SE655 Decoded Linear Imaging Engine

Integration Guide

SE655 Decoded Linear Imaging Engine Integration Guide

72E-136168-05
Revision A
March 2012

Motorola Solutions, Inc.
One Motorola Plaza
Holtsville, New York 11742-1300
http://www.motorolasolutions.com

Warranty

For the complete Motorola hardware product warranty statement, go to:
http://www.motorola.com/enterprisemobility/warranty

Revision History

Changes to the original manual are listed below:

Change	Date	Description
-01 Rev A	3/2011	Initial release
-02 Rev A	6/2011	Updated: Matrix 2 of 5 default length; *Table 5-6* format; *Table 5-7* Bootup and System Failure code values; Field Description table formats; decode ranges; technical specifications.
-03 Rev A	7/2011	Updated *Figure 2-2 on page 2-2* to include location of engine Pin 1.
-04 Rev A	1/2012	Updated the microprocessor reset period (*page 1-2*).
-05 Rev A	3/2012	Updates for Rev C software: • Changed "time from low power to normal operation" to <10 ms. • Updated "DISABLE ALL SYMBOLOGIES" host and decoder requirements. • Updated UCC Coupon Extended Code and Coupon Report. • Added the following params: Additional Scan Data Transmission Format; Parameter Scanning; Parameter Pass Through; Prefix /Suffix Values; Host Serial Response Time-out; Host Character Time-out. • Added the following SSI Commands: Disable All Symbologies; SCAN_DISABLE; SCAN_ENABLE. • Added Codabar Upper or Lower Case Start/Stop Characters Detection • Changed low power current from 1.5 mA to 115 μA.

Table of Contents

About This Guide

Introduction

The *SE655 Decoded Linear Imaging Engine Integration Guide* provides general instructions for mounting and setting up the engines.

NOTE This guide provides general instructions for the installation of the scan engine into a customer's device. It is recommended that an opto-mechanical engineer perform an opto-mechanical analysis prior to integration.

Configurations

Available versions of the SE655 scan engine include:

- SE655-E100R - 1D linear CCD engine

Chapter Descriptions

Topics covered in this guide are as follows:

- *Chapter 1, Getting Started* provides an overview, theory of operation, and power management information for the engine and decoder.
- *Chapter 2, Installation* describes how to install the engine, and provides considerations for ESD, optical, and positioning aspects.
- *Chapter 3, SE655 Specifications* provides the technical specifications for the SE655 engine.
- *Chapter 4, Parameter Menus* provides the bar codes necessary to program the scan engine system.
- *Chapter 5, Serial Interface Protocol* describes the system requirements of the Simple Serial Interface (vSSI), which provides a communications link between decoders and a serial host.
- *Appendix A, Miscellaneous Code Information* provides information on AIM code identifiers.

Notational Conventions

The following conventions are used in this document:

- *Italics* are used to highlight chapters and sections in this and related documents.
- **Bold** text is used to highlight parameter and option names:
- 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.

NOTE This symbol indicates something of special interest or importance to the reader. Failure to read the note will not result in physical harm to the reader, equipment or data.

CAUTION This symbol indicates that if this information is ignored, the possibility of data or material damage may occur.

WARNING! **This symbol indicates that if this information is ignored the possibility that serious personal injury may occur.**

Service Information

If you have a problem using the equipment, contact your facility's technical or systems support. If there is a problem with the equipment, they will contact the Motorola Solutions Global Customer Support Center at: www.motorolasolutions.com/support.

When contacting the Motorola Solutions Global Customer Support Center, please have the following information available:

- Serial number of the unit
- Model number or product name
- Software type and version number.

Motorola responds to calls by E-mail, telephone or fax within the time limits set forth in support agreements.

If your problem cannot be solved by Motorola support, you may need to return your equipment for servicing and will be given specific directions. Motorola is not responsible for any damages incurred during shipment if the approved shipping container is not used. Shipping the units improperly can possibly void the warranty.

If you purchased your business product from a Motorola business partner, contact that business partner for support.

Chapter 1 Getting Started

Introduction

The SE655 engine is a miniaturized, good performance single line CCD-based, decoded bar code scan engine.

The scan engine offers an economic solution without compromising size, quality, reliability, durability and performance. The engine is an improvement over its predecessors, the SE625 and CSE600.

Features include:

- Steady and crisp, easy to see aiming line.
- 50 scans/second nominal.
- Fast decode time: typical 15 msec.
- Integration Flexibility - small size and lightweight to maximize the customer's design flexibility.
- Low power consumption that maximizes battery life in portable devices.
- Flash upgradable.
- Custom default settings.
- Drop shocks of 2,000G.
- RoHS compliant upon product release.

With over 8 million scan engines installed worldwide, Motorola scan engines are unmatched for reliability, performance, durability and size.

Theory of Operation

The SE655 is a scan engine combined with a microprocessor to control the functionality of the engine, perform decoding of 1D bar codes and provide a communication link to the host computer.

Scan Engine

The basic functionality of a scan engine is outlined below:

- An LED is focused to generate a narrow, horizontal slab of light, which is aligned to be coincidental with the sensor's field of view. The LED is used for both aiming and illumination.
- The 1500 pixel CCD sensor captures the linear image producing an analog waveform, which is fed to an A/D input of the microprocessor.
- The waveform is sampled and analyzed by the decoder software, which runs on the microprocessor.
- Upon a successful decode the microprocessor turns off the LED, asserts the DECODE signal, and sends the ASCII data to the host.
- The microprocessor may enter sleep mode, in which the power supply to the peripheral circuitry is shut off for the purpose of reducing the power consumption.

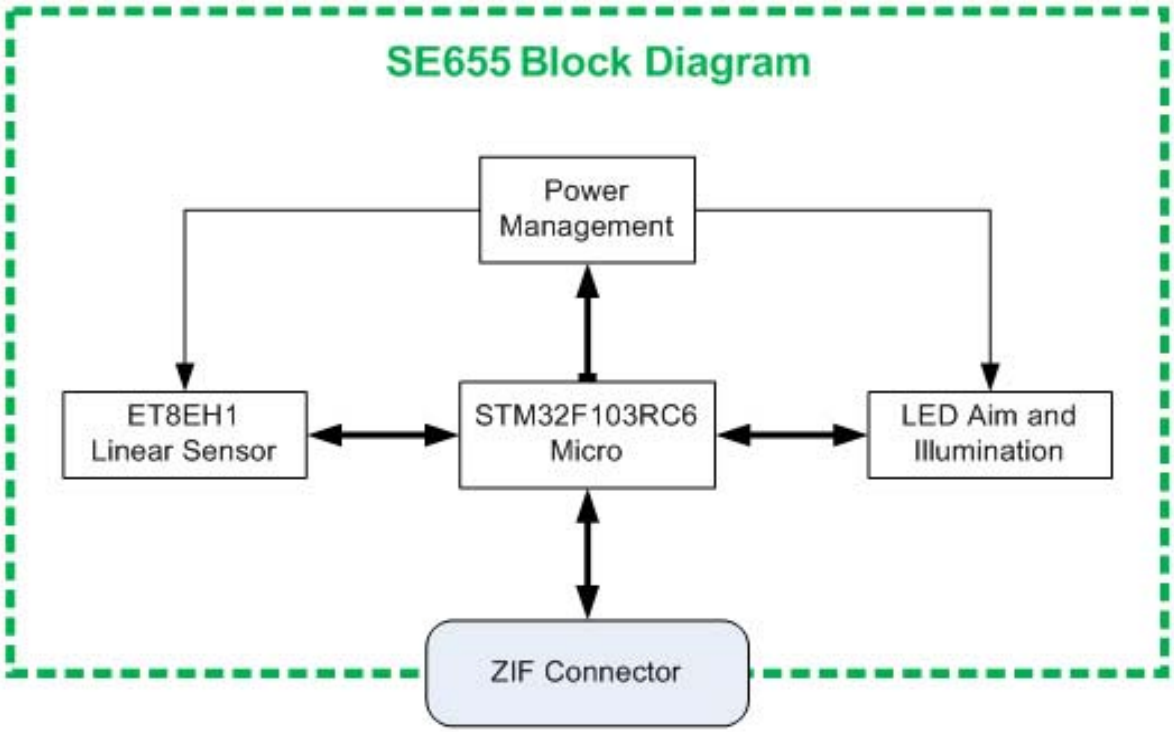


Figure 1-1 *Symbol SE655 Scan Engine Block Diagram*

The LED control circuitry is designed to ensure compliance with the regulatory eye safety requirements.

Microprocessor

The SE655 utilizes a microprocessor to drive the vSSI host interface, to control the scanning functional blocks, and to perform general decoder maintenance.

The micro-controller contains a watchdog timer. The enabling/disabling and maintenance of this watchdog are internal to the SE655; the host cannot configure the watchdog. The decoder's reset circuitry holds the micro-controller in reset after power-up to allow sufficient time for hardware initialization. This reset period will be no more than 50 milliseconds. A reset can occur upon power up, or power supply voltage falling below 2.7 V.

Power Management

The SE655 has two power states (Awake and Sleep) and two power modes (Continuous Power and Low Power).

Power States

WAKEUP and SLEEP commands (see *WAKEUP on page 5-30* and *SLEEP on page 5-27*), are sent to the scan engine to set the Power state to Awake or Sleep. The Low Power mode has an automatic timer that puts the unit into the Sleep state after a specified period of time.

When the SE655 is in the Sleep power state the PWRDWN signal (see *Table 1-3*) is asserted. The host uses this signal to remove power from the SE655. Do not remove power without using this signal since the PWRDWN signal is the only indication if the decoder is not transmitting, receiving, decoding, or writing data to non-volatile memory.

Power Modes

Power modes are controlled by the Power Mode parameter (see *Power Mode on page 4-8*).

- In **Continuous Power** mode, the scan engine remains in the Awake state after each decode attempt. The Continuous Power mode parameter (see *Power Mode on page 4-8*) sets the SE655 to remain in the Awake power state unless it receives a SLEEP command. In this mode, the SE655 can switch power states using the SLEEP and WAKEUP commands (see *SLEEP on page 5-27* and *WAKEUP on page 5-30*); automatic power state switching is not supported.
- In **Low Power** mode, the scan engine enters into a low power consumption Sleep state whenever possible (provided all WAKEUP commands were released), drawing less current than in Continuous Power mode. This makes the Low Power mode more suitable for battery powered applications. The Low Power mode also allows the SE655 to switch power states using the SLEEP and WAKEUP commands (see *SLEEP on page 5-27* and *WAKEUP on page 5-30*). The SE655 must be awakened from the Sleep power state before performing any functions.

Table 1-1 shows how to put the SE655 into Low Power mode. *Table 1-2* shows how to awaken it.

Table 1-1 *Putting the SE655 into Low Power Mode*

Action	Behavior
Set the Power Mode parameter to Low Power	The SE655 enters Low Power mode and automatically switches to the Sleep power state whenever possible.
Send the serial SLEEP command	The SE655 enters Sleep power state only once, as soon as possible.

Table 1-2 *Waking Up the SE655*

Signal	State to Wakeup
WAKE*	High to low transition
TRIG*	High to low transition
RXD	Send 00h

Signal names with the "*" modifier are asserted when at the positive logic 0 state (active low). Signal names without the "*" modifier are asserted when at the positive logic 1 state (active high).

When the SE655 is awakened, it remains awake for at least 1 second before re-entering Low Power mode. The host must perform its first action within the 1 second time period if the power mode parameter is set to Low Power.

Electrical Interface

Table 1-3 lists the pin functions of the SE655 interface.

Table 1-3 *Electrical Interface*

Mnemonic (Signal Name)	Pin No.	I/O	Description
PWRDWN	1	Out	Power Down
DVDD	2	-	Supply voltage (nominal 3.3V)
GND	3	-	Ground
WAKE*	4	In	Wake Up (active low)
DECODE	5	Out	Decode Signal The decode signal (DECODE) is asserted by the SE655 whenever the unit successfully decodes a bar code. This signal remains asserted for 200 msec. A host system could use this signal to control a beeper/tone generation circuit to provide audible feedback to the user.
TRIG*	6	In	Trigger (active low)
NC7	7	-	Reserved for special use
NC8	8	-	Reserved for special use
UART1_RX	9	In	UART TTL Receive
UART1_TX	10	Out	UART TTL Transmit

Notes:
1. I/O refers to signal direction relative to the engine (“In” is input to engine).
2. Interface connector: FCI 10051922.
2. Signal names with the “*” modifier are asserted when at the ground level (logic 0, active low).

The voltage characteristics and current characteristics in *Table 1-4* and *Table 1-5*, respectively are stress ratings only and functional operation of the engine at these conditions is not implied. Exposure to maximum rating conditions for extended periods may affect engine reliability. Stresses above the absolute maximum ratings listed these tables may cause permanent damage to the engine.

Table 1-4 *Voltage Characteristics*

Symbol	Ratings	Min	Max	Unit
V_{DD}–V_{SS}	External main supply voltage (including V_{DDA} and V_{DD})(1)	–0.3	4.0	V
V_{IN}	Input voltage on five volt tolerant pin(2)	V_{SS} – 0.3	+5.5	
	Input voltage on any other pin(2)	V_{SS} – 0.3	V_{DD}+0.3	
$\lvert\Delta V_{DDx}\rvert$	Variations between different V_{DD} power pins		50	mV
$\lvert V_{SSX} - V_{SS}\rvert$	Variations between all the different ground pins		50	
$V_{ESD(HBM)}$	Electrostatic discharge voltage (human body model)	Based on three different tests (ESD, LU) using specific measurement methods, the device is stressed in order to determine its performance in terms of electrical sensitivity.		

Notes:
1. All main power (V_{DD}, V_{DDA}) and ground (V_{SS}, V_{SSA}) pins must always be connected to the external power supply, in the permitted range.

2. $I_{INJ(PIN)}$ must never be exceeded (see *Table 1-5 on page 1-5*). This is implicitly insured if V_{IN} maximum is respected. If V_{IN} maximum cannot be respected, the injection current must be limited externally to the $I_{INJ(PIN)}$ value. A positive injection is induced by $V_{IN} > V_{IN}$ max while a negative injection is induced by $V_{IN} < V_{SS}$.

Table 1-5 *Current Characteristics*

Symbol	Ratings	Max.	Unit
I_{IO}	Output current sunk by any I/O and control pin	25	mA
	Output current source by any I/Os and control pin	-25	mA

Chapter 2 Installation

Introduction

This chapter provides information for mounting and installing the SE655 scan engine, including physical and electrical considerations and recommended window properties.

The Motorola SE655 imager engine meets the accessible light limits for an IEC Class 1 LED device. Any product containing the SE655 can meet these same regulations. Contact a Motorola sales representative for further details.

ESD

The SE655 is protected from ESD events that may occur in an ESD-controlled environment. Always exercise care when handling the module. Use grounding wrist straps and handle in a properly grounded work area.

Environment

The SE655 must be sufficiently enclosed to prevent dust particles from gathering on the optical components. Dust and other external contaminants eventually cause degradation in unit performance. Motorola does not guarantee performance of the engine when used in an exposed application.

Mounting

Install the engine to the UDK board using the holes shown. The holes in the engine are for self tapping screws. Install the engine to the corresponding holes based on the information contained in Table 1 on the UDK board silk screen. Recommended hardware: p/n 50-12800-1276, M1.6- Trilobe x 4 mm, Pan, TX. Note that a minimum of 3.5 mm of screw penetration into the chassis is recommended.

NOTE Unless otherwise specified:

1. Chassis is electrically isolated.
2. These drawings are for reference only. For complete integration requirements, see the appropriate sections in this guide.
3. Pointing of scan and illumination rays can skew by ± 3°.

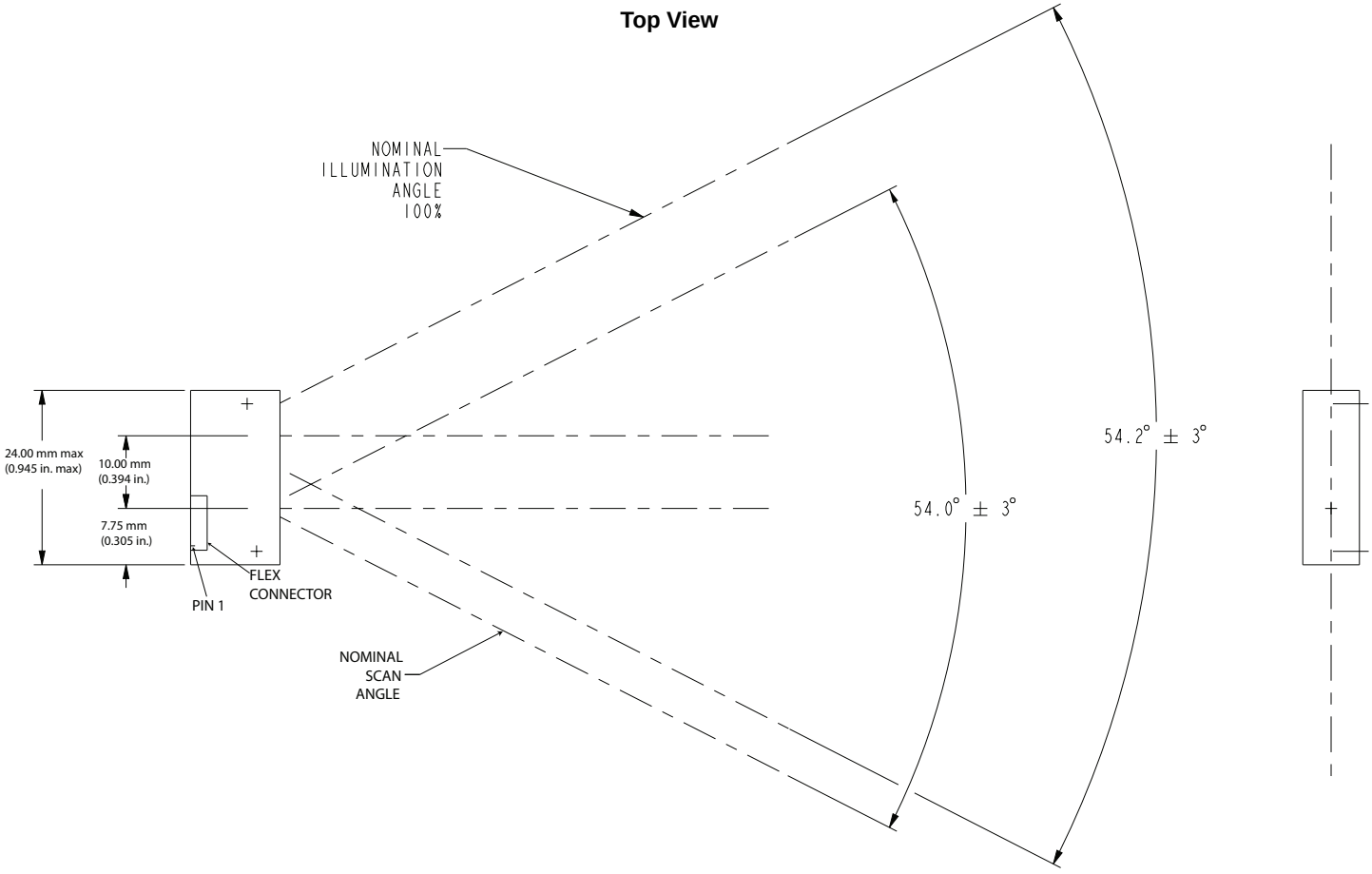


Figure 2-2 *SE655 Mounting Diagram - Top View*

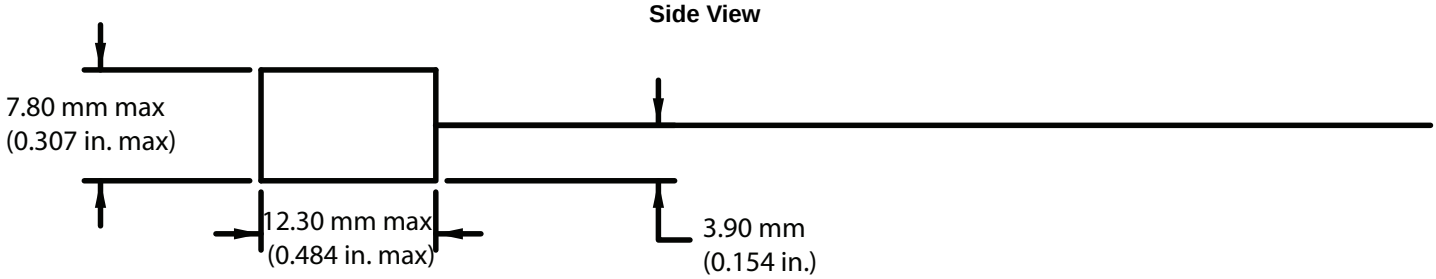


Figure 2-3 *SE655 Mounting Diagram - Side View*

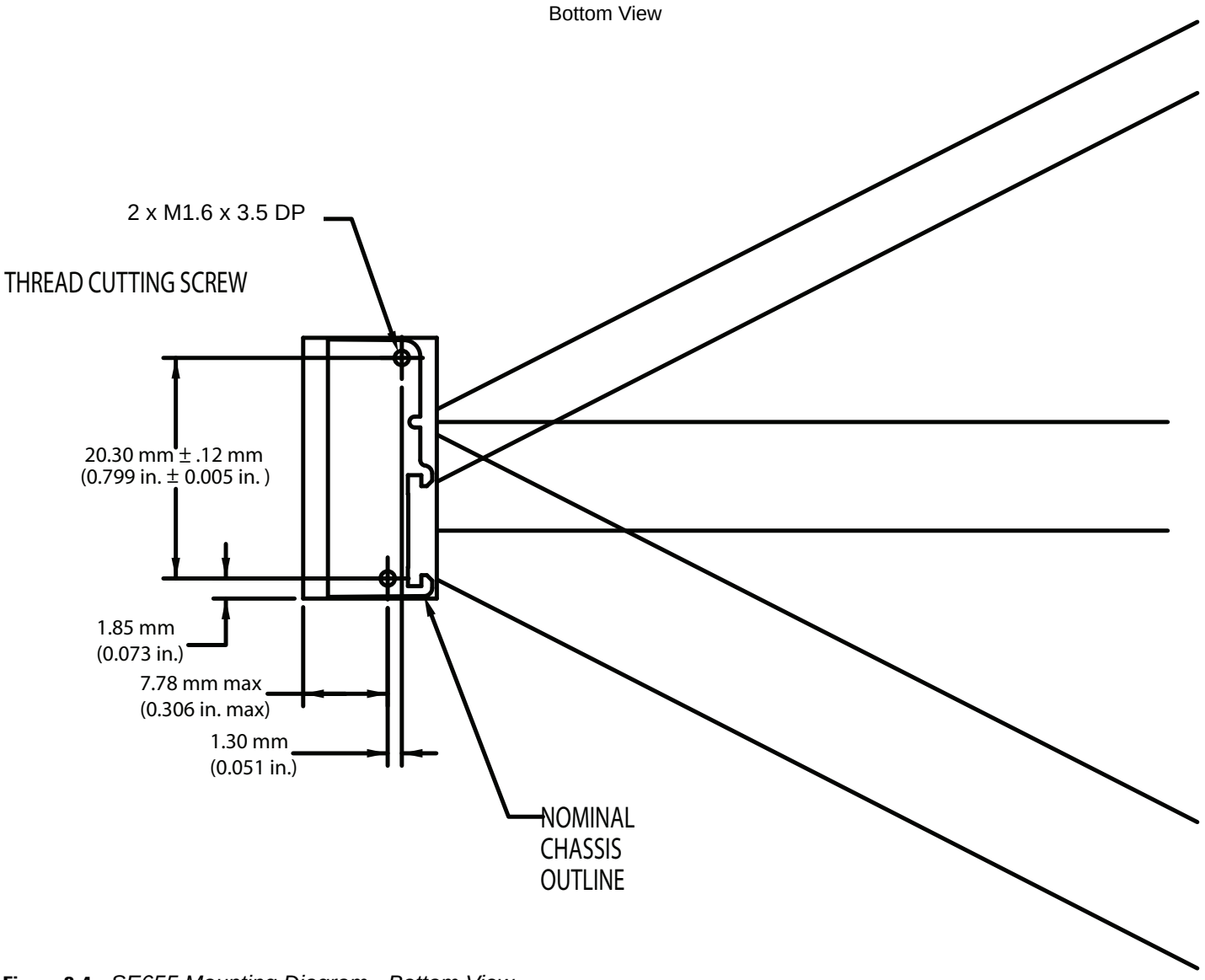


Figure 2-4 *SE655 Mounting Diagram - Bottom View*

Installing the SE655

Before installing the SE655 into the host equipment, consider these important points:

- The SE655 chassis is not electrically connected to ground.
- Leave sufficient space to accommodate the maximum size of the engine.

