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User's Manual

Bulletin 2755 Enhanced Medium-Speed Scan Head

(Catalog No. 2755-L4FAA, -L4FBA, -L4FCA, -L4FDA,
2755-L4RAA, -L4RBA, -L4RCA, -L4RDA,
2755-L5RAA, -L5RBA, -L5RCA, -L5RDA)

40062-133-01(A)

Publication 2755-829 – October, 1989

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Important User Information

Solid-state equipment has operational characteristics differing from those of electromechanical equipment. "Application Considerations for 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.

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Chapter 1 Using This Manual

Chapter Objectives

Read this chapter to familiarize yourself with the rest of the manual. You will learn about:

- Contents of the manual.
- Intended audience.
- Warnings and cautions.

Overview of This Manual

This manual is for Catalog No. 2755-L4FAA, -L4FBA, -L4FCA, -L4FDA, -L4RAA, -L4RBA, -L4RCA, -L4RDA, -L5RAA, -L5RBA, -L5RCA, and -L5RDA Enhanced Medium-Speed Scan Heads.

Chapter	Title	Purpose
1	Using This Manual	Provides an overview of the manual.
2	Description	Features and capabilities are described.
3	How the System Operates	Bar code operation is explained.
4	Installing the Scan Head	Rules and recommendations are detailed.
5	Maintenance and Troubleshooting	Troubleshooting guidelines are provided.
6	Specifications	Electrical, mechanical, environmental and operational information is listed.
–	Glossary	
–	Index	

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Intended Audience

No special knowledge is needed to read this manual and follow its directions. If the system will be used to communicate with a higher level controller, we assume you are familiar with communication terminology.

Warnings and Cautions

Both warnings and cautions are found in this manual and on the equipment. The following symbols are used:



CAUTION: This laser caution symbol appears where laser radiation is present.



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



CAUTION: A caution symbol is used when machinery could be damaged if the procedures are not followed.

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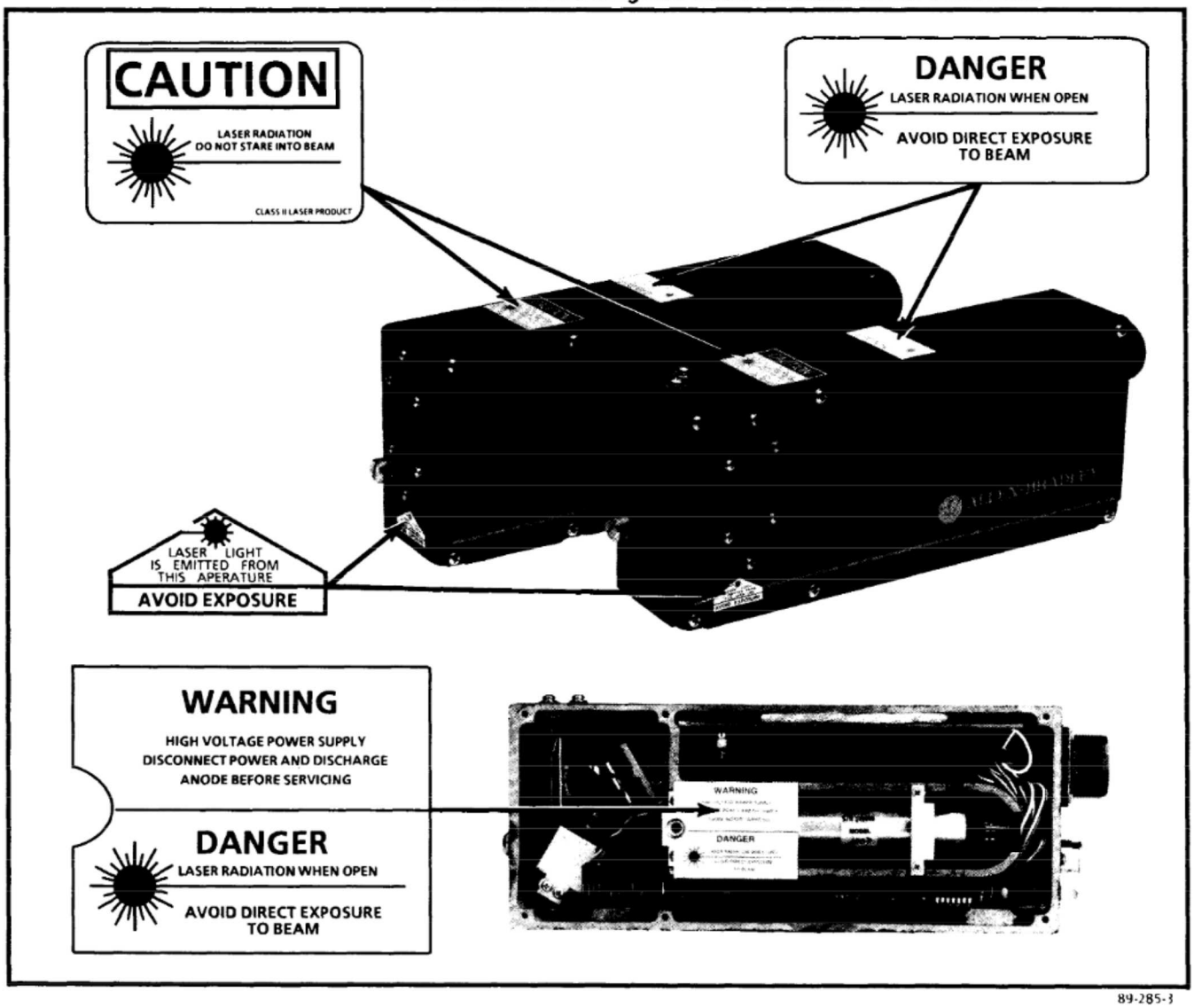
Danger and Caution Labels

The scan head is labeled in accordance with federal regulations. If any label is removed, lost, or becomes illegible, order a replacement from your Allen-Bradley representative. Figure 1.1 shows location of the labels on the scan head.

