

MICROSCAN®

*MS-610 Scanner
User's Manual*



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About the MS-610 Scanner

The MS-610 scanner integrates a scan head and decoder in a single unit. It uses a ten-sided mirror spinning at speeds of 200 scans per second to direct laser beams across bar code labels and converts reflected light to waveforms. The waveforms are then decoded and sent to the host as ASCII data.

About This Manual

This manual provides complete information on setting up and installing the MS-610 (visible) and the MS-615 (infrared) scanner. Unless otherwise noted, references to the MS-610 apply also to the MS-615.

Chapter 1 provides overall step-by-step instructions for setting up and installing the MS-610 scanner with specific “go to” references to other chapters and appendices.

Chapter 2 provides instructions for configuring the MS-610 scanner by menu.

Chapter 3 provides instructions for configuring the MS-610 scanner by serial command.

Chapter 4 describes serial operational commands that can be used by the host. For specifications, see appendix A. The appendices also include reference tables, as well as other useful information relating to bar coding and the MS-610 scanner.

Keystroke Entries

Keystrokes to be entered from your terminal are highlighted in bold, as in **<D>**, including a < left angle bracket symbol (unless redefined by Command Start Character command) and followed by a > right angle bracket symbol.

Approvals

This equipment is approved for use by the following organizations:

- CDRH (Center for Devices & Radiological Health)
- UL (Underwriters Laboratories, Inc.)
- CSA (Canadian Standards Association)
- CISPR (International Special Committee on Radio Interference)
- CE (European Community)
- TÜV (Technischer Überwachungs-Verein) (MS-610 only)
- FCC (Federal Communication Commission)
- This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet Appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

For connection to a Listed direct plug-in power unit marked Class 2 and rated at 5 VDC @ 400 mA and ± 12 VDC @ 80 mA.

Warning and Caution Summary

Caution: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause interference in which case the user will be required to correct the interference at his or her own expense



WARNING

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



WARNING

Up to 5 mW of laser diode power can be present in the interior. Avoid opening the scan head. Inspect housing to verify that loose casings or panels do not allow access to laser light.

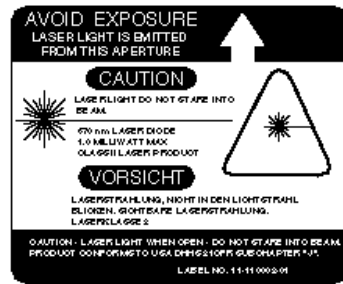


WARNING

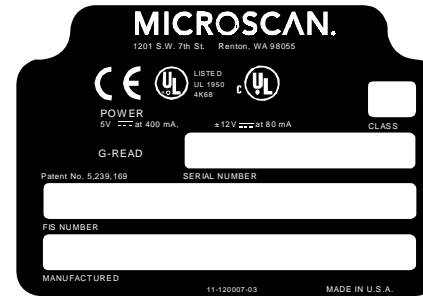
The laser beam can be harmful to eyesight. Avoid direct eye contact with the laser beam. Never point the beam at other people, or in a direction where people may be passing.

Safety Labels

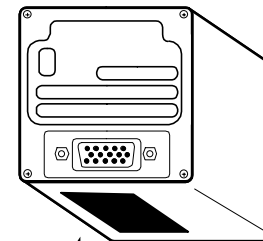
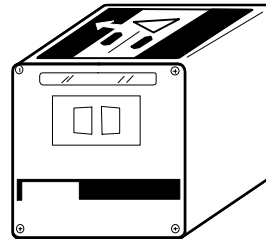
Note: Back Label will carry a Class II designation when placed on an MS-610 with 670 nm visible light and a Class I designation when placed on an MS-615 with 780 nm infrared light.



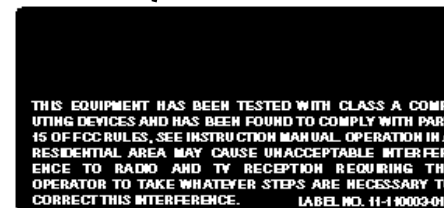
Top Label



Back Label



Bottom Label



Chapter 1

Setup and Installation

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This chapter provides step-by-step instructions for setting up and installing the MS-610 scanner.

Note: Bar code labels should meet minimum ANSI (American National Standards Institute) standards as specified in ANSI Bar Code Print Quality Guideline, X3.182-1990.

1 Plan Scanning System

Before installing the MS-610 scanner you should sketch out a diagram of your scanning system, showing equipment, connector and cable types, and cable lengths.

Figure 1-1 shows a possible scanning system setup without an adapter box. If using an adapter box, refer to figure 1-2. For wiring information, see "Attach Cabling" on page 1-6.

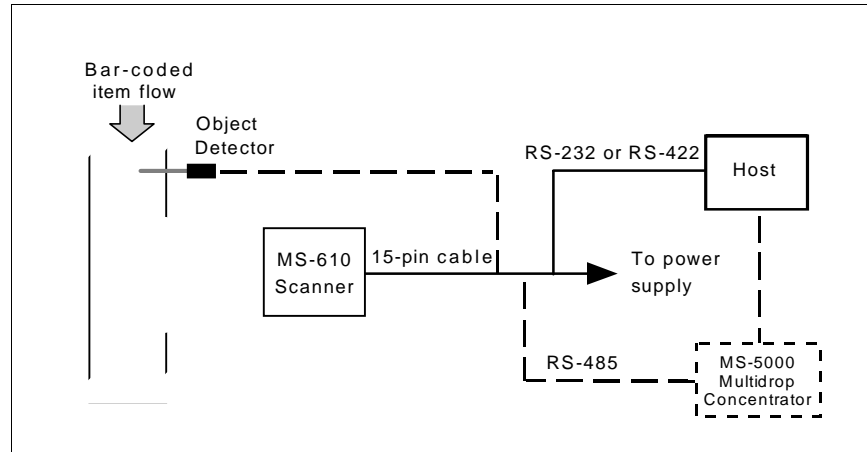


Figure 1-1 System Diagram (without adapter box)

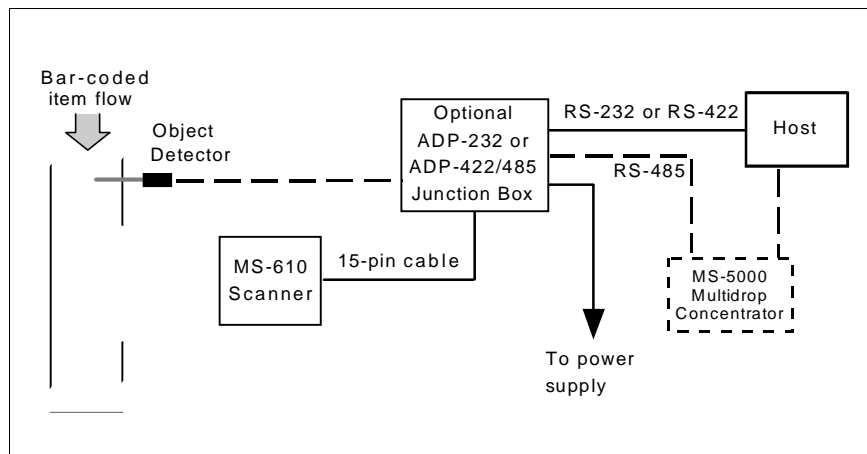


Figure 1-2 System Diagram (with adapter box)

2 Verify Read Range and Scan Width

Table 1-1 shows readable ranges and maximum scan widths for specific bar code density (narrow-bar-width) types. Use this table as a reference to verify that the planned range for your label falls within one of the listed ranges.

Scan width is that portion of the scan line in which a label can be read. For ladder oriented labels, scan width must only be wide enough to fully cover the label length, including quiet zones. With picket fence oriented labels, scan width is a factor in determining the time in which the label can be read (see Calculate Number of Scans" on page 1-4).

Table 1-1 Read Ranges and Scan Widths

Laser Type	Range	Narrow-bar-width	Read Range ^a	Maximum Scan Width
Visible	UHD	.0047"	1.75–3" (45–76 mm)	3" (76 mm)
		.0075"	1–4" (25–102 mm)	4" (102 mm)
	Standard	.0075"	2–5" (51–127 mm)	4.75" (121 mm)
		.010"	1.5–6" (38–152 mm)	6" (152 mm)
		.015"	1–7" (25–178 mm)	7.5" (191 mm)
		.020"	1–9" (25–229 mm)	9.25" (235 mm)
		.030"	4–10" (102–254 mm)	9.5" (241 mm)
		.040"	4–10" (102–254 mm)	9.5" (241 mm)
Infrared	UHD	.0047"	1.75–3" (45–76 mm)	3" (76 mm)
		.0075"	1.25–3" (32–76 mm)	3.5" (89 mm)
	Standard	.0075"	2–4.5" (51–114 mm)	3.5" (89 mm)
		.010"	1.5–5" (38–127 mm)	4.75" (1.21 mm)
		.015"	1–6" (25–152 mm)	6" (152 mm)
		.020"	1–7" (25–178 mm)	7" (178 mm)
		.030"	4–9" (102–229 mm)	8.5" (216 mm)
		.040"	4–9" (102–229 mm)	8.5" (216 mm)
.050"	5–9" (127–229 mm)	8.5" (216 mm)		

a. *Read range* is the distance of the label from the scanner (measured from the front of the scanner bezel) in which the label can be reliably read. The distance between the minimum and maximum ranges is the *depth of field*.

For information on label orientation, see Appendix C, "Orientation," on page A-6.

3 Calculate Number of Scans

To ensure reliable scanning, we recommend that you apply a minimum of **five** scans to each label. Use the formulas below to calculate the number of scans that your label will receive. For definitions of terms, see inset on page 1-5.

If the number of scans you derive from one of these calculations is less than the minimum for your application, plug in the minimum number of scans and solve for another parameter that might be changed, such as label speed or scans per second.

Ladder Calculation

$$\left(\frac{LH}{LS} \times SR\right) - 3 = \text{number of complete scans}^1 \quad (\text{EQ 1})$$

Where LH = Label Height, LS = Label Speed, and SR = Scan Rate.

Example 1:

LH = 1.5 inch

LS = 10 inches per second

SR = 200 scans per second

$$\left(\frac{1.5}{10} \times 200\right) - 3 = 27 \text{ complete scans}$$

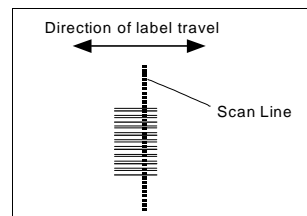


Figure 1-3 Ladder Orientation

Picket Fence Calculation

$$\left(\frac{SW - LL}{LS} \times SR\right) - 3 = \text{number of complete scans}^1 \quad (\text{EQ 2})$$

Where SW = Scan Width, LL = Label Length, LS = Label Speed and SR = Scan Rate

Example 2:

LL = 1.5 inch (including quiet zones)

LS = 10 inches per second

SW = 3 inches

SR = 200 scans per second

$$\left(\frac{3 - 1.5}{10} \times 200\right) - 3 = 27 \text{ complete scans}$$

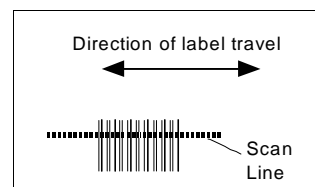


Figure 1-4 Picket Fence Orientation

1. The -3 component in the formula is included to allow for AGC acquisition, an incomplete first scan, and an incomplete last scan. This applies only if the number inside the parentheses equals 4 or more. If the number equals 3, then only subtract 2 to derive 1 good scan.

Angled Picket Fence Calculation

The number of complete scans for angled picket fence is calculated the same as that for picket fence, with the exception that the scan width is shortened in proportion to scan tilt.

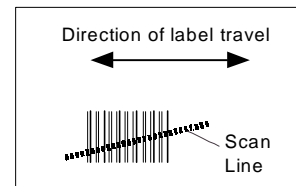


Figure 1-5 Angled Picket Fence Orientation

- **Scan Rate (SR)** is the number of scans per second that a given scanner is capable of emitting.
- **Scan Width (SW)** (picket fence formula only) is the width across the scan beam, at a given distance from the scanner, in which a label can be read.
- **Label Speed (LS)** is the distance per second that a label moves as it travels through the scan lines.
- **Label Length (LL)** (picket fence formula only) is the length of the longest printed label to be read plus the length of the quiet zones (figure 1-6).
- **Label Height (LH)** (ladder formula only) is a measurement of the height of individual bars (figure 1-6).

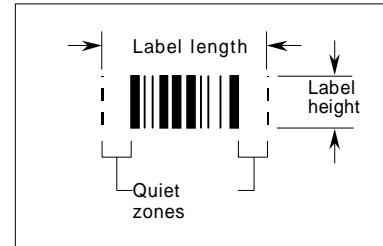


Figure 1-6 Label Dimensions

Note: While the formulas given here solve for the predicted number of scans, you may also assign a value for number of scans (5 or more) and to solve for other parameters that might be changed, such as scan rate (motor speed), label speed, etc.

4 Attach Cabling

The MS-610 scanner uses a high-density, 15-pin, D-subminiature socket connector (figure 1-7) for all input and output.

Caution: Switching power supplies for Microscan equipment with switching noise of 20 mV p-p or greater with ± 12 VDC are not recommended.

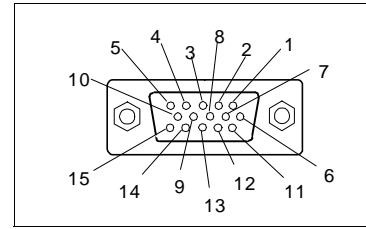


Figure 1-7 High Density 15-pin D-Sub Miniature Socket

Table 1-2 Pin Assignments

Pin #	Function
1	+5 VDC (input)
2	RS-232 (transmit)
3	RS-232 (receive)
4	RS-232 (signal gnd)
5	CTS, ^a RS-422/RS-485 (- transmit), or New Master Pin
6	RTS or RS-422/RS-485 (+ transmit) ^b
7	Relay Driver (5V, 20 mA capability) (output)
8	Reset (to default configuration) (input)
9	Trigger (input) (3 to 24 VDC)
10	Signal Ground
11	+12 VDC (input)
12	RS-422/RS-485 (+ receive)
13	GND (chassis)
14	RS-422/RS-485 (- receive)
15	-12 VDC (input)

Table 1-3 Scanner/MS-610 ADP (adapter) Pinouts

Pin #	Connectors				
	15-pin MS-610	25-pin Host	Power Supply	Object Detector	RS-422/485
1	1	9	3	3	
2	2	2			
3	3	3			
4	4	7	1	5	1, 6
5	5	5, 14			5
6	6	4, 19			4
7	7	8			
8	8	11			
9	9	10		1	
10	10				
11	11		5	4	
12	12	13			2
13	13	1	2		
14	14	16			3
15	15		4		

a. CTS is used with the RS-232 option. See "FIS Options" on page A-4.
 b. RTS is used with the RS-232 option. See "FIS Options" on page A-4.

Under ideal conditions, maximum cable lengths can meet the distances shown in table 1-4. However, since cable lengths and sizes are dictated by local conditions such as wire size, wire shape (flat or round), shielding, grounding, extraneous signal noise, etc., maximum cable distances will be variable.

Table 1-4 Cable Distances

Maximum Distance	Interface
50 feet	RS-232
4000 feet	RS-485 Multidrop
4000 feet	RS-422

5 Configure Scanner

Settings for Communications, Operations, Code Types, and User Outputs are stored in non-volatile memory and can be configured from a host or auxiliary terminal by menu (Chapter 2, "Menu Configuration") or serial command (Chapter 3, "Serial Configuration").

For explanations of configuration settings, see Chapter 2, "Menu Configuration"

To establish communication you will need to match the host's or auxiliary terminal's communication settings with your scanner's settings (see Communications Menu" on page 2-5). Also make certain that the code type enabled in the scanner matches that of the label being used (see Code Types Menu" on page 2-19).

Hint: Enabling autodiscrimination in the menus (or with the <P> command) will allow your scanner to read all of the listed code types.

Communicating with an ASCII Terminal

The MS-610 scanner communicates in full duplex, terminal mode with no handshake. It also recognizes carriage returns and line feeds.

The host or ASCII terminal with must match the following default settings before any communication can take place: **9600** Baud Rate, **Seven** Data Bits, **Even** Parity, and **One** Stop Bit.

A PC or Macintosh computer can be used as an ASCII terminal if connected as shown in table 1-3 and running a communications program set to the above defaults. See your computer manual for communication's port pinouts.

6 Position Scanner and Label

Before testing the read rate, you will need to position the scanner and label in a manner that matches as nearly as possible the actual conditions of your application.

- a. Position the scanner and label, taking care to avoid excessive tilt, skew, or pitch.¹

Note: The photo diode, located behind the large window on the scanner, cannot be blocked because it receives the return signal from each scan. See mechanical specifications on page A-2.

- b. Pitch label (or scanner) slightly up or down as shown in figure 1-8 to avoid specular reflection, the return of direct, non-diffused light.²

Another way to avoid specular reflection is to skew the scanner slightly relative to the label.

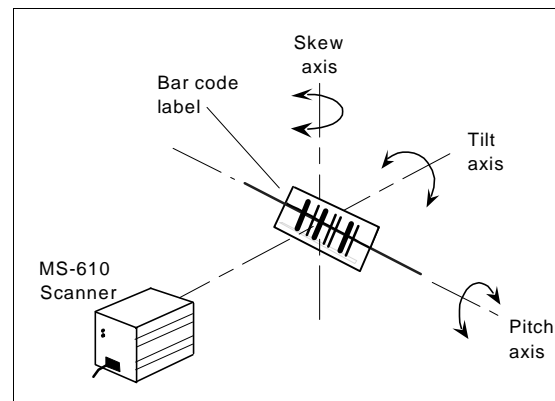


Figure 1-8 Tilt, Skew, and Pitch Axes

Note: If this label were moving from left to right (or vice versa), the orientation of the label, relative to the scan beam, would be “picket fence;” if the label were moving from top to bottom (or vice versa), the orientation of the label, relative to the scan beam, would be “ladder.”

