Model 20 Series II

Bar Code Scanner

OPERATIONS AND MAINTENANCE MANUAL

Revision: 2.2 Release Date: 12/02

Product Addendum

Model 20 Operations Manual
Model 22 Operations Manual

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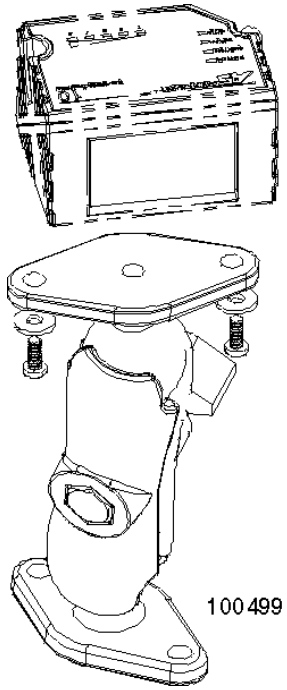
Introduction

This addendum documents an additional mounting option for your Model 20 and 22 laser scanners. This information supersedes any similar information in your manual.

Specifications

This new mounting assembly p/n 100499 can be used to mount the Models 20 and 22 to any structure. It is shown below with a Model 10. To use the 100499 with a Model 20 an M26B is required. To use with a Model 22, a MDL22-8B is required.



INTRODUCTION

This is the Operations and Maintenance Manual for the Model 20. It provides details on everything you need to know to unpack, set up, operate, and maintain your system.

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

This document does not provide detailed information about any equipment used in or with this system that Accu-Sort Systems does not manufacture.

This manual is not a troubleshooting or service procedure guide. Customers can purchase technical service training directly from Accu-Sort. Direct any questions about detailed troubleshooting or service to the Accu-Sort Systems Customer Service Department.

MANUAL REVISIONS

This Operations and Maintenance Manual is under revision control. Any addenda 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 less than 0.1 is automatically considered preliminary. Any document with a revision 1.0 or greater 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.

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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 20 Serial Tag

Serial Number Breakdown:

WWXXXXXX (YY...)

WW - Two digit year of manufacture
XXXXXX - Six digit sequential build number
Y - Optional suffix(es) that reflect actual catalog options for the off-the shelf units

Model 20 Suffix		Interface Box Suffix		Add Ons	
A	Standard	A	Without relays	Z	Custom
B	High Density	B	With relays	ZR1	Custom 1@10 Raster
C	High Speed			ZR2	Custom 1/2@10 Raster

- ex: M20A would have "A" as suffix
- at least 6 digits can be placed on the tag
- if "Z" is called out, this indicates a custom unit requiring folder
- could be used for special designations

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

SAFETY RECOMMENDATIONS AND PRECAUTIONS

The Model 20 is an electronic microprocessor-based imaging unit. 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.

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

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.

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.

Measures must be taken to prevent Electrostatic Discharge (ESD) at all times when the cover is off the Model 20. Circuit Boards are at the most risk. *See Safety Recommendations and Precautions - Electrostatic Discharge.*

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.

WHEN UNPACKING AND MOUNTING

- Do not drop the unit
- Do not touch the exit window glass

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.

WARNING
If for any reason your Model 20 does not work, do not attempt to open the unit. The Model 20 is designed to be returned to the factory for repair/replacement.

GENERAL PRECAUTIONS

Please follow these precautions:

- Avoid staring at the laser beam. Staring at the laser beam for prolonged periods could result in eye damage.
- Do not create any obstructions of airflow to the unit. Keep the area around the unit clean to provide for cooling.
- 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.
- 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 source.
- 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 20. If a cable is damaged in any way, replace it.
- Routinely examine all wiring and plugs for any signs of exposed wire or deteriorating insulation.
- Check mounting hardware periodically for tightness and stability.
- Do not use sheet rock or wood as a mounting surface for the Model 20. Use steel or aluminum as a mounting structure.

LASER SAFETY

To prevent possible exposure to laser light that may exceed the CDRH's Accessible Emission Limit for a Class II laser, your Model 20 has a "Scanning Safeguard" feature which shuts off the laser power if the mirror wheel fails to rotate. This ensures that a stationary laser beam cannot exit the scan head.

The following software command has been provided as an alternate to the beam attenuator. When <ESC><ESC><ESC> is sent to the scanner, it causes the unit to turn the laser off. The commands 1600 (save), 1602 (abort), or 1603 (use) will cause the laser to turn back on.

The use of optical instruments with this product will increase eye hazard. Do not look into the laser beam with instruments such as telescopes, binoculars, or cameras.

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

GROUNDING THE MODEL 20

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

- Ensure your AC power outlet has a properly grounded receptacle.
- Make sure you have the appropriate power cord for your country before turning on the unit.
- 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 cut or remove the round grounding prong from the plug under any circumstances.
- Do not use an extension cord to defeat the ground.

ELECTROSTATIC DISCHARGE

Electrostatic discharge (ESD), the transfer of static electricity from one object to another, is an often-unnoticeable hazard to electronic components. Boards and other devices with integrated circuits are particularly sensitive to ESD damage. Product failures may not occur until days or weeks after the component was damaged.

Static damage to components can take the form of upset failures or catastrophic failures (direct and latent).

An upset failure occurs when an electrostatic discharge is not significant enough to cause total failure, but may result in intermittent gate leakage, causing loss of software or incorrect storage of information.

Direct catastrophic failures occur when a component is damaged to the point where it is permanently damaged.

The following note box is displayed where ESD precautions must be followed:

Measures must be taken to prevent Electrostatic Discharge (ESD) at all times when the cover is off the Model 20. Circuit Boards are at the most risk. *See Safety Recommendations and Precautions - Electrostatic Discharge.*

Five Basic Rules for ESD Control

Below are some keys to effectively control unnecessary ESD damage. When working with ESD-sensitive devices:

- Define an ESD protective area and work on the ESD-sensitive devices in this area only;
- Define the sensitivity of devices to be handled in the ESD protective area;
- Establish a suitable static control program that both limits static generation to less than the damage threshold of the most sensitive device in the environment, and provides a safe, defined path for the dissipation of static charges;
- Prevent contamination of the protective area by unnecessary non-static controlled materials; and
- Audit the ESD protective area regularly to ensure that static control is maintained. Document the findings for future reference.

LABEL LOCATIONS

The following labels identify areas of the Model 20 that require special precautions or handling, or provide general information.

Label Locations

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Getting Started With Your Model 20

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ABOUT THE MODEL 20

Accu-Sort presents the Model 20 Bar Code Scanning System, one of the smallest complete scanning systems available. Most bar code scanning and decoding applications need an external decoder/logic unit and a remote scanning head. The Model 20, however, has a built-in decoder/logic.

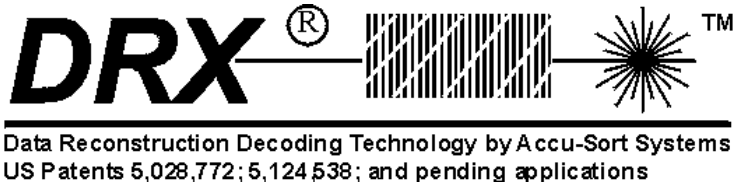
Accu-Sort Systems developed the Model 20 with the various needs of their customers in mind. Because of this, the Model 20 is designed with many powerful features that make bar code scanning easier to implement and maintain. The standard features include:

- RISC Processor
- Operator LED indicators
- Autodiscrimination of bar code symbologies
- Preset scanning distances for a wide variety of code densities
- Automatic Laser Control (ALC) to automatically adjust for deviations in bar code color, quality, and reflectance

Optional features designed to enhance the performance of the Model 20 are also available. These features include:

- High Density scanning
- Accu-Sort's patented DRX technology
- High speed scanning (700 scans per second)

If your unit uses Accu-Sort's patented DRX technology, the following patent numbers apply:



PRODUCT SPECIFICATIONS

Physical	
Size	2.34" L (59.4 mm) x 2.12" W (53.8 mm) x 1.41" H (35.8 mm)
Weight	5 oz. (140 grams)
Enclosure	NEMA 12 standard (gasketed, drip-proof and dust-tight)
Visual Diagnostics	One multifunction LED that indicates Power, Object Detection, Laser and Go/No Read
Environmental	
Temperature Range	32 to 104°F (0 - 40°C)
Operating Parameters	
Power Requirements	500 mA at 5 VDC
Radiant Power Output	<5.0 mW (650nm)
Scan Rate	500 scans per second (standard); 300 scans per second (high density and long range); 700 scans per second (high speed)
Scanning Range	1" (25.4mm) to 12" (304.8mm)
Bar Code Types	All standard 1D symbologies
Communications	RS232, RS422, RS485, Current loop (with interface box option), and programmable I/O

DECODING BAR CODES

The Model 20 scans a bar code, turns the reflected light into electronic signals and then amplifies the signals. It then converts the analog signal to digital pulses.

The Model 20 is designed with a powerful RISC (Reduced Instruction Set Computer) processor. The RISC processor determines the width of each bar and space based on the time it took the laser to sweep across each of the elements in the bar code.

The Model 20 transmits the decoded bar code information to a CRT or host computer.

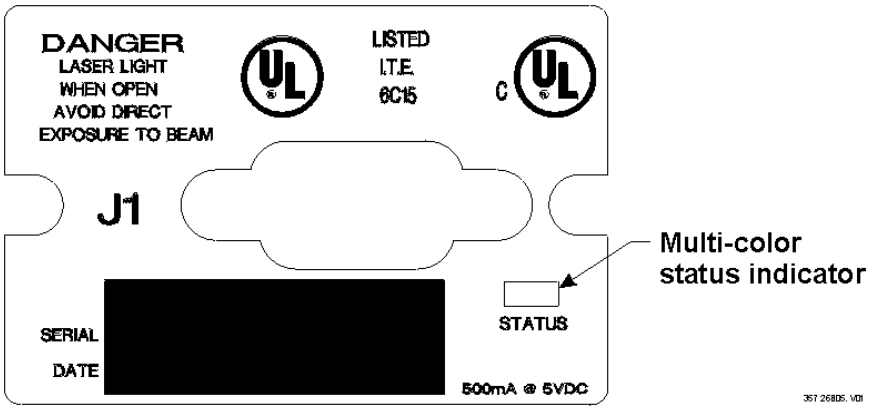
HOW YOUR MODEL 20 SCANNING SYSTEM WORKS

As soon as you set up and install your Model 20 as discussed in the remaining chapters of this manual, it is ready to read bar codes.

The Model 20 has one multi-color LED indicator at the rear of the unit that provides you with operational information. The location of this LED is shown in the following drawing. The LED provides status on power (idle), trigger (carton presence), good read, no read or non-valid code (NVC), and failure. The following are descriptions of each LED.

