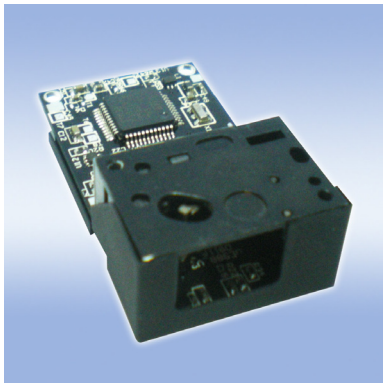
MINDEO

uE988 Scan Engine

User Manual



Version: uE_UM_EN_V1.1.7

Notice

Make sure you carefully read the following information to ensure that your barcode scan engine is able to perform at the level for which it is designed.

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.
4. The manufacturer assumes no responsibility for any loss or claims by third parties which may arise from the use of this manual.
5. Do not throw or drop the scan engine or otherwise subject it to strong impact, which can damage the scanner, interrupt program execution, corrupt memory contents, or otherwise interfere with proper operation.
6. Sudden temperature changes can cause condensation to form on the scanner's case. Operating the scan engine while condensation is present can interfere with proper operation. Take care to avoid conditions that cause the formation of condensation. If condensation does form, wait until it dries completely before using the scan engine.

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1 Technical specifications

Table 1 Technical specifications

Item	Description
Input voltage	3.3 VDC ± 5%
Scanning Current	110 mA typical / 130mA max
Standby current	<8μA
Laser	650nm laser diode
Scan rate	100±10 scans/sec
Scanning angle	±50°, ±65°, ±35° (Skew, Pitch, Roll)
Min. element width	0.078mm (3mil)
Decode capability	UPC-A, UPC-E, 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, Matrix 2 of 5, Codabar(NW7), Code 128, Code 93, Code 11(USD-8), MSI/Plessey, UK/Plessey, UCC/EAN 128, China Post, China Finance, GS1 DataBar (formerly RSS) variants
Decode Depth of Field	See decode zone diagrams beginning on section “Decode zone”
Indicator Interface	To control external Beeper, LED
Interface supported	UART
Operating mode	Pulse trigger Mode / UART Command Mode
Dimensions	Optical: Height × Width × Depth: 11.8mm × 21.2mm × 14.5mm PCB: 20.6mm × 37.5mm × 4.5mm, see associated diagrams on section “Dimensions”
Weight	10.5±0.5g
Cable	Tapered 12-pin Flex Strip (12 x 0.5mm)
Durability	Drop shocks of 2000G
Vibration	Unpowered engine withstands a random vibration along each of the X, Y and Z axes for a period of one hour per axis, define as follows: 20 to 80 Hz — Ramp up to $0.04G^2$/Hz at the rate of 3dB/oct 80 to 350 Hz — $0.04G^2$/Hz 350Hz to 2000Hz — Ramp down at the rate of 3dB/oct
ESD Protection (IEC 61000-4-2)	Contact discharge: +/-2KV Air discharge: +/- 8KV
RF Immunity (IEC 61000-4-3)	10V/m
Laser safety	EN60825-1, Class 1
Emissions	FCC Part 15 Class B
Temperature	Operating: 0° to 50°C (32° to 120°F); Storage :-40° to 60°C (-40° to 140°F)
Humidity	5% to 95% (non-condensing)
Programming method	a)Manual (scanning special barcode in sequence) b)send command via UART interface
Program upgrade	Online

2 Default settings for each barcode

Table 2 Default settings

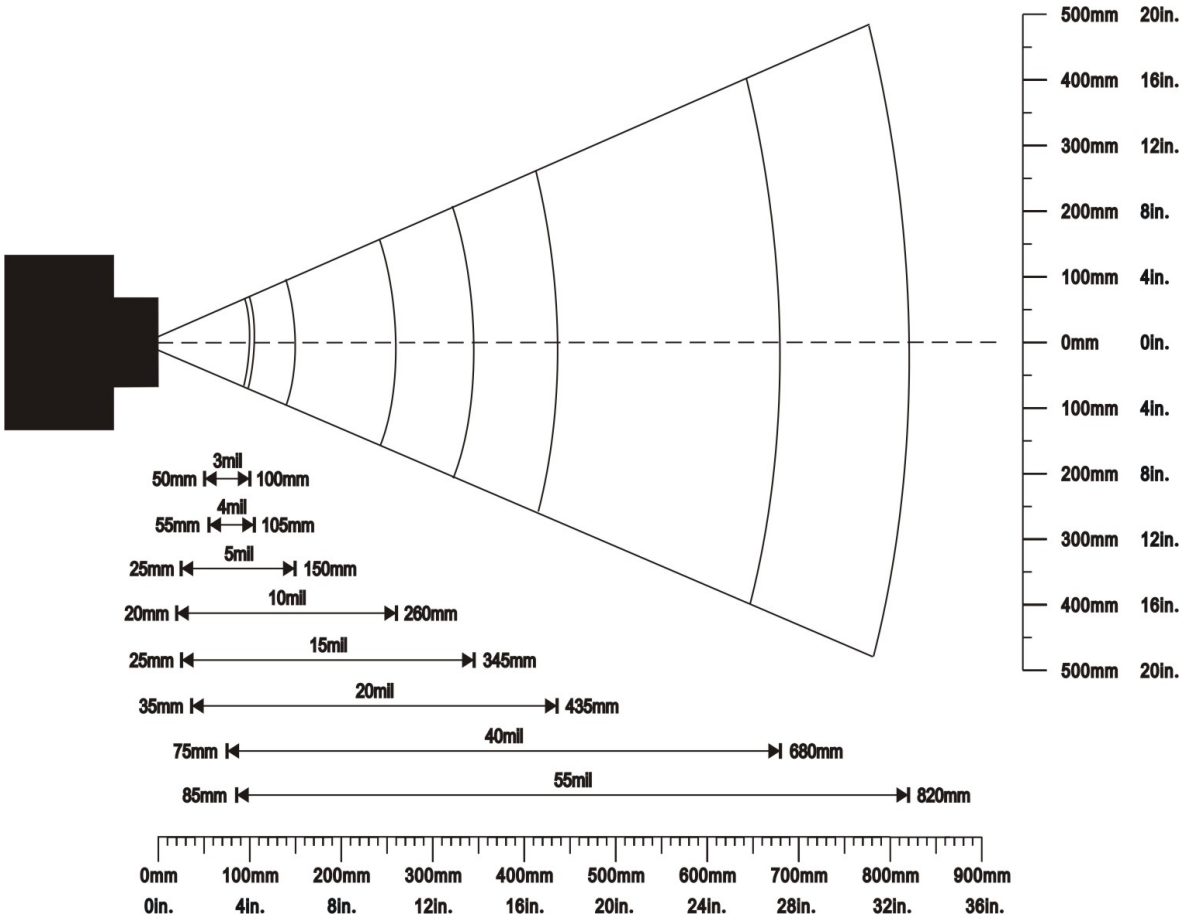
Code type	Read enable	Check digit verification	Check digit transmission	Min. code length	Proprietary code ID	AIM code ID
UPC-A	√	√	√	(12)[2]	A	]Em
UPC-E	√	√	√	(8)[2]	D	]Em
EAN-13	√	√	√	(13)[2]	A	]Em
EAN-8	√	√	√	(8)[2]	C	]Em
ISBN/ISSN[1]	√	√	√	(13)[2]	A	]Em
Code 39	√	-	-	1	M	]Am
Interleaved 2 of 5	√	-	-	6	I	]Im
Industrial 2 of 5	√	-	-	4	H	]Im
Matrix 2 of 5	√	-	-	6	X	]Im
Codabar	√	-	-	4	N	]Fm
Code 128	√	√	-	1	K	]Cm
Code 93	√	√	-	1	L	]Gm
Code 11	-	√	-	4	V	-
MSI/Plessey	√	-	-	4	O	]Mm
UK/Plessey	√	√	-	1	U	]Mm
UCC/EAN 128	√	√	-	1	K	]Cm
China Post	√	-	-	(11)[2]	T	]Im
China Finance	√	-	-	(10)[2]	Y	-
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
PDF417	-	-	-	1	P	]Lm
MicroPDF417	-	-	-	1	P	]Lm

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

[2] Fixed-length barcodes.

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

3 Decode zone



4 Dimensions

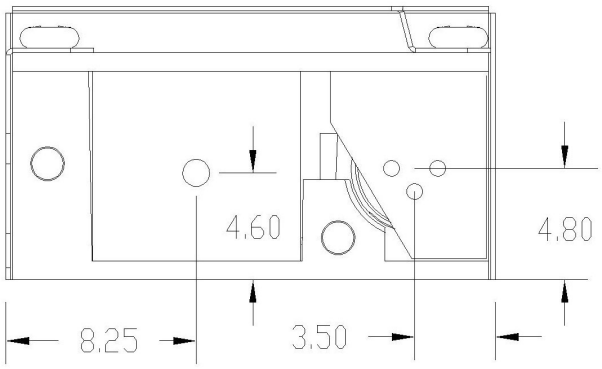


Figure 4-1 Backward View

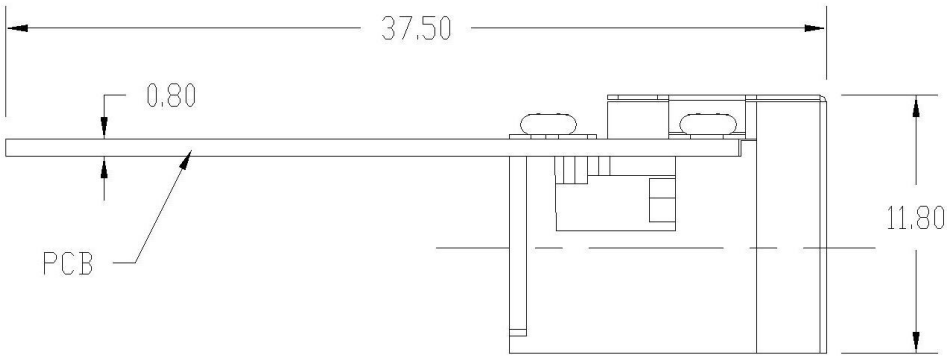


Figure 4-2 Left Side View

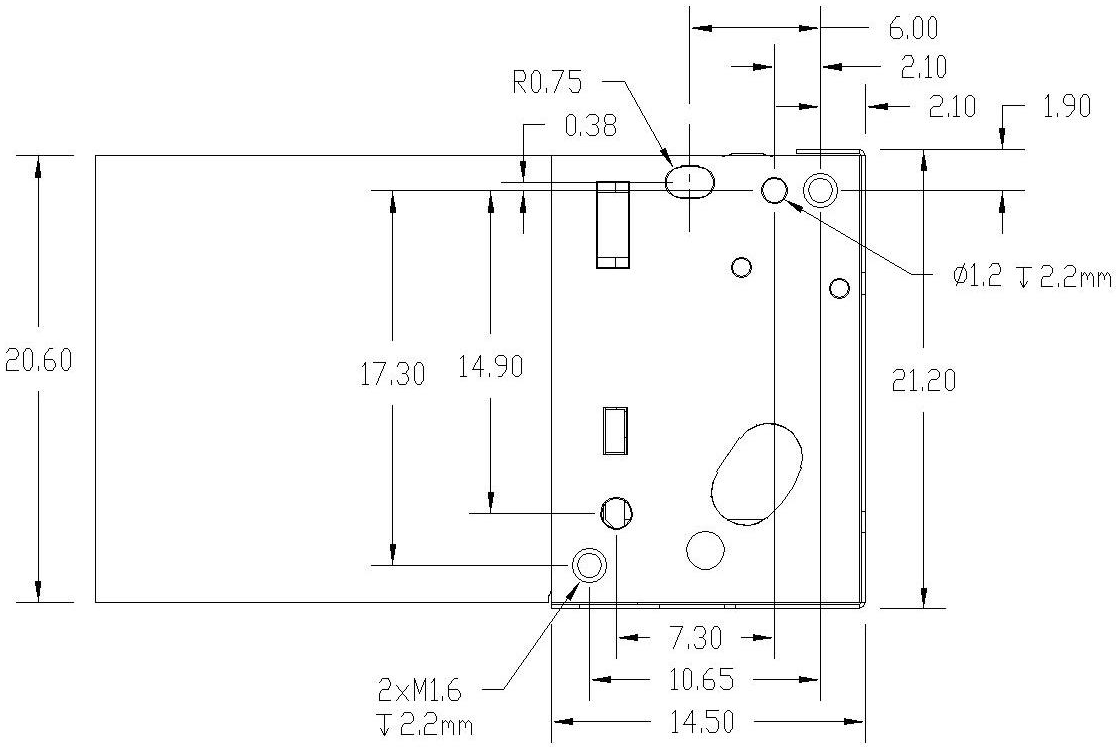


Figure 4-3 Top View

5 Electrical Interface

uE988 provides a low profile ZIF 12-pin connector to connect to a 0.5 mm × 12 position FFC/FPC cable. The pin assignments are as follows:

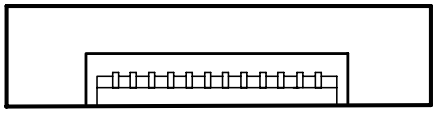
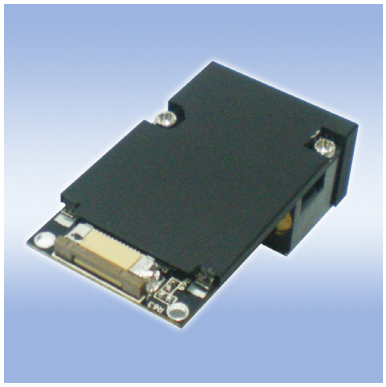


Table 3 Electrical Interface

PIN No	Signal Name	Type	Description
1	Flash_DWLD	Input	Flash download. Pull low for download.
2	VCC	Input	VCC (3.3V)
3	GND	Input	GND
4	RxD	Input	Received Data: Serial input port.
5	TxD	Output	Transmitted Data: Serial output port.
6	CTS	Input	Clear to Send: Serial port handshaking line.
7	RTS	Output	Request to Send: Serial port handshaking line.
8	PWRDWN	Output	Power Down Ready: When high, the decoder is in low power mode.
9	BPR	Output	Beeper: Low current beeper output.
10	DLED	Output	Decoder LED: Low current decode LED output.
11	WAKE	Input	Wake up: When decoder is in low power mode, pulses this pin low for 200 ns to awaken it.
12	TRIG	Input	Trigger: Hardware triggering line, Driving this low pin causes the decoder to start a scan and decode session.