Table 2-6 *Screw Torque*

	Recommended
Standard	14 ± 2 oz-in
Metric	0.72 ± 0.14 kg-cm

NOTE The recommended torque applies to the Tri-Lobe screw called out above. Other thread cutting screw types may require a greater torque to assure full seating of the engine. Each mounting application should be dealt with on a case by case basis.

CAUTION When integrating scan engines into their final destination, adhesives may be required. High quality optical surfaces are sensitive to out-gassing from adhesives such as cyanoacrylates (super glue). Out-gassing is the release of a gas/vapor/particulate trapped in the adhesive. Most out-gassing occurs while the adhesive is curing. During this time, particulate can collect on critical surfaces and reduce engine performance. Therefore, Motorola strongly recommends using very low out-gassing/blooming adhesives such as acrylics or epoxies when adhesives are required.

Optical

The SE655 uses a sophisticated optical system that provides scanning performance that matches or exceeds the performance of much larger scan engines. The performance of the scan engine is not affected by a properly designed enclosure.

NOTE This guide provides general instructions for the installation of the scan engine into a customer's device. It is recommended that an opto-mechanical engineer perform an opto-mechanical analysis prior to integration.

The following guidelines aid the Optical Engineer in design and specification of the window and enclosure.

Housing Design

The orientation of the exit window has a large effect on scan engine performance. See *Table 3-2 on page 3-5* for exit window distances. In addition to providing obstacle-free paths for outgoing and incoming light, a good housing design ensures that the outgoing light reflected off of the window back into the housing is attenuated sufficiently before reaching the detector.

Unwanted light reaching the detector is termed “stray light”. As a goal, stray light should be kept as minimal as possible for full range performance. Stray light is difficult to model and is highly dependent upon the housing design. It is influenced by the placement of the exit window and the surface properties of the components in the immediate vicinity of the scan engine. The surface color and finish of components surrounding the engine must be considered. Black surfaces can absorb as much as 90%-98% of the incident light. Smooth specular reflecting surfaces can be used to steer stray light away from the engine. Diffuse surfaces can be used to attenuate the light by spreading the reflected light over a wide range of angles. Use caution if the scan line reflects off of circuit boards. Traces and solder pads behave like mirrors and can inadvertently cause performance degradation.

The tilt of the exit window is properly determined by ray tracing the exit beam reflection off of the window, and ensuring that the reflected light is directed away from the inside of the scan engine. This analysis should include the positional and angular tolerances of the scan engine and exit window. Recessing the window into the housing is also recommended to prevent scratches on the window. In keeping with good practice, a proper design should be supplemented with testing and verification.

The height and width of the exit window is determined such that the outgoing beam and return light is not clipped. See *Figure 2-10 on page 2-13* and *Table 2-10 on page 2-13* for recommended minimum widths at various window positions. It is highly recommended to analyze additional positioning tolerance of the scan engine based on your specific application and increase window size accordingly.

NOTE SE655 performance is not sensitive to exit window thickness. However, window thickness is application dependent. For most applications it is 1.0 mm to 2.0 mm (.039 in to 079 in).

Wavefront Distortion

Wavefront distortion is a measure of the window's optical quality. Since the optical requirements of the exit window are different for the exit and entrance beam envelopes, the imaging clear aperture and the illumination clear aperture are defined. The imaging clear aperture requires high optical performance, and the illumination clear aperture requires fair optical performance. See *Figure 2-5* for the location of the two apertures.

The following Wavefront Distortion specifications are recommended:

Wavefront Distortion (transmission) measured at 633 nm

1. Within imaging clear aperture: Over any 1.0 mm diameter area.
   - optical power measured in any direction: <0.050 waves
   - irregularities after subtracting optical power and astigmatism: <0.120 waves (P-V) and < 0.015 waves (RMS).
2. Within illumination clear aperture: < 10 waves (P-V).

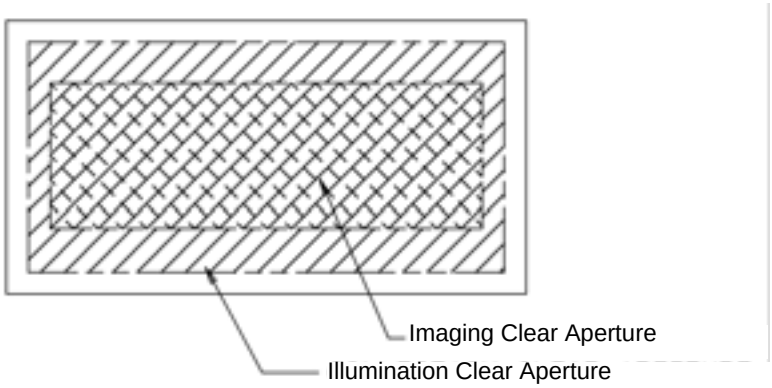


Figure 2-5 *Clear Apertures*

Imaging Clear Aperture

The imaging clear aperture is the area on the exit window that intersects the beam envelope as shown in *Figure 2-6*. For dimensions and information about clear aperture calculations see *Exit Window Characteristics on page 2-13* and *Exit Window Positioning on page 2-13*.

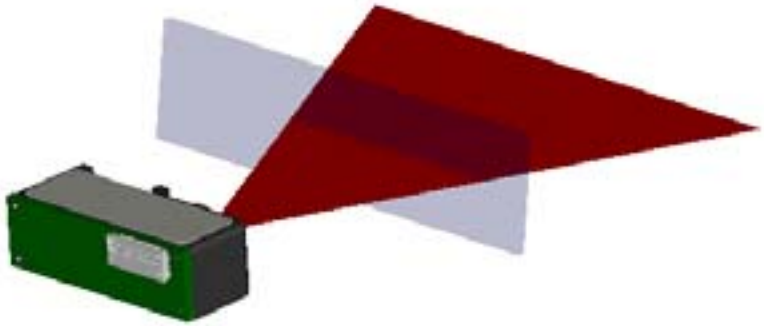


Figure 2-6 *Imaging Beam Envelope*

Illumination Clear Aperture

As shown in *Figure 2-7*, the illumination clear aperture is the area on the exit window which intersects the illumination beam envelope. In both cases, ensure that the paths are free of obstructions. Also incorporate a minimum of a 0.020” to 0.040” spacing between the clear apertures and the window borders.

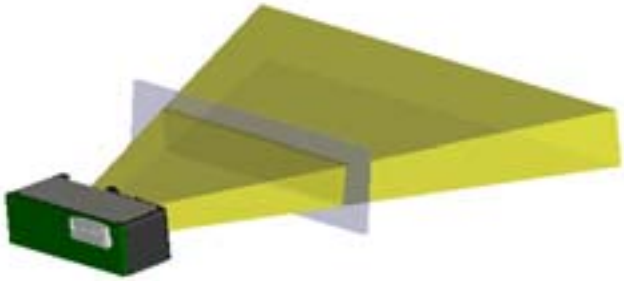


Figure 2-7 *Illumination Beam Envelope*

Combined Imaging and Illumination Clear Aperture

Figure 2-7 shows the combined imaging and illumination beam envelope. Minimum exit window size, as defined in *Table 2-10 on page 2-13*, is the area of intersection between the illumination field of view and the plane of the exit window at that particular distance. The imaging clear aperture is a subset of this area and for the purpose of exit window design can be considered to be 1 mm smaller all around.

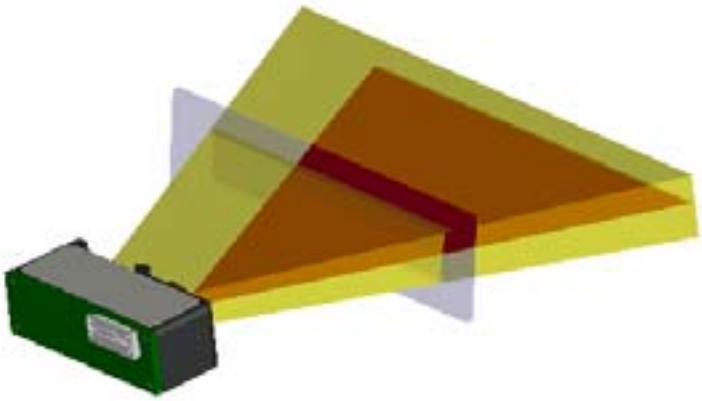


Figure 2-8 *Combined Imaging and Illumination Beam Envelope*

Exit Window Materials

Many window materials that look perfectly clear to the eye can contain stresses and distortions which affect the beam and reduce scan engine performance. For this reason, only optical glass or cell cast plastics are recommended. Following are descriptions of three popular exit window materials:

- Poly-methyl Methacrylic (PMMA)
- Allyl Diglycol Carbonate (ADC)
- Chemically tempered float glass.

Cell Cast Acrylic (ASTM: PMMA)

Cell Cast Acrylic, or Poly-methyl Methacrylic is fabricated by casting acrylic between two precision sheets of glass. This material has very good optical quality, but is relatively soft and susceptible to attack by chemicals, mechanical stress and UV light. It is strongly recommended to have acrylic hard-coated with Polysiloxane to provide abrasion resistance and protection from environmental factors. Acrylic can be laser-cut into odd shapes and ultrasonically welded.

Cell Cast ADC, Allyl Diglycol Carbonate (ASTM: ADC)

Also known as CR-39™, ADC, a thermal setting plastic widely used for plastic eyeglasses, has excellent chemical and environmental resistance. It also has an inherently moderate surface hardness and therefore does not require hard-coating. This material cannot be ultrasonically welded.

Chemically Tempered Float Glass

Glass is a hard material which provides excellent scratch and abrasion resistance. However, unannealed glass is brittle. Increased flexibility strength with minimal optical distortion requires chemical tempering. Glass cannot be ultrasonically welded and is difficult to cut into odd shapes.

Table 2-7 *Suggested Window Properties*

Property	Description
Material	Red cell-cast acrylic.
Spectral Transmission	85% minimum from 635 to 690 nanometers.
Thickness	0.059 ± 0.005
Wavefront Distortion (transmission)	0.2 wavelengths peak-to-valley maximum over any 0.08 in. diameter within the clear aperture.
Surface Quality	60-20 scratch/dig
Coating	Both sides to be anti-reflection coated to provide 0.5% max reflectivity (each side) from 635 to 690 nanometers at nominal window tilt angle. Coatings will comply with the hardness adherence requirements of MIL-M-13508.

Abrasion Resistance

To gauge a window's durability, quantify its abrasion resistance using ASTM standard D1044, Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion. Also known as the Taber Test, this measurement quantifies abrasion resistance as a percent increase in haze after a specified number of cycles and load. Lower values of the increase in haze correspond to better abrasion and scratch resistance. See *Table 2-8*.

Table 2-8 *Taber Test Results on Common Exit Window Materials*

Sample	Haze 100 cycles	Haze 500 cycles	Abrasion Resistance
Chemically Tempered Float Glass	1.20%	1.50%	Best
PMMA with Polysiloxane Hardcoat	3%	10%	
ADC	5%	30%	
PMMA	30%		Worst
*** All measurements use a 100 gram load and CS-10F Abraser**			

Color

Plastic is available in a wide range of colors. Exit windows can be colored if desired as long as the optical transmission is in the spectral region between 640 nm and 670 nm (a minimum of 85%).

Surface Quality

Surface quality refers to residual defects on the surfaces of the window. The recommended window specification for this follows the US Military Specification Standard MIL-0-13830A for scratch and dig performance.

Surface Quality: 60-20 per MIL-0-13830A

Commercially Available Coatings

Table 2-9 on page 2-10 lists some exit window manufacturers and anti-reflection coaters.

Anti-Reflection (AR) Coatings

Anti-reflection coatings are not required for SE655 stray light control.

Polysiloxane Coating

Polysiloxane type coatings are applied to plastic surfaces to improve the surface resistance to both scratch and abrasion. They are generally applied by dipping and then allowed to air dry in an oven with filtered hot air.

Table 2-9 *Exit Window Manufacturers and Coaters*

Company	Discipline	Specifics
Fosta-Tek Optics, Inc. 320 Hamilton Street Leominster, MA 01453 (978) 534-6511	Cell-caster, hard coater, laser cutter	CR39 exit window manufacturer
Glasflex Corporation 4 Sterling Road Stirling, NJ 07980 (908) 647-4100	Cell-caster	Acrylic exit window manufacturer
Optical Polymers Int. (OPI) 110 West Main Street Milford, CT 06460 (203)-882-9093	CR-39 cell-caster, coater, laser cutter	CR39 exit window manufacturer
Polycast 70 Carlisle Place Stamford, CT 06902 800-243-9002	Acrylic cell-caster, hard coater, laser cutter	Acrylic exit window manufacturer
TSP 2009 Glen Parkway Batavia, OH 45103 800-277-9778	Acrylic cell-caster, coater, laser cutter	Acrylic exit window manufacturer

Location and Positioning

NOTE Integrate the scan engine in an environment no more extreme than the product's specification, where the engine does not exceed its temperature range. For instance, do not mount the engine on to or next to a large heat source. When placing the engine with another device, ensure there is proper convection or venting for heat. Follow these suggestions to ensure product longevity, warranty, and overall satisfaction with the scan engine.

Specular Reflection

When beams reflect *directly* back into the scanner from the bar code, they can "blind" the scanner and make decoding difficult. This phenomenon is called specular reflection.

To avoid this, scan the bar code so that the beam does not bounce *directly* back. But don't scan at too oblique an angle; the scanner needs to collect scattered reflections from the scan to make a successful decode. Practice quickly shows what angles to work within.

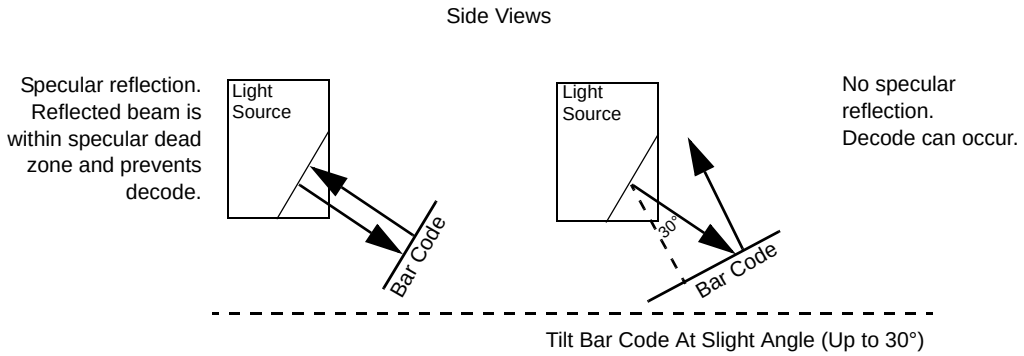


Figure 2-9 *Avoiding Specular Reflection*

When scanning a 1D bar code, there is only a small specular dead zone to avoid ($\pm$ 2^{o} from the direct beam). However, the scanner is not as effective if its beams hit the bar code's surface at an angle greater than 30^{o} from the normal to that surface.

Symbol Position with Respect to a Fixed-Mount Scan Engine

It is sometimes necessary to mount the SE655 in such a way that it is able to read symbols that are automatically presented to it, or that are always presented in a pre-determined location. In these situations positioning of the SE655 with respect to the symbol location is critical. Failure to properly position the scan engine and symbol may lead to unsatisfactory reading performance.

Following is a series of steps you should take to ensure satisfactory operation of the SE655 in your installation:

1. Determine the optimum distance between the scan engine and the symbol. Due to the large variety of symbol sizes, densities, print quality, etc., there is no simple formula to calculate this optimum symbol distance. Try this:
   a. Measure the maximum and minimum distance at which your symbols can be read.
   b. Locate the scan engine so the symbol is near the middle of this range when being scanned.

   Check the near and far range on several symbols. If they are not reasonably consistent there may be a printing quality problem that can degrade the performance of your system. Motorola can provide advice on how to improve your installation.
2. Center the symbol (left to right) in the scan line whenever possible.
3. Position the symbol so that the scan line is as near as possible to perpendicular to the bars and spaces in the symbol.
4. Avoid specular reflection (glare) off the symbol by tilting the top or bottom of the symbol away from the engine. The exact angle is not critical, but it must be large enough so that if a mirror were inserted in the symbol location, the reflected scan line would miss the front surface of the engine. See *Exit Window Characteristics on page 2-13* for maximum angles.
5. If a window is to be placed between the engine and the symbol, the determination of optimum symbol location should be made with a representative window in the desired window position. Read the sections of this chapter concerning window quality, coatings and positioning.
6. Give the scan engine time to dwell on the symbol for a minimum of 40 msec. Poor quality symbols take longer to decode. When first enabled, the scan engine may take two or three scans before it reaches maximum performance. Enable the scan engine before the symbol is presented, if possible.

Exit Window Characteristics

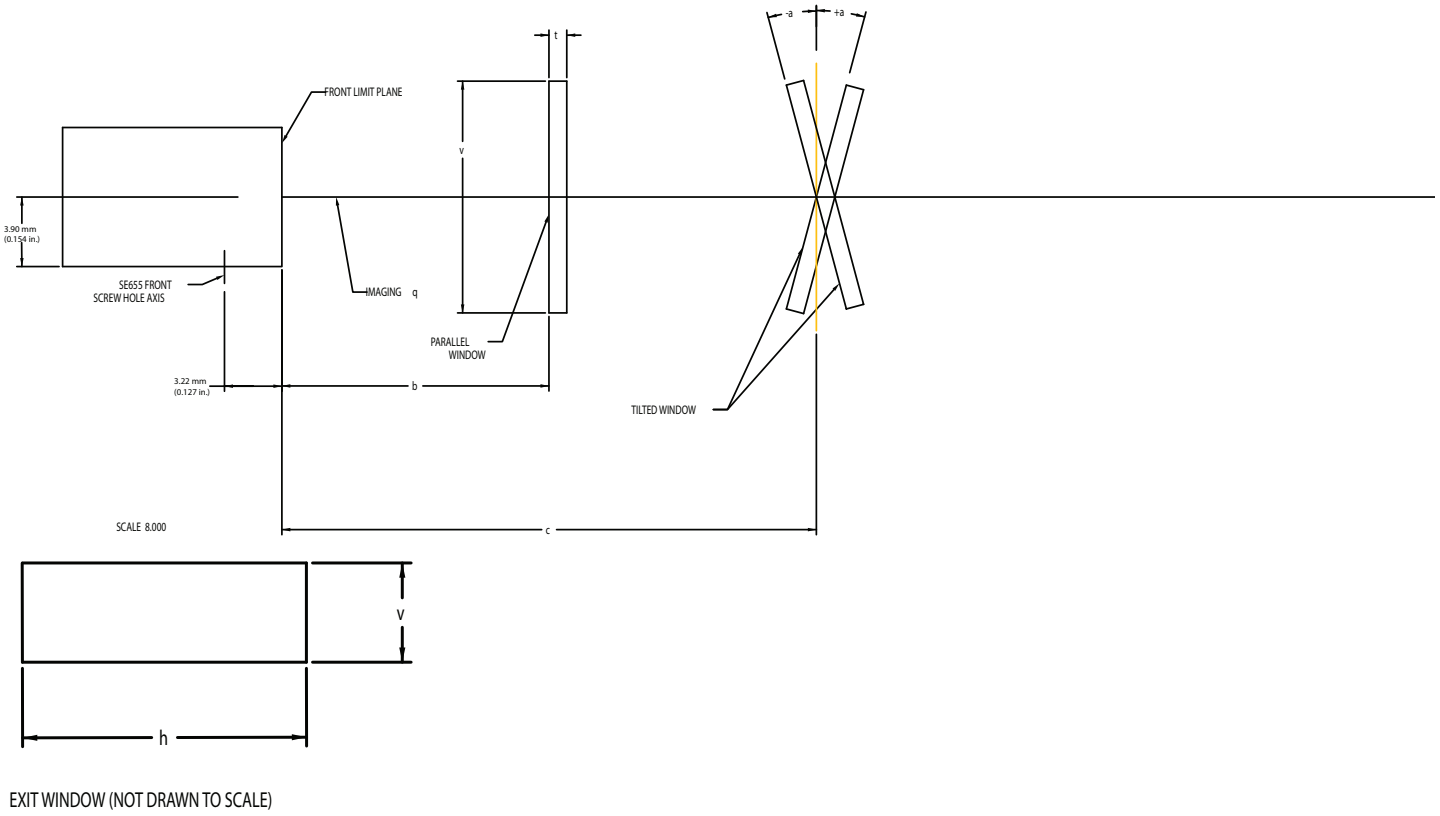


Figure 2-10 *Exit Window Positioning*

NOTE Ensure window is free of dust, smudges and scratches.

