE FOR XX HOURS

Sets the timeout period of the remote wakeup function after the BHT is turned off. During the timeout period, the BHT is ready to receive remote wakeup commands. The entry range is from 1 to 24 hours.

Select a desired item by using the numerical keys or **F5** and **F6** key. Select a desired setting by using the **F7** and **F8**, and then press the **ENT** key.

When setting the timeout period in [3] above, press the **F7** key to decrease it by one hour; press **F8** key to increase it by one hour.

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

[11] Downloading/Uploading the System Message File

The system message file (named "_B80MSG.FN3") stores system messages, e.g., "Shutdown in progress. Do not remove the battery." and "Charge the battery!."

The SYSTEM MESSAGE transfer menu allows you to upload or download the system message file to/from the host computer.

If you select the "2:UPLOAD," the system will set up the system message file based on the current settings and upload it to the host computer. After that, the created file will be deleted.

If you select the "1:DOWNLOAD," the BHT will receive the system message file from the host computer and apply the stored messages. After that, the received file will be deleted.

For uploading/downloading, the BHT will use the communications parameters, communications protocol, and interface port specified in Subsection 2.5.3, "[4.5] Setting the communications environments."

TIP Usually you do not need to use this SYSTEM MESSAGE transfer menu since system messages have been set at the time of delivery from the factory.

SYSTEM MESSAGE transfer menu

```

SYSTEM MESSAGE
 1:DOWNLOAD
 2:UPLOAD
  
```

Pressing the **6** key while holding down the **SF** key on the SYSTEM MENU calls up the screen shown at left.

[1] DOWNLOAD: Downloads the system message file to the user area of the BHT.

[2] UPLOAD: Uploads the system message file stored in the BHT.

Select a desired item by using the numerical keys or **F5** and **F6**, then press the **ENT** key.

Press the **C** key to return to the SYSTEM MENU.

[11.1] Downloading the system message file

```

DOWNLOAD
** Waiting **
  
```

⇓

Selecting "1:DOWNLOAD" on the SYSTEM MESSAGE menu calls up the screen shown at left. With this screen displayed, the BHT waits for the system message file to be downloaded.

```
DOWNLOAD
  _B80MSG.FN3
** Loading **
XXXXXXXX/YYYYYYY
```



```
DOWNLOAD
  _B80MSG.FN3
** Completed **
```

While the downloading operation is in progress, the screen shown at left is displayed indicating the file name and the number of received records/the total number of records.

To abort the downloading operation, press the **C** key. The screen will switch back to the SYSTEM MESSAGE transfer menu.

Upon completion of downloading, the BHT displays the screen shown at left and beeps once.

Press the **C** key to return to the SYSTEM MESSAGE transfer menu.

NOTE When the BHT downloads the system message file, it creates a temporary file named "_B80MSG.FN3" in the user area. If the user area is insufficient for creating the temporary file, therefore, an error will result.

The created temporary file will be automatically deleted after completion of downloading.

If an error occurs during downloading

If some error occurs during downloading, the BHT beeps three times and shows one of the following screens with the prompt "Retry?":

To retry the download, press the **1** and **ENT** keys; to abort it, press the **2** and **ENT** keys.

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

```
DOWNLOAD

Out of memory!!

Retry?
  1:Yes 2:No
```

■ Problem

The memory is insufficient for storing the system message file to be downloaded.

■ Solution

Press the **2** key to return to the SYSTEM MENU, then delete unnecessary files in the memory. (Refer to Subsection 2.5.3, [7].)

```

DOWNLOAD

File mismatch!!

Retry?
  1:Yes 2:No

```

■ **Problem**

You attempted to download a file other than the system message file.

■ **Solution**

Check whether the file you attempted to download is the system message file.

```

DOWNLOAD

Too many files!!

Retry?
  1:Yes 2:No

```

■ **Problem**

The current download will exceed the maximum of 80 files in the memory.

■ **Solution**

Press the **2** key to return to the SYSTEM MENU, then delete unnecessary files in the memory. (Refer to Subsection 2.5.3, [7].)

```

DOWNLOAD

_B80MSG.FN3
Communication error!!

Retry?
  1:Yes 2:No

```

■ **Problem**

Downloading has failed.

■ **Solution**

To retry downloading, press the **1** key.

To return to the SYSTEM MENU, press the **2** key. Check the interface port and communications parameters in the SET SYSTEM menu or perform the communications test in the TEST menu. (Refer to Subsection 2.5.3, [4.5] and [5.7].)

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

[11.2] Uploading the system message file

```
UPLOAD
** Waiting **
```



```
UPLOAD
  B80MSG.FN3
** Loading **
XXXXXXXX/YYYYYYY
```



```
UPLOAD
  B80MSG.FN3
** Completed **
```

Selecting "2:UPLOAD" on the SYSTEM MESSAGE transfer menu calls up the screen shown at left. With this screen displayed, the BHT waits for the system message file to be uploaded.

While the uploading operation is in progress, the screen shown at left is displayed indicating the file name and the number of sent records/the total number of records.

To abort the uploading operation, press the **C** key. The screen will switch back to the SYSTEM MESSAGE transfer menu.

Upon completion of uploading, the BHT displayed the screen shown at left and beeps once.

Press the **C** key to return to the SYSTEM MESSAGE transfer menu.

NOTE

When the BHT uploads the system message file, it creates a temporary file named "_B80MSG.FN3" in the user area. If the user area is insufficient for creating the temporary file, therefore, an error will result.

The created temporary file will be automatically deleted after completion of uploading.

If an error occurs during uploading

If some error occurs during uploading, one of the following screens will appear and the beeper beeps three times.

To retry the uploading operation, press the **1** and **ENT** keys; to abort it, press the **2** and **ENT** keys.

Press the **C** key to return to the SYSTEM MESSAGE transfer menu.

```
UPLOAD
Out of memory!!
```

■ Problem

The memory is insufficient for setting up the system message file.

■ Solution

Press the **C** key to return to the SYSTEM MENU, then delete unnecessary files in the memory. (Refer to Subsection 2.5.3, [7].)

```
UPLOAD
Too many files!!
```

■ **Problem**

The memory has already contained 80 files, so the BHT system message file cannot be set up.

■ **Solution**

Press the **C** key to return to the SYSTEM MENU, then delete unnecessary files in the memory. (Refer to Subsection 2.5.3, [7].)

```
UPLOAD
_B80MSG.FN3
Communication error!!
Retry?
1:Yes 2:No
```

■ **Problem**

Uploading has failed.

■ **Solution**

To retry uploading, press the **1** key.

To return to the SYSTEM MENU, press the **2** key. Check the interface port and communications parameters in the SET SYSTEM menu or perform the communications test in the TEST menu. (Refer to Subsection 2.5.3, [4.5] and [5.7].)

```
UPLOAD
_B80MSG.FN3
File error!!
Upload?
1:Yes 2:No
```

■ **Problem**

The file you attempted to upload is broken.

■ **Solution**

To upload the broken file as is, press the **1** key.

2.6 Starting Up User Programs

You may start up user programs (application programs) in the BHT in several ways. This section outlines those ways.

■ Starting from the EXECUTE PROGRAM menu in System Mode

If you select a desired user program as an execution program in the EXECUTE PROGRAM menu, then the selected program will immediately start running. The selected program will always start from the beginning.

For details, refer to Subsection 2.5.3, "[1] Program Execution."

■ Starting the auto-start execution program selected in the SET SYSTEM menu in System Mode, by turning the power on

If you select a desired user program as an auto-start execution program on the SET EXECUTE PROGRAM screen in the SET SYSTEM menu and turn the BHT off, then the selected program will automatically run when the BHT is turned on at the next time. If the resume function is activated, turning the BHT on will resume the program at the current point that had been running before the BHT was turned off.

For details, refer to Subsection 2.5.3, "[4.1] Setting an execution program."

■ Starting the first registered execution program, by turning the power on--with Directory Manager

If no auto-start execution program has been selected on the SET EXECUTE PROGRAM screen in the SET SYSTEM menu, then turning the BHT on will transfer the control to Directory Manager that starts a first-registered one out of user programs (.PD3) loaded in the BHT.

If the resume function is activated, turning the BHT on will resume the program at the current point that had been running before the BHT was turned off.

When downloading more than one user program after system initialization, you should download first a desired program to be run as an auto-start execution program since downloaded programs will be registered in the system in the downloading order.

At the time of updating programs, use the same program names in downloading, and the registration order of programs will not change so that the same execution program may run.

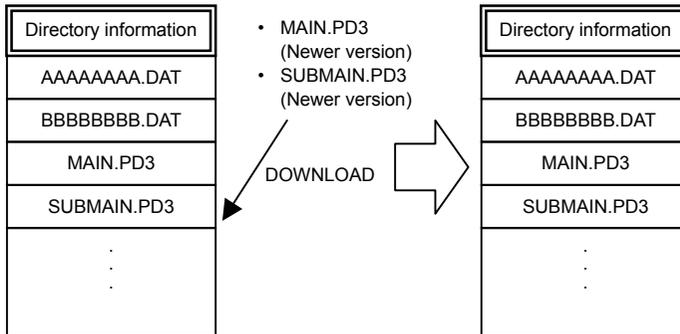
NOTE: Directory Manager in system manages also files other than program files (.PD3). If you delete a non-program file (e.g., .DAT) registered preceding the first-registered execution program and download a new user program, then the new user program will be registered into the position of the deleted non-program file. To prevent such a problem, it is recommended that after initialization you first download an execution program to be run first when the BHT is turned on.

On the next page are downloading examples and Directory Manager control. In those samples, the following file names are used:

MAIN.PD3	Program to be run by turning the PW key on
SUBMAIN.PD3	Program chained from the MAIN.PD3 with the CHAIN statement in BHT-BASIC
USER.PD3	New user program
AAAAAAAAA.DAT	Data file 1 to be used by user programs
BBBBBBBBB.DAT	Data file 2 to be used by user programs

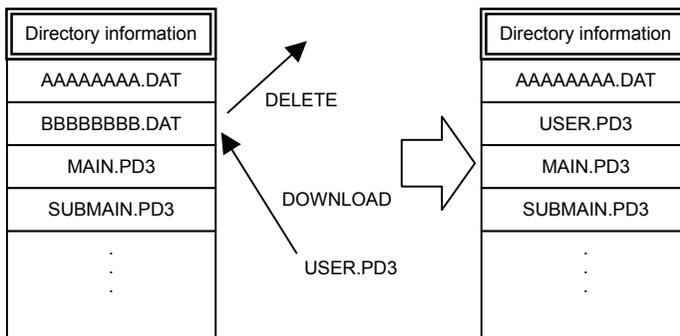
Example 1: Downloading updated versions of the MAIN.PD3 and SUBMAIN.PD3

In this case, the registration order of user programs will not change, so turning the **PW** key will start the MAIN.PD3.



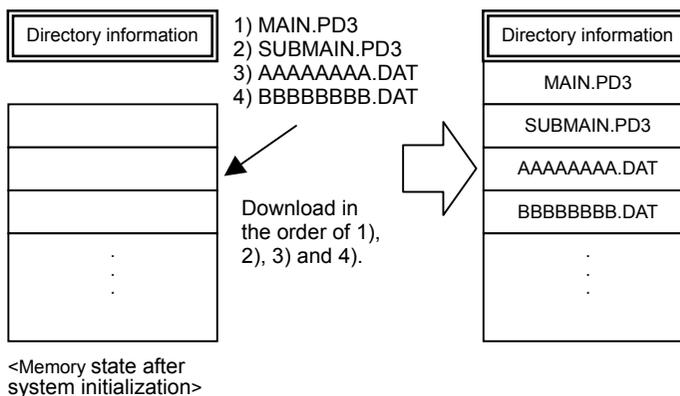
Example 2: Deleting the BBBBBBBBB.DAT and downloading new USER.PD3

In this case, the USER.PD3 will be registered into the position of the deleted BBBBBBBBB.DAT so that the USER.PD3 will become an execution program to be run when the **PW** key is pressed.



Example 3: Recommended downloading order

After system initialization, download first an execution program you want to run by pressing the **PW** key. As long as you do not delete the execution program or download any other program, the execution program is always registered in the top of the directory.



■ Starting with the wakeup function

If you specify the wakeup time in user programs, the wakeup function will automatically wake up the BHT at the specified time and run a user program.

If an auto-start execution program has been selected on the SET EXECUTE PROGRAM screen in the SET SYSTEM menu, then the selected program will run at the time of wakeup. If no auto-start execution program has been specified, the control will be transferred to Directory Manager that starts a first-registered one out of user programs (.PD3) loaded in the BHT.

For details about the wakeup function, refer to the BHT-BASIC Programmer's Manual, Chapter 12, "Power-related Functions."

■ Starting with the remote wakeup function

If the remote wakeup function is activated, the BHT will wake up upon receipt of the specified control command from the host computer. At the time of wakeup, if the BHTRMT.PD3 file exists in the BHT, the BHTRMT.PD3 will execute.

Therefore, if a user program is chained to the BHTRMT.PD3 by using the CHAIN statement in BHT-BASIC, then the chained-to user program may run at the time of remote wakeup.

For details about the remote wakeup, refer to Subsection 2.5.3, "[10] Setting the Remote Wakeup" and the BHT-BASIC Programmer's Manual, Chapter 12, "Power-related Functions."

Chapter 3

Communications Operations of BHT

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

3.1	Infrared Communication	92
3.2	RS-232C Interface Specifications	93
	[1] Interface Connector and Pin Assignment	93
	[2] Interface Cable Connection	94
3.3	Basic Communications Specifications and Parameters	95
	3.3.1 Basic Communications Specifications	95
	3.3.2 Communications Parameters	97
3.4	Communications Protocols	98
	3.4.1 BHT-protocol	98
	[1] Overview	98
	[2] Control Characters	99
	[3] Basic Format of Transmission Messages	100
	[4] Text Format	101
	3.4.2 BHT-Ir Protocol	103
	[1] Overview	103
	[2] Control Characters	104
	[3] Basic Format of Transmission Messages	105
	[4] Text Format	106

3.1 Infrared Communication

The BHT has an integrated infrared (IR) communications device which enables wireless transfer of programs and data between the BHT and the host computer and between the BHTs, instead of the conventional wire transfer.

The IR communications device features the following:

- Wireless communications
- Small and lightweight design
- High transmission speed
- Freedom from the codes/regulations and licenses which differ from country to country, unlike radio devices

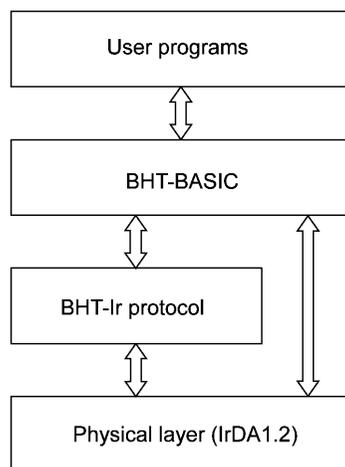
The BHT may communicate with other IrDA-compliant equipment just by aligning their IrDA interface ports with each other. The effective IR range and IrDA port angle may differ depending upon the target equipment, so observe the instructions given in manuals furnished with such equipment.

NOTE If IR transfer fails, bring the BHT closer to the target station or change the IrDA interface port angle, and try again.

The BHT's IR communications device is IrDA-compliant. IrDA stands for Infrared Data Association, which has defined hardware (IrDA Serial Infrared Physical Layer Link) and communications protocols for IR communications.

The BHT's physical layer complies with the IrDA1.2 Low power, with a maximum transfer distance of 0.15 m and maximum transmission rate of 115.2 kbits per second.

The BHT adopts the exclusive BHT-Ir protocol which allows you to develop user programs for IR communications in BHT-BASIC, as can be done with conventional wire communications.

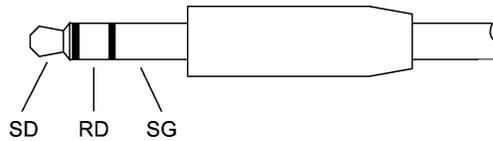


3.2 RS-232C Interface Specifications

[1] Interface Connector and Pin Assignment

The BHT has a direct-connect interface port which is connectable to the 3-pole mini stereo plug ($\phi 2.5$ mm or 0.1") and supports a subset of the RS-232C interface as shown below.

Using a direct-connect interface cable having the mini stereo plugs makes it possible to connect the BHT to a host computer (or another BHT) directly without any routing through the CU-8000.



The poles of the plug are assigned as listed below.

Signal Name	Function	Signal Input/Output	
		BHT	External device
SD	Send data		→
RD	Receive data		←
SG	Signal ground		

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

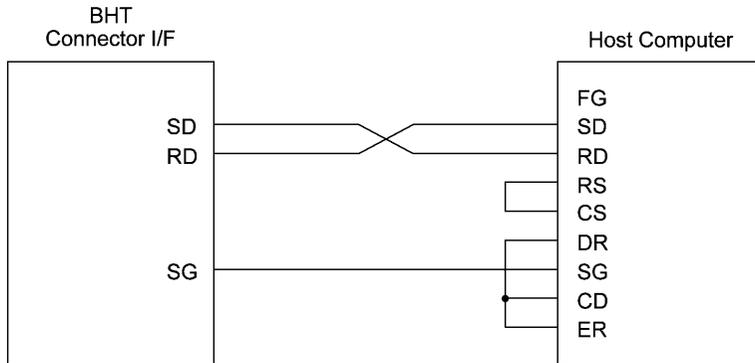
Logical Value	Input Voltage Threshold (RD)	Output Voltage Threshold (SD)
0	3V min.	5V min.
1	-3V max.	-5V max.

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 plug will shorten. To connect the BHT to a host computer having no IrDA interface port (or another BHT) frequently, use the CU-8000.

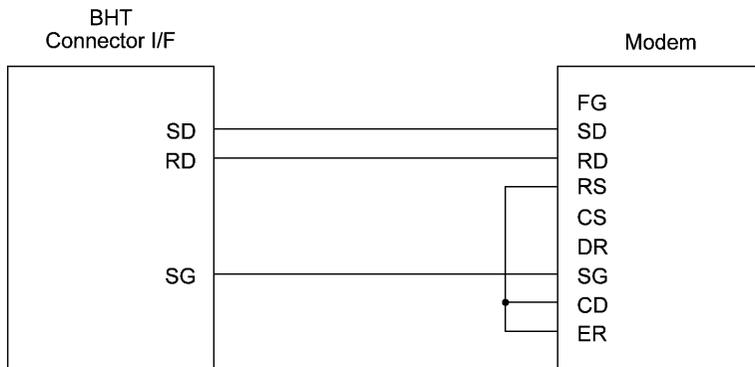
NOTE Allow the specified signals only to enter the direct-connect interface port. Entry of other signals will result in a failure or malfunction of the BHT.

