

# **XL-3956 2D Barcode Scanner**

## **User Manual**

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# Chapter 1 Getting Started

## Introduction

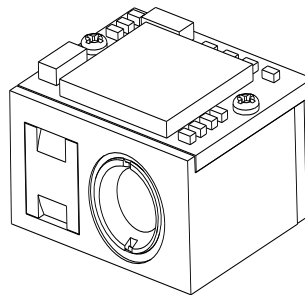
NLS-XL-3956 series embedded 2D barcode scan engines, armed with the SUNLUX , a patented computerized image recognition system, bring about a new era of 2D barcode scan engines.

The XL-3956's 2D barcode decoder chip ingeniously blends technology and advanced chip design & manufacturing, which significantly simplifies application design and delivers superior performance and solid reliability with low power consumption.

The XL-3956 supports all mainstream 1D as well as PDF417, QR Code (QR1, QR2, Micro QR), Data Matrix and GS1-DataBarTM(RSS) (RSS-Limited, RSS-14, RSS-14 Stacked and RSS-Expand).

The XL-3956 can read barcodes on virtually any medium - paper, plastic card, mobile phones and LCD displays. It provides an ideal solution for both emerging mobile phone-based barcode applications, like digital coupons, electronic tickets and boarding passes, and traditional applications.

This compact engine weighs only 3 grams and fits easily into even the most space-constrained equipments such as data collectors, meter readers, ticket validators and PDAs. Moreover, the instant power on/off feature along with ultra-low power consumption brings greater efficiency and convenience in barcode scanning.



---

## About This Guide

This guide provides programming instructions for the XL-3956. Users can configure the XL-3956 by scanning the programming barcodes included in this manual.

The XL-3956 has been properly configured for most applications and can be put into use without further configuration. Users may check the Factory Defaults Table in Appendix for reference. Throughout the manual, options marked with asterisks (\*\*) are factory default values.

## Connecting EVK to PC

The EVK tool is provided to assist users in application development for the XL-3956. The EVK can be connected to PC via the RS-232 or USB interface.

## Barcode Scanning

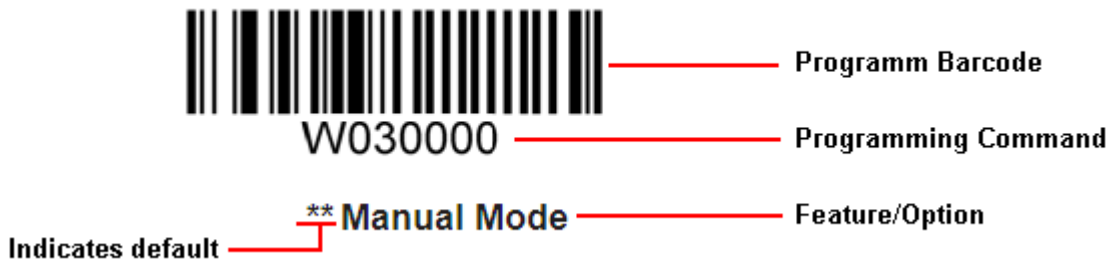
Powered by area-imaging technology and SUNLUX patented technology, the XL-3956 features fast scanning and accurate decoding. Barcodes rotated at any angle can still be read with ease. When scanning a barcode, simply center the aiming beam projected by the XL-3956 over the barcode.

## Configuring the XL-3956

There are two ways to configure the engine: barcode programming and command programming.

### Barcode Programming

The XL-3956 can be configured by scanning programming barcodes. All user programmable features/options are described along with their programming barcodes/commands in the following sections.



### Command Programming

Besides the barcode programming method, the XL-3956 can also be configured by serial commands sent from the host device. Note that communication parameters on the engine and the host must match so that two devices can communicate with each other. The default settings of the engine are 9600bps, no parity check, 8 data bits, 1 stop bit, and no flow control. The engine uses 8-bit registers.

### Read Register

The read command is used to read the contents of 1 to 256 contiguous registers in the engine.

#### Format of read command: {Prefix1} {Types} {Lens} {Address} {Datas} {FCS}

Prefix1 : 0x7E 0x00

Types : 0x07

Lens : 0x01

Address: 0x0000~0x00FF, starting register address.

Datas : 0x00~0xFF, number of registers to be read. When Datas=0x00, 256 contiguous registers are to be read.

FCS : CRC-CCITT checksum, 2 bytes.

Computation sequence: Types+ Lens+Address+Datas; polynomial:  $X^{16}+X^{12}+X^5+1$  (0x1021), initial value: 0x0000.

The following C language program is provided for reference.

---

```
unsigned int crc_cal_by_bit(unsigned char* ptr, unsigned int len)
{
    unsigned int crc = 0;
    while(len-- != 0)
    {
        for(unsigned char i = 0x80; i != 0; i /= 2)
        {
            crc *= 2;
            if((crc&0x10000) !=0)
                crc ^= 0x11021;
            if((*ptr&i) != 0)
                crc ^= 0x1021;
        }
        ptr++;
    }
    return crc;
}
```

---

**Reply: {Prefix2} {Types} {Lens} {Datas} {FCS}**

1) Success message:

Prefix2 : 0x02 0x00

Types : 0x00 (success)

Lens : The number of data returned. If Lens=0x00, that means values of 256 contiguous registers are returned.

Datas : 0x00~0xFF, data that are returned.

FCS : CRC-CCITT checksum.

2) CRC check failure message:

Prefix2 : 0x02 0x00

Types : 0x01 (CRC check failure)

Lens : 0x01

Datas : 0x00

FCS : CRC-CCITT checksum (0x04 0x01)

3) Invalid command message:

Prefix2 : 0x02 0x00

Types : 0x03 (invalid command)

Lens : 0x01

Datas : 0x00

FCS : CRC-CCITT checksum (0x6A 0x61)

---

**Example:**

Read the content (0x3E) of register 0x000A

1) Read operation succeeds:

Command sent: 0x7E 0x00 0x07 0x01 0x00 0x0A 0x01 0xEE 0x8A

Message received: 0x02 0x00 0x00 0x01 0x3E 0xE4 0xAC

2) CRC check fails:

Command sent: 0x7E 0x00 0x07 0x01 0x00 0x0A 0x01 0x11 0x22

Message received: 0x02 0x00 0x01 0x01 0x00 0x04 0x01

3) Situations that may cause the engine to respond with an invalid command message: Command sent is shorter than the required length, or the third byte is not sent out within 400ms after the first two bytes "0x7e 0x00" are sent

Command sent: 0x7E 0x00 0x07 0x01 0x00 0x0A 0x01

Message received: 0x02 0x00 0x03 0x01 0x00 0x6A 0x61

---

## Write Register

The write command is used to write contiguous registers (1 to 256 registers) in the engine.

### Format of write command: {Prefix1} {Types} {Lens} {Address} {Datas} {FCS}

Prefix1 : 0x7E 0x00 (2 bytes)

Types : 0x08 (1 byte)

Lens : 0x00~0xFF (1 byte), byte count, i.e. number of registers written. When Lens=0x00, 256 contiguous registers are to be written.

Address : 0x0000~0xFFFF (2 bytes), starting register address.

Datas : 0x00~0xFF (1~256 bytes), data to be written into the register(s)

FCS : CRC-CCITT checksum, 2 bytes.

Computation sequence: Types+ Lens+Address+Ddatas; polynomial:  $X^{16}+X^{12}+X^5+1$  (0x1021), initial value: 0x0000.

The following C language program is provided for reference.

---

```
unsigned int crc_cal_by_bit(unsigned char* ptr, unsigned int len)
{
    unsigned int crc = 0;
    while(len-- != 0)
    {
        for(unsigned char i = 0x80; i != 0; i /= 2)
        {
            crc *= 2;
            if((crc&0x10000) !=0)
                crc ^= 0x11021;
            if((*ptr&i) != 0)
                crc ^= 0x1021;
        }
        ptr++;
    }
    return crc;
}
```



---

**Reply: {Prefix2} {Types} {Lens} {Datas} {FCS}**

1) Success message:

Prefix2 : 0x02 0x00

Types : 0x00 (success)

Lens : 0x01

Datas : 0x00

FCS : CRC-CCITT checksum (0x33 0x31)

2) CRC check failure message:

Prefix2 : 0x02 0x00

Types : 0x01 (CRC check failure)

Lens : 0x01

Datas : 0x00

FCS : CRC-CCITT checksum (0x04 0x01)

3) Invalid command message:

Prefix2 : 0x02 0x00

Types : 0x03 (invalid command)

Lens : 0x01

Datas : 0x00

FCS : CRC-CCITT checksum (0x6A 0x61)

---

**Example:**

Write 0x3E into register 0x000A

1) Write operation succeeds:

Command sent: 0x7E 0x00 0x08 0x01 0x00 0x0A 0x3E 0x4C 0xCF

Message received: 0x02 0x00 0x00 0x01 0x00 0x33 0x31

2) CRC check fails:

Command sent: 0x7E 0x00 0x08 0x01 0x00 0x0A 0x3E 0x11 0x22

Message received: 0x02 0x00 0x01 0x01 0x00 0x04 0x01

3) Situations that may cause the engine to respond with an invalid command message: Command sent is shorter than the required length, or the third byte is not sent out within 400ms after the first two bytes "0x7e 0x00" are sent

Command sent: 0x7E 0x00 0x08 0x01 0x00 0x0A 0x3E

Message received: 0x02 0x00 0x03 0x01 0x00 0x6A 0x61

---

## Save Register Data in EEPROM

The save command is used to save register data into an external EEPROM.

### Format of save command: {Prefix1} {Types} {Lens} {Address} {Datas} {FCS}

Prefix1 : 0x7E 0x00

Types : 0x09

Lens : 0x01

Address: 0x0000

Datas : 0x00

FCS : CRC-CCITT checksum (0xDE 0xC8)

### Reply: {Prefix2} {Types} {Lens} {Datas} {FCS}

1) Success message:

Prefix2 : 0x02 0x00

Types : 0x00 (success)

Lens : 0x01

Datas : 0x00

FCS : CRC-CCITT checksum (0x33 0x31)

2) CRC check failure message:

Prefix2 : 0x02 0x00

Types : 0x01 (CRC check failure)

Lens : 0x01

Datas : 0x00

FCS : CRC-CCITT checksum (0x04 0x01)

---

---

3) Invalid command message:

Prefix2 : 0x02 0x00

Types : 0x03 (invalid command)

Lens : 0x01

Datas : 0x00

FCS : CRC-CCITT checksum (0x6A 0x61)

---

## Relationship between Programming Command and Serial Command

### 1. Program general parameter with serial command

A programming command (i.e. the characters under programming barcode) contains 7 characters. The function of each character is described in the table below.

1st Char	2nd Char ~3rd Char	4th Char~5th Char	6th Char~7th Char	Remark
CMD	BITPOSITION	ADDR	DATA	
"W"	"00"~"FF"	"00"~"FF"	"00"~"FF"	Write a value (DATA) to the specified bits (BITPOSITION) of the register (ADDR).

Note:1. **CMD**: Command type.

2. **ADDR**: Address of register to be written.