LED ACTION	STATUS	DESCRIPTION
Blinking Yellow	Idle	Model 20 has power, is not triggered, and is functioning normally
Solid Yellow	Trigger	Model 20 laser is on, and either the trigger input is active or the unit is in continuous read mode
Green for ½ second	Good Read	Model 20 has successfully decoded a bar code
Solid red for ½ second	No Read	Model 20 was not successful in decoding a bar code, or a non valid bar code was detected
Flashes in red, yellow, green sequence	Confirming Setup Mode	Model 20 is in setup mode
Solid red for an extended period of time or blinking red	Failure	Model 20 has detected a malfunction or is not functioning up to specifications (in either of these cases, contact Accu-Sort)

For additional information see the Problem/Solution list in Chapter 4 (Troubleshooting).



Model 20 Status LED Location

EXAMPLES OF LED FUNCTIONALITY

The following are two scenarios of how the Model 20 Status LED works:

When your Model 20 is programmed for Hardware or Serially Controlled Trigger (Refer to your *Accu-Setup Suite Small Scanner Module Programming Manual*), the following sequence of events should occur:

1. When the Model 20 is supplied with power, and nothing triggers the unit, the status LED blinks yellow.
2. When the trigger signal is activated (example; a box blocks the photoeye), the status LED turns to solid yellow for the amount of time the box blocks the triggering device.

Solid yellow always indicates that the laser is on.

Then:

- the status LED changes to green for 1/2 second if the Model 20 successfully decodes the bar code

-OR-

- the status LED changes to red for 1/2 second if the Model 20 does not successfully decode the bar code

3. The status LED changes back to blinking yellow until the trigger signal (could be a serial character or hardware transition) is activated again.

When your Model 20 is programmed for Continuous Read (refer to your *Accu-Setup Suite Small Scanner Module Programming Manual*), the following sequence of events should occur:

The Model 20 ignores any trigger input, hardware or serial.

1. When the Model 20 is supplied with power, the status LED blinks yellow for about five seconds, then it turns solid yellow, indicating read mode.
2. The status LED changes to green for 1/2 second every time the Model 20 successfully decodes the bar code.
3. The status LED then changes back to yellow.

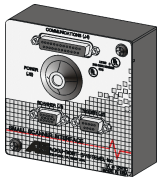
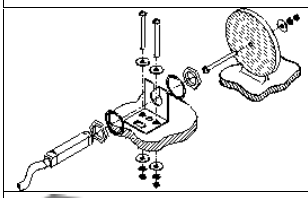
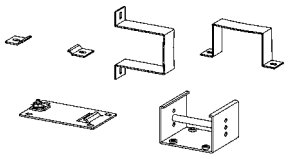
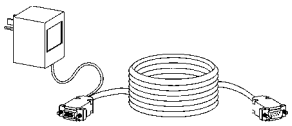
With this scenario, the status LED never turns red, because it does not know when something passes in front of the Model 20.

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

As soon as you open the box(es), 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 20 packaging was specifically designed to protect the unit during shipment. **Do not throw it away**. Save all the packaging materials for possible future use.

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		
Part	**Part Number**	**Description**
	1000017344	Model 20 Custom Assembly
	1000017345	Model 20 Custom 1 @ 10 Raster Assembly
	1000017346	Model 20 Custom .5 @ 10 Raster Assembly
	OTS Distributor Units	
	1000025478	Model 20, Standard, Linear Decoding, 12 Sided Mirror
	1000025479	Model 20, Standard, DRX Decoding, 12 Sided Mirror
	1000025480	Model 20, Standard, Linear Decoding, .5@10 Raster
	1000025481	Model 20, High Density, Linear Decoding, 12 Sided Wheel
	1000025482	Model 20, High Density, DRX Decoding, 12 Sided Wheel
	1000025483	Model 20, High Density, Linear Decoding, .5@10 Raster
	1000025484	Model 20, High Speed, Linear Decoding, 12 Sided Wheel
	1000025485	Model 20, High Speed, DRX Decoding, 12 Sided Wheel
	1000025486	Model 20, High Speed, Linear Decoding, .5@10 Raster
	1000017362	Small Scanner Interface without relays
	1000017365	Small Scanner Interface with relays
	1000014575	Interconnect Cable
	The Small Scanner Interface connects to the Model 20 to provide a regulated 5 VDC. The Interface also separates the power input, communication port and hardware trigger input into three discrete connectors, making it easy to use the Model 20 with existing equipment without having to wire these lines directly into the Model 20. Use the interconnect cable to connect the interface box to the Model 20.	
	1000020527	Photoeye
	This is a photo-electric eye that sends a signal to the Model 20 when something blocks its path of light. Photoeyes provide one way to trigger the Model 20 when an object arrives and when an object leaves the scanner.	
	1000022163	110V AC Power Supply, connects to interface box only
	1000017359	110V AC Local Power Supply, connects to Model 20 only
	1000015618	220V AC Power Supply, connects to interface box only
	1000017360	220V AC Local Power Supply, connects to Model 20 only
	1000017384	Mounting Clips
	1000017383	Ladder Mounting Bracket
	1000017382	Picket Fence Mounting Bracket
	1000017379	Mounting Plate
	1000017380	Cradle Mounting Bracket
	Five different mounting options are offered. All of the options depend on the type of application they are to be used in.	
	1000017381	110V AC Model 20 Programming Kit
	1000017382	220V AC Model 20 Programming Kit
	The programming kit connects the Model 20 to a standard 9 pin serial port on the back of a personal computer when setting-up the Model 20 software. The PC setup program is called Accu-Setup. Refer to the Accu-Setup Suite Small Scanner Module Programming Manual for details about programming the Model 20. This kit can be used to provide only power and RS232 communications, if no other signals are to be used in the application.	

Parts Table

	Be careful when making any electrical connections. Electric shock is possible when making any contact with electricity.
	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.

Chapter Two ▼ *Contents*

MOUNTING YOUR MODEL 20

When you mount your Model 20, make sure there is enough space around the unit for the connections to the accessories needed for your application. There must also be enough room to allow the Model 20 and its equipment to stay cool. The minimum space requirements for the Model 20 are as follows:

Minimum Space Requirements for Mounting	
Overhead	Enough room for air flow
Back	2.25" (5.7 cm) for connections
Sides	Enough room for air flow
Front	No obstructions between the scanner and the bar code to be scanned during the read cycle

There are many different ways to mount the Model 20. You can purchase the following five pieces of equipment from Accu-Sort to mount the Model 20:

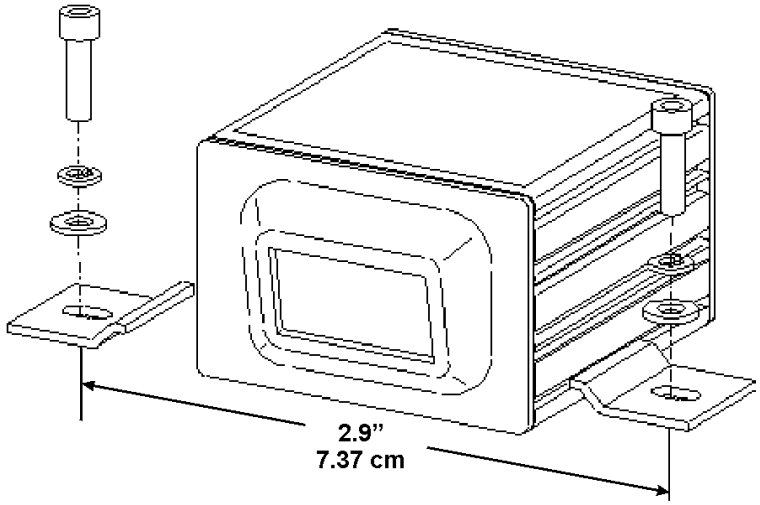
CLIPS

There are two mounting clips designed to hold the Model 20 in a position so the scan line is parallel to the mounting surface. Each clip has an oblong slot designed for a #6 mounting screw. The mounting screws are to be located 2.9" (7.37 cm) apart. Insert the mounting clips into the grooves on the sides of the Model 20, as shown below.

You can use any type of fasteners with these mounting brackets, as long as they are compatible with the mounting surface.

To mount the Model 20:

1. Fasten one clip to the mounting surface.
2. Slide the clip into one of the grooves on the side of the Model 20.
3. Place the remaining clip in the groove on the same level on the other side of the Model 20.
4. Fasten the remaining clip to the mounting surface. This ensures a tight mount so the Model 20 does not have any room for movement during operation.



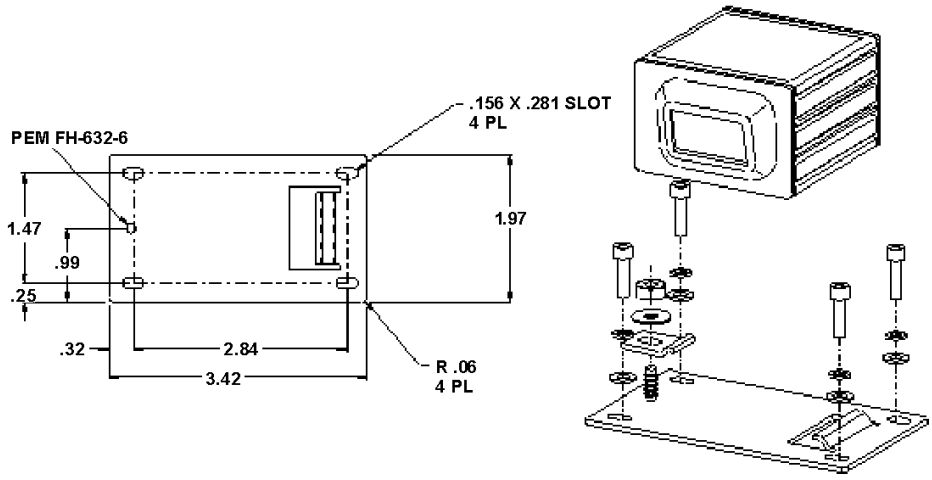
Mounting the Model 20 Using Mounting Clips

MOUNTING PLATE

There is one mounting plate, one mounting clip, one #6-32 nut, and one #6 internal tooth lockwasher included with this assembly. The mounting plate is designed to hold the Model 20 in position so the scan line is parallel to the mounting surface. The plate is rectangular with an oval slot near corners. The slots are designed for #6 mounting screws.

