MICROSCAN

Series 4000 Raster Scanner User's Manual

P/N 83-004280 REV. C

Information and specifications in this manual are subject to change without notice.

by Microscan Systems, Inc.,
1201 S.W. 7th Street, Renton, Washington, U.S.A. 98055
(206) 226-5700 FAX: (206) 226-8250

Warranty Information

Microscan Systems, Inc. warrants products manufactured by it to be free from defects in material or workmanship under normal use and service for a period of one year from date of shipment.

This warranty is specifically limited to the replacement or repair of any such warrantable defects, without charge, when the complete product is returned to Microscan Systems, Inc., freight prepaid, at the address shown above. Contact the factory at the address above for a Return Material Authorization (RMA) number before returning the product.

Microscan Systems, Inc. shall be the sole judge of the warrantability of alleged product defects. Products that are returned for warranty examination and that are found to be non-warrantable are chargeable and are returned freight collect. Upon request, an estimate will be provided before any chargeable repairs are attempted. A hard copy of a purchase order with the amount of the charge must be received by Microscan, either by mail or by FAX, before any equipment is returned. Warrantable products are repaired or replaced at no charge and returned freight prepaid.

THIS EXPRESS WARRANTY EXCLUDES ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PURPOSE. MICROSCAN SYSTEMS, INC., SHALL NOT BE LIABLE FOR WARRANTY IN ANY AMOUNT EXCEEDING THE PURCHASE PRICE OF THE GOODS. MICROSCAN SYSTEMS, INC., SHALL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER IN CONTRACT, TORT, OR OTHERWISE.

The buyer acknowledges that he/she is not relying on the seller's skill or judgment to select or furnish goods suitable for any particular purpose and that there are no warranties that extend beyond the description on the face hereof.

This warranty extends only to the original purchaser, and shall not apply to any products or parts that have been subject to misuse, neglect, accident, or abnormal conditions or operations. Claims for damage in transit are directed to the freight carrier upon receipt.

Table of Contents

List of Illustrations

List of Tables

Approvals

This equipment is approved for use by the following organizations:

- CDRH (Center for Devices and Radiological Health)

Warning and Caution Summary

The following should be noted by the user:

CAUTION: *There are no user serviceable parts in the MS-4280 scanner. Opening the scanner voids the Microscan Systems warranty and could expose the user to laser diode power of up to 5 mW.*

CAUTION: *This equipment generates, uses, and can radiate radio frequency energy, and may cause interference to radio and TV communications. It has been tested and found to comply with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC rules which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area could cause interference, in which case the user, at his or her own expense, must take whatever measures may be required to correct the interference.*

WARNING

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

WARNING

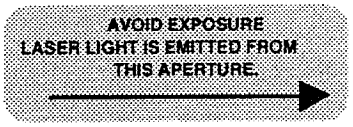
Up to 5 mW of laser diode power can be present in the interior. Avoid opening the scanner. Inspect housing to verify that loose casings or panels do not allow access to laser light.

WARNING

The laser beam can be harmful to eyesight. Avoid direct eye contact with the laser beam when the mirror is not spinning, and avoid prolonged eye contact with the laser beam when the mirror is spinning. Never point the beam at other people, or in a direction where people may be passing.

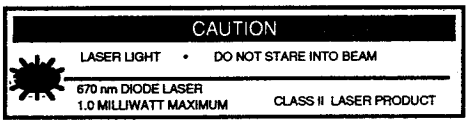
Safety Labels

The following labels are found on the MS-4280:



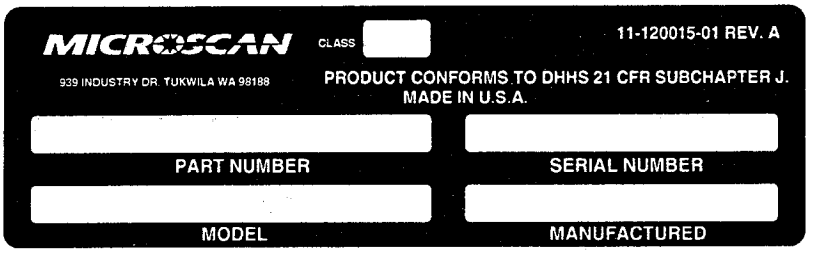
Part # 10-100004-03

Part # 10-100003-01



Part # 11-100009-01

Part # 11-000003-01



Part # 11-1200015

Chapter 1 Introduction

Chapter Contents

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

This manual provides complete information on setting up, installing, and configuring the MS-4280 raster scanner. The raster scanner is part of the series 4000 integrated scanners which also include the non-rastering MS-4200 and MS-4210 scanners.

> ***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.*

MS-4280 Description

As with other series 4000 scanners, the MS-4280 raster scanner integrates a scan head and decoder in a single unit. In addition, the MS-4280 employs a stepper motor to drive an oscillating raster mirror.

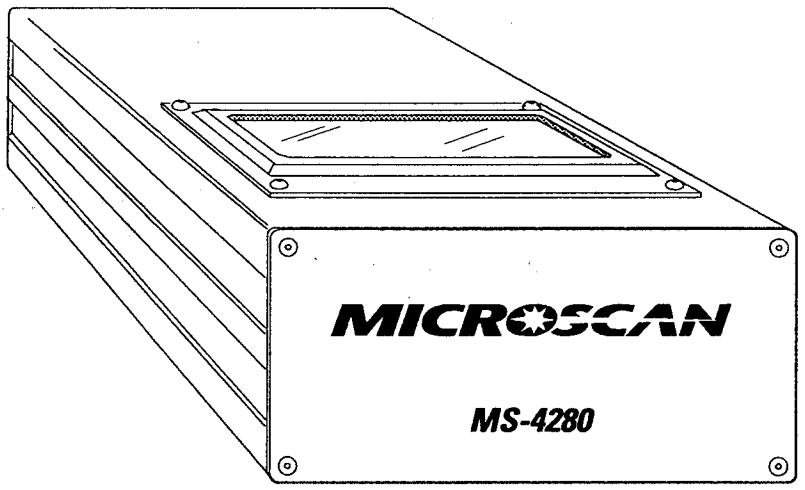


Figure 1-1 MS-4280 Raster Scanner

Standard features of the MS-4280 include:

- Integrated scan head/decoder
- Precision raster stepper motor
- Scan rate of 400 scans per second
- 40° scan width
- Status lights
- Object detector input capability
- Multiple label read, match code capabilities
- Autodiscriminate up to six popular codes
- RS-232 (with RTS/CTS), RS-422 and RS-485 multidrop capabilities
- Menu and serial commands from the host to control raster motor speed and raster mirror arc

Status Lights

The two red LEDs (light emitting diodes) on the rear panel of the scanner serve as visual indicators that the scanner is operating correctly.

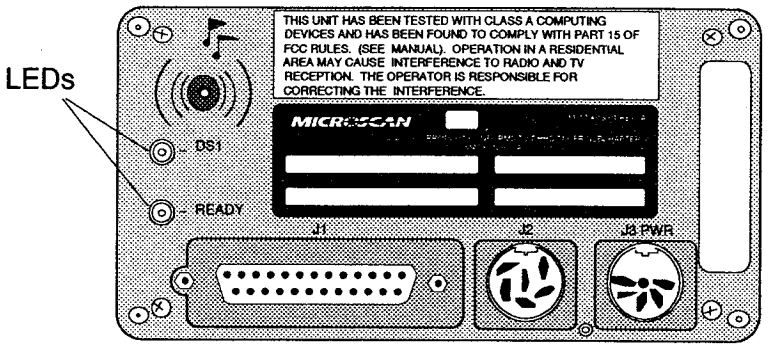


Figure 1-2 Back of MS-4280 Raster Scanner

The *DS1 LED* indicates a good read. It illuminates RED whenever a bar code label is decoded.

The *READY LED* indicates a "ready" condition. It illuminates RED at the end of a read cycle, indicating that the scanner is ready to accept a new trigger.

Table 1-1 lists detailed responses to various conditions.

Table 1-1 Status Lights

Status	DS1 LED	READY LED
Continuous Read or Continuous 1 Output	Flashes RED when a good read occurs.	
Triggered Mode (External or Serial Trigger)	Illuminates RED when a good read occurs and remains ON until a new trigger occurs.	Illuminates RED at the end of a read cycle and remains ON until a new trigger occurs.
While in menu configuration program	Illuminates RED	Illuminates RED
Data overflow from host	Illuminates RED two seconds after the end of a read cycle, provided a new read cycle does not begin within that time. Remains ON until a reset or new read cycle occurs.	

Raster Scanning

A raster scanner distributes multiple laser scan lines over a broad area to create a visible, rectangular raster pattern, much like a TV image. Although the raster scanner can be positioned in any angle, the term "raster height" is used to describe the added dimension that raster scanning supplies (figure 1-3).

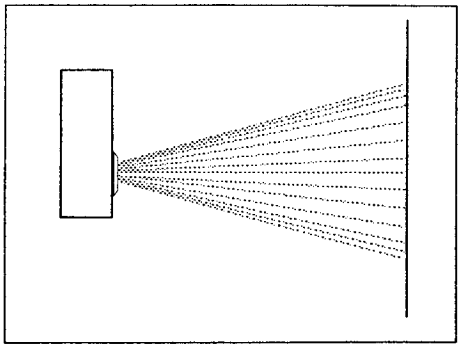


Figure 1-3 MS-4280 Raster Scanner, side view

When projected on a light-colored surface in a dimly lit setting, the raster pattern is discernible to the eye.

Raster scanning allows (1) flexibility in label placement, and (2) improved read capabilities. Improved, because even poor quality labels can be decoded by taking advantage of multiple passes across the label at different heights.

The height of the raster pattern is selectable by menu-driven software in terms of degrees of arc ranging from 0 to 45 degrees.

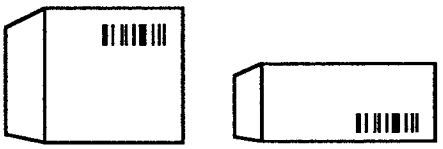
See "Raster Height and Raster Arc" in chapter 2.

Raster Applications

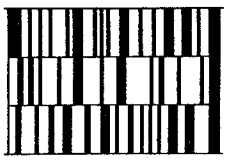
Raster scanners are typically used where:

- Label location is variable

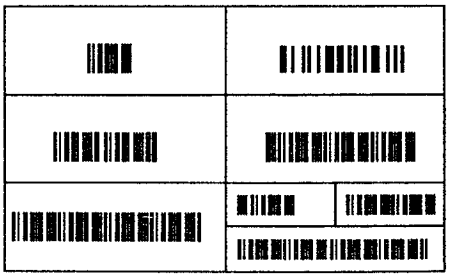
- Different sized label-bearing products are used



- Bar codes are stacked (e.g., Code 49)



- Multiple bar codes are used



FIS Options

The MS-4280 model is available in standard and extended optics, identified by FIS (final instruction sheet) numbers (see table 1-2). The FIS number specifies the basic model and option combination assigned to each customer order.

Table 1-2 Available MS-4280 Options

FIS #	Optics/Range
FIS-4280-0020	Standard
FIS-4280-0021	Extended

See "Read Ranges" in chapter 2, "Setup and Installation," for further discussion of operating ranges.

The Scanning System

Figure 1-4 shows a possible scanning system setup. There are three cable connectors on the MS-4280 scanner, the 25-pin host, the 6-pin trigger, and the 5-pin power.

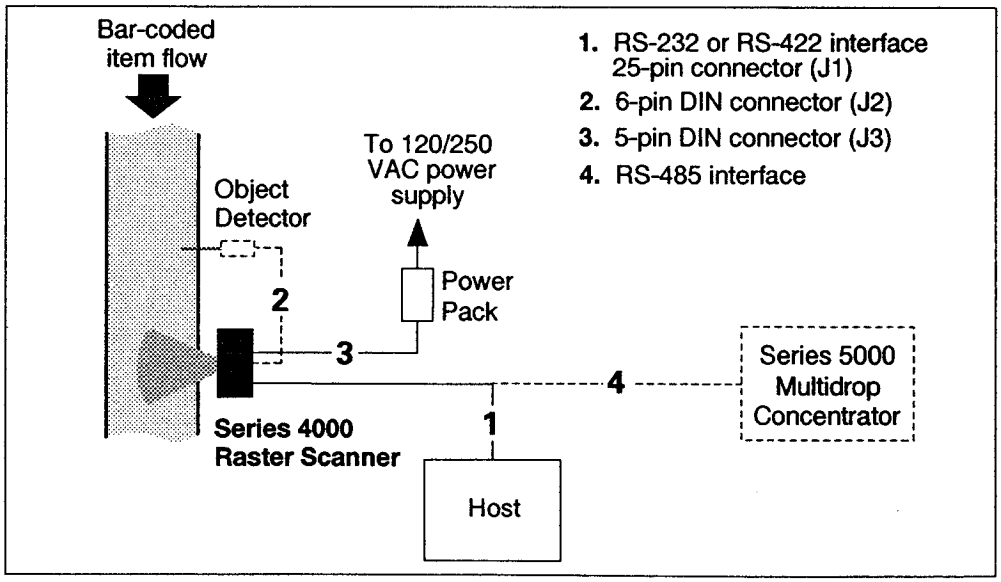


Figure 1-4 System Diagram

While not absolutely required for operation, an object detector is almost always used. The object detector, in conjunction with a scanner, allows the user to determine when a read cycle should begin, when a good read should occur, and if it does not occur, how to notify the user. (See "Connectors and Pinouts" in chapter 2 for more information on cabling.)

Chapter 2

Setup and Installation

Chapter Contents

This chapter provides instructions for setting up and installing the MS-4280 raster scanner.

Careful evaluation of the specific application, including the number, type, and location of scanners and object detectors, as required, is a prerequisite to successful bar code scanning.

Setup Goals

To achieve the desired number of scans required by the application, scanners must be positioned so that the scan beam crosses a label within the read range. To accomplish this, refer to table 2-1, bar code label orientations, scan calculations, and scanner orientation, as described later in this section.

In addition, do a read rate test to ensure that optimum scanning and decoding is occurring.

Determine the following before installation:

1. **Label Orientation.** Position the scanner and label so that the label is given as many scans as possible. (Take into account, and adjust, if necessary, label speed and/or the distance between bar-coded objects.) Avoid angles that result in direct (specular) reflected light, or blurring.
2. **Object Detector Orientation**. Position object detector (if used) so that the detector senses the object before the scanner can read it, and ensure that object detector light does not reflect back into the scanner's sensor.
3. **Read Range**. Position the scanner at a distance from the label that is within the ranges specified by your application and verify ranges by performing a read rate test.
4. **Number of Scans**. Ensure that each label receives the required number of scans for your application.

Label Orientation

As labels move through or across the scan lines, they present themselves in a picket fence or ladder orientation. If the bars are perpendicular to the direction of travel, as shown in the left illustration in figure 2-1, the label is said to be in a *picket fence* orientation; if the bars are parallel with the direction of travel, the label is said to be in a *ladder* orientation.

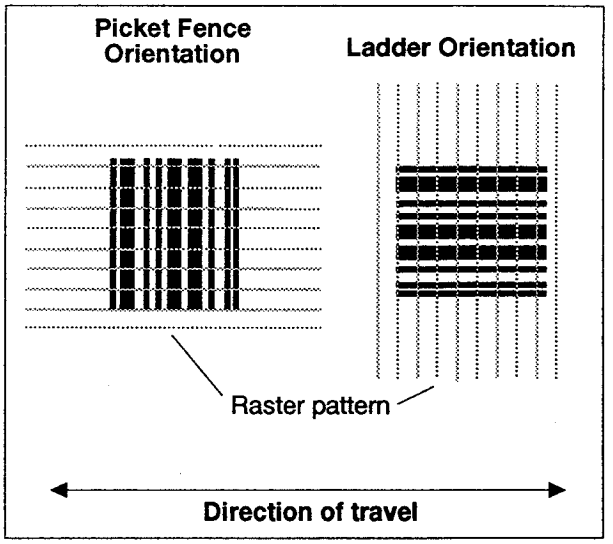


Figure 2-1 Bar Code Label Orientation

Raster scanners are almost always applied in the picket fence orientation. Ladder orientation labels are only used with raster scanners in special applications, for example, where the labeled object comes to a stop in varying locations before being scanned.

***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.*

Tilt, Skew, and Pitch

Tilt refers to the label rotation, relative to the scanner, as it rotates on the tilt axis, as shown in figure 2-2.

Skew refers to the angle of the label, relative to the scanner, as it rotates on the skew axis, as shown in figure 2-2. Series 4000 raster scanners can be skewed to a maximum of ±40 degrees from the centerline.

Pitch refers to the position of the label, relative to the scanner, as it rotates on the pitch axis. Maximum pitch is ±40 degrees from the centerline. Pitch angles between ±7 degrees should be avoided since they may cause *specular reflection*, the return of direct, non-diffused light.

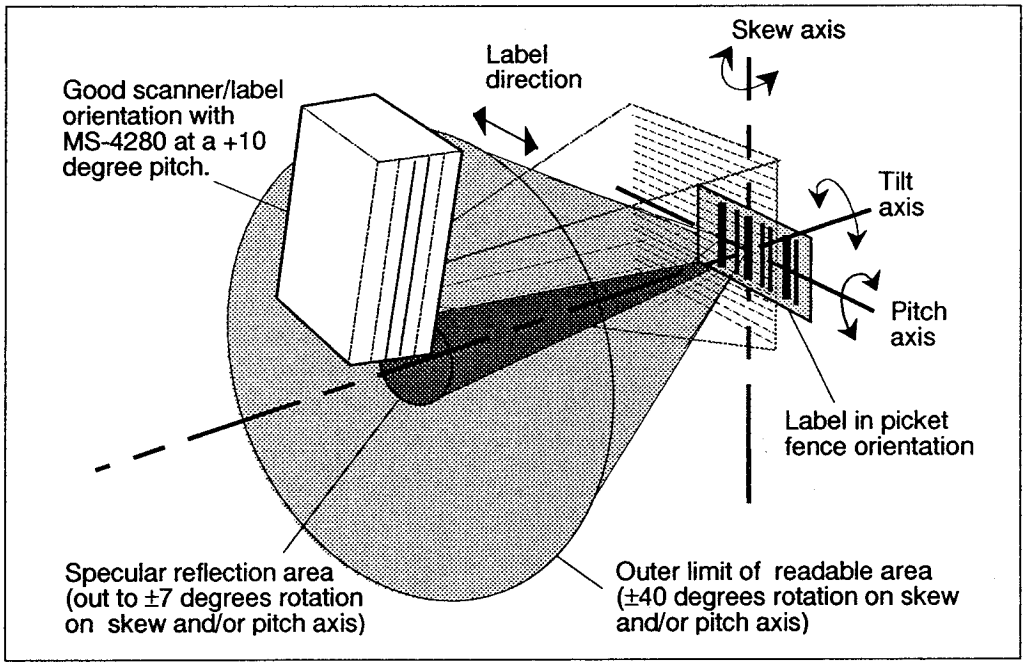


Figure 2-2 Tilt, Skew, and Pitch Axes

Object Detector Orientation

Microscan products can be triggered from either a host or an object detector.

An object detector uses infrared light to detect the presence of a bar-coded object and relays that information to the scanner, which will, if correctly configured, initiate a 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 beam does not interfere with the scanner's reception.

Read Ranges

A label must be within the read range—the zone, as measured from the front of the scanner bezel, in which a label can be reliably read. Figure 2-3 shows the read ranges for standard and extended models. See table 2-1 for ranges and scan widths[1] per label densities (narrow-bar-widths).

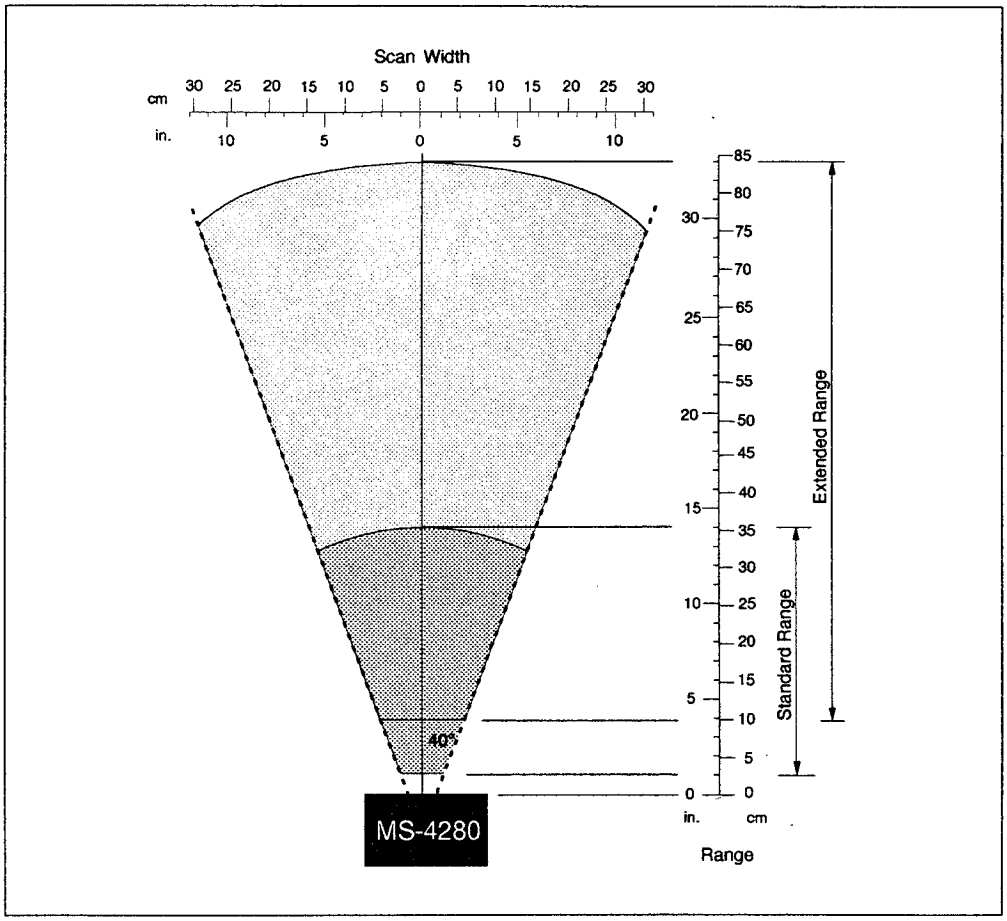


Figure 2-3 MS-4280 Scan Range and Width

1. Scan Width is the distance across the scan beam in which a given label can be reliably read. Scan width varies with read range. The greater the scan width, the longer a moving label will be readable and the greater the number of expected scans.