Table 2-10 *SE655 Exit Window Requirements*

Non-AR Coated Exit-Window Tile Angle for SE655 Integration					
Field	Distance	Tilt Angle (a) (Minimum for Far Field)		Minimum Exit Window Size	
				Horizontal (h)	Vertical (v)
Near	<.08 in (2mm) (b)	0	0	.91 in (23 mm)	.16 in (4 mm)
Far	0.25 in (6.35mm) (c)	+12~	-12~	1.14 in (29 mm)	.2 in (5 mm)
	0.5 in (12.7mm) (c)	+10~	-10~	1.42 in (36 mm)	.24 in (6 mm)
	1.0 in (25.4 mm) (c)	+7~	-7~	1.97 in (50 mm)	.28 in (7 mm)

Accessories

Flex Cables

A flex strip cable can be used to connect the SE655 scan engine to OEM equipment. Any custom flex strip cable must be designed to mate with the onboard connector, FCI part number 10051922, referenced in *Figure 2-12 on page 2-16* - the schematic representing the pin out for flex strip cable, p/n 15-141354-xx. *Figure 2-11 on page 2-15* illustrates the primary side of the 12-pin tapered flex strip cable (p/n 15-141354-xx) on the development board. *Figure 2-13 on page 2-17* illustrates Detail “B” and Detail “C.” *Table 2-11* lists the available accessories for the scan engine, available from Motorola.

Table 2-11 *Accessories: Flex Strips and Adapter Plate*

Item	Part Number
2.5 in. 12 Pin Flex Strip (10 count)	KT-15-141354-10
2.5 in. 12 Pin Flex Strip (100 count)	KT-15-141354-100
Universal (Scan Engine) Developer Kit	DKSE-1000-000R

Tapered 10-Pin to 12-Pin Flex Strip

The 10-pin to 12-pin flex strip in *Figure 2-11* below (p/n *15-141354-xx*) is recommended for evaluation purposes only and is intended for use with DKSE-1000-000R.

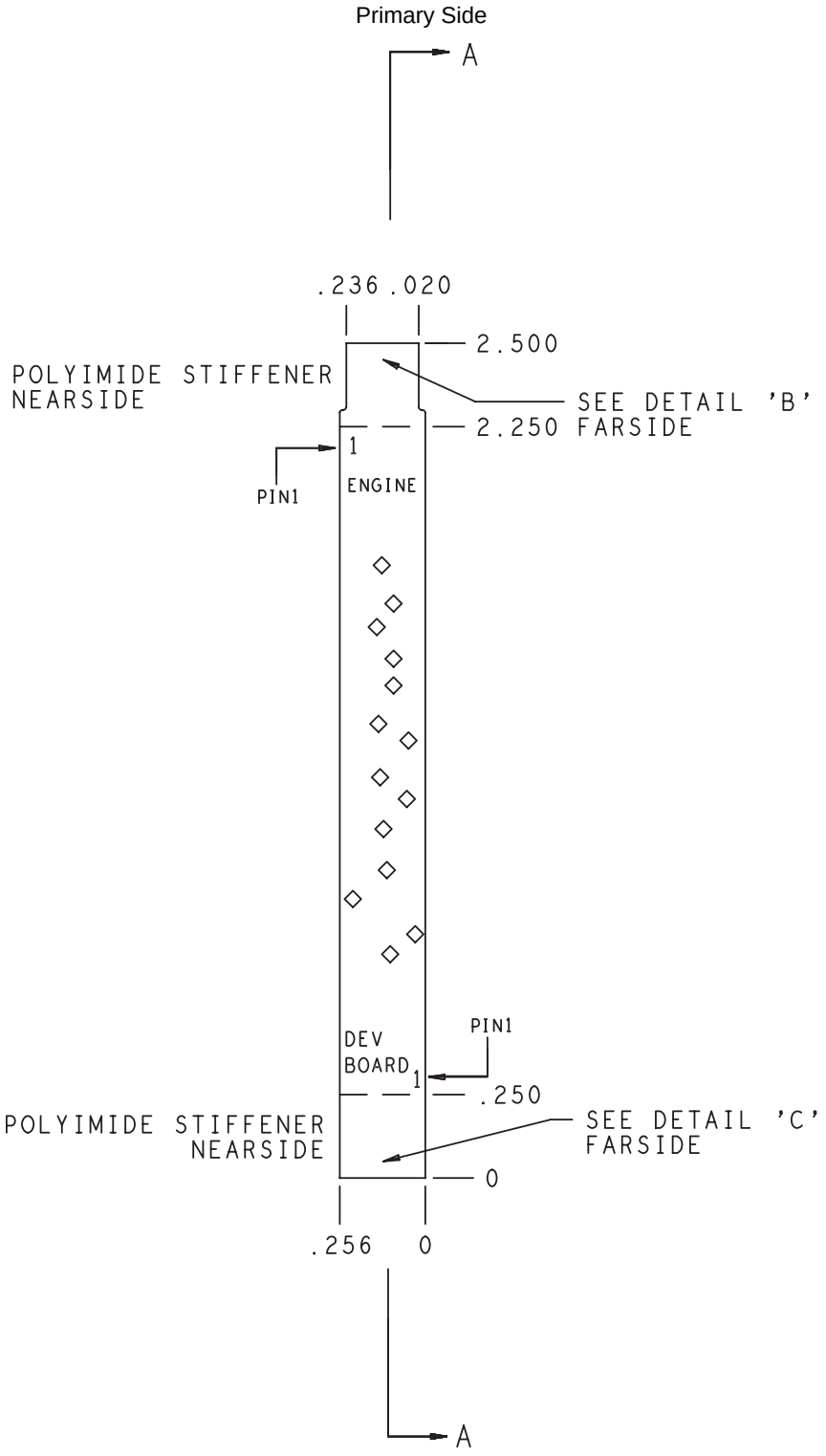


Figure 2-11 *Flex Strip, p/n 15-141354-xx; Primary Side*

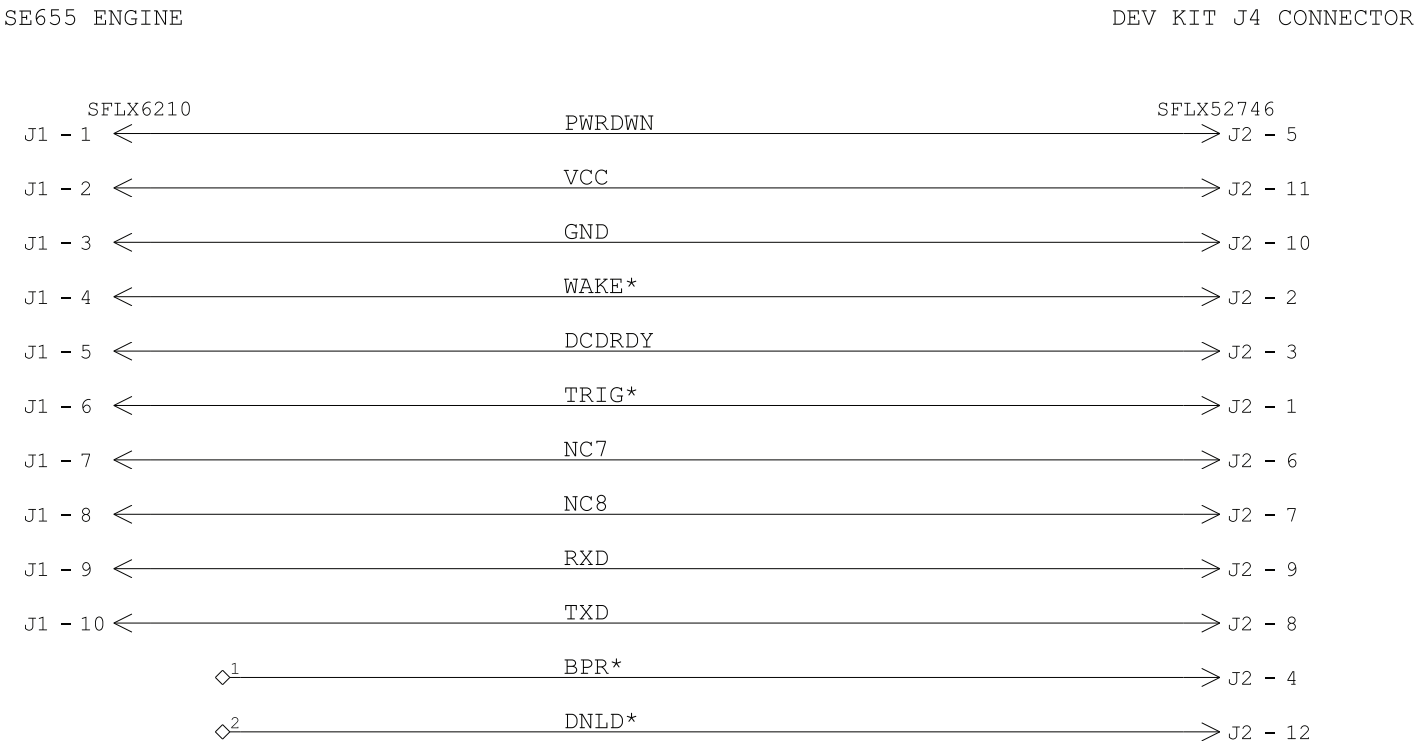
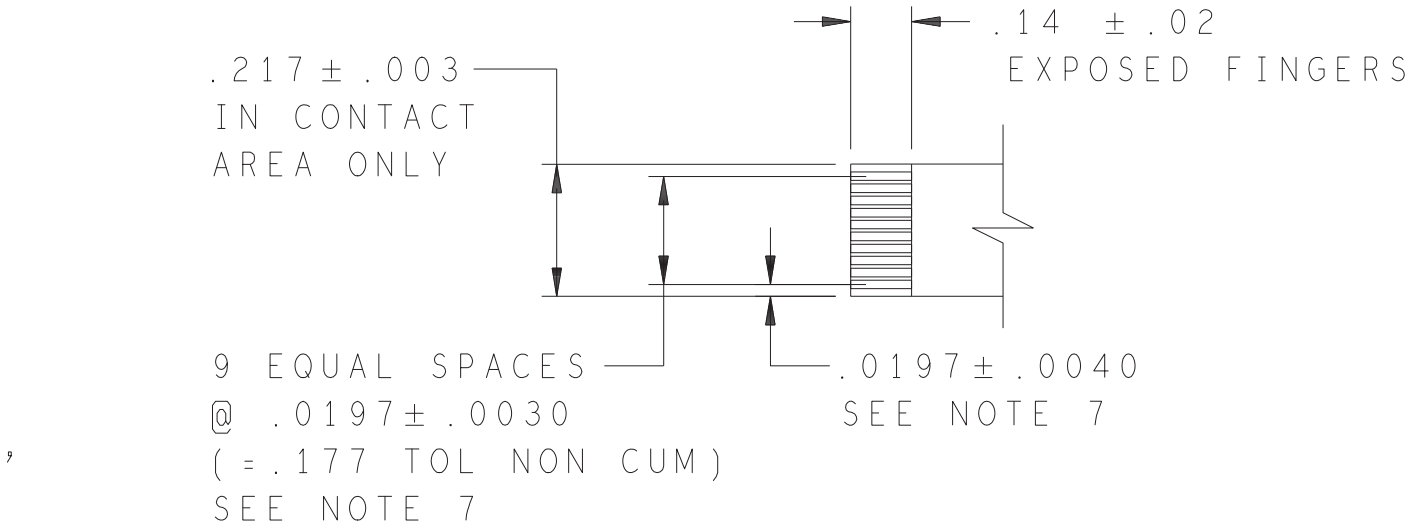
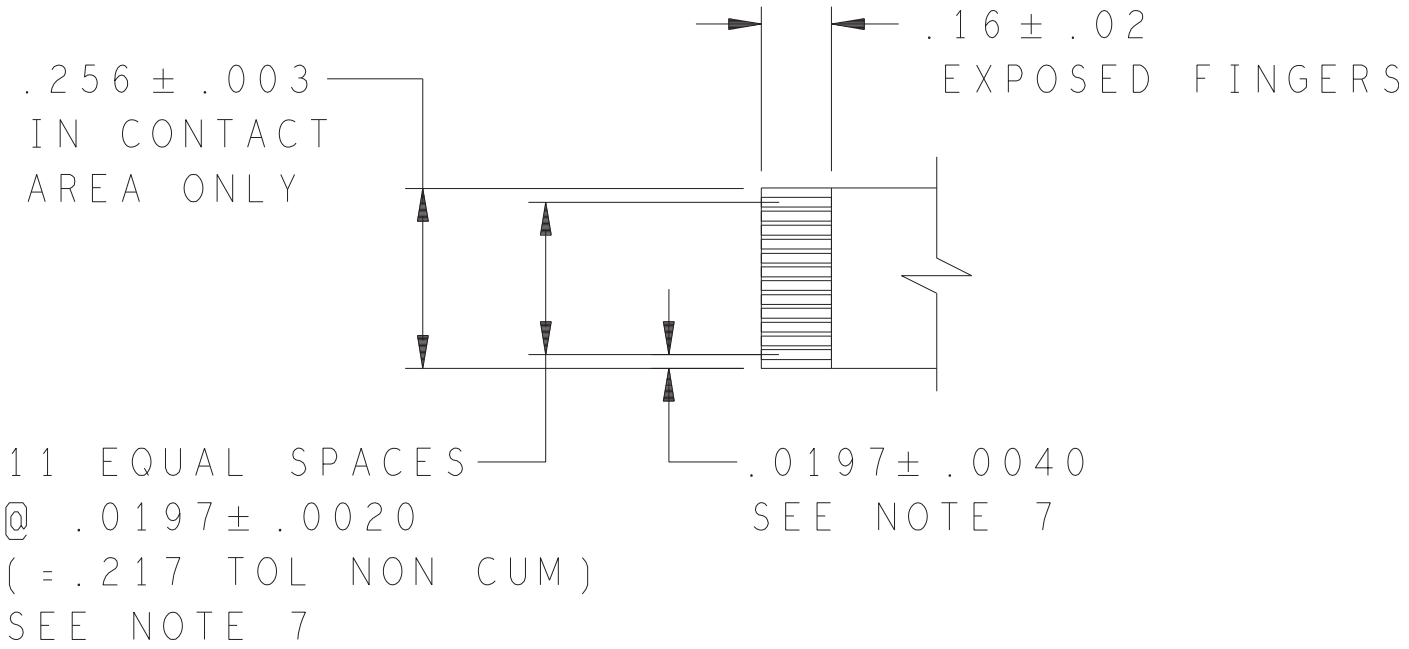


Figure 2-12 *Flex Strip 15-141354-xx, Schematic*



DETAIL "B"

SCALE: NONE



DETAIL "C"

SCALE: NONE

Figure 2-13 *Flex Strip, p/n 15-141354-xx; Detail "B" and Detail "C"*

Scan Engine Developer Kit

The Scan Engine Developer Kit (p/n DKSE-1000-000R) enables development of products and systems around the SE655 using the Windows 98, 2000, or XP platform. The kit provides the software and hardware tools required to design and test the embedded scan engine application before integration into the host device.

Chapter 3 SE655 Specifications

Introduction

This chapter provides the technical specifications of the SE655 scan engine. Decode zone and exit window characteristics are also presented.

Technical Specifications

Table 3-1 *Technical Specifications @ 23°C*

Item	Description
Power Requirements	
Input Voltage	3.0 VDC to 3.6 VDC
Scanning Current (Typical)	165 mA
Standby Current (Typical)	45 mA
Low Power Current (Typical)	115 µA
Time from low power to normal operation (standby)	<10 ms
Scan Repetition Rate	Nominally 50 scans/second
Optical Resolution	5 mil (minimum readable bar code module size)
Print Contrast	20% (minimum print contrast)
Scan Angle	53.3° ± 3°
Decode Depth of Field	See *Table 3-2 on page 3-5*
Pitch Angle	Condition: 100% UPC at 5 in. ± 65° from normal (see *Figure 3-1 on page 3-3*)

Table 3-1 *Technical Specifications @ 23°C (Continued)*

Item	Description
Skew Tolerance	Condition: 100% UPC at 5 in. ± 50° from normal (see *Figure 3-1 on page 3-3*)
Roll	Condition: 100% UPC at 5 in. ± 25° from vertical (see *Figure 3-1 on page 3-3*)
Ambient Light Immunity	**Light Source:** / **Intensity (lux):** Fluorescent — 4845 ± 5% High efficiency fluorescent — 4845 ± 5% Incandescent — 4845 ± 5% Mercury Vapor — 4845 ± 5% Sodium Vapor — 4845 ± 5% Sunlight — 9690 ±5%
Shock Endurance	2,000G applied via any mounting surface from 32° F to 122° F (0° C to 50° C) for a period of 0.85 msec.
Vibration	Point of sale: .02g²/Hz 20Hz to 2 KHz 60 minute duration per axis.
ESD Protection (IEC 61000-4-2)	±2kV Contact pin direct discharge, ±8kV indirect discharge.
RF Immunity (IEC 61000-4-3)	10V/m
Operating Temperature	-4° F to 122° F (-20° C to 50° C) in free air ambient temperature.
Storage Temperature	-40°F to 158° F (-40° C to 70° C)
Humidity	5% to 95% (non-condensing), not intended for exposed operation.
Height	0.303 in (7.7mm) maximum
Width	0.937 in (23.8mm) maximum
Depth of Chassis	0.472 in (12.0mm) maximum
Weight	0.035 ounces ± 0.009 ounces (approximately 1 gram ± 0.25 grams)
Regulatory	
Classification	Intended for use in CDRH Class II/IECClass 1 devices.
Electrical Safety	UL, VDE, and CUL recognized.
Emissions	FCC Part 15 Class B, ICES-003 Class B, CISPR Class B, Japan VCCI Class B
RoHS	Meets RoHS requirements

NOTE This diagram is for reference only. The scan engine pictured is not a facsimile.

