SE965HP ENGINE INTEGRATION GUIDE

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Warranty

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

Revision History

Changes to the original guide are listed below:

Change	Date	Description
-01 Rev A	9/2011	Initial release

TABLE OF CONTENTS

Chapter 7: Parameter Menus

ABOUT THIS GUIDE

Introduction

The *SE965HP Engine Integration Guide* discusses the theory of operation, installation, and specifications of the engine, and how to integrate the engine into data capture devices.

NOTE This guide provides general instructions for installing the engine into a customer's device. Motorola recommends that an opto-mechanical engineer perform an opto-mechanical analysis prior to integration.

Chapter Descriptions

This guide includes the following topics:

- *Chapter 1, Getting Started* provides an overview of the engine, the theory of operation, and electrical information.
- *Chapter 2, Installation* discusses mounting and installing the SE965HP scan engine, including physical, electrical, and optical considerations and recommended window properties.
- *Chapter 3, Replacing Existing Engines* provides information for replacing an SE955 or SE1224 scan engine with the SE965HP.
- *Chapter 4, Specifications* provides technical specifications for the engine, including decode ranges.
- *Chapter 5, Regulatory Requirements* describes the integration, documentation, and labeling requirements for Class 2 laser products.
- *Chapter 6, Application Notes* describes the electrical characteristics of the imaging system and provides timing waveforms.
- *Chapter 7, Parameter Menus* provides the bar codes necessary to program the scan engine system.
- *Chapter 8, Remote Scanner Management* provides the hardware signals, protocol commands and attribute support for Remote Scanner Management.
- *Chapter 9, Simple Serial Interface* provides the engine code for the SE965HP for use with the Simple Serial Interface (SSI), and refers to the *Simple Serial Interface Programmer's Guide*.

- *Appendix A, Miscellaneous Code Information* provides information on AIM code identifiers and prefix/suffix values.

Notational Conventions

The following conventions are used in this document:

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

Related Documents and Software

- *Universal Scan Engine Developer's Kit*, p/n DKSE-2000-000R
- *Universal Scan Engine Developer's Kit Installation Guide*, p/n 72E-59636-xx
- *Simple Serial Interface (SSI) Software Developer's Kit Programmer Guide*, p/n 72E-59860-xx
- *Simple Serial Interface (SSI) Developer's Guide*, p/n 72E-50705-xx
- *Simple Serial Interface (SSI) Programmer's Guide*, p/n 72E-40451-xx
- *OPOS Driver and Management Suite for Motorola Scanners Programmer Guide*, p/n 72E-77502-xx

For the latest version of this guide and all guides, go to: http://supportcentral.motorola.com.

Service Information

If you have a problem with your equipment, contact Motorola Solutions support for your region. Contact information is available at: http://supportcentral.motorola.com.

When contacting Motorola Solutions support, 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 service agreements.

If your problem cannot be solved by Motorola Solutions 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, please contact that business partner for support.

CHAPTER 1 GETTING STARTED

CAUTION This device emits CDRH/IEC Class 2 laser light. Do not stare into beam.

Introduction

The SE965HP is a miniature decoded scan engine offering best in class for performance, size, reliability, and durability. The SE965HP is built upon a long heritage of high-performance scan engines and is unique for its working range, making it the industry benchmark. The SE965HP has more features than any other scan engine available and delivers a new level of performance, giving your product a competitive advantage.

SE965HP features include:

- Identical form factor as the SE955
- Patented adaptive scanning for maximum working range
- Longest and best working range on all 1D bar codes
- Small size and light weight to optimize product designs
- Extremely fast decode time (< 60ms)
- Bright scan line for easy and intuitive scanning
- Quick and easy integration
- Patented die cast chassis for strength and durability
- Industry's best for reliability and durability (withstands multiple 2000G shocks)

- Low power consumption to maximize battery life in portable devices
- Flash upgradeable
- Patented Liquid Polymer Technology
- Lifetime warranty on motor
- Enhanced aim

Theory of Operation

The SE965HP is a scan engine combined with a microprocessor to control the functionality of the engine and provide a communication link to the host computer.

The scan engine provides the following functions:

- Ability to decode 1D bar codes
- Adaptive scanning
- Laser drive circuit controlling a 650 nm laser diode
- Scan element drive circuit controlling a resonant single line scan element
- Analog receiver with circuitry to identify the bar and space locations in the received signal

The microprocessor provides control of the programmable features of the analog circuitry used for optimizing decode performance.

Scan Engine

A scan engine functions as follows:

- A laser diode emits a coherent beam of light focused to a diameter appropriate for the bar code densities to be read.
- The laser beam strikes the mirror of the scan element. This mirror oscillates about its vertical axis deflecting the beam, forming the outgoing scan line.
- As the laser spot sweeps across the bar code it is either reflected off the white spaces or absorbed by the black bars.
- A collection mirror tracks the location of the laser spot on the bar code, collects the reflected light, and focuses it onto the receiver photodiode.
- The photodiode is a transducer that converts optical energy to electrical current. This current feeds into the analog signal processing circuitry.
- The analog signal processing circuitry amplifies, filters, and edge enhances the signal returned from the bar code. These edges represent where the laser transitions between a bar and a space, and communicates the information contained in the bar code.
- The digitizer circuitry generates a digital waveform whose ones and zeros represent the widths of the bars and spaces in the bar code. This waveform is called the Digital Bar Pattern (DBP).
- The decoded data is sent to the host microprocessor.

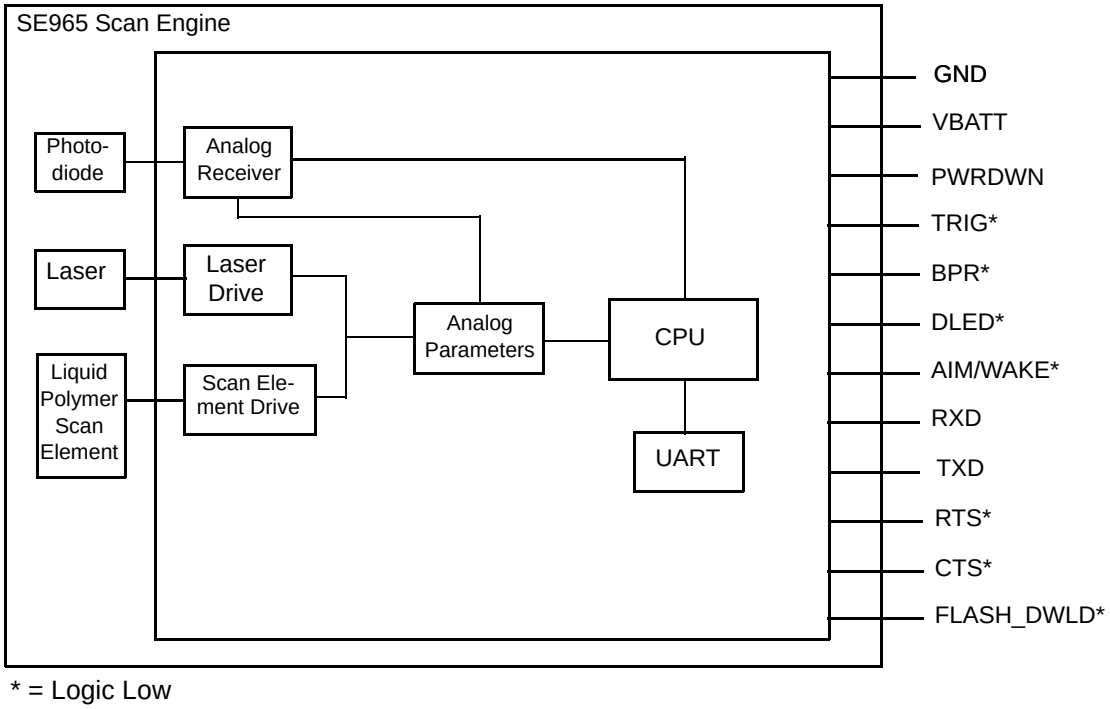


Figure 1-1 *Scan Engine Block Diagram*

The laser drive uses multiple forms of feedback (optical and electrical) to control the diode laser to emit constant optical power, and to ensure compliance with the laser regulatory standards described in *Chapter 5, Regulatory Requirements*.

The scan element is a mirror and magnet assembly cantilevered on a spring. This is a resonant system with a natural frequency of 52 Hz resulting in 104 scans per second. Alternating current forced through a drive coil mounted adjacent to the magnet causes the mirror to deflect to either side of its steady state position. This deflection causes the laser spot to sweep across the bar code. A feedback coil coaxial with the drive measures the amplitude of the scan element and sets the scan amplitude. The SE965HP is factory calibrated to generate three user selectable scan angles - narrow (10°), medium (35°), and wide (47°, default).

Adaptive Scanning

The SE965HP's patented adaptive scanning process uses a range finder to provide feedback on how far away a bar code is when scanning, and automatically optimizes parameters to improve decode performance. These parameters include bandwidth, receiver gain, digitizer settings, and scan angle; however scan angle is the only noticeable parameter controlled.

When the bar code reaches a certain distance from the engine (approximately 30 inches), the engine automatically reduces the scan angle to narrow (10°). (The exception is highly reflective bar codes, which may not cause the scan engine to switch to the narrow angle). However, if the scan line is not touching a bar code, the engine may switch to the narrow scan angle at a much shorter distance. This improves decode range on certain bar codes. This feature can be disabled and the user can select narrow, medium, or wide angle only, depending on application needs. See *Adaptive Scanning on page 7-13*.

Simple Serial Interface (SSI)

The SE965HP scan engine supports the Simple Serial Interface (see *Table 1-3*) and various triggering modes of operation (see *Triggering Modes on page 7-14*), including:

- Scan mode
- Enhanced Aim trigger mode
- Blink mode for presentation scanning
- Continuous mode.

NOTE In Scan mode the pre-selected scan amplitude is used, i.e., 10°, 35°, or 47° (default). Also see *Scan Angle on page 7-13*.

Aim mode provides a laser aim dot, used to align the scan engine to a bar code before scanning. To aim then scan, the host controls the engine using the hardware AIM/WKUP* then TRIG* lines at the SSI interface (see *Table 1-2*), or by SSI commands (see *Chapter 9, Simple Serial Interface*).

Blink mode is used for triggerless operation in presentation scanning applications. To minimize power consumption, the engine performs low duty cycle scanning until it detects a change in background. The engine then performs high duty cycle scanning until it decodes a bar code, if present. The engine returns to low duty cycle scanning until it detects the next change in background (see *Triggering Modes on page 7-14*).

In Continuous scanning mode, the engine is always scanning and decoding (see *Power Mode on page 7-20*).

Power Management

The SE965 has two power states (Awake and Sleep) and two power modes (Continuous Power and Low Power).

Power States

WAKEUP and SLEEP commands (refer to the *Simple Serial Interface (SSI) Programmer's Guide*) are sent to the scan engine to set the Power state to Awake or Sleep. Low Power mode puts the engine into the Sleep state after a specified period of time.

When the SE965HP is in the Sleep power state the PWRDWN signal is asserted (see *Table 1-3*). The host uses this signal to remove power from the SE965HP. 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

The Power Mode parameter controls power modes (see *Power Mode on page 7-20*).

- 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 7-20*) sets the SE965 to remain in the Awake power state unless it receives a SLEEP command. In this mode, the SE965 can switch power states using the SLEEP and WAKEUP commands (refer to the *Simple Serial Interface (SSI) Programmer's Guide*). 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 SE965 to switch power states using the SLEEP and WAKEUP commands (refer to the *Simple Serial Interface (SSI) Programmer's Guide*). The SE965 must be awakened from the Sleep power state before performing any functions.

Table 1-1 indicates how to put the SE965HP into Low Power mode. *Table 1-2* shows how to awaken it.

Table 1-1 *Putting the SE965 into Low Power Mode*

Action	Behavior
Set the Power Mode parameter to Low Power	The SE965 enters Low Power mode and automatically switches to the Sleep power state whenever possible.
Send the serial SLEEP command	The SE965 enters Sleep power state only once, as soon as possible.

Note: All wake up signals (see *Table 1-2*) must be inactive to enter Sleep power state. Once the SE965 is awakened, at least 1 second must elapse before it re-enters Low Power mode.

Table 1-2 *Waking Up the SE965*

Signal	State to Wake Up
AIM/WKUP*	Low
TRIG*	Low
CTS*	Low
RXD	Send 0x00

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 SE965HP 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 SE965HP interface..

Table 1-3 *Electrical Interface*

Mnemonic	Pin No.	Type	Description
V_{BATT}	2	PWR	Power supply: 3.0 to 3.6 VDC
GND	3	PWR	Ground
AIM/WAKE*	11	I	**Wake Up:** When the SE965 is in low power mode, pulsing this pin low for 200 nsec awakens the SE965. **AIM:** This pin provides a hard wired trigger line that creates an AIM pattern (a spot). This spot allows positioning the bar code and laser beam alignment to maximize the scan capability of the SE965.
FLASH_DWLD*	1	I	**Flash Down Load:** Do not drive high. Pull low for download.
RXD	4	I	**Received Data:** Serial input port.
CTS*	6	I	**Clear to Send:** Serial port handshaking line.
TRIG*	12	I	**Trigger:** Hardware triggering line. Driving this pin low causes the SE965 to start a scan and decode session.
TXD	5	O	**Transmitted Data:** Serial output port.
RTS*	7	O	**Request to Send:** Serial port handshaking line.
PWRDWN	8	O	**Power Down Ready**: When high, the decoder is in low power mode.
BPR*	9	O	**Beeper:** Low current beeper output.
DLED*	10	O	**Decode LED:** Low current decode LED output.

Notes:
1. Signal names with the "*" modifier are asserted when at the ground level (logic 0, active low).
2. Signal names without the "*" modifier are asserted when at the positive supply voltage level (logic 1, active high).

CHAPTER 2 INSTALLATION

Introduction

This chapter provides information for mounting and installing the SE965HP scan engine, including physical and electrical considerations and recommended window properties.

Grounding

CAUTION The SE965HP chassis is connected to GROUND. When installing the SE965HP to a hot or powered host, you must isolate the two.

An insulator can be inserted between the two chassis, and if using metallic (non-magnetic) screws, shoulder washers must be used to isolate the screws from the host. Non-metallic screws may also be used if mechanical considerations permit.

ESD

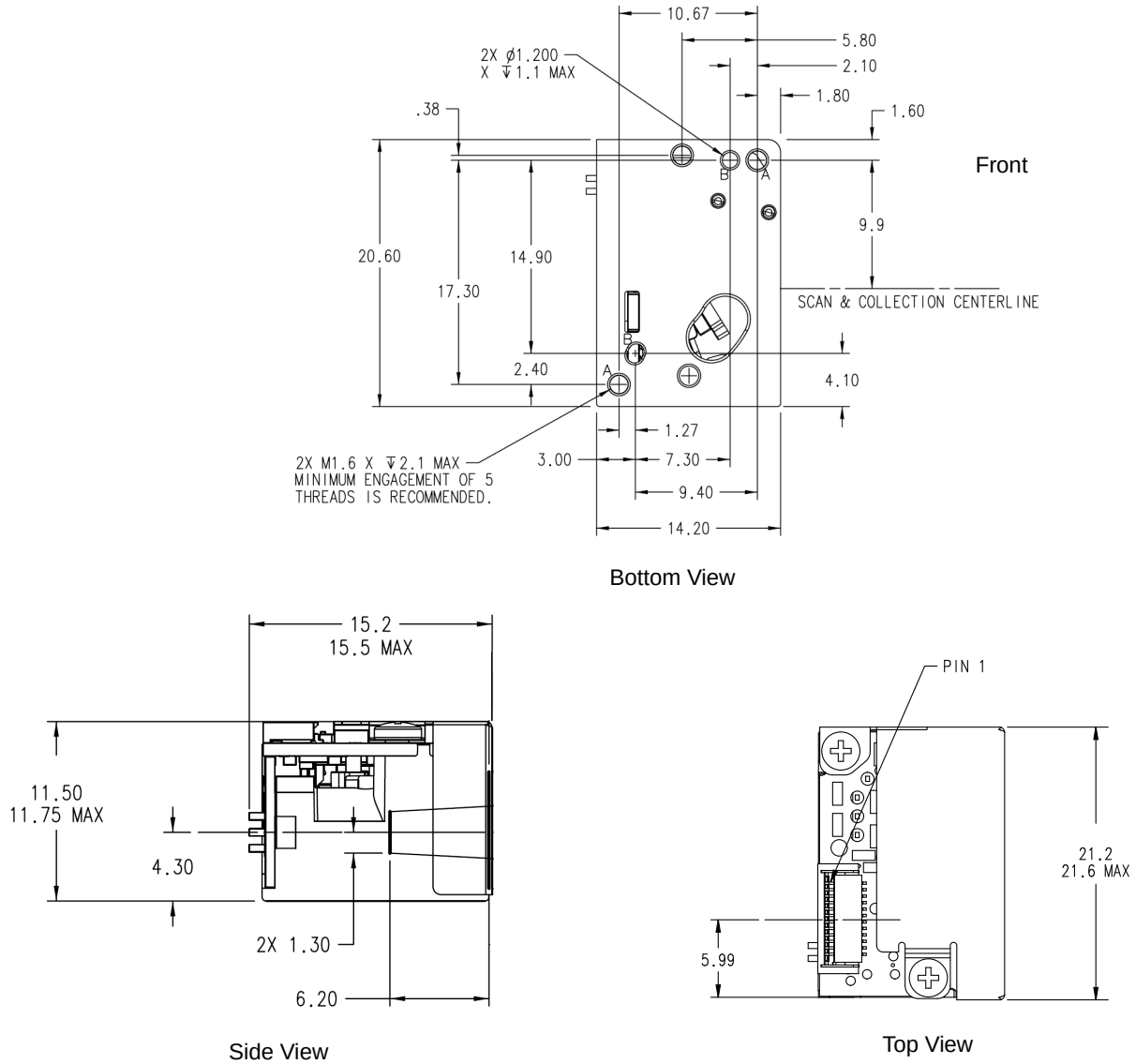
The SE965HP is protected from ESD events that may occur in an ESD-controlled environment. Always exercise care when handling the module. Use grounding wrist straps and handle in a properly grounded work area.

Environment

Enclose the SE965HP properly to prevent dust particles from gathering on the mirrors, laser lens, and the photodiode. Dust and other external contaminants eventually degrade unit performance. Motorola does not guarantee performance of the engine when used in an exposed application.

Mounting

There are two mounting holes (M1.6 x 0.35), and two locator holes on the bottom of the chassis. The SE965HP may be mounted in any orientation without any degradation in performance.



Dimensions are in: mm.

Notes:

1. Chassis is electrically connected to ground and must be isolated from Vcc.
2. Mounting screws and locating pins must be non-magnetic material. Do not place any magnetic material within 1 inch of the SE965HP chassis without testing.
3. Holes marked ‘A’ are mounting holes. Holes marked ‘B’ are scan engine location aids.
4. The SE965HP has a back latch 12-pin connector. See *Connector on page 2-14* for details.
5. This is a reference drawing and is not intended to specify or guarantee all possible integration requirements for this engine.
6. Untoleranced dimensions: .x: ± .5 mm; .xx: ± .25 mm; .xxx: ± .125 mm

Figure 2-1 *SE965HP Mounting Diagram*

Installing the SE965HP

Before installing the SE965HP into the host equipment, consider the following:

- The SE965HP chassis is electrically connected to ground. It must be isolated from Vcc.
- Use only non-magnetic screws (i.e., stainless steel 300 series screws) or locating pins when mounting the SE965HP. Magnetic screws or pins can change the scan element/mirror neutral position. Recommended screw torque is shown in *Table 2-1*.

Table 2-1 *Screw Torque*

	Recommended
Standard	10 ± 2 oz-in
Metric	0.72 ± 0.14 kg-cm

- Using a thread locking method such as a Nylok patch (a thread locking compound pre-applied to the screws) is strongly recommended.
- Do not place magnetic material (e.g., dynamic speakers, ringers, vibrators, inductors, metal parts) within one inch of the SE965HP chassis. The SE965HP liquid polymer scan element used to generate the scan line has a magnet on one end. Locating magnetic or ferrous material near the scan engine can influence the pointing of the scan line coming out of the engine. Evaluate placement of all magnetic or ferrous material during system layout to determine if one inch is sufficient.
- Leave sufficient space to accommodate the maximum size of the engine.

CAUTION When using metallic non-magnetic screws, ensure that the screwdriver or screw tip used is non-magnetic. Magnetic screwdrivers or screw tips change the scan element/mirror neutral position. Note that magnetic screwdrivers do not permanently alter pointing, as long as they are removed.

CAUTION Integrating scan engines into the final product may require adhesives. 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 SE965HP uses a sophisticated optical system that can provide scanning performance that matches or exceeds that of much larger scanners. A properly designed enclosure does not degrade the performance of the scan engine.

NOTE This guide provides general instructions for installing 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 the design and specification of the window and enclosure.

Housing Design

Exit window orientation has a significant effect on scanner performance. See *Table 2-4*, *Table 2-5*, *Table 2-6*, and *Table 2-7* for exit window distances. In addition to providing obstacle-free paths for outgoing and incoming light, a good housing design ensures the outgoing laser light reflected off of the window back into the housing is attenuated sufficiently before reaching the detector.

Unwanted laser light reaching the detector is termed “stray light”. As a goal, keep stray light below 5 nanowatts for full range performance. Stray light is difficult to model and is highly dependent on 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 circuit boards. Traces and solder pads behave like mirrors and can inadvertently degrade performance.

The position of the detector creates a side field of view area where ambient light into this area can affect scanner performance. See *Figure 2-8 on page 2-12* for an illustration of the side field of view. Although not required, designing the housing to block ambient light into the side field of view to increase performance at 10,000 FCD is recommended.

To properly determine the tilt of the exit window, ray trace the exit beam reflection off the window and ensure 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, supplement the design with testing and verification.

Determine the height and width of the exit window such that the outgoing laser beam and return light is not clipped. See *Figure 2-8 on page 2-12*, *Table 2-6 on page 2-13*, and *Table 2-7 on page 2-13* for recommended minimum widths at various window positions. Motorola highly recommends analyzing additional positioning tolerance of the scan engine based on your specific application and increasing window size accordingly.

NOTE SE965HP 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, a laser clear aperture and the collection clear aperture are defined. The laser clear aperture requires high optical performance, and the collection clear aperture requires fair optical performance. See *Figure 2-2 on page 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 laser 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 collection clear aperture: < 10 waves (P-V).

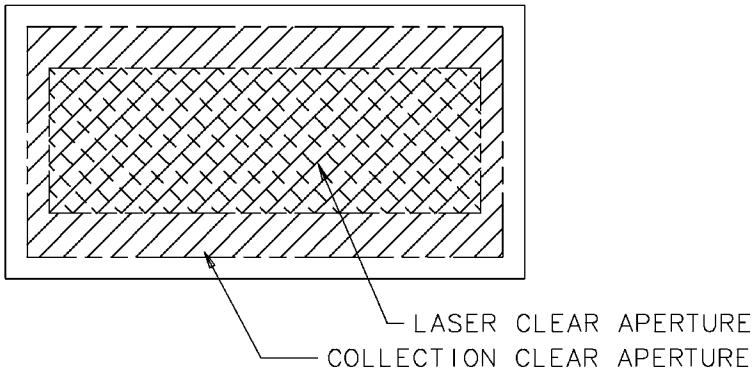


Figure 2-2 *Clear Apertures*

Collection Beam Geometry

Figure 2-2 also illustrates the beam envelope entering the scan engine. Ensure that the collection path is free of obstruction for full scan angle performance.

Laser Clear Aperture

The laser clear aperture is the area on the exit window that intersects the exit beam envelope as shown in *Figure 2-3*. Note that at any instance in time, the outgoing laser beam is collimated and approximately 1 mm in diameter, while during scanner operation the beam is constrained within the exit beam envelope. For dimensions and information about clear aperture calculations, see *Exit Window Characteristics on page 2-10* and *Exit Window Positioning on page 2-12*.

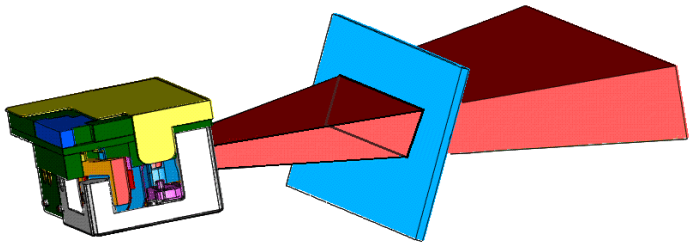


Figure 2-3 *Exit Beam Envelope*

Collection Clear Aperture

As shown in *Figure 2-4*, the collection clear aperture is the area on the exit window which intersects the collection beam envelope. In both cases, ensure that the paths are free of obstruction. In addition, incorporate a minimum of a 0.020” to 0.040” spacing between the clear apertures and the window borders.

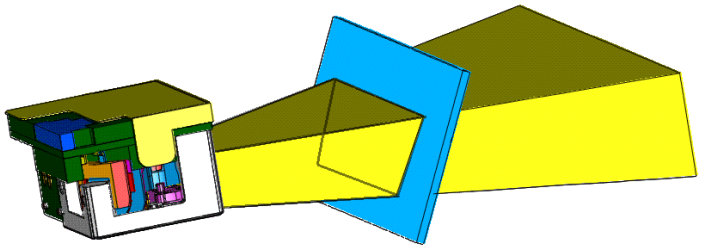


Figure 2-4 *Entrance Beam Envelope*

Exit Window Materials

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

- **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.

Abrasion Resistance

To gauge a window's durability, it is useful to 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 2-2*.

Table 2-2 *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.**			

Anti-Reflection (AR) Coatings

Anti-reflection coatings can be used for stray light control or to achieve maximum working range, however, they are expensive and therefore not recommended. AR coatings also have very poor abrasion and scratch resistance, making only single-side AR coatings practical (the AR coated side of the window faces the interior of the scanner).

Color

Plastic is available in a wide range of colors. Exit windows can be colored if desired. The only requirement is that the optical transmission in the spectral region between 640 nm and 670 nm should be 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 2-3 on page 2-8 lists some exit window manufacturers and anti-reflection coaters.

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, then air drying in an oven with filtered hot air.

Table 2-3 *Exit Window Manufacturers and Coaters*

Company	Discipline	Specifics
Evaporated Coatings, Inc. 2365 Maryland Road Willow Grove, PA 19090 (215) 659-3080	Anti-reflection coater	Acrylic window supplier Anti-reflection coater
Fosta-Tek Optics, Inc. 320 Hamilton Street Leominster, MA 01453 (978) 534-6511	Cell-caster, hard coater, laser cutter	CR39 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

Symbol Position with Respect to a Fixed-Mount Scan Engine

When mounting the SE965HP in order to read symbols automatically presented, or always presented in a pre-determined location, positioning the SE965HP with respect to symbol location is critical. Failure to properly position the scan engine and symbol can cause unsatisfactory reading performance.

The SE965HP can be programmed to three different scan angles. It is recommended that the position of the scan engine is set using the widest scan angle (47°). Setting the position for the medium scan angle (35°) and then changing the scan angle can cause clipping of the laser beam against the housing.