A picture of a uE988 with a ZIF 12-pin connector is shown below:



The uE988 has two power states: low power state (I_{cc}<8uA) and awake state (I_{cc} <30mA). In default, the uE988 will automatically enter low power state if TRIG pin is not pulled down and no data is received via RXD within 2 seconds. When the uE988 is in the low power state the PWNDWN is asserted. Host can remove the power from uE988 only if PWNDWN is asserted; otherwise uE988 may fail to write data to internal flash memory.

Only if the uE988 is in the awake state, it can receive TRIG signal or CCI command to start decoding. Once uE988 is in the low power state, host must assign one of the four wake-up events to waken uE988 before any other operations.

The host can also force uE988 to always operate in awake state by modifying parameter Power Mode=0.

Four events can wake up uE988 from sleep state.

a) Falling-edge of pin WAKE.
b) Falling-edge of pin CTS.
c) Falling-edge of pin RXD. Send 0x00 to uE988 RXD port.
d) Falling-edge of pin TRIG. TRIG signal to wake up uE988 is not supported in some hardware version.

5-1 AC Electrical Characteristics

Symbol	Parameter	Conditions	Min	Max	Unit
General char.					
t_f	High to low fall time	C_L=50pf		1.0	us
t_r	Low to high rise time	C_L=50pf		1.0	us
Uart					
t_{rlcl}	RTS low to CTS low		0	25	ms
t_{clbl}	CTS low to first start bit			Note 1	
T_{blbl_cr}	Byte to byte delay	With CTS/RTS control		990	ms
t_{rhrh}	End of the packet to RTS			Note 2	ms
Trigger timing					
t_{trig_l}	Trigger low level hold time		6		ms
t_{trig_h}	Trigger high level hold time		25		ms
t_{dbt}	Trigger debounce time			1.1	ms
Beeper timing					
$f_{beeping}$	Beeping frequency		2000	2700	Hz
t_{bpd}	Beeping duration		90		ms
Power up timing					
t_{pw_rise}	VIN rise time			10	ms
Wake up timing					
t_{aw2fo}	From wake up to full operation			8	ms
t_{fo2trl}	Full operation to trigger low		0	2	s
t_{fo2rsd}	Full operation to receive command		0	2	s

Note 1: The host RTS may be held low indefinitely to prevent uE988 from transmitting.

Note 2: The host RTS should be released as soon as possible after transmitting so that uE988 can process next scanning.

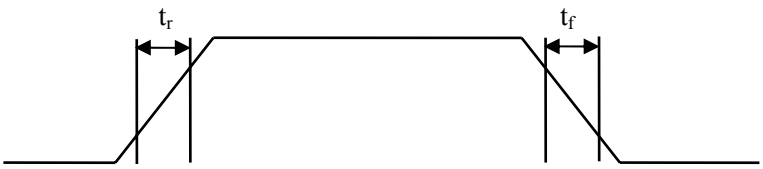


Figure 5-1 General Characteristics

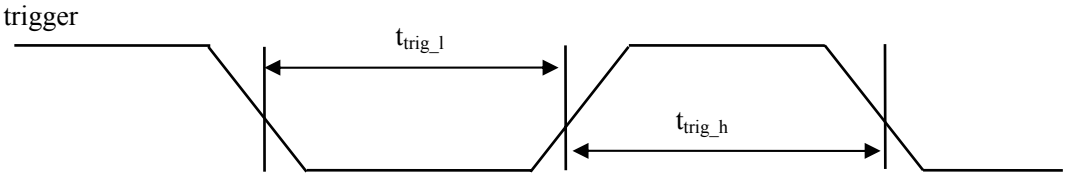


Figure 5-2 Hardware Trigger Timing

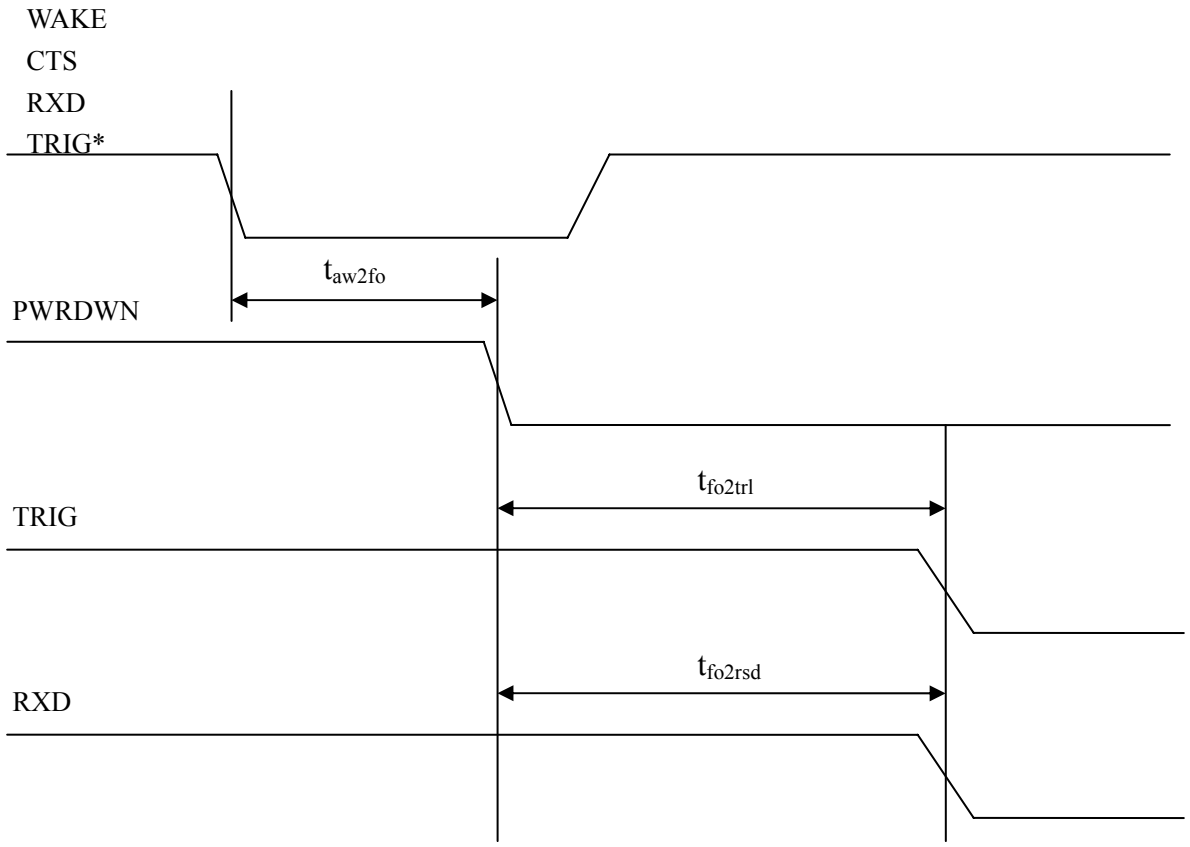


Figure 5-3 Wake up Timing

7 Barcode Programming Instruction

Refer to the next page, the steps of programming are:

a) Scan the **SETUP** bar code on the parameter setting part.

b) Enter the option mode by scanning the **Option bar code**.

c) To the right of the option barcode, the necessary alphanumeric inputs are listed. Scan these alphanumeric entries.

d) Scan the **END** bar code, listed on the lower right hand corner of each parameter setting part.

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

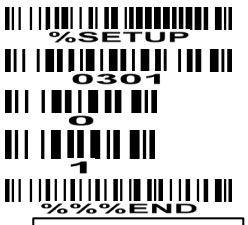
f) During the process of programming, LED is lighting to indicate the programming correctness. LED will go off if any incorrect programming operation performed.

g) After each successful programming, LED will go off and the scanner will beep twice.

h) Throughout the programming bar code menus, **the factory default settings are indicated with asterisks (*).**

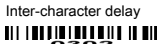
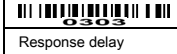
Example: to set Flow control to be XON/XOFF.

Steps: Scan the following barcodes in order.

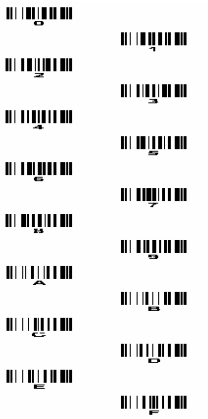


SETUP bar code

SETUP

Option bar code	Option	Alpha. entry
Flow control 	None RTS/CTS (Host: Low RTS) RTS/CTS (Host: High RTS) XON/XOFF ACK/NAK	00* 01 02 03 04
Inter-character delay 	00-99 (ms)	00-99 00*
Block trans. delay 	00-99 (10 ms)	00-99 00*
Response delay 	00-99 (100 ms)	00-99 00*

END



Option bar code | END bar code | Alpha. entries

Figure 7-1 Set Flow control to be RTS/CTS

7-1 RS-232 interface

Flow control:

uE988 must use RTS/CTS handshaking to communicate with host.

None- No Ack/Nak.

ACK/NAK- After transmitting data, 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.

%SETUP SETUP

Option bar code	Option	MD Serial	uE serial
Flow control 0301	None RTS/CTS (Host idle: Low RTS) RTS/CTS (Host idle: High RTS) XON/XOFF ACK/NAK	00* 01 02 03 04	00 04*
Inter-character delay 0302	0~99 (1ms)	00*	00*
Reserved 0303			
Response delay 0304	00-99 (100ms)	00-99 00*	20*
Baud rate 0305	300 600 1200 2400 4800 9600 19200 38400 57600 115200	00 01 02 03 04 05* 06 07 08 09	00 01 02 03 04 05* 06 07 08 09
Parity 0306	None Odd Even	00* 01 02	00* 01 02
Data bit 0307	8 bits 7 bits	00* 01	00*
Stop bit 0308	One bit Two bits	00* 01	00* 01

%%%END END

7-2 Pulse Trigger mode & some global settings

Scanning mode:

Good-read off-The trigger button must be pressed once to activate scanning. The light source of scanner stops scanning when there is a successful reading or no code is decoded after the Stand-by duration elapsed.

Momentary-The trigger button acts as a switch. Press button to activate scanning and release button to stop scanning. The light source of scanner stops scanning when there is a successful reading or no code is decoded after the Stand-by duration elapsed.

Alternate-The trigger button acts as a toggle switch. Press button to activate or stop scanning.

Continue-The scanner always keeps scanning, and it does not matter when the trigger button is pressed or duration is elapsed.

Timeout off-The trigger button must be pressed once to activate scanning. The light source of scanner stops scanning when no code is successful decoded after the Stand-by duration elapsed.

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 scanning the same barcode. When this feature is set to be “0xFF”, then the delay time is indefinite.

Double confirm: If it is enabled, the scanner will require a several times of same-decoded-data to confirm a valid reading.

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, or otherwise the labels of the symbology 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. Please set the max./min. length for individual barcode in later sections, if special demand is requested.
2. The number of check digits is included in max./min. code length.
3. These two settings have no effect on the symbologies with fixed-length, e.g. UPC-A, UPC-E, EAN-13, EAN-8 and China Post.

Global G1-G6 string selection: The scanner offer one or two string group for ALL symbologies. By setting one or two digits to indicate which string group you want to apply. You may refer to the chapters of “String setting” and “String position & Number of truncated leading/ending character”.