WARNING: No user maintenance of the scan head is required. **Do not open the enclosure!**

WARNING: Improperly controlling, adjusting, or operating the scan head can result in hazardous radiation exposure.

Figure 1.1
Location of Warning and Caution Labels on the Scan Head



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Chapter 2 Description

Chapter Objectives

The capabilities of the scan head are described when connected to a Catalog No. 2755-DM1 or DM6 Decoder.

Overview

The Enhanced Medium-Speed Scan Head is a moving beam, bar code scan head capable of scanning symbols up to 50 inches away, when connected to a Catalog No. 2755-DM1 or -DM6 Decoder. Scanning is bi-directional at approximately 200 scans per second. Scan heads are available in 3 different configurations:

- Front scanning (Catalog No. 2755-L4F*x*A*)
- Side scanning (Catalog No. 2755-L4R*x*A*)
- Raster scanning (Catalog No. 2755-L5R*x*A*)

* The *x* stands for one of 4 different range selections, The range selections, A through D, are illustrated in Figure 2.1

The *front scanning model* allows the beam to exit through the front of the scan head. The *side scanning model* uses an additional mirror to reflect the beam out the side of the scan head. The *raster scanning model* uses a mirror, oscillating at 20Hz, to project what appears to be a number of parallel beams. This type of scan head is useful when attempting to scan poor quality or misaligned labels. Chapter 3 explains how to correctly position labels and illustrates a raster pattern (figure 3.6) created by a raster scan head.

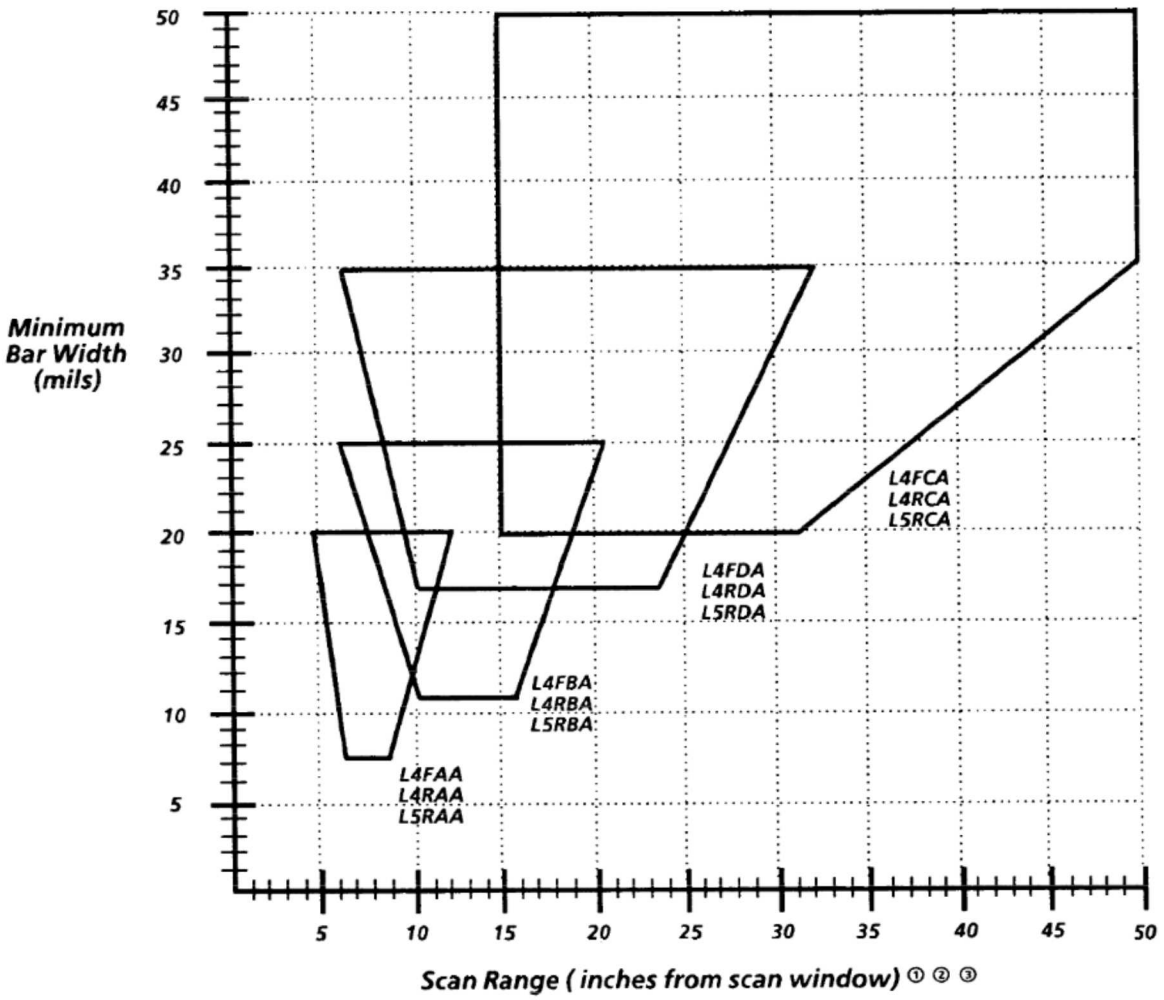
Figure 2.1 illustrates the **average reading ranges**, relative to the symbol's minimum bar width, that you should expect when using a Catalog No. **2755-DM1 or DM6 Decoder.**

Not all symbols or applications are perfect, so, slight variations in the the reading distances will occur.

