MINDEO

FS580 Industrial Fixed Laser Barcode Scanner

User Manual

Version: FS580_UM_EN_V1.1.6

Notice

Make sure you carefully read the following information to ensure that your barcode scanner is able to perform at the designed level.

1. All software, including firmware, furnished to the user is on a licensed basis.
2. The right is reserved to make changes to any software or product to improve reliability, function, or design.
3. The material in this manual is subject to change without notice. Please go to www.mindeo.cn for latest service information.
4. The manufacturer assumes no responsibility for any loss or claim by third parties which may arise from the use of this manual.
5. Do not throw or drop the scanner or subject it to strong impact. Otherwise that can damage the scanner, interrupt program execution, corrupt memory contents, or interfere with proper operation.
6. Please do keep exit window clean, otherwise it may cause that the scanner decodes incorrectly or fails to read the barcode.

Notes about structure and electric circuit design

1. Use non-magnetic screws, or locating pins when mounting the scanner. Magnetic screws or locating pins can cause element/mirror central position to change.
2. It is recommended to use a thread locking method, such as a Nylok patch.
3. It is not recommended to place magnetic material (e.g. dynamic speakers, ringers, vibrators, inductors, metal parts) within 1 inch of the scanner's optics. Evaluate placement of all magnetic or ferrous material during system layout to determine if 1 inch is sufficient. Please read section *"3-1 Important notes of installation"* for detail.
4. Leave sufficient space to accommodate the maximum size of the scanner.
5. Read section *"2-1 Electrical interface/Pin assignment"* carefully to learn about the electrical interface design.
6. Read section *"2-2 Power management"* carefully to learn about the two power states.
7. Read section *"3-4 Scan angle"* carefully to learn about the scan angle of the scanner.
8. Do not hold the scanner vertically over the bar code. Please refer to section *"3-5 Tilt angle and dead zone"* for details.
9. Refer to section *"5-13 PARAM_SEND"*, be noted that frequent permanent changes of parameter value are not recommended due to the limited write-cycles of flash memory. It is recommended to change parameter temporarily, if frequently modifying parameter is a must.
10. Read section *"6-4 SCI transactions notes"* carefully.

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1 Specifications

1-1 Technical specifications

Table 1-1 Technical specifications @25°C

Item	Description
Input voltage	5 VDC ±5%
Scanning current	RS232: 145mA (Typ.) / 235mA (Max.) USB: 145mA (Typ.) / 220mA (Max.)
Standby current	RS232: 0.9mA(Deep Sleep) or 25mA USB: 30mA
Laser	650nm laser diode
Scan rate	100±10 scans/second
Scanning angle	Wide (Default): 55°±5°, decode rate: 0.5 time/scan Narrow: 40°±5°, decode rate: 1 time/scan
Pitch angle	±65°(Condition: 100% UPC at 5 in. See *Figure 1-1*)
Skew angle	±50°(Condition: 100% UPC at 5 in. See *Figure 1-1*)
Roll angle	±35°(Condition: 100% UPC at 5 in. See *Figure 1-1*)
Decode capability	UPC-A, UPC-E, UPC-E1, EAN-13, EAN-8, ISBN/ISSN, Code 39, Code 39 full ASCII, Code 32, Trioptic Code 39, Interleaved 2 of 5, Industrial 2 of 5 (Discrete 2 of 5), Matrix 2 of 5, Codabar (NW7), Code 128, Code 93, Code 11 (USD-8), MSI/Plessey, UK/Plessey, UCC/EAN 128, ISBT128,China Post, GS1 DataBar (formerly RSS) variants
Indicator	Beeper, LED
Interface supported	RS232, USB Keyboard, USB virtual COM
Scan mode	Single scan, Continuous scan, Auto-detection, Scan Output Buffering, Command
Housing makings	Zinc alloy
Dimensions	Height×Width ×Depth: 35.7mm ×41.3mm ×17.2mm (maximum)
Weight	70g
Cable	RJ-45
Temperature	Operating: -10℃ to 60℃ (-4℉ to 140℉); Storage: -40℃ to 70℃ (-40℉ to 158℉)
Humidity	5% to 90% (non-condensing)
Programming method	Method I: Manual (scanning special barcode in sequence) Method II: Send command via RS232 interface or USB virtual COM
Firmware upgrade	Online
Decoding depth & Max. resolution	(1 mil = 0.0254 mm) 4 mil: 45- 75 mm 5 mil: 45-105 mm 10 mil: 15-230 mm 15 mil: 30-350 mm 20 mil: 40-420 mm 30 mil: 40-600 mm 55 mil: 80-700 mm See section "*1-3 Decode zone* " for more information.
Safety and Certification	Laser safety:EN60825-1,Class 1 EMC:EN55022,EN55024 Protection class:IP64

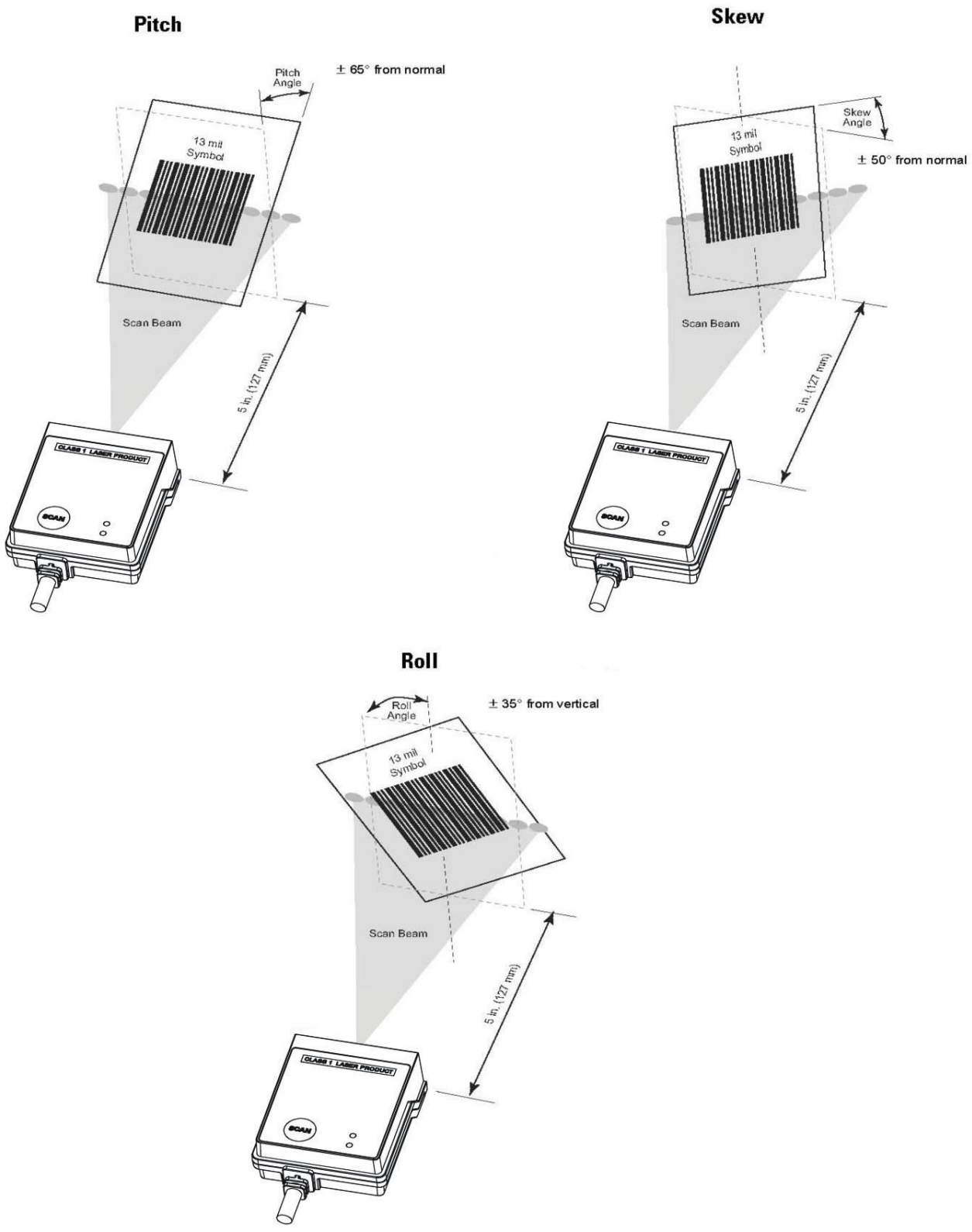


Figure 1-1 Pitch, Skew and Roll

1-2 Default settings for various types of barcode

Table 1-2 Default settings

Code type	Read enable	Check digit verification	Check digit transmission	Min. code length	Proprietary code ID	AIM code ID
UPC-A	√	√	√	(12)[2]	A	]Em
UPC-E	√	√	√	(8)[2]	D	]Em
UPC-E1	√	√	√	(8)[2]	D	]Em
EAN-13	√	√	√	(13)[2]	A	]Em
EAN-8	√	√	√	(8)[2]	C	]Em
ISBN/ISSN[1]	√	√	√	(13)[2]	A	]Em
Code 39	√	-	-	1	M	]Am
Interleaved 2 of 5	√	-	-	6	I	]Im
Industrial 2 of 5 (Discrete 2 of 5)	-	-	-	4	H	]Im
Matrix 2 of 5	√	-	-	6	X	]Im
Codabar (NW7)	√	-	-	4	N	]Fm
Code 128	√	√	-	1	K	]Cm
UCC/EAN 128	√	√	-	1	K	]Cm
ISBT 128	√	√	-	1	K	]Cm
Code 93	√	√	-	1	L	]Gm
Code 11 (USD-8)	-	√	-	4	V	-
MSI/Plessey	-	-	-	4	O	]Mm
UK/Plessey	√	√	-	1	U	]Mm
China Post	√	-	-	(11)[2]	T	]Im
GS1 DataBar	√	-	-	(16)[2]	R	]em
GS1 DataBar Truncated[3]	√	-	-	(16)[2]	R	]em
GS1 DataBar Limited	√	-	-	(16)[2]	R	]em
GS1 DataBar Expanded	√	-	-	1	R	]em

Note: [1]The settings for ISBN/ISSN and EAN-13 must be the same except the code ID.

[2] Fixed-length barcodes.

[3]The settings for GS1 DataBar Truncated and GS1 DataBar must be the same.

1-3 Decode zone

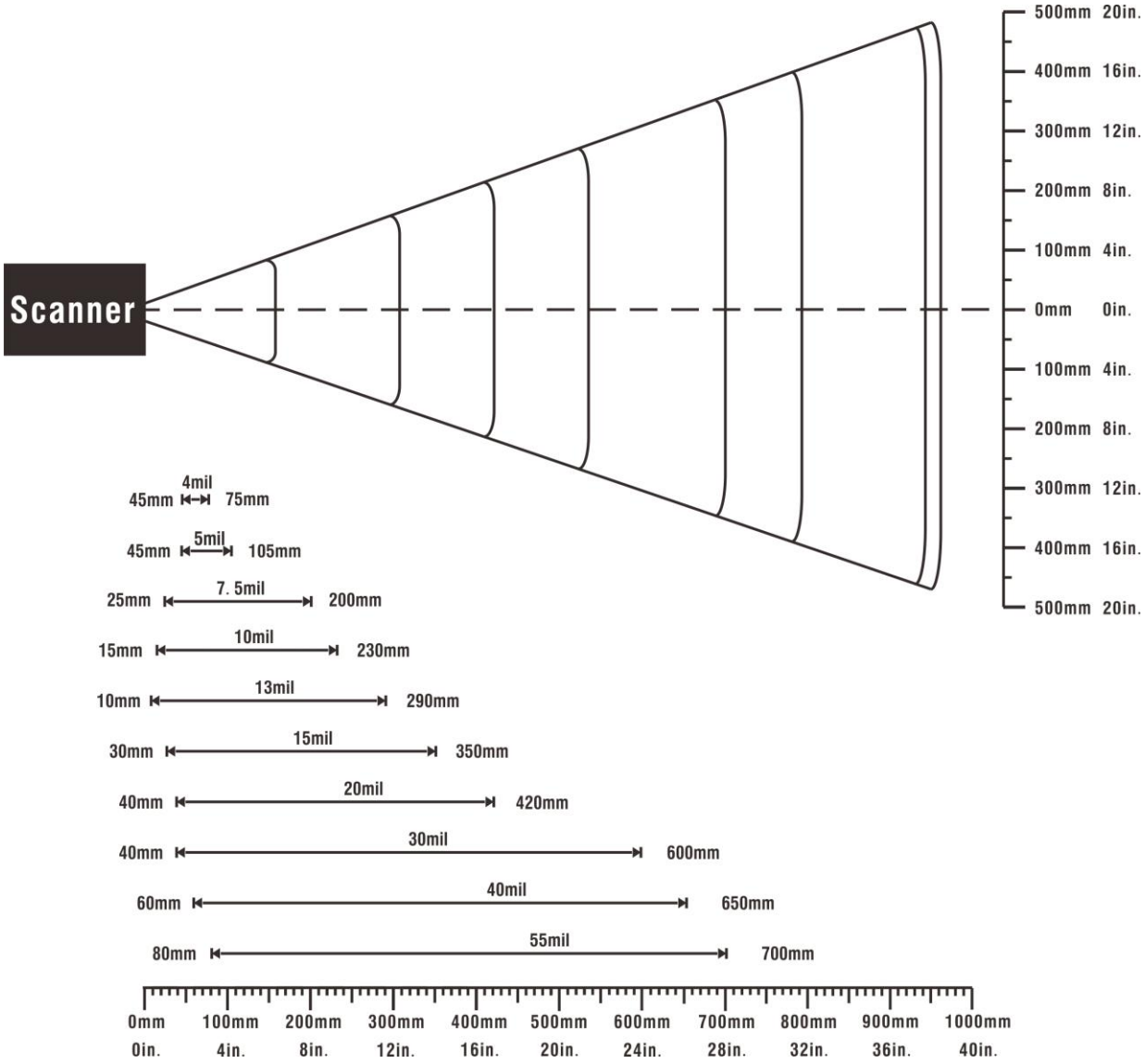


Figure 1-2 Decode zone @25°C, scan angle: 55°

Table 1-3 Description of barcode patterns applied in Figure 1-2

Resolution	Barcode type	Wide-narrow element ratio	Barcode content	Contrast
4.0 mil	Code 128	2.5:1	123456789	80%
5.0 mil	Code 39	2.5:1	123	80%
7.5 mil	Code 39	2.5:1	ABCDEF	80%
10 mil	Code 39	2.5:1	123	90%
13 mil	100% UPC	-	1234546	90%
15 mil	Code 39	2.5:1	ABCD	80%
20 mil	Code 39	2.2:1	123	80%
30 mil	Code 39	2.2:1	EF	80%
40 mil	Code 39	2.2:1	AB	80%
55 mil	Code 39	2.2:1	CD	80%

2 Get started

2-1 Electrical interface/Pin assignment

The scanner provides a RJ-45 cable connector.

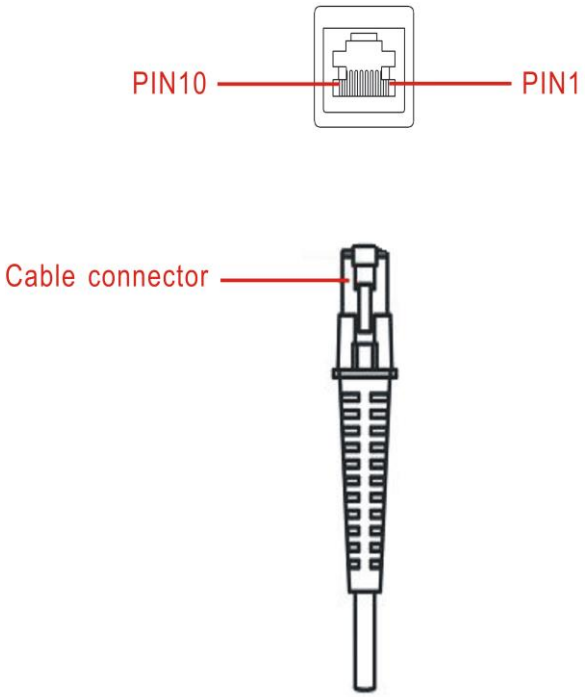


Figure 2-1 Electrical interface/Pin

Table 2-1 lists the pin assignments of the scanner.

Table 2-1 Electrical interface/Pin assignment

Pin	RS232 cable	USB cable
1	Power(+5V)	Power(+5V)
2	Reserved	Reserved
3	Ground	Ground
4	+3.3V (for interface auto selection purpose)	Ground (for interface auto selection purpose)
5	TxD	Reserved
6	RxD	Reserved
7	Reserved	Reserved
8	Reserved	Reserved
9	CTS	D-
10	RTS	D+

Note: Voltage level of all RS232 Pin-outs (RXD, TXD, CTS and RTS) is 0V for logic low level and 3.3V for logic high level. A transceiver (MAX232) PCB is designed inside the RS232 cable, and it can achieve signal transition between TTL and RS232.

2-2 Power management

The scanner has two power states (**Awake** and **Sleep**).

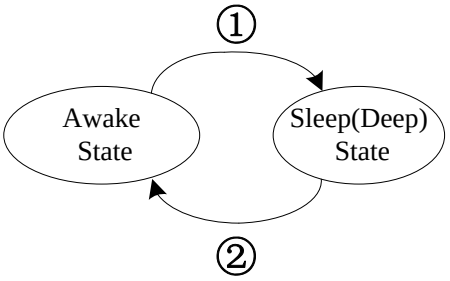


Figure 2-2 State machine of power management

① After finishing all operation, scanner will go to **Sleep state** base on Auto-sleep delay(see *"4-5 Scan mode & some global settings"*), and turn off laser, swing-mirror etc.

