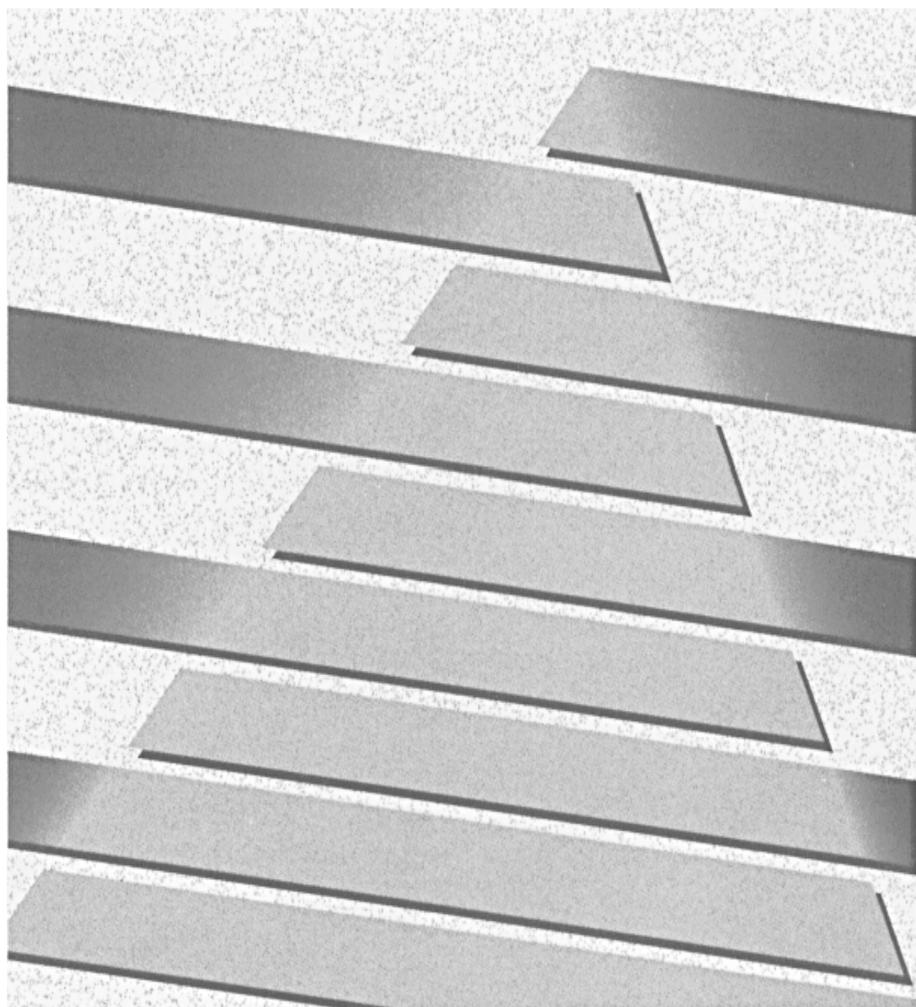




ALLEN-BRADLEY

Bulletin 2755
Hand-Held Scanner
with RS-232 Option
(Catalog No. 2755-G3-D or -G6-D)

User Manual



Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. “Application Guidelines for Application, Installation, and Maintenance of Solid State Controls” (Publication SGI-1.1) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will the Allen-Bradley Company be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, the Allen-Bradley Company cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Allen-Bradley Company with respect to use of information, circuits, equipment, or software described in this manual.

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Using this Manual

Chapter Objectives

This chapter gives an overview of the manual including:

- Contents of Package
- Intended Audience
- Overview of Manual
- Warnings and Cautions
- Related Publications

Contents of Package

You should receive the following items when ordering the Catalog No. 2755-G3-D or 2755-G6-D Scanner:

- Scanner
- Scanner Holder
- User Manual

Intended Audience

No special knowledge is required to read this manual or use the scanner. However, this manual does not show you how to generate an application program on the host computer to receive the scanned data.

Overview of Manual

This manual shows how to set up and use the scanner with an RS-232 serial device for non-contact scanning applications. The contents of each chapter are:

Chapter	Title	Purpose
1	Using this Manual	Provides an overview of this manual.
2	Overview of Scanner	Gives an overview of scanner functions, operating modes, and scanner setup parameters.
3	Using the Scanner	Provides basic instructions on how to use the scanner for non-contact scanning.
4	Setup Instructions	Shows how to connect the scanner to the serial host device and how to select scanner operating parameters.
5	General Operating Parameters	Covers parameters specific to the operation of the scanner including beeper, power consumption, and capture count. Parameters are selected by scanning bar code labels.
6	Serial Communication Parameters	Covers parameters that control serial communications between the scanner and the host device. Parameters are selected by scanning bar codes.
7	Message Format Parameters	Covers parameters that control the format of messages transmitted to the host. Parameters are selected by scanning bar codes.
8	Symbology Parameters	Covers parameters that enable bar code symbologies the scanner is capable of reading. Symbologies are disabled or enabled by scanning bar codes.
9	Serial Commands	Describes serial commands and communications between the scanner and host computer. It also covers precautions when operating in serial communication mode.
10	Specifications	Details specifications of the scanners.

Warning and Caution Symbols

This manual contains the following caution and warning symbols.



CAUTION:

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



WARNING

A warning symbol means people might be injured if procedures are not followed.



CAUTION

A caution symbol is used when equipment may be damaged if procedures are not followed.

Related Publications

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

- **Publication No. 2755-921**
Bar Code Basics
Describes bar code symbologies, equipment, and typical applications.
- **Publication No. 2755-2.44**
Product Data for
Visible Laser Diode Hand-Held Scanners

Overview of Scanner

Chapter Objectives

This chapter gives an overview of the scanner including:

- Function of Scanner
- Operating Modes
- Scanner Setup Parameters
- Serial Commands
- Accessories

Function of Scanner

The scanner is capable of scanning, decoding, and transmitting bar code data to devices equipped with RS-232 serial communication ports, including personal computers and terminals.

You configure the scanner for serial communications by modifying the built-in setup parameters of the scanner. Parameters are selected based on the requirements of the host device and the types of bar codes used in your application.

The scanner is easily configured by scanning the appropriate bar code labels in Chapters 4 through 8 of this manual. When a configuration label is scanned, the scanner sends a 1 or 2 line acknowledgement message to your terminal display.

Important: It is your responsibility to provide the application program on the host device that will receive and store the data.

Operating Modes

The scanner functions in one of two operating modes: Hand-Held mode or Autosense mode.

Hand-Held Mode

In hand-held mode, you hold the scanner in your hand and press the trigger every time you want to scan a bar code symbol.

Chapter 3 provides details on using the scanner in hand-held mode.

Autosense Mode

In this mode the scanner operates in an optional Autostand (Catalog No. 2755-NS2) for hands-free operation. The scanner uses a low level laser beam as an internal object sensor.

When the scanner is placed in the stand it becomes immediately active for reading any bar code label presented to it. The scanner is triggered when the scan beam path (between the reflector on the stand and the scanner) is broken.

You also have the option of removing the scanner from the stand and using it as a conventional hand-held scanner. The low level beam will not interfere with hand-held use of the scanner.

When replaced in the stand the scanner reverts automatically to the Autosense mode.

Note: Autosense mode can also be set up using a PHOTOSWITCH® reflector. See Accessories.

Setup Parameters

The built-in setup parameters of the scanner fall into four general categories:

- General Setup
- Serial Communication
- Message Format
- Symbologies

Each category controls parameters that relate to specific functions of scanner operations or communications with the host device.

General Setup Parameters

General setup parameters are basic to the operation of the scanner. These parameters control:

- System Status
- Power Consumption
- Beeper Operation
- Capture Count
- Spotter Beam
- Autosense Mode
- External Trigger

General parameters are set by scanning bar code labels in Chapter 5.

Serial Communication Parameters

The serial communication parameters define how the scanner will communicate with the host computer through its serial interface including:

- Baud Rate
- Serial Data Parameters
- Intercharacter Delay
- Protocol
- Serial Transmit Buffer

Serial Communication parameters are set by scanning bar code labels in Chapter 6.

Message Format Parameters

Parameters that control the format of messages transmitted to the host include:

- Prefix
- Suffix
- Scanner Identifier
- Code Identifier
- Preamble
- Postamble

Message Format parameters are enabled or disabled by scanning bar codes in Chapter 7.

Symbology Parameters

The symbology parameters enable or disable the types of bar codes the scanner is capable of reading. The scanner supports the following symbologies:

- Code 39
- Interleaved 2 of 5
- Standard 2 of 5
- Codabar
- UPC
- EAN/JAN
- Code 128

Symbologies are selected based on the requirements of the application.

You enable or disable symbologies by scanning bar codes in Chapter 8.

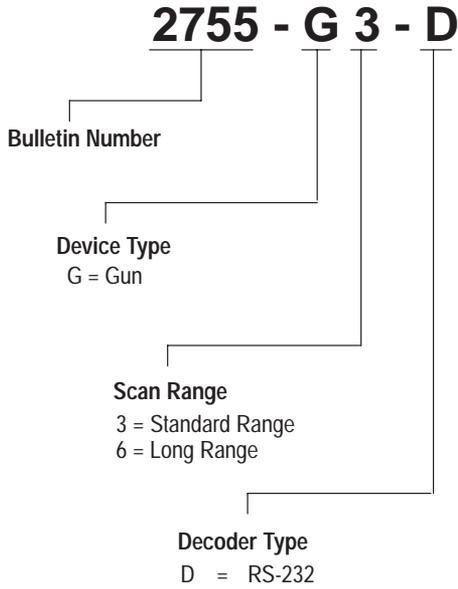
Serial Commands

The scanner also supports a set of serial commands that can be sent from the host to configure scanner operations and communications between the scanner and host device.

The serial commands perform the same functions as scanning the menus of bar code labels. Chapter 9 covers topics related to serial programming.

Ordering a Scanner

The following figure shows the catalog number breakdown for ordering a scanner.



Scanner Accessories

Table 2.A lists the RS-232 interface cables available for the scanners. Cables are available with different pinouts to support either DTE or DCE configurations. Appendix D lists the pinouts for each cable.

Table 2.A
Interface Cables with 25 Pin D-Type Connector

Catalog No.	Description
2755-NCR1	RS-232 DCE, Female, 8 Foot (2.4 Meter) Coiled Cable This cable is typically used with IBM PC compatible computers. You may have to use an adapter with this cable if your computer has a 9-pin port.
2755-NCR2	RS-232 DTE, Male, 8 Foot (2.4 Meter) Coiled Cable ¹

¹ This cable is compatible with the AUX port on the Single and Dual-Head Enhanced Bar Code Decoders (Cat. No. 2755-DS1A, -DD1A).

Table 2.B lists other accessories for the scanners.

Table 2.B
Scanner Accessories

Catalog No.	Description
2755-NS1	Scanner Holder (included with scanner).
2755-NS2	Autostand ¹
2755-GB1	Holster Belt
2755-GH5	Scanner Holster (can function on belt or sling).
2755-PW1	5V Power Supply, 110 VAC, 60 Hz
2755-NT1	Reflective Tape, 2 inch (50.8 mm) square
92-39 ²	Circular Reflector, 3 inch (76.2 mm) diameter
92-47 ²	Circular Reflector, 1 1/4 inch (31.8 mm) diameter

¹ Reflective tape is supplied with Autostand. Additional reflective tape is available by ordering Catalog No. 2755-NT1.

