Model 10

Bar Code Scanner

OPERATIONS AND MAINTENANCE MANUAL

Revision: 1.1 Release Date: 01/23/01

INTRODUCTION

This is the Operations and Maintenance Manual for the Model 10. It provides details on everything you need to know to unpack, set up, operate, maintain, and troubleshoot your system.

This note box is used throughout this manual to indicate supplementary information important to the current topic.

MANUAL REVISIONS

This Operations and Maintenance Manual is under revision control. Any addendums or other documents associated with this manual are under separate revision controls. A revision number is changed by 0.1 whenever technical information is changed or added to a document. Any revision between 0.1 and 0.9 is automatically considered preliminary. Any document with a revision greater than 0.9 has been officially released by the Accu-Sort Systems ECN process. The document revision history can be found in the Revision History section at the end of this manual.

DISCLAIMER

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WARRANTY

Accu-Sort Systems, inc. warrants that its scanner and component parts will be free from defects in material and workmanship for a period of one year from the date of shipment (15 months for distributors to account for stocking of units). All new replacement units will also be warranted for the remainder of the original one-year time period. Unless otherwise stated, warranty for products not manufactured by ASI is limited to the manufacturer's warranty. Accu-Sort's sole obligation with respect to damage (whether direct, incidental or consequential, resulting from the use or performance of the unit) is to replace the defective units thereof.

Service requests due to misuse, abuse, neglect, changes in the original specifications, or service calls not related to the Accu-Sort equipment, will be charged at the then current service rate plus all travel related expenses.

- **If the unit fails within two weeks of shipping (Out Of Box Failure):**
  Standard units and custom units with only custom software are replaced within 48 hours with new units. Units with custom hardware will be replaced in 72 hours with new units. If the defective unit is not returned within 30 days, the customer will be contacted. If the defective unit is not returned after 45 days, the customer will be invoiced for that unit. Accu-Sort will issue an RA# (return authorization number) for each defective unit.

- **If the unit fails after two weeks of shipment, but before the end of the warranty period:**
  These procedures are the same as Out Of Box Failures, except Accu-Sort will send refurbished units instead of new units. These refurbished units will be warranted for 90 days from date of shipment or the balance of the original one-year warranty, whichever is greater.

- **If the unit fails after the original warranty period (Out Of Warranty Failures):**
  These procedures are the same as Out Of Box Failures, except Accu-Sort will send refurbished units instead of new units. These refurbished units will be warranted for 90 days from date of shipment. All out of warranty defective units will be replaced for a fixed price. Contact the Accu-Sort Customer Service Department for the current prices.

Additional details on the coverage, support, and services available for your bar code scanning and automated systems equipment is available from:

Accu-Sort Systems, inc.

2800 Crystal Drive
Hatfield, PA 19440

511 School House Road
Telford, PA 18969

2398 North Penn Road
Hatfield, PA 19440

Phone: (215) 723-0981
1-800-BAR-CODE

FAX: Telford Main.....(215) 721-5551
Customer Service...(215) 723-1515
Systems.....(215) 996-8181
Sales.....(215) 996-8282
Acct/Mktg.....(215) 996-8249
TMS.....(215) 996-8787
North Penn.....(215) 997-4848

Internet: www.accusort.com

CUSTOMER SERVICE

If you have any problems or questions that require Accu-Sort's help, direct your calls to the Customer Service Department.

Accu-Sort Customer Service: phone: (215) 723-0981
1-800-BAR-CODE
(ask for Customer Service)
fax: (215) 723-1515

To ensure that Accu-Sort's response is prompt and accurate, please have the following information ready to give the Customer Service Department when calling:

- Product Serial Number
- Product Type or name
- Detailed description of the question or problem
- Customer contact name and phone number

Product Type	Serial Number

Model 10 Serial Tag

Serial Number Breakdown:

WWXXXXXX

WW - Two digit year of manufacture

XXXXXX - Six digit sequential build number

The WWXXXXXX fields are bar coded with a Code 128 type bar code.

SAFETY RECOMMENDATIONS AND PRECAUTIONS

The Model 10 is an electronic microprocessor-based bar code scanner. Please follow the safety precautions and warnings found throughout this manual in order to prevent personal injury or damage to the unit. Failure to follow these precautions may void your warranty.

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

The following note boxes are displayed throughout this manual to indicate safety concerns and/or warnings.

This note box is used to alert the user they are about to perform an action involving a dangerous level of voltage, or to warn against an action that could cause electrical shock.

This note box is used to provide precautions and/or guidelines, warning the user that personal injury or damage to the unit may occur during the task they are performing.

WHEN UNPACKING AND MOUNTING

- Do not drop the unit, internal damage may result
- Do not touch the exit window glass. Fingerprints on the glass may diminish scanner performance. If the window becomes dirty, refer to Exit Window Cleaning in Chapter 6.

WARNING
This is a Class A product. In a domestic environment this product can cause radio interference in which case the user may be required to take adequate measures. (ref. CISPR 22 = EN 55 022:1995)

WARNING
In order to maintain Electromagnetic Compatibility (EMC) Compliance interconnecting cables must be connected using a 360° shield connection of all the interface cables with a conductive strain relief for RF shielding purposes (i.e.:'metalized' 'D' sub-strain relief). This applies to all I/O cables connected through 'D' sub-connectors.

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

GENERAL PRECAUTIONS

Please follow these precautions:

Do not attempt to open the housing. This product contains no user-serviceable parts. Disassembly of the product will void the warranty. Refer any service to the Accu-Sort Customer Service Department.

Laser power up to 7 mW could be accessible inside the unit.

- Avoid staring at the laser beam. Staring at the laser beam for prolonged periods could result in eye damage (*see illustration page vi*).
- Any service should be performed so as not to violate compliance with the Code of Federal Regulations, Title 21, Part 1040, Section 10 (21 CFR 1040.10), as administered by the Center for Devices and Radiological Health, a service of the Food and Drug Administration under the Department of Health and Human Services. Do not attempt to defeat any safety provisions.
- Do not create any obstructions of airflow to the unit. Keep the area around the unit clean to provide for cooling.
- Learn where the disconnect switches or circuit breakers are for your area. (Ensure that others using the equipment know this also.)
- Use shielded interface cables with this product. To maintain FCC compliance, the cable shield must make a 360˚ connection to the shielded mating connector.
- Before performing any type of maintenance, turn off power to the unit and disconnect the power cord.
- Be certain your hands and the floor of your work area are dry before touching electrical equipment or connecting cords.
- Routinely check all connections to your Model 10. If a cable is damaged in any way, replace it.
- Check mounting hardware periodically for tightness and stability.

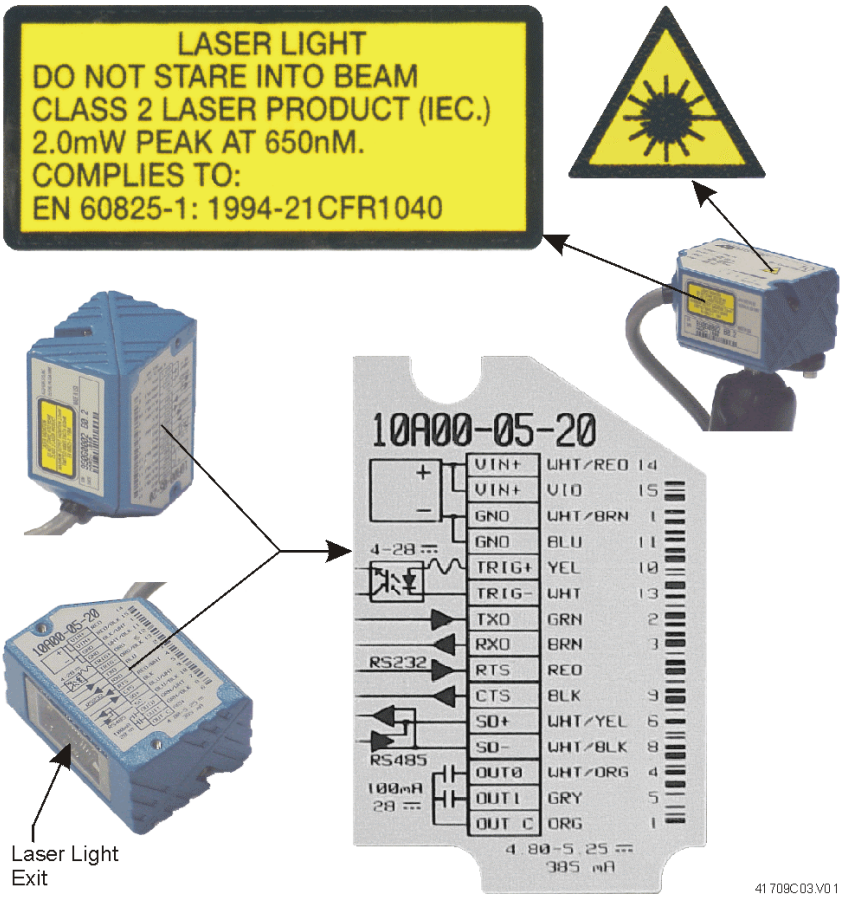
GROUNDING THE MODEL 10

The system must be grounded electrically at all times. Please follow these precautions:

- Ensure your AC power outlet has a properly grounded receptacle.
- Do not turn on the system until all components are properly cabled and grounded with three-conductor AC power cords.

LABEL LOCATIONS

The following labels identify areas of the Model 10 that require special precautions or handling, or provide general information.



Model 10 Labels and Locations

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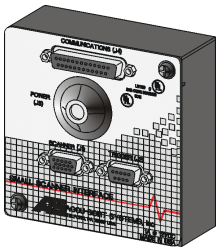
CHECKING THE PACKING SLIP

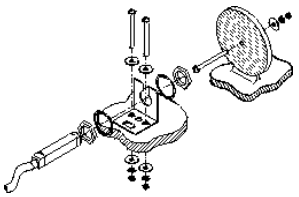
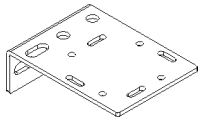
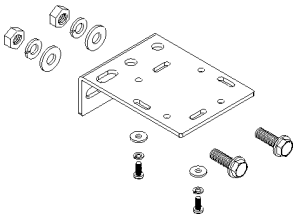
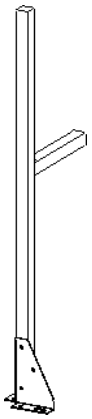
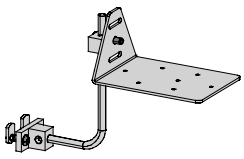
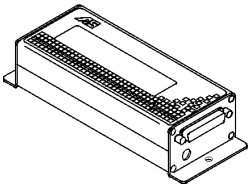
Enclosed in plastic on the outside of your box is a packing slip. The packing slip lists the parts of your order.

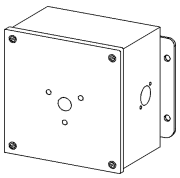
As soon as you open the box, check the equipment against the packing slip to ensure you received everything you ordered. If any equipment is missing or has been damaged during shipment, contact Accu-Sort immediately at 1-800-BAR-CODE (*refer to Customer Service*).

The Model 10 packaging was specifically designed to protect the unit during shipment. **Do not throw it away**. Save all the packaging materials in case you have to transport your unit to a different building.

Depending upon your needs, you may have one or more of the pieces of equipment shown in the following table:

DRAWINGS ARE NOT TO SCALE		
Model 10	**Part Number**	**Description**
	1000001001	Scanner with Internal Logic
Model 10 Options		
1. Optical Setup	1000022760	General Purpose 10 mil min. (300 scans/sec)
	1000024871	High Density (200 scans/sec)
2. Customization	1000022761	
3. Mirror Wheel	1000003008	Straight (6-sided)
	1000003727	Raster (6-sided) 1/2" @ 5.0"
	1000003728	Raster (6-sided) !/4" @ 5.0"
4. Supply Voltage		Logic Board
	1000004679	5 VDC
	1000004680	Variable Custom Supply Voltage (10.0 - 30.0 VDC)
5. Cable Configuration	1000008758	1 Meter, 20 Compatible 15pin
	1000008759	1 Meter, EM-50 Compatible
	1000008760	1 Meter, Flying Leads, 15 Conductors
OTS Distributor Units		
	1000025466	General Purpose, 10 mil min, .5@5 Raster, EM (300 Scans/Second) 5VDC
	1000025467	General Purpose, 10 mil min, .5@5 Raster, FF (300 Scans/Second) 5VDC
	1000025468	General Purpose, 10 mil min, .5@5 Raster, FF (300 Scans/Second) 24VDC
	1000025469	High Density, 5 mil min, .5@5 Raster, EM (200 Scans/Second) 5VDC
	1000025470	High Density, 5 mil min, .5@5 Raster, FF (200 Scans/Second) 5VDC
	1000025471	High Density, 5 mil min, .5@5 Raster, FF (200 Scans/Second) 24VDC
	1000025472	General Purpose, 10 mil min, .25@5 Raster, EM (300 Scans/Second) 5VDC
	1000025473	General Purpose, 10 mil min, .25@5 Raster, FF (300 Scans/Second) 5VDC
	1000025474	General Purpose, 10 mil min, .25@5 Raster, FF (300 Scans/Second) 24VDC
	1000025475	High Density, 5 mil min, .25@5 Raster, EM (200 Scans/Second) 5VDC
	1000025476	High Density, 5 mil min, .25@5 Raster, FF (200 Scans/Second) 5VDC
	1000025477	High Density, 5 mil min, .25@5 Raster, FF (200 Scans/Second) 24VDC
Model 10 Accessories		
Interface Boxes/Expansion Modules		
	1000017362	Small Scanner Interface without relays
	1000017365	Small Scanner Interface with relays
	1000017376	Small Scanner Interface with solid state relays
	1000015791	Scanner Expansion Module
Power Supplies		
	1000022163	110V AC Power Supply (for Small Scanner Interface)
	1000015618	220V AC Power Supply (for Small Scanner Interface)
	1000017369	120V AC 5V DC Programming Kit
	1000017371	220V AC 5V DC Programming Kit
	1000017370	110V AC 12V DC Programming Kit (for Optional Input Voltage)
	1000017372	220V AC 12V DC Programming Kit (for Optional Input Voltage)

DRAWINGS ARE NOT TO SCALE		
	Part Number	**Description**
Photoeyes		
	1000020527	Standard 9 Pin D Connector Photoeye Kit
Mounting Equipment		
	1000003614	Bracket Mounting, Universal
	1000003627	Universal Mounting Shipkit (includes 1000003614)
	1000003656	Ball and Socket Mount Kit
	1000018197	Mounting Structure Assembly
	1000018208	Mounting Kit
Displays		
	1000016277	External Display
	1000016281	External Display w/ 10 Ft. Cable
	1000016280	110V External Power Supply for Display
	1000016283	220V External Power Supply for Display

DRAWINGS ARE NOT TO SCALE		
	Part Number	**Description**
Lamp Enclosures		
	1000017045	Single Green Lamp Enclosure
	1000017046	Single Red Lamp Enclosure
	1000017047	Dual Lamp Enclosure
Communication Interfaces		
	1000015450	15 pin port DeviceNet
	1000015843	External Serial to Ethernet Converter Kit (Plugs into 15 pin connector on scanner)
Model 10 Documentation		
	1000025606	Small Scanners Installation Software and User Documentation CD-ROM

Parts Table

GENERAL DESCRIPTION OF SYSTEM OPERATION

The Model 10 combines impressive optical performance with useful electrical features in a rugged IP-65 / NEMA 4 rated enclosure. Its compact size, zero clearance cable exit, and flexible software parameters ease integration into existing as well as new designs.

Fault tolerant inputs and outputs provide protection against field miswiring. Solid state relay outputs interface directly with PLCs requiring either current sourcing or sinking.

Versatile mounting features including M3 metric threaded holes allow mounting on two sides and require no additional brackets.

Installation is simplified with visual diagnostics designed to verify scanning efficiency.