② Interrupted event(SCAN button is pressed or falling-edge of signal RXD occurs) will make the scanner go to **Awake state**.

Note: Once the scanner is awakened, at least Auto-sleep delay must elapse before it re-enters **Sleep state**.

The scanner will automatically switch to the **Sleep state** whenever possible, so that the scanner can consume as less current as possible. If RS232 cable is currently applied and Deep sleep(see *"4-5 Scan mode & some global settings"*)is enabled, the scanner can enter **Sleep State** more deeply, and the supply current can drop to be 0.9mA.

In other cases, the supply current in **Sleep State** is 25mA (RS232 cable) or 30mA (USB cable).

3 Installation guide

3-1 Notes of installation

This section provides information for mounting and installing the scanner, including physical considerations.

- **IP64**

With IP64 approval, it is not necessary to provide extra sealing protection.

- **Magnetism**

Mounting screws and locating pins should be non-magnetic material. It is not recommended to place any magnetic material within 1 inch (2.54 cm) of the scanner's optics without testing.

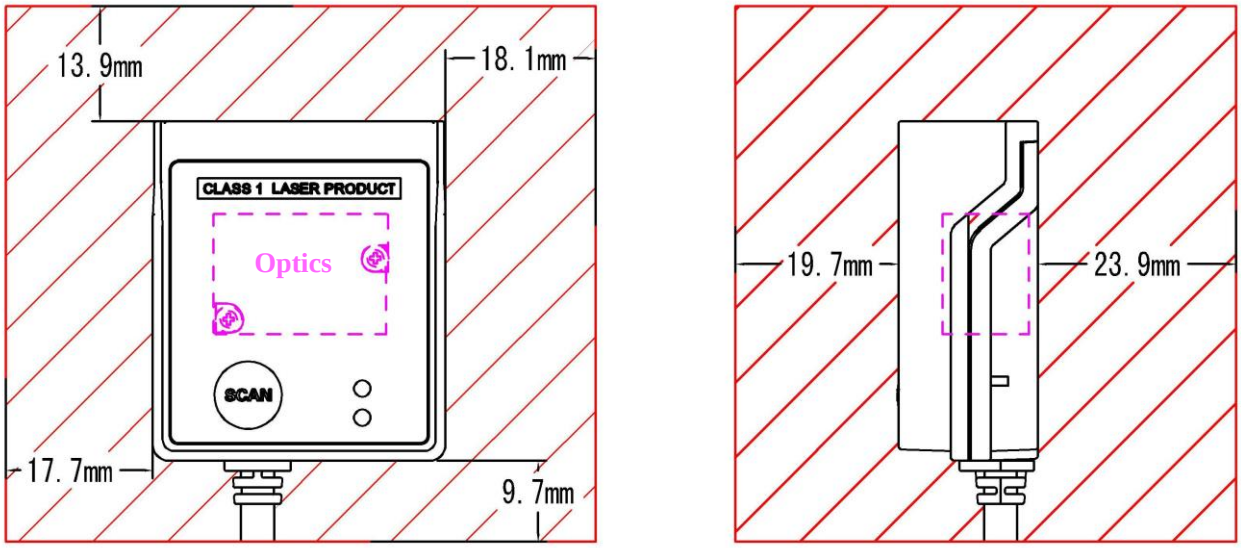


Figure 3-1 The zone without magnetic material placement

3-2 Mounting

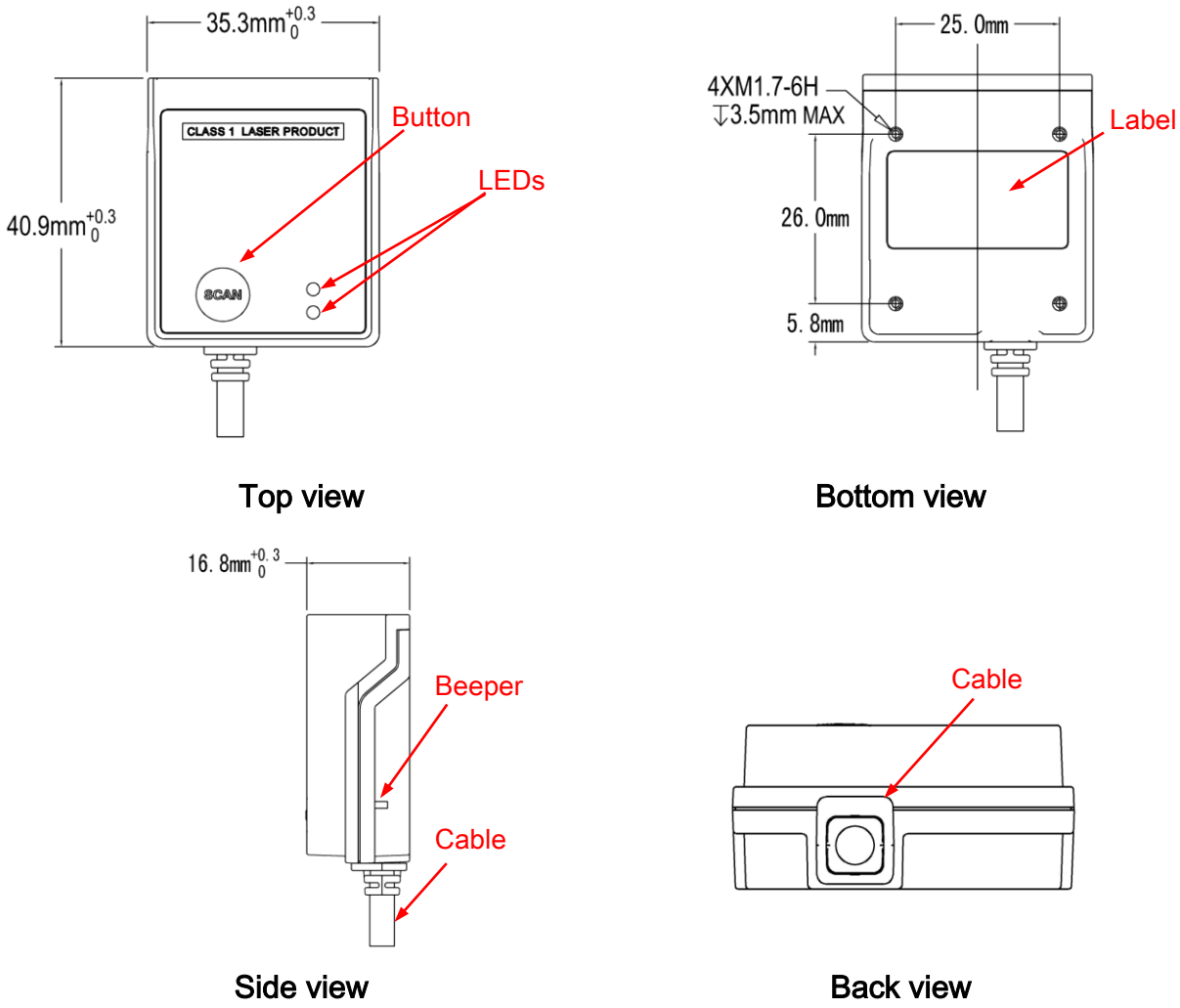


Figure 3-2 Mounting diagram

Notes: Mounting screws and locating pins should be non-magnetic material. It is not recommended to place any magnetic material within 1 inch of the scanner's optics without testing.

3-3 Appearance of the scanner

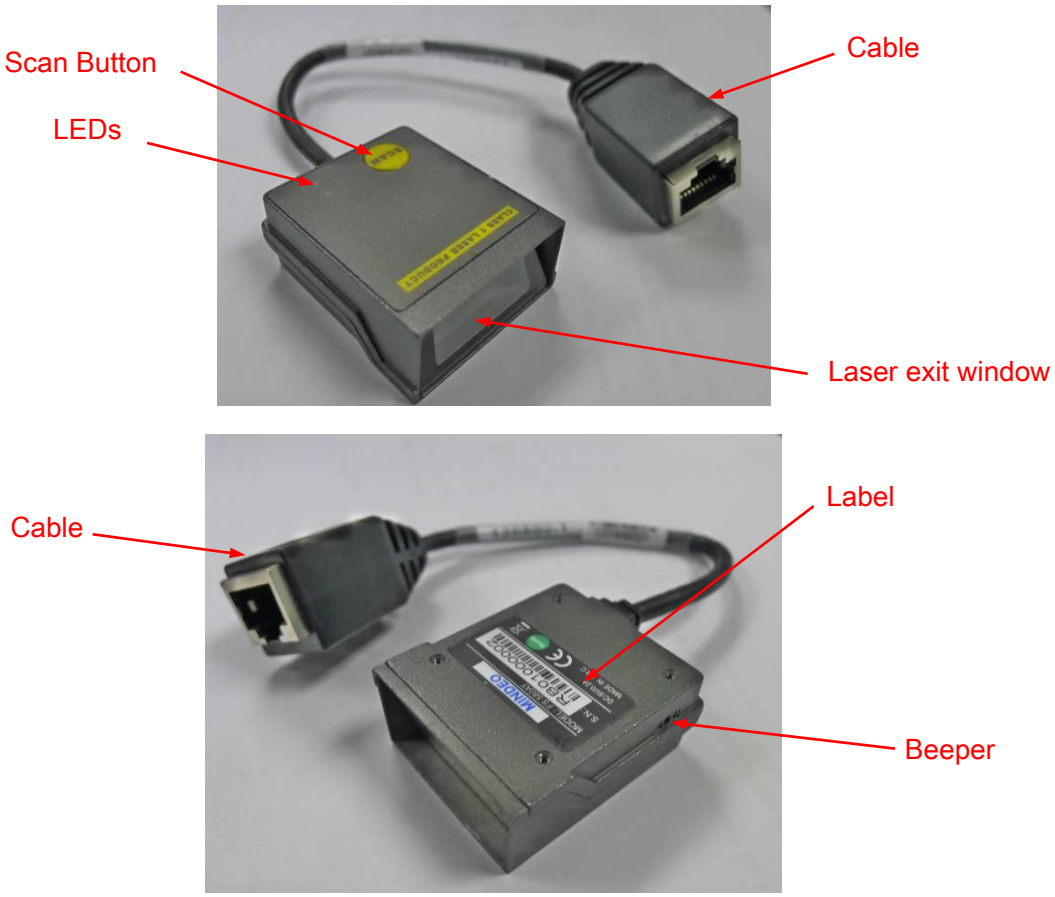
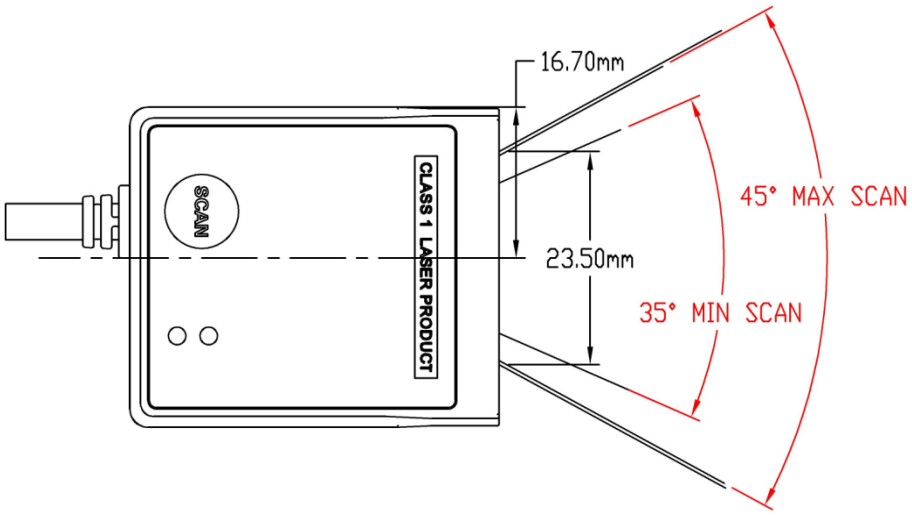
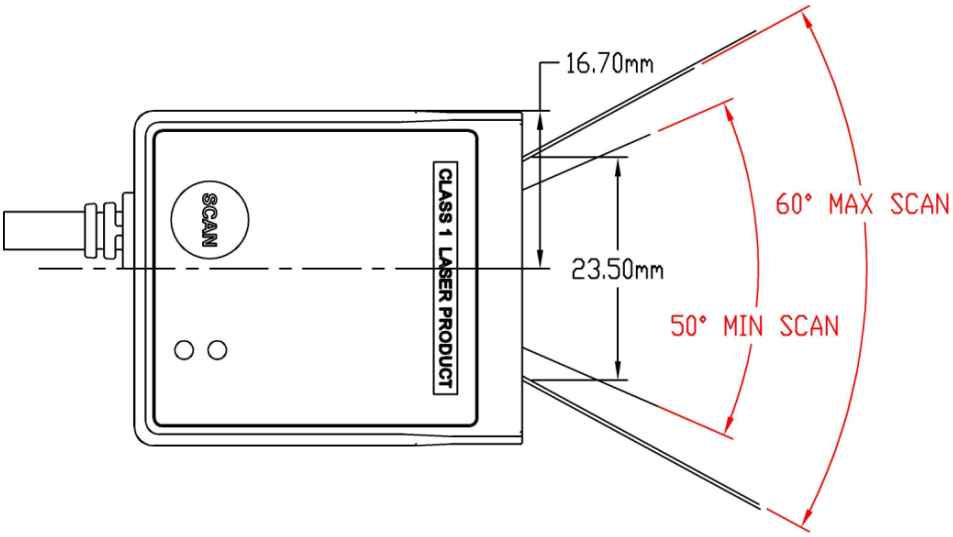


Figure 3-3 Appearance of the scanner

3-4 Scan angle



Scan angle (Narrow): 40°±5°



Scan angle (Wide): 55°±5°

Figure 3-4 Scan angle

3-5 Tilt angle and dead zone

While scanning a bar code, do not hold the scanner vertically over it. This can cause the issue of specular reflection which is the mirror-like reflection of light from a surface. In this case, the specular refection is caused because the laser light reflects directly back into the scanner from the bar code. This specular reflection can make decoding difficult. Tilt angle and dead zone are shown in Figure 3-5.

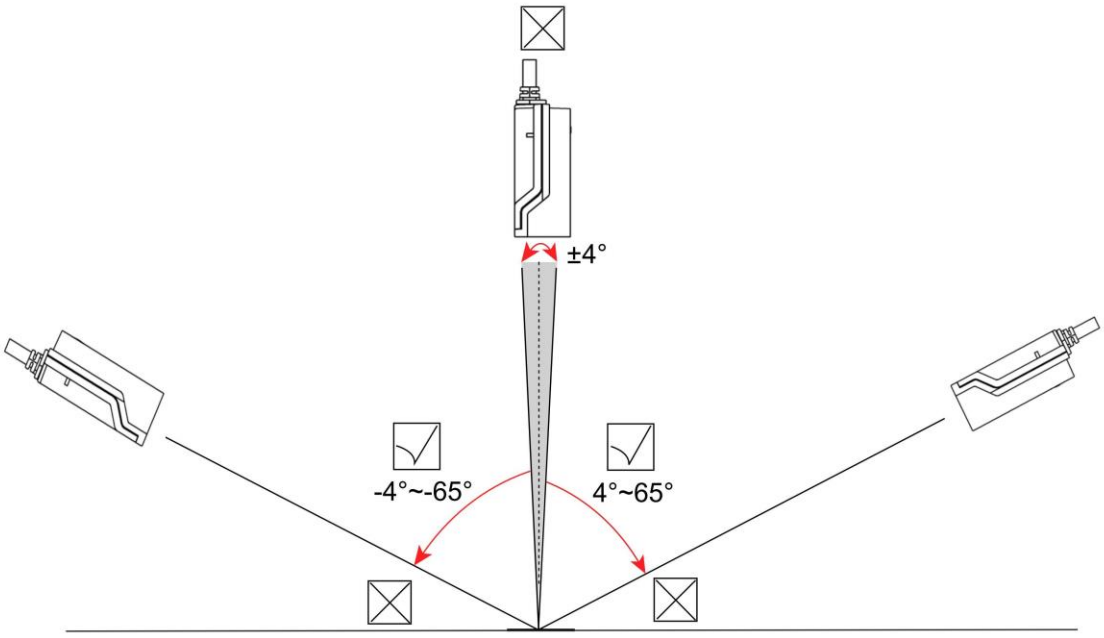


Figure 3-5 Tilt angle and dead zone

4 Parameter menus

4-1 Introduction

This section describes the programmable parameters, provides barcodes for programming, and hexadecimal equivalents for host parameter programming through SCI.

The scanner is shipped with the factory default settings as described in this chapter. These factory-default-settings values are stored in flash memory and are preserved even when the scanner is powered down. Changes to the factory default values can be stored as custom defaults. These values are also stored in flash memory and are preserved even when the scanner is powered down.

There are two methods to change the parameter values as described following.

- Scan the appropriate barcodes as the example shown in the following Section of *"4-2 Instruction: configure scanner by scanning configuration barcodes"*. The new values replace the existing memory values.

  Referring to the section of *"11 Return default parameters & firmware version"*, scan the **Write to custom default setting** (%%WCDF) barcode to set the new values as custom defaults. The factory default or custom default parameter values can be recalled by scanning the **Restore factory defaults** (%%%DEF) barcode, or the **Restore custom default setting** (%%RSDF) barcode.
- Send parameters through the scanner's serial port using the SCI command **PARAM_SEND**. The parameters are described in details in later sections of this chapter. Instructions for changing parameter value using this method can be found in the section of *"5-13 PARAM_SEND"*.

Note: When the scanner is scanning, ensure the laser beam crosses every bar and space of the barcode. See Figure 4-1.

Figure 4-1 Scanning angle

4-2 Example: configure scanner

Note: The factory default settings are indicated with asterisks (*) in this manual.

The scanner offers 3 methods to configure scanner: single-scan setting、multiple-scan setting and command setting.