Table 2-1 Series 4000 Raster Read Ranges and Scan Widths

	Narrow-Bar-Width	Read Range	Maximum Scan Width
Visible Laser			
Standard Range	.0075" (.191 mm)	2.5–4" (64–102 mm)	4.5" (114 mm)
	.010" (.254 mm)	2–4.5" (51–114 mm)	5" (127 mm)
	.015" (.381 mm)	1–8" (25–203 mm)	7" (178 mm)
	.020" (.508 mm)	1–9" (25–229 mm)	8" (203 mm)
	.030" (.762 mm)	2–12" (51–305 mm)	9" (229 mm)
	.040" (1.02 mm)	2–14" (51–356 mm)	10.5" (267 mm)
Extended Range	.015" (.381 mm)	6–11" (152–279 mm)	9" (229 mm)
	.020" (.508 mm)	4–17" (102–432 mm)	12.5" (318 mm)
	.030" (.762 mm)	4–24" (102–610 mm)	17.5" (445 mm)
	.040" (1.02 mm)	4–30" (102–762 mm)	21.5" (546 mm)
	.050" (1.27 mm)	4–33" (102–838 mm)	23.5" (597 mm)

To achieve optimum performance with your application,

1. configure the scanner for read rate mode,[1]
2. temporarily position the scanner, and
3. map out a label placement area by manually moving your label in and out and back and forth while observing read rates on the screen.

Read rates will vary due to differences in label quality, positioning, etc.

1. See "Read Rate Test" in this chapter.

Raster Height and Raster Arc

In setting up, raster height depends on the raster arc and label distance (range) from the scanner. Raster height and raster arc are shown at their maximum with raster arc set to 45°. Both the top offset and bottom offsets can be adjusted independently in 1-degree increments and the resulting arc can vary from 0° to 45°.

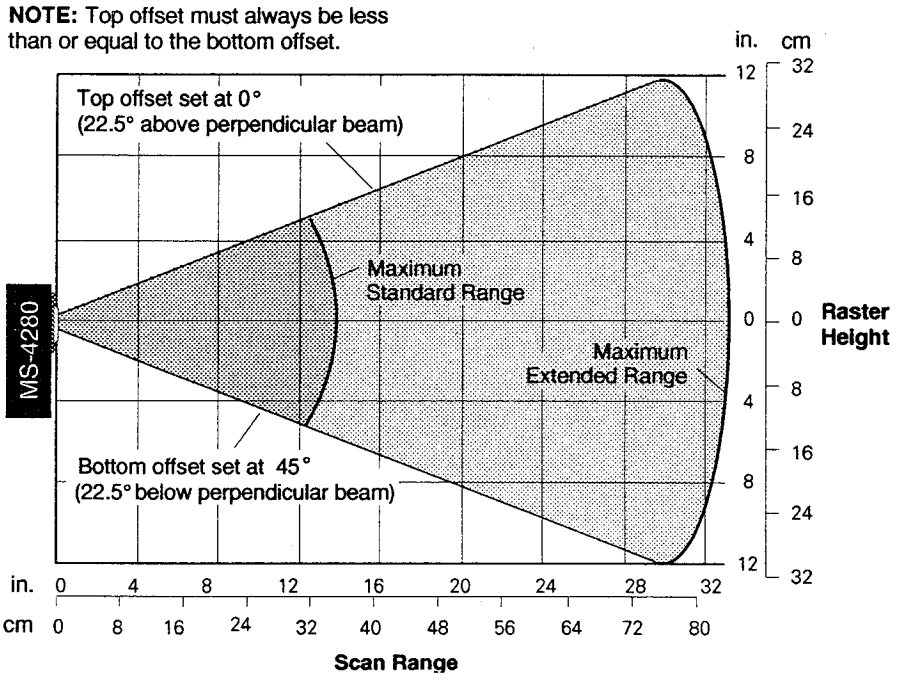


Figure 2-4 Raster Height

Raster Height. If raster arc and label range are known, raster height can be derived by the following formula where Ø is raster arc in degrees:[1]

$$RH = (2 \cdot Scan\ Range) \cdot TAN\left(\frac{\emptyset}{2}\right)$$

Raster Arc. If raster height and label range are known, the raster arc can be derived by using the following formula where RH is raster height:

$$\emptyset = 2 \cdot ARCTAN\left(\frac{RH}{2 \cdot Scan\ Range}\right)$$

1. Raster Height and Raster Arc formulas assume a straight-on symmetrical arc.

Calculating Number of Scans

To ensure reliable, accurate decoding, a label moving through the raster scan area in a picket fence orientation should receive a minimum of ***five*** complete scans. The number of scans that a label can be expected to receive can be calculated if the inputs listed below are known.

- **Scan Rate** (SR) is the number of scans per second that a given scan head is capable of emitting. For the MS-4280, the standard rate is 400 scans per second.
- **Scan Width** (SW) is the distance that a label moves as it travels through the readable scan range. The greater the scan width, the longer the label remains in the read area.
- **Label Speed** (LS) is the distance that a label moves as it travels through the scan lines. The slower the label speed, the longer the label remains in the read area and the more scans the label receives.
- **Label Length** (LL) is the length of the longest printed label to be read plus the length of the quiet zones (figure 2-5). The shorter the label length, the longer time the label remains in the read area.
- **Label Height** (LH) is the height of individual bars (figure 2-5). The taller the label, the more scans it potentially can receive.
- **Raster Height** (RH) is the distance between the extremities of the scan lines as shown in the raster image in figure 2-6. Raster height is generally dictated by the application (range and label placement). Other factors being equal, the greater the raster height, the fewer scan lines available for a given label.

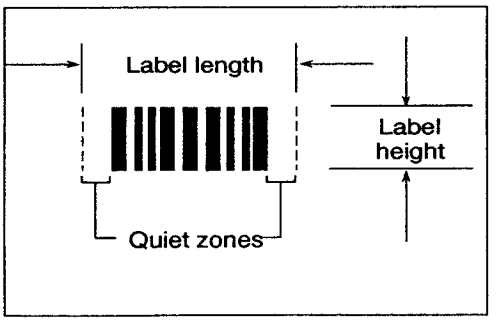


Figure 2-5 Label Dimensions

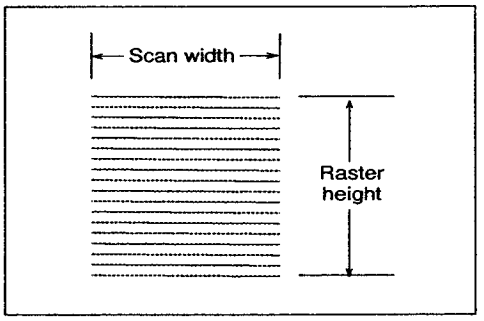


Figure 2-6 Raster Image

For raster scanning, number of scans (NS) is arrived at by first solving for sweeps per second (SPS).

Sweeps per Second (SPS) is the user-programmable number of raster sweeps that transpire in a second. A ***sweep*** is defined as a single pass, up or down, describing the raster image. Sweeps per second should generally be as few as possible in order to maximize the number of scans crossing a given label and to minimize wear on the raster parts and vibration to the scanner.

The formula for finding sweeps per second (SPS) is as follows:[1]

$$SPS = \frac{2(LS)}{(SW - LL)}$$

Since ***one*** is the minimum raster sweep speed that can be entered into the software (see "Raster Setup Menu" in chapter 3), ***SPS can never be less than one***. If it is less than one, then assign a value of one to SPS in calculating number of scans.

Number of Scans (NS) be calculated by the following formula:

$$NS = \frac{(LH)\ (SR)}{(RH)\ (SPS)} - 3$$

Example # 1: If SW = 10, LL = 2, and LS = 2, then SPS will equal 0.5. Since 0.5 is less than one, we will assign a value of one in the Sweeps per Second option as described "Raster Setup Menu" in chapter 3, and in the NS formula which (with LH = 1, SR=400, RH = 10, and SPS = 1) calculates out to 37 complete scans.[2]

Example # 2: If example # 1 is altered so that LS = 80, and LH = 0.5, then SPS will equal 20 and NS will calculate out to one (1). Since this is four less than our recommended five scan minimum, one or more parameters such as raster height, scan width, label speed, etc. will need to be changed to increase the number of scans. Try setting NS = 5 and solving for any other parameter that can be easily changed.

1. The number 2 in the SPS formula doubles the number of sweeps to ensure that each label receives two full raster sweeps.

2. The - 3 component is added to allow for the first and last scans, an AGC scan.

Read Rate Test

This test calculates the percentage of scans decoded. It is useful during setup procedures to help optimize scanner-to-label orientation.

Place the label used in your application in front of the scanner and within the desired read range.

NOTE: *Ensure that the label being scanned is of a code type enabled in the scanner's software. (See "Code Types" in chapter 3, "Configuration.")*

NOTE: *Read rates are easier to read on the screen if Postamble in the Communications menu is enabled.*

1. Send a <C> Enter Read Rate Test command to the scanner to start testing. (See chapter 4, "Operational Commands.")

   A percentage number from 0 to 100 will be displayed on the monitor in the read rate test indicating the ratio of decodes per total number of scans.

2. Find the correct read rate area by moving the label in and out and right and left while observing read rate on the monitor.

   Avoid the specular reflection area (±7 degrees).

3. Record the range area measurements and file the test results away for future reference.

   If the results are not satisfactory, reposition or re-configure the scanner or choose a different narrow-bar-width label size.

4. Send a <J> Exit Read Rate Test command to the scanner when testing is complete.

Connectors and Pinouts

The MS-4280 raster scanner has three I/O ports:

1. Host (J1) (25-pin D-subminiature socket)
2. Trigger (Microscan or other object detector) (J2) (6-pin DIN socket)
3. Power (J3) (5-pin DIN socket)

(See chapter 1, "Introduction," for more information on LEDs.)

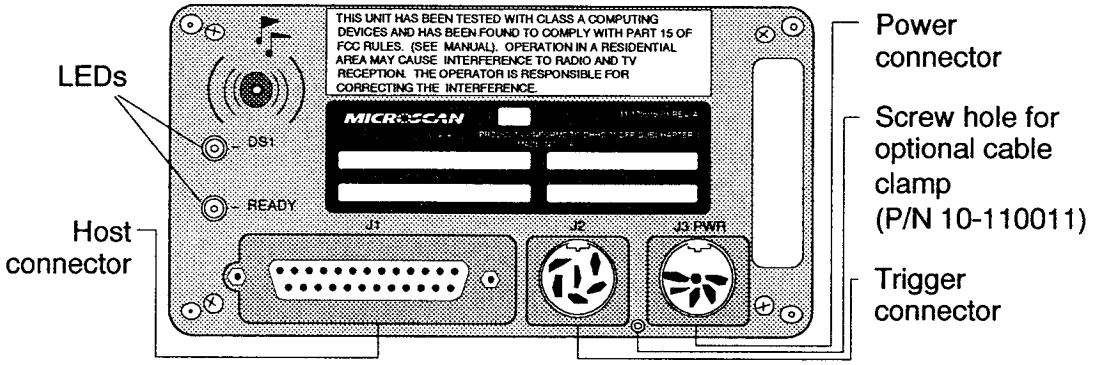


Figure 2-7 Rear Panel of MS-4280

Host Connector

The host connector (J1) (figure 2-7), a 25-pin D-subminiature socket, allows the scanner to be connected to a host, a concentrator, or other communications device such as a PLC (programmable logic controller), a monitor, a PC, a relay, a diverter, an alarm, etc.

> ***CAUTION:*** *All Microscan products are configured as DTE at the host connector when in RS-232 operation. They generally require a null modem cable to the host computer, as shown in figure 2-8.*

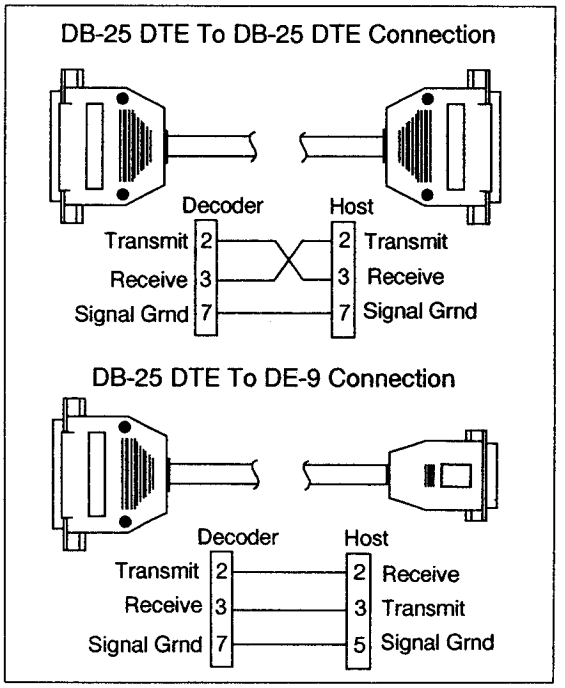


Figure 2-8 DTE and DCE Host Connections

CAUTION: *Do not use a host cable with more wires connected than are required for the application. The host connector of the scanner has many outputs that could cause damage or interfere with normal operation if connected and improperly used.*

Table 2-2 Host Connector Pin Assignments on 25-pin Socket[1]

Ports	Pin	Signal	Comment
Misc.	1	Chassis ground	Connected to DC ground
	6	TTL 5V signal	Indicates a good read
	8	TTL 5V signal	Indicates a no-read
	9	+5 VDC	Auxiliary supply
	10	Trigger input	+3 VDC to +24 VDC
	11	Default (reset)	Used to default configuration
	12	Aux Input	(future use)
	21	Profile Card Input	
	22	Signal Ground	
	23	-12 VDC	
	24		Reserved.
	25	Match Code	Next label read as master label, if enabled
RS-232	2	Transmit data	+12V data output from the decoder
	3	Receive data	±12V signal indicating data from the host to the decoder
	4	Request-to-send	±12V signal asserted high by the decoder when it has data to send to the host
	5	Clear-to-send	±12V signal asserted low by the host to stop the decoder from sending data to it (data transmission will resume when the signal is asserted high.)
	7	Signal Ground	Connected to chassis ground
	20	+12 VDC	Data Terminal Ready (asserted high on power-up to indicate scanner is on)
RS-422 and RS-485	13	RXDB +	Receive Data B +
	14	TXDA -	Transmit Data A -
	16	RXDA -	Receive Data A -
	19	TXDB +	Transmit Data B+

1. The default communications mode does not support pin 4 (RTS). If RTS is not required by the host, pin 4 should not be wired, as the results will be unpredictable.

Trigger Connector

The trigger connector is used for external trigger input and TTL level relay driver output.

The trigger port connector (J2) is a 6-pin DIN socket (figure 2-9) that mates with a 240° 6-pin DIN plug. To access this connector, Microscan offers an optical object detector (part number 99-440001-03) and a user-customized trigger port connector (part number 20-600090-02). [1]

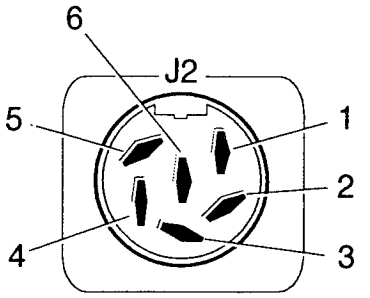


Figure 2-9 Trigger Connector Socket

Table 2-3 lists pin assignments. Pin 1 of the trigger connector is the input pin from the object detector. When operating the scanner in external trigger mode, a toggle at this pin causes the scanner to begin a read cycle.

Pin 2 of the trigger connector is a programmable relay driver. Software in the MS-4280 can be programmed to set this pin to high or low upon a good read, a no read, a good match, or a mismatch. This pin can source or sink 4 mA (maximum) and can be used to drive a small relay to operate an alarm, diverter, etc.

Pins 3, 4, and 5 can be used to supply +5 VDC, +12 VDC, and ground respectively to an external triggering device.

Table 2-3 Trigger Connector Pin Assignments

Pin	Signal
1	Trigger Input +3 VDC to +24 VDC
2	TTL Relay driver output signal 5 VDC
3	+5 VDC
4	+12 VDC
5	Ground
6	Not used

1. Trigger sources other than the Microscan object detector can be used. Mechanical switches, relays, etc.—which tend to be slow and bouncy and produce multiple trigger signals—are not recommended unless equipped with optical sensors or filtered transitions (optical, Hall effect, or DC solid state relays).

Figure 2-10 shows examples of positive and negative external trigger inputs that could be applied to the trigger connector.

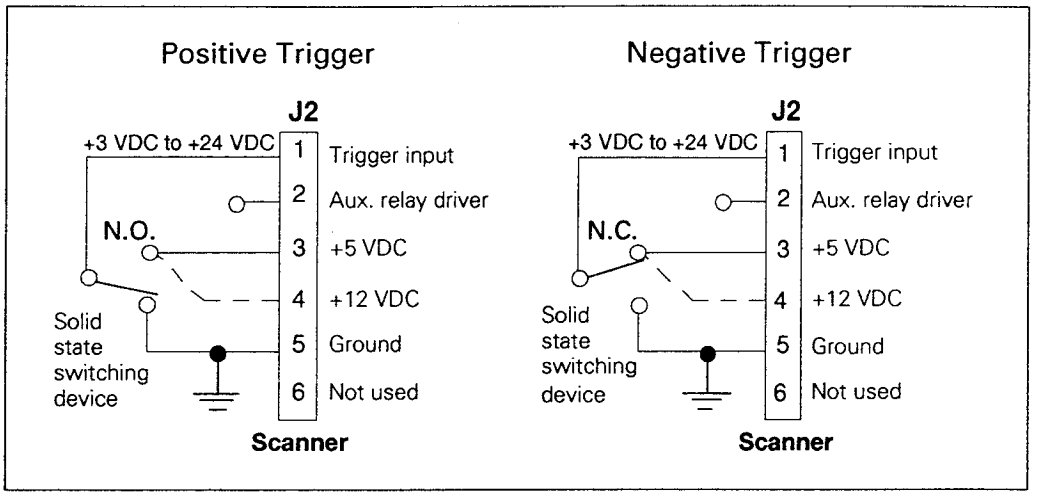


Figure 2-10 Trigger Connector Wiring Diagram

Power Connector

The power connector (J3 PWR) on the back of the MS-4280 scanner (figure 2-11) is a 5-pin DIN socket which typically connects to the Microscan power pack. The pin assignments are specified in table 2-4.

If using an alternate (regulated) DC voltage source, a mating connector (Switchcraft #05BL5M plug) is required.

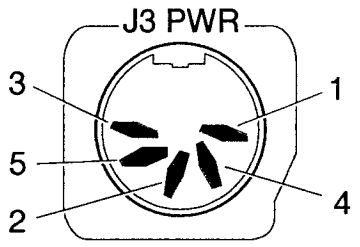


Figure 2-11 Power Connector Socket (J3)

Table 2-4 Power Connector Pin Assignments

Pin	Signal
1	DC Ground
2	Chassis Ground
3	+5 VDC
4	-12 VDC
5	+12 VDC

***CAUTION:** Switching power supplies for Microscan equipment with switching noise of 20 mV or greater with ±12 VDC are not recommended due to excessive ripple characteristics.*

Cabling Requirements

Under ideal conditions, maximum cable lengths can meet the distances shown in table 2-5. 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 2-5 Cable Distances

Cabling	Maximum Distance
RS-232 Scanner to Host	50 ft. (15.2 m)
RS-422 Scanner to Host	4000 ft. (1016 m)
RS-485 Multidrop Trunk	4000 ft. (1016 m)
RS-485 Multidrop Drop	10 ft. (2.54 m)

Mounting the Scanner

The MS-4280 raster scanner can be mounted directly to a mounting surface of your choice, or indirectly, via a Microscan mounting plate, P/N 98-500001-01.

To permanently mount the scanner:

1. Position the scanner in a dry place, devoid of sunlight, bright lights, or laser light from other sources.
2. Before mounting, ensure sufficient clearance at the rear of the scanner for the connectors and cables.
3. **If not using the mounting plate**, use the measurements provided in figure 2-12 to locate centers of mounting holes and drill four 5/32 inch (4 mm) holes, or

   If using the mounting plate, use the four perimeter holes for mounting the plate and mount scanner directly to the four inner holes of the plate.
4. Secure scanner with four 6-32 screws.

***CAUTION:** Make certain that the mounting screws do not penetrate into the scanner case more than .175 in. (4.4 mm) or damage to the scanner may result.*

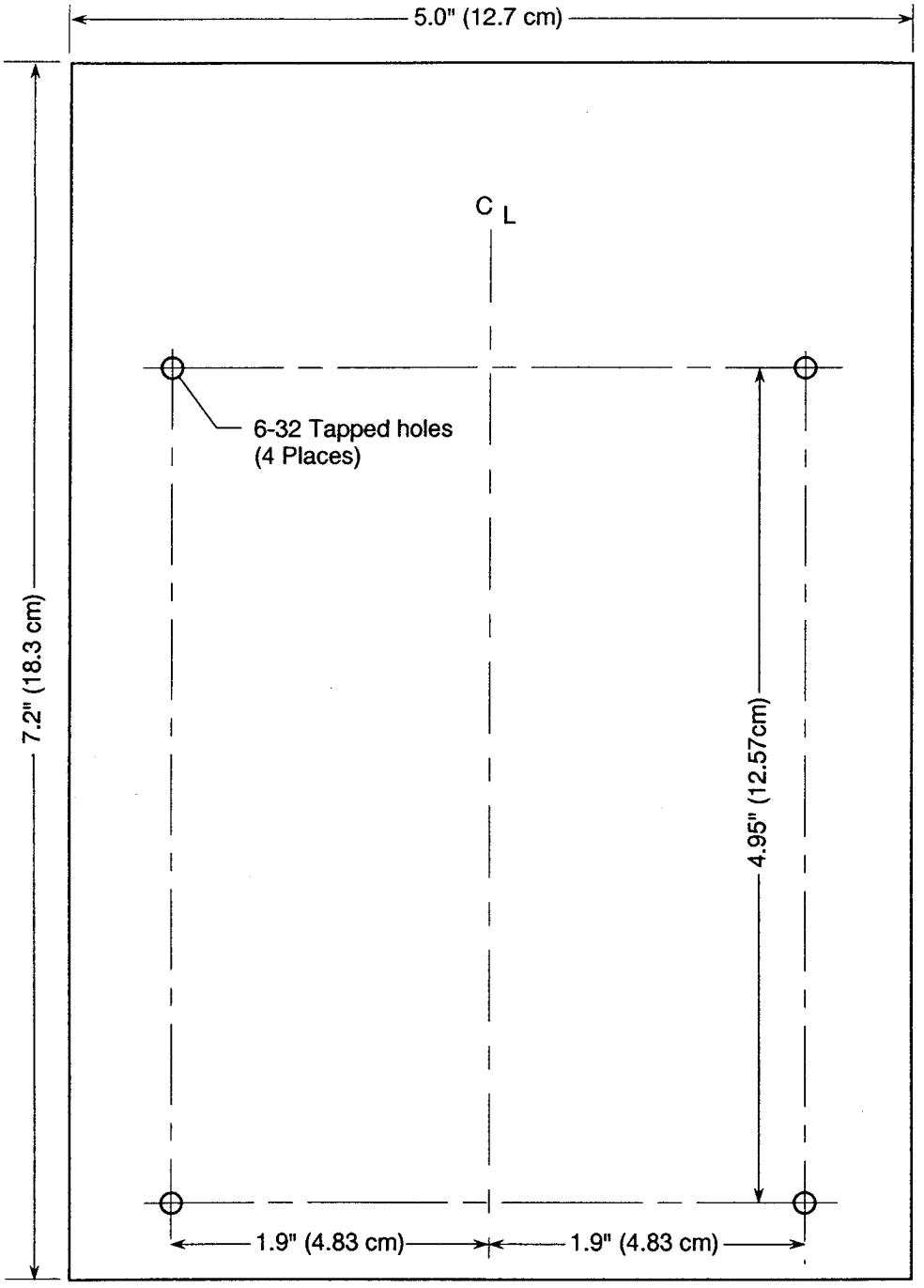


Figure 2-12 MS-4280 Bottom Mounting Holes (not true size)

Operational Tips

Do:

- Check the label for readability in the visible (670 nm) range. If there is any question about the label's readability, contact your Microscan representative.
- Check inputs (label speed, length, height, etc.) to ensure the desired number of scans per label.
- As much as possible, avoid excessive tilt, pitch, and skew of the bar code label.
- Test scanner readability with a label that is known to be good and log the results.
- Clean the laser window on a regular basis with a clean, dry Q-tip or cotton cloth on a regular basis.