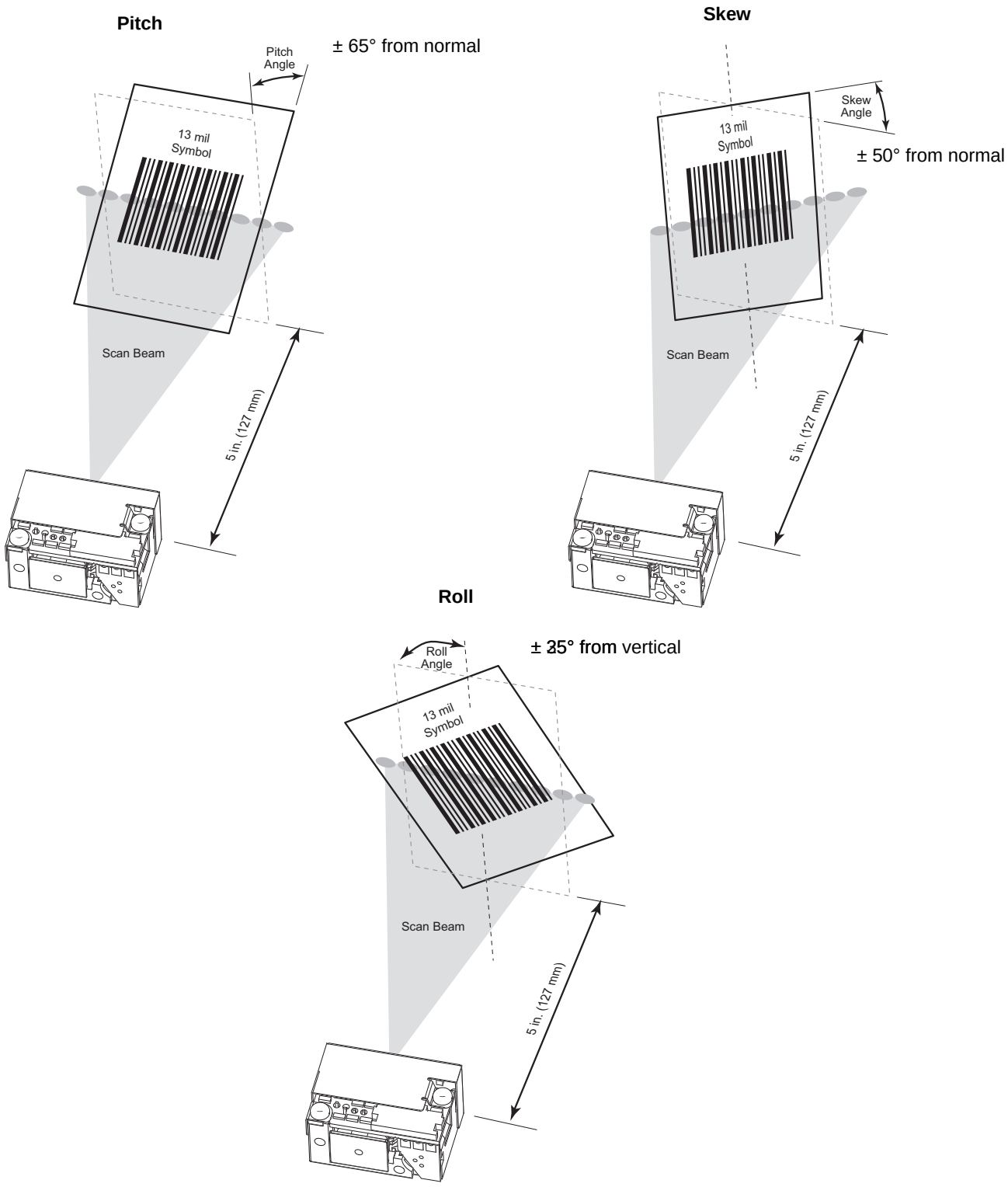
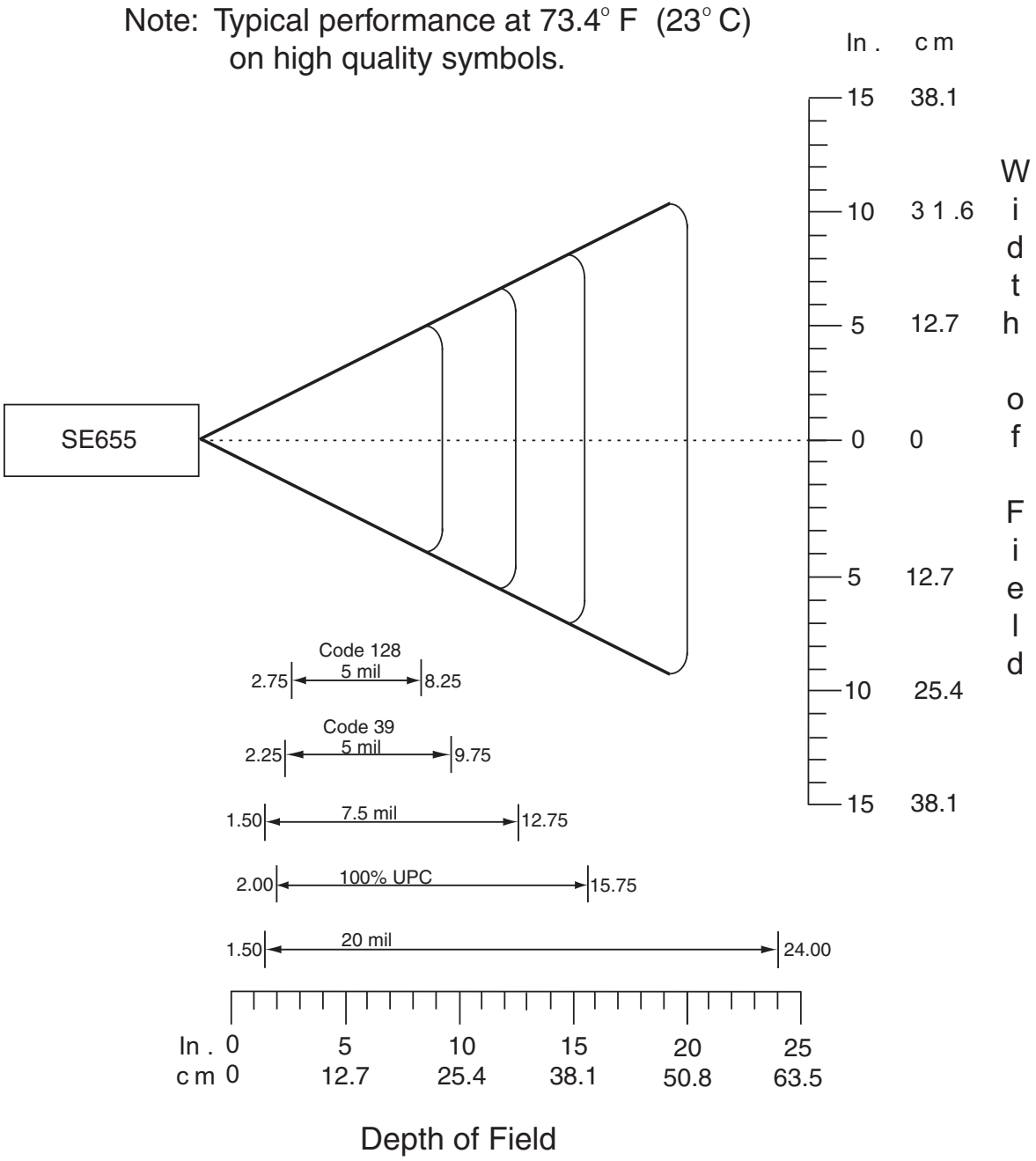


Figure 3-1 *Pitch, Skew and Roll*

Decode Ranges

Figure 3-2 shows the decode zone for the SE655 scan engine. The figures shown are typical values. *Table 3-2* lists the typical and guaranteed distances for selected bar code densities. The minimum element width (or “symbol density”) is the width in mils of the narrowest element (bar or space) in the symbol.



*Minimum distance determined by symbol length and scan angle

Figure 3-2 *SE655 Decode Zone*

Table 3-2 *Decode Ranges*

Barcode	Distance	Typical	Guaranteed
Code 128 5mil	Near	2.75 in. / 70 mm	3.90 in. / 99 mm
	Far	8.25 in. / 210 mm	6.25 in. / 159 mm
Code 39 5mil	Near	2.25 in. / 57 mm	3.15 in. / 80 mm
	Far	9.75 in. / 248 mm	8.00 in. / 203 mm
Code 39 7.5mil	Near	1.50 in. / 38 mm	2.50 in. / 64 mm
	Far	12.75 in. / 324 mm	10.25 in. / 260 mm
100% UPC-A	Near	2.00* in. / 51 mm	2.25 in. / 57 mm
	Far	15.75 in. / 400 mm	11.00 in. / 279 mm
Code 39 20mil	Near	1.50* in. / 38 mm	2.00* in. / 51 mm
	Far	24.0 in. / 610 mm	18.25 in. / 464 mm

Notes:
1. **Distances are measured from the front flange surface of the image lens.**
2. **The distances marked with asterisk (*) are a result of the field of view (FOV) limitation.**
3. **Image signal should be with "Raw" option checked**
4. **Successful decoder criteria: Less than 250ms decode time, maximum of two attempts.**
5. **Symbols are to be mounted with a pitch of 15 +/- 3 degrees away from the engine.**
6. **Maximum allowable roll angle of symbols relative to the engine mounting base plane is +/- 3.0 degrees.**

Chapter 4 Parameter Menus

Introduction

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

Operational Parameters

The SE655 is shipped with the factory default settings shown in *Table 4-1 on page 4-2.* These factory default values are stored in non-volatile memory and are preserved even when the scan engine is powered down. Changes to the factory default values are also stored in non-volatile memory and are preserved even when the scan engine is powered down.

To change the parameter values:

- Scan the appropriate bar codes included in this chapter. The new values replace the existing memory values. The factory default parameter values can be recalled by scanning **Set Factory Defaults** on *page 4-7*.

  or

- Send the parameter through the scan engine's serial port using the SSI command PARAM_SEND. Hexadecimal parameter numbers are shown in this chapter below the parameter title, and options appear in parenthesis beneath the accompanying bar codes. Instructions for changing parameters using this method are found in *Chapter 5, Serial Interface Protocol*.

Parameter Programming Recommendations

When setting parameters via bar code or via SSI with the permanent flag set, the following conditions must be met:

- The system must have stable power applied to the scanner.
- The engine and host must be operating and communicating with no interference.

Failure to meet these conditions can corrupt the scan engine's memory.

Parameter Defaults

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

Table 4-1 *Factory Default Table*

Parameter	Parameter Number (Hex)	Factory Default	Page Number
Set Factory Default		All Defaults	*4-7*
LED On Time	88h	3.0 sec	*4-7*
Power Mode	80h	Low Power	*4-8*
Trigger Mode	8Ah	Level	*4-9*
Transmit “No Read” Message	5Eh	Disable	*4-10*
Parameter Scanning	ECh	Enable	*4-11*
Parameter Pass Through	F1h 71h	Disable	*4-12*
Disable All Symbologies	N/A	N/A	*4-13*
Linear Code Type Security Levels	4Eh	1	*4-14*
UPC/EAN			
UPC-A	01h	Enable	*4-16*
UPC-E	02h	Enable	*4-16*
UPC-E1	0Ch	Disable	*4-17*
EAN-8	04h	Enable	*4-17*
EAN-13	03h	Enable	*4-18*
Bookland EAN	53h	Disable	*4-18*
Bookland ISBN Format	F1h 40h	ISBN-10	*4-18*
Decode UPC/EAN Supplementals	10h	Ignore	*4-20*
Decode UPC/EAN Supplemental Redundancy	50h	7	*4-22*
UPC/EAN/JAN Supplemental AIM ID Format	F1h A0h	Combined	*4-23*
Transmit UPC-A Check Digit	28h	Enable	*4-24*

***See *Table 5-10 on page 5-22* for formatting of any parameter whose number is 100h or greater.**

Table 4-1 *Factory Default Table (Continued)*

Parameter	Parameter Number (Hex)	Factory Default	Page Number
Transmit UPC-E Check Digit	29h	Enable	*4-24*
Transmit UPC-E1 Check Digit	2Ah	Enable	*4-25*
UPC-A Preamble	22h	System Character	*4-25*
UPC-E Preamble	23h	System Character	*4-26*
UPC-E1 Preamble	24h	System Character	*4-27*
Convert UPC-E to A	25h	Disable	*4-28*
Convert UPC-E1 to A	26h	Disable	*4-28*
EAN-8 Zero Extend	27h	Disable	*4-29*
UPC/EAN Security Level	4Dh	1	*4-30*
UCC Coupon Extended Code	55h	Disable	*4-31*
Coupon Report	F1h DAh	Autodiscriminate Coupon Format	*4-31*
ISSN EAN	F1h 69h	Disable	*4-32*
Code 128			
Code 128	08h	Enable	*4-33*
Set Length(s) for Code 128	D1h D2h	1-55	*4-33*
GS1-128 (formerly UCC/EAN-128)	0Eh	Enable	*4-35*
ISBT 128	54h	Enable	*4-35*
ISBT Concatenation	F1h 41h	Disable	*4-36*
Check ISBT Table	F1h 42h	Enable	*4-37*
ISBT Concatenation Redundancy	DFh	10	*4-37*
Code 39			
Code 39	00h	Enable	*4-38*
Trioptic Code 39	0Dh	Disable	*4-38*
Convert Code 39 to Code 32	56h	Disable	*4-39*
Code 32 Prefix	E7h	Disable	*4-39*
Set Length(s) for Code 39	12h 13h	2-55	*4-40*
Code 39 Check Digit Verification	30h	Disable	*4-41*

***See *Table 5-10 on page 5-22* for formatting of any parameter whose number is 100h or greater.**

Table 4-1 *Factory Default Table (Continued)*

Parameter	Parameter Number (Hex)	Factory Default	Page Number
Transmit Code 39 Check Digit	2Bh	Disable	*4-41*
Code 39 Full ASCII Conversion	11h	Disable	*4-42*
Code 93			
Code 93	09h	Disable	*4-43*
Set Length(s) for Code 93	1Ah 1Bh	4-55	*4-43*
Code 11			
Code 11	0Ah	Disable	*4-45*
Set Lengths for Code 11	1Ch 1Dh	4 to 55	*4-45*
Code 11 Check Digit Verification	34h	Disable	*4-47*
Transmit Code 11 Check Digit(s)	2Fh	Disable	*4-48*
Interleaved 2 of 5			
Interleaved 2 of 5	06h	Enable	*4-49*
Set Length(s) for I 2 of 5	16h 17h	14	*4-49*
I 2 of 5 Check Digit Verification	31h	Disable	*4-51*
Transmit I 2 of 5 Check Digit	2Ch	Disable	*4-51*
Convert I 2 of 5 to EAN 13	52h	Disable	*4-52*
Discrete 2 of 5			
Discrete 2 of 5	05h	Disable	*4-53*
Set Length(s) for D 2 of 5	14h 15h	12	*4-53*
Chinese 2 of 5			
Chinese 2 of 5	F0h 98h	Disable	*4-55*
Matrix 2 of 5			
Matrix 2 of 5	F1h 6Ah	Disable	*4-56*
Matrix 2 of 5 Lengths	F1h 6Bh F1h 6Ch	14	*4-56*
Matrix 2 of 5 Redundancy	F1h 6Dh	Disable	*4-57*
Matrix 2 of 5 Check Digit	F1h 6Eh	Disable	*4-58*

***See *Table 5-10 on page 5-22* for formatting of any parameter whose number is 100h or greater.**

Table 4-1 *Factory Default Table (Continued)*

Parameter	Parameter Number (Hex)	Factory Default	Page Number
Transmit Matrix 2 of 5 Check Digit	F1h 6Fh	Disable	*4-58*
Inverse 1D			
Inverse 1D	F1h 4Ah	Regular	*4-59*
Codabar			
Codabar	07h	Disable	*4-60*
Set Lengths for Codabar	18h 19h	5-55	*4-60*
CLSI Editing	36h	Disable	*4-62*
NOTIS Editing	37h	Disable	*4-62*
Codabar Upper or Lower Case Start/Stop Characters Detection	F2h 57h	Lower Case	*4-63*
MSI			
MSI	0Bh	Disable	*4-64*
Set Length(s) for MSI	1Eh 1Fh	6-55	*4-65*
MSI Check Digits	32h	One	*4-66*
Transmit MSI Check Digit	2Eh	Disable	*4-66*
MSI Check Digit Algorithm	33h	Mod 10/Mod 10	*4-67*
GS1 DataBar			
GS1 DataBar Omnidirectional	F0h 52h	Enable	*4-68*
GS1 DataBar Limited	F0h 53h	Enable	*4-68*
GS1 DataBar Expanded	F0h 54h	Enable	*4-69*
Convert GS1 DataBar to UPC/EAN	F0h 8Dh	Disable	*4-69*
Data Options			
Transmit Code ID Character	2Dh	None	*4-70*
Prefix/Suffix Values Prefix Suffix 1 Suffix 2	 69h 68h 6Ah	 NULL CR (0DH) LF (0AH)	*4-71*
Scan Data Transmission Format	EBh	Data as is	*4-77*
Serial Parameters			

***See *Table 5-10 on page 5-22* for formatting of any parameter whose number is 100h or greater.**

Table 4-1 *Factory Default Table (Continued)*

Parameter	Parameter Number (Hex)	Factory Default	Page Number
Baud Rate	9Ch	9,600	*4-79*
Decode Data Packet Format	EEh	Raw Decode Data	*4-80*
Host Serial Response Time-out	9Bh	2 sec	*4-80*
Host Character Time-out	EFh	50 msec	*4-81*
Event Reporting*			
Boot Up Event	F0h 02h	Disable	*4-82*
Parameter Event	F0h 03h	Enable	*4-83*

***See *Table 5-10 on page 5-22* for formatting of any parameter whose number is 100h or greater.**

Set Default Parameter

Scan **Set Factory Defaults** to restore the factory default values listed in *Table 4-1 on page 4-2*.

Set Factory Defaults

LED On Time

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 25.5 seconds.

To set an LED On Time, scan the bar code below. Next scan three numeric bar codes beginning on *page 4-84* that correspond to the desired on time. Single digit numbers must have a leading zero. For example, to set an on time of 0.5 seconds, scan the bar code below, then scan the "0", "0", and "5" bar codes; to set an on time of 10.5 seconds, scan the bar code below, then scan the "1", "0" and "5" bar codes. To cancel an entry prior to scanning the third numeric digit, scan *Cancel on page 4-85*.

LED On Time
(Default: 3.0 sec.)

Power Mode

Parameter # 80h

This parameter determines the power mode of the engine.

In Low Power mode, the scan engine enters into a low power consumption Sleep power state whenever possible (provided all WAKEUP commands were released). See *Power Management on page 1-3*.

In Continuous Power mode, the scan engine remains in the Awake state after each decode attempt (see *Power Management on page 1-3*).

The Sleep and Awake commands (see *SLEEP on page 5-27* and *WAKEUP on page 5-30*) can be used to change the power state in either the Low Power mode or the Continuous Power mode.

Continuous Power
(00h)

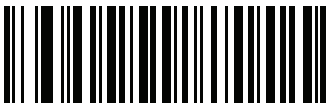
***Low Power**
(01h)

Trigger Mode

Parameter # 8Ah

Select one of the following trigger modes for the digital engine:

- **Continuous** - A trigger pull activates decode processing. Decode processing continues for as long as the trigger remains pulled (asserted). As the scan engine encounters different bar codes, each one is decoded and transmitted.
- **Level** - A trigger pull activates decode processing. Decode processing continues until the bar code is decoded, the trigger is released, or the Decode Session Timeout is reached.



Continuous
(01h)

*** Level**
(00h)

Transmit “No Read” Message

Parameter # 5Eh

Enable this option to transmit “NR” if a symbol does not decode during the timeout period or before the trigger is released. Any enabled prefix or suffixes are appended around this message.

Enable No Read
(01h)

When disabled, and a symbol cannot be decoded, no message is sent to the host.

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

Parameter Scanning

Parameter # ECh

To disable decoding of parameter bar codes, scan **Disable Parameter Scanning** below. To re-enable the scanning of parameter bar codes, you must set this parameter to 01h (scan **Enable Parameter Scanning**) via a serial command.

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

Disable Parameter Scanning (00h)

Parameter Pass Through

Parameter # F1h 71h

Enable **Parameter Pass Through** to transmit bar codes in the following format, in Code 128, to the host:

<FNC3>L<any length data>

<FNC3>B<12 characters of data>

Note that the special Code 128 character <FNC3> must appear at the beginning of this data. However, if the appropriate data does not follow this as shown above, it does not transmit to the host device.

Enable Parameter Pass Through
(01h)

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

Disable All Symbologies

Scan the bar code below to disable the decoding of all symbologies. Use this to simplify selecting a single symbology to decode by scanning this, then scanning the desired enable code type bar code. Note that the decoder can still decode parameter bar codes.

Disable All Symbologies

Linear Code Type Security Level

Parameter # 4Eh

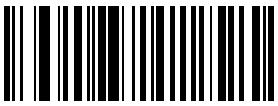
The SE655 offers four levels of decode security for linear code types (e.g. Code 39, Interleaved 2 of 5). Select higher security levels for decreasing levels of bar code quality. As security levels increase, the scan engine's aggressiveness decreases.

Select the security level appropriate for your bar code quality.

Linear Security Level 1

The following code types must be successfully read twice before being decoded:

Code Type	Length
Codabar	8 or less
MSI	4 or less
D 2 of 5	8 or less
I 2 of 5	8 or less



***Linear Security Level 1**
(01h)

Linear Security Level 2

All code types must be successfully read twice before being decoded.

Linear Security Level 2
(02h)

Linear Code Type Security Level (continued)

Linear Security Level 3

Code types other than the following must be successfully read twice before being decoded. The following codes must be read three times:

Code Type	Length
Codabar	8 or less
MSI	4 or less
D 2 of 5	8 or less
I 2 of 5	8 or less

Linear Security Level 3
(03h)

Linear Security Level 4

All code types must be successfully read three times before being decoded.

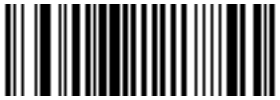
Linear Security Level 4
(04h)

UPC/EAN

Enable/Disable UPC-A

Parameter # 01h

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



***Enable UPC-A**
(01h)

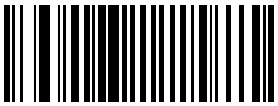
Disable UPC-A
(00h)

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)

Enable/Disable UPC-E1

Parameter # 0Ch

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

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

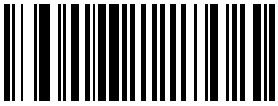
Enable UPC-E1
(01h)

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

Enable/Disable EAN-8

Parameter # 04h

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



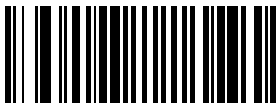
***Enable EAN-8**
(01h)

Disable EAN-8
(00h)

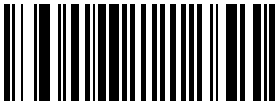
Enable/Disable EAN-13

Parameter # 03h

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



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



Disable EAN-13
(00h)

Enable/Disable Bookland EAN

Parameter # h53h

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

Enable Bookland EAN
(01h)

***Disable Bookland EAN**
(00h)

NOTE If you enable Bookland EAN, select a *Bookland ISBN Format on page 4-19*. Also select either Decode UPC/EAN Supplementals, Autodiscriminate UPC/EAN Supplementals, or Enable 978/979 Supplemental Mode in *Decode UPC/EAN Supplementals on page 4-20*.

Bookland ISBN Format

Parameter # F1h 40h

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

- **Bookland ISBN-10** - The digital scanner 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 digital scanner 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 4-18*), then select either Decode UPC/EAN Supplementals, Autodiscriminate UPC/EAN Supplementals, or Enable 978/979 Supplemental Mode in *Decode UPC/EAN Supplementals on page 4-20*.

Decode UPC/EAN 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 scanner is presented with a UPC/EAN plus supplemental symbol, the scanner decodes UPC/EAN and ignores the supplemental characters.
- If you select **Decode UPC/EAN with Supplementals**, the scanner only decodes UPC/EAN symbols with supplemental characters, and ignores symbols without supplementals.
- If you select **Autodiscriminate UPC/EAN Supplementals**, the scanner decodes UPC/EAN symbols with supplemental characters immediately. If the symbol does not have a supplemental, the scanner must decode the bar code the number of times set via *Decode UPC/EAN Supplemental Redundancy on page 4-22* before transmitting its data to confirm that there is no supplemental.
- If you select one of the following **Supplemental Mode** options, the scanner immediately transmits EAN-13 bar codes starting with that prefix that have supplemental characters. If the symbol does not have a supplemental, the scanner must decode the bar code the number of times set via *Decode UPC/EAN Supplemental Redundancy on page 4-22* before transmitting its data to confirm that there is no supplemental. The scanner 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 4-18* to enable Bookland EAN, and select a format using *Bookland ISBN Format on page 4-19*.

