OMRON

V550-A20 Bar Code Reader

Operation Manual

Cat. No. Q01BAZ2

Notice:

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to the product.

DANGER! Indicates information that, if not heeded, is likely to result in loss of life or serious injury.

WARNING Indicates information that, if not heeded, could possibly result in loss of life or serious injury.

Caution Indicates information that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation.

OMRON Product References

All OMRON products are capitalized in this manual. The terms ***Unit and Module*** are also capitalized when referring to an OMRON product, regardless of whether or not it appears in the proper name of the product.

The abbreviation “PLC” means Programmable Controller and is not used as an abbreviation for anything else.

Visual Aids

The following headings appear in the left column of the manual to help you locate different types of information.

Note Indicates information of particular interest for efficient and convenient operation of the product.

1, 2, 3... 1. Indicates lists of one sort or another, such as procedures, checklists, etc.

Table Of Contents

About This Manual:

This manual describes the operation of the V550-A20 Bar Code Reader system and includes the sections described below.

Please read this manual completely and be sure you understand the information provided before attempting to operate the system.

Section 1 Provides a general introduction to the Bar Code Reader system and the basics of bar coding.

Section 2 Describes unpacking, mounting, and basic setup of the V550-A20.

Section 3 Explains how to connect the V550-A20 to external devices and how to supply power to the bar code reader.

Section 4 Provides information on the cleaning procedure and some troubleshooting techniques.

WARNING	Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product, or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.

Section I

Getting Started

This section describes what a bar code is, how one is read, and the different types of bar codes. It also describes the V550-A20 scanning system and how it reads bar codes.

Getting Started

About the V550-A20

Omron presents the V550-A20 Bar Code Scanning System, the smallest complete scanning system available. Most bar code scanning and decoding applications need an external decoder/logic unit and a remote scanning head. The V550-A20, however, has a built-in decoder/logic.

The V550-A20 is designed with many powerful features that make bar code scanning easier to implement and maintain. 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 V550-A20 are also available. These features include:

- High density scanning
- DRX (data reconstruction technology)
- High speed scanning (700 scans per second)

Specifications

Part number		V550-A20 V550-A20-X	V550-A20HD V550-A20HD-X	V550-A20HS V550-A20HS-X
Type		Standard	High density	High speed
Applicable bar code symbols	Detectable bar code types	Code 39, Code 128, UPC-E, EAN-8, EAN-13, Codabar, Interleaved 2 of 5, Straight 2 of 5, AS-10, 10 bit periodic binary, Code 93, Extension for UPC and EAN types, Pharmacode.		
	Readable digits	Symbology dependent		
Reading characteristics	Resolution	0.25 mm (0.0009 in.)	0.13 mm (0.005 in.)	0.25 mm (0.009 in.)
	Reading distance	25 – 305 mm (1 – 12 in.)	51 – 152 mm (2 – 6 in.)	25 – 35 mm (1 – 12 in.)
	Max. scan window	244 mm (9.6 in.)	122 mm (4.8 in.)	244 mm (9.6 in.)
	Scan rate	500 scans /sec	300 scans / sec	700 scans / sec
	Light source	0.95 mW visible red laser diode; 670 nm wavelenght, Class II		
	Decoder	Auto decode installed		
	Skewed label correction	DRX data reconstruction technology (on -X models)		
	Indicator	Multi-status LED		
Interface		D subminiature male 15 pin connector (RS232, RS422, RS485)		
Programming		External computer or terminal.		
Serial communication speed		300 – 57.6K Baud user selectable		
Trigger input		5V TTL or dry contact		
Outputs		2 (open collector - 5V, 100 mA max.)		
Power supply		5 VDC (4.85 VDC minimum 5.25 VDC maximum)		
Current consumption		500 mA typical, 600 mA maximum)		
Vibration resistance		10 to 150Hz, 0.5 mm double amplitude for 8 min in each X, Y, and Z direction. Completed 4 times with an acceleration of 7G.		
Shock resistance		20G, 3 times in each ±X, ±Y, and ±Z directions.		
Weight		142 g (5 oz.)		
Environment	Operating temperature	0°C to 40°C (32°F to 104°F)		
	Operating humidity	10% to 90% non-condensing		
	Enclosure rating	NEMA 12		
Approvals	UL/CSA	Listed (USA) NRTL/C (Canada) file number E134951 (when used with a UL listed Class II power supply).		
Dimensions		65mm x 54mm x 36mm (2.56 in x 2.14 in x 1 43 in.)		
External devices		• Interface cable • Power supply • PLC and/or host computer		