To ensure satisfactory operation of the SE965HP in an 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 symbols are decodable.
   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 system performance. 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 2-10* for maximum angles.
5. If placing a window between the engine and the symbol, use a representative window in the desired window position to determine optimum symbol location. See the sections of this chapter concerning window quality, coatings, and positioning.
6. Allow the scan engine 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 presenting the symbol, if possible.

Exit Window Characteristics

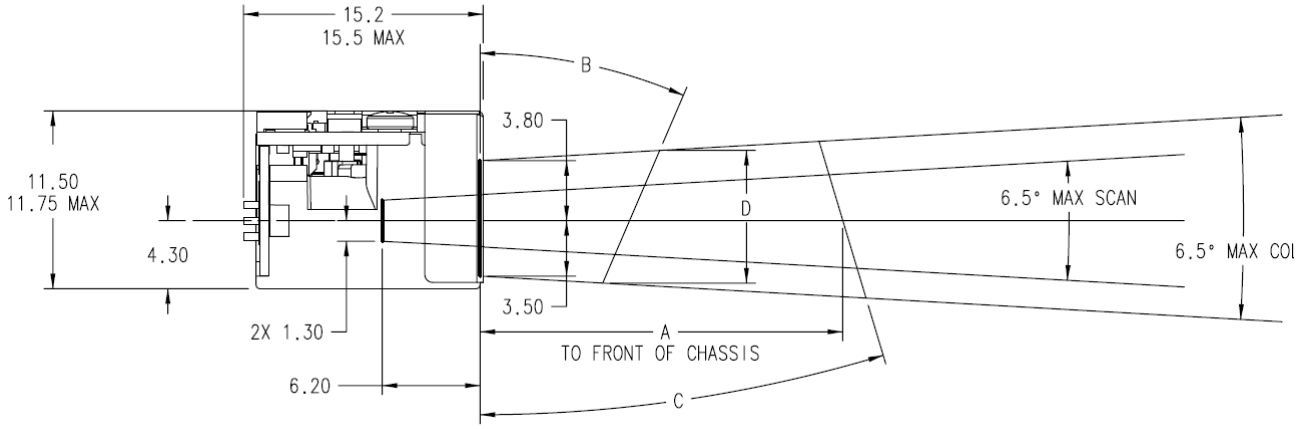


Figure 2-5 *Exit Window Tilt Angle*

Table 2-4 *Exit Window Distance from Scan Engine: 0.15 in - 0.36 in (3.8 mm - 9.0 mm)*

A	Distance from Scan Engine on center line (in./mm)*	0.15/ 3.8	0.156/ 4	0.18/ 4.5	0.20/ 5	0.22/ 5.5	0.24/ 6	0.25/ 6.35	0.26/ 6.5	0.28/ 7	0.31/ 8	0.36/ 9
B	Minimum Window Positive Tilt (degrees)	36.0	35.0	32.5	31.0	29.0	27.5	26.5	26.0	25.0	22.5	20.5
C	Minimum Window Negative Tilt (degrees)	34.0	33.5	31.0	29.5	27.5	26.0	25.0	24.5	23.5	21.5	19.5

Table 2-5 *Exit Window Distance from Scan Engine: 0.39 in - 2.00 in (10.0 mm - 50.8 mm)*

A	Distance from Scan Engine on center line (in./mm)*	0.39/ 10	0.48/ 12	0.50/ 12.7	0.55/ 14	0.75/ 19	1.00/ 25.4	1.25/ 31.8	1.50/ 38	1.75/ 44.5	2.00/ 50.8
B	Minimum Window Positive Tilt (degrees)	19.0	17.0	16.5	15.0	12.0	10.0	9.0	8.0	7.5	7.0
C	Minimum Window Negative Tilt (degrees)	18.5	16.0	15.5	14.5	12.5	9.5	8.5	7.5	7.0	6.5

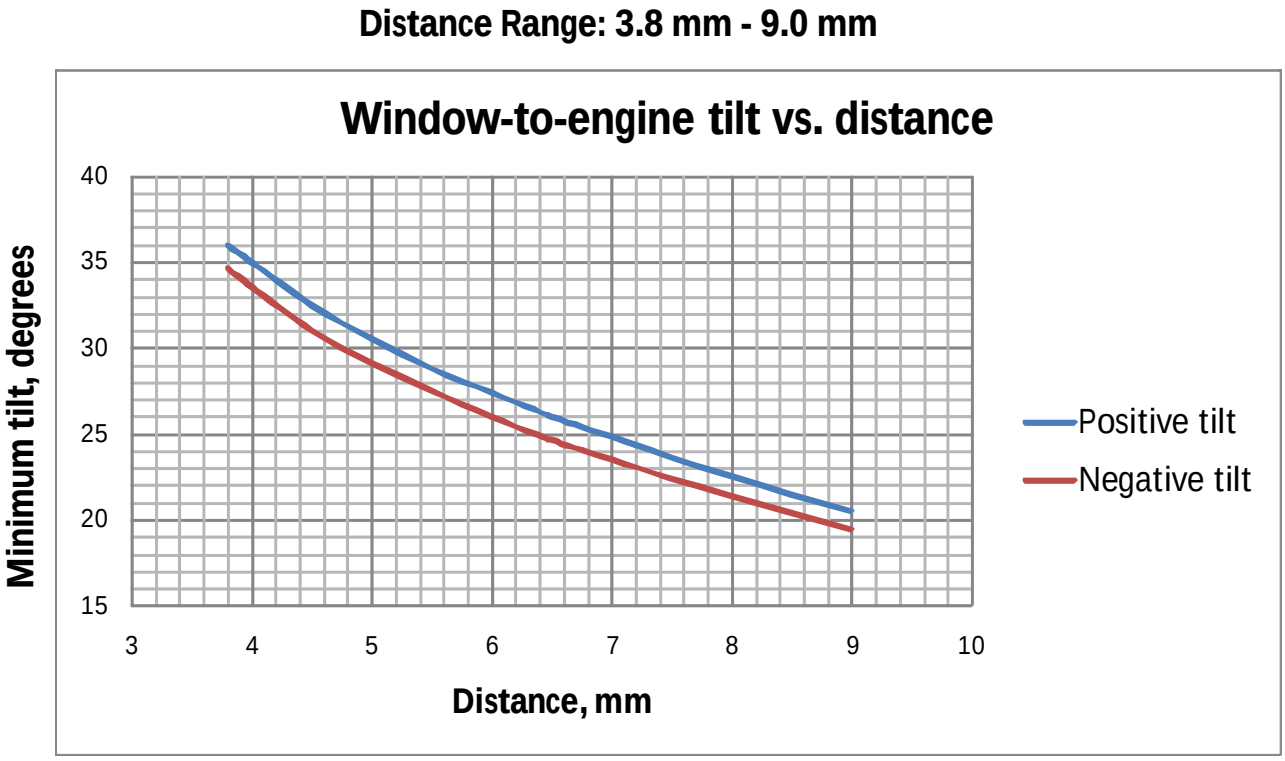


Figure 2-6 *Exit Window Tilt vs. Distance: 3.8 mm - 9 mm*

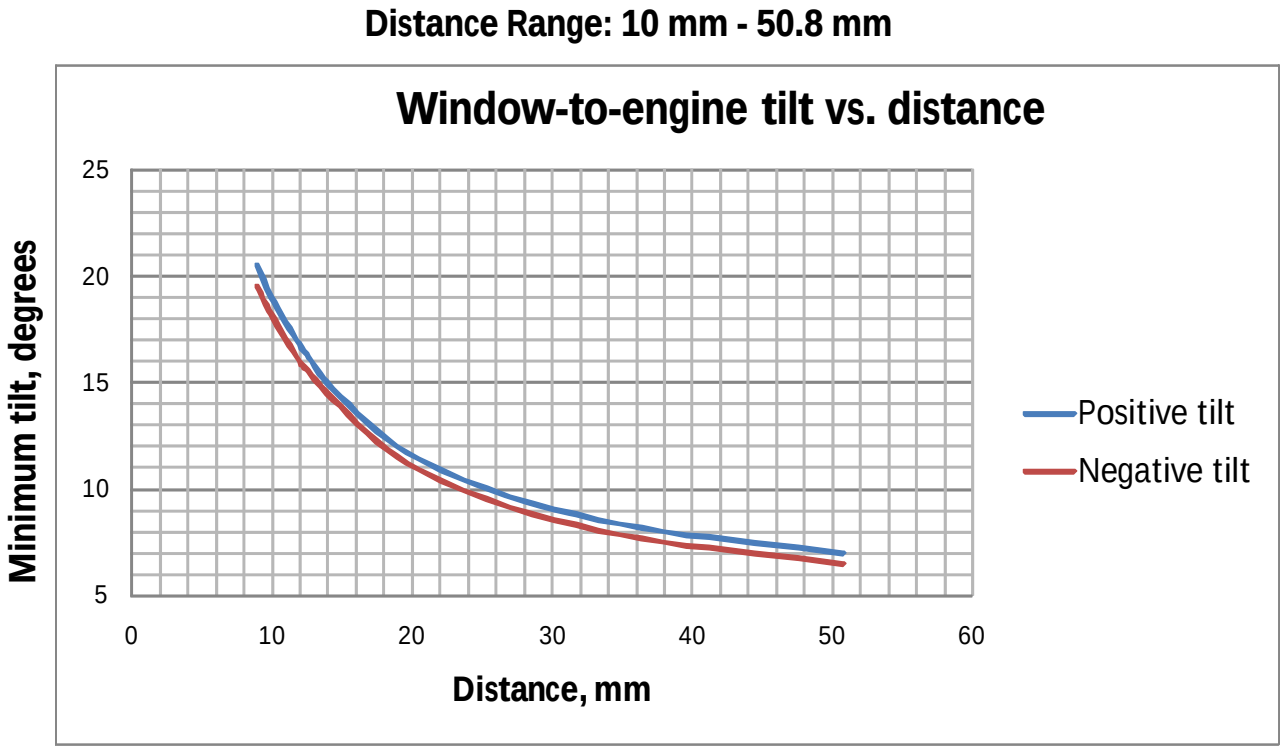


Figure 2-7 *Exit Window Tilt vs. Distance: 10.0 mm - 50.8 mm*

Exit Window Notes

- Keep the exit window clean and free of smudges, fingerprints, or other particles. A soiled window can reduce working range and disable Adaptive Scanning.
- If installing the engine in an environment where a soiled window is unavoidable, increase the distance between the engine and the window to reduce sensitivity. Also use a non-AR coated window which is easier to clean.

Notes:

1. Chassis is electrically at ground.
2. Maximum horizontal scan/collection envelope (denotes max. scan/max. coll in top views) = nominal scan angle + tolerance.
   a. Two programmable nominal scan angles: 35°, 47°. For the 10° scan angle, see *Adaptive Scanning on page 1-3*.
   b. Total tolerance = 10°, includes:
      i. Scan angle tolerance: ± 3° typ.
      ii. Pointing error: ± 3° typ.
      iii. Pointing shift after 2000G shock: ±1.5º typ.
3. Maximum vertical scan/collection envelope (denotes max. scan / max. coll in side views) = nominal scan line + tolerance.
   a. Nominal vertical scan line: 0°
   b. Total tolerance = 6.5°, includes:
      i. Pointing error: ± 3° typ.
      ii. Pointing shift after 2000G shock: ±0.5º typ.
4. Maximum envelope does not include integration tolerances.
5. For increased working range at 10,000 FCD, position opaque material to block ambient light from entering the zone labeled **Direct Field of View of Photo Detector**.
6. The entire scan line of the SE965HP scan engine is usable. The 47° scan line provides identical scanning performance to older scan engines with a scan line of 53°.
7. Untoleranced dimensions: .x: ± .5 mm; .xx: ± .25 mm; .xxx: ± .125 mm
8. This is a reference drawing and is not intended to specify or guarantee all possible integration requirements for this engine.

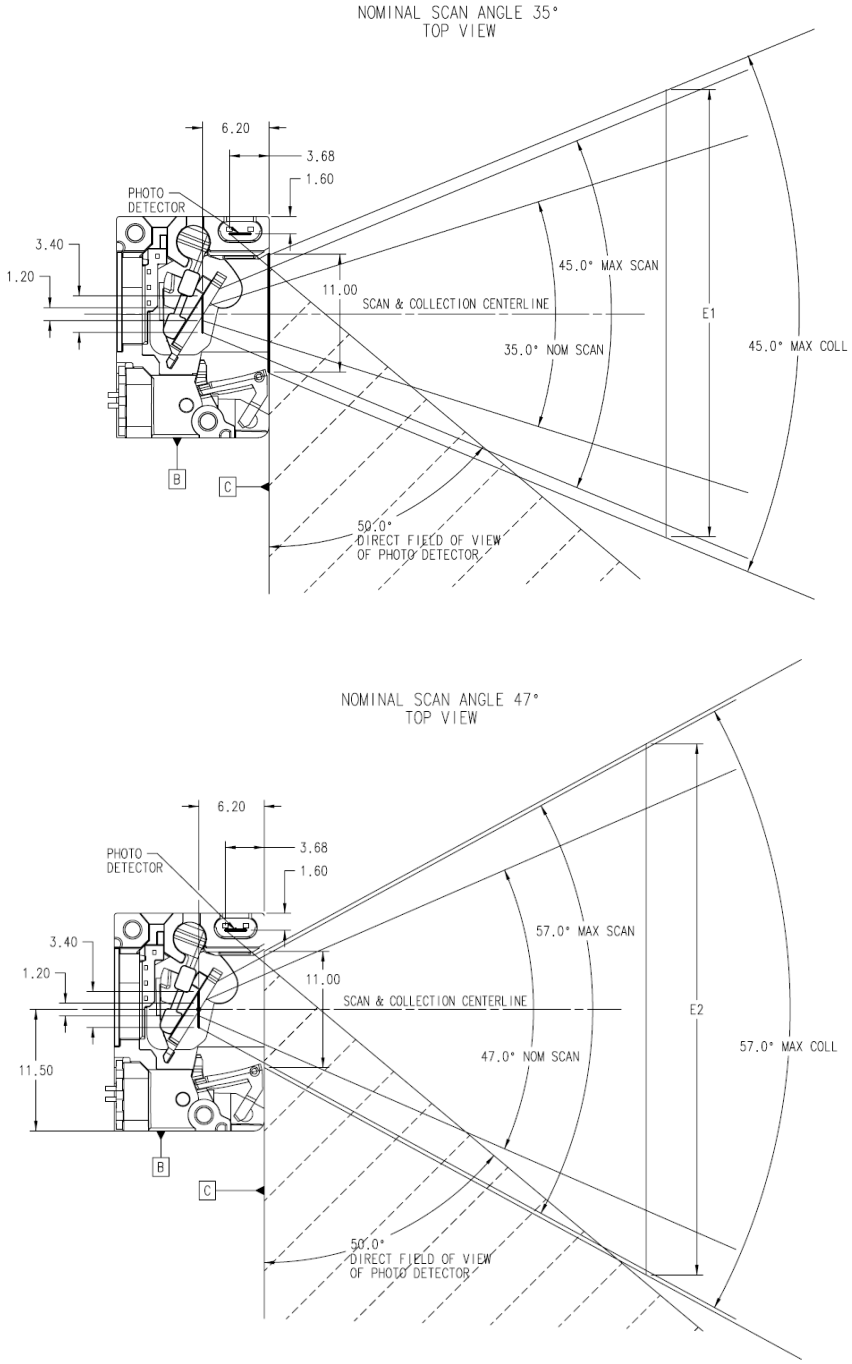


Figure 2-8 *Exit Window Positioning*

Table 2-6 *Exit Window Distance from Scan Engine: 0.15 in - 0.36 in (3.8 mm - 9.0 mm)*

A	Distance from Scan Engine on center line (in./mm)*	0.15/ 3.8	0.156/ 4	0.18/ 4.5	0.20/ 5	0.22/ 5.5	0.24/ 6	0.25/ 6.35	0.26/ 6.5	0.28/ 7	0.31/ 8	0.36/ 9
D	Minimum Window Clear Aperture Height (mm)	8.2	8.2	8.2	8.3	8.3	8.4	8.4	8.4	8.5	8.6	8.7
E 1	Minimum Window Clear Aperture Width (mm) at nominal scan plane (for 35° Scan Angle)	14.2	14.2	14.8	15.2	15.6	16.1	16.3	16.5	16.9	17.6	18.5
E 2	Minimum Window Clear Aperture Width (mm) at nominal scan plane (for 47° Scan Angle)	15.2	15.2	15.9	16.5	17.0	17.6	18.0	18.3	18.7	19.7	20.8

Note: Minimum window tilt is the same for AR coated and non-AR coated windows. Illustrated window position is at the inner surface. For window positions not shown, minimum window angle and width can be linearly interpolated between the two nearest shown positions.

Table 2-7 *Exit Window Distance from Scan Engine: 0.39 in - 2.00 in (10.0 mm - 50.8 mm)*

A	Distance from Scan Engine on center line (in./mm)*	0.39/ 10	0.48/ 12	0.50/ 12.7	0.55/ 14	0.75/ 19	1.00/ 25.4	1.25/ 31.8	1.50/ 38	1.75/ 44.5	2.00/ 50.8
D	Minimum Window Clear Aperture Height (mm)	8.8	9.0	9.1	9.3	9.7	10.5	11.1	11.8	12.7	13.5
E 1	Minimum Window Clear Aperture Width (mm) at nominal scan plane (for 35° Scan Angle)	19.3	21.0	21.5	22.6	26.7	32.0	37.3	42.4	47.7	52.9
E 2	Minimum Window Clear Aperture Width (mm) at nominal scan plane (for 47° Scan Angle)	21.9	24.1	24.9	26.2	31.7	38.6	45.5	52.2	59.2	66.0

Note: Minimum window tilt is the same for AR coated and non-AR coated windows. Illustrated window position is at the inner surface. For window positions not shown, minimum window angle and width can be linearly interpolated between the two nearest shown positions.

Accessories

Flex Cable

A flex strip cable can connect the SE965 scan engine to OEM equipment. *Figure 2-10* illustrates the 12-pin tapered flex strip cable (p/n 15-81378-01), *Figure 2-11* illustrates the 12-pin 53 mm even width flex strip cable (p/n 50-16000-139R), and *Figure 2-12* illustrates the 12-pin 245 mm even width flex strip cable (p/n 50-16000-134R). *Table 2-8* lists the available accessories for the scan engine, available from Motorola.

Table 2-8 *Accessories: Flex Strips and Adapter Plate*

Item	Part Number
Tapered 12-Pin Flex Strip	15-81378-01
Even Width 12 pin Straight Flex Strip - 10 in. (254 mm)	50-16000-134R
Even Width 12-Pin Straight Flex Strip - 2 in. (53 mm)	50-16000-139R
12-Pin Straight Flex - connectors on opposite sides	50-16000-308R
Universal (Scan Engine) Developer Kit	DKSE-1000-000R
Mounting Adapter Plate (for SE1224 conversion only)	KT-1200MB-01

Connector

Table 2-9 lists the 12-pin ZIF connector, with gold pin terminations, available in small quantities from Motorola. For detailed connector information, refer to the manufacturer's specifications.

Table 2-9 *Gold Connector*

Engine	Manufacturer	Manufacturer Part Number	Description
SE965HP	FCI	10051922-121LF	12 pin, horizontal ZIF connector, back latch gold terminations

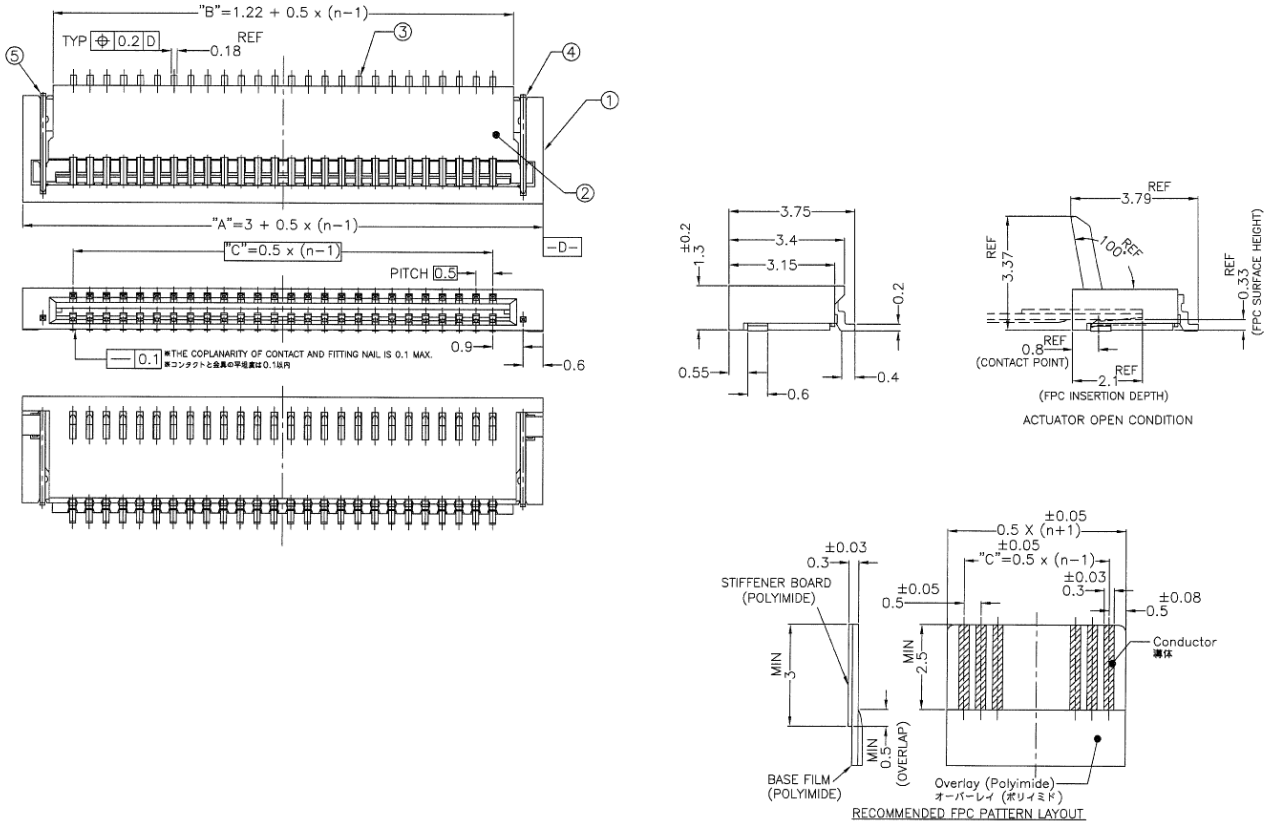


Figure 2-9 *12-Pin ZIF Connector (SE965HP to Flex), Motorola P/N 50-12100-2292 (FCI P/N 10051922-121LF)*

Hardware Accessory Sources

Table 2-10 lists sources for hardware accessories for the scan engine.

Table 2-10 *Hardware Accessories*

Company	Discipline	Specifics
Tower Fasteners Inc. 1690 North Ocean Ave. Holtsville, New York 11742-1823 (631) 289-8800	Fasteners	Metallic, non-magnetic M1.6 x 0.35 machine screws. Length is integration dependent. However, a minimum of 5 threads is recommended.
AXON Cable Inc. 1314 Plum Grove Road Schaumburg, IL 60173 (847) 230-7800	Flex Cables	Ensure flex mates with Molex 54548-1070.

Tapered 12-Pin Flex Strip

The 12-pin to 12-pin flex strip (p/n 15-81378-01), may be used only for evaluation purposes and not for production units (see *Figure 2-10*)

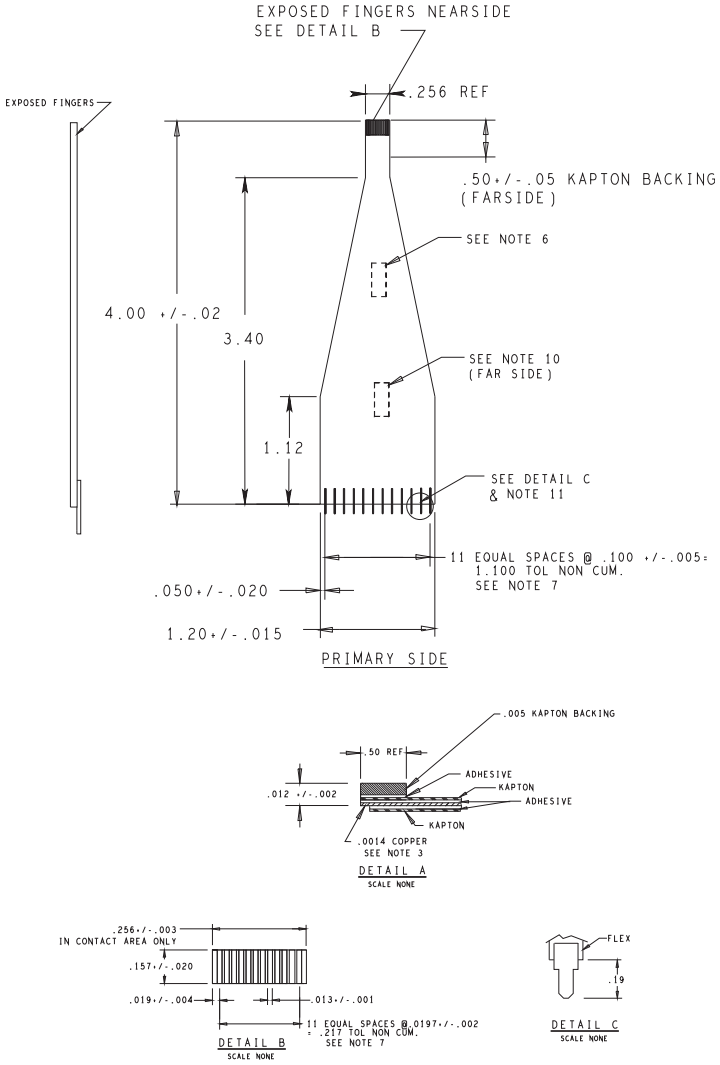
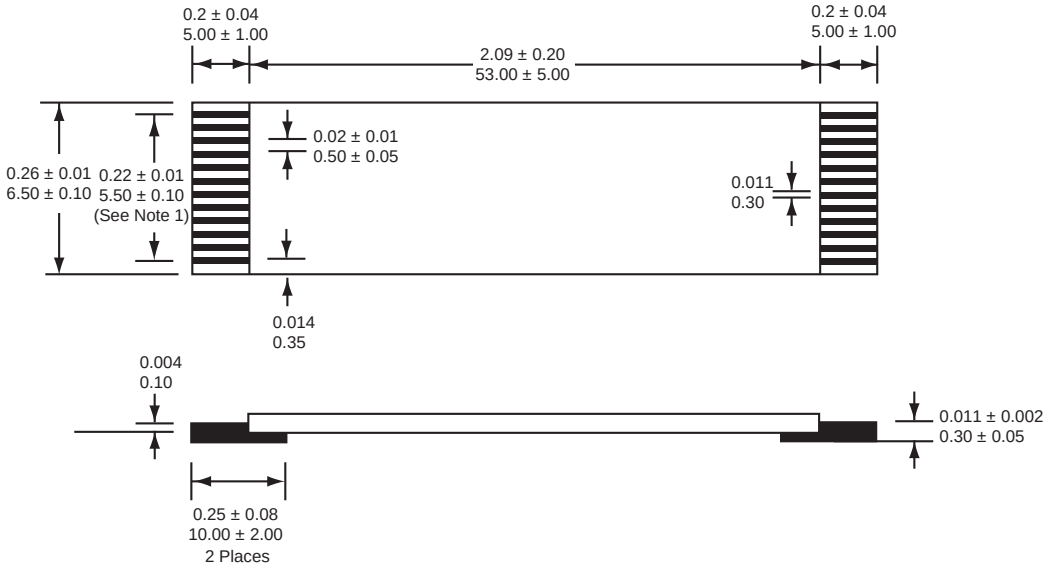


Figure 2-10 *Flex Strip, p/n 15-81378-01 (Tapered)*



Note:
1. Dimension of conductor is center to center.
2. Dimensions are in: inches
mm

Figure 2-11 *Flex Strip, p/n 50-16000-139R (Even Width, 53 mm)*

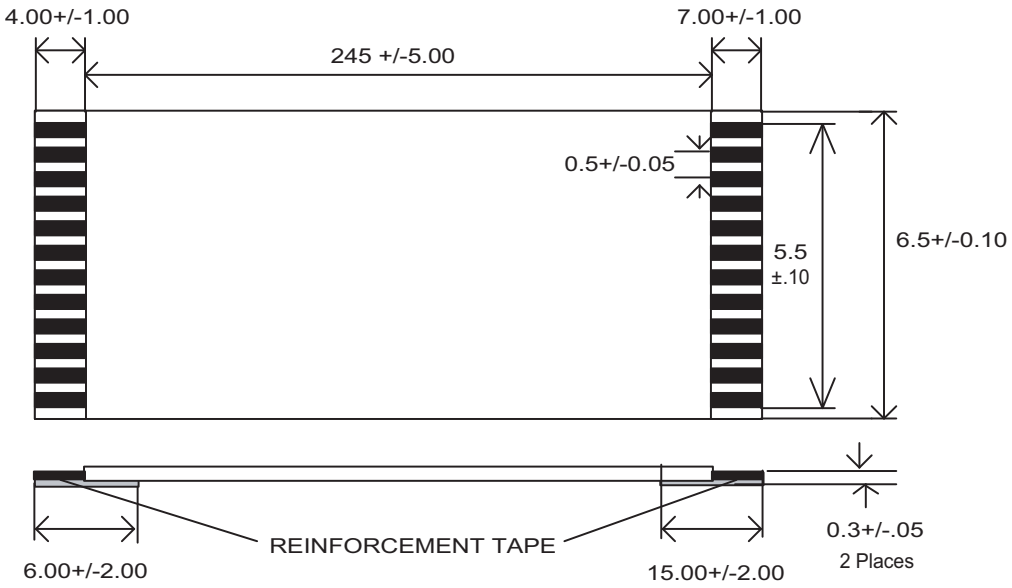


Figure 2-12 *Flex Strip, p/n 50-16000-134R (Even Width, 245 mm)*

Regulatory Requirements

See *Chapter 5, Regulatory Requirements* for integration, documentation, and labeling requirements for Class 2 laser products.