Do Not:

- Aim the scanner into sunlight, photo detectors, or other light-emitting sources.
- Obstruct the laser window with mounting hardware or other objects.
- Connect chassis of scanner(s) and host to different ground potentials.
- Operate the scanner in excessive temperature environments (see appendix A, "Scanner Specifications").

Defaulting the Scanner

| ***NOTE:*** *There are no menu options or host commands for resetting configuration.* |

| ***NOTE:*** *Power must be available to the scanner during default procedures.* |

Defaulting will reset the scanner parameters to the original factory settings. Defaulting might be necessary if communications between the scanner and another device are interrupted or if using incompatible equipment (for example, a terminal is set to communicate at 9600 baud, but the scanner is configured at 38.4 K baud).

Communication can also be lost if an address has been assigned to the scanner since the scanner is now looking for a concentrator instead of a host. However, access to the configuration menu of a scanner that is in polled mode can be forced by use of a profile card (see mode 0 in "Profile Card Configuration" at the end of chapter 3).

Using the Profile Card

Turn the scanner ON and insert the end of the profile card labeled "DECODER" into the scanner's host connector. Set all four mode switches to OFF, set number 3 data switch to ON (as shown in figure 2-13), and press the LOAD button. (See "Profile Card Configuration" in chapter 3, "Configuration.")

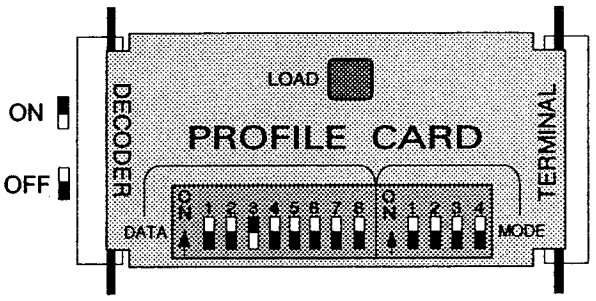


Figure 2-13 Profile Card Default Setting

Listen for two beeps in succession (the second louder than the first). If the beeps do not occur as described, repeat the default procedure.

Shorting Pins 7 and 11

If a profile card is not accessible, it is necessary to default the scanner by shorting pins 7 and 11.

| ***CAUTION:*** *Be certain that the correct pins are shorted. Shorting the wrong pins can cause serious damage to the unit.* |

1. Locate pins 7 and 11 on the J1 (host) connector (figure 2-14) and mark with a pen.

   (Use a small length of light wire approx. 4 inches, 18 to 26 gauge for shorting.)

2. Momentarily short pins 11 and 7. Listen for a series of short beeps.
3. Within 3 seconds, short pins 11 and 7 again. A longer beep should be heard. If not, repeat the process.

NOTE: *Using switching power supplies as a power source is not recommended due to excessive ripple characteristics.*

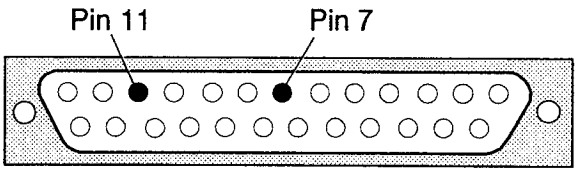


Figure 2-14 Host Connector Default Pins (on back of scanner)

Using a Dumb Terminal

The MS-4280 raster 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	• **Even** Parity
• **Seven** Data Bits	• **One** Stop Bit

NOTE: *A PC or Macintosh computer can also be used as a dumb terminal if connected as shown under "Host Connector" and running a communications program such as Procomm, Crosstalk, Kermit, etc. set to the above defaults. See your computer manual for communication's port pinouts.*

(For more information see chapter 3, "Configuration.")

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.

Any data line, as necessary, can be shielded. If used, isolate the shielding from the scanner and ground only to the host earth ground.

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 2-15. You may need to examine and if necessary cut the shielding connection at or near the scanner cable connector.

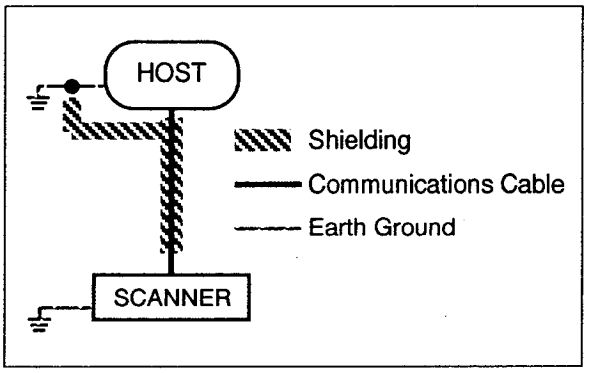


Figure 2-15 Grounding Diagram, Scanner-Host

Ground Loops

Ground loops, signal degradation due to different ground potentials in communicating devices, can be eliminated or minimized by:

1. Ensuring that both the host and scanner are connected to a common earth ground, and
2. Ensuring that power supplies to the host and scanner provide a ground.

Chapter 3

Configuration

Chapter Contents

The three sections in this chapter describe different methods to configure the MS-4280 raster scanner: screen menus, serial commands, and profile card.

All five configuration areas (Communications, Operations, Code Types, User Outputs, and Raster Setup) can be defined with either screen menus or serial commands. Configuration with the profile card, while applicable to most commands, does not allow for Raster Setup configuration.

NOTE: *"Operations," as used in this chapter, applies to configuration parameters and not to the serial operational commands described in chapter 4, "Operational Commands."*

Menu Configuration

Entering the Menu Configuration Program[1]

To see the Main menu (figure 3-1), from an ASCII terminal that is connected to the scanner, send the operational command <D> (enter the brackets < > as well as the upper case D).[2]

```
                        MICROSCAN SYSTEMS, INC.
                         CONFIGURATION PROGRAM
                              MAIN MENU
                            35-214001-XX
-------------------------------------------------------------------------------

   TOPICS                          DESCRIPTIONS

1) COMMUNICATIONS                  HOST PROTOCOL, HOST PORT, AND AUX PORT.
2) OPERATIONS                      TRIGGERING, TIMEOUTS, ETC.
3) CODE TYPES                      CODE SELECTIONS, CODE LENGTHS, ETC.
4) USER OUTPUTS                    BEEPER, DATA LINE POLARITY, ETC.
5) RASTER SETUP                    RASTER TOP ANGLE, BOTTOM ANGLE AND SPEED.




-------------------------------------------------------------------------------
          ESC = MAIN MENU OR EXIT     N  = NEXT ITEM
          M   = PREVIOUS MENU         SP = NEXT ITEM
          B   = PREVIOUS ITEM         CR = THIS ITEM
-------------------------------------------------------------------------------
MAIN--> COMMUNICATIONS
```

Figure 3-1 Configuration Program - Main Menu

If the menu does not appear, see appendix C, "Troubleshooting."

> ***NOTE:*** *The user may return to the Main menu at any time by pressing* ***ESC*** *(Escape key) and* ***M.***

The bottom line on the screen is called the *command line*. The command line allows the user to scroll through various menu options, which are displayed on the command line as *prompts*.

---

1. See "Using a Dumb Terminal" in chapter 2, "Setup and Installation."
2. Command start character, by default a left angle bracket, <, may be redefined by menu or serial command. However, the end character, a right angle bracket, >, cannot be changed.

Communications Menu

At the following prompt on the command line:

MAIN–> COMMUNICATIONS

Press **CR** to see the Communications menu (shown in figure 3-2).

```
                    CURRENT SETTINGS FOR COMMUNICATIONS
-------------------------------------------------------------------------------
HOST PROTOCOL                              || PARAMETER | HOST PORT  | AUX PORT
-------------------------------------------||-----------|-----------|----------
PROTOCOL  = POINT TO POINT                 || BAUD RATE |  9600     |  9600
PREAMBLE  = DISABLED = <CR ><NUL>          || PARITY    | EVEN      | EVEN
POSTAMBLE = DISABLED = <CR ><LF >          || STOP BITS | ONE       | ONE
ADDRESS   =  1                             || DATA BITS | SEVEN     | SEVEN
RES = <NUL>                                || RS-422    | DISABLED  | DISABLED
REQ = <NUL>                                || AUX MODE  | N/A       | DISABLED
EOT = <NUL>                                ||           |           |
STX = <NUL>                                ||           |           |
ETX = <NUL>                                ||           |           |
ACK = <NUL>                                ||           |           |
NAK = <NUL>                                ||           |           |
LRC = DISABLED                             ||           |           |
RESPONSE TIMEOUT =     12 ms               ||           |           |
INTERCHAR DELAY  =      0 ms               ||           |           |
-------------------------------------------------------------------------------
            ESC = MAIN MENU OR EXIT     N  = NEXT ITEM
            M   = PREVIOUS MENU         SP = NEXT ITEM
            B   = PREVIOUS ITEM         CR = THIS ITEM
-------------------------------------------------------------------------------
COMMUNICATIONS--> HOST PROTOCOL
```

Figure 3-2 Communications Menu

The communications menu allows the user to set the communication protocols between the scanner and the host.

This particular menu can be regarded as two menus in one: a Host Protocol menu and a Host Port communications menu (Aux Port is not used). To help visualize the menu organizational structure, see figure 3-3. Note that the parameters (baud rate, parity, etc.) relate to Host Port.

NOTE: *Host Port settings must 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).*

NOTE: *Aux Port parameters do not apply to series 4000 scanners.*

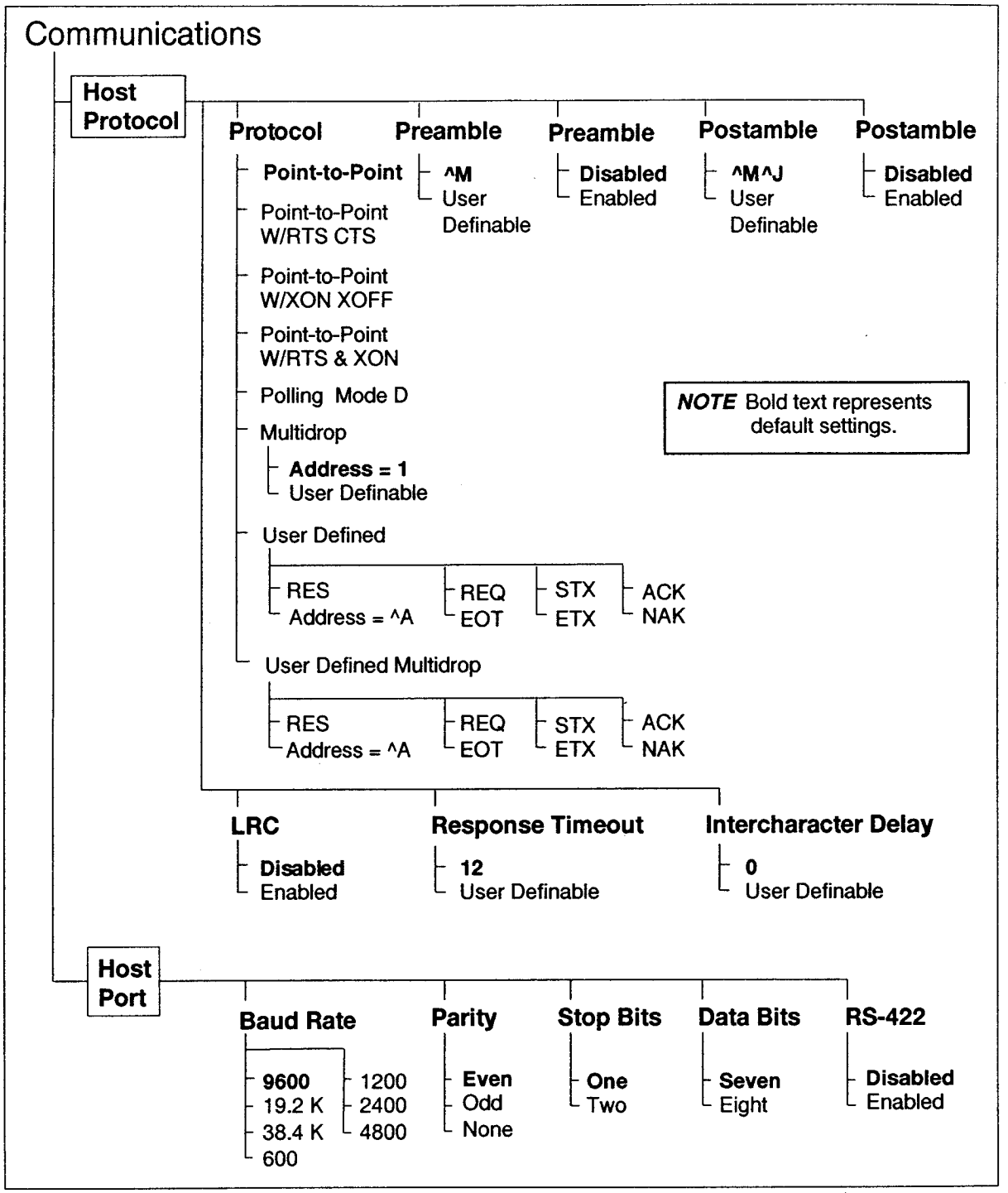


Figure 3-3 Communications Menu Structure

Host Protocol Parameters

The following command line is the first to appear (at the bottom of the screen) in the Communications menu:

COMMUNICATIONS -> HOST PROTOCOL

Press **CR** to see the first Host Protocol item,

HOST PROTOCOL -> PROTOCOL

Press **CR** to display the following on the command line:

HOST PROTOCOL -> PROTOCOL -> POINT-TO-POINT = ENABLED

Protocol

Default setting for Protocol is Point-to-Point.

Protocol options are:

- Point-to-Point
- Point-to-Point with RTS and CTS
- Point-to-Point with XON/XOFF
- Point-to-Point with RTS/CTS and XON/XOFF
- Polling Mode D
- Multidrop
- User Defined
- User Defined Multidrop

Protocols are sets of rules which define the sequence and format in which information is transferred between devices. Generally there are two basic protocol modes: unpolled and polled. In unpolled mode (all of the Point-to-Point protocols), a device sends information without being asked for by the host. In polled mode (Multidrop, Polling Mode D, and User Defined Multidrop), a device has an address and waits for a request from the host before sending data.

Press **SP** to scroll through the Protocol options.

To select a protocol (with the exception of User Defined and User Defined Multidrop), press **SP** to scroll to the desired protocol and press **CR**. Press **M** twice to refresh the screen.

> ***NOTE:*** *User Defined and User Defined Multidrop have more options available to them. Selection instructions for these protocols are provided under each topic.*

With the screen refreshed, you may continue exploring protocol by moving on to User Defined or User Defined Multidrop (see topics in this section), or you may advance to the next Host Protocol item, Preamble, by pressing **CR** and **SP**. (Go to "Preamble" instructions following "Protocol" section.)

Point-to-Point

Has no address and sends data to the host whenever it is available, 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. RTS and CTS signals are transmitted over two dedicated wires (pins 4 and 5) as defined in the RS-232 standard.

Point-to-Point with XON/XOFF (Transmitter On/Off)

Used with RS-232 or RS-422. 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 the 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.

Multidrop

The Multidrop protocol always uses RS-485. It allows a host to communicate via a multidrop concentrator with several peripheral devices. Multidrop is similar to Polling Mode D except that a unique poll address and select address are required for each device, and only one host port connection is needed for up to 50 devices.

The series 5000 concentrator is programmed to communicate with up to 50 polled devices configured exclusively in the standard Multidrop protocol.

***NOTE:** Scanners intended to link up to a series 5000 multidrop concentrator can only be configured in standard Multidrop protocol.*

***NOTE:** Once the scanner is configured for Multidrop, a profile card (using mode 0) or a default procedure must be used to access the configuration menus again (although "K" commands will continue to function).*

Multidrop requires the user to assign a unique address to the scanner. This number (1 to 50) is then displayed on the scanner configuration screen. However during transmission, poll and select addresses from 1C to 7F hex are substituted for the displayed decimal values. For example, if a 1 has been assigned as the Multidrop address, then 1C hex is substituted as the poll address and 1D hex as the select address.

***HINT:** Attach a tag to each scanner to identify its multidrop address.*

When Multidrop is selected, the protocol characters for RES, REQ, etc. are assigned automatically. LRC, which is recommended for data transfer security, is also enabled.

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

User Defined

Used only with RS-232 or RS-422. For special applications, User Defined protocol allows the user to assign ASCII characters to the address and/or to protocol commands (RES, REQ, EOT, STX, ETX, ACK, and NAK). (See "ASCII Table with Control Characters" in appendix B.) 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. The protocol can then be modified as required.

User Defined is determined to be in a polled mode only if an address has been assigned by the user. Even with an address, the scanner cannot operate in Multidrop protocol. (Only Multidrop and User Defined Multidrop operate with RS-485.) If no address has been assigned, the scanner will be in an unpolled mode.

The address can be any ASCII character from the ASCII table in appendix B, except a NUL. Note that the same ASCII character should never be assigned more than once to an address or protocol command.

NOTE: *Definitions of protocol commands in User Defined and User Defined Multidrop must be matched in host applications to allow communications sequences to execute correctly.*

HINT: *To delete any unwanted command, assign a NUL (null) character.*

Carriage Returns, Spaces, and Nulls

In the assignment of characters, a carriage return (CR), a space (SP), and a null (NUL) are special cases in the menus.

To define a CR as a character, a space (SP) must precede it. Press **SP** followed by **CR**. Press **CR** again to enable. A ^M is displayed on the command line. Press **M** to refresh the screen. A **CR** is displayed in the appropriate place in the menu.

To define a space as the character, press **SP** twice, followed by **CR**. Press **M** to refresh the screen. A blank space will appear after the appropriate parameter or command. While it may appear that nothing has been assigned, the hex value 20 will be sent during data transmission.

To select a NUL (null), which has the effect of nullifying the command, press **SP** followed by a **0** (zero). The command is now nullified and will be displayed as a null (<NUL>) in the menu when the screen is refreshed.

A simple ACK/NAK protocol can be developed by first selecting Point-to-Point, next selecting User Defined, and then assigning characters to ACK and NAK commands.

For example, to define an ACK/NAK protocol, at the prompt,

COMMUNICATIONS -> HOST PROTOCOL

Press **CR** twice to see:

HOST PROTOCOL ->PROTOCOL -> POINT-TO-POINT = ENABLED

Press **CR** to re-enable.

Press **B** twice to scroll to User Defined and **CR** once to see:

HOST PROTOCOL ->PROTOCOL -> USER DEFINED-> RES =

Press **SP** six times to scroll to ACK and **CR** once to see the following:

HOST PROTOCOL ->PROTOCOL -> USER DEFINED-> ACK = ->

Enter a ^F by holding down the **Control** key while pressing the **F** key and press **CR** to see the following:

HOST PROTOCOL ->PROTOCOL -> USER DEFINED -> ACK = ^F[1]

Press **SP** once to advance to NAK and **CR** once to see:

HOST PROTOCOL ->PROTOCOL -> USER DEFINED -> NAK = ->

Enter a ^U by holding down the **Control** key while pressing the **U** key. Press **CR** to see:

HOST PROTOCOL ->PROTOCOL -> USER DEFINED -> NAK = ^U

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

Press **M** three times to see the following updated screen (figure 3-4).

```
                    CURRENT SETTINGS FOR COMMUNICATIONS
-------------------------------------------------------------------------------
HOST PROTOCOL                          || PARAMETER | HOST PORT  | AUX PORT
---------------------------------------||-----------|------------|------------
PROTOCOL  = USER DEFINED               || BAUD RATE |  9600      |  9600
PREAMBLE  = DISABLED = <CR ><NUL>      || PARITY    | EVEN       | EVEN
POSTAMBLE = DISABLED = <CR ><LF >      || STOP BITS | ONE        | ONE
ADDRESS   =                            || DATA BITS | SEVEN      | SEVEN
RES = <NUL>                            || RS-422    | DISABLED   | ENABLED
REQ = <NUL>                            || AUX MODE  | N/A        | DISABLED
EOT = <NUL>                            ||           |            |
STX = <NUL>                            ||           |            |
ETX = <NUL>                            ||           |            |
ACK = <ACK>                            ||           |            |
NAK = <NAK>                            ||           |            |
LRC = ENABLED                          ||           |            |
RESPONSE TIMEOUT =    12 ms            ||           |            |
INTERCHAR DELAY  =     0 ms            ||           |            |
-------------------------------------------------------------------------------
             ESC = MAIN MENU OR EXIT     N  = NEXT ITEM
             M   = PREVIOUS MENU         SP = NEXT ITEM
             B   = PREVIOUS ITEM         CR = THIS ITEM
-------------------------------------------------------------------------------
COMMUNICATIONS--> HOST PROTOCOL
```

Figure 3-4 Defining an ACK-NAK Protocol

Notice that the mnemonics ACK and NAK replace the default NULs. This is the typical configuration for a simple ACK/NAK protocol. Although Longitudinal Redundancy Check (LRC) is automatically enabled, it can be disabled if it is not required for your application. (See instructions under "Longitudinal Redundancy Check" later in this section.)