3. **BITPOSITION**: Bit(s) the value is written to. For example, if only bit 3 is to be written, the BITPOSITION should be "08"; if all bits are to be written, the BITPOSITION should be "FF".

4. **DATA**: Value written to the BITPOSITION.

The **ADDR** and **DATA** in programming command correspond to **Address** and **Datas** in serial command, respectively:

1) If BITPOSITION="FF", the values of ADDR and DATA can be used directly in the write command.

e.g., programming command: WFFD9D8 (write value 0xD8 to register 0x00D9)

serial command sent : 0x7E 0x00 0x08 0x01 0x00 0xD9 0xD8 0x91 0x53

reply received : 0x02 0x00 0x00 0x01 0x00 0x33 0x31

2) If BITPOSITION≠"FF", users need to read the register content, calculate the value (Datas) and then write the value into the register, as shown in the following example.

e.g., programming command: W030002 (write value 0x02 to bit1 and bit0 of register 0x0000)

**Step 1**: Read the content of register 0x0000.

serial command sent : 0x7E 0x00 0x07 0x01 0x00 0x00 0x01 0x01 0x41

---

---

reply received : 0x02 0x00 0x00 0x01 0xD4 0xB8 0xC8

**Step 2:** Calculate the value written to the register.

$$\text{Datas} = (0xD4 \& (! 0x03)) + 0x02 = 0xD5$$

**Step 3:** Write the value into the register.

serial command sent : 0x7E 0x00 0x08 0x01 0x00 0x00 0xD5 0xEF 0x41

reply received : 0x02 0x00 0x00 0x01 0x00 0x33 0x31

## 2. Program special parameter with serial command

The serial commands used for programming the following parameters are practically irrelevant to their programming commands.

Feature	Serial Command
Program the sensitivity level	0x7E 0x00 0x08 0x01 0x00 0x03 0xTT 0xSS 0xSS
Program the image stabilization timeout	0x7E 0x00 0x08 0x01 0x00 0x04 0xTT 0xSS 0xSS
Program the timeout between decodes	0x7E 0x00 0x08 0x01 0x00 0x05 0xTT 0xSS 0xSS
Program the decode session timeout	0x7E 0x00 0x08 0x01 0x00 0x06 0xTT 0xSS 0xSS

**Note:** Red: Address of register.

Blue: Value written to register. For example, to set the sensitivity level to 10, 0xTT should be 0x0A.

Pink: CRC checksum calculated.

## 3. Save register data in EEPROM

Scanning a programming barcode can change register value and save register data in EEPROM as well. As for command programming, it requires a write command and a save command to perform these two tasks. To save register data in an external EEPROM, users need to send the save command to the engine.

save command sent: 0x7E 0x00 0x09 0x01 0x00 0x00 0xDE 0xC8

reply received : 0x02 0x00 0x00 0x01 0x00 0x33 0x31

---

## Registers

Register	0x0000	
Bit	Feature	
Bit 7	1: Good read LED on	0: Good read LED off
Bit 6	1: Disable the mute mode	0: Enable the mute mode
Bit 5-4	Aiming: 00: OFF                      01: Normal                      10/11: Always ON	
Bit 3-2	Illumination: 00: OFF                      01: Normal                      10/11: Always ON	
Bit 1-0	Scan Mode: 00: Manual Mode    01: Command Trigger Mode    10: Continuous Mode    11: Sense Mode	
Register	0x0002	
Bit	Feature	
Bit 7	1: Enable CODE ID prefix for all symbologies	0: Disable CODE ID prefix for all symbologies
Bit 6	1: Enable decode result notification	0: Disable decode result notification
Bit 5	Reserved	
Bit 4	1: Video reverse ON	0: Video reverse OFF
Bit 3-0	Reserved	
Register	0x0004	
Bit	Feature	
Bit 7-0	Image Stabilization Timeout: 0x00-0xFF: 0.0-25.5s	
Register	0x0005	
Bit	Feature	
Bit 7-0	Timeout between Decodes: 0x00-0xFF: 0.0-25.5s	
Register	0x0006	
Bit	Feature	
Bit 7-0	Decode Session Timeout: 0x00-0xFF: 0.0-25.5s	

Register	0x0009	
Bit	Feature	
Bit 7-0	Good Read Beep Frequency 0xDA: Low                      0x4B: Medium                      0x25: High	
Register	0x000A	
Bit	Feature	
Bit 7-0	Good Read Beep Duration 0x1F: 40ms                      0x3E: 80ms                      0x5D: 120ms	
Register	0x000C	
Bit	Feature	
Bit 7-4	Reserved	
Bit 3	1: Enable Data Matrix	0: Disable Data Matrix
Bit 2	1: Enable 1D symbologies	0: Disable 1D symbologies
Bit 1	1: Enable AIM ID prefix for PDF417	0: Disable AIM ID prefix for PDF417
Bit 0	1: Enable PDF417	0: Disable PDF417
Register	0x000D	
Bit	Feature	
Bit 7	1: Enable QR Code	0: Disable QR Code
Bit 6-2	Reserved	
Bit 1-0	00: USB DATAPIPE 10: USB COM Port Emulation	01: USB HID-KBW 11: HID-POS
Register	0x000E	
Bit	Feature	
Bit 7-4	Reserved	
Bit 3	1: Beep on unknown character	0: Do not beep on unknown character
Bit 2	1: Good read beep on	0: Good read beep off
Bit 1-0	Reserved	



Register	0x0010	
Bit	Feature	
Bit 7-5	Reserved	
Bit 4-3	00: Disable AIM ID prefix for 1D symbologies 01: Allow to enable/disable AIM ID prefix for individual 1D symbology 10/11: Enable AIM ID prefix for 1D symbologies	
Bit 2-0	Reserved	
Register	0x0011	
Bit	Feature	
Bit 7	1: Enable AIM ID prefix for ISSN Note: Bit4 and Bit3 of register 0x0010 must be set to "01" in order for this parameter to function.	0: Disable AIM ID prefix for ISSN
Bit 6	1: Enable ISSN	0: Disable ISSN
Bit 5	1: Enable EAN-13 5-digit add-on code	0: Disable EAN-13 5-digit add-on code
Bit 4	1: Enable EAN-13 2-digit add-on code	0: Disable EAN-13 2-digit add-on code
Bit 3	1: EAN-13 add-on code required	0: EAN-13 add-on code not required
Bit 2	1: Transmit EAN-13 check digit	0: Do not transmit EAN-13 check digit
Bit 1	1: Enable AIM ID prefix for EAN-13 Note: Bit4 and Bit3 of register 0x0010 must be set to "01" in order for this parameter to function.	0: Disable AIM ID prefix for EAN-13
Bit 0	1: Enable EAN-13	0: Disable EAN-13
Register	0x0012	
Bit	Feature	
Bit 7	Reserved	
Bit 6	1: Transmit Code 93 check digit Note: Code 93 check digit verification must be enabled for this parameter to function.	0: Do not transmit Code 93 check digit
Bit 5	1: Enable Code 93 check digit	0: Disable Code 93 check digit
Bit 4	1: Enable AIM ID prefix for Code 93 Note: Bit4 and Bit3 of register 0x0010 must be set to "01" in order for this parameter to function.	0: Disable AIM ID prefix for Code 93
Bit 3	1: Enable Code 93	0: Disable Code 93
Bit 2	ISBN Format 1: ISBN-10 0: ISBN-13	
Bit 1	1: Enable AIM ID prefix for ISBN Note: Bit4 and Bit3 of register 0x0010 must be set to "01" in order for this parameter to function.	0: Disable AIM ID prefix for ISBN
Bit 0	1: Enable ISBN	0: Disable ISBN

Register	0x0013	
Bit	Feature	
Bit 7	Reserved	
Bit 6	1: Enable EAN-8 zero extend	0: Disable EAN-8 zero extend
Bit 5	1: Enable EAN-8 5-digit add-on code	0: Disable EAN-8 5-digit add-on code
Bit 4	1: Enable EAN-8 2-digit add-on code	0: Disable EAN-8 2-digit add-on code
Bit 3	1: EAN-8 add-on code required	0: EAN-8 add-on code not required
Bit 2	1: Transmit EAN-8 check digit	0: Do not transmit EAN-8 check digit
Bit 1	1: Enable AIM ID prefix for EAN-8 Note: Bit4 and Bit3 of register 0x0010 must be set to "01" in order for this parameter to function.	0: Disable AIM ID prefix for EAN-8
Bit 0	1: Enable EAN-8	0: Disable EAN-8
Register	0x0014	
Bit	Feature	
Bit 7	Reserved	
Bit 6	1: Enable UPC-E 5-digit add-on code	0: Disable UPC-E 5-digit add-on code
Bit 5	1: Enable UPC-E 2-digit add-on code	0: Disable UPC-E 2-digit add-on code
Bit 4	1: UPC-E add-on code required	0: UPC-E add-on code not required
Bit 3	1: Transmit UPC-E system character	0: Do not transmit UPC-E system character
Bit 2	1: Transmit UPC-E check digit	0: Do not transmit UPC-E check digit
Bit 1	1: Enable AIM ID prefix for UPC-E Note: Bit4 and Bit3 of register 0x0010 must be set to "01" in order for this parameter to function.	0: Disable AIM ID prefix for UPC-E
Bit 0	1: Enable UPC-E	0: Disable UPC-E
Register	0x0015	
Bit	Feature	
Bit 7	1: Enable UPC-E extend	0: Disable UPC-E extend
Bit 6	1: Enable UPC-A 5-digit add-on code	0: Disable UPC-A 5-digit add-on code
Bit 5	1: Enable UPC-A 2-digit add-on code	0: Disable UPC-A 2-digit add-on code
Bit 4	1: UPC-A add-on code required	0: UPC-A add-on code not required
Bit 3	1: Transmit UPC-A preamble character	0: Do not transmit UPC-A preamble character
Bit 2	1: Transmit UPC-A check digit	0: Do not transmit UPC-A check digit
Bit 1	1: Enable AIM ID prefix for UPC-A Note: Bit4 and Bit3 of register 0x0010 must be set to "01" in order for this parameter to function.	0: Disable AIM ID prefix for UPC-A
Bit 0	1: Enable UPC-A	0: Disable UPC-A