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

All valid settings include 00, 01, 02, 03, 04, 05, 06, 10, 11, 12, 13, 14, 15, 16, 20, 21, 22, 23, 24, 25, 26, 30, 31, 32, 33, 34, 35, 36, 40, 41, 42, 43, 44, 45, 46, 50, 51, 52, 53, 54, 55, 56, 60, 61, 62, 63, 64, 65 and 66.

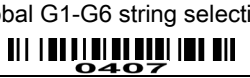
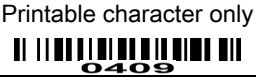
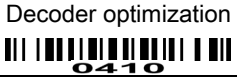
Element amendment: If it is enabled, the scanner can read the barcode comprised with bars and spaces in different scale.

Printable character only: If it is enabled, the scanner will output the printable characters only, i.e. in

ASCII from 20H to 7EH.

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.

SETUP

Option bar code	Option	MD Serial	uE serial
Scanning mode 	Good-read off Momentary Alternate Continue Timeout off or Host	00 01* 02 03 04	00 01* 02 03 04(Host)
Standby duration 	01-99 (second)	01-99 04*	01-99 (100ms) 30*
Same barcode delay time 	00-FF_{16} (50ms)	00-FF_{16} 08*	00-99(100ms) 10*
Double confirm 	00-09 (00: no)	00-09 00*	Reserved
Global max. code length 	04-99	04-99 99*	Reserved
Global min. code length 	01-99	01-99 04*	Reserved
Global G1-G6 string selection 	00-66	00-66 00*	Reserved
Element amendment 	Disable Enable	00 01*	Reserved
Printable character only 	Disable Enable	00* 01	Reserved
Decoder optimization 	Disable Enable	00 01*	Reserved
Reserved 			

END

7-3 Indication

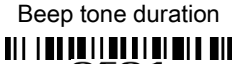
Power on alert: After power-on the scanner will generate an alert signal to indicate a successful self-test.

LED indication: After each successful reading, the LED above the scanner will light up to indicate a good barcode reading.

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.

SETUP

Option bar code	Option	MD Serial	uE Serial
Power on alert 	Disable Enable	00 01*	Reserved
LED indication 	Disable Enable	00 01*	Reserved
Beeper indication 	Disable Enable	00 01*	00 01*
Beep tone duration 	01-09 (10ms)	01-09 05*	75ms

END

7-4 UPC-A

Read: Format

Leading zero	Data digits (11 digits)	Check digit

Check digit verification: The check digit 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 String transmission.

Insertion group selection: Refer to Global insertion group selection of the chapter of Hand-held scan & some global settings.

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

Format

Leading zero	Data digits (11 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.

%SETUP SETUP

Option bar code	Option	MD Serial	uE Serial
Read 1101	Disable Enable	00 01*	00 01*
Check digit verification 1102	Disable Enable	00 01*	Reserved
Check digit trans. 1103	Disable Enable	00 01*	00 01*
Code ID setting 1104	00-FF_{16} (ASCII)	00-FF_{16} <A>*	<A>
Insert group selection 1105	00-66	00-66 00*	Reserved
Supplement digits 1106	None 2 digits 5 digits 2 or 5 digits	00* 01 02 03	00* 03
Truncation/Expansion 1107	None Truncate leading zeros Expand to EAN-13	00* 01 02	00* 02
Reserved 1108			

%%%END END

7-5 UPC-E

Read: Format

Leading zero	Data digits (6 digits)	Check digits

Check digit verification: The check digit is optional and made as the sum of the numerical value of the data digits.

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

Code ID setting: Refer to Code ID setting of UPC-A.

Insertion group selection: Refer to Insertion group selection of UPC-A.

Supplement digits:

Format

Leading zero	Data digits (6 digits)	Check digit	Supplement digits 2 or 5

Truncation/Expansion:

Truncate leading zeros- Refer to Truncation/Expansion of UPC-A.

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

Example: Barcode “0123654”,

Output: “0012360000057”.

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

%SETUP SETUP

Option bar code	Option	MD Serial	uE Serial
Read 1201	Disable Enable	00 01*	00 01*
Check digit verification 1202	Disable Enable	00 01*	Reserved
Check digit trans. 1203	Disable Enable	00 01*	00 01*
Code ID setting 1204	00-FF_{16} (ASCII)	00-FF_{16} <D>*	<A>
Insert group selection 1205	00-66	00-66 00*	Reserved
Supplement digits 1206	None 2 digits 5 digits 2 or 5 digits	00* 01 02 03	00* 03
Truncation/Expansion 1207	None Truncate leading zeros Expand to EAN-13 Expand to UPC-A	00* 01 02 03	00* 02
Reserved 1208			

%%%END END

7-6 EAN-13

Read:

Format

Data digits (12 digits)	Check digit

Check digit verification: The check digit is optional and made as the sum of the numerical value of the data digits.

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

Code ID setting: Refer to Code ID setting of UPC-A.

Insertion group selection: Refer to Insertion group selection of 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 symbology.

Example:

Barcode “9780194315104”, Output: “019431510X”.

Barcode “9771005180004”, Output: “10051805”.

%SETUP SETUP

Option bar code	Option	MD Serial	uE Serial
Read 1301	Disable Enable	00 01*	00 01*
Check digit verification 1302	Disable Enable	00 01*	Reserved
Check digit transmission 1303	Disable Enable	00 01*	00 01*
Code ID setting 1304	00-FF_{16} (ASCII)	00-FF_{16} <A>*	<A>
Insert group selection 1305	00-66	00-66 00*	Reserved
Supplement digits 1306	None 2 digits 5 digits 2 or 5 digits	00* 01 02 03	00* 03
ISBN/ISSN conversion 1307	Disable Enable	00* 01	Reserved
Reserved 1308			

%%%END END

7-7 EAN-8

Read:

Format

Data digits (7 digits)	Check digit

Check digit verification: The check digit is optional and made as the sum of the numerical value of the data digits.

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

Code ID setting: Refer to Code ID setting of UPC-A.

Insertion group selection: Refer to Insertion group selection of UPC-A.

Supplement digits:

Format

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

Truncation/Expansion: Refer to Truncation/Expansion of UPC-A.

%SETUP SETUP

Option bar code	Option	MD Serial	uE Serial
Read 1401	Disable Enable	00 01*	00 01*
Check digit verification 1402	Disable Enable	00 01*	Reserved
Check digit trans. 1403	Disable Enable	00 01*	Reserved
Code ID setting 1404	00-FF_{16} (ASCII)	00-FF_{16} <A>*	Reserved
Insert group selection 1405	00-66	00-66 00*	Reserved
Supplement digits 1406	None 2 digits 5 digits 2 or 5 digits	00* 01 02 03	00* 03
Truncation/Expansion 1407	None Truncate leading zero Expand to EAN-13	00* 01 02	00* 02
Reserved 1408			

%%%END END

7-8 Code 39

Read:

Format

⋆	Data digits (variable)	Check digit (optional)	⋆

Check digit verification: The check digit is optional and made as the sum module 43 of the numerical value of the data digits.

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

Max./Min. code length: Each symbology 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, or otherwise all the labels of the symbology 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.

Code ID setting: Refer to Code ID setting of UPC-A.

Insertion group selection: Refer to Insertion group selection of UPC-A.

Start/End transmission: The start and end characters 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

$	Data digits (6 digits)	$

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

%SETUP SETUP

Option bar code	Option	MD Serial	uE Serial
Read 1501	Disable Enable	00 01*	00 01*
Check digit verification 1502	Disable Enable	00* 01	00* 01
Check digit transmission 1503	Disable Enable	00* 01	00* 01
Max. code length 1504	00-99	00-99 00*	00-99 55*
Min. code length 1505	00-99	00-99 01*	00-99 02*
Code ID setting 1506	00-FF_{16} (ASCII)	00-FF_{16} <M>*	<B> (fix)
Insert group selection 1507	00-66	00-66 00*	Reserved
Format 1508	Standard Full ASCII	00* 01	00* 01
Start/End transmission 1509	Disable Enable	00* 01	Reserved
“★” as data character 1510	Disable Enable	00* 01	Reserved
Convert Code 39 to Code 32 1511	Disable Enable	00* 01	00* 01
Code 32 Prefix “A” transmission 1512	Disable Enable	00* 01	00* 01
Trioptic Code 39 read 1513	Disable Enable	00 01*	01*
Trioptic Code 39 Start/End transmission 1514	Disable Enable	00* 01	-

%%%END END

7-9 Interleaved 2 of 5

Read:

Format

Data digits (Variable)	Check digit (optional)

Check digit verification: The check digit is made as the sum module 10 of the numerical values of all data digits. There are two optional check digit algorithms: the specified Uniform Symbology Specification (USS) and the Optical Product Code Council (OPCC).

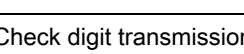
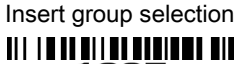
Check digit transmission: By setting Enable, check digit will be transmitted.

Max./Min. code length: Refer to Max./Min. code length of Code 39.

Code ID setting: Refer to Code ID setting of UPC-A.

Insertion group selection: Refer to Insertion group selection of UPC-A.

SETUP

Option bar code	Option	MD Serial	uE Serial
Read 	Disable Enable	00 01*	00 01*
Check digit verification 	Disable USS OPCC	00* 01 02	00* 01 02
Check digit transmission 	Disable Enable	00* 01	00* 01
Max. code length 	00-99	00-99 00*	00-99 14*
Min. code length 	00-99	00-99 06*	00-99 14*
Code ID setting 	00-FF_{16} (ASCII)	00-FF_{16} <I>*	<F> fix
Insert group selection 	00-66	00-66 00*	Reserved
Reserved 			

END

7-10 Industrial 2 of 5

Read:

Format

Data digits (variable)	Check digit (optional)

Max./Min. code length: Refer to Max./Min. code length of Code 39.

Code ID setting: Refer to Code ID setting of UPC-A.

Insertion group selection: Refer to Insertion group selection of UPC-A.

%SETUP SETUP

Option bar code	Option	Md Serail	uE Serial
Read 1701	Disable Enable	00 01*	Reserved
Max. code length 1702	00-99	00-99 00*	Reserved
Min. code length 1703	00-99	00-99 00*	Reserved
Code ID setting 1704	00-FF_{16} (ASCII)	00-FF_{16} <H>*	Reserved
Insert group selection 1705	00-66	00-66 00*	Reserved
Reserved 1706			

%%%END END

7-11 Matrix 2 of 5

Read:

Format

Data digits (variable)	Check digit (optional)

Check digit verification: The check digit is made as the sum module 10 of the numerical values of all data digits.

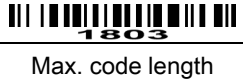
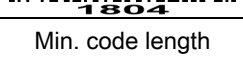
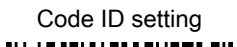
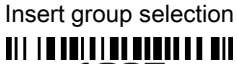
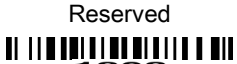
Check digit transmission: By setting Enable, check digit will be transmitted.

Max./Min. code length: Refer to Max./Min. code length of Code 39.

Code ID setting: Refer to Code ID setting of UPC-A.

Insertion group selection: Refer to Insertion group selection of UPC-A.

SETUP

Option bar code	Option	MD Serial	uE Serial
Read 	Disable Enable	00 01*	Reserved
Check digit verification 	Disable Enable	00* 01	Reserved
Check digit transmission 	Disable Enable	00* 01	Reserved
Max. code length 	00-99	00-99 00*	Reserved
Min. code length 	00-99	00-99 06*	Reserved
Code ID setting 	00-FF_{16} (ASCII)	00-FF_{16} <X>*	Reserved
Insert group selection 	00-44	00-44 00*	Reserved
Reserved			

END

7-12 Codabar

Read:

Format

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

Check digit verification: The check digit is made as the sum module 16 of the numerical values of all data digits.

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

Max./Min. code length: Refer to Max./Min. code length of Code 39.

Code ID setting: Refer to Code ID setting of UPC-A.

Insertion group selection: Refer to Insertion group selection of 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: Refer to Start/End transmission of Code 39.

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

%SETUP SETUP

Option bar code	Option	MD Serial	uE Serial
Read 1901	Disable Enable	00 01*	00* 01
Check digit verification 1902	Disable Enable	00* 01	Reserved
Check digit transmission 1903	Disable Enable	00* 01	Reserved
Max. code length 1904	00-99	00-99 00*	00-99 55*
Min. code length 1905	00-99	00-99 00*	00-99 5*
Code ID setting 1906	00-FF_{16} (ASCII)	00-FF_{16} <N>*	<C> fix
Insert group selection 1907	00-66	00-66 00*	Reserved
Start/End type 1908	ABCD/ABCD abcd/abcd ABCD/TN⋆E abcd/tn⋆e	00* 01 02 03	Reserved
Start/End transmission 1909	Disable Enable	00* 01	Enable
Start/End character equality 1910	Disable Enable	00* 01	Reserved

%%%END END

7-13 Code 128

Read:

Format

Data digits (variable)	Check digit (optional)

Check digit verification: The check digit is made as the sum module 103 of all data digits.