To mount the Model 20:
1. Fasten the plate to the mounting surface.
2. The plate has one fixed retaining clip, one #6-32 stud and one #6 nut that holds the adjustable clip. Place the Model 20 in position so the slot on the side of the housing is engaged by the fixed clip.
3. Move the adjustable clip towards the Model 20 until it engages the other slot of the Model 20 housing.
4. Tighten the nut on the stud to secure the Model 20.

This ensures a tight mount so the Model 20 does not have any room for movement during operation, and it also allows you to remove the Model 20 and replace it with the use of only one nut.



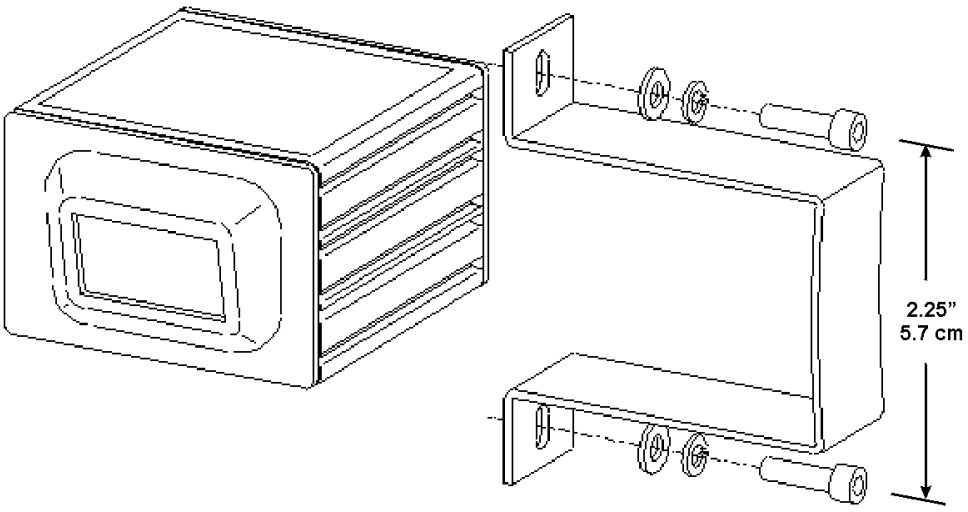
Mounting the Model 20 Using the Mounting Plate

LADDER MOUNTING BRACKET

The ladder mounting bracket is designed to hold the Model 20 in a position so the scan line is perpendicular to the mounting surface. The bracket fits around the Model 20, but is not directly secured to the Model 20. Flanges on the bracket provide oblong slots that are designed for #6 mounting screws on either side of the Model 20. Mounting screws need to be located 2.25" (5.7 cm) apart.

To mount the Model 20:

1. Place the bracket around the Model 20 so the support of the bracket rests on one of the sides of the Model 20, as shown below.
2. Place the mounting bracket, with the Model 20 clamped inside, against the mounting surface.
3. Insert and tighten the mounting screws in the oblong slots on the bracket. This ensures the Model 20 is secured within the bracket against the mounting surface.



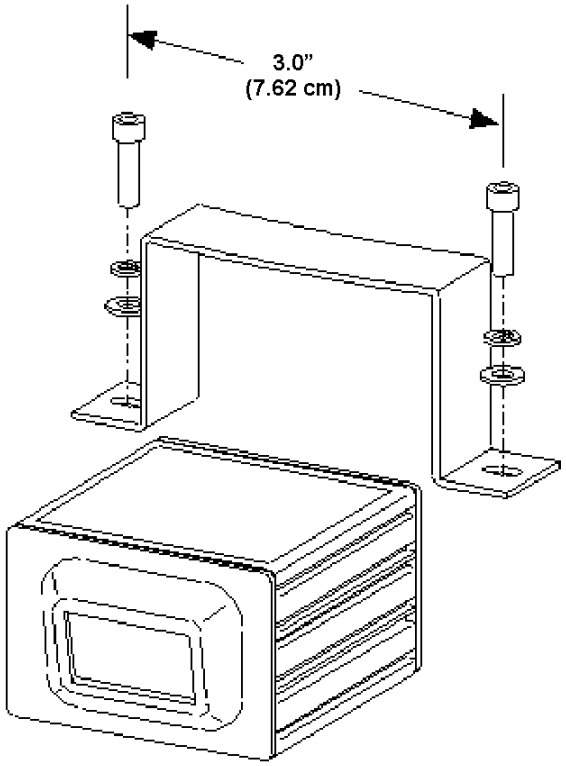
Mounting the Model 20 Using the Ladder Mounting Bracket

PICKET FENCE MOUNTING BRACKET

The picket fence mounting bracket is designed to hold the Model 20 in a position so the scan line is parallel to the mounting surface. The bracket fits around the Model 20, but is not directly secured to the Model 20. Flanges on the bracket provide oval slots that are designed for #6 mounting screws on either side of the Model 20. Mounting screws need to be located 3" (7.62 cm) apart.

To mount the Model 20:

1. Place the bracket around the Model 20 so the backing of the bracket rests on top of the Model 20, as shown below.
2. Place the mounting bracket, with the Model 20 clamped inside, against the mounting surface.
3. Insert and tighten the mounting screws in the oblong slots on the bracket. This ensures the Model 20 is secured within the bracket against the mounting surface.



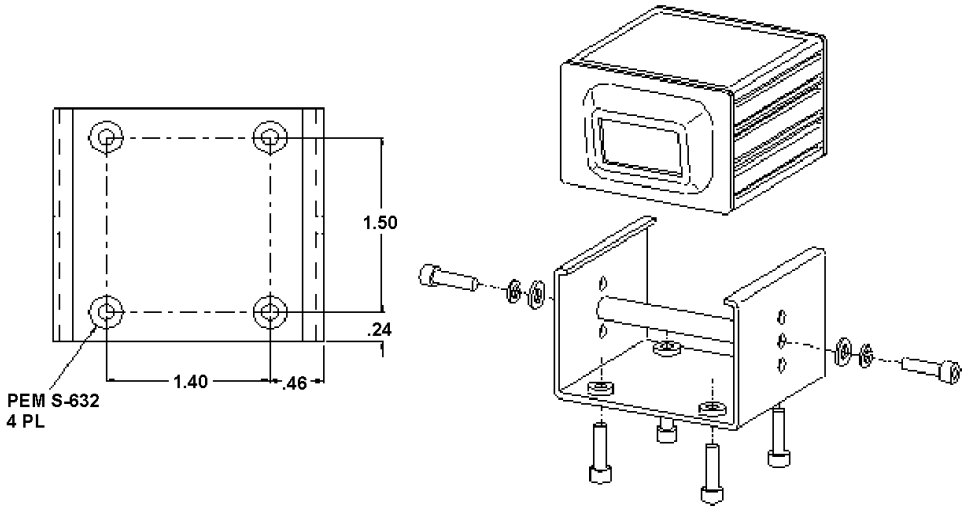
Mounting the Model 20 Using the Picket Fence Mounting Bracket

CRADLE MOUNTING BRACKET

There is one cradle mounting bracket, one 2-1/8" #6-32 round spacer, two 3/8" #6-32 socket head cap screws, two #6 flat washers, and two #6 split lockwashers included with this assembly. The cradle-mounting bracket is designed to hold the Model 20 in a position so the scan line is parallel to the mounting surface. Four #6-32 pem nuts are provided on the bottom of the bracket.

The top edges on both sides of the cradle are bent at a 90-degree angle. This results in two flanges that fit into the slots on the sides of the Model 20. There are six slots on each side of the Model 20. Different sets of slots can be used with the following results:

Bottom Slots	Overall height (bracket and Model 20) 2.75"
Four up from bottom	Overall height (bracket and Model 20) 2.05"



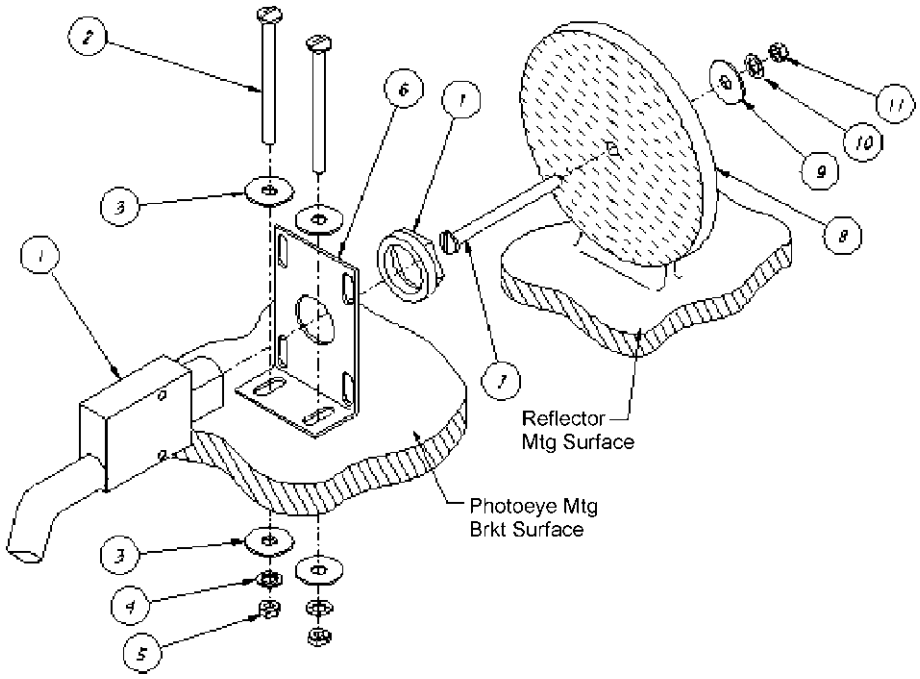
Mounting the Model 20 Using the Cradle Bracket

MOUNTING THE PHOTOEYE

This section describes how to mount your photoeye to the photoeye mounting bracket. Photoeyes work by bouncing a light beam off a reflector and detecting when something breaks the path of light. In order for your photoeyes to work properly, you must make sure the following things are done:

- The photoeye must have a reflector mounted directly opposite it on the other side of the conveyor.
- The photoeye must be mounted so the light exit window is perpendicular to the conveyor, facing the reflector.
- The reflector must be mounted perpendicular to the conveyor, facing the photoeye.