[2] Interface Cable Connection

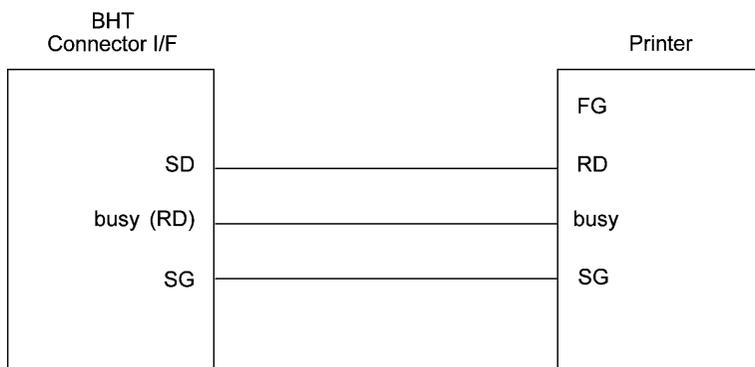
Connect the BHT directly to a host computer, a modem, or a printer with a direct-connect interface cable as illustrated below.



Cable Connection between BHT and Host Computer



Cable Connection between BHT and Modem



Cable Connection between BHT and Printer

3.3 Basic Communications Specifications and Parameters

3.3.1 Basic Communications Specifications

Listed below are the communications specifications when the BHT exchanges data with a host computer through the IrDA interface or direct-connect interface.

	IrDA Interface	Direct-connect Interface
Synchronization	Start-stop	
Transmission Speed	2400, 9600, 19200, 38400, 57600, or 115200 bps	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200 bps
Transmission Code	JIS 8-bit codes	JIS 7- or 8-bit codes
Transmission Bit Order	LSB (Least significant bit) first	
Vertical Parity	None	Even, odd, or none

■ 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).

■ IrDA Interface Communications Range

The IrDA interface's maximum effective range is 15 cm (5.9 in.) with the IR beam within a 10° angle of divergence.

To communicate via the CU-8000, put the BHT on the CU-8000.

■ Switching Time between Sending and Receiving on IrDA Interface

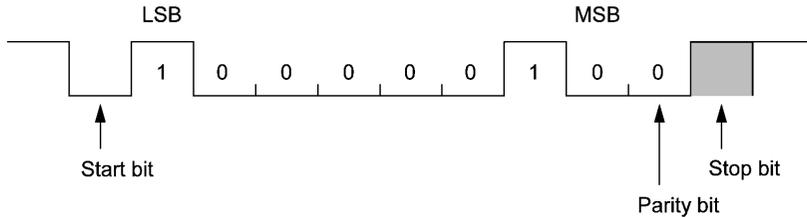
The IrDA interface should satisfy the following requirements in switching between sending and receiving:

- (1) Within 10 ms from completion of sending, the IrDA interface should become ready to receive.
- (2) After 10 ms or more from completion of receiving, the IrDA interface should start sending.

■ 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 is JIS 7- or 8-bit code. The transmission bit order is LSB (Least significant bit) first.

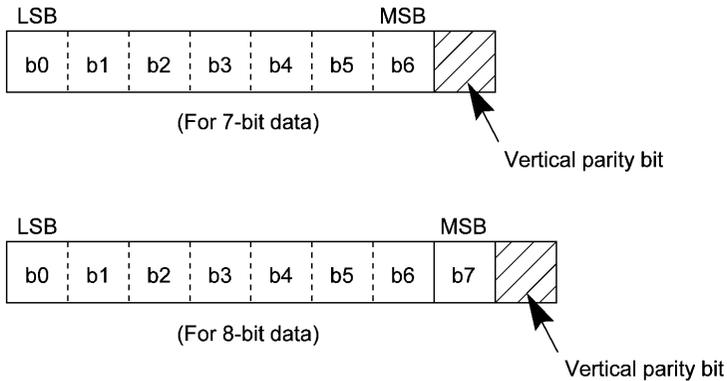
What follows is an example for transmitting character A (41h, 0100001b) coded to JIS 8-level code with an even parity and a single bit each for start and stop bits.



■ 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 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.



3.3.2 Communications Parameters

In System Mode and user programs written in BHT-BASIC, you may set the communications parameters listed below.

Communications Port	IrDA interface	Direct-connect interface
Transmission Speed	2400, 9600, 19200, 38400, 57600, or 115200 bps	300, 600, 1200, 2400, 4800, 9600, 9200, 38400, 57600, or 115200 bps
Character Length	8 bits	7 or 8 bits
Vertical Parity	None	Odd, even, or none
Stop Bit Length	1 bit	1 or 2 bits

In System Mode

Refer to Chapter 2, Subsection 2.5.3, [4.5], "Setting the communications environments."

In BHT-BASIC

To set the transmission speed, character length, vertical parity, and stop bit length (To set the transmission speed only for the IrDA interface), use the OPEN "COM:" statement in BHT-BASIC.

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

OPEN "COM1: ..." Opens the IrDA interface port for data transmission, irrespective of the setting in System Mode.

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

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

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

3.4 Communications Protocols

The BHT supports both the BHT-protocol and the BHT-Ir protocol for file transmission.

3.4.1 BHT-protocol

[1] Overview

The BHT-protocol is the communications procedure used to transmit files between the BHT and a host (or between the BHTs). 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.

For details about the transmission control sequences and horizontal parity checking, refer to Appendix B, B.1, "BHT-protocol."

[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).

■ Transparency

The BHT 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.

(2) Text control characters

The text control characters are used to format transmission texts. 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).

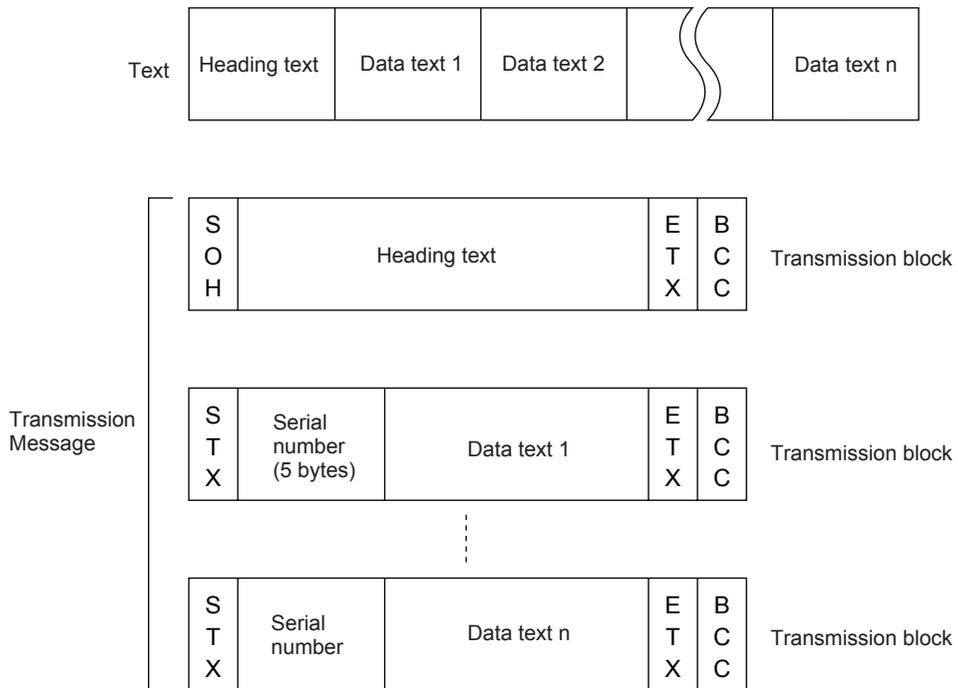
You may designate headers and a terminator with the protocol functions in BHTBASIC. If you designate none of them in a user program, the BHT may apply those as listed above. Refer to the "BHT-BASIC Programmer's Manual."

[3] Basic Format of Transmission Messages

Basically, the BHT transmits data as units 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, then a header and terminator are added to each block. If the serial number management or error checking by BCC (Block Check Character) is required, the serial number or BCC is also added to each block, respectively. This procedure forms a transmission block. A set of transmission blocks makes up one transmission message.

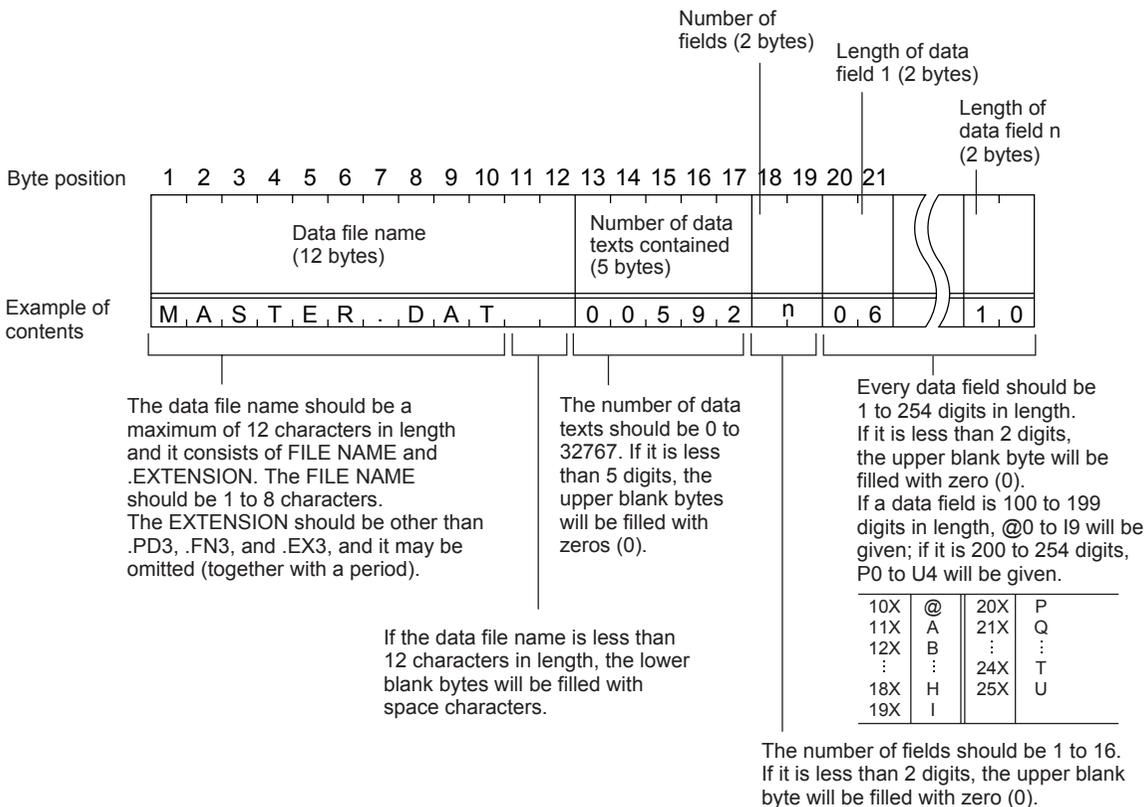
Shown below is an example of a transmission message formed with the BHT-protocol.



In the above figure, SOH, STX, and ETX are text control characters as described in [2] Control Characters, (2). A serial number is expressed by a five-digit decimal number, starting from 00001 to 32767, and identifies transmitted data texts. For the BCC, refer to Appendix B, B.1, "BHT-protocol," [3].

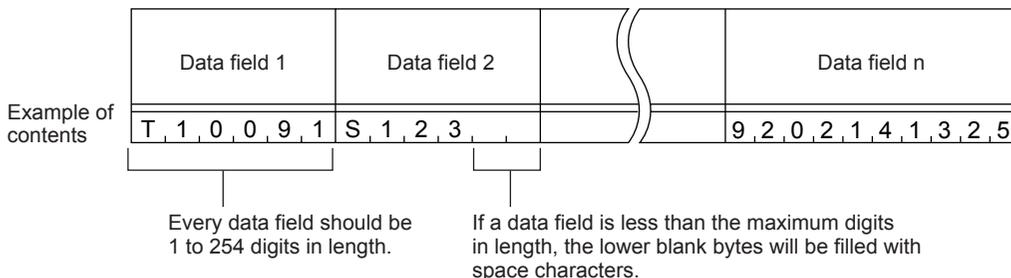
■ Data Text Format

(1) Heading text



NOTE To transfer a data file containing a data field(s) of 100 digits or more, use the Windows-based Transfer Utility. The MS-DOS-based Transfer Utility does not support transmission of data fields exceeding 99 digits.

(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 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.

3.4.2 BHT-Ir Protocol

[1] Overview

The BHT-Ir protocol is the communications procedure for the serial infrared link, which is used to transmit files between the BHT and a host (or between the BHTs). It adopts the response method using ACK/NAK codes. The BHT-Ir protocol can be used also for communications through the direct-connect interface.

The BHT-Ir 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.

For details about the transmission control sequences and CRC, refer to Appendix B, B.2, "BHT-Ir protocol."

[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
DLE EOT	1004h	End Of Transmission	Releases a data link (Phase 3). Requests abort of transmission (Phase 2).
DLE ENQ	1005h	Enquiry	Requests establishment of a data link (Phase 1). Prompts the receiver to respond to the sent text (Phase 2).
DLE ACK	1006h	Acknowledge	Acknowledgment response to DLE ENQ (Phase 1). Acknowledgment response to text (Phase 2). Acknowledgment response to DLE EOT (Phase 3).
DLE NAK	1015h	Negative Acknowledge	Negative acknowledgment response to DLE ENQ (Phase 1). Negative acknowledgment response to text (Phase 2).
WACK	103Bh	Wait for Acknowledge	Requests suspension of data reception during erasure of the flash memory.

■ Transparency

The BHT uses the transparent mode which allows the control characters and codes (e.g., STX, ETX, SOH, and DLE) to be transmitted as normal data in the transmission texts.

To transmit a DLE as normal data, type DLE DLE per DLE.

(2) Text control characters

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

Symbol	Value	Meaning	Function
DLE SOH	1001h	Start Of Heading	Indicates the start of heading text (Phase 2).
DLE STX	1002h	Start Of Text	Indicates the start of data text (Phase 2).
DLE ETX	1003h	End Of Text	Indicates the end of data text (Phase 2).

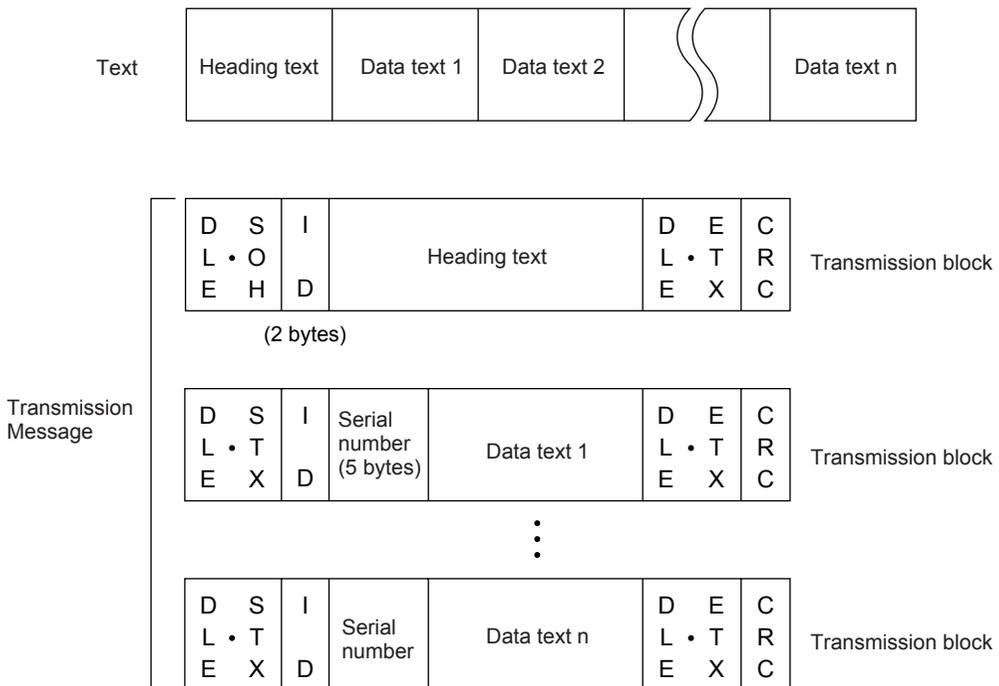
In the BHT-Ir protocol, you cannot change the values of the headers and terminator with the protocol functions in BHT-BASIC.

[3] Basic Format of Transmission Messages

Basically, the BHT transmits data as units 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, then a header, terminator, serial number, receiver station's ID, and CRC-16 (Cyclic Redundancy Check) are added to each block. This procedure forms a transmission block. A set of transmission blocks makes up one transmission message.

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



In the above figure, DLE SOH, DLE STX and DLE ETX are text control characters as described in [2] Control Characters, (2). An ID denotes the ID number of the receiver station, expressed by two bytes. A serial number is expressed by a five-digit decimal number, starting from 00001 to 32767, and identifies data texts. For the CRC-16, refer to Appendix B, B.2, "BHT-Ir protocol," [3].

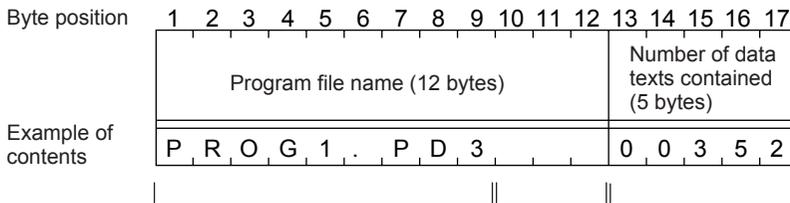
TIP You can use the control characters for expressing IDs, serial numbers, or text data.

[4] Text Format

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

■ Program Text Format

(1) Heading text

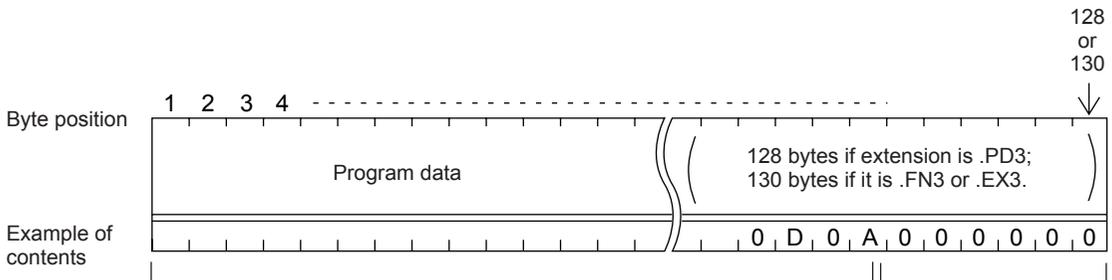


The program file name should be a maximum of 12 characters in length and it consists of FILE NAME and .EXTENSION. The FILE NAME should be 1 to 8 characters. The EXTENSION should be .PD3 (.FN3 and .EX3 may be available for future functional expansion).