² Allen-Bradley PHOTOSWITCH® part number.

Using the Scanner

Chapter Objectives

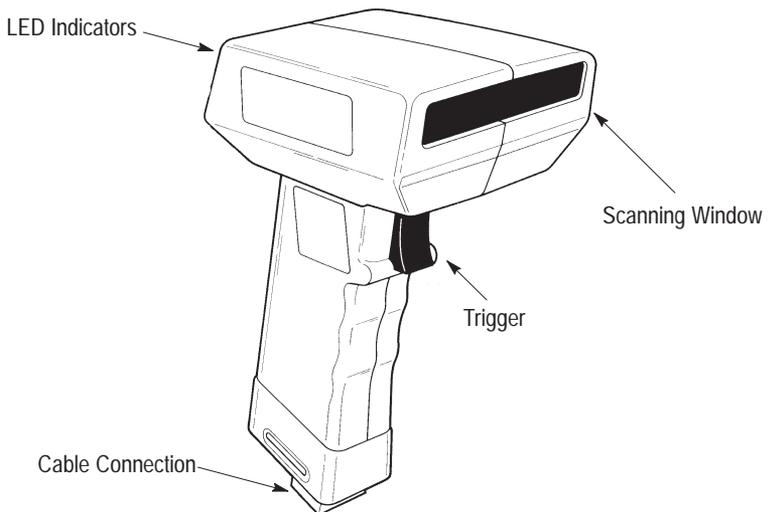
This chapter covers some basic topics on the operation and use of the scanner including:

- Physical Description
- LED Indicators
- Safety Labels
- Scanning Ranges
- Operating Scanner
- Beep
- Operating Tips
- Troubleshooting

Physical Description

The scanners use a low power visible laser diode light source for non-contact scanning applications.

The trigger in the handle of the scanner turns on the light beam. The beam exits the window on the front of the scanner.



Note: If your scanner is enabled for Autosense mode, the internal object sensor is automatically triggered when bar codes are presented to it.

Light, reflected off the bar code symbols, passes back through the window and is detected by light sensors. When a label is read, the laser is automatically turned off until the next pull of the trigger.

The laser beam looks like a narrow red line of light. It is actually a tiny spot of light traveling very fast. The laser spot moves across the bar code symbol at approximately 35 scans/second. The bar code is scanned many times in a short period of time.

LED Indicators

The rear of the scanner has two indicators that provide a visual indication of scanner operation.

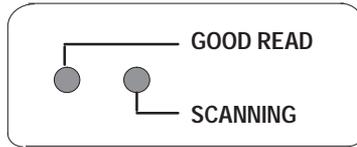


Table 3.A defines the color and function of each LED indicator.

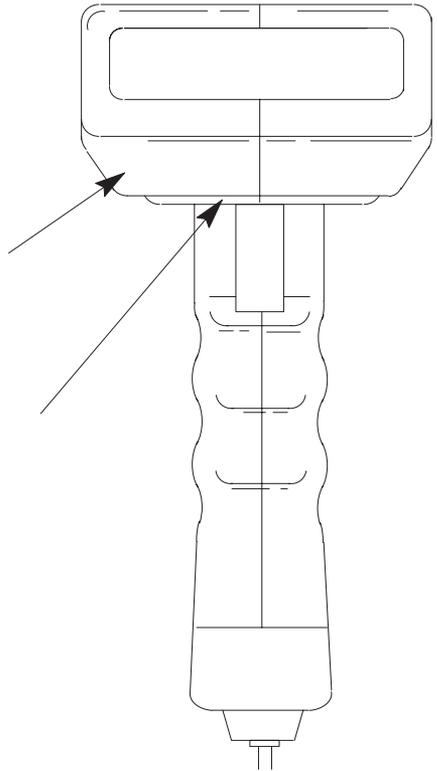
Table 3.A
LED Indicators

LED Label	Color	Function
GOOD READ	Green	The GOOD READ light momentarily turns on (and you will hear a beep) when a bar code symbol has been successfully decoded.
SCANNING	Yellow	The SCANNING light turns on when the device is scanning.

Safety Labels

The scanners use a low power visible laser diode. As with any bright light source, such as the sun, 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.



CAUTION

Use of controls, adjustments, or performance of procedures other than those specified herein may result in hazardous visible light exposure.

Scanning Ranges

The scanners can read bar code labels at various distances depending on the bar code width (width of narrowest element in bar code, either bar or space).

Table 3.B defines the scanning ranges for both the standard and long range scanner. Scanning ranges are listed for symbols with bar code widths from 6.0 mil to 55.0 mil (.15 mm to 1.40 mm).

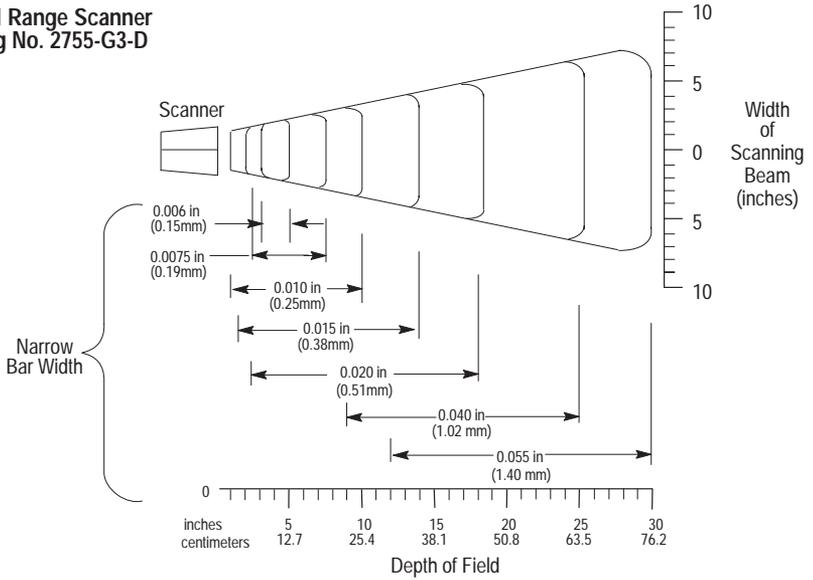
Table 3.B
Scanning Ranges: Standard and Long Range Scanners

Bar Code Width	Standard Range (2755-G3-D)	Long Range (2755-G6-D)
6.0 mil (.15 mm)	3.0 in - 5.0 in 7.6 cm - 12.7 cm	N.A.
7.5 mil (.19 mm)	2.5 in - 7.5 in 6.4 cm - 19.0 cm	N.A.
10.0 mil (.25 mm)	1.0 in - 10.0 in 2.5 cm - 25.4 cm	N.A.
15.0 mil (.38 mm)	1.5 in - 14.0 in 3.8 cm - 35.6 cm	8.0 in - 22 in 20.3 cm - 55.9 cm
20.0 mil (.51 mm)	2.5 in - 18.0 in 6.4 cm - 45.7 cm	12 in - 36 in 30.5 cm - 91.4 cm
40.0 mil (1.02 mm)	9.0 in - 25.0 in 22.9 cm - 63.5 cm	23 in - 60 in 58.4 cm - 152.4 cm
55.0 mil (1.40 mm)	12.0 in - 30.0 in 30.5 cm - 76.2 cm	23 in - 66 in 58.4 cm - 167.6 cm

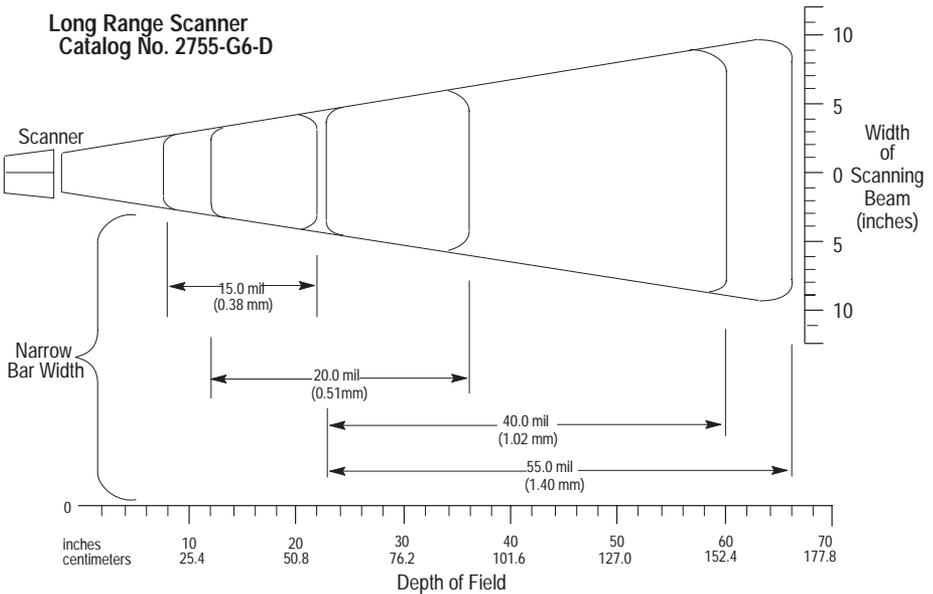
Figure 3.1 illustrates the scanning ranges in graphic form. The figure shows that the scanning range of the standard range scanner for a 40.0 mil (1.02 mm) bar code width is 9.0 - 25.0 inches (22.9 - 63.5 cm). The scanning range of the long range scanner for the 40.0 mil (1.02 mm) bar code width is 23 - 60 inches (58.4 - 152.4 cm).

Figure 3.1
Scanning Ranges

Standard Range Scanner
Catalog No. 2755-G3-D



Long Range Scanner
Catalog No. 2755-G6-D



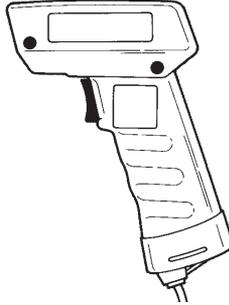
Operating Scanner

Follow these basic steps to operate scanner.

1. Check

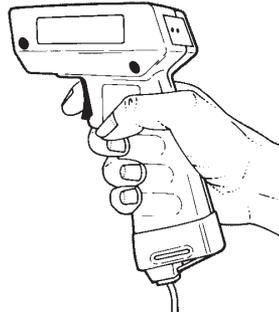
Before using the scanner, check all cable connections to make sure they are secure.

Chapter 4 defines connections between scanner, power supply, and serial communication device.



2. Test

Aim the scanner at the work surface and press the trigger. You should see the red beam on the work surface, and the SCANNING indicator on the back of the unit should be on.

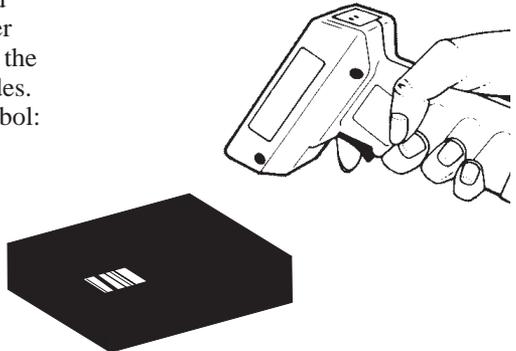


2. Scan

Aim the scanner at the bar code and press the trigger. Adjust the scanner position so the beam is centered on the bar code and overlaps it on both sides. When the scanner has read the symbol:

- You will hear a beep and/or ...
- The GOOD READ indicator will turn on momentarily.
- The red scan beam will turn off.

