CipherLab

# User Guide

BASIC Language Programming

Part II: Data Communications

For 8 Series Mobile Computers

Version 5.08

CIPHERLAB

**CIPHERLAB CO., LTD.**
Website: http://www.cipherlab.com

# RELEASE NOTES

| Version | Date | Notes |
|---|---|---|

5.09 Sep. 26, 2016 Part I

- Modified: **Appendix I** –

  Symbology Parameter Table for CCD/Laser/Long Range Reader –

  : ‘59’, ’62’, ’65’, ’68’ = Max. 127 (default)

  : ‘60’, ’63’, ’66’, ’69’ = Min. 4 (default)

  Symbology Parameter Table for 2D/Extra Long Range Reader –

  : '61'=1, '62'=Max. 55, '63'=Min. 4

  : '65'=Max. 55, '66'=Min. 4

  : '68'=Max. 55, '69'=Min. 4

  : '88'=1, '89'=Max. 55, '90'=Min. 4

  : '113'=1, '114'=Max. 55, '115'=Min. 4

  : '116'=1, '117'=Max. 55, '118'=Min. 4

  : '119'=1, '120'=Max. 55, '121'=Min. 4

  : '122'=1, '123'=Max. 55, '124'=Min. 4

- Modified: **Appendix II** –

  Scan Engine, CCD or Laser –

  CODE 2 OF 5 FAMILY –

  INDUSTRIAL 25:

  : '59' = Max. 127 (default), '60' = Min. 4 (default)

  INTERLEAVED 25:

  : '62' = Max. 127 (default), '63' = Min. 4 (default)

  MATRIX 25:

  : '65' = Max. 127 (default), '66' = Min. 4 (default)

  MSI –

  : '68' = Max. 127 (default), '69' = Min. 4 (default)

  Scan Engine, 2D or (Extra) Long Range Laser –

  CODABAR –

  :'122'=1, '123'=Max. 55, '124'=Min. 4

  descriptions for Length Qualification added

  CODE 2 OF 5 FAMILY –

  INDUSTRIAL 25 (DISCRETE 25):

  :'119'=1, '120'=Max. 55, '121'=Min. 4

  INTERLEAVED 25:

  :'61'=1, '62'=Max. 55, '63'=Min. 4

  CODE 39 –

  :'88'=1, '89'=Max. 55, '90'=Min. 4

  CODE 93 –

  :'113'=1, '114'=Max. 55, '115'=Min. 4

  MSI –

  :'68'=Max. 55, '69'=Min. 4

  CODE 11 –

  :'116'=1, '117'=Max. 55, '118'=Min. 4

  2D Scan Engine Only –

  MATRIX 25 –

  :'65'=Max. 55, '66'=Min. 4

Part II

- None –

| | | |
|---|---|---|
| 5.08 | Mar. 18, 2016 | Part I |

- Modified: **4.9.1** – Wedge_3$ in the WedgeSetting array
- Modified: **4.16.1** – SET_AUTO_BKLIT() supports 8300
- Modified: **Appendix I** –

  Symbology Parameter Table for CCD/Laser/Long Range Reader –

  : ‘39’ MSI Check Digit Verification (default 0)

  : ‘40’ MSI Check Digit Transmission (default 0)

  : ‘44’ Convert UPC-A to EAN-13 (default 0)

  : ‘300’ ~ ‘307’ & ‘308’ addon security & mode support 8000/8300

  : ‘312’ ~ ‘317’ Quiet Zone Checking supports 8000/8300

  Symbology Parameter Table for 2D/Extra Long Range Reader –

  : ‘24’ Transmit Code 39 Check Digit (default 1)

  : ‘29’ Transmit Interleaved 25 Check Digit (default 1)

  : ‘33’ Transmit Matrix 25 Check Digit (default 1)

  : ‘39’ MSI Check Digit Verification (default 0)

  : ‘51’ Transmit UPC-E0 System Number (default 0)

  : ‘53’ Convert EAN-8 to EAN-13 (default 0)

  : ‘92’ Transmit UPC-E1 Check Digit (default 1)

  : ‘188’, ‘189’ GS1 formatting support 8200
- Modified: **Appendix II** –

  Scan Engine, CCD or Laser –

  : ‘39’ MSI Check Digit Verification (default 0)

  : ‘40’ MSI Check Digit Transmission (default 0)

  : ‘44’ Convert UPC-A to EAN-13 (default 0)

  : ‘300’ ~ ‘307’ & ‘308’ addon security & mode support 8000/8300

  : ‘312’ ~ ‘317’ Quiet Zone Checking supports 8000/8300

  Scan Engine, 2D or (Extra) Long Range Laser –

  : ‘24’ Transmit Code 39 Check Digit (default 1)

  : ‘29’ Transmit Interleaved 25 Check Digit (default 1)

  : ‘39’ MSI Check Digit Verification (default 0)

  : ‘51’ Transmit UPC-E0 System Number (default 0)

  : ‘53’ Convert EAN-8 to EAN-13 (default 0)

  : ‘92’ Transmit UPC-E1 Check Digit (default 1)

  2D Scan Engine Only –

  : ‘33’ Transmit Matrix 25 Check Digit (default 1)

  : ‘188’, ‘189’ GS1 formatting support 8200

Part II

- Modified: **Appendix IV** –

  Bluetooth Examples – Bluetooth HID

  : Wedge_3$ in the WedgeSetting array

  USB Examples – USB HID

  : Wedge_3$ in the WedgeSetting array

5.07 Aug. 19, 2015 Part I

- Modified: descriptions relating to CD-ROM removed
- Modified: **Appendix VII Key Code Table** – MCR/LCR/RCR added for 8200 with Key Code ‘168’

Part II

- None –

5.06 Jun. 22, 2015 Part I

- Modified: **Appendix I** – SYMBOLOGY PARAMETER TABLE FOR CCD/LASER/LONG RANGE READER:
  : 300~306, 308 updated with 8400
  : 312~317 added for Quiet Zone check settings (8200/8400)
- Modified: **Appendix II** – SCAN ENGINE, CCD OR LASER:
  : 300~306 updated with 8400
  : 308 updated with 8400 (Addon Security)
  : 312 ~ 317 added for Quiet Zone check settings (8200/8400)

Part II

- Modified: **Appendix III – Wireless Networking** table updated

5.05 Mar. 06, 2015 Part I

- Modified: **Appendix I** – update “Symbology Parameter Table for CCD/Laser/Long Range Reader” with 180~299 & 300~308
- Modified: **Appendix II** – Scan Engine, CCD or Laser – UPC/EAN Families: “EAN-13 Addon Mode” and “Addon Security for UPC/EAN” added

Part II

- None –

5.04 Mar. 28, 2014 Part I

- Modified: **Appendix I - SYMBOLOGY PARAMETER TABLE I**
  >No. (N1%): 87 (GTIN -> GTIN-14)
- Removed: **Appendix I - SYMBOLOGY PARAMETER TABLE II**
  >No. (N1%): 188 (GS1 formatting for GS1 DataMatrix)
- Modified: **Appendix II Symbology Parameters – Scan Engine, CCD or Laser**
  >UPC/EAN FAMILIES: No. 87 (GTIN -> GTIN-14)
- Removed: **Appendix II – Scan Engine, CCD or Laser – 2D SCAN ENGINE ONLY**
  >2D SYMBOLOGIES|MAXICODE, DATA MATRIX & QR CODE: No. 188

Part II

- Modified: **3.1.2 - Commands**
  >”A$” variable table updated for SET_NET_PARAMETER
- Modified: **Appendix II – Net Parameters by Index – Wireless Networking**
  >-92~-96 (GET)/92~96 (SET) indexes updated

5.03 Feb. 19, 2014 Part I

- Replace “RSS” with “GS1 DataBar”
- Modified: **Chapter 1** – Windows 95/98/7 supported (chapter 1, 2)
- Modified: **2.3 Configure Menu** – descriptions for “Create DBF Files” command revised
- Modified: **4.15 KEYPAD COMMANDS** | **4.15.1 GENERAL** –

  >8000 supports OSK_TOGGLE, GET_TRIGGER, SET_TRIGGER, SET_PWR_KEY commands

  >SET_MIDDLE_ENTER command added for 8400/8700

  >SET_PISTOL_ENTER command added for 8200/8700
- Modified: **4.18 Fonts** | **4.18.4 Special Font Files** –

  >Turkey (33) added to GET_LANGUAGE, SET_LANGUAGE
- Modified: **Appendix I - SYMBOLOGY PARAMETER TABLE I**

  >No. (N1%): 54, 173, 174, 175, 176, 177, 178, 179 added
- Modified: **Appendix I - SYMBOLOGY PARAMETER TABLE II**

  >No. (N1%): 94 (Disable TCIF Linked Code 39 by default)

  >No. (N1%): 174, 176 ~ 179/181 ~ 188 added
- Modified: **Appendix II Symbology Parameters –**

  **Scan Engine, CCD or Laser**

  >Code39: No. 173

  >CODE 128/EAN-128/ISBT 128: No. 174

  >GS1 DataBar FAMILY: No. 175

  >UPC/EAN FAMILIES: No. 54

  >UPC/EAN FAMILIES: UPC-E Triple Check descriptions

  **SCAN ENGINE, 2D OR (EXTRA) LONG RANGE LASER**

  >CODE 128 | UCC/EAN-128: No. 174

  >GS1 DataBar FAMILY: No. 183~185

  **2D SCAN ENGINE ONLY**

  >COMPOSITE CODES | CC-A/B/C: No. 186~187

  >TLC-39: No. 94 (Disable TCIF Linked Code 39 by default)

  >2D SYMBOLOGIES|MAXICODE, DATA MATRIX & QR CODE: No. 188
- Modified: **Appendix III Scanner Parameter –**

  >READ REDUNDANCY: No. 182

  >USER PREFERENCES: No. 181

Part II

- None –

| | | |
|---|---|---|
| 5.02 | Mar. 27, 2013 | Part I<br>▸ Modified: **4.7.2 Code Type** – CodeType Table II: add 8400/8700 2D scan engine to Composite_CC_A/B/C symbologies (Decimal 47/55/118)<br>▸ Modified: **4.15.1 General** – OSK_TOGGLE, SET_PWR_KEY: support for 8400/8700 added<br>▸ Modified: **Appendix I** – Symbology Parameter Table II: add 8400/8700 2D scan engine to No. 44 (Convert UPC-A to EAN-13)<br>▸ Modified: **Appendix II** – Scan Engine, 2D or (extra) Long Range Laser: add 8400/8700 2D scan engine to No. 44 (Convert UPC-A to EAN-13)<br>Part II<br>- None – |
| 5.01 | Dec. 07, 2012 | Part I<br>▸ Modified: **1.1 Directory Structure** – Font Files (8200/8400/8700)<br>▸ Modified: **4.7.2 Code Type Table II** – Symbology added (No. 47/55/118)<br>▸ Added: **4.15 Keypad Commands** – OSK_TOGGLE, SET_PWR_KEY commands added<br>▸ Modified: **4.15.2 ALPHA KEY** – GET_ALPHA_STATE command removed<br>▸ Modified: **4.18.1 Font Size** – 20x20 added<br>▸ Modified: **4.18.4** – SELECT_FONT command modified<br>▸ Modified: **Appendix I** – Symbology Parameter Table II – value & description added (No. 44)<br>Part II<br>- None – |
| 4.24 | Oct. 23, 2012 | Part I<br>▸ Modified: **4.15 Keypad Commands** \| **4.15.1 General** – SET_TRIGGER, GET_TRIGGER commands added for 8200/8400/8700; CHECK_ENTER_KEY for 8200/8700; SET_MIDDLE_ENTER for 8200<br>▸ Modified: **4.16 LCD Commands** \| **4.16.1 Properties** – BACKLIT command revised; GET_BKLIT_LEVEL, SET_AUTO_BKLIT, SET_BKLIT_LEVEL commands added for 8200/8400/8700<br>▸ Modified: **2.5 Help Menu** one command is provided (not three)<br>▸ Modified: **Appendix VII Key Code Table** – MCR/LCR/RCR added for 8200; LCR/RCR added for 8700<br>Part II<br>▸ New: **4.3 Scanning for Wi-Fi Hotspots** – WIFI_SCAN command added for 8200/8400/8700 |
| 4.23 | July. 02, 2012 | Part II<br>▸ New: Appendix II add Wi-Fi Profile index<br>▸ New: Appendix IV add PCAT — Swiss(German) and Hungarian for 8400/8700.<br>▸ New: 4.2 Wi-Fi Profile |

| | | |
|---|---|---|
| 4.22 | Apr. 26, 2012 | Part II<br>▸ Add PCAT — Swiss(German) and Hungarian for 8200.<br>▸ Task: Rename FTP Files — add File already exists. |
| 4.21 | Mar. 13, 2012 | Part I<br>▸ Modified: **Appendix I ScannerDesTbl Array** \| **Symbology Table II** \| Note: MSI and Code 11 are disabled for 8400 2D scan engine by default.<br>▸ Modified: **Appendix II Symbology Parameters** \| **Scan Engine, 2D or (Extra) Long Range Laser** – Note: MSI and Code 11 are disabled for 8400 2D scan engine by default.<br>Part II<br>▸ New: 10.3.1 “Command: FTP_ROUTINE$” \| Remarks \| FTP Task Variable Table - Note (4) |
| 4.20 | Dec. 12, 2011 | Part I<br>▸ None<br>Part II<br>▸ Modified: 8780 removed from the manual.<br>▸ Modified: 10.3.1: Parameters to rename / delete FTP files added to command **FTP_ROUTINE$** for 8200 & 8400.<br>▸ Modified: Appendix V: FTP messages for renaming / deleting FTP files added. |
| 4.10 | Jul. 07, 2011 | Part I<br>▸ Modified: 4.19 Memory Commands — 8700’s updated<br>Part II<br>▸ Modified: 5.1 Bluetooth Profiles Supported — Bluetooth HSP for 8200 removed<br>▸ Modified: Appendix IV Examples — Bluetooth HSP (8200 Only) removed |
| 4.00 | Mar. 21, 2011 | BASIC Programming Guide split into Part I: Basics and Hardware Control, and Part II: Data Communications<br>▸ Modified: add 8200 support<br>▸ Modified: add 8700 support<br>▸ Modified: remove 8580/8590 |

Part I

- 3.2.1 Variable Names and Declaration Characters — add “About Real Number”
- 4.6.2 System Information — SYSTEM_INFORMATION$() for 8200 bootloader version
- 4.10 Buzzer Commands — BEEP() allows setting 8200’s speaker mute
- 4.15.3 FN Key — Auto Resume mode for 8300 allows re-pressing the function key to exit the function mode
- Appendix VII Key Code Table — updated for 8200/8700

Part II

- Add support of Bluetooth HSP and FTP for 8200
- 1.3.1 Commands — SET_COM_TYPE() supports USB Virtual COM_CDC and Bluetooth HSP for 8200
- 8.1.2 USB Virtual COM — add support of USB Virtual COM_CDC for 8200
- 9 GPS Functionality — add support of GPS for 8700
- 10 FTP Functionality

# CONTENTS

# INTRODUCTION

CipherLab BASIC Compiler provides users with a complete programming environment to develop application programs for CipherLab 8 Series Mobile Computers using the BASIC language. The Windows-based Basic Compiler comes with a menu-driven interface to simplify software development and code modifications. Many system configurations, such as COM port properties and database file settings can be set up in the menus. Using this powerful programming tool to get rid of lengthy coding, users can develop an application to meet their own needs efficiently. The CipherLab BASIC Compiler has been modified and improved since its first release in November 1997. Users can refer to RELEASE.TXT for detailed revision history.

This manual is meant to provide detailed information about how to use the BASIC Compiler to write application programs for CipherLab 8 Series Mobile Computers. It is organized in chapters giving outlines as follows:

## Part I: Basics and Hardware Control

| | |
|---|---|
| Chapter 1 | "Development Environment" – gives a concise introduction about the CipherLab BASIC Compiler, the development flow for applications, and the BASIC Compiler Run-time Engines. |
| Chapter 2 | "Using CipherLab BASIC Compiler" – gives a tour of the programming environment of the BASIC Compiler. |
| Chapter 3 | "Basics of CipherLab BASIC Language" – discusses the specific characteristics of the CipherLab BASIC Language. |
| Chapter 4 | "BASIC Commands" – discusses all the supported BASIC functions and statements. More than 200 BASIC functions and statements are categorized according to their functions, and discussed in details. |

## Part II: Data Communications

| | |
|---|---|
| Chapter 1 | "Communication Ports" |
| Chapter 2 | "TCP/IP Communications" |
| Chapter 3 | "Wireless Networking" |
| Chapter 4 | "IEEE 802.11b/g" |
| Chapter 5 | "Bluetooth" |
| Chapter 6 | "GSM/GPRS" |
| Chapter 7 | "Modem, Ethernet & GPRS Connection" |
| Chapter 8 | "USB Connection" |
| Chapter 9 | "GPS Functionality" |
| Chapter 10 | "FTP Functionality" |

Chapter 1

# COMMUNICATION PORTS

There are at least two communication (COM) ports on each mobile computer, namely *COM1* and *COM2*. The user has to call **SET_COM_TYPE** to set up the communication type for the COM ports before using them. Commands for triggering the COM event: **OFF COM**, **ON COM GOSUB...**

Note: SET_COM_TYPE is not applicable to RFID (COM 4).

The table below shows the mapping of the communication (COM) ports. Specifying which type of interface is to be used, the user can use the same commands to open, close, read, and write data (**OPEN_COM**, **CLOSE_COM**, **READ_COM$**, and **WRITE_COM**).

| Series | COM1 | COM2 | COM3 | COM4 | COM5 |
|---|---|---|---|---|---|
| *8000* | Serial IR, IrDA | Acoustic Coupler, Bluetooth | N/A | N/A | N/A |
| *8200* | RS-232 | Bluetooth | N/A | N/A | USB |
| *8300* | RS-232, Serial IR, IrDA | Acoustic Coupler, RF, Bluetooth | N/A | RFID | N/A |
| *8400* | RS-232 | Bluetooth | N/A | N/A | USB |
| *8500* | Serial IR, IrDA | Bluetooth | GSM | RFID | N/A |
| *8700* | RS-232 | Bluetooth | 3.5G | RFID | USB |

Note: (1) The Bluetooth profiles supported include SPP, DUN, HID, and FTP.
(2) Bluetooth FTP is supported on 8200 only.
(3) GSM/GPRS/EDGE or UMTS/HSDPA services are supported on 8700.

## IN THIS CHAPTER

## 1.1 BASICS

### 1.1.1 COMMUNICATION PARAMETERS

#### RS-232 Parameters

| | |
|---|---|
| **Baud Rate:** | 115200, 76800, 57600, 38400, 19200, 9600, 4800, 2400 |
| **Data Bits:** | 7 or 8 |
| **Parity:** | Even, Odd, or None |
| **Stop Bit:** | 1 |
| **Flow Control:** | RTS/CTS, XON/XOFF, or None |

#### Serial IR Parameters

| | |
|---|---|
| **Baud Rate:** | 115200, 57600, 38400, 19200, 9600 |
| **Data Bits:** | 8 |
| **Parity:** | Even, Odd, or None |
| **Stop Bit:** | 1 |
| **Flow Control:** | None |

#### IrDA, USB Parameters

| | |
|---|---|
| **Baud Rate:** | Ignored, included only for compatibility in coding. |
| **Data Bits:** | Ignored, included only for compatibility in coding. |
| **Parity:** | Ignored, included only for compatibility in coding. |
| **Stop Bit:** | Ignored, included only for compatibility in coding. |
| **Flow Control:** | Ignored, included only for compatibility in coding. |

### 1.1.2 RECEIVE & TRANSMIT BUFFERS

#### Receive Buffer

A 256 byte FIFO buffer is allocated for each port. The data successfully received is stored in this buffer sequentially (if any error occurs, e. g. framing, parity error, etc., the data is simply discarded). However, if the buffer is already full, the incoming data will be discarded and an overrun flag is set to indicate this error.

#### Transmit Buffer

The system does not allocate any transmit buffer. It simply records the pointer of the string to be sent. The transmission stops when a null character (0x00) is encountered. The application program must allocate its own transmit buffer and not to modify it during transmission.

## 1.2 FLOW CONTROL

To avoid data loss, three options of flow control are supported and done by background routines.

1) None (= Flow control is disabled.)
2) RTS/CTS
3) XON/XOFF

Note: Flow control is only applicable to the direct RS-232 COM port, which is usually assigned as COM1.

### 1.2.1 RTS/CTS

RTS now stands for *Ready for Receiving* instead of *Request To Send*, while CTS for *Clear To Send*. The two signals are used for hardware flow control.

| Receive |
|---|
| The RTS signal is used to indicate whether the storage of receive buffer is free or not. If the receive buffer cannot take more than 5 characters, the RTS signal is de-asserted, and it instructs the sending device to halt the transmission. When its receive buffer becomes enough for more than 15 characters, the RTS signal becomes asserted again, and it instructs the sending device to resume transmission. As long as the buffer is sufficient (may be between 5 to 15 characters), the received data can be stored even though the RTS signal has just been negated. |

| Transmit |
|---|
| Transmission is allowed only when the CTS signal is asserted. If the CTS signal is negated (= de-asserted) and later becomes asserted again, the transmission is automatically resumed by background routines. However, due to the UART design (on-chip temporary transmission buffer), up to five characters might be sent after the CTS signal is de-asserted. |

### 1.2.2 XON/XOFF

Instead of using RTS/CTS signals, two special characters are used for software flow control — XON (hex 11) and XOFF (hex 13). XON is used to enable transmission while XOFF to disable transmission.

| Receive |
| --- |
| The received characters are examined to see if it is normal data (which will be stored to the receive buffer) or a flow control code (set/reset transmission flag but not stored). If the receive buffer cannot take more than 5 characters, an XOFF control code is sent. When the receive buffer becomes enough for more than 15 characters, an XON control code will be sent so that the transmission will be resumed. As long as the buffer is sufficient (may be between 5 to 15 characters), the received data can be stored even when in XOFF state. |

| Transmit |
| --- |
| When the port is opened, the transmission is enabled. Then every character received is examined to see if it is normal data or flow control codes. If an XOFF is received, transmission is halted. It is resumed later when XON is received. Just like the RTS/CTS control, up to two characters might be sent after an XOFF is received. |

Note: If receiving and transmitting are concurrently in operation, the XON/XOFF control codes might be inserted into normal transmit data string. When using this method, make sure that both sides feature the same control methodology; otherwise, dead lock might happen.

## 1.2.3 COMMANDS

**GET_CTS** **8200, 8300, 8400, 8700**

| | |
|---|---|
| Purpose | To check the current CTS state on the direct RS-232 port. |
| Syntax | *A%* = GET_CTS(*N%*) |
| Remarks | "*A%*" is an integer variable to be assigned to the result. |

| A% | Meaning |
|---|---|
| 0 | CTS signal is negated. (= space) |
| 1 | CTS signal is asserted. (= mark) |

"*N%*" is an integer variable, indicating on which COM port to get CTS level.

Example

```
A% = GET_CTS(1)
```

**SET_RTS** **8200, 8300, 8400, 8700**

| | |
|---|---|
| Purpose | To set the RTS signal on the direct RS-232 port. |
| Syntax | SET_RTS(*N1%*, *N2%*) |
| Remarks | "*N1%*" is an integer variable, indicating on which COM port to set RTS level. |
| | "*N2%*" is an integer variable, indicating the RTS state. |

| N2% | Meaning |
|---|---|
| 0 | RTS signal is negated. (= space) |
| 1 | RTS signal is asserted. (= mark) |

Example

```
SET_RTS(1, 1)                  ' set COM1 RTS to the “mark” state
```

## 1.3 CONFIGURE SETTINGS

### 1.3.1 COMMANDS

**COM_DELIMITER**

| | |
|---|---|
| Purpose | To change delimiter of sending and receiving string for a specified COM port. |
| Syntax | COM_DELIMITER(*N%*, *C%*) |
| Remarks | The default COM_DELIMITER is 0x0d (CR).<br>"*N%*" is an integer variable, indicating which COM port is to be set.<br>"*C%*" is an integer variable, representing the ASCII code of the delimiter character, in the range of 0 to 255. If it is negative, no delimiter will be applied. |
| Example | `COM_DELIMITER(1, 13)          ' use RETURN as delimiter`<br>`COM_DELIMITER(1, 10)          ' use Line Feed as delimiter` |

**IRDA_TIMEOUT** **8000, 8300, 8500**

| | |
|---|---|
| Purpose | To set the timeout for IrDA connection. |
| Syntax | IRDA_TIMEOUT(*N%*) |
| Remarks | "*N%*" is an integer variable in the range of 1 to 8, indicating a specified period of time. |

| N% | Meaning |
|---|---|
| 1 | 3 sec |
| 2 | 8 sec |
| 3 | 12 sec |
| 4 | 16 sec |
| 5 | 20 sec |
| 6 | 25 sec |
| 7 | 30 sec |
| 8 | 40 sec |

Example

```
IRDA_TIMEOUT(7)                ' set timeout to 30 seconds
```

## SET_COM_TYPE

| | |
|---|---|
| Purpose | To assign the communication type to a specified COM port. |
| Syntax | SET_COM_TYPE(*N%*, *type%*) |
| Remarks | "*N%*" is an integer variable, indicating which COM port is to be set. Refer to the COM Port Mapping table. |
| | "*type%*" is an integer variable, indicating the type of interface. |

| TYPE% | Meaning |
|---|---|
| 1 | Direct RS-232 |
| 2 | I/O pins via cradle (8200/8400/8700) |
| 3 | Serial IR via IR transceiver (8000/8300/8500);<br>Auto-detect (8200/8400/8700) |
| 4 | Standard IrDA (8000/8300/8500) |
| 5 | RF, Bluetooth SPP/DUN/HID<br>RF, Bluetooth SPP/DUN/HID (8200) |
| 6 | GSM_SMS (8500/8700) |
| 7 | Acoustic Coupler (8000/8300); GSM_Modem (8500/8700) |
| 8 | USB HID (8400/8700) |
| 9 | USB Virtual COM (8200/8400/8700) |
| 10 | USB Mass Storage (8200/8400/8700) |
| 11 | USB Virtual COM_CDC (8200/8700) |

**This function needs to be called BEFORE opening a COM port. However, it is not necessary for RFID.**

Note that the COM port mapping is different for each model of mobile computer, and a COM port may not support all the communication types.

