symbol®

LS 4800/4900

Product Reference Guide

LS 4800/4900
Product Reference Guide

70-12540-04
Revision A
August 1999

symbol®

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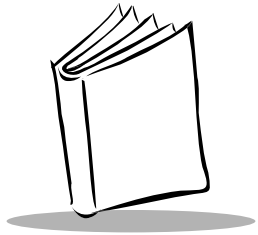

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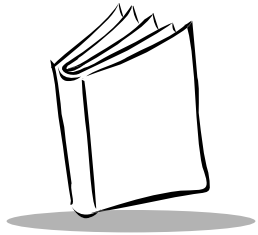

About This Manual

The *LS 4800/4900 Product Reference Guide* provides general instructions for setup, operation, troubleshooting, maintenance, and programming.

Notational Conventions

The following conventions are used in this document:

- The term "LS 4800" refers to both the LS 4800 and LS 4900, except where the LS 4900 is specifically called out.
- 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.
- Bar codes are called out in uppercase bold.
- Keystrokes are called out in uppercase, no bold.

Related Publications

- *LS 4800 Quick Reference Guide*, p/n 70-15663-XX
- *LS 4800/4900 and LS 6800 Flash Memory Programming*, p/n 70-17636-XX

Service Information

If you have a problem with your equipment, contact the *Symbol Support Centers*. Before calling, have the model number, serial number, and several of your bar code symbols at hand.

Call the Support Center from a phone near the scanning equipment so that the service person can try to talk you through your problem. If the equipment is found to be working properly and the problem is symbol readability, the Support Center will request samples of your bar codes for analysis at our plant.

If your problem cannot be solved over the phone, you may need to return your equipment for servicing. If that is necessary, you will be given specific directions.

Note: *Symbol Technologies 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 the original shipping container was not kept, contact Symbol to have another sent to you.*

Symbol Support Centers

For service information, warranty information or technical assistance contact or call the Symbol Support Center in:

United States
Symbol Technologies, Inc.
One Symbol Plaza
Holtsville, New York 11742-1300
1-800-653-5350

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Symbol Technologies Canada, Inc.
2540 Matheson Boulevard East
Mississauga, Ontario, Canada L4W 4Z2
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Symbol Place
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If you purchased your Symbol product from a Symbol Business Partner, contact that Business Partner for service.

Warranty

Symbol Technologies, Inc ("Symbol") manufactures its hardware products in accordance with industry-standard practices. Symbol warrants that for a period of twelve (12) months from date of shipment, products will be free from defects in materials and workmanship.

This warranty is provided to the original owner only and is not transferable to any third party. It shall not apply to any product (i) which has been repaired or altered unless done or approved by Symbol, (ii) which has not been maintained in accordance with any operating or handling instructions supplied by Symbol, (iii) which has been subjected to unusual physical or electrical stress, misuse, abuse, power shortage, negligence or accident or (iv) which has been used other than in accordance with the product operating and handling instructions. Preventive maintenance is the responsibility of customer and is not covered under this warranty.

Wear items and accessories having a Symbol serial number, will carry a 90-day limited warranty. Non-serialized items will carry a 30-day limited warranty.

Warranty Coverage and Procedure

During the warranty period, Symbol will repair or replace defective products returned to Symbol's manufacturing plan in the US. For warranty service in North America, call the Symbol Support Center at 1-800-653-5350. International customers should contact the local Symbol office or support center. If warranty service is required, Symbol will issue a Return Material Authorization Number. Products must be shipped in the original or comparable packaging, shipping and insurance charges prepaid. Symbol will ship the repaired or replacement product freight and insurance prepaid in North America. Shipments from the US or other locations will be made F.O.B. Symbol's manufacturing plant.

Symbol will use new or refurbished parts at its discretion and will own all parts removed from repaired products. Customer will pay for the replacement product in case it does not return the replaced product to Symbol within 3 days of receipt of the replacement product. The process for return and customer's charges will be in accordance with Symbol's Exchange Policy in effect at the time of the exchange.

Customer accepts full responsibility for its software and data including the appropriate backup thereof.

Repair or replacement of a product during warranty will not extend the original warranty term.

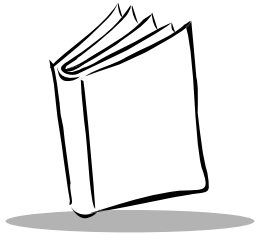
Symbol's Customer Service organization offers an array of service plans, such as on-site, depot, or phone support, that can be implemented to meet customer's special operational requirements and are available at a substantial discount during warranty period.

General

Except for the warranties stated above, Symbol disclaims all warranties, express or implied, on products furnished hereunder, including without limitation implied warranties of merchantability and fitness for a particular purpose. The stated express warranties are in lieu of all obligations or liabilities on part of Symbol for damages, including without limitation, special, indirect, or consequential damages arising out of or in connection with the use or performance of the product.

Seller's liability for damages to buyer or others resulting from the use of any product, shall in no way exceed the purchase price of said product, except in instances of injury to persons or property.

Some states (or jurisdictions) do not allow the exclusion or limitation of incidental or consequential damages, so the proceeding exclusion or limitation may not apply to you.



Chapter 1
The LS 4800 Series Scanner

This revolutionary hand-held scanner emits a raster, rather than linear, scanning pattern, specifically designed to scan PDF417 bar codes, but it is also capable of reading standard 1-D bar codes.

The LS 4800 is based on the Visible Laser Diode; it can read color bar codes and symbols printed on virtually any substrates. There are three LED indicators, red for laser on and alignment of the scanner with the bar code, yellow as a low power indication (on battery powered versions only), and green for successful decode.

The scanner indicates a successful decode through an audible beep and decode LED.

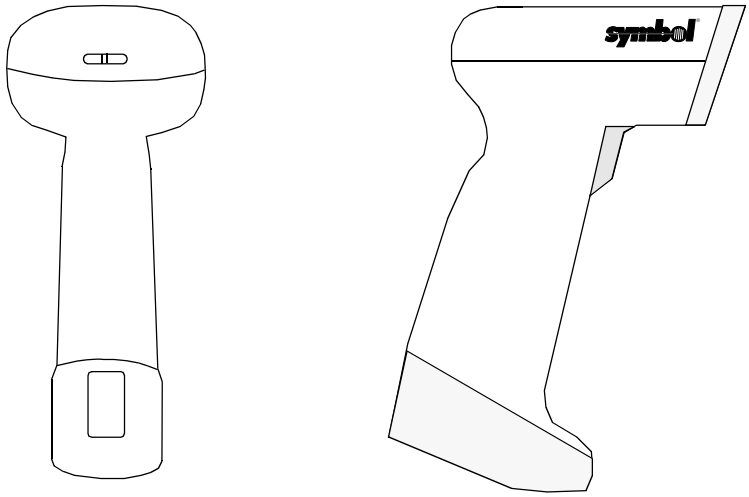


Figure 1-1. The LS 4800 Scanner

Decode Capability

The LS 4800's internal decoder can decode the following symbologies:

- 2-D Symbology: PDF417/MicroPDF417
- 1-D Symbologies: UPC-A, UPC-E, EAN-8, EAN-13, Code 39, Code 39 Full ASCII, Trioptic Code 39, Code 93, Code 128, Codabar, Interleaved 2 of 5, Discrete 2 of 5, UCC/EAN 128, Bookland EAN, UPC Coupon Code, MSI Plessey.

Each LS 4800 model provides full host system compatibility through RS-232C single port cables or Synapse™ "Smart" Cables, with programmable options in each case.

Scan Stand Mode

Through a magnetically activated switch, the LS 4800 detects placement into a scan stand, which causes the laser to blink at regular intervals while the motor is constantly on. This mode, however, cannot be used with battery power.

Host Interface

Host interface consists of an appropriate RS-232C cable or Synapse™ "Smart Cable" set.

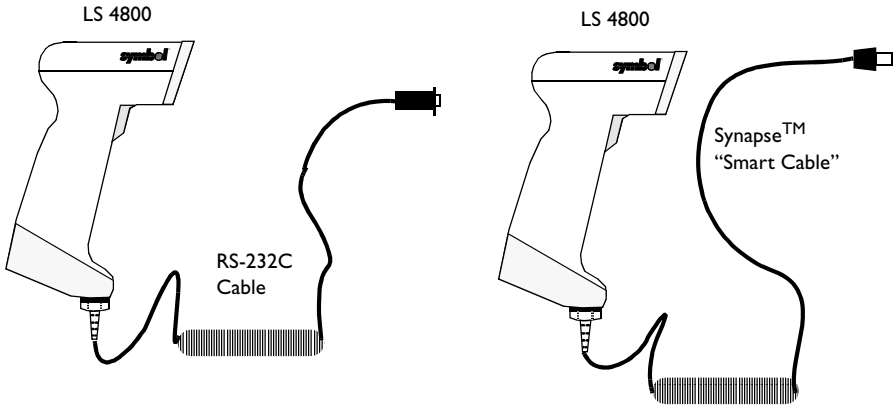


Figure 1-2. LS 4800 with RS-232C and Synapse Cables

Model Configurations — LS 4800 and LS 4900

LS 4800s are powered by a power supply or by host power, while LS 4900s are battery-powered versions. The interface for either model (RS-232C or Synapse) is determined by the cable. LS 4800 and LS 4900 models support both interfaces.

Battery Power Options

LS 4900 models can be powered by a NiCad battery pack in the handle.

The rechargeable 600 mah battery pack is inserted through the bottom of the scanner's handle. Insert the battery pack until you hear a click. Recharge through the standard interface cable or the Universal Four-Slot Charger (see the documentation provided with the charger for further instructions). Each full recharge provides up to 3000 2-second decode sessions.

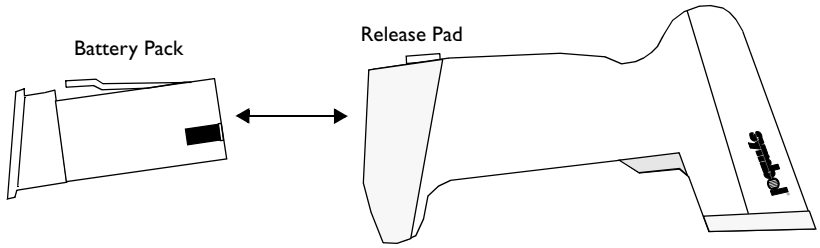
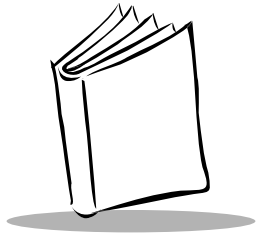


Figure 1-3. Battery Pack for LS 4900s



Chapter 2
Setup

Unpacking

Remove the equipment from its packing and inspect it for damage. If any equipment was damaged in transit, call Service at one of the telephone numbers listed in the introductory matter. **KEEP THE PACKING.** It is the approved shipping container and should be used if you ever need to return your equipment for servicing.

Stationary Operation with the LS 4800 and RS-232C Cables

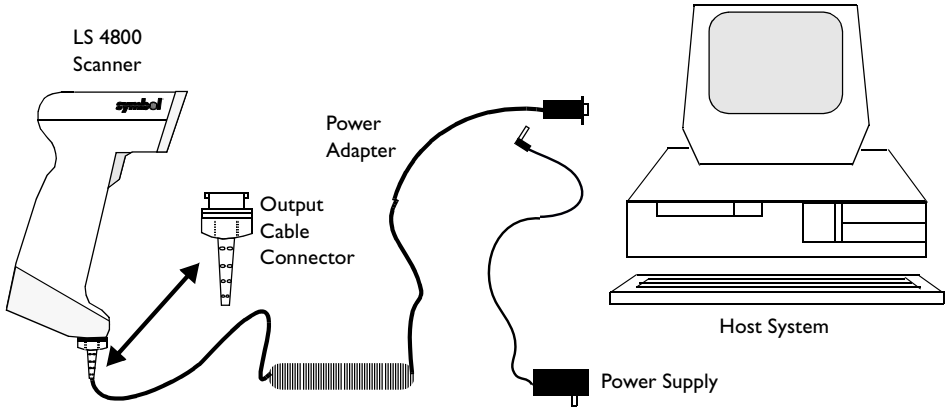


Figure 2-1. LS 4800 RS-232C Operation

To connect the LS 4800 to a host via RS-232:

1. Switch off all devices to be connected to the LS 4800 scanning system.
2. Connect the output cable into the port at the base of the scanner's handle. Use the end indicated in Figure 2-1.
   - Plug in the modular connector.
   - Twist the collar clockwise to snap into place.
3. If external power is required, connect the power supply to the Power Adapter input port on the cable and then to a receptacle supplying AC power of the proper voltage level.
4. Plug the opposite end of the host interface cable into the receiving port on the host system.
5. Program all desirable host interface, decode, and communications parameters. Use the bar code menus in Chapter 6, *Advanced Data Formatting*.
6. Power up the host device.

Stationary Operation with the LS 4800 and Synapse™ "Smart Cables"

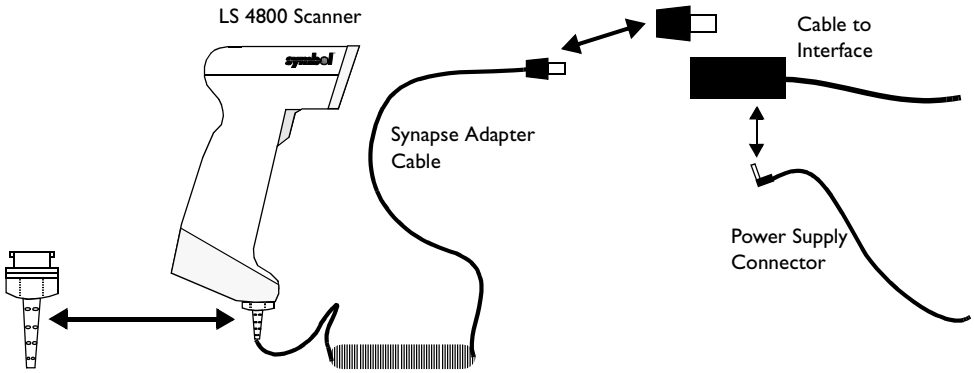


Figure 2-2. LS 4800 Operation with Synapse Cable

To connect the LS 4800 to a host via Synapse:

1. Switch off all devices to be connected to the LS 4800 scanning system.
2. Connect the output cable into the port at the base of the scanner's handle.
   - Plug in the modular connector.

- Twist the collar clockwise to snap into place.

Follow additional instructions in the cable's Interface Guide. Power is supplied by the Synapse "Smart Cable" interface.

Scan Stand Operation with the LS 4800

The LS 4800 supports hands-free operation with a specially configured scan stand. When placed in that scan stand, a magnetic switch in the LS 4800 detects that placement, turns the laser on continuously, and causes the scanner to emit a periodic "blink" or straight line for placing a bar code.

When a bar code is placed in proper orientation within the aiming area, the scanner decodes it. If the bar code is PDF417, the scan pattern opens dynamically to an optimal geometry for scanning.

Scan stand mode is not available for LS 4900 models using battery power. The scan stand itself has a Quick Reference Guide with user instructions.

Portable Operation with LS 4900 Models

For portable operation, battery-operated LS 4900 scanners must be used with a portable terminal (e.g., PDT 3300).

If you want to carry the portable terminal and scanner in holsters, the adjustable belt is important for making portable operation simple. Two holsters also can be very useful. One is available to hold the portable terminal to the belt, while a second holster, for the scanner, attaches directly to the belt.

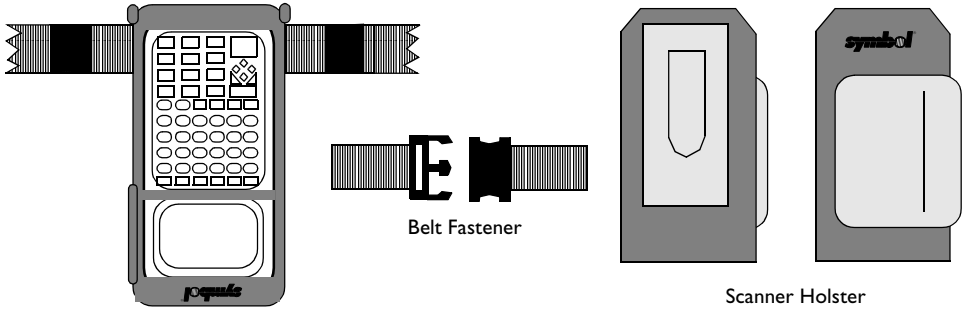


Figure 2-3. LS 4900 Portable Operation Accessories

Setup for Portable Operation: Preliminaries

To prepare the scanner, holster, and data terminal:

1. Switch off all devices to be connected to the LS 4900 scanner.
2. If you use the optional belt and holsters, set up accordingly:

As shown below, thread the belt through a loop on the back of the portable terminal's holster. Add the scanner holster in the same way, or use the belt clip. Naturally, locate the equipment to suit left- or right-handed scanning preferences.

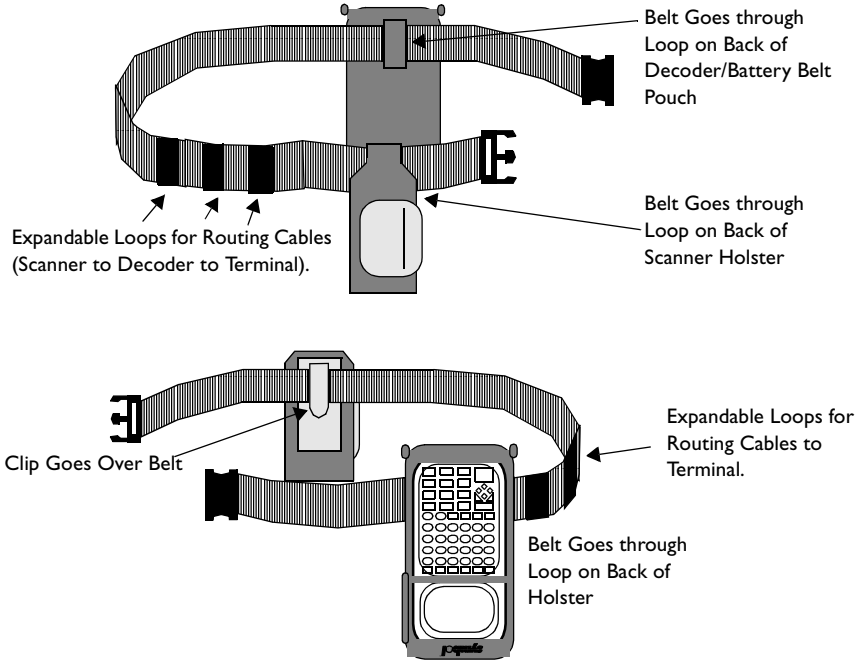


Figure 2-4. Belting Together the Scanner and Terminal

3. Adjust the belt to your size and buckle together the locking ends.

Note that mounting the portable terminal upside down in the holster actually makes it more immediately accessible than mounting it right-side up.

Connect the System Components

To connect the LS 4900 to a portable terminal:

1. Plug the 9-pin DB connector at the end of the LS 4900 scanner's coil cord into the receiving port on the portable terminal.

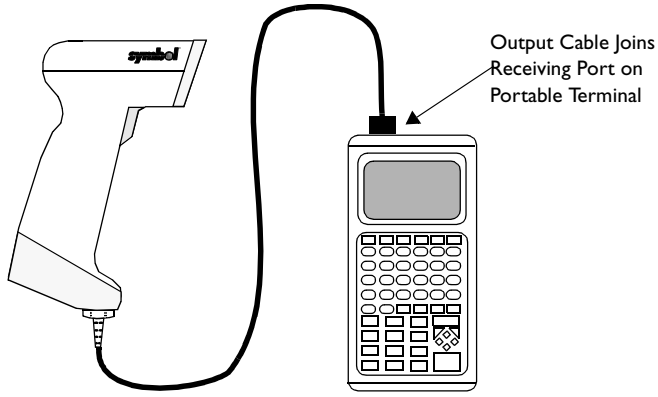
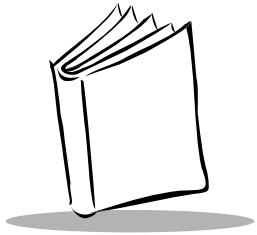


Figure 2-5. LS 4900 Basic Setup with Portable Terminal

2. Power up the host device.
3. Program all desirable host interface, decode, and communication parameters. Use the bar code menus in Chapter 6, *Advanced Data Formatting*.



Chapter 3
Scanning with the LS 4800

LS 4800 Scanning Mode Options

The LS 4800 supports several scanning options:

Smart Raster

The LS 4800 programmable "Smart Raster" capability causes the scanner to emit a raster pattern dynamically adjusted to the particular PDF417 bar code's height. To increase scanning efficiency and decrease decode time, the scanner determines the height of the bar code, opening at a size optimal for decoding that bar code.

In normal "Smart Raster" operation, a trigger pull causes a slab raster pattern to appear. If the target is a 1-D bar code, the scanner decodes the symbol. If the target bar code is PDF417,

the scanning patterns open up to a full, optimized raster pattern as soon as the scanner is properly aligned over the bar code.