The Model 10 features:

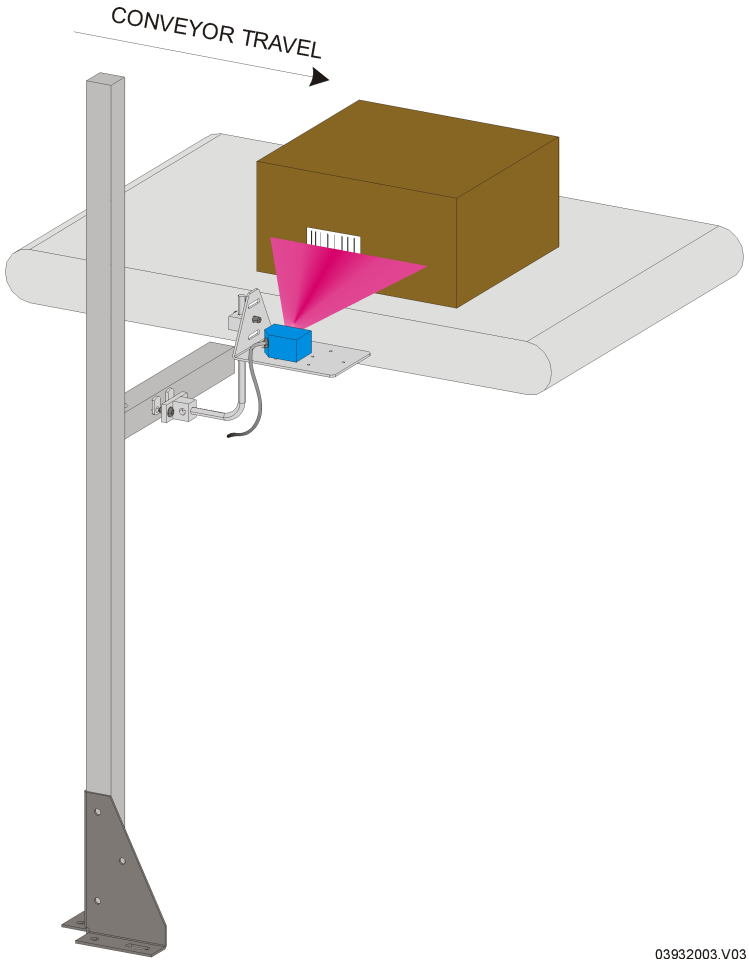
- Lowest cost Accu-Sort solution
- Widest scan angle for its size
- Easy integration
- Easy installation
- 2 Optical setups
- Material Handling and Embedded applications

The system contains:

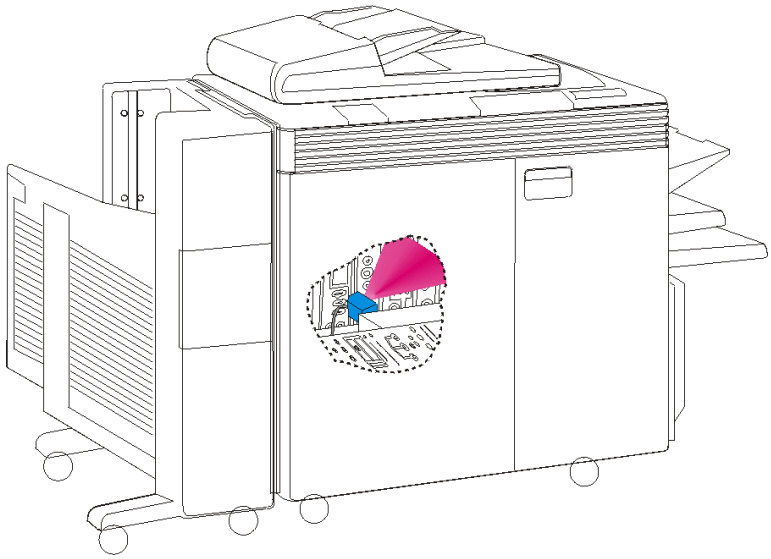
- NEMA 4 / IP-65 enclosure
- Integrated pigtail cable
- Bar graph LEDs
- Individual LEDs
- Diagnostic Pushbutton
- 2M on board FLASH memory
- Diagnostic bar code support
- Windows Setup Program

Typical applications include:

- Automatic Teller Machines
- Library access control systems
- Medical specimen tracking systems
- Document handling machines
- Label printer verification
- Semiconductor wire bonding machines



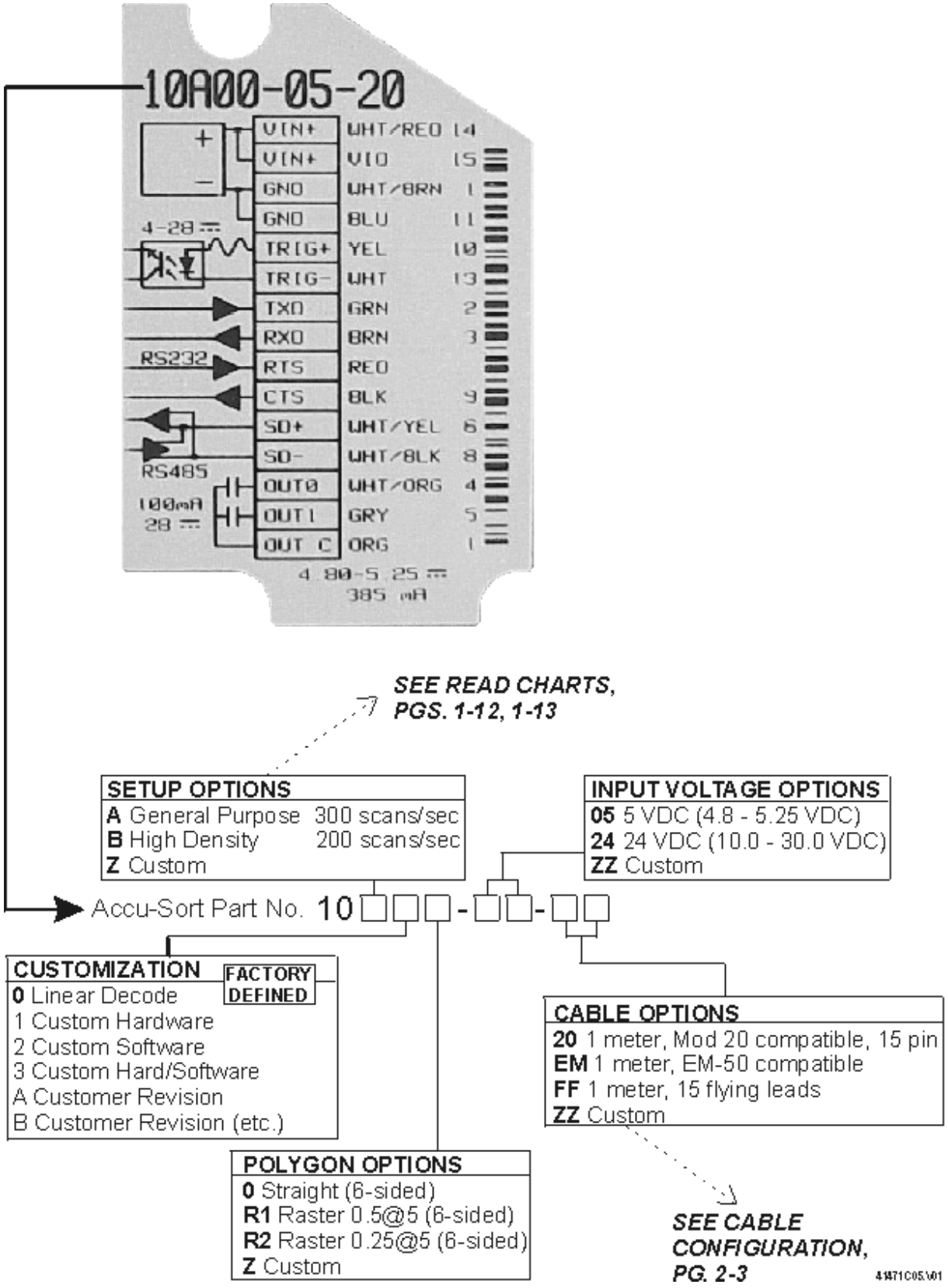
Typical Model 10 Installation (Material Handling)



Typical Model 10 Installation (Embedded)

The installation of the Model 10 as an embedded laser normally requires that the end product be certified to the regulations of the Center for Devices and Radiological Health (CDRH).

BLOCK DIAGRAM OF MODEL 10 SYSTEM

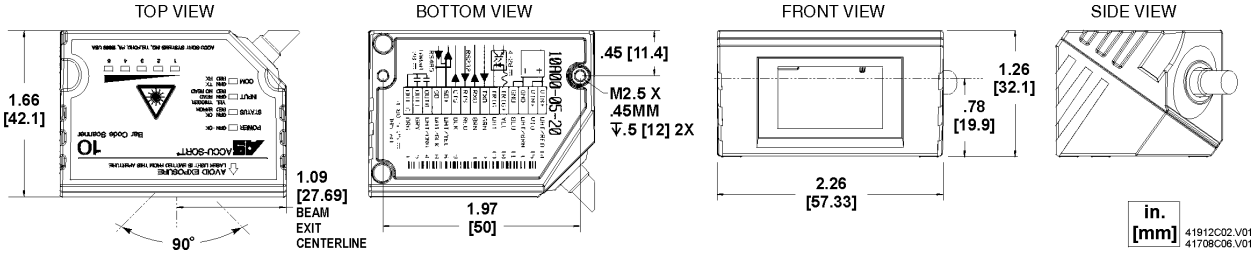


Bottom Label of Model 10 with Model Configuration

PRODUCT SPECIFICATIONS

Physical Features		
Enclosure	Die-cast zinc O-ring seal meets NEMA 4, IP65 Environmental specifications	
Size	Length 1.8 in (46 mm) Width 2.25 in (57 mm) Height 1.3 in (33 mm)	
Cabling	Pigtail cable with zero clearance requirement. Does not contribute to length, width, or height	
Mounting	Two M2.5 threaded thru holes (metric threads provide clearance for #2-56X1.5) Optional stainless steel bracket and conversion brackets for competitive products	
Visual Diagnostics	Power LED Transmit/Receive LED Status LED Trigger/GO/NVC LED 5 segment LED bar graph	Indicates voltage is within specified limits Shows serial port activity and direction Blinks green, yellow, or red, indicating software activity, and whether errors have been logged Shows status of read cycle Displays real time performance information Scanning Efficiency (Good scans/100) Read Rate (Good reads/Trigger cycles)
User Input	Single pushbutton to scroll through available diagnostics	

Performance Features	
Ambient temperature range	32° – 120° F (0° – 50° C)
Laser diode light source	650 nM, 2 mW peak
Scan Rate	200-300 scans per second
Decoder	Self contained (linear)
Motor	Brushless DC motor
Mirror wheel	Polygon scanning element, machined aluminum, 6 facets
Input power	Single 5 volt or 10 to 30 Volt power supply (separate versions) Polarity and over-voltage protected
Serial interfaces, 115.2K baud (max)	RS232 with RTS/CTS support RS485 Multidrop RS422 Half-duplex (2 wire only)
I/O	Trigger input: ±4.5 to 30 Volt, Opto-isolated 2 outputs: Solid state relays, Opto-isolated, short circuit protected, user selectable sink or source
Precision beam exit properties	Beam exit angle parallel to mounting surface ±.050 in. (1.3 mm) throughout depth of field Unintentional raster less than ±.050 in. (1.3 mm) at far distance
Large scan angle	±40° usable scan angle Scan coverage 4.5 in. (114 mm) minimum @ 2 in. (50 mm) distance
Optical throw	5 in. (127 mm) maximum for 10 mil bar code 8 in. (203 mm) maximum for 20 mil bar code



Model 10 Dimensions

Do not turn on the system until all components are properly cabled and grounded with three-conductor AC power cords. Do not use a two-prong adapter. Do not use an extension cord to defeat the ground.

FEATURES

- Installation simplified
- Predictable beam exit (parallel to mounting surface)
- Input voltage, pin-out labeled on unit
- Unit ships reading and transmitting 4 symbologies
- Bar graph ships in “Scanning Efficiency” mode
- Mounting achieved without manuals or computer feedback
- Installer leaves bar graph in “Scanning Efficiency” mode for future monitoring
- Bar graph modes can be enabled without affecting the normal operation of the scanner

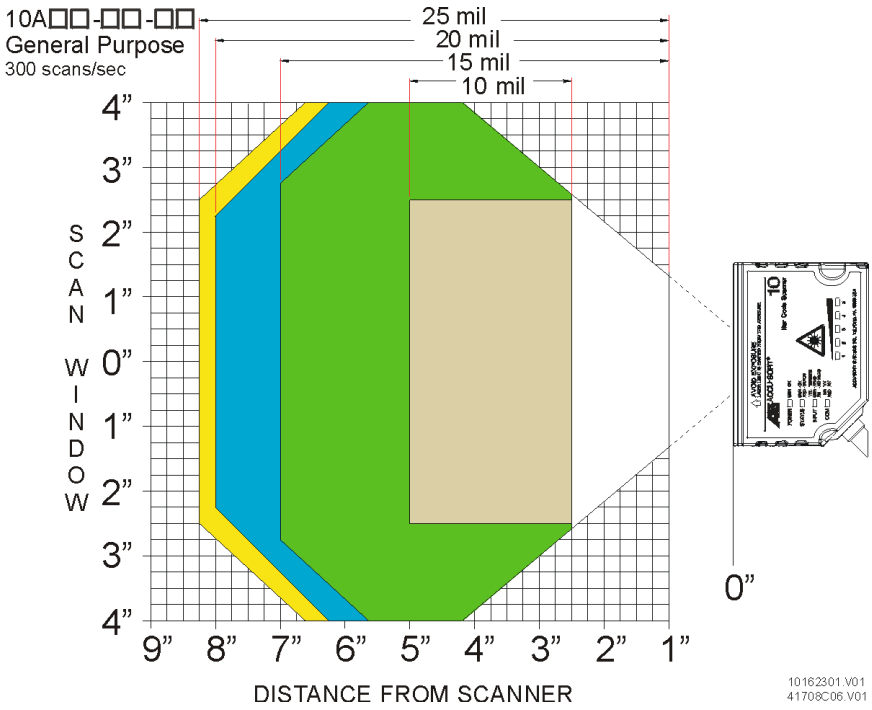
READ CHARTS

The following charts depict the scanning capabilities of the Model 10 in relation to the optical setup. There are two optical setups available for the Model 10.

- A - General Purpose
- B - High Density

GENERAL PURPOSE

Laser Diode	650 nm / 7 mW
Nominal outgoing laser power	2.5 mW
Scans Per Second	300
Pitch	+/- 10°
Skew	+/- 20° (do not mount at 0° skew)
Depth of Field + Scan Window	based on ≥96% scanning efficiency
Minimum allowable print contrast signal (PCS)	75%. Read chart obtained using Code 39 ANSI grade "A" bar codes. Laser printed, black on white. Results may vary depending on symbology and code quality
Scan Angle	80°



“x” element	
mil	*mm*
5	0.127
7.5	0.191
10	0.254
15	0.381
20	0.508
25+	0.635+

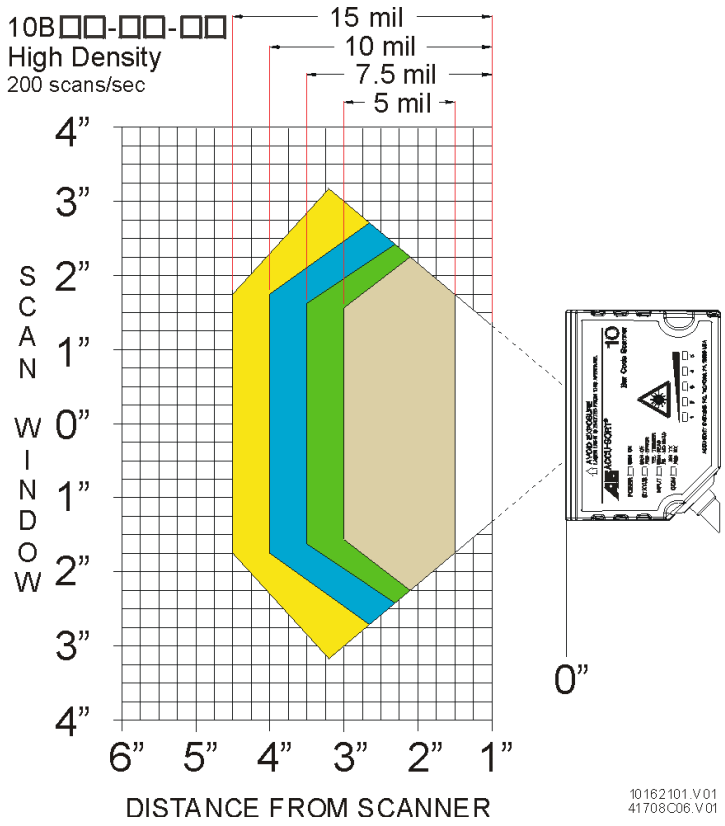
read chart	
in	*mm*
1	25.4
2	50.8
3	76.2
4	101.6
5	127.0
6	152.4
7	177.8
8	203.2
9	228.6

Narrow Element Width	Reading Range	Depth of Field	Maximum Scan Window
10.0 mil (.25mm)	2.5”-5” (63.5-127mm)	2.5” (63.5mm)	5.0” (127mm) @ 2.8” (71mm)
15.0 mil (.38mm)	1”-7” (25.4-178mm)	6” (152mm)	8.0” (203mm) @ 4.6” (116mm)
20.0 mil (.50mm)	1”-8” (25.4-203mm)	7” (178mm)	8.0” (203mm) @ 4.6” (116mm)
25.0 mil (.88mm)	1”-8.25” (25.4-210mm)	7.25” (184mm)	8.0” (203mm) @ 4.6” (116mm)

General Purpose Read Chart

HIGH DENSITY

Laser Diode	650 nm / 7 mW
Nominal outgoing laser power	2.0 mW
Scans Per Second	200
Pitch	+/- 10°
Skew	+/- 20° (do not mount at 0° skew)
Depth of Field + Scan Window	based on ≥96% scanning efficiency
Minimum allowable print contrast signal (PCS)	75%. Read chart obtained using Code 39 ANSI grade "A" bar codes. Laser printed, black on white. Results may vary depending on symbology and code quality
Scan Angle	80°



“x” element	
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read chart	
in	*mm*
1	25.4
2	50.8
3	76.2
4	101.6
5	127.0
6	152.4
7	177.8
8	203.2
9	228.6

Narrow Element Width	Reading Range	Depth of Field	Maximum Scan Window
5.0 mil (.13mm)	1.5”-3” (38.1-76.2mm)	1.5” (38.1mm)	3.9” (99mm) @ 2.1” (53mm)
7.5 mil (.19mm)	1”-3.5” (25.4-88.9mm)	2.5” (63.5mm)	4.25” (107mm) @ 2.37” (60mm)
10.0 mil (.25mm)	1”-4” (25.4-101.6mm)	3” (76.2mm)	4.8” (122mm) @ 2.6” (66mm)
15.0 mil (.38mm)	1”-4.5” (25.4-114.3mm)	3.5” (88.9mm)	5.6” (142mm) @ 3.3” (84mm)

High Density Read Chart

Chapter Two ▼ *Contents*

WIRING AND TERMINATING CONNECTIONS

Do not turn on the system until all components are properly cabled and grounded with three-pronged conductor AC power cords. **Do not use a two-prong adapter. Do not use an extension cord to defeat the ground.**

You must use shielded interface cables with this product. To maintain FCC compliance, the cable shield must make a 360° connection to the shielded mating connector.

You must connect all peripheral equipment before you begin operating the system.

Below is a table of the different cable pin configurations for the Model 10:

CABLE PIN CONFIGURATION			
	1000008760	**1000008758**	**1000008759**
Function	15 Flying Leads, stripped and tinned	15-pin high-density 'D' sub- connector	EM-50-connector
DC+	WHT/RED	14	J1 - 6
DC+	VIO	15	J1 - 7
GND	WHT/BRN	1	J2 - 1
GND	BLU	11	J1 - 8
TRIG+	YEL	10	J1 - 3
TRIG-	WHT	13	J1 - 5
TXD	GRN	2	J2 - 2
RXD	BRN	3	J2 - 3
RTS	RED	12	no connect
CTS	BLK	9	J1 - 2
SD+	WHT/YEL	6	J2 - 6
SD-	WHT/BLK	8	J2 - 8
OUT0	WHT/ORG	4	J2 - 4
OUT1	GRY	5	J2 - 5
OUTC	ORG	1*	J1 - 1*
Shield	Braid	Shell	Braid

*Tied to ground at connector termination to maintain compatibility with the respective product

Cable Pin Configurations

OBJECT-SENSING SIGNAL DEVICE

The Model 10 must be informed when an object on the conveyor is about to enter its reading zone. An object-sensing signal device is typically used to do this. The device is mounted on the conveyor upstream from the Model 10 in relation to conveyor travel. It informs the Model 10 when the leading edge and trailing edge of objects traveling on the conveyor have passed.