Example

```
SET_COM_TYPE(1, 3)          ' set COM1 of 8300 to serial IR communication
```

## SET_COM

| | |
|---|---|
| Purpose | To set parameters for a specified COM port. |
| Syntax | SET_COM(*N%*, *Baudrate%*, *Parity%*, *Data%*, *Handshake%*) |
| Remarks | **This command needs to be called BEFORE opening a COM port. However, it is not necessary for RF, GSM, and RFID.** |

This command also serves Bluetooth configuration for SPP, DUN, HID and Wedge. Refer to Bluetooth Examples.

| Parameters | Values | Remarks |
|---|---|---|
| *N%* | 1 or 2 | Indicates which COM port is to be set. |
| *Baudrate%* | 1: 115200 bps<br>2: 76800 bps Note<br>3: 57600 bps<br>4: 38400 bps<br>5: 19200 bps<br>6: 9600 bps<br>7: 4800 bps Note<br>8: 2400 bps Note | Specifies the baud rate of the COM port.<br>▸ For acoustic coupler setting, 1 ~ 4 is used to indicate its volume (low to high). |
| | Note: These are not applicable to Serial IR. | |
| *Parity%* | 1: None<br>2: Odd<br>3: Even<br>4: Cradle commands | Specifies the parity of the COM port.<br>Refer to Appendix IV — Cradle Commands. |
| *Data%* | 1: 7 data bits<br>2: 8 data bits | Specifies the data bits of the COM port. |
| *Handshake%* | 1: None<br>2: CTS/RTS<br>3: XON/XOFF<br>4: Wedge<br>5 ~ 14: 2 stop bits<br>15: for DTMF only | ▸ Specifies the method of flow control for direct RS-232.<br>▸ Set 1 for Serial IR or IrDA.<br>▸ For 8000/8300 Series, to disable Reserved Host Commands, add 16 to the value of Handshake%. (see table below)<br>▸ For 8300 Series, to enable URPower 5V, add 32 to the value of Handshake%. (see table below)<br>▸ For acoustic coupler, 5 ~ 14 is used to indicate the character delay for 2 stop bits; 15 is for DTMF mode only.<br>5 for Bell202 – 0 character delay;<br>6 for Bell202 – 1 character delay;<br>7 for Bell202 – 3 characters delay; |

| | | |
|---|---|---|
| | | 8 for Bell202 – 5 characters delay;<br>9 for Bell202 – 10 characters delay;<br>10 for V23 – 0 character delay;<br>11 for V23 – 1 character delay;<br>12 for V23 – 3 characters delay<br>13 for V23 – 5 characters delay;<br>14 for V23 – 10 characters delay;<br>15 for DTMF 8 characters delay 2 characters gap. |

| Value | Handshake% | Reserved Host Commands | URPower 5V |
|---|---|---|---|
| 1 | None | Enabled | Disabled |
| 17 | (=1+16) | Disabled | Disabled |
| 33 | (=1+32) | Enabled | Enabled |
| 49 | (=1+16+32) | Disabled | Enabled |
| 2... | CTS/RTS | Same options | Same options |
| 3... | XON/XOFF | Same options | Same options |
| 4... | Wedge Emulator | Same options | Same options |

Example

```
SET_COM(1, 1, 1, 2, 1)      ' COM1, 115200, None, 8, No handshake
SET_COM(1, 1, 1, 2, 17)     ' COM1, 115200, None, 8, No handshake,
                            Reserved Host Commands disabled
SET_COM(1, 1, 1, 2, 33)     ' COM1, 115200, None, 8, No handshake,
                            URPower 5V enabled
SET_COM(1, 1, 1, 2, 49)     ' COM1, 115200, None, 8, No
                            handshake,Reserved Host Commands
                            disabled, URPower 5V enabled
```

## 1.4 OPEN AND CLOSE COM

### 1.4.1 COMMANDS

**CLOSE_COM**

| | |
|---|---|
| Purpose | To terminate communication and disable a specified COM port. |
| Syntax | CLOSE_COM(*N%*) |
| Remarks | "*N%*" is an integer variable, indicating which COM port is to be disabled. |
| Example | `CLOSE_COM(2)` |

**OPEN_COM**

| | |
|---|---|
| Purpose | To enable a specified COM port and initialize communication. |
| Syntax | OPEN_COM(*N%*) |
| Remarks | "*N%*" is an integer variable, indicating which COM port is to be enabled. |
| Example | `OPEN_COM(1)` |

## 1.5 READ AND WRITE DATA

### 1.5.1 COMMANDS

| **IRDA_STATUS** | **8000, 8300, 8500** |
|---|---|
| Purpose | To check the IrDA connection status or transmission status. |
| Syntax | *A%* = IRDA_STATUS(*N%*) |
| Remarks | "*A%*" is an integer variable to be assigned to the result.<br>"*N%*" is an integer variable, indicating the action to take. |

| N% | Meaning |
|---|---|
| 0 | To check IrDA connection status.<br>▶ When A% = 0, it means the IrDA connection is disabled.<br>▶ When A% = 1, it means the IrDA connection is enabled. |
| 1 | To check whether data being transmitted successfully or not.<br>▶ A% is the length of string (delimiters are included). |

Example

```
CLS
SET_COM_TYPE(1, 4)                  ' set COM1 of 8300 as IrDA port
OPEN_COM(1)

Loop1:
IF (IRDA_STATUS(0) = 1) THEN        ' check connection
    BEEP(4400, 5)
ELSE
    GOTO Loop1
END IF
WRITE_COM(1, "My Data")
IF (IRDA_STATUS(1) = 7) THEN        ' check transmission
    PRINT "Write OK"
ELSE
    PRINT "Write NG"
END IF
CLOSE_COM(1)
```

## READ_COM$

| | |
|---|---|
| Purpose | To read data from a specified COM port. |
| Syntax | *A$* = READ_COM$(*N%*) |
| Remarks | "*A$*" is a string variable to be assigned to the data. |
| | "*N%*" is an integer variable, indicating from which COM port the data is to be read. If the receive buffer is empty, an empty string will be returned. |

Example

```
    ON COM(1) GOSUB HostCommand
    …
HostCommand:
    Cmd$ = READ_COM$(1)
    CmdIdentifier$ = LEFT$(Cmd$, 1)
    DBFNum% = VAL(MID$(Cmd$, 2, 1))
    IDFNum% = VAL(MID$(Cmd$, 3, 1))
    CardID$ = RIGHT$(Cmd$,LEN(Cmd$)-3)
    IF CmdIdentifier$ = "-" THEN
        DEL_RECORD(DBFNum%, IDFNum%)
    ELSE
    …
```

## WRITE_COM

| | |
|---|---|
| Purpose | To send a string to the host through a specified COM port. |
| Syntax | WRITE_COM(*N%*, *A$*) |
| Remarks | "*N%*" is an integer variable, indicating which COM port the data is to be sent to. |
| | "*A$*" is a string variable, representing the string to be sent. |

Example

```
    ON READER(1) GOSUB BcrData_1
    …
BcrData_1:
    BEEP(2000, 5)
    Data$ = GET_READER_DATA$(1)
    WRITE_COM(1, Data$)
    …
```

# Chapter 2

# TCP/IP COMMUNICATIONS

Here are the BASIC functions and statements related to TCP/IP networking.

Commands for triggering the TCPIP event: **OFF TCPIP**, **ON TCPIP GOSUB…**

## IN THIS CHAPTER

## 2.1 CONFIGURE SETTINGS

### 2.1.1 COMMANDS

**IP_CFG or IP_CONFIGURE**

| | |
|---|---|
| Purpose | To configure the TCP/IP setting. |
| Syntax | IP_CFG(*index%*, *IP$*) or IP_CONFIGURE(*index%*, *IP$*) |
| Remarks | **This command is to be replaced by SET_NET_PARAMETER.**<br>Note that it is not necessary to configure the setting every time.<br>"*index%*" is an integer variable, indicating a specific configuration item.<br>"*IP$*" is a string variable indicating the IP address that is to be configured. |
| Example | `IP_CFG(1, "192.168.1.241")          ' set local IP`<br>`IP_CFG(2, "255.255.255.0")          ' set IP of subnet mask`<br>`IP_CFG(3, "192.168.1.250")          ' set IP of default gateway`<br>`IP_CFG(4, "168.95.1.1")             ' set IP of DNS server` |

**SOCKET_IP**

| | |
|---|---|
| Purpose | To get network settings. |
| Syntax | *A$* = SOCKET_IP(*port%*) |
| Remarks | **This command is to be replaced by GET_NET_PARAMETER$.** |
| Example | `NetSetting$ = SOCKET_IP(0)` |

## 2.2 OPEN AND CLOSE CONNECTION

### 2.2.1 COMMANDS

**DNS_RESOLVER**

| | |
|---|---|
| Purpose | To get the remote IP address by remote name. |
| Syntax | *IP$* = DNS_RESOLVER(*A$*) |
| Remarks | "*IP$*" is a string variable to be assigned to the result. |
| | "*A$*" is a string variable, indicating a specific remote name. |
| | Note that it is necessary to define the DNS server IP before running this command. |
| Example | `GetIP$ = DNS_RESOLVER("www.cipherlab.com")` |

**NCLOSE**

| | |
|---|---|
| Purpose | To close a TCP/IP connection. |
| Syntax | NCLOSE(*N%*) |
| Remarks | "*N%*" is an integer variable in the range of 0 to 5, indicating the connection number. |

| N% | Meaning |
|---|---|
| 0~3 | TCP/IP connection |
| 4 | FTP connection<br>(currently supported on 8000, 8200, 8300, 8400, 8700 only) |
| 5 | Bluetooth FTP connection (currently supported on 8200 only) |

Example `NCLOSE(0)`

## TCP_OPEN

| | |
|---|---|
| Purpose | To open a TCP/IP connection. |
| Syntax | TCP_OPEN(*N%, IP$, RP%, LP%* [, *Protocol%*] [, *Delimiter%*]) |

Remarks

**Note that this function must be called before using any socket read/write commands.**

"*N%*" is an integer variable in the range of 0 to 5, indicating the connection number. For FTP, refer to 10.2.1 Command: TCP_OPEN.

| N% | Meaning |
|---|---|
| 0~3 | TCP/IP connection |
| 4 | FTP connection<br>(currently supported on 8000, 8200, 8300, 8400, 8700 only) |
| 5 | Bluetooth FTP connection (currently supported on 8200 only) |

"*IP$*" is a string variable, indicating the IP address of the remote port. If it is set to "0.0.0.0", the connection will become server mode and the LP% must be defined.

"*RP%*" is an integer variable, indicating the port number of the remote port, which is to be connected. It has to be a positive integer in client mode. However, it has to be set to 0 when in server mode.

"*LP%*" is an integer variable, indicating the port number of the local port. It has to be a positive integer in server mode. However, it has to be set to 0 when in client mode.

| | Server mode | Client mode | |
|---|---|---|---|
| N% | 0 ~ 3 | 0 ~ 4 | 5 |
| IP$ | "0,0,0,0" | Required | "0,0,0,0" |
| RP% | 0 | Required | 0 |
| LP% | Required | 0 | 0 |

"*Protocol%*" is an integer variable, indicating the networking protocol in use. This parameter is optional and it is set to 0 by default (using TCP/IP protocol). If it is set to 1, the system will use UDP/IP protocol. However, it can only be set to 2 for FTP and Bluetooth FTP.

"*Delimiter%*" is an integer variable, indicating whether to transmit the delimiter or not. This parameter is optional and it is set to 0x0d (Carriage Return) by default. The valid values range from 0 to 255. If it is set to -1, the system will not transmit any delimiter.

Example

```
TCP_OPEN(0, "0.0.0.0", 0, 23)
TCP_OPEN(1, "0.0.0.0", 0, 24)
TCP_OPEN(2, "0.0.0.0", 0, 25, 1)
TCP_OPEN(3, "0.0.0.0", 0, 26, 0, 59)
TCP_OPEN(4, "192.168.6.24", 0, 21, 2, 59)
TCP_OPEN(5, "0.0.0.0", 0, 0, 2, 59)
```

## 2.3 READ AND WRITE DATA

### 2.3.1 COMMANDS

#### NREAD$

| | |
|---|---|
| Purpose | To read data from a TCP/IP connection. |
| Syntax | *A$* = NREAD$(*N%*) |
| Remarks | "*A$*" is a string variable to be assigned to the result.<br>"*N%*" is an integer variable in the range of 0 to 3, indicating the connection number. |
| Example | `A$ = NREAD$(0)` |

#### NWRITE

| | |
|---|---|
| Purpose | To write data to a TCP/IP connection. |
| Syntax | NWRITE(*N%*, *A$*) |
| Remarks | "*N%*" is an integer variable in the range of 0 to 3, indicating the connection number.<br>"*A$*" is a string variable, representing the string to be sent to the connection. |
| Example | `NWRITE(0, "Hello")` |

#### SOCKET_CAN_SEND

| | |
|---|---|
| Purpose | To check if data can be sent. |
| Syntax | *A%* = SOCKET_CAN_SEND(*N%*, *L%*) |
| Remarks | "*A%*" is an integer variable to be assigned to the result. |

| A% | Meaning |
|---|---|
| 0 | Normal – data can be sent |
| 3000 | Invalid connection number |
| 3004 | Connection is closed |
| 3007 | Cannot send data |
| 3012 | Never run START TCPIP |

"*N%*" is an integer variable in the range of 0 to 3, indicating the connection number.

"*L%*" is an integer variable, indicating the length of data.

| | |
|---|---|
| Example | `A% = SOCKET_CAN_SEND(0, 10)` |

## SOCKET_HAS_DATA

| | |
|---|---|
| Purpose | To check if data is available. |
| Syntax | *A%* = SOCKET_HAS_DATA(*N%*) |
| Remarks | "*A%*" is an integer variable to be assigned to the result. |

| A% | Meaning |
|---|---|
| 0 | Normal – data in buffer. |
| 3000 | Invalid connection number |
| 3004 | Connection is closed |
| 3005 | No data |
| 3012 | Never run START TCPIP |

"*N%*" is an integer variable in the range of 0 to 3, indicating the connection number.

Example

```
A% = SOCKET_HAS_DATA(0)
```

## SOCKET_OPEN

| | |
|---|---|
| Purpose | To check if the remote end of connection is open. |
| Syntax | *A%* = SOCKET_OPEN(*N%*) |
| Remarks | "*A%*" is an integer variable to be assigned to the result. |

| A% | Meaning |
|---|---|
| 0 | Normal – connection is open |
| 3000 | Invalid connection number |
| 3004 | Connection is closed |
| 3012 | Never run START TCPIP |

"*N%*" is an integer variable in the range of 0 to 3, indicating the connection number.

Example

```
ConnectState% = SOCKET_OPEN(0)
```

## 2.4 GET TCP/IP MESSAGE

### 2.4.1 COMMAND

**GET_TCPIP_MESSAGE**

| | |
|---|---|
| Purpose | To get the message of TCPIP event trigger. |
| Syntax | *A%* = GET_TCPIP_MESSAGE |
| Remarks | This command can also be called in normal program to detect the TCP/IP status by polling method. Once it is fetched, the message will be cleared by the system. |
| | When entering TCPIP event trigger, the first thing is to call this routine so that the trigger message will be cleared out. |
| | "*A%*" is an integer variable to be assigned to the result. |

| A% | Meaning |
|---|---|
| 4000 | Connection #0 overflow |
| 4001 | Connection #1 overflow |
| 4002 | Connection #2 overflow |
| 4003 | Connection #3 overflow |
| 4013 | Abnormal break during connection |
| 4014 | Networking initialization error |
| 4015 | Port initialization error |
| 4020 | Connection #0: connected |
| 4021 | Connection #1: connected |
| 4022 | Connection #2: connected |
| 4023 | Connection #3: connected |
| 4040 | Connection #0: disconnected |
| 4041 | Connection #1: disconnected |
| 4042 | Connection #2: disconnected |
| 4043 | Connection #3: disconnected |
| 4060 | Connection #0: data is coming |
| 4061 | Connection #1: data is coming |
| 4062 | Connection #2: data is coming |
| 4063 | Connection #3: data is coming |
| 4080 | IP is ready |

Example

```
    ON TCPIP GOSUB TCPIP_Trigger
    …
TCPIP_Trigger:
    MSG% = GET_TCPIP_MESSAGE
    …
```

## 2.5 GET TCP/IP ERROR CODE

### 2.5.1 COMMAND

**TCP_ERR_CODE**

| | |
|---|---|
| Purpose | To check the result after running any command related to TCP/IP (except STOP TCPIP). |
| Syntax | *A%* = TCP_ERR_CODE |
| Remarks | "*A%*" is an integer variable to be assigned to the result, indicating an error description. If a routine is working normally, the return value will be 0 in general. However, it will return "N%"(the connection number) for TCP_OPEN and "1 ~ 255"(the length of data being read) for NREAD$. |

| A% | Meaning |
|---|---|
| 0 | Normal |
| 3000 | Invalid connection number |
| 3001 | Connection is already opened. |
| 3002 | Undefined local port in server mode |
| 3003 | Undefined remote port in client mode |
| 3004 | Connection is closed. |
| 3005 | No data received in buffer |
| 3006 | Data is too long. |
| 3007 | Networking is busy or data is too long. |
| 3008 | Data transmission error |
| 3009 | Hardware initialization failure |
| 3010 | START TCPIP has already been running. Need to run STOP TCPIP. |
| 3011 | All connections are unavailable. |
| 3012 | Never run START TCPIP |
| -10 | Parameter error |
| -11 | Host is not reachable. |
| -12 | Time out |
| -13 | Hardware failure |
| -14 | Protocol error |
| -15 | No buffer space |
| -16 | Invalid connection block |
| -17 | Invalid pointer argument |
| -18 | Operation would block. |
| -19 | Message is too long. |
| -20 | Protocol unavailable |
| -30 | Unknown remote name |

| A% | Meaning |
|---|---|
| -31 | DNS protocol error (package class) |
| -32 | DNS protocol error (package type) |
| -33 | Remote name too long (more than 38 characters) |

Example

```
ERR% = TCP_ERR_CODE
```

Chapter 3

# WIRELESS NETWORKING

This section describes the commands related to wireless network configuration. These command sets are only applicable to the mobile computers according to their hardware configuration. Refer to Appendix IV — Examples.

- WLAN stands for IEEE 802.11b/g
- SPP stands for Serial Port Profile of Bluetooth
- DUN stands for Dial-Up Networking Profile of Bluetooth for connecting a modem
- DUN-GPRS stands for Dial-Up Networking Profile of Bluetooth for activating a mobile's GPRS
- HID stands for Human Interface Device Profile of Bluetooth
- FTP stands for File Transfer Protocol Profile of Bluetooth
- GSM stands for Global System for Mobile Communications
- GPRS stands for General Packet Radio Service
- UMTS stands for Universal Mobile Telecommunications System
- HSDPA stands for High Speed Downlink Packet Access

Wireless Product Family

| **Mobile Computer** | **8000** | **8200** | **8300** | **8400** | **8500** | **8700** |
|---|---|---|---|---|---|---|
| Bluetooth only | 8062 | 8260 | 8362 | 8400 | 8500 | 8700 |
| WLAN (802.11b/g) only | 8071 | | 8370 | | | |
| Bluetooth + WLAN | | 8230 | 8330 | 8470 | 8570 | 8770 |
| Bluetooth + WLAN + WWAN | | | | | | 8790 |

Note: (1) Refer to the previous section for port mapping of Bluetooth and GSM.
(2) GSM/GPRS/EDGE or UMTS/HSDPA services are supported on 8700.
(3) Bluetooth FTP is supported on 8200 only.

## IN THIS CHAPTER

## 3.1 NETWORK CONFIGURATION

Before bringing up (initializing) the network, some related parameters must be configured. These parameters are kept by the system during normal operations and power on/off cycles.

### 3.1.1 IMPLEMENTATION

The parameters can be accessed through System Menu or an application program (via **GET_NET_PARAMETER$**, **SET_NET_PARAMETER**). Refer to Appendix II — Net Parameters by Index.

Note: The parameters will be set back to the default values when updating kernel.

### 3.1.2 COMMANDS

**GET_NET_PARAMETER$**

| | |
|---|---|
| Purpose | To get network settings. |
| Syntax | *A$* = GET_NET_PARAMETER$(*index%*) |
| Remarks | "*A$*" is a string variable to be assigned to the result. |
| | "*index%*" is an integer variable, indicating a specific configuration item by index number. See Appendix II — Net Parameters by Index. |

| Error Code | Meaning |
|---|---|
| 0 | Normal status: connection is open |
| 3000 | Invalid index number |
| 3004 | Connection is closed |
| 3012 | Never run START TCPIP |

| | |
|---|---|
| Example | `NetSetting$ = GET_NET_PARAMETER$(0)` |
| See Also | SOCKET_IP, TCP_ERR_CODE |

## SET_NET_PARAMETER

| | |
|---|---|
| Purpose | To configure network settings. |
| Syntax | SET_NET_PARAMETER(*index%*, *A$*) |
| Remarks | "*index%*" is an integer variable, indicating a specific configuration item by index number. See Appendix II — Net Parameters by Index. |
| | "*A$*" is a string variable indicating the network setting to be configured. |

| A$ | Setup string |
|---|---|
| (Boolean type) | "Enable" / "Disable" |
| Authentication | "Open" / "Share" |
| WEP Key Length | "64 bits" / "128 bits" |
| System Scale | "Low" / "Medium" / "High" / "Custom-Txrate" / "Custom-RSSI" |
| Preamble Type | "Short" / "Long" / "Both" |
| WPA Pass Phrase | 8 ~ 63 characters |
| RoamingTxLimit_11b | "1Mbps" / "2Mbps" / "5.5Mbps" / "11Mbps" |
| RoamingTxLimit_11g | "1Mbps" / "2Mbps" / "5.5Mbps" / "11Mbps"<br>"6Mbps" / "9Mbps" / "12Mbps" / "18Mbps"<br>"24Mbps" / "36Mbps" / "48Mbps" / "54Mbps" |
| SCAN_CHANNEL | "bbbbbbbbbbbbbb". b=1 or 0 |
| SCAN_CHANNEL_TIME | "60" / "70" / "80" / "90" / "100" / "110" |
| ROAMING_RSSI_THRESHOLD | "-50" / "-55" / "-60" / "-65" / "-70" / "-75" / "-80" / "-85" / "-90" |
| ROAMING_RSSI_DELTA | "0" / "5" / "10" / "15" / "20" |
| ROAMING_PERIOD | "3" / "4" / "5" / "6" / "7" / "8" / "9" / "10" |

For indexes 5 ~ 10, 19, 20, 25, 27, 32, you may simply input an empty string to clear settings.

P_SCAN_CHANNEL, P_SCAN_CHANNEL_TIME, P_ROAM_RSSI_THRHOLD, P_ROAM_RSSI_DELTA, P_ROAM_PERIOD are available only for 8200.

Note that it is not necessary to configure the setting every time.

Example

```
SET_NET_PARAMETER(1, "192.168.1.241")  ' set local IP
SET_NET_PARAMETER(11, "Disable")       ' disable DHCP
SET_NET_PARAMETER(22, "Short")         ' set preamble type "Short"
SET_NET_PARAMETER(12, "Share")         ' set authentication "Share
                                       Key"
```

See Also IP_CFG, TCP_ERR_CODE

## 3.2 INITIALIZATION & TERMINATION

After the networking parameters are properly configured, an application program can call **START TCPIP** to initialize any wireless module (802.11b/g, Bluetooth, or GSM/GPRS) and networking protocol stack.

- The wireless modules will not be powered until **START TCPIP** is called.
- When an application program needs to stop using the network, **STOP TCPIP** must be called to shut down the network as well as the modules (so that power can be saved). To enable the network again, **START TCPIP** must be called again.

Note: Any previous network connection and data will be lost after calling STOP TCPIP.