A drawing of the V550-A20 is shown below:

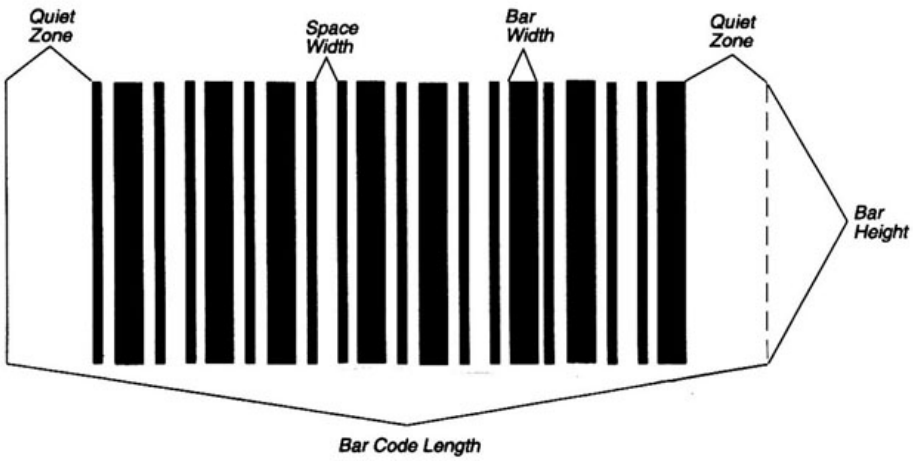
The V550-A20 Bar Code Scanner

Bar Code Basics

preset pattern. The pattern is organized to represent elements of data referred to as characters. The standard industry codes can represent several alphanumeric characters.

There are many different types of bar codes. Each type uses its own symbology, which defines how the bars and spaces represent the letters and numbers.

The figure below shows each part of a bar code. The labels for each part remain the same even if the position, orientation, or type of bar code changes.



The V550-A20 is capable of reading eight different bar codes simultaneously. V550-X versions can read up to four bar codes simultaneously. The code types can be chosen from the following list:

Straight 2 of 5 - fixed or variable length - Developed in the late 1960's, Straight 2 of 5 is the predecessor to Interleaved 2 of 5. It is widely used for numbering airline tickets and warehouse sortation systems. All of the data information is contained in the bars, the spaces are simply there to separate the bars. Straight 2 of 5 is usually found in applications that have been in existence for a number of years.

The Standard V550-A20 is preset for variable length Code 39, variable length Code 128, UPCA (12 char.), and UPCE (12 char.). UPC has a built in Mod check, and MOD checks are disabled for all codes.

Interleaved 2 of 5 - fixed or variable length - More commonly called I 2 of 5, this numeric only bar code was developed in the early 1970's. Because of its high code densities, I 2 of 5 is most often found in distribution applications. Due to the limited amount of characters I 2 of 5 can use, and the simple structure of the start and stop characters, even partial scans can result in valid reads. If I 2 of 5 is chosen for your application., Omron recommends that the V550-A20 is programmed to a fixed length in all scanning applications.

Code 39 - fixed or variable length - Code 39, or Code 3 of 9, was the first bar code developed that used both numbers and uppercase letters. It is the most recognized and widely used for non-retail applications. Each character is represented by a stand-alone group of 5 bars and 4 spaces. The basic code set includes 0-9, A-Z, * which is used for the start and stop characters, and six other symbols - . $ / + and % for a total of 43 characters. Because each of the characters are discrete and self-checking, Code 39 provides a high level of data security. The V550-A20 automatically checks all data for this symbology.

Code 128 - Code 128 is a continuous code made up of 3 bars and 3 spaces for each character. The Uniform Code Council and the International Article Numbering Association have developed standards for the use of bar codes in the global distribution of retail, industrial, commercial, pharmaceutical, meat and other products using Code 128 as an application identifier. Since the nature of Code 128 is such that each character depends on the characters before and after it for code structure, a check digit is incorporated in the bar code. The check digit, which is automatically checked by the V550-A20, provides a high level of data security.

Codabar - Widely used in libraries, photo-finishing systems, and blood bank applications, Codabar uses numbers along with 6 special characters. Four different combinations of start and stop characters can be used to mean specific things for each application. The V550-A20 can be programmed to either transmit or suppress, the start and stop characters.

UPCA (Universal Product Code, version A) - This bar code type is most often found in the fast-paced retail and supermarket industries. The first character of the 12-character code is the number system; the next ten characters identify the product and manufacturer; and the last character is the check digit. In many applications, the UPC code is compared with a look-up table for added security.