The typical object-sensing option for use with the Model 10 is:

- **Retroreflective Pair:** An emitter bounces a light beam off a reflector, and detects when the beam is broken.

The object sensing signal device will be connected to the 9-pin female connector TRIGGER (J2) on the Small Scanner Interface, or the terminal block connector on the EM-50.

You must use shielded interface cables with the Model 10. To maintain FCC compliance, the cable shield must make a 360° connection to the shielded mating connector.

For mounting instructions on your object-sensing signal device, refer to shipkit 1000020527. For setup instructions, refer to the Accu-Setup Suite: Small Scanner Module Software Manual.

Chapter Three ▼ *Contents*

INSTALLATION REQUIREMENTS

POWER

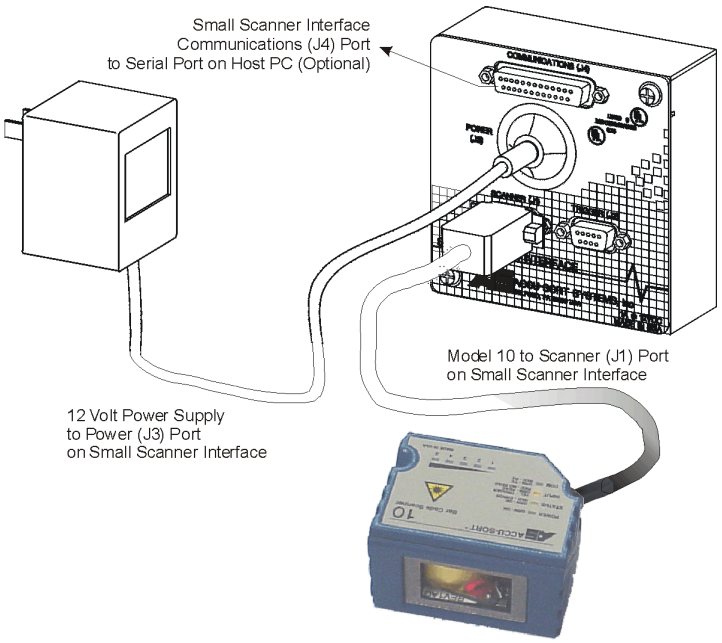
There are two supply voltages available for the Model 10:

4.80 - 5.25 Volt

- Input range 4.80 to 5.25 VDC, over-voltage and reverse polarity protected
- Easily powered from system 5 Volt Bus, Small Scanner Interface, or EM-50.

10 - 30 Volt

- Input range 10 to 30 VDC, reverse polarity protected
- Internal DC/DC converter
- Designed to tie into PLC 24 Volt rail



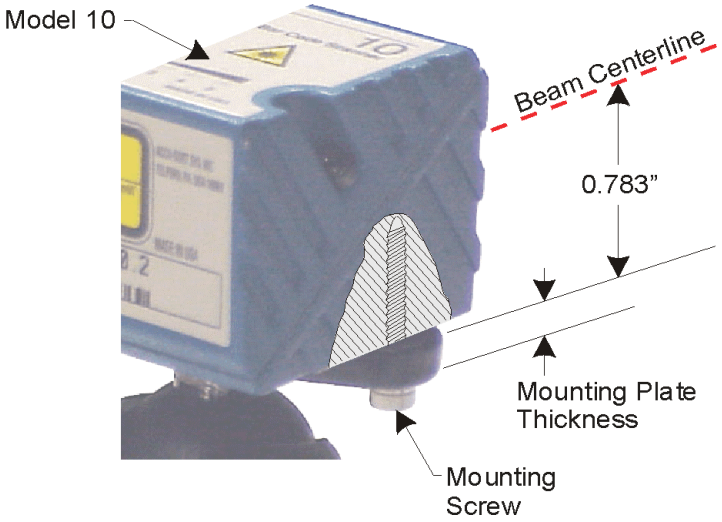
Power Connection Example

Do not turn on the system until all components are properly cabled and grounded with three-conductor AC power cords.

MOUNTING REQUIREMENTS

You must meet the following conditions when mounting your Model 10:

- Install beam blocks at the far side of all conveyor locations to limit the amount of laser light exposure.
- Under no circumstances should the Model 10 be mounted in a position that would cause the laser light to be a distraction, or would cause personnel to look into the beam.
- Make sure the mounting structure is constructed according to the guidelines in the *Accu-Sort Systems, inc. Standard Pre-Installation Guide*.
- Provide a 3’ (91.44 cm) minimum clearance over the top of the unit, and a 2' (60.96 cm) minimum clearance around all other sides. This clearance is necessary to provide proper ventilation.
- Do not obstruct the scanner's line of sight (the scanner's view of the conveyor).
- Do not touch the exit window at any time. Fingerprints on the glass will severely reduce the scanner’s read rate.

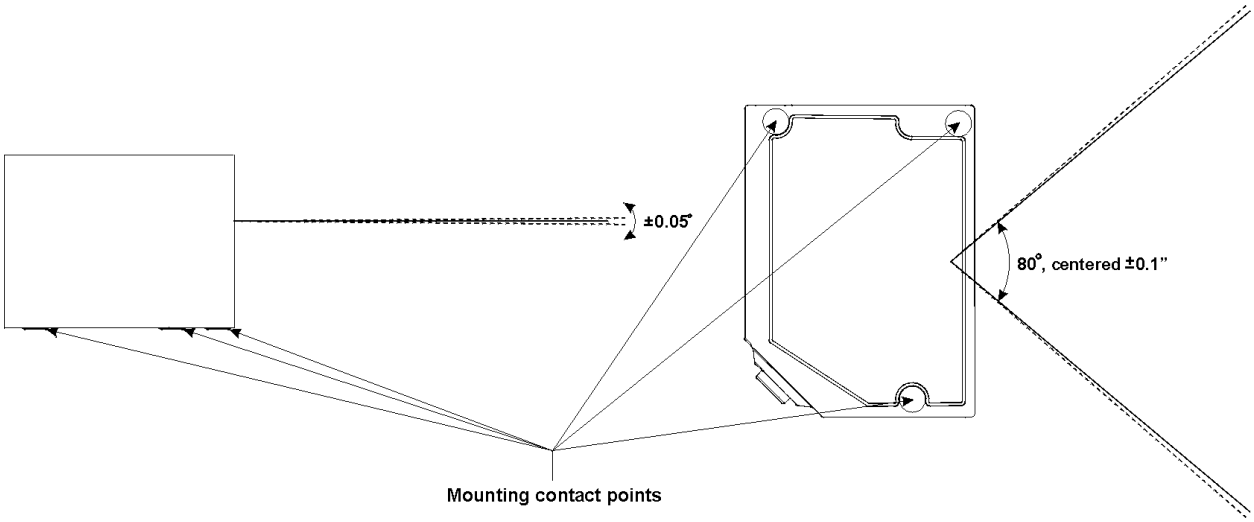


Mounting Plate Thickness (mm) (add 1 mm if using washer)	Mounting Screw Length (mm)	Notes
1 – 2	6	1, 4
3 – 4	8	1
5 – 6	10	1
7 – 8	12	

1. Supplied with scanner
2. Minimum thread engagement in scanner mounting holes = 3mm
3. Do not over tighten
4. Use with supplied mounting brackets

Mounting Screw Selection

Mounting contact points provide three points of contact for repeatability. The Model 10 can be removed from its mounting position, and be replaced in the exact same position. The contact points also ensure the Model 10 will rest parallel to the mounting surface.

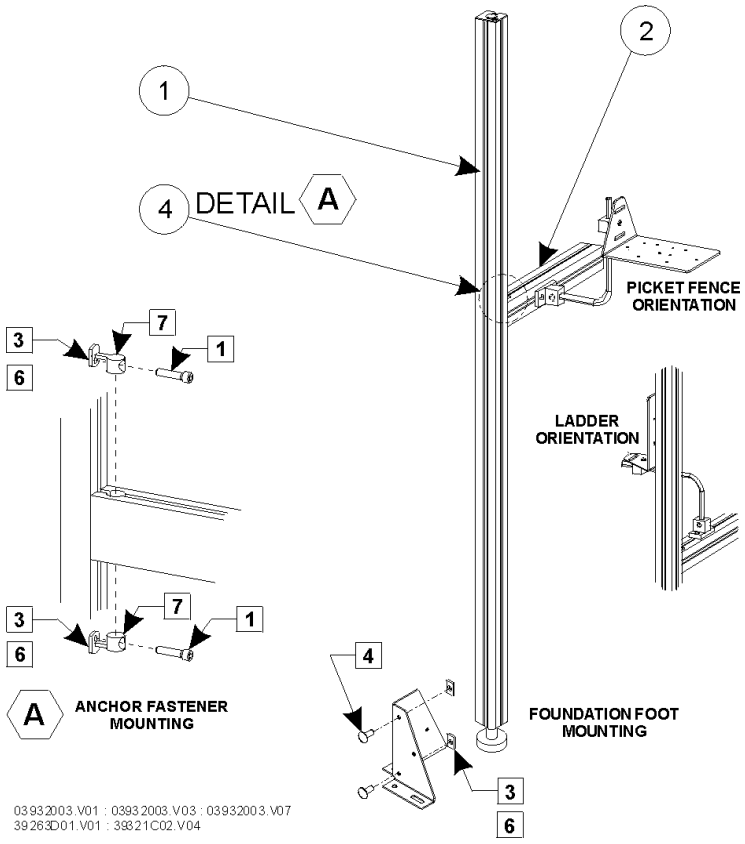


Mounting Contact Points

MOUNTING THE MODEL 10

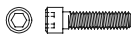
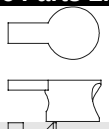
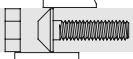
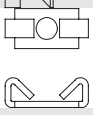
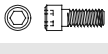
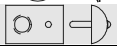
There are several mounting options for the Model 10. The following tables and diagrams provide the information necessary to mount your Model 10 properly for your application.

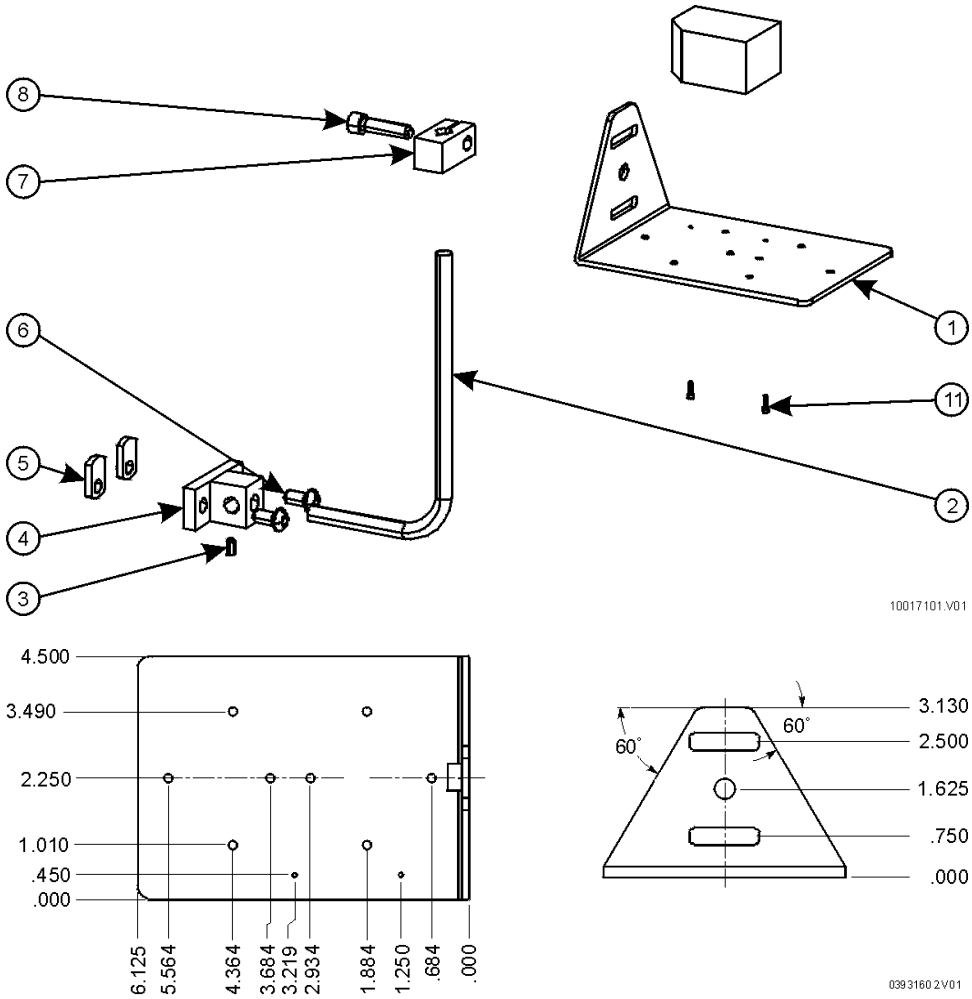
MULTIPURPOSE MOUNTING BRACKET



Mounting Column with Multipurpose Mounting Bracket

Mounting Column Parts List			
Item	***Quantity***	***Description***	***Part Number***
1	1	Extrusion Frame Member	1000013667
2	1	Extrusion Frame Member	1000013667
4	1	Anchor, Assembly	1000018266

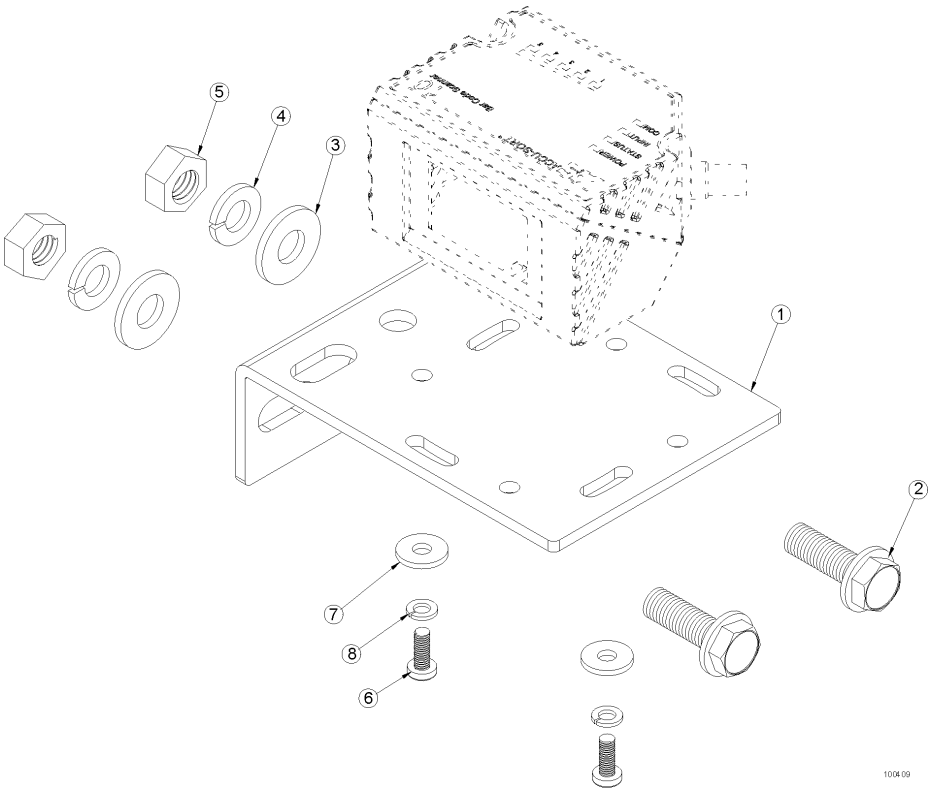
Fastening Hardware Parts List					
1		5/16-18 x 1.25” Socket Head Cap Screw	**7**		Anchor Fastener
2		SAE Flat Washer	**8**		5/16-18 x .75” Tee-Stud
3		5/16-18 Econo Tee-Nut	**9**		End Fastener
4		5/16-18 x .625” Button Head Socket Screw	**10**		5/16-18 x 1.00” Button Head Socket Screw
5		5/16-18 Flanged Hex Nut	**11**		5/16-18 x ¾” Socket Head Cap Screw
6		5/16-18 Drop-In Tee Nut			



Multipurpose Mounting Bracket

Multipurpose Mounting Bracket Parts List			
Item	***Quantity***	***Description***	***Part Number***
1	1	Mount, Model 10/20/22/30 Tilt	1000002333
2	1	Rod, Mounting	1000002330
3	1	10-32 3/8 Set, Cup Point	1000005795
4	1	Block, Mounting	1000002329
5	2	T-Nut, 5/16-18 Black	1000018505
6	2	5/16-18X5/8 Cap, Button Head Black Hex	1000009218
7	1	Block, Pivot	1000002331
8	1	5/16-18X1-1/4 Cap, Socket Head Black Hex	1000009209
11	2	M3X8mm Socket Head Cap	1000017415

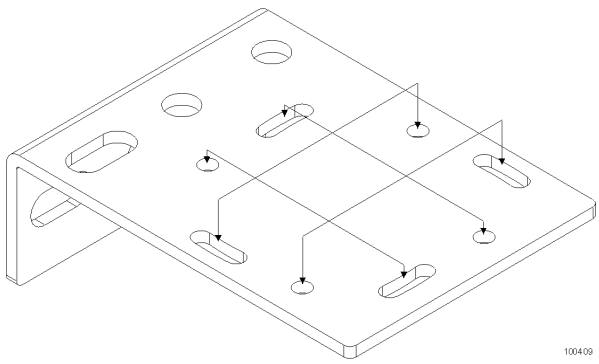
UNIVERSAL MOUNTING SHIPKIT



Universal Mounting Shipkit

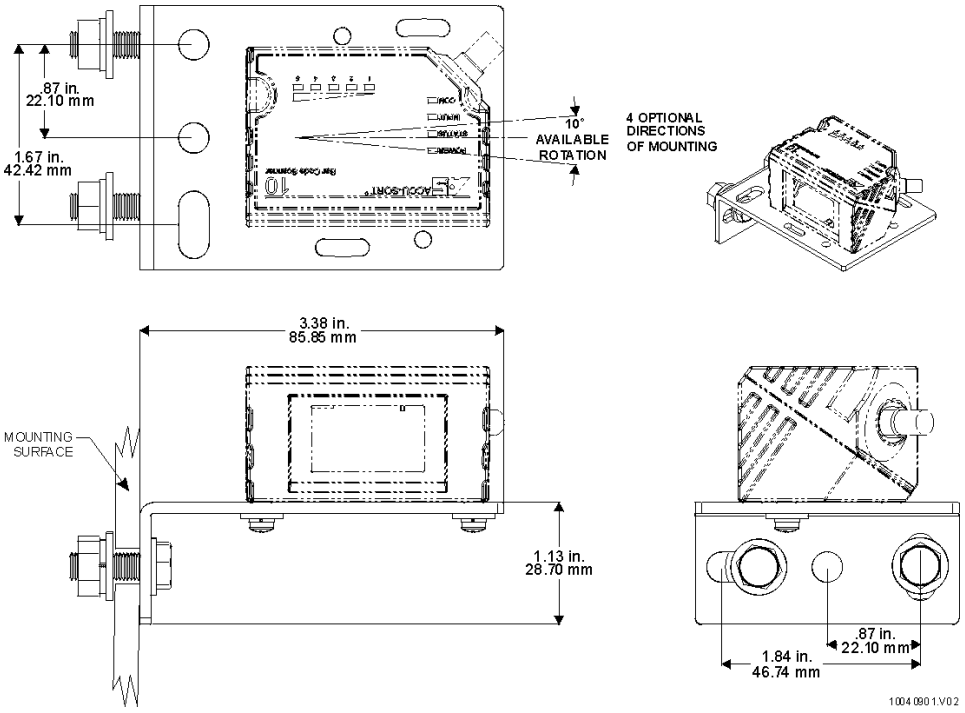
Universal Mounting Shipkit Parts List (p/n 1000003627)			
Item	***Quantity***	***Description***	***Part Number***
1	1	Mounting Bracket, Universal, Model 10	1000003614
2	2	1/4-20 x 3/4 Hex Head Machine Screw	1000005121
3	2	1/4-20 Flat Washer	1000022133
4	2	1/4-20 Split Lock Washer	1000019976
5	2	1/4-20 Hex Nut	1000018475
6	2	M3 x .5 x 10mm Pan Head Phillips Screw	1000017407
7	2	M3 Flat Washer	1000022105
8	2	M3 Split Lock Washer	1000019967

The Model 10 can be attached to this bracket using any of the two connected holes in the graphic below. In conjunction with the fact that the bracket can be secured, with the remaining holes, to many different types of extrusion in a variety of ways, the mounting configurations with this bracket are substantial.