### 3.2.1 OVERVIEW

| | | |
|---|---|---|
| **8000 Series** | | |
| 8062 | START TCPIP (3) | Enables mobile's GPRS functionality via Bluetooth (DUN) |
| 8071 | START TCPIP | Enables 802.11b/g (WLAN) |
| **8200 Series** | | |
| 8230 | START TCPIP<br>START TCPIP (0) | Enables 802.11b/g (WLAN) |
| | START TCPIP (3) | Enables mobile's GPRS functionality via Bluetooth (DUN) |
| | START TCPIP (5) | Enables PPP connection via direct RS-232 (to a generic modem) |
| 8260 | START TCPIP (3) | Enables mobile's GPRS functionality via Bluetooth (DUN) |
| | START TCPIP (5) | Enables PPP connection via direct RS-232 (to a generic modem) |
| **8300 Series** | | |
| 8330 | START TCPIP<br>START TCPIP (0) | Enables 802.11b/g (WLAN) |
| | START TCPIP (3) | Enables mobile's GPRS functionality via Bluetooth (DUN) |
| | START TCPIP (5) | Enables PPP connection via direct RS-232 (to a generic modem) |
| 8362 | START TCPIP (3) | Enables mobile's GPRS functionality via Bluetooth (DUN) |
| | START TCPIP (5) | Enables PPP connection via direct RS-232 (to a generic modem) |
| 8370 | START TCPIP | Enables 802.11b/g (WLAN) |
| | START TCPIP (5) | Enables PPP connection via direct RS-232 (to a generic modem) |

| | | |
|---|---|---|
| **8400 Series** | | |
| 8400 | START TCPIP (3) | Enables mobile's GPRS functionality via Bluetooth (DUN) |
| | START TCPIP (5) | Enables PPP connection via direct RS-232 (to a generic modem) |
| 8470 | START TCPIP<br>START TCPIP (0) | Enables 802.11b/g (WLAN) |
| | START TCPIP (3) | Enables mobile's GPRS functionality via Bluetooth (DUN) |
| | START TCPIP (5) | Enables PPP connection via direct RS-232 (to a generic modem) |
| **8500 Series** | | |
| 8500 | START TCPIP (3) | Enables mobile's GPRS functionality via Bluetooth (DUN) |
| 8570 | START TCPIP<br>START TCPIP (0) | Enables 802.11b/g (WLAN) |
| | START TCPIP (3) | Enables mobile's GPRS functionality via Bluetooth (DUN) |
| **8700 Series** | | |
| 8700 | START TCPIP (3) | Enables mobile's GPRS functionality via Bluetooth (DUN) |
| 8770 | START TCPIP<br>START TCPIP (0) | Enables 802.11b/g (WLAN) |
| | START TCPIP (3) | Enables mobile's GPRS functionality via Bluetooth (DUN) |
| 8790 | START TCPIP<br>START TCPIP (0) | Enables 802.11b/g (WLAN) |
| | START TCPIP (2) | Enables 3.5G |
| | START TCPIP (3) | Enables mobile's GPRS functionality via Bluetooth (DUN) |
| **All Series** | | |
| via Modem Cradle | START TCPIP (4) | Enables PPP connection via Modem Cradle |
| via Ethernet Cradle | START TCPIP (6) | Enables Ethernet connection via Ethernet Cradle |

Note: START TCPIP (7) is used to enable GPRS connection via 8400 GPRS Cradle only.

## 3.2.2 COMMANDS

### START TCPIP

| | |
|---|---|
| Purpose | To enable TCP/IP communication. |
| Syntax | START TCPIP<br>START TCPIP(*N%*) |
| Remarks | This routine is used to perform general initialization. It must be the first network function call, and cannot be called again unless STOP TCPIP has been called.<br>"*N%*" is an integer variable, indicating which wireless module is to be used. |

| N% | Meaning |
|---|---|
| 0 | 802.11b/g (default) |
| 1 | Reserved |
| 2 | GPRS |
| 3 | Mobile's GPRS via Bluetooth (DUN) |
| 4 | PPP Connection via Modem Cradle |
| 5 | PPP Connection via RS-232 |
| 6 | Ethernet Connection via Ethernet Cradle |
| 7 | GPRS Connection via GPRS Cradle |

Example
```
START TCPIP                        ' this is hardware-dependent
```

See Also OFF TCPIP, ON TCPIP GOSUB..., STOP TCPIP, TCP_ERR_CODE, TCP_OPEN

### STOP TCPIP

| | |
|---|---|
| Purpose | To disable TCP/IP communication. |
| Syntax | STOP TCPIP |
| Remarks | |

Example
```
STOP TCPIP
```

## 3.3 NETWORK STATUS

Once the network has been initialized, there is some status information can be retrieved from the system. It will be periodically updated by the system. Refer to Appendix III – Net Status by Index.

Note: (1) User program must explicitly call GET_NET_STATUS to get the latest status.
(2) If GET_NET_STATUS(7) returns -1, it means an abnormal break occurs during PPP, DUN-GPRS, or GPRS connection. Such disconnection may be caused by the mobile computer being out of range, improperly turned off, etc.

### 3.3.1 COMMAND

**GET_NET_STATUS**

| | |
|---|---|
| Purpose | To get network status. |
| Syntax | *A%* = GET_NET_STATUS(*index%*) |
| Remarks | "*A%*" is an integer variable to be assigned to the result.<br>"*index%*" is an integer variable indicating a specific configuration item by index number.<br>Note that it is necessary to define the DNS server IP before running this command.<br>Please refer to the table below. |
| Example | `nQuality = GET_NET_STATUS(2)      ' check communication quality` |

Chapter 4

# IEEE 802.11B/G/N

IEEE 802.11b/g/n is an industrial standard for Wireless Local Area Networking (WLAN), which enables wireless communications over a long distance. The speed of connection between two wireless devices will vary with range and signal quality.

To maintain a reliable connection, the data rate of the 802.11b/g/n system will automatically fall back as range increases or signal quality decreases.

**802.11 Specification**

| | |
|---|---|
| *Frequency Range:* | 2.4 GHz |
| *Data Rate:* | 802.11b - 1, 2, 5.5, 11 Mbps<br>802.11g - 6, 9, 12, 18, 24, 36, 48, 54 Mbps<br>802.11n – 6.5, 13, 19.5, 26, 39, 52, 58.5, 65 Mbps |
| *Connected Devices:* | 1 for ad-hoc mode (No AP)<br>Multiple for infrastructure mode (AP required) |
| *Protocol:* | IP/TCP/UDP |
| *Max. Output Power:* | 50 mW (802.11b) |
| *Spread Spectrum:* | DSSS/OFDM |
| *Modulation:* | 802.11b - DBPSK, DQPSK, CCK<br>802.11g – BPSK, QPSK, 16-QAM, 64-QAM<br>802.11n – BPSK, QPSK, 16-QAM, 64-QAM |
| *Standard:* | IEEE 802.11b/g/n, interoperable with Wi-Fi devices |

Note: All specifications are subject to change without prior notice. IEEE 802.11n is only for 8231.

## IN THIS CHAPTER

## 4.1 OBSOLETE COMMAND

Note: For the stability and compatibility concern, it is recommended to use **GET_NET_STATUS**.

**GET_WLAN_STATUS**

| | |
|---|---|
| Purpose | To get network status. |
| Syntax | *A%* = GET_WLAN_STATUS(*index%*) |
| Remarks | **This command is to be replaced by GET_NET_STATUS.** |
| Example | `nQuality = GET_WLAN_STATUS(2)      ' check communication quality` |

## 4.2 WI-FI PROFILE

For a prompt connection via Wi-Fi device, you can configure pre-settings into a profile. Base on variety configurations including AP, Authentication, Security, Preamble Type and so on. Here supports you up to four vacant profiles used for saving the pre-settings.

### 4.2.1 COMMANDS

**GET_NET_PARAMETER$** **8200, 8700**

Purpose: To get Profile configurations.

Syntax: *A$* = GET_NET_PARAMETER$(*index%*)

Remarks: "*A$*" is a string variable to be assigned to the result.

"*index%*" is an integer variable, indicating a specific configuration item by index number. See Appendix II — Net Parameters by Index.

| Index | Meaning |
|---|---|
| -84~-87 | Read PROFILEX |

Example: `A$=GET_NET_PARAMETER$(-84)         ' Read Profile1`

See Also: TCP_ERR_CODE

## SET_NET_PARAMETER 8200, 8700

| | |
|---|---|
| Purpose | To set Profile configurations. |
| Syntax | SET_NET_PARAMETER(*index%*, *A$*) |
| Remarks | "*index%*" is an integer variable, indicating a specific configuration item by index number. See Appendix II — Net Parameters by Index.<br>"*A$*" is an empty or string variable indicating the configured network settings to be saved. |

| Index | A$ | Setup String |
|---|---|---|
| 84~87 | "" | If A$ is a empty string, save active setting to PROFILEx |
| | Setting String | Save A$ to Profilex |
| 88~91 | "" | If A$ is a empty string, load PROFILEx to active setting |
| | Setting String | Load A$ to active setting |

Example

```
A$="55,1,1,1,1,1234567890,9988776655,4433221122,5555566666"
SET_NET_PARAMETER(84,A$)           ' save A$ to PROFILE1


SET_NET_PARAMETER(88,"")           ' Apply PROFILE1
```

See Also TCP_ERR_CODE

## Setting String Forma(A$)

A$= Basic Items + Security Items

**Basic Items:**

| *SSID (Length:32)* | *BSSTYPE (Length:1)* | *Security (Length:1)* |
|---|---|---|
| | 0: Ad-Hoc<br>1: Infrastructure | 0: None<br>1: WEP OpenSystem<br>2: WEP ShareKey<br>3: WPA-PSK<br>4: WPA2-PSK<br>5: EAP |

**Security Items 1 or 2 – WEP:**

| *WEPLEN (Length:1)* | *Default key (Length:1)* | *Key1 (Length: 14)* | *Key2 (Length: 14)* | *Key3 (Length: 14)* | *Key4 (Length: 14)* |
|---|---|---|---|---|---|
| 0: 64bit<br>1: 128bit | 0: key1<br>1: key2<br>2: key3<br>3: key4 | Length:<br>5 or 13 | Length:<br>5 or 13 | Length:<br>5 or 13 | Length:<br>5 or 13 |

Note: Input the WEP security key with Ascii and the length of WEP key must be specified to 5 or 13 characters.

**Security Items 3 or 4 – WPA:**

| *WPA Passphrase (Length:64)* |
|---|
| |

**Security Items 5 – EAP:**

| *EAP ID (Length:33)* | *EAP Password (Length:33)* |
|---|---|
| | |

**Example 1:**

SSID: 55

BSSTYPE: 1

Security: 1 (WEP OpenSystem)

WEPLEN: 1 (128bit)

Defaultkey: 1 (Key2)

Key1: 12345

Key2: 99887

Key3: 44332

Key4: 55555

```
A$= “55,1,1,1,1,12345,99887,44332,55555”
A$= “55,1,1,1,3,,,,55555”                (only configure key 4)
```

**Example 2:**

SSID: 66

BSSTYPE: 1

Security: 3 (WPA-PSK)

WPA Passphrase: 1234567890123456789012345678901234567890123456789 0

```
A$= “66,1,3,12345678901234567890123456789012345678901234567890”
```

**Example 3:**

SSID: aAbBcCdD

BSSTYPE: 1

Security: 5 (EAP)

EAP ID: 111222333

EAP Password: 7778888999

```
A$= “aAbBcCdD,1,5,111222333,777888999”
```

## 4.3 SCANNING FOR WI-FI HOTSPOTS

**WIFI_SCAN** **8200, 8400, 8700**

| | |
|---|---|
| Purpose | To scan Wi-Fi hotspots. |
| Syntax | *A$* = WIFI_SCAN(*N1%*,*N2%*) |
| Remarks | "*N1%*" is an integer variable used as parameter1. |
| | "*N2%*" is an integer variable used as parameter2. |
| | "*A$*" is a string variable to hold the result. |

| N1 | Meaning | N2 | Meaning | A$ |
|---|---|---|---|---|
| 1 | Scan hotspots | 1~8 | Maximum number of hotspots to search | Number of found hotspots |
| 2 | Read information about the found hotspot | | Index of the hotspot | Information about the hotspot |

Structure of the information string

| Offset of A$ | Meaning |
|---|---|
| 1~2 | Length of SSID |
| 3~34 | SSID, max 32bytes |
| 35~46 | BSSID |
| 47~48 | RSSI |
| 49~50 | Channel |
| 51 | Band Type. "1" - 802.11b/g, "2" - 802.11b |
| 52 | BSS Type. "1" - Ad-hoc, "2" - Infrastructure |
| 53 | Security. "0" - none, "1" - WEP, "2" - WPA, "4" - WPA2, "6" - WPA/WPA2 |

Example

```
A$=WIFI_SCAN(1,5)                  ' Scan 5 hotspots
B%=ASC(A$)
IF B%>=2  THEN                     ' IF find more than 2 hotspots
   W1$=WIFI_SCAN(2,1)              ' Read hotspot1
   PRINT W1$
   W2$=WIFI_SCAN(2,2)              ' Read hotspot2
   PRINT W2$
END IF
```

Chapter 5

# BLUETOOTH

Refer to Appendix IV — Examples.

| Bluetooth Specification | |
|---|---|
| *Frequency Range:* | 2.4 GHz |
| *Profiles:* | SPP, DUN, HID, FTP |
| *Spread Spectrum:* | FHSS |
| *Modulation:* | GFSK |
| *Standard:* | Bluetooth version 2.0 + EDR |

Note: All specifications are subject to change without prior notice.

## IN THIS CHAPTER

## 5.1 BLUETOOTH PROFILES SUPPORTED

| Serial Port Profile (SPP) |
|---|
| For ad-hoc networking, without going through any access point. |

| Dial-Up Networking Profile (DUN) |
|---|
| For a mobile computer to make use of a Bluetooth modem or mobile phone as a wireless modem. Also, it can be used to activate the GPRS functionality on a mobile phone. |

| Human Interface Device Profile (HID) |
|---|
| For a mobile computer to work as an input device, such as a keyboard for a host computer. |

| File Transfer Protocol Profile (FTP) |
|---|
| For a mobile computer to connect to a file server for file transfer. |

Note: Bluetooth FTP is supported on 8200 only.

## 5.2 FREQUENT DEVICE LIST

Through the pairing procedure, the mobile computer is allowed to keep record of the latest connected device(s) for different Bluetooth services, regardless of authentication enabled or not. Such record is referred to as “Frequent Device List”.

| Service Type | | In Frequent Device List |
|---|---|---|
| Serial Port | SPP | Only 1 device is listed for quick connection. |
| Dial-up Networking | DUN | Only 1 device is listed for quick connection. |
| Human Interface Device | HID | Only 1 device is listed for quick connection. |
| File Transfer | FTP | Only 1 device is listed for quick connection. |

### Get Frequent Device List

The length of Frequent Device List by calling **GET_NET_PARAMETER$** is 83 characters:

```
LIST$ = GET_NET_PARAMETER$(-40)
```

| *Length* | *Properties* | *Char* | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Service Type | 1 | 13 2 | | | | | | | | | | | |
| 2 ~ 13 | MAC ID | 12 | “0” | “0” | “D” | “0” | “1” | “7” | “3” | “0” | “1” | “2” | “3” | “4” |
| 14 ~ 33 | Device Name | 20 | “M” | “Y” | “ ” | “N” | “A” | “M” | “E” | 0 | ... | .... | .... | 0 |
| 34 ~ 50 | PIN Code | 17 | “1” | “2” | “3” | “4” | 0 | ... | .... | .... | .... | .... | .... | 0 |
| 51 ~ 83 | Link Key | 33 | “1” | “2” | “4” | “F” | “5” | “3” | .... | .... | .... | .... | .... | 0 |

- The first character of Frequent Device List is the service type that the device is engaged. Currently, there are four types that have been defined:

| *Service Type* | | *In Frequent Device List* |
|---|---|---|
| **3** | SPP | Only 1 device is recorded. |
| **4** | DUN | Only 1 device is recorded. |
| **5** | HID | Only 1 device is recorded. |
| **6** | Reserved | |
| **7** | FTP | Only 1 device is recorded. |

Note: If bit 7 = 1, it means that this device is currently connected.

- After the service type, from 2nd to the 13th character stands for the string of MAC ID.
- The next property after MAC ID is Device Name, which consists of up to 20 characters and ends with a delimiter code “\r”.
- The next property after Device Name is PIN code, which consists of up to 17 characters and ends with a delimiter code “\r”.
- The last property of Frequent Device List is Link Key, which is normally generated when the pairing procedure is completed. This unique Link Key is applied to the specific device connection only. Once the connection is renewed with a different device, a new Link Key will be generated.

Note: Make sure to put "\r" as a delimiter for Device Name, PIN Code, and Link Key.

```
Sample code:
      FREQ_DEV$ = ""
      CLS
      FOR K% = 1 TO 8
         FDL$ = ""
         FDL$ = GET_NET_PARAMETER$(-39-K%)
            IF MID$(FDL$, 1, 1)<>CHR$(0) THEN
               DEV$ = MID$(FDL$, 14, 20)
               MAC_ID$ = MID$(FDL$, 2, 12)
               MACHINE$ = MID$(FDL$, 1, 1)
               FREQ_DEV$ = FREQ_DEV$+DEV$
               FREQ_MAC$ = FREQ_MAC$+MAC_ID$
               FREQ_MC$ = FREQ_MC$+MACHINE$
            END IF
      NEXT K%
    I% = MENU(FREQ_DEV$)
```

## Set Frequent Device List

To enable quick connection to a specific device without going through the inquiry and pairing procedure, a user-definable Frequent Device List can be set up by calling **SET_NET_PARAMETER**.

- If there is an existing Frequent Device List generated from the inquiry and pairing procedure, it then may be partially or overall updated by this, and vice versa.
- There are five fields: Service Type, MAC ID, Device Name, PIN Code, and Link Key.
- If authentication is disabled, you only need to specify the first three fields. Otherwise, the PIN code field needs to be specified for generating Link Key.

```
Sample code (1):
      ' setting up a DUN Frequent Device List without authentication
      ' by calling SET_NET_PARAMETER:
      …
      FDL$ = CHR$(4+128) + "00d017401234" + "TestDev." + CHR$(13)
      SET_NET_PARAMETER(40, FDL$)
      …

sample code (2):
      ' setting up a SPP Frequent Device List with authentication
      ' (needs PIN code) by calling SET_NET_PARAMETER:
      …
      FDL$ = CHR$(3+128) + "00d017401234" + "TestDev." + CHR$(13) + "1234"+CHR$(13)
      SET_NET_PARAMETER(40, FDL$)
```

## 5.3 INQUIRY

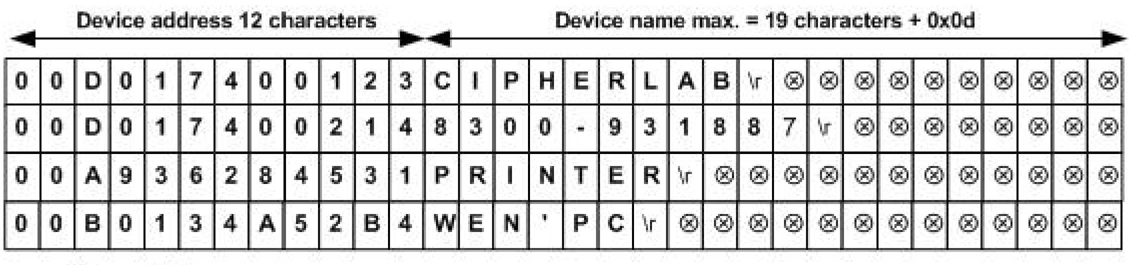
To complete the pairing procedure, it consists of two steps: (1) to discover the Bluetooth devices in range, and (2) to page one of them that provides a particular service. These are handled by **BT_INQUIRY$** and **BT_PAIRING** respectively.

- Once the pairing procedure is completed and the list is generated, next time the mobile computer will automatically connect to the listed device(s) without going through the pairing procedure.

### 5.3.1 COMMAND

**BT_INQUIRY$**

| | |
|---|---|
| Purpose | To discover any available Bluetooth devices in range. |
| Syntax | *A$* = BT_INQUIRY$ |
| Remarks | It takes about 20 seconds to get the Bluetooth device information of whomever in range. The string contains address (12 bytes) and name (20 bytes) of the devices. |
| | Note that there might be many devices concatenated together, each occupying 32 bytes. Information regarding the Bluetooth devices in range will be put in the format of MENU() string as shown below: |


Device address 12 characters
Device name max. = 19 characters + 0x0d

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | D | 0 | 1 | 7 | 4 | 0 | 0 | 1 | 2 | 3 | C | I | P | H | E | R | L | A | B | \r | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ |
| 0 | 0 | D | 0 | 1 | 7 | 4 | 0 | 0 | 2 | 1 | 4 | 8 | 3 | 0 | 0 | - | 9 | 3 | 1 | 8 | 8 | 7 | \r | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ |
| 0 | 0 | A | 9 | 3 | 6 | 2 | 8 | 4 | 5 | 3 | 1 | P | R | I | N | T | E | R | \r | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ |
| 0 | 0 | B | 0 | 1 | 3 | 4 | A | 5 | 2 | B | 4 | W | E | N | ' | P | C | \r | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ |

⊗ = NULL

Example

```
…
MENU_STR$ = BT_INQUIRY$
I% = MENU(MENU_STR$)
…
```

## 5.4 PAIRING

According to the search results for nearby Bluetooth devices, the application can then try to pair with any of the remote devices by calling **BT_PAIRING**.

### 5.4.1 COMMAND

**BT_PAIRING**

| | |
|---|---|
| Purpose | To check if the discovered device can provide a specific type of service, and (if required), the PIN code for authentication is matching. |
| Syntax | *A%* = BT_PAIRING(*addr$*, *type%*) |
| Remarks | "*A%*" is an integer variable to be assigned to the result. |

| A% | Meaning |
|---|---|
| 1 | Pairing successfully |
| 0 | Service unavailable or wrong PIN code |

"*addr$*" is a string variable, indicating the address of the Bluetooth device.

"*type%*" is an integer variable, indicating a specific type of service.

| TYPE% | Meaning |
|---|---|
| 1 | Reserved |
| 3 | SPP |
| 4 | DUN |
| 6 | Reserved |
| 7 | FTP |

It will try to pair with any Bluetooth device that has the specific type of service. If authentication is enabled, then correct PIN code will be required for setting up the Link Key. Once the pairing procedure is completed, the MAC ID of the remote device will be recorded in the "Frequent Device List" for quick connection in the future.

Example

```
…
MENU_STR$ = BT_INQUIRY$
I% = MENU(MENU_STR$)
DEVICE$ = MID$(MENU_STR$, 1+32*(I%-1), 32)
R% = BT_PAIRING(DEVICE$, 3)
…
```

Chapter 6

# GSM/GPRS

This section describes the BASIC commands related to GSM/GPRS. Currently, these commands are for the use of 8700 Series.

Data services of GSM, including SMS (Short Message Service) and data call, are provided for receiving and sending data. They are performed via a virtual COM port, namely, *COM3*. The communication type, *GSM_SMS* and *GSM_Modem*, which are for SMS and data call respectively, should be assigned by calling **SET_COM_TYPE** before use. The *GSM_SMS* supports uncompressed PDU (Protocol Description Unit) message mode. It can handle both 7-bit default alphabet and 8-bit data. In addition, concatenated messages are also supported. Refer to Appendix IV — Examples.

Note: GSM/GPRS/EDGE or UMTS/HSDPA services are supported on 8700.

## IN THIS CHAPTER

## 6.1 DATA FORMAT

### READ_COM$ data format

For SMS service, the data format for single messages and concatenated messages is different. The short messages will be removed from the SIM card after being read out. If it is necessary to save the received data, data storage structure like a DAT or DBF file is recommended.

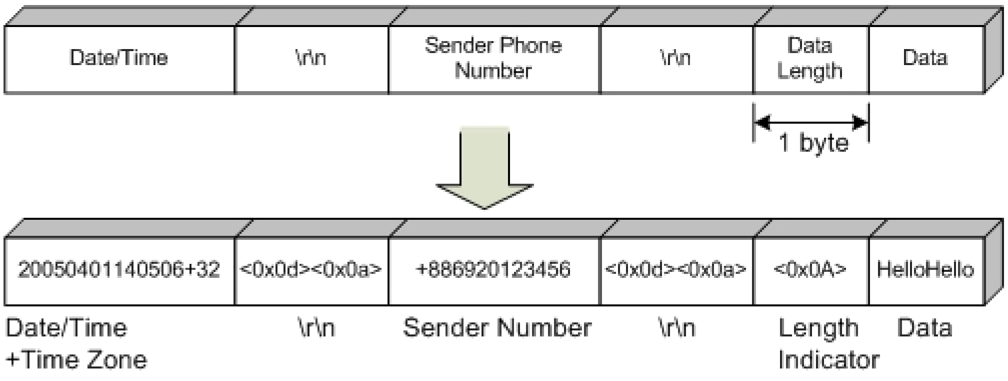
| Message Type | Single Message | Concatenated Message |
|---|---|---|
| *Using 7-bit default alphabet* | total length ≤ 160 characters | total length > 160 characters |
| *Using 8-bit* | total length ≤ 140 octets | total length > 140 octets |
| *Using 16-bit* | total length ≤ 70 characters | total length > 70 characters |

- Single Message:

  The diagram below shows the data format for a single message received by calling **READ_COM$**. The data length is the number of octets of data.