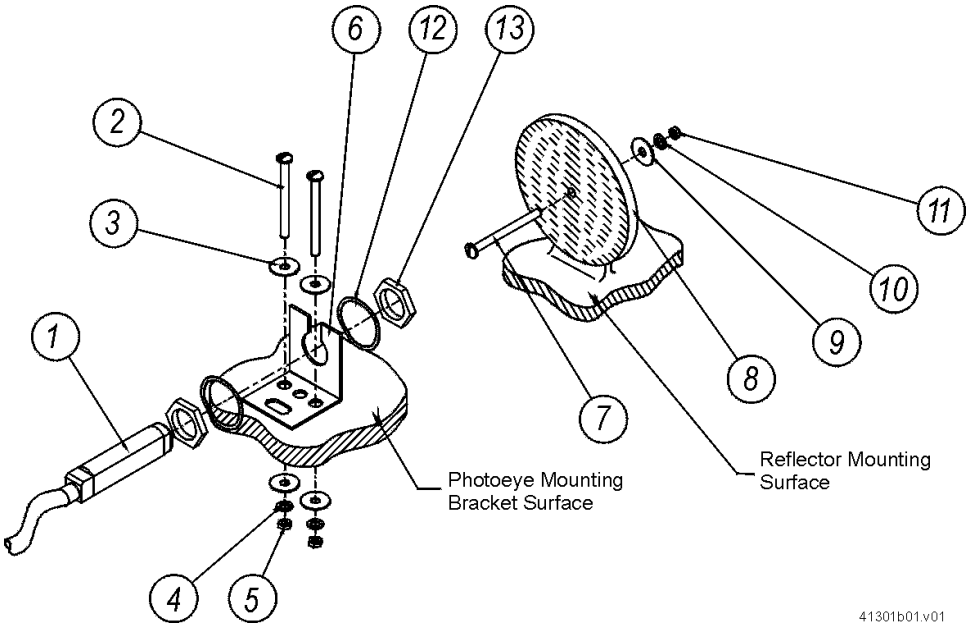
Use the following drawings to help you mount your photoeye. The tables provide information pertaining to each item number in the drawing.



Photoeye Mounting Diagram

Use the following table to match item numbers with the photoeye mounting diagram above:

Quantity Required	Description	Part Number	Item Number
1	#8-32 Nut	1000018466	11
1	#8 Internal Tooth Lock Washer	1000016778	10
1	#8 Flat Washer	1000022114	9
1	3” Reflector	1000013792	8
1	8-32 2” Machined Pan HD	1000010689	7
1	Model 30 PE Mtg. Bracket	1000011711	6
2	#6-32 Nut	1000018459	5
2	#6 Internal Tooth Lock Washer	1000016776	4
4	#6 Flat Washer	1000022111	3
2	6-32 2” Machined Pan HD	1000009740	2
1	Polarized Photoeye	1000013425	1



Photoeye Mounting Diagram

Use the following table to match item numbers with the photoeye mounting diagram above:

Quantity Required	Description	Part Number	Item Number
1	Polarized Photoeye	1000013425	1
2	1/4-20 x 2" Machined Pan HD		2
4	1/4-20 Flat Washer	1000022104	3
2	1/4-20 Internal Tooth Lock Washer	1000016772	4
2	1/4-20 Nut	1000018475	5
1	Photoeye Mounting Bracket		6
1	8-32 x 2" Machined Pan HD	1000010689	7
1	3" Reflector	1000013792	8
1	#8 Flat Washer	1000022114	9
1	#8 Internal Tooth Lock Washer	1000016778	10
1	#8-32 Nut	1000018466	11
2	M18 Spring Lock Washer		12
2	M18 Nut		13

SETTING UP YOUR MODEL 20

Follow the steps below to set up your Model 20 Scanning System:

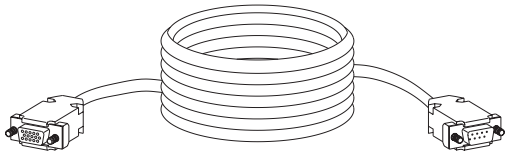
1. Remove all materials from the box.
2. Check the materials against the packing list and make sure everything is there.
3. Make sure none of the parts are broken.
4. Make all the appropriate connections to your Model 20 as explained in Chapter Three.
5. If you need to make any programming changes to your Model 20, connect your Model 20 to a PC or TERMINAL as described in Chapter Three, and refer to your Accu-Setup Small Scanner Module Programming Manual.
6. Mount your Model 20 as described earlier in this chapter.
7. Begin reading your bar codes.

If you have any problems or questions concerning setting up your Model 20, contact Accu-Sort immediately and refer to the Customer Service Section of this manual.

Chapter Three ▼ *Contents*

CONNECTING YOUR MODEL 20 TO THE INTERFACE BOX

When you connect your Model 20 to the Accu-Sort Small Scanner Interface Box, it is recommended that you use the interconnect cable provided with your interface box, as shown below:

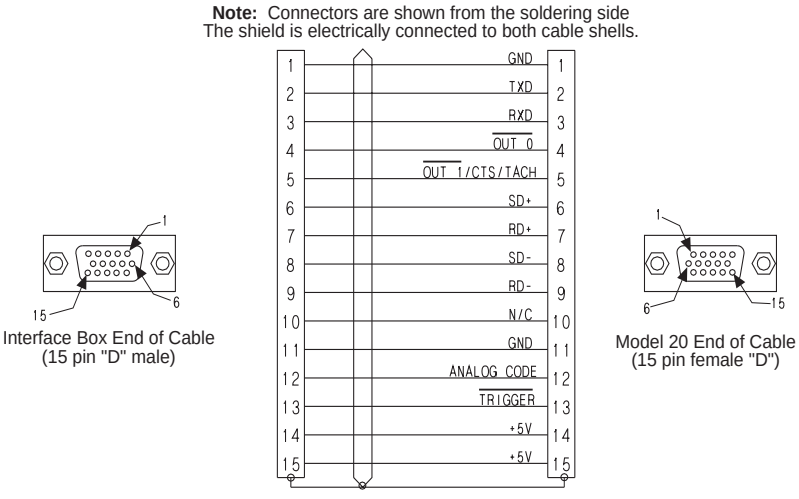


Interconnect Cable

This cable has two 15-pin "D" connectors. Connect the female end of the cable to the 15-pin "D" male connector on the rear of the Model 20, and tighten the screws with a small flat-head screwdriver. Connect the other end of the cable to the 15-pin "D" female connector labeled SCANNER J1 on the interface box, and tighten the screws with a small flat-head screwdriver. The small scanner interface box provides the Model 20 with operational power.

IF THE INTERCONNECT CABLE IS NOT AVAILABLE

If you do not have the interconnect cable, you need to create one. The following drawing shows the pin connections for the 15-pin "D" male connector on the Model 20 and the 15-pin "D" female connector on the interface box. The maximum length of this cable is 30 feet.



Pinouts for the Connections Between the Interface Box and the Model 20

CONNECTING YOUR MODEL 20 TO OTHER EXTERNAL DEVICES

The Model 20 is versatile when you need to connect to other devices. The drawings below shows all the pin connections for Model 20 when using serial communications. If you need to create your own cables to wire your Model 20 to another device, use these drawings as a guide. It is very important that you make the proper pin connections.

Below is a list of terms used in these drawings:

GND-	Ground	**RXD**	Receive Data (RS232)
TXD	Transmit Data(RS232)	**RTS**	Request To Send (RS232)
CTS-	Clear To Send (RS232)	**RD+**	Receive Data (RS422)
RD-	Received Data (RS422)	**SD+**	Non-inverting Line (RS485) Send Data (RS422)
SD-	Inverting Line (RS485) Send Data (RS422)		

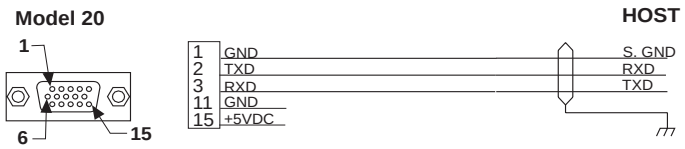
Be careful when you wire your own cable for the Model 20. You must make sure the Model 20 receives only 5 volts on pins 14 and 15.

You must enable communication types using the software. Refer to your Accu-Setup Suite Small Scanner Module Programming Manual.

RS232 WITH NO HANDSHAKING

Use the following drawing as a guide when you want to connect your Model 20 to a device that is using RS232 communicationwith no handshaking:

NOTE: All connectors are shown from the soldering side.



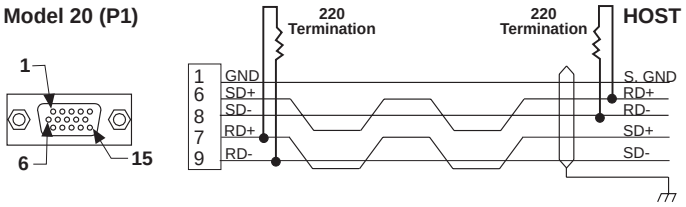
Recommended Cable Type: ALPHA # 5473C or Equivalent
Maximum Cable Length: 50 Feet

RS422 (POINT-TO-POINT)

The Model 20 does not communicate using current loop directly. You must set up the Model 20 to communicate using RS-422 and use the Small Scanner Interface box to convert it to current loop.

Use the following drawing as a guide when you want to connect your Model 20 to a device that is using RS422 serial communication:

NOTE: All connectors are shown from the soldering side.



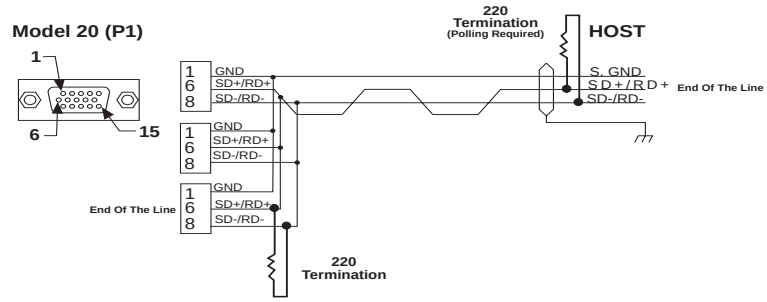
NOTE: Termination resistors may be placed inside the connector strain relief.
The termination resistor value is 220 OHM 1/4 watt.
With RS-422, the receive lines on both sides must be terminated.

CABLE TYPE: ALPHA #5473C (OR EQUIVALENT).

RS485 MULTIDROP

Use the following drawing as a guide when you want to connect your Model 20 to a device that is using RS485 multidrop serial communication:

NOTE: All connectors are shown from the soldering side.



NOTE: RS485 allows for communication across the same lines
Termination resistors can be placed inside the connector strain relief.
The termination resistor value is 220 OHM 1/4 watt.
The transmit-receive lines on both sides must be terminated.