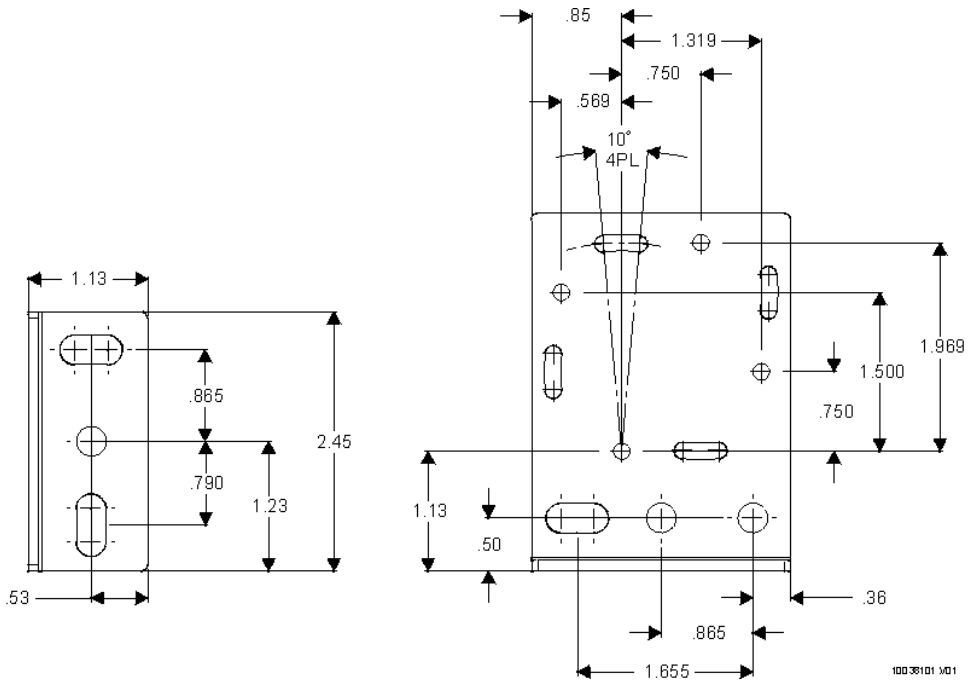


Universal Mounting Shipkit Mounting Holes

Additional views of the shipkit are shown below.



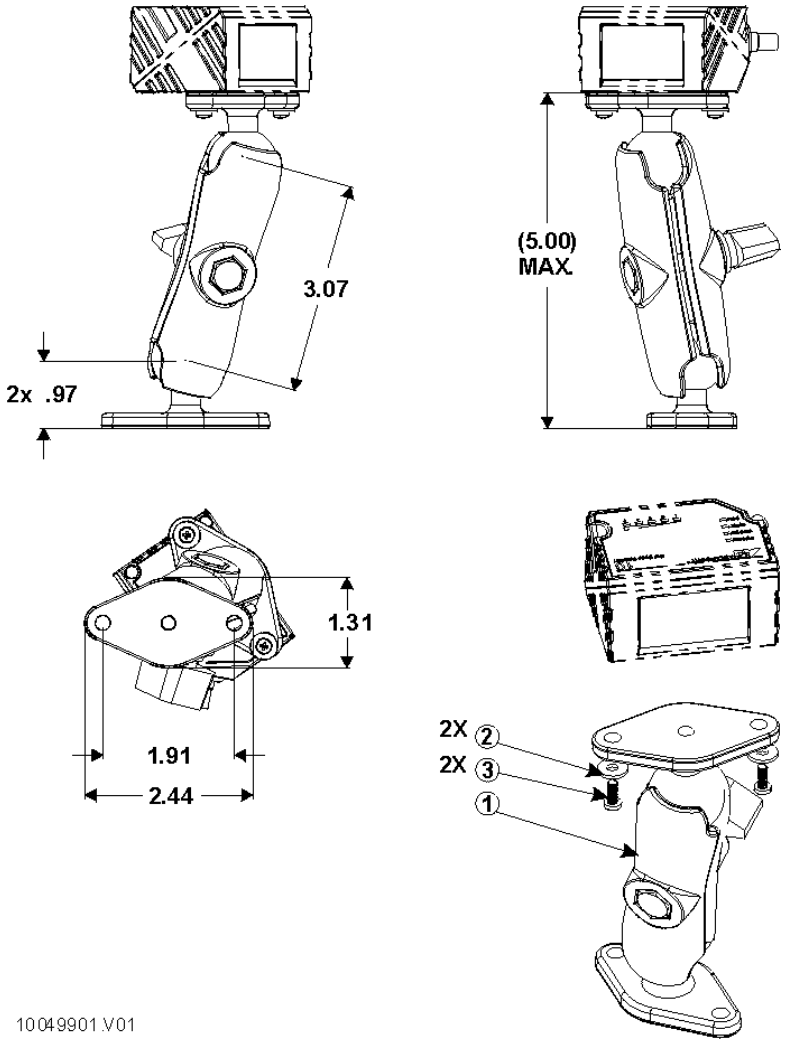
Universal Mounting Shipkit



Universal Mounting Bracket

BALL AND SOCKET MOUNT

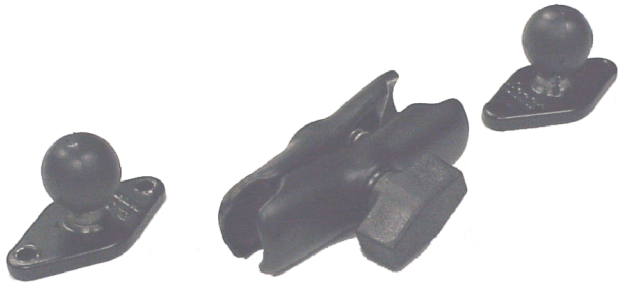
The mounting configurations with this bracket are virtually endless. See *Mounting Examples* on *page 3-13* to get an idea of some of the possibilities.



Ball and Socket Mount

Ball and Socket Mount Parts List (p/n 1000003656)			
Item	***Quantity***	***Description***	***Part Number***
1	1	Mount, Ball & Socket – RAM	1000017556
2	2	M3 Flat Washer	1000022105
3	2	M3 X 8 Pan Head Machine Screw	1000017417

As shown below, both ends of the ball & socket mount will come off when the clamp is loosened.



To mount the Model 10 using the ball and socket mount (the drawing below points out the terms used in this procedure):

Ball & Socket Mount Terms

1. Loosen the clamp, remove the lower ball, and secure it to the mounting surface.

2. Remove the upper ball. Squeeze the end of the socket containing the spring and place the socket onto the lower ball.

It is very important that the upper ball be placed in the upper position. If the upper ball is in the lower position, when the clamp is loosened, the entire ball & socket mount loosens, and it is much more difficult to repeat the same mounting position of the scanner. When the upper ball is in the upper position, and the clamp is loosened, the mount remains intact, and the scanner can be replaced very easily in much the same orientation.

3. Lastly, attach the upper ball to the Model 10 using the supplied M3 Flat Washers and M3 X 8 Pan Head Machine Screws, place it into the socket, and tighten the clamp.

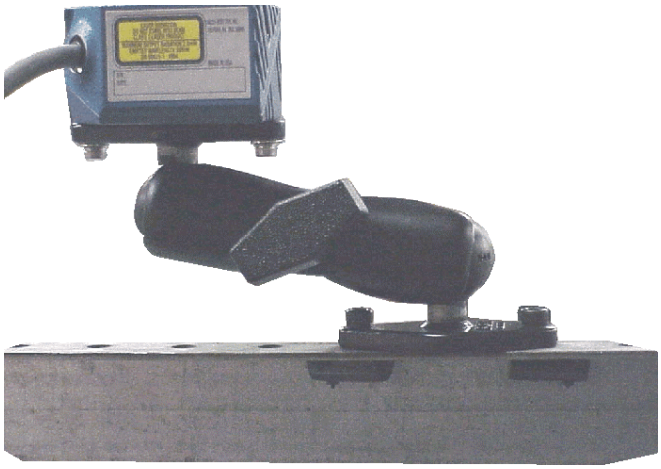
When powering up the Model 10 and setting up your application, you can always loosen the clamp slightly and adjust the position of the upper ball to achieve the proper positioning of the Model 10's scan pattern.

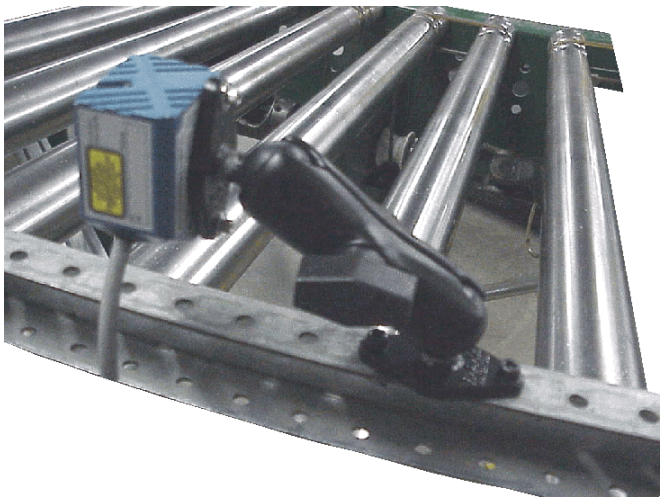
When the Model 10 has been fully mounted and a scanner needs to be replaced, all that is necessary to replace it is to loosen the clamp slightly, and take out the upper ball with the scanner attached. You can then perform maintenance on the scanner and place it back into the mount, or replace the scanner with another.

MOUNTING EXAMPLES

The following examples are provided to give ideas of different ways the Model 10 can be mounted.

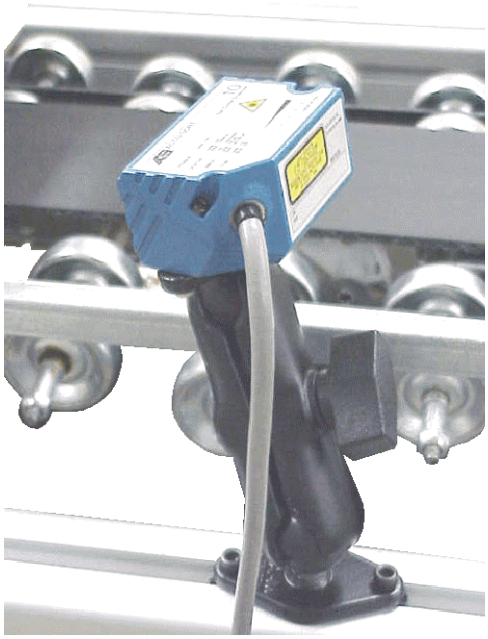
SIDE READ





TOP READ

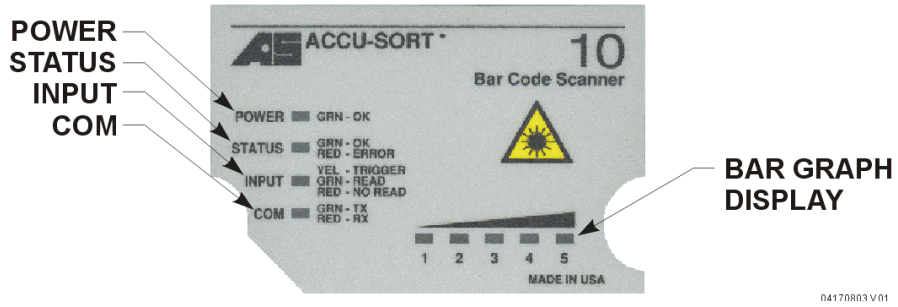
BACK READ



Chapter Four ▼ *Contents*

DISPLAY PANEL

The LEDs on the Model 10 display panel relay many different types of information. They help the user understand how the unit is operating and make any necessary adjustments.



LED	Description
Power	Lights solid green to indicate voltage is within specified limits
Status	Blinks green, yellow, or red, indicating software activity, and whether errors have been logged
Input	Shows status of read cycle
Com	Shows serial port activity and direction
5 segment bar graph (*see below*)	Displays real time performance information Mode 1: Scanning Efficiency (Good/scans/100) Mode 2: Read Rate (Good reads/Trigger cycles) Mode 3: Self-Test

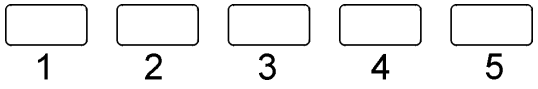
Model 10 LED Descriptions

BAR GRAPH DISPLAY

The Bar Graph Display is comprised of five LED segments arranged in a row to give an "analog" representation of numerical information.

As shown below, segment 1 is to the left. All displayed values begin with segment 1 as their lowest value and grow to the right.

The actual value of each segment is dependent on which display mode is selected.



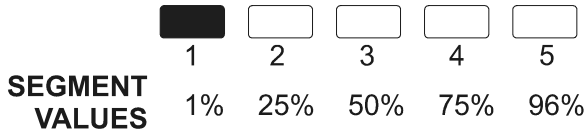
Five Segment LED Bar Graph Display

Display Mode_ID	Display Mode Description	Value Range		Reset Value	Unit of Measure	Bar Graph LED Values				
		Min	Max			1	2	3	4	5
1	Scanning Efficiency	0	100	0	%	1	25	50	75	96
2	Read Percentage	0	100	100	%	96	97	98	99	100
3	Self-Test	0	100	0	%	1	25	50	75	96
4	Future Use									
5	Future Use									

Display Mode Descriptions

The Model 10 bar graph display has five user-selectable modes.

Mode 1 – Scan Efficiency



Mode 1 Segment Values

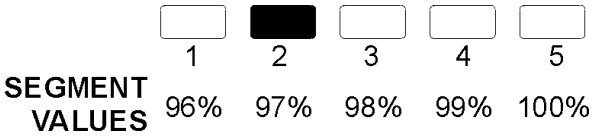
In this mode, the Model 10 periodically samples 100 consecutive scans. The Model 10 counts how many of these decoded and subtracts any decoded scans which did not match the winning decode.

For example: Out of 100 consecutive scans, 95 decoded. However, because not all decoded to the same data, the data with the most 'votes' is correct. Scan efficiency, in this case, is 87%.

CompBuf	Decodes	Bar Graph Appearance
1234567890	87	
1234567000	5	
1234560000	3	

Update Frequency: Approximately every 100 scans.
Data Reset Value: None

Mode 2 – Read Rate



Mode 2 Segment Values

In this mode, the Model 10 continually monitors the number of trigger cycles and good reads since the last boot sequence. The counters for Trigger and Good Reads are both 16 bits wide.

For example: The read rate is displayed below for the number of good reads compared to triggers.

Trigger	**Good Reads**	**Read Rate (%)**	**Bar Graph Appearance**
1	1	100	
2	2	100	
3	3	100	
4	4	100	
65	64	98	
143	138	96	
685	665	97	

Update Frequency: End of every Trigger

Mode 3 – Self-Test

Accu-Sort Diagnostic Code

This mode can be used to verify scanner operation by reading the Accu-Sort diagnostic code (ASIDiag01).

To perform the test:

1. Save your settings.
2. Unplug the Model from the host serial connection.
3. Place the code in the beam path.
4. Press the test button until C led is lit. All 5 LEDs will blink at a high rate of speed.
5. Press and hold the test button for approximately 1 second. All 5 LEDs will blink at a higher rate of speed.
6. The Model 10 attempts to read the code. If the code is read, the Model 10 dumps all three display screens (5000, 5001, 5003) at 9600 7E2, and then returns to normal operations. If the code is not read, or the button is not pressed and held, in 10 seconds, the scanner returns to normal operations.