If the program file name is less than 12 characters in length, the lower blank bytes will be filled with space characters.

The number of data texts should be 0 to 32767. If it is less than 5 digits, the upper blank bytes will be filled with zeros (0).

(2) Data text

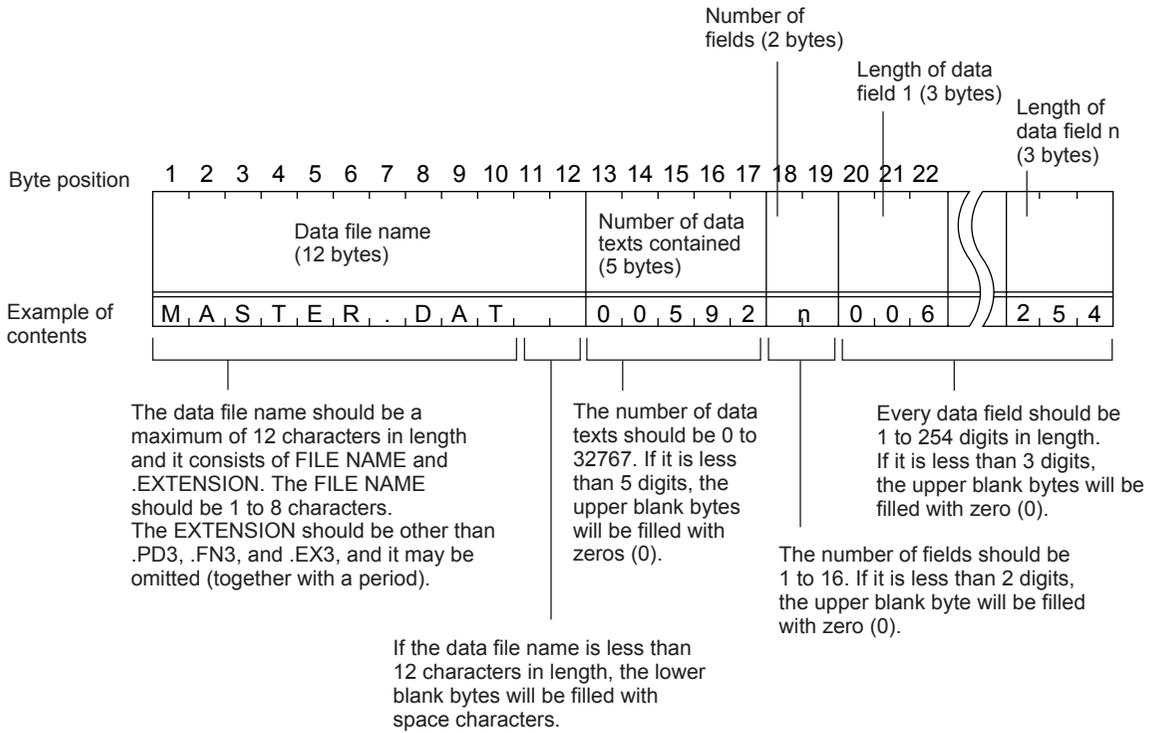


Object file (compiled from a source program file having one of the extensions .PD3, .FN3, and .EX3.)

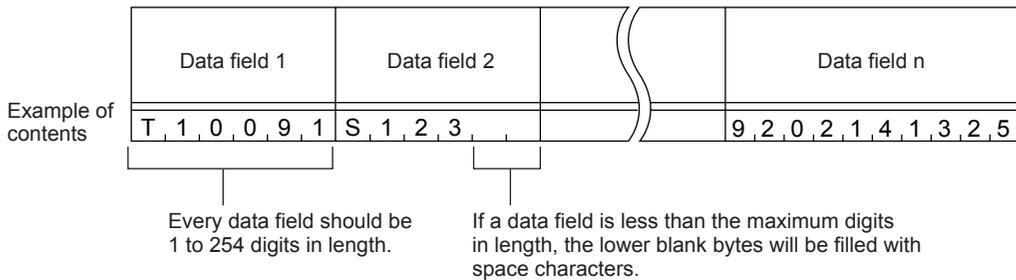
If a program data field is less than the maximum digits in length, the lower blank bytes will be filled with zeros (0).

■ 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 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.

Chapter 4

Error Messages

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

4.1 System Errors.....	110
4.2 Errors in System Mode.....	115

4.1 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.

```
*****  
** No System! **  
*****
```

System Program error

■ **Problem**

A System Program error has occurred.

NOTE If this error occurs, the BHT beeps five times (for 0.1 second per beep) and then turns itself off.

■ **Solution**

Contact your system administrator.

```
Battery voltage  
has lowered.
```

Low battery warning

■ **Problem**

When the power is turned on or off or during execution of program (System Mode or application), the battery output level has dropped below a specified lower limit.

NOTE If low battery is detected, the BHT displays this message for approx. 2 seconds and beeps three times (for 0.1 second per beep). After that, it will resume previous regular operation.

■ **Solution**

The dry cells are running down or the battery cartridge will be discharged soon.

If the BHT is loaded with dry cells, replace them; if it is loaded with the rechargeable battery cartridge, replace or recharge it.

(When dry cells are loaded)

```
Replace the
  batteries!
```

(When the rechargeable battery cartridge is loaded)

```
Charge the
  battery!
```

```
Set the current
date and time.
```

```
02/01/01 00:00
```

```
_ / / :
```

Shutdown due to low battery

■ Problem

When the BHT is turned on or during execution of program (System Mode or application), the battery output level has lowered so that the BHT no longer operates.

NOTE

If lower battery is detected, the BHT beeps five times (for 0.1 second per beep) and then turns itself off. Depending upon the battery level, the beeper may not sound five times.

■ Solution

If the BHT is loaded with dry cells, replace them; if it is loaded with the rechargeable battery cartridge, replace or recharge it.

(For the charging procedure, refer to Chapter 5, Section 5.5.)

Calendar clock stopped

■ Problem

The calendar clock integrated in the BHT has stopped because:

- the dry cells or battery cartridge had been removed for a long time,
- dry cells had not been replaced, or
- the rechargeable battery cartridge had not been recharged for a long time

NOTE

The indication of 00/01/01 00:00 will change depending upon the calendar clock state.

■ Solution

Set the calendar clock (refer to Chapter 2, Subsection 2.3.2).

Abnormal shutdown

```
Your terminal was
not shut down
properly the last
time it was used.
```

[SF+2]

```
Unsaved data
was lost.
```

[SF+2]

■ Problem

If shut down abnormally*, the BHT has been left without dry cells or battery cartridge loaded, or with dead dry cells or discharged battery cartridge loaded, so unsaved data was lost.

(*"Normally shut down" refers to "turned off with the **PW** key or by the auto power-off feature.")

■ Solution

Refer to Chapter 2, Subsection 2.3.6.

System Program malfunction

■ Problem

During execution of System Program, the System Program has attempted to write onto the write-protected area of the memory.

(xxxxxxx: Error address)

NOTE If this error occurs, the BHT beeps five times (for 0.1 second per beep).

■ Solution

Unload and reload the dry cells or battery cartridge, then turn the BHT on. If this error occurs frequently, make a note of the displayed message and codes and contact your nearest dealer.

■ Problem

During execution of System Program, the System Program has received an invalid command code.

(xxxxxxx: Error address)

NOTE If this error occurs, the BHT beeps five times (for 0.1 second per beep).

■ Solution

Unload and reload the dry cells or battery cartridge, then turn the BHT on. If this error occurs frequently, make a note of the displayed message and codes and contact your nearest dealer.

```
Reload the battery
to restart!
```

XXXXXXXXXX

01

```
Reload the battery
to restart!
```

```
tsskid:XXXXXXXX
erccd :XXXXXXXX
addr :XXXXXXXX
```

02

No execution
program loaded.
Contact your
administrator.

No execution program loaded

■ Problem

No user program to be executed when the BHT is turned on is loaded.

NOTE If this error occurs, the BHT beeps five times (for 0.1 second per beep) and then turns itself off.

■ Solution

Run System Mode and download a user program(s) in DOWNLOADING menu. (For the downloading procedure, refer to Chapter 2, Subsection 2.5.3, [2].)

System administrator to be called

Contact your
administrator.
Note the error
number.
(XXXX)

■ Problem

Any of the following errors has occurred:

- | | |
|--|--------|
| (1) Hardware error or calendar clock error | (1010) |
| Flash memory error | (1020) |
| (2) Memory storage error | (20XX) |
| (3) Execution program error | (3010) |
| (XXXX: Error code) | |

TIP If any of the above errors occurs, the BHT beeps five times (for 0.1 second per beep) and then turns itself off.

■ Solution

Turn the BHT on again.

If error (1) above occurs frequently, contact your nearest dealer.

If error (2) occurs frequently, initialize the BHT System (the whole user area including the font file area).

If error (3) occurs frequently, delete the program file that causes this error or download the original program file to overwrite the current one.

No resume info.
has been retained.
Program restarts
automatically.

Resume data lost

■ Problem

Although the resume function had been set to ON, no resume data has been retained since the BHT was not normally turned off and then left without dry cells or battery cartridge loaded or with dead dry cells or discharged battery cartridge loaded.

NOTE The BHT displays this error message for three seconds and automatically runs the execution program from the point of start-up.

Your settings in
System Mode
have been lost.

Will reset
to defaults.

Error in System Mode settings

■ Problem

Your settings made in System Mode contain an error.

TIP If this error occurs, the System Mode settings revert to the factory defaults.

TIP The BHT displays this error for three seconds and runs a user program first registered in the BHT from the beginning. The program may not be the auto-start execution program preset before occurrence of the error.

If no user program is loaded in the BHT, the message "No execution program loaded. Contact your administrator." appears following this error message.

■ Solution

Make your settings in System Mode again.

If the message "No execution program loaded. Contact your administrator." appears, run System Mode and download a user program(s) in DOWNLOADING menu. (For the downloading procedure, refer to Chapter 2, Subsection 2.5.3, [2].)

System down error

■ Problem

An error has occurred during execution of System Program.

NOTE If this error occurs, the BHT beeps five times (for 0.1 second per beep).

■ Solution

Unload and reload dry cells or battery cartridge, then turn the BHT on.

If this error occurs frequently, make a note of the message and codes on the LCD and contact your nearest dealer.

Reload the battery
to restart!

E:xxxxxxxx-F:xxxxxxxx
l:xxxxxxxx-2:xxxxxxxx
P:xxxxxxxx-R:xxxxxxxx

4.2 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 *
*****
```

When selecting a program file or data file

■ Problem

You attempted to execute a user program in the EXECUTE PROGRAM menu, even though no user program files had been stored in the memories.

■ Solution

Press the **C** key to return to the SYSTEM MENU screen, then download user programs. (Refer to Chapter 2, Subsection 2.5.3, [2].)

SET EXECUTE PROGRAM

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

■ Problem

In the SET SYSTEM menu, you attempted to select a user program file as an execution program to be run when the power is applied, but no user program files had been stored in the memories.

■ Solution

Press the **C** key to return to the SYSTEM MENU screen, then download user programs. (Refer to Chapter 2, Subsection 2.5.3, [2].)

UPLOAD FILE

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

■ Problem

You attempted to select "ONE FILE" or "ALL FILES" for uploading in the UPLOAD menu, but no data files had been stored in the memory.

■ Solution

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

DELETE FILE

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

■ Problem

You have deleted all of the files stored in the memory in the DELETE FILE menu.

■ Solution

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

During downloading of a program file, data file, BHT system parameter file, or system message file

```
DOWNLOAD FILE
XXXXXXX.XXX
Out of memory!!
Retry?
  1:Yes 2:No
```

■ Problem

The memory is insufficient for storing files to be downloaded.

■ Solution

Press the **2** key to return to the SYSTEM MENU, then delete unnecessary files in the memory or decrease the size of the file to be downloaded. (Refer to Chapter 2, Subsection 2.5.3, [7], [2], [9], and [11].)

```
DOWNLOAD
File mismatch!!
Retry?
  1:Yes 2:No
```

■ Problem

In the SYSTEM PARAMETER transfer menu, you attempted to download a file other than the BHT system parameter file. Or in the SYSTEM MESSAGE transfer menu, you attempted to download a file other than the system message file.

■ Solution

Check the file you attempted to download and then download the file in the appropriate menu (DOWNLOAD menu, SYSTEM PARAMETER transfer menu, or SYSTEM MESSAGE transfer menu).

```
DOWNLOAD FILE
XXXXXXX.XXX
Too many files!!
Retry?
  1:Yes 2:No
```

■ Problem

The current download will exceed the maximum of 80 files in the memory.

■ Solution

Press the **2** key to return to the SYSTEM MENU, then delete unnecessary files in the memory (or decrease the number of files to be downloaded if you attempted to download more than one file in the DOWNLOAD menu.)

(Refer to Chapter 2, Subsection 2.5.3, [7], [2], [9], and [11].)

```
DOWNLOAD FILE
XXXXXXX.XXX
Program file error!!
Retry?
  1:Yes 2:No
```

■ Problem

You attempted to download an invalid program file.

■ Solution

Check whether the program file you attempted to download is available to your BHT model. If it is not available, download the appropriate program.

```

DOWNLOAD FILE

XXXXXXXXX.XXX
Communication error!!

Retry?
  1:Yes 2:No

```

■ **Problem**

Downloading has failed.

■ **Solution**

To retry downloading, press the **1** key.

To return to the SYSTEM MENU, press the **2** key. Check the interface port, communications parameters, and communications protocol in the SET SYSTEM menu or perform the communications test in the TEST menu. (Refer to Chapter 2, Subsection 2.5.3, [4.5] and [5.7].)

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

During uploading of a program file, data file, BHT system parameter file, or system message file

```

UPLOAD FILE

File error!!

Upload?
  1:Yes 2:No

```

■ **Problem**

The file you attempted to upload is damaged.

■ **Solution**

To upload the damaged file as is, press the **1** key.

```

UPLOAD

Out of memory!!

```

■ **Problem**

The memory is insufficient for setting up the BHT system parameter file or system message file to be uploaded.

■ **Solution**

Press the **C** key to return to the SYSTEM MENU and delete unnecessary files. (Refer to Chapter 2, Subsection 2.5.3, [7].)

```

UPLOAD

Too many files!!

```

■ **Problem**

The memory has already contained 80 files, so the BHT system parameter file or system message file cannot be set up.

■ **Solution**

Press the **C** key to return to the SYSTEM MENU and delete unnecessary files. (Refer to Chapter 2, Subsection 2.5.3, [7].)