To return to Protocol, press **CR** twice and **SP** to scroll through the options.

Or to advance to Preamble, press **CR** and **SP**.

User Defined Multidrop

Functions exactly the same as User Defined (including the selection of ASCII characters) except that RS-485 is enabled instead of RS-232 or RS-422. It is used when connecting a concentrator or other device that does not match standard Multidrop protocol.

> ***NOTE:*** *The series 5000 concentrator is programmed to communicate with scanners in multidrop protocol only. When linked to a series 5000 concentrator, a scanner must use standard multidrop protocol.*

***NOTE:** Definitions of commands in User Defined and User Defined Multidrop must be duplicated in host applications to enable poll and select sequences to execute correctly during transmission.*

Unlike standard Multidrop, User Defined Multidrop can define an address as any one character (01 hex to 7E hex) in the ASCII table. The address 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, the ^B (02 hex) becomes the select address that the host will use in sending host select commands.

Thus, remember that in User Defined Multidrop:

1. Never assign two consecutive ASCII characters as multidrop addresses, and
2. Never assign the same ASCII character more than once in the protocol.

Typically, parameters in User Defined Multidrop are defined by first enabling Multidrop, then enabling User Defined Multidrop. This pre-loads Multidrop characters into the parameters. The user then changes individual characters to match the host or other requirements.

For example, to modify Multidrop, from the prompt,

COMMUNICATIONS ->HOST PROTOCOL

Press **CR** twice and press **B** three times to scroll back to Multidrop.

Press **CR** twice to see the following:

HOST PROTOCOL -> PROTOCOL -> MULTIDROP -> ADDRESS = 1 ->

Enter an address from 1 to 50 and press **CR** and **M**.

Press **SP** twice to scroll to User Defined Multidrop.

Press **CR** twice to see,

HOST PROTOCOL -> PROTOCOL -> USER DEFINED MULTI-> RES = ^D ->

Enter an ASCII character, then press **CR**.

Press **SP** to scroll through the protocol commands (RES to NAK) and modify as desired, following the same procedure used for User Defined.

To return to the Protocol prompt, press **M** two times. Press **SP** to advance to Preamble.

Preamble

Allows the user 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, to display each decoded message on its own line.

The default characters are CR (^M) and NUL (spacebar + 0).

If User Defined, Polling Mode D, or Multidrop protocol is enabled, the Preamble and Postamble (see Postamble later in this section) characters are transmitted within the STX and ETX data block.

At the following prompt,

COMMUNICATIONS -> HOST PROTOCOL

Press **CR**, **SP** to see,

HOST PROTOCOL-> PREAMBLE = ^M

Preamble (and Postamble) characters can be defined by first displaying the current ASCII characters and then substituting other characters.

^M is the default ASCII control character that corresponds to the CR displayed to the right of Preamble (see table A-1 in appendix B for a complete list). They can be ordinary alphanumeric characters such as a C or an 8, or they can be control characters such as ^J or ^]. Control characters entered in the command line are displayed in the menu as mnemonic characters.

To change the Preamble characters, press **CR**, enter the new character(s). For example, to enter a ^J as the character, hold down the **Control** key while pressing **J**. The following is displayed in the command line:

HOST PROTOCOL -> PREAMBLE = ^M -> ^J

Press **CR** and **M**. The screen is refreshed, ^J replaces ^M on the command line, and the control character mnemonic LF (line feed) is displayed in the menu next to Preamble.

Postamble characters can be changed in the same way.

Press **CR** once and **SP** twice to advance to Preamble (enable/disable).

Preamble (enable/disable)

Allows the user to enable or disable the preamble character(s). Preamble can be enabled or disabled within any protocol.

Preamble is disabled by default.

To enable, press **CR**, **SP**, and **CR**. The command line should appear as follows:

HOST PROTOCOL -> PREAMBLE = ENABLED

Press **SP** to advance to Postamble.

Postamble

Functions on the same principle as Preamble, except that the character(s) will appear after the decoded message.

The default characters are CR (^M) and LF (^J).

To change the default Postamble setting, use the same procedure described earlier in Preamble.

Press **CR** once and **SP** four times to advance to Postamble (enable/disable).

Postamble (enable/disable)

Allows the user to enable or disable the Postamble data string. Postamble can be enabled or disabled within any protocol.

Postamble is disabled by default.

To enable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to LRC.

Longitudinal Redundancy Check

An error-checking routine which verifies the accuracy of transmissions.

In unpolled mode, LRC is disabled by default. In polled mode it is enabled by default.

To enable LRC, at the prompt,

HOST PROTOCOL-> LRC = DISABLED

Press **CR**, **SP** and **CR**.

Press **SP** to advance to Response Timeout.

Response Timeout

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

Default setting is 12 ms.

The range is from 0 to 65,000 ms. A zero (0) setting will cause an indefinite wait.

To change Response Timeout, press **CR**, enter any number from 0 to 65,000, and press **CR** to display it on the command line.

Press **SP** to advance to "Interchar Delay."

Intercharacter Delay

Allows the user to set the time interval between individual characters transmitted from the scanner to the host.

Default setting is 0 ms.

The range is from 0 to 255 ms. A zero (0) causes no delay between characters. 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.

To change Intercharacter Delay, press **CR**, enter a number from 0 to 255, and press **CR** to display it on the command line.

This concludes the Host Protocol options. Press **M** to return to the Host Protocol prompt.

Host Port Parameters

At the following command line,

COMMUNICATIONS -> HOST PROTOCOL

Press **SP** to see the Host Port prompt, then **CR** to advance to the first Host Port parameter, Baud Rate.

Baud Rate

Allows the user to set the number of bits transmitted per second. Rates range from 600 to 38.4 K.

> ***NOTE:*** *Due to timing considerations, polled modes require 2400 baud or faster.*

9600 is enabled by default.

Options for this parameter are 600, 1200, 2400, 4800, 9600, 19.2 K, and 38.4 K.

To change Baud Rate, at the prompt,

HOST PORT -> BAUD RATE = 9600

press **CR**. The following will be displayed:

HOST PORT -> BAUD RATE = 9600 -> 9600

Press **SP** to scroll through the options. At the desired option, press **CR**. The new option will be displayed in place of 9600.

Press **SP** to advance to Parity.

Parity

Allows the user 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.

Even is enabled by default.

The options are Even, Odd, and None.

To change Parity, press **CR** to display the following:

HOST PORT -> PARITY = EVEN -> EVEN

Press **SP** to scroll through the options. At the desired option, press **CR**. The new option will be displayed in place of Even.

Press **SP** to advance to Stop Bits.

Stop Bits

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

One is enabled by default.

Options are One and Two.

To change the setting for Stop Bits to two, press **CR** to display the following on the command line:

HOST PORT -> STOP BITS= ONE -> ONE

Press **SP** and **CR**. Two will be displayed in place of one.

Press **SP** to advance to Data Bits.

Data Bits

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

Seven is enabled by default.

Options are Seven and Eight.

To change Data Bits to Eight, press **CR**. The following will be displayed on the command line:

HOST PORT –> DATA BITS = SEVEN –> SEVEN

Press **SP** and **CR**. Eight will be displayed in place of Seven.

Press **SP** to advance to RS-422.

RS-422

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

(See appendix E, "Interface Standards," for an explanation of RS-422.)

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.

RS-422 is disabled by default.

To enable RS-422, press **CR**. This command line will be displayed:

HOST PORT –> RS-422 = DISABLED –> DISABLED

Press **SP** and **CR**. RS-422 will now be enabled.

This concludes the Host Port options.

Press **M** twice to return to the Main menu.

Operations Menu

From the Main menu, press **SP** to advance to the Operations prompt and press **CR** to see the Operations menu (figure 3-5):

```
                    CURRENT SETTINGS FOR OPERATIONS
-------------------------------------------------------------------------------

TRIGGERING  MODE        = CONTINUOUS READ
END OF READ CYCLE       = TIMEOUT
TIMEOUT in 10ms incs    =   1000 ms
TRIGGER CHARACTER       = N/A
EXTERNAL TRIGGER        = N/A
NOREAD MESSAGE          = NOREAD
NOREAD MESSAGE          = ENABLED
BARCODE OUTPUT          = ENABLED
WHEN TO OUTPUT          = AS SOON AS POSSIBLE
GOOD DECODE READS       =      1
MATCH CODE              = DISABLED
NUMBER OF LABELS        = ONE
FIELD SEPARATOR         = ,


-------------------------------------------------------------------------------
            ESC = MAIN MENU OR EXIT     N  = NEXT ITEM
            M   = PREVIOUS MENU         SP = NEXT ITEM
            B   = PREVIOUS ITEM         CR = THIS ITEM
-------------------------------------------------------------------------------
OPERATIONS--> TRIGGERING MODE = CONTINUOUS READ
```

Figure 3-5 Operations Menu

> ***NOTE:*** *"Operations," as used in this chapter, applies to configuration parameters and not to the serial operational commands described in the chapter 4, "Operational Commands."*

See figure 3-6 for menu structure.

The following command line should appear at the bottom of the screen:

OPERATIONS–> TRIGGERING MODE = CONTINUOUS READ

Triggering Mode is the first parameter in the Operations menu.

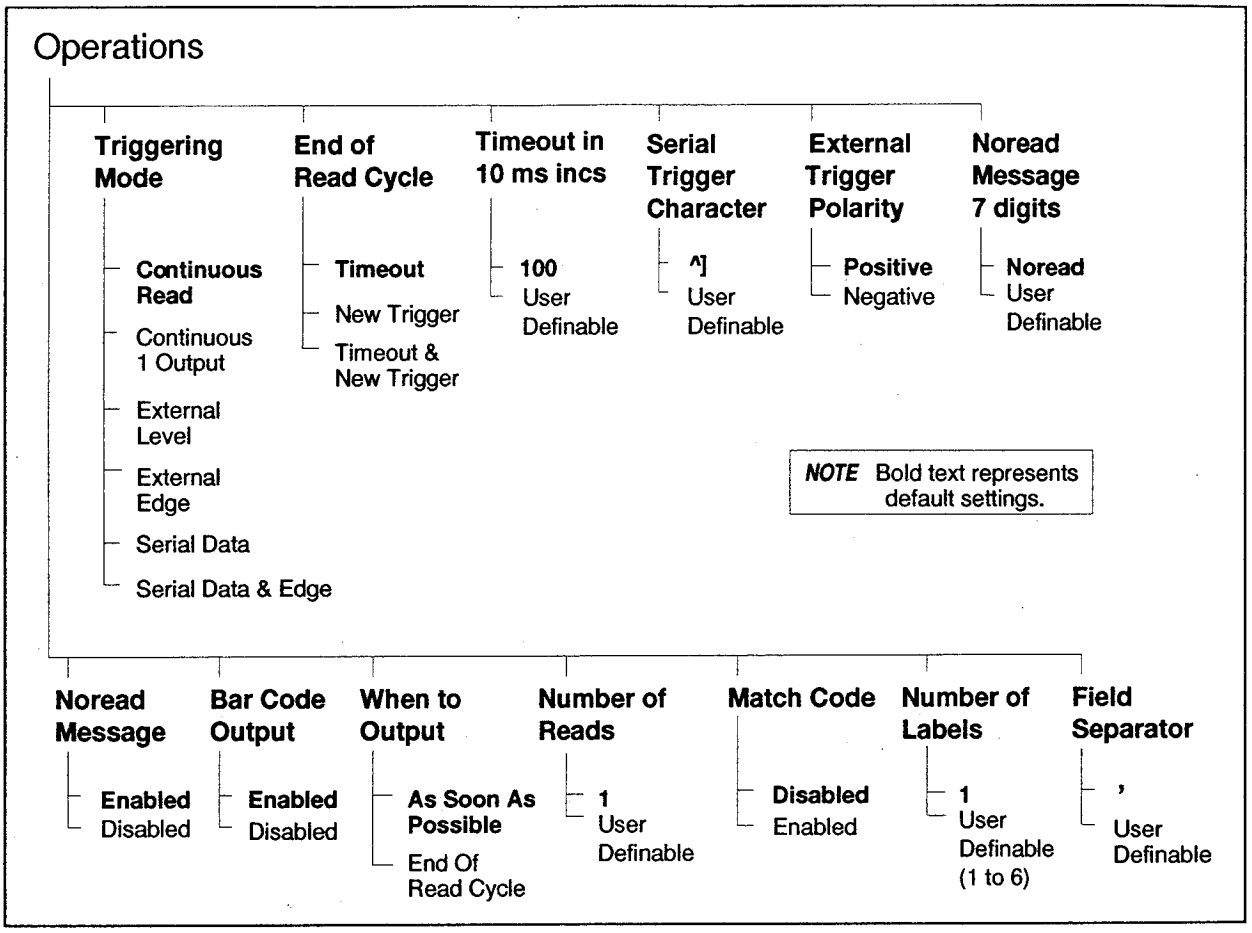


Figure 3-6 Operations Menu Structure

Triggering Mode

Establishes the type of trigger event which initiates or ends the read cycle. (See "End of Read Cycle" later in this section.)

Continuous Read is enabled by default.

Options are Continuous Read, Continuous Read 1 Output, External Level, External Edge, Serial Data Trigger, and Serial Data & Edge Trigger.

Press **CR** to access the options. The command line should read:

OPERATIONS -> TRIGGERING MODE = CONTINUOUS READ -> CONTINUOUS READ

Press **SP** to scroll through the options.

Continuous Read

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 range of the scanner. When To Output options have no affect on Continuous Read. Continuous Read is useful in testing label or scanner operations.

Continuous Read 1 Output

Similar to Continuous Read except that data from a specific label is output only once per read cycle. A different label (that is, a label not identical to the one just scanned) will allow a new output at the end of the read cycle.

Whenever Timeout is enabled, label output will be repeated at the end of each timeout period, provided that the same label is readable. For example, if Timeout is set to one second, label data from a given label will be output immediately and repeated at intervals of one second as long as the label remains readable.

Whenever Timeout is disabled (that is, New Trigger enabled), only a different label can produce a new read.

External Level

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 3-7).[1]

1. *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. For the purposes of this discussion, *rising edge* is the trigger signal associated with the appearance of an object and *falling edge* is the trigger signal associated with the subsequent disappearance of the object.

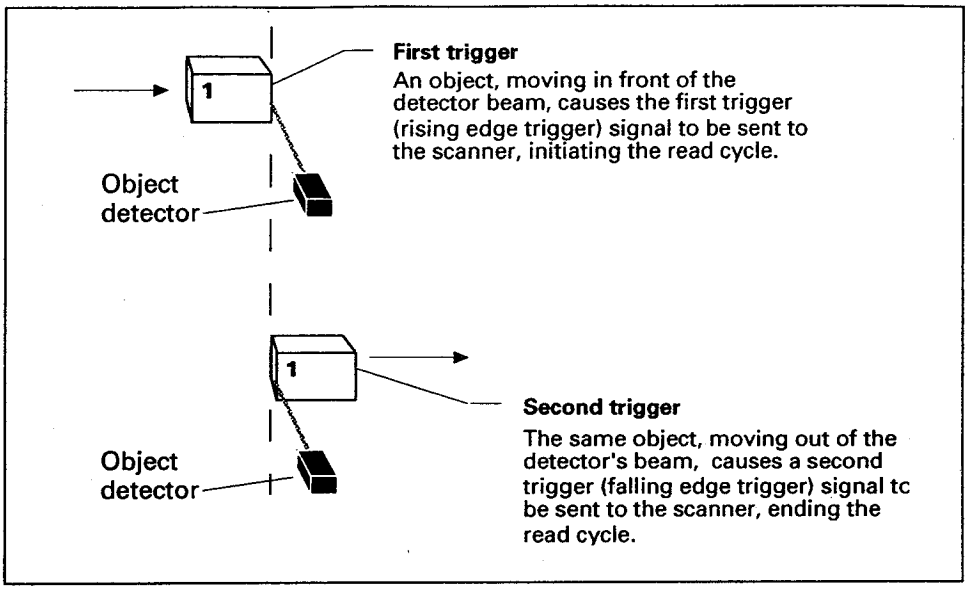


Figure 3-7 External Level Trigger Signals

External Edge

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, the read cycle ends with a good read, a timeout, or a new trigger (figure 3-8).

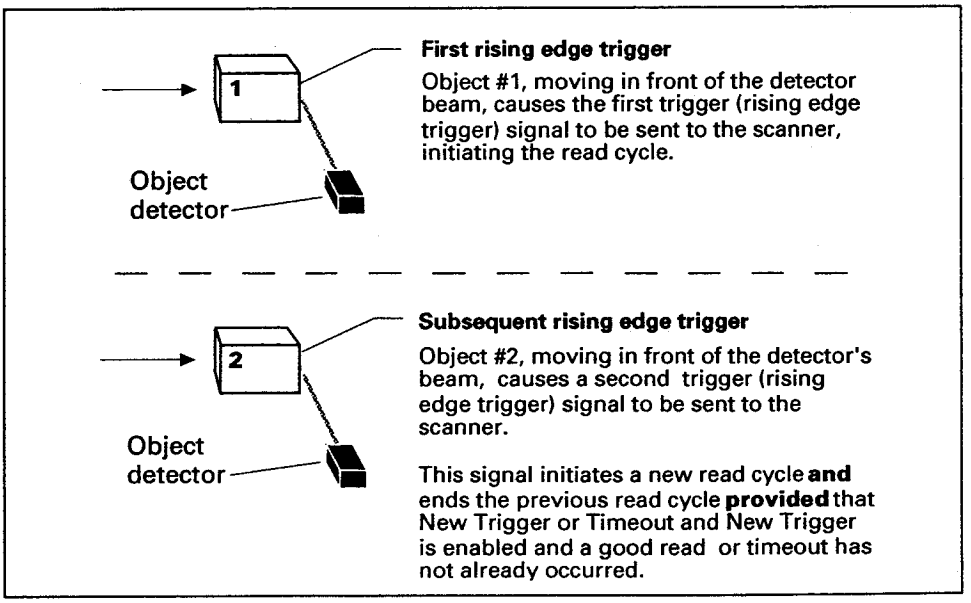


Figure 3-8 External Edge Trigger Signals

Serial Data

The scanner accepts an ASCII character from the host or controlling device as a trigger to start a read cycle.

Serial Data & Edge

The scanner accepts either an external trigger or a serial ASCII command to start a read cycle.

Press **CR** at the desired setting.

Press **SP** to advance to End Of Read Cycle.

End of Read Cycle

Allows the user to choose what event 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.*

Timeout is enabled by default.

Options are Timeout, New Trigger, and Timeout & New Trigger.

To change End of Read Cycle, press **CR** to see,

OPERATIONS -> END OF READ CYCLE = TIMEOUT -> TIMEOUT

Press **SP** to scroll through the options.

Timeout

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.

With either External Edge, Serial Data, or Serial Data & Edge enabled, a timeout ends the read cycle.

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.

With Continuous Read 1 Output enabled, a timeout initiates a new read cycle and allows the same label to be read again.

New Trigger

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.

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.

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.

Timeout & New Trigger

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.

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. An edge or serial trigger also initiates a new read cycle.

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.

Press **CR** to enable the desired option.

Press **SP** to advance to Timeout in 10 ms incs.

Timeout

Allows the user to define the duration of the timeout period.

The default value is 100 (which is equal to one second).

To change the timeout period, at the prompt,

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

Press **CR**. Enter a number from 0 to 65535. This number is derived by multiplying the required number of seconds times 100.

Press **CR** to enable.

Press **SP** to advance to Serial Trigger Character.

Serial Trigger Character

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

The default character is an ASCII GS (1DH), displayed on the terminal screen as <SOH>. The prompt displayed on the command line is ^].

> ***NOTE:*** *When selecting a trigger character, ensure that the selected character is not a NUL (00H) and is not used for other host commands or online protocol characters. For example, if an upper case D is assigned as a serial trigger character, a <D> command will no longer launch the menu program. (See chapter 4, "Operational Commands," for a list of operational commands used by the scanner and appendix B for a list of ASCII characters.)*

To change the serial trigger character, press **CR**, enter the new trigger character, and press **CR** to enable.

Press **SP** to advance to External Trigger Polarity.

External Trigger Polarity

Allows the user to determine whether a positive or negative transition will initiate the read cycle. When using a Microscan-supplied object detector, use the default (Positive) trigger polarity.

External Trigger Polarity is Positive by default.

To change the selection to Negative, press **CR**, **SP**, and **CR** again.

Press **SP** to advance to Noread Message.

Noread Message (user defined)

Allows the user to define any combination of ASCII characters (except a NUL) up to seven characters as the noread message.

The noread message, if enabled and if no bar code label has been decoded, will be transmitted to the host at a timeout or the end of a read cycle.

The default message is NOREAD.

To change Noread Message, press **CR**, enter the new message (up to seven characters), and press **CR** to enable.

Press **SP** to advance to Noread Message (enable/disable).

Noread Message (enable/disable)

Allows the user to enable or disable the noread message.

Noread Message is enabled by default.

To disable Noread Message, press **CR**, **SP**, and **CR**.

Press **SP** to advance to Bar Code Output.

Bar Code Output

Allows the user to choose whether or not to send label data (or noreads) to the host.

Bar Code Output is enabled by default.

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.

To disable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to When To Output.

When to Output (bar code label)

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

As Soon As Possible is enabled by default.

Options are As Soon As Possible and End Of Read Cycle.

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.

To change When to Output to End of Read Cycle, press **CR**, **SP**, and **CR**.

Press **SP** to advance to # of Reads Before a Good Decode.

Number of Reads Before a Good Decode

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

# of Reads Before a Good Decode is set to 1 by default.

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

To change, press **CR**, enter a number from 1 to 31, and press **CR**.

Press **SP** to advance to Match Code.

Match Code

Identical to <E> Enter Match Code Option in chapter 4.

When in a triggered mode, allows the user to enter a master label into the scanner's memory to be compared with subsequently scanned labels.

Match Code is disabled by default.

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

1. Toggling pin 25 to ground (pin 7) 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)> (Master data label entered in place of the Xs.)

Figure 3-9 shows the sequence of operation (and reference) for setting up and entering master labels. See also "New Master Pin" and table 3-1, "Relay Driver Options/Outputs," later in this section under "User Outputs."