If you fail to scan, see the *Troubleshooting* section.



Beep

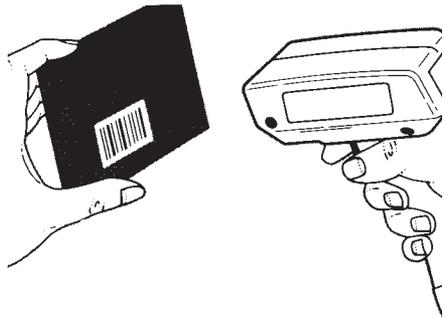
When scanning a bar code symbol, listen for one short, high tone. It means the bar code has been decoded successfully.

A low-high-medium sequence of beeps on power up means the scanner has been configured in a continuous power mode for operation with serial communication devices.

Operating Tips

Hold at an Angle

Do not hold the scanner directly over the bar code. In this position light can reflect back into the scanner and prevent decoding. Angle the scanner slightly.



Scan the Entire Symbol

- Move the scanner so the beam crosses every bar and space on the symbol.
- The larger the symbol the farther away you should hold the scanner.
- Hold the scanner closer for symbols with bars that are close together.
- If you have difficulty reading a label hold the scanner beyond the recommended range in Table 3.B and then move the scanner closer.

RIGHT

WRONG

Troubleshooting

This section provides a list of things to check if you are having problems scanning.

Note: Scanning problems are most often caused by poor quality bar code symbols. If scanning problems arise, test your bar code system using the high quality bar code test symbols supplied in Appendix A.

- Make sure the scanner is configured to read the the type of bar codes you are trying to scan.
- Check if the bar code symbol is worn or damaged.
- Verify that you are holding the scanner at an angle.
- Make sure the beam crosses every bar and space on the symbol.
- Check for loose cable connections.
- Check that there is power to the scanner and serial communication device.

If you perform these checks and the symbol still does not scan, contact your Allen-Bradley representative.

Setup Instructions

Chapter Objectives

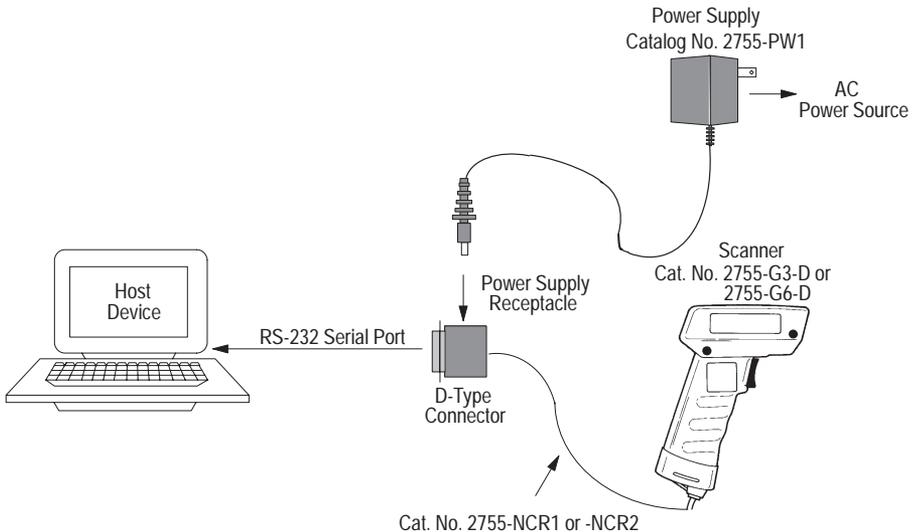
This chapter provides setup instructions including:

- Connecting Scanner to Host
- Scanner Configuration Guidelines
- Scanner Default Settings
- Resetting Factory Defaults

Connecting Scanner to Host

Before configuring parameters of the scanner, you must connect the scanner to the host device using the appropriate interface cable and power supply. Figure 4.1 shows the connections.

Figure 4.1
System Connections



Installing Interface Cable

The interface cable has a modular plug (resembling a telephone connector) on one end and a 25 pin D-Type connector on the other end. The available interface cables are listed in Table 2.A.



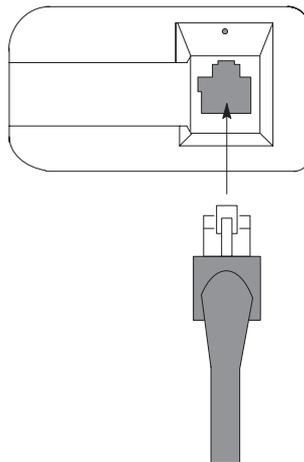
CAUTION:

Do not connect scanner to host until host device is turned off. Failure to do this could result in damage to the scanner.

To install the interface cable:

1. Turn power to host computer OFF.
2. Insert the modular plug into the opening at the bottom of the scanner's handle (see Figure 4.2). The modular plug is keyed to insure proper insertion. Press firmly until the plug clicks into place.

Figure 4.2
Installing Interface Cable



3. Plug the 25 pin D-Type connector into the RS-232 receiving port of the host device.

Note: You may need an adapter if your computer has a 9-pin port.

Removing Interface Cable

At some point you may have to replace the interface cable with another cable.

To remove the interface cable, follow these steps.

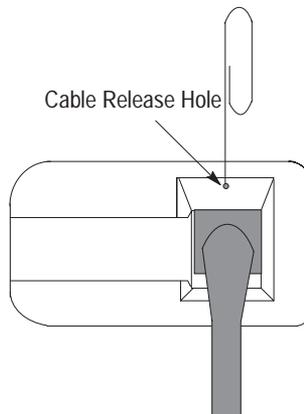


CAUTION:

Do not remove the interface cable until host device is turned off. Failure to do this could result in damage to the scanner.

1. Turn power to host device off.
2. Disconnect power supply from AC power source.
3. Disconnect scanner from host device.
4. Insert a straightened paper clip into the cable release hole as shown in Figure 4.3.
5. Press down firmly on the paper clip to release the retainer and gently pull the connector out of the scanner.

Figure 4.3
Removing Interface Cable



Installing Power Supply

The external power supply (Catalog No. 2755-PW1) provides power to the scanner. One end connects to a standard AC receptacle supplying the appropriate voltage level. The other end plugs into the power receptacle of the 25 pin D-Type connector.



CAUTION:

The Catalog No. 2755-PW1 Power Supply has the following polarity:



If using another power supply, the polarity must be the same.

To install the power supply:

1. Power to the host device must be turned off.



CAUTION:

Do not connect power supply until the host device is turned off. Failure to follow this caution could result in damage to the scanner or host device.

2. Plug the circular connector into the power supply receptacle of the 25-pin connector.
3. Plug the power supply into a standard AC power source.
4. Review all connections. At this point all components of the system should be connected. Power on the host device.
5. Aim the scanner down at the work surface and press the trigger. You should see the red beam and the SCANNING indicator on the back of the unit should be on.

Before configuring the scanner, review the next two sections of this chapter.

Scanner Configuration Guidelines

Configuration is the process of enabling or disabling scanner operating parameters. The host system and the types of bar codes that will be encountered will determine which parameters should be enabled or disabled.

Follow three basic steps when selecting parameters:

1. Review the rest of this manual to familiarize yourself with each group of scanner parameters.
2. Review the requirements of your host system and application. This will enable you to determine if the factory defaults must be changed.
3. Enable or disable the relevant parameters by scanning the bar codes in Chapters 5 through 8. The section that follows describes this process. All configuration bar code labels in this manual are Code 128, Character Set B.

Scanning Menu Labels

The scanner does not have a distinct configuration mode. Instead, it automatically recognizes and reacts to labels you scan. *You do not scan a label to enter or exit configuration mode.*

Most parameters are set by scanning one label. For example, assume that to be compatible with your host system, the scanner's baud rate setting must be changed from its default value of 9600 to 2400 baud.

To make this change, locate the baud rate bar code menu in Chapter 5 and scan the label to the left of **2400 Baud**. The correct label is shown below.



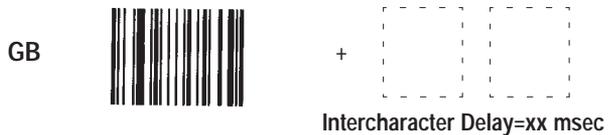
A successful scan is indicated by two short-high beeps. An unsuccessful scan produces no beeps and requires you to rescan the bar code.

Most parameters are modified in this way. When you are finished with modifications you can resume normal bar code scanning.

Note: When enabling or disabling a parameter, be sure the scanner beam illuminates only one symbol at a time. The layout of this manual minimizes the accidental scanning of multiple labels.

Some parameters require that you scan multiple labels to modify a setting. An example is the **Intercharacter Delay** parameter. To set the intercharacter delay to 5 milliseconds (msec):

1. Scan the **Intercharacter Delay (GB)** label and listen for *one* short beep.



The dotted boxes to the right of the label indicate that you must scan two additional labels; one for the digit 0 and the second for the digit 5.

2. After the beep, scan the bar code beside 0 in Appendix B, and listen for one short-high beep.
3. Scan the bar code beside 5 in Appendix B and listen for *two* short beeps. The two beeps indicate that you scanned the last parameter argument.

If you scan the **Intercharacter Delay (GB)** label and then scan a normal data label (instead of 0 and 5), a normal tone is emitted in response to the data label, and the programming command is ignored. *No exit code is required to resume normal operations.*

Scanner Default Settings

Table 4.A lists the factory default settings for each group of scanner parameters.

Table 4.A
Scanner Default Settings

General Scanner Setup

Parameter	Options	Default
Power Consumption	Enable Continuous Full Power Enable Standby	Enable Standby
Beeper Operation	Beeper Off Beeper On; Volume Low Beeper On; Volume Medium Beeper On; Volume Loud	Beeper On; Volume Loud
Capture Count	1 or 2	1
External Trigger	Disable External Trigger (+) External Trigger (-)	Disable
Spotter Beam	Enable or Disable	Disable
Autosense Mode	Enable or Disable	Disable

Message Format

Parameter	Options	Default
Prefix	None, STX, or SOH	None
Suffix	None, ETX, CR, LF, HT, or CR and LF	CR and LF
Scanner Identifier	Disable or a number (01- 99)	Disable
Code Identifier	Disable or Enable	Disable
Preamble	None or 1-4 characters	None
Postamble	None or 1-4 characters	None

Table 4.A (continued)
Scanner Default Settings

Serial Communication

Parameters	Options	Default
Baud Rate	300, 600, 1200, 2400, 4800, 9600, 19200	9600
Serial Data Transmission (Start Bit, Data Bits, Stop Bits, Parity)	7 Data Bits/1Stop Bit/ Odd Parity Even Parity Mark Parity Space Parity 7 Data Bits/2 Stop Bit/Odd Parity Even Parity Mark Parity Space Parity 8 Data Bits/1Stop Bit/ Odd Parity Even Parity Mark Parity Space Parity No Parity 8 Data Bits/2Stop Bit/ No Parity	7 Data Bits/1Stop Bit/ Space Parity
Intercharacter Delay	User Defined Delay (in msec) or No Intercharacter Delay	No Intercharacter Delay
Protocol	XON/XOFF, CTS, RTS or None	None
Serial Transmit Buffer	Full Buffering, No Buffering, One Label Buffering	Full Buffering

