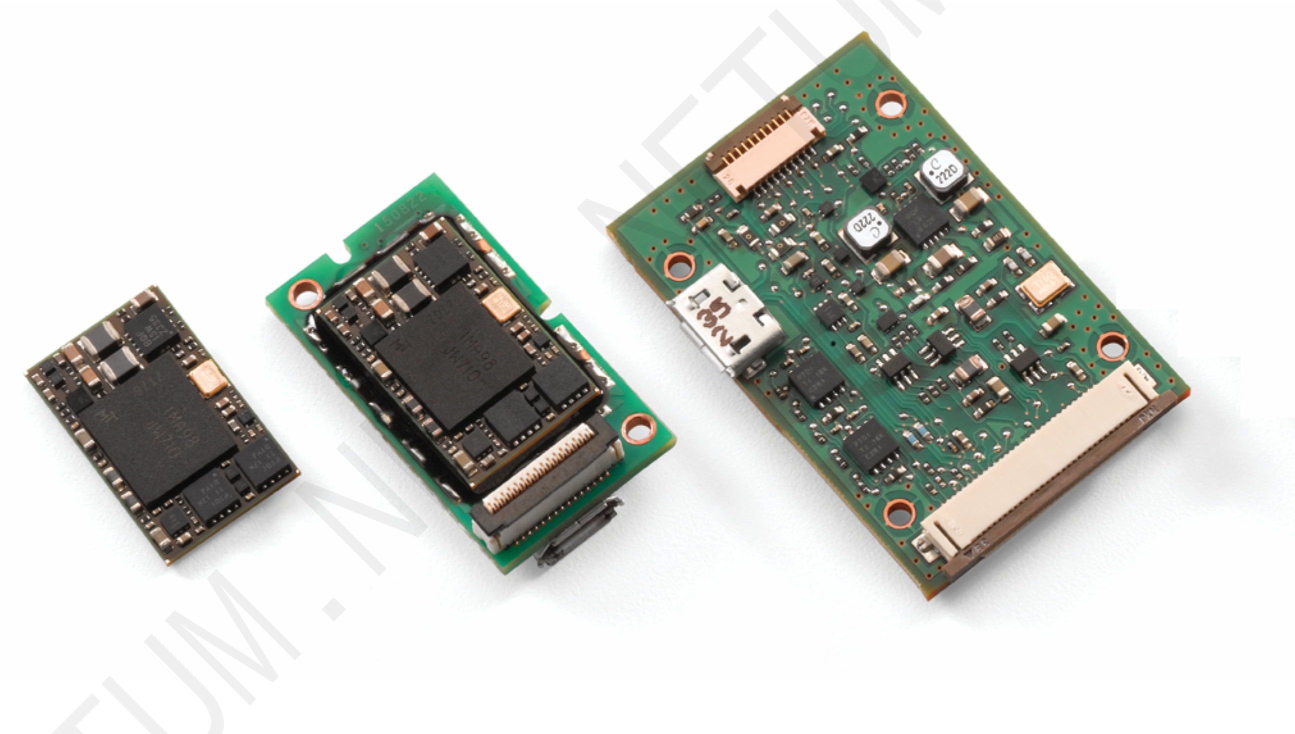
ZEBRA PL3307

NETUM E950

INTEGRATION GUIDE



PL3307
INTEGRATION GUIDE

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Revision A

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Revision History

Changes to the original guide are listed below:

Change	Date	Description
-01 Rev A	12/2011	Initial release
-02 Rev A	3/2012	Add PL3307-A and PL3307-C configurations

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ABOUT THIS GUIDE

Introduction

The *PL3307 Decoder Integration Guide* provides general instructions for mounting, setting up, and programming the PL3307 decoders.

Chapter Descriptions

Topics covered in this guide are as follows:

- *Chapter 1, Getting Started* provides an overview of the PL3307 decoder, including a theory of operation.
- *Chapter 2, PL3307-A Installation and Specifications* describes how to connect and mount the PL3307-A small form factor decoder.
- *Chapter 3, PL3307-B Installation and Specifications* describes how to connect and mount the PL3307-B standard decoder.
- *Chapter 4, PL3307-C Installation and Specifications* describes how to connect and mount the PL3307-C BGA decoder.
- *Chapter 5, Accessories* provides information on accessories for the PL3307 decoder.
- *Chapter 6, User Preferences & Miscellaneous Options* describes features frequently used to customize how data transmits to the host device and programming bar codes for selecting user preference features for the decoder.
- *Chapter 7, Imaging Preferences* provides imaging preference features and programming bar codes for selecting these features.
- *Chapter 8, USB Interface* describes how to set up the decoder with a USB host.
- *Chapter 9, SSI Interface* describes the system requirements of the Simple Serial Interface (SSI), which provides a communications link between Motorola decoders and a serial host.
- *Chapter 10, Serial Interface* describes how to set up the decoder with a serial host, such as point-of-sale devices, host computers, or other devices with an available RS-232 port.
- *Chapter 11, Symbologies* describes all symbology features and provides programming bar codes for selecting these features for the decoder.

- *Chapter 12, 123Scan2* describes this PC-based scanner configuration tool which enables rapid and easy customized setup of Symbol scanners.
- *Chapter 13, Advanced Data Formatting* briefly describes ADF, a means of customizing data before transmission to the host device, and includes a reference to the *ADF Programmer Guide*.
- *Appendix A, Standard Default Parameters* provides a table of all host devices and miscellaneous defaults.
- *Appendix B, Programming Reference* provides a table of AIM code identifiers, ASCII character conversions, and keyboard maps.
- *Appendix C, Sample Bar Codes* includes sample bar codes of various code types.
- *Appendix D, Numeric Bar Codes* includes the numeric bar codes to scan for parameters requiring specific numeric values.
- *Appendix E, ASCII Character Sets* provides ASCII character value tables.

Notational Conventions

The following conventions are used in this document:

- *Italics* are used to highlight the following:
  - Chapters and sections in this and related documents
  - Dialog box, window and screen names
  - Drop-down list and list box names
  - Check box and radio button names
- **Bold** text is used to highlight the following:
  - Key names on a keypad
  - Button names on a screen.
- bullets (•) indicate:
  - Action items
  - Lists of alternatives
  - Lists of required steps that are not necessarily sequential
- Sequential lists (e.g., those that describe step-by-step procedures) appear as numbered lists.
- Throughout the programming bar code menus, asterisks (*****) are used to denote default parameter settings.

* Indicates Default — ***Baud Rate 9600** — Feature/Option

Related Documents

- *SE3300 Integration Guide*, p/n 72E-148589-xx
- *SE4500 Integration Guide*, p/n 72E-112996-xx
- *Motorola Scanner SDK for Windows Developer's Guide*, p/n 72E-149784-xx
- *Molex Connector Specification*, *Series 47346, 52437, and 54809*, http://www.molex.com
- *JST Connector Specification, Series FXZT*, http://www.jst.com
- *Axon Flat Flexible Cable Specification*, http://www.axon-cable.com
- *Kyocera Connector Specification*, *Series 6283*, http://global.kyocera.com

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CHAPTER 1 GETTING STARTED

Introduction

The PL3307 is a companion decoder for the SE3300 and SE4500 imager engines, which controls the imager, acquires images, and decodes 1D and 2D symbologies. For information on the imager engines, refer to the *SE3300 Integration Guide* and *SE4500 Integration Guide*.

The PL3307 is available in three configurations:

- PL3307-A: decoder board, small form factor
- PL3307-B: standard decoder board
- PL3307-C: BGA decoder chip

The PL3307 architecture is composed of an ARM core and related subsystems. The PL3307 includes asynchronous serial (the standard Symbol Simple Serial Interface/SSI command set) and SNAPI (Symbol Native API) interfaces, as well as a variety of USB and RS-232 host interfaces.

PL3307 architecture includes:

- Atmel AT91SAM9G20 processor core, 400 MHz
- 512 MB Mobile LPSDRAM
- 1G asynchronous flash
- Camera Sensor Interface (CSI) port
- Host communication port.

System peripherals include:

- One UART (RS-232) channel: SSI support for compatibility with existing devices and applications
- I^2C bus used for camera control
- USB 2.0 Full Speed port for image and bar code data transfers.

This integration guide describes the decoder theory of operation, installation, specifications, and configuration.

Theory of Operation

During image capture:

1. The image sensor array in the imager engine captures an image of the bar code through the engine's optical lens. If necessary, the engine automatically adjusts illumination, exposure, and other parameters to obtain the best quality image.
2. The imager engine sends the image to the PL3307 decoder.
3. The PL3307 processes the image to identify the target bar code(s), decodes them, and transmits the decoded data to the host.

Set various parameters provided in this guide to adjust the performance of the imager engine and PL3307 to match the application or desired usage profile.

PL3307 Decoder

Figure 1-1 provides a block diagram for the decoder.

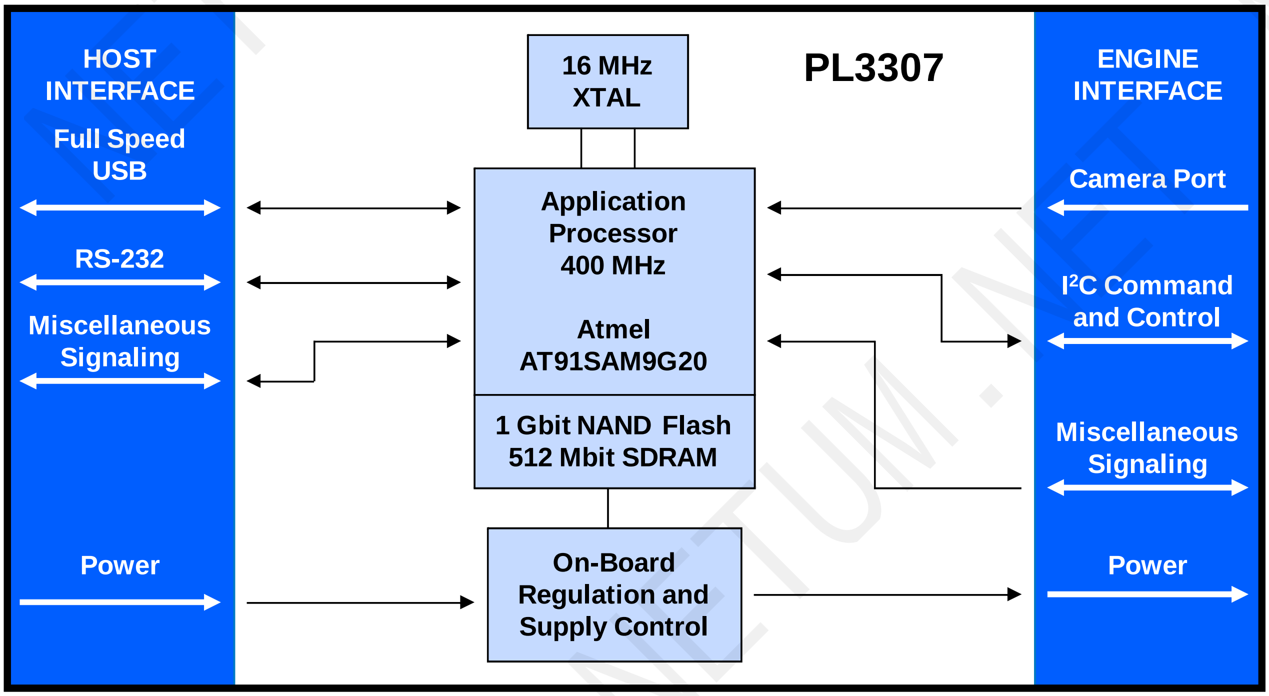

Figure 1-1 *PL3307 Decoder Block Diagram*

Atmel AT91SAM9G20 Processor

The digital system is built on an Atmel AT91SAM9G20, a RISC processor based on ARM v5TEJ architecture. The major features of the core are:

- CPU clock speed up to 400 MHz with external LP SDRAM bus speed of 133 MHz.
- 32 KB instruction/32 KB data cache, 256 KB instruction cache, 32 KB internal SRAM.

Power Management

The PL3307 has various power management options depending on the host interface.

USB (SNAPI, USB HID Keyboard, etc.)

The PL3307 automatically manages its power usage, including USB suspend mode. Additionally, when drawing power from the USB bus, the PL3307 and imager engine do not exceed the USB limit of 500 mA (see *Interfaces on page 1-4*).

✓ ***NOTE*** The PL3307 does not use Low Power mode when connected to a USB-based host.

SSI or RS-232

When using SSI or any RS-232 host interface, set the PL3307 to use one of the following power modes:

- **Continuous Power**: The PL3307 is fully awake and running, even when not in a decode session.
- **Low Power** (default): The PL3307 draws less current at idle than when in Continuous Power mode, and is more suitable for battery-powered applications. See *Technical Specifications* in each PL3307 configuration chapter.

Table 1-1 *Methods of Placing the PL3307 into Low Power Mode*

Action	Behavior
Set the Power Mode parameter to Low Power (see *Power Mode (Serial Hosts Only) on page 6-18*)	The PL3307 enters Low Power mode automatically whenever possible.
Send the SLEEP command (see *Table 9-1 on page 9-2*)	The PL3307 enters Low Power mode only once, as soon as possible.
Note: All Wake Up signals (see *Table 1-2*) must be inactive to enter Low Power mode.	

In Low Power mode the PL3307 reduces its current draw whenever possible, and must be awakened before performing any functions. Any of the following conditions wake the device.

Table 1-2 *Waking Up the PL3307*

Signal	State to Wake Up	Comment
HOST_AIM_WAKE*	Low	
HOST_TRIGGER*	Low	
HOST_CTS	Low	Applies to SSI host only.

When the PL3307 is awakened, it remains awake for 1 second (or for another value set via the *Time Delay to Low Power Mode on page 6-18*) before re-entering Low Power mode.

Interfaces

The PL3307's host interface type is configured via two pins on the host interface. Logic low (0) is set by grounding the respective pin. Logic high (1) requires no connection. See the appropriate table for the host type/port.

NOTE When using micro USB, setting the system configuration pins is not required.

Table 1-3 *Host Configuration*

HOST_SYS_CFG1	HOST_SYS_CFG0	Configuration Options
0	0	RS-232. The decoder defaults to the SSI interface. To select another RS-232 interface type, scan a bar code in *Serial Host Types on page 10-5*.
1	1	USB bus or self-powered. See **Note** below. The SysCfg pins on the 30-pin host connector have internal pull-ups so there is no need to drive them on the host connector.

NOTE In USB modes the decoder defaults to SNAPI with Imaging Interface mode. To select another USB interface type, scan a bar code in ***USB Device Type on page 8-3***

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Beeper and Decode LED Signals from the PL3307

The BEEPER_OUT and HOST_DEC_LED* output lines provide user feedback but do not provide enough current drive for the actual beeper and LED device. Additional buffering is required.

The PL3307's beeper output ranges from 2.024 KHz to 2.694 KHz. The beeper output is a 50% duty cycle square wave at maximum volume, 12.5% at low volume.

If using a non-inverting driver to buffer the HOST_DEC_LED* line, connect the output of the driver to the cathode (-) end of the LED.

Table 1-4 *User Interface Indications*

Description	Indication		SSI Event
	Beeper	Decode LED	
Trigger pull	No sound	No light	TRIGGER_PULLED
No decode			NODECODE_MSG
Wakeup			WAKEUP
Video is off			VIDEO_OFF
Video is on	No Sound	Light	VIDEO_ON
Decode	Middle Tone	Flash of light	DECODE
Snapshot started	Low Tone	Blinking	SNAPSHOT_START
Snapshot is complete	Low Tone	No light	SNAPSHOT_COMPLETE
Bootup	Low Tone, Middle Tone, High Tone	No light	BOOTUP
Transmission error	Four Low Tones	No light	TRANSMIT_ERROR
Entry error	Low Tone, High Tone	Flash of light	ENTRY_ERROR
Defaults set	High Tone, Low Tone, High Tone, Low Tone	Flash of light	DEFAULTS_SET
Parameter entered			PARAM_ENTERED
Number entry expected	High Tone, Low Tone	Flash of light	NUMBER_EXPECTED

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Supported Symbologies

The following bar code types are supported and can be individually enabled or disabled:

1D Symbologies

UPC/EAN
Bookland EAN
UCC Coupon Code
ISSN EAN
Code 128
GS1-128
ISBT 128
Code 39
Trioptic Code 39
Code 32
Code 93
Code 11
Interleaved 2 of 5
Discrete 2 of 5
Codabar
MSI
Chinese 2 of 5
Matrix 2 of 5
Korean 3 of 5
Inverse 1D
GS1 DataBar
Composite Codes

2D Symbologies

PDF417
MicroPDF417
Data Matrix
Data Matrix Inverse
Maxicode
QR Code
MicroQR
QR Inverse
Aztec
Aztec Inverse

Postal Codes

US Postnet
US Planet
UK Postal
Japan Postal
Australian Postal
Netherlands KIX Code
USPS 4CB/One Code/Intelligent Mail
UPU FICS Postal

Operating Modes

The PL3307 supports the following operating modes. See *Operating Modes on page 7-4* for the bar codes to change between modes.

- Decode (default mode) - for decoding a bar code
- Snapshot - for capturing an image
- Snapshot with Viewfinder Mode - provides a video of the subject until a snapshot of the image is captured.
- Video - provides a video of the subject.

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CHAPTER 2 PL3307-A INSTALLATION AND SPECIFICATIONS

Introduction

This chapter provides information for connecting and mounting the PL3307-A decoder board.

General Information

Electrical Isolation

Both sides of the PL3307-A decoder board include components and electrical conductors that must be isolated from contact with components on the host device. See *PL3307-A Decoder Board on page 2-3*.

Electrostatic Discharge (ESD)

The PL3307-A decoder is protected from ESD events that can occur in an uncontrolled environment, however, use care when handling the module and apply standard ESD precautions such as using grounding wrist straps and handling only in a properly grounded work area.

Environment

Enclose the PL3307-A decoder sufficiently to prevent dust from gathering on the printed circuit board and components. Dust and other contaminants can eventually degrade performance. Motorola does not guarantee performance of the decoder when used in an exposed application.

Power Supply Noise

For reliable operation a low-noise power supply is required. Pay close attention to power supply quality and testing to ensure the best performance from the PL3307-A and imager engine components.

5V Host: For a host that supplies 5 VDC (HOST_5V or USB2_5V) to the decoder, the decoder maintains proper regulation and supply quality.

3.3V Host: For a host that provides power via the HOST_3P3 connection, the power supply passes directly through the decoder module to the imager engine. In bar code applications, up to 100 mV peak-to-peak noise is acceptable on the 3.3V supply (10 Hz to 100 kHz). For image capture applications, limit power supply noise to 30 mV peak-to-peak across the same frequency range. To achieve improvements in both image quality and decode performance, provide additional filtering of the HOST_3P3 supply. Carefully review both the efficiency and current delivering capacity of the regulator.

Thermal Considerations

The PL3307-A decoder module includes several high-power components that dissipate heat during operation. These components can exhibit high temperatures when the PL3307-A/imager engine pair is running at 60 frames per second with full illumination. Use care when integrating the PL3307-A/imager engine pair into the target application.

Protective measures that reduce power consumption and/or facilitate heat removal within a target system include but are not limited to:

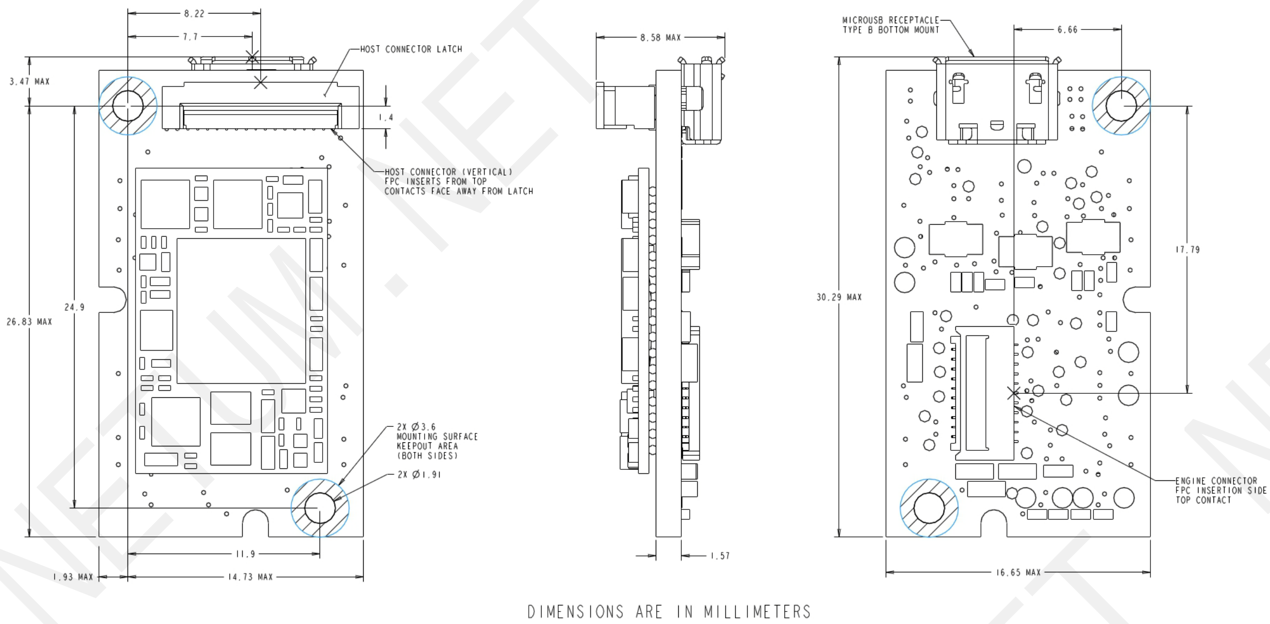
- Using reduced frame rates (e.g., 15 fps)
- Reducing illumination intensity on the imager engine
- Mounting the PL3307-A to a solid metallic surface using metal screws
- Selecting a housing design that allows for natural or forced convection.

Note that running the PL3307-A/imager engine pair in continuous 60 fps with both aiming and illumination enabled full time is highly uncommon. Typical decoding and image capture applications are low duty cycle operations and internal temperature rise due to the PL3307-A/imager engine pair should be minimal.

PL3307-A Decoder Board

There are two mounting holes (1.91 mm / 0.075 in.) on the decoder board. *Figure 2-1* provides an outline drawing for the PL3307-A decoder board. Position the board in the host equipment so that the connecting interface cable reaches the engine.

The PL3307-A boards contain components and circuitry on both sides.



Notes: Unless otherwise specified:

- This is a reference drawing and is not intended to specify or guarantee all possible integration requirements for this decoder.
- Dimensions are in mm.
- Tolerance for dimensions are ± 0.25 mm / ± 0.01 in.

Figure 2-1 *PL3307-A Decoder Board Drawing*

PL3307-A Electrical Information

Power Supply Requirements

The PL3307-A decoder board can be powered from one of three possible sources: Host 3.3 VDC, Host 5 VDC, or Micro USB 5 VDC. The PL3307-A uses an intelligent hardware multiplexer to configure the most efficient power supply arrangement for the combined PL3307-A/imager engine system. *Figure 2-2* shows a block diagram of the supply multiplexer.

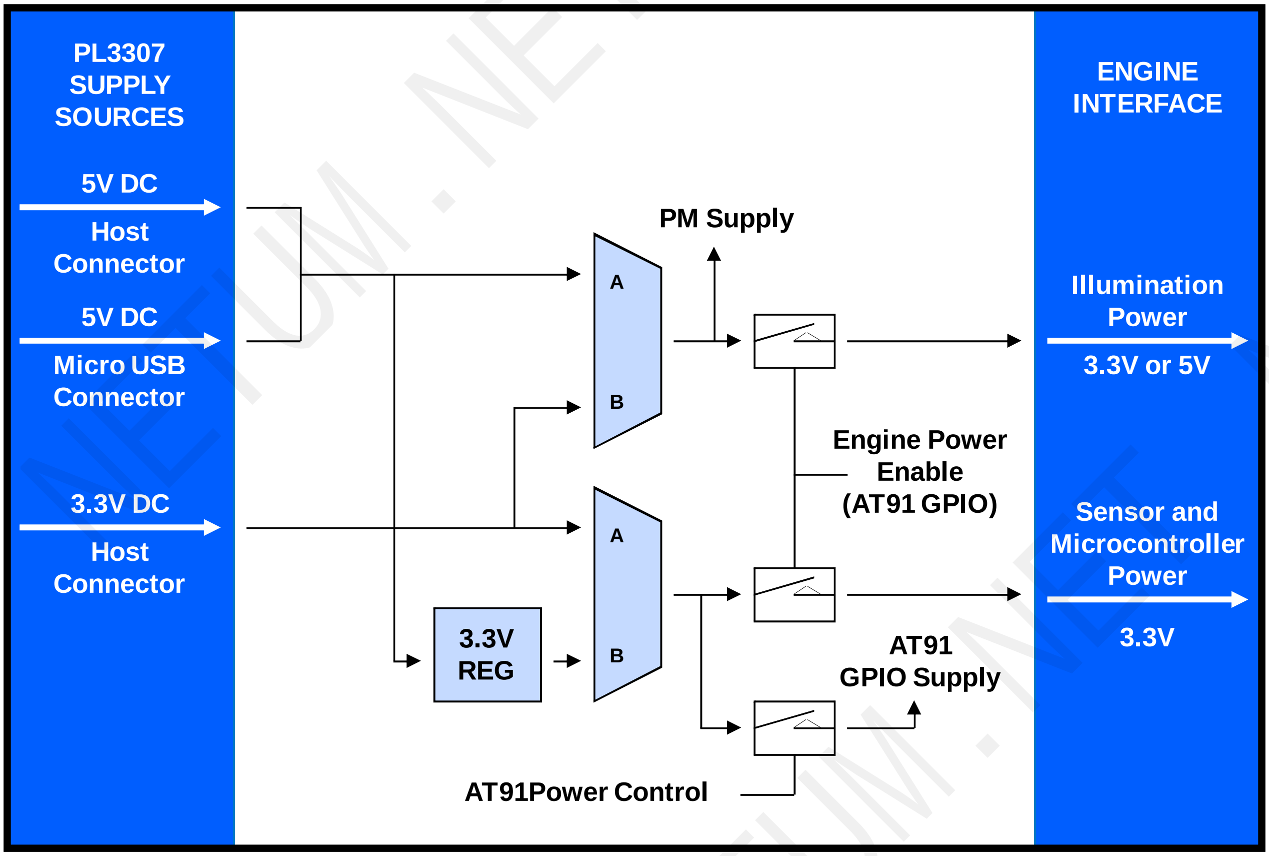


Figure 2-2 *PL3307-A Power Supply Multiplexer*

The multiplexers are low resistance switches that automatically select between A and B inputs. If both inputs are present (e.g., Host 5 VDC and Host 3.3 VDC) the A input takes precedence.

This arrangement allows powering the PL3307-A using 3.3 V, 5 V, or combined supply voltages that offer improved efficiency for the overall system due to the different supplies that the PL3307-A decoder and imager engine require internally.

✓ ***NOTE*** Host 5 VDC and Micro USB 5 VDC cannot be applied simultaneously to the PL3307 input as these lines are tied together internally.

Table 2-1 *PL3307-A Electrical Characteristics*

Symbol	Parameter	Condition	Minimum	Typical	Maximum	Units
HOST_3P3	Supply Voltage		3.0	3.3	3.6	V
HOST_5V	Supply Voltage		4.5	5.0	5.5	V
USB2_5V	Supply Voltage		4.5	5.0	5.5	V
NOTE: Logic Levels are referred to AT91SAM9G20 GPIO supply (HOST_3P3=3.3V)						
VIH	Input High voltage		2		HOST_3P3 +0.3	V
VIL	Input Low voltage		-0.3		0.8	V
I_{CC}					See *Table 2-5 on page 2-13*	mA
I_{iL}	Input Low Leakage current	V_{in} = GND, no pull up or pull down			± 1	uA
I_{iH}	Input High Leakage current	$V_{in} = V_{CC}$, no pull up or pull down			± 1	uA
I_{oL}	Output Low Current	V_{oL} = 0.4 V	-8			mA
I_{oH}	Output High Current	V_{oh} = HOST_3P3-0.4 V			8	mA
C_{i_usb}	Input capacitance, USB_OUT+/-				9.18	pF
Note: Supply current varies depending on factors such as what function the software is performing and which PL3307-A functions are being used.						

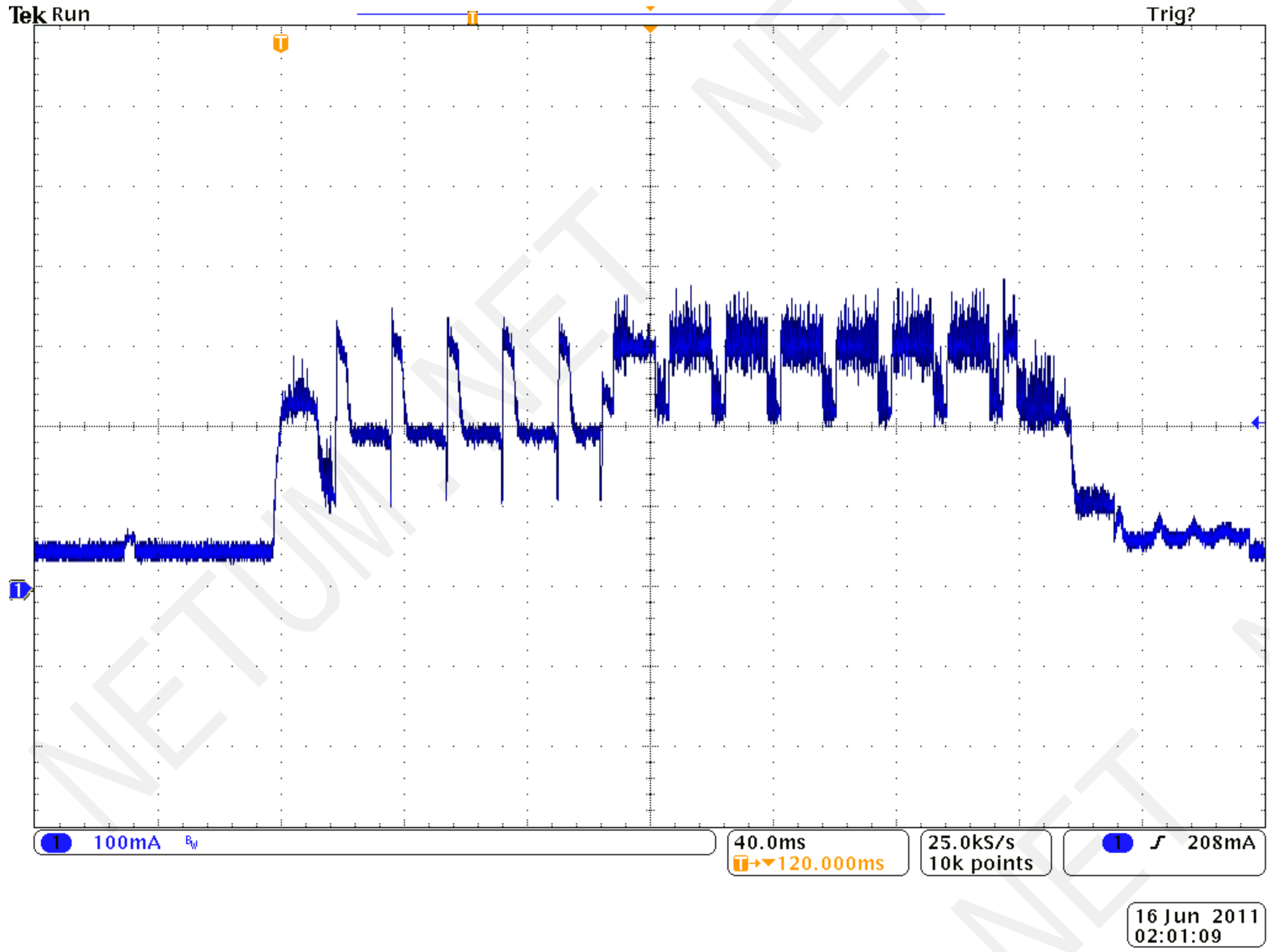


Figure 2-3 *PL3307-A Supply Current - 3.3 V Operation (RS-232, SSI, Scan/Decode Session)*

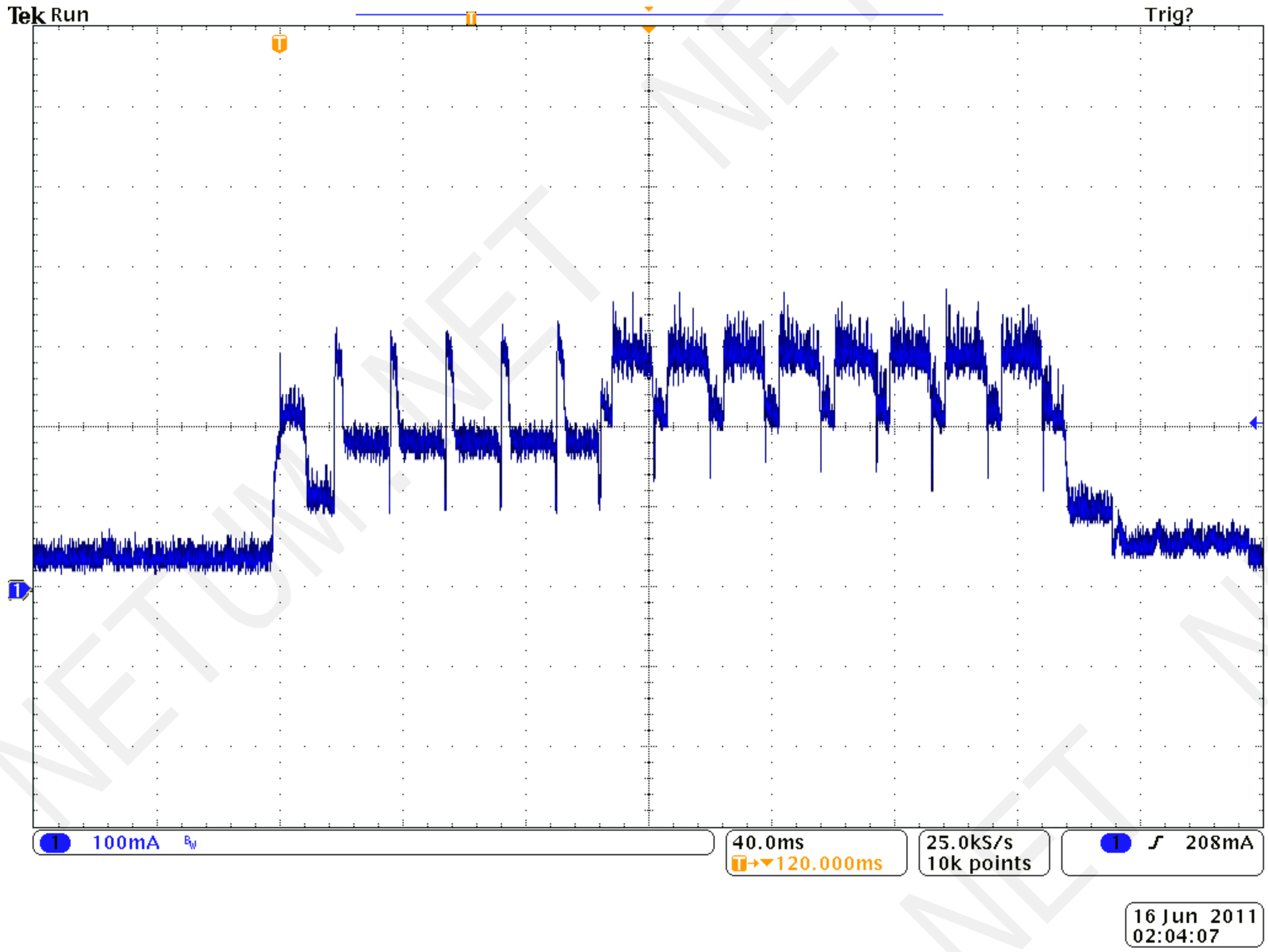


Figure 2-4 *PL3307-A Supply Current - 5 V Operation (USB Bus Powered, Scan/Decode Session)*

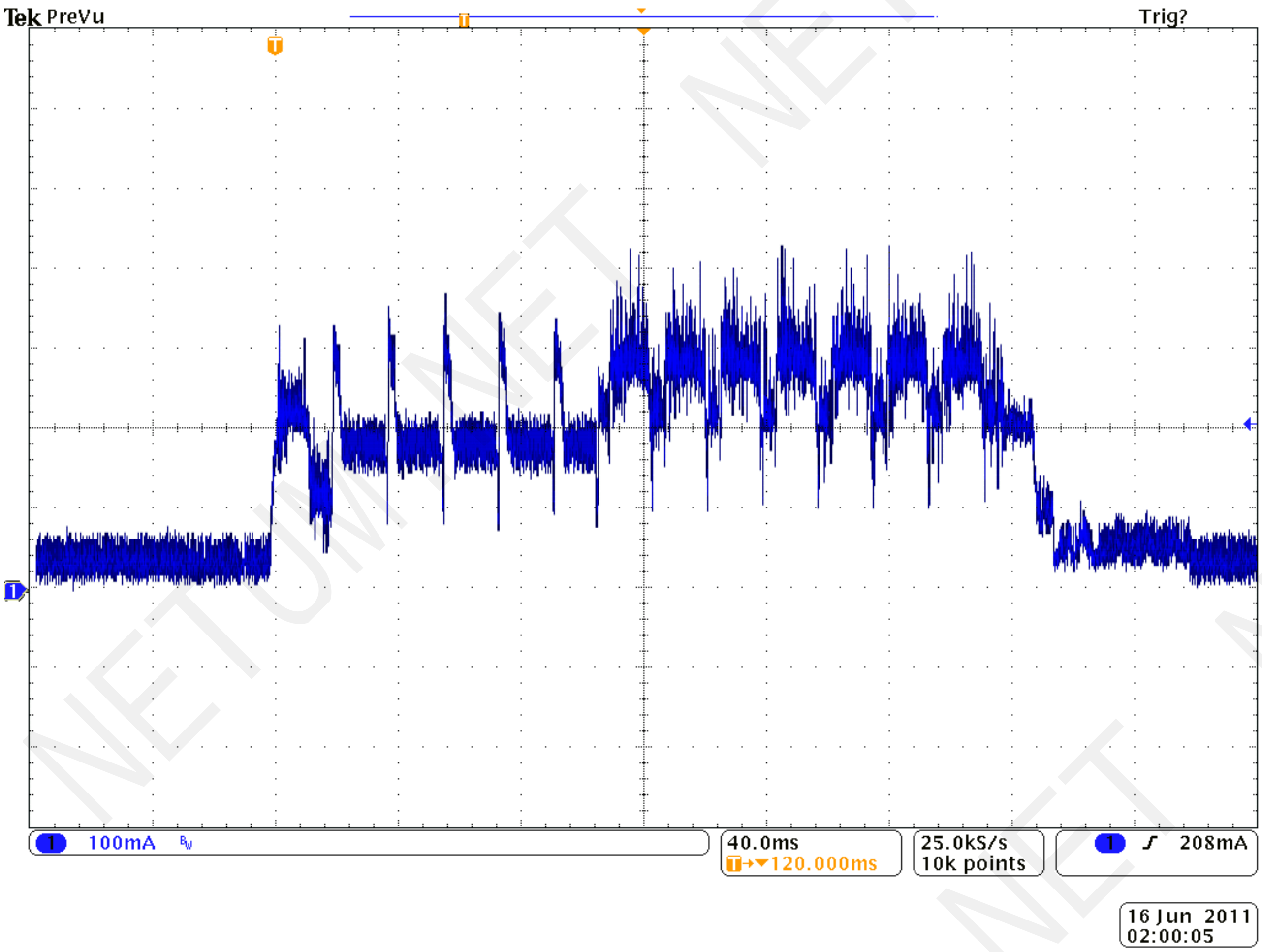


Figure 2-5 *PL3307-A Supply Current - 5 V Operation (USB Self Powered, Scan/Decode Session)*

Electrical Interface

Table 2-2 and *Table 2-3* list the pin functions of the imager engine and PL3307-A host interfaces, and illustrate typical input and output circuitry.

NOTE Signal directions are listed relative to PL3307-A decoder module.

Table 2-2 *Imager Engine Signal Descriptions*

Signal Name	Description	Dir	Engine Interface	Comments
GND	Power supply	-	1	Imager engine power supply return
GND	Power supply	-	2	Imager engine power supply return
I2C_CLK	Communication interface	Out	3	Imager engine I^2C Clock
I2C_DATA	Communication interface	In/ Out	4	Imager engine I^2C Data
VSYNC	Vertical sync synchronized to a WVGA frame	In	5	Vertical sync clock from the imager engine
PIX_DATA_7	Pixel data	In	6	Pixel data from the imager engine (MSB)
PIX_DATA_6	Pixel data	In	7	Pixel data from the imager engine
PIX_DATA_5	Pixel data	In	8	Pixel data from the imager engine
PIX_DATA_4	Pixel data	In	9	Pixel data from the imager engine
PIX_DATA_3	Pixel data	In	10	Pixel data from the imager engine
PIX_DATA_2	Pixel data	In	11	Pixel data from the imager engine
PIX_DATA_1	Pixel data	In	12	Pixel data from the imager engine
PIX_DATA_0	Pixel data	In	13	Pixel data from the imager engine (LSB)
EXT_ILLUM_EN	Illumination enable	In	14	Enable external illumination
VCC_SENSOR	Power supply	-	15	Decoder provided 3.3V for imager engine image sensor and oscillator
VCC	Power supply	-	16	Decoder provided 3.3V for imager engine logic control system
VCC_ILLUM	Power supply	-	17	Decoder provided 3.3 to 5V for imager engine illumination system
HSYNC	Horizontal sync synchronized to the rows of the image data	In	18	Horizontal sync clock from the imager engine
GND	Power supply	-	19	Imager engine power supply return
PIXCLK	Pixel clock used to synchronize the decoder to the pixel data	In	20	Pixel clock returned from the imager engine
GND	Power supply	-	21	Imager engine power supply return
Note: Signal directions are listed relative to the PL3307-A decoder module.				

Table 2-3 *PL3307-A Signal Descriptions*

Signal Name	Description	Dir	Host Connector Pin	Control State	Comments
HOST_DOWNLOAD	PL3307 download signal	In	1	L = PL3307 in software download mode H = No action	Signal is sampled immediately following a reset state. It indicates to the PL3307 the system is ready to accept a new software image.
HOST_3P3	+3.3 V power supply	In	2		PL3307 supply voltage
GND	System ground		3		PL3307 power supply return
HOST_RXD	RS-232 receive	In	4		See *Typical Input Circuit*
HOST_TXD	RS-232 transmit	Out	5		
HOST_CTS	RS-232 Clear To Send control signal	In	6		See *Typical Input Circuit*
HOST_RTS	RS-232 Request To Send control signal	Out	7		
POWER_DOWN	Status signal from the PL3307 indicating power down state	Out	8	L = Normal state H = Engine is in a power down state	
BEEPER_OUT*	Pulse width modulated output used to control an external beeper	Out	9		The beeper output ranges from 2.024 KHz to 2.694 KHz and is a 50% duty cycle square wave at maximum volume, 12.5% at low volume. Normally used as a control signal for beeper drive circuit. Control line can source/sink 8 mA.
HOST_DEC_LED*	Active low output used to indicate a valid bar code decode	Out	10	L = LED on H = LED off	Normally used as a control signal for an LED drive circuit. Control line can source/sink 8 mA.
HOST_AIM_WAKE*	Signal functions as aiming pattern control when the PL3307 is not in a low power state	In	11	L = Aiming pattern on H= Aiming pattern off	See *Typical Input Circuit*. Set the appropriate parameters for this signal to function properly.
	Signal functions as a wakeup only when the PL3307 is in a low power state			L = Wake up PL3307 from a power down state H = No action	
HOST_TRIGGER*	Used to start a decode session	In	12	L = Start session H = Inactive	See *Typical Input Circuit*.

Note: Signal directions are listed relative to the PL3307 decoder module.

Table 2-3 *PL3307-A Signal Descriptions (Continued)*

Signal Name	Description	Dir	Host Connector Pin	Control State	Comments
HOST_3P3	+3.3 V power supply	In	13		PL3307 supply voltage
GND	System ground		14		PL3307 power supply return
GND	System ground		15		PL3307 power supply return
HOST_3P3	+3.3 V power supply		16		PL3307 supply voltage
HOST_3P3	+3.3 V power supply	In	17		PL3307 supply voltage
Reserved			18		
Reserved			19		
GND	System ground		20		PL3307 power supply return
HOST_USB_P	Positive differential data signal for the USB bus	In/ Out	21		USB 2.0 full speed bus
HOST_USB_N	Negative differential data signal for the USB bus	In/ Out	22		USB 2.0 full speed bus
GND	System ground		23		PL3307 power supply return
GND	System ground		24		PL3307 power supply return
HOST_5V	+5.0V power supply	In	25		PL3307 supply voltage
HOST_5V	+5.0V power supply	In	26		PL3307 supply voltage
HOST_5V	+5.0V power supply	In	27		PL3307 supply voltage
HOST_5V	+5.0V power supply	In	28		PL3307 supply voltage
ILLUM_EN_OUT*	External illumination control signal	Out	29	L = Illumination on H = Illumination off	Reserved for external illumination control. Control line can only source/sink 8 mA.
HOST_SYS_CFG0	System configuration bits	In	30		Used to determine which host interface is used after reset state. See *Interfaces on page 1-4*.
HOST_SYS_CFG1		In	31		

Note: Signal directions are listed relative to the PL3307 decoder module.

Table 2-4 *PL3307-A Signal Descriptions - Micro USB-B Connector*

Signal Name	Description	Dir	Connector Pin(s)	Comments
USB2_5V	Power supply	-	1	PL3307 power supply
D-	Communication interface	In/Out	2	PL3307 USB D-
D+	Communication interface	In/Out	3	PL3307 USB D+
N/A	No connect		4	Not connected
GND	Power supply	-	5	PL3307 power supply return

Note: Signal directions are listed relative to the PL3307-A decoder module.

Typical Input Circuit

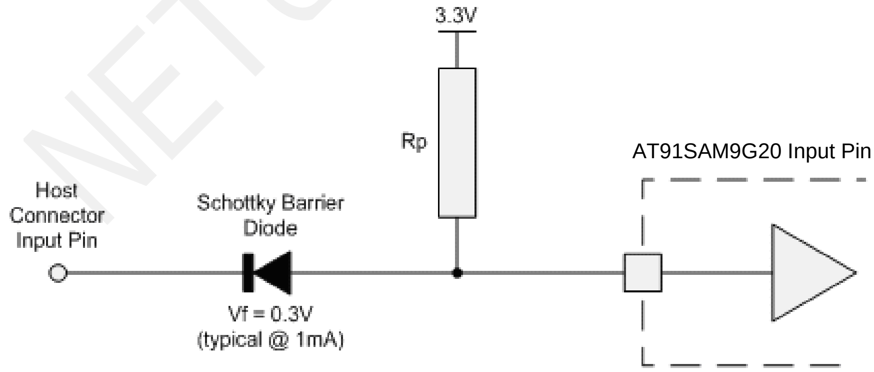


Figure 2-6 *Input Circuit*

Pull-up resistor, R_p, is 4.7K ohms. The input circuit allows a host with 5V logic to communicate directly with the PL3307-A and eliminates the possibility of back powering the decoder.

Technical Specifications

Table 2-5 provides the technical specifications for the PL3307-A decoder. Note that current draw figures are valid for a PL3307-A with an attached SE3300WA imager engine.

Table 2-5 *PL3307-A Decoder Technical Specifications at 23°C*

Item	Description
Power Requirements:	Supply currents listed below are typical values in mA, RMS, at nominal supply voltage unless otherwise specified.
Host Supply 3.3 V (HOST_3P3):	
Supply Voltage	3.3 V +/- 0.3 V
Low Power Current	15 mA
Idle Current	45 mA
Operating Current	280 mA (scan/decode session)
Peak Current	400 mA (see *Figure 2-3 on page 2-6*)
Host Supply 5.0 V (HOST_5V or USB2_5V):	Applies only when the PL3307-A is USB bus powered via the micro USB port
Supply Voltage	5.0 V +/- 0.5 V
Suspend Current Draw	15 mA
Idle Current	35 mA
Operating Current	270 mA
Peak Current	400 mA See *Figure 2-5 on page 2-8*
Maximum Power Supply Noise	100 mVp-p - bar code and image capture applications, host supply = 5 VDC (HOST_5V or USB2_5V) 100 mVp-p - bar code applications, host supply = 3.3 VDC (HOST_3P3 only) 30 mVp-p - image capture applications, host supply VCC = 3.3 VDC (HOST_3P3 only)
Start Up Time	
From Power On	RS-232: 1200 ms typical (RS-232) USB: Host dependent
From Low Power Mode	3 ms typical
Baud Rate	9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600
Temperature	
Operating	-30° C to 55° C (-22° F to 131° F)
Storage	-40° C to 70° C (-40° F to 158° F)
Humidity	
Operating	95% RH, non-condensing at 55°C
Storage	85% RH, non-condensing at 70°C
Shock	2000 G ± 5% applied via any mounting surface at -30º C and 55º C for a period of 0.85 ± 0.05% msec 2500 G ± 5% applied via any mounting surface at 20º C for a period of 0.85 ± 0.05% msec

Table 2-5 *PL3307-A Decoder Technical Specifications at 23°C (Continued)*

Item	Description
Vibration	Unpowered decoder board withstands a random vibration along each of the X, Y, and Z axes for a period of one hour per axis, defined as follows:
	20 to 80 Hz — Ramp up at 0.04 G^2/Hz at 3 dB/octave
	80 to 350 Hz — 0.04 G^2/Hz
	350 Hz to 2 kHz — Ramp down at 0.04 G^2/Hz at 3 dB/octave
Dimensions (max)	30.29 mm x 16.65 mm x 8.58 mm (1.193 in. x 0.656 in. x 0.338 in.)
Weight	3.2 g (0.11 oz)

CHAPTER 3 PL3307-B INSTALLATION AND SPECIFICATIONS

Introduction

This chapter provides information for connecting and mounting the PL3307-B decoder board.