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

NOTE: *Enabling Match Code when Number of Labels is set to any number greater than one, will cause Number of Labels to default back to one.*

To enable Match Code, press **CR**, **SP**, and **CR**.

Press **SP** to advance to Number Of Labels.

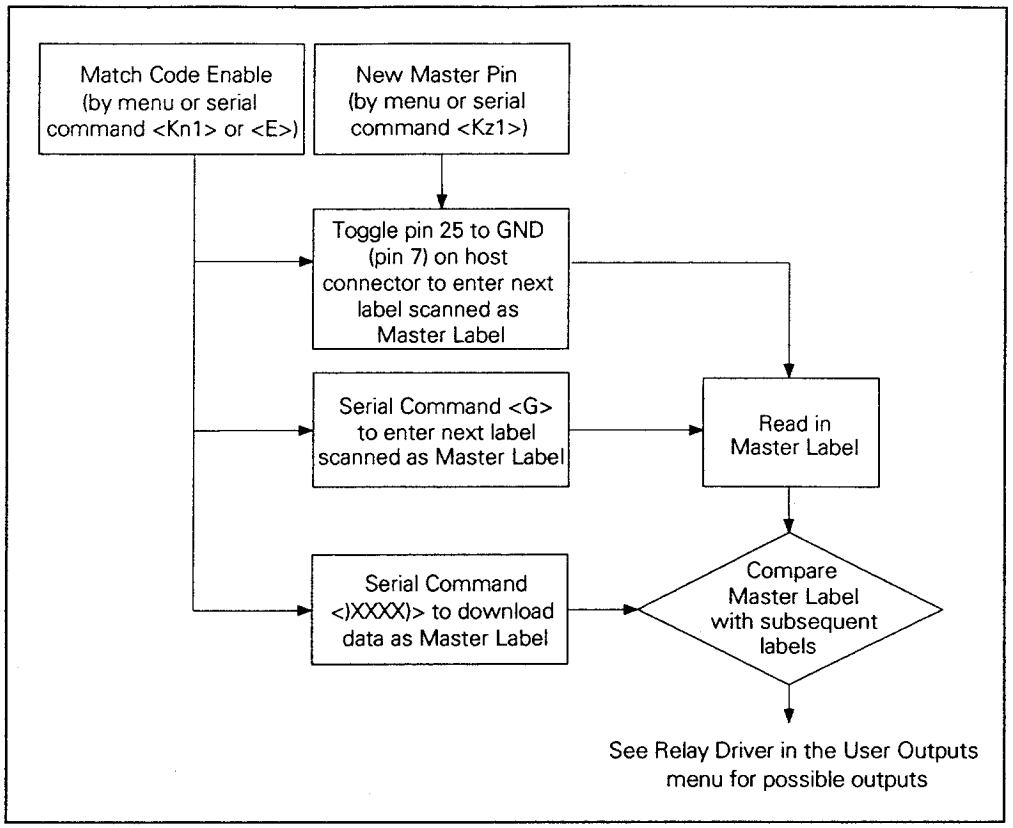


Figure 3-9 Match Code Logic Diagram

Number of Labels

Sometimes referred to as "multiple labels," this option allows the user to select the number of labels from one to six that the scanner can read during one read cycle. The multiple labels can be a mix of any enabled bar code symbologies and more than one label can be decoded per scan line. The following restrictions apply to this command:

1. Each label, to be read, must be different.
2. The maximum number of characters in any one label is 31.
3. The maximum number of characters in a single scan line is 62.

The default number for Number of Labels is One.

Options are One, Two, Three, Four, Five, and Six.

To change Number of Labels, press **CR**, scroll to the new option, and press **CR**.

Press **SP** to advance to Field Separator.

NOTE: *Enabling Match Code or Continuous Read 1 Output when Number of Labels is set to any number greater than one, will cause Number of Labels to default back to one.*

Field Separator

Inserts a separator character between each label.

The default character for Field Separator is a comma (,).

Any ASCII character may be used, except a NUL.

To change the separator character, press **CR**, enter the new character, and press **CR**.

Press **M** to return to the Main menu.

Code Types Menu

From the Main menu, press **SP** to advance to the Code Types prompt. Press **CR** to see the Code Types menu (figure 3-10):

```
                    CURRENT SETTINGS FOR CODE TYPES
-------------------------------------------------------------------------
                |  CODE 39 | CODABAR  | I 2 OF 5 |   UPC    | CODE 128 |
----------------|----------|----------|----------|----------|----------|
CODE TYPE       | ENABLED  | DISABLED | DISABLED | DISABLED | DISABLED |
FIXED LENGTH    | DISABLED | DISABLED |   N/A    |   N/A    | DISABLED |
CODE LENGTH #1  |    10    |    10    |    10    |   N/A    |    10    |
CODE LENGTH #2  |   N/A    |   N/A    |     6    |   N/A    |   N/A    |
CHECK DIGIT     | DISABLED |   N/A    | DISABLED |   N/A    |   N/A    |
C/D OUTPUT      | DISABLED |   N/A    | DISABLED |   N/A    |   N/A    |
INTERCHAR GAP   | DISABLED | DISABLED |   N/A    |   N/A    |   N/A    |
S/S MATCH       |   N/A    | ENABLED  |   N/A    |   N/A    |   N/A    |
S/S OUTPUT      |   N/A    | ENABLED  |   N/A    |   N/A    |   N/A    |
EAN             |   N/A    |   N/A    |   N/A    | DISABLED |   N/A    |
SUPPLEMENTALS   |   N/A    |   N/A    |   N/A    | DISABLED |   N/A    |
NARROW MARGINS  | DISABLED | DISABLED | DISABLED | DISABLED | DISABLED |


-------------------------------------------------------------------------
            ESC = MAIN MENU OR EXIT     N  = NEXT ITEM
            M   = PREVIOUS MENU         SP = NEXT ITEM
            B   = PREVIOUS ITEM         CR = THIS ITEM
-------------------------------------------------------------------------
CODE TYPES--> NARROW MARGINS = DISABLED
```

Figure 3-10 Code Types Menu

This menu allows the user to choose among the various bar code types and define their parameters.

The first command line for the Code Types menu is:

CODE TYPES - - > NARROW MARGINS = DISABLED

Press **SP** from the Narrow Margins prompt to scroll through the five bar code types.

The Code Types menu is arranged in table format. Pressing **CR** at any of the code types will display its current status. From this point use **SP** to scroll through the available options (listed in the first column) for that code type. Options can be defined for any bar code type whether or not the bar code itself is enabled at the time.

Press **M** to resume scrolling through the code type options. See figure 3-11 for menu structure.

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

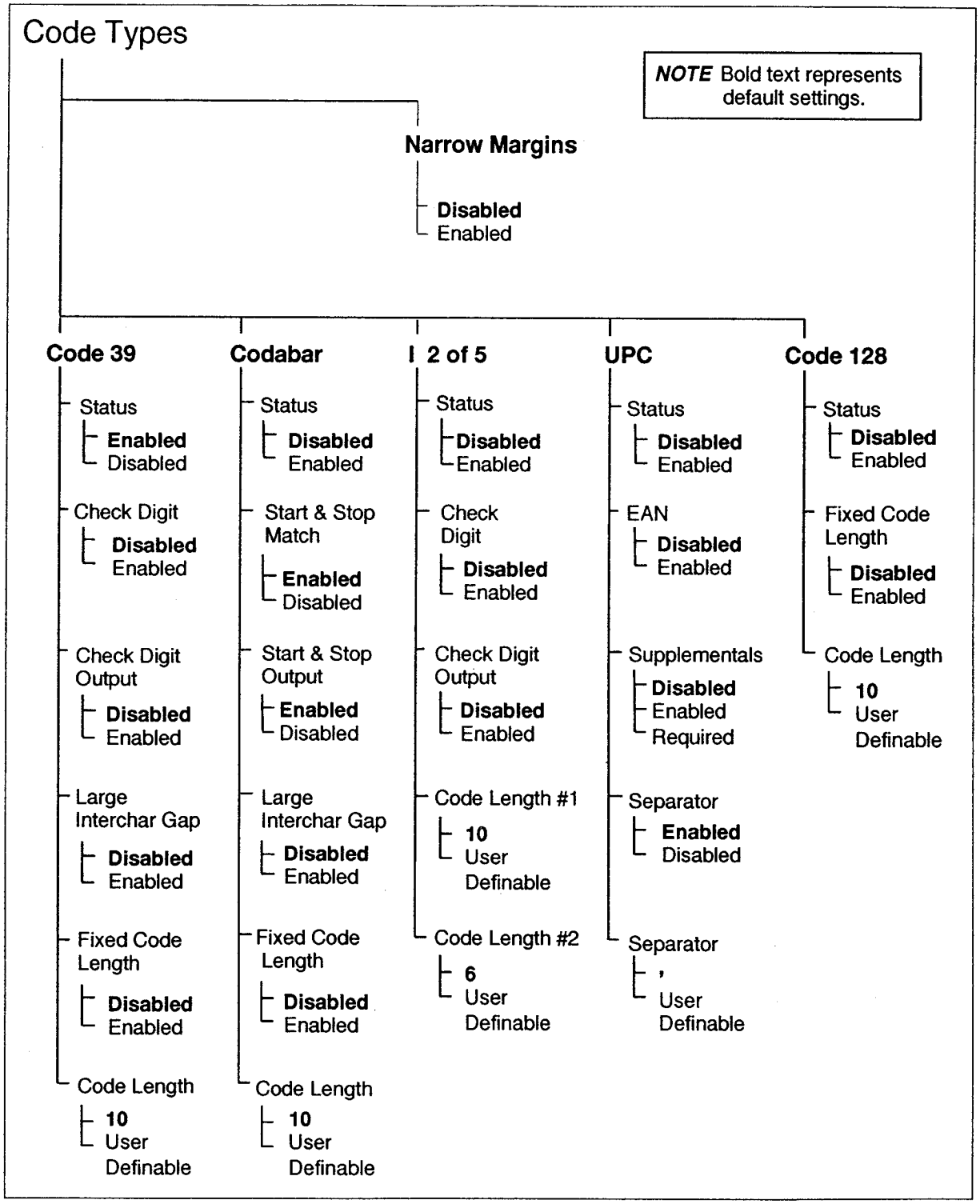


Figure 3-11 Code Types Menu Structure

Narrow Margins

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.

Narrow Margins is disabled by default.

To enable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to Code 39.

Code 39

Code 39 is enabled by default.

Press **CR** to display the following on the command line:

CODE TYPES –> CODE 39 –> STATUS = ENABLED

To disable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to the first Code 39 item, Check Digit.

Check Digit

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.

Check Digit is disabled by default.

With Check Digit and an External or Serial trigger option enabled, an invalid check digit calculation will cause a noread message to be transmitted at the end of the read cycle.

To enable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to Check Digit Output.

Check Digit Output

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

Check Digit Output is disabled by default.

In Disabled mode, a good read will output the label data but not the check digit character.

To enable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to "Large Interchar Gap."

Large Intercharacter Gap

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

Large Intercharacter Gap is disabled by default.

To enable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to Fixed Code Length.

Fixed Code Length

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

Fixed Code Length is disabled by default.

To enable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to Code Length 1-31.

Code Length

Allows the user to specify the exact number of characters that the scanner will recognize. Any code not having the prescribed length will be ignored by the scanner. Available only when Fixed Code Length is enabled.

Code Length 1-31 is set to 10 by default.

Code Length 1-31 is definable from 1 to 31 characters.

To change the default value, press **CR**, enter a number from 1 to 31, and press **CR**.

Press **SP** to cycle back to Code 39 status, or press **M** and **SP** to advance to Codabar.

Codabar

Codabar is disabled by default.

Press **CR** to display the following on the command line:

CODE TYPES –> CODABAR–> STATUS = DISABLED

To enable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to Start & Stop Match.

Start & Stop Match

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

Start & Stop Match is enabled by default.

To disable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to Start & Stop Output.

Start & Stop Output

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

Start & Stop Output is enabled by default.

To disable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to "Large Interchar Gap."

Large Intercharacter Gap

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

Large Intercharacter Gap is disabled by default.

To enable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to Fixed Code Length.

Fixed Code Length

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

Fixed Code Length is disabled by default.

To enable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to Code Length 1-31.

Code Length

Allows the user to specify the exact number of characters that the scanner will recognize. Any code not having the prescribed length will be ignored by the scanner. Available only when Fixed Code Length is enabled.

Code Length 1-31 is set to 10 by default.

Code Length 1-31 is definable from 1 to 31 characters.

To change the default value, press **CR**, enter a number from 1 to 31, and press **CR**.

Press **SP** to cycle back to Codabar status, or press **M** and **SP** to advance to I 2 of 5.

Interleaved 2 of 5

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.

I 2 of 5 is disabled by default.

To enable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to Check Digit.

Check Digit

I 2 of 5 uses a Modulus 10 check digit.

Check Digit is disabled by default.

To enable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to Check Digit Output.

Check Digit Output

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

Check Digit Output is disabled by default.

To enable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to Code Length # 1.

Code Length # 1

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.

By default, Code Length # 1 is set to 10 characters.

The user may specify a zero or any even code length from 2 to 30.

To change Code Length # 1, press **CR**, enter an even number from 2 to 30, and press **CR**.

(Entering an odd number will result in the next lower number being used.)

Press **SP** to advance to Code Length # 2.

Code Length # 2

If using a second label, the user has the option to again specify a zero or any even code length from 2 to 30. If a second label is not being used, set Code Length # 2 to 0 so that data integrity is ensured.

Code Length # 2 is set to 6 characters by default.

To change the setting, press **CR**, enter the new number, and press **CR**.

(Entering an odd number will result in the next lower number being used.)

Press **SP** to cycle back to I 2 of 5 status, or press **M** and **SP** to advance to UPC.

UPC

UPC is the standard twelve digit retail code. When enabled, the scanner will read UPC version A and UPC version E only.

UPC is disabled by default.

Press **CR** to display the following on the command line:

CODE TYPES –> UPC –> STATUS = DISABLED

To enable UPC, press **CR**, **SP**, and **CR**.

Press **SP** to advance to EAN.

EAN

When enabled, the scanner will read UPC version A, UPC version E, EAN 13, and EAN 8.

When reading a UPC version A label with the EAN option enabled, a leading zero is appended to the label information and 13 digits are transmitted. If 13 digits are not desired when reading UPC version A labels, the EAN option must be disabled.

EAN is disabled by default.

| ***NOTE:*** *UPC must also be enabled for EAN to take effect.* |

To enable EAN, press **CR**, **SP**, and **CR**.

Press **SP** to advance to Supplementals.

Supplementals

When enabled, the scanner can read supplemental bar code data that has been appended to the standard UPC or EAN codes.

Supplementals is disabled by default.

The options are Disabled, Enabled, and Required.

When in Required mode, supplemental data must be found or a noread will result.

| ***NOTE:*** *Narrow Margins must be enabled if the gap size between the standard code and the supplemental code is between 5:1 and 10:1 (in relation to narrow-bar-width).* |

To change Supplementals press **CR** and use **SP** to scroll through the options. At the desired option press **CR**.

Press **SP** to advance to Separator.

Separator

When enabled, inserts a character between the standard UPC or EAN code and the supplemental code.

Separator is enabled by default. The default separator character is defined as a comma (,).

To retain the above default settings, press **M** and **SP** to advance to the Code 128 prompt.

To disable Separator, press **CR**, **SP**, and **CR**. Then press **M** and **SP** to advance to the Code 128 prompt.

To keep Separator enabled but change the separator character from a comma to a new value, press **SP** to advance to the following command line:

CODE TYPES–> UPC–> SEPARATOR = ,

Press **CR**, enter the new Separator character, and press **CR** again. The new value is displayed and will be transmitted as the Separator character between the decoded bar code data and the supplemental data.

Press **SP** to cycle back to the UPC status, or press **M** and **SP** to advance to Code 128.

Code 128

Code 128 is disabled by default.

To enable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to Fixed Code Length.

Fixed Code Length

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

Fixed Code Length is disabled by default.

To enable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to Code Length 1-31.

Code Length

Allows the user to specify the exact number of characters that the scanner will recognize. Any code not having the prescribed length will be ignored by the scanner. Available only when Fixed Code Length is enabled.

Code Length 1-31 is set to 10 by default.

Code Length 1-31 is definable from 1 to 31 characters.

To change the default value, press **CR**, enter a number from 1 to 31, and press **CR**.

This is the last selection for Code 128. Press **M** to return to Code Types menu.

Press **M** again to return to the Main menu.

User Outputs Menu

This menu allows the user to control the external (video or audio) outputs which identify scanning conditions. From the Main menu, press **SP** to advance to the User Outputs prompt. Press **CR** to see the following menu (figure 3-12):

```
                    CURRENT SETTINGS FOR USER OUTPUTS
------------------------------------------------------------------------------


BEEPER                    = ON GOOD
BEEPER VOLUME             = LEVEL 4
FULL SCREENS              = ENABLED
RELAY DRIVER              = MISMATCH OR NOREAD
NEW MASTER PIN            = DISABLED
LASER ON/OFF              = DISABLED
REVERSE VIDEO             = DISABLED
GOOD/BAD POLARITY         = POSITIVE
GOOD/BAD PULSE WIDTH      =   50 ms
COMMAND START CHARACTER = <


------------------------------------------------------------------------------
            ESC = MAIN MENU OR EXIT     N  = NEXT ITEM
            M   = PREVIOUS MENU         SP = NEXT ITEM
            B   = PREVIOUS ITEM         CR = THIS ITEM
------------------------------------------------------------------------------
USER OUTPUTS--> BEEPER = ON GOOD
```

Figure 3-12 User Outputs Menu

Figure 3-13 displays the structure of this menu.

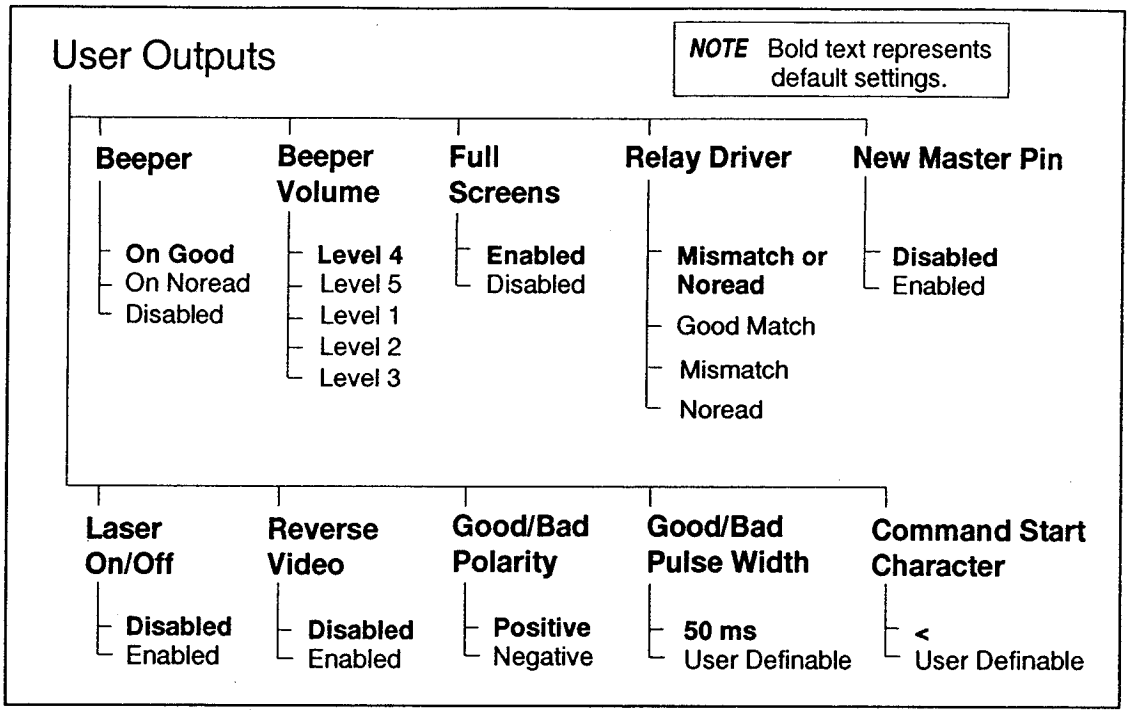


Figure 3-13 User Outputs Menu Structure

Beeper

A beep is emitted either after each good read of a bar code label, after each noread, or not at all, according to the setting.

On Good is enabled by default.

The options are On Good, On Noread, or Disabled.

To change Beeper status, press **CR**. Press **SP** to scroll through the options, then **CR** at the desired option.

Press **SP** to advance to Beeper Volume.

> ***NOTE:*** *The beeper interrupts operations for approximately 100 ms. In high speed Multidrop operations it is advisable to disable the beeper for good reads since the time delay can cause labels to be missed.*

Beeper Volume

Level 4 is enabled by default.

The options are Level 1 through Level 5.

To change Beeper Volume, at the volume prompt press **CR** and use **SP** to scroll through the levels. At the desired level, press **CR**.

The new volume level will be displayed in the command line and on the updated menu next to Beeper Volume.

Press **SP** to advance to Full Screens.

Full Screens

Allows the option of displaying either the full menu screen or just the command line.

Full Screens is enabled by default.

When Full Screens is disabled, the monitor will only display the command line.

To disable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to Relay Driver.

Relay Driver

Allows the user to determine the conditions under which a Relay Driver pulse of 5V is output.

Mismatch Or Noread is enabled by default.

The options are Mismatch Or Noread, Good Match, Mismatch, and Noread.

Relay Driver output pulse will work in all modes, but match and mismatch operations require that:

1. Match Code option be enabled, and
2. a master label be downloaded into memory.

A master label can be downloaded into memory with either a <G> or <)XXXX)> command, as shown in chapter 4, "Operational Commands."

Table 3-1, "Relay Driver Options/Outputs" shows the effects of each of the four Relay Driver options under various scanning conditions.

| ***NOTE:*** *This table is only valid if Match Code is enabled.* |

Table 3-1 Relay Driver Options/Outputs

Option enabled under Relay Driver	Scanning Result	Output						
		Counter incremented by one?						
		Trigger Counter	Match Counter	Mismatch Counter	Noread Counter	Relay Pulse Output? A	Bar Code Data Output? B	Noread Message Output? C
Mismatch or Noread	• Matches the master label	√	√					
	• Does not match the master label	√		√		√	√	
	• Label not decoded	√			√	√		√
Good Match	• Matches the master label	√	√			√	√	
	• Does not match the master label	√		√				
	• Label not decoded	√			√			
Mismatch	• Matches the master label	√	√					
	• Does not match the master label	√		√		√	√	
	• Label not decoded	√			√			
Noread	• Matches the master label	√	√					
	• Does not match the master label	√		√				
	• Label not decoded	√			√	√		√

A. Pin 2 of trigger connector.
B. Pin 6 of host connector.
C. Pin 8 of host conncecor.

Mismatch or Noread

A pulse is sent to pin 2 of the trigger connector (J2) when a label's data does not match that of the master label, or the label is not decoded before the end of the read cycle.