UPCE (Universal Product Code, version E) - This version of the UPC bar code shortens the information to 6 characters. This allows the code to fit on smaller packages.

EAN-13 (European Article Number) - This bar code type is almost the same as the UPC code. The EAN-13 contains the same number system, manufacturer, and product information as the UPC code, but also includes parity information.

EAN-8 is a shortened version which identifies the country code in the first two characters, the next five characters are for data, and the last is a check digit.

Code 93 derives its name from the fact that every character is constructed from nine elements arranged into three bars with their adjacent spaces. This is similar to the UPC symbol (widely used in the grocery industry). This symbol also includes two powerful check digits that minimize the possibility of reader substitution errors due to printing defects.

AS-10 Code is a bar code symbology developed by Accu-Sort Systems. This code contains nine segments per character plus a single segment intercharacter space for a total of 10 segments per character. Each character has four printed bars consisting of one double bar and three single bars. Each character begins and ends with a bar. This enables the pattern to be self-checking.

10 Bit Periodic Binary Code uses binary numbers (1s & 0s) as a base. It was developed with the rule that the number of code bars or "bits" required is dictated by the number of product identifications required.

MOD 10 or **MOD 43** checks can either be enabled or disabled for each of the four bar codes selected. A Modulus check character is a mathematical check to ensure the accuracy of a read. Certain bar codes use Mod check character(s) to determine if that bar code was scanned correctly.

Extensions are two or five character additional encodations that are available to add to the end of UPC or EAN bar code types.

Decoding Bar Codes

The V550-A20 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 V550-A20 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 V550-A20 transmits the decoded bar code information to a terminal or host computer.

How Your V550-A20 Scanning System Works

As soon as you set up and install your V550-A20 as discussed in the remaining chapters of this manual, it is ready to read bar codes.

The V550-A20 has a multi-color LED indicator at the rear of the unit that provides operational information. The location of this LED is shown below. The LED provides status on power (idle), Trigger (carton presence), good read, no read or NVC (non-valid code), and failure. The following are descriptions of each LED.

IDLE - When the LED is blinking yellow, it means the V550-A20 has power, is not triggered, and it is functioning normally.

TRIGGER - When the LED is solid yellow, it means the laser is on. Either trigger input is active or the unit is in continuous read mode.

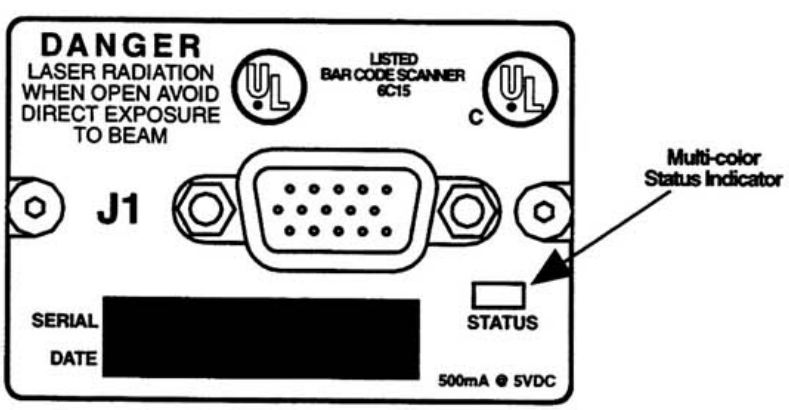
GOOD READ - When the LED is green for 1/2 second, it means the V550-A20 has successfully decoded a bar code.

NO READ - When the LED is solid red for 1/2 second, it means the V550-A20 was not successful in decoding a bar code, or a non valid bar code was detected.

CONFIRMING SETUP MODE - When the LED flashes in the Red, Yellow, Green sequence, the V550-A20 is in Setup mode.

FAILURE - When the LED appears solid red for an extended period of time or it is blinking red, it means the V550-A20 has detected a mal-function or it is not functioning up to specifications. In either of these cases, call your Omron distributor.

More information is provided in Section 4 of this manual (Trouble-shooting Section).



V550-A20 LED Location

Examples of LED Functionality

The following are two scenarios of how the V550-A20 LED works:

When your V550-A20 is programmed for Hardware or Serially Controlled Trigger (Refer to your BCSETUP Manual), the following sequence of events should occur:

1. When the V550-A20 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 photoelectric trigger sensor), the status LED turns to solid yellow for the amount of time the box blocks the triggering device. Then

   • The status LED changes to green for 1/2 second if the V550-A20 successfully decodes the bar code.

   -OR-

   • The status LED changes to red for 1/2 second if the V550-A20 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.