Register	0x0018	
Bit	Feature	
Bit 7	1: Transmit ITF-14 check digit	0: Do not transmit ITF-14 check digit
Bit 6	1: Enable AIM ID prefix for ITF-14 Note: Bit4 and Bit3 of register 0x0010 must be set to "01" in order for this parameter to function.	0: Disable AIM ID prefix for ITF-14
Bit 5	1: Enable ITF-14	0: Disable ITF-14
Bit 4	1: Transmit appended "0" of Interleaved 2 of 5 0: Do not transmit appended "0" of Interleaved 2 of 5	
Bit 3	1: Transmit Interleaved 2 of 5 check digit Note: Interleaved 2 of 5 check digit verification must be enabled for this parameter to function.	0: Do not transmit Interleaved 2 of 5 check digit
Bit 2	1: Enable Interleaved 2 of 5 check digit	0: Disable Interleaved 2 of 5 check digit
Bit 1	1: Enable AIM ID prefix for Interleaved 2 of 5 Note: Bit4 and Bit3 of register 0x0010 must be set to "01" in order for this parameter to function.	0: Disable AIM ID prefix for Interleaved 2 of 5
Bit 0	1: Enable Interleaved 2 of 5	0: Disable Interleaved 2 of 5
Register	0x0019	
Bit	Feature	
Bit 7	Reserved	
Bit 6	1: Transmit Industrial 2 of 5 check digit Note: Industrial 2 of 5 check digit verification must be enabled for this parameter to function.	0: Do not transmit Industrial 2 of 5 check digit
Bit 5	1: Enable Industrial 2 of 5 check digit	0: Disable Industrial 2 of 5 check digit
Bit 4	1: Enable AIM ID prefix for Industrial 2 of 5 Note: Bit4 and Bit3 of register 0x0010 must be set to "01" in order for this parameter to function.	0: Disable AIM ID prefix for Industrial 2 of 5
Bit 3	1: Enable Industrial 2 of 5	0: Disable Industrial 2 of 5
Bit 2	1: Transmit ITF-6 check digit	0: Do not transmit ITF-6 check digit
Bit 1	1: Enable AIM ID prefix for ITF-6 Note: Bit4 and Bit3 of register 0x0010 must be set to "01" in order for this parameter to function.	0: Disable AIM ID prefix for ITF-6
Bit 0	1: Enable ITF-6	0: Disable ITF-6

Register	0x001A	
Bit	Feature	
Bit 7	1: Transmit Standard 2 of 5 check digit Note: Standard 2 of 5 check digit verification must be enabled for this parameter to function.	0: Do not transmit Standard 2 of 5 check digit
Bit 6	1: Enable Standard 2 of 5 check digit	0: Disable Standard 2 of 5 check digit
Bit 5	1: Enable AIM ID prefix for Standard 2 of 5 Note: Bit4 and Bit3 of register 0x0010 must be set to "01" in order for this parameter to function.	0: Disable AIM ID prefix for Standard 2 of 5
Bit 4	1: Enable Standard 2 of 5	0: Disable Standard 2 of 5
Bit 3	1: Transmit Matrix 2 of 5 check digit Note: Matrix 2 of 5 check digit verification must be enabled for this parameter to function.	0: Do not transmit Matrix 2 of 5 check digit
Bit 2	1: Enable Matrix 2 of 5 check digit	0: Disable Matrix 2 of 5 check digit
Bit 1	1: Enable AIM ID prefix for Matrix 2 of 5 Note: Bit4 and Bit3 of register 0x0010 must be set to "01" in order for this parameter to function.	0: Disable AIM ID prefix for Matrix 2 of 5
Bit 0	1: Enable Matrix 2 of 5	0: Disable Matrix 2 of 5
Register	0x001B	
Bit	Feature	
Bit 7	1: Enable AIM ID prefix for RSS-Expand Note: Bit4 and Bit3 of register 0x0010 must be set to "01" in order for this parameter to function.	0: Disable AIM ID prefix for RSS-Expand
Bit 6	1: Enable RSS-Expand	0: Disable RSS-Expand
Bit 5	1: Transmit RSS-Limited application identifier 0: Do not transmit RSS-Limited application identifier	
Bit 4	1: Enable AIM ID prefix for RSS-Limited Note: Bit4 and Bit3 of register 0x0010 must be set to "01" in order for this parameter to function.	0: Disable AIM ID prefix for RSS-Limited
Bit 3	1: Enable RSS-Limited	0: Disable RSS-Limited
Bit 2	1: Transmit RSS-14 application identifier	0: Do not transmit RSS-14 application identifier
Bit 1	1: Enable AIM ID prefix for RSS-14 Note: Bit4 and Bit3 of register 0x0010 must be set to "01" in order for this parameter to function.	0: Disable AIM ID prefix for RSS-14
Bit 0	1: Enable RSS-14	0: Disable RSS-14

Register	0x001C	
Bit	Feature	
Bit 7-6	Reserved	
Bit 5	1: Enable Code 39 Full ASCII	0: Disable Code 39 Full ASCII
Bit 4	1: Transmit Code 39 check digit Note: Code 39 check digit verification must be enabled for this parameter to function.	0: Do not transmit Code 39 check digit
Bit 3	1: Enable Code 39 check digit	0: Disable Code 39 check digit
Bit 2	1: Transmit Code 39 start/stop characters	0: Do not transmit Code 39 start/stop characters
Bit 1	1: Enable AIM ID prefix for Code 39 Note: Bit4 and Bit3 of register 0x0010 must be set to "01" in order for this parameter to function.	0: Disable AIM ID prefix for Code 39
Bit 0	1: Enable Code 39	0: Disable Code 39
Register	0x001D	
Bit	Feature	
Bit 7-6	Reserved	
Bit 5	1: Transmit Code 11 check digit Note: Code 11 check digit verification must be enabled for this parameter to function.	0: Do not transmit Code 11 check digit
Bit 4-2	Code 11 Check Digit Verification: 000: Disable 001: One check digit, MOD11 010: Two check digits, MOD11/MOD11 011: Two check digits, MOD11/MOD9 100: One check digit, MOD11 (Len <= 11); two check digits, MOD11/MOD11 (Len > 11) 101: One check digit, MOD11 (Len <= 11); two check digits, MOD11/MOD9 (Len > 11)	
Bit 1	1: Enable AIM ID prefix for Code 11 Note: Bit4 and Bit3 of register 0x0010 must be set to "01" in order for this parameter to function.	0: Disable AIM ID prefix for Code 11
Bit 0	1: Enable Code 11	0: Disable Code 11

---

Register	0x001E	
Bit	Feature	
Bit 7-6	Reserved	
Bit 5	1: Transmit Codabar check digit Note: Code 39 check digit verification must be enabled for this parameter to function.	0: Do not transmit Codabar check digit
Bit 4	1: Enable Codabar check digit	0: Disable Codabar check digit
Bit 3-2	Codabar Start/Stop Character Format: 00: ABCD/ABCD 10: abcd/abcd	
		01: ABCD/TN*E 11: abcd/tn*e
Bit 1	1: Transmit Codabar start/stop characters	0: Do not transmit Codabar start/stop characters
Bit 0	1: Enable Codabar	0: Disable Codabar
Register	0x001F	
Bit	Feature	
Bit 7	Reserved	
Bit 6	1: Transmit MSI-Plessey check digit Note: MSI-Plessey check digit verification must be enabled for this parameter to function.	0: Do not transmit MSI-Plessey check digit
Bit 5-4	MSI-Plessey Check Digit Verification: 00: Disable 01: One check digit, MOD10 10: Two check digits, MOD10/MOD10 11: Two check digits, MOD10/MOD11	
Bit 3	1: Enable MSI-Plessey	0: Disable MSI-Plessey
Bit 2	1: Transmit Plessey check digit Note: Plessey check digit verification must be enabled for this parameter to function.	0: Do not transmit MSI-Plessey check digit
Bit 1	1: Enable Plessey check digit	0: Disable Plessey check digit
Bit 0	1: Enable Plessey	0: Disable Plessey

---

Register	0x0020	
Bit	Feature	
Bit 7-3	Reserved	
Bit 2	1: Enable AIM ID prefix for MSI-Plessey	0: Disable AIM ID prefix for MSI-Plessey Note: Bit4 and Bit3 of register 0x0010 must be set to "01" in order for this parameter to function.
Bit 1	1: Enable AIM ID prefix for Plessey	0: Disable AIM ID prefix for Plessey Note: Bit4 and Bit3 of register 0x0010 must be set to "01" in order for this parameter to function.
Bit 0	1: Enable AIM ID prefix for Codabar	0: Disable AIM ID prefix for Codabar Note: Bit4 and Bit3 of register 0x0010 must be set to "01" in order for this parameter to function.
Register	0x002B, 0x2A	
Bit	Feature	
Bit 15-13	Reserved	
Bit 12-0	0x09C4: Baud rate 1200 0x04E2: Baud rate 2400 0x0271: Baud rate 4800 0x0139: Baud rate 9600 0x00D0: Baud rate 14400 0x009C: Baud rate 19200 0x004E: Baud rate 38400 0x0034: Baud rate 57600 0x001A: Baud rate 115200	
Register	0x004A	
Bit	Feature	
Bit 7-5	Reserved	
Bit 4	0: 752*480 image	1: 640*480 image
Bit 3-2	00: Decode unmirrored Data Matrix only	01: Decode mirrored Data Matrix only 10/11: Decode both
Bit 1	1: Decode Data Matrix starting with the character whose ASCII value is 129 0: Do not decode Data Matrix starting with the character whose ASCII value is 129	
Bit 0	1: Decode Data Matrix with FNC1 0: Do not decode Data Matrix with FNC1	



Register	0x004B		
Bit	Feature		
Bit 7-2	Reserved		
Bit 1	1: Decode rectangular Data Matrix	0: Do not decode rectangular Data Matrix	
Bit 0	Reserved		
Register	0x0060		
Bit	Feature		
Bit 7	Reserved		
Bit 6-5	Terminating Character Suffix: 00/11: CR (0x0D)                      01: CRLF (0x0D,0x0A)                      10: TAB (0x09)		
Bit 4	Reserved		
Bit 3	1: Caps Lock ON	0: Caps Lock OFF	
Bit 2-1	00: Standard Keyboard 10/11: Function Key Mapping	01: Emulate ALT+Keypad	
Bit 0	1: Enable terminating character suffix	0: Disable terminating character suffix	
Register	0x006B		
Bit	Feature		
Bit 7-0	USB country keyboard types 00: U.S.                      01: Belgium                      02: Brazil 03: Canada                      04: Czech                      05: Denmark 06: Denmark                      07: France                      08: Austria 09: Greece                      0A: Hungary                      0B: Israel 0C: Italy                      0D: Latin America                      0E: Netherland 0F: Norway                      10: Poland                      11: Portugal 12: Romania                      13: Russia                      15: Slovakia 16: Spain                      17: Sweden                      18: Switzerland 19: Turkey1                      1A: Turkey2                      1B: UK 1C: Japan		

---

<b>Register</b>	<i>0x006F</i>	
<b>Bit</b>	<b>Feature</b>	
Bit 7-6	Inter-keystroke delay 00: No delay 10: Medium delay (10ms)	01: Short delay (5ms) 11: Long delay (15ms)
Bit 5-4	Convert case 00: No case conversion      10: Convert All to Upper Case      11: Convert All to Lower Case	
Bit 3	Reserved	
Bit 2	1: Emulate numeric keypad	0: Do not emulate numeric keypad
Bit 1-0	Reserved	
<b>Register</b>	<i>0x008A</i>	
<b>Bit</b>	<b>Feature</b>	
Bit 7-1	Reserved	
Bit 0	1: Visible Code ID (original+0x40)	0: Original Code ID
<b>Register</b>	<i>0x0099</i>	
<b>Bit</b>	<b>Feature</b>	
Bit 7-4	Reserved	
Bit 3	1: Decode mirrored Micro QR	0: Do not decode mirrored Micro QR
Bit 2	1: Enable Micro QR	0: Disable Micro QR
Bit 1	1: Enable AIM ID prefix for QR	0: Disable AIM ID prefix for QR
Bit 0	Reserved	

---

---

## Programming Barcode Data

Programming barcode data (e.g. WFFD980) can be transmitted to the Host. To enable this feature, scan the barcode below. After the feature is enabled, programming barcodes will be handled as non-programming barcodes and they cannot be used to configure the scan engine. The barcode data will be sent to the Host when a programming barcode is scanned and decoded. By default, the XL-3956 does not transmit programming barcode data.