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

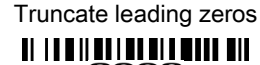
Max./Min. code length: Refer to Max./Min. code length of Code 39.

Code ID setting: Refer to Code ID setting of UPC-A.

Insertion group selection: Refer to Insertion group selection of UPC-A.

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

SETUP

Option bar code	Option	MD Serial	uE Serail
Read 	Disable Enable	00 01*	00 01*
Check digit verification 	Disable Enable	00 01*	Reserved
Check digit transmission 	Disable Reserved	00* 01	Reserved
Max. code length 	00-99	00-99 00*	Reserved
Min. code length 	00-99	00-99 01*	Reserved
Code ID setting 	00-FF_{16} (ASCII)	00-FF_{16} <K>*	<D> fix
Insert group selection 	00-66	00-66 00*	Reserved
Truncate leading zeros 	Disable All leading “0”s Only the first “0”	00* 01 02	Reserved

END

7-14 Code 93

Read:

Format

Data digits (variable)	2 check digits (optional)

Check digit verification: The check digit is made as the sum module 47 of the numerical values of all data digits.

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

Max./Min. code length: Refer to Max./Min. code length of Code 39.

Code ID setting: Refer to Code ID setting of UPC-A.

Insertion group selection: Refer to Insertion group selection of UPC-A.

SETUP

Option bar code	Option	MD Serial	uE Serial
Read 	Disable Enable	00 01*	00* 01
Check digit verification 	Disable Enable	00 01*	Reserved
Check digit transmission 	Disable Enable	00* 01	Reserved
Max. code length 	00-99	00-99 00*	00-99 55*
Min. code length 	00-99	00-99 01*	00-99 04*
Code ID setting 	$00\text{-}FF_{16}$ (ASCII)	$00\text{-}FF_{16}$ <L>*	<E> fix
Insert group selection 	00-66	00-66 00*	Reserved
Reserved 			Reserved

END

7-15 Code 11

Read:

Format

Data digits (variable)	Check digit 1 (optional)	Check digit 2 (optional)

Check digit verification: The check digit is presented as the sum module 11 of all data digits.

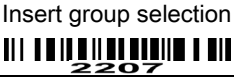
Check digit transmission: By setting Enable, check digit 1 and check digit 2 will be transmitted upon your selected check digit verification method.

Max./Min. code length: Refer to Max./Min. code length of Code 39.

Code ID setting: Refer to Code ID setting of UPC-A.

Insertion group selection: Refer to Insertion group selection of UPC-A.

SETUP

Option bar code	Option	MD Serial	uE Serial
Read 	Disable Enable	00 01*	00* 01
Check digit verification 	Disable One digit Reserved Reserved	00 01* 02 03	00* 01 02
Check digit transmission	Disable Enable	00* 01	00* 01
Max. code length 	00-99	00-99 00*	00-99 55*
Min. code length 	00-99	00-99 00*	00-99 4*
Code ID setting 	$00\text{-}FF_{16}$ (ASCII)	$00\text{-}FF_{16}$ <V>*	<H> fix
Insert group selection 	00-66	00-66 00*	Reserved
Reserved 			Reserved

END

7-16 MSI/Plessey

Read:

Format

Data digits (variable)	Check digit 1 (optional)	Check digit 2 (optional)

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

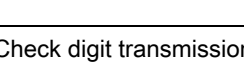
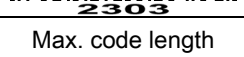
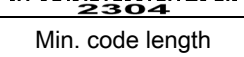
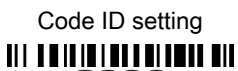
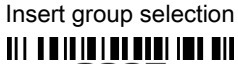
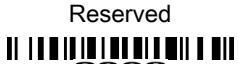
Check digit transmission: By setting Enable, check digit 1 and check digit 2 will be transmitted upon your selected check digit verification method.

Max./Min. code length: Refer to Max./Min. code length of Code 39.

Code ID setting: Refer to Code ID setting of UPC-A.

Insertion group selection: Refer to Insertion group selection of UPC-A.

SETUP

Option bar code	Option	MD Serial	uE Serail
Read 	Disable Enable	00* 01	00* 01
Check digit verification 	Disable 1 digit (mod 10) Reserved Reserved	00* 01 02 03	01* 02 03
Check digit transmission 	Disable Enable	00* 01	00* 01
Max. code length 	00-99	00-99 00*	00-99 55*
Min. code length 	00-99	00-99 00*	00-99 6*
Code ID setting 	00-FF_{16} (ASCII)	00-FF_{16} <O>*	<J> fix
Insert group selection 	00-66	00-66 00*	Reserved
Reserved 			Reserved

END

7-17 UK/Plessey

Read:

Format

Data digits (variable)	2 check digits (optional)

Check digit verification: The UK/Plessey has one or 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 Code 39.

Code ID setting: Refer to Code ID setting of UPC-A.

Insertion group selection: Refer to Insertion group selection of UPC-A.

SETUP

Option bar code	Option	MD Serial	uE Serial
Read 	Disable Enable	00* 01	Reserved
Check digit verification 	Disable Enable	00 01*	Reserved
Check digit transmission 	Disable Enable	00* 01	Reserved
Max. code length 	00-99	00-99 00*	Reserved
Min. code length 	00-99	00-99 01*	Reserved
Code ID setting 	00-FF_{16} (ASCII)	00-FF_{16} <U>*	Reserved
Insert group selection 	00-66	00-66 00*	Reserved
Reserved 			Reserved

END

7-18 UCC/EAN 128

Read:

Format

Data digits (variable)	Check digit (optional)

Check digit verification: The check digit is made as the sum module 103 of all data digits.

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

Max. /Min. code length: Refer to Max./Min. code length of Code 39.

Code ID setting: Refer to Code ID setting of UPC-A.

Insertion group selection: Refer to Insertion group selection of UPC-A.

Truncate leading zeros: Refer to Truncate leading zeros of Code 128.

SETUP

Option bar code	Option	MD Serial	uE Serial
Read 	Disable Enable	00 01*	00 01*
Check digit verification 	Disable Enable	00 01*	Reserved
Check digit transmission 	Disable Reserved	00* 01	Reserved
Max. code length 	00-99	00-99 00*	Reserved
Min. code length 	00-99	00-99 01*	Reserved
Code ID setting 	00-FF$_{16}$ (ASCII)	00-FF$_{16}$ <K>*	Reserved
Insert group selection 	00-66	00-66 00*	Reserved
Truncate leading zeros 	Disable All leading “0”s Only the first “0”	00* 01 02	Reserved

END

7-19 China Post

Read:

Format

11 Data digits

Code ID setting: Refer to Code ID setting of UPC-A.

Insertion group selection: Refer to Insertion group selection of UPC-A.

SETUP

Option bar code	Option	MD Serial	uE Serial
Read 	Disable Enable	00 01*	00* 01
Reserved 			
Reserved 			
Reserved 			
Reserved 			
Code ID setting 	00-FF_{16} (ASCII)	00-FF_{16} <T>*	00-FF_{16} <T>*
Insert group selection 	00-66	00-66 00*	00-66 00*
Reserved 			

END

7-20 GS1 DataBar (GS1 DataBar Truncated)

GS1 DataBar Truncated is structured and encoded 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 UPC-A.

Insertion group selection: Refer to Insertion group selection of UPC-A.

Conversion:

UCC/EAN 128- Refer to Code ID transmission of 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

Option bar code	Option	MD Serial	uE988 Serial
Read 	Disable Enable	00 01*	00 01*
Code ID setting 	00-FF_{16} (ASCII)	00-FF_{16} <R >*	Reserved
Insert group selection 	00-66	00-66 00*	Reserved
Conversion 	None UCC/EAN 128 UPC-A or EAN-13	00* 01 02	00* 02
Reserved 			

END

7-21 GS1 DataBar Limited

Read:

Format

16 Data digits

Code ID setting: Refer to Code ID setting of UPC-A.

Insertion group selection: Refer to Insertion group selection of UPC-A.

Conversion: Refer to Conversion of GS1 DataBar (GS1 DataBar Truncated).

%SETUP SETUP

Option bar code	Option	MD Serial	uE Serial
Read 2801	Disable Enable	00 01*	00* 01
Code ID setting 2802	00-FF_{16} (ASCII)	00-FF_{16} <R >*	<R > Fix
Insert group selection 2803	00-66	00-66 00*	Reserved
Conversion 2804	None UCC/EAN 128 UPC-A or EAN-13	00* 01 02	00* 02
Reserved 2805			

%%%END END

7-22 GS1 DataBar Expanded

Read:

Format

Data characters (variable)

Code ID setting: Refer to Code ID setting of UPC-A.

Insertion group selection: Refer to Insertion group selection of UPC-A.

Conversion:

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

%SETUP SETUP

Option bar code	Option	MD Serial	uE Serial
Read 2901	Disable Enable	00 01*	00* 01
Max. code length 2902	00-99	00-99 00*	Reserved
Min. code length 2903	00-99	00-99 01*	Reserved
Code ID setting 2904	00-FF_{16} (ASCII)	00-FF_{16} <R >*	<R > Fix
Insert group selection 2905	00-66	00-66 00*	Reserved
Conversion 2906	None UCC/EAN 128	00* 01	Reserved
Reserved 2907			

%%%END END

7-23 PDF417

This decoder is only applied with a specified firmware.

The symbol size in the standard of PDF417 says, number of rows: 3 to 90, and number of columns: 1 to 30. This scanner can only decode PDF417 at rows from 3 to 40 and columns from 1 to 20.

The error correction level for a PDF417 symbol is from 0 to 8. This scanner can only support the levels from 0 to 6.

Read:

Format

Data characters (variable)

Code ID setting: Refer to Code ID setting of UPC-A.

Insertion group selection: Refer to Insertion group selection of UPC-A.

SETUP

Option bar code	Option	MD Serial	uE Serial
Read 	Disable Enable	00* 01	Reserved
Max. code length 	00-99	00-99 00*	Reserved
Min. code length 	00-99	00-99 01*	Reserved
Code ID setting 	00-FF_{16} (ASCII)	00-FF_{16} <P>*	Reserved
Insert group selection 	00-66	00-66 00*	Reserved
Reserved 			

END

7-24 MicroPDF417

This decoder is only applied with a specified firmware.

Read:

Format

Data characters (variable)

Max. /Min. code length: Refer to Max./Min. code length of Code 39.

Code ID setting: Refer to Code ID setting of UPC-A.

Insertion group selection: Refer to Insertion group selection of UPC-A.

SETUP

Option bar code	Option	MD Serial	uE Serial
Read 	Disable Enable	00* 01	Reserved
Max. code length 	00-99	00-99 00*	Reserved
Min. code length 	00-99	00-99 01*	Reserved
Code ID setting 	00-FF_{16} (ASCII)	00-FF_{16} <P>*	Reserved
Insert group selection 	00-66	00-66 00*	Reserved
Reserved 			Reserved
Reserved 			Reserved

END

7-25 China Finance

Note: This type of barcode is not Omni-directionally decodable. The encodable character set includes numeric 0 to 9. Among the symbol of 0 to 9, 0 and 2, 4 and 9, 5 and 8, 6 and 7, have the symmetrical pattern; the pattern of 1 and 3 is symmetrical.

Read:

Format

10 Data digits

Max./Min. code length: Refer to Max./Min. code length of Code 39.

Check digit verification: The check digit is made as the sum module 10 of the numerical values of all data digits.

Leading character 5/6/7/8/9 converted to A/B/C/D/E: By setting, leading character 5/6/7/8/9 can be converted to A/B/C/D/E.

Leading character assignment: By setting, only the barcode with the assigned leading character can be output.

Code ID setting: Refer to Code ID setting of UPC-A.

Insertion group selection: Refer to Insertion group selection of UPC-A.

%SETUP SETUP

Option bar code	Option	MD Serial	uE Serial
Read 3201	Disable Enable	00 01*	Reserved
Max. code length 3202	00-99	00-99 10*	Reserved
Min. code length 3203	00-99	00-99 10*	Reserved
Check digit verification 3204	Disable Reserved	00* 01	Reserved
Leading character 5/6/7/8/9 converted to A/B/C/D/E 3205	Disable Enable Only 5 converted to A Only 6 converted to B Only 7 converted to C Only 8 converted to D Only 9 converted to E	00 01* 02 03 04 05 06	Reserved
Leading character assignment 3206	Disable Assigned to 0 Assigned to 5(A) Assigned to 6(B) Assigned to 7(C) Assigned to 8(D) Assigned to 9(E) Assigned to 1 Assigned to 2 Assigned to 3 Assigned to 4	00 01* 02 03 04 05 06 07 08 09 10	Reserved
Code ID setting 3207	00-FF$_{16}$ (ASCII)	00-FF$_{16}$ <Y>*	Reserved
Insert group selection 3208	00-66	00-66 00*	Reserved

%%%END END

%%LLDS

Laser Light Direction Setting: By scanning the barcode above, the decoding direction of the scanner's laser light is from left to right. By scanning the up-side-down barcode above, the decoding direction of the scanner's laser light is from right to left.