Solid yellow always indicates that the laser is on.

When your V550-A20 is programmed for Continuous Read (Refer to your BCSETUP Manual), the following sequence of events should occur:

The V550-A20 ignores any trigger input, hardware or serial.

1. When the V550-A20 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 V550-A20 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 V550-A20.

Section 2

What to Do After Receiving the V550-A20

This Section describes different types of equipment that may be used in a V550-A20 scanning system. Next, some general scanning terms are discussed that may be helpful while mounting your V550-A20. Finally, this Section describes how to mount each piece of equipment within your V550-A20 system and how to set up your V550-A20.

Some of the equipment described in this Section might not be used with your system. Skip over sections that do not apply.

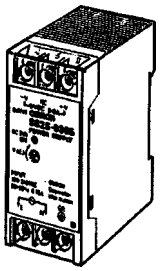
Unpacking Instructions

Depending on your needs, you may have one, or more, of the following pieces of equipment:

CAUTION

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

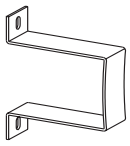
Power Supply - A power supply is available from Omron. Please make sure that you have the correct one for your application. Connecting the wrong power supply to the V550-A20 will result in damage to the V550-A20. A UL Class 2 power supply should be used for UL approval.



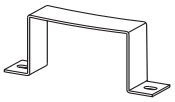
Omron S82S-0305 Power Supply (not UL Class 2)

Mounting Hardware - five different mounting options are offered. All of the options depend on the type of application they are to be used in. Each is described below with its part number:

Mounting Clips
part # V509-A26F

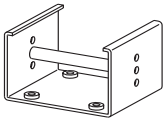


Ladder Mounting Bracket
part # V509-A26E



Picket Fence
Mounting Bracket
part # V509-A26D

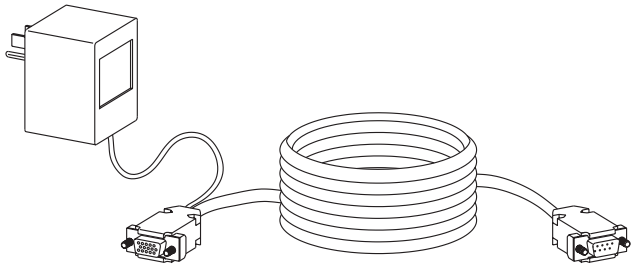
Mounting Plate
part # V509-A26A



Cradle Mounting Bracket
part # V509-A26B

Mounting Brackets

Programming Kit - The Programming Kit connects the V550-A20 to a standard 9 pin serial port on the back of a personal computer when setting-up the V550-A20 software. The PC setup program is called BCSETUP. Refer to your BCSETUP manual for details about programming the V550-A20. This kit can be used to provide only power and RS232 communications, if no other signals are to be used in the application.



Programming Kit
110V AC part # V559-A25C

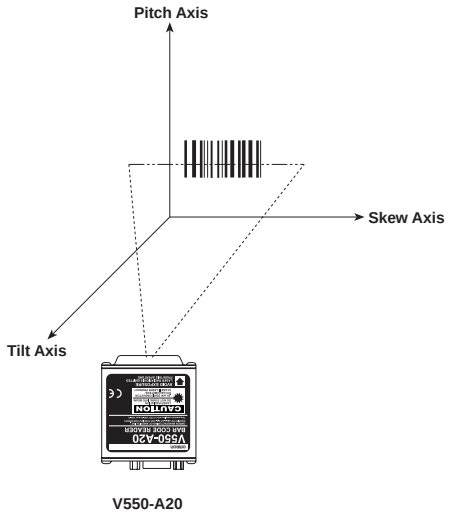
Facts To Know Before Mounting Your V550-A20

There are a few common terms in bar code scanning that you need to know before you mount your V550-A20. Understanding these terms will help you when you mount your scanner or if you ever have to move your scanner from its original mounting place.

Ladder orientation refers to a bar code whose bars are parallel to the bar code's direction of travel. **Picket Fence** means that the bars of the bar code are perpendicular to the direction of travel. Regardless of the direction of travel, the scan line *must* be perpendicular to the bars.