1、Single-scan setting

Scan the appropriate Single-scan setting barcode according to the user's demand.

Example: Set Flow control to be none.

Steps: Scan the following barcode.

%0301D00%

2、Multiple-scan setting

The steps of configuration are:

a) Scan the SETUP barcode on the parameter setting part.

b) Enter the option mode by scanning the Parameter name barcode.

c) To the right of the option barcode, the necessary alphanumeric inputs are listed. Scan these alphanumeric entries (see *"12 Configuration alphanumeric value barcode")* individually as Para. Value.

d) Scan the END barcode, listed on the bottom of each parameter setting part.

Notes that only one parameter can be setup at each time.

Example: Set Flow control to be none.

Steps: Scan the following barcodes in order.

%SETUP

0301

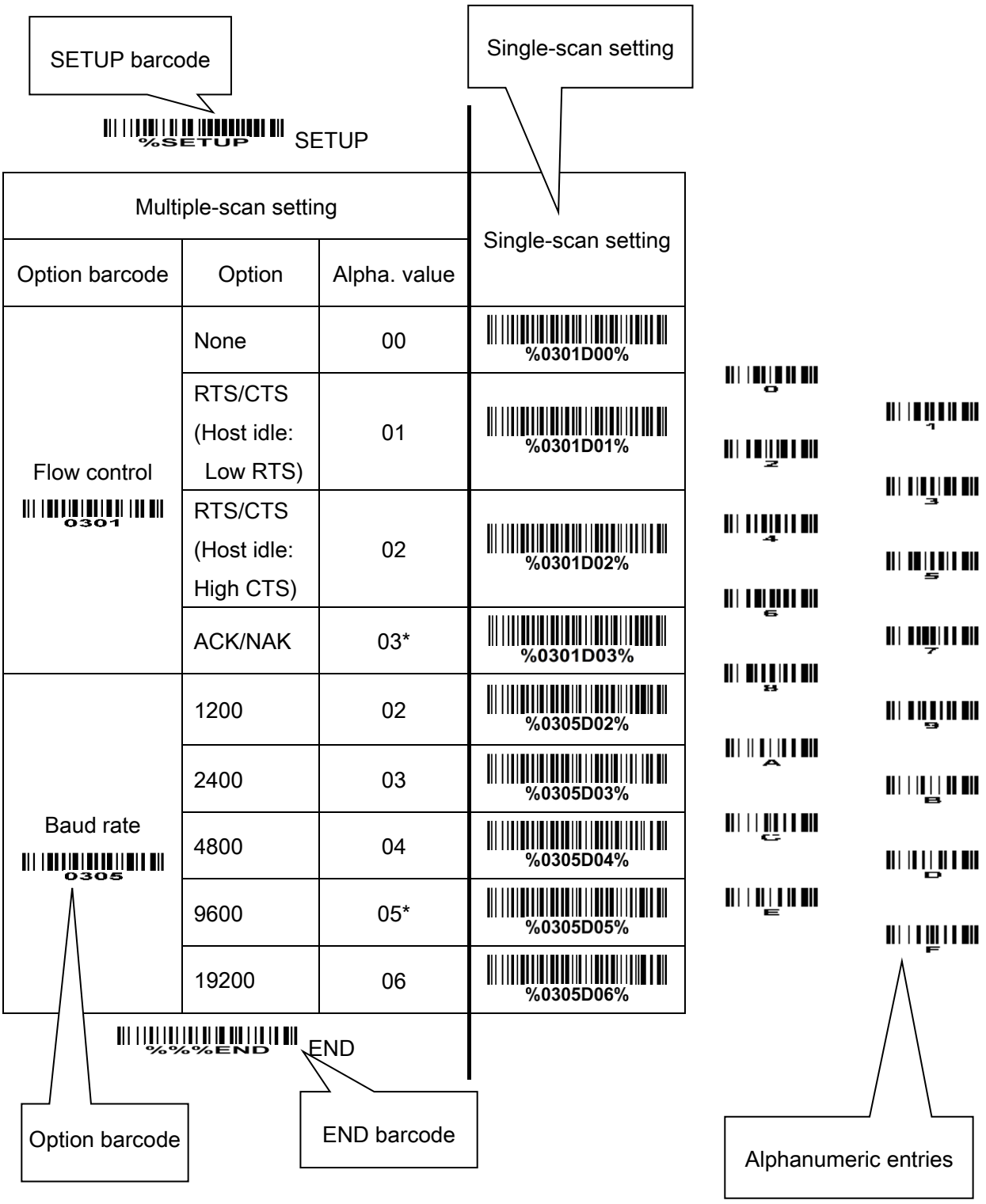
0

0

%%%END

3、Command setting

Please refer to *"5-13 PARAM_SEND"*.


SETUP barcode
%SETUP
SETUP
Single-scan setting
Multiple-scan setting
Single-scan setting
Option barcode
Option
Alpha. value
Flow control
0301
None
00
%0301D00%
RTS/CTS (Host idle: Low RTS)
01
%0301D01%
RTS/CTS (Host idle: High CTS)
02
%0301D02%
ACK/NAK
03*
%0301D03%
Baud rate
0305
1200
02
%0305D02%
2400
03
%0305D03%
4800
04
%0305D04%
9600
05*
%0305D05%
19200
06
%0305D06%
%%%END
END
Option barcode
END barcode
Alphanumeric entries

4-3 RS232 interface

Flow control:

None- The communication only uses TXD and RXD signals without any hardware or software handshaking protocol.

RTS/CTS- If the scanner requests to send the barcode data to host computer, it will issue the RTS signal first, wait for the CTS signal from the host computer, and then perform the normal data communication. If there is no replied CTS signal from the host computer after the Response delay timeout, the scanner will issue an error indication. By setting (Host idle: Low RTS or Host idle: High RTS), the scanner can be set to match the Serial Host RTS line.

ACK/NAK- If Decode data packet format is set to **Packeted**, after barcode data transmitted, the scanner expects either an ACK (acknowledge) or NAK (not acknowledge) response from the host. When a NAK is received, the scanner transmits the same data again and waits for either an ACK or NAK. After three unsuccessful attempts to send data when NAK are received, the scanner issues an error indication and discards the data.

When the scanner finishes receiving the command from host, it will send ACK/NAK to host. See *"5-3 CMD_ACK"* and *"5-4 CMD_NAK "* for more information.

Note: If Decode data packet format is set to Raw, the scanner will not wait for ACK/NAK after transmitting decoded data completely.

Response delay: This delay is the time that the scanner waits for a handshaking acknowledgment (NAK or ACK) from the host.

Host-character delay: This delay is the time that the scanner waits for the host to send the next character in serial communication.

Decode data packet format:

Raw- Scanner sends raw decoded data directly.

Packeted- The decoded data is sent in data packet (see *"5-5 DECODE_DATA"*).

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Flow control 0301	None	00	%0301D00%
	RTS/CTS (Host idle: Low RTS)	01	%0301D01%
	RTS/CTS (Host idle: High RTS)	02	%0301D02%
	ACK/NAK	03*	%0301D03%
Response delay 0304	01-99 (100 ms)	01-99	
		20*	%0304D20%
Baud rate 0305	1200	02	%0305D02%
	2400	03	%0305D03%
	4800	04	%0305D04%
	9600	05*	%0305D05%
	19200	06	%0305D06%
	38400	07	%0305D07%
	57600	08	%0305D08%
	115200	09	%0305D09%
Parity 0306	None	00*	%0306D00%
	Odd	01	%0306D01%
	Even	02	%0306D02%
Data bit 0307	8 bits	00*	%0307D00%
Stop bit	1 bit	00*	%0308D00%

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
0308	2 bits	01	%0308D01%
Host-character delay 0309	01-99 (10ms)	01-99	
		20*	%0309D20%
Decode data packet format 0310	Raw	00*	%0310D00%
	Packeted	01	%0310D01%

%%%END END

4-4 USB interface

USB device type:

HID keyboard– By setting, the scanner is used as a USB HID keyboard emulation device.

USB virtual COM– By setting, the scanner emulates a USB virtual COM device. If a Microsoft Windows PC is connected to the scanner, a driver is required to install on the connected PC. The driver will use the next available COM Port number. The driver and the installation guide can be found in the associated CD and on the manufacturer's website. A Windows-based software COM_Text is recommended to display the barcode data in text format. COM_Text emulates some kind of serial-key typing.

While emulating as a USB virtual COM, the scanner will send the data in data packet format if the Decode data packet format is **Packeted** (see *"4-3 RS232 Interface")*. The scanner also follows the Flow control (see *"4-3 RS232 Interface")* flow control, if it is set **ACK/NAK**.

Note: After changing USB Device Types, the scanner will restart automatically.

Keyboard layout: The scanner supports different national keyboard layouts.

Inter-character delay: This delay is inserted after each data character transmitted.

Numeric key:

Alphabetic key- The scanner will output code result as alphabetic key.

Numeric key- The scanner will output code result as pressing numeric keypad ('0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '.', '+', '-', '/', '*' only).

Alt+ keypad- The scanner will output code result as pressing Alt+ numeric key (on keypad). Note that the Num Lock control key must be ON. This setting can be specially adapted for use with different national keyboard layout.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
USB device type 0901	HID keyboard	00*	%0901D00%
	HID keyboard for Apple Mac	01	%0901D01%
	USB virtual COM	02	%0901D02%
Keyboard layout 0902	USA	00*	%0902D00%
	Turkish F	01	%0902D01%
	Turkish Q	02	%0902D02%
	French	03	%0902D03%
	Italian	04	%0902D04%
	Spanish	05	%0902D05%
	Slovak	06	%0902D06%
	Denmark	07	%0902D07%
	Japanese	08	%0902D08%
	German	09	%0902D09%
	Belgian	10	%0902D10%
	Russian	11	%0902D11%
Inter-character delay 0903	0 ms	00	%0903D00%
	5 ms	01*	%0903D01%
	10 ms	02	%0903D02%
	20 ms	03	%0903D03%

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
	40 ms	04	%0903D04%
	60 ms	05	%0903D05%
Numeric key 0904	Alphabetic key	00*	%0904D00%
	Numeric keypad	01	%0904D01%
	Alt+ keypad	02	%0904D02%

%%%END END

4-5 Scan mode & some global settings

Scan mode:

Single scan- A scanning attempt is active once if trigger button is pressed or the command STAR_DECODE is received. A scanning attempt stops when there is a successful reading or the command STOP_DECODE is received or no barcode is decoded after the Stand-by duration elapses.

Continuous scan- The scanner always keeps scanning, and it does not matter when the trigger button is pressed or Stand-by duration is elapsed or the command STOP_DECODE is received.

Auto-detection- The scanner will start scanning if any nearby object has been detected. The scanner stops scanning when there is a successful reading or the command STOP_DECODE is received or no barcode is decoded after the Stand-by duration elapsed. The Auto-detection function works again only when the object leaves the scanner. The **SCAN** button is still valid when Auto-detection enabled.

Output-buffering Scan- The **SCAN** button acts as a toggle switch. Press the **SCAN** button to activate or stop scanning. When scanning, it does not matter when Stand-by duration is elapsed or the command STOP_DECODE is received. And the scanner will store the barcode data into a buffer (buffer size: 1K byte). Until the **SCAN** button is pressed again to stop scanning, the scanner will send all the barcode data in the buffer to host. When the unused space in the buffer is not enough to store the current barcode data, the scanner will beep to warn and discard the current barcode data.

Note: Restoring the default settings by the host command or scanning the barcode that will not affect the scan mode settings.

Standby duration: The duration time for a single scanning attempt.

Same barcode delay time: If a barcode has been scanned and output once successfully, the laser beam must be off or moved away from the barcode beyond delay time to active next scanning the same barcode. When this feature is set to be “0xFF”, then the delay time is indefinite.

Multiple confirm: If this parameter is set to be larger than zero, the scanner will require several successful reads of same-decoded-data to confirm a valid reading. The number of successful reads can be different according to different types of barcode. As the number of Multiple confirm gets larger, the scanner’s aggressiveness decreases. **The number of successful reads** required for different types of barcode is listed below, which is related to the parameter of Multiple confirm.

Table 6-1 The number of successful reads.

Barcode type	Multiple confirm (m)			
	m=0	m=1	m=2	m>=3
EAN-13, EAN-8, UPC-A, Code93, China Post, UK Plessey	2	3	4	m+1
UPC-E, Codabar, Interleaved 2/5, Code39, Industry2/5, Matrix 2/5, Code11, MSI Plessey, UPC-E1	3	4	4	m+1
UCC/EAN128, Code128, GS1 DataBar, GS1 DataBar Limited, GS1 DataBar Expand, ISBT 128	1	2	3	m+1

Global Max./Min. code length: These two lengths are defined as the valid range of decoded barcode data length. Make sure that the minimum length setting is no greater than the maximum length setting, otherwise the labels of the symbol will not be readable. In particular, the same value can be set for both minimum and maximum reading length to force the fixed length barcode decoded.

Notes:

1. Only set the **Max./Min. code length** for the specific code type to be zero, can **Global Max./Min. code length** be valid.
2. Please refer to the settings of **max./min. length** for each specific code type in later sections
3. The number of check digits is included in **max./min. code length**.
4. These two settings have no effect on the symbols with fixed-length, e.g. UPC-A, UPC-E, EAN-13, EAN-8 and China Post.

Global G1-G4 string selection: The scanner offer one or two string group for all symbols. By setting one or two digits to indicate which string group you want to apply. You may refer to the chapters of *"4-28 G1-G4 & FN1 substitution string setting"* and *"4-29 G1-G4 string position & Code ID position"*.

Example: Group 1 → set 01 or 10. Group 2 and 4 → set 24 or 42.

All valid settings include 00, 01, 02, 03, 04, 10, 11, 12, 13, 14, 20, 21, 22, 23, 24, 30, 31, 32, 33, 34, 40, 41, 42, 43, and 44.

Setting value	Description
00	None
01、10、11	Only Group 1
02、20、22	Only Group 2
03、30、33	Only Group 3
04、40、44	Only Group 4
12、21	Group 1 first, then Group 2
13、31	Group 1 first, then Group 3
14、41	Group 1 first, then Group 4
23、32	Group 2 first, then Group 3

Setting value	Description
24、42	Group 2 first, then Group 4
34、43	Group 3 first, then Group 4

Element amendment: If it is enabled, the scanner can read the barcode comprised with bars and spaces in different scale.

Character output restraint:

Disable- the scanner will output all the barcode data .

Printable character only- If this option is selected, the scanner will output the printable characters only, i.e. in ASCII from 20H to 7EH.

Alphanumeric character only- If this option is selected, the scanner will output the alphanumeric characters only, i.e. “A”-“Z”, “a”-“z”, “0”-“9”.

Decoder optimization: If it is enabled, the scanner will optimize the decoder with error correction. This function is not effective for all types of barcodes.

Scan angle: If narrow angle (40°) is selected, the decode rate is 1 time/scan; if wide angle (55°) is selected, the decode rate is 0.5 time/scan.

Auto-sleep delay: After responding to the host’s requirement, the scanner will automatically enter deep sleep state within Auto-sleep delay time. The scanner will be awakened while the SCAN button is pressed or a command WAKEUP (0x00) is received again.

“No read” response: If it is enabled, while the scanner receives the STOP_DECODE command or fails to decode a barcode within the Stand-by duration time, “NR” will be transmitted as decode data.

Deep sleep:

Disable- When Stand-by duration is elapsed, the scanner will enters normal **sleep state**. Any external interrupt can wake up the scanner. It is not necessary to send a command WAKEUP (0x00) before sending any other commands.

Enable- When Stand-by duration is elapsed, the scanner will enters sleep state deeply, and the supply current will drop to be 0.9mA. And at this case, it is necessary to send a command WAKEUP (0x00) and delay for 15ms, before sending any other commands.

Character encoding system: A character encoding system consists of a code that pairs each character from a given repertoire. Common examples include Morse code, the Baudot code, the ASCII and Unicode. If the data received does not display with the proper characters, it may be because the barcode being scanned was created using a character encoding system that is different from the one the host program is expecting. Try alternate options to find the proper one.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Scanning mode[Note 1] 0401	Single Scan	00	%0401D00%
	Continuous Scan	01	%0401D01%
	Auto-detection	02	%0401D02%
	Output-buffering Scan	03	%0401D03%
Standby duration 0402	01-99 (100ms)	01-99	
		40*	%0402D40%
Same barcode delay time 0403	00-FF_{16}(100ms) (00:None)	00-FF_{16}	
		00	%0403H00%
		0A*	%0403H0A%
Double confirm 0404	00-09 (00:None)	00-09	
		00*	%0404D00%
Global max. code length 0405	04-99	04-99	
		99*	%0405D99%
Global min. code length 0406	01-99	01-99	
		04*	%0406D04%
Global G1-G6 string selection 0407	00-44 (00:None)	00-44	
		00*	%0407D00%
Element amendment	Disable	00	%0408D00%

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
0408	Enable	01*	%0408D01%
Character output restraint 0409	Disable	00*	%0409D00%
	Printable character only	01	%0409D01%
	Alphabetic & Numeric only	02	%0409D02%
Decoder optimization 0410	Disable	00	%0410D00%
	Enable	01*	%0410D01%
Scan angle 0411	Wide (56°)	00*	%0411D00%
	Narrow (40°)	01	%0411D01%
Auto-sleep delay[Note 2] 0412	1 second	00	%0412D00%
	5 seconds	01	%0412D01%
	10 seconds	02	%0412D02%
	30 seconds	03*	%0412D03%
	1 minute	04	%0412D04%
	3 minutes	05	%0412D05%
	10 minutes	06	%0412D06%
	30 minutes	07	%0412D07%
	1 hour	08	%0412D08%
	3 hours	09	%0412D09%

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
	Never	10	%0412D10%
“No read” response 0413	Disable	00*	%0413D00%
	Enable	01	%0413D01%
Deep sleep 0414	Disable	00*	%0414D00%
	Enable	01	%0414D01%
Character encoding system 0415	ASCII	00*	%0415D00%
	UTF-8	01	%0415D01%
	Windows-1251	02	%0415D02%

%%%END END

Note 1: This configure will not be changed when the scanner scans load default setting barcode or receives PARAM_DEFAULTS command.