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Overview
(continued)

Figure 2.1
Average Scan Range vs. Minimum Bar Width



① Distances will be reduced by 10% on all side scanning models (2755-L4R, -L5R)
② Scan Range will vary with symbol quality. This application was based on no more than 30° pitch and 20° skew.
③ For applications outside of the designated areas, and for applications using a 2755-DM1 to decode UPC or Code 128 labels, consult the factory.

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Lens Combinations

Table 2.A compares the minimum bar width to the scan range of each catalog number.

Table 2.A
2755-L4 Catalog Number identification

Minimum Bar Width	Scan Range (inches)①②③④	Front Scanning	Side Scanning	Raster Scanning
7.5 mil 10 mil 20 mil	6.5 - 8.5 6 -9 5 - 12	2755-L4FAA	2755-L4RAA	2755-L5RAA
11 mil 20 mil 25 mil	10 - 16 8 - 19 6 - 21	2755-L4FBA	2755-L4RBA	2755-L5RBA
20 mil 35 mil 50 mil	15 - 32 15 - 50 15 - 50	2755-L4FCA	2755-L4RCA	2755-L5RCA
17 mil 25 mil 35 mil	10 - 24 8 - 27 6 - 33	2755-L4FDA	2755-L4RDA	2755-L5RDA

① Distances will be reduced by 10% on all side scanning models (2755-L4R, -L5R)
② Scan Range will vary with symbol quality. This application guide was based on no more than 30° pitch and 20° skew.
③ For applications outside of the designated areas, and for applications using a 2755-DM1 to decode UPC or Code 128 labels, consult the factory.
④ Symbol lengths greater than one half the usable beam width will restrict the near range.

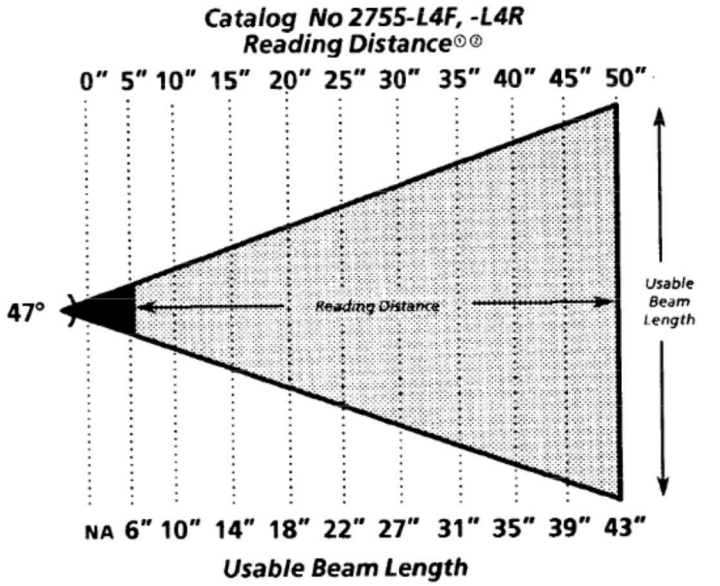
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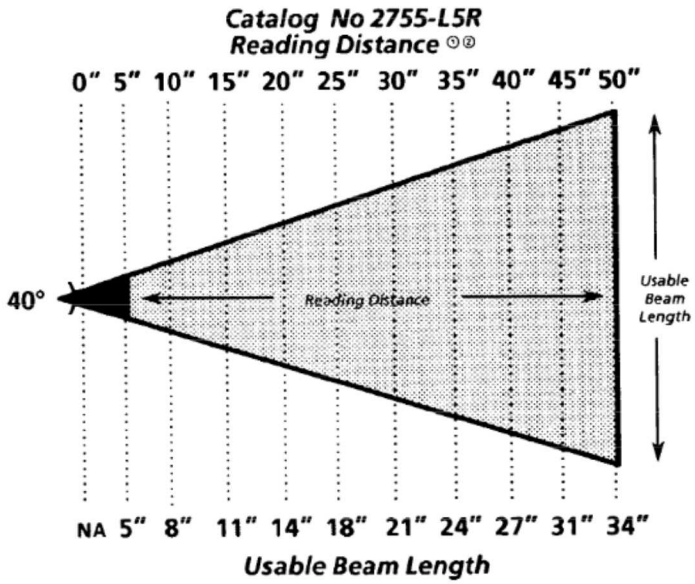
Reading Distance

Figure 2.2 shows the size and shape of the scanning window. The black area is a no read area.

The *Usable Beam Length* (bottom of chart) is compared to the the *Reading Distance* (top of chart). The Usable Beam Length is slightly less than the total beam length. The reading distance is measured from the scan window to the center of the label.

Figure 2.2
Reading Distance vs. Usable Beam Length





① Measured from the scan window to the center of bar code symbol
② Distances will be reduced by 10% on all side scanning models (2755-L4R, -L5R)

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Features

Shutter control. Rotate this knob to prevent projection of the laser beam.

