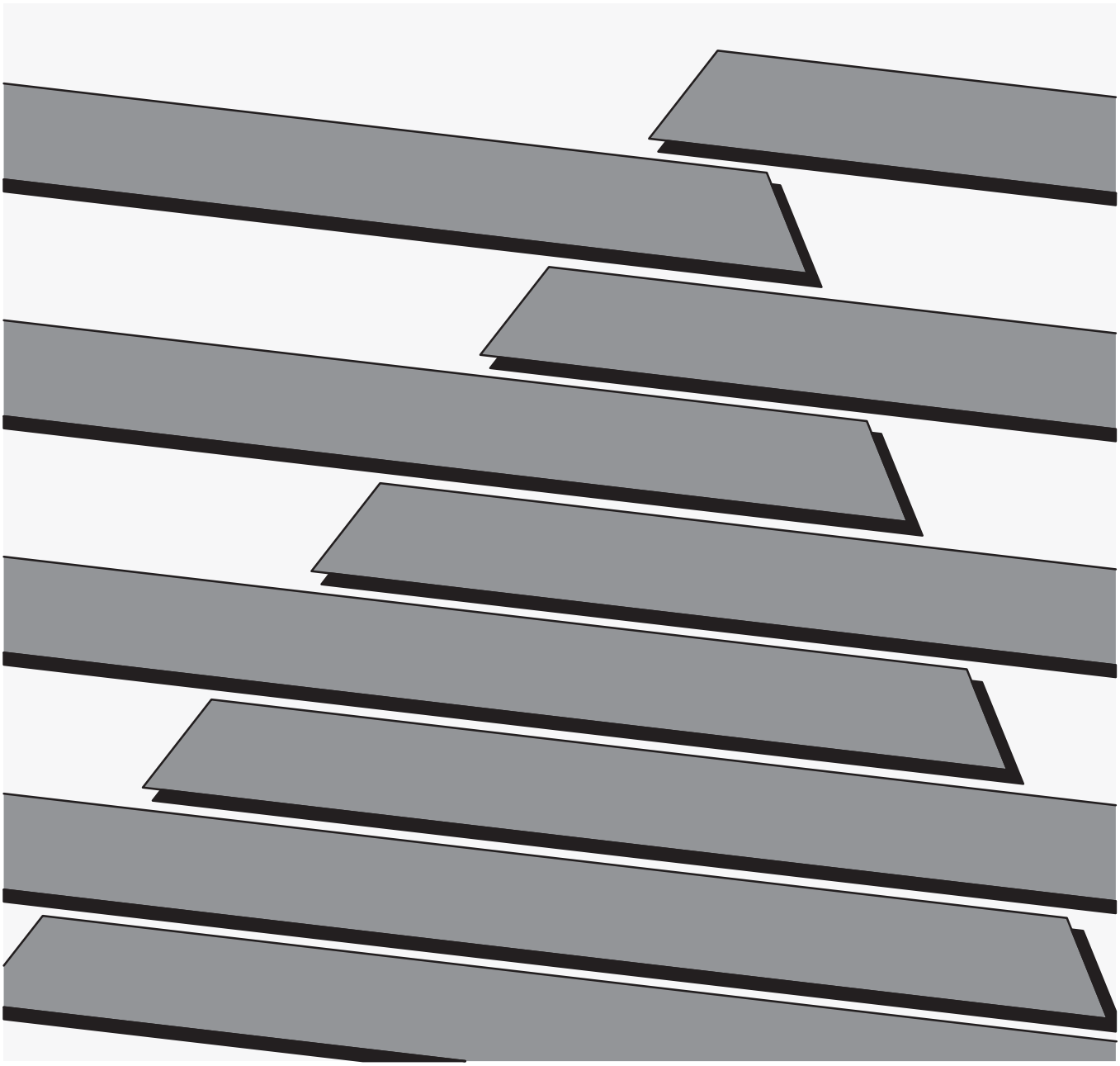
ALLEN-BRADLEY

Bulletin 2755
High Speed Decoder

(Catalog Numbers 2755-DM9 & -DM9E)

User Manual



Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. “Safety Guidelines for the 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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Throughout this manual we use notes to make you aware of safety considerations.

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

Attentions help you:

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

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

Using This Chapter

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Chapter 2

How the Decoder Operates

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Configuring Your Decoder

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Communicating With a Host — Chapter 6

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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.
- Conventions useed.
- Warnings and cautions.

Overview of this Manual

This manual describes how to use the Catalog No. 2755–DM9 and DM9E High Speed Decoders. This manual contains the following chapters:

Chapter	Title	Purpose
1	Using This Manual	Provides an overview of the manual.
2	Description of the Hardware	Describes features and design of the decoder.
3	How the Decoder Operates	Describes how the decoder operates.
4	Configuring Your Decoder	Provides step-by-step instructions on how to configure the decoder.
5	Installing the Decoder	Provides general rules and recommendations for installing the decoder.
6	Communicating With a Host	Describes how a host device can communicate with a decoder.
7	Host Commands Using the RS-232 or RS-422 Interface	Describes how to send host commands and receive data using the RS-232 and RS-422 interfaces.
8	Host Commands Using the RS–485 Interface	Describes how to send commands and receive data on an RS-485 Local Area Network.
9	Maintenance and Troubleshooting	Describes basic troubleshooting and fuse replacement procedures.
10	Specifications	Provides basic decoder specifications.
-	Appendices	Includes glossary of terms.
-	Index	Alphabetical index.

Intended Audience

You do not require any special knowledge to read this manual and follow its instructions. If the decoder will be used to communicate with a computer or PLC ™ programmable controller, we assume you are familiar with communication devices, communications standards (RS–232, RS–422, RS–485), and communications terminology. In this manual, we describe the commands that a host device can transmit to the decoder and the command responses sent by the decoder. We do not describe how to create PLC or computer programs for generating the commands.

Conventions Used

Some chapters in this manual contain examples of how to enter data or commands. The following conventions are used:

- A symbol or word in brackets represents a single key you would press. These include keys such as [RETURN], [SHIFT] or [A].
- Punctuation, such as commas, and symbols such as "/" would be entered as shown.
- ASCII codes are represented by either their mnemonic (CR, ETX, LF, etc.) or their decimal number equivalent (CR =13, S=83, etc.). Refer to Appendix C for a listing of the ASCII codes.

Note: When the [RETURN] key is specified, this is the carriage return function of your keyboard. This key may also be labeled ENTER or use some other symbol.

We have included numerous examples of CRT displays. All CRT displays are shown inside a box with a double lined border. We have reproduced these screens as accurately as possible. However, due to legibility and space requirements we have modified some of the spacing.

When describing the programming terminal used to configure the decoder, we make reference to arrow keys. If you use an Allen–Bradley Industrial Terminal (Catalog No. 1770–T1, –T2, or –T3), you do not have arrow keys. Use the [CTRL] and [U], [D], [L], or [R] keys for the Up, Down, Left, or Right cursor functions, respectively.

Warnings And Cautions

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

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.

Nomenclature

This manual may contain some terms that you are not familiar with. We have provided a glossary of terms at the back of this manual (Appendix G) to assist you.

Related Publications

The following table lists related publications that you may require to install and operate the decoder.

Description	Title	Purpose of Publication
Catalog Number 2755-ND002②	User's Manual for Bulletin 2755 Industrial Medium and High Speed Bar Code Scanners.	Provides information on the Catalog Number 2755-L7 and -L9 scan heads①.
Publication 2755-829②	User's Manual for Bulletin 2755 Enhanced Medium Speed Scan Heads	Provides information on the Catalog Number 2755-L4F and -L4R enhanced scan heads①.
Publication 2755-826②	User's Manual for Bulletin 2755 Medium Speed Material Handling Scanners	Provides information on the Catalog Number 2755-L4F and -L4R scan heads①.
Publication 2755-801②	User's Manual for Bulletin 2755 Modular Bar Code Scanners	Provides information on the Catalog Number 2755-L4 and -L5 scan heads①.
Publication 2760-812	User's Manual for Bulletin 2760–RB Flexible Interface Module	Provides information on the Catalog Number 2760-RB Flexible Interface Module.
Publication 2760-822	Protocol Cartridge Programming Manual	Provides instruction on using the RS-232/RS-422 protocol cartridge for the 2760-RB module.
Publication 2760-823	Protocol Cartridge Programming Manual	Provides instruction on using the RS-485 protocol cartridge for the 2760-RB module.
Publication 1771-6.5.34	BASIC Module User's Manual	Provides information on the Catalog Number 1771-DB BASIC module.
Publication 1771-6.5.15	User's Manual for 1771–KE and 1771–KF	Provides information on the Catalog Number 1771-KE and -KF Communications Controllers.
Publication 1771-6.5.13	ASCII I/O Module User's Manual	Provides information on the Catalog Number 1771-DA ASCII I/O module.

① We have provided only a partial catalog number since there are various configurations available for these scan heads.

② Additional scan heads may be available for use with the Catalog Number 2755-DM9 decoder. Refer to your Allen-Bradley representative for more information.

Chapter 2

Description of Hardware

Chapter Objectives

This chapter provides an overview of the Catalog Number 2755-DM9, -DM9E Bar Code Decoder. We also provide descriptions of the major features.

Note: In this chapter and in subsequent chapters, we will refer to the Catalog Number 2755-DM9, -DM9E High Speed Decoder as the decoder.

Differences between Catalog Number 2755-DM9 & 2755-DM9E

- Catalog Number 2755-DM9 decoder includes a 120 VAC power cord, and an English language manual. An LED label in English is attached to the decoder.
- Catalog Number 2755-DM9E decoder includes an unterminated 220 VAC line cord and information for ordering User's Manuals in English and other languages. LED labels in English, French, German, Italian, and Spanish are packaged with the decoder. Operation of the 2755-DM9 and DM9E decoders is identical.

Features

The decoder acquires video data from a separate laser scan head and then decodes this data. The decoder can then:

- Send the decoded data to another device such as a host computer, auxiliary terminal, or programmable controller.
- Compare the decoded data to previously stored data and use the results of this comparison to operate up to eight discrete outputs (match code operation).

Note: The decoder also maintains counters for package count, no-reads, and discrete outputs.

The decoder is capable of decoding the following types of bar code symbols:

- Code 39.
- Interleaved 2 of 5.
- Codabar.
- UPC-A and E
- EAN-8 and 13
- Code 128.

You can program many of the operating parameters of the decoder. This programming capability allows you to adapt the decoder to a specific application. You can:

- Specify decoder operating modes.
- Select types and lengths of symbols to be read.
- Select communications protocols used when communicating with a computer or programmable controller.
- Enter up to eight match codes.
- Specify up to eight discrete outputs.
- Specify up to eight discrete outputs.

You can select continuous scanning or you can define what event will trigger the label reading process. You can specify the trigger to be:

- A signal from the package detector connected to the laser scan head.
- A command received from a host computer.
- The decoder's internal timer.

The decoder can communicate with a host computer using the following standards:

- RS-232.
- RS-422.
- RS-485 (Multi-drop Network using Allen-Bradley DH485 protocol).

Laser Scan Heads

The decoder will operate with the following scan heads:

- Catalog No. 2755-L7 and -L9 Medium and High Speed, Industrial Bar Code Scanners.
- Catalog No. 2755-L4F, -L4R, and -L5R Medium Speed, Enhanced, Material Handling Scanners.

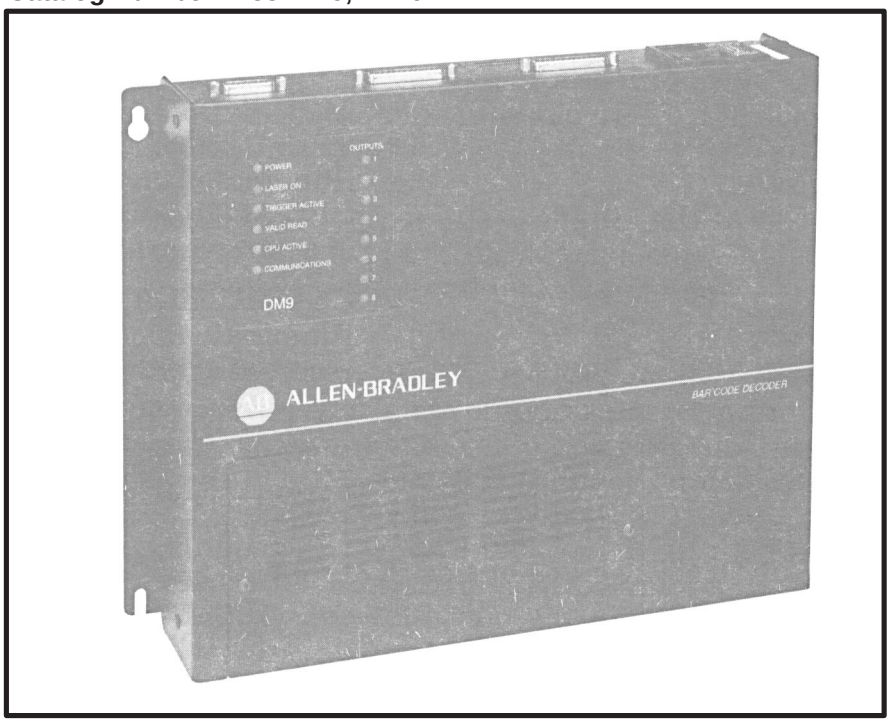
Note: We have not listed complete catalog numbers for the scan heads. These scan heads are available in a variety of configurations.

Physical Description

Figure 2.1 shows the decoder. The decoder is housed in a steel enclosure (NEMA 1 rating). The decoder enclosure is 14" wide, 2.81" tall, and 10.75" deep (refer to Chapter 5 for installation drawing). On top of the decoder are fourteen indicator LEDs which indicate the status of the decoder and the outputs (refer to Indicator Section in this chapter). On the back of the decoder are the communications ports (refer to Communications Port Section in this chapter). A separate removable cover allows for easy access to the discrete output modules and fuses (refer to Output Module Section in this chapter). Connectors are also provided for the laser scan head and power line connector cables.

(Continued)

Figure 2.1
Catalog Number 2755-DM9, -DM9E



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Indicators

Fourteen LED indicators (Figure 2.2) provide an indication of the decoder status. The indicators provide the following indications:

- POWER - This green indicator illuminates when power is applied to the decoder.
- LASER ON - This red indicator illuminates when the decoder has enabled the scan head to turn on the laser light source. The LED may illuminate even if the scan head is disconnected or the “Laser On” switch for the Catalog No. 2755-L7 or -L9 scan heads is in the OFF position.
- TRIGGER ACTIVE - This yellow indicator illuminates when the decoder is in the triggered mode and scanning has been triggered by:
  1. The package detector connected to the scan head.
  2. A Start Scan command sent by the host.
  3. The internal timer.

  The LED remains on until a trigger OFF command is received.

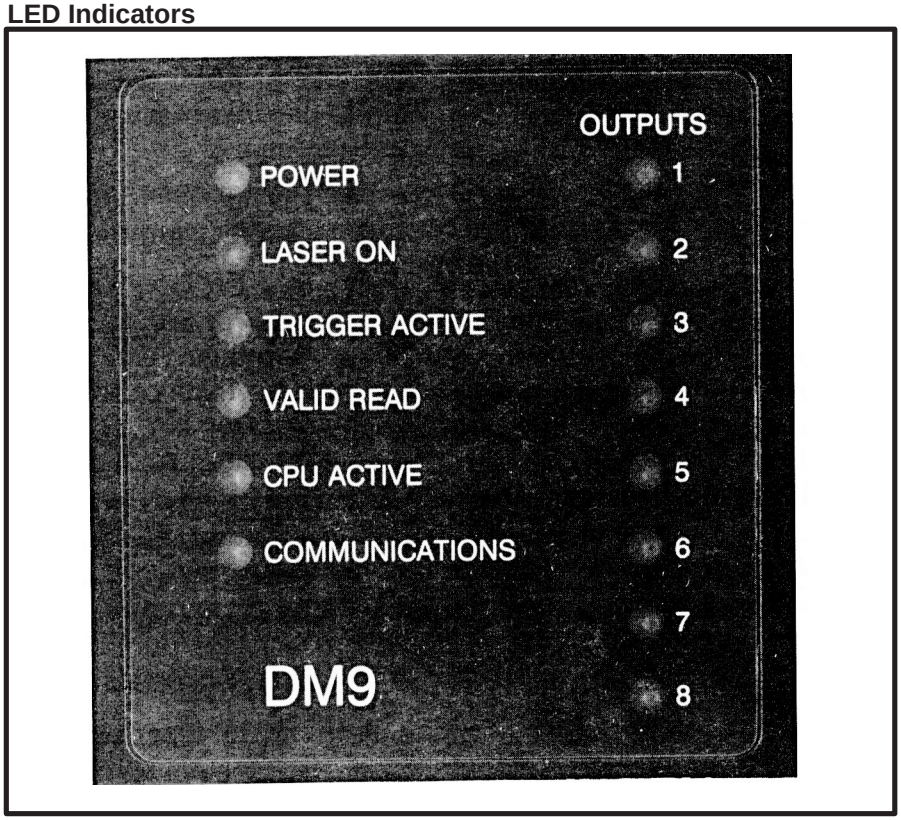
- VALID READ - This green indicator illuminates momentarily whenever the decoder has met the fields per scan and capture count parameters.

Note: This LED may not correspond to a *read* output condition (refer to page 4-41). In the triggered mode, the read output condition must meet the fields per package parameter.

- CPU ACTIVE - This green indicator is continuously illuminated under normal operation. Failure of the CPU ACTIVE indicator to illuminate is an indication of a hardware failure.
- COMMUNICATIONS - This yellow indicator illuminates momentarily whenever data is sent to or received at either of the communications ports.
- OUTPUTS 1 through 8- Each of these red indicators indicate the status of the output modules. When an output module is turned on, the respective indicator illuminates.

Note: If you have a Catalog No. 2755-DM9 decoder, the LED label is attached. If you have a Catalog No. 2755-DM9E decoder, the LED label is not attached. Apply the appropriate language label supplied with the decoder.

Figure 2.2
LED Indicators



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Communications Ports

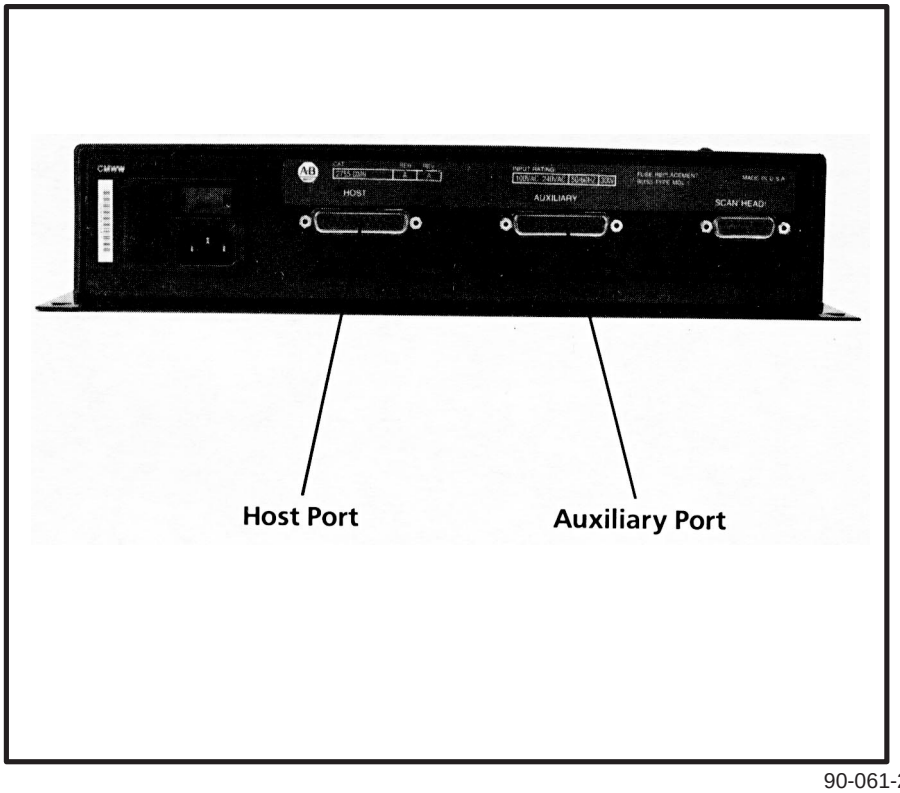
There are two communication port connectors on the decoder:

- HOST port connector. The HOST port connector supports RS-232, RS-422, and RS-485 communication interfaces. Through this port, you can link the decoder to a host computer or programmable controller. Both commands and data may be sent to/from the host device.

Note: The RS-485 interface allows the decoder to be installed as part of a multi-drop network. Refer to Chapter 3 for a more detailed description.

- AUX port connector. The AUX or auxiliary port connector allows you to program and monitor the decoder using one of the following CRTs: Allen-Bradley Industrial Data Terminal (Catalog No. 1770-T1, -T2, and -T3), Allen-Bradley T45 Laptop Terminal (Catalog No. 1784-T45), Digital VT100, Televideo 955, Lear Siegler ADM 3E, or a terminal/computer that emulates one of the terminals listed.

Figure 2.3
Communication Ports



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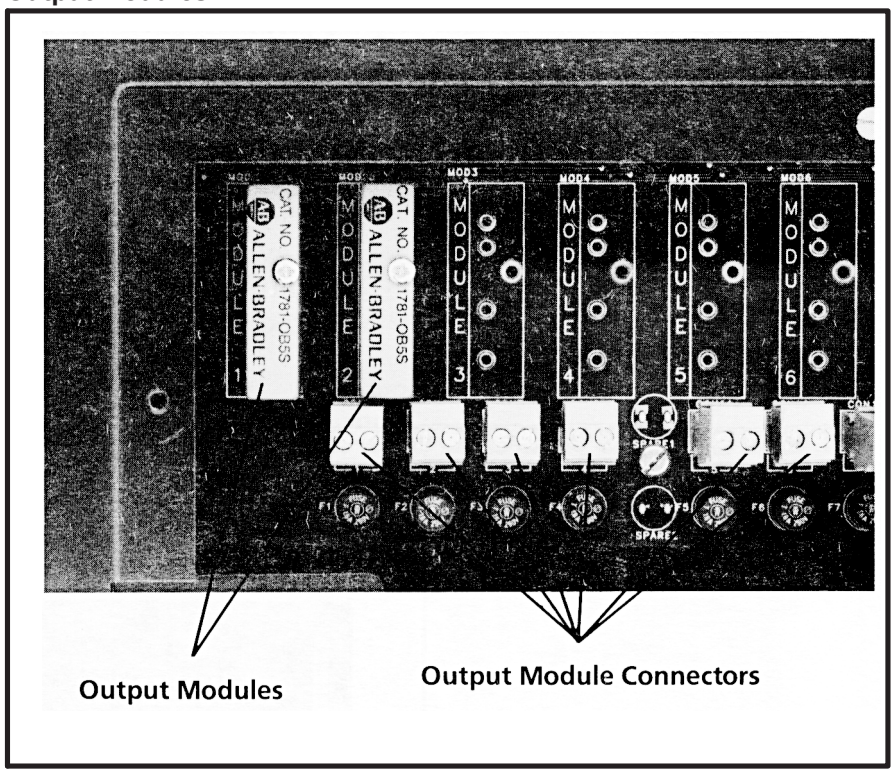
Output Modules

Two DC output modules (Catalog No. 1781-OB5S) are provided with the decoder. You can add up to six more AC or DC output modules for a total of eight. Module location #8 can also accept an input module for auto loading match codes (refer to Chapters 3 and 4). All output module types can be installed in any of the eight module slots. You can program the decoder to turn on these output modules based upon the conditions you specify during configuration of the decoder. Use these outputs to operate electromechanical devices such as relays, alarms, etc. Fuses protect the decoder from power overloads.

Figure 2.4
Output Modules



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The following output modules are available.

Note: Output modules function as a switch, not as a power source.

Catalog No.	1781-0B5S	1781-0A5S	1781-OM5S
Nominal Line Voltage	--	120 VAC	240 VAC
Maximum Line Voltage	60 VDC	140 VAC	280 VAC
Minimum Line Voltage	3.0 VDC	12 VAC	24 VAC
Maximum Peak Off State Voltage	60 VDC	400 V Peak	600 V Peak
Maximum Off-State Leakage	1.0 mA	2.5 mA RMS	4.0 mA RMS
Static off-state dv/dt	--	200 V/ usec	200 V/ usec
Maximum On-State Current	0.5 A DC	0.5 A RMS	0.5 A RMS
Minimum On-State Current	10 mA DC	50 mA RMS	50 mA RMS
Maximum 1 Cycle Surge	--	4.0 A Peak	4.0 A Peak
Maximum 1 Second Surge	1.5 A DC	--	--
Peak On-State Voltage	1.5 V DC	1.6 V Peak	1.6 V Peak

The following input modules are available (for position No. 8 only). See Chapters 3 and 4.

Note: The input modules require a voltage source for activation.

Catalog No.	1781-IB5S	1781-IA5S	1781-IM5S
Maximum Input Voltage	32 VDC	140V RMS/AC	280 V RMS/AC
Minimum Input Voltage	3.3 VDC	90V RMS/AC	180 V RMS/AC
Input Resistance	1k ohm	-	-
Maximum Input Current	32mA DC @ 32 VDC	10mA RMS @ 140 VRMS	8mA RMS @ 280 VRMS
Drop Out Current	1.0 mA DC	2.5 mA RMS	1.5 mA RMS
Allowable Off State Input Current	1.0 mA DC	3.0 mA RMS	2.0 mA RMS
Allowable Off State Input Voltage	2.0 VDC	50 VRMS/AC	120 VRMS/AC

Note: Note polarity when connecting DC Input and Output modules.

Power and Scan Head Connectors

The decoder will accept line voltages from 85 to 264 volts AC at a frequency of 47 to 63 Hz without any adjustments. The Catalog No. 2755-DM9 decoder is supplied with a 120VAC rated power cord. If you are powering a 2755-DM9 decoder with a supply voltage greater than 120 VAC, you must obtain a suitable power cord.

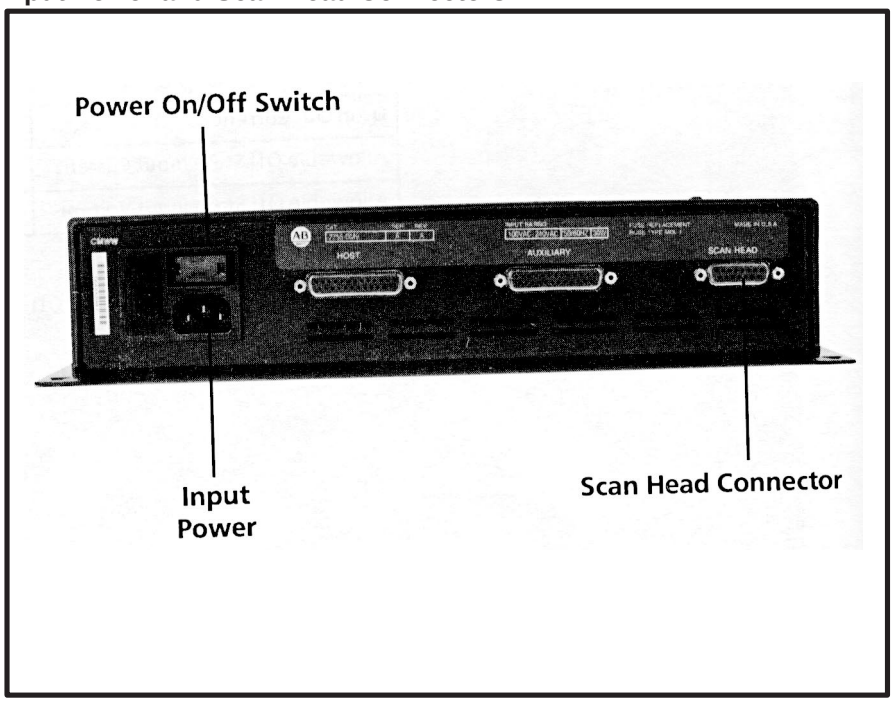
Note: Catalog No. 2755-DM9E is supplied with an unterminated power cord. Attach a suitable connector using the diagram provided in Chapter 5.

A 15 pin D connector is provided on the decoder for connecting the laser scan head. You can connect the decoder to the scan head using one of the following:

- For Catalog No. 2755-L7 and -L9 scan heads use-
  10 foot (3.05 meter) cable (Catalog No. 2755-CL10)
  25 foot (7.62 meter) cable (Catalog No. 2755-CL25)
- For Catalog No. 2755-L4 and -L5 scan heads use-
  10 foot (3.05 meter) cable (Catalog No. 2755-CK10)
  25 foot (7.62 meter) cable (Catalog No. 2755-CK25)

Note: The scan head is powered by the decoder through the cable. The scan heads do not require a separate power source.

Figure 2.5
Input Power and Scan Head Connectors



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Accessories

The following table lists the accessories that you may require for use with the decoder.

Catalog Number	Item	Description
2755-L7①	Industrial Medium Speed Bar Code Scanner	Raster and side scanning devices that operate at 350 scans per second. Raster scanners scan both vertical and horizontal directions simultaneously. Some of these scan heads have a maximum read distance of 50" (1.27 meters) depending upon symbol size and quality. Scanners can read Case Code symbols (symbols directly printed on kraft paper/cardboard boxes).
2755-L9①	Industrial High Speed Bar Code Scanner	Raster and side scanning devices that operate at 800 scans per second. Raster scanners scan both vertical and horizontal directions simultaneously. Some of these scan heads have a maximum read distance of 30" (76 cm) depending upon symbol size and quality.
2755-L4F① -L4R①	Enhanced Medium Speed Scanner	Front or side scanners that operate at 200 scans per second. Some of these scan heads have a maximum read distance of 50" (1.27 meter) depending upon symbol size and quality. Scanners can read Case Code symbols (symbols directly printed on kraft paper/cardboard boxes).
2755-L5R①	Enhanced Medium Speed Raster Scanner	Raster scanners that operate at 200 scans per second. This scan head has a maximum read distance of 45" (1.14 meters) depending upon symbol size and quality. Scan head scans both vertical and horizontal directions simultaneously. Scanner can read Case Code symbols (symbols directly printed on kraft paper/cardboard boxes).
1781-OB5S	DC Output Module	3 to 60 VDC output at 0.5 amperes.
1781-OA5S	AC Output Module	12 to 140 VAC output at 0.5 amperes.
1781-OM5S	AC Output Module	24 to 280 VAC output at 0.5 amperes.
1781-IB5S	DC Input Module	3.3 to 32 VDC
1781-IA5S	AC Input Module	90 to 140 VRMS/VDC
1781-IM5S	AC Input Module	180 to 280 VRMS/VDC
2760-A485	RS-485 Connector	Use these connectors to create cables for an RS-485 network.
2755-CL10	10-ft (3.05 meters) Scan Head Cable	Use to connect decoder to Catalog No. 2755-L7 or -L9 scan head.①
2755-CL25	25-ft (7.62 meters) Scan Head Cable	Use to connect decoder to Catalog No. 2755-L7 or -L9 scan head.①
2755-CK10	10-ft (3.05 meters) Scan Head Cable	Use to connect decoder to Catalog No. 2755-L4 or -L5 scan head.①
2755-CK25	25-ft (7.62 meters) Scan Head Cable	Use to connect decoder to Catalog No. 2755-L4 or -L5 scan head.①
W77104-899-01	Replacement Fuse- Power Output Modules	Plug-in type fuses provide overload protection for the decoder.
Purchased Locally	Replacement Fuse- Line Input Power	250V (1 amp, slow blow), 5 x 20 mm or 3AG
Package Detector Assembly 	2755-NP3 2755-NP5 2755-NP1 2755-NP4	Optional, for 2755-L7, -L9 Scan Heads Optional, for 2755-L7, -L9 Scan Heads Optional, for 2755-L4, -L5 Scan Heads Optional, for 2755-L4, -L5 Scan Heads
User Created	Host Port Communications Cable	For connecting host device to the decoder, refer to Chapter 6.
User Created	Auxiliary Port Communications Cable	For connecting programming terminal to the decoder. Refer to Appendix A.
W77121-801-01 W77121-801-02	Power Cords - 120 VAC 220 VAC- Unterminated one end	Replacement power cord. User must provide suitable connector.

① We have not provided the complete catalog number since these heads are available in a variety of configurations.

Chapter 3

How the Decoder Operates

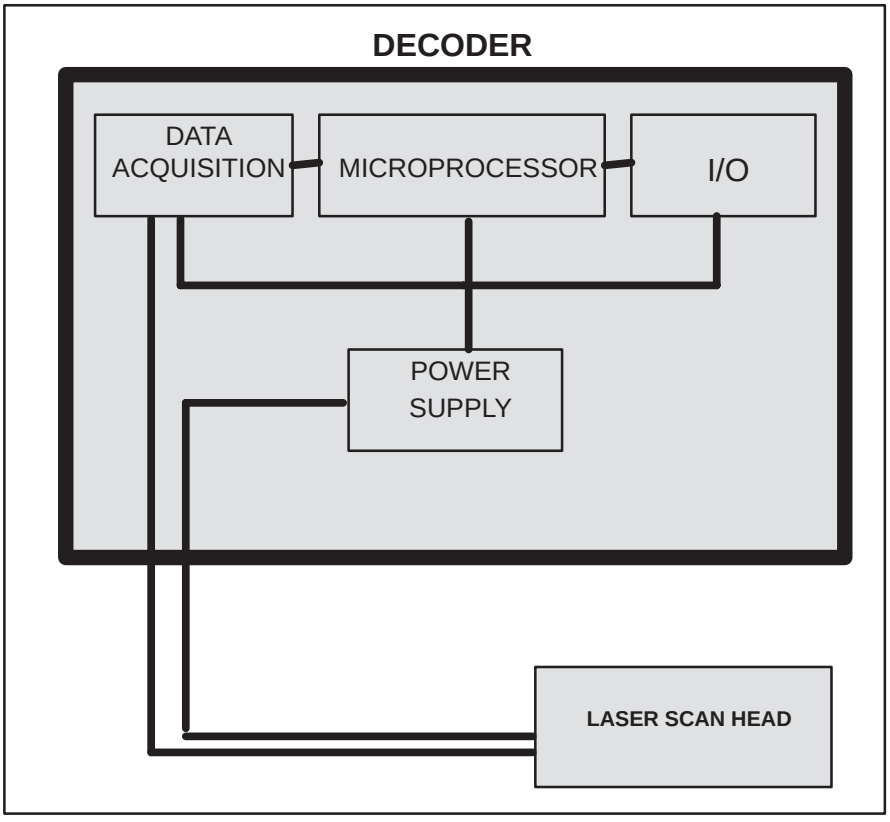
Chapter Objectives

This chapter provides a brief description of how the decoder operates. We also provide a brief description of how the decoder communicates with host devices.

How the Decoder Operates

Figure 3.1 is a block diagram of the decoder.

Figure 3.1
Catalog Number 2755-DM9 Decoder



POWER SUPPLY - An internal power supply provides power for both the laser scan head and internal circuitry of the decoder. As stated earlier, the source voltage may range from 85 to 264 volts AC. The power supply will automatically adjust to the input voltage.

DATA ACQUISITION CIRCUIT - The data acquisition circuitry of the decoder receives both video and synchronization signals from the laser scan head. The data acquisition circuitry filters and stores blocks of data received from the scan head in the Random Access Memory (RAM) of the decoder.

MICROPROCESSOR - The microprocessor reads the information obtained by the data acquisition circuit, processes the information, and then makes decisions on what to do with the decoded data based upon your programming instructions.

I/O - A single 25 pin connector (HOST PORT) provides three different interfaces (RS-232, RS-422, and RS-485) for communications with a host computer or programmable controller. The I/O section of the decoder supports asynchronous data transmission at baud rates of up to 38,400 bits per second.

Another 25 pin connector (AUX PORT) provides an RS-232 interface for programming and monitoring of the decoder using a programming terminal. Refer to Chapter 2 for a listing of the terminals that can be used for programming or monitoring.

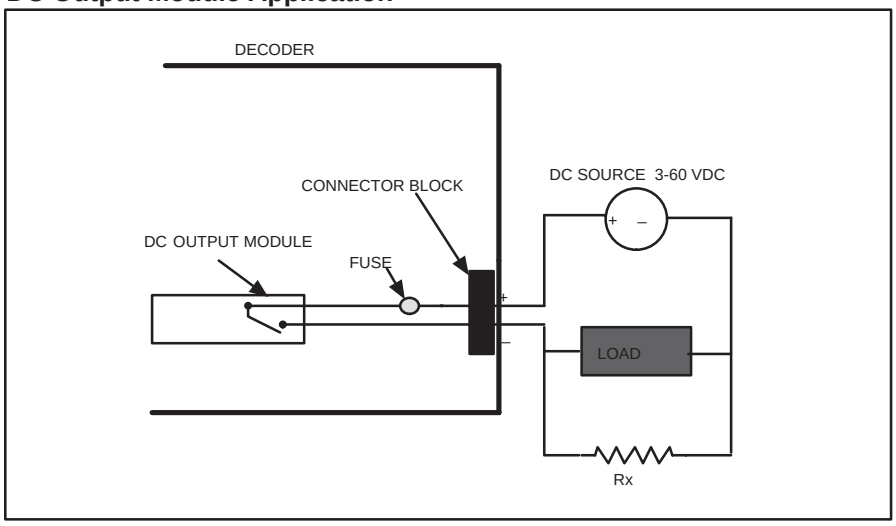
Up to eight modules can be plugged into the circuit board of the decoder. Refer to Chapter 2 for a description of the input and output modules that can be used. Output modules function as switches, not as power sources (refer to Figures 3.2 and 3.3).

Note: Outputs are initially turned off (open) when power is first applied to the decoder and when the decoder is turned off.

DC Output Module Application

Figure 3.2 illustrates a typical DC output module application. When using high impedance loads, you may have to add an additional resistor (Rx) in parallel with the load. Select a value for Rx that maintains a minimum current of 10 mA through the output module in the on state. Typical values for Rx range from 300 to 6,000 ohms depending upon the source voltage.