Note 2: The tolerance is ±20%.

4-6 Indication

Power on alert: After power-on or restart, the scanner will generate alert signal (Beeper beeping and LED flashing).

LED indication: When the scanner decodes successfully, the LED will glitter.

Beeper indication: After each successful reading, the scanner will beep to indicate a good barcode reading, and its beep tone duration is adjustable.

Beep tone duration: This parameter can be adjusted for a good reading upon favorite usage.

Volume of beeper: This parameter can be adjusted for different level of the volume of the beeper.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Power on alert 0501	Disable	00	%0501D00%
	Enable	01*	%0501D01%
LED indication 0502	Disable	00	%0502D00%
	Enable	01*	%0502D01%
Beeper indication 0503	Disable	00	%0503D00%
	Enable	01*	%0503D01%
Beep tone duration 0504	01-09 (25ms)	01-09	
		03*	%0504D03%
Volume of beeper 0505	Low	00	%0505D00%
	Middle	01	%0505D01%
	High	02*	%0505D02%

%%%END END

4-7 UPC-A

Read: Format

System character	Data digits (10 digits)	Check digit

Check digit verification: The check digit verification is optional.

Check digit trans.: By setting Enable, check digit will be transmitted.

Code ID setting: Code ID is a one-or-two-character string used to represent the symbol upon a succeeding reading. If you want application to transmit Code ID, you must set Code ID transmission to be enabled. Refer to the chapter of *"4-30 String transmission"*.

Insertion group selection: Refer to Global insertion group selection of the chapter of *"4-5 Scan mode& some global settings"*.

Supplement digits: The Supplement digits barcode is the supplemental 2 or 5 characters.

Format

System character	Data digits (10 digits)	Check digit	Supplement digits 2 or 5

Truncation/Expansion:

Truncate leading zeros- The leading "0" digits of UPC-A data characters can be truncated when the feature is enabled.

Expand to EAN-13- It extends to 13-digits with a "0" leading digit when the feature is enabled.

Truncate system character- The system character of UPC-A data can be truncated when the feature is enabled.

Add country code- The country code ("0" for USA) can be added when the feature is enabled.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Read 1101	Disable	00	%1101D00%
	Enable	01*	%1101D01%
Check digit verification 1102	Disable	00	%1102D00%
	Enable	01*	%1102D01%
Check digit trans. 1103	Disable	00	%1103D00%
	Enable	01*	%1103D01%

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Code ID setting 1104	00-FF$_{16}$ (ASCII)	00-FF$_{16}$	
		<A>*	%1104H41%
Insert group selection 1105	00-44 (00:None)	00-44	
		00*	%1105D00%
Supplement digits 1106	None	00*	%1106D00%
	2 digits	01	%1106D01%
	5 digits	02	%1106D02%
	2 or 5 digits	03	%1106D03%
Truncation/Expansion 1107	None	00*	%1107D00%
	Truncate leading zeros	01	%1107D01%
	Expand to EAN-13	02	%1107D02%
	Truncate system character	03	%1107D03%
	Add country code	04	%1107D04%
Ink Spreading Canceling[Note 1] 1108	Disable	00*	%1108D00%
	Enable	01	%1108D01%

%%%END END

Note 1: If enabled, the scanner can more easily read the UPC-A barcode printed with ink spreading. But it may cause the scanner to decode some well-printed UPC-A barcode wrongly. Please ask the advice from the support engineer of the manufacturer before applying this function.

4-8 UPC-E

Read: Format

System character “0”	Data digits (6 digits)	Check digits

Check digit verification: The check digit verification is optional.

Check digit trans.: By setting Enable, check digit will be transmitted.

Code ID setting: Refer to Code ID setting of *“4-7 UPC-A”*.

Insertion group selection: Refer to Insertion group selection of *“4-7 UPC-A”*.

Supplement digits:

Format

System character “0”	Data digits (6 digits)	Check digit	Supplement digits 2 or 5

Truncation/Expansion:

Truncate leading zeros - Refer to Truncation/Expansion of *“4-7 UPC-A”*.

Expand to EAN-13 - It extends to 13-digits with “0” digits when the feature is set to be enabled.

Example: Barcode “01236547”, Output: “0012360000057”.

Expand to UPC-A - It extends to 12-digits when the feature is set to be enabled.

Example: Barcode “01236547”,

Output: “012360000057”.

Truncate system character - The system character “0” of UPC-E data can be truncated when this feature is enabled.

Add country code - The country code (“0” for USA) can be added when the feature is enabled.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Read 1201	Disable	00	%1201D00%
	Enable	01*	%1201D01%
Check digit verification 1202	Disable	00	%1202D00%
	Enable	01*	%1202D01%
Check digit trans. 1203	Disable	00	%1203D00%
	Enable	01*	%1203D01%

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Code ID setting 1204	00-FF_{16} (ASCII)	00-FF_{16}	
		<D>*	%1204H44%
Insert group selection 1205	00-44 (00:None)	00-44	
		00*	%1205D00%
Supplement digits 1206	None	00*	%1206D00% *
	2 digits	01	%1206D01%
	5 digits	02	%1206D02%
	2 or 5 digits	03	%1206D03%
Truncation/Expansion 1207	None	00*	%1207D00%
	Truncate leading zeros	01	%1207D01%
	Expand to EAN-13	02	%1207D02%
	Expand to UPC-A	03	%1207D03%
	Truncate system character	04	%1207D04%
	Add country code	05	%1207D05%

%%%END END

4-9 UPC-E1

Read: Format

System character “1”	Data digits (6 digits)	Check digits

Check digit verification: The check digit verification is optional.

Check digit trans.: By setting Enable, check digit will be transmitted.

Code ID setting: Refer to Code ID setting of *“4-7 UPC-A”*.

Insertion group selection: Refer to Insertion group selection of *“4-7 UPC-A”*.

Supplement digits:

Format

System character “1”	Data digits (6 digits)	Check digit	Supplement digits 2 or 5

Truncation/Expansion:

Expand to EAN-13 - It extends to 13-digits with “0” digits when the feature is set to be enabled.

Example: Barcode “11236597”, Output: “0112365000097”.

Expand to UPC-A - It extends to 12-digits when the feature is set to be enabled.

Example: Barcode “11236597”, Output: “112365000097”.

Truncate system character - The system character “1” of UPC-E1 data can be truncated when the feature is enabled.

Add country code - The country code (“0” for USA) can be added when the feature is enabled.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Read 3401	Disable	00	%3401D00%
	Enable	01*	%3401D01%
Check digit verification 3402	Disable	00	%3402D00%
	Enable	01*	%3402D01%
Check digit trans. 3403	Disable	00	%3403D00%
	Enable	01*	%3403D01%
Code ID setting 3404	00-FF_{16} (ASCII)	00-FF_{16}	
		<D>*	%3404H44%
Insert group selection 3405	00-44 (00:None)	00-44	
		00*	%3405D00%
Supplement digits 3406	None	00*	%3406D00%
	2 digits	01	%3406D01%
	5 digits	02	%3406D02%
	2 or 5 digits	03	%3406D03%
Truncation/Expansion 3407	None	00*	%3407D00%
	Expand to EAN-13	02	%3407D02%
	Expand to UPC-A	03	%3407D03%
	Truncate system character	04	%3407D04%
	Add country code	05	%3407D05%

%%%END END

4-10 EAN-13 (ISBN/ISSN)

Read:

Format

Data digits (12 digits)	Check digit

Check digit verification: The check digit verification is optional.

Check digit transmission: By setting Enable, check digit will be transmitted.

EAN-13 code ID setting: Refer to Code ID setting of *"4-7 UPC-A"*.

Insertion group selection: Refer to Insertion group selection of *"4-7 UPC-A"*.

Supplement digits:

Format

Data digits (12 digits)	Check digit	Supplement digits 2 or 5

ISBN/ISSN: The ISBN (International Standard Book Number) and ISSN (International Standard Serial Number) are two kinds of barcode for books and magazines. The ISBN is 10 digits with leading "978" and the ISSN is 8 digits with leading "977" of the EAN-13 symbol.

Example:

Barcode "9780194315104", Output: "019431510X".

Barcode "9771005180004", Output: "10051805".

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Read 1301	Disable	00	%1301D00%
	Enable	01*	%1301D01%
Check digit verification 1302	Disable	00	%1302D00%
	Enable	01*	%1302D01%
Check digit transmission 1303	Disable	00	%1303D00%
	Enable	01*	%1303D01%
EAN-13 code ID setting 1304	00-FF_{16} (ASCII)	00-FF_{16}	
		<A>*	%1304H41%

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Insert group selection 1305	00-44 (00:None)	00-44	
		00*	%1305D00%
Supplement digits 1306	None	00*	%1306D00%
	2 digits	01	%1306D01%
	5 digits	02	%1306D02%
	2 or 5 digits	03	%1306D03%
ISBN/ISSN conversion 1307	Disable	00*	%1307D00%
	Enable	01	%1307D01%
Ink Spreading Canceling[Note 1] 1308	Disable	00*	%1308D00%
	Enable	01	%1308D01%
ISBN/ISSN code ID setting 1309	00-FF_{16} (ASCII)	00-FF_{16}	
		<B>*	%1309H42%

%%%END END

Note 1: If enabled, the scanner can more easily read the EAN-13 barcode printed with ink spreading. But it may cause the scanner to decode some well-printed EAN-13 barcode wrongly. Please ask the advice from the support engineer of the manufacturer before applying this function.

4-11 EAN-8

Read:

Format

Data digits (7 digits)	Check digit

Check digit verification: The check digit verification is optional.

Check digit trans.: By setting Enable, check digit will be transmitted.

Code ID setting: Refer to Code ID setting of *"4-7 UPC-A"*.

Insertion group selection: Refer to Insertion group selection of *"4-7 UPC-A"*.

Supplement digits:

Format

Data digits (7 digits)	Check digit	Supplement Digits 2 or 5

Truncation/Expansion: Refer to Truncation/Expansion of *"4-7 UPC-A"*.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Read 1401	Disable	00	%1401D00%
	Enable	01*	%1401D01%
Check digit verification 1402	Disable	00	%1402D00%
	Enable	01*	%1402D01%
Check digit trans. 1403	Disable	00	%1403D00%
	Enable	01*	%1403D01%
Code ID setting 1404	00-FF_{16} (ASCII)	00-FF_{16}	
		<C>*	%1404H43%
Insert group selection 1405	00-44 (00:None)	00-44	
		00*	%1405D00%
Supplement digits 1406	None	00*	%1406D00%
	2 digits	01	%1406D01%
	5 digits	02	%1406D02%
	2 or 5 digits	03	%1406D03%
Truncation/Expansion 1407	None	00*	%1407D00%
	Truncate leading zero	01	%1407D01%
	Expand to EAN-13	02	%1407D02%

%%%END END

4-12 Code 39 (Code 32, Trioptic Code 39)

Read:

Format

Start character(∗)	Data digits (variable)	Check digit (optional)	End character(∗)

Check digit verification: The check digit verification is optional.

Check digit transmission: By setting Enable, check digit will be transmitted.

Max./Min. code length: Each symbol has own max./min. code length. If both setting of max./min. code length are "00"s, the setting of global max./min. code length is effective. The length is defined as to the actual barcode data length to be sent. Label with length exceeds these limits will be rejected. Make sure that the minimum length setting is no greater than the maximum length setting, otherwise all the labels of the symbol will not be readable. In particular, you can see the same value for both minimum and maximum reading length to force the fixed length barcode decoded. Refer to *"4-5 Scan mode & some global settings"*.

Code ID setting: Refer to Code ID setting of *"4-7 UPC-A"*.

Insertion group selection: Refer to Insertion group selection of *"4-7 UPC-A"*.

Start/End transmission: The start character and end character of Code 39 are "∗"s. You can transmit all data digits including two "∗"s.

"∗" as data character: By setting Enable, "∗" can be recognized as data character.

Convert Code 39 to Code 32: Code 32 is a variant of Code 39 used by the Italian pharmaceutical industry. Note that Code 39 must be enabled in order for this parameter to function.

Format of Code 32

"A" (optional)	Data digits (8 digits)	Check digit

Code 32 Prefix "A" transmission: By setting Enable, the prefix character "A" can be added to all Code 32 barcodes.

Trioptic Code 39 read: Trioptic Code 39 is a variant of Code 39 used in the marking of magnetic tapes and computer cartridges. Trioptic Code 39 symbols always contain six characters.

Format of Trioptic Code 39

Start character ($)	Data digits (6 digits)	End character ($)

Trioptic Code 39 Start/End transmission: The start character and end character of Trioptic Code 39 are "$"s. You can transmit all data digits including two "$"s.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Read 1501	Disable	00	%1501D00%
	Enable	01*	%1501D01%
Check digit verification 1502	Disable	00*	%1502D00%
	Enable	01	%1502D01%
Check digit transmission 1503	Disable	00*	%1503D00%
	Enable	01	%1503D01%
Max. code length 1504	00-99	00-99	
		99*	%1504D99%
Min. code length 1505	00-99	00-99	
		01*	%1505D01%
Code ID setting 1506	00-FF_{16} (ASCII)	00-FF_{16}	
		<M>*	%1506H4D%
Insert group selection 1507	00-44 (00:None)	00-44	
		00*	%1507D00%
Format 1508	Standard	00*	%1508D00%
	Full ASCII	01	%1508D01%
Start/End transmission 1509	Disable	00*	%1509D00%
	Enable	01	%1509D01%
“*” as data character 1510	Disable	00*	%1510D00%
	Enable	01	%1510D01%
Convert Code 39 to Code 32	Disable	00*	%1511D00%

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
1511	Enable	01	%1511D01%
Code 32 Prefix “A” transmission 1512	Disable	00*	%1512D00%
	Enable	01	%1512D01%
Trioptic Code 39 read 1513	Disable	00*	%1513D00%
	Enable	01	%1513D01%
Trioptic Code 39 Start/End transmission 1514	Disable	00*	%1514D00%
	Enable	01	%1514D01%

%%%END END

Note 1: If Trioptic Code 39 is set Enable, Code 39 is forced Enable.

Note 2: If Code 39 is set Disable, Trioptic Code 39 is forced Disable.

4-13 Interleaved 2 of 5

Read:

Format

Data digits (variable)	Check digit (optional)

Check digit verification: The check digit verification is optional.

Check digit transmission: By setting Enable, check digit will be transmitted.

Max./Min. code length: Refer to Max./Min. code length of *"4-12 Code 39 (Code 32, Trioptic Code 39)"*.

Code ID setting: Refer to Code ID setting of *"4-7 UPC-A"*.

Insertion group selection: Refer to Insertion group selection of *"4-7 UPC-A"*.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Read 1601	Disable	00	%1601D00%
	Enable	01*	%1601D01%
Check digit verification 1602	Disable	00*	%1602D00%
	USS	01	%1602D01%
	OPCC	02	%1602D02%
Check digit transmission 1603	Disable	00*	%1603D00%
	Enable	01	%1603D01%
Max. code length 1604	00-99	00-99	
		99*	%1604D99%
Min. code length 1605	00-99	00-99	
		06*	%1605D06%
Code ID setting 1606	00-FF_{16} (ASCII)	00-FF_{16}	
		<I>*	%1606H49%
Insert group selection 1607	00-44 (00:None)	00-44	
		00*	%1607D00%

%%%END END

4-14 Industrial 2 of 5

Read:

Format

Data digits (variable)

Check digit transmission: By setting Enable, check digit will be transmitted.

Max./Min. code length: Refer to Max./Min. code length of *"4-12 Code 39 (Code 32, Trioptic Code 39)"*.

Code ID setting: Refer to Code ID setting of *"4-7 UPC-A"*.

Insertion group selection: Refer to Insertion group selection of *"4-7 UPC-A"*.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Read 1701	Disable	00*	%1701D00%
	Enable	01	%1701D01%
Max. code length 1702	00-99	00-99	
		99*	%1702D99%
Min. code length 1703	00-99	00-99	
		04*	%1703D04%
Code ID setting 1704	00-FF_{16} (ASCII)	00-FF_{16}	
		<H>*	%1704H48%
Insert group selection 1705	00-44 (00:None)	00-44	
		00*	%1705D00%

%%%END END

4-15 Matrix 2 of 5

Read:

Format

Data digits (variable)	Check digit (optional)

Check digit verification: The check digit verification is optional.

Check digit transmission: By setting Enable, check digit will be transmitted.

Max./Min. code length: Refer to Max./Min. code length of *"4-12 Code 39 (Code 32, Trioptic Code 39)"*.

Code ID setting: Refer to Code ID setting of *"4-7 UPC-A"*.

Insertion group selection: Refer to Insertion group selection of *"4-7 UPC-A"*.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Read 1801	Disable	00	%1801D00%
	Enable	01*	%1801D01%
Check digit verification 1802	Disable	00*	%1802D00%
	Enable	01	%1802D01%
Check digit transmission 1803	Disable	00*	%1803D00%
	Enable	01	%1803D01%
Max. code length 1804	00-99	00-99	
		99*	%1804D99%
Min. code length 1805	00-99	00-99	
		06*	%1805D06%
Code ID setting 1806	00-FF_{16} (ASCII)	00-FF_{16}	
		<X>*	%1806H58%
Insert group selection 1807	00-44 (00:None)	00-44	
		00*	%1807D00%

%%%END END

4-16 Codabar

Read:

Format

Start character	Data digits (variable)	Check digit (optional)	End character

Check digit verification: The check digit verification is optional.