General Information

Grounding

The mounting holes for the PL3307-B include exposed copper that may, if necessary, be used to electrically ground the decoder to the host using metal screws. If installing the PL3307-B in a host where there is a potential to inject ground noise, use nylon or other non-conductive hardware. In this case the PL3307-B ground is provided through the host connector.

Electrical Isolation

Both sides of the PL3307-B decoder board include components and electrical conductors that must be isolated from contact with components on the host device. See *PL3307-B Decoder Board on page 3-3*.

Electrostatic Discharge (ESD)

The PL3307-B decoder is protected from ESD events that can occur in an uncontrolled environment, however, use care when handling the module and apply standard ESD precautions such as using grounding wrist straps and handling only in a properly grounded work area.

Environment

Enclose the PL3307-B decoder sufficiently to prevent dust from gathering on the printed circuit board and components. Dust and other contaminants can eventually degrade performance. Motorola does not guarantee performance of the decoder when used in an exposed application.

Power Supply Noise

For reliable operation a low-noise power supply is required. Pay close attention to power supply quality and testing to ensure the best performance from the PL3307-B and imager engine components.

5V Host: For a host that supplies 5 VDC (HOST_5V or USB2_5V) to the decoder, the decoder maintains proper regulation and supply quality.

3.3V Host: For a host that provides power via the HOST_3P3 connection, the power supply passes directly through the decoder module to the imager engine. In bar code applications, up to 100 mV peak-to-peak noise is acceptable on the 3.3V supply (10 Hz to 100 kHz). For image capture applications, limit power supply noise to 30 mV peak-to-peak across the same frequency range. To achieve improvements in both image quality and decode performance, provide additional filtering of the HOST_3P3 supply. Carefully review both the efficiency and current delivering capacity of the regulator.

Thermal Considerations

The PL3307-B decoder module includes several high-power components that dissipate heat during operation. These components can exhibit high temperatures when the PL3307-B/imager engine pair is running at 60 frames per second with full illumination. Use care when integrating the PL3307-B/imager engine pair into the target application.

Protective measures that reduce power consumption and/or facilitate heat removal within a target system include but are not limited to:

- Using reduced frame rates (e.g., 15 fps)
- Reducing illumination intensity on the imager engine
- Mounting the PL3307-B to a solid metallic surface using metal screws
- Selecting a housing design that allows for natural or forced convection.

Note that running the PL3307-B/imager engine pair in continuous 60 fps with both aiming and illumination enabled full time is highly uncommon. Typical decoding and image capture applications are low duty cycle operations and internal temperature rise due to the PL3307-B/imager engine pair should be minimal.

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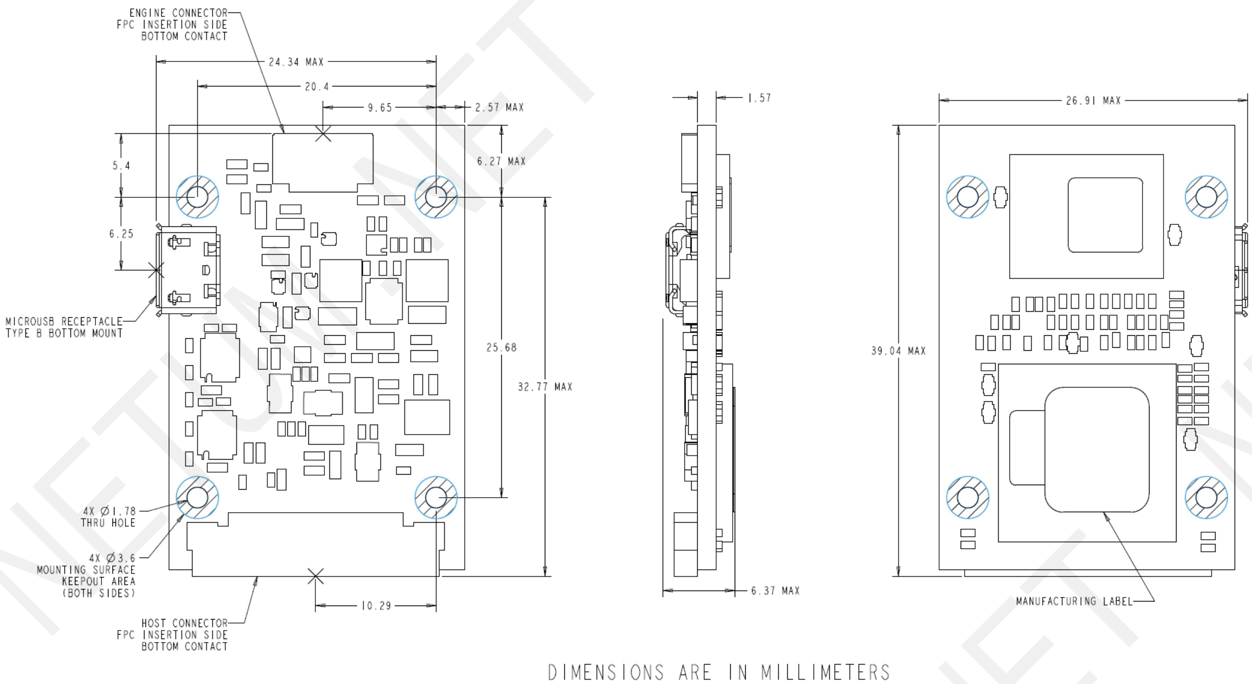
PL3307-B Decoder Board

There are four mounting holes (1.78 mm / 0.07 in.) on the decoder board. *Figure 3-1* provides an outline drawing for the PL3307-B decoder board. Position the board in the host equipment so that the connecting interface cable reaches the engine.

The PL3307-B boards contain components and circuitry on both sides.



Notes: Unless otherwise specified:

- This is a reference drawing and is not intended to specify or guarantee all possible integration requirements for this decoder.
- Dimensions are in mm.
- Tolerance for dimensions are ± 0.25 mm / ± 0.01 in.

Figure 3-1 *PL3307-B Decoder Board Drawing*

PL3307-B Electrical Information

Power Supply Requirements

The PL3307-B decoder board can be powered from one of three possible sources: Host 3.3 VDC, Host 5 VDC, or Micro USB 5 VDC. The PL3307-B uses an intelligent hardware multiplexer to configure the most efficient power supply arrangement for the combined PL3307-B/imager engine system. *Figure 3-2* shows a block diagram of the supply multiplexer.

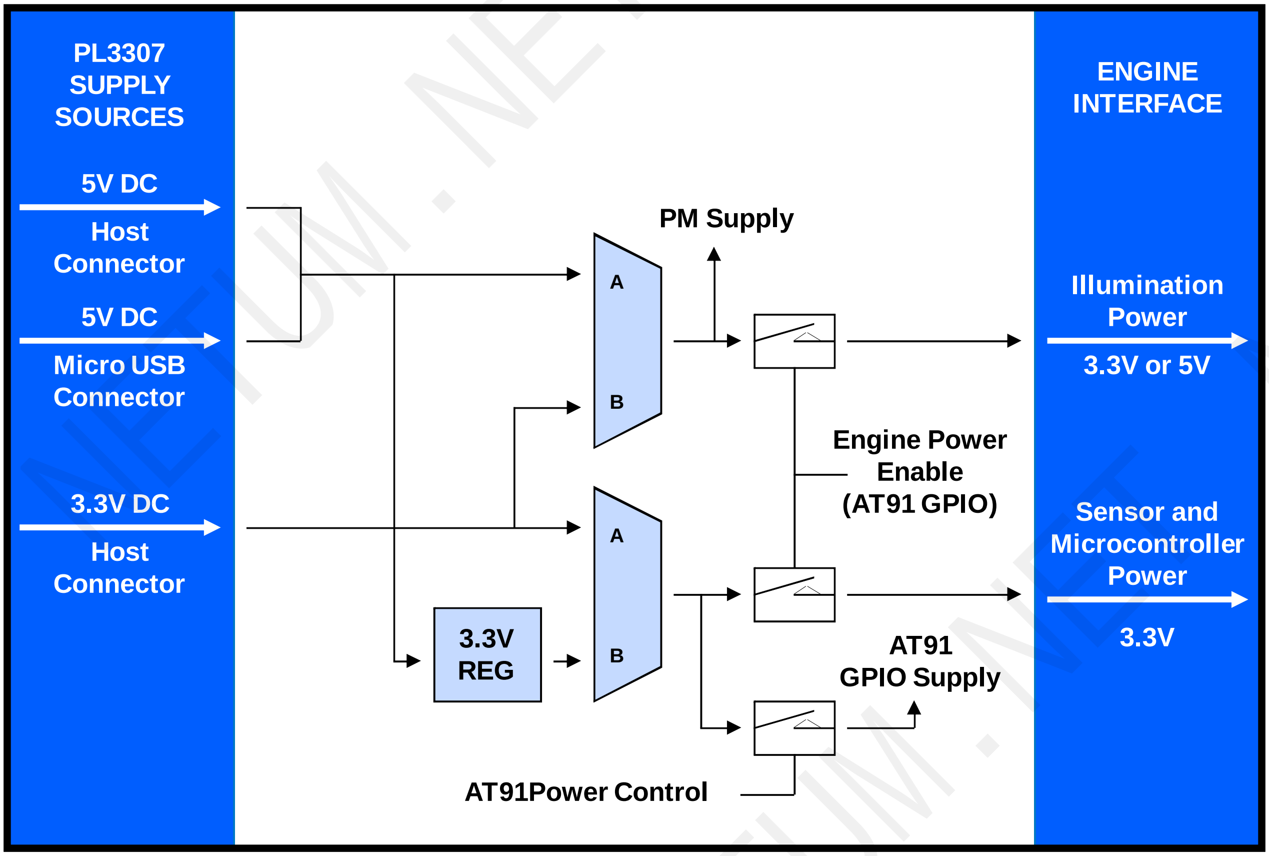


Figure 3-2 *PL3307-B Power Supply Multiplexer*

The multiplexers are low resistance switches that automatically select between A and B inputs. If both inputs are present (e.g., Host 5 VDC and Host 3.3 VDC) the A input takes precedence.

This arrangement allows powering the PL3307-B using 3.3 V, 5 V, or combined supply voltages that offer improved efficiency for the overall system due to the different supplies that the PL3307-B decoder and imager engine require internally.

✓ ***NOTE*** Host 5 VDC and Micro USB 5 VDC cannot be applied simultaneously to the PL3307 input as these lines are tied together internally.

Table 3-1 *PL3307-B Electrical Characteristics*

Symbol	Parameter	Condition	Minimum	Typical	Maximum	Units
HOST_3P3	Supply Voltage		3.0	3.3	3.6	V
HOST_5V	Supply Voltage		4.5	5.0	5.5	V
USB2_5V	Supply Voltage		4.5	5.0	5.5	V
NOTE: Logic Levels are referred to AT91SAM9G20 GPIO supply (HOST_3P3=3.3V)						
VIH	Input High voltage		2		HOST_3P3 +0.3	V
VIL	Input Low voltage		-0.3		0.8	V
I_{CC}					See *Table 3-5 on page 3-13*	mA
I_{iL}	Input Low Leakage current	V_{in} = GND, no pull up or pull down			± 1	uA
I_{iH}	Input High Leakage current	$V_{in} = V_{CC}$, no pull up or pull down			± 1	uA
I_{oL}	Output Low Current	V_{oL} = 0.4 V	-8			mA
I_{oH}	Output High Current	V_{oh} = HOST_3P3-0.4 V			8	mA
C_{i_usb}	Input capacitance, USB_OUT+/-				9.18	pF
Note: Supply current varies depending on factors such as what function the software is performing and which PL3307-B functions are being used.						

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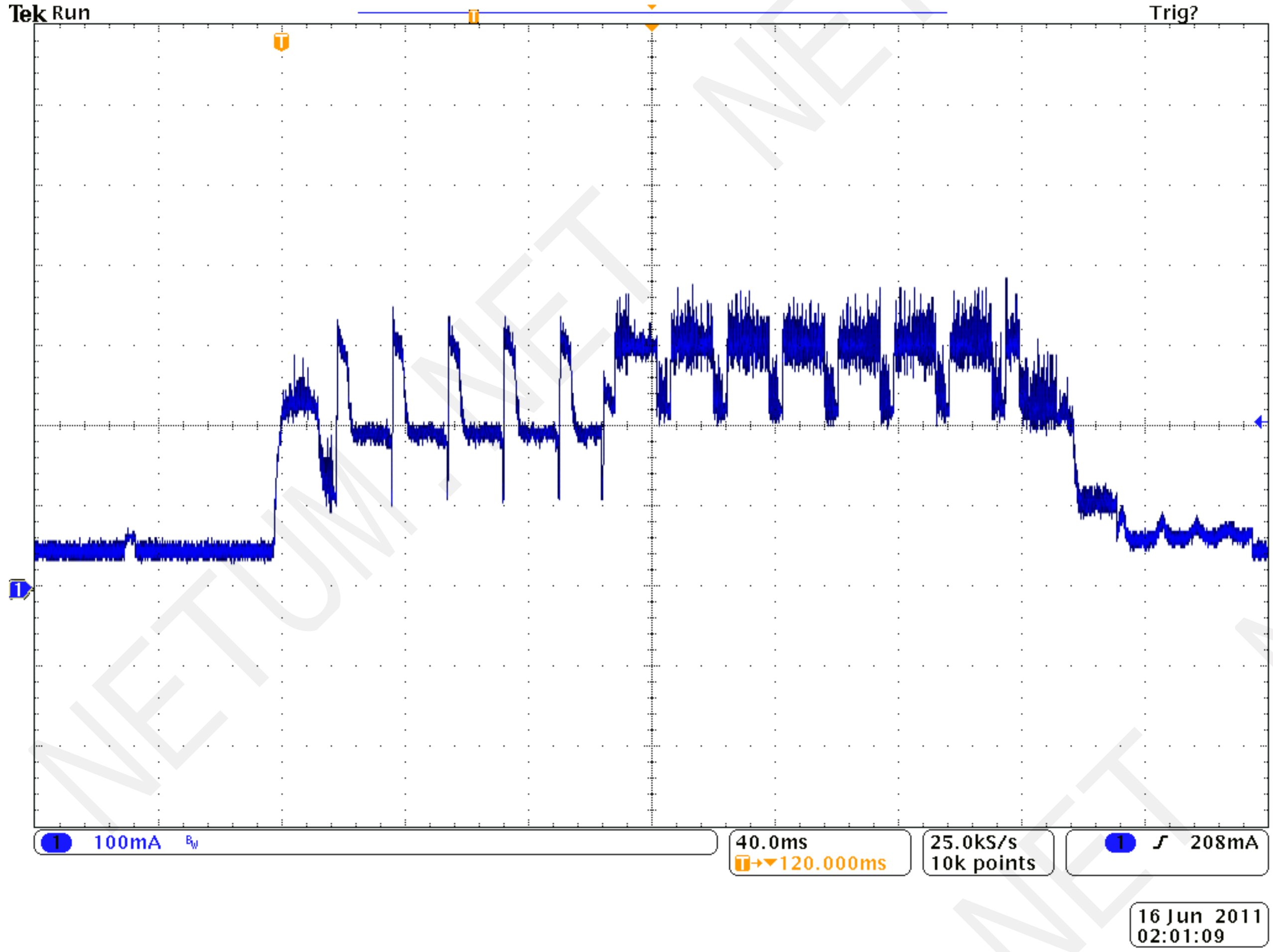

Figure 3-3 *PL3307-B Supply Current - 3.3 V Operation (RS-232, SSI, Scan/Decode Session)*

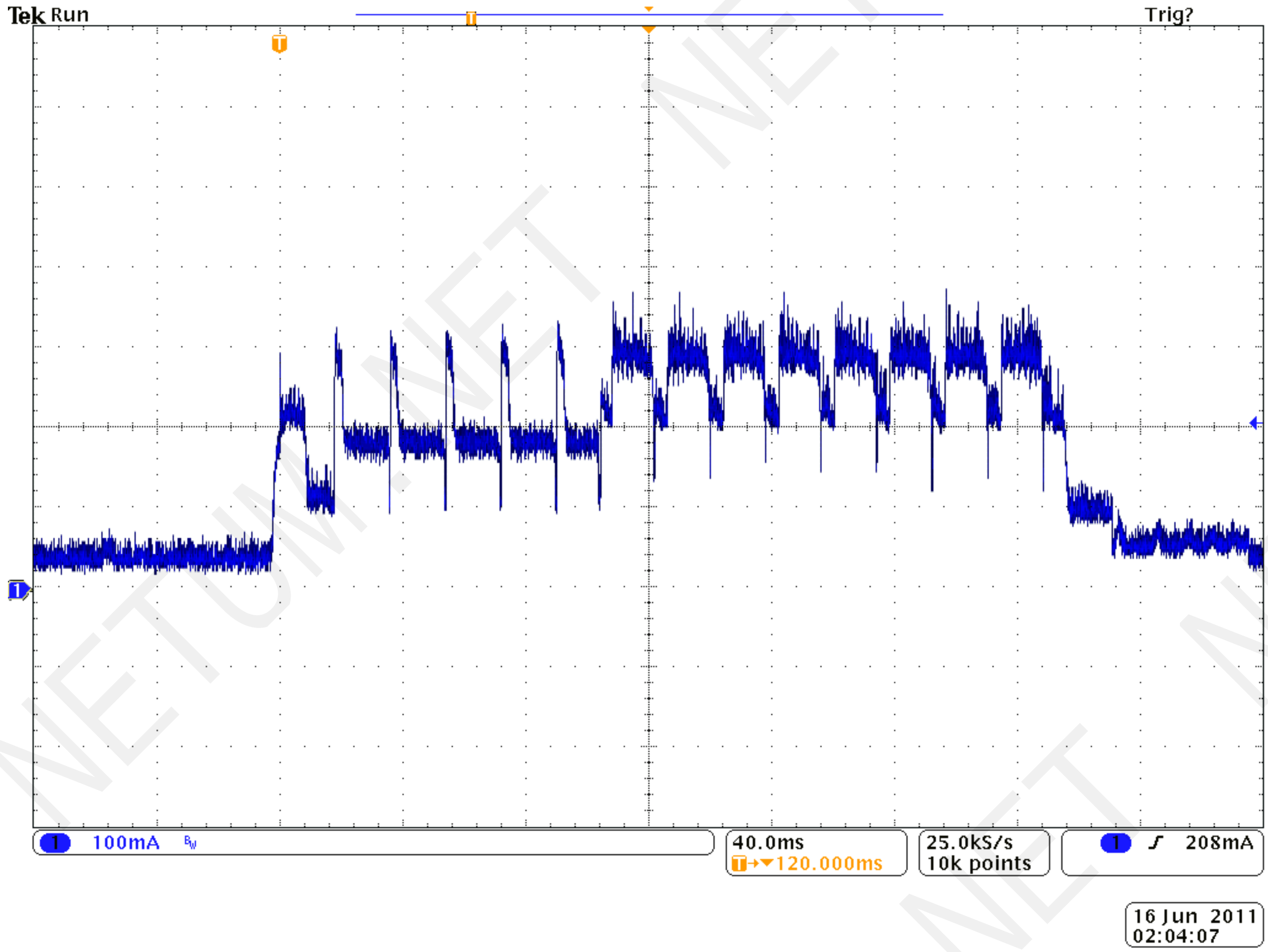

Figure 3-4 *PL3307-B Supply Current - 5 V Operation (USB Bus Powered, Scan/Decode Session)*

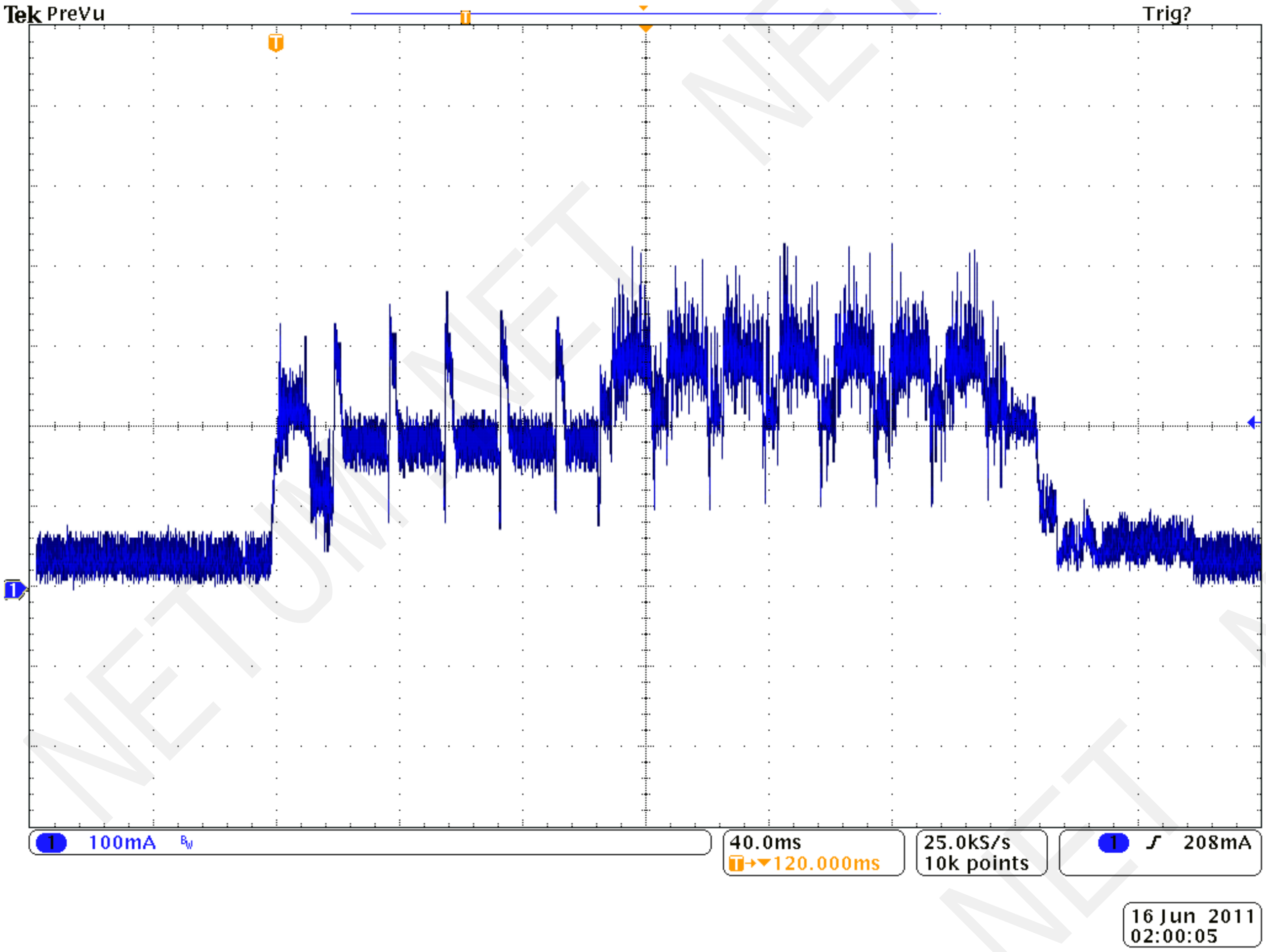

Figure 3-5 *PL3307-B Supply Current - 5 V Operation (USB Self Powered, Scan/Decode Session)*

Electrical Interface

Table 3-2 and *Table 3-3* list the pin functions of the imager engine and PL3307-B interfaces, and illustrate typical input and output circuitry.

NOTE Signal directions are listed relative to PL3307-B decoder module.

Table 3-2 *Imager Engine Signal Descriptions*

Signal Name	Description	Dir	Engine Interface	Comments
GND	Power supply	-	1	Imager engine power supply return
GND	Power supply	-	2	Imager engine power supply return
I2C_CLK	Communication interface	Out	3	Imager engine I^2C Clock
I2C_DATA	Communication interface	In/ Out	4	Imager engine I^2C Data
VSYNC	Vertical sync synchronized to a WVGA frame	In	5	Vertical sync clock from the imager engine
PIX_DATA_7	Pixel data	In	6	Pixel data from the imager engine (MSB)
PIX_DATA_6	Pixel data	In	7	Pixel data from the imager engine
PIX_DATA_5	Pixel data	In	8	Pixel data from the imager engine
PIX_DATA_4	Pixel data	In	9	Pixel data from the imager engine
PIX_DATA_3	Pixel data	In	10	Pixel data from the imager engine
PIX_DATA_2	Pixel data	In	11	Pixel data from the imager engine
PIX_DATA_1	Pixel data	In	12	Pixel data from the imager engine
PIX_DATA_0	Pixel data	In	13	Pixel data from the imager engine (LSB)
EXT_ILLUM_EN	Illumination enable	In	14	Enable external illumination
VCC_SENSOR	Power supply	-	15	Decoder provided 3.3V for imager engine image sensor and oscillator
VCC	Power supply	-	16	Decoder provided 3.3V for imager engine logic control system
VCC_ILLUM	Power supply	-	17	Decoder provided 3.3 to 5V for imager engine illumination system
HSYNC	Horizontal sync synchronized to the rows of the image data	In	18	Horizontal sync clock from the imager engine
GND	Power supply	-	19	Imager engine power supply return
PIXCLK	Pixel clock used to synchronize the decoder to the pixel data	In	20	Pixel clock returned from the imager engine
GND	Power supply	-	21	Imager engine power supply return
Note: Signal directions are listed relative to the PL3307-B decoder module.				

Table 3-3 *PL3307-B Signal Descriptions*

Signal Name	Description	Dir	Host Connector Pin	Control State	Comments
HOST_DOWNLOAD	PL3307 download signal	In	1	L = PL3307 in software download mode H = No action	Signal is sampled immediately following a reset state. It indicates to the PL3307 the system is ready to accept a new software image.
HOST_3P3	+3.3 V power supply	In	2		PL3307 supply voltage
GND	System ground		3		PL3307 power supply return
HOST_RXD	RS-232 receive	In	4		See *Typical Input Circuit*
HOST_TXD	RS-232 transmit	Out	5		
HOST_CTS	RS-232 Clear To Send control signal	In	6		See *Typical Input Circuit*
HOST_RTS	RS-232 Request To Send control signal	Out	7		
POWER_DOWN	Status signal from the PL3307 indicating power down state	Out	8	L = Normal state H = Engine is in a power down state	
BEEPER_OUT*	Pulse width modulated output used to control an external beeper	Out	9		The beeper output ranges from 2.024 KHz to 2.694 KHz and is a 50% duty cycle square wave at maximum volume, 12.5% at low volume. Normally used as a control signal for beeper drive circuit. Control line can source/sink 8 mA.
HOST_DEC_LED*	Active low output used to indicate a valid bar code decode	Out	10	L = LED on H = LED off	Normally used as a control signal for an LED drive circuit. Control line can source/sink 8 mA.
HOST_AIM_WAKE*	Signal functions as aiming pattern control when the PL3307 is not in a low power state	In	11	L = Aiming pattern on H= Aiming pattern off	See *Typical Input Circuit*. Set the appropriate parameters for this signal to function properly.
	Signal functions as a wakeup only when the PL3307 is in a low power state			L = Wake up PL3307 from a power down state H = No action	
HOST_TRIGGER*	Used to start a decode session	In	12	L = Start session H = Inactive	See *Typical Input Circuit*.

Note: Signal directions are listed relative to the PL3307 decoder module.

Table 3-3 *PL3307-B Signal Descriptions (Continued)*

Signal Name	Description	Dir	Host Connector Pin	Control State	Comments
HOST_3P3	+3.3 V power supply	In	13		PL3307 supply voltage
GND	System ground		14		PL3307 power supply return
Reserved			15		
GND	System ground		16		PL3307 power supply return
Reserved			17		
HOST_3P3	+3.3 V power supply	In	18		PL3307 supply voltage
Reserved			19		
Reserved			20		
Reserved			21		
GND	System ground		22		PL3307 power supply return
HOST_USB_P	Positive differential data signal for the USB bus	In/ Out	23		USB 2.0 full speed bus
HOST_USB_N	Negative differential data signal for the USB bus	In/ Out	24		USB 2.0 full speed bus
GND	System ground		25		PL3307 power supply return
HOST_5V	+5.0V power supply	In	26		PL3307 supply voltage
HOST_5V	+5.0V power supply	In	27		PL3307 supply voltage
ILLUM_EN_OUT*	External illumination control signal	Out	28	L = Illumination on H = Illumination off	Reserved for external illumination control. Control line can only source/sink 8 mA.
HOST_SYS_CFG0	System configuration bits	In	29		Used to determine which host interface is used after reset state. See *Interfaces on page 1-4*.
HOST_SYS_CFG1		In	30		

Note: Signal directions are listed relative to the PL3307 decoder module.

Table 3-4 *PL3307-B Signal Descriptions - Micro USB-B Connector*

Signal Name	Description	Dir	Connector Pin(s)	Comments
USB2_5V	Power supply	-	1	PL3307 power supply
D-	Communication interface	In/Out	2	PL3307 USB D-
D+	Communication interface	In/Out	3	PL3307 USB D+
N/A	No connect		4	Not connected
GND	Power supply	-	5	PL3307 power supply return
Note: Signal directions are listed relative to the PL3307-B decoder module.				

Typical Input Circuit

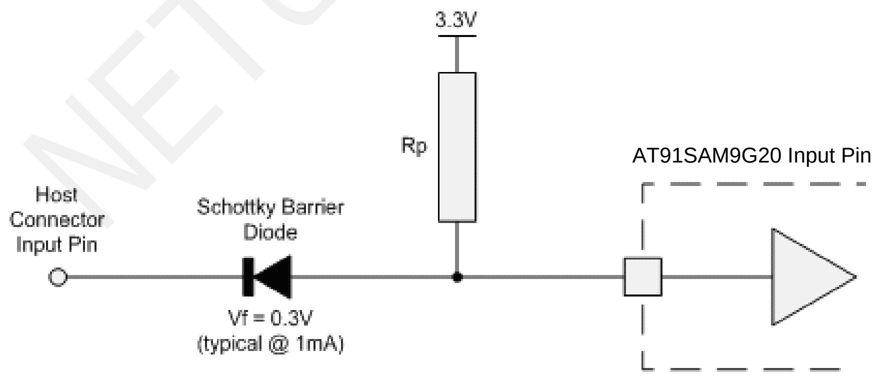

Figure 3-6 *Input Circuit*

Pull-up resistor, R_p, is 4.7K ohms. The input circuit allows a host with 5V logic to communicate directly with the PL3307-B and eliminates the possibility of back powering the decoder.

Technical Specifications

Table 3-5 provides the technical specifications for the PL3307-B decoder. Note that current draw figures are valid for a PL3307-B with an attached SE3300WA imager engine.

Table 3-5 *PL3307-B Decoder Technical Specifications at 23°C*

Item	Description
Power Requirements:	Supply currents listed below are typical values in mA, RMS, at nominal supply voltage unless otherwise specified.
Host Supply 3.3 V (HOST_3P3):	
Supply Voltage	3.3 V +/- 0.3 V
Low Power Current	15 mA
Idle Current	45 mA
Operating Current	280 mA (scan/decode session)
Peak Current	400 mA (see *Figure 3-3 on page 3-6*)
Host Supply 5.0 V (USB2_5V or HOST_5V):	Applies only when the PL3307-B is USB bus powered via the micro USB port
Supply Voltage	5.0 V +/- 0.5 V
Suspend Current Draw	15 mA
Idle Current	35 mA
Operating Current	270 mA
Peak Current	400 mA See *Figure 3-5 on page 3-8*
Maximum Power Supply Noise	100 mVp-p - bar code and image capture applications, host supply = 5 VDC (HOST_5V or USB2_5V) 100 mVp-p - bar code applications, host supply = 3.3 VDC (HOST_3P3 only) 30 mVp-p - image capture applications, host supply VCC = 3.3 VDC (HOST_3P3 only)
Start Up Time	
From Power On	RS-232: 1200 ms typical (RS-232) USB: Host dependent
From Low Power Mode	3 ms typical
Baud Rate	9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600
Temperature	
Operating	-30° C to 55° C (-22° F to 131° F)
Storage	-40° C to 70° C (-40° F to 158° F)
Humidity	
Operating	95% RH, non-condensing at 55°C
Storage	85% RH, non-condensing at 70°C
Shock	2000 G ± 5% applied via any mounting surface at -30º C and 55º C for a period of 0.85 ± 0.05% msec 2500 G ± 5% applied via any mounting surface at 20º C for a period of 0.85 ± 0.05% msec

Table 3-5 *PL3307-B Decoder Technical Specifications at 23°C (Continued)*

Item	Description
Vibration	Unpowered decoder board withstands a random vibration along each of the X, Y, and Z axes for a period of one hour per axis, defined as follows: 20 to 80 Hz — Ramp up at 0.04 G^2/Hz at 3 dB/octave 80 to 350 Hz — 0.04 G^2/Hz 350 Hz to 2 kHz — Ramp down at 0.04 G^2/Hz at 3 dB/octave
Dimensions (max)	39.04 mm x 26.91 mm x 6.37 mm (1.537 in. x 1.059 in x 0.251 in.)
Weight	5.7 g (0.20 oz)

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CHAPTER 4 PL3307-C INSTALLATION AND SPECIFICATIONS

Introduction

This chapter provides installation and electrical information for the PL3307-C BGA decoder.

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Installing the PL3307-C

Surface Mount Assembly Considerations

PL3307-C assembly includes:

- Standard solder paste printing of PCB
- Placement using standard pick and place equipment (due to package design, offset pickup and placement capability is required)
- Solder reflow and cleaning.

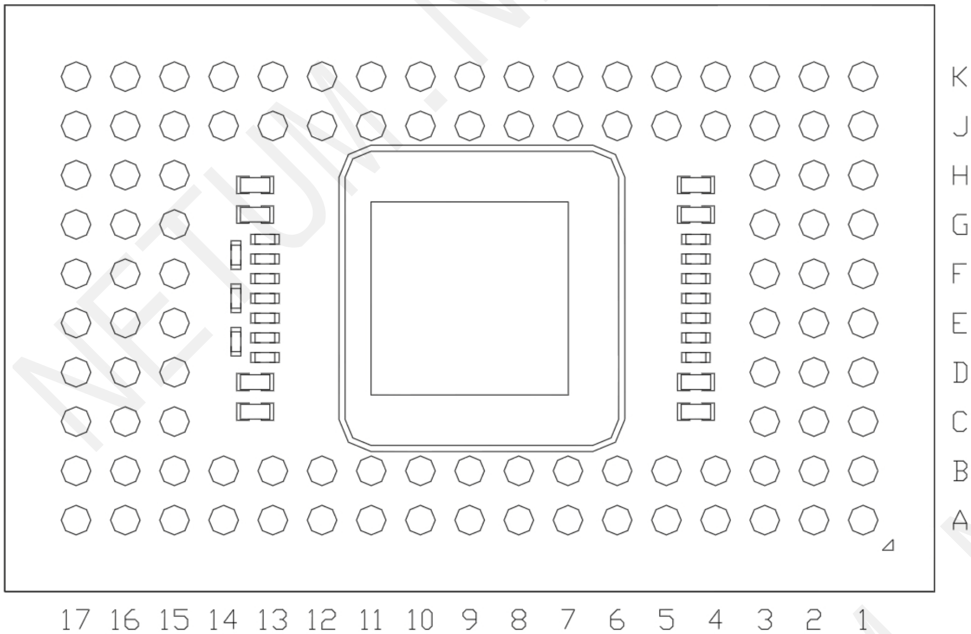


Figure 4-1 *PL3307-C Pin Mapping (Bottom View)*

PCB Pad Layout

Choose from two types of surface mount attach pads/land patterns for BGA attachment:

- Non-Solder Mask Defined (NSMD)
- Solder Mask Defined (SMD).

An NSMD pad is the preferred design due to better control and tolerance of the PCB fabrication metallization process. NSMD also allows for a reduction in concentrated stresses on the PCB side solder joint as compared to SMD.

Ensure the trace width used on the NSMD pad geometry does not exceed 2/3 of the pad diameter.

Table 4-1 *Recommended Pad Geometry*

Pad Type	Copper	Solder Mask Opening
NSMD	0.014 in.	0.016 in.
SMD	0.021 in.	0.015 in.

.

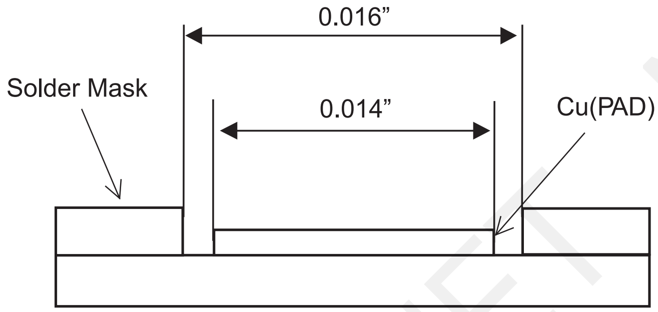


Figure 4-2 *Non-Solder Mask Defined Pad*

The dimensions in *Figure 4-2* are based on dimensions of 0.450 mm / 0.0177 in. component pad size. Solder reflow and cleaning is dependent on flux chemistry.

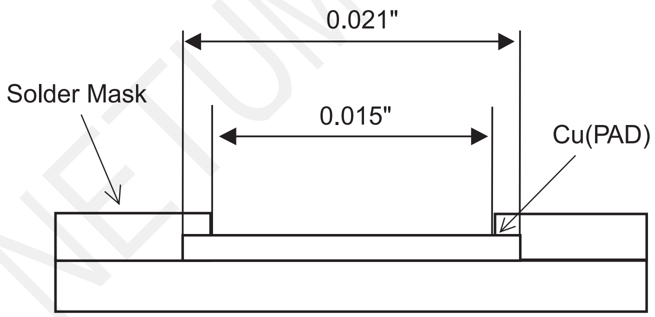
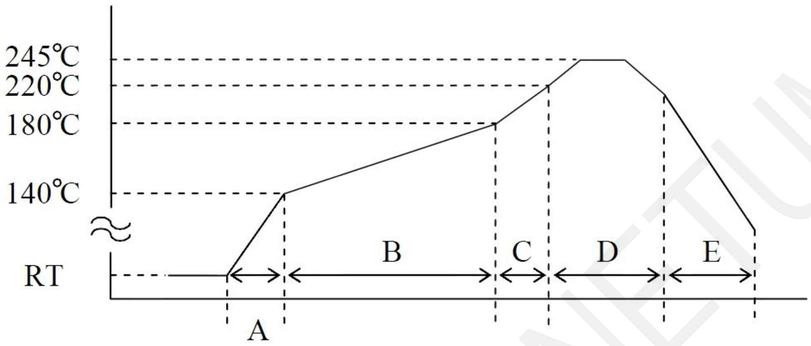


Figure 4-3 *Solder Mask Defined Pad*



A: 1.5^o - 4.0^o C / sec

B: 60-120 sec

C: < 4.0^o C / sec

D: Time above 220^o C = 30-60 seconds with a Peak Temperature = 245^oC

E: < 4.0^o C / sec

Figure 4-4 *Recommended Reflow Soldering Profile*

ESD

The engine and decoder are protected from ESD events that can occur in an ESD-controlled environment. Use care when handling these components. Use grounding wrist straps and handle in a properly grounded work area.

Recommendations for Assembly

Reflow Soldering

- After opening the aluminum laminate bag, store modules in a dry atmosphere such as in a desiccator. If storing the modules at less than 60% humidity and at less than 30^{o}C, mount the modules within three days after opening the bag, even if a second reflow soldering is done. If more than three days passes after opening the bag, perform a baking treatment before the first and second reflow soldering.
- Recommended reflow soldering times are 2 cycles max.
- To prevent moisture absorption in MCM packages, an aluminum laminate bag, which has high moisture-proof characteristics, is used with silica gel. If the humidity indicator in the laminate bag indicates more than 40% RH, perform a baking treatment.
- Follow the reflow profile shown in *Figure 4-4 on page 4-3*.

Baking

- Use a high temperature oven which can control temperature to 125^{o}C ±3^{o}.
- Place modules, which are on a heat resistant tray, into the oven for 12 hours. Remove them from the oven and allow to cool using natural air convection.
- Keep the temperature of the working environment between 5^{o} and 30^{o}C, with humidity less than 60% RH. Also take appropriate measures to address electro-static discharge to avoid module deterioration.
- Baking treatment can be performed up to two times under the previous conditions.

Cleaning

- If using a cleaning solvent, determine its effect on components prior to use.
- For best results, do not use ultrasonic wave cleaning, which can damage components. If ultrasonic wave cleaning must be used, determine its impact prior to use.

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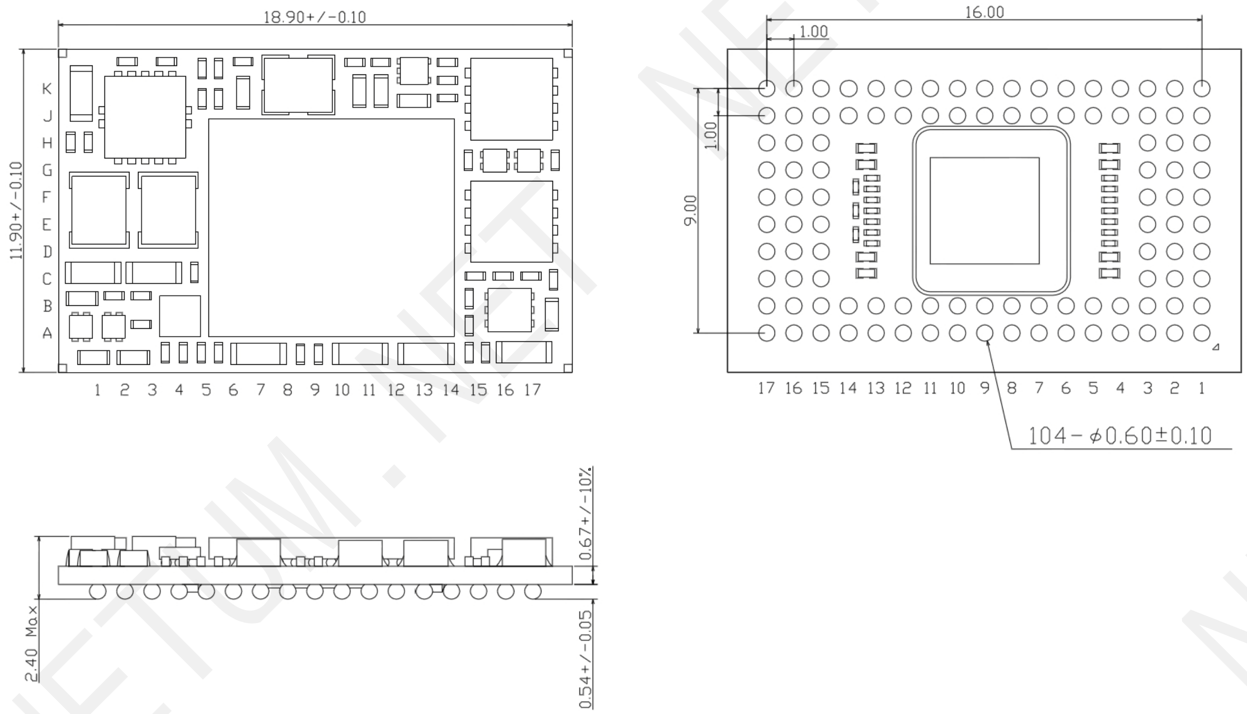

Figure 4-5 *PL3307-C Mechanical Drawing*

PL3307-C Electrical Interface

Table 4-2 *PL3307-C Electrical Characteristics*

Symbol	Parameter	Condition	Minimum	Typical	Maximum	Units
HOST_3P3	Supply Voltage		3.0	3.3	3.6	V
HOST_5V	Supply Voltage		4.5	5.0	5.5	V
NOTE: Logic Levels are referred to AT91SAM9G20 GPIO supply (HOST_3P3=3.3V)						
VIH	Input High voltage		2		HOST_3P3 +0.3	V
VIL	Input Low voltage		-0.3		0.8	V
I_{CC}					See *Table 4-4 on page 4-16*	mA
I_{iL}	Input Low Leakage current	V_{in} = GND, no pull up or pull down			± 1	uA
I_{iH}	Input High Leakage current	V_{in} = V_{CC}, no pull up or pull down			± 1	uA
I_{oL}	Output Low Current	V_{oL} = 0.4 V	-8			mA
I_{oH}	Output High Current	V_{oh} = HOST_3P3-0.4 V			8	mA
C_{i_usb}	Input capacitance, USB_OUT+/-				9.18	pF
Note: Supply current varies depending on factors such as what function the software is performing and which PL3307-C functions are being used.						

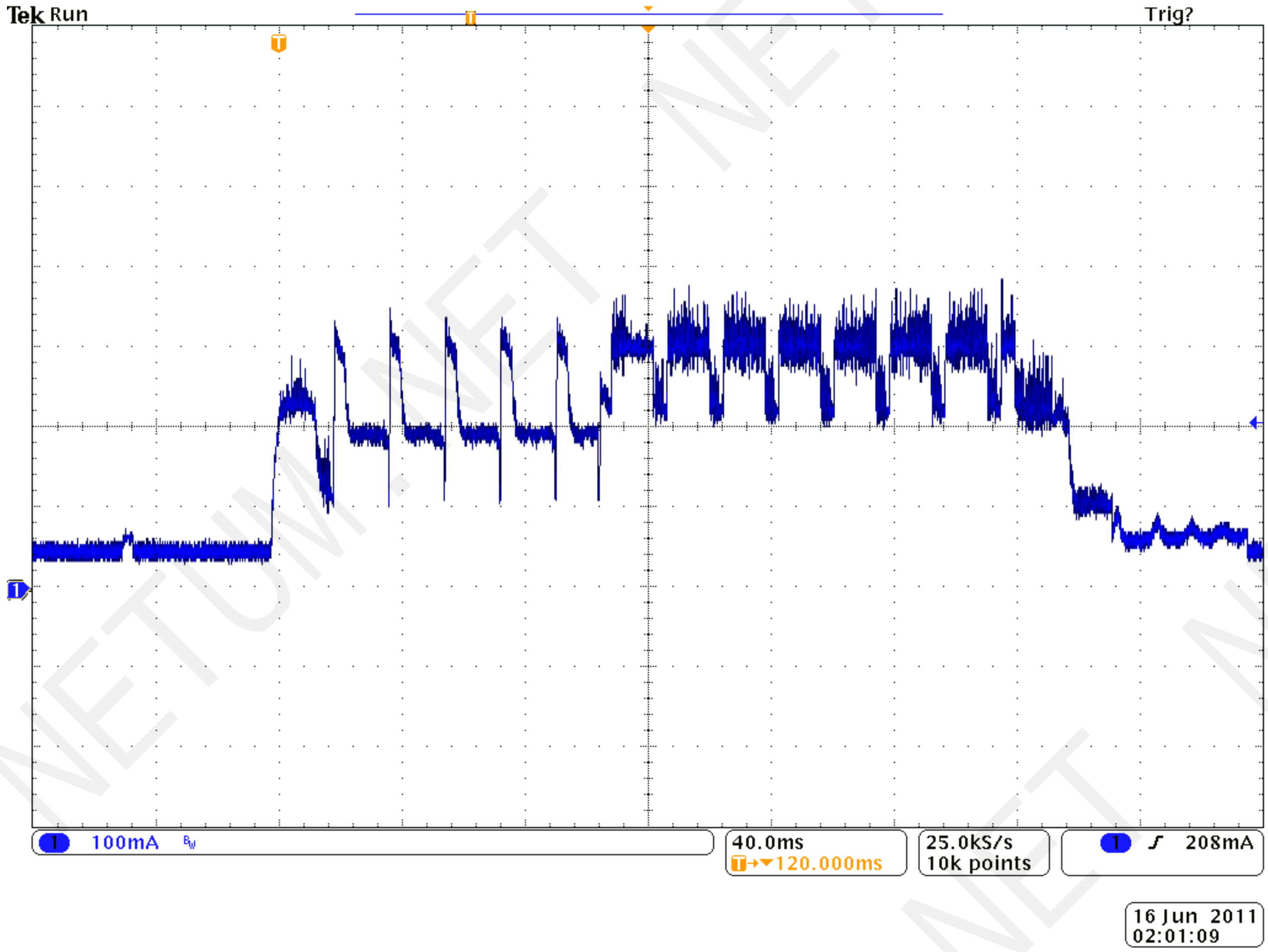

Figure 4-6 *PL3307-C Supply Current - 3.3 V Operation (RS-232, SSI, Scan/Decode Session)*

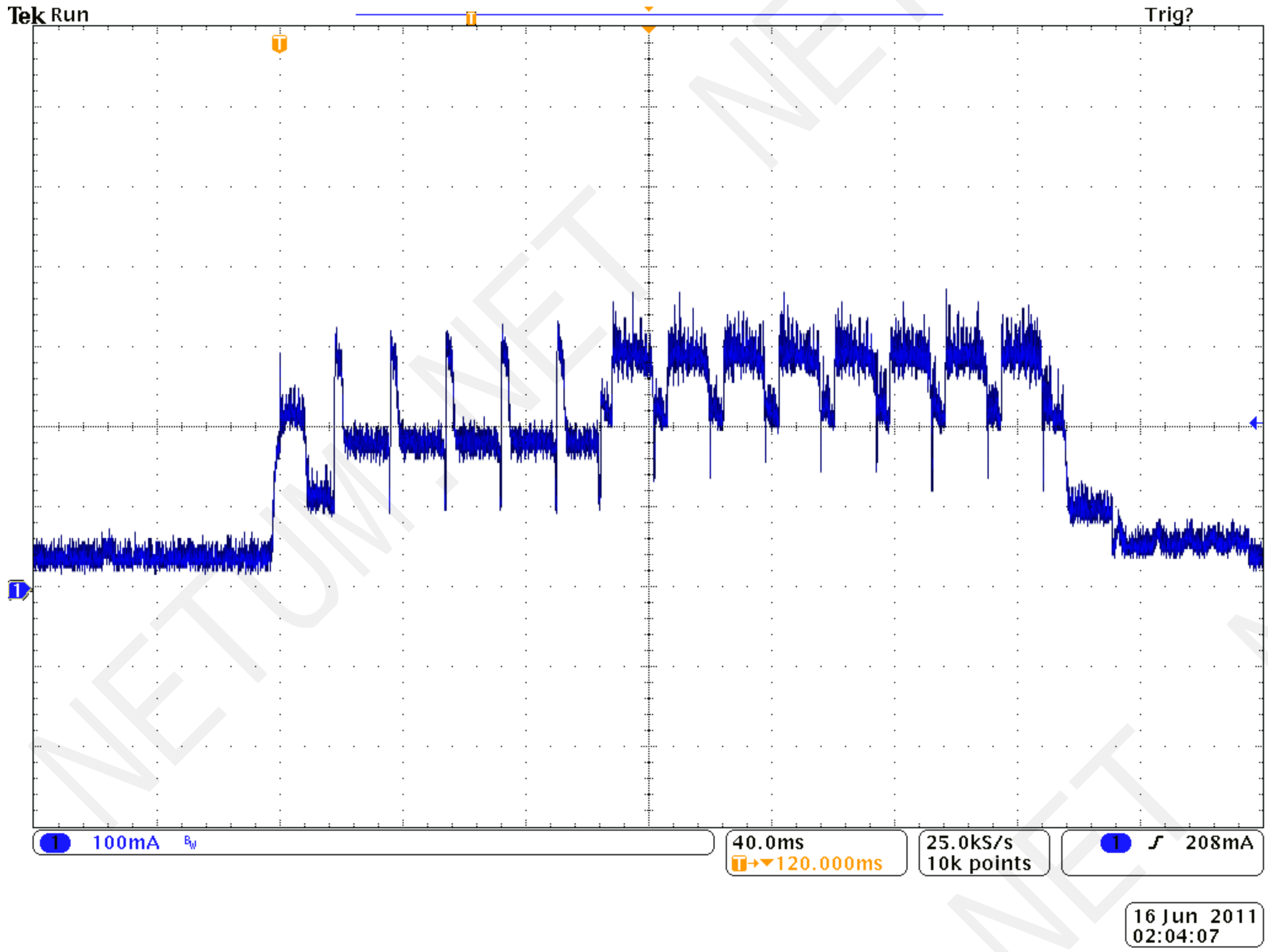

Figure 4-7 *PL3307-C Supply Current - 5 V Operation (Scan/Decode Session)*

Table 4-3 *PL3307 Ball Descriptions*

Signal Name	Description	Dir	BGA Ball	Control State	Comments
HOST_DOWNLOAD	PL3307 download signal	In	F1	L = PL3307 in software download mode H = No action	Signal is sampled immediately following a reset state. It indicates to the PL3307 the system is ready to accept a new software image.
HOST_3P3	+3.3 V power supply	In	C15, D15, E15, F15, G15, H15		PL3307 supply voltage
HOST_RXD	RS-232 receive	In	A7		
HOST_TXD	RS-232 transmit	Out	A6		
HOST_CTS	RS-232 Clear To Send control signal	In	E3		
HOST_RTS	RS-232 Request To Send control signal	Out	F3		
HOST_USB_P	Positive differential data signal for the USB bus	In/ Out	A15		USB 2.0 full speed bus
HOST_USB_N	Negative differential data signal for the USB bus	In/ Out	A14		USB 2.0 full speed bus
HOST_5V	+5.0V power supply	In	B16, C16, C17, H16, H17, J16		PL3307 supply voltage
HOST_DEC_LED*	Active low output used to indicate a valid bar code decode	Out	G2	L = LED on H = LED off	Normally used as a control signal for an LED drive circuit. Control line can source/sink 8 mA.
HOST_AIM_WAKE*	Signal functions as aiming pattern control when the PL3307 is not in a low power state	In	E2	L = Aiming pattern on H= Aiming pattern off	Set the appropriate parameters for this signal to function properly.
	Signal functions as a wakeup only when the PL3307 is in a low power state			L = Wake up PL3307 from a power down state H = No action	
HOST_TRIGGER*	Used to start a decode session	In	K10	L = Start session H = Inactive	
HOST_SYS_CFG0	System configuration bits	In	B4		Used to determine which host interface is used after reset state.
HOST_SYS_CFG1		In	A4		

Note: Signal directions are listed relative to the PL3307 decoder module.