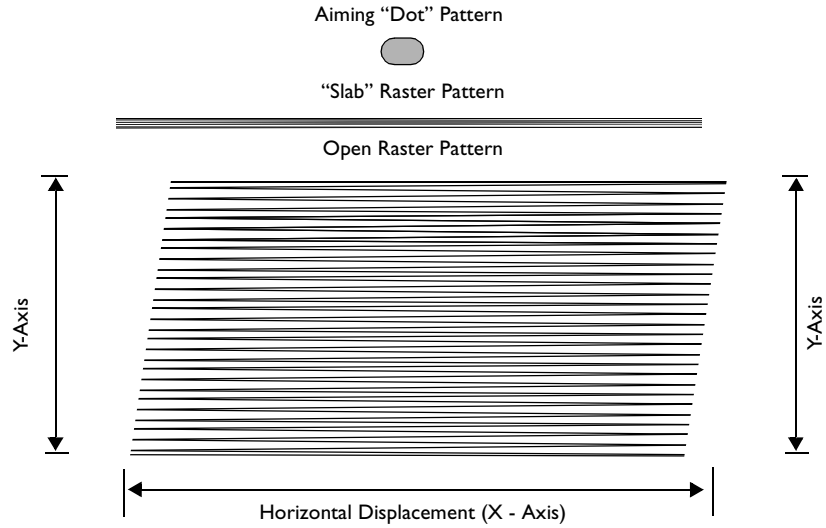


Figure 3-1. LS 4800 Aiming and Scanning Patterns

For best operation in Smart Raster mode, keep the scan pattern as parallel to the symbol's rows as possible, keep the scanner as still as possible, and hold the scanner at an angle which does not give specular reflection (refer to *Specular Reflection* on page 3-9). Likewise, the symbol should be in good condition.

Unless otherwise programmed, the LS 4800 operates with Smart Raster performance.

Slab Only Raster

Scanner activation creates a slab raster pattern which does not open vertically, regardless of bar code type. This may provide optimal performance on small PDF417 and 1D bar codes.

Always Raster

When programmed to this option, the scanner directly opens the raster pattern to the programmed height and at the programmed expansion speed when the trigger is pulled.

Programmable Raster

The user programs the height of the raster pattern and the rate at which it expands. Scanner activation creates the slab raster pattern which only opens for PDF417 or MicroPDF417 bar

codes, useful when decoding low-profile 1D and 2D bar codes where over-scanning is not desired. Note that the height and expansion rate are directly, but not linearly, proportional to their respective parameter values.

Aiming Modes

There are two aiming modes: aiming with a dot pattern, or with a slab raster pattern. Note that aiming modes do not work with the Always Raster scanning option.

Aiming Dot Option

A trigger pull creates the single dot aiming pattern, which lasts for a fixed interval. This dot can easily be seen in outdoor or high ambient light environments. A slab raster pattern or an open raster pattern appears next, depending on the programmed scanning option. There are two programmable timeout periods for this option — normal and extended.

Slab Raster Option

A trigger pull creates the slab raster pattern. If the target is a 1-D bar code, the pattern never gets beyond a slab raster. If the target bar code is PDF417, the pattern opens up to an optimized raster pattern as soon as the scanner is properly aligned over the bar code.

Scanning 1-D or 2-D Bar Codes

Ready

Make sure connections are secure. Also make sure the symbol you want to scan is within the scanning range; refer to *LS 4800 Decode Zones* on page 3-11.

Hold the scanner close for dense symbols, and farther away for large symbols. Practice shows what works.

Aim the Scanner

Aim the scanner at the bar code. If you're scanning a 2-D symbol, try to keep the nose of the scanner parallel with the symbol's rows.

- Press the trigger. The red LED comes on.
- Center the aiming pattern (a spot or slab raster, as programmed) on the bar code, as illustrated below.

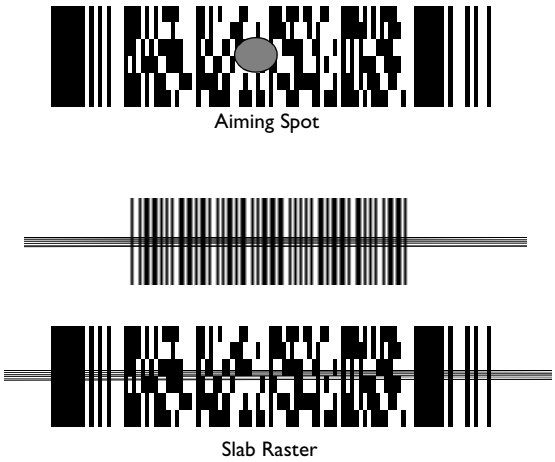


Figure 3-2. Aiming Patterns on 1-D and 2-D Bar Codes

- If the scanner is not aligned properly over the bar code, the red LED blinks.

Scan

For a 1-D symbol, the slab raster pattern reads the bar code. However, a full raster pattern also reads a 1-D bar code so aggressively that scan pattern alignment does not have to be precise.

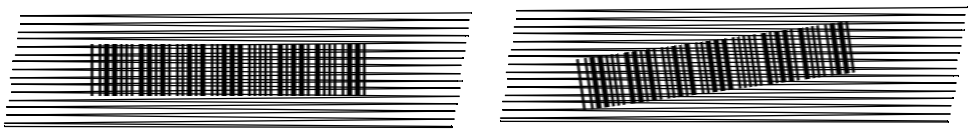


Figure 3-3. Full Raster Patterns on 1-D Bar Codes

For a 2-D symbol, the pattern spreads vertically to cover the symbol if it is parallel to the symbol's rows. Keep the pattern in the same horizontal plane as the bar code.

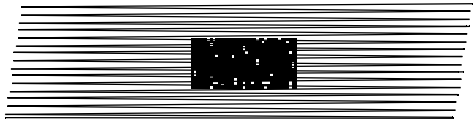


Figure 3-4. Full Raster Pattern on MicroPDF417 Symbol

If the pattern does not cover the top and bottom of the 2-D symbol, pull the scanner back until it does. Make sure the scan pattern extends *at least three quarters of an inch* beyond the edges of the bar code. *Simple practice will show you what works best.*

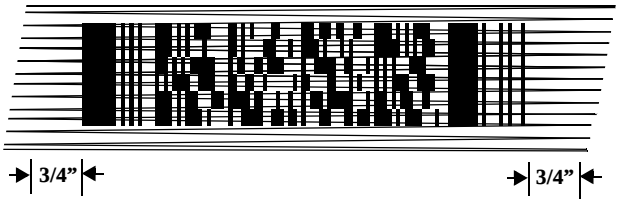


Figure 3-5. Full Raster Pattern Expanded Over PDF417 Symbol

In Always Raster mode, the raster pattern spreads fully over the bar code, regardless of symbology.

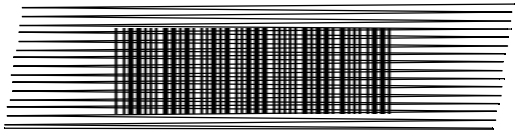


Figure 3-6. Always Raster Pattern on 1-D Bar Code

If the bar code is not properly aligned with the scan pattern, the red LED blinks to indicate this.

Successful Decode

The lit green LED and a short, high-tone beep indicate successful decode, and the laser turns off.

Output

Decoded data is transmitted to the host device. Make sure that the RS-232C parameters (e.g., baud rate, parity) are set properly. Communication parameters are described in *Chapter 5, Programming the LS 4800*.

Scan the Entire Bar Code Symbol

- The larger the symbol, the farther away you should hold the scanner to permit the raster pattern to cover the symbol (but not more than 8 inches). See *LS 4800 Decode Zones* on page 3-11.
- Hold the scanner close for denser symbols (not less than 2 inches).
- In all cases, make sure the scan pattern extends *at least 3/4 inch* beyond each edge of the bar code.
- The PDF417 bar code symbol has multiple rows, but the raster pattern also has multiple scanning rows. For this reason, use the following guidelines while scanning:
  - Center the aiming pattern on the bar code, as in Figure 3-2.
  - Keep the pattern in the same horizontal plane as the bar code.

Figure 3-7. Orienting Scanning Pattern On PDF417 Bar Code

- If the vertical scan pattern is not high enough to cover a "tall" PDF417 symbol, move the scanner slowly down toward the bottom of the symbol, keeping the beam horizontal to the rows, and then slowly back upward to the top.

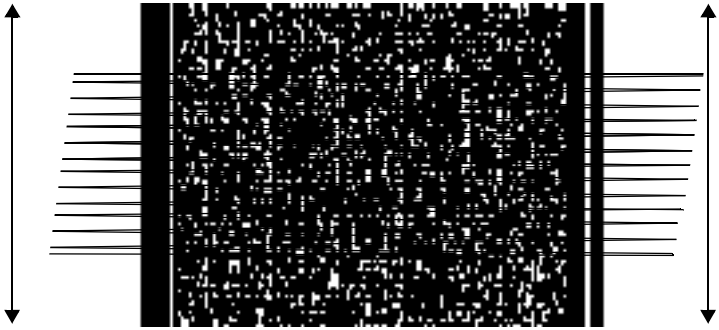


Figure 3-8. Moving Scan Pattern Upward and Downward on "Tall" PDF Symbol

- The scan beam does not have to be *perfectly* parallel with the top and bottom of the symbol (up to a 4^{o} tilt is permitted).

Scan Stand Operation

Scan Stand operation allows hands-free scanning. When the scanner is placed in the stand, the scan pattern begins to blink on the surface below. The red LED lights to indicate scanning activity.

To scan, present the symbol in the path of the scan pattern, but no more than 7" away. Make sure the scan pattern extends at three quarters of an inch beyond the symbol's edges. When the symbol is properly oriented, the scan pattern expands vertically to cover the symbol. The lit green LED and a short, high-tone beep indicate successful decode.

After a successful decode, remove the symbol from the scan path. If the symbol does not decode, or if the pattern does not expand, remove the symbol from the scan path and try again. Make sure the bar code is on a clean, white, non-reflective surface.

Battery Operation

During battery operation, a blinking yellow LED during scanning and a quick "trill" beep following a scan attempt indicate that the battery needs recharge.

While the battery recharges, the yellow LED remains lit. When charging is complete, the yellow LED turns off.

Beeper Definitions

Table 3-1 provides standard beeper definitions.

Table 3-1. Standard Beeper Definitions

Beeper Sequence	Indication
Standard Use	
1 Beep - short high tone	A bar code symbol was decoded (if decode beeper is enabled).
1 Beep - long high tone	Thermal shutdown.
3 Beeps - short high tone	Power-on or reset. Occurs immediately after the unit is turned on, indicating that the system software is working properly. If three beeps occur during normal operation, it is due to a reset and any work in progress is lost. If this occurs often, contact the Symbol Services Division.
Parameter Menu Scanning	
1 Beep- short high tone	Correct entry scanned or correct menu sequence performed.
1 Beep- hi/lo/hi/lo tone	Successful program exit with change in the parameter setting.
2 Beeps - lo/hi tone	Input error, incorrect bar code, or “Cancel” scanned, wrong entry, incorrect bar code programming sequence; remain in program mode.
Communication	
4 Beeps - short high tone	Communication error in the indication field.
4 Beeps - hi/hi/hi/lo	Receive error.
3 Beeps - lo/hi/lo	ADF transmit error.

Macro PDF

Table 3-2 provides beeper definitions for Macro PDF mode.

Table 3-2. Macro PDF Beeper Indications

Beeper Sequence	Indication
Error	
1 Low Long	Hi-level decode error caused by incorrect symbol.
2 Low Long	File ID error. A bar code not in the current MPDF sequence was scanned.
3 Low Long	Out of memory. There is not enough buffer space to store the current MPDF symbol.
4 Low Long	Bad symbology. You scanned a 1-D or 2-D bar code in an MPDF sequence, a duplicate MPDF label, an incorrect sequence, or are trying to transmit an empty or illegal MPDF field.
5 Low Long	Flushing buffer.
Fast Warble	Successful parameter scanned.
Decode Beep Sequence	
Single short	Standard decode and transmit beep for all symbols.
Double short	MPDF symbol is buffered. A single beep indicates transmission of the buffered data.

Specular Reflection

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

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

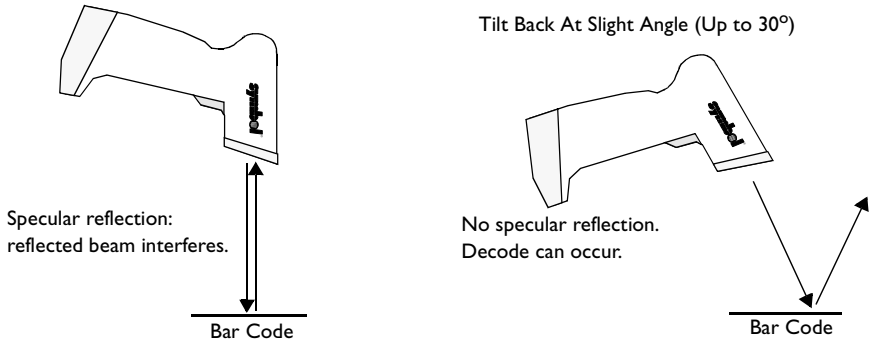
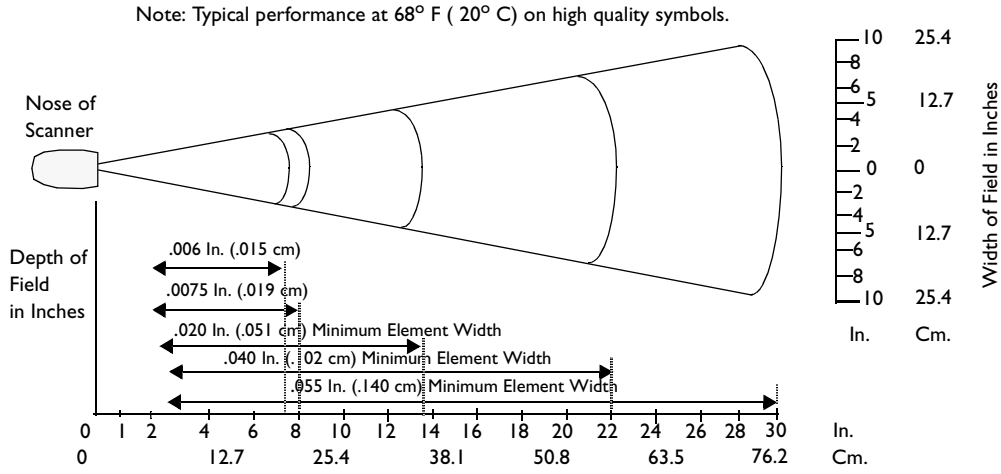


Figure 3-9. Avoiding Specular Reflection

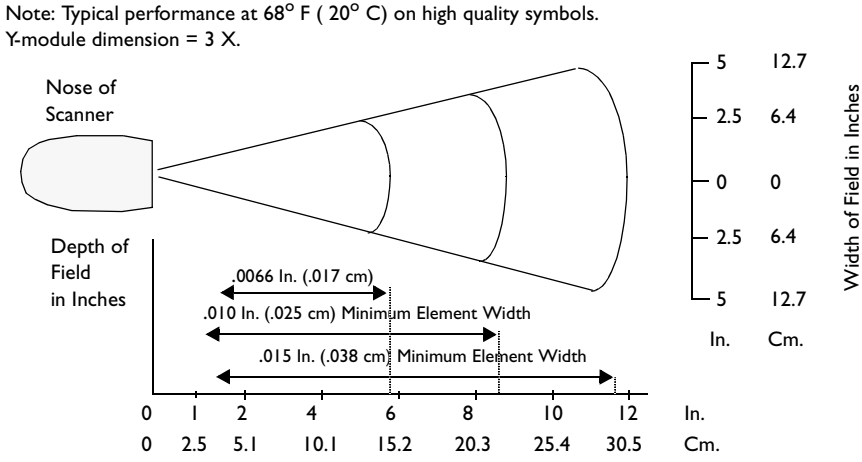
For scanning a 1-D bar code, there is only a small specular dead zone to avoid (± 2° from the direct laser beam). The specular dead zone is larger for scanning PDF417 (± 9° from the direct laser beam). At the same time, the scanner is not effective if its beams hit the bar code's surface at an angle greater than 30° from the normal to that surface.

LS 4800 Decode Zones



LS 4800 1-D Decode Zone: Depth of field as a function of minimum element width.

Figure 3-10. Decode Zone for 1-D Bar Codes



LS 4800 2-D Decode Zone: Depth of field as a function of minimum element width.

Figure 3-11. Decode Zone for PDF417 Bar Codes

Note: Typical performance at 68° F (20° C) on high quality symbols.

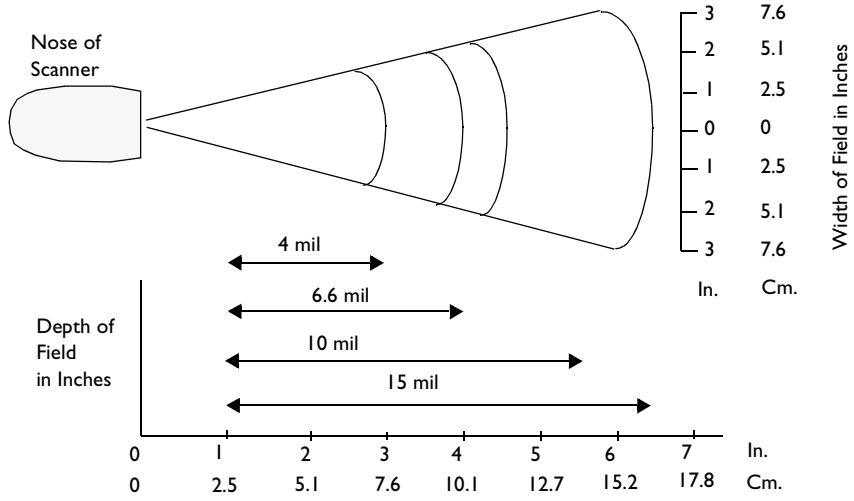
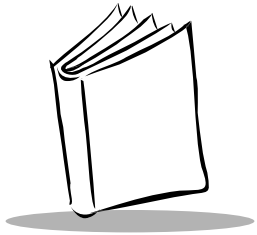


Figure 3-12. VHD Decode Zone



Chapter 4
Maintenance and Specifications

Maintenance

The LS 4800 scanner, the LS 4900 battery pack, and the power supply for both models have been designed to provide reliable service over an extended period of time with virtually no maintenance.

For the scanner, the only maintenance required is periodic recharging of the battery pack and cleaning of the exit window.

- Do not allow any abrasive material to touch the window.
- Remove any dirt particles with a damp cloth.
- Wipe the window using a tissue moistened with ammonia/water.
- Do not spray water or other cleaning liquids directly into the window.

Flash Memory Programming

The LS 4800 series scanners are equipped with flash memory, which can be updated by a field service technician or at a repair depot. Through this process, software revisions and features can be added easily to existing units.

Battery Use (LS 4900 Models Only)

Battery powered LS 4900 models use NiCad rechargeable batteries.

Low battery power is indicated by a quick trill beep, along with a quick blink of the yellow LED, after a scan attempt. When this occurs, change the battery pack or recharge the one in the scanner. NiCad batteries may be recharged by inserting them in battery adapters on the Universal Four Slot Charger or UBC 1000. See Table 4-2 on page 4-8 for required charge time.

If the LS 4900 is attached to a host system supplying the scanner power, the batteries are trickle-charged. Note that batteries can be constantly charged without damage.

Changing Battery Packs with the Four-Slot Charger (LS 4900 Models Only)

You can charge battery packs on the Universal Four Slot Battery Charger so that a charged battery pack is available when needed. By charging spares, you can have charged battery packs available while charging used ones. In this case, simply remove the depleted battery pack and replace it with a freshly charged one. User instructions accompany your charger.

Caution

Recharge only nickel cadmium type rechargeable batteries.
Other types of batteries may rupture!

1. Remove the battery pack from the Scanner.

Press in the release pad on the handle, as indicated below. With this pressed in, slide the battery pack out from the handle. There is a tab on the bottom which can be gripped for pulling.