  Example:

  ```
  20050401140506+32<0x0d><0x0a>+886920123456<0x0d><0x0a><0x0A>
  HelloHello
  ```



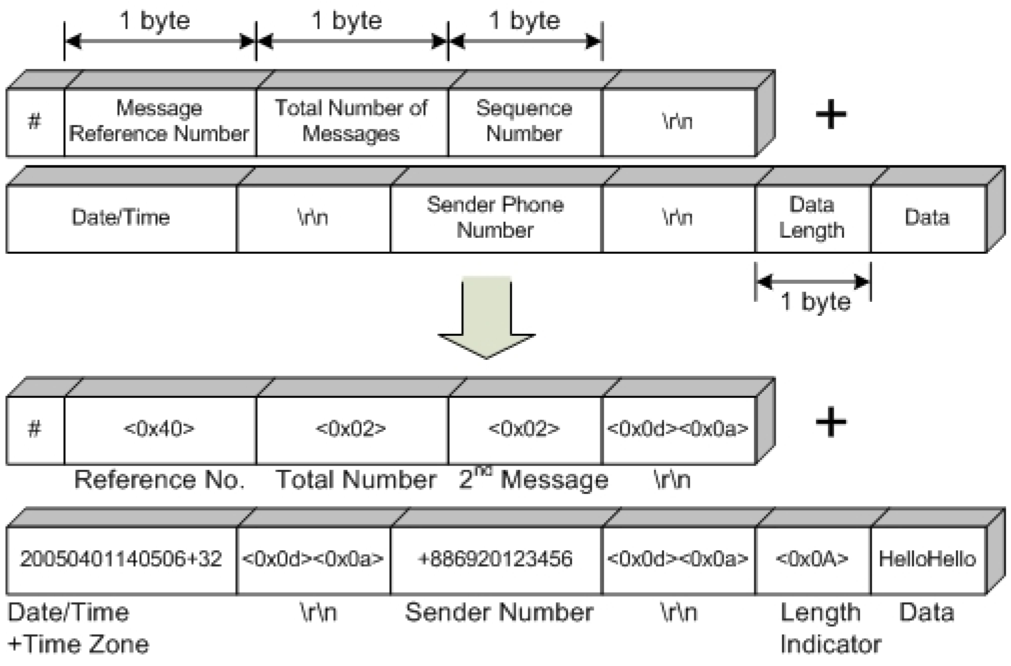
- Concatenated Message

The whole data will be separated into several sections.

The diagram below shows the data format for a concatenated message received by calling **READ_COM$**. The data length is the number of octets of data.

Example:

```
#<0x40><0x02><0x02><0x0d><0x0a>20050401140506+32<0x0d><0x0a>
+886920123456<0x0d><0x0a><0x0A>HelloHello
```



## WRITE_COM data format

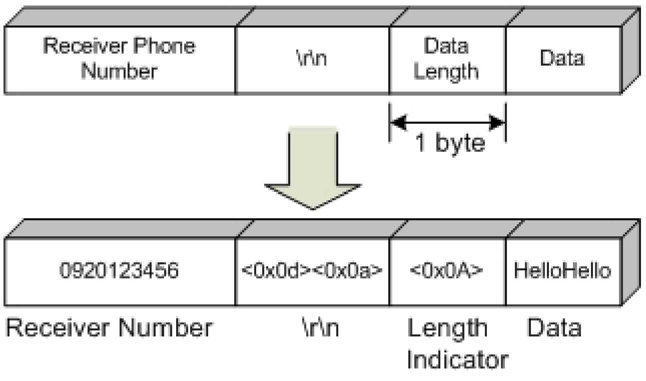
For sending a message, the maximum length is limited to 255 characters.

- For long messages (see Message Type - Concatenated Message above), data will be sent successfully by using **WRITE_COM**, and then each message will be separated into sections intentionally.

  The sending data buffer will not be overwritten until **GET_NET_STATUS(13)** returns 1 to indicate the transmission is completed.

  The data format for sending a message is as shown below.

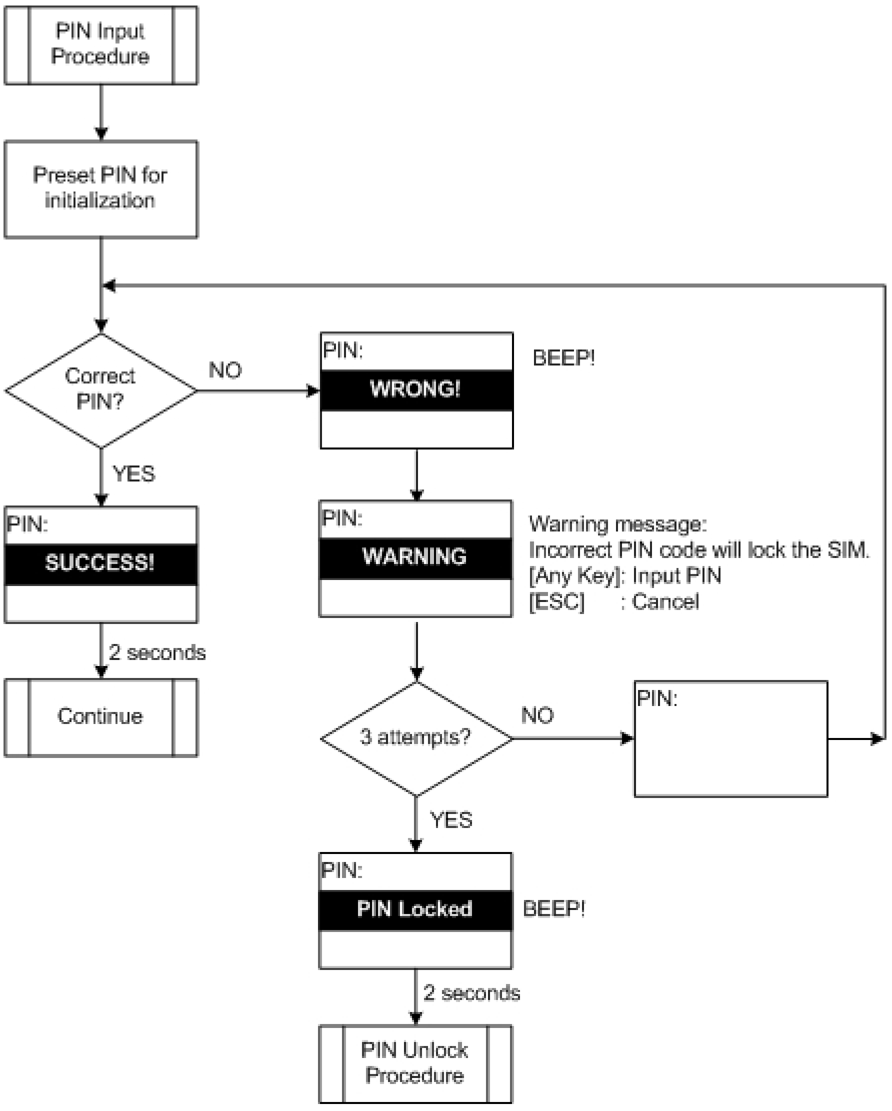
  Example: `0920123456<0x0d><0x0a><0x0A>HelloHello`



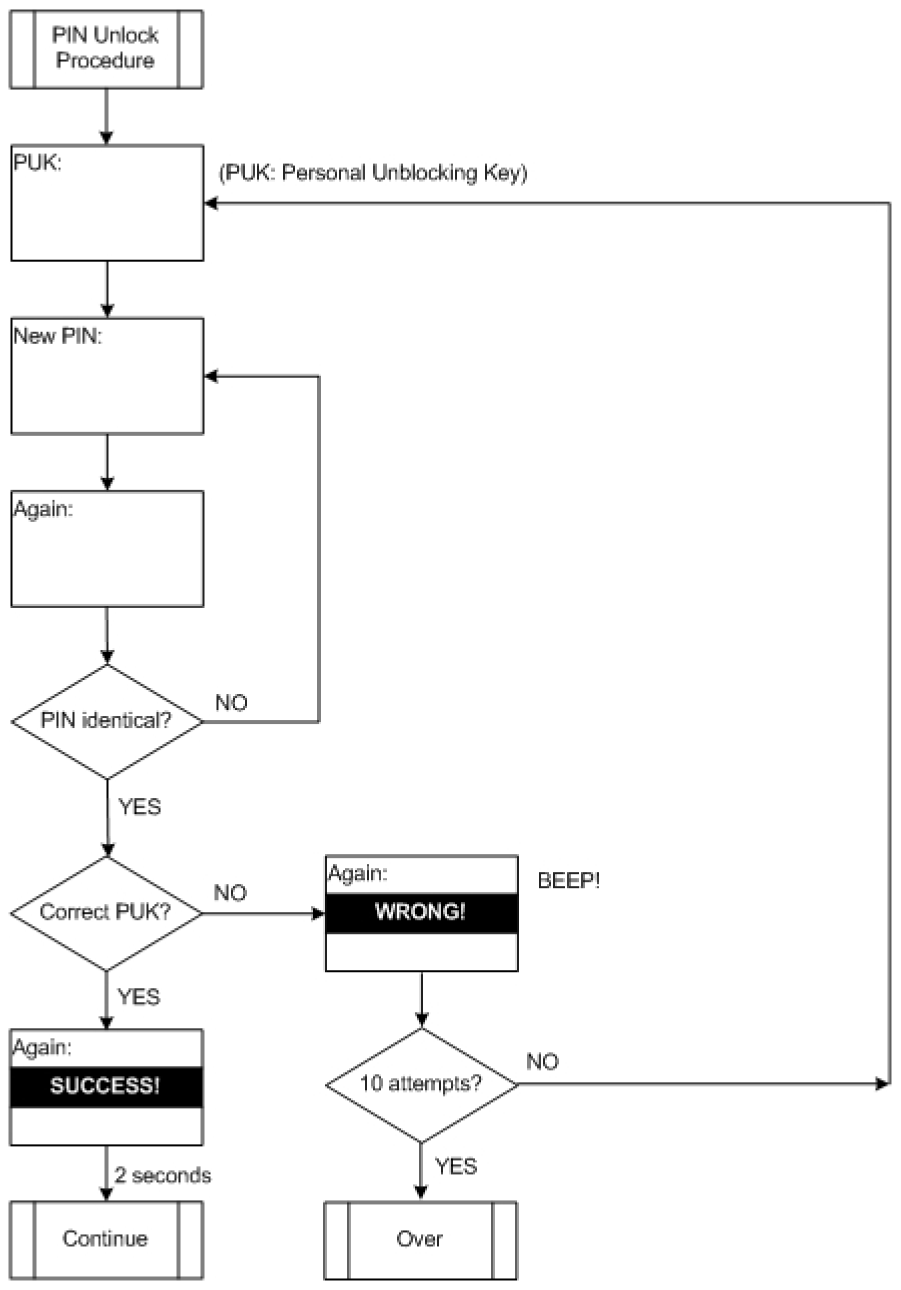
## 6.2 SECURITY

PIN (Personal Identity Number) is a 4-8 digit access code which can be used to secure your SIM card from use. If the wrong PIN is entered in more than three times, the SIM card will be locked. PUK (Personal Unblocking Key) is an 8-digit code used to unlock the PIN code if your SIM card is blocked. Contact your service provider for PUK. If the wrong PUK is entered ten times in a row, the device will become permanently blocked and unrecoverable, requiring a new SIM card.

### 6.2.1 PIN PROCEDURE



## 6.2.2 PUK PROCEDURE



## 6.3 PIN CODE

### 6.3.1 COMMANDS

| **GSM_CHANGE_PIN** | **8790** |
|---|---|

| | |
|---|---|
| Purpose | To change the PIN code. |
| Syntax | *A%* = GSM_CHANGE_PIN(*old$*, *new$*) |
| Remarks | "*A%*" is an integer variable assigned to the result. |

| A% | Meaning |
|---|---|
| 1 | The new PIN code has been accepted. |
| 0 | The old PIN code is incorrect. |
| -1 | The GSM/GPRS module is running. |
| -2 | Hardware error occurs. |
| -5 | The request times out. |

**Note that this command cannot be executed while the GSM/GPRS module is running.** The old PIN string must be the password of facility. In this case, the new PIN code can be adopted and the remaining attempt counter of PIN will be reset to 3. If the old code is wrong, not only the password cannot be changed successfully, but also the counter will be decremented by 1.

Example

```
GSM_CHANGE_PIN(PIN1$, PIN2$)     ' to change PIN code from PIN1 to PIN2.
```

| **GSM_CHECK_PIN** | **8790** |
|---|---|

| | |
|---|---|
| Purpose | To verify the PIN code. |
| Syntax | *A%* = GSM_CHECK_PIN(*pin$*) |
| Remarks | "*A%*" is an integer variable assigned to the result. |

| A% | Meaning |
|---|---|
| 2 | No PIN code is required. |
| 1 | The new PIN code has been accepted. |
| 0 | The old PIN code is incorrect. |
| -1 | The GSM/GPRS module is running. |
| -2 | Hardware error occurs. |
| -6 | The PUK procedure is required. |

**Note that this command cannot be executed while the GSM/GPRS module is running.** If the input code is the correct PIN code, the remaining attempt counter of PIN is reset to 3. If the old code is wrong, the counter will be decremented by 1.

Example

```
GSM_CHECK_PIN(PIN1$)     ' to verify whether the PIN code is PIN1 or not
```

## GSM_SET_PINLOCK 8790

| | |
|---|---|
| Purpose | To decide whether to lock the SIM card or not. |
| Syntax | *A%* = GSM_SET_PINLOCK(*pin$*, *mode%*) |
| Remarks | "*A%*" is an integer variable assigned to the result. |

| A% | Meaning |
|---|---|
| 1 | The new PIN code has been accepted. |
| 0 | The old PIN code is incorrect. |
| -1 | The GSM/GPRS module is running. |
| -2 | Hardware error occurs. |
| -3 | The PIN code has already been locked. |
| -4 | The PIN code has already been unlocked. |
| -5 | The request times out. |

| MODE% | Meaning |
|---|---|
| 0 | Unlock the SIM card |
| 1 | Lock the SIM card |

**Note that this command cannot be executed while the GSM/GPRS module is running.** If the PIN code lock is already enabled (or disabled), one further enabling (or disabling) execution does not take effect.

For an unlocking process, the correct PIN code is required. Otherwise, the execution will fail and the remaining attempt counter of PIN will be decremented by 1. For a locking process, the old PIN code used before unlocking is required. Otherwise, the execution will fail and the counter will be decremented by 1.

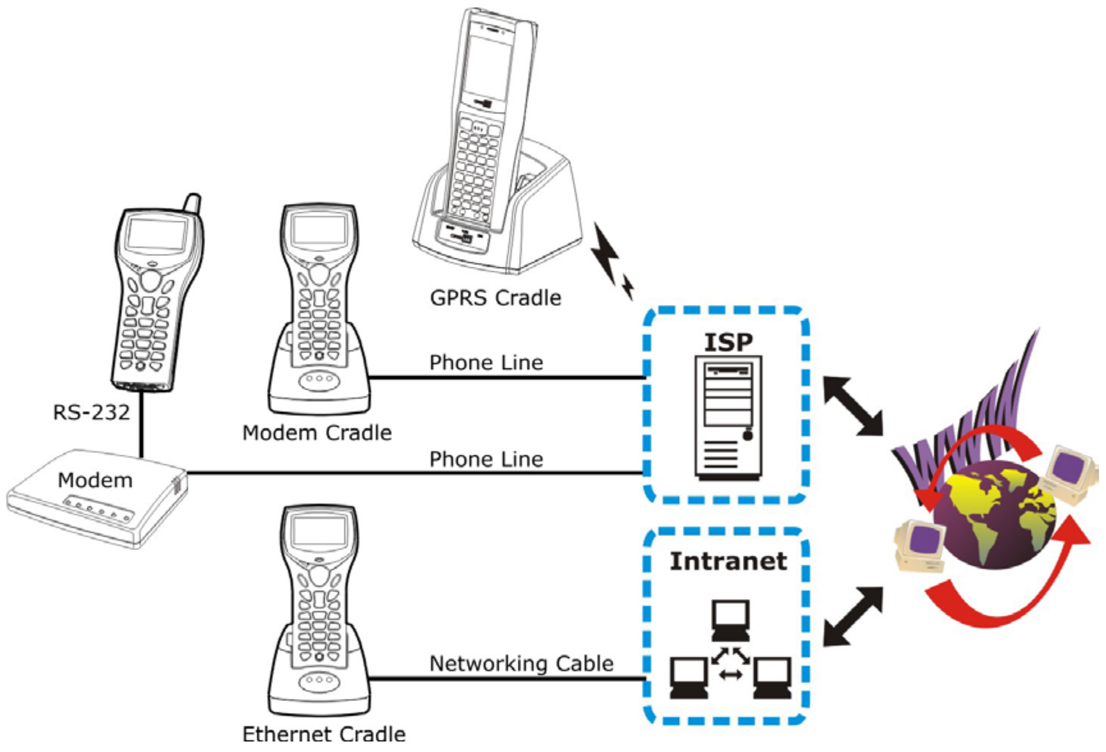
Example

```
GSM_SET_PINLOCK(PIN1$, 1)  ' to lock the SIM card, using PIN code "PIN1$"
```

Chapter 7

# MODEM, ETHERNET & GPRS CONNECTION

Below are available libraries that support (1) PPP connection over serial links, (2) Ethernet connection (Transparent mode), and (3) GPRS connection (Transparent mode). Refer to Appendix IV — Examples.



Note: GPRS (Transparent mode) is currently supported on 8400, with use of GPRS Cradle. Cradle firmware must be version 1.01 or later.

## IN THIS CHAPTER

## 7.1 PPP VIA MODEM CRADLE/RS-232

PPP, short for Point-to-Point Protocol, is a method of connecting the mobile computer to the Internet over serial links. It sends TCP/IP packets to a server that connects to the Internet.

### PPP Connection via Modem Cradle

It is supported when making use of the proprietary modem cradle. For baud rate setting, any value other than 57600 bps (default) must be configured through the DIP switch of the IR control board.

Note: For 8000/8300 Series, the version of IR control board on the modem cradle must be greater than SV3.01.

### PPP Connection via RS-232

It is supported on 8200/8300/8400/8700 only when being connected to a generic modem (direct RS-232).

### 7.1.1 CONFIG SETTINGS

Follow the same programming flow of WLAN Example (802.11b/g). Before calling **START TCPIP(4)** or **START TCPIP(5)**, the following parameters of PPP must be specified.

| Index | | Configuration Item | Default | Description |
|---|---|---|---|---|
| -70 | 70 | P_PPP_DIALUPPHONE [20] | --- | Phone number of ISP |
| -71 | 71 | P_PPP_LOGINNAME [41] | --- | Login user name of ISP |
| -72 | 72 | P_PPP_LOGINPASSWORD [20] | --- | Login password of ISP |
| -73 | 73 | P_PPP_BAUDRATE (cf. SET_COM) | 1 | Baud rate matching modem cradle or modem |

Note: For baud rate values of IR or RS-232, see the baud rate parameter in SET_COM.

## 7.2 ETHERNET VIA CRADLE

It is supported when making use of the proprietary Ethernet cradle. First, configure the Ethernet cradle to work in “Transparent” mode. Then, follow the same programming flow of WLAN Example (802.11b/g) using **START TCPIP(6)**.

Refer to the Ethernet Cradle manual for more information on the working modes.

## 7.3 GPRS VIA CRADLE

It is supported when making use of the 8400 GPRS Cradle. Use AT commands to configure PIN code and GPRS AP name. Then, follow the same programming flow of WLAN Example (802.11b/g) using **START TCPIP(7)**. It fails to initialize a connection in the following conditions: (1) PIN code and GPRS AP name are not configured correctly via AT commands, and (2) CHAP settings are not configured correctly on 8400.

Refer to the 8400 GPRS Cradle manual for more information on the working modes.

Chapter 8

# USB CONNECTION

Applications are to read and/or write data via a virtual COM port, namely, *COM5*. The communication types should be assigned by calling **SET_COM_TYPE** before use. Before calling **OPEN_COM(5)**, the following parameters of USB must be specified.

| Index | | Configuration Item | Default | Description |
|---|---|---|---|---|
| -80 | 80 | P_USB_VCOM_BY_SN | Disable | USB Virtual COM port varies by serial number |

Refer to Appendix IV — Examples.

## IN THIS CHAPTER

## 8.1 OVERVIEW

### 8.1.1 USB HID

For 8200/8400/8700 Series, it can be set to work as an input device, such as a keyboard for a host computer.

### 8.1.2 USB VIRTUAL COM

#### USB Virtual COM

For 8200/8400/8700 Series, when USB Virtual COM is in use, it is set to use one Virtual COM port for all (USB_VCOM_FIXED) whenever connecting more than one mobile computer to PC via USB. This setting requires you to connect one mobile computer at a time, and will facilitate configuring a great amount of 8200/8400/8700 mobile computers via the same Virtual COM port (for administrators' or factory use). If necessary, you can have it set to use variable Virtual COM port (USB_VCOM_BY_SN), which will vary by the serial number of each different mobile computer.

#### USB Virtual COM_CDC

For 8200/8700 Series, when USB Virtual COM_CDC is in use, it is set to use one Virtual COM_CDC port for all (USB_VCOM_FIXED) whenever connecting more than one mobile computer to PC via USB. This setting requires you to connect one mobile computer at a time, and will facilitate configuring a great amount of mobile computers via the same Virtual COM_CDC port (for administrators' or factory use). If necessary, you can have it set to use variable Virtual COM_CDC port (USB_VCOM_BY_SN), which will vary by the serial number of each different mobile computer.

### 8.1.3 USB MASS STORAGE DEVICE

When 8200/8400/8700 Series is equipped with SD card and connected to your computer via the USB cable, it can be treated as a removable disk as long as it is configured properly through programming or System Menu.

Chapter 9

# GPS FUNCTIONALITY

8700 supports GPS functionality as long as the GPS module is present. Call **OPEN_COM(6)**, **SYSTEM_INFORMATION$(index)**, and then **CLOSE_COM(6)**.

The information on GPS speed, latitude, longitude and altitude is not confirmed until the return value of GPS status becomes 1.

| Index | SYSTEM_INFORMATION$(index) | Meaning |
|---|---|---|
| 21 | GPS Status | GPS status |
| 22 | GPS Speed | Your speed when heading toward a target (relative speed, km/h) |
| 23 | GPS Latitude | Your location on earth by latitude coordinates (N for North, S for South):<br>▸ ddmm.mmmmN or ddmm.mmmmS<br>▸ For example, 1211.1111N means 12° 11' 6.67" North. |
| 24 | GPS Longitude | Your location on earth by longitude coordinates (E for East, W for West):<br>▸ dddmm.mmmmE or dddmm.mmmmW<br>▸ For example, 2326.2141E means 23° 26' 12.85" East. |
| 25 | GPS SNR | Signal to Noise ratio, average (dB) |
| 26 | GPS Satellite Number | Number of satellites found |
| 27 | GPS Altitude | Your location on earth by altitude (meters) |

Chapter 10

# FTP FUNCTIONALITY

File Transfer Protocol (FTP), which runs over Transmission Control Protocol (TCP), is used to transfer files over any network that supports TCP/IP regardless of operating systems. The FTP functions provided here are for the 8000/8200/8300/8400/8700 Mobile Computers to log in to any FTP server and log out over network. During a valid session, the mobile computer can issue commands to the server to perform a specific task, such as create, change or remove directories on the server, delete, upload or download files, etc.

Below lists the BASIC commands used to start an FTP session.

- Call **FTP_ROUTINE$()** to get information on the working directory, change directory, or transfer files.
- Call **SET_NET_PARAMETER()** to configure user name and password.
- Call **TCP_OPEN()** to open a connection and log on to the host.
- Call **NCLOSE()** to close the connection.

Note: Only one connection is allowed at a time.

## Compiler and Runtime

Any FTP application written in BASIC language requires a certain version of the runtime program specific to the mobile computer that is capable of wireless connectivity:

| Mobile Computer | 8071 | 8230 | 8330, 8370 | 8470 |
|---|---|---|---|---|
| BASIC Runtime | Version 4.15 or later | Version 1.00 or later | Version 4.08 or later | Version 1.10 or later |

Note: BASIC Compiler must be version 4.17 or later.

## IN THIS CHAPTER

## 10.1 CONFIGURE SETTINGS

### 10.1.1 NET PARAMETERS BY INDEX

| **Index** | | **Configuration Item** | **Default Setup String** | **FTP** |
|---|---|---|---|---|
| GET_NET_ PARAMETER$ | SET_NET_ PARAMETER | | | |
| -81 | 81 | FTP_USERNAME [65] | --- | ✓ |
| -82 | 82 | FTP_PASSWORD [65] | --- | ✓ |

### 10.1.2 COMMAND: GET_NET_PARAMETER

| **GET_NET_PARAMETER$** | **8000, 8200, 8300, 8400, 8700** |
|---|---|

Purpose To get network settings.