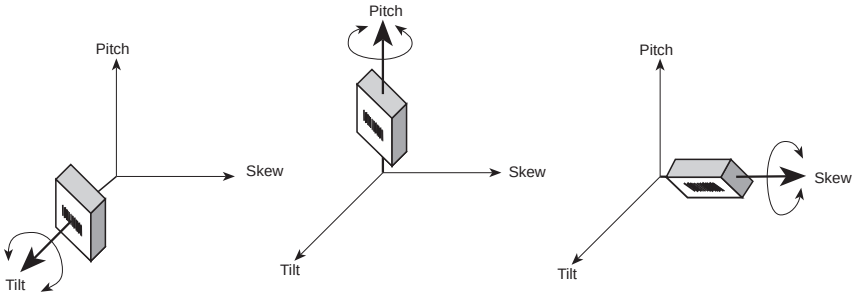
Bar Codes In Ladder (left) And Picket Fence (right) Orientations

Tilt, Pitch, and **Skew** refer to the way the bar code lines up with the scan line. In the drawing below, the bar code is perpendicular to the scan line. The **skew** axis is parallel to the scan line in this position. The **pitch** axis is parallel to the bars in this position. The **tilt** axis is perpendicular to the plane of the scan window.



The Tilt, Pitch, and Skew Axes

Tilt is the way the bar code rotates around the tilt axis. Similarly, pitch and skew occur when the bar code is rotating around those axes.



Tilted, Pitched, and Skewed Bar Codes

The **Exit Window** is where the laser beam exits the scanner. **Near Distance**, also called **Optical Throw**, is the closest the V550-A20 can be to the bar code and still read the bar code passing through its scan line. The **Far Distance** is the farthest distance at which the V550-A20 can read a bar code. The **Depth of Field** is the range over which the V550-A20 can read bar codes. To calculate your Depth of Field, subtract the Near Distance from the Far Distance. The V550-A20's **Optimum Distance** is the Center of the Depth of Field. The **Scan Window** is the usable amount of the laser beam at any given depth of field.

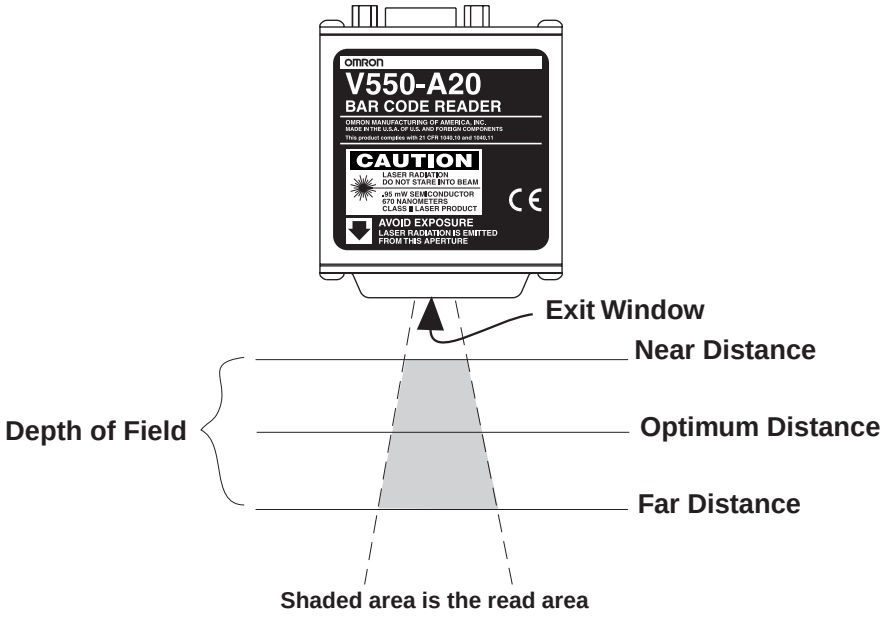


Illustration of Scanning Terms

When you mount your V550-A20, 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 V550-A20 and its equipment to stay cool. The minimum space requirements for the V550-A20 are as follows:

- Overhead - Leave enough room for air flow
- Back - 2.25" for connections
- Sides - Leave enough room for air flow
- Front - Make sure there are no obstructions between the scanner and the bar code to be scanned during the read cycle

There are many different ways to mount the V550-A20. You can purchase the following five pieces of equipment from Omron to mount the V550-A20:

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

Clips (part # V559-A26F)

There are two mounting clips. They are designed to hold the V550-A20 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 inches apart. The V550-A20 has grooves on each side. Use these grooves with the mounting clips as shown below, to mount the V550-A20.

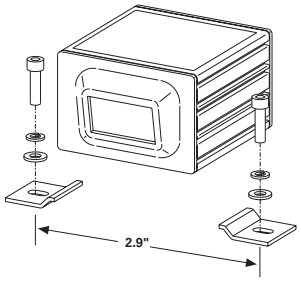
To mount the V550-A20:

Step 1 Fasten one clip to the mounting surface.