Note: For test purposes the label shown here is pitched. In final installation,

it is typically the fixed-mount scanner rather than the moving label that is pitched.

For more information, see Appendix C, “Orientation,” on page A-6.

1. Maximum tilt is determined by label characteristics and number of scans required. Maximum skew is $\pm 40^\circ$; maximum pitch is $\pm 50^\circ$.
2. The specular reflection zone is a narrow zone straight out from the scanner in which direct reflected light from a label can distort the scanner’s ability to distinguish bars from spaces.

7 Do Read Rate Test

To begin the read rate test:

- a. Position the label in front of a functioning scanner; enter the **<C>** command from the host terminal to launch the read rate test (see Status Commands” on page 4-5).
- b. Observe read rate.
- c. Check depth-of-field (minimum/maximum range) by moving the label closer and further relative to the scanner and noting the points where the read rates fall below a level acceptable to your application.

Ideally, the label used in your application should pass through or near the center of the depth-of-field.

90	%	THIRTY
100	%	THIRTY
96	%	THIRTY
92	%	THIRTY
└	Read	└ Label
	Rate per	Data
	Second	
		* Example shows output when Post-

- d. Repeat steps a through c for other labels used in your application and end the read rate test with the **<J>** command.

If the read rate is acceptable, go to Step 9, “Install Scanner,” on page 1-13. If the read rate is unacceptable, go to Step 8, “Adjust Other Scanning Parameters,” on page 1-11.

Important: If, after making adjustments, you have changed the read range or another parameter used in the number of scans formula, you should recalculate the number of scans (Step 3, “Calculate Number of Scans,” on page 1-4).

Note: Variations between labels are common. For this reason, the greater number of sample labels you test, the more likely you are to achieve optimum read rates.

8 Adjust Other Scanning Parameters

This section lists various adjustments that may improve read rates.

After changing any of the parameters described in this section,

- a. If applicable, recalculate the number of scans (Step 3, “Calculate Number of Scans,” on page 1-4).
- b. Repeat Step 7, “Do Read Rate Test,” on page 1-10.
- c. Compare the new read rate results with those obtained before changes were made.

Range

Adjusting the label's range, if possible, is one of the quickest and most effective ways to improve read rates. However, in some applications you may need to select a less than optimum range, or one that is beyond the fringes of the ranges listed in table 1-1 on page 1-3.

After making changes, repeat Step 3, “Calculate Number of Scans,” on page 1-4 and Step 7, “Do Read Rate Test,” on page 1-10.

Scan Width

Increasing scan width will increase the number of scans in a picket fence oriented application. Scan width is linked with scan range (as shown in table 1-1 on page 1-3) and changing one will usually require a change in the other.

After making changes, repeat Step 3, “Calculate Number of Scans,” on page 1-4 and Step 7, “Do Read Rate Test,” on page 1-10.

Label Speed

Applies to both picket fence and ladder oriented labels. If your application allows it, label speed (the time in seconds that a label is fully within the scan width of the scanner) is an effective way to alter the number of scans.

After making changes, repeat Step 3, “Calculate Number of Scans,” on page 1-4 and Step 7, “Do Read Rate Test,” on page 1-10.

Label Dimensions, Label Density, and Label Ratio

Not usually an option in most applications, but changes to label parameters can affect number-of-scan calculations and possibly read rates.

If your application allows it, shortening the length of a picket fence label means the label will be in the scan range longer and hence receive a greater number of scans. Increasing the height of a ladder label means it

Chapter 1 Setup and Installation

will receive more scans. Changing label density and/or bar code ratio is another way ranges, read rates, etc. can be altered.

After making changes, repeat Step 3, "Calculate Number of Scans," on page 1-4 and Step 7, "Do Read Rate Test," on page 1-10.

9 Install Scanner

The MS-610 scanner can be mounted directly to a mounting surface of your choice, or indirectly, via a mounting plate.

To permanently mount the scanner:

1. Position the scanner in a dry place, devoid of sunlight, bright lights, or laser light from other sources.
- b. Before mounting, ensure sufficient clearance at the rear of the scanner to allow for the 15-pin connector and cable.
- c. **If not using the mounting plate**, use the measurements provided in figure 1-9 to locate centers of mounting holes and drill four 5/32 inch (4 mm) holes, or

If using the mounting plate (see appendix D), use the four perimeter holes to mount the plate and mount scanner directly to the four inner holes on the plate.

- d. Secure scanner with four 6-32 screws.

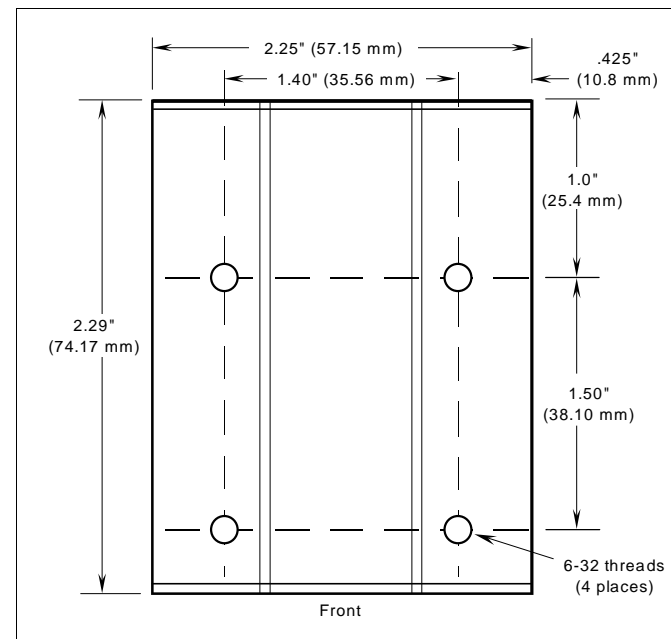


Figure 1-9 Bottom Mounting Holes (not full size)

Caution: Do not allow the mounting screws to penetrate into the scanner case more than 0.175 in. (4.4 mm) or damage to the scanner may result.

Caution: To prevent twisting or distortion of the scanner housing, ensure that the mounting surface or bracket is flat.

10 Position Object Detector

If you are not using an object detector, continue with step 11.

In a typical operation, a scanner will wait for bar code data only during a triggered read cycle. A read cycle is initiated by a “trigger” that can be in the form of a serial command from the host (internal trigger) or a signal from an object detector (external trigger).

When an object detector is used, it is set up so that its beam will bounce off the approaching object and the resulting pulse will be sent to the scanner to begin the read cycle. Typically, a detector is positioned so that it will detect the presence of an object before the object’s label can be scanned by the scanner.

An object detector is mounted in almost any position relative to the object as long as (1) the object passes within range of the detector and (2) direct or reflected light from the detector does not interfere with the scanner’s reception.

As the item continues to move down the line, its label moves into the scanner beam and is read by the scanner.

Figure 1-10 shows a picket fence label being scanned with the detector and scanner at right angles to each other.

Figure 1-11 shows a label in the ladder direction with the object detector on the same side as the scanner, but positioned so as not to cause interference.

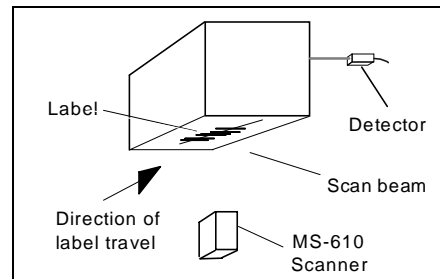


Figure 1-10 Detector Right-Angle Orientation

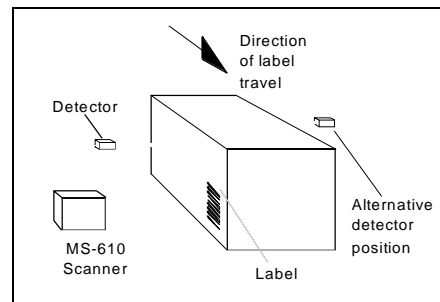


Figure 1-11 Detector Side Orientation

Operational Tips

Do:

- Check inputs (label speed, length, height, etc.) to ensure the desired number of scans per label.
- Avoid excessive tilt, pitch, and skew of the bar code label.
- Check the label for readability by doing a read rate test. If there is any question about the label's readability, contact your Microscan representative.
- After changing any parameter that might affect read rate, repeat read rate test.
- Clean the scanner window with a clean, dry Q-tip or cotton cloth on a regular basis.

Do Not:

- Aim the scanner into direct light or sunlight.
- Aim the scanner into an external object detector or other light-emitting device.
- Obstruct the scanner window with mounting hardware or other objects.
- Connect chassis of scanner and host to different ground potentials (see "Ground and Shield Considerations" on page 1-16).
- Operate the scanner in excessive temperature environments (see "Environment" on page A-2).

Ground and Shield Considerations

Proper grounding is necessary for operator safety, noise reduction, and the protection of equipment from voltage transients. Buildings, including any steelwork, all circuits, and all junction boxes must be grounded directly to an earth ground in compliance with local and national electrical codes.

RS-232 signals have a common signal ground (pin 4). Pin 4 is normally connected to pin 13 (chassis ground) in the scanner; however, under certain conditions (e.g., when potential differences exist between power outlet grounds) signal and chassis grounds can be isolated from each other inside the scanner by Microscan technicians.

Noise Interference

Noise interference can be minimized if cabling subject to noise interference is twisted and/or shielded or encased in grounded conduit, and the conduit or shielding ("drain" line) is grounded only to earth ground at the host, as shown in figure 1-12. You might need to examine and if necessary cut the shielding connection at or near the scanner cable connector.

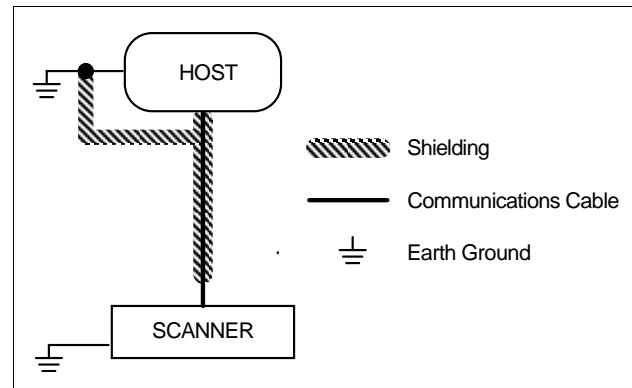


Figure 1-12 Grounding Diagram, Scanner-Host

Ground Loops

Ground loops, signal degradation due to different ground potentials in communicating devices, can be eliminated or minimized by ensuring that both the host, scanner, and their power supplies are connected to a common earth ground.

Chapter 2

Menu Configuration

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This chapter describes how to configure the MS-610 scanner with on screen menu commands from a host or an auxiliary terminal.

All keystrokes are in **bold** typeface.

Default parameters in the menu structures are also in **bold** typeface.

Communicating with an ASCII Terminal

The MS-610 scanner communicates in full duplex, terminal mode with no handshake. It also recognizes carriage returns and line feeds.

The host or ASCII terminal must match the following default settings before any communication can take place: **9600** Baud Rate, **Seven** Data Bits, **Even** Parity, and **One** Stop Bit.

A PC computer can be used as an ASCII terminal if connected as shown under "Host Connector" and running a communications program set to the above defaults. See your computer manual for communication's port pinouts.

Entering the Menu Configuration Program

To see the Main menu (figure 2-1), from an ASCII terminal that is connected to the scanner, enter the operational command <D> (enter the < > brackets as well as the upper case **D**).¹

MICROSCAN SYSTEMS, INC. CONFIGURATION PROGRAM MAIN MENU 35-216001-xx	
TOPICS	DESCRIPTIONS
1) COMMUNICATIONS	HOST PROTOCOL, HOST PORT
2) OPERATIONS	TRIGGERING, TIMEOUTS, ETC.
3) CODE TYPES	CODE SELECTIONS, CODE LENGTHS, ETC.
4) USER OUTPUTS	BEEPER, DATA LINE POLARITY, ETC.
ESC = MAIN MENU OR EXIT N = NEXT ITEM M = PREVIOUS MENU SP = NEXT ITEM B = PREVIOUS ITEM CR = THIS ITEM	
MAIN - - > COMMUNICATIONS	

Figure 2-1 Configuration Program - Main Menu

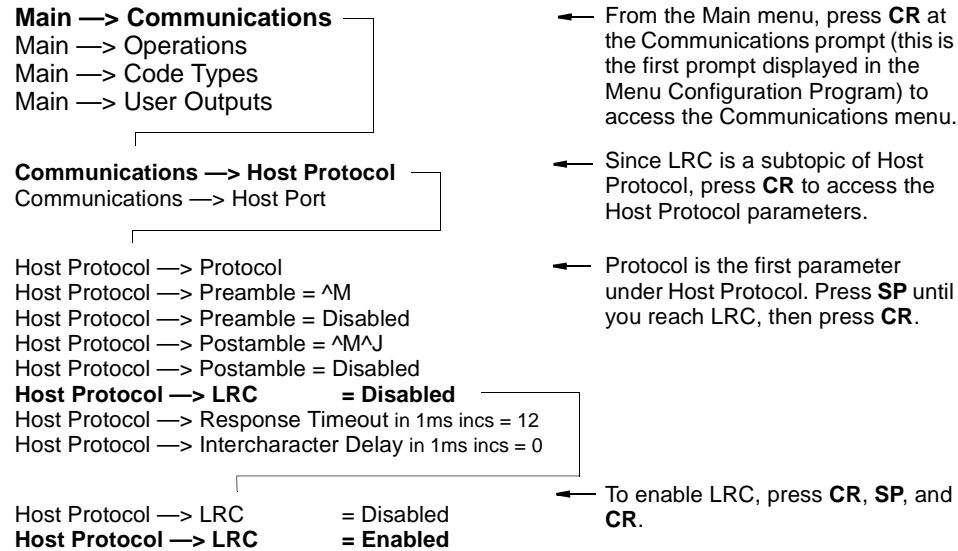
Using the Menu Configuration Program

The bottom line on the screen is called the command line. The command line identifies your place in the menu program, shows current status and allows you to review and change options. Use the designated keys² to scroll to and select the parameter you wish to change; press **SP** (space bar key) or **N** to scroll ahead, **B** to scroll back, **CR** (carriage return key) to select, and **M** to return to the previous higher level menu. To return to the Main menu at any time, press **ESC** (escape key) and **M**.

1. Command start character by default is a left angle bracket, <. It may be redefined by menu or serial command. However, the end character, a right angle bracket, >, cannot be changed.

2. The menu navigational keys are displayed in each menu.

For example, to enable LRC (see figure 2-2, “Communications Menu Structure,” on page 2-5 and “Longitudinal Redundancy Check” on page 2-8), you would use the following command line path:



2-Menu Config.

To view LRC’s new status in the menu, press **M** to refresh the screen. To return to the Main menu, press **M** again. You can make additional changes within another menu before exiting the program. Simply follow the same method of scrolling to and selecting each main topic, then its subtopics, until you reach the parameter you want to change. Remember, to return to the Main menu at any time, press **ESC** (escape key) and **M**.

Some parameters are user defined, in which case they prompt you with an arrow for data, such as:

```
OPERATIONS--> TIMEOUT in 10ms increments = 100 -->
```

At the prompt, redefine the parameter within the allowable range, and press **CR** to enable.

Saving Menu Changes

Press ESC (escape key) to see the following on the command line:

```
EXIT OR MAIN MENU (E,M)
```

Press M to return to the Main menu, or press E to exit the Menu Configuration program. If E is pressed, the following question will appear:

```
Do you want to save changes for power on ? (Y=yes N=no)
```

Press N to exit without saving changes, or press Y to retain the current settings for power-on. If Y is selected, a beep will indicate the save has been carried out.

Loss of Communications

Making changes to communications parameters such as Baud Rate, Parity, Stop Bits, LRC, etc. without corresponding changes in linked device(s) can result in the loss of menu access. If this should occur, default the scanner. See Appendix D, "Defaulting the Scanner," on page A-8.

Defining Special Characters

To define any control character from the ASCII table: Press **SP** once, then enter the control character by holding down the control key and simultaneously pressing the desired character. For example to define a line feed, press **SP**, then **Control** and **J** simultaneously. It is displayed as ^J on the command line and as <LF> in the menu when the screen is refreshed.