Table 4-3 *PL3307 Ball Descriptions (Continued)*

Signal Name	Description	Dir	BGA Ball	Control State	Comments
POWER_DOWN	Status signal from the PL3307 indicating power down state	Out	D3	L = Normal state H = Engine is in a power down state	
BEEPER_OUT*	Pulse width modulated output used to control an external beeper	Out	A5		The beeper output ranges from 2.024 KHz to 2.694 KHz and is a 50% duty cycle square wave at maximum volume, 12.5% at low volume. Normally used as a control signal for beeper drive circuit. Control line can source/sink 8 mA.
ILLUM_EN_OUT*	External illumination control signal	Out	A3	L = Illumination on H = Illumination off	Reserved for external illumination control. Control line can only source/sink 8 mA.
GND	Power supply	-	A2, A13, A16, B1, B5, B10, B15, B17, D16, E1, E16, G1, J1, J3, J9, J12, J15, J17, K2, K9, K11, K13, K15, K16		PL3307 power supply return
VCC	Power supply	-	F16, F17		Decoder provided 3.3V for PL3307 logic control system
VCC_ILLUM	Power supply	-	G16, G17		Decoder provided 3.3 to 5V for PL3307 illumination system
I2C_CLK	Communication interface	Out	H3		Imager engine I^2C clock
I2C_DATA	Communication interface	In/ Out	G3		Imager engine I^2C data
VSYNC	Vertical sync synchronized to a WVGA frame	In	K3		Vertical sync clock from the imager engine
PIX_DATA_7	Pixel data	In	J7		Pixel data from the imager engine (MSB)
PIX_DATA_6	Pixel data	In	J5		Pixel data from the imager engine
PIX_DATA_5	Pixel data	In	K7		Pixel data from the imager engine
PIX_DATA_4	Pixel data	In	K5		Pixel data from the imager engine

Note: Signal directions are listed relative to the PL3307 decoder module.

Table 4-3 *PL3307 Ball Descriptions (Continued)*

Signal Name	Description	Dir	BGA Ball	Control State	Comments
PIX_DATA_3	Pixel data	In	J6		Pixel data from the imager engine
PIX_DATA_2	Pixel data	In	J4		Pixel data from the imager engine
PIX_DATA_1	Pixel data	In	K6		Pixel data from the imager engine
PIX_DATA_0	Pixel data	In	K4		Pixel data from the imager engine (LSB)
EXT_ILLUM_EN	Illumination enable	In	C3		Enable external illumination
HSYNC	Horizontal sync synchronized to the rows of the image data	In	J8		Horizontal sync clock from the imager engine
PIXCLK	Pixel clock used to synchronize the decoder to the pixel data	In	K8		Pixel clock returned from the imager engine
Reserved			A1, C1, D1, H1, K1, B3, C2, B2, D2, F2, J2, H2, A8, A9, A10, A11, A12, B12, B13, B11, B8, B9, B6, B7, K17, E17, D17, A17, J14, B14, K12, K14, J10, J11, J13		No connection

Note: Signal directions are listed relative to the PL3307 decoder module.

PL3307-C Reference Connections

The PL3307-C can be powered from either 5 volts or 3.3 volts.

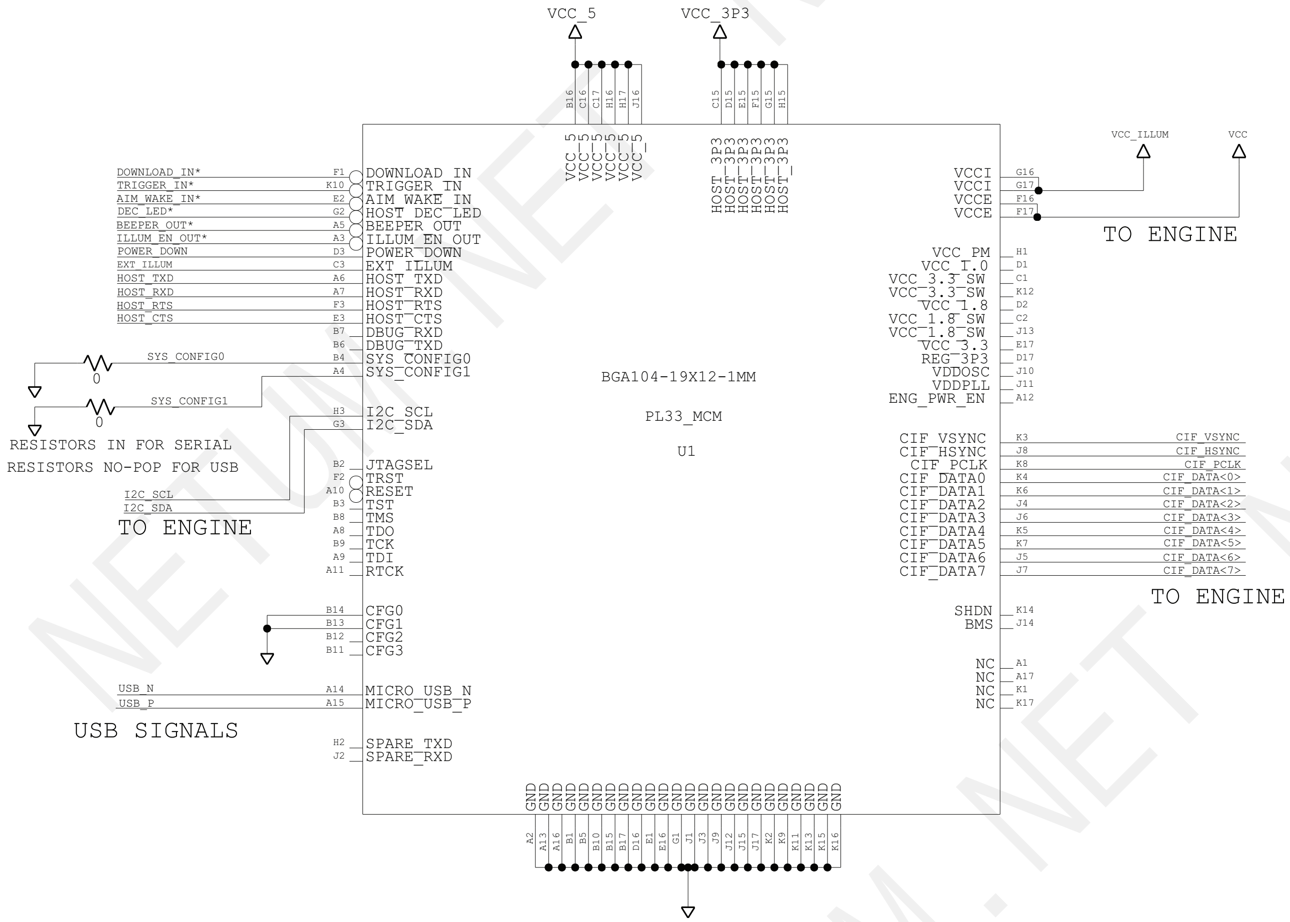

Figure 4-8 *Reference PL3307-C Connections*

Camera Connection

Use any flex connector for camera connection. *Figure 4-9* shows a Molex 54809 as a reference.

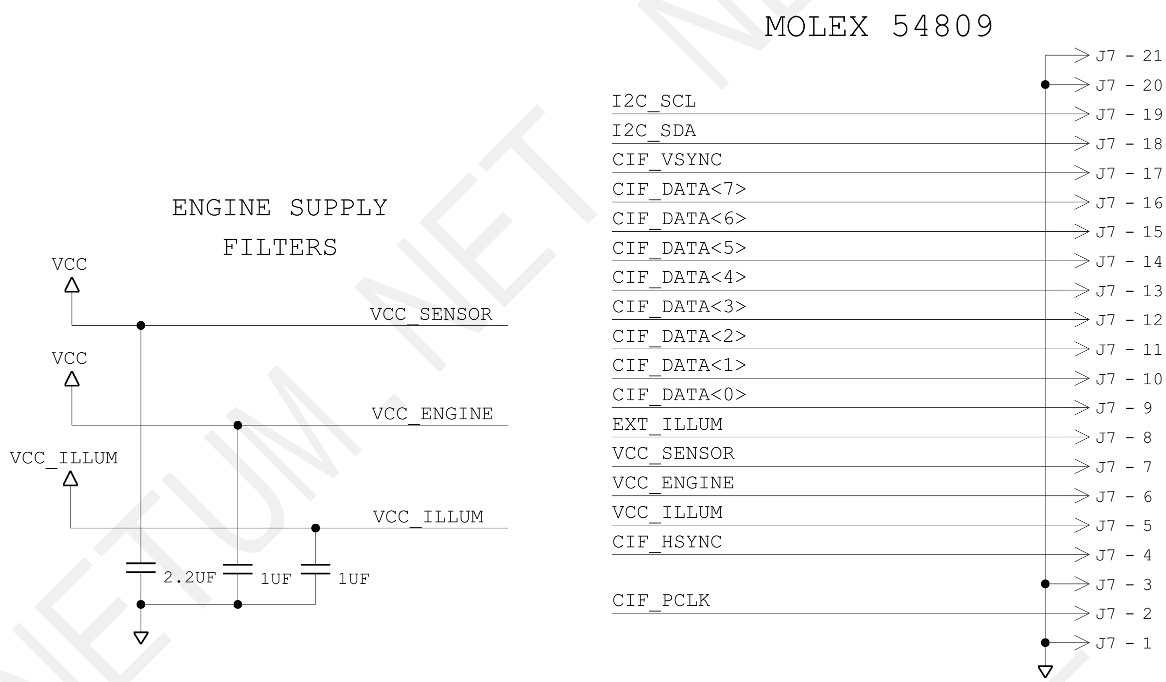

Figure 4-9 *Reference Camera Connection*

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Decode LED Connection

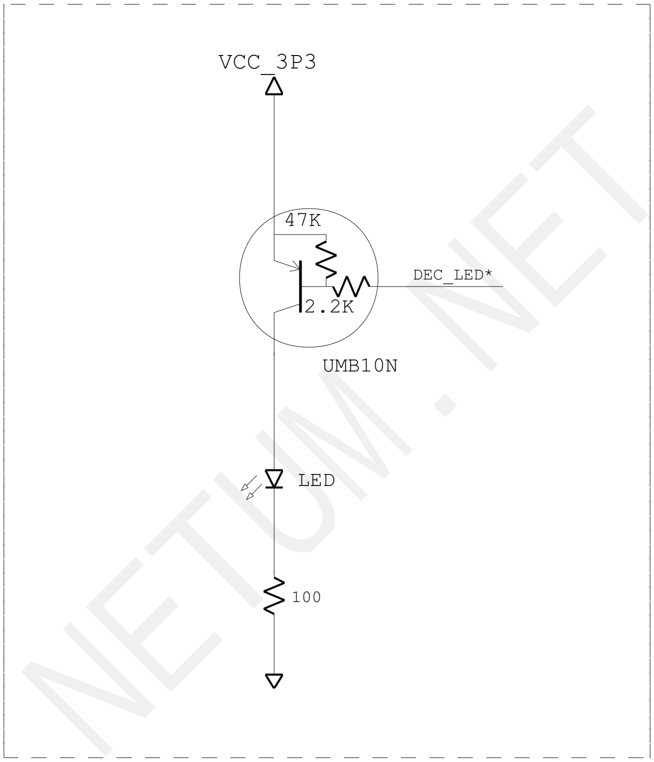

Figure 4-10 *Reference LED Drive Circuit*

Beeper Connection

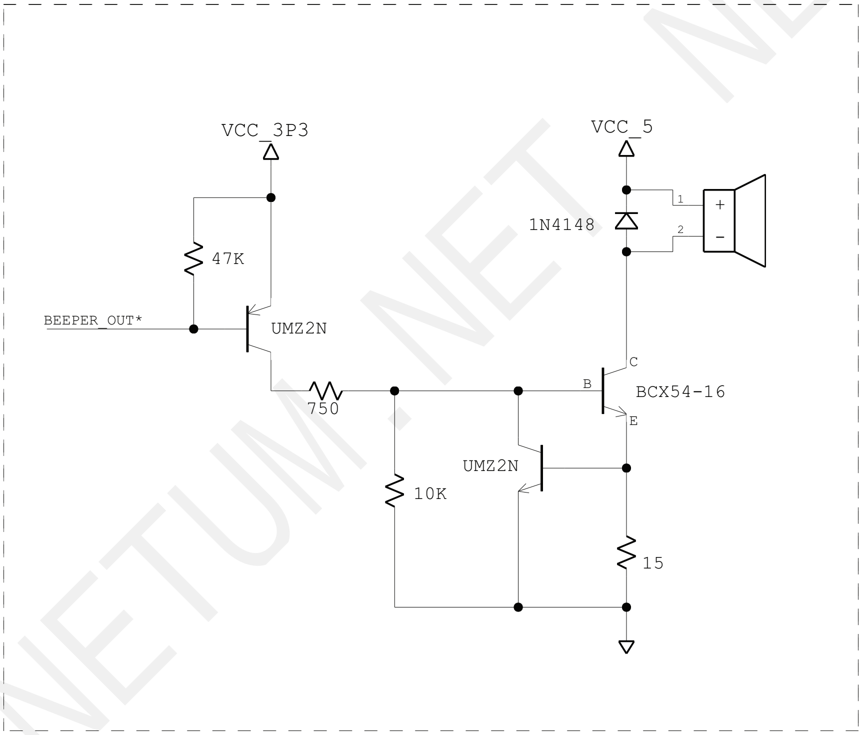

Figure 4-11 *Reference Beeper Circuit*

Trigger Connection

Create the **Trigger_In*** signal from a switch as shown or a microprocessor's output port pin.

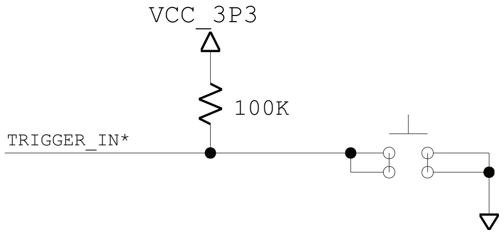

Figure 4-12 *Reference Trigger Connection*

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Technical Specifications

Table 4-4 provides the technical specifications for the PL3307-C decoder. Note that current draw figures are valid for a PL3307-C with an attached SE3300WA imager engine.

Table 4-4 *PL3307-C Decoder Technical Specifications at 23°C*

Item	Description
Power Requirements:	Supply currents listed below are typical values in mA, RMS, at nominal supply voltage unless otherwise specified.
Host Supply 3.3 V (HOST_3P3):	
Supply Voltage	3.3 V +/- 0.3 V
Low Power Current	15 mA
Idle Current	45 mA
Operating Current	280 mA (scan/decode session)
Peak Current	400 mA (see *Figure 4-6 on page 4-7*)
Host Supply 5.0 V (HOST_5V):	
Supply Voltage	5.0 V +/- 0.5 V
Suspend Current Draw	15 mA
Idle Current	35 mA
Operating Current	270 mA
Peak Current	400 mA (see *Figure 4-7 on page 4-8*)
Maximum Power Supply Noise	100 mVp-p - bar code and image capture applications, host supply = 5 VDC (HOST_5V) 100 mVp-p - bar code applications, host supply = 3.3 VDC (HOST_3P3 only) 30 mVp-p - image capture applications, host supply VCC = 3.3 VDC (HOST_3P3 only)
Start Up Time	
From Power On	RS-232: 1200 ms typical (RS-232) USB: Host dependent
From Low Power Mode	3 ms typical
Baud Rate	9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600
Temperature	
Operating	-30° C to 55° C (-22° F to 131° F)
Storage	-40° C to 70° C (-40° F to 158° F)
Humidity	
Operating	95% RH, non-condensing at 55°C
Storage	85% RH, non-condensing at 70°C
Dimensions (max)	19.00 mm x 12.00 mm x 2.40 mm (0.748 in. x 0.472 in. x 0.094 in.)
Weight	0.9 g (0.03 oz)

CHAPTER 5 ACCESSORIES

Introduction

Table 5-1 lists the accessories for the PL3307 system.

Table 5-1 *PL3307 Accessories*

Accessory	Ordering Number
Flex for connecting the imager engine to the PL3307-B (21 pin, 0.3 mm pitch, 55 mm length)	KT-IMGENG-01
Flex for connecting the imager engine to the PL3307-A (21 pin, 0.3 mm pitch, 55 mm length)	KT-IMGENG-02
Flex for connecting the PL3307-B to a host (30 pin, 0.5 mm pitch, 45 mm length)	KT-IMGENG-03
Flex for connecting the PL3307-A (and SE3307) to a host (31 pin, 0.3 mm pitch, 76 mm length)	KT-IMGENG-04
Flex and connector for connecting the imager engine to a host circuit board using PL3307-C (21 pins, 0.3 mm pitch, 55 mm length)	KT-IMGENG-05

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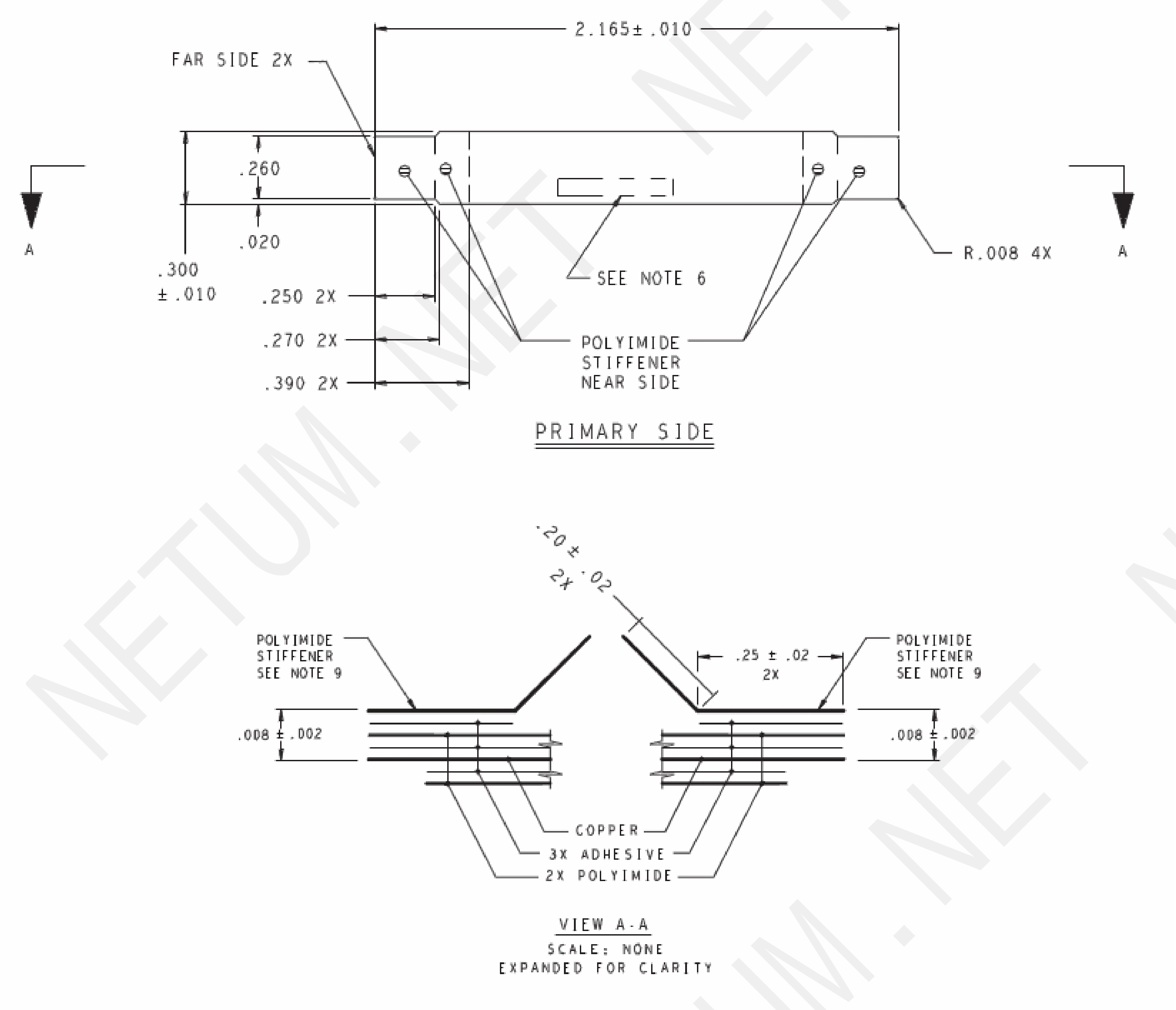


Figure 5-1 *Imager Engine to PL3307-B 21-Pin Flex*

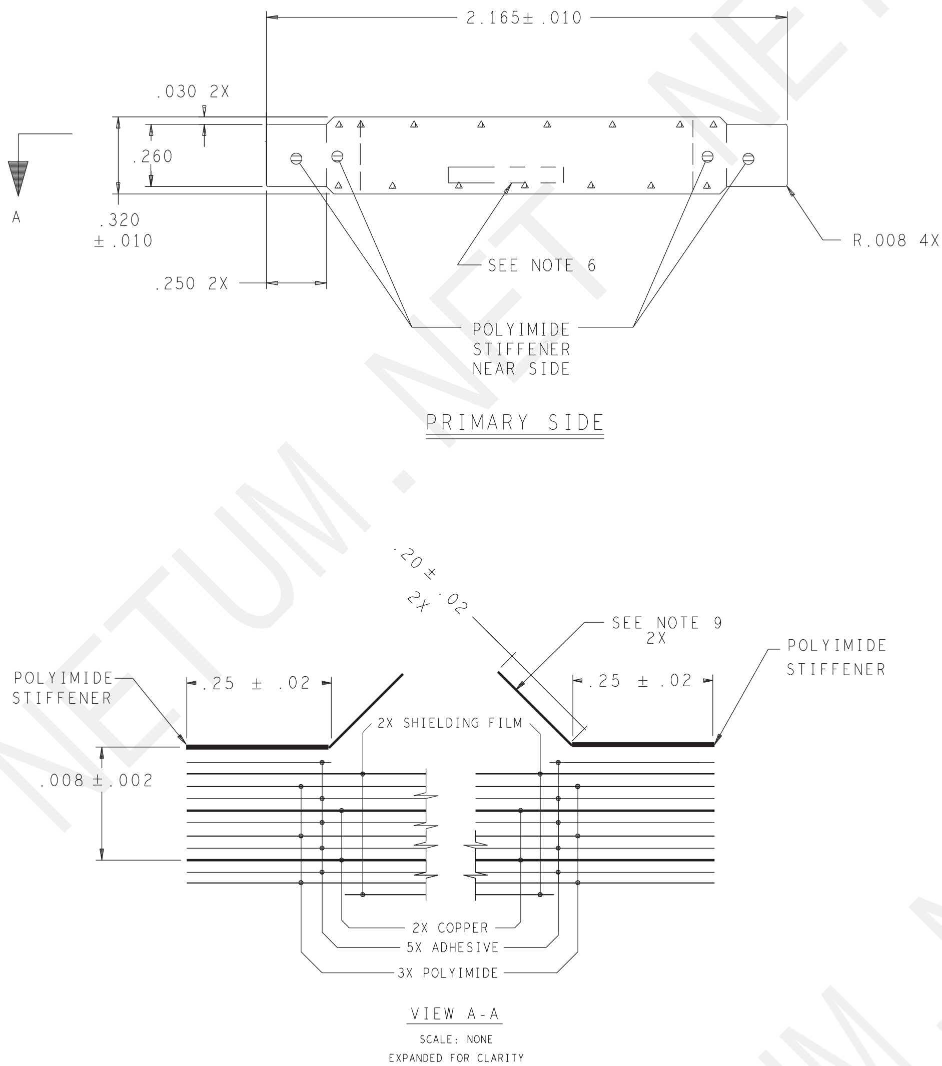
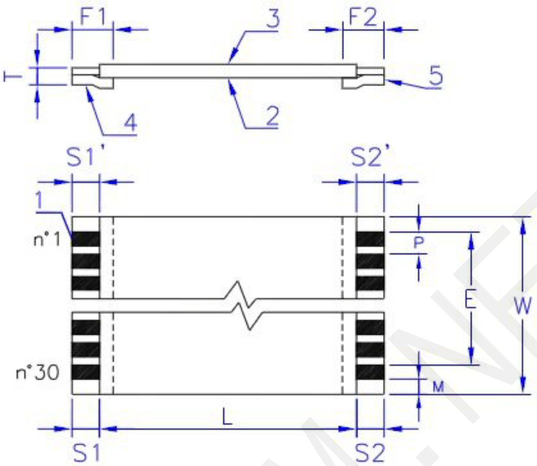


Figure 5-2 *Imager Engine to PL3307-A 21-Pin Flex*



DIMENSIONS

ITEMS	UNITS	SPECIFICATIONS	
Number of conductors	–	30	
Pitch	MM	0,50 ± 0,05	P
Span	MM	14,50 ± 0,10	E
Total width	MM	15,50 ± 0,10	W
Margin	MM	0,35 +0,15/–0.096	M
Strip length	MM	4 ± 1	S1
Strip length	MM	4 ± 1	S2
End thickness	MM	0,30 ± 0,05	T
Insulated length	MM	37 ± 2	L
Reinforcement length	MM	6 ± 2	F1
Reinforcement length	MM	6 ± 2	F2
Strip difference S–S'	MM	0,30 max	

CHARACTERISTICS

ITEMS	VALUE	TEST METHOD
Resistance of conductor	730 Ohm/km maxi	–
Conductor to conductor insulation resistance	10 MOhm.m mini	500 V DC
Dielectric test (conductor to conductor)	1 minute	200 V AC
Temperature rating	80 °C maxi	–
Voltage rating	30 V AC maxi	–
Flame resistance	VW – 1	UL 758

COMPOSITION

COMPONENTS		UNITS	SPECIFICATIONS	Item
Conductor	Material	–	Tin plated copper (2 µm typ)	1
	Dimensions	MM	0,30x0,10 mm nominal	
Insulation	Material	–	Polyester+flame retardant adhesive insulation	2 3
	Thickness	MM	0,11 mm nominal	
Reinforcement tape	Material	–	Blue polyester	4 5
	Thickness	MM	0,23 mm nominal	

Figure 5-3 *PL3307-B to Host 30-Pin Flex*

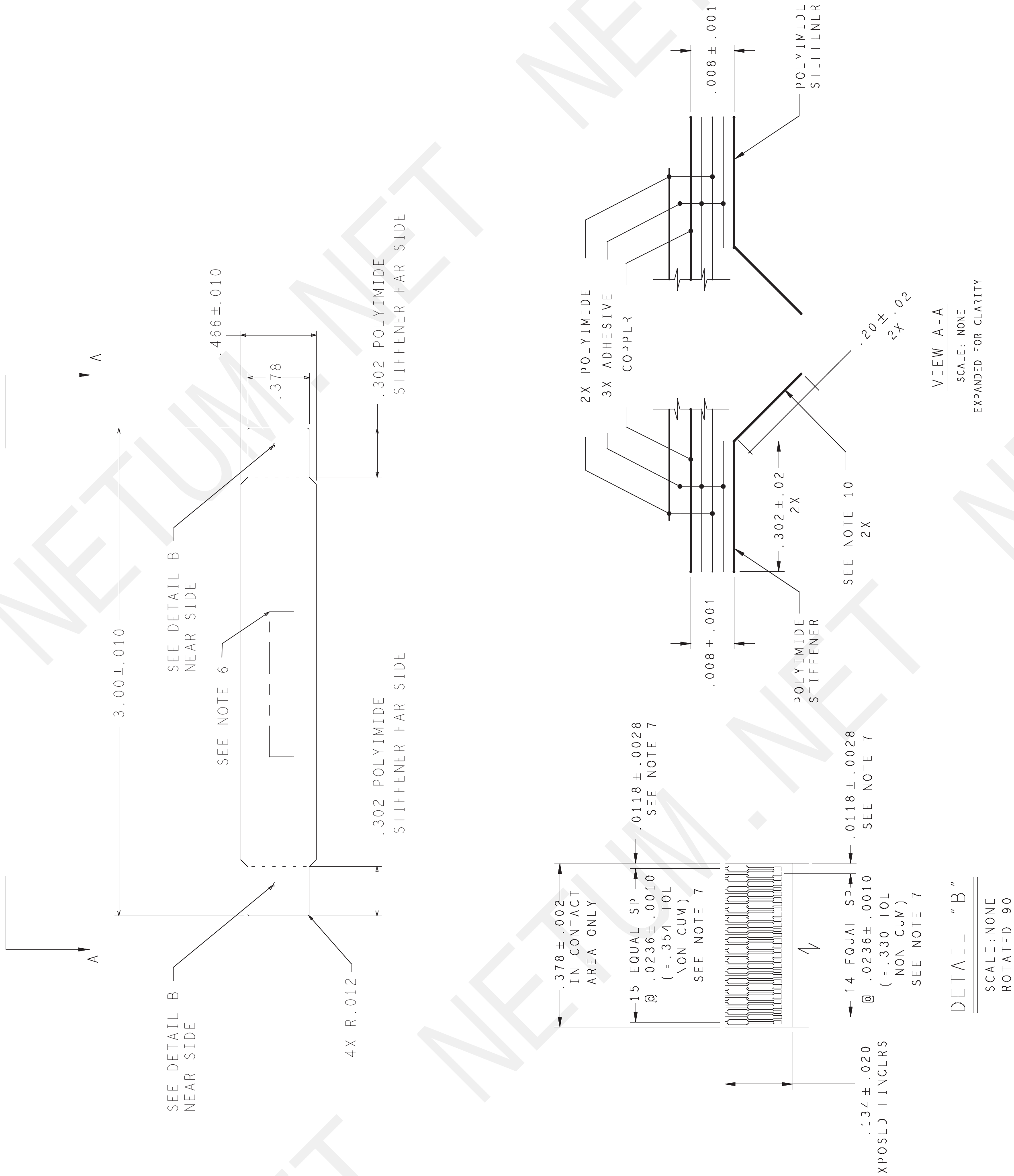


Figure 5-4 *PL3307-A to Host 31-Pin Flex*

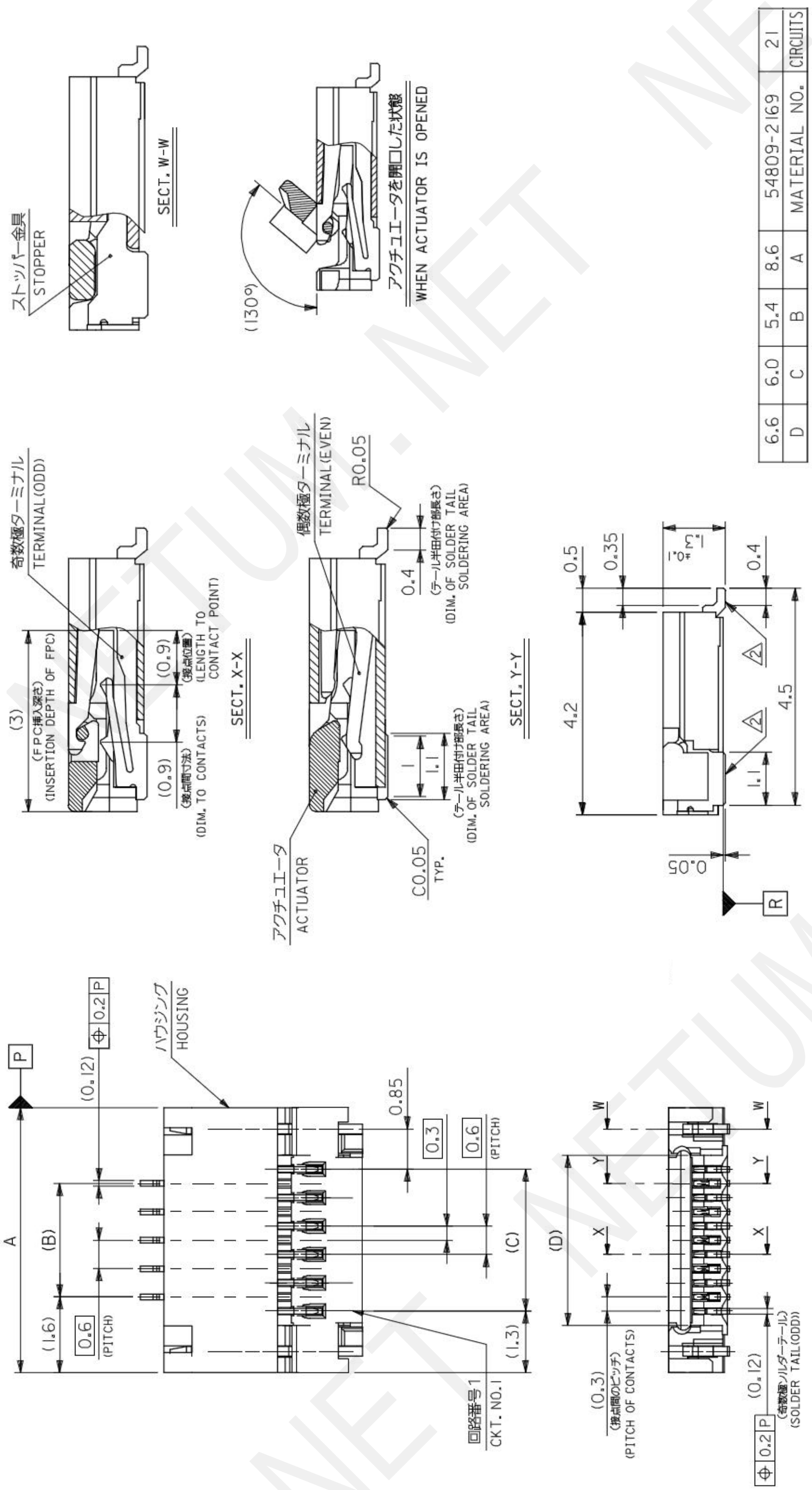


Figure 5-5 *21-Pin ZIF Connector (PL3307-B Decoder to Imager Engine), Molex 54809 Series*

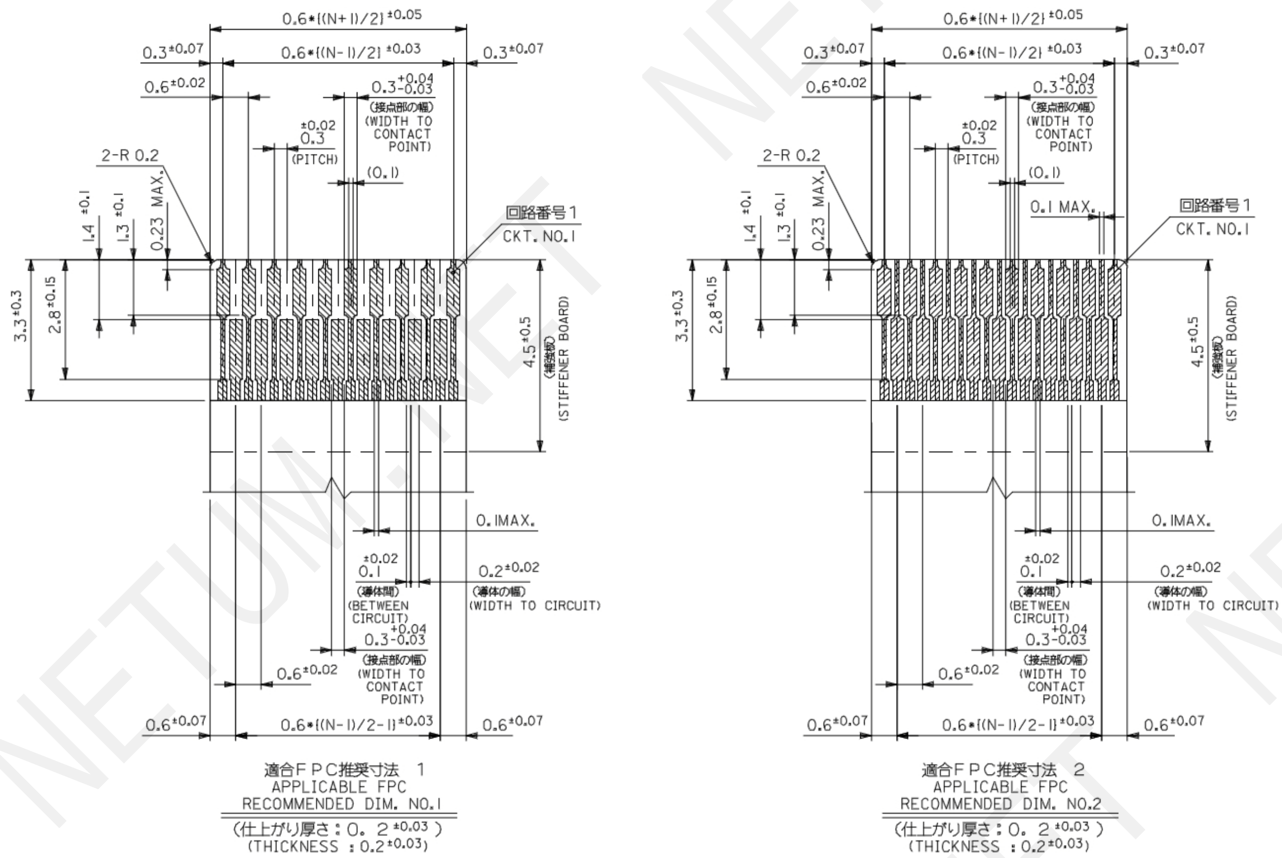


Figure 5-6 *21-Pin ZIF Connector (PL3307-B Decoder to Imager Engine), Molex 54809 Series (continued)*