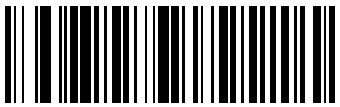
  - **Enable 977 Supplemental Mode.**
  - **Enable 414/419/434/439 Supplemental Mode.**
  - **Enable 491 Supplemental Mode.**
  - **Enable Smart Supplemental Mode** - applies to EAN-13 bar codes starting with any prefix listed previously.

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

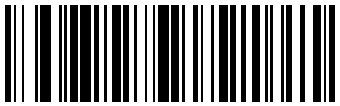
Decode UPC/EAN Supplementals (continued)

Select the desired option by scanning one of the following bar codes.

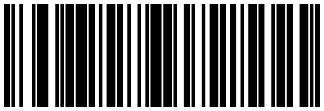
Decode UPC/EAN With Supplementals (01h)



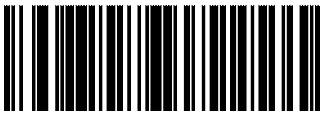
***Ignore UPC/EAN With Supplementals (00h)**



Autodiscriminate UPC/EAN Supplementals (02h)



Enable 378/379 Supplemental Mode (04h)



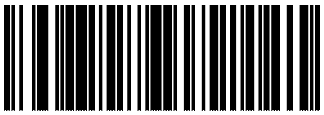
Enable 978/979 Supplemental Mode (05h)

Decode UPC/EAN Supplementals (continued)

Enable 977 Supplemental Mode
(07h)

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

Enable 491 Supplemental Mode
(08h)



Enable Smart Supplemental Mode
(03h)

Decode UPC/EAN Supplemental Redundancy

Parameter # 50h

With *Autodiscriminate UPC/EAN Supplementals* selected, this option adjusts the number of times a symbol without supplementals are decoded before transmission. The range is from 2 to 20 times. Five or above is recommended when decoding a mix of UPC/EAN symbols with and without supplementals, and the autodiscriminate option is selected.

Scan the bar code below to select a decode redundancy value. Next scan two numeric bar codes beginning on *page 4-84*. Single digit numbers must have a leading zero. To change the selection or cancel an incorrect entry, scan *Cancel on page 4-85*.

Decode UPC/EAN Supplemental Redundancy
(Default: 7)

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 4-70* 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)

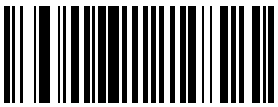
***Combined**
(01h)

Separate Transmissions
NEW END

Transmit UPC-A Check Digit

Parameter # 28h

Scan the appropriate bar code below to transmit the symbol with or without the UPC-A check digit.



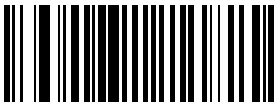
***Transmit UPC-A Check Digit**
(01h)

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

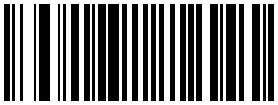
Transmit UPC-E Check Digit

Parameter # 29h

Scan the appropriate bar code below to transmit the symbol with or without the UPC-E check digit.



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



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

Transmit UPC-E1 Check Digit

Parameter # 2Ah

Scan the appropriate bar code below to transmit the symbol with or without the UPC-E1 check digit.

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

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

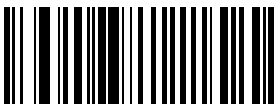
UPC-A Preamble

Parameter # 22h

Preamble characters (Country Code and System Character) can be transmitted as part of a UPC-A symbol. Select one of the following options for transmitting UPC-A preamble to the host device: transmit system character only, transmit system character and country code (“0” for USA), or transmit no preamble.

No Preamble
(<DATA>)
(00h)

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

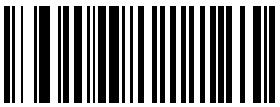


System Character & Country Code
(< COUNTRY CODE> <SYSTEM CHARACTER> <DATA>)
(02h)

UPC-E Preamble

Parameter # 23h

Preamble characters (Country Code and System Character) can be transmitted as part of a UPC-E symbol. Select one of the following options for transmitting UPC-E preamble to the host device: transmit system character only, transmit system character and country code (“0” for USA), or transmit no preamble.



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 (Country Code and System Character) can be transmitted as part of a UPC-E1 symbol. Select one of the following options for transmitting UPC-E1 preamble to the host device: transmit system character only, transmit system character and country code (“0” for USA), or transmit no preamble.

No Preamble
(<DATA>)
(00h)

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

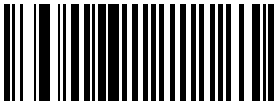
System Character & Country Code
(< COUNTRY CODE> <SYSTEM CHARACTER> <DATA>)
(02h)

Convert UPC-E to UPC-A

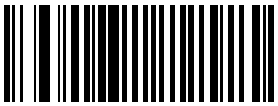
Parameter # 25h

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

Scan **DO NOT CONVERT UPC-E TO UPC-A** to transmit UPC-E (zero suppressed) decoded data.



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

Scan **DO NOT CONVERT UPC-E TO UPC-A** to transmit UPC-E1 (zero suppressed) decoded data.

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

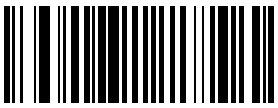
***Do Not Convert UPC-E1 to UPC-A (Disable)**
(00h)

EAN Zero Extend

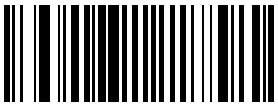
Parameter # 27h

When enabled, this parameter adds five leading zeros to decoded EAN-8 symbols to make them compatible in format to EAN-13 symbols.

Disable this parameter to transmit EAN-8 symbols as is.



Enable EAN Zero Extend
(01h)



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

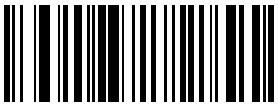
UPC/EAN Security Level

Parameter # 4Dh

The SE655 offers four levels of decode security for UPC/EAN bar codes. Increasing levels of security are provided for decreasing levels of bar code quality. Select higher levels of security for decreasing levels of bar code quality. Increasing security decreases the scan engine's aggressiveness, so choose only that level of security necessary for the application.

UPC/EAN Security Level 0

This default setting allows the scan engine to operate in its most aggressive state, while providing sufficient security in decoding most "in-spec" UPC/EAN bar codes.



UPC/EAN Security Level 0
(00h)

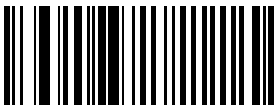
UPC/EAN Security Level 1

As bar code quality levels diminish, certain characters become prone to mis-decodes before others (i.e., 1, 2, 7, 8). If mis-decodes of poorly printed bar codes occur, and the mis-decodes are limited to these characters, select this security level.

***UPC/EAN Security Level 1**
(01h)

UPC/EAN Security Level 2

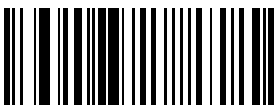
If mis-decodes of poorly printed bar codes occur, and the mis-decodes are not limited to characters 1, 2, 7, and 8, select this security level.



UPC/EAN Security Level 2
(02h)

UPC/EAN Security Level 3

If misdecodes still occur after selecting Security Level 2, select this security level. Be advised, selecting this option is an extreme measure against mis-decoding severely out of spec bar codes. Selection of this level of security significantly impairs the decoding ability of the scan engine. If this level of security is necessary, try to improve the quality of the bar codes.



UPC/EAN Security Level 3
(03h)

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)**

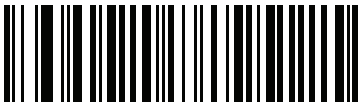
✓ ***NOTE*** See *Decode UPC/EAN Supplemental Redundancy on page 4-22* to control autodiscrimination of the GS1-128 (right half) of a coupon code.

Coupon Report

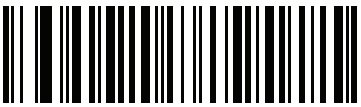
Parameter # F1h DAh

Select an option to determine which type of coupon format to support.

- Select **Old Coupon Format** to support UPC-A/GS1-128 and EAN-13/GS1-128.
- Select **New Coupon Format** as an interim format to support UPC-A/GS1-DataBar and EAN-13/GS1-DataBar.
- If you select **Autodiscriminate Format**, the linear imager scanner supports both **Old Coupon Format** and **New Coupon Format.**



Old Coupon Format (00h)



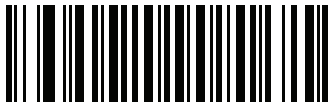
New Coupon Format (01h)

***Autodiscriminate Coupon Format (02h)**

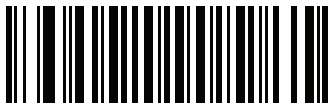
ISSN EAN

Parameter # F1h 69h

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



Enable ISSN EAN
(01h)



***Disable ISSN EAN**
(00h)

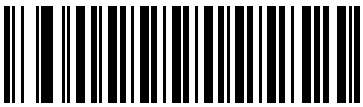
Code 128

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

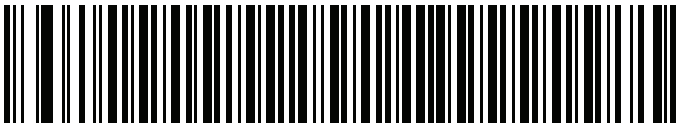
Parameter # L1 = D1h L2 = D2h

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.

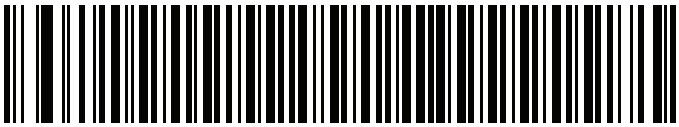
NOTE When setting lengths for different bar code types, enter a leading zero for single digit numbers.

- **One Discrete Length** - Select this option to decode only Code 128 symbols containing a selected length. Select the length using the numeric bar codes beginning on *page 4-84*. 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 4-85*.
- **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 beginning on *page 4-84*. 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 4-85*.
- **Length Within Range** - Select this option to decode a Code 128 symbol with a specific length range. Select lengths using numeric bar codes beginning on *page 4-84*. 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 4-85*.
- **Any Length** - Select this option to decode Code 128 symbols containing any number of characters within the digital scanner's capability.

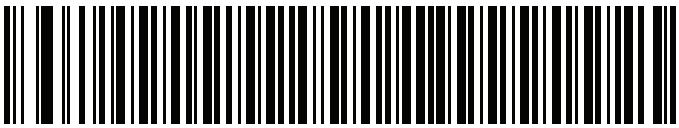
Set Lengths for Code 128 (continued)



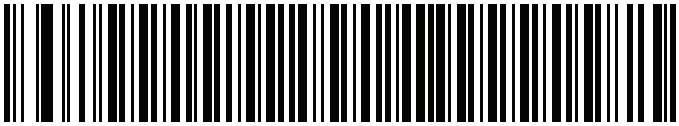
Code 128 - One Discrete Length



Code 128 - Two Discrete Lengths



Code 128 - Length Within Range

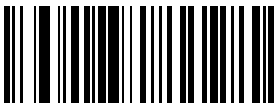


***Code 128 - Any Length**

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

Parameter # 0Eh

To enable or disable GS1-128, scan the appropriate bar code below. (See *Appendix A, Miscellaneous Code Information* for details on *GS1-128 (formerly UCC/EAN-128)*.)



***Enable GS1-128**
(01h)

Disable GS1-128
(00h)

Enable/Disable ISBT 128

Parameter # 54h

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

***Enable ISBT 128**
(01h)

Disable ISBT 128
(00h)

ISBT Concatenation

Parameter # F1h 41h

Select an option for concatenating pairs of ISBT code types:

- If you select **Disable ISBT Concatenation**, the digital scanner 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 digital scanner to decode and perform concatenation. The digital scanner does not decode single ISBT symbols.
- If you select **Autodiscriminate ISBT Concatenation**, the digital scanner decodes and concatenates pairs of ISBT codes immediately. If only a single ISBT symbol is present, the digital scanner must decode the symbol the number of times set via *ISBT Concatenation Redundancy on page 4-37* before transmitting its data to confirm that there is no additional ISBT symbol

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

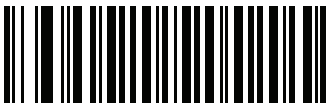
Enable ISBT Concatenation
(01h)

Autodiscriminate ISBT Concatenation
(00h)

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)**

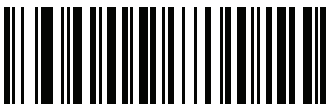
Disable Check ISBT Table (00h)

ISBT Concatenation Redundancy

Parameter # DFh

If you set **ISBT Concatenation** to **Autodiscriminate,** use this parameter to set the number of times the digital scanner 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 *Numeric Bar Codes on page 4-84* 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 4-85*. The default is 10.



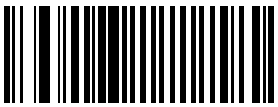
ISBT Concatenation Redundancy

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 marking 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 Trioptic Code 39 and Code 39 Full ASCII cannot be enabled simultaneously. If the Enable Trioptic Code 39 setting is not accepted*****, disable Code 39 Full ASCII and try again.

***** An SSI parameter entry error, event ID 07h, is sent to the host if packeted data communication is enabled to inform the user that the parameter change was not accepted.

Convert Code 39 to Code 32 (Italian Pharma Code)

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 in order 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

Enable this parameter to add the prefix character “A” to all Code 32 bar codes. Convert Code 39 to Code 32 (Italian Pharma Code) must be enabled for this parameter to function.

Enable Code 32 Prefix
(01h)

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

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. Lengths for Code 39 may be set for 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. To set lengths via serial commands, see *Setting Code Lengths Via Serial Commands on page A-7*.

NOTE When setting lengths, single digit numbers must always be preceded by a leading zero.

One Discrete Length - This option limits decodes to only those Code 39 symbols containing a selected length. Lengths are selected from the numeric bar codes beginning on *page 4-84*. For example, to decode only Code 39 symbols with 14 characters, scan **Code 39 - One Discrete Length**, then scan **1** followed by **4**. To change the selection or cancel an incorrect entry, scan *Cancel on page 4-85*.

Code 39 - One Discrete Length

Two Discrete Lengths - This option limits decodes to only those Code 39 symbols containing either of two selected lengths. Lengths are selected from the numeric bar codes beginning on *page 4-84*. For example, to decode only those Code 39 symbols containing either 2 or 14 characters, select **Code 39 - Two Discrete Lengths**, then scan **0**, **2**, **1**, and then **4**. To change the selection or cancel an incorrect entry, scan *Cancel on page 4-85*.

Code 39 - Two Discrete Lengths

Length Within Range - This option limits decodes to only those Code 39 symbols within a specified range. 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**. Numeric bar codes begin on *page 4-84*. To change the selection or cancel an incorrect entry, scan *Cancel on page 4-85*.

Code 39 - Length Within Range

Any Length - Scan this option to decode Code 39 symbols containing any number of characters.

Code 39 - Any Length

Code 39 Check Digit Verification

Parameter # 30h

When this feature is enabled, the scan engine checks the integrity of all Code 39 symbols to verify that the data complies with specified check digit algorithm. Only those Code 39 symbols which include a modulo 43 check digit are decoded. Only enable this feature if your Code 39 symbols contain a module 43 check digit.

Verify Code 39 Check Digit
(01h)

***Do Not Verify Code 39 Check Digit**
(00h)

Transmit Code 39 Check Digit

Parameter # 2Bh

Scan this symbol to transmit the check digit with the data.

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

Scan this symbol to transmit data without the check digit.

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

Enable/Disable Code 39 Full ASCII

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
(00h)

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

NOTE Trioptic Code 39 and Code 39 Full ASCII cannot be enabled simultaneously. If the Enable Trioptic Code 39 setting is not accepted*, disable Code 39 Full ASCII and try again.

*An SSI parameter entry error, event ID 07h, is sent to the host if packeted data communication is enabled to inform the user that the parameter change was not accepted.

Code 93

Enable/Disable Code 93

Parameter # 09h

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

Enable Code 93
(01h)

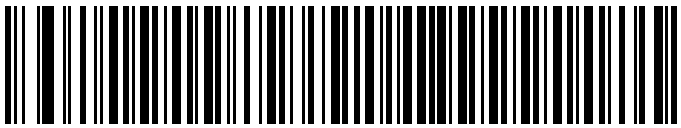
***Disable Code 93**
(00h)

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. Lengths for Code 93 may be set for any length, one or two discrete lengths, or lengths within a specific range. To set lengths via serial commands, see *Setting Code Lengths Via Serial Commands on page A-7*.

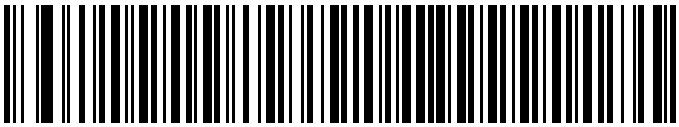
One Discrete Length - Select this option to decode only those codes containing a selected length. For example, select **Code 93 One Discrete Length**, then scan **1**, **4**, to limit the decoding to only Code 93 symbols containing 14 characters. Numeric bar codes begin on *page 4-84*. To change the selection or cancel an incorrect entry, scan *Cancel on page 4-85*.



Code 93 - One Discrete Length

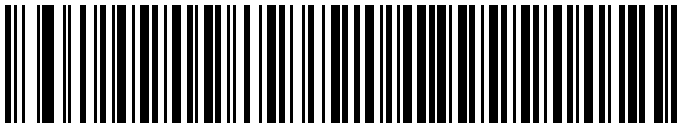
Set Lengths for Code 93 (continued)

Two Discrete Lengths - Select this option to decode only those codes containing two selected lengths. For example, select **Code 93 Two Discrete Lengths**, then scan **0**, **2**, **1**, **4**, to limit the decoding to only Code 93 symbols containing 2 or 14 characters. Numeric bar codes begin on *page 4-84*. To change the selection or cancel an incorrect entry, scan *Cancel on page 4-85*.



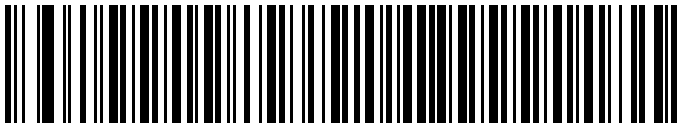
Code 93 - Two Discrete Lengths

Length Within Range - This option sets the unit to decode a code type within a specified range. 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** (single digit numbers must always be preceded by a leading zero). Numeric bar codes begin on *page 4-84*. To change the selection or cancel an incorrect entry, scan *Cancel on page 4-85*.



Code 93 - Length Within Range

Any Length - Scan this option to decode Code 93 symbols containing any number of characters.



Code 93 - Any Length

Code 11

Enable/Disable Code 11

Parameter # 0Ah

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

Enable Code 11
(01h)

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

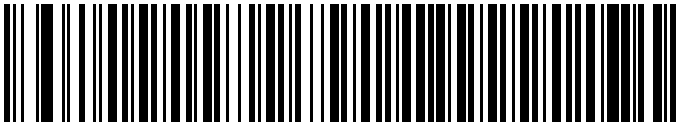
Set Lengths for Code 11

Parameter # L1 = 1Ch L2 = 1Dh

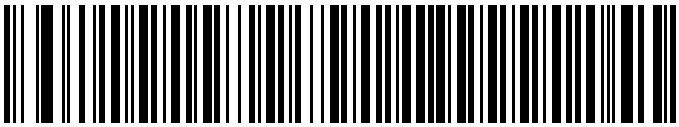
The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. Set lengths for Code 11 to any length, one or two discrete lengths, or lengths within a specific range.

- **One Discrete Length** - Select this option to decode only Code 11 symbols containing a selected length. Select the length using the numeric bar codes beginning on *page 4-84*. 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 4-85*.
- **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 beginning on *page 4-84*. For example, to decode only those 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 4-85*.
- **Length Within Range** - Select this option to decode a Code 11 symbol with a specific length range. Select lengths using numeric bar codes beginning on *page 4-84*. 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** (single digit numbers must always be preceded by a leading zero). To correct an error or change the selection, scan *Cancel on page 4-85*.
- **Any Length** - Scan this option to decode Code 11 symbols containing any number of characters within the scan engine capability.

Set Lengths for Code 11 (continued)



Code 11 - One Discrete Length



Code 11 - Two Discrete Lengths

Code 11 - Length Within Range

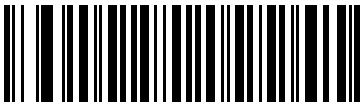
Code 11 - Any Length

Code 11 Check Digit Verification

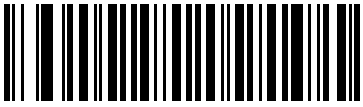
Parameter # 34h

This feature allows the scan engine 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.

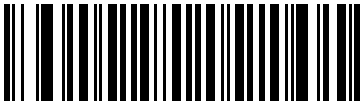
To enable this feature, scan the bar code below corresponding to the number of check digits encoded in your Code 11 symbols.



***Disable**
(00h)



One Check Digit
(01h)



Two Check Digits
(02h)

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.

Interleaved 2 of 5

Enable/Disable Interleaved 2 of 5

Parameter # 06h

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

***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. Lengths for I 2 of 5 may be set for any length, one or two discrete lengths, or lengths within a specific range. To set lengths via serial commands, see *Setting Code Lengths Via Serial Commands* on page B-8.

NOTE When setting lengths, single digit numbers must always be preceded by a leading zero.

One Discrete Length - Select this option to decode only those codes containing a selected length. For example, select **I 2 of 5 One Discrete Length**, then scan **1**, **4**, to decode only I 2 of 5 symbols containing 14 characters. Numeric bar codes begin on *page 4-84*. To change the selection or cancel an incorrect entry, scan *Cancel on page 4-85*.

I 2 of 5 - One Discrete Length

Set Lengths for Interleaved 2 of 5 (continued)

Two Discrete Lengths - Select this option to decode only those codes containing two selected lengths. For example, select **I 2 of 5 Two Discrete Lengths**, then scan **0**, **6**, **1**, **4**, to decode only I 2 of 5 symbols containing 6 or 14 characters. Numeric bar codes begin on *page 4-84*. To change the selection or cancel an incorrect entry, scan *Cancel on page 4-85*.

I 2 of 5 - Two Discrete Lengths

Length Within Range - Select this option to decode only codes within a specified range. 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** (single digit numbers must always be preceded by a leading zero). Numeric bar codes begin on *page 4-84*. To change the selection or cancel an incorrect entry, scan *Cancel on page 4-85*.