After the engine is powered down and re-energized, this feature will be automatically disabled (i.e. the engine does not transmit programming barcode data) and the ability of programming barcodes to configure the engine will be restored.



**Transmit Programming Barcode Data**

## Factory Defaults

Scanning the following barcode can restore the engine to the factory defaults. See **Appendix A: Factory Defaults Table** for more information.

**Note:** Use this feature with discretion.



**Restore All Factory Defaults**

## Chapter 2 Communication Interface

The XL-3956 series provides a TTL-232 interface XL-3956 and a USB interface (XL-3956) to communicate with the host device. The host device can receive scanned data and send commands to control the engine or to access/alter the configuration information of the engine via the TTL-232 interface.

### TTL-232 Interface (for XL-3956)

Serial communication interface is usually used to connect the engine to a host device (like PC, POS). When the XL-3956 is connected to a host device through its TTL-232 interface, **Serial Communication** is enabled by default. However, to ensure smooth communication and accuracy of data, communication parameters (including baud rate, parity check, data bit and stop bit) on the engine must match those on the host device.

The serial communication interface provided by the engine is based on TTL-level signals. TTL-232 can be used for most application architectures. For those requiring RS-232, an external conversion circuit is needed.

Listed below are the engine's default serial communication parameters, among which only baud rate can be altered.

Parameter	Factory Default
Serial Communication	Standard TTL-232
Baud Rate	9600
Parity Check	None
Number of Data Bits	8
Number of Stop Bits	1
Hardware Flow Control	None

---

## Baud Rate

Baud rate is the number of bits of data transmitted per second. Set the baud rate to match the Host requirements.



WFFD9D3

**\*\* 9600**



WFFD9D0

**1200**



WFFD9D5

**19200**



WFFD9D1

**2400**



WFFD9D6

**38400**



WFFD9D2

**4800**



WFFD9D7

**57600**



WFFD9D4

**14400**



WFFD9D8

**115200**

---

## USB Interface (for XL-3956)

When the engine is connected to a host device through its USB interface, **USB DATAPIPE** is enabled by default. User can switch between options – **USB DATAPIPE**, **USB HID-KBW**, **USB COM Port Emulation** and **HID-POS**, upon actual need.

### USB DATAPIPE

A driver is required when using this protocol to communicate with the engine.



W030D00

**\*\* USB DATAPIPE**

### USB HID-KBW

When the engine is connected to the Host via a USB connection, you can enable the **USB HID-KBW** feature by scanning the barcode below. Then the engine's transmission will be simulated as USB keyboard input. The Host receives keystrokes on the virtual keyboard. It works on a Plug and Play basis and no driver is required.



W030D01

**USB HID-KBW**

---

---

## Standard Keyboard

When the USB HID-KBW feature is enabled, the engine selects **Standard Keyboard** by default. Besides that, the other two options are provided: **Emulate ALT+Keypad** and **Function Key Mapping**.



**\*\* Standard Keyboard**

## Emulate ALT+Keypad

When **Emulate ALT+Keypad** is enabled, any ASCII character (0x00 - 0xFF) is sent over the numeric keypad no matter which keyboard type is selected. Since sending a character involves multiple keystroke emulations, this method appears less efficient.

1. ALT Make
2. Enter the number corresponding to the ASCII character on the keypad.
3. ALT Break



**Emulate ALT+Keypad**

**Note:** It is recommended to turn on the Num Lock light on the host when using this feature.

---

## Function Key Mapping

When **Function Key Mapping** is enabled, function character (0x00 - 0x1F) are sent as ASCII sequences over the numeric keypad.

1. CTRL Make
2. Press function key (Refer to the **ASCII Function Key Mapping Table** on the following page)
3. CTRL Break



**Function Key Mapping**



---

**ASCII Function Key Mapping Table**

<b>ASCII Value (HEX)</b>	<b>Function Key</b>	<b>ASCII Value (HEX)</b>	<b>Function Key</b>
00	2	10	P
01	A	11	Q
02	B	12	R
03	C	13	S
04	D	14	T
05	E	15	U
06	F	16	V
07	G	17	W
08	H	18	X
09	I	19	Y
0A	J	1A	Z
0B	K	1B	[
0C	L	1C	\
0D	M	1D	]
0E	N	1E	6
0F	O	1F	.

---

## USB Country Keyboard Types

Keyboard layouts vary from country to country. All supported keyboard types are listed below. The default setting is US keyboard.



WFF6B00

**\*\* 1 - U.S.**



WFF6B01

**2 - Belgium**



WFF6B02

**3 - Brazil**



WFF6B03

**4 - Canada**



WFF6B04

**5 - Czech**



WFF6B05

**6 - Denmark**



WFF6B06

**7 - Finland**



WFF6B07

**8 - France**



WFF6B08

9 - Austria



WFF6B09

10 - Greece



WFF6B0A

11 - Hungary



WFF6B0B

12 - Israel



WFF6B0C

13 - Italy



WFF6B0D

14 - Latin America



WFF6B0E

15 - Netherland



WFF6B0F

16 - Norway



WFF6B10

17 - Poland



WFF6B11

18 - Portugal



WFF6B12

19 - Romania



WFF6B13

20 - Russia



WFF6B15

21 - Slovakia



WFF6B16

22 - Spain



WFF6B17

23 - Sweden



WFF6B18

24 - Switzerland



WFF6B19

25 - Turkey1



WFF6B1A

26 - Turkey 2



WFF6B1B

27 - UK



WFF6B1C

28 - Japan

---

## Beep on Unknown Character

Due to the differences in keyboard layouts, some characters contained in barcode data may be unavailable on the selected keyboard. As a result, the engine fails to transmit the unknown characters.

Scan the appropriate barcode below to enable or disable the emission of beep when an unknown character is detected.



W080E08

**\*\* Beep on Unknown Character**



W080E00

**Do Not Beep on Unknown Character**

## Inter-Keystroke Delay

This parameter specifies the delay between emulated keystrokes.



WC06F00

**\*\* No Delay**



WC06F40

**Short Delay (5ms)**



WC06F80

**Medium Delay (10ms)**



WC06FC0

**Long Delay (15ms)**

---

## Caps Lock

The **Caps Lock ON** option can invert upper and lower case characters contained in barcode data. This inversion occurs regardless of the state of Caps Lock key on the Host's keyboard.



\*\* Caps Lock OFF



Caps Lock ON

**Note:** Emulate ALT+Keypad ON/ Convert All to Upper Case/ Convert All to Lower Case prevails over Caps Lock ON.

**Example:** When the **Caps Lock ON** is selected, barcode data "AbC" is transmitted as "aBc".

---

## Convert Case

Scan the appropriate barcode below to convert all bar code data to your desired case.



W306F00

**\*\* No Case Conversion**



W306F30

**Convert All to Lower Case**



W306F20

**Convert All to Upper Case**

**Example:** When the **Convert All to Lower Case** feature is enabled, barcode data “AbC” is transmitted as “abc”.

---

## Emulate Numeric Keypad

When this feature is disabled, sending barcode data is emulated as keystroke(s) on main keyboard.

To enable this feature, scan the **Emulate Numeric Keypad** barcode. Sending a number (0-9) is emulated as keystroke on numeric keypad, whereas sending other character like "+", "\_", "\*", "/" and "." is still emulated as keystroke on main keyboard. However, this feature is influenced by the state of the Num Lock key on the host: if the Num Lock light on the host is ON, numbers are sent over numeric keypad, if it is OFF, numbers are sent over main keyboard.



**Emulate Numeric Keypad**



**\*\* Do Not Emulate Numeric Keypad**

**Note:** Make sure the Num Lock light of the Host is turned ON when using this feature.

**Emulate ALT+Keypad ON** prevails over **Emulate Numeric Keypad**.



---

## USB COM Port Emulation

If you connect the engine to the Host via a USB connection, the USB COM Port Emulation feature allows the Host to receive data in the way as a serial port does. However, you need to set communication parameters on the engine to match the Host requirements. A driver is required for this feature.



W030D02

**USB COM Port Emulation**

## HID-POS

The HID-POS interface is recommended for new application programs. It can send up to 56 characters in a single USB report and appears more efficient than USB HID-KBW.

Features:

- ✧ HID based, no custom driver required.
- ✧ Way more efficient in communication than USB HID-KBW and traditional RS-232 interface.

**Note:** HID-POS does not require a custom driver. However, a HID interface on Windows 98 does. All HID interfaces employ standard driver provided by the operating system. Use defaults when installing the driver.



W030D03

**HID-POS**

---

---

## Access the Scanner with Your Program

1. Use CreateFile to access the engine as a HID device.
2. Use ReadFile to deliver the scanned data to the application program.
3. Use WriteFile to send data to the engine.

For detailed information about USB and HID interfaces, go to [www.USB.org](http://www.USB.org).

## Acquire Scanned Data

After a barcode is decoded, the engine sends an input report as below:

Byte	Bit							
	7	6	5	4	3	2	1	0
0	Report ID = 0x02							
1	Barcode Length							
2-57	Decoded Data (1-56)							
58-61	Reserved (1-4)							
62	0x00							
63	-	-	-	-	-	-	-	Decoded Data

## VID/PID

USB uses VID (Vendor ID) and PID (Product ID) to identify and locate a device. The VID is assigned by USB Implementers Forum. SUNLUX's vendor ID is 1EAB (Hex). A range of PIDs are used for each SUNLUX product family. Every PID contains a base number and interface type (keyboard, COM port, etc.).

Product	Interface	PID (Hex)	PID (Dec)
XL-3956	USB DATAPIPE	8001	32769
	USB HID-KBW	8003	32771
	USB COM Port Emulation	8006	32774
	HID-POS	8010	32784

---

## Chapter 3 Scan Mode

### Manual Mode

**Manual Mode** (default): A trigger pull activates a decode session. The decode session continues until the barcode is decoded or the trigger is released.



**\*\*Manual Mode**

---

## Continuous Mode

**Continuous Mode:** The engine automatically activates a decode session. The decode session continues until the barcode is decoded or the decode session timeout expires. When a decode session is completed, the engine waits until the timeout between decodes expires and then starts next session. The engine continues to work in this pattern if the following situation does not happen: no barcode is presented to the engine or passed in front of it in a decode session, the engine will automatically suspend barcode reading. Pressing the trigger can suspend/resume barcode reading.