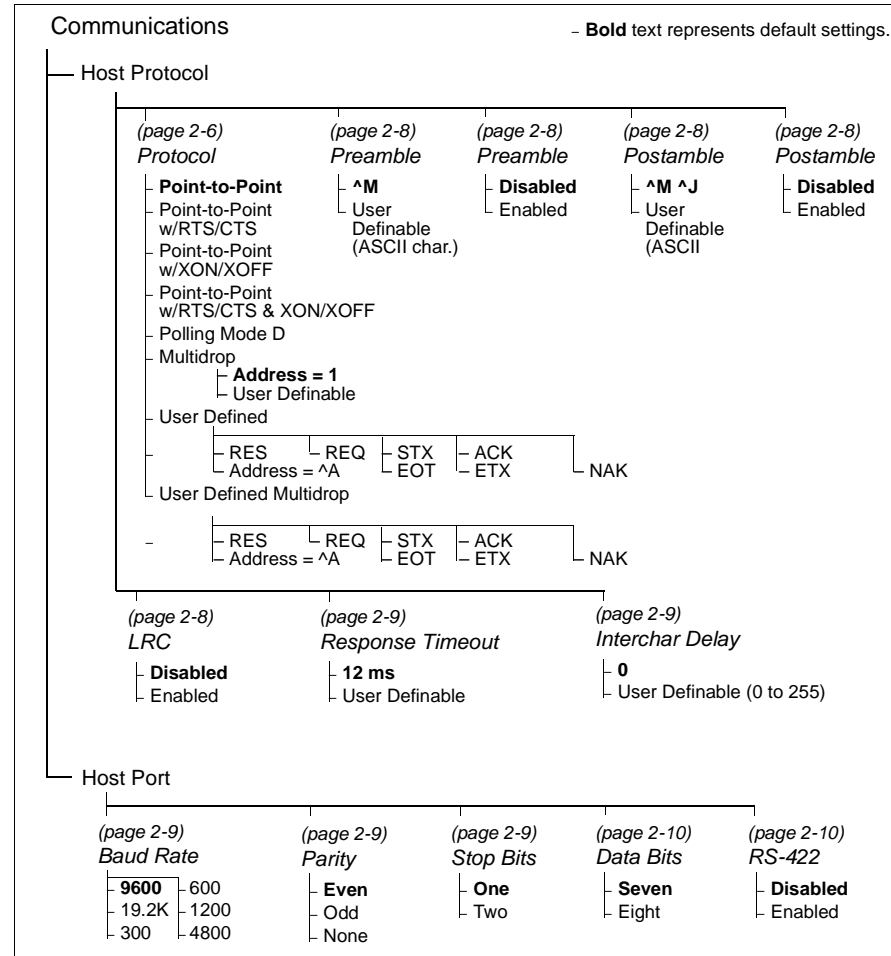
To define CR as a character: Press **SP**, then **CR**. It is displayed as ^M on the command line and as <CR> in the menu when the screen is refreshed.

To define a space as a character: Press **SP** twice. It is displayed as a blank space in the menu when the screen is refreshed. While it appears that nothing has been assigned, the hex value 20 will be sent during data transmission.

To select NUL as the character: Press **SP**, then a **0** (zero). It is displayed as <NUL> in the menu when the screen is refreshed.

Communications Menu

The Communications menu allows you to set the communication protocols between the scanner and the host.



2-Menu Config.

Figure 2-2 Communications Menu Structure

Note: Be sure that all new settings match your system; otherwise you risk losing communications with the configuration terminal when you exit the menu program (whether or not changes are saved for power-on).

Host Protocol

Protocol

Default: Point-to-Point

Options: Point-to-Point, Point-to-Point with RTS/CTS, Point-to-Point with XON/XOFF, Point-to-Point with RTS/CTS & XON/XOFF, Polling Mode D, User Defined, User Defined Multidrop

Protocols define the sequence and format in which information is transferred between devices.

Selecting: *Has this effect:*

Point-to-Point	Has no address and sends data to the host (RS-232) whenever it is available and without any request or handshake from the host.
Point-to-Point with RTS/CTS (Request-to-Send/Clear-to-Send)	Used only with RS-232. This is a simple handshaking protocol that allows a device to initiate data transfers to the host with an RTS (request-to-send) transmission. The host, when ready, responds with a CTS (clear-to-send) and the data is transmitted. CTS and RTS signals are transmitted over two dedicated wires (pins 6 and 10) as defined in the RS-232 standard.
Point-to-Point with XON/XOFF (Transmitter On/Off)	Used only with RS-232. This selection enables the host to send a single byte transmission command of start (XON) or stop (XOFF). If an XOFF has been received from the host, data will not be sent to the host until the host sends an XON. During the XOFF phase, the host is free to carry on other chores and accept data from other devices.
Point-to-Point with RTS/CTS & XON/XOFF	Used only with RS-232. It is a combination of Point-to-Point with RTS/CTS and Point-to-Point with XON/XOFF.
Polling Mode D	Like Point-to-Point, Polling Mode D requires a separate channel to the host but unlike Point-to-Point, it requires a device to have an address and to wait for a poll from the host before sending data. When in Polling Mode D, an address 1 is automatically displayed on the configuration screen. However, during transmission, a 1C hex poll address (FS) and a 1D hex select address (GS) are substituted for the 1.

<i>Selecting:</i>	<i>Has this effect:</i>
Multidrop ^a Note: <i>Scanners intended to link up to a Microscan MS-5000 multidrop concentrator can only be configured in standard Multidrop protocol.</i>	Similar to Polling Mode D except that a unique poll address and select address are required for each multidrop device, and only one host port connection is needed for up to 50 devices. (For Multidrop poll and select characters, see Table A-7, "Multidrop Address Characters," on page A-18.) Requires a concentrator or controller using RS-485 communications. When Multidrop is selected, the protocol characters for RES, REQ, etc. are assigned automatically. (See "Appendix I — Multidrop Communications" on page A-15 for poll and select sequences.)
User Defined Note: <i>A specific ASCII character must not be assigned more than once.</i>	Used only with RS-232 or RS-422. ASCII characters can be assigned as an address and as protocol commands (RES, REQ, EOT, STX, ETX, ACK, and NAK). User Defined is necessary when a new protocol must be defined to match a specific host protocol. When User Defined is selected, the displayed protocol commands match those of the previously selected protocol. User Defined is considered to be in a polled mode only if an address has been assigned. The address can be any ASCII character from the ASCII in appendix B, except NUL. ^b
User Defined Multidrop Note: <i>A specific ASCII character must not be assigned more than once.</i>	Used when connecting to a concentrator or other device that does not match standard Multidrop protocol. Any single character (01 hex to 7E hex) in the ASCII table can be assigned as the address character. The character chosen is used as the poll character and the subsequent ASCII character becomes the select character. For example, if a ^A (01 hex) is selected as the address, ^B (02 hex) becomes the select address that the host will use in sending host select commands. (See Table A-7, "Multidrop Address Characters," on page A-18.)

- a. Once the scanner is configured for Multidrop, a profile card, a terminal connected to the auxiliary RS-232 pins, or a default procedure must be used to access the configuration menus again (although serial commands will continue to function).
- b. For example a simple ACK/NAK protocol can be developed by first selecting Point-to-Point, then User Defined, and then assigning characters to ACK and NAK commands. First scroll to the following command:
 HOST PROTOCOL --> PROTOCOL --> USER DEFINED--> ACK = -->
 Enter a ^F by holding down the **Control** key while pressing the **F** key, and then press **CR** to see the following:
 HOST PROTOCOL --> PROTOCOL --> USER DEFINED --> ACK = ^F
 The mnemonics ACK and NAK replace the default NULs in the menu.

Preamble

Default: $\backslash M$ (and a null). Corresponds to <CR><NUL> (carriage return/null) displayed in the menu.

Options: Any ASCII character, including control characters. Control characters entered on the command line are displayed in the menu as mnemonic characters. See “Defining Special Characters” on page 2-4 and Table A-5, “ASCII Table with Control Characters,” on page A-5.

Allows you to define a one or two character data string that can be added to the front of the decoded data. For example, a carriage return and line feed would display each decoded message on its own line.

Preamble (enable/disable)

Default: Disabled

Options: Disabled, Enabled (within any protocol)

Allows you to enable or disable the preamble character(s).

Postamble

Default: $\backslash M\backslash J$. Corresponds to <CR><LF> (carriage return/line feed) displayed in the menu.

Options: Any ASCII character, including control characters. Control characters entered on the command line are displayed in the menu as mnemonic characters. See “Defining Special Characters” on page 2-4 and Table A-5, “ASCII Table with Control Characters,” on page A-5.

Allows you to define a one or two character data string that can be added after the decoded message.

Postamble (enable/disable)

Default: Disabled

Options: Disabled, Enabled (within any protocol)

Allows you to enable or disable the Postamble character(s).

Longitudinal Redundancy Check

Default: Disabled

Options: Disabled, Enabled

An error-checking routine that verifies the accuracy of transmissions. It is the exclusive OR of all characters following the SOM (start of message) up to and including the EOM (end of message).

Response Timeout

Default: 12 ms

Options: 0 to 65,000 ms. A zero (0) will cause an indefinite wait.

Allows you to set the time the scanner will wait before timing out if ACK, NAK, and ETX are enabled, and a host response is expected.

Intercharacter Delay

Default: 0. Corresponds to 0 ms displayed in the menu.

Options: 0 to 255. Zero (0) causes no delay between characters.

Allows you to set the time interval in milliseconds between individual characters transmitted from the scanner to the host. A high setting will significantly slow down communications. For example, a 200 setting will result in a 1/5 second delay between each character that is transmitted.

Host Port

Allows you to set parameters for RS-232 communication whenever an RS-232 protocol has been enabled.

Baud Rate

Default: 9600

Options: 9600, 19.2K, 300, 600, 1200, 2400, 4800

Allows you to set the number of bits transmitted per second.

Parity

Default: Even

Options: Even, Odd, None

Allows you to select an error detection routine in which one data bit in each character is set to 1 or 0 so that the total number of 1 bits in the data field is even or odd.

Stop Bits

Default: One

Options: One, Two

Allows you to select the last one or two bits in each character to indicate the end of the character.

Data Bits

Default: Seven

Options: Seven, Eight

Allows you to establish the total number of bits in each character.

RS-422

Default: Disabled

Options: Disabled, Enabled

Used only in Point-to-Point protocol, and not with RTS or CTS.

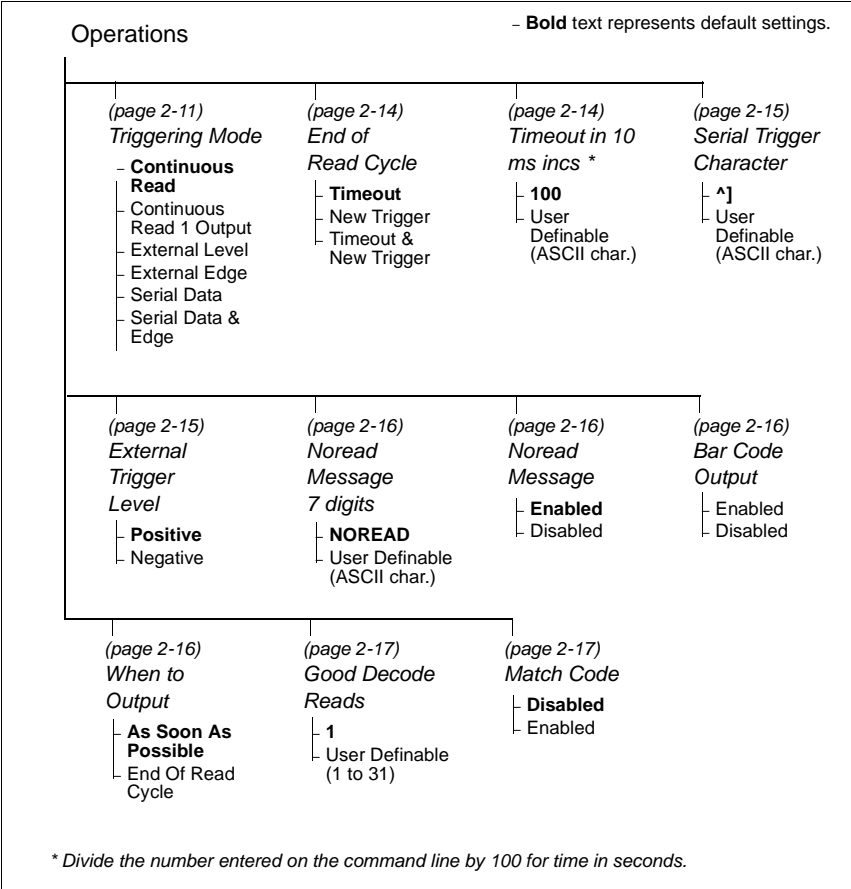
Whenever RS-422 is disabled, RS-232 is enabled in the background. However, an exception occurs whenever Multidrop has been selected. In this case the functioning protocol will be RS-485 regardless of the displayed status of RS-422 in the menus.

See also Appendix H, "Interface Standards," on page A-14.

Operations Menu

The Operations menu allows you to set the operations parameters for the scanner.

To help visualize the menu's organization and to locate the page number where each topic is described, see figure 2-3.



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Figure 2-3 Operations Menu Structure

Triggering Mode

- Default: Continuous Read
- Options: Continuous Read, Continuous Read 1 Output, External Level, External Edge, Serial Data, Serial Data & External Edge

Allows you to establish the type of trigger event that will initiate or end the read cycle. (See “End of Read Cycle” on page 2-14.)

Selecting: Has this effect:

Continuous Read	<p>Trigger input options are disabled and the scanner is always in the read cycle. Bar code data is decoded, and label information is transmitted repeatedly, as long as the label is in the read range of the scanner. When to Output options have no affect on Continuous Read. Continuous Read is useful in testing label or scanner functions.</p> <p>Note: <i>If both Continuous Read and Match Code are enabled the scanner defaults to Continuous Read 1 Output mode.</i></p>
Continuous Read 1 Output	<p>Label data is immediately transmitted once every time new label data is placed in front of the scanner. With Timeout enabled for End of Read Cycle, if the label doesn't change, the scanner will repeat the output at the end of each subsequent timeout period. For example, if Timeout were set to one second, the scanner would output the label data immediately, and then repeat the output at intervals of one second, for as long as the label continued to be scanned.</p> <p>With Timeout disabled (that is, End of Read Cycle set to New Trigger), the scanner will output the current label data immediately, but output it only once. A new label appearing at any time in the scan range will produce a new read output as long as the new label is not identical to the previous label.</p>
External Level	<p>Allows a read cycle to be initiated by a trigger signal from an object detector when an object appears within the detector's range. The read cycle exists as long as the detector “sees” the object and ends when the object moves out of the detector's range (figure 2-4 on page 2-13).^a</p>
External Edge	<p>As with Level, Edge allows a read cycle to be initiated by a trigger signal from an object detector when it detects the appearance of an object (rising edge). But unlike Level mode, the removal of an object (falling edge) does not end the read cycle. With Edge enabled, the read cycle ends with a good read output, a timeout, or a new trigger (figure 2-5 on page 2-13).</p>
Serial Data	<p>The scanner accepts an ASCII character from the host or controlling device as a trigger to start a read cycle. Serial data trigger behaves the same as External Edge.</p>
Serial Data & External Edge	<p>The scanner accepts either an external trigger or a serial ASCII command to start a read cycle.</p>

- a. *Level* and *Edge* apply to the active logic state (positive or negative) that exists while the object is in a read cycle, between the rising edge and falling edge. *Rising edge* is the trigger signal associated with the appearance of an object. *Falling edge* is the trigger signal associated with the subsequent disappearance of the object.

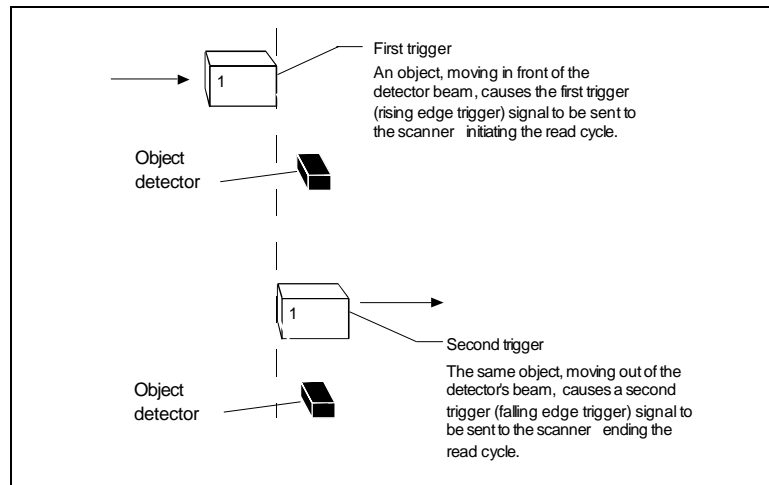


Figure 2-4 External Level Trigger Signals

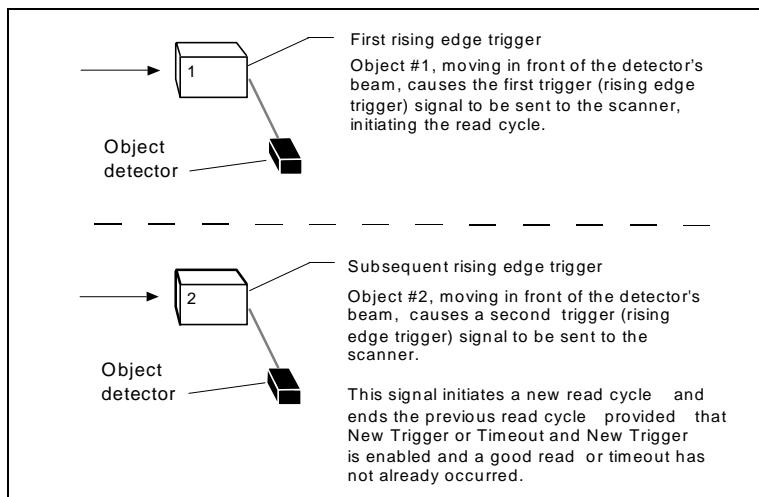


Figure 2-5 External Edge Trigger Signals

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End of Read Cycle

Default: Timeout

Options: Timeout, New Trigger, Timeout & New Trigger

Allows you to choose the circumstances that will end the read cycle. The read cycle is the time during which the scanner will receive and process label data. When the Triggering Mode option is set in an External or Serial mode of operation, the trigger event initiates the read cycle.

Note: When operating in Continuous Read or Continuous Read 1 Output, the scanner is always in the read cycle.