I 2 of 5 - Length Within Range

Any Length - Scan this option to decode I 2 of 5 symbols containing any number of characters.

NOTE Selecting this option may lead to misdecodes for I 2 of 5 codes.

I 2 of 5 - Any Length

I 2 of 5 Check Digit Verification

Parameter # 31h

When enabled, this parameter checks the integrity of an I 2 of 5 symbol to ensure it complies with a specified algorithm, either USS (Uniform Symbology Specification), or OPCC (Optical Product Code Council).

***Disable**
(00h)

USS Check Digit
(01h)

OPCC Check Digit
(02h)

Transmit I 2 of 5 Check Digit

Parameter # 2Ch

Scan this symbol to transmit the check digit with the data.

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

Scan this symbol to transmit data without the check digit.

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

Convert I 2 of 5 to EAN-13

Parameter # 52h

This parameter converts a 14 character I 2 of 5 code into EAN-13, and transmits to the host as EAN-13. To accomplish this, I 2 of 5 must be enabled, one length must be set to 14, 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)

Discrete 2 of 5

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. Lengths for D 2 of 5 may be set for any length, one or two discrete lengths, or lengths within a specific range. To set lengths via serial commands, see *Setting Code Lengths Via Serial Commands on page A-7*.

One Discrete Length - Select this option to decode only those codes containing a selected length. For example, select **D 2 of 5 One Discrete Length**, then scan **1**, **4**, to decode only D 2 of 5 symbols containing 14 characters. Numeric bar codes begin on *page 4-84*. To change the selection or cancel an incorrect entry, scan *Cancel on page 4-85*.

D 2 of 5 - One Discrete Length

Two Discrete Lengths - Select this option to decode only those codes containing two selected lengths. For example, select **D 2 of 5 Two Discrete Lengths**, then scan **0**, **2**, **1**, **4**, to decode only D 2 of 5 symbols containing 2 or 14 characters. Numeric bar codes begin on *page 4-84*. To change the selection or cancel an incorrect entry, scan *Cancel on page 4-85*.

D 2 of 5 - Two Discrete Lengths

Set Lengths for Discrete 2 of 5 (continued)

Length Within Range - Select this option to decode codes within a specified range. 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** (single digit numbers must be preceded by a leading zero). Numeric bar codes begin on *page 4-84*. To change the selection or cancel an incorrect entry, scan *Cancel on page 4-85*.

D 2 of 5 - Length Within Range

Any Length - Scan this option to decode D 2 of 5 symbols containing any number of characters.

NOTE Selecting this option may lead to misdecodes for D 2 of 5 codes.

D 2 of 5 - Any Length

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)

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)

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 beginning on *page 4-84*. 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 4-85*.
- **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 beginning on *page 4-84*. 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 4-85*.
- **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 beginning on *page 4-84*. 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 4-85*.
- **Any Length** - Scan this option to decode Matrix 2 of 5 symbols containing any number of characters within the digital scanner's capability.

Set Lengths for Matrix 2 of 5 (continued)

***Matrix 2 of 5 - One Discrete Length**

Matrix 2 of 5 - Two Discrete Lengths

Matrix 2 of 5 - Length Within Range

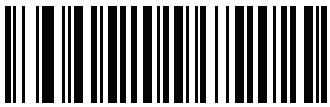
Matrix 2 of 5 - Any Length

Matrix 2 of 5 Redundancy

Parameter # F1h 6Dh

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

Enable Matrix 2 of 5 Redundancy (01h)



***Disable Matrix 2 of 5 Redundancy (00h)**

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)

Inverse 1D

Parameter # F1h 4Ah

This parameter sets the 1D inverse decoder setting. Options are:

- **Regular Only** - the digital scanner decodes regular 1D bar codes only.
- **Inverse Only** - the digital scanner decodes inverse 1D bar codes only.
- **Inverse Autodetect** - the digital scanner decodes both regular and inverse 1D bar codes.

***Regular**
(00h

Inverse Only
(01h)

Inverse Autodetect
(02h)

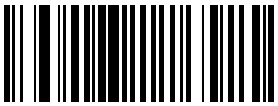
Codabar

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. Lengths for Codabar may be set for any length, one or two discrete lengths, or lengths within a specific range. To set lengths via serial commands, see *Setting Code Lengths Via Serial Commands on page A-7*.

One Discrete Length - Select this option to decode only those codes containing a selected length. For example, select **Codabar One Discrete Length**, then scan **1**, **4**, to decode only Codabar symbols containing 14 characters. Numeric bar codes begin on *page 4-84*. To change the selection or cancel an incorrect entry, scan *Cancel on page 4-85*.

Codabar - One Discrete Length

Two Discrete Lengths - This option sets the unit to decode only those codes containing two selected lengths. For example, select **Codabar Two Discrete Lengths**, then scan **0**, **2**, **1**, **4**, to decode only Codabar symbols containing 6 or 14 characters. Numeric bar codes begin on *page 4-84*. To change the selection or cancel an incorrect entry, scan *Cancel on page 4-85*.

Codabar (continued)

Codabar - Two Discrete Lengths

Length Within Range - Select this option to decode a code within a specified range. 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** (single digit numbers must always be preceded by a leading zero). Numeric bar codes begin on *page 4-84*. To change the selection or cancel an incorrect entry, scan *Cancel on page 4-85*.

Codabar - Length Within Range

Any Length - Scan this option to decode Codabar symbols containing any number of characters.

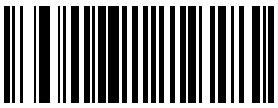
Codabar - Any Length

CLSI Editing

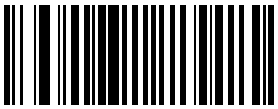
Parameter # 36h

When enabled, this parameter strips the start and stop characters and inserts a space after the first, fifth, and tenth characters of a 14-character Codabar symbol.

NOTE Symbol length does not include start and stop characters.



Enable CLSI Editing
(01h)

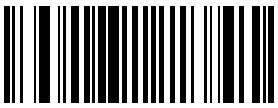


***Disable CLSI Editing**
(00h)

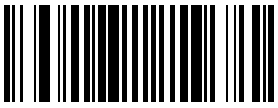
NOTIS Editing

Parameter # 37h

When enabled, this parameter strips the start and stop characters from decoded Codabar symbol.



Enable NOTIS Editing
(01h)

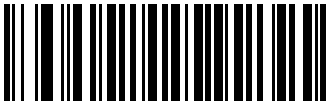


***Disable NOTIS Editing**
(00h)

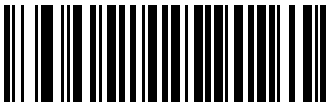
Codabar Upper or Lower Case Start/Stop Characters Detection

Parameter # F2h 57h

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



Upper Case
(00h)



***Lower Case**
(01h)

MSI

Enable/Disable MSI

Parameter # 0Bh

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

Enable MSI
(01h)

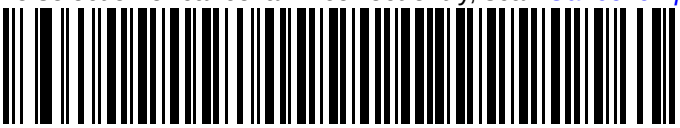
***Disable MSI**
(00h)

Set Lengths for MSI

Parameter # L1 = 1Eh L2 = 1Fh

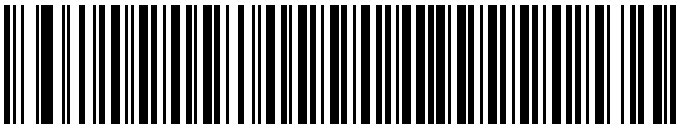
The length of a code refers to the number of characters (i.e., human readable characters) the code contains, and includes check digits. Lengths for MSI can be set for any length, one or two discrete lengths, or lengths within a specific range. See Table B-5 on page B-9 for ASCII equivalents. To set lengths via serial commands, see *Setting Code Lengths Via Serial Commands on page A-7*.

One Discrete Length - Select this option to decode only those codes containing a selected length. For example, select **MSI - One Discrete Length**, then scan **1**, **4**, to decode only MSI symbols containing 14 characters. Numeric bar codes begin on *page 4-84*. To change the selection or cancel an incorrect entry, scan *Cancel on page 4-85*.



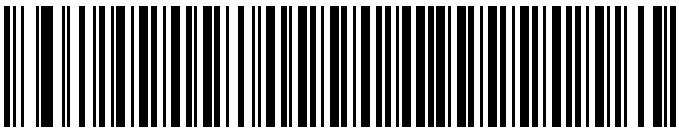
MSI - One Discrete Length

Two Discrete Lengths - Select this option to decode only those codes containing two selected lengths. For example, select **MSI - Two Discrete Lengths**, then scan **0**, **6**, **1**, **4**, to decode only MSI symbols containing 6 or 14 characters. Numeric bar codes begin on *page 4-84*. To change the selection or cancel an incorrect entry, scan *Cancel on page 4-85*.



MSI - Two Discrete Lengths

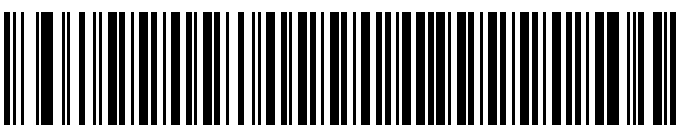
Length Within Range - Select this option to decode codes within a specified range. For example, to decode MSI symbols containing between 4 and 12 characters, first scan **MSI Length Within Range**, then scan **0**, **4**, **1** and **2** (single digit numbers must always be preceded by a leading zero). Numeric bar codes begin on *page 4-84*. To change the selection or cancel an incorrect entry, scan *Cancel on page 4-85*.



MSI - Length Within Range

Any Length - Scan this option to decode MSI Plessey symbols containing any number of characters.

NOTE Selecting this option may lead to misdecodes for MSI codes.



MSI - Any Length

MSI Check Digits

Parameter # 32h

These check digits at the end of the bar code verify the integrity of the data. At least one check digit is always required. Check digits are not automatically transmitted with the data.

***One MSI Check Digit**
(00h)

If two check digits are selected, also select an *MSI Check Digit Algorithm on page 4-67*.

Two MSI Check Digit
(01h)

Transmit MSI Check Digit

Parameter # 2Eh

Scan this symbol to transmit the check digit with the data.

Transmit MSI Check Digit (Enable)
(01h)

Scan this symbol to transmit data without the check digit.

***Do Not Transmit MSI Check Digit (Disable)**
(00h)

MSI Check Digit Algorithm

Parameter # 33h

When the Two MSI check digits option is selected, an additional verification is required to ensure integrity. Select one of the following algorithms.

MOD 10/ MOD 11
(00h)

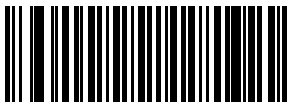
***MOD 10/ MOD 10**
(01h)

GS1-DataBar

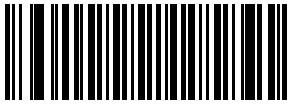
Enable/Disable GS1 DataBar Omnidirectional

Parameter # F0h 52h

To enable or disable GS1 DataBar Omnidirectional, scan the appropriate bar code below.



***Enable GS1 DataBar Omnidirectional**
(01h)



Disable GS1 DataBar Omnidirectional
(00h)

Enable/Disable GS1 DataBar Limited

Parameter # F0h 53h

To enable or disable GS1 DataBar Limited, scan the appropriate bar code below.

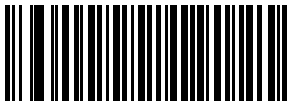
***Enable GS1 DataBar Limited**
(01h)

Disable GS1 DataBar Limited
(00h)

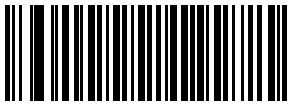
Enable/Disable GS1 DataBar Expanded

Parameter # F0h 54h

To enable or disable GS1 DataBar Expanded, scan the appropriate bar code below.



***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 Omnidirectional and GS1 DataBar Limited symbols. When this conversion is enabled, GS1 DataBar Omnidirectional and GS1 DataBar Limited symbols encoding a single zero as the first digit have the leading '010' stripped and the bar code reported as EAN-13.

Bar codes beginning with two or more zeros but not six zeros have the leading '0100' stripped and the bar code reported as UPC-A. The UPC-A Preamble parameter to transmit 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

***Disable Convert GS1 DataBar to UPC/EAN**

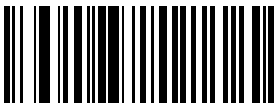
Data Options

Transmit Code ID Character

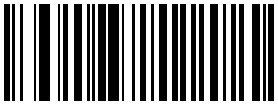
Parameter # 2Dh

A code ID character identifies the code type of a scanned bar code. This can be useful when decoding more than one code type. The code ID character is inserted between the prefix character (if selected) and the decoded symbol.

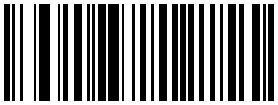
Select no code ID character, a Symbol Code ID character, or an AIM Code ID character. The Symbol Code ID characters are listed below; see *Appendix A, Miscellaneous Code Information* for *Symbol Code Identifiers* and *AIM Code Identifiers*.



Symbol Code ID Character
(02h)



Aim Code ID Character
(01h)



***None**
(00h)

Prefix/Suffix Values

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

A prefix and/or one or two suffixes can be appended to scan data for use in data editing. To set these values, scan a four-digit number (i.e. four bar codes) that corresponds to ASCII values. See *Table 4-2 on page 4-72* and *Numeric Bar Codes on page 4-84*. To change the selection or cancel an incorrect entry, scan *Cancel on page 4-85*. To set the Prefix/Suffix values via serial commands, see *Setting Prefixes and Suffixes Via Parameter Bar Codes on page 4-72*.

NOTE In order to use Prefix/Suffix values, the *Scan Data Transmission Format on page 4-77* must be set. See *page 4-77*.

Scan Prefix

Scan Suffix 1

Scan Suffix 2

Data Format Cancel

Setting Prefixes and Suffixes Via Parameter Bar Codes

To append a prefix and suffixes to the decode data:

1. Set the Scan Data Transmission Format (parameter EBh) to the desired option.
2. Enter the required value(s) for Prefix (69h), Suffix1 (68h) or Suffix2 (6Ah) using the hex values for the desired ASCII value from *Table 4-2*.

Table 4-2 *Character Equivalents*

Scan Value	Hex Value	Full ASCII Code 39 Encode Char.	Keystroke
1000	00h	%U	CTRL 2
1001	01h	$A	CTRL A
1002	02h	$B	CTRL B
1003	03h	$C	CTRL C
1004	04h	$D	CTRL D
1005	05h	$E	CTRL E
1006	06h	$F	CTRL F
1007	07h	$G	CTRL G
1008	08h	$H	CTRL H
1009	09h	$I	CTRL I
1010	0Ah	$J	CTRL J
1011	0Bh	$K	CTRL K
1012	0Ch	$L	CTRL L
1013	0Dh	$M	CTRL M
1014	0Eh	$N	CTRL N
1015	0Fh	$O	CTRL O
1016	10h	$P	CTRL P
1017	11h	$Q	CTRL Q
1018	12h	$R	CTRL R
1019	13h	$S	CTRL S
1020	14h	$T	CTRL T
1021	15h	$U	CTRL U
1022	16h	$V	CTRL V
1023	17h	$W	CTRL W
1024	18h	$X	CTRL X

Table 4-2 *Character Equivalents (Continued)*

Scan Value	Hex Value	Full ASCII Code 39 Encode Char.	Keystroke
1025	19h	$Y	CTRL Y
1026	1Ah	$Z	CTRL Z
1027	1Bh	%A	CTRL [
1028	1Ch	%B	CTRL \
1029	1Dh	%C	CTRL]
1030	1Eh	%D	CTRL 6
1031	1Fh	%E	CTRL -
1032	20h	Space	Space
1033	21h	/A	!
1034	22h	/B	‘
1035	23h	/C	#
1036	24h	/D	$
1037	25h	/E	%
1038	26h	/F	&
1039	27h	/G	‘
1040	28h	/H	(
1041	29h	/I	)
1042	2Ah	/J	*
1043	2Bh	/K	+
1044	2Ch	/L	,
1045	2Dh	-	-
1046	2Eh	.	.
1047	2Fh	/	/
1048	30h	0	0
1049	31h	1	1
1050	32h	2	2
1051	33h	3	3
1052	34h	4	4
1053	35h	5	5
1054	36h	6	6

Table 4-2 *Character Equivalents (Continued)*

Scan Value	Hex Value	Full ASCII Code 39 Encode Char.	Keystroke
1055	37h	7	7
1056	38h	8	8
1057	39h	9	9
1058	3Ah	/Z	:
1059	3Bh	%F	;
1060	3Ch	%G	<
1061	3Dh	%H	=
1062	3Eh	%I	>
1063	3Fh	%J	?
1064	40h	%V	@
1065	41h	A	A
1066	42h	B	B
1067	43h	C	C
1068	44h	D	D
1069	45h	E	E
1070	46h	F	F
1071	47h	G	G
1072	48h	H	H
1073	49h	I	I
1074	4Ah	J	J
1075	4Bh	K	K
1076	4Ch	L	L
1077	4Dh	M	M
1078	4Eh	N	N
1079	4Fh	O	O
1080	50h	P	P
1081	51h	Q	Q
1082	52h	R	R
1083	53h	S	S
1084	54h	T	T

Table 4-2 *Character Equivalents (Continued)*

Scan Value	Hex Value	Full ASCII Code 39 Encode Char.	Keystroke
1085	55h	U	U
1086	56h	V	V
1087	57h	W	W
1088	58h	X	X
1089	59h	Y	Y
1090	5Ah	Z	Z
1091	5Bh	%K	[
1092	5Ch	%L	\
1093	5Dh	%M	]
1094	5Eh	%N	^
1095	5Fh	%O	_
1096	60h	%W	‘
1097	61h	+A	a
1098	62h	+B	b
1099	63h	+C	c
1100	64h	+D	d
1101	65h	+E	e
1102	66h	+F	f
1103	67h	+G	g
1104	68h	+H	h
1105	69h	+I	i
1106	6Ah	+J	j
1107	6Bh	+K	k
1108	6Ch	+L	l
1109	6Dh	+M	m
1110	6Eh	+N	n
1111	6Fh	+O	o
1112	70h	+P	p
1113	71h	+Q	q
1114	72h	+R	r

Table 4-2 *Character Equivalents (Continued)*

Scan Value	Hex Value	Full ASCII Code 39 Encode Char.	Keystroke
1115	73h	+S	s
1116	74h	+T	t
1117	75h	+U	u
1118	76h	+V	v
1119	77h	+W	w
1120	78h	+X	x
1121	79h	+Y	y
1122	7Ah	+Z	z
1123	7Bh	%P	{
1124	7Ch	%Q	|
1125	7Dh	%R	}
1126	7Eh	%S	~
1127	7Fh		Undefined

Values from 1128 through 1255 (hex values 80h through FFh for SSI) may also be set.

Scan Data Transmission Format

Parameter # EBh

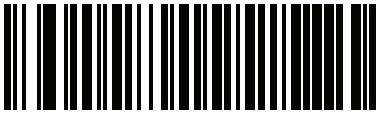
To change the Scan Data Transmission Format, scan one of the eleven bar codes corresponding to the desired format.

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

<DATA><CR><LF>
(01h)

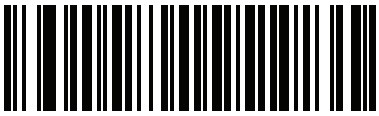
<DATA> <CR>
(02h)

<DATA> <LF>
(03h)

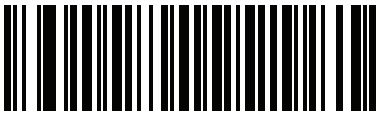


<DATA> <SUFFIX1>
(04h)

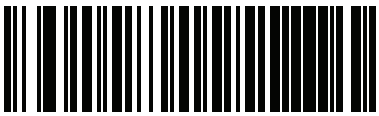
Scan Data Transmission Format (continued)



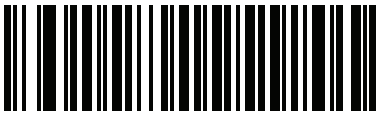
<DATA> <SUFFIX2>
(05h)



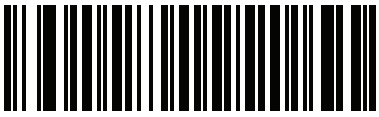
<DATA> <SUFFIX1><SUFFIX2>
(06h)



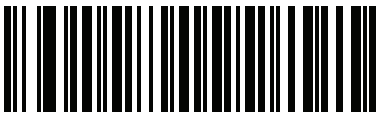
<PREFIX><DATA>
(07h)



<PREFIX><DATA> <SUFFIX1>
(08h)



<PREFIX><DATA> <SUFFIX2>
(09h)



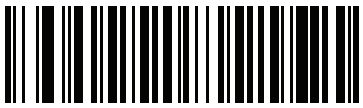
<PREFIX><DATA> <SUFFIX1><SUFFIX2>
(0Ah)

Serial Parameters

Baud Rate

Parameter # 9Ch

Baud rate is the number of bits of data transmitted per second. The scan engine's baud rate setting should match the data rate setting of the host device. If not, data may not reach the host device or may reach it in distorted form.



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

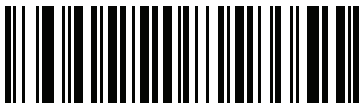
Baud Rate 19,200

(07h)

Baud Rate 38,400
(08h)

Baud Rate 57,600

(0ah)



Baud Rate 115,200
(0bh)

Decode Data Packet Format

Parameter # EEh

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

If the raw format is selected, ACK/NAK handshaking is disabled for decode data.

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

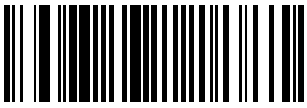
Send Packeted Decode Data
(01h)

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.

The delay period can range from 0.0 to 9.9 seconds in 0.1 second increments. After scanning the bar code below, scan two numeric bar codes beginning on *page 4-84*. Values less than 10 require a leading zero. To change the selection or cancel an incorrect entry, scan *Cancel on page 4-85*.