Syntax *A$* = GET_NET_PARAMETER$(*index%*)

Remarks "*A$*" is a string variable to be assigned to the result.

"*index%*" is an integer variable, indicating a specific configuration item by index number. See 10.1.1 Net Parameters by Index.

| Error Code | Meaning |
|---|---|
| 0 | Normal status: connection is open |
| 3000 | Invalid index number |
| 3004 | Connection is closed |
| 3012 | Never run START TCPIP |

Example

```
UserName$ = GET_NET_PARAMETER$(-81)
Password$ = GET_NET_PARAMETER$(-82)
```

### 10.1.3 COMMAND: SET_NET_PARAMETER

| **SET_NET_PARAMETER** | **8000, 8200, 8300, 8400, 8700** |
|---|---|

Purpose To configure network settings.

Syntax SET_NET_PARAMETER(*index%*, *A$*)

Remarks "*index%*" is an integer variable, indicating a specific configuration item by index number. See 10.1.1 Net Parameters by Index.

"*A$*" is a string variable indicating the network setting to be configured.

Note that it is not necessary to configure the setting every time.

Example

```
SET_NET_PARAMETER(81, "Test")          ' set login user name
SET_NET_PARAMETER(82, "1234")          ' set password
```

## 10.2 CONNECT AND DISCONNECT

Use **TCP_OPEN(4, ...)** to open a connection and log on to the host over network. Refer to 10.1 Configure Settings for configuring username and password.

### 10.2.1 COMMAND: TCP_OPEN

| **TCP_OPEN** | **8000, 8200, 8300, 8400, 8700** |
|---|---|
| Purpose | To open an FTP connection via 802.11b/g. For 8200, it also supports connecting via Ethernet Cradle or Bluetooth. See Bluetooth FTP example. |
| Syntax | TCP_OPEN(*4, IP$, RP%, LP%* [, *Protocol%*] [, *Delimiter%*]) |
| Remarks | **Note that this function must be called before using any socket read/write commands.** |

"*N%*" is "4" for FTP connection and "5" for Bluetooth FTP connection.

| N% | Meaning |
|---|---|
| 4 | FTP connection via 802.11b/g or Ethernet Cradle<br>(Ethernet Cradle currently supported for 8200 only) |
| 5 | Bluetooth FTP connection (currently supported on 8200 only) |

"*IP$*" is a string variable, indicating the IP address of the remote port. If it is set to "0.0.0.0", the connection will become server mode and the LP% must be defined.

"*RP%*" is an integer variable, indicating the port number of the remote port, which is to be connected. It has to be a positive integer in client mode. However, it has to be set to 0 when in server mode.

"*LP%*" is an integer variable, indicating the port number of the local port. It has to be a positive integer in server mode. However, it has to be set to 0 when in client mode.

| | Server mode | Client mode | |
|---|---|---|---|
| N% | 0 ~ 3 | 0 ~ 4 | 5 |
| IP$ | "0,0,0,0" | Required | "0,0,0,0" |
| RP% | 0 | Required | 0 |
| LP% | Required | 0 | 0 |

"*Protocol%*" is an integer variable, indicating the networking protocol in use. This parameter is optional and it is set to 0 by default (using TCP/IP protocol). If it is set to 1, the system will use UDP/IP protocol. However, it can only be set to 2 for FTP and Bluetooth FTP.

"*Delimiter%*" is an integer variable, indicating whether to transmit the delimiter or not. This parameter is optional and it is set to 0x0d (Carriage Return) by default. The valid values range from 0 to 255. If it is set to -1, the system will not transmit any delimiter.

Example

```
START TCPIP        'select network via 802.11b/g
LOOP:              ' check if initialization is done
   IF GET_NET_STATUS(7)=0 THEN
      GOTO LOOP
   END IF
TCP_OPEN(4,"192.168.6.24", 0, 21, 2, 59) 'log on to the ftp server
```

## 10.2.2 COMMAND: NCLOSE

| **NCLOSE** | **8000, 8200, 8300, 8400, 8700** |
|---|---|
| Purpose | To close an FTP connection. |
| Syntax | NCLOSE(*N%*) |
| Remarks | "*N%*" is "4" for FTP connection and "5" for Bluetooth FTP connection. |

| N% | Meaning |
|---|---|
| 4 | FTP connection<br>(currently supported on 8000, 8200, 8300, 8400, 8700 only) |
| 5 | Bluetooth FTP connection (currently supported on 8200 only) |

Example

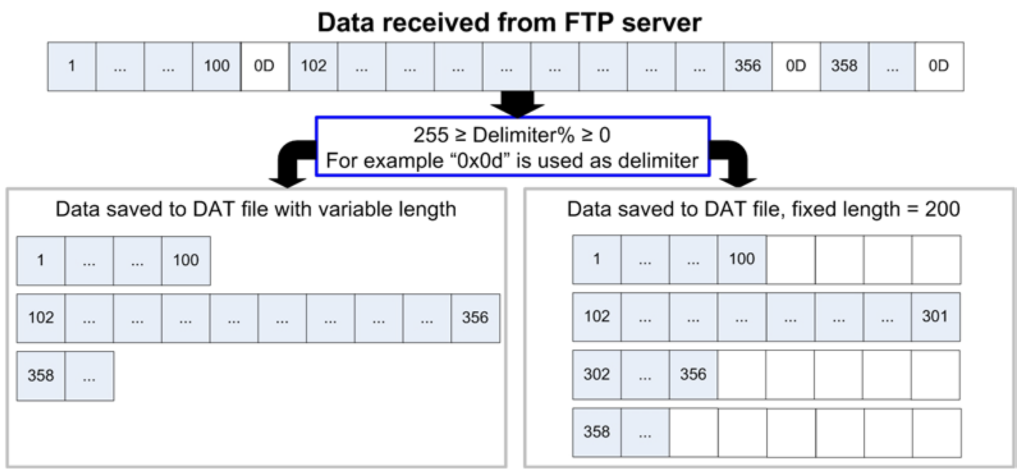
```
NCLOSE(4)                              ‘ close FTP connection
NCLOSE(5)                              ‘ close Bluetooth FTP connection
```

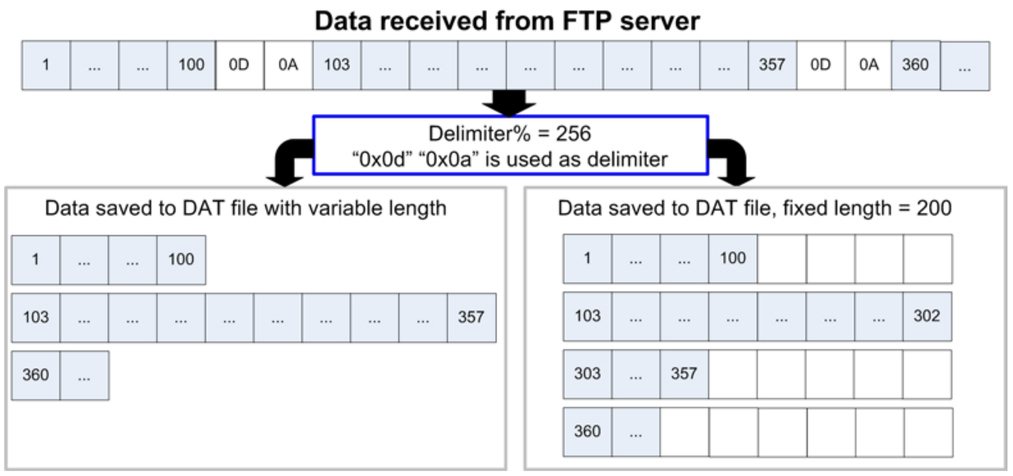
## 10.2.3 DELIMITER HANDLING

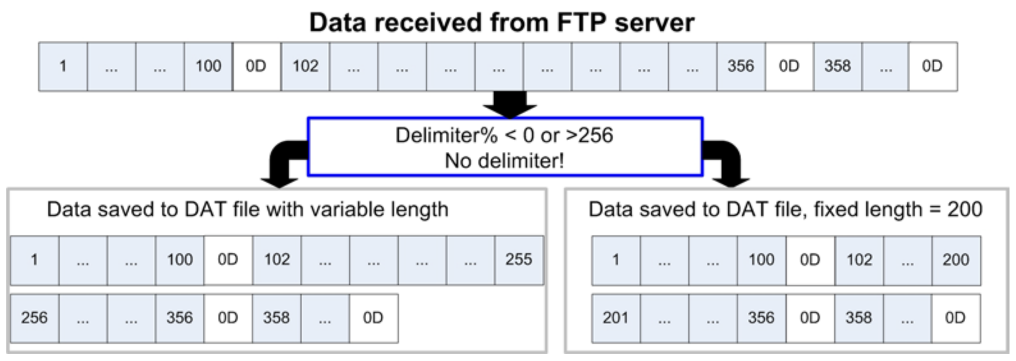
The delimiter set by **TCP_OPEN()** will affect the arrangement of data, which is either received in the DAT file system or stored in the buffer for being sent out over the network.

- The parameter for delimiter is optional and it is set to 0x0d (Carriage Return) by default. The valid values range from 0 to 256. If it is set to a value smaller than 0 or larger than 256, it will not transmit any delimiter.

### Data received from Server

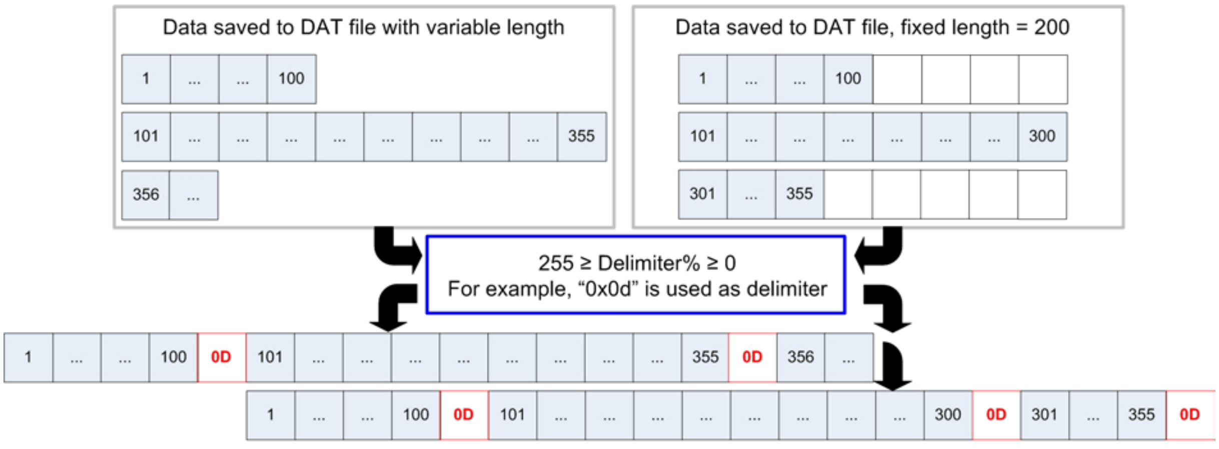

Data received from FTP server
1 ... ... 100 0D 102 ... ... ... ... ... ... ... ... 356 0D 358 ... 0D
255 ≥ Delimiter% ≥ 0
For example "0x0d" is used as delimiter
Data saved to DAT file with variable length
1 ... ... 100
102 ... ... ... ... ... ... ... ... 356
358 ...
Data saved to DAT file, fixed length = 200
1 ... ... 100
102 ... ... ... ... ... ... 301
302 ... 356
358 ...


Data received from FTP server
1 ... ... 100 0D 0A 103 ... ... ... ... ... ... ... ... 357 0D 0A 360 ...
Delimiter% = 256
"0x0d" "0x0a" is used as delimiter
Data saved to DAT file with variable length
1 ... ... 100
103 ... ... ... ... ... ... ... ... 357
360 ...
Data saved to DAT file, fixed length = 200
1 ... ... 100
103 ... ... ... ... ... ... 302
303 ... 357
360 ...


Data received from FTP server
1 ... ... 100 0D 102 ... ... ... ... ... ... ... ... 356 0D 358 ... 0D
Delimiter% < 0 or >256
No delimiter!
Data saved to DAT file with variable length
1 ... ... 100 0D 102 ... ... ... ... 255
256 ... ... 356 0D 358 ... 0D
Data saved to DAT file, fixed length = 200
1 ... ... 100 0D 102 ... 200
201 ... ... 356 0D 358 ... 0D

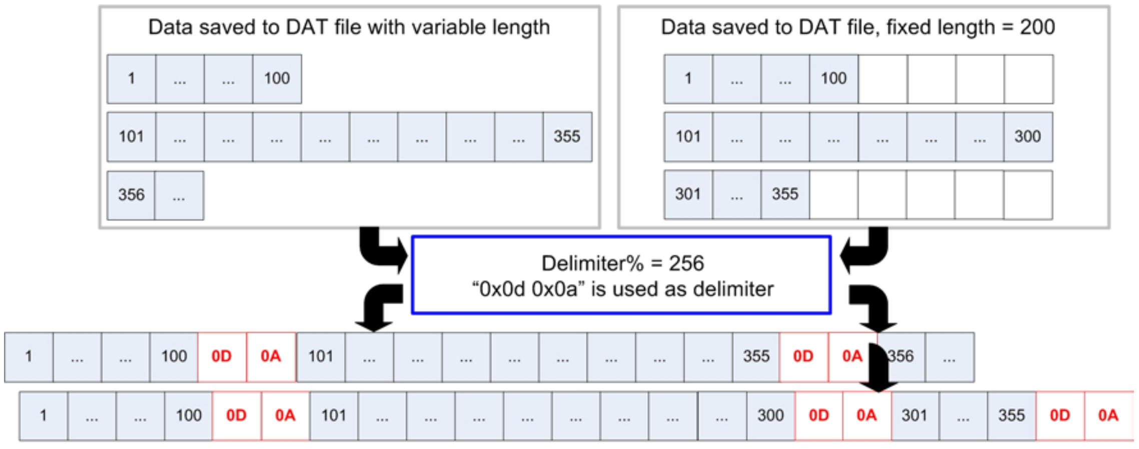
## Send Data to Server

When sending a file to the FTP server, each line reading from the file system may be appended with a delimiter if specified, and put in the buffer.



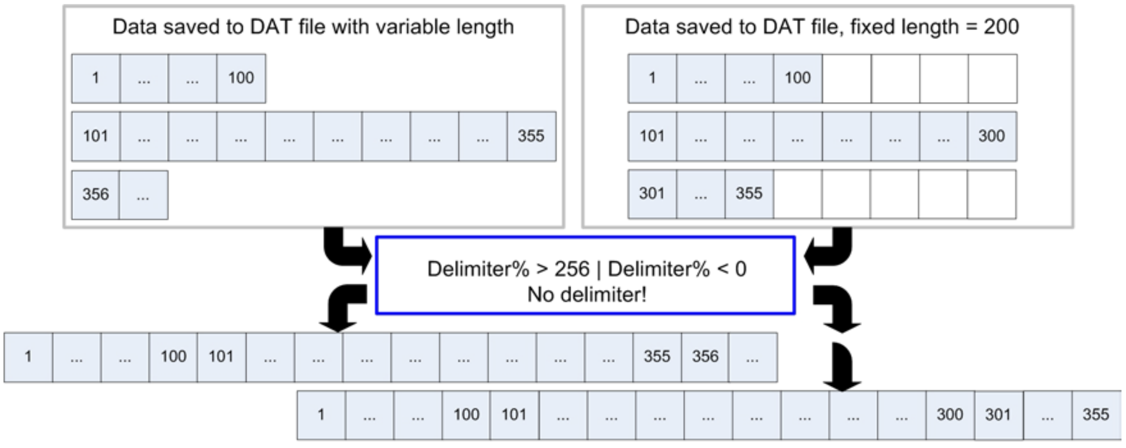
Data saved to DAT file with variable length
Data saved to DAT file, fixed length = 200
255 ≥ Delimiter% ≥ 0
For example, "0x0d" is used as delimiter

Data being sent to FTP server (buffered)



Data saved to DAT file with variable length
Data saved to DAT file, fixed length = 200
Delimiter% = 256
"0x0d 0x0a" is used as delimiter

Data being sent to FTP server (buffered)



Data saved to DAT file with variable length
Data saved to DAT file, fixed length = 200
Delimiter% > 256 | Delimiter% < 0
No delimiter!

Data being sent to FTP server (buffered)

## 10.3 DO FTP TASK

**FTPRoutine$** allows the mobile computers to log in to an FTP server and log out. The mobile computer can issue commands to the server to perform a specific task, such as create, change or remove directories on the server, delete, upload or download files, etc.

All these FTP tasks have been integrated in a BASIC function called **FTPRoutine$**. Logging in must be carried out after having established a connection by calling **START TCPIP** and **TCP_OPEN**, while logging out must be carried out before the connection is terminated by **NCLOSE** and **STOP TCPIP**.

## 10.3.1 COMMAND: FTP_ROUTINE$

Varying by the system running on the host, you may specify a relative path or absolute path when manipulating files or directories. For changing working directory, it allows the usage of ".." (back to the parent directory of the current director) and "/" (back to the root directory).

| **FTP_ROUTINE$** | **8000, 8200, 8300, 8400, 8700** |
|---|---|

| | |
|---|---|
| Purpose | To execute a specific FTP task. |
| Syntax | A$ = FTP_ROUTINE$(*N%*, *file%*, *Para1$*, *Para2$*) |
| Remarks | **Note that this function must be called after calling START TCPIP and TCP_OPEN.** |

"*A$*" is a string variable, indicating the status of a specific FTP task.

"*N%*" is an integer variable, indicating which FTP task is to be executed.

"*file%*" is an integer variable in the range of 1 to 6, indicating which file to access.

"*Para1$*" is a string variable, indicating the first parameter of a specific FTP task.

"*Para2$*" is a string variable, indicating the second parameter of a specific FTP task.

| FTP Task | N% | FILE% | PARA1$ | PARA2$ |
|---|---|---|---|---|
| Get Directory | 13 | 1~6 | --- | --- |
| Change Directory | 17 | --- | Path | --- |
| Upload File | 18 | 0: SD card access<br>1~6: DAT file<br>11~15: DBF file | Remote file name | Local file name (SD) |
| Append to File | 19 | 0: SD card access<br>1~6: DAT file<br>11~15: DBF file | Remote file name | Local file name (SD) |
| Download File | 20 | 0: SD card access<br>1~6: DAT file<br>11: DBF file<br>18: BASIC application (.tkn)<br>19: BASIC runtime (.bin) | Remote file name | Local file name (SD) |
| Rename FTP files (for 8200/8400/8700) | 21 | --- | New remote file name | Old remote file name |
| Delete FTP files (for 8200/8400/8700) | 22 | --- | Remote file name | --- |

Note: (1) "---" means the parameter can be ignored or is not required.
(2) For the FILE% marked with a sequence of hyphens "---", it must be

set to 0.

(3) Append to File is not supported by Bluetooth FTP. Setting N% to 19 will get the same result as setting N% to 18.

(4) When N% is either 18, 19, or 20 and File% is other than 0, PARA2$ must be set to "". For examples:

```
FTP_RECV:
RESULT$=FTP_ROUTINE$(20,6, Remote$, "")

FTP_SEND:
RESULT$=FTP_ROUTINE$(18,1, Remote$, "")
```

Example

```
FTP_CWD:
        RESULT$=FTP_ROUTINE$(17,0,"FTPTest")
Remote$="xact.txt"
Local$="A:/Basic/Five/Basic/8400.txt"
FTP_RECV:
        RESULT$=FTP_ROUTINE$(20,6, Remote$, "")
        RESULT$=FTP_ROUTINE$(20,0,  Remote$, Local$)
FTP_SEND:
        RESULT$=FTP_ROUTINE$(18,1, Remote$, "")
FTP_RENAME:
        RESULT$=FTP_ROUTINE$(21,0, NewRemote$, OldRemote$)
FTP_DELETE:
        RESULT$=FTP_ROUTINE$(22,0, Remote$, "")
```

## 10.4 DOWNLOAD PROGRAM UPDATES

One of the major benefits of establishing an FTP connection is to download updates from the host for BASIC programs.

Use **FTP_ROUTINE$(20, …)** to receive the program files and **UPDATE_BASIC()** to activate each of them. Refer to 10.3 Do FTP Task and 10.4.3 Activating Programs.

Note: For 8200/8400/8700, access to SD card is allowed. Refer to 10.6 SD Card Access.

### 10.4.1 UPDATING BASIC RUNTIME

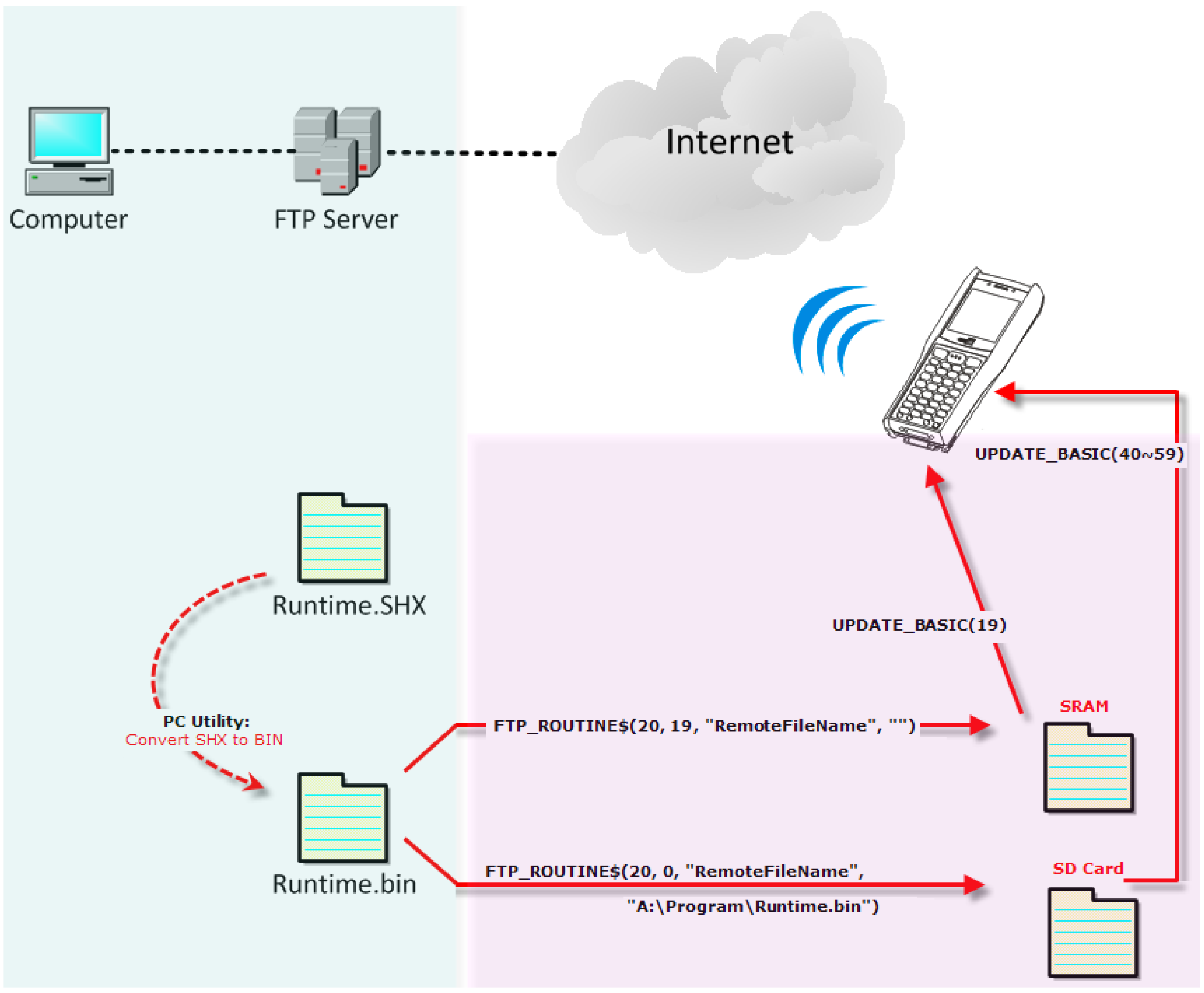
#### Format

```
FTP_ROUTINE$(20, 19, RemoteFileName$, LoacalFileName$)

/* Source file saved in SRAM */



FTP_ROUTINE$(20, (40~59), RemoteFileName$, LoacalFileName$)

/* Source file saved on SD card, for 8200/8400/8700 only */
```

#### Example

```
Remote$=”basic.bin”
RESULT$=FTP_ROUTINE$(20, 19, REMOTE$, “”)
UPDATE_BASIC(19)
…
```

Note: BASIC runtime program can be a .shx or .bin file. However, the file made available on the host must be a .bin file. Use PC utility “SHX2Bin.exe” to convert the program (.shx → .bin).