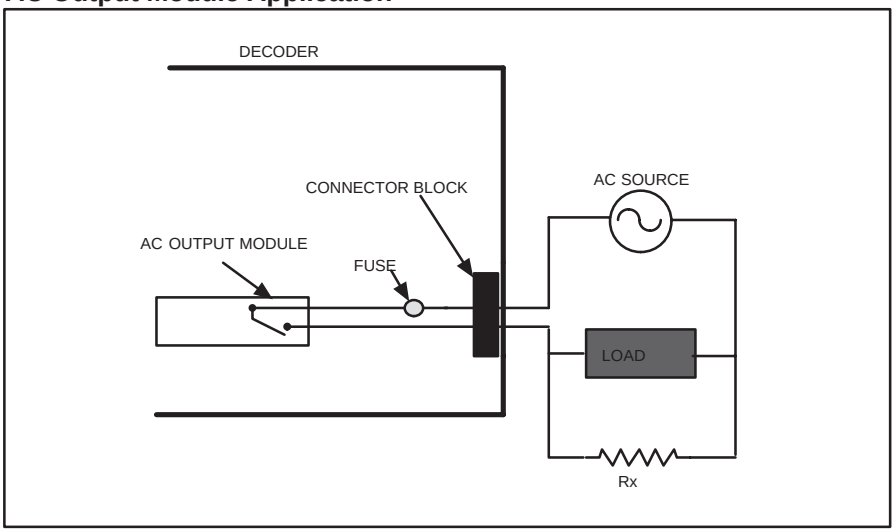
Figure 3.2
DC Output Module Application



AC Output Module Application

Figure 3.3 illustrates a typical AC output module application. When using high impedance loads, you may have to add an additional resistor (Rx) in parallel with the load. Select a value for Rx that maintains a minimum current of 50 mA RMS through the output module in the on state.

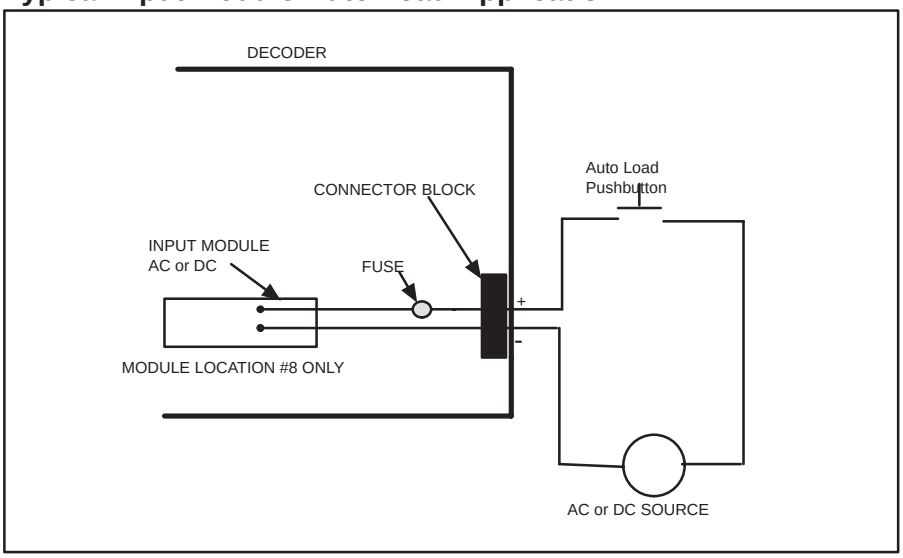
Figure 3.3
AC Output Module Application



Input Module Auto Load Application

Figure 3.4 illustrates the auto load input module application.

Figure 3.4
Typical Input Module Auto Load Application



Communications

As stated earlier the decoder can transmit decoded bar code information to a host computer or programmable controller. The three communications

interfaces (RS-232, RS-422, and RS-485) provide a variety of ways to accomplish communications with a host. Figure 3.5 illustrates some of the possible host interfaces.

Note: You can also use the decoder as a stand-alone device using the discrete outputs for control.

Figure 3.5
Communications Interface Examples

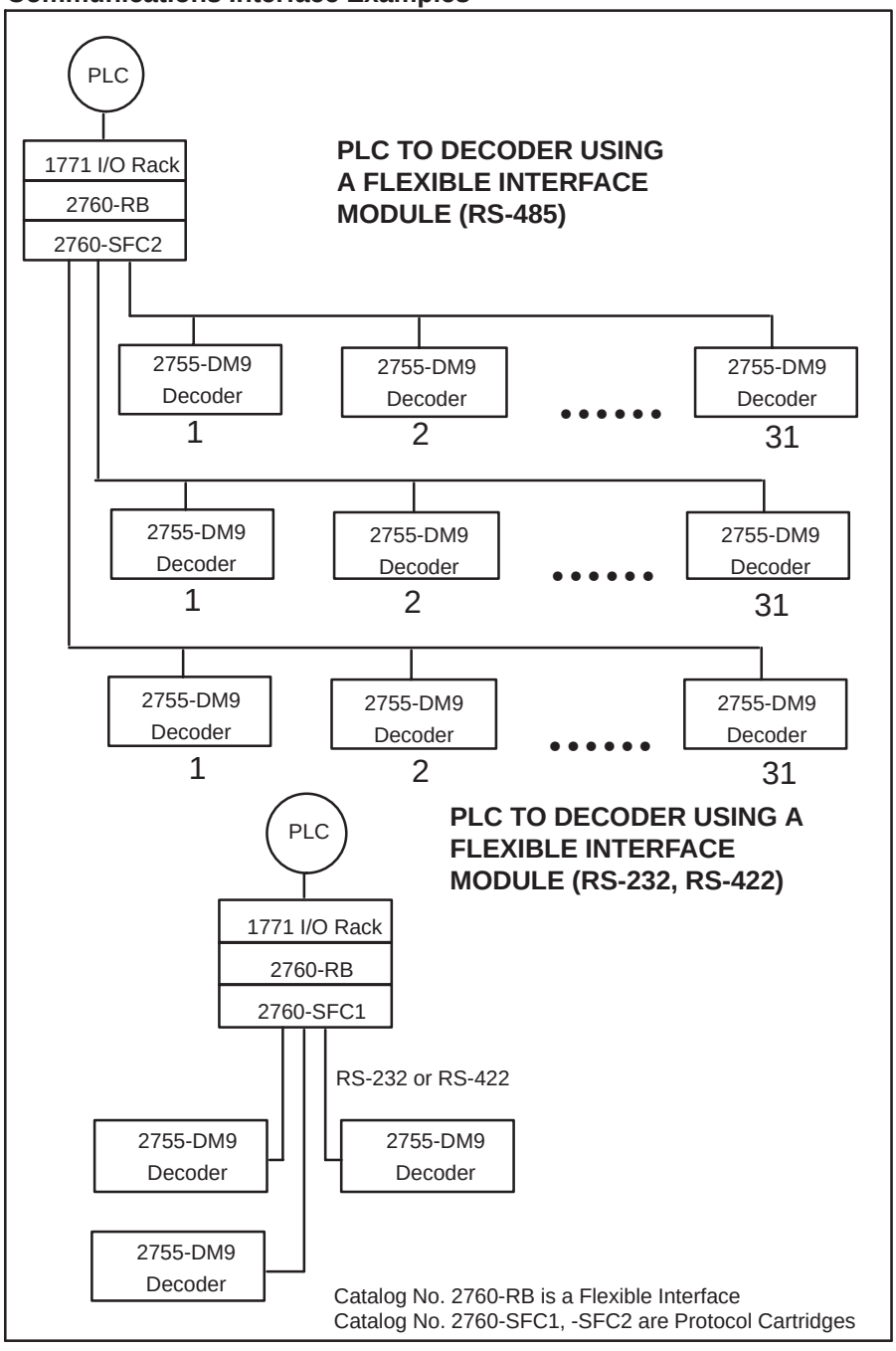
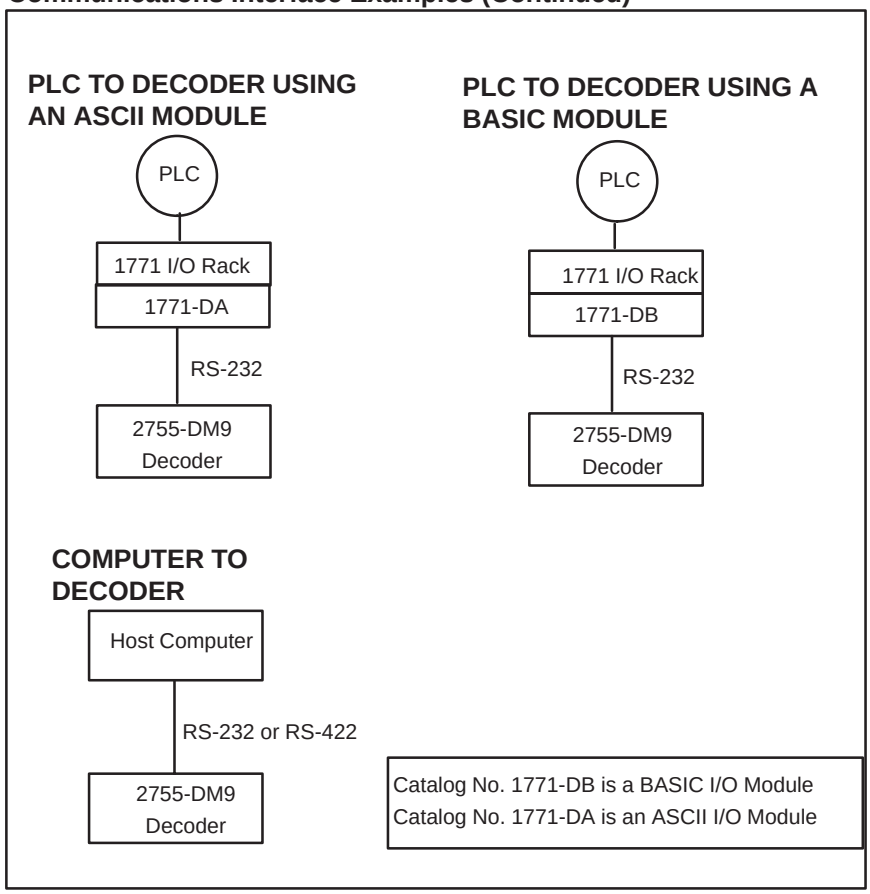


Figure 3.5
Communications Interface Examples (Continued)



ALLEN-BRADLEY LOCAL-AREA NETWORK - Using the Catalog No. 2760-RB Flexible Interface Module with the 2760-SFC2 protocol cartridge and the DM9 in the RS-485 mode, you can multi-drop up to 31 devices on each port of the 2760-RB module.

PROGRAMMABLE CONTROLLERS - You can connect the decoder to a programmable logic controller in one of three ways:

- Through the Allen-Bradley Data Highway.
- Through a Flexible Interface Module (Catalog No. 2760-RB). This module can be used to create an RS-485 Local Area Network or point-to-point communications using the RS-232 or RS-422 communications interfaces.
- Directly, using a Catalog No. 1771-DB BASIC module or 1771-DA ASCII I/O module.

HOST COMPUTERS- In most cases, you can directly connect your host computer to the decoder using the RS-232 or RS-422 interface. The decoder can also communicate with an industrial computer through the Allen-Bradley Data Highway.

RAM and EEPROM Memory

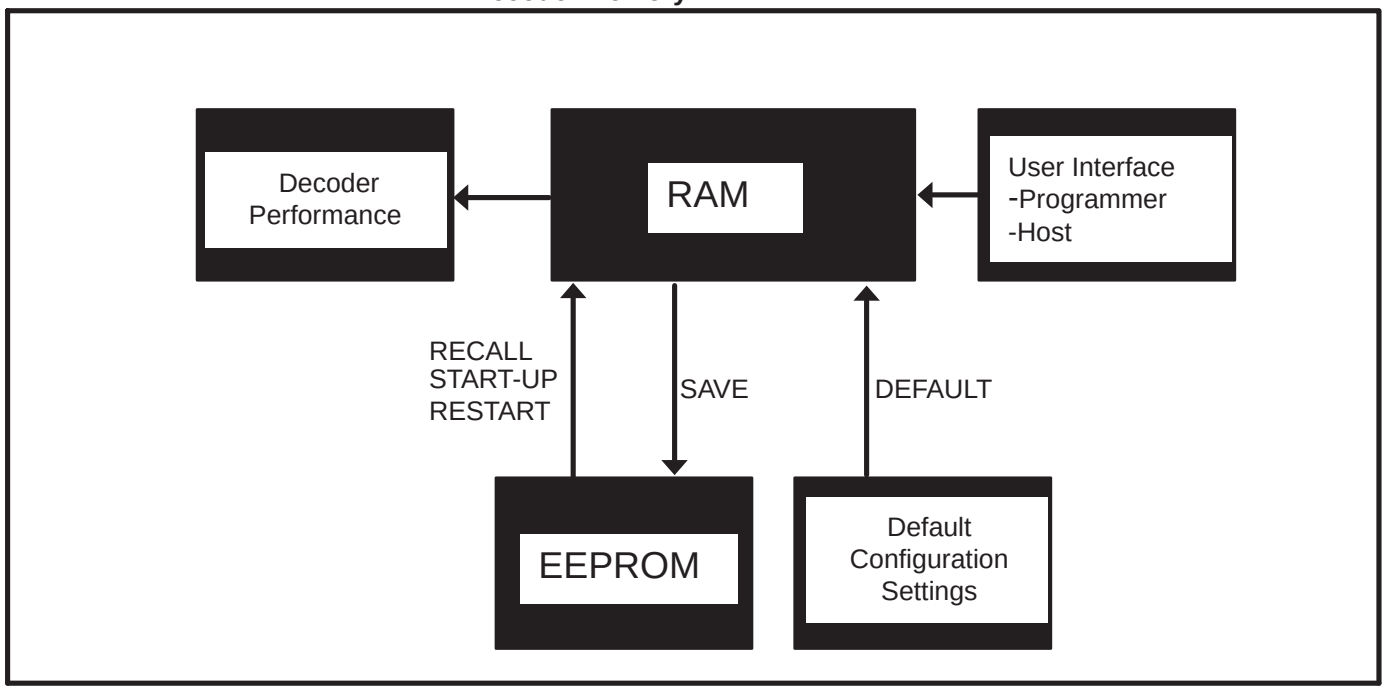
Before you try to change the operating configuration of the decoder, you should understand how configuration parameters are stored. The decoder has two types of memory:

- EEPROM- Electrically Erasable Programmable Read Only Memory contains the "non-volatile" operating configuration of the decoder. The term "non-volatile" means that the memory is not lost when you turn the power off or restart the decoder.
- RAM- Random Access Memory contains the current operating configuration of the decoder. Any changes made to the the operating configuration of the decoder are made to the decoder's RAM. All information stored in the RAM is erased when the power to the decoder is turned off. When the decoder is turned back on (rebooted), the configuration parameters are copied from non-volatile memory (EEPROM) to the RAM.

Figure 3.6 illustrates the relationship between the RAM and EEPROM memory. Notice that the user interface is with the RAM memory. Also, notice that the decoder transfers the contents of the RAM to the EEPROM during a SAVE operation and copies the same contents from the EEPROM to RAM during startup.

Note: The configuration in RAM determines the decoder performance (operating characteristics).

Figure 3.6
Decoder Memory



When you change the operating configuration of the decoder, you are changing the configuration stored in the decoder's RAM. Since the decoder takes its current operating instructions from RAM, any changes you make

will become effective immediately (except for host communications parameters listed below). If you want to enter changes into the decoder's permanent memory (EEPROM), you must use the SAVE command. When the decoder is restarted, the operating parameters of the EEPROM are transferred into RAM. If you don't transfer the contents of the RAM to the EEPROM (SAVE function), any changes made to the operating configuration stored in RAM will be erased when the power is turned off.

Note: Unlike the other decoder operating parameters, changes to the following parameters will not take effect until you SAVE the changes and then restart the decoder.

- HOST PROTOCOL
- DEVICE ADDRESS
- ACK and NAK CHARACTERS①
- BAUD RATE
- NUMBER OF DATA & STOP BITS
- PARITY

① Changes to ACK NAK characters will take effect immediately if you are in the ACK/NAK mode.

The decoder also stores the original factory set operating parameters in EPROM. This type of memory cannot be changed by the user, and is always available in case of a programming error. When you use a DEFAULT command (described in next chapter), the decoder transfers the factory set default parameters to the RAM. Once installed in RAM, the default parameters control the operation of the decoder. If you want to save the default parameters into the EEPROM, you must use the SAVE command.

A RECALL command (described in next chapter) transfers the previously SAVED configuration from the EEPROM to the decoder's RAM. Once installed into RAM, the recalled configuration is displayed and controls operation of the decoder.

Operating Modes

When you configure the operation of the decoder, you will be required to provide a variety of operating parameters. You should have an understanding of the decoder's operating modes prior to configuring the decoder (Chapter 4). The decoder operates in one of two modes:

- Continuous mode - In this mode, the decoder will continuously attempt to decode data. Use this mode for initial scan head adjustments and positioning.
- Triggered mode - In this mode, the decoder will only attempt to decode data after receiving a trigger.

In the triggered mode of operation, there are three possible trigger sources:

- Host command - The command is generated by a host computer or programmable controller.
- Package detect - A package detector connected to the scan head is the source for the trigger.
- Internal timer - The internal timer cycles the trigger from on to off based on a timed interval.

Trigger Ending Coditions

When a trigger on is received, the decoder will continuously attempt to decode bar codes until one of the following trigger ending conditions occurs:

(a) The number of fields (bar codes) per package count is satisfied.

(b) A trigger off command is sent by a host device.

(c) Package detect signal is no longer present.

(d) The internal timer (No-Read timer) times out.

Response Modes

In the triggered mode of operation there are two options which determine when the decoder will send bar code information to a host and/or operate discrete outputs:

- After Valid Package - A valid package is a package that has valid bar code symbols and meets the fields (bar codes) per package count (condition (a) listed above).
- End of Trigger - Refer to trigger ending conditions (b, c, d) listed above.

Chapter 4

Configuring Your Decoder

Chapter Objectives

Because the decoder can be used many ways, you will need to configure the decoder to meet the requirements of your application. To do this, you must make some decisions. We will show you how to use the menus and setup screens that appear on a programming terminal to select the options you need.

Initial Programming of the Decoder

You must configure the decoder to meet the requirements of the application. You can configure the decoder either before or after installation. **If you change the configuration while a triggered decode is in progress, there is the possibility of missing a package and/or losing data.**

Note: The default parameters for the decoder are given in Appendix B. If these settings meet your requirements, you will not have to program the decoder.

You will need the following equipment:

1. Decoder with power cable.

2. One of the following programming terminals:

- Allen-Bradley Industrial Terminal (Catalog No.1770-T1, -T2, or -T3).
- Allen-Bradley T45 Laptop Terminal (Catalog No. 1784-T45).
- Lear Siegler 3E.
- Televideo 955.
- DEC VT-100.
- A terminal or personal computer that accurately emulates one of the above.

3. A cable to connect your programming terminal to the decoder.

Note: Prior to configuring your decoder, we suggest that you review the description of how the decoder stores configuration data (refer to Chapter 3, RAM and EEPROM Memory descriptions).

Note: Refer to Appendix A for programming terminal setup. The programming terminal you use must be configured with the following parameters:
Number of data bits: **8**
Number of stop bits: **1**
Baud rate: **9600**
Parity: **None**
Flow Control: XON / XOFF

Programming Terminal Cable

Programming of the decoder is done through the AUX connector on the back of the decoder. The AUX port connector on the decoder is a standard 25 pin, female, D type connector. Depending upon your programming terminal, most standard RS-232 communications cables will work. If you need to create a communications cable, refer to Appendix A.

Menus and Setup Screens

You can program and/or monitor the operation of the decoder using the following CRT screens:

- Select Language Screen - Use this screen to select English, French, German, Italian, or Spanish language screens.
- CRT Select Menu - You use this menu to select the type of programming terminal being used.
- Select operation Menu - Using this menu, you select one of six operations:

  1) Display Labels Screen- Displays bar code labels as they are decoded.

  2) System Status Screen- Displays the status of the decoder.

  3) Setup Screens-

  Setup Screen 1- Use this screen to configure the host interface which includes host message format, host communications parameters and protocol, and filtering of the package detect input.

  Setup Screen 2- Use this screen to configure the decoder for the bar code symbologies, bar code lengths, scan head operation, match code settings, and configuration of output modules.

  4) Reset Status and Counters

  5) Restart System

  6) Select Language Screen- This screen allows you to reselect one of the following languages:

  - English
  - French
  - German
  - Italian
  - Spanish

Start-up Procedure

After you have connected the programming terminal to the decoder and attached the power cord:

Step 1 - Turn ON the programming terminal and configure the terminal for communications with the decoder. Appendix A provides information on setting up the programming terminal.

Step 2 - Turn the decoder ON. The green LEDs, labeled POWER ON and CPU ACTIVE, will light.

Step 3 - When the following screen appears, press the key that corresponds to the language you are using. All of the remaining screens will appear in the selected language.

```
SELECT LANGUAGE      CHOIX DU LANGAGE      WAEHLE SPRACHE
1) English           1) Anglais            1) Englisch
2) French            2) Francais           2) Franzoesisch
3) German            3) Allemand           3) Deutsch
4) Italian           4) Italien            4) Italienisch
5) Spanish           5) Espagnol           5) Spanisch

Press 1, 2, 3, 4, 5, or ESC                Appuyer 1, 2, 3, 4, 5 ou ESC  Drueck
                                           e 1, 2, 3, 4, 5, oder ESC

SELEZIONARE LINGUA   SELECCIONAR LENGUA
1) Inglese           1) Ingles
2) Francese          2) Frances
3) Tedesco           3) Aleman
4) Italiano          4) Italiano
5) Spangnolo         5) Castellano

Premere 1, 2, 3, 4, 5 o ESC                Pulsar 1, 2, 3, 4, 5, o ESC
```

Step 4 - After selecting the language, the decoder will display the CRT select screen. Press the key (1, 2, 3, 4, or 5) that corresponds to the terminal you are using. Pressing the [ESC] key, will return you to the language selection screen.

```
          2755-DM9  Bar Code Reader  VX.XX
Copyright 1990 Allen-Bradley Company, Inc.

SELECT CRT TYPE

1 - Allen-Bradley 1770 Industrial Terminal
2 - Allen-Bradley T45 Portable Terminal
3 - Lear Siegler ADM 3E
4 - Televideo 955
5 - Digital VT100

Press 1, 2, 3, 4, 5 or ESC
```

Step 5 - After selecting the CRT type, the decoder will display the select operation menu. The remaining displays that you will see depends upon the operation that you select.

Select Operation Menu

After selecting the CRT type, the following Select Operation menu will appear:

```
        2755-DM9  Bar Code Reader  VX.XX
Copyright 1990 Allen-Bradley Company, Inc.

SELECT OPERATION

1)  Display Bar Code Labels
2)  Display Status and Counters
3)  Display/Change Configuration
4)  Reset Status and Counters
5)  Restart
6)  Select Language

Press 1, 2, 3, 4, 5, 6, or ESC
```

The following are explanations of each operation listed on the Select Operation menu:

1) Display Bar Code Labels - This operating mode allows you to monitor bar code labels as they are being scanned. After selecting this operation by pressing the [1] key, bar code labels will be displayed as they are decoded. The display will scroll up as new labels appear on the bottom of the screen. If more than one label is decoded on the same scan, the labels will be displayed on the same line separated by a space. If a no-read condition occurs, the decoder will display the no-read message that you enter as part of the decoder configuration. Pressing the [ESC] key will exit this function. The following is an example of how the display bar code labels screen might appear:

(Continued)

```
19876367  3456721
59874292
45763019
56474821
10945280
45674895  7689577
87599039
35426881
11987454
54664778
87997070
56400982
54664747
09585746  7563778
53647747
87745646
35647465
6545456
```

2) Display Status and Counters - After selecting this operation by pressing the [2] key at the select operations menu, the decoder will display the following:

- Decoder Performance - The percentage of decodable scans over a 100 scan sample. The 100 scan sample is not made up of the raw scans from the scan head. Instead, the 100 scan sample is made up of scans which have passed through a “qualifier” circuit in the data acquisition circuitry. The “qualifier” circuit acts as a pre-filter that discards empty, partial, or noisy scans before decoding is attempted. Because of this, it is possible to have a high decoder performance even though only a small percentage of the scans are crossing the label (such as when a raster scan head is used or the label is moving). This display is only available if continuous trigger mode is selected and fields per package parameter (entered as part of configuration programming) is anything but “any”.

Note: You can use the decoder performance monitor during:

Installation. By monitoring the percentage of good reads, you will be able to determine the optimum location for the scan head in relation to the label(s) being read.

Operation. If the percentage of good reads drops significantly below what it was during installation, the scan head window may require cleaning or the label quality may have degraded.

- No-Read Counter - The number of No-Reads. This counter is incremented each time a package start trigger is generated and a stop trigger occurs without a valid package. No-reads also occur when the decoder does not decode the correct number of fields on a package as

specified by the fields per package configuration parameter. Data that is lost due to an overflow of the buffer does not increment this counter.

- Package Counter- The number of packages detected. This counter is incremented each time a package trigger is generated by the scan head package detector, a host command, or the internal timer.

- Output Counters 1 through 8 - The number of times an output condition has occurred.

The following is an example of how the display status and counters screen may appear:

```
2755-DM9  Bar Code Reader  VX.XX
Copyright 1990 Allen-Bradley Company, Inc.

Decoder Performance : 100%
No-Read Counter : 10
Package Counter : 300

Output Counter 1 : 44
Output Counter 2 : 45
Output Counter 3 : 56
Output Counter 4 : 5
Output Counter 5 : 33
Output Counter 6 : 23
Output Counter 7 : 40
Output Counter 8 : 67

ESC to Exit
```

This screen is updated approximately once per second.

Press the [ESC] key to exit the function.

3) Display/Change Configuration- Pressing the [3] key at the operation menu will allow you to change the operating configuration of the decoder. Two setup screens are used to configure the decoder. Before entering the setup screens, the decoder will display a message asking you if you want the outputs disabled during configuration:

CAUTION

Configuration changes may cause the discrete outputs to switch.

If outputs are to remain ENABLED, press ESC.

Otherwise press any other key to continue. Outputs will be DISABLED until the device is restarted.

Note: We recommend that you disable the outputs while configuring the decoder. This will prevent the outputs from being turned on unintentionally during changes to the configuration.

If you press any key other than the [ESC] key, the outputs will be disabled (off) during configuration. The outputs will remain disabled until you restart (refer to restart operation) or cycle the power off and then back on (remember to SAVE configuration first). If you press the [ESC] key, the outputs will remain enabled during configuration. After responding to the above message, the decoder will display the first of two setup screens:

------- MESSAGE FORMAT -------		------- HOST COMM -------	
SEND BAR CODE DATA:	Yes	BAUD RATE:	9600
SEND PACKAGE COUNT:	No	BITS/CHAR:	8 Data, 1 Stop
SEND BAR CODE TYPE:	No	PARITY:	None
SEND SOURCE IDENTIFIER:	No		
SEND HEADER MESSAGE:	No	ACK CHAR:	None
SEND NO-READ MESSAGE:	No	NAK CHAR:	None
		START SCAN CHAR:	None
EXPAND UPC-E:	Yes	STOP SCAN CHAR:	None
SOURCE IDENTIFIER:		LARGE BUFFER:	No
LABEL DELIMITER:	None	RESPONSE MODE:	End of Trigger
START CHAR:	None	HOST PROTOCOL:	RS232
END MESSAGE:	CRLF	DEVICE ADDRESS:	01
TRANSMISSION CHECK:	None		
HEADER MESSAGE:			
NO-READ MESSAGE:			
CODE 39 CHECK CHAR:	No SEND: No	---PACKAGE DETECT INPUT---	
I 2-OF-5 CHECK CHAR:	No SEND: No	FILTER: No	
CODABAR CHECK CHAR:	No SEND: No	SENSE: LO = Package	

Commands: ESC Change: SPACE Cursor Control: ARROWS

If you press the [ESC] key to select the command bar, you will notice that the NEXT PAGE command is highlighted in reverse video on the bottom of the screen. Press the [RETURN] key to enter the command. The decoder will then display the second setup screen, which looks like this:

```
-- SYMBOLOGY --   -------- LENGTHS --------   -------- SCANNER CONTROL --------
   CODE 39:  Yes   00 00 00 00 00 00 00 00   LASER-ON MODE:    Continuous
   I 2-OF-5:  No   00 00 00 00 00 00 00 00 DECODE TRIGGER:    Package Detect
  CODE 128:  No    00 00 00 00 00 00 00 00  CAPTURE COUNT:    2  (scans)
  CODABAR:  No     00 00 00 00 00 00 00 00       FIELDS/SCAN:  1
    UPC-A:  No                             FIELDS/PACKAGE:    1
    UPC-E:  No                              NO-READ TIMER:    0000 (msec)
    EAN-8:  No                            INTER-SCAN TIMER:   0000 (msec)
   EAN-13:  No                            MATCH COMPLETE:     1

 ---------MATCH CODE TABLE----------     ----------- OUTPUTS  [DISABLED]--------
1)  CODE 39   N                              None                          0000
2)  CODE 39   N                              None                          0000
3)  CODE 39   N                              None                          0000
4)  CODE 39   N                              None                          0000
5)  CODE 39   N                              None                          0000
6)  CODE 39   N                              None                          0000
7)  CODE 39   N                              None                          0000
8)  CODE 39   N                              None                          0000
_____________________________________________
          Commands: ESC       Change: SPACE       Cursor Control: ARROWS
_____________________________________________
```

Note: The two setup screens display the current operating parameters of the decoder. Any changes made to the configuration will become effective immediately with the exception of the host communication parameters. In order for changes to the host port baud rate, stop bits, parity, host protocol, or device address to take effect, you must save the changes to the decoder's EEPROM (SAVE command) and then restart. You can restart the decoder by pressing the [5] key (Restart System) at the Select Operation menu, through a host command, or by turning the power off and then back on.

In the following sections of this chapter we will provide a description of all the options available on the two setup screens. We will also provide a step-by-step programming example.

4) Reset Status and Counters- Pressing the [4] key at the operations menu will reset the package counter, no-read counter, and output counters. Prior to resetting the counters, the decoder will display a confirmation prompt:

```
RESET STATUS AND COUNTERS . . . Confirm (Y/N)
```

Press the [Y] key to confirm the reset. Pressing the [N] key will cancel the reset function.

5) Restart System- Pressing the [5] key at the select operation menu will reboot the decoder. This has the same effect as turning the power off and then back on. Prior to restarting the system, the decoder will display a confirmation prompt:

```
RESTART SYSTEM . . . Confirm (Y/N)
```

Press the [Y] key to confirm the restart. Pressing the [N] key will cancel the restart function.

6) Select Language- Pressing the [6] key at the operations select menu will display the following menu:

```
SELECT LANGUAGE     CHOIX DU LANGAGE     WAEHLE SPRACHE
1) English          1) Anglais           1) Englisch
2) French           2) Francais          2) Franzoesisch
3) German           3) Allemand          3) Deutsch
4) Italian          4) Italien           4) Italienisch
5) Spanish          5) Espagnol          5) Spanisch

Press 1, 2, 3, 4, 5, or ESC              Appuyer 1, 2, 3, 4, 5 ou ESC   Drueck
                    e 1, 2, 3, 4, 5, oder ESC

SELEZIONARE LINGUA  SELECCIONAR LENGUA
1) Inglese          1) Ingles
2) Francese         2) Frances
3) Tedesco          3) Aleman
4) Italiano         4) Italiano
5) Spangnolo        5) Castellano

Premere 1, 2, 3, 4, 5 o ESC              Pulsar 1, 2, 3, 4, 5, o ESC
```

Press the key that corresponds with the language you want to use. After selecting the language, the decoder will return you to the CRT selection screen. All of the other screens will appear in the selected language.

Using and Editing the Configuration (Setup) Screens

When programming the decoder, use the two configuration (setup) screens to set operating parameters. There are two types of fields that you can change on the configuration screens:

- SELECT Fields - In the select fields, you have fixed selections such as YES or NO. Pressing the [SPACE] bar multiple times will step through the selections available. Pressing the [RETURN] key will enter the selection.
- EDIT Fields - In the edit fields, you can enter strings of ASCII character codes, numeric values, or text. Pressing the [SPACE] bar will open the field for changes and clear the current values. You can then enter new data. Pressing the [RETURN] key will close the field and enter the data. Pressing the [ESC] key will cancel any changes, return the values back to the original contents when the field was opened, and close the field.

Depending upon the type of field (select or edit) that you are configuring, use the commands listed in Table 4.A:

To do this:	You must:	Comments
Return to SELECT OPERATION menu.	Press the [ESC] key to select the command bar and then press the [ESC] key again.	
Change any field.	Press [SPACE] bar.	In select fields, next option is displayed. In edit fields, field is cleared and new data can be entered.
Enter a new or different value.	Press [RETURN] key.	New value is highlighted in reverse video.
Move to a different field.	Press [RETURN] key or arrow keys.①	See note ① below.
Move to next menu.	Press [ESC] key to select the command bar and press the [RETURN] key.	
Transfer new parameters into the Decoder's memory (EEPROM). ***SAVE***	Press [ESC] key to select command bar. Use [SPACE] bar to select SAVE and press the [RETURN] key. Press [Y] key at confirmation prompt.	New configuration parameters are transferred to the decoder's EEPROM.
Recall previously set parameters from the Decoder's memory (EEPROM–User Definable). ***RECALL***	Press [ESC] key to select command bar. Use [SPACE] bar to select RECALL and press the [RETURN] key. Press [Y] key at confirmation prompt.	Previously set parameters are displayed.
Reset decoder to factory set parameters (EPROM–Defaults). ***DEFAULT***	Press [ESC] key to select command bar. Use [SPACE] bar to select DEFAULT and press the [RETURN] key. Press [Y] key at confirmation prompt.	Refer to Appendix B for factory set parameters.

① Allen-Bradley Industrial Terminals (Catalog Number 1770-T1, -T2, or -T3) do not have arrow keys. Use the [CTRL] and U, D, L or R keys for Up, Down, Left or Right cursor movement.

EDIT FIELDS - There are three types of data that can be entered or modified in an edit field:

1) ASCII character codes-(decimal values 0 to 255)

2) Numeric values

3) Text strings

To open an edit field for a change, press the [SPACE] key. The cleared field will appear as a block in reverse video and the decoder will display the edit keys you can use at the bottom of the screen. All other keys will be ignored:

```
EDIT  --  Cancel:ESC  Enter:RETURN  Erase Char: BACKSPACE
```

Type in the new data and press the [RETURN] key to close the field and enter the data.

Note: Pressing the [ESC] key while you are entering data in an edit field will return the contents of the field back to the original contents prior to editing.

When you enter a value in a field that requires an ASCII decimal value, you have three options:

1) You can enter the decimal (numeric) equivalent value (refer to Appendix C). After entering the decimal value, the selected ASCII character will be displayed.

2) You can enter the ASCII character (non-numeric only) such as “T”. The decoder will automatically enter the decimal equivalent value (T = 84).

3) If you press the [RETURN] key when the field is empty, “NONE” is displayed (no ASCII value is defined). A decimal value of 255 is also interpreted as “NONE”.

You can enter non-printable ASCII control characters into the following edit fields:

- Source Identification Message
- Header Message
- No-Read Message
- Match Table Entry

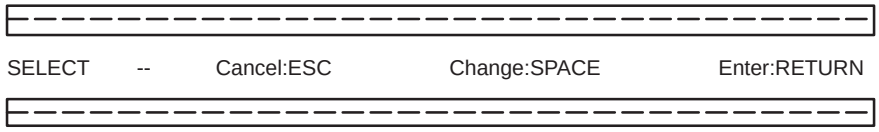
To enter non-printable ASCII control characters (ASCII 0 through 31) into a text string, refer to Table 4.B. For example: to enter carriage return and line feed control characters, you would enter **%M%J**. The decoder will interpret **%M%J** as the ASCII control characters **CR** and **LF**. The **%** character is equivalent to ASCII 37 (decimal). Non-printable control characters are always entered as a two character sequence and the second character must be listed in Table 4.B. To enter the character **%**, you must use **%%**.

Note: Some fields have restrictions on the type of data that you can enter. For example: numeric values only are allowed in the inter-scan timer field. If you attempt to enter an invalid character, you will hear a beep. Numeric values are also checked for range (min and max values) when the [RETURN] key is pressed. An audible beep indicates a value is out of the specified range. To correct an entry, you can either:

- Delete the incorrect entry by using the backspace, left arrow, [CTRL] [L], or rubout keys.
- Press the [ESC] key once to return the field back to its original contents.

ASCII Control Character	Enter:	ASCII Control Character	Enter:	ASCII Control Character	Enter:
NUL	%@	VT	%K	SYN	%V
SOH	%A	FF	%L	ETB	%W
STX	%B	CR	%M	CAN	%X
ETX	%C	SO	%N	EM	%Y
EOT	%D	SI	%O	SUB	%Z
ENQ	%E	DLE	%P	ESC	%[
ACK	%F	DC1	%Q	FS	%\
BEL	%G	DC2	%R	GS	%]
BS	%H	DC3	%S	***RS***	%^
HT	%I	DC4	%T	US	%_
LF	%J	NAK	%U		

SELECT FIELDS- To change the contents of a select field, press the [SPACE] key. After pressing the [SPACE] key, he next option is displayed and the decoder will display the control keys you can use at the bottom of the screen. All other keys are ignored:

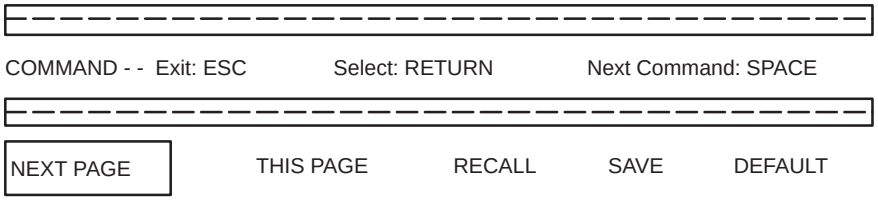


Press the [SPACE] key again until the option you want is displayed. Press the [RETURN] key to enter the selected option.