Check digit transmission: By setting Enable, check digit will be transmitted.

Max./Min. code length: Refer to Max./Min. code length of *"4-12 Code 39 (Code 32, Trioptic Code 39)"*.

Code ID setting: Refer to Code ID setting of *"4-7 UPC-A"*.

Insertion group selection: Refer to Insertion group selection of *"4-7 UPC-A"*.

Start/End type: Codabar has four pairs of Start/End pattern; you may select one pair to match your application.

Start/End transmission: By setting Enable, the start and end character of a Codabar barcode will be transmitted.

Start/End character equality: By setting Enable, the start and end character of a Codabar barcode must be the same.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Read 1901	Disable	00	%1901D00%
	Enable	01*	%1901D01%
Check digit verification 1902	Disable	00*	%1902D00%
	Enable	01	%1902D01%
Check digit transmission 1903	Disable	00*	%1903D00%
	Enable	01	%1903D01%
Max. code length 1904	00-99	00-99	
		99*	%1904D99%

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Min. code length 1905	00-99	00-99	
		04*	%1905D04%
Code ID setting 1906	00-FF$_{16}$ (ASCII)	00-FF$_{16}$	
		<N>*	%1906H4E%
Insert group selection 1907	00-44 (00:None)	00-44	
		00*	%1907D00%
Start/End type 1908	ABCD/ABCD	00*	%1908D00%
	abcd/abcd	01	%1908D01%
	ABCD/TN*E	02	%1908D02%
	abcd/tn*e	03	%1908D03%
Start/End transmission 1909	Disable	00*	%1909D00%
	Enable	01	%1909D01%
Start/End character equality 1910	Disable	00*	%1910D00%
	Enable	01	%1910D01%

%%%END END

4-17 Code 128

Read:

Format

Data digits (variable)	Check digit (optional)

Check digit verification: The check digit verification is optional.

Check digit transmission: By setting Enable, check digit will be transmitted.

Max./Min. code length: Refer to Max./Min. code length of *"4-12 Code 39 (Code 32, Trioptic Code 39)"*.

Code ID setting: Refer to Code ID setting of *"4-7 UPC-A"*.

Insertion group selection: Refer to Insertion group selection of *"4-7 UPC-A"*.

Truncate leading zeros: The leading "0" digits or all "0" digits of Code 128 barcode characters can be truncated when the feature is enabled.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Read 2001	Disable	00	%2001D00%
	Enable	01*	%2001D01%
Check digit verification 2002	Disable	00	%2002D00%
	Enable	01*	%2002D01%
Check digit transmission 2003	Disable	00*	%2003D00%
	Reserved	01	%2003D01%
Max. code length 2004	00-99	00-99	
		99*	%2004D99%
Min. code length 2005	00-99	00-99	
		01*	%2005D01%
Code ID setting 2006	00-FF_{16} (ASCII)	00-FF_{16}	
		<K>*	%2006H4B%
Insert group selection 2007	00-44 (00:None)	00-44	
		00*	%2007D00%
Truncate leading zeros 2008	Disable	00*	%2008D00%
	All leading “0”s	01	%2008D01%
	Only the first “0”	02	%2008D02%

%%%END END

4-18 UCC/EAN 128

Read:

Format

Data digits (variable)	Check digit (optional)

Check digit verification: The check digit verification is optional.

Check digit transmission: By setting Enable, check digit will be transmitted.

Max. /Min. code length: Refer to Max. /Min. code length of *"4-12 Code 39 (Code 32, Trioptic Code 39)"*.

Code ID setting: Refer to Code ID setting of *"4-7 UPC-A*."

Insertion group selection: Refer to Insertion group selection of *"4-7 UPC-A"*.

Truncate leading zeros: The leading "0" digits or all "0" digits of UCC/EAN 128 barcode characters can be truncated when the feature is enabled.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Read 2501	Disable	00	%2501D00%
	Enable	01*	%2501D01%
Check digit verification 2502	Disable	00	%2502D00%
	Enable	01*	%2502D01%
Check digit transmission 2503	Disable	00*	%2503D00%
	Reserved	01	%2503D01%
Max. code length 2504	00-99	00-99	
		99*	%2504D99%
Min. code length 2505	00-99	00-99	
		01*	%2505D01%
Code ID setting 2506	00-FF_{16} (ASCII)	00-FF_{16}	
		<K>*	%2506H4B%
Insert group selection 2507	00-44 (00:None)	00-44	
		00*	%2507D00%
Truncate leading zeros 2508	Disable	00*	%2508D00%
	All leading “0”s	01	%2508D01%
	Only the first “0”	02	%2508D02%

%%%END END

4-19 ISBT 128

Read:

Format

Start character(“=” or “&”)	Data digits (variable)	Check digit (optional)

Check digit verification: The check digit verification is optional.

Check digit transmission: By setting Enable, check digit will be transmitted.

Max./Min. code length: Refer to Max./Min. code length of *“4-12 Code 39 (Code 32, Trioptic Code 39)”*.

Code ID setting: Refer to Code ID setting of *“4-7 UPC-A”*.

Insertion group selection: Refer to Insertion group selection of *“4-7 UPC-A”*.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Read 3301	Disable	00	%3301D00%
	Enable	01*	%3301D01%
Check digit verification 3302	Disable	00	%3302D00%
	Enable	01*	%3302D01%
Check digit transmission 3303	Disable	00*	%3303D00%
	Reserved	01	%3303D01%
Max. code length 3304	00-99	00-99	
		99*	%3304D99%
Min. code length 3305	00-99	00-99	
		01*	%3305D01%
Code ID setting 3306	00- FF_{16} (ASCII)	00-FF_{16}	
		<K>*	%3306H4B%
Insert group selection 3307	00-44 (00:None)	00-44	
		00*	%3307D00%

%%%END END

4-20 Code 93

Read:

Format

Data digits (variable)	2 check digits (optional)

Check digit verification: The check digit verification is optional.

Check digit transmission: By setting Enable, check digit will be transmitted.

Max./Min. code length: Refer to Max./Min. code length of *"4-12 Code 39 (Code 32, Trioptic Code 39)"*.

Code ID setting: Refer to Code ID setting of *"4-7 UPC-A"*.

Insertion group selection: Refer to Insertion group selection of *"4-7 UPC-A"*.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Read 2101	Disable	00	%2101D00%
	Enable	01*	%2101D01%
Check digit verification 2102	Disable	00	%2102D00%
	Enable	01*	%2102D01%
Check digit transmission 2103	Disable	00*	%2103D00%
	Enable	01	%2103D01%
Max. code length 2104	00-99	00-99	
		99*	%2104D99%
Min. code length 2105	00-99	00-99	
		01*	%2105D01%
Code ID setting 2106	00-FF_{16} (ASCII)	00-FF_{16}	
		<L>*	%2106H4C%
Insert group selection 2107	00-44 (00:None)	00-44	
		00*	%2107D00%

%%%END END

4-21 Code 11

Read:

Format

Data digits (variable)	1 or 2 check digits (optional)

Check digit verification: The check digit verification is optional.

Check digit transmission: By setting Enable, 1 or 2 check digits will be transmitted upon the selected check digit verification method.

Max./Min. code length: Refer to Max./Min. code length of *"4-12 Code 39 (Code 32, Trioptic Code 39)"*.

Code ID setting: Refer to Code ID setting of *"4-7 UPC-A"*.

Insertion group selection: Refer to Insertion group selection of *"4-7 UPC-A"*.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Read 2201	Disable	00*	%2201D00%
	Enable	01	%2201D01%
Check digit verification 2202	Disable	00	%2202D00%
	One digit	01*	%2202D01%
	Two digit	02	%2202D02%
Check digit transmission 2203	Disable	00*	%2203D00%
	Enable	01	%2203D01%
Max. code length 2204	00-99	00-99	
		99*	%2204D99%
Min. code length 2205	00-99	00-99	
		04*	%2205D04%
Code ID setting 2206	00-FF_{16} (ASCII)	00-FF_{16}	
		<V>*	%2206H56%
Insert group selection 2207	00-44 (00:None)	00-44	
		00*	%2207D00%

%%%END END

4-22 MSI/Plessey

Read:

Format

Data digits (variable)	1 or 2 check digits (optional)

Check digit verification: The MSI/Plessey has one or two optional check digits. There are three methods to verify check digits, i.e. Mod10, Mod10/10 and Mod 10/11. 1 or 2 check digits will be calculated as the sum module 10 or 11 of the data digits.

Check digit transmission: By setting Enable, 1 or 2 check digits will be transmitted upon the selected check digit verification method.

Max./Min. code length: Refer to Max./Min. code length of *"4-12 Code 39 (Code 32, Trioptic Code 39)"*.

Code ID setting: Refer to Code ID setting of *"4-7 UPC-A"*.

Insertion group selection: Refer to Insertion group selection of *"4-7 UPC-A"*.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Read 2301	Disable	00*	%2301D00%
	Enable	01	%2301D01%
Check digit verification 2302	Disable	00*	%2302D00%
	1 digit (Mod 10)	01	%2302D01%
	2 digit (Mod 10/10)	02	%2302D02%
	2 digit (Mod 10/11)	03	%2302D03%
Check digit transmission 2303	Disable	00*	%2303D00%
	Enable	01	%2303D01%
Max. code length 2304	00-99	00-99	
		99*	%2304D99%
Min. code length 2305	00-99	00-99	
		04*	%2305D04%
Code ID setting 2306	00-FF_{16} (ASCII)	00-FF_{16}	
		<O>*	%2306H4F%
Insert group selection 2307	00-44 (00:None)	00-44	
		00*	%2307D00%

%%%END END

4-23 UK/Plessey

Read:

Format

Data digits (variable)	2 check digits (optional)

Check digit verification: The UK/Plessey has two optional check digits. The check digit 1 and check digit 2 will be calculated as the sum module 10 or 11 of the data digits.

Check digit transmission: By setting Enable, check digit will be transmitted.

Max./Min. code length: Refer to Max./Min. code length of *"4-12 Code 39 (Code 32, Trioptic Code 39)"*.

Code ID setting: Refer to Code ID setting of *"4-7 UPC-A"*.

Insertion group selection: Refer to Insertion group selection of *"4-7 UPC-A"*.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Read 2401	Disable	00	%2401D00%
	Enable	01*	%2401D01%
Check digit verification 2402	Disable	00	%2402D00%
	Enable	01*	%2402D01%
Check digit transmission 2403	Disable	00*	%2403D00%
	Enable	01	%2403D01%
Max. code length 2404	00-99	00-99	
		99*	%2404D99%
Min. code length 2405	00-99	00-99	
		01*	%2405D01%
Code ID setting 2406	00-FF_{16} (ASCII)	00-FF_{16}	
		<U>*	%2406H55%
Insert group selection 2407	00-44 (00:None)	00-44	
		00*	%2407D00%

%%%END END

4-24 China Post

Read:

Format

11 Data digits

Max. /Min. code length: Refer to Max. /Min. code length of *"4-12 Code 39 (Code 32, Trioptic Code 39)"*.

The code length of China Post is 11.

Code ID setting: Refer to Code ID setting of *"4-7 UPC-A"*.

Insertion group selection: Refer to Insertion group selection of *"4-7 UPC-A"*.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Read 2601	Disable	00	%2601D00%
	Enable	01*	%2601D01%
Max. code length 2604	00-99	00-99	
		11*	%2604D11%
Min. code length 2605	00-99	00-99	
		11*	%2605D11%
Code ID setting 2606	00-FF_{16} (ASCII)	00-FF_{16}	
		<T>*	%2606H54%
Insert group selection 2607	00-44 (00:None)	00-44	
		00*	%2607D00%

%%%END END

4-25 GS1 DataBar (GS1 DataBar Truncated)

GS1 DataBar Truncated is structured and encoded as the same as the standard GS1 DataBar format, except its height is reduced to a 13 modules minimum; while GS1 DataBar should have a height greater than or equal to 33 modules.

Read:

Format

16 Data digits

Code ID setting: Refer to Code ID setting of *"4-7 UPC-A"*.

Insertion group selection: Refer to Insertion group selection of *"4-7 UPC-A"*.

Conversion:

UCC/EAN 128- Refer to Code ID transmission of "*4-30 String transmission*",]Cm will be identified as AIM ID.

UPC-A or EAN-13- Barcode beginning with a single zero as the first digit has the leading "010" stripped and the barcode reported as EAN-13. Barcode beginning with two or more zeros but not six zeros has the leading "0100" stripped and the barcode reported as UPC-A.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Read 2701	Disable	00	%2701D00%
	Enable	01*	%2701D01%
Code ID setting 2702	00-FF_{16} (ASCII)	00-FF_{16}	
		<R >*	%2702H52%
Insert group selection 2703	00-44 (00:None)	00-44	
		00*	%2703D00%
Conversion 2704	None	00*	%2704D00%
	UCC/EAN 128	01	%2704D01%
	UPC-A or EAN-13	02	%2704D02%

%%%END END

4-26 GS1 DataBar Limited

Read:

Format

16 Data digits

Code ID setting: Refer to Code ID setting of *"4-7 UPC-A"*.

Insertion group selection: Refer to Insertion group selection of *"4-7 UPC-A"*.

Conversion: Refer to Conversion of *"4-25 GS1 DataBar (GS1 DataBar Truncated)"*.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option barcode	Option	Alpha. value	
Read 2801	Disable	00	%2801D00%
	Enable	01*	%2801D01%
Code ID setting 2802	00-FF_{16} (ASCII)	00-FF_{16}	
		<R >*	%2802H52%
Insert group selection 2803	00-44 (00:None)	00-44	
		00*	%2803D00%
Conversion 2804	None	00*	%2804D00%
	UCC/EAN 128	01	%2804D01%
	UPC-A or EAN-13	02	%2804D02%

%%%END END

4-27 GS1 DataBar Expanded

Read:

Format

Data characters (variable)

Code ID setting: Refer to Code ID setting of *"4-7 UPC-A"*.

Insertion group selection: Refer to Insertion group selection of *"4-7 UPC-A"*.

Conversion:

UCC/EAN 128- Refer to Code ID transmission of *"4-30 String transmission"*,]Cm will be identified as AIM ID.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option bar code	Option	Alpha. value	
Read 2901	Disable	00	%2901D00%
	Enable	01*	%2901D01%
Max. code length 2902	00-99	00-99	
		99*	%2902D99%
Min. code length 2903	00-99	00-99	
		01*	%2903D01%
Code ID setting 2904	00-FF_{16} (ASCII)	00-FF_{16}	
		<R >*	%2904H52%
Insert group selection 2905	00-44 (00:None)	00-44	
		00*	%2905D00%
Conversion 2906	None	00*	%2906D00%
	UCC/EAN 128	01	%2906D01%

%%%END END

4-28 G1-G4 & FN1 substitution string setting

Format of barcode data transmission

Prefix	Code name	Preamble	Code ID	Code length	Code data	Code ID	Postamble	Suffix

Suffix string setting: The <enter > key is represented in different ASCII when it is applied by different OS. For a Windows/DOS OS, <enter> is represented as <CR><LF> (0x0D 0x0A); for an Apple MAC OS, <enter> is represented as <CR> (0x0D); for a Linux/Unix OS, <enter> is represented as <LF> (0x0A).

Prefix/Suffix string setting & Preamble/Postamble string setting:

They are appended to the data automatically when a barcode is decoded.

Example: Add a symbol of "$" as a prefix for all type of barcode.

Steps:

1) Look up in the ASCII table to find the value of $→24.
2) Scan SETUP and Prefix string setting barcode.
3) Scan 2 and 4 barcode.
4) Scan END barcode.
5) Refer to *"4-30 String transmission"*, set Prefix transmission to be Enable.

Scanning steps: Scan the following barcodes in order.

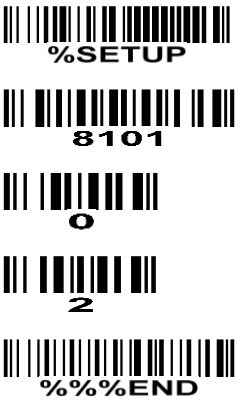
Insert G1/G2/G3/G4 string setting: The scanner offers 4 positions and 4 character strings to insert among the barcode data string.

Example: Set G1 string to be "AB".

Original code data	"1 2 3 4 5 6"
Output code data	"1 2 A B 3 4 5 6"

Steps:

1) Look up in the ASCII table to find the value of A→41, B→42.
2) Scan SETUP and Insert G1 string setting barcode "8005".
3) Scan 4, 1 and 4, 2 barcode.
4) Scan END barcode.
5) Refer to the chapter of *"4-29 G1-G4 string position & Code ID position"*.
6) Refer to the chapter of *"4-5 Scan mode & some global settings"*.



Testing barcode:

FN1 substitution string setting: The FN1 character (0x1D) in an UCC/EAN128 barcode, or a Code 128 barcode, or a GS1 DataBar barcode can be substituted with a defined string.

Example: Set FN1 substitution string to be “ABCD”.

Original code data (hexadecimal)	“31 1D 32 1D 33 1D 34 1D 35”
Output code data (hexadecimal)	“31 41 32 42 33 43 34 44 35”

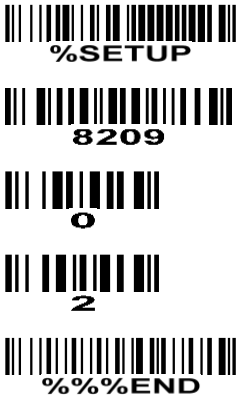
Steps:

1) Set FN1 substitution string to be ABCD.

2) Refer to *“4-30 String transmission”*, enable FN1 substitution transmission.

In this example, because the interface of the scanner is RS232, so set “8209” to 02.

Scanning steps: Scan the following barcodes in order.



