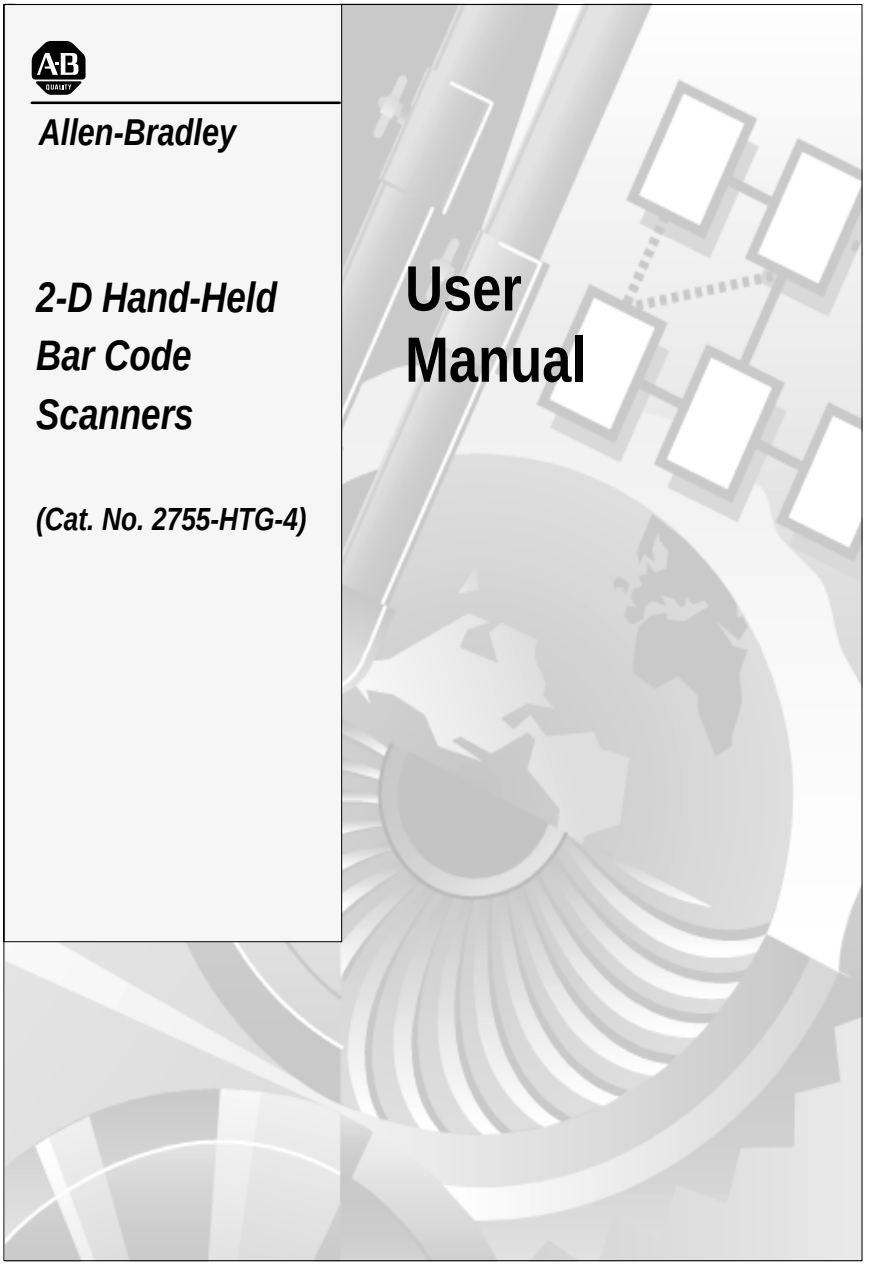


Allen-Bradley

2-D Hand-Held Bar Code Scanners

(Cat. No. 2755-HTG-4)

User Manual

Important User Information

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Allen-Bradley does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen-Bradley publication SGI-1.1, *Safety Guidelines for the Application, Installation, and Maintenance of Solid-State Control* (available from your local Allen-Bradley office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

Throughout this manual we use notes to make you aware of safety considerations:

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage or economic loss.

Attention statements help you to:

- identify a hazard
- avoid the hazard
- recognize the consequences

Important: Identifies information that is critical for successful application and understanding of the product.

Table of Contents

Chapter 2 Connecting the Scanner

Chapter 3 Operating the Scanner

Chapter 4 Configuring the Scanner

Chapter 5 Configuring Communications (Synapse Cable)

Read this preface to familiarize yourself with the rest of the manual. This preface covers the following topics:

- intended audience
- contents of this manual
- related publications
- laser warning symbol

Intended Audience

No special knowledge is required to understand this document or use the scanner. The 2-D (2-Dimensional) scanner may be used with a variety of host devices. You should be familiar with the host's communication ports.

ATTENTION: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous laser light exposure.

Important: You will need the *Programming Guide for 2-D Bar Code Scanners* (Publication 2755-6.7) to scan configuration bar codes for the scanners.

Contents of this Manual

Chapter	Title	Contents
Preface		Describes the purpose, background, and scope of this manual. Also provides a list of related publications.
1	Scanner Features	Provides an overview of the scanner. Includes read range charts and a description of accessory items.
2	Connecting the Scanner	Describes how to connect your scanner to system hardware.
3	Operating the Scanner	Describes how to use the scanner to scan 1-Dimensional and 2-Dimensional bar codes.
4	Configuring the Scanner	Describes how to configure the scanner using the bar codes in the *Programming Guide for 2-D Scanners.*
5	Configuring Communications (Synapse Cable)	Describes how to configure the communication parameters for the Synapse cable using the bar codes in the *Programming Guide for 2-D Scanners.*
6	Maintenance and Troubleshooting	Describes how to maintain and troubleshoot your scanner system hardware.
Appendix A	Specifications	Provides optical, electrical, mechanical and environmental specifications. Also lists agency certifications.
Appendix B	Cable Pinouts	Provides scanner pinout signal names and a brief description of each.
Appendix C	ASCII Table	Lists ASCII conversion chart including Code 39 Full ASCII encoded characters.

Chapter	Title	Contents
Appendix D	AIM Code Identifiers	Describes the AIM Code Identifiers that can be transmitted with decoded data.
Appendix E	Advanced Data Formatting	Describes how to customize data before it is transmitted to your host device.
Appendix F	European Union Directive Compliance	Provides details for using the scanner in industrial environments requiring compliance with European Union Directives.
Glossary		Provides terms found within this document.

Related Publications

Below is a list of related publications you may need to refer to when using the 2-D scanners.

Publication No.	Title
2755-6.7	Programming Guide for 2-D Bar Code Scanners
2755-921	Bar Code Basics

Laser Warning Symbol

Be aware of the following laser caution symbol.

CAUTION:

A laser caution symbol that appears where laser light is present.

Scanner Features

This chapter describes the features of the 2-D Bar Code Scanners, including:

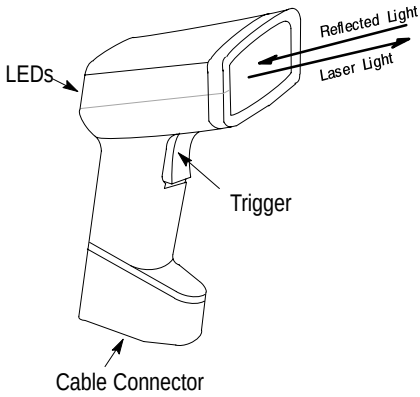
- major features
- LED indicators
- smart raster capability
- scanning options
- configuration options
- decoding options
- scanning ranges
- safety labels
- accessories

Scanner Features

The 2-D scanner emits a raster scanning pattern which is capable of scanning both:

- One-dimensional bar codes
- Two-dimensional bar codes (PDF417 bar codes)

The scanners use a low power visible (red) laser diode for scanning, which can read color bar codes and symbols printed on just about any substrate. The trigger turns on the laser which scans a label at approximately 560 scans per second.



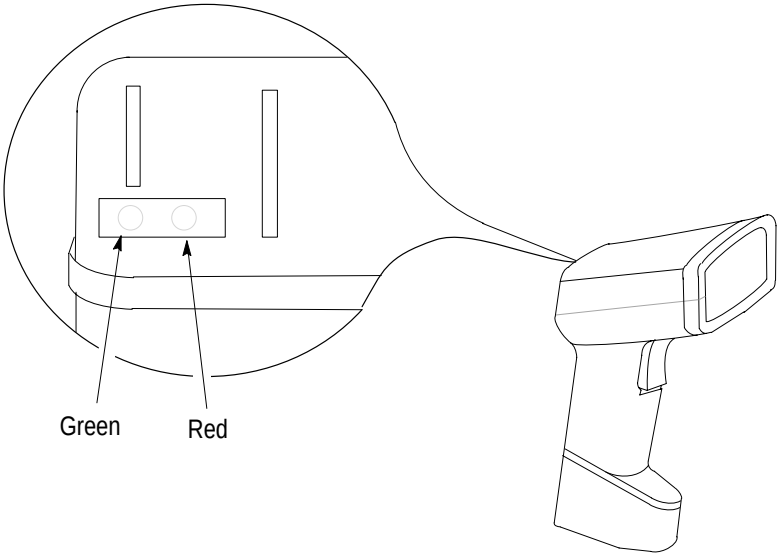
The laser beam:

- exits through the scan window
- reflects off the label back through the window
- is detected by a sensor in the scanner

When a label is read, the laser beam is automatically turned off until the trigger is pressed again. If no label is read, the laser beam automatically turns off after 0.5 to 3 seconds (timeout is adjustable) and remains off until the trigger is released and pressed again.

LED Indicators

On the back of the scanner there is a clear window through which two LEDs are visible.



Green LED = Decode, indicating that a bar code symbol has been scanned and decoded. LED remains on until the next scan (trigger pressed).

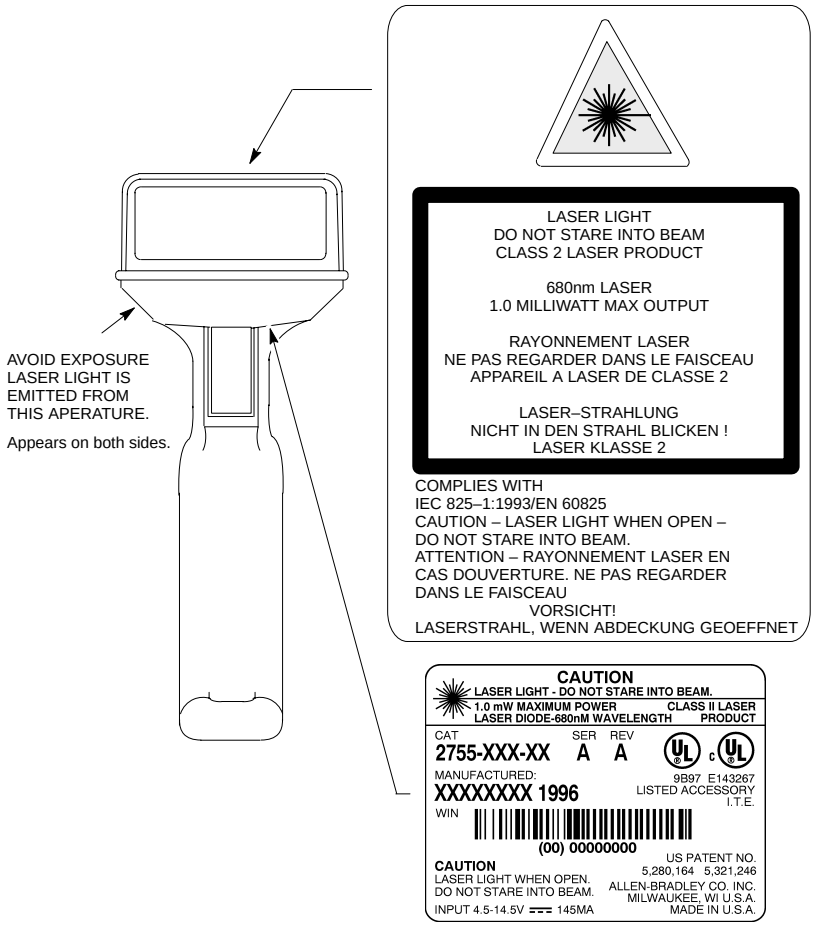
The scanner indicates a successful decode through an audible beep and the decocde (Green) LED.

Red LED = Scanning, indicating that the laser light is on and alignment of the scanner with the bar code.

Safety Labels

The scanners use a low power visible laser diode. As with any bright light source, you should avoid staring directly into the beam. Momentary exposure to a CDRH Class II laser is not known to be harmful.

The following figure shows the location of all safety labels as they appear on the scanner.



Smart Raster

The scanner has a programmable *smart raster* capability, which causes the scanner to emit a raster pattern dynamically adjusted to the height of a 2-D (PDF417) bar code. To increase scanning efficiency and decrease decode time, the scanner determines the height of the bar code and then opens the scan pattern to a size optimal for decoding the bar code.

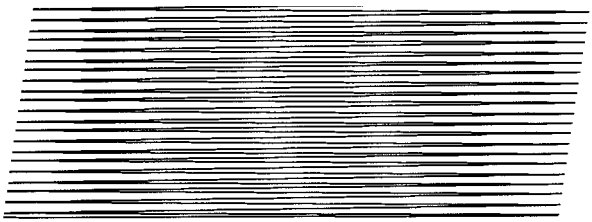
In normal *smart raster* operation, a trigger pull causes a slab raster pattern to appear. If the target is a 1-D bar code, the pattern never opens beyond a slab raster.

If the target bar code is a 2-D (PDF417) bar code, the scanning pattern opens to a full, optimized raster pattern when the scanner is poperly aligned over the bar code.

The scanner operates with a smart raster capability unless programmed otherwise.

Aiming Dot Pattern

Slab Raster Pattern



Open Raster Pattern

Scanning Options

The scanner has 3 scanning options: aiming dot, slab raster and always raster.