Command Bar

When you first enter either setup screen you will observe the following at the bottom of the display:

Notice that the command bar display provides a quick reference to the commands used to edit the setup screen. If you select the command bar by pressing the [ESC] key, the following will be displayed:



After selecting the command bar, you will notice that the first command option NEXT PAGE is highlighted in reverse video. To display the other

(next) setup screen you would press the [RETURN] key. To select another of the displayed commands, press the [SPACE] key until the desired command is highlighted and then press the [RETURN] key. Pressing the [ESC] key after selecting the command bar will return you to the select operation menu. The following are explanations of each command in the command bar:

- NEXT PAGE - Selecting this command will display the other setup screen. Remember that there are two setup screens used to configure the decoder.
- THIS PAGE - Selecting this command will return you to the top of the current setup screen.
- RECALL - Selecting this command will recall all the previously SAVED configuration parameters from the decoder's Electrically Erasable Programmable Read Only Memory (EEPROM) to the decoder's Random Access Memory (RAM). Once moved into the decoder's RAM, the recalled configuration is displayed and controls the operation of the decoder.
- SAVE - Selecting this command will save all the configuration parameters to the decoder's EEPROM. You must use the save function after programming, or the decoder's operating configuration will revert back to the original configuration after a restart (or power loss) of the decoder.
- DEFAULT - Selecting this command will change the setup to the factory default selections. Refer to Appendix B for the default parameters. If the default values meet the requirements of your application, you do not have to program the decoder.

Setup Screen #1

Figure 4.1 shows the first setup screen. The first setup screen configures the communication parameters and host protocol. We have used lowercase letters to indicate fields of the configuration data. These letters are keyed to Table 4.C, listing the options available for each field type. Following the table is a short description of the effect each option has on the decoder operation.

Figure 4.1
Setup Screen #1

---------- MESSAGE FORMAT ----------			---------- HOST COMM ----------	
SEND BAR CODE DATA:	**a**		BAUD RATE:	**u**
SEND PACKAGE COUNT:	**b**		BITS/CHAR:	**v**
SEND BAR CODE TYPE:	**c**		PARITY:	**w**
SEND SOURCE IDENTIFIER:	**d**			
SEND HEADER MESSAGE:	**e**		ACK CHAR:	**x**
SEND NO-READ MESSAGE:	**f**		NAK CHAR:	**y**
			START SCAN CHAR:	**z**
EXPAND UPC-E:	**g**		STOP SCAN CHAR:	**aa**
SOURCE IDENTIFIER:	**h**		LARGE BUFFER:	**bb**
LABEL DELIMITER:	**i**		RESPONSE MODE:	**cc**
START CHAR:	**j**		HOST PROTOCOL:	**dd**
END MESSAGE:	**k**		DEVICE ADDRESS:	**ee**
TRANSMISSION CHECK:	**l**			
HEADER MESSAGE:	**m**			
NO-READ MESSAGE:	**n**			
CODE 39 CHECK CHAR:	**o**	SEND: **p**	---PACKAGE DETECT INPUT---	
I 2-OF-5 CHECK CHAR:	**q**	SEND: **r**	FILTER: **ff**	
CODABAR CHECK CHAR:	**S**	SEND: **t**	SENSE: **gg**	

Commands: ESC Change: SPACE Cursor Control: ARROWS

Reference Letter	Description	Field Type	Options (Select Field Only)	Valid Entries (Edit Field Only)
a	Send bar code field data to host.	Select	Yes or No	N/A
b	Send package count to host.	Select	Yes or No	N/A
c	Send bar code type indicator to host.	Select	Yes or No	N/A
d	Send source identification string to host.	Select	Yes or No	N/A
e	Send header message to host.	Select	Yes or No	N/A
f	Send no–read message to host, if no–read.	Select	Yes or No	N/A
g	Expand UPC–E bar codes.	Select	Yes or No	N/A
h	Source identification message.	Edit	N/A	Up to four ASCII characters.①
i	Label delimiter character.	Edit	N/A	Numeric ASCII code (0 to 255) 255 = None. Refer to Appendix C.
j	Start character.	Edit	N/A	Numeric ASCII code (0 to 255) 255 = None. Refer to Appendix C.
k	End of message.	Select	None, CRLF, CR, LF, ETX	N/A
l	Transmission check method.	Select	None, LRC, Checksum–LSB, Checksum–MSB	N/A
m	Header message.	Edit	N/A	Up to 32 ASCII characters.①
n	No–read message.	Edit	N/A	Up to 32 ASCII characters.①
o	Employ check character for Code 39.	Select	Yes or No	N/A
p	Send Code 39 check character.	Select	Yes or No	N/A
q	Employ check character for Interleaved 2–of–5.	Select	Yes or No	N/A
r	Send Interleaved 2–of–5 check character.	Select	Yes or No	N/A
s	Employ check character for Codabar.	Select	Yes or No	N/A
t	Send Codabar check character.	Select	Yes or No	N/A

① You can enter non-printable characters in these fields, refer to the table on page 4-12.

Reference Letter	Description	Field Type	Options (Select Field Only)	Valid Entries (Edit Field Only)
u	Host port–baud rate.	Select	300, 1200, 2400, 4800, 9600, 19200, 38400	N/A
v	Host port–number of data and stop bits.	Select	8 data, 1 stop 8 data, 2 stop 7 data, 1 stop 7 data, 2 stop	N/A
w	Host port–parity.	Select	None, Odd, or Even	N/A
x	Host port–ACK character.	Edit	N/A	Numeric ASCII code (0 to 255) 255 = None.②
y	Host Port–NAK character.	Edit	N/A	Numeric ASCII code (0 to 255) 255 = None.②
z	Host port–start scan character.	Edit	N/A	Numeric ASCII code (0 to 255) 255 = None. ②
aa	Host port–stop scan character.	Edit	N/A	Numeric ASCII code (0 to 255) 255 = None.②
bb	Enable host port buffer (8k bytes).	Select	Yes or No	N/A
cc	Response mode.	Select	End of Trigger, or After Valid Package.	N/A
dd	Host protocol.	Select	**RS232** No flow control **RS232 XON/XOFF** **RS232 RTS/CTS–1**① **RS232 RTS/CTS–2**① **RS422** No flow control **RS422 XON/XOFF** **RS485 PCCC–1** PCCC with write replies **RS485 PCCC–2** PCCC without write replies **RS485 ASCII–1** ASCII Commands with command responses **RS485 ASCII–2** ASCII Commands without command responses	N/A
ee	Device address for Class 1 node.	Edit	N/A	00 through 31
ff	Enable package detect filter.	Select	Yes or No	N/A
gg	Package detect polarity (sense).	Select	LO = Package HI = Package	N/A

① Refer to Chapter 6 for a description of the RS-232 modes 3 and 4. Both of these modes use the modem control lines (RTS, CTS and DTR). However, there are differences in how these control lines are used.
② Refer to Appendix C for ASCII conversion chart.

Setup Screen #1 Fields

The following are detailed explanations of the fields on setup screen #1. We have provided reference letters (a through gg) which are keyed to Table 4.C and Figure 4.2.

Note: Fields with reference letters (a) through (t) control the format of bar code data that is sent to a host device. Refer to Figure 6.5 for an illustration of the data format. Table 6.A provides a short explanation of each field in a data message.

Message Format

SEND BAR CODE DATA (a) - Selecting YES for this field will enable the decoder to transmit the bar code data message to the host (refer to Figure 6.5). The bar code data message will not be sent to a host if you select NO.

SEND PACKAGE COUNT (b) - Selecting YES for this field will enable the decoder to transmit the contents of the package counter to the host. Package counts will not be sent if NO is selected. Refer to Figure 6.5, item #14.

SEND BAR CODE TYPE (c) - Selecting YES for this field will enable the decoder to transmit the type of code being decoded (Codabar, Code 39, etc) to the host. Bar code type will not be sent if NO is selected. Bar code type is transmitted as a 2 digit code, refer to Table 6.A. Figure 6.5, item #5 illustrates the position of the data in the data message.

SEND SOURCE IDENT (d) - Selecting YES for this field will enable the decoder to transmit the contents of the SOURCE IDENT field to the host. Source identification will not be sent if NO is selected. Refer to Figure 6.5, item #2.

SEND HEADER MESSAGE (e) - Selecting YES for this field will enable the decoder to transmit the contents of the HEADER MESSAGE field to the host. Header message will not be sent if NO is selected. Refer to Figure 6.5, item #3.

SEND NO-READ MESSAGE (f) - Selecting YES for this field will enable the decoder to transmit the contents of the NO-READ MESSAGE field to the host whenever a no-read occurs. The no-read message will not be sent if NO is selected. Refer to Figure 6.5, item #8.

EXPAND UPC-E (g) - Selecting YES for this field will result in UPC-E being transmitted in a 12 digit (expanded) format. UPC-E will be transmitted in a 6 digit (compressed) format if NO is selected.

SOURCE IDENT (h) - You can enter one of two options:
1) The identification label you want sent to a host with each communication (Send Source Ident selected). This entry is limited to 4 ASCII characters. Refer to Figure 6.5, item #2.

2) Leave field blank.

LABEL DELIMITER (i) - You can enter one of two options:
1) The label delimiter characters being used. These characters indicate the beginning and end of bar code label information. Refer to Table 6.A for a more detailed description. Refer to Figure 6.5, items #4,#12, and #13. The host can use this character as a marker between fields to sort out the data.

2) 255 = None.

START CHAR (j) - You can enter one of two options:

1) The start character you want to specify. Refer to Figure 6.5, item #1.

2) 255 = None.

END MESSAGE (k) - Refer to Figure 6.5, item #15. You can select one of five options:

1) CRLF. Selecting CRLF will send the ASCII control codes CRLF at the end of the transmission.

2) CR. Selecting CR will send the ASCII control code CR at the end of the transmission.

3) LF. Selecting LF will send the ASCII control code LF at the end of the transmission.

4) ETX. Selecting ETX will send the ASCII control code ETX at the end of the transmission.

5) None.

TRANSMISSION CHECK (l) - When enabled, the transmission check characters follow the end of message character(s). Refer to Figure 6.5, item #16. You can select one of four options:

1) LRC (Longitudinal Redundancy Check). Selecting 8-BIT LRC will cause the decoder to verify transmissions using the Longitudinal Redundancy Check method (exclusive OR of all bytes in the message).

2) Checksum-LSB (Least Significant Byte). Selecting LSB SUM-16 will cause the decoder to verify transmissions using the checksum method (sum of all message bytes) with the least significant byte transmitted first.

3) Checksum-MSB (Most Significant Byte). Selecting MSB SUM-16 will cause the decoder to verify transmissions using the checksum method (sum of all message bytes) with the most significant byte transmitted first.

4) None.

Note: If you select one of the transmission check options, do not use XON/XOFF flow control. There is the possibility of the transmission check bytes being interpreted as an XOFF character.

Note: If you want more information on how check characters are generated and what they mean, refer to Appendix F.

HEADER MESSAGE (m) - Refer to Figure 6.5, item #3. You can enter one of two options:

1) The header message you want sent to a host (Send Header Message selected). This entry is limited to 32 ASCII characters.

2) Leave field blank (none).

NO-READ MESSAGE (n) - Refer to Figure 6.5, item #8. You can enter one of two options:

1) The no-read message you want sent with each no-read (Send No-Read Message selected). This entry is limited to 32 ASCII characters.

2) Leave field blank (none).

Data Check Characters

CODE 39 CHECK CHAR (o) - Selecting YES for this field will enable the decoder to compute and verify a code check character for Code 39 bar codes. The code check character ensures that the data is read correctly. If NO is selected, the decoder will assume that a check character does not exist. Refer to Figure 6.5, item #9.

Note: The Code 39 check character is computed as a Modulus 43 sum of all character values as specified in AIM specification USS-39. AIM is an acronym for Automatic Identification Manufacturers.

SEND CODE 39 CHECK CHARACTER (p) - Selecting YES for this field will enable the decoder to transmit the code check character with the bar code data. A code check character will not be sent if NO is selected. Refer to Figure 6.5, item #9.

I 2-OF-5 CHECK CHAR (q) - Selecting YES for this field will enable the decoder to compute and verify a code check character for Interleaved 2-of-5 bar codes. The code check character ensures that the data is read correctly. If NO is selected, the decoder will assume that a check character does not exist. Refer to Figure 6.5, item #9.

Note: The Interleaved 2-of-5 check character is computed as a Modulus 10 sum of all character values as specified in AIM specification USS-I 2/5.

SEND I 2-OF-5 CHECK CHARACTER (r)- Selecting YES for this field will enable the decoder to transmit the code check character with the bar code data. A code check character will not be sent if NO is selected. Refer to Figure 6.5, item #9.

CODABAR CHECK CHAR (s)- Selecting YES for this field will enable the decoder to compute and verify a code check character for Codabar bar codes. The code check character ensures that the data is read correctly. If NO is selected, the decoder will assume that a check character does not exist. Refer to Figure 6.5, item #9.

Note: The Codabar check character is computed as a Modulus 16 sum of all character values as specified in AIM specification USS-Codabar.

SEND CODABAR CHECK CHARACTER (t) - Selecting YES for this field will enable the decoder to transmit the code check character with the bar code data. A code check character will not be sent if NO is selected. Refer to Figure 6.5, item #9.

Host Communications

Note: Unlike the other decoder operating parameters, changes to the following parameters will not take effect until you SAVE the changes, and then restart the decoder: HOST PROTOCOL, DEVICE ADDRESS, ACK and NAK CHARACTERS, BAUD RATE, NUMBER OF DATA & STOP BITS, PARITY.

BAUD RATE (u) - This field sets the baud rate at the HOST port connector. You can select one of seven baud rates:

1) 300
2) 1200
3) 2400
4) 4800
5) 9600
6) 19200
7) 38400

BITS/CHAR (v) - This field sets the number of data and stop bits sent with each character. You can select one of the following:

8 Data, 1 Stop
8 Data, 2 Stop
7 Data, 1 Stop
7 Data, 2 Stop

PARITY (w) - This field defines the parity bit for each character transmitted or received at the host port. You can select None, Odd, or Even parity.

ACK CHAR (x) - This field sets the Positive Acknowledgment character used in ACK/NAK protocol. The ACK character is sent by the host to acknowledge receipt of a message. You have one of two options:

1) The ACK character you will be using. This entry is in decimal ASCII code (0 through 254). Refer to Appendix C for ASCII coding.

2) 255 = None

Note: Any command that the decoder receives from the host is also interpreted as a positive acknowledgment (ACK).

NAK CHAR (y) - This field sets the Negative Acknowledgment character used in ACK/NAK protocol. The NAK character is sent by the host, when a message is not received properly, to prompt a retry. You have one of two options:

1) The NAK character you will be using. This entry is in decimal ASCII code (0 through 254). Refer to Appendix C for ASCII coding.

2) 255 = None

Note: You must specify both an ACK and NAK character when using ACK/NAK protocol. ACK/NAK protocol is usually used in conjunction with the transmission check and provides error detection. The ACK/NAK protocol can also be used to provide flow control. ACK/NAK protocol only applies to the bar code data that is sent to a host.

When using the ACK/NAK protocol, the decoder will hold the last transmitted bar code data message until an ACK character is sent. A NAK character informs the decoder to retransmit the last message (up to three times).

START SCAN CHARACTER (z) - This field sets the character which will inform the decoder to begin scanning. Scanning will continue until a decodable label is found or the host sends a stop scan character. You have two options:

1) The start scan character you will be using. This entry is in decimal ASCII code (0 through 254). Refer to Appendix C for ASCII coding.

2) 255 = None

Note: The Decode Trigger Mode (on second setup screen) must be set for Host Command.

STOP SCAN CHARACTER (aa) - This field sets the character which will inform the decoder to stop scanning and is used in conjunction with the Start Scan character. You have two options:

1) The stop scan character you will be using. This entry is a decimal number for the ASCII character (0 through 254). Refer to Appendix C for ASCII coding.

2) 255 = None

Note: The Decode Trigger Mode (on second setup screen) must be set for Host Command.

ENABLE HOST PORT BUFFER (bb) - Selecting YES will enable an 8K buffer on the transmitter of the host port. This buffer allows the decoder to decode and buffer messages to the host. You should use this feature in applications where the host may be incapable of handling high burst rates of data from the decoder. If NO is selected, the decoder will only buffer one message.

RESPONSE MODE (cc) - The response mode specifies when the decoder will send data to a host or activate an output module. In the triggered mode of operation, you have two response options you can select:

1) End of Trigger - Selecting End of Trigger response will cause the decoder to transmit data or activate discrete outputs after the end of a trigger. The end of the trigger is determined by the triggering mode and may occur when:

- Package detector no longer detects a package.
- Trigger Off signal is received from the host.
- Trigger is timed out by no-read timer.

2) After Valid Package - Selecting After Valid Package will cause the decoder to transmit data or activate output modules immediately following a valid package (fields per package count satisfied) or after a no-read is detected.

If a valid package is never decoded, outputs and transmission of data occur at the end of the trigger, as stated above.

HOST PROTOCOL (dd)- You can select one of ten options:

1) RS232: No flow control is selected.

2) RS232 XON/XOFF: XON/XOFF flow control is selected.

3) RS232 RTS/CTS-1: Modem controls (Request to Send-RTS, Clear to Send-CTS, and Data Terminal Ready-DTR) are used. A description of these control lines is provided in Chapter 6.

Note: The decoder has two modes of host communication which use the modem control lines CTS, RTS, and DTR. RS-232 RTS/CTS-1 provides flow control of communications from the decoder to the host. RS-232 RTS/CTS-2 provides bi-directional flow control. When communicating with a 2760-RA or 2760-RB communications device that has modem controls enabled, you must use RS232 RTS/CTS-2.

4) RS232 RTS/CTS-2: Modem controls (Request to Send-RTS, Clear to Send-CTS, and Data Terminal Ready-DTR) are used. A description of these control lines is provided in Chapter 6. Use RS-232 RTS/CTS-2 when you connect the decoder to a 2760-RA or -RB that has modem controls enabled.

5) RS422: No flow control is selected.

6) RS422 XON/XOFF: XON/XOFF flow control is selected.

7) RS485 PCCC-1: PCCC Commands, with Write Replies.

8) RS485 PCCC-2: PCCC Commands, Without Write Replies.

9) RS485 ASCII-1: ASCII Commands with Responses.

10) RS485 ASCII-2: ASCII Commands without Responses.

DEVICE ADDRESS (ee) - You must specify an address when you use the RS-485 LAN. Each device on the network must have a unique address. You can enter a numeric value in the range of 0 to 31 for the decoder address.

Package Detect Input

INPUT FILTER (ff) - Selecting YES will enable a debounce filter on the package detect sensor input from the scan head. Any package detect signal less than 10 msec will be ignored. To trigger the decoder, a continuous package detect input of at least 20 msec should be provided. The input filter will be disabled if NO is selected.

Note: When using the package detector as a trigger source and input filter is enabled, make sure that the detect signal is of long enough duration to allow for both adequate scanning and 20 msec filter. For example: Assuming you are using a 800 scan/sec head and you want at least 5 scans, the package detect must be on for at least 27 msec (20 msec + 5 scans x 1.25 msec/scan).

SENSE (gg) - This field determines whether a package is detected when the voltage at the package detect input is High or Low. You can select one of two options:

1) LO = Package Present

2) HI = Package Present

Setup Screen #2

Figure 4.2 shows the second setup screen. We have used lowercase letters to indicate fields of the configuration data. These letters are keyed to the table on Page 4-25 and 4-26 which lists the options available for each field type. Following the table is a short description of the effect each option has on the operation of the decoder.

Figure 4.2
Setup Screen #2

```
-- SYMBOLOGY --   -------- LENGTHS --------   -------- SCANNER CONTROL --------
   CODE 39: a      i  i  i  i  i  i  i  i     LASER-ON MODE:  m
   I 2-OF-5: b     j  j  j  j  j  j  j  j     DECODE TRIGGER: n
  CODE 128: c      k  k  k  k  k  k  k  k     CAPTURE COUNT:  o    (scans)
  CODABAR: d       l  l  l  l  l  l  l  l        FIELDS/SCAN: p
    UPC-A: e                                  FIELDS/PACKAGE: q
    UPC-E: f                                   NO-READ TIMER: r    (msec)
    EAN-8: g                                  INTER-SCAN TIMER: s  (msec)
   EAN-13: h                                   MATCH COMPLETE: t

----------MATCH CODE TABLE-------------  -------------  OUTPUTS [ z ]-------------
1) u              v     w                    x                        y
2) u              v     w                    x                        y
3) u              v     w                    x                        y
4) u              v     w                    x                        y
5) u              v     w                    x                        y
6) u              v     w                    x                        y
7) u              v     w                    x                        y
8) u              v     w                    x                        y

          Commands: ESC          Change: SPACE          Cursor Control: ARROWS
```

Reference Letter	Description	Field Type	Options (Select Field Only)	Valid Entries (Edit Field Only)
a	Code 39 symbology enable.	Select	Yes or No	N/A
b	Interleaved 2–of–5 symbology enable.	Select	Yes or No	N/A
c	Code 128 symbology enable	Select	Yes or No	N/A
d	Codabar symbology enable.	Select	Yes or No	N/A
e	UPC–A symbology enable.	Select	Yes or No	N/A
f	UPC–E symbology enable.	Select	Yes or No	N/A
g	EAN–8 symbology enable.	Select	Yes or No	N/A
h	EAN–13 symbology enable.	Select	Yes or No	N/A
i	Specified code lengths for Code 39. Includes check character. Does not include start and stop characters.	Edit	N/A	Numeric entries from 0 through 64. 0 indicates no length check.

Reference Letter	Description	Field Type	Options (Select Field Only)	Valid Entries (Edit Field Only)
j	Specified code lengths for Interleaved 2–of–5. Includes check character.	Edit	N/A	Even numeric entries from 0 through 64. 0 indicates no length check. Must be even number.
k	Specified code lengths for Code 128. Does not include start, stop, or check characters.	Edit	N/A	Numeric entries from 0 through 64. 0 indicates no length check.
l	Specified code lengths for Codabar. Includes start, stop, and check characters.	Edit	N/A	Numeric entries from 0 through 64. 0 indicates no length check.
m	Laser–On mode select.	Select	Continuous or Triggered.	N/A
n	Trigger select.	Select	Package Detect, Host Command, Internal Timer, Continuous.	N/A
o	Capture count.	Edit	N/A	Numeric value from 1 through 8.
p	Number of bar code fields per scan.	Select	1, 2, 3, 4 or Any	N/A
q	Number of bar code fields per package.	Edit	N/A	Numeric value from 1 through 8.
r	No–read timer (milliseconds).	Edit	N/A	Numeric value from 10 through 9999. 0 indicates no timer.
s	Inter–scan timer (milliseconds).	Edit	N/A	Numeric value from 10 through 9999. 0 indicates no timer.
t	Match complete count.	Edit	N/A	Numeric value from 1 through 8.
u	Bar code symbology for match code operation.	Select	Code 39, Interleaved 2–of–5, Code 128, Codabar, UPC–A, UPC–E, EAN–8, EAN–13	N/A
v	Enable for match code operation.	Select	Y or N	N/A

Reference Letter	Description	Field Type	Options (Select Field Only)	Valid Entries (Edit Field Only)
w	Match table entry.	Edit	N/A	Any ASCII character string up to 32 characters maximum. The ? character will result in a match with any ASCII character.①
x	Conditions for Output.	Select	None, Match Entry In Table, Match–Complete, Read (Package), No–Read (Package), Read and No–Match, No–Read or No–Match, Auto Load Auto Load (INPUT)②③	N/A
y	Duration of output pulse (milliseconds).	Edit	N/A	Numeric value from 10 through 9999. 0 indicates no pulse.
z	Output Condition.	N/A	N/A	Outputs are enabled or disabled by responding to the prompt prior to entering the configuration screens, refer to page 4–8.

① You can enter non-printable control characters in this field, refer to the table on Page 4-12.
② Auto Load and Auto Load (INPUT) will not turn an output on or off. The decoder will change an auto load field to Match Entry in table after the auto load.
③ Auto Load (INPUT) only applies to the #8 module position.

Setup Screen #2 Fields

Bar Code Types

CODE 39 ENABLE (a) - Selecting YES will enable the decoder to decode Code 39 bar code labels. Code 39 bar code labels will not be decoded if NO is selected.

INTERLEAVED 2-OF-5 ENABLE (b) - Selecting YES will enable the decoder to decode Interleaved 2-of-5 bar code labels. Interleaved 2-of-5 bar code labels will not be decoded if NO is selected.

Note: Case Code labels are read as two separate Interleaved 2-of-5 labels; ie. 2 fields per scan.

CODE 128 ENABLE (c) - Selecting YES will enable the decoder to decode Code 128 bar code labels. Code 128 bar code labels will not be decoded if NO is selected.

CODABAR ENABLE (d) - Selecting YES will enable the decoder to decode Codabar bar code labels. Codabar bar code labels will not be decoded if NO is selected.

UPC-A ENABLE (e) - Selecting YES will enable the decoder to decode UPC-A bar code labels. UPC-A bar code labels will not be decoded if NO is selected.

UPC-E ENABLE (f) - Selecting YES will enable the decoder to decode UPC-E bar code labels. UPC-E bar code labels will not be decoded if NO is selected.

EAN-8 ENABLE (g) - Selecting YES will enable the decoder to decode EAN-8 bar code labels. EAN-8 bar code labels will not be decoded if NO is selected.

EAN-13 ENABLE (h) - Selecting YES will enable the decoder to decode EAN-13 bar code labels. EAN-13 bar code labels will not be decoded if NO is selected.

Note: The decoder ignores (will not decode) UPC and EAN supplements.

Note: If you enable more than one symbology, the decoder will autodiscriminate between the symbologies. For optimum decoder performance, we recommend that you only enable the symbologies that you want to decode.

Code Lengths

LENGTHS-CODE 39 (i) - You can specify up to 8 code lengths (maximum of 64 characters) for Code 39 bar code labels. The code length includes the check character but not the start and stop characters . If you do not want to specify a code length, enter a zero (any lengths to the right of zero are ignored).

Note: Specifying a code length serves two purposes:

1) It provides an additional means of checking the validity of bar code data. When you set the decoder for specific lengths, only bar code fields that contain the exact number of characters are decoded.

2) The decoder uses the code length information to optimize the performance of the data acquisition circuitry. Only scans containing a sufficient number of bars and spaces (based upon selected symbology(s) and code length(s)) are passed on to the microprocessor for decoding.

LENGTHS-INTERLEAVED 2-OF-5 (j) - You can specify up to 8 code lengths (maximum of 64 characters) for Interleaved 2-of-5 bar code labels. The value you enter must be an even number. The code length includes the

check character but not the start and stop characters. If you do not want to specify a code length, enter a zero (any lengths to the right of the zero are ignored).

Note: If the decoder is going to read Interleaved 2-of-5 bar code labels, we recommend that you specify a code length. If you do not specify a code length, it is possible for a partial scan of symbols to be interpreted as a valid shorter message. If two character codes are being decoded you **must** set the length to 2.

LENGTHS-CODE 128 (k) - You can specify up to 8 code lengths (maximum of 64 characters) for Code 128 bar code labels. The code length does not include the start, stop, and check characters. If you do not want to specify a code length, enter a zero (any lengths to the right of the zero are ignored).

LENGTHS-CODABAR (l) - You can specify up to 8 code lengths (maximum of 64 characters) for Codabar bar code labels. The code length includes the start, stop, and check characters. If you do not want to specify a code length, enter a zero (any lengths to the right of the zero are ignored).

Scanner Control

LASER-ON MODE (m)- You can select one of two options:

1) Continuous- If you select the continuous mode, the scan head will scan continuously.

Note: Laser scanners have a turn on time of approximately 50 msec in addition to a short warm up time. The optimum performance of the laser scanner is achieved after the warm up period. You should refer to the user manual for the scanner you are using.

2) Triggered - If you select the triggered mode, the scan head will only scan when triggered by the package detector, host, or internal timer. Once triggered, the scan head will continue scanning until the option selected in the Decode Trigger mode field (see next section) indicates the end of the trigger.

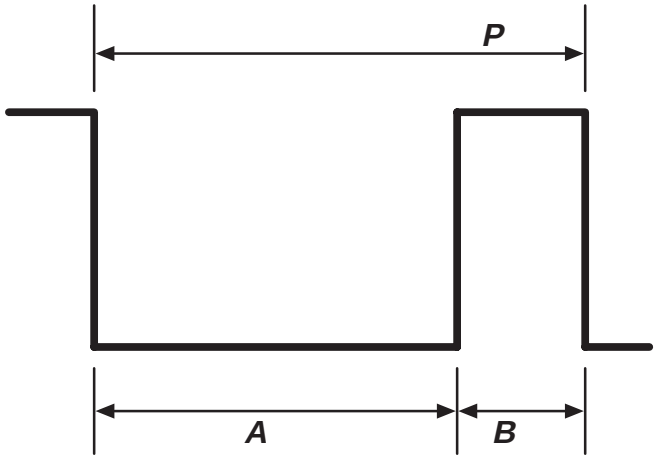
DECODE TRIGGER MODE (n) - You must specify how the decoder starts and stops decoding. You have four options:

1) Package Detect - If you select package detect, the decoder will trigger on when a package detect signal is present and trigger off when one of the following occurs:

- Fields per package count is met.
- Package detect signal is off.
- No-read timer times out.

When you set the decoder trigger mode to package detect and send data packets to the host, you must take into consideration the length of the package detect signal, the package rate, and the transmission time. The decoder is able to generate data at a rate that is much faster than the transmission rate. Therefore, at high package rates the decoded data can exceed the speed at which the data is transmitted. Refer to Figure 4.3.

Figure 4.3
Package Detect Timing with Communications Enabled



P = A + B = Time from one package to the next.

A = Trigger Active period. Refer to Input Filter description for timing considerations.

B = Time between packages. This must be a minimum of 5 msec without the package detect filter enabled, and 15 msec with the package detect filter enabled.

For long message packets, allow additional time to prevent loss of data due to a buffer overflow. When the no-read timer is disabled, the time needed between packages can be calculated as follows.

$$B = \frac{6 \times (\text{Number of Characters})}{\text{Baud Rate (where Baud rate is} \geq 9600)}$$

When the no-read timer is enabled, the time required between packages can be calculated as follows:

$$B = \frac{6 \times (\text{Number of Characters})}{\text{Baud Rate (where Baud rate is} \geq 9600)} + (\text{No-Read Timer}) - A$$

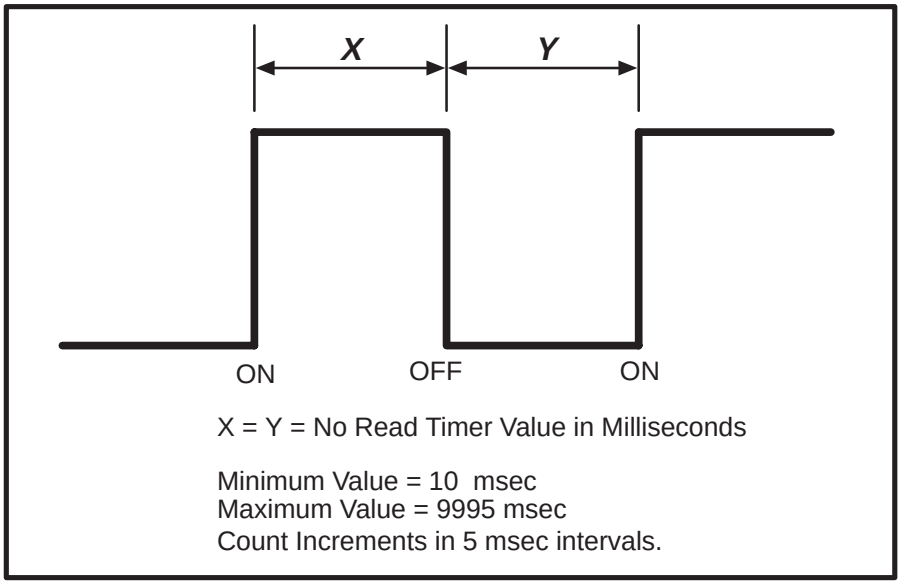
2) Host - If you select host triggering, the decoder will trigger on when a host start scan command is received and trigger off when one of the following occurs:

- Fields per package count is met.
- Stop scan command is received from host.
- No-read timer times out.

Chapter 7 provides a description of how to send start and stop trigger commands from a host.

3) Internal Timer - If you select internal timer, the decoder will only decode scan head data based upon the duration of the No-Read timer. The No-read timer simulates the package detect input. When functioning as a trigger source, the No-Read timer will alternate the trigger from ON to OFF. The length of time the trigger is on and the trigger is off are equal and is determined by the value entered in the No-Read timer field. Refer to Figure 4.4.

Figure 4.4
Internal Timer Trigger



Note: When the decode trigger is not set to internal timer, the No-Read timer functions as a trigger timeout. Once triggered by the host or package detector, the decoder will decode bar code data until either the end of the trigger or the No-Read timer times down to zero.

4) Continuous - If you select continuous decode triggering, the decoder will continuously try to decode data received from the scan head.

Note: The No-Read condition does not exist in the continuous scanning mode.

CAPTURE COUNT (o) - The capture count field sets the number of identical and valid scans that must be decoded before the read is considered valid. This entry is a numeric value from 1 through 8. The default value is 2.

When a poor quality label is scanned, it is possible for the decoder to interpret the label in one of three ways:

- Valid Scan. The decoded information matches label.
- Undecodable Scan. The video data sent from the scanner to the decoder does not correspond (for any or all characters) to a valid pattern within the symbology selected.
- Mis-Read. Or substitution error; the video data for a particular scan matches a valid pattern within a selected symbology that is different from the intended pattern. This error is often caused by smudges, stray marks, voids, or print errors that result in wider or narrower bars being decoded.

The purpose of the capture count is to reduce the chance of a mis-read by forcing the decoder to read the label multiple times before issuing a valid read.

Certain bar code symbologies are more susceptible to mis-reads because they are not self checking (Code 39, Interleaved 2 of 5, and Codabar when check characters are not used). For these bar code symbologies, the capture count should be set to no less than two.

Setting the capture count too high may result in excessive “no-reads“, particularly when the number of scans crossing the label within a trigger period is low (5-10 scans). The capture count should be set to a value which results in minimum mis-reads and maximum valid reads. We recommend that the capture count should be set no greater than half of the number of scans crossing the label in a trigger period. The capture count should be set to at least two for symbologies that are not self checking.

FIELDS/SCAN (p) - The fields per scan field sets the number of bar code labels that are to be included in each scan. The bar code fields in each scan must be of the same symbology type. A scan refers to the movement of the laser beam from one side to the other. During the scan, the decoder looks for a valid bar code field to decode. On a single scan, the decoder can decode up to 4 successive bar code fields. You can select from five options: 1, 2, 3, 4, or Any. If you select ANY, the decoder will look for 1, 2, 3, or 4 fields. For optimum performance and security against missing labels, we recommend that you specify the number of fields per scan.

Note: If the decoder is operating in any of the triggered modes and you select “ANY” fields per scan, multiple bar code fields in each label should have unique first characters. If two bar code fields have the same first characters, the decoder will assume duplicate fields have been decoded and ignore the second field.

FIELDS/PACKAGE (q) - The fields per package field sets the number of bar code symbols that are on each package being scanned. You can enter a

numeric value from 1 through 8. This parameter must be met for a "Read" to occur (see Output section later in this chapter).

NO-READ TIMER (Milliseconds) (r) - This timer determines a no-read condition when the decoder is in a triggered mode. After receiving a trigger, the no-read timer will begin to time out. If a "Read" (satisfying the fields/package requirements) does not occur before the timer times out, a No-Read condition will occur. The No-Read timer must be long enough to allow the entire package to be read, otherwise a no-read will occur. The no-read timer can also function as a trigger source when the decode trigger is set to internal timer (refer to the description of the Decode Trigger Mode field). You must enter either a numeric value from 10 through 9999 or a value of 0 which disables the timer.

Note: The timers (No-Read & Inter-Scan) have an accuracy of ± 5 milliseconds.

INTER-SCAN TIMER (Milliseconds) (s) - This field sets the allotted time between a valid read and the beginning of the next scan in which decoding can be attempted.

You should use the inter-scan timer in applications where you need to discriminate between multiple bar code fields appearing on the same label (on different scans) and you cannot ensure the uniqueness of the bar code fields. The first valid scan starts the inter-scan timer. The decoder cannot decode another scan until the inter-scan timer times out. You can use the inter-scan timer in both continuous or triggered scanning modes. You must enter either a numeric value from 10 through 9999 or a value of 0 which disables the timer. You should set the timer so that after a valid scan, the attempt to decode the next scan is started between the bar code fields (see next page).

After the decoder decodes the first scan, a second scan is not recognized until a scan is decoded that is different from the first. The third bar code scanned must be different from the second, etc.

Note: When using both the no-read and inter-scan timers, make sure that your no-read timer is set to a value greater than the value entered for the inter-scan timer so that all labels on the package are read before the No-Read timer times out.

Note: Automotive Industry Action Group (AIAG) labels contain unique bar code fields. Therefore, we recommend that you disable the inter-scan timer when scanning AIAG labels.

Note: If continuous decode triggering is selected and the same bar code field is decoded continuously, the inter-scan timer will effectively determine the rate at which the decoded data is sent to the HOST port, AUX port, or used for match code operation.

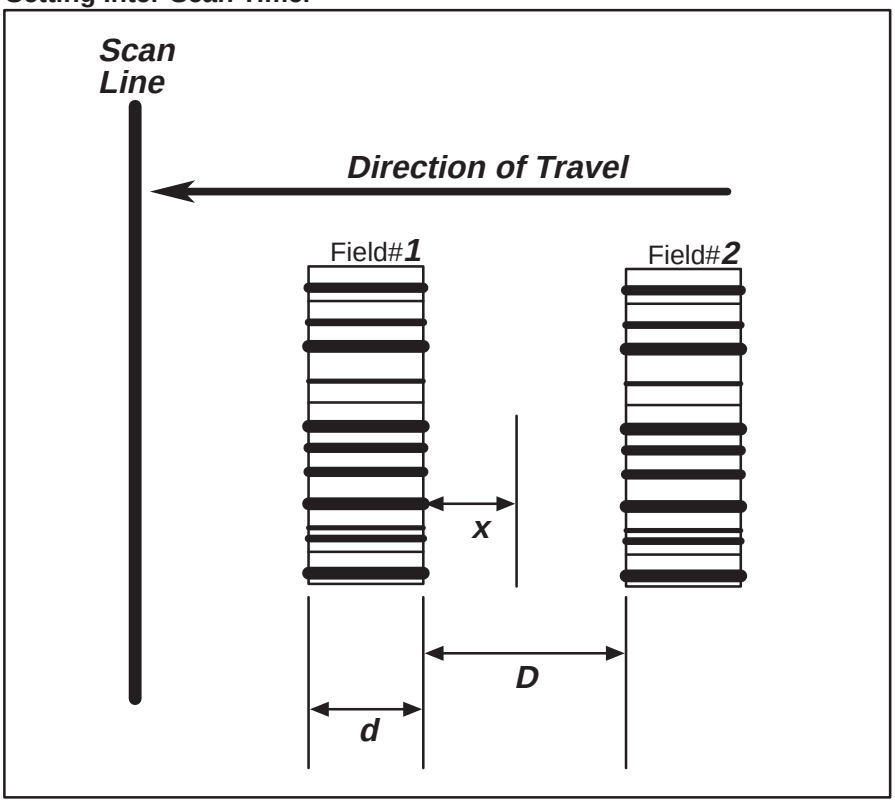
Note: The timers (No-Read & Inter-Scan) have an accuracy of ± 5 milliseconds.