Symbologies

Code	Options	Default
Code 39	Disable Code 39 Enable Standard Code 39 Enable Full ASCII Code 39	Enable Standard Code 39
	Enable or Disable Modulo 43 Check Character	Disable
	Enable or Disable Transmission of Start/Stop Characters	Disable
	Minimum Label Length	1
	Maximum Label Length	32

Table 4.A (continued)
Scanner Default Settings

Symbologies

Code	Options	Default
UPC (A and E)	Disable UPC (A and E) Enable with 2 or 5 Digit Supplements Enable without 2 or 5 Digit Supplements	Enable without 2 or 5 Digit Supplements
	Enable or Disable Expanded UPC-E	Disable
	Enable or Disable Transmission of Number System Digit	Enable
	Enable or Disable Transmission of Check Digit	Enable
	Enable/Disable UPC to EAN Translation	Disable
	EAN/JAN (8 or 13 digit)	Disable EAN/JAN (8 or 13 digit) Enable with 2 or 5 Digit Supplements Enable without 2 or 5 Digit Supplements
Enable or Disable Transmission Number System Digit		Enable
Enable or Disable Transmission of Check Digit		Enable
Interleaved 2 of 5	Disable Interleaved 2 of 5 Enable without Check Digit Enable with Check Digit	Disable
	Minimum Label Length	2
	Maximum Label Length	32
Standard 2 of 5	Enable or Disable Standard Code 2 of 5	Disable
	Minimum Label Length	4
	Maximum Label Length	32
Code 128	Enable or Disable Code 128	Enable
	Minimum Label Length	1
	Maximum Label Length	32
Codabar	Enable or Disable Codabar	Disable
	Enable or Disable Transmission Start/Stop Characters	Disable
	Minimum Label Length	1
	Maximum Label Length	32

Resetting Factory Defaults

To reset the scanner to the factory default settings, scan label **ZA**.

ZA



Reset to
Factory Defaults

Note: Scanning this label produces a bi-level tone.

General Setup Parameters

Chapter Objectives

This chapter describes parameters specific to the operation of the scanner including:

- System Status
- Power Consumption
- Beeper Operation
- Capture Count
- Spotter Beam
- Autosense Mode
- External Trigger Operation

To set specific operating parameters, scan the appropriate bar code labels in each section.

Note: Throughout this chapter, default settings for parameters are flagged by an asterisk (*).

System Status

The labels in this section allow you to examine the configuration of your system.

To send a list of currently programmed parameters to the display device, scan option **ZB**. A sample display is shown on the top of the next page.

Note: Scanning **ZB** may interfere with your terminal software, depending on your application.

ZB



Display Configuration

Display Configuration Example (ZB Command)

Power	Standby	Model	5312	Version	2.51
Data Bits	8	Beeper	Loud	Baud Rate	9600
Char Delay	00	Parity	None	Stop Bits	1
Scanner ID	None	Protocol	Off	RTS	Rcv Rdy+
Preamble	None	Prefix	Off	Suffix	CR/LF
Code ID Char	No	Postamble	None	* Redundant Scan	No
Serial Buffr	Full	Labels	Unbuffered	Label Delay	00
		Display	Duplex Half	Auto Label Bfr	Off

Symbology

Parameter	39	UPC	EAN	I 2/5	S 2/5	128	Codabr
*Armed	Yes	Yes	No	No	No	Yes	No
ASCII	No	-	-	-	-	-	-
*Addendum	-	No	No	-	-	-	-
Xmit S/S	No	-	-	-	-	-	No
Check Ch	No	-	-	No	-	-	-
Send Sys #	-	Yes	Yes	-	-	-	-
Send Ck Ch	-	Yes	Yes	-	-	-	-
UPCE Expand	-	No	-	-	-	-	-
Limits	01-32	-	-	02-32	04-32	01-32	01-32

* Redundant Scan=Capture Count, Armed=Enabled, Addendum=Supplements

■ Shaded parameters are not supported in this product.

Scan option **ZC** to send the program version number followed by carriage return-line feed (CR-LF) to the display device. The version number is sent in the form **##.##** (1.00, for example).

ZC  Transmit Version Number

Scan option **@C** to send an identification code which verifies the specific program type of the scanner to the display device.

@C  Transmit Program ID

Note: Options **ZC** and **@C** are used for troubleshooting to identify the scanner.

Power Consumption

You can select one of two power consumption modes for the scanner. Option **@A** supplies full power to the scanner at all times. Option **@B** allows the scanner to revert to standby mode after a successful read. This mode is a power conservation feature whereby the scanner uses extremely low power (microwatts).

To supply full power to the scanner at all times, scan label **@A**.

@A



Enable Continuous
Full Power

Note: The scanner automatically uses full power when configured to operate in Autosense mode.

To allow the scanner to revert to standby mode after a successful read, scan label **@B**.

@B



Enable
Standby Power *

Beeper Operation

To disable or set the volume of the beeper, scan the appropriate option below.

AA



Beeper Off

AB



**Beeper On;
Volume Low**

AC



**Beeper On;
Volume Medium**

AD



**Beeper On;
Volume Loud ***

Capture Count

Capture Count determines the number of successful, identical decodes that must occur for a valid read. You can use the capture count to enhance the security of the bar code reader.

Option **BC** sets the capture count to 1 which requires one successful decode.

BC



Capture Count = 1 *

Scan option **BD** to set the capture count to 2. Two identical decodes must occur for a valid read.

BD



Capture Count = 2

Because the laser scans a label many times a second, you will notice little or no change in the speed of the decode.

Spotter Beam

You can enable the scanner to use a spotter beam which helps when aiming the scanner. Each time the scanner is triggered it generates a bright laser spot for a fixed duration, after which the scanner beam is activated.

The spotter beam is recommended for long range applications.

Scanning label **NP** disables the spotter beam. **Hold the trigger for two seconds after scanning.**



To enable the spotter beam, scan label **NQ**, then scan a digit from 0 – 9 (Appendix B), **holding the trigger for two seconds after scanning the digit.** Each digit enables the spotter beam for a specified duration as shown in the table below. For example, to enable the spotter beam for 200 milliseconds, scan the **NQ** label, then scan code 3 in Appendix B.



This Digit	Enables Spotter Beam for:
0	50 ms
1	100 ms
2	150 ms
3	200 ms
4	250 ms
5	300 ms
6	350 ms
7	400 ms
8	450 ms
9	500 ms

Note: Spotter beam and Autosense mode are mutually exclusive parameters. Only one of these parameters can be enabled at a time.

Autosense Mode

In Autosense mode, the scanner has an internal object sensor allowing you to operate the scanner in an optional Autostand (Catalog No. 2755-NS2) for hands-free operation.

When the scanner is placed in the Autostand it becomes immediately active for reading any bar code label presented to it. The scanner is triggered when a bar code label breaks the scan beam path between the reflective label on the stand and the scanner.

To activate Autosense mode, scan the **Enable Autosense (NO)** label. **You must hold the trigger down for two seconds after scanning the label.**

NO



Enable
Autosense Mode

The scanner will respond by emitting a continuous, low level, red beam of light.

Note: The scanner is automatically configured to use full power (not standby power) in Autosense mode.

For details on how to set up the scanner to operate in the optional Autostand, see Appendix C.

To deactivate Autosense mode, scan the **Disable Autosense symbol (NN)**. **You must hold the trigger down for two seconds after scanning the label.**

NN



Disable
Autosense Mode *

Note: Spotter Beam and Autosense Mode are mutually exclusive parameters. Only one of these parameters can be enabled at a time.

External Trigger Operation

External trigger operation enables an external device to control scanning. External trigger is controlled by applying an external trigger signal to the CTS input (refer to Appendix D) with external triggering enabled. When active, this signal causes scanning to begin just as if the scanner's trigger were pressed. Scanning continues until a label is decoded or the external signal is deactivated.

Note: CTS protocol cannot be used when external triggering is enabled.

When a decode occurs, the trigger signal **must** be deactivated for a minimum of 50 milliseconds before another scan can be attempted (*tying* the trigger signal active does not cause continuous scanning and decoding).

When **External Trigger (+)** is scanned, scanning begins when a low level input is applied to the CTS input. Conversely, when **External Trigger (-)** is scanned, scanning begins when a high level is applied to CTS. When CTS is not connected, it is treated as if a low level is applied.

HA



Disable External Trigger *

HE



External Trigger (+)

HF



External Trigger (-)

Serial Communication Parameters

Chapter Objectives

This chapter covers parameters that control serial communications between the scanner and the host device including:

- Baud Rate
- Data Transmission Parameters
- Intercharacter Delay
- Protocol
- Serial Transmit Buffer

Serial communication parameters are selected by scanning appropriate bar code labels in each section.

Note: Throughout this chapter, default settings for parameters are flagged by an asterisk (*).

Baud Rate

The serial communication baud rate selections are listed below. Your scanner and the serial host computer **must** be set at the same baud rate. Scan the appropriate rate.

DA  300 Baud

DB  600 Baud

DC  1200 Baud

DD  2400 Baud

DE  4800 Baud

DF  9600 Baud *

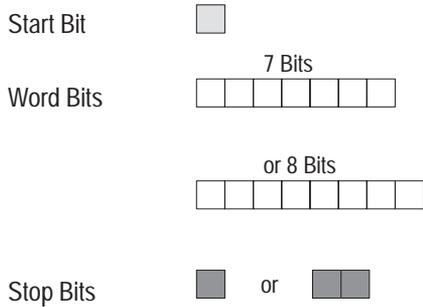
DG  19200 Baud

Serial Data Transmission Parameters

Serial transmission data consists of three or four different elements depending on the host system requirements. These elements are:

- Start Bit
- Data Bits (7 or 8)
- Optional Parity Bits
- Stop Bits (1 or 2)

In this manual, these elements are represented graphically in the following manner:



The Parity bit is used for error detection (e.g., data altered in transmission), but is not required by all systems. A parity bit, if required will be in one of the following four formats:

Odd	=	
Even	=	
Mark	=	
Space	=	

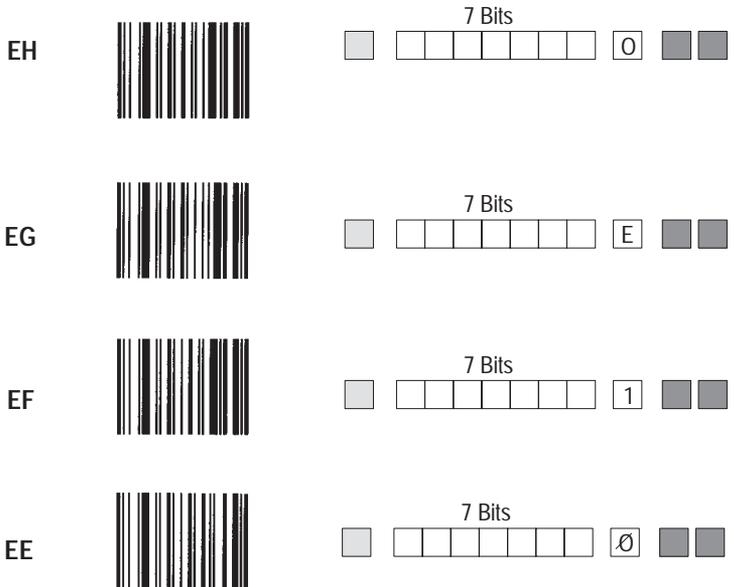
7 Data Bits, 1 Stop Bit, Parity Check

If your system requires a word length of 7 Data bits, a single Stop bit, and Parity check, scan the appropriate label below.