7-26 G1-G6 & 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 symbologies.

Steps:

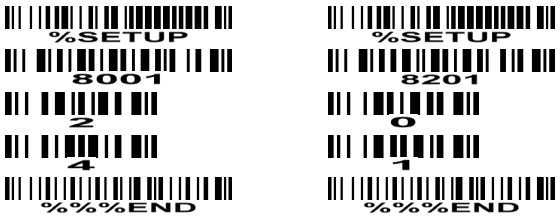
1) Scan SETUP and Prefix string setting barcode.

2) Use the ASCII table to find the value of $→24.

3) Scan 2 and 4 from the barcode on the foldout back page.

4) Scan END barcode.

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 symbol.

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) Scan SETUP and Insert G1 string setting barcode.

2) Use the ASCII table to find the value of A→41, B→42.

3) Scan 4, 1 and 4, 2 from the barcode on the foldout back page.

4) Scan END barcode.

5) Refer to the chapter of G1-G4 string position & Code ID position.

6) Refer to the chapter of Hand-held scan & some global settings.

Testing barcode:

123456

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.

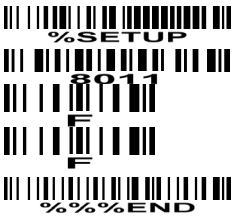
Truncate leading G5 string setting: By setting, a defined leading character or string can be truncated. Also a single character can be un-defined.

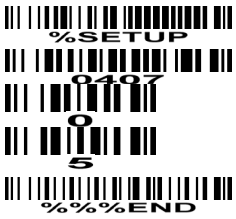
Repeat of a G5 character setting: While G5 is set as a single defined/un-defined character, G5 can also be set to be repeated. This setting is ignored when the truncate number is more than the barcode data characters. The option of "FF" for this setting is not active while the option of Truncate leading G5 string setting is "00".

Example: Truncate all leading zeros for all symbologies.

Original code data	"0001 2 3 4 5 6"
Output code data	"1 2 3 4 5 6"

Steps:





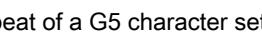
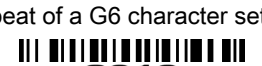
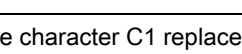
Testing barcode:

000123456

Truncate ending G6 string setting: By setting, a defined ending character or string can be truncated. Also a single character can be un-defined.

Repeat of a G6 character setting: While G5 is set as a single defined/un-defined character, G6 can also be set to be repeated. This setting is ignored when the truncate number is more than the barcode data characters. The option of "FF" for this setting is not active while the option of Truncate ending G6 string setting is "00".

SETUP

Option bar code	Option	MD Serial	uE Serial
Prefix string setting 	0-22 characters None	00-FF$_{16}$ 00*	0-1 characters None
Suffix string setting 	0-22 characters <ENTER>	00-FF$_{16}$ 0A0D*	0-2 characters 0A0D
Preamble string setting 	0-22 characters None	00-FF$_{16}$ 00*	Reserved
Postamble string setting 	0-22 characters None	00-FF$_{16}$ 00*	Reserved
Insert G1 string setting 	0-22 characters None	00-FF$_{16}$ 00*	Reserved
Insert G2 string setting 	0-22 characters None	00-FF$_{16}$ 00*	Reserved
Insert G3 string setting 	0-22 characters None	00-FF$_{16}$ 00*	Reserved
Insert G4 string setting 	0-22 characters None	00-FF$_{16}$ 00*	Reserved
FN1 substitution string setting 	0-4 characters <SP>	00-FF$_{16}$ 20*	Reserved
Truncate leading G5 string setting 	A un-defined character 1-22 defined characters <0>	00 01-7F$_{16}$ 30*	Reserved
Repeat of a G5 character setting 	Once Defined times Un-defined times (All)	01* 01-22 FF	Reserved
Truncate ending G6 string setting	A un-defined character 1-22 defined characters <0>	00 01-7F$_{16}$ 30*	Reserved
Repeat of a G6 character setting 	Once Defined times Un-defined times (All)	01* 01-22 FF	Reserved
Single character C1 replacement 	<0000>	0000* 0000-FFFF $_{16}$	Reserved
Single character C2 replacement 			Reserved

END

7-27 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 code ID position/placement.

SETUP

Option bar code	Option	MD Serial	uE Serial
Insert G1 string position 	00-99	00-99 00*	Reserved
Insert G2 string position 	00-99	00-99 00*	Reserved
Insert G3 string position 	00-99	00-99 00*	Reserved
Insert G4 string position 	00-99	00-99 00*	Reserved
Code ID position 	Before code data After code data	00* 01	Reserved
Reserved 			Reserved
Reserved 			Reserved

END

7-28 String transmission

Note: The information in this chapter is closely related to the chapter of String setting.

Format of barcode data transmission

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

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 Default setting for each barcode.

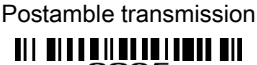
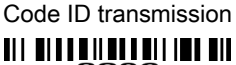
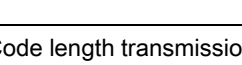
Code length transmission: The length of code data string can be transmitted before the code data when Enable is selected. The length is represented by a number with two digits.

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

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 G1-G6 & FN1 substitution string setting).

SETUP

Option bar code	Option	MD Serial	uE Serial
Prefix transmission 	Disable Enable	00* 01	00* 01
Suffix transmission 	Disable Enable	00 01*	00* 01
Code name transmission 	Disable Enable	00* 01	Reserved
Preamble transmission 	Disable Enable	00* 01	Reserved
Postamble transmission 	Disable Enable	00* 01	Reserved
Code ID transmission 	Disable Proprietary ID AIM ID	00* 01 02	00* 01 02
Code length transmission 	Disable Enable	00* 01	Reserved
Case conversion 	Disable Upper (data only) Lower (data only) Upper (whole string) Lower (whole string)	00* 01 02 03 04	Reserved
FN1 substitution transmission 	Disable Keyboard wedge/USB RS-232 Keyboard wedge/USB/RS-232	00* 01 02 03	Reserved
Reserved 			

END

7-29 Return default parameters & others

%%%DEF

WARNING: Default value initialization

If you wish to return the scanner to all the factory default settings, scan the barcode above.

Wirte to Customer Default

Write current parameter settings to customer default settings

Restore customer default

Restore customer default settings to current settings. If failed, restore factory default settings.

%%%VER

Firmware version list

If you wish to display the firmware version, scan the barcode above.

7-30 Configuration alphanumeric entry barcode

8 Parameter Menus

Introduction

This chapter describes the programmable parameters, provides bar codes for programming, and hexadecimal equivalents for host parameter programming through CCI.

Operational Parameters

The uE988 is shipped with the factory default settings shown in Table 8-1. These factory default values are stored in non-volatile 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 non-volatile memory and are preserved even when the scanner is powered down.

To change the parameter values:

- Scan the appropriate bar codes included in this section. The new values replace the existing memory values. To set the new values as custom defaults, scan the Write to Custom Defaults bar code. The factory default or custom default parameter values can be recalled by scanning the Set Factory Defaults bar code or the Restore Defaults bar code referring to section Return default parameters & others.

  or

- Send the parameter through the scan engine's serial port using the CCI command PARAM_SEND. Hexadecimal parameter numbers are shown in this chapter below the parameter title, and options appear in parenthesis beneath the accompanying bar codes. Instructions for changing parameters using this method are found in section Communication Control Interface.

Table 8-1 lists the factory defaults for all parameters. To change any option, scan the appropriate bar code(s).

Table 8-1. Factory Default Table

Parameter	Parameter Number (Hex)	Parameter Range	Factory Default
Set Factory Default			All Defaults
Beeper Volume	0x8C	0:High 1:Medium 2:Low	1 (Medium)
Beeper Tone	0x91	0:Low Frequency 1:Medium Frequency 2:High Frequency	1 (Medium Frequency)
Beeper Frequency Adjustment	0xF0 0x91	-127(1230Hz)~127(3770Hz) (unit 10Hz)	0 (2500 Hz)
Laser On Time	0x88	0~99 (unit 100ms)	30 (3.0 sec)
Aim Duration	0xED	0~99 (unit 100ms)	0 (0.0sec)
Scan Angle	0xBF	0xB7 (Narrow 35°) 0xB7 (Wide 47°)	0xB7 (Wide)

Parameter	Parameter Number (Hex)	Parameter Range	Factory Default
Power Mode	0x80	0: Continuous Power 1: Low Power	1(Low Power)
Trigger Mode	0x8A	0x00: Level 0x02: Pulse 0x04: Continuous 0x05: Alternate 0x07: Blinking 0x08: Host	0x00 (Level)
Time-out Between Same Symbol	0x89	0~99 (unit 100ms)	10 (1.0 sec)
Beep After Good Decode	0x38	0: Disable 1: Enable	1 (Enable)
Transmit “No Read” Message	0x5E	0: Disable 1: Enable	0 (Disable)
UPC/EAN			
UPC-A	0x01	0: Disable 1: Enable	1 (Enable)
UPC-E	0x02	0: Disable 1: Enable	1 (Enable)
EAN-8	0x04	0: Disable 1: Enable	1 (Enable)
EAN-13	0x03	0: Disable 1: Enable	1 (Enable)
Decode UPC/EAN Supplementals	0x10	0x00: Ignore 0x02: 2 or 5 digits	0x00 (Ignore)
Transmit UPC-A Check Digit	0x28	0: Disable 1: Enable	1 (Enable)
Transmit UPC-E Check Digit	0x29	0: Disable 1: Enable	1 (Enable)
UPC-A Preamble	0x22	0: Data 1: System Character + Data	1 (System Character + Data)
Convert UPC-E to A	0x25	0: Disable 1: Enable	1 (Enable)
Convert UPC-E1 to A	0x26	0: Disable 1: Enable	1 (Disable)
EAN-8 Zero Extend	0x27	0: Disable 1: Enable	0 (Disable)
Code 128			
Code-128	0x08	0: Disable 1: Enable	1 (Enable)
UCC/EAN-128	0x0E	0: Disable 1: Enable	1 (Enable)
Code 39			
Code 39	0x00	0: Disable	1 (Enable)

Parameter	Parameter Number (Hex)	Parameter Range	Factory Default
		1: Enable	
Convert Code 39 to Code 32	0x56	0: Disable 1: Enable	0 (Disable)
Code 32 Prefix	0xE7	0: Disable 1: Enable	0 (Disable)
Set Length(s) for Code 39	0x12(L1) 0x13(L2)	0~99 0~99	2 55
Code 39 Check Digit Verification	0x30	0: Disable 1: Enable	0 (Disable)
Transmit Code 39 Check Digit	0x2B	0: Disable 1: Enable	0 (Disable)
Code 39 Full ASCII Conversion	0x11	0: Disable 1: Enable	0 (Disable)
Code 93			
Code 93	0x09	0: Disable 1: Enable	1 (Enable)
Set Length(s) for Code 93	0x1A (L1) 0x1B (L2)	0~99 0~99	4 55
Code 11			
Code 11	0x0A	0: Disable 1: Enable	0 (Disable)
Set Lengths for Code 11	0x1C (L1) 0x1D (L2)	0~99 0~99	4 55
Code 11 Check Digit Verification	0x34	0: Disable 1: One check digit 2: Two check digit	0 (Disable)
Transmit Code 11 Check Digit(s)	0x2F	0: Disable 1: Enable	0 (Disable)
Interleaved 2 of 5			
Interleaved 2 of 5	0x06	0: Disable 1: Enable	1 (Enable)
Set Length(s) for I 2 of 5	0x16 (L1) 0x17 (L2)	0~99 0~99	14 14
I 2 of 5 Check Digit Verification	0x31	0: Disable 1: USS Check Digit	0 (Disable)
Transmit I 2 of 5 Check Digit	0x2C	0: Disable 1: Enable	0 (Disable)
Convert I 2 of 5 to EAN 13	0x52	0: Disable 1: Enable	0 (Disable)
Chinese 2 of 5 (China Post)			
Chinese 2 of 5	0xF0 0x98	0: Disable 1: Enable	0 (Disable)