To assist you in setting the inter-scan timer, we have provided the following guidelines. These guidelines will only allow you to approximate the setting of the timer. Since many factors, including label quality, determine when the first read occurs, you may have to try several different timer settings before finding a setting for your application.

Refer to Figure 4.5. The inter-scan timer setting can be approximated using the following equation:

$$\frac{\text{d (inches) X 1000 (msec/sec)}}{\text{Line Speed (inches/sec)}} = \text{Approximate Inter-Scan Timer Value (msec)}$$

Figure 4.5
Setting Inter-Scan Timer



In Figure 4.5, the decoder will decode Field #1, start the inter-scan timer, stop decoding, and wait for the timer to time out. The decoder will then resume decoding. When the timer times out, Field #1 will be x distance behind the scan line. The distance x is measured from the trailing edge of Field #1 and will be a value between zero and d depending upon where the scan line was in Field #1 when the valid read occurred.

Note: The layout of the label must be such that the distance d is less than or equal to D for the scanner to scan all of Field #2. In addition, the line speed must be constant.

MATCH COMPLETE (t) - This field sets the specific number of entries in the match code table that must be matched to a package before a Match Complete condition occurs. Match Complete is one of the six conditions that can turn on an output (refer to the match code table information which follows). You must enter a numeric value from 1 through 8.

Note: The Match Complete entry does not have to be the same as the Fields Per Package entry. However, if the Match Complete entry is greater than the Fields Per Package entry, a match complete condition will never occur.

Match Code Table

BAR CODE SYMBOLOGY (u) - When using the match code operation, you must specify the type of symbology used. You can select from one of the following symbologies: Code 39, Interleaved 2-of-5, Code 128, Codabar, UPC-A, UPC-E, EAN-8, EAN-13.

MATCH CODE ENABLE (v) - Each of the match codes may be individually enabled by selecting Y(Yes) in the enable field. Selecting N(No) will disable the match code operation.

MATCH CODE (w) - In these fields, you may enter the code that you want to match. You must enter the code as it will be transmitted to the host (e.g. do not include check digits if you have selected to suppress the transmission of the check digit in the decoder's configuration). The decoder will compare the match code with any decoded bar code data. If the decoded bar code data matches the match code, a Match condition occurs. You can enter up to 32 ASCII characters in each of the eight fields.

Note: *The ? character is a "wild card" character that will result in a match with any other ASCII character.* You can enter a non-printable control character as shown in Table 4.B.

Outputs

OUTPUT CONTROL (x)- These fields specify the conditions that must be met to turn an output on. You can operate up to eight output modules based upon a variety of conditions. You can select one of eight options for each condition (Module position # 8 has nine options).

1) None: Selecting none will disable the output module.

2) Match Entry: Selecting this option will turn on the module whenever a bar code matches the match code entry to the left of this field.

3) Match-Complete: Selecting the match complete option will turn on the output module when the number of matches made to **any** one or combination of the selected match codes is **equal** to the quantity specified in the MATCH COMPLETE field.

4) Read (Package): In the continuous scanning mode, an output will be turned on when the following conditions are met:

- **Fields per scan** parameter is met.
- Each field is valid.
- Scan capture count parameter is met.

In the triggered mode of operation, there is an additional requirement:

- **Fields per package** count must be met.

5) No-Read (Package): Selecting the no-read option will result in the output module being turned on whenever a no-read condition occurs. A No-Read condition occurs whenever a valid package is expected but not found. A No-Read condition will also occur whenever the No-Read timer times out before there is a valid package read. No-read conditions do **not** occur if the continuous trigger mode of operation is selected.

Note: A No-Read will also occur if there is a valid read and the buffer to the host is full at the end of a trigger. Under these circumstances, the No-Read condition indicates that the decoder cannot process the bar code without overwriting data in the buffer.

6) Read and No-Match: Selecting the read and no-match option will result in the output module being turned on whenever a symbol is read but does not match **any** code provided in the match code table.

7) No-Read or No-Match: Selecting the no-read or no-match option will result in the output being turned on whenever a no-read **or** a no-match condition (with **any** code provided in the match code table) occurs. If the data buffer overflows and data is lost, the No-Read or No-Match output will also be turned on.

8) Auto Load: The Auto Load feature provides the ability to automatically fill the Match Table entry with bar code fields read from a valid package. After selecting Auto Load, SAVE the configuration and perform a RESTART. When a valid package is decoded, the bar code fields (32 characters max.) are sequentially loaded into the Match Table for each entry that has Auto Load selected until:

- All entries (designated as Auto Load) are filled.

-or-

- The Fields /Package requirement has been satisfied. If the number of fields to be filled exceeds the fields per package setting, only the number of fields equal to the fields per package setting will be filled. You can fill remaining fields by saving the new configuration and restarting.

-or-

- An invalid operation has occurred (no-read, required symbology not enabled, improper bar code length, etc.). If any field within the package cannot be decoded, all fields will be ignored and the decoder will wait for the next package.

For each match table entry that is filled, the decoder will:

- Automatically set the bar code symbology.
- Change the match code enable to YES.
- Enter match code string into the match table.
- Change output condition from Auto Load to Match-Entry In Table.
- Send the match code string to the AUX port if at the select language screen. This provides the ability to monitor the auto loaded string at any display device connected at the AUX port.

Note: You must SAVE the configuration and RESTART the decoder after auto loading if you want the newly loaded match codes to be stored in EEPROM.

Enable auto load in one of two ways:

- Enable the auto load condition for one or more outputs and perform a SAVE and a RESTART. You can RESTART the decoder by cycling the power, sending a RESTART command from the host, or selecting RESTART at the Select Operations menu of the programmer CRT.
- If you have Auto Load (INPUT) selected for module #8, an auto load input signal can be sent to an input module in the #8 position. This signal activates the input module which enables the auto load. Refer to Input section below for more information.

Note: When Auto Load is enabled, only the bar code fields from the first valid package are entered into the match table. Auto Load is then disabled until the next RESTART or Auto Load (INPUT) signal is detected.

Note: When you auto load a "%" character, the decoder will automatically enter "%%" into the match table. The "%" character is used to enter non-printable control characters. Refer to page 4-14.

Inputs

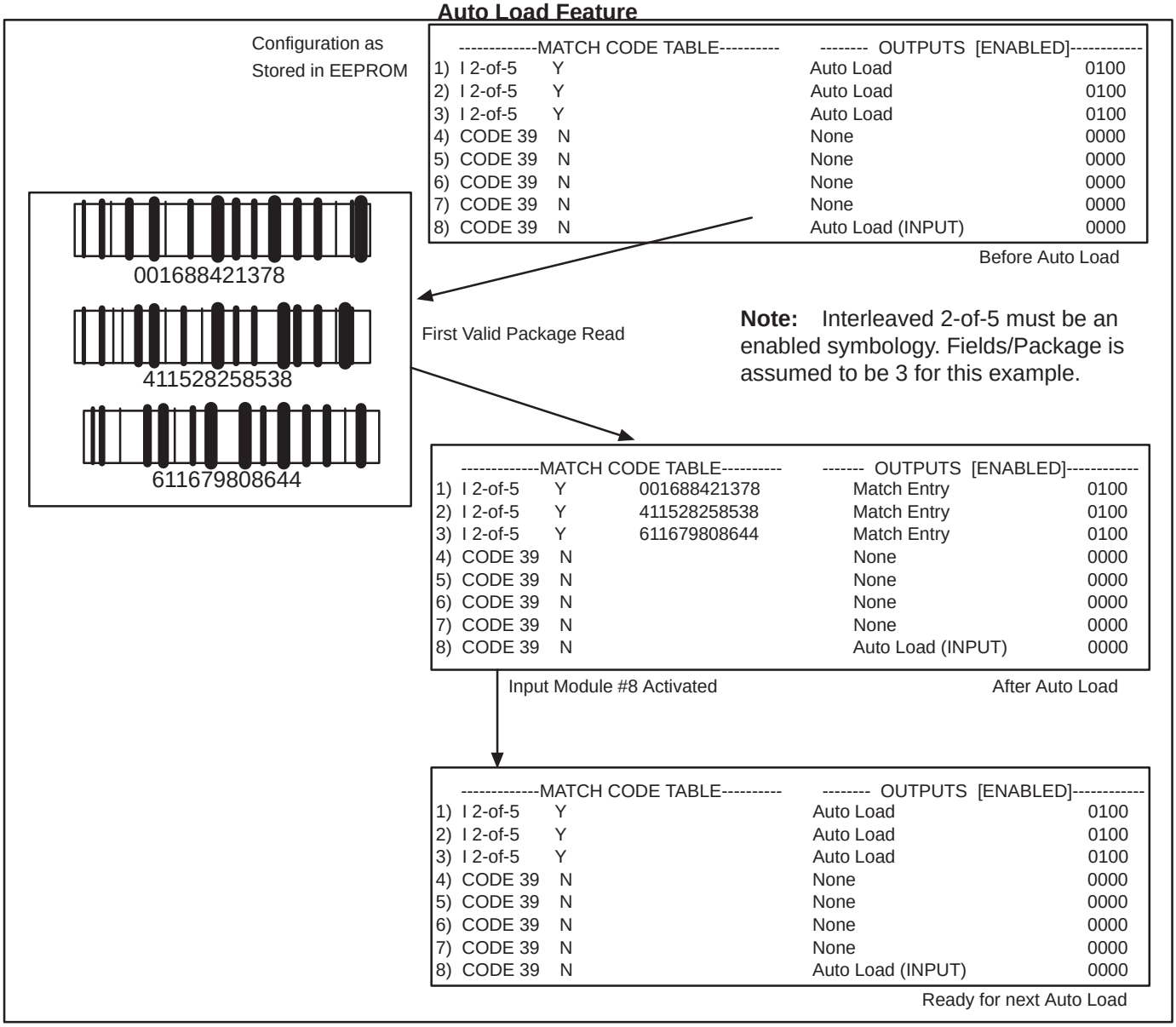
Auto Load (INPUT): The Auto Load (INPUT) condition only applies to module position #8. This module position is unique and can accept either an input or an output module. Selecting Auto Load (INPUT) configures module position #8 to accept an input module. Otherwise, module position #8 functions the same as module positions 1 through 7.

When you select the Auto Load (INPUT) condition for module #8, make sure that at least one of the output conditions for modules #1 through #7 is configured for Auto Load and SAVED to EEPROM. Auto Load (INPUT) changes outputs #1 through #7 (if configured for Auto Load) by clearing out

the current match codes and loading new match codes. Auto Load (INPUT) does not cause match code data to be loaded into match table entry #8.

Auto Load (INPUT) is useful in product verification applications where new match codes need to be loaded into the decoder on a regular basis. When a new product label needs to be entered into the match table, an Auto Load pushbutton is pressed by an operator. Then, a sample of the product is run by the scanner. The new match code is automatically entered. If a display is connected to the AUX port, you can then read and verify the match code value.

Figure 4.6
Auto Load Feature



OUTPUT DURATION (Milliseconds) (y) - These fields specify the length of time an output is turned on. You may enter a value from 10 through 9999. If you enter a 0, the output is disabled. The accuracy of the output duration is ± 5 msec.

OUTPUT CONDITION (z) - This is an indication of the operating condition of the output modules. You disable or enable the outputs by responding to the screen that is displayed prior to entering the configuration screens. Refer to page 4-8 for more information.

Programming Example

To assist you in becoming familiar with the menus and setup screens, wehave provided the following programming example:

1) Make the necessary connections, configure your programming terminal, and turn the decoder on. The following will be displayed:

```
SELECT LANGUAGE     CHOIX DU LANGAGE     WAEHLE SPRACHE
1) English          1) Anglais           1) Englisch
2) French           2) Francais          2) Franzoesisch
3) German           3) Allemand          3) Deutsch
4) Italian          4) Italien           4) Italienisch
5) Spanish          5) Espagnol          5) Spanisch

Press 1, 2, 3, 4, 5, or ESC  Appuyer 1, 2, 3, 4, 5 ou ESC   Druecke 1, 2, 3, 4, 5, oder ESC

SELEZIONARE LINGUA   SELECCIONAR LENGUA
1) Inglese           1) Ingles
2) Francese          2) Frances
3) Tedesco           3) Aleman
4) Italiano          4) Italiano
5) Spangnolo         5) Castellano

Premere 1, 2, 3, 4, 5 o ESC                    Pulsar 1, 2, 3, 4, 5, o ESC
```

2) Press the [1] key to select English. The following screen will be displayed:

```
                2755-DM9  Bar Code Reader  VX.XX
          Copyright 1990 Allen-Bradley Company, Inc.

          SELECT CRT TYPE

          1)  Allen-Bradley 1770 Industrial Terminal
          2)  Allen-Bradley T45 Portable Terminal
          3)  Lear Siegler ADM 3E
          4)  Televideo 955
          5)  Digital VT100

          Press 1, 2, 3, 4, 5 or ESC
```

3) Press the key which corresponds to your programming terminal. After specifying the CRT type, the following will be displayed:

```
        2755-DM9  Bar Code Reader  VX.XX
Copyright 1990 Allen-Bradley Company, Inc.

SELECT OPERATION

1)  Display Bar Code Labels
2)  Display Status and Counters
3)  Display/Change Configuration
4)  Reset Status and Counters
5)  Restart
6)  Select Language

Press 1, 2, 3, 4, 5, 6, or ESC
```

4) Press the [3] key to select the Display/Change Configuration operation. The following will be displayed:

```
                    CAUTION


Configuration changes may cause the discrete outputs to switch.

If outputs are to remain ENABLED, press ESC.

Otherwise press any other key to continue.  Outputs
will be DISABLED until the device is restarted.
```

Note: We recommend that the outputs be **DISABLED** during configuration to prevent unintentional switching. The outputs can be ENABLED by performing a Restart after configuration (remember to SAVE changes to EEPROM before Restarting.

The decoder will display:

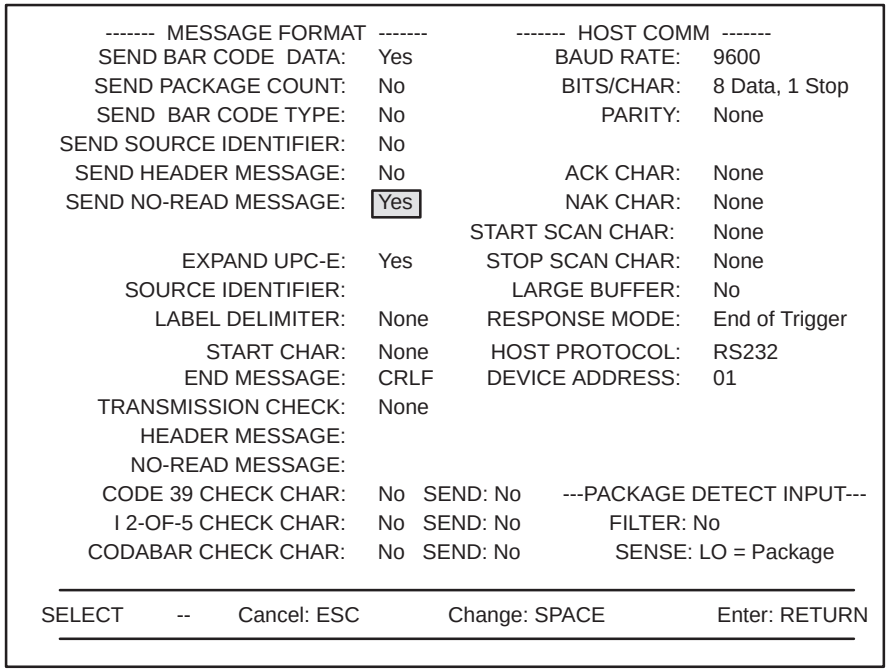
```
------- MESSAGE FORMAT -------          ------- HOST COMM -------
SEND BAR CODE  DATA:  Yes                BAUD RATE:    9600
SEND PACKAGE COUNT:   No                 BITS/CHAR:    8 Data, 1 Stop
SEND  BAR CODE TYPE:  No                 PARITY:       None
SEND SOURCE IDENTIFIER: No
SEND HEADER MESSAGE:  No                 ACK CHAR:     None
SEND NO-READ MESSAGE: No                 NAK CHAR:     None
                                         START SCAN CHAR: None
EXPAND UPC-E:         Yes                STOP SCAN CHAR: None
SOURCE IDENTIFIER:                       LARGE BUFFER: No
LABEL DELIMITER:      None               RESPONSE MODE: End of Trigger
START CHAR:           None               HOST PROTOCOL: RS232
END MESSAGE:          CRLF               DEVICE ADDRESS: 01
TRANSMISSION CHECK:   None
HEADER MESSAGE:
NO-READ MESSAGE:
CODE 39 CHECK CHAR:   No  SEND: No       ---PACKAGE DETECT INPUT---
I 2-OF-5 CHECK CHAR:  No  SEND: No       FILTER: No
CODABAR CHECK CHAR:   No  SEND: No       SENSE: LO = Package

Commands: ESC     Change: SPACE     Cursor Control: ARROWS
```

Note: Different values or selections may appear depending upon the previous programming of your decoder

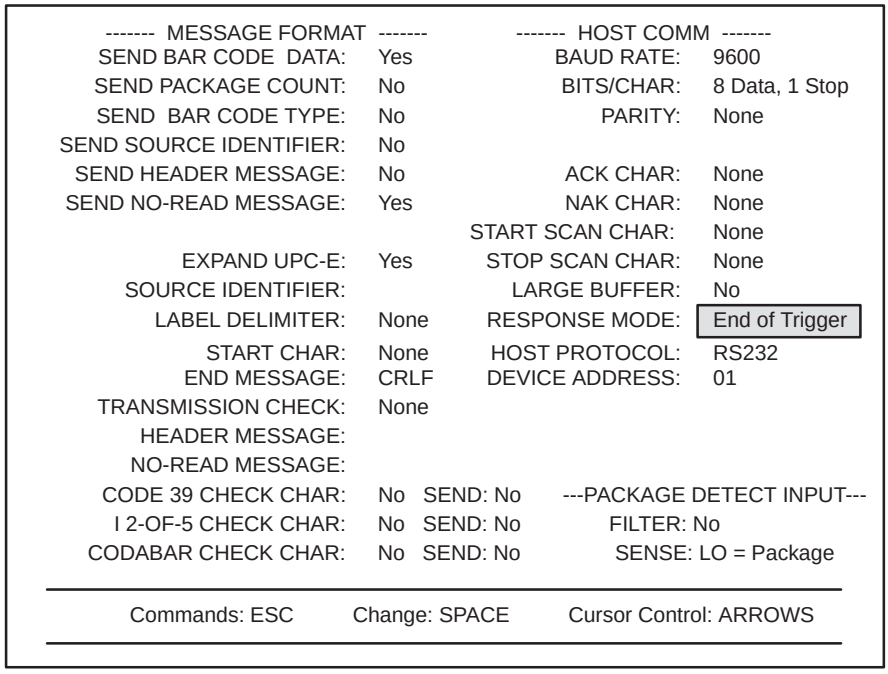
5) In this example we want to enter a SEND NO-READ message and set the decoder response mode to After Valid Package. To do this, press the down arrow or [RETURN] key five times until the SEND NO-READ MESSAGE field is highlighted in reverse video:

```
------- MESSAGE FORMAT -------          ------- HOST COMM -------
SEND BAR CODE  DATA:  Yes                BAUD RATE:    9600
SEND PACKAGE COUNT:   No                 BITS/CHAR:    8 Data, 1 Stop
SEND  BAR CODE TYPE:  No                 PARITY:       None
SEND SOURCE IDENTIFIER: No
SEND HEADER MESSAGE:  No                 ACK CHAR:     None
SEND NO-READ MESSAGE: No                 NAK CHAR:     None
                                         START SCAN CHAR: None
EXPAND UPC-E:         Yes                STOP SCAN CHAR: None
SOURCE IDENTIFIER:                       LARGE BUFFER: No
LABEL DELIMITER:      None               RESPONSE MODE: End of Trigger
START CHAR:           None               HOST PROTOCOL: RS232
END MESSAGE:          CRLF               DEVICE ADDRESS: 01
TRANSMISSION CHECK:   None
HEADER MESSAGE:
NO-READ MESSAGE:
CODE 39 CHECK CHAR:   No  SEND: No       ---PACKAGE DETECT INPUT---
I 2-OF-5 CHECK CHAR:  No  SEND: No       FILTER: No
CODABAR CHECK CHAR:   No  SEND: No       SENSE: LO = Package

Commands: ESC     Change: SPACE     Cursor Control: ARROWS
```

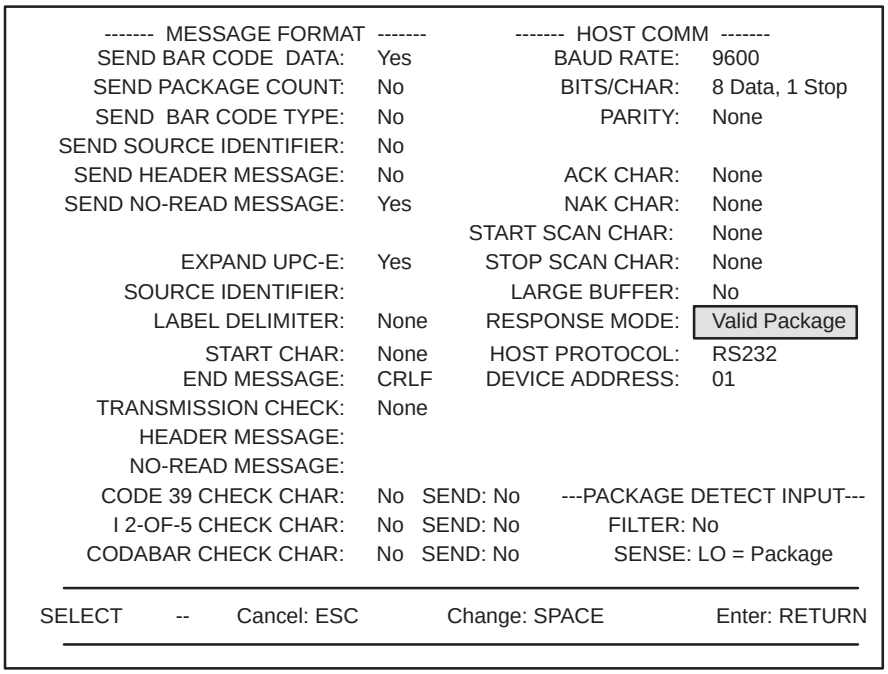
6) If the YES option is not displayed, press the [SPACE] bar to select the YES option:



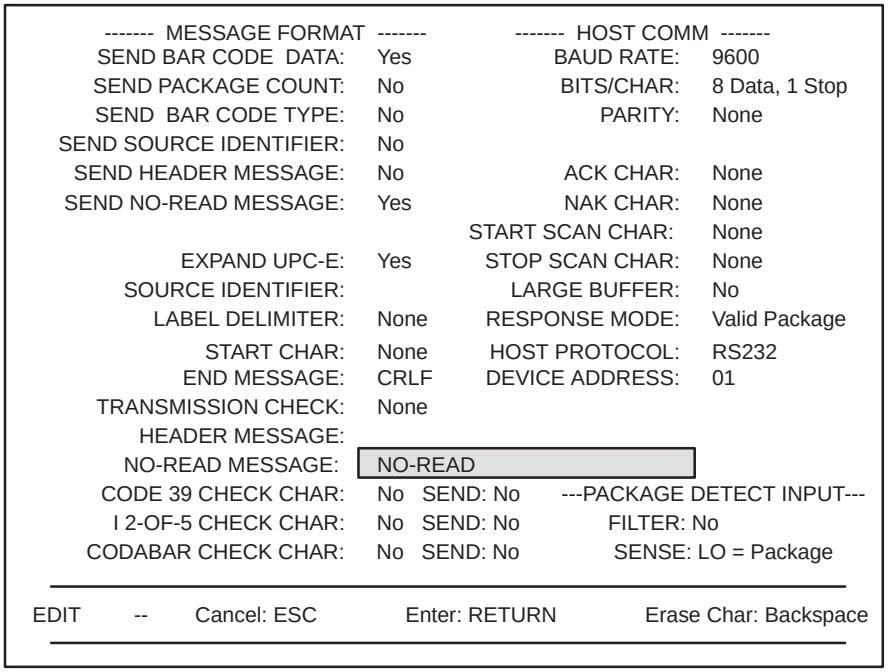
7) Press the [RETURN] key to enter the value and press [RETURN] key again until the LABEL DELIMITER field is highlighted. Press the right arrow key to highlight the RESPONSE MODE field (use [CTRL] and [R] keys on Allen-Bradley Industrial Terminals):



8) Press the [SPACE] key to display the the Valid Package response mode:



9) Press the [RETURN] key to enter the value and use [RETURN] and arrow keys to position the cursor at the NO-READ MESSAGE field. Press the [SPACE] bar. Type a NO-READ message into the empty field:



10) Press the [RETURN] key to enter the No-Read message and then press the [ESC] key to select the command bar. Notice that the five commands are shown on the bottom of the display:

```
------- MESSAGE FORMAT -------          ------- HOST COMM -------
SEND BAR CODE  DATA:    Yes              BAUD RATE:    9600
SEND PACKAGE COUNT:     No               BITS/CHAR:    8 Data, 1 Stop
SEND  BAR CODE TYPE:    No               PARITY:       None
SEND SOURCE IDENTIFIER: No
SEND HEADER MESSAGE:    No               ACK CHAR:     None
SEND NO-READ MESSAGE:   Yes              NAK CHAR:     None
                                         START SCAN CHAR: None
EXPAND UPC-E:           Yes              STOP SCAN CHAR:  None
SOURCE IDENTIFIER:                       LARGE BUFFER:    No
LABEL DELIMITER:        None             RESPONSE MODE:   Valid Package
START CHAR:             None             HOST PROTOCOL:   RS232
END MESSAGE:            CRLF             DEVICE ADDRESS:  01
TRANSMISSION CHECK:     None
HEADER MESSAGE:
NO-READ MESSAGE:        NO-READ
CODE 39 CHECK CHAR:     No  SEND: No     ---PACKAGE DETECT INPUT---
I 2-OF-5 CHECK CHAR:    No  SEND: No     FILTER: No
CODABAR CHECK CHAR:     No  SEND: No     SENSE: LO = Package

COMMAND --      Exit: ESC      Select: RETURN      Next Command: SPACE

  NEXT PAGE      THIS PAGE      RECALL      SAVE      DEFAULT
```

11) Notice that the NEXT PAGE command is highlighted. Press the [RETURN] key to enter the command. The next setup screen will be displayed:

```
-- SYMBOLOGY --   -------- LENGTHS --------   -------- SCANNER CONTROL --------
  CODE 39: Yes   00 00 00 00 00 00 00 00   LASER-ON MODE:    Continuous
  I 2-OF-5: No   00 00 00 00 00 00 00 00   DECODE TRIGGER:   Package Detect
 CODE 128: No    00 00 00 00 00 00 00 00   CAPTURE COUNT:    2  (scans)
 CODABAR: No     00 00 00 00 00 00 00 00   FIELDS/SCAN:      1
   UPC-A: No                               FIELDS/PACKAGE:   1
   UPC-E: No                               NO-READ TIMER:    0000 (msec)
   EAN-8: No                               INTER-SCAN TIMER: 0000 (msec)
  EAN-13: No                               MATCH COMPLETE:   1

----------MATCH CODE TABLE----------   --------- OUTPUTS  [DISABLED]---------
1) CODE 39   N                          None                          0000
2) CODE 39   N                          None                          0000
3) CODE 39   N                          None                          0000
4) CODE 39   N                          None                          0000
5) CODE 39   N                          None                          0000
6) CODE 39   N                          None                          0000
7) CODE 39   N                          None                          0000
8) CODE 39   N                          None                          0000

    Commands: ESC      Change: SPACE      Cursor Control: ARROWS
```

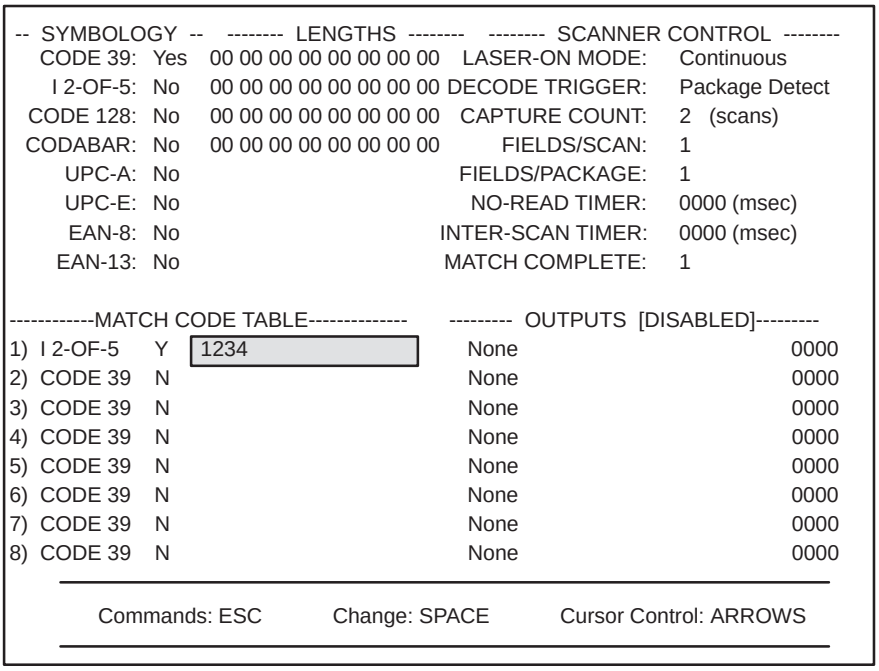
12) In this example we want to turn output #1 on for 10 milliseconds whenever a I 2-OF-5 label containing the data 1234 is read. Use the arrow keys to highlight the code type field for entry #1. Press the [SPACE] key until the I 2-OF-5 option appears. Press the [RETURN] key to enter the selection.

```
-- SYMBOLOGY --   -------- LENGTHS --------   -------- SCANNER CONTROL --------
   CODE 39:  Yes   00 00 00 00 00 00 00 00   LASER-ON MODE:    Continuous
    I 2-OF-5:  No   00 00 00 00 00 00 00 00 DECODE TRIGGER:    Package Detect
  CODE 128:  No   00 00 00 00 00 00 00 00   CAPTURE COUNT:    2  (scans)
  CODABAR:  No   00 00 00 00 00 00 00 00      FIELDS/SCAN:    1
     UPC-A:  No                             FIELDS/PACKAGE:    1
     UPC-E:  No                              NO-READ TIMER:    0000 (msec)
     EAN-8:  No                            INTER-SCAN TIMER:    0000 (msec)
    EAN-13:  No                             MATCH COMPLETE:    1

------------MATCH CODE TABLE--------------    --------- OUTPUTS  [DISABLED]---------
1) [I 2-OF-5]  N                                 None                          0000
2)  CODE 39    N                                 None                          0000
3)  CODE 39    N                                 None                          0000
4)  CODE 39    N                                 None                          0000
5)  CODE 39    N                                 None                          0000
6)  CODE 39    N                                 None                          0000
7)  CODE 39    N                                 None                          0000
8)  CODE 39    N                                 None                          0000

        Commands: ESC          Change: SPACE          Cursor Control: ARROWS
```

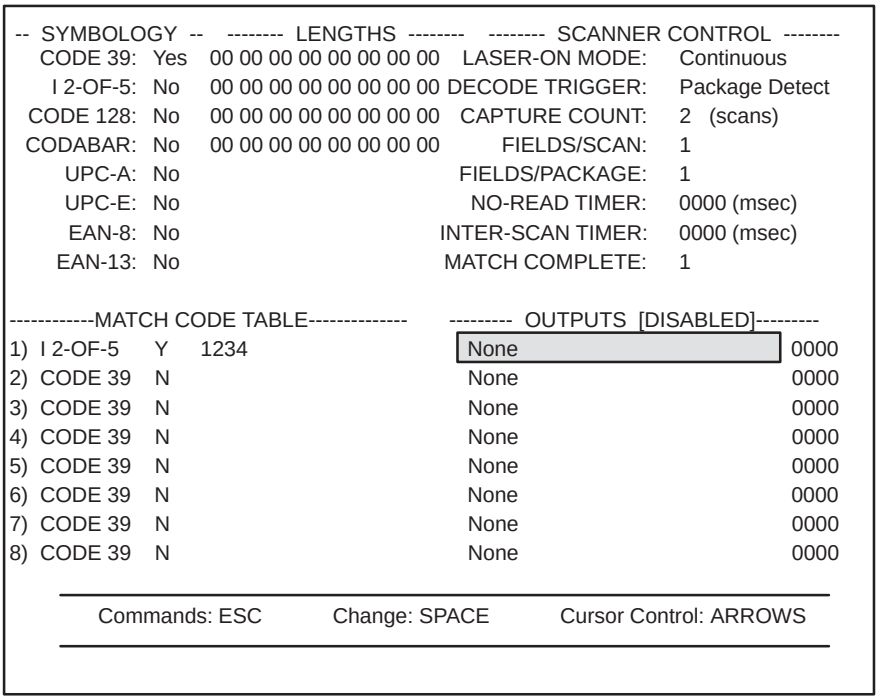
13) Use the arrow keys to highlight the match table enable field for output #1:

```
-- SYMBOLOGY --   -------- LENGTHS --------   -------- SCANNER CONTROL --------
   CODE 39:  Yes   00 00 00 00 00 00 00 00   LASER-ON MODE:    Continuous
    I 2-OF-5:  No   00 00 00 00 00 00 00 00 DECODE TRIGGER:    Package Detect
  CODE 128:  No   00 00 00 00 00 00 00 00   CAPTURE COUNT:    2  (scans)
  CODABAR:  No   00 00 00 00 00 00 00 00      FIELDS/SCAN:    1
     UPC-A:  No                             FIELDS/PACKAGE:    1
     UPC-E:  No                              NO-READ TIMER:    0000 (msec)
     EAN-8:  No                            INTER-SCAN TIMER:    0000 (msec)
    EAN-13:  No                             MATCH COMPLETE:    1

------------MATCH CODE TABLE--------------    --------- OUTPUTS  [DISABLED]---------
1)  I 2-OF-5  [N]                                None                          0000
2)  CODE 39    N                                 None                          0000
3)  CODE 39    N                                 None                          0000
4)  CODE 39    N                                 None                          0000
5)  CODE 39    N                                 None                          0000
6)  CODE 39    N                                 None                          0000
7)  CODE 39    N                                 None                          0000
8)  CODE 39    N                                 None                          0000

        Commands: ESC          Change: SPACE          Cursor Control: ARROWS
```

14) Press the [SPACE] bar to select the YES option. Press [RETURN]. Use the arrow keys to move the cursor to the text field of the match code table. Press the [SPACE] bar to clear the field (field now in reverse video) and type in the example 1234:



15) Press the [RETURN] key to enter the match table entry. Use the arrow keys to highlight the output control field:



16) Press the [SPACE] bar until the Match Entry option is displayed. Press [RETURN]. Use the right arrow key to select the output time field, press the [SPACE] key, enter a value of 10 (10 milliseconds), and then press the [RETURN] key:

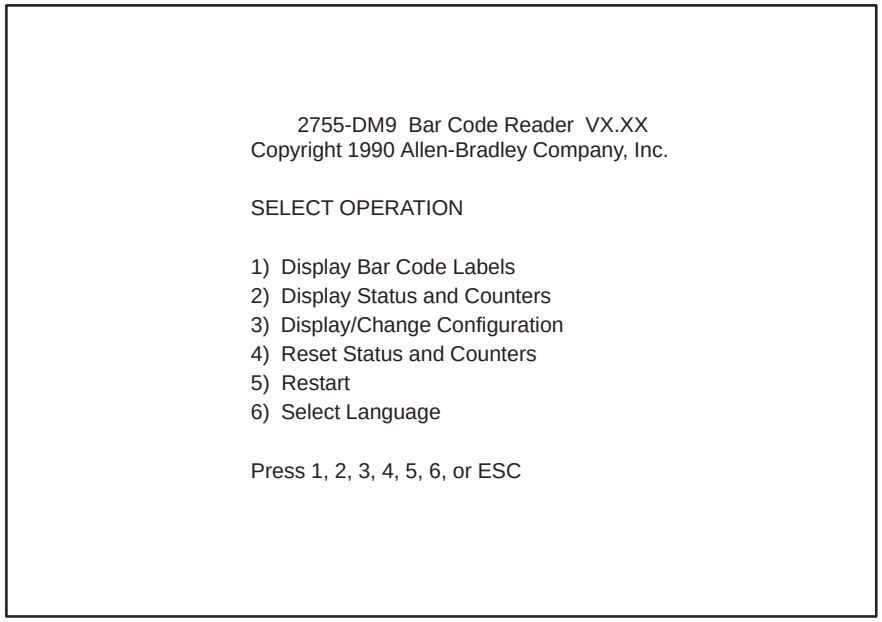
```
-- SYMBOLOGY --   -------- LENGTHS --------   -------- SCANNER CONTROL --------
   CODE 39:  Yes   00 00 00 00 00 00 00 00   LASER-ON MODE:    Continuous
    I 2-OF-5:  No   00 00 00 00 00 00 00 00 DECODE TRIGGER:    Package Detect
  CODE 128:  No   00 00 00 00 00 00 00 00   CAPTURE COUNT:    2  (scans)
  CODABAR:  No   00 00 00 00 00 00 00 00      FIELDS/SCAN:    1
     UPC-A:  No                             FIELDS/PACKAGE:    1
     UPC-E:  No                              NO-READ TIMER:    0000 (msec)
     EAN-8:  No                            INTER-SCAN TIMER:    0000 (msec)
    EAN-13:  No                            MATCH COMPLETE:    1

------------MATCH CODE TABLE--------------   --------- OUTPUTS  [DISABLED]---------
1)  I 2-OF-5    Y    1234                     Match Entry                    0010
2)  CODE 39     N                             None                           0000
3)  CODE 39     N                             None                           0000
4)  CODE 39     N                             None                           0000
5)  CODE 39     N                             None                           0000
6)  CODE 39     N                             None                           0000
7)  CODE 39     N                             None                           0000
8)  CODE 39     N                             None                           0000

        Commands: ESC          Change: SPACE          Cursor Control: ARROWS
```

17) Press the [ESC] key to select the command bar, press the [SPACE] key until the SAVE command is highlighted:

```
-- SYMBOLOGY --   -------- LENGTHS --------   -------- SCANNER CONTROL --------
   CODE 39:  Yes   00 00 00 00 00 00 00 00   LASER-ON MODE:    Continuous
    I 2-OF-5:  No   00 00 00 00 00 00 00 00 DECODE TRIGGER:    Package Detect
  CODE 128:  No   00 00 00 00 00 00 00 00   CAPTURE COUNT:    2  (scans)
  CODABAR:  No   00 00 00 00 00 00 00 00      FIELDS/SCAN:    1
     UPC-A:  No                             FIELDS/PACKAGE:    1
     UPC-E:  No                              NO-READ TIMER:    0000 (msec)
     EAN-8:  No                            INTER-SCAN TIMER:    0000 (msec)
    EAN-13:  No                            MATCH COMPLETE:    1

------------MATCH CODE TABLE--------------   --------- OUTPUTS  [DISABLED]---------
1)  I 2-OF-5    Y    1234                     Match Entry                    0010
2)  CODE 39     N                             None                           0000
3)  CODE 39     N                             None                           0000
4)  CODE 39     N                             None                           0000
5)  CODE 39     N                             None                           0000
6)  CODE 39     N                             None                           0000
7)  CODE 39     N                             None                           0000
8)  CODE 39     N                             None                           0000

        Commands: ESC          Chan: SPACE          Cursor Control: ARROWS

NEXT PAGE        THIS PAGE        RECALL        SAVE        DEFAULT
```

18) Press the [RETURN] key. Press the [Y] key at the confirmation prompt. The decoder will display a message to wait while the configuration data is transferred to the decoder's memory (EEPROM).