<i>Selecting:</i>	<i>Has this effect:</i>
Timeout	<p>Can end the read cycle after a specified period of time, and if no label has been read, causes a noread message, if enabled, to be transmitted.</p> <p>With either External Edge, Serial Data, or Serial Data & Edge enabled, a timeout ends the read cycle.</p> <p>With External Level enabled, the read cycle does not end until the falling edge trigger occurs, and the next read cycle does not begin until the next rising edge trigger.</p> <p>With Continuous Read 1 Output enabled, a timeout initiates a new read cycle and allows the same label to be read again.</p>
New Trigger	<p>Ends the read cycle at the occurrence of a new trigger event, and if no label has been read, causes a noread message, if enabled, to be transmitted at the occurrence of the new trigger event.</p> <p>With either External Edge, Serial Data, or Serial Data & Edge enabled, an edge or serial trigger ends a read cycle and initiates the next read cycle.</p> <p>With External Level enabled, a falling edge trigger ends a read cycle. However, the next read cycle does not begin until the occurrence of the next rising edge trigger.</p>
Timeout & New Trigger	<p>Ends the read cycle after a specified period of time or at the occurrence of new trigger event, and if no label has been read, causes a noread message, if enabled, to be transmitted.</p> <p>With either External Edge, Serial Data, or Serial Data & Edge enabled, a timeout, or an edge or serial trigger, whichever comes first, ends the read cycle.</p> <p>With External Level enabled, the read cycle does not end until the occurrence of a falling edge, and the next read cycle does not begin until the next rising edge trigger.</p>

Timeout (in 10 ms incs)

Default: 100 (one second). Corresponds to 1000 ms displayed in the menu.

Options: 0 to 65535. Divide the number entered on the command line by 100 for time in seconds.

Note: Timeout or Timeout & New Trigger under End of Read Cycle (page 2-14) must be enabled for Timeout (in 10 ms incs) to take effect.

Allows you to define the duration of the timeout period.

Serial Trigger Character

Default: ^]. Corresponds to <GS> displayed in the menu.

Options: Any single ASCII character, including control characters, except NUL (00H), an existing host command character,¹ or an on-line protocol character. Control characters entered on the command line are displayed in the menu as mnemonic characters.

Note: See “Defining Special Characters” on page 2-4 and Table A-5, “ASCII Table with Control Characters,” on page A-5.

Note: Serial Data (page 2-12) or Serial Data & Edge (page 2-12) must be enabled for Serial Trigger Character to take effect. “N/A” is displayed in the menu when all other triggering modes are enabled.

Allows you to define a single ASCII character as the host serial trigger character that initiates the read cycle. The serial trigger is considered an on-line host command and requires the same command format as all host commands (that is, to be entered within the < > brackets).

External Trigger Level

Default: Positive

Options: Positive, Negative

Note: External Level (page 2-12), External Edge (page 2-12), or Serial Data & Edge (page 2-12) must be enabled for External Trigger Level to take effect. “N/A” is displayed in the menu when all other triggering modes are enabled.

Allows you to determine whether a positive or negative transition will initiate the read cycle.

Note: If using the Microscan object detector (P/N 99-440001-03), use positive trigger level.

1. For example, assigning an upper case D would nullify the <D> (Enter Menu Configuration) command. For a list of operational commands used by the scanner, see Chapter 4, “Operational Commands.”

Noread Message

Default: NOREAD

Options: Up to seven ASCII characters (except NUL)

Allows you to define any combination of ASCII characters (except NUL) up to seven characters as the noread message. When enabled, the noread message will be transmitted to the host at a timeout or the end of a read cycle if the bar code label has not been decoded.

Noread Message (enable/disable)

Default: Enabled

Options: Enabled, Disabled

Note: If Noread Output is enabled, the noread message will only output if Bar Code Output (page 2-16) is also enabled.

Allows you to enable or disable the noread message.

Bar Code Output

Default: Enabled

Options: Enabled, Disabled

Allows you to choose whether or not to send label data (or noread messages) to the host. When disabled, a label is decoded and the read cycle transpires as usual, but neither label data nor the noread message is transmitted to the host. All scanner counters are updated, and the number of good reads or noreads can be obtained via operational commands.

When to Output (bar code data)

Default: As Soon As Possible

Options: As Soon As Possible, End of Read Cycle

Allows you to choose when bar code data is sent to the host.

<i>Selecting:</i>	<i>Has this effect:</i>
As Soon As Possible	Causes bar code data (good reads) to be transmitted immediately upon a good decode.
End of Read Cycle	Causes bar code data output to be delayed until the end of the read cycle.

Good Decode Reads

Default: 1

Options: 1 to 31

Allows you to select the number of good reads (from 1 to 31) required per label before a good decode output.

Note: *Be sure to set the value within the determined scan rate for the scanning setup so that the scanner is capable of scanning a label the required number of times.*

Match Code

Default: Disabled

Options: Disabled, Enabled

Note: *A triggered mode (page 2-11 to page 2-12) must be enabled for Match Code to take effect.*

Note: *If both Match Code and Continuous Read are enabled the scanner defaults to Continuous Read 1 Output mode, and the label data must change before the scanner will output data again, unless a timeout, if enabled, occurs.*

Allows you to enter a master label into the scanner's memory to be compared with subsequently scanned labels.

With Match Code enabled, a master label can be entered in three ways:

- 1. With New Master Pin enabled (see page 2-27), toggling pin 5 to ground (pin 12) enables the next good read to be the master label.*
- 2. Sending serial command <G> enables the next good read to be the master label.*
- 3. Sending serial command <)XXXX)> downloads data as master label.*

Figure 2-6 on page 2-18 shows the sequence of operation (and reference) for setting up and entering master labels.

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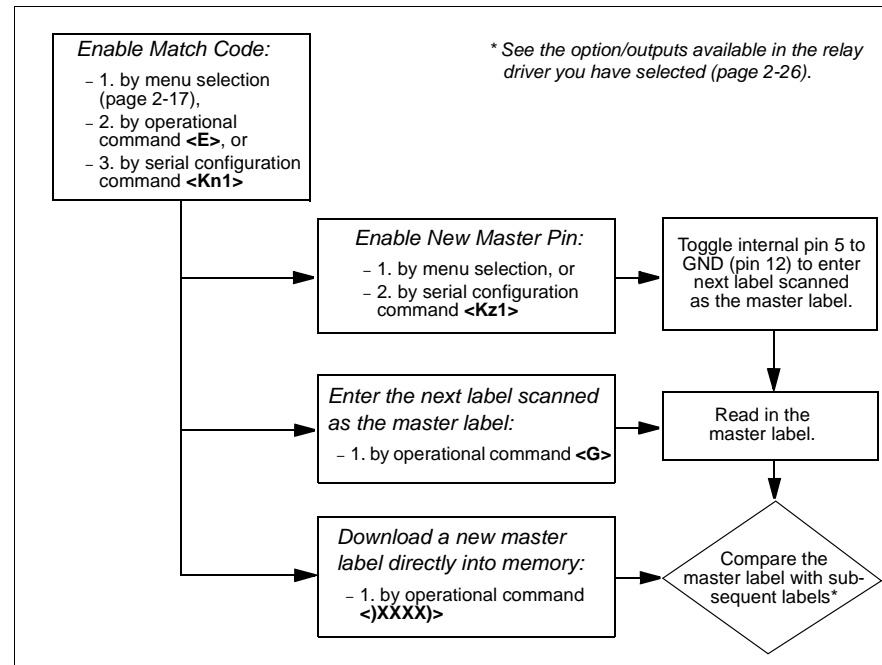


Figure 2-6 Match Code Logic Diagram

If Match Code is enabled, Relay Driver (page 2-28) must be set to an option other than Good Read. If Relay Driver is set to Good Read, there will be no output to the host or a relay pulse.

Code Types Menu

The Code Types menu allows you to choose among five bar code types and define their parameters.

To help visualize the menu's organization and to locate the page number where each topic is described, see figure 2-7, "Code Types Menu Structure," on page 2-20.

Note: Options listed in the command line do not always appear in the same order as those posted in the first column of the menu.

Options can be defined for any bar code type whether or not the bar code itself is enabled at the time.

Narrow Margins

Default: Disabled

Options: Disabled, Enabled

Allows the scanner to read bar codes with quiet zones less than 10 times the narrow-bar-width. Quiet zone is a term used to describe the minimum space at the leading and trailing ends of a label. Each quiet zone can be as small as five times the narrow bar element when Narrow Margins is enabled.

Code 39

Status

Default: Enabled

Options: Enabled, Disabled

Check Digit

Default: Disabled

Options: Disabled, Enabled

Code 39 is self-checking and does not normally require a check digit. However, for additional data integrity, a Modulus 43 check digit can be added to the bar code message. With Check Digit and an External or Serial trigger option enabled (see "Triggering Mode" on page 2-11), an invalid check digit calculation will cause a noread message to be transmitted at the end of the read cycle.

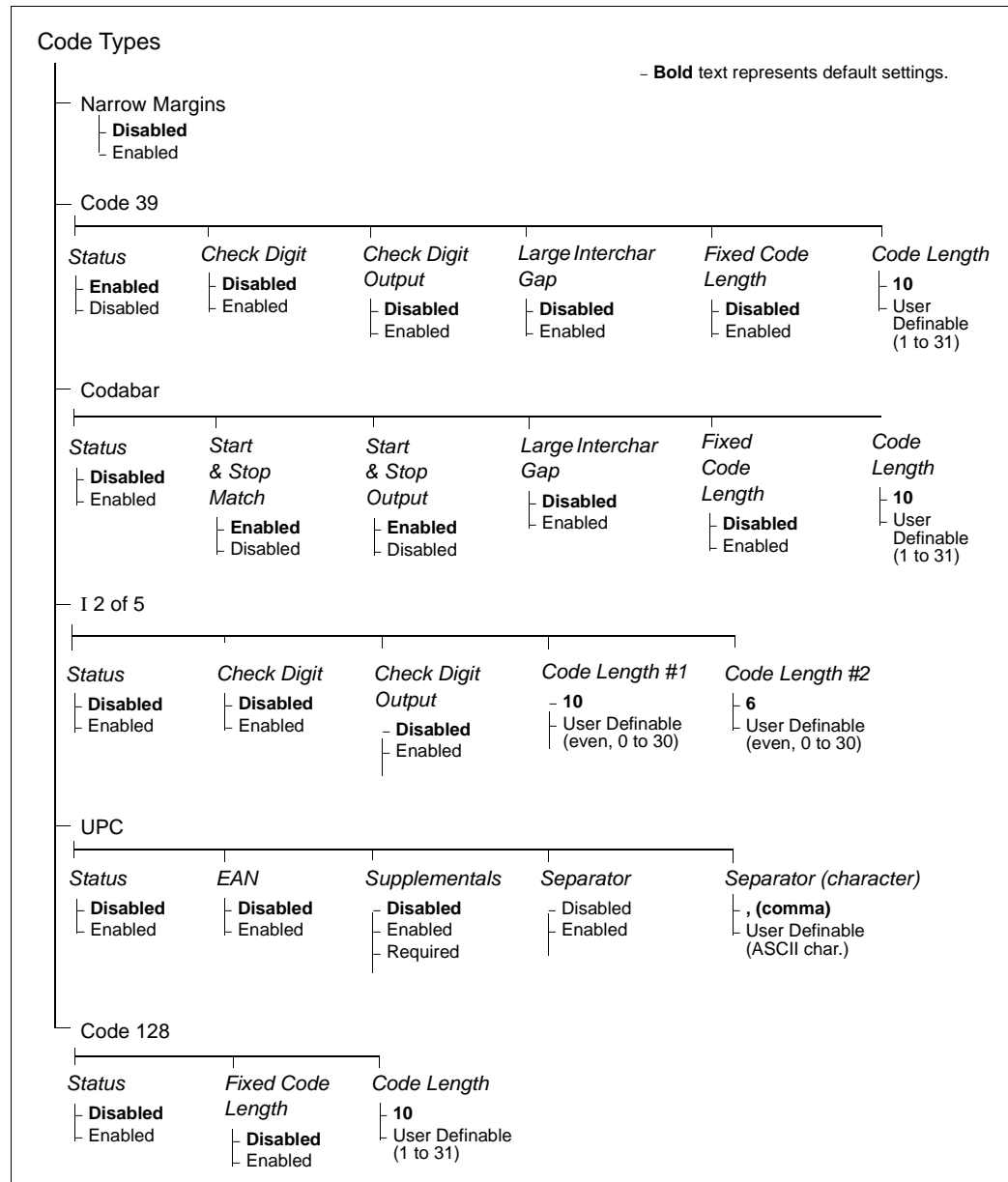


Figure 2-7 Code Types Menu Structure

Check Digit Output

Default: Disabled

Options: Disabled, Enabled

When enabled, the check digit character is sent along with the label data.
When disabled, label data is sent without the check digit.

Large Intercharacter Gap

Default: Disabled

Options: Disabled, Enabled

Allows the scanner to read labels with gaps between bar code characters exceeding three times the narrow element width.

Fixed Code Length

Default: Disabled

Options: Disabled, Enabled

Used to increase data integrity by ensuring that only one label length will be accepted.

Code Length

Default: 10

Options: 1 to 31

NOTE: Fixed Code Length (page 2-21) must be enabled for Code Length to take effect.

Allows you to specify the exact number of characters that the scanner will recognize (this does not include start and stop). The scanner will ignore any code not having the specified length.

Codabar

Status

Default: Disabled

Options: Disabled, Enabled

Start & Stop Match

Default: Enabled

Options: Enabled, Disabled

Requires the Codabar start and stop characters (a, b, c, or d) to match before a valid read can occur.

Start & Stop Output

Default: Enabled

Options: Enabled, Disabled

Allows the start and stop characters to be transmitted with bar code data.

Large Intercharacter Gap

Default: Disabled

Options: Disabled, Enabled

Allows the scanner to read labels with gaps between bar code characters exceeding three times the narrow element width.

Fixed Code Length

Default: Disabled

Options: Disabled, Enabled

Used to increase data integrity by ensuring that only label length will be accepted.

Code Length

Default: 10

Options: 1 to 31

Note: Fixed Code Length (page 2-22) must be enabled for Code Length to take effect.

Allows you to specify the exact number of characters that the scanner will recognize. The scanner will ignore any code not having the specified length.

Interleaved 2 of 5

Status

Default: Disabled

Options: Disabled, Enabled

Because I 2 of 5 is a continuous code, it is prone to substitution errors. Hence, a code length must be defined and a bar code label containing an even number of digits must be used. It is also recommended that a Modulus 10 check digit be used to ensure the best possible data integrity.

Check Digit

Default: Disabled

Options: Disabled, Enabled

I 2 of 5 uses a Modulus 10 check digit.

Check Digit Output

Default: Disabled

Options: Disabled, Enabled

When enabled, the check digit character is sent along with the label data. When disabled, label data is sent without the check digit.

Code Length #1

Default: 10

Options: 0 to 30, even. If you enter an odd number the scanner will use the next lower number.

With I 2 of 5, two code lengths can be defined. When using only one label length in an application, we recommend setting Code Length #2 to 0 to ensure data integrity. If a check digit is used, it must be included in the code length count.

Code Length #2

Default: 6

Options: 0 to 30, even. If you enter an odd number the scanner will use the next lower number.

If using a second label, you may also specify a zero or any even code length from 2 to 30. If not using a second label, set Code Length #2 to 0 to ensure data integrity.

UPC

Status

Default: Disabled

Options: Disabled, Enabled

When enabled, the scanner will read UPC version A and UPC version E only.

EAN

Default: Disabled

Options: Disabled, Enabled

Note: UPC must be enabled for EAN to take effect.

When EAN is enabled, the scanner will read UPC version A, UPC version E, EAN 13, and EAN 8. It will also append a leading zero to UPC version A label information and transmit 13 digits. If you do not want to transmit 13 digits when reading UPC version A labels, disable EAN.

Supplementals

Default: Disabled

Options: Disabled, Enabled, Required

Note: Supplementals is set to Enabled, Triggering Mode (page 2-11) must not be set to Continuous Read 1 Output.

Allows the scanner to read supplemental bar code data that has been appended to the standard UPC or EAN codes.

When set to Required, the scanner treats the supplemental data and the bar code label as a single label. Also, supplemental data must be found or a noread will result.

When set to Enabled, the scanner treats the supplemental data and the bar code label as separate labels.

Separator

Default: Disabled

Options: Disabled, Enabled

Allows you to insert a character between the standard UPC or EAN code and the supplemental code.

Separator (character)

Default: , (comma)

Options: Any ASCII character.

Allows you to change the separator character from a comma to a new value.

Code 128

Status

Default: Disabled

Options: Disabled, Enabled

Fixed Code Length

Default: Disabled

Options: Disabled, Enabled

Allows you to increase data integrity by ensuring that only one label length will be accepted.

Code Length

Default: 10

Options: 1 to 31

Note: Fixed Code Length must be enabled for Code Length to take effect.

Allows you to specify the exact number of characters that the scanner will recognize. The scanner will ignore any code not having the specified length.

User Outputs Menu

The User Outputs menu allows you to control the external (video or audio) outputs that identify scanning conditions.

To help visualize the menu's organization and to locate the page number where each topic is described, see figure 2-8 on page 2-26.

Beeper Status

Default: On Good

Options: On Good, On Noread, Disabled

A beep is emitted either after each good read of a bar code label or after each noread.

Note: The beep period will be short for triggered modes where a new trigger occurs immediately or the output is delayed to the end of the read cycle on edge and serial triggers.