Testing barcode:

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option bar code	Option	Alpha. value	
Prefix string setting 8001	0-22 characters (Default: None)	00-FF$_{16}$	
Suffix string setting 8002	0-22 characters	00-FF$_{16}$	
	<ENTER>	0D0A*	
Preamble string setting 8003	0-22 characters (Default: None)	00-FF$_{16}$	
Postamble string setting 8004	0-22 characters (Default: None)	00-FF$_{16}$	
Insert G1 string setting 8005	0-22 characters (Default: None)	00-FF$_{16}$	
Insert G2 string setting 8006	0-22 characters (Default: None)	00-FF$_{16}$	
Insert G3 string setting 8007	0-22 characters (Default: None)	00-FF$_{16}$	
Insert G4 string setting 8008	0-22 characters (Default: None)	00-FF$_{16}$	
FN1 substitution string setting 8009	0-4 characters	00-FF$_{16}$	
	<SP>	20*	%8009H20%

%%%END END

4-29 G1-G4 string position & Code ID position

Format of barcode data transmission

Prefix	Code name	Preamble	Code ID	Code length	Code data	Code ID	Postamble	Suffix

Insert G1/G2/G3/G4 string position: The scanner offers 4 positions to insert strings among the symbol. In case of the insertion position is greater than the length of the symbol, the insertion of string is not effective.

Code ID position: It is allowed to select different positions of code ID placement.

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option bar code	Option	Alpha. value	
Insert G1 string position 8101	00-99	00-99	
		00*	%8101D00%
Insert G2 string position 8102	00-99	00-99	
		00*	%8102D00%
Insert G3 string position 8103	00-99	00-99	
		00*	%8103D00%
Insert G4 string position 8104	00-99	00-99	
		00*	%8104D00%
Code ID position 8105	Before code data	00*	%8105D00%
	After code data	01	%8105D01%

%%%END END

4-30 String transmission

Format of barcode data transmission

Prefix	Code name	Preamble	Code ID	Code length	Code data	Code ID	Postamble	Suffix

Prefix transmission: By setting Enable, prefix will be appended before the data transmitted.

Suffix transmission: By setting Enable, suffix will be appended after the data is transmitted.

Code name transmission: By setting Enable, code name will be transmitted before code data.

Preamble transmission: By setting Enable, preamble will be appended before the data transmitted.

Postamble transmission: By setting Enable, postamble will be appended after the data is transmitted.

Code ID transmission: Code ID can be transmitted in the format of either Proprietary ID or AIM ID. Refer to the chapter of *"1-2 Default settings for various types of barcode"*.

Code length transmission: The length of code data string can be transmitted before the code data when Enable is selected. The length is represented by a number with two digits.

Case conversion: The characters within code data or the whole output string can be set in either upper case or lower case.

FN1 substitution transmission: The scanner supports a FN1 substitution feature for keyboard wedge, USB and RS-232 interface. The replacement string of FN1 can be chosen by user (see chapter of *"4-28 G1-G4 & FN1 substitution string setting"*).

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option bar code	Option	Alpha. value	
Prefix transmission 8201	Disable	00*	%8201D00%
	Enable	01	%8201D01%
Suffix transmission 8202	Disable	00	%8202D00%
	Enable	01*	%8202D01%
Code name transmission 8203	Disable	00*	%8203D00%
	Enable	01	%8203D01%
Preamble transmission 8204	Disable	00*	%8204D00%
	Enable	01	%8204D01%

%SETUP SETUP

Multiple-scan setting			Single-scan setting
Option bar code	Option	Alpha. value	
Postamble transmission 8205	Disable	00*	%8205D00%
	Enable	01	%8205D01%
Code ID transmission 8206	Disable	00*	%8206D00%
	Proprietary ID	01	%8206D01%
	AIM ID	02	%8206D02%
Code length transmission 8207	Disable	00*	%8207D00%
	Enable	01	%8207D01%
Case conversion 8208	Disable	00*	%8208D00%
	Upper (data only)	01	%8208D01%
	Lower (data only)	02	%8208D02%
	Upper (whole string)	03	%8208D03%
	Lower (whole string)	04	%8208D04%
FN1 substitution transmission 8209	Disable	00*	%8209D00%
	Keyboard wedge/USB	01	%8209D01%
	RS232	02	%8209D02%
	Keyboard wedge/USB/RS232	03	%8209D03%

%%%END END

5 Serial Communication Interface

Note: SCI is supported for RS232 interface or USB virtual COM only.

This section describes the system requirements of the Serial Communication Interface (SCI), which provides a communication link between a scanner and a host via RS232 interface or USB virtual COM. SCI allows the host to configure the scanner. All communication between the scanner and the host occur over the hardware interface lines using the SCI protocol.

The host and the scanner exchange messages in packets. A packet is a collection of bytes framed by the proper SCI protocol formatting bytes. The maximum number of bytes per packet allowed by the SCI protocol for any transaction is 257 (255 bytes of data + 2 bytes of checksum).

Decode data may be sent as ASCII data (unpacked), or as part of a larger message (packeted), depending on the scanner configuration.

Table 5-1 SCI commands

No.	Command name	Operation code	Description
1	BEEP	0x42('B')	Sound the beeper.
2	CMD_ACK	0x59('Y')	Positive acknowledgement.
3	CMD_NAK	0x4E('N')	Negative acknowledgement.
4	DECODE_DATA	0x50('P')	Decode data in SCI packet format.
5	LED_CTR	0x4C('L')	Turn on/off the led.
6	REQUEST_REVISION	0x56('V')	Request scanner's software revision.
7	REPLY_REVISION	0x52('R')	Reply scanner's software revision.
8	START_DECODE	0x53('S')	Tell scanner to attempt to decode a barcode.
9	STOP_DECODE	0x45('E')	Tell scanner to abort a decode attempt.
10	PARAM_DEFAULT	0x25('%')	Load scanner's default settings.
11	PARAM_REQUEST	0x3F('?')	Request values of certain parameters.
12	PARAM_SEND	0x23('#')	Parameter transmission.
13	CUSTOM_DEFAULTS	0x26('&')	Custom defaults option to write/restore.
14	CMD_RESTART	0x5e('^')	Tell scanner to restart as soon as possible.
15	WAKUP	N/A	Wakeup scanner after it has been in sleep state.
16	CMD_OUTPUTBUFFER_CTR	0x62('b')	Control output buffer.

5-1 SCI message formats

The general packet format for SCI message is as following:

Length	Opcode	Status	Data	Checksum

Table 5-2 lists the descriptions of fields that occur in all messages. These descriptions are repeated for each opcode. For messages that use the Data field, the specific type of data is described in that field in later sections.

Table 5-2 Field descriptions

Field name	Format	Size	Description
Length	Information length (not including checksum)	1 Byte	Length of message not including the check sum bytes. Maximum value is 0xFF.
Opcode	See *Table 5-1* for details	1 Byte	Identifies this opcode type.
Status	Bit 0: Identifies transmit status Bit 5-1: Parameter property (For PARAM_REQUEST and PARAM_SEND only.) Bit 6: Change type(apply to parameter transmission) Bit 7: Command source	1 Byte	Bit 0: 0 = First time packet is sent 1 = Subsequent transmission attempts Bit 5-1: 0=Maximum parameter value 1= Minimum parameter value 2= Permanent parameter value 3= Temporary parameter value 4=Default 0 parameter value 5=Custom default parameter value 6-15=Reserved Bit 6: 0 = Temporary change 1 = Permanent change Bit 7: 0=Command is from the scanner 1=Command is from the host All unused bits recommend to be set to 0.
Data	See individual sections for details	Variable number of Bytes	
Checksum	2's complement sum of message contents excluding checksum	2 Bytes	Checksum of message formatted as High-Byte Low-Byte
Note: The checksum is a 2 byte checksum and must be sent as High-Byte followed by Low-Byte. Checksum = 0x10000 - Length - Opcode - Status - Data.			

5-2 BEEP

Description: Ask the scanner to sound the beeper.

Packet Format

Length	Opcode	Status	Beep Code	Checksum
0x04	0x42			

Field Descriptions

Field Name	Format	Size	Description
Length	0x04	1 Byte	Length Field
Opcode	0x42	1 Byte	Identifies this opcode type.
Status	Bit 0: Identifies transmit status Bit 6-1: Unused Bit 1-7: Command source	1 Byte	Bit 0: 0=First time packet is sent 1= Subsequent transmission attempts Bit 7: always be 1(message is from the host) All unused bits recommend to be set to 0.
Beep Code	See *Table 5-3*.	1 Byte	Number that identifies a beep sequence.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

This command instructs the scanner to sound the beep sequence indicated by the Beep Code field.

In Table 5-3, Duration (a relative term) is the length of a sound, Pitch (a relative term) is the pitch of the sound, and Number of Beeps indicates the times of a repeated beep pitch at the specified duration.

Table 5-3 Beep code definitions

Beep Code	Duration (ms)	Pitch	No. of beeps		Beep Code	Duration (ms)	Pitch	No. of beeps
0x00	72	High	1 (Short)		0x0D	1569	High	4 (Long)
0x01	193	High	2 (Short)		0x0E	2011	High	5 (Long)
0x02	315	High	3 (Short)		0x0F	241	Low	1 (Long)
0x03	436	High	4 (Short)		0x10	684	Low	2 (Long)
0x04	558	High	5 (Short)		0x11	1126	Low	3 (Long)
0x05	72	Low	1 (Short)		0x12	1569	Low	4 (Long)
0x06	193	Low	2 (Short)		0x13	2011	Low	5 (Long)
0x07	315	Low	3 (Short)		0x14	382	Hi-Lo-Hi-Lo	4 (Fast Warble)
0x08	436	Low	4 (Short)		0x15	965	Hi-Lo-Hi-Lo	4 (Slow Warble)
0x09	558	Low	5 (Short)		0x16	191	Hi-Lo	2 (Mix 1)
0x0A	241	High	1 (Long)		0x17	191	Lo-Hi	2 (Mix 2)
0x0B	684	High	2 (Long)		0x18	292	Hi-Lo-Hi	3 (Mix 3)
0x0C	1126	High	3 (Long)		0x19	282	Lo-Hi-Lo	3 (Mix 4)

For example: Host sends beep command to scanner (Beep code: 0x06)

Length	Opcode	Status	Beep Code	Checksum
0x04	0x42	0x80	0x06	0xFF 0x34

The method of calculating Checksum:

Checksum=0x10000-0x04-0x42-0x80-0x06.

Host Requirements

The host sends this command to cause the scanner to beep.

Scanner Requirements

When the scanner receives this command, it beeps the sequence provided in the Beep code field. If ACK/NAK handshaking is enabled and a valid beep code (see *Table 5-3*) is received, the scanner replies ACK. Otherwise it sends NAK_DENIED (see *"5-4 CMD_NAK"*).

5-3 CMD_ACK

Description: Positive acknowledgment of received packet.

Packet Format

Length	Opcode	Status	Checksum
0x03	0x59		

Field Descriptions

Field name	Format	Size	Description
Length	0x03	1 Byte	Length of Field
Opcode	0x59	1 Byte	Identifies the command being sent.
Status	Bit 0: Identifies transmit status Bit 6-1: Unused Bit 7: Command source	1 Byte	Bit 0: 0=First time packet is sent 1= Subsequent transmission attempts Bit 7: 0=Command is from the scanner 1=Command is from the host All unused bits recommend to be set to 0.
Checksum	2's complement sum of message contents excluding checksum	2 Bytes	Checksum of message

CMD_ACK message is sent to the SCI packet transmitter when the received packet passes the checksum check and no negative acknowledgment conditions apply. If the data to be sent is in response to a command (e.g. REQUEST_REVISION), CMD_ACK message is not in need.

- ACK/NAK handshaking can be disabled, but this is not recommended.
- It is not necessary to respond to a valid ACK or NAK message.

For example: Scanner sends ACK.

Length	Opcode	Status	Checksum
0x03	0x59	0x00	0xFF 0xA4

Host Requirements

The host must send a CMD_ACK or response data within the programmable Response delay to acknowledge receipt of all messages, unless noted otherwise in the message description section.

Scanner Requirements

If the scanner does not receive an ACK within Response delay, it sends the previous message again. The scanner retries twice more (with the retransmit status bit set) before declaring a transmit error.

5-4 CMD_NAK

Description: Negative acknowledgment of received packet

Packet Format

Length	Opcode	Status	Cause	Checksum
0x04	0x4E			

Field Descriptions

Field Name	Format	Size	Description
Length	0x04	1 Byte	Length Field
Opcode	0x4E	1 Byte	Identifies the opcode type.
Status	Bit 0: Identifies transmit status Bit 6-1: Unused Bit 7: Command source	1 Byte	Bit 0: 0=First time packet is sent 1= Subsequent transmission attempts Bit 7: 0=Command is from the scanner 1=Command is from the host All unused bits recommend to be set to 0.
Cause	Reason code	1 Byte	Identifies the reason the NAK occurred: 01 = NAK_OVERFLOW(Data Overflow, with baud rate of 115200b/s) 02 = NAK_RESEND(Checksum failure) 04 = NAK_BAD_CONTEXT(Unexpected or unknown message) 08 = NAK_DENIED(Host denies executing the require of Opcode) 40 = NAK_NO_PARA (The parameter requests to be changed doesn't exist) 80 = NAK_OUT_OF_RANGE(The parameter requests to be changed exceeds the range)
Checksum	2's complement sum of message contents excluding checksum.	2 Byte	Checksum of message.

This message is sent when the received packet fails the checksum verification or some error occurred while handling the message.

- ACK/NAK handshaking can be disabled, but this is not recommended.
- It is not necessary to respond to a valid ACK or NAK message.

For example: Scanner sends NAK.

Length	Opcode	Status	Cause	Checksum
0x04	0x4E	0x00	0x40 (the parameter requested is not exist)	0xFF 0x6E

Table 5-4 describes NAK types supported by the scanner.

Table 4-5 Scanner-supported NAK types

NAK Type	Meaning	Receiver Action
NAK_OVERFLOW	Data Overflow	While receiving message with the baud rate 115200B/s, scanners receive buffer may occur overflow. If the message length is greater than 7, the scanner fails to receive and process the data without delay, and reply NAK_OVERFLOW to host.
NAK_RESEND	Checksum incorrect.	Ensure checksum is correct. Send packet again with resend bit set (with the retransmit status bit set).
NAK_BAD_CONTEXT	The parameter want to be changed do not exist	Do not send the same message again. Ensure the correct message is sent.
NAK_DENIED	The parameter want to be changed exceeds the range	
NAK_NO_PARA	Host does not recognize the command.	
NAK_OUT_OF_RANGE	Host is unable to comply with the requested command (e.g., scan mode setting code is out of range).	

5-5 DECODE_DATA

Description: Decode data in SCI packet format

Packet Format

Length	Opcode	Status	Decode Data	Checksum
	0x50			

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	0x50	1 Byte	Identifies the opcode type.
Status	Bit 0: Identifies transmit status Bit 6-1: Unused Bit 7: Command source	1 Byte	Bit 0: 0=First time packet is sent 1= Subsequent transmission attempts Bit 7: always be 0(message is from the scanner) All unused bits recommend to be set to 0.
Decode Data	<data>	Variable	Data is decoded data including prefix and suffix sent in ASCII format.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

When the scanner uses this opcode Decode data packet format is selected to send decoded barcode data to the host. The decoded data is contained in the Decode Data field.

For example: the decode data is “1234”, the DECODE_DATA message sent to host is as following.

Length	Opcode	Status	Decode Data	Checksum
0x07	0x50	0x00	0x31 0x32 0x33 0x34	0xFE 0xDF

Host Requirements

If ACK/NAK handshaking is enabled, the host responds ACK to the scanner when received correct data packet.

Scanner Requirements

Decode data is sent in this format if Decode data packet format is selected via parameter. The host responds to this message with a CMD_ACK, if ACK/NAK handshaking is enabled.

5-6 LED_CTR

Description: LED control, it can control LED0 (red) and LED1 (blue).

Packet Format

Length	Opcode	Status	LED Option	LED Status	Checksum
0x05	0x4C				

Field Descriptions

Field Name	Format	Size	Description
Length	0x05	1 Byte	Length Field
Opcode	0x4C	1 Byte	Identifies the opcode type.
Status	Bit 0: Identifies transmit status Bit 6-1: Unused Bit 7: Command source	1 Byte	Bit 0: 0=First time packet is sent 1= Subsequent transmission attempts Bit 7: always be 1(message is from the host) All unused bits recommend to be set to 0.
LED Option	Bit 0-7: Each bit controls one LED. And it can control multiple LEDs at the same time.	1 Byte	Bit 0: 1=Control LED0 0= Don't control LED0 Bit 1: 1=Control LED1 0= Don't control LED1 Bit2-7: reserved to be 0.
LED Status	Bit 0-7: Each bit controls one LED's status	1 Byte	Bit 0: 1=LED0 ON 0=LED0 OFF Bit 1: 1=LED1 ON 0=LED1 OFF Bit2-7: reserved to be 0.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

For example: Host controls LED0 and LED1 at the same time (turn on LED0 and turn off LED1).

Length	Opcode	Status	LED Option	LED Status	Checksum
0x05	0x4C	0x80	0x03	0x02	0xFF 0x2A

Host Requirements

None.

Scanner Requirements

Scanner turns on LED0 and turns off LED1.

5-7 REQUEST_REVISION

Description: Request the software revision string from the scanner

Packet Format

Length	Opcode	Status	Checksum
0x03	0x56		

Field Descriptions

Field Name	Format	Size	Description
Length	0x03	1 Byte	Length Field
Opcode	0x56	1 Byte	Identifies this opcode type.
Status	Bit 0: Identifies transmit status Bit 6-1: Unused Bit 7: Command source	1 Byte	Bit 0: 0=First time packet is sent 1= Subsequent transmission attempts Bit 7: always be 1(message is from the host) All unused bits recommend to be set to 0.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

For example:

Length	Opcode	Status	Checksum
0x03	0x56	0x80	0xFF 0x27

Host Requirements

The host sends this message to request revision information from the scanner. The scanner responds with REPLY_REVISION.