CHAPTER 3 REPLACING EXISTING ENGINES

Introduction

This chapter provides information for replacing a SE955 or SE1224 scan engine with the SE965HP.

Replacing a SE955 with the SE965HP Scan Engine

The SE965HP can replace the SE955 scan engine. The mounting features of the SE965HP and SE955 are the same.

As with the SE955 scan engine, the SE965HP scan engine chassis is electrically connected to ground and must be isolated from the host Vcc ground.

Table 3-1 lists the basic differences between the SE955 and the SE965HP.

Table 3-1 *SE955 vs. SE965HP Specifications*

Parameter	SE965HP	SE955
Connector	Back latch	Front latch
Operating current, typical (mA)	78	86
Operating voltage (V)	3.3V +/- 0.3V	3.3V +/- 10%
Supported scan angles	47^o, 35^o, 10^o	47^o, 35^o
Adaptive scanning	yes	no
Aim power	0.67mW	0.5mW
Pitch/skew/roll (+ / -)	65^o / 40^o / 35^o 20 mil @ 10"	65^o / 50^o / 35^o 100% UPC @ 5”
Highest density bar code	5 mil	4 mil
Internal temperature sensor	No	Yes

Mounting

Figure 3-1 illustrates the mounting features of the SE955 and SE965HP scan engines. The SE965HP can replace the SE955 scan engine because the mounting features are identical. You do not have to modify the mounting holes and locating pins on the host device.

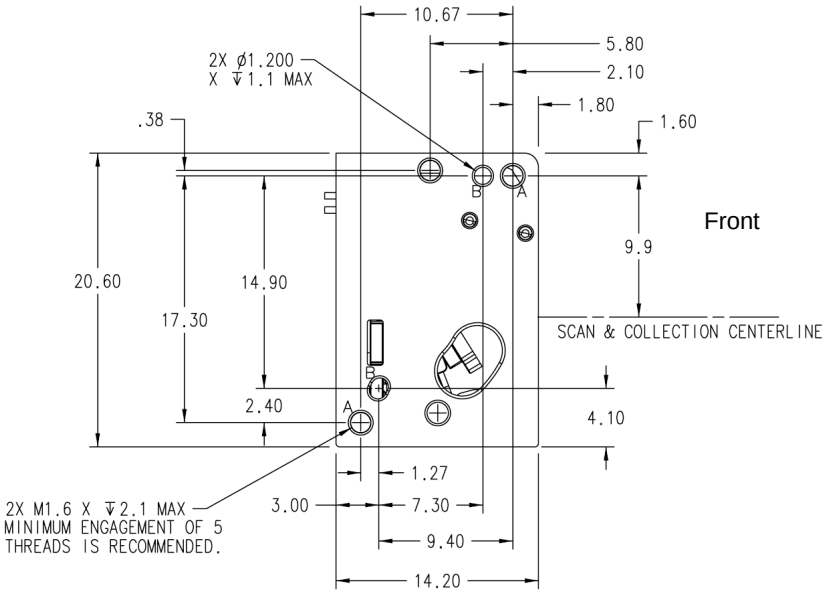


Figure 3-1 *SE955 and SE965HP Mounting Diagram*

Electrical

Like the SE955 chassis, the SE965HP chassis is electrically connected to ground and must be isolated from the host ground.

The SE955 scan engine operates at a Vcc of 3.3 VDC (±10%). The SE965HP scan engine operates at a Vcc of 3.3 V (±0.3VDC) only.

The engine supports the following SSI features:

- Changing the scan angle between 10°, 35°, and 47°
- Configuring the scan engine to support AIM or Scanstand modes
- Configuring the scan engine to turn adaptive scanning on and off
- RSM reporting
- Reflashing the scan engine to support firmware upgrades.

See *Chapter 9, Simple Serial Interface*.

Software

The firmware update process for the SE965HP is identical to that of Motorola imaging engines. For more information see *Chapter 8, Remote Scanner Management*.

Optical

When replacing an SE955 scan engine with the SE965HP scan engine, consider the following:

- Ensure an opto-mechanical engineer reviews the housing design.
- The exit window angle and size requirements (see *Table 2-6* and *Table 2-7 on page 2-13*) are the same for SE965HP engine as for SE955.
- The SE965HP can be programmed to three different scan angles. It is recommended that the position of the scan engine is set using the widest scan angle (47°).
- See *Optical on page 2-4* for recommendations on window properties (material, color, spectral transmission, wavefront distortion, surface quality, coating). Window properties that satisfy the recommendations for the SE955 scan engine also satisfy the recommendations for SE965HP scan engine.
- To take full advantage of the engine's extended range capability, see the recommendations offered in *Exit Window Notes on page 2-12*.

Mechanical

When replacing an SE955 scan engine with the SE965HP scan engine, consider the maximum height of the SE965HP.

Regulatory

See *Chapter 5, Regulatory Requirements* for integration, documentation, and labeling requirements for Class 2 laser products.

Replacing a SE1224 with the SE965HP Scan Engine

Mounting

The SE965HP can replace the SE1224 scan engine. However, the mounting holes for the SE965HP do not match those of the SE1224. In order to mount the SE965HP in place of an SE1224, you can use an adapter bracket, KT-1200MB-01, to mount the SE965HP.

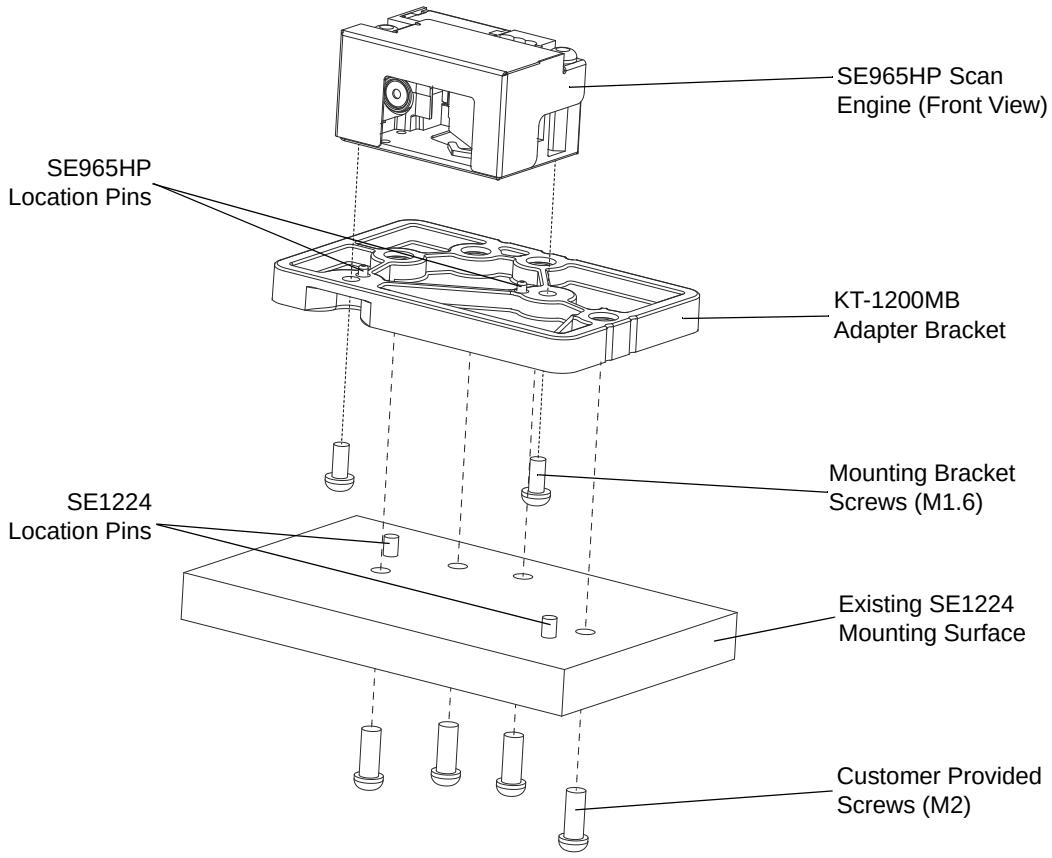


Figure 3-2 *SE1224 Adapter Bracket*

NOTE An extended flex cable is required to compensate for the adapter bracket when connecting the SE965HP scan engine to the host interface.

To mount the SE965HP scan engine and adapter bracket to an existing SE1224 housing:

1. Align the location pins on the adapter bracket with the holes on the SE965HP.
2. Secure the adapter bracket to the SE965HP using the two screws provided.
3. Align the scan engine and adapter bracket with the location pins on the housing.
4. Secure the scan engine and adapter bracket to the housing using customer-provided screws.

Electrical

The SE1224 chassis is electrically connected to Vcc while the SE965HP chassis is electrically connect to ground. The SE965HP must be isolated from the host Vcc.

The SE1224 scan engine operates at a Vcc of 3.3 - 5.0 VDC (±10%). The SE965HP scan engine operates at a Vcc of 3.3 VDC (±0.3V).

Software

The firmware update process for the SE965HP is identical to that of Motorola imaging engines. For more information see *Chapter 8, Remote Scanner Management*.

Optical

When replacing a SE1224 scan engine with the SE965HP scan engine, consider the following:

- Ensure an opto-mechanical engineer reviews the housing design.
- See *Table 2-6* and *Table 2-7 on page 2-13* to verify whether the exit window angle and size satisfy the recommended minimum requirement.
- Baffles designed for the SE1224 may not be appropriate for the SE965HP due to the positioning of the photo-diode.
- The SE965HP can be programmed to three different scan angles. It is recommended that the position of the scan engine is set using the widest scan angle (47°).
- The entire scan line of the SE965HP scan engine is usable. The 47° scan line provides identical scanning performance to older scan engines with a scan line of 53°.
- See *Optical on page 2-4* for recommended window properties (material, color, spectral transmission, wavefront distortion, surface quality, coating). Window properties that satisfy the recommendations for the SE1224 scan engine also satisfy the recommendations for SE965HP scan engine.
- To take full advantage of the engine's extended range capability, see the recommendations offered in *Exit Window Notes on page 2-12*.

Mechanical

When replacing a SE1224 scan engine with the SE965HP scan engine consider the following:

- Regulatory labels must reflect new VLD power.
- Existing cable flexes may not be compatible with the SE965HP scan engine.
- Mounting holes.

Regulatory

See *Chapter 5, Regulatory Requirements* for integration, documentation, and labeling requirements for Class 2 laser products.

CHAPTER 4 SPECIFICATIONS

Introduction

This chapter provides the technical specifications of the SE965HP, including decode zone and exit window characteristics.

Technical Specifications

Table 4-1 *Technical Specifications @ 23°C*

Item	Description
Power Requirements Input Voltage Input Current Standby Current V_{cc} Noise Level	 3.3 VDC ±0.3 VDC 78 mA (rms), 100 mA peak 25 µA typical / 60 µA max 100 mV peak to peak max
Surge Current	Engine power-up supply current < 200 mA (typical) Motorola recommends using a soft start power supply to minimize the maximum inrush current
Scan Repetition Rate	104 (± 12) scans/sec (bidirectional)
Laser Power (at 650 nm)	Scanning mode: 1.7mW (nominal peak power) Aiming mode: after each trigger pull, the laser power momentarily (< 3.0 ms) is set to 1.7 mW for the engine calibration, then remains at 0.67 mW
Optical Resolution	0.005 in. minimum element width
Print Contrast	Minimum 25% absolute dark/light reflectance measured at 650 nm
Scan Angle Wide (Default) Medium Narrow	 47° (typical) 35° (typical) 10° (typical) Note: The entire scan line of the SE965HP scan engine is usable. The 47° scan line provides identical scanning performance to older scan engines with a scan line of 53°.
Decode Depth of Field	See *Decode Zones on page 4-5*.
Pitch Angle	Condition: 20 mil Code 39 at 10 in. ± 65° from normal (see *Figure 4-1 on page 4-4*)
Skew Tolerance	Condition: 20 mil Code 39 at 10 in. ± 40° from normal (see *Figure 4-1 on page 4-4*)
Roll	Condition: 20 mil Code 39 at 10 in. ± 35° from vertical (see *Figure 4-1 on page 4-4*)
Specular Dead Zone	± 8°
Ambient Light Immunity Sunlight Artificial Light	 10,000 ft. candles (107,640 lux) 450 ft. candles (4,844 lux) See Note 5 in *Figure 2-8 on page 2-12* for maximum performance at 10,000 fcd

Table 4-1 *Technical Specifications @ 23°C (Continued)*

Item	Description
Shock Endurance	2000G ± 5% in the direction of any of the six principal axes applied via the mounting surface from -4° F to 140° F (-20° C to 60° C) for a period of 0.85 ± 0.1 msec
Vibration	Unpowered engine withstands a random vibration along each of the X, Y, and Z axes for a period of one hour per axis, defined as follows: 20 to 80 Hz — Ramp up to 0.04 G^2/Hz at the rate of 3 dB/octave 80 to 350 Hz — 0.04 G^2/Hz 350 to 2000 Hz — Ramp down at the rate of 3 dB/octave
Laser Class	The scan engine is classified as a CDRH Class II/IEC Class 2 devices
RoHS	Meets RoHS requirements
Operating Temperature (chassis)	-22° F to 140° F (-30° C to 60° C)
Storage Temperature	-40°F to 158° F (-40° C to 70° C)
Humidity	5% to 95% (non-condensing)
Height	0.463 in (11.75 mm) maximum
Width	0.85 in (21.6mm) maximum
Depth of Chassis	0.60 in (15.2mm) maximum
Depth of Chassis to Laser Boundary	0.61 in (15.5mm) maximum
Weight	0.265 ounces ± 0.009 ounces (7.5 grams ± 0.25 grams)

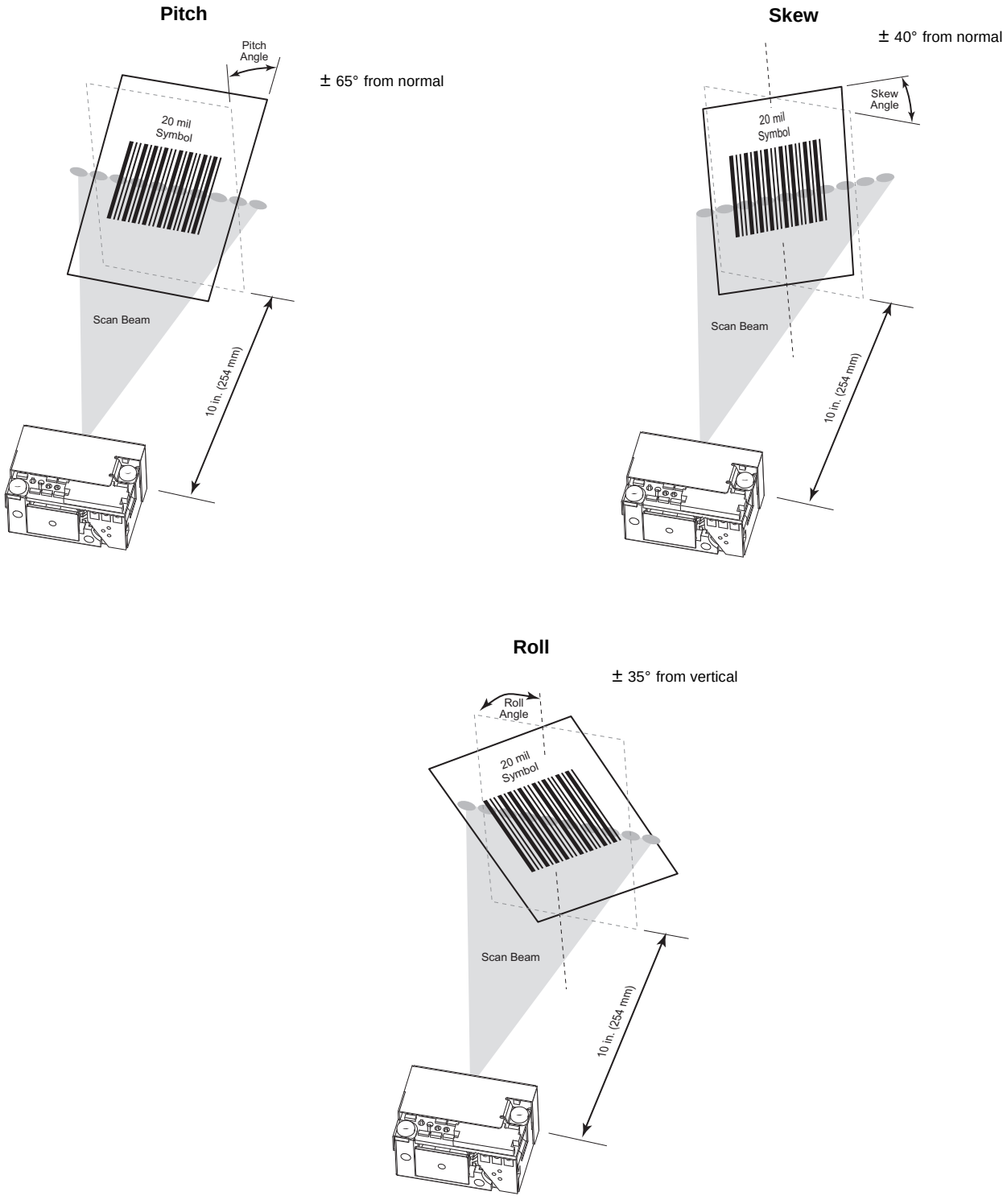


Figure 4-1 *Pitch, Skew and Roll*

Decode Zones

Figure 4-2 shows the decode zone for the SE965HP scan engine. The figures are typical values. *Table 4-2* 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.

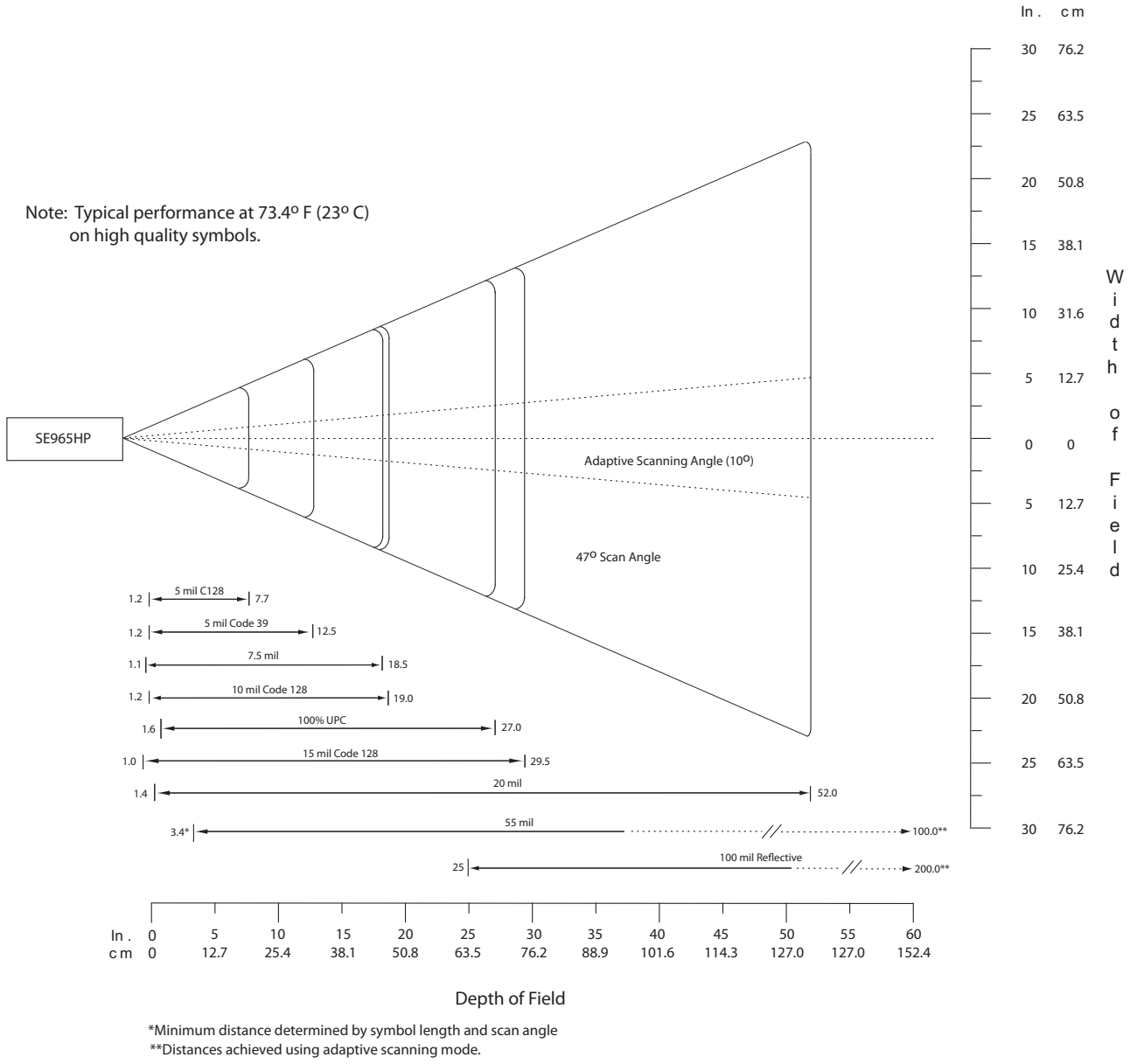


Figure 4-2 *SE965HP Adaptive Scanning Decode Zone*

Table 4-2 *SE965HP Decode Distances in Adaptive Mode*

Symbol Density/ Bar Code Type/ W-N Ratio	Bar Code Content/ Contrast[Note 1]	Typical Working Ranges		Guaranteed Working Ranges	
		Near	Far	Near	Far
5.0 mil Code 128	1234 80% MRD	1.2 in 3.05 cm	7.7 in 19.56 cm	2.7 in 6.86 cm	3.1 in 7.87 cm
5.0 mil Code 39; 2.5:1	ABCDEFGH 80% MRD	1.2 in 3.05 cm	12.5 in 31.75 cm	2.7 in 6.86 cm	8.6 in 21.84 cm
7.5 mil Code 39; 2.5:1	ABCDEF 80% MRD	1.1 in 2.79 cm	18.5 in 46.99 cm	2.6 in 6.60 cm	16.8 in 42.67 cm
10 mil Code 128	1234 80% MRD	1.2 in 3.05 cm Note 3	19.0 in 48.26 cm	Note 3	15.9 in 40.39 cm
13 mil 100% UPC	12345678905 80% MRD	1.6 in 4.06 cm	27.0 in 68.58 cm	2.3 in 5.84 cm	23.75 in 60.33 cm
15 mil Code 128	1234 80% MRD	1.0 in 2.54 cm Note 3	29.5 in 74.93 cm	Note 3	25.0 in 63.50 cm
20 mil Code 39; 2.2:1	123 80% MRD	1.4 in 3.56 cm Note 3	52.0 in 132.08 cm	Note 3	43.0 in 109.22 cm
55 mil Code 39; 2.2:1	CD 80% MRD	3.4 in 8.64 cm Note 3	100.0 in 254.00 cm	Note 3	76.5 in 194.31 cm
100 mil Code 39; 3.0:1 reflective	123456 80% MRD	2 ft 60.96cm Note 3	17 ft 518.16 cm	Note 3	15 ft 457.20 cm

Notes:

1. Contrast measured as Mean Reflective Difference (MRD) at 650 nm.
2. Working range specifications at ambient temperature (23°C), photographic quality symbols. Pitch=10°, roll=0°, skew=0°, ambient light < 150 ft-candles using Symbol or equivalent decoder.
3. Dependent on width of bar code.
4. Distances measured from front edge of chassis.

CHAPTER 5 REGULATORY REQUIREMENTS

Introduction

This chapter describes the integration, documentation, and labeling requirements for Class 2 laser products.

General Regulatory Requirements

When integrating the scan engines described in this guide, the following requirement must be met to maintain laser classification: The scan engine may not have the capability to be placed into AIM mode for more than 5 seconds continuously.