W030002

Continuous Mode

## Decode Session Timeout

This parameter sets the maximum time decode session continues during a scan attempt. It is programmable in 0.1s increments from 0.1s to 25.5s. The default timeout is 5.0s. If the parameter is set to 0, the engine scans and decodes barcode continuously. To learn how to program this parameter, see ***Appendix E: Parameter Programming Examples.***



M00031D

Decode Session Timeout

---

## Timeout between Decodes

This parameter sets the timeout between decode sessions. When a decode session ends, next session will not happen until the timeout between decodes expires. It is programmable in 0.1s increments from 0.1s to 25.5s. The default timeout is 1.0s. To learn how to program this parameter, see ***Appendix E: Parameter Programming Examples***.



Timeout between Decodes

---

## Sense Mode

**Sense Mode:** The engine waits for the image stabilization timeout to expire before activating a decode session every time it detects a change in ambient illumination. Decode session continues until the barcode is decoded or the decode session timeout expires. After a decode session ends, the engine waits for the timeout between decodes to expire before beginning to monitor ambient illumination. If no barcode is presented to the engine or passed in front of it in a decode session, the engine will automatically suspend barcode reading and start to monitor ambient illumination.

In the Sense mode, a trigger pull can also activate a decode session. The decode session continues until the barcode is decoded or the trigger is released. When the session ends, the engine will continue to monitor ambient illumination.



W030003

Sense Mode

## Decode Session Timeout

This parameter sets the maximum time decode session continues during a scan attempt. It is programmable in 0.1s increments from 0.1s to 25.5s. The default timeout is 5.0s. If the parameter is set to 0, the engine scans and decodes barcode continuously. To learn how to program this parameter, see ***Appendix E: Parameter Programming Examples***.



M00031D

Decode Session Timeout

---

---

## Timeout between Decodes

After a decode session ends, the engine waits for the timeout between decodes to expire before beginning to monitor ambient illumination. This parameter is programmable in 0.1s increments from 0.1s to 25.5s. The default timeout is 1.0s. To learn how to program this parameter, see ***Appendix E: Parameter Programming Examples***.



Timeout between Decodes

## Image Stabilization Timeout

The engine waits for the image stabilization timeout to expire before activating a decode session every time it detects a change in ambient illumination. This parameter is programmable in 0.1s increments from 0.1s to 25.5s. The default timeout is 0.4s. To learn how to program this parameter, see ***Appendix E: Parameter Programming Examples***.



Image Stabilization Timeout

---

## Sensitivity

Sensitivity specifies the degree of acuteness of the engine's response to changes in ambient illumination. The higher the sensitivity, the lower requirement in illumination change to trigger the engine. You can select an appropriate degree of sensitivity that fits the ambient environment. The default setting is **Medium Sensitivity**.



WFF0308

High Sensitivity



WFF0320

\*\* Medium Sensitivity



WFF0340

Low Sensitivity

Sensitivity levels range from 0 to 255. The smaller the number, the higher the sensitivity.

User can select a desired sensitivity level that helps achieve greater efficiency. To learn how to program this parameter, see **Appendix E: Parameter Programming Examples**.



M00031A

Custom Sensitivity



---

## Command Trigger Mode

**Command Trigger Mode:** Decode session is activated by a host command (i.e. set the bit0 of register 0x0002 to “1”). The decode session continues until the barcode is decoded or the decode session timeout expires.



W030001

Command Trigger Mode

## Decode Session Timeout

This parameter sets the maximum time decode session continues during a scan attempt. It is programmable in 0.1s increments from 0.1s to 25.5s. The default timeout is 5.0s. If the parameter is set to 0, the engine scans and decodes barcode continuously. To learn how to program this parameter, see ***Appendix E: Parameter Programming Examples***.



M00031D

Decode Session Timeout

## Chapter 4 Illumination & Aiming

### Illumination

A couple of illumination options are provided to improve the lighting conditions during every image capture:

**Normal** (default): Illumination LED is turned on during image capture.

**Always ON**: Illumination LED keeps ON after the engine is powered on.

**OFF**: Illumination LED is OFF all the time.



W0C0004

\*\* Normal



W0C0000

OFF



W0C000C

Always ON

---

## Aiming

When scanning/capturing image, the engine projects an aiming beam which allows positioning the target barcode within its field of view and thus makes decoding easier.

**Normal** (default): The engine projects an aiming beam only during barcode scanning/capture.

**Always ON:** Aiming beam is constantly ON after the engine is powered on.

**OFF:** Aiming beam is OFF all the time.



W300010

**\*\* Normal**



W300000

**OFF**



W300030

**Always ON**

## Chapter 5 Notification

### Mute Mode

Scanning the **Enable Mute Mode** can turn off all notification beeps. By default, mute mode is disabled.



W400000

**Enable Mute Mode**



W400040

**\*\*Disable Mute Mode**

### Good Read Beep



W040E04

**\*\* Good Read Beep On**



W040E00

**Good Read Beep Off**

---

## Good Read Beep Frequency



WFF09DA

Low



WFF094B

\*\* Medium



WFF0925

High

## Good Read Beep Duration



WFF0A1F

40ms



WFF0A3E

\*\*80ms



WFF0A5D

120ms

---

## Decode Result Notification

When enabled, if a barcode does not decode, "F" is transmitted; if a barcode is decoded, "S" is appended to the barcode data as the most left character.



**Enable Decode Result Notification**



**\*\* Disable Decode Result Notification**

# Chapter 6 Data Formatting

In many applications, barcode data needs to be edited and distinguished from one another.

Usually AIM ID and Code ID can be used as identifiers, but in some special cases terminating character suffix like Carriage Return or Line Feed can also be the alternative.

The engine can be configured to transmit barcode data in the following format:

[“F”/ “S”] + [Code ID] + [AIM ID] + [DATA] + [terminating character]

Note: [DATA] must be transmitted while user can decide whether to transmit any of the rest parts.

[“F”/ “S”]: decode result notification.

## AIM ID Prefix

AIM (Automatic Identification Manufacturers) IDs define symbology identifiers and data carrier identifiers. For the details, see **Appendix B: AIM ID Table**. If AIM ID prefix is enabled, the engine will add the symbology identifier before the scanned data after decoding.



Enable AIM ID Prefix



\*\* Disable AIM ID Prefix

---

## CODE ID Prefix

Code ID can also be used to identify barcode type. For more information, refer to **Appendix C: Code ID Table**.



Enable CODE ID Prefix



\*\* Disable CODE ID Prefix

User can choose to transmit original CODE ID or visible CODE ID by scanning the appropriate barcode below.



\*\* Original CODE ID



Visible CODE ID



---

## Terminating Character Suffix

A terminating character such as carriage return (CR) or carriage return/line feed pair (CRLF) or horizontal tab (TAB) can be used to mark the end of data.



W616000

**\*\* Disable Terminating Character Suffix**



W616001

**Append CR**



W616021

**Append CRLF**



W616041

**Append TAB**

## Chapter 7 Symbologies

### General Settings

#### Enable/Disable All Symbologies

If all symbologies are disabled, the engine can only identify programming barcodes.



WFFD981

**Enable All Symbologies**



WFFD982

**Disable All Symbologies**

#### Enable/Disable 1D Symbologies



WFFD983

**Enable 1D Symbologies**



WFFD984

**Disable 1D Symbologies**

#### Enable/Disable 2D Symbologies



WFFD985

**Enable 2D Symbologies**



WFFD986

**Disable 2D Symbologies**

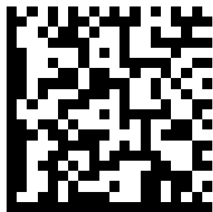
---

## Video Reverse

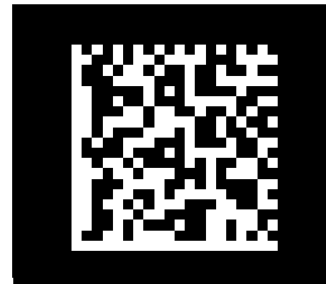
Regular barcode: Dark image on a bright background.

Inverse barcode: Bright image on a dark background.

The examples of regular barcode and inverse barcode are shown below.



Regular Barcode



Inverse Barcode

Video Reverse is used to allow the engine to read barcodes that are inverted.

**Video Reverse ON:** Read both regular barcodes and inverse barcodes.

**Video Reverse OFF** (default): Read regular barcodes only.

The engine shows a slight decrease in scanning speed when Video Reverse is ON.



W100210

**Video Reverse ON**



W100200

**\*\* Video Reverse OFF**

---

# 1D Symbologies

## Code 128

### Restore Factory Defaults



Restore the Factory Defaults of Code 128

### Enable/Disable Code 128



\*\* Enable Code 128



Disable Code 128

---

## UCC/EAN-128 (GS1-128)

### Restore Factory Defaults



WFFD991

Restore the Factory Defaults of UCC/EAN-128

### Enable/Disable UCC/EAN-128



W011701

\*\* Enable UCC/EAN-128



W011700

Disable UCC/EAN-128

---

## AIM 128

### Restore Factory Defaults



WFFD992

Restore the Factory Defaults of AIM 128

### Enable/Disable AIM 128



W101610

\*\* Enable AIM 128



W101600

Disable AIM 128

---

## EAN-8

### Restore Factory Defaults



WFFD994

Restore the Factory Defaults of EAN-8

### Enable/Disable EAN-8



W011301

\*\* Enable EAN-8



W011300

Disable EAN-8

### Transmit Check Digit

EAN-8 is 8 digits in length with the last one as its check digit used to verify the integrity of the data.



W041304

\*\* Transmit EAN-8 Check Digit



W041300

Do Not Transmit EAN-8 Check Digit

---

## Add-On Code

An EAN-8 barcode can be augmented with a two-digit or five-digit add-on code to form a new one. In the examples below, the part surrounded by blue dotted line is an EAN-8 barcode while the part circled by red dotted line is add-on code.



Enable 2-Digit Add-On Code



\*\* Disable 2-Digit Add-On Code



Enable 5-Digit Add-On Code



\*\* Disable 5-Digit Add-On Code

**Enable 2-Digit Add-On Code/ Enable 5-Digit Add-On Code:** The engine decodes a mix of EAN-8 barcodes with and without 2-digit/5-digit add-on codes.

**Disable 2-Digit Add-On Code/ Disable 5-Digit Add-On Code:** The engine decodes EAN-8 and ignores the add-on code when presented with an EAN-8 plus add-on barcode. It can also decode EAN-8 barcodes without add-on codes.



---

### Add-On Code Required

When **EAN-8 Add-On Code Required** is selected, the engine will only read EAN-8 barcodes that contain add-on codes.



**EAN-8 Add-On Code Required**



**\*\* EAN-8 Add-On Code Not Required**

### EAN-8 Extension

**Disable EAN-8 Zero Extend:** Transmit EAN-8 barcodes as is.

**Enable EAN-8 Zero Extend:** Add five leading zeros to decoded EAN-8 barcodes to extend to 13 digits.



**Enable EAN-8 Zero Extend**



**\*\* Disable EAN-8 Zero Extend**

---

## EAN-13

### Restore Factory Defaults



WFFD995

Restore the Factory Defaults of EAN-13

### Enable/Disable EAN-13



W011101

\*\* Enable EAN-13



W011100

Disable EAN-13

### Transmit Check Digit

EAN-13 is 13 digits in length with the last one as its check digit used to verify the integrity of the data.