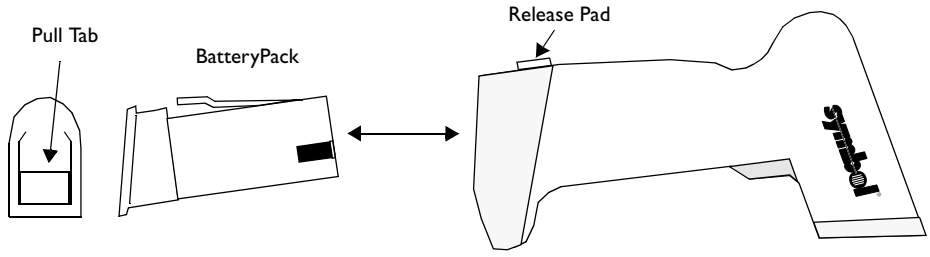
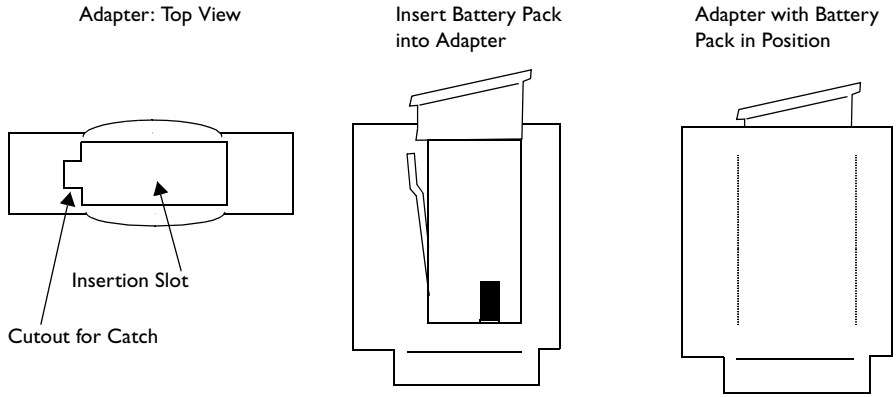


Figure 4-1. LS 4900 Battery Packs

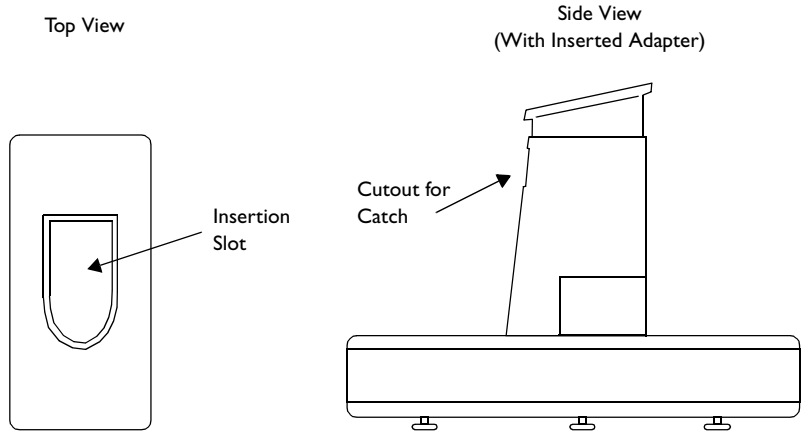
2. Insert the battery pack in the adapter for the Four-Slot Charger or UBC 1000.

Insert the battery pack upside down through the slot on top of the adapter. Be sure to line up the adapter catch with the cutout in the insertion slot. Push the battery pack down until it clicks into position.

Place the battery pack into an adapter that mounts on the top of the Four-Slot Charger or UBC 1000. As illustrated in Figure 4-2 on page 4-3, press the battery pack into the adapter until it clicks into place.



LS 4800 Battery Pack Recharging Adapter for Four-Slot Charger



LS 4800 Battery Pack Recharging Adapter for UBC 1000

Figure 4-2. Putting the Battery Pack into LS 4800 Adapters

1. Per instructions on using your charger, mount the adapter on the charger. Many chargers accommodate multiple adapters.
2. After the battery pack is fully charged, insert the battery pack in the scanner's handle. Slide the charged battery up into handle until it locks securely into place.

What If ...

Nothing happens when you follow the operating instructions?

- Check the system power.
- Make sure you are using the correct interface cable for the host device.
- Check for loose cable connections.
- Make sure the scanner is programmed to read the symbology you are trying to read. See ***Chapter 5, Programming the LS 4800***.
- Check the label to make sure it is not defaced; if damaged beyond its error correction capability, it will not decode.
- Try scanning a test symbol of the symbology you are trying to read.

Your terminal operates but scanned data is not displayed correctly?

- Check the system power.
- Check for loose cable connections.
- If you're working with a Synapse cable, refer to your *Installation Guide*.
- Check that the communication parameters (baud rate, parity, stop bits, etc.) are set properly for the receiving device.

The laser does not activate, which is followed by a beep sequence?

- You may be scanning in an inappropriately hot environment. Remove the scanner from the environment, or allow the laser to cool down.

Transmitting PDF bar code data through a scanner/wand emulation Synapse cable causes transmit errors?

- The scanner / wand emulation Synapse cable has a transmission limit of approximately 46 characters. This does not apply to other Synapse cables.

Accessories

Required Accessories

These items must be included to complete the system. The following are available through contacting your local Symbol representative or business partner.

- Host Interface Cables for RS-232 Operation (Available in 6' and 14' lengths):
  - 25-Pin, Male, D Connector (TxD on Pin 3)
  - 25-Pin, Male, D Connector (TxD on Pin 2)
  - 25-Pin, Female, D Connector (TxD on Pin 3)
  - 25-Pin, Female, D Connector (TxD on Pin 2)
  - 9-Pin, Female, D Connector (PC AT: TxD on Pin 3)
- Portable Terminal Interface Cables:
  - Cable for PDT 3300 (Serial TTL 9-Pin Connector)
  - Cable for PDT 3300 (Modular Connector)
- Synapse Adapter Cable
- Power Supply (Select One):
  - 115 VAC Power Supply
  - 220/240 VAC Power Supply (Europe)
  - 100 VAC Power Supply (Japan)
- User Documentation
  - LS 4800 Product Reference Guide

Optional Accessories

These items are not included in the standard configuration. The following are available through contacting your local Symbol representative or business partner.

- Battery Pack Unit / NiCad
- NiCd Battery Adapter for Four-Slot Charger
- NiCd Battery Adapter for UBC 1000 Charger
- Retractable Pulley
- Utility Belt
- Snap-On Protective Boot (with Metal Loop)
- IntelliStand

- Under Register Stand
- Wall Mount Stand
- Free Standing Stand (height 5” - 8”)
- ECR Stand

LS 4800 Scanner Specifications

Table 4-1 lists the specifications for the LS 4800 scanner.

Table 4-1. Scanner Specifications

Item	Description
Power Requirements	+5 V, 400 mA Typical
Laser Diode Power	1.0 mW, max.
Scan Pattern:	
Start Time	0.065 sec. to 75% of steady state horizontal amplitude; 0.50 sec. to 90% of steady state vertical amplitude
Scan Angle	LS 4800, LS 4900: 34° ± 2° LS 4804 VHD: 24° ± 2°
Scan Rate	560 scans/sec. 280 Hz ±15 Hz (horizontal)
Frame Rate	25 frames/sec. 12.5 Hz ±1 Hz (vertical)
Optical Resolution	Can decode a 6.6 mil (minimum X-dimension) symbol (PDF417); *Y-dimension must be 2X or greater.* VHD version: 4 mil minimum
Angular Orientation Tolerances:	
Pitch Tolerance	± 30° (“front to back”)
Skew	± 15° from plane parallel to symbol (“side-to-side”)
Rotational Tolerance	± 4° (for scanning benchmark label, assuming 3:1 codeword aspect ratio)
Dead Zone/Optical Throw	± 2° *(1-D symbologies)* or ± 9°*(PDF417)* from beam direction
Print Contrast Resolution	25% *(1-D symbologies)* or 35% *(PDF417)* absolute dark/light reflectance differential, measured at 650 nm.
Ambient Light Immunity	Up to 8000 ft-candles of sunlight
Humidity	5 - 95% (non-condensing)
Shock	LS 4804: 5-ft drop to concrete LS 4904: 4-ft drop to concrete

Table 4-1. Scanner Specifications (Continued)

Item	Description
Environmental Sealing	MIL-STD-810E windblown dust and rain
Operating Temperature	-20° to 40° C; -4° to 104° F
Storage Temperature	-40° to 60° C; -40° to 140° F
Scanner Connector	**10-pin modular** connector at base of handle **Pin 1**: + 5V power supply **Pin 2**: Trigger signal output/input **Pin 3**: Transmit (TxD) **Pin 4**: Receive (RxD) **Pin 5**: Ready to Send (RTS) **Pin 6**: Clear to Send (CTS) **Pin 7**: Synapse control data **Pin 8**: Synapse control clock **Pin 9**: Ground **Pin 10**: Data Terminal Ready (DTR)
Coil Cable Length	6 ft.; 183 cm
Weight	9 oz; 252 gm (without cable or batteries)
Height	6.72 in.; 17 cm
Length	4.4 in.; 11.2 cm
Width	2.5 in.; 6.4 cm
Agency Approvals	CDRH Class II, IEC 825 Class II, FCC Class A, UL, CSA, VDE, CE
Decode Capability	1-D Symbologies: UPC-A, UPC-E, EAN-8, EAN-13, Code 39, Code 39 Full ASCII, Trioptic Code 39, Code 93, Code 128, Codabar, Interleaved 2 of 5, Discrete 2 of 5, UCC/EAN 128, Bookland EAN, UPC Coupon Code, MSI Plessey. Cannot autodiscriminate between Code 39 and Code 39 Full ASCII. 2-D Symbology: PDF417 (up to 928 codewords at security level 0 - 8), MicroPDF417.
Memory	64K RAM, 256K Flash

LS 4900 Battery Pack Specifications

Table 4-2 lists the battery pack specifications for the LS 4900.

Table 4-2. Battery Pack Specifications

Item	Description
Battery Size	5 Prismatic NiCad Cells - 600 mA-hrs
Recharge Time	12 hr. trickle charge
Charging Temperature	+15° to 40° C; 59° to 104° F
Typical Battery Life	300 recharge cycles
Package Weight	5.3 oz; 150.4 gm
Height	3.25 in.; 10.2 cm
Length	1.75 in.; 11.2 cm
Width	1.0 in. ; 3.6 cm

Cable Pinouts

The following tables describe the pinouts for connector cables.

Table 4-3. Single-Port RS-232C, 25-Pin Male D-Type Connector P/N 25-13523-01

Pin	Signal	Function
2	RxD	Serial data receive input. It is driven by the serial data transmit output on the device communicating with the scanner.
3	TxD	Serial data transmit output. It drives the serial data receive input on the device communicating with the scanner.
4	CTS	Clear-to-send handshaking input line. It may be used optionally by another device to signal the scanner that it may commence transmitting data. It can be used only in conjunction with the RTS line.
5	RTS	Request-to-send handshaking output line. It may be used optionally by the scanner to signal another device that data is available to send. It can be used only in conjunction with the CTS line.
6	DTR	Data Terminal Ready. This signal is hardwired active.

Table 4-3. Single-Port RS-232C, 25-Pin Male D-Type Connector P/N 25-13523-01 (Continued)

Pin	Signal	Function
7	Ground	Power supply input ground pin and reference for both output signals. It must be capable of sinking all return current.

Table 4-4. Single-Port RS-232C, 25-Pin Male D-Type Connector P/N 25-13522-01

Pin	Signal	Function
2	TxD	Serial data transmit output. It drives the serial data receive input on the device communicating with the scanner.
3	RxD	Serial data receive input. It is driven by the serial data transmit output on the device communicating with the scanner.
4	RTS	Request-to-send handshaking output line. It may be used optionally by the scanner to signal another device that data is available to send. It can be used only in conjunction with the CTS line.
5	CTS	Clear-to-send handshaking input line. It may be used optionally by another device to signal the scanner that it may commence transmitting data. It can be used only in conjunction with the RTS line.
7	Ground	Power supply input ground pin and reference for both output signals. It must be capable of sinking all return current.
20	DTR	Data Terminal Ready. This signal is hardwired active.

Table 4-5. Single-Port RS-232C, 25-Pin Female D-Type Connector P/N 25-13525-01

Pin	Signal	Function
2	RxD	Serial data receive input. It is driven by the serial data transmit output on the device communicating with the scanner.
3	TxD	Serial data transmit output. It drives the serial data receive input on the device communicating with the scanner.
4	CTS	Clear-to-send handshaking input line. It may be used optionally by another device to signal the scanner that it may commence transmitting data. It can be used only in conjunction with the RTS line.
5	RTS	Request-to-send handshaking output line. It may be used optionally by the scanner to signal another device that data is available to send. It can be used only in conjunction with the CTS line.
6	DTR	Data Terminal Ready. This signal is hardwired active.
7	Ground	Power supply input ground pin and reference for both output signals. It must be capable of sinking all return current.

Table 4-6. Single-Port RS-232C, 25-Pin Female D-Type Connector P/N 25-13524-01

Pin	Signal	Function
2	TxD	Serial data transmit output. It drives the serial data receive input on the device communicating with the scanner.
3	RxD	Serial data receive input. It is driven by the serial data transmit output on the device communicating with the scanner.
4	**RTS**	Request-to-send handshaking output line. It may be used optionally by the scanner to signal another device that data is available to send. It can be used only in conjunction with the CTS line

Table 4-6. Single-Port RS-232C, 25-Pin Female D-Type Connector P/N 25-13524-01 (Continued)

Pin	Signal	Function
5	CTS	Clear-to-send handshaking input line. It may be used optionally by another device to signal the scanner that it may commence transmitting data. It can be used only in conjunction with the RTS line.
7	Ground	Power supply input ground pin and reference for both output signals. It must be capable of sinking all return current.
20	DTR	Data Terminal Ready. This signal is hardwired active.

Table 4-7. Single-Port RS-232C, 9-Pin Female D-Type Connector (PC/AT) P/N 25-13527-01

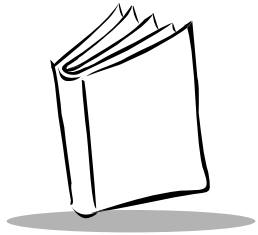
Pin	Signal	Function
2	TxD	Serial data transmit output. It drives the serial data receive input on the device communicating with the scanner.
3	RxD	Serial data receive input. It is driven by the serial data transmit output on the device communicating with the scanner.
5	Ground	Power supply input ground pin and reference for both output signals. It must be capable of sinking all return current.
7	CTS	Clear-to-send handshaking input line. It may be used optionally by another device to signal the scanner that it may commence transmitting data. It can be used only in conjunction with the RTS line.
8	RTS	Request-to-send handshaking output line. It may be used optionally by the scanner to signal another device that data is available to send. It can be used only in conjunction with the CTS line.

Table 4-8. Single-Port RS-232C, 9-Pin Female D-Type Connector for PDT 3300 Interface Board P/N 25-13521-01

Pin	Signal	Function
1	CTS	Clear-to-send handshaking input line. It may be used optionally by another device to signal the scanner that it may commence transmitting data. It can be used only in conjunction with the RTS line.
2	RxD	Serial data receive input. It is driven by the serial data transmit output on the device communicating with the scanner.
3	RTS	Request-to-send handshaking output line. It may be used optionally by the scanner to signal another device that data is available to send. It can be used only in conjunction with the CTS line.
6	TxD	Serial data transmit output. It drives the serial data receive input on the device communicating with the scanner.
7	Ground	Power supply input ground pin and reference for both output signals. It must be capable of sinking all return current.

Table 4-9. 10-Pin Male Modular Connector for Synapse Cable P/N 25-13526-01

Pin	Signal	Function
1	SYNDATA	Synapse-compatible data line. Bi-directional line.
2	SYNCLK	Synapse-compatible clock line. Bi-directional line.
3	VCC	Power.
4	GND	Power supply ground pin and reference for both output signals. It must be capable of sinking all return current.



Chapter 5
Programming the LS 4800

Before programming, follow the pertinent setup instructions in *Chapter 2, Setup*.

This chapter provides parameter descriptions and programming bar codes. Table 5-1 beginning on page 5-3 shows selectable parameters and standard default values for the LS 4800's decoder.

If the default values suit your requirements, all you need to do is scan the **SET DEFAULT** bar code. Parameters other than default values can be set by scanning single bar codes or short bar code sequences.

Note that all parameter settings are stored in non-volatile memory and so are retained after powerdown.

Scanning Sequence Examples

In most cases you need only scan one bar code to set a specific parameter. For example, if you want to set the baud rate to 9600, simply scan the **9600** bar code listed under section on page 63. The scanner issues a warble tone, signifying a successful parameter entry.

If you want to set specific code lengths or specify Serial Response Time-Out, you have to scan several bar codes. This procedure is described later in this chapter.

Errors While Scanning

Don't worry if you make an error during a scanning sequence. Merely reenter the correct parameter.

Set Default Parameter

Scanning the SET DEFAULT bar code returns all parameters to the values listed in the Table 5-1 and Table 5-2.

<FN3>91

Set Defaults

Parameter Selections and Defaults

Table 5-1 and Table 5-2 provides parameter selections and their defaults for general and Macro PDF parameters.

Table 5-1. General Parameter Table

Parameter	Selection	Default
Set Defaults	None	Set Default Values
Add / Delete Codes to be Decoded	UPC-A, UPC-E, EAN-8, EAN-13, Code 128, Code 39, Code 39 Full ASCII, Trioptic Code 39, Code 93, Codabar, Interleaved 2 of 5, Discrete 2 of 5, UCC/EAN 128, Bookland EAN, UPC Coupon Code, MSI Plessey, PDF417, MicroPDF417	UPC-A/E, EAN-8/13, Code 128, Code 39, UCC/EAN 128, PDF417, MicroPDF417
Code 39 Lengths	Any Length, Length Within Range, 1 or 2 Discrete Lengths	Length Within Range: 01-55
Code 93 Lengths	Any Length, Length Within Range, 1 or 2 Discrete Lengths	Length Within Range: 04-55
Codabar Lengths	Any Length, Length Within Range, 1 or 2 Discrete Lengths	Length Within Range: 02-55
Interleaved 2 of 5 Lengths	Any Length, Length Within Range (2 to 54 characters), 1 or 2 Discrete Lengths	1 Discrete Length 14
Discrete 2 of 5 Lengths	Any Length, Length Within Range (2 to 54 characters), 1 or 2 Discrete Lengths	1 Discrete Length 12
MSI Plessey Lengths	Any Length, Length Within Range, 1 or 2 Discrete Lengths	Any Length
Decode Options:		
Transmit UPC-A Check Digit	Enabled, Disabled	Enabled
Transmit UPC-E Check Digit	Enabled, Disabled	Enabled
Convert UPC-E to UPC-A	Enabled, Disabled	Disabled
Code 39 Check Digit Verification	Enabled, Disabled	Disabled

Table 5-1. General Parameter Table (Continued)

Parameter	Selection	Default
Transmit Code 39 Check Digit	Enabled, Disabled	Disabled
I 2 of 5 Check Digit Verification	Enabled, Disabled	Disabled
Transmit I 2 of 5 Check Digit	Enabled, Disabled	Disabled
Convert I 2 of 5 to EAN-13	Enabled, Disabled	Disabled
MSI Plessey Check Digits	One, Two	One
Transmit MSI Plessey Check Digit	Enabled, Disabled	Disabled
MSI Plessey Check Digit Algorithm	Mod 10/Mod 10, Mod 10/Mod 11	Mod 10/Mod 10
Convert EAN-8 to EAN-13	Enabled, Disabled	Enabled
Decode UPC/EAN Supplemental	Enabled, Disabled, Auto	Disabled
CLSI Editing	Enabled, Disabled	Disabled
NOTIS Editing	Enabled, Disabled	Disabled
Transmit Code ID Character	Enabled, Symbol Std., AIM Std.	Disabled
Buffer Output Data	Enabled, Disabled	Disabled
Transmit “No Decode” Message	Enabled, Disabled	Disabled
Transmit LRC Checksum	Enabled, Disabled	Disabled
UPC-A Preamble	None, System Character, System Character & Country Code	None
UPC-E Preamble	None, System Character, System Character & Country Code	None
Code 128 Emulation	Enabled, Disabled	Enabled
UCC/EAN-128 Emulation	Decode, Ignore, Auto-discriminate Linked Symbol	Ignore
Pause Duration	0.0 to 9.9 seconds	0.0 seconds
Prefix Suffix Values	4-Digit ASCII Value	Enter
Scan Data Transmission Format	<Data>; <Data><Suffix>; <Prefix><Data><Suffix>; <Prefix><Data>	<Data>

Table 5-1. General Parameter Table (Continued)

Parameter	Selection	Default
Scanning Options:		
Decode Attempt Duration	0.0 to 9.9 seconds	5 seconds
Scanning Mode	Smart Raster, Always Raster, Slab Only Raster, Programmable Raster	Smart Raster
Raster Height	01 - 15	15
Raster Expansion	01 - 15	11
Aiming Mode	Aiming Dot, Slab Raster	Slab Raster
Beep After Good Decode	Enabled, Disabled	Enabled
Beeper Tone	High, Medium, Low	High
Scan Stand Options:		
Time Delay to Low Power	30 sec., 1, 2, 3 minutes	30 Seconds
Timeout Bet. Same Symbol	0.0 to 9.9 seconds	0.6 Seconds
Timeout Bet. Diff. Symbols	0.0 to 9.9 seconds	0.0 Seconds
Security Options:		
Decode UPC/EAN Supplemental Redundancy	2 - 20	7
Linear Code Type Security Levels	1 - 4	1
Bi-directional Redundancy	Enabled, Disabled	Disabled
UPC/EAN Security Levels	0 - 3	1
Host Port RS-232 Options:		
Baud Rate	300, 600, 1200, 2400, 4800, 9600, 19.2K, 38.4 K	9600
Parity	Even, Odd, Mark, Space, None	None
Check Parity of Received Data	Enabled, Disabled	Enabled
Stop Bit Select	One, Two	One
Hardware Handshaking	None, RTS/CTS Options 1, 2, 3	None

Table 5-1. General Parameter Table (Continued)

Parameter	Selection	Default
Software Handshaking	None, ENQ, ACK/NAK, ACK/NAK with ENQ, XON/XOFF	None
Intercharacter Delay	00 - 99 ms.	0
Host Serial RTS Line State	Low RTS, High RTS	Low RTS
Serial Response Time-out	00 - 9.9 seconds	2.0 seconds
Beep on <BEL>	Enabled, Disabled	Disabled
ASCII Format	7-Bit ASCII, 8-Bit ASCII	8-Bit ASCII

Table 5-2. Macro PDF Parameter Table

Parameter	Selection	Default
Macro PDF Transmit/Decode Mode	Buffer All Symbols / Transmit Macro PDF When Complete Transmit Any Symbol in Set / No Particular Order Scan in Sequence Only / Transmit in Sequence Without Buffering Buffer Scans Out of Order / Transmit Scans in Order	Buffer All Symbols / Transmit Macro PDF When Complete
Transmit Each Symbol in Codeword Format	Enabled or Disabled	Disabled
ESC Characters	ECI Protocol, GLI Protocol, None	None
Delete Character Set ECIs	Delete Character Set ECIs, Transmit Character Set ECIs	Enabled
ECI Decoder	Enabled, Disabled	Enabled
Transmit Unknown Codewords	Enabled or Disabled	Disabled

Table 5-2. Macro PDF Parameter Table (Continued)

Parameter	Selection	Default
Transmit Macro PDF User-Selected Field:		
Transmit File Name	Enabled, Disabled	Disabled
Transmit Block Count	Enabled, Disabled	Disabled
Transmit Time Stamp	Enabled, Disabled	Disabled
Transmit Sender	Enabled, Disabled	Disabled
Transmit Addresses	Enabled, Disabled	Disabled
Transmit File Size	Enabled, Disabled	Disabled
Transmit Checksum	Enabled, Disabled	Disabled
Transmit Macro PDF Control Header	Enabled, Disabled	Disabled
Last Block Marker	Enabled, Disabled	Disabled

Host Selection

This determines whether the LS 4800 interfaces with an RS-232C host, a Synapse host, or no host.