Laser Safety Statement

SE965HP scan engines offer integrators a significant advantage in both reduced time to market and simplified regulatory testing and approvals. The engines contain a full suite of host independent fault protection mechanisms and have been proven to stay within classification during operation and single fault conditions as required by EN/IEC 60950.* Because this testing was performed by an independent accredited laboratory, integrators placing the engine in most ITE (Information Technology Equipment) products should not need to undergo the significant single-point failure testing that would normally be required for laser safety compliance (certain types of products aimed at medical, military, or other specialty markets may require additional testing). Additionally, the scan engines do not require any beam attenuation (via scanning window attenuation, distance-based attenuation, or other electronic controls) to meet their laser power classification, provided that the product's laser classification matches the engine.

Motorola also provides the documentation you need to speed through your regulatory approvals, including:

- Initial EN/IEC 60825-1 certificates showing classification and restrictions to aid development efforts (restrictions include labeling and other product level restrictions that are impossible to implement on the component engine itself)*.
- FDA Accession number
- EN/IEC 60950-1 Certificates
- Proof of UL 60950-1 Recognition
- Motorola will provide copies of the EN/IEC 60825-1 laser safety test reports to your laser/product safety test laboratory upon receipt of a standard NDA agreement signed by both the lab and Motorola.
- Upon request, Motorola will also provide copies of the UL Recognition report and/or the European and CB Scheme EN/IEC 60950-1 report to your laser/product safety test laboratory upon receipt of a standard NDA agreement signed by both the lab and Motorola.

Note that some specialty markets such as medical, military, or other specialty markets may have more specialized regulatory controls, and may require additional tests to be performed.

* The Class 2 SE965HP has one usage restriction: In order to maintain classification, the AIM mode input from the host cannot be active for more than 5 seconds at a time.

Disclaimer

- The integrator is responsible for ensuring they meet any and all applicable regulatory requirements for their product after integration of the Motorola scan engine. For example, if the integrator's equipment is a medical device, then all the regulatory requirements for a medical device are applicable.
- Laser class certification for the end product is the integrator's responsibility. The integrator, per the IEC and FDA regulations is responsible for selecting the laser class and demonstrating that the final product is in compliance with the FDA and/or IEC standards. The SE965HP scan engine has the necessary safety circuits on board to stay in class (as required by the FDA and IEC standards) during operation, maintenance, and foreseeable fault conditions, but product labeling and application-specific requirements must be met by the integrator.

Recycling

The customer is responsible for complying with all recycling laws and regulations, including European Directive: Waste Electrical and Electronic Equipment (WEEE). Motorola has no responsibility for collecting the products sold to the customer.

RoHS Compliance

This product is RoHS compliant.

CHAPTER 6 APPLICATION NOTES

Introduction

This chapter includes AC electrical characteristics and timing information.

AC Electrical Characteristics

AC electrical characteristics appear in *Table 6-1*. All output lines are measured with 10K pull-up.

Table 6-1 *Timing Characteristics*

Symbol	Figure	Parameter	Min	Max	Unit
General Characteristics					
t_f	*Figure 6-1*	High-to-Low fall time, all outputs, C_L = 50 pf		1.0	µsec
t_r	*Figure 6-1*	Low-to-High rise time, all outputs, C_L = 50 pf		1.0	µsec
Serial I/O Timing, Host Transmit					
t_{rlcl}	*Figure 6-2*	Request to Send low to Clear to Send low	0	25	msec
t_{clxl}	*Figure 6-2*	Clear to Send low to first start bit		Note 2	
t_{xlxl}	*Figure 6-2*	Byte to byte delay, (see Note 1)		990	msec
t_{rhrh}	*Figure 6-2*	End of the packet to RTS* high		Note 4	msec

Notes:
1. If byte to byte delay exceeds the maximum specified time, a transmission error is declared. The sender is expected to retransmit the packet in its entirety.
2. The host may hold the Host RTS* low indefinitely, but it locks out the SE965HP from transmitting.
3. The decoder may transmit any time the Host RTS* is high.
4. The host should release its Host RTS* as soon as possible after transmitting so the decoder can process the message.
5. The SE965HP's micro-controller is in full operation whenever the PWRDWN line is driven low.
6. See the *Power Management on page 1-4* if trigger is not pulled after the maximum specified amount of time.
7. In addition, see *Decode Session Timeout on page 7-12* and *Triggering Modes on page 7-14*.

Table 6-1 *Timing Characteristics (Continued)*

Symbol	Figure	Parameter	Min	Max	Unit
Serial I/O Timing, Decoder Transmit, (see Note 3)					
t_{vlvl}	*Figure 6-4*	Byte to byte delay, (see Note 1)		99	msec
Hardware Trigger Timing					
t_{glwl}	*Figure 6-5*	Trigger hold time, level and pulse trigger mode, (see Note 6)	6		msec
t_{ghtw}	*Figure 6-5*	Trigger release time, level and pulse trigger mode (see Note 6)	25		msec
t_{dbt}	*Figure 6-5*	Trigger debounce time		1	msec
Beeper Timing					
f_{blht}	*Figure 6-6*	Beeper frequency	1220	3770	Hz
t_{btw}	*Figure 6-6*	Beeper duration (decode)	90 (typ)		msec
Power Up Timing					
t_{ehpm}	*Figure 6-7*	V_{BATT} rise time		10	msec
Wake Up Timing					
t_{aldl}	*Figure 6-8*	From wake up to full operation, (see Note 5)		8	msec
t_{dlgl}	*Figure 6-8*	Trigger low after full operation, (see Notes 6 and 7)	0	1	sec

Notes:
1. If byte to byte delay exceeds the maximum specified time, a transmission error is declared. The sender is expected to retransmit the packet in its entirety.
2. The host may hold the Host RTS* low indefinitely, but it locks out the SE965HP from transmitting.
3. The decoder may transmit any time the Host RTS* is high.
4. The host should release its Host RTS* as soon as possible after transmitting so the decoder can process the message.
5. The SE965HP's micro-controller is in full operation whenever the PWRDWN line is driven low.
6. See the *Power Management on page 1-4* if trigger is not pulled after the maximum specified amount of time.
7. In addition, see *Decode Session Timeout on page 7-12* and *Triggering Modes on page 7-14*.

Timing Waveforms

Explanation Of The AC Symbols

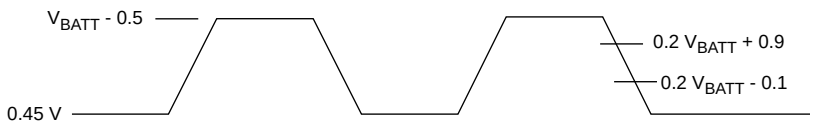
Each timing symbol has five characters. The first character is either “t” for time or “f” for frequency. The other characters indicate the name of the signal or the logical status of that signal. Designations are:

Table 6-2

Character	Definition
a	WKUP*
b	BPR*
c	Host CTS*
d	PWRDWN
f	float, fall time
g	trigger
h	logic level high
l	logic level low
pm	minimum voltage level
r	Host RTS*
tw	time duration
v	Host RXD
w	width
x	Host TXD

*** Active Low Examples:**
t_{bltw} = Beeper drive low time
t_{rlcl} = Time for RTS low to CTS low

AC Test Points



NOTE AC inputs during testing are driven at V_{BATT} -0.5 for logic “1” and 0.45 for logic “0.” Timing measurements are made at 0.2 V_{BATT} +0.9 and 0.2 V_{BATT} -0.1.

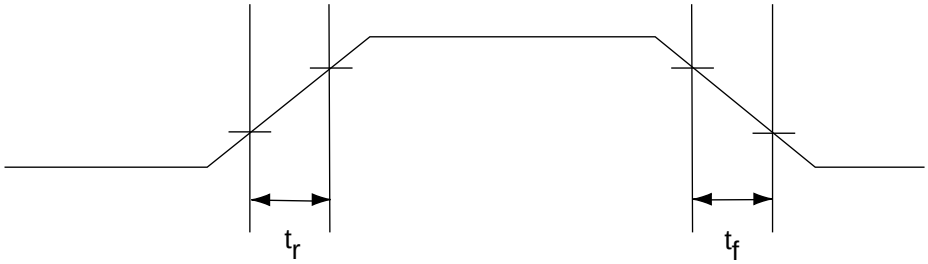


Figure 6-1 *General Characteristics*

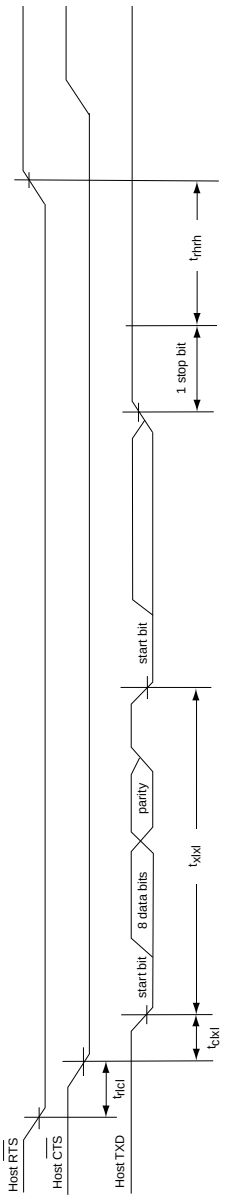


Figure 6-2 *Serial I/O Timing, Host Transmit*

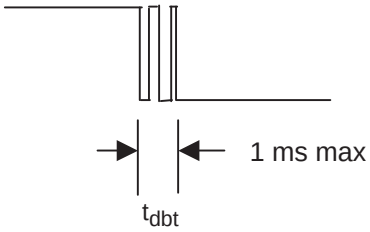


Figure 6-3 *Trigger Debounce Timing*

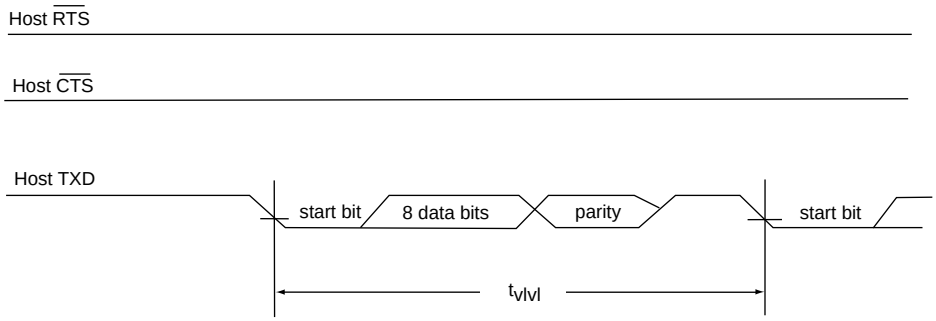


Figure 6-4 *Serial I/O Timing, Decoder Transmit*

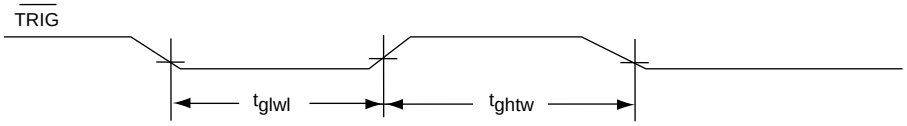


Figure 6-5 *Hardware Trigger Timing*

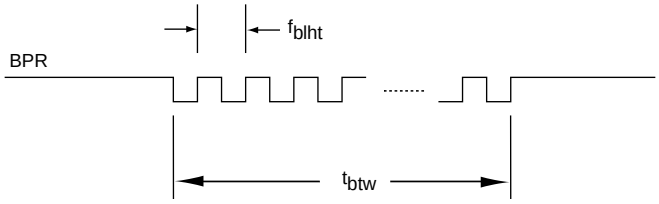


Figure 6-6 *Beeper Timing*

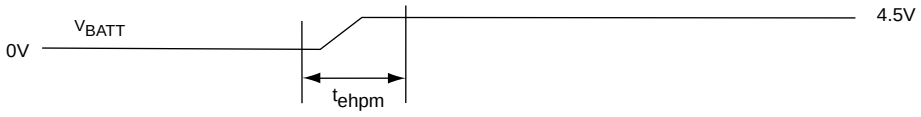


Figure 6-7 *V_{BATT} Rise Time*

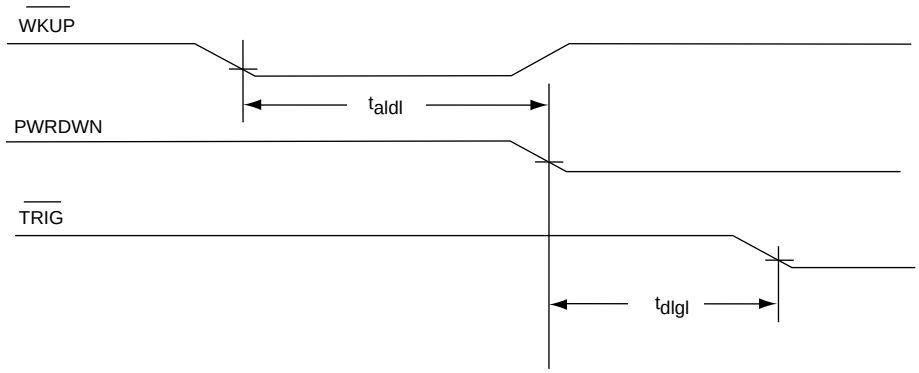


Figure 6-8 *Wake Up Timing*

CHAPTER 7 PARAMETER MENUS

Introduction

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

Operational Parameters

The SE965HP is shipped with the factory default settings shown in *Table 7-1 on page 7-2.* 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 can be stored as custom defaults. These 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. To set the new values as custom defaults, scan the **Write to Custom Defaults** bar code. The factory default or custom default parameter values can be recalled by scanning the **Set Factory Defaults** bar code or the **Restore Defaults** bar code on *page 7-8*.

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 9, Simple Serial Interface*.

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 engine.
- 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 scan engine's memory.

Parameter Defaults

Table 7-1 lists the factory defaults for all parameters. To change any option, scan the appropriate bar code(s).

Table 7-1 *Factory Default Table*

Parameter	Parameter Number (Hex)	Factory Default	Page Number
Set Factory Default		All Defaults	*7-8*
Beeper Volume	8Ch	Medium	*7-9*
Beeper Tone	91h	Medium Frequency	*7-10*
Beep After Good Decode	38h	Enable	*7-11*
Suppress Power-up Beeps	F1h D1h	Suppress	*7-11*
Decode Session Timeout	88h	3.0 sec	*7-12*
Aim Duration	EDh	0.0 sec	*7-12*
Scan Angle	BFh	Wide (47°)	*7-13*
Adaptive Scanning	F2h 51h	Enable	*7-13*
Trigger Mode	8Ah	Level	*7-14*
Enhanced Aim Timeouts Aim Timeout Scan Timeout	 F2h 55h F2h 56h	 2.0 sec 1.0 sec	*7-16*
Timeout Between Decodes, Same Symbol	89h	1.0 sec	*7-17*
Timeout Between Decodes, Different Symbols	90h	0.2 sec	*7-17*
Continuous Bar Code Read	F1h 89h	Disable	*7-18*
Unique Bar Code Reporting	F1h D31h	Disable	*7-18*
Transmit “No Read” Message	5Eh	Disable	*7-19*

***Refer to the *Simple Serial Interface (SSI) Programmer's Guide* for formatting of any parameter whose number is 0x100 or greater.**

Table 7-1 *Factory Default Table (Continued)*

Parameter	Parameter Number (Hex)	Factory Default	Page Number
Power Mode	80h	Low Power	7-20
Time Delay to Low Power Mode	92h	1 hour	7-21
Parameter Scanning	ECh	Enable	7-23
Parameter Pass Through	F1h 71h	Disable	7-23
Disable All Symbologies	N/A	N/A	7-24
Linear Code Type Security Levels	4Eh	1	7-24
Bi-directional Redundancy	43h	Disable	7-26
UPC/EAN			
UPC-A	01h	Enable	7-26
UPC-E	02h	Enable	7-27
UPC-E1	0Ch	Disable	7-27
EAN-8/JAN-8	04h	Enable	7-28
EAN-13/JAN-13	03h	Enable	7-28
Bookland EAN	53h	Disable	7-29
Decode UPC/EAN Supplementals	10h	Ignore	7-30
User-Programmable Supplementals Supplemental 1: Supplemental 2:	 F1h 43h F1h 44h		7-33
Decode UPC/EAN Supplemental Redundancy	50h	7	7-33
Decode UPC/EAN/JAN Supplemental AIM ID Format	F1h A0h	Combined	7-34
Transmit UPC-A Check Digit	28h	Enable	7-35
Transmit UPC-E Check Digit	29h	Enable	7-35
Transmit UPC-E1 Check Digit	2Ah	Enable	7-36
UPC-A Preamble	22h	System Character	7-37
UPC-E Preamble	23h	System Character	7-38
UPC-E1 Preamble	24h	System Character	7-39
Convert UPC-E to A	25h	Disable	7-40
Convert UPC-E1 to A	26h	Disable	7-40
EAN-8 Zero Extend	27h	Disable	7-41

***Refer to the *Simple Serial Interface (SSI) Programmer's Guide* for formatting of any parameter whose number is 0x100 or greater.**

Table 7-1 *Factory Default Table (Continued)*

Parameter	Parameter Number (Hex)	Factory Default	Page Number
Bookland ISBN Format	F1h 40h	ISBN-10	*7-42*
UPC/EAN Security Level	4Dh	0	*7-43*
UCC Coupon Extended Code	55h	Disable	*7-44*
Coupon Report	F1h DAh	New Coupon Symbols	*7-45*
ISSN EAN	F1h 69h	Enable	*7-46*
Code 128			
Code 128	08h	Enable	*7-47*
Set Lengths for Code 128	D1h D2h	Any Length	*7-47*
GS1-128 (formerly UCC/EAN-128)	0Eh	Enable	*7-49*
ISBT 128	54h	Enable	*7-49*
ISBT Concatenation	F1h 41h	Disable	*7-50*
Check ISBT Table	F1h 42h	Enable	*7-51*
ISBT Concatenation Redundancy	DFh	10	*7-51*
Code 39			
Code 39	00h	Enable	*7-52*
Trioptic Code 39	0Dh	Disable	*7-52*
Convert Code 39 to Code 32	56h	Disable	*7-53*
Code 32 Prefix	E7h	Disable	*7-53*
Set Length(s) for Code 39	12h 13h	Length within Range: 2 - 55	*7-54*
Code 39 Check Digit Verification	30h	Disable	*7-56*
Transmit Code 39 Check Digit	2Bh	Disable	*7-56*
Code 39 Full ASCII Conversion	11h	Disable	*7-57*
Code 93			
Code 93	09h	Disable	*7-58*
Set Length(s) for Code 93	1Ah 1Bh	Length within Range: 4 - 55	*7-58*

***Refer to the *Simple Serial Interface (SSI) Programmer's Guide* for formatting of any parameter whose number is 0x100 or greater.**

Table 7-1 *Factory Default Table (Continued)*

Parameter	Parameter Number (Hex)	Factory Default	Page Number
Code 11			
Code 11	0Ah	Disable	*7-60*
Set Lengths for Code 11	1Ch 1Dh	Length within Range: 4 - 55	*7-60*
Code 11 Check Digit Verification	34h	Disable	*7-62*
Transmit Code 11 Check Digit(s)	2Fh	Disable	*7-63*
Interleaved 2 of 5			
Interleaved 2 of 5	06h	Enable	*7-63*
Set Length(s) for I 2 of 5	16h 17h	One Length: 14	*7-64*
I 2 of 5 Check Digit Verification	31h	Disable	*7-65*
Transmit I 2 of 5 Check Digit	2Ch	Disable	*7-66*
Convert I 2 of 5 to EAN 13	52h	Disable	*7-66*
Discrete 2 of 5			
Discrete 2 of 5	05h	Disable	*7-67*
Set Length(s) for D 2 of 5	14h 15h	One Length: 12	*7-67*
Chinese 2 of 5			
Chinese 2 of 5	F0h 98h	Disable	*7-69*
Matrix 2 of 5			
Matrix 2 of 5	F1h 6Ah	Disable	*7-70*
Matrix 2 of 5 Lengths	F1h 6Bh F1h 6Ch	One Length: 14	*7-70*
Matrix 2 of 5 Check Digit	F1h 6Eh	Disable	*7-72*
Transmit Matrix 2 of 5 Check Digit	F1h 6Fh	Disable	*7-72*
Korean 3 of 5			
Korean 3 of 5	F1h 45h	Disable	*7-73*

***Refer to the *Simple Serial Interface (SSI) Programmer's Guide* for formatting of any parameter whose number is 0x100 or greater.**

Table 7-1 *Factory Default Table (Continued)*

Parameter	Parameter Number (Hex)	Factory Default	Page Number
Codabar			
Codabar	07h	Disable	*7-74*
Set Lengths for Codabar	18h 19h	Length within Range: 5 - 55	*7-74*
CLSI Editing	36h	Disable	*7-76*
NOTIS Editing	37h	Disable	*7-76*
Codabar Upper or Lower Case Start/Stop Characters Detection	F2h 57h	Lower Case	*7-77*
MSI			
MSI	0Bh	Disable	*7-78*
Set Length(s) for MSI	1Eh 1Fh	Length within Range: 6 - 55	*7-78*
MSI Check Digits	32h	One	*7-80*
Transmit MSI Check Digit	2Eh	Disable	*7-80*
MSI Check Digit Algorithm	33h	Mod 10/Mod 10	*7-81*
GS1 DataBar			
GS1 DataBar (GS1 DataBar Omnidirectional, GS1 DataBar Truncated, GS1 DataBar Stacked, GS1 DataBar Stacked Omnidirectional)	F0h 52h	Enable	*7-82*
GS1 DataBar Limited	F0h 53h	Enable	*7-83*
GS1 DataBar Limited Security Level	F1h D8h	3	*7-84*
GS1 DataBar Expanded (GS1 DataBar Expanded, GS1 DataBar Expanded Stacked)	F0h 54h	Enable	*7-85*
Convert GS1 DataBar to UPC/EAN	F0h 8Dh	Disable	*7-85*
Data Options			
Transmit Code ID Character	2Dh	None	*7-86*
Prefix/Suffix Values Prefix Suffix 1 Suffix 2	 69h 68h 6Ah	 NULL LF CR	*7-87*
Scan Data Transmission Format	EBh	Data as is	*7-88*

***Refer to the *Simple Serial Interface (SSI) Programmer's Guide* for formatting of any parameter whose number is 0x100 or greater.**

Table 7-1 *Factory Default Table (Continued)*

Parameter	Parameter Number (Hex)	Factory Default	Page Number
Serial Interface			
Baud Rate	9Ch	9600	*7-90*
Parity	9Eh	None	*7-92*
Check Parity	97h	Disable	*7-93*
Software Handshaking	9Fh	Enable	*7-94*
Host RTS Line State	9Ah	RTS Low	*7-95*
Decode Data Packet Format	EEh	Unpacketed	*7-95*
Stop Bits	9Dh	1	*7-96*
Host Serial Response Timeout	9Bh	2 sec	*7-97*
Host Character Timeout	EFh	200 msec	*7-98*
Event Reporting*			
Decode Event	F0h, 00h	Disable	*7-99*
Boot Up Event	F0h, 02h	Disable	*7-100*
Parameter Event	F0h, 03h	Disable	*7-100*

***Refer to the *Simple Serial Interface (SSI) Programmer's Guide* for formatting of any parameter whose number is 0x100 or greater.**

Set Default Parameter

The SE965HP can be reset to two types of defaults: factory defaults or custom defaults. Scan the appropriate bar code below to reset the SE965HP to its default settings and/or set the scan engine's current settings as the custom default.

- **Restore Defaults** - Scan this bar code to reset all default parameters as follows.
  - If custom defaults were set by scanning **Write to Custom Defaults**, scan **Restore Defaults** to retrieve and restore the scan engine's custom default settings.
  - If no custom defaults were set, scan **Restore Defaults** to restore the factory default values listed in *Table 7-1 on page 7-2*.
- **Set Factory Defaults** - Scan this bar code to restore the factory default values listed in *Table 7-1 on page 7-2.* If custom defaults were set, they are eliminated.
- **Write to Custom Defaults** - Scan this bar code to store the current scan engine settings as custom defaults. Once custom default settings are stored, they can be recovered at any time by scanning **Restore Defaults**.

***Restore Defaults**

Set Factory Defaults

Write to Custom Defaults

Beeper Volume

Parameter # 8Ch

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

Low Volume
(02h)

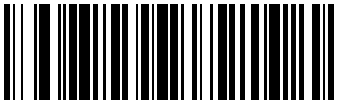
***Medium Volume**
(01h)

High Volume
(00h)

Beeper Tone

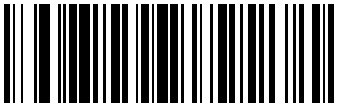
Parameter # 91h

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



Low Frequency
(02h)

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



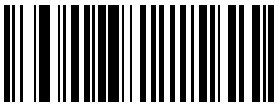
High Frequency
(00h)

Beep After Good Decode

Parameter # 38h

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

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



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

Suppress Power-up Beeps

Parameter # F1h D1h

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

***Suppress Power-up Beeps**
(01h)

Do Not Suppress Power-up Beeps
(00h)

Decode Session Timeout

Parameter # 88h

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

To set a Decode Session Timeout, scan the bar code below. Next scan two numeric bar codes beginning on *page 7-101* that correspond to the desired on time. Include a leading zero for single digit numbers. For example, to set a timeout of 0.5 seconds, scan the bar code below, then scan the **0** and **5** bar codes; to set a timeout of 9.5 seconds, scan the bar code below, then scan the **9** and **5** bar codes. To change the selection or cancel an incorrect entry, scan *Cancel on page 7-102*.

Decode Session Timeout
(Default: 3.0 sec.)

Aim Duration

Parameter # EDh

When a scan engine with an aim mode is triggered either by a trigger pull, or a START_DECODE command, this parameter sets the duration the aiming pattern is seen before a a scan attempt begins. It does not apply to the aim signal or the AIM_ON command. It is programmable in 0.1 second increments from 0.0 to 9.9 seconds. No aim pattern is visible when the value is 0.0. For more information on the use of this parameter, refer to the *Simple Serial Interface (SSI) Programmer's Guide*.

To set an aim duration, scan the bar code below. Next scan two numeric bar codes beginning on *page 7-101* that correspond to the desired aim duration. Single digit numbers must have a leading zero. For example, to set an aim duration of 0.5 seconds, scan the bar code below, then scan the "0" and "5" bar codes. To change the selection or cancel an incorrect entry, scan *Cancel on page 7-102*.

Aim Duration
(Default: 0.0 sec.)

Scan Angle

Parameter # BFh

This parameter sets the scan angle to narrow, medium, or wide.

Narrow Angle (10°)
(00h)

Medium Angle (35°)
(01h)

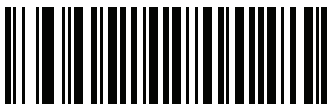
***Wide Angle (47°)**
(02h)

Adaptive Scanning

Parameter # F2h 51h

Enable Adaptive Scanning to improve decode range and optimize decode performance on certain bar codes. See *Adaptive Scanning on page 1-3* for a detailed explanation.