Aiming Dot

A trigger pull creates the single aiming dot pattern, which lasts for a fixed interval. This dot is easily visible in outdoor or high ambient light environments. After the aiming dot, a slab raster or open raster pattern appears, depending on the configured scanning option. You can select the aiming dot option with either a normal or extended timeout period.

Slab Raster

A trigger pull creates the slab raster pattern. If the target is a 1-D bar code, the pattern never opens beyond a slab raster. If the target is a 2-D (PDF417) bar code, the pattern opens to an optimized raster pattern when the scanner is properly aligned over the bar code.

Always Raster

A trigger pull opens to a full raster pattern.

Configuration Options

The scanner is adaptable to a wide variety of applications by scanning configuration bar codes. The configuration bar codes control the operation of:

- decoding
- scanning
- communications

The 2-D scanner provides full host compatiblility through a Synapse cable with programmable options.

Chapters 4 and 5 describe the configuration options.

Decoding

The scanner can decode the following symbologies:

- One-Dimensional Bar Codes
  - UPC-A, UPC-E
  - EAN-8, EAN-13
  - Code 39, Code 39 Full ASCII
  - Interleaved 2 of 5
  - Code 128
  - Codabar
  - UCC/EAN 128
- Two-Dimensional Bar Codes
  - PDF417

The scanner is autodiscriminating so that multiple symbologies may be enabled at the same time. The only exception is the scanner cannot discriminate between Code 39 and Code 39 Full ASCII.

Scanning Ranges

The scanner can read bar code symbols at various distances depending on the type of bar codes and the bar code width (width of bars or spaces).

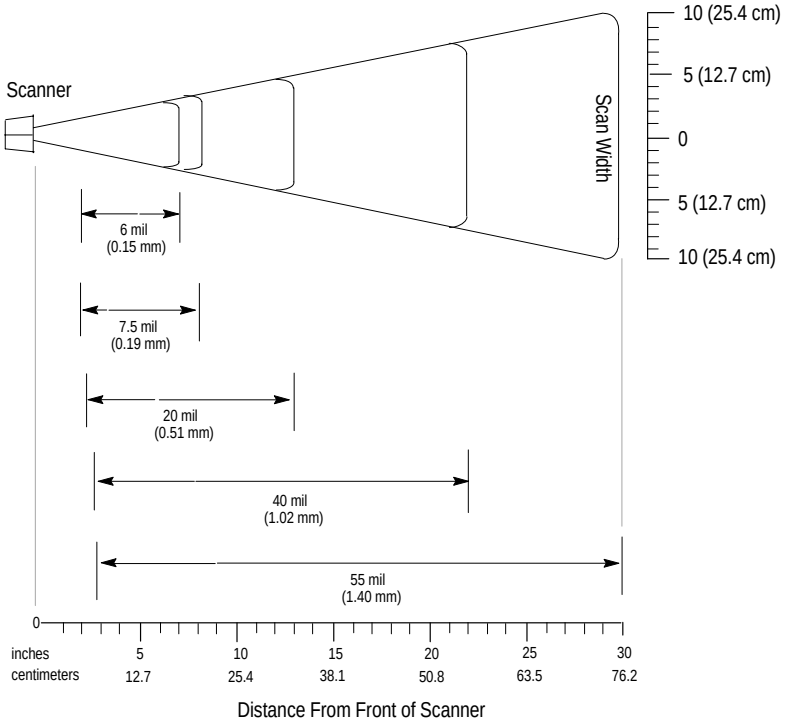
This section show the read ranges for both the:

- 1-D bar codes
- 2-D bar codes

Read Ranges
1-D Bar Codes

Minimum Bar Code Width	Read Range (Catalog No. 2755-HTG-4) Inches / Centimeters
6.0 mil (.15 mm)	2.0 in to 7.25 in (5.1 cm to 18.4 cm)
7.5 mil (.19 mm)	2.0 in to 8.0 in (5.1 cm to 20.3 cm)
20.0 mil (.51 mm)	2.25 in to 13.50 in (5.7 cm to 34.3 cm)
40.0 mil (1.02 mm)	2.5 in to 22.0 in (6.35 cm to 55.9 cm)
55.0 mil (1.40 mm)	2.5 in to 30.0 in (6.35 cm to 76.2 cm)

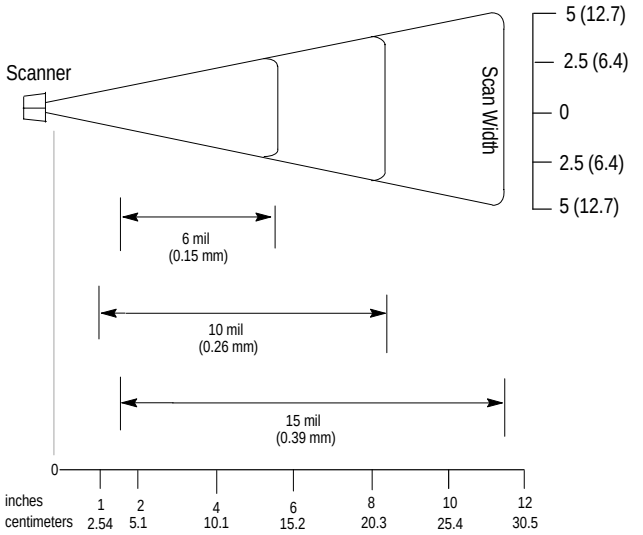
Read Ranges
1-D Bar Codes



Read Ranges
2-D Bar Codes (PDF417)

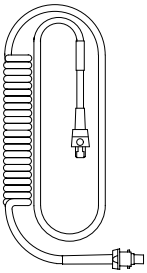
Minimum Bar Code Width	Read Range (Catalog No. 2755-HTG-4) Inches / Centimeters
6.0 mil (.15 mm)	1.5 in to 5.75 in (3.8 cm to 14.6 cm)
10.0 mil (.26 mm)	1.25 in to 8.25 in (3.2 cm to 21.0 cm)
15.0 mil (.39 mm)	1.5 in to 11.50 in (3.8 cm to 29.2 cm)

Read Ranges
2-D Bar Codes



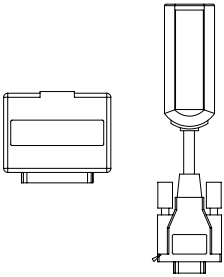
Accessories

The following accessories are available.



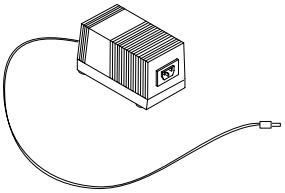
Scanner Cable – Connects scanner to Synapse cable. See page 2–4.

- 8 ft. / 2.44 meter
  (Catalog No. 2755-HTC-GS1-08)



RS-232 Synapse Cables – Provides RS-232 output. Cables are configurable. See page 2–6.

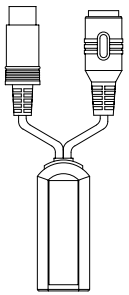
- RS-232-C, 25-pin DB, male, Txd on Pin 3
  (Catalog No. 2755-HFC-SR2-01)
- RS-232-C, 9-pin DB, female, Txd on Pin 2
  (Catalog No. 2755-HFC-SR3-01)



Power Supplies – Connects to RS-232, keyboard wedge or scanner emulation Synapse cable. Provides power to scanner①.

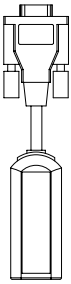
- 100 - 240 VAC, 50 - 60 Hz (Catalog No. 2755-HFP-D1)
- Power cable for power supply, IEC 320 terminated, US 110V AC (Part No. 77121-801-01)
- Power cable for power supply, IEC 320 unterminated, US 240V AC (Part No. 77121-801-02)
- Power cable for power supply, IEC 320 unterminated, European 240V AC (Part No. 77121-801-03)

① Some applications may not require a power supply if the host provides adequate power for the scanner. The ability of the host to provide power varies with system configurations. Scanner with cable requires 390mA at 5 volts (typical).

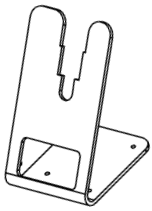


Keyboard Wedge Synapse Cables – Connects between keyboard and host device. Host device receives decoded bar code data the same as keyboard input. See page 2–8.

- For IBM XT/AT keyboard, 5-pin DIN (Catalog No. 2755-HFC-SP1-01)
- For PS/2 keyboard, 6-pin Mini-DIN (Catalog No. 2755-HFC-SP2-01)
- For DEC VT220, 320, 420 keyboards (Catalog No. 2755-HFC-SV1-01)
- For DEC VT520 keyboards (Catalog No. 2755-HFC-SV2-01)

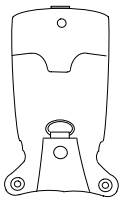


Scanner Emulation Synapse Cable – Provides undecoded scanner output. See page 2–5.



Multi-mount Stand – Rubber coated, fixed mount holder for counter or wall mounting.

- (Catalog No. 2755-HFN-K3)



Protective Boot – Heavy canvas boot provides additional protection for the scanner.

- (Catalog No. 2755-HTN-H1)

Connecting the Scanner

This chapter describes how to connect the scanner to various cables and hardware. Sections include:

- Scanner cable connection
- Scanner Emulation Synapse cable connections
- RS-232 Synapse cable connections
- Keyboard Wedge Synapse cable connections
- Allen-Bradley Enhanced Decoder connection
- Flexible Interface Module (RB) connection
- PLC connection
- SLC connection

Safety

ATTENTION: Caution - use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous laser light exposure.

Overview

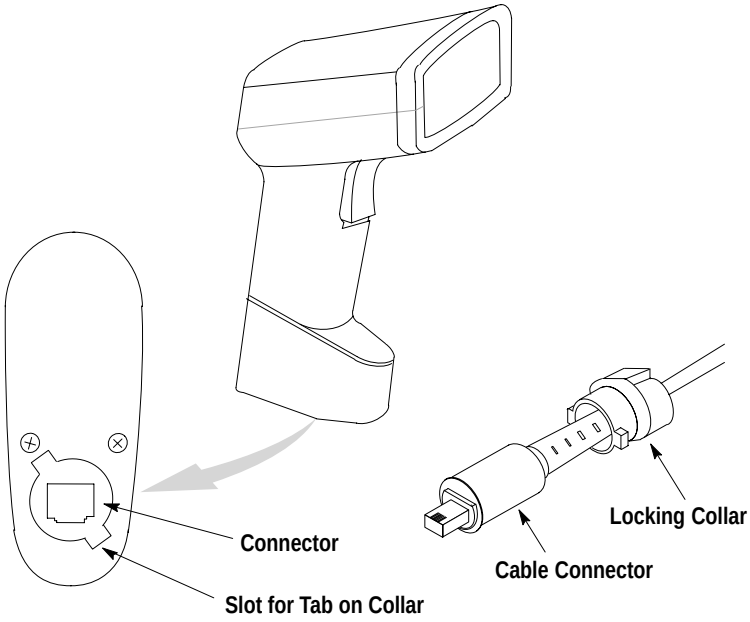
The scanner may be connected to a variety of host devices through a synapse cable. The communication parameters for the cables are configured by scanning bar codes. The three types of cables are:

- RS-232 Synapse cable
- Keyboard Wedge Synapse cable
- Scanner Emulator Synapse cable

All configuration bar codes are in the Programming Guide for 2-D Bar Code Scanners.

Scanner Cable Connection

The scanner cable (Catalog No. 2755-HTC-GS1-08) connects to the bottom of the scanner handle. The other end of the scanner cable connects to the Synapse cable.



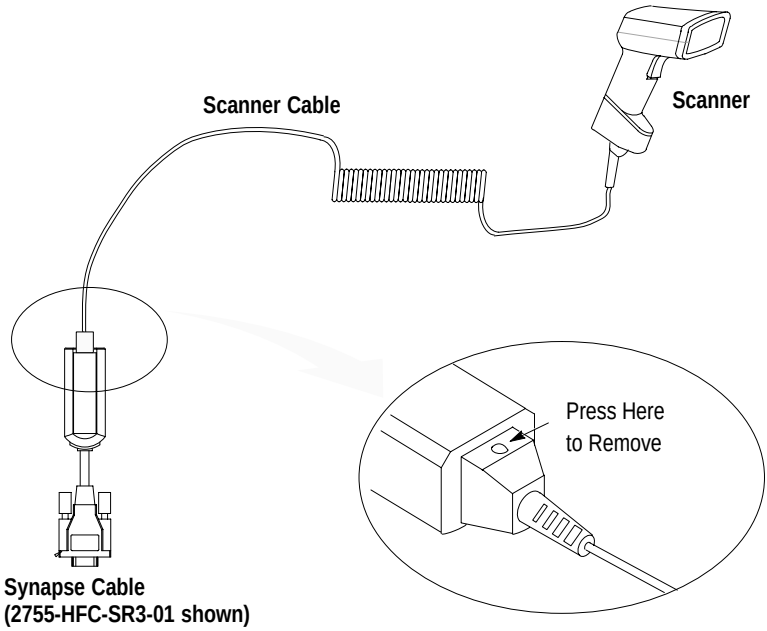
To attach the cable to the scanner:

1. Pull back the locking collar from the connector.
2. Insert the cable connector into the scanner.
3. Align the tabs on the locking collar with the slots on the handle.
4. Push in and turn the locking collar counterclockwise to lock. Connector is locked when flat edge of locking collar aligns with the front edge of the scanner handle.

Remove a scanner cable from a scanner by rotating the locking collar clockwise until the cable be pulled out of the scanner.

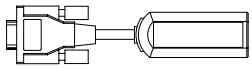
Scanner Cable to Synapse Cable Connection

To connect the scanner cable to a Synapse cable, push the cable into the connector until you hear the connector snap in place. To remove the scanner cable, press down on the small raised bump on the connector end and remove cable.