<FN3>2050A37

RS-232 Host

SYNAPSE HOST

Note that the bar code for making this selection is in the Interface Guide which accompanies the interface cable.

<FN3>2050AFE

Null Host

Code Type

The bar code menu selections enable the scanner to decode any or all of the following symbologies.

- UPC Versions A and E (EAN 8 and 13)
- Code 39
- Code 39 Full ASCII
- Trioptic Code 39
- Code 93
- Codabar
- Bookland EAN
- UPC Coupon Code
- Code 128
- UCC/EAN 128
- Interleaved 2 of 5
- Discrete 2 of 5
- MSI Plessey
- PDF417
- MicroPDF417

The integrated decoder autodiscriminates between all of the above symbologies, except for Code 39 and Code 39 Full ASCII.

Code 39 / Code 39 Full ASCII

The ASCII character set assigns a code to letters, punctuation marks, numerals, and most control keystrokes on the keyboard.

The first 32 codes are non-printable and are assigned to keyboard control characters, such as **BACKSPACE** and **RETURN**. The other 96 are called printable codes because all but **SPACE** and **DELETE** produce visible characters.

Code 39 Full ASCII interprets the bar code control character ($ + % /) preceding a Code 39 symbol and assigns an ASCII character value. For example, when Code 39 Full ASCII is enabled and a **+B** is scanned, it is interpreted as **b**, %J as ?, and $H emulates the keystroke **BACKSPACE**. Scanning **ABC$M** outputs the keystroke equivalent of “ABC ENTER”.

The LS 4800's integrated decoder autodiscriminates between Code 39 and Code 39 Full ASCII.

Code Type (Continued)

<FN3>1000011

Enable UPC-A

<FN3>1000010

Disable UPC-A

<FN3>1000021

Enable UPC-E

<FN3>1000020

Disable UPC-E

<FN3>1000041

Enable EAN-8

<FN3>1000040

Disable EAN-8

<FN3>1000031

Enable EAN-13

<FN3>1000030

Disable EAN-13

Code Type (Continued)

<FN3>1000001

Enable Code 39

<FN3>1000000

Disable Code 39

<FN3>1020111

Enable Code 39 Full ASCII

<FN3>1020110

Disable Code 39 Full ASCII

<FN3>1000221

Enable Trioptic Code 39

<FN3>1000220

Disable Trioptic Code 39

<FN3>1000111

Enable Code 93

<FN3>1000110

Disable Code 93

Code Type (Continued)

<FN3>1000101

Enable Code 128

<FN3>1000100

Disable Code 128

<FN3>1040331

Enable UCC/EAN-128

<FN3>1040330

Disable UCC/EAN-128

<FN3>1000071

Enable Codabar

<FN3>1000070

Disable Codabar

<FN3>1000061

Enable I 2 of 5

<FN3>1000060

Disable I 2 of 5

<FN3>1000051

Enable Discrete 2 Of 5

<FN3>1000050

Disable Discrete 2 Of 5

Code Type (Continued)

<FN3>1000141

Enable MSI Plessey

<FN3>1000140

Disable MSI Plessey

<FN3>1000231

Enable Bookland EAN

<FN3>1000230

Disable Bookland EAN

<FN3>1000241

Enable UPC/EAN Coupon Code

<FN3>1000240

Disable UPC/EAN Coupon Code

<FN3>1000161

Enable PDF417

<FN3>1000160

Disable PDF417

<FN3>1000341

Enable MICROPDF417

<FN3>1000340

Disable MICROPDF417

Code Lengths

Code lengths for certain one-dimensional code types (i.e., Code 39, Codabar, etc.) may be set for any length, one or two discrete lengths, or lengths within a specific range. The length of a code refers to the number of characters (i.e., human readable characters) the code contains.

- **Length Within Range** - This option allows you to decode a one-dimensional code type within a specified range. For example, to decode Code 39 characters 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).
- **One Discrete Length** - This option allows you to decode only those one-dimensional codes containing a selected length. For example, if you select **CODABAR - ONE DISCRETE LENGTH**, then scan **1** and **4**, the only Codabar codes decoded are those containing 14 characters. No discrete lengths can be set for Code 128.
- **Two Discrete Lengths** - This option allows you to decode only those one-dimensional codes containing two selected lengths. For example, if you select **I 2 OF 5 TWO DISCRETE LENGTHS**, then scan **0**, **2**, **1**, **4**, the only Interleaved 2 of 5 codes decoded are those containing 2 or 14 characters. No discrete lengths can be set for Code 128.
- **Any Length** - Scanning this option allows you to decode the selected one-dimensional code type containing any number of characters. For example, if you scan **CODABAR ANY LENGTH**, you can decode a Codabar symbol containing any number of characters.

Code Lengths (Continued)

To select two lengths for each code type:

1. Scan the desired option.
2. Scan two numeric bar codes from page 20 for each desired length. For example, for a length of “12”, scan “1” then “2”. For a length of “3”, scan “0”, then “3”. You must always scan two bar codes for each length.
3. If you make an error, or wish to change your selection, scan **Cancel** on page 5-20.

<FN3>F0010001013700000

Code 39 Any Length

<FN3>F3010001013700000

Code 39 Length Within Range

<FN3>F1010001013700000

Code 39 1 Discrete Length

<FN3>F2010001013700000

Code 39 2 Discrete Lengths

Code Lengths (Continued)

<FN3>F0010A0B02370001I

Code 93 Any Length

<FN3>F3010A0B02370001I

Code 93 Length Within Range

<FN3>F1010A0B02370001I

Code 93 1 Discrete Length

<FN3>F2010A0B00370001I

Code 93 2 Discrete Lengths

Code Lengths (Continued)

<FN3>F0010203003700007

Codabar Any Length

<FN3>F3010203013700007

Codabar Length Within Range

<FN3>F1010203013700007

Codabar 1 Discrete Length

<FN3>F2010203013700007

Codabar 2 Discrete Lengths

Code Lengths (Continued)

<FN3>F0010809003700006

I 2 Of 5 - Any Length

<FN3>F3010809023700006

I 2 Of 5 - Length Within Range

<FN3>F1010809023700006

I 2 Of 5 1 Discrete Length

<FN3>F2010809023700006

I 2 Of 5 2 Discrete Lengths

<FN3>F0010607023700005

D 2 Of 5 Any Length

<FN3>F3010607023700005

D 2 Of 5 Length Within Range

<FN3>F1010607023700005

D 2 Of 5 1 Discrete Length

<FN3>F2010607003700005

D 2 Of 5 2 Discrete Lengths

Code Lengths (Continued)

<FN3>F0010F10013700014

MSI Plessey - Any Length

<FN3>F3010F10013700014

MSI Plessey - Length Within Range

<FN3>F1010F10013700014

MSI Plessey 1 Discrete Length

<FN3>F2010F10003700014

MSI Plessey 2 Discrete Lengths

Code Lengths (Continued)

<FN3>A0

0

<FN3>A1

1

<FN3>A2

2

<FN3>A3

3

<FN3>A4

4

<FN3>A5

5

<FN3>A6

6

<FN3>A7

7

<FN3>A8

8

<FN3>A9

9

<FN3>A-

Cancel

Decode Options

Transmit UPC-E/UPC-A Check Digit

Select if decoded UPC symbols are transmitted with or without a check digit.

<FN3>1020021

Transmit UPC-A Check Digit

<FN3>1020020

Do Not Transmit UPC-A Check Digit

<FN3>1020031

Transmit UPC-E Check Digit

<FN3>1020030

Do Not Transmit UPC-E Check Digit

Convert UPC-E to UPC-A

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

<FN3>1020001

Convert UPC-E To UPC-A

<FN3>1020000

Do Not Convert UPC-E To UPC-A

Code 39 Check Digit Verification

When enabled, this parameter checks the integrity of a Code 39 symbol to ensure that it complies with specified algorithms. Only those code 39 symbols which include a modulo 43 check digit are decoded when this parameter is enabled.

<FN3>1020041

Enable Code 39 Check Digit

<FN3>1020040

Disable Code 39 Check Digit

Transmit Code 39 Check Digit

When Code 39 Check Digit Verification is enabled, select if you want to transmit data with or without the check digit.

<FN3>1020241

Transmit Code 39 Check Digit (Enable)

<FN3>1020240

Do Not Transmit Code 39 Check Digit (Disable)

I 2 of 5 Check Digit Verification

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

<FN3>2051E00

Disable

<FN3>2051E01

USS Check Digit

<FN3>2051E02

OPCC Check Digit

Transmit I 2 of 5 Check Digit

Select if decoded I 2 of 5 symbols are transmitted with or without a check digit.

<FN3>1020211

Transmit I 2 Of 5 Check Digit

<FN3>1020210

Do Not Transmit I 2 Of 5 Check Digit

Convert I 2 of 5 to EAN-13

This parameter converts a 14 character I 2 of 5 code into EAN-13, and transmits to the host as EAN-13. In order to accomplish this, the I 2 of 5 code must be enabled, one length must be set to 14, and the code must have a leading zero and a valid EAN-13 check digit.

<FN3>1020201

Convert I 2 Of 5 To EAN-13

<FN3>1020200

Do Not Convert I 2 Of 5 To EAN-13

MSI Plessey Check Digits

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.

<FN3>1020120

One MSI Plessey Check Digit

<FN3>1020121

Two MSI Plessey Check Digits

Transmit MSI Plessey Check Digit

Select if you want to transmit data with or without the check digit.

<FN3>1020131

Transmit MSI Plessey Check Digit

<FN3>1020130

Do Not Transmit MSI Plessey Check Digit

MSI Plessey Check Digit Algorithm

When the two MSI Plessey check digits option is selected, an additional verification is required to ensure integrity. Select either the Mod 10/Mod 10 or Mod 10/Mod 11 algorithm.

<FN3>1020230

MOD 10/MOD 11

<FN3>1020231

MOD 10/MOD 10

Convert EAN-8 to EAN-13

This parameter adds five leading zeros to decoded EAN-8 symbols to make them compatible in format to EAN-13 symbols.

<FN3>1020011

Enable Convert EAN-8 To EAN-13

<FN3>1020010

Disable Convert EAN-8 To EAN-13

Decode UPC/EAN Supplemental

Select whether UPC/EAN is decoded with or without supplemental characters. Supplementals are additionally appended characters (2 or 5) according to specific code format conventions (e.g., UPC A+2, UPC E+2, EAN 8+2).

If UPC/EAN with supplemental characters is selected, UPC/EAN symbols without supplemental characters won't be decoded. If UPC/EAN without supplemental characters is selected and the interface scanner is presented with a UPC/EAN plus supplemental symbol, the UPC/EAN is decoded and the supplemental characters ignored. If autodiscrimination is chosen, the LS 4800 scanner transmits either, after additional processing to ensure a good decode.

Note: *To minimize the risk of invalid data transmission, it is recommended that you select whether to read or ignore supplemental characters.*

.

<FN3>2010E01

Decode UPC/EAN Supplementals

<FN3>2010E00

Ignore UPC/EAN Supplementals

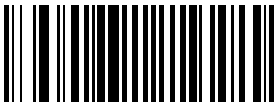
<FN3>2010E02

Autodiscriminate UPC/EAN Supplementals

CLSI Editing

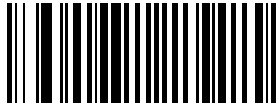
When enabled, this parameter strips the start and stop characters and inserts a space after the first, fifth, and tenth characters of a 14-character Codabar symbol.

Note: *Symbol length does not include start and stop characters.*



<FN3>1020051

Enable CLSI Editing

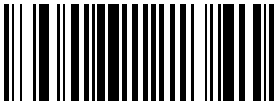


<FN3>1020050

Disable CLSI Editing

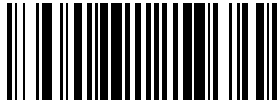
NOTIS Editing

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



<FN3>1020061

Enable NOTIS Editing



<FN3>1020060

Disable NOTIS Editing

Transmit Code ID Character

A code ID character identifies the code type of a scanned bar code. This may be useful when the scanner is decoding more than one code type. If a prefix is selected, the code ID character is sent after the prefix and before the decoded symbol.

You may select no code ID character, a Symbol code ID character, or an AIM ID character. Symbol code ID characters are listed below. AIM ID characters are listed in the section *AIM Code Identifiers* on page A-1.

Table 5-3. Symbol Code ID Characters

Code Type	Symbol Identifier
UPC-A, UPC-E, EAN-13, EAN-8	A
Code 39	B
Codabar	C
Code 128	D
Code 93	E
Interleaved 2 of 5	F
Discrete 2 of 5, D 2 of 5 IATA	G
MSI Plessey	J
UCC/EAN 128	K
Bookland EAN	L
Trioptic Code 39	M
PDF417, MicroPDF417	X

<FN3>2051702

Transmit Symbol Code ID Character

<FN3>2051701

Transmit AIM Code ID Character

<FN3>2051700

Do Not Transmit Code ID Character

Decode Buffering

This option permits the scanner to store decode data until the host device is ready to receive them. If the scanner reaches its capacity to store decoded symbols before the host is ready, subsequent trigger pulls have no effect until a buffer is available.

<FN3>2051401

Enable Decode Buffering

<FN3>2051400

Disable Decode Buffering

Transmit "No Decode" Message

When this feature is enabled, "FR" is transmitted if a PDF symbol was detected but not decoded, and "NR" if no PDF symbol is detected and a 1D bar code was not decoded. Prefixes and suffixes enabled are appended around this message.

<FN3>1020101

Transmit "No Decode" Message

<FN3>1020100

Do Not Transmit "No Decode" Message

LRC Checksum

Enabling this option allows for appending an LRC checksum character at the end of a decode transmission.

When an LRC checksum is enabled, the format of output data is as follows: <STX> <DATA...> <ETX> <LRC>. If <DATA...> contains the special characters STX, ETX, and DLE, a DLE character is used as an escape character and is added before each of those characters so that the receiving side knows not to interpret the special characters in the data as control characters. The LRC character is the exclusive OR of all characters except for the LRC character itself.

<FN3>1040401

Enable LRC Checksum

<FN3>1040400

Disable LRC Checksum

UPC-A/UPC-E Preamble

Three options are given for the lead-in characters of decoded UPC-A or UPC-E symbols transmitted to the host device. Select one preamble for UPC-A decodes and one for UPC-E decodes. These lead-in characters are considered part of the symbol itself. The three options are:

- a system character only
- the country code and system character
- no preamble

The system character is the digit printed to the extreme left of a UPC symbol. The country code for UPC is always zero, and it cannot be transmitted without the system character.

UPC-A Preamble

Select one option for UPC-A preamble by scanning the appropriate bar code.

<FN3>2030100

None

<FN3>2030101

System Character

<FN3>2030102

System Character & Country Code

UPC-E Preamble

Select one option for UPC-E preamble by scanning the appropriate bar code.

<FN3>2030000

None

<FN3>2030001

System Character

<FN3>2030002

System Character & Country Code

Code 128 Emulation

When this parameter is enabled, the scanner transmits data from certain MicroPDF417 symbols as if it was encoded in Code 128 symbols. Transmit AIM Symbology Identifiers must be enabled for this parameter to work.

If Code 128 Emulation is enabled, these MicroPDF417 symbols are transmitted with the one of the following prefixes:

-]**C1** if the first codeword is 903-907, 912, 914, 915
-]**C2** if the first codeword is 908 or 909
-]**C0** if the first codeword is 910 or 911

If disabled, they are transmitted with one of the following prefixes:

-]**L3** if the first codeword is 903-907, 912, 914, 915
-]**L4** if the first codeword is 908 or 909
-]**L5** if the first codeword is 910 or 911

Scan a bar code below to enable or disable Code 128 Emulation.

<FN3>10M0171

Enable Code 128 Emulation

<FN3>10M0170

Disable Code 128 Emulation

UCC/EAN-128 Emulation

Certain MicroPDF417 symbols can be "linked" with a linear symbol during transmission as if they were one symbol. The MicroPDF417 symbol provides supplemental data to the linear symbol. Three scanning options are offered for these symbols:

- If Decode Linked Symbol is selected, Code 128, ITF-14 and UPC/EAN symbols are not decoded unless a MicroPDF417 symbol beginning with codeword 906, 907, 912, 914, or 915 is present.
- If Ignore Linked Symbol is selected, MicroPDF417 symbols beginning with codeword 906, 907, 912, 914, or 915 are ignored.
- If Autodiscriminate Linked Symbol is selected, the scanner looks for a MicroPDF417 symbol when scanning a 1-D symbol. If a MicroPDF417 symbol is not detected within the timeout period, the 1-D symbol data is transmitted.

The Timeout Between Decodes, Different Symbols parameter must be set to 0 before Ignore Linked Symbol or Autodiscriminate Linked Symbol can be selected.

Select one option for UCC/EAN 128 Emulation by scanning the appropriate bar code.

<FN3>20N0501

Decode Linked Symbol

<FN3>20N0500

Ignore Linked Symbol

<FN3>20N0502

Autodiscriminate Linked Symbol

Pause Duration

This parameter, used in data editing, allows a pause to be inserted at any point in the data transmission. Pauses are set by scanning a two digit number (i.e., two bar codes), and are measured in 1/10 second intervals. For example, scanning bar codes “0” and “1” inserts a 1/10 second pause; “0” and “5” gives you a 1/2 second delay.

To set a pause duration:

1. Scan the **PAUSE DURATION** bar code below.
2. Scan two bar codes on the next page which represent the desired pause. You must always scan two bar codes.
3. If you make an error, or wish to change your selection, scan **CANCEL**.

<FN3>30C0D20063

Pause Duration

Pause Duration (Continued)

<FN3>A0

0

<FN3>A1

1

<FN3>A2

2

<FN3>A3

3

<FN3>A4

4

<FN3>A5

5

<FN3>A6

6

<FN3>A7

7

<FN3>A8

8

<FN3>A9

9

<FN3>A-

Cancel

Prefix/Suffix Values

A prefix/suffix may be appended to scan data for use in data editing. These values are set by scanning a four digit number (i.e., four bar codes) that correspond to ASCII characters for various terminals. See Table A-3 on page A-5 for ASCII values.

Note: *If a keyboard interface is being used, refer to the Synapse "Smart Cable" Interface Guide for keystroke values to be used as prefix/ suffix values.*

To set a **PREFIX/SUFFIX** value:

1. Scan the option bar code you wish to set.
2. Scan four bar codes on the next page which correspond to the ASCII value or keystroke value you wish to assign (see Table A-3 on page A-5 or the Synapse "Smart Cable" Interface Guide). The ENTER key is the default for all options.
3. If you make an error, or wish to change your selection, scan CANCEL.