***Enable Adaptive Scanning**
(00h)



Disable Adaptive Scanning
(01h)

Triggering Modes

Parameter # 8Ah

Choose one of the options below to trigger the scan engine. Bar codes and option numbers are on the following page.

- **Scan (Level)** - A trigger pull activates the laser and decode processing. The laser remains on and decode processing continues until a trigger release, a valid decode, or the Laser On Timeout is reached.
- **Scan (Pulse)** - A trigger pull activates the laser and decode processing. The laser remains on and decode processing continues until a valid decode or the Laser On Timeout is reached.
- **Continuous** - This trigger mode is used for triggerless operation. The laser is always on and decoding.
- **Blink** - This trigger mode is used for triggerless operation. While blinking, the scan angle is fixed at wide. Scanning range is reduced in this mode.
- **Host** - A host command issues the triggering signal. The scan engine interprets an actual trigger pull as a Level triggering option.
- **Enhanced Aim** - The engine alternates between aiming and scanning until a decode occurs or the decode session times out. This facilitates aiming at a targeted bar code while the scan line is not easily visible, e.g., from a distance or for outdoor scanning through a car windshield. If you set the *Aim Duration on page 7-12*, the engine begins in aim mode for that duration; otherwise it begins in scan mode. The engine remains in scan mode for the **Scan Timeout** set in *Enhanced Aim Timeouts on page 7-16*. When that time expires it switches back to aim mode for the **Aim Timeout** set in *Enhanced Aim Timeouts*. The engine continues to alternate between the two modes until a decode occurs or the decode session times out. Setting the *Decode Session Timeout on page 7-12* to 9.9 seconds is recommended.

Triggering Modes (continued)

*Level
(00h)

Pulse
(02h)

Continuous
(04h)

Blink
(07h)

Host
(08h)

Enhanced Aim
(0Bh)

Enhanced Aim Timeouts

Aim Timeout: Parameter # F2h 55h

Scan Timeout: Parameter # F2h 56h

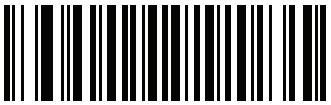
If you selected **Enhanced Aim** as the trigger mode, select an aim timeout and a scan timeout:

1. Scan the **Aim Timeout** or **Scan Timeout** bar code below.
2. Scan two numeric bar codes beginning on *page 7-101* that correspond to the desired timeout. Single digit values must have a leading zero. For example, to set a timeout of 0.5 seconds, scan the bar code below, then scan the **0** and **5** bar codes. To change the selection or cancel an incorrect entry, scan *Cancel on page 7-102*.

The **Aim Timeout** value must be in the range of 0.0 - 9.9, and the default is 2.0 seconds.

The **Scan Timeout** value must be in the range of 0.5 - 9.9, and the default is 1.0 second.

Aim Timeout



Scan Timeout

Timeout Between Decodes, Same Symbol

Parameter # 89h

In **Continuous** and **Blink** triggering modes and when **Contiuous Bar Code Read** is enabled, this parameter sets the minimum time that must elapse before the scan engine decodes a second bar code identical to one just decoded. This reduces the risk of accidently scanning the same symbol twice. It is programmable in 0.1 second increments from 0.0 to 9.9 seconds.

To set this timeout, scan the bar code below. Next scan two numeric bar codes beginning on *page 7-101* that correspond to the desired timeout. Single digit values must have a leading zero. For example, to set a timeout of 0.5 seconds, scan the bar code below, then scan the **0** and **5** bar codes. To change the selection or cancel an incorrect entry, scan *Cancel on page 7-102*.

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

Timeout Between Same Symbol
(Default: 1.0 sec)

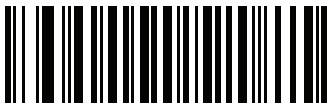
Timeout Between Decodes, Different Symbols

Parameter # 90h

In **Continuous** and **Blink** triggering modes and when **Contiuous Bar Code Read** is enabled, this parameter sets the minimum time that must elapse before the scan engine decodes a second bar code different from the one just decoded. It is programmable in 0.1 second increments from 0.1 to 9.9 seconds.

To set this timeout, scan the bar code below. Next scan two numeric bar codes beginning on *page 7-101* that correspond to the desired timeout. Single digit values must have a leading zero. For example, to set a timeout of 0.5 seconds, scan the bar code below, then scan the **0** and **5** bar codes. To change the selection or cancel an incorrect entry, scan *Cancel on page 7-102*.

✓ ***NOTE*** The Timeout between Decodes, Different Symbols **cannot** be greater than or equal to the *Timeout Between Decodes, Same Symbol*.



Timeout Between Decodes, Different Symbols
(Default: 0.2 sec)

Continuous Bar Code Read

Parameter # F1h 89h

In **Level** and **Host** triggering modes, enable this to report every bar code while the trigger is pressed.

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

Enable Continuous Bar Code Read
(01h)

Unique Bar Code Reporting

Parameter # F1h D3h

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

***Disable Unique Bar Code Reporting**
(00h)

Enable Unique Bar Code Reporting
(01h)

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.

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

Enable No Read
(01h)

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

Power Mode

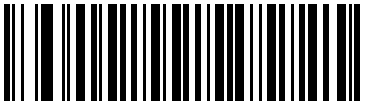
Parameter # 80h

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 1-4*.

In **Continuous Power** mode, the scan engine remains in the Awake state after each decode attempt (see *Power Management on page 1-4*).

The Sleep and Awake commands (refer to the *Simple Serial Interface (SSI) Programmer's Guide*) can be used to change the power state in either **Low Power** mode or **Continuous Power** mode.



Continuous Power
(00h)

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

Time Delay to Low Power Mode

Parameter # 92h

In **Low Power** mode, this parameter sets the time the engine remains active before entering **Low Power** mode. The engine wakes upon trigger pull or when the host attempts to communicate with the engine.

1 Second
(11h)

10 Seconds
(1Ah)

1 Minute
(21h)

5 Minutes
(25h)

15 Minutes
(2Bh)

Time Delay to Low Power Mode (continued)

30 Minutes
(2Dh)

45 Minutes
(2Eh)

***1 Hour**
(31h)

3 Hours
(33h)

6 Hours
(36h)

9 Hours
(39h)

Parameter Scanning

Parameter # ECh

To disable decoding of parameter bar codes, scan the **Disable Parameter Scanning** bar code. To enable decoding of parameter bar codes, either scan **Enable Parameter Scanning** or **Set Factory Defaults** on *page 7-8*.

***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 User Parameter Pass Through
(01h)

***Disable User 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 engine can still decode parameter bar codes.

Disable All Symbologies

Linear Code Type Security Level

Parameter # 4Eh

The SE965HP 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	All
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 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
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)

Bi-directional Redundancy

Parameter # 43h

This parameter is only valid when a *Linear Code Type Security Level on page 7-24* is enabled. When this parameter is enabled, a bar code must be successfully scanned in both directions (forward and reverse) before being decoded.

Enable Bi-directional Redundancy
(01h)

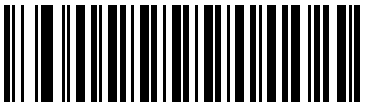
***Disable Bi-directional Redundancy**
(00h)

UPC/EAN

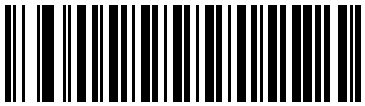
Enable/Disable UPC-A

Parameter # 01h

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



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

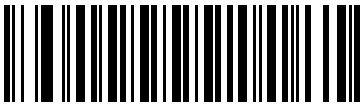


Disable UPC-A
(00h)

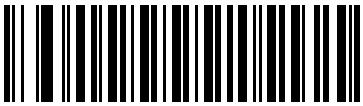
Enable/Disable UPC-E

Parameter # 02h

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



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



Disable UPC-E
(00h)

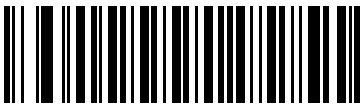
Enable/Disable UPC-E1

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)

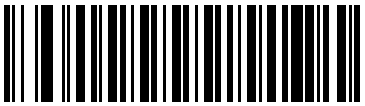


***Disable UPC-E1**
(00h)

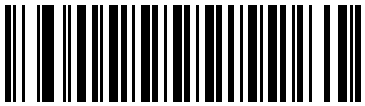
Enable/Disable EAN-8/JAN-8

Parameter # 04h

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



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

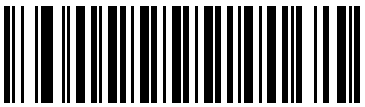


Disable EAN-8/JAN-8
(00h)

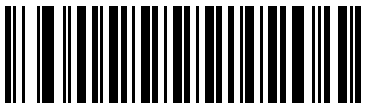
Enable/Disable EAN-13/JAN-13

Parameter # 03h

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



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



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

Enable/Disable Bookland EAN

Parameter # 53h

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

Enable Bookland EAN
(01h)

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

✓ ***NOTE*** If you enable Bookland EAN, select a *Bookland ISBN Format on page 7-42*. Also select either Decode UPC/EAN Supplementals, Autodiscriminate UPC/EAN Supplementals, or Enable 978/979 Supplemental Mode in *Decode UPC/EAN/JAN Supplementals on page 7-30*.

Decode UPC/EAN/JAN Supplementals

Parameter # 10h

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

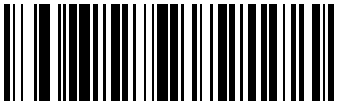
- If you select **Decode UPC/EAN/JAN with Supplementals**, the engine only decodes UPC/EAN symbols with supplemental characters, and ignores symbols without supplementals.
- If you select **Ignore UPC/EAN/JAN Supplementals**, and the engine is presented with a UPC/EAN plus supplemental symbol, the engine decodes UPC/EAN and ignores the supplemental characters.
- If you select **Autodiscriminate UPC/EAN/JAN Supplementals**, the engine decodes UPC/EAN symbols with supplemental characters immediately. If the symbol does not have a supplemental, the engine must decode the bar code the number of times set via *Decode UPC/EAN Supplemental Redundancy on page 7-33* before transmitting its data to confirm that there is no supplemental.
- If you select one of the following **Supplemental Mode** options, the engine immediately transmits EAN-13 bar codes starting with that prefix that have supplemental characters. If the symbol does not have a supplemental, the engine must decode the bar code the number of times set via *Decode UPC/EAN Supplemental Redundancy on page 7-33* before transmitting its data to confirm that there is no supplemental. The engine 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 7-29* to enable Bookland EAN, and select a format using *Bookland ISBN Format on page 7-42*.

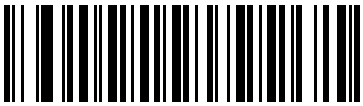
  - **Enable 977 Supplemental Mode.**
  - **Enable 414/419/434/439 Supplemental Mode.**
  - **Enable 491 Supplemental Mode.**
  - **Enable Smart Supplemental Mode** - applies to EAN-13 bar codes starting with any prefix listed previously.
  - **Supplemental User-Programmable Type 1** - applies to EAN-13 bar codes starting with a 3-digit user-defined prefix. Set this 3-digit prefix using *User-Programmable Supplementals on page 7-33*.
  - **Supplemental User-Programmable Type 1 and 2 -** applies to EAN-13 bar codes starting with either of two 3-digit user-defined prefixes. Set the 3-digit prefixes using *User-Programmable Supplementals on page 7-33***.**
  - **Smart Supplemental Plus User-Programmable 1** - applies to EAN-13 bar codes starting with any prefix listed previously or the user-defined prefix set using *User-Programmable Supplementals on page 7-33*.
  - **Smart Supplemental Plus User-Programmable 1 and 2 -** applies to EAN-13 bar codes starting with any prefix listed previously or one of the two user-defined prefixes set using *User-Programmable Supplementals on page 7-33*.

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

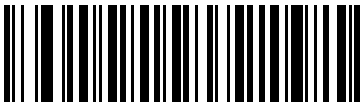
Decode UPC/EAN/JAN Supplementals (continued)



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



***Ignore Supplementals (00h)**



Autodiscriminate UPC/EAN/JAN Supplementals (02h)

Enable 378/379 Supplemental Mode (04h)

Enable 978/979 Supplemental Mode (05h)

Enable 977 Supplemental Mode (07h)

Decode UPC/EAN/JAN Supplementals (continued)

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

Enable 491 Supplemental Mode (08h)

Enable Smart Supplemental Mode (03h)

Supplemental User-Programmable Type 1 (09h)

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

Smart Supplemental Plus User-Programmable 1 (0Bh)

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

User-Programmable Supplementals

Supplemental 1: Parameter # F1h 43h

Supplemental 2: Parameter # F1h 44h

If you selected a Supplemental User-Programmable option from *Decode UPC/EAN/JAN Supplementals on page 7-30*, select **User-Programmable Supplemental 1** to set the 3-digit prefix. Then select the 3 digits using the numeric bar codes beginning on *page 7-101*. Select **User-Programmable Supplemental 2** to set a second 3-digit prefix. Then select the 3 digits using the numeric bar codes beginning on *page 7-101*.

User-Programmable Supplemental 1

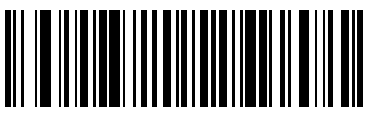
User-Programmable Supplemental 2

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 30 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 7-101*. Single digit numbers must have a leading zero. To change the selection or cancel an incorrect entry, scan *Cancel on page 7-102*.



UPC/EAN/JAN Supplemental Redundancy

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 7-86* set to **AIM Code ID Character**:

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

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

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

  ]E3<data+supplemental data>

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

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

Separate
(00h)

***Combined**
(01h)

Separate Transmissions
(02h)

Transmit UPC-A Check Digit

Parameter # 28h

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

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

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

Transmit UPC-E Check Digit

Parameter # 29h

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

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

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

Transmit UPC-E1 Check Digit

Parameter # 2Ah

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

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

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

UPC-A Preamble

Parameter # 22h

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

No Preamble (<DATA>)
(00h)

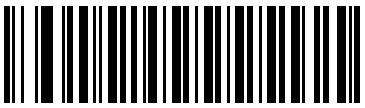
***System Character (<SYSTEM CHARACTER> <DATA>)**
(01h)

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

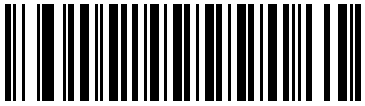
UPC-E Preamble

Parameter # 23h

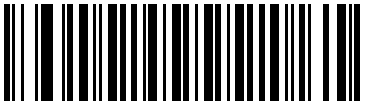
Preamble characters are part of the UPC symbol, and include Country Code and System Character. There are three options for transmitting a UPC-E preamble to the host device: transmit System Character only, transmit System Character and Country Code (“0” for USA), and transmit no preamble. Select the appropriate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



No Preamble (<DATA>)
(00h)



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



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

UPC-E1 Preamble

Parameter # 24h

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

No Preamble (<DATA>)
(00h)

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

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

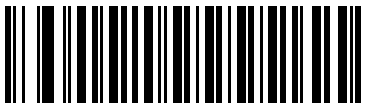
Convert UPC-E to UPC-A

Parameter # 25h

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

When disabled, UPC-E decoded data is transmitted as UPC-E data, without conversion.

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



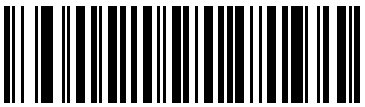
***Do Not Convert UPC-E to UPC-A (Disable)**
(00h)

Convert UPC-E1 to UPC-A

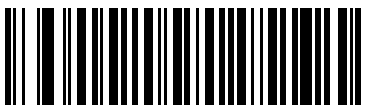
Parameter # 26h

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

When disabled, UPC-E1 decoded data is transmitted as UPC-E1 data, without conversion.



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



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

EAN-8/JAN-8 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.

When disabled, EAN-8 symbols are transmitted as is.

Enable EAN/JAN Zero Extend (01h)

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

Bookland ISBN Format

Parameter # F1h 40h

If you enabled Bookland EAN using *Enable/Disable Bookland EAN on page 7-29*, select one of the following formats for Bookland data:

- **Bookland ISBN-10** - The engine 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 engine 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)

c

NOTE For Bookland EAN to function properly, first enable Bookland EAN using *Enable/Disable Bookland EAN on page 7-29*, then select either Decode UPC/EAN Supplementals, Autodiscriminate UPC/EAN Supplementals, or Enable 978/979 Supplemental Mode in *Decode UPC/EAN/JAN Supplementals on page 7-30*.

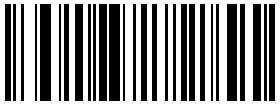
UPC/EAN Security Level

Parameter # 4Dh

The SE965HP 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)

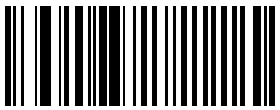
UPC/EAN Security Level 1

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

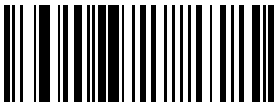
If mis-decodes of poorly printed bar codes occur, and the mis-decodes are not limited to characters 1, 2, 7, and 8, select this security level.



***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.

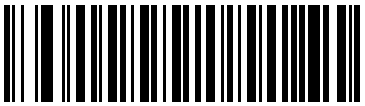


***UPC/EAN Security Level 3**
(03h)

UCC Coupon Extended Code

Parameter # 55h

The UCC Coupon Extended Code is an additional bar code adjacent to a UCC Coupon Code. To enable or disable UCC Coupon Extended Code, scan the appropriate bar code below.



Enable UCC Coupon Extended Code
(01h)

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

Coupon Report

Parameter # F1h DAh

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

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

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

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

Old Coupon Symbols
(00h)

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

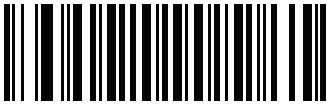
Both Coupon Formats
(02h)

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

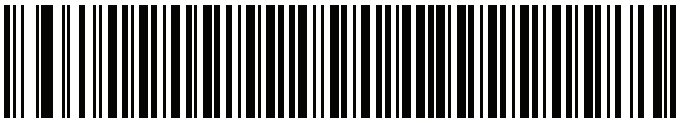
Parameter # L1 = D1h, L2 = D2h

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.

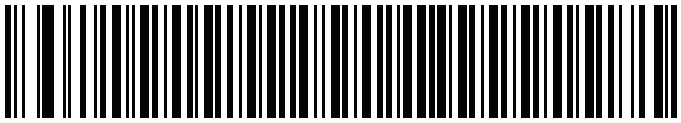
NOTE When setting lengths for different bar code types, enter a leading zero for single digit numbers.

- **One Discrete Length** - Select this option to decode only Code 128 symbols containing a selected length. Select the length using the *Numeric Bar Codes on page 7-101*. 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 7-102*.
- **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 on page 7-101*. 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 7-102*.
- **Length Within Range** - Select this option to decode a Code 128 symbol with a specific length range. Select lengths using the *Numeric Bar Codes on page 7-101*. 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 7-102*.
- **Any Length** - Select this option to decode Code 128 symbols containing any number of characters within the engine's capability.

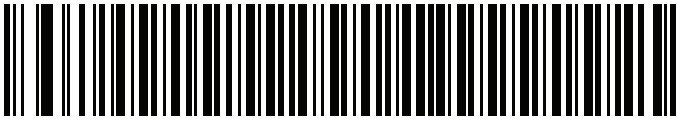
Set Lengths for Code 128 (continued)



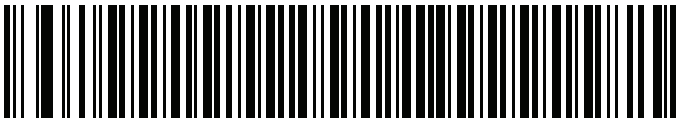
Code 128 - One Discrete Length



Code 128 - Two Discrete Lengths



Code 128 - Length Within Range

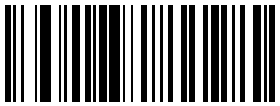


***Code 128 - Any Length**

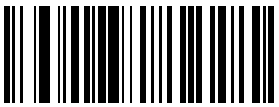
Enable/Disable GS1-128 (formerly UCC/EAN-128)

Parameter # 0Eh

To enable or disable GS1-128, scan the appropriate bar code below. See *Appendix B, 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 engine 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 engine to decode and perform concatenation. The engine does not decode single ISBT symbols.
- If you select **Autodiscriminate ISBT Concatenation**, the engine decodes and concatenates pairs of ISBT codes immediately. If only a single ISBT symbol is present, the engine must decode the symbol the number of times set via *ISBT Concatenation Redundancy on page 7-51* 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)**

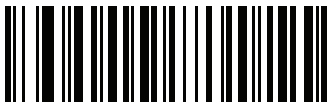
Disable Check ISBT Table (00h)

ISBT Concatenation Redundancy

Parameter # DFh

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

Scan the bar code below, then scan two *Numeric Bar Codes on page 7-101* 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 7-102*. The default is 10.



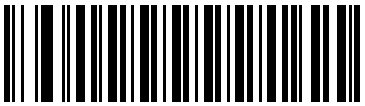
ISBT Concatenation Redundancy

Code 39

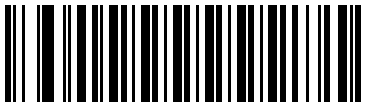
Enable/Disable Code 39

Parameter # 00h

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



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

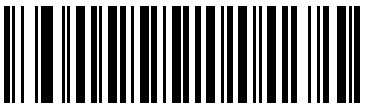


Disable Code 39
(00h)

Enable/Disable Trioptic Code 39

Parameter # 0Dh

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



Enable Trioptic Code 39
(01h)

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

✓ ***NOTE*** Trioptic Code 39 and Code 39 Full ASCII cannot be enabled simultaneously. If an error beep sounds when enabling Trioptic Code 39, disable Code 39 Full ASCII and try again.

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 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. Set lengths for Code 39 to any length, one or two discrete lengths, or lengths within a specific range. If Code 39 Full ASCII is enabled, **Length Within a Range** or **Any Length** are the preferred options.

NOTE When setting lengths for different bar code types by scanning single digit numbers, single digit numbers must always be preceded by a leading zero.

- **One Discrete Length** - Select this option to decode only Code 39 symbols containing a selected length. Select the length using the *Numeric Bar Codes on page 7-101*. For example, to decode only Code 39 symbols with 14 characters, scan **Code 39 - One Discrete Length**, then scan **1** followed by **4**. To correct an error or change the selection, scan *Cancel on page 7-102*.
- **Two Discrete Lengths** - Select this option to decode only Code 39 symbols containing either of two selected lengths. Select lengths using the *Numeric Bar Codes on page 7-101*. 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 correct an error or change the selection, scan *Cancel on page 7-102*.
- **Length Within Range** - Select this option to decode a Code 39 symbol with a specific length range. Select lengths using the *Numeric Bar Codes on page 7-101*. 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** (single digit numbers must always be preceded by a leading zero). To correct an error or change the selection, scan *Cancel on page 7-102*.
- **Any Length** - Select this option to decode Code 39 symbols containing any number of characters within the decoder capability.

Set Lengths for Code 39 (continued)

Code 39 - One Discrete Length

Code 39 - Two Discrete Lengths

***Code 39 - Length Within Range**
(Default: 2 - 55)

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.

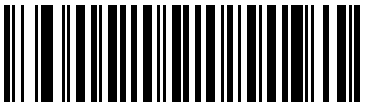
Enable Code 39 Check Digit
(01h)

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

Transmit Code 39 Check Digit

Parameter # 2Bh

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



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

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

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

Code 39 Full ASCII Conversion

Parameter # 11h

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

See *Table B-5 on page B-7* for the mapping of Code 39 characters to ASCII values.

Enable Code 39 Full ASCII (01h)

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

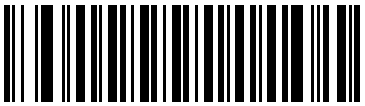
✓ ***NOTE*** Trioptic Code 39 and Code 39 Full ASCII cannot be enabled simultaneously. If you get an error beep when enabling Code 39 Full ASCII, disable Trioptic Code 39 and try again.

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 B-6*.

- **One Discrete Length** - Select this option to decode only Code 93 symbols containing a selected length. Select the length using the *Numeric Bar Codes on page 7-101*. For example, to decode only Code 93 symbols with 14 characters, scan **Code 93 - One Discrete Length**, then scan **1** followed by **4**. To correct an error or to change the selection, scan *Cancel on page 7-102*.
- **Two Discrete Lengths** - Select this option to decode only Code 93 symbols containing either of two selected lengths. Select lengths using the *Numeric Bar Codes on page 7-101*. For example, to decode only those Code 93 symbols containing either 2 or 14 characters, select **Code 93 - Two Discrete Lengths**, then scan **0**, **2**, **1**, and then **4**. To correct an error or to change the selection, scan *Cancel on page 7-102*.
- **Length Within Range** - Select this option to decode a Code 93 symbol with a specific length range. Select lengths using the *Numeric Bar Codes on page 7-101*. 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). To correct an error or change the selection, scan *Cancel on page 7-102*.
- **Any Length** - Scan this option to decode Code 93 symbols containing any number of characters within the decoder's capability.

Set Lengths for Code 93 (continued)

Code 93 - One Discrete Length

Code 93 - Two Discrete Lengths

***Code 93 - Length Within Range**
(Default: 4 - 55)

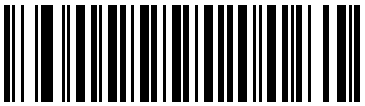
Code 93 - Any Length

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 on page 7-101*. 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 7-102*.
- **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 on page 7-101*. 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 7-102*.
- **Length Within Range** - Select this option to decode a Code 11 symbol with a specific length range. Select lengths using the *Numeric Bar Codes on page 7-101*. 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 7-102*.
- **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**
(Default: 4 - 55)

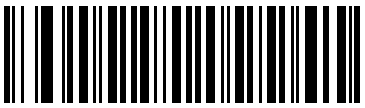
Code 11 - Any Length

Code 11 Check Digit Verification

Parameter # 34h

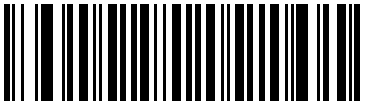
This feature allows the scan engine to check the integrity of all Code 11 symbols to verify that the data complies with the specified check digit algorithm. This selects the check digit mechanism for the decoded Code 11 bar code. The options are to check for one check digit, check for two check digits,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

To enable this feature, scan the bar code below corresponding to the number of check digits encoded in the 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)

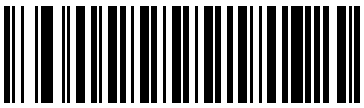
***Do Not Transmit Code 11 Check Digit(s) (Disable)**
(00h)

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

Interleaved 2 of 5

Parameter # 06h

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



***Enable Interleaved 2 of 5**
(01h)

Disable Interleaved 2 of 5
(00h)

Set Lengths for Interleaved 2 of 5

Parameter # L1 = 16h, L2 = 17h

The length of a code refers to the number of characters (i.e., human readable characters), including check digit(s) the code contains. 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, include a leading zero for single digit numbers.