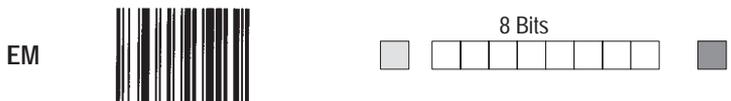
7 Data Bits, 2 Stop Bits, Parity Check

If your system requires a word length of 7 Data bits, 2 Stop bits, and Parity check, scan the label below.



8 Data Bits, 1 Stop Bit, No Parity Check

If your system requires a word length of 8 Data bits, 1 Stop bit, and no Parity check, scan the label below.



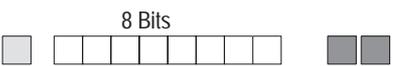
8 Data Bits, 1 Stop Bit, Parity Check

If your system requires a word length of 8 Data bits, 1 Stop bit, and Parity check, scan the appropriate label below.

EL		
EK		
EJ		
EI		

8 Data Bits and 2 Stop Bits

If your system requires a word length of 8 Data bits and 2 Stop bits, scan the label below. Parity check is not possible with this combination of data bits and stop bits.

EN		
----	---	---

Protocol

Protocol controls data flow between your scanner and the serial host computer. The protocol options are: None, XON/XOFF, CTS, RTS.

XON/XOFF

When selecting XON/XOFF protocol, the scanner recognizes the ASCII XON/XOFF characters. The host may then stop transmission with XOFF and resume with XON.

Controlled data flow is achieved between devices when the *receiving device* sends ASCII XON/XOFF codes to the *transmitting device*. When the receiving device is unable to accept data, it sends an XOFF code to inform the host to temporarily suspend data transmission. When the receiving device *catches up*, it sends an XON code to inform the host that it is again ready to accept data.

XON/XOFF protocol does not require additional hardware for implementation; only transmit, receive, and signal ground are required.

CTS Protocol

Like XON/XOFF protocol, CTS protocol is a mechanism used to control data flow out. The CTS input is used to inform the scanner that the host terminal is ready to accept scanned data.

When CTS (+) protocol is selected, the scanner waits for a high level on its CTS input before transmitting data.

When CTS(-) is selected, the signal polarities are reversed and a low level indicates data may be transmitted. The CTS protocol may be programmed independently of the RTS protocol, however the signal polarities must be the same. You may not select CTS(+) and RTS(-).

Note: CTS protocol cannot be used if external triggering is enabled. See page 5–8 for details.

RTS Protocol

The RTS output from the scanner may be programmed to operate in one of three different modes.

1. In the default mode, RTS signals when the scanner is ready to receive commands or data.
2. RTS is in a fixed state.
3. RTS signals when the scanner has data to transmit.

The RTS modes are independent of the CTS protocol. However, you must select the same active state for RTS as for CTS. You may not select CTS(-) and RTS fixed high. If CTS(-) is selected, then the active state for RTS will be low.

Scan the appropriate protocol option.

HA		CTS Protocol=None * RTS high indicates scanner ready to receive data
HB		Protocol=XON/XOFF
HC		Protocol=CTS(+)
HD		Protocol=CTS(-)

HG



RTS always high

HH



RTS always low

HI



RTS high indicates
scanner has data
to transmit

HJ



RTS low indicates
scanner has data
to transmit

HK



RTS low indicates
scanner ready to
receive data

Intercharacter Delay

Certain terminals and computers require an intercharacter delay to simulate the effects of keystroke delays. Selecting an intercharacter delay causes the characters to be sent at the slower rate required by the device to which you are interfacing.

Scanning label **GA** disables intercharacter delay.



To set Intercharacter Delay to a value other than zero, scan label **GB**, then two separate digits from Appendix B. **The intercharacter delay cannot exceed 31 milliseconds.**



For example, to set the delay to 15 milliseconds, scan the **GB** label, then scan codes 1 and 5 in Appendix B.

Serial Transmit Buffer

The scanner supports three levels of serial buffering: Full Buffering, No Buffering, One Label Buffering.

Full Buffering

With Full Buffering (the default) selected, the scanner will place all scanned labels into a 64 byte serial transmit buffer if the host is unavailable to receive data. This allows you to continue scanning even though the previous label may not have been transmitted yet. Scanning will continue normally until the buffer is full, then scanning will stop. Scanning will continue when enough space is available for the current message.

Note: The buffer holds other message parameters, so you must consider the total message length (including label) to determine how many labels can be buffered. See Chapter 7, Message Format Parameters.

No Buffering

When No Buffering is selected, scanning is stopped until the current label is completely transmitted.

One Label Buffering

When One Label Buffering is selected, the scanner will allow you to scan one more label in addition to the label already in the transmit buffer.

NE



Full Buffering *

NF



No Buffering

NG



One Label Buffering

Message Format Parameters

Chapter Objectives

This chapter defines parameters that control the format of transmitted bar code messages including:

- Prefix and Suffix
- Scanner Identifier
- Code Identifier
- Preamble and Postamble

Message Format

A message transmitted from the scanner upon a successful decode has the following format:

Prefix	Scanner Identifier	Preamble	Code Identifier	Data	Postamble	Suffix
--------	--------------------	----------	-----------------	------	-----------	--------

Some of these message parameters may not be required or may vary from one host system to another. You select parameters based on the requirements of your application and the host system.

To select message parameters, you scan the appropriate bar code labels in each section.

Note: Throughout this chapter, default settings for parameters are flagged by an * (asterisk).

Prefix

A prefix is a subset of the preamble normally formatted to some industry standard. It is represented by a specific ASCII code. An example of a prefix is the STX (Start of Transmission) code.

Scan the appropriate prefix label.

IA



Prefix=None *

IB



Prefix=STX

IC



Prefix=SOH

Suffix

A suffix is a subset of the postamble. Like the prefix, it is normally assigned to a specific ASCII code. Examples of suffixes are CR (Carriage Return) and LF (Line Feed).

Scan the suffix appropriate for your application.

MA		Suffix=None
MB		Suffix=ETX
MC		Suffix=CR
MD		Suffix=LF
ME		Suffix=HT
MF		Suffix=CR and LF *

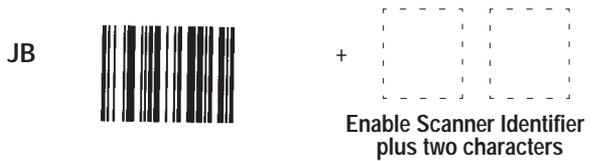
Scanner Identifier

Scanner ID characters are used to identify individual scanners when more than one scanner is interfaced with the host system. Options available are none (Disabled) or digits 01 through 99.

Scanning label **JA** disables the scanner identifier.



To enter a scanner ID, scan label **JB** and then two separate digits from Appendix B. The ID character cannot exceed 99.



For example, to enter a scanner ID of 01, scan the **JB** label, then scan codes 0 and 1 in Appendix B.

Code Identifier

A single-character code identifier may optionally be transmitted with a message. This option allows the host computer to identify the type of bar code scanned, as well as the encoded information.

Scan option **FA** to disable the code identifier.



Scan option **FB** to enable the code identifier.



Table 7.A shows the code identifier character assignments.

Table 7.A
Code Identifier Characters

Symbology	Code Identifier
Code 39	a
Interleaved 2 of 5	b
Standard 2 of 5	c
UPC/EAN/JAN	d
Code 128	f
Codabar	h

Preamble or Postamble

Preambles and postambles consist of up to four ASCII characters. Each ASCII character is encoded as two hexadecimal characters. Use Table 7.B, Hexadecimal Conversion Table, to look up the hexadecimal equivalent.

To use the conversion table:

1. Find each ASCII character in the table and locate the corresponding **bold** hexadecimal equivalent character in the top row and the left column of the table. For example, the ASCII character "Q" is represented by the hexadecimal numbers **5** (top) and **1** (left).
2. Scan the bar code symbols that correspond to the hexadecimal equivalent characters. First scan the bar code symbol that corresponds to the bold hex character at the *top*. Then scan the bar code symbol that corresponds to the bold hex character at the *left*.

For example, for the ASCII character "Q", first scan the bar code symbol labeled **5**, then scan the bar code symbol labeled **1**. If your preamble or postamble contains an "N", first scan **4** and then **E**.

3. Repeat this procedure for each ASCII character you want to enter.

Note: If you select a preamble or postamble you must scan four ASCII characters, even if the preamble or postamble is less than four characters in length. Do this by scanning null (NUL) characters for the additional characters.

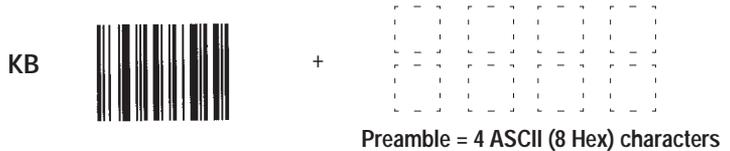
For example, if your preamble is "AB" (in ASCII code), enter A, B, and two null characters by scanning the hexadecimal characters **4,1 4,2 0,0 0,0**. Because each ASCII character is represented by two hexadecimal characters, you need eight scans.

Preamble

A preamble is a string of characters that prefixes a message that is transmitted to the host. The preamble may be used to identify the scanner that sent the message. The maximum preamble length is four ASCII characters.



To enter a preamble, scan the **KB** label, then refer to Table 7.B to enter the four ASCII characters. The procedure on the previous page explains how to enter preamble characters.

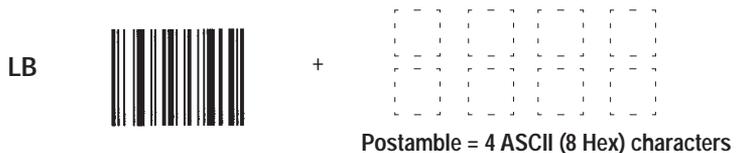


Postamble

A postamble is similar to a preamble, except it is appended to the message which is transmitted to the host. Its maximum length is four ASCII characters.



To enter a postamble, scan the **LB** label, then refer to Table 7.B to enter the four ASCII characters. The procedure on the previous page explains how to enter preamble characters.



Chapter 7

Message Format Parameters

0



1



2



3



4



5



6



7



Table 7.B
Hexadecimal Conversion Table

	0	1	2	3
0	NUL	DLE	SP	0
1	SOH	DC1	!	1
2	STX	DC2	"	2
3	ETX	DC3	#	3
4	EOT	DC4	\$	4
5	ENQ	NAK	%	5
6	ACK	SYN	&	6
7	BEL	ETB	'	7
8	BS	CAN	(8
9	HT	EM)	9
A	LF	SUB	*	:
B	VT	ESC	+	;
C	FF	FS	,	<
D	CR	GS	-	=
E	SO	RS	.	>
F	SI	US	/	?