Host Serial Response Time-out
(Default: 2.0 sec.)

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. The time-out is set in 0.01 second increments from 0.01 seconds to 0.99 seconds. After scanning the bar code below, scan two bar codes beginning on *page 4-84* to set the desired time-out. To change the selection or cancel an incorrect entry, scan *Cancel on page 4-85*.

Host Character Time-out
(Default: 50 msec.)

Event Reporting

The host can request the decoder to furnish certain information (events) relative to the decoder's behavior. Enable or disable the events listed in *Table 4-3* by scanning the appropriate bar codes on the pages that follow. Parameter number format for these parameters follow those shown in *Table 5-10 on page 5-22* for parameters numbered 256 or higher.

Event report packets are only communicated to the host when the Decode Data Packet Format parameter is set to **Send Packeted Decode Data** (*page 4-80*).

Table 4-3 *Event Codes*

Event Class	Event	Code Reported
Boot Up Event	System power-up	03h
Parameter Event	Parameter entry error Parameter stored Defaults set (and parameter event is enabled by default) Number expected	07h 08h 0Ah 0Fh
System Failure Event	A fault has been detected which prevents further scanning operation	20h

Boot Up Event

Parameter # F0h 02h

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

Enable
(01h)

***Disable**
(00h)

Parameter Event

Parameter # F0h 03h

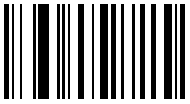
When enabled, the decoder sends a message to the host when one of the events specified in *Table 4-3 on page 4-82* occurs. When disabled, no message is sent.

*** Enable**
(01h)

Disable
(00h)

Numeric Bar Codes

For parameters requiring specific numeric values, scan the appropriately numbered bar code(s).



0

1

2

3

4

5

Numeric Bar Codes (continued)

6

7

8

9

Cancel

To change the selection or cancel an incorrect entry, scan the bar code below.

Cancel

Chapter 5 Serial Interface Protocol

Introduction

The decoder supports a variation of the Simple Serial Interface protocol over RS-232 which does not require the use of hardware handshaking. vSSI provides a cost effective, highly integrated, flexible protocol for designing bar code scanning applications and Auto-ID markets using the Motorola decoder. vSSI provides a communication link between decoded engines and a serial host for decode session control, parameter manipulation and re-flashing.

This chapter describes the system requirements of vSSI over RS-232.

Comparison Between vSSI and Standard SSI Protocols

Table 5-1 *vSSI versus Standard SSI Protocols*

Characteristic	vSSI	Standard SSI
RTS/CTS hardware handshaking signals	Not required. Protocol communication is carried out over TxD/RxD only	Required.
Use of software handshaking packets	Required always. (ACK/NAK and natural response packets.)	Not required.
Out of sequence packet handling scheme	Naturally supported. See *vSSI Transactions on page 5-31*.)	Not naturally supported. (Handled by RTS/CTS handshaking)

Communication

vSSI performs the following functions for the host device:

- Provides command and control *(triggering, revision query, capabilities requests, and configuration settings (Refer to chapter 4)) of the decoder from host.
- Provides a mechanism for the decoder to send decode data and asynchronous events to the host.

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).

All commands sent between the decoder and host must use the format described in *SSI Message Formats on page 5-5*. *vSSI Transactions on page 5-31* describes the required sequence of messages in specific cases.

Table 5-2 lists all the SSI Opcodes that the SE655 supports. It identifies the SSI partner allowed to send a message of each type. The host transmits type **H** opcodes, the decoder transmits type **D** opcodes, and either partner can transmit Host/Decoder (**H/D**) types.

Table 5-2 *SSI Commands*

Name	Type	Opcode	Description	Page
CAPABILITIES_REQUEST	H	D3h	Request commands the decoder supports.	*5-7*
CAPABILITIES_REPLY	D	D4h	List commands supported by the decoder.	*5-5*
CMD_ACK	H/D	D0h	Positive acknowledgment of received packet.	*5-8*
CMD_NAK	H/D	D1h	Negative acknowledgment of received packet.	*5-9*
DECODE_DATA	D	F3h	Decode data in SSI packet format.	*5-11*
CHANGE ALL SYMBOLOGIES	H	C9h	Enable/Disable all symbologies.	*5-13*
EVENT	D	F6h	Event indicated by associated event code.	*5-14*
IMAGER_MODE	H	F7h	Instruct the engine to enter an alternate operating mode.	*5-17*
IMAGE_DATA	D	B1h	Raw sensor data with header record.	*5-15*
PARAM_DEFAULTS	H	C8h	Set parameter default values.	*5-18*
PARAM_REQUEST	H	C7h	Request values of certain parameters.	*5-19*
PARAM_SEND	H/D	C6h	Host request to change parameter values or a decoder response to a PARAM_REQUEST.	*5-21*
REPLY_REVISION	D	A4h	Reply to REQ_REVISION.	*5-23*
REQUEST_REVISION	H	A3h	Request software revision string.	*5-24*
SCAN_DISABLE	H	EAh	Prevent the operator from scanning bar codes.	*5-25*
SCAN_ENABLE	H	E9h	Permit bar code scanning.	*5-26*
SLEEP	H	EBh	Request to place the decoder into low power.	*5-27*

Note: D = Decoder, H = Host, H/D = Host/Decoder

Table 5-2 *SSI Commands (Continued)*

Name	Type	Opcode	Description	Page
START_SESSION	H	E4h	Tell decoder to attempt to decode a bar code.	*5-28*
STOP_SESSION	H	E5h	Tell decoder to abort a decode attempt.	*5-29*
WAKEUP	H	N/A	Wakeup decoder after it's been powered down.	*5-30*
Note: D = Decoder, H = Host, H/D = Host/Decoder				

Figure 5-1 shows the general packet format for SSI messages, and *Table 5-3* lists the descriptions of fields that occur in all messages. These descriptions are repeated for each Opcode in the SSI message formats section. For messages that use the *Data* field, the specific type of data is shown in that field.

Length	Opcode	Message Source	Status	Data	Checksum

Figure 5-1 *General Packet Format*

Table 5-3 *Field Descriptions*

Field	Format	Sub-Field	Description
Length	1 Byte	Length	Length of message not including the check sum bytes. Maximum value is FFh.
Opcode	1 Byte	See *Table 5-2* for details.	Identifies the type of packet data being sent.
Message Source	1 Byte	0 = Decoder 04 = Host	Identifies where the message is coming from.
Status	Bit 0	Retransmit	0 = First time packet is sent 1 = Subsequent transmission attempts
	Bit 1	Continuation Bit (applicable to IMAGE_DATA only)	0 = Last packet 1 = Intermediate packet
	Bit 2	Reserved	Always set to zero
	Bit 3	Change Type (applies to parameters)	0 = Temporary change 1 = Permanent change
	Bits 4 - 7		Unused bits must be set to 0.
Data	Variable number of bytes	See individual sections for details.	
Checksum	2 Bytes	2's complement sum of message contents excluding checksum.	Checksum of message formatted as HIGH BYTE LOW BYTE

Note: The checksum is a 2 byte checksum and must be sent as HIGH BYTE followed by LOW BYTE.

SSI Message Formats

The following sections describe each of the SSI messages that can be communicated between the decoder and host. See *vSSI Transactions on page 5-31* for the protocol required to transmit these messages.

CAPABILITIES_REPLY

Description: Provides details of supported commands and communication capabilities.

Packet Format

Length	Opcode	Message Source	Status	Data	Checksum
	D4h	00h			

Field Descriptions

Field	Format	Size	Description
Length	Length of message (not including checksum)	1 Byte	Length field
Opcode	D4h	1 Byte	Identifies this Opcode type
Message Source	0 = Decoder	1 Byte	Identifies where the message is coming from
Status	Bit 0: Retransmit Bit 1-7: Unused	1 Byte	Identifies the transmission status Unused bits must be set to 0
Data	Capabilities description	Variable	See *Table 5-4 on page 5-6*.
Checksum	2's complement sum of message contents excluding checksum	2 Bytes	Checksum of message

Host Requirements

The host must not CMD_ACK or CMD_NAK this message, as this is a natural response to the CAPABILITIES_REQUEST message.

Decoder Requirements

The decoder sends this message upon receipt of the CAPABILITIES_REQUEST message.

Table 5-4 *Data Fields*

Field	Size	Description	Supported	
Baud Rates Supported	2 Bytes Bit mapped	Bit 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	Definition 300 Baud 600 Baud 1200 Baud 2400 Baud 4800 Baud 9600 Baud 19200 Baud 28800 Baud 38400 Baud 57600 Baud 115200 Baud 230400 Baud 460800 Baud 921600 Baud Reserved Reserved	1 = Supported 0 = Not Supported
Misc Serial Parameters	1 Byte Bit Mapped	Bit 0 1 2 3 4 5 6	Definition Odd Parity Even Parity Parity None Check Parity Do Not Check Parity One Stop Bit Two Stop Bits	1 = Supported 0 = Not Supported
Multi Packet Options	1 Byte Bit Mapped	Bit 0 1 2	Definition Option 1 Option 2 Option 3	1 = Supported 0 = Not Supported
Command List	1 Byte per Command	In this sequential list, the decoder details the commands it supports.		

CAPABILITIES_REQUEST

Description: Requests the decoder's serial capabilities.

Packet Format

Length	Opcode	Message Source	Status	Data	Checksum
04h	D3h	04h			

Field Descriptions

Field	Format	Size	Description
Length	Length of message (not including checksum)	1 Byte	Length field
Opcode	D3h	1 Byte	Identifies this Opcode type
Message Source	4 = Host	1 Byte	Identifies where the message is coming from
Status	Bit 0: Retransmit Bit 1-7: Unused	1 Byte	Identifies the transmission status Unused bits must be set to 0
Data			None
Checksum	2's complement sum of message contents excluding checksum	2 Bytes	Checksum of message

Host Requirements

The host transmits this message to request the serial capabilities of the decoder system.

Decoder Requirements

Upon receipt of this command, the decoder responds with the CAPABILITIES_REPLY message.

CMD_ACK

Description: Positive acknowledgment of received packet.

Packet Format

Length	Opcode	Message Source	Status	Data	Checksum
04h	D0h				

Field Descriptions

Field	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	D0h	1 Byte	Identifies this Opcode type.
Message Source	0 = Decoder 4 = Host	1 Byte	Identifies where the message is coming from.
Status	Bit 0: Retransmit Bit 1-7: unused	1 Byte	Identifies the transmission status. All unused bits must be set to 0.
Data			None
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

This message is sent to the SSI packet transmitter when the received packet passes the checksum check and no negative acknowledgment conditions apply (see *CMD_NAK on page 5-9*). If the data is in response to a command (e.g., PARAM_REQUEST, REQUEST_REVISION, etc.), no ACK is sent.

Host Requirements

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

Decoder Requirements

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

CMD_NAK

Description: Negative acknowledgment of received packet.

Packet Format

Length	Opcode	Message Source	Status	Cause	Checksum
05h	D1h				

Field Descriptions

Field	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	D1h	1 Byte	Identifies this Opcode type.
Message Source	0 = Decoder 4 = Host	1 Byte	Identifies where the message is coming from.
Status	Bit 0: Retransmit Bit 1-7: unused	1 Byte	Identifies the transmission status. Unused bits must be set to 0.
Cause	Reason code	1 Byte	Identifies the reason the NAK occurred: 0 = Reserved 1 = (RESEND) Checksum failure 2 = (BAD_CONTEXT) Unexpected or Unknown message 3 = Reserved 4 = Reserved 5 = Reserved 6 = (DENIED) Host Directive Denied 7 = Reserved 8 = Reserved 9 = Reserved
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

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

Table 5-5 describes NAK types supported by the SE655.

Table 5-5 *Decoder-Supported NAK Types*

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

The decoder only resends a message twice. If the message is not sent successfully either time, the decoder declares a transmit error.

DECODE_DATA

Description: Decode data in SSI packet format.

Packet Format

Length	Opcode	Message Source	Status	Bar code Type	Decode Data	Checksum
	F3h	00h				

Field Descriptions

Field	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	F3h	1 Byte	Identifies this Opcode type.
Message Source	0 = Decoder	1 Byte	Identifies where the message is coming from.
Status	Bit 0: Retransmit Bits 1-7: unused	1 Byte	Identifies the transmission status. Unused bits must be set to 0.
Bar Code Type	See *Table 5-6*	1 Byte	Identifies the scanned data code type.
Decode Data	<data>	Variable	Data is decoded data including prefix and suffix sent in ASCII format.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

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

Table 5-6 lists all SE655 supported code types. The associated hex value for each code (as required) is entered in the Code Type field.

Table 5-6 *Supported Code Types*

Code Type	Hex Value	Code Type	Hex Value
Not Applicable	00h	Code 128	03h
Bookland EAN	16h	Coupon Code	17h
Chinese 2 of 5	72h	Databar Coupon Code	B4h
Codabar	02h	Discrete 2 of 5	04h
Code 11	0Ch	EAN 8	0Ah
Code 39	01h	EAN 8 with 2 Supps	4Ah
Code 39 Full ASCII	13h	EAN 8 with 5 Supps	8Ah
Code 93	07h	EAN 13	0Bh

Table 5-6 *Supported Code Types (Continued)*

Code Type	Hex Value	Code Type	Hex Value
EAN 13 with 2 Supps	4Bh	Trioptic Code 39	15h
EAN 13 with 5 Supps	8Bh	UPC A	08h
GS1-128	0Fh	UPC A with 2 Supps	48h
GS1 DataBar Limited	31h	UPC A with 5 Supps	88h
GS1 DataBar-14	30h	UPC E0	09h
GS1 DataBar Expanded	32h	UPC E0 with 2 Supps	49h
IATA 2 of 5	05h	UPC E0 with 5 Supps	89h
ISBT 128	19h	UPC E1	10h
Matrix 2 of 5	39h	UPC E1 with 2 Supps	50h
MSI	0Eh	UPC E1 with 5 Supps	90h

Host Requirements

None.

Decoder Requirements

Decode data is sent in this format if packeted decode data is selected via parameter. The host responds to this message with a CMD_ACK.

CHANGE ALL SYMBOLOGIES

Description: Enable or disable all code types

Packet Format

Length	Opcode	Message Source	Status	Data	Checksum
05h	C9h	04h			

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (not including checksum)	1 Byte	Length field
Opcode	C9h	1 Byte	Identifies this Opcode type
Message Source	4 = Host	1 Byte	Identifies where the message is coming from
Status	Bit 0: Retransmit Bits 1-2: Unused Bit 3: Change Type Bits 4-7: Unused	1 Byte	Bit 0: 1 = Retransmit Bit 3: 0 = Temporary change - lost when power removed 1 = Permanent change
Change Value	Change request	1 Byte	0 = Disable All Symbologies 1 = Enable All Symbologies
Checksum	2's complement sum of message contents excluding checksum	2 Bytes	Checksum of message

Host Requirements

None.

Decoder Requirements

Enable or disable all symbologies based upon requested action.

NOTE When all symbologies are disabled, parameter bar codes remain decodable.

EVENT

Description: Indicate selected events occurred.

Packet Format

Length	Opcode	Message Source	Status	Event Code	Checksum
05h	F6h	00h			

Field Descriptions

Field	Format	Size	Description
Length	Length of message (not including checksum)	1 Byte	Length field
Opcode	F6h	1 Byte	Identifies this Opcode type
Message Source	0 = Decoder	1 Byte	Identifies where the message is coming from
Status	Bit 0: Retransmit Bit 1-7: Unused	1 Byte	Identifies the transmission status Unused bits must be set to 0
Event Code	Type of Event Code	1 Byte	See *Table 5-7* below.
Checksum	2's complement sum of message contents excluding checksum	2 Bytes	Checksum of message

The decoder sends this message when a parameter event occurs. See parameter number F0 03 (*Parameter Event on page 4-83*) for controlling whether or not parameter events are generated.

Host Requirements

The host receives this message when a selected event occurs.

Decoder Requirements

Generate this message when a selected event occurs. The decoder communicates an event only if the event type is enabled and packeted decode data transmission is enabled (see *Decode Data Packet Format on page 4-80*).

Event Codes

Table 5-7 *Event Codes*

Event	Code
Parameter Defaults	0Ah
Bootup	03h
System Failure	20h
Parameter Entry Error	07h
Parameter Num Expected	0Fh
Parameter Stored	08h

IMAGE_DATA

Description: Contains the 8-bit gray scale pixel bytes plus a preamble data record.

Packet Format

Length	Opcode	Message Source	Status	Image Data	Checksum
	B1h	00h			

This packet communicates the single raw sensor pixels along with a simple header record that provides in-formation about the data.

Field Descriptions

Field	Format	Size	Description
Length	Length of message (not including checksum)	1 Byte	Length field
Opcode	B1h	1 Byte	Identifies this Opcode type
Message Source	0 = Decoder	1 Byte	Identifies where the message is coming from
Status	Bit 0: Retransmit Bit 1: Continuation Bit Bits 2-7: Reserved	1 Byte	Bit 0: 1 = Retransmit Bit 1: 0 = Last Packet 1 = Intermediate packet
Image Data	Header and image data	Variable	See *Table 5-8 on page 5-15* and packet sequence on page *5-16*.
Checksum	2's complement sum of message contents excluding checksum	2 Bytes	Checksum of message

The image preamble consists of the fields in *Table 5-8*.

Table 5-8 *Image Preamble Fields*

Field	Size	Description
Exposure	2 byte field	The exposure used to generate the image Units are 0.1 usec Little endian byte order
Black Level	1 byte field	Measured black level
White Level	1 byte field	Measured white level

NOTE The preamble only appears in the first packet of the multi-packet stream.

In a multi-packeted environment, one image frame is spread over several packets in the following format:

Packet 1

Header	Preamble	Image Data, Part 1	Checksum

Packet 2

Header	Image Data, Part 2	Checksum

Packet N

Header	Last of Image Data	Checksum

This is re-assembled by the host into:

Preamble	Image Frame

IMAGER_MODE

Description: Commands decoder into Operational Modes.

Packet Format

Length	Opcode	Message Source	Status	Mode	Checksum
05h	F7h	04h			

Field Descriptions

Field	Format	Size	Description
Length	Length of message (not including checksum)	1 Byte	Length field
Opcode	F7h	1 Byte	Identifies this Opcode type
Message Source	0 = Decoder	1 Byte	Identifies where the message is coming from
Status	Bit 0: Retransmit Bit 1-7: Unused	1 Byte	Identifies the transmission status Unused bits must be set to 0
Mode	0 = Decode Mode 1 = Image Capture (Snapshot) Mode 2 = Video Mode	1 Byte	See *Table 5-11 on page 5-28*.
Checksum	2's complement sum of message contents excluding checksum	2 Bytes	Checksum of message

By default, the sensor operates in Decode Mode meaning that any trigger event initiates a decode session where image frames are continuously acquired until either a successful decode occurs, the trigger event is released or the decode session timer elapses. All other operational modes are transient modes that revert back to Decode Mode once they are complete.

Both Image Capture Mode and Video Mode revert to Decode Mode if no trigger event is received within 10 seconds.

The Last Acquire Image value instructs the decoder to return an IMAGE_DATA stream of the most recently acquired image frame. If the decoder recently issued a DECODE_DATA message, and no other trigger event was received, then this request returns the decoded image. Upon ACK'ing this mode, the decoder immediately reverts to Decode Mode.

Host Requirements

The host sends this command with the data field set to the requested operational m.

Decoder Requirements

The decoder (imager) sends a CMD_ACK if the mode is valid, and CMD_NAK if not.

PARAM_DEFAULTS

Description: Sets the parameters to their factory default values.

Packet Format

Length	Opcode	Message Source	Status	Checksum
04h	C8h	04h		

Field Descriptions

Field	Format	Size	Description
Length	Length of message (not including checksum)	1 Byte	Length field
Opcode	C8h	1 Byte	Identifies this Opcode type
Message Source	4 = Host	1 Byte	Identifies where the message is coming from
Status	Bit 0: Retransmit Bit 1-7: Unused	1 Byte	Identifies the transmission status Unused bits must be set to 0
Checksum	2's complement sum of message contents excluding checksum	2 Bytes	Checksum of message

This command returns all parameters to their factory default settings.

Host Requirements

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

Decoder Requirements

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

Recommendations

When setting parameters via SSI packets with the permanent flag set, the following conditions must be met:

- The system must have stable power applied to the scanner.
- The engine and host must be operating and communicating with no interference.
- Power must be maintained for at least two seconds after sending the command or scanning the parameter bar code.

If sending parameters upon every power up, ensure they are temporary. Motorola does not recommend sending permanent parameters or **Set Defaults** upon every power up. Motorola also recommends not using a hard power switch on the power supply.

Failure to meet these conditions can corrupt the decoder's memory.

PARAM_REQUEST

Description: Request values of selected parameters.

Packet Format

Length	Opcode	Message Source	Status	Request Data	Checksum
	C7h	04h			

Field Descriptions

Field	Format	Size	Description
Length	Length of message (not including checksum)	1 Byte	Length field
Opcode	C7h	1 Byte	Identifies this Opcode type
Message Source	4 = Host	1 Byte	Identifies where the message is coming from
Status	Bit 0: Retransmit Bit 1-7: Unused	1 Byte	Identifies the transmission status Unused bits must be set to 0
Request Data	<Param_num><Param_num><Param_num>...	Variable	
Checksum	2's complement sum of message contents excluding checksum	2 Bytes	Checksum of message

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

Host Requirements

The host requests the decoder's current values for specific parameters by listing the parameter numbers in the Request_Data field. If the host asks for a parameter value not supported by the decoder, the decoder does not send a value for this unsupported param_num. If none of the requested values is supported, the decoder transmits an empty PARAM_SEND message. If the host requests the value of all the parameters, it sends a special param_num called ALL_PARAMS (FEh) in the first position of the Request_Data field.

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

Decoder Requirements

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

Hints for requesting parameter values:

Before forming a PARAM_REQUEST, confirm that the decoder supports the requested parameters. To find out what parameters are supported, send an FEh (request all parameters). The response to this is a PARAM_SEND which contains all the supported parameters and their values. FEh must be in the first position of the Request_Data field if used, or it is treated as an unsupported parameter.