As the laser turns on the Model 10 reverts to the following settings:

- 9600 baud
- 7 data bits
- Even parity
- 2 stop bits

The following message is transmitted via both the RS485 and the RS232 interfaces:

- Clear Bar Graph display
- Dump of all Menus (use existing 5000, 5001, 5003 menu dumps)

There are two types of input are possible, Press And Release (PAR), and Press And Hold (PAH)

PAR
- Pushbutton switch is closed for a duration between 100ms and 3 seconds
- Used to scroll through available Display Modes
- The trailing edge of PAR (release of pushbutton) initiates action

PAH
- Pushbutton switch is closed for a duration greater than 3 seconds
- Used to Reset Display Mode data to the Reset Value

Bar Graph State	Description	Entered How?	Exited How?
Display Data	Constantly updates the bar graph with current data corresponding to the current mode.	power on	go to next mode
(Stable state)	Normal default state.	PAR	
Display Mode ID	Single LED on (no blink) indicates the current Display Mode		
(Unstable state)	From Display Data State, 1st PAR trailing edge indicates current Mode (1 - 5). Additional PARs increment Mode and single LED scrolls through available Modes. (wraps from last to 1) PAH during this Display Mode state will Reset Display Mode data of the current Mode to the Reset Value.		

PAH never causes Mode to increment because PAR trailing edge never occurs. Without a PAR or PAH, the Model 10 returns to the Display Data state after a 3 second timeout.

START-UP TASKS

Do not turn on the system until all components are properly cabled and grounded with three-conductor AC power cords. Do not use a two-prong adapter. Do not use an extension cord to defeat the ground.

Ensure your AC power outlet has a properly grounded receptacle. Make sure you have the appropriate power cord for your country before powering the unit.

Do NOT use the Model 10 power line to operate other equipment, especially induction motors and solenoids.

Prior to operating your Model 10 complete all of the following tasks:

1. Using the customer-specific specifications provided with your order, verify that the mounting distances, mounting angle, and product sensing signal device (photoeye) distances are correct.

2. Verify that all of the necessary connections have been made correctly and that the connected equipment is functioning properly. (*Refer to Chapter Two*).

3. Apply power to the Model 10.

4. Set up your software as described in the *Accu-Setup Suite - Small Scanner Module Programming Manual*.

Chapter Five ▼ *Contents*

TROUBLESHOOTING

PRELIMINARY STEPS

1. Verify the power indicator is on steady, not blinking.
2. Verify that the Status LED is blinking green.
3. Verify that when trigger toggles, the trigger LED goes yellow following active trigger input.
4. Verify that when trigger input is active the laser is energized.

The laser may be set to be on continuously.

5. Verify that when the laser is energized, the entire bar code is in the laser beam. This means that the entire bar code (either direction, first bar to last bar, or last bar to first bar) must be 'sliced' by the laser beam.

After verifying the above steps to be true, refer to the tables below.

TROUBLESHOOTING TABLES

The following series of tables will help you solve problems that may arise in your Model 10.

The following table will help to guide you to the correct table/page for your problem:

1	No power indication
Possible Cause(s)	**Solution**
A - Type of power input	**A** - If using any interface box, verify (using the appropriate documentation that describes proper voltage and current requirements) that power is supplied to the interface box. If no interface box is being used, verify (using the appropriate documentation that describes proper voltage and current requirements) that power is supplied to the Model 10 and on the correct wires. If the correct power is being supplied, and the Model 10 does not power up, return the unit to Accu-Sort Systems, inc. for further repair.

2	Status LED blinks red
Possible Cause(s)	**Solution**
A - Laser / Motor failure	**A** - *1* - Connect the Model 10 to a PC running Accu-Setup (Small Scanner Setup). *2* - Establish a connection to the scanner (See Small Scanner Setup Instructions.) *3* - Select **Utilities** - **Terminal Mode**. It may be necessary to use the standard terminal interface, or if a button has already been defined, select Hwerr, or (<ESC><^B>3003<^M><ESC>). *4* - The HARDWARE / SOFTWARE STATS should be displayed. Look for the **Laser/Motor failures**. If either is greater than 0, call Accu-Sort Systems, inc. with the noted problem and return the unit for further repair.

3	Status LED blinks yellow
Possible Cause(s)	**Solution**
A – Watchdog resets error	**A** - *1* - Connect the Model 10 to a PC running Accu-Setup (Small Scanner Setup). *2* - Establish a connection to the scanner (See Small Scanner Setup Instructions.) *3* - Select **Utilities** - **Terminal Mode**. It may be necessary to use the standard terminal interface, or if a button has already been defined, select Hwerr, or (<ESC><^B>3003<^M><ESC>). *4* - The HARDWARE/SOFTWARE STATS should be displayed. Look for the **Watchdog resets**. If greater than 0, call Accu-Sort Systems, inc. with the noted problem and return the unit for further repair. **NOTE** - The Watchdog resets error is normally used to diagnose a software problem. It will be necessary to give as much detail about how this error occurs, such as scanning with excessive noise on the box, or any specific piece of nearby equipment starting/stopping).

4	Status LED blinks repeated red-green-yellow sequence
Possible Cause(s)	**Solution**
A - Model 10 is in setup mode	**A** – Return the Model 10 to run mode by cycling power **-- or --** *1* - Return the Model 10 to run mode by connecting the Model 10 to a PC running Accu-Setup (Small Scanner Setup). *2* - Establish a connection to the scanner (See Small Scanner Setup Instructions.) *3* - Select **Exit Accu-Setup**. *4* - If the scanner appears to go into the setup mode again, re-establish a connection to the scanner. Select **Modify Setup - Port Setup**. Ensure the **Always allow setup mode** box is <u>not</u> checked. This box allows the setup mode to be entered by the <ESC><ESC><ESC> sequence.

5 **Input LED does not toggle**	
Possible Cause(s)	**Solution**
A – Software currently not set up properly	**A** - If using HARDWARE TRIGGER *1* - Connect the Model 10 to a PC running Accu-Setup (Small Scanner Setup). *2* - Establish a connection to the scanner (See Small Scanner Setup Instructions.) *3* - Select **Modify Setup - Trigger Setup** and ensure that Trigger Mode is set to **Hardware trigger**, and that the Trigger State is set correctly. Select OK on the Trigger Setup screen, then select OK on the Modify Setup screen. *4* - Select **Utilities - Terminal Mode**, and ensure that the unit is in the **Run Mode**. *5* - Attempt to trigger the unit using the hardware trigger device. If there is no transmission from the scanner, and the Input LED does not follow the trigger input, attempt to locate the triggering device. If the triggering device has any indication built into it, then attempt to trigger the device, and observe this built in indicator. If the indicator changes state with trigger, it may be necessary to troubleshoot the wiring. If this cannot be done on-site, call Accu-Sort Systems, inc. with the noted problem, and return the unit for further repair. - If using SERIAL TRIGGER *1* - Connect the Model 10 to a PC running Accu-Setup (Small Scanner Setup). *2* - Establish a connection to the scanner (See Small Scanner Setup Instructions.) *3* - Select **Modify Setup - Trigger Setup** and ensure that Trigger Mode is set to **Serial trigger**, and that the Character to start/end trigger is set correctly. Select OK on the Trigger Setup screen, then select **Port Settings**. Ensure that the Port settings match the port settings of the device being used to serially trigger the scanner. Select OK on the Port Settings screen, then Select **Utilities - Terminal Mode**, and ensure that the unit is in the **Run Mode**. *4* - Attempt to trigger the unit using the same serial characters selected in the Trigger Setup screen. If there is no transmission from the scanner, and the Input LED does not follow the trigger input call Accu-Sort Systems, inc. with the noted problem, and return the unit for further repair.

6 **Model 10 will not decode**	
Possible Cause(s)	**Solution**
A - Problems with bar code setup	**A** - DETERMINE BAR CODE TYPE *1* - Connect the Model 10 to a PC running Accu-Setup (Small Scanner Setup). *2* - Establish a connection to the scanner (See Small Scanner Setup Instructions.) *3* - Select **Diagnostic Mode - Learn Bar Code Type**, and follow the instructions on the screen. If this diagnostic mode can determine which bar code was read, exit the diagnostic screen, and select **Modify Setup - Bar Code Setup**. Verify that the scanner is set up to read the correct bar code type. *4* - If the diagnostic mode cannot determine which bar code was read, it may be necessary to go to the **Bar Code Setup** screen and alternately enable every allowed bar code, and manually test the scanner to see which bar code is readable. If no bar code can be read, call Accu-Sort Systems, inc. with the noted problem, and return the unit for further repair. USE SCANS/100 BAR GRAPH INDICATION *1* - Once the scanner is verified to be set up to read the correct bar code type, return the scanner to the run mode, then enter the scans/100 mode. *2* - Make the trigger signal active to the scanner, and place the bar code in the laser line. *3* - Observe the bar graph display, and move the bar code in/out and side to side in the laser line slowly until the maximum readout is obtained on the bar graph display. It may be necessary to move the scanner so that it is reading the bar code in this area.
B - Exit Window is dirty or smudged	**B** - Clean Exit Window (see Maintenance Procedures, page 6-3)
C - Loose hardware connections	**C** - Check all hardware connections for tightness

7	Model 10 will not communicate with Accu-Setup
Possible Cause(s)	**Solution**
A - Improper or faulty cabling	**A** - *1* - Connect the Model 10 to a PC running Accu-Setup (Small Scanner Setup). *2* - Attempt to establish a connection to the scanner (See Small Scanner Setup Instructions.) *3* - If no communication can be established, observe the 'COM' LED on the Model 10. When Accu-Setup is attempting to communicate with the Model 10, Accu-Setup will send the 'SETUP' command to the Model 10, and the 'COM' LED should show short red blips. If there are no red blips on the 'COM' LED, there may be a problem with the communication cable, or the PC. If this problem is isolated to the Model 10 cabling, it may be necessary to call Accu-Sort Systems, inc. with the noted problem, and return the unit for further repair. *4* - If the LED is giving red blips, then there should also be green blips (Model 10 Response). If there are no green blips, verify that the unit is in setup by observing the 'STATUS' LED blinking red/yellow/green. *5* - If the Model 10 is in setup, cycle power while connected to the PC running Accu-Setup. If the Model 10 again gets into setup, there is a problem with either the cabling or the PC, that is keeping the PC from receiving the response from the Model 10. If this problem is isolated to the Model 10 cabling, it may be necessary to call Accu-Sort Systems, inc. with the noted problem, and return the unit for further repair.

8	Model 10 sends data but the host does not receive it
Possible Cause(s)	**Solution**
A - Model 10 currently not set up properly	**A** - *1* - Connect the Model 10 to a PC running Accu-Setup (Small Scanner Setup) *2* - Establish a connection to the scanner (See Small Scanner Setup Instructions.) *3* - Select **Modify Setup - Port Setup/Advanced** (if necessary). *4* - Verify that the scanner port settings match the host settings including *Advanced settings*. Not only is it necessary to have BAUD / PARITY / DATA / STOP / PROTOCOL / FLOW set up correctly, normally transmissions are in a packet format, TRANSMIT HEADER / DATA / TRANSMIT TRAILER. If this formatting is not set up correctly, the host will most likely not 'receive' the data.

Chapter Six ▼ *Contents*

MAINTENANCE TASKS

This chapter contains the information you need to service your unit properly.

The Model 10 was specifically designed for a tough industrial environment. It is NEMA 4 rated, which means it is intended for indoor or outdoor use primarily to provide protection against windblown dust and rain, splashing water, and hose-directed water, and is undamaged by the formation of ice on the enclosure.

If the tasks outlined below are performed as recommended, the Model 10 will continue to provide reliable operation. If you have followed all of the steps and your unit needs to be serviced, contact the Accu-Sort Customer Service Department (*refer to Customer Service in the front of this manual*).

- exit window cleaning
- exterior cleaning
- check connections for tightness

EXIT WINDOW CLEANING

Occasional cleaning of the exit window glass may be necessary to maintain peak performance.

1. Lightly brush off any loose dirt particles with a soft, cotton cloth (the window glass may become scratched if abrasive material is wiped from its surface).
2. Moisten a cotton cloth with a cleaning solution of 50 parts water/50 parts denatured alcohol.
3. Wet the window surface with a gentle wiping motion.
4. Immediately wipe the window surface dry to prevent streaking.
5. Inspect the window surface and repeat steps 3-5 if necessary.

At this time, you may also want to clean off any photoeyes/reflectors or tachometers (especially the wheels) you are using in your system.

EXTERIOR CLEANING

Occasional cleaning of the exterior may be necessary to properly view the LEDs. Simply wipe or spray the exterior with water and a mild soap solution. High-pressure steam / water jets should not be directed at the Model 10. To restore a clear optical path, follow the steps under Exit Window Cleaning.

CHECK CONNECTIONS FOR TIGHTNESS

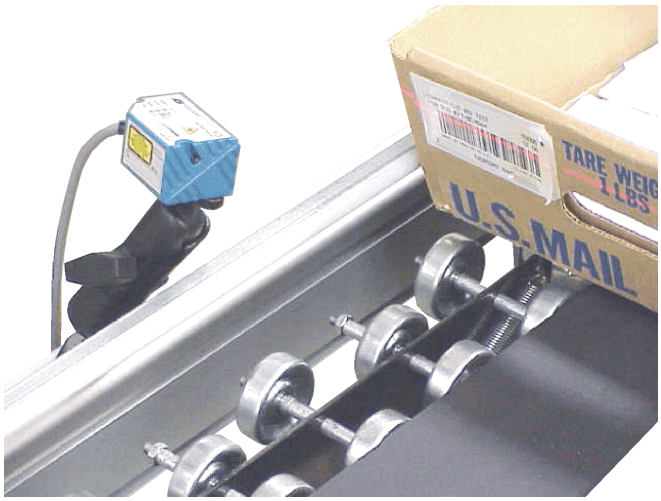
All connections should be checked regularly to ensure their integrity. If any cables are frayed, they should be replaced immediately. If the Model 10 cable is frayed, contact Accu-Sort immediately.

Chapter Seven ▼ *Contents*

APPLICATION EXAMPLES

The following graphics depict typical Model 10 applications. They do not cover all applications that the Model 10 is capable of fulfilling. Please note that not all graphics are actual installations; rather, they are set up to show conceptually how an application works.

LABEL PRINTING VERIFICATION

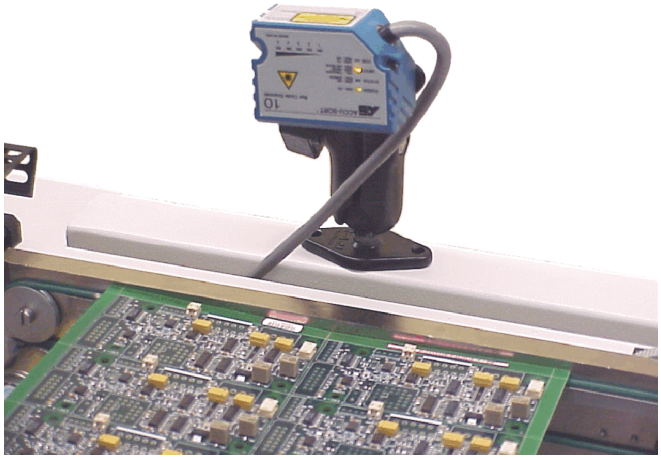


Label Printing Verification Application

BAR CODE VERIFICATION

Bar Code Verification Application

PC BOARD TRACKING

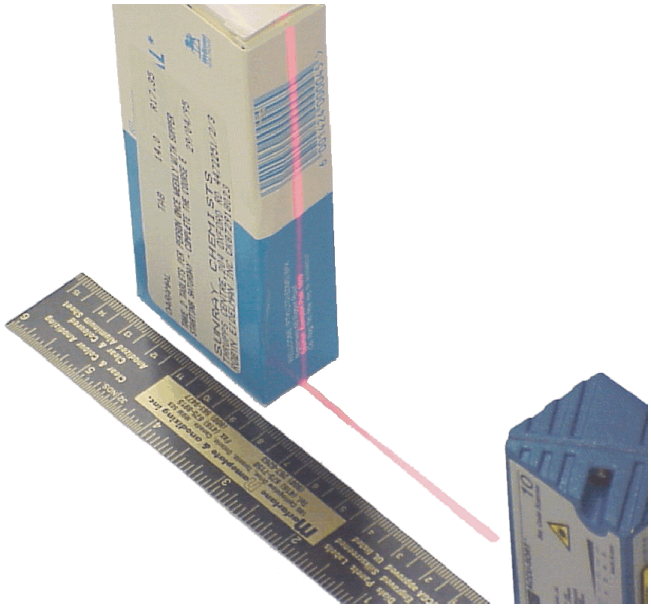


PC Board Tracking Application

PRODUCT COUNTING

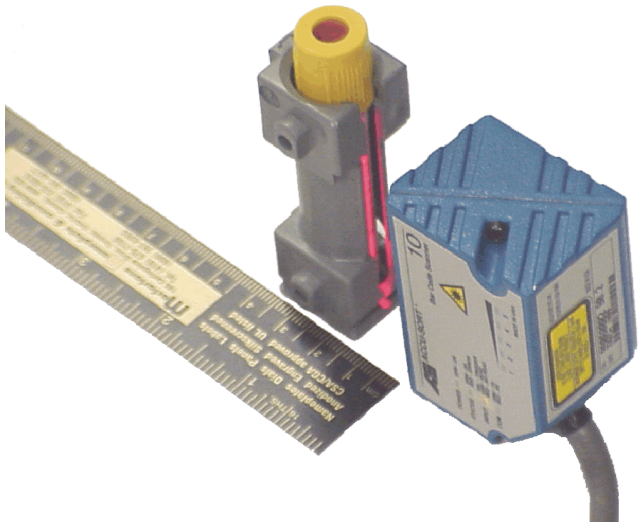
Product Counting Application

PRODUCT IDENTIFICATION



Product Identification Application

AUTOMATED BLOOD ANALYZER



Automated Blood Analyzer Application

Appendix A ▼ *Contents*

ASCII COMMUNICATIONS

STANDARD RS485 MULTIDROP COMMUNICATIONS

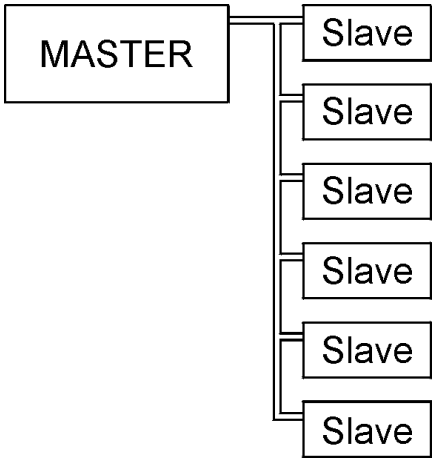
RS485 communications is an Engineering Industries Association standard for the transmitters and receivers of a digital equipment interface. RS485 communication uses differential signal lines and allows for multiple transmitters on one signal pair (although only one transmitter may be enabled at any given time). This is a way of allowing one device to communicate with one or more other devices using the Master/Slave method.