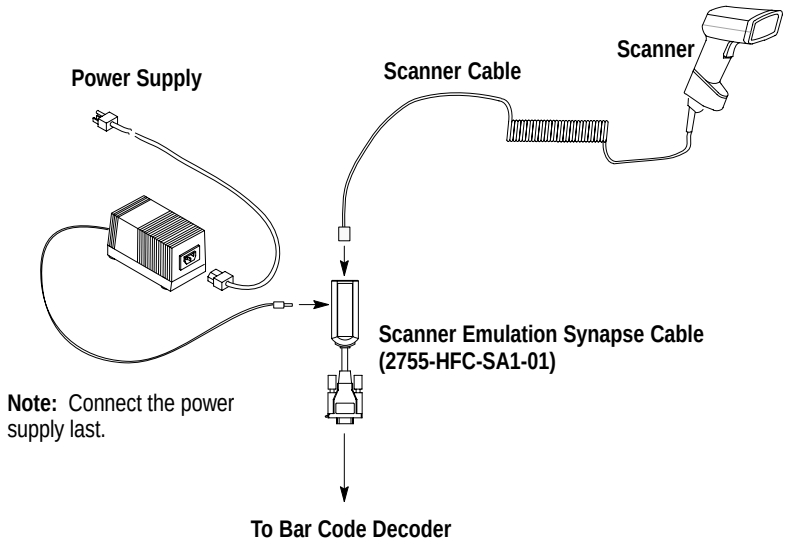
Scanner Emulation Synapse Cable Connections

Use the Scanner Emulation Synapse cable to provide undecoded output to a scanner input port of a bar code decoder (cable has female 9-pin DB connector).



Catalog No. 2755-HFC-SA1-01

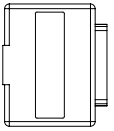
A separate power supply provides power to the scanner. The power supply plugs into the Scanner Emulation Synapse cable.



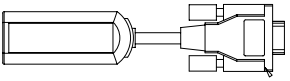
ATTENTION: Do not install the Scanner Emulation Synapse cable with power applied to either the Synapse cable or decoder. Failure to follow this caution may result in damage to the scanner, Synapse cable, or decoder.

RS-232 Synapse Cable Connections

Use the RS-232 Synapse cable to connect the scanner to any host RS-232C input port. Two types of RS-232 Synapse cables are available:



Catalog No. 2755-HFC-SR2-01

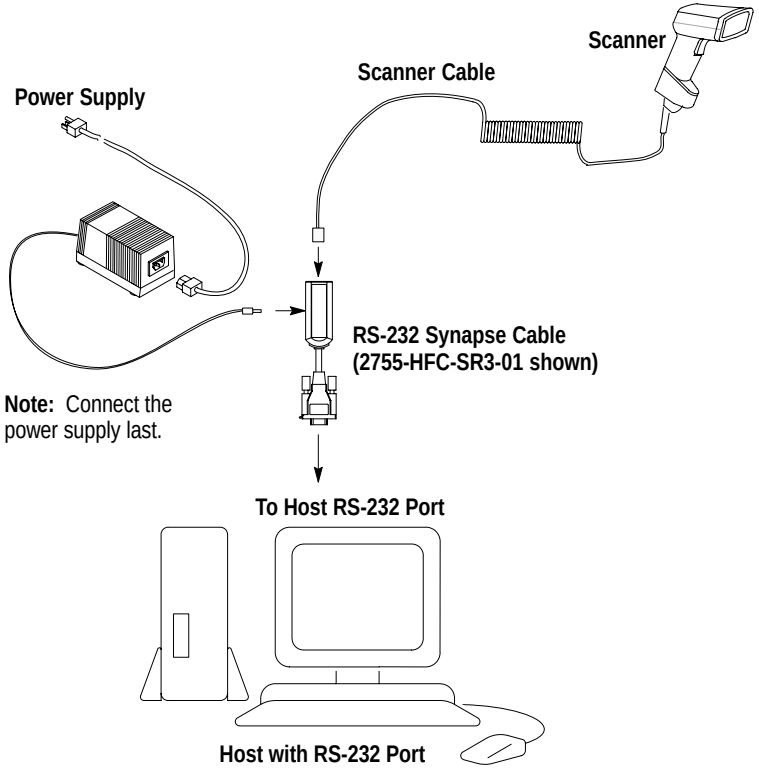


Catalog No. 2755-HFC-SR3-01

RS-232 Synapse Cable	Output Connector	Output Signal
2755-HFC-SR2-01	Male 25-pin DB	RS-232C, Txd on Pin #3
2755-HFC-SR3-01	Female 9-pin DB	RS-232C, Txd on Pin #2

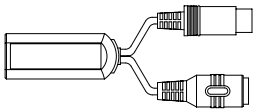
ATTENTION: Do not install the RS-232 Synapse cable with power applied to either the Synapse cable or host device. Failure to follow this caution may result in damage to the scanner, Synapse cable, or host device.

Connect the scanner to an RS-232 port as shown below. A separate power supply provides power to the scanner. The power supply plugs into the RS-232 Synapse cable.

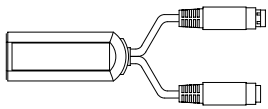


Keyboard Wedge Synapse Cable Connections

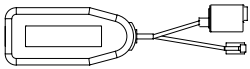
Use the Keyboard Wedge Synapse cable to connect the scanner between a keyboard and a host device. The host device interprets the decoded scanner output the same as keyboard data. Four types of Keyboard Wedge Synapse cables are available:



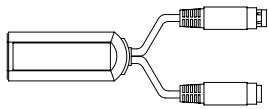
Catalog No. 2755-HFC-SP1-01



Catalog No. 2755-HFC-SP2-01



Catalog No. 2755-HFC-SV1-01

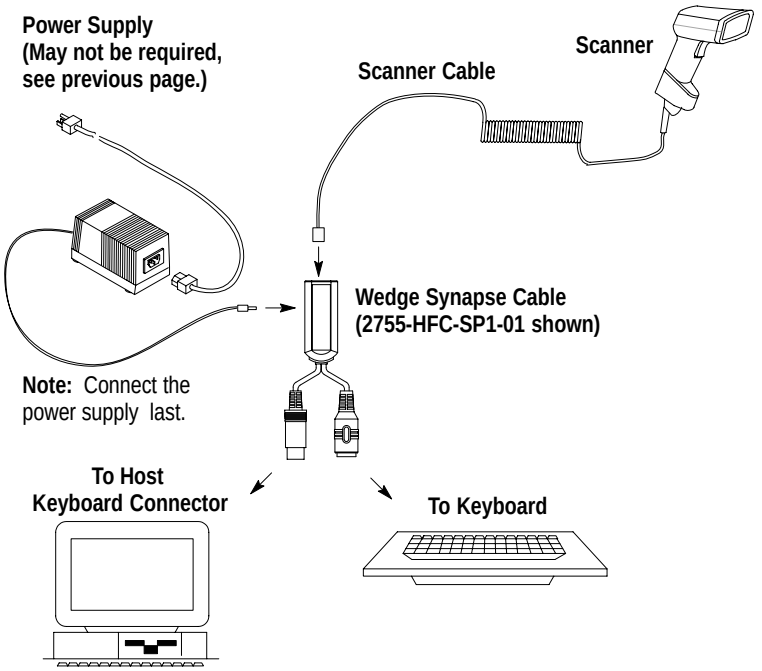


Catalog No. 2755-HFC-SV2-01

Keyboard Wedge Synapse Cable	For Keyboard Type:
2755-HFC-SP1-01	IBM AT/XT Keyboard (5-pin DIN)
2755-HFC-SP2-01	PS/2 Keyboard (6-pin Mini-DIN)
2755-HFC-SV1-01	DEC VT220/320/420
2755-HFC-SV2-01	DEC VT520

A separate power supply plugs into the Synapse cable and provides power to the scanner. The following wedge cable applications may not require the power supply if the host provides adequate power for the scanner (depends on system configuration):

- IBM PC/AT
- IBM PS / 2-50, 55SX, 60, 70, 80
- IBM PC/XT and compatibles
- IBM PS/2-30



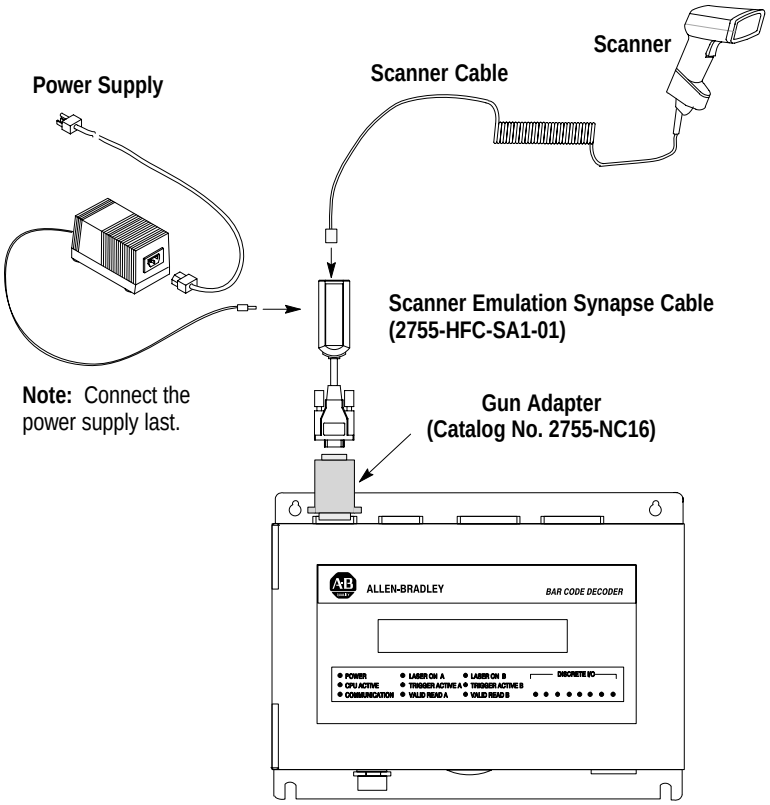
To connect the scanner cable to the keyboard wedge cable, push the cable into the connector until you hear the connector snap in place. To remove the scanner cable, press down on the small raised bump on the connector end and remove cable.

ATTENTION: Do not install the wedge cable or disconnect/connect the keyboard with power applied to either the wedge cable or host device. Failure to follow this caution may result in damage to the scanner, wedge interface cable, or host device.

The Wedge Synapse cable connects between the keyboard and the host device. Unplug the keyboard and connect one end of the wedge cable to the host keyboard input. Connect the other end of the wedge interface cable to the keyboard.

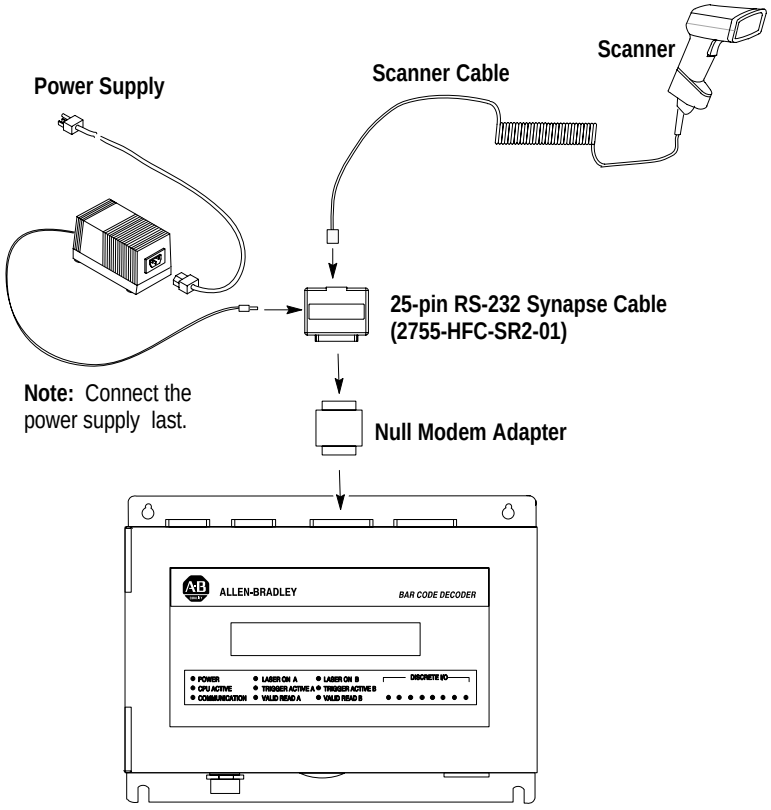
Scanner to Enhanced Decoder Scanner Port Connection

Use the Scanner Emulation Synapse cable (Catalog No. 2755-HFC-SA1-01) and Gun Adapter (Catalog No. 2755-NC16, Series B) to connect the scanner cable to a scanner port on the Allen-Bradley Enhanced Decoders (2755-DS1/DD1).