Table 7.B (continued)
Hexadecimal Conversion Table

	4	5	6	7
0	@	P	'	p
1	A	Q	a	q
2	B	R	b	r
3	C	S	c	s
4	D	T	d	t
5	E	U	e	u
6	F	V	f	v
7	G	W	g	w
8	H	X	h	x
9	I	Y	i	y
A	J	Z	j	z
B	K	[k	{
C	L	\	l	
D	M]	m	}
E	N	^	n	~
F	O	_	o	DEL



8



9



A



B



C



D



E



F

Symbologies

Chapter Objectives

This chapter shows how to enable bar code symbologies the scanner is capable of reading including:

- Code 39
- UPC-A and UPC-E
(with optional 2 or 5-digit supplements)
- EAN-8 and EAN-13
(with optional 2 or 5-digit supplements)
- Interleaved 2 of 5
- Standard 2 of 5
- Code 128
- Codabar

To disable or enable specific bar code symbologies, scan the appropriate bar code labels in each section.

Note: We recommend that you disable all symbologies not used by your application.

Throughout this chapter, the default symbology selections are flagged by an asterisk (*).

Label Lengths

The minimum label lengths are set to 1 character, except for Interleaved 2 of 5 which is set to 2 characters and Standard 2 of 5 which is set to 4 characters. The maximum label length for all symbologies is set to 32 characters. You can set minimum and maximum label lengths.

Note: The minimum length must be less than or equal to the maximum length for scanning to occur.

Code 39

To disable Code 39, scan label **OA**.

OA



Disable Code 39

To enable Code 39, scan option **OB** or **OC**. After enabling Code 39, make any additional required selections from options **OD** through **OI**.

OB



Enable Standard Code 39 *

OC



Enable Full ASCII Code 39

Modulo 43 Check Character

Options **OD** and **OE** allow you to enable or disable the Modulo 43 check character for Code 39. To enable the Modulo 43 check character, scan label **OE**. To disable the Modulo 43 check character, scan label **OD**.

OD



Disable Modulo 43 *
Check Character

OE



Enable Modulo 43
Check Character

Transmit Start/Stop Characters

You can transmit or suppress the Start and Stop characters in Code 39. To suppress transmission of the Start and Stop characters, scan label **OF**.

OF



Do Not Transmit *
Start and Stop

To enable transmission of the Start and Stop characters, scan label **OG**.

OG



Transmit
Start and Stop

**Code 39
(continued)**

Minimum Length

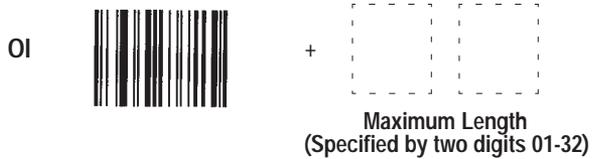
The minimum length of Code 39 is set by scanning label **OH** and then two digits (01 - 32) in Appendix B.



For example, to enter a minimum length of 05, scan the **OH** label, then scan codes 0 and 5 in Appendix B.

Maximum Length

The maximum length of Code 39 is set by scanning label **OI** and then two digits (01 - 32) in Appendix B.



For example, to enter a maximum length of 05, scan the **OI** label, then scan codes 0 and 5 in Appendix B.

If the minimum and maximum lengths are set equal, only codes of that exact length are read.

UPC (A and E)

To disable all UPC labels, scan label **QA**.

QA



Disable UPC (A and E)

Supplements

Option **QB** or option **QC** enable both UPC-A and UPC-E. To enable scanning of UPC labels with the 2 or 5 Digit supplements, scan label **QB**.

QB



Enable UPC
with 2 or 5 Digit
Supplement Enabled

To enable scanning of UPC labels with the 2 or 5 Digit supplements disabled, scan label **QC**.

QC



Enable UPC *
with 2 or 5 Digit
Supplement Disabled

Expanded UPC-E

You can enable/disable expansion of E labels to A labels. To disable expanded UPC-E, scan label **QH**.

QH



Disable *
Expanded UPC-E

To enable expansion of E labels to A labels, scan label **QI**.

QI



Enable
Expanded UPC-E

UPC (A and E) (continued)

Transmit Number System Digit

You can enable or disable the transmission of the first character in a UPC symbol (the number system character). To disable transmission of the first character in a UPC symbol, scan label **QD**.



To enable transmission of the first character in a UPC symbol (the number system character), scan label **QE**.



Transmit Check Digit

You can enable or disable the transmission of the last character in a UPC symbol (the check digit). To disable transmission of the check digit in a UPC symbol, scan label **QF**.



To enable transmission of the check digit in a UPC symbol, scan label **QG**.



UPC to EAN Translation

You can cause UPC labels to be transmitted as EAN-13 labels. To enable UPC to EAN translation, scan label **QJ**.

QJ



Enable UPC to EAN
Translation

To disable UPC to EAN translation, scan label **QK**.

QK



Disable UPC to EAN
Translation *

EAN/JAN

Scan label **RA** to disable EAN/JAN (8 or 13 digit).

RA



Disable EAN/JAN *
(8 or 13 digit)

Supplements

Option **RB** or option **RC** enables both EAN 8-digit and EAN 13-digit. EAN/JAN labels can be read with or without supplements. To enable scanning of EAN/JAN labels with the 2 or 5 digit supplements, scan label **RB**.

RB



Enable EAN/JAN
with 2 or 5 Digit
Supplement Enabled

To enable scanning of EAN/JAN labels with the 2 or 5 Digit supplements disabled, scan label **RC**.

RC



Enable EAN/JAN
with 2 or 5 Digit
Supplement Disabled

Transmit Number System Digit

You can enable or disable the transmission of the first character in an EAN/JAN symbol (the number system character). To disable transmission of the first character in an EAN/JAN symbol, scan label **RD**.



To enable transmission of the first character in an EAN/JAN symbol, scan label **RE**.



Transmit Check Digit

You can enable or disable the transmission of the last character in an EAN/JAN symbol (the check digit). To disable transmission of the check digit in an EAN/JAN symbol, scan label **RF**.



To enable transmission of the check digit in an EAN/JAN symbol, scan label **RG**.



Interleaved 2 of 5

Scan label **PA** to disable Interleaved 2 of 5.

PA



Disable
Interleaved 2 of 5 *

Check Digit

You can enable Interleaved 2 of 5 with or without the check digit. To enable Interleaved 2 of 5 without the check digit, scan label **PB**.

PB



Enable
Interleaved 2 of 5
without Check Digit

To enable Interleaved 2 of 5 with the check digit, scan label **PC**.

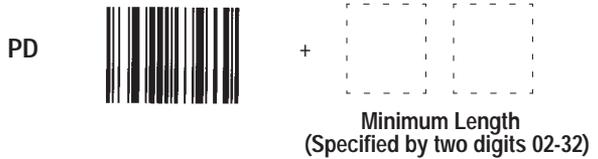
PC



Enable
Interleaved 2 of 5
with Check Digit

Minimum Length

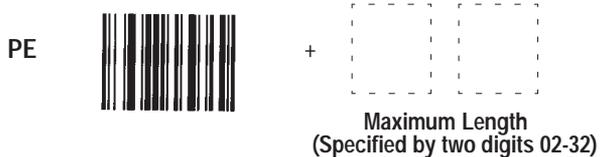
To set a minimum length (other than two) for Interleaved 2 of 5, scan label **PD** and then two digits (02-32) in Appendix B. **The value of the number you scan must be even. Odd numbers are ignored.**



For example, to enter a minimum length of 12, scan the **PD** label, then scan codes 1 and 2 in Appendix B.

Maximum Length

To set a maximum length for Interleaved 2 of 5, scan label **PE** and then two digits (02-32) in Appendix B. **The value of the number you scan must be even.**



For example, to enter a maximum length of 12, scan the **PE** label, then scan codes 1 and 2 in Appendix B.

If the minimum and maximum lengths are set equal, only codes of that exact length are read.

Standard 2 of 5

Scan label **PF** to disable Standard Code 2 of 5.

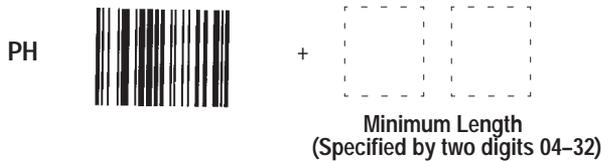


To enable Standard Code 2 of 5, scan label **PG**.



Minimum Length

To set a minimum length (other than 4) for Standard Code 2 of 5, scan label **PH** and then two digits (04-32) in Appendix B.



Maximum Length

To set a maximum length for Standard Code 2 of 5, scan label **PI** and then two digits (04-32) in Appendix B.



If the minimum and maximum lengths are set equal, only codes of that exact length are read.

Code 128

Scan label **TA** to disable Code 128.



Scan option **TB** to enable Code 128.



Minimum Length

To set a minimum length for Code 128, scan label **TC**, then two digits (01-32) in Appendix B.



Maximum Length

To set a maximum length for Code 128, scan **TD**, then two digits (01-32) in Appendix B.



If the minimum and maximum lengths are set equal, only codes of that exact length are read.

Codabar

Scan label **VA** to disable Codabar.

VA



Disable Codabar *

Scan option **VB** to enable Codabar.

VB



Enable Codabar

Transmit Start/Stop Characters

You can enable or disable the transmission of the Start and Stop characters in Codabar. To disable transmission of the Start and Stop characters, scan label **VC**.

VC



Disable Transmission *
Start/Stop Characters

To enable transmission of the Start and Stop characters, scan label **VD**.

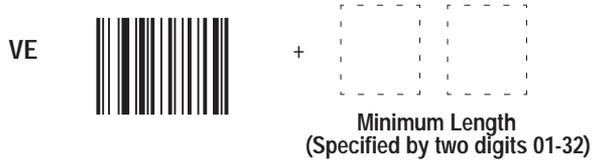
VD



Enable Transmission
Start/Stop Characters

Minimum Length

To set a minimum length for Codabar, scan label **VE** and then two digits (01-32) in Appendix B.



For example, to enter a minimum length of 05, scan the **VE** label, then scan codes 0 and 5 in Appendix B.

Maximum Length

To set a maximum length for Codabar messages, scan label **VF**, and then two digits (01-32) in Appendix B.



For example, to enter a maximum length of 05, scan the **VF** label, then scan codes 0 and 5 in Appendix B.

If the minimum and maximum lengths are set equal, only codes of that exact length are read.

Serial Commands

Chapter Objectives

This chapter covers serial commands that can be sent from the host to configure the scanner including:

- Serial Command Format
- Manual Scanning Interaction
- ACK/NAK Protocol
- Power Standby and Serial Commands
- Communication Parameter Changes

Serial Command Format

The format of serial commands is as follows:

STX ESC LT1 LT2 <optional parameters> ETX

Note: **STX**= Ctrl-B **ETX**= Ctrl-C

STX, ESC, and ETX are ASCII codes whose values are 02H, 1BH, and 03H, respectively.

LT1 and LT2 are uppercase ASCII letters that represent a serial command. LT1 is the first letter of the command; LT2 is the second letter of the command. Each bar code label in this manual is preceded by a two character serial command.

The ESC code that follows the STX code identifies this as a command.

Some commands require parameters such as minimum and maximum code lengths, and strings of hexadecimal characters. When parameters are required by the command they immediately follow LT2. Serial commands never contain spaces.

Table 9.A shows some serial programming command examples and the corresponding functions. For a complete list of serial commands, see Appendix F.