19) Press the [ESC] key to return to the Select Operations menu. Since we disabled the outputs prior to configuration, you must select the restart operation to enable the outputs.



Chapter 5

Installing the Decoder

Chapter Objectives

We will present rules and recommendations for laying out, installing, and connecting the decoder. Carefully read this chapter before installing the decoder.

Equipment You Eill Need

You will need the following equipment, listed in Table 5.A, to install a complete system.

Equipment	Catalog No.	Required or Optional
Scan Head	2755-L7, -L9, -L4, or -L5①	Required.
Decoder	2755-DM9, -DM9E	Required.
Host Port Communications Cable	User Provided, Refer to Chapter 6	Required if decoder is connected to a host device or I/O rack module.
Auxiliary Port Communications Cable	User Provided, Refer to Appendix A	Required if programming terminal is used.
Scan Head Cable	**2755-L7, -L9 Scan Heads:** 2755-CL10 (10-feet, 3.05 meter) or 2755-CL25 (25-feet, 7.62 meter) **2755-L4, -L5 Scan Heads:** 2755-CK10 (10-feet, 3.05 meter) or 2755-CK25 (25-feet, 7.62 meter)	Required. Connects scan head to decoder.
Package Detector Assembly	2755-NP3 2755-NP5 2755-NP1 2755-NP4	Optional, for 2755-L7, -L9 Scan Heads Optional, for 2755-L7, -L9 Scan Heads Optional, for 2755-L4, -L5 Scan Heads Optional, for 2755-L4, -L5 Scan Heads
Output Modules	1781-OB5S 1781-OA5S 1781-OM5S	Optional. Two 1781-0B5S modules are provided with decoder. Refer to Chapter 2 for descriptions.
Input Modules	1781-IB5S 1781-IA5S 1781-IM5S	Optional. For module position #8 only. Refer to Chapters 2 and 4 for descriptions and implementation.
Mounting Hardware	User Provided.	Refer to mounting instructions (in this chapter).
RS-485 Connector	2760-A485	Optional. Use for multidropping decoders in an Allen-Bradley DH485 network.

① Not a complete catalog number, these scan heads are available in a variety of configurations.

Electrical Precautions

WARNING: Do not remove the housing of the decoder. No user maintenance of the decoder is required. An access panel is provided for installation and wiring of output modules.

Install this equipment using publication NFPA 70E, *Electrical Safety Requirements for Employee Workplaces*. We have set up a few specific guidelines for you to follow in addition to the general guidelines of NFPA 70E.

Before connecting the decoder to the incoming power, verify that the source power is 85 to 264 volts AC, 47 to 63 Hz.

Careful wire routing helps to cut down on electrical noise. To reduce electrical noise, the decoder should be connected to its own branch circuit. The input power must be externally protected by a fuse or circuit breaker rated at no more than 15 amps. Route incoming power to the Decoder by a separate path from the communication cables. **Do not run signal wiring and power wiring in the same conduit!** Where paths must cross, their intersection should be perpendicular.

With solid-state systems, grounding helps to limit the effects of noise due to electromagnetic interference (EMI). To avoid problems caused by EMI, shielded cables should be used.

How to Handle Excessive Noise

The recommendations given above will provide favorable operating conditions for most installations.

When the decoder 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

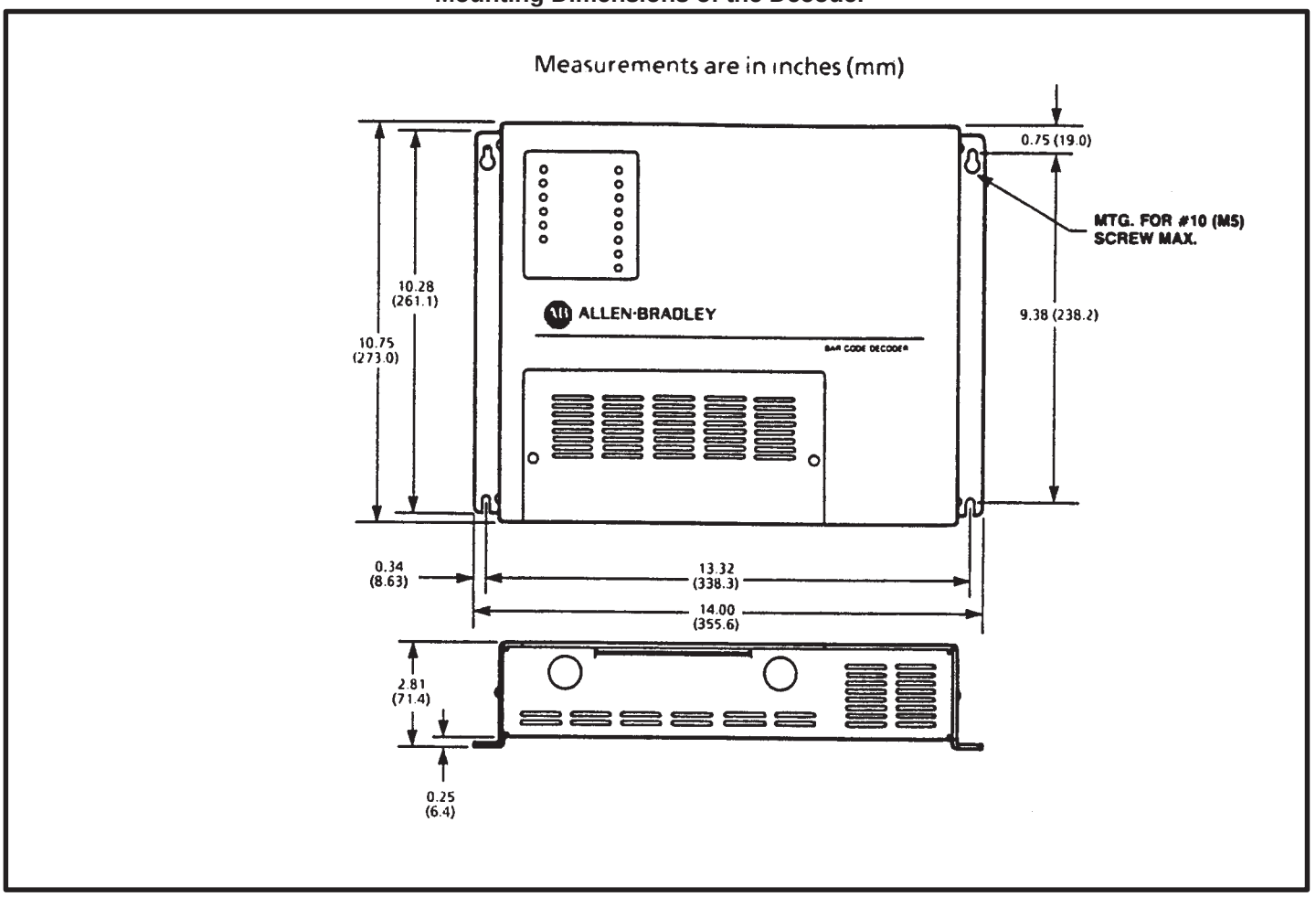
Grounding is an important safety measure in electricalinstallations. With solid-state systems, grounding also helps limit the effects of noise due to electromagnetic interference (EMI).

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.

Determining the Space Requirements

The decoder and scan head are separate units that can be mounted on separate surfaces. A 10 or 25-foot (3.05 or 7.62 meter) cable is used to connect the two units. Figure 5.2 shows the outline dimensions of the decoder.

Figure 5.2
Mounting Dimensions of the Decoder



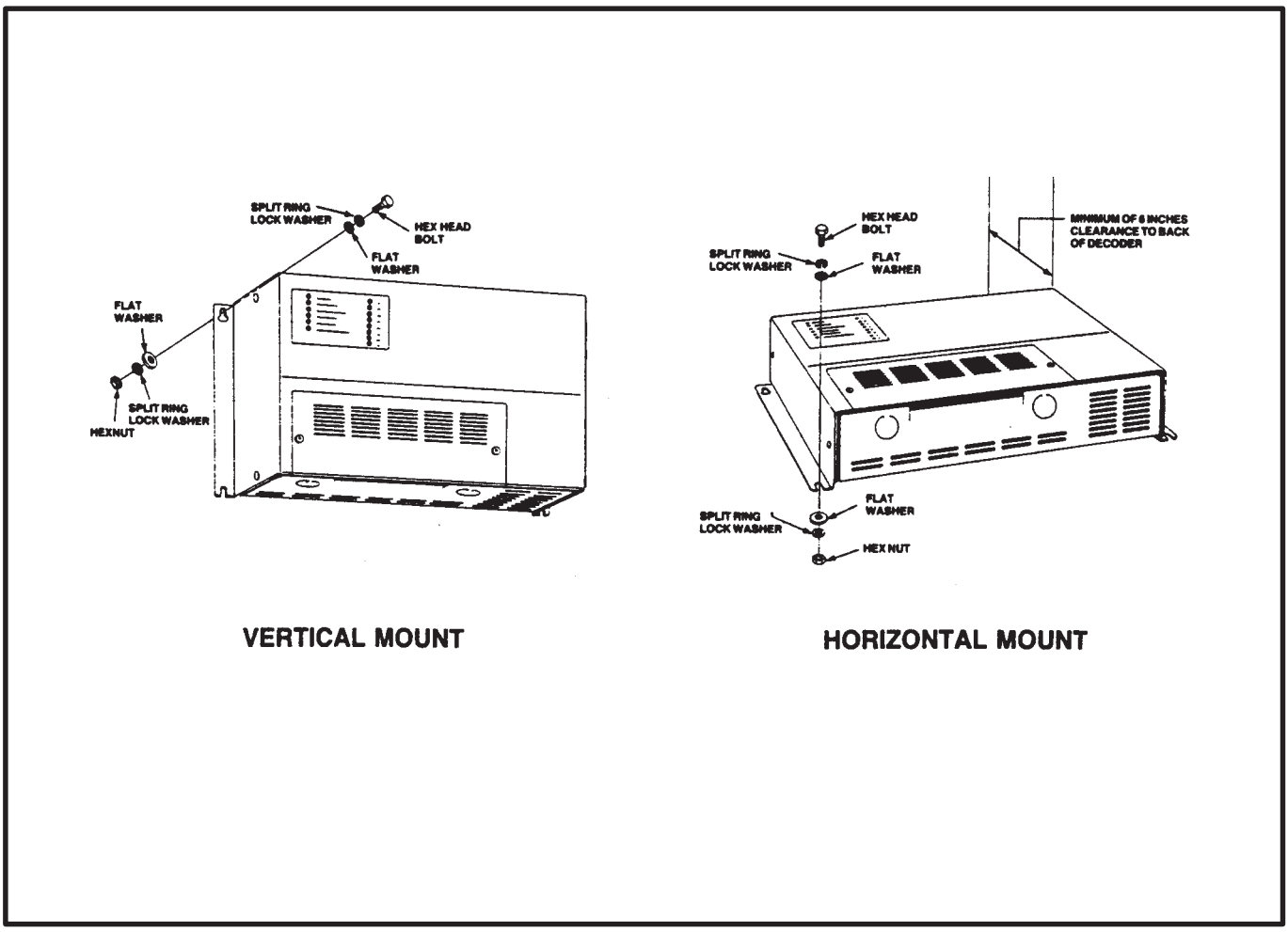
Installing the Decoder

Before installing the decoder, review the following information:

- The decoder can be either wall or floor mounted.
- Allow a minimum clearance of 8 inches (0.2 meter) at the rear of the decoder so you can attach the cables to the various ports.
- If output modules are being used, allow a minimum clearance of 8 inches at the top of the decoder so you can remove or rewire output modules.

You will need four 1/4 - 20 hexagon-head capscrews with flat and split lockwashers and nuts. Select a capscrew length that equals the thickness of the mounting surface, plus the thickness of the washers, plus at least 1/4-inch (12.7 mm) to accommodate the nut and mounting brackets of the decoder. Figure 5.3 shows the fasteners used for a typical installation.

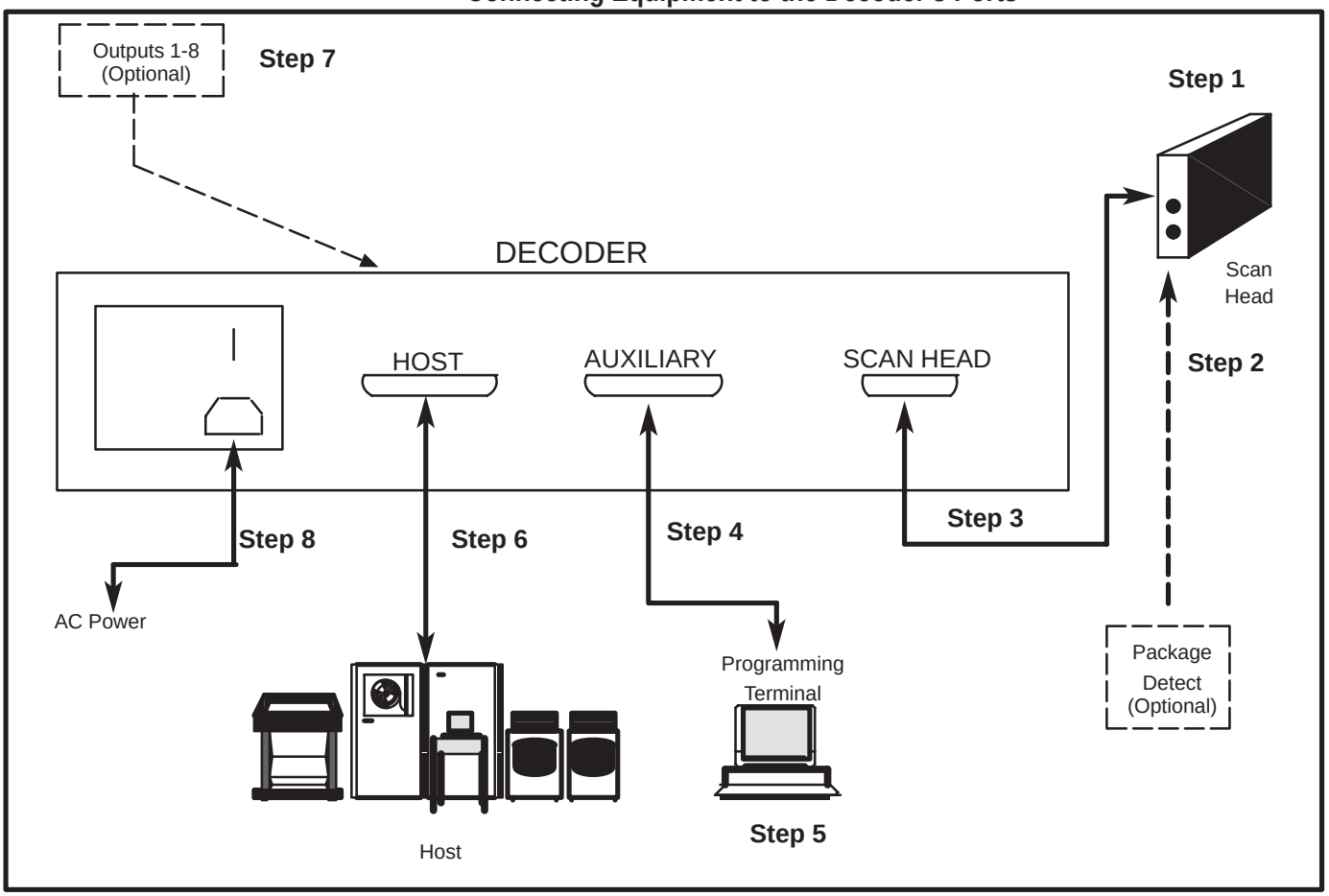
Figure 5.3
Fasteners Used to Mount Decoder



How to Connect Your Equipment

Connect your equipment using the appropriate cables. Refer to Figure 5.4 as you follow the step-by-step procedures provided.

Figure 5.4
Connecting Equipment to the Decoder's Ports



Step 1 - Mount the scan head. Refer to the applicable user's manual for the scan head.

Note: Make sure the decoder is securely mounted. The power switch should be in the off position and the power cable should not be connected.

Step 2 - If a package detector will be used, connect it to the scan head.

Step 3 - Connect the scan head to the port labeled SCAN HEAD or SCANNER on the back of the decoder using one of the following:

Catalog No. 2755-L7, -L9 Scan Heads:
10 foot (3.05 meter) cable (Catalog No 2755-CL10)
25 foot (7.62 meter) cable (Catalog No. 2755-CL25)

Catalog No. 2755-L4, -L5 Scan Heads:
10 foot (3.05 meter) cable (Catalog No 2755-CK10)
25 foot (7.62 meter) cable (Catalog No. 2755-CK25)

Step 4 - Connect the terminal that will be used for programming to the port labeled AUX or AUXILIARY on the decoder. Since the programming may have been done earlier, this step is optional.

Note: It is possible to program the decoder from a host device. However, it is preferable to use a programming terminal as described in Chapter 4.

Step 5 - The initial programming should be done at this time, if it was not done earlier (at a simulation).

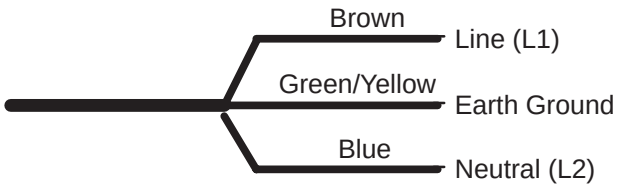
Step 6 - If a host device will be used, connect it to the port labeled HOST on the back of the decoder. Refer to Chapter 6 and Figures 2.3 and 3.3.

Step 7 - If input or output devices are used, perform the following:

- Verify that fuses are installed. Refer to section titled Module Fuse Replacement (Chapter 9).
- Install additional modules, if needed. Refer to section titled Installing and Wiring Modules.
- Connect wiring to the module connectors (located under access cover). Refer to Installing and Wiring Modules.

Step 8 - Make sure the power switch on the decoder is in an off position, plug cord into the decoder, and connect the power cord to a power source.

Note: The 2755-DM9E is supplied with an unterminated cable. Attach a suitable connector using the diagram below.



Installing and Wiring Modules

Remove and install modules as follows:

1) Disconnect the power from the output modules and the decoder.

2) Remove the two hex head screws (5/64 inch) which secure the module access cover and remove cover.

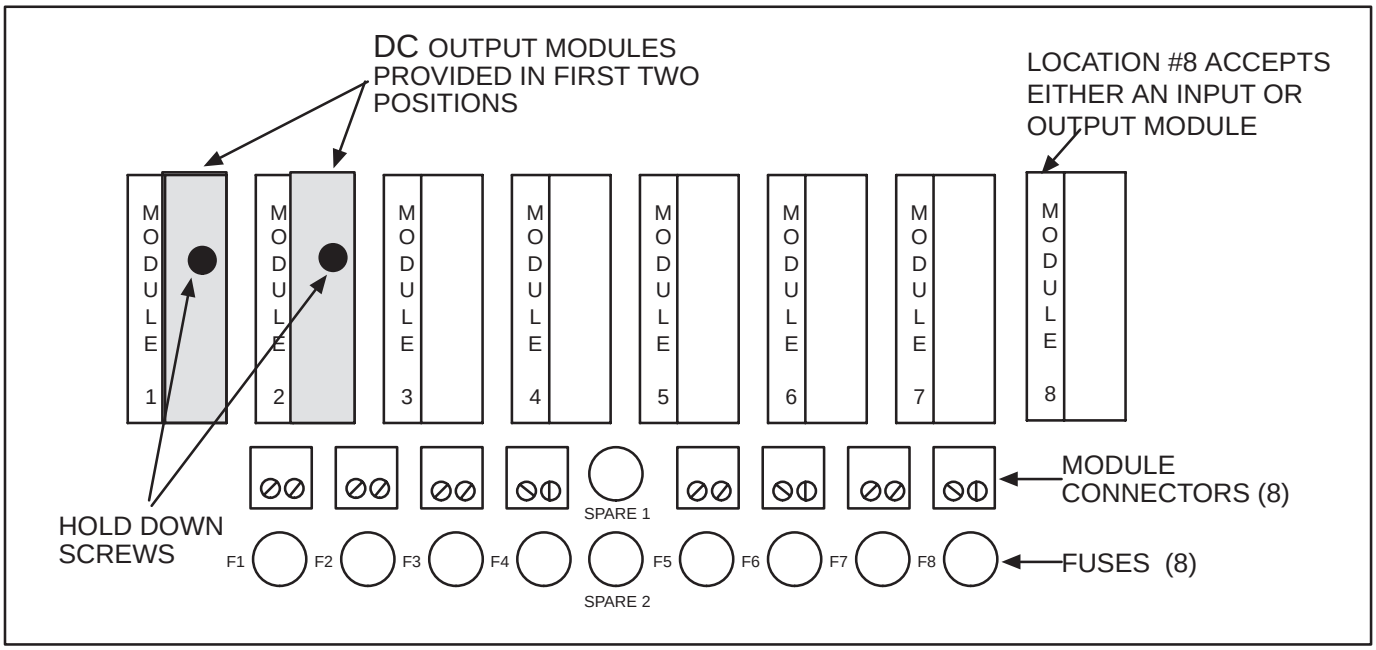
3) There are eight positions for the modules. Locations #1 through #8 accept any combination of output modules. Location #8 may also be configured to accept an input module for the Auto Load function. Refer to Figure 5.4. The first two modules are installed at the factory.

4) After loosening the hold-down screws, modules can be pulled or plugged into the circuit board. Be careful not to damage the board. Make sure hold-down screws are tightened on installed modules.

Connect wiring to the modules as follows:

1) Eight terminal block type connectors are provided. Refer to Figure 5.5. These connectors will accept up to 14 gauge wiring.

Figure 5.5
Modules and Connectors



2) When wiring, refer to Figure 5.6 for the terminal connections. Make sure that you note the **polarity** when using DC modules.

3) Strip 1/4-inch (6 mm) of the insulation from the wire. Open the connector by turning the locking screw counterclockwise until the wire can be inserted into the connector.

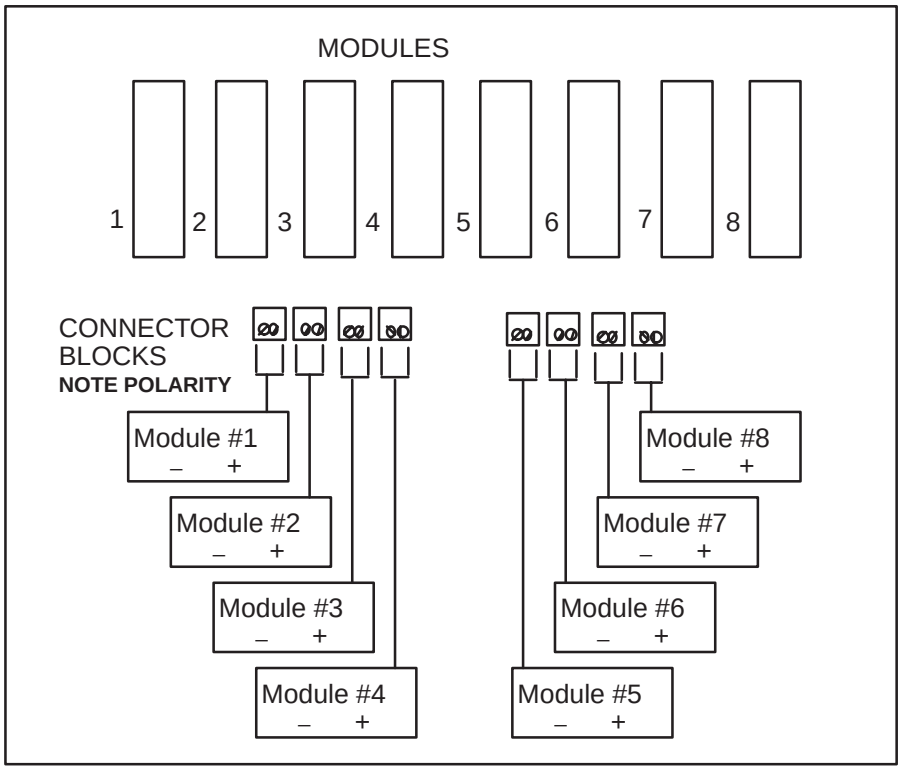
4) Tighten the locking screw on the connector to secure the wire.

5) Route wires from the module connectors through either the round knockout into conduit or the slot provided on the back of the chassis.

WARNING: If you are using output modules with voltages exceeding 30 volts RMS or 42.4 volts peak / DC, the wiring to all modules MUST be routed through the round knockouts into conduit. The slot on the back of the chassis should only be used if all modules are used with voltages below 30 volts RMS or 42.4 volts peak / DC.

6) Install module access cover.

Figure 5.6
Module Connections



Chapter 6

Communicating With a Host

Chapter Objectives

This chapter provides a basic description of the decoder's ability to communicate with a host device. In addition, this chapter provides a description of the:

- Host communications port.
- Communications cable required to connect your host device to the decoder.
- Format of the bar code data sent to a host.
- Available communications standards and how they are used.

Host Port

The HOST communications port on the back of the decoder provides for communications with a host using the following standards:

- RS-232
- RS-422
- RS-485

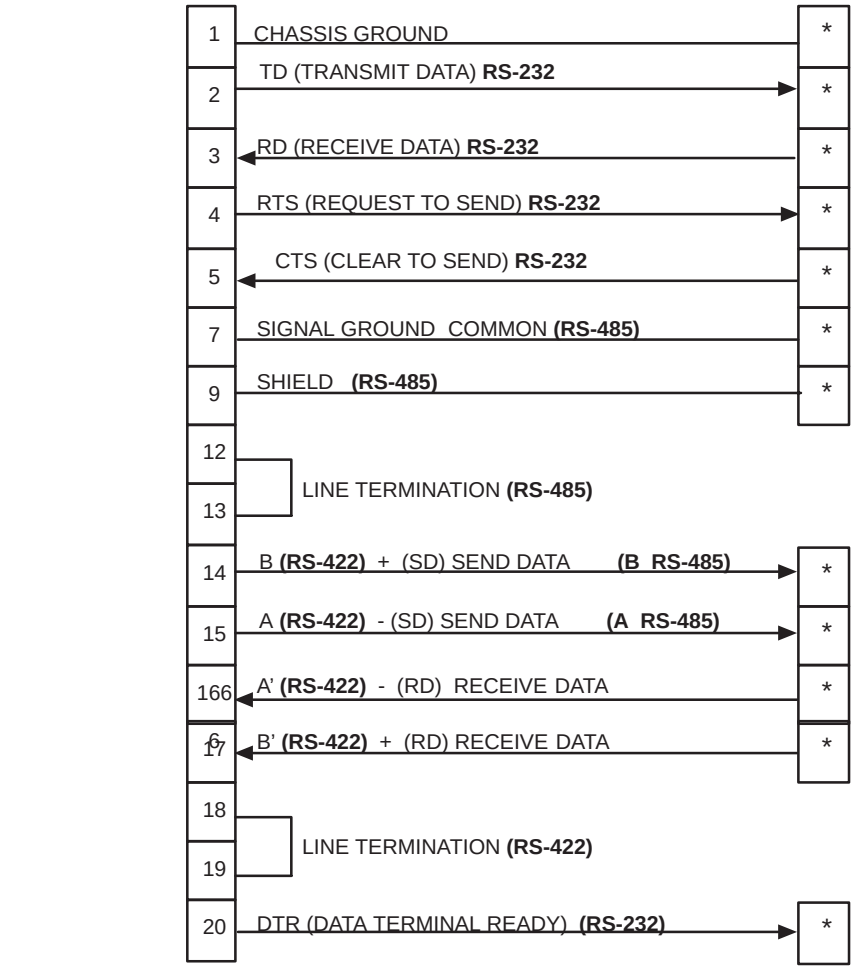
All three communications interfaces are provided in the same 25 pin D connector. Figure 6.1 shows the pin numbers for the HOST port.

Note: We have provided connection diagrams for each interface in the appropriate sections of this chapter.

The type of cable that you use to connect the decoder to a host will vary depending upon the communication standard being used and the type of connector on the host's serial communications port. You should use the connection diagrams provided in this chapter for the communications standard you are using. Using these diagrams, you can determine your requirements and create or purchase a host communications cable.

Note: Refer to Appendix E for a protocol selection table which lists all of the host protocol options.

Figure 6.1
HOST Port Pin Numbers



Connector:
User defined.
Unique to each host device

Cable:
Use shielded cable that is appropriate for the communications standard you are using.

HOST Port on Decoder,
Data Terminal Equipment (DTE)
Note: Connect shield to shell of HOST port cable connector.

Host Device
* Exact pin designations depend on specific host device used.

RS-232 Interface

As shown in Figure 6.1 the RS-232 interface uses pins 2, 3, 4, 5 and 20 of the HOST port connector. Three of the communications lines, pins 4 (RTS), 5 (CTS), and 20 (DTR), are optional flow control lines. Depending upon how the decoder is configured (HOST PROTOCOL configuration parameter, described in Chapter 4), these modem control lines are enabled or disabled:

- RS-232: no flow control.
- RS-232 XON/XOFF: XOFF character from the host suspends transmission and the XON character resumes the transmission. Both the XON and XOFF characters are removed from a message by the receiving device.
- RS-232 RTS/CTS-1: enables the RS-232 (RTS and CTS) control lines for flow control.
- RS-232 RTS/CTS-2: enables the RS-232 (RTS and CTS,) control lines for flow control. Use this mode when the decoder is communicating with a 2760-RA or -RB communications controller using modem controls.

The following are descriptions of the three RS-232 modem control lines:

DTR (Pin #20) (RTS/CTS-1, -2) — The Data Terminal Ready signal is sent by the decoder and informs the host device that the decoder is on-line and capable of receiving data from the host. The DTR line will remain on while the decoder is on.

Note: The DTR line will be asserted (turned on) regardless of the communications interface being used.

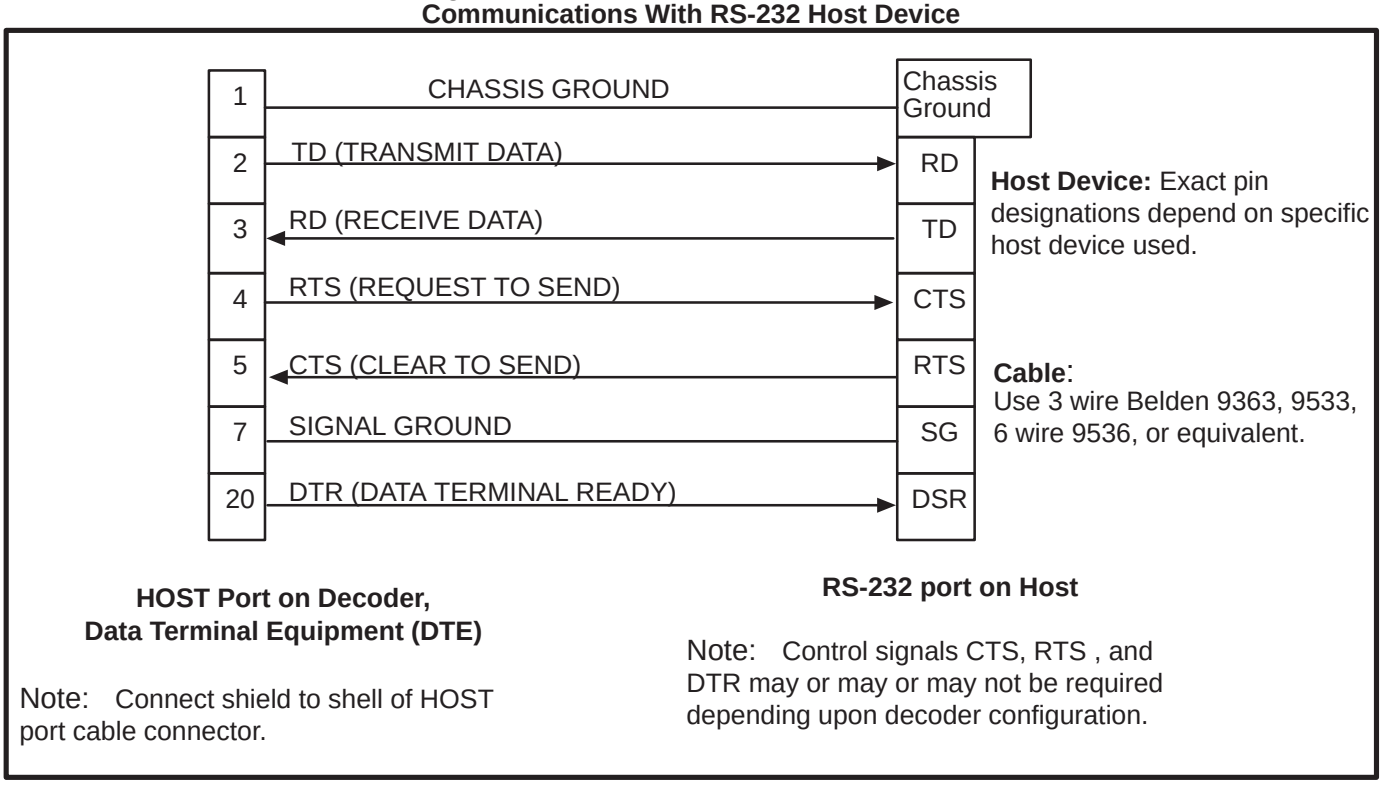
RTS (Pin #4) (RTS/CTS-1) — The Request To Send signal is sent by the decoder and informs the host device that the decoder is ready to send data. When the host receives an RTS signal (pin #4) from the decoder, the host must assert CTS to inform the decoder to begin sending data. When the decoder stops sending an RTS, the host must stop sending a CTS before the decoder can assert the RTS again.

RTS (Pin #4) (RTS/CTS-2) — In this mode, the RTS signal (pin #4) is sent by the decoder to inform the host that the decoder can accept data. The host should only send data when RTS is asserted.

CTS (Pin#5) (RTS/CTS-1,-2) — The Clear To Send signal is sent by the host device and informs the decoder that the host will accept data. The decoder will only send data if the CTS line is on.

Refer to Figure 6.2 for an illustration of how to connect a host device to the decoder using the RS-232 interface.

Figure 6.2
Communications With RS-232 Host Device



RS-422 Interface

As shown in Figure 6.1, the RS-422 interface uses pins 14 (B), 15 (A), 16 (A'), and 17 (B'). The send data and receive data lines are:

- B is the + Send Data (SD) line.
- A is the - Send Data (SD) line.
- B' is the + Receive Data (RD) line.
- A' is the - Receive Data (RD) line.

The send data lines carry data from the decoder to the host device. The receive data lines carry data from the host to the decoder.

No flow control lines are used in the RS-422 interface. Optional flow control is provided using XON/XOFF control which is selected by the HOST PROTOCOL configuration parameter (described in Chapter 4). There are two options:

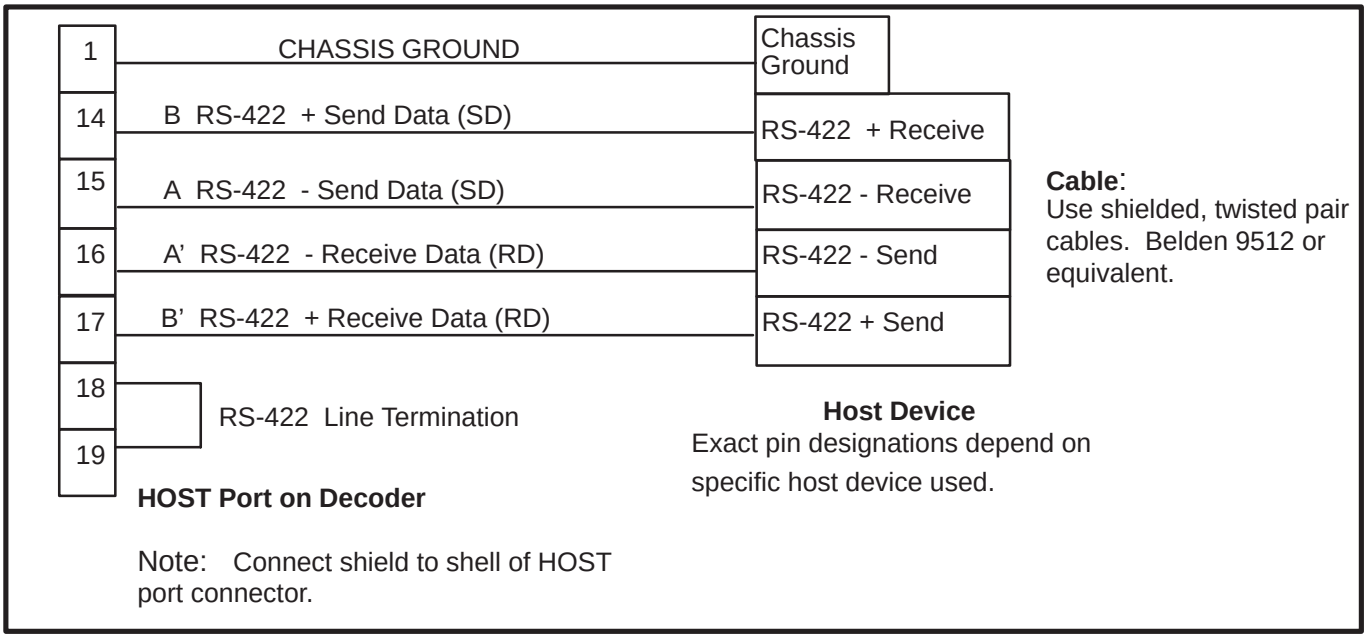
- RS-422: no flow control.
- RS-422 XON/XOFF: XON/XOFF flow control.