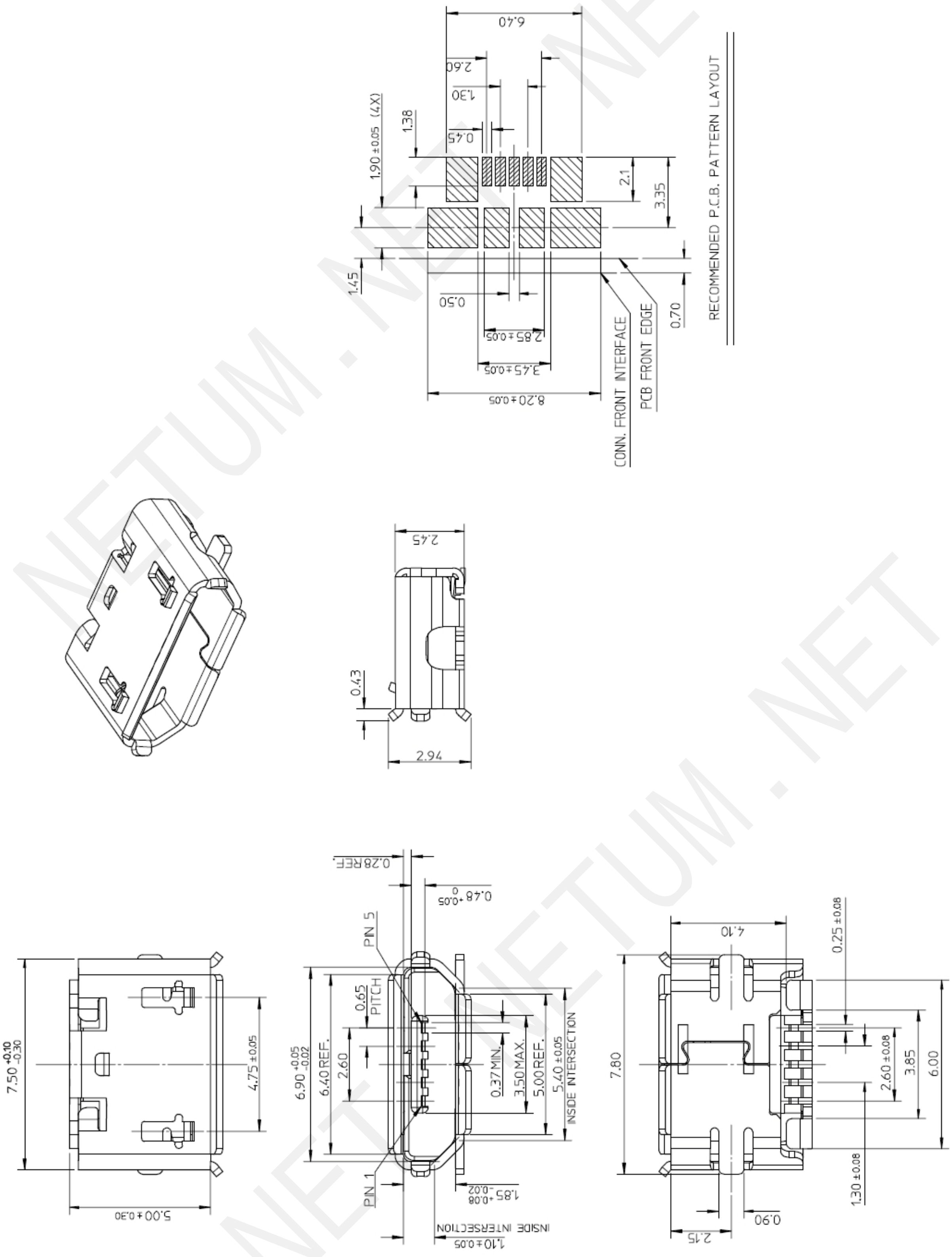


Figure 5-7 *PL3307-A/PL3307-B microUSB Host Connector, Molex 47346 Series*

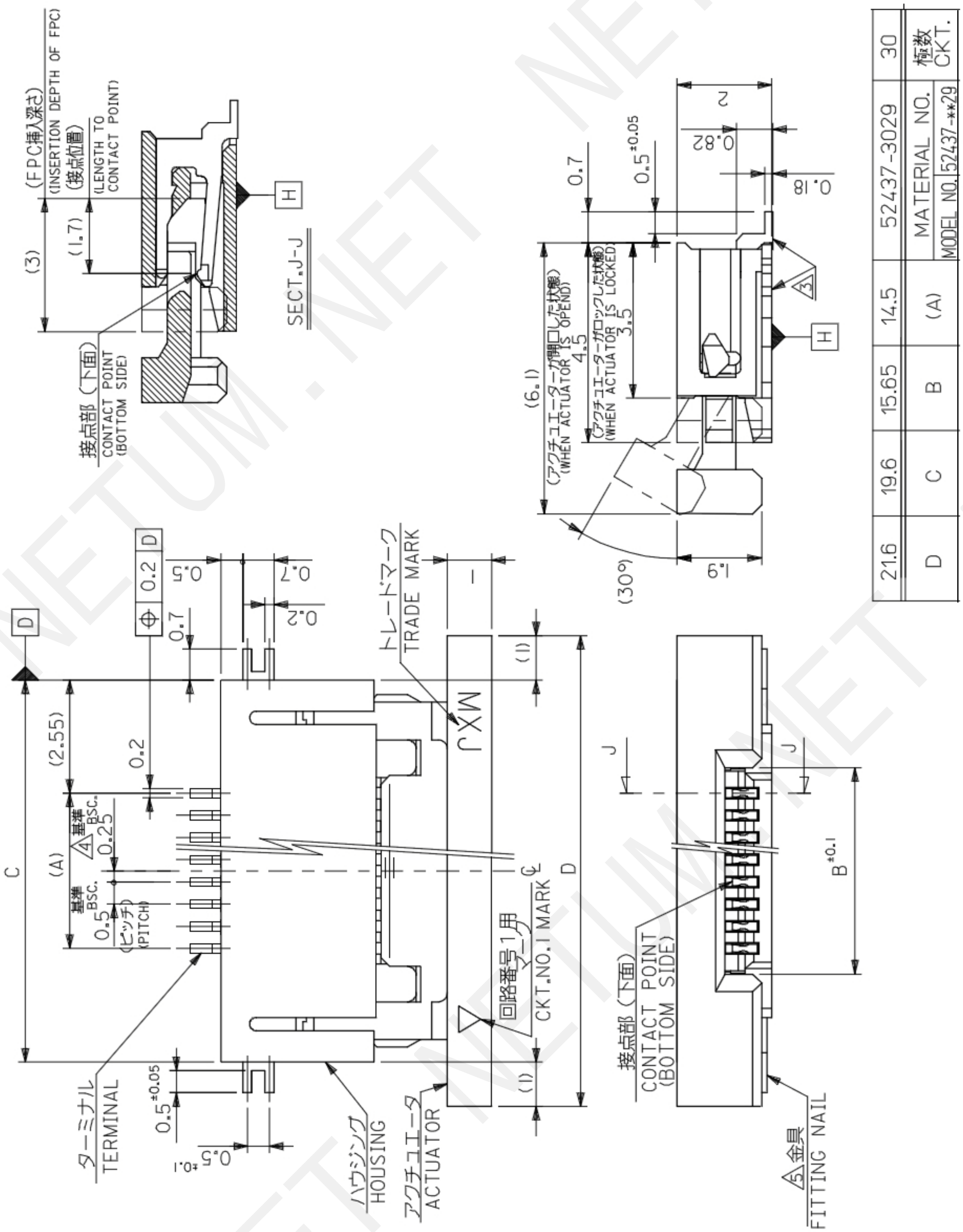


Figure 5-8 *PL3307-B 30-Pin Host Connector, Molex 52437 Series*

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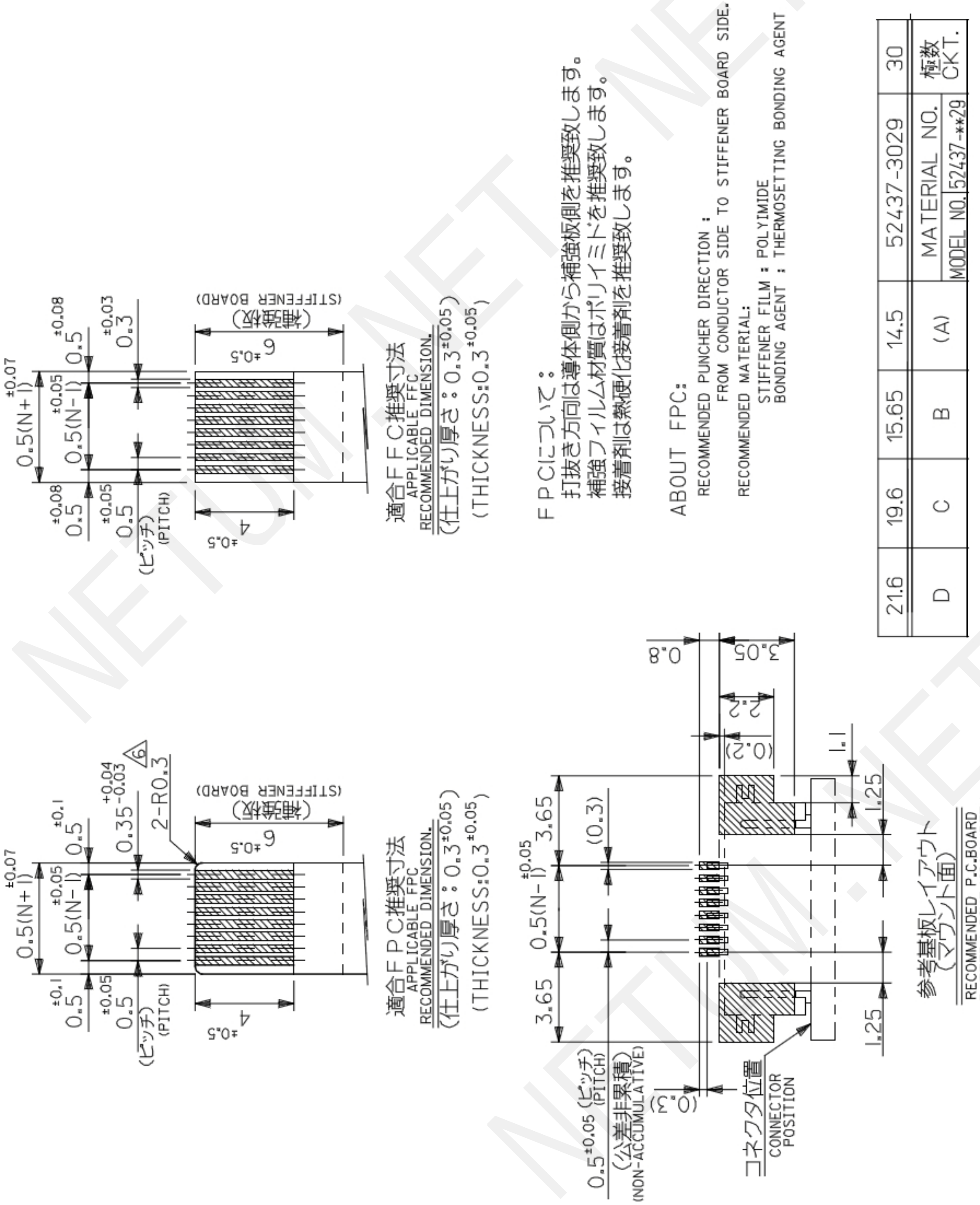
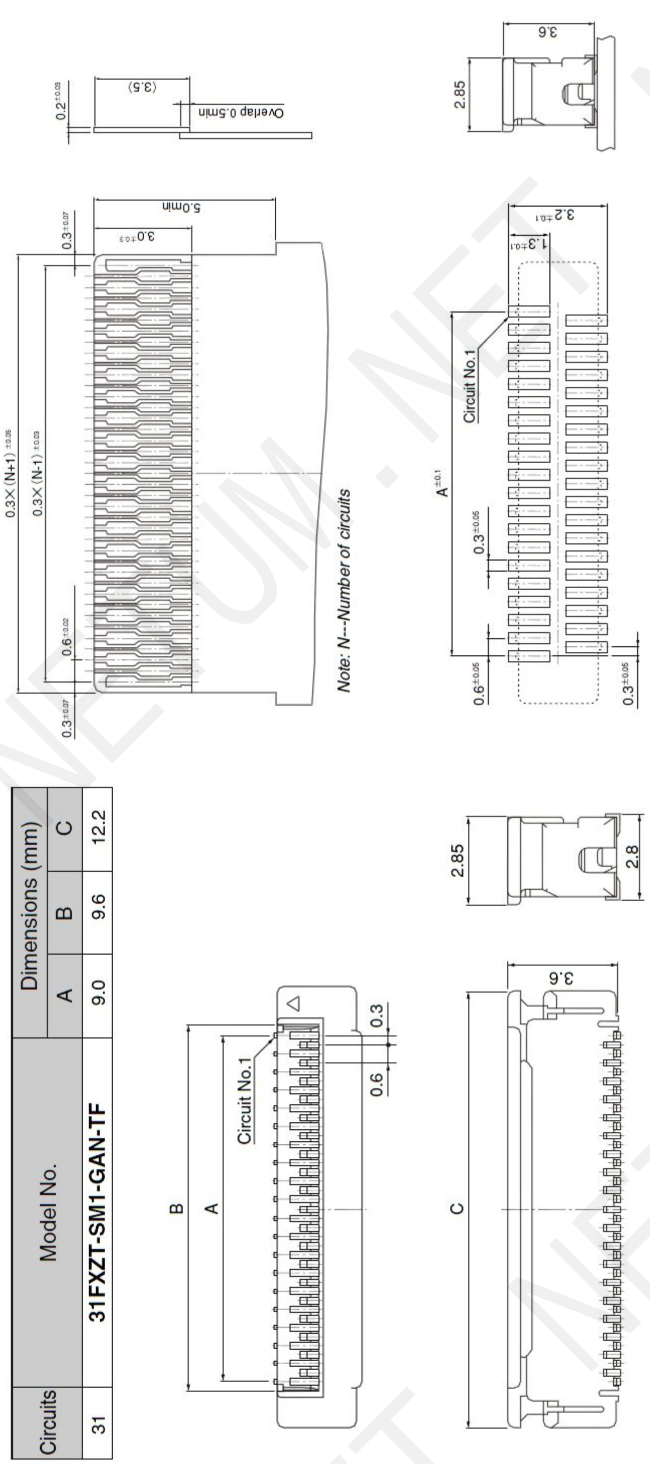
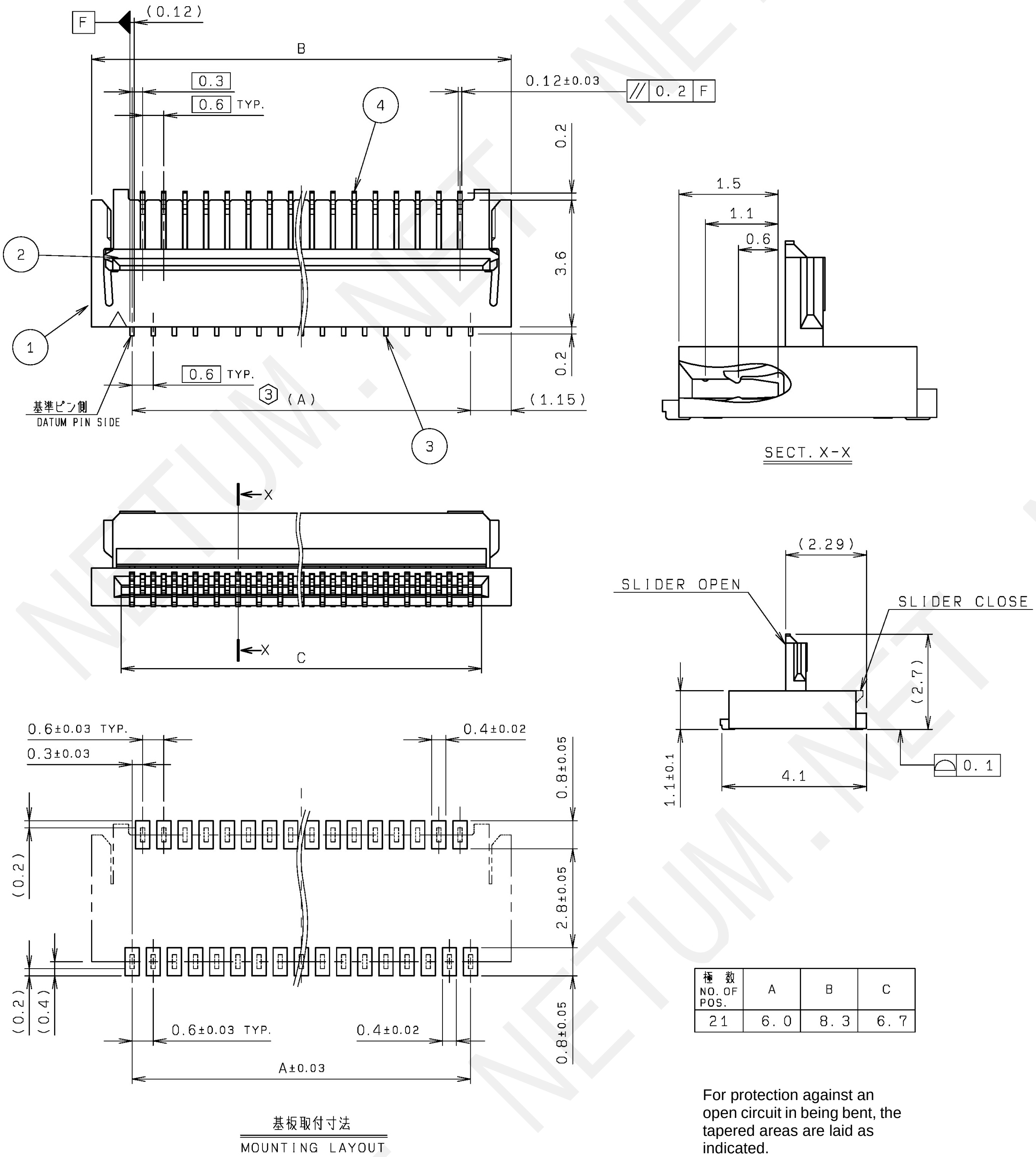


Figure 5-9 *PL3307-B 30-Pin Host Connector, Molex 52437 Series (continued)*



Circuits	Model No.	Dimensions (mm)		
		A	B	C
31	31FXZT-SM1-GAN-TF	9.0	9.6	12.2

Figure 5-10 *PL3307-A 31-Pin Host Connector, JST FXZT Series*



極 数 NO. OF POS.	A	B	C
21	6.0	8.3	6.7

For protection against an open circuit in being bent, the tapered areas are laid as indicated.

Figure 5-11 *21-Pin ZIF Connector (Imager Engine Connector and PL3307-A Connector to Engine), Kyocera 6283 Series*

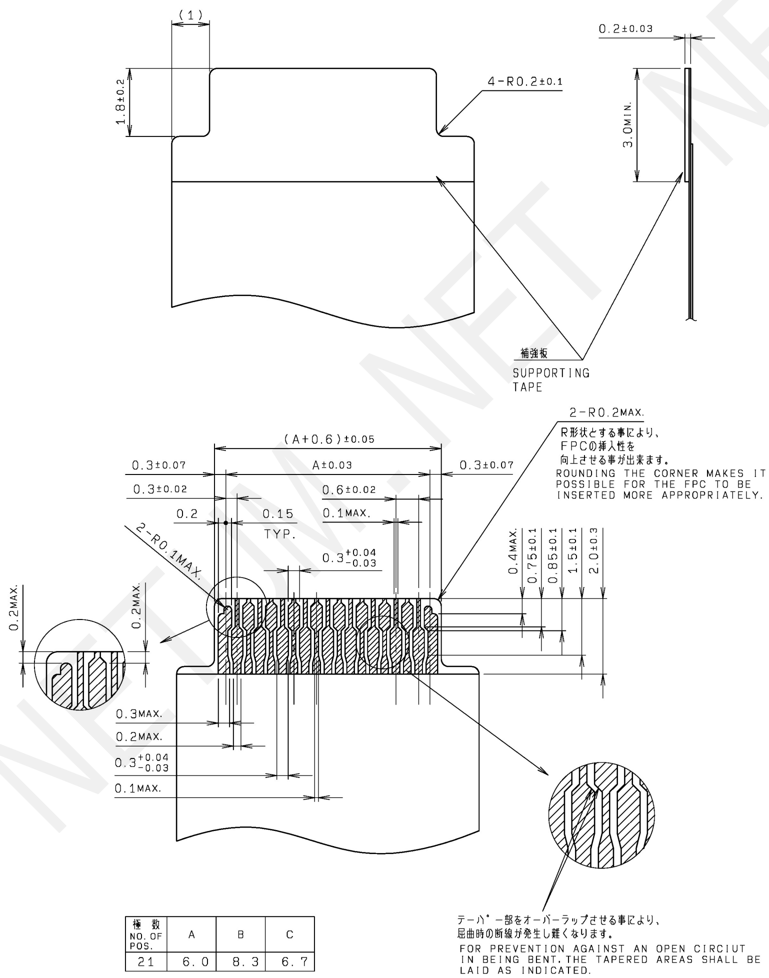


Figure 5-12 *21-Pin ZIF Connector (Imager Engine Connector and PL3307-A Connector to Engine), Kyocera 6283 Series (continued)*

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CHAPTER 6 USER PREFERENCES & MISCELLANEOUS OPTIONS

Introduction

This chapter describes each user preference feature and provides the programming bar codes necessary for selecting these features.

Host Selection

See *Table 2-3 on page 2-10* and *Table 3-3 on page 3-10* for methods of selecting a host type (serial or USB) for the PL3307. The default serial host is SSI and the default USB host is SNAPI with Imaging, as these host types provide more flexibility during integration when configuring the unit via host command.

Selecting other host configurations require scanning bar code menus and are not available via host programming. These hosts do not support host triggering, and require a method to trigger the reader for initial configuration. Use caution when selecting one of these hosts. Be sure to consider how setting up via bar code menu, which includes providing a triggering method, can impact integration. See each host chapter for configuration options for each host type.

Phantom Scan Session

The Phantom Scan Session feature places the system into a known state for two seconds immediately after the power-up beep sequence in order to decode a parameter bar code without intervention and regardless of existing settings and mode. This allows you to scan a **Set Defaults** or other parameter bar code without triggering the decoder or initiating a host scan session in order to return an unresponsive system to its factory default settings. Aim and illumination are turned off and Phantom Scan exits upon a trigger pull, host command, or successful decode.

Changing Default Values

The decoder ships with the settings shown in the *Table 6-1 on page 6-3* (also see *Appendix A, Standard Default Parameters* for all host and miscellaneous defaults). If the default values suit requirements, programming is not necessary.

There are two ways to change a parameter value:

- Scan the appropriate bar codes in this guide. These new values replace the standard default values in memory.
- For SSI and USB SNAPI hosts, send a “parameter send” command from the host system. Hexadecimal parameter numbers appear in this chapter below the parameter title, and options appear in parenthesis beneath the accompanying bar codes. See the *Simple Serial Interface (SSI) Programmer’s Guide* for detailed instructions for changing parameter values using this method.

NOTE Most computer monitors allow scanning the bar codes directly on the screen. When scanning from the screen, be sure to set the document magnification to a level where you can see the bar code clearly, and bars and/or spaces are not merging.

To return all features to default values, scan **Restore Defaults on page 6-5*. Throughout the programming bar code menus, asterisks (*****) indicate default values.

* Indicates Default — ***High Volume** — Feature/Option

(00h) — Option Hex Value for programming via SSI command

Scanning Sequence Examples

In most cases, scanning one bar code sets the parameter value. For example, to set the beeper tone to high, scan the **High Frequency** (beeper tone) bar code listed under *Beeper Tone on page 6-11*. The decoder issues a fast warble beep and the LED turns green, signifying a successful parameter entry.

Other parameters, such as **Serial Response Time-Out** or **Data Transmission Formats**, require scanning several bar codes. See these parameter descriptions for this procedure.

Errors While Scanning

Unless otherwise specified, to correct an error during a scanning sequence, just re-scan the correct parameter.

User Preferences Parameter Defaults

Table 6-1 lists defaults for user preferences parameters. To change any parameter value, scan the appropriate bar code(s) provided in the User Preferences section beginning on *page 6-5*.

✓ ***NOTE*** See *Appendix A, Standard Default Parameters* for all user preferences, hosts, symbologies, and miscellaneous default parameters.

Table 6-1 *User Preferences Default Table*

Parameter	Parameter Number	Default	Page Number
User Preferences			
Set Default Parameter		Restore Defaults	6-5
Parameter Scanning	ECh	Enable	6-6
Lock Parameter Scanning	F2h 22h	Disable	6-7
Unlock Parameter Scanning	F2h 23h	Disable	6-7
User Parameter Pass Through	F1h 71h	Disable	6-9
Beep After Good Decode	38h	Enable	6-10
Beeper Tone	91h	Medium	6-11
Beeper Volume	8Ch	High	6-12
Beeper Duration	F1h 74h	Medium	6-13
Suppress Power-up Beeps	F1h D1h	Do not suppress	6-13
Decode LED Behavior	F1h E8h	Power down after LED shuts off	6-14
Visual Decode Indicator Decode Blinks Decode Blink Duration	 F2h 5Bh F2h 5Ch	 Disable Timeout Between Decodes, Different Symbols value	6-15 6-15 6-16
Trigger Modes	8Ah	Level	6-17
Power Mode	80h	Low Power	6-18
Time Delay to Low Power Mode	92h	1.0 Sec	6-18
Picklist Mode	F0h 92h	Disabled Always	6-20
Decode Session Timeout	88h	9.9 Sec	6-20
Timeout Between Decodes, Same Symbol	89h	0.6 Sec	6-21
Timeout Between Decodes, Different Symbols	90h	0.2 Sec	6-21
Continuous Bar Code Read	F1h 89h	Disable	6-22

Table 6-1 *User Preferences Default Table*

Parameter	Parameter Number	Default	Page Number
Unique Bar Code Reporting	F1h D31h	Disable	*6-22*
Low Light Motion Detection	F2h 2Ah	No Low Light Motion Detection	*6-23*
Presentation Mode Field of View	F1h 61h	Medium Field of View	*6-24*
Fuzzy 1D Processing	F1h 02h	Enable	*6-25*
Mirrored Image	F1h 70h	Disable	*6-25*
Mobile Phone/Display Mode	F1h CCh	Disable	*6-26*
Validate Concatenated Parameter Bar Codes	F1h B4h	Disable	*6-26*
PDF Prioritization	F1h CFh	Disable	*6-27*
PDF Prioritization Timeout	F1h D0h	200 ms	*6-27*
Miscellaneous Scanning Parameters			
Transmit Code ID Character	2Dh	None	*6-28*
SSI Prefix Value	69h	<CR>	*6-29*
SSI Suffix 1 Value SSI Suffix 2 Value	68h 6Ah	<CR> <CR>	*6-29*
Scan Data Transmission Format	EBh	Data as is	*6-30*
FN1 Substitution Values	67h, 6Dh	Set	*6-31*
Transmit “No Read” Message	5Eh	Disable	*6-32*
Report Version			*6-33*
Report Decoder Manufacturing Version			*6-33*
Report Scan Engine Manufacturing Version			*6-33*
Diagnostic Testing and Reporting			*6-34*

User Preferences

Set Default Parameter

You can reset the PL3307 to two types of defaults: factory defaults or custom defaults. Scan the appropriate bar code below to reset the decoder to its default settings and/or set its current settings as custom defaults.

- **Restore Defaults** - Scan this bar code to reset all default parameters as follows.
  - If you previously set custom defaults by scanning **Write to Custom Defaults**, scan **Restore Defaults** to retrieve and restore the decoder's custom default settings.
  - If you did not set custom defaults, scan **Restore Defaults** to restore the factory default values listed in *Table A-1*.
- **Set Factory Defaults** - Scan this bar code to restore the factory default values listed in *Table A-1.* This deletes any custom defaults set.
- **Write to Custom Defaults** - Scan this bar code to set the current decoder settings as custom defaults. Once set, you can recover custom default settings by scanning **Restore Defaults**.

***Restore Defaults**

Set Factory Defaults

Write to Custom Defaults

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Parameter Scanning

Parameter # ECh

To disable the decoding of parameter bar codes, including the **Set Defaults** parameter bar codes, scan the **Disable Parameter Scanning** bar code below. To enable decoding of parameter bar codes, scan **Enable Parameter Scanning**.

***Enable Parameter Scanning**
(01h)

Disable Parameter Scanning
(00h)

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Lock/Unlock Parameter Scanning

Lock: Parameter # F2h 22h

Unlock: Parameter # F2h 23h

This feature prevents the decoder from scanning parameter bar codes and provides an added level of security not offered via **Disable Parameter Scanning**. Note that *Parameter Scanning* must be enabled in order to lock the decoder.

After locking the decoder, the only parameter bar code that can decode is **Unlock**. Scanning any other parameter bar code including the **Enable** or **Disable Parameter Scanning** bar code results in a parameter error beep.

To lock the decoder:

1. Scan the **Lock** bar code.
2. Scan four bar codes from *Appendix D, Numeric Bar Codes* that represent the desired PIN. Enter leading zeros for numbers below 1000, e.g., to program a PIN of 29, enter **0**, **0**, **2**, **9**. A "lock" beep sounds.

To unlock the decoder:

1. Scan the **Unlock** bar code.
2. Scan four bar codes from *Appendix D, Numeric Bar Codes* that represent the correct PIN. An "unlock" beep sounds. Entering an incorrect pin results in a parameter error beep.

Lock

Unlock

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Locking/Unlocking via SSI/SNAPI

Using SSI or SNAPI, enter any value within the range of 1-9999 for the PIN. Values outside the allowable range are ignored. If the value locks the decoder, the “lock” beep sounds. If the value unlocks the decoder, the “unlock” beep sounds.

For example, to lock parameter scanning via SSI for the pin mentioned above, enter:

0A C6 04 00 FF F4 F2 22 00 1D FC 08

To unlock, enter:

0A C6 04 00 FF F4 F2 23 00 1D FC 07

To lock parameter scanning via SNAPI for the pin mentioned above, enter:

0B 81 02 00 22 03 1D 00

To unlock via SNAPI, enter:

0B 81 02 00 23 03 1D 00

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User Parameter Pass Through

Parameter # F1h 71h

Enable this to send user-defined parameter bar codes (see *User-Defined Parameter Bar Code Format*) as normal decode data in decode data packets for SSI and SNAPI hosts (see *Decode Data Format*).

User-Defined Parameter Bar Code Format

Code 128 bar codes with:

<FNC3><L><data>

or

<FNC3><B><12 bytes of data>

Decode Data Format

<0xf3><L><data>

or

<0xf3><B><12 bytes of data>

Note that the **B** type only works with 12 bytes of data.

A normal decode beep sounds upon a successful decode of a user-defined parameter bar code.

Enable User Parameter Pass Through
(01h)

***Disable User Parameter Pass Through**
(00h)

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Beep After Good Decode

Parameter # 38h

Scan a bar code below to select whether or not the decoder issues a beep signal after a good decode. If selecting **Do Not Beep After Good Decode**, beeper signals still occur during parameter menu scanning and to indicate error conditions.

***Beep After Good Decode**
(Enable)
(01h)

Do Not Beep After Good Decode
(Disable)
(00h)

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Beeper Tone

Parameter # 91h

To select a decode beep frequency (tone), scan the **Low Frequency, Medium Frequency**, or **High Frequency** bar code.

Low Frequency
(02h)

***Medium Frequency**
(Optimum Setting)
(01h)

High Frequency
(00h)

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Beeper Volume

Parameter # 8Ch

To select a beeper volume, scan the **Low Volume, Medium Volume**, or **High Volume** bar code.

Low Volume
(02h)

Medium Volume
(01h)

***High Volume**
(00h)

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Beeper Duration

Parameter # F1h 74h

To select the duration for the beeper, scan one of the following bar codes.

Short
(00h)

*** Medium**
(01h)

Long
(02h)

Suppress Power-up Beeps

Parameter # F1h D1h

Select whether or not to suppress the decoder's power-up beeps.

*** Do Not Suppress Power-up Beeps**
(00h)

Suppress Power-up Beeps
(01h)

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Decode LED Behavior

Parameter # F1h E8h

Select one of the following options to control decode LED behavior with respect to low power mode for serial hosts:

- **Power Down After LED Shuts Off** - the decode LED remains on for approximately 1.5 seconds, then the scanner can enter **Low Power Mode**.
- **Decode LED Off on Power-Down** - the decode LED remains on until the scanner enters **Low Power Mode**. This allows the scanner to enter **Low Power Mode** quickly, but also have the decode LED light.
- **Disable Decode LED** - shuts off the decode LED completely.

***Power Down After LED Shuts Off**
(02h)

Decode LED Off on Power-Down
(01h)

Disable Decode LED
(00h)

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Visual Decode Indicator

In **Presentation Mode**, this feature specifies how many times to blink the illumination to indicate a successful decode. This feature is disabled by default (no blink).

To enable this feature, scan a **Decode Blink** bar code to specify the number of blinks. Next, scan the **Decode Blink Duration** bar code, and then scan two numeric bar codes from *Appendix D, Numeric Bar Codes* that correspond to the desired duration of decode blinks in 100 msec increments. Values can range from 00 to 99 (9.9 seconds). Changing the **Decode Blink Duration** also changes the values set for *Timeout Between Decodes, Different Symbols*.

To return the duration to the value specified by *Timeout Between Decodes, Different Symbols on page 6-21*, scan **Set Decode Blink Duration to Timeout Between Decodes, Different Symbols**.

Decode Blinks

Parameter # F2h 5Bh

***Disable Decode Blinks**
(00h)

1 Decode Blink
(01h)

2 Decode Blinks
(02h)

3 Decode Blinks
(03h)

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Decode Blink Duration

Parameter # F2h 5Ch

Decode Blink Duration

*Set Decode Blink Duration to
Timeout Between Decodes, Different Symbols
(00h)

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Trigger Modes

Parameter # 8Ah

- **Level** - A trigger event activates decode processing, which continues until the trigger event ends, a valid decode, or the *Decode Session Timeout on page 6-20* occurs.
- **Presentation Mode** - When the decoder detects an object in its field of view, it triggers and attempt to decode. The range of object detection does not vary under normal lighting conditions. This applies to decode mode only. In this mode the unit does not enter Low Power mode.
- **Host** - A host command issues the triggering signal. The decoder interprets an actual trigger pull as a Level triggering option.
- **Auto Aim** - This trigger mode turns on the aiming pattern when the decoder senses motion. A trigger pull activates decode processing. After 2 seconds of inactivity the aiming pattern automatically shuts off.
- **Auto Aim with Illumination** - This trigger mode turns on the aiming pattern and internal illumination LEDs when the decoder senses motion. A trigger pull activates decode processing. After 2 seconds of inactivity the aiming pattern and internal illumination LEDs automatically shut off.

***Level**
(00h)

Presentation Mode
(07h)

Host
(08h)

Auto Aim
(09h)

Auto Aim with Illumination
(0Ah)

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Power Mode (Serial Hosts Only)

Parameter # 80h

Select whether or not the decoder enters Low Power consumption mode after a decode attempt. In Continuous On mode, the decoder does not enter this low power state.

Continuous On
(00h)

***Low Power Mode**
(01h)

Time Delay to Low Power Mode

Parameter # 92h

This parameter sets the time the decoder remains active after decoding. After a scan session, the decoder waits this amount of time before entering Low Power Mode.

NOTE This parameter only applies when **Power Mode** is set to **Low**.
To program a different value for this parameter than those provided here, see *Using Time Delay to Low Power Mode with SSI on page 9-7*.

***1 Second**
(11h)

5 Seconds
(15h)

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Time Delay to Low Power Mode (continued)

1 Minute
(21h)

5 Minutes
(25h)

15 Minutes
(2Bh)

1 Hour
(31h)

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Picklist Mode

Parameter # F0h 92h

Picklist mode enables the decoder to decode only bar codes aligned under the center of the aiming pattern. Select one of the following picklist modes:

- **Disabled Always** - Picklist mode is always disabled.
- **Enabled Always** - Picklist mode is always enabled.

✓ ***NOTE*** With Picklist Mode enabled, the decode aiming pattern turns on even when the *Decode Aiming Pattern on page 7-13* is disabled.

***Disabled Always**
(00h)

Enabled Always
(02h)

Decode Session Timeout

Parameter # 88h

This parameter sets the maximum time decode processing continues during a scan attempt. It is programmable in 0.1 second increments from 0.5 to 9.9 seconds. The default timeout is 9.9 seconds.

To set a **Decode Session Timeout**, scan the bar code below. Next, scan two numeric bar codes from *Appendix D, Numeric Bar Codes* that correspond to the desired on time. Provide a leading zero for single digit numbers. For example, to set a **Decode Session Timeout** of 0.5 seconds, scan the bar code below, then scan the **0** and **5** bar codes. To correct an error or change the selection, scan *Cancel on page D-2*.

Decode Session Timeout

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Timeout Between Decodes, Same Symbol

Parameter # 89h

Use this option in **Presentation Mode** or **Continuous Bar Code Read** to prevent multiple reads of a symbol left in the decoder's field of view. The timeout begins when you remove the symbol from the field of view.

To select the timeout between decodes for the same symbol, available in 0.1 second increments from 0.0 to 9.9 seconds, scan the bar code below, then scan two numeric bar codes from *Appendix D, Numeric Bar Codes* that correspond to the desired interval. The default interval is 0.6 seconds.

✓ ***NOTE*** The **Timeout Between Decodes, Same Symbol** value must be greater than the *Timeout Between Decodes, Different Symbols* value.

Timeout Between Decodes, Same Symbol

Timeout Between Decodes, Different Symbols

Parameter # 90h

Use this option in **Presentation Mode** or **Continuous Bar Code Read** to control the time the decoder is inactive between decoding different symbols. It is programmable in 0.1 second increments from 0.1 to 9.9 seconds. The default is 0.2 seconds.

To select the timeout between decodes for different symbols, scan the bar code below, then scan two numeric bar codes from *Appendix D, Numeric Bar Codes* that correspond to the desired interval, in 0.1 second increments.

✓ ***NOTE*** The **Timeout Between Decodes, Different Symbols** value cannot be greater than or equal to the *Timeout Between Decodes, Same Symbol* or the *Decode Session Timeout on page 6-20* value.

Timeout Between Decodes, Different Symbols

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Continuous Bar Code Read

Parameter # F1h 89h

Select **Enable** to allow decode processing to continue until the trigger event ends or the *Decode Session Timeout on page 6-20* occurs. User indications occur upon decoding each bar code. Select **Disable** to end decode processing upon a valid decode as well. This mode does not apply to **Presentation Mode**.

NOTE Motorola strongly recommends enabling *Picklist Mode on page 6-20* with this feature. Disabling Picklist Mode can cause accidental decodes when more than one bar code is in the decoder's field of view.

***Disable Continuous Bar Code Read**
(00h)

Enable Continuous Bar Code Read
(01h)

Unique Bar Code Reporting

Parameter # F1h D3h

Enable this to report only unique bar codes while the trigger is pressed. This option only applies when **Continuous Bar Code Read** is enabled.

*** Disable Continuous Bar Code Read Uniqueness**
(00h)

Enable Continuous Bar Code Read Uniqueness
(01h)

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Low Light Motion Detection

Parameter # F2h 2Ah

In **Presentation Mode**, this feature allows motion detection in dim to dark illumination environments by using the aiming dot or dim illumination to assist in the detection of motion.

NOTE If this parameter is enabled and *Decoding Illumination on page 7-12* is disabled, this parameter takes precedence.

If the decoder is connected to the SE4500, it does not support **Aiming Dot Low Light Motion Detection**.

***No Low Light Motion Detection**
(00h)

Aiming Dot Low Light Motion Detection
(01h)

Dim Illumination Low Light Motion Detection
(02h)

Presentation Mode Field of View

Parameter # F1h 61h

In **Presentation Mode**, the decoder searches for a bar code in the region around the aiming pattern's center.

To search for a bar code in a smaller region around the aiming pattern in order to speed search time, select **Small Field of View**, or to search a larger area, select **Full Field of View.**

Small Field of View
(00h)

***Medium Field of View**
(01h)

Full Field of View
(02h)

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Fuzzy 1D Processing

Parameter # F1h 02h

This option is enabled by default to optimize decode performance on 1D bar codes, including damaged and poor quality symbols. Disable this only if you experience time delays when decoding 2D bar codes, or in detecting a no decode.

***Enable Fuzzy 1D Processing (01h)**

Disable Fuzzy 1D Processing (00h)

Mirrored Image

Parameter # F1h 70h

Enable this to scan images in reverse, or mirrored, as if seen through a mirror. This mode is useful in applications requiring scanning through a mirror and using symbologies that do not decode in reverse.

Enabling this mode when using snapshot, video, or video viewfinder mode transmits images as mirrored images.

***Disable Mirrored Image (00h)**

Enable Mirrored Image (01h)

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Mobile Phone/Display Mode

Parameter # F1h CCh

This mode improves bar code reading performance with target bar codes displayed on mobile phones and electronic displays.

*Disable Mobile Phone/Display Mode
(00h)

Enable Mobile Phone/Display Mode
(03h)

Validate Concatenated Parameter Bar Codes

Parameter # F1h B4h

The decoder can encounter invalid parameters when using concatenated parameter bar codes intended for different scanner models or different versions of a scanner. This parameter determines how to process concatenated parameter bar codes when the decoder encounters an invalid parameter setting in the bar code.

Disable this to ignore invalid parameters and configure valid parameters. Enable this to ignore all parameters if one or more are invalid.

*Disable Validate Concatenated Parameter Bar Codes
(00h)

Enable Validate Concatenated Parameter Bar Codes
(01h)

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PDF Prioritization

Parameter # F1h CFh

Enable this feature to delay decoding a 1D bar code (Code 128 of 8 to 25 characters length) by the value specified in *PDF Prioritization Timeout*. During that time the decoder attempts to decode a PDF417 symbol (e.g., on a US driver's license), and if successful reports this only. If it does not decode (can not find) a PDF417 symbol, it reports the 1D symbol after the timeout. The 1D symbol must be in the device's field of view for the decoder to report it. This parameter does not affect decoding other symbologies.

***Disable PDF Prioritization**
(00h)

Enable PDF Prioritization
(01h)

PDF Prioritization Timeout

Parameter # F1h D0h

When *PDF Prioritization* is enabled, this timeout specifies how long the decoder attempts to decode a PDF417 symbol before reporting the 1D bar code in the field of view.

Scan the following bar code, then scan four digits from *Appendix D, Numeric Bar Codes* that specify the timeout in milliseconds. For example, to enter 400 ms, scan the following bar code, then scan 0400. The range is 0 to 5000 ms, and the default is 200 ms.

PDF Prioritization Timeout

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Miscellaneous Scanning Parameters

Transmit Code ID Character

Parameter # 2Dh

A Code ID character identifies the code type of a scanned bar code. This is useful when decoding more than one code type. In addition to any single character prefix already selected, the Code ID character is inserted between the prefix and the decoded symbol.

Select no Code ID character, a Symbol Code ID character, or an AIM Code ID character. For Code ID Characters, see *Symbol Code Identifiers on page B-1* and *AIM Code Identifiers on page B-3*.

✓ ***NOTE*** If you enable Symbol Code ID Character or AIM Code ID Character, and enable *Transmit "No Read" Message on page 6-32*, the decoder appends the code ID for Code 39 to the NR message.

Symbol Code ID Character
(02h)

AIM Code ID Character
(01h)

***None**
(00h)

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Prefix/Suffix Values

Key Category Parameter # P = 63h, S1 = 62h, S2 = 64h

Decimal Value Parameter # P = 69h, S1 = 68h, S2 = 6Ah

You can append a prefix and/or one or two suffixes to scan data for use in data editing. To set a value for a prefix or suffix, scan the prefix or suffix bar code below, then scan a four-digit number (i.e., four bar codes from *Appendix D, Numeric Bar Codes*) that corresponds to that value. The first digit defines the key category (type of character to send) and is stored in the key category parameter. The remaining three digits define the value of the character and are stored in the decimal value parameter. Be sure to use both key category and decimal value parameters to define the prefix/suffix value. See *Table E-1 on page E-1* for the four-digit codes.

When using host commands to set the prefix or suffix, set the key category parameter to 1, then set the 3-digit decimal value. See *Table E-1 on page E-1* for the four-digit codes.

To correct an error or change a selection, scan *Cancel on page D-2*.

NOTE To use Prefix/Suffix values, set the *Scan Data Transmission Format on page 6-30*.

Scan Prefix
(07h)

Scan Suffix 1
(06h)

Scan Suffix 2
(08h)

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Scan Data Transmission Format

Parameter # EBh

To change the scan data format, scan one of the following eight bar codes corresponding to the desired format.

NOTE If using this parameter do not use ADF rules to set the prefix/suffix.

To set values for the prefix and/or suffix, see *Prefix/Suffix Values on page 6-29*.

***Data As Is**
(00h)

<DATA> <SUFFIX 1>
(01h)

<DATA> <SUFFIX 2>
(02h)

<DATA> <SUFFIX 1> <SUFFIX 2>
(03h)

<PREFIX> <DATA >
(04h)

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Scan Data Transmission Format (continued)

<PREFIX> <DATA> <SUFFIX 1>
(05h)

<PREFIX> <DATA> <SUFFIX 2>
(06h)

<PREFIX> <DATA> <SUFFIX 1> <SUFFIX 2>
(07h)

FN1 Substitution Values

Key Category Parameter # 67h

Decimal Value Parameter # 6Dh

The USB HID keyboard host supports a FN1 Substitution feature. Enabling this substitutes any FN1 character (0x1b) in an EAN128 bar code with a value. This value defaults to 7013 (Enter key).

When using host commands to set the FN1 substitution value, set the key category parameter to 1, then set the 3-digit keystroke value. See the ASCII character set table for the current host interface for the desired value.

To select a FN1 substitution value via bar code menus:

1. Scan the bar code below.

Set FN1 Substitution Value

2. Locate the keystroke desired for FN1 substitution in the ASCII character set table in the appropriate host interface chapter. Enter the 4-digit ASCII value by scanning each digit in *Appendix D, Numeric Bar Codes*.

To correct an error or change the selection, scan *Cancel on page D-2*.

See *USB Keyboard FN 1 Substitution on page 8-13* to enable FN1 substitution for the USB HID keyboard.

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Transmit “No Read” Message

Parameter # 5Eh

Scan a bar code below to select whether or not to transmit a No Read message. Enable this to transmit the characters NR when a successful decode does not occur before trigger release or the *Decode Session Timeout on page 6-20* expires. Disable this to send nothing to the host if a symbol does not decode.

NOTE If you enable **Transmit No Read**, and also enable Symbol Code ID Character or AIM Code ID Character for *Transmit Code ID Character on page 6-28*, the decoder appends the code ID for Code 39 to the NR message.

Enable No Read
(01h)

***Disable No Read**
(00h)

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Report Version

Scan the bar code below to report the version of software currently installed in the decoder.

Report Software Version

Report Decoder Manufacturing Information

Scan the bar code below to report the part number, serial number, and manufacture date of the decoder.

Report Decoder Manufacturing Information

Report Scan Engine Manufacturing Information

Scan the bar code below to report the part number, serial number, and manufacture date of the scan engine.

Report Engine Manufacturing Information

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Diagnostic Testing and Reporting (Attribute #10061)

This feature allows the host to retrieve diagnostic information relative to the scan engine's functionality. The host uses the RSM attribute get command to request the scan engine's diagnostic information. This is a read only attribute, and can be accessed through various host interfaces such as SSI and USB SNAPI.

For the command/response structures over SSI, see *Encapsulation of RSM Commands/Responses over SSI on page 9-8*. For command/response structures using the Motorola Scanner SDK over USB, refer to the *Motorola Scanner SDK for Windows Developer's Guide*, p/n 72E-149784-xx, available at: http://www.motorolasolutions.com/windowssdk.

Table 6-2 *Diagnostic Report Format*

Byte Offset	Test Name	Description	Results
Data byte 0/1	I^2C interface	Verifies communication between decoder and engine	Pass / Fail
Data byte 2/3	Laser reference current	Verifies the laser reference current is within preset limits	Pass / High / Low / Fail
Data byte 4/5	Laser operating current	Verifies the laser operating current is within preset limits	Pass / High / Low / Fail
Data byte 6/7	Operating temperature	Verifies the engine temperature is within preset limits	Pass / Warning / Critical / Fail
Data byte 8/9	Laser reference current stored	Indicates when laser reference current exceeds preset limits	Pass / High / Low / Fail
Data byte 10/11	Laser operating current stored	Indicates when laser operating current exceeds preset limits	Pass / High / Low / Fail
Data byte 12/13	Operating temperature stored	Indicates when engine temperature exceeds preset limits	Pass / Warning / Critical / Fail

Notes:
1. A **Fail** result for laser current and temperature tests indicates a communication failure between the scan engine and decoder.
2. Laser current and temperature tests are applicable only when an SE4500 engine is attached to the decoder. Otherwise, the test result is **N/A**.

Table 6-3 *Test Results*

Test Result	Description
0	Pass
1	Fail
2	Not tested
3	N/A
4	High
5	Low
6	Warning
7	Critical
8	Fatal

CHAPTER 7 IMAGING PREFERENCES

Introduction

You can program the decoder to perform various functions, or activate different features. This chapter describes imaging preference features and provides programming bar codes for selecting these features.

> **NOTE** Only the Symbol Native API (SNAPI) with Imaging interface supports image capture. See *USB Device Type on page 8-3* to enable this host.

The decoder ships with the settings in *Imager Preferences Default Table on page 7-2* (also see *Appendix A, Standard Default Parameters* for all host device and miscellaneous defaults). If the default values suit requirements, programming is not necessary.

There are two ways to change a parameter value:

- Scan the appropriate bar codes in this guide. These new values replace the standard default values in memory.
- For SSI and USB SNAPI hosts, send a “parameter send” command from the host system. Hexadecimal parameter numbers appear in this chapter below the parameter title, and options appear in parenthesis beneath the accompanying bar codes. See the *Simple Serial Interface (SSI) Programmer’s Guide* for detailed instructions for changing parameter values using this method.

> **NOTE** Most computer monitors allow scanning the bar codes directly on the screen. When scanning from the screen, be sure to set the document magnification to a level where you can see the bar code clearly, and bars and/or spaces are not merging.

Select a host type (see each host chapter for specific host information) after the power-up beep signal activates. This is only necessary upon the first power-up when connected to a new host.

To return all features to default values, scan the *Set Default Parameter on page 6-5*. Throughout the programming bar code menus, asterisks (*****) indicate default values.

* Indicates Default

***Enable Decode Aiming Pattern** — Feature/Option

(02h) — Option Hex Value

Scanning Sequence Examples

In most cases scanning one bar code sets the parameter value. For example, to disable image capture illumination, scan the **Disable Image Capture Illumination** bar code under *Image Capture Illumination on page 7-14*. The decoder issues a fast warble beep and the LED turns green, signifying a successful parameter entry.

Other parameters require scanning several bar codes. See these parameter descriptions for this procedure.

Errors While Scanning

Unless otherwise specified, to correct an error during a scanning sequence, just re-scan the correct parameter.

Imaging Preferences Parameter Defaults

Table 7-1 lists the defaults for imaging preferences parameters. To change the default values, scan the appropriate bar codes in this guide. These new values replace the standard default values in memory. To recall the default parameter values, scan the *Set Default Parameter on page 6-5*.

✓ ***NOTE*** See *Appendix A, Standard Default Parameters* for all user preferences, hosts, symbologies, and miscellaneous default parameters.

Table 7-1 *Imager Preferences Default Table*

Parameter	Parameter Number	Default	Page Number
Imaging Options			
Aim Brightness	F0h 9Ch	0	7-5
Illumination Brightness	F0h 9Dh	10	7-6
Frame Rate	F1h A2h	Auto	7-7
LED Illumination	F0h ADh	Internal LED Illumination	7-9
Fixed Gain	F1h 38h	50	7-11
Exposure Time	F4h F1h 37h	100 (10 ms)	7-11
Decoding Autoexposure	F0h 29h	Enable	7-12
Decoding Illumination	F0h 2Ah	Enable	7-12
Decode Aiming Pattern	F0h 32h	Enable	7-13
Image Capture Autoexposure	F0h 68h	Enable	7-14
Image Capture Illumination	F0h 69h	Enable	7-14
Snapshot Mode Timeout	F0h 43h	0 (30 seconds)	7-15
Snapshot Aiming Pattern	F0h 2Ch	Enable	7-15

Table 7-1 *Imager Preferences Default Table (Continued)*

Parameter	Parameter Number	Default	Page Number
Image Cropping	F0h 2Dh	Disable	7-16
Crop to Pixel Addresses	F4h F0h 3Bh; F4h F0h 3Ch; F4h F0h 3Dh; F4h F0h 3Eh	0 top, 0 left, 479 bottom, 751 right	7-17
Image Resolution	F0h 2Eh	Full	7-18
Image Brightness (Target White)	F0h 86h	180	7-19
Image File Format Selection	F0h 30h	JPEG	7-20
JPEG Image Options	F0h 2Bh	Quality	7-20
JPEG Quality Value	F0h 31h	65	7-21
JPEG Size Value	F1h 31h	160	7-21
Image File Meta Data	F1h B5h	Disable	7-22
Image Enhancement	F1h 34h	Low	7-23
Image Edge Sharpening	F1h 98h	Low	7-24
Image Contrast Enhancement	F1h 9Ah	Enable	7-25
Image Rotation	F1h 99h	0	7-26
Bits per Pixel (BPP)	F0h 2Fh	8 BPP	7-27
Video View Finder	F0h 44h	Disable	7-27
Target Video Frame Size	F0h 48h	2200 bytes	7-28
Video View Finder Image Size	F0h 49h	1700 bytes	7-28
Video Resolution	F0h 9Bh	1/4 resolution	7-29

Imager Preferences

The parameters in this chapter control image capture characteristics. Image capture occurs in all modes of operation, including decode, video, and snapshot.

Operating Modes

The decoder has two modes of operation:

- Decode Mode
- Snapshot Mode
  - Snapshot with Viewfinder Mode
- Video Mode.

Decode Mode

By default, upon a trigger event, the decoder attempts to locate and decode bar codes within its field of view. The decoder remains in this mode as long as the trigger is active, until it decodes a bar code, or it reaches the *Decode Session Timeout on page 6-20*.

Snapshot Mode

Use Snapshot Mode to capture a high-quality image and transmit it to the host. To temporarily enter this mode scan the **Snapshot Mode** bar code. While in this mode the decoder blinks the green LED at 1-second intervals to indicate it is not in standard operating (decode) mode.

In Snapshot Mode, the decoder turns on the imager engine’s aiming pattern to highlight the area to capture in the image. The next trigger event instructs the decoder to capture a high quality image and transmit it to the host. A short time may pass (less than 2 seconds) between trigger activation and image capture as the decoder adjusts to the lighting conditions. Hold the decoder steady until image capture, denoted by a single beep.

If a trigger event does not occur within the Snapshot Mode Timeout period, the decoder returns to Decode Mode. Use *Snapshot Mode Timeout on page 7-15* to adjust this timeout period. The default timeout period is 30 seconds.

To disable the aiming pattern during Snapshot Mode, see *Snapshot Aiming Pattern on page 7-15*.

Use *Video View Finder on page 7-27* to enable **Snapshot with Viewfinder Mode**. In this mode the decoder behaves as a video camera until the trigger activates, at which time a Snapshot occurs as described above.

Video Mode

In this mode the decoder behaves as a video camera as long as the trigger is active. Upon trigger release, the decoder returns to Decode Mode. Scan the **Video Mode** bar code to temporarily enter Video Capture Mode.

Snapshot Mode

Video Mode

Aim Brightness

Parameter # F1h 9Ch

This feature sets the brightness of the aim pattern. The default is 0, which indicates that the aim pattern is always on in between camera exposures. For values above 0, each increment of the brightness value increments the aim duration 0.5 ms.

To program Aim Brightness, scan this bar code followed by three numeric bar codes in *Appendix D, Numeric Bar Codes* that correspond to the value representing brightness. Settings range from 0 to 255. The maximum aim duration is limited by the frame time, so the recommended range is 0 to 30 when the frame rate is set to 60 fps.

Aim Brightness

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Illumination Brightness

Parameter # F1h 9Dh

This feature sets the brightness of the illumination by altering LED power. The default is 10, which is maximum LED brightness. For values from 1 to 10, LED brightness varies from lowest to highest level of brightness.

To program Illumination Brightness, scan this bar code followed by two numeric bar codes in *Appendix D, Numeric Bar Codes* that correspond to the value of desired illumination brightness. For example, to set Illumination Brightness to 6, scan the bar code below followed by the 0 and 6 bar codes.

Illumination Brightness

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Frame Rate

Select an option to control the rate at which frames are captured and transmitted. When capturing images, using lower frame rates can improve image brightness.

NOTE The aiming pattern appears to blink when the frame rate is 30 frames per second (fps) or lower.

Settings for frame rate are:

- Auto - The PL3307 controls the frame rate and changes dynamically based on the mode of operation to provide optimal performance.
- 60 fps - The frame rate is fixed at 60 frames per second
- 55 fps - The frame rate is fixed at 55 frames per second
- 50 fps - The frame rate is fixed at 50 frames per second
- 45 fps - The frame rate is fixed at 45 frames per second
- 40 fps - The frame rate is fixed at 40 frames per second
- 30 fps - The frame rate is fixed at 30 frames per second
- 20 fps - The frame rate is fixed at 20 frames per second
- 15 fps - The frame rate is fixed at 15 frames per second
- 10 fps - The frame rate is fixed at 10 frames per second

***Auto**
(00h)

60 fps
(01h)

55 fps
(05h)

50 fps
(06h)

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Frame Rate (continued)

45 fps
(07h)

40 fps
(08h)

30 fps
(02h)

20 fps
(09h)

15 fps
(03h)

10 fps
(04h)

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LED Illumination

Parameter # F0h ADh

Select the type of LED illumination to use:

- **Internal Illumination** - use the engine's illumination.
- **External Illumination** - assert the ILLUM_EN_OUT signal continuously during a decode session, and do not use the engine's illumination.
- **Internal and External Illumination** - use the engine's illumination and assert the ILLUM_EN_OUT signal continuously during a decode session.
- **Internal Illumination Matches Engine (SE4500 Only)** - use the engine's illumination and pulse the ILLUM_EN_OUT signal to match the engine's illumination duration for each frame. Note that the SE3300 does not support this option.
- **Alternating Internal and External Illumination (SE4500 Only)** - use the engine's illumination and ILLUM_EN_OUT signal on alternating frames. Note that the SE3300 does not support this option.