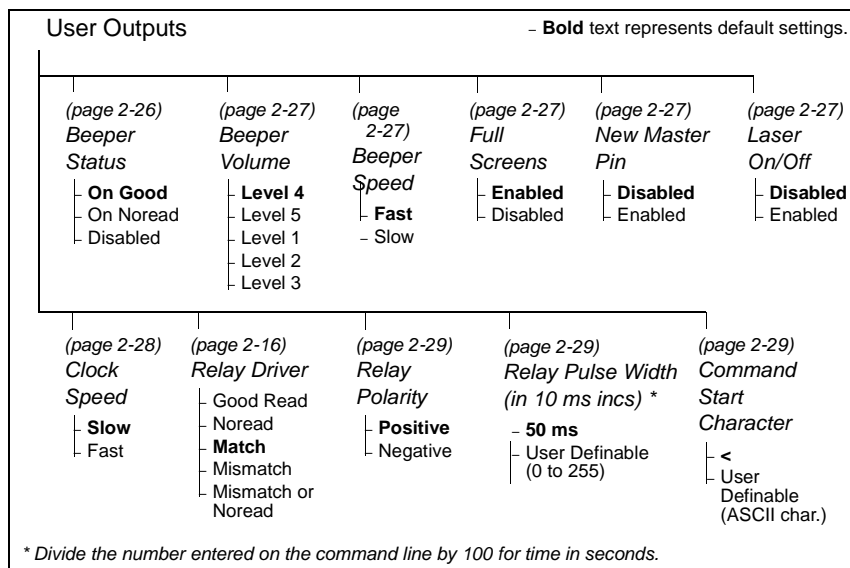


Figure 2-8 User Outputs Menu Structure

Beeper Volume

Default: Level 4

Options: Level 4, Level 5, Level 1, Level 2, Level 3

Beeper Speed

Default: Fast

Options: Fast, Slow

Allows you to set the beeper to accommodate your application. The beeper takes approximately 80 ms to sound when Slow is enabled. If your application speed is faster than 80 ms (approximately), enable Fast.

Full Screens

Default: Enabled

Options: Enabled, Disabled

Allows you to display either the full menu screen or just the command line. When Full Screens is disabled, only the command line will be displayed.

New Master Pin

Default: Disabled

Options: Disabled, Enabled

Note: Match Code (page 2-17) and a triggered mode (page 2-11) must be enabled for New Master Pin to take effect.

Allows you to momentarily connect pin 5 to ground (pin 10) in order to clear any existing master label information from memory and allows the next label to be read as the new master label information.

Note: *Even if it is enabled, New Master Pin will not load the new master label information if RS-422, RS-485 or RTS/CTS is enabled because it uses the CTS pin.*

Laser On/Off

Default: Disabled

Options: Disabled, Enabled

Note: A serial or external trigger (see "Triggering Mode" on page 2-11) must be enabled for Laser On/Off to take effect.

When enabled, the laser is ON only during the read cycle. When disabled, the laser operates continuously.

Note: Laser On/Off does not relate to the <H> (Enable Laser Scanning) or <I> (Disable Laser Scanning) operational commands on page 4-3.

Clock Speed

Default: Slow

Options: Slow, Fast

Provides a means to set internal clock speed according to the label range and bar code label density. Generally, the slow setting is used with lower density labels (20 mil narrow-bar-width or wider) and with labels placed closer to the scanner; while the fast setting is used with higher density labels (about 5 mil narrow-bar-width) and with labels placed further from the scanner.

Relay Driver

Default: Good Read

Options: Good Read, Noread, Match, Mismatch, Mismatch or Noread

Note: If Relay Driver is set to Mismatch or Noread, or Mismatch, a relay pulse will not output unless Match Code (page 2-17) is enabled and a master label is downloaded into memory (page 2-27).

Allows you to set the conditions that will output a relay pulse of 5V to pin 7. To see your options for enabling Match Code and downloading a master label into memory, see figure 2-6, "Match Code Logic Diagram," on page 2-18.

If Match Code (page 2-17) is enabled, Relay Driver must be set to an option other than Good Read. If Relay Driver is set to Good Read, there will be no output to the host or a relay pulse.

<i>Selecting:</i>	<i>Has this effect:</i>
Good Read	Sends a pulse when the label's data is accurately scanned and decoded.
Noread	Sends a pulse when the label's data is not decoded before the end of the read cycle.
Match	Sends a pulse when the decoded label matches the master label. (If Match Code is disabled, a good read will have the same effect.)
Mismatch	Sends a pulse when the label's data does not match that of the master label.
Mismatch or Noread	Sends a pulse when the label's data does not match that of the master label or the label is not decoded before the end of the read cycle.

Relay Polarity

Default: Positive

Options: Positive, Negative

Allows you to choose between positive and negative output signals at pin 7.

Relay Pulse Width (in 10 ms incs)

Default: 5 (.05 seconds). Corresponds to 50 ms displayed in the menu.

Options: 0 to 255 (0 to 2.55 seconds). Divide the number entered on the command line by 100 for time in seconds.

Allows you to set the duration of the good match/noread output signals at pin 7.

Command Start Character

Default: <

Options: Any ASCII character

Allows you to define a new ASCII start character in a serial command.

Chapter
3

Serial Configuration

Chapter Contents

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Most of the configuration changes to the scanner that can be made in the menu can also be accomplished by command strings from the host.

Serial command strings are entered from an ASCII terminal. As with menu configuration commands, serial configuration commands relate to the initial scanner setup.

To quickly reference the serial configuration commands, see table 3-1 on page 3-2.

Summary of Serial Configuration Commands

Table 3-1 Summary of Serial Configuration Commands

Function	Parameter	Command	Format
(Not in menu)	KF	Trigger Filter Timing Value	<KF?> <KF time in 10 ms increments>
Communications	Kf	Communications Protocol	<Kfprotocol,address>
	Kd	Preamble	<Kdstatus,ASCII characters>
	Ke	Postamble	<Kestatus,ASCII characters>
	KA	Response Timeout	<KAtimeout setting>
	Kc	LRC	<Kcstatus>
	KB	Intercharacter Delay	<KBnumber>
	Ka	Host Port	<Kabaud,parity,stop bits,data bits>
Operations	Kb	RS-422	<Kbstatus>
	Kg	Triggering Mode	<Kgmode>
	Kh	End of Read Cycle	<Khmode,time>
	Ki	Serial Trigger Character	<Kicharacter>
	Kj	External Trigger Level	<Kjmode>
	Kk	Noread Message	<Kkstatus,message>
	Kl	Bar Code Output	<Klstatus,when to output>
	Km	Good Decode Reads	<Kmnumber>
Code Types	Kn	Match Code	<Knstatus>
	Ko	Narrow Margins	<Kostatus>
	Kp	Code 39	<Kpstatus,check digit status,check digit output status,large intercharacter gap,fixed code length status,code length>
	Kq	Codabar	<Kqstatus,start & stop match status,start & stop output status,large intercharacter gap,fixed code length status,code length>
	Kr	Interleaved 2 of 5	<Krstatus,check digit,check digit output,length 1,length 2>
	Ks	UPC/EAN	<Ksstatus,EAN status,supplementals status,separator status,separator char.>
	Kt	Code 128	<Ktstatus,fixed length,length>

Table 3-1 Summary of Serial Configuration Commands (continued)

Function	Parameter	Command	Format
User Outputs	Ku	Beeper	<Kustatus,volume,speed>
	KN	New Master Pin	<KNstatus>
	KC	Laser On/Off	<KCstatus>
	Kz	Clock Speed	<Kzspeed>
	Kv	Relay Driver	<Kvstatus>
	Kw	Relay Polarity	<Kwstatus>
	Kx	Relay Pulse Width	<Kxnumber>
	KE	Command Start Character	<KEASCII character>

Serial Configuration Command Format

The format for a serial configuration command is,

<Kparameterdata,data,...etc.><initializing command>

Where:

- Less than < and greater than > symbols are included as part of the commands.¹
- “parameter,” as used here, are those character(s) that precede the data.
- The “initializing command” <A> or <Z> is sent after configuration is complete. <Z> resets and saves for power up. <A> initializes the change to RAM.² (For more information, see page 4-3.)

For example, the following command enables UPC and saves the change for power-on: **<Ks1><Z>**.

When using serial configuration commands, note also the following conventions:

- Parameters and data are “case sensitive.” That is, characters must be entered as upper or lower case, as specified.
- All data fields (except the last) must be followed by a comma (without a space).
- If there is no change in a given field, then commas can be entered alone, or with the existing data (for example, **<Ka,,,0>** or **<Ka4,1,0,0>**).

1. Command start character by default is a left angle bracket, <. It may be redefined by menu or serial command. However, the end character, a right angle bracket, >, cannot be changed.

2. See “Initializing serial configuration commands” on page 3-4 for definitions and examples.

- All fields preceding the modified field must be included. For example, in Host Port, to change Data Bits to Eight without changing any other field, enter either: **<Ka,,,1>** or **<Ka4,1,0,1>**.
- All fields following the modified field can be left out. For example, in the RS-232 port, to change Baud Rate to 4800, enter **<Ka3>**.

(See examples on following pages.)

Initializing serial configuration commands

To ensure that a serial configuration command will take effect, you need to follow it with one of the operational commands below:

<A> To reset but not save changes for power-on

<Z> To reset and save changes for power-on

For example, to change Baud Rate and reset without saving changes for power-up, enter **<Ka3><A>**.

To change Baud Rate and reset, saving the changes to NOVRAM, enter **<Ka3><Z>**.

Concatenating Serial Commands

Commands can be concatenated (added together) to a maximum of 64 characters in a single string or data block. Additional data blocks of 64 or less characters can be sent provided there is at least a 10 ms pause between blocks.

For example, **<Kc1><Kh1><Ko1><A>** enables LRC, sets End of Read Cycle mode to New Trigger, enables Narrow Margins and resets the data buffers (without saving the changes for power-on).

Loss of Communications

Making changes to communications parameters such as Baud Rate, Parity, Stop Bits, LRC, etc. without corresponding changes in linked device(s) can result in the loss of menu access. If this should occur, default the scanner. See Appendix D, "Defaulting the Scanner," on page A-8.

Trigger Filter Timing Value

Format: **<KF?>**

Returns the current trigger filter timing value in milliseconds.

Format: **<KFone tenth trigger filter timing value>**

Allows you to set trigger filter timing. Divide the desired number of milliseconds by 10 and enter the quotient.

Communications Commands

Protocol

If selecting one of the options form 0 to 4 (Point-to-Point, Point-to-Point with RTS/CTS, Point-to-Point with XON/XOFF, Point-to-Point with RTS/CTS and XON/XOFF, or Polling Mode D), use this format:

Format: **<Kfprotocol>**

protocol:

0 = Point-to-Point	4 = Polling Mode D
1 = Point-to-Point with RTS/CTS	5 = Multidrop (requires address)
2 = Point-to-Point with XON/XOFF	6 = User Defined
3 = Point-to-Point with RTS/CTS & XON/XOFF	7 = User Defined Multidrop

Example: To change the Protocol to Polling Mode D, enter **<Kf4>**.

If selecting Multidrop (5), you must define an address and append it to the command string.

Format: **<Kf5protocol,address>**

protocol:

5 = Multidrop

address:

Any number from
1 to 50

Example: To change the Protocol to Multidrop with an address of 33, enter **<Kf5,33>**.

If selecting User Defined (6) or User Defined Multidrop (7), complete the format by either choosing new parameters or concatenating unchanged data fields (separate by commas).

Tip: For User Defined, first select Point-to-Point **<Kf0>** and then User Defined **<Kf6...>**. For user Defined Multidrop, first select Multidrop **<Kf5>**, then User Defined Multidrop **<Kf7...>**.

Format: <Kfprotocol,RES,address,REQ,EOT,STX,ETX,ACK,NAK>

Protocol:

6 = User Defined

7 = User Defined Multidrop

Note: Address, can be assigned any ASCII character except a null. Control characters are used to define RES through NAK (except Address). Table 3-2 lists the control characters used for these data fields. (Refer to Table A-5, "ASCII Table with Control Characters," on page A-5 for more information.)

Example: To select an unpolled ACK/NAK User Defined protocol with LRC disabled, enter <Kf0><Kf6,,,,,,,,^F,^U><Kc0>. ¹ ACK and NAK will be displayed in the menu. ²

Table 3-2 Protocol Commands

Protocol Command (Mnemonic displayed on Microscan menu)	Control Characters (Entered in menu or serial command)	Effect of Command
RES	^D	Reset
REQ	^E	Request
EOT	^D	Reset
STX	^B	Start of Text
ETX	^C	End of Text
ACK	^F	Acknowledge
NAK	^U	Negative Acknowledge

Preamble

Format: <Kdstatus,preamble character(s)>

status: preamble character(s):

0 = Disabled Enter one or two preamble characters except a null

1 = Enabled (00H). Default is **^M**.

Example: To enable Preamble with just one character, an FF (form feed), enter <Kd1,^L>.

1. <Kf0> nulls the address and <Kc0> disables LRC.

2. A control character, although conventionally represented here and in the ASCII table on page A-5 as two characters (^F or ^U, etc.), is actually a single ASCII character that is entered on the keyboard by holding down the control key while pressing the desired letter.

Postamble

Format: <Kestatus,postamble character(s)>

status: postamble character(s):

0 = Disabled Enter one or two postamble characters except a null
 1 = Enabled (00H). Default characters are ^M^J.

Example: To enable Postamble, enter <Ke1>.

Response Timeout

Format: <KAtimeout setting>

timeout setting:

Any number from 0 to 6500 (a zero creates an indefinite wait). Default is 0.

Example: To change Response Timeout to 30 ms, enter <KA30>.

LRC

Format: <Kcstatus>

status:

0 = Disabled
 1 = Enabled

Example: To enable LRC, enter <Kc1>.

Intercharacter Delay

Format: <KBtime interval>

time interval (between characters in milliseconds):

Any number from 0 to 255. Default is 0.

Example: To change Inter-character Delay to 30 ms, enter <KB30>.

Host Port

Format: <Kabaud rate,parity,stop bits,data bits>

baud rate:

0 = 600 3 = 4800 6 = 300
 1200 **4 = 9600**
 2 = 2400 5 = 19.2K

parity:

0 = None
1 = Even
 2 = Odd

stop bits:

0 = One
 1 = Two

data bits:

0 = Seven
 1 = Eight

Example: To change Host Port Baud Rate to 2400, enter <Ka2>.

RS-422

Format: **<KbRS-422>**

RS-422:

0 = Disabled 1 = Enabled

Example: To enable RS-422, enter **<Kb1>**.

Note: Whenever RS-422 is disabled, RS-232 is enabled in the background. However, an exception occurs whenever Multidrop has been selected. In this case the functioning protocol will be RS-485 regardless of the displayed status of RS-422 in the menus.

Operations Commands

Triggering Mode

Format: **<Kgtriggering mode>**

triggering mode:

0 = Continuous Read 3 = External Edge
1 = Continuous Read 1 Output 4 = Serial Data
2 = External Level 5 = Serial Data & Edge

Example: To select External Edge, enter **<Kg3>**.

End of Read Cycle

Format: **<Khend of read cycle mode,timeout>**

end of read cycle mode: timeout (in 10 millisecond increments):

0 = Timeout Any number between 0 and 65535. Default is
1 = New Trigger **100** (one second).
2 = Timeout & New Trigger

Example: To select Timeout and change the timeout value to 6 seconds, enter **<Kh0,600>**.

Serial Trigger Character¹

Format: **<Kiserial trigger character>**

serial trigger character:

Any available ASCII character (see "ASCII Table with Control Characters" on page A-5). Default is **^**].

1. Avoid selecting a serial trigger character that is also an operational command. For example, an uppercase C cannot be used as a serial trigger character because it is the operational command for Enter Read Rate Test. However, a lowercase c could be used without initiating the read rate test.

Example: To define the Serial Trigger Character as a lowercase c, enter **<Kic>**.

External Trigger Level

Format: **<Kjexternal trigger level>**

external trigger level (initiates a read cycle):

0 = Negative **1 = Positive**

Example: To change External Trigger Level to Negative, enter **<Kj0>**.

Noread Message

Format: **<Kkstatus,message>**

status: *message:*

0 = Disabled Any ASCII string up to 7 digits. Default is **NOREAD**.

1 = Enabled

Example: To enable Noread Message and send the message "FAIL," enter **<Kk1,FAIL>**.

Bar Code Output

Format: **<Klstatus,when to output>**

status: *when to output:*

0 = Disabled **0 = As Soon As Possible**

1 = Enabled 1 = End of Read Cycle

Example: To set When to Output to End of Read Cycle, enter **<Kl3,1>**.

Good Decode Reads

Format: **<Kmnumber of reads>**

number of reads (before a good decode):

Any number from 1 to 31.

Default is 1.

Example: To change Good Decode Reads to 3, enter **<Km3>**.

Match Code

Format: **<Knstatus>**

status:

0 = Disabled

1 = Enabled

Example: To enable Match Code, enter **<Kn1>**.

Code Types Commands

Narrow Margins

Format: **<Kostatus>**

status:

0 = Disabled
1 = Enabled

Example: To enable Narrow Margins, enter **<Ko1>**.

Code 39

Format: **<Kpstatus,check digit status,check digit output status,large intercharacter gap,fixed code length status,code length>**

<i>status:</i>	<i>check digit status:</i>	<i>check digit output status:</i>
0 = Disabled	0 = Disabled	0 = Disabled
1 = Enabled	1 = Enabled	1 = Enabled

<i>large intercharacter gap:</i>	<i>fixed code length status:</i>	<i>code length:</i>
0 = Disabled	0 = Disabled	Any number from 1 to 31. Default is 10 .
1 = Enabled	1 = Enabled	

Example: To set Fixed Code Length to 30, enter **<Kp,,,1,30>** or **<Kp1,0,0,0,1,30>**.

Codabar

Format: **<Kqstatus,start & stop match status,start & stop output status,large intercharacter gap,fixed code length status,code length>**

<i>status:</i>	<i>start & stop match status:</i>	<i>start & stop output status:</i>
0 = Disabled	0 = Disabled	0 = Disabled
1 = Enabled	1 = Enabled	1 = Enabled

<i>large inter-character gap:</i>	<i>fixed code length status:</i>	<i>code length:</i>
0 = Disabled	0 = Disabled	Any number from 1 to 31. Default is 10 .
1 = Enabled	1 = Enabled	

Example: To set Fixed Code Length to 9, enter **<Kq,,,1,9>** or **<Kq1,1,1,0,1,9>**.