The Master/Slave system works as follows:

The master device (usually a decoder logic or computer) originates poll messages. The poll message is a message from the master to a slave requesting the slave to respond with data (if data is available). The slave is usually a bar code scanner. The slave device responds to the polls from the master. It is not allowed to transmit unless it has been “asked” (polled) by the master.

Shown below is a simplified drawing of one way that RS485 communications works:

This representation shows one Master and six slaves. You can ultimately have up to 32 slaves for each serial port on the master (depending on the line length and required response time).



RS485 Communications Example

The remainder of this section defines the message formats and timing requirements for the protocol used on RS485 multidrop (2-wire) communications lines. The protocol is defined for both the “master” device and the “slave” devices. This protocol is defined for a one-master system only. The following definitions may help you understand this protocol a little better.

ASCII digit	This means the ASCII code for a single decimal digit. For example, 30h is the ASCII digit that encodes a zero.
HEX digit	This means the ASCII code for a single hexadecimal digit. Some examples are, 35h is the code for a five, 42h is the code for a "B" (which equals 11 base 10), the hexadecimal number "5A" would be encoded by the two HEX digits 35h and 41h.

MESSAGE FORMATS

The standard communications parameters are as follows:

Standard asynchronous data frame (least significant bit first)

7 data bits
1 even parity bit
2 stop bits

If the master can only support 8 bit data plus a parity bit, the format is as follows:

8 data bits
1 odd parity bit
1 stop bit

(Odd parity is required to make sure that the guard character will be all ones with one for parity.)

You can use any baud rate that is supported by both the master and the slaves. System performance is usually best when using the highest baud rate possible.

The following is framing for all messages sent by any device on the multidrop line:

0FFH STX ID(2) TYPE(2) SEQ DATA LRC(2) CR

(FFhex) = Guard Character	This character is "sacrificed" to the line noise that occurs when the unit transmitter is first turned on. The unit software may (optionally) wait one character time between transmitter enable and transmission of the STX (the next character). This eliminates transmitting the guard character. The receiver ignores this character.
STX(02hex) = Start of text character	This character indicates the start of a message. The receiver should clear any characters in its receive buffer whenever it receives this character.
ID(2 ASCII digits) = The unit ID	This field indicates the unit identification number of the unit to which the message is directed, if the message is coming from the master. This field indicates the unit identification number of the unit transmitting the message, if the message is from a slave. A message with an ID of "00" from the master is a broadcast message. All slave units should act on the message (display data, reset, etc.), but no slave should respond to the message.
TYPE(2 ASCII digits) = The message type	This field describes the purpose of the message that is sent. There are five message types as shown below:

Message Types

01	**Poll**	This message type is sent by the master unit to request data from a slave.
02	**Data**	This message type is sent by either a master to transfer data to a slave or by a slave to transfer data to the master after receiving a poll. The TYPE field will then be followed by a SEQ field and a data field.
03	**ACK**	This message type is sent by the unit that has just received a valid data message.
04	**Wake up**	This message type is sent by the master. The slave that receives it should acknowledge the message.
05	**No data**	This message type may be sent by a slave indicating that the slave has no data to send in response to a poll. This message is optional. If the slave has no data, it may ignore the poll.

SEQ(1 ASCII digit) = The sequence number	This field starts at zero at power up, and is incremented by one for each data message sent. When the sequence number reaches nine, it wraps around to one. This field is only present in a data message.
DATA = The content of the data field	This field contains data, if the message type indicates that data is included. This field may contain no characters (length of zero; poll, acknowledge and wake up messages do not have data fields.)
LRC(2 HEX digits) = The Linear Redundancy Check Sequence	The LRC is computed by exclusive-oring all the characters in the ID, TYPE, SEQ, and data fields, then converting the hex number into two ascii digits. This mathematical process checks to make sure that the message is valid.
CR (0Dh) = Carriage return	This character indicates the end of the message. When this character is received, the unit should check to see that the message started with a STX, and check that the LRC is correct before accepting it as a valid message.

MESSAGE SEQUENCING

The master unit initiates all data transfers by either sending data to a slave or requesting data from a slave. This protocol is strictly half duplex; only one device may be transmitting at any time. A slave device should not transmit unless it receives a valid message that requires a response--when it does receive such a message, it must respond quickly (See *Timing*). The master unit should respond in a timely manner, but is not under the same constraints as a slave. The following is an example of processing a Master/Slave interaction.

	Master	Slave's response	Master's response
1.	Wake up	ACK	-none-
2.	Poll	Data	ACK
3.	Poll	No data	-none-
4.	Poll	-none-	-none-
5.	Data	ACK	-none-

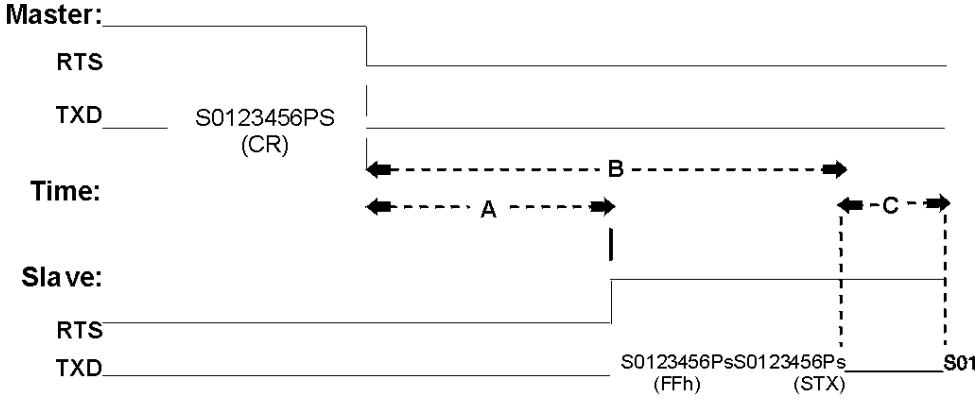
TIMING

If a slave unit is going to respond to a poll from the master, it must start its response within two character times of the end of the carriage return at the end of the poll.

This makes the response time dependent upon the baud rate.

The slave must turn on its transmitter within two character times after receiving the CR of the master's poll. The slave must place the STX at the beginning of its response, into its serial port no later than three character times after receipt of the master's carriage return.

Once the slave begins transmitting, it must not allow a gap of more than one half a character time between characters. Most transmissions will take place under interrupt, so this should not be a problem; however, it means that serial port interrupts may not be disabled for an extended period of time during data transmission.



Master/Slave Timing Diagram

"S" is the start bit, "0123456" are the character bits, "P" is the parity bit and "s" is the stop bit.

Typically, the “RTS” line is used to control the transmitter. In this diagram, “RTS” is high when the transmitter is enabled and low when the transmitter is disabled (“tri-stated”).

The slave’s “FF” may be replaced with a one character time (10/baud rate) delay between transmitter turn-on and transmission of the STX.

Time Limits		
A	*Maximum*	2 character times (20/baud rate)
	Minimum	0
B	*Maximum*	4 character times (40/baud rate)
	Minimum	2 character times (due to guard character + STX transmission time)
C	*Maximum*	1/2 character time (5/baud rate)
	Minimum	0

Both the master and the slave must disable their transmitter as soon as possible after transmitting the carriage return at the end of the message. The transmitter must remain enabled while the carriage return is being sent out, however. This means that the transmitting device must wait for a “transmitter empty” (as opposed to a “transmitter ready”) indication from the serial port before disabling the transmitter.

This protocol has been designed for a "slow" master to communicate with a "fast" slave. The only time-critical item for the master is for the master to release control of the line immediately after sending a message to a slave. While the slave must respond within a very short time window, there are no such constraints on the master. The master may have any amount of time between messages or between characters within its message.

Error Recovery	
Error	The slave does not understand a poll message.
Recovery	None. The master will time out, waiting for the slave’s response, then will go on to the next unit.
Error	The slave does not understand a data message from the master.
Recovery	The master will retransmit the data message again after timing out while waiting for the acknowledgement.
Error	The master does not understand the slave’s acknowledgement of a data message.
Recovery	The master will retransmit the data message after timing out while waiting for the acknowledgement. The slave will acknowledge the retransmitted message and discard it, since the message will have the same sequence number as the last message received.
Error	The master does not understand the slave’s data message (response to a poll).
Recovery	The master will time out waiting for the slave’s response, then continue on to the next poll. Since the slave did not receive an acknowledgement for the data message, it will retransmit the same message in response to the next poll.
Error	The slave does not understand the master’s acknowledgement of the slave’s data message.
Recovery	The slave will retransmit the same message in response to the next poll. The master will see that it is a duplicate message, acknowledge it, and discard it.
Error	The slave does not understand a broadcast message.
Recovery	None. The message will be lost.

The general rules are as follows:

1. **Each data message will be acknowledged by the recipient**. If a data message is not acknowledged, the transmitter should retransmit it again up to three retries. After the third retry, a communications error message should be displayed and the message discarded (in some systems the message may be recorded in a disk file or on a printer to prevent data loss).

2. **Each new message will have a new sequence number**. If a message is received that has the same message number as the last message received, the recipient should acknowledge the message and then discard it. The sequence number should only be checked for equality to the last sequence number received: there is no requirement that the sequence number must be the next number expected (although in some systems the master will keep track of "out of sequence" errors since they would indicate that messages had been lost).

   The sequence number zero is a special case, since it indicates that the data message is the first data message sent since the device sending it has powered up. Messages with a sequence number of zero should always be processed as required, regardless of whether or not they are repeated "back to back".

3. **Any message that contains parity errors, LRC errors or an unrecognized message type should be discarded**. No acknowledgement should be sent. In some systems, the master will keep track of these transmission errors.

4. **Any message that contains a correct LRC, has no errors, is of a correct type, and requires an acknowledgement should be acknowledged even if its sequence number indicates that it is a duplicate message (the sequence number is the same as the last message)**. If it is a duplicate message, it should be acknowledged then discarded. In some systems, the master will keep track of these duplicate message errors since they would indicate that an acknowledgement had been lost. A broadcast message (one sent to unit "00") must not be acknowledged.

MULTIDROP PROTOCOL EXAMPLES

Message framing

FFh,	**02h,**	**idhigh,**	**idlow,**	**type,**	**seq no,**	**...data...,**	**lrc0,**	**lrc1,**	**0Dh**
(DEL,	STX,	?,	?,	?,	?,	?,	?,	?,	CR)

The DEL character is used as a guard character to make sure that the transmission line is quiet for one character time before the STX is sent. The sequence number only appears on data messages. The LRC stands for "linear redundancy check" and appears on all messages.

Polling sequence:

1. MUX polls slave at address 01 with the following format:

STX, unit id (2 char), 0, 1, lrc (2 char), CR							
Example:	**STX**	**0**	**1**	**0**	**1**	**0**	**0**	**CR**
HEX:	02h	30h	31h	30h	31h	30h	30h	0Dh

2. SLAVE answers the poll with the data in the following format:

STX, unit id, 0, 2, seq (1 char), ...data..., lrc, CR														
Example:	**STX**	**0**	**1**	**0**	**2**	**1**	**A**	**B**	**C**	**D**	**E**	**7**	**3**	**CR**
HEX:	02h	30h	31h	30h	32h	31h	41h	42h	43h	44h	45h	37h	33h	0Dh

If no data is available:

STX, unit id, 0, 5, lrc, CR

Example:	**STX**	**0**	**1**	**0**	**5**	**0**	**4**	**CR**
HEX:	02h	30h	31h	30h	35h	30h	34h	0Dh

It is normally faster to allow the master to time out (which takes three character times) than to use the "no data" response.

3. MUX acknowledges data in the following format:

STX, unit id, 0, 3, lrc, CR

Example:	**STX**	**0**	**1**	**0**	**3**	**0**	**2**	**CR**
HEX:	02h	30h	31h	30h	31h	30h	32h	0Dh

4. MUX polls the next unit . . .

PROTOCOLS USED WITH RS232, CURRENT LOOP, AND 422

RTS/CTS (Used with only RS232)	This protocol stands for "Request To Send" and "Clear To Send". This is a common type of "handshaking" that goes on between two units. When one device wants to transmit to another device, it will drive the RTS line indicating it has data to transmit. When the receiving device is ready to receive, it will drive the CTS line indicating it is ready. When you use RTS/CTS it requires the addition of two more wires on the communication cable. If they are not needed then it is advised not to use any other additional lines in the cable.
ACK/NAK	This is a software protocol. When a unit receives a message, it indicates whether it has received that message correctly. If all information is received, the unit will transmit an "ACK" (acknowledge). The ACK is a signal that more information may be transmitted. If the information is not received correctly, then it will transmit a "NAK" (non-acknowledge). The NAK is a signal requesting a message be retransmitted. Most software has a limit to the number of retransmits. Three NAKS is common.
XON/XOFF	This is a software protocol. XON stands for "transmit on" and XOFF stands for "transmit off". A unit receiving data may signal the unit transmitting that it should stop sending data by transmitting and XOFF (ctrl-S). An XON (ctrl-Q) signals the original unit to begin transmitting again.

ASCII CHART

HEXADECIMAL & DECIMAL CHARACTER ASCII TABLE											
DEC	HEX	ASCII	DEC	HEX	ASCII	DEC	HEX	ASCII	DEC	HEX	ASCII
000	00	^@ NUL	032	20	SPC	064	40	@	096	60	’
001	01	^A SOH	033	21	!	065	41	A	097	61	a
002	02	^B STX	034	22	"	066	42	B	098	62	b
003	03	^C ETX	035	23	#	067	43	C	099	63	c
004	04	^D EOT	036	24	$	068	44	D	100	64	d
005	05	^E ENQ	037	25	%	069	45	E	101	65	e
006	06	^F ACK	038	26	&	070	46	F	102	66	f
007	07	^G BEL	039	27	’	071	47	G	103	67	g
008	08	^H BS	040	28	(	072	48	H	104	68	h
009	09	^I HT	041	29	)	073	49	I	105	69	I
010	0A	^J LF	042	2A	*	074	4A	J	106	6A	j
011	0B	^K VT	043	2B	+	075	4B	K	107	6B	k
012	0C	^L FF	044	2C	,	076	4C	L	108	6C	l
013	0D	^M CR	045	2D	-	077	4D	M	109	6D	m
014	0E	^N SO	046	2E	.	078	4E	N	110	6E	n
015	0F	^O SI	047	2F	/	079	4F	O	111	6F	o
016	10	^P DLE	048	30	0	080	50	P	112	70	p
017	11	^Q DC1 XON	049	31	1	081	51	Q	113	71	q
018	12	^R DC2	050	32	2	082	52	R	114	72	r
019	13	^S DC3 XOFF	051	33	3	083	53	S	115	73	s
020	14	^T DC4	052	34	4	084	54	T	116	74	t
021	15	^U NAK	053	35	5	085	55	U	117	75	u
022	16	^V SYN	054	36	6	086	56	V	118	76	v
023	17	^W ETB	055	37	7	087	57	W	119	77	w
024	18	^X CAN	056	38	8	088	58	X	120	78	x
025	19	^Y EM	057	39	9	089	59	Y	121	79	y
026	1A	^Z SUB	058	3A	:	090	5A	Z	122	7A	z
027	1B	^[ESC	059	3B	;	091	5B	[	123	7B	{
028	1C	^\ FS	060	3C	<	092	5C	\	124	7C	|
029	1D	^] GS	061	3D	=	093	5D	]	125	7D	}
030	1E	^^ RS	062	3E	>	094	5E	^	126	7E	~
031	1F	^- US	063	3F	?	095	5F	_	127	7F	DEL

ASCII Chart

Glossary ▼

ACK
A control character sent to acknowledge that a transmission block has been received.

Active/Passive Device
In 20mA current loop communications, a device capable of providing the current for the loop (active) and a device that draws the current from the equipment it is connected to (passive).

Address
A unique designation for the location of data or the identity of a smart device; allows each device on a single communications line to respond to its own message.

AEL (Accessible Emission Limit)
The average power limitations of electronic radiation from a laser light source as defined by the CDRH.

AIM
Automatic Identification Manufacturers, Inc.

Alignment
The position of a scanner or light source in relation to the target of a receiving element.

Alphanumeric
Consisting of letters, numbers, and symbols.

Ambient Light
The lighting conditions in the scanning area. Ambient light can interfere with successful scanning of bar codes.

ANSI (American National Standards Institute)
The principle standards development group in the U.S. A non-profit, non-governmental group supported by over 1000 trade organizations, professional societies, and companies. Member body to the ISO (International Standards Organization).

Aperture
Term used on the required CDRH warning labels to describe the laser exit window.

Application
A use to which something is put, or how it is used.

APM Protocol
Acronym for Application Protocol Messages. A protocol used by system integrators who want to design system applications without AdaptaScan Software.

ASCII (American Standard Code for Information Interchange)
Pronounced *as-kee*. A standard seven bit plus parity code, representing 256 characters, established by ANSI to achieve compatibility between data services.

Aspect Ratio
The ratio of height to width of a bar code symbol. A code twice as high as wide would have an aspect ratio of 2; a code twice as wide as high would have an aspect ratio of ½ or 0.5.

Asynchronous Transmission
Transmission in which the time intervals between transmitted characters may be of unequal length. Transmission is controlled by start and stop bits at the beginning and end of each character.

Autodiscrimination
The ability of bar code reading equipment to recognize and correctly decode more than one bar code symbology.

Autodistinguish
The ability of a scanner to recognize a selectable number of different symbologies and process the data without operator intervention; this is a prerequisite feature of linear bar code scanners employed in open systems.

Autoload
The process of automatically transferring scanned character strings and the symbology type into a match entry value.

Bar
The dark elements of a printed bar code symbol.

Bar Code
An array of rectangular bars and spaces arranged in a predefined pattern to represent elements of data referred to as characters.

Bar Code Character
A single group of bars and spaces that represent an individual number, letter, or other symbol.

Bar Code Density
The number of characters that can be represented in a linear unit of measure. Bar code density is often referred to in characters per inch (CPI).

Bar Code Label
A label that carries a bar code and can be affixed to an article.

Bar Code Reader
A device that examines a printed spacial pattern and decodes the encoded data.

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

Bar Height
The height of the shortest bar in a bar code.

Bar Length
The bar dimension perpendicular to the bar width.

Bar Width
The thickness of a bar measured from the edge closest to the symbol start character to the trailing edge of the same bar.

Baud Rate
A unit used to measure communications speed or data transfer rate; represents the number of discrete conditions or events per second.