<FN3>50C0006

Scan Suffix (Value 1)

<FN3>50C0107

Scan Prefix (Value 2)

Prefix/Suffix Values (Continued)

<FN3>A0

0

<FN3>A1

1

<FN3>A2

2

<FN3>A3

3

<FN3>A4

4

<FN3>A5

5

<FN3>A6

6

<FN3>A7

7

<FN3>A8

8

<FN3>A9

9

<FN3>A-

Cancel

Data Transmission Formats

Options for selectable scan data formats can be selected by the user. The following are standard selections:

Standard: <data>

Option 1: <data> <SUFFIX>

Option 2: <PREFIX> <data> <SUFFIX>

Option 3: <PREFIX> <data>

<data> = scanned bar code data

<PREFIX> and <SUFFIX> as selected by the user.

To select a data transmission format:

1. Scan the SCAN OPTIONS bar code.
2. Scan the bar code corresponding to the desired converted data format.
3. Scan ENTER.
4. If you make a mistake, scan CANCEL on the next page.

Note: *RS-232C hosts treat the extended keypad default suffix (7013) as ASCII data.*

<FN3>7B1210

Scan Options

<FN3>6A110

Data As Is

<FN3>6A13071

<DATA> <SUFFIX>

Data Transmission Formats (Continued)

<FN3>6A1572071

<PREFIX> <DATA> <SUFFIX>

<FN3>6A13720

<PREFIX> <DATA>

<FN3>4

Enter

<FN3>6Q

Cancel

Scanning Options

Decode Attempt Duration

Set the maximum time for decode processing to continue during a scan attempt. This is programmable in 0.1 second increments from 0.1 to 9.9 seconds. The recommended interval is between 1.0 and 5.0 seconds, the larger value most appropriate for large PDF symbols.

1. Scan the option bar code below.
2. Scan two bar codes on the next page which correspond to the desired interval, in 0.1 second increments.
3. If you make an error, or wish to change your selection, scan CANCEL.

<FN3>3050020163

Decode Attempt Duration

Decode Attempt Duration (Continued)

<FN3>A0

0

<FN3>A1

1

<FN3>A2

2

<FN3>A3

3

<FN3>A4

4

<FN3>A5

5

<FN3>A6

6

<FN3>A7

7

<FN3>A8

8

<FN3>A9

9

<FN3>A-

Cancel

Scanning Mode

This parameter allows you to select one of the following scanning mode options (see *LS 4800 Scanning Mode Options* on page 3-1 for descriptions):

- Smart Raster
- Slab Only Raster
- Always Raster
- Programmable Raster

Select a scanning mode.

<FN3>2050901

Smart Raster

<FN3>2050904

Slab Only Raster

<FN3>2050902

Always Raster

<FN3>2050903

Programmable Raster

Programmable Raster Height And Raster Expansion Speed

This parameter allows you to select the laser pattern's height and rate of expansion, and is only used when Programmable Raster or Always Raster is enabled. This parameter is intended for very specific applications, and is usually not necessary.

Select the laser pattern's height and/or rate of expansion.

1. Scan the bar code for either **RASTER HEIGHT** or **RASTER EXPANSION SPEED** below.
2. To represent a two-digit value, scan two bar codes from the next page. Valid values are between 01 and 15.
3. If you make an error, or wish to change your selection, scan **CANCEL**.

<FN3>30N032010F

Raster Height (Default 15)

<FN3>30N022010F

Raster Expansion Speed (Default 11)

Programmable Raster Height And Raster Expansion Speed (Continued)

<FN3>A0

0

<FN3>A1

1

<FN3>A2

2

<FN3>A3

3

<FN3>A4

4

<FN3>A5

5

<FN3>A6

6

<FN3>A7

7

<FN3>A8

8

<FN3>A9

9

<FN3>A-

Cancel

Aiming Mode

This parameter allows you to select either an aiming dot or slab raster for aiming. See *Aiming Modes* on page 3-3 for descriptions.

Select the aiming mode.

Note: *Aiming modes can not be used with the Always Raster scanning option.*

<FN3>2051B00

Slab Raster

<FN3>2051B01

Aiming Dot
(Normal Timeout)

<FN3>2051B02

Aiming Dot
(Extended Timeout)

Trigger Mode

This parameter controls scanner triggering. “Trigger” refers to an external hardware trigger or a scanner trigger.

- If Level is selected, a trigger pull activates the laser and decode processing. The laser remains on and decode processing continues until a successful decode, the trigger is released, or the Decode Attempt Duration is reached.
- If Pulse is selected, a trigger pull activates the laser and decode processing. The laser remains on and decode processing continues until a successful decode or the Decode Attempt Duration is reached.

Select either Level or Pulse trigger mode.

<FN3>2050200

Level

<FN3>2050202

Pulse

Beep After Good Decode

This parameter determines if the unit beeper sounds during normal scanning. Usually it is desirable to operate the unit with the beeper enabled. In all cases, the beeper operates during parameter menu scanning and indicates error conditions. See *Beeper Definitions* on page 3-8.

Select whether or not to beep after a successful decode. If you select to beep, then set the beeper tone or frequency.

<FN3>1040021

Beep After Good Decode

<FN3>1040020

Do Not Beep After Good Decode

Beeper Tone

This parameter sets the decode beep frequency or tone — low, medium, or high.

<FN3>2050E02

Low Frequency

<FN3>2050E01

Medium Frequency

<FN3>2050E00

High Frequency

Scan Stand Options

Time Delay to Low Power Mode

For extending laser life in scan stand mode, select the time the scanner remains active following a successful decode. Selectable options include 30 seconds, 1 minute, 2 minutes, 3 minutes. To awaken the scanner in low power mode, present a symbol to the scan path. A successful decode restores it to normal blinking.

<FN3>2051000

30 Second Delay

<FN3>2051001

1 Minute Delay

<FN3>2051002

2 Minute Delay

<FN3>2051003

3 Minute Delay

Timeout Between Decodes

Timeout Between Decodes, Same Symbol is used in scan stand mode to prevent the beeper from continuously beeping when a symbol is left in the scanner's field of view. It is programmable in 0.1 second increments from 0.0 to 9.9 seconds. The recommended interval is 0.6 seconds.

Timeout Between Decodes, Different Symbols is used in scan stand mode to prevent the beeper from beeping when a different symbol appears in the scanner's field of view before the timeout period between decodes has expired. This is programmable in 0.1 second increments from 0.0 to 9.9 seconds. The recommended value is 0.0 seconds.

Select the timeouts between decodes for the same or different symbols.

1. Scan the option bar code you wish to set.
2. Scan two bar codes on the next page which correspond to the desired interval, in 0.1 second increments.
3. If you make an error, or wish to change your selection, scan CANCEL.

<FN3>3050120063

Timeout Between Decodes - The Same Symbol

<FN3>3050D20063

Timeout Between Decodes - Different Symbols

Timeout Between Decodes (Continued)

<FN3>A0

0

<FN3>A1

1

<FN3>A2

2

<FN3>A3

3

<FN3>A4

4

<FN3>A5

5

<FN3>A6

6

<FN3>A7

7

<FN3>A8

8

<FN3>A9

9

<FN3>A-

Cancel

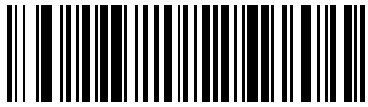
Security Options

Decode UPC/EAN Supplemental Redundancy

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

To select a decode redundancy value:

1. Scan the bar code below.
2. Scan two bar codes on the next page which represent the desired value. Single digit numbers must have a leading zero.
3. If you make an error, or wish to change your selection, scan **CANCEL**.



<FN3>305182021E

Decode UPC/EAN Supplemental Redundancy

Decode UPC/EAN Supplemental Redundancy (Continued)

<FN3>A0

0

<FN3>A1

1

<FN3>A2

2

<FN3>A3

3

<FN3>A4

4

<FN3>A5

5

<FN3>A6

6

<FN3>A7

7

<FN3>A8

8

<FN3>A9

9

<FN3>A-

Cancel

Linear Code Type Security Level

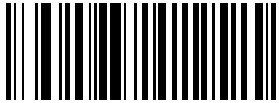
Note: *Does not apply to Code 128.*

The LS 4800 offers four levels of decode security for linear code types (e.g., Code 39, Interleaved 2 of 5). Higher security levels are selected for decreasing levels of bar code quality. As security levels increase, the scanner'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 Plessey	4 or less
D 2 of 5	8 or less
I 2 of 5	8 or less



<FN3>2051501

Linear Security Level 1

Linear Security Level 2

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

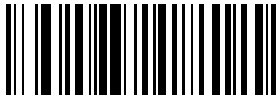
<FN3>2051502

Linear Security Level 2

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 Plessey	4 or less
D 2 of 5	8 or less
I 2 of 5	8 or less
Codabar	8 or less

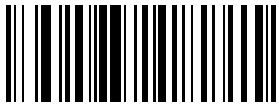


<FN3>2051503

Linear Security Level 3

Linear Security Level 4

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



<FN3>2051504

Linear Security Level 4

Bi-directional Redundancy

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

<FN3>1040311

Enable Bi-directional Redundancy

<FN3>1040310

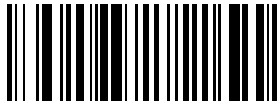
Disable Bi-directional Redundancy

UPC/EAN Security Level

The LS 4800 offers four levels of decode security for UPC/EAN bar codes. Increasing levels of security are provided for decreasing levels of bar code quality. There is an inverse relationship between security and scanner aggressiveness, so be sure to choose only that level of security necessary for any given application. Select a UPC/EAN security level:

- **UPC/EAN Security Level 0**: This is the default setting which allows the scanner to operate in its most aggressive state, while providing sufficient security in decoding "in-spec" UPC/EAN bar codes.
- **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 you are experiencing mis-decodes of poorly printed bar codes, and the mis-decodes are limited to these characters, select this security level.
- **UPC/EAN Security Level 2**: If you are experiencing mis-decodes of poorly printed bar codes, and the mis-decodes are not limited to characters 1, 2, 7, and 8, select this security level.
- **UPC/EAN Security Level 3**: If you have tried Security Level 2, and are still experiencing misdecodes, 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 scanner. If this level of security is necessary, you should try to improve the quality of your bar codes.

UPC/EAN Security Level (Continued)

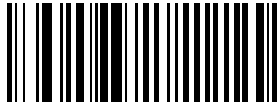


<FN3>2051100

UPC/EAN Security Level 0

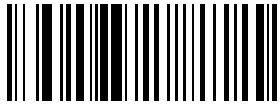
<FN3>2051101

UPC/EAN Security Level 1



<FN3>2051102

UPC/EAN Security Level 2



<FN3>2051103

UPC/EAN Security Level 3

RS-232 Options

RS-232C Host Types

This parameter selects an RS-232C host interface option. When you select a specific host, this automatically configures RS-232C parameters such as RS-232C protocol and code types to those of that specific host. See Table 5-4 and Table 5-5 for these automatically determined settings.

Table 5-4. Standard RS-232, Nixdorf

Parameter	Std. RS-232	Nixdorf Mode A	Nixdorf Beetle
Xmit Code ID	No	Yes	Yes
Data Trans. Error	Data	Data/Suffix	Data/Suffix
Suffix	None	CR(1013)	CR(1013)
Baud Rate	9600	9600	9600
Parity	None	Odd	Odd
H/W Handshaking	None	None	RTS/CTS Opt. 3
S/W Handshaking	None	None	None
Serial Resp. T/O	2.0 Sec.	9.9 Sec.	9.9 Sec.
Stop Bit Select	One	One	One
ASCII Format	8-Bit	8-Bit	8-Bit
Beep on <BEL>	Disabled	Disabled	Disabled
RTS Line State	Low Always	Low Always	Low Always
Special Notes	None	None	Output 0x60 for all CR except last one

RS-232C Host Types (Continued)

Table 5-5. Fujitsu, ICL, PDT 3300

Parameter	Fujitsu	ICL	PDT 3300
Xmit Code ID	Yes	Yes	Yes
Data Trans. Error	Data/Suffix	Data/Suffix	STX/Data/ETX/ LRC
Suffix	CR(1013)	CR(1013)	None
Baud Rate	9600	9600	9600
Parity	None	Even	Even
H/W Handshaking	None	RTS/CTS Opt. 3	RTS/CTS
S/W Handshaking	None	None	ACK/NAK
Serial Resp. T/O	2.0 Sec.	9.9 Sec.	9.9 Sec.
Stop Bit Select	One	One	One
ASCII Format	8-Bit	8-Bit	7-Bit
Beep on <BEL>	Disabled	Disabled	Disabled
RTS Line State	Low Always	High Always	Low Always
Special Notes	None	None	None

RS-232C Host Types (Continued)

Scan one of the following bar codes to select an RS-232C host.

<FN3>2050A37

Standard RS-232C

<FN3>2050A89

ICL RS-232C

<FN3>2050A8A

Nixdorf RS-232C

<FN3>2050A8B

Fujitsu RS-232C

<FN3>2050A8C

Beetle RS-232C

<FN3>2050A8D

PDT 3300

Baud Rate

Baud rate is the number of bits of data transmitted per second. The scanner's respective baud rate settings should match the data rate settings of the host and auxiliary devices. If not, data may not reach the devices or may reach them in distorted form.

Set the baud rate for RS-232C transmission.

<FN3>2090100

110

<FN3>2090101

300

<FN3>2090102

600

<FN3>2090103

1200

<FN3>2090104

2400

<FN3>2090105

4800

<FN3>2090106

9600

<FN3>2090107

19200

<FN3>2090108

38400

Parity

A parity check bit is the most significant bit of each ASCII coded character and is helpful in detecting transmission errors.

If you select **ODD** parity, the parity bit has a value 0 or 1, based on data, to ensure that an odd number of 1 bits are contained in the coded character. If you select **EVEN** parity, the parity bit has a value 0 or 1, to ensure that an even number of 1 bits are contained in the coded character. If **MARK** is selected, the parity bit is always 1, while if **SPACE** is selected, the parity bit is always 0.

Set the type of parity for RS-232C transmission.

<FN3>2090300

Odd

<FN3>2090301

Even

<FN3>2090302

Mark

<FN3>2090303

Space

<FN3>2090304

None

Check Parity

Select whether or not the parity of received characters is checked. The type of parity used is selectable through the **PARITY** parameter.

<FN3>1080011

Check Parity

<FN3>1080010

Do Not Check Parity

Stop Bit Select

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

Select the desired number of stop bits for RS-232C communications.

<FN3>2090201

1 Stop Bit

<FN3>2090202

2 Stop Bits

Hardware Handshaking

The data interface consists of an RS-232C port designed to operate either with or without the hardware handshaking lines, *Request to Send (*RTS*)*, and *Clear to Send (*CTS*)*.

If Standard RTS/CTS handshaking is selected, scan data is transmitted according to the following sequence:

- The scanner reads the CTS line for activity. If CTS is asserted, the scanner waits up to 2 seconds for the host to negate the CTS line. If, after 2 seconds (default), the CTS line is still asserted, the scanner sounds a transmit error and any scanned data is lost.
- When the CTS line is negated, the scanner asserts the RTS line and waits up to 2 seconds for the host to assert CTS. When the host asserts CTS, data is transmitted. If, after 2 seconds (default), the CTS line is not asserted, the scanner sounds a transmit error and discards the data.
- When data transmission is complete, the scanner negates RTS 10 msec after sending the last character.
- The host should respond by negating CTS. The scanner checks for a negated CTS upon the next transmission of data.

During the transmission of data, the CTS line should be asserted. If CTS is asserted for less than 50 ms between characters, the transmission is aborted, the scanner sounds a transmission error, and the data is discarded.

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

Note: *The* ***DTR*** *signal is jumpered active.*

Hardware handshaking may not be used in conjunction with software handshaking.

Select whether the scan data is to be transmitted as soon as it is available or whether transmission follows the RTS/CTS procedure.

- **RTS/CTS Option 1**: The scanner asserts RTS before transmitting and ignores the state of CTS. The scanner deasserts RTS when the transmission is incomplete.
- **RTS/CTS Option 2**: RTS is always high or low (user-programmed logic level). However, the scanner waits for CTS to be asserted before transmitting data. If CTS is not asserted within two seconds, the scanner issues an error indication and discards the data.

- **RTS/CTS Option 3:** The scanner asserts RTS prior to data transmission, regardless of the state of CTS. The scanner waits up to two seconds for CTS to be asserted. If CTS is not asserted during this time, the scanner issues an error indication and discards the data. The scanner deasserts RTS when transmission is incomplete.

<FN3>2090500

None

<FN3>2090501

RTS/CTS

<FN3>2090502

RTS/CTS Option 1

<FN3>2090503

RTS/CTS Option 2

<FN3>2090504

RTS/CTS Option 3

Software Handshaking

This parameter offers control of the data transmission process. It may be used instead of, but not in conjunction with, hardware handshaking. **ACK/NAK** handshaking may be combined with **ENQ** handshaking.

- **No Software Handshaking:** Data is transmitted immediately.
- **ACK/NAK Only:** When this option is selected, after transmitting data, the scanner expects either an ACK or NAK response from the host. When a NAK is received, the scanner transmits the same data again and waits for either an ACK or NAK. After three unsuccessful attempts to send data when NAKs are received, the scanner issues an error indication and discards the data.
- **ENQ Only**: When this option is selected, the scanner waits for an ENQ character from the host before transmitting data. If an ENQ is not received within 2 seconds, the scanner issues an error indication and discards the data. The host must transmit an ENQ character at least every 2 seconds to prevent transmission errors.
- **ACK/NAK with ENQ**: This combines the two previous handshaking options.
- **XON/XOFF**: An XOFF character turns the scanner transmission off until the scanner receives an XON character. There are two situations for XON/XOFF:
  - XOFF is received before the scanner has data to send. When the scanner has data to send, it then waits for an XON character before transmission. The scanner waits up to 2 seconds to receive the XON. If the XON is not received within this time, the scanner issues an error indication and discards the data.
  - XOFF is received during a transmission. Data transmission then stops after sending the current byte. When the scanner receives an XON character, it sends the rest of the data message. The scanner waits indefinitely for the XON.

Select the type of RS-232C software handshaking protocol.

Software Handshaking (Continued)

<FN3>2090400

None

<FN3>2090401

ACK/NAK

<FN3>2090402

ACK/NAK with ENQ

<FN3>2090403

ENQ Only

<FN3>2090404

XON/XOFF

Intercharacter Delay

Select the intercharacter delay option matching host device requirements. The intercharacter delay gives the host system time to service its receiver and perform other tasks between characters. Select from no delay to a 99 ms delay between the transmission of each character.

To set a host communications intercharacter delay:

1. Scan the INTERCHARACTER DELAY bar code below.
2. Scan two bar codes on the next page which represent the desired delay. You must always scan two bar codes.
3. If you make an error, or wish to change your selection, scan CANCEL.

<FN3>30C0C20063

Intercharacter Delay

Intercharacter Delay (Continued)

<FN3>A0

0

<FN3>A1

1

<FN3>A2

2

<FN3>A3

3

<FN3>A4

4

<FN3>A5

5

<FN3>A6

6

<FN3>A7

7

<FN3>A8

8

<FN3>A9

9

<FN3>A-

Cancel

Host Serial RTS Line State

This parameter sets the default host serial RTS line state to either high or low.

To select LOW RTS, scan the bar code below.

<FN3>1080040

Host: Low RTS

To select HIGH RTS, scan the bar code below.

<FN3>1080041

Host: High RTS

Serial Response Timeout

This parameter determines the maximum period allowed to elapse before the scanner assumes end of transmission. The delay period can range from 0 to 9.9 seconds.

To set a serial (RS-232C) response timeout:

1. Scan the SERIAL RESPONSE TIMEOUT bar code below.
2. Scan two bar codes on the next page which represent the desired time-out. You must always scan two bar codes.
3. If you make an error, or wish to change your selection, scan CANCEL.

<FN3>3090020063

Serial Response Timeout

Serial Response Timeout (Continued)

<FN3>A0

0

<FN3>A1

1

<FN3>A2

2

<FN3>A3

3

<FN3>A4

4

<FN3>A5

5

<FN3>A6

6

<FN3>A7

7

<FN3>A8

8

<FN3>A9

9

<FN3>A-

Cancel

Beep On <BEL>

When this parameter is enabled, the scanner issues a beep when a **<BEL>** character is detected on the RS-232C serial data line. **<BEL>** is used to gain a user's attention to indicate an illegal entry or other important event. If this parameter is enabled and the system is in battery mode, a 100 ms delay is placed at the end of the decode transmission.

Select whether to enable or disable this parameter.

<FN3>1080001

Beep On <BEL> Character

<FN3>1080000

Do Not Beep On <BEL> Character

Data Transmission - 7 or 8-Bit ASCII Data Format

This parameter determines whether data transmissions occur in the 7-bit or 8-bit ASCII format. Select this parameter according to the requirement of the receiving device. The default value is 8-bit ASCII.

Select either 7-bit or 8-bit ASCII format for RS-232C communications.

<FN3>2090707

7-Bit

<FN3>2090708

8-Bit

Macro PDF Features

This section discusses programmable Macro PDF features fully supported by the LS 4800. Macro PDF is a special feature for concatenating multiple PDF symbols into one file. The LS 4800 can decode symbols that are encoded with this feature, however, the 64K version cannot buffer large sets of macro PDF symbols.