W041104

\*\* Transmit EAN-13 Check Digit



W041100

Do Not Transmit EAN-13 Check Digit

---

## Add-On Code

An EAN-13 barcode can be augmented with a two-digit or five-digit add-on code to form a new one. In the examples below, the part surrounded by blue dotted line is an EAN-13 barcode while the part circled by red dotted line is add-on code.



Enable 2-Digit Add-On Code



\*\* Disable 2-Digit Add-On Code



Enable 5-Digit Add-On Code



\*\* Disable 5-Digit Add-On Code

**Enable 2-Digit Add-On Code/ Enable 5-Digit Add-On Code:** The engine decodes a mix of EAN-13 barcodes with and without 2-digit/5-digit add-on codes.

**Disable 2-Digit Add-On Code/ Disable 5-Digit Add-On Code:** The engine decodes EAN-13 and ignores the add-on code when presented with an EAN-13 plus add-on barcode. It can also decode EAN-13 barcodes without add-on codes.

---

### **Add-On Code Required**

When **EAN-13 Add-On Code Required** is selected, the engine will only read EAN-13 barcodes that contain add-on codes.



W081108

**EAN-13 Add-On Code Required**



W081100

**\*\* EAN-13 Add-On Code Not Required**

---

## ISSN

### Restore Factory Defaults



WFFD996

Restore the Factory Defaults of ISSN

### Enable/Disable ISSN



W401140

Enable ISSN



W401100

\*\* Disable ISSN

---

## ISBN

### Restore Factory Defaults



WFFD997

Restore the Factory Defaults of ISBN

### Enable/Disable ISBN



W011201

\*\* Enable ISBN



W011200

Disable ISBN

### Set ISBN Format



W041200

\*\* ISBN-13



W041204

ISBN-10

---

## UPC-E

### Restore Factory Defaults



WFFD998

Restore the Factory Defaults of UPC-E

### Enable/Disable UPC-E



W011501

\*\* Enable UPC-E



W011500

Disable UPC-E

### Transmit Check Digit

UPC-E is 8 digits in length with the last one as its check digit used to verify the integrity of the data.



W041504

\*\* Transmit UPC-E Check Digit



W041500

Do Not Transmit UPC-E Check Digit

---

## Add-On Code

A UPC-E barcode can be augmented with a two-digit or five-digit add-on code to form a new one. In the examples below, the part surrounded by blue dotted line is a UPC-E barcode while the part circled by red dotted line is add-on code.



Enable 2-Digit Add-On Code



\*\* Disable 2-Digit Add-On Code



Enable 5-Digit Add-On Code



\*\* Disable 5-Digit Add-On Code

**Enable 2-Digit Add-On Code/ Enable 5-Digit Add-On Code:** The engine decodes a mix of UPC-E barcodes with and without 2-digit/5-digit add-on codes.

**Disable 2-Digit Add-On Code/ Disable 5-Digit Add-On Code:** The engine decodes UPC-E and ignores the add-on code when presented with a UPC-E plus add-on barcode. It can also decode UPC-E barcodes without add-on codes.



---

### Add-On Code Required

When **UPC-E Add-On Code Required** is selected, the engine will only read UPC-E barcodes that contain add-on codes.



**UPC-E Add-On Code Required**



**\*\* UPC-E Add-On Code Not Required**

### Transmit System Character

The first character of UPC-E barcode is the system character "0".



**Transmit System Character "0"**



**\*\* Do Not Transmit System Character "0"**

### UPC-E Extension

**Disable UPC-E Extend:** Transmit UPC-E barcodes as is.

**Enable UPC-E Extend:** Extend UPC-E barcodes to make them compatible in length to UPC-A.



**Enable UPC-E Extend**



**\*\*Disable UPC-E Extend**

---

## UPC-A

### Restore Factory Defaults



WFFD999

Restore the Factory Defaults of UPC-A

### Enable/Disable UPC-A



W011401

\*\* Enable UPC-A



W011400

Disable UPC-A

### Transmit Check Digit

UPC-A is 13 digits in length with the last one as its check digit used to verify the integrity of the data.



W041404

\*\* Transmit UPC-A Check Digit



W041400

Do Not Transmit UPC-A Check Digit

---

## Add-On Code

A UPC-A barcode can be augmented with a two-digit or five-digit add-on code to form a new one. In the examples below, the part surrounded by blue dotted line is a UPC-A barcode while the part circled by red dotted line is add-on code.



Enable 2-Digit Add-On Code



\*\* Disable 2-Digit Add-On Code



Enable 5-Digit Add-On Code



\*\* Disable 5-Digit Add-On Code

**Enable 2-Digit Add-On Code/ Enable 5-Digit Add-On Code:** The engine decodes a mix of UPC-A barcodes with and without 2-digit/5-digit add-on codes.

**Disable 2-Digit Add-On Code/ Disable 5-Digit Add-On Code:** The engine decodes UPC-A and ignores the add-on code when presented with a UPC-A plus add-on barcode. It can also decode UPC-A barcodes without add-on codes.

---

---

### Add-On Code Required

When **UPC-A Add-On Code Required** is selected, the engine will only read UPC-A barcodes that contain add-on codes.



W101410

**UPC-A Add-On Code Required**



W101400

**\*\* UPC-A Add-On Code Not Required**

### Transmit Preamble Character



W081408

**Transmit Preamble Character "0"**



W081400

**\*\* Do Not Transmit Preamble Character "0"**

**Note:** The preamble character "0" usually does not appear in printed UPC-A barcodes.

---

## Interleaved 2 of 5

### Restore Factory Defaults



WFFD99A

Restore the Factory Defaults of Interleaved 2 of 5

### Enable/Disable Interleaved 2 of 5



W011801

\*\* Enable Interleaved 2 of 5



W011800

Disable Interleaved 2 of 5

---

## Check Digit Verification

A check digit is optional for Interleaved 2 of 5 and can be added as the last digit. It is a calculated value used to verify the integrity of the data.

**Disable:** The engine transmits Interleaved 2 of 5 barcodes as is.

**Do Not Transmit Check Digit After Verification:** The engine checks the integrity of all Interleaved 2 of 5 barcodes to verify that the data complies with the check digit algorithm. Barcodes passing the check will be transmitted except the last digit, whereas those failing it will not be transmitted.

**Transmit Check Digit After Verification:** The engine checks the integrity of all Interleaved 2 of 5 barcodes to verify that the data complies with the check digit algorithm. Barcodes passing the check will be transmitted, whereas those failing it will not be transmitted.



W0C1800

\*\* Disable



W0C1804

Do Not Transmit Check Digit After Verification



W0C180C

Transmit Check Digit After Verification

---

### Transmit Appended "0"

If an Interleaved 2 of 5 barcode contains an odd number of characters, a leading zero must be appended. Scan the appropriate barcode to choose whether to transmit the appended "0".



**\*\* Transmit Appended "0"**



**Do Not Transmit Appended "0"**

---

## ITF-6

ITF-6 is a special kind of Interleaved 2 of 5 with a length of 6 characters and the last character as the check character.



WFFD99B

**Restore the Factory Defaults of ITF-6**



W011900

**\*\* Disable ITF-6**



W051901

**Enable ITF-6 But Do Not Transmit Check Digit**



W051905

**Enable ITF-6 and Transmit Check Digit**

**Note:** It is advisable not to enable ITF-6 and Interleaved 2 of 5 at the same time.



---

## ITF-14

ITF-14 is a special kind of Interleaved 2 of 5 with a length of 14 characters and the last character as the check character.



WFFD99C

Restore the Factory Defaults of ITF-14



W201800

Disable ITF-14



WA01820

Enable ITF-14 But Do Not Transmit Check Digit



WA018A0

\*\* Enable ITF-14 and Transmit Check Digit

**Note:** It is advisable not to enable ITF-14 and Interleaved 2 of 5 at the same time.

---

## Matrix 2 of 5

### Restore Factory Defaults



WFFD99F

Restore the Factory Defaults of Matrix 2 of 5

### Enable/Disable Matrix 2 of 5



W011A01

\*\* Enable Matrix 2 of 5



W011A00

Disable Matrix 2 of 5

---

**Check Digit Verification**



**\*\* Disable**



**Do Not Transmit Check Digit After Verification**



**Transmit Check Digit After Verification**

---

## Industrial 25

### Restore Factory Defaults



WFFD9A0

Restore the Factory Defaults of Industrial 25

### Enable/Disable Industrial 25



W081908

\*\* Enable Industrial 25



W081900

Disable Industrial 25

---

**Check Digit Verification**



**\*\* Disable**



**Do Not Transmit Check Digit After Verification**



**Transmit Check Digit After Verification**

---

## Standard 25

### Restore Factory Defaults



WFFD9A1

Restore the Factory Defaults of Standard 25

### Enable/Disable Standard 25



W101A10

\*\* Enable Standard 25



W101A00

Disable Standard 25

---

**Check Digit Verification**



**\*\* Disable**



**Do Not Transmit Check Digit After Verification**



**Transmit Check Digit After Verification**

---

## Code 39

### Restore Factory Defaults



WFFD9A2

Restore the Factory Defaults of Code 39

### Enable/Disable Code 39



W011C01

\*\* Enable Code 39



W011C00

Disable Code 39

### Transmit Start/Stop Character



W041C04

Transmit Start/Stop Character



W041C00

\*\* Do Not Transmit Start/Stop Character



---

## Check Digit Verification



W081C00

**\*\* Disable**



W181C08

**Do Not Transmit Check Digit After Verification**



W181C18

**Transmit Check Digit After Verification**

## Enable/Disable Code 39 Full ASCII

The engine can be configured to identify all ASCII characters by scanning the appropriate barcode below.