Table 9.A
Serial Programming Command Examples

Command	Function
STX ESC PC ETX	Enable Interleaved 2 of 5 with check digit.
STX ESC PD12 ETX	Set Interleaved 2 of 5 minimum length to 12.
STX ESC PE14 ETX	Set Interleaved 2 of 5 maximum length to 14.
STX ESC KB31323334 ETX 	Set Preamble to '1234'.
STX ESC LB6162364 ETX 	Set Postamble to 'abcd'.

 Each ASCII character is encoded as two hexadecimal characters. For example: 1=31, 2=32, 3=33, 4=34 and a=61, b=62, c=63, d=64.

Manual Scanning Interaction

The scanner firmware makes **no** attempt to resolve conflicts between serial programming commands and manually scanned menu labels. If you plan to scan menu labels, do not attempt serial programming, and vice versa.

Serial commands are given priority over pending menu labels. For example, if you scan the menu label **PD** (which sets a minimum length for Interleaved 2 of 5 labels) and the scanner is waiting for a two-digit minimum length code when a serial command is issued, the serial command is acted upon and the pending manual command (**PD – Set Interleaved 2 of 5 Minimum Length**) is ignored.

ACK/NAK Protocol

The scanner provides ACK/NAK protocol during serial programming to provide feedback to the host computer which is programming the scanner.

ACK/NAK protocol provides two functions.

- It provides the host with positive acknowledgement that its commands are being accepted and acted upon.
- It ensures the host will not issue commands to the scanner faster than the scanner can process them.

For example, every time the scanner receives a correct command, it modifies its internal EEPROM, a function that takes about one second. At 9600 baud, the host can easily issue commands to the scanner faster than they can be processed.

If, after issuing each command, the host waits to receive an ACK or NAK code before issuing the next command the scanner cannot be overrun.

If XON/XOFF or CTS/RTS protocol is being used, the scanner cannot be overrun by programming commands. However, the host is not provided with feedback as to the outcome of its commands.

The ACK/NAK Protocol is quite simple. Whenever the scanner receives a correctly formatted command, it sends a confirmation message followed by an ACK (06H) code. The following example shows the command and response for the BEEPER OFF command.

Command from Host:

STX ESC AA ETX

Response from Scanner:

BEEPER OFF CR-LF ACK

If the scanner receives an unknown command or improperly formatted command, or if the required parameters are missing or out-of-range, it sends a NAK (15H) code.

Power Standby and Serial Commands

When the scanner is programmed for standby power operation (**@B**), the first character of the command is used to *wake-up* the scanner; it will not be recognized by the scanner's CPU. When there is any possibility that the scanner is in standby mode, an extra space code should be transmitted before STX to ensure the scanner is *awake* before sending commands to it.

If you are not operating the scanner in standby mode, the space has no effect on commands (space prefixed commands are properly decoded).

Having sent the space code to *wake-up* the scanner, a 150 to 200 millisecond pause **must** be observed to allow the scanner's CPU to complete its initialization tasks, during which time it is unable to accept serial commands before issuing the programming command. Failure to observe this delay causes the scanner to ignore the incoming command.

Communication Parameter Changes

All commands which affect serial communication are acted upon immediately. When changing communication parameters (such as baud rate, word length, parity), the scanner will send the ACK code, using the newly implemented communication parameters.

There should be a delay after the host sends a communication parameter setup command. This delay allows the host computer to modify its internal parameters and correctly receive the ACK code from the scanner. This is due to the internal, one second delay required for the scanner to update its internal EEPROM.

Specifications

Hand-Held Scanners
Catalog No. 2755-G3-D
Catalog No. 2755-G6-D

Optical

Nominal Scan Rate	35 scans/second
Wavelength (nominal)	670 nm
Maximum Pitch	±55 degrees
Maximum Skew	±65 degrees
Scanning Range	

Minimum Bar Width	Standard Range (2755-G3-D)	Long Range (2755-G6-D)
6.0 mil (.15 mm)	3.0 in - 5.0 in 7.6 cm - 12.7 cm	N.A.
7.5 mil (.19 mm)	2.5 in - 7.5 in 6.4 cm - 19.0 cm	N.A.
10.0 mil (.25 mm)	1.0 in - 10.0 in 2.5 cm - 25.4 cm	N.A.
15.0 mil (.38 mm)	1.5 in - 14.0 in 3.8 cm - 35.6 cm	8.0 in - 22 in 20.3 cm - 55.9 cm
20.0 mil (.51 mm)	2.5 in - 18.0 in 6.4 cm - 45.7 cm	12 in - 36 in 30.5 cm - 91.4 cm
40.0 mil (1.02 mm)	9.0 in - 25.0 in 22.9 cm - 63.5 cm	23 in - 60 in 58.4 cm - 152.4 cm
55.0 mil (1.40 mm)	12.0 in - 30.0 in 30.5 cm - 76.2 cm	23 in - 66 in 58.4 cm - 167.6 cm

Scanning Range

Autosense Mode	36 in (91.4 cm) maximum (to reflective label or tape)
----------------	--

Electrical

Supply Voltage	4.75 to 14 VDC
Current Consumption	
While Scanning	200 mA maximum
Standby Power	100 µA maximum
Continuous Full Power	200 mA maximum [¶]

[¶] Autosense mode automatically uses continuous full power.

Mechanical

Dimensions

Inches 4.0(L) x 2.8(W) x 6.6(H)
Millimeters 102(L) x 71(W) x 168(H)

Weight 8.0 oz (0.23 kg)

LED Indicators

Good Read Green
Scanning Yellow

Environmental

Operating Temperature 0° to 122° F
-18° to +50° C

Storage Temperature -40° to 158° F
-40° to +70° C

Relative Humidity 5 to 95% (noncondensing)

Electrostatic Discharge 15kv to any
external surface

Drop Test 5 feet (1.27 meter)
on concrete

Dust and Rain MIL STD 810D
Sections 510.2I & 506.2II

Interface

RS-232

Certification

Dept. of Health and Human Services (DHHS) Class II laser product.
Complies with DHHS radiation performance standards, 21 CFR subchapter J.

Bar Code Test Symbols

Use the following labels to insure that your scanner is functioning properly. The only label the long range scanner can read below is the Interleaved 2-of-5 (15 mil) label.



UPC E 13 MIL



EAN 8 13 MIL



UPC A 13 MIL



EAN 13 13 MIL



Code 39 11 MIL



Code 128 11 MIL



Interleaved 2-of-5 15 MIL

Digit Selection Symbols

0



1



2



3



4



5



6



7



8



9



Autosense Mode

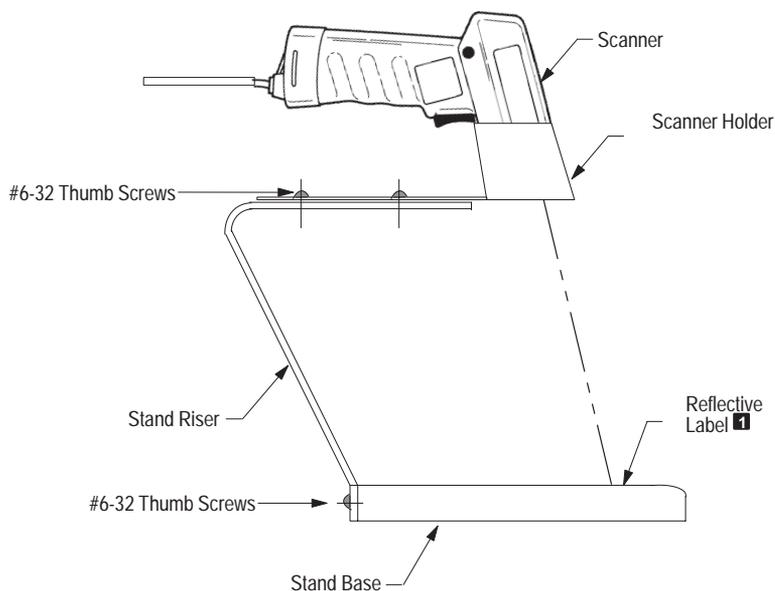
To set up the scanner to operate in Autosense mode using the optional Autostand follow the steps below while referring to Figure C.1.

1. Enable the scanner to operate in Autosense mode by scanning the **Enable Autosense (NO)** label in Chapter 5.
2. Attach the *Stand Riser* to the *Stand Base* using two of the supplied #6-32 thumb screws.
3. Attach the *Scanner Holder* to the top of the *Stand Riser* using the other two #6-32 thumb screws.
4. Verify that the reflective label is affixed to the *Stand Base*.
5. Place the scanner in the stand as shown in Figure C.1.
6. Check that the red beam of light is aimed at the reflective label on the stand.

The Autostand is now ready to read bar code labels presented to it.

While the scanner is activated in Autosense mode you are able to remove the scanner from its holder and use it for hand-held applications. When the scanner is removed from the Autostand the scanning beam is turned on automatically to read a bar code label. If the scanner does not see a label the scanning beam will turn off after four seconds. Scanning is re-initiated by manually pulling the trigger. The scanner can then be placed into the stand once again and it will function in Autosense mode.

Figure C.1
Autostand



Important: When the scanner is to be powered from a battery such as in a hand-held terminal, you should disable Autosense mode. In this application, you may need to use the power conservation mode (see page 5-3) of the scanner when drawing power from a battery. Autosense mode will function only in full power mode.

1 Reflective tape is supplied with the autostand. Additional reflective tape is available by ordering Catalog No. 2755-NT1.

Interface Cable Pinouts

The Catalog No. 2755-NCR1 Cable is typically used to connect the scanner to IBM PC Compatible computers. You may have to use an adapter if your computer has a 9-pin port.

Table D.1
RS232 DCE, 25-Pin, Female, D-Type Connector
Catalog No. 2755-NCR1

Pin	Signal Name	Function
2	RxD	Serial data receive input.
3	TxD	Serial data transmit output.
4	CTS	Clear-To-Send (or External Trigger) ¹ Handshaking input line.
5	RTS	Request-To-Send Handshaking output line.
7	Ground	Ground pin and reference for both output signals.

- ¹ External trigger operation is controlled by applying an external signal to the CTS input (with external triggering enabled). CTS protocol and External Trigger Enabled are mutually exclusive parameters. See Chapter 5 for details on how to enable the scanner for external trigger operation.

Appendix D

Interface Cable Pinouts

The Catalog No. 2755-NCR2 cable is compatible with the AUX port on the Single and Dual-Head Enhanced Bar Code Decoders (Catalog No. 2755-DS1A, -DD1A).

Table D.2
RS232 DTE, 25-Pin, Male, D-Type Connector
Catalog No. 2755-NCR2

Pin	Signal Name	Function
2	TxD	Serial data transmit output.
3	RxD	Serial data receive input.
4	RTS	Request-To-Send Handshaking output line
5	CTS	Clear-To-Send (or External Trigger)  Handshaking input line
7	Ground	Ground pin and reference for both output signals.

-  External trigger operation is controlled by applying an external signal to the CTS input (with external triggering enabled). CTS Protocol and External Trigger Enabled are mutually exclusive parameters. See Chapter 5 for details on how to enable the scanner for external trigger operation.

Maintenance

This appendix provides general maintenance information for your scanner.

Cleaning 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.

**CAUTION:**

Do not use abrasive materials (e.g., disposable wipes, facial tissue) or solvents (e.g., alcohol or acetone) on the window. These items may damage the window or finish on the scanner.

**WARNING:**

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

Inspecting Cables

Periodically inspect the cable on the scanner for wear and other signs of damage. A worn or damaged cable may interfere with the operation of the scanner. Contact your Allen-Bradley representative to order replacement cables.