Good Match

A pulse is sent to pin 2 of the trigger connector when a label's data matches that of the master label.

Mismatch

A pulse is sent to pin 2 of the trigger connector when a label's data does not match that of the master label.

Noread

A pulse is sent to pin 2 of the trigger connector when no data is decoded before the end of the read cycle.

To change Relay Driver, press **CR** and use **SP** to scroll through the options. At the desired option, press **CR**.

Press **SP** to advance to New Master Pin.

New Master Pin

When enabled, allows the user to externally toggle pin 25 to momentarily bring it to ground (pin 7). This clears any existing master label information from memory and records the next good read as the new master label information.

New Master Pin is disabled by default.

To enable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to Laser On/Off.

Laser On/Off

When enabled, the laser is ON only during the read cycle, provided the scanner is enabled for a Serial or External trigger (see "Triggering Mode" under "Operations Menu").

> ***NOTE:*** *Laser On/Off should not be confused with the <H> and <I> operational commands (chapter 4).*

When Laser On/Off is disabled, the laser will operate continuously.

Laser On/Off is disabled by default.

To enable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to Reverse Video.

Reverse Video

When enabled, the scanner will read bar code labels with white bars.

Reverse Video is disabled by default.

To enable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to Good/Bad Polarity.

Good/Bad Polarity

Allows the user to choose between positive and negative output signals for pins 6 (good read) and 8 (noread) on the host connector and pin 2 on the trigger connector.

Positive is enabled by default.

To change to Negative, press **CR**, **SP**, and **CR**.

Press **SP** to advance to Good/Bad Pulse Width.

Good/Bad Pulse Width

Allows the user to set the duration of the good read/no read output signals at host port pins 6 and 8 on the host connector and pin 2 on the trigger connector by entering any number from 0 to 255. (Divide the number entered on the command line by 100 to obtain the time in seconds.)

Good/Bad Pulse Width default setting is 50 ms (.05 seconds). (The displayed value is 5 on the command line.)

To change Good/Bad Pulse Width, press **CR** and enter the new value (0 to 255). This number is derived by multiplying the required number of seconds times 100.

Press **CR** to enable.

Press **SP** to advance to Command Start Character.

Command Start Character

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

The default character for Command Start Character is <.

To change Command Start Character, press **CR**, enter any ASCII character, and press **CR** again.

Press **M** to return to the Main menu.

Press **SP** to advance to Raster Setup Menu.

Raster Setup Menu

From the Main menu, scroll to Raster Setup and press **CR.** Figure 3-14 shows the menu for Raster Setup:

```
                    CURRENT SETTINGS FOR RASTER SETUP
-------------------------------------------------------------------------------


STATUS                      = ENABLED
TOP OFFSET IN DEGREES       =   0
BOTTOM OFFSET IN DEGREES    =  45
SWEEPS PER SECOND           =  14









-------------------------------------------------------------------------------
            ESC = MAIN MENU OR EXIT     N  = NEXT ITEM
            M   = PREVIOUS MENU         SP = NEXT ITEM
            B   = PREVIOUS ITEM         CR = THIS ITEM
-------------------------------------------------------------------------------
RASTER SETUP--> STATUS = ENABLED
```

Figure 3-14 Raster Setup Menu

Figure 3-15 shows the structure of this menu:

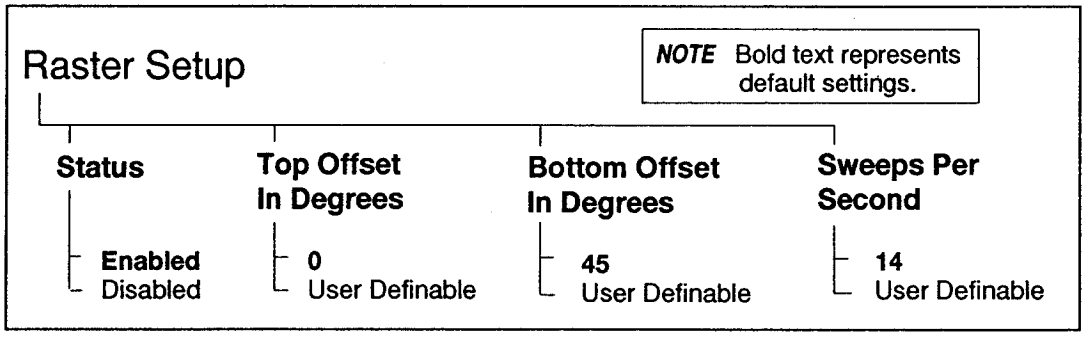


Figure 3-15 Raster Setup Menu Structure

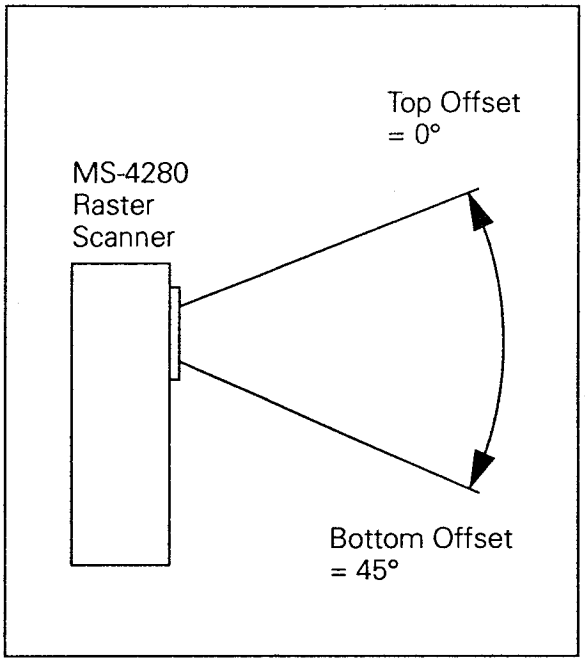


Figure 3-16 Raster Sweep Arc

Table 3-2 Raster Settings

Raster Arc	Minimum Sweeps per Second	Maximum Sweeps per Second
1°	1	135
5°	1	75
10°	1	45
15°	1	35
20°	1	29
25°	1	23
30°	1	21
35°	1	19
40°	1	17
45°	1	14

Raster Setup is configured with the defaults as shown in figure 3-14 and 3-15. Both top and bottom offsets as well as raster sweeps per second are adjustable by menu command.

For additional information on raster setup, see "Raster Height and Raster Arc" and "Calculating Number of Scans" in chapter 2.

Raster Setup is disabled by default.

To enable, press **CR**, **SP**, and **CR**.

Press **SP** to advance to Top Offset In Degrees.

Top Offset in Degrees

Top Offset is adjustable from 0 degrees to a maximum of 45 degrees in one-degree increments.

The default value for Top Offset in Degrees is 0 degrees.

To change Top Offset in Degrees, press **CR**, enter any number from 0 to 45, and press **CR** again.

Press **SP** to advance to Bottom Offset In Degrees.

***NOTE:** Top Offset must always be less than the bottom offset or the resulting arc will be 0°.*

Bottom Offset in Degrees

Bottom Offset is adjustable from 0 degrees to a maximum of 45 degrees in one-degree increments.

The default value for Bottom Offset in Degrees is 45.

To change Bottom Offset in Degrees, press **CR**, enter any number from 0 to 45, and press **CR** again.

Press **SP** to advance to Sweeps Per Second.

Sweeps Per Second

Allows the user to control the raster motor speed.

A "sweep" is defined as a single pass, up or down, describing the raster image.

Table 3-2 shows minimum and maximum possible sweep speeds at selected raster arcs. The minimum possible speed at any arc is always one sweep per second. Maximum sweep speeds are the maximums to which the scanner defaults even if higher speeds are entered by the user.

To maximize the number of scans a label will receive, it is recommended that as few as possible sweeps per second be selected. However, to ensure that the minimum required scan lines cross the bar code label, it is essential that at least ***two full sweeps*** occur during the time it takes for the label to pass through the readable scan width area.

For example, if the label is readable in the read range for only 1/10th of a second, then the number of sweeps per second should be at least 20. If readable for only 1 second, then sweeps per second (SPS) should be at least 2. (To see a formula for calculating sweeps per second, see "Calculating Number of Scans" in chapter 2.)

The default value for Sweeps Per Second is 14.

To change Sweeps Per Second, press **CR**, enter any number from 0 to 135, and press **CR** again.

This concludes the items in the Menu Configuration program. Press **M** to return to the Main menu.

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 up? (Y = yes N = no)

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

Serial Configuration

All 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 (also called "K" commands) are entered from an ASCII terminal. As with menu configuration commands, serial configuration commands relate to the initial scanner setup.

For an alphabetical listing of serial configuration commands, see table 3-5, "Summary of Serial Configuration "K" Commands," at the end of this section. Trigger Filter Timing Value command, listed immediately prior to "Communications" in this section, is not an option in the menu configuration program.

Serial Command Format

The format for a serial configuration command is,

<Kparameter*dataA,dataB*...etc.>

For example, the following command enables UPC: <Ks1>.

When using serial configuration commands, note the following conventions:

- "K" is the symbol used to represent a configuration change.
- "Parameter" is a single alphabetical character.
- Parameters and data are "case sensitive;" that is, characters must be entered as upper or lower case, as specified.
- Data fields must be separated by commas but no spaces.
- 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>).
- All fields before the one being modified 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>. However, fields which come after the modified field can be left out. The effect is that all other settings remain as they were before the command was sent.

When commas are used alone without field data, the existing field remains unchanged. This is helpful when a command change has several data options in the format.

(See examples on following pages.)

Implementing Serial Commands

To ensure that a serial command will take effect, one of the following serial operational commands must be added after the "K" command or, in the case of concatenated commands, after the last "K" command.

- <A> Reset, to initialize changes made, but to not save changes for power-up
- <Z> Reset and save for power-up

For example, to enable Narrow Margins and reset without saving changes for power-up, send: <Ko1><A>.

To enable Narrow Margins and reset, saving the changes to non-volatile RAM, send: <Ko1><Z>.

Concatenating Serial Commands

Commands can also be concatenated (added together). For example, the following command, <Kc1><KA24><Ko1><A> enables LRC, sets the Host Protocol Response Timeout to 24 ms, enables Narrow Margins and resets the data buffers (without saving the changes for power-up).

A maximum of 64 characters can be concatenated 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.

***NOTE:** Data in excess of 64 characters will reset the buffer, causing the first 64 characters of the string to be lost and indicator #1 to illuminate red 2 seconds after the end of each read cycle, until the scanner's memory is reset.*

Resetting the Parameters to Default Values

Assigning a Multidrop address to a scanner or 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 "Defaulting the Scanner" in chapter 2, "Setup and Installation.")

Trigger Filter Timing Value

Format: <KF?>

Returns current trigger filter timing value in milliseconds. Call your Microscan representative for additional information. (Not available in the menu configuration program.)

Communications

> ***NOTE:*** *Changes made in the scanner to communications parameters such as baud rate, parity, stop bits, LRC, etc., must be matched in the other device(s) or communications will be lost. If this occurs, default the scanner as described in chapter 2.*

Protocol

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

Format: <Kf*dataA*>

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

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

If selecting Multidrop (5), you must define an address and add it to the format (data B).

Format: <Kf*dataA,dataB*>

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

Data A (protocol option 5):

Data B (address):
Any number from 1 to 50.

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

Format: <Kf*dataA,dataB,dataC,dataD,dataE, dataF,dataG,dataH,dataI*>

Data A (protocol option 6 or 7)

Data B (RES)

Data C (address)

Data D (REQ)

Data E (EOT)

Data F (STX)

Data G (ETX)

Data H (ACK)

Data I (NAK)

NOTE: *Data C, address, can be assigned any ASCII character except a null. Control characters are used to define data B through I. Table 3-3 lists the control characters used for these data fields. (Refer to table A-1, "ASCII Table with Control Characters," in appendix B for more information.)*

For example, to select an unpolled ACK/NAK User Defined protocol with LRC disabled (as shown in the ACK/NAK menu under "Communications" in this chapter) send: <Kf0><Kf6,,,,,,,^F,^U><Kc0>.[1] ACK and NAK will be displayed in the menu.[2]

Table 3-3 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

1. The <Kf0> nulls the address and the <Kc0> disables LRC.
2. A control character, although conventionally represented here and in the ASCII table in appendix B as two characters (^F or ^U, etc.), is actually a single ASCII character which is entered on the keyboard by holding down the control key while pressing the desired letter.

Preamble

Format: <Kd*dataA,dataB*>

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

Data A (status):
0 = Disabled
1 = Enabled

Data B (preamble character(s)):
Enter one or two preamble characters from the ASCII table in appendix B, except a null (00H). Default is **^M.**

Postamble

Format: <Ke*dataA,dataB*>

Example:
To enable Postamble with two characters, an FF (form feed) and a **CR** (carriage return), send: <Ke1,^L^M>.

Data A (status):
0 = Disabled
1 = Enabled

Data B (postamble character(s)):
Enter one or two postamble characters from the ASCII table, except a null (00H). Default characters are **^M^J**.

LRC

Format: <Kc*dataA*>

Example:
To enable LRC, send: <Kc1>.

Data A (status):
0 = Disabled
1 = Enabled

Response Timeout

Format: <KA*dataA*>

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

Data A (timeout setting in milliseconds):
Any number from 0 to 65,000 (A zero (0) creates an indefinite wait.) Default is **12.**

Intercharacter Delay

Format: <KB*dataA*>

Example:
To change Intercharacter Delay to 30 ms, send: <KB30>.

Data A (time interval in milliseconds between characters):
Any number from 0 to 255. Default is **0**.

Host Port

Format:
<Ka*dataA,dataB,dataC,dataD*>

Example:
To change the Baud Rate to 2400, send: <Ka2>.

To change data bits to eight without changing any other fields, enter either: <Ka,,,1> or <Ka4,1,0,1>. (See "Serial Command Format" earlier in this section..

Data A (baud rate):
0 = 600
1 = 1200
2 = 2400
3 = 4800
4 = 9600
5 = 19.2 K
6 = 38.4 K

Data B (parity):
0 = None
1 = Even
2 = Odd

Data C (stop bits):
0 = One
1 = Two

Data D (data bits):
0 = Seven
1 = Eight

RS-422

Format: <Kb*dataA*>

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

Data A (status):
0 = Disabled
1 = Enabled

This command assumes the scanner is in RS-232 before RS-422 is enabled.

***NOTE:** If a multidrop address has been already assigned, the scanner will be in RS-485 communications, regardless of RS-422 status.*

Operations

> ***NOTE:*** *"Operations," as used in this chapter, applies to configuration parameters and not to the serial operational commands described in chapter 4, "Operational Commands."*

Triggering Mode

Format: <Kg*dataA*>

Example:
To select External Edge, send: <Kg3>.

Data A (triggering mode options):
0 = Continuous Read
1 = Continuous 1 Output
2 = External Level
3 = External Edge
4 = Serial Data
5 = Serial Data and Edge

End of Read Cycle

Format: <Kh*dataA,dataB*>

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

Data A (end of read cycle options):
0 = Timeout
1 = New Trigger
2 = Timeout & New Trigger

Data B (timeout in 10 millisecond increments):
The default is one second when Timeout is selected. To change the timeout duration, enter a number between 0 and 65535. (This number is derived by multiplying the desired number of seconds by 100.)

Serial Trigger Character

Format: <Ki*dataA*>

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

Data A (selection of a serial trigger character):
Enter any available ASCII character (see appendix B). Default is **^]**.

Do not select a serial trigger character that is also an operational command because it will make that operational command unavailable, though

the trigger will still work. 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 interfering with the read rate test.

External Trigger Polarity

Format: <Kj*dataA*>

Example:
To change External Trigger Polarity to Negative, send: <Kj0>.

Data A (polarity):
0 = Negative
1 = Positive

Noread Message

Format: <Kk*dataA,dataB*>

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

Data A (status):
0 = Disabled
1 = Enabled

Data B (message):
Any ASCII string up to 7 digits. Default is **NOREAD**.

Bar Code Output

Format: <Kl*dataA,dataB*>

Example:
To set Bar Code Output to End of Read Cycle, send: <Kl1,1>.

Data A (status):
0 = Disabled
1 = Enabled

Data B (when to output):
0 = As Soon As Possible
1 = End of Read Cycle

Number of Reads Before a Good Decode

Format: <Km*dataA*>

Example:
To change Number of Reads to 3, send: <Km3>.

Data A (desired number of reads before a good decode):
Any number from 1 to 31.

Match Code

Format: <Kn*dataA*>

Example:
To enable Match Code, send: <Kn1>.

Data A (status):
0 = Disabled
1 = Enabled

Number of Labels

Format: <KL*dataA,dataB*>

Example:
To set Number of Labels to four labels with a dash (-) for a Field Separator, send: <KL3,->.

Data A (number of labels):
0 = One label
1 = Two labels
2 = Three labels
3 = Four labels
4 = Five labels
5 = Six labels

Data B (field separator):
Any ASCII character, except a NUL. Default is a comma (,).

Code Types

Narrow Margins

Format: <Ko*dataA*>

Example:
To enable Narrow Margins, send: <Ko1>.

Data A (status):
0 = Disabled
1 = Enabled

Code 39

Format: <Kp*dataA,dataB, dataC,dataD,dataE,dataF*>

Example:
To enable Code 39 and set fixed code length to 30, send: <Kp1,,,,1,30> or <Kp1,0,0,0,1,30>.

Data A (status):
0 = Disabled
1 = Enabled

Data B (check digit status):
0 = Disabled
1 = Enabled

Data C (check digit output status):
0 = Disabled
1 = Enabled

Data D (large inter-char. gap status):
0 = Disabled
1 = Enabled

Data E (fixed code length status):
0 = Disabled
1 = Enabled

Data F
(code length):
Any number from 1 to 31. Default is **10**.

Codabar

Format: <Kq*dataA,dataB, dataC,dataD,dataE,dataF*>

Example:
To enable Codabar and set Fixed Code Length to 9, send: <Kq1,,,,1,9> or <Kq1,1,1,0,1,9>.

Data A (status):
0 = Disabled
1 = Enabled

Data B (start & stop match status):
0 = Disabled
1 = Enabled

Data C (start & stop output status):
0 = Disabled
1 = Enabled

Data D (large inter-char. gap status):
0 = Disabled
1 = Enabled

Data E (fixed code length status):
0 = Disabled
1 = Enabled

Data F (code length):
Any number from 1 to 31. Default is **10**.

I 2 of 5

Format: <Kr*dataA,dataB, dataC,dataD,dataE*>

Example:
To enable I 2 of 5 and to set Fixed Code Length # 1 to 8 and Fixed Code Length # 2 to 4, send: <Kr1,,,8,4> or <Kr1,0,0,8,4>.

Data A (status):
0 = Disabled
1 = Enabled

Data B (check digit status):
0 = Disabled
1 = Enabled

Data C (check digit output status):
0 = Disabled
1 = Enabled

Data D (code length #1):
Zero or any even number from 2 to 30. Default is **10**.

Data E (code length #2):
Zero or any even number from 2 to 30. Default is **6**.

UPC/EAN

Format: <Ks*dataA, dataB,dataC,dataD,dataE*>

Example:
To enable UPC and EAN, change supplementals to required, and change separator character to a dash (-), send: <Ks1,1,2,1,-> or <Ks1,1,2,,->.

Data A (status):
0 = Disabled
1 = Enabled

Data B (EAN status):
0 = Disabled
1 = Enabled (UPC must also be enabled)

Data C (supplementals status):
0 = Disabled
1 = Enabled
2 = Required

Data D (separator status):
0 = Disabled
1 = Enabled

Data E (separator character):
Any ASCII character (except a NUL). Default is a comma (,).

Code 128

Format: <Kt*dataA, dataB,dataC*>

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

Data A (status):
0 = Disabled
1 = Enabled

Data B (fixed code length status):
0 = Disabled
1 = Enabled

Data C (code length):
Any number from 1 to 31. Default is **10**.

User Outputs

Beeper

Format: <Ku*dataA,dataB*>

Example:
To enable the beeper for On Noread and set the Beeper volume to Level 5, send: <Ku2,4>.

Data A (beeper output options):
0 = Disabled
1 = On Good
2 = On Noread

Data B (beeper volume):
0 = Level 1
1 = Level 2
2 = Level 3
3 = Level 4
4 = Level 5

Relay Driver

Format: <Kv*dataA*>

Example:
To change Relay Driver to Noread, send: <Kv2>.

Data A (match code options):
0 = Good Match
1 = Mismatch
2 = Noread
3 = Mismatch or Noread

New Master Pin

Format: <Kz*dataA*>

Example:
To enable New Master Pin, send: <Kz1>.

Date A (status):
0 = Disabled
1 = Enabled

Laser On/Off

Format: <KC*dataA*>

Example:
To enable Laser On/Off, send: <KC1>.

Data A (status):
0 = Disabled
1 = Enabled

Reverse Video

Format: <KD*dataA*>

Example:
To enable Reverse Video, send: <KD1>.

Data A (status):
0 = Disabled
1 = Enabled

Good/Bad Polarity

Format: <Kw*dataA*>

Example:
To change Good/Bad Polarity to Negative, send: <Kw0>.

Data A (polarity):
0 = Negative
1 = Positive

Pins 6 and 8 on host connector, and pin 2 on trigger connector.

Good/Bad Pulse Width

Format: <Kx*dataA*>

Example:
To set Good/Bad Pulse Width to 600 ms, send: <Kx60>.

Data A (sets duration of relay pulse in 10 ms increments):
Any number from 0 to 255.
Default is **50.**

Pins 6 and 8 on host connector, and pin 2 on trigger connector.

Command Start Character

Format: <KE*dataA*>

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

Data A (start character):
Any ASCII character.
Default is **<.**

NOTE: *Subsequent commands must start with a colon (:). For example, send :D> to access the menu, or :KE<> to change back to the default character.*

Raster Setup

Format: <KR*dataA, dataB,dataC,dataD*>

Example:
To set the raster arc to 35° and the raster motor speed to 10 sweeps per second, send: <KR1,5,40,10>.

Data A (status):
0 = Disabled
1 = Enabled

Data B (top offset in degrees)
Any number from 0 to 45. Default is **0**.

Data C (bottom offset in degrees)
Any number from 0 to 45. Default is **45**.