The RS-422 communication lines are unterminated. You can enable a termination network (120 ohm resistor in series with a 0.01 microfarad capacitor) by connecting pins 18 and 19 together.

Note: We recommend that you terminate the RS-422 lines if excessive noise occurs on long RS-422 communication links.

Refer to Figure 6.3 for an illustration of how to connect a host device to the decoder using the RS-422 interface.

Figure 6.3
Communications With RS-422 Host Device



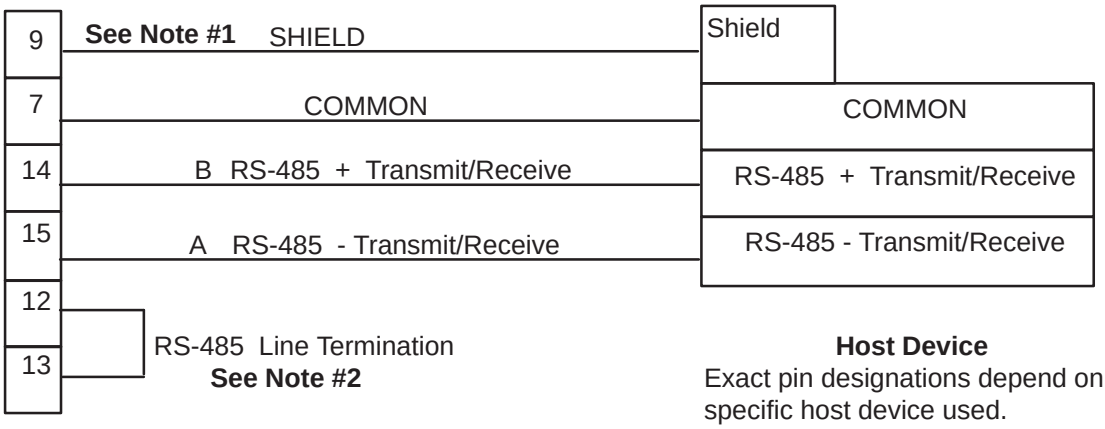
RS-485 Interface

The RS-485 interface provides the ability to multi-drop up to 31 decoders (from each port) in a communications network using the Catalog No. 2760-RB Flexible Interface Module. As shown in Figure 6.4, the RS-485 interface uses pins 14 (+ Transmit/Receive) and 15 (- Transmit/Receive). If the decoder is on either of the ends (last drop) in a multi-drop network, you must enable the termination network (120 ohm resistor in series with a 0.01 microfarad capacitor) by connecting pins #12 and #13 together. Otherwise, leave pins #12 and #13 open.

Note: Only one of the devices in a multi-drop network must have the cable shield connected to chassis ground.

Refer to Figure 6.4 for an illustration of how to connect the decoder to an RS-485 network.

Figure 6.4
Communications in an RS-485 Network



Note #1: One and only one of the devices on the network must have the cable shield connected to chassis ground. This is accomplished by connecting the shield to pin #1 instead of pin #9.

Note #2: The devices at each end of the network must have the line termination enabled. You enable the line termination by connecting pins #12 and #13 together. Otherwise, pins #12 and #13 are left open.

When you select the RS-485 interface during the decoder's configuration, the following parameters are fixed:

- 8 Data Bits
- Even Parity
- 1 Stop Bit

Note: There are four RS-485 application modes:

- RS485 PCCC-1: PCCC commands with write replies.
- RS485 PCCC-2: PCCC commands without write replies.
- RS-485 ASCII-1: ASCII commands with responses.
- RS-485 ASCII-2: ASCII command without responses.

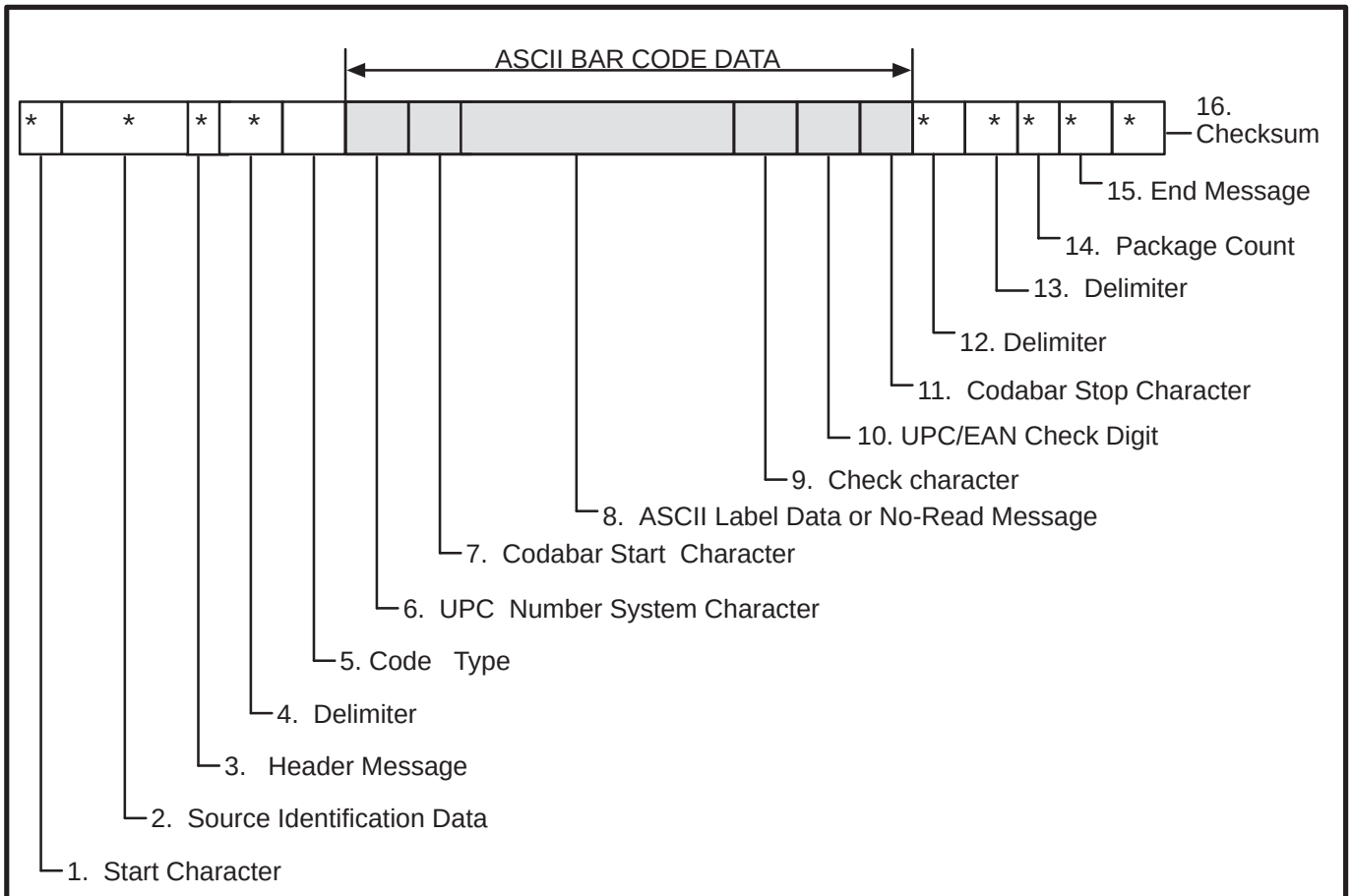
Refer to Chapter 8 for more information.

Message Format

Bar code data is transmitted after the end of trigger or after a valid package as specified by the RESPONSE MODE you selected as part of the decoder's configuration. Bar code data is sent as a string. Figure 6.5 illustrates the structure of the data. Table 6.A explains the contents of each field in the data string.

Note: The format of the bar code data is dependent upon the transmission parameters you entered; some of the fields shown in Figure 6.5 are optional.

Figure 6.5
Data Message Format



* This field contains characters that you program from the setup menus. Refer to Chapter 4 for more information.

NOTE: The presence of fields 1→5, 8, 9, and 12→16 is determined by the configuration parameters. The presence of fields 6, 7, 10, and 11 is determined by the bar code.

Field	Number of Characters in each Field	Explanation
1. Start Character	0 or 1	Optional. ASCII character that indicates start of text or message.
2. Source Identification Data	0 to 4	Optional. Can include up to 4 alphanumeric characters.
3. Header Message	0 to 32	Optional. Any message can be put into the header.
4. Delimiter	0 or 1	Optional. Used to indicate the beginning of label information. The same delimiter is used in Fields 12 and 13. **Note:** We recommend you specify a unique character not used in any of the labels or for any other function.
5. Code Type	0 or 2	Optional. Indicates type of code: 01= Code 39 02= Interleaved 2-of-5 03= Codabar 04= UPC-A 05= UPC-E 06= EAN-8 07= EAN-13 08= Code 128
6. UPC Number System Character	1	Only appears with UPC labels.
7. Codabar Start Character	1	Only appears with Codabar labels.
8. Label Data or No-Read Indication	0 to 64	Optional. Default is to transmit the label data. If a No-Read occurs, the no-read message is in this field.
9. Check Character	0 or 1	Optional check character for Code 39, I 2-of-5, and Codabar.
10. UPC/EAN Check Digit	1	Only appears with UPC-A, UPC-E (Expanded), EAN-8, and EAN-13 labels.
11. Codabar Stop Character	1	Only appears with Codabar labels.
12. Delimiter	0 or 1	Optional. Used to indicate the end of a label field. If multiple labels are being read, the delimiter also indicates the start of the next label field. A double delimiter indicates the end of label information. The same delimiter is used in Field 4. **Note:** We recommend you specify a unique character not used in any of the labels or for any other function.
13. Delimiter	0 or 1	Refer to field 12.
14. Package Count.	0 or 6	Optional. If selected, a 6 character package counter is returned. The count resets to 000000 when: • 999999 is reached. • Power to the scanner is cycled. • Counters are reset.

Field	Number of Characters in each Field	Explanation
15. End Message	0, 1, or 2	Specifies the end of message control code: • None • CRLF • CR • LF • ETX
16. Checksum.	0, 1, or 2	Message checksum. There are four options: • None • Longitudinal Redundancy Check (1 Byte). • Checksum- Least significant byte first (2 Bytes). • Checksum- Most significant byte first (2 Bytes).

Example Data Messages

To help you program your host device, we have provided the following examples. These example show the data transmitted by the decoder. In these examples, the host protocol was setup as follows:

Start Character:	#
Send Source Identifier:	Yes
Source Identifier:	183
Header Message:	Data From Scanner 1B3
Label Delimiter:	=
Send Bar Code Type:	Yes
Send Bar Code Data:	Yes
No-Read Message:	No-Read
Send Package Count:	Yes
End of Message Character:	CRLF
Transmission Check:	None
Send No-Read Message:	Yes

Example #1 - If one Code 39 label is decoded, the decoder would transmit the following:

#183Data From Scanner 1B3=01001122334455==000013CRLF

Where 01 is the code type (code 39), 001122334455 is the bar code data and 000013 is the package count.

Example #2 - If two Code 39 labels are scanned on a single package, the decoder would transmit the following:

#183Data From Scanner 1B3=01998877665=01001122334==000014CRLF

Where 01 is the code type (code 39), 998877665 is the data for the first bar code, 001122334 is the data for the second bar code, and 000014 is the package count.

Example #3 - If a No-Read occurs, the decoder would transmit the following:

#183Data From Scanner 1B3=No-Read==000015CRLF

Where 000015 is the package count.

Host Commands

Your host device can also transmit commands to the decoder. Using these commands you can request data and/or change the operating configuration of the decoder. Depending upon the type of communication interface used to communicate with the decoder, refer to the following chapter:

- If you are using the RS-232 or RS-422 interface, refer to Chapter 7.
- If you are using the RS-485 interface, refer to Chapter 8.

Note: Chapter 7 and Chapter 8 describe the format of both a host command and the decoder's response to a command.

Chapter 7

Host Commands Using the RS or RS-422 Interface

Chapter Objectives

In this chapter, we tell you how to send host commands to the decoder when you are using either the RS-422 or RS-232 communications interface. Along with each command, we also provide the format of the decoder's response.

RS-232/RS-422 ASCII Command Protocol

The commands that a host device sends to the decoder using the RS-232 or RS-422 interface consist of ASCII character strings. In response to a command, the decoder will transmit a response code (also an ASCII character string). There are two basic types of host commands:

- Single character commands
- Two character commands

The RS-485 communications interface has an application layer which can use the ASCII command protocol. Refer to Appendix E for a protocol selection chart which lists all of the protocol options.

Single Character Commands

There are four single character commands:

- Start Scan Character
- Stop Scan Character
- ACK Character
- NAK Character

The characters that are used for the single character commands are selected by you as part of the configuration of the decoder. Refer to the description of the setup screen #1 in Chapter 4.

If you specified the decode trigger to be a host command, single character commands are used to stop and start the scan:

START SCAN COMMAND - When the decoder receives the start scan command, it will begin scanning. The decoder will continue to scan until one of the ending conditions occurs.

STOP SCAN COMMAND - The stop scan command informs the decoder to stop scanning.

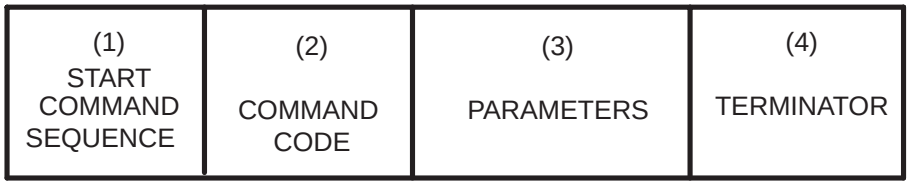
ACK and NAK COMMANDS- If ACK/NAK communications protocol is selected as part of the communications configuration of the decoder:

1) The host device must send an ACK after every bar code data message is received correctly. If the message is not properly received, the host should send a NAK to prompt a retry.

2) If a NAK is received by the decoder, the decoder will retransmit the last message, up to three times. After the third NAK, the decoder will discard the message.

Two Character Commands

The remainder of this chapter describes the two character commands that you transmit to a decoder. Before we describe the commands, you should first understand the format of the two character commands. Two character commands have the following structure:



1) The start command sequence contains an escape sequence <ESC>=! where <ESC> is ASCII decimal code 27. Refer to the following table.

Character	ASCII	Hex
ESC	27	1B
=	61	3D
!	33	21

Note: The start sequence is optional. The purpose of the <ESC>=! sequence is to differentiate between two character and single character commands. You **must use** the escape sequence if your single character commands use one of the following characters:

C D H I M N O P R S.

If your single character commands do not use any of these characters, you do not have to use the start command sequence.

2) The second part of the command is the command code.

3) The third part of the code contains the command parameters. Some commands do not have parameters.

4) The fourth part of the command code is any ASCII control code (less than decimal 32). The control code is used to terminate the command. Typical control codes are: <CR>, <LF>, <CRLF>, or <ETX>.

Responses to Commands

After receiving a command, the decoder will send a reply. Response messages sent from the decoder to the host have the following structure:

(1) PARAMETER	(2) END OF PARAMETER CODE	(3) =	(4) RESPONSE CODE	(5) END OF MESSAGE CODE

Note: The first two parts of the response may or may not be present depending upon the command used.

1) The first part of the response is the parameter. Some commands do not return any parameters.

2) The second part of the response is the end of parameter code. This code is the same as the end of message code.

3) The third part of the response is = which is equivalent to ASCII 61.

4) The fourth part of the response is the code itself; indicating the status of the command processing (refer to Table 7.B).

Response (Hex)	Description
00	Command complete (normal termination)
11	Valid command but format is invalid
50	Command not found
97	Reset to new configuration received
98	Reset to default configuration received

5) The last part of the response code is the end of message control code that is specified on the communications configuration screen (setup screen #1). There are four possible end of message codes: CR, CRLF, LF, ETX, or None. Refer to section titled Setup Screen #1 Data Fields (Chapter 4) for more information on how to select end of message codes.

Host Commands

The remainder of this chapter describes the format of the following host commands:

Reference Letter	Mnemonic	Function
1	CC	Set Code 39, I 2-of-5, and Codabar Check Characters
2	CM	Clear Output Counter
3	CT	Enable/Disable Bar Code Type
4	DD	Set Configuration to Default Values
5	HC	Set Host Communications
6	HM	Write Header Message
7	IF	Set Package Detect Input Filter and Sense
8	IM	Write Source Identification Message
9	MC	Read Output Counter
10	MF	Set Message Format
11	MR	Read Match Code Table
12	MW	Write Match Code Table
13	NC	Clear No-Read Count
14	NM	Write No-Read Message
15	NR	Read No-Read Count
16	OC	Set Output Condition and Duration
17	PC	Clear Package Count
18	PR	Read Package Count
19	RE	Reset Decoder
20	RD	Set Configuration to Default Values, Save to EEPROM, and Restart
21	RN	Save Configuration to EEPROM and Restart
22	SA	Save Configuration to EEPROM (No Restart)
23	SC	Set Scanner Control
24	SL	Set Bar Code Specific Length

1. Set Code 39, I 2 of 5 and Codabar Check Characters

Command: CCabcdef

Function: Enables or disables decoder generated code check characters.

Response: =rr<end>

Comments: CC = Generate code check characters command.

a through f are the yes (1) and No (0) responses to the following parameters (in sequence shown):

a = Code 39 check character?
b = Send Code 39 check character?
c = I 2-of-5 check character?
d = Send I 2-of-5 check character?
e = Codabar check character?
f = Send Codabar check character?
rr = response code, refer to Table 7.B.
<end> = end of message control code.

Example:

Command: CC110011

Response: = 00CR

Comments:
1 = Code 39 check character verified.
1 = Code 39 check character sent.
0 = I 2-of-5 check character not verified.
0 = I 2-of-5 check character not sent.
1 = Codabar check character verified.
1 = Codabar check character sent.
00 = “command complete” response code.
CR = end of message control code for Carriage Return.

2. Clear Output Counter

Command: CMn

Function: Clear the output counter.

Response: =rr<end>

Comments:
CM = Clear output counter command.
n = output counter. This value must be from 1 through 8.
<end> =end of message code
.rr = response code, refer to table on Page 7-3.

Example:

Command: CM3

Response: =00CR

Comments: 3 = output counter #3
00 = “command complete” response code
CR = end of message code for Carriage Return

3. Enable/Disable Bar Code Type

Command: CTfcc

Function: Enables and disables the decoding of bar code types.

Response: =rr <end>

Comments: CT = Bar code type disable/enable command.

f = enable/disable bar code type
1- enabled
0- disabled

cc = code type
01- Code 39
02- Interleaved 2 of 5
03- Codabar
04- UPC-A
05- UPC-E
06- EAN-8
07- EAN-13
08- CODE 128

rr = response code, refer to Table 7.B.

<end> = end of message code.

Example:

Command: CT103

Response =00LF

Comments: 1 = enables bar code type
03 = Codabar bar code type
00 = “command complete” response code
LF = end of message code for Line Feed

4. Set Configuration to Default Values

Command: DD

Function: Set decoder to default configuration.

Response: =00CRLF

Note: Host communication port parameters and the contents of the EEPROM are not changed with this command.

5. Set Host Communications

Command: HCaaannnsssppfr

Function: Set host communication parameters.

Response: =rr<end>

Comments: HC = Set host communications command.

aaa = ACK (positive acknowledgment) character. Must be ASCII decimal value from 000 to 254. A value of 255 = None.

nnn = NAK (negative acknowledgment) character. Must be ASCII decimal value from 000 to 254. A value of 255 = None.

sss = start scan character. Must be ASCII decimal value from 000 to 254. A value of 255 = None.

ppp = stop scan character. Must be ASCII decimal value from 000 to 254. A value of 255 = None.

f = large buffer enable
1 = YES
0 = NO

r = selects response mode
0 = End of Trigger
1 = After Valid Package

rr = response code, refer to table on Page 7-3.

<end> = end of message control code.

Note: The ACK/NAK, start scan, and stop scan characters will not be entered into the operating system until the configuration is saved to EEPROM and the decoder is restarted (ESC = ! RN). After setting new ACK/NAK characters, the host must begin sending the new characters with each transmission.

Example:

Command: HC03603703504311

Response: = 00CR

Comments: 036 =¤ character for the ACK character.
037 =% character for the NAK character.
035 =# character for start scan character.
043 = + character for stop scan character.
1 = enables the large buffer.
1 = end of trigger response mode.
00 = “command complete” response code.
CR = end of message control code for Carriage Return.

6. Write Header Message

Command: HMllstring

Function: Write header message.

Response: =rr<end>

Comments: HM = Write header message command.

ll = length of the header message. Must be from 00 to 32.

string = header message, up to 32 characters can be specified.

rr = response code, refer to Table 7.B.

<end> = end of message control code.

Example:

Command: HM03A-B

Response: =00LF

Comments: 03 = message length.
A-B = header message.
00 = “command complete” response code.
LF = end of message control code for Line Feed.

7. Set Package Detect Input Filter and Sense

Command: IFf

Function: When sent, this command will enable or disable the 10 msec input filter and determine the sense of the package detect input signal.

Response: =rr<end>

Comments: IF = Set input filter command.

f = disable or enable filter/select sense.
0 - disable filter, LO when package is present.
1-enable filter, LO when package is present.
2-disable filter, HI when package is present.
3-enable filter, HI when package is present.

rr = response code, refer to Table 7.B.

<end> = end of message code.

Example:

Command: IF1

Response: = 00CR

Comments: 1 = enable filter, LO = package.
00 = "command complete" response code.
CR = end of message control code for Carriage Return.

8. Write Source Identification Message

Command: IMlstring

Function: Write source code identification message.

Response: =rr<end>

Comments: IM = Write source identification command.

l = length of the source identification message. Must be from 0 to 4.

string = source identification message, up to four characters can be specified.

rr = response code, refer to Table 7.B.

<end> = end of message control code.

Example:

Command: IM2#1

Response: =00LF

Comments: 2 = message length.
#1 = source identification message.
00 = “command complete” response code.
LF = end of message control code for Line Feed.

9. Read Output Counter

Command: MCn

Function: Reads the output counter.

Response: mmmmmm<end>=rr<end>

Comments: MC = Read output counter command.

n = output counter. This value must be from 1 through 8.

mmmmmm = output counter count. Maximum value of 999999.

<end> = end of message code.

rr = response code, refer to Table 7.B.

<end> = end of message code.

Example:

Command: MC3

Response: 000121LF=00LF

Comments: 000121 = Output #3 has been activated 121 times since the last restart or reset.
LF = end of message code for Line Feed
00 = “command complete” response code
LF = end of message code for Line Feed

10. Set Message Format

Command: MFabcdefgdddsssshx

Function: Specifies the format of messages.

Response =rr<end>

Comments: MF = Set message format command.

a through g are yes (1) and no (0) responses to the following parameters (in sequence listed):

a = Send bar code data?
b = Send package count?
c = Send bar code type?
d = Send source identification?
e = Send header message?
f = Send no-read message?
g = Expand UPC-E?

ddd = label delimiter character (decimal ASCII equivalent from 000 to 254). A value of 255 = None.

sss = start character (decimal ASCII equivalent from 0 to 254). A value of 255 = None.

h = end message control character.
0 = CRLF
1 = CR
2 = LF
3 = ETX
4 = None

x = transmission check method.
0 = None
1 = LRC
2 = Checksum- LSB first
3 = Checksum- MSB first

Note: Refer to Chapter 4 for a description of the message format parameters.

<end> = end of message code.

rr= response code, refer to Table 7.B.

Example:

Command: MF110011009404210

Response: =00ETX

Comments: 1 = Bar code data sent.
1 = Package count is sent.
0 = Bar code type is not sent.
0 = Source identification is not sent.
1 = Header message is sent.
1 = No-read message is sent.
0 = UPC-E is not expanded.
094 = Caret label delimiter character.
042 = Asterisk start character.
1 = CR is end message control code.
0 = No transmission check.
00 = "command complete" response code.
ETX = end of message code for End Transmission.

11. Read Match Code Table

Command: MRn

Function: Read match code table entry n.

Response: nfcclstring<end>=rr<end>

Comments: MR = Match read command.

n = match code table entry number. This entry must be a value from 1 to 8.

f = enable/disable match operation where:
1- enabled
0- disabled

cc = code type:
01- Code 39
02- Interleaved 2 of 5
03- Codabar
04- UPC-A
05- UPC-E
06- EAN-8
07- EAN-13
08- Code 128

ll = number of characters in the match sequence. This will be a value from 00 to 32.

string = characters in the match code sequence.

<end> = end of message code.

rr = response code, refer to Table 7.B

Example:

Command: MR 3

Response: 310105MATCHCR=00CR

Comments:
3 = match code table entry #3 is specified.
1 = match operation enabled.
01 = Code 39.
05 = 5 characters long.
MATCH = match sequence MATCH.
CR = end of message code for Carriage Return.
00 = “command complete” response code.

12. Write Match Code Table

Command: MWnfcc||string

Function: Write match code entry n if the sequence meets the code rules.

Response: =rr<end>

Comments: MW = Write match code command.

n = match code table entry number This value must be from 1 to 8.

f = enable/disable match code operation:
1- enabled
0- disabled

cc = code type:
01- Code 39
02- Interleaved 2 of 5
03- Codabar
04- UPC-A
05- UPC-E
06- EAN-8
07- EAN-13
08- CODE 128

|| = indicates the number of characters in the match sequence. This must be a value from 0 to 32

string = characters in the match code sequence.

<end> = end of message code.

rr = response code, refer to Table 7.B

Example:

Command: MW4102041289

Response: =00LF

Comments: 4 = match table entry number
1 = match operation enabled
02 = Interleaved 2 of 5
04 =four character code length
1289 = character string
00 = “command complete” response code
LF = end of message code for Line Feed

Command: NC

Function: When sent, this command will zero the no-read counter.

Response: =rr<end>

Comments: NC = Clear No-Read command.

rr = response code, refer to Table 7.B.

<end> = end of message code.

Example:

Command: NC

Response: =00CR

Comments: 00 = “command complete” response code.
CR = end of message control code for Carriage Return.

14 Write No-READ Message

Command: NMllstring

Function: Write no-read message.

Response: =rr<end>

Comments: NM = Write no-read message command.

ll = length of the no-read message. Must be from 00 to 32.

string = no-read message. Up to 32 characters can be specified.

rr = response code, refer to Table 7.B.

<end> = end of message control code.

Example:

Command: NM07NO-READ

Response: =00CR

Comments: 07 = message length.
NO-READ = header message.
00 = “command complete” response code.
CR = end of message control code for Carriage Return.

Read No-Read Count

Command: NR

Function: When sent, this command will return the count in the no-read counter.

Response: pppppp<end>=rr<end>

Comments: NR = Read No-Read command.

pppppp = No-read count, up to 999999.

<end> = end of message code.

rr = response code, refer to Table 7.B.

<end> = end of message code.

Example:

Command: NR

Response: =000016CR=00CR

Comments: 000016 = no-read count of 16
CR = end of message control code for Carriage Return.
00 = “command complete” response code.
CR = end of message control code for Carriage Return.

16. Set Output Condition and Output Duration

Command: OCnctttt

Function: Sets the condition that will assert (turn on) an output and sets the length of time in milliseconds that an output is turned on.

Response: =rr<end>

Comments: OC = Set output condition and duration command.

n = output number. This value must be from 1 through 8.

c = condition that will assert an output:0 = None
1 = Read (Package)
2 = No-Read (Package)
3 = Match-Complete
4 = Match Entry In Table
5 = Read and No Match
6 = No-Read or No-Match
7 = Auto Load
8 = Auto Load (INPUT) (*Only if n = 8)*

tttt = time in milliseconds that the output will be turned on. Value must be in the range of 0010 to 9999.

rr = response code, refer to Table 7.B.

<end> = end of message code.

Example:

Command: OC510110

Response: =00CR

Comments: 5 = specifies output #5.
1 = specifies an output with Read (Package).
0110 = sets output duration to 110 milliseconds.
00 = "command complete" response code.
CR = end of message code for Carriage Return.

17. Clear Package Count

Command: PC

Function: When sent, this command will clear the package count (set to zero).

Response: =rr<end>

Comments: PC = Clear package count command.

rr = response code, refer to Table 7.B.

<end> = end of message code.

18. Read Package Count

Command: PR

Function: Read the Package Count

Response: pppppp<end>=rr<end>

Comments: PR = Read package count command

pppppp = package count. Maximum value of 999999.

<end> = end of message code.

rr = response code, refer to Table 7.B.

<end> = end of message code.

Example:

Command: PR

Response: 000075LF=00LF

Comments: 000075 = number of packages counted by the decoder. The response can equal up to 999999.
LF = end of message code for Line Feed.
00 = "command complete" response code.
LF = end of message code for Line Feed.

19. Reset Decoder

Command: RE

Function: Reset decoder. Recalls the configuration from EEPROM and restarts the decoder.

Response: =97<end>

Comments: The response =97 indicates the command has been received and the decoder is resetting.

<end> = end of message code.

Note: The reset operation takes approximately 5 seconds.

20. Set Configuration to Default Values, Save to EEPROM and Restart

Command: RD

Function: Reset decoder to default configuration and saves the default configuration to the decoder's memory (EEPROM) and then restarts the decoder.

Note: Host port communication parameters are not changed to default values with this command.

Response: =98<end>

Comments: The response of =98 indicates that the command has been received and the decoder is resetting.

<end> = end of message code.

Note: The decoder enters the factory set parameters, saves the configuration in the EEPROM, and resets. Operation will then resume according to the default configuration parameters. Refer to Appendix B for factory set parameters. The reset operation takes approximately 5 seconds.

21. Save Configuration to EEPROM and Restart

Command: RN

Function: Saves decoder configuration to memory and restarts decoder.

Response: =97 <end>

Comments: The response of =97 indicates that the command has been received and the decoder is resetting.

<end> = end of message code.

Note: The decoder saves the new configuration in the EEPROM and resets. Operation will then resume according to the new configuration parameters. The reset operation takes approximately 5 seconds.

22. Save Configuration to EEPROM (No Restart)

Command: SA

Function: Saves decoder configuration to memory.

Response: =00 <end>

Comments: The response of =00 indicates that the command has been received.

<end> = end of message code.

Note: The decoder saves the new configuration in the EEPROM. Operation will then continue according to the new configuration parameters.

23. Set Scanner Control

Command: SCldcsprrrrttttm

Function: Specifies operating parameters of the scan head.

Response: =rr<end>

Comments: SC = Scanner control command.

l = laser-on mode:
0 = Continuous
1 = Triggered

d = trigger mode:
0 = Package Detect
1 = Host Command
2 = Internal Timer
3 = Continuous

c = capture count. Count must be a value from 1 through 8.

s = number of bar code fields per scan. This entry must be a value from 0 through 4. A value of 0 = ANY 1, 2, 3, or 4).

p = number of bar code fields per package. Must be a value 1 through 8.

rrrr = no-read timer value in milliseconds. Must be value from 0010 to 9999. A value of 0000 will disable the timer.

tttt = inter-scan timer value in milliseconds. Must be value from 0010 to 9999. A value of 0000 will disable the timer.

m = match complete count. Must be value from 1 through 8.

Note: Refer to Chapter 4 for a description of scanner control parameters.

<end> = end of message code.

rr = response code, refer to Table 7.B.

Example:

Command: SC01211005500601

Response: =00CR

Comments: 0 = Continuous scanning
1 = Host command.
2 = Capture count of 2 set.
1 = one bar code field per scan.
1 = one bar code field per package.
0055 = No-read 55 millisecond timer.
0060 = Inter-scan timer value of 60 milliseconds.1 = match complete count of one.
00 = “command complete” response code.
CR = end of message code for carriage return.

24. Set Bar Code Specific Length

Command: SLccssttuuvvwwxxyyzz

Function: Specifies code length for Code 39, Interleaved 2-of-5, Codabar, and Code 128 labels.

Response: =rr<end>

Comments: cc = bar code type:
01 = Code 39
02 = Interleaved 2-of-5
03 = Codabar
08 = Code 128

ss, tt, uu, vv, ww, xx, yy, zz are the specified lengths. These must be values from 00 through 64. A length of 00 means lengths are not checked and any length up to 64 characters is acceptable. Any value to the right of a 00 entry will be ignored. The length for Interleaved 2-of-5 must be an even number.

rr = response code, refer to Table 7.B.

<end> = end of message code.

Example:

Command: SL032008000000000000

Response: =00CRLF

Comments: 03 = Codabar bar code type selected.
20 = bar code length of 20 specified.

08 = bar code length of 8 specified.
000000000000 = no specified lengths for the remaining six length fields.

00 = “command complete” response code.
CRLF = end of message code for Carriage Return and Line Feed.

Chapter 8

Host Commands Using the RS-485 Interface

Chapter Objectives

In this chapter, we tell you how to send host commands to the decoder when you are using the RS-485 interface. We also provide the format of the decoder's response.

RS-485 Command Protocols

When you use the RS-485 communications interface, you have four protocol options. These options are selected as part of the decoder's configuration. Refer to HOST PROTOCOL field description (Chapter 4). Your options are:

- RS-485 PCCC-1 Protocol with Write Replies
- RS-485 PCCC-2 Protocol without Write Replies
- RS-485 ASCII-1 Protocol with Responses
- RS-485 ASCII-2 Protocol without Responses

Note: Refer to Appendix E for a protocol selection chart which lists all of the protocol options.

The DM9 supports the following Link Service Access Points (LSAPs):

LSAP	FUNCTION
0	Diagnostic Status
1	PCCC Application Services
128	PCCC or ASCII Application Services
129	Link Reset- Immediate Block

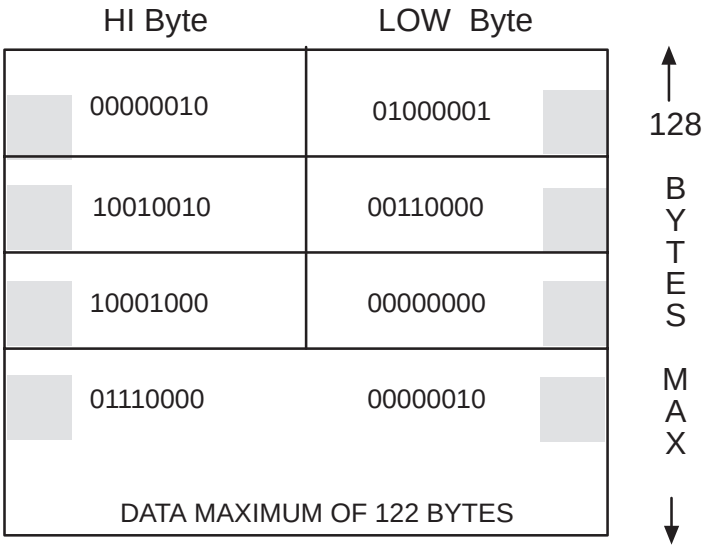
RS-485 ASII Command Protocol

If you select RS-485 ASCII, the decoder will accept commands in the form of ASCII strings and you can use the commands described in Chapter 7. However, the start command sequence (<ESC>=!) is unnecessary and cannot be used with RS-485 ASCII. The remainder of this chapter describes the Programmable Controller Communication Commands.

Note: If you select RS-485 ASCII-2 (without response codes), you will keep the data traffic on the RS-485 link to a minimum. Response codes are usually unnecessary since the link layer of an Allen-Bradley RS-485 network insures that a command is properly received.

RS-485 PCCC Command Protocol

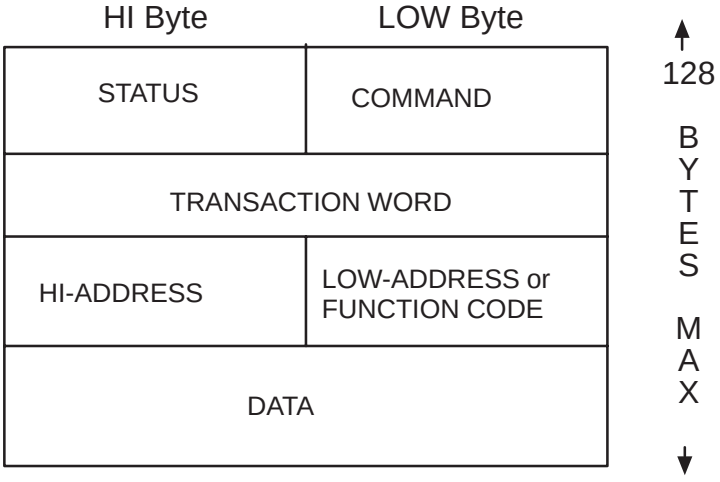
You can use RS-485 PCCC to communicate with a host programmable controller using a PCCC format. The following diagram illustrates a PCCC command.



The diagram illustrates both the high byte and low byte of each data word (word = 2 bytes). Data is always transmitted with the low byte of each data word first and then the high byte. The numbers on the diagram indicate the order in which data bytes are transmitted.

PCCC Command Format

The Programmable Controller Communications Commands (PCCC) are sent in packets of data having the following structure.