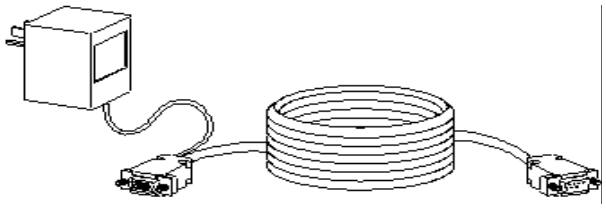
Cable type: Alpha #5473C (or equivalent)

You must enable communication types using the software. Refer to your Accu-Setup Suite Small Scanner Module Programming Manual.

CONNECTING YOUR MODEL 20 TO A PC

Accu-Sort recommends that you purchase the programming kit for your Model 20. This kit provides you with the cables that you need to connect your Accu-Sort device to a PC. If you would like to purchase the programming kit, call the Accu-Sort Customer Service Department at toll free 1-800-BAR-CODE with the following information:

Part Name	Part Number
Model 20 Programming Kit-110VAC	1000017369
Model 20 Programming Kit-220VAC	1000017371



Model 20 Programming Kit

To connect your Model 20 to most PCs using the programming kit:

1. Plug in the 15-pin connector on the programming kit cable labeled P1 to the 15-pin connector on the back of your Model 20.
2. Plug in the 9-pin connector end of your programming kit cable labeled PC to a 9-pin serial port on your PC.
3. Use a small standard slot-head screwdriver to tighten the screws on the strain reliefs at both ends.
4. Plug in the programming kit power supply in the appropriate wall socket.

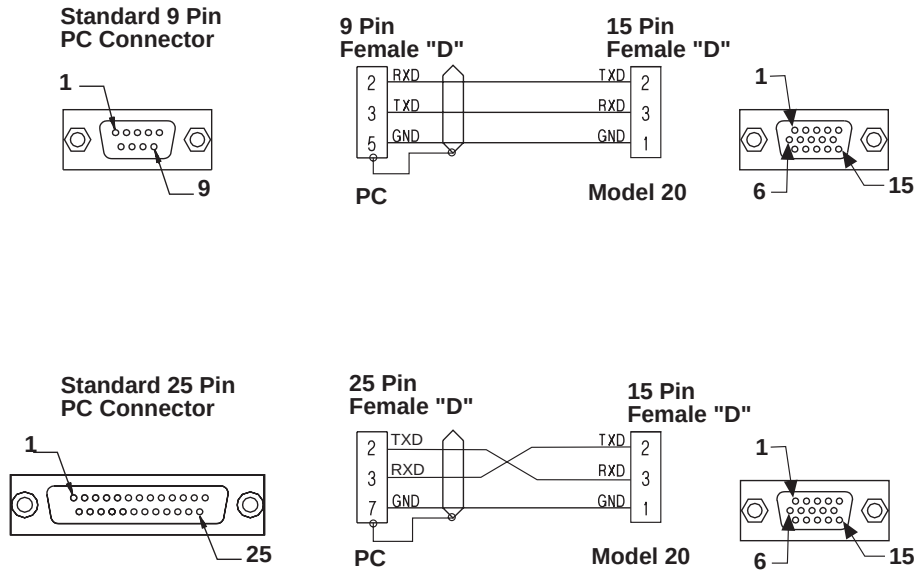
Connecting to a PC without the Programming Kit

If you choose not to purchase the Model 20 Programming Kit, you need to make your own cables. The following diagrams show typical RS232 communication cable pin connections from your PC to your Model 20 with connector and cable specifications.

Specifications	
15-pin connector	Assmann part # A-HDF15LL-T or equivalent
9-pin connector	CINCH part # DEM-9S or equivalent
Cable	Alpha part # 5473C, Manhattan Part # M3264, or equivalent
15-pin & 9-pin strain relief	Northern Technologies part # C88300004 or equivalent

If your PC has a 25 pin serial connector, you can use any standard 9 pin to 25 pin mating connector adapter to make the connection.

NOTE: All connectors are shown from the soldering side.



Model 20 to PC Connections

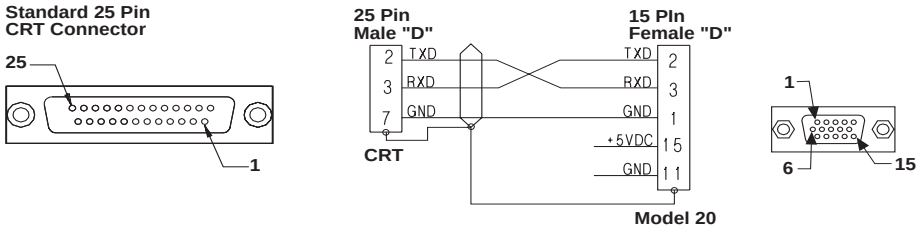
If your PC has a 25 pin serial connector, you can use any standard 9 pin to 25 pin mating connector adapter to make the connection.

CONNECTING YOUR MODEL 20 TO A TERMINAL

If you are using a terminal to program your Model 20, you need to make your own cables. The following diagrams below show typical RS232 communication cable pin connections from your terminal to your Model 20 and connector and cable specifications. These pin connections are correct for most Terminals. Your terminal may be different. Before you begin making your cable, check your terminal documentation to make sure these pin connections are accurate.

Specifications	
15-pin connector	Assmann part # 1000012239 or equivalent
25 pin connector	CINCH part # DEM-25P or equivalent
Cable	Alpha part # 1000009323, Manhattan Part # 1000017397, or equivalent
25 pin strain relief	Northern Technologies part # 1000014297 or equivalent
15-pin strain relief	Northern Technologies part # 1000014298 or equivalent

NOTE: All connectors are shown from the soldering side.



Terminal to Accu-Sort Device Connections

SUPPLYING POWER TO YOUR MODEL 20

You must supply power to the Model 20 through the 15 pin connector at the rear of the unit. You can supply power using one of the following three methods: using the small scanner interface box, using one of the Accu-Sort local power supplies, or wiring power directly into the Model 20 using one of your own methods.

The Model 20 must meet the following three requirements regardless of the method that you use to supply power:

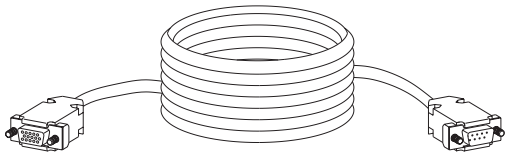
- +5VDC must be supplied (range between +4.85VDC and +5.25VDC @ 500 mA, maximum ripple 100mV)
- Ground must be supplied
- Metal shell of connector must be grounded

Make sure the metal shell of the connector is grounded. This provides chassis ground to the unit case, and is necessary for proper operation.

USING THE SMALL SCANNER INTERFACE BOX FOR POWER

To use the small scanner interface box as a power source for the Model 20, you can use the Accu-Sort Interconnect Cable as shown below. This method of supplying power to the Model 20 complies with all the requirements mentioned above.

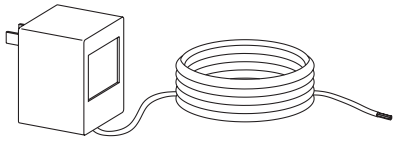
This cable has two 15 pin "D" connectors. Connect one end to the 15 pin "D" male connector on the rear of the Model 20, and connect the other end to the 15 pin "D" female connector labelled SCANNER J1 on the interface box. The small scanner interface box provides the Model 20 with operational power.



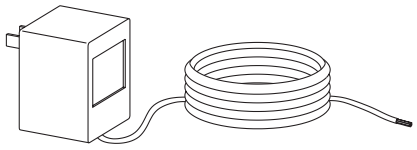
Interconnect Cable

USING ACCU-SORT'S LOCAL POWER SUPPLY FOR POWER

You can use the Accu-Sort 110V AC or the 220V AC local power supply that comes with flying leads to supply power to the Model 20 15 pin "D" connector. These power supplies are shown below:



110 VAC Local Power Supply connects to Model 20 only



220 VAC Local Power Supply connects to Model 20 only

These power supplies do not provide power to the small scanner interface box. Refer to Chapter Four of this manual for Interface Box power requirements.

If you use one of these power supplies, you need to connect the leads to the Model 20 15 Pin "D" connector. You need to comply with the Model 20 power requirements mentioned on the previous page, to ensure proper operation. Use the following information to make these connections:

110V and 220V Power Supply	Model 20 Pin #
Striped Wire - ground	Pin 11
Non-striped Wire - +5V	Pin 15

If no ground is available from another source, you can split the ground wire from the local power supply. This grounds the shell/case.

When you are using Accu-Sort's local power supply, make sure the metal shell of the connector is grounded.

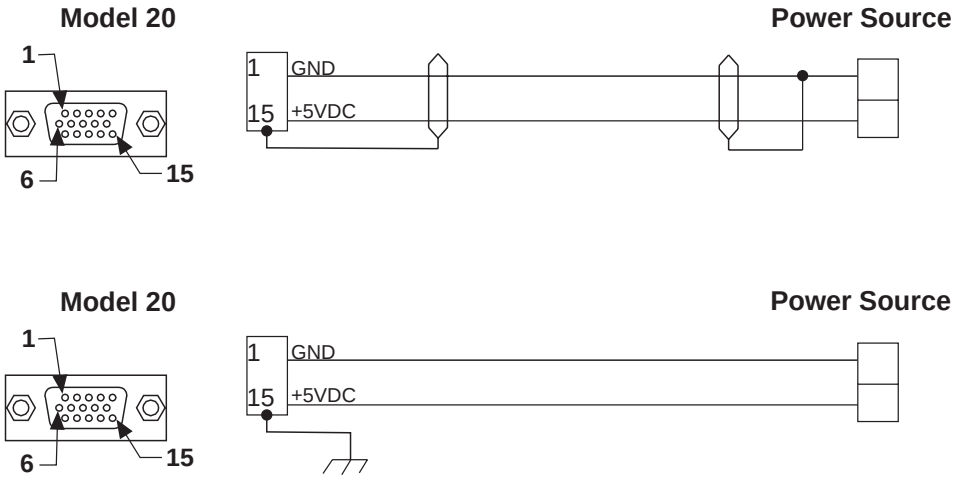
WIRING OTHER SOURCES OF POWER DIRECTLY

To supply power to the Model 20 15 pin "D" connector, you can use many other sources than those previously mentioned. You must comply with the Model 20 power requirements, mentioned in the beginning of this section, to ensure proper operation.

When you are providing power to the Model 20 directly from another source, make sure the metal shell of the connector is grounded.

Isolation may be required, if the chassis is used as a conductive plate.