This parameter only applies for decoding if *Decoding Illumination on page 7-12* is enabled, or for image capture if *Image Capture Illumination on page 7-14* is enabled. Disabling Decoding Illumination or Image Capture Illumination turns off all illumination for that mode, regardless of this LED Illumination setting.

LED Illumination (continued)

***Internal Illumination**
(00h)

External Illumination
(01h)

Internal and External Illumination
(02h)

Internal Illumination Matches Engine
(SE4500 Only)
(04h)

Alternating Internal and External Illumination
(SE4500 Only)
(05h)

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Fixed Gain

Parameter # F1h 38h

This parameter only applies when Decoding or Image Capture Autoexposure is disabled. Gain is a means of amplifying the raw image data before it is converted into 8-bit grayscale values. Increasing the fixed gain increases brightness and contrast, but also increases noise (undesired electrical fluctuations in the image) which makes the image less attractive and/or harder to decode.

To set the fixed gain, scan the bar code below followed by 3 bar codes from *Appendix D, Numeric Bar Codes*, in the range of 1 to 100, representing the value. The default is 50.

Fixed Gain

Exposure Time

Parameter # F4h F1h 37h

This parameter only applies when Decoding or Image Capture Autoexposure is disabled. It configures the exposure for both Decode and Snapshot modes.

Each integer value represents 100 µs worth of exposure. The default value is 100 which results in an exposure setting of 10 ms.

NOTE The maximum exposure time is based on the configured *Frame Rate*. For example, for a frame rate of 60 fps, the maximum exposure time allowed is 15 ms. Setting exposure time to a larger value than the frame rate allows sets the value to the maximum allowed exposure time.

As exposure time lengthens, aim brightness decreases.

To set the Exposure Time parameter, scan **Fixed Exposure** followed by four numeric bar codes representing the value in the range of 1 - 1000. Insert leading zeros if necessary. For example, to set a Fixed Exposure value of 9.9 ms, scan 0, 0, 9, 9. See *Appendix D, Numeric Bar Codes* for numeric bar codes.

Exposure Time
(4 digits)

Decoding Autoexposure

Parameter # F0h 29h

Select **Enable Decoding Autoexposure** to allow the imager engine to control gain settings and exposure (integration) time to best capture an image for decode mode.

Select **Disable Decoding Autoexposure** to manually adjust the gain and exposure time (see *Fixed Gain* and *Exposure Time*). Motorola recommends this option only for advanced users with difficult decoding situations.

***Enable Decoding Autoexposure**
(01h)

Disable Decoding Autoexposure
(00h)

Decoding Illumination

Parameter # F0h 2Ah

Selecting **Enable Decoding Illumination** causes the decoder to turn on illumination every image capture to aid decoding. Select **Disable Decoding Illumination** to prevent the decoder from using decoding illumination.

Enabling illumination usually results in superior images. The effectiveness of illumination decreases as the distance to the target increases.

NOTE Changing this parameter while using **Presentation Mode**, with or without **Motion Enhancement**, is not recommended.

***Enable Decoding Illumination**
(01h)

Disable Decoding Illumination
(00h)

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Decode Aiming Pattern

Parameter # F0h 32h

Select **Enable Decode Aiming Pattern** to project the aiming pattern during bar code capture, or **Disable Decode Aiming Pattern** to turn the aiming pattern off.

NOTE With *Picklist Mode on page 6-20* enabled, the decode aiming pattern flashes even when the **Decode Aiming Pattern** is disabled.

* **Enable Decode Aiming Pattern**
(02h)

Disable Decode Aiming Pattern
(00h)

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Image Capture Autoexposure

Parameter # F0h 68h

Select **Enable Image Capture Autoexposure** to allow the decoder to control gain settings and exposure (integration) time to best capture an image for snapshot mode.

Select **Disable Image Capture Autoexposure** to manually adjust the gain and exposure time (see *Fixed Gain* and *Exposure Time*). Motorola recommends this option only for advanced users with difficult image capture situations.

***Enable Image Capture Autoexposure**
(01h)

Disable Image Capture Autoexposure
(00h)

Image Capture Illumination

Parameter # F0h 69h

Selecting **Enable Image Capture Illumination** causes illumination to turn on during every image capture. Disable illumination to prevent the decoder from using illumination.

Enabling illumination usually results in superior images. The effectiveness of illumination decreases as the distance to the target increases.

***Enable Image Capture Illumination**
(01h)

Disable Image Capture Illumination
(00h)

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Snapshot Mode Timeout

Parameter # F0h 43h

This parameter sets the amount of time the decoder remains in Snapshot Mode. The decoder exits Snapshot Mode upon a trigger event, or when the Snapshot Mode Timeout elapses. To set this timeout value, scan the bar code below followed by a bar code from *Appendix D, Numeric Bar Codes*. The default value is 0 which represents 30 seconds; values increment by 30. For example, 1 = 60 seconds, 2 = 90 seconds, etc.

Snapshot Mode Timeout

Snapshot Aiming Pattern

Parameter # F0h 2Ch

Select **Enable Snapshot Aiming Pattern** to project the aiming pattern when in Snapshot Mode, or **Disable Snapshot Aiming Pattern** to turn the aiming pattern off.

***Enable Snapshot Aiming Pattern**
(01h)

Disable Snapshot Aiming Pattern
(00h)

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Image Cropping

Parameter # F0h 2Dh

This parameter crops a captured image. Select **Disable Image Cropping** to present the full 742 x 480 pixels. Select **Enable** to crop the image to the pixel addresses set in *Crop to Pixel Addresses on page 7-17*.

NOTE The decoder has a cropping resolution of 4 pixels. Setting the cropping area to less than 3 pixels transfers the entire image.

Enable Image Cropping
(01h)

***Disable Image Cropping**
(Use Full 742 x 480 Pixels)
(00h)

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Crop to Pixel Addresses

Parameter # F4h F0h 3Bh (Top)
Parameter # F4h F0h 3Ch (Left)
Parameter # F4h F0h 3Dh (Bottom)
Parameter # F4h F0h 3Eh (Right)

If Enable Image Cropping is selected, set the pixel addresses from (0,0) to (751,479) to crop to.

Columns are numbered from 0 to 751, rows from 0 to 479. Specify four values for Top, Left, Bottom, and Right, where Top and Bottom correspond to row pixel addresses, and Left and Right correspond to column pixel addresses. For example, for a 4 row x 8 column image in the extreme bottom-right section of the image, set the following values:

Top = 476, Bottom = 479, Left = 744, Right = 751

To set the pixel address to crop to, scan each Pixel Address bar code followed by three bar codes from *Appendix D, Numeric Bar Codes* which represent the value. Include leading zeros, so to enter a value of 3, for example, scan **0**, **0**, **3**.

NOTE The decoder has a minimum cropping resolution of four pixels; increment and decrement cropping addresses in multiples of four. Other values are rounded up. For example, choosing to crop from the top at addresses 0, 1, or 2 (removing 1, 2, or 3 pixels) has the same result as cropping at address 3; this removes four rows from the top.

Top Pixel Address
(0 - 479 Decimal)

Left Pixel Address
(0 - 751 Decimal)

Bottom Pixel Address
(0 - 479 Decimal)

Right Pixel Address
(0 - 751 Decimal)

Image Resolution

Parameter # F0h 2Eh

This option alters image resolution before compression. Rows and columns are removed from the image, resulting in a smaller image containing the original content with reduced resolution.

Select one of the following values:

Resolution Value	Uncropped Image Size
Full	752 x 480
1/2	376 x 240
1/4	188 x 120

***Full Resolution**
(00h)

1/2 Resolution
(01h)

1/4 Resolution
(03h)

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Image Brightness (Target White)

Parameter # F0h 86h

This parameter sets the Target White value used in Snapshot and Video modes when using autoexposure. White and black are defined as 240 decimal and 1, respectively. Setting the value to the default of 180 results in a white level of ~180 for the image.

To set the Image Brightness parameter, scan **Image Brightness** below followed by three numeric bar codes representing the value. Include leading zeros. For example, to set an Image Brightness value of 99, scan 0, 9, 9. See *Appendix D, Numeric Bar Codes* for numeric bar codes.

***180**

Image Brightness
(3 digits)

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Image File Format Selector

Parameter # F0h 30h

Select an image format appropriate for the system (BMP, TIFF, or JPEG). The decoder stores captured images in the selected format.

BMP File Format
(03h)

***JPEG File Format**
(01h)

TIFF File Format
(04h)

JPEG Image Options

Parameter # F0h 2Bh

JPEG images can be optimized for either size or for quality. Scan the **Quality Selector** bar code to enter a quality value; the decoder then selects the corresponding image size. Scan the **Size Selector** bar code to enter a size value; the decoder then selects the best image quality.

***JPEG Quality Selector**
(01h)

JPEG Size Selector
(00h)

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JPEG Quality and Size Value

JPEG Quality = Parameter # F0h 31h
JPEG Size = Parameter # F1h 31h

If you select JPEG Quality Selector, scan the **JPEG Quality Value** bar code followed by 3 bar codes from *Appendix D, Numeric Bar Codes* corresponding to a value from 5 to 100, where 100 represents the highest quality image.

If you select JPEG Size Selector, scan **JPEG Size Value** followed by 3 bar codes from *Appendix D, Numeric Bar Codes* corresponding to a value from 5 to 350 which represents the file size in multiples of 1024 bytes (1K). For example, setting this value to 8 (008) permits the file size to be as large as 8192 bytes.

JPEG Quality Value
(Default: 065)
(5 - 100 Decimal)

JPEG Size Value
(Default: 160)
(5 - 350 Decimal)

Image File Meta Data

Parameter # F1h B5h

Enable this option to tag images transmitted in JPEG format with the following EXIF 2.2 standard data fields:

- Time (since power up)
- Sensor used
- Device name
- Manufacturer
- Frame rate
- Host type
- Image number (since power up)
- Image Enhancement parameter setting
- Image Edge Sharpness parameter setting
- Image Contract Enhancement parameter setting.

This parameter has no effect on images transmitted in TIFF or BMP format.

Enable Image File Meta Data
(01h)

***Disable Image File Meta Data**
(00h)

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Image Enhancement

Parameter # F1h 34h

This feature uses a combination of edge sharpening and contrast enhancement to produce an image that is visually pleasing. If you select **User**, also set the *Image Edge Sharpening on page 7-24* and *Image Contrast Enhancement on page 7-25* to enhance the image.

The levels of image enhancement are:

- Off (0)
- Low (1) - Default
- Med (2)
- High (3)
- User (4).

Off
(0)

***Low**
(1)

Medium
(2)

High
(3)

User
(4)

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Image Edge Sharpening

Parameter # F1h 98h

This feature uses an edge sharpening technique, and only applies if you set the *Image Enhancement* parameter to **User**. To set this parameter, scan the **Image Edge Sharpening** bar code, followed by three numeric bar codes in *Appendix D, Numeric Bar Codes* that represent the image edge sharpening value. Alternatively, to set a recommended value, scan one of the value bar codes below.

Recommended settings are:

- Off (0)
- Low (30) - Default
- Med (75)
- High (100).

Image Edge Sharpening

Off (0)

***Low (30)**

Medium (75)

High (100)

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Image Contrast Enhancement

Parameter # F1h 9Ah

Enable this feature to enhance the contrast of an image. This parameter only applies if you set the *Image Enhancement* parameter to **User**.

Disable
(00h)

***Enable**
(01h)

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Image Rotation

Parameter # F1h 99h

This parameter controls the rotation of the image by 0, 90,180, or 270 degrees.

***Rotate 0°**
(00h)

Rotate 90°
(01h)

Rotate 180°
(02h)

Rotate 270°
(03h)

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Bits per Pixel

Parameter # F0h 2Fh

Select the number of significant bits per pixel (BPP) to use when capturing an image. Select 1 BPP for a black and white image, 4 BPP to assign 1 of 16 levels of grey to each pixel, or 8 BPP to assign 1 of 256 levels of grey to each pixel. The decoder ignores these settings for JPEG files, which always use 8 BPP.

1 BPP
(00h)

4 BPP
(01h)

***8 BPP**
(02h)

Video View Finder

Parameter # F0h 44h

Select **Enable Video View Finder** to project the video view finder while in Image Mode, or **Disable Video View Finder** to turn the video view finder off.

***Disable Video View Finder**
(00h)

Enable Video View Finder
(01h)

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Target Video Frame Size

Parameter # F0h 48h

Select the number of 100-byte blocks to transmit per second. Selecting a smaller value transmits more frames per second but reduces video quality; selecting a larger value increases video quality but slows transmission.

To set the Target Video Frame Size, scan the bar code below followed by three bar codes from *Appendix D, Numeric Bar Codes* corresponding to the 100-byte value from 800 to 20,000 bytes. For example, to select 1500 bytes, enter 0, 1, 5. To select 900 bytes, enter 0, 0, 9. The default is 2200 bytes.

Target Video Frame Size

Video View Finder Image Size

Parameter # F0h 49h

Select the number of 100-byte blocks. Values range from 800 to 12,000 bytes. Selecting a smaller value transmits more frames per second; selecting a larger value increases video quality.

To set the Video View Finder Image Size, scan the bar code below followed by three bar codes from *Appendix D, Numeric Bar Codes* corresponding to the 100-byte value from 800 to 12,000 bytes. For example, to select 1500 bytes, enter 0, 1, 5. To select 900 bytes, enter 0, 0, 9. The default is 1700 bytes.

Video View Finder Image Size

Video Resolution

Parameter # F1h 9Bh

This parameter alters the video resolution before transmission. Rows and columns are removed from the image, resulting in a smaller video image containing the original content with reduced resolution.

Select one of the following values:

Resolution Value	Video Image Size
Full	752 x 480
1/2	376 x 240
1/4	188 x 120

Full Resolution
(00h)

1/2 Resolution
(01h)

***1/4 Resolution**
(03h)

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CHAPTER 8 USB INTERFACE

Introduction

This chapter describes how to set up the decoder with a USB host. The decoder connects directly to a USB host, or a powered USB hub, which powers it. No additional power supply is required.

Throughout the programming bar code menus, asterisks (*) indicate default values.

*Indicates Default —— ***North American Standard USB Keyboard** —— Feature/Option

NOTE Most computer monitors allow scanning the bar codes directly on the screen. When scanning from the screen, be sure to set the document magnification to a level where you can see the bar code clearly, and bars and/or spaces are not merging.

USB Parameter Defaults

Table 8-1 lists the defaults for USB host parameters. To change any option, scan the appropriate bar code(s) provided in the Parameter Descriptions section beginning on page *8-3*.

NOTE See *Appendix A, Standard Default Parameters* for all user preferences, hosts, symbologies, and miscellaneous default parameters.

Table 8-1 *USB Interface Parameter Defaults*

Parameter	Default	Page Number
USB Host Parameters		
USB Device Type	SNAPI with Imaging	8-3
Symbol Native API (SNAPI) Status Handshaking	Enable	8-5
USB Country Keyboard Types (Country Codes)	North American	8-6
USB Keystroke Delay	No Delay	8-8
Simulated Caps Lock	Disable	8-9
USB CAPS Lock Override	Disable	8-9
USB Ignore Unknown Characters	Enable	8-10
USB Convert Unknown to Code 39	Disable	8-10
USB Ignore Beep Directive	Honor	8-11
USB Ignore Type Directive	Honor	8-11
Emulate Keypad	Disable	8-12
Emulate Keypad with Leading Zero	Disable	8-12
USB FN1 Substitution	Disable	8-13
Function Key Mapping	Disable	8-13
Simulated Caps Lock	Disable	8-9
Convert Case	None	8-14
USB Static CDC	Enable	8-14
USB Polling Interval	8 msec	8-15
Quick Keypad Emulation	Disable	8-17

USB Host Parameters

USB Device Type

Select the desired USB device type.

NOTE When changing USB Device Types, the decoder automatically resets and issues the standard startup beep sequences.

NOTE Before selecting **USB CDC Host**, install the CDC INF file on the host to ensure the decoder does not stall during power up (due to a failure to enumerate USB). If the decoder stalls, to recover it:

1) Install the CDC INF file
   or
2) After power-up, hold the trigger for 10 seconds, which allows the decoder to power up using an alternate USB configuration. Upon power-up, scan another **USB Device Type**.

NOTE The **SSI over USB CDC** option enables a subset of the SSI protocol over the USB CDC interface which omits all hardware handshaking functionality. For more information see *Chapter 9, SSI Interface* and the *SSI Programmer's Guide*.

***Symbol Native API (SNAPI) with Imaging Interface**

Symbol Native API (SNAPI) without Imaging Interface

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USB Device Type (continued)

HID Keyboard Emulation

IBM Table Top USB

IBM Hand-Held USB

USB OPOS Hand-Held

Simple COM Port Emulation

USB CDC Host

SSI over USB CDC

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Symbol Native API (SNAPI) Status Handshaking

After selecting a SNAPI interface as the USB device type, select whether to enable or disable status handshaking.

***Enable SNAPI Status Handshaking**

Disable SNAPI Status Handshaking

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USB Country Keyboard Types - Country Codes

Scan the bar code corresponding to the keyboard type. This setting applies only to the USB HID Keyboard Emulation device.

NOTE When changing USB country keyboard types the decoder automatically resets and issues the standard startup beep sequences.

***North American Standard USB Keyboard**

German Windows

French Windows

French Canadian Windows 95/98

French Canadian Windows 2000/XP

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USB Country Keyboard Types - Country Codes (continued)

French Belgian Windows

Spanish Windows

Italian Windows

Swedish Windows

UK English Windows

Japanese Windows (ASCII)

Portuguese-Brazilian Windows

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USB Keystroke Delay

This parameter sets the delay, in milliseconds, between emulated keystrokes. Scan a bar code below to increase the delay when hosts require a slower transmission of data.

*No Delay

Medium Delay (20 msec)

Long Delay (40 msec)

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Simulated Caps Lock

Enable this to invert upper and lower case characters on the bar code as if the Caps Lock state is enabled on the keyboard. This inversion occurs regardless of the keyboard's **Caps Lock** state. Note that this only applies to alpha characters.

***Disable Simulated Caps Lock**

Enable Simulated Caps Lock

USB CAPS Lock Override

This option applies only to the HID Keyboard Emulation device. Enable this to preserve the case of the data regardless of the state of the **Caps Lock** key. This setting is always enabled for the Japanese, Windows (ASCII) keyboard type and can not be disabled.

Override Caps Lock Key
(Enable)

***Do Not Override Caps Lock Key**
(Disable)

NOTE If both Simulated Caps Lock and Caps Lock Override are enabled, Caps Lock Override takes precedence.

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USB Ignore Unknown Characters

This option applies only to the HID Keyboard Emulation device and IBM device. Unknown characters are characters the host does not recognize. Select **Send Bar Codes With Unknown Characters** to send all bar code data except for unknown characters. The decoder issues no error beeps.

Select **Do Not Send Bar Codes With Unknown Characters**, for IBM devices, to prevent sending bar codes containing at least one unknown character are to the host, or for HID Keyboard Emulation devices, this sends the bar code characters up to the unknown character. The decoder issues an error beep.

***Send Bar Codes with Unknown Characters**
(Transmit)

Do Not Send Bar Codes with Unknown Characters
(Disable)

USB Convert Unknown to Code 39

This option applies only to the IBM hand-held, IBM tabletop, and OPOS devices. Scan a bar code below to enable or disable converting unknown bar code type data to Code 39.

***Disable Convert Unknown to Code 39**

Enable Convert Unknown to Code 39

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USB Ignore Beep Directive

This applies only to IBM hand-held, IBM tabletop, and OPOS devices. Scan one of the following bar codes to honor or ignore a beep directive. All directives are still acknowledged as if they were processed.

***Honor USB Beep Directive**

Ignore USB Beep Directive

USB Ignore Type Directive

This applies only to IBM hand-held, IBM tabletop, and OPOS devices. Scan one of the following bar codes to honor or ignore a code type enable/disable directive. All directives are still acknowledged as if they were processed.

***Honor USB Ignore Type Directive**

Ignore USB Ignore Type Directive

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Emulate Keypad

Enable this to send all characters as ASCII sequences over the numeric keypad. For example ASCII A transmits as “ALT make” 0 6 5 “ALT Break”.

***Disable Keypad Emulation**

Enable Keypad Emulation

Emulate Keypad with Leading Zero

Enable this to send character sequences sent over the numeric keypad as ISO characters which have a leading zero. For example ASCII A transmits as “ALT MAKE” 0 0 6 5 “ALT BREAK”.

***Disable Keypad Emulation with Leading Zero**

Enable Keypad Emulation with Leading Zero

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USB Keyboard FN 1 Substitution

This option applies only to the USB HID Keyboard Emulation device. Enable this to replace any FN 1 characters in an EAN 128 bar code with a user-selected Key Category and value (see *FN1 Substitution Values on page 6-31* to set the Key Category and Key Value).

Enable

***Disable**

Function Key Mapping

ASCII values under 32 are normally sent as a control-key sequences (see *Table 8-2 on page 8-18*). Enable this parameter to send the keys in bold in place of the standard key mapping. Table entries that do not have a bold entry remain the same whether or not you enable this parameter.

***Disable Function Key Mapping**

Enable Function Key Mapping

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Convert Case

Enable this to convert all bar code data to the selected case.

*No Case Conversion

Convert All to Upper Case

Convert All to Lower Case

USB Static CDC

When disabled, each device connected consumes another COM port (first device = COM1, second device = COM2, third device = COM3, etc.)

When enabled, each device connects to the same COM port.

*Enable USB Static CDC

Disable USB Static CDC

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USB Polling Interval

This option speeds up the USB HID Keyboard Emulation Device. Scan a bar code below to set the polling interval. The polling interval determines the rate at which data can be sent between the decoder and the host computer. A lower number indicates a faster data rate. The default value is 8 msec.

When the polling interval is changed the decoder re-initializes.

CAUTION Ensure your host machine can handle the selected data rate. Selecting a data rate that is too fast for your host machine may result in lost data.

1 msec

2 msec

3 msec

4 msec

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USB Polling Interval (continued)

5 msec

6 msec

7 msec

*8 msec

9 msec

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Quick Keypad Emulation

This option applies only to the HID Keyboard Emulation Device when Emulate Keypad is enabled. This parameter enables a quicker method of emulation utilizing the numeric keypad. The default value is **Disable**.

Enable

***Disable**

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ASCII Character Set for USB

Table 8-2 *USB Prefix/Suffix Values*

Prefix/ Suffix Value	Full ASCII Code 39 Encode Char.acter	Keystroke
1000	%U	CTRL 2
1001	$A	CTRL A
1002	$B	CTRL B
1003	$C	CTRL C
1004	$D	CTRL D
1005	$E	CTRL E
1006	$F	CTRL F
1007	$G	CTRL G
1008	$H	CTRL H/**BACKSPACE**[1]
1009	$I	CTRL I/**HORIZONTAL TAB**[1]
1010	$J	CTRL J
1011	$K	CTRL K
1012	$L	CTRL L
1013	$M	CTRL M/**ENTER**[1]
1014	$N	CTRL N
1015	$O	CTRL O
1016	$P	CTRL P
1017	$Q	CTRL Q
1018	$R	CTRL R
1019	$S	CTRL S
1020	$T	CTRL T
1021	$U	CTRL U
1022	$V	CTRL V
1023	$W	CTRL W
1024	$X	CTRL X
1025	$Y	CTRL Y

[1]The keystroke in bold transmits only if you enable *Function Key Mapping on page 8-13*. Otherwise, the unbolded keystroke transmits.

Table 8-2 *USB Prefix/Suffix Values (Continued)*

Prefix/ Suffix Value	Full ASCII Code 39 Encode Char.acter	Keystroke
1026	$Z	CTRL Z
1027	%A	CTRL [/**ESC**[1]
1028	%B	CTRL \
1029	%C	CTRL]
1030	%D	CTRL 6
1031	%E	CTRL -
1032	Space	Space
1033	/A	!
1034	/B	“
1035	/C	#
1036	/D	$
1037	/E	%
1038	/F	&
1039	/G	‘
1040	/H	(
1041	/I	)
1042	/J	*
1043	/K	+
1044	/L	,
1045	-	-
1046	.	.
1047	/O	/
1048	0	0
1049	1	1
1050	2	2
1051	3	3
1052	4	4
1053	5	5
1054	6	6

[1]The keystroke in bold transmits only if you enable *Function Key Mapping on page 8-13*. Otherwise, the unbolded keystroke transmits.

Table 8-2 *USB Prefix/Suffix Values (Continued)*

Prefix/ Suffix Value	Full ASCII Code 39 Encode Char.acter	Keystroke
1055	7	7
1056	8	8
1057	9	9
1058	/Z	:
1059	%F	;
1060	%G	<
1061	%H	=
1062	%I	>
1063	%J	?
1064	%V	@
1065	A	A
1066	B	B
1067	C	C
1068	D	D
1069	E	E
1070	F	F
1071	G	G
1072	H	H
1073	I	I
1074	J	J
1075	K	K
1076	L	L
1077	M	M
1078	N	N
1079	O	O
1080	P	P
1081	Q	Q
1082	R	R
1083	S	S

[1]The keystroke in bold transmits only if you enable *Function Key Mapping on page 8-13*. Otherwise, the unbolded keystroke transmits.

Table 8-2 *USB Prefix/Suffix Values (Continued)*

Prefix/ Suffix Value	Full ASCII Code 39 Encode Char.acter	Keystroke
1084	T	T
1085	U	U
1086	V	V
1087	W	W
1088	X	X
1089	Y	Y
1090	Z	Z
1091	%K	[
1092	%L	\
1093	%M	]
1094	%N	^
1095	%O	_
1096	%W	`
1097	+A	a
1098	+B	b
1099	+C	c
1100	+D	d
1101	+E	e
1102	+F	f
1103	+G	g
1104	+H	h
1105	+I	i
1106	+J	j
1107	+K	k
1108	+L	l
1109	+M	m
1110	+N	n
1111	+O	o
1112	+P	p

[1]**The keystroke in bold transmits only if you enable** ***Function Key Mapping on page 8-13*****. Otherwise, the unbolded keystroke transmits.**

Table 8-2 *USB Prefix/Suffix Values (Continued)*

Prefix/ Suffix Value	Full ASCII Code 39 Encode Char.acter	Keystroke
1113	+Q	q
1114	+R	r
1115	+S	s
1116	+T	t
1117	+U	u
1118	+V	v
1119	+W	w
1120	+X	x
1121	+Y	y
1122	+Z	z
1123	%P	{
1124	%Q	|
1125	%R	}
1126	%S	~

[1]The keystroke in bold transmits only if you enable ***Function Key Mapping on page 8-13*****. Otherwise, the unbolded keystroke transmits.**

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Table 8-3 *USB ALT Key Character Set*

ALT Keys	Keystroke
2064	ALT 2
2065	ALT A
2066	ALT B
2067	ALT C
2068	ALT D
2069	ALT E
2070	ALT F
2071	ALT G
2072	ALT H
2073	ALT I
2074	ALT J
2075	ALT K
2076	ALT L
2077	ALT M
2078	ALT N
2079	ALT O
2080	ALT P
2081	ALT Q
2082	ALT R
2083	ALT S
2084	ALT T
2085	ALT U
2086	ALT V
2087	ALT W
2088	ALT X
2089	ALT Y
2090	ALT Z

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Table 8-4 *USB GUI Key Character Set*

GUI Key	Keystroke
3000	Right Control Key
3048	GUI 0
3049	GUI 1
3050	GUI 2
3051	GUI 3
3052	GUI 4
3053	GUI 5
3054	GUI 6
3055	GUI 7
3056	GUI 8
3057	GUI 9
3065	GUI A
3066	GUI B
3067	GUI C
3068	GUI D
3069	GUI E
3070	GUI F
3071	GUI G
3072	GUI H
3073	GUI I
3074	GUI J
3075	GUI K
3076	GUI L
3077	GUI M
3078	GUI N
3079	GUI O
3080	GUI P
3081	GUI Q

Note: GUI Shift Keys - The Apple™ iMac keyboard has an apple key on either side of the space bar. Windows-based systems have a GUI key to the left of the left ALT key, and to the right of the right ALT key.

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Table 8-4 *USB GUI Key Character Set (Continued)*

GUI Key	Keystroke
3082	GUI R
3083	GUI S
3084	GUI T
3085	GUI U
3086	GUI V
3087	GUI W
3088	GUI X
3089	GUI Y
3090	GUI Z
Note: GUI Shift Keys - The Apple™ iMac keyboard has an apple key on either side of the space bar. Windows-based systems have a GUI key to the left of the left ALT key, and to the right of the right ALT key.	

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Table 8-5 *USB F Key Character Set*

F Keys	Keystroke
5001	F1
5002	F2
5003	F3
5004	F4
5005	F5
5006	F6
5007	F7
5008	F8
5009	F9
5010	F10
5011	F11
5012	F12
5013	F13
5014	F14
5015	F15
5016	F16
5017	F17
5018	F18
5019	F19
5020	F20
5021	F21
5022	F22
5023	F23
5024	F24

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Table 8-6 *USB Numeric Keypad Character Set*

Numeric Keypad	Keystroke
6042	*
6043	+
6044	undefined
6045	-
6046	.
6047	/
6048	0
6049	1
6050	2
6051	3
6052	4
6053	5
6054	6
6055	7
6056	8
6057	9
6058	Enter
6059	Num Lock

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Table 8-7 *USB Extended Keypad Character Set*

Extended Keypad	Keystroke
7001	Break
7002	Delete
7003	PgUp
7004	End
7005	Pg Dn
7006	Pause
7007	Scroll Lock
7008	Backspace
7009	Tab
7010	Print Screen
7011	Insert
7012	Home
7013	Enter
7014	Escape
7015	Up Arrow
7016	Down Arrow
7017	Left Arrow
7018	Right Arrow

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CHAPTER 9 SSI INTERFACE

Introduction

This chapter describes the system requirements of the Simple Serial Interface (SSI), which provides a communications link between Motorola decoders (e.g., scan engines, slot scanners, hand-held scanners, two-dimensional scanners, hands-free scanners, and RF base stations) and a serial host. It provides the means for the host to control the decoder or scanner.

Communications

All communication between the decoder and host occurs over the hardware interface lines using the SSI protocol. Refer to the *Simple Serial Interface Programmer's Guide*, p/n 72-40451-xx, for more information on SSI.

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

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

SSI performs the following functions for the host device:

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

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

SSI transmits all decode data including special formatting (e.g., AIM ID). Parameter settings can control the format of the transmitted data.

The decoder can 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 the SSI Message Formats section. *SSI Transactions on page 9-3* describes the required sequence of messages in specific cases.

Table 9-1 lists all the SSI opcodes the decoder supports. It identifies the SSI partner allowed to send a message of each type. The host transmits opcodes designated type H. The decoder transmits type D opcodes, and either partner can transmit Host/Decoder (H/D) types.

Table 9-1 *SSI Commands*

Name	Type	Opcode	Description
AIM_OFF	H	0xC4	Deactivate aim pattern.
AIM_ON	H	0xC5	Activate aim pattern.
BEEP	H	0xE6	Sound the beeper.
CAPABILITIES_REPLY	D	0xD4	Reply to CAPABILITIES_REQUEST; contains a list of the capabilities and commands the decoder supports.
CAPABILITIES_REQUEST	H	0xD3	Request capabilities report from the decoder.
CMD_ACK	H/D	0xD0	Positive acknowledgment of received packet.
CMD_NAK	H/D	0xD1	Negative acknowledgment of received packet.
DECODE_DATA	D	0xF3	Decode data in SSI packet format.
EVENT	D	0xF6	Event indicated by associated event code.
LED_OFF	H	0xE8	De-activate LED output.
LED_ON	H	0xE7	Activate LED output.
PARAM_DEFAULTS	H	0xC8	Set parameter default values.
PARAM_REQUEST	H	0xC7	Request values of certain parameters.
PARAM_SEND	H/D	0xC6	Send parameter values.
REPLY_ID	D	0xA6	Reply to REQUEST_ID; contains decoder's serial number.
REPLY_REVISION	D	0xA4	Reply to REQUEST_REVISION contains decoder's software/hardware configuration.
REQUEST_ID	H	0xA3	Request the decoder's serial number.
REQUEST_REVISION	H	0xA3	Request the decoder's configuration.
SCAN_DISABLE	H	0xEA	Prevent the operator from scanning bar codes.
SCAN_ENABLE	H	0xE9	Permit bar code scanning.
SLEEP	H	0xEB	Request to place the decoder into low power.
START_DECODE	H	0xE4	Tell decoder to attempt to decode a bar code.
STOP_DECODE	H	0xE5	Tell decoder to abort a decode attempt.
WAKEUP	H	N/A	Wakeup decoder after it has entered low power mode.

For details of the SSI protocol, refer to the *Simple Serial Interface Programmer's Guide* (72-40451-xx).

SSI Transactions

General Data Transactions

ACK/NAK Handshaking

If you enable ACK/NAK handshaking, all packeted messages must have a CMD_ACK or CMD_NAK response, unless the command description states otherwise. This parameter is enabled by default. Motorola recommends leaving this handshaking 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 which can occur if you disable ACK/NAK handshaking:

- The host sends a PARAM_SEND message to the decoder to change the baud rate from 9600 to 19200.
- The decoder cannot interpret the message.
- The decoder does not implement the change the host requested.
- The host assumes that the parameter change occurred and acts accordingly.
- Communication is lost because the change did not occur on both sides.

If you enable ACK/NAK handshaking, 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.

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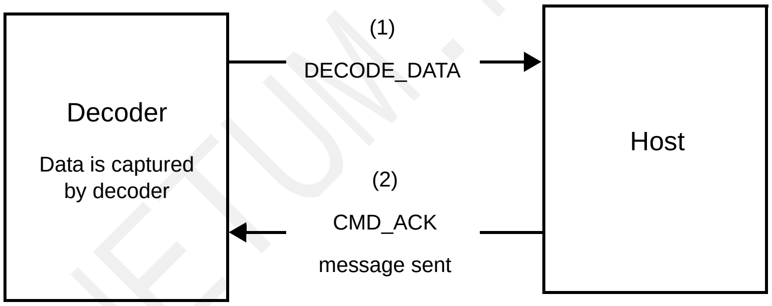
Transfer of Decode Data

The Decode Data Packet Format parameter controls how decode data is sent to the host. Set this parameter to send the data in a DECODE_DATA packet. Clear this parameter to transmit the data as raw ASCII data.

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

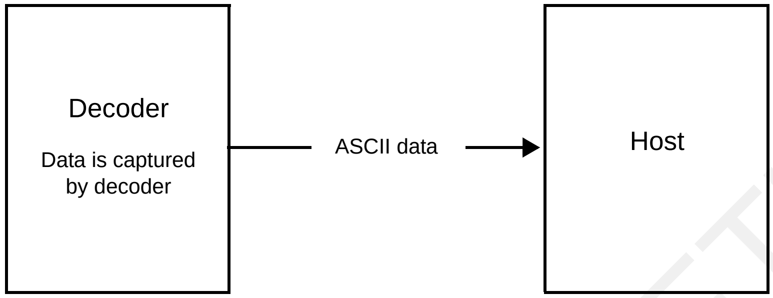
ACK/NAK Enabled and Packeted Data

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 two more times 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.



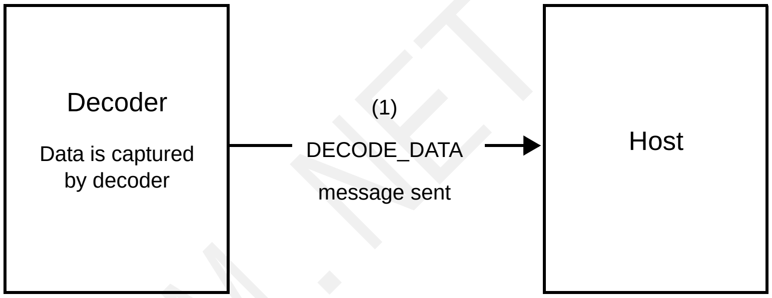
ACK/NAK Enabled and Unpacketed ASCII Data

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.



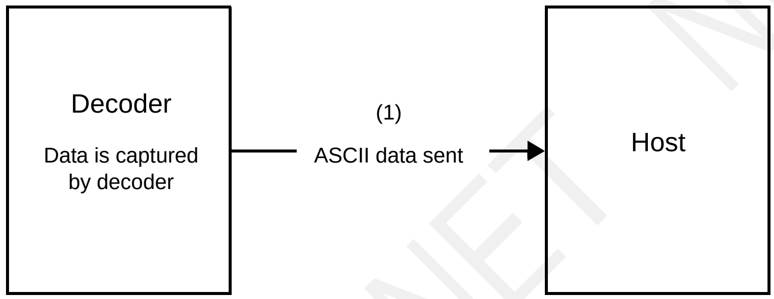
ACK/NAK Disabled and Packeted DECODE_DATA

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 the *Simple Serial Interface Programmer's Guide*, p/n 72-40451-xx. If hardware handshaking is disabled or bypassed, the WAKEUP command must be sent prior to all other communications, or the first byte of a communication message may be lost during the decoder wakeup sequence.

ACK/NAK Option

Enable or disable ACK/NAK handshaking. This handshaking is enabled by default and Motorola recommends leaving it enabled. Disabling this handshaking can cause communication problems, as handshaking is the only acknowledgment 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 it is enabled.

Number of Data Bits

All communication with the decoder must use 8-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. Set the same value for both the host and decoder.

✓ ***NOTE*** You can temporarily change the Serial Response Time-out when the host takes longer to process an ACK or longer data string. Motorola does not recommend frequent permanent changes 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 you use PARAM_SEND to change these serial parameters, the ACK response to the PARAM_SEND uses the previous values for these parameters. The new values then take effect for the next transaction.

Errors

The decoder issues 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
- Failure to receive an ACK or NAK after initial transmit and two resends.

Things to Remember When Using SSI Communication

When not using hardware handshaking, space messages sufficiently apart. The host must not communicate with the decoder if the decoder is transmitting.

When using hardware handshaking, 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. Removing power from the decoder discards temporary changes. Permanent changes are written to non-volatile memory. Frequent changes shorten the life of the non-volatile memory.

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Using Time Delay to Low Power Mode with SSI

Time Delay to Low Power Mode on page 6-18 provides bar codes to select a general time delay. To program a more specific delay value, use an SSI command according to *Table 9-2*.

Table 9-2 *Values for Selecting Time Delay to Low Power*

Value	Timeout	Value	Timeout	Value	Timeout	Value	Timeout
0x00	15 Mins	0x10	1 Sec	0x20	1 Min	0x30	1 Hour
0x01	30 Mins	0x11	1 Sec	0x21	1 Min	0x31	1 Hour
0x02	60 Mins	0x12	2 Secs	0x22	2 Mins	0x32	2 Hours
0x03	90 Mins	0x13	3 Secs	0x23	3 Mins	0x33	3 Hours
N/A	N/A	0x14	4 Secs	0x24	4 Mins	0x34	4 Hours
N/A	N/A	0x15	5 Secs	0x25	5 Mins	0x35	5 Hours
N/A	N/A	0x16	6 Secs	0x26	6 Mins	0x36	6 Hours
N/A	N/A	0x17	7 Secs	0x27	7 Mins	0x37	7 Hours
N/A	N/A	0x18	8 Secs	0x28	8 Mins	0x38	8 Hours
N/A	N/A	0x19	9 Secs	0x29	9 Mins	0x39	9 Hours
N/A	N/A	0x1A	10 Secs	0x2A	10 Mins	0x3A	10 Hours
N/A	N/A	0x1B	15 Secs	0x2B	15 Mins	0x3B	15 Hours
N/A	N/A	0x1C	20 Secs	0x2C	20 Mins	0x3C	20 Hours
N/A	N/A	0x1D	30 Secs	0x2D	30 Mins	0x3D	30 Hours
N/A	N/A	0x1E	45 Secs	0x2E	45 Mins	0x3E	45 Hours
N/A	N/A	0x1F	60 Secs	0x2F	60 Mins	0x3F	60 Hours

CAUTION With hardware handshaking disabled, the PL3307 wakes from low power mode upon receiving a character. However, the PL3307 does not process this character or any others it receives during the 7 ms period following wakeup. Wait at least 7 ms after wakeup to send valid characters.

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Encapsulation of RSM Commands/Responses over SSI

The SSI protocol allows the host to send a command that is variable in length up to 255 bytes. Although there is a provision in the protocol to multi-packet commands from the host, the scan engine does not support this. The host must fragment packets using the provisions in the RSM protocol.

Command Structure

Byte	7	6	5	4	3	2	1	0
0	Length (not including the checksum)							
1	SSI_MGMT_COMMAND (0x80)							
2	Message Source (4 - Host)							
3	Reserved (0)				Reserved (0)	Reserved (0)	Cont'd packet	Retransmit
4	Payload data (see the following example)							
...								
Length -1								
Length	2's complement checksum (MSB)							
Length +1	2's complement checksum (LSB)							

The expected response in the positive case is SSI_MGMT_COMMAND which may be a multi-packet response. For devices that do not support the SSI_MGMT_COMMAND, the response is the standard SSI_NAK.

Response Structure

Byte	7	6	5	4	3	2	1	0
0	Length (not including the checksum)							
1	SSI_MGMT_COMMAND (0x80)							
2	Message Source (0 - Decoder)							
3	Reserved (0)				Reserved (0)	Reserved (0)	Cont'd packet	Retransmit
4	Payload data (see the following example)							
...								
Length -1								
Length	2's complement checksum (MSB)							
Length +1	2's complement checksum (LSB)							

Example Transaction

The following example illustrates how to retrieve diagnostic information (*Diagnostic Testing and Reporting (Attribute #10061)* decimal) from the engine using encapsulation of RSM commands over SSI. Before sending any RSM command, the host must send the RSM Get Packet Size command to query the packet size supported by the device.

Command from Host to Query Packet Size Supported by Device

0A 80 04 00 00 06 20 00 FF FF FD 4E

Where:

- 0A 80 04 00 is encapsulation of RSM commands over SSI command header
- 00 06 20 00 FF FF is RSM Get Packet Size command
- FD 4E is SSI command checksum

Response from Device with Packet Size Information

0C 80 00 00 00 08 20 00 00 F0 00 F0 FD 6C

Where:

- 0C 80 00 00 is encapsulation of RSM command over SSI command header
- 00 08 20 00 00 F0 00 F0 is RSM Get Packet Size response
- FD 6C is SSI response checksum

Command from Host to Retrieve Diagnostic Information

0C 80 04 00 00 08 02 00 27 4D 42 00 FE B0

Where:

- 0C 80 04 00 is encapsulation of RSM commands over SSI command header
- 00 08 02 00 27 4D 42 00 is attribute Get command requesting attribute 10061 decimal
- FE B0 is SSI command checksum

Response from Device with Diagnostic Information

21 80 00 00 00 1D 02 00 27 4D 41 01 42 00 0E 00 00 00 00 01 03 02 03 03 03 04 03 05 03 06 03 FF FF FC 15

Where:

- 21 80 00 00 00 1D 02 00 27 4D 41 01 42 00 0E 00 00 is encapsulation of RSM responses over SSI command header
- 00 00 01 03 02 03 03 03 04 03 05 03 06 03 is attribute Get response which includes diagnostic report value
- FF FF is attribute Get response, packet termination
- FC 15 is SSI response checksum

Simple Serial Interface Default Parameters

This section describes how to set up the decoder with a SSI host. When using SSI, program the decoder via bar code menu or SSI hosts commands.

Throughout the programming bar code menus, asterisks (*) indicate default values.

* Indicates Default

***Baud Rate 9600**

(06h)

Feature/Option

Option Hex Value for programming via SSI command

NOTE Most computer monitors allow scanning the bar codes directly on the screen. When scanning from the screen, be sure to set the document magnification to a level where you can see the bar code clearly, and bars and/or spaces are not merging.

Table 9-3 lists the defaults for the SSI host. There are two ways to change the default values:

- Scan the appropriate bar codes in this guide. These new values replace the standard default values in memory. To recall the default parameter values, scan the **Restore Defaults* bar code on *page 6-5*.
- Download data through the device's serial port using SSI. Hexadecimal parameter numbers appear in this chapter below the parameter title, and options appear in parenthesis beneath the accompanying bar codes. Refer to the *Simple Serial Interface (SSI) Programmer's Guide* for detailed instructions for changing parameters using this method.

NOTE See *Appendix A, Standard Default Parameters* for all user preferences, hosts, symbologies, and miscellaneous default parameters.

Table 9-3 *SSI Default Table*

Parameter	Parameter Number	Default	Page Number
Select SSI Host	N/A	N/A	*9-11*
Baud Rate	9Ch	9600	*9-12*
Parity	9Eh	None	*9-13*
Check Parity	97h	Disable	*9-14*
Stop Bits	9Dh	1	*9-14*
Software Handshaking	9Fh	ACK/NAK	*9-15*
Host RTS Line State	9Ah	Low	*9-16*
Decode Data Packet Format	EEh	Send Raw Decode Data	*9-16*
Host Serial Response Time-out	9Bh	2 sec	*9-17*

Table 9-3 *SSI Default Table (Continued)*

Parameter	Parameter Number	Default	Page Number
Host Character Time-out	EFh	200 msec	*9-18*
Multipacket Option	F0h 4Eh	Option 1	*9-19*
Interpacket Delay	F0h 4Fh	0 ms	*9-20*
Event Reporting			
Decode Event	F0h 00h	Disable	*9-21*
Boot Up Event	F0h 02h	Disable	*9-22*
Parameter Event	F0h 03h	Disable	*9-22*

✓ ***NOTE*** SSI interprets Prefix, Suffix1, and Suffix2 values listed in *Table E-1 on page E-1* differently than other interfaces. SSI does not recognize key categories, only the 3-digit decimal value. The default value of 7013 is interpreted as CR only.

SSI Host Parameters

Select SSI Host

To select SSI as the host interface, scan the following bar code.

SSI Host

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Baud Rate

Parameter # 9Ch

Baud rate is the number of bits of data transmitted per second. Set the decoder's baud rate to match the baud rate setting of the host device. Otherwise, data may not reach the host device or may reach it in distorted form.

***Baud Rate 9600**
(06h)

Baud Rate 19,200
(07h)

Baud Rate 38,400
(08h)

Baud Rate 57,600
(0Ah)

Baud Rate 115,200
(0Bh)

Baud Rate 230,400
(0Ch)

Baud Rate (continued)

Baud Rate 460,800
(0Dh)

Baud Rate 921,600
(0Eh)

Parity

Parameter # 9Eh

A parity check bit is the most significant bit of each ASCII coded character. Select the parity type according to host device requirements.

- Select **Odd** parity and the parity bit has a value 0 or 1, based on data, to ensure that an odd number of 1 bits is contained in the coded character.
- Select **Even** parity and the parity bit has a value 0 or 1, based on data, to ensure that an even number of 1 bits is contained in the coded character.
- If no parity is required, select **None**.

Odd
(02h)

Even
(01h)

***None**
(00h)

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Check Parity

Parameter # 97h

Select whether or not to check the parity of received characters. Use the Parity parameter to select the type of parity.

***Do Not Check Parity**
(00h)

Check Parity
(01h)

Stop Bits

Parameter # 9Dh

The stop bit(s) at the end of each transmitted character marks the end of transmission of one character and prepares the receiving (host) device for the next character in the serial data stream. Set the number of stop bits (one or two) to match host device requirements.

***1 Stop Bit**
(01h)

2 Stop Bits
(02h)

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Software Handshaking

Parameter # 9Fh

This parameter offers control of data transmission in addition to the control hardware handshaking offers. Hardware handshaking is always enabled; you cannot disable it.

- **Disable ACK/NAK Handshaking**: When this option is selected, the decoder neither generates nor expects ACK/NAK handshaking packets.
- **Enable ACK/NAK Handshaking**: When this option is selected, after transmitting data, the decoder expects either an ACK or NAK response from the host. The decoder also ACKs or NAKs messages from the host.

  The decoder waits up to the programmable Host Serial Response Time-out to receive an ACK or NAK. If the decoder does not get a response in this time, it resends its data up to two times before discarding the data and declaring a transmit error.

Disable ACK/NAK
(00h)

***Enable ACK/NAK**
(01h)

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Host RTS Line State

Parameter # 9Ah

This parameter sets the expected idle state of the Serial Host RTS line.

The SSI Interface is used with host applications which also implement the SSI protocol. However, you can use the decoder in a "scan-and-transmit" mode to communicate with any standard serial communication software on a host PC (see *Decode Data Packet Format on page 9-16*). If transmission errors occur in this mode, the host PC may be asserting hardware handshaking lines which interfere with the SSI protocol. Scan the **Host: RTS High** bar code to address this problem.

***Host: RTS Low**
(00h)

Host: RTS High
(01h)

Decode Data Packet Format

Parameter # EEh

This parameter selects whether to transmit decoded data in raw format (unpacketed), or with the packet format defined by the serial protocol.

Selecting the raw format disables ACK/NAK handshaking for decode data.

***Send Raw Decode Data**
(00h)

Send Packeted Decode Data
(01h)

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Host Serial Response Time-out

Parameter # 9Bh

This parameter specifies how long the decoder waits for an ACK or NAK before resending. Also, if the decoder wants to send, and the host has already been granted permission to send, the decoder waits for the designated time-out before declaring an error.

To set the delay period (options are 2, 5, 7.5, or 9,9 seconds), scan one of the following bar codes.

NOTE Other values are available via SSI command.

***Low - 2 Seconds**
(14h)

Medium - 5 Seconds
(32h)

High - 7.5 Seconds
(4Bh)

Maximum - 9.9 Seconds
(63h)

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Host Character Time-out

Parameter # EFh

This parameter determines the maximum time the decoder waits between characters transmitted by the host before discarding the received data and declaring an error.