The LOW-byte is always sent out first and then the HI-byte. The following are descriptions of each field of the command:

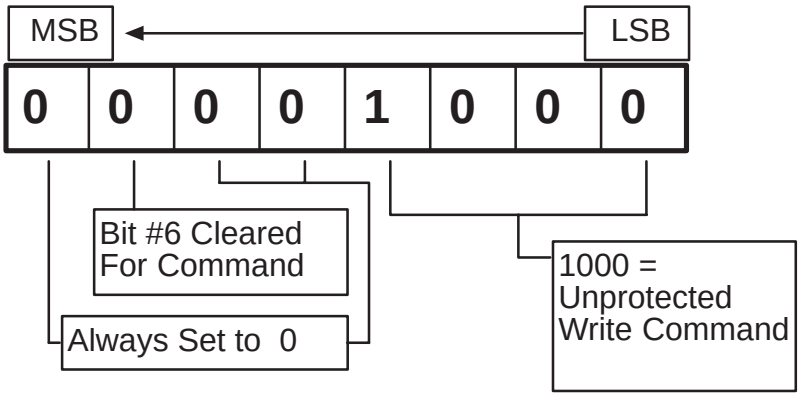
COMMAND (Byte 0) - The first byte indicates one of the following commands:

- Unprotected Read
- Diagnostic
- Unprotected Write

The command byte has the following structure:

- Bits 7, 5, and 4 are always zero.
- Bit 6 is cleared (0) for command, set (1) for reply.
- Bits 0, 1, 2, and 3 contain the command code:
  0001 = Unprotected Read
  0110 = Diagnostic
  1000 = Unprotected Write

Example: To send an unprotected write command the following data would be sent as byte 0:



STATUS (Byte 1)- The second byte of a command indicates the status code of any command response:

- Bits 0 through 3 are reserved for local status codes.
- Bits 4 through 7 are for remote status codes.

Note: Since the decoder does not implement local status codes, bits 0 through 3 are always cleared (set at 0).

The following table lists the status response codes for all of the commands.

Binary Value	Hex Value	Meaning of Code
00000000	00	Success, No errors.
00010000	10	Valid command, but the format or address is invalid.
00100000	20	Invalid or unsupported command.
00110000	30	Hardware fault (reserved and unused).
01000000	40	Success, but no data available (read command only).
10000000	80	Success, but data truncated.

TRANSACTION WORD (Bytes 2 and 3) - This 16 bit message is assigned by the host and is returned in the reply message from the decoder with the same value as the command command and status bytes.

LOW-ADDRESS or FUNCTION CODE (Byte 4) - This is an optional code that allows the host device to send supplemental codes. The meaning of these codes is dependent upon the COMMAND byte (0):

- For Read and Write commands, this byte contains the low-byte of a two byte address.
- When used with the Diagnostic command, this byte contains the diagnostic command. Refer to Link Diagnostic Command section.

HI-ADDRESS (Byte 5) - This optional byte specifies the high-byte of a two byte address when using the Read or Write commands.

DATA (Byte 6 or 4) - This data field is optional and begins at byte 6 or 4. The length of this data field depends upon whether or not bytes 4 and 5 (Low-Address/Function Code and High-Address) are used:

- If bytes 4 and 5 are used, the data field begins at byte 6 and may contain 122 bytes.
- If bytes 4 and 5 are not used, the data field begins at byte 4 and may be 124 bytes long. How the data in this field is used depends upon the command and optional function code.

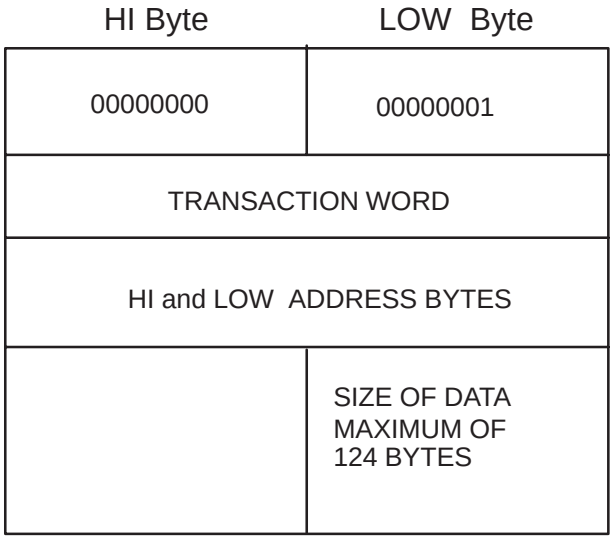
PCCC Commands

In the remainder of this chapter, we provide the PCCC commands. The following commands are available:

- Unprotected Read Command
- Unprotected Write Command
- Communication Link Diagnostic Command

Unprotected Read Command

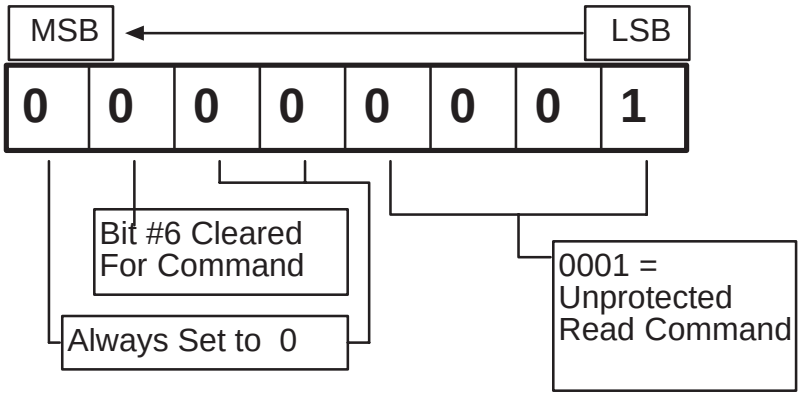
Use the unprotected read command to obtain data from the decoder's memory. Using this command you can "map" the memory of the decoder. The read command is structured as follows:



UNPROTECTED READ COMMAND

Unprotected Read Command Structure

COMMAND (Byte 0) - The command byte for the unprotected read command has the following structure.



STATUS (Byte 1)- Status byte is cleared.

TRANSACTION WORD (Bytes 2 & 3)- As stated earlier, the transaction word is provided by the host device and returned by the decoder (exactly as it was sent) in the reply.

HI- AND LOW ADDRESS (Bytes 4 & 5) - These bytes specify the area of memory in the decoder that is going to be read. There are four readable areas in the decoder's memory (memory addresses are provided in hexadecimal):

1) Current Bar Code Data - Address 100 to 3FF (hex). The bar code data is stored in the decoder's host port buffer as a packet, each packet contains the results of one read operation. The data is at address 100 (hex).

Note: Unlike the other readable areas of the decoder's memory, the host buffer may or may not contain data.

2) Decoder Configuration Block- Address 400 to 5FF. Refer to Appendix D for the addresses of the configuration parameters.

3) Status/Counters- Address 600 to 6FF. Table 8.B provides the addresses of the status and counters.

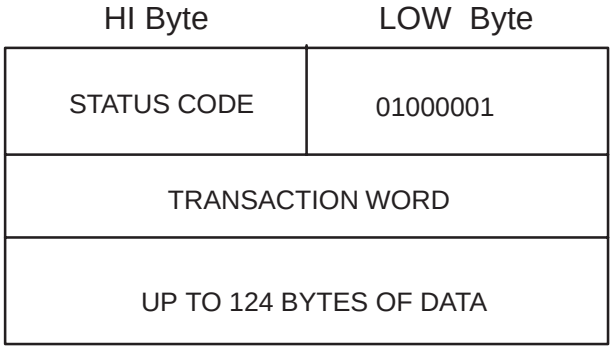
Address (Hexadecimal)	Contents	Number of Bytes
600	Package counter.	4
604	Output Counter Number 1	4
608	Output Counter Number 2	4
60C	Output Counter Number 3	4
610	Output Counter Number 4	4
614	Output Counter Number 5	4
618	Output Counter Number 6	4
61C	Output Counter Number 7	4
620	Output Counter Number 8	4
624	No-Read Counter	4

4) Last Message to Host- Address 800.

SIZE OF DATA (Byte 6)- The size of data field specifies the number of bytes that will be returned. A maximum of 124 bytes may be read.

Unprotected Read Reply Format

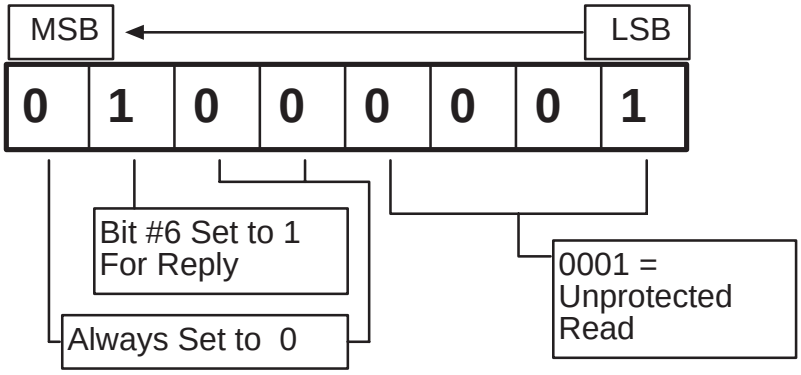
The decoder's reply to a read command has the following structure:



UNPROTECTED READ REPLY

The following are descriptions of the decoder's reply to a read command:

REPLY (Byte 0) - The reply byte has the following structure:



STATUS (Byte 1) - Refer to Table 8.A for an explanation of the status codes. If the returned status code is 00 (hexadecimal), an entire packet of data was removed from the decoder's buffer. A status code of 80 (hexadecimal) indicates that only part of a data packet was read.

Note: If only part of the data was read (status code 80 hexadecimal received), the entire packet of data will remain at the decoder's host port buffer. The remainder of the data can be read by using another read command that has an address that is the number of bytes received greater than the previous address:

First read command address = X

N = data bytes received with an 80 (hexadecimal) status code; indicating data was truncated.

Send another read command with an address of X + N

Continue read commands until a 00 (hexadecimal) status code is received indicating completion of the read. After the last segment of the data packet is sent, the data packet is removed from the decoder's host port buffer.

TRANSACTION WORD (Bytes 2 &3) - The transaction word (2 bytes) is the same as the transaction word sent with the Read Command.

DATA (Bytes 4 through 123)- Following the transaction word is the data (up to 124 bytes).

Unprotected Read Example

To help you understand how to use the unprotected read command, we have provided the following example. In this example we are going to read the contents of output counter #1 (contains count of 9).

HI Byte	LOW Byte
00000000 Status	00000001 Read Command
10101010	10101010 Transaction Word
00000110	00000100 Counter Address
00000000	00000010 2 Bytes Returned

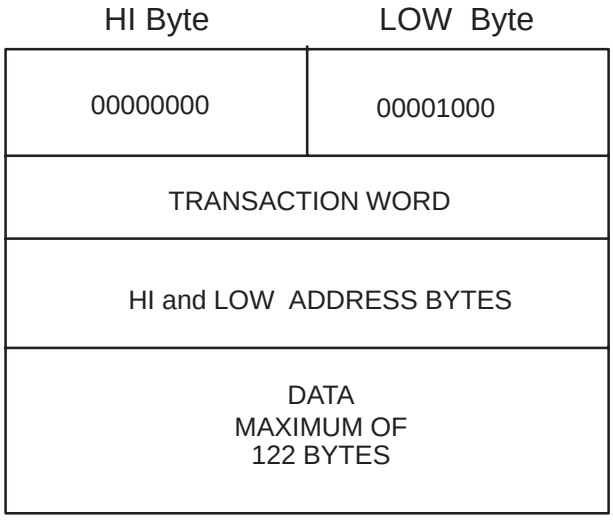
UNPROTECTED READ

HI Byte	LOW Byte
00000000 Status-Successful	01000001 Read Reply
10101010	10101010 Transaction Word
00000000	00001001 Count of 9

UNPROTECTED READ REPLY

Unprotected Write Command

You can use the unprotected write command to send configuration parameters and commands to the decoder. The write command is structured as follows:

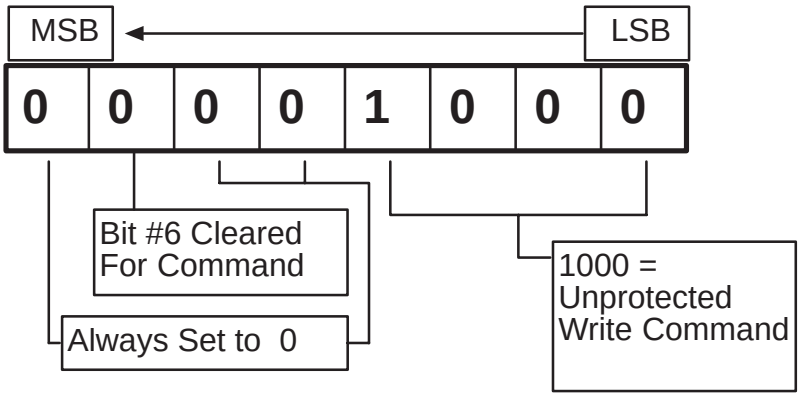


UNPROTECTED WRITE COMMAND

Unprotected Write Command Structure

The following are descriptions of each byte in the command.

COMMAND (Byte 0) - The command byte for an unprotected write command has the following structure:



STATUS (Byte 1) - The status byte is cleared for the command.

TRANSACTION WORD (Bytes 2 & 3) - The transaction word is provided by the host and is returned by the decoder (exactly as it was sent) in the reply.

HI and LOW ADDRESS (Bytes 4 & 5) - These bytes specify the area in the decoder's memory which are going to be written to. There are two areas of

the decoder's memory where the host can write data (addresses are provided in hexadecimal):

1) Configuration Block- Address 400 to 5FF. Refer to Appendix D for addresses of specific configuration data.

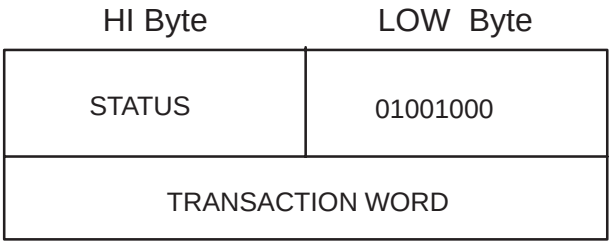
2) Command Area- 600 to 6FF. Writing to the command area will initiate a command. Table 8.C lists the commands that can be initiated.

Address (Hex)	Function	Address (Hex)	Function
600	Clear Package Counter.	630	Clear All Match Counters.
604	Clear Output Counter 1.	631	Clear All Counters.
608	Clear Output Counter 2.	632	Save Configuration to EEPROM.
60C	Clear Output Counter 3.	633	Set Configuration to Default Values.
610	Clear Output Counter 4.	634	Start Scan Trigger.
614	Clear Output Counter 5.	635	Stop Scan Trigger.
618	Clear Output Counter 6.	636	Flush Host Buffer.
61C	Clear Output Counter 7.	637	Restart.
620	Clear Output Counter 8.	640	Repeat Read (See page 8-13).
624	Clear No-Read Counter.	641	Cancel Repeat Read (See page 8-13).

DATA (Bytes 6 through 127)- These bytes contain the data that is to be written into memory (up to 122 bytes).

Unprotected Write Reply Format

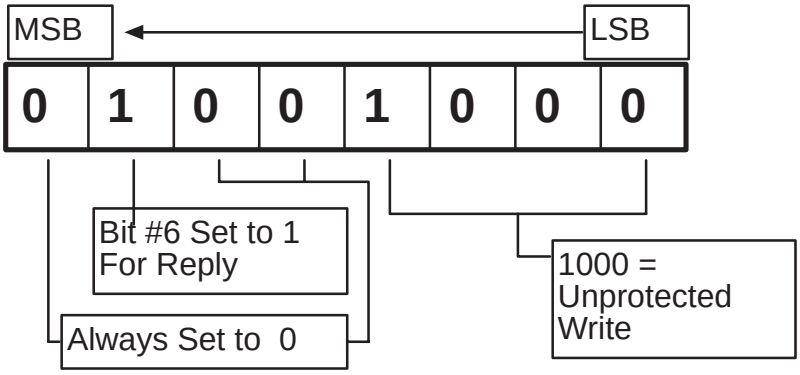
The decoder's reply to a write command has the following structure:



UNPROTECTED WRITE REPLY

The following are descriptions of each byte in the write reply message:

REPLY (Byte O)- The command reply byte has the following structure.



STATUS (Byte 1) - Table 8.A describes the meaning of the status codes. An invalid address will return a code of 10 (hex).

TRANSACTION WORD (Bytes 2 & 3) - These two bytes are the same transaction word that was sent out with the write command.

Writing to the Command Area Memory

Table 8.C lists the areas of memory in the command block of the decoder that the host can write to. When a specific address of the command block memory is used in a write command, that specific command will be initiated by the decoder. For example, to clear all counters the following write command would be sent:

HI Byte	LOW Byte
00000000	00001000
TRANSACTION WORD	
00000110	00110001

UNPROTECTED WRITE TO COMMAND AREA OF MEMORY

Note: The address for the Clear All Counters is 631 (hexadecimal) which is equivalent to 00000110 00110001 in binary.

Most of the commands that can be initiated using the write command are self explanatory (Table 8.C). Two of these commands (Repeat Read and Cancel Repeat Read) require an additional explanation:

REPEAT READ - The repeat read command instructs the decoder to wait for data. When data becomes available, the decoder will then send the data to

the host using a write command to a specific address in the host's memory. The host device does not have to request data, the decoder will automatically send data as it is decoded.

The repeat read command has the following structure:

HI Byte	LOW Byte
00000000	00001000
TRANSACTION WORD	
00000110	01000000
STARTING ADDRESS	
REPEAT (r)	SIZE (n)

REPEAT READ COMMAND

HIGH AND LOW ADDRESS (Bytes 4 & 5) - Specifies the address for the repeat read command (640 hexadecimal).

STARTING ADDRESS (Bytes 6 & 7) - The address of the host's memory where the first packet of data will be sent.

SIZE (n) (Byte 8) - The size specifies the the maximum number of bytes in each message sent to the host and functions like a read reply.

REPEAT (r) (Byte 9) - This value determines the total number of data packets or messages that can be sent to the host. If 0 is entered, then an unlimited number of messages may be sent to the host.

After a Repeat Read command is sent to the decoder, the decoder will return a write reply and then perform the repeat read function. The decoder will continue to send data until the repeat count is reached, a Repeat Cancel command is sent, or another Repeat Read command is received.

Writing to Configuration Area of Memory

Appendix D provides the address locations of the decoder's configuration memory. The host device can change the configuration of the decoder by directly writing data into these memory locations. Refer to Chapter 4 for a

description of the configuration parameters. For example to enable the large buffer you would instruct the host to send:

HI Byte	LOW Byte
00000000 Status	00001000 Write Command
10101010	10101010 Transaction Word
00000100	00011000 Buffer Address
00000000	00000001 Data- Value of 1

UNPROTECTED WRITE

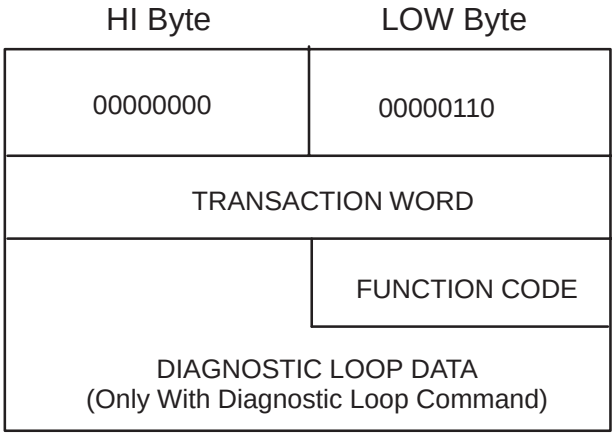
HI Byte	LOW Byte
00000000 Status- Successful	01001000 Write Reply
10101010	10101010 Transaction Word

UNPROTECTED WRITE REPLY

Note: In the example provided, the HI and LOW address (bytes 4 & 5) is for the host buffer area of memory (418 hexadecimal). The data (byte 6) is to enable the host buffer (1 = YES).

Communication Link Diagnostic Commands

You can obtain diagnostic data on the communications link (RS-485 Local-Area Network) using the diagnostic commands. The diagnostic command has the following structure:

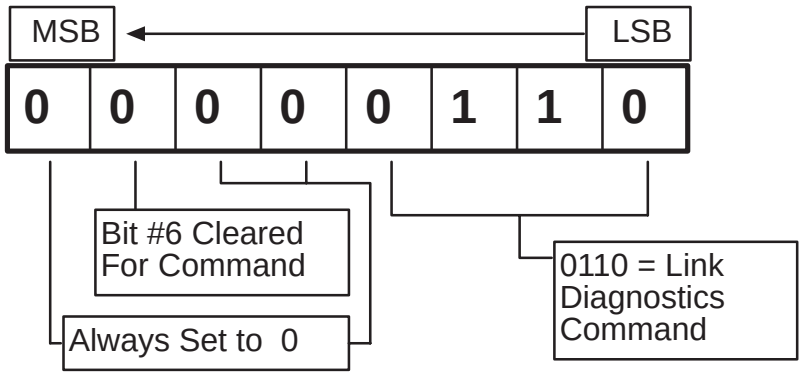


LINK DIAGNOSTIC COMMAND

Link Diagnostic Command Structure

The following are descriptions of each byte in the diagnostic link command:

COMMAND (Byte 0) - The command byte for the link diagnostics command has the following structure:



STATUS (Byte 1)- The status byte is cleared for command.

TRANSACTION WORD (Bytes 2 &3) - As with the other commands the transaction word is a two byte code that is returned (exactly as it was sent) in the decoder's reply message.

FUNCTION CODE (Byte 4)- The function code specifies the diagnostic command:

00 = Diagnostic Loop

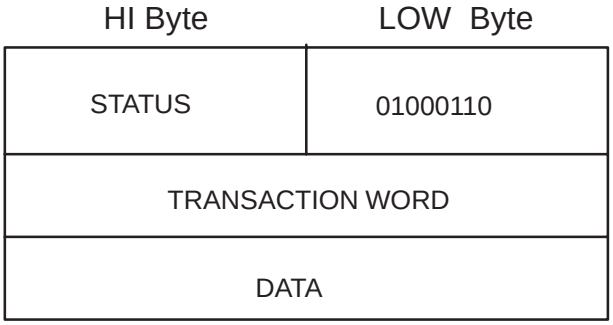
01 = Read Diagnostic Counters

03 = Read Diagnostic Status

07 = Reset Diagnostic Counters.

Diagnostic Link Reply Format

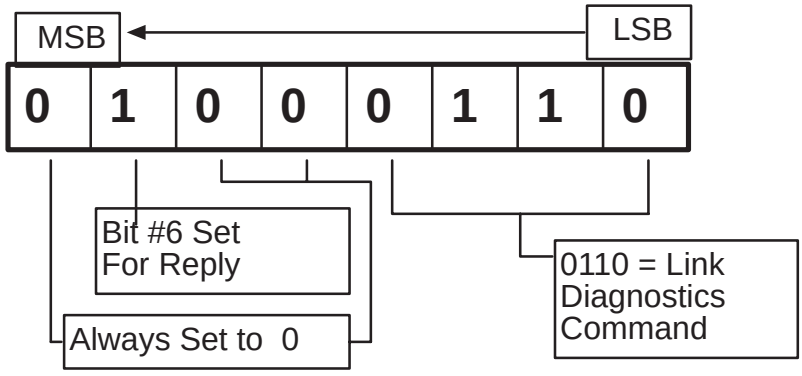
The decoder's reply to a diagnostic command has the following structure:



LINK DIAGNOSTIC REPLY

The following are explanations of each byte in the reply message:

REPLY (Byte 0) - The reply byte has the following structure:



STATUS (Byte 1) - Refer to Table 8.D for an explanation of the status codes.

TRANSACTION WORD (Bytes 2 &3) - The transaction word is returned exactly as it was sent in the command.

DATA (Bytes 4 through X) - Depending upon the function code, the following data is returned:

Read Diagnostic Counters Reply

Read Diagnostic Counters - The reply returns values for twelve diagnostic counters:

1) Total Message Packets Received (2 bytes).

2) Total Message Packets Sent (2 bytes).

3) Message ACK Time-out/Retries (1 byte).

4) Message Retry Failures (1 byte).

5) Messages Replied with NAK-NOMEMORY (1 byte).

6) Message Received with NAK-NOMEMORY (1 byte).

7) Bad Messages Received (1 byte).

8) Messages Replied with NAK-NOSERVICE (1 byte).

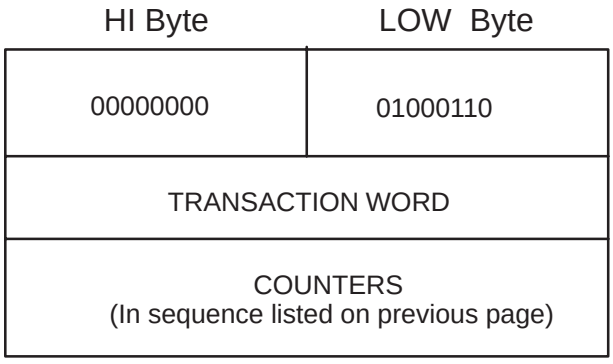
9) Message Replied with NAK-SOLICIT (1 byte)

10) Messages Replied with NAK-TOOBIG (1 byte).

11) Messages Replied with INVALID CMD (1byte).

12) Messages Received with INVALID ADDR (1 byte).

The data in the read diagnostic counters reply message has the following structure:



READ DIAGNOSTIC COUNTERS REPLY

Read Diagnostic Status Reply

Read Diagnostic Status - Seven diagnostic status parameters can be read:

1)	Mode/Status	(00)	(1 byte)
2)	Extender Type	(EE hex)	(1 byte)
3)	Interface Type	(22 hex)	(1 byte)
4)	Processor Type	(21 hex)	(1 byte)
5)	Series/Revision	(00)	(1 byte)
6)	Bulletin Number/Name	(ASCII)	(11 bytes)
7)	Product Information	(unused)	(8 bytes)

The read diagnostic status reply message has the following organization. Characters in quotes ‘ ’ are ASCII equivalent characters all other values are hexadecimal.

HI Byte	LOW Byte
00000000	01000110
TRANSACTION WORD	
EE 21 ‘2’ ‘5’ ‘-’ ‘M’ 0 20	00 22 00 ‘7’ ‘5’ ‘D’ ‘9’ 20 20
Next eight bytes = 00	

READ DIAGNOSTIC STATUS REPLY

The Reply (Byte 0) is a value of 46 (hex).

The Status (Byte 1) is listed in Table 8.D

The Transaction Word (Bytes 2 & 3) are returned the same as sent in the read command.

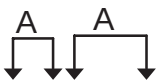
The Mode/Status (Byte 4) is unused. A value of 00 (hex) will be returned.

The Extender Type (Byte 5) is unused. A value of EE (hex) will be returned.

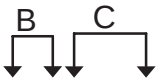
The Interface Type (Byte 6) will be returned as a value of 22 (hex).

The Processor Type (Byte 7) will be returned as a value of 21 (hex).

The Series/Revision (Byte 8) indicates the decoder series and revision levels. The first three most significant bits indicate the series and the five other bits indicate the revision. A value of 0 (hex) = A, 1 (hex) = B, etc. For example:



Series A, Revision A decoder would return- 00000000



Series B, Revision C decoder would return- 00100010

The Bulletin Number/Name (Bytes 9 through 19) will be returned as an ASCII encoded message “2755-DM9 [SPACE][SPACE][SPACE]”.

The Product Information (Bytes 20 through 27) are unused and returned as a value of 00 (hex).

Diagnostic Loop Reply

Diagnostic Loop - Refer to the following illustration. The response to a diagnostic loop command echoes any data contained in the diagnostic loop data area of the command.

HI Byte	LOW Byte
00000000	01000110
TRANSACTION WORD	
LOOP DATA (SAME DATA AS COMMAND)	

DIAGNOSTIC LOOP REPLY

Reset Counters Reply

Reset Counters - After resetting the counters, the decoder returns the following:

HI Byte	LOW Byte
00000000	01000110
TRANSACTION WORD	

RESET COUNTERS REPLY

Chapter 9

Maintenance and Troubleshooting

Chapter Objectives

This chapter provides maintenance procedures and troubleshooting charts.

Maintaining the Decoder

WARNING: Other than fuses, the decoder does not contain any user serviceable items. Do not remove the decoder cover. A separate access panel is provided for access to the modules and their fuses.

Power Input Fuse Replacement

The power input module fuse protects the decoder from current overloads. The fuse is located next to the power cord connector. To replace the fuse:

1) Disconnect the power from the decoder.

2) Try to determine which component is faulty (check cables for shorts). Since the decoder contains no user serviceable components, you can only isolate the problem to the scan head, cables, or decoder. Disconnect the scan head cable from the decoder and replace the fuse as described below. If the fuse blows again without the scan head, the problem is with the decoder. If fuse blows again when scan head is reconnected, the problem is with the scan head or scan head cable.

3) Use a small screwdriver to remove the power input fuse module. The input fuse module is located next to the power cord connector. Pry on the tab provided using the small screwdriver. The fuse module will slide out. Refer to Figure 9.1.

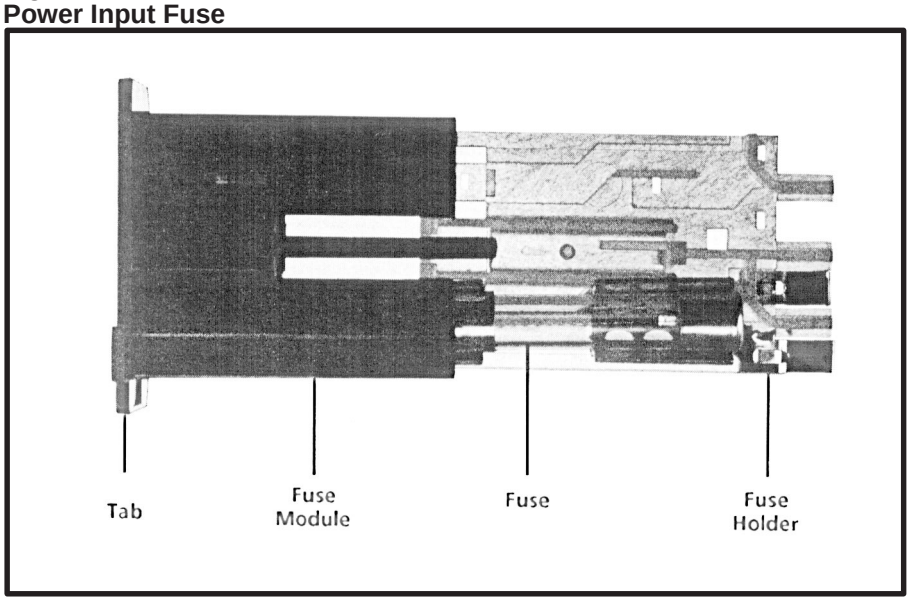
4) Remove fuse holder from the fuse module.

5) Remove and install new fuse: 250V, (1 amp, slow blow), 5 x 20 mm or 3AG.

6) Insert fuse holder into fuse module and reinstall fuse module into the decoder.

7) Apply power to verify operation of the decoder.

Figure 9.1
Power Input Fuse



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Module Fuse Replacement

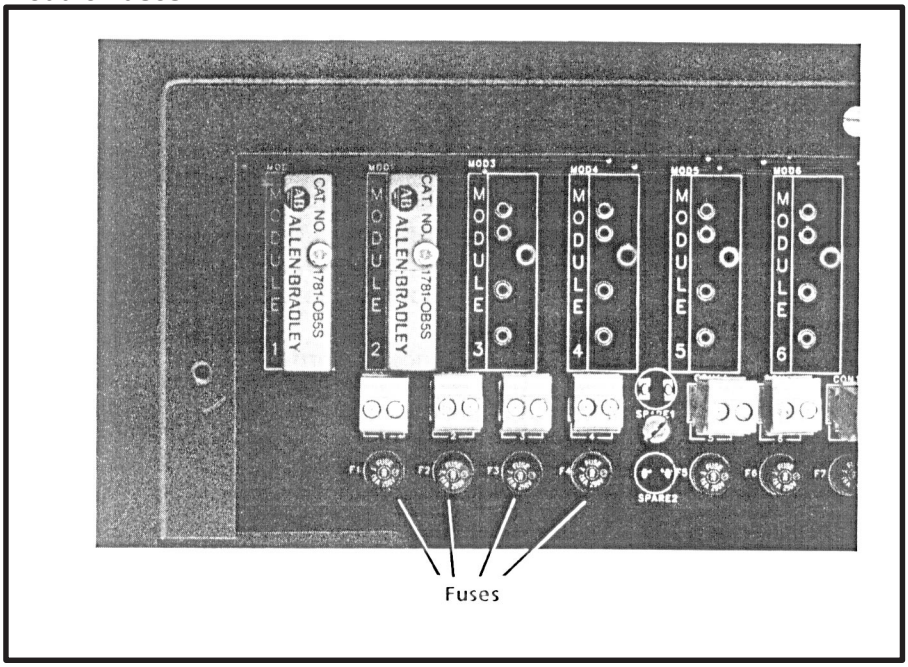
The module fuses are located on the decoder circuit board next to the modules (refer to Figure 9–2). To replace these fuses:

1) Disconnect the power from both the decoder and the module.

2) Isolate reason for fuse blowing and correct problem.

3) Remove module access cover.

Figure 9.2
Module Fuses



90–061–3

4) Remove and install new fuse (Replacement Part No. W77104–899–01).

5) Install access cover, apply power, and test to verify operation of module.

Troubleshooting

Refer to Table 9.A for troubleshooting. It is impossible to list every possible malfunction. If a problem occurs that is not listed in the troubleshooting table, refer the problem to your A–B service representative.

Problem	Probable Cause(s)	Corrective Action(s)
Decoder POWER indicator does not light and scan head does not operate.	Decoder is not turned on.	Turn decoder on.
	No incoming power.	Verify power source.
	Improper connection to power source.	Check connections.
	Input power fuse is blown.	Replace input power fuse.
	Faulty power cord.	Replace power cord.
Scan head PWR ON indicator does not light. Decoder POWER indicator is lit.	Cable connection between scan head and decoder is loose.	Check cable connections.
	Defective cable between scan head and decoder.	Replace cable.
	Defective scan head.	Refer to scan head user's manual.
No communication between decoder and programming terminal.	Communication parameters of programming terminal and decoder do not match.	Check that baud rate, parity, and number of stop bits match.
	Incorrect CRT type selected on CRT type select screen .	Review section of this manual on the CRT select screen and select your type of terminal.
	Incorrect CRT setup.	Verify setup using Appendix A.
	Improperly connected cable.	Check cable connections.
	Improperly fabricated cable.	Verify setup using Appendix A.
No communication between decoder and a host device.	Host/Decoder communication parameters do not match.	Check setup screen #1 and verify that correct communication parameters are set. If incorrect, change parameters, SAVE configuration, and reset the decoder.
	Improperly connected cable.	Check connections.
	Improperly fabricated cable.	Verify connections using Chapter 6.

Problem	Probable Cause(s)	Corrective Action(s)
Unable to read a label.	Improperly positioned scan head or labels.	Refer to scan head user's manual.
	Decoder is improperly programmed.	Check the configuration of the decoder to make sure parameters are set for your application. Check: • Trigger mode. • Code type. • Length of code. • Minimum number of reads before valid read (capture count). • Use of check digit.
	Poor quality labels.	Verify by either checking labels or using labels known to be within AIM specifications.
	Loose cables or connections.	Check cables and connections.
	Defective or improperly adjusted scan head.	Refer to scan head user's manual.
Output modules do not operate.	Improperly defined parameters.	Review setup configuration to verify that correct parameters have been entered.
	Improper connections.	Check connections to the output modules. Verify that power is present. Check polarity of DC modules.
	Output module fuse blown	Determine reason for fuse blowing, correct problem, and then replace fuse.
	Defective output module.	Replace module.

Chapter 10

Specifications

Decoder - Catalog Number 2755-DM9 & 2755-DM9E

Electrical

Input Line Voltage:	85-264 VAC, 47-63 Hz
Power:	50 VA maximum with scan head attached.

Mechanical

Enclosure:	Steel (NEMA Type 1)
LED Indicators:	• POWER • LASER ON • TRIGGER ACTIVE • VALID READ • CPU ACTIVE • COMMUNICATIONS • OUTPUTS 1 through 8
Weight:	8.8 lbs (4.0 kg)
Dimensions:	14” x 10.75” x 2.81” (356 x 273 x 71 mm)
Environment:	Ambient temperature range 32° to 122°F (0° to 50°C)
Relative Humidity:	5-95%, noncondensing

Communications

Communication Port (Host)	• RS-422, RS-232, RS-485 (LAN) • Baud Rates: 300, 1200, 2400, 4800, 9600, 19200, 38400 • Parity: none, odd, even • Data Bits: 7 or 8 • Stop Bits: 1 or 2 • Flow Control: None, Xon/Xoff, RTS/CTS
Communication Port (Aux)	• Data Bits: 8 • Stop Bit: 1 • Baud Rate: 9600 • Parity: None

Output Modules

Number of Outputs:	Two modules provided, up to eight outputs can be installed.

Pulse Durations:	Programmable from 10 to 9999 milliseconds (0 disables output) Accuracy ± 5 milliseconds.
Conditions for Output:	Read (Package), No-Read (Package), Match-Complete, Match Entry, Read and No-Match, No-Read or No-Match.
Electrical Characteristics	See following tables.