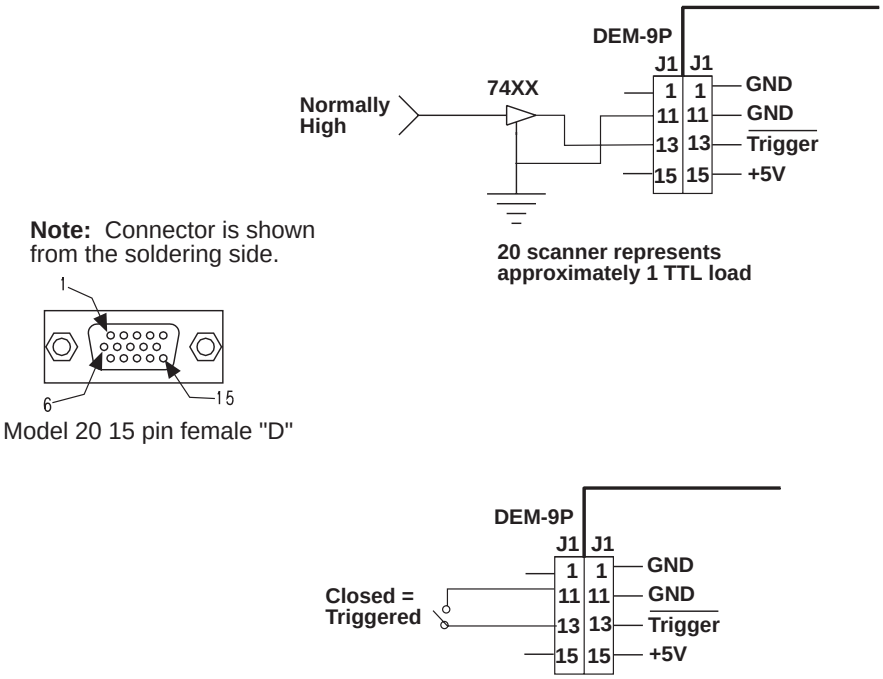
The drawings below show alternate ways of wiring power into the Model 20:



Alternative Wiring Methods for Supplying Power to the Model 20

SUPPLYING A TRIGGER INPUT TO YOUR MODEL 20

A triggering device can be used to supply an electronic signal or pulse to inform the scanner of the presence of an object within its reading zone. If you are not using the Small Scanner Interface Box and you need a connection for trigger input, you can wire a triggering device directly to the Model 20 15-pin connector using pins 11 and 13. The drawing below shows two of the most common ways to wire a triggering device directly to your Model 20.



Two Different Ways to Wire a Triggering Device to Your Model 20 (Top TTL Method, Bottom-Dry Contact Method)

USING MODEL 20 PARALLEL OUTPUTS

The Model 20 has two parallel outputs; NVC/NO MATCH and GO/MATCH. These output timers are activated or deactivated from pin 4 and pin 5 respectively on the Model 20 15-pin connector. Both of these outputs are controlled by software. (Refer to your Accu-Setup Small Scanner Module Programming Manual)

You can use these outputs to have a beeper sound when you receive a no read or no match (when used as a verifier), or you could have a light turn on every time there is a go (good read) or match (when used as a verifier). There are many other uses for these outputs. When you connect these pins to the small scanner interface box, they control the relays in the box.

HOW THE OUTPUTS WORK

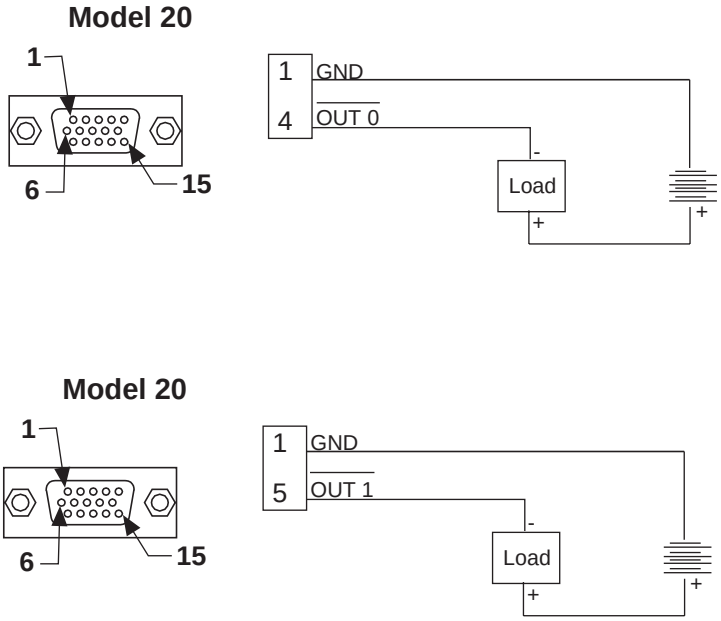
The Go/Match (out 1) output can not be enabled when RTS/CTS protocol is enabled. (Refer to your Accu-Setup Suite Small Scanner Module Programming Manual.)

The names of the two outputs directly reflect their purpose. The NVC/NO MATCH output changes its electrical state dependent on receiving a no read or a no match (while in verifier mode). The GO/MATCH output timer changes its electrical state dependent on receiving a good bar code or a match (while in verifier mode).

These outputs are open collectors. When the signal is low, it causes the state of the relay to remain unchanged. When the signal is high, it causes the state of the output to change. For example, if you set the NVC/NO MATCH timer for 150 milliseconds, every time the scanner sees a non valid bar code the NVC/NO MATCH timer signal remains high until that 150 millisecond time period is complete.

PARALLEL OUTPUT CONNECTIONS

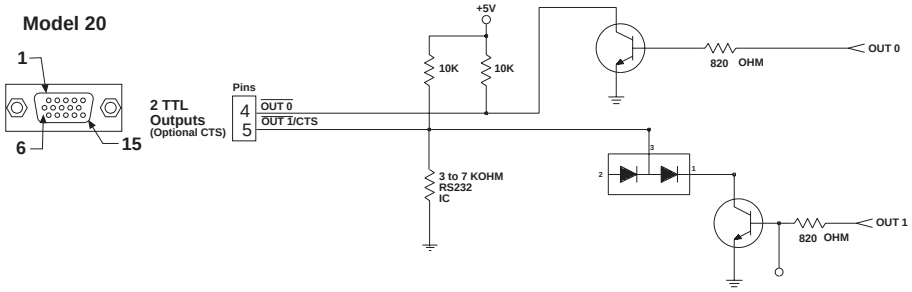
The following diagrams show the proper connections that you need to ensure that the outputs function properly. If you use the interface cable to connect the Model 20 to the Small Scanner Interface Box, you do not need to make any other connections.



Output Connections

The table below defines some basic terminology. The drawing below shows the schematic of the output circuitry:

Software	Model 20	Interface Box
NVC/No Match =	OUT 0 =	Relay 1
Go/Match =	OUT 1 =	Relay 2



Model 20 Output Circuitry

> For true TTL compatible output from pin 5, an external 750 OHM pullup resistor is required between pin 5 and pin 14.

Chapter Four ▼ *Contents*

INTRODUCTION

The Model 20 hardware was specifically designed for the tough industrial environment. The unit does not need anything more than some basic cleaning and check-ups every month, depending on the harshness of your environment. This chapter provides you with a cleaning procedure and some troubleshooting techniques.

CLEANING PROCEDURE

The Model 20 enclosure is tightly sealed to prevent dust or dirt from entering the unit. Nothing inside of the Model 20 needs to be cleaned on a regular basis. If the Model 20 needs repair, do not open the unit. The Model 20 is designed to be shipped back for repair. Refer to the Customer Service Section of this manual.

To clean the Model 20:

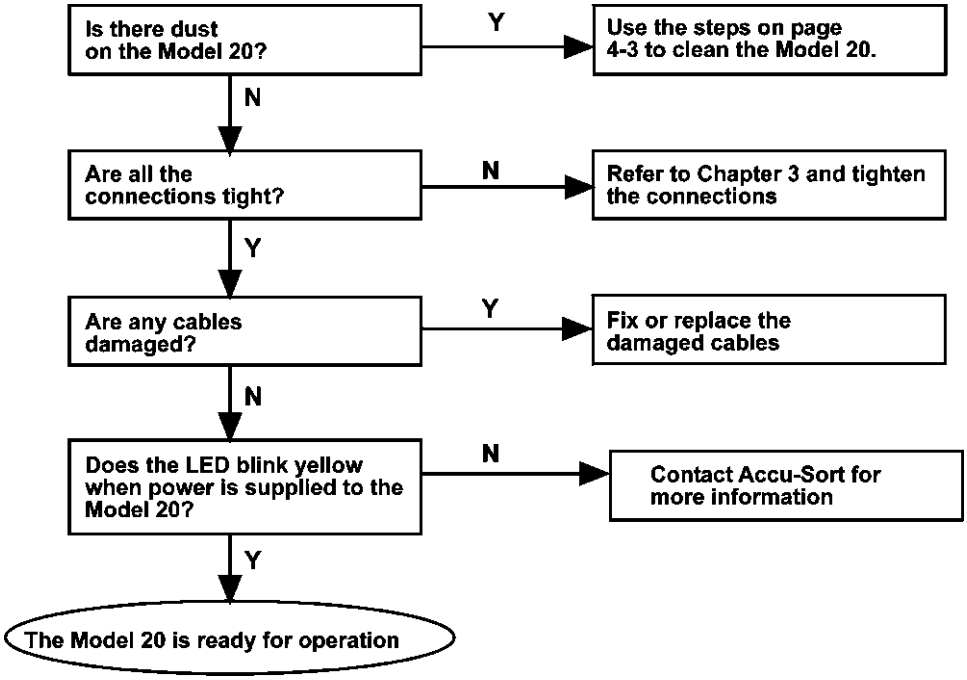
1. Slightly dampen a lint-free cloth with a solution made of mild detergent and water.
2. Gently wipe the enclosure of the Model 20. Be careful to avoid the exit window.
3. Dry the enclosure of the Model 20 with a dry lint-free cloth.

To clean the Model 20 exit window:

1. Dampen a lint-free tissue with distilled water and wipe off any dust particles.
2. Dry the exit window with a dry lint-free tissue.

TROUBLESHOOTING YOUR MODEL 20

Use the following chart to help troubleshoot the Model 20. If your Model 20 is damaged, please contact our Customer Service Department at 1-800-BAR-CODE. Please refer to the Customer Service Section in the front of this manual for more information about your equipment.



PROBLEM/SOLUTION TABLE

The following is a list of events that can occur with your scanning system. Below each event has a cause and solution.