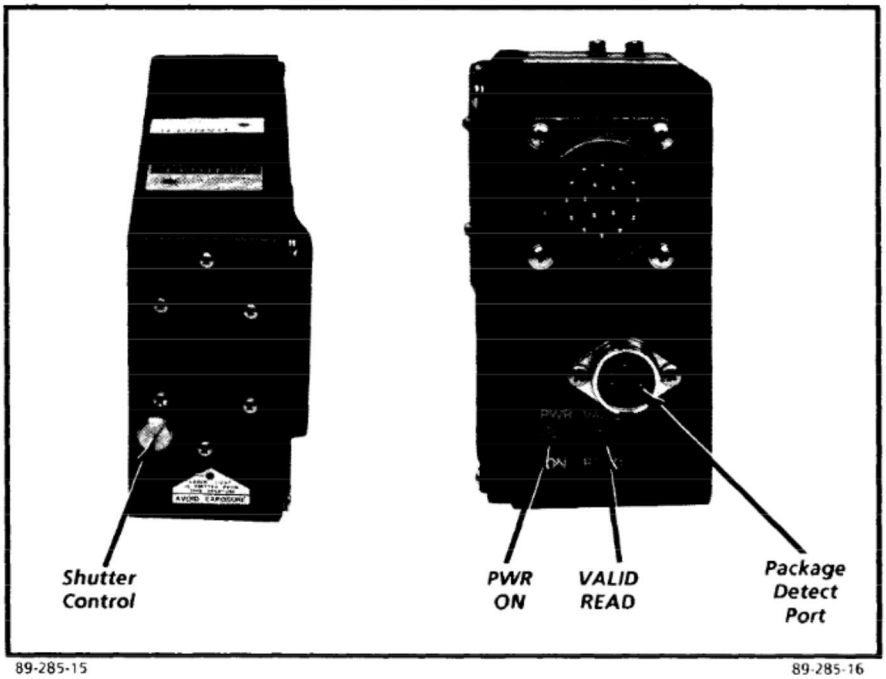
LED indicators. There are two LEDs on the back of the scan head. They are defined in Table 2.B.

Table 2.B
The LEDs on the Scanner

Label	Meaning
PWR ON	The scan head must be connected to the decoder and the decoder must be ON before this LED lights.
VALID READ	Flashes momentarily after any valid label is scanned.

Package Detect Port. Connect the optional Package Detect Assembly (Catalog No. 2755-NP1) to this port to allow the scan head to be turned on only when there is a package present.

Figure 2.3
Scan Head Features



89-285-15 89-285-16

Cabling

To provide maximum installation and application possibilities, the scan head is housed in a separate enclosure from the decoder. The small size of the scan head allows it to be installed in tight areas. Refer to table 2.C for information necessary to order a cable.

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Accessories

Several accessories are available to provide installation and operational flexibility, including:

- **Package detector assembly.** This assembly consists of a photoelectric switch and a reflector. You use the switch to indicate to the Decoder when a package is present.
- **Mounting hardware.** A swivel ball mounting base and flat mounting plate are available for the scan head to provide installation flexibility.
- **Replaceable Windows.** Replaceable glass and plastic windows are available.

Table 2.C lists system accessories.

Table 2.C
Accessories Available for the Scan Head

Catalog Number	Item	Description
2755-NP1	Package Detector Assembly	An infrared photoelectric switch and reflector. For "package present" detection.
2755-NC7	Package Detector Port Connector	Use to connect user-supplied package detector to scan head
2755-NM1	Swivel Mounting Base	Universal swivel ball mount for greater installation flexibility. **Note:** Must be used with "T" Mounting Plate (Catalog No. 2755-NM2).
2755-NM2	"T" Mounting Plate	Use to mount Swivel Mounting Base (Catalog No. 2755-NM1) to scan head.
2755-NM3	Flat Mounting Plate	Attach this plate to scan head in order to use your own brackets, or to use the Swivel Mounting Base (Catalog No. 2755-NM1) when you want the swivel ball close to the base of the scan head.
2755-C1	10-ft Cable	Connects Catalog No. 2755-DM1 Decoder to scan head
2755-C2	25-ft Cable	Connects Catalog No. 2755-DM1 Decoder to scan head
2755-CK10	10-ft Cable	Connects Catalog No. 2755-DM6 Decoder to scan head
2755-CK25	25-ft Cable	Connects Catalog No. 2755-DM6 Decoder to scan head
W77119-023-01①	Replacement Window	Anti-reflective, optical glass replacement window
W77119-159-01①	Replacement Window	Hard coated, anti-reflective, plastic replacement window

① *Replacement part number*

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Chapter 3 How the System Operates

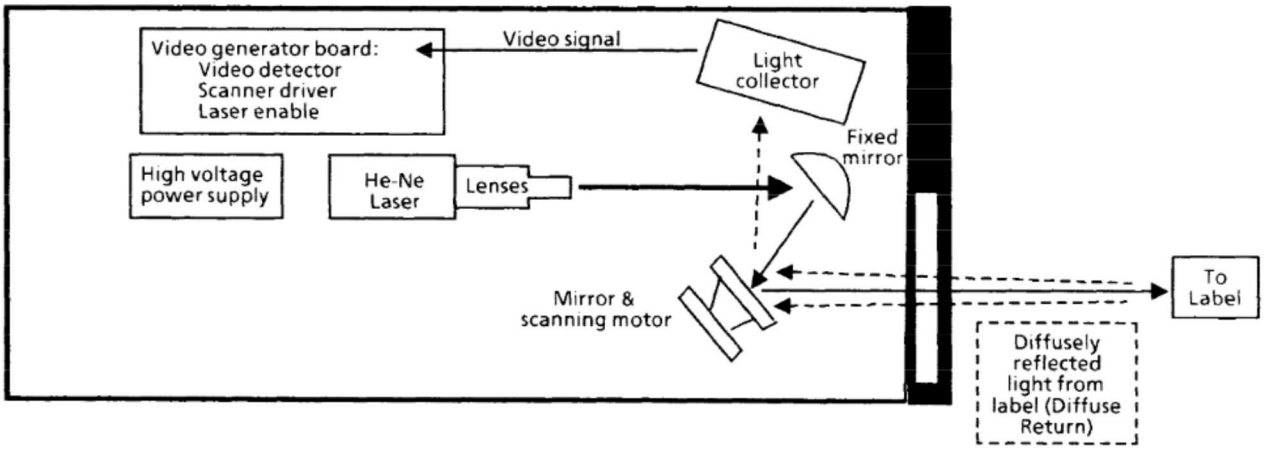
Chapter Objectives

Bar code operation is briefly described. The importance of proper symbol positioning and movement is also discussed.