- **One Discrete Length** - Select this option to decode only I 2 of 5 symbols containing a selected length. Select the length using the *Numeric Bar Codes on page 7-101*. For example, to decode only I 2 of 5 symbols with 14 characters, scan **I 2 of 5 - One Discrete Length**, then scan **1** followed by **4**. To correct an error or to change the selection, scan *Cancel on page 7-102*.
- **Two Discrete Lengths** - Select this option to decode only I 2 of 5 symbols containing either of two selected lengths. Select lengths using the *Numeric Bar Codes on page 7-101*. For example, to decode only those I 2 of 5 symbols containing either 2 or 14 characters, select **I 2 of 5 - Two Discrete Lengths**, then scan **0**, **2**, **1**, and then **4**. To correct an error or to change the selection, scan *Cancel on page 7-102*.
- **Length Within Range** - Select this option to decode an I 2 of 5 symbol with a specific length range. Select lengths using the *Numeric Bar Codes on page 7-101*. 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). To correct an error or change the selection, scan *Cancel on page 7-102*.
- **Any Length** - Scan this option to decode I 2 of 5 symbols containing any number of characters within the decoder capability.

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

***I 2 of 5 - One Discrete Length (Default: 14)**

I 2 of 5 - Two Discrete Lengths

Set Lengths for Interleaved 2 of 5 (continued)

I 2 of 5 - Length Within Range

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)

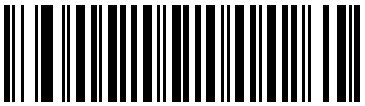
USS Check Digit
(01h)

OPCC Check Digit
(02h)

Transmit I 2 of 5 Check Digit

Parameter # 2Ch

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



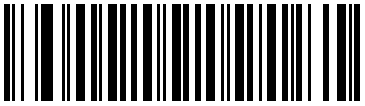
Transmit I 2 of 5 Check Digit (Enable)
(01h)

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

Convert I 2 of 5 to EAN-13

Parameter # 52h

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



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

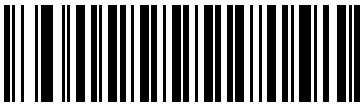
***Do Not Convert I 2 of 5 to EAN-13 (Disable)**
(00h)

Discrete 2 of 5

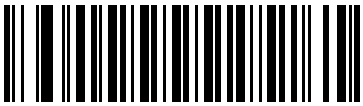
Enable/Disable Discrete 2 of 5

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 B-6*.

- **One Discrete Length** - Select this option to decode only D 2 of 5 symbols containing a selected length. Select the length using the *Numeric Bar Codes on page 7-101*. For example, to decode only D 2 of 5 symbols with 14 characters, scan **D 2 of 5 - One Discrete Length**, then scan **1** followed by **4**. To correct an error or to change the selection, scan *Cancel on page 7-102*.
- **Two Discrete Lengths** - Select this option to decode only D 2 of 5 symbols containing either of two selected lengths. Select lengths using the *Numeric Bar Codes on page 7-101*. For example, to decode only those D 2 of 5 symbols containing either 2 or 14 characters, select **D 2 of 5 - Two Discrete Lengths**, then scan **0**, **2**, **1**, and then **4**. To correct an error or to change the selection, scan *Cancel on page 7-102*.
- **Length Within Range** - Select this option to decode a D 2 of 5 symbol with a specific length range. Select lengths using the *Numeric Bar Codes on page 7-101*. 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 always be preceded by a leading zero). To correct an error or change the selection, scan *Cancel on page 7-102*.
- **Any Length** - Scan this option to decode D 2 of 5 symbols containing any number of characters within the decoder capability.

Set Lengths for Discrete 2 of 5 (continued)

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

***D 2 of 5 - One Discrete Length (Default: 12)**

D 2 of 5 - Two Discrete Lengths

D 2 of 5 - Length Within Range

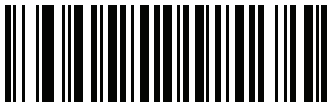
D 2 of 5 - Any Length

Chinese 2 of 5

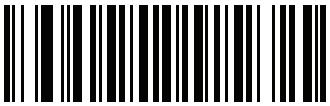
Enable/Disable Chinese 2 of 5

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)**

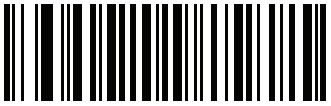
Matrix 2 of 5

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 on page 7-101*. 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 7-102*.
- 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 on page 7-101*. 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 7-102*.
- 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 on page 7-101*. 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 7-102*.
- Any Length - Scan this option to decode Matrix 2 of 5 symbols containing any number of characters within the decoder’s capability.

Set Lengths for Matrix 2 of 5 (continued)

*Matrix 2 of 5 - One Discrete Length
(Default: 14)

Matrix 2 of 5 - Two Discrete Lengths

Matrix 2 of 5 - Length Within Range

Matrix 2 of 5 - Any Length

Matrix 2 of 5 Check Digit

Parameter # F1h 6Eh

The check digit is the last character of the symbol used to verify the integrity of the data. Scan the appropriate bar code below to transmit the bar code data with or without the Matrix 2 of 5 check digit.

Enable Matrix 2 of 5 Check Digit (01h)

***Disable Matrix 2 of 5 Check Digit (00h)**

Transmit Matrix 2 of 5 Check Digit

Parameter # F1h 6Fh

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

Transmit Matrix 2 of 5 Check Digit (01h)

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

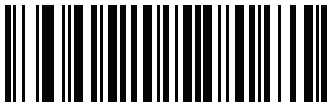
Korean 3 of 5

Enable/Disable Korean 3 of 5

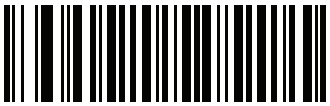
Parameter # F1h 45h

To enable or disable Korean 3 of 5, scan the appropriate bar code below.

✓ ***NOTE*** The length for Korean 3 of 5 is fixed at 6.



Enable Korean 3 of 5 (01h)



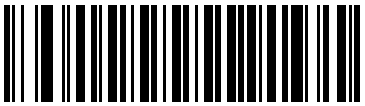
***Disable Korean 3 of 5 (00h)**

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 B-6*.

- **One Discrete Length** - Select this option to decode only Codabar symbols containing a selected length. Select the length using the *Numeric Bar Codes on page 7-101*. For example, to decode only Codabar symbols with 14 characters, scan **Codabar - One Discrete Length**, then scan **1** followed by **4**. To correct an error or to change the selection, scan *Cancel on page 7-102*.
- **Two Discrete Lengths** - Select this option to decode only Codabar symbols containing either of two selected lengths. Select lengths using the *Numeric Bar Codes on page 7-101*. For example, to decode only Codabar symbols containing either 2 or 14 characters, select **Codabar - Two Discrete Lengths**, then scan **0**, **2**, **1**, and then **4**. To correct an error or to change the selection, scan *Cancel on page 7-102*.
- **Length Within Range** - Select this option to decode a Codabar symbol with a specific length range. Select lengths using the *Numeric Bar Codes on page 7-101*. 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). To correct an error or change the selection, scan *Cancel on page 7-102*.
- **Any Length** - Scan this option to decode Codabar symbols containing any number of characters within the decoder capability.

Set Lengths for Codabar (continued)

Codabar - One Discrete Length

Codabar - Two Discrete Lengths

***Codabar - Length Within Range (Default: 5 - 55)**

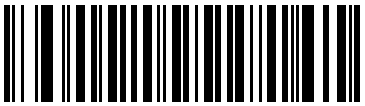
Codabar - Any Length

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.

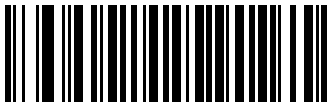
Enable NOTIS Editing
(01h)

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

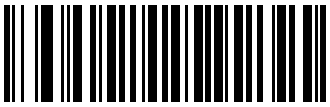
Codabar Upper or Lower Case Start/Stop Characters Detection

Parameter # F2h 57h

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



***Lower Case**
(01h)



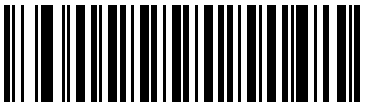
Upper Case
(00h)

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-7* for ASCII equivalents. To set lengths via serial commands, see *Setting Code Lengths Via Serial Commands on page B-6*.

- **One Discrete Length** - Select this option to decode only MSI symbols containing a selected length. Select the length using the *Numeric Bar Codes on page 7-101*. For example, to decode only MSI symbols with 14 characters, scan **MSI - One Discrete Length**, then scan **1** followed by **4**. To correct an error or to change the selection, scan *Cancel on page 7-102*.
- **Two Discrete Lengths** - Select this option to decode only MSI symbols containing either of two selected lengths. Select lengths using the *Numeric Bar Codes on page 7-101*. For example, to decode only MSI symbols containing either 2 or 14 characters, select **MSI - Two Discrete Lengths**, then scan **0**, **2**, **1**, and then **4**. To correct an error or to change the selection, scan *Cancel on page 7-102*.
- **Length Within Range** - Select this option to decode a MSI symbol with a specific length range. Select lengths using the *Numeric Bar Codes on page 7-101*. 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). To correct an error or change the selection, scan *Cancel on page 7-102*.
- **Any Length** - Scan this option to decode MSI symbols containing any number of characters within the decoder capability.

Set Lengths for MSI (continued)

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

MSI - One Discrete Length

MSI - Two Discrete Lengths

***MSI - Length Within Range (Default: 6 - 55)**

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. If two check digits are selected, also select an *MSI Check Digit Algorithm on page 7-81*.

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

Two MSI Check Digits
(01h)

Transmit MSI Check Digit

Parameter # 2Eh

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

Transmit MSI Check Digit(s) (Enable)
(01h

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

MSI Check Digit Algorithm

Parameter # 33h

Two algorithms are possible for the verification of the second MSI check digit. Select the bar code below corresponding to the algorithm used to encode the check digit.

MOD 10/MOD 11
(00h)

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

GS1 DataBar

GS1 DataBar types are:

- GS1 DataBar Omnidirectional
- GS1 DataBar Truncated
- GS1 DataBar Stacked
- GS1 DataBar Stacked Omnidirectional
- GS1 DataBar Limited
- GS1 DataBar Expanded
- GS1 DataBar Expanded Stacked

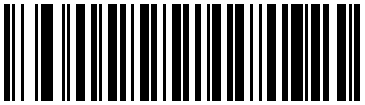
Scan the appropriate bar codes to enable or disable each type of GS1 DataBar.

GS1 DataBar

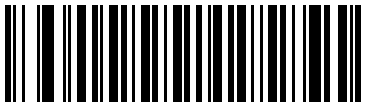
Parameter # F0h 52h

Scan the appropriate bar code below to enable or disable the following code types:

- GS1 DataBar Omnidirectional
- GS1 DataBar Truncated
- GS1 DataBar Stacked
- GS1 DataBar Stacked Omnidirectional,



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

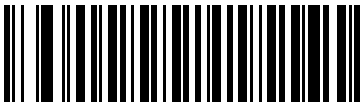


Disable GS1 DataBar
(00h)

GS1 DataBar Limited

Parameter # F0h 53h

*Enable GS1 DataBar Limited
(01h)



Disable GS1 DataBar Limited
(00h)

GS1 DataBar Limited Security Level

Parameter # F1h D8h

The engine offers four levels of decode security for GS1 DataBar Limited bar codes. There is an inverse relationship between security and engine aggressiveness. Increasing the level of security may result in reduced aggressiveness in scanning, so only choose the level of security necessary.

- Level 1 – No clear margin required. This complies with the original GS1 standard, yet might result in erroneous decoding of the DataBar Limited bar code when scanning some UPC symbols that start with the digits “9” and “7”.
- Level 2 – Automatic risk detection. This level of security may result in erroneous decoding of DataBar Limited bar codes when scanning some UPC symbols. If a misdecode is detected, the engine operates in Level 3 or Level 1.
- Level 3 – Security level reflects newly proposed GS1 standard that requires a 5X trailing clear margin.
- Level 4 – Security level extends beyond the standard required by GS1. This level of security requires a 5X leading and trailing clear margin.

Security Level 1
(01h)

Security Level 2
(02h)

***Security Level 3**
(03h)

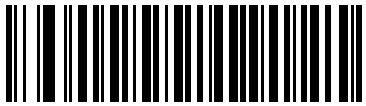
Security Level 4
(04h)

GS1 DataBar Expanded

Parameter # F0h 54h

Scan the appropriate bar code below to enable or disable the following code types:

- GS1 DataBar Expanded
- GS1 DataBar Expanded Stacked.



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

Disable GS1 DataBar Expanded (00h)

Convert GS1 DataBar to UPC/EAN

Parameter # F0h, 8Dh

This parameter only applies to GS1 DataBar and GS1 DataBar Limited symbols not decoded as part of a Composite symbol. Enable this to strip the leading '010' from DataBar and DataBar Limited symbols encoding a single zero as the first digit, and report the bar code as EAN-13.

For bar codes beginning with two or more zeros but not six zeros, this parameter strips the leading '0100' and reports the bar code as UPC-A. The UPC-A Preamble parameter that transmits the system character and country code applies to converted bar codes. Note that neither the system character nor the check digit can be stripped.

Enable Convert GS1 DataBar to UPC/EAN (01h)

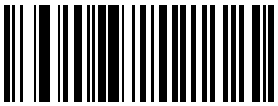
***Disable Convert GS1 DataBar to UPC/EAN (00h)**

Transmit Code ID Character

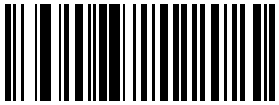
Parameter # 2Dh

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.

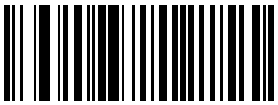
Select no code ID character, a Symbol Code ID character, or an AIM Code ID character. For Symbol and AIM code ID characters, see*Code Identifiers on page B-3*.



Symbol Code ID Character
(02h)



AIM Code ID Character
(01h)



***None**
(00h)

Prefix/Suffix Values

Parameter # Prefix = 69h, Suffix1 = 68h, Suffix2 = 6Ah

A prefix and/or one or two suffixes can be appended to scan data for use in data editing. To set a value for a prefix or suffix, scan the prefix or suffix bar code below, then scan a four-digit number (i.e., four bar codes from *Numeric Bar Codes on page 7-101*) that corresponds to that value. See *Table B-5 on page B-7* for the four-digit code values. To change the selection or cancel an incorrect entry, scan *Cancel on page 7-102*. To set the Prefix/Suffix values via serial commands, see *Setting Prefixes and Suffixes Via Serial Commands on page B-7*.

✓ ***NOTE*** To send a Prefix or Suffix with bar code data, first enable the format in which they are sent by setting the *Scan Data Transmission Format on page 7-88*.

Scan Prefix
(07h)

Scan Suffix 1
(06h)

Scan Suffix 2
(08h)

Data Format Cancel

Scan Data Transmission Format

Parameter # EBh

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

To set values for the prefix and/or suffix, see *Prefix/Suffix Values on page 7-87*.

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

<DATA> <SUFFIX 1>
(01h)

<DATA> <SUFFIX 2>
(02h)

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

<PREFIX> <DATA >
(04h)

Scan Data Transmission Format (continued)

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

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

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

Serial Parameters

Baud Rate

Parameter # 9Ch

Baud rate is the number of bits of data transmitted per second. Set the engine's baud rate to match the data rate setting of the host device. Otherwise, data may not reach the host.

Scan the appropriate baud rate bar code that matches the baud rate setting of the host device.

Baud Rate 1200
(03h)

Baud Rate 2400
(04h)

Baud Rate 4800
(05h)

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

Baud Rate 19,200
(07h)

Baud Rate (continued)

Baud Rate 38,400
(08h)

Baud Rate 57,600
(0Ah)

Baud Rate 115,200
(0Bh)

Parity

Parameter # 9Eh

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

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

Odd
(00h)

Even
(01h)

***None**
(04h)

Check Parity

Parameter # 97h

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

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

Check Parity
(01h)

Software Handshaking

Parameter # 9Fh

This parameter offers control of the data transmission process in addition to that offered by hardware handshaking. Hardware handshaking is always enabled and cannot be disabled by the user.

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

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

Disable ACK/NAK
(00h)

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

Host RTS Line State

Parameter # 9Ah

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

Use the SSI interface with host applications which also implement the SSI protocol. You can also use the engine in a "scan-and-transmit" mode to communicate with any standard serial communication software on a host PC (see *Decode Data Packet Format on page 7-95*). If transmission errors occur in this mode, the host PC may be asserting hardware handshaking lines which interfere with the SSI protocol. Scan the **Host: RTS High** bar code to address this problem.

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

Host: RTS High
(01h)

Decode Data Packet Format

Parameter # EEh

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

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

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

Send Packeted Decode Data
(01h)

Stop Bits

Parameter # 9Dh

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

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

2 Stop Bits
(02h)

Host Serial Response Timeout

Parameter # 9Bh

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

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

NOTE Other values are available via SSI command.

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

Medium - 5 Seconds
(32h)

High - 7.5 Seconds
(4Bh)

Maximum - 9.9 Seconds
(63h)

Host Character Timeout

Parameter # EFh

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

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

NOTE Other values are available via SSI command.

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

Medium - 500 ms
(32h)

High - 750 ms
(4Bh)

Maximum - 990 ms
(63h)

Event Reporting

The host can request the engine to provide certain information (events) relative to the engine's behavior. Enable or disable the events listed in *Table 7-2* and on the following pages by scanning the appropriate bar codes.

Table 7-2 *Event Codes*

Event Class	Event	Code Reported
Decode Event	Non parameter decode	01h
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

Decode Event

Parameter # F0h, 00h

If you enable this, the engine generates a message to the host whenever it successfully decodes a bar code. Disable this to send no notification.

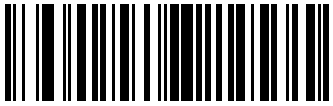
Enable Decode Event (01h)

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

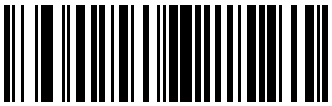
Boot Up Event

Parameter # F0h, 02h

If you enable this, the engine generates a message to the host whenever power is applied. Disable this to send no notification.



Enable Boot Up Event
(01h)

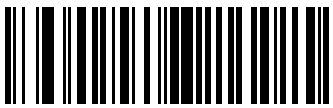


***Disable Boot Up Event**
(00h)

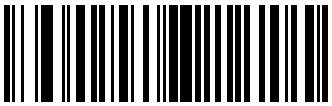
Parameter Event

Parameter # F0h, 03h

If you enable this, the engine generates a message to the host when one of the events specified in *Table 7-2* occurs. Disable this to send no notification.



Enable Parameter Event
(01h)



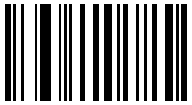
***Disable Parameter Event**
(00h)

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)

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

6

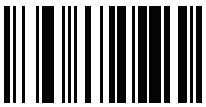
7

8

9

Cancel

To correct an error or change a selection, scan the bar code below.



Cancel

CHAPTER 8 REMOTE SCANNER MANAGEMENT

Introduction

Symbol Remote Scanner Management (RSM) technology enables a host to manage a scanner or scan engine. The scanner or scan engine can provide asset-tracking information (attributes) to the host such as serial number, date of manufacture and firmware version. In addition, Remote Scanner Management technology provides the ability to automate the configuration process, monitor and optimize scan engine operation, and enables firmware upgrade to support new features.

The SE965HP scan engine supports the ability to be remotely managed by supporting discovery, parameter configuration, and firmware updates electronically through Simple Serial Interface (SSI).

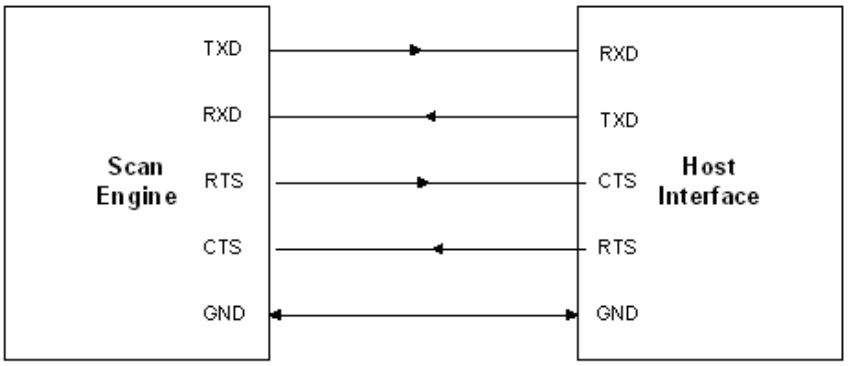
Discovery is defined as the ability to query "born on" information such as the model number, scan engine serial number, date of manufacture, and firmware version. This information can be retrieved electronically from the scan engine (through the SSI host interface) so that an application or Management Agent can publish the "discovered" information to the enterprise backend.

Parameter configuration allows the ability to query and set the device settings (i.e., scan amplitude) electronically.

For more information about SSI that supports the Remote Scanner Management architecture, see *Chapter 9, Simple Serial Interface*.

Hardware Signals

The basic SE965HP scan engine & host interconnection diagram for the RSM transaction is shown in *Figure 8-1* below.



RSM Via RS232 - Scan Engine and Host Interconnection

Figure 8-1 *RSM via RS232 Interconnection*

Protocol Commands

Table 8-1 identifies the required support based upon Device Class.

Table 8-1 *Device Class*

Device Class	Supported Interfaces	Features
SE965HP Scan Engine	RS232 - SSI	RMD_GET_PACKETSIZE ATTRIBUTE_GETALL ATTRIBUTE_GET ATTRIBUTE_GET_NEXT ATTRIBUTE_GET_OFFSET ATTRIBUTE_SET ATTRIBUTE_STORE

Attribute Support

Table 8-2 identifies the list of attribute numbers supported in the SE965HP scan engine.

NOTE Write access to the fields in this above RMD command list shall occur in supervisor mode (i.e., FAT or Manufacturing only).

Table 8-2 *Supported Attribute Numbers*

Attribute Number	Attribute Name	User Mode Access	Supervisor Mode Access	Size (Bytes)	Description
0 - 9999	System Parameters	R/W	R/W	Variable	All system parameters are accessible via 'GET' and 'SET' attribute commands.
191	Motor Scan Angle	R/W	R/W	1	Scan Angle setting the engine currently uses.
534	Serial Number	R	R/W	16	This is the serial number of the device. This attribute exists for both the base and scan engine. This field is programmed during manufacturing.
535	Date of Manufacture	R	R/W	7	The date of the manufacture DD- Day MMM- Month, Jan, Feb, Apr YY -Year This attribute exists for both the base and scan engine. This field is programmed during manufacturing.
536	Date of Last Service	R	R/W	7	The date of the manufacture DD- Day MMM- Month, Jan, Feb, Apr YY -Year This attribute exists for both the base and scan engine. This field is programmed during manufacturing and Service Depot.
20004	Firmware Version	R	R	18	This attribute represents the firmware version of the device. This attribute exists for both the base and scan engine. This field is determined at software build time.
20005	Engine ID	R	R/W	1	The engine ID of the attached scan engine.
20006	Hardware Version	R	R/W	1	The version or versions of the boards in the system.

Table 8-2 *Supported Attribute Numbers (Continued)*

Attribute Number	Attribute Name	User Mode Access	Supervisor Mode Access	Size (Bytes)	Description
533	Model Number	R	R/W	18	The model number of the device. This attribute exists for both the base and scan engine. This field is programmed during manufacturing. The format is: "SE965-YYYY..Y"
614	Date of First Program	R	R/W	7	The date of the first program DD-Day MMM- Month, Jan, Feb, Apr YY -Year. This attribute exists for both the base and scan engine. This field is programmed during manufacturing.
848	Second Serial Number	R	R/W	16	This attribute is the second serial number of the device. This field is programmed during manufacturing.
20011	Current RSM Version	R	R	4	This attribute is the current RSM version the device uses. This attribute exists for both the base and scan engine. This field is determined at software build time.
20012	Current Top-level Release Version	R	R	18	This attribute represents the top-level release version of the device. This attribute shall exist for both the base and scan engine. This field is determined at software build time.

RMD Protocol Over RS232 (SSI)

Encapsulation of RMD Commands/Responses over SSI

The SSI protocol allows the host to send a command that is variable in length up to 255 bytes. Although there is a provision in the protocol to multi-packet commands from the host, it is not supported in the scan engine. It is required that the host fragment packets using the provisions supplied in the RMD protocol (ATTRIBUTE_SET_OFFSET, ATTRIBUTE_GET_OFFSET).

Command Structure

	Bit							
Byte	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	Length (Not including the checksum)							
1	SSI_MGMT_COMMAND (0x80)							
2	Message Source (4 - Host)							
3	Reserved (0)				Reserved (0)	Reserved (0)	Cont'd packet	Retransmit
4	Management Payload							
...								
...								
...								
...								
Length -1								
Length	2's compliment checksum (MSB)							
Length +1	2's compliment checksum (LSB)							

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

Response Structure

Byte	7	6	5	4	3	2	1	0
0	Length (Not including the checksum)							
1	SSI_MGMT_COMMAND (0x80)							
2	Message Source (0 - Decoder)							
3	Reserved (0)				Reserved (0)	Reserved (0)	Cont'd packet	Retransmit
4	Management Payload							
...								
...								
...								
...								
Length -1								
Length	2's compliment checksum (MSB)							
Length +1	2's compliment checksum (LSB)							

Example Transaction

The following example shows how to retrieve the serial number (Attribute # 534 decimal) from the engine.

Command from Host to Retrieve the Serial Number

Entire command: 0A 80 04 00 00 06 02 00 02 16 FF 52

Where:

- 0A 80 04 00 - Encapsulation of RMD Commands/Responses over SSI command header
- 00 06 02 00 02 16 - Attribute Get command requesting attribute 534 decimal
- FF 52 - Encapsulation of RMD Commands/Responses over SSI command checksum.

Response from Engine with Serial Number

Entire response: 23 80 00 00 00 1F 02 00 02 16 53 01 00 11 00 00 4D 31 4A 36 39 57 32 39 47 20 20 20 20 20 20 20 00 FF FF F9 A1

Where:

- 23 80 00 00 - Encapsulation of RMD Commands/Responses over SSI command header
- 00 1F 02 00 02 16 53 01 00 11 00 00 4D 31 4A 36 39 57 32 39 47 20 20 20 20 20 20 20 00 FF FF - Attribute get response which returns attribute 534 as a string response
- F9 A1- Encapsulation of RMD Commands/Responses over SSI command checksum.

RSM Protocol (Management Payload)

The RSM protocol is defined as a host initiated command/response type protocol. Unsolicited responses are not currently addressed or supported by this protocol. The functionality of this protocol can be extended, if required, in the future.

The primitive commands supported by the SE965HP RSM protocol are listed in *Table 8-3*.

Table 8-3 *Supported RSM Protocol*

Command	Opcode
RSM_GET_PACKETSIZE	0x20
ATTRIBUTE_GETALL	0x01
ATTRIBUTE_GET	0x02
ATTRIBUTE_GET_NEXT	0x03
ATTRIBUTE_GET_OFFSET	0x04
ATTRIBUTE_SET	0x05
ATTRIBUTE_STORE	0x06

All Motorola scanning devices must support the commands prefixed with ATTRIBUTE_ in order to be RSM compliant. Cascaded legacy devices (such as scan engines) may be compliant as long as they are attached to a root that is RSM compliant.

The commands prefixed with TUNNEL_ are exclusively used for devices that fit the cascaded model (cordless multi-point scanners and table-top with auxiliary scanners).