Data D (motor speed in sweeps per second)
Any number from 0 to 135. Default is **14**.

Table 3-4 Summary of Serial Configuration "K" Commands

Parameter	Command	Format
Ka	Host Port	<Ka*baud,parity,stop bits,data bits*>
Kb	RS-422	<Kb*status*>
Kc	LRC	<Kc*status*>
Kd	Preamble	<Kd*status,ASCII characters*>
Ke	Postamble	<Ke*status,ASCII characters*>
Kf	Communications	<Kf*protocol,data,...*>
Kg	Triggering Mode	<Kg*mode*>
Kh	End of Read Cycle	<Kh*mode,time*>
Ki	Serial Trigger Character	<Ki*character*>
Kj	External Trigger Polarity	<Kj*polarity*>
Kk	Noread Message	<Kk*status,message*>
Kl	Bar Code Output	<Kl*status,when to output*>
Km	Number of Reads	<Km*number*>
Kn	Match Code	<Kn*status*>
Ko	Narrow Margins	<Ko*status*>
Kp	Code 39	<Kp*status,check digit,check digit output,large inter-char gap,fixed length,length*>
Kq	Codabar	<Kq*status,S/S match,S/S output,large interchar gap,fixed length,length*>
Kr	Interleaved 2 of 5	<Kr*status,check digit,check digit output, length 1, length 2*>
Ks	UPC/EAN	<Ks*status,EAN status,supplementals status, separator status, separator char.*>
Kt	Code 128	<Kt*status,fixed length,length*>
Ku	Beeper	<Ku*status,volume*>
Kv	Relay Driver	<Kv*mode*>
Kw	Good/Bad Polarity	<Kw*polarity*>
Kx	Good/Bad Pulse Width	<Kx*number*>
Kz	New Master Pin	<Kz*status*>
KA	Host Response Timeout	<KA*number*>
KB	Intercharacter Delay	<KB*number*>
KC	Laser On/Off	<KC*status*>
KD	Reverse Video	<KD*status*>
KE	Command Start Character	<KE*ASCII character*>
KF	Trigger Filter Timing Value	<KF*?*>
KL	Number of Labels	<KL*number of labels,separator character*>
KR	Raster Setup	<KR*status,top offset,bottom offset,motor speed*>

Profile Card Configuration

The third method of configuration is with a profile card (figure 3-17).

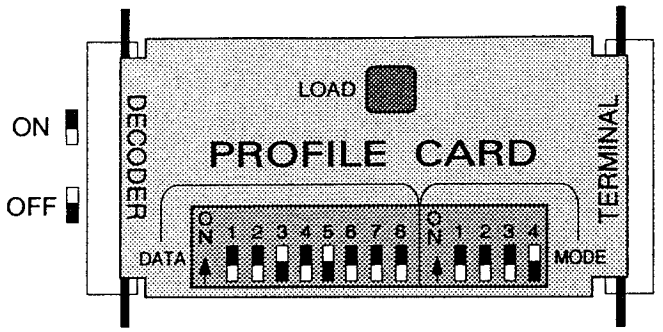


Figure 3-17 Profile Card

The profile card, which connects directly to the 25-pin connector of the scanner, allows changes to be made directly to a powered ON MS-4280 scanner without a host or ASCII terminal.

Simple switch setting procedures allow configuration settings to be downloaded to other scanners, or saved for later use. Configuration changes take affect when both data and mode switches are set and the load button is pressed.

Mode Switches

Setting the four mode switches determines which configuration parameter(s) are accessible.

For example, the profile card in figure 3-17 is set to Mode 7. (Refer to "Mode 7" under "Mode and Data Switch Settings" in this section.) The two parameters in Mode 7 are Triggering Mode and End of Read Cycle.

There are 15 different modes (mode 0 through mode 14) used to configure the MS-4280 scanner. They are described in table 3-5 in this section.

Data Switches

Setting the data switches (all eight are typically not used) determines the configuration parameter(s) for the selected mode. The number of parameters assigned to a specific mode will vary, according to the number of parameter options.

Data switches are often used in combinations to set the desired parameter. For example, the data switches in figure 3-17 are set to External Edge (Triggering Mode) and new Trigger (End of Read Cycle). (See "Mode 7" under "Mode and Data Switch Settings.")

***NOTE:** When configuring modes with more than one parameter, make sure that all of the parameters are set correctly, even if only one parameter needs resetting. Otherwise, parameters may be inadvertently changed.*

In the case of a simple enable/disable command, only one data switch is required for that parameter (OFF for disabled, ON for enabled). Unused data switches may be in either position.

Mode Descriptions

Table 3-5 explains the 15 different mode settings used for profile card configuration. Each mode has a corresponding mode switch combination on the right of the profile card. Once in the desired mode, parameters can be set with the data switches.

Table 3-5 Mode Descriptions

Mode	Parameter	Function
0	Write-to-Device Funct ion	Downloads (copies) all of the configuration parameters from the profile card to the connected scanner.
	Read Function	Uploads configuration data from the volatile RAM of the scanner to the non-volatile RAM of the profile card.
	Default	Sets unit to the default configuration settings.
	Menu	Enters menu program while the scanner is in polled mode.
1	Copy & Assign Address	Combines the write features from mode 0 with the address features of mode 2. Downloads a multidrop address in conjunction with all of the configuration parameters in the profile card memory.
2	Assign Multidrop Address	Defines multidrop address in the scanner by using data switches 1-6. Binary representation of the multidrop address is used (the range is 0 to 50).
3	Baud Rate	Defines Baud Rate for the host port.
	Parity	Defines Parity for the host port.
	Stop Bits	Defines Stop Bits for the host port.
	Data Bits	Defines Data Bits for the host port.

Table 3-5 Mode Descriptions

Mode	Parameter	Function
4	Preamble	Enables/disables Preamble.
	Postamble	Enables/disables Postamble.
5	Protocol	Defines the communications protocol.
	RS-422	Enables/disables RS-422.
6	Aux Port	Not used with series 4000 scanners.
7	Triggering Mode	Defines Triggering Mode.
	End of Read Cycle	Defines End of Read Cycle.
8	Bar Code Output	Enables/disables Bar Code Output.
	When to Output	Defines the conditions for When to Output.
	External Trigger Polarity	Defines External Trigger Polarity (negative/positive).
	Match Code	Enables/disables Match Code.
	Noread Message	Enables/disables Noread Message.
9	Timeout in 10 ms inc.	Sets the trigger timeout value. The range is 1-255 for corresponding values of 0.1 to 25.5 seconds.
10	Serial Trigger Character	Assigns the Serial Trigger Character. (See the ASCII table in appendix B for decimal values and corresponding characters.)
11	Number of Reads	Sets the number of reads for a good decode from 1-31.
12	Narrow Margins	Enables/disables Narrow Margins for all code types.
	Code Types	Enables individual bar code types or Autodiscriminate.
13	Beeper Volume	Sets the beeper volume.
	Beeper	Sets the conditions when the beeper is emitted.
14	Relay Driver	Defines the Relay Driver selection for Match Code.
	Full Screens	Enables/disables Full Screens.
	Good/Bad Polarity	Sets the Polarity of the Relay Driver.
	New Master Pin	Enables/disables New Master Pin.
	Laser On/Off	Enables/disables Laser On/Off.
	Reverse Video	Enables/disables Reverse Video.

Operating Instructions

The profile card obtains all operating voltages from the scanner. Turn the scanner off before starting procedures.

1. Insert the end of the profile card which is labeled DECODER into the host connector (J1) of scanner.
2. Turn scanner ON.
3. Set the mode and data switches to the desired settings.

***NOTE:** Be sure all of the data switch settings are correct for the selected mode before pressing the load button.*

4. Press the load button to register the configuration settings for that mode.
5. A beep will sound. This initializes the change and saves it to non-volatile RAM for access on power-up.
6. When the configuration is complete, turn off the power to the scanner and remove the profile card.

If using RS-232 (only) and communication between the host and the scanner is desired with the profile card, connect a cable to the profile card end labeled TERMINAL and connect it to the host.

Mode and Data Switch Settings

General Settings

Mode 0: Write, Read, Default, Menu

Mode Switches: ○○○○ ● = ON ○ = OFF

Data Switches

OPTIONS:	1	2	3	4
Write	●	○	○	○
Read	○	●	○	○
Default	○	○	●	○
Menu	○	○	○	●

NOTE: *Unintentional defaults may occur when using the profile card's write functions (modes 0 and 1) to copy configuration changes from versions* ***-26 and earlier*** *to versions* ***-27 and later*** *(and vice versa), and when copying from versions* ***-27 through -31*** *to versions* ***-32 and later*** *(and vice versa) of Microscan standard firmware.[1] To solve, you can change all EPROMs to the same firmware version, use a separate profile card for each version group, or use a single profile card to first make all configuration copy changes within one group (those with all earlier or all later versions) and then, after individually changing the settings in one scanner of the second group, copying them to the other scanners in that group.*

1. The firmware number is 35-214001-XX for series 4000 scanners. The XX is substituted here for the version number. The firmware version can be found on a label on the EPROM, displayed in the heading of the Main menu in the Configuration program, or on later versions, displayed by invoking the<#> serial operational command. You can also call-in the serial numbers of the scanners to Microscan to get the firmware versions issued with those scanners.

Mode 1: Copy Configuration and Assign Address

Mode Switches: ● ○ ○ ○ ● = ON ○ = OFF

Data Switches

ADDRESS:	1	2	3	4	5	6	ADDRESS:	1	2	3	4	5	6
1	●	○	○	○	○	○	26	○	●	○	●	●	○
2	○	●	○	○	○	○	27	●	●	○	●	●	○
3	●	●	○	○	○	○	28	○	○	●	●	●	○
4	○	○	●	○	○	○	29	●	○	●	●	●	○
5	●	○	●	○	○	○	30	○	●	●	●	●	○
6	○	●	●	○	○	○	31	●	●	●	●	●	○
7	●	●	●	○	○	○	32	○	○	○	○	○	●
8	○	○	○	●	○	○	33	●	○	○	○	○	●
9	●	○	○	●	○	○	34	○	●	○	○	○	●
10	○	●	○	●	○	○	35	●	●	○	○	○	●
11	●	●	○	●	○	○	36	○	○	●	○	○	●
12	○	○	●	●	○	○	37	●	○	●	○	○	●
13	●	○	●	●	○	○	38	○	●	●	○	○	●
14	○	●	●	●	○	○	39	●	●	●	○	○	●
15	●	●	●	●	○	○	40	○	○	○	●	○	●
16	○	○	○	○	●	○	41	●	○	○	●	○	●
17	●	○	○	○	●	○	42	○	●	○	●	○	●
18	○	●	○	○	●	○	43	●	●	○	●	○	●
19	●	●	○	○	●	○	44	○	○	●	●	○	●
20	○	○	●	○	●	○	45	●	○	●	●	○	●
21	●	○	●	○	●	○	46	○	●	●	●	○	●
22	○	●	●	○	●	○	47	●	●	●	●	○	●
23	●	●	●	○	●	○	48	○	○	○	○	●	●
24	○	○	○	●	●	○	49	●	○	○	○	●	●
25	●	○	○	●	●	○	50	○	●	○	○	●	●

Communications Settings

Mode 2: Address

Mode Switches: ○●○○

Address selection for mode 2 is identical to mode 1.
See the mode 1 table for data switch settings.

Mode 3: Baud Rate, Parity, Stop Bits, Data Bits

Mode Switches: ●●○○ ● = ON ○ = OFF

Data Switches

BAUD RATE:	1	2	3	PARITY:	4	5	STOP BITS:	6	DATA BITS:	7
600	○	○	○	None	○	○	One	○	Seven	○
1200	●	○	○	Even	●	○	Two	●	Eight	●
2400	○	●	○	Odd	○	●				
4800	●	●	○							
9600	○	○	●							
19200	●	○	●							
38400	○	●	●							

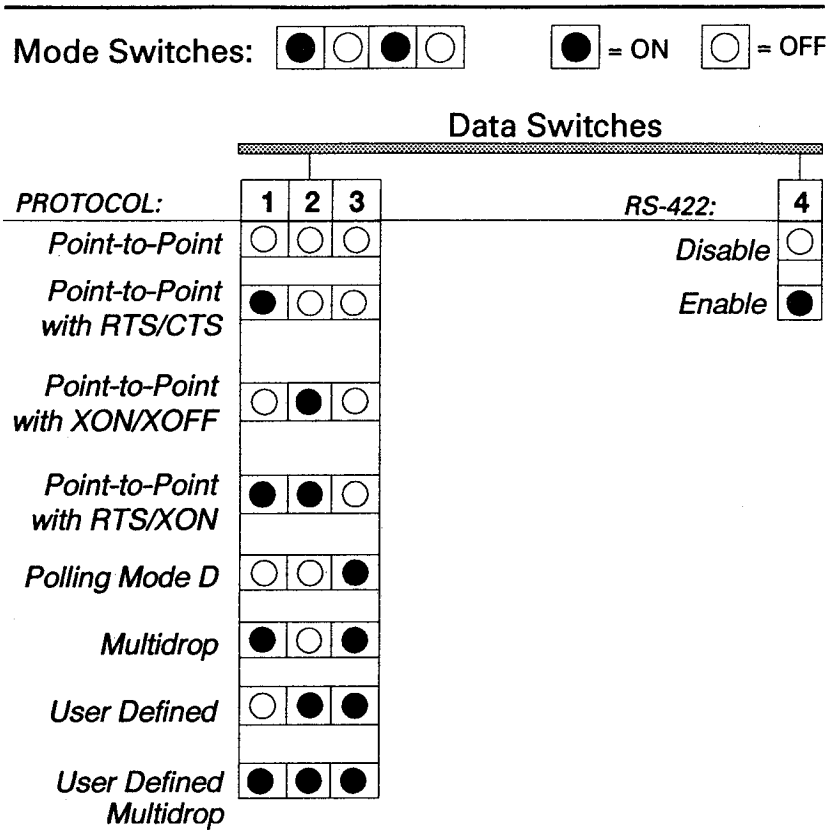
Mode 4: Preamble, Postamble

Mode Switches: ○○●○ ● = ON ○ = OFF

Data Switches

PREAMBLE:	1	POSTAMBLE:	2
Disable	○	Disable	○
Enable	●	Enable	●

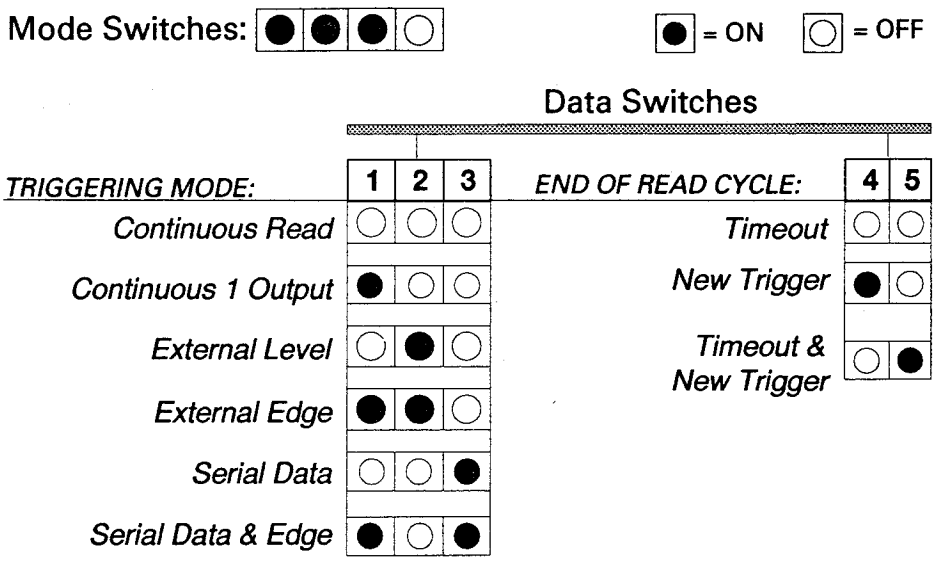
Mode 5: Protocol, RS-422



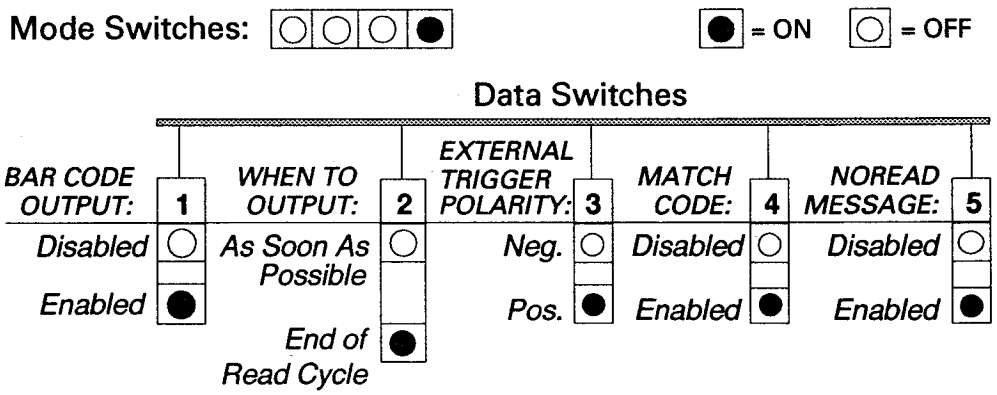
(Mode 6 is not used with series 4000 scanners.)

Operations Settings

Mode 7: Triggering Mode, End of Read Cycle



Mode 8: Bar Code Output, When to Output, External Trigger Polarity, Match Code, Noread Message



Mode 9: Timeout

Mode Switches: 

Since the number of profile card settings is limited to 255, read cycle timeouts entered from the profile card can only affect a range from 0.1 seconds to 25.5 seconds, in tenths of a second.

To set Timeout, multiply the desired number of seconds for trigger timeout by 10 and enter the result in binary format.

See mode 1 swith settings for timeout ranges from 0.1 seconds to 5 seconds. (Although not shown for mode 1, switches 7 and 8 are OFF for 1 through 50.)

See appendix F, "Binary Calculation for the Profile Card" for timeout ranges from 5.1 seconds to 25.5 seconds.

Mode 10: Serial Trigger Character

Mode 10 allows the user to set the serial trigger character by using the ASCII table (appendix B) to look up decimal values and corresponding characters. A few examples are provided below. See "Binary Calculation for the Profile Card," appendix F, if selecting values from 51 to 255.

Mode Switches: 

 = ON  = OFF

SAMPLE SERIAL TRIGGER ASCII CHARACTERS:	*ASCII REFERENCE NUMBER:*	Data Switches 1	2	3	4	5	6	7	8
^]	*29*	●	○	●	●	●	○	○	○
1	*49*	●	○	○	○	●	●	○	○
A	*65*	●	○	○	○	○	○	●	○
Z	*90*	○	●	○	●	●	○	●	○

Mode 11: Number of Reads before a Good Decode

Mode Switches: ● ● ○ ● ● = ON ○ = OFF

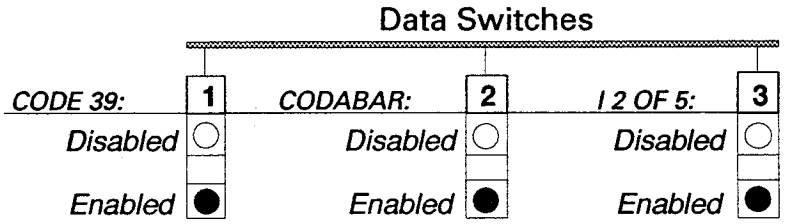
The range for Number of Reads before a Good Decode is 1-31. See "Mode 1" for switch settings.

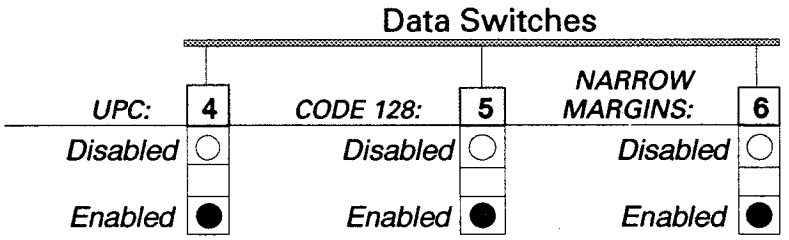
Code Types Settings

Mode 12: Code 39, Codabar, I 2 of 5, UPC, Code 128, Narrow Margins

Enabling data switches 1 through 5 will autodiscriminate for all code types.

Mode Switches: ○ ○ ● ● ● = ON ○ = OFF





User Outputs Settings

Mode 13: Beeper Volume, Beeper Enable

Mode Switches: ● ○ ● ● ● = ON ○ = OFF

Data Switches

BEEPER VOLUME:	1	2	3
Level 1	○	○	○
Level 2	●	○	○
Level 3	○	●	○
Level 4	●	●	○
Level 5	○	○	●

BEEPER ENABLE:	4	5
Disabled	○	○
On Good Read	●	○
On Noread	○	●

Mode 14: Relay Driver, Full Screens, Good/Bad Polarity, New Master Pin, Laser On/Off, Reverse Video

Mode Switches: ○ ● ● ● = ON ○ = OFF

Data Switches

RELAY DRIVER:	1	2
Good Match	○	○
Mismatch	●	○
Noread	○	●
Mismatch or Noread	●	●

FULL SCREENS:	3
Disabled	○
Enabled	●

GOOD/BAD POLARITY:	4
Negative	○
Positive	●

Data Switches

NEW MASTER PIN:	5
Disabled	○
Enabled	●

LASER ON/OFF:	6
Disabled	○
Enabled	●

REVERSE VIDEO:	7
Disabled	○
Enabled	●

Chapter

4

Operational Commands

Chapter Contents

This chapter includes a description of all serial operational commands and their functions, followed by a one page summary of the same commands.

> ***NOTE:*** *Operational commands should not be confused with configuration "operations" described earlier in chapter 3, "Configuration."*

Online 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 which are generally used in initial setup.

Operational commands are always preceded by a < left angle bracket symbol (unless redefined by Command Start Character command) and followed by a > right angle bracket symbol.

Operational Commands

<A> Software Reset

Initializes all serial configuration commands and resets all counters and operating parameters. Settings for Baud Rate, Stop Bits, Code Length, etc. do not change until this command is sent. If the numeric counters are being used, it is recommended that data be collected prior to sending this command.

<C> Enter Read Rate Test

Instructs the scanner to output the percentage of scans decoded of a given label. The read rate can vary dramatically as the angle and location of the label changes in relation to the scan line. This test is very useful in aligning and positioning the scanner during installation. See "Read Rate Test" in chapter 2, "Setup and Installation."