Caution

When printing, keep each Macro PDF sequence separate, for each sequence has unique identifiers. Do not mix bar codes from several Macro PDF sequences, even if they encode the same data. When scanning Macro PDF sequences, scan the entire Macro PDF sequence without interruption. If you scan a mixed sequence, you get two long low beeps (Lo Lo) for inconsistent file ID or inconsistent symbology error.

Caution

When scanning macro PDF with battery-powered LS 4900 models, remember that the decoder must remain active throughout the session, which depletes battery power. For best results, make sure battery power is adequate, and scan the macro PDF sequence efficiently.

Before programming these special features, follow the physical setup instructions in Chapter 2, *Setup*. Then program the required generic decode and data transmission parameters using the bar codes on the following pages. Use the same programming method for setting Macro PDF features as used for standard features.

Note that all parameter settings are stored in non-volatile memory and so are retained after powerdown.

Macro PDF Transmit / Decode Mode Symbols

Select only one of the four options below for handling the decoding of Macro PDF.

- **Buffer All Symbols / Transmit Macro PDF When Complete:** This activates transmission of all decode data from an entire Macro PDF sequence. Transmission does not occur until the entire Macro PDF sequence is scanned and decoded. This is the default option.

  If the decode data exceeds the limit of 9.5K bytes or more than 64 Macro PDF bar codes have been scanned, there is no transmission because the entire sequence has not been scanned, and an error occurs. Use the parameter Flush Macro PDF Buffer to purge the buffer.
- **Transmit Any Symbol in Set / No Particular Order:** This causes transmission of data from each Macro PDF417 symbol as decoded, whether it is in sequential order or not. Up to 1024 Macro PDF bar codes may be transmitted.
- **Scan in Sequence Only / Transmit in Sequence Without Buffering:** This causes transmission of data from each symbol within the Macro PDF sequence as decoded, provided the Macro PDF symbols are scanned in order. If you do not scan the symbols in order, an error occurs. Up to 1024 Macro PDF bar codes may be transmitted.
- **Buffer Scans Out of Order / Transmit Scans in Order:** When enabled, decode data from each symbol within the Macro PDF sequence is transmitted when decoded, provided that the Macro PDF symbols are scanned in order. Decode data from symbols out of order in the Macro PDF sequence is buffered. The decoder can buffer up to 9.5K bytes or 64 Macro PDF bar codes. Use the parameter Flush Macro PDF Buffer to purge the buffer.

Macro PDF Transmit / Decode Mode Symbols (Continued)

<FN3>20N0000

Buffer All Symbols /
Transmit When Complete - Default

<FN3>20N0001

Transmit Any Symbol In Set /
No Particular Order

<FN3>20N0002

Scan In Sequence Only /
Transmit In Sequence Without Buffering

<FN3>20N0003

Buffer Scans Out Of Order/
Transmit Scans In Order

Transmit Symbols in Codeword Format

Enabling this activates transmission of each PDF symbol as directly decoded data codewords, whether that symbol is part of a macro PDF sequence or not. Note that data is output as *codeword values — not as interpreted data*.

"Codeword values" is an ASCII representation of a number from 000 to 928 for each codeword, preceded by an escape character. This escape character is a backslash by default, but the user may change this value. For example, the codeword value 005 is sent to the host in the form of **\005** for GLIs, and **\C005C** for ECIs. This output format is based on the *AIM USA Uniform Symbology Specification* for PDF417 (1994).

All output codewords take up exactly 4 characters for GLIs and 6 characters for ECIs. However, there may be non-decodable characters in the PDF symbol, such as a GLI sequence. This special codeword sequence activates a certain kind of interpretation to the encoded data. Non-decodable codewords like GLIs are embedded in the output stream just like any other codeword, e.g., \927\001.

Because GLIs are indistinguishable from other codewords in the output data stream, the host must intelligently recognize them as GLIs and process their interpretations.

Note that when a macro PDF sequence is transmitted, the last character in the last block of data transmitted is always**\922** (if selected). This indicates the end of that macro PDF transmission.

Transmit Symbols in Codeword Format (Continued)

Enable or disable by scanning the appropriate bar code.

<FN3>10M0001

Enable Transmit In Codeword Format

<FN3>10M0000

Disable Transmit In Codeword Format

Escape Characters

This enables the backslash (\) character as an Escape character for systems that can process transmissions containing special data sequences. Scan a bar code below to either format special data (e.g., GLI escapes, MacroPDF417 Control Block optional fields) according to the GLI (Global Label Identifier) protocol or the ECI (Extended Channel Interpretation) protocol, or to disable this parameter.

<FN3>20N0401

ECI Protocol

<FN3>20N0402

GLI Protocol

<FN3>20N0400

None

Delete Character Set ECIs

This parameter enables the scanner to delete any escape sequences representing Character Set ECIs (also known as GLIs) from its buffer before transmission. In many receiving systems, Character Set ECIs can be removed without affecting the way data is displayed or processed.

When deletion is selected, the scanner transmits data from PDF417 and MicroPDF417 bar codes containing Character Set ECIs, even when the ECI Protocol is disabled.

Scan a bar code to delete or transmit character set ECIs.

<FN3>10M0151

Delete Character Set ECIs

<FN3>10M0150

Transmit Character Set ECIs

ECI Decoder

This parameter enables the scanner to interpret any Extended Channel Interpretations (ECIs) that are supported by the scanner firmware. This parameter has no effect on symbols that were not encoded using ECIs. This version of the product supports ECIs 000900 through 000913, used for efficient encoding of Common Data Syntax Format 00-99. If this parameter is disabled, and a symbol is scanned that was encoded using an ECI escape, the scanner transmits the ECI escape followed by the uninterpreted data.

Scan a bar code to enable or disable this option.

<FN3>10M0161

Enable ECI Decoder

<FN3>10M0160

Disable ECI Decoder

Transmit Unknown Codewords

This enables using the output codeword format for transmitting any non-GLI or non-macro PDF codeword. If this is *not* enabled and an unknown codeword is found, a decode error beep sounds.

Enable or disable by scanning the appropriate bar code.

<FN3>10M0131

Transmit Unknown Codewords

<FN3>10M0130

Do Not Transmit Unknown Codewords

Transmit Macro PDF User-Selected Fields

When enabled, the following parameters cause transmission of the specified field in subsequently scanned Macro PDF417 symbols. Unless transmission of a specific field is enabled, it is not transmitted. The options cannot be changed in the middle of a Macro PDF set entry. All user-selected fields are prefixed by \923 for GLIs, and \C923C for ECIs. Tags and examples in the following parameters demonstrate GLI protocol, but the ECI tag (\C923C) can be used instead if ECI protocol is enabled.

- **Transmit File Name**: Activates transmission of the file name field. The field character tag is \923\000. For example, the filename MANHOURS.WK1 is sent as: \923\000MANHOURS.WK1.
- **Transmit Block Count**: This activates transmission of the block count field. The field character tag is \923\001. For example, the field may be: \923\0011856.
- **Transmit Time Stamp**: This activates transmission of the time stamp field. The field character tag is \923\002. For example, the field may be: \923\0022123443243234.
- **Transmit Sender**: Activates transmission of the sender field. The field character tag is \923\003. For example, the field may be: \923\003Symbol TechnologiesHoltsville, NY.
- **Transmit Addressee**: Activates transmission of the addressee field. The field character tag is \923\004. For example, the field may be: \923\004AIM USA.
- **Transmit File Size**: Activates transmission of the file size field. The field character tag is \923\005. For example, the field may be: \923\005179234.
- **Transmit Checksum**: Activates transmission of the checksum field. The field character tag is \923\006. For example, the field may be: \923\00663823.
- **Transmit Macro PDF Control Header**: Activates transmission of the control header, which contains the segment index and the file ID. For example, the field may be: \92800000\725\120\343. The five digits after the \928 are the segment index (or block index), and \725\120\343 is the file ID.
- **Enable / Disable Last Block Marker**: This enables marking the last block in the set by the codeword \922.

Transmit Macro PDF User-Selected Fields (Continued)

Enable or disable by scanning the appropriate bar code.

<FN3>10M0011

Enable File Name Transmit

<FN3>10M0010

Disable File Name Transmit

<FN3>10M0031

Enable Time Stamp Transmit

<FN3>10M0030

Disable Time Stamp Transmit

<FN3>10M0021

Enable Block Count Transmit

<FN3>10M0020

Disable Block Count Transmit

<FN3>10M0041

Enable Sender Transmit

<FN3>10M0040

Disable Sender Transmit

Transmit Macro PDF User-Selected Fields (Continued)

<FN3>10M0051

Enable Addressee Transmit

<FN3>10M0050

Disable Addressee Transmit

<FN3>10M0071

Enable Checksum Transmit

<FN3>10M0070

Disable Checksum Transmit

<FN3>10M0061

Enable File Size Transmit

<FN3>10M0060

Disable File Size Transmit

<FN3>10M0101

Enable Macro PDF Control Header Transmit

<FN3>10M0100

Disable Macro PDF Control Header Transmit

<FN3>10M0121

Enable Last Block Marker

<FN3>10M0120

Disable Last Block Marker

Flush Macro Buffer

This flushes the buffer of all decoded Macro PDF data stored to that point, transmits it to the host device, and aborts from Macro PDF mode.

<FN3>FLUSH

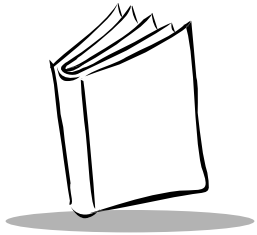
Flush Macro PDF Buffer

Abort Macro PDF Entry

This clears all currently-stored Macro PDF data in the buffer without transmission and aborts from Macro PDF mode.

<FN3>ABORT

Abort Macro PDF Entry



Chapter 6
Advanced Data Formatting

Introduction

Advanced Data Formatting (ADF) is a means of customizing data before transmission to your host device. Scan data can be edited to suit your particular requirements.

ADF can be implemented through scanning a related series of bar codes, which appear in Chapter 7, *ADF Bar Codes*.

Rules: Criteria Linked to Actions

In ADF, data is customized through **rules**. These rules perform detailed actions when the data meets certain criteria. One rule may consist of single or multiple criteria applied to single or multiple actions.

For instance, a data formatting rule could be the following:

Criteria: *When scan data is Code 39, length 12,*
and data at the start position is the string "129",

Actions: *pad all sends with zeros to length 8,*
send all data up to X,
send a space.

If a Code 39 bar code of 1299X1559828 is scanned, the following is transmitted: 00001299<space>. If a Code 39 bar code of 1299X15598 is scanned, this rule is ignored.

The rule specifies the editing conditions and requirements before data transmission occurs.

Using ADF Bar Codes

When you program a rule, make sure the rule is logically correct. Plan ahead before you start scanning.

To program each data formatting rule:

- **Start the Rule**. Scan the **BEGIN NEW RULE** bar code on page 7-1.
- **Criteria**. Scan the bar codes for all pertinent criteria. Criteria can include code type (e.g., Code 128), code length, or data that contains a specific character string (e.g., the digits "129"). These options are described in *Criteria* on page 6-4.
- **Actions**. Scan all actions related to, or affecting, these criteria. The actions of a rule specify how to format the data for transmission. These options are described in *Actions* on page 6-5.
- **Save the Rule**. Scan the **SAVE RULE** bar code on page 7-2. This places the rule in the "top" position in the rule buffer.
- If you make errors during this process, some special-purpose bar codes may be useful: **Erase Criteria and Start Again**, **Erase Actions and Start Again**, **Erase Previously Saved Rule**, etc.

Criteria, actions, and entire rules may be erased by scanning the appropriate bar code (see *Erase* on page 7-2).

Beeper Definitions on page 6-12 help guide you through the programming steps.

Special Commands

Begin New Rule

Scan this bar code first when programming a data formatting rule.

Save Rule

Scan this bar code to complete a data formatting rule.

Erase

Use these bar codes to erase criteria, actions, and rules.

Quit Entering Rules

Scan this bar code to quit entering rules.

Disable Rule Set

These bar codes allow you to disable particular rule sets.

Criteria

Code Types

Select any number of code types to be affected. All selected codes must be scanned in succession, prior to selecting other criteria. *If you don't select a code type, all code types will be affected.*

Code Lengths

Define the number of characters the selected code type must contain. *If you don't select a code length, selected code types of any length will be affected.*

Message Containing A Specific Data String

Select whether the formatting affects data that begins with a specific character or data string, or contains a specific character or data string.

Specific String at Start

Scan this bar code, then scan the bar codes representing the desired character or characters (up to a total of 8) in the *Alphanumeric Keyboard* beginning on page 7-50.

Specific String, Any Location

Scan this bar code, then, using the *Numeric Keypad* on page 7-12, scan a two-digit number representing the ***position*** (use a leading "zero" if necessary). Then scan the desired character or characters (up to a total of 8) on the *Alphanumeric Keyboard* beginning on page 7-50, followed by the **END OF MESSAGE** bar code on page 7-56.

Any Message OK

By not scanning any bar code, all selected code types are formatted, regardless of information contained.

Rule Belongs To Set

Select the set a rule belongs to.

Actions

Select how to format the data for transmission.

Send Data

Send all data that remains, send all data up to a specific character selected from the *Alphanumeric Keyboard* on page 7-50, or send the next N characters. N = any number from 1 to 254, selected from the *Alphanumeric Keyboard* on page 7-50.

Setup Field(s)

Define fields as follows:

Move Cursor To a Character

Scan the **MOVE CURSOR TO CHARACTER** bar code on page 7-17, then any printable ASCII character from the *Alphanumeric Keyboard* on page 7-50. When this is used, the cursor moves to the position after the matching character. If the character is not there, the rule fails and ADF tries the next rule.

Move Cursor to Start of Data

Scan this bar code to move cursor to the beginning of the data.

Move Cursor Past a Character

This parameter moves the cursor past all sequential occurrences of a selected character. Scan the **MOVE CURSOR PAST CHARACTER** bar code on page 7-17, then select a character from the *Alphanumeric Keyboard* on page 7-50. If the character is not there, the cursor does not move (i.e., has no effect).

Skip Ahead "N" Characters

Scan one of these bar codes to select the number of positions ahead you wish to move the cursor.

Skip Back "N" Characters

Scan one of these bar codes to select the number of positions back you wish to move the cursor.

Send Preset Value

Send Values 1 through 6 by scanning the appropriate bar code. These values must be set using *Prefix / Suffix Values* on page A-5.

Value 1 = Scan Suffix

Value 2 = Scan Prefix

Modify Data

Modify data in the ways listed. The following actions work for all send commands that follow it within a rule. If you program *pad zeros to length 6, send next 3 characters, stop padding, send next 5 characters,* three zeros are added to the first send, and the next send is unaffected by the padding. These options do not apply to the **Send Keystroke** or **Send Preset Value** options.

Remove All Spaces

To remove all spaces in the send commands that follow, scan this bar code.

Crunch All Spaces

To leave one space between words, scan this bar code. This also removes all leading and trailing spaces.

Stop Space Removal

Scan this bar code to disable space removal.

Remove Leading Zeros

Scan this bar code to remove all leading zeros.

Stop Zero Removal

Scan this bar code to disable the removal of zeros.

Pad Data With Spaces

To pad data to the left, scan the bar code containing the desired number of spaces. This parameter is activated by Send commands.

Pad Data With Zeros

To pad data to the left, scan the bar code containing the desired number of zeros. This parameter is activated by Send commands.

Beeps

Select a beep sequence for each ADF rule.

Send Keystroke (Control Characters and Keyboard Characters)

Scan the "Send __" bar code for the keystroke you wish to send.

Turn On/Off Rule Sets

Use these bar codes to turn rule sets on and off.

ADF Bar Code Menu Example

This section provides an example of how ADF rules are entered and used for scan data.

An auto parts distribution center wants to encode manufacturer ID, part number, and destination code into their own Code 128 bar codes. The distribution center also has products that carry UPC bar codes, placed there by the manufacturer. The Code 128 bar codes have the following format:

MMMMMPPPPPDD

Where: M = Manufacturer ID

P = Part Number

D = Destination Code

The distribution center uses a PC with dedicated control characters for manufacturer ID <CTRL M>, part number <CTRL P>, and destination code <CTRL D>. At this center the UPC data is treated as manufacturer ID code.

The following rules need to be entered:

When scanning data of code type Code 128, send the next 5 characters, send the manufacturer ID key <CTRL M>, send the next 5 characters, send the part number key <CTRL P>, send the next 2 characters, send the destination code key <CTRL D>.

When scanning data of code type UPC/EAN, send all data, send the manufacturer ID key <CTRL M>.

To enter these rules, follow the steps below:

Rule 1: The Code 128 Scanning Rule

Table 6-1. Code 128 Scanning Rule

Step	Bar Code	On Page	Beep Indication
1	Begin New Rule	7-1	High High
2	Code 128	7-5	High High
3	Send next 5 characters	7-14	High High
4	Send <CTRL M>	7-34	High High
5	Send next 5 characters	7-14	High High
6	Send <CTRL P>	7-35	High High
7	Send next 2 characters	7-14	High High
8	Send <CTRL D>	7-33	High High
9	Save Rule	7-2	High Low High Low

Rule 2: The UPC Scanning Rule

Table 6-2. UPC Scanning Rule

Step	Bar Code	On Page	Beep Indication
1	Begin New Rule	7-1	High High
2	UPC/EAN	7-6	High High
3	Send all remaining data	7-14	High High
4	Send <CTRL M>	7-34	High High
5	Save Rule	7-2	High Low High Low

If you made any mistakes while entering this rule, scan the **QUIT ENTERING RULES** bar code on page 7-3. If you already saved the rule, scan the **ERASE PREVIOUSLY SAVED RULE** bar code on page 7-2.

Alternate Rule Sets

ADF rules may be grouped into one of four alternate sets which can be turned on and off when needed. This is useful when you want to format the same message in different ways. For example, a Code 128 bar code contains the following information:

Class (2 digits), Stock Number (8) digits, Price (5 digits)

This bar code might look like this:

245671243701500

where:

Class = 24

Stock Number = 56712437

Price = 01500

Ordinarily you would send this data as follows:

24 (class key)

56712437 (stock key)

01500 (enter key)

But, when there is a sale, you may want to send only the following:

24 (class key)

56712437 (stock key)

and the cashier will key the price manually.

To implement this, you would first enter an ADF rule that applies to the normal situation. This rule may look like this:

When scanning a bar code of length 15, send the next 2 characters, send the class key, send the next 8 characters, send the stock key, send the data that remains, send the Enter key.

The "sale" rule may look like this:

When scanning a bar code of length 15, send the next 2 characters, send the class key, send the next 8 characters, send the stock key.

To switch between the two sets of rules, a "switching rule" must be programmed. This rule specifies what type of bar code must be scanned to switch between the rule sets. For example,

in the case of the "sale" rule above, the rule programmer wants the cashier to scan the bar code "M" before a sale. To do this, a rule can be entered as follows:

When scanning a bar code of length 1 that begins with "M", select rule set number 1.

Another rule could be programmed to switch back.

When scanning a bar code of length 1 that begins with "N", turn off rule set number 1.

The switching back to normal rules can also be done in the "sale" rule. For example, the rule may look like this:

When scanning a bar code of length 15, send the next 2 characters, send the class key, send the next 8 characters, send the stock key, turn off rule set 1.

It is recommended that you scan the **Disable All Rule Sets** bar code after programming a rule belonging to an alternate rule set.

In addition to enabling and disabling rule sets within the rules, you can enable or disable them by scanning the appropriate bar codes on *Code Lengths* on page 7-7.

Rules Hierarchy (in Bar Codes)

The order of programming individual rules is important.The most general rule should be programmed last.

All programmed rules are stored in a buffer. As they are programmed, they are stored at the "top" of a rules list. If three rules have been created, the list would be configured as follows:

Third Rule

Second Rule

First Rule

When data is scanned, the rules list is checked from top to bottom to determine if the criteria matches (and therefore, if the actions should occur). Input is modified into the data format specified by the first matching set of criteria it finds. Be sure that your most general rule is the last one programmed.

For example, if the THIRD rule states:

When scanning a bar code of any length, send all data, then send the ENTER key.

And the SECOND rule states:

When scanning a Code 128 bar code of length 12, send the first four characters, then send the ENTER key, then send all remaining data.

If a Code 128 bar code of length 12 were scanned, the THIRD rule would be in effect. The SECOND rule would appear to not function.

Note also that ADF rules are actually created when you use the standard data editing functions. Scan options are entered as ADF rules, and the hierarchy mentioned above also applies to them. For the LS 4800, this applies to prefix/suffix programming in the parameter *Scan Data Transmission Format*.

These rules reside in the same "rule list" as ADF Rules, so the order of their creation is also important.

Default Rules

Every unit has a default rule to send all scan data. Units with custom software may have one or more default rules burned in. The rules hierarchy checks user programmable rules first, then the default rules. Default rules can be disabled by entering the following general rule in the user programmable buffer:

When receiving scan data, send all data.

Since this rule always applies, ADF will never go into the default rules.