Scanner to Enhanced Decoder Aux Port Connection

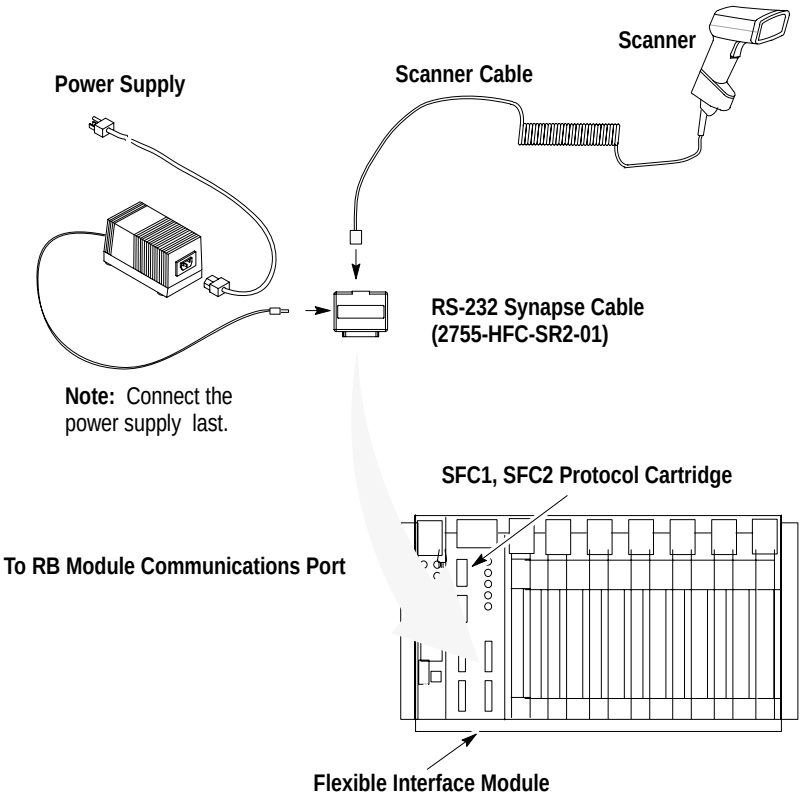
Use the 25-pin RS-232 Synapse cable (Catalog No. 2755-HFC-SR2-01) to connect the scanner cable to Aux port on the Allen-Bradley Enhanced Decoders (2755-DS1/DD1).



Allen-Bradley Enhanced Decoder (2755-DS1/DD1)

Scanner to Flexible Interface (RB) Module Connection

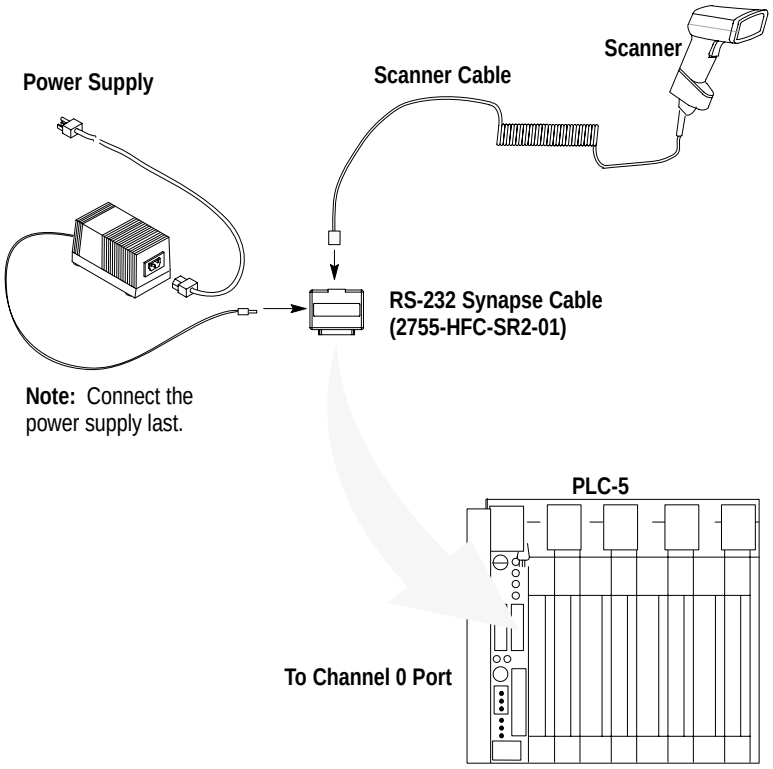
Use the 25-Pin RS-232 Synapse cable (Catalog No. 2755-HFC-SR2-01) to connect the scanner cable to a port on the Flexible Interface Module (Catalog No. 2760-RB). The protocol cartridges (Catalog No. 2760-SFC1, -SFC2) support RS-232 communications.



Refer to the user manual for the Flexible Interface Module for the proper configuration. Make sure the Synapse cable communications settings match the Flexible Interface Module settings for the port.

Scanner to PLC Connection

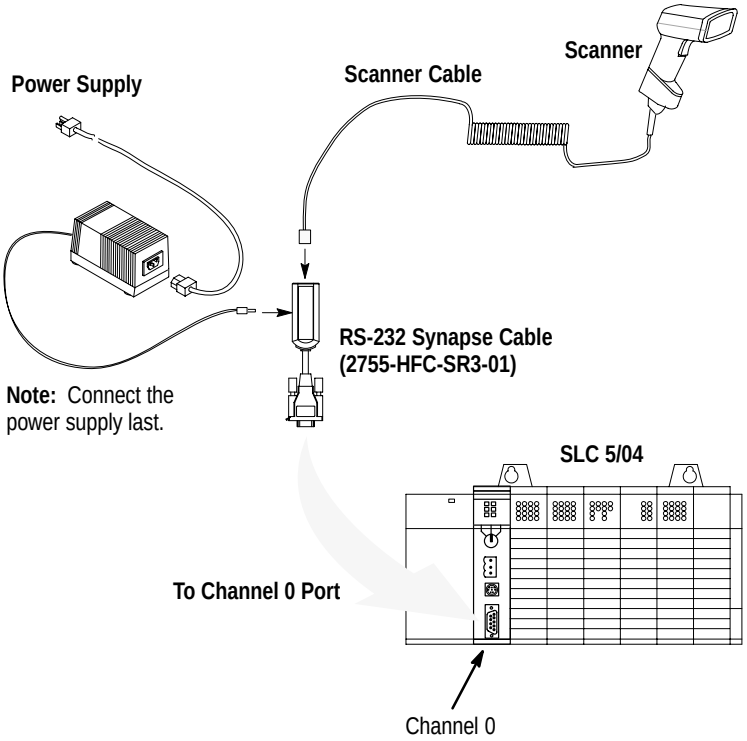
Use the 25-Pin RS-232 Synapse cable (Catalog No. 2755-HFC-SR2-01) to connect the scanner cable to the Channel 0 port of a PLC-5. The Channel 0 port must be configured for RS-232 communications.



Refer to the user manuals for the Allen-Bradley 6200 Series Programming Software to make sure the Channel 0 settings match the Synapse cable settings.

Scanner to SLC Connection

Use the 9-Pin RS-232 Synapse cable (Catalog No. 2755-HFC-SR3-01) to connect the scanner cable to the Channel 0 port on an SLC-5/03 or 5/04. The Channel 0 port must be configured for RS-232 communications.



Refer to the user manuals for the Allen-Bradley Advanced Programming Software (APS) to make sure the Channel 0 settings match the Synapse cable settings.

Operating the Scanner

This chapter describes how to operate the scanner, including:

- Scanning 1-D bar codes
- Scanning 2-D bar codes
- Scan the Entire Label
- Specular Reflection
- Dead Zone
- Beeper Indications

Scanning 1-D Bar Codes

Any scan pattern is adequate for scanning 1-D bar codes.

1. Verify that all connections are secure.
2. Aim the scanner.
   - Aim the scanner at the bar code.
   - Press the trigger. The red LED should light.
   - For proper orientation, while using a scanning pattern, center the beam on the bar code as shown below.

Aiming Dot on Code 39 Bar Code

Slab Raster Pattern on a Code 39 Bar Code

   If you hold the scanner in a position which makes the bar code unreadable, the red LED blinks.

3. Scan a label.

   Make sure the symbol you want to scan is within the scanning range (3 to 11 inches). See page 1–8.

   When the scanner has decoded a symbol successfully:
   - laser turns off
   - green LED lights
   - short, high-tone beep occurs

4. Decoded data is transmitted to the host device using the communication parameters described in Chapter 5.

Scanning 2-D Bar Codes

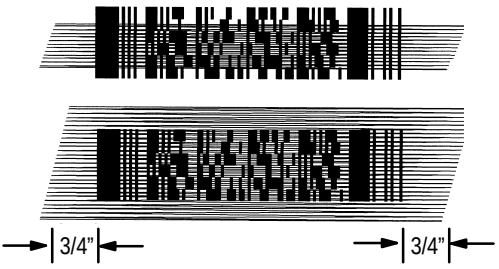
1. Verify that all connections are secure.
2. Aim the scanner. Try to keep the nose of the scanner parallel with the symbol's rows.
3. Scan a label.
   - Make sure the symbol you want to scan is within the scanning range (3 to 8 inches). See page 1–10.
   - Press the trigger.

     The scan pattern first covers the symbol horizontally.

Slab Raster Pattern on a PDF417 Bar Code

   - Make sure the scan pattern extends *at least three quarters* of an inch beyond the edges of the bar code.

     If the pattern is parallel to the symbol's rows, the pattern spreads vertically to cover the symbol. If the pattern does not cover the top and bottom of the symbol, pull the scanner back until it does.



Scan Pattern Spreading over PDF417 Bar Code

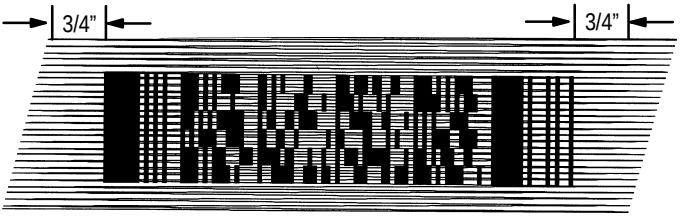
When the scanner has decoded a symbol successfully:

- laser turns off
- green LED lights
- short, high-tone beep occurs

4. Decoded data is transmitted to the host device using the communication parameters described in Chapter 5.

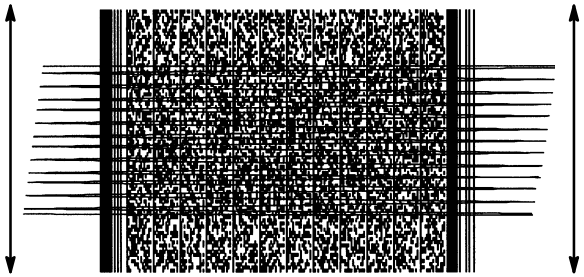
Scan the Entire Bar Code Symbol

- 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).
- Hold the scanner close for denser symbols (but not less than 2 inches).
- In all cases, make sure the scan pattern extends at least *three quarters of an 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. Do three basic things when scanning:
  - Center the aiming pattern on the bar code.
  - Keep the pattern in the same horizontal plane as the bar code.



Orienting Scan Pattern on PDF417 Bar Code

– 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 toward the top.



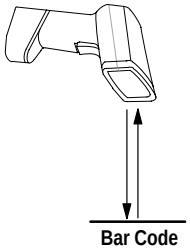
Moving Scan Pattern Up and Down on Tall PDF Symbol

– The scan beam does not have to be perfectly parallel with the top and bottom of the symbol (up to a 4° tilt will work).

Specular Reflection

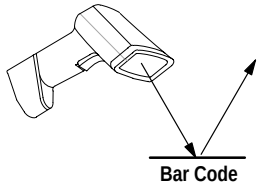
When the laser beam reflects directly back into the scanner from the decode, it can blind the scanner and make decoding difficult. This is called *specular reflection.*

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



1. Specular reflection; reflected beam interferes.

Tilt Back at Slight Angle (up to 30°)

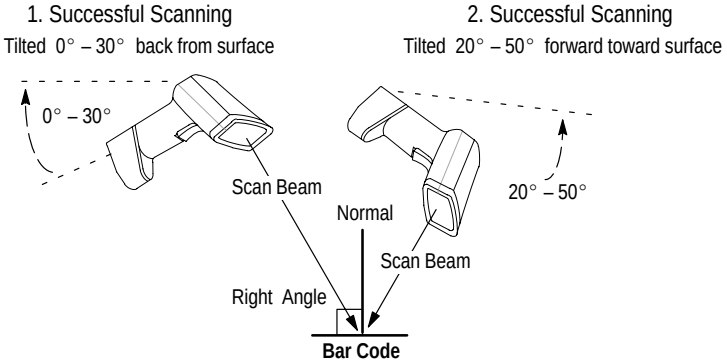


2. No specular reflection. Decode can occur.

Avoiding Specular Reflection

Dead Zone

When 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 when scanning PDF417 (+9° from the direct laser beam). At the same time, the scanner is not effective if its beam hits the bar code's surface at an angle greater than 30° from normal to that surface.



Angles for Good Decodes

You can also scan successfully by tilting the scanner forward from parallel about 20° to 50° toward the scanning surface.

Beeper Indications

When scanning a bar code symbol, listen for a single, short beep from the scanner. This beep indicates a successful decode. Refer to the tables below for all other responses.

Beeper Indications During Normal Operation

This Response	Indicates
1 Beep (short high tone)	Bar code symbol decoded. Beeper Tone must be enabled.
1 Beep (long high tone)	Thermal shutdown.
3 Beeps (short high tone)	Power-on or reset. Occurs immediately after the scanner is turned on, indicating the system software is working properly. If 3 beeps occur during normal operation, it is due to a reset; any work in progress is lost. If this occurs, contact your Allen-Bradley representative.
4 Beep (high/high/high/high tone)	Low battery power. A trill sound following a decode attempt.

Beeper Indications During Configuration

This Response	Indicates
1 Beep (short high tone)	Correct configuration bar code scanned or correct sequence performed.
1 Beep (high / low / high / low tone)	Exited configuration mode without changing parameter setting.
2 Beeps (low / high tone)	Input error. Possible causes are: Incorrect bar code scanned. Incorrect sequence of bar codes scanned. Cancel scanned. Remain in configuration mode.

Beeper Indications During Communication

This Response	Indicates
4 Beeps (short high tone)	Communication error in the indication field.
4 Beeps (high / high / high / low tone)	Receive error.
3 Beeps (low / high / low tone)	ADF transmit error.

Configuring the Scanner

This chapter describes the scanner configuration options.

Important Notes on Configuring Scanner

- Bar codes for configuring the scanner and Synapse cable are located in the Programming Guide for 2-D Bar Code Scanners (Publication 2755-6.7).
- Configure the scanner.
- Configure the Synapse cable. Separate configuration codes are scanned to configure the cable.