W201C20

**Enable Code 39 Full ASCII**



W201C00

**\*\* Disable Code 39 Full ASCII**

---

## Codabar

### Restore Factory Defaults



WFFD9A3

Restore the Factory Defaults of Codabar

### Enable/Disable Codabar



W011E01

\*\* Enable Codabar



W011E00

Disable Codabar

---

## Check Digit Verification



W101E00

\*\* Disable



W301E10

Do Not Transmit Check Digit After Verification



W301E30

Transmit Check Digit After Verification

## Transmit Start/Stop Character



W021E02

\*\* Transmit Start/Stop Character



W021E00

Do Not Transmit Start/Stop Character

---

## Start/Stop Character Format



W0C1E00

**\*\* ABCD/ABCD as the Start/Stop Character**



W0C1E04

**ABCD/TN\*E as the Start/Stop Character**



W0C1E08

**abcd/abcd as the Start/Stop Character**



W0C1E0C

**abcd/tn\*e as the Start/Stop Character**

---

## Code 93

### Restore Factory Defaults



WFFD9A4

Restore the Factory Defaults of Code 93

### Enable/Disable Code 93



W081208

\*\* Enable Code 93



W081200

Disable Code 93

---

**Check Digit Verification**



**Disable**



**\*\* Do Not Transmit Check Digit After Verification**



**Transmit Check Digit After Verification**

---

## Code 11

### Restore Factory Defaults



WFFD9A5

Restore the Factory Defaults of Code 11

### Enable/Disable Code 11



W011D01

\*\* Enable Code 11



W011D00

Disable Code 11

---

## Check Digit Verification



W1C1D00

Disable



W1C1D04

\*\* One Check Digit, MOD11



W1C1D08

Two Check Digits, MOD11/MOD11



W1C1D0C

Two Check Digits, MOD11/MOD9



W1C1D10

One Check Digit, MOD11 (Len <= 11)  
Two Check Digits, MOD11/MOD11 (Len > 11)



W1C1D14

One Check Digit, MOD11 (Len <= 11)  
Two Check Digits, MOD11/MOD9 (Len > 11)



W201D20

\*\* Transmit Check Digit



W201D00

Do Not Transmit Check Digit



---

## Plessey

### Restore Factory Defaults



WFFD9A6

Restore the Factory Defaults of Plessey

### Enable/Disable Plessey



W011F01

\*\* Enable Plessey



W011F00

Disable Plessey

---

**Check Digit Verification**



W021F00

Disable



W061F02

**\*\* Do Not Transmit Check Digit After Verification**



W061F06

**Transmit Check Digit After Verification**

---

## MSI-Plessey

### Restore Factory Defaults



WFFD9A7

Restore the Factory Defaults of MSI-Plessey

### Enable/Disable MSI-Plessey



W081F08

\*\* Enable MSI-Plessey



W081F00

Disable MSI-Plessey

---

## Check Digit Verification



W301F00

Disable



W301F10

\*\* One Check Digit, MOD10



W301F20

Two Check Digits, MOD10/MOD10



W301F30

Two Check Digits, MOD10/MOD11



W401F40

\*\* Transmit Check Digit



W401F00

Do Not Transmit Check Digit

---

## RSS-14

### Restore Factory Defaults



WFFD9A8

Restore the Factory Defaults of RSS-14

### Enable/Disable RSS-14



W011B01

\*\* Enable RSS-14



W011B00

Disable RSS-14

### Transmit Application Identifier "01"



W041B04

\*\* Transmit Application Identifier "01"



W041B00

Do Not Transmit Application Identifier "01"

---

## RSS-Limited

### Restore Factory Defaults



WFFD9A9

Restore the Factory Defaults of RSS-Limited

### Enable/Disable RSS-Limited



W081B08

\*\* Enable RSS-Limited



W081B00

Disable RSS-Limited

### Transmit Application Identifier "01"



W201B20

\*\* Transmit Application Identifier "01"



W201B00

Do Not Transmit Application Identifier "01"

---

## RSS-Expand

### Restore Factory Defaults



WFFD9AA

Restore the Factory Defaults of RSS-Expand

### Enable/Disable RSS-Expand



W401B40

\*\* Enable RSS-Expand



W401B00

Disable RSS-Expand

---

## 2D Symbologies

PDF417

Restore Factory Defaults



Restore the Factory Defaults of PDF417

Enable/Disable PDF417



**\*\*Enable PDF417**



**Disable PDF417**



---

## Data Matrix

### Restore Factory Defaults



WFFD9B1

Restore the Factory Defaults of Data Matrix

### Enable/Disable Data Matrix



W080C08

\*\*Enable Data Matrix



W080C00

Disable Data Matrix

### Rectangular Barcodes



W034B03

\*\* Decode Rectangular Barcodes



W034B00

Do Not Decode Rectangular Barcodes

---

**Mirror Images**



**\*\* Decode Unmirrored DM Only**



**Decode Mirrored DM Only**



**Decode Both**

---

## QR Code

### Restore Factory Defaults



WFFD9B2

Restore the Factory Defaults of QR Code

### Enable/Disable QR Code



W800D80

**\*\*Enable QR Code**



W800D00

**Disable QR Code**

### Micro QR



W049904

**\*\*Enable Micro QR**



W049900

**Disable Micro QR**

---

**Mirrored Micro QR**



W089908

**Decode Mirrored Micro QR**



W089900

**\*\* Do Not Decode Mirrored Micro QR**

# Appendix

## Appendix A: Factory Defaults Table

Parameter	Factory Default	Remark
<b>Programming Barcode</b>		
Barcode Programming	Enabled	
Programming Barcode Data	Do not send	If Send Programming Barcode Data is enabled, barcode programming will be disabled.
<b>Communication Interfaces</b>		
TTL-232 Interface	Baud Rate	9600
	Parity Check	None
	Number of Data Bits	8
	Number of Stop Bits	1
	Hardware Flow Control	None
USB Interface	USB DATAPIPE	Other options: USB HID-KBW, USB COM Port Emulation, HID-POS.
USB HID-KBW	Input Mode	Standard Keyboard
	USB Country Keyboard Type	U.S.
	Beep on Unknown Character	Enabled
	Inter-Keystroke Delay	No delay
	Caps Lock	Disabled
	Convert Case	No conversion
	Emulate Numeric Keypad	Disabled
<b>Scan Mode</b>		
Scan Mode	Manual mode	Other options: Continuous Mode, Sense Mode, Command Trigger Mode.

Continuous Mode	Decode Session Timeout	5.0s	0.1-25.5s; 0: infinite.
	Timeout between Decodes	1.0s	0-25.5s
Sense Mode	Decode Session Timeout	5.0s	0.1-25.5s; 0: infinite.
	Timeout between Decodes	1.0s	0-25.5s
	Image Stabilization Timeout	0.4s	0-25.5s
	Sensitivity	Medium	
Command Trigger Mode	Decode Session Timeout	5.0s	0.1-25.5s; 0: infinite.
<b>Illumination &amp; Aiming</b>			
Illumination		Normal	Turn on when scanning barcode
Aiming		Normal	Turn on when scanning barcode
<b>Notification</b>			
Mute Mode		Disabled	
Good Read Beep	Beep on Good Read	Enabled	
	Beep Frequency	Medium	
	Beep Duration	80ms	Other options: 40ms, 120ms.
Decode Result Notification		Disabled	"S": Good read; "F": No read.
<b>Data Formatting</b>			
AIM ID Prefix		Disabled	
Code ID Prefix		Disabled	
Code ID Type		Original Code ID	
Terminating Character Suffix		Disabled	Terminating character options:CR, CRLF, TAB.

Parameter	Factory Default	Remark
<b>Symbologies</b>		
Video Reverse	Disabled	Applicable to all symbologies.
<b>Code 128</b>		
Code 128	Enabled	
<b>UCC/EAN-128 (GS1-128)</b>		
UCC/EAN-128	Enabled	
<b>AIM 128</b>		
AIM 128	Enabled	
<b>EAN-8</b>		
EAN-8	Enabled	
Check Digit	Transmit	
2-Digit Add-On Code	Disabled	
5-Digit Add-On Code	Disabled	
Add-On Code	Not required	
Extend to EAN-13	Disabled	
<b>EAN-13</b>		
EAN-13	Enabled	
Check Digit	Transmit	
2-Digit Add-On Code	Disabled	
5-Digit Add-On Code	Disabled	
Add-On Code	Not required	
<b>ISSN</b>		
ISSN	Disabled	
<b>ISBN</b>		
ISBN	Enabled	
ISBN Format	ISBN-13	

Parameter	Factory Default	Remark
<b>UPC-E</b>		
UPC-E	Enabled	
Check Digit	Transmit	
2-Digit Add-On Code	Disabled	
5-Digit Add-On Code	Disabled	
Add-On Code	Not required	
Extend to UPC-A	Disabled	
System Character "0"	Do not transmit	
<b>UPC-A</b>		
UPC-A	Enabled	
Check Digit	Transmit	
2-Digit Add-On Code	Disabled	
5-Digit Add-On Code	Disabled	
Add-On Code	Not required	
Preamble Character "0"	Do not transmit	
<b>Interleaved 2 of 5</b>		
Interleaved 2 of 5	Enabled	
Check Digit Verification	Disabled	
Check Digit	Do not transmit	
Appended "0"	Transmit	For Interleaved 2 of 5 barcodes that contain an odd number of characters
<b>ITF-6</b>		
ITF-6	Disabled	
Check Digit	Do not transmit	
<b>ITF-14</b>		
ITF-14	Enabled	
Check Digit	Transmit	
<b>Matrix 2 of 5</b>		
Matrix 2 of 5	Enabled	
Check Digit Verification	Disabled	
Check Digit	Do not transmit	



Parameter	Factory Default	Remark
<b>Industrial 25</b>		
Industrial 25	Enabled	
Check Digit Verification	Disabled	
Check Digit	Do not transmit	
<b>Standard 25</b>		
Standard 25	Enabled	
Check Digit Verification	Disabled	
Check Digit	Do not transmit	
<b>Code 39</b>		
Code 39	Enabled	
Check Digit Verification	Disabled	
Check Digit	Do not transmit	
Start/Stop Character	Do not transmit	
Code 39 Full ASCII	Disabled	
<b>Codabar</b>		
Codabar	Enabled	
Check Digit Verification	Disabled	
Check Digit	Do not transmit	
Start/Stop Character	Transmit	
Start/Stop Character Format	ABCD/ABCD	
<b>Code 93</b>		
Code 93	Enabled	
Check Digit Verification	Enabled	
Check Digit	Do not transmit	
<b>Code 11</b>		
Code 11	Enabled	
Check Digit Verification	One check digit, MOD11	
Check Digit	Transmit	

Parameter	Factory Default	Remark
<b><i>Plessey</i></b>		
Plessey	Enabled	
Check Digit Verification	Enabled	
Check Digit	Do not transmit	
<b><i>MSI-Plessey</i></b>		
MSI-Plessey	Enabled	
Check Digit Verification	One check digit, MOD10	
Check Digit	Transmit	
<b><i>RSS-14</i></b>		
RSS-14	Enabled	
AI (Application Identifier)	Transmit	
<b><i>RSS-Limited</i></b>		
RSS-Limited	Enabled	
AI (Application Identifier)	Transmit	
<b><i>RSS-Expand</i></b>		
RSS-Expand	Enabled	
<b><i>PDF417</i></b>		
PDF417	Enabled	
<b><i>Data Matrix</i></b>		
Data Matrix	Enabled	
Rectangular Barcodes	Decode	
Mirror Images	Decode unmirrored DM only	
<b><i>QR Code</i></b>		
QR Code	Enabled	
Micro QR	Enabled	
Mirrored Micro QR	Do not decode	

## Appendix B: AIM ID Table

Symbology	AIM ID	Remark
Code 128	]C0	Standard Code 128
UCC/EAN 128 (GS1-128)	]C1	FNC1 is the character right after the start character
AIM 128	]C2	FNC1 is the 2nd character after the start character
EAN-8	]E4	Standard EAN-8
	]E4....]E1...	EAN-8 + 2-Digit Add-On Code
	]E4....]E2...	EAN-8 + 5-Digit Add-On Code
EAN-13	]E0	Standard EAN-13
	]E3	EAN-13 + 2/5-Digit Add-On Code
ISSN	]X5	Standard ISSN
ISBN	]X4	Standard ISBN
UPC-E	]E0	Standard UPC-E
	]E3	UPC-E + 2/5-Digit Add-On Code
UPC-A	]E0	Standard UPC-A
	]E3	UPC-A + 2/5-Digit Add-On Code
Interleaved 2 of 5	]I0	No check digit verification
	]I1	Transmit check digit after verification
	]I3	Do not transmit check digit after verification
ITF-6	]I1	Transmit check digit
	]I3	Do not transmit check digit
ITF-14	]I1	Transmit check digit
	]I3	Do not transmit check digit
Matrix 2 of 5	]X1	No check digit verification
	]X2	Transmit check digit after verification
	]X3	Do not transmit check digit after verification
Industrial 25	]S0	Not specified
Standard 25	]R0	No check digit verification
	]R8	One check digit, MOD 7; do not transmit check digit
	]R9	One check digit, MOD 7; transmit check digit