How the Scan Head Operates

Inside the scan head is the laser, the lens and mirror system and the electronics. The laser generates a small, concentrated light beam that is focused and projected through a window. This light is reflected by a label and returned to the scan head for processing. The signal is then sent to the decoder for further processing. Refer to figure 3.1

Figure 3.1
How the Scan Head Operates



Positioning the Symbols Correctly

As the symbols move past the scan head, they must be correctly oriented. The laser's line of light must cut through all the bars and spaces in one sweep.

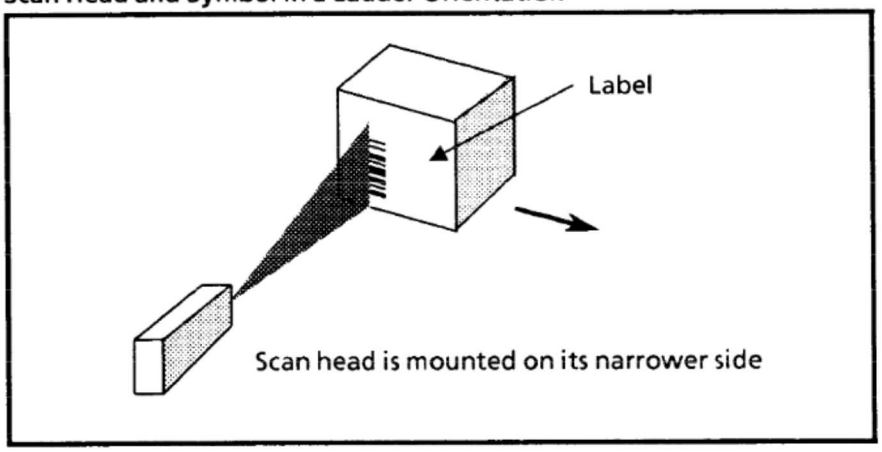


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Positioning the Symbols Correctly (continued)

For example, if the scan head is mounted so the laser beam is in the vertical direction, then the symbol must also be mounted vertically, commonly known as the *ladder orientation*. Figure 3.2 shows a vertically oriented system.

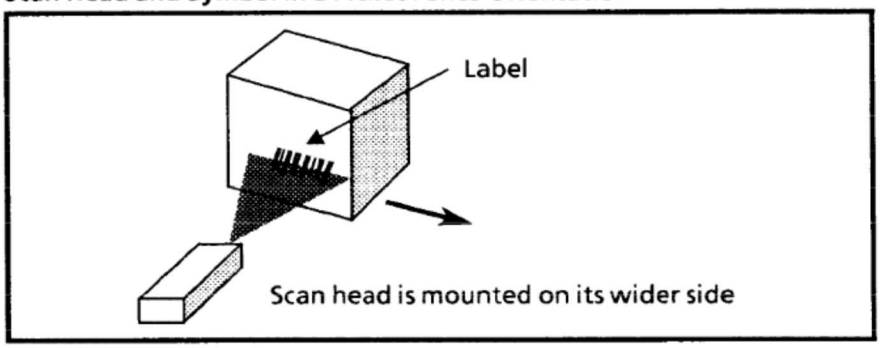
Figure 3.2
Scan Head and Symbol in a Ladder Orientation



If the scan head is mounted so the beam is in the horizontal direction, the symbol must also be in the horizontal direction. This is termed *picket fence orientation*.

Refer to figure 3.3 for an example of the scan head and symbol in a *picket fence* orientation.

Figure 3.3
Scan Head and Symbol in a Picket Fence Orientation

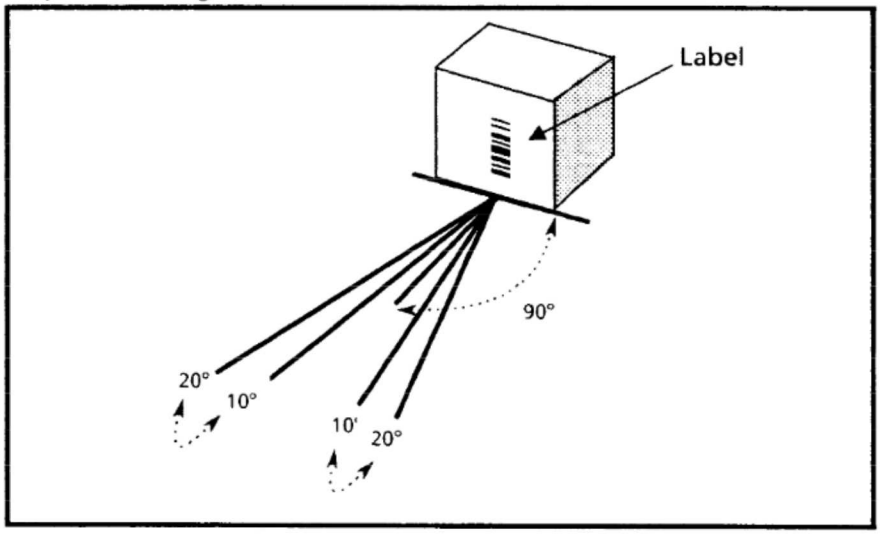


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Positioning the Symbols Correctly (continued)

When setting up a front or side scanning model, you should attempt to have the laser line of light perpendicular to the bars and spaces of the symbol. For optimal performance, mount the scan head at a 10° to 20° angle off normal from the label, as shown in figure 3.4.