Step 2 Slide the grooves on one side of the V550-A20 along the clip.

Step 3 Place the remaining clip in the grooves on the other side of the V550-A20.

Step 4 Fasten that clip to the mounting surface. This ensures a tight mount so the V550-A20 does not have any room for movement during operation.



Mounting The V550-A20 Using Mounting Clips

Mounting Your V550-A20

Mounting Plate (part # V559-A26A)

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 V550-A20 in position so the scan line is parallel to the mounting surface. The plate is rectangular with an oval slot near each of the four corners. The slots are designed for #6 mounting screws.

To mount the V550-A20:

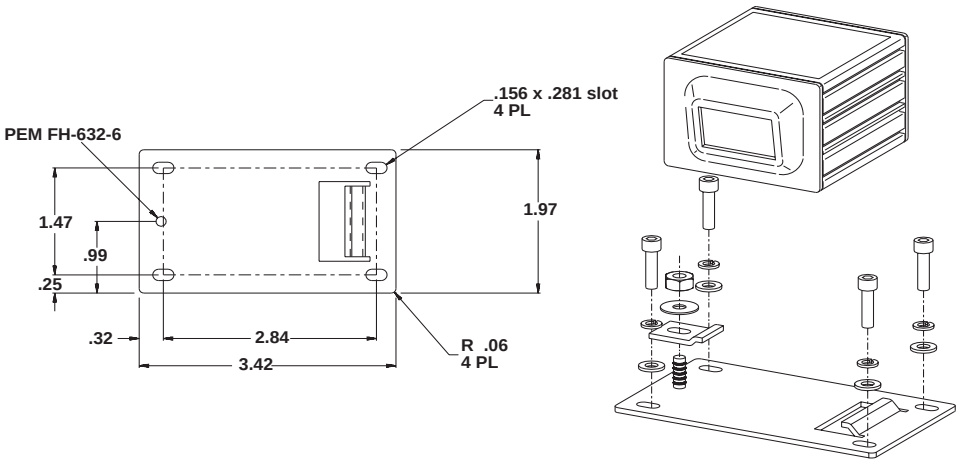
Step 1 Fasten the plate to the mounting surface.

Step 2 The plate has one fixed retaining clip, one #6-32 stud and one #6 nut that holds the adjustable clip. Place the V550-A20 in position so the slot in the side of the housing is engaged by the fixed clip.

Step 3 Move the adjustable clip towards the V550-A20 until it engages the other slot of the V550-A20 housing.

Step 4 Tighten the nut on the stud to secure the V550-A20.

This ensures a tight mount so the V550-A20 does not have any room for movement during operation, and it also allows you to remove the V550-A20 and replace it with the use of only one nut.



Mounting The V550-A20 Using The Mounting Plate

Ladder Mounting Bracket (part # V559-A26E)

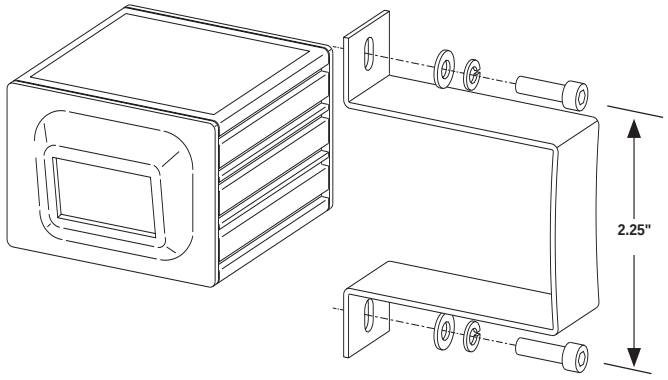
The ladder mounting bracket is designed to hold the V550-A20 in a position so the scan line is perpendicular to the mounting surface. The bracket fits around the V550-A20, but is not directly secured to the V550-A20. Flanges on the bracket provide oblong slots that are designed for #6 mounting screws on either side of the V550-A20. Mounting screws need to be located 2.25 inches apart.

To mount the V550-A20:

Step 1 Place the bracket around the V550-A20 so the backing of the bracket rests on one of the sides of the V550-A20, as shown below.

Step 2 Place the mounting bracket, with the V550-A20 clamped inside, against the mounting surface.

Step 3 Insert and tighten the mounting screws in the oblong slots on the bracket. This ensures the V550-A20 is secured within the bracket against the mounting surface.