Computer
FTP Server
Internet
UPDATE_BASIC(40~59)
Runtime.SHX
UPDATE_BASIC(19)
PC Utility:
Convert SHX to BIN
FTP_ROUTINE$(20, 19, "RemoteFileName", "")
SRAM
Runtime.bin
FTP_ROUTINE$(20, 0, "RemoteFileName",
"A:\Program\Runtime.bin")
SD Card

### 10.4.2 UPDATING BASIC APPLICATION

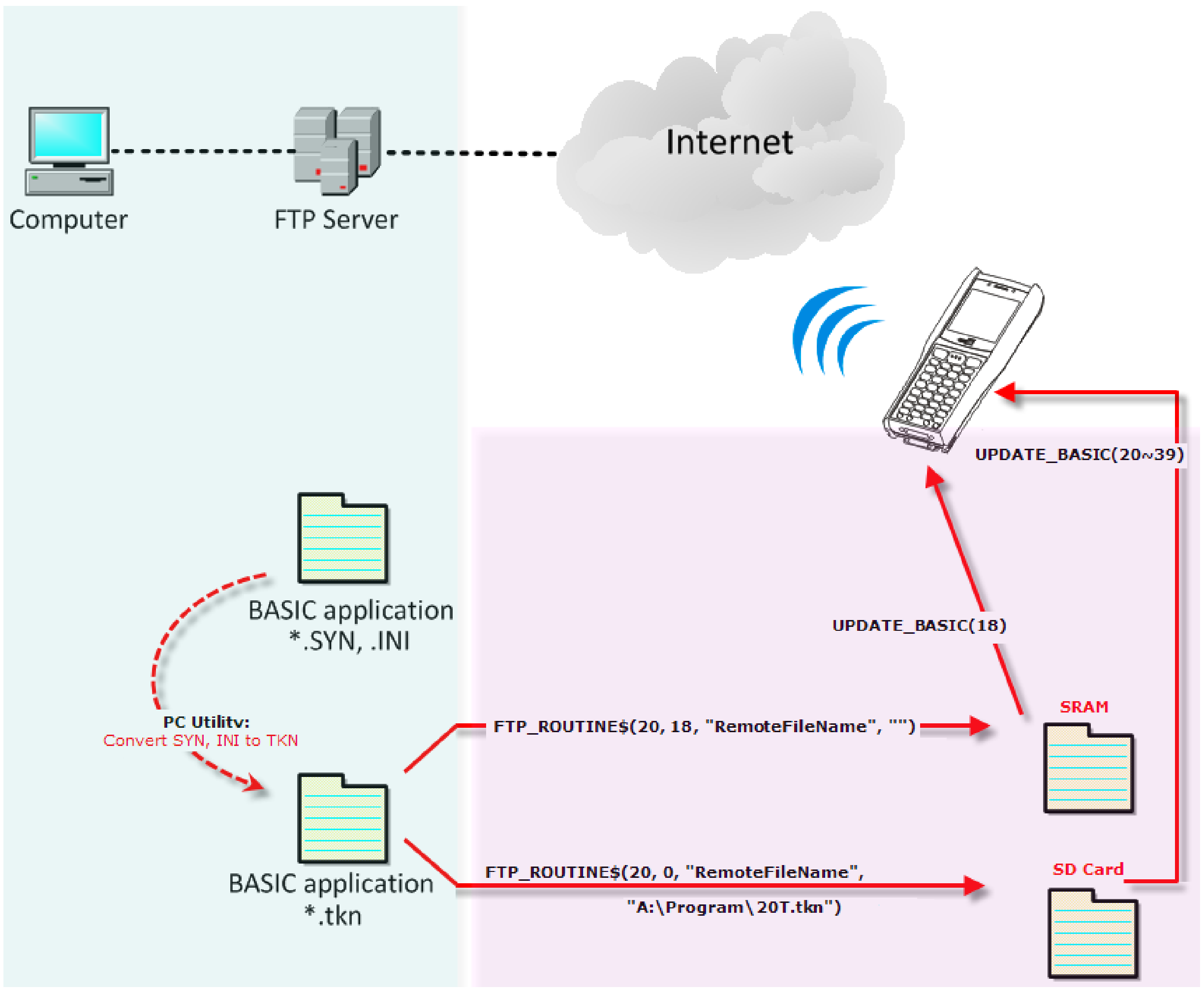
#### Format

```
FTP_ROUTINE$(20, 18, RemoteFileName$, LoacalFileName$)

/* Source file saved in SRAM */


FTP_ROUTINE$(20, (20~39), RemoteFileName$, LoacalFileName$)

/* Source file saved on SD card, for 8200/8400/8700 only */
```

#### Example

```
Remote$=”graphic.tkn”
RESULT$=FTP_ROUTINE$(20, 18, REMOTE$, “”)
UPDATE_BASIC(18)
…
```

Note: BASIC application program can be .syn, .ini, or a merged file (.tkn). However, the file made available on the host must be a .tkn file. Use PC utility “IniSyn2Token.exe” to merge the program (.syn, .ini → .tkn).


Computer
FTP Server
Internet
UPDATE_BASIC(20~39)
BASIC application
*.SYN, .INI
UPDATE_BASIC(18)
PC Utility:
Convert SYN, INI to TKN
FTP_ROUTINE$(20, 18, "RemoteFileName", "")
SRAM
BASIC application
*.tkn
FTP_ROUTINE$(20, 0, "RemoteFileName",
"A:\Program\20T.tkn")
SD Card

## 10.4.3 ACTIVATING PROGRAMS

If the source files have been downloaded to SRAM via FTP, use the following commands:

- **UPDATE_BASIC(18)** to activate an application program (.tkn)
- **UPDATE_BASIC(19)** to activate a runtime program (.bin)

If the source files have been downloaded to SD card via FTP, use the following commands:

- **UPDATE_BASIC(20~39)** to activate an application program (.tkn)
- **UPDATE_BASIC(40~59)** to activate a runtime program (.bin)

## 10.4.4 COMMAND: UPDATE_BASIC

**UPDATE_BASIC**

| | |
|---|---|
| Purpose | To have a BASIC program become the active program. |
| Syntax | A% = UPDATE_BASIC(*file%*) |
| Remarks | "*A%*" is an integer variable to be assigned to the result. |

| Value | Meaning |
|---|---|
| -1 | Invalid file number |
| -2 | Invalid file format |
| -8 | No free space in flash before writing |
| -9 | Fail to read program header (.ini) |
| -10Note | Fail to read object file (.syn) |
| -11 | RAM size cannot fit. |
| -12Note | Fail to write new program into flash due to insufficient space, illegal address or the sector of flash cannot be erased. |
| -13Note | Fail to write program header after new program written into flash |
| -14 | Cannot find file on SD card |
| -15 | Cannot read file on SD card |
| -16 | File on SD card with filename length over 64 bytes |

Note that it may not return the error code if the original BASIC program has been overwritten.

"*file%*" is an integer variable, indicating from which transaction file (or invisible file on 8200/8400/8700) the program is copied to the active area in flash memory. If successful, it will restart automatically.

| Value | Meaning |
|---|---|
| 1~6 | Application program saved in file system<br>- Source file will be kept unless you erase it manually. |

| | |
|---|---|
| 18 | Application program (.tkn) saved in SRAM via FTP or DOWNLOAD_BASIC(18)<br>▸ Source file will be removed after execution.<br>(currently supported on 8000, 8200, 8300, 8400, 8700 only) |
| 19 | Runtime program (.bin) saved in SRAM via FTP<br>▸ Source file will be removed after execution, but file system will be kept.<br>(currently supported on 8000, 8200, 8300, 8400, 8700 only) |
| 20~39 | Application program (.tkn, or .syn, .ini) saved on SD card<br>▸ Source file will be kept after execution. |
| 40~59 | Runtime program(.bin or .shx) saved on SD card<br>▸ Source file and file system will be kept after execution. |

- For 8200/8400/8700, if the source file is on SD card, "*file%*" must be set in a specific range, as shown above. You must follow these steps to make it active —

| | |
|---|---|
| Step 1: | Rename the program by prefixing a number in the specific range. For example,<br>EchoTest.ini -> 25EchoTest.ini<br>EchoTest.syn -> 25EchoTest.syn |
| Step 2: | Copy the header file and object file to the specified directory "\Program" on SD card. |
| Step 3: | Call UPDATE_BASIC(25). System will search the file whose name starts with "25" in the directory "\Program". |

Example

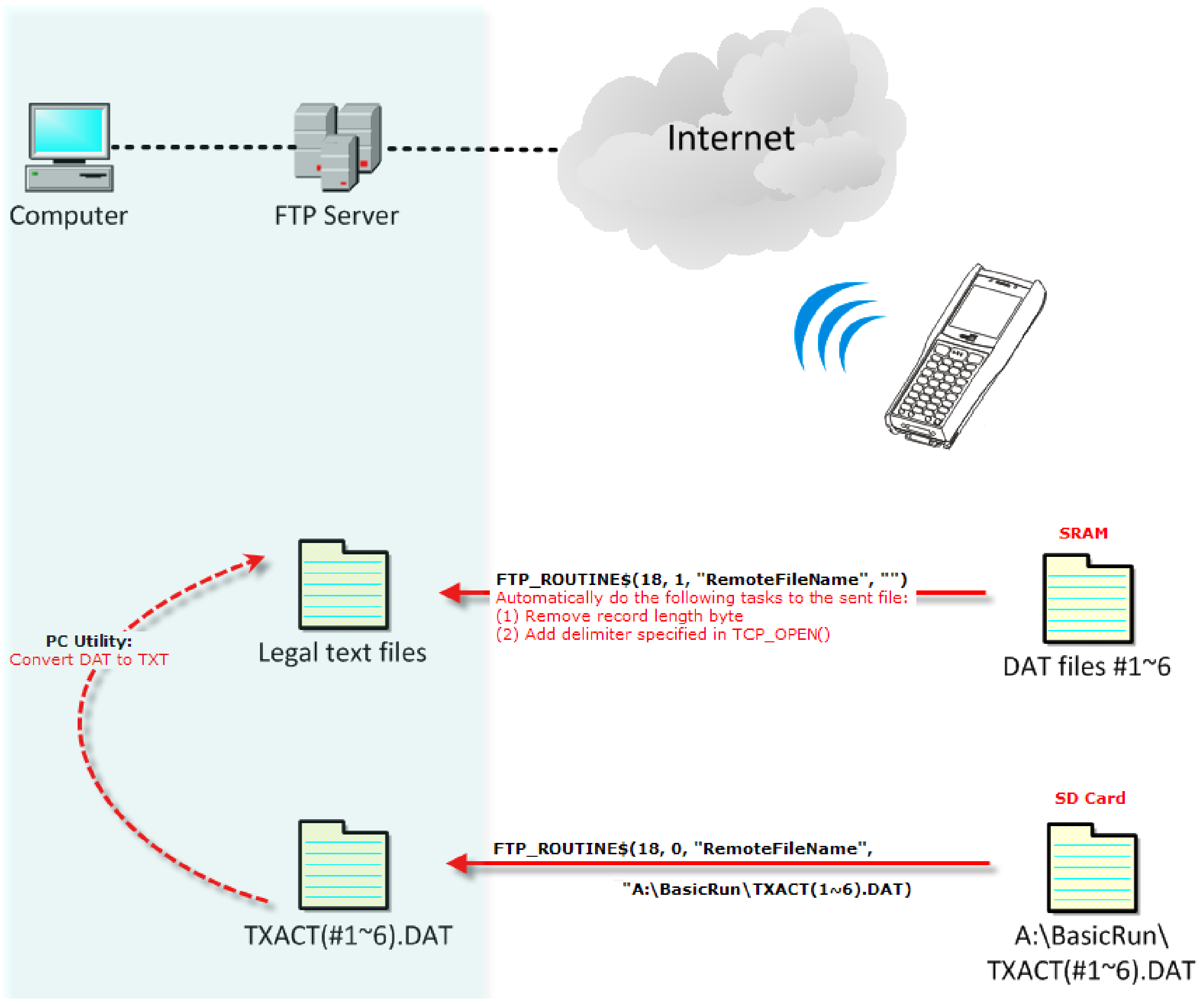
```
Error_Code% = UPDATE_BASIC(18)
```

## 10.5 FILE HANDLING

### 10.5.1 DAT FILES

| Upload via FTP | Pre-processing of File in Format, Data, etc. |
|---|---|
| Host | |
| Mobile Computer: | |
| SRAM | Not required<br>▸ DAT files will be uploaded as text files after automatically removing record length byte and adding desired delimiter specified in TCP_OPEN(). |
| SD card<br>(8200/8400/8700 only) | Remote only: Use PC utility “DataConverter.exe” to convert TXACT.DAT files to text files . |

Note: For BASIC programs, 8200/8400/8700 with SD card cannot be treated as mass storage.

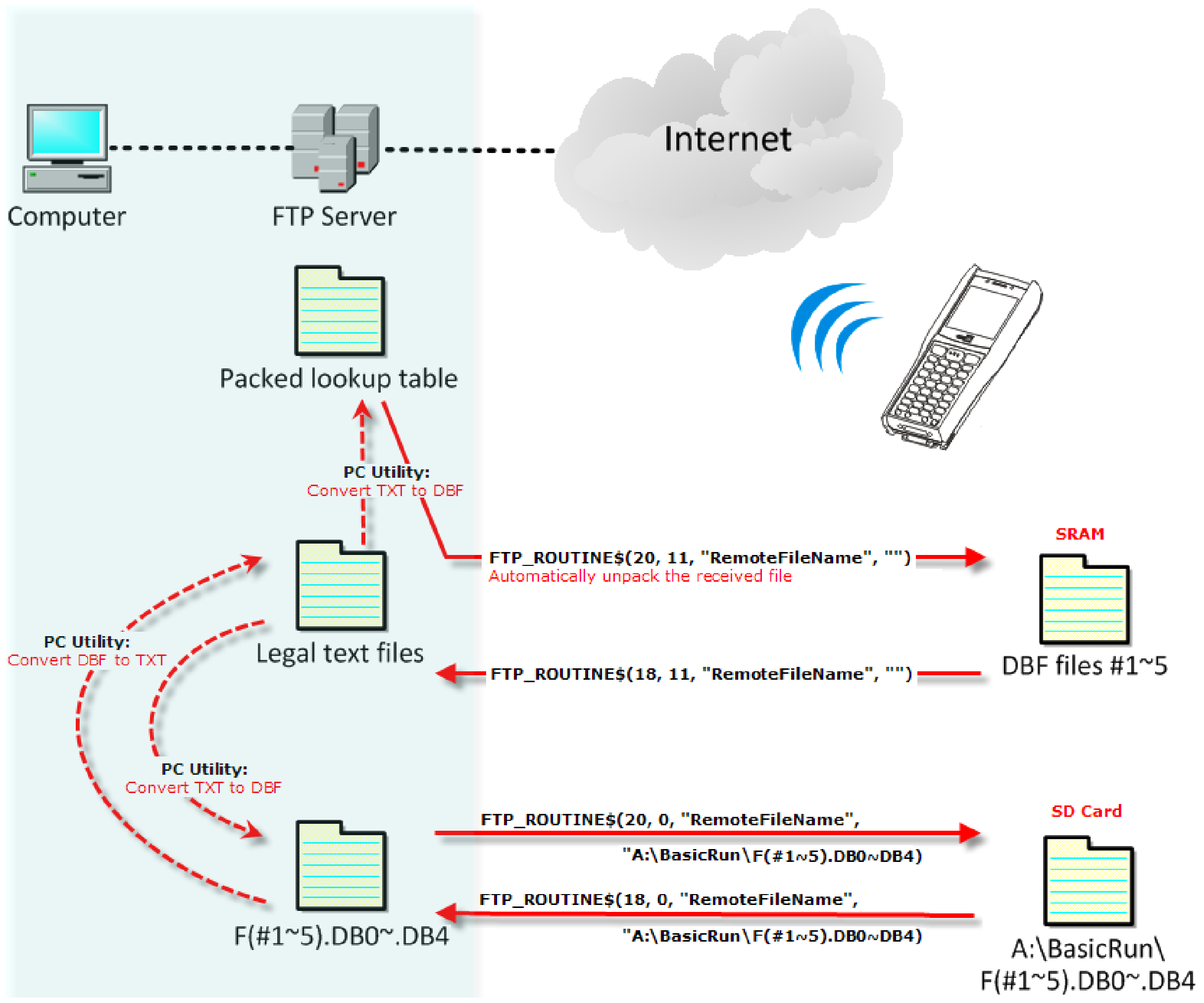

Computer
FTP Server
Internet
PC Utility:
Convert DAT to TXT
Legal text files
FTP_ROUTINE$(18, 1, "RemoteFileName", "")
Automatically do the following tasks to the sent file:
(1) Remove record length byte
(2) Add delimiter specified in TCP_OPEN()
SRAM
DAT files #1~6
TXACT(#1~6).DAT
FTP_ROUTINE$(18, 0, "RemoteFileName",
"A:\BasicRun\TXACT(1~6).DAT)
SD Card
A:\BasicRun\
TXACT(#1~6).DAT

### 10.5.2 DBF FILES

| Download via FTP | Pre-processing of File in Format, Data, etc. | |
|---|---|---|
| Host | | |
| Mobile Computer: | | |
| SRAM | Remote only: | Use PC utility "DataConverter.exe" to create legal files (pack lookup table), which will then be automatically unpacked by the runtime program pre-loaded on the mobile computer. |
| SD card (8200/8400/8700 only) | Remote only: | Use PC utility "DataConverter.exe" to convert text files to SD files (DB0; DB1~4 for IDX files). |

| Upload via FTP | Pre-processing of File in Format, Data, etc. | |
|---|---|---|
| Host | | |
| Mobile Computer: | | |
| SRAM | Not required | |
| SD card (8200/8400/8700 only) | Remote only: | Use PC utility "DataConverter.exe" to convert SD files (DB0; DB1~4 for IDX files) to text files. |

Note: For BASIC programs, 8200/8400/8700 with SD card cannot be treated as mass storage.


Computer
FTP Server
Internet
Packed lookup table
PC Utility:
Convert TXT to DBF
Legal text files
PC Utility:
Convert DBF to TXT
PC Utility:
Convert TXT to DBF
F(#1~5).DB0~.DB4
FTP_ROUTINE$(20, 11, "RemoteFileName", "")
Automatically unpack the received file
SRAM
DBF files #1~5
FTP_ROUTINE$(18, 11, "RemoteFileName", "")
FTP_ROUTINE$(20, 0, "RemoteFileName", "A:\BasicRun\F(#1~5).DB0~DB4)
SD Card
FTP_ROUTINE$(18, 0, "RemoteFileName", "A:\BasicRun\F(#1~5).DB0~DB4)
A:\BasicRun\F(#1~5).DB0~.DB4

## 10.6 SD CARD ACCESS

For 8200/8400/8700, access to SD card is allowed. When a file name is required as an argument passed to a function call, it must be given in full path as shown below. Only absolute path is supported, and the file name is not case-sensitive.

- DAT files created on SD card by previous BASIC runtime are not compatible in file format with new BASIC runtime, starting from version 1.10.
- The size of DAT files on SD card can be calibrated via System Menu. If the function DEL_TRANSACTION_DATA( ) or DEL_TRANSACTION_DATA_EX( ) is called in BASIC applications to remove records from file top, the space will not be released immediately. Users have to refresh the size of “A:\BASICRUN\TXACTn.DAT” (n=1~6) via **System Menu | 1. SD Card Menu | 2. Access SD Card | 4. Check File Size**.

| | |
|---|---|
| Warning: | Although file name may be case-sensitive on remote host, for use with SD card, it is suggested to avoid using letter case for identifying two files with identical file name, such as “AAA.txt” and “aaa.txt”. |

## 10.6.1 DIRECTORY

Unlike the file system on SRAM, the file system on SD card supports hierarchical tree directory structure and allows creating sub-directories. Several directories are reserved for particular use.

| Reserved Directory | Related Application or Function | Remark | | |
|---|---|---|---|---|
| \Program | ‣ Program Manager \| Download<br>‣ Program Manager \| Activate<br>‣ Kernel Menu \| Load Program<br>‣ Kernel Menu \| Kernel Update<br>‣ UPDATE_BASIC() | Store programs to this folder so that you can download them to 8200/8400/8700:<br>‣ C program — *.SHX<br>‣ BASIC program — *.INI and *.SYN | | |
| \BasicRun | BASIC Runtime | Store DAT and DBF files that are created and accessed in BASIC runtime to this folder. Their permanent filenames are as follows: | | |
| | | DAT Filename | | |
| | | DAT file #1 | TXACT1.DAT | |
| | | DAT file #2 | TXACT2.DAT | |
| | | DAT file #3 | TXACT3.DAT | |
| | | DAT file #4 | TXACT4.DAT | |
| | | DAT file #5 | TXACT5.DAT | |
| | | DAT file #6 | TXACT6.DAT | |
| | | DBF Filename | | |
| | | DBF file #1 | Record file | F1.DB0 |
| | | | System Default Index | F1.DB1 |
| | | | Index file #1 | F1.DB2 |
| | | | Index file #2 | F1.DB3 |
| | | | Index file #3 | F1.DB4 |
| | | DBF file #2 | Record file | F2.DB0 |
| | | | System Default Index | F2.DB1 |
| | | | Index file #1 | F2.DB2 |
| | | | Index file #2 | F2.DB3 |
| | | | Index file #3 | F2.DB4 |
| | | DBF file #3 | Record file | F3.DB0 |
| | | | System Default Index | F3.DB1 |
| | | | Index file #1 | F3.DB2 |

| | | | | |
|---|---|---|---|---|
| | | | Index file #2 | F3.DB3 |
| | | | Index file #3 | F3.DB4 |
| | | DBF file #4 | Record file | F4.DB0 |
| | | | System Default Index | F4.DB1 |
| | | | Index file #1 | F4.DB2 |
| | | | Index file #2 | F4.DB3 |
| | | | Index file #3 | F4.DB4 |
| | | DBF file #5 | Record file | F5.DB0 |
| | | | System Default Index | F5.DB1 |
| | | | Index file #1 | F5.DB2 |
| | | | Index file #2 | F5.DB3 |
| | | | Index file #3 | F5.DB4 |
| \AG\DBF<br>\AG\DAT<br>\AG\EXPORT<br>\AG\IMPORT | Application Generator (a.k.a. AG) | Store DAT, DBF, and Lookup files that are created and/or accessed in Application Generator to this folder. | | |

### 10.6.2 FILE NAME

A file name must follow 8.3 format (= short filenames) — at most 8 characters for filename, and at most three characters for filename extension. The following characters are unacceptable: **“ * + , : ; < = > ? | [ ]**

- On 8200/8400/8700 Series, it can only display a filename of 1 ~ 8 characters (the null character not included), and filename extension will be displayed if provided. If a file name specified is longer than eight characters, it will be truncated to eight characters.
- Long filenames, at most 255 characters, are allowed when using 8200/8400/8700 equipped with SD card as a mass storage device. For example, you may have a filename “123456789.txt” created from your computer. However, when the same file is directly accessed on 8200/8400/8700, the filename will be truncated to “123456~1.txt”.
- If a file name is specified other in ASCII characters, in order for 8200/8400/8700 to display it correctly, you may need to download a matching font file to 8200/8400/8700 first.
- The file name is not case-sensitive.

# CRADLE COMMANDS

Through programming 8000/8300/8500 Series mobile computer, you can use cradle commands to control the Cradle.

- To determine whether cradle commands are applied, use the parameter *Parity%* of **SET_COM**.
- To determine which type of cradle to control, use the parameter *Baudrate%* of **SET_COM**.

| Command | Parameters | Values | Remarks |
|---|---|---|---|
| SET_COM<br>(<br>N%,<br>Baudrate%,<br>Parity%,<br>Data%,<br>Handshake%<br>) | *N%* | 1 or 2 | Indicates which COM port is to be set. |
| | *Baudrate%* | 1: 115200 bps<br><br>3: 57600 bps<br>4: 38400 bps<br>5: 19200 bps<br>6: 9600 bps | - Unless you have changed the baud rate setting via the DIP switch onboard, assign 1 for Ethernet Cradle because its factory setting is 115200 bps.<br>- Unless you have changed the baud rate setting via the DIP switch onboard, assign 3 for Modem Cradle because its factory setting is 57600 bps. |
| | *Parity%* | 1: None<br>2: Odd<br>3: Even<br>4: Cradle commands | The parity setting is NOT applicable.<br>- Simply assign 4. |
| | *Data%* | 1: 7 data bits<br>2: 8 data bits | The data bits setting must be 8 bits.<br>- Assign 2. |
| | *Handshake%* | 1: None<br>2: CTS/RTS<br>3: XON/XOFF<br>4: Wedge | The handshake setting is NOT applicable.<br>- Simply assign 1. |

For example,

- Call **SET_COM_TYPE(1, 3)** to set COM1 to Serial IR communication.
- To enable the issuing of cradle commands over COM port to the Ethernet Cradle, call

  **SET_COM(1, 1, 4, 2, 1)**;

  to enable the issuing of cradle commands over COM port to the Modem Cradle, call

  **SET_COM(1, 3, 4, 2, 1)**.

- Call **OPEN_COM(1)** to initialize the connection over COM1.
- Issue a cradle command listed below. For example,

```
Sendbase$ = "#vErSiOn?"
```

- Call **WRITE_COM(1, Sendbase$)**.