  Chapter 5 describes the communication setup (cable configuration) codes for the RS-232, keyboard wedge cable, scanner emulation.

Configuration Bar Codes for Scanner

All configuration bar codes are found in the Programming Guide for 2-D Bar Code Scanners (Publication 2755-6.7). The scanner is always enabled to read Code 128 configuration bar codes since all configuration codes use this symbology.

Configuring the Scanner

1. Connect the appropriate Synapse cable to the scanner.
2. Apply power to the Synapse cable (if required).
3. Scan the **Set Defaults** bar code (in the Programming Guide for 2-D Bar Code Scanners) to configure the scanner with default settings. Table 4.A lists the scanner default settings.
4. Scan individual bar codes (in the Programming Guide for 2-D Bar Code Scanners) for parameters you want to change.
5. Scan the communication bar codes for the **Synapse** cable.

Scanner Default Settings

Table 4.A
Scanner Default Settings

Configuration Parameters	Default Setting	Programming Guide Reference
Set Default	Set Defaults	1-1
Symbologies	All Enabled, except I 2 of 5, and Codabar	1-3
Code 39 Options		
Code 39 Full ASCII	Enabled	1-6
Code 39 Check Digit	Disabled	1-6
UPC/EAN Options		
Transmit UPC-A Check Digit	Enabled	1-7
Transmit UPC-E Check Digit	Enabled	1-7
Convert UPC-E to UPC-A	Disabled	1-7
Decode UPC / EAN Supplemental	Disabled	1-8
Convert EAN-8 to EAN-13	Disabled	1-8
UPC-A Preamble	System Character	1-9
UPC-E Preamble	System Character	1-9

Configuration Parameters	Default Setting	Programming Guide Reference
Code Lengths		
Code 39 – Any Length	None	1-10
Code 39 – Length Within Range	Range (1-55)	1-10
Code 39 – 1 Discrete Length	None	1-10
Code 39 – 2 Discrete Lengths	None	1-10
Codabar – Any Length	Range (2-55)	1-11
Codabar – Length Within Range	Range (2-55)	1-11
Codabar – 1 Discrete Length	None	1-11
Codabar – 2 Discrete Lengths	None	1-11
Interleaved 2 of 5 – Any Length	Range (2-54)	1-12
Interleaved 2 of 5 – Length Within Range	None	1-12
Interleaved 2 of 5 – 1 Discrete Length	14	1-12
Interleaved 2 of 5 – 2 Discrete Lengths	None	1-12
Data Format Options		
Prefix/Suffix	Enter	1-14
Data Transmission Format	<Data> As Is	1-16
Transmit No Read Message	Disabled	1-17
Transmit LRC Checksum	Disabled	1-17
Transmit Code ID Character	Disabled	1-18
Decode Options		
Beep After Good Decode	Enabled	1-19
Beeper Tone	High	1-19
Decode Buffering	Disabled	1-19
Pause Duration	0.0 seconds	1-20
Decode Attempt Duration	5 seconds	1-20
Scanning Options		
Smart Raster Mode	Enabled	1-22
Hand-Held Options	Slab Raster	1-22

Set Defaults

Scan the **Set Defaults** bar code to return all parameters to the default values listed in Table 4.A.

Select Symbologies

Scan the bar code labels for the symbologies you want the scanner to decode. Only enable the symbologies you expect to read. The scanner automatically discriminates between all of the symbologies below. The only exception is that the scanner cannot discriminate between Code 39 and Code 39 Full ASCII.

- UPC Versions A and E (EAN 8 and 13)
- Code 39 (Code 39 Full ASCII)
- Codabar
- UCC/EAN 128
- Interleaved 2 of 5
- Discrete 2 of 5
- PDF417

By default, all symbologies are enabled except Interleaved 2 of 5 and Codabar.

To enable a symbology, scan the **Enable** bar code for the symbology.

To disable a symbology, scan the **Disable** bar code. You can enable all code types (only Code 39 Full ASCII is disabled).

Code 39 Options

Code 39 Full ASCII

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

The first 32 codes are non-printable and are assigned to keyboard control keys, 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 characters ($ + % /) preceding a Code 39 symbol and assigns an ASCII character value. For example, when **+B** is scanned, it is interpreted as b, **%J** as ?, and **$H** emulates the keystroke BACKSPACE. Scanning **ABC$M** outputs the keystroke equivalent ABC ENTER.

Refer to Appendix C for a list of the Code 39 Full ASCII codes.

The scanner cannot autodiscriminate between Code 39 and Code 39 Full ASCII symbols.

Code 39 Check Digit

When enabled, this parameter checks the integrity of a Code 39 symbol to ensure that is complies with specified algorithms.

UPC / EAN Options

The section defines options available for UPC-A and UPC-E codes.

Transmit UPC-A Check Digit

When enabled, UPC-A symbol data is transmitted with the check digit. Enabled is the default.

Transmit UPC-E Check Digit

When enabled, UPC-E symbol data is transmitted with the check digit. Enabled is the default.

Convert UPC-E to UPC-A

When enabled, this option converts UPC-E (zero suppressed) decoded data to a UPC-A format before transmission. After conversion, the output data follows UPC format and follows UPC-A programming selections (e.g., preamble, check digit). Disabled is the default.

Decode UPC / EAN Supplemental

The options for decoding UPC/EAN supplemental digits are:

- **Enabled** – supplemental digits are decoded (2 or 5 according to specific code format conventions, e.g., UPC A+2, UPC E+2, EAN 8+2). Only symbols with supplemental digits are decoded.
- **Disabled** – supplemental digits are ignored even if present. Disabled is the default.
- **Autodiscriminate** – codes with and without supplemental digits are decoded.

To minimize the risk of invalid data transmission, we recommend that you select whether to read or ignore supplemental characters.

UPC / EAN Options (Continued)

Convert EAN-8 to EAN-13

When enabled, five leading zeros are added to decoded EAN 8 symbols. The five zeros make the EAN 8 symbols compatible with the EAN 13 format. Disabled is the default.

UPC-A / UPC-E Preambles

Three options are available 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. The preamble is considered a part of the symbol. The three options are:

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

The system character is the the first character on the left side of the symbol. The country code for UPC is always 0, and cannot be transmitted without the system character. System character is the default.

Code Lengths

The length of a code refers to the number of characters (human readable characters) the code contains. You can set the code length for certain one-dimensional code types (Code 39, Codabar, Interleaved 2 of 5) to any length, one or two disrete lengths, or lengths within a specific range. You cannot set a discrete length for Code 128.

Any Length

Select this option to decode a one-dimensional code containing any number of characters. For example, to scan a Codabar symbol containing any number of characters, scan **Codabar Any Length**.

Length Within Range

Select this option to decode a one-dimensional code containing a length within a specified range. For example, to decode Code 39 codes containing between 4 and 12 characters, scan the **Code 39 Length Within Range** code. Then scan, **0**, **4**, **1**, **2**. Single digit numbers must be preceded with a zero.

One Discrete Length

Select this option to decode only one-dimensional codes containing a selected length. For example, to decode Codabar codes containing 14 characters, scan **Codabar – One Discrete Length**. Then scan **1** and **4**.

Two Discrete Lengths

Select this option to decode only one-dimensional codes containing two selected lengths. For example, to decode Interleaved 2 of 5 codes containing 2 or 14 characters, scan **Interleaved 2 of 5 – Two Discrete Lengths**. Then scan **0**, **2**, **1, 4**. Single digit numbers must be preceded with a zero.

Data Format Options

Prefix / Suffix

You can add a prefix/suffix to bar code data. To enter a prefix/suffix, you must scan a four digit number (four bar codes) that represents the ASCII equivalent value for each character (See ASCII Characters in Appendix C). When you enter the last digit of a prefix or suffix, the scanner lets you know that you have entered a valid value by providing a high-low-high beep.

The default prefix/suffix is the ENTER key (ASCII equivalent 1073).

For example, to add the prefix < (ASCII equivalent 1060) to bar code data, scan these labels:

- **Prefix**
- **1** (under Prefix/Suffix Values)
- **0** (under Prefix/Suffix Values)
- **6** (under Prefix/Suffix Values)
- **0** (under Prefix/Suffix Values)

For example, to add the suffix > (ASCII equivalent 1062) to bar code data, scan these labels:

- **Suffix**
- **1** (under Prefix/Suffix Values)
- **0** (under Prefix/Suffix Values)
- **6** (under Prefix/Suffix Values)
- **2** (under Prefix/Suffix Values)

Transmit No Read Message

When enabled, this option transmits “NR” when a symbol does not decode. Enabled prefixes and suffixes are appended around this message. The default is disabled.

Data Format Options (continued)

Data Transmission Format

You can specify whether or not the prefix and/or suffix is added to decoded bar code data. The options are listed below.

<Data>	Sends only bar code data.
<Prefix><Data>	Sends bar code data with a prefix
<Data><Suffix>	Sends bar code data with a suffix
<Prefix><Data><Suffix>	Sends bar code data with a prefix and suffix

The prefix and suffix are user defined. For example, the prefix [and suffix] are defined for bar code data. To send the decoded bar code data with the prefix only, scan these labels:

- **Scan This Symbol First**
- **<Prefix><Data>**
- **Scan Enter After Selecting Option**

Transmit LRC Checksum

When enabled, this option appends an LRC checksum character at the end of a decode transmission. The default is disabled.

With LRC Checksum enabled, the format of the output data is:

<STX> <DATA . . . > <ETX> <LRC> .

If <DATA . . . > contains the special characters STX, ETX, and DLE, the 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.

Transmit Code ID Character

When enabled, this option transmits a code ID character or an AIM ID character to identify the code type of the symbol scanned. This option is useful if you are scanning more than one code type. If a prefix is defined, the code ID character is sent after the prefix and before the decoded symbol. The default is to not transmit a Code ID character.

Code ID characters are listed below. AIM ID characters are listed in Appendix D.

Code Type	Code Identifier (ID)
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
UCC/EAN 128	K
PDF417	X

Decode Options

Beep After Good Decode

When enabled, the beeper sounds during scanning. We recommend that you operate the unit with the beeper enabled. The default is enabled.

The beeper always operates during parameter menu scanning and indicates error conditions. See page 3–8 for beeper indications.

Beeper Tone

Sets the decode beep frequency or tone to low, medium or high. The default is high.

Decode Buffering

When enabled, this option allows the scanner to store decoded data until the host device is ready to receive them. If the scanner reaches its capacity for storing decoded symbols before the host is ready, subsequent triggers have no effect until the buffer is available. The default is disabled.

Pause Duration

This parameter inserts a pause after a bar code is scanned to allow time for the data to be decoded and transferred to the host. You can set a pause duration in .1 (1/10) second intervals from 0.1 to 9.9 seconds. Pauses are set by scanning a two digit number. The default is 0.0 seconds.

For example, to set a .5 (1/2) second delay, scan the following labels:

- **Pause Duration**
- **0** (under Pause Duration)
- **5** (Under Pause Duration)

Decode Attempt Duration

Sets the maximum time decode processing continues during a scan attempt. You set the duration in .1 second increments from 0.1 to 9.9 seconds. The recommended interval is between 1.0 and 5.0 seconds. The default is 5.0 seconds. A longer interval is appropriate for PDF417 symbols that are hard to decode.

The duration is set by scanning a two digit number. For example, to set the interval to 6.0 seconds, scan the labels:

- **Decode Attempt Duration**
- **6** (under Pause Duration)
- **0** (Under Pause Duration)

Scanning Options

Smart Raster Mode

When enabled, Smart Raser Mode automatically detects the height of the PDF417 symbol and expands the raster pattern to cover the symbol vertically. Change this mode only if the raster pattern cannot cover a poorly printed symbol. The default is Smart Raster enabled.

Hand–Held Options

Select the scanning pattern.

- **Slab raster** – In this mode, a trigger pull yields a slab raster pattern. This is the default.
- **Aiming dot** – In this mode, a trigger pull creates a bright aiming dot. The aiming dot helps you to center the pattern while aiming the scanner, especially in bright light conditions. You can select aiming dot with either a normal timeout or an extended timeout.

  Depending on the selected option, a standard slab raster or an open raster appears when the dot expires.
- **Always raster** – When Always Raster is enabled, a trigger pull causes the scanner to open a full raster pattern. Always Raster does not exclude aiming dot or slab raster options because a raster always follows when the aiming dot expires.

Communication Setup (Synapse Cable)

This chapter describes how to configure scanner communication parameters. The types of options available depends on the synapse cable you are using.

For This Cable:	See These Pages:
RS-232 Synapse Cables	5–2 through 5–8
IBM PC Keyboard Wedge Synapse Cables	5–9 through 5–12
DEC VT520 Keyboard Wedge Synapse Cable	5–13 through 5–15
DEC VT220, VT320, VT420 Keyboard Wedge Synapse Cable	5–16 through 5–18
Scanner Emulation Synapse Cable	5–19 through 5–23

Important: All programming codes are located in the Programming Guide for 2-D Bar Code Scanners (Publication 2755-6.7).

Cable Defaults

To set cable defaults, scan the default label for the synapse cable you are using. Refer to each cable section for a table listing the defaults. The selections for cable defaults are:

- Set RS-232 Synapse Cable Defaults
- Set IBM PC Keyboard Wedge Synapse Cable Defaults
- Set DEC VT 520 Keyboard Wedge Synapse Cable Defaults
- Set DEC VT VT220, VT320, VT420 Wedge Synapse Cable Defaults

Setting RS-232 Synapse Cable Options

This section defines the communication options available when the scanner is connected to one of these RS-232 Synapse cables:

- Catalog No. 2755-HFC-SR2-01
- Catalog No. 2755-HFC-SR3-01

Default Settings

Scanning the **Set RS-232 Synapse Cable Defaults** bar code sets the following parameters:

Parameter	Default Setting	Refer to Description on Page:	Programming Guide ① Page Reference
Host	Standard RS-232	5–3	2-3
Baud Rate	9600	5–3	2-4
Parity	None	5–4	2-5
Check Parity	Enabled	5–4	2-6
Stop Bits	1	5–4	2-6
Data Bits	8	5–4	2-6
Hardware Handshaking	None	5–5	2-7
RTS State	Low	5–5	2-7
Software Handshaking	None	5–6	2-8
Beep on BEL	Enabled	5–7	2-9
Unknown Characters	Send Bar Codes With Unknown Characters	5–7	2-9
Response Timeout	2 seconds	5–7	2-10
Parameter Set	Set #1	5–8	2-12

① Programming Guide for 2-D Bar Code Scanners (Publication 2755-6.7).