```
UPLOAD FILE
XXXXXXXXX.XXX
Communication error!!
Retry?
  1:Yes 2:No
```

■ **Problem**

Uploading has failed.

■ **Solution**

To retry uploading, press the **1** key.

To return to the SYSTEM MENU, press the **2** key. Check the interface port, communications parameters, and communications protocol in the SET SYSTEM menu or perform the communications test in the TEST menu. (Refer to Chapter 2, Subsection 2.5.3, [4.5] and [5.7].)

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

5.1	Functions of the CU-8000	120
5.2	Components and Functions	121
5.3	Applying Power to the CU-8000	122
5.4	Communicating with the Host Computer	123
5.4.1	Setting the Transmission Speed of the CU-8000	123
5.4.2	Interface Cable Connection	124
5.4.3	Interfacing with the Host Computer	125
5.5	Charging the Ni-MH Battery Cartridge (using the CU-8001)	126
5.5.1	Ni-MH Battery Cartridge Loaded in the BHT	126
5.5.2	Ni-MH Battery Cartridge Alone	128
[1]	Fully Discharging and then Charging—Refreshing	129
[2]	Charging Only	130
5.6	RS-232C Interface Specifications	131
[1]	Interface Connector and Pin Assignment	131
[2]	Interface Cable Connection	132

Chapter 5

Handling the CU-8000 (Option)

This chapter describes the handling procedure of the CU-8000, the interfacing with the host computer, and the charging of the rechargeable battery cartridge.

5.1 Functions of the CU-8000

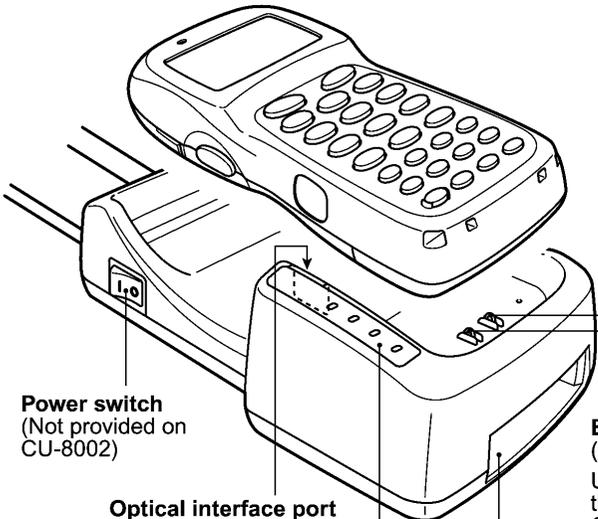
The optical communication unit CU-8000 is available in two models: CU-8001 and CU-8002. The CU-8001 has both of functions (1) and (2) given below; the CU-8002 has only function (1).

(1) Data exchange function

The CU-8001/CU-8002 exchanges data and programs between the BHT and the host computer. It interfaces with the BHT via the IrDA interface and with the host computer via the RS-232C interface.

(2) Battery cartridge charging function

5.2 Components and Functions



Power switch
(Not provided on CU-8002)

Optical interface port
Used to exchange data optically with the BHT.

BHT charge terminals
(Not provided on CU-8002)

Used to charge the battery cartridge loaded in the BHT. Clean these terminals periodically. If they are stained, the charging efficiency may decrease.

Battery cartridge slot
(Not provided on CU-8002)

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

Status indicator
(Not provided on CU-8002)

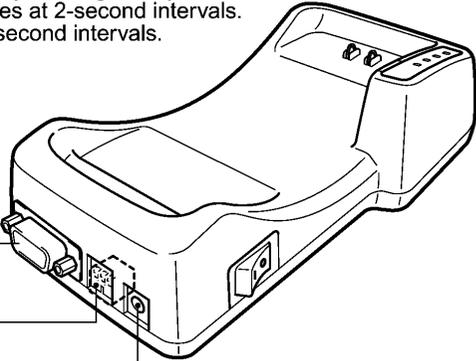


DATA communications LED (green)
Lights when the BHT is communicating with the host computer.

CHG1 LED (BHT charge lamp) (yellow)
Lights when the CU-8001 is charging a battery cartridge loaded in the BHT. Upon completion of charging, this LED flashes at 2-second intervals.

CHG2 LED (Battery cartridge charge lamp) (yellow)
Lights when the CU-8001 is charging a battery cartridge all by itself. Upon completion of charging, this LED flashes at 2-second intervals. During discharging, this LED flashes at 0.5-second intervals.

POWER LED (green)
Lights when the power is applied to the CU-8001.



RS-232C interface port
Used to exchange data with the host computer or communication station.

DIP switch
Used to set the CU's transmission speed.

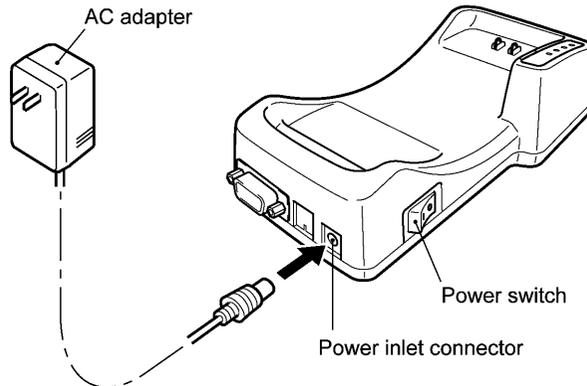
Power inlet connector
(Not provided on CU-8002)

Plug the AC adapter into this connector.

5.3 Applying Power to the CU-8001

The CU-8001 should be supplied with power from a wall socket via the dedicated AC adapter. Connect the outlet plug of the AC adapter to the power inlet connector of the CU-8001, then plug the other end into a wall socket.

The CU-8002 requires no AD adapter.



<p>⚠ WARNING</p>	<ul style="list-style-type: none"> • If smoke, abnormal odors or noises come from the CU, immediately unplug the AC adapter from the wall socket and contact your nearest dealer. Failure to do so could cause fire or electrical shock. • If foreign material or water gets into the CU, immediately unplug the AC adapter from the wall socket and contact your nearest dealer. Failure to do so could cause fire or electrical shock. • If you drop the CU so as to damage its housing, immediately unplug the AC adapter from the wall socket and contact your nearest dealer. Failure to do so could cause fire or electrical shock. • Use the dedicated AC adapter only. Failure to do so could result in a fire. • Never use the CU on the line voltage other than the specified level. Doing so could cause the CU to break or burn. • If the power cord of the AC adapter is damaged (e.g., exposed or broken lead wires), stop using it and contact your nearest dealer. Failure to do so could result in a fire or electrical shock. 	
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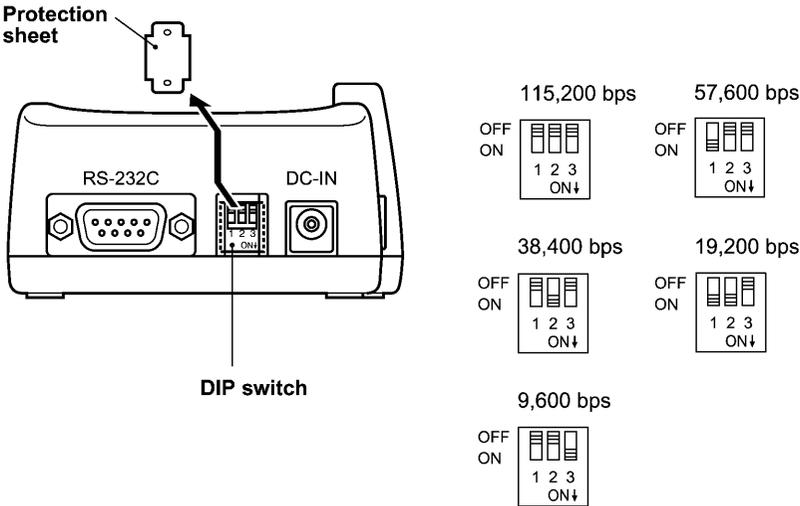
<p>⚠ CAUTION</p>	<ul style="list-style-type: none"> • If you are not using the CU for a long time, be sure to unplug the AC adapter from the wall socket for safety. Failure to do so could result in a fire. • When caring for the CU, unplug the AC adapter from the wall socket for safety. Failure to do so could result in an electrical shock. • Never cover or wrap up the CU or AC adapter in a cloth or blanket. Doing so could cause the unit to heat up inside, deforming its housing, resulting in a fire. Always use the CU and AC adapter in a well-ventilated area. • Keep the power cord away from any heating equipment. Failure to do so could melt the sheathing, resulting in a fire or electrical shock. 	
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5.4 Communicating with the Host Computer

5.4.1 Setting the Transmission Speed of the CU-8000

Set the transmission speed of the CU-8000 to the same value as that of the BHT and host computer, by using the DIP switch next to the RS-232C interface connector as shown below.

- (1) Remove the protection sheet from the CU-8000.
- (3) Set the selectors of the DIP switch as shown below.

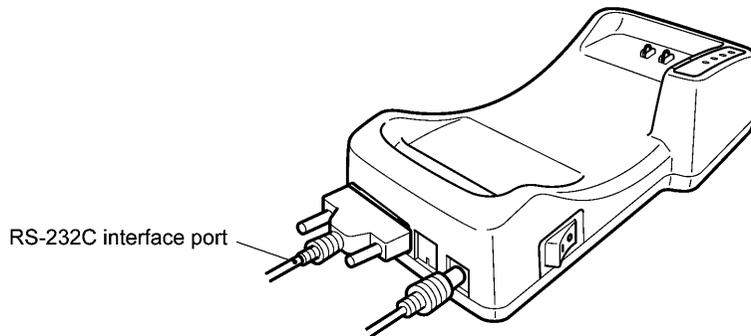


- (3) Reinstall the protection sheet.

NOTE Do not set the DIP switch to any configurations other than one of the five shown above. When removing the protection sheet, take care not to let any foreign material get into the CU.

5.4.2 Interface Cable Connection

- (1) For the CU-8001, unplug the AC adapter from the wall socket.
- (2) Make sure that the host computer is turned off.
- (3) Connect the 9-pin connector (Dsub-9S) of the interface cable to the RS-232C interface port of the CU-8000.

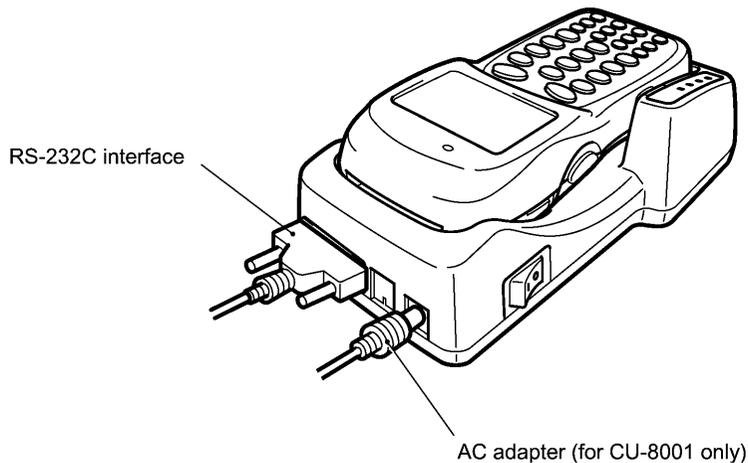


- (4) Connect the other end of the interface cable to the RS-232C port of the host computer.
- (5) For the CU-8001, plug the AC adapter into a wall socket.

5.4.3 Interfacing with the Host Computer

This section describes how to start communication with the host computer in System Mode. The same may apply when you use a user program.

- (1) Turn the host computer on.
- (2) For the CU-8001, turn the power switch on. The POWER LED will come on.
The CU-8002 is supplied with power via the RS-232C interface. It has no POWER LED.
- (3) Make sure that the BHT is turned off, then put it on the CU-8000.



- (4) Turn the BHT on and run System Mode. Set the communications environments (communications protocol, interface port, communications parameters, and protocol options).

Regarding the communications protocol: When using Ir-Transfer Utility C or Ir-Transfer Utility E on the host computer, select the BHT-Ir protocol; when using Transfer Utility, select the BHT-protocol. Regarding the interface port: Select the IrDA interface port.

- (5) On the host computer, initiate a communications program (e.g., Ir-Transfer Utility C/Ir-Transfer Utility E/Transfer Utility, or equivalent).
- (6) To transfer data stored in the BHT to the host computer, select "3: UPLOAD" on the SYSTEM MENU in System Mode. To transfer data from the host computer to the BHT, select "2: DOWNLOAD." (For details, refer to Chapter 2, Section 2.5.)

The BHT and the host computer will start communications with each other via the CU-8000. On the CU-8001, the DATA LED will come on upon start of communications, and after completion of communications, the LED will go off.

- (7) For the CU-8001, turn the power switch off.

5.5 Charging the Rechargeable Battery Cartridge (using the CU-8001)

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

TIP Service Life of Ni-MH Battery Cartridge:

Ni-MH batteries 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's operating time becomes extremely short 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 approx. 200 cycles of charging and discharging operation.

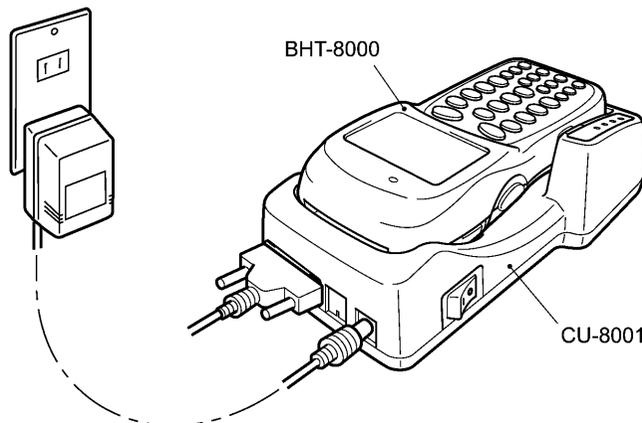
Memory Accumulation:

If a Ni-MH battery undergoes many cycles of imperfect charging and discharging (e.g., one-hour recharge followed by one-hour use), the operating time may become short before the service life is really expired, just as the battery memorizes the use conditions. It is called "Memory Accumulation." The memory accumulation can be avoided by discharging a Ni-MH battery fully before charging (called "refresh"). For refreshing the battery cartridge, use the CU-8001 or C-600.

NOTE If left unused for a long time, the battery cartridge may have been inactive. Charge and discharge such a battery cartridge several times before use.

5.5.1 Rechargeable Battery Cartridge Loaded in the BHT

- (1) Turn the CU-8001 on. The POWER LED comes on.