Mounting The V550-A20 Using The Ladder Mounting Bracket

Picket Fence Mounting Bracket (part # V559-A26D)

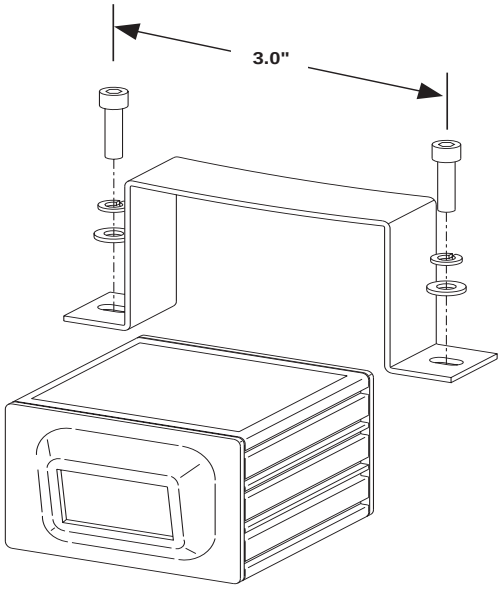
The picket fence mounting bracket is designed to hold the V550-A20 in a position so the scan line is parallel to the mounting surface. The bracket fits around the V550-A20, but is not directly secured to the V550-A20. Flanges on the bracket provide oval slots that are designed for #6 mounting screws on either side of the V550-A20. Mounting screws need to be located 3.00 inches apart.

To mount the V550-A20:

Step 1 Place the bracket around the V550-A20 so the backing of the bracket rests on top of the V550-A20, as shown below.

Step 2 Place the mounting bracket, with the V550-A20 clamped inside, against the mounting surface.

Step 3 Insert and tighten the mounting screws in the oblong slots on the bracket. This ensures the V550-A20 is secured within the bracket against the mounting surface.



Mounting The V550-A20 Using The Picket Fence Mounting Bracket

Cradle Mounting Bracket (part # V559-M26B)

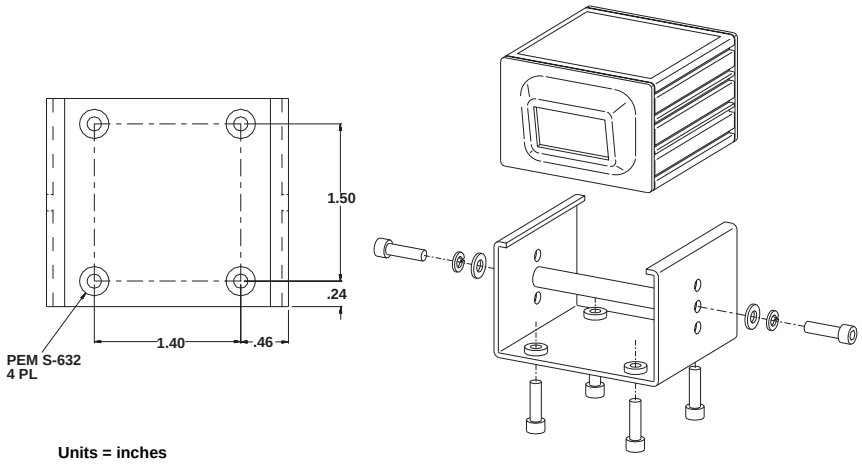
There is one cradle mounting bracket, one 2-1/8" #6-32 round spacer, two 3/8" #6-32 socket head cap screws, two #6 flat washers, and two #6 split lockwashers included with this assembly. The cradle mounting bracket is designed to hold the V550-A20 in a position so the scan line is parallel to the mounting surface. Four #6-32 Pem nuts are provided on the bottom of the bracket.

To mount the V550-A20:

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 V550-A20. There are six slots on each side of the V550-A20. Different sets of slots can be used with the following results:

Bottom Slots:
overall height (bracket and V550-A20) - 2.75"

Four up from bottom:
overall height (bracket and V550-A20) - 2.05"



Mounting The V550-A20 Using The Cradle Bracket

Setting Up Your V550-A20

The steps below represent one recommended scenario to set up your V550-A20 Scanning System:

Step 1: Remove all materials from the box.

Step 2: Make all the appropriate connections to your V550-A20 as explained in Section Three.

Step 3: If you need to make any programming changes to your V550-A20, connect your V550-A20 to a PC or terminal as described in Section Three of this manual, and refer to your BCSETUP Programming Manual.

Step 4: Mount your V550-A20 as described earlier in this Section.

Step 5: Begin reading your bar codes.

If you have any problems or questions concerning setting up your V550-A20, contact your Omron Distributor immediately.