Parameter	Parameter Number (Hex)	Parameter Range	Factory Default
Codabar			
Codabar	0x07	0: Disable 1: Enable	0 (Disable)
Set Lengths for Codabar	0x18 (L1) 0x19 (L2)	0~99 0~99	5 55
MSI			
MSI	0x0B	0: Disable 1: Enable	0 (Disable)
Set Length(s) for MSI	0x1E (L1) 0x1F (L2)	0~99 0~99	6 55
MSI Check Digits	0x32	0:One digit 1:Two digit	0 (One digit)
Transmit MSI Check Digit	0x2E	0: Disable 1: Enable	0 (Disable)
MSI Check Digit Algorithm	0x33	0: Mod10/Mod11 1: Mod10/Mod10	1 (Mod 10/Mod 10)
RSS			
RSS-14	0xF0 0x52	0: Disable 1: Enable	0 (Disable)
RSS-Limited	0xF0 0x53	0: Disable 1: Enable	0 (Disable)
RSS-Expanded	0xF0 0x54	0: Disable 1: Enable	0 (Disable)
Convert RSS to UPC/EAN	0xF0 0x8D	0: Disable 1: Enable	0 (Disable)
Data Options			
Transmit Code ID Character	0x2D	0:None 1:AIM code ID 2: User Defined ID	0 (None)
Prefix/Suffix Values Prefix Suffix 1 Suffix 2	0x69 0x68 0x6A	0x00~0x7F 0x00~0x7F 0x00~0x7F	0x00 (NULL) 0x0A (LF) 0x0D (CR)
Scan Data Transmission Format	0xEB	0x00: Data Only 0x01: Data + Suffix1 0x02: Data + Suffix2 0x03: Data +Suf1+Suf2 0x04: Prefix+Data 0x05:Prefix+Data+Suf1 0x06:Prefix+Data+Suf2 0x07: Prefix + Data + Suf1 + Suf2	0x00 (Data Only)
Serial Interface			
Baud Rate	0x9C	0x1: Baud 300 0x2: Baud 600	0x6 (Baud 9600)

Parameter	Parameter Number (Hex)	Parameter Range	Factory Default
		0x3: Baud 1200 0x4: Baud 2400 0x5: Baud 4800 0x6: Baud 9600 0x7: Baud 19200 0x8: Baud 38400 0x9: Baud 57600 0xa: Baud 115200	
Parity	0x9E	0x0: Odd Parity 0x1: Even Parity 0x4: None	0x4 (None)
Software Handshaking	0x9F	0: Disable 1: Enable	1 (Enable)
Decode Data Packet Format	0xEE	0: Data only 1: Packed Data	0 (Data only)
Host Serial Response Time-out	0x9B	0~99 (unit 100ms)	20 (2 sec)
Stop Bit Select	0x9D	1: One Stop bit 2: Two Stop bit	1 (One Stop bit)
Intercharacter Delay	0x6E	0~99 (unit 1ms)	0 (Zero ms)
Host Character Time-out	0xEF	0~99(unit 10ms)	20 (200 msec)
Event Reporting			
Decode Event	0xF0 0x00	0: Disable 1: Enable	0 (Disable)
Boot Up Event	0xF0 0x02	0: Disable 1: Enable	0 (Disable)
Parameter Event	0xF0 0x03	0: Disable 1: Enable	0 (Disable)

10 Communication Control Interface

Introduction

This chapter describes the system requirements of the Communication Control Interface (CCI), which provides a communications link between uE988 scan engine decoder and a host via uart. CCI allows the host to control the decoder.

Communication

All communication between the decoder and host occur over the hardware interface lines using the CCI protocol.

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

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

CCI performs the following functions for the host device:

- Maintains a bi-directional interface with the decoder
- Allows the host to send commands which can control the decoder
- Passes data from the decoder to a host device in the formatted CCI packet format or straight decode message.

The CCI environment consists of a decoder, a serial cable which attaches to the host device, and in some instances, a power supply.

The CCI interface transmits all decode data including special formatting (e.g., AIM ID). The format of this data can be controlled via parameter settings. The decoder may also send parameter information, product identification information or event codes to the host.

All commands sent between the decoder and host must use the format described in section “CCI Message Formats” and section “CCI Transactions” describes the required sequence of messages in specific cases.

Table 10-1 lists all the CCI Op-codes supported by the uE988. It identifies the CCI partner allowed to send a message of each type. The host transmits type H Op-codes, the decoder transmits type D Op-codes, and either partner can transmit Host/Decoder (H/D) types.

Table 10-1. CCI Commands

Name	Type	Op-code	Description	Supported
AIM_OFF	H	0xC4	Deactivate aim pattern	Reserved
AIM_ON	H	0xC5	Activate aim pattern.	Reserved
BEEP	H	0xE6	Sound the beeper.	Yes
CMD_ACK	H/D	0xD0	Positive acknowledgment of received packet.	Yes
CMD_NAK	H/D	0xD1	Negative acknowledgment of received	Yes

Name	Type	Op-code	Description	Supported
			packet.	
DECODE_DATA	D	0xF3	Decode data in CCI packet format.	Yes
EVENT	D	0xF6	Event indicated by associated event code.	Yes
LED_OFF	H	0xE8	De-activate LED output.	Yes
LED_ON	H	0xE7	Activate LED output.	Yes
PARAM_DEFAULTS	H	0xC8	Set parameter default values.	Yes
PARAM_REQUEST	H	0xC7	Request values of certain parameters.	Yes
PARAM_SEND	H/D	0xC6	Send parameter values.	Yes
REPLY_REVISION	D	0xA4	Reply to REQ_REV contains decoder's software/ hardware configuration.	Yes
REQUEST_REVISION	H	0xA3	Request the decoder's configuration.	Yes
SCAN_DISABLE	H	0xEA	Prevent the operator from scanning bar codes.	Yes
SCAN_ENABLE	H	0xE9	Permit bar code scanning.	Yes
SLEEP	H	0xEB	Request to place the decoder into low power.	Yes
START_DECODE	H	0xE4	Tell decoder to attempt to decode a bar code.	Yes
STOP_DECODE	H	0xE5	Tell decoder to abort a decode attempt.	Yes
WAKEUP	H	N/A	Wakeup decoder after it's been powered down.	Yes
CUSTOM_DEFAULTS	H	0x12	Custom defaults option to write/restore	Yes

Figure 10-1 shows the general packet format for CCI messages, and Table 10-2 lists the descriptions of fields that occur in all messages. These descriptions are repeated for each Op-code in the CCI message formats section. For messages that use the Data field, the specific type of data is shown in that field.

Length	Op-code	Message Source	Status	Data	Checksum

Figure 10-1. General Packet Format

Table 10-2. Field Descriptions

Field Name	Format	Sub-Field	Meaning
Length	1 Byte	Length	Length of message not including the check sum bytes. Maximum value is 0xFF.
Op-code	1 Byte	See Table 10-1 for details.	Identifies the type of packet data being sent.
Message Source	1 Byte	0 = Decoder 04 = Host	Identifies where the message is coming from.
Status	Bit 0	Retransmit	0 = First time packet is sent 1=Subsequent transmiCCIon attempts
	Bit 1	Reserved	Always set to zero
	Bit 2	Reserved	Always set to zero
	Bit 3	Change Type (applies to parameters)	0=Temporary change 1=Permanent change
	Bits 4 - 7		Unused bits must be set to 0.

Data...	Variable number of bytes	See individual sections for details.	
Checksum	2 Bytes	2's complement sum of message contents excluding checksum.	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.			

CCI Message Formats

The following sections describe each of the CCI messages that can be communicated between the decoder and host. See CCI Transactions on page 10-27 for the protocol required to transmit these messages.

The messages are separated into two categories:

- Engine Control Commands - Commands that configure and control various scan engine features. These commands are considered public commands and are available to all hosts. These Op-codes are in the range of [0x04 - 0xF6].
- Remote Monitoring Commands - Commands that are used for remote monitoring of the scan engine attributes. These commands are also considered public commands and are available to all hosts. These Op-codes are in the range of [0x60 - 0x7F].

Engine Control Commands

AIM_OFF

Description: Turn off aiming pattern

AIM_ON

Description: Turn on aiming pattern

BEEP

Description: Sound the beeper

Packet Format

Length	Op-code	Message Source	Status	Beep Code	Checksum
0x05	0xE6	0x04			

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Op-code	0xE6	1 Byte	Identifies this Op-code type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status	Bit 0: Retransmit Bit 1-7: unused	1 Byte	Identifies the transmission status. All unused bits must be set to 0.
Beep Code	See Table 10-4.	1 Byte	Number that identifies a beep sequence.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

This Op-code instructs the receiver to sound the beep sequence indicated by the Beep Code field.

For Table 10-4, 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 number of times a beep pitch is repeated at the specified duration.

Table 10-4. Beep Code Definitions

Beep Code	Duration	Pitch	Number of Beeps		Beep Code	Duration	Pitch	Number of Beeps
0x00	Short	High	1		0x0D	Long	High	4
0x01	Short	High	2		0x0E	Long	High	5
0x02	Short	High	3		0x0F	Long	Low	1
0x03	Short	High	4		0x10	Long	Low	2
0x04	Short	High	5		0x11	Long	Low	3
0x05	Short	Low	1		0x12	Long	Low	4
0x06	Short	Low	2		0x13	Long	Low	5
0x07	Short	Low	3		0x14	Fast Warble	Hi-Lo-Hi-Lo	4
0x08	Short	Low	4		0x15	Slow Warble	Hi-Lo-Hi-Lo	4
0x09	Short	Low	5		0x16	Mix 1	Hi-Lo	2
0x0A	Long	High	1		0x17	Mix 2	Lo-Hi	2
0x0B	Long	High	2		0x18	Mix 3	Hi-Lo-Hi	3
0x0C	Long	High	3		0x19	Mix 4	Lo-Hi-Lo	3

For example:

Length	Op-code	Message Source	Status	Beep Code	Checksum
0x05	0xE6	0x04	0x0	0x06	0xff 0x0b

The method of calculating Checksum:

Checksum=~(0x05 + 0xe6 + 0x04 +0x0 +0x06)+1

Host Requirements

The host sends this command to cause the decoder to beep. The host may also send these beep codes as part of the PARAM_SEND directive.

Decoder Requirements

When the decoder receives this command, it beeps the sequence provided in the BEEP directive. If ACK/NAK handshaking is enabled, the decoder ACKs if a valid beep code is requested. Otherwise it sends NAK_DENIED.

CMD_ACK

Description: Positive acknowledgment of received packet

Packet Format

Length	Op-code	Message Source	Status	Data	Checksum
0x04	0xD0				

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Op-code	0xD0	1 Byte	Identifies this Op-code type.
Message Source	0 = Decoder 4 = Host	1 Byte	Identifies where the message is coming from.
Status	Bit 0: Retransmit Bit 1-7: unused	1 Byte	Identifies the transmission status. All unused bits must be set to 0.
Data			None
Checksum	2's complement sum of message contents excluding	2 Bytes	Checksum of message.

This message is sent to the CCI packet transmitter when the received packet passes the checksum check and no negative acknowledgment conditions apply (see CMD_NAK). If the data is in response to a command (e.g., PARAM_REQUEST, REQUEST_REVISION, etc.), no ACK is sent.

☞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:

Length	Op-code	Message Source	Status	Data	Checksum
0x04	0xD0	0x00	0x00	0x00	0xff 0x2c

Host Requirements

The decoder must send a CMD_ACK or response data within the programmable Serial Response Time-out to acknowledge receipt of all messages, unless noted otherwise in the message description section. If the host sends data and does not receive a response within the programmable serial response time-out, it resends the message (with the retransmit status bit set) before declaring a failure. The host should limit the number of retries.

Decoder Requirements

The decoder must send a CMD_ACK or response data within the programmable Serial Response Time-out to acknowledge receipt of all messages, unless noted otherwise in the message description section. If the decoder does not receive an ACK within this time period, it sends the previous message again. The decoder retries twice more (with the retransmit status bit set) before declaring a transmit error.

CMD_NAK

Description: Negative acknowledgment of received packet

Packet Format

Length	Op-code	Message Source	Status	Cause	Checksum
0x05	0xD1				

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Op-code	0xD1	1 Byte	Identifies this Op-code type.
Message Source	0 = Decoder 4 = Host	1 Byte	Identifies where the message is coming from.
Status	Bit 0: Retransmit Bit 1-7: unused	1 Byte	Identifies the transmission status. Unused bits must be set to 0.
Cause	Reason code	1 Byte	Identifies the reason the NAK occurred: 0 = Reserved 1 = (RESEND) Checksum failure 2 = (BAD_CONTEXT) Unexpected or Unknown message 3 = Reserved 4 = Reserved 5 = Reserved 6 = (DENIED) Host Directive Denied 7 = Reserved 8 = Reserved 9 = Reserved

Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	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:

Length	Op-code	Message Source	Status	Cause	Checksum
0x05	0xD1	0x00	0x00	0x01(Checksum failure)	0xff 0x29

Table 10-5 describes NAK types supported by the uE988.

Table 10-5. Decoder-Supported NAK Types

NAK Type	Meaning	Receiver Action
NAK_RESEND	Checksum incorrect.	Ensure checksum is correct. Limit number of resends. Send packet again with resend bit set.
NAK_DENIED	Host is unable to comply with the requested message (e.g., beep code is out of range).	Do not send data with this message again. Developer should check values with specified values. Developer should ensure the proper character is sent, if using wake-up character.
NAK_BAD_CONTEXT	Host does not recognize the command.	