Unsupported parameters are not listed in the PARAM_SEND response. Requesting unsupported parameters has no effect, but can cause delays in responding to requests for valid parameters. See *Table 5-9* for example requests and responses.

Table 5-9 *Example Requests and Replies*

PARAM_REQUEST message		Response PARAM_SEND message
#ALL	05 C7 04 00 FE FE 32	0D C6 00 00 FF 01 00 02 01 9C 07 E6 63 FC 3E
#1, 9C	06 C7 04 00 01 9C FE 92	09 C6 00 00 FF 01 00 9C 07 FD 8E
#All, 1, 9C	07 C7 04 00 FE 01 9C FD 93	0D C6 00 00 FF 01 00 02 01 9C 07 E6 63 FC 3E
#1, 9C, ALL	07 C7 04 00 01 9C FE FD 93	09 C6 00 00 FF 01 00 9C 07 FD 8E
#4	05 C7 04 00 04 FF 2C	05 C6 00 00 FF FE 36
#ALL - 3 times	07 C7 04 00 FE FE FE FC 34	0D C6 00 00 FF 01 00 02 01 9C 07 E6 63 FC 3E
#1 -3 times	07 C7 04 00 01 01 01 FF 2B	0B C6 00 00 FF 01 00 01 00 01 00 FE 2D

PARAM_SEND

Description: Respond to a PARAM_REQUEST, change particular parameter values.

Packet Format

Length	Opcode	Message Source	Status	Beep Code	Param data	Checksum
	C6h					

Field Descriptions

Field	Format	Size	Description
Length	Length of message (not including checksum)	1 Byte	Length field
Opcode	C6h	1 Byte	Identifies this Opcode type
Message Source	0 = Decoder 4 = Host	1 Byte	Identifies where the message is coming from
Status	Bit 0: Retransmit Bits 1, 2: Unused Bit 3: Change Type Bits 4-7: Unused	1 Byte	Bit 0: 1= Retransmit * Bit 3: 1 = Permanent change 0 = Temporary change - lost when power removed Unused bits must be set to 0 * There is a permanent/temporary bit in the PARAM_SEND message. Temporary changes are lost when power is removed from the decoder. Permanent changes are written to non-volatile memory. Frequent changes shorten the life of the non-volatile memory.
Beep code	FFh	1 Byte	This field must contain FFh.
Param_data	See *Table 5-10 on page 5-22*	Variable	The parameter numbers and data to be sent to the requester
Checksum	2's complement sum of message contents excluding checksum	2 Bytes	Checksum of message

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

Parameter numbers F0h (+256), F1h (+512), F2h (+768) are used to access parameters whose numbers are 256 and higher. For example, to access the first parameter in the 256-511 range, use F0h and 00h.

Table 5-10 *Param Data Format*

Parameter Number	Data Format
0 through EFh	<param_num> <value>
F0h, F1h, F2h	<extended parameter code> <param_num offset> <value>
F4h	<WORD parameter><Parameter Number><Value : High Byte><Value : Low Byte> or <WORD parameter><Extended parameter code><Parameter Number> <Value : High Byte><Value : Low Byte>

Host Requirements

The host transmits this message to change the decoder's parameters. Be sure the Change Type bit in the Status byte is set as desired.

Decoder Requirements

When the decoder receives a PARAM_SEND, it interprets and stores the parameters, then ACKs the command. These parameters are stored permanently only if the Change Type (bit 3 of the Status byte) is set to 1. If bit 3 is set to 0 the changes are temporary, and are lost when the decoder is powered down.

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

The decoder issues a PARAM_SEND in response to a PARAM_REQUEST from the host. It responds to the PARAM_REQUEST message by sending all supported parameter values. No value is sent for any unsupported param_num. If none of the requested values is supported, the PARAM_SEND message is transmitted with no parameters. When sending this command, the Change Type bit (bit 3 of Status byte) can be ignored.

Recommendations

When setting parameters via SSI with the permanent flag set, the following conditions must be met:

- The system must have stable power applied to the scanner.
- The engine and host must be operating and communicating with no interference.
- Power must be maintained for at least two seconds after sending the command or scanning the parameter bar code.

If sending parameters upon every power up, ensure they are temporary. Motorola does not recommend sending permanent parameters or **Set Defaults** upon every power up. Motorola also recommends not using a hard power switch on the power supply.

Failure to meet these conditions can corrupt the decoder's memory.

REPLY_REVISION

Description: Reply to REQUEST_REVISION command with software revision string.

Packet Format

Length	Opcode	Message Source	Status	Revision	Checksum
	A4h	00h			

Field Descriptions

Field	Format	Size	Description
Length	Length of message (not including checksum)	1 Byte	Length field
Opcode	A4h	1 Byte	Identifies this Opcode type
Message Source	0 = Decoder	1 Byte	Identifies where the message is coming from
Status	Bit 0: Retransmit Bit 1-7: Unused	1 Byte	Identifies the transmission status Unused bits must be set to 0
Revision	ASCII data	variable	Software revision in ASCII (see format below)
Checksum	2's complement sum of message contents excluding checksum	2 Bytes	Checksum of message

Host Requirements

None.

Decoder Requirements

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

S/W_REVISION <space> SCANKIT_REVISION

where:

- **S/W_REVISION** is the release name of the software
- **SCANKIT_REVISION** is the revision string for the ScanKit library.

REQUEST_REVISION

Description: Request the software revision string from the decoder.

Packet Format

Length	Opcode	Message Source	Status	Data	Checksum
04h	A3h	04h			

Field Descriptions

Field	Format	Size	Description
Length	Length of message (not including checksum)	1 Byte	Length field
Opcode	A3h	1 Byte	Identifies this Opcode type
Message Source	4 = Host	1 Byte	Identifies where the message is coming from
Status	Bit 0: Retransmit Bit 1-7: Unused	1 Byte	Identifies the transmission status Unused bits must be set to 0
Data			None
Checksum	2's complement sum of message contents excluding checksum	2 Bytes	Checksum of message

Host Requirements

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

Decoder Requirements

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

SCAN_DISABLE

Description: Prevent the decoder from scanning bar codes

Packet Format

Length	Opcode	Message Source	Status	Data	Checksum
04h	EAh	04h			

Field Descriptions

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

Host Requirements

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

Decoder Requirements

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

SCAN_ENABLE

Description: Permit the decoder to scan bar codes

Packet Format

Length	Opcode	Message Source	Status	Data	Checksum
04h	E9h	04h			

Field Descriptions

Field Name	Format	Size	Description
Length	Length of message (not including checksum)	1 Byte	Length field
Opcode	E9h	1 Byte	Identifies this Opcode type
Message Source	4 = Host	1 Byte	Identifies where the message is coming from
Status	Bit 0: Retransmit Bit 1-7: Unused	1 Byte	Identifies the transmission status Unused bits must be set to 0
Data			None
Checksum	2's complement sum of message contents excluding checksum	2 Bytes	Checksum of message

Host Requirements

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

Decoder Requirements

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

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

SLEEP

Description: Request to place the decoder into Sleep power state.

Packet Format

Length	Opcode	Message Source	Status	Data	Checksum
04h	EBh	04h			

Field Descriptions

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

Host Requirements

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

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

Decoder Requirements

None.

START_SESSION

Description: Tell the engine to attempt to acquire data based upon the current operating mode.

Packet Format

Length	Opcode	Message Source	Status	Data	Checksum
04h	E4h	04h			

Field Descriptions

Field	Format	Size	Description
Length	Length of message (not including checksum)	1 Byte	Length field
Opcode	E4h	1 Byte	Identifies this Opcode type
Message Source	4 = Host	1 Byte	Identifies where the message is coming from
Status	Bit 0: Retransmit Bit 1-7: Unused	1 Byte	Identifies the transmission status Unused bits must be set to 0
Data			None
Checksum	2's complement sum of message contents excluding checksum	2 Bytes	Checksum of message

This command tells the engine to begin a scan session. The engines action in response to this command is dependent upon its current operating mode.

Table 5-11 *START_SESSION Actions*

Operational Mode	Actions Upon Receipt of Command	End Result of Session
Decode Mode	The decoder attempts to decode a bar code.	Successful decode or STOP_SESSION command.
Image Capture	The decoder clicks the shutter	An image is captured.
Video Mode	The decoder continuously produces a video stream.	STOP_SESSION command.

Host Requirements

This action is equivalent to the physical trigger signal being asserted.

Decoder Requirements

None.

STOP_SESSION

Description: Tell the engine to abort the decode or video session.

Packet Format

Length	Opcode	Message Source	Status	Data	Checksum
04h	E5h	04h			

Field Descriptions

Field	Format	Size	Description
Length	Length of message (not including checksum)	1 Byte	Length field
Opcode	E5h	1 Byte	Identifies this Opcode type
Message Source	4 = Host	1 Byte	Identifies where the message is coming from
Status	Bit 0: Retransmit Bit 1-7: Unused	1 Byte	Identifies the transmission status Unused bits must be set to 0
Data			None
Checksum	2's complement sum of message contents excluding checksum	2 Bytes	Checksum of message

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

Host Requirements

None.

Decoder Requirements

None.

WAKEUP

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

If the decoder is in Sleep power state, sending the single character, **NULL** (00h) wakes up the decoder. (See *Power Management on page 1-3*.)

Host Requirements

Once the WAKEUP command is sent, the host must wait at least 10 msec, but less than 1 second before sending additional data, since the decoder is required to wait 1 second after waking up before going back to sleep (if low power mode is enabled).

Decoder Requirements

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

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

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

vSSI Transactions

ACK/NAK Handshaking

All packeted messages must have a CMD_ACK or CMD_NAK response, unless the command description states otherwise. Raw decode data and WAKEUP do not use ACK/NAK handshaking since they are not packeted data.

Crosstalk or Command Collision Handling

A condition can arise where both the decoder and the host initiate a vSSI message transaction simultaneously. Following the initial message/packet, both end-points, the decoder and the host, are awaiting their respective response packets but instead receive the message/request from their partner. In order to gracefully recover from this unexpected response, both end-points are required to immediately respond to the received command and then resume waiting for their response message.

Figure 5-2 provides an example.

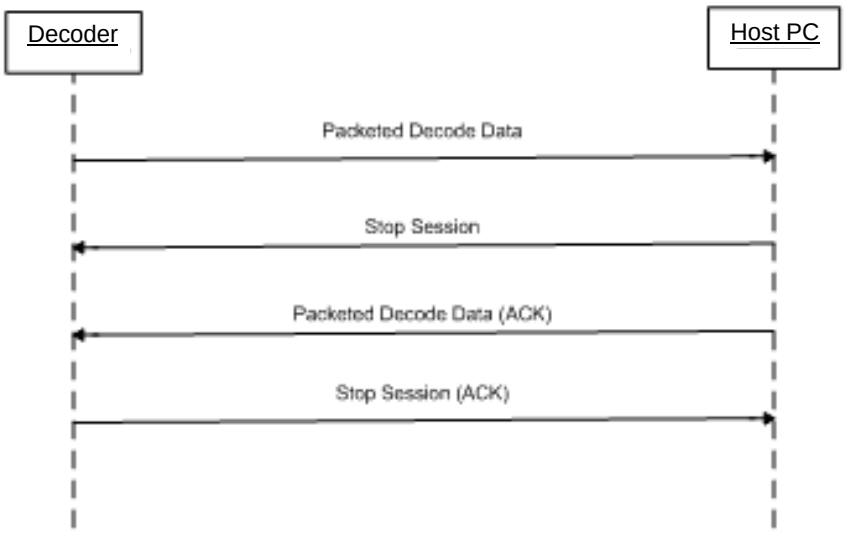


Figure 5-2 *Decoder and Host Initiate SSI Message Transaction*

In this example, the decoder sends an unsolicited 'Packeted Decode Data' message at the same time that the host issues the 'Stop Session' command to the decoder. When this situation occurs, both end-points must temporarily suspend waiting for their respective ACK/NAK response and react to the newly received command; this implies responding to the command with its appropriate response message. Both end-points then resume awaiting the response to the original message.

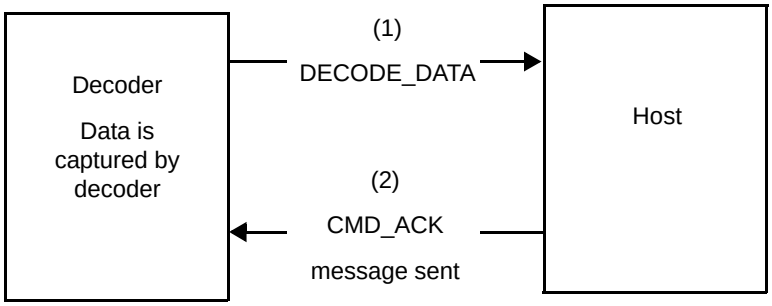
Transfer of Decode Data

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

NOTE When decode data is transmitted as raw ASCII data, ACK/NAK handshaking does not apply.

Packeted Data

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



Unpacketed ASCII Data

No handshaking occurs because the handshaking applies only to packeted data.

Communication Summary

Number of Data Bits

All communication with the decoder must use eight bit data.

Serial Response Time-out

The Serial Response Timeout determines how long the decoder or host should wait for a response before trying again or aborting further attempts due to the retry limit being reached (see the Retries section below). This timeout value is set to 250 ms by the decoder and it is recommended that the host use this same value during SSI transactions.

Retries

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

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

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

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

vSSI Communication Notes

There is a permanent/temporary bit in the PARAM_SEND message. Temporary changes are lost when power is removed from the SE655. Permanent changes are written to non-volatile memory. Frequent changes shorten the life of the non-volatile memory.

Do not scan parameter bar codes and send parameters via vSSI simultaneously. All parameters can be accessed via vSSI, so parameter bar code scanning may not be necessary.

Appendix A Miscellaneous Code Information

Introduction

This Appendix provides information on the following:

GS1-128 (formerly UCC/EAN-128)

GS1-128 is a convention for printing data fields with standard Code 128 bar code symbols. GS1-128 symbols are distinguished by a leading FNC 1 character as the first or second character in the symbol. Other FNC 1 characters are used to delineate fields.

When GS1-128 symbols are read, they are transmitted after special formatting strips off the leading FNC 1 character, and replaces other FNC 1 characters with the ASCII 29 (GS) control character.

When AIM symbology identifiers are transmitted, the modifier character indicates the position of the leading FNC 1 character according to AIM guidelines. For example, **]c1** indicates a GS1-128 symbol with a leading FNC1 character.

Standard Code 128 bar codes which do not have a leading FNC 1 may still be used, but are not encoded according to the GS1-128 convention. Standard Code 128 and GS1-128 may be mixed in an application. The SE655 autodiscriminates between these symbols, and can enable or disable one or both code types. *Table A-1* indicates the behavior of the SE655 in each of the four possible parameter settings.

Table A-1 *Reading Standard Code 128 & GS1-128*

Standard Code 128	GS1-128	Effect and Example
Disable	Disable	No Code 128 symbols can be read.
Disable	Enable	Read only symbols with leading FNC 1. Examples: ^{FNC1}ABCD^{FNC1}E are read as ABCD^{29}E A^{FNC1}BCD^{FNC1}E are read as ABCD^{29}E ^{FNC1FNC1}ABCD^{FNC1}E are read as ABCD^{29}E ABCD^{FNC1}E cannot be read ABCDE cannot be read
Enable	Disable	Read only symbols without leading FNC 1. Examples: ^{FNC1}ABCD^{FNC1}E cannot be read A^{FNC1}BCD^{FNC1}E cannot be read ^{FNC1FNC1}ABCD^{FNC1}E cannot be read ABCD^{FNC1}E is read as ABCD^{29}E ABCDE is read as ABCDE
Enable	Enable	Read both types of symbols. Examples: ^{FNC1}ABCD^{FNC1}E are read as ABCD^{29}E A^{FNC1}BCD^{FNC1}E are read as ABCD^{29}E ^{FNC1FNC1}ABCD^{FNC1}E are read as ABCD^{29}E ABCD^{FNC1}E is read as ABCD^{29}E ABCDE is read as ABCDE

Symbol Code Identifiers

Table A-2 *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
E	Code 93
F	Interleaved 2 of 5
G	Discrete 2 of 5
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
U	Chinese 2 of 5
X	ISSN

AIM Code Identifiers

Each AIM Code Identifier contains the three-character string **]cm** where:

] = Flag Character (ASCII 93)
c = Code Character (see *Table A-3*)
m = Modifier Character (see *Table A-4*).

Table A-3 *Code Characters*

Code Character	Code Type
A	Code 39, Code 39 Full ASCII, Code 32
C	Code 128, ISBT 128, GS1-128, Coupon (Code 128 portion)
E	UPC/EAN, Coupon (UPC portion)
F	Codabar
G	Code 93
H	Code 11
I	Interleaved 2 of 5
M	MSI
S	Discrete 2 of 5, IATA 2 of 5
X	Code 39 Trioptic, Bookland EAN, Matrix 2 of 5, Chinese 2 of 5, ISSN
e	GS1 DataBar Family

The modifier character is the sum of the applicable option values based on the following table.

Table A-4 *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 in the first position, FNC1 Aim Id 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.
	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.

Table A-4 *Modifier Characters (Continued)*

Code Type	Option Value	Option
	Example: A Code 93 bar code 012345678905 is transmitted as **]G0**012345678905	
MSI		
	0	Mod 10 check digit checked and transmitted.
	1	Mod 10 check digit checked but not transmitted.
	Example: An MSI bar code 4123, with a single check digit checked, is transmitted as **]M0**4123	
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 packet in full EAN country code format, which is 13 digits for UPC-A, UPC-E, and EAN-13 (not including supplemental data).
	1	Two digit supplement data only.
	2	Five digit supplement data only.
	3	Combined data packet comprising 13 digits from a UPC-A, UPC-E, or EAN-13 symbol and 2 or 5 digits from a 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	

According to AIM standards, a UPC with supplemental bar code is transmitted in the following format:

]E0 (UPC chars) (terminator) **]E2** (supplemental) (terminator)

In the SE655, however, the format is changed to:

]E0 (UPC chars) **]E2** (supplemental)

Therefore, a UPC with two supplemental characters, 01234567890510, is transmitted to the host as a 21-character string, **]E0**0012345678905**]E1**10.

Setting Code Lengths Via Serial Commands

There are two lengths (L1 and L2) for each variable length code type. See the individual code types in *Chapter 4, Parameter Menus* for the L1 and L2 parameter numbers.

Depending on the selected option, the scan engine decodes:

- One discrete length bar code
- Two discrete length bar codes
- Bar codes within a range of lengths within the scan engine capability
- Any length of bar codes within the scan engine capability.

Table A-5 lists the requirements for each option.

Table A-5 *Setting Variable Code Lengths*

Code Length Option	L1 value	L2 value
One discrete length is decoded.	Discrete length to decode	00h
Two discrete lengths is decoded.	Higher length value	Lower length value
Lengths within a range are decoded within the scan engine capability.	Lower length value	Higher length value
Any length bar code is decoded within the scan engine capability.	00h	00h

Index

A

B

C

D

E

F

H

I

L

M

N

O

P

R

S

T

U

V

W

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

DCP. See **Device Configuration Package**.

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.

Device Configuration Package. The Symbol Device Configuration Package provides the Product Reference Guide (PRG), flash partitions, Terminal Configuration Manager (TCM) and the associated TCM scripts. With this package hex images that represent flash partitions can be created and downloaded to the mobile computer.

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

F

File Transfer Protocol (FTP). A TCP/IP application protocol governing file transfer via network or telephone lines. See **TCP/IP.**

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 and LED operation classes based on power output during operation.

IEC (825) Class 1. This is the lowest power IEC laser and LED classification.

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.

Internet Protocol Address. See **IP**.

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. Internet Protocol. The IP part of the TCP/IP communications protocol. IP implements the network layer (layer 3) of the protocol, which contains a network address and is used to route a message to a different network or subnetwork. IP accepts “packets” from the layer 4 transport protocol (TCP or UDP), adds its own header to it and delivers a “datagram” to the layer 2 data link protocol. It may also break the packet into fragments to support the maximum transmission unit (MTU) of the network.

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

MC. Mobile Computer.

MDN. Mobile Directory Number. The directory listing telephone number that is dialed (generally using POTS) to reach a mobile unit. The MDN is usually associated with a MIN in a cellular telephone -- in the US and Canada, the MDN and MIN are the same value for voice cellular users. International roaming considerations often result in the MDN being different from the MIN.

MIL. 1 1 mil = 1 thousandth of an inch.

MIN. Mobile Identification Number. The unique account number associated with a cellular device. It is broadcast by the cellular device when accessing the cellular system.

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.

Mobile Computer. In this text, *mobile computer* refers to the Symbol Series 9000 wireless portable computer. It can be set up to run as a stand-alone device, or it can be set up to communicate with a network, using wireless radio technology.

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.

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.

SMDK. Symbol Mobility Developer's Kit.

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.

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.

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. See **Mobile Computer**.

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.

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.**

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.

Tell Us What You Think...

We'd like to know what you think about this Manual. Please take a moment to fill out this questionnaire and fax this form to: (631) 627-7184, or mail to:

Motorola Solutions, Inc.
One Motorola Plaza M/S B-10
Holtsville, NY 11742-1300
Attention: Technical Publications Manager
Advanced Data Capture Division

Important If you need product support, please call the appropriate customer support number for your area. Unfortunately, we cannot provide customer support at the fax number above.

Manual Title:_____
(please include revision level)

How familiar were you with this product before using this manual?

☐ Very familiar ☐ Slightly familiar ☐ Not at all familiar

Did this manual meet your needs? If not, please explain.

_____
_____
_____
_____

What topics need to be added to the index, if applicable?

_____
_____
_____
_____

What topics do you feel need to be better discussed? Please be specific.

_____
_____
_____
_____

What can we do to further improve our manuals?

_____
_____
_____
_____

Thank you for your input—We value your comments.

Motorola Solutions, Inc.
One Motorola Plaza
Holtsville, New York 11742, USA
1-800-927-9626
http://www.motorolasolutions.com

72E-136168-05 Revision A - March 2012