Error Commands

All RSM commands that fail receive the following response from the device.

Response Structure

Byte	Bit							
	7	6	5	4	3	2	1	0
0	Length (MSB)							
1	Length (LSB)							
2	Opcode (MGMT_ERROR) (0x50)							
3	Status							

Key

- Length: Length of the message including the length itself
- Opcode
- Status:
  - UNKNOWN_CMD (1)
  - TUNNEL_ERROR (2)
  - RSM_GET_PACKETSIZE not received (3).

RSM_GET_PACKETSIZE

The RSM_GET_PACKETSIZE command allows the host to query packet size that is supported by the device. This command is required because each device has a different resource availability.

NOTE It is required that the host sends this command before it issues any other RSM command. If this command is not received, the host responds with an MGMT_ERROR message.

Command Structure

Byte	Bit							
	7	6	5	4	3	2	1	0
0	Length (MSB)							
1	Length (LSB)							
2	Opcode (RSM_GET_PACKETSIZE) (0x20)							
3	Reserved (0)							
4	Maximum response size (MSB)							
5	Maximum response size (LSB)							

Response Structure

Byte	Bit							
	7	6	5	4	3	2	1	0
0	Length (MSB)							
1	Length (LSB)							
2	Opcode (RSM_GET_PACKETSIZE) (0x20)							
3	Status							
4	Device Receive Packet Size (MSB)							
5	Device Receive Packet Size (LSB)							
6	Device Transmit Packet Size (MSB)							
7	Device Transmit Packet Size (LSB)							

ATTRIBUTE_GETALL

The ATTRIBUTE_GETALL command provides the ability to read out the supported attributes of the device being queried. The command itself does not report the values of the attributes but rather, the attribute numbers supported by the device itself. This command was added as an optimization for the host to report the "discoverable" device attributes.

NOTE The maximum command/response frame is limited to 240 bytes due to the memory constraints of the devices queried. If the response does not fit in the 240-byte response frame, then it is up to the application to parse the response and determine where the command should pick up. The command set has provisions that support this feature.

Command Structure

Byte	Bit							
	7	6	5	4	3	2	1	0
0	Length (MSB)							
1	Length (LSB)							
2	Opcode (ATTRIBUTE_GETALL) (0x01)							
3	Reserved (0)							
4	Start Attribute Number (MSB)							
5	Start Attribute Number (LSB)							

Key

- Length: Length of the command 7 bytes.
- Opcode.
- Start Attribute Number: The seed for the ATTRIBUTE_GETALL command. The first attribute retrieved is equal to or greater than this field.

Response Structure

Byte	Bit							
	7	6	5	4	3	2	1	0
0	Length (MSB)							
1	Length (LSB)							
2	Opcode (ATTRIBUTE_GETALL) (0x01)							
3	Status							
4	Attribute Number 1 (MSB)							
5	Attribute Number 1 (MSB)							
...								
...								
237	Attribute Number N							

Key

- Length: Length of the response frame.
- Opcode.
- Status:
  - 0 = Command Successful.
- Attribute Number: A 16 bit value that represents the attribute number. An attribute value of 0xFFFF indicates that the end of the attribute table was reached. If the attribute value at the end of the list is not 0xFFFF, it is the responsibility of the host software to send an ATTRIBUTE_GETALL command that starts off with the last attribute number that reported + 1.

Transaction Diagram

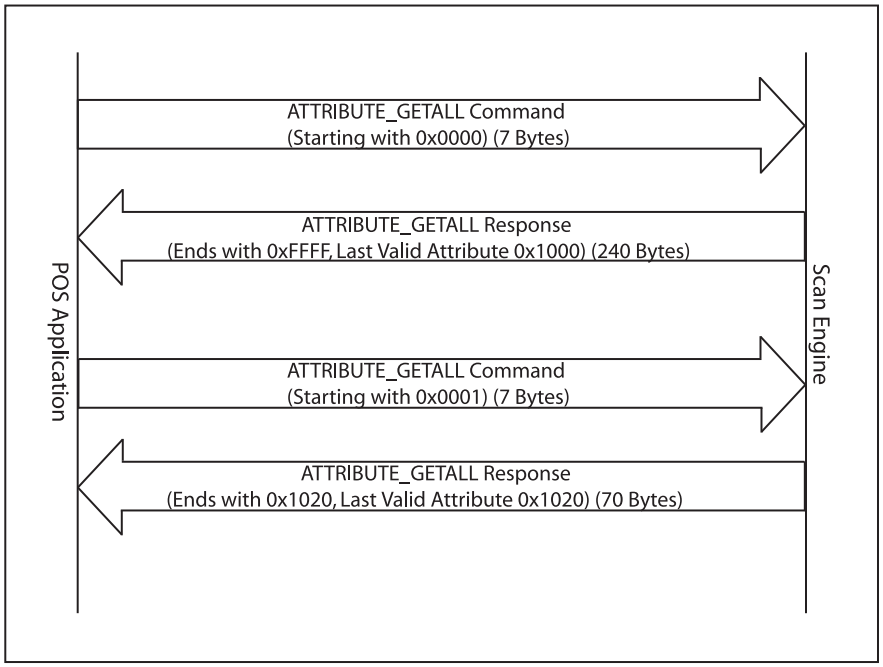


Figure 8-2 *Transaction Diagram*

ATTRIBUTE_GET

The ATTRIBUTE_GET command is used to retrieve a scan engine attribute when the attribute number is provided. The command supports the ability to request one or more parameters that are only limited by the size of the command that it can send. The current size limit of this command is 240 bytes.

Command Structure

Byte	Bit							
	7	6	5	4	3	2	1	0
0	Length (MSB)							
1	Length (LSB)							
2	Opcode (ATTRIBUTE_GET) (0x02)							
3	Reserved (0)							
4	First Attribute (MSB)							
5	FIrst Attribute (LSB)							
...	...							
237	Last Attribute (LSB)							

Response Structure

Byte	Bit							
	7	6	5	4	3	2	1	0
0	Length (MSB)							
1	Length (LSB)							
2	Opcode (ATTRIBUTE_GETALL) (0x02)							
3	Status							
4...4 + length of attribute	First Attribute Value							
...	...							
...								
237 - length of attribute ...237	Last Attribute Value							

NOTE This packet terminates when the last value is 0xFFFF.

Attribute Value Sub-structure

The Attribute values are stored in a structure that self describes the data type as well as the amount of storage that each attribute supports. The tag that differentiates the types is human readable. For all types, an upper case letter indicates that the value is unsigned. The lower case letter indicates that the value is signed. This rule does not apply to the string 'S' and array 'A' data types.

Generic Structure

Attribute	Type	Properties	Value

Type	Definition
'B'	Byte - unsigned char
'C'	Char - signed byte
'F'	Bit Flags
'W'	WORD - short unsigned integer (16 bits)
'I'	SWORD - short signed integer (16 bits)
'D'	DWORD - long unsigned integer (32 bits)
'L'	SDWORD - long signed integer (32 bits)
'A'	Array
'S'	String

Properties

Byte	Bit							
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	Reserved (0)	Reserved (0)	Reserved (0)	Reserved (0)	Reserved (0)	Persistent	Write	Read

Key

- Write - Attribute value is writable.
- Read - Attribute value is readable.
- Persistent - Attribute value is non-volatile.

Value

- Variable depends on the 'TYPE' field.

Byte Value Structure

0	1	2	3	4
Attribute	Attribute	Type	Properties	Data
MSB	LSB	‘B’	<val>	<val>

Char Value Structure

0	1	2	3	4
Attribute	Attribute	Type	Properties	Data
MSB	LSB	‘C’	<val>	<val>

Flag Value Structure

0	1	2	3	4
Attribute	Attribute	Type	Properties	Data
MSB	LSB	‘F’	<val>	<val>

Short Unsigned Integer Value Structure

0	1	2	3	4	5
Attribute	Attribute	Type	Flags	Properties	Data
MSB	LSB	‘W’	<val>	MSB <val>	LSB <val>

Short Signed Integer Value Structure

0	1	2	3	4	5
Attribute	Attribute	Type	Flags	Properties	Data
MSB	LSB	‘I’	<val>	MSB <val>	LSB <val>

Long Unsigned Integer Value Structure

0	1	2	3	4	5	6	7
Attribute	Attribute	Type	Properties	Data	Data	Data	Data
MSB	LSB	‘D’	<val>	MSB <val>	<val>	<val>	LSB <val>

Long Signed Integer Value Structure

0	1	2	3	4	5	6	7
Attribute	Attribute	Type	Properties	Data	Data	Data	Data
MSB	LSB	‘L’	<val>	MSB <val>	<val>	<val>	LSB <val>

String Value Structure

0	1	2	3	4	5	6	7	8	9	10	11
Attribute	Attribute	Prop-erties	Flags	Length	Offset	Offset	Value	Value	Value	Value	Value
MSB	LSB	‘S’	<val>	MSB	LSB	MSB	LSB	‘S’	‘T’	‘R’	‘\O’

NOTE String values returned are NULL terminated. However, the size that is returned always represents the actual size of the data storage. It may seem wasteful however the get functionality serves as a way to self-describe the variable including the storage limits.

Array Value Structure

0	1	2	3	4	5	6	7	8	9	10	11	12
Attribute	Attribute	Type	Prop-erties	Sub Type	Length	Length	Offset	Offset	Value	Value	Value	Value
MSB	LSB	‘A’	<val>	‘W’	MSB (00)	LSB (0x04)	MSB (0x00)	LSB (0x00)	0xDE	0xAD	0xBE	0xEF

The length and offset are represented in byte values. They do not indicate the element count or number of elements.

Transaction Diagram

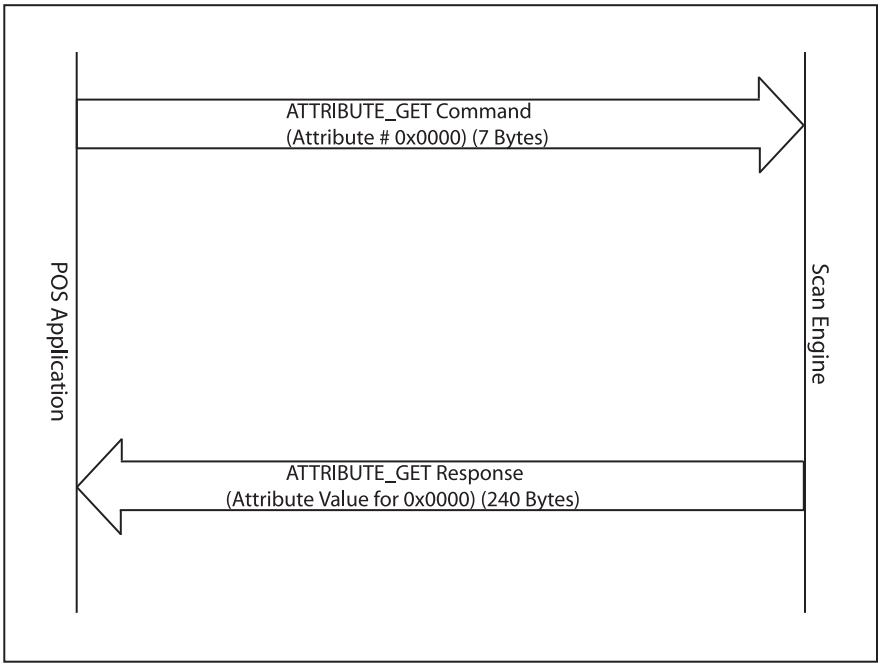


Figure 8-3 *Transaction Diagram*

ATTRIBUTE_GETNEXT

The ATTRIBUTE_GETNEXT command provides a way for the application to retrieve the next attribute in the attribute table. This command takes an attribute number as a starting point for which the search commences.

This command is very similar to the ATTRIBUTE_GET command (*page 8-12*) in structure except that the command only supports a single attribute request.

Command Structure

Byte	Bit							
	7	6	5	4	3	2	1	0
0	Length (MSB)							
1	Length (LSB)							
2	Opcode (ATTRIBUTE_GETNEXT) (0x03)							
3	Reserved (0)							
4	Starting Attribute (MSB)							
5	Starting Attribute (LSB)							

Response Structure

Byte	Bit							
	7	6	5	4	3	2	1	0
0	Length (MSB)							
1	Length (LSB)							
2	Opcode (ATTRIBUTE_GETALL) (0x02)							
3	Status							
4...4 + length of attribute	First Attribute Value							
...	...							
...								
237 - length of attribute ...237	Last Attribute Value							

ATTRIBUTE_GET_OFFSET

The ATTRIBUTE_GET_OFFSET command provides the ability to retrieve string/array attribute values that do not fit within a packet. It is the responsibility of the application to determine what the starting offset is.

Command Structure

Byte	Bit							
	7	6	5	4	3	2	1	0
0	Length (MSB)							
1	Length (LSB)							
2	Opcode (ATTRIBUTE_GET_OFFSET) (0x04)							
3	Reserved (0)							
4	First Attribute (MSB)							
5	First Attribute (LSB)							
6	Offset (MSB)							
7	Offset (LSB)							

Response Structure

Byte	Bit							
	7	6	5	4	3	2	1	0
0	Length (MSB)							
1	Length (LSB)							
2	Opcode (ATTRIBUTE_GET_OFFSET) (0x04)							
3	Status							
4...4 + length of attribute	GET_OFFSET Attribute Value							

ATTRIBUTE_SET

The ATTRIBUTE_SET command provides a mechanism for the application to change attributes on the device. The values altered by the ATTRIBUTE_SET are by definition volatile. These values do not persist when a power cycle occurs. See *ATTRIBUTE_STORE on page 8-20* for non-volatile storage.

The number of attribute "sets" is limited by the size of the packet that can be sent to the device (currently 240 bytes).

Command Structure

Byte	Bit							
	7	6	5	4	3	2	1	0
0	Length (MSB)							
1	Length (LSB)							
2	Opcode (ATTRIBUTE_SET) (0x05)							
3	Reserved (0)							
4	Attribute Value							
...	Attribute Value N							

Response Structure

Byte	Bit							
	7	6	5	4	3	2	1	0
0	Length (MSB)							
1	Length (LSB)							
2	Opcode (ATTRIBUTE_SET) (0x05)							
3	Status							

Status Key

- 0 = Command Successful.
- 1 = Command Unsuccessful.

ATTRIBUTE_STORE

The ATTRIBUTE_STORE command provides a mechanism for the application to change attributes on the device. The values altered by the ATTRIBUTE_STORE are by definition non-volatile.

CAUTION The number of non-volatile writes are limited.

NOTE This command works in supervisor mode (i.e., FAT or Manufacturing) only.

The number of attribute "sets" is limited by the size of the packet that can be sent to the device (currently 240 bytes).

Command Structure

Byte	Bit							
	7	6	5	4	3	2	1	0
0	Length (MSB)							
1	Length (LSB)							
2	Opcode (ATTRIBUTE_STORE) (0x06)							
3	Reserved (0)							
4	Attribute Value							
...	Attribute Value N							

Response Structure

Byte	Bit							
	7	6	5	4	3	2	1	0
0	Length (MSB)							
1	Length (LSB)							
2	Opcode (ATTRIBUTE_STORE) (0x06)							
3	Status							

Status Key

- 0 = Command Successful.
- 1 = Command Partially Successful.
- 2 = Command Unsuccessful.

Remote Monitoring Commands

Remote Monitoring commands support the Remote Scanner Management architecture. The host uses these commands to query the scan engine for important information, e.g., software revision and serial number. These commands can also indicate the status of several key scan engine subsystems.

The scan engine responds with the requested data byte(s). However, for commands that require a parameter (e.g., REQUEST_DATE_OF_MANUFACTURE), the scan engine responds with CMD_NACK if it receives an invalid parameter.

Serial Number

Attribute Number 534

Description

The host uses this command to request the serial number of the scan engine. This is a read/write parameter. Write is performed in FAT or manufacturing mode only.

Response Format for ATTRIBUTE_GET command		
Number of Bytes Returned to Host	Byte 16 through Byte 31	Byte 35 & Byte 36
35 Bytes (not including checksum)	Serial Number String Value	Checksum on Byte 0 through Byte 34

Date of Manufacture

Attribute Number 535

Description

The host uses this command to request the date of manufacturing of the scan engine. This is a read/write parameter. Write is performed in FAT or manufacturing mode only.

Response Format for ATTRIBUTE_GET command		
Number of Bytes Returned to Host	Byte 16 through Byte 22	Byte 26 & Byte 27
26 Bytes (not including checksum)	Date of Manufacture Value	Checksum on Byte 0 through Byte 25

Date of Last Service

Attribute Number 536

Description

The host uses this command to request the date of service of the scan engine. This is a read/write parameter. Write is performed in FAT or manufacturing mode only.

Response Format for ATTRIBUTE_GET command		
Number of Bytes Returned to Host	Byte 16 through Byte 22	Byte 26 & Byte 27
26 Bytes (not including checksum)	Date of Service Value	Checksum on Byte 0 through Byte 25

Firmware Version

Attribute Number 20004

Description

The host uses this command to request the firmware version loaded on the scan engine. This is a read only parameter.

Response Format for ATTRIBUTE_GET command		
Number of Bytes Returned to Host	Byte 16 through Byte 33	Byte 37 & Byte 38
37 Bytes (not including checksum)	Firmware Version	Checksum on Byte 0 through Byte 36

Engine ID

Attribute Number 20005

Description

The host uses this command to request the Engine ID (Class I or Class II) of the scan engine. This is a read/write parameter. Write is performed in FAT or manufacturing mode only.

Class II SE965 Engine - 0xAB

Response Format for ATTRIBUTE_GET command		
Number of Bytes Returned to Host	Byte 12	Byte 15 & Byte 16
15 Bytes (not including checksum)	Engine ID Value	Checksum on Byte 0 through Byte 14

Hardware Version

Attribute Number 20006

Description

The host uses this command to request the hardware version of the scan engine. This is a read/write parameter. Write is performed in FAT or manufacturing mode only.

Response Format for ATTRIBUTE_GET command		
Number of Bytes Returned to Host	Byte 12	Byte 15 & Byte 16
15 Bytes (not including checksum)	Hardware Version Value	Checksum on Byte 0 through Byte 14

NOTE String values returned are NULL terminated.

Model Number

Attribute Number 533

Description

The host uses this command to request the model number of the scan engine. This is a read/write parameter. Write is performed in FAT or manufacturing mode only.

Response Format for ATTRIBUTE_GET command		
Number of Bytes Returned to Host	Byte 16 through Byte 33	Byte 37 & Byte 38
37 Bytes (not including checksum)	Model Number String Value	Checksum on Byte 0 through Byte 36

Date of First Program

Attribute Number 614

Description

The host uses this command to request the date of first program of the scan engine. This is a read/write parameter. Write is performed in FAT or manufacturing mode only.

Response Format for ATTRIBUTE_GET command		
Number of Bytes Returned to Host	Byte 16 through Byte 22	Byte 26 & Byte 27
26 Bytes (not including checksum)	Date of First Program	Checksum on Byte 0 through Byte 25

Second Serial Number

Attribute Number 848

Description

The host uses this command to request the second serial number of the scan engine. This is a read/write parameter. Write is performed in FAT or manufacturing mode only.

Response Format for ATTRIBUTE_GET command		
Number of Bytes Returned to Host	Byte 16 through Byte 31	Byte 35 & Byte 36
35 Bytes (not including checksum)	Date of Second Serial Number	Checksum on Byte 0 through Byte 34

Current RSM Version

Attribute Number 20011

Description

The host uses this command to request the current RSM version of the scan engine. This is a read only parameter.

Response Format for ATTRIBUTE_GET command		
Number of Bytes Returned to Host	Byte 16 through Byte 19	Byte 23 & Byte 24
23 Bytes (not including checksum)	Top-level Release Version String Value	Checksum on Byte 0 through Byte 22

Current Top-level Release Version

Attribute Number 20012

Description

The host uses this command to request the top-level release version of the scan engine. This is a read only parameter.

Response Format for ATTRIBUTE_GET command		
Number of Bytes Returned to Host	Byte 16 through Byte 33	Byte 37 & Byte 38
37 Bytes (not including checksum)	RSM Version String Value	Checksum on Byte 0 through Byte 36

Firmware Update

RSM enables electronic firmware update through Simple Serial Interface (SSI) to support new features.

Performing Firmware Update

To update firmware, the engine must be in SSI mode using the following communication settings: 9600 baud, 8 data bits, 1 stop bits, no parity. Use SSI commands to set these parameters.

To update the firmware, first send the **Firmware Update** (Flash Program) SSI command:

<Len> <Op> <Msg-Src> <Status> <Data…> <Checksum>

Or:

<0x06> <0xEE> <0x04> <0x00> <0x46 0x44> <0xFE 0x7E>

The system enters Firmware Update, or raw RS-232, mode. In this mode RTS/CTS is not required.

Next, optionally execute the Negotiate Baud Rate procedure to establish a common maximum baud rate to speed firmware download. If you skip this step, the download occurs at a fixed 9600 baud. *Negotiating Baud Rate on page 8-27*.

Send the contents of the DAT file to the engine:

1. Open the DAT file.
2. Verify the DAT file CRC. See *CRC Calculation on page 8-29* for the algorithm to calculate the CRC value of all bytes in the DAT file excluding the last two bytes. The result must equal the value of the last word (2 bytes) in the file.
3. Advance to the first Firmware-Update record. In general the first record is offset 8 bytes from the start of the file. See *DAT File Format on page 8-28* for details.
4. While not end-of-file:
   a. Read a record from the DAT file (see *DAT File Format on page 8-28*).
   b. Format the DAT record into a Firmware-Update command as follows:
      - Initialize a Firmware-Update command structure (see *Table 8-4*)
      - Copy the DAT record **firmware data** field into the Firmware-Update command **firmware data** field.
      - Calculate the length and insert into the Firmware-Update command **length** field.
      - Calculate the 2-byte checksum and insert into the Firmware-Update command **checksum** field.
   c. Send the command (via RS-232) to the engine.
   d. Wait for a response from the engine (see *Table 8-5*) and verify the command was successful. As per *Table 8-5* the **status** field must be any value from 0x00 to 0x0F for success. Any other value indicates a failure.
5. Close the DAT file.

The engine performs an internal procedure which lasts up to two minutes (typically much less), then sends a completion code (0x04, single byte) indicating the firmware download is complete. If 0x04 is not received the download failed.

Following this completion code the engine reboots and powers up using the new firmware.

Firmware Update Command/Response Formats

Table 8-4 *RS-232 Firmware Update Command Format (Host to Engine)*

Byte	Field	Field Description
0	STX	STX = start of packet/command. Value is always 0x02.
1	Length	Length of command. Excludes **STX** and **Checksum**.
2 - n	Firmware_Data	Flash Data. This is the same data as in lines 3c, 4c, etc. in *Table 8-6*.
(n+1) - (n+2) (2 bytes)	Checksum	16-bit 2's complement sum of packet-bytes (including length but excluding **STX**). Big endian or MSB first.

Table 8-5 *RS-232 Firmware Update Response Format (Engine to Host)*

Byte	Field	Field Description
0	STX	STX = start of packet/response. Value is always 0x02.
1	Length	Length of response. Excludes **STX** and **Checksum**. Responses are fixed length so the length byte is always 0x07.
2 - 6	Reserved	Proprietary.
7	Status	0x00 - 0x0F: Command completed successfully. Any other value indicates command failed.
8 - 9	Checksum	16-bit 2's complement sum of packet-bytes (including length but excluding **STX**). Big endian or MSB first.

Negotiating Baud Rate

Updating firmware at the default baud rate of 9600 can take more than 10 minutes. Perform the **Negotiate Baud Rate** sequence to synchronize the host and engine to their highest common baud rate and reduce the time to update the firmware. This sequence is optional.

To perform this sequence, the host builds and sends a **Change Baud** command with the **Baud** field set to its highest supported baud rate. It then waits for a response from the engine:

- The engine responds **OK** (the response **status** field = 0x00) if it supports the baud rate, and both the engine and host switch to this new baud rate.
- If the engine responds with **Baud Unsupported** (the response **status** field = 0x03), both the engine and host must remain at 9600. The host must then build and send another **Change Baud** command specifying its next highest supported baud rate. The host again waits for the engine response and takes the appropriate action based on the returned **status** field.

The host continues to perform this sequence, each time specifying a lower baud rate, until the engine responds **OK**. The engine must respond **OK** to 9600.

Note that the baud rate must remain at 9600 throughout this procedure, and can change only when the host receives the **OK** response. The next command (from host to engine) is then at the new baud rate.

Change Baud Sequence

The **Change Baud** command is:

[0x02] [0x07] [0x00 0x06 0x64 0x00 0x07] [baud_rate] [checksum-MSB] [checksum LSB]

where **baud-rate** is:

0x06=153600, 0x05=115200, 0x04=76800, 0x03=57600, 0x02=38400, 0x01=19200, or 0x00=9600.

The **Change Baud** response is:

[0x02] [0x07] [0x00 0x06 0x64 0x00 0x87] [status] [checksum-MSB] [checksum LSB]

For example:

Change Baud to 115200: 0x02 0x07 0x00 0x06 0x64 0x00 0x07 0x05 0xFF 0x83

Change Baud to 38400: 0x02 0x07 0x00 0x06 0x64 0x00 0x07 0x02 0xFF 0x86

The two responses (**OK** and **Unsupported**) are always the same, regardless of the baud rate specified in the **Change Baud** command, and are:

OK: 0x02 0x07 0x00 0x06 0x64 0x00 0x87 0x00 0xFF 0x08

Unsupported: 0x02 0x07 0x00 0x06 0x64 0x00 0x87 0x03 0xFF 0x05

DAT File Format

A DAT file is a formatted file containing an array of records (as well as other fields). *Table 8-6* describes the specific format of the file.