- (2) Place the BHT loaded with a rechargeable battery cartridge onto the CU-8001.
The CU-8001 lights the CHG1 LED and starts charging. The charging time is approx. 8 hours.
Upon completion of charging, the CHG1 LED starts flashing at 2-second intervals.
- (3) Remove the BHT from the CU-8001.

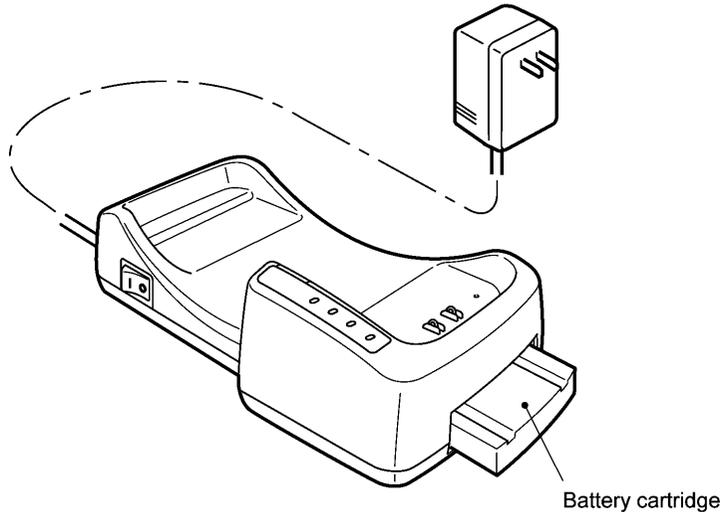


■ Charging Operation and LED Indication

Operator's Action	CU-8001 Status	LED Indication
Turn on the CU-8001.	On standby	 ON
⇓	⇓	
Place the BHT on the CU-8001.	Ordinary charging	 ON ON
⇓	⇓	
After approx. 8 hours	Trickle charging*	 Flashing at 2-second intervals ON
⇓	⇓	
Take out the BHT.	On standby	 OFF ON

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

5.5.2 Rechargeable Battery Cartridge Alone



The CU-8001 can charge Ni-MH battery cartridges all by themselves in either of the following two ways:

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

* Fully discharging and then charging battery cartridges can eliminate "Memory Accumulation" as described on page 126.

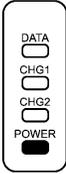
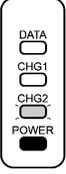
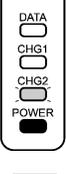
To select [1], first turn on the CU-8001 and then load a rechargeable battery cartridge into it. To select [2], first load a rechargeable battery cartridge into the CU-8001 and then turn on the CU-8001.

 WARNING	<ul style="list-style-type: none"> • Never use the CU-8001 for charging anything other than the specified battery cartridges. Doing so could cause heat, battery-rupture, or fire. 	
 CAUTION	<p>Handling the battery cartridge</p> <ul style="list-style-type: none"> • Never charge a wet or damp Ni-MH battery cartridge. Doing so could cause the batteries to break, generate heat, rupture, or burn. • Do not insert or drop foreign materials such as metals or anything inflammable into the CU-8000 through the openings (vents or battery cartridge slot). Doing so could result in a fire or electrical shock. 	

[1] Fully Discharging and then Charging—"Refreshing"

- (1) Turn the CU-8001 on. The POWER LED comes on.
- (2) Load a Ni-MH battery cartridge into the CU-8001 from the battery cartridge slot.
 The CU-8001 flashes the CHG2 LED at 0.5-second intervals and starts discharging the cartridge. The discharging time differs depending upon the battery condition, but never more than 3 hours.
 Upon completion of discharging, the CHG2 LED comes to stay on and the CU-8001 starts charging. The charging time is approx. 8 hours.
 Upon completion of charging, the CHG2 LED starts flashing at 2-second intervals.
- (3) Remove the battery cartridge from the CU-8001.

■ Discharging & Charging Operations and LED Indication

Operator's Action	CU-8001 Status	LED Indication
Turn on the CU-8001	On standby	 ON
⇓	⇓	
Load a battery cartridge into the CU-8001.	Discharging	 Flashing at 0.5-second intervals ON
⇓	⇓	
After discharging	Ordinary charging	 ON ON
⇓	⇓	
After approx. 8 hours	Trickle charging*	 Flashing at 2-second intervals ON
⇓	⇓	
Take out the battery cartridge.	On standby	 OFF ON

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

[2] Charging Only

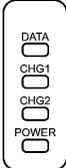
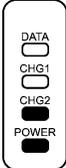
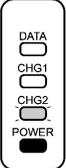
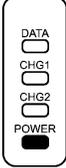
- (1) Load a Ni-MH battery cartridge into the CU-8001 from the battery cartridge slot.
- (2) Turn the CU-8001 on. The charging time is approx. 8 hours.

The CU-8001 turns on the CHG2 LED and starts charging the cartridge.

Upon completion of charging, the CHG2 LED starts flashing at 2-second intervals.

- (3) Remove the battery cartridge.

■ Charging Operation and LED Indication

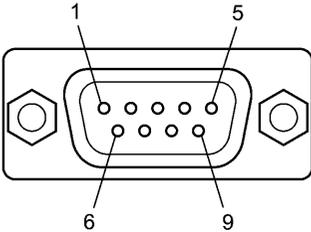
Operator's Action	CU-8001 Status	LED Indication	
Load a battery cartridge into the CU-8001.	Turned OFF		
⇓	⇓		
Turn on the CU-8001.	Ordinary charging		ON ON
⇓	⇓		
After approx. 8 hours	Trickle charging*		Flashing at 2-second intervals ON
⇓	⇓		
Take out the battery cartridge.	On standby		OFF ON

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

5.6 RS-232C Interface Specifications

[1] Interface Connector and Pin Assignment

The CU-8000 has an RS-232C interface port (Dsub-9P).



RS-232C interface port (Dsub-9P) on the CU-8000

Pin No.	Signal	Functions	Signal Input/Output	
			CU-8000	External device
2	RD	Receive data		←
3	SD	Send data		→
4	ER	Data terminal equipment ready		–
5	SG	Signal ground		–
6	DR	Data set ready		–
7	RS	Request to send		–
8	CS	Ready to send		–

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

CU-8001

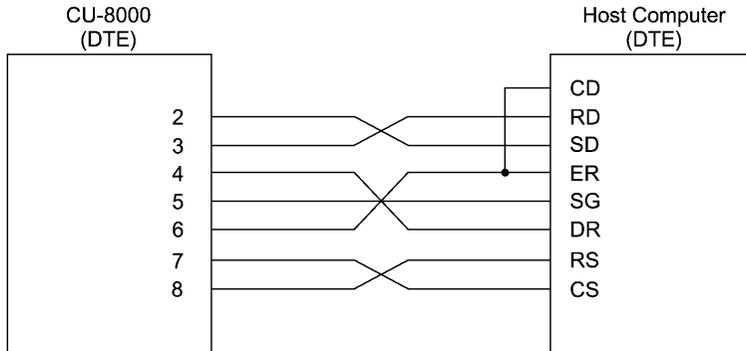
Logical Value	Input Voltage Threshold (<i>n</i>)	Output Voltage Threshold
0	$3V \leq n \leq 15V$	5V min.
1	$-15V \leq n \leq -3V$	-5V max.

CU-8002

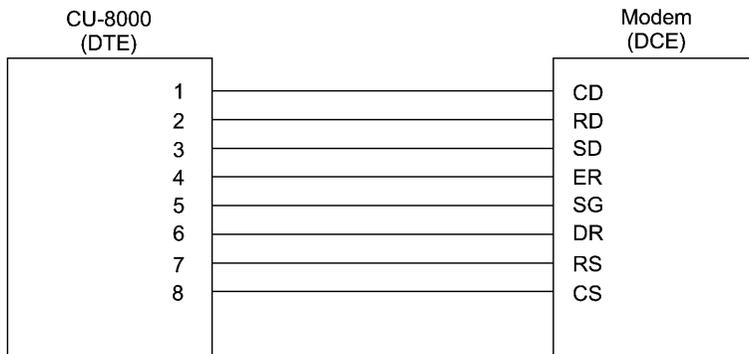
Logical Value	Input Voltage Threshold (<i>n</i>)	Output Voltage Threshold
0	$5V \leq n \leq 15V$	3.2V min.
1	$-15V \leq n \leq -5V$	-3.2V max.

[2] Interface Cable Connection

As illustrated below, connect the CU-8000 (on which the BHT is put) to a host computer with a cross-mode cable. To connect it to a modem, use a straight-mode cable.



Cable Connection between CU-8000 and Host Computer



Cable Connection between CU-8000 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-8000 on which the BHT is put 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).

Appendix A. Specifications	134
A.1 BHT-8000	134
[1] Product Specifications	134
[2] Bar Code Specifications	135
[3] Interface Specifications.....	139
A.2 CU-8000	140
[1] Product Specifications	140
[2] Charging/Discharging Requirements (CU-8001).....	140
[3] Interface Specifications.....	141
Appendix B. Communications Protocol Details	142
B.1 BHT-protocol	142
[1] Transmission Control Sequences.....	142
[2] Aborting Data Transmission	150
[3] BCC for Horizontal Parity Checking	150
B.2 BHT-Ir protocol	151
[1] Transmission Control Sequences.....	151
[2] Aborting Data Transmission	161
[3] CRC.....	162
[4] ID.....	162
Appendix C. A Typical Basic Operation	163

Appendices

Appendix A. Specifications

A.1 BHT-8000

[1] Product Specifications

Power Source	Main power	<ul style="list-style-type: none"> • Two dry cells (alkaline manganese batteries), LR03 or • Rechargeable Ni-MH battery cartridge (2.4 VDC)
Dimensions (W) x (L) x (H)	62 x 147 x 22 mm (2.4 x 5.8 x 0.9 inches)	
Weight	Approx. 160 g (Approx. 5.7 oz.) including dry cells or battery cartridge	
Operating Ambient Temperature	-5°C to 50°C (23°F to 122°F)	
Operating Humidity	20% to 80% (with no dew condensation)	
Ambient Illuminance	20 to 10,000 lx. (Depth of field: 160 mm, ITF: 1.0 magnification, PCS value: 0.9 min., Reflection intensity: 85% min. for white and 5% max. for black)	
Controller	CPU:	32-bit RISC
	RAM:	512KB
	Flash ROM:	4MB
Keypad	Function keys:	4
	Magic keys:	8
	Numerical keys and others:	16
Display	Type:	Dot-matrix, FSTN liquid crystal display (LCD) with backlight
	Formation:	128 dots wide by 64 dots high

Screen mode	Font size		Chars x Lines	Dots (W x H)
Single-byte ANK* mode	Standard-size		21 x 8	6 x 8
	Small-size		21 x 10	6 x 6
Two-byte Kanji mode	16-dot font	Full-width	8 x 4	16 x 16
		Half-width	16 x 4	8 x 16
	16-dot font (Double-width)	Full-width	4 x 4	32 x 16
		Half-width	8 x 4	16 x 16
	12-dot font	Full-width	10 x 5	12 x 12
		Half-width	20 x 5	6 x 12
12-dot font (Double-width)	Full-width	5 x 5	24 x 12	
	Half-width	10 x 5	12 x 12	

*ANK: Alphanumerics and Katakana

Calendar Clock	Year, month, day, hour, minute, and second Year: Two digits (with auto-correction on February 29 up to year 2099)
Reading Confirmation LED	Colors: Red and green
EMC standard	VCCI Class B

[2] Bar Code Specifications

Normal-range Type

(1) Available Bar Code Types

Bar code type	Bar dimensions	Readable magnification
Universal product codes		
EAN-13	0.26 to 0.33 mm (10.24 to 13.0 mils)	0.8 to 1.0 magnification
EAN-8	0.26 to 0.46 mm (10.24 to 18.1 mils)	0.8 to 1.4 magnifications
UPC-A	0.26 to 0.33 mm (10.24 to 13.0 mils)	0.8 to 1.0 magnification
UPC-E	0.26 to 0.56 mm (10.24 to 22.0 mils)	0.8 to 1.7 magnifications
EAN-13 with supplemental codes		
EAN-8 with supplemental codes		
UPC-A with supplemental codes		
UPC-E with supplemental codes		
2-digit add-on	0.26 to 0.66 mm (10.24 to 26.0 mils)	0.8 to 2.0 magnification min.
5-digit add-on	0.26 to 0.66 mm (10.24 to 26.0 mils)	0.8 to 2.0 magnification min. (Long-range scanning)
Interleaved 2of5 (ITF)	0.1 mm min. (3.94 mils min.) PCS value ≥ 0.9 Reflection intensity difference between white and black bars ≥ 0.8	
Standard 2of5 (STF)		
Codabar (NW-7)		
Code 39		
Code 93	0.15 mm min. (5.91 mils min.) (PCS value ≥ 0.45)	
Code 128		

* The above values (except for those for bar codes with supplemental codes) are under the following conditions:

- Touch scanning
- Ambient illuminance: 500 to 3000 lux. (Xenon lamp)

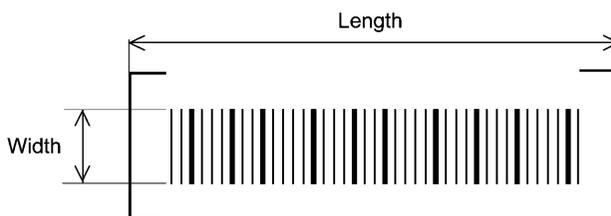
(2) Optical Properties Required for Bar Code Labels

White bars: Reflection intensity 45% min.
 Black bars: Reflection intensity 25% max.
 PCS value 0.45 min.

(3) Bar Code Label Size

Recommended width: 10 mm min. (0.39 inch min.)

Length:	Depth of field (Distance from bar codes to the bar-code reading window)	Length of labels (including margins)
0 mm		33 mm max. (1.30 inches max.) (Minimum narrow bar width: 0.1 mm min.)* ¹