Output Modules

Catalog No.	1781-0B5S	1781-0A5S	1781-0M5S
Nominal Line Voltage	--	120 VAC	240 VAC
Maximum Line Voltage	60 VDC	140 VAC	280 VAC
Minimum Line Voltage	3.0 VDC	12 VAC	24 VAC
Maximum Peak Off State Voltage	60 VDC	400 V Peak	600 V Peak
Maximum Off-State Leakage	1.0 mA	2.5 mA RMS	4.0 mA RMS
Static off-state dv/dt	--	200 V/ usec	200 V/ usec
Maximum On-State Current	0.5 A DC	0.5 A RMS	0.5 A RMS
Minimum On-State Current	10 mA DC	50 mA RMS	50 mA RMS
Maximum 1 Cycle Surge	--	4.0 A Peak	4.0 A Peak
Maximum 1 Second Surge	1.5 A DC	--	--
Peak On-State Voltage	1.5 V DC	1.6 V Peak	1.6 V Peak

Input Modules

Catalog No.	1781-IB5S	1781-IA5S	1781-IM5S
Maximum Input Voltage	32 VDC	140V RMS/AC	280 V RMS/AC
Minimum Input Voltage	3.3 VDC	90V RMS/AC	180 V RMS/AC
Input Resistance	1k ohm	-	-
Maximum Input Current	32mA DC @ 32 VDC	10mA RMS @ 140 VRMS	8mA RMS @ 280 VRMS
Drop Out Current	1.0 mA DC	2.5 mA RMS	1.5 mA RMS
Allowable Off State Input Current	1.0 mA DC	3.0 mA RMS	2.0 mA RMS
Allowable Off State Input Voltage	2.0 VDC	50 VRMS/AC	120 VRMS/AC

Appendix A

Setting Up the Programming Terminal

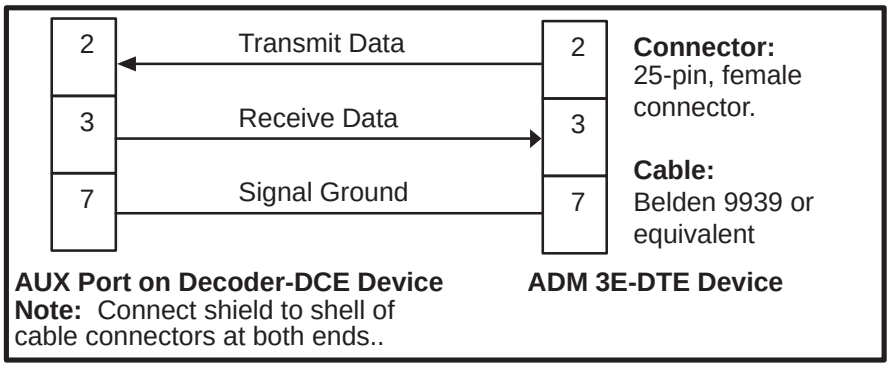
Using a Lear Siegler ADM 3E Terminal for Programming

If you are using a Lear Siegler ADM 3E, follow these steps:

Step 1 - Connect the scan head to the decoder.

Step 2 - Construct an appropriate cable to connect the Decoder to the ADM 3E. Refer to Figure A.1.

Figure A.1
Connections for Cable Used With an ADM 3E Terminal



Step 3 - Set the terminal for:

- Full Duplex (FDX)
- 9600 Baud
- 8 data bits per character
- No Parity
- XON/XOFF flow control or handshake
- Blinking Block Cursor

Step 4 - Plug decoder and terminal into power supply.

Step 5 - Turn terminal ON.

Step 6 - Enter Set-Up B on the terminal.

Step 7 - Turn the decoder ON.

Step 8 - Proceed with programming (Chapter 4).

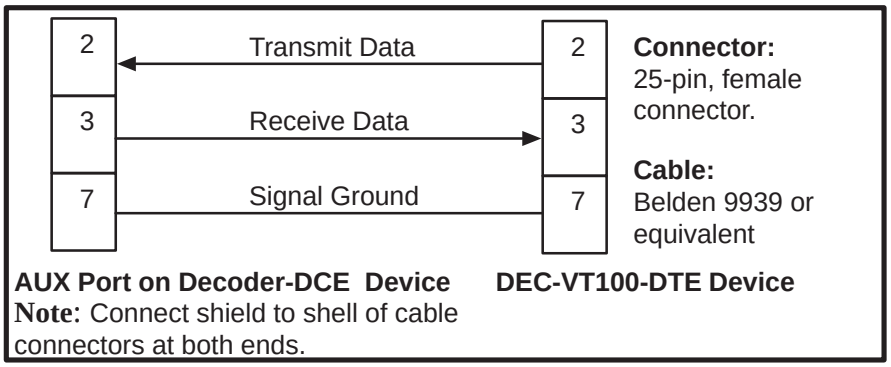
Using a DEC-VT100 for Programming

If you are using a DEC -VT100, follow these steps:

Step 1 - Connect the scan head to the decoder.

Step 2 - Construct an appropriate cable to connect the Decoder to the VT-100. Refer to Figure A.2.

Figure A.2
Connections for Cable Used with DEC-VT100 Terminal

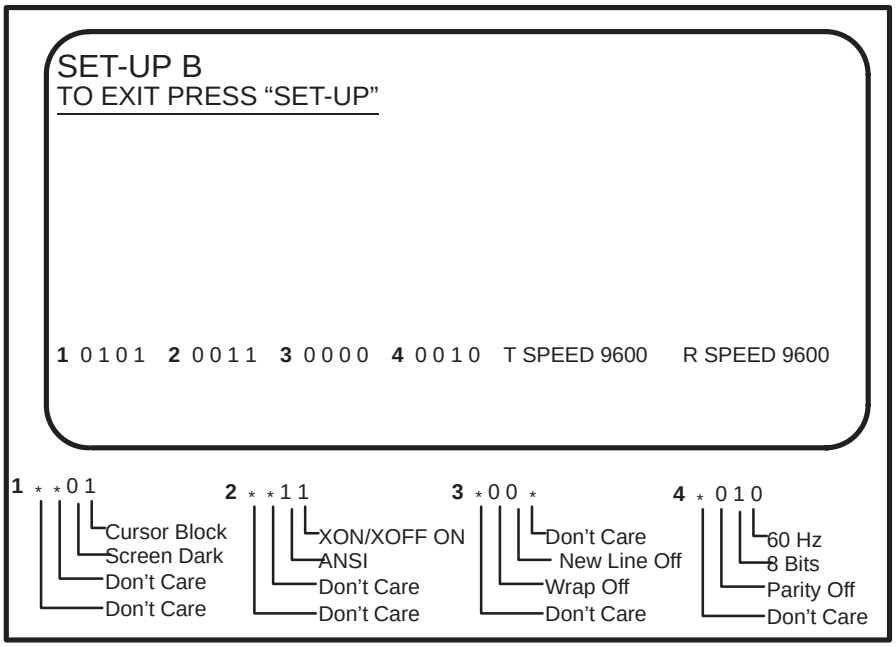


Step 3 - Plug decoder and terminal into power supply.

Step 4 - Turn terminal ON.

Step 5 - Enter Set-Up B on the terminal. Figure A.3 shows one possible setup for the terminal.

Figure A.3
One possible setup for DEC-VT100 Terminal



Step 6 - Turn the decoder ON.

Step 7 - Proceed with programming the system as described in Chapter 4.

Using a Catalog Number 1784-T45 Terminal for Programming

The Catalog No. 1784-T45 Programming Terminal may be used to program the 2755-DM9, -DM9E decoder. Set the T45 Terminal Emulation to the following:

- F1DGC D200 Terminal
- F2Modem = External
- F3Flow Control = On
- F4Duplex = Full
- F6Print = Off

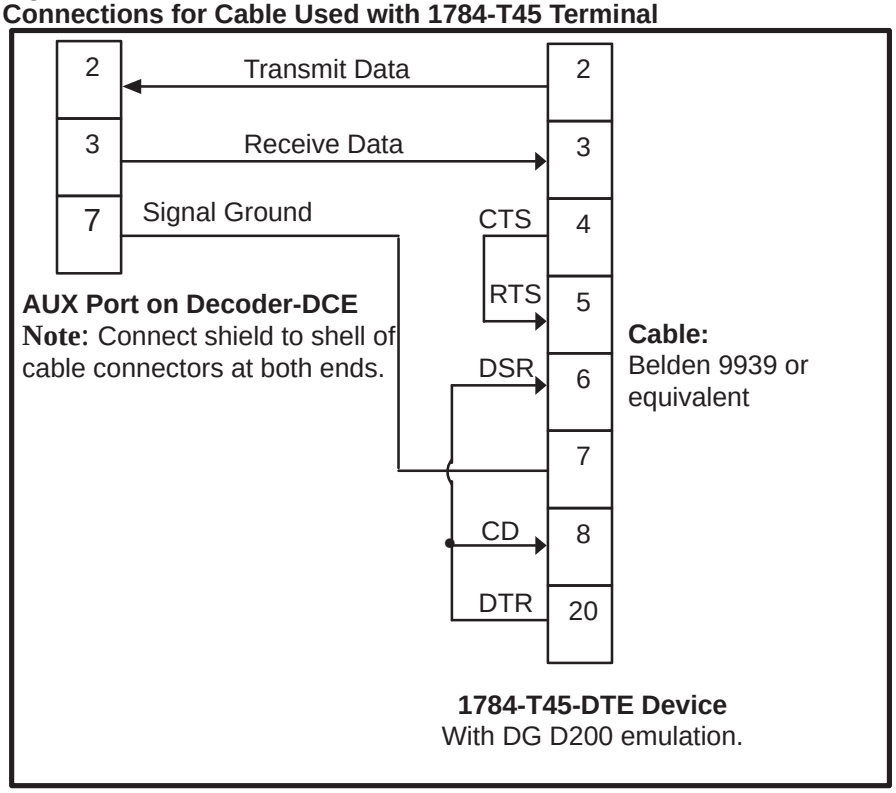
Set the COM 1 parameters to:

- F1Baud = 9600
- F2Parity = None
- F3Data Bits = 8
- F4Stop Bits = 1
- F5Type = Standard PC Compatible Com

Note: If an internal modem is being used, it must be disabled using the MODE command.

Fabricate the cable shown in Figure A.4.

Figure A.4
Connections for Cable Used with 1784-T45 Terminal



When the **Select CRT Type** menu appears, select Data General D200 emulation.

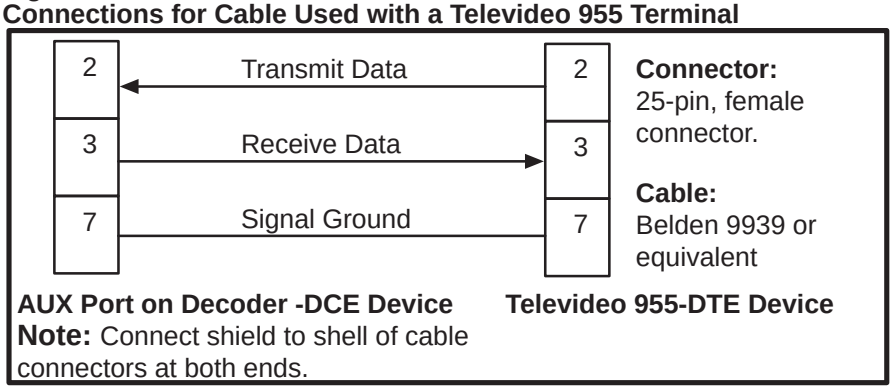
Using a Televideo 955 Terminal for Programming

If you are using a Televideo 955, follow these steps:

Step 1 - Connect the scan head to the decoder.

Step 2 - Construct an appropriate cable to connect the Decoder to the terminal. Refer to Figure A.5.

Figure A.5
Connections for Cable Used with a Televideo 955 Terminal



Step 3 - Plug decoder and terminal into power supply.

Step 4 - Turn terminal ON.

Step 5 - Set terminal configuration as follows:

MAIN PORT 1

Baud Rate = 9600
Word = 8
Parity = No
Stop = 1
Comm = FDX
Hand = X-ON

SCREEN FORMAT

Col = 80
Top = No
Bot = No
Wrap = Off
TOB = No

SCREEN ATTR

Back = Dark
Cur = BBlk
Attr = Space
Base = Page
Norm = Full
Stat = Norm

KEYBOARD 1

CR = CR
Down = ^/V
EDTK = DUPE
REPT = ON

MAIN PORT 2

IMDM = Off

KEYBOARD 2

Esc = Enable

Step 6 - Turn the decoder ON.

Step 7 - Proceed with programming the system as described in Chapter 4.

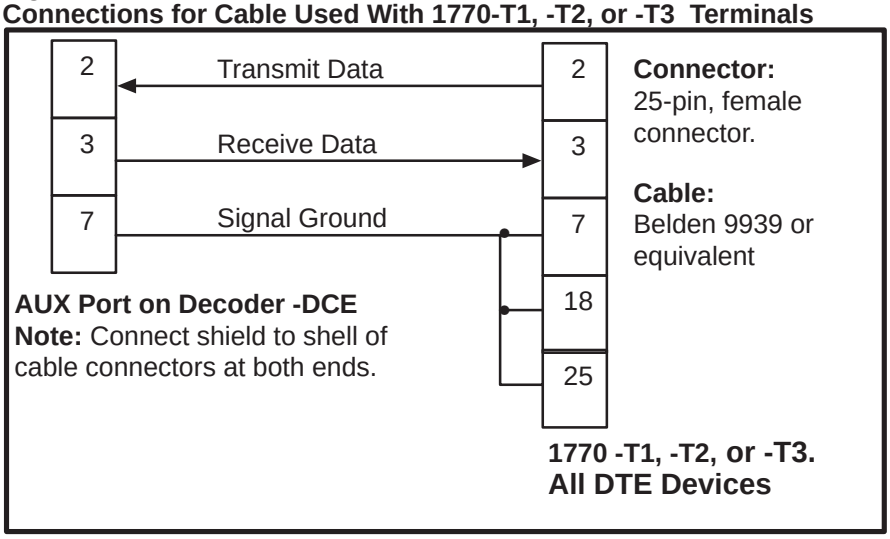
Using a Catalog Number 1770-T1, -T2 or -T3 Terminal for Programming

If you are using an Allen-Bradley 1770-T1, -T2, or -T3 programming terminal, follow these steps:

Step 1 - Connect the scan head to the decoder.

Step 2 - Construct an appropriate cable to connect the decoder to the terminal (Channel B). Refer to Figure A.6.

Figure A.6
Connections for Cable Used With 1770-T1, -T2, or -T3 Terminals



Step 3 - Plug decoder and terminal into power supply.

Step 4 - Turn terminal ON.

Step 5 - Select Alphanumeric mode and set the following parameters:

- Baud Rate = 9600
- Parity = None
- Stop Bits = 1
- Channel Config. = B IN/OUT
- Duplex = Full
- Channel C = On *or* Off
- Cursor = On
- Auto Line Feed After Return = Off
- Control Code Display = Off

Note: Use the [Ctrl] and U, D, L, or R keys for Up, Down, Left, and Right cursor movement.

Step 6 - Turn the decoder ON.

Step 7 - Proceed with programming the system as described in Chapter 4.

Appendix **B**

Default Parameters of Decoder

The following table lists the factory set default parameters of the decoder.

Type	Default Parameters		
Message Format	Send Bar Code Data:	**Yes**	
	Send Package Count:	**No**	
	Send Bar Code Type:	**No**	
	Send Source Identifier:	**No**	
	Send Header Message:	**No**	
	Send No–Read Message:	**No**	
	Expand UPC–E:	**Yes**	
	Source Identifier:	**None**	
	Label Delimiter:	**None**	
	Start Character:	**None**	
	End Message:	**CRLF**	
	Transmission Check:	**None**	
	Header Message:	**None**	
	No–Read Message:	**None**	
	Code 39 Check Character:	**No**	Send**: No**
	I 2–of–5 Check Character:	**No**	Send**: No**
	Codabar Check Character:	**No**	Send**: No**
Host Communication Parameters	Baud rate:	**9600**	
	Bits/Char:	**8 Data, 1 Stop**	
	Parity:	**None**	
	ACK Character:	**None**	
	NAK Character:	**None**	
	Start Scan Character:	**None**	
	Stop Scan Character:	**None**	
	Large Buffer:	**No**	
	Response Mode:	**End Of Trigger**	
	Host Protocol:	**RS–232**	
	Device Address:	**01**	
Package Detect Input	Filter:	**No**	
	Sense:	**Lo = Package**	
Bar Code Type	Code 39:	**Enabled**	
	Interleaved. 2–of 5:	**Disabled**	
	Code 128:	**Disabled**	
	Codabar:	**Disabled**	
	UPC–A:	**Disabled**	
	UPC–E:	**Disabled**	
	EAN–8:	**Disabled**	
	EAN–13:	**Disabled**	
Bar Code Lengths	Code 39:	**00, 00, 00, 00, 00, 00, 00, 00**	
	Interleaved. 2–of 5:	**00, 00, 00, 00, 00, 00, 00, 00**	
	Code 128:	**00, 00, 00, 00, 00, 00, 00, 00**	
	Codabar:	**00, 00, 00, 00, 00, 00, 00, 00**	

Appendix B
Default Parameters of the Decoder

Type	Default Parameters	
Scanner Control	Laser On Mode:	**Continuous**
	Decode Trigger:	**Package Detect**
	Capture Count:	2
	Fields/Scan:	1
	Fields/Package:	1
	No–Read Timer:	0
	Inter–Scan Timer:	0
	Match Complete:	1
Match Code Table (1–8)	Bar Code Symbology:	**Code 39**
	Match Code Enable:	N (No)
	Text String:	None
Outputs (1–8)	Condition To Assert:	**None**
	Output Pulse Duration:	0

Appendix C

ASCII Conversion Table

ASCII or Control Char.	Decimal Value	Hex Value	ASCII or Control Char.	Decimal Value	Hex Value	ASCII or Control Char.	Decimal Value	Hex Value	ASCII or Control Char.	Decimal Value	Hex Value
NUL	0	0	[Space]	32	20	@	64	40	‘	96	60
SOH	1	1	!	33	21	A	65	41	a	97	61
STX	2	2	”	34	22	B	66	42	b	98	62
ETX	3	3	#	35	23	C	67	43	c	99	63
EOT	4	4	$	36	24	D	68	44	d	100	64
ENQ	5	5	%	37	25	E	69	45	e	101	65
ACK	6	6	&	38	26	F	70	46	f	102	66
BEL	7	7	’	39	27	G	71	47	g	103	67
BS	8	8	(	40	28	H	72	48	h	104	68
HT	9	9	)	41	29	I	73	49	i	105	69
LF	10	A	*	42	2A	J	74	4A	j	106	6A
VT	11	B	+	43	2B	K	75	4B	k	107	6B
FF	12	C	,	44	2C	L	76	4C	l	108	6C
CR	13	D	–	45	2D	M	77	4D	m	109	6D
SO	14	E	.	46	2E	N	78	4E	n	110	6E
SI	15	F	/	47	2F	O	79	4F	o	111	6F
DLE	16	10	0	48	30	P	80	50	p	112	70
DC1	17	11	1	49	31	Q	81	51	q	113	71
DC2	18	12	2	50	32	R	82	52	r	114	72
DC3	19	13	3	51	33	S	83	53	s	115	73
DC4	20	14	4	52	34	T	84	54	t	116	74
NAK	21	15	5	53	35	U	85	55	u	117	75
SYN	22	16	6	54	36	V	86	56	v	118	76
ETB	23	17	7	55	37	W	87	57	w	119	77
CAN	24	18	8	56	38	X	88	58	x	120	78
EM	25	19	9	57	39	Y	89	59	y	121	79
SUB	26	1A	:	58	3A	Z	90	5A	z	122	7A
ESC	27	1B	;	59	3B	[	91	5B	{	123	7B
FS	28	1C	<	60	3C	\	92	5C	|	124	7C
GS	29	1D	=	61	3D	]	93	5D	}	125	7D
RS	30	1E	>	62	3E	^	94	5E	¿	126	7E
US	31	1F	?	63	3F	_	95	5F			

Appendix D

Configuration Areas of Memory

PCCC Address	Configuration Parameter	Number of Bytes	(* = Default) Acceptable Values
400h	Send Bar Code Data	1	0 = No 1 = *Yes
401h	Send Package Count	1	0 = *No 1 = Yes
402h	Send Bar Code Type	1	0 = *No 1 = Yes
403h	Send Source Ident	1	0 = *No 1 = Yes
404h	Send Header Message	1	0 = *No 1 = Yes
405h	Send No–Read Message	1	0 = *No 1 = Yes
406h	Expand UPC–E	1	0 = No 1 = *Yes
407h	Label Delimiter	1	ASCII 0–255, 255 = *None
408h	Start Character	1	ASCII 0–255, 255 = *None
409h	End Message	1	0 = None 1 = *CRLF 2 = CR 3 = LF 4 = ETX
40Ah	Transmission Check	1	0 = *None 1 = LRC 2 = Checksum–LSB 3 = Checksum–MSB
40Bh	Code 39 Check Char	1	0 = *No 1 = Yes
40Ch	Send Code 39 Check Char	1	0 = *No 1 = Yes
40Dh	I 2–of–5 Check Char	1	0 = *No 1 = Yes
40Eh	Send I 2–of–5 Check Char	1	0 = *No 1 = Yes
40Fh	Codabar Check Char	1	0 = *No 1 = Yes
410h	Send Codabar Check Char	1	0 = *No 1 = Yes

PCCC Address	Configuration Parameter	Number of Bytes	(* = Default) Acceptable Values
411h	Host Port - Baud Rates (READ–ONLY)	1	0 = *9600 1 = 4800 2 = 2400 3 = 1200 4 = 300 5 = 19200 6 = 38400
412h	Host Port - Stop Bits (READ–ONLY)	1	0 = *8 data, 1 stop 1 = 8 data, 2 stop 2 = 7 data, 1 stop 3 = 7 data, 2 stop
413h	Host Port - Parity (READ–ONLY)	1	0 = *None 1 = Odd 2 = Even
414h	Host Port - ACK Character	1	ASCII 0–255, 255 = *None
415h	Host Port - NAK Character	1	ASCII 0–255, 255 = *None
416h	Start Scan Character	1	ASCII 0–255, 255 = *None
417h	Stop Scan Character	1	ASCII 0–255, 255 = *None
418h	Enable Large Buffer	1	0 = *No 1 = Yes
419h	Response Mode	1	0 = *End of Trigger 1 = After Valid Package
41Ah	Host Protocol (READ–ONLY)	1	0 = *RS232 1 = RS232 XON/XOFF 2 = RS232 RTS/CTS–1 3 = RS232 RTS/CTS–2 4 = RS422 5 = RS422 XON/XOFF 6 = RS485 PCCC–1 7 = RS485 PCCC–2 8 = RS485 ASCII–1 9 = RS485 ASCII–2
41Bh	Device Address (READ–ONLY)	1	00, *01 – – – 31
41Ch	Enable Input Filter and Set Sense of Package Detect Input	1	0 = *No Filter, LO = Package 1 = Filter (15 msec), LO = Package 2 = No Filter, HI = Package 3 = Filter (15 msec), HI = Package
41Dh	Enable Code 39	1	0 = No 1 = *Yes
41Eh thru 425h	Code 39 Specific Lengths	8	*0 – – – 64
426h	Enable Interleaved 2 of 5	1	0 = *No 1 = Yes
427h thru 42Eh	I 2–of–5 Specific Lengths	8	*0 – – – 64 (Must be even)

PCCC Address	Configuration Parameter	Number of Bytes	(* = Default) Acceptable Values
42Fh	Enable Code 128	1	0 = *No 1 = Yes
430h thru 437h	Code 128 Specific Lengths	8	*0 – – – 64
438h	Enable Codabar	1	0 = *No 1 = Yes
439h thru 440h	Codabar Specific Lengths	8	*0 – – – 64
441h	Enable UPC–A	1	0 = *No 1 = Yes
442h	Enable UPC–E	1	0 = *No 1 = Yes
443h	Enable EAN–8	1	0 = *No 1 = Yes
444h	Enable EAN–13	1	0 = *No 1 = Yes
445h	Laser–On Mode	1	0 = *Continuous 1 = Triggered
446h	Decode Trigger Mode	1	0 = *Package Detect 1 = Host 2 = Internal 3 = Continuous
447h	Capture Count	1	1, *2 – – – 8
448h	Fields/Scan	1	0 = Any 1 = *1 2 = 2 3 = 3 4 = 4
449h	Fields/Package	1	*1 – – – 8
44Ah	Match Complete Count	1	*1 – – – 8
44Bh	Source Ident Length Source Ident String	1 4	0–4, 0 = *empty 4 Characters
450h	Header Message Length Header Message String	1 32	0–32, 0 = *empty 32 Characters
471h	No–Read Message Length No–Read Message String	1 32	0–32, 0 = *empty 32 Characters
492h	No–Read Timer	2	*0 = Timer Disabled 0010 – – – 9999

PCCC Address	Configuration Parameter	Number of Bytes	(* = Default) Acceptable Values
494h	Inter–Scan Timer	2	*0 = Timer Disabled 0010 – – – 9999
496h	Bar Code Type in Match Code Table Entry 1	1	0 = *Code 39 1 = Interleaved 2 of 5 2 = Codabar 3 = UPC–A 4 = UPC–E 5 = EAN–8 6 =EAN–13 7 =Code 128
497h	Enable Match Code Table Entry 1	1	0 = *No 1 = Yes
498h	Match Code 1) Length Match Code 1) String	1 32	0–32, 0 = *empty 32 Characters
4B9h	Output Condition 1	1	0 = *None 1 = Read (Package) 2 = No–Read (Package) 3 = Match–Complete 4 = Match Entry 5 = Read and No–Match 6 = No–Read or No–Match 7 = Auto Load
4BAh	Output Pulse 1) Duration	2	*0, 10 – – – 9999
4BCh	Bar Code Type in Match Code Table Entry 2	1	0 = *Code 38 1 = Interleaved 2 of 5 2 =Codabar 3 = UPC–A 4 =UPC–E 5 = EAN–8 6 = EAN–13 7 = Code 128
4BDh	Enable Match Code Table Entry 2	1	0 = *No 1 = Yes
4BEh	Match Code 2) Length Match Code 2) String	1	0–32, 0 = *empty 32 Characters
4DFh	Output Condition 2	1	0 = *None 1 = Read (Package) 2 = No–Read (Package) 3 = Match–Complete 4 = Match Entry 5 = Read and No–Match 6 = No–Read or No–Match 7 = Auto Load
4E0h	Output Pulse 2) Duration	2	*0, 10 – – – 9999

PCCC Address	Configuration Parameter	Number of Bytes	(* = Default) Acceptable Values
4E2h	Bar Code Type in Match Code Table Entry 3	1	0 = *Code 39 1 = Interleaved 2 of 5 2 = Codabar 3 = UPC–A 4 = UPC–E 5 = EAN–8 6 = EAN–13 7 =Code 128
4E3h	Enable Match Code Table Entry 3	1	0 = *No 1 = Yes
4E4h 505h	Match Code 3) Length Match Code 3) String Output Condition 3	1 32 1	0–32, 0 = *empty 32 Characters 0 = *None 1 = Read (Package) 2 = No–Read (Package) 3 = Match–Complete 4 = Match Entry 5 = Read and No–Match 6 = No–Read or No–Match 7 = Auto Load
506h	Output Pulse 3) Duration	2	*0, 10 – – – 9999
508h	Bar Code Type in Match Code Table Entry 4	1	0 = *Code 39 1 = Interleaved 2 of 5 2 = Codabar 3 = UPC–A 4 = UPC–E 5 = EAN–8 6 = EAN–13 7 = Code 128
509h	Enable Match Code Table Entry 4	1	0 = *No 1 = Yes
50Ah	Match Code 4) Length Match Code 4) String	1 32	0–32, 0 = *empty 32 Characters
52Bh	Output Condition 4	1	0 = *None 1 = Read (Package) 2 = No–Read (Package) 3 = Match–Complete 4 = Match Entry 5 = Read and No–Match 6 = No–Read or No–Match 7 = Auto Load
52Ch	Output Pulse 4) Duration	2	*0, 10 – – – 9999

PCCC Address	Configuration Parameter	Number of Bytes	(* = Default) Acceptable Values
52Eh	Bar Code Type in Match Code Table Entry 5	1	0 = *Code 39 1 = Interleaved 2 of 5 2 = Codabar 3 = UPC–A 4 = UPC–E 5 = EAN–8 6 = EAN–13 7 = Code 128
52Fh	Enable Match Code Table Entry 5	1	0 = *No 1 = Yes
530h Match Code 5) String	Match Code 5) Length	1 32	0–32, 0 = *empty 32 Characters
551h	Output Condition 5	1	0 = *None 1 = Read (Package) 2 = No–Read (Package) 3 = Match–Complete 4 = Match Entry 5 = Read and No–Match 6 = No–Read or No–Match 7 = Auto Load
552h	Output Pulse 5) Duration	2	*0, 10 – – – 9999
554h	Bar Code Type in Match Code Table Entry 6	1	0 = *Code 39 1 = Interleaved 2 of 5 2 =Codabar 3 = UPC–A 4 = UPC–E 5 =EAN–8 6 =EAN–13 7 = Code 128
555h	Enable Match Code Table Entry 6	1	0 = *No 1 = Yes
556h Match Code 6) String	Match Code 6) Length	1 32	0–32, 0 = *empty 32 Characters
577h	Output Condition 6	1	0 = *None 1 = Read (Package) 2 = No–Read (Package) 3 = Match–Complete 4 = Match Entry 5 = Read and No–Match 6 = No–Read or No–Match 7 = Auto Load
578h	Output Pulse 6) Duration	2	*0, 10 – – – 9999

PCCC Address	Configuration Parameter	Number of Bytes	(* = Default) Acceptable Values
57Ah	Bar Code Type in Match Code Table Entry 7	1	0 = *Code 39 1 = Interleaved 2 of 5 2 = Codabar 3 = UPC–A 4 = UPC–E 5 = EAN–8 6 = EAN–13 7 = Code 128
57Bh	Enable Match Dode Table Entry 7	1	0 = *No 1 = Yes
57Ch 59Dh	Match Code 7) Length Match Code 7) String Output Condition 7	1 32 1	0–32, 0 = *empty 32 Characters 0 = *None 1 = Read (Package) 2 = No–Read (Package) 3 = Match–Complete 4 = Match Entry 5 = Read and No–Match 6 = No–Read or No–Match 7 = Auto Load
59Eh	Output Pulse 7) Duration	2	*0, 10 – – – 9999
5A0h	Bar Code Type in Match Code Table Entry 8	1	0 = *Code 39 1 = Interleaved 2 of 5 2 = Codabar 3 = UPC–A 4 = UPC–E 5 = EAN–8 6 = EAN–13 7 = Code 128
5A1h	Enable Match Code Table Entry 8	1	0 = *No 1 = Yes
5A2h	Match Code 8) Length Match Code 8) String	1 32	0–32, 0 = *empty 32 Characters
5C3h	Output Condition 8	1	0 = *None 1 = Read (Package) 2 = No–Read (Package) 3 = Match–Complete 4 = Match Entry 5 = Read and No–Match 6 = No–Read or No–Match 7 = Auto Load 8 = Auto Load (INPUT)
5C4h	Output Pulse 8) Duration	2	*0, 10 – – – 9999
5C4h	Last Valid Address in Configuration Area		

Appendix E

Protocol Selection

The following table lists the available options for host communications.

PHYSICAL INTERFACE	FLOW CONTROL	COMMUNICATIONS LINK LAYER	APPLICATION LAYER	CONFIGURATION
RS–232	None	–	ASCII	RS232
RS–232	None	ACK/NAK	ASCII	RS232 ACK CHAR Defined NAK CHAR Defined
RS–232	XON/XOFF	–	ASCII	RS232 XON/XOFF
RS–232	XON/XOFF	ACK/NAK	ASCII	RS232 XON/XOFF ACK CHAR Defined NAK CHAR Defined
RS–232	RTS/CTS– RS–232 Modem Controls	–	ASCII	RS232 RTS/CTS–1
RS–232	RTS/CTS– RS–232 Modem Controls	ACK/NAK	ASCII	RS232 RTS/CTS–1 ACK CHAR Defined NAK CHAR Defined
RS–232	RTS/CTS– Bulletin 2760 Modem Controls	–	ASCII	RS232 RTS/CTS–2
RS–232	RTS/CTS– Bulletin 2760 Modem Controls	ACK/NAK	ASCII	RS232–RTS/CTS–2 ACK CHAR Defined NAK CHAR Defined
RS–422	None	–	ASCII	RS422
RS–422	None	ACK/NAK	ASCII	RS422 ACK CHAR Defined NAK CHAR Defined
RS–422	XON/XOFF	–	ASCII	RS422 XON/XOFF
RS–422	XON/XOFF	ACK/NAK	ASCII	RS422 XON/XOFF ACK CHAR Defined NAK CHAR Defined
RS–485	RS–485 Local Area Network	RS–485 Local Area Network	PCCC With Write Replies	RS485 PCCC–1 LSAP 128
RS–485	RS–485 Local Area Network	RS–485 Local Area Network	PCCC Without Write Replies	RS485 PCCC–2 LSAP 128
RS–485	RS–485 Local Area Network	RS–485 Local Area Network	ASCII With Responses	RS485 ASCII–1 LSAP 128
RS–485	RS–485 Local Area Network	RS–485 Local Area Network	ASCII Without Responses	RS485 ASCII–2 LSAP 128

Appendix F

Transmission Check

The decoder can generate three types of transmission checks:

- Longitudinal Redundancy Check - A byte developed by an exclusive OR on all bytes in a message.
- Checksum, Most Significant Byte First - Sixteen bit sum of all the bytes in a message with the most significant byte transmitted first.
- Checksum, Least Significant Byte First - Sixteen bit sum of all the bytes in a message with the least significant byte transmitted first.

To assist you in understanding how transmission checks are generated, we have provided the following example:

Assume that the message contains the following data:

Start Character = *

Label Delimiter = ¤

End of Message = CR LF

Label Data = ABC

The message would be transmitted in the following sequence:

* ¤ A B C ¤ ¤ CR LF TRANSMISSION CHECK

Note: Refer to Figure 6.5 and Table 6.A for data transmission format.

The table on the following page shows what the transmission checks would be for the above message.

Transmission Check Codes

	ASCII CHARACTER	HEX VALUE	BINARY VALUE
	*	2A	0010 1010
	¤	24	0010 0100
	A	41	0100 0001
	B	42	0100 0010
	C	43	0100 0011
	¤	24	0010 0100
	¤	24	0010 0100
	CR	OD	0000 1101
	LF	OA	0000 1010
LRC CHECK	I	49	0100 1001
CHECKSUM MSB	SOH s	01 73	0000 0001 0111 0011
CHECKSUM LSB	s SOH	73 01	0111 0011 0000 0001

Note: The sum of all the bytes in the message is 173 (hex). Checksums are transmitted in a sixteen bit format. The value 01 (hex) is equivalent to the ASCII control code SOH, 49 (hex) is equivalent to the ASCII character I, and 73 (hex) is equivalent to the ASCII character “s” (refer to Appendix C).

A

ACK
An abbreviated term for Positive Acknowledgement. A control code that indicates that the previous transmission block was received.

address
A character or group of characters that identifies a register, a particular part of storage, or some other data source or destination. To refer to a device or an item of data by its address.

AIM

Acronym for Automatic Identification Manufacturers. A trade group that sets standards for bar code equipment.

alphanumeric or alphameric
The character set which contains letters, digits, and other characters such as punctuation marks.

ASCII
The character set and code described in American National Standard Code for Information Interchange, ANSI X3.4–1977. Each ASCII character is encoded with 8–bits including parity check.

AUX Port
Serial port that can be connected to an ASCII terminal to monitor and program the decoder.

B

bar
The dark element of a printed symbol.

bar code
An arrangement of rectangular bars and spaces in a predetermined pattern.

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

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

bit
An acronym for Binary Digit. The smallest unit of information in the binary numbering system. Represented by the digits 0 and 1.

byte
A unit of data that contains 8 bits.

C

capture count
The number of identical and valid scans which must be deoded before a valid read occurrs.

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 the read.

code
A set of unambiguous rules specifying the way in which data may be represented. See **bar code**.

CRT
Acronym for Cathode Ray Tube. In this manual, refers to the programming terminal.

D

decoder logic
The electronic package which receives the signals from the scanner, interprets the signals into meaningful data and provides the interface to other devices.

E

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

H

helium neon laser
The type of laser most commonly used in bar code scanners. Because the laser beam is bright red, bars must not be printed with red ink since they would be indistinguishable from the background.

Hex
Abbreviated form of the word hexadecimal.

Hexadecimal
A base 16 numbering system.

Host port
Serial port which supports RS–232, RS–422, and RS–485 communications interfaces through which a device can control the operation of the decoder and receive decoded information.

I

Interleaved 2–of–5 bar code
A bar code in which characters are paired together using bars to represent the first character and spaces to represent the second.

L

LAN
Acronym for Local Area Network. A system of computers, programmable controllers, terminals, etc which are linked by communications lines.

LSAP
An acronym for Link Service Access Point. The device which controls the data link in an RS–485 communications network.

M

match code
A sequence that specifies a code type and character string which can be compared against decoded (valid) bar codes

match code table
A list of match codes that is compared to each valid read.

misread
A condition which occurs when the data output of a reader does not agree with the encoded data presented.

modulo check digit or character
A calculated character within a data field used for error detection. The calculated character is determined by a modulus calculation on the sum or weighted sum of the data field contents.

msec

Abbreviation for millisecond (1/1000 of one second).

multidrop
A term used to describe multiple devices linked by a communications network.

multiplexer
A device which sends two or more signals over the same circuit.

N

NAK
An abbreviated term for Negative Acknowledgement. A control code that indicates the previous transmission block was not received correctly.

NEMA
Acronym for National Electrical Manufacturers Association

No–Read
A conditon where a bar code is expected but is not read.

numeric
A machine vocabulary that includes only the numbers as contrasted to alphanumeric which includes both letters and numerals.

P

parity bit
A parity bit is added to a binary array to make the sum of all the bits always odd or always even; a fundamental check.

Percent Good Reads
The number of successful reads per 100 attempts to read a particular symbol.

R

restart
Another term for rebooting the software. Same function as turning power on the decoder off then back on.

S

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

scan area
The area intended to contain a symbol.

scan head
An electronic device that optically converts printed information into electrical signals.

self–checking
A bar code or symbol using a checking algorithm which can be applied to each character to guard against undetected errors. Non–self–checked codes 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 character
A bar code character that provides the scanner with start and stop reading instructions as well as code orientation. The start character is normally at the left–hand end of a horizontal code and adjacent to the most significant character. The stop character is normally at the right–hand end of a horizontal code and adjacent to the least significant character.

string
A sequence of ASCII characters.

symbol
A combination of characters including start/stop characters and check characters, as required, which form a complete scannable entity.

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.

U

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

V

valid read
A scan(s) that when processed by a decoder, satisfies the following parameters:

1) Belongs to an enabled symbology
2) Field length (no. of characters)
3)Fields per scan
4)Capture count

valid package
A scan (or group of scans) that is comprised of valid reads and satisfies the fields per package parameter.

W

word
A unit of data which contains two bytes (16 bits).

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