Figure 3.4
Proper Mounting of Scan Head



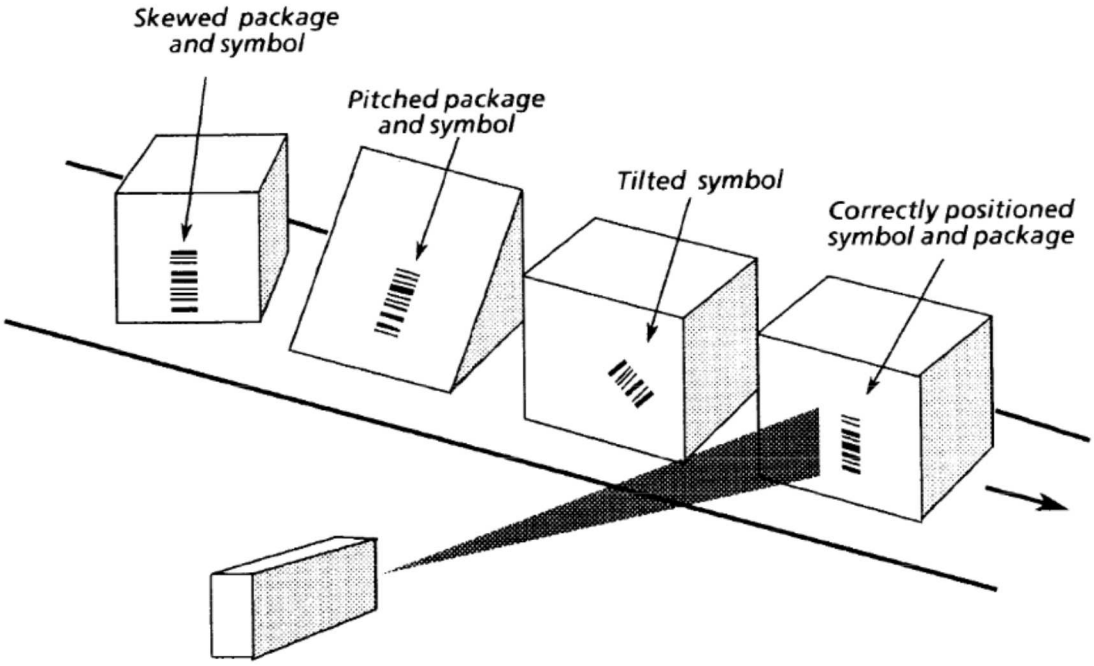
The scan head can successfully decode symbols that are up to ±50° out of alignment, provided that the projected, or apparent, bar element widths are within the minimum widths shown in table 2.A. Symbols that are pitched or tilted up to ±45°, are still readable. Skewed symbols can also be read as long as the misalignment is less than ±50°. Figure 3.5 shows a correctly placed symbol as well as misaligned symbols.

WARNING: If at any time during operation an intense dot of light is reflected onto a label instead of a line of light, rotate the shutter control knob on the scan head to close the scan window. Then turn the decoder OFF.

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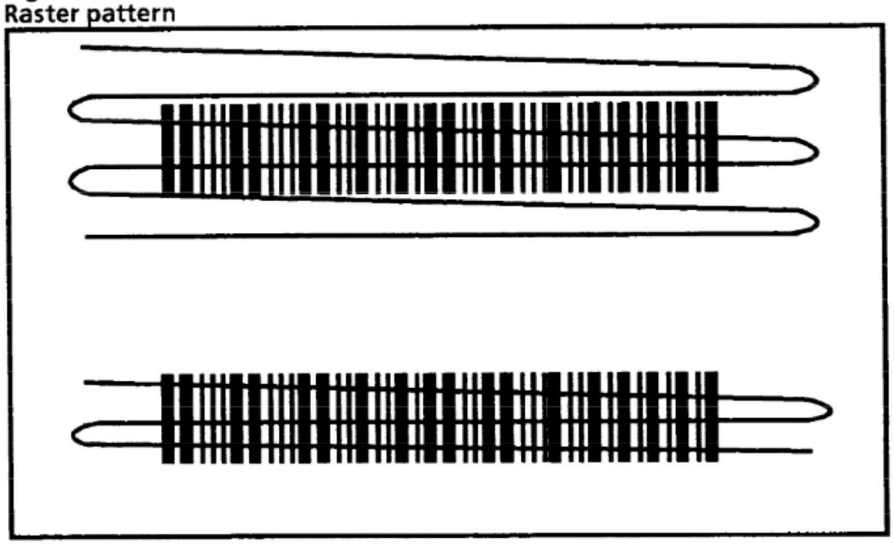
Positioning the Symbols Correctly (continued)

Figure 3.5
Examples of Correctly Positioned and Misaligned Symbols



When setting up a raster scaning model, the pattern created by the raster can overlap the entire symbol, to aid in the scanning of misaligned symbols, or be restricted to cover only a portion of the label, which is helpful when scanning symbols of poor quality. Refer to figure 3.6

Figure 3.6
Raster pattern



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Chapter 4 Installing the Scan Head

Chapter Objectives

Carefully read this chapter before installing the system. We will present rules and recommendations for installing and connecting the scan head.