290 mm (11.42 inches)		260 mm max. (10.24 inches max.) (Minimum narrow bar width: 1.2 mm min.)* ⁵



(4) Thickness of Bars and Depth of Field

Minimum narrow bar width	Depth of field
0.15 mm (5.91 mils)	Up to 30 mm (0 to 1.18 inches)* ²
0.33 mm (12.99 mils)	Up to 75 mm (0 to 2.95 inches)* ³
1.0 mm (39.37 mils)	Up to 250 mm (0 to 9.84 inches)* ⁴
1.2 mm (47.24 mils)	Up to 290 mm (0 to 11.42 inches)* ⁵

*¹ Under the following conditions:
 - Ambient illuminance: 500 lux. (Xenon lamp)
 - Code 39
 Narrow bar : Wide bar = 1 : 2.2
 - Reflection intensity of white bars: 85% min.
 Reflection intensity of black bars: 5% max.

*² Under the following conditions:
 - Ambient illuminance: 500 lux. (Xenon lamp)
 - ITF 20 digits
 Narrow bar : Wide bar = 1 : 2.2
 - Reflection intensity of white bars: 85% min.
 Reflection intensity of black bars: 5% max.

*³ Under the following conditions:
 - Ambient illuminance: 500 lux. (Xenon lamp)
 - EAN-13
 - Reflection intensity of white bars: 85% min.
 Reflection intensity of black bars: 5% max.
 - 1.0 magnification

*⁴ Under the following conditions:
 - Ambient illuminance: 500 lux. (Xenon lamp)
 - ITF conforming to the UPC Shipping Container Code
 - Reflection intensity of white bars: 85% min.
 Reflection intensity of black bars: 5% max.
 - 1.0 magnification

*⁵ Under the following conditions:
 - Ambient illuminance: 500 lux. (Xenon lamp)
 - ITF conforming to the UPC Shipping Container Code
 - Reflection intensity of white bars: 85% min.
 Reflection intensity of black bars: 5% max.
 - 1.2 magnifications

Long-range Type (BHT-8000D)

(1) Available Bar Code Types

Bar code type	Bar dimensions	Readable magnification
Universal product codes	0.26 to 0.66 mm (10.24 to 26.0 mils)	0.8 to 2.0 magnifications
EAN-13		
EAN-8		
UPC-A		
UPC-E		
EAN-13 with supplemental codes		
EAN-8 with supplemental codes		
UPC-A with supplemental codes		
UPC-E with supplemental codes	0.15 mm min. (5.9 mils min.) PCS value ≥ 0.9 Reflection intensity difference between white and black bars ≥ 0.8	
2-digit add-on		
5-digit add-on		
Interleaved 2of5 (ITF)		
Standard 2of5 (STF)		
Codabar (NW-7)		
Code 39	0.19 mm min. (7.5 mils min.) (PCS value ≥ 0.45)	
Code 93		
Code 128		

* The all above values are under the following conditions

- Depth of field: 68 mm (2.7")
- Ambient illuminance: 500 lux. (Xenon lamp)

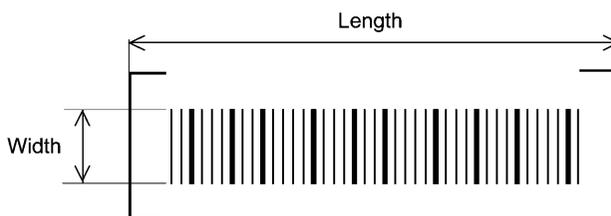
(2) Optical Properties Required for Bar Code Labels

- White bars: Reflection intensity 45% min.
- Black bars: Reflection intensity 25% max.
- PCS value 0.45 min.

(3) Bar Code Label Size

Recommended width: 10 mm min. (0.39 inch min.)

Length:	Depth of field (Distance from bar codes to the bar-code reading window)	Length of labels (including margins)
	68 mm (2.7 inches)	95 mm max. (3.74 inches max.) (Minimum narrow bar width: 0.15 mm min.)* ¹
	400 mm (15.75 inches)	340 mm max. (13.39 inches max.) (Minimum narrow bar width: 1.2 mm min.)* ⁴



(4) Thickness of Bars and Depth of Field

Minimum narrow bar width	Depth of field
0.15 mm (5.91 mils)	20 to 80 mm (0.79 to 3.15 inches)* ¹
0.33 mm (12.99 mils)	Up to 180 mm (7.09 inches)* ²
1.0 mm (39.37 mils)	Up to 300 mm (11.81 inches)* ³
1.2 mm (47.24 mils)	Up to 400 mm (15.75 inches)* ⁴

*¹ Under the following conditions:
 - Ambient illuminance: 500 lux. (Xenon lamp)
 - Code 39
 Narrow bar : Wide bar = 1 : 2.2
 - Reflection intensity of white bars: 85% min.
 Reflection intensity of black bars: 5% max.

*² Under the following conditions:
 - Ambient illuminance: 500 lux. (Xenon lamp)
 - ITF 20 digits
 - Reflection intensity of white bars: 85% min.
 Reflection intensity of black bars: 5% max.

*³ Under the following conditions:
 - Ambient illuminance: 500 lux. (Xenon lamp)
 - ITF conforming to the UPC Shipping Container Code
 - Reflection intensity of white bars: 85% min.
 Reflection intensity of black bars: 5% max.
 - 1.0 magnification

*⁴ Under the following conditions:
 - Ambient illuminance: 500 lux. (Xenon lamp)
 - ITF conforming to the UPC Shipping Container Code
 - Reflection intensity of white bars: 85% min.
 Reflection intensity of black bars: 5% max.
 - 1.2 magnifications

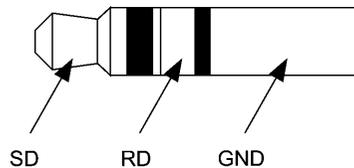
[3] Interface Specifications

IrDA Interface

Synchronization: Start-stop
 Input signals: RD
 Output signals: SD
 Transmission speed: 115,200 bps max.

Direct-connect Interface

Synchronization: Start-stop
 Transmission speed: 115,200 bps max.
 Signal level: Conforms to the RS-232C interface
 Pin assignment: As shown below.



Pin No.	Signal	Functions	Signal Input/Output	
			BHT	External device
1	SG (GND)	Ground for signals		–
2	SD	Send data		→
3	RD	Receive data		←

A.2 CU-8000

[1] Product Specifications

	CU-8001	CU-8002
Power Source	100 VAC (via the AC adapter)	Supplied via the RS-232C interface
Power Consumption	8VA	5V 10 mA, -5V -5mA
Dimensions (W) x (L) x (H)	90 x 176 x 49 mm (3.54 x 6.93 x 1.93 inches)	
Weight	Approx. 170 g	Approx. 160 g
Operating Ambient Temperature	0°C to 40°C (32°F to 104°F)	
Operating Humidity	20% to 80% (with no dew condensation)	

[2] Charging/Discharging Requirements (CU-8001)

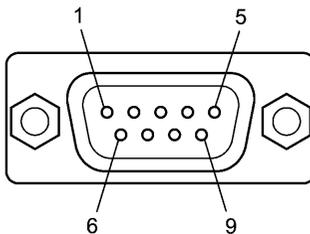
For charging a Ni-MH battery cartridge loaded in the BHT

Charge current: 90 mA
Charge time: Approx. 8 hours

For charging a Ni-MH battery cartridge all by itself

Charge current: 90 mA
Charge time: Approx. 8 hours
Discharge current: 180 mA
Discharge time: Approx. 3 hours

[3] Interface Specifications

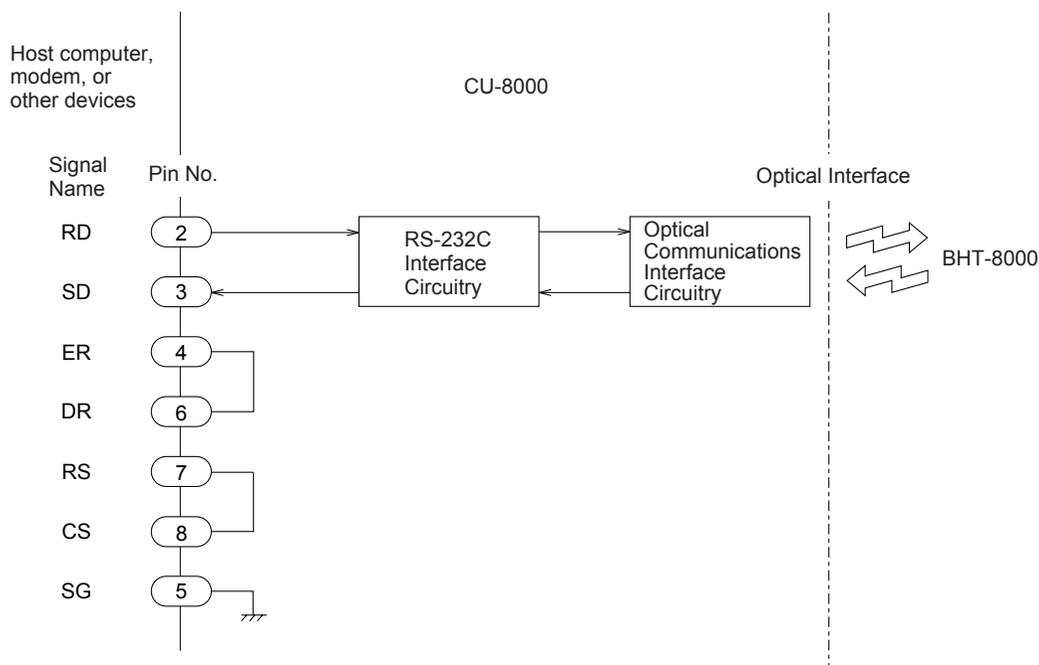


RS-232C interface port (Dsub-9P) on the CU-8000

Pin No.	Signal	Functions	Signal Input/Output	
			CU-8000	External device
2	RD	Receive data		←
3	SD	Send data	→	
4	ER	Data terminal equipment ready	→	
5	SG	Signal ground	—	
6	DR	Data set ready	—	
7	RS	Request to send	—	
8	CS	Ready to send	—	

NOTE

Shown below is a diagram of the internal connection in the CU-8000.

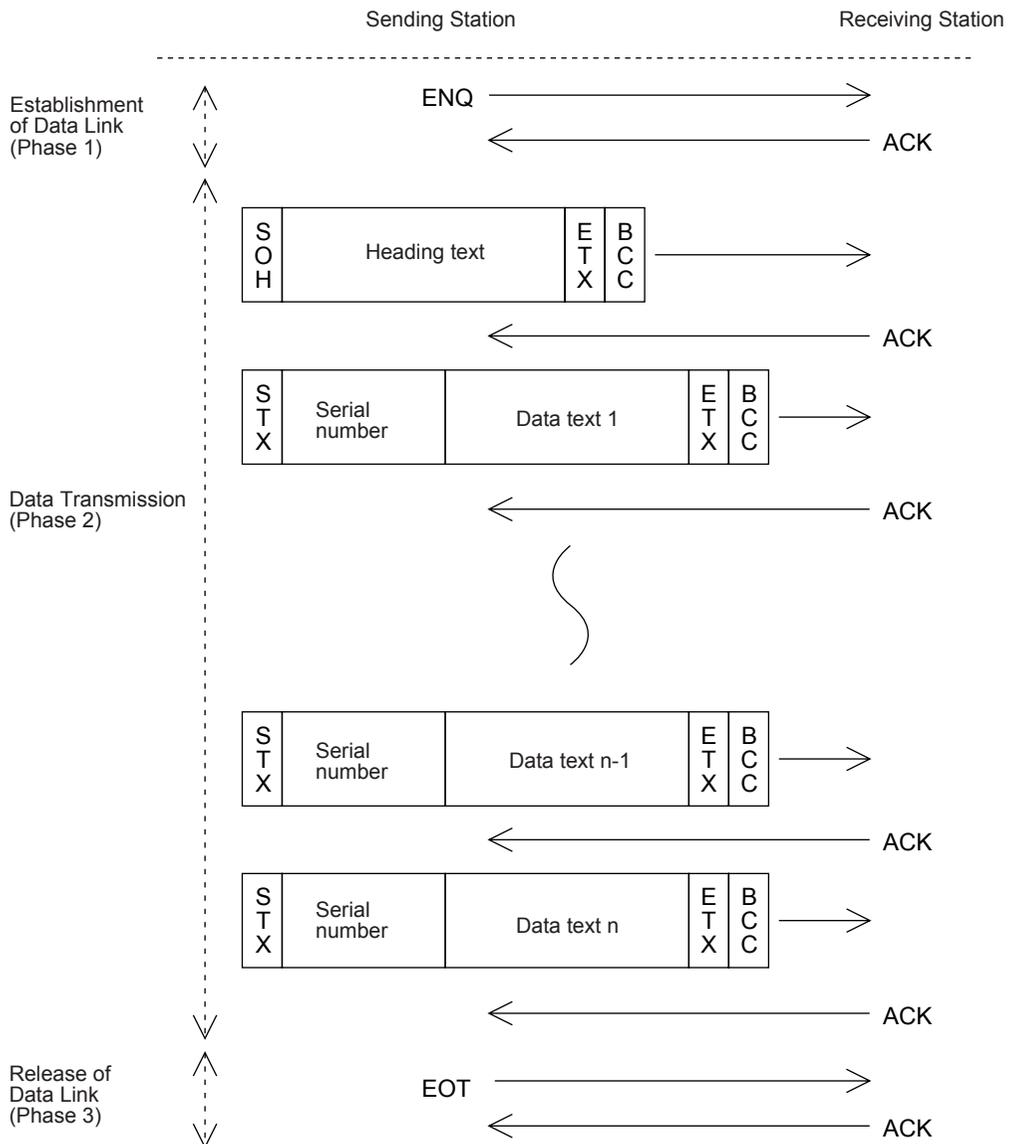


Appendix B. Communications Protocol Details

B.1 BHT-protocol

[1] Transmission Control Sequences

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

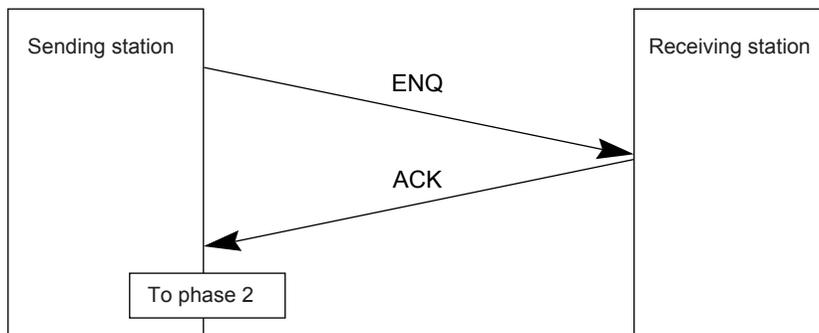


Data transmission may accidentally involve various types of errors. The BHT-protocol is designed to recover from those errors as frequently as possible. What follows is the BHT-protocol for phases 1 through 3.

Phase 1: Establishment of Data Link

■ Normal phase 1

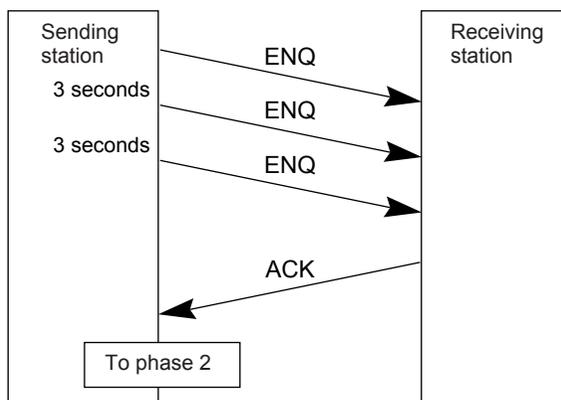
The sending station transmits an ENQ to the receiving station. Upon receipt of an ACK from the receiving station, the sending station shifts to phase 2.



■ Phase 1 with iterated ENQ transmission due to no response or invalid response

If the sending station receives no response or any invalid response from the receiving station in response to an ENQ sent, then 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.

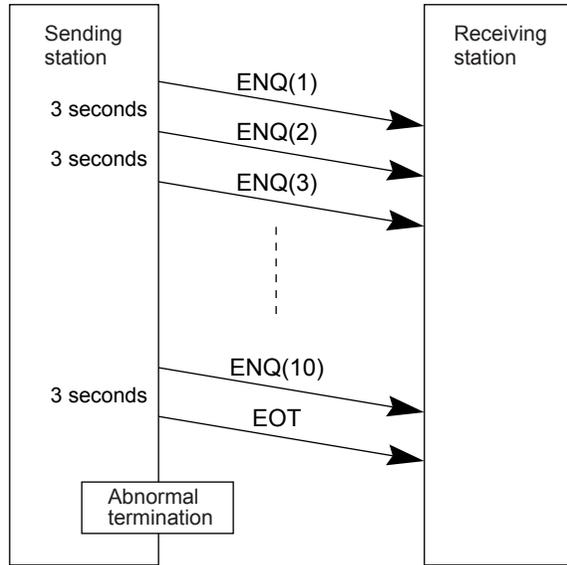


TIP

You may modify the number of ENQ iterations for the sending station. The default is 10 times at three-second intervals. For details, refer to the SET PROTOCOL screen in System Mode (pp. 56 and 58) and the XFILE statement given in "BHT-BASIC Programmer's Manual."

■ 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, then it sends an EOT to the receiving station after three seconds from the 10th ENQ to terminate the message transmission abnormally.



TIP

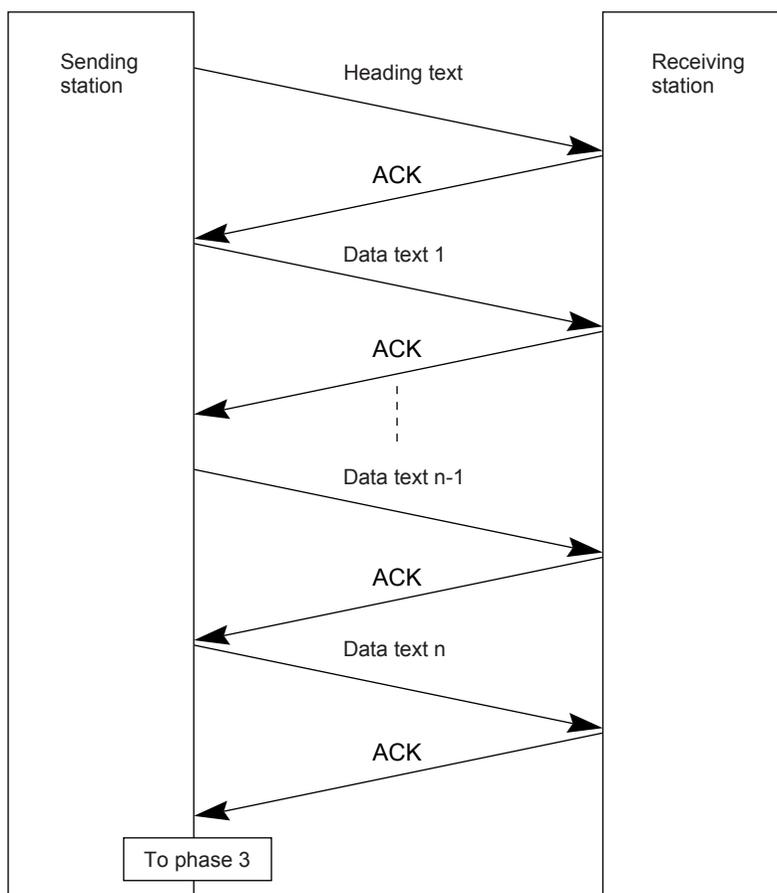
The receiving station's default timeout is 30 seconds. You may modify the timeout length on the SET PROTOCOL screen in System Mode (pp. 56 and 58) or by using the XFILE statement (refer to the "BHT-BASIC Programmer's Manual").

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.

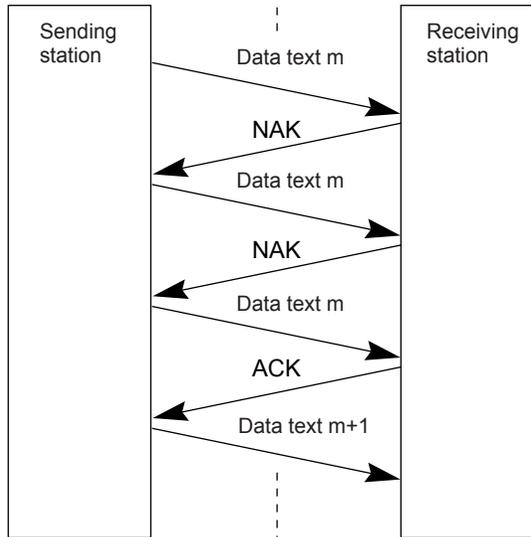
If a transmission message contains no data text, the sending station transmits the heading text only.



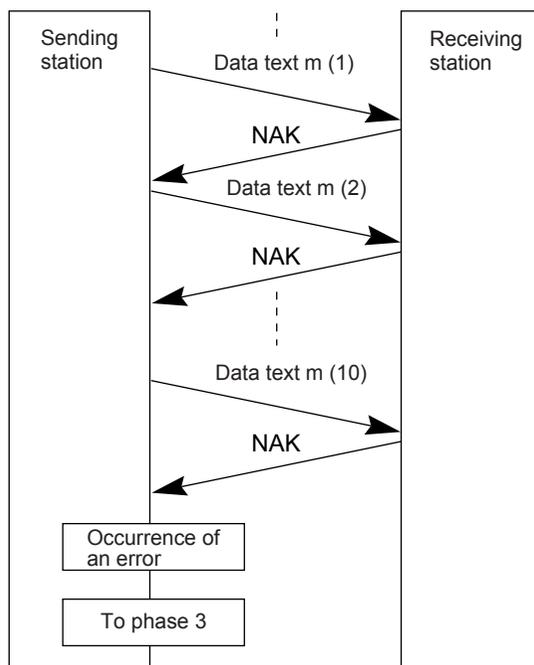
■ Phase 2 with NAK

If the sending station receives a NAK from the receiving station in response to a transmission block containing text data m , then 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.

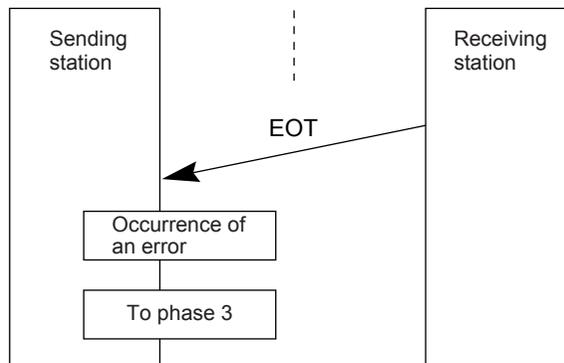


If the sending station receives a NAK 10 times in succession or it fails to send a same transmission block, then it shifts to phase 3 to terminate the message transmission abnormally. Even if the phase 3 terminates normally, the transmission results in an abnormal end.



■ Phase 2 with EOT

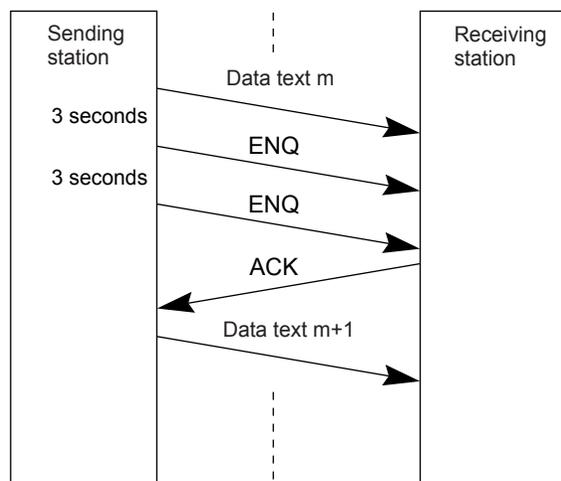
If the sending station receives an EOT anytime during phase 2, it shifts to phase 3 to terminate the message transmission abnormally. Even if the phase 3 terminates normally, the transmission results in an abnormal end.



■ Phase 2 with iterated ENQ transmission due to no response or invalid response

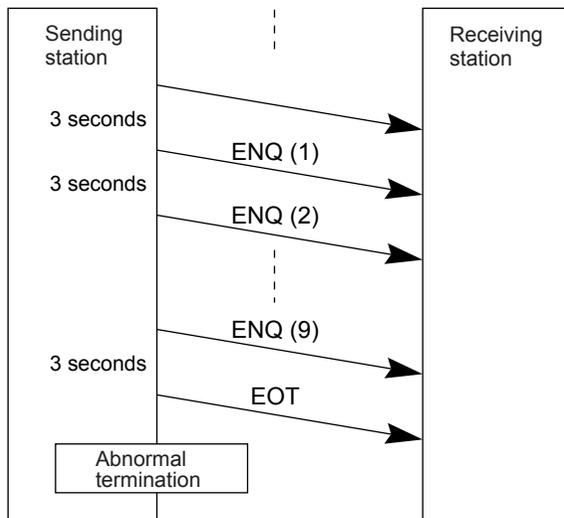
If the sending station receives no response or any invalid response from the receiving station in response to a transmission block sent, then it iterates sending of an ENQ at three-second intervals up to nine times.

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)

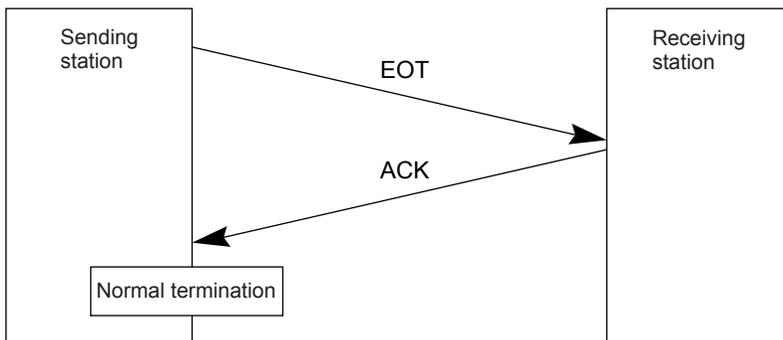
If the sending station receives no ACK from the receiving station after sending an ENQ nine times in succession, then it sends an EOT to the receiving station after 3 seconds from the 9th ENQ to terminate this transmission sequence abnormally.