BCC (Block Check Character)
Used to check transmission accuracy, a character transmitted by the sender after each message block and compared with a block check character computed by the receiver.

Bed Width
The width of the conveyor bed measured in inches.

BEL
A control character that is used when there is a need to call for attention; it may control alarm or attention devices.

Belt Width
The width of the conveyor belt measured in inches.

Bidirectional
A bar code symbol capable of being read successfully independent of scanning direction.

Bit (Binary Digit)
The contraction of binary digit, the smallest unit of information in the binary system; a one or zero condition.

Bottom Read
When the scanner is mounted under the conveyor to read codes on the bottom of the boxes or on the front or back of the boxes. If used there is not enough clearance for a standard front or back read.

BPS (Bits per Second)
Unit of data transmission rate. *See baud rate.*

Bridge
An interface between links in a communication network that routes messages from one link to another when a station on one link addresses a message to a station on another link.

Buffer
A temporary storage device used to compensate for a difference in data rate and data flow between two devices (typically M).

Bus
An internal pathway along which electronic signals travel between the components of an electronic device.

Byte
A binary element string functioning as a unit, usually shorter than a computer "word". Eight-bit bytes are most common. Also called a "character".

CART
(Also known as trigger) A signal, typically provided by a photoeye or proximity switch, that informs the scan head of the presence of an object within its reading zone.

CCD (Charge Coupled Device)
Used in scanners to sense the light and dark areas of a symbol.

CDRH (Center for Devices and Radiological Health)
This organization (a service of the Food and Drug Administration) is responsible for the safety regulations governing acceptable limitations on electronic radiation from laser devices. Accu-Sort is in compliance with the CDRH regulations.

Capture count
The number of consecutive identical valid decodes that result in a valid read.

Character
A single group of bars and spaces in a code that represent an individual number, letter, punctuation mark or other graphic element. Used as part of the organization, control, or representation of data.

Character self-checking
The feature which allows a bar code reader to determine if a scanned group of elements is a valid symbol character. If a symbology is described as character self-checking, a single printed defect (edge error) in any symbol character does not produce a valid character.

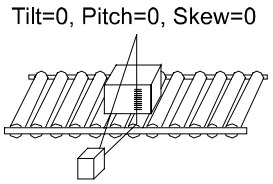
Character set
Those characters available for encodation in a particular automatic identification technology.

Check Character
A character (usually at the end of the code) that is used to perform a mathematical check to ensure the accuracy of a scan of the bar code.

Code Length
The length of the bar code measured from the start of the first bar to the end of last bar.

Code Orientation
The relationship of the bar code with reference to the scan head's reading zone. Typical code orientations are Ladder and Picket Fence.

Code Placement
Variation in code placement affects the ability of a scanner to read a code. The terms Tilt, Pitch, and Skew deal with the angular variations of code placement in the X, Y and Z axes. Variations in code placement affect the pulse width and therefore the decoding of the code. Pulse width is defined as a change from the leading edge of a bar or space to the trailing edge of a bar or space over time. Pulse width is also referred to as a transition. Tilt, pitch, and skew impact the pulse width of the code.



Changes to this code presentation cause the bar codes to appear smaller to the scanner which results in a smaller pulse width. Each of these variation has a different effect on a scanner reading these codes and the combination of the variations leads to more complicated effects.

Code Quality
The number of scans successfully decoded during a read cycle.

Code set
The specific assignment of data characters to symbol characters.

Communications Protocol
The rules governing exchange of information between devices connected together on the same communications line.

Configuration
The arrangement and interconnection of hardware components within a system, and the hardware (switch and jumper) and software selections that determine the operating characteristics of the system.

Configuration file
The set of attributes which belongs to and defines the operation of a single physical device.

Continuous code
A bar code symbology where all spaces within the symbol are parts of the characters (Interleaved 2 of 5). There is no interactive gap in a continuous bar code symbology.

Conveyor Speed
The speed that the conveyor is moving measured in feet per minute. Conveyor speed directly impacts the time that the code is in front of the scanner; therefore, it affects the number of reads that are possible.

CPI
Characters per inch. See density.

CR (Carriage Return)
An ASCII or EBCDIC control character that moves the cursor or print mechanism to the left margin.

CRT (Cathode-Ray Tube)
Device similar to a television screen for sending, receiving, and displaying serial data. Also known as Dumb Terminal, Display screen, or Monitor.

CTS (Clear to Send)
The Modem interface signal that indicates to the DTE device to begin transmission.

Current Loop
Method of interconnecting terminals and transmitting signals, whereby a mark (binary 1) is represented by current on the line and a space (binary 0) is represented by the absence of current.

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

Decoder
As part of a bar code reading system, the electronic package which receives the signals from the scanner, performs the algorithm to interpret the signals into meaningful data and provides the interface to other devices.

Decoder Logic
The electronic package that receives signals from the scan head, interprets the signals into useful data, and provides the interface to other devices.

Depth of Field
The distance between the maximum and minimum plane in which a symbol can be read. This range is from the specified optical throw to the far reading distance.

Density
The number of data characters which can be represented in a linear unit of measure. Bar code density is often expressed in characters per inch (CPI).

DIP Switches
Switches that are the approximate size of an integrated circuit.

Discrete code
A bar code or symbol where the space between characters, intercharacter gap, are not part of the code as with Code 39. See continuous code.

Dot Matrix Printer
A dot matrix printer is an impact printer that consists of a series of pins arranged in an array. The pins strike an inked ribbon against the label stock to form the bar code and characters. This is the most common type of printer used to print labels on-demand. Some dot matrix printers use a moving print head and stationary stock. The print head moves across the label, printing one dot at a time, to complete one line. The print head then begins printing the next line. Other dot matrix printers use a stationary print head. These printers typically print one line at a time and are therefore much quicker than a printer with a moving print head.

Common Problems with dot matrix printing
The printed ink (bars) tends to expand or "bleed". This causes the size of the bars of a code to expand while shrinking the spaces. There tends to be small gaps between pins of a dot matrix printed bar. This can lead to problems with scanners because these gaps can appear as spaces. Ribbon wear is a factor when printing dot matrix codes. If a printer uses a circular type ribbon (ribbon is used over and over again) the contrast of the bar code diminishes over time. A bar code printed with an old ribbon can be more difficult to read than one printed with a new ribbon.

Benefits of dot matrix printing
It is inexpensive to print bar codes using dot matrix printers.

Downloading
The process of sending configuration parameters, operating software or related data from a central source to remote stations.

DSR (Data Set Ready)
An RS232 modem interface control signal which indicates that the terminal is ready for transmission.

DSR (Data Terminal Ready)
Modem interface signal which alerts the modem that the DTE device is ready for transmission.

Duplex Transmission
See Full and Half Duplex.

EAN
European Article Number System. The international standard bar code for retail food packages.

EDI (Electronic Data Interchange)
A method by which data is electronically transmitted from one point to another.

EIA-232
Interface between data terminal equipment and data communication equipment employing serial binary data interchange.

EIA-422
Electrical characteristics of balanced-voltage digital interface circuits.

EIA-485
The recommended standard of the Electronic Industry Association that specifies the electrical characters of generators and receivers for use in balanced digital multipoint systems.

Element
Dimensionally the narrowest width in a character - bar or space.

Element width
The thickness of an element measured from the edge closest to the symbol start character to the trailing edge of the same element.

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

ENQ (Enquiry)
A transmission control character used as a request for a response from a remote station. (^E)

ESC (Escape)
A control character which is used to provide additional control functions. It alters the meaning of a limited number of continuously following bit combinations. (^[)

Error
A discrepancy between a computed, observed or measured value or condition and the true, specified or theoretically correct value or condition.

ETX (End of Text)
A transmission control character that terminates a text.

Even Parity
A data verification method in which each character must have an even number of on bits.

Expansion Bus
Allows the microprocessor to communicate with controllers for peripheral devices, such as a network card or an internal modem.

Far Distance
The distance (in inches) from the face of the scanner to the farthest point at which a code can be successfully scanned.

Flying Lead
A lead that exits the back of the connector hood on the outside of the cable jacket. It is normally attached to the drain wire or shield and connected to the chassis of the switch, modem, etc. It can also be a hardware control lead.

Front Read
The scanner is mounted to read bar codes on the leading edge of a box as it passes the scanner. In a front read application, the scanner can be mounted above or on the side of the conveyor.

Full Duplex (FDX)
Simultaneous, two-way, independent transmission in both directions.

Guard bars
1) The bars at the ends and center of a UPC and EAN symbol that ensure a complete scan of the bar code. 2) The optional bars outside the quiet zone of an Interleaved 2 of 5 symbol that ensure a complete scan of the bar code.

Half Duplex (HDX)
Transmission in either direction, but not simultaneous.

Handshaking
Exchange of predetermined signals between two devices establishing a connection. Usually part of a communications protocol.

Height of Scan
The maximum vertical scanning dimension of a moving beam scanner at a specific distance from the face of the scanner.

Helium Neon Laser
A type of laser commonly used in bar code scanning. Because the laser beam is bright red, bars must not be printed with red ink since they would be indistinguishable from the code's background.

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

Host
1) A central controlling computer in a network system. 2) Any device on a network system that provides a controlling function to another device on the network. 3) Any intelligent device for which another device is providing a communication interface to a network.

Ink Jet Printing
Ink jet is a non-contact printer that projects drops of ink at a printing surface. The sprayed drops are controlled electronically to form a bar code.

Common Problems with ink jet printing
Its main restriction is that ink jet printing is usually capable of printing only low density codes.

Benefits of ink jet printing
Because ink-jet printers are non-contact and non-impact, they can print bar codes on a variety of contoured, rough, and delicate surfaces. Capable of printing random or sequential information on labels. Ink jet printers can print directly on cartons and avoid the cost of label stock.

Input/Output Modules
Since many scanners are operating in environments that have electrical noise problems, it is helpful to have equipment electrically isolated from other equipment. The standard method for isolating inputs and outputs is through the use of OPTICALLY ISOLATED INPUT/OUTPUT MODULES. These flexible modules allow the scanner to control high voltage outputs that are susceptible to noise. Since they are isolated from each other the noise is not picked up in the scanner.

The modules come in both input and output versions. The output versions are controlled by a 5VDC input. The output of the modules can range from 24VAC - 140VAC or 3VDC - 200VDC. Foreign voltage ranges are available. The maximum current that the modules can supply is limited by the output voltage and the module type. The input versions are controlled by either a DC or AC input ranging from 3VDC - 32VDC or 90VAC - 140VAC. Foreign voltage ranges are available. The output of the modules is a 5VDC level. The maximum current is limited by the input modules. These output modules are commonly used to control diverters, alarms, external relays, etc. The input modules can be used for photoeye inputs.

Intercharacter Gap
The space between two adjacent bar code characters in a discrete code.

Interface
A shared boundary defined by common physical interconnection characteristics, signal characteristics and meanings of interchanged signals.

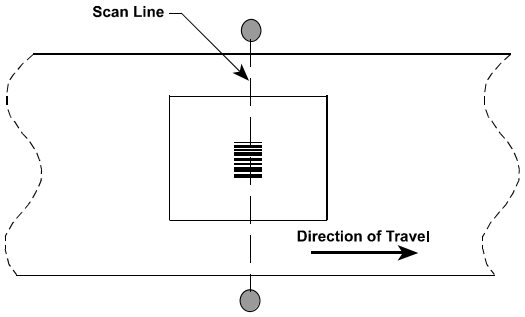
Interleaved Bar Code
A bar code in which characters are paired together using bars to represent the first character and spaces to represent the second.

Inter-symbol no-read count
The minimum number of no-reads that must occur between symbols scanned when Self-Triggered (continuous decode) is selected as the decode trigger. Symbols that are not preceeded by the minimum nuber of no-reads are ignored.

I/O
The abbreviation for input/output. The keyboard and a printer, are examples of I/O devices. I/O activity is different from computational activity. When a program sends a document to the printer, it is engaging in I/O activity; when the program sorts a list of terms, it is engaging in computational activity.

Jumper
A wire that connects a number of pins on one end of a cable only, such as looping back Request to Send from Clear to Send pins 4 and 5.

Ladder Orientation
When the bar code's bars are positioned horizontally on the product, causing them to appear as a ladder. The ends of all bars will enter the scan window first.



LAN
The acronym for local area network. A LAN system is usually confined to the same building or a few nearby buildings, with all equipment linked by wiring dedicated specifically to the LAN.

Laser Gun
A hand-held non-contact laser scanner that is usually activated with a trigger.

Laser Scanner
An optical bar code reading device using a low energy laser light beam as its source of illumination.

Laser Printing
Laser printers use a pulsed or rastered laser light source to positively charge an image on a dielectric cylinder of an electrostatic printing mechanism. Toner used in the laser printing process adheres to the charged portion of the cylinder. This toner is then transferred to paper using heat.

Common Problems with laser printing
The labels are more expensive than those used in dot matrix printers.

Benefits of laser printing
Labels can be printed at various speeds. Laser printed bar code labels are high quality and very accurate.

LCD (Liquid Crystal Display)
A low-power display often used for notebook computers. An LCD consists of a liquid crystal solution between two sheets of polarizing material. An electric current causes each crystal to act like a shutter that can open to allow light past or close to block the light.

LDI (Lamp Driver Interface Board)

LED (Light Emitting Diode)
A semiconductor generally made from gallium arsenide, that can serve as a visible or near infrared light source when voltage is applied continuously or in pulses. LEDs have extremely long lifetimes when properly operated.

LF (Line Feed)
An ASCII control character that moves the cursor or print mechanism to the next line. (^J)

LMM (Light Monitoring Module)

mA
The abbreviation for milliampere(s).

Match
A condition in which decoded data matches data in the match entry.

Match entry
An output condition in which decoded data matches and the data in a match entry configuration.

Memory
A computer can contain several different forms of memory, such as RAM, ROM, and video memory. The term *memory* is generally used to define RAM. When a computer has 8 MB of memory, it actually has 8 MB of RAM.

Memory Address
A specific location, usually expressed as a hexadecimal number, in the computer's RAM.

Message
1) A meaningful combination of alphanumeric characters that establishes the content and format of a report. 2) In a communication network, the unit of exchange at the application layer.

Message buffer
Storage register for the temporary storage of data that allows decoding to continue while the host is retrieving data from the serial port.

Message buffer warning
An output condition that occurs when the message buffer has used a defined amount of the message buffer.

MHz
The abbreviation for megahertz.

Microprocessor
The primary computational chip inside the computer, referred to as the "brain". The microprocessor contains an arithmetic processing unit and a control unit. Software written for one microprocessor must usually be revised to run on another microprocessor.

Mil
One thousandth of an inch (0.001 inch). Bars and spaces of codes are commonly referred to as being a certain number of mils wide.

Misread
The scanner incorrectly decodes a bar code as it passes through the scan zone.

Modulo check digit or character
A calculated character within a data field used for error detection. The calculated character is determined by a modulus calculation on the sum or the weighted sum of the data field contents.

Mouse
A pointing device that controls the movement of the cursor on a screen. Mouse-aware software allows the user to activate commands by clicking a mouse button while pointing at objects displayed on the screen.

Moving-Beam
Rather than using a stationary laser beam and relying on product movement for a single scan, a multi-facet mirror wheel and motor is used to 'move' the beam across the code several times while in motion itself.

Moving-Beam Bar Code Scanner
A device that dynamically searches for a bar code symbol by sweeping a moving optical beam through a field of view called the scanning zone. Automatic bar code reader that reads codes by sweeping a moving optical beam through a field of view. Moving-beam scanners are usually mounted in a fixed position and read codes as they pass by.

MTBF
The abbreviation for mean time between failures.

Multidrop Line
A single communications circuit that interconnects many stations, each of which contains terminal devices. *See EIA-485.*

NAK (Negative Acknowledgment)
A control character used to indicate that the previous transmission block was in error and the receiver is ready to accept retransmissions.

Narrow Bar (NB)/Narrow Space (NS)
Smallest code element, bar or space, in the bar code symbol. Also known as the X dimension.

NCDRH (National Center for Devices and Radiological Health)
This organization (a service of the Food and Drug Administration) is responsible for the safety regulations governing acceptable limitations on electronic radiation from laser devices. Accu-Sort is in compliance with the NCDRH regulations.

Near Distance
The distance (in inches) from the face of the scanner to the closest point at which a code can be successfully scanned.

NEMA
In order to rate the quality of an enclosure the National Electrical Manufacturers Association (NEMA) has developed a system for rating all enclosures. A partial list of the NEMA enclosures is shown below along with what particles it is designed to restrict.

Ratings
- **3** Enclosures are intended for indoor or outdoor use primarily to provide protection against windblown dust, rain, and sleet, and is undamaged by the formation of ice on the enclosure.
- **4** Enclosures are intended for indoor or outdoor use primarily to provide protection against windblown dust and rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure.
- **4X** Enclosures are intended for indoor or outdoor use primarily to provide protection against corrosion windblown dust and rain, splashing water, and hose directed water; undamaged by the formation of ice on the enclosure.
- **6** Enclosures are intended for use indoors or outdoors where occasional submersion is encountered.
- **12** Enclosures are intended for indoor use primarily to provide a degree of protection against dust, falling dirt, and dripping non-corrosive liquids.
- **13** Enclosures are intended for indoor use primarily to provide a degree of protection against dust, spraying of water, oil, non-corrosive coolant.

Network
A series of stations (nodes) connected by some type of communication medium. A network may be made up of a single link or multiple links.

NVC
The acronym for non-valid code. Defines the condition that occurs when an object has been scanned and no bar code could be decoded. Usually, this indicates that either no code was on the object or the code was badly damaged and could not be decoded.

Node
The connection point at which media access is provided.

No-match
An output condition in which decoded data does not match an entry in the match code table.

No-Read
When the scanner is unable to decode a bar code as it passes through the scan zone.

Non-Read
The absence of data at the scanner output after an attempted scan due to no code, defective code, scanner failure or operator error.

Odd Parity
A data verification method in which each character must have an odd number of on bits.

Omnidirectional
Orientation is unpredictable and can be ladder, picket fence, or any angle in between. A single scan line is not sufficient to scan bar codes oriented omnidirectionally.

Operating Range
The sum of the scanner's optical throw and depth-of-field.

Optical Throw
Measured distance from the scanner's window to the near reading distance of the depth of field. Typically, this is the closest a bar code can be to the scanner's window and still be properly decoded.

Optimum Reading Distance
Typically, the center of the depth of field.