Problem	Cause	Solution
The Status LED turns red for and extended period of time or it blinks	The Model 20 detects a failure.	Call Accu-Sort Customer Service
There is no laser beam exiting from the scanner when power is supplied	No power is applied to the Model 20.	Check to ensure power is plugged in and power is applied to the interface connector.
The Model 20 is not reading bar codes	Code type is not enabled or wrong code length	Enable code type or correct code length
Model 20 has poor read rate	Model 20 window is dirty, label is not within reading range, or label quality is poor.	Clean Model 20 window, check reading range or label, or check code quality.
Model 20 has poor read rate in hardware trigger	Photoeye not adjusted, or it is misaligned.	Adjust the photoeye
Model 20 has poor read rate in serial trigger	Serial trigger is not timed properly with the arrival of the bar code.	Adjust the timing of your serial trigger so it turns on before the bar code and turns off after the bar code.
No communication to host	Host communication to scanner does not match	Connect the Model 20 to a PC and use your Accu-Setup Suite Small Scanner Module Programming Manual to confirm communications parameters.

Appendix A ▼ *Contents*

ASCII COMMUNICATIONS

STANDARD RS485 MULTIDROP COMMUNICATIONS

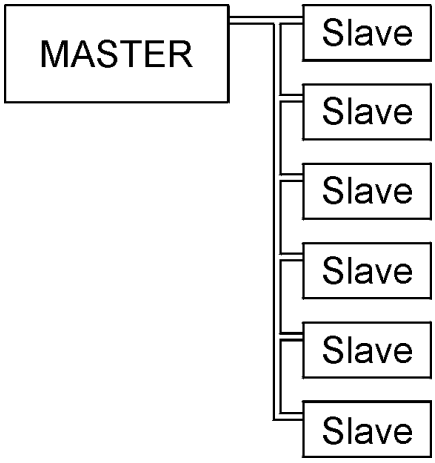
RS485 communications is an Engineering Industries Association standard for the transmitters and receivers of a digital equipment interface. RS485 communication uses differential signal lines and allows for multiple transmitters on one signal pair (although only one transmitter may be enabled at any given 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-

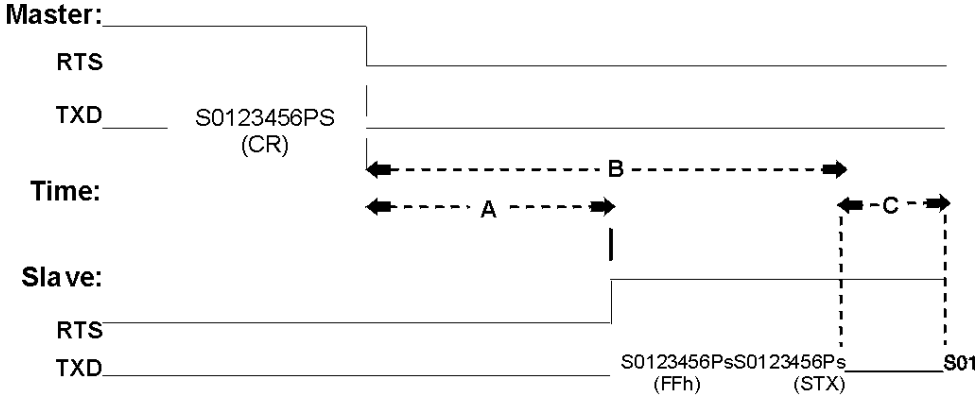
TIMING

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

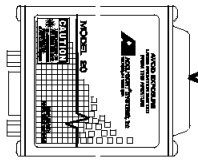
ASCII Chart

Appendix B ▼ *Contents*

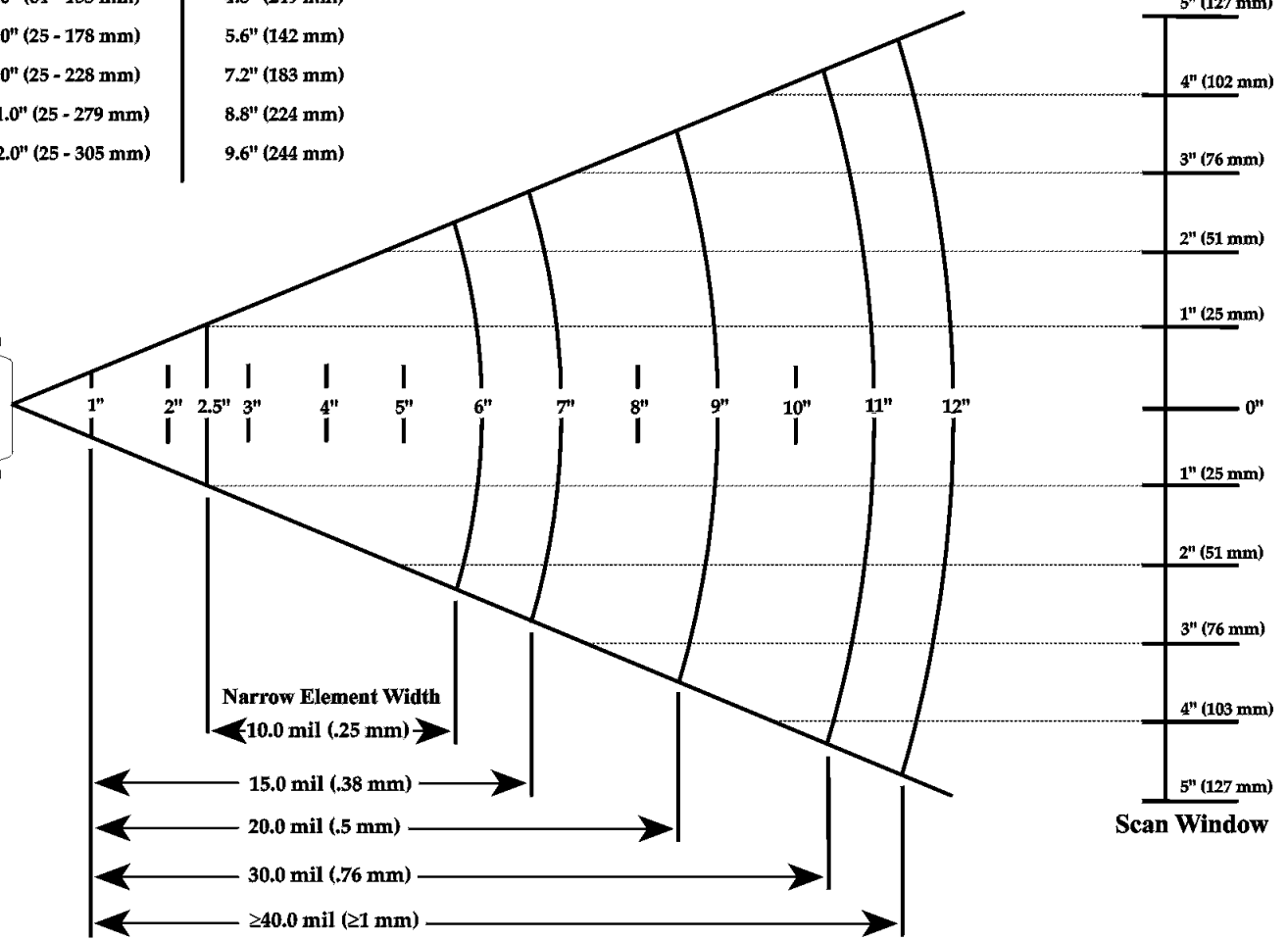
Standard Scan Head - Optical Performance (Model Number M20A)

Narrow Element Width	Reading Distance	Maximum Scan Window
10.0 mil (.25 mm)	2.5" - 6.0" (64 - 153 mm)	4.8" (249 mm)
15.0 mil (.38 mm)	1.0" - 7.0" (25 - 178 mm)	5.6" (142 mm)
20.0 mil (.5 mm)	1.0" - 9.0" (25 - 228 mm)	7.2" (183 mm)
30.0 mil (.76 mm)	1.0" - 11.0" (25 - 279 mm)	8.8" (224 mm)
≥40.0 mil (≥1 mm)	1.0" - 12.0" (25 - 305 mm)	9.6" (244 mm)

Scan Rate: 500 Scans Per Second



Not To Scale



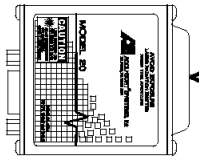
NOTE: These read ranges were obtained using quality bar codes (rated 'A' by ANSI standards). Results may vary depending on quality of bar codes.

Depth of Field

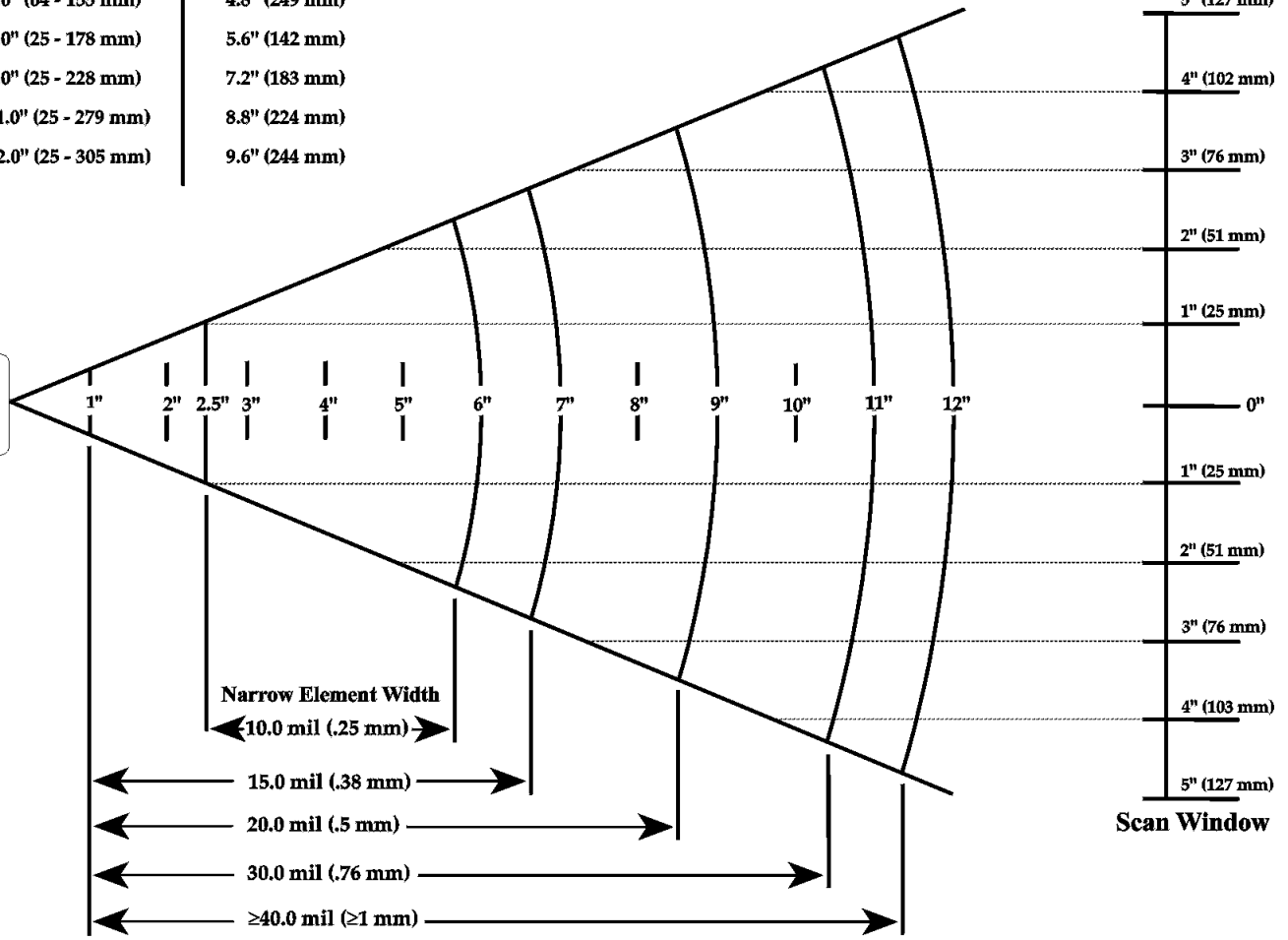
High Speed Scan Head - Optical Performance (Model Number M20C)