Scanner Requirements

The scanner sends its revision string to the host. See *"5-8 REPLY_REVISION"*.

5-8 REPLY_REVISION

Description: Reply to REQUEST_REVISION command with software revision string

Packet Format

Length	Opcode	Status	Revision	Checksum
	0x52			

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	0x52	1 Byte	Identifies this opcode type.
Status	Bit 0: Identifies transmit status Bit 6-1: Unused Bit 7: Command source	1 Byte	Bit 0: 0=First time packet is sent 1= Subsequent transmission Bit 7: always be 0(message is from the scanner) All unused bits recommend to be set to 0.
Revision	ASCII data	variable	Software revision in ASCII (see following for details).
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

For example: If the HW/SW_REVISION is “FS580_HW1.0_SW1.0”, the REPLY_REVISION message is:

Length	Opcode	Status	Revision	Checksum
0x16	0x52	0x00	0x46 0x53 0x35 0x38 0x30 0x5F 0x48 0x57 0x31 0x2E 0x30 0x5F 0x53 0x57 0x31 0x2E 0x30 0x20 0x2D	0xFA 0xF0

Host Requirements

None.

Scanner Requirements

The scanner sends its Revision field data string to the host in the following format:

HW/SW_REVISION<space>SCANNER_ID

Resolving:

HW/SW_RIVISION: the version string of hardware and software information.

SCANNER_ID: the ID information of scanner.

Scanner ID Listed:

Scanner ID	Product		Scanner ID	Product
0x2C	FS380		0x1A	ME4144
0x2D	FS580		0x1B	ES4200
0xAB	uE988		0x1C	ES4290
0xAB	uE966		0x3A	ME5110

5-9 START_DECODE

Description: Ask the scanner to attempt to decode a barcode

Packet Format

Length	Opcode	Status	Checksum
0x03	0x53		

Field Descriptions

Field Name	Format	Size	Description
Length	0x03	1 Byte	Length Field
Opcode	0x53	1 Byte	Identifies this opcode type.
Status	Bit 0: Identifies transmit status Bit 6-1: Unused Bit 7: Command source	1 Byte	Bit 0: 0=First time packet is sent 1= Subsequent transmission Bit 7: always be 1(message is from the host) All unused bits recommend to be set to 0.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

This command asks the scanner to start a scan and a decode session. The decode session ends with a successful decode, or a scan session time-out, or a STOP_DECODE command.

For example: Host sends START_DECODE command

Length	Opcode	Status	Checksum
0x03	0x53	0x80	0xFF 0x2A

Host Requirements

None.

Scanner Requirements

The scanner must attempt decode a barcode once whatever the scan mode is, after receiving the START_DECODE command.

5-10 STOP_DECODE

Description: Ask scanner to abort a decode attempt

Packet Format

Length	Opcode	Status	Checksum
0x03	0x45		

Field Descriptions

Field Name	Format	Size	Description
Length	0x03	1 Byte	Length Field
Opcode	0x45	1 Byte	Identifies this opcode type.
Status	Bit 0: Identifies transmit status Bit 6-1: Unused Bit 7: Command source	1 Byte	Bit 0: 0=First time packet is sent 1= Subsequent transmission Bit 7: always be 1(message is from the host) All unused bits recommend to be set to 0.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

This command asks the scanner to stop a scan and a decode attempt.

For example:

Length	Opcode	Status	Checksum
0x03	0x45	0x80	0xFF 0x38

Host Requirements

None.

Scanner Requirements

The scanner stop decoding operation, after receiving a STOP_DECODE command (if ACK/NAK handshaking is enabled, the scanner will respond with an ACK or NAK).

Note: When Scan mode is Continuous, after receiving STOP_DECODE command, the scanner will not stop scanning.

5-11 PARAM_DEFAULTS

Description: Set the parameters to default values

Packet Format

Length	Opcode	Status	Setting type	Checksum
0x04	0x25			

Field Descriptions

Field Name	Format	Size	Description
Length	0x04	1 Byte	Length Field
Opcode	0x25	1 Byte	Identifies this opcode type.
Status	Bit 0: Identifies transmit status Bit 6-1: Unused Bit 7: Command source	1 Byte	Bit 0: 0=First time packet is sent 1= Subsequent transmission Bit 7: always be 1(message is from the host) All unused bits recommend to be set to 0.
Setting type	Default setting type	1 Byte	0-255. 0: Default setting 0 (Mindeo standard)
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

For example: return all parameters to the factory default setting values.

Length	Opcode	Status	Setting type	Checksum
0x04	0x25	0x80	0x00	0xFF 0x57

Host Requirements

The host sends this command to reset the scanner's parameter settings to the factory default values.

Scanner Requirements

Upon receiving this command, the scanner's resets all parameters (except Scan mode) to the factory default values. The behavior is the same as scanning **factory defaults** configuration barcode, see section *"11 Return default parameters & firmware version"*.

5-12 PARAM_REQUEST

Description: Request values of selected parameters

Packet Format

Length	Opcode	Status	Parameter code	Checksum
	0x3F			

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	0x3F	1 Byte	Identifies this opcode type.
Status	Bit 0: Identifies transmit status Bit 5-1: Unused Bit 6: Unused Bit 7: Command source	1 Byte	Bit 0: 0 = First time packet is sent 1 = Subsequent transmission attempts Bit 5-1: Reserved Bit 6: Reserved Bit 7: always be 1(message is from the host) All unused bits recommend to be set to 0.
Request Data	Parameter1, Parameter2, …	Variable	Each parameter code has 4 bytes; Host can request several parameters at the same time.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

The host uses this message to request some specific parameters from the scanner.

For example: the value of scanner parameter “0301” is 01, when host queries value of the parameter “0301”, the PARAM_REQUEST sent by host is as following:

Length	Opcode	Status	Parameter code	Checksum
0x07	0x3F	0x80	0x30 0x33 0x30 0x31	0xFE 0x76

the PARAM_SEND responded by scanner is as following:

Length	Opcode	Status	Parameter code	Data type	parameter	Checksum
0x0A	0x23	0x00	0x30 0x33 0x30 0x31	0x44	0x30 0x31	0xFE 0x6A

Host Requirements

The host requests the scanner’s current values for specific parameters by listing the parameter codes in the Request Data field. If the host asks for a parameter which is not supported by the scanner, the scanner responds with NAK.

The scanner’s response to this command is PARAM_SEND, not ACK. Depending on the time-out setting, and the number of parameters requested, this reply may fall outside the programmable Response delay. If this occurs, this is not a time-out error. To compensate, increase the Response delay.

Scanner Requirements

When the scanner receives this message, it processes the information by formatting a PARAM_SEND

message containing all requested parameters supported and their values. The programmable Response delay can be exceeded when processing this message, depending on the time-out set and the number of parameters requested.

5-13 PARAM_SEND

Description: the command performs two optional operations:

1) The scanner responds to a PARAM_REQUEST.

2) The host demands scanner to change particular parameter values.

Packet Format

Length	Opcode	Status	Parameter code	Data type	Parameter value	…	Checksum
	0x23						

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (Not including checksum).	1 Byte	Length Field
Opcode	0x23	1 Byte	Identifies this opcode type.
Status	Bit 0: Identifies transmit status Bit 5-1: Unused Bit 6: Change type Bit 7: Command source	1 Byte	Bit 0: 0 = First time packet is sent 1 = Subsequent transmission attempts Bit 5-1:Reserved Bit 6: 0 = Temporary change 1 = Permanent change Bit 7: 0=Command is from the scanner 1=Command is from the host All unused bits recommend to be set to 0.
Parameter Code	Parameter code	4 Bytes	Each parameter code has 4 bytes
Data type Note	‘H’ (0x48) or ‘D’ (0x44) or ‘S’ (0x53)	1 Byte	‘H’: The type of the parameter value is hexadecimal, the length of parameter value is 2 bytes. ‘D’: The type of the parameter value is decimal, the length of parameter value is 2 bytes. ‘S’: The parameter value is a string ended with ‘\0’ (0x00), the length of parameter value is 1-23 bytes
Parameter Value		Variable	1-23
…		Variable	Next parameter (parameter code, data type, parameter value) ….
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

Note: When data type is ‘S’, it supports 8001-8009 option barcode only.

This message is sent by the scanner in response to the PARAM_REQUEST message, or by the host to change the scanner’s parameter values.

Example 1: to set parameter Flow control to be **None** (see *"4-3 RS232 interface"*).

Length	Opcode	Status	Parameter code	Data type	Parameter value	Checksum
0x0A	0x23	0xC0	0x30 0x33 0x30 0x31	0x44	0x30 0x30	0xFD 0xAB

Example 2: to set parameter Code ID setting of UPC-A to be **U (0x55).**

Length	Opcode	Status	Parameter code	Data type	Parameter value	Checksum
0x0A	0x23	0xC0	0x31 0x31 0x30 0x34	0x48	0x35 0x35	0xFD 0x9B

Example 3: to set parameter Prefix string setting to be **ABCD.**

Length	Opcode	Status	Parameter code	Data type	Parameter value	Checksum
0x0D	0x23	0xC0	0x38 0x30 0x30 0x31	0x53	0x41 0x42 0x43 0x44 0x00	0xFC 0xEA

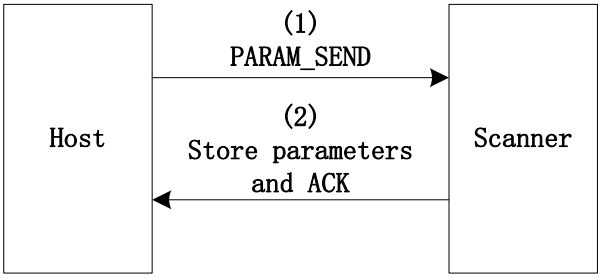
Host Requirements

The host transmits this message to change the scanner's parameters. Please be sure that the Change Type bit (bit 6 of the Status byte) in the Status field is set as desired.

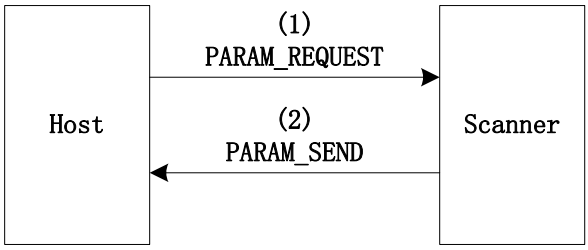
Scanner Requirements

- When the scanner receives a PARAM_SEND, it interprets and stores the parameters, then ACKs the command (if ACK/NAK handshaking is enabled). These parameters are stored permanently only if the Change Type (bit 6 of the Status byte) is set to 1. Frequent permanent changes are not recommended due to the limited write-cycles of flash memory. If bit 6 is set to 0 the changes are temporary, and are lost when the scanner is powered down.

  If the scanner changes the parameter, it issues the requested beep sequence and stores the requested parameter values.



- The scanner issues a PARAM_SEND in response to a PARAM_REQUEST from the host. It responds to the PARAM_REQUEST message by sending all supported parameter values. No value is sent for any unsupported parameter. If none of the requested values is supported, the scanner responds to the host with NAK.
- When the scanner sends PARAM_SEND message, the Change Type bit (bit 6 of Status byte) can be ignored.


(1)
PARAM_REQUEST
Host
(2)
PARAM_SEND
Scanner

5-14 CUSTOM_DEFAULTS

Description: Two optional operations: 1) Write current setting to Custom Defaults, or 2) Set the parameters to custom default values.

Packet Format

Length	Opcode	Status	Operation option	Checksum
0x04	0x26			

Field Descriptions

Field Name	Format	Size	Description
Length	0x04	1 Byte	Length Field
Opcode	0x26	1 Byte	Identifies this opcode type.
Status	Bit 0: Identifies transmit status Bit 6-1: Unused Bit 7: Command source	1 Byte	Bit 0: 0=First time packet is sent 1= Subsequent transmission Bit 7: always be 1(message is from the host) All unused bits recommend to be set to 0.
Operation option	'S' or 'L'	1 Bytes	'S': **Write to Custom Defaults** 'L': **Restore Custom Defaults**
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

For example:

1) Write to Custom Defaults:

Length	Opcode	Status	Operation option	Checksum
0x04	0x26	0x80	0x53	0xFF 0xC3

2) Restore Custom Defaults:

Length	Opcode	Status	Operation option	Checksum
0x04	0x26	0x80	0x4C	0xFF 0x0A

Host Requirements

The host sends this command to program or restore the custom default parameter values.

Scanner Requirements

Upon receiving this command, the scanner writes/stores the current parameter settings to the custom defaults buffer. They can be recovered at any time by sending a restore action.

If the restore action is requested, reset all default parameters as follows:

- If custom defaults were set by sending **Write to Custom Defaults** command, send **Restore Custom Defaults** command to retrieve and restore the scan scanner custom default settings.
- If no custom defaults were set, send **Restore Custom Defaults** to restore the factory default values.

5-15 WAKEUP

Description: Wakeup scanner when it's been in Sleep state

Command format: Null (0x00)

If RS232 cable is currently applied and Deep sleep(see *"4-5 Scan mode & some global settings"*)is enabled, the scanner can enter **Sleep State** more deeply. And at this case, it is necessary to send a command **WAKEUP** (0x00) and delay for 15ms, before sending any other commands.

Host Requirements

Once the WAKEUP command is sent, the host must wait at least 15 ms for the scanner to be ready, then but send other any commands within 30 seconds (default, see *"4-5 Scan mode& some global settings"*).

Scanner Requirements

The scanner must not return to deep **Sleep state** for at least 30 seconds after waking up.

- The mechanism to wake up a scanner in this manner also works if characters other than WAKEUP(0x00) are sent to the scanner. There is, however, no guarantee that these commands are interpreted correctly upon power-up. Therefore, it is not recommended that characters other than WAKEUP be used to awaken the scanner.

The WAKEUP command has no effect if the scanner is in **Awake** state. If the host is unsure of the scanner power state, it can send some WAKEUP commands anytime it wants to communicate with the scanner, and waits at least 15 ms then sends the command.

5-16 CMD_RESTART

Description: Ask the scanner to restart.

Packet Format

Length	Opcode	Status	Checksum
0x03	0x5E('^')		

Field Descriptions

Field Name	Format	Size	Description
Length	0x03	1 Byte	Length Field
Opcode	0x5E	1 Byte	Identifies this opcode type.
Status	Bit 0: Identifies transmit status Bit 6-1: Unused Bit 7: Command source	1 Byte	Bit 0: 0=First time packet is sent 1= Subsequent transmission attempts Bit 7: always be 1(message is from the host) All unused bits recommend to be set to 0.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

For example: the host sends the command to restart the scanner.

Length	Opcode	Status	Checksum
0x03	0x5E	0x80	0xFF 0x1F

Host Requirements

The host sends command CMD_RESTART to tell the scanner to restart once. This command is only supported by RS232 interface or USB Virtual COM.

Scanner Requirements

If ACK/NAK handshaking is enabled, the scanner responds with ACK or NAK and restart, when the command CMD_RESTART received.

5-17 CMD_OUTPUTBUFFER_CTR

Description: Ask the scanner to do an output buffer control before transmit barcode data.

Packet Format

Length	Opcode	Status	Option	Checksum
0x04	0x62('b')			

Field Descriptions

Field Name	Format	Size	Description
Length	0x04	1 byte	Length Field
Opcode	0x62	1 byte	Identifies this opcode type.
Status	Bit 0: Identifies transmit status Bit 6-1: Unused Bit 7: Command source	1 byte	Bit 0: 0=First time packet is sent 1=Subsequent transmission attempts Bit 7: always be 1(message is from the host) All unused bits recommend to be set to 0.
Option	output buffer control	1 byte	0x00：Disable output buffering 0x01：Enable output buffering 0x02：Clear data in output buffer Other: Reserved.
Checksum	2's complement sum of message contents excluding checksum.	2 byte	Checksum of message.

For example：Host sends command to ask scanner to enable output buffering.

Length	Opcode	Status	Option	Checksum
0x04	0x62	0x80	0x01	0xFF 0x19

Host Requirements

Host sends command CMD_OUTPUTBUFFER_CTR to ask scanner to control the output buffer.

Scanner Requirements

While receiving command CMD_OUTPUTBUFFER_CTR, the scanner responds with ACK or NAK if ACK/NAK handshaking is enabled. If the command requests to enable output buffering, the scanner will store the decode data into the output buffer; and the scanner will send all the barcode data in the buffer to host until it receive a command to request to disable output buffering. When the unused space in the buffer is not enough to store the current barcode data, the scanner will beep to warn and discard the current barcode data.

If the command requests to clear output buffer, the scanner will discard all data in output buffer.

Note: The command can be accepted only if the scanning mode is **Continuous scan** currently. Otherwise, after receiving command CMD_OUTPUTBUFFER_CTR, the scanner always responds NAK (if ACK/NAK is enabled).

6 SCI transactions

6-1 ACK/NAK handshaking

If ACK/NAK handshaking is enabled, all packeted messages must have a CMD_ACK or CMD_NAK response, unless the command description states otherwise. This parameter is enabled by default, and should remain enabled to provide feedback to the host. Raw ASCII data and WAKEUP command do not use ACK/NAK handshaking since they are not packeted data.

The following samples are to show the importance of ACK/NAK handshaking.

ACK/NAK handshaking is disabled	Host and scanner fail to communicate: 1) The host sends a PARAM_SEND message to the scanner to change the baud rate from 9600 to 115200. 2) By some reasons, the scanner fails to interpret the message and does not implement the changes requested by the host. 3) The host assumes that the parameter changes have occurred and acts accordingly (i.e. applying the new baud rate at 115200). 4) Communications are lost because the change did not occur on both sides, since the baud rate for scanner is 9600 and the one for the host is 115200.
ACK/NAK handshaking is enabled	Host and scanner communicates successfully: 1) The host sends a PARAM_SEND message to the scanner to change the baud rate from 9600 to 115200. 2) By some reasons, the scanner cannot interpret the message. 3) The scanner CMD_NAKs the message. 4) The host resends the PARAM_SEND message. 5) The scanner receives the message successfully, responds with CMD_ACK, and implements parameter changes.