Host Selection

Currently, the only host selection is for standard RS-232 communications. Additional host selections may be added in the future.

- Standard RS-232 (default)

Baud Rate

Sets the rate (bits per second) at which the scanner transmits data. The scanner baud rate setting must match the host setting.
The selections are:

- 110
- 300
- 600
- 1200
- 2400
- 4800
- 9600 (default)
- 19200

Setting RS-232 Synapse Cable Options (Continued)

Parity

Set the parity of each ASCII coded character that is transmitted. Make sure the parity matches the requirements of the host. The selections are:

- Odd
- Even
- Mark (parity bit always set to 1)
- Space (parity bit always set to 0)
- None (default)

Check Parity

When enabled, the scanner checks the parity bit.

Number of Stop Bits

The stop bit marks the end of each character transmitted. Set the number of stop bits to match the host device. The selections are:

- 1 Stop Bit (default)
- 2 Stop Bits

Data Bits

Determines the number of data bits for each ASCII character. The selections are:

- 7 data bits
- 8 data bits (default)

Hardware Handshaking

When enabled, handshaking verifies the readiness of a receiving device before data is transmitted. You can enable or disable the hardware handshaking lines. The DTR (Data Terminal Ready) signal is either active high or low (see below).

This is how the scanner handshaking functions:

1. The scanner checks the Clear to Send (CTS) line. If CTS is active, the scanner will wait for up to 2 seconds and check the line again. If the line is still active, the scanner will provide an audible beep and any scanned data will be lost.
2. If the CTS line is not active, the scanner will assert the Request to Send (RTS) line and wait for two seconds for the host to assert the CTS line. When the host asserts the CTS line, the scanner transmits the data.
3. After the transmission is completed, the scanner negates the RTS.
4. The host device should then negate CTS. The scanner checks the CTS line on the next transmission.

RTS State

Selects the active state for the Request to Send (RTS) signal. Make sure that this setting matches the requirements of the host device. The selections are:

- RTS State Low (default)
- RTS State High

Setting RS-232 Synapse Cable Options (Continued)

Software Handshaking

Software handshaking controls the transmission of data. Use software handshaking instead of (but not with) hardware handshaking. The four options are:

- None (default)
- ACK/NAK Only
- ENQ Only
- ACK/NAK with ENQ
- XON/XOFF

ACK/NAK Only checks the result of a transmission. The scanner waits for one of two response from the host: ACK which means a successful transmission or NAK which means there was a problem. Whenever the scanner receives a NAK, it retransmits the data up to three times. If an ACK is still not received after three attempts, the transmission is aborted and the scanner will provide four short beeps.

ENQ Only requires that the scanner receive an enquire character (ENQ) from the host before sending data. With ENQ enabled, the scanner must receive an ENQ from the host within a two second period after the last scan or a transmission error occurs. The scanner will provide four short beeps to indicate the error.

ACK/NAK with ENQ combines both ACK/NAK and ENQ options.

With **XON/ XOFF** enabled, the Synapse cable assumes an XON for the first transmission. The scanner will transmit data until an XOFF is received from the host device. If an XON is not received within 30 seconds after an XOFF, a transmission error occurs.

Beep on BEL

When enabled, the scanner will beep when a <BEL> character is detected on the RS-232 link. <BEL> may be used to indicate an event such as an illegal entry.

Unknown Characters

Unknown characters are characters not recognized by the scanner. When **Send Bar Codes with Unknown Characters** is enabled, all decoded bar code data is transmitted except for the unknown characters. If this option is disabled, bar codes containing one or more unknown characters are not transmitted.

Response Timeout

The response timeout determines the maximum amount of time the scanner will wait before it assumes the end of a transmission. The timeout period may be from 0.0 to 9.9 seconds in 0.1 second increments. The default is 2.0 seconds.

To enter a new timeout, scan the timeout label followed by the two digit timeout. The decimal point is fixed between the first and second digits.

Setting RS-232 Synapse Cable Options (Continued)

Advanced Features

The advanced feature options allow you to store communication parameters for up to two applications. If you have already configured the scanner, all of the communication settings are stored as Parameter 1 settings (default setting). Using the advanced feature options, you can also create Parameter 2 settings. When using the scanner, scan the correct parameter setting bar code to configure the scanner for each application.

To set Parameter Set 1 configuration:

Configure the scanner communications as described in this chapter. Since Parameter Set 1 is the default you do not have to scan the **Parameter Set 1** bar code.

To change the Parameter Set 1 configuration after storing settings in Parameter Set 2, scan the Parameter Set 1 code and then change the communication parameters as necessary.

To set Parameter Set 2 configuration:

1. Scan the **Parameter Set 2** bar code.
2. Configure the scanner communication parameters as described in this chapter.

To set defaults for a parameter set, scan the appropriate default bar code. The selections are:

- **Set Cable Defaults Current Parameter Set**
- **Set Cable Defaults Both Parameter Sets**

Setting IBM PC Keyboard Wedge Synapse Cable Options

This section defines the communication options available when the scanner is connected to one of these IBM AT/XT or PS/2 Keyboard Wedge Synapse cables:

- Catalog No. 2755-HFC-SP1-01
- Catalog No. 2755-HFC-SP2-01

Defaults Settings

Scan the **Set PC Wedge Synapse Cable Defaults** bar code to set the synapse cable to default settings. The following table lists the default settings.

Parameter	Default Setting	Refer to Description on Page:	Programming Guide ① Page Reference
Host	IBM PC/AT IBM PS/2-50, 55SX, 60, 70, 80	5–10	3-2
Country	North American	5–10	3-3
Bar Codes with Unknown Labels	Send Bar Codes With Unknown Characters	5–11	3-4
Intercharacter Delay	5 milliseconds	5–11	3-4
Parameter Set	Parameter Set 1	5–12	3-5

① Programming Guide for 2-D Bar Code Scanners (Publication 2755-6.7)

Setting IBM PC Keyboard Wedge Synapse Cable Options (Continued)

Host Selection

Select the type of host the scanner will be communicating with. The selections are:

- IBM PC/AT , PS/2-50, 55SX, 60, 70, 80 (default)
- IBM PC/XT
- IBM PS/2-30
- NCR 7052

Country Selection

Select the country for the keyboard type the synapse cable is connected to. The selections are:

- North American (default)
- German
- French
- French International
- Spanish
- Italian
- Swedish
- British

Unknown Characters

Unknown characters are characters not recognized by the scanner. When **Send Bar Codes with Unknown Characters** is enabled (default), all decoded bar code data is transmitted except for the unknown characters. If this option is disabled, bar codes containing one or more unknown characters are not transmitted.

Intercharacter Delay

Setting an intercharacter delay provides the host time to perform processing tasks between characters. The default is short delay (5 msec). The options are:

- Short 5 msec delay (default)
- Medium 50 msec delay
- Long 99 msec delay

Setting IBM PC Keyboard Wedge Synapse Cable Options (Continued)

Advanced Features

The advanced feature options allow you to store communication parameters for up to two applications. If you have already configured the scanner, all of the communication settings are stored as Parameter 1 settings (default setting). Using the advanced feature options, you can also create Parameter 2 settings. When using the scanner, scan the correct parameter setting bar code to configure the scanner for each application.

To use and/or set Parameter Set 1 configuration:

Configure the scanner communications as described in this chapter. Since Parameter Set 1 is the default you do not have to scan the **Parameter Set 1** bar code.

To change the Parameter Set 1 configuration after storing settings in Parameter Set 2, scan the Parameter Set 1 code and then change the communication parameters as necessary.

To use and/or set Parameter Set 2 configuration:

1. Scan the **Parameter Set 2** bar code.
2. Configure the scanner communication parameters as described in this chapter.

To set defaults for a parameter set, scan the appropriate default bar code. The selections are:

- **Set Cable Defaults Current Parameter Set**
- **Set Cable Defaults Both Parameter Sets**

Setting DEC VT520 Keyboard Wedge Synapse Cable Options

This section defines the communication options available when the scanner is connected to this DEC Keyboard Wedge Synapse cable:

- Catalog No. 2755-HFC-SV2-01

Default Settings

Scan the **Set DEC VT 520 Keyboard Wedge Synapse Cable Defaults** bar code to set the Synapse cable to default settings. Refer to the table below for the default settings.

Parameter	Default Setting	Refer to Description on Page:	Programming Guide① Page Reference
Host	DEC VT520	5–14	4-2
Country	North American	5–14	4-2
Unknown Characters	Send Bar Codes With Unknown Characters	5–14	4-4
Intercharacter Delay	5 Millisecond	5–14	4-4
Parameter Set	Parameter Set 1	5–15	4-5

① Programming Guide for 2-D Bar Code Scanners (Publication 2755-6.7)

Setting DEC VT520 Keyboard Wedge Synapse Cable Options (Continued)

Host Selection

Select the type of host the scanner will be communicating with. The selections are:

- DEC VT520 (default)
- DEC VT520 with PS/2 Keyboard

Country Selection

Select the country for the keyboard type the Synapse cable is connected to. The selections are:

- North American (default)
- German
- French
- French International
- Spanish
- Italian
- Swedish
- British

Unknown Characters

Unknown characters are characters not recognized by the scanner. When **Send Bar Codes with Unknown Characters** is enabled (default), all decoded bar code data is transmitted except for the unknown characters. If this option is disabled, bar codes containing one or more unknown characters are not transmitted.

Intercharacter Delay

Some devices require a delay between characters to simulate the effect of keystroke delays (characters are sent at a lower rate). The default is short delay (5 msec). The options are:

- Short 5 msec delay (default)
- Medium 50 msec delay
- Long 99 msec delay

Advanced Features

The advanced feature options allow you to store communication parameters for up to two applications. If you have already configured the scanner, all of the communication settings are stored as Parameter 1 settings (default setting). Using the advanced feature options, you can also create Parameter 2 settings. When using the scanner, scan the correct parameter setting bar code to configure the scanner for each application.

To set Parameter Set 1 configuration:

Configure the scanner communications as described in this chapter. Since Parameter Set 1 is the default you do not have to scan the **Parameter Set 1** bar code.

To change the Parameter Set 1 configuration after storing settings in Parameter Set 2, scan the Parameter Set 1 code and then change the communication parameters as necessary.

To set Parameter Set 2 configuration:

1. Scan the **Parameter Set 2** bar code.
2. Configure the scanner communication parameters as described in this chapter.

To set defaults for a parameter set, scan the appropriate default bar code. The selections are:

- **Set Defaults Current Parameter Set**
- **Set Defaults Both Parameter Sets**

Setting DEC VT220 / VT320 / VT420 Keyboard Wedge Synapse Cable Options

This section defines the communication options available when the scanner is connected to this DEC Keyboard Wedge Synapse cable:

- Catalog No. 2755-HFC-SV1-01

Default Settings

Scan the **Set DEC VT 20/320/420 Wedge Synapse Cable Defaults** bar code to set the Synapse cable to default settings. The table below lists the defaults.

Parameter	Default Setting	Refer to Description on Page:	Programming Guide ① Page Reference
Host	DEC VT220 / 320	5–16	5-2
Country	North American	5–17	5-2
Unknown Characters	Send Bar Codes With Unknown Characters	5–17	5-4
Intercharacter Delay	5 Millisecond	5–17	5-4
Parameter Set	Parameter Set 1	5–18	5-5

① Programming Guide for 2-D Bar Code Scanners (Publication 2755-6.7)

Host Selection

Select the type of host the scanner will be communicating with. The selections are:

- DEC VT 220/320 (default)
- DEC VT420

Country Selection

Select the country for the keyboard type the Synapse cable is connected to. The selections are:

- North American (default)
- German
- French
- French International
- Spanish
- Italian
- Swedish
- British

Unknown Characters

Unknown characters are characters not recognized by the scanner. When **Send Bar Codes with Unknown Characters** is enabled (default), all decoded bar code data is transmitted except for the unknown characters. If this option is disabled, bar codes containing one or more unknown characters are not transmitted.

Intercharacter Delay

Some devices require a delay between characters to simulate the effect of keystroke delays (characters are sent at a lower rate). The default is short delay (5 msec). The options are:

- Short 5 msec delay (default)
- Medium 50 msec delay
- Long 99 msec delay

Setting DEC VT220 / VT320 / VT420 Keyboard Wedge Synapse Cable Options (Continued)

Advanced Features

The advanced feature options allow you to store communication parameters for up to two applications. If you have already configured the scanner, all of the communication settings are stored as Parameter 1 settings (default setting). Using the advanced feature options, you can also create Parameter 2 settings. When using the scanner, scan the correct parameter setting bar code to configure the scanner for each application.

To set Parameter Set 1 configuration:

Configure the scanner communications as described in this chapter. Since Parameter Set 1 is the default you do not have to scan the **Parameter Set 1** bar code.

To change the Parameter Set 1 configuration after storing settings in Parameter Set 2, scan the Parameter Set 1 code and then change the communication parameters as necessary.

To set Parameter Set 2 configuration:

1. Scan the **Parameter Set 2** bar code.
2. Configure the scanner communication parameters as described in this chapter.