...

Note: (1) Make sure the default delimiter 0x0d (CR) is in use; otherwise, call COM_DELIMITER().
(2) Unless you have changed the baud rate setting via the DIP switch onboard, pass the factory setting BAUD_115200 for Ethernet Cradle and BAUD_57600 for Modem Cradle.
(3) Baud rate will be reset to the DIP switch setting whenever you plug or unplug the RS-232 cable.

| #fOrMaT:x | Cradle Command |
|---|---|

| | |
|---|---|
| Purpose | To change the serial port settings of the cradle. |
| Syntax | WRITE_COM(*N%*, *A$*) |
| Remarks | "*N%*" is an integer variable, indicating which COM port the data is to be sent to. |
| | "*A$*" is a string variable, representing the string to be sent. The format of *A$* should be "**#fOrMaT:x**", and |

| **#fOrMaT:***x* | *Meaning* |
|---|---|
| **0** | Set serial port mode to 8, N, 1 |
| **1** | Set serial port mode to 7, N, 2 |
| **2** | Set serial port mode to 7, O, 2 |
| **3** | Set serial port mode to 7, E, 2 |

Example

```
SET_COM_TYPE(1, 3)
SET_COM(1, 3, 4, 2, 1)
OPEN_COM(1)
COMMANDSTR$ = "#fOrMaT:2"
WRITE_COM(1, COMMANDSTR$)          // set to 7,0,2 mode
```

| | |
|---|---|
| Return Value | If successful, it returns "#DONE". |
| Remarks | This cradle command is supported by firmware version 3.50 and later. |
| See Also | #SeRiAl |

| #mOdEm | Cradle Command |
|---|---|
| Purpose | To set the working mode of cradle to MODEM mode. |
| Syntax | WRITE_COM(*N%*, *A$*) |
| Remarks | "*N%*" is an integer variable, indicating which COM port the data is to be sent to.<br>"*A$*" is a string variable, representing the string to be sent. The format of *A$* should be "**#mOdEm**". |
| Example | `SET_COM_TYPE(1, 3)`<br>`SET_COM(1, 3, 4, 2, 1)`<br>`OPEN_COM(1)`<br>`COMMANDSTR$ = "#mOdEm"`<br>`WRITE_COM(1, COMMANDSTR$)          // set to MODEM mode` |
| Return Value | If successful, it returns "#DONE". |
| Remarks | After issuing the command, the baud rate of the cradle will be reset to the DIP switch setting. |

Note: For the Ethernet Cradle, this command "#mOdEm" actually means "to select Ethernet" because the modem board has been replaced by the Ethernet board.

| #SeRiAl | Cradle Command |
|---|---|
| Purpose | To reset the serial port settings of the cradle to defaults. |
| Syntax | WRITE_COM(*N%*, *A$*) |
| Remarks | "*N%*" is an integer variable, indicating which COM port the data is to be sent to.<br>"*A$*" is a string variable, representing the string to be sent. The format of *A$* should be "**#SeRiAl**". |
| Example | `SET_COM_TYPE(1, 3)`<br>`SET_COM(1, 3, 4, 2, 1)`<br>`OPEN_COM(1)`<br>`COMMANDSTR$ = "#SeRiAl"`<br>`WRITE_COM(1, COMMANDSTR$)            // set to default` |
| Return Value | If successful, it returns "#DONE".<br>Otherwise, it returns "#CABLE!" to indicate no RS-232 cable is detected. |
| Remarks | This cradle command is supported by firmware version 3.30 and later. It will reset the serial port settings to defaults - N, 8, 1; however, the baud rate depends on the current DIP switch setting (57600 bps by default). |

Note: Baud rate will be reset to the DIP switch setting whenever you plug or unplug the RS-232 cable.

| #vErSiOn? | Cradle Command |
|---|---|
| Purpose | To retrieve the version information of the IR board. |
| Syntax | WRITE_COM(*N%*, *A$*) |
| Remarks | "*N%*" is an integer variable, indicating which COM port the data is to be sent to.<br>"*A$*" is a string variable, representing the string to be sent. The format of *A$* should be "**#vErSiOn?**". |
| Example | `SET_COM_TYPE(1, 3)`<br>`SET_COM(1, 3, 4, 2, 1)`<br>`OPEN_COM(1)`<br>`COMMANDSTR$ = "#vErSiOn?"`<br>`WRITE_COM(1, COMMANDSTR$)` |
| Return Value | If successful, it returns the firmware version. For example, "#Ver03.20" |

Note: There will be no response if the IR board version is no later than v3.00!

## UNKNOWN COMMAND

It simply returns "#NAK".

# NET PARAMETERS BY INDEX

The number in a pair of square brackets indicates the length of a string, e.g. GPRS_AP [21] means the maximum length of the string for remote IP address is 21 characters.

## WIRELESS NETWORKING

| **Index** | | **Configuration Item** | **Default Setup String** | **802.11b only** | **802.11b/g** |
|---|---|---|---|---|---|
| GET_NET_ PARAMETER$ | SET_NET_ PARAMETER | | | | |
| 0 ~ 3 | | REMOTE_IP (string) | Read only | ✓ | ✓ |
| -1 | 1 | LOCAL_IP (string) | 0.0.0.0 | ✓ | ✓ |
| -2 | 2 | SUBNET_MASK (string) | 0.0.0.0 | ✓ | ✓ |
| -3 | 3 | DEFAULT_GATEWAY (string) | 0.0.0.0 | ✓ | ✓ |
| -4 | 4 | DNS_SERVER (string) | 0.0.0.0 | ✓ | ✓ |
| -5 | 5 | LOCAL_NAME [33] | S/N | ✓ | ✓ |
| -6 | 6 | SS_ID [33] | --- | ✓ | ✓ |
| -7 to -10 | 7 to 10 | WEP_KEY_1~4 [14] | --- | ✓ | ✓ |
| -11 | 11 | DHCP_ENABLE | Enable | ✓ | ✓ |
| -12 | 12 | AUTHEN_ENABLE | Open | ✓ | ✓ |
| -13 | 13 | WEP_LEN | 128 bits | ✓ | ✓ |
| -14 | 14 | SYSTEM_SCALE | Medium | ✓ | ✓ |
| -15 | 15 | DEFAULT_WEP_KEY | 1 | ✓ | ✓ |
| -16 | | DOMAIN_NAME [129] | Read only | ✓ | ✓ |
| -17 | 17 | WEP_ENABLE | Disable | ✓ | ✓ |
| -18 | 18 | EAP_ENABLE | Disable | ✓ | ✓ |
| -19 | 19 | EAP_ID [33] | --- | ✓ | ✓ |
| -20 | 20 | EAP_PASSWORD [33] | --- | ✓ | ✓ |
| -21 | 21 | POWER_SAVE_ENABLE | Enable | ✓ | ✓ |
| -22 | 22 | PREAMBLE | Long | ✓ | ✓ |
| -23 | | MAC_ID (string) | Read only | ✓ | ✓ |
| -30 | 30 | ADHOC | Disable | ✓ | ✓ |
| -31 | | FIRMWARE_VERSION [4] | Read only | ✓ | ✓ |
| -33 | 33 | WPA_ENABLE<br>WPA_PSK_ENABLE | Disable | ✓ | ✓ |

| **Index** | | **Configuration Item** | **Default Setup String** | **802.11b only** | **802.11b/g** |
|---|---|---|---|---|---|
| GET_NET_ PARAMETER$ | SET_NET_ PARAMETER | | | | |
| -34 | 34 | WPA_PASSPHRASE [64] | --- | ✓ | ✓ |
| -35 | | BSSID (string) | --- | ✓ | ✓ |
| -36 | 36 | FIXED_BSSID (string) | --- | ✓ | ✓ |
| -37 | 37 | ROAM_TXRATE_11B | 2 Mbps | ✓ | ✓ |
| -38 | 38 | ROAM_TXRATE_11G | 11 Mbps | ✓ | ✓ |
| -39 | 39 | WPA2_PSK_ENABLE | Disable | ✓ | ✓ |
| -83 | 83 | SCAN_TIME | 0 | --- | ✓ |
| -84 | 84 | PROFILE1 | --- | --- | ✓ |
| -85 | 85 | PROFILE2 | --- | --- | ✓ |
| -86 | 86 | PROFILE3 | --- | --- | ✓ |
| -87 | 87 | PROFILE4 | --- | --- | ✓ |
| | 88 | APPLY_PROFILE1 | --- | --- | ✓ |
| | 89 | APPLY_PROFILE2 | --- | --- | ✓ |
| | 90 | APPLY_PROFILE3 | --- | --- | ✓ |
| | 91 | APPLY_PROFILE4 | --- | --- | ✓ |
| -92 | 92 | SCAN_CHANNEL | 1111111111 1111 | --- | ✓ |
| -93 | 93 | SCAN_CHANNEL_TIME | 100 | --- | ✓ |
| -94 | 94 | ROAMING_RSSI_THRESH OLD | -70 | --- | ✓ |
| -95 | 95 | ROAMING_RSSI_DELTA | 5 | --- | ✓ |
| -96 | 96 | ROAMING_PERIOD | 5 | --- | ✓ |

Note: (1) The parameters ROAM_TXRATE_11B and ROAM_TXRATE_11G only work with "Custom-TxRate" system scale. Roaming starts when the data transmission rate gets lower than the specified value.

(2) Indexes -92 ~ -96 (GET)/92 ~ 96 (SET) are available only for 8200.

## BLUETOOTH SPP, FTP, DUN

| **Index** | | **Configuration Item** | **Default Setup String** | **SPP** | **FTP** | **DUN** |
|---|---|---|---|---|---|---|
| GET_NET_ PARAMETER$ | SET_NET_ PARAMETER | | | | | |
| -5 | 5 | LOCAL_NAME [33] | S/N | ✓ | ✓ | ✓ |
| -24 | | BT_MACID (string) | Read only | ✓ | ✓ | ✓ |
| -25 | 25 | BT_REMOTE_NAME [20] | --- | ✓ | ✓ | ✓ |
| -26 | 26 | BT_SECURITY | Disable | ✓ | ✓ | ✓ |
| -27 | 27 | BT_PIN_CODE [16] | --- | ✓ | ✓ | ✓ |
| -28 | 28 | BT_BROADCAST_ON | Enable | ✓ | ✓ | ✓ |
| -29 | 29 | BT_POWER_SAVE_ON | Enable | ✓ | ✓ | ✓ |
| -32 | 32 | BT_GPRS_APNAME [20] | | | | ✓ |
| -40 to -47 | 40 to 47 | BT_FREQUENT_DEVICE 1~8 | --- | ✓ | ✓ | ✓ |

Note: When Bluetooth security is enabled without providing a pre-set PIN code, dynamic input of PIN code is supported.

## GSM/GPRS

| **Index** | | **Configuration Item** | **Default Setup String** | **GSM** | **GPRS** |
|---|---|---|---|---|---|
| GET_NET_ PARAMETER$ | SET_NET_ PARAMETER | | | | |
| -60 | | GSM_SERVICE_CENTER [21] | Read only | ✓ | |
| -61 | 61 | GSM_PIN_CODE [9] | --- | ✓ | ✓ |
| -62 | 62 | GPRS_AP [21] | --- | | ✓ |
| -63 | | GSM_NET [21] | Read only | ✓ | |
| -64 | 64 | GSM_MODEM_DIAL_NUM [21] | --- | ✓ | |
| -65 | 65 | GPRS_CHAP_ENABLE | Disable | | ✓ |
| -66 | 66 | GPRS_CHAP_PASSWORD [33] | --- | | ✓ |
| -67 | 67 | GPRS_CHAP_USERNAME [33] | --- | | ✓ |

| **Index** | | **Configuration Item** | **Default Setup String** | **GPRS Cradle Transparent Mode** |
|---|---|---|---|---|
| GET_NET_ PARAMETER$ | SET_NET_ PARAMETER | | | |
| -63 | | GSM_NET [21] | Read only | ✓ |
| -65 | 65 | GPRS_CHAP_ENABLE | Disable | ✓ |
| -66 | 66 | GPRS_CHAP_PASSWORD [33] | --- | ✓ |
| -67 | 67 | GPRS_CHAP_USERNAME [33] | --- | ✓ |

## PPP

| Index | | Configuration Item | Default Setup String | PPP |
|---|---|---|---|---|
| GET_NET_ PARAMETER$ | SET_NET_ PARAMETER | | | |
| -70 | 70 | PPP_DIALUPPHONE [20] | --- | ✓ |
| -71 | 71 | PPP_LOGINNAME [41] | --- | ✓ |
| -72 | 72 | PPP_LOGINPASSWORD [20] | --- | ✓ |
| -73 | 73 | PPP_BAUDRATE<br>(cf. SET_COM) | 1 | ✓ |

## USB

| Index | | Configuration Item | Default Setup String | USB |
|---|---|---|---|---|
| GET_NET_ PARAMETER$ | SET_NET_ PARAMETER | | | |
| -80 | 80 | USB_VCOM_BY_SN | Disable | ✓ |

## FTP

| Index | | Configuration Item | Default Setup String | FTP |
|---|---|---|---|---|
| GET_NET_ PARAMETER$ | SET_NET_ PARAMETER | | | |
| -81 | 81 | FTP_USERNAME [65] | --- | ✓ |
| -82 | 82 | FTP_PASSWORD [65] | --- | ✓ |

# Appendix III

# NET STATUS BY INDEX

## WIRELESS NETWORKING

For 8000/8200/8300/8400/8700 with 802.11b/g module, we suggest using indexes 14~16 instead of indexes 2~4. For 8231 with 802.11b/g/n module, indexes 2~4 are not supported.

| **Index** | **Configuration Item** | **Return Value** | | **802.11b only** | **802.11b/g** | **802.11b/g/n** |
|---|---|---|---|---|---|---|
| **GET_NET_ STATUS** | | | | | | **8231 Return value** |
| 1 | WLAN_State: Connection state | 0<br>1 | Disabled<br>Connected | ✓ | ✓ | ✓ |
| 2 | WLAN_Quality:<br>Link quality | 0 ~ 10<br>10 ~ 15<br>15 ~ 30<br>30 ~ 50<br>50 ~ 80 | Very poor<br>Poor<br>Fair<br>Good<br>Very good | ✓ | ✓ | Not Supported |
| 3 | WLAN_Signal:<br>Signal strength level | 0 ~ 30<br>30 ~ 60<br>60 ~ 120 | Weak<br>Moderate<br>Strong | ✓ | ✓ | Not Supported |
| 4 | WLAN_Noise:<br>Noise Level | 1<br>2 ~ 3<br>4 ~ 5 | Weak<br>Moderate<br>Strong | ✓ | ✓ | Not Supported |
| 5 | WLAN_Channel:<br>Current channel # | 1 ~ 11 | | ✓ | ✓ | ✓ |
| 6 | WLAN_TxRate:<br>Transmit rate | 1<br>2<br>4<br>8<br>16<br>32<br>48<br>64<br>80 | 1 Mbps<br>2 Mbps<br>5.5 Mbps<br>11 Mbps<br>6 Mbps<br>9 Mbps<br>12 Mbps<br>18 Mbps<br>24 Mbps | ✓ | ✓ | ✓Note |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 96<br>112<br>128 | 36 Mbps<br>48 Mbps<br>54 Mbps | | | |
| 7 | NET_IPReady:<br>Mobile computer IP status | -1<br>0<br>1 | Error[Note]<br>Not ready<br>Ready | ✓ | ✓ | ✓ |
| 14 | WLAN_SNR: Signal to Noise ratio (dB) | 0 ~ 10<br>10 ~ 20<br>20 ~ 30<br>30 ~ 40<br>over 40 | Very poor<br>Poor<br>Fair<br>Good<br>Very good | | ✓ | ✓ |
| 15 | WLAN_RSSI:<br>Received Signal Strength Indication (-dBm) | 0 ~ 60<br>60 ~ 75<br>over 75 | Strong<br>Moderate<br>Weak | | ✓ | ✓[Note]<br>0~60: Strong<br>-60~-75: Moderate<br><-75: Weak |
| 16 | WLAN_NOISEFLOOR: Noise floor (-dBm) | 0 ~ 92<br>92 ~ 98<br>over 98 | Strong<br>Moderate<br>Weak | | ✓ | ✓[Note] |

Note: (1) If GET_NET_STATUS(7) returns -1, it means an abnormal break occurs during PPP, DUN-GPRS, or GPRS connection. Such disconnection may be caused by the mobile computer being out of range, improperly turned off, etc.
(2) Indexes 14~16 are only valid for 8000/8200/8231/8300/8400/8700 with 802.11b/g or 802.11b/g/n module.
(3) For 8231, unlike 8230, the received TxRate value (index 6) is exactly the data rate without conversion. For instance, suppose the data rate is 54Mbps; 8231 gets the received TxRate of 54 while 8230 gets 128 that is to be converted according to the parameter table.
(4) WLAN_RSSI and WLAN_NOISEFLOOR are negative values in dBm.

## BLUETOOTH SPP, FTP, DUN

DUN[1] refers to Bluetooth DUN for connecting a modem.

DUN[2] refers to Bluetooth DUN-GPRS for activating a mobile's GPRS.

| Index<br>GET_NET_STATUS | Configuration Item | Return Value | | SPP | FTP | DUN[1] | DUN[2] |
|---|---|---|---|---|---|---|---|
| 7 | NET_IPReady:<br>Mobile computer IP status | -1<br>0<br>1 | Error[Note]<br>Not ready<br>Ready | | | | ✓ |
| 8 | BT_State:<br>Connection state | 0<br>1 | Disabled<br>Connected | ✓ | ✓ | ✓ | ✓ |
| 9 | BT_Signal:<br>RSSI signal level | -10 to -6<br>-6 to 5<br>5 to 30 | Weak<br>Moderate<br>Strong | ✓ | ✓ | ✓ | ✓ |

Note: If GET_NET_STATUS(7) returns -1, it means an abnormal break occurs during PPP, DUN-GPRS, or GPRS connection. Such disconnection may be caused by the mobile computer being out of range, improperly turned off, etc.

## GSM/GPRS

| Index<br>GET_NET_STATUS | Configuration Item | Return Value | | GSM | GPRS |
|---|---|---|---|---|---|
| 10 | GSM_state: connection state | 0<br>1 | Disabled<br>Connected | ✓ | ✓ |
| 11 | GSM_RSSIQuality:<br>RSSI signal level | 0<br>1<br>2<br>…<br>(3 ~ 29)<br>30<br>31<br>99 | -113 dbm or less<br>-111 dbm<br>-109 dbm<br>…<br>(+2 dbm per increment)<br>-53 dbm<br>-51 dbm or greater<br>Not known or not detectable | ✓ | ✓ |
| 12 | GSM_PINstate:<br>PIN code status | 0<br>1 | Disabled<br>PIN code required | ✓ | ✓ |
| 13 | GSM connection status | 0<br>1 | Transmission undergoing<br>Transmission completed | ✓ | |

Appendix IV

# EXAMPLES

## WLAN EXAMPLE (802.11b/g)

### Configure Network Parameters

Generally, network configuration has to be done in advance by calling **GET_NET_PARAMETER$** and **SET_NET_PARAMETER**.

### Initialize Networking Protocol Stack & Wireless Module

The wireless module, such as of 802.11b/g, Bluetooth or GSM/GPRS, will not be powered until START TCPIP is called.

| *Mobile Computer* | *WLAN (802.11b/g)* | *GPRS* | *Bluetooth DUN-GPRS* | *PPP via RS-232* |
|---|---|---|---|---|
| **8062** | --- | --- | START TCPIP(3) | --- |
| **8071** | START TCPIP | --- | --- | --- |
| **8230** | START TCPIP<br>START TCPIP(0) | --- | START TCPIP(3) | START TCPIP(5) |
| **8260** | --- | --- | START TCPIP(3) | START TCPIP(5) |
| **8330** | START TCPIP<br>START TCPIP(0) | --- | START TCPIP(3) | START TCPIP(5) |
| **8362** | --- | --- | START TCPIP(3) | START TCPIP(5) |
| **8370** | START TCPIP | --- | --- | START TCPIP(5) |
| **8400** | --- | --- | START TCPIP(3) | START TCPIP(5) |
| **8470** | START TCPIP<br>START TCPIP(0) | --- | START TCPIP(3) | START TCPIP(5) |
| **8500** | --- | --- | START TCPIP(3) | --- |
| **8570** | START TCPIP<br>START TCPIP(0) | --- | START TCPIP(3) | --- |
| **8700** | --- | --- | START TCPIP(3) | --- |
| **8770** | START TCPIP<br>START TCPIP(0) | --- | START TCPIP(3) | --- |
| **8790** | START TCPIP<br>START TCPIP(0) | START TCPIP(2) | START TCPIP(3) | --- |

Note: (1) For the use of Modem Cradle, use START TCPIP(4) for PPP via IR or direct connect.
(2) For the use of Ethernet Cradle, use START TCPIP(6) for Ethernet via IR or direct connect.

### Check Network Status

The **START TCPIP** routine does the first stage of the initialization process, and it will generate a system task to finish the rest of the process. When **START TCPIP** returns, the initialization process might not have been done yet. Therefore, it is necessary for the application program to check whether the status is "IP is ready" by calling **GET_TCPIP_MESSAGE** or **GET_NET_STATUS** before it proceeds to perform any networking operations.

Note: In case of initialization error, such as an abnormal break during PPP, DUN-GPRS, or GPRS connection, GET_NET_STATUS(7) will return -1.

Once the initialization process is done, the network status can be retrieved from the system. It will be periodically updated by the system. The application program must explicitly call **GET_NET_STATUS** to get the latest status.

### Open Connection

Before reading and writing to the remote host, a connection must be established (opened). Call **TCP_OPEN** to open a connection. The application program needs to define a connection number (0~3), so that it can identify a particular connection in subsequent calls to other TCP/IP stack routines.

It is necessary for the application to check whether the status of the particular connection is "connected" by calling **GET_TCPIP_MESSAGE** before it proceeds to perform any read/write operations. Once the value of 4013 is returned (= connection is dropped abnormally, say, the mobile computer is shut down accidentally or by the AUTO_OFF timer), user program has to specify its own handling method. For example, if you wish to reconnect, simply call **START TCPIP** again.

### Transmit Data

#### SOCKET_CAN_SEND

Before sending data to the network, call **SOCKET_CAN_SEND** to check if there is enough buffer size to write out the data immediately. It also can be used to check if the data being sent is more than 4 packets when there is no response from the remote host. Then, call **NWRITE** to send data on the network.

#### SOCKET_HAS_DATA

Before receiving data from the network, call **SOCKET_HAS_DATA** to check if there is data in the buffer. Then, call **NREAD$** to receive data on the network.

Note: In case of an abnormal break during PPP, DUN-GPRS, or GPRS connection, GET_TCPIP_MESSAGE will return 4013 while GET_NET_STATUS(7) will return -1.

### Other Useful Functions…

There are other routines for obtaining additional information or setting control for a connection.

#### SOCKET_OPEN, SOCKET_HAS_DATA, etc.

To check the connection status by polling method.

#### GET_NET_PARAMETER$

To get the networking configuration and the remote site IP address.

#### TCP_ERR_CODE

To get the operation result after calling any TCPIP routines.

#### TCPIP Event Trigger

ON TCPIP GOSUB… and OFF TCPIP are used to get higher working performance. Once the TCPIP event occurs, it is necessary for the application program to check the trigger type by getting the value of the **GET_TCPIP_MESSAGE** routine.

### Close Connection

Call **NCLOSE** to terminate a particular connection when the application program does not use it any more.

### Terminate Networking Protocol Stack & Wireless Module

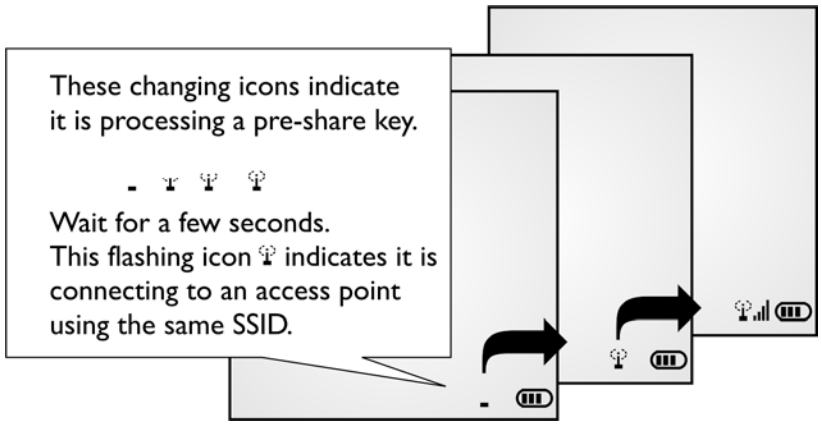
When the application program wishes to stop using the network, call **STOP TCPIP** to terminate networking and shut down the power to the module so that it can save power. To enable the network again, it is necessary to call **START TCPIP** again.