Phase 3: Release of Data Link

■ Normal phase 3

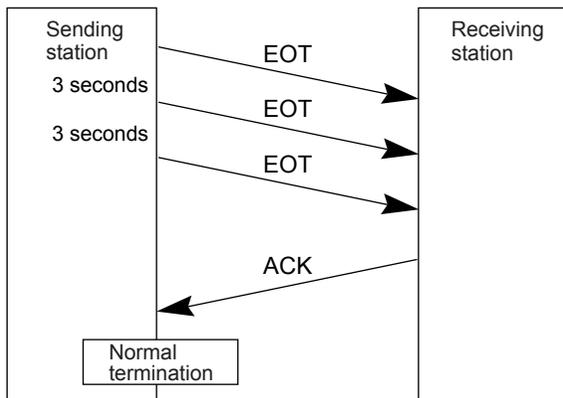
The sending station transmits an EOT to the receiving station. Upon receipt of an ACK from the receiving station, the sending station terminates the message transmission normally and releases the data link.



■ Phase 3 with iterated EOT transmission due to no response or invalid response

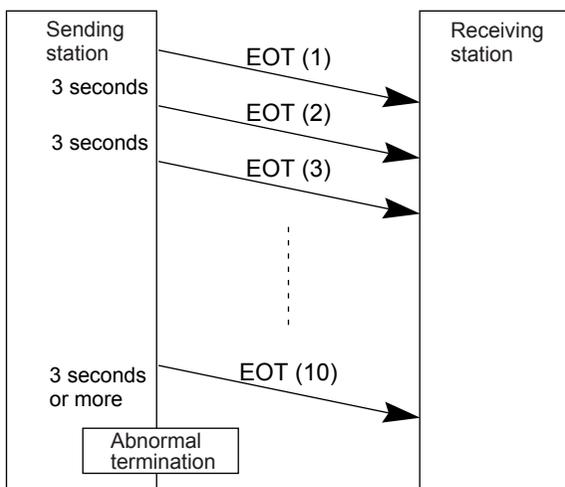
If the sending station receives no response or any invalid response from the receiving station in response to an EOT sent, then it iterates sending of an EOT at three second intervals up to ten times.

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.



[2] Aborting Data Transmission

Pressing the **C** key aborts data transmission.

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

If it is pressed during uploading, the BHT transmits the current transmission block followed by EOT and then aborts the file transmission.

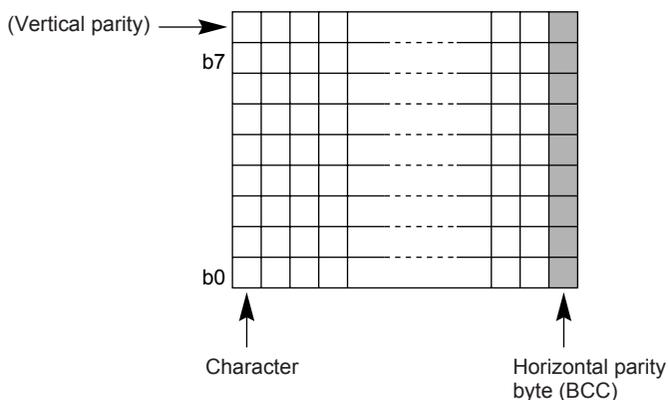
[3] BCC for Horizontal Parity Checking

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

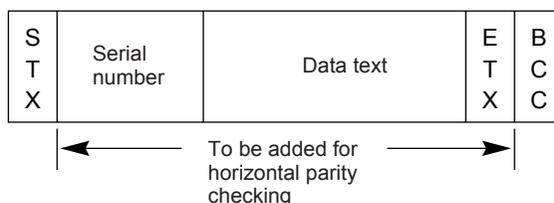
In horizontal parity checking, a horizontal parity byte so called BCC (Block Check Character) is suffixed to an ETX of every transmission block.

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, excluding SOH, STX, and functions SOH\$ and STX\$.

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



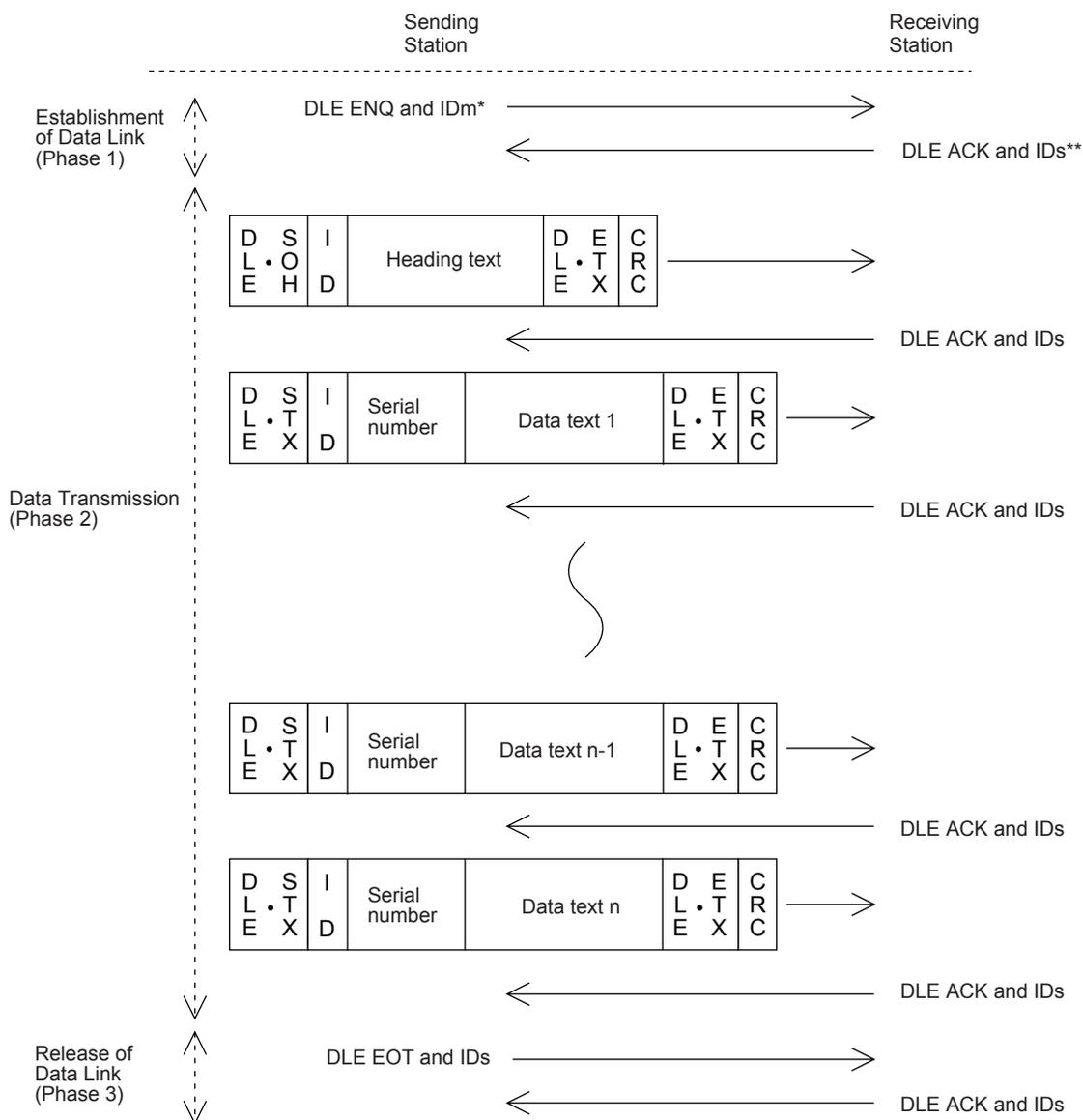
Shown below is a data text block indicating the bits to be added for horizontal parity checking.



B.2 BHT-Ir protocol

[1] Transmission Control Sequences

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



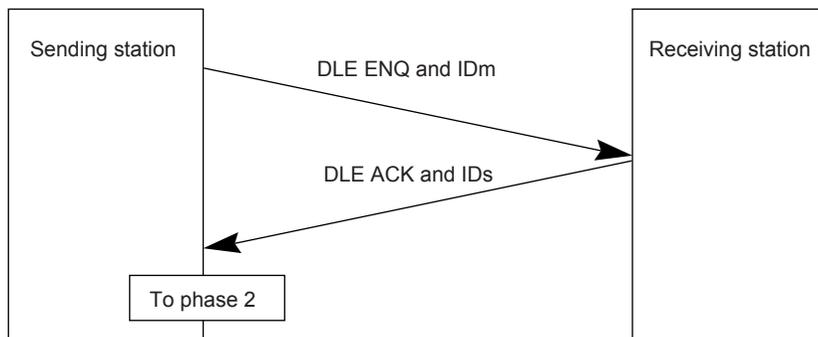
*IDm: ID of sending station
**IDr: ID of receiving station

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

Phase 1: Establishment of Data Link

■ Normal phase 1

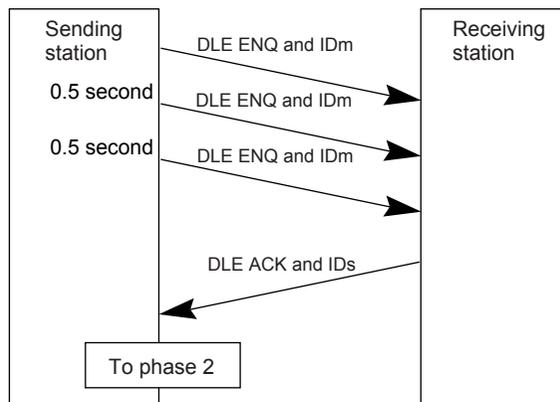
The sending station transmits a sequence of DLE ENQ and IDm (sending station's ID) to the receiving station. Upon receipt of a sequence of DLE ACK and IDs (receiving station's ID) from the receiving station, the sending station shifts to phase 2.



■ Phase 1 with iterated transmission of DLE ENQ and IDm due to no response or invalid response

If the sending station receives no response or any invalid response from the receiving station in response to the sent sequence of DLE ENQ and IDm, then it iterates sending of the sequence at 0.5-second intervals up to 60 times.

If the sending station receives a sequence of DLE ACK and IDs before sending the sequence of DLE ENQ and IDm 60 times, then it shifts to phase 2.

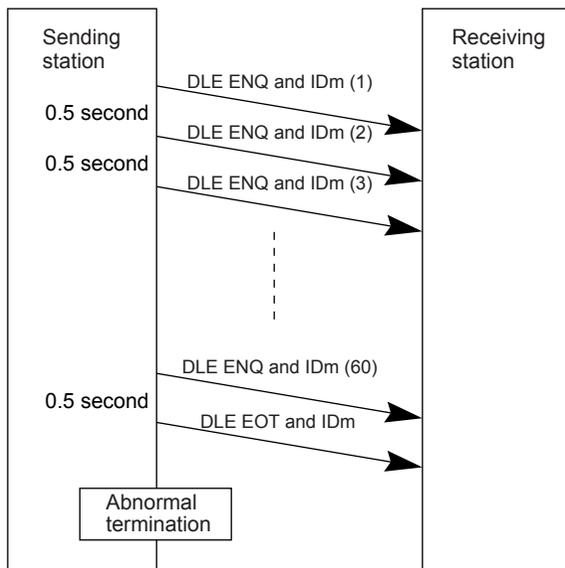


TIP

You may modify the number of iterations of a sequence of DLE ENQ and IDm for the sending station. The default is 60 times at 0.5-second intervals. For details, refer to the SET PROTOCOL screen in System Mode (pp. 56 and 58) and the XFILE statement given in "BHT-BASIC Programmer's Manual."

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

If the sending station receives no sequence of DLE ACK and ID's from the receiving station after sending a sequence of DLE ENQ and IDm 60 times in succession, then it sends a sequence of DLE EOT and IDm to the receiving station after 0.5 second from the 60th sequence of DLE ENQ and IDm, then aborts the message transmission abnormally.



TIP

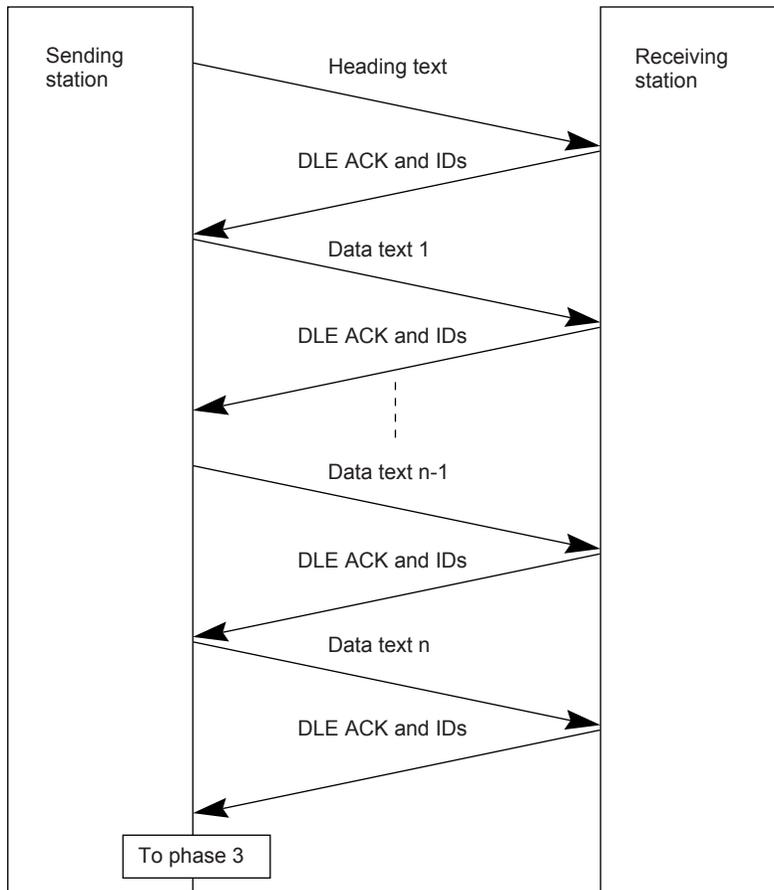
The receiving station's default timeout is 30 seconds. You may modify the timeout length on the SET PROTOCOL screen in System Mode (pp. 56 and 58) or by using the XFILE statement (refer to the "BHT-BASIC Programmer's Manual").

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 a sequence of DLE ACK and IDs from the receiving station, it sends a transmission block containing the data texts as shown below. Upon receipt of a sequence of DLE ACK and IDs in response to the last transmission block (data text n), the sending station shifts to phase 3.

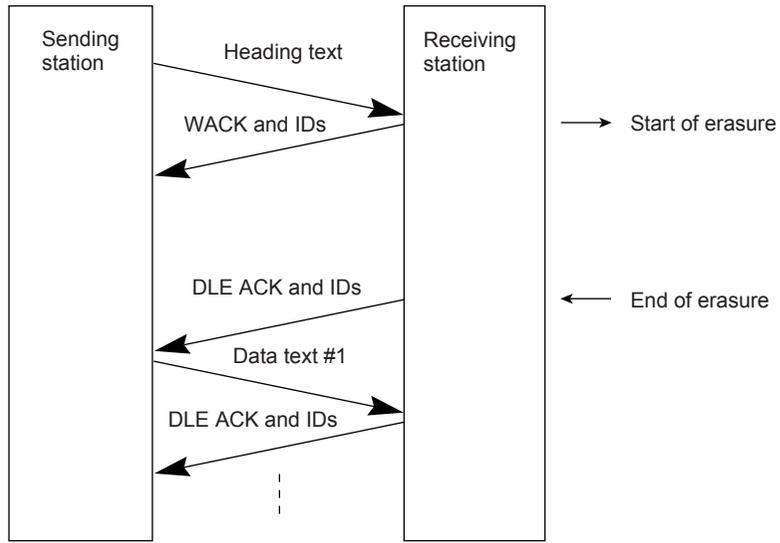
If a transmission message contains no data text, the sending station transmits the heading text only.



■ Phase 2 with suspension of data reception for erasure of the flash memory

If the receiving BHT requires the flash memory to be erased for receiving downloaded files, it sends a sequence of WACK and IDs to the sending station to suspend the data transmission.

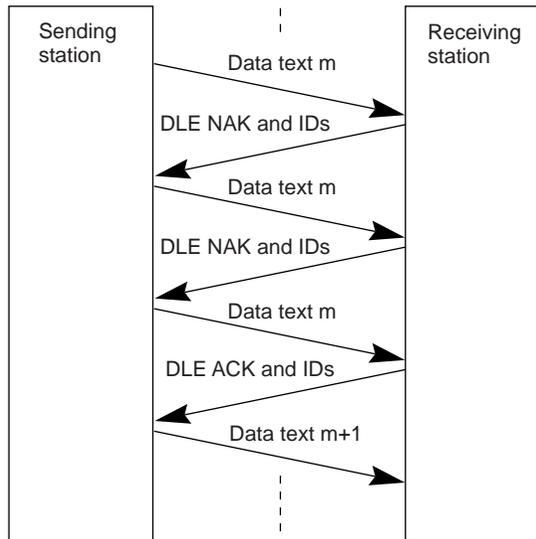
Upon receipt of the sequence of WACK and IDs, the sending station stops the data transmission until any response comes from the receiving station for one minute. If no response comes within one minute, the sending station sends a sequence of DLE EOT and IDs and then aborts the current transmission.



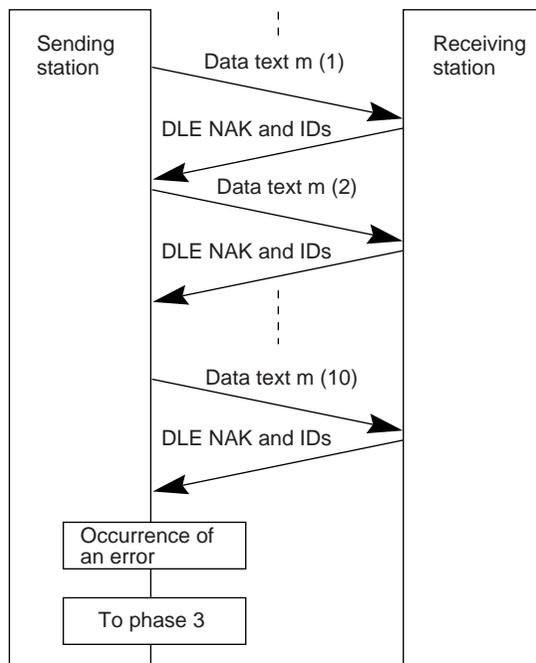
■ Phase 2 with a sequence of DLE NAK and IDs

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

If the sending station receives a sequence of DLE ACK and IDs before receiving the sequence of DLE NAK and IDs 10 times in succession, then it continues the subsequent message transmission.

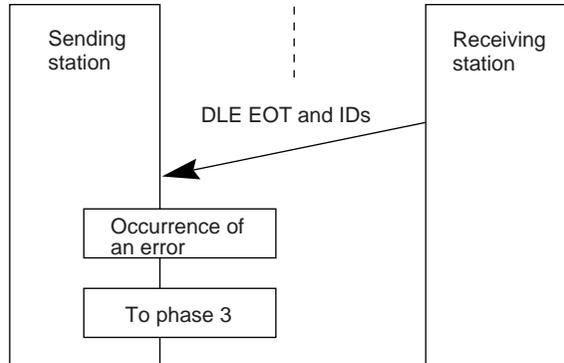


If the sending station receives a sequence of DLE NAK and IDs 10 times in succession or it fails to send a same transmission block, then it shifts to phase 3 to terminate the message transmission abnormally. Even if the phase 3 terminates normally, the transmission results in an abnormal end.



■ Phase 2 with a sequence of DLE EOT and IDs

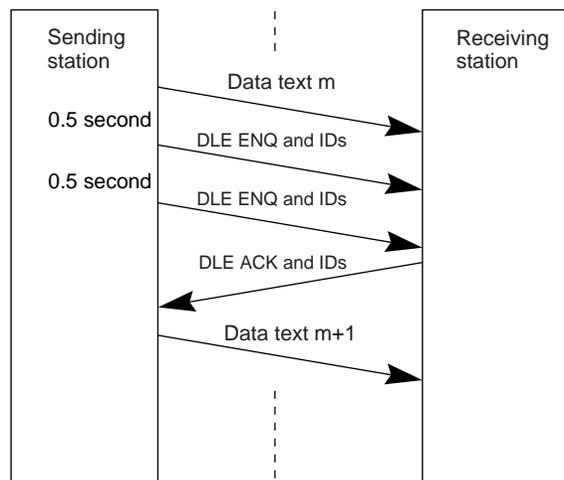
If the sending station receives a sequence of DLE EOT and IDs anytime during phase 2, it shifts to phase 3 to terminate the message transmission abnormally. Even if the phase 3 terminates normally, the transmission results in an abnormal end.



■ Phase 2 with iterated transmission of DLE ENQ and IDs due to no response or invalid response

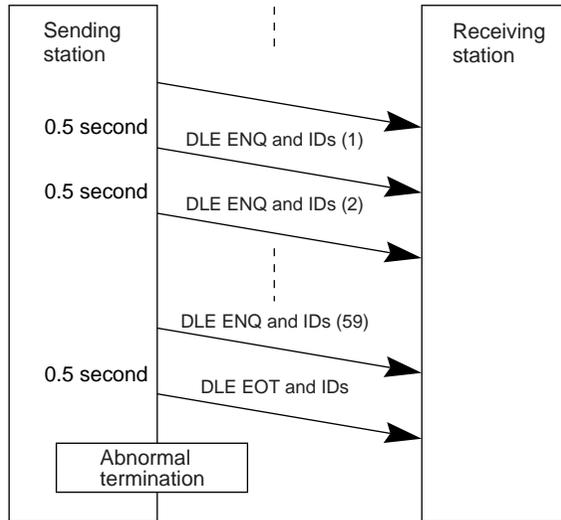
If the sending station receives no response or any invalid response from the receiving station in response to a transmission block sent, it iterates sending of a sequence of DLE ENQ and IDs at 0.5-second intervals up to 59 times.

If the sending station receives a sequence of DLE ACK and IDs before sending the sequence of DLE ENQ and IDs 59 times, it continues the subsequent message transmission.



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

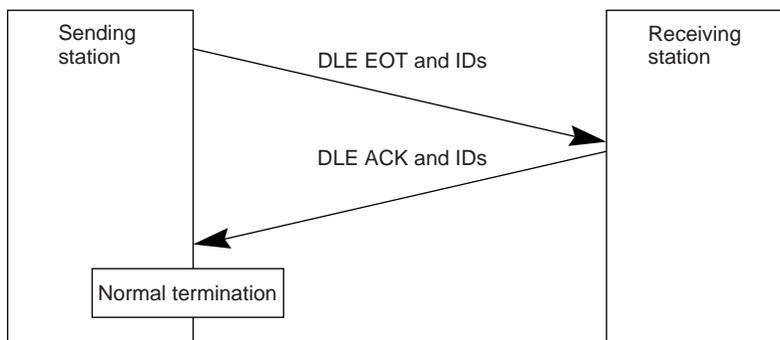
If the sending station receives no sequence of DLE ACK and IDs from the receiving station after sending a sequence of DLE ENQ and IDs 59 times in succession, then it sends a sequence of DLE EOT and IDs to the receiving station after 0.5 second from the 59th sequence of DLE ENQ and IDs and then aborts this transmission abnormally.



Phase 3: Release of Data Link

■ Normal phase 3

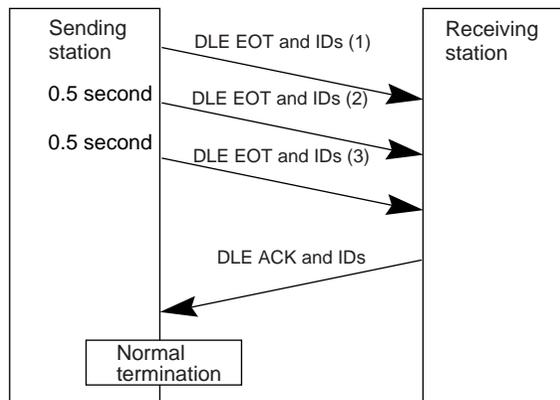
The sending station transmits a sequence of DLE EOT and IDs to the receiving station. Upon receipt of a sequence of DLE ACK and IDs from the receiving station, the sending station terminates the message transmission normally and releases the data link.



■ Phase 3 with iterated transmission of DLE EOT and IDs due to no response or invalid response

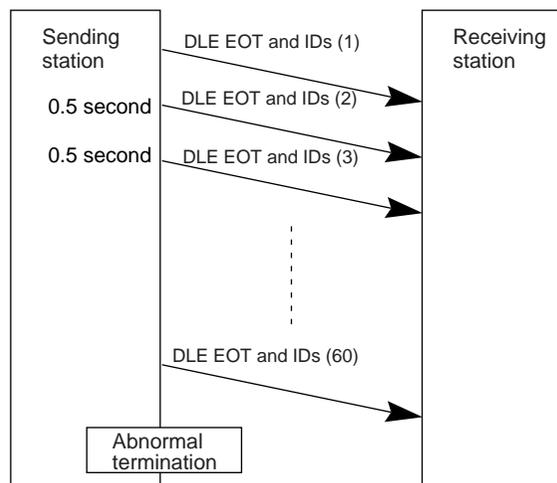
If the sending station receives no response or any invalid response from the receiving station in response to the sent sequence of DLE EOT and IDs, then it iterates sending of the sequence at 0.5-second intervals up to 60 times.

If the sending station receives a sequence of DLE ACK and IDs before sending the sequence of DLE EOT and IDs 60 times, then it terminates the message transmission normally and releases the data link.



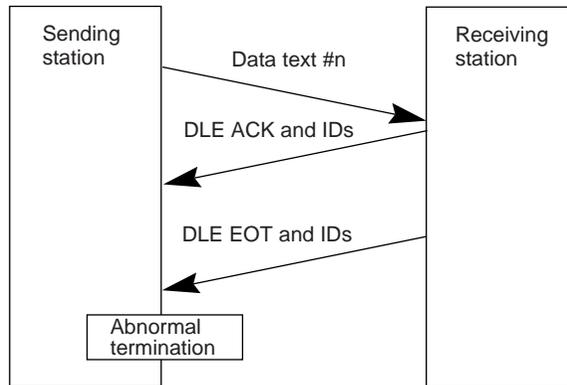
■ Abnormal termination of phase 3

If the sending station receives no sequence of DLE ACK and IDs from the receiving station within 0.5 second from the 60th sequence of DLE EOT and IDs, then it aborts the message transmission abnormally and releases the data link.



■ Phase 3 with timeout at the receiving station

If the receiving station receives no subsequent text or normal sequence of DLE EOT and IDs within 30 seconds after sending a sequence of DLE ACK and IDs, then it sends a sequence of DLE EOT and IDs and aborts the transmission abnormally.



[2] Aborting Data Transmission

Pressing the **C** key aborts data transmission.

If the **C** key is pressed during downloading, the BHT transmits a sequence of DLE EOT and IDs and aborts the file transmission.

If it is pressed during uploading, the BHT transmits the current transmission block followed by a sequence of DLE EOT and IDs and then aborts the file transmission.

[3] CRC

To check whether data has been transmitted accurately, the BHT-Ir protocol supports CRC (Cyclic Redundancy Check) which employs the CRC-16 generating system. In CRC, a CRC character is suffixed to a sequence of DLE ETX of every transmission block.

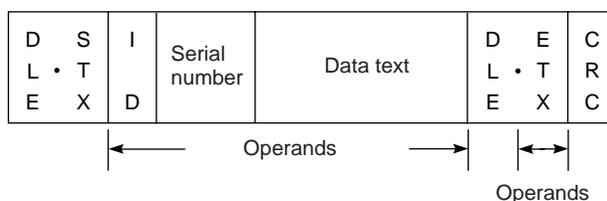
Operands for CRC-16

The CRC generates CRC-16 from all bytes of a transmission block excluding DLE SOH or DLE STX characters (which are at the head of a transmission block), DLE character of DLE ETX and DLE character of DLE DLE in the text.

CRC operation