Scanner Commands

Each label in this manual is preceded by two characters which represent the serial command for a scanner parameter. The following tables list the command mnemonic for each scanner parameter and the page location of the corresponding label.

General Scanner Setup Parameters

Mnemonic	Function	Page #
ZA	Set Scanner to Factory Defaults	4-10
ZB	Display Scanner Configuration	5-1
ZC	Transmit Program Version Number	5-2
@C	Transmit Program ID	5-2
@A	Enable Full Continuous Power	5-3
@B	Enable Standby Power	5-3
AA	Beeper Off	5-4
AB	Beeper On; Volume Low	5-4
AC	Beeper On; Volume Medium	5-4
AD	Beeper On; Volume Loud	5-4
BC	Capture Count=1	5-5
BD	Capture Count=2	5-5
NP	Disable Spotter Beam	5-6
NQ	Enable Spotter Beam	5-6
NO	Enable Autosense Mode	5-7
NN	Disable Autosense Mode	5-7
HA	Disable External Trigger	5-8
HE	External Trigger (+)	5-8
HF	External Trigger (-)	5-8

Serial Communication Parameters

Mnemonic	Function	Page #
DA	Baud Rate = 300	6-2
DB	Baud Rate = 600	6-2
DC	Baud Rate = 1200	6-2
DD	Baud Rate = 2400	6-2
DE	Baud Rate = 4800	6-2
DF	Baud Rate = 9600	6-2
DG	Baud Rate = 19200	6-2
EA	7 Data Bits, 1 Stop Bit, Space Parity	6-4
EB	7 Data Bits, 1 Stop Bit, Mark Parity	6-4
EC	7 Data Bits, 1 Stop Bit, Even Parity	6-4
ED	7 Data Bits, 1 Stop Bit, Odd Parity	6-4
EE	7 Data Bits, 2 Stop Bits, Space Parity	6-5
EF	7 Data Bits, 2 Stop Bits, Mark Parity	6-5
EG	7 Data Bits, 2 Stop Bits, Even Parity	6-5
EH	7 Data Bits, 2 Stop Bits, Odd Parity	6-5
EI	8 Data Bits, 1 Stop Bit, Space Parity	6-6
EJ	8 Data Bits, 1 Stop Bit, Mark Parity	6-6
EK	8 Data Bits, 1 Stop Bit, Even Parity	6-6
EL	8 Data Bits, 1 Stop Bit, Odd Parity	6-6
EM	8 Data Bits, 1 Stop Bit, No Parity	6-5
EN	8 Data Bits, 2 Stop Bits, No Parity	6-6
HA	CTS Protocol = None	6-8
HB	Protocol = XON/XOFF	6-8
HC	Protocol = CTS(+)	6-8
HD	Protocol = CTS(-)	6-8
HG	RTS always high	6-9
HH	RTS always low	6-9
HI	RTS high means scanner has data to transmit	6-9
HJ	RTS low means scanner has data to transmit	6-9
HK	RTS low means scanner ready to receive data	6-9
GA	No Intercharacter Delay	6-10
GB	Set Intercharacter Delay	6-10
NE	Serial Transmit Buffer = Full Buffering	6-11
NF	Serial Transmit Buffer = No Buffering	6-11
NG	Serial Transmit Buffer = One Label Buffering	6-11

Message Format Parameters

Mnemonic	Function	Page #
IA	Prefix = None	7-2
IB	Prefix = STX	7-2
IC	Prefix = SOH	7-2
MA	Suffix=None	7-3
MB	Suffix = ETX	7-3
MC	Suffix = CR	7-3
MD	Suffix = LF	7-3
ME	Suffix = HT	7-3
MF	Suffix = CR and LF	7-3
JA	Disable Scanner Identifier	7-4
JB	Enable Scanner Identifier	7-4
FA	Disable Code Identifier	7-5
FB	Enable Code Identifier	7-5
KA	Preamble = None	7-7
KB	Preamble = 4 ASCII Characters	7-7
LA	Postamble = None	7-7
LB	Postamble = 4 ASCII Characters	7-7

Symbology Parameters

Mnemonic	Function	Page #
OA	Disable Code 39	8-2
OB	Enable Standard Code 39	8-2
OC	Enable Full ASCII Code 39	8-2
OD	Disable Modulo 43 Check Character	8-3
OE	Enable Modulo 43 Check Character	8-3
OF	Do Not Transmit Code 39 Start/Stop Characters	8-3
OG	Transmit Code 39 Start/Stop Characters	8-3
OH	Set Minimum Length for Code 39 Labels	8-4
OI	Set Maximum Length for Code 39 Labels	8-4
QA	Disable UPC (A and E)	8-5
QB	Enable UPC (A and E) with 2 or 5 Digit Supplements	8-5
QC	Enable UPC (A and E) without 2 or 5 Digit Supplements	8-5

Symbology Parameters (continued)

Mnemonic	Function	Page #
QD	Disable Transmission UPC Number System Digit	8-6
QE	Enable Transmission UPC Number System Digit	8-6
QF	Disable Transmission UPC Check Digit	8-6
QG	Enable Transmission UPC Check Digit	8-6
QH	Disable Expanded UPC-E	8-5
QI	Enable Expanded UPC-E	8-5
QJ	Enable UPC to EAN Translation	8-7
QK	Disable UPC to EAN Translation	8-7
RA	Disable EAN/JAN (8 or 13)	8-8
RB	Enable EAN/JAN with 2 or 5 Digit Supplements	8-8
RC	Disable EAN/JAN without 2 or 5 Digit Supplements	8-8
RD	Disable Transmission EAN/JAN Number System Digit	8-9
RE	Enable Transmission EAN/JAN Number System Digit	8-9
RF	Disable Transmission EAN/JAN Check Digit	8-9
RG	Enable Transmission EAN/JAN Check Digit	8-9
PA	Disable Interleaved 2 of 5	8-10
PB	Enable Interleaved 2 of 5 without Check Digit	8-10
PC	Enable Interleaved 2 of 5 with Check Digit	8-10
PD	Set Minimum Length for Interleaved 2 of 5 Labels	8-11
PE	Set Maximum Length for Interleaved 2 of 5 Labels	8-11
PF	Disable Standard 2 of 5	8-12
PG	Enable Standard 2 of 5	8-12
PH	Set Minimum Length for Standard 2 of 5 Labels	8-12
PI	Set Maximum Length for Standard 2 of 5 Labels	8-12
TA	Disable Code 128	8-13
TB	Enable Code 128	8-13
TC	Set Minimum Length for Code 128 Labels	8-13
TD	Set Maximum Length for Code 128 Labels	8-13
VA	Disable Codabar	8-14
VB	Enable Codabar	8-14
VC	Disable Transmission Codabar Start/Stop Characters	8-14
VD	Enable Transmission Codabar Start/Stop Characters	8-14
VE	Set Minimum Length for Codabar Labels	8-15
VF	Set Maximum Length for Codabar Labels	8-15

ACK: See acknowledgement.

acknowledgement (ACK): An ASCII control character used to acknowledge the reception and acceptance of a transmission block.

AIM: Acronym for Automatic Identification Manufacturers.

alphanumeric: The character set containing letters, numbers, punctuation marks, and symbols.

ASCII: American Standard Code for Information Interchange. It is a seven-bit code with an optional parity bit used to represent alphanumerics, punctuation marks, and control codes.

bar: The dark element of a printed symbol.

bar code: The parallel bars and spaces found in a bar code symbol.

bar code density: The number of characters which can be represented in a linear inch.

bar code label: A label that carries a bar code and is suitable to be affixed to an article.

bar code symbol: A group of parallel bars that represent a character or group of characters whose spacing is determined by a specific set of rules. In most cases, human readable characters are printed below the bars.

bar length: The bar dimension perpendicular to the bar width.

bar width: The thickness of a bar measured from the edge closest to the symbol's start character to the trailing edge of the same bar.

baud: A unit of signaling speed equal to the number of discrete conditions or signal events per second.

character: A single group of bars and spaces representing an individual number, letter or punctuation mark. A graphic shape representing a letter, number or symbol.

check digit: A digit included within a symbol whose value is based mathematically on other characters included in the symbol. It is used to mathematically check the accuracy of a symbol.

clear area: A clear space, containing no dark marks, that precedes the start character of a symbol and follows the stop character.

Codabar: A numeric symbology consisting of 16 data characters and 4 start/stop characters. Codabar is primarily used by the medical community.

Code 128: A symbology representing the full 128 ASCII character set. Numeric data may be represented in a double density mode where two digits are represented by one character.

Code 39: An alphanumeric symbology recognized by most nations, widely used in the manufacturing industry.

code type: See symbology.

decode: The process of translating a bar code into data characters using a specific set of rules for each symbology.

decoder: A device used to decode, or make usable, a digital or analog signal transmitted from a scanning device. The scanner contains a decoder.

EAN: Acronym for European Article Numbering system, the international standard bar code for retail food packages.

element: Dimensionally the narrowest width in a character, bar or space.

encoded area: The total linear dimension consisting of all the characters of a code pattern, including start/stop characters and data.

guard bars: Bars at the ends and center of a UPC and EAN symbol. They ensure a complete scan of the bar code.

hex: Abbreviated form of the word hexadecimal. See hexadecimal.

hexadecimal: A base-16 numbering system that uses the symbols 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F.

horizontal bar code: A bar code or symbol presented in a manner that its overall length dimension is parallel to the horizon. The bars look like a picket fence.

Interleaved 2 of 5: A symbology in which characters are paired together using bars to represent odd number characters and spaces to represent even number characters.

ladder orientation: See vertical bar code.

modulus 43 check character: Used in Code 39 for data security in addition to the built-in self-checking characters. The check-character is the modulus 43 sum of all of the character values in a given message and is the last character in the code.

NAK: See negative acknowledgement.

negative acknowledgement (NAK): An ASCII control character transmitted by a receiver as a negative response to the sender.

orientation: The alignment of bars and spaces to the scanner. Often referred to as vertical (ladder) or horizontal (picket fence).

parity bit: An additional non-data bit attached to a binary word to provide a check of the data integrity by making the sum of the number of ones in a word always even or odd.

picket fence code: See horizontal bar code.

scan: The search for a symbol or marks which are to be optically recognized.

scan area: The area intended to contain a bar code symbol.

scanner: A device that optically scans bar code symbols and converts the optical information into digital or analog form and sends it to a decoder.

self-checking: A bar code or symbol using a checking algorithm which can be applied to each character to guard against undetected errors. Codes that are not self-checking may employ a check digit or other redundancy in addition to the data message.

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

start/stop characters: Bar code characters that provide the scanner with information on how the code is bounded and its orientation. The start character is normally at the left end of a horizontal code and adjacent to the most significant character. The stop character is normally at the end of a horizontal code and adjacent to the least significant character.

symbolology: The conventions, or rules, which govern the formation of characters and strings in bar codes. The language of the bar code symbol.

symbol density: The number of characters per linear inch.

symbol length: The length of the symbol measured from the beginning of the quiet area adjacent to the start character to the end of the quiet area adjacent to a stop character.

UPC: Acronym for Universal Product Code. The standard bar code for retail food packages in the United States.

vertical bar code: A code pattern in which the overall coded area from start to stop is perpendicular to the horizon. The individual bars appear as rungs of a ladder.

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