The decoder only resends a message twice. If the message is not sent successfully either time, the decoder declares a transmit error and issues transmit error beeps (LO-LO-LO-LO).

DECODE_DATA

Description: Decode data in CCI packet format

Packet Format

Length	Op-code	Message Source	Status	Bar code Type	Decode Data	Checksum
	0xF3	0x00				

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Op-code	0xF3	1 Byte	Identifies this Op-code type.
Message Source	0 = Decoder	1 Byte	Identifies where the message is coming from.
Status	Bit 0: Retransmit Bits 1-7: unused	1 Byte	Identifies the transmission status. Unused bits must be set to 0.
Bar Code Type	See Table 10-6	1 Byte	Identifies the scanned data code type.
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.

The decoder uses this Op-code when packeted data is selected to send decoded bar code data to the host. The decoded message is contained in the Decode Data field.

Table 10-6 lists all UE988 supported code types. The associated hex value for each code (as required) is entered in the Code Type field.

Table 10-6. Supported Code Types

Not Applicable	0x00		EAN 13 with 5 Supps.	0x8B
Code 39	0x01		EAN 13	0x0B
Codabar	0x02		EAN 13 with 2 Supps.	0x4B
Code 128	0x03		EAN 13 with 5 Supps.	0x8B
Discrete 2 of 5	0x04		MSI	0x0E
IATA 2 of 5	0x05		EAN 128	0x0F
Interleaved 2 of 5	0x06		UPC E1	0x10
Code 93	0x07		UPC E1 with 2 Supps.	0x50
UPC A	0x08		UPC E1 with 5 Supps.	0x90
UPC A with 2 Supps.	0x48		Trioptic Code 39	0x15
UPC A with 5 Supps.	0x88		Bookland EAN	0x16 (Reserved)
UPC E0	0x09		Coupon Code	0x17 (Reserved)
UPC E0 with 2 Supps.	0x49		RSS-Limited	0x23
UPC E0 with 5 Supps.	0x89		RSS-14	0x24
EAN 8	0x0A		RSS-Expanded	0x25

Host Requirements

If DECODE_EVENT reporting is enabled, the beep event message is received prior to the DECODE_DATA message. If ACK/NAK handshaking is enabled, the host responds to each of these messages.

Decoder Requirements

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

EVENT

Description: Indicate selected events occurred

Packet Format

Length	Op-code	Message Source	Status	Event Code	Checksum
0x05	0xF6	0x00			

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Op-code	0xF6	1 Byte	Identifies this Op-code type.
Message Source	0 = Decoder	1 Byte	Identifies where the message is coming from.
Status	Bit 0: Retransmit Bit 1-7: Unused	1 Byte	Identifies the transmission status. Unused bits must be set to 0.
Event Code	Type of Event Code.	1 Byte	*See chapter of Parameter Menus.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

*Event codes description:

Event Class	Event	Code Reported	Support
Decode Event	Non-parameter decode	0x01	Reserved
Boot Up Event	System power-up	0x03	Yes
Parameter Event	Parameter Entry Error Parameter stored Default set Number expected	0x07 0x08 0x0A 0x0F	Reserved Reserved Reserved Reserved

For example:

Length	Op-code	Message Source	Status	Event Code	Checksum
0x05	0xF6	0x00	0x00	0x03	0xff 0x02

The decoder sends this message when an enabled event occurs.

Host Requirements

The host receives this message when a selected event occurs.

Decoder Requirements

Generate this message when a selected event occurs.

LED_OFF

Description: De-activate LED output

Packet Format

Length	Op-code	Message Source	Status	LED Selection	Checksum
0x05	0xE8	0x04		0x01	

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Op-code	0xE8	1 Byte	Identifies this Op-code type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status	Bit 0: Retransmit Bit 1-7: Unused	1 Byte	Identifies the transmission status. Unused bits must be set to 0.
LED Selection	Bit 0 - 7: LED bit numbers to turn off.	1 Byte	Bit 0 = decode LED All other bits should be set to 0.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

The host sends this message to turn off the decode LED.

For example:

Length	Op-code	Message Source	Status	LED Selection	Checksum
0x05	0xE8	0x04	0x00	0x01	0xFF 0x0E

Host Requirements

None.

Decoder Requirements

The decoder turns off the decode LED.

LED_ON

Description: Activate LED output

Packet Format

Length	Op-code	Message Source	Status	LED Selection	Checksum
0x05	0xE7	0x04		0x01	

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (not	1 Byte	Length Field

	including checksum).		
Op-code	0xE7	1 Byte	Identifies this Op-code type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status	Bit 0: Retransmit Bit 1-7: Unused	1 Byte	Identifies the transmission status. Unused bits must be set to 0.
LED Selection	Bit 0 - 7: LED bit numbers to turn on.	1 Byte	Bit 0 = decode LED All other bits should be set to 0.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

The host sends this message to turn on the decode LED.

For example:

Length	Op-code	Message Source	Status	LED Selection	Checksum
0x05	0xE7	0x04	0x00	0x01	0xff 0x0f

Host Requirements

None.

Decoder Requirements

The decoder turns on the decode LED.

PARAM_DEFAULTS

Description: Sets the parameters to their factory default values

Packet Format

Length	Op-code	Message Source	Status	Checksum
0x04	0xC8	0x04		

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Op-code	0xC8	1 Byte	Identifies this Op-code type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status	Bit 0: Retransmit Bit 1-7: Unused	1 Byte	Identifies the transmission status. Unused bits must be set to 0.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

This command returns all parameters to their factory default settings.

For example:

Length	Op-code	Message Source	Status	Checksum
0x04	0xC8	0x04	0x00	0xff 0x30

Host Requirements

The host sends this command to reset the decoders parameter settings to the factory default values.

Decoder Requirements

Upon receiving this command, the decoder resets all its parameters to the factory default values. The behavior is the same as scanning a Set Factory Defaults bar code.

PARAM_REQUEST

Description: Request values of selected parameters

Packet Format

Length	Op-code	Message Source	Status	Request Data	Checksum
	0xC7	0x04			

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Op-code	0xC7	1 Byte	Identifies this Op-code type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status	Bit 0: Retransmit Bit 1-7: Unused	1 Byte	Identifies the transmission status. Unused bits must be set to 0.
Request Data	<Param_num><Param_num> <Param_num>...	Variable	
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

The host uses this message to request selected parameters from the decoder.

Host Requirements

The host requests the decoder's current values for specific parameters by listing the parameter numbers in the Request_Data field. If the host asks for a parameter value not supported by the decoder, the decoder responses NAK.

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

Decoder Requirements

When the decoder receives this message, it processes the information by formatting a PARAM_SEND message containing all requested parameters supported and their values. The programmable Serial Response Time-out can be exceeded when processing this message, depending on the time-out set and the number of parameters requested.

Hints for requesting parameter values:

Before forming a PARAM_REQUEST, confirm that the decoder supports the requested parameters (Table 10-7). To find out what parameters are supported, send a 0xFE (request all parameters). The response to this is a PARAM_SEND which contains all the supported parameters and their values.

Table 10-7. Example of Supported Parameter Numbers

Supported Parameter Number	Associated Parameter Values
01	00
02	01
9C	07
E6	63

0xFE must be in the first position of the request_data field if used, or it is treated as an unsupported parameter.

Unsupported parameters are not listed in the PARAM_SEND response. Requesting unsupported parameters has no effect, but can cause delays in responding to requests for valid parameters. See Table 10-8 for example requests and responses.

Table 10-8. Example Requests and Replies

PARAM_REQUEST message		Response PARAM_SEND message
#1, 9C	06 C7 04 00 01 9C FE 92	09 C6 00 00 FF 01 00 9C 07 FD 8E
#4	05 C7 04 00 04 FF 2C	05 C6 00 00 FF FE 36

PARAM_SEND

Description: Respond to a PARAM_REQUEST, change particular parameter values

Packet Format

Length	Op-code	Message Source	Status	Beep Code	Param data	Checksum
	0xC6					

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Op-code	0xC6	1 Byte	Identifies this Op-code type.
Message Source	0 = Decoder 4=Host	1 Byte	Identifies where the message is coming from.
Status	Bit 0: Retransmit Bits 1, 2: Unused Bit 3: Change Type Bits 4-7: Unused	1 Byte	Bit 0: 1 indicates a retransmit Bit 3: 1 Permanent change 0 Temporary change - lost when power removed. Unused bits must be set to 0.
Beep code	See Table 10-4.	1 Byte	If no beep is required, set this field to 0xFF.
Param_data	See Table 10-9.		The parameter numbers and data to be sent to the requester.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

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

Parameter numbers 0xF0 (+256), 0xF1 (+512), 0xF2 (+768) are used to access parameters whose numbers are 256 and higher. For example, to access the first parameter in the 256-511 range, use 0xF0 and 0x00.

Table 0-9. Param Data Format

Parameter Number	Data Format
0 through 0xEF	<param_num> <value>
0xF0, 0xF1, 0xF2	<extended parameter code> <param_num offset> <value>

For example: to enable UPC-A

Length	Op-code	Message Source	Status	Beep Code	Param data	Checksum
0x07	0xC6	0x04	0x08	0x00	0x01 0x01	0xff 0x25

Host Requirements

☞Due to the processing time of interpreting and storing parameters contained in the message, the

decoder may not be able to send an ACK within the programmable Serial Response time-out. This is not an error; to compensate, increase the time-out.

The host transmits this message to change the decoder's parameters. Be sure the Change Type bit in the Status byte is set as desired. If no beep is required, the beep code must be set to 0xFF, or the decoder beeps as defined in Table 10-4.

Decoder Requirements

When the decoder 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 3 of the Status byte) is set to 1. If bit 3 is set to 0 the changes are temporary, and are lost when the decoder is powered down.

If the PARAM_SEND sent by the host contains a valid beep code, the decoder issues the requested beep sequence, and changes the requested parameter values.

The decoder 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 param_num. If none of the requested values is supported, the PARAM_SEND message is transmitted with no parameters. When sending this command, the Change Type bit (bit 3 of Status byte) can be ignored.

REPLY_REVISION

Description: Reply to REQUEST_REVISION command with software revision string

Packet Format

Length	Op-code	Message Source	Status	Revision	Checksum
	0xA4	0x00			

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Op-code	0xA4	1 Byte	Identifies this Op-code type.
Message Source	0 = Decoder	1 Byte	Identifies where the message is coming from.
Status	Bit 0: Retransmit Bits 1-7: Unused	1 Byte	Identifies the transmission status. Unused bits must be set to 0.
Revision	ASCII data	variable	Software revision in ASCII
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

For example:

Length	Op-code	Message Source	Status	Revision	Checksum
0x15	0xA4	0x00	0x00	0x75 0x45 0x39 0x38 0x38 0x5F 0x53 0x79 0x73 0x41 0x70 0x70 0x5F 0x56 0x31 0x2E 0x31	0xF9 0xE0

Host Requirements

None.

Decoder Requirements

The decoder sends its revision string to the host in the following format:

REQUEST_REVISION

Description: Request the software revision string from the decoder

Packet Format

Length	Op-code	Message Source	Status	Data	Checksum
0x04	0xA3	0x04			

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Op-code	0xA3	1 Byte	Identifies this Op-code type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status	Bit 0: Retransmit Bits 1-7: Unused	1 Byte	Identifies the transmission status. Unused bits must be set to 0.
Data			None
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

For example:

Length	Op-code	Message Source	Status	Data	Checksum
0x04	0xA3	0x04	0x00		0xff 0x55

Host Requirements

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

Decoder Requirements

The decoder sends its revision string to the host. See REPLY_REVISION for format.

SCAN_DISABLE

Description: Prevent the decoder from scanning bar codes

Packet Format

Length	Op-code	Message Source	Status	Data	Checksum
0x04	0xEA	0x04			

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Op-code	0xEA	1 Byte	Identifies this Op-code type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status	Bit 0: Retransmit Bits 1-7: Unused	1 Byte	Identifies the transmission status. Unused bits must be set to 0.
Data			None
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

For example:

Length	Op-code	Message Source	Status	Data	Checksum
0x04	0xEA	0x04	0x00		0xff 0x0e

Host Requirements

All scan attempts are disabled by this command until either a SCAN_ENABLE is sent, or the decoder is reset.

Decoder Requirements

When the decoder receives this command, it ignores all trigger/START_DECODE requests until a SCAN_ENABLE command is received.

SCAN_ENABLE

Description: Permit the decoder to scan bar codes

Packet Format

Length	Op-code	Message Source	Status	Data	Checksum
0x04	0xE9	0x04			

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Op-code	0xE9	1 Byte	Identifies this Op-code type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status	Bit 0: Retransmit Bits 1-7: Unused	1 Byte	Identifies the transmission status. Unused bits must be set to 0.
Data			None
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

For example:

Length	Op-code	Message Source	Status	Data	Checksum
0x04	0xE9	0x04	0x00		0xff 0x0f

Host Requirements

The host sends the SCAN_ENABLE command to enable scanning in the decoder. Scanning is enabled upon power-up, so this command need only be send if a prior SCAN_DISABLE command has been sent.