6-2 Transfer of decode data

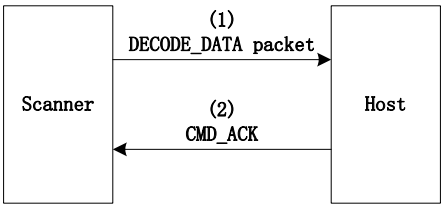
The parameter of Decode Data Packet Format (see *"4-3 RS232 interface"*) controls how decode data is sent to the host. When Decode Data Packet Format is set as **Packeted**, the data is sent in a DECODE_DATA packet. When Decode Data Packet Format is set as **Raw**, the data is transmitted as raw ASCII data.

When decode data is transmitted as raw ASCII data, ACK/NAK handshaking does not apply regardless of the state of the ACK/NAK handshaking parameter.

a) Flow control=ACK/NAK, Decode Data Packet Format=Packeted

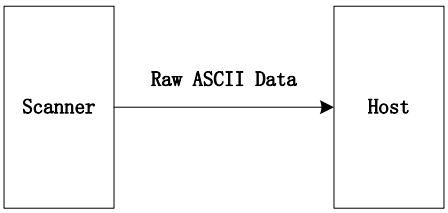
The scanner sends a DECODE_DATA packet message after a successful decode. The scanner waits for a programmable time-out for a CMD_ACK response. If it does not receive the response, the scanner tries to send twice more before issuing a host transmission error.

If the scanner receives a CMD_NAK from the host, it may attempt a retry depending on the cause field of the CMD_NAK message.



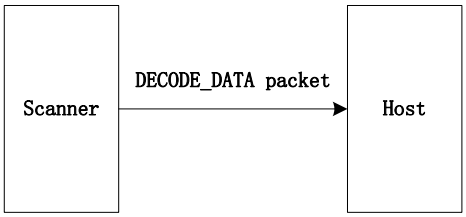
b) Flow control=ACK/NAK, Decode Data Packet Format=Raw

Even though the ACK/NAK handshaking is enabled, no handshaking occurs because the handshaking applies only to packet data.



c) Flow control≠ACK/NAK, Decode Data Packet Format=Packeted

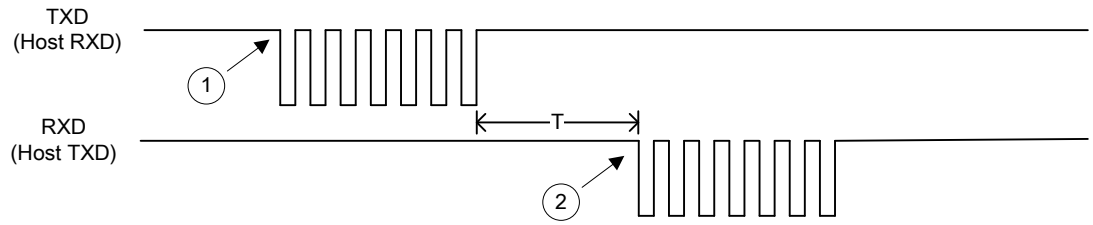
In this example ACK/NAK does not occur because the ACK/NAK handshaking parameter is disabled.



d) Flow control≠ACK/NAK, Decode Data Packet Format=Raw

Data is captured.

6-3 Transaction examples

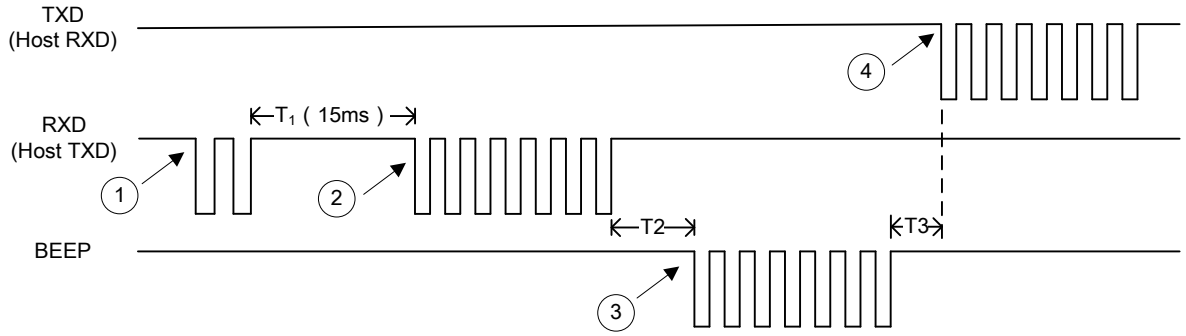


1.Scanner transmits decoded data (data packet)

2.Host sends an ACK

Note: T is determined by host.

Figure 6-1 Basic decoder initiated transaction (data packet)



1.Host sends 0x00 to wakeup scanner

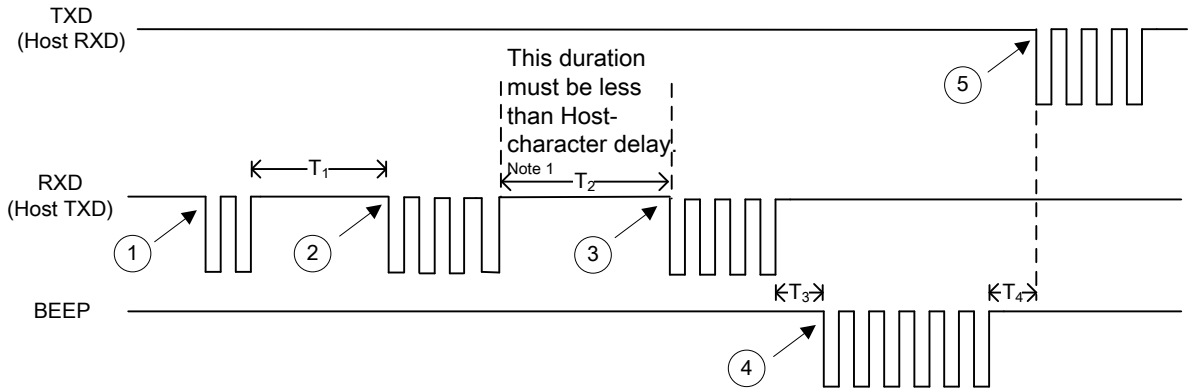
2.Host sends BEEP command

3.Beeper of scanner beeps

4.Scanner sends an ACK

Note: T_1 is determined by host(T_1= 15ms),T_2 and T_3 are determined by scanner(T_2 ≈380us，T_3≈150us).

Figure 6-2 Basic host initiated transaction



Note 1: The Host-character delay determines the maximum time the scanner waits between characters transmitted by the host before discarding the received data and declaring an error. The default value is 200 ms.

1.Host sends 0x00 to wakeup scanner

2.Host sends 1/2 BEEP command

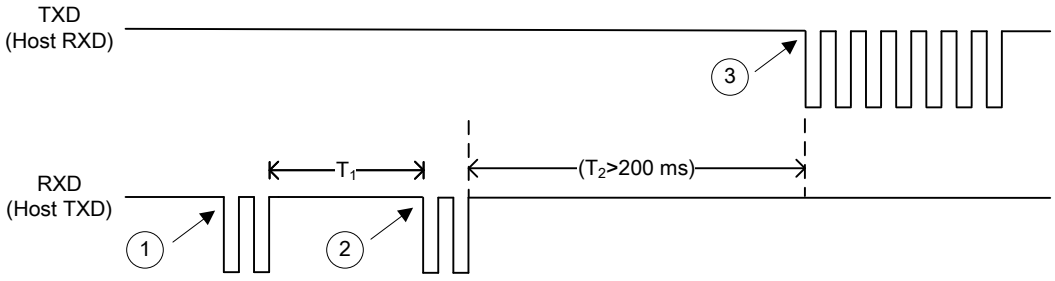
3.Host sends remainder of BEEP command

4.Beeper of scanner beeps

5.Scanner sends an ACK

Note: T_1 and T_2 are determined by host(T_1 =15ms, T_2<200ms),T_3 and T_4 are determined by scanner(T_2 ≈ 380us，T_3≈150us).

Figure 6-3 Host initiated transaction with pausing during transmission



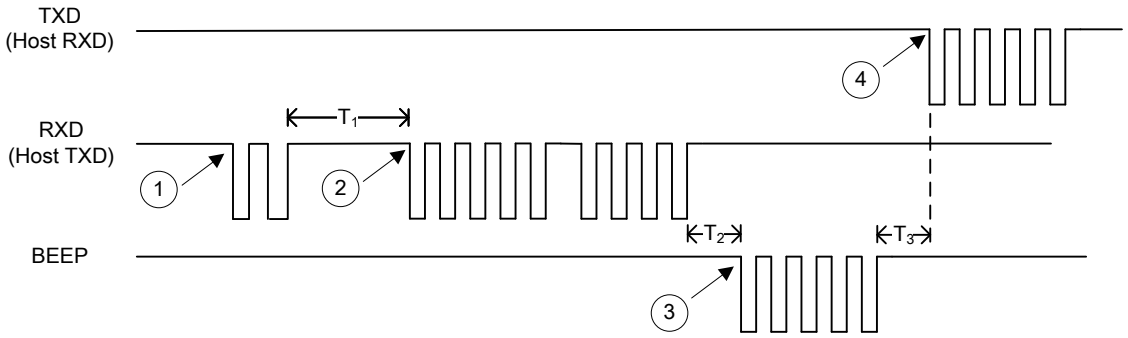
1.Host sends 0x00 to wakeup scanner

2.Host sends 2 characters of a command

3.Scanner waits for a character, times out then sends a NAK

Note: T_1 and T_2 are determined by host (T_1 =15ms, T_2 >200ms).

Figure 6-4 Error transmission: Host sends only the first 2 characters of a command



1.Host sends 0x00 to wakeup scanner

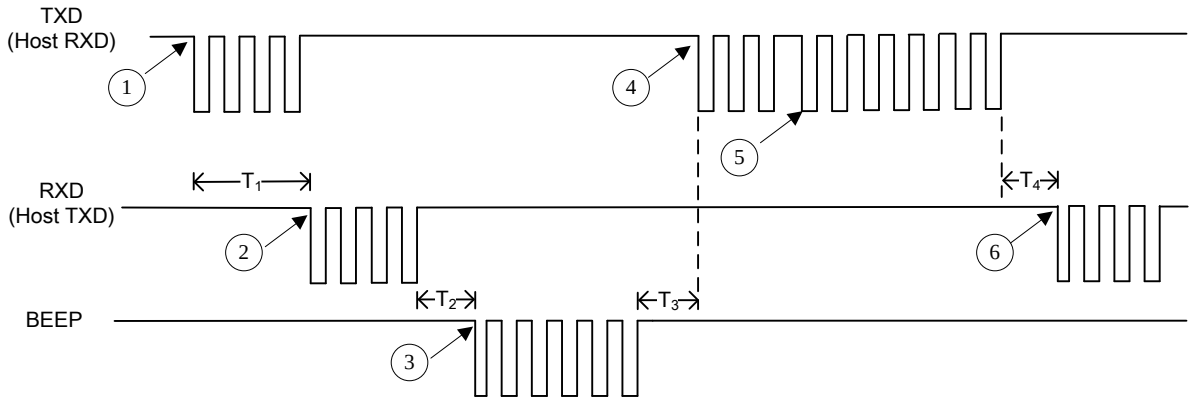
2.Host sends 2 BEEP commands instead of 1

3.Scanner responses the first BEEP command

4.Scanner sends an ACK

Note: T_1 is determined by host(recommend 15ms),T_2 and T_3 are determined by scanner(T_2 ≈380us，T_3≈150us).

Figure 6-5 Error condition: Host sends 2 valid BEEP commands back to back



1. Scanner transmits decoded data (data packet)

2. Host causes scanner's transmission aborted by sending BEEP

3. Beeper of scanner beeps

4. Scanner sends an ACK

5. Engine resends data

6. Host sends an ACK

Note: T_1 and T_4 are determined by host,T_2 and T_3 are determined by scanner(T_2 ≈380us，T_3≈150us).

Figure 6-6 Host causes engine to abort transmission

6-4 SCI transactions notes

a) Flow control Option

ACK/NAK handshaking is selected by default. Changing this is not recommended as it causes some communication problems (see 6-1) since ACK/NAK handshaking is the only indication that a message was received and if it was received correctly. ACK/NAK is not used to respond to the unpacked decode data whatever Flow control is set.

b) Number of Data Bits

All communication with the scanner must use eight bit data.

c) Response delay (see section *"4-3 RS232 interface"*)

The Response delay parameter determines how long to wait for a handshaking response before trying again, or aborting any further attempts. Both the host and scanner should apply the same parameter value during communication.

- A temporary change may be made to the Response delay when the host takes longer to process an ACK, or longer data string. Frequent permanent changes are not recommended due to the limited write-cycles of flash memory.

d) Retries

When sending data, the host should resend twice after the initial send if the scanner does not respond with an ACK or NAK (if ACK/ NAK handshaking is selected).

e) Baud Rate, Stop Bits, Parity, Response Time-out, ACK/NAK Handshake

If the serial parameters above are changed using PARAM_SEND, the ACK response to the PARAM_SEND uses the previous values for these parameters. The new values then take effect for the subsequent transaction.

f) Errors

The scanner generates a communication error when:

- The time that scanner waits Host-character delay is time-out.
- Failed to receive an ACK or NAK after initial transmit and two resends.

g) SCI Communication Notes

- If handshaking is not used, messages should be spaced sufficiently apart, and the host must avoid communicating with the scanner when the scanner is sending.
- There is a permanent/temporary bit in the PARAM_SEND message. Temporary changes are lost when power is removed from the scanner. Permanent changes are written to flash memory. Frequent permanent changes are not recommended due to the limited write-cycles of flash memory.
- Do not scan configuration barcodes and send parameters via SCI simultaneously.

7 Glossary

Bar	The dark element in a printed barcode.
Space	The lighter element of a barcode formed by the background between bars.
Barcode density	The thickness of the narrowest element in the barcode (e.g. 5mil, 10mil, etc).
Resolution	The narrowest element dimension which can be distinguished by a particular reading device or printed with a particular device or method.
Decode zone	An area within a scanner's field of view.
Mil	1 mil = 1 thousandth of an inch, i.e. 0.0254mm.
Byte	1 byte = 8 bits

8 Barcode representing non-printable character

Notes to make the following barcode:

1. According to different barcode printing software, the method of printing following barcode is different.
2. If using CODESOFT software, firstly read the information through “Help→Index→Code128→Special input syntax”. For example, if we wish to make “F1” barcode, select “Code128”, then select “CODE A” type, and input “{DC1}” as data.

Up ↑

Down ↓

Left ←

Right →

Page Up

Page Down

Backspace

Tab

Home

End

Enter

Insert

Delete

F1

F2

F3

F4

F5

F6

F7

F8

F9

F10

Esc

F11

F12

9 ASCII table

	for keyboard wedge		for RS-232	
H / L	0	1	0	1
0	Null		NUL	DLE
1	Up	F1	SOH	DC1
2	Down	F2	STX	DC2
3	Left	F3	ETX	DC3
4	Right	F4	EOT	DC4
5	PgUp	F5	ENQ	NAK
6	PgDn	F6	ACK	SYN
7		F7	BEL	ETB
8	Bs	F8	BS	CAN
9	Tab	F9	HT	EM
A		F10	LF	SUB
B	Home	Esc	VT	ESC
C	End	F11	FF	FS
D	Enter	F12	CR	GS
E	Insert	Ctrl+	SO	RS
F	Delete	Alt+	SI	US

Notes: The 2nd and the 3rd columns above are used for keyboard wedge only.

H / L	2	3	4	5	6	7
0	SP	0	@	P	`	p
1	!	1	A	Q	a	q
2	“	2	B	R	b	r
3	#	3	C	S	c	s
4	$	4	D	T	d	t
5	%	5	E	U	e	u
6	&	6	F	V	f	v
7	‘	7	G	W	g	w
8	(	8	H	X	h	x
9	)	9	I	Y	i	y
A	*	:	J	Z	j	z
B	+	;	K	[	k	{
C	,	<	L	\	l	|
D	-	=	M	]	m	}
E	.	>	N	^	n	~
F	/	?	O	_	o	DEL

Example: ASCII “A” = “41”.

10 Test chart

UPC-A

UPC-E

UPC-E1

EAN-13

ISBN/ISSN

EAN-8

Code 39

Code 32

Trioptic Code 39

(Default setting: Disable)

Interleaved 2 of 5

Industrial 2 of 5

(Default setting: Disable)

Matrix 2 of 5

Codabar

Test chart (continue)

Code 128

UCC/EAN 128

ISBT 128

Code 93

Code 11

(Default setting: Disable)

MSI/Plessey

(Default setting: Disable)

UK/Plessey

China Post

GS1 DataBar (GS1 DataBar Truncated)

GS1 DataBar Limited

GS1 DataBar Expanded

11 Return default parameters & firmware version

WARNING: Restore factory defaults

If you wish to return the scanner to all the factory default settings, scan the barcode above. But Scan mode remains unchanged.

Write to custom defaults

Write current parameter settings to the custom default settings. But Scan mode remains unchanged.

Restore custom defaults

Restore the custom default settings to current settings. If failed, restore the factory default settings. But Scan mode remains unchanged.

Firmware version list

If you wish to display the firmware version, scan the barcode above. If the interface is RS232 or USB virtual COM, and Decode data format is set to packet, the firmware version will be packet and transmitted.

12 Configuration alphanumeric value barcode (as Para. value)

To finish parameter setting, please scan the bar code below.