Table 8-6 *DAT File Format*

	Field / Size	Sub-field	Description
1	4 bytes		Product ID (information purposes only)
2	4 bytes		Release level (information purposes only)
3a	Record 1 (variable length)	Len: 1 byte	Length of Record 1 **Data** field
3b		Pad: 3 bytes	Proprietary (these bytes do not get transmitted)
3c		Data: xx bytes	Data for 1st Flash command
4a	Record 2 (variable length)	Len: 1 byte	Length of Record 2 **Data** field
4b		Pad: 3 bytes	Proprietary (these bytes do not get transmitted)
4c		Data: xx bytes	Data for 2nd Flash command
5a	Record 3 (variable length)	Len: 1 byte	Length of Record 3 **Data** field
5b		Pad: 3 bytes	Proprietary (these bytes do not get transmitted)
5c		Data: xx bytes	Data for 3rd Flash command
	:	:	:
	:	:	:
	:	:	:
	:	:	:
	Record **n** (variable length)	Len: 1 byte	Length of Record **n Data** field
		Pad: 3 bytes	Proprietary (these bytes are not transmitted)
		Data: xx bytes	Data for **n**th Flash command
	1 byte		Marks the end of records = 0x00
	2 bytes		CRC of file. Verifies the integrity of the DAT file (see appendix A)

CRC Calculation

```
typedef unsigned char  BYTE;
typedef unsigned short WORD;
typedef unsigned long  DWORD;

typedef union
{
   WORD  w;
   struct
   {
      BYTE  lo,
            hi;
   } b;
} BYTEWORD;


static const WORD ccittrev_tbl[] =
{
   0x0000,  0xC0C1,  0xC181,  0x0140,  0xC301,  0x03C0,  0x0280,  0xC241,
   0xC601,  0x06C0,  0x0780,  0xC741,  0x0500,  0xC5C1,  0xC481,  0x0440,
   0xCC01,  0x0CC0,  0x0D80,  0xCD41,  0x0F00,  0xCFC1,  0xCE81,  0x0E40,
   0x0A00,  0xCAC1,  0xCB81,  0x0B40,  0xC901,  0x09C0,  0x0880,  0xC841,
   0xD801,  0x18C0,  0x1980,  0xD941,  0x1B00,  0xDBC1,  0xDA81,  0x1A40,
   0x1E00,  0xDEC1,  0xDF81,  0x1F40,  0xDD01,  0x1DC0,  0x1C80,  0xDC41,
   0x1400,  0xD4C1,  0xD581,  0x1540,  0xD701,  0x17C0,  0x1680,  0xD641,
   0xD201,  0x12C0,  0x1380,  0xD341,  0x1100,  0xD1C1,  0xD081,  0x1040,
   0xF001,  0x30C0,  0x3180,  0xF141,  0x3300,  0xF3C1,  0xF281,  0x3240,
   0x3600,  0xF6C1,  0xF781,  0x3740,  0xF501,  0x35C0,  0x3480,  0xF441,
   0x3C00,  0xFCC1,  0xFD81,  0x3D40,  0xFF01,  0x3FC0,  0x3E80,  0xFE41,
   0xFA01,  0x3AC0,  0x3B80,  0xFB41,  0x3900,  0xF9C1,  0xF881,  0x3840,
   0x2800,  0xE8C1,  0xE981,  0x2940,  0xEB01,  0x2BC0,  0x2A80,  0xEA41,
   0xEE01,  0x2EC0,  0x2F80,  0xEF41,  0x2D00,  0xEDC1,  0xEC81,  0x2C40,
   0xE401,  0x24C0,  0x2580,  0xE541,  0x2700,  0xE7C1,  0xE681,  0x2640,
   0x2200,  0xE2C1,  0xE381,  0x2340,  0xE101,  0x21C0,  0x2080,  0xE041,
   0xA001,  0x60C0,  0x6180,  0xA141,  0x6300,  0xA3C1,  0xA281,  0x6240,
   0x6600,  0xA6C1,  0xA781,  0x6740,  0xA501,  0x65C0,  0x6480,  0xA441,
   0x6C00,  0xACC1,  0xAD81,  0x6D40,  0xAF01,  0x6FC0,  0x6E80,  0xAE41,
   0xAA01,  0x6AC0,  0x6B80,  0xAB41,  0x6900,  0xA9C1,  0xA881,  0x6840,
   0x7800,  0xB8C1,  0xB981,  0x7940,  0xBB01,  0x7BC0,  0x7A80,  0xBA41,
   0xBE01,  0x7EC0,  0x7F80,  0xBF41,  0x7D00,  0xBDC1,  0xBC81,  0x7C40,
   0xB401,  0x74C0,  0x7580,  0xB541,  0x7700,  0xB7C1,  0xB681,  0x7640,
   0x7200,  0xB2C1,  0xB381,  0x7340,  0xB101,  0x71C0,  0x7080,  0xB041,
   0x5000,  0x90C1,  0x9181,  0x5140,  0x9301,  0x53C0,  0x5280,  0x9241,
   0x9601,  0x56C0,  0x5780,  0x9741,  0x5500,  0x95C1,  0x9481,  0x5440,
   0x9C01,  0x5CC0,  0x5D80,  0x9D41,  0x5F00,  0x9FC1,  0x9E81,  0x5E40,
   0x5A00,  0x9AC1,  0x9B81,  0x5B40,  0x9901,  0x59C0,  0x5880,  0x9841,
   0x8801,  0x48C0,  0x4980,  0x8941,  0x4B00,  0x8BC1,  0x8A81,  0x4A40,
```

```
    0x4E00,  0x8EC1,  0x8F81,  0x4F40,  0x8D01,  0x4DC0,  0x4C80,  0x8C41,
    0x4400,  0x84C1,  0x8581,  0x4540,  0x8701,  0x47C0,  0x4680,  0x8641,
    0x8201,  0x42C0,  0x4380,  0x8341,  0x4100,  0x81C1,  0x8081,  0x4040
};

WORD ComputeCRC16(BYTE *data, DWORD data_length)
{
   BYTE *ptr;
   BYTEWORD retval;

   /* Initialize the CRC */
   retval.w = 0xFFFF;

   /* Iterate through the data */
   for (ptr=data; ptr<data+data_length; ptr++)
   {
      // retval.w = IterateCRC16(ptr, retval);
      retval.w = retval.b.hi ^ (ccittrev_tbl[retval.b.lo ^ *ptr]);

   }

   /* Finalize the CRC */
   retval.w = ~retval.w;

   /* Done. */
   return retval.w;
}
```

CHAPTER 9 SIMPLE SERIAL INTERFACE

Introduction

For information on the Simple Serial Interface (SSI), which provides a communications link between Motorola decoders (e.g., SE965HP scan engine, slot scanners, hand-held scanners, two-dimensional scanners, hands free scanners, and RF base stations) and a serial host, refer to the *Simple Serial Interface Programmer's Guide*, p/n 72E-40451-xx.

The engine code for the SE965HP is 0xAB. In reference to the Scan Engine Code table, it includes the Aiming Pattern, Blinking Trigger, and Laser Clipping.

APPENDIX A MISCELLANEOUS CODE INFORMATION

Introduction

This appendix provides information on the following:

- *GS1-128 (formerly UCC/EAN-128)*
- *Code Identifiers*
- *Setting Code Lengths Via Serial Commands*
- *Setting Prefixes and Suffixes Via Serial Commands*

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 SE955 autodiscriminates between these symbols, and can enable or disable one or both code types. *Table A-1* indicates the behavior of the SE955 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

Code Identifiers

Table A-2 lists Symbol and AIM code type identifiers. Each AIM Code Identifier contains the three-character string **]cm** where:

] = Flag Character (ASCII 93)
c = Code Character (see *Table A-2*)
m = Modifier Character (see *Table A-3*).

Table A-2 *Code Characters*

Code Type	Symbol Code Character	AIM Code Character
UPC-A, UPC-E, UPC-E1, EAN-8, EAN-13	A	E
Code 39, Code 32	B	A
Codabar	C	F
Code 128, ISBT 128	D	C
Code 93	E	G
Interleaved 2 of 5	F	I
Discrete 2 of 5, or Discrete 2 of 5 IATA	G	S
Code 11	H	H
MSI	J	M
GS1-128	K	
Bookland EAN	L	X
Trioptic Code 39	M	X
Coupon Code	N	E (UPC portion) C (Code 128 portion)
GS1 DataBar Family	R	e
UCC Composite, TLC 39	T	
Chinese 2 of 5	U	X

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

Table A-3 *Modifier Characters*

Code Type	Option Value	Option
Code 39		
	0	No Check character or Full ASCII processing.
	1	Reader has checked one check character.
	3	Reader has checked and stripped check character.
	4	Reader has performed Full ASCII character conversion.
	5	Reader has performed Full ASCII character conversion and checked one check character.
	7	Reader has performed Full ASCII character conversion and checked and stripped check character.
	Example: A Full ASCII bar code with check character W, **A+I+MI+DW**, is transmitted as **]A7**AimId where 7 = (3+4).	
Trioptic Code 39		
	0	No option specified at this time. Always transmit 0.
	Example: A trioptic bar code 412356 is transmitted as **]X0**412356	
Code 128		
	0	Standard data packet, No Function code 1 in first symbol position.
	1	Function code 1 in first symbol character position.
	2	Function code 1 in second symbol character position.
	Example: A Code (EAN) 128 bar code with Function 1 character 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.
	Example: A Code 93 bar code 012345678905 is transmitted as **]G0**012345678905	

Table A-3 *Modifier Characters (Continued)*

Code Type	Option Value	Option
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 SE955, 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 7, 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-4 lists the requirements for each option.

Table A-4 *Setting Variable Code Lengths*

Code Length Option	L1 value	L2 value
One discrete length is decoded.	Discrete length to decode	0x00
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.	0x00	0x00

Setting Prefixes and Suffixes Via Serial Commands

To append a prefix and suffixes to the decode data:

1. Set the Scan Data Transmission Format (parameter 0xE2) to the desired option.
2. Enter the required value(s) for Prefix (0x69), Suffix1 (0x68) or Suffix2 (0x6A) using the hex values for the desired ASCII value from *Table A-5*.

Table A-5 *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 A-5 *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
1055	37h	7	7

Table A-5 *Character Equivalents (Continued)*

Scan Value	Hex Value	Full ASCII Code 39 Encode Char.	Keystroke
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
1085	55h	U	U
1086	56h	V	V

Table A-5 *Character Equivalents (Continued)*

Scan Value	Hex Value	Full ASCII Code 39 Encode Char.	Keystroke
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
1115	73h	+S	s
1116	74h	+T	t
1117	75h	+U	u

Table A-5 *Character Equivalents (Continued)*

Scan Value	Hex Value	Full ASCII Code 39 Encode Char.	Keystroke
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.

GLOSSARY

A

Aperture. The opening in an optical system defined by a lens or baffle that establishes the field of view.

API. An interface by means of which one software component communicates with or controls another. Usually used to refer to services provided by one software component to another, usually via software interrupts or function calls

Application Programming Interface. See **API**.

ASCII. American Standard Code for Information Interchange. A 7 bit-plus-parity code representing 128 letters, numerals, punctuation marks and control characters. It is a standard data transmission code in the U.S.

Autodiscrimination. The ability of an interface controller to determine the code type of a scanned bar code. After this determination is made, the information content is decoded.

B

Bar. The dark element in a printed bar code symbol.

Bar Code. A pattern of variable-width bars and spaces which represents numeric or alphanumeric data in machine-readable form. The general format of a bar code symbol consists of a leading margin, start character, data or message character, check character (if any), stop character, and trailing margin. Within this framework, each recognizable symbology uses its own unique format. See **Symbology**.

Bar Code Density. The number of characters represented per unit of measurement (e.g., characters per inch).

Bar Height. The dimension of a bar measured perpendicular to the bar width.

Bar Width. Thickness of a bar measured from the edge closest to the symbol start character to the trailing edge of the same bar.

BIOS. Basic Input Output System. A collection of ROM-based code with a standard API used to interface with standard PC hardware.

Bit. Binary digit. One bit is the basic unit of binary information. Generally, eight consecutive bits compose one byte of data. The pattern of 0 and 1 values within the byte determines its meaning.

Bits per Second (bps). Bits transmitted or received.

Boot or Boot-up. The process a computer goes through when it starts. During boot-up, the computer can run self-diagnostic tests and configure hardware and software.

BOOTP. A protocol for remote booting of diskless devices. Assigns an IP address to a machine and may specify a boot file. The client sends a bootp request as a broadcast to the bootp server port (67) and the bootp server responds using the bootp client port (68). The bootp server must have a table of all devices, associated MAC addresses and IP addresses.

bps. See **Bits Per Second**.

Byte. On an addressable boundary, eight adjacent binary digits (0 and 1) combined in a pattern to represent a specific character or numeric value. Bits are numbered from the right, 0 through 7, with bit 0 the low-order bit. One byte in memory is used to store one ASCII character.

C

CDRH. Center for Devices and Radiological Health. A federal agency responsible for regulating laser product safety. This agency specifies various laser operation classes based on power output during operation.

CDRH Class 1. This is the lowest power CDRH laser classification. This class is considered intrinsically safe, even if all laser output were directed into the eye's pupil. There are no special operating procedures for this class.

CDRH Class 2. No additional software mechanisms are needed to conform to this limit. Laser operation in this class poses no danger for unintentional direct human exposure.

Character. A pattern of bars and spaces which either directly represents data or indicates a control function, such as a number, letter, punctuation mark, or communications control contained in a message.

Character Set. Those characters available for encoding in a particular bar code symbology.

Check Digit. A digit used to verify a correct symbol decode. The scanner inserts the decoded data into an arithmetic formula and checks that the resulting number matches the encoded check digit. Check digits are required for UPC but are optional for other symbologies. Using check digits decreases the chance of substitution errors when a symbol is decoded.

Codabar. A discrete self-checking code with a character set consisting of digits 0 to 9 and six additional characters: (- $: / , +).

Code 128. A high density symbology which allows the controller to encode all 128 ASCII characters without adding extra symbol elements.

Code 3 of 9 (Code 39). A versatile and widely used alphanumeric bar code symbology with a set of 43 character types, including all uppercase letters, numerals from 0 to 9 and 7 special characters (- . / + % $ and space). The code name is derived from the fact that 3 of 9 elements representing a character are wide, while the remaining 6 are narrow.

Code 93. An industrial symbology compatible with Code 39 but offering a full character ASCII set and a higher coding density than Code 39.

Code Length. Number of data characters in a bar code between the start and stop characters, not including those characters.

Cold Boot. A cold boot restarts the mobile computer and erases all user stored records and entries.

COM port. Communication port; ports are identified by number, e.g., COM1, COM2.

Continuous Code. A bar code or symbol in which all spaces within the symbol are parts of characters. There are no intercharacter gaps in a continuous code. The absence of gaps allows for greater information density.

Cradle. A cradle is used for charging the terminal battery and for communicating with a host computer, and provides a storage place for the terminal when not in use.

D

Dead Zone. An area within a scanner's field of view, in which specular reflection may prevent a successful decode.

Decode. To recognize a bar code symbology (e.g., UPC/EAN) and then analyze the content of the specific bar code scanned.

Decode Algorithm. A decoding scheme that converts pulse widths into data representation of the letters or numbers encoded within a bar code symbol.

Decryption. Decryption is the decoding and unscrambling of received encrypted data. Also see, **Encryption** and **Key**.

Depth of Field. The range between minimum and maximum distances at which a scanner can read a symbol with a certain minimum element width.

Discrete 2 of 5. A binary bar code symbology representing each character by a group of five bars, two of which are wide. The location of wide bars in the group determines which character is encoded; spaces are insignificant. Only numeric characters (0 to 9) and START/STOP characters may be encoded.

Discrete Code. A bar code or symbol in which the spaces between characters (intercharacter gaps) are not part of the code.

DRAM. Dynamic random access memory.

E

EAN. European Article Number. This European/International version of the UPC provides its own coding format and symbology standards. Element dimensions are specified metrically. EAN is used primarily in retail.

Element. Generic term for a bar or space.

Encoded Area. Total linear dimension occupied by all characters of a code pattern, including start/stop characters and data.

ENQ (RS-232). ENQ software handshaking is also supported for the data sent to the host.

ESD. Electro-Static Discharge

F

Flash Disk. An additional megabyte of non-volatile memory for storing application and configuration files.

Flash Memory. Flash memory is responsible for storing the system firmware and is non-volatile. If the system power is interrupted the data is not be lost.

FTP. See **File Transfer Protocol**.

H

Hard Reset. See **Cold Boot**.

Host Computer. A computer that serves other terminals in a network, providing such services as computation, database access, supervisory programs and network control.

Hz. Hertz; A unit of frequency equal to one cycle per second.

I

IDE. Intelligent drive electronics. Refers to the solid-state hard drive type.

IEC. International Electrotechnical Commission. This international agency regulates laser safety by specifying various laser operation classes based on power output during operation.

IEC60825-1 Class 1. This is the lowest power IEC laser classification. Conformity is ensured through a software restriction of 120 seconds of laser operation within any 1000 second window and an automatic laser shutdown if the scanner's oscillating mirror fails.

IEEE Address. See **MAC Address**.

Input/Output Ports. I/O ports are primarily dedicated to passing information into or out of the terminal’s memory. Series 9000 mobile computers include Serial and USB ports.

Intercharacter Gap. The space between two adjacent bar code characters in a discrete code.

Interleaved 2 of 5. A binary bar code symbology representing character pairs in groups of five bars and five interleaved spaces. Interleaving provides for greater information density. The location of wide elements (bar/spaces) within each group determines which characters are encoded. This continuous code type uses no intercharacter spaces. Only numeric (0 to 9) and START/STOP characters may be encoded.

Interleaved Bar Code. A bar code in which characters are paired together, using bars to represent the first character and the intervening spaces to represent the second.

Interleaved 2 of 5. A binary bar code symbology representing character pairs in groups of five bars and five interleaved spaces. Interleaving provides for greater information density. The location of wide elements (bar/spaces) within each group determines which characters are encoded. This continuous code type uses no intercharacter spaces. Only numeric (0 to 9) and START/STOP characters may be encoded.

I/O Ports. interface The connection between two devices, defined by common physical characteristics, signal characteristics, and signal meanings. Types of interfaces include RS-232 and PCMCIA.

IOCTL. Input/Output Control.

IP Address. (Internet Protocol address) The address of a computer attached to an IP network. Every client and server station must have a unique IP address. A 32-bit address used by a computer on a IP network. Client workstations have either a permanent address or one that is dynamically assigned to them each session. IP addresses are written as four sets of numbers separated by periods; for example, 204.171.64.2.

IPX/SPX. Internet Package Exchange/Sequential Packet Exchange. A communications protocol for Novell. IPX is Novell's Layer 3 protocol, similar to XNS and IP, and used in NetWare networks. SPX is Novell's version of the Xerox SPP protocol.

IS-95. Interim Standard 95. The EIA/TIA standard that governs the operation of CDMA cellular service. Versions include IS-95A and IS-95B. See CDMA.

K

Key. A key is the specific code used by the algorithm to encrypt or decrypt the data. Also see, **Encryption** and **Decrypting**.

L

LASER. Light Amplification by Stimulated Emission of Radiation.The laser is an intense light source. Light from a laser is all the same frequency, unlike the output of an incandescent bulb. Laser light is typically coherent and has a high energy density.

Laser Diode. A gallium-arsenide semiconductor type of laser connected to a power source to generate a laser beam. This laser type is a compact source of coherent light.

Laser Scanner. A type of bar code reader that uses a beam of laser light.

LCD. See **Liquid Crystal Display**.

LED Indicator. A semiconductor diode (LED - Light Emitting Diode) used as an indicator, often in digital displays. The semiconductor uses applied voltage to produce light of a certain frequency determined by the semiconductor's particular chemical composition.

Light Emitting Diode. See **LED**.

Liquid Crystal Display (LCD). A display that uses liquid crystal sealed between two glass plates. The crystals are excited by precise electrical charges, causing them to reflect light outside according to their bias. They use little electricity and react relatively quickly. They require external light to reflect their information to the user.

M

MIL. 1 mil = 1 thousandth of a meter.

Misread (Misdecode). A condition which occurs when the data output of a reader or interface controller does not agree with the data encoded within a bar code symbol.

N

Nominal. The exact (or ideal) intended value for a specified parameter. Tolerances are specified as positive and negative deviations from this value.

Nominal Size. Standard size for a bar code symbol. Most UPC/EAN codes are used over a range of magnifications (e.g., from 0.80 to 2.00 of nominal).

NVM. Non-Volatile Memory.

O

ODI. See **Open Data-Link Interface**.

Open Data-Link Interface (ODI). Novell's driver specification for an interface between network hardware and higher-level protocols. It supports multiple protocols on a single NIC (Network Interface Controller). It is capable of understanding and translating any network information or request sent by any other ODI-compatible protocol into something a NetWare client can understand and process.

Open System Authentication. Open System authentication is a null authentication algorithm.

P

PAN . Personal area network. Using Bluetooth wireless technology, PANs enable devices to communicate wirelessly. Generally, a wireless PAN consists of a dynamic group of less than 255 devices that communicate within about a 33-foot range. Only devices within this limited area typically participate in the network.

Parameter. A variable that can have different values assigned to it.

PC Card. A plug-in expansion card for laptop computers and other devices, also called a PCMCIA card. PC Cards are 85.6mm long x 54 mm wide, and have a 68 pin connector. There are several different kinds:

- Type I; 3.3 mm high; use - RAM or Flash RAM
- Type II; 5 mm high; use - modems, LAN adaptors
- Type III; 10.5 high; use - Hard Disks

PCMCIA. Personal Computer Memory Card Interface Association. See **PC Card**.

Percent Decode. The average probability that a single scan of a bar code would result in a successful decode. In a well-designed bar code scanning system, that probability should approach near 100%.

PING. (Packet Internet Groper) An Internet utility used to determine whether a particular IP address is online. It is used to test and debug a network by sending out a packet and waiting for a response.

Presentation Mode. Typically used when the digital scanner sits on a countertop or is mounted on a wall, in this mode, the digital scanner operates in continuous (constant-on) mode, where it automatically decodes a bar code presented in its field of view.

Print Contrast Signal (PCS). Measurement of the contrast (brightness difference) between the bars and spaces of a symbol. A minimum PCS value is needed for a bar code symbol to be scannable. PCS = (RL - RD) / RL, where RL is the reflectance factor of the background and RD the reflectance factor of the dark bars.

Programming Mode. The state in which a scanner is configured for parameter values. See **Scanning Mode**.

Q

Quiet Zone. A clear space, containing no dark marks, which precedes the start character of a bar code symbol and follows the stop character.

QWERTY. A standard keyboard commonly used on North American and some European PC keyboards. “QWERTY” refers to the arrangement of keys on the left side of the third row of keys.

R

RAM. Random Access Memory. Data in RAM can be accessed in random order, and quickly written and read.

Reflectance. Amount of light returned from an illuminated surface.

Resolution. The narrowest element dimension which is distinguished by a particular reading device or printed with a particular device or method.

RF. Radio Frequency.

ROM. Read-Only Memory. Data stored in ROM cannot be changed or removed.

Router. A device that connects networks and supports the required protocols for packet filtering. Routers are typically used to extend the range of cabling and to organize the topology of a network into subnets. See **Subnet**.

RS-232. An Electronic Industries Association (EIA) standard that defines the connector, connector pins, and signals used to transfer data serially from one device to another.

S

Scan Area. Area intended to contain a symbol.

Scanner. An electronic device used to scan bar code symbols and produce a digitized pattern that corresponds to the bars and spaces of the symbol. Its three main components are: 1) Light source (laser or photoelectric cell) - illuminates a bar code,; 2) Photodetector - registers the difference in reflected light (more light reflected from spaces); 3) Signal conditioning circuit - transforms optical detector output into a digitized bar pattern.

Scanning Mode. The scanner is energized, programmed and ready to read a bar code.

Scanning Sequence. A method of programming or configuring parameters for a bar code reading system by scanning bar code menus.

SDK. Software Development Kit

Self-Checking Code. A symbology that uses a checking algorithm to detect encoding errors within the characters of a bar code symbol.

Shared Key. Shared Key authentication is an algorithm where both the AP and the MU share an authentication key.

SHIP. Symbol Host Interface Program.

SID. System Identification code. An identifier issued by the FCC for each market. It is also broadcast by the cellular carriers to allow cellular devices to distinguish between the home and roaming service.

Soft Reset. See **Warm Boot**.

Space. The lighter element of a bar code formed by the background between bars.

Specular Reflection. The mirror-like direct reflection of light from a surface, which can cause difficulty decoding a bar code.

Standard Trigger Mode. The digital scanner uses this mode when lifted off the counter or removed from the wall mount. In this mode, aim the digital scanner at a bar code and pull the trigger to decode.

Start/Stop Character. A pattern of bars and spaces that provides the scanner with start and stop reading instructions and scanning direction. The start and stop characters are normally to the left and right margins of a horizontal code.

STEP. Symbol Terminal Enabler Program.

Subnet. A subset of nodes on a network that are serviced by the same router. See **Router**.

Subnet Mask. A 32-bit number used to separate the network and host sections of an IP address. A custom subnet mask subdivides an IP network into smaller subsections. The mask is a binary pattern that is matched up with the IP address to turn part of the host ID address field into a field for subnets. Default is often 255.255.255.0.

Substrate. A foundation material on which a substance or image is placed.

SVTP. Symbol Virtual Terminal Program.

Symbol. A scannable unit that encodes data within the conventions of a certain symbology, usually including start/stop characters, quiet zones, data characters and check characters.

Symbol Aspect Ratio. The ratio of symbol height to symbol width.

Symbol Height. The distance between the outside edges of the quiet zones of the first row and the last row.

Symbol Length. Length of symbol measured from the beginning of the quiet zone (margin) adjacent to the start character to the end of the quiet zone (margin) adjacent to a stop character.

Symbology. The structural rules and conventions for representing data within a particular bar code type (e.g. UPC/EAN, Code 39, PDF417, etc.).

T

TCP/IP. (Transmission Control Protocol/Internet Protocol) A communications protocol used to internetwork dissimilar systems. This standard is the protocol of the Internet and has become the global standard for communications. TCP provides transport functions, which ensures that the total amount of bytes sent is received correctly at the other end. UDP is an alternate transport that does not guarantee delivery. It is widely used for real-time voice and video transmissions where erroneous packets are not retransmitted. IP provides the routing mechanism. TCP/IP is a routable protocol, which means that all messages contain not only the address of the destination station, but the address of a destination network. This allows TCP/IP messages to be sent to multiple networks within an organization or around the world, hence its use in the worldwide Internet. Every client and server in a TCP/IP network requires an IP address, which is either permanently assigned or dynamically assigned at startup.

Telnet. A terminal emulation protocol commonly used on the Internet and TCP/IP-based networks. It allows a user at a terminal or computer to log onto a remote device and run a program.

Terminal Emulation. A “terminal emulation” emulates a character-based mainframe session on a remote non-mainframe terminal, including all display features, commands and function keys. The VC5000 Series supports Terminal Emulations in 3270, 5250 and VT220.

Terminate and Stay Resident (TSR). A program under DOS that ends its foreground execution to remain resident in memory to service hardware/software interrupts, providing background operation. It remains in memory and may provide services on behalf of other DOS programs.

TFTP. (Trivial File Transfer Protocol) A version of the TCP/IP FTP (File Transfer Protocol) protocol that has no directory or password capability. It is the protocol used for upgrading firmware, downloading software and remote booting of diskless devices.

Tolerance. Allowable deviation from the nominal bar or space width.

Transmission Control Protocol/Internet Protocol. See **TCP/IP.**

Trivial File Transfer Protocol. See **TFTP.**

TSR. See **Terminate and Stay Resident**.

U

UDP. User Datagram Protocol. A protocol within the IP protocol suite that is used in place of TCP when a reliable delivery is not required. For example, UDP is used for real-time audio and video traffic where lost packets are simply

ignored, because there is no time to retransmit. If UDP is used and a reliable delivery is required, packet sequence checking and error notification must be written into the applications.

UPC. Universal Product Code. A relatively complex numeric symbology. Each character consists of two bars and two spaces, each of which is any of four widths. The standard symbology for retail food packages in the United States.

V

Visible Laser Diode (VLD). A solid state device which produces visible laser light.

W

Warm Boot. A warm boot restarts the mobile computer by closing all running programs. All data that is not saved to flash memory is lost.

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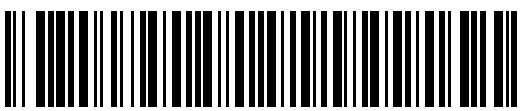

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