OCR
Optical Character Recognition.

Orientation
The alignment of the code's bars and spaces to the scan head. Often referred to as vertical (picket fence) and horizontal (ladder).

Output counter
A counter that is associated with each output condition. The counter increments by 1 each time the condition occurs.

Oversquare
Used to describe bar codes that are taller (from top to bottom of the bars) than they are wide (from first to last bar).

Trigger or Cart
The standard abbreviation for a signal indicating that an object is passing by the scanner is called Cart. This signal indicates to the scanner to start or stop reading.

Trigger or Cart Cycle
The time during which the scanner is attempting to read the bar code.

Hardware Cart
This is an electrical signal from a relay, photoeye, or proximity switch indicating that an object is passing by the scanner.

Start and End of Cart Photoeyes
The cart cycle begins when the start of cart photoeye is blocked and continues until the end of cart photoeye is unblocked. Relay decisions and data communication take place after the end of cart photoeye is unbroken. The diagram below shows start and end of cart photoeye placement.

Induct Photoeyes
The cart cycle begins when the start of cart photoeye is blocked and continues until the cart photoeye is unblocked. Blocking the INDUCT photoeye causes relay decisions and data communication. For this placement the distance between the CART and INDUCT photoeyes must be less than the minimum box size plus the minimum box spacing.

Software Cart
A serial message from an external device that controls the cart cycle.

Self Cart
This form of cart requires no input signal. The scanner is continuously attempting to decode bar codes. When a scanner is in self cart, there is no way of determining if there is a package present or a NO-READ.

Flip Lens
A moveable lens inside a scanner that increases Depth of Field.

Package Spacing
This is the spacing between items on a conveyor. Package spacing is measured one of two ways: Leading edge of one box to leading edge of the next or trailing edge of one box to trailing edge of the next. Package spacing is critical to system operations.

Parameter
A value or opinion that you specify to a program. A parameter is sometimes called a *switch* or an *argument*.

Parity Bit
A bit that is set at "0" or "1" in a character to ensure that the total number of 1 bits in the data field is even or odd.

Percent good reads
The number of successful reads per refresh period. This is valid only when the refresh period is set to 0.

Performance indicator
A bar code decoder function that counts the number of decodes during a trigger period. When the period = 0, the performance indicator provides the number of decodes (up to 100 attempts). Use the performance indicator to provide a general indication of bar code symbol quality or verify proper setup of the scanner.

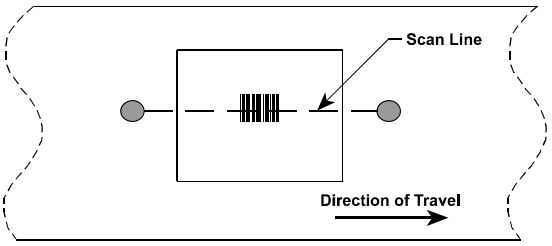
Performance indicator limit
A set point that will produce a discrete output if the performance indicator falls below the set point value.

Pen Scanner
A pen-like device either connected by wire to a device, or self-contained, used to read bar codes. Requires direct contact with the symbol.

Peripheral Device
An internal or external device, such as a printer, a disk drive, or a keyboard, connected to a computer.

Photoeye
Used as a presence detector to identify objects in the scanner's reading zone. The photoeye emits a beam and is used with a reflector to create a photoelectric circuit. When the beam is blocked by an object, breaking the circuit, a signal called CART is sent to the scanner.

Picket Fence Orientation
When the bar code's bars are positioned vertically on the product, causing them to appear as a picket fence. The first bar will enter the scan window first.



Pitch
Rotation of a code pattern about the X-axis. The normal distance between center line or adjacent characters.

Polarized Laser
A specialized laser source used in high glare environments.

Polling
A means of controlling devices on a multipoint line.

Protocol
A formal set of conventions governing the formatting and relative timing of message exchange between two communicating systems.

Pulse Width
A change from the leading edge of a bar or space to the trailing edge of a bar or space over time. Pulse width is also referred to as a transition.

Queue
A buffer used to hold data in order until it is used or transmitted.

Quiet Zone
Required distance before the first bar and after the last bar of the code that must be free of marks or printing.

Radio Frequency
Non-optical automatic identification devices that use radio waves to transmit data.

Raster
The process of projecting the laser beam at varied angles spaced evenly from each other. Typically, the mirror wheel surfaces are angled to create multiple scan lines instead of a single beam.

Raster Mirror Wheel
The standard mirror wheel forms the laser line that is projected from the scanner. Although the mirror wheel projects 8 separate lines (for an 8-sided mirror wheel), the speed of the sweep makes it appear that it is actually one line. This type of mirror wheel is adequate for a ladder orientation because the laser line will pass from the bottom to the top of the code. For a picket fence orientation the standard mirror wheel is not always adequate. One problem facing the picket fence orientation is that the same portion of the code is being repeatedly scanned. If the printing quality at this point is not good the label may not be scanned even though other parts of the label are good. Another problem for a picket fence orientation is the placement of the label. If the placement is off enough a single scan line will not read all the bar codes presented to the scanner.

Read-only
A read-only file is one that you are prohibited from editing or deleting. A file can have read-only status if:
- Its read-only attribute is enabled.
- It resides on a physically write-protected diskette.
- It is located on a network in a directory to which the system administrator has assigned read-only rights to you.

Read Zone
Area in front of the scanner's window in which the bar code should appear for scanning. This zone consists of the scan window and the raster width (if used).

Reflectance
The amount of light returned from an illuminated surface.

Relay
Relays are simply electrical switches that are typically used to control external diverts, alarms, etc. Relay types available are FORM A and FORM C. FORM C type relays have both normally open and normally closed contacts available while FORM A type relays have only normally open contacts available.

Relay Output Duration
This is the time (in seconds) after the relay is energized that it should be turned off.

Relay Output Delay
The time lapse between an event and the energizing of the relay.

Request To Send (RTS)
An RS232 modem interface signal which indicates that the DTE has data to transmit.

Resolution
The narrowest element dimension which can be distinguished by a particular reading device or printed with a particular device or method.

Response Time
The elapsed time between the generation of the last character of a message at a terminal and the receipt of the first character of the reply. It includes terminal delay and network delay.

ROM
The acronym for read-only memory. The computer contains programs essential to its operation in ROM. A ROM chip retains its contents even after you turn off your computer.

RPM
The abbreviation for revolutions per minute.

RS-232
Interface between data terminal equipment and data communication equipment employing serial binary data interchange.

RS422
The Electronic Industries Association standard that specifies the electrical characteristics of balanced voltage digital interface circuits.

RS485
The Electronic Industries Association standard that specifies the electrical characters of generators and receivers for use in balanced digital multipoint systems.

Scan
A single pass of the laser beam over the code or a portion of the code. The search for a bar code symbol that is to be optically recognized.

Scan Area
The area intended to contain a symbol.

Scan Window
The usable length of the scanning beam that may detect the bar codes. The scan window is perpendicular to the depth of field.

Scanner
An electronic device that optically converts printed information into electrical signals. These signals are sent to the decoder logic.

Scanner Orientation
Relationship of the scan head with reference to the bar code's location on products. The scan head must be set up to insure that all code bars and spaces are bisected at the same time. Typically, either side read or top read is used for picket fence or ladder code orientations.

SCSI
The acronym for small computer system interface. An I/O but interface with faster data transmission rates than standard ports. The user can connect up to seven devices to one SCSI interface.

Self-checking
A bar code or symbol using a checking algorithm which can be independently applied to each character to guard against undetected errors.

Sensor
A device that detects or measures something and generates a corresponding electrical signal to an input circuit of a controller.

Serial Port
An I/O port used most often to connect a modem or a mouse to your computer, identifiable by its 9-pin connector.

Serial Transmission
The most common transmission mode; serial, information bits are sent sequentially on a single data channel.

Serial Asynchronous Transmission Of Data
The following are common communications interfaces: RS232, RS422, RS485, 20mA current loop and RS423.

When data is transmitted serially from a communications port, the information is transferred between the two devices one data bit at a time. The data flow can follow one of three different communications modes: simplex, half duplex, or full duplex. Each character of data within the data flow is transported in a binary bit frame called the asynchronous data frame.

The start bit begins each frame. A low voltage signal on the data communications line marks the beginning of the start bit, at which point the receiving device begins looking for binary zeros and ones (0's and 1's).The following five to eight data bits (the number depends on the format used) comprise the binary character. For error detection, an optional parity bit can define whether the total number of zeros or ones was even or odd. There are five different parity selections as shown below:

ODD
last data bit is a logical 0 if the total number of logical 1's in the first seven data bits is odd.

EVEN
last data bit is a logical 0 if the total number of logical 1's in the first seven data bits is even.

MARK
last data bit is always a logical 1 (i.e.: high/mark).

SPACE
last data bit is always a logical 0 (i.e.: low/space).

OFF (NONE)
last data bit is not present.

The method used to catch errors by using parity bits is as follows: When the transmitter frames a character, it tallies the number of 0's and 1's within the frame and attaches a parity bit. (The parity bit varies according to whether the total is even or odd.) The

receiving end then counts the 0's and 1's and compares the total to the odd or even recorded by the parity bit. If a discrepancy is noticed by the receiving end, it can flag the error and request a retransmission of the data.

A stop bit is used to signal the end of the character. (Stop bits are typically one or two bits in length. The slower the transmission speed, the more stop bits required for recognition of the end of the data frame.)

In addition to the direction of data flow and the data framing, there are other considerations to insure uniform transmissions. Certain operating parameters must be followed to prevent the loss of valuable data.

The first consideration is the speed of transmission, known as baud rate. Serial data transmission is measured in bits per second (BPS). The baud rate selections typically available are: 110, 300, 1200, 2400, 4800, 9600 and 19200. To enable two devices to interact, they must both be transmitting/receiving data at the same baud rate. If it is not possible to do this, there must be a buffer (typically additional storage memory) that accommodates the differences in communications speed.

Many serial communications links also use a flow control system to handle data transmission in addition to memory buffers.

X-ON/X-OFF Protocol
A common type of flow control is the X-ON/X-OFF protocol. When a receive buffer nears its memory capacity, the receiving device sends an ASCII X-OFF signal to the transmitting device, telling it to stop sending data. When the memory buffer has enough space to handle more data, the X-ON signal is sent to the transmitting device, telling it to start sending data again.

ACK/NAK Protocol
Another common protocol is ACK/NAK protocol. When the device transmits a message to the host, the host responds with either an ACK (06H) or a NAK (15H). If the host transmits an ACK to the device, the device deletes its transmit message and the communication sequence is complete. If the host transmits a NAK, the device will retransmit. The device resends data a maximum of three times. Optionally this may be changed to 1, 2, 3, or infinite retransmits by the user. If the device receives a fourth NAK, it will delete the data in its transmit buffer and display "MAX REXMITS".
A transmitting device ignores ACK and NAK characters received during data transmission. If, for example, a device receives a NAK during a data transmission, it will not resend the data at the completion of the transmission.

The device also has a retransmit timer. This timer is activated each time the device transmits data to the host. If the timer runs for two seconds (this is also changeable) and the device does not receive an ACK or NAK from the host, a timeout occurs and the device retransmits its data. Each time the device retransmits because of a timeout, it treats the timeout the same as receiving a NAK from the host computer. If the device does not receive an ACK before the end of the fourth timeout, it will delete the data in its transmit buffer and display "MAX REXMITS". The device deletes data in its transmit buffer and displays the error message when any combination of four timeouts and NAKs from the host occurs.

When the device receives a message from the host, it calculates the BCC for the message and compares the calculated BCC to the received BCC. If the two values match, the device transmits an ACK, ending the communication. If the values do not match, the device transmits a NAK to the host and waits for the host to retransmit the message. The host, like the device, should retransmit a maximum of three times.

The sequence number starts at zero (30H) and is incremented each time a device transmits a new message. When the sequence number reaches nine (39H), it wraps around to one (31H). If the sequence number skips a number, the receiving device knows that a message was lost. If the same sequence number is received on two sequential messages, the second message is responded to with an ACK or NAK (as appropriate) and ignored.

Shielding
Protective covering that eliminates electromagnetic and radio frequency interference.

Side Read
The scanner is mounted to read the side of a box as it passes by the head.

Signal
An impulse or fluctuating electrical quantity (i.e.: a voltage or current) the variations of which represent changes in information.

Skew
Rotation about the Y-axis. Rotational deviation from correct horizontal and vertical orientation; may apply to single character, line or entire encoded item.

Space
The lighter elements of a bar code symbol formed by the background between bars.

Specular Reflections
A condition when the laser light is reflected back from the code's surface at an angle equal, or nearly equal, to the angle of incidence of the laser light. This condition makes it difficult for the scan head to detect the differences in light variation caused by the code's bars and spaces.

Spot
The undesirable presence of an area of low reflectance in a space.
start and stop characters

Stacked Codes
16K and Code 49 are examples where a long symbol is broken into sections and "stacked" one upon another similar to sentences in a paragraph. Extremely compact codes.

Start Bit
In asynchronous transmission, the first bit or element in each character, normally a space, that prepares the receiving equipment for the reception and registration of the character.

Stop Bit
The last bit in an asynchronous transmission, used to indicate the end of a character, normally a mark condition, that serves to return the line to its idle or rest state.

STX (Start of Text)
A transmission control character that precedes a text and is used to terminate a heading. (^B)

Symbol
A combination of characters including start/stop and checksum characters, as required, that form a complete scannable bar code.

Symbologies
Code 39
A bar code with a full alphanumeric character set, a unique start and stop character, and three other characters. The name is derived from its code structure, which is 3 wide elements out of a total of 9 elements. The nine elements consist of five bars and four spaces.

Code 128
A bar code symbology capable of encoding the full ASCII 128 character set. It encodes these characters using fewer code elements per character resulting in a more compact code. It features a unique start and stop character for bidirectional and variable length decoding, both bar and space character parity for character integrity, a check character for symbol integrity, a function character for symbol linking, and spare function characters for unique application definition and/or future expansion.

Interleaved 2 of 5 (I 2of5)
A bar code with a numeric character set with different start and stop characters. The name is derived from the method used to encode two characters. In the symbol, two characters are paired together using bars to represent the first character and the spaces to represent the second. This interleaved structure allows information to be encoded in both the bars and the spaces. A start character, bar and space arrangement, at one end, and a different stop character bar and space arrangement at the other end, provide for bidirectional decoding of this symbol.

Syntax
The rules dictating how you must type a command or instruction so the computer will understand it.

***System.ini* file**
When you start Windows, it consults the system.ini file to determine a variety of options for the Windows operating environment. Among other things, the system.ini file records which video, mouse, and keyboard drivers are installed for Windows. Running the Control Panel or Windows Setup program may change options in the system.ini file.

Tag
A collection of information associated with a single variable or I/O point.

Two-width symbology
A bar code symbology whose bar and spaces are characterized simply as wide or narrow. Codabar, Code 39, and Interleaved 2 of 5 are examples of two-width symbologies.

Terminal Program
Computer software that sends, receives, and displays serial data.

Thermal Printing
Thermal printers use heated print heads and special heat activated paper. There are two types of thermal printers. One uses a method similar to the dot matrix printer where an array of heated dots move along the paper and form the character or bar code.

The other method uses a heated bar and the paper moves across the bar. Another type of thermal printer is called a Thermal Transfer printer. The main difference between this type of printer and a thermal printer is the use of heat sensitive ribbons as opposed to heat sensitive paper. This type of printing is permanent on label stock.

Common Problems with thermal printing
Since the paper used is heat activated the labels will deteriorate over time in a warm environment. Infrared scanners cannot detect the bar codes and consequently a visible red light laser must be used to scan these codes.

Benefits of thermal printing
Thermal printers are quiet and inexpensive.

Thermal Transfer
A printing system like thermal except a one-time ribbon is used and common paper is used as a substrate. Eliminates the problems of fading or changing color inherent in thermal printing.

Tilt
Rotation around the Z axis. Used to describe the position of the bar code with respect to the laser scan line.

Trigger
(Also known as cart) A signal, typically provided by a photoeye or proximity switch, that informs the scan head of the presence of an object within its reading zone.

UCC (Uniform Code Council)
The organization which administers the UPC and other retail standards.

Undersquare
Used to describe bar codes that are longer (from the first to last bar) than they are high (from the top to bottom of the bars).

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

UPS
The abbreviation for uninterruptible power supply. A battery-powered unit that automatically supplies power to your computer in the event of an electrical failure.

Utility
A program used to manage system resources including memory, disk drives, and printers.

Vane Raster
Decreases the amount of scans possible due to a smaller percentage of scans bisecting the code.

Verifier
A device that makes measurements of the bars, spaces, quiet zones and optical characteristics of a symbol to determine if the symbol meets the requirements of a specification or standard.

Vibrating Vane
A variable raster that can have an unlimited number of raster lines. It covers a larger area and is adjustable.

Visible Laser Diode
A light source used in scanners to illuminate the bar code symbol. Generates visible red light at wavelengths between 660 and 700 nM. Replaced Helium-Neon tubes in most scanners because they are small and consume less power.

Void
The undesirable presence of an area of high reflectance in a bar.

Wand Scanner
A hand-held contact laser scanner that an operator guides across the bar code.

Wedge
A device that plugs in between a keyboard and a terminal. It allows data to be entered either by keyboard or by various types of scanners.

Wide Bar (WB)/Wide Space (WS)
Widest code element, bar or space, in the bar code symbol.

Wide to Narrow Ratio
Dividing the size of the wide elements by the size of the narrow elements of a bar code yields the bar and space ratios. Bar and space ratios can differ. NOTE: If the narrow bar and narrow space are equal and the wide bar and wide space are equal then you calculate only one ratio.

Window
A display area that the users interacts with to operate a tool.

Word
A unit of data which contains two bytes (16 bits).

Write-protected
Read-only files are said to be *write-protected*. You can write-protect a 3.5-inch diskette by sliding its write-protect tab to the open position and a 5.25-inch diskette by placing an adhesive label over its write-protect notch.

"X" Dimension
The dimension of the narrowest bar and narrowest space in a bar code.

XON
A control character sent by the receiving device to signal the transmitting device to begin sending data.

XOFF
A control character sent by the receiving device to signal the transmitting device to stop sending data.

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Revision History ▼

Document Revision Number	ECN Number	Date	Changes Made
1.0	5962	11/16/00	rev 1.0 release for Small Scanner CD-ROM (p/n 1000025606)
1.1	5731	01/23/01	new part numbers added for OTS distributor units