To set the delay period (options are 200, 500, 750, or 990 ms), scan one of the following bar codes.

NOTE Other values are available via SSI command.

***Low - 200 ms**
(14h)

Medium - 500 ms
(32h)

High - 750 ms
(4Bh)

Maximum - 990 ms
(63h)

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Multipacket Option

Parameter # F0h, 4Eh

This parameter controls ACK/NAK handshaking for multi-packet transmissions.

- **Multi-Packet Option 1**: The host sends an ACK / NAK for each data packet during a multi-packet transmission.
- **Multi-Packet Option 2**: The decoder sends data packets continuously, with no ACK/NAK handshaking to pace the transmission. The host, if overrun, can use hardware handshaking to temporarily delay decoder transmissions. At the end of transmission, the decoder waits for a CMD_ACK or CMD_NAK.
- **Multi-Packet Option 3**: Option 3 is the same as option 2 with the addition of a programmable interpacket delay.

***Multipacket Option 1**
(00h)

Multipacket Option 2
(01h)

Multipacket Option 3
(02h)

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Interpacket Delay

Parameter # F0h, 4Fh

This parameter specifies the interpacket delay if you selected **Multipacket Option 3**.

To set the delay period (options are 0, 25, 50, 75, or 99 ms), scan one of the following bar codes.

> ***NOTE*** Other values are available via SSI command.

***Minimum - 0 ms**
(00h)

Low - 25 ms
(19h)

Medium - 50 ms
(32h)

High - 75 ms
(4Bh)

Maximum - 99 ms
(63h)

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Event Reporting

The host can request the decoder to provide certain information (events) relative to the decoder's behavior. Enable or disable the events listed in *Table 9-4* and on the following pages by scanning the appropriate bar codes.

Table 9-4 *Event Codes*

Event Class	Event	Code Reported
Decode Event	Non parameter decode	0x01
Boot Up Event	System power-up	0x03
Parameter Event	Parameter entry error Parameter stored Defaults set (and parameter event is enabled by default) Number expected	0x07 0x08 0x0A 0x0F

Decode Event

Parameter # F0h, 00h

When enabled, the decoder generates a message to the host upon a successful bar code decode. When disabled, no notification is sent.

Enable Decode Event
(01h)

***Disable Decode Event**
(00h)

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Boot Up Event

Parameter # F0h, 02h

When enabled, the decoder generates a message to the host whenever power is applied. When disabled, no notification is sent.

Enable Boot Up Event
(01h)

***Disable Boot Up Event**
(00h)

Parameter Event

Parameter # F0h, 03h

When enabled, the decoder generates a message to the host when one of the events specified in *Table 9-4 on page 9-21* occurs. When disabled, no notification is sent.

Enable Parameter Event
(01h)

***Disable Parameter Event**
(00h)

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CHAPTER 10 SERIAL INTERFACE

Introduction

This chapter describes how to set up the decoder with a serial host. The serial interface connects the decoder to point-of-sale devices, host computers, or other devices with an available serial port (e.g., com port).

If the host is not listed in *Table 10-2*, refer to the documentation for the host device to set communication parameters to match the host.

NOTE The decoder uses TTL signal levels, which interface with most system architectures. System architectures that use RS-232C signal levels require a conversion circuitry.

Throughout the programming bar code menus, asterisks (*****) indicate default values.

* Indicates Default — ***Baud Rate 57,600** — Feature/Option

NOTE The serial host type requires proper configuration of the sysconfig lines, and typically requires scanning bar code menus as part of initial configuration.

Most computer monitors allow scanning the bar codes directly on the screen. When scanning from the screen, be sure to set the document magnification to a level where you can see the bar code clearly, and bars and/or spaces are not merging.

CAUTION The PL3307 wakes from low power mode upon receiving a character. However, the PL3307 does not process this character or any others it receives during the 7 ms period following wakeup. Wait at least 7 ms after wakeup to send valid characters.

Serial Parameter Defaults

Table 10-1 lists the defaults for serial host parameters. To change any option, scan the appropriate bar code(s) provided in the Serial Host Parameters section beginning on *page 10-3*.

NOTE See *Appendix A, Standard Default Parameters* for all user preferences, hosts, symbologies, and miscellaneous default parameters.

Table 10-1 *Serial Host Default Table*

Parameter	Default	Page Number
Serial Host Parameters		
Serial Host Types	Standard RS-232	*10-5*
Baud Rate	9600	*10-7*
Parity Type	None	*10-9*
Stop Bits	1	*10-10*
Data Bits	8-Bit	*10-10*
Check Receive Errors	Enable	*10-11*
Hardware Handshaking	None	*10-12*
Software Handshaking	None	*10-14*
Host Serial Response Time-out	2 Sec	*10-16*
RTS Line State	Low RTS	*10-17*
Beep on <BEL>	Disable	*10-17*
Intercharacter Delay	0 msec	*10-18*
Nixdorf Beep/LED Options	Normal Operation	*10-19*
Ignore Unknown Characters	Send Bar Code	*10-19*

Serial Host Parameters

Various serial hosts use their own parameter default settings. Selecting standard, ICL, Fujitsu, Wincor-Nixdorf Mode A, Wincor-Nixdorf Mode B, OPOS/JPOS, Olivetti, Omron, or Common Use Terminal Equipment (CUTE-LP/LG bar code readers) sets the defaults listed in *Table 10-2*.

Table 10-2 *Terminal Specific RS-232*

Parameter	ICL	Fujitsu	Wincor-Nixdorf Mode A	Wincor-Nixdorf Mode B/ OPOS/JPOS	Olivetti	Omron	CUTE
Baud Rate	9600	9600	9600	9600	9600	9600	9600
Parity	Even	None	Odd	Odd	Even	None	Even
Stop Bits	One	One	One	One	One	One	One
ASCII Format	8-Bit	8-Bit	8-Bit	8-Bit	7-Bit	8-Bit	7-Bit
Hardware Handshaking	RTS/CTS Option 3	None	RTS/CTS Option 3	RTS/CTS Option 3	None	None	None
Software Handshaking	None	None	None	None	ACK/NAK	None	None
Serial Response Time-out	9.9 Sec.	2 Sec.	None	None	9.9 Sec.	9.9 Sec.	9.9 Sec.
RTS Line State	High	Low	Low	Low = No data to send	Low	High	High
Beep On <BEL>	Disable	Disable	Disable	Disable	Disable	Disable	Disable
Transmit Code ID	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Data Transmission Format	Data/Suffix	Data/Suffix	Data/Suffix	Data/Suffix	Prefix/Data/ Suffix	Data/ Suffix	Prefix/ Data/ Suffix
Prefix	None	None	None	None	STX (1002)	None	STX (1002)
Suffix	CR (1013)	CR (1013)	CR (1013)	CR (1013)	ETX (1003)	CR (1013)	CR (1013) ETX (1003)

In the Nixdorf Mode B, if CTS is low, scanning is disabled. When CTS is high, scanning is enabled. If you scan Nixdorf Mode B without connecting the decoder to the proper host, it may appear unable to scan. If this happens, scan a different serial host type within 5 seconds of cycling power to the decoder.
The CUTE host disables all parameter scanning, including Set Defaults. If you inadvertently select CUTE, scan ****Enable Parameter Scanning (01h) on page 6-6*****, then change the host selection.**

Serial Host Parameters (continued)

Selecting ICL, Fujitsu, Wincor-Nixdorf Mode A, Wincor-Nixdorf Mode B, OPOS/JPOS, Olivetti, Omron, or Common Use Terminal Equipment (CUTE-LP/LG bar code readers) enables the transmission of code ID characters listed in *Table 10-3*. These code ID characters are not programmable and are separate from the Transmit Code ID feature. Do not enable the Transmit Code ID feature for these terminals.

Table 10-3 *Terminal Specific Code ID Characters*

Code Type	ICL	Fujitsu	Wincor-Nixdorf Mode A	Wincor-Nixdorf Mode B/ OPOS/JPOS	Olivetti	Omron	CUTE
UPC-A	A	A	A	A	A	A	A
UPC-E	E	E	C	C	C	E	None
EAN-8/JAN-8	FF	FF	B	B	B	FF	None
EAN-13/JAN-13	F	F	A	A	A	F	A
Bookland EAN	F	F	A	A	A	F	None
Code 39	C <len>	None	M	M	M <len>	C <len>	3
Code 39 Full ASCII	None	None	M	M	None	None	3
Trioptic	None	None	None	None	None	None	None
Code 32	None	None	None	None	None	None	None
Codabar	N <len>	None	N	N	N <len>	N <len>	None
Code 128	L <len>	None	K	K	K <len>	L <len>	5
GS1-128	L <len>	None	P	P	P <len>	L <len>	5
Code 93	None	None	L	L	L <len>	None	None
I 2 of 5	I <len>	None	I	I	I <len>	I <len>	1
D 2 of 5	H <len>	None	H	H	H <len>	H <len>	2
MSI	None	None	O	O	O <len>	None	None
Code 11	None	None	None	None	None	None	None
IATA	H<len>	None	H	H	H<len>	H<len>	2
GS1 Databar Variants	None	None	E	E	None	None	None
PDF417	None	None	Q	Q	None	None	6
MicroPDF417	None	None	S	S	None	None	6
Data Matrix	None	None	R	R	None	None	4
Maxicode	None	None	T	T	None	None	None
QR Codes	None	None	U	U	None	None	7
Aztec/Aztec Rune	None	None	V	V	None	None	8

Serial Host Types

To select a serial host interface, scan one of the following bar codes.

NOTE Scanning **Standard RS-232** activates the serial driver, but does not change port settings (e.g., parity, data bits, handshaking). Selecting another serial host type bar code changes these settings.

Standard RS-232

ICL Serial

Wincor-Nixdorf Serial Mode A

Wincor-Nixdorf Serial Mode B

Olivetti ORS4500

Omron

Serial Host Types (continued)

OPOS/JPOS

Fujitsu Serial

CUTE [1]

[1]The CUTE host disables all parameter scanning, including Set Defaults. If you inadvertently select CUTE, scan *Enable Parameter Scanning (01h) on page 6-6, then change the host selection.

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Baud Rate

Baud rate is the number of bits of data transmitted per second. Set the decoder's baud rate to match the baud rate setting of the host device. Otherwise, data may not reach the host device or may reach it in distorted form.

***Baud Rate 9600**

Baud Rate 19,200

Baud Rate 38,400

Baud Rate 57,600

Baud Rate 115,200

Baud Rate 230,400

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Baud Rate (continued)

Baud Rate 460,800

Baud Rate 921,600

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Parity

A parity check bit is the most significant bit of each ASCII coded character. Select the parity type according to host device requirements.

- Select **Odd** parity to set the parity bit value to 0 or 1, based on data, to ensure that an odd number of 1 bits are contained in the coded character.
- Select **Even** parity to set the parity bit value to 0 or 1, based on data, to ensure that an even number of 1 bits are contained in the coded character.
- Select **None** when no parity bit is required.

Odd

Even

***None**

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Stop Bits

The stop bit(s) at the end of each transmitted character marks the end of transmission of one character and prepares the receiving device for the next character in the serial data stream. Select the number of stop bits (one or two) based on the number the receiving device is programmed to accommodate.

*1 Stop Bit

2 Stop Bits

Data Bits

This parameter allows the decoder to interface with devices requiring a 7-bit or 8-bit ASCII protocol.

7-Bit

*8-Bit

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Check Receive Errors

Select whether or not to check the parity, framing, and overrun of received characters. The parity value of received characters is verified against the setting of *Parity on page 10-9*.

***Check For Received Errors**

Do Not Check For Received Errors

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Hardware Handshaking

The data interface consists of a serial port designed to operate either with or without the hardware handshaking lines *Request to Send* (RTS) and *Clear to Send* (CTS).

If Standard RTS/CTS handshaking is not selected, scan data transmits as it becomes available. Select Standard RTS/CTS handshaking to transmit scan data according to the following sequence:

- The decoder reads the CTS line for activity. If CTS is asserted, the decoder waits up to the Host Serial Response Time-out for the host to de-assert the CTS line. If, after the Host Serial Response Time-out (default) the CTS line is still asserted, the decoder sounds a transmit error and discards any scanned data.
- When the CTS line is de-asserted, the decoder asserts the RTS line and waits up to the Host Serial Response Time-out for the host to assert CTS. When the host asserts CTS, data transmits. If, after the Host Serial Response Time-out (default) the CTS line is not asserted, the decoder sounds a transmit error and discards the data.
- When data transmission completes, the decoder de-asserts RTS 10 msec after sending the last character.
- The host responds by negating CTS. The decoder checks for a de-asserted CTS upon the next transmission of data.

During data transmission, the CTS line should be asserted. If CTS is deasserted for more than 50 ms between characters, the decoder aborts transmission, sounds a transmission error, and discards the data.

If the above communication sequence fails, the decoder issues an error indication. In this case, the data is lost and must be rescanned.

If hardware handshaking and software handshaking are both enabled, hardware handshaking takes precedence.

✓ ***NOTE*** The DTR signal is jumpered to the active state.

- **None**: Scan this bar code to disable hardware handshaking.
- **Standard RTS/CTS**: Scan this bar code to select Standard RTS/CTS Hardware Handshaking.
- **RTS/CTS Option 1**: The decoder asserts RTS before transmitting and ignores the state of CTS. The decoder de-asserts RTS when transmission completes.
- **RTS/CTS Option 2**: RTS is always high or low (user-programmed logic level). However, the decoder waits for CTS to be asserted before transmitting data. If CTS is not asserted within Host Serial Response Time-out (default), the decoder issues an error indication and discards the data.
- **RTS/CTS Option 3**: The decoder asserts RTS prior to any data transmission, regardless of the state of CTS. The decoder waits up to Host Serial Response Time-out (default) for CTS to be asserted. If CTS is not asserted during this time, the decoder issues an error indication and discards the data. The decoder de-asserts RTS when transmission completes.

Hardware Handshaking (continued)

*None

Standard RTS/CTS

RTS/CTS Option 1

RTS/CTS Option 2

RTS/CTS Option 3

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Software Handshaking

This parameter offers control of data transmission in addition to, or instead of, the control hardware handshaking offers. There are five options.

If software handshaking and hardware handshaking are both enabled, Hardware Handshaking takes precedence.

- **None**: Data transmits immediately. No response is expected from host.
- **ACK/NAK**: After transmitting data, the decoder expects either an ACK or NAK response from the host. When the decoder receives a NAK, it transmits the same data again and waits for either an ACK or NAK. After three unsuccessful attempts to send data when NAKs are received, the decoder issues an error indication and discards the data.

  The decoder waits up to the programmable Host Serial Response Time-out to receive an ACK or NAK. If the decoder does not receive a response in this time, it issues an error indication and discards the data. There are no retries when a time-out occurs.
- **ENQ**: The decoder waits for an ENQ character from the host before transmitting data. If the decoder does not receive an ENQ within the Host Serial Response Time-out, it issues an error indication and discards the data. The host must transmit an ENQ character at least every Host Serial Response Time-out to prevent transmission errors.
- **ACK/NAK with ENQ**: This combines the two previous options. For re-transmissions of data due to a NAK from the host, an additional ENQ is not required.
- **XON/XOFF**: An XOFF character turns the decoder transmission off until the decoder receives an XON character. There are two situations for XON/XOFF:
  - The decoder receives an XOFF before it has data to send. When the decoder has data to send, it waits up to the Host Serial Response Time-out for an XON character before transmission. If it does not receive an XON within this time, the decoder issues an error indication and discards the data.
  - The decoder receives an XOFF during a transmission. Data transmission then stops after sending the current byte. When the decoder receives an XON character, it sends the rest of the data message. The decoder waits indefinitely for the XON.

Software Handshaking (continued)

*None

ACK/NAK

ENQ

ACK/NAK with ENQ

XON/XOFF

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Host Serial Response Time-out

This parameter specifies how long the decoder waits for an ACK, NAK, or CTS before determining that a transmission error occurred. This only applies when in one of the ACK/NAK software handshaking modes, or RTS/CTS hardware handshaking mode.

***Minimum: 2 Sec**

Low: 2.5 Sec

Medium: 5 Sec

High: 7.5 Sec

Maximum: 9.9 Sec

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RTS Line State

This parameter sets the idle state of the Serial Host RTS line. Scan a bar code below to select **Low RTS** or **High RTS** line state.

***Host: Low RTS**

Host: High RTS

Beep on <BEL>

When this parameter is enabled, the decoder issues a beep when it detects a <BEL> character on the serial line. <BEL> gains a user's attention to an illegal entry or other important event.

Beep On <BEL> Character
(Enable)

***Do Not Beep On <BEL> Character**
(Disable)

NOTE A NULL character must be sent to the decoder before BEL to ensure the BEL character is processed correctly.

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Intercharacter Delay

This parameter specifies the intercharacter delay inserted between character transmissions.

***Minimum: 0 msec**

Low: 25 msec

Medium: 50 msec

High: 75 msec

Maximum: 99 msec

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Nixdorf Beep/LED Options

Select Nixdorf Mode B to indicate when the decoder beeps and turns on its LED after a decode.

***Normal Operation**
(Beep/LED immediately after decode)

Beep/LED After Transmission

Beep/LED After CTS Pulse

Ignore Unknown Characters

Unknown characters are characters the host does not recognize. Select **Send Bar Codes with Unknown Characters** to send all bar code data except for unknown characters. The decoder issues no error beeps. Select **Do Not Send Bar Codes With Unknown Characters** to send bar code data up to the first unknown character. The decoder issues an error beep.

***Send Bar Code**
(with unknown characters)

Do Not Send Bar Codes
(with unknown characters)

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ASCII Character Set for Serial Hosts

You can assign the values in *Table 10-4* as prefixes or suffixes for ASCII character data transmission.

Table 10-4 *Prefix/Suffix Values*

Prefix/Suffix Value	Full ASCII Code 39 Encode Character	ASCII Character
1000	%U	NUL
1001	$A	SOH
1002	$B	STX
1003	$C	ETX
1004	$D	EOT
1005	$E	ENQ
1006	$F	ACK
1007	$G	BELL
1008	$H	BCKSPC
1009	$I	HORIZ TAB
1010	$J	LF/NW LN
1011	$K	VT
1012	$L	FF
1013	$M	CR/ENTER
1014	$N	SO
1015	$O	SI
1016	$P	DLE
1017	$Q	DC1/XON
1018	$R	DC2
1019	$S	DC3/XOFF
1020	$T	DC4
1021	$U	NAK
1022	$V	SYN
1023	$W	ETB
1024	$X	CAN
1025	$Y	EM
1026	$Z	SUB
1027	%A	ESC

Table 10-4 *Prefix/Suffix Values (Continued)*

Prefix/Suffix Value	Full ASCII Code 39 Encode Character	ASCII Character
1028	%B	FS
1029	%C	GS
1030	%D	RS
1031	%E	US
1032	Space	Space
1033	/A	!
1034	/B	"
1035	/C	#
1036	/D	$
1037	/E	%
1038	/F	&
1039	/G	‘
1040	/H	(
1041	/I	)
1042	/J	*
1043	/K	+
1044	/L	,
1045	-	-
1046	.	.
1047	/O	/
1048	0	0
1049	1	1
1050	2	2
1051	3	3
1052	4	4
1053	5	5
1054	6	6
1055	7	7
1056	8	8
1057	9	9
1058	/Z	:

Table 10-4 *Prefix/Suffix Values (Continued)*

Prefix/Suffix Value	Full ASCII Code 39 Encode Character	ASCII Character
1059	%F	;
1060	%G	<
1061	%H	=
1062	%I	>
1063	%J	?
1064	%V	@
1065	A	A
1066	B	B
1067	C	C
1068	D	D
1069	E	E
1070	F	F
1071	G	G
1072	H	H
1073	I	I
1074	J	J
1075	K	K
1076	L	L
1077	M	M
1078	N	N
1079	O	O
1080	P	P
1081	Q	Q
1082	R	R
1083	S	S
1084	T	T
1085	U	U
1086	V	V
1087	W	W
1088	X	X
1089	Y	Y

Table 10-4 *Prefix/Suffix Values (Continued)*

Prefix/Suffix Value	Full ASCII Code 39 Encode Character	ASCII Character
1090	Z	Z
1091	%K	[
1092	%L	\
1093	%M	]
1094	%N	^
1095	%O	_
1096	%W	`
1097	+A	a
1098	+B	b
1099	+C	c
1100	+D	d
1101	+E	e
1102	+F	f
1103	+G	g
1104	+H	h
1105	+I	i
1106	+J	j
1107	+K	k
1108	+L	l
1109	+M	m
1110	+N	n
1111	+O	o
1112	+P	p
1113	+Q	q
1114	+R	r
1115	+S	s
1116	+T	t
1117	+U	u
1118	+V	v
1119	+W	w
1120	+X	x

Table 10-4 *Prefix/Suffix Values (Continued)*

Prefix/Suffix Value	Full ASCII Code 39 Encode Character	ASCII Character
1121	+Y	y
1122	+Z	z
1123	%P	{
1124	%Q	|
1125	%R	}
1126	%S	~
1127		Undefined
7013		ENTER

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CHAPTER 11 SYMBOLOGIES

Introduction

This chapter describes symbology features and provides the programming bar codes for selecting these features. Before programming, follow the instructions in *Chapter 1, Getting Started*.

The decoder is shipped with the settings shown in *Table 11-1 on page 11-2* (also see *Appendix A, Standard Default Parameters* for all host device and miscellaneous defaults). If the default values suit requirements, programming is not necessary.

There are two ways to change a parameter value:

- Scan the appropriate bar codes in this guide. These new values replace the standard default values in memory.
- For SSI and USB SNAPI hosts, send a “parameter send” command from the host system. Hexadecimal parameter numbers are shown in this chapter below the parameter title, and options are shown in parenthesis beneath the accompanying bar codes. See the *Simple Serial Interface (SSI) Programmer’s Guide* for detailed instructions for changing parameter values using this method.

✓ ***NOTE*** Most computer monitors allow scanning the bar codes directly on the screen. When scanning from the screen, be sure to set the document magnification to a level where the bar code can be seen clearly, and bars and/or spaces are not merging.

Select a host type (see each host chapter for specific host information) after the power-up beeps sound. This is only necessary upon the first power-up when connected to a new host.

To return all features to default values, scan the *Set Default Parameter on page 6-5*. Throughout the programming bar code menus, asterisks (*****) indicate default values.

* Indicates Default — ***Enable UPC-A** — Feature/Option

(01h) — Option Hex Value

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Scanning Sequence Examples

In most cases, scanning one bar code sets the parameter value. For example, to transmit bar code data without the UPC-A check digit, simply scan the **Do Not Transmit UPC-A Check Digit** bar code under *Transmit UPC-A Check Digit on page 11-18*. The decoder issues a fast warble beep and the LED turns green, signifying a successful parameter entry.

Other parameters, such as **Set Length(s) for D 2 of 5** require scanning several bar codes. See the individual parameter, such as **Set Length(s) for D 2 of 5**, for this procedure.

Errors While Scanning

Unless otherwise specified, to correct an error during a scanning sequence, just re-scan the correct parameter.

Symbology Parameter Defaults

Table 11-1 lists the defaults for all symbologies parameters. To change the default values, scan the appropriate bar codes in this guide. These new values replace the standard default values in memory. To recall the default parameter values, scan the *Set Default Parameter on page 6-5*.

✓ ***NOTE*** See *Appendix A, Standard Default Parameters* for all user preferences, hosts, and miscellaneous default parameters.

Table 11-1 *Parameter Defaults*

Parameter	Parameter Number	Default	Page Number
Disable All Code Types			*11-8*
UPC/EAN			
UPC-A	01h	Enable	*11-9*
UPC-E	02h	Enable	*11-9*
UPC-E1	0Ch	Disable	*11-10*
EAN-8/JAN 8	04h	Enable	*11-10*
EAN-13/JAN 13	03h	Enable	*11-11*
Bookland EAN	53h	Enable	*11-11*
Bookland ISBN Format	F1h 40h	ISBN-10	*11-12*
Decode UPC/EAN/JAN Supplementals (2 and 5 digits)	10h	Ignore	*11-14*
User-Programmable Supplementals Supplemental 1: Supplemental 2:	 F1h 43h F1h 44h	N/A	*11-16*
UPC/EAN/JAN Supplemental Redundancy	50h	10	*11-16*

Table 11-1 *Parameter Defaults (Continued)*

Parameter	Parameter Number	Default	Page Number
Decode UPC/EAN/JAN Supplemental AIM ID	F1h A0h	Combined	11-17
Transmit UPC-A Check Digit	28h	Enable	11-18
Transmit UPC-E Check Digit	29h	Enable	11-18
Transmit UPC-E1 Check Digit	2Ah	Enable	11-19
UPC-A Preamble	22h	System Character	11-19
UPC-E Preamble	23h	System Character	11-19
UPC-E1 Preamble	24h	System Character	11-21
Convert UPC-E to A	25h	Disable	11-22
Convert UPC-E1 to A	26h	Disable	11-22
EAN-8/JAN-8 Extend	27h	Disable	11-23
UCC Coupon Extended Code	55h	Disable	11-23
Coupon Report	F1h DAh	New Coupon Symbols	11-24
ISSN EAN	F1h 69h	Disable	11-25
Code 128			
Code 128	08h	Enable	11-26
Set Length(s) for Code 128	D1h, D2h	Any Length	11-26
GS1-128 (formerly UCC/EAN-128)	0Eh	Enable	11-27
ISBT 128	54h	Enable	11-28
ISBT Concatenation	F1h 41h	Disable	11-29
Check ISBT Table	F1h 42h	Enable	11-30
ISBT Concatenation Redundancy	DFh	10	11-30
Code 39			
Code 39	00h	Enable	11-31
Trioptic Code 39	0Dh	Disable	11-31
Convert Code 39 to Code 32 (Italian Pharmacy Code)	56h	Disable	11-32
Code 32 Prefix	E7h	Disable	11-32
Set Length(s) for Code 39	12h, 13h	Length Within Range: 2 to 55	11-33
Code 39 Check Digit Verification	30h	Disable	11-34
Transmit Code 39 Check Digit	2Bh	Disable	11-34

Table 11-1 *Parameter Defaults (Continued)*

Parameter	Parameter Number	Default	Page Number
Code 39 Full ASCII Conversion	11h	Disable	11-35
Buffer Code 39	71h	Disable	11-36
Code 93			
Code 93	09h	Disable	11-38
Set Length(s) for Code 93	1Ah, 1Bh	Length Within Range: 4 to 55	11-38
Code 11			
Code 11	0Ah	Disable	11-40
Set Lengths for Code 11	1Ch, 1Dh	Length Within Range: 4 to 55	11-40
Code 11 Check Digit Verification	34h	Disable	11-42
Transmit Code 11 Check Digit(s)	2Fh	Disable	11-43
Interleaved 2 of 5 (ITF)			
Interleaved 2 of 5 (ITF)	06h	Disable	11-44
Set Lengths for I 2 of 5	16h, 17h	1 Length; Length = 14	11-44
I 2 of 5 Check Digit Verification	31h	Disable	11-46
Transmit I 2 of 5 Check Digit	2Ch	Disable	11-46
Convert I 2 of 5 to EAN 13	52h	Disable	11-47
Discrete 2 of 5 (DTF)			
Discrete 2 of 5	05h	Disable	11-48
Set Length(s) for D 2 of 5	14h, 15h	1 Length; Length = 12	11-48
Codabar (NW - 7)			
Codabar	07h	Disable	11-50
Set Lengths for Codabar	18h, 19h	Length Within Range: 5 to 55	11-50
CLSI Editing	36h	Disable	11-52
NOTIS Editing	37h	Disable	11-52
Codabar Upper or Lower Case Start/Stop Characters Detection	F2h 57h	Upper Case	11-53

Table 11-1 *Parameter Defaults (Continued)*

Parameter	Parameter Number	Default	Page Number
MSI			
MSI	0Bh	Disable	*11-54*
Set Length(s) for MSI	1Eh, 1Fh	Length Within Range: 4 to 55	*11-54*
MSI Check Digits	32h	One	*11-56*
Transmit MSI Check Digit	2Eh	Disable	*11-56*
MSI Check Digit Algorithm	33h	Mod 10/Mod 10	*11-57*
Chinese 2 of 5			
Chinese 2 of 5	F0h 98h	Disable	*11-57*
Matrix 2 of 5			
Matrix 2 of 5	F1h 6Ah	Disable	*11-58*
Matrix 2 of 5 Lengths	F1h 6Bh F1h 6Ch	Length; Length = 14	*11-59*
Matrix 2 of 5 Check Digit	F1h 6Eh	Disable	*11-60*
Transmit Matrix 2 of 5 Check Digit	F1h 6Fh	Disable	*11-60*
Korean 3 of 5			
Korean 3 of 5	F1h 45h	Disable	*11-61*
Inverse 1D	F1h 4Ah	Regular	*11-62*
Postal Codes			
US Postnet	59h	Disable	*11-63*
US Planet	5Ah	Disable	*11-63*
Transmit US Postal Check Digit	5Fh	Enable	*11-64*
UK Postal	5Bh	Disable	*11-64*
Transmit UK Postal Check Digit	60h	Enable	*11-65*
Japan Postal	F0h 22h	Disable	*11-65*
Australia Post	F0h 23h	Disable	*11-66*
Australia Post Format	F1h CEh	Autodiscriminate	*11-67*
Netherlands KIX Code	F0h 46h	Disable	*11-68*
USPS 4CB/One Code/Intelligent Mail	F1h 50h	Disable	*11-68*
UPU FICS Postal	F1h 63h	Disable	*11-69*

Table 11-1 *Parameter Defaults (Continued)*

Parameter	Parameter Number	Default	Page Number
GS1 DataBar			
GS1 DataBar (GS1 DataBar Omnidirectional, GS1 DataBar Truncated, GS1 DataBar Stacked, GS1 DataBar Stacked Omnidirectional)	F0h 52h	Enable	*11-70*
GS1 DataBar Limited	F0h 53h	Disable	*11-71*
GS1 DataBar Limited Security Level	F1h D8h	3	*11-72*
GS1 DataBar Expanded (GS1 DataBar Expanded, GS1 DataBar Expanded Stacked)	F0h 54h	Enable	*11-73*
Convert GS1 DataBar to UPC/EAN	F0h 8Dh	Disable	*11-73*
Composite			
Composite CC-C	F0h 55h	Disable	*11-74*
Composite CC-A/B	F0h 56h	Disable	*11-74*
Composite TLC-39	F0h 73h	Disable	*11-75*
UPC Composite Mode	F0h 58h	UPC Always Linked	*11-75*
Composite Beep Mode	F0h 8Eh	Beep As Each Code Type is Decoded	*11-76*
GS1-128 Emulation Mode for UCC/EAN Composite Codes	F0h ABh	Disable	*11-76*
2D Symbologies			
PDF417	0Fh	Enable	*11-77*
MicroPDF417	E3h	Disable	*11-77*
Code 128 Emulation	7Bh	Disable	*11-78*
Data Matrix	F0h 24h	Enable	*11-79*
Data Matrix Inverse	F1h 4Ch	Regular	*11-79*
Decode Mirror Images (Data Matrix Only)	F1h 19h	Auto	*11-80*
Maxicode	F0h 26h	Disable	*11-81*
QR Code	F0h 25h	Enable	*11-81*
QR Inverse	F1h 4Bh	Regular	*11-82*
MicroQR	F1h 3Dh	Enable	*11-82*
Aztec	F1h 3Eh	Enable	*11-83*
Aztec Inverse	F1h 4Dh	Inverse Autodetect	*11-83*

Table 11-1 *Parameter Defaults (Continued)*

Parameter	Parameter Number	Default	Page Number
Symbology-Specific Security Levels			
Redundancy Level	4Eh	1	*11-84*
Security Level (UPC/EAN and Code 93)	4Dh	1	*11-86*
Intercharacter Gap Size	F0h 7Dh	Normal	*11-87*
Macro PDF			
Macro PDF Transmit/Decode Mode Symbols	BCh	Passthrough Mode	*11-89*
Transmit Macro PDF Control Header	B8h	Disable	*11-90*
Escape Characters	E9h	None	*11-90*
Flush Macro PDF Buffer			*11-91*
Abort Macro PDF Entry			*11-91*

Disable All Code Types

To disable all symbologies, scan the bar code below. This is useful when enabling only a few code types.

Disable All Code Types

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UPC/EAN

Enable/Disable UPC-A

Parameter # 01h

To enable or disable UPC-A, scan the appropriate bar code below.

*Enable UPC-A
(01h)

Disable UPC-A
(00h)

Enable/Disable UPC-E

Parameter # 02h

To enable or disable UPC-E, scan the appropriate bar code below.

*Enable UPC-E
(01h)

Disable UPC-E
(00h)

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Enable/Disable UPC-E1

Parameter # 0Ch

UPC-E1 is disabled by default.

To enable or disable UPC-E1, scan the appropriate bar code below.

NOTE UPC-E1 is not a UCC (Uniform Code Council) approved symbology.

Enable UPC-E1
(01h)

***Disable UPC-E1**
(00h)

Enable/Disable EAN-8/JAN-8

Parameter # 04h

To enable or disable EAN-8/JAN-8, scan the appropriate bar code below.

***Enable EAN-8/JAN-8**
(01h)

Disable EAN-8/JAN-8
(00h)

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Enable/Disable EAN-13/JAN-13

Parameter # 03h

To enable or disable EAN-13/JAN-13, scan the appropriate bar code below.

*Enable EAN-13/JAN-13
(01h)

Disable EAN-13/JAN-13
(00h)

Enable/Disable Bookland EAN

Parameter # 53h

To enable or disable Bookland EAN, scan the appropriate bar code below.

*Enable Bookland EAN
(01h)

Disable Bookland EAN
(00h)

NOTE If Bookland EAN is enabled, select a *Bookland ISBN Format on page 11-12*. Also select either Decode UPC/EAN Supplementals, Autodiscriminate UPC/EAN Supplementals, or Enable 978/979 Supplemental Mode in *Decode UPC/EAN/JAN Supplementals on page 11-13*.

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Bookland ISBN Format

Parameter # F1h 40h

If Bookland EAN is enabled, select one of the following formats for Bookland data:

- **Bookland ISBN-10** - The decoder reports Bookland data starting with 978 in traditional 10-digit format with the special Bookland check digit for backward-compatibility. Data starting with 979 is not considered Bookland in this mode.
- **Bookland ISBN-13** - The decoder reports Bookland data (starting with either 978 or 979) as EAN-13 in 13-digit format to meet the 2007 ISBN-13 protocol.

***Bookland ISBN-10**
(00h)

Bookland ISBN-13
(01h)

NOTE For Bookland EAN to function properly, ensure Bookland EAN is enabled (see *Enable/Disable Bookland EAN on page 11-11*), then select either Decode UPC/EAN Supplementals, Autodiscriminate UPC/EAN Supplementals, or Enable 978/979 Supplemental Mode in *Decode UPC/EAN/JAN Supplementals on page 11-13*.

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Decode UPC/EAN/JAN Supplementals

Parameter # 10h

Supplementals are bar codes appended according to specific format conventions (e.g., UPC A+2, UPC E+2, EAN 13+2). The following options are available:

- If you select **Ignore UPC/EAN with Supplementals**, and the decoder is presented with a UPC/EAN plus supplemental symbol, the decoder decodes UPC/EAN and ignores the supplemental characters.
- If you select **Decode UPC/EAN with Supplementals**, the decoder only decodes UPC/EAN symbols with supplemental characters, and ignores symbols without supplementals.
- If you select **Autodiscriminate UPC/EAN Supplementals**, the decoder decodes UPC/EAN symbols with supplemental characters immediately. If the symbol does not have a supplemental, the decoder must decode the bar code the number of times set via *UPC/EAN/JAN Supplemental Redundancy on page 11-16* before transmitting its data to confirm that there is no supplemental.
- If you select one of the following **Supplemental Mode** options, the decoder immediately transmits EAN-13 bar codes starting with that prefix that have supplemental characters. If the symbol does not have a supplemental, the decoder must decode the bar code the number of times set via *UPC/EAN/JAN Supplemental Redundancy on page 11-16* before transmitting its data to confirm that there is no supplemental. The decoder transmits UPC/EAN bar codes that do not have that prefix immediately.
  - **Enable 378/379 Supplemental Mode**
  - **Enable 978/979 Supplemental Mode**

NOTE If you select 978/979 Supplemental Mode and are scanning Bookland EAN bar codes, see *Enable/Disable Bookland EAN on page 11-11* to enable Bookland EAN, and select a format using *Bookland ISBN Format on page 11-12*.

  - **Enable 977 Supplemental Mode**
  - **Enable 414/419/434/439 Supplemental Mode**
  - **Enable 491 Supplemental Mode**
  - **Enable Smart Supplemental Mode** - applies to EAN-13 bar codes starting with any prefix listed previously.
  - **Supplemental User-Programmable Type 1** - applies to EAN-13 bar codes starting with a 3-digit user-defined prefix. Set this 3-digit prefix using *User-Programmable Supplementals on page 11-16*.
  - **Supplemental User-Programmable Type 1 and 2 -** applies to EAN-13 bar codes starting with either of two 3-digit user-defined prefixes. Set the 3-digit prefixes using *User-Programmable Supplementals on page 11-16*.
  - **Smart Supplemental Plus User-Programmable 1** - applies to EAN-13 bar codes starting with any prefix listed previously or the user-defined prefix set using *User-Programmable Supplementals on page 11-16*.
  - **Smart Supplemental Plus User-Programmable 1 and 2 -** applies to EAN-13 bar codes starting with any prefix listed previously or one of the two user-defined prefixes set using *User-Programmable Supplementals on page 11-16*.

NOTE To minimize the risk of invalid data transmission, select either to decode or ignore supplemental characters.

Decode UPC/EAN/JAN Supplementals (continued)

Decode UPC/EAN/JAN Only With Supplementals
(01h)

***Ignore Supplementals**
(00h)

Autodiscriminate UPC/EAN/JAN Supplementals
(02h)

Enable 378/379 Supplemental Mode
(04h)

Enable 978/979 Supplemental Mode
(05h)

Enable 977 Supplemental Mode
(07h)

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Decode UPC/EAN/JAN Supplementals (continued)

Enable 414/419/434/439 Supplemental Mode
(06h)

Enable 491 Supplemental Mode
(08h)

Enable Smart Supplemental Mode
(03h)

Supplemental User-Programmable Type 1
(09h)

Supplemental User-Programmable Type 1 and 2
(0Ah)

Smart Supplemental Plus User-Programmable 1
(0Bh)

Smart Supplemental Plus User-Programmable 1 and 2
(0Ch)

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User-Programmable Supplementals

Supplemental 1: Parameter # F1h 43h

Supplemental 2: Parameter # F1h 44h

If you selected a Supplemental User-Programmable option from *Decode UPC/EAN/JAN Supplementals on page 11-13*, select **User-Programmable Supplemental 1** to set the 3-digit prefix. Then select the 3 digits using the numeric bar codes beginning on *page D-1*. Select **User-Programmable Supplemental 2** to set a second 3-digit prefix. Then select the 3 digits using the numeric bar codes beginning on *page D-1*.

User-Programmable Supplemental 1

User-Programmable Supplemental 2

UPC/EAN/JAN Supplemental Redundancy

Parameter # 50h

If you selected **Autodiscriminate UPC/EAN/JAN Supplementals**, this option adjusts the number of times to decode a symbol without supplementals before transmission. The range is from two to thirty times. Five or above is recommended when decoding a mix of UPC/EAN/JAN symbols with and without supplementals. The default is 10.

Scan the bar code below to set a decode redundancy value. Next, scan two numeric bar codes in *Appendix D, Numeric Bar Codes*. Enter a leading zero for single digit numbers. To correct an error or change a selection, scan *Cancel on page D-2*.

UPC/EAN/JAN Supplemental Redundancy

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UPC/EAN/JAN Supplemental AIM ID Format

Parameter # F1h A0h

Select an output format when reporting UPC/EAN/JAN bar codes with Supplementals with *Transmit Code ID Character on page 6-28* set to **AIM Code ID Character**:

- **Separate** - transmit UPC/EAN with supplementals with separate AIM IDs but one transmission, i.e.:

  ]E<0 or 4><data>]E<1 or 2>[supplemental data]

- **Combined** – transmit UPC/EAN with supplementals with one AIM ID and one transmission, i.e.:

  ]E3<data+supplemental data>

- **Separate Transmissions** - transmit UPC/EAN with supplementals with separate AIM IDs and separate transmissions, i.e.:

  ]E<0 or 4><data>
  ]E<1 or 2>[supplemental data]

Separate
(00h)

***Combined**
(01h)

Separate Transmissions
(02h)

Transmit UPC-A Check Digit

Parameter # 28h

The check digit is the last character of the symbol used to verify the integrity of the data. Scan the appropriate bar code below to transmit the bar code data with or without the UPC-A check digit. It is always verified to guarantee the integrity of the data.

***Transmit UPC-A Check Digit**
(01h)

Do Not Transmit UPC-A Check Digit
(00h)

Transmit UPC-E Check Digit

Parameter # 29h

The check digit is the last character of the symbol used to verify the integrity of the data. Scan the appropriate bar code below to transmit the bar code data with or without the UPC-E check digit. It is always verified to guarantee the integrity of the data.

***Transmit UPC-E Check Digit**
(01h)

Do Not Transmit UPC-E Check Digit
(00h)

Transmit UPC-E1 Check Digit

Parameter # 2Ah

The check digit is the last character of the symbol used to verify the integrity of the data. Scan the appropriate bar code below to transmit the bar code data with or without the UPC-E1 check digit. It is always verified to guarantee the integrity of the data.

***Transmit UPC-E1 Check Digit**
(01h)

Do Not Transmit UPC-E1 Check Digit
(00h)

UPC-A Preamble

Parameter # 22h

Preamble characters are part of the UPC symbol, and include Country Code and System Character. There are three options for transmitting a UPC-A preamble to the host device: transmit System Character only, transmit System Character and Country Code (“0” for USA), and transmit no preamble. Select the appropriate option to match the host system.

No Preamble (<DATA>)
(00h)

***System Character (<SYSTEM CHARACTER> <DATA>)**
(01h)

System Character & Country Code
(< COUNTRY CODE> <SYSTEM CHARACTER> <DATA>)
(02h)

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UPC-E Preamble

Parameter # 23h

Preamble characters are part of the UPC symbol, and include Country Code and System Character. There are three options for transmitting a UPC-E preamble to the host device: transmit System Character only, transmit System Character and Country Code (“0” for USA), and transmit no preamble. Select the appropriate option to match the host system.

No Preamble (<DATA>)
(00h)

***System Character (<SYSTEM CHARACTER> <DATA>)**
(01h)

System Character & Country Code
(< COUNTRY CODE> <SYSTEM CHARACTER> <DATA>)
(02h)

UPC-E1 Preamble

Parameter # 24h

Preamble characters are part of the UPC symbol, and include Country Code and System Character. There are three options for transmitting a UPC-E1 preamble to the host device: transmit System Character only, transmit System Character and Country Code (“0” for USA), and transmit no preamble. Select the appropriate option to match the host system.

No Preamble (<DATA>)
(00h)

***System Character (<SYSTEM CHARACTER> <DATA>)**
(01h)

System Character & Country Code
(< COUNTRY CODE> <SYSTEM CHARACTER> <DATA>)
(02h)

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Convert UPC-E to UPC-A

Parameter # 25h

Enable this to convert UPC-E (zero suppressed) decoded data to UPC-A format before transmission. After conversion, the data follows UPC-A format and is affected by UPC-A programming selections (e.g., Preamble, Check Digit).

Disable this to transmit UPC-E decoded data as UPC-E data, without conversion.

Convert UPC-E to UPC-A (Enable)
(01h)

***Do Not Convert UPC-E to UPC-A (Disable)**
(00h)

Convert UPC-E1 to UPC-A

Parameter # 26h

Enable this to convert UPC-E1 decoded data to UPC-A format before transmission. After conversion, the data follows UPC-A format and is affected by UPC-A programming selections (e.g., Preamble, Check Digit).

Disable this to transmit UPC-E1 decoded data as UPC-E1 data, without conversion.

Convert UPC-E1 to UPC-A (Enable)
(01h)

***Do Not Convert UPC-E1 to UPC-A (Disable)**
(00h)

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EAN-8/JAN-8 Extend

Parameter # 27h

Enable this parameter to add five leading zeros to decoded EAN-8 symbols to make them compatible in format to EAN-13 symbols.

Disable this to transmit EAN-8 symbols as is.

Enable EAN/JAN Zero Extend
(01h)

***Disable EAN/JAN Zero Extend**
(00h)

UCC Coupon Extended Code

Parameter # 55h

Enable this parameter to decode UPC-A bar codes starting with digit ‘5’, EAN-13 bar codes starting with digit ‘99’, and UPC-A/GS1-128 Coupon Codes. UPCA, EAN-13, and GS1-128 must be enabled to scan all types of Coupon Codes.

Enable UCC Coupon Extended Code
(01h)

***Disable UCC Coupon Extended Code**
(00h)

✓ ***NOTE*** See *UPC/EAN/JAN Supplemental Redundancy on page 11-16* to control autodiscrimination of the GS1-128 (right half) of a coupon code.

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Coupon Report

Parameter # F1h DAh

Traditional coupon symbols (old coupon symbols) are composed of two bar codes: UPC/EAN and Code128. A new coupon symbol is composed of a single Databar Expanded bar code. The new coupon format offers more options for purchase values (up to $999.99) and supports complex discount offers such as a second purchase requirement.

An interim coupon symbol also exists that contains both types of bar codes: UPC/EAN and Databar Expanded. This format accommodates both retailers that do not recognize or use the additional information included in the new coupon symbol, as well as those who can process new coupon symbols.

Scan a bar code below to select one of the following options for decoding coupon symbols:

- **Old Coupon Symbols** - Scanning an old coupon symbol reports both UPC and Code 128, scanning an interim coupon symbol reports UPC, and scanning a new coupon symbol reports nothing (no decode).
- **New Coupon Symbols** - Scanning an old coupon symbol reports either UPC or Code 128, and scanning an interim coupon symbol or a new coupon symbol reports Databar Expanded.
- **Both Coupon Formats** - Scanning an old coupon symbol reports both UPC and Code 128, and scanning an interim coupon symbol or a new coupon symbol reports Databar Expanded.

Old Coupon Symbols
(00h)

***New Coupon Symbols**
(01h)

Both Coupon Formats
(02h)

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ISSN EAN

Parameter # F1h 69h

To enable or disable ISSN EAN, scan the appropriate bar code below.

Enable ISSN EAN
(01h)

*Disable ISSN EAN
(00h)

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Code 128

Enable/Disable Code 128

Parameter # 08h

To enable or disable Code 128, scan the appropriate bar code below.

*Enable Code 128
(01h)

Disable Code 128
(00h)

Set Lengths for Code 128

Parameter # L1 = D1h, L2 = D2h

The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Set lengths for Code 128 to any length, one or two discrete lengths, or lengths within a specific range.

NOTE When setting lengths for different bar code types, enter a leading zero for single digit numbers.

- **One Discrete Length** - Select this option to decode only Code 128 symbols containing a selected length. Select the length using the numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode only Code 128 symbols with 14 characters, scan **Code 128 - One Discrete Length**, then scan **1** followed by **4**. To correct an error or change the selection, scan *Cancel on page D-2*.
- **Two Discrete Lengths** - Select this option to decode only Code 128 symbols containing either of two selected lengths. Select lengths using the numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode only Code 128 symbols containing either 2 or 14 characters, select **Code 128 - Two Discrete Lengths**, then scan **0**, **2**, **1**, and then **4**. To correct an error or change the selection, scan *Cancel on page D-2*.
- **Length Within Range** - Select this option to decode a Code 128 symbol with a specific length range. Select lengths using numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode Code 128 symbols containing between 4 and 12 characters, first scan **Code 128 - Length Within Range**. Then scan **0**, **4**, **1,** and **2** (enter a leading zero for single digit numbers). To correct an error or change the selection, scan *Cancel on page D-2*.
- **Any Length** - Select this option to decode Code 128 symbols containing any number of characters within the decoder's capability.

Set Lengths for Code 128 (continued)

Code 128 - One Discrete Length

Code 128 - Two Discrete Lengths

Code 128 - Length Within Range

*Code 128 - Any Length

Enable/Disable GS1-128 (formerly UCC/EAN-128)

Parameter # 0Eh

To enable or disable GS1-128, scan the appropriate bar code below.

*Enable GS1-128
(01h)

Disable GS1-128
(00h)

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Enable/Disable ISBT 128

Parameter # 54h

ISBT 128 is a variant of Code 128 used in the blood bank industry. Scan a bar code below to enable or disable ISBT 128. If necessary, the host must perform concatenation of the ISBT data.

*Enable ISBT 128
(01h)

Disable ISBT 128
(00h)

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ISBT Concatenation

Parameter # F1h 41h

Select an option for concatenating pairs of ISBT code types:

- If you select **Disable ISBT Concatenation**, the decoder does not concatenate pairs of ISBT codes it encounters.
- If you select **Enable ISBT Concatenation**, there must be two ISBT codes in order for the decoder to decode and perform concatenation. The decoder does not decode single ISBT symbols.
- If you select **Autodiscriminate ISBT Concatenation**, the decoder decodes and concatenates pairs of ISBT codes immediately. If only a single ISBT symbol is present, the decoder must decode the symbol the number of times set via *ISBT Concatenation Redundancy on page 11-30* before transmitting its data to confirm that there is no additional ISBT symbol.

***Disable ISBT Concatenation**
(00h)

Enable ISBT Concatenation
(01h)

Autodiscriminate ISBT Concatenation
(00h)

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Check ISBT Table

Parameter # F1h 42h

The ISBT specification includes a table that lists several types of ISBT bar codes that are commonly used in pairs. If you set **ISBT Concatenation** to **Enable**, enable **Check ISBT Table** to concatenate only those pairs found in this table. Other types of ISBT codes are not concatenated.