To set defaults for a parameter set, scan the appropriate default bar code. The selections are:

- **Set Defaults Current Parameter Set**
- **Set Defaults Both Parameter Sets**

Setting Scanner Emulation Synapse Cable Options

This section defines the communication options available when the scanner is connected to this Scanner Emulation Synapse cable:

- Catalog No. 2755-HFC-SA1-01

Default Settings

Scan the **Set Scanner Emulation Cable Defaults** bar code to set the Synapse cable to default settings. Refer to the table below for the default settings.

Parameter	Default Setting	Refer to Description on Page:	Programming Guide① Page Reference
Emulation	Standard	5–20	6-2
Leading Margin	80 Millisecond	5–20	6-3
Decode LED	Enabled	5–20	6-3
Emulation Timeout	3 Seconds	5–21	6-4
Polarity	Margin Low / Bar High	5–21	6-5
Unknown Characters	Send Bar Codes with Unknown Characters	5–21	6-5
Convert All to Code 39	Disabled	5–22	6-6
Code 39 to Code 39 Full ASCII	Disabled	5–22	6-6
Parameter Set	Parameter Set 1	5–23	6-7

① Programming Guide for 2-D Bar Code Scanners (Publication 2755-6.7)

Setting Scanner Emulation Synapse Cable Options (Continued)

Emulation

Select the type of emulation your decoder requires.
The selections are:

- Standard Emulation (default)
- MSI Wand Emulation
- Texlon Wand Emulation
- Norand Wand Emulation

Variable Leading Margin

Sets the leading margin for wand emulation. The leading margin can be varied to allow more time for the decoder to wake up before the bar code data is received. The selections are:

- 80 msec (default)
- 140 msec
- 200 msec

Check for Decode LED

When enabled (default), a transmission error occurs if the decode LED line from the host is not active.

Emulation Timeout

Determines how long:

- the Synapse cable waits for the laser on signal from the scanner after the trigger is pulled.
- the scanner waits for a decode LED (check if Decode LED is enabled).

The options:

- 3 second timeout (default)
- 4 second timeout
- 5 second timeout
- 10 second timeout
- 30 second timeout

Polarity

Sets the polarity of the wand emulation signal. The selections are:

- Margin Low / Bar High (default)
- Margin High / Bar Low

Unknown Characters

Unknown characters are characters not recognized by the scanner. When **Send Bar Codes with Unknown Characters** is enabled, all decoded bar code data is transmitted except for the unknown characters. If this option is disabled, bar codes containing one or more unknown characters are not transmitted.

Setting Scanner Emulation Synapse Cable Options (Continued)

Convert All to Code 39

When enabled, decoded data is converted and transmitted as Code 39 data.

Note: ASCII from the scanner is transmitted as Code 39 data.

Code 39 to Code 39 Full ASCII

When enabled, Code 39 data is transmitted as Code 39 Full ASCII. The full ASCII option allows the scanner to output any ASCII character or control code (including non-printable characters). Refer to Appendix C for a list of the Code 39 Full ASCII codes.

Advanced Features

The advanced feature options allow you to store communication parameters for 2 separate applications. If you have already configured the scanner, all of the communication settings are stored as Parameter 1 settings (default setting). Using the advanced feature options, you can also create Parameter 2 settings. When using the scanner, scan the correct parameter setting bar code for each application.

To select and/or set Parameter Set 1 configuration:

Configure the scanner communications as described in this chapter. Since Parameter Set 1 is the default you do not have to scan the **Parameter Set 1** bar code.

To change the Parameter Set 1 configuration after storing settings in Parameter Set 2, scan the Parameter Set 1 code and then change the communication parameters as necessary.

To set Parameter Set 2 configuration:

1. Scan the **Parameter Set 2** bar code.
2. Configure the scanner communication parameters as described in this chapter.

To select and/or set defaults for a parameter set, scan the appropriate default bar code. The selections are:

- **Set Defaults Current Parameter Set**
- **Set Defaults Both Parameter Sets**

Troubleshooting and Maintenace

This chapter describes how to troubleshoot and maintain the scanner.

- troubleshooting chart
- cleaning the scan window
- Allen-Bradley Global Technical Support

Troubleshooting the Scanner

This section provides a list of the most common operating problems, the probable causes, and suggested corrective actions.

Problem	Probable Cause(s)	Corrective Action
No Scan Beam.	1. Power supply not connected to Synapse cable.	1. Make sure power supply is connected and plugged into a power source.
	2. Scan beam has timed out.	2. Normal operation. Release trigger completely and scan again.
	3. Defective interface cable.	3. If possible, try another cable.
	4. Defective scanner.	4. If possible, try another scanner using the same connections. Contact Allen-Bradley Global Support (GTS).
Scan Beam Appears as a Dot Not a line	1. Defective scanner.	1. Contact Allen-Bradley Global Technical Support.
Scanned data appears incorrectly on a display terminal when using a keyboard wedge cable.	1. Scanner not configured for correct wedge cable.	1. Make sure scanner is configured for correct wedge cable.
	2. Caps lock is on.	2. Turn Caps lock off.
	3. Incorrect interface cable.	3. Check that you are using the proper cable.
	4. Decoder options not properly configured.	4. Check all options such as UPC-E to UPC-A conversion.
	5. Scanned data still appears incorrectly.	5. Contact Allen-Bradley Global Technical Support.

Problem	Probable Cause(s)	Corrective Action
Scan Beam Present, Symbols Not Read	1. Scanner not set to decode symbol type scanned.	1. Verify the scanner decoder settings.
	2. Scanner not held at slight angle to symbol.	2. Hold scanner at an angle to the symbol.
	3. Scan beam not crossing entire symbol.	3. Make sure scan beam crosses every bar and space on the symbol.
	4. Poor quality bar code symbols.	4. Use the symbols provided on the inside back cover for testing.
	5. Loose cable connections.	5. Check for loose cable connections.
	6. Incorrect interface cable.	6. Check that you are using the proper cable.
Data is decoded but not transmitted to host.	1. Scanner is not configured for the proper cable.	1. Make sure the scanner is configured for the correct cable (standard RS-232 or smart cable).
	2. Loose connections	2. Check all cable connections.
	3. Scanner communication settings do not match host requirements.	3. Verify cable communication settings such as baud rate.

Cleaning the Scan Window

You may need to clean the window of the scanner. **Carefully** clean the window by first removing loose particles of dirt with clean air. Then use an *optical quality cloth* moistened with an *optical quality cleaning fluid* for **plastic lenses** and wipe the window in a single direction (don't wipe cloth back and forth across window). Do not leave streaks.

ATTENTION: Do not use abrasive materials such as disposable wipes and facial tissue. Do not use solvents like alcohol or acetone. These materials will damage the window or the finish on the scanner.

ATTENTION: The scanner has no serviceable parts. Do not open the housing of the scanner.

A-B Technical Support

If you should require assistance or need additional information on operating the scanner or Allen-Bradley decoder, contact Allen-Bradley Global Technical Services (GTS) at (**216**) **646-6800**.

Specifications

Optical

Scan Pattern	
Start Time	0.065 sec. to 75% of steady state horizontal amplitude; 0.50 sec. to 90% of steady state vertical amplitude
Pattern Size	At 9.5 in. (24.13 cm) from the nose of the scanner, the pattern is 7.2 in. (18.3 cm) horizontally and 2.4 in. (6.1 cm) vertically.
Scan Rate	560 scans/second 280 Hz ±10 horizontal
Frame Rate	25 frames/second 12.5 Hz ±1 horizontal
Optical Resolution	Can decode a 6.6 mil (minimum X-dimension) symbol (PDF417); *Y-dimension must be 3X*.
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	
1-D Labels	±2° from beam direction
2-D (PDF417) Labels	±9° from beam direction
Print Contrast Resolution	
1-D Labels	25% absolute dark/light reflectance differential, measured at 675 nm.
2-D (PDF417) Labels	35% absolute dark/light reflectance differential, measured at 675 nm.
Ambient Light Immunity	8000 ft. candles (86,112 lux) of sunlight

Electrical

Laser Diode Power	1.2 mW, maximum
Power Requirements	+5V dc, 390 mA (typical)

Mechanical

Dimensions	
Inches	4.4 (L) x 2.5 (W) x 6.72 (H)
Millimeters	112 (L) x 64 (W) x 170 (H)
Weight	9.0 oz (252 g) without scanner cable

Memory

RAM	64K, 128K or 256K
Flash	256K

Environmental

Operating Temperature	-20° to 40°C (-4° to 104°F)
Storage Temperature	-40° to 60°C (-40° to 140°F)
Humidity	5% to 95% (noncondensing)
Shock	5ft (1.5 meter) to concrete

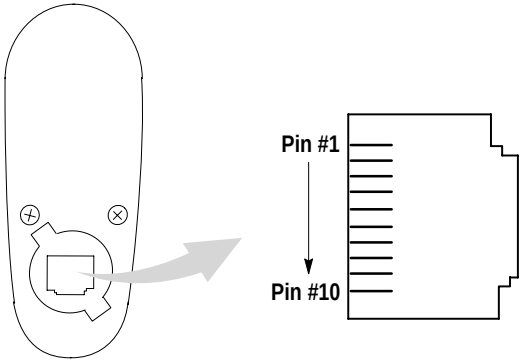
Laser Certifications

CDRH	Class II laser product
IEC	825 Class II
FCC	Class A

Agency Certifications

UL Listed
CSA Listed
CE marked for all applicable directives

Scanner Pinout Connections



Pin	Function Synapse Cable
1	+5V power supply
2	Trigger Signal output/input
3	Transmit (TxD)
4	Receive (RxD)
5	Ready to Send (RTS)
6	Clear to Send (CTS)
7	Synapse Control Data
8	Synapse Control Clock
9	Ground
10	Data Terminal Ready (DTR)

ASCII Chart

This appendix lists:

- ASCII chart
- ALT key values
- Miscellaneous key values
- Numeric key values
- Numeric Keypad key values

ASCII Value	Full ASCII Code 39 Encode Char.	Character (Control Code)	ASCII Value	Full ASCII Code 39 Encode Char.	Character (Control Code)
1000	%U	NULL (CTRL 2)	1016	$P	DLE (CTRL P)
1001	$A	SOH (CTRL A)	1017	$Q	DC1 (CTRL Q)
1002	$B	STX (CTRL B)	1018	$R	DC2 (CTRL R)
1003	$C	ETX (CTRL C)	1019	$S	DC3 (CTRL S)
1004	$D	EOT (CTRL D)	1020	$T	DC4 (CTRL T)
1005	$E	ENQ (CTRL E)	1021	$U	NAK (CTRL U)
1006	$F	ACK (CTRL F)	1022	$V	SYN (CTRL V)
1007	$G	BEL (CTRL G)	1023	$W	ETB (CTRL W)
1008	$H	BS (CTRL H)	1024	$X	CAN (CTRL X)
1009	$I	HT (CTRL I)	1025	$Y	EM (CTRL Y)
1010	$J	LF (CTRL J)	1026	$Z	SUB (CTRL Z)
1011	$K	VT (CTRL K)	1027	%A	ESC (CTRL[)
1012	$L	FF (CTRL L)	1028	%B	FS (CTRL \)
1013	$M	CR (CTRL M)	1029	%C	GS (CTRL])
1014	$N	SO (CTRL N)	1030	%D	RS (CTRL 6)
1015	$O	SI (CTRL O)	1031	%E	US (CTRL –)

ASCII Value	Full ASCII Code 39 Encode Char.	Character	ASCII Value	Full ASCII Code 39 Encode Char.	Character
1032	SP	SP	1057	9	9
1033	/A	!	1058	/Z	:
1034	/B	”	1059	%F	;
1035	/C	#	1060	%G	<
1036	/D	$	1061	%H	=
1037	/E	%	1062	%I	>
1038	/F	&	1063	%J	?
1039	/G	‘	1064	%V	@
1040	/H	(	1065	A	A
1041	/I	)	1066	B	A
1042	/J	*	1067	C	C
1043	/K	+	1068	D	D
1044	/L	,	1069	E	E
1045	-	-	1070	F	F
1046	.	.	1071	G	G
1047	/	/	1072	H	H
1048	0	0	1073	I	I
1049	1	1	1074	J	J
1050	2	2	1075	K	K
1051	3	3	1076	L	L
1052	4	4	1077	M	M
1053	5	5	1078	N	N
1054	6	6	1079	O	O
1055	7	7	1080	P	P
1056	8	8	1081	Q	Q

ASCII Value	Full ASCII Code 39 Encode Char.	Character	ASCII Value	Full ASCII Code 39 Encode Char.	Character
1082	R	R	1105	+I	i
1083	S	S	1106	+J	j
1084	T	T	1107	+K	k
1085	U	U	1108	+L	l
1086	V	V	1109	+M	m
1087	W	W	1110	+N	n
1088	X	X	1111	+O	o
1089	Y	Y	1112	+P	p
1090	Z	Z	1113	+Q	q
1091	%K	[	1114	+R	r
1092	%L	\	1115	+S	s
1093	%M	]	1116	+T	t
1094	%N	^	1117	+U	u
1095	%O	_	1118	+V	v
1096	%W	‘	1119	+W	w
1097	+A	a	1120	+X	x
1098	+B	b	1121	+Y	y
1099	+C	c	1122	+Z	z
1100	+D	d	1123	%P	{
1101	+E	e	1124	%Q	|
1102	+F	f	1125	%R	}
1103	+G	g	1126	%S	~
1104	+H	h	1127		Undefined

ALT Key Values

ALT Key Value	Keystroke	ALT Key Value	Keystroke	ALT Key Value	Keystroke
2064	ALT 2	2075	ALT K	2086	ALT V
2065	ALT A	2076	ALT L	2087	ALT W
2066	ALT B	2077	ALT M	2088	ALT X
2067	ALT C	2078	ALT N	2089	ALT Y
2068	ALT D	2079	ALT O	2090	ALT Z
2069	ALT E	2080	ALT P	2091	ALT [
2070	ALT F	2081	ALT Q	2092	ALT \
2071	ALT G	2082	ALT R	2093	ALT]
2072	ALT H	2083	ALT S	2094	ALT 6
2073	ALT I	2084	ALT T	2095	ALT -
2074	ALT J	2085	ALT U		

Miscellaneous Key Values

Misc. Key Value	Keystroke	Misc. Key Value	Keystroke	Misc. Key Value	Keystroke
3001	PA 1	3009	CMD 7	3017	°
3002	PA 2	3010	CMD 8	3018	$^1/_2$
3003	CMD 1	3011	CMD 9	3019	
3004	CMD 2	3012	CMD 10	3020	
3005	CMD 3	3013		3021	|
3006	CMD 4	3014		3022	0/00
3007	CMD 5	3015			
3008	CMD 6	3016	–		

Numeric Key Values

Numeric Key Value	Keystroke	Numeric Key Value	Keystroke	Numeric Key Value	Keystroke
6042	*	6049	1	6056	8
6043	+	6050	2	6057	9
6044	Undefined	6051	3	6058	Enter
6045	–	6052	4	6059	Num Lock
6046	.	6053	5	6060	00
6047	/	6054	6		
6048	0	6055	7		

Extended Keyapd Key Values

Numeric Key Value	Keystroke	Numeric Key Value	Keystroke	Numeric Key Value	Keystroke
7001	Break	7008	Backspace	7015	Up Arrow
7002	Delete	7009	Tab	7016	Down Arrow
7003	Page Up	7010	Print Screen	7017	Left Arrow
7004	End	7011	Insert	7018	Right Arrow
7005	Page Down	7012	Home	7019	Back Tab
7006	Pause	7013	Enter		
7007	Scroll Lock	7014	Escape		

AIM Code Identifiers

Each AIM Code Identifier contains the 3-character string **]cm** where:

] = Flag Character (ASCII 93)
c = Code Character (see table below)
m = Modifier (see table on next pages)

Code Character / Generic Identifier	Code Type
A /]A0	Code 39
C /]C0	Code 128
E /]E0	UPC/EAN
I /]I0	Interleaved 2 of 5
L /]L0	PDF417

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

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 1234 with check character W, **A+I+MI+DW**, can be transmitted as **]A7**1234 where 7 = (1+2+4).