Narrow Element Width	Reading Distance	Maximum Scan Window
10.0 mil (.25 mm)	2.5" - 6.0" (64 - 153 mm)	4.8" (249 mm)
15.0 mil (.38 mm)	1.0" - 7.0" (25 - 178 mm)	5.6" (142 mm)
20.0 mil (.5 mm)	1.0" - 9.0" (25 - 228 mm)	7.2" (183 mm)
30.0 mil (.76 mm)	1.0" - 11.0" (25 - 279 mm)	8.8" (224 mm)
≥40.0 mil (≥1 mm)	1.0" - 12.0" (25 - 305 mm)	9.6" (244 mm)

Scan Rate: 700 Scans Per Second



Not To Scale



NOTE: These read ranges were obtained using quality bar codes (rated 'A' by ANSI standards). Results may vary depending on quality of bar codes.

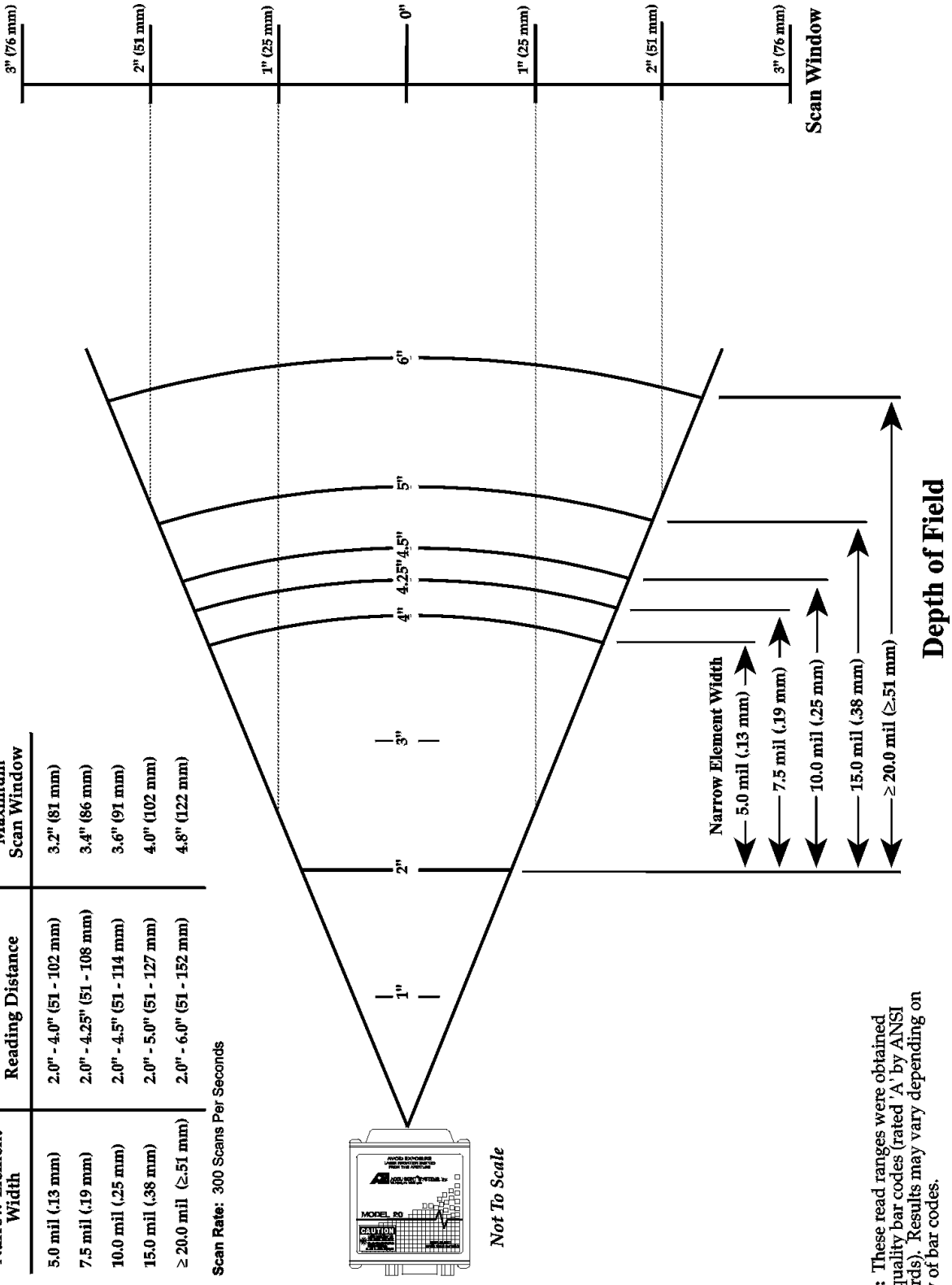
Depth of Field

HIGH DENSITY SCAN HEAD

High Density Scan Head - Optical Performance (Model Number M20B)

Narrow Element Width	Reading Distance	Maximum Scan Window
5.0 mil (.13 mm)	2.0" - 4.0" (51 - 102 mm)	3.2" (81 mm)
7.5 mil (.19 mm)	2.0" - 4.25" (51 - 108 mm)	3.4" (86 mm)
10.0 mil (.25 mm)	2.0" - 4.5" (51 - 114 mm)	3.6" (91 mm)
15.0 mil (.38 mm)	2.0" - 5.0" (51 - 127 mm)	4.0" (102 mm)
≥ 20.0 mil (≥.51 mm)	2.0" - 6.0" (51 - 152 mm)	4.8" (122 mm)

Scan Rate: 300 Scans Per Seconds



Not To Scale

NOTE: These read ranges were obtained using quality bar codes (rated 'A' by ANSI standards). Results may vary depending on quality of bar codes.

Appendix C ▼ *Contents*

PART NUMBERS

Listed below are the part numbers of some of the components and accessories of the Model 20.

Part Number	Description	
1000017362	Small Scanner Interface without relays	
1000017365	Small Scanner Interface with relays	
1000014575	Interconnect Cable	
1000020527	Photoeye	
1000022163	110V AC Power Supply	
1000015618	220V AC Power Supply	
1000017359	110V AC Power Supply	
1000017360	220V AC Power Supply	
1000017384	Mounting Clips	
1000017383	Ladder Mounting Bracket	
1000017382	Picket Fence Mounting Bracket	
1000017379	Mounting Plate	
1000017380	Cradle Mounting Bracket	
1000017381	110V AC Model 20 Programming Kit	
1000017382	220V AC Model 20 Programming Kit	
1000017344	Model 20 Custom Assembly	
1000017345	Model 20 Custom 1 @ 10 Raster Assembly	
1000017346	Model 20 Custom .5 @ 10 Raster Assembly	
1000025478	Model 20, Standard, Linear Decoding, 12 Sided Mirror	***OTS Distributor Units***
1000025479	Model 20, Standard, DRX Decoding, 12 Sided Mirror	
1000025480	Model 20, Standard, Linear Decoding, .5@10 Raster	
1000025481	Model 20, High Density, Linear Decoding, 12 Sided Wheel	
1000025482	Model 20, High Density, DRX Decoding, 12 Sided Wheel	
1000025483	Model 20, High Density, Linear Decoding, .5@10 Raster	
1000025484	Model 20, High Speed, Linear Decoding, 12 Sided Wheel	
1000025485	Model 20, High Speed, DRX Decoding, 12 Sided Wheel	
1000025486	Model 20, High Speed, Linear Decoding, .5@10 Raster	

For ordering information please refer to the Customer Service page at the front of the manual.

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.

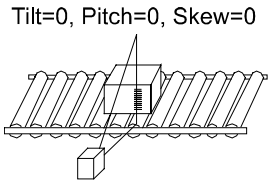
Character set
Those characters available for encodation in a particular automatic identification technology.

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.

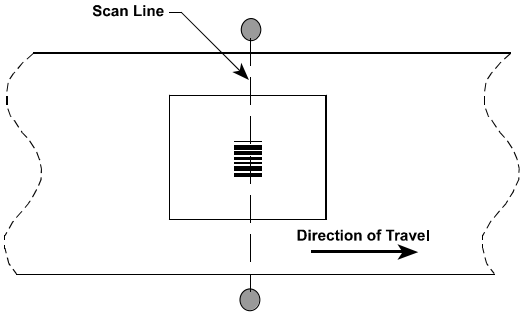
Interleaved Bar Code
A bar code in which characters are paired together using bars to represent the first character and spaces to represent the second.

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.

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)

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.

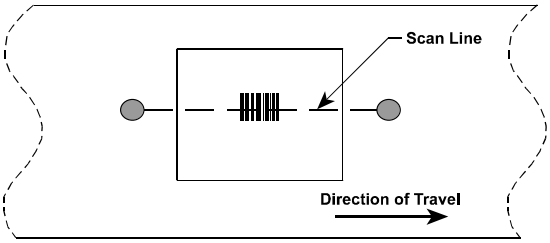
Performance indicator limit
A set point that will produce a discrete output if the performance indicator falls below the set point value.

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.

V

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.

W

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
2.0	6010	11/5/00	rev 2.0 release for Small Scanner CD-ROM (p/n 1000025606)
2.1	5731	01/23/01	new part numbers added for OTS distributor units