***Enable Check ISBT Table**
(01h)

Disable Check ISBT Table
(00h)

ISBT Concatenation Redundancy

Parameter # DFh

If you set **ISBT Concatenation** to **Autodiscriminate,** use this parameter to set the number of times the decoder must decode an ISBT symbol before determining that there is no additional symbol.

Scan the bar code below, then scan two numeric bar codes in *Appendix D, Numeric Bar Codes* to set a value between 2 and 20. Enter a leading zero for single digit numbers. To correct an error or change a selection, scan *Cancel on page D-2*. The default is 10.

ISBT Concatenation Redundancy

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Code 39

Enable/Disable Code 39

Parameter # 00h

To enable or disable Code 39, scan the appropriate bar code below.

***Enable Code 39**
(01h)

Disable Code 39
(00h)

Enable/Disable Trioptic Code 39

Parameter # 0Dh

Trioptic Code 39 is a variant of Code 39 used in the marking of computer tape cartridges. Trioptic Code 39 symbols always contain six characters. To enable or disable Trioptic Code 39, scan the appropriate bar code below.

Enable Trioptic Code 39
(01h)

***Disable Trioptic Code 39**
(00h)

NOTE You cannot enable Trioptic Code 39 and Code 39 Full ASCII simultaneously.

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Convert Code 39 to Code 32

Parameter # 56h

Code 32 is a variant of Code 39 used by the Italian pharmaceutical industry. Scan the appropriate bar code below to enable or disable converting Code 39 to Code 32.

NOTE Code 39 must be enabled for this parameter to function.

Enable Convert Code 39 to Code 32
(01h)

***Disable Convert Code 39 to Code 32**
(00h)

Code 32 Prefix

Parameter # E7h

Scan the appropriate bar code below to enable or disable adding the prefix character “A” to all Code 32 bar codes.

NOTE Convert Code 39 to Code 32 must be enabled for this parameter to function.

Enable Code 32 Prefix
(01h)

***Disable Code 32 Prefix**
(00h)

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Set Lengths for Code 39

Parameter # L1 = 12h, L2 = 13h

The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Set lengths for Code 39 to any length, one or two discrete lengths, or lengths within a specific range. If Code 39 Full ASCII is enabled, **Length Within a Range** or **Any Length** are the preferred options.

NOTE When setting lengths for different bar code types, enter a leading zero for single digit numbers.

- **One Discrete Length** - Select this option to decode only Code 39 symbols containing a selected length. Select the length using the numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode only Code 39 symbols with 14 characters, scan **Code 39 - One Discrete Length**, then scan **1** followed by **4**. To correct an error or change the selection, scan *Cancel on page D-2*.
- **Two Discrete Lengths** - Select this option to decode only Code 39 symbols containing either of two selected lengths. Select lengths using the numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode only Code 39 symbols containing either 2 or 14 characters, select **Code 39 - Two Discrete Lengths**, then scan **0**, **2**, **1**, and then **4.** To correct an error or change the selection, scan *Cancel on page D-2*.
- **Length Within Range** - Select this option to decode a Code 39 symbol with a specific length range. Select lengths using numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode Code 39 symbols containing between 4 and 12 characters, first scan **Code 39 - Length Within Range**. Then scan **0**, **4**, **1,** and **2** (enter a leading zero for single digit numbers). To correct an error or change the selection, scan *Cancel on page D-2*.
- **Any Length** - Select this option to decode Code 39 symbols containing any number of characters within the decoder's capability.

Code 39 - One Discrete Length

Code 39 - Two Discrete Lengths

***Code 39 - Length Within Range**

Code 39 - Any Length

Code 39 Check Digit Verification

Parameter # 30h

Enable this feature to check the integrity of all Code 39 symbols to verify that the data complies with specified check digit algorithm. Only Code 39 symbols which include a modulo 43 check digit are decoded. Enable this feature if the Code 39 symbols contain a Modulo 43 check digit.

Enable Code 39 Check Digit
(01h)

***Disable Code 39 Check Digit**
(00h)

Transmit Code 39 Check Digit

Parameter # 2Bh

Scan a bar code below to transmit Code 39 data with or without the check digit.

Transmit Code 39 Check Digit (Enable)
(01h)

***Do Not Transmit Code 39 Check Digit (Disable)**
(00h)

NOTE Code 39 Check Digit Verification must be enabled for this parameter to function.

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Code 39 Full ASCII Conversion

Parameter # 11h

Code 39 Full ASCII is a variant of Code 39 which pairs characters to encode the full ASCII character set. To enable or disable Code 39 Full ASCII, scan the appropriate bar code below.

Enable Code 39 Full ASCII
(01h)

***Disable Code 39 Full ASCII**
(00h)

NOTE You cannot enable Trioptic Code 39 and Code 39 Full ASCII simultaneously.

Code 39 Full ASCII to Full ASCII Correlation is host-dependent, and is therefore described in the ASCII Character Set Table for the appropriate interface. See the *ASCII Character Set for USB on page 8-18* or the *ASCII Character Set for Serial Hosts on page 10-20*.

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Code 39 Buffering - Scan & Store

Parameter # 71h

This feature allows the decoder to accumulate data from multiple Code 39 symbols.

Selecting the Scan and Store option (Buffer Code 39) temporarily buffers all Code 39 symbols having a leading space as a first character for later transmission. The leading space is not buffered.

Decoding a Code 39 symbol with no leading space transmits in sequence all buffered data in a first-in first-out format, plus the “triggering” symbol. See the following pages for further details.

Select **Do Not Buffer Code 39** to transmit all decoded Code 39 symbols immediately without storing them in the buffer.

This feature affects Code 39 only. If selecting **Buffer Code 39**, we recommend configuring the decoder to decode Code 39 symbology only.

Buffer Code 39 (Enable)
(01h)

***Do Not Buffer Code 39 (Disable)**
(00h)

While there is data in the transmission buffer, you cannot select **Do Not Buffer Code 39**. The buffer holds 200 bytes of information.

To disable Code 39 buffering when there is data in the transmission buffer, first force the buffer transmission (see *Transmit Buffer on page 11-37*) or clear the buffer.

Buffer Data

To buffer data, enable Code 39 buffering and scan a Code 39 symbol with a space immediately following the start pattern.

- Unless the data overflows the transmission buffer, the decoder issues a low/high beep to indicate successful decode and buffering. (For overflow conditions, see *Overfilling Transmission Buffer on page 11-37*.)
- The decoder adds the decoded data excluding the leading space to the transmission buffer.
- No transmission occurs.

Clear Transmission Buffer

To clear the transmission buffer, scan the **Clear Buffer** bar code below, which contains only a start character, a dash (minus), and a stop character.

- The decoder issues a short high/low/high beep.
- The decoder erases the transmission buffer.
- No transmission occurs.

Clear Buffer

> **NOTE** The Clear Buffer contains only the dash (minus) character. In order to scan this command, set Code 39 lengths to include length 1.

Transmit Buffer

There are two methods to transmit the Code 39 buffer.

1. Scan the **Transmit Buffer** bar code below, which includes only a start character, a plus (+), and a stop character.
2. The decoder transmits and clears the buffer.
   - The decoder issues a low/high beep.

Transmit Buffer

3. Scan a Code 39 bar code with a leading character other than a space.
   - The decoder appends new decode data to buffered data.
   - The decoder transmits and clears the buffer.
   - The decoder signals that it transmitted the buffer with a low/high beep.
   - The decoder transmits and clears the buffer.

> **NOTE** The Transmit Buffer contains only a plus (+) character. In order to scan this command, set Code 39 lengths to include length 1.

Overfilling Transmission Buffer

The Code 39 buffer holds 200 characters. If the symbol just read overflows the transmission buffer:

- The decoder indicates that it rejected the symbol by issuing three long, high beeps.
- No transmission occurs. The data in the buffer is not affected.

Attempt to Transmit an Empty Buffer

If you scan the **Transmit Buffer** symbol and the Code 39 buffer is empty:

- A short low/high/low beep signals that the buffer is empty.
- No transmission occurs.
- The buffer remains empty.

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Code 93

Enable/Disable Code 93

Parameter # 09h

To enable or disable Code 93, scan the appropriate bar code below.

Enable Code 93
(01h)

***Disable Code 93**
(00h)

Set Lengths for Code 93

Parameter # L1 = 1Ah, L2 = 1Bh

The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Set lengths for Code 93 to any length, one or two discrete lengths, or lengths within a specific range.

- **One Discrete Length** - Select this option to decode only Code 93 symbols containing a selected length. Select the length using the numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode only Code 93 symbols with 14 characters, scan **Code 93 - One Discrete Length**, then scan **1** followed by **4**. To correct an error or to change the selection, scan *Cancel on page D-2*.
- **Two Discrete Lengths** - Select this option to decode only Code 93 symbols containing either of two selected lengths. Select lengths using the numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode only Code 93 symbols containing either 2 or 14 characters, select **Code 93 - Two Discrete Lengths**, then scan **0**, **2**, **1**, and then **4**. To correct an error or to change the selection, scan *Cancel on page D-2*.
- **Length Within Range** - Select this option to decode a Code 93 symbol with a specific length range. Select lengths using the numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode Code 93 symbols containing between 4 and 12 characters, first scan **Code 93 - Length Within Range**. Then scan **0**, **4**, **1,** and **2** (enter a leading zero for single digit numbers). To correct an error or change the selection, scan *Cancel on page D-2*.
- **Any Length** - Scan this option to decode Code 93 symbols containing any number of characters within the decoder's capability.

Set Lengths for Code 93 (continued)

Code 93 - One Discrete Length

Code 93 - Two Discrete Lengths

*Code 93 - Length Within Range

Code 93 - Any Length

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Code 11

Code 11

Parameter # 0Ah

To enable or disable Code 11, scan the appropriate bar code below.

Enable Code 11
(01h)

***Disable Code 11**
(00h)

Set Lengths for Code 11

Parameter # L1 = 1Ch, L2 = 1Dh

The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Set lengths for Code 11 to any length, one or two discrete lengths, or lengths within a specific range.

- **One Discrete Length** - Select this option to decode only Code 11 symbols containing a selected length. Select the length using the numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode only Code 11 symbols with 14 characters, scan **Code 11 - One Discrete Length**, then scan **1** followed by **4**. To correct an error or to change the selection, scan *Cancel on page D-2*.
- **Two Discrete Lengths** - Select this option to decode only Code 11 symbols containing either of two selected lengths. Select lengths using the numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode only Code 11 symbols containing either 2 or 14 characters, select **Code 11 - Two Discrete Lengths**, then scan **0**, **2**, **1**, and then **4**. To correct an error or to change the selection, scan *Cancel on page D-2*.
- **Length Within Range** - Select this option to decode a Code 11 symbol with a specific length range. Select lengths using numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode Code 11 symbols containing between 4 and 12 characters, first scan **Code 11 - Length Within Range**. Then scan **0**, **4**, **1,** and **2** (enter a leading zero for single digit numbers). To correct an error or change the selection, scan *Cancel on page D-2*.
- **Any Length** - Scan this option to decode Code 11 symbols containing any number of characters within the decoder's capability.

Set Lengths for Code 11 (continued)

Code 11 - One Discrete Length

Code 11 - Two Discrete Lengths

*Code 11 - Length Within Range

Code 11 - Any Length

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Code 11 Check Digit Verification

Parameter # 34h

This feature allows the decoder to check the integrity of all Code 11 symbols to verify that the data complies with the specified check digit algorithm. This selects the check digit mechanism for the decoded Code 11 bar code. The options are to check for one check digit, check for two check digits, or disable the feature.

To enable this feature, scan the bar code below corresponding to the number of check digits encoded in the Code 11 symbols.

***Disable**
(00h)

One Check Digit
(01h)

Two Check Digits
(02h)

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Transmit Code 11 Check Digits

Parameter # 2Fh

This feature selects whether or not to transmit the Code 11 check digit(s).

Transmit Code 11 Check Digit(s) (Enable)
(01h)

***Do Not Transmit Code 11 Check Digit(s) (Disable)**
(00h)

NOTE Code 11 Check Digit Verification must be enabled for this parameter to function.

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Interleaved 2 of 5 (ITF)

Enable/Disable Interleaved 2 of 5

Parameter # 06h

To enable or disable Interleaved 2 of 5, scan the appropriate bar code below, and select an Interleaved 2 of 5 length from the following pages.

Enable Interleaved 2 of 5
(01h)

***Disable Interleaved 2 of 5**
(00h)

Set Lengths for Interleaved 2 of 5

Parameter # L1 = 16h, L2 = 17h

The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Set lengths for I 2 of 5 to any length, one or two discrete lengths, or lengths within a specific range. The range for Interleaved 2 of 5 lengths is 0 - 55.

- **One Discrete Length** - Select this option to decode only I 2 of 5 symbols containing a selected length. Select the length using the numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode only I 2 of 5 symbols with 14 characters, scan **I 2 of 5 - One Discrete Length**, then scan **1** followed by **4**. To correct an error or to change the selection, scan *Cancel on page D-2*.
- **Two Discrete Lengths** - Select this option to decode only I 2 of 5 symbols containing either of two selected lengths. Select lengths using the numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode only I 2 of 5 symbols containing either 2 or 14 characters, select **I 2 of 5 - Two Discrete Lengths**, then scan **0**, **2**, **1**, and then **4**. To correct an error or to change the selection, scan *Cancel on page D-2*.
- **Length Within Range** - Select this option to decode an I 2 of 5 symbol with a specific length range. Select lengths using numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode I 2 of 5 symbols containing between 4 and 12 characters, first scan **I 2 of 5 - Length Within Range**. Then scan **0**, **4**, **1,** and **2** (enter a leading zero for single digit numbers). To correct an error or change the selection, scan *Cancel on page D-2*.
- **Any Length** - Scan this option to decode I 2 of 5 symbols containing any number of characters within the decoder's capability.

✓ ***NOTE*** Due to the construction of the I 2 of 5 symbology, it is possible for a scan line covering only a portion of the code to transmit as a complete scan, yielding less data than is encoded in the bar code. To prevent this, select specific lengths (I 2 of 5 - One Discrete Length, Two Discrete Lengths) for I 2 of 5 applications.

Set Lengths for Interleaved 2 of 5 (continued)

*I 2 of 5 - One Discrete Length

I 2 of 5 - Two Discrete Lengths

I 2 of 5 - Length Within Range

I 2 of 5 - Any Length

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I 2 of 5 Check Digit Verification

Parameter # 31h

Enable this feature to check the integrity of all I 2 of 5 symbols to verify the data complies with either the specified Uniform Symbology Specification (USS), or the Optical Product Code Council (OPCC) check digit algorithm.

***Disable**
(00h)

USS Check Digit
(01h)

OPCC Check Digit
(02h)

Transmit I 2 of 5 Check Digit

Parameter # 2Ch

Scan the appropriate bar code below to transmit I 2 of 5 data with or without the check digit.

Transmit I 2 of 5 Check Digit (Enable)
(01h)

***Do Not Transmit I 2 of 5 Check Digit (Disable)**
(00h)

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Convert I 2 of 5 to EAN-13

Parameter # 52h

Enable this parameter to convert 14-character I 2 of 5 codes to EAN-13, and transmit to the host as EAN-13. To accomplish this, the I 2 of 5 code must be enabled, and the code must have a leading zero and a valid EAN-13 check digit.

Convert I 2 of 5 to EAN-13 (Enable)
(01h)

***Do Not Convert I 2 of 5 to EAN-13 (Disable)**
(00h)

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Discrete 2 of 5 (DTF)

Enable/Disable Discrete 2 of 5

Parameter # 05h

To enable or disable Discrete 2 of 5, scan the appropriate bar code below.

Enable Discrete 2 of 5
(01h)

***Disable Discrete 2 of 5**
(00h)

Set Lengths for Discrete 2 of 5

Parameter # L1 = 14h, L2 = 15h

The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Set lengths for D 2 of 5 to any length, one or two discrete lengths, or lengths within a specific range. The range for Discrete 2 of 5 lengths is 0 - 55.

- **One Discrete Length** - Select this option to decode only D 2 of 5 symbols containing a selected length. Select the length using the numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode only D 2 of 5 symbols with 14 characters, scan **D 2 of 5 - One Discrete Length**, then scan **1** followed by **4**. To correct an error or to change the selection, scan *Cancel on page D-2*.
- **Two Discrete Lengths** - Select this option to decode only D 2 of 5 symbols containing either of two selected lengths. Select lengths using the numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode only D 2 of 5 symbols containing either 2 or 14 characters, select **D 2 of 5 - Two Discrete Lengths**, then scan **0**, **2**, **1**, and then **4**. To correct an error or to change the selection, scan *Cancel on page D-2*.
- **Length Within Range** - Select this option to decode a D 2 of 5 symbol with a specific length range. Select lengths using numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode D 2 of 5 symbols containing between 4 and 12 characters, first scan **D 2 of 5 - Length Within Range**. Then scan **0**, **4**, **1,** and **2** (enter a leading zero for single digit numbers). To correct an error or change the selection, scan *Cancel on page D-2*.
- **Any Length** - Scan this option to decode D 2 of 5 symbols containing any number of characters within the decoder's capability.

✓ ***NOTE*** Due to the construction of the D 2 of 5 symbology, it is possible for a scan line covering only a portion of the code to transmit as a complete scan, yielding less data than is encoded in the bar code. To prevent this, select specific lengths (**D 2 of 5 - One Discrete Length, Two Discrete Lengths**) for D 2 of 5 applications.

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Set Lengths for Discrete 2 of 5 (continued)

*D 2 of 5 - One Discrete Length

D 2 of 5 - Two Discrete Lengths

D 2 of 5 - Length Within Range

D 2 of 5 - Any Length

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Codabar (NW - 7)

Enable/Disable Codabar

Parameter # 07h

To enable or disable Codabar, scan the appropriate bar code below.

Enable Codabar
(01h)

***Disable Codabar**
(00h)

Set Lengths for Codabar

Parameter # L1 = 18h, L2 = 19h

The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Set lengths for Codabar to any length, one or two discrete lengths, or lengths within a specific range.

- **One Discrete Length** - Select this option to decode only Codabar symbols containing a selected length. Select the length using the numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode only Codabar symbols with 14 characters, scan **Codabar - One Discrete Length**, then scan **1** followed by **4**. To correct an error or to change the selection, scan *Cancel on page D-2*.
- **Two Discrete Lengths** - Select this option to decode only Codabar symbols containing either of two selected lengths. Select lengths using the numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode only Codabar symbols containing either 2 or 14 characters, select **Codabar - Two Discrete Lengths**, then scan **0**, **2**, **1**, and then **4**. To correct an error or to change the selection, scan *Cancel on page D-2*.
- **Length Within Range** - Select this option to decode a Codabar symbol with a specific length range. Select lengths using numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode Codabar symbols containing between 4 and 12 characters, first scan **Codabar - Length Within Range**. Then scan **0**, **4**, **1,** and **2** (enter a leading zero for single digit numbers). To correct an error or change the selection, scan *Cancel on page D-2*.
- **Any Length** - Scan this option to decode Codabar symbols containing any number of characters within the decoder's capability.

Set Lengths for Codabar (continued)

Codabar - One Discrete Length

Codabar - Two Discrete Lengths

*Codabar - Length Within Range

Codabar - Any Length

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CLSI Editing

Parameter # 36h

Enable this parameter to strip the start and stop characters and insert a space after the first, fifth, and tenth characters of a 14-character Codabar symbol. Enable this feature if the host system requires this data format.

NOTE Symbol length does not include start and stop characters.

Enable CLSI Editing
(01h)

***Disable CLSI Editing**
(00h)

NOTIS Editing

Parameter # 37h

Enable this parameter to strip the start and stop characters from a decoded Codabar symbol. Enable this feature if the host system requires this data format.

Enable NOTIS Editing
(01h)

***Disable NOTIS Editing**
(00h)

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Codabar Upper or Lower Case Start/Stop Characters Detection

Parameter # F2h 57h

Select whether to detect upper case or lower case Codabar start/stop characters.

Lower Case
(01h)

***Upper Case**
(00h)

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MSI

Enable/Disable MSI

Parameter # 0Bh

To enable or disable MSI, scan the appropriate bar code below.

Enable MSI
(01h)

***Disable MSI**
(00h)

Set Lengths for MSI

Parameter # L1 = 1Eh, L2 = 1Fh

The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Set lengths for MSI to any length, one or two discrete lengths, or lengths within a specific range.

- **One Discrete Length** - Select this option to decode only MSI symbols containing a selected length. Select the length using the numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode only MSI symbols with 14 characters, scan **MSI - One Discrete Length**, then scan **1** followed by **4**. To correct an error or to change the selection, scan *Cancel on page D-2.*
- **Two Discrete Lengths** - Select this option to decode only MSI symbols containing either of two selected lengths. Select lengths using the numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode only MSI symbols containing either 2 or 14 characters, select **MSI - Two Discrete Lengths**, then scan **0**, **2**, **1**, and then **4**. To correct an error or to change the selection, scan *Cancel on page D-2*.
- **Length Within Range** - Select this option to decode a MSI symbol with a specific length range. Select lengths using numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode MSI symbols containing between 4 and 12 characters, first scan **MSI - Length Within Range**. Then scan **0**, **4**, **1,** and **2** (enter a leading zero for single digit numbers). To correct an error or change the selection, scan *Cancel on page D-2.*
- **Any Length** - Scan this option to decode MSI symbols containing any number of characters within the decoder's capability.

Set Lengths for MSI (continued)

✓ ***NOTE*** Due to the construction of the MSI symbology, it is possible for a scan line covering only a portion of the code to transmit as a complete scan, yielding less data than is encoded in the bar code. To prevent this, select specific lengths (**MSI - One Discrete Length, Two Discrete Lengths**) for MSI applications.

MSI - One Discrete Length

MSI - Two Discrete Lengths

***MSI - Length Within Range**

MSI - Any Length

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MSI Check Digits

Parameter # 32h

With MSI symbols, one check digit is mandatory and always verified by the reader. The second check digit is optional. If the MSI codes include two check digits, scan the **Two MSI Check Digits** bar code to enable verification of the second check digit.

See *MSI Check Digit Algorithm on page 11-57* for the selection of second digit algorithms.

***One MSI Check Digit**
(00h)

Two MSI Check Digits
(01h)

Transmit MSI Check Digit(s)

Parameter # 2Eh

Scan a bar code below to transmit MSI data with or without the check digit.

Transmit MSI Check Digit(s) (Enable)
(01h

***Do Not Transmit MSI Check Digit(s) (Disable)**
(00h)

MSI Check Digit Algorithm

Parameter # 33h

Two algorithms are possible for the verification of the second MSI check digit. Select the bar code below corresponding to the algorithm used to encode the check digit.

MOD 10/MOD 11
(00h)

*MOD 10/MOD 10
(01h)

Chinese 2 of 5

Enable/Disable Chinese 2 of 5

Parameter # F0h 98h

To enable or disable Chinese 2 of 5, scan the appropriate bar code below.

Enable Chinese 2 of 5
(01h)

*Disable Chinese 2 of 5
(00h)

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Matrix 2 of 5

Enable/Disable Matrix 2 of 5

Parameter # F1h 6Ah

To enable or disable Matrix 2 of 5, scan the appropriate bar code below.

Enable Matrix 2 of 5
(01h)

***Disable Matrix 2 of 5**
(00h)

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Set Lengths for Matrix 2 of 5

Parameter # L1 = F1h 6Bh, L2 = F1h 6Ch

The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Set lengths for Matrix 2 of 5 to any length, one or two discrete lengths, or lengths within a specific range.

- **One Discrete Length** - Select this option to decode only Matrix 2 of 5 symbols containing a selected length. Select the length using the numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode only Matrix 2 of 5 symbols with 14 characters, scan **Matrix 2 of 5 - One Discrete Length**, then scan **1** followed by **4**. To correct an error or to change the selection, scan *Cancel on page D-2*.
- **Two Discrete Lengths** - Select this option to decode only Matrix 2 of 5 symbols containing either of two selected lengths. Select lengths using the numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode only Matrix 2 of 5 symbols containing either 2 or 14 characters, select **Matrix 2 of 5 - Two Discrete Lengths**, then scan **0**, **2**, **1**, and then **4**. To correct an error or to change the selection, scan *Cancel on page D-2*.
- **Length Within Range** - Select this option to decode a Matrix 2 of 5 symbol with a specific length range. Select lengths using the numeric bar codes in *Appendix D, Numeric Bar Codes*. For example, to decode Matrix 2 of 5 symbols containing between 4 and 12 characters, first scan **Matrix 2 of 5 - Length Within Range**. Then scan **0**, **4**, **1,** and **2** (enter a leading zero for single digit numbers). To correct an error or change the selection, scan *Cancel on page D-2*.
- **Any Length** - Scan this option to decode Matrix 2 of 5 symbols containing any number of characters within the decoder's capability.

***Matrix 2 of 5 - One Discrete Length**

Matrix 2 of 5 - Two Discrete Lengths

Matrix 2 of 5 - Length Within Range

Matrix 2 of 5 - Any Length

Matrix 2 of 5 Check Digit

Parameter # F1h 6Eh

The check digit is the last character of the symbol used to verify the integrity of the data. Scan the appropriate bar code below to transmit the bar code data with or without the Matrix 2 of 5 check digit.

Enable Matrix 2 of 5 Check Digit
(01h)

***Disable Matrix 2 of 5 Check Digit**
(00h)

Transmit Matrix 2 of 5 Check Digit

Parameter # F1h 6Fh

Scan a bar code below to transmit Matrix 2 of 5 data with or without the check digit.

Transmit Matrix 2 of 5 Check Digit
(01h)

***Do Not Transmit Matrix 2 of 5 Check Digit**
(00h)

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Korean 3 of 5

Enable/Disable Korean 3 of 5

Parameter # F1h 45h

To enable or disable Korean 3 of 5, scan the appropriate bar code below.

NOTE The length for Korean 3 of 5 is fixed at 6.

Enable Korean 3 of 5
(01h)

***Disable Korean 3 of 5**
(00h)

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Inverse 1D

Parameter # F1h 4Ah

This parameter sets the 1D inverse decoder setting. Options are:

- **Regular Only -** the decoder decodes regular 1D bar codes only.
- **Inverse Only -** the decoder decodes inverse 1D bar codes only.
- **Inverse Autodetect -** the decoder decodes both regular and inverse 1D bar codes.

***Regular**
(00h)

Inverse Only
(01h)

Inverse Autodetect
(02h)

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Postal Codes

US Postnet

Parameter # 59h

To enable or disable US Postnet, scan the appropriate bar code below.

Enable US Postnet
(01h)

***Disable US Postnet**
(00h)

US Planet

Parameter # 5Ah

To enable or disable US Planet, scan the appropriate bar code below.

Enable US Planet
(01h)

***Disable US Planet**
(00h)

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Transmit US Postal Check Digit

Parameter # 5Fh

Select whether to transmit US Postal data, which includes both US Postnet and US Planet, with or without the check digit.

***Transmit US Postal Check Digit**
(01h)

Do Not Transmit US Postal Check Digit
(00h)

UK Postal

Parameter # 5Bh

To enable or disable UK Postal, scan the appropriate bar code below.

Enable UK Postal
(01h)

***Disable UK Postal**
(00h)

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Transmit UK Postal Check Digit

Parameter # 60h

Select whether to transmit UK Postal data with or without the check digit.

***Transmit UK Postal Check Digit (01h)**

Do Not Transmit UK Postal Check Digit (00h)

Japan Postal

Parameter # F0h, 22h

To enable or disable Japan Postal, scan the appropriate bar code below.

Enable Japan Postal (01h)

***Disable Japan Postal (00h)**

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Australia Post

Parameter # F0h, 23h

To enable or disable Australia Post, scan the appropriate bar code below.

Enable Australia Post
(01h)

***Disable Australia Post**
(00h)

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Australia Post Format

Parameter # F1h, CEh

To select one of the following formats for Australia Post, scan the appropriate bar code below:

- **Autodiscriminate** (or Smart mode) - Attempt to decode the Customer Information Field using the N and C Encoding Tables.

> ***NOTE*** This option increases the risk of misdecodes because the encoded data format does not specify the Encoding Table used for encoding.

- **Raw Format** - Output raw bar patterns as a series of numbers 0 through 3.
- **Alphanumeric Encoding** - Decode the Customer Information Field using the C Encoding Table.
- **Numeric Encoding** - Decode the Customer Information Field using the N Encoding Table.

For more information on Australia Post Encoding Tables, refer to the *Australia Post Customer Barcoding Technical Specifications* available at http://www.auspost.com.au.

***Autodiscriminate**
(00h)

Raw Format
(01h)

Alphanumeric Encoding
(02h)

Numeric Encoding
(03h)

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Netherlands KIX Code

Parameter # F0h, 46h

To enable or disable Netherlands KIX Code, scan the appropriate bar code below.

Enable Netherlands KIX Code
(01h)

***Disable Netherlands KIX Code**
(00h)

USPS 4CB/One Code/Intelligent Mail

Parameter # F1h 50h

To enable or disable USPS 4CB/One Code/Intelligent Mail, scan the appropriate bar code below.

Enable USPS 4CB/One Code/Intelligent Mail
(01h)

***Disable USPS 4CB/One Code/Intelligent Mail**
(00h)

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UPU FICS Postal

Parameter # F1h 63h

To enable or disable UPU FICS Postal, scan the appropriate bar code below.

Enable UPU FICS Postal
(01h)

***Disable UPU FICS Postal**
(00h)

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GS1 DataBar

GS1 DataBar types are:

- GS1 DataBar Omnidirectional
- GS1 DataBar Truncated
- GS1 DataBar Stacked
- GS1 DataBar Stacked Omnidirectional
- GS1 DataBar Limited
- GS1 DataBar Expanded
- GS1 DataBar Expanded Stacked

Scan the appropriate bar codes to enable or disable each type of GS1 DataBar.

GS1 DataBar

Parameter # F0h 52h

Scan the appropriate bar code below to enable or disable the following code types:

- GS1 DataBar Omnidirectional
- GS1 DataBar Truncated
- GS1 DataBar Stacked
- GS1 DataBar Stacked Omnidirectional,

***Enable GS1 DataBar**
(01h)

Disable GS1 DataBar
(00h)

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GS1 DataBar Limited

Parameter # F0h 53h

Enable GS1 DataBar Limited
(01h)

*Disable GS1 DataBar Limited
(00h)

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GS1 DataBar Limited Security Level

Parameter # F1h D8h

The decoder offers four levels of decode security for GS1 DataBar Limited bar codes. There is an inverse relationship between security and decoder aggressiveness. Increasing the level of security may result in reduced aggressiveness in scanning, so only choose the level of security necessary.

- Level 1 – No clear margin required. This complies with the original GS1 standard, yet might result in erroneous[1] decoding of the DataBar Limited bar code when scanning some UPC symbols that start with the digits “9” and “7”.
- Level 2 – Automatic risk detection. This level of security may result in erroneous decoding of DataBar Limited bar codes when scanning some UPC symbols. If a misdecode is detected, the decoder operates in Level 3 or Level 1.
- Level 3 – Security level reflects newly proposed GS1 standard that requires a 5X trailing clear margin.
- Level 4 – Security level extends beyond the standard required by GS1. This level of security requires a 5X leading and trailing clear margin.

Security Level 1
(01h)

Security Level 2
(02h)

***Security Level 3**
(03h)

Security Level 4
(04h)

1.May result in erroneous decoding due to Databar Limited and UPC symbologies.

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GS1 DataBar Expanded

Parameter # F0h 54h

Scan the appropriate bar code below to enable or disable the following code types:

- GS1 DataBar Expanded
- GS1 DataBar Expanded Stacked.

***Enable GS1 DataBar Expanded**
(01h)

Disable GS1 DataBar Expanded
(00h)

Convert GS1 DataBar to UPC/EAN

Parameter # F0h, 8Dh

This parameter only applies to GS1 DataBar and GS1 DataBar Limited symbols not decoded as part of a Composite symbol. Enable this to strip the leading '010' from DataBar and DataBar Limited symbols encoding a single zero as the first digit, and report the bar code as EAN-13.

For bar codes beginning with two or more zeros but not six zeros, this parameter strips the leading '0100' and reports the bar code as UPC-A. The UPC-A Preamble parameter that transmits the system character and country code applies to converted bar codes. Note that neither the system character nor the check digit can be stripped.

Enable Convert GS1 DataBar to UPC/EAN
(01h)

***Disable Convert GS1 DataBar to UPC/EAN**
(00h)

Composite

Composite CC-C

Parameter # F0h 55h

Scan a bar code below to enable or disable Composite bar codes of type CC-C.

Enable CC-C
(01h)

***Disable CC-C**
(00h)

Composite CC-A/B

Parameter # F0h 56h

Scan a bar code below to enable or disable Composite bar codes of type CC-A/B.

NOTE If you enable this code type, also see *UPC Composite Mode on page 11-75*.

Enable CC-A/B
(01h)

***Disable CC-A/B**
(00h)

Composite TLC-39

Parameter # F0h 73h

Scan a bar code below to enable or disable Composite bar codes of type TLC-39.

Enable TLC39
(01h)

***Disable TLC39**
(00h)

UPC Composite Mode

Parameter # F0h 58h

If you enable *Composite CC-A/B on page 11-74*, select an option for linking UPC symbols with a 2D symbol during transmission as if they were one symbol:

- Select **UPC Never Linked** to transmit UPC bar codes regardless of whether a 2D symbol is detected.
- Select **UPC Always Linked** to transmit UPC bar codes and the 2D portion.
  If 2D is not present, the UPC bar code does not transmit.
- If you select **Autodiscriminate UPC Composites**, the decoder determines if there is a 2D portion, then transmits the UPC, as well as the 2D portion if present.

UPC Never Linked
(00h)

***UPC Always Linked**
(01h)

Autodiscriminate UPC Composites
(02h)

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Composite Beep Mode

Parameter # F0h, 8Eh

To select the number of decode beeps when a composite bar code is decoded, scan the appropriate bar code.

Single Beep After Both are Decoded
(00h)

***Beep as Each Code Type is Decoded**
(01h)

Double Beep After Both are Decoded
(02h)

GS1-128 Emulation Mode for UCC/EAN Composite Codes

Parameter # F0h, ABh

Select whether to enable or disable this mode.

Enable GS1-128 Emulation Mode for
UCC/EAN Composite Codes
(01h)

***Disable GS1-128 Emulation Mode for**
UCC/EAN Composite Codes
(00h)

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2D Symbologies

Enable/Disable PDF417

Parameter # 0Fh

To enable or disable PDF417, scan the appropriate bar code below.

*Enable PDF417
(01h)

Disable PDF417
(00h)

Enable/Disable MicroPDF417

Parameter # E3h

To enable or disable MicroPDF417, scan the appropriate bar code below.

Enable MicroPDF417
(01h)

*Disable MicroPDF417
(00h)

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Code 128 Emulation

Parameter # 7Bh

Enable this parameter to transmit data from certain MicroPDF417 symbols as Code 128. *AIM Code ID Character (01h) on page 6-28* must be enabled for this parameter to work.

Enable Code 128 Emulation to transmit these MicroPDF417 symbols with one of the following prefixes:

]C1 if the first codeword is 903-905

]C2 if the first codeword is 908 or 909

]C0 if the first codeword is 910 or 911

Disable Code 128 Emulation to transmit these MicroPDF417 symbols with one of the following prefixes:

]L3 if the first codeword is 903-905

]L4 if the first codeword is 908 or 909

]L5 if the first codeword is 910 or 911

Scan a bar code below to enable or disable Code 128 Emulation.

NOTE Linked MicroPDF codewords 906, 907, 912, 914, and 915 are not supported. Use GS1 Composites instead.

Enable Code 128 Emulation
(01h)

***Disable Code 128 Emulation**
(00h)

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Data Matrix

Parameter # F0h, 24h

To enable or disable Data Matrix, scan the appropriate bar code below.

***Enable Data Matrix**
(01h)

Disable Data Matrix
(00h)

Data Matrix Inverse

Parameter # F1h 4Ch

This parameter sets the Data Matrix inverse decoder setting. Options are:

- **Regular Only -** the decoder decodes regular Data Matrix bar codes only.
- **Inverse Only -** the decoder decodes inverse Data Matrix bar codes only.
- **Inverse Autodetect -** the decoder decodes both regular and inverse Data Matrix bar codes.

***Regular**
(00h)

Inverse Only
(01h)

Inverse Autodetect
(02h)

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Decode Mirror Images (Data Matrix Only)

Parameter # F1h 19h

Select an option for decoding mirror image Data Matrix bar codes:

- Always - decode only Data Matrix bar codes that are mirror images
- Never - do not decode Data Matrix bar codes that are mirror images
- Auto - decode both mirrored and unmirrored Data Matrix bar codes.

Never
(00h)

Always
(01h)

*** Auto**
(02h)

Maxicode

Parameter # F0h, 26h

To enable or disable Maxicode, scan the appropriate bar code below.

Enable Maxicode
(01h)

***Disable Maxicode**
(00h)

QR Code

Parameter # F0h,25h

To enable or disable QR Code, scan the appropriate bar code below.

***Enable QR Code**
(01h)

Disable QR Code
(00h)

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QR Inverse

Parameter # F1h 4Bh

This parameter sets the QR inverse decoder setting. Options are:

- **Regular Only** - the decoder decodes regular QR bar codes only.
- **Inverse Only** - the decoder decodes inverse QR bar codes only.
- **Inverse Autodetect** - the decoder decodes both regular and inverse QR bar codes.

***Regular**
(00h)

Inverse Only
(01h)

Inverse Autodetect
(02h)

MicroQR

Parameter # F1h 3Dh

To enable or disable MicroQR, scan the appropriate bar code below.

***Enable MicroQR**
(01h)

Disable MicroQR
(00h)

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Aztec

Parameter # F1h 3Eh

To enable or disable Aztec, scan the appropriate bar code below.

***Enable Aztec**
(01h)

Disable Aztec
(00h)

Aztec Inverse

Parameter # F1h 4Dh

This parameter sets the Aztec inverse decoder setting. Options are:

- **Regular Only -** the decoder decodes regular Aztec bar codes only.
- **Inverse Only -** the decoder decodes inverse Aztec bar codes only.
- **Inverse Autodetect -** the decoder decodes both regular and inverse Aztec bar codes.

Regular
(00h)

Inverse Only
(01h)

***Inverse Autodetect**
(02h)

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Redundancy Level

Parameter # 4Eh

The decoder offers four levels of decode redundancy. Select higher redundancy levels for decreasing levels of bar code quality. As redundancy levels increase, the decoder's aggressiveness decreases.

Select the redundancy level appropriate for the bar code quality.

Redundancy Level 1

The following code types must be successfully read twice before being decoded:

Table 11-2 *Redundancy Level 1 Codes*

Code Type	Code Length
Codabar	8 characters or less
MSI	4 characters or less
D 2 of 5	8 characters or less
I 2 of 5	8 characters or less

Redundancy Level 2

The following code types must be successfully read twice before being decoded:

Table 11-3 *Redundancy Level 2 Codes*

Code Type	Code Length
All	All

Redundancy Level 3

Code types other than the following must be successfully read twice before being decoded. The following codes must be read three times:

Table 11-4 *Redundancy Level 3 Codes*

Code Type	Code Length
MSI	4 characters or less
D 2 of 5	8 characters or less
I 2 of 5	8 characters or less
Codabar	8 characters or less

Redundancy Level 4

The following code types must be successfully read three times before being decoded:

Table 11-5 *Redundancy Level 4 Codes*

Code Type	Code Length
All	All

***Redundancy Level 1**
(01h)

Redundancy Level 2
(02h)

Redundancy Level 3
(03h)

Redundancy Level 4
(04h)

Security Level

Parameter # 4Dh

The decoder offers four levels of decode security for delta bar codes, which include UPC/EAN and Code 93. Select increasing levels of security for decreasing levels of bar code quality. There is an inverse relationship between security and decoder aggressiveness, so choose only that level of security necessary for any given application.

- **Security Level 0:** This setting allows the decoder to operate in its most aggressive state, while providing sufficient security in decoding most “in-spec” bar codes.
- **Security Level 1:** This default setting eliminates most misdecodes.
- **Security Level 2:** Select this option if Security level 1 fails to eliminate misdecodes.
- **Security Level 3:** If you selected Security Level 2 and misdecodes still occur, select this security level. Be advised, selecting this option is an extreme measure against mis-decoding severely out of spec bar codes. Selecting this level of security significantly impairs the decoding ability of the decoder. If you need this level of security, try to improve the quality of the bar codes.

Security Level 0
(00h)

***Security Level 1**
(01h)

Security Level 2
(02h)

Security Level 3
(03h)

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Intercharacter Gap Size

Parameter # F0h, 7Dh

The Code 39 and Codabar symbologies have an intercharacter gap that is typically quite small. Due to various bar code-printing technologies, this gap can grow larger than the maximum size allowed, preventing the decoder from decoding the symbol. If this problem occurs, scan the **Large Intercharacter Gaps** parameter to tolerate these out-of-specification bar codes.

***Normal Intercharacter Gaps**
(06h)

Large Intercharacter Gaps
(0Ah)

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Macro PDF Features

Macro PDF is a special feature for concatenating multiple PDF symbols into one file. The decoder can decode symbols that are encoded with this feature, and can store more than 64 Kb of decoded data stored in up to 50 MacroPDF symbols.

CAUTION When printing, keep each Macro PDF sequence separate, as each sequence has unique identifiers. Do not mix bar codes from several Macro PDF sequences, even if they encode the same data. When scanning Macro PDF sequences, scan the entire sequence without interruption. When scanning a mixed sequence, two long low beeps (Low/Low) indicates an inconsistent file ID or inconsistent symbology error.

Macro PDF User Indications

In this mode the decoder provides the following feedback.

Table 11-6 *Macro PDF User Indications*

User Scans	Passthrough All Symbols		Transmit Any Symbol in Set		Buffer All Symbols	
	Beep	**T**	**Beep**	**T**	**Beep**	**T**
Last Macro PDF in set	Decode Beep	Y	Decode Beep	Y	Decode Beep	Y
Any Macro PDF in set except last	Decode Beep	Y	Decode Beep	Y	2 Short Low	N
Macro PDF is not in current Set	Decode Beep	Y	2 Long Low	N	2 Long Low	N
Invalid formatted Macro PDF	Decode Beep	Y	2 Long Low	N	2 Long Low	N
Macro PDF from a set has already been scanned	Decode Beep	Y	4 Long Low	N	4 Long Low	N
Out of Macro PDF memory	N/A		3 Long Low	N	3 Long Low	N
Any non-Macro PDF scanned during a set	N/A	-	4 Long Low	N	4 Long Low	N
Flush Macro PDF	Low High	N	5 Long Low	N	5 Long Low	Y
Abort Macro PDF	High Low High Low	N	High Low High Low	N	High Low High Low	N

Notes:
1. The beep only sounds if the *BEEPER_ON signal is connected.
2. The column marked T indicates whether the symbol is transmitted to the host.
N = No transmission.

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Macro PDF Transmit / Decode Mode Symbols

Parameter # BCh

Select one of the options below for handling Macro PDF decoding. In **Buffer All Symbols** the decoder can handle sets of up to 50 maximum-sized Macro PDF symbols. In all other modes there is no limit to the size of the MacroPDF set.

- **Buffer All Symbols / Transmit Macro PDF When Complete**: This transmits all decode data from an entire Macro PDF sequence only when the entire sequence is scanned and decoded. Use the beeper and LED signals provided with the PL3307 when using this mode to ensure proper user feedback. If the decode data exceeds the limit of 50 symbols, there is no transmission because the entire sequence was not scanned. Use the parameter *Flush Macro Buffer on page 11-91* to purge the buffer.
- **Transmit Any Symbol in Set / No Particular Order**: This transmits data from each Macro PDF symbol as decoded, regardless of the sequence (although some error handling is performed; see *Table 11-6*). When selecting this mode, enable *Transmit Macro PDF Control Header on page 11-90*. Also use the beeper and LED signals provided with the PL3307 to ensure proper user feedback.
- **Passthrough All Symbols**: This transmits and decodes all Macro PDF symbols and performs no processing. In this mode the host is responsible for detecting and parsing the Macro PDF sequences.

  Use this mode when the decoder's BEEPER_ON signal is not used to drive a beeper (see *Table 2-3 on page 2-10* and *Table 3-3 on page 3-10*). In the other modes, some Macro PDF scanning sequences provide audible feedback only, so if BEEPER_ON is not used no user feedback is provided. In *Table 11-6*, all actions marked **No Tranmission** provide no feedback unless the BEEPER_ON signal is used. By using **Passthrough All Symbols** mode every user decode is transmitted to the host where the host software can provide the appropriate feedback.

Buffer All Symbols / Transmit Macro PDF When Complete
(00h)

Transmit Any Symbol in Set / No Particular Order
(01h)

***Passthrough All Symbols**
(04h)

Transmit Macro PDF Control Header

Parameter # B8h

When enabled, this activates transmission of the control header, which contains the segment index and the file ID, in Macro PDF symbols. For example, the field may be: \92800000\725\120\343. The five digits after the \928 are the segment index (or block index), and \725\120\343 is the file ID.

Enable this when selecting **Transmit Any Symbol in Set / No Particular Order** for the *Macro PDF Transmit / Decode Mode Symbols on page 11-89*, and disable this when selecting **Buffer All Symbols / Transmit Macro PDF When Complete**. This parameter has no effect when **Passthrough All Symbols** is selected.

Enable Macro PDF Control Header Transmit
(01h)

***Disable Macro PDF Control Header Transmit**
(00h)

Escape Characters

Parameter # E9h

This enables the backslash (\) character as an Escape character for systems that can process transmissions containing special data sequences. Scan a bar code below to either format special data according to the GLI (Global Label Identifier) protocol, or to disable this parameter. This parameter only affects the data portion of a Macro PDF symbol transmission; the Macro PDF Control Header (if enabled) is always sent with GLI formatting.

GLI Protocol
(02h)

***None**
(00h)

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Flush Macro Buffer

This flushes the buffer of all decoded Macro PDF data stored to that point, transmits it to the host device, and aborts from Macro PDF mode.

Flush Macro PDF Buffer

Abort Macro PDF Entry

This clears all currently-stored Macro PDF data in the buffer without transmission and aborts from Macro PDF mode.

Abort Macro PDF Entry

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CHAPTER 12 123SCAN2

Introduction

123Scan² is an easy to use, PC-based software tool that enables rapid customized setup of Motorola decoders.

123Scan² uses a wizard tool to guide users through a streamlined set up process. Settings are saved in a configuration file that can be distributed via e-mail, electronically downloaded via a USB cable, or used to generate a sheet of scannable programming bar codes.

Additionally 123Scan² can upgrade decoder firmware, check online to enable support for newly released products, generate a collection of multi-setting bar codes if the number of settings is very large, stage a large number of decoders simultaneously, generate reports with asset tracking information, and create custom products.

Communication with 123Scan²

To communicate with the 123Scan² program which runs on a host computer running a Windows XP SP2 or Windows 7 operating system, use a USB cable to connect the decoder to the host computer.

123Scan² Requirements

- Host computer with Windows XP SP2 or Windows 7
- Decoder
- USB cable.

For more information on123Scan², go to: http://www.motorolasolutions.com/123Scan

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Scanner SDK, Other Software Tools, and Videos

Tackle all your scanner programming needs with our diversified set of software tools. Whether you need to simply stage a device, or develop a fully featured application with image and data capture as well as asset management, these tools help you every step of the way. To download any of the free tools listed below, go to: www.motorolasolutions.com/scannersoftware.

- 123Scan2 configuration utility (described in this chapter)
- Scanner SDK for Windows
- How-to videos
- Virtual COM port driver
- OPOS driver
- JPOS driver
- Scanner user documentation
- Archive of older drivers.

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CHAPTER 13 ADVANCED DATA FORMATTING

Introduction

Advanced Data Formatting (ADF) is a means of customizing data before transmission to the host device. Use ADF to edit scan data to suit requirements. Implement ADF by scanning a related series of bar codes which program the decoder with ADF rules.

For information and programming bar codes for ADF, refer to the *Advanced Data Formatting Programmer Guide*, p/n 72E-69680-xx.

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APPENDIX A STANDARD DEFAULT PARAMETERS

Table A-1 *Standard Default Parameters Table*

Parameter	Parameter Number	Default	Page Number
User Preferences			
Set Default Parameter		Restore Defaults	6-5
Parameter Scanning	ECh	Enable	6-6
Lock Parameter Scanning	F2h 22h	Disable	6-7
Unlock Parameter Scanning	F2h 23h	Disable	6-7
User Parameter Pass Through	F1h 71h	Disable	6-9
Beep After Good Decode	38h	Enable	6-10
Beeper Tone	91h	Medium	6-11
Beeper Volume	8Ch	High	6-12
Beeper Duration	F1h 74h	Medium	6-13
Suppress Power-up Beeps	F1h D1h	Do not suppress	6-13
Decode LED Behavior	F1h E8h	Power down after LED shuts off	6-14
Visual Decode Indicator Decode Blinks Decode Blink Duration	 F2h 5Bh F2h 5Ch	 Disable Timeout Between Decodes, Different Symbols value	6-15
Trigger Modes	8Ah	Level	6-17
Power Mode	80h	Low Power	6-18
[1]**User selection is required to configure this interface and this is the most common selection.**			

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Table A-1 *Standard Default Parameters Table (Continued)*

Parameter	Parameter Number	Default	Page Number
Time Delay to Low Power Mode	92h	1.0 Sec	6-18
Picklist Mode	F0h 92h	Disabled Always	6-20
Decode Session Timeout	88h	9.9 Sec	6-20
Timeout Between Decodes, Same Symbol	89h	0.6 Sec	6-21
Timeout Between Decodes, Different Symbols	90h	0.2 Sec	6-21
Continuous Bar Code Read	F1h 89h	Disable	6-22
Unique Bar Code Reporting	F1h D31h	Disable	6-22
Low Light Motion Detection	F2h 2Ah	No Low Light Motion Detection	6-23
Presentation Mode Field of View	F1h 61h	Medium Field of View	6-24
Fuzzy 1D Processing	F1h 02h	Enable	6-25
Mirrored Image	F1h 70h	Disable	6-25
Mobile Phone/Display Mode	F1h CCh	Disable	6-26
Validate Concatenated Parameter Bar Codes	F1h B4h	Disable	6-26
PDF Prioritization	F1h CFh	Disable	6-27
PDF Prioritization Timeout	F1h D0h	200 ms	6-27
Miscellaneous Scanning Parameters			
Transmit Code ID Character	2Dh	None	6-28
SSI Prefix Value	69h	<CR>	6-29
SSI Suffix 1 Value SSI Suffix 2 Value	68h 6Ah	<CR> <CR>	6-29
Scan Data Transmission Format	EBh	Data as is	6-30
FN1 Substitution Values	67h, 6Dh	Set	6-31
Transmit “No Read” Message	5Eh	Disable	6-32
Report Version			6-33
Report Decoder Manufacturing Version			6-33
Report Scan Engine Manufacturing Version			6-33
Diagnostic Testing and Reporting			6-34
Imaging Options			
Aim Brightness	F0h 9Ch	0	7-5
Illumination Brightness	F0h 9Dh	10	7-6
[1]User selection is required to configure this interface and this is the most common selection.			