Code Type	Option Value	Option
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 1234 with Function 1 character in the first position, **Fcnt1**12**2345** will transmitted as **]C1**12345.
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 will be transmitted as **]E0**0012345678905.
Interleaved 2 of 5	0	No check digit processing.
	1	Reader has checked check digit.
	2	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.

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 2755-HTG-4, however, this format is changed to:

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

Therefore, a UPC with two supplemental characters, 01234567890510, will be transmitted as a 21-character string **]E0**0012345678905**]E1**10.

Advanced Data Formatting

Advanced Data Formatting (ADF) provides a way to customize data before transmitting it to a host device. Scan data can be edited to meet your particular requirements. Topics in this appendix include:

- Rules
- Programming a Rule
- Criteria
- Actions
- ADF Formatting Example
- Alternate Rule Sets
- Default Rules
- Rules Hierarchy (in Bar Codes)
- Beeper Definitions

ADF can be implemented by scanning a related series of bar codes, which appear in the Programming Guide (Publication 2755-6.7). The table below references the page location of the ADF bar codes.

Rules

ADF data is customized using 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.

The following describes an example of a data formatting rule:

- **Criteria** – 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, then the following is transmitted: 00001299<SPACE>. If a Code 39 bar code of 1299X15598 is scanned, this rule is ignored because the code length is not 12.

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

Programming a Rule

When programming a rule, the rule must follow a specific format. Plan ahead before you start scanning.

To program each data formatting rule:

- **Start the Rule**. Scan the **Start New Rule** bar code.
- **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 the Criteria section.
- **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 describe in the Actions section.
- **Save the Rule**. Scan the **Save Rule** bar code. This places the rule in the top position in the rule buffer.
- If you make errors during this process, the following bar codes may be use useful:
  - **Erase Criteria and Start Again**
  - **Erase Actions and Start Again**
  - **Erase Previously Saved Rule**

The table on pages E–13 and E–14 provides beeper indications to help guide you through the programming steps.

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 ignored.

Code Length

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 will affect 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, than scan the desired character or characters (up to 8) from the **Alphanumeric Keyboard** bar codes.
- **Specific String Any Location** – Scan this bar code, then, using the the **Numeric Keypad** bar codes, scan a 2-digit number representing the position (using a leading zero if necessary). Then scan the desired characters (up to 8) on the **Alphanumeric Keyboard**, followed by the **End of Message** bar code.
- **Any Message OK** – By not scanning any bar code, all selected code types will be formatted, regardless of information contained.

Actions

Select how to format the data for transmission.

- **Send Data** – Send all data that follows, send all data up to a specific character selected from the **Alphanumeric Keyboard** bar codes, or send the next N characters. N= any number from 1 to 254, selected from the **Alphanumeric Keyboard**.
- **Setup Fields** – Define fields as follows:
  - **Move Cursor To Character** – Scan this bar code, then any printable ASCII character from the **Alphanumeric Keyboard**. 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** – Scan this bar code to move cursor to the beginning of the data.
  - **Move Cursor to Position "N"** – Scan this bar code, then select the position to which you want to move (1 to 254) from the **Numeric Keypad** bar codes.
  - **Move Cursor Ahead "N" Positions** – Scan this bar code, then select the number of positions ahead you want to move (0 to 254) from the **Numeric Keypad** bar codes.
  - **Move Cursor Back "N" Positions** – Scan this bar code, then select the number of positions back you want to move (0 to 254) from the **Numeric Keypad** bar codes.
  - **Move Cursor Past Character** – This parameter will move the cursor past all occurrences of a selected character. Scan this bar code, then select a character from the **Alphanumeric Keyboard** bar codes. If the character is not there, the cursor does not move (has no affect).

- **Send Keystroke** – Scan the Send "___ " bar code for the keystroke you want to send.
- **Send Preset Value** – Send Values 1 through 6 by scanning the appropriate bar code. These values must be set using the Scan Prefix or Scan Suffix bar codes located on page 1-16.
- **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.
  - **Turn Off Space Removal** – Scan this bar code to disable space removal.
  - **Pad Data on Left 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.
  - **Remove Leading Zeros** – Scan this bar code to remove all leading zeroes.
  - **Turn Off Zero Removal** – Scan this bar code to disable the removal of zeros.
  - **Pad Data on Left 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.

ADF Formatting Example

This section shows how ADF rules are entered and used for scan data.

An auto parts distributor 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 personal computer with dedicated control characters for manufacturer ID [CTRL M], part number [CTRL P], and destination code [CTRL D]. At the 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].

Rule 1 – The Code 128 Scanning Rule

Step	Bar Code	On Page	Beeper Indication
1	Scanner Port		High High
2	Code 128	G-5	High High
3	Send next 5 characters	G-15	High High
4	Send [CTRL M]	G-34	High High
5	Send next 5 characters	G-15	High High
6	Send [CTRL P]	G-35	High High
7	Send next 2 characters	G-15	High High
8	Send [CTRL D]	G-33	High High
9	Save Rule	G-2	High Low High Low

Rule 2 – The UPC Scanning Rule

Step	Bar Code	On Page	Beeper Indication
1	Scanner Port		High High
2	UPC/EAN	G-5	High High
3	Send all remaining data	G-15	High High
4	Send [CTRL M]	G-34	High High
5	Save Rule	G-2	High Low High Low

If you made any mistakes while entering the rule, scan **Quit Entering Rules** bar code.

Alternate Rule Sets

ADF rules may be grouped into one of four alternate sets which can be turned on and off as 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:

Class = 24
Stock Number = 56712437
Price = 01500

Ordinarily you would send the 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 and 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” you must program a switch rule. This rule specifies what type of bar code must be scanned to switch between the two rule sets. For example, in the case of the “sale” rule above, you want the cashier to scan the bar code “M” before a sale. To do this rule, you can enter a rule as follows:

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

You can program another rule to switch back.

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

The switching back to normal rules can also be done on the “sale” rule. For example:

When scanning a bar code length of 15:

- send the next 2 characters
- send the class key
- send the next 8 characters
- send the stock key
- turn off rule set 1

We recommend that you scan the **Disable All Rules Sets** bar code after programming a rule belonging to an alternate rule set.

Besides enabling and disabling rule sets within rules, you can enable or disable them by scanning the appropriate bar codes.

Rules Hierarchy (in Bar Codes)

In addition to the correct programming of rules, you must be aware of the order of programming individual rules. **Program the most general rule 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 the actions should occur). Input is modified into the data format specified by the first matching set of criteria it finds.

Important: The order of rules in the buffer is very important. 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 128 bar code of length 12, send the first four characters, then send the ENTER key, then send remaining data.**

If a code 128 bar code of length 12 were scanned, the Third rule would be in affect. The Second rule would appear not to 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 scanner, this applies to prefix/suffix programming when selecting the **Data Transmission Format**.

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 will check 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 – Normal Data Entry

During normal data entry, the duration of tones is short.

Beeper Sequence	Indication
High–Low	Entry of a number is expected. Enter another digit. Add leading zeros 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.
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).

Beeper Definitions – Error Indications

When errors occur, the duration of tones 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–Low	Cancel rule entry. Rule entry mode exited because of an error or you 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.

European Union Directives

If the 2-D Hand-Held Bar Code Scanner is installed within the European Union or EEA regions and has the CE mark, the following regulations apply.

EMC Directive

2-D Hand-Held Bar Code Scanners

This apparatus is tested to meet EMC Directive 89/336/EEC and Low Voltage Directive 73/23/EEC using the following standards, in whole or in part:

- EN 55 022 : 1988
- EN 50 082-1 : 1992
  IEC 801.2 : 1988
  IEC 801.3 : 1988
  IEC 801.4 : 1988
- EN 60 950 : 1992 + A1:1993 + A2:1993

The product described is intended for use in an industrial environment.

Declarations of Conformity

A copy of the Declaration of Conformity is provided on the next page. This document declares that the terminals conform to the applicable directives.

DECLARATION OF CONFORMITY

This Declaration of Conformity is suitable to the European Standard EN 45014, "General criteria for supplier's declaration of conformity." The basis for the criteria has been found in international documentation, particularly in: ISO/IEC Guide 22, 1982, "Information on manufacturer's declaration of conformity with standards or other technical specifications."

Allen-Bradley liability under this declaration is limited to that set forth in the current Allen-Bradley publication 6500, Terms and Conditions of Sale as well as similar publications from Allen-Bradley affiliates doing business in the European Community.

Applied Council Directive(s):
Electromagnetic Compatability Directive (EMC) 89/336/EEC,
Low Voltage Directive 73/23/EEC,
and amending directives 91/263/EEC, 92/31/EEC, 93/68/EEC

We,

Manufacturer:	Allen-Bradley Company, Inc. 1201 South 2nd Street Milwaukee, WI 53204 U.S.A.	**Authorized Representative in the Community (and location of Responsible Person):**	Allen-Bradley, subsidary of Rockwell International GmbH Düsselberger Str. 15 D-42781 Haan, Germany

declare under our sole responsibility that the product(s) (name, type/model, batch/serial number):

Hand Held Barcode Scanners identified by the following Allen-Bradley Catalog Number:
Bul 2755-HTG-4, -HTG-4X

to which this declaration relates is in conformity with the relevant provisions of the following standard(s) or other normative document(s):

EN 55 022 : 1988
EN 50 082-1 : 1992 (IEC 801.2 : 1988, IEC 801.3 : 1988, IEC 801.4 : 1988)
EN 60 950 : 1992 + A1 : 1993 + A2 : 1993

Test Information is maintained at:
Allen-Bradley Company, Inc.
1201 South Second Street
Milwaukee, WI 53204 USA

Year of CE Marking (Low Voltage Directive): 1996

We, the undersigned, hereby declare that the product(s) specified above conforms to the listed directive(s) and standard(s).

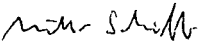
Manufacturer

Signature

Full Name: Robert Gardiner
Position: Manager, Quality Engineering
Date: Oct. 25 1996

Authorized Representative in the Community through its Responsible Person

Signature



Full Name: Viktor Schiffer
Position: Engineering Manager
Date: Oct 31 1996

Chg Ltr: A Rel. No.: 680-96-1 Sheet 1 of 1 43500-251-01

A

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 printer 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 value widths over the entire symbol.

B

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 code.

Bar Width Deviation
Increase or decrease in bar width as compared with nominal bar width.

Baud Rate
A measure of data flow or number signaling events occurring per second. When one bit is the standard event, this is the 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.

C

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.

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

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

Cluster
One of three subsets of mutually exclusive codeword definitions in 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 six 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 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.

D

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

Decode
To recognize a bar code symbology (e.g., UPC/EAN) and then analyze the content of the specific bar code scanned. To translate the bar/space pattern into defined characters within a defined symbology.

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

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 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.

E

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

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 ability 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 (e.g., tracking and splatter).

F

First Read Rate
Percentage of correct readings obtainable by one pass of a scanning device over a bar code.

G

Guard Bars
The start, stop and center delimiting bars of UPC and EAN symbols.

H

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

I

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

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 represent the first character and the intervening spaces to represent the second.

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

L

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 power depth of focus.

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

LED Indicator
A semiconductor diode (LED – Light Emitting Diode) used as an indicator, often in digital displays.

M

Mil
1 mil = 1 thousandth of an inch.

Minimum Reflectance Difference (MRD)
The difference in percentage between light reflected from spaces (Rs) and light reflected from bars (R_B). MRD = $\%R_S - \%R_B$.

Misread
A condition which occurs when the data output of a reader or interface controller does not agree with the data decoded 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.

N

Nanometer
A unit of measure used to define the wavelength of light. Equal to 10^{-9} meter.

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).

O

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.

P

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

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

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

Q

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

R

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 after the Stop pattern.

S

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.

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

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

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

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.

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

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 Width
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.

T

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.

U

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.

V

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.

X

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

Y

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

Z

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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