Symbology	AIM ID	Remark
Code 39	JA0	Transmit barcodes as is; Full ASCII disabled; no check digit verification
	JA1	One check digit, MOD 43; transmit check digit
	JA3	One check digit, MOD 43; do not transmit check digit
	JA4	Full ASCII enabled; no check digit verification
	JA5	Full ASCII enabled; MOD43; transmit check digit
	JA7	Full ASCII enabled; MOD43; do not transmit check digit
Codabar	JF0	Standard Codabar
	JF2	Transmit check digit after verification
	JF4	Do not transmit check digit after verification
Code 93	JG0	Not specified
Code 11	JH0	One check digit, MOD11; transmit check digit
	JH1	Two check digits, MOD11/MOD11; transmit check digit
	JH3	Do not transmit check digit after verification
	JH8	Two check digits, MOD11/MOD9; transmit check digit
	JH9	No check digit verification
Plessey	JP0	Not specified
MSI Plessey	JM0	One check digit, MOD10; transmit check digit
	JM1	One check digit, MOD10; do not transmit check digit
	JM7	Two check digits, MOD10 /MOD11; do not transmit check digit
	JM8	Two check digits, MOD10 /MOD11; transmit check digit
	JM9	No check digit verification
RSS-14/RSS-Limited RSS-Expand	Je0	
PDF417	JL0	Comply with 1994 PDF417 specifications
Data Matrix	jd0	ECC 000 - 140
	jd1	ECC 200
	jd2	ECC 200; FNC1 is the 1st or 5th character after the start character
	jd3	ECC 200; FNC1 is the 2nd or 6th character after the start character
	jd4	ECC 200, ECI protocol supported
	jd5	ECC 200; FNC1 is the 1st or 5th character after the start character;

Symbology	AIM ID	Remark
		ECI supported
	]d6	ECC 200; FNC1 is the 2nd or 6th character after the start character; ECI supported
QR Code	]Q0	QR1 (comply with AIM ISS 97-001 specifications)
	]Q1	QR2 (2005 symbol), ECI protocol not supported
	]Q2	QR2 (2005 symbol), ECI protocol supported
	]Q3	QR2 (2005 symbol), ECI protocol not supported; FNC1 is the character right after the start character
	]Q4	QR2 (2005 symbol), ECI protocol supported; FNC1 is the character right after the start character
	]Q5	QR2 (2005 symbol), ECI protocol not supported; FNC1 is the 2nd character right after the start character
	]Q6	QR2 (2005 symbol), ECI protocol supported; FNC1 is the 2nd character right after the start character

Reference: ISO/IEC 15424:2008 Information technology – Automatic identification and data capture techniques – Data Carrier Identifiers (including Symbology Identifiers)

## Appendix C: Code ID Table

Symbology	Original Code ID	Visible Code ID
Code 128 FNC3	1	A(0x41)
Code 128	2	B(0x42)
UCC/EAN 128	3	C(0x43)
EAN-8	4	D(0x44)
EAN-13	5	E(0x45)
UPC-E	6	F(0x46)
UPC-A	7	G(0x47)
Interleaved 2 of 5	8	H(0x48)
ITF-14	9	I(0x49)
ITF-6	10	J(0x4A)
Code 39	13	M(0x4D)
Codabar	15	O(0x4F)
Standard 25	16	P(0x50)
Code 93	17	Q(0x51)
AIM 128	21	U(0x55)
MSI Plessey	22	V(0x56)
ISBN	23	W(0x57)
Industrial 25	24	X(0x58)
Matrix 2 of 5	25	Y(0x59)
RSS-14	26	Z(0x5A)
RSS Limited	27	[(0x5B)
RSS Expand	28	\(0x5C)
Code 11	29	] (0x5D)
Plessey	30	^(0x5E)
ISSN	31	_(0x5F)
PDF417	32	`(0x60)
QR	33	a(0x61)
Data Matrix	35	c(0x63)

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## Appendix D: ASCII Table

Hex	Dec	Char
00	0	NUL (Null char.)
01	1	SOH (Start of Header)
02	2	STX (Start of Text)
03	3	ETX (End of Text)
04	4	EOT (End of Transmission)
05	5	ENQ (Enquiry)
06	6	ACK (Acknowledgment)
07	7	BEL (Bell)
08	8	BS (Backspace)
09	9	HT (Horizontal Tab)
0a	10	LF (Line Feed)
0b	11	VT (Vertical Tab)
0c	12	FF (Form Feed)
0d	13	CR (Carriage Return)
0e	14	SO (Shift Out)
0f	15	SI (Shift In)
10	16	DLE (Data Link Escape)
11	17	DC1 (XON) (Device Control 1)
12	18	DC2 (Device Control 2)
13	19	DC3 (XOFF) (Device Control 3)
14	20	DC4 (Device Control 4)
15	21	NAK (Negative Acknowledgment)
16	22	SYN (Synchronous Idle)
17	23	ETB (End of Trans. Block)
18	24	CAN (Cancel)
19	25	EM (End of Medium)
1a	26	SUB (Substitute)
1b	27	ESC (Escape)
1c	28	FS (File Separator)
1d	29	GS (Group Separator)

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Hex	Dec	Char
1e	30	RS (Request to Send)
1f	31	US (Unit Separator)
20	32	SP (Space)
21	33	! (Exclamation Mark)
22	34	" (Double Quote)
23	35	# (Number Sign)
24	36	\$ (Dollar Sign)
25	37	% (Percent)
26	38	& (Ampersand)
27	39	` (Single Quote)
28	40	( (Right / Closing Parenthesis)
29	41	) (Right / Closing Parenthesis)
2a	42	* (Asterisk)
2b	43	+ (Plus)
2c	44	, (Comma)
2d	45	- (Minus / Dash)
2e	46	. (Dot)
2f	47	/ (Forward Slash)
30	48	0
31	49	1
32	50	2
33	51	3
34	52	4
35	53	5
36	54	6
37	55	7
38	56	8
39	57	9
3a	58	: (Colon)
3b	59	; (Semi-colon)
3c	60	< (Less Than)
3d	61	= (Equal Sign)

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Hex	Dec	Char
3e	62	> (Greater Than)
3f	63	? (Question Mark)
40	64	@ (AT Symbol)
41	65	A
42	66	B
43	67	C
44	68	D
45	69	E
46	70	F
47	71	G
48	72	H
49	73	I
4a	74	J
4b	75	K
4c	76	L
4d	77	M
4e	78	N
4f	79	O
50	80	P
51	81	Q
52	82	R
53	83	S
54	84	T
55	85	U
56	86	V
57	87	W
58	88	X
59	89	Y
5a	90	Z
5b	91	[ (Left / Opening Bracket)
5c	92	\ (Back Slash)
5d	93	] (Right / Closing Bracket)

---

---

Hex	Dec	Char
5e	94	^ (Caret / Circumflex)
5f	95	_ (Underscore)
60	96	' (Grave Accent)
61	97	A
62	98	B
63	99	C
64	100	d
65	101	e
66	102	f
67	103	g
68	104	h
69	105	i
6a	106	j
6b	107	k
6c	108	l
6d	109	m
6e	110	n
6f	111	o
70	112	p
71	113	q
72	114	r
73	115	s
74	116	t
75	117	u
76	118	v
77	119	w
78	120	x
79	121	y
7a	122	z
7b	123	{ (Left/ Opening Brace)
7c	124	(Vertical Bar)
7d	125	} (Right/Closing Brace)
7e	126	~ (Tilde)
7f	127	DEL (Delete)

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## Appendix E: Parameter Programming Examples

The following examples show you how to program parameters by scanning programming barcodes.

### Program the Decode Session Timeout

**Example: Set the decode session timeout to 5.0s**

1. Scan the **Decode Session Timeout** barcode.
2. Scan the numeric barcodes “5” and “0”.
3. Scan the **Save** barcode.

### Program the Timeout between Decodes

**Example: Set the timeout between decodes to 5.0s**

1. Scan the **Timeout between Decodes** barcode.
2. Scan the numeric barcodes “5” and “0”.
3. Scan the **Save** barcode.

### Program the Image Stabilization Timeout

**Example: Set the image stabilization timeout to 5.0s**

1. Scan the **Image Stabilization Timeout** barcode.
2. Scan the numeric barcodes “5” and “0”.
3. Scan the **Save** barcode.

---

## Program the Sensitivity Level

### Example: Set the sensitivity level to 5

1. Scan the **Custom Sensitivity** barcode.
2. Scan the numeric barcode “5”.
3. Scan the **Save** barcode.

---

## Appendix F: Digit Barcodes

0 ~ 5



D000000

0



D000001

1



D000002

2



D000003

3



D000004

4



D000005

5

---

6~ 9



D000006

6



D000007

7



D000008

8



D000009

9

---

A ~ F



D00000A

A



D00000B

B



D00000C

C



D00000D

D



D00000E

E



D00000F

F

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## Appendix G: Save/Cancel Barcodes

After reading numeric barcode(s), you need to scan the **Save** barcode to save the data. If you scan the wrong digit(s), you can either scan the **Cancel the Last Digit** barcode and then the correct digit, or scan the **Cancel All Digits** barcode and then the digits you want.

For instance, after reading the **Decode Session Timeout** barcode and numeric barcodes “1”, “2” and “3”, you scan:

- ✧ **Cancel the Last Digit:** The last digit “3” will be removed.
- ✧ **Cancel All Digits:** All digits “123” will be removed.



D 0 0 0 0 1 2

Save



D 0 0 0 0 1 0

Cancel the Last Digit



D 0 0 0 0 1 1

Cancel All Digits



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## Appendix H: Frequently-Used Serial Commands

Feature	Serial Command
Set baud rate to 9600	7E 00 08 01 00 D9 D3 20 38
Set baud rate to 115200	7E 00 08 01 00 D9 D8 91 53
Save register data in EEPROM	7E 00 09 01 00 00 DE C8
Query the baud rate	7E 00 07 01 00 2A 02 D8 0F

After receiving the Query Baud Rate serial command, the engine may respond with one of the following messages.

Message	Baud Rate
02 00 00 02 C4 09 SS SS	1200
02 00 00 02 E2 04 SS SS	2400
02 00 00 02 71 02 SS SS	4800
02 00 00 02 39 01 SS SS	9600
02 00 00 02 D0 00 SS SS	14400
02 00 00 02 9C 00 SS SS	19200
02 00 00 02 4E 00 SS SS	38400
02 00 00 02 34 00 SS SS	57600
02 00 00 02 1A 00 SS SS	115200

Note: SS SS: CRC-CCITT checksum.