Warnings and Cautions



- **WARNING:** Do not make adjustments to the equipment. Only use procedures specified in this manual.
- **WARNING:** If at any time during operation an intense dot of light is generated instead of a thin line of light, immediately close the shutter control on the scan head and remove power.



CAUTION: Do not look directly into the laser beam since you could damage your eyes.



CAUTION: No user maintenance of the hardware is required. **Do not open the unit's housing!**



WARNING: Do not open the unit's housing. No user maintenance of the scan head is required.

Before You Start

The angle and distance between the scan head and the labels is an important consideration. These considerations, orientation and alignment, are described in Chapter 3.

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Tools You Will Need

Normally, the only tool you will need for installation is an adjustable, open-ended wrench. If the optional Swivel Mounting Base and Plate are used (Catalog No. 2755-NM1 and 2755-NM2), you will also need a screwdriver and a $^{3}/_{16}$-inch allen wrench.

How to Handle Excessive Noise

When the system is operating in a noise-polluted industrial environment, special consideration should be given to possible electrical interference. The effect of electrical interference has been minimized by the basic design of the hardware. Properly grounding the equipment, correctly routing wires and the use of shielded cables will also help minimize interference.

Grounding Recommendations

Grounding is an important safety measure in electrical installations. With solid-state systems, grounding also helps limit the effects of noise due to electromagnetic interference (EMI).

An authoritative source on grounding requirements is the National Electrical Code published by the National Fire Protection Association of Boston, Massachusetts. Article 250 of the Code discusses the types and sizes of wire conductors and safe methods of grounding electrical equipment and components.

Connecting Your Equipment

Connect your equipment using the appropriate cables. Follow the step-by-step procedure described below.

Step 1 Connect the scan head to the port labeled SCAN HEAD on the back of the decoder.

Step 2 Connect the terminal that will be used for programming to the proper port on the decoder (refer to the User' Manual supplied with your decoder).

Step 3 The initial programming should be done at this time, if it was not done earlier (refer to the User's Manual supplied with your decoder).

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Connecting Your Equipment (continued)

Step 4 If a host computer will be used, connect it to the port labeled COMM on the back of your Catalog No. 2755-DM1 decoder, or the port marked HOST on your Catalog No. 2755-DM6 decoder (refer to the User's Manual supplied with your decoder).

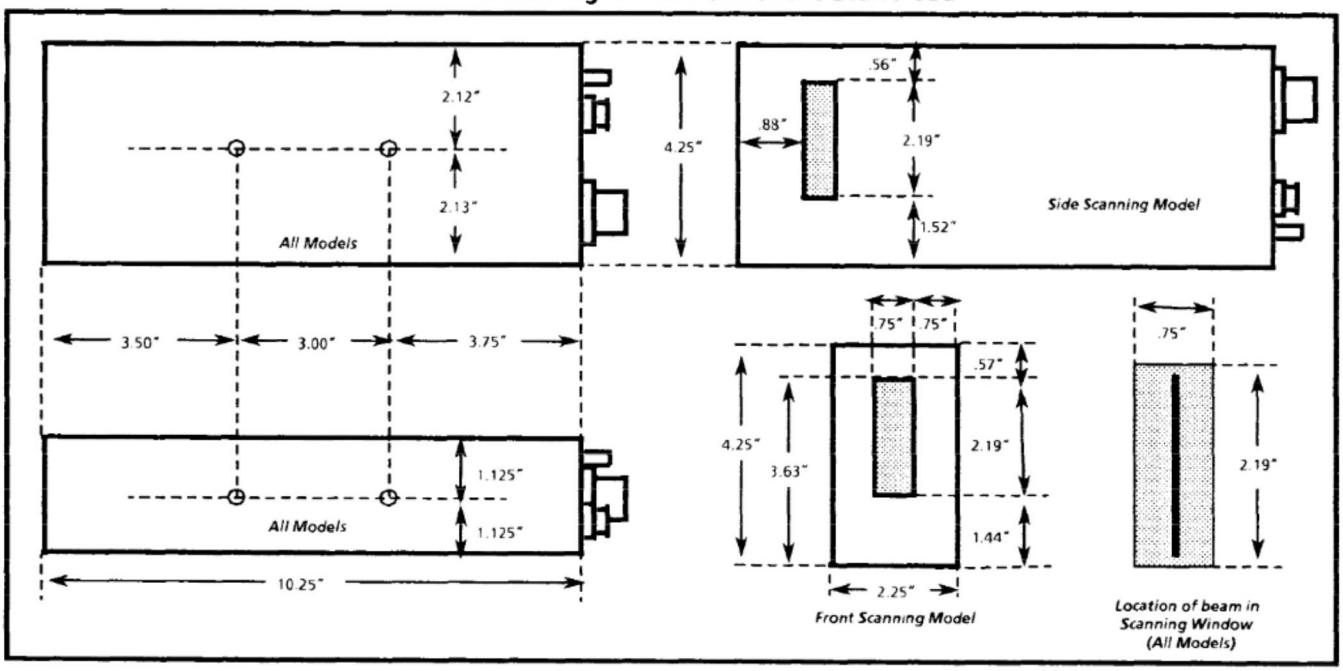
Step 5 If output devices will be used, connect them to the decoder (refer to the User's Manual supplied with your decoder).

Step 6 If a package detector will be used, connect it to the small port on the scan head.

Determining the Space Requirements

The decoder and scan head are separate units that can be mounted on separate surfaces. A 10- or 25-foot cable is used to connect the two units. Figure 4.1 illustrates the dimensions of the scan head.