Beeper Definitions

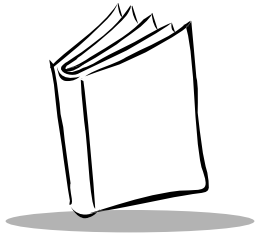
The following table defines beep sequences which occur during data entry.

Table 6-3. Beeper Definitions

Normal Data Entry. Duration of tones are short.	
Beeper Sequence	**Indication**
High-Low	Entry of a number is expected. Enter another digit. Add leading zeros to the front if necessary.
Low-Low	Entry of an alphabetic character is expected. Enter another character or scan the End of Message bar code.
High-High	Entry of Criterion/Action is expected. Enter another criterion or action, or scan the Save Rule bar code.
High-Low-High-Low	Rule saved. Rule entry mode exited.
High-Low-Low	All criteria or actions were cleared for rule currently being entered; continue entry of rule.

Table 6-3. Beeper Definitions (Continued)

Normal Data Entry. Duration of tones are short.	
Low	Last saved rule was successfully deleted. The rule presently being entered is left intact.
Low-High-High	All rules are now deleted. The rule presently being entered is left intact. (This beep sequence has a different meaning outside of ADF.)
Error Indications. Duration of tones are very long.	
Beeper Sequence	**Indication**
Low-High-Low-High	Out of rule memory. Erase some existing rules, then try to save rule again. (The current rule need not be re-entered.)
Low-High-Low	Cancel rule entry. Rule entry mode exited because of an error or the user asked to exit rule entry.
Low-High	Entry error, wrong bar code scanned. Re-enter criterion or action. All previously entered criteria and actions are retained. Criteria or action list is too long for a rule.



Chapter 7
ADF Bar Codes

Special Commands

Begin New Rule

Scan this bar code to start entering a new rule.

<FN3>7B1211

BEGIN NEW RULE

Save Rule

Scan this bar code to save the rule you entered.

<FN3>4

SAVE RULE

Erase

Use these bar codes to erase criteria, actions, or rules.

<FN3>6C-

ERASE CRITERIA AND START AGAIN

<FN3>6A-

ERASE ACTIONS AND START AGAIN

<FN3>81

ERASE PREVIOUSLY SAVED RULE

<FN3>80

ERASE ALL RULES

Quit Entering Rules

Scan this bar code to quit entering rules.

<FN3>6Q

QUIT ENTERING RULES

Disable Rule Set

Use these bar codes to disable rule sets.

<FN3>01

DISABLE RULE SET 1

<FN3>02

DISABLE RULE SET 2

<FN3>03

DISABLE RULE SET 3

<FN3>04

DISABLE RULE SET 4

<FN3>00

DISABLE ALL RULE SETS

Criteria

Code Types

Scan the bar codes for all code types desired before selecting other criteria.

<FN3>6C13D01

CODE 39

<FN3>6C13D02

CODABAR

<FN3>6C13D03

CODE 128

<FN3>6C13D06

I 2 OF 5

<FN3>6C13D0F

EAN 128

Code Types (Continued)

<FN3>6C13D08

UPC-A

<FN3>6C13D09

UPC-E

<FN3>6C13D0A

EAN-8

<FN3>6C13D0B

EAN-13

<FN3>6C13D00

PDF417

<FN3>6C13D1A

ADF for Macro PDF417
(Applies rule to each block in MPDF set.)

Code Lengths

Scan these bar codes to define the number of characters the selected code types must contain. Select one length per rule only.

Note: *This is not a keypad.*

<FN3>6C13701

1

<FN3>6C13702

2

<FN3>6C13703

3

<FN3>6C13704

4

<FN3>6C13705

5

<FN3>6C13706

6

<FN3>6C13707

7

<FN3>6C13708

8

Code Lengths (Continued)

<FN3>6C13709

9

<FN3>6C1370A

10

<FN3>6C1370B

11

<FN3>6C1370C

12

<FN3>6C1370D

13

<FN3>6C1370E

14

<FN3>6C1370F

15

<FN3>6C13710

16

Code Lengths (Continued)

<FN3>6C13711

17

<FN3>6C13712

18

<FN3>6C13713

19

<FN3>6C13714

20

<FN3>6C13715

21

<FN3>6C13716

22

<FN3>6C13717

23

<FN3>6C13718

24

Code Lengths (Continued)

<FN3>6C13719

25

<FN3>6C1371A

26

<FN3>6C1371B

27

<FN3>6C1371C

28

<FN3>6C1371D

29

<FN3>6C1371E

30

Specific Data String

After scanning the following bar code:

1. Enter a string using the *Alphanumeric Keyboard* beginning on page 7-50.
2. Scan **END OF MESSAGE** on page 7-56.

<FN3>6C201

SPECIFIC STRING AT START

After scanning the following bar code:

1. Enter a location using the *Numeric Keypad* on page 7-12.
2. Enter a string using the *Alphanumeric Keyboard* beginning on page 7-50.
3. Scan **END OF MESSAGE** on page 7-56.

<FN3>6C200

SPECIFIC STRING ANY LOCATION

Numeric Keypad

Bar codes on this page should not be confused with those on the alphanumeric keyboard.

<FN3>A0
0

<FN3>A1
1

<FN3>A2
2

<FN3>A3
3

<FN3>A4
4

<FN3>A5
5

<FN3>A6
6

<FN3>A7
7

<FN3>A8
8

<FN3>A9
9

<FN3>A-
CANCEL

Rule Belongs To Set

Scan a bar code below to select which set a rule belongs to.

<FN3>6C12A1

RULE BELONGS TO SET 1

<FN3>6C12A2

RULE BELONGS TO SET 2

<FN3>6C12A3

RULE BELONGS TO SET 3

<FN3>6C12A4

RULE BELONGS TO SET 4

Actions

Send Data

Use these bar codes to send data.

<FN3>6A5211

SEND DATA UP TO CHARACTER

<FN3>6A110

SEND ALL DATA THAT REMAINS

<FN3>6A141001

SEND NEXT CHARACTER

<FN3>6A141002

SEND NEXT 2 CHARACTERS

<FN3>6A141003

SEND NEXT 3 CHARACTERS

<FN3>6A141004

SEND NEXT 4 CHARACTERS

<FN3>6A141005

SEND NEXT 5 CHARACTERS

<FN3>6A141006

SEND NEXT 6 CHARACTERS

<FN3>6A141007

SEND NEXT 7 CHARACTERS

Send Data (Continued)

<FN3>6A141008

SEND NEXT 8 CHARACTERS

<FN3>6A141009

SEND NEXT 9 CHARACTERS

<FN3>6A14100A

SEND NEXT 10 CHARACTERS

<FN3>6A14100B

SEND NEXT 11 CHARACTERS

<FN3>6A14100C

SEND NEXT 12 CHARACTERS

<FN3>6A14100D

SEND NEXT 13 CHARACTERS

<FN3>6A14100E

SEND NEXT 14 CHARACTERS

<FN3>6A14100F

SEND NEXT 15 CHARACTERS

<FN3>6A141010

SEND NEXT 16 CHARACTERS

<FN3>6A141011

SEND NEXT 17 CHARACTERS

Send Data (Continued)

<FN3>6A141012

SEND NEXT 18 CHARACTERS

<FN3>6A141013

SEND NEXT 19 CHARACTERS

<FN3>6A141014

SEND NEXT 20 CHARACTERS

<FN3>6A141032

SEND NEXT 50 CHARACTERS

<FN3>6A141064

SEND NEXT 100 CHARACTERS

<FN3>6A141096

SEND NEXT 150 CHARACTERS

<FN3>6A1410C8

SEND NEXT 200 CHARACTERS

<FN3>6A1410FA

SEND NEXT 250 CHARACTERS

Setup Fields

Scan a bar code below to move the cursor in relation to a specified character. Then enter a character by scanning a bar code from the *Alphanumeric Keyboard* beginning on page 7-50.

Note: *If there is no match when the rule is interpreted and the rule fails, the next rule is checked.*

<FN3>6A5230

MOVE CURSOR TO CHARACTER

<FN3>6A1231

MOVE CURSOR TO START

<FN3>6A5235

MOVE CURSOR PAST CHARACTER

Skip Ahead

Use the following bar codes to skip ahead characters.

<FN3>6A143301

SKIP AHEAD 1 CHARACTER

<FN3>6A143302

SKIP AHEAD 2 CHARACTERS

<FN3>6A143303

SKIP AHEAD 3 CHARACTERS

<FN3>6A143304

SKIP AHEAD 4 CHARACTERS

<FN3>6A143305

SKIP AHEAD 5 CHARACTERS

<FN3>6A143306

SKIP AHEAD 6 CHARACTERS

<FN3>6A143307

SKIP AHEAD 7 CHARACTERS

<FN3>6A143308

SKIP AHEAD 8 CHARACTERS

Skip Ahead (Continued)

<FN3>6A143309

SKIP AHEAD 9 CHARACTERS

<FN3>6A14330A

SKIP AHEAD 10 CHARACTERS

<FN3>6A143332

SKIP AHEAD 50 CHARACTERS

<FN3>6A143364

SKIP AHEAD 100 CHARACTERS

<FN3>6A143396

SKIP AHEAD 150 CHARACTERS

<FN3>6A1433C8

SKIP AHEAD 200 CHARACTERS

<FN3>6A1433FA

SKIP AHEAD 250 CHARACTERS

Skip Back

Use the following bar codes to skip back characters.

<FN3>6A143401

SKIP BACK 1 CHARACTERS

<FN3>6A143402

SKIP BACK 2 CHARACTERS

<FN3>6A143403

SKIP BACK 3 CHARACTERS

<FN3>6A143404

SKIP BACK 4 CHARACTERS

<FN3>6A143405

SKIP BACK 5 CHARACTERS

<FN3>6A143406

SKIP BACK 6 CHARACTERS

<FN3>6A143407

SKIP BACK 7 CHARACTER

<FN3>6A143408

SKIP BACK 8 CHARACTERS

Skip Back (Continued)

<FN3>6A143409

SKIP BACK 9 CHARACTERS

<FN3>6A14340A

SKIP BACK 10 CHARACTERS

<FN3>6A143432

SKIP BACK 50 CHARACTERS

<FN3>6A143464

SKIP BACK 100 CHARACTERS

<FN3>6A143496

SKIP BACK 150 CHARACTERS

<FN3>6A1434C8

SKIP BACK 200 CHARACTERS

<FN3>6A1434FA

SKIP BACK 250 CHARACTERS

Send Preset Value

Use these bar codes to send preset values.

<FN3>6A1271

SEND VALUE 1

<FN3>6A1272

SEND VALUE 2

Modify Data

Use the bar codes below to modify data.

<FN3>6A1260

REMOVE ALL SPACES

<FN3>6A1261

CRUNCH ALL SPACES

<FN3>6A1262

STOP SPACE REMOVAL

<FN3>6A1264

REMOVE LEADING ZEROS

<FN3>6A1265

STOP ZERO REMOVAL

Pad Data with Spaces

Use these bar codes to pad data with spaces.

<FN3>6A146301

PAD SPACES TO LENGTH 1

<FN3>6A146302

PAD SPACES TO LENGTH 2

<FN3>6A146303

PAD SPACES TO LENGTH 3

<FN3>6A146304

PAD SPACES TO LENGTH 4

<FN3>6A146305

PAD SPACES TO LENGTH 5

<FN3>6A146306

PAD SPACES TO LENGTH 6

<FN3>6A146307

PAD SPACES TO LENGTH 7

<FN3>6A146308

PAD SPACES TO LENGTH 8

Pad Data with Spaces (Continued)

<FN3>6A146309

PAD SPACES TO LENGTH 9

<FN3>6A14630A

PAD SPACES TO LENGTH 10

<FN3>6A14630B

PAD SPACES TO LENGTH 11

<FN3>6A14630C

PAD SPACES TO LENGTH 12

<FN3>6A14630D

PAD SPACES TO LENGTH 13

<FN3>6A14630E

PAD SPACES TO LENGTH 14

<FN3>6A14630F

PAD SPACES TO LENGTH 15

<FN3>6A146310

PAD SPACES TO LENGTH 16

Pad Data with Spaces (Continued)

<FN3>6A146311

PAD SPACES TO LENGTH 17

<FN3>6A146312

PAD SPACES TO LENGTH 18

<FN3>6A146313

PAD SPACES TO LENGTH 19

<FN3>6A146314

PAD SPACES TO LENGTH 20

<FN3>6A146315

PAD SPACES TO LENGTH 21

<FN3>6A146316

PAD SPACES TO LENGTH 22

<FN3>6A146317

PAD SPACES TO LENGTH 23

<FN3>6A146318

PAD SPACES TO LENGTH 24

Pad Data with Spaces (Continued)

<FN3>6A146319

PAD SPACES TO LENGTH 25

<FN3>6A14631A

PAD SPACES TO LENGTH 26

<FN3>6A14631B

PAD SPACES TO LENGTH 27

<FN3>6A14631C

PAD SPACES TO LENGTH 28

<FN3>6A14631D

PAD SPACES TO LENGTH 29

<FN3>6A14631E

PAD SPACES TO LENGTH 30

<FN3>6A146300

STOP PAD SPACES

Pad Data with Zeros

Use these bar codes to pad data with zeros.

<FN3>6A146601

PAD ZEROS TO LENGTH 1

<FN3>6A146602

PAD ZEROS TO LENGTH 2

<FN3>6A146603

PAD ZEROS TO LENGTH 3

<FN3>6A146604

PAD ZEROS TO LENGTH 4

<FN3>6A146605

PAD ZEROS TO LENGTH 5

<FN3>6A146606

PAD ZEROS TO LENGTH 6

<FN3>6A146607

PAD ZEROS TO LENGTH 7

<FN3>6A146608

PAD ZEROS TO LENGTH 8

Pad Data With Zeros (Continued)

<FN3>6A146609

PAD ZEROS TO LENGTH 9

<FN3>6A14660A

PAD ZEROS TO LENGTH 10

<FN3>6A14660B

PAD ZEROS TO LENGTH 11

<FN3>6A14660C

PAD ZEROS TO LENGTH 12

<FN3>6A14660D

PAD ZEROS TO LENGTH 13

<FN3>6A14660E

PAD ZEROS TO LENGTH 14

<FN3>6A14660F

PAD ZEROS TO LENGTH 15

<FN3>6A146610

PAD ZEROS TO LENGTH 16

Pad Data With Zeros (Continued)

<FN3>6A146611

PAD ZEROS TO LENGTH 17

<FN3>6A146612

PAD ZEROS TO LENGTH 18

<FN3>6A146613

PAD ZEROS TO LENGTH 19

<FN3>6A146614

PAD ZEROS TO LENGTH 20

<FN3>6A146615

PAD ZEROS TO LENGTH 21

<FN3>6A146616

PAD ZEROS TO LENGTH 22

<FN3>6A146617

PAD ZEROS TO LENGTH 23

<FN3>6A146618

PAD ZEROS TO LENGTH 24

Pad Data With Zeros (Continued)

<FN3>6A146619

PAD ZEROS TO LENGTH 25

<FN3>6A14661A

PAD ZEROS TO LENGTH 26

<FN3>6A14661B

PAD ZEROS TO LENGTH 27

<FN3>6A14661C

PAD ZEROS TO LENGTH 28

<FN3>6A14661D

PAD ZEROS TO LENGTH 29

<FN3>6A14661E

PAD ZEROS TO LENGTH 30

<FN3>6A146600

STOP PAD ZEROS

Beeps

Select one beep sequence per ADF rule.

<FN3>6A13A01

BEEP ONCE

<FN3>6A13A02

BEEP TWICE

<FN3>6A13A03

BEEP THREE TIMES

Control Characters

Scan these bar codes to send control characters.

<FN3>6A144100

SEND CONTROL 2

<FN3>6A144101

SEND CONTROL A

<FN3>6A144102

SEND CONTROL B

<FN3>6A144103

SEND CONTROL C

<FN3>6A144104

SEND CONTROL D

<FN3>6A144105

SEND CONTROL E

<FN3>6A144106

SEND CONTROL F

<FN3>6A144107

SEND CONTROL G

Control Characters (Continued)

<FN3>6A144108

SEND CONTROL H

<FN3>6A144109

SEND CONTROL I

<FN3>6A14410A

SEND CONTROL J

<FN3>6A14410B

SEND CONTROL K

<FN3>6A14410C

SEND CONTROL L

<FN3>6A14410D

SEND CONTROL M

<FN3>6A14410E

SEND CONTROL N

<FN3>6A14410F

SEND CONTROL O

Control Characters (Continued)

<FN3>6A144110

SEND CONTROL P

<FN3>6A144111

SEND CONTROL Q

<FN3>6A144112

SEND CONTROL R

<FN3>6A144113

SEND CONTROL S

<FN3>6A144114

SEND CONTROL T

<FN3>6A144115

SEND CONTROL U

<FN3>6A144116

SEND CONTROL V

<FN3>6A144117

SEND CONTROL W

Control Characters (Continued)

<FN3>6A144118

SEND CONTROL X

<FN3>6A144119

SEND CONTROL Y

<FN3>6A14411A

SEND CONTROL Z

<FN3>6A14411B

SEND CONTROL [

<FN3>6A14411C

**SEND CONTROL **

<FN3>6A14411D

SEND CONTROL]

<FN3>6A14411E

SEND CONTROL 6

<FN3>6A14411F

SEND CONTROL -

Keyboard Characters

Use these bar codes to send keyboard characters.

<FN3>6A144120

SEND SPACE

<FN3>6A144121

SEND !

<FN3>6A144122

SEND “

<FN3>6A144123

SEND #

<FN3>6A144124

SEND $

<FN3>6A144125

SEND %

<FN3>6A144126

SEND &

<FN3>6A144127

SEND ‘

Keyboard Characters (Continued)

<FN3>6A144128

SEND (

<FN3>6A144129

SEND)

<FN3>6A14412A

SEND *

<FN3>6A14412B

SEND +

<FN3>6A14412C

SEND ,

<FN3>6A14412D

SEND -

<FN3>6A14412E

SEND .

<FN3>6A14412F

SEND /

Keyboard Characters (Continued)

<FN3>6A144130

SEND 0

<FN3>6A144131

SEND 1

<FN3>6A144132

SEND 2

<FN3>6A144133

SEND 3

<FN3>6A144134

SEND 4

<FN3>6A144135

SEND 5

<FN3>6A144136

SEND 6

<FN3>6A144137

SEND 7

Keyboard Characters (Continued)

<FN3>6A144138

SEND 8

<FN3>6A144139

SEND 9

<FN3>6A14413A

SEND :

<FN3>6A14413B

SEND ;

<FN3>6A14413C

SEND <

<FN3>6A14413D

SEND =

<FN3>6A14413E

SEND >

<FN3>6A14413F

SEND ?

Keyboard Characters (Continued)

<FN3>6A144140

SEND @

<FN3>6A144141

SEND A

<FN3>6A144142

SEND B

<FN3>6A144143

SEND C

<FN3>6A144144

SEND D

<FN3>6A144145

SEND E

<FN3>6A144146

SEND F

<FN3>6A144147

SEND G

Keyboard Characters (Continued)

<FN3>6A144148

SEND H

<FN3>6A144149

SEND I

<FN3>6A14414A

SEND J

<FN3>6A14414B

SEND K

<FN3>6A14414C

SEND L

<FN3>6A14414D

SEND M

<FN3>6A14414E

SEND N

<FN3>6A14414F

SEND O

Keyboard Characters (Continued)

<FN3>6A144150

SEND P

<FN3>6A144151

SEND Q

<FN3>6A144152

SEND R

<FN3>6A144153

SEND S

<FN3>6A144154

SEND T

<FN3>6A144155

SEND U

<FN3>6A144156

SEND V

<FN3>6A144157

SEND W

Keyboard Characters (Continued)

<FN3>6A144158

SEND X

<FN3>6A144159

SEND Y

<FN3>6A14415A

SEND Z

<FN3>6A14415B

SEND [

<FN3>6A14415C

**SEND **

<FN3>6A14415D

SEND]

<FN3>6A14415E

SEND ^

<FN3>6A14415F

SEND _

Keyboard Characters (Continued)

<FN3>6A144160

SEND ‘

<FN3>6A144161

SEND a

<FN3>6A144162

SEND b

<FN3>6A144163

SEND c

<FN3>6A144164

SEND d

<FN3>6A144165

SEND e

<FN3>6A144166

SEND f

<FN3>6A144167

SEND g

Keyboard Characters (Continued)

<FN3>6A144168

SEND h

<FN3>6A144169

SEND i

<FN3>6A14416A

SEND j

<FN3>6A14416B

SEND k

<FN3>6A14416C

SEND l

<FN3>6A14416D

SEND m

<FN3>6A14416E

SEND n

<FN3>6A14416F

SEND o

Keyboard Characters (Continued)

<FN3>6A144170

SEND p

<FN3>6A144171

SEND q

<FN3>6A144172

SEND r

<FN3>6A144173

SEND s

<FN3>6A144174

SEND t

<FN3>6A144175

SEND u

<FN3>6A144176

SEND v

<FN3>6A144177

SEND w

Keyboard Characters (Continued)

<FN3>6A144178

SEND x

<FN3>6A144179

SEND y

<FN3>6A14417A

SEND z

<FN3>6A14417B

SEND {

<FN3>6A14417C

SEND |

<FN3>6A14417D

SEND }

<FN3>6A14417E

SEND ~

Turn On/Off Rule Set

Use these bar codes to turn rule sets on and off.