I 2 of 5

Format: <Krstatus,check digit status,check digit output status,code length #1,code length #2>

<i>status:</i>	<i>check digit status:</i>	<i>check digit output status:</i>
0 = Disabled	0 = Disabled	0 = Disabled
1 = Enabled	1 = Enabled	1 = Enabled
<i>code length #1:</i>	<i>code length #2:</i>	
Zero or any even number from 2 to 30. Default is 10 .	Zero or any even number from 2 to 30. Default is 6 .	

Example: To set Fixed Code Length #1 to 8 and Fixed Code Length #2 to 4, enter <Kr,,,8,4> or <Kr1,0,0,8,4>.

UPC/EAN

Format: <KsUPC status,EAN status,supplementals status,separator status,separator character>/

<i>UPC status:</i>	<i>EAN status:</i>	<i>supplementals status:</i>
0 = Disabled	0 = Disabled	0 = Disabled
1 = Enabled	1 = Enabled	1 = Enabled
	(UPC must also be enabled)	2 = Required
<i>separator status:</i>	<i>separator character:</i>	
0 = Disabled	Any ASCII character (except NUL). Default is a comma (,).	
1 = Enabled		

Example: To change Supplementals to Required, and change Separator Character to a dash (-), enter <Ks1,1,2,1,-> or <Ks,,2,1,->.

Code 128

Format: <Ktstatus,fixed code length status,code length>

<i>status:</i>	<i>fixed code length status:</i>	<i>code length:</i>
0 = Disabled	0 = Disabled	Any number from 1 to 31.
1 = Enabled	1 = Enabled	Default is 10 .

Example: To enable Code 128, enable Fixed Code Length, and set Code Length to 9, enter <Kt1,1,9>.

User Outputs Commands

Beeper

Format: <K**u**beeper status,beeper volume,beeper speed>

beeper status:	beeper volume:	beeper speed:
0 = Disabled	0 = Level 1	0 = Fast
1 = On Good	1 = Level 2	1 = Slow
2 = On Noread	2 = Level 3	
	3 = Level 4	
	4 = Level 5	

Example: To set the beeper for On Noread and set the beeper volume to Level 1, enter <K**u**2,0>.

New Master Pin

Format: <K**N**status>

status:

0 = Disabled
1 = Enabled

Example: To enable New Master Pin, enter <K**N**1>.

Laser On/Off

Format: <K**C**status>

status:

0 = Disabled
1 = Enabled

Example: To enable Laser On/Off, enter <K**C**1>.

Clock Speed

Format: <K**z**status>

status:

0 = Sow
1 = Fast

Example: To change Clock Speed to Fast, enter <K**z**1>.

Relay Driver

Format: <Kvmode>

mode:

0 = Good Read 3 = Mismatch
1 = Noread 4 = Mismatch or Noread
2 = Match

Example: To change Relay Driver to NOREAD, enter <Kv1>.

Relay Polarity

Format: <Kwpolarity>

polarity:

0 = Negative
1 = Positive

Example: To change Relay Polarity to Negative, enter <Kw0>.

Relay Pulse Width

Format: <Kxpulse width>

pulse width (in 10 millisecond increments):

Any number from 0 to 255. Default is **5** (50 ms).

Example: To set Relay Pulse Width to 600 ms, enter <Kx60>.

Command Start Character

Format: r<KEcommand start character>

ASCII character:

Any ASCII character. Default is <.

Example: To change Command Start Character to a colon (:), enter <KE:>.

Note: Subsequent commands must start with a colon (:). For example, enter :D> to access the Menu Configuration Program, or :KE<> to change back to the default character.

Chapter
4

Operational Commands

Chapter Contents

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This chapter describes all of the serial operational commands and their functions. See “Summary of Operational Commands,” on page 4-2 for quick reference.

On-line serial operational commands are sent from the host to the scanner to carry out routine operations “on the fly” as distinguished from serial configuration commands that are generally used in initial setup.

Operational commands are preceded by a < left angle bracket symbol and followed by a > right angle bracket symbol.¹

1. Command start character by default is a left angle bracket, <. It may be redefined by menu or serial command. However, the end character, a right angle bracket, >, cannot be changed.

Summary of Operational Commands

Table 4-1 Summary of Operational Commands

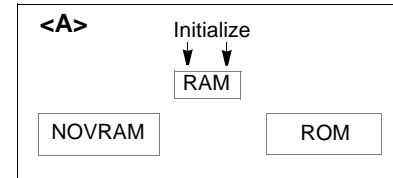
Command Type	Command	Result
Program Management	<A>	Software Reset (does not save for power-on)
	<D>	Enter Configuration Mode
	<Z>	Software Reset/Save Parameters for Power-on
Device Control	<H>	Enable Laser Scanning (Laser On)
	<I>	Disable Laser Scanning (Laser Off)
	<L>	Host Relay Driver
Code Types	<P>	Autodiscriminate All Codes
	<Q>	Enable Code 39 Only*
	<R>	Enable Codabar Only*
	<S>	Enable 1 2 Of 5 Only*
Counter	<N>	Noread Counter
	<O>	Noread Counter Reset
	<T>	Trigger Counter
	<U>	Trigger Counter Reset
	<V>	Match Counter
	<W>	Match Counter Reset
	<X>	Mismatch Counter
	<Y>	Mismatch Counter Reset
Test	<C>	Enter Read Rate Test
	<J>	Exit Read Rate Test
Status	<#>	Display Software Part Number
	<!>	Display Checksum of EPROM
Master Label	<E>	Enable Match Code Option*
	<F>	Disable Match Code Option ^a
	<G>	Store Next Label Scanned as Master Label
	<)XXXX)>	Download Master Label Information
	<)>	Request Master Label Information
	<))>	Delete Master Label Information

a. Can also be set in the configuration menu or with a serial configuration command.

4-Operations.

Program Management Commands

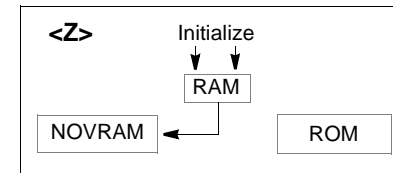
<A> Software Reset. Initializes all serial configuration commands in RAM and resets all counters and operating parameters. Changes for Baud Rate, Code Length, etc. do not take effect until this command is sent.



Note: Software Reset will cause the numeric counters in use to lose their count; record all data that you wish to save prior to sending this command.

<D> Enter Configuration Mode. Enters the menu configuration program. See Chapter 2, "Menu Configuration."

<Z> Software Reset/Save Parameters for Power-on. Saves the current configuration to nonvolatile memory for availability on power-on.



The values of numeric counters are not saved by this command.

Note: The <Z> Save Configuration command can be executed at least 10,000 times. In normal usage this will exceed the life of the scanner. If frequent changes to the operating parameters are required, it is recommended that the <Z> command be used only when the current configuration has been changed and the changes are to be permanent.

Device Control Commands

<H> Enable Laser Scanning (Laser On).

<I> Disable Laser Scanning (Laser Off). This feature is useful during extended periods of time when no bar code labels are being scanned. Disabling laser scanning will not affect any downloaded commands to the scanner.

<L> Host Relay Driver Pulse. Allows you to send a pulse to pin 7 at any time regardless of Match Code or Relay Driver status.

Code Type Commands

<P> Autodiscriminate All Codes. Enables the scanner to decode all available bar code types without changing scanner configuration settings.

Note: For maximum scanning speed, enable only those bar code symbologies used in the application.

<Q> Enable Code 39 Only. Allows only Code 39 labels to be read.

<R> Enable Codabar Only. Allows only Codabar labels to be read.

<S> Enable I 2 of 5 Only. Allows only Interleaved 2 of 5 labels to be read.

Counter Commands

The Xs in all counter commands that follow denote a numeric value from 00000 to 65,535. After reaching the maximum numeric limit of 65,535, you will receive an error message and the counter will automatically rollover and start counting again at 00000. To obtain the cumulative total of counts after the rollover has occurred, add 65,536 per each rollover (the scanner does not keep track of the number of rollovers) to the current count.

Note: You will lose all counter values if you cycle power to the scanner, send the <A> command, or enter the Menu Configuration Program.

Note: If you activate the counter command during a read cycle, the scanner will not output the count until the read cycle ends.

<N> Noread Counter. The message N/XXXXX displays the total number of noreads that have occurred since power-on or the last Noread Counter Reset command.

<O> Noread Counter Reset. Sets Noread Counter to 00000.

<T> Trigger Counter. The message T/XXXXX displays the total number of triggers since power-on or the last Trigger Counter Reset command.

<U> Trigger Counter Reset. Sets the trigger counter to 00000.

<V> Match Counter (or Good Read Counter). The message V/XXXXX displays the total number of good reads matching the master label since power-on or the last Match Counter Reset command. This counter is always enabled, but will only work as a match count when Match Code option is enabled. If the Match Code option is not enabled, this counter records the number of good reads, or decodes. This count can be requested at any time.

<W> Match Counter Reset. Sets the Match Counter to 00000.

<X> Mismatch Counter. The message X/XXXXX displays the number of labels successfully read that do not match the master label since power-on or the last Mismatch Counter command.

<Y> Mismatch Counter Reset. Sets the Mismatch Counter to zero.

downloaded at any time, and can be saved in nonvolatile memory with a <Z> command. A stored master label will not affect standard operation unless Match Code option is enabled.

The Xs denote alphanumeric data, from 1 to 31 characters.

<I> Request Master Label Information. Immediately sends the master label information to the host. To prevent conflicts with outputting label data, first send the <I> command (Disable Laser Scanning (Laser Off)).

Note: *If the master label information has previously been stored in nonvolatile RAM (by a <Z> command), cycling the power will restore that information.*

<D> Delete Master Label Information. Deletes master label information that has previously been loaded by either <XXXX> Download Master Label Information Command or <G> Store Next Label as Master Label command.

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Appendix A — Scanner Specifications

Mechanical

Length: 2.92" (74.2 mm) Width: 2.25" (57.2 mm)
 Height: 2.25" (57.2 mm) Weight: 9 oz. (257 g)

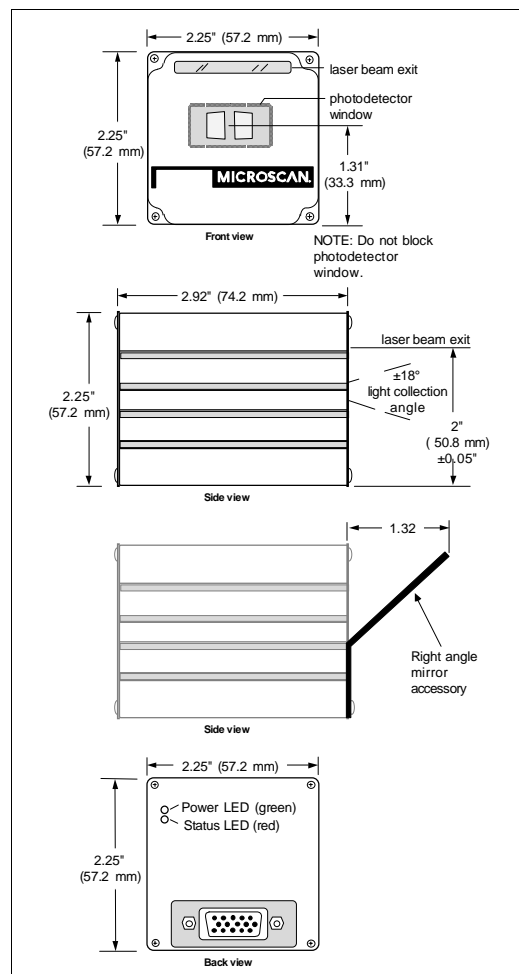


Figure A-1 Mechanical Dimensions

Light Source

Type: Semiconductor Laser Diode
 Beam Spot: Round or oval

Output Wavelength: 670 nm nominal (visible),
 780 nm nominal (infrared)
 Safety Class: CDRH Class II (visible), CDRH Class I (infrared)
 Operating Life: 50,000 hours @ 25°C (visible),
 400,000 hours @ 25°C (infrared)

Scanning Parameters

Mirror Type: Rotating 10-faceted polygon
 Scan Rate: 200 scans per second
 Scan Width Angle: 60°
 Raster Image: 10 raster scan lines over a 2-degree arc
 (or 0.24 inch raster at 6-inch distance)

Scan Range	Raster Height
2 inches (50.8 mm)	0.10 inch (2.54 mm)
4 inches (101.6 mm)	0.17 inch (4.32 mm)
6 inches (152.4 mm)	0.24 inch (6.1 mm)
8 inches (203.2 mm)	0.31 inch (7.87 mm)
10 inches (254 mm)	0.38 inch (9.65 mm)

Communications

Interface: RS-232, RS-422, RS-485
 Baud Rates: 300, 600, 1200, 2400, 4800, 9600, 19.2K
 Parity: Odd, Even, None
 Stop Bits: 1, 2
 Data Bits: 7, 8

Code Types

Code 39, Codabar, Interleaved 2 of 5, UPC/EAN, Code 128

Protocols

Point-to-Point, Point-to-Point w/RTS/CTS, Point-to-Point
 w/XON/XOFF, Point-to-Point w/RTS/CTS & XON/XOFF, Poll-
 ing Mode D, Multidrop, User Defined, User Defined Multidrop

Environment

Operating Temperature: 32° to 104°F (0° to 40°C) (visible),
 32° to 113°F (0° to 45°C) (infrared)
 Storage Temperature: -58° to 158°F (-50° to 70°C)
 Humidity: Up to 95% (non-condensing)
 Ambient Light Immunity: • 450 foot candles (indoor: fluo-
 rescent, incandescent, mercury vapor, sodium vapor)
 • 2000 foot candles (soft outdoors)

I/O Connector

Connector: High-density, 15-pin, D-subminiature socket
 wired as DTE (RS-232, RS-422, RS-485)

Table A-1 15-pin Connector

Pin #	Function
1	+5 VDC (input)
2	RS-232 (transmit)
3	RS-232 (receive)
4	RS-232 (signal gnd)
5	CTS, ^a RS-422/RS-485 (- transmit), or New Master Pin
6	RTS or RS-422/RS-485 (+ transmit) ^b
7	Relay Driver (5 V, 20 mA capability) (output)
8	Reset (to default configuration) (input)
9	Trigger (input) (3 to 24 VDC)
10	Signal Ground
11	+12 VDC (input)
12	RS-422/RS-485 (+ receive)
13	GND (chassis)
14	RS-422/RS-485 (- receive)
15	-12 VDC (input)

^a CTS is used with the RS-232 option. See "FIS Options" on page A-4.

^b RTS is used with the RS-232 option. See "FIS Options" on page A-4.

Table A-2 Scanner/MS-610 ADP (adapter) Pinouts

Connectors				
MS-610 Connector	25-pin Host	Power Supply	Object Detector	RS-422/485 Multidrop
1	9	3	3	
2	2			
3	3			
4	7	1	5	1, 6
5	5, 14			5
6	4, 19			4
7	8			
8	11			
9	10	1		
10				
11		5	4	
12	13			2
13	1	2		
14	16			3
15		4		

Optical Characteristics

Standard operating range: 1 to 10 inches (visible), 1 to 9 inches (infrared), depending on label type and size

UHD operating range: 1 to 4 inches (visible), 1.25 to 3 inches (infrared), depending on label type and size

Scan width: 9 inches maximum

Skew: ±40° maximum

Pitch: ±50° maximum

Label contrast: 25% min. absolute dark to light differential at 670 nm wavelength (visible), 40% min. absolute dark to light differential at 780 nm wavelength (infrared)

figure A-2 and Table A-3 show scan widths and read range minimum and maximums for several bar code densities.

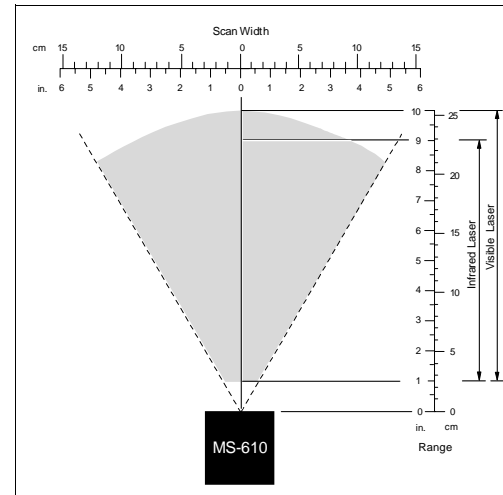


Figure A-2 Scan Range Width Graph

Table A-3 Read Ranges and Scan Widths

Laser Type	Range	Narrow-bar-width	Read Range ^a	Maximum Scan Width
VIS	UHD	.0047"	1.75–3" (45–76 mm)	3" (76 mm)
		.0075"	1–4" (25–102 mm)	4" (102 mm)
	STD	.0075"	2–5" (51–127 mm)	4.75" (121 mm)
		.010"	1.5–6" (38–152 mm)	6" (152 mm)
		.015"	1–7" (25–178 mm)	7.5" (191 mm)
		.020"	1–9" (25–229 mm)	9.25" (235 mm)
		.030"	4–10" (102–254 mm)	9.5" (241 mm)
		.040"	4–10" (102–254 mm)	9.5" (241 mm)
		.050"	5–10" (127–254 mm)	9.75" (248 mm)
		.050"	5–9" (127–229 mm)	8.5" (216 mm)
IR	UHD	.0047"	1.75–3" (45–76 mm)	3" (76 mm)
		.0075"	1.25–3" (32–76 mm)	3.5" (89 mm)
	STD	.0075"	2–4.5" (51–114 mm)	3.5" (89 mm)
		.010"	1.5–5" (38–127 mm)	4.75" (1.21 m)
		.015"	1–6" (25–152 mm)	6" (152 mm)
		.020"	1–7" (25–178 mm)	7" (178 mm)
		.030"	4–9" (102–229 mm)	8.5" (216 mm)
		.040"	4–9" (102–229 mm)	8.5" (216 mm)
		.050"	5–9" (127–229 mm)	8.5" (216 mm)
		.050"	5–9" (127–229 mm)	8.5" (216 mm)

^a Read range is the distance of the label from the scanner (measured from the front of the scanner bezel) in which the label can be reliably read. The distance between the minimum and maximum ranges is the depth of field.