The CRC system generates CRC-16 as follows: It multiplies the polynomial formed by aligning all of the bits starting from the LSB of the first byte to the MSB of the last byte in a transmission block in descending order, by X^{16} . Next, divide the polynomial by the generative polynomial $X^{16} + X^{15} + X^2 + 1$. The remainder is the value of CRC-16.

Shown below is a data text transmission block and operands for CRC-16 generation.



[4] ID

ID is a 2-digit hexadecimal and designated in 0000h through FFFFh in (2 bytes). 0000h is assigned to the host computer. Any of 0001h through FFFFh is assigned to the BHT as follows.

- The system sets an ID when the BHT is initialized.
- You may set an arbitrary ID in System Mode or by using the OUT statement in BHT-BASIC.

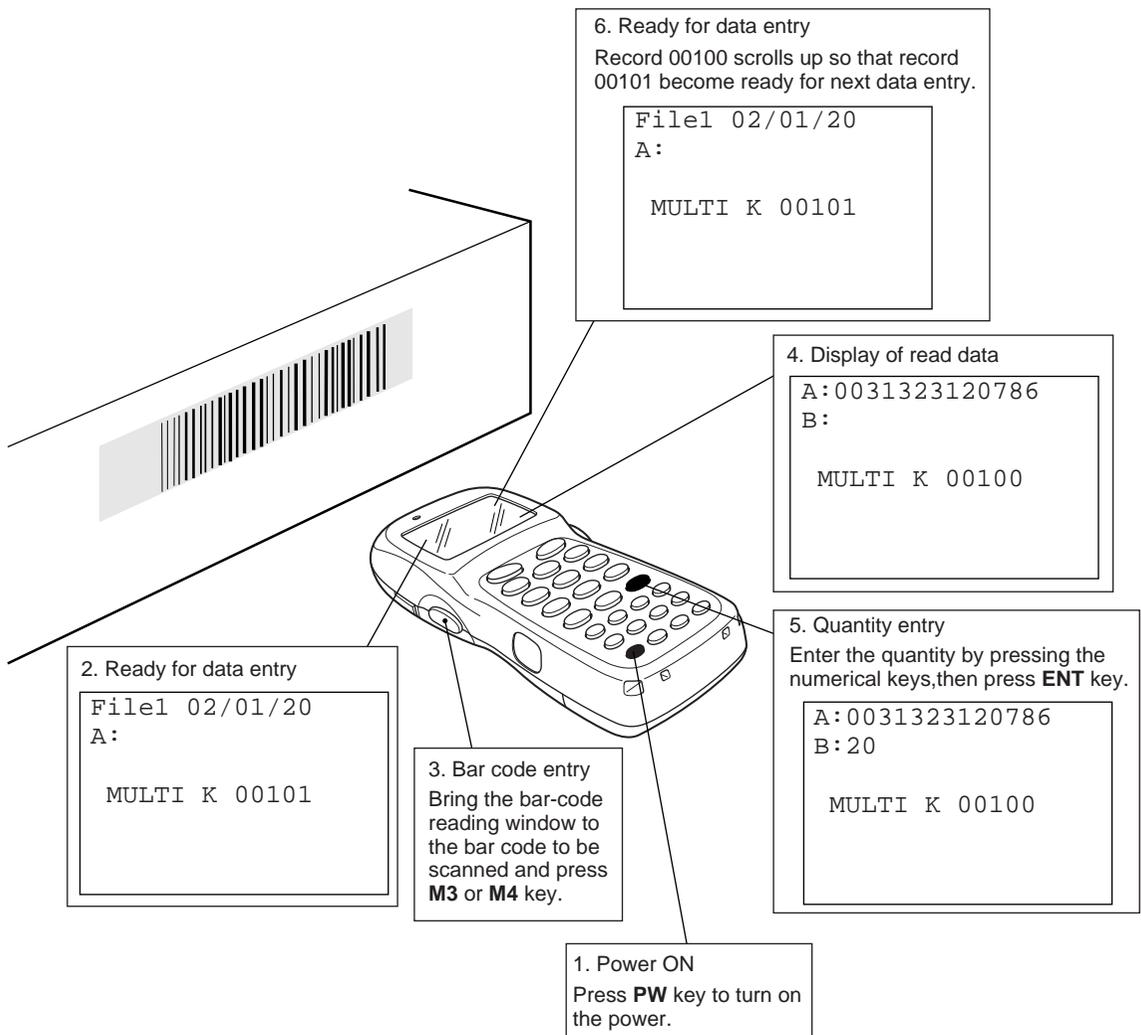
Appendix C. A Typical Basic Operation

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.



Index

Symbols

\$BRKLST.SYS [30](#)
_B80MSG.FN3 [83](#), [84](#), [85](#), [86](#), [87](#)
3-pole mini stereo plug [10](#), [43](#), [70](#), [93](#)
9-pin plug (Dsub-9P) [124](#)

A

abnormal shutdown [112](#)
AC adapter [v](#), [vi](#), [vii](#), [122](#), [124](#)
aging test [38](#), [63](#), [66](#)
auto power-off [28](#)

B

backlight function on/off key [61](#)
backlight, backlight function [4](#), [134](#)
bar-code reading test [38](#), [63](#), [64](#)
batteries [v](#), [vi](#), [vii](#), [16](#), [17](#), [18](#), [20](#), [26](#), [126](#),
[127](#), [128](#), [129](#), [130](#), [134](#)
battery cartridge [ii](#), [v](#), [vi](#), [ix](#), [16](#), [17](#), [18](#), [19](#),
[20](#), [26](#), [27](#), [28](#), [110](#), [111](#), [112](#), [114](#), [120](#),
[126](#), [128](#), [129](#), [130](#), [134](#)
battery cartridge slot [18](#), [128](#), [129](#), [130](#)
battery cover [16](#)
battery cover lock [16](#), [17](#)
battery voltage level [19](#), [25](#), [51](#)
beeper scale test [63](#), [66](#)
beeper test [38](#)
beeper volume [23](#), [24](#), [51](#), [77](#)
BHT-BASIC Compiler [9](#), [10](#), [13](#)
BHT-BASIC Extension Library [9](#)
BHT-BASIC Interpreter [12](#)
BHT-Ir protocol [10](#), [11](#), [56](#), [57](#), [59](#), [98](#), [103](#),
[104](#), [105](#), [106](#), [125](#), [151](#), [152](#), [161](#)
BHT-protocol [11](#), [55](#), [59](#), [98](#), [99](#), [100](#), [101](#), [125](#),
[142](#), [143](#), [150](#)
BHTRMT.PD3 [90](#)
black-and-white inverted label reading function
[54](#)

C

C-600 [18](#), [20](#), [126](#)
calendar clock [12](#), [18](#), [21](#), [26](#), [27](#), [30](#), [35](#),
[37](#), [43](#), [47](#), [50](#), [53](#), [113](#), [134](#)
calendar clock stopped [111](#)
character length [55](#), [57](#), [95](#), [97](#)
CHG1 LED [126](#)
CHG2 LED [129](#), [130](#)
Codabar (NW-7) [50](#), [54](#), [64](#), [135](#), [137](#)
Code 128 [64](#), [135](#), [137](#)
Code 39 [64](#), [135](#), [136](#), [137](#), [138](#)
Code 93 [64](#), [135](#), [137](#)
communications parameter [37](#), [45](#), [49](#),
[55](#), [56](#), [57](#), [77](#), [79](#), [81](#), [83](#), [85](#), [87](#), [97](#), [117](#),
[118](#), [125](#)
communications protocol [ii](#), [55](#), [56](#), [57](#), [58](#), [59](#),
[77](#), [83](#), [92](#), [98](#), [125](#), [142](#)
communications test [38](#), [45](#), [49](#), [63](#), [70](#), [79](#), [81](#),
[85](#), [87](#), [117](#), [118](#)
connector cover [43](#)
control character [98](#), [99](#), [100](#), [103](#), [104](#), [105](#)
CRC [103](#), [161](#)
CU-8000 [ii](#), [v](#), [vii](#), [6](#), [9](#), [10](#), [11](#), [93](#), [120](#), [123](#),
[124](#), [125](#), [128](#), [131](#), [132](#), [139](#), [140](#), [141](#)
CU-8001 [18](#), [20](#), [120](#), [122](#), [124](#), [125](#), [126](#),
[127](#), [128](#), [129](#), [130](#), [131](#)
CU-8002 [120](#), [131](#), [140](#)

D

DCE [132](#)
decode level [54](#)
defective file [69](#)
deleting files [39](#), [75](#)
deleting font files [39](#), [76](#)
DIP switch [123](#)
direct-connect interface, direct connect [vii](#),
[10](#), [11](#), [43](#), [55](#), [57](#), [58](#), [70](#), [72](#), [93](#), [94](#), [95](#),
[97](#), [103](#), [139](#)
directory manager [88](#)
download, downloading [37](#), [39](#), [43](#), [44](#), [45](#),
[77](#), [78](#), [83](#), [84](#), [89](#), [116](#), [125](#)

drivers [12](#)
dry cell support [16](#)
DTE [132](#)

E

EAN-13 [64](#), [135](#), [136](#), [137](#)
EAN-8 [64](#), [135](#), [137](#)
error in system mode settings [114](#)
execution program [30](#), [37](#), [43](#), [50](#), [51](#), [88](#), [89](#),
[90](#), [114](#), [115](#)

F

FIELD SPACE [55](#), [56](#), [58](#)
file test [38](#), [69](#)
flash ROM [76](#), [134](#)
font size [134](#)

H

hand strap [3](#)
horizontal parity [55](#), [56](#), [58](#), [98](#), [150](#)
HT<-->HT COPY [43](#), [47](#)

I

illumination LED [2](#)
indicator LED [2](#), [38](#), [64](#), [67](#)
infrared communication [6](#), [92](#)
initializing, initialization [32](#), [34](#), [35](#)
interface cable [6](#), [9](#), [10](#), [43](#), [93](#), [94](#), [124](#),
[132](#)
interface port [37](#), [43](#), [45](#), [49](#), [50](#), [55](#), [58](#),
[77](#), [79](#), [81](#), [83](#), [85](#), [87](#), [97](#), [117](#), [118](#), [124](#),
[125](#), [131](#), [141](#)
Interleaved 2of5 (ITF) [64](#), [135](#), [137](#)
IR beam [95](#)
IrDA [6](#), [10](#), [58](#), [92](#)
IrDA interface, IrDA interface port [6](#), [9](#),
[10](#), [11](#), [43](#), [55](#), [56](#), [70](#), [71](#), [92](#), [93](#), [95](#), [97](#),
[120](#), [125](#), [139](#)
Ir-Transfer Utility C [9](#), [10](#), [13](#), [44](#), [48](#), [59](#), [125](#)
Ir-Transfer Utility E [9](#), [10](#), [11](#), [13](#), [44](#), [48](#), [59](#),
[125](#)
ITF [50](#), [54](#), [64](#), [134](#), [135](#), [136](#), [137](#), [138](#)

J

JIS font files [13](#)
JIS Level 1 font, JIS1 font [12](#), [13](#), [74](#)
JIS Level 2 font, JIS2 font [12](#), [13](#), [74](#)

K

key-entry, beeper, and vibrator test [73](#)

L

LCD and indicator LED tests [63](#), [67](#)
LCD contrast [23](#), [35](#), [51](#), [77](#)
low battery indication [19](#)
low battery warning [19](#), [110](#)

M

M1 key [4](#), [23](#), [60](#), [61](#), [73](#)
M2 key [60](#), [61](#), [73](#)
M3 key [60](#), [61](#), [73](#)
M4 key [23](#), [60](#), [61](#), [73](#)
magic key [37](#), [50](#), [60](#), [61](#)
memory test [38](#), [65](#)
message version [33](#), [37](#), [38](#), [50](#), [51](#), [74](#)

N

Ni-MH battery cartridge [v](#), [16](#), [17](#), [126](#), [128](#),
[129](#), [130](#), [134](#), [140](#)
no execution program loaded [113](#)
NW-7 [64](#), [135](#), [137](#)

O

one time [26](#), [93](#)
optical communication unit [6](#), [9](#), [120](#)

P

parity [96](#)
POWER LED [126](#), [129](#)
program execution [110](#)
protection sheet (of DIP switch) [123](#)
protocol [55](#), [56](#), [57](#), [58](#), [59](#), [150](#)

R

RAM [63](#), [65](#), [74](#), [134](#)
remote wakeup [39](#), [82](#), [90](#)

response method [98](#), [103](#)
resume data lost [114](#)
resume function [30](#), [37](#), [50](#), [62](#), [88](#), [114](#)
RS-232C [ii](#), [6](#), [9](#), [10](#), [93](#), [120](#), [123](#), [124](#), [125](#),
[131](#), [132](#)

S

serial number [55](#), [56](#), [58](#), [100](#), [105](#)
shift key [37](#), [50](#), [51](#), [60](#), [61](#)
shutdown due to low battery [19](#), [111](#)
small-size font [13](#), [134](#)
Standard 2of5 (STF) [64](#), [135](#), [137](#)
standard-size font [13](#), [134](#)
STF [50](#), [54](#)
stop bit length [55](#), [57](#), [97](#)
supplemental codes [135](#), [137](#)
system administrator to be called [113](#)
system area [12](#)
system down error [114](#)
system information [38](#), [74](#)
system message file [39](#), [83](#), [84](#), [85](#), [86](#), [87](#), [117](#)
system parameter file [39](#), [77](#), [78](#), [79](#), [80](#),
[81](#), [116](#), [117](#)
system program error [110](#)
system program malfunction [112](#)
system status indication [37](#), [51](#), [52](#)

T

timeout [56](#), [58](#), [71](#), [72](#), [82](#), [144](#), [153](#), [160](#)
touch scanning [135](#)
Transfer Utility [9](#), [10](#), [11](#), [13](#), [44](#), [48](#), [59](#),
[102](#), [125](#)
transmission speed, transmit speed [10](#),
[55](#), [56](#), [57](#), [82](#), [92](#), [95](#), [97](#), [123](#), [139](#)
transparency [99](#), [104](#)
trigger switch [2](#), [23](#), [60](#), [61](#), [73](#)
turning-off notes [28](#)

U

UPC-A [64](#), [135](#), [137](#)
UPC-E [64](#), [135](#), [137](#)
upload, uploading [12](#), [21](#), [30](#), [31](#), [37](#), [39](#), [43](#),
[47](#), [48](#), [49](#), [58](#), [59](#), [69](#), [76](#), [77](#), [80](#), [81](#), [83](#),
[86](#), [87](#), [115](#), [117](#), [118](#), [125](#), [150](#), [160](#)
user area [12](#), [13](#), [32](#), [33](#), [34](#), [42](#), [43](#), [62](#), [76](#),
[77](#), [83](#), [84](#), [86](#), [113](#)

V

vertical parity, parity bit [55](#), [57](#), [95](#), [96](#), [97](#),
[150](#)

W

wakeup [90](#)

Bar Code Handy Terminal BHT-8000

User's Manual

First Edition, April 2002

DENSO WAVE INCORPORATED

The purpose of this manual is to provide accurate information in the handling and operating of the BHT-8000. 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.

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