<FN3>6A13911

TURN ON RULE SET 1

<FN3>6A13921

TURN ON RULE SET 2

<FN3>6A13931

TURN ON RULE SET 3

<FN3>6A13941

TURN ON RULE SET 4

<FN3>6A13910

TURN OFF RULE SET 1

<FN3>6A13920

TURN OFF RULE SET 2

<FN3>6A13930

TURN OFF RULE SET 3

<FN3>6A13940

TURN OFF RULE SET 4

Alphanumeric Keyboard

<FN3>B20

SPACE

<FN3>B23

#

<FN3>B24

$

<FN3>B25

%

<FN3>B2A

*****

<FN3>B2B

+

<FN3>B2D

-

<FN3>B2E

.

<FN3>B2F

/

<FN3>B21

!

Alphanumeric Keyboard (Continued)

<FN3>B22

“

<FN3>B26

&

<FN3>B27

‘

<FN3>B28

(

<FN3>B29

)

<FN3>B3A

:

<FN3>B3B

;

<FN3>B3C

<

<FN3>B3D

=

<FN3>B3E

>

Alphanumeric Keyboard (Continued)

<FN3>B3F

?

<FN3>B40

@

<FN3>B5B

[

<FN3>B5C

\

<FN3>B5D

]

<FN3>B5E

^

<FN3>B5F

_

<FN3>B60

`

Alphanumeric Keyboard (Continued)

Bar codes on this page should not be confused with those on the numeric keypad.

<FN3>B30

0

<FN3>B31

1

<FN3>B32

2

<FN3>B33

3

<FN3>B34

4

<FN3>B35

5

<FN3>B36

6

<FN3>B37

7

<FN3>B38

8

<FN3>B39

9

Alphanumeric Keyboard (Continued)

<FN3>B41

A

<FN3>B42

B

<FN3>B43

C

<FN3>B44

D

<FN3>B45

E

<FN3>B46

F

<FN3>B47

G

<FN3>B48

H

<FN3>B49

I

<FN3>B4A

J

Alphanumeric Keyboard (Continued)

<FN3>B4B

K

<FN3>B4C

L

<FN3>B4D

M

<FN3>B4E

N

<FN3>B4F

O

<FN3>B50

P

<FN3>B51

Q

<FN3>B52

R

<FN3>B53

S

<FN3>B54

T

Alphanumeric Keyboard (Continued)

<FN3>B55

U

<FN3>B56

V

<FN3>B57

W

<FN3>B58

X

<FN3>B59

Y

<FN3>B5A

Z

<FN3>B-

CANCEL

<FN3>B+

END OF MESSAGE

Alphanumeric Keyboard (Continued)

<FN3>B61

a

<FN3>B62

b

<FN3>B63

c

<FN3>B64

d

<FN3>B65

e

<FN3>B66

f

<FN3>B67

g

<FN3>B68

h

<FN3>B69

i

<FN3>B6A

j

Alphanumeric Keyboard (Continued)

<FN3>B6B

k

<FN3>B6C

l

<FN3>B6D

m

<FN3>B6E

n

<FN3>B6F

o

<FN3>B70

p

<FN3>B71

q

<FN3>B72

r

<FN3>B73

s

<FN3>B74

t

Alphanumeric Keyboard (Continued)

<FN3>B75

u

<FN3>B76

v

<FN3>B77

w

<FN3>B78

x

<FN3>B79

y

<FN3>B7A

z

<FN3>B7B

{

<FN3>B7C

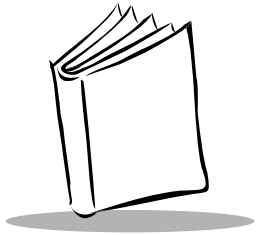
|

<FN3>B7D

}

<FN3>B7E

~



Appendix A
Programming Reference

AIM Code Identifiers

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

] = Flag Character (ASCII 93)
c = Code Character
m = Modifier Character

Table A-1. AIM Code Identifiers

Code Character	Code Type
A	Code 39
C	Code 128
E	UPC/EAN
F	Codabar
G	Code 93
I	Interleaved 2 of 5
L	PDF417, MicroPDF417
M	MSI Plessey
S	D 2 of 5, IATA 2 of 5
X	Code 39 Trioptic, Bookland EAN

The modifier character is the sum of the applicable option values based on Table A-2.

Table A-2. Modifier Characters

Code Type	Option Value	Option
Code 39	0	No Check character or Full ASCII processing.
	1	Reader has checked one check character.
	2	Reader has stripped check character.
	4	Reader has performed Full ASCII character conversion.
		Example: A Full ASCII bar code with check character W, **A+I+MI+DW**, can be transmitted as]**A7**AimId where 7 = (1+2+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 93	0	No option specified at this time. Always transmit 0.
		Example: A Code 39 bar code 012345678905 is transmitted as]**G0**012345678905.
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, **Fcnt1**AimId is transmitted as]**C1**AimId.
EAN/UPC	0	Standard packet in full EAN country code format, which is 13 digits for UPC-A and UPC-E (not including supplemental data).
	1	Two digit supplement data only.
	2	Five digit supplement data only.
	4	EAN-8 data packet.
		Example:A UPC-A bar code 012345678905 is transmitted as]**E0**0012345678905.

Table A-2. Modifier Characters (Continued)

Code Type	Option Value	Option
Interleaved 2 of 5	0 1 2	No check digit processing. Reader has checked check digit. Reader has stripped check digit before transmission. Example: An I 2 of 5 bar code without check digit, 4123, will be transmitted as]**I0**4123.
Discrete 2 of 5	0	No option specified at this time. Always transmit 0. Example: A D 2 of 5 bar code 4123 is transmitted as]**S0**4123.
MSI Plessey	0 1 2 3	Single check digit checked. Two check digits checked. Single check digit verified and stripped before transmission. Two check digits verified and stripped before transmission. Example: An MSI Plessey bar code 4123, with a single check digit checked, is transmitted as]**M0**4123.
Bookland EAN	0	No option specified at this time. Always transmit 0. Example: A Bookland EAN bar code 123456789X is transmitted as]**X0**123456789X.

Table A-2. Modifier Characters (Continued)

Code Type	Option Value	Option
PDF417, MicroPDF417	0	Reader set to conform to protocol defined in 1994 PDF417 symbology specifications. **Note:** When this option is transmitted, the receiver cannot reliably determine whether ECIs have been invoked or whether data byte 92_{DEC} has been doubled in transmission.
	1	Reader set to follow the ECI protocol (Extended Channel Interpretation). All data characters 92_{DEC} are doubled.
	2	Reader set for Basic Channel operation (no escape character transmission protocol). Data characters 92_{DEC} are not doubled. **Note:** When decoders are set to this mode, unbuffered Macro symbols and symbols requiring the decoder to convey ECI escape sequences cannot be transmitted.
	3	The bar code contains a UCC/EAN-128 symbol, and the first codeword is 903-907, 912, 914, 915.
	4	The bar code contains a UCC/EAN-128 symbol, and the first codeword is in the range 908-909.
	5	The bar code contains a UCC/EAN-128 symbol, and the first codeword is in the range 910-911.
		Example: A PDF417 bar code ABCD, with no transmission protocol enabled, is transmitted as]L2ABCD

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

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

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

In the LS 4800, 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**00012345678905]**E1**10.

Prefix / Suffix Values

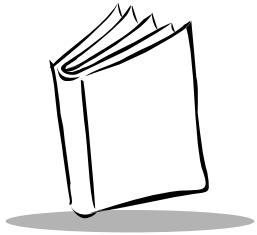
The following values can be assigned as prefixes or suffixes for ASCII character data transmission. If you're using a keyboard interface, refer to the *Synapse "Smart Cable" Interface Guide* for keystroke prefix/suffix values.

Table A-3. Prefix/Suffix Values

Prefix/Suffix Value	Full ASCII Code 39 Encode Char.	ASCII Character	Prefix/Suffix Value	Full ASCII Code 39 Encode Char.	ASCII Character
1000	%U	NUL	1030	%D	RS
1001	$A	SOH	1031	%E	US
1002	$B	STX	1032	Space	Space
1003	$C	ETX	1033	/A	!
1004	$D	EOT	1034	/B	"
1005	$E	ENQ	1035	/C	#
1006	$F	ACK	1036	/D	$
1007	$G	BELL	1037	/E	%
1008	$H	BCKSPC	1038	/F	&
1009	$I	HORIZ TAB	1039	/G	‘
1010	$J	LF/NW LN	1040	/H	(
1011	$K	VT	1041	/I	)
1012	$L	FF	1042	/J	*
1013	$M	CR/ENTER	1043	/K	+
1014	$N	SO	1044	/L	,
1015	$O	SI	1045	-	-
1016	$P	DLE	1046	.	.
1017	$Q	DC1	1047	/	/
1018	$R	DC2	1048	0	0
1019	$S	DC3	1049	1	1
1020	$T	DC4	1050	2	2
1021	$U	NAK	1051	3	3
1022	$V	SYN	1052	4	4
1023	$W	ETB	1053	5	5
1024	$X	CAN	1054	6	6
1025	$Y	EM	1057	7	7
1026	$Z	SUB	1056	8	8
1027	%A	ESC	1057	9	9
1028	%B	FS	1058	/Z	:
1029	%C	GS	1059	%F	;

Table A-3. Prefix/Suffix Values (Continued)

Prefix/Suffix Value	Full ASCII Code 39 Encode Char.	ASCII Character	Prefix/Suffix Value	Full ASCII Code 39 Encode Char.	ASCII Character
1060	%G	<	1095	%O	_
1061	%H	=	1096	%W	`
1062	%I	>	1097	+A	a
1063	%J	?	1098	+B	b
1064	%V	@	1099	+C	c
1065	A	A	1100	+D	d
1066	B	B	1101	+E	e
1067	C	C	1102	+F	f
1068	D	D	1103	+G	g
1069	E	E	1104	+H	h
1070	F	F	1105	+I	i
1071	G	G	1106	+J	j
1072	H	H	1107	+K	k
1073	I	I	1108	+L	l
1074	J	J	1109	+M	m
1075	K	K	1110	+N	n
1076	L	L	1111	+O	o
1077	M	M	1112	+P	p
1078	N	N	1113	+Q	q
1079	O	O	1114	+R	r
1080	P	P	1115	+S	s
1081	Q	Q	1116	+T	t
1082	R	R	1117	+U	u
1083	S	S	1118	+V	v
1084	T	T	1119	+W	w
1085	U	U	1120	+X	x
1086	V	V	1121	+Y	y
1087	W	W	1122	+Z	z
1088	X	X	1123	%P	{
1089	Y	Y	1124	%Q	|
1090	Z	Z	1125	%R	}
1091	%K	[	1126	%S	~
1092	%L	\	1127		Undefined
1093	%M	]			
1094	%N	^	7013		ENTER



Glossary

APERTURE	The opening in an optical system defined by a lens or baffle that establishes the field of view.
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.
ASYMMETRIC WIDTH GROWTH	Non-uniform growth of elements in a printed symbol.
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 can be decoded.
AVERAGE BAR WIDTH GROWTH	Average deviation of bars from nominal widths over the entire symbol.
BAD CHECK DIGIT	Error message resulting from failure of the check digit to calculate properly.
BAD DATA CHARACTER	Error message caused by failure of one or more data characters to decode properly.
BAD PRINT CONTRAST	Error message due to lack of contrast between the background and the bars of the symbol.
BAR	The dark element in a printed bar code symbol.

BAR CODE DENSITY	The number of characters represented per unit of measurement (e.g., characters per inch in one-dimensional symbologies, characters per square inch in PDF417).
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.
BAR WIDTH DEVIATION	Increase or decrease in bar width as compared with nominal bar width.
BAUD RATE	A measure of the data flow or number of signaling events occurring per second. When one bit is the standard "event," this is a measure of bits per second (bps). For example, a baud rate of 50 means transmission of 50 bits of data per second.
BIDIRECTIONAL READING CAPABILITY	The ability to decode a symbol successfully by reading in complementary (opposite) directions across bars and spaces.
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."
BUFFER	An area of memory allocated for data storage. In this context, a buffer's data storage capacity is needed when data can flow into the device more quickly than the device can process that data. Buffering the data preserves it until it can be processed.
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 can be used to store one ASCII character.
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 encodation 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 and Code 128 but are optional for other symbologies. Using check digits decreases the chance of substitution errors when a symbol is decoded.

CLUSTER — One of three subsets of mututally exclusive codeword definitions within PDF417.

CODABAR — A discrete self-checking code with a character set consisting of start/stop characters (A B C D or * T N E), digits 0 to 9, and these additional characters: (- $: / , +).

CODE — Set of unambiguous rules specifying the way in which data may be represented.

CODEWORD — In PDF417, a single group of bars and spaces (4 bars and 4 spaces, for a total of 17 module widths) which represents one or more numbers, letters, or other symbols.

CODEWORD PD (CODEWORD PERCENT DECODE) — Within a PDF417 symbol, the percentage of codewords which decoded successfully; the number of good codewords divided by the total number of codewords (data codewords plus error correction codewords).

CODE LENGTH — Number of data characters in a bar code between the start and stop characters, not including those characters.

CODE 128 — A high density symbology which allows the interface 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.

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.
COUNTRY FLAG	In EAN-8 and EAN-13 codes, two or three digits which appear immediately following the left guard bar pattern.
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. To translate the bar/space pattern into defined characters within a defined symbology.
DECODE ALGORITHM	A decoding scheme that converts pulse widths into data representation of the letters or numbers encoded within a bar code symbol.
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 CODE	A bar code or symbol in which the spaces between characters (intercharacter gaps) are not part of the code (e.g., Code 39).
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.
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. Main variants are EAN-8 and EAN-13.
EDGE ROUGHNESS	Edge irregularities as compared with a nominal bar edge.
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.

ERROR CORRECTION In addition to error detection, the recovery capability of PDF417 over missing, destroyed, or misdecoded codewords. Error correction capability is based on the level of security (0 - 8) selected when the PDF417 label is printed.

EXTRANEOUS INK Ink in a scan area not intended to be there (i.e., tracking and splatter).

FIRST READ RATE Percentage of correct readings obtainable by one pass of a scanning device over a bar code.

FLASH Derived from EEPROM, this is a type of memory that holds its content without power but must be erased in bulk — or in a "flash." Typically, these memory chips are less expensive and provide higher bit densities.

GUARD BARS The start, stop, and center delimiting bars of UPC and EAN symbols.

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

INTERCHARACTER GAP The space between two adjacent bar code characters in a discrete code.

INTERLEAVED BAR CODE A bar code in which characters are paired together, using bars to represents 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.

LASER — An acronym for 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 SPOT SIZE — The diameter of the spot of laser light scanning the bar code, as measured at a given distance from the bar code. Smaller spot sizes yield higher resolution but poorer depth of focus.

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.

MIL — 1 mil = 1 thousandth of an inch.

MINIMUM REFLECTANCE DIFFERENCE (MRD) — The difference in percentage between light reflected from spaces (R_S) and light reflected from bars (R_B). **MRD = $\%R_S$ - $\%R_B$.**

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.

MODULE — The narrowest bar or space (unit of measure) in a code. The term is used by the Uniform Code Council in its description of UPC/EAN code; it is also used in the description of Code 128. Contiguous modules are used to form bars or spaces which are wider than one unit.

MODULE ASPECT RATIO — The ratio of height to width of the narrowest bar or space, or unit of measure, in a bar code.

NANOMETRE — A unit of measure used to define the wavelength of light. Equal to 10^{-9} metre.

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 can be used over a range of magnifications (e.g., from 0.80 to 2.00 of nominal).

NUMBER SYSTEM CHARACTER In the UPC/EAN code used in a retail application, the mandatory, first encoded character, after the left guard bars. The corresponding human readable character identifies the coded character and appears at the bottom left-hand margin of the symbol. The assigned system number corresponds to a usage category for the bar coded item.

ONE-DIMENSIONAL SYMBOLOGY Symbologies which encode data only in a linear or horizontal dimension (X-dimension); the symbol's vertical height (Y-dimension) is redundant (e.g., UPC/EAN, Code 39).

OPACITY The capacity for material to interfere with transmission of light.

OVERHEAD The number of characters required for start, stop, and checking for a given symbol (in PDF417, also left and right row indicators and error correction codewords). For example, a one-dimensional symbol requiring start/stop and two check characters contains four characters of overhead. Thus, to encode three data characters, seven characters are required.

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

PARITY TYPE A parity check bit is the most significant bit of each ASCII coded character. The parity should be set to help detect transmission errors. The parity should be set to match that of the receiving device. If even parity is selected, the parity bit has a value (0 or 1) to ensure that an even number of 1 bits are contained in the coded character. If odd parity is selected, the parity bit will have a value (0 or 1) to ensure that an odd number of 1 bits are contained in the coded character. If 0 parity is selected, the parity bit always will be set to 0. If 1 parity is selected, the parity bit always will be set to 1.

PDF417	A two-dimensional, or stacked, bar code symbology which can encode over one kilobyte of data per label and which represents data in the form of codewords (values 0 - 928). Each codeword consists of four bars and four spaces, for a total of 17 module widths; modules vary in width from one to six element widths. The symbology permits encoding up to 30 data columns and from 3 to 90 data rows. For ease of reading while still maintaining high data density, codewords are encoded in three mutually-exclusive encodation sets, or clusters, with the same cluster repeating sequentially each third row.
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%.
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.
PROM	Acronym for Programmable Read Only Memory. An integrated circuit which can be programmed through special processes and accessed at random during normal operation. Reprogramming is possible, but only through processes such as ultraviolet light erasing and electrical rewriting of data.
PROTOCOL	For a specific signaling type, a set of recognized rules governing the format and timing of message exchange. Between data communications devices, this includes an exchange of predetermined signals arranged for both establishing connection and for disconnecting.
QUIET ZONE	A clear space, containing no dark marks, which precedes the start character of a bar code symbol and follows the stop character.
REFLECTANCE	Amount of light returned from an illuminated surface.

RESOLUTION	The narrowest element dimension which can be distinguished by a particular reading device or printed with a particular device or method.
ROW INDICATORS	To help synchronize a PDF417 symbol's structure, codewords which collectively indicate which row a particular one is, which is the left and right side of that row, how many rows are in the symbol, what security level is encoded in the symbol, and how many data columns are in the rows. Left Row Indicators occur in each row immediately after the Start pattern; Right Row Indicators occur in each row immediately before the Stop pattern.
SCAN	Search for a symbol to be optically recognized.
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.**
SELF-CHECKING CODE	A symbology that uses a checking algorithm to detect encoding errors within the characters of a bar code symbol.
SHOW-THROUGH	The generally undesirable property of a substrate that permits underlying markings to be seen.
SPACE	The lighter element of a bar code formed by the background between bars.
SPECULAR REFLECTION	The mirror-like reflection of light from a surface, which can "blind" a scanner.
SPOT SIZE	Size of the scanning aperture.
SPOTS	The presence of ink in a bar code's spaces or clear areas. These generally reduce the percent 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 the first and last encoded characters of a bar code.
SUBSTRATE	A foundation material on which a substance or image is placed.
SUBSTRATE SCATTERING	Optical phenomenon which causes bars to appear larger and spaces narrower than they are actually printed. It is caused by the scattering of incident light rays within the medium.
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).
SYMMETRIC BAR WIDTH GROWTH	Uniform growth of bars evenly distributed.
TOLERANCE	Allowable deviation from the nominal bar or space width.
TWO-DIMENSIONAL SYMBOLOGY	Designed for high information density and higher encoding capability than one-dimensional bar codes, a symbology which encodes data in both the horizontal (X-dimension) and vertical dimensions, usually in a “stacked” or multi-row arrangement.
UPC	Universal Product Code. A relatively complex numeric symbology. Each character consists of two bars and two spaces, each of which can be any of four widths. The standard symbology for retail food packages in the United States.

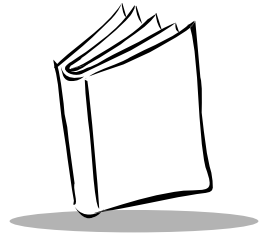
VISIBLE LASER DIODE (VLD) A solid state device which produces visible laser light. Laser light emitted from the diode has a wavelength of 670 to 680 nanometers.

VOID Absence of ink within printed bars.

X-DIMENSION Width of the narrowest element (bar of space) in a bar code symbol.

Y-DIMENSION Element height, as applied to a two-dimensional symbology, which must equal or exceed a required minimum.

ZERO-SUPPRESSED CODE A version of UPC/EAN which reduces the number of characters in the code. The resulting code combines the manufacturer's code and the product's code of Version A in a retail application.



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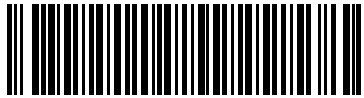

70-12540-04
Revision A — August 1999

Symbol Technologies, Inc. One Symbol Plaza, Holtsville N.Y. 11742