The displayed message is in the form of XXX% actual bar code data.

Send a <J> Exit Read Rate Test command to the scanner when testing is complete.

<D> Enter Configuration Mode

Used to enter the menu configuration program. See chapter 3, "Configuration."

<E> Enter Match Code Option

Identical to match code command in chapter 3, "Configuration."

Instructs the scanner to compare bar code labels being scanned with a master label that has been entered in non-volatile or volatile RAM.

Enter Match Code Option is intended for use when the scanner is in a triggered mode. If the Match Code option is enabled in the Continuous Read mode, the scanner defaults to Continuous Read One Output mode, and the label data must change before the scanner will output data again, unless a timeout, if enabled, occurs.

See "<G> Store Next Label Scanned as Master Label" and "<)XXXXX)> Download Master Label Information" in this chapter. See also, "Relay Driver" in chapter 3, "Configuration."

<F> Exit Match Code Option

Disables Match Code.

<G> Store Next Label Scanned as Master Label

Causes the scanner to use the next bar code label read as the master label if Match Code option has been enabled. All subsequently decoded labels are compared against the master label information stored in RAM. (See "Match Code" in "Operations Menu," chapter 3.)

<H> Enable Laser Scanning

Enables laser scanning.

<I> Disable Laser Scanning

Disables laser scanning. This feature can be used when there are extended periods of time during which no bar code labels are being scanned. Disabling laser scanning will not affect any downloaded commands to the scanner. The scanner remains active during this period.

<J> Exit Read Rate Test

Exits the read rate test.

<Kdata> Serial Configuration Commands

All commands beginning with the letter K are classified in chapter 3 as Serial Configuration commands (also called "K" commands). Generally, these commands parallel the menu configuration options accessible through the menu configuration program discussed in chapter 3, "Configuration."

<L> Host Relay Driver

Sends a pulse to pin 2 of the trigger connector. Allows the user to send a pulse to pin 2 at any time regardless of Match Code or Relay Driver status.

<N> Noread Counter

Used to obtain the total number of noreads (nonreads) that have occurred since power-up or the last Noread Counter Reset command. The noread counter is incremented by one each time a triggered read cycle is completed and no bar code information has been decoded.

NOTE: *If the Noread Counter command is invoked during a read cycle, the scanner will not output a noread count until the read cycle ends, or a good read occurs.*

Noread Counter message is in the form of N/XXXXX, where the X's denote a numeric value from 00000 to 65,535. If the counter exceeds the value of 65,535, an error message is displayed the first time Noread Counter is invoked. The error message is in the form of: N/ERROR. After reaching the maximum numeric limit of 65,535 the noread counter will automatically roll over and start counting again at 00001. To obtain the total number of noreads after the error message is received, the next value obtained by a Noread Counter command can be added to 65,535. This statement is true only if the noread counter has rolled over one time.

NOTE: *All counter values are stored in volatile memory, and will be lost if power to the scanner is cycled.*

<O> Noread Counter Reset

Sets Noread Counter to 00000.

<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.

<T> Trigger Counter

Used to obtain the total number of triggers since power-up or the last Trigger Counter Reset command.

Trigger Counter is incremented by one each time the scanner is triggered.

> ***NOTE:*** *If the trigger count is requested during a read cycle, the scanner will not output the trigger count until the read cycle ends or a good read occurs.*

Trigger Counter message is in the form of T/XXXXX. The Xs denote a numeric value from 00000 to 65,535. If the counter exceeds the value of 65,535 an error message (T/ERROR) is sent the first time the trigger counter is requested. After reaching the maximum numeric limit of 65,535, the trigger counter will automatically roll over and start counting again at 00001. To obtain the total number of triggers after an error message is received, the next value obtained by request for number of triggers can be added to 65,535. This statement is true only if **the** trigger counter has rolled over one time.

> ***NOTE:*** *All counter values are stored in volatile memory and will be lost if power to the scanner is cycled.*

<U> Trigger Counter Reset

Sets the trigger counter to 00000.

<V> Match Counter (or Good Read Counter)[1]

Used to obtain the total number of good reads matching the master label since power-up or the last Match Counter Reset command. This counter is always enabled, but will only work as a match counter if the decoder is in a triggered mode, Match Code option is enabled, and a master label has been downloaded into the decoder's memory. If this is not the case, the counter counts all of the good reads. This count can be requested at any time.

> ***NOTE:*** *If the Match Counter command is invoked during a read cycle, the scanner will not output the match count until the read cycle ends or a good read occurs.*

1. Can also be used as a good read counter when Match Code is not enabled.

Match Counter message is in the form of V/XXXXX. The Xs denote a numeric value from 00000 to 65,535. If the counter exceeds the value of 65,535, an error message (V/ERROR) is sent the first time Match Counter command is invoked. After reaching the maximum numeric limit of 65,535, the counter will automatically roll over and start counting again at 00001. To obtain the total number of matches after an error message is received, the next value obtained by the Match Counter command can be added to 65,535. This statement is true only if the Match Counter has rolled over only once.

> ***NOTE:*** *All counter values are stored in volatile memory and will be lost if power to the scanner is cycled.*

<W> Match Counter Reset[1]

Sets the Match Counter to 00000.

<X> Mismatch Counter

Used to obtain the number of labels successfully read that do not match the master label since power-up or the last Mismatch Counter Reset command, provided that Match Code has been enabled, a master label has been downloaded into decoder memory, and the decoder is in a triggered mode.

> ***NOTE:*** *If the Mismatch Counter command is invoked during a read cycle, the scanner will not output the mismatch count until the read cycle ends or a mismatch occurs.*

Mismatch Counter message is in the form of X/XXXXX. The Xs denote a numeric value from 00000 to 65,535. If the counter exceeds the value of 65,535, an error message is sent the first time the Mismatch Counter command is invoked. The error message is in the form of X/ERROR. After reaching the maximum numeric limit of 65,535, the Mismatch Counter will automatically roll over and start counting again at 00001. To obtain the total number of good reads after an error message is received, the next value obtained by the Mismatch Counter command can be added to 65,535. This statement is true only if the Mismatch counter has rolled over only once.

> ***NOTE:*** *All counter values are stored in volatile memory and will be lost if power to the scanner is cycled.*

1. Will also reset good read count if Match Code has not been enabled.

<Y> Mismatch Counter Reset

Sets the Mismatch Counter to 00000.

<Z> Save Configuration

Saves the current configurations to non-volatile memory for availability on power-up.

The values of numeric counters such as the number of matches, mismatches, etc. are not saved by <Z> Save Configuration.

***NOTE:** The <Z> Save Configuration command can be executed 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 before shutdown or whenever power interruption is anticipated.*

<m> Scans per Second

Displays the number of scans per second projected by the spinning mirror.

<)XXXX)> Download Master Label Information

Downloads master label information from the host or a terminal. The master label information can be downloaded at any time, and can be saved in non-volatile memory with a <Z> command. A stored master label will not affect standard operations unless Match Code option is enabled.

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

<)> 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.

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

<#> Display Software Part Number

Displays software part number.

<!> Display Checksum of EPROM

Displays a four-digit hex number (corresponding to a given firmware version) used to verify a scanner's EPROM.

Summary of Serial Operational Commands

Table 4-1 Serial Operational Commands

Command	Result
<A>	Software Reset (does not save for power-up)
<C>	Enter Read Rate Test
<D>	Enter Configuration Mode
<E>	Enter Match Code Option*
<F>	Exit Match Code Option*
<G>	Store Next Label Scanned as Master Label
<H>	Enable Laser Scanning
<I>	Disable Laser Scanning
<J>	Exit Read Rate Test
<Kdata>	Serial Configuration Commands
<L>	Host Relay Driver
<N>	Noread Counter
<O>	Noread Counter Reset
<P>	Autodiscriminate All Codes
<Q>	Enable Code 39 Only*
<R>	Enable Codabar Only*
<S>	Enable I 2 Of 5 Only*
<T>	Trigger Counter
<U>	Trigger Counter Reset
<V>	Match Counter (or Good Read Counter)
<W>	Match Counter Reset (or Good Read Counter Reset)
<X>	Mismatch Counter
<Y>	Mismatch Counter Reset
<Z>	Save Configuration for Power-up
<m>	Scans per Second
<)XXXX)>	Download Master Label Information
<))>	Delete Master Label Information
<#>	Display Software Part Number
<!>	Display Checksum of EPROM

* Can also be accomplished in configuration menu or serial configuration command.

Appendices

Contents

Appendix A — Scanner Specifications

The following specifications apply to the MS-4280 raster scanner.

Physical

Length:	7.53 in. (191.3 mm)
Width:	5.0 in. (127 mm)
Height:	2.85 in. (72.4 mm)
Weight:	3.31 lbs. (1.5 kg)

Scanning Parameters

Type:	Rotating polygon mirror and oscillating raster mirror
Scan Rate:	400 scans per second
Scan Width Angle:	40°
Raster Arc:	0 to 45 degrees, adjustable
Raster Motor Speed:	0 to 135 sweeps per second, adjustable

Electrical

+12 VDC @ 200 mA	20 mV p-p maximum allowed ripple
-12 VDC @ 100 mA	20 mV p-p maximum allowed ripple
+5 VDC @ 500 mA	200 mV p-p maximum allowed ripple

Optical

Composite read ranges for several Code 39 narrow-bar-width sizes at 2.5:1 wide-to-narrow bar ratios.

	Standard Range	Extended Range
Read Range:	1 in. to 14 in. (25 mm to 356 mm)	4 in. to 33 in. (102 mm to 838 mm)
Max. Scan Width:	10.5 in. (267 mm)	23.5 in. (597 mm)

Skew:	±40° maximum
Pitch:	±40° maximum
Label Contrast:	25% min. absolute dark/light differential at 670 nm wavelength

Laser Light

Type:	Semiconductor laser diode
Beam Spot:	Round
Output Wavelength:	670 nm VLD (visible light)
Safety Class:	CDRH Class II
Operating Life:	50,000 hours at 25° C

Environmental

Operating Temp.:	32° F to 104° F (0° C to 40° C)
Storage Temp.:	-58° F to 158° F (-50° C to 70° C)
Humidity:	Up to 95% (non-condensing)
Ambient Light Immunity:	Immune to normal indoor lighting

Default Communications Settings

Baud Rate:	9600
Parity:	Even
Stop Bits:	One
Data Bits:	Seven

Appendix B — Quick Reference Tables

Table A-1 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

Table A-2 Serial Configuration Commands

Parameter	Command	Format
Ka	Host Port	<Ka*baud,parity,stop bits,data bits*>
Kb	RS-422	<Kb*status*>
Kc	LRC	<Kc*status*>
Kd	Preamble	<Kd*status,ASCII characters*>
Ke	Postamble	<Ke*status,ASCII characters*>
Kf	Communications	<Kf*protocol,data,...*>
Kg	Triggering Mode	<Kg*mode*>
Kh	End of Read Cycle	<Kh*mode,time*>
Ki	Serial Trigger Character	<Ki*character*>
Kj	External Trigger Polarity	<Kj*polarity*>
Kk	Noread Message	<Kk*status,message*>
Kl	Bar Code Output	<Kl*status,when to output*>
Km	Number of Reads	<Km*number*>
Kn	Match Code	<Kn*status*>
Ko	Narrow Margins	<Ko*status*>
Kp	Code 39	<Kp*status,check digit,check digit output, large interchar gap,fixed length,length*>
Kq	Codabar	<Kq*status,S/S match,S/S output,large interchar gap, fixed length,length*>
Kr	Interleaved 2 of 5	<Kr*status,check digit,check digit output, length 1, length 2*>
Ks	UPC/EAN	<Ks*status,EAN status,supplementals status, separator status, separator character*>
Kt	Code 128	<Kt*status,fixed length,length*>
Ku	Beeper	<Ku*status,volume*>
Kv	Relay Driver	<Kv*mode*>
Kw	Good/Bad Polarity	<Kw*polarity*>
Kx	Good/Bad Pulse Width	<Kx*number*>
Kz	New Master Pin	<Kz*status*>
KA	Host Response Timeout	<KA*number*>
KB	Intercharacter Delay	<KB*number*>
KC	Laser On/Off	<KC*status*>
KD	Reverse Video	<KD*status*>
KE	Command Start Character	<KE*ASCII character*>
KF	Trigger Filter Timing Value	<KF*?*>
KL	Number of Labels	<KL*number of labels,separator character*>
KR	Raster Control	<KR*status,top offset,bottom offset,motor speed*>

Table A-3 Serial Operational Commands

Command	Result
<A>	Software Reset (does not save for power-up)
<C>	Enter Read Rate Test
<D>	Enter Configuration Mode
<E>	Enter Match Code Option*
<F>	Exit Match Code Option*
<G>	Store Next Label Scanned as Master Label
<H>	Enable Laser Scanning
<I>	Disable Laser Scanning
<J>	Exit Read Rate Test
<K*data*>	Serial Configuration Commands
<L>	Host Relay Driver
<N>	Noread Counter
<O>	Noread Counter Reset
<P>	Autodiscriminate All Codes
<Q>	Enable Code 39 Only*
<R>	Enable Codabar Only*
<S>	Enable I 2 of 5 Only*
<T>	Trigger Counter
<U>	Trigger Counter Reset
<V>	Match Counter (or Good Read Counter)
<W>	Match Counter Reset (or Good Read Counter Reset)
<X>	Mismatch Counter
<Y>	Mismatch Counter Reset
<Z>	Save Configuration for Power-up
<m>	Display Number of Scans per Second
<)XXXX)>	Download Master Label Information
<))>	Delete Master Label Information
<#>	Display Software Part Number
<!>	Display Checksum of the EPROM

*** Can also be set in configuration menu or serial configuration command.**

Table A-4 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 C — Troubleshooting

The series 4000 raster scanner, when used correctly, should produce good reads. If not, table A-5 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.

WARNING

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

Table A-5 Series 4000 Raster Scanner Troubleshooting Table

Problem	Possible Cause	Solution
Menu does not display when configuration command is sent	Host cable defective or not wired properly	Check cable connections and wiring (chapter 2).
	Wrong configuration command (or lower case d) sent	Verify that a <D> serial command (with an *upper case* D) is being sent.
	Scanner configuration settings do not match host's	Reset scanner to default and/or match host settings with scanner's.
Scanner does not transmit or decode labels (scanner motor and indicator lights on but no data displayed on screen)	Host cable defective	Ensure the cable is correctly wired (see host pinout table in chapter 2).
	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. Ensure that fixed length and check sums, if enabled, are set correctly.
	Poor label quality	Scan a label that is known to be good.
	Scanner not configured properly	Reset scanner to default and/or match host settings with scanner's.
	Excessive ambient light, sunlight, or strobes	Shield the bar code and/or scanner to verify that excessive light is not the problem.

Table A-5 Series 4000 Raster Scanner Troubleshooting Table

Problem	Possible Cause	Solution
Scanner does not transmit or decode labels (scanner motor and indicator lights on but no data is displayed on screen)	Scanner is not triggered when in external or serial mode	Ensure trigger device is operating properly. Do Read Rate Test <C>. If it reads successfully, the problem is triggering. Ensure serial trigger character is sent with < > brackets.
	Power supply problem	Have technician measure AC input voltage and power supply DC output voltages. Replace if power supply is not supplying correct voltages.
	External electrical noise	See "Ground and Shield Considerations" in chapter 2.
	Incorrect firmware for application	Some applications may require custom firmware. Call your Microscan representative.
Scanner motor does not rotate and laser is off (determine motor movement by feel or sound)	Scanner is not connected properly	Ensure that the modular cable is inserted into the modular connectors. Inspect cable for damage. If questionable, try another cable.
	Laser scanning disabled by the <I> serial command	Enable laser scanning with the <H> serial command
	Laser On/Off enabled	Disable Laser On/Off to make the laser operate continuously. Otherwise, scanner is operating correctly; Laser On/Off activates the laser during the read cycle only.
Power indicator does not illuminate when scanner is ON	Power supply problem	Have technician measure AC input voltage and power supply DC output voltages. Replace if power supply is not supplying correct voltages.
Getting only "hieroglyphics" or unintelligible code	Host and scanner baud rates or parity not matched	Check baud rates and parity and change to match host's settings.
Getting only noread messages on the screen	Bar code label not readable	Try another label that is known to be readable. (Ensure that the new label is the same code type and density.)
	Incorrect label range	Refer to range data in chapter 2 and/or to find range reposition label and perform the read rate test.
	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 or raster pattern when it is supposed to be. Ensure that the bar code is pitched so as to avoid specular light.
	Triggering/timeout out of sync	Review triggering and timing.

Table A-5 Series 4000 Raster Scanner Troubleshooting Table

Problem	Possible Cause	Solution
Getting only noread messages on the screen	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.
Previous label read, but subsequent label will not read	Scanner configured in Continuous One mode with New Trigger enabled	Scan a label that contains different data than that of one being read, or change End of Read Cycle to Timeout.
	Scanner in polled mode	Check communications protocol.
Scanner not communicating in polled mode.	LRC disabled	Enable LRC.
Scanner not entering read cycle (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 "Connectors and Pinouts," chapter 2).
	Object detector inoperative	Check detector range and sensitivity. Try a detector that is known to be good.
Scanner not reading during the read cycle	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 for the application	Ensure that the proper end of read is defined in scanner configuration.

Appendix D — Bar Code Symbology

Some factors to consider before choosing a bar code symbol are:[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 decoder 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 9 black and white elements per character, 3 of which are always wide.

Codabar. A 16-character set (0 through 9, and the characters $, :, /, ., +, and -) with start/stop codes and 18 different bar widths.

I 2 of 5. Interleaved 2 of 5 is a high-density, continuous numeric symbology. 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. The European Article Numbering system (EAN) is a well-known variation of UPC. Both UPC and EAN can have 2 or 5 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.

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

Appendix E — 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 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. 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" in chapter 3, "Configuration," for additional information on standards.*

Appendix F — Binary Calculation for the Profile Card

Data switch settings for values 51-255 must be determined by the user with binary calculation. (Specifically, the timeout values for 51-255 in mode 9 and various serial trigger character selections in mode 10.)

The eight data switches on the profile card represent the eight data bits that define any number from 0 to 255 in binary format. To convert a number to its binary equivalent:

1. Determine which decimal equivalent (1, 2, 4, 8, 16, 32, 64, 128) is the largest number not exceeding the original number to convert. (See table A-6.)
2. Put a one (1) above that number. A one (1) in a column represents an ON position for that data switch.

   For example, table A-6 shows the calculation process for the number 250. The first one (1) is placed in the eighth bit column over the number 128, since that is the largest possible decimal equivalent to use.

Table A-6 Calculating Binary Conversion

● = ON
○ = OFF

1	2	3	4	5	6	7	8	Data Switches (Bit Representation)
○	●	○	●	●	●	●	●	Data Switch Setting
	1		1	1	1	1	1	Binary Code
	2		10	26	58	122		Remainder Numbers
							250	Original Number to Convert
1	***2***	***4***	***8***	***16***	***32***	***64***	***128***	***Decimal Equivalent***

3. Subtract the decimal equivalent from the original number.
4. Place the remainder above the next largest decimal equivalent that does not exceed the remainder number.
5. Put a one (1) above that number.
6. Continue this process until the remainder equals zero (0), as follows:

   250 -128=122, -64=58, -32=26, -16=10, -8=2, -2=0

OFF positions on the data switches result from:

- Decimal equivalent numbers **passed over** because they are greater than the remainder (the third bit in table A-6),
- Decimal equivalent numbers **not used** because the formula has terminated with a remainder of zero (0) (the first bit in table A-6).

Appendix G — Glossary of Terms

Autodiscriminate. The ability to decode various bar code symbologies without having to change scanner functions.

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 .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 conditions or signal events per second. In RS-232 and RS-422/485 systems, baud rate is the same as bits per second (bps).

Blurring. Congestion of bars and spaces, typically occurring when scanning at severe angles and/or distances, to a point that the scan beam is distorted and individual bar code elements are not discerned.

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.

Concentrator. Intermediary device which communicates with up to 50 other devices, and relays data from those devices to the host as well as commands from the host to the devices.

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 to provide in/out connectivity for various circuits and pins.

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

Decoder. A device that analyzes digital input provided by the scan head and translates it into bar code information.

Depth of Field. The range in which a scanner is focused for bar code reading, as measured from the front of the scanner. See "Read Range."

EPROM. Erasable, programmable, read only memory. The EPROM stores the coded information that contains decoding algorithms and options that can be changed by the user.

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/Bad Pulses. TTL signals sent by the scanner to indicate to a controlling device that a good or bad read has occurred.

Good Match. The event which occurs when a scanned bar code label matches the master label information that is stored in the memory of the scanner.

Good Read. The event which 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 discrete bar code symbol.

Label Height. Regardless of orientation, the measurement taken along the length of a bar.

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 that a label moves through the scan beam.

Ladder Label Orientation. A bar code label in which the bars are parallel to the 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 .0254 mm. In bar-coding, a measurement that identifies a bar code label by the width of its narrowest element.

Mismatch. A mismatch 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 decoders 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-read. (Also called "no read") The absence of data at the scanner output after an attempted scan due to no code, defective code, scanner failure or operator error.

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. Classified as serial commands, operational commands are used to change day-to-day operating parameters. With only a few exceptions, the structure consists of a less than (<) symbol, a capital letter, and a greater than (>) symbol.

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 direction of travel.

Pitch. Label (or scanner) rotation around the center of the X-axis.

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

Polled Protocol. A communication protocol in which the host requests information from the scanner by means of an address.

Port. 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 communication 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.

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. "

Read Rate. The reading performance of the scanner for a given label based on the percentage of good reads per a determined number of scans.

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

Round Spot. The standard laser beam as it appears on the label being scanned, sometimes slightly ovalized.

Scanner. A scanning device which is comprised of a scan head and a decoder combined into one package.

Scan Head. The module that projects laser light on bar code labels and receives reflected light back. This device changes the analog signal to a digital representation of the bar code and outputs it to a decoder.

Scan Rate. The number of times the scanner scans per second.

Scan Width. The measurement (inches or centimeters) of the scan beam line at the readable scan range of a given application.

Serial Commands. The classification of commands that are generated by the following structure: a less than (<) symbol, specific command datum, and a greater than (>) symbol.

Serial Configuration. The method of changing factory default settings via command strings. The structure consists of a less than (<) symbol, a capital K, a parameter letter, configuration data, and a greater than (>) symbol.

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

Specular Reflection. The direct, mirror-like reflection of laser light back to the scanner, causing over-light saturation.

Symbology. A set of bar code symbols, such as Code 39 or Code 128, which 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 center of the Z-axis.

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

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.

Index

O

P

R

S

T

U

W