Table A-1 *Standard Default Parameters Table (Continued)*

Parameter	Parameter Number	Default	Page Number
Frame Rate	F1h A2h	Auto	*7-7*
LED Illumination	F0h ADh	Internal LED Illumination	*7-9*
Fixed Gain	F1h 38h	50	*7-11*
Exposure Time	F4h F1h 37h	100 (10 ms)	*7-11*
Decoding Autoexposure	F0h 29h	Enable	*7-12*
Decoding Illumination	F0h 2Ah	Enable	*7-12*
Decode Aiming Pattern	F0h 32h	Enable	*7-13*
Image Capture Autoexposure	F0h 68h	Enable	*7-14*
Image Capture Illumination	F0h 69h	Enable	*7-14*
Snapshot Mode Timeout	F0h 43h	0 (30 seconds)	*7-15*
Snapshot Aiming Pattern	F0h 2Ch	Enable	*7-15*
Image Cropping	F0h 2Dh	Disable	*7-16*
Crop to Pixel Addresses	F4h F0h 3Bh; F4h F0h 3Ch; F4h F0h 3Dh; F4h F0h 3Eh	0 top, 0 left, 479 bottom, 751 right	*7-17*
Image Resolution	F0h 2Eh	Full	*7-18*
Image Brightness (Target White)	F0h 86h	180	*7-19*
Image File Format Selection	F0h 30h	JPEG	*7-20*
JPEG Image Options	F0h 2Bh	Quality	*7-20*
JPEG Quality Value	F0h 31h	65	*7-21*
JPEG Size Value	F1h 31h	160	*7-21*
Image File Meta Data	F1h B5h	Disable	*7-22*
Image Enhancement	F1h 34h	Low	*7-23*
Image Edge Sharpening	F1h 98h	Low	*7-24*
Image Contrast Enhancement	F1h 9Ah	Enable	*7-25*
Image Rotation	F1h 99h	0	*7-26*
Bits per Pixel (BPP)	F0h 2Fh	8 BPP	*7-27*
Video View Finder	F0h 44h	Disable	*7-27*
Target Video Frame Size	F0h 48h	2200 bytes	*7-28*
Video View Finder Image Size	F0h 49h	1700 bytes	*7-28*

[1]User selection is required to configure this interface and this is the most common selection.

Table A-1 *Standard Default Parameters Table (Continued)*

Parameter	Parameter Number	Default	Page Number
Video Resolution	F0h 9Bh	1/4 resolution	7-29
USB Host Parameters			
USB Device Type		SNAPI with Imaging	8-3
Symbol Native API (SNAPI) Status Handshaking		Enable	8-5
USB Country Keyboard Types (Country Codes)		North American	8-6
USB Keystroke Delay		No Delay	8-8
Simulated Caps Lock		Disable	8-9
USB CAPS Lock Override		Disable	8-9
USB Ignore Unknown Characters		Enable	8-10
USB Convert Unknown to Code 39		Disable	8-10
USB Ignore Beep Directive		Honor	8-11
USB Ignore Type Directive		Honor	8-11
Emulate Keypad		Disable	8-12
Emulate Keypad with Leading Zero		Disable	8-12
USB FN1 Substitution		Disable	8-13
Function Key Mapping		Disable	8-13
Convert Case		None	8-14
USB Static CDC		Enable	8-14
USB Polling Interval		8 msec	8-15
Quick Keypad Emulation		Disable	8-17
SSI Host Parameters			
Select SSI Host	N/A	N/A	9-11
Baud Rate	9Ch	9600	9-12
Parity	9Eh	None	9-13
Check Parity	97h	Disable	9-14
Stop Bits	9Dh	1	9-14
Software Handshaking	9Fh	ACK/NAK	9-15
Host RTS Line State	9Ah	Low	9-16

[1]User selection is required to configure this interface and this is the most common selection.

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Table A-1 *Standard Default Parameters Table (Continued)*

Parameter	Parameter Number	Default	Page Number
Decode Data Packet Format	EEh	Send Raw Decode Data	9-16
Host Serial Response Time-out	9Bh	2 sec	9-17
Host Character Time-out	EFh	200 msec	9-18
Multipacket Option	F0h 4Eh	Option 1	9-19
Interpacket Delay	F0h 4Fh	0 ms	9-20
Event Reporting			
Decode Event	F0h 00h	Disable	9-21
Boot Up Event	F0h 02h	Disable	9-22
Parameter Event	F0h 03h	Disable	9-22
Serial Host Parameters			
Serial Host Types		Standard RS-232	10-5
Baud Rate		9600	10-7
Parity Type		None	10-9
Stop Bits		1	10-10
Data Bits		8-Bit	10-10
Check Receive Errors		Enable	10-11
Hardware Handshaking		None	10-12
Software Handshaking		None	10-14
Host Serial Response Time-out		2 Sec	10-16
RTS Line State		Low RTS	10-17
Beep on <BEL>		Disable	10-17
Intercharacter Delay		0 msec	10-18
Nixdorf Beep/LED Options		Normal Operation	10-19
Ignore Unknown Characters		Send Bar Code	10-19
Symbology Parameters			
Disable All Code Types			11-8
UPC/EAN			
UPC-A	01h	Enable	11-9
UPC-E	02h	Enable	11-9
UPC-E1	0Ch	Disable	11-10

[1]**User selection is required to configure this interface and this is the most common selection.**

Table A-1 *Standard Default Parameters Table (Continued)*

Parameter	Parameter Number	Default	Page Number
EAN-8/JAN 8	04h	Enable	*11-10*
EAN-13/JAN 13	03h	Enable	*11-11*
Bookland EAN	53h	Enable	*11-11*
Bookland ISBN Format	F1h 40h	ISBN-10	*11-12*
Decode UPC/EAN/JAN Supplementals (2 and 5 digits)	10h	Ignore	*11-13*
User-Programmable Supplementals Supplemental 1: Supplemental 2:	 F1h 43h F1h 44h	N/A	*11-16*
UPC/EAN/JAN Supplemental Redundancy	50h	10	*11-16*
Decode UPC/EAN/JAN Supplemental AIM ID	F1h A0h	Combined	*11-17*
Transmit UPC-A Check Digit	28h	Enable	*11-18*
Transmit UPC-E Check Digit	29h	Enable	*11-18*
Transmit UPC-E1 Check Digit	2Ah	Enable	*11-19*
UPC-A Preamble	22h	System Character	*11-19*
UPC-E Preamble	23h	System Character	*11-20*
UPC-E1 Preamble	24h	System Character	*11-21*
Convert UPC-E to A	25h	Disable	*11-22*
Convert UPC-E1 to A	26h	Disable	*11-22*
EAN-8/JAN-8 Extend	27h	Disable	*11-23*
UCC Coupon Extended Code	55h	Disable	*11-23*
Coupon Report	F1h DAh	New Coupon Symbols	*11-24*
ISSN EAN	F1h 69h	Disable	*11-25*
Code 128			
Code 128	08h	Enable	*11-26*
Set Length(s) for Code 128	D1h, D2h	Any Length	*11-26*
GS1-128 (formerly UCC/EAN-128)	0Eh	Enable	*11-27*
ISBT 128	54h	Enable	*11-28*
ISBT Concatenation	F1h 41h	Disable	*11-29*
Check ISBT Table	F1h 42h	Enable	*11-30*
ISBT Concatenation Redundancy	DFh	10	*11-30*

[1]User selection is required to configure this interface and this is the most common selection.

Table A-1 *Standard Default Parameters Table (Continued)*

Parameter	Parameter Number	Default	Page Number
Code 39			
Code 39	00h	Enable	11-31
Trioptic Code 39	0Dh	Disable	11-31
Convert Code 39 to Code 32 (Italian Pharmacy Code)	56h	Disable	11-32
Code 32 Prefix	E7h	Disable	11-32
Set Length(s) for Code 39	12h, 13h	Length Within Range: 2 to 55	11-33
Code 39 Check Digit Verification	30h	Disable	11-34
Transmit Code 39 Check Digit	2Bh	Disable	11-34
Code 39 Full ASCII Conversion	11h	Disable	11-35
Buffer Code 39	71h	Disable	11-36
Code 93			
Code 93	09h	Disable	11-38
Set Length(s) for Code 93	1Ah, 1Bh	Length Within Range: 4 to 55	11-38
Code 11			
Code 11	0Ah	Disable	11-40
Set Lengths for Code 11	1Ch, 1Dh	Length Within Range: 4 to 55	11-40
Code 11 Check Digit Verification	34h	Disable	11-42
Transmit Code 11 Check Digit(s)	2Fh	Disable	11-43
Interleaved 2 of 5 (ITF)			
Interleaved 2 of 5 (ITF)	06h	Disable	11-44
Set Lengths for I 2 of 5	16h, 17h	1 Length; Length = 14	11-44
I 2 of 5 Check Digit Verification	31h	Disable	11-46
Transmit I 2 of 5 Check Digit	2Ch	Disable	11-46
Convert I 2 of 5 to EAN 13	52h	Disable	11-47
Discrete 2 of 5 (DTF)			
Discrete 2 of 5	05h	Disable	11-48
Set Length(s) for D 2 of 5	14h, 15h	1 Length; Length = 12	11-48

[1] User selection is required to configure this interface and this is the most common selection.

Table A-1 *Standard Default Parameters Table (Continued)*

Parameter	Parameter Number	Default	Page Number
Codabar (NW - 7)			
Codabar	07h	Disable	*11-50*
Set Lengths for Codabar	18h, 19h	Length Within Range: 5 to 55	*11-50*
CLSI Editing	36h	Disable	*11-52*
NOTIS Editing	37h	Disable	*11-52*
Codabar Upper or Lower Case Start/Stop Characters Detection	F2h 57h	Upper Case	*11-53*
MSI			
MSI	0Bh	Disable	*11-54*
Set Length(s) for MSI	1Eh, 1Fh	Length Within Range: 4 to 55	*11-54*
MSI Check Digits	32h	One	*11-56*
Transmit MSI Check Digit	2Eh	Disable	*11-56*
MSI Check Digit Algorithm	33h	Mod 10/Mod 10	*11-57*
Chinese 2 of 5			
Chinese 2 of 5	F0h 98h	Disable	*11-57*
Matrix 2 of 5			
Matrix 2 of 5	F1h 6Ah	Disable	*11-58*
Matrix 2 of 5 Lengths	F1h 6Bh F1h 6Ch	Length; Length = 14	*11-59*
Matrix 2 of 5 Check Digit	F1h 6Eh	Disable	*11-60*
Transmit Matrix 2 of 5 Check Digit	F1h 6Fh	Disable	*11-60*
Korean 3 of 5			
Korean 3 of 5	F1h 45h	Disable	*11-61*
Inverse 1D	F1h 4Ah	Regular	*11-62*
Postal Codes			
US Postnet	59h	Disable	*11-63*
US Planet	5Ah	Disable	*11-63*
Transmit US Postal Check Digit	5Fh	Enable	*11-64*
UK Postal	5Bh	Disable	*11-64*
Transmit UK Postal Check Digit	60h	Enable	*11-65*

[1]User selection is required to configure this interface and this is the most common selection.

Table A-1 *Standard Default Parameters Table (Continued)*

Parameter	Parameter Number	Default	Page Number
Japan Postal	F0h 22h	Disable	*11-65*
Australia Post	F0h 23h	Disable	*11-66*
Australia Post Format	F1h CEh	Autodiscriminate	*11-67*
Netherlands KIX Code	F0h 46h	Disable	*11-68*
USPS 4CB/One Code/Intelligent Mail	F1h 50h	Disable	*11-68*
UPU FICS Postal	F1h 63h	Disable	*11-69*
GS1 DataBar			
GS1 DataBar (GS1 DataBar Omnidirectional, GS1 DataBar Truncated, GS1 DataBar Stacked, GS1 DataBar Stacked Omnidirectional)	F0h 52h	Enable	*11-70*
GS1 DataBar Limited	F0h 53h	Disable	*11-71*
GS1 DataBar Limited Security Level	F1h D8h	3	*11-72*
GS1 DataBar Expanded (GS1 DataBar Expanded, GS1 DataBar Expanded Stacked)	F0h 54h	Enable	*11-73*
Convert GS1 DataBar to UPC/EAN	F0h 8Dh	Disable	*11-73*
Composite			
Composite CC-C	F0h 55h	Disable	*11-74*
Composite CC-A/B	F0h 56h	Disable	*11-74*
Composite TLC-39	F0h 73h	Disable	*11-75*
UPC Composite Mode	F0h 58h	UPC Always Linked	*11-75*
Composite Beep Mode	F0h 8Eh	Beep As Each Code Type is Decoded	*11-76*
GS1-128 Emulation Mode for UCC/EAN Composite Codes	F0h ABh	Disable	*11-76*
2D Symbologies			
PDF417	0Fh	Enable	*11-77*
MicroPDF417	E3h	Disable	*11-77*
Code 128 Emulation	7Bh	Disable	*11-78*
Data Matrix	F0h 24h	Enable	*11-79*
Data Matrix Inverse	F1h 4Ch	Regular	*11-79*
Decode Mirror Images (Data Matrix Only)	F1h 19h	Auto	*11-80*

[1]User selection is required to configure this interface and this is the most common selection.

Table A-1 *Standard Default Parameters Table (Continued)*

Parameter	Parameter Number	Default	Page Number
Maxicode	F0h 26h	Disable	*11-81*
QR Code	F0h 25h	Enable	*11-81*
QR Inverse	F1h 4Bh	Regular	*11-82*
MicroQR	F1h 3Dh	Enable	*11-82*
Aztec	F1h 3Eh	Enable	*11-83*
Aztec Inverse	F1h 4Dh	Inverse Autodetect	*11-83*
Symbology-Specific Security Levels			
Redundancy Level	4Eh	1	*11-84*
Security Level (UPC/EAN and Code 93)	4Dh	1	*11-86*
Intercharacter Gap Size	F0h 7Dh	Normal	*11-87*
Macro PDF			
Macro PDF Transmit/Decode Mode Symbols	BCh	Passthrough Mode	*11-89*
Transmit Macro PDF Control Header	B8h	Disable	*11-90*
Escape Characters	E9h	None	*11-90*
Flush Macro PDF Buffer			*11-91*
Abort Macro PDF Entry			*11-91*
[1]**User selection is required to configure this interface and this is the most common selection.**			

APPENDIX B PROGRAMMING REFERENCE

Symbol Code Identifiers

Table B-1 *Symbol Code Characters*

Code Character	Code Type
A	UPC-A, UPC-E, UPC-E1, EAN-8, EAN-13
B	Code 39, Code 32
C	Codabar
D	Code 128, ISBT 128, ISBT 128 Concatenated
E	Code 93
F	Interleaved 2 of 5
G	Discrete 2 of 5, or Discrete 2 of 5 IATA
H	Code 11
J	MSI
K	GS1-128
L	Bookland EAN
M	Trioptic Code 39
N	Coupon Code
R	GS1 DataBar Family
S	Matrix 2 of 5
T	UCC Composite, TLC 39
U	Chinese 2 of 5

Table B-1 *Symbol Code Characters (Continued)*

Code Character	Code Type
V	Korean 3 of 5
X	ISSN EAN, PDF417, Macro PDF417, Micro PDF417
z	Aztec, Aztec Rune
P00	Data Matrix
P01	QR Code, MicroQR
P02	Maxicode
P03	US Postnet
P04	US Planet
P05	Japan Postal
P06	UK Postal
P08	Netherlands KIX Code
P09	Australia Post
P0A	USPS 4CB/One Code/Intelligent Mail
P0B	UPU FICS Postal

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AIM Code Identifiers

Each AIM Code Identifier contains the three-character string **]cm** where:

] = Flag Character (ASCII 93)
c = Code Character (see *Table B-2*)
m = Modifier Character (see *Table B-3*)

Table B-2 *Aim Code Characters*

Code Character	Code Type
A	Code 39, Code 39 Full ASCII, Code 32
C	Code 128, ISBT 128, ISBT 128 Concatenated, GS1-128, Coupon (Code 128 portion)
d	Data Matrix
E	UPC/EAN, Coupon (UPC portion)
e	GS1 DataBar Family
F	Codabar
G	Code 93
H	Code 11
I	Interleaved 2 of 5
L	PDF417, Macro PDF417, Micro PDF417
L2	TLC 39
M	MSI
Q	QR Code, MicroQR
S	Discrete 2 of 5, IATA 2 of 5
U	Maxicode
z	Aztec, Aztec Rune
X	Bookland EAN, ISSN EAN, Trioptic Code 39, Chinese 2 of 5, Matrix 2 of 5, Korean 3 of 5, US Postnet, US Planet, UK Postal, Japan Postal, Australia Post, Netherlands KIX Code, USPS 4CB/One Code/ Intelligent Mail, UPU FICS Postal

The modifier character is the sum of the applicable option values based on *Table B-3*.

Table B-3 *Modifier Characters*

Code Type	Option Value	Option
Code 39	0	No check character or Full ASCII processing.
	1	Reader has checked one check character.
	3	Reader has checked and stripped check character.
	4	Reader has performed Full ASCII character conversion.
	5	Reader has performed Full ASCII character conversion and checked one check character.
	7	Reader has performed Full ASCII character conversion and checked and stripped check character.
	Example: A Full ASCII bar code with check character W, **A+I+MI+DW**, is transmitted as **]A7**AIMID where 7 = (3+4).	
Trioptic Code 39	0	No option specified at this time. Always transmit 0.
	Example: A Trioptic bar code 412356 is transmitted as **]X0**412356	
Code 128	0	Standard data packet, no Function code 1 in first symbol position.
	1	Function code 1 in first symbol character position.
	2	Function code 1 in second symbol character position.
	Example: A Code (EAN) 128 bar code with Function 1 character $^{\text{FNC1}}$ in the first position, AIMID is transmitted as **]C1**AIMID	
I 2 of 5	0	No check digit processing.
	1	Reader has validated check digit.
	3	Reader has validated and stripped check digit.
	Example: An I 2 of 5 bar code without check digit, 4123, is transmitted as **]I0**4123	
Codabar	0	No check digit processing.
	1	Reader has checked check digit.
	3	Reader has stripped check digit before transmission.
	Example: A Codabar bar code without check digit, 4123, is transmitted as **]F0**4123	
Code 93	0	No options specified at this time. Always transmit 0.
	Example: A Code 93 bar code 012345678905 is transmitted as **]G0**012345678905	
MSI	0	Check digits are sent.
	1	No check digit is sent.
	Example: An MSI bar code 4123, with a single check digit checked, is transmitted as **]M1**4123	

Table B-3 *Modifier Characters (Continued)*

Code Type	Option Value	Option
D 2 of 5	0	No options specified at this time. Always transmit 0.
	Example: A D 2 of 5 bar code 4123, is transmitted as **]S0**4123	
UPC/EAN	0	Standard data packet in full EAN format, i.e. 13 digits for UPC-A, UPC-E, and EAN-13 (not including supplemental data).
	1	Two digit supplemental data only.
	2	Five digit supplemental data only.
	3	Combined data packet comprising 13 digits from EAN-13, UPC-A or UPC-E symbol and 2 or 5 digits from supplemental symbol.
	4	EAN-8 data packet.
	Example: A UPC-A bar code 012345678905 is transmitted as **]E0**0012345678905	
Bookland EAN	0	No options specified at this time. Always transmit 0.
	Example: A Bookland EAN bar code 123456789X is transmitted as **]X0**123456789X	
ISSN EAN	0	No options specified at this time. Always transmit 0.
	Example: An ISSN EAN bar code 123456789X is transmitted as **]X0**123456789X	
Code 11	0	Single check digit
	1	Two check digits
	3	Check characters validated but not transmitted.
GS1 DataBar Family		No option specified at this time. Always transmit 0. GS1 DataBar and GS1 DataBar Limited transmit with an Application Identifier “01”. Note: In GS1-128 emulation mode, GS1 DataBar is transmitted using Code 128 rules (i.e.,]C1).
	Example: A GS1 DataBar bar code 0110012345678902 is transmitted as **]e0**0110012345678902.	
EAN.UCC Composites (GS1 DataBar, GS1-128, 2D portion of UPC composite)		Native mode transmission. Note: UPC portion of composite is transmitted using UPC rules.
	0	Standard data packet.
	1	Data packet containing the data following an encoded symbol separator character.
	2	Data packet containing the data following an escape mechanism character. The data packet does not support the ECI protocol.
	3	Data packet containing the data following an escape mechanism character. The data packet supports the ECI protocol.
		GS1-128 emulation Note: UPC portion of composite is transmitted using UPC rules.
	1	Data packet is a GS1-128 symbol (i.e., data is preceded with]JC1).

Table B-3 *Modifier Characters (Continued)*

Code Type	Option Value	Option
PDF417, Micro PDF417	0	Reader set to conform to protocol defined in 1994 PDF417 symbology specifications. **Note:** When this option is transmitted, the receiver cannot reliably determine whether ECIs have been invoked or whether data byte 92_{DEC} has been doubled in transmission.
	1	Reader set to follow the ECI protocol (Extended Channel Interpretation). All data characters 92_{DEC} are doubled.
	2	Reader set for Basic Channel operation (no escape character transmission protocol). Data characters 92_{DEC} are not doubled. **Note:** When decoders are set to this mode, unbuffered Macro symbols and symbols requiring the decoder to convey ECI escape sequences cannot be transmitted.
	3	The bar code contains a GS1-128 symbol, and the first codeword is 903-907, 912, 914, 915.
	4	The bar code contains a GS1-128 symbol, and the first codeword is in the range 908-909.
	5	The bar code contains a GS1-128 symbol, and the first codeword is in the range 910-911.
	Example: A PDF417 bar code ABCD, with no transmission protocol enabled, is transmitted as]L2ABCD.	
Data Matrix	0	ECC 000-140, not supported.
	1	ECC 200.
	2	ECC 200, FNC1 in first or fifth position.
	3	ECC 200, FNC1 in second or sixth position.
	4	ECC 200, ECI protocol implemented.
	5	ECC 200, FNC1 in first or fifth position, ECI protocol implemented.
	6	ECC 200, FNC1 in second or sixth position, ECI protocol implemented.
MaxiCode	0	Symbol in Mode 4 or 5.
	1	Symbol in Mode 2 or 3.
	2	Symbol in Mode 4 or 5, ECI protocol implemented.
	3	Symbol in Mode 2 or 3, ECI protocol implemented in secondary message.

Table B-3 *Modifier Characters (Continued)*

Code Type	Option Value	Option
QR Code	0	Model 1 symbol.
	1	Model 2 / MicroQR symbol, ECI protocol not implemented.
	2	Model 2 symbol, ECI protocol implemented.
	3	Model 2 symbol, ECI protocol not implemented, FNC1 implied in first position.
	4	Model 2 symbol, ECI protocol implemented, FNC1 implied in first position.
	5	Model 2 symbol, ECI protocol not implemented, FNC1 implied in second position.
	6	Model 2 symbol, ECI protocol implemented, FNC1 implied in second position.
Aztec	0	Aztec symbol.
	C	Aztec Rune symbol.

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APPENDIX C SAMPLE BAR CODES

Code 39

123ABC

UPC/EAN

UPC-A, 100%

0 12345 67890 5

EAN-13, 100%

3 456789 012340

Code 128

1 2 3 4 5 6 7 8 9 0

Interleaved 2 of 5

12345678901231

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GS1 DataBar-14

NOTE DataBar-14 must be enabled to read the bar code below (see *GS1 DataBar on page 11-70*).

7612341562341

PDF417

Data Matrix

Maxicode

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QR Code

US Postnet

0123456784

UK Postal

001ABCD1AB9MX

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APPENDIX D NUMERIC BAR CODES

Numeric Bar Codes

For parameters requiring specific numeric values, scan the appropriately numbered bar code(s).

0

1

2

3

4

Numeric Bar Codes (continued)

5

6

7

8

9

Cancel

To correct an error or change a selection, scan the bar code below.

Cancel

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APPENDIX E ASCII CHARACTER SETS

Table E-1 *ASCII Value Table*

ASCII Value	Full ASCII Code 39 Encode Char	Keystroke
1000	%U	CTRL 2
1001	$A	CTRL A
1002	$B	CTRL B
1003	$C	CTRL C
1004	$D	CTRL D
1005	$E	CTRL E
1006	$F	CTRL F
1007	$G	CTRL G
1008	$H	CTRL H/**BACKSPACE**[1]
1009	$I	CTRL I/**HORIZONTAL TAB**[1]
1010	$J	CTRL J
1011	$K	CTRL K
1012	$L	CTRL L
1013	$M	CTRL M/**ENTER**[1]
1014	$N	CTRL N
1015	$O	CTRL O

The keystroke in bold transmits only if you enabled Function Key Mapping. Otherwise, the unbold keystroke transmits.

Table E-1 *ASCII Value Table (Continued)*

ASCII Value	Full ASCII Code 39 Encode Char	Keystroke
1016	$P	CTRL P
1017	$Q	CTRL Q
1018	$R	CTRL R
1019	$S	CTRL S
1020	$T	CTRL T
1021	$U	CTRL U
1022	$V	CTRL V
1023	$W	CTRL W
1024	$X	CTRL X
1025	$Y	CTRL Y
1026	$Z	CTRL Z
1027	%A	CTRL [
1028	%B	CTRL \
1029	%C	CTRL]
1030	%D	CTRL 6
1031	%E	CTRL -
1032	Space	Space
1033	/A	!
1034	/B	“
1035	/C	#
1036	/D	$
1037	/E	%
1038	/F	&
1039	/G	‘
1040	/H	(
1041	/I	)
1042	/J	*
1043	/K	+
1044	/L	,
The keystroke in bold transmits only if you enabled Function Key Mapping. Otherwise, the unbold keystroke transmits.		

Table E-1 *ASCII Value Table (Continued)*

ASCII Value	Full ASCII Code 39 Encode Char	Keystroke
1045	-	-
1046	.	.
1047	/o	/
1048	0	0
1049	1	1
1050	2	2
1051	3	3
1052	4	4
1053	5	5
1054	6	6
1055	7	7
1056	8	8
1057	9	9
1058	/Z	:
1059	%F	;
1060	%G	<
1061	%H	=
1062	%I	>
1063	%J	?
1064	%V	@
1065	A	A
1066	B	B
1067	C	C
1068	D	D
1069	E	E
1070	F	F
1071	G	G
1072	H	H
1073	I	I
The keystroke in bold transmits only if you enabled Function Key Mapping. Otherwise, the unbold keystroke transmits.		

Table E-1 *ASCII Value Table (Continued)*

ASCII Value	Full ASCII Code 39 Encode Char	Keystroke
1074	J	J
1075	K	K
1076	L	L
1077	M	M
1078	N	N
1079	O	O
1080	P	P
1081	Q	Q
1082	R	R
1083	S	S
1084	T	T
1085	U	U
1086	V	V
1087	W	W
1088	X	X
1089	Y	Y
1090	Z	Z
1091	%K	[
1092	%L	\
1093	%M	]
1094	%N	^
1095	%O	_
1096	%W	‘
1097	+A	a
1098	+B	b
1099	+C	c
1100	+D	d
1101	+E	e
1102	+F	f
The keystroke in bold transmits only if you enabled Function Key Mapping. Otherwise, the unbold keystroke transmits.		

Table E-1 *ASCII Value Table (Continued)*

ASCII Value	Full ASCII Code 39 Encode Char	Keystroke
1103	+G	g
1104	+H	h
1105	+I	i
1106	+J	j
1107	+K	k
1108	+L	l
1109	+M	m
1110	+N	n
1111	+O	o
1112	+P	p
1113	+Q	q
1114	+R	r
1115	+S	s
1116	+T	t
1117	+U	u
1118	+V	v
1119	+W	w
1120	+X	x
1121	+Y	y
1122	+Z	z
1123	%P	{
1124	%Q	|
1125	%R	}
1126	%S	~

The keystroke in bold transmits only if you enabled Function Key Mapping. Otherwise, the unbold keystroke transmits.

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Table E-2 *ALT Key Standard Default Tables*

ALT Keys	Keystroke
2064	ALT 2
2065	ALT A
2066	ALT B
2067	ALT C
2068	ALT D
2069	ALT E
2070	ALT F
2071	ALT G
2072	ALT H
2073	ALT I
2074	ALT J
2075	ALT K
2076	ALT L
2077	ALT M
2078	ALT N
2079	ALT O
2080	ALT P
2081	ALT Q
2082	ALT R
2083	ALT S
2084	ALT T
2085	ALT U
2086	ALT V
2087	ALT W
2088	ALT X
2089	ALT Y
2090	ALT Z

Table E-3 *USB GUI Key Character Set*

GUI Key	Keystroke
3000	Right Control Key
3048	GUI 0
3049	GUI 1
3050	GUI 2
3051	GUI 3
3052	GUI 4
3053	GUI 5
3054	GUI 6
3055	GUI 7
3056	GUI 8
3057	GUI 9
3065	GUI A
3066	GUI B
3067	GUI C
3068	GUI D
3069	GUI E
3070	GUI F
3071	GUI G
3072	GUI H
3073	GUI I
3074	GUI J
3075	GUI K
3076	GUI L
3077	GUI M
3078	GUI N
3079	GUI O
3080	GUI P
3081	GUI Q

Note: GUI Shift Keys - The Apple™ iMac keyboard has an apple key on either side of the space bar. Windows-based systems have a GUI key to the left of the left ALT key, and to the right of the right ALT key.

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Table E-3 *USB GUI Key Character Set (Continued)*

GUI Key	Keystroke
3082	GUI R
3083	GUI S
3084	GUI T
3085	GUI U
3086	GUI V
3087	GUI W
3088	GUI X
3089	GUI Y
3090	GUI Z
Note: GUI Shift Keys - The Apple™ iMac keyboard has an apple key on either side of the space bar. Windows-based systems have a GUI key to the left of the left ALT key, and to the right of the right ALT key.	

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Table E-4 *PF Key Standard Default Table*

PF Keys	Keystroke
4001	PF 1
4002	PF 2
4003	PF 3
4004	PF 4
4005	PF 5
4006	PF 6
4007	PF 7
4008	PF 8
4009	PF 9
4010	PF 10
4011	PF 11
4012	PF 12
4013	PF 13
4014	PF 14
4015	PF 15
4016	PF 16

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Table E-5 *F key Standard Default Table*

F Keys	Keystroke
5001	F 1
5002	F 2
5003	F 3
5004	F 4
5005	F 5
5006	F 6
5007	F 7
5008	F 8
5009	F 9
5010	F 10
5011	F 11
5012	F 12
5013	F 13
5014	F 14
5015	F 15
5016	F 16
5017	F 17
5018	F 18
5019	F 19
5020	F 20
5021	F 21
5022	F 22
5023	F 23
5024	F 24

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Table E-6 *Numeric Key Standard Default Table*

Numeric Keypad	Keystroke
6042	*
6043	+
6044	Undefined
6045	-
6046	.
6047	/
6048	0
6049	1
6050	2
6051	3
6052	4
6053	5
6054	6
6055	7
6056	8
6057	9
6058	Enter
6059	Num Lock

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Table E-7 *Extended Keypad Standard Default Table*

Extended Keypad	Keystroke
7001	Break
7002	Delete
7003	Pg Up
7004	End
7005	Pg Dn
7006	Pause
7007	Scroll Lock
7008	Backspace
7009	Tab
7010	Print Screen
7011	Insert
7012	Home
7013	Enter
7014	Escape
7015	Up Arrow
7016	Dn Arrow
7017	Left Arrow
7018	Right Arrow

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GLOSSARY

A

Aperture. The opening in an optical system defined by a lens or baffle that establishes the field of view.

API. An interface by means of which one software component communicates with or controls another. Usually used to refer to services provided by one software component to another, usually via software interrupts or function calls

Application Programming Interface. See **API**.

ASCII. American Standard Code for Information Interchange. A 7 bit-plus-parity code representing 128 letters, numerals, punctuation marks and control characters. It is a standard data transmission code in the U.S.

Autodiscrimination. The ability of an interface controller to determine the code type of a scanned bar code. After this determination is made, the information content is decoded.

B

Bar. The dark element in a printed bar code symbol.

Bar Code. A pattern of variable-width bars and spaces which represents numeric or alphanumeric data in machine-readable form. The general format of a bar code symbol consists of a leading margin, start character, data or message character, check character (if any), stop character, and trailing margin. Within this framework, each recognizable symbology uses its own unique format. See **Symbology**.

Bar Code Density. The number of characters represented per unit of measurement (e.g., characters per inch).

Bar Height. The dimension of a bar measured perpendicular to the bar width.

Bar Width. Thickness of a bar measured from the edge closest to the symbol start character to the trailing edge of the same bar.

BIOS. Basic Input Output System. A collection of ROM-based code with a standard API used to interface with standard PC hardware.

Bit. Binary digit. One bit is the basic unit of binary information. Generally, eight consecutive bits compose one byte of data. The pattern of 0 and 1 values within the byte determines its meaning.

Bits per Second (bps). Bits transmitted or received.

Boot or Boot-up. The process a computer goes through when it starts. During boot-up, the computer can run self-diagnostic tests and configure hardware and software.

BOOTP. A protocol for remote booting of diskless devices. Assigns an IP address to a machine and may specify a boot file. The client sends a bootp request as a broadcast to the bootp server port (67) and the bootp server responds using the bootp client port (68). The bootp server must have a table of all devices, associated MAC addresses and IP addresses.

bps. See **Bits Per Second**.

Byte. On an addressable boundary, eight adjacent binary digits (0 and 1) combined in a pattern to represent a specific character or numeric value. Bits are numbered from the right, 0 through 7, with bit 0 the low-order bit. One byte in memory is used to store one ASCII character.

C

CDRH. Center for Devices and Radiological Health. A federal agency responsible for regulating laser product safety. This agency specifies various laser operation classes based on power output during operation.

CDRH Class 1. This is the lowest power CDRH laser classification. This class is considered intrinsically safe, even if all laser output were directed into the eye's pupil. There are no special operating procedures for this class.

CDRH Class 2. No additional software mechanisms are needed to conform to this limit. Laser operation in this class poses no danger for unintentional direct human exposure.

Character. A pattern of bars and spaces which either directly represents data or indicates a control function, such as a number, letter, punctuation mark, or communications control contained in a message.

Character Set. Those characters available for encoding in a particular bar code symbology.

Check Digit. A digit used to verify a correct symbol decode. The scanner inserts the decoded data into an arithmetic formula and checks that the resulting number matches the encoded check digit. Check digits are required for UPC but are optional for other symbologies. Using check digits decreases the chance of substitution errors when a symbol is decoded.

Codabar. A discrete self-checking code with a character set consisting of digits 0 to 9 and six additional characters: (- $: / , +).

Code 128. A high density symbology which allows the controller to encode all 128 ASCII characters without adding extra symbol elements.

Code 3 of 9 (Code 39). A versatile and widely used alphanumeric bar code symbology with a set of 43 character types, including all uppercase letters, numerals from 0 to 9 and 7 special characters (- . / + % $ and space). The code name is derived from the fact that 3 of 9 elements representing a character are wide, while the remaining 6 are narrow.

Code 93. An industrial symbology compatible with Code 39 but offering a full character ASCII set and a higher coding density than Code 39.

Code Length. Number of data characters in a bar code between the start and stop characters, not including those characters.

Cold Boot. A cold boot restarts the mobile computer and erases all user stored records and entries.

COM port. Communication port; ports are identified by number, e.g., COM1, COM2.

Continuous Code. A bar code or symbol in which all spaces within the symbol are parts of characters. There are no intercharacter gaps in a continuous code. The absence of gaps allows for greater information density.

Cradle. A cradle is used for charging the terminal battery and for communicating with a host computer, and provides a storage place for the terminal when not in use.

D

Dead Zone. An area within a scanner's field of view, in which specular reflection may prevent a successful decode.

Decode. To recognize a bar code symbology (e.g., UPC/EAN) and then analyze the content of the specific bar code scanned.

Decode Algorithm. A decoding scheme that converts pulse widths into data representation of the letters or numbers encoded within a bar code symbol.

Decryption. Decryption is the decoding and unscrambling of received encrypted data. Also see, **Encryption** and **Key**.

Depth of Field. The range between minimum and maximum distances at which a scanner can read a symbol with a certain minimum element width.

Discrete 2 of 5. A binary bar code symbology representing each character by a group of five bars, two of which are wide. The location of wide bars in the group determines which character is encoded; spaces are insignificant. Only numeric characters (0 to 9) and START/STOP characters may be encoded.

Discrete Code. A bar code or symbol in which the spaces between characters (intercharacter gaps) are not part of the code.

DRAM. Dynamic random access memory.

E

EAN. European Article Number. This European/International version of the UPC provides its own coding format and symbology standards. Element dimensions are specified metrically. EAN is used primarily in retail.

Element. Generic term for a bar or space.

Encoded Area. Total linear dimension occupied by all characters of a code pattern, including start/stop characters and data.

ENQ (RS-232). ENQ software handshaking is also supported for the data sent to the host.

ESD. Electro-Static Discharge

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F

Flash Disk. An additional megabyte of non-volatile memory for storing application and configuration files.

Flash Memory. Flash memory is responsible for storing the system firmware and is non-volatile. If the system power is interrupted the data is not be lost.

FTP. See **File Transfer Protocol**.

H

Hard Reset. See **Cold Boot**.

Host Computer. A computer that serves other terminals in a network, providing such services as computation, database access, supervisory programs and network control.

Hz. Hertz; A unit of frequency equal to one cycle per second.

I

IDE. Intelligent drive electronics. Refers to the solid-state hard drive type.

IEC. International Electrotechnical Commission. This international agency regulates laser safety by specifying various laser operation classes based on power output during operation.

IEC60825-1 Class 1. This is the lowest power IEC laser classification. Conformity is ensured through a software restriction of 120 seconds of laser operation within any 1000 second window and an automatic laser shutdown if the scanner's oscillating mirror fails.

IEEE Address. See **MAC Address**.

Input/Output Ports. I/O ports are primarily dedicated to passing information into or out of the terminal's memory. Series 9000 mobile computers include Serial and USB ports.

Intercharacter Gap. The space between two adjacent bar code characters in a discrete code.

Interleaved 2 of 5. A binary bar code symbology representing character pairs in groups of five bars and five interleaved spaces. Interleaving provides for greater information density. The location of wide elements (bar/spaces) within each group determines which characters are encoded. This continuous code type uses no intercharacter spaces. Only numeric (0 to 9) and START/STOP characters may be encoded.

Interleaved Bar Code. A bar code in which characters are paired together, using bars to represent the first character and the intervening spaces to represent the second.

Interleaved 2 of 5. A binary bar code symbology representing character pairs in groups of five bars and five interleaved spaces. Interleaving provides for greater information density. The location of wide elements (bar/spaces) within each group determines which characters are encoded. This continuous code type uses no intercharacter spaces. Only numeric (0 to 9) and START/STOP characters may be encoded.

I/O Ports. interface The connection between two devices, defined by common physical characteristics, signal characteristics, and signal meanings. Types of interfaces include RS-232 and PCMCIA.

IOCTL. Input/Output Control.

IP Address. (Internet Protocol address) The address of a computer attached to an IP network. Every client and server station must have a unique IP address. A 32-bit address used by a computer on a IP network. Client workstations have either a permanent address or one that is dynamically assigned to them each session. IP addresses are written as four sets of numbers separated by periods; for example, 204.171.64.2.

IPX/SPX. Internet Package Exchange/Sequential Packet Exchange. A communications protocol for Novell. IPX is Novell's Layer 3 protocol, similar to XNS and IP, and used in NetWare networks. SPX is Novell's version of the Xerox SPP protocol.

IS-95. Interim Standard 95. The EIA/TIA standard that governs the operation of CDMA cellular service. Versions include IS-95A and IS-95B. See CDMA.

K

Key. A key is the specific code used by the algorithm to encrypt or decrypt the data. Also see, **Encryption** and **Decrypting**.

L

LASER. Light Amplification by Stimulated Emission of Radiation.The laser is an intense light source. Light from a laser is all the same frequency, unlike the output of an incandescent bulb. Laser light is typically coherent and has a high energy density.

Laser Diode. A gallium-arsenide semiconductor type of laser connected to a power source to generate a laser beam. This laser type is a compact source of coherent light.

Laser Scanner. A type of bar code reader that uses a beam of laser light.

LCD. See **Liquid Crystal Display**.

LED Indicator. A semiconductor diode (LED - Light Emitting Diode) used as an indicator, often in digital displays. The semiconductor uses applied voltage to produce light of a certain frequency determined by the semiconductor's particular chemical composition.

Light Emitting Diode. See **LED**.

Liquid Crystal Display (LCD). A display that uses liquid crystal sealed between two glass plates. The crystals are excited by precise electrical charges, causing them to reflect light outside according to their bias. They use little electricity and react relatively quickly. They require external light to reflect their information to the user.

M

MIL. 1 mil = 1 thousandth of a meter.

Misread (Misdecode). A condition which occurs when the data output of a reader or interface controller does not agree with the data encoded within a bar code symbol.

N

Nominal. The exact (or ideal) intended value for a specified parameter. Tolerances are specified as positive and negative deviations from this value.

Nominal Size. Standard size for a bar code symbol. Most UPC/EAN codes are used over a range of magnifications (e.g., from 0.80 to 2.00 of nominal).

NVM. Non-Volatile Memory.

O

ODI. See **Open Data-Link Interface**.

Open Data-Link Interface (ODI). Novell's driver specification for an interface between network hardware and higher-level protocols. It supports multiple protocols on a single NIC (Network Interface Controller). It is capable of understanding and translating any network information or request sent by any other ODI-compatible protocol into something a NetWare client can understand and process.

Open System Authentication. Open System authentication is a null authentication algorithm.

P

PAN . Personal area network. Using Bluetooth wireless technology, PANs enable devices to communicate wirelessly. Generally, a wireless PAN consists of a dynamic group of less than 255 devices that communicate within about a 33-foot range. Only devices within this limited area typically participate in the network.

Parameter. A variable that can have different values assigned to it.

PC Card. A plug-in expansion card for laptop computers and other devices, also called a PCMCIA card. PC Cards are 85.6mm long x 54 mm wide, and have a 68 pin connector. There are several different kinds:

- Type I; 3.3 mm high; use - RAM or Flash RAM
- Type II; 5 mm high; use - modems, LAN adaptors
- Type III; 10.5 high; use - Hard Disks

PCMCIA. Personal Computer Memory Card Interface Association. See **PC Card**.

Percent Decode. The average probability that a single scan of a bar code would result in a successful decode. In a well-designed bar code scanning system, that probability should approach near 100%.

PING. (Packet Internet Groper) An Internet utility used to determine whether a particular IP address is online. It is used to test and debug a network by sending out a packet and waiting for a response.

Presentation Mode. Typically used when the digital scanner sits on a countertop or is mounted on a wall, in this mode, the digital scanner operates in continuous (constant-on) mode, where it automatically decodes a bar code presented in its field of view.

Print Contrast Signal (PCS). Measurement of the contrast (brightness difference) between the bars and spaces of a symbol. A minimum PCS value is needed for a bar code symbol to be scannable. PCS = (RL - RD) / RL, where RL is the reflectance factor of the background and RD the reflectance factor of the dark bars.

Programming Mode. The state in which a scanner is configured for parameter values. See **Scanning Mode**.

Q

Quiet Zone. A clear space, containing no dark marks, which precedes the start character of a bar code symbol and follows the stop character.

QWERTY. A standard keyboard commonly used on North American and some European PC keyboards. “QWERTY” refers to the arrangement of keys on the left side of the third row of keys.

R

RAM. Random Access Memory. Data in RAM can be accessed in random order, and quickly written and read.

Reflectance. Amount of light returned from an illuminated surface.

Resolution. The narrowest element dimension which is distinguished by a particular reading device or printed with a particular device or method.

RF. Radio Frequency.

ROM. Read-Only Memory. Data stored in ROM cannot be changed or removed.

Router. A device that connects networks and supports the required protocols for packet filtering. Routers are typically used to extend the range of cabling and to organize the topology of a network into subnets. See **Subnet**.

RS-232. An Electronic Industries Association (EIA) standard that defines the connector, connector pins, and signals used to transfer data serially from one device to another.

S

Scan Area. Area intended to contain a symbol.

Scanner. An electronic device used to scan bar code symbols and produce a digitized pattern that corresponds to the bars and spaces of the symbol. Its three main components are: 1) Light source (laser or photoelectric cell) - illuminates a bar code,; 2) Photodetector - registers the difference in reflected light (more light reflected from spaces); 3) Signal conditioning circuit - transforms optical detector output into a digitized bar pattern.

Scanning Mode. The scanner is energized, programmed and ready to read a bar code.

Scanning Sequence. A method of programming or configuring parameters for a bar code reading system by scanning bar code menus.

SDK. Software Development Kit

Self-Checking Code. A symbology that uses a checking algorithm to detect encoding errors within the characters of a bar code symbol.

Shared Key. Shared Key authentication is an algorithm where both the AP and the MU share an authentication key.

SHIP. Symbol Host Interface Program.

SID. System Identification code. An identifier issued by the FCC for each market. It is also broadcast by the cellular carriers to allow cellular devices to distinguish between the home and roaming service.

Soft Reset. See **Warm Boot**.

Space. The lighter element of a bar code formed by the background between bars.

Specular Reflection. The mirror-like direct reflection of light from a surface, which can cause difficulty decoding a bar code.

Standard Trigger Mode. The digital scanner uses this mode when lifted off the counter or removed from the wall mount. In this mode, aim the digital scanner at a bar code and pull the trigger to decode.

Start/Stop Character. A pattern of bars and spaces that provides the scanner with start and stop reading instructions and scanning direction. The start and stop characters are normally to the left and right margins of a horizontal code.

STEP. Symbol Terminal Enabler Program.

Subnet. A subset of nodes on a network that are serviced by the same router. See **Router**.

Subnet Mask. A 32-bit number used to separate the network and host sections of an IP address. A custom subnet mask subdivides an IP network into smaller subsections. The mask is a binary pattern that is matched up with the IP address to turn part of the host ID address field into a field for subnets. Default is often 255.255.255.0.

Substrate. A foundation material on which a substance or image is placed.

SVTP. Symbol Virtual Terminal Program.

Symbol. A scannable unit that encodes data within the conventions of a certain symbology, usually including start/stop characters, quiet zones, data characters and check characters.

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Symbol Aspect Ratio. The ratio of symbol height to symbol width.

Symbol Height. The distance between the outside edges of the quiet zones of the first row and the last row.

Symbol Length. Length of symbol measured from the beginning of the quiet zone (margin) adjacent to the start character to the end of the quiet zone (margin) adjacent to a stop character.

Symbology. The structural rules and conventions for representing data within a particular bar code type (e.g. UPC/EAN, Code 39, PDF417, etc.).

T

TCP/IP. (Transmission Control Protocol/Internet Protocol) A communications protocol used to internetwork dissimilar systems. This standard is the protocol of the Internet and has become the global standard for communications. TCP provides transport functions, which ensures that the total amount of bytes sent is received correctly at the other end. UDP is an alternate transport that does not guarantee delivery. It is widely used for real-time voice and video transmissions where erroneous packets are not retransmitted. IP provides the routing mechanism. TCP/IP is a routable protocol, which means that all messages contain not only the address of the destination station, but the address of a destination network. This allows TCP/IP messages to be sent to multiple networks within an organization or around the world, hence its use in the worldwide Internet. Every client and server in a TCP/IP network requires an IP address, which is either permanently assigned or dynamically assigned at startup.

Telnet. A terminal emulation protocol commonly used on the Internet and TCP/IP-based networks. It allows a user at a terminal or computer to log onto a remote device and run a program.

Terminal Emulation. A “terminal emulation” emulates a character-based mainframe session on a remote non-mainframe terminal, including all display features, commands and function keys. The VC5000 Series supports Terminal Emulations in 3270, 5250 and VT220.

Terminate and Stay Resident (TSR). A program under DOS that ends its foreground execution to remain resident in memory to service hardware/software interrupts, providing background operation. It remains in memory and may provide services on behalf of other DOS programs.

TFTP. (Trivial File Transfer Protocol) A version of the TCP/IP FTP (File Transfer Protocol) protocol that has no directory or password capability. It is the protocol used for upgrading firmware, downloading software and remote booting of diskless devices.

Tolerance. Allowable deviation from the nominal bar or space width.

Transmission Control Protocol/Internet Protocol. See **TCP/IP.**

Trivial File Transfer Protocol. See **TFTP.**

TSR. See **Terminate and Stay Resident**.

U

UDP. User Datagram Protocol. A protocol within the IP protocol suite that is used in place of TCP when a reliable delivery is not required. For example, UDP is used for real-time audio and video traffic where lost packets are simply ignored, because there is no time to retransmit. If UDP is used and a reliable delivery is required, packet sequence checking and error notification must be written into the applications.

UPC. Universal Product Code. A relatively complex numeric symbology. Each character consists of two bars and two spaces, each of which is any of four widths. The standard symbology for retail food packages in the United States.

V

Visible Laser Diode (VLD). A solid state device which produces visible laser light.

W

Warm Boot. A warm boot restarts the mobile computer by closing all running programs. All data that is not saved to flash memory is lost.

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