Appendices

FIS Options

MS-610 models are identified by FIS (final instruction sheet) numbers. FIS options that are created for specific customer applications are not listed below.

FIS #	Spot Type		Scan Beam		Range		Interface	
	Round	Oval	Single Line	Raster	Standard	UHD	RS-232	RS-422/485
Visible								
FIS-0610-0001	√		√		√		√	
FIS-0610-0002	√			√	√		√	
FIS-0610-0003	√		√			√	√	
FIS-0610-0004	√			√		√	√	
FIS-0610-0009		√	√		√		√	
FIS-0610-0010		√		√	√		√	
FIS-0610-0011		√	√			√	√	
FIS-0610-0012		√		√		√	√	
FIS-0610-0017	√		√		√			√
FIS-0610-0018	√			√	√			√
FIS-0610-0019	√		√			√		√
FIS-0610-0020	√			√		√		√
FIS-0610-0025		√	√		√			√
FIS-0610-0026		√		√	√			√
FIS-0610-0027		√	√			√		√
FIS-0610-0028		√		√		√		√
Infrared								
FIS-0615-0005	√		√		√		√	
FIS-0615-0006	√			√	√		√	
FIS-0615-0007	√		√			√	√	
FIS-0615-0008	√			√		√	√	
FIS-0615-0013		√	√		√		√	
FIS-0615-0014		√		√	√		√	
FIS-0615-0015		√	√			√	√	
FIS-0615-0016		√		√		√	√	
FIS-0615-0021	√		√		√			√
FIS-0615-0022	√			√	√			√
FIS-0615-0023	√		√			√		√
FIS-0615-0024	√			√		√		√
FIS-0615-0029		√	√		√			√
FIS-0615-0030		√		√	√			√
FIS-0615-0031		√	√			√		√
FIS-0615-0032		√		√		√		√

Electrical Characteristics

Power Supply Requirements:

- +12 VDC regulated @ 80 mA with 20 mV p-p max. ripple
- 12 VDC regulated @ 80 mA with 20 mV p-p max. ripple
- +5 VDC regulated @ 400 mA with 200 mV p-p max. ripple

Status Lights

Table A-4 Status Lights

LED	Lumiance	Status
Power LED	Green	On power-on
Status LED	Red	<p><u>Normal operations:</u> illuminates whenever a bar code label is decoded and remains on until a new trigger occurs.</p> <p><u>Continuous Read or Continuous Read 1 Output:</u> flashes for each good read.</p>

Appendix B — ASCII Table

Table A-5 ASCII Table with Control Characters

Dec	Hex	Mne	Ctrl	Dec	Hex	Ch	Dec	Hex	Ch	Dec	Hex	Ch
00	00	NUL	^@	32	20	SP	64	40	@	96	60	`
01	01	SOH	^A	33	21	!	65	41	A	97	61	a
02	02	STX	^B	34	22	"	66	42	B	98	62	b
03	03	ETX	^C	35	23	#	67	43	C	99	63	c
04	04	EOT	^D	36	24	\$	68	44	D	100	64	d
05	05	ENQ	^E	37	25	%	69	45	E	101	65	e
06	06	ACK	^F	38	26	&	70	46	F	102	66	f
07	07	BEL	^G	39	27	'	71	47	G	103	67	g
08	08	BS	^H	40	28	(	72	48	H	104	68	h
09	09	HT	^I	41	29	)	73	49	I	105	69	i
10	0A	LF	^J	42	2A	*	74	4A	J	106	6A	j
11	0B	VT	^K	43	2B	+	75	4B	K	107	6B	k
12	0C	FF	^L	44	2C	,	76	4C	L	108	6C	l
13	0D	CR	^M	45	2D	-	77	4D	M	109	6D	m
14	0E	SO	^N	46	2E	.	78	4E	N	110	6E	n
15	0F	SI	^O	47	2F	/	79	4F	O	111	6F	o
16	10	DLE	^P	48	30	0	80	50	P	112	70	p
17	11	DC1	^Q	49	31	1	81	51	Q	113	71	q
18	12	DC2	^R	50	32	2	82	52	R	114	72	r
19	13	DC3	^S	51	33	3	83	53	S	115	73	s
20	14	DC4	^T	52	34	4	84	54	T	116	74	t
21	15	NAK	^U	53	35	5	85	55	U	117	75	u
22	16	SYN	^V	54	36	6	86	56	V	118	76	v
23	17	ETB	^W	55	37	7	87	57	W	119	77	w
24	18	CAN	^X	56	38	8	88	58	X	120	78	x
25	19	EM	^Y	57	39	9	89	59	Y	121	79	y
26	1A	SUB	^Z	58	3A	:	90	5A	Z	122	7A	z
27	1B	ESC	^[	59	3B	;	91	5B	[	123	7B	{
28	1C	FS	^\	60	3C	<	92	5C	\	124	7C	|
29	1D	GS	^]	61	3D	=	93	5D	]	125	7D	}
30	1E	RS	^^	62	3E	>	94	5E	^	126	7E	~
31	1F	US	^_	63	3F	?	95	5F	_	127	7F	Δ

Appendix C — Orientation

If the bar code label bars are parallel to the direction of travel, as shown in figure A-3, the label is said to be in a *ladder* orientation; if the bars are perpendicular with the direction of travel, the label is said to be in a *picket fence* orientation (figure A-4).

Ladder Orientation

In general, depending on label size and speed, ladder orientation is preferable because different portions of the label are scanned as the label goes by. In addition, label placement is not as critical. As shown in figure A-3, a label can be successfully read if fully placed (including quiet zones) anywhere within the readable portion of the scan line.

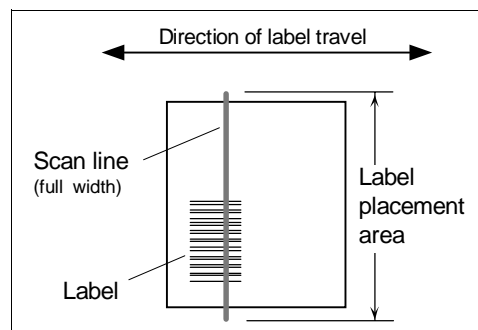


Figure A-3 Ladder Orientation

Note: Unless your application calls for a stop and go label, it is unlikely that ladder orientation will be used with a raster scanner.

Picket Fence Orientation

Unlike ladder, picket fence allows only a small portion of the entire label to be scanned. As a result, labels must be of good quality since even slight label imperfections such as extraneous ink, voids, etc., can cause misreads or non-reads.

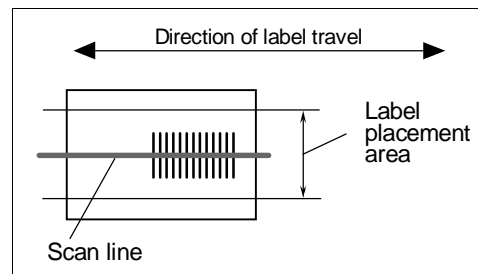


Figure A-4 Picket Fence Orientation

One advantage of the picket fence over the ladder orientation is in the area of label speed. In ladder mode, the label travel distance is the height of the bar code; in picket fence mode, the label can be read while it travels the full distance of the scan width.

Note: Either ladder or picket fence can be rotated without losing its orientation, provided that the label's direction of travel does not change in relation to the scan line.

Note: Raster scanning is almost always done with picket fence labels. Maximum raster height is 0.38 inch at 10 inches.

Angled Picket Fence Orientation

The problems associated with picket fence can be minimized by slightly tilting the scan line (figure A-5). This allows a larger portion of the label to be scanned and increases the label placement area by “simulating” the ladder orientation. This of course is impractical with a short bar code height.

Angled picket fence is recommended only where the bar code is reasonably tall and the label speed is not too fast in relation to the scan field width, since angling the label will reduce the number of scans on the label.

Note: Since raster lines will cross most picket fence labels several times, there is typically no advantage to angled picket fence in connection with raster scanning.

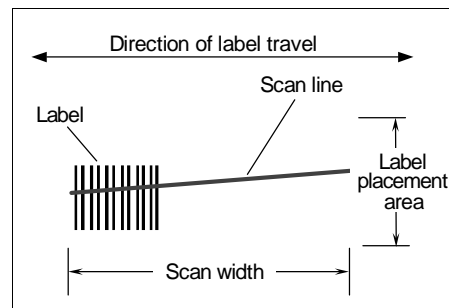


Figure A-5 Angled Picket Fence Orientation

Appendix D — Defaulting the Scanner

Defaulting the scanner resets the configuration parameters to factory default values.

Defaulting is necessary if:

- You wish to quickly restore default settings to the configuration program after making some temporary changes.¹
- Communications between the scanner and another device are interrupted because of incompatible settings (for example, a terminal is set to communicate at 9600 baud, but the scanner is configured at 38.4K baud).
- The scanner has been assigned a polling address and you wish to access the scanner's menu.

Access to the configuration menus of a scanner that is in a polled mode can be forced by sending a <D> command from an auxiliary terminal via the auxiliary RS-232 port.

Caution: Be certain that you short the correct pins. Shorting the wrong pins can cause serious damage to the unit.

Procedure:

1. Turn power to the scanner ON.
2. Locate and mark the default pins or wires connecting to default pins.
If you have wired your own cable: locate pins 8 and 13 (figure A-6) on the back port of the MS-610 scanner.
If using an ADP box: locate pins 11 and 7 (figure A-7) on the 25-pin connector.
3. (Complete this step within three seconds.) Momentarily short the default pins. Listen for a series of quick beeps, then short the default pins again.
4. You should hear a longer beep. If not, repeat the process.

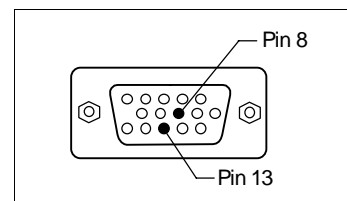


Figure A-6 15-pin Socket
(on back of scanner)

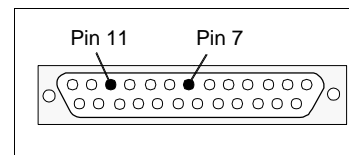


Figure A-7 25-pin Connector,
RS-232 (J4)
(on back of ADP box)

1. There are no menu options or host commands for resetting the configuration program.

Appendix E — Troubleshooting

WARNING

Do not look directly into laser aperture.
Laser light can be hazardous to your eyes.

The MS-610 scanner when used correctly should produce good reads. If not, table A-6 lists some of the more common problems associated with setting up and using the scanner. If you are unable to locate or correct the problem, call your Microscan representative.

Table A-6 Troubleshooting Table

Problem	Possible Cause	Solution
Menus do not display when configuration command is sent	Host cable defective or not wired properly	Check cable connections and wiring. (See "Attach Cabling" on page 1-6.)
	Wrong configuration command (or lower case d) entered	Verify that a <D> serial command (with an upper case D) is being entered.
	Scanner configuration settings do not match host's	Reset scanner to default and/or match host settings with scanner's.
Getting only "hieroglyphics" or unintelligible code	Host and scanner baud rates or parity not matched	Check baud rates and parity and change to match the host's settings.
Menus display but no read rate in read rate test (<C>)	Wrong label type (different label type being scanned than that enabled in firmware)	Check label configuration settings to be certain that they match the label type being scanned. If label type is in doubt, enable Autodiscriminate All Codes (<P> command). Ensure that fixed length and check sums, if enabled, are set correctly.
	Incorrect label range or label too long to be totally covered by scan beam.	See range data in Step 2, "Verify Read Range and Scan Width" on page 1-3. Reposition label and check the read rate (<C> command).
	Poor label quality	Try a label that is known to be readable.
	Excessive ambient light, sunlight, or strobes	Shield the bar code and/or scan head to verify that excessive light is not the problem.
Menus display but no read rate in read rate test (<C>)	Object detector or another scanner interfering with reads	Remedy by remounting, eliminating interference, or shielding. Many object detectors emit pulsed infrared signals that can seriously degrade the read rate if they shine into the scanner or onto the bar code label when it is being read.

Appendices

Problem	Possible Cause	Solution
Low read rates during read rate test (<C>)	Poor label, range, placement, etc.	See "Menus display..." in previous Problem heading. Do Step 8, "Adjust Other Scanning Parameters" on page 1-11.
Read rate okay but not getting any output (including noreads) in triggered mode	Object detector not positioned properly	Ensure read cycle is active during the time the label is in the scan line.
	End of Read Cycle not properly defined	Ensure that the proper End of Read Cycle is defined in scanner configuration.
	Scanner not triggered when in external mode	Ensure trigger device is operating properly. Do Read Rate Test <C>. If it reads successfully, the problem is triggering.
	Scanner not triggered when in serial mode	Ensure that correct serial trigger character is entered with start/stop characters (a left angle bracket < (unless redefined) and a right angle bracket >).
	Label misaligned or reflecting direct laser light	Ensure the label is not excessively skewed, tilted, or otherwise disoriented. Ensure the bar code is in the scan line when it is supposed to be. Ensure that the bar code is pitched or skewed slightly so as to avoid specular reflection.
Read rate okay but getting only noread messages in triggered mode	Triggering/timeout out of sync	Review triggering and timing. (See the Operations menu structure on page 2-11.)
	Object detector or another scanner interfering with reads	Remedy by remounting, eliminating interference, or shielding. Many object detectors emit pulsed infrared signals that can seriously degrade the read rate if they shine into the scanner or onto the bar code label when it is being read.
	Window dirty or obstructed	Clean or remove obstruction.
Previous label read, but subsequent label will not read	Scanner configured in Continuous Read 1 Output	Scan a label that contains different data than that of the one being read.
	Scanner in polled mode	Check communications protocol.
Scanner not entering read cycle in triggered mode (trigger not working)	Proper trigger levels not enabled	Ensure that the trigger pulse and the trigger polarity settings are correct.
	Trigger circuit not correctly wired	Ensure that the trigger circuit wiring meets the scanner requirements. (See "Attach Cabling" on page 1-6.)
	Object detector inoperative	Check detector range and sensitivity. Try a detector that is known to be good.

Appendix F — Optional Equipment

Mounting Plate Kit

Part Number: 98-500002

To mount the scanner with the mounting plate, “pair up” the mounting plate’s four inner screw holes to the scanner’s mounting holes (see figure 3-1 in chapter 3, “Installation”) and attach plate to scan head. Next, mount entire assembly using the four outer holes on the plate.

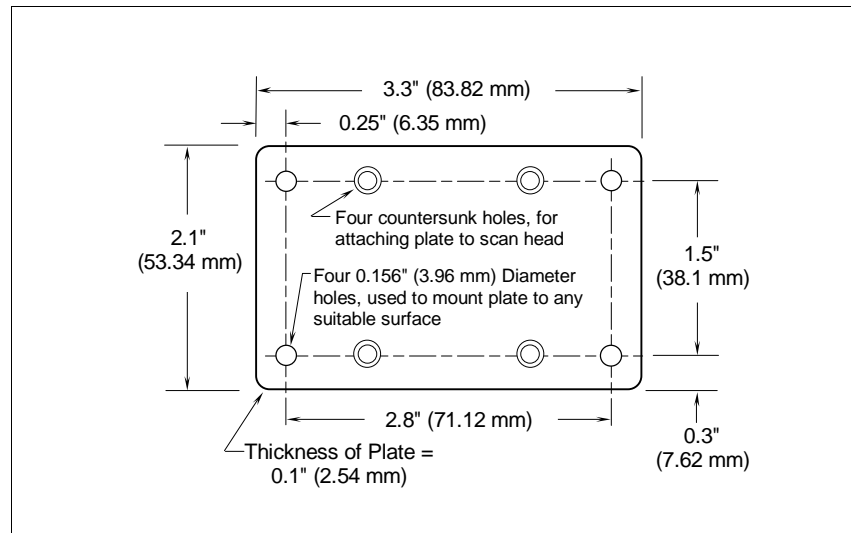


Figure A-8 MS-520 Bottom Mounting Plate (not full size)

Universal Stand

The Microscan Universal Stand is available in 4-inch, 6-inch, and 10-inch flex models as well as a 7-1/4" extension kit.