Figure 4.1
Mounting Dimensions of the Scan Head



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Installing the Scan Head

Before installing the scan head, review the following information:

- Determine the optimum position of the scan head relative to the labels that are to be read. Refer to Chapter 3 for positioning information.
- If you are using the optional swivel base or brackets, add their dimensions into your positioning calculations.
- Allow a minimum clearance of 8 inches at the rear of the scan head so you can attach the cables to the various ports.
- Securely mount the scan head to a rigid surface to ensure proper operation of the scanning mechanism.

Because the thickness of the mounting surface (table top, shelf or bracket) determines the length of the screws or bolts required, fasteners are not supplied with the scan head.

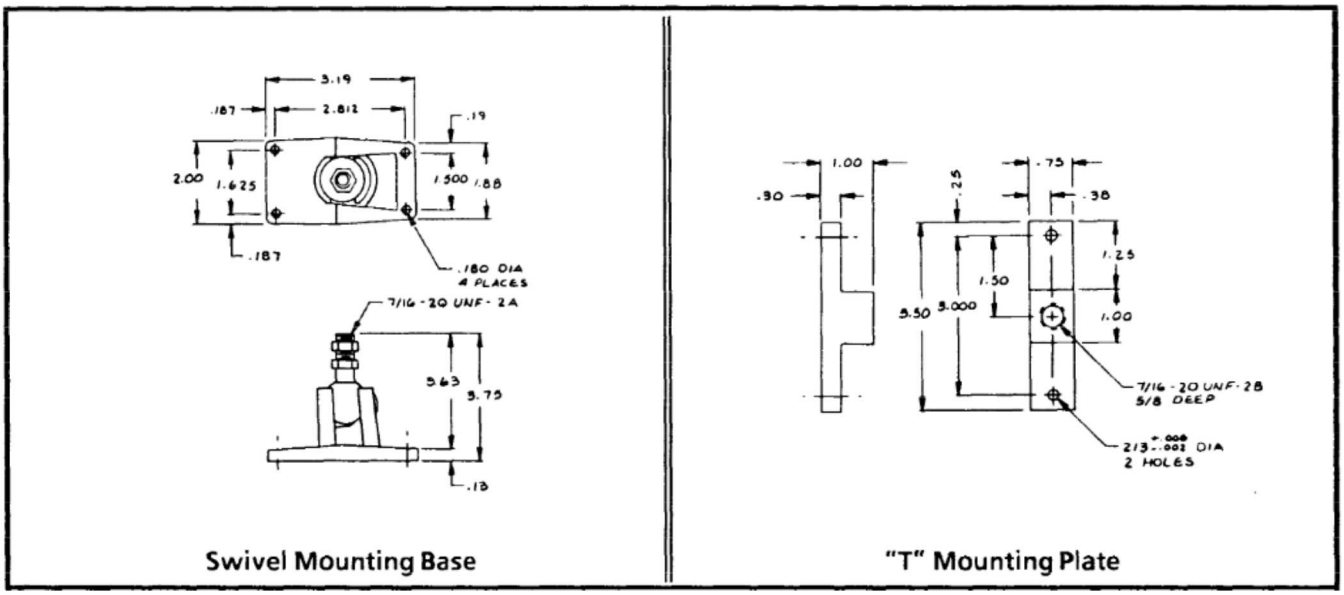
You will need two 10-32 hexagon-head cap screws, with flat and split washers. Select a length that equals the thickness of the mounting surface, thickness of the washers plus 3/8-inch (depth of screw holes).

How to Install the Swivel Mounting Base (Catalog No. 2755-NM1 and 2755-NM2)

For greater installation flexibility, you can attach the scan head to an optional Swivel Mounting Base. The installation dimensions of the Swivel Base and its associated "T" Mounting Plate are shown in Figure 4.2.

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Figure 4.2
Mounting Dimensions of Swivel and "T" Mounting Plate



Swivel Mounting Base

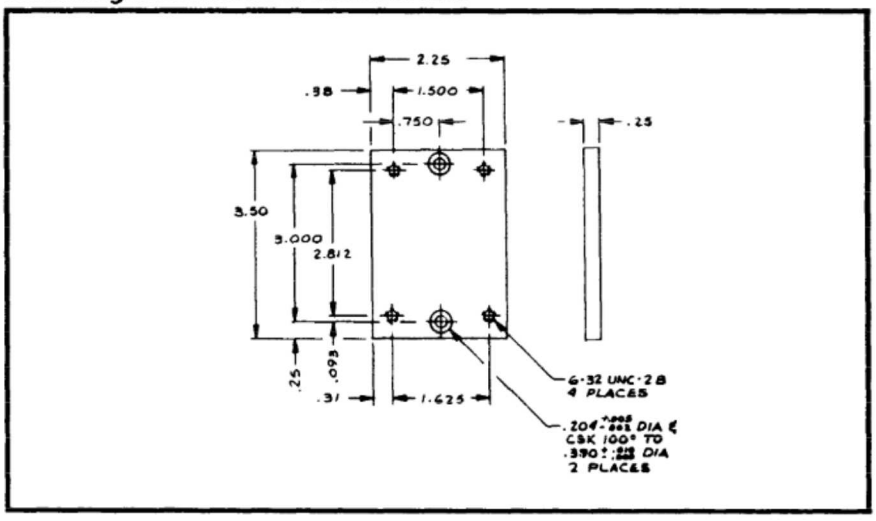
"T" Mounting Plate

Using the Flat Mounting Plate (Catalog No. 2755-NM2)

A Flat Mounting Plate is also available. By attaching this plate to the bottom of your scan head, you can position the swivel mounting ball close to the base of the scan head. You may also use the Flat Mounting Plate when you want to mount the scan head with brackets of your own design.

The dimensions are shown in Figure 4.3.

Figure 4.3
Mounting Dimensions of the Flat Plate



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