Decoder Requirements

The decoder allows scanning and decoding upon receipt of this command.

☞At initial power-up, the decoder assumes SCAN_ENABLED.

SLEEP

Description: Request to place the decoder into Sleep power state

Packet Format

Length	Op-code	Message Source	Status	Data	Checksum

0x04	0xEB	0x04			

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Op-code	0xEB	1 Byte	Identifies this Op-code type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status	Bit 0: Retransmit Bits 1-7: Unused	1 Byte	Identifies the transmission status. Unused bits must be set to 0.
Data			None
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

For example:

Length	Op-code	Message Source	Status	Data	Checksum
0x04	0xEB	0x04	0x00		0xff 0x0d

Host Requirements

The host sends this command to place the decoder into Sleep power state. If the low power mode parameter is enabled, the scanner goes into Sleep power state automatically, and the SLEEP command is not necessary.

The decoder will not sleep immediately upon acknowledging the command if it is processing data when the SLEEP command is sent.

Decoder Requirements

None.

START_DECODE

Description: Tell decoder to attempt to decode a bar code

Packet Format

Length	Op-code	Message Source	Status	Data	Checksum
0x04	0xE4	0x04			

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Op-code	0xE4	1 Byte	Identifies this Op-code type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status	Bit 0: Retransmit Bits 1-7: Unused	1 Byte	Identifies the transmission status. Unused bits must be set to 0.
Data			None
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

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

For example:

Length	Op-code	Message Source	Status	Data	Checksum
0x04	0xE4	0x04	0x00		0xFF 0x14

Host Requirements

If the TRIGGER_MODE parameter is set to HOST, the host can use this command instead of a trigger pull.

Decoder Requirements

None.

STOP_DECODE

Description: Tell decoder to abort a decode attempt

Packet Format

Length	Op-code	Message Source	Status	Data	Checksum
0x04	0xE5	0x04			

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Op-code	0xE5	1 Byte	Identifies this Op-code type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status	Bit 0: Retransmit Bits 1-7: Unused	1 Byte	Identifies the transmission status. Unused bits must be set to 0.
Data			None
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

This command tells the decoder to stop a scan and decode attempt.

For example:

Length	Op-code	Message Source	Status	Data	Checksum
0x04	0xE5	0x04	0x00		0xFF 0x13

Host Requirements

The TRIGGER_MODE parameter must be set to HOST.

Decoder Requirements

None.

WAKEUP

Description: Wakeup decoder after it's been put into Sleep power state

If the decoder is in Sleep power state, sending the single character, NULL (0x00) wakes up the decoder. This character is only needed when hardware handshaking is not used or is bypassed. (See Power Management on page 1-4.)

Host Requirements

Once the WAKEUP command is sent, the host must wait at least 10 ms, but less than 1 second before sending additional data, since the decoder is required to wait 1 second after waking up before going

back to sleep (if low power mode is enabled).

Decoder Requirements

The decoder must not return to low power mode for at least 1 second after waking up.

☞The mechanism to wake up a decoder in this manner also works if characters other than WAKEUP are sent to the decoder. 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 decoder.

The WAKEUP character has no effect if sent when the scanner is awake. If the host is unsure of the scanner power state, it can send the wakeup character anytime it wants to communicate with the scanner.

CUSTOM_DEFAULTS

Description: Sets the parameters to their default values. This command returns all parameters to their default settings.

Packet Format

	Bit							
Byte	7	6	5	4	3	2	1	0
0	Length = 6 (not including checksum)							
1	Op-code = 12h							
2	Message Source = 4							
3	ΔMIMIC Supported		Reserved					Retransmit
4	Action							
5-6	Checksum							

Field Descriptions

Field Name	Description
Length	Length of message not including the checksum.
Op-code	The Op-code for this message.
Message Source	Identifies the sender of the message: Host = 4
ΔMIMIC Supported	Identifies compliance to the MIMIC System Architecture.
Retransmit	Identifies if a message was resent or not. Values: 0 = First transmission 1 = Subsequent transmission
Action	Identifies the operation to perform on the custom defaults buffer. Values: 0 = Write to Custom Defaults 1 = Restore Custom Defaults
Checksum	16 bit twos complements checksum of message (two byte field size).

For example:

Write to Custom Defaults：0x05 0x12 0x04 0x00 0x00 0xFF 0xE5

Restore Custom Defaults：0x05 0x12 0x04 0x00 0x01 0xFF 0xE4

Host Requirements

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

Decoder Requirements

Upon receiving this command, the scan engine 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**, send **Restore Custom Defaults** to retrieve and restore the scan engine custom default settings.
- If no custom defaults were set, send **Restore Custom Defaults** to restore the factory default values.

CCI Transactions

General data transactions

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 decode data and WAKEUP do not use ACK/NAK handshaking since they are not packeted data.
Following is an example of a problem that can occur when ACK/NAK handshaking is disabled:

- The host sends a PARAM_SEND message to the decoder to change the baud rate from 9600 to 115200.
- The decoder cannot interpret the message.
- The decoder does not implement the changes requested by the host.
- The host assumes that the parameter changes have occurred and acts accordingly.
- Communications are lost because the change did not occur on both sides.

If the ACK/NAK handshaking is enabled, the following occurs:

- The host sends a PARAM_SEND message
- The decoder cannot interpret the message
- The decoder CMD_NAKs the message
- The host resends the message
- The decoder receives the message successfully, responds with CMD_ACK, and implements parameter changes.

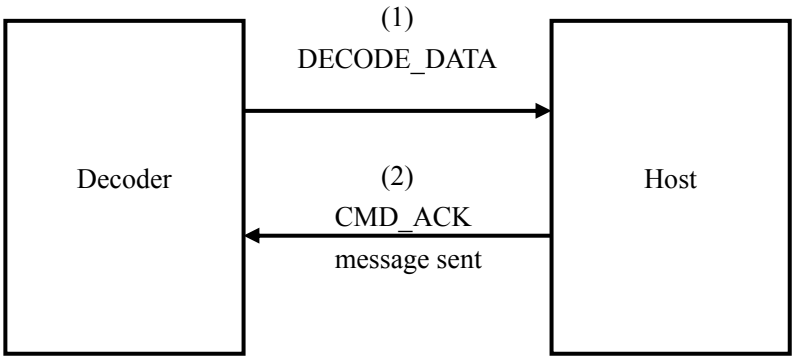
Transfer of Decode Data

The Decode Data Packet Format parameter controls how decode data is sent to the host. When this parameter is set, the data is sent in a DECODE_DATA packet. When the parameter is cleared, 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.

ACK/NAK Enabled and Packeted Data

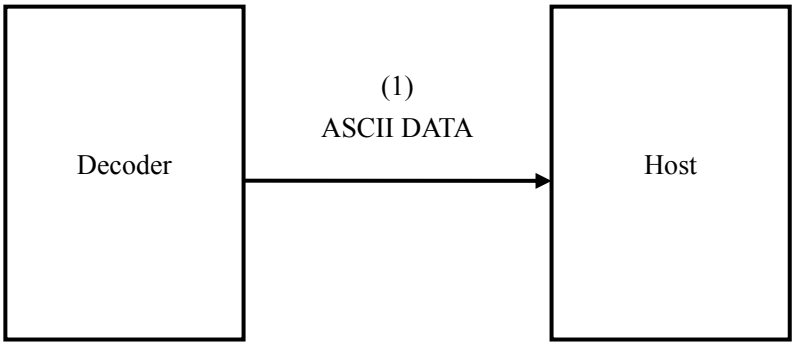
The decoder sends a DECODE_DATA message after a successful decode. The decoder waits for a

programmable time-out for a CMD_ACK response. If it does not receive the response, the decoder tries to send twice more before issuing a host transmission error.
If the decoder receives a CMD_NAK from the host, it may attempt a retry depending on the cause field of the CMD_NAK message.



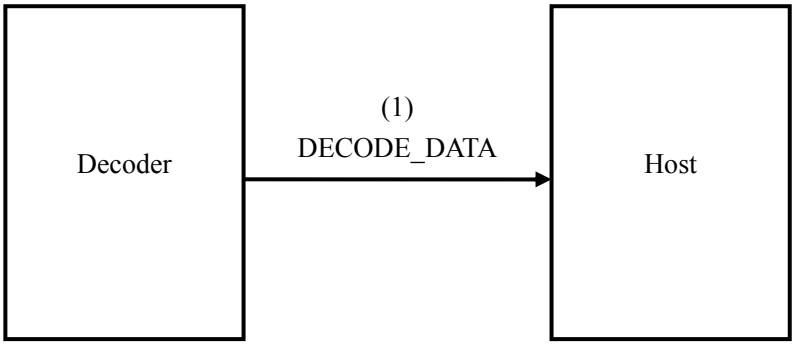
ACK/NAK Enabled and Unpacketed ASCII Data

Even though the ACK/NAK handshaking is enabled, no handshaking occurs because the handshaking applies only to packeted data. In this example the packeted_decode parameter is disabled.



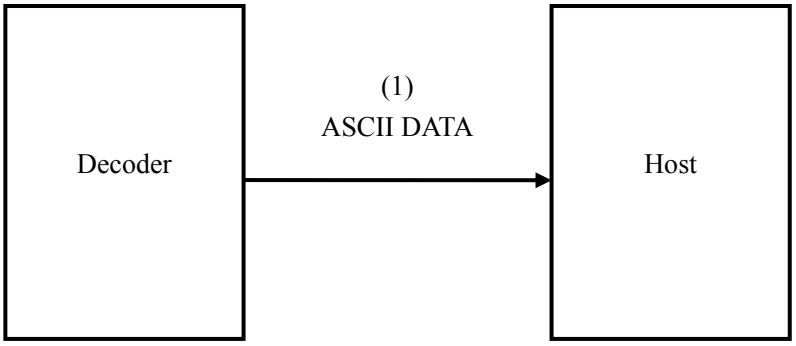
ACK/NAK Disabled and Packeted DECODE_DATA

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



ACK/NAK Disabled and Unpacketed ASCII Data

Data captured by the decoder is sent to the host.



Communication Summary

RTS/CTS Lines

All communication must use RTS/CTS handshaking as described in Appendix A, Communication Control Interface Specification.

ACK/NAK Option

ACK/NAK handshaking can be enabled or disabled. This handshaking is enabled by default; disabling this is not recommended as it can lead to communication problems, since handshaking is the only indication that a message was received and if it was received correctly. ACK/NAK is not used with unpacketed decode data regardless of whether or not this option is enabled.

Number of Data Bits

All communication with the decoder must use eight bit data.

Serial Response Time-out

The Serial Response Time-out parameter determines how long to wait for a handshaking response before trying again, or aborting any further attempts. Both the host and decoder should use the same value for this parameter.

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

Retries

When sending data, the host should resend twice after the initial send if the decoder does not respond with an ACK or NAK (if ACK/ NAK handshaking is enabled), or response data (e.g., PARAM_SEND, REPLY_REVISION). If the decoder replies with a NAK RESEND, the host resends the data. All resent messages must have the resend bit set in the Status byte.

The decoder resends data two times after the initial send if the host fails to reply with an ACK or NAK (if ACK/NAK handshaking is enabled).

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.

Errors

The decoder generates a communication error when:

- The CTS line is asserted when the decoder tries to transmit, and is still asserted on each of 2 successive retries
- Failed to receive an ACK or NAK after initial transmit and two resends.

CCI Communication Notes

If hardware handshaking is not used, messages should be spaced sufficiently apart, and the host must not communicate with the uE988 when the uE988 is sending.
If hardware handshaking is used, frame each message properly with the handshaking signals. Do not try to send two commands within the same handshaking frame.
There is a permanent/temporary bit in the PARAM_SEND message. Temporary changes are lost when power is removed from the uE988. Permanent changes are written to non-volatile memory. Frequent changes shorten the life of the non-volatile memory.
Do not scan parameter bar codes and send parameters via CCI simultaneously. All parameters can be accessed via CCI, so parameter bar code scanning is not necessary.

11-1 Test Chart

UPC-A

UPC-E

EAN-8

EAN-13

Code 39

Code 32

Code 128

Interleaved 2 of 5

Industrial 2 of 5

Matrix 2 of 5

Code 93

UCC/EAN 128

Code 11

11-2 Test Chart (Continued)

MSI/Plessey

0123456789

UK/Plessey

01ABEF89

ISBN/ISSN

9 780194 315104

China Post

5478963214 5

GS1 DataBar (GS1 DataBar Truncated)

1234567890123

GS1 DataBar Limited

987654321012

GS1 DataBar Expanded

Ab_09+yZ

PDF417

01Az+-=

MicroPDF417

23+-mdo

12 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”.