4-inch, knob adjustable handle	98-200008
6-inch, knob adjustable head and foot	98-200007
10-inch flex neck, adjustable head	98-200006
7-1/4-inch extension kit	98-200024
MS-610 Adapter plate	98-200011

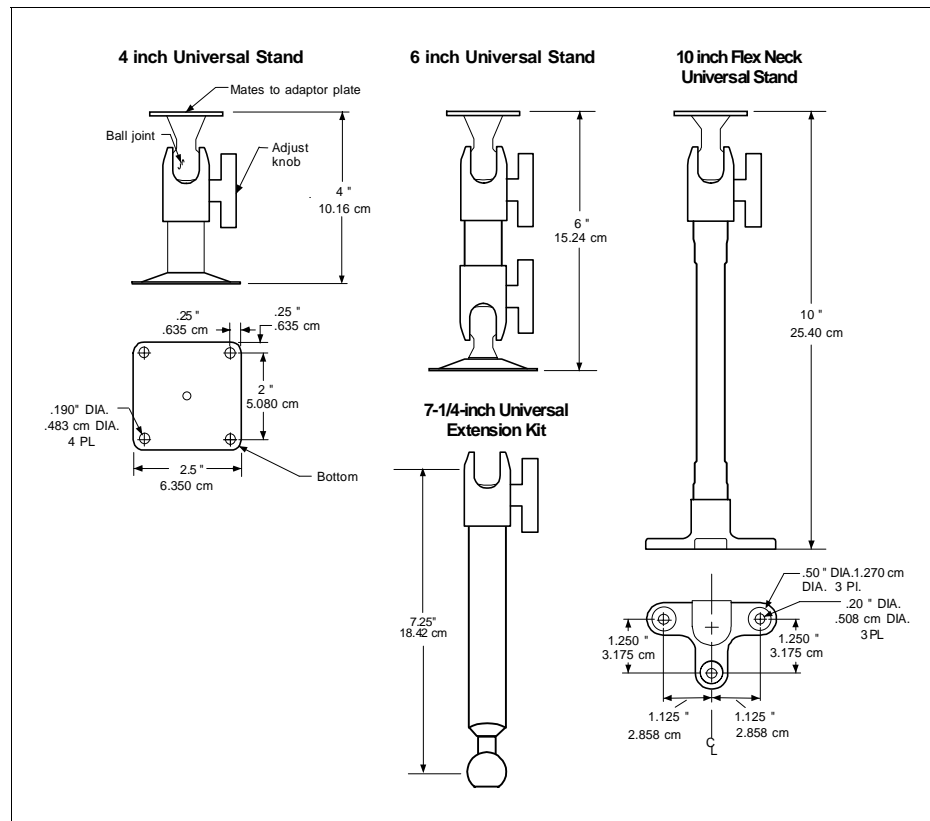


Figure A-9 Universal Stand

Appendix G — Bar Code Symbology

Before choosing a bar code symbol, consider:¹

- the type of information to be scanned (numeric only, alphanumeric)
- the length of the messages to be encoded
- how and where labels are to be applied
- label printer capabilities
- scan speed
- beam width
- the space available on the object to be identified
- host software limitations
- range of the scanner
- the speed of the conveyor

Microscan standard scanner firmware supports the following five bar code symbologies. (Firmware can also be custom ordered to support other symbologies.)

Code 39. An alphanumeric code with unique start/stop code patterns, composed of nine black and white elements per character, three of which are always wide. Considered the de facto standard for non-retail symbology.

Codabar. A 16-character set (0 through 9, and the characters \$, :, /, ., +, and -) with start/stop codes and at least two distinctly different bar widths. It is commonly used in libraries, photo finishing, and air parcel express applications. (A check digit is highly recommended.)

I 2 of 5. Interleaved 2 of 5 is a high-density, continuous numeric symbology used mainly in the distribution industry. I 2 of 5 encodes two digits: one in the bars, and one in the spaces. (A check digit is highly recommended.)

UPC and EAN. UPC (Universal Product Code) is a fixed length numeric, continuous symbology used in the supermarket and retail industry. The European Article Numbering (EAN) system is a well-known variation of UPC. Both UPC and EAN can have two or five digit supplemental bar code data following the normal code.

Code 128. A very high density alphanumeric symbology. Will encode all 128 ASCII characters, it is continuous, has variable length, and uses multiple element widths measured edge to edge. It is widely used in the non-food distribution industry and shipping containers.

1. For further information about symbology, see *The Bar Code Book*, by Roger C. Palmer, Helmers Publishing, Inc., 1989.

Appendix H — Interface Standards

Interface Standards, established by the Electronic Industries Association (EIA), specify such things as the signaling voltage levels, maximum cable lengths, and number of drivers. With Microscan devices, selection of interface is made by pin assignment (see table A-3 on page A-3) and, in the case of the host communications, by software switching between RS-232 and RS-422. Microscan devices use RS-232, RS-422, and RS-485 multidrop.

RS-232

RS-232 defines an interface between two devices such as, for example, the scanner and host. It differs from the other interfaces by dedicating individual pins to specific functions and by requiring both devices to share a common ground line (pin 4). Since both device chassis are connected to a common ground, a ground loop potential and the possibility of noise interference exists. Therefore cable lengths are limited to a maximum of 50 feet (19.7 m). Despite being the most limited, this interface is used frequently because of the large installed base of RS-232 equipment.

RS-422

RS-422, unlike RS-232, measures signals *differentially* that is, the receiver looks at the potentials between the two receive (or transmit) wires rather than the potential between signal and ground. As a result, cables, if shielded, can be up to 4000 feet (1575 m) in length. Like RS-232, RS-422 communication is designed for only two devices on a single line. It can be used wherever RS-232 is used.

RS-485

RS-485, like RS-422, can transmit up to 4000 feet (1575 m) using differential voltages but unlike RS-422, its transmitters are turned off until a request for data is received from the host. RS-485 is used exclusively in Multidrop protocol.

Note: See “Protocol,” on page 2-6 for additional information on standards.

Appendix I — Multidrop Communications

This appendix describes the rules for setting up a concentrator or controller to communicate with a scanner in standard Multidrop protocol, as presented in “Protocol,” on page 2-6.

Figure A-10 shows a typical Multidrop network in which 1 to 50 scanners can communicate with a host via an intermediary device, a concentrator or a controller.

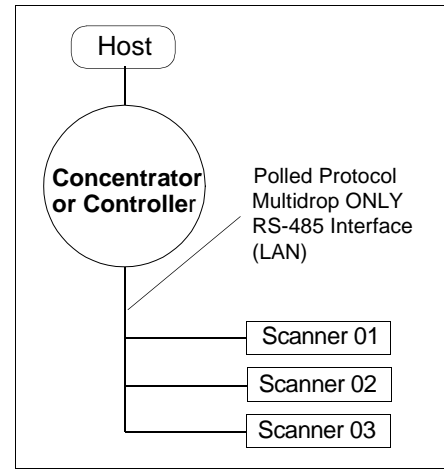


Figure A-10 Typical Multidrop Network

Multidrop Addresses

- No two scanners in the Multidrop Network can have the same address.
- Each scanner in the network must have an address (from 01 to 50) assigned in its configuration program.

Each address has its own separate poll and select address (from 1C to 7F hex as shown in table A-7 on page A-18).

For example, during a polling sequence, Scanner 03 expects a 20 hex (“SP” ASCII poll character) from the concentrator. And during a select command, it looks for a select value 21 hex (“!” ASCII select character).

Polling Sequence

Data that is transmitted to the host (bar code data, noread messages, counters, etc.) via concentrators is solicited by poll requests from the host.

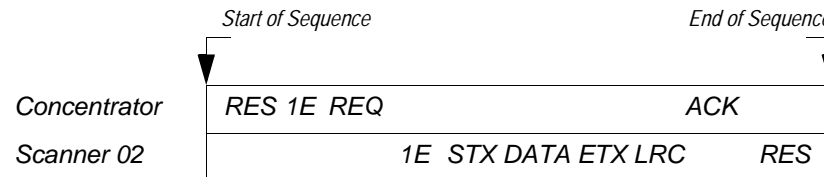


Figure A-11 Polling Sequence

The polling sequence example in figure A-11 begins with a RES (reset) from the concentrator followed by poll address 1E (ASCII hex value for

Scanner 02) and a REQ (request). The scanner responds by first transmitting its own address, 1E, followed by a STX (start of text) character, and then the data. Next it transmits an ETX (end of text) character and an LRC (longitudinal redundancy check) character.

If the concentrator (or controller) receives the data from the scanner and is able to validate it with an LRC calculation, it responds with an ACK (acknowledgment). If the scanner in turn receives the ACK, the scanner ends this successful exchange with a RES (reset).

Polling Reset

- If the scanner has no information, it responds to a poll request by transmitting a RES (reset).
- If the scanner receives a NAK instead of the ACK after transmitting its data string, it will re-attempt to transmit the data string up to three times. If the scanner still does not receive an ACK, it will transmit a RES (reset) and discard the data in its buffers.
- If the scanner transmits data to the concentrator and the concentrator responds with an ACK or NAK, but the scanner doesn't receive the concentrator's response, the scanner will timeout and transmit a REQ to the concentrator and request another response. If after three retries (the number of times it transmits a REQ to the concentrator) the scanner receives no response, it ends the transmission with a RES (reset).

Select Sequence

Unlike poll requests, select commands always originate from the host and consist of serial configuration or operation commands to devices that are configured in Multidrop. The scanner complies with the command when it is polled during the cycle.

Figure A-12 is an example of a select sequence.

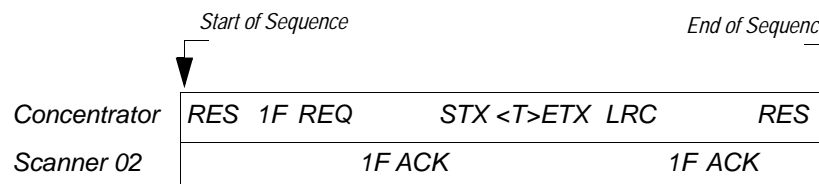


Figure A-12 Select Sequence

A RES (reset) is the first command in the select sequence. The 1F hex is the select address associated with Scanner 02 address (see table A-7 on page A-18). It is followed by a REQ (request). The scanner responds with its own

select address, 1F hex, and an ACK (acknowledge). The concentrator then transmits an STX (start of text), the data (in this case a <T>), an ETX (end of text), and an LRC character.

The scanner replies by transmitting its own address, followed by an ACK, acknowledging receipt of the command. Upon receipt of an ACK, the concentrator concludes the successful exchange with a RES.

In the example above, the scanner only *acknowledges* a trigger counter request from the concentrator. It does not respond to the trigger counter request until a subsequent poll. For example, if the scanner's trigger count was 12 at the time the trigger counter request was received, on a subsequent poll it would transmit 02T/00012. (The 02 at the beginning of the string is the scanner's address.)

Select Reset

- If the scanner receives bad data from the concentrator, it transmits a SEL (its select address) and a NAK to the concentrator. The concentrator retransmits the data up to three times. The concentrator will end the sequence with a RES (reset) if no ACK is received.¹

1. For additional information on Multidrop, see the *MS-5000 Multidrop Concentrator User's Manual*.

Table A-7 Multidrop Address Characters

Multidrop Address	Poll Character		Select Character		Multidrop Address	Poll Character		Select Character	
	ASCII	HEX	ASCII	HEX		ASCII	HEX	ASCII	HEX
01	^\ 	1C	^] 	1D	26	N	4E	O	4F
02	^^ 	1E	^- 	1F	27	P	50	Q	51
03	SP 	20	! 	21	28	R	52	S	53
04	" 	22	# 	23	29	T	54	U	55
05	\$ 	24	% 	25	30	V	56	W	57
06	& 	26	' 	27	31	X	58	Y	59
07	(	28	)	29	32	Z	5A	[	5B
08	* 	2A	+ 	2B	33	\	5C	]	5D
09	, 	2C	- 	2D	34	^ 	5E	_	5F
10	. 	2E	/ 	2F	35	` 	60	a	61
11	0 	30	1 	31	36	b 	62	c	63
12	2 	32	3 	33	37	d 	64	e	65
13	4 	34	5 	35	38	f 	66	g	67
14	6 	36	7 	37	39	h 	68	i	69
15	8 	38	9 	39	40	j 	6A	k	6B
16	: 	3A	; 	3B	41	l 	6C	m	6D
17	< 	3C	= 	3D	42	n 	6E	o	6F
18	> 	3E	? 	3F	43	p 	70	q	71
19	@ 	40	A 	41	44	r 	72	s	73
20	B 	42	C 	43	45	t 	74	u	75
21	D 	44	E 	45	46	v 	76	w	77
22	F 	46	G 	47	47	x 	78	y	79
23	H 	48	I 	49	48	z 	7A	{	7B
24	J 	4A	K 	4B	49	|	7C	}	7D
25	L 	4C	M 	4D	50	~ 	7E	Δ	7F

Appendix J — Glossary of Terms

Autodiscriminate. The ability to decode several different bar code symbolologies without changing configuration.

AWG. Abbreviation for American Wire Gauge. This is a standard measuring system for wire sizes, listed from 0 (biggest) to 40 (smallest). A 26 AWG is equivalent to 0.0159 in. (0.405 mm) in diameter.

Bar Code. Data that has been encoded into an array of parallel bars and spaces of varying widths.

Bar Code Density. Number of characters per inch or other unit of measure.

Baud Rate. The term used to describe the number of discrete signal events per second. In RS-232 and RS-422/485 systems, baud rate is the same as bits per second (bps).

Clock Speed. Internal decoder timing relative to individual bars and spaces.

Code 39. An alphanumeric bar code with a character set containing a start/stop character, 10 numbers, 26 letters, 6 symbols, and a space. This code is discrete, variable length, and self-checking.

Configuration. The method used to change factory default settings for operational features to match a specific application. Configuration can be done through menu selection or with serial commands.

Connector. Physical device (plug or socket) on unit or cable to provide in/out connectivity for various circuits and pins.

Counter. Memory space provided to keep track of read cycle events.

Depth of Field. The distance between the minimum and maximum range in which a scanner can read bar code labels.

EPROM. Erasable, programmable, read only memory.

End of Read Cycle. The time at which the scanner stops expecting label information to decode. This can be caused by a timeout, a trigger event, or a good read.

Focal Length. The distance measured from the scanner to the center of the depth of field, or *focal* point.

Good Read. The event that occurs when a label's data is accurately scanned and decoded.

Intercharacter Gap. The extra space between the last element of one character and the first element of the adjacent character of a specific bar code symbol.

Label Height. Regardless of orientation, the measurement taken along the length of a label's individual bars.

Label Length. Regardless of orientation, the measurement taken across the label's bars from one end to the other, including the quiet zone.

Label Speed. The rate in inches or centimeters per second at which a label moves through the scan beam.

Ladder Label Orientation. A bar code label in which the bars are parallel to the label's direction of travel.

Match Code. The ability to compare bar code labels being scanned against a master label that is stored in the memory of the scanner.

Menu Configuration. The process of changing factory default settings via a sequence of menus displayed on a terminal monitor.

Mil. One thousandths of an inch or 0.0254 mm. In bar-coding, a measurement that identifies a bar code label by the width of its narrowest element.

Mismatch. An event that occurs when the scanned bar code label does not match the master label that is stored in the memory of the scanner.

Multidrop. A communications protocol for networking two or more scanners or other devices with a concentrator (or controller) and characterized by the use of individual device addresses and the RS-485 standard.

Narrow-bar-width. The width of the narrowest bar of a given label, expressed in thousands of an inch (or mils).

Non-volatile RAM (NOVRAM). Random Access Memory that is available on power-on; that is, after power to the unit has been recycled.

Noread. A non-read. A condition that occurs when the scanner is set up to decode labels, and no labels are scanned during the read cycle.

Number of Scans Calculation. The number of times a bar code label is scanned by the scanner during one pass through the laser beam.

Object Detector. A photo electric device used to sense to presence or absence of an object.

Operational Commands. Serial commands from the host to the scanner that control current operating parameters, counters, master label operations, and program management that are not stored in non-volatile RAM.

Oval Spot. An elongated laser beam involving custom optics that is designed to project lengthwise with the label's bars and spaces.

Picket Fence Label Orientation. A bar code label in which the bars are perpendicular to the label's direction of travel.

Pitch. Label (or scanner) rotation around the center a line perpendicular to the label's bars.

Point-to-Point. A protocol consisting of a single communications event, typically used to connect a bar code reader to a terminal or host computer.

Port. Logical circuit for data entry and exit. (One or more ports may be included within a single connector.)

Protocol. The rules for communication between devices, providing a means to control the orderly flow of information between linked devices.

Quiet Zones. Specified "clear" (nonprinted) areas immediately before and after the bar code symbol. The area is usually white (for black and white bar code) and at least 10 times the width of the narrowest bar, as measured in thousands of an inch. The zones can be other than white as long as their densities remains consistent and they have the required contrast relative to the bars.

RAM. Random Access Memory. Memory that is lost after power is recycled to the unit.

Read Cycle. A programmed period of time or condition during which the scanner will accept bar code label input.

Read Range. The distances in which a label can be reliably read, as measured from the front of the scanner. See "Depth of Field."

Relay Driver. A TTL signal sent by the scanner. The output is determined by the relay driver selection during configuration.

ROM. Read Only Memory. Memory that cannot be changed.

Scanner. A scanning device that is comprised of a scan head and a decoder integrated in one package.

Scan Rate. Number of scans per second that the scanner projects.

Scan Width. That portion of the scan line in which a label can be read.

Serial Commands. On-line data strings (including configuration and operations) from a host or other terminal to the scanner, that are always preceded by a < left angle bracket symbol and followed by a > right angle bracket symbol.

Serial Configuration (Host Configuration). Serial command specifically for changing configuration and distinguished from operational command by the fact that they modify the non-volatile for power up configuration. Most of these commands begin with the upper case K character immediately following the left angle bracket symbol, as in <Kg3>.

Skew. Label (or scanner) rotation around the center of the skew axis.

Specular Reflection. The direct, mirror-like reflection of laser light back to the scanner, causing over-light saturation. For the MS-610 scanner, specular reflection occurs at pitch angles between +3 and +5 degrees.

Symbology. A set of bar code symbols, such as Code 39 or Code 128, that have special rules to define the widths and positions of bars and spaces to represent specific numeric or alphanumeric information.

Tilt. Label (or scanner) rotation around the centerline of the scan beam.

Timeout. A user-selected period of time that ends a scanner's read cycle.

Tracking. Parameter of analog-to-digital converter that affects the accuracy to the digitized signal.

Trigger. A signal, either external or serial, that initiates the read cycle and causes the scanner to expect label input.

TTL. Abbreviation for transistor-transistor logic, the standard for signal output.

Wide-to-narrow Ratio. The ratio of the width of the widest (or wider) bar to the narrowest bar of a given bar code symbology. For example, 2:1, 2:5:1, 3:1, and 4:1.

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