Note: After calling STOP TCPIP, any previous network connection and data will be lost.

## WPA ENABLED FOR SECURITY

If WPA-PSK/WPA2-PSK is enabled for security, SSID and Passphrase will be processed to generate a pre-share key. If you change SSID or Passphrase, it will have to re-generate a pre-share key.

1) For initial association with an access point, you will see an antenna icon developing on the screen to indicate that the mobile computer is processing a pre-share key.


These changing icons indicate it is processing a pre-share key.
Wait for a few seconds.
This flashing icon indicates it is connecting to an access point using the same SSID.

2) After having generated the pre-share key, the mobile computer proceeds to establish a connection with an access point, and you will see the whole antenna is flashing.

3) When the mobile computer has been connected to the access point successfully, you will see the whole antenna and the indication of wireless signal strength.

Note: Be aware that these icons will appear on the device screen after START TCPIP() is called. (WPA-PSK/WPA2-PSK must be enabled first!)

## BLUETOOTH EXAMPLES

| Command | Parameters | Values | Remarks |
|---|---|---|---|
| SET_COM<br>(<br>N%,<br>Baudrate%,<br>Parity%,<br>Data%,<br>Handshake%<br>) | *N%* | 2 | Indicates Bluetooth COM port is to be set. |
| | *Baudrate%* | 1: 115200 bps<br>2: 76800 bps<br>3: 57600 bps<br>4: 38400 bps<br>5: 19200 bps<br>6: 9600 bps<br>7: 4800 bps<br>8: 2400 bps | The baud rate setting is NOT applicable to Bluetooth. Simply assign –<br>▸ 1 for SPP Slave<br>▸ 4 for SPP Master<br>▸ 5 for DUN<br>▸ 6 for HID |
| | *Parity%* | 1: None<br>2: Odd<br>3: Even<br>4: Cradle Commands | The parity setting is NOT applicable to Bluetooth.<br>▸ Simply assign 1 for Bluetooth.<br>▸ To determine which type of cradle to control, use the parameter *Baudrate%* of **SET_COM**. Refer to Appendix I — Cradle Commands. |
| | *Data%* | 1: 7 data bits<br>2: 8 data bits | The data bits setting is NOT applicable to Bluetooth.<br>▸ Simply assign 1 for Bluetooth. |
| | *Handshake%* | 1: None<br>2: CTS/RTS<br>3: XON/XOFF<br>4: Wedge Emulator | The handshake setting is NOT applicable to Bluetooth. Simply assign –<br>▸ 1 for Bluetooth SPP/DUN/HID<br>▸ 4 for Bluetooth Wedge Emulator |

## SPP MASTER

### Inquiry

Call **BT_INQUIRY$** to discover nearby Bluetooth devices.

### Pairing

Call **BT_PAIRING (addr$, 3)** to pair with a Bluetooth device.

### Set Communication Type

Call **SET_COM_TYPE(2, 5)** to set COM2 for Bluetooth communication.

### Set Bluetooth Service

Call **SET_COM(2, 4, 1, 1, 1)** to initialize Bluetooth SPP Master.

### Open COM Port

Call **OPEN_COM(2)** to initialize the Bluetooth module and set up connection.

### Check Connection

Call **GET_NET_STATUS(8)** to detect if connection is completed. For example,

```
LOOP003:
IF GET_NET_STATUS(8) = 0 THEN
    GOTO LOOP003
    BEEP(4400, 4)
    CLS
    PRINT “Connect OK”
```

### Transmit/receive Data

Call **WRITE_COM(2)** and **READ_COM$(2)** to transmit and receive data respectively.

### Check Connection

Call **GET_NET_STATUS(8)** to detect if connection is maintained. For example,

```
IF GET_NET_STATUS(8) = 0 THEN
    BEEP(3300, 4)
    CLOSE_COM(2)
END IF
```

### Close COM Port

Call **CLOSE_COM(2)** to terminate communication and shut down the Bluetooth module.

## SPP SLAVE

### Set Communication Type

Call **SET_COM_TYPE(2, 5)** to set COM2 for Bluetooth communication.

### Set Bluetooth Service

Call **SET_COM(2, 1, 1, 1, 1)** to initialize Bluetooth SPP Slave.

### Open COM Port

Call **OPEN_COM(2)** to initialize the Bluetooth module and set up connection.

### Check Connection

Call **GET_NET_STATUS(8)** to detect if connection is completed. For example,

```
LOOP003:
IF GET_NET_STATUS(8) = 0 THEN
    GOTO LOOP003
    BEEP(4400, 4)
    CLS
    PRINT “Connect OK”
```

### Transmit/receive Data

Call **WRITE_COM(2)** and **READ_COM$(2)** to transmit and receive data respectively.

### Check Connection

Call **GET_NET_STATUS(8)** to detect if connection is maintained. For example,

```
IF GET_NET_STATUS(8) = 0 THEN
    BEEP(3300, 4)
    CLOSE_COM(2)
END IF
```

### Close COM Port

Call **CLOSE_COM(2)** to terminate communication and shut down the Bluetooth module.

## WEDGE EMULATOR VIA SPP

Refer to **Part I: 4.9 Keyboard Wedge Commands** and **4.9.3 Wedge Emulator**.

**SET_COM**(N%, Baudrate%, Parity%, Data%, Handshake%) - To set the wedge emulation flag, use the last parameter regarding hardware handshake setting.

```
SET_COM_TYPE(2, 5)

SET_COM(2, 1, 1, 1, 4)

OPEN_COM(2)
```

And then, use the normal wedge functions to send data.

```
SET_COM_TYPE(2, 5)

SET_COM(2, 1, 1, 1, 4)

OPEN_COM(2)

CLS

PRINT "Wait to Connect"

LOOP000:

IF WEDGE_READY = 0 THEN GOTO LOOP000

BEEP(4400, 4)

CLS PRINT "OK! Try to Send"


LOOP:

KeyData$ = INKEY$

IF KeyData$ = "" THEN GOTO LOOP


IF KeyData$ = "0" THEN

    IF WEDGE_READY = 1 THEN

        PRINT "READY"

    ELSE

        PRINT "NOT READY"

    END IF

ELSE IF KeyData$ = "1" THEN
```

```
    SEND_WEDGE(“Hello”)

ELSE IF KeyData$ = “2” THEN

    PRINT “Hello”

END IF

GOTO LOOP
```

## BLUETOOTH HID

### Configure Wedge Settings

Bluetooth HID makes use of the **WedgeSetting$** array to govern the HID operations. Refer to **Part I: 4.9 Keyboard Wedge Commands**.

| Parameter | Bit | Description |
|---|---|---|
| Wedge_1$ | 7 - 0 | KBD / Terminal Type |
| Wedge_2$ | 7 | 1: Enable capital lock auto-detection<br>0: Disable capital lock auto-detection |
| Wedge_2$ | 6 | 1: Capital lock on<br>0: Capital lock off |
| Wedge_2$ | 5 | 1: Ignore alphabets' case<br>0: Alphabets are case-sensitive |
| Wedge_2$ | 4 - 3 | 00: Normal<br>10: Digits at lower position<br>11: Digits at upper position |
| Wedge_2$ | 2 - 1 | 00: Normal<br>10: Capital lock keyboard<br>11: Shift lock keyboard |
| Wedge_2$ | 0 | 1: Use numeric keypad to transmit digits<br>0: Use alpha-numeric key to transmit digits |
| Wedge_3$ | 7 | 1: Combination Key<br>0: Extend ASCII Code<br>(for 8200/8400 only) |
| Wedge_3$ | 6 - 1 | Inter-character delay |
| Wedge_3$ | 0 | HID Character Transmit Mode<br>1: By character<br>0: Batch processing |

**Wedge_1$**: It is used to determine which type of keyboard wedge is applied, and the possible value is listed below.

| Setting Value | Terminal Type | Setting Value | Terminal Type |
|---|---|---|---|
| 0 | Null (Data Not Transmitted) | 8 | PCAT (BE) |
| 1 | PCAT (US) | 9 | PCAT (SP) |
| 2 | PCAT (FR) | 10 | PCAT (PO) |
| 3 | PCAT (GR) | 11 | IBM A01-02 (Japanese OADG109) |
| 4 | PCAT (IT) | 12 | PCAT (Turkish) |
| 5 | PCAT (SV) | 13 | PCAT (Hungarian), 8200/8400/8700 |
| 6 | PCAT (NO) | 14 | PCAT (Swiss(German)),8200/8400/8700 |
| 7 | PCAT (UK) | | |

**Wedge_2$**: For details, refer to **Part I: 4.9 Keyboard Wedge Commands**.

**Wedge_3$:** It is used to configure how it sends data to the host, either by character or batch processing.

### Set Communication Type

Call **SET_COM_TYPE(2, 5)** to set COM2 for Bluetooth communication.

### Set Bluetooth Service

Call **SET_COM(2, 6, 1, 1, 1)** to initialize Bluetooth HID functionality.

### Open COM Port

Call **OPEN_COM(2)** to initialize the Bluetooth module and set up connection.

### Check Connection

Call **GET_NET_STATUS(8)** to detect if connection is completed. For example,

```
LOOP003:
IF GET_NET_STATUS(8) = 0 THEN
    GOTO LOOP003
    BEEP(4400, 4)
    CLS
    PRINT “Connect OK”
```

### Frequent Device List

When there is a host device recorded in the Frequent Device List, the mobile computer (as SPP Master) will automatically connect to it. If the connection fails, the mobile computer will try again. If it fails for the second time, the mobile computer will wait 7 seconds for another host to initiate a connection. If still no connection is established, the mobile computer will repeat the above operation.

When there is no device recorded in the Frequent Device List, the mobile computer (as SPP Slave) simply must wait for a host device (as SPP Master) to initiate a connection.

Note: As an HID input device (keyboard), the mobile computer must wait for a host to initiate a connection. Once the HID connection is established, the host device will be recorded in the Frequent Device List identified as HID Connection.

### Transmit Data

Call **WRITE_COM(2, *data)** to transmit data.

### Check Connection

Call **GET_NET_STATUS(8)** to detect if connection is maintained. For example,

```
IF GET_NET_STATUS(8) = 0 THEN
   BEEP(3300, 4)
   CLOSE_COM(2)
END IF
```

### Close COM Port

Call **CLOSE_COM(2)** to terminate communication and shut down the Bluetooth module.

## DUN

### Inquiry

Call **BT_INQUIRY$** to discover nearby Bluetooth devices.

### Pairing

Call **BT_PAIRING (addr$, 4)** to pair with a Bluetooth device that can work as a modem.

### Set Communication Type

Call **SET_COM_TYPE(2, 5)** to set COM2 for Bluetooth communication.

### Set Bluetooth Service

Call **SET_COM(2, 5, 1, 1, 1)** to initialize Bluetooth DUN functionality.

### Open COM Port

Call **OPEN_COM(2)** to initialize the Bluetooth module and set up connection.

### Check Connection

Call **GET_NET_STATUS(8)** to detect if connection is completed. For example,

```
LOOP003:
IF GET_NET_STATUS(8) = 0 THEN
    GOTO LOOP003
    BEEP(4400, 4)
    CLS
    PRINT “Connect OK”
```

### Transmit/receive Data

Call **WRITE_COM(2)** and **READ_COM$(2)** to transmit and receive data respectively.

### Check Connection

Call **GET_NET_STATUS(8)** to detect if connection is maintained. For example,

```
IF GET_NET_STATUS(8) = 0 THEN
    BEEP(3300, 4)
    CLOSE_COM(2)
END IF
```

### Close COM Port

Call **CLOSE_COM(2)** to terminate communication and shut down the Bluetooth module.

## DUN-GPRS

To activate the GPRS functionality on a mobile phone via the built-in Bluetooth dial-up networking technology, follow the same programming flow of WLAN Example (802.11b/g).

- Before calling **START TCPIP(3)**, the following parameters of DUN-GPRS must be specified.

| Index | | Configuration Item | Default | Description |
|---|---|---|---|---|
| -32 | 32 | P_ BT_GPRS_APNAME [20] | Null | Name of Access Point for Bluetooth DUN-GPRS |

## FTP (8200 ONLY)

### Inquiry

Call **BT_INQUIRY$** to discover nearby Bluetooth devices.

### Pairing

Call **BT_PAIRING (addr$, 7)** to pair with the FTP server.

### Open Connection

Before transferring files with the FTP server, a connection must be established (opened). Call **TCP_OPEN (5, "0.0.0.0", 0, 0, 2, [, Delimieter%])** to open a connection.

### Perform FTP Tasks

Call **FTP_ROUTINE$ (N%, file%, Para1$, Para2$)** to execute a specific FTP task.

### Close Connection

Call **NCLOSE (5)** to terminate the connection.

## GSM/GPRS EXAMPLES

### GPRS

To establish a connection to the content server connected to the internet, follow the same programming flow of WLAN Example (802.11b/g). Only client-initiated connection is supported.

#### Connecting Mobile Computer

Before calling **START TCPIP(2)**, the following parameters of GPRS must be specified.

| Index | | Configuration Item | Default | Description |
|---|---|---|---|---|
| -61 | 61 | P_ GSM_PIN_CODE [9] | Null | PIN Code for GSM/GPRS |
| -62 | 62 | P_ GPRS_AP [21] | Null | Name of Access Point for GPRS |

#### Connecting 8400 GPRS Cradle (Transparent Mode)

Before calling **START TCPIP(7)**, use AT commands to configure PIN code and GPRS AP name.

- If CHAP is enabled, you must configure the settings from the mobile computer.
- It fails to initialize a connection in the following conditions: (1) PIN code and GPRS AP name are not configured correctly via AT commands, and (2) CHAP settings are not configured correctly on 8400.

Note: A client-initiated connection occurs when the connection is established in response to a request from the client.

## GSM

### Configure Parameters

Call **SET_NET_PARAMETER** to set variables, such as PINCode[], ModemDialNum[], and so on.

It is recommended that the correct PIN code should be initialized before opening the GSM port. This is because the PIN code will be taken as a password to activate the SIM card. Therefore, any input of incorrect PIN code during initialization will result in wasting one attempt of PIN entry. If you fail the PIN entry three times, the procedure of PIN code entry will be locked.

### Set Communication Type

Call **SET_COM_TYPE(3, 6)** to set COM3 for SMS (GSM_SMS).

Or call **SET_COM_TYPE(3, 7)** to set COM3 for data call (GSM_Modem).

### Open COM Port

Call **OPEN_COM(3)** to initialize the GSM/GPRS module. The initialization takes about 10 seconds.

An antenna icon representing the GSM(*GSM_SMS* only)/GPRS operation will be displayed, and it keeps flashing until **OPEN_COM(3)** procedure is completed. Once the procedure is completed, the signal strength bar will be displayed next to the antenna icon, and it will be updated every five seconds. The level of the signal strength bar ranges from 0 to 5.

- The value of the PIN code will be fetched as a password required for initializing the operation.
- Refer to 6.2.1 PIN Procedure and 6.2.2 PUK Procedure for handling PINCode[] errors. New PIN code re-entry and PUK unblock operation are furnished.
- Once the PIN code check is passed, PINCode[] will be updated with the input value.
- After **OPEN_COM(3)** is completed, relevant information will be obtained, such as SMServiceCenter[], NET[], and PINstatus.

| **Signal Bar** | **RSSI Range** | |
|---|---|---|
| **(Empty)** | x < 10 | (< -93 dbm) |
| ▂ | 10 ≤ x < 12 | (-93 ≤ x < -89 dbm) |
| ▂▃ | 12 ≤ x < 15 | (-89 ≤ x < -83 dbm) |
| ▂▃▄ | 15 ≤ x < 18 | (-83 ≤ x < -77 dbm) |
| ▂▃▄▅ | 18 ≤ x < 21 | (-77 ≤ x < -71 dbm) |
| ▂▃▄▅▆ | 21 ≤ x | (-71 ≤ x) |

Note: For GSM_Modem, refer to GSMModemGetRSSI(). GetNetStatus(GSM_RSSIQuality) will become available only when GSMModemGetRSSI() is called first.

### Check Connection

Call **GET_NET_STATUS(13)** to detect if the initialization is completed. For example,

```
OPEN_COM(3)

LOOP:
GSMeot% = GET_NET_STATUS(13)
IF GSMeot% = 1 THEN
    GOTO INIT_DONE
ENDIF
…
GOTO LOOP

INIT_DONE:
…
```

Such checking must be carried out to ensure the initialization of the GSM/GPRS module has been completed. **GET_NET_STATUS(13)** will return 1 if the initialization is completed.

Note: The POWER key will be disabled during the connection process. Yet, the [ESC] key is provided for being able to abort the PIN code check while connecting.

### Transmit/receive Data

Call **WRITE_COM(3, A$)** and **READ_COM$(3)** to transmit and receive data respectively.

### Check Connection

Call **GET_NET_STATUS(13)** to detect if the transmission is completed. For example,

```
    WRITE_COM(3, A$)

W_LOOP:
    GSMeot% = GET_NET_STATUS(13)
    IF GSMeot% = 1 THEN
        GOTO W_DONE
    ENDIF
    …
        GOTO W_LOOP

W_DONE:
…
```

### Close COM Port

Call **CLOSE_COM(3)** to terminate communication and shut down the GSM/GPRS module.

## USB EXAMPLES

### USB VIRTUAL COM

#### Set Communication Type

Call **SET_COM_TYPE(5, 9)** to set COM5 for USB Virtual COM communication.

#### Open COM Port

Call **OPEN_COM(5)** to initialize the COM port.

#### Transmit/receive Data

Call **WRITE_COM(5, A$)** and **READ_COM$(5)** to transmit and receive data respectively.

#### Close COM Port

Call **CLOSE_COM(5)** to terminate USB communication.

## USB HID

### Configure Wedge Settings

Like Bluetooth HID, USB HID also makes use of the **WedgeSetting$** array to govern the HID operations. Refer to **Part I: 4.9 Keyboard Wedge Commands**.

| Parameter | Bit | Description |
|---|---|---|
| Wedge_1$ | 7 – 0 | KBD / Terminal Type |
| Wedge_2$ | 7 | 1: Enable capital lock auto-detection<br>0: Disable capital lock auto-detection |
| Wedge_2$ | 6 | 1: Capital lock on<br>0: Capital lock off |
| Wedge_2$ | 5 | 1: Ignore alphabets' case<br>0: Alphabets are case-sensitive |
| Wedge_2$ | 4 – 3 | 00: Normal<br>10: Digits at lower position<br>11: Digits at upper position |
| Wedge_2$ | 2 – 1 | 00: Normal<br>10: Capital lock keyboard<br>11: Shift lock keyboard |
| Wedge_2$ | 0 | 1: Use numeric keypad to transmit digits<br>0: Use alpha-numeric key to transmit digits |
| Wedge_3$ | 7 | 1: Combination Key<br>0: Extend ASCII Code<br>(for 8200/8400 only) |
| Wedge_3$ | 6 - 1 | Inter-character delay |
| Wedge_3$ | 0 | HID Character Transmit Mode<br>1: By character<br>0: Batch processing |

**Wedge_1$**: It is used to determine which type of keyboard wedge is applied, and the possible value is listed below.

| Setting Value | Terminal Type | Setting Value | Terminal Type |
|---|---|---|---|
| 0 | Null (Data Not Transmitted) | 8 | PCAT (BE) |
| 1 | PCAT (US) | 9 | PCAT (SP) |
| 2 | PCAT (FR) | 10 | PCAT (PO) |
| 3 | PCAT (GR) | 11 | IBM A01-02 (Japanese OADG109) |
| 4 | PCAT (IT) | 12 | PCAT (Turkish) |
| 5 | PCAT (SV) | 13 | PCAT (Hungarian), 8200/8400/ 8700 |
| 6 | PCAT (NO) | 14 | PCAT (Swiss(German)),8200/8400/8700 |
| 7 | PCAT (UK) | | |

**Wedge_2$**: For details, refer to **Part I: 4.9 Keyboard Wedge Commands**.

**Wedge_3$**: It is used to configure how it sends data to the host, either by character or batch processing.

### Set Communication Type

Call **SET_COM_TYPE(5, 8)** to set COM5 for USB HID communication.

### Open COM Port

Call **OPEN_COM(5)** to initialize the COM port.

### Transmit Data

Call **WRITE_COM(5, A$)** to transmit data.

### Close COM Port

Call **CLOSE_COM(5)** to terminate USB communication.

## USB MASS STORAGE DEVICE

### Set Communication Type

Call **SET_COM_TYPE(5, 10)** to set COM5 for the use of USB removable disk.

### Open COM Port

Call **OPEN_COM(5)** to initialize the COM port.

### Check Connection

Call **IOPIN_STATUS(3)** to detect if connection is completed. For example,

```
LOOP1:
   A%=IOPIN_STATUS(3)
IF A% = 0 THEN
   PRINT “Disconnect”
ELSE IF A% = 1 THEN
   PRINT “Connected”
ELSE IF A% = 3 THEN
   PRINT “Device is being accessed”
END IF
   GOTO LOOP1
```

# FTP MESSAGE

FTP messages are responses to FTP commands, and each consists of a 4-digit response code ("5XYZ").

You may use **GET_TCPIP_MESSAGE()** to get the message after executing an FTP task:

```
TCP_EVENT% = GET_TCPIP_MESSAGE
```

| TCP_EVENT% | | | | Description |
|---|---|---|---|---|
| 5 | | | | The 1st digit is always "5". |
| | X | | | The 2nd digit refers to which FTP task is executed.<br>1: Open a connection by TCP_OPEN()<br>2: Get directoy by FTP_ROUTINE$(13, …)<br>3: Change directoy by FTP_ROUTINE$(17, …)<br>4: Download file by FTP_ROUTINE$(20, …)<br>5: Upload file by FTP_ROUTINE$(18, …)<br>6: Append to file by FTP_ROUTINE$(19, …) |
| | | Y | | If not zero, it refers to possible causes that result in error. |
| | | | Z | The 4th digit refers to the result.<br>1: Success<br>2: Fail to execute a specific FTP task |

## TASK: CONNECT

| TCP_EVENT% | | | | Description |
|---|---|---|---|---|
| 5 | 1 | 0 | 1 | Open a connection successfully |
| 5 | 1 | 1 | 2 | Failed to connect to host (command connection error) |
| 5 | 1 | 2 | 2 | Incorrect username or missing parameter |
| 5 | 1 | 3 | 2 | Incorrect password or missing parameter |
| 5 | 1 | 4 | 2 | Connection lost |

## TASK: GET DIRECTORY

| TCP_EVENT% | | | | Description |
|---|---|---|---|---|
| 5 | 2 | 0 | 1 | Get directory successfully |
| 5 | 2 | 1 | 2 | Failed to open local file |

| | | | | |
|---|---|---|---|---|
| 5 | 2 | 2 | 2 | Failed to open data connection |
| 5 | 2 | 3 | 2 | Failed to save data |
| 5 | 2 | 4 | 2 | Connection error or lost |

## TASK: CHANGE DIRECTORY

| TCP_EVENT% | | | | Description |
|---|---|---|---|---|
| 5 | 3 | 0 | 1 | Change directory successfully |
| 5 | 3 | 0 | 2 | Failed to change working directory at host |

## TASK: UPLOAD FILE

| TCP_EVENT% | | | | Description |
|---|---|---|---|---|
| 5 | 5 | 0 | 1 | Transmit a file successfully |
| 5 | 5 | 1 | 2 | Failed to find local file at terminal (= no file to send) |
| 5 | 5 | 2 | 2 | Failed to open data connection |
| 5 | 5 | 3 | 2 | Connection error or lost |

## TASK: APPEND TO FILE

| TCP_EVENT% | | | | Description |
|---|---|---|---|---|
| 5 | 6 | 0 | 1 | Transmit data and append to a file successfully |
| 5 | 6 | 1 | 2 | Failed to find local file at terminal (= no file to send) |
| 5 | 6 | 2 | 2 | Failed to open data connection |
| 5 | 6 | 3 | 2 | Connection error or lost |

## TASK: DOWNLOAD FILE

| TCP_EVENT% | | | | Description |
|---|---|---|---|---|
| 5 | 4 | 0 | 1 | Receive a file successfully |
| 5 | 4 | 1 | 2 | Failed to open local file |
| 5 | 4 | 2 | 2 | Failed to open data connection |
| 5 | 4 | 3 | 2 | Failed to save data |
| 5 | 4 | 4 | 2 | Connection error or lost |

## TASK: RENAME FTP FILES

| TCP_EVENT% | | | | Description |
|---|---|---|---|---|
| 5 | 7 | 0 | 1 | An FTP file is renamed successfully. |

| | | | | |
|---|---|---|---|---|
| 5 | 7 | 4 | 2 | Connection error or lost. |
| 5 | 7 | 5 | 2 | File doesn’t exist. |
| 5 | 7 | 6 | 2 | File already exists |

## TASK: DELETE FTP FILES

| TCP_EVENT% | | | | Description |
|---|---|---|---|---|
| 5 | 8 | 0 | 1 | An FTP file is deleted successfully. |
| 5 | 8 | 4 | 2 | Connection error or lost. |
| 5 | 8 | 5 | 2 | File doesn’t exist. |

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