What to Do After Receiving the V550-A20

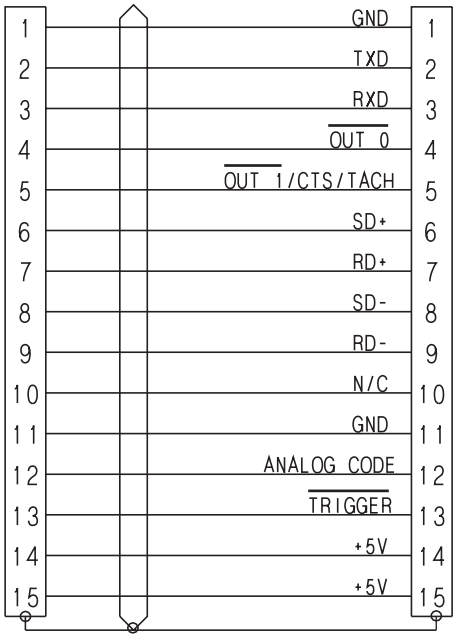
Section 3

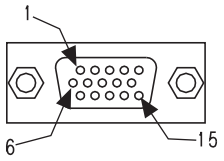
Connecting Your V550-A20 To An External Device

This chapter explains how to connect your V550-A20 to external devices including a PC and Terminal. This chapter also explains how to supply power to your V550-A20. You must make these connections before you can begin setting up or using your V550-A20.

Connecting Your V550-A20 To Other External Devices

Note: Connectors are shown from the soldering side
The shield is electrically connected to both cable shells.





V550-A20 End of Cable
(15 pin female "D")

The V550-A20 is versatile when you need to connect to other devices. The drawings below shows all the pin connections for V550-A20 when using serial communications. If you need to create your own cables to wire your V550-A20 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
TXD-Transmit Data (RS-232)
CTS-Clear To Send (RS-232)
RD-Receive Data (RS-422)
SD- -Inverting Line (RS-485)
Send Data (RS-422)
RXD-Receive Data (RS-232)
RTS-Request To Send (RS-232)
RD+ -Receive Data (RS-422)
SD+ -Non-inverting Line (RS-485)
Send Data (RS-422)

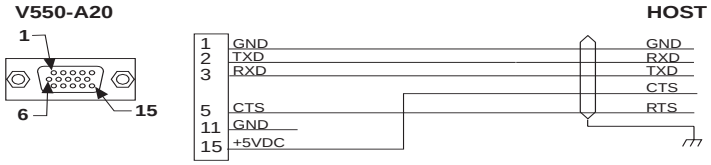
CAUTION

Be careful when you wire your own cable for the V550-A20. You must make sure that V550-A20 receives only 5 volts on pins 14 and 15.

RS-232 With No Handshaking

Use the following drawing as a guide when you want to connect your V550-A20 to a device that is using RS-232 communication with no handshaking:

NOTE: All connectors are shown from the soldering side.



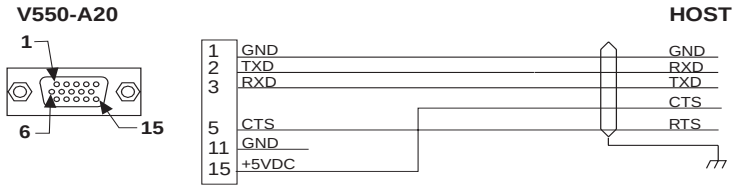
NOTE: Recommended Cable Type: ALPHA # 5473C or Equivalent Maximum Cable Length: 50 Feet

You must enable communication types using the software. Refer to your BCSETUP Manual for more information.

RS-232 With RTS/CTS Handshaking

Use the following drawing as a guide when you want to connect your V550-A20 to a device that is using RS-232 communication with RTS/CTS handshaking:

NOTE: All connectors are shown from the soldering side.

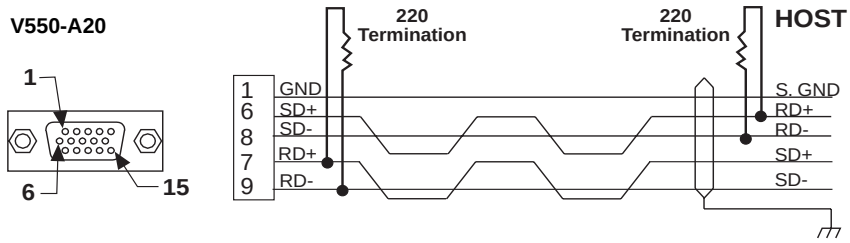


NOTE: Recommended Cable Type: ALPHA # 5473C or Equivalent Maximum Cable Length: 50 Feet

RS-422 (point to point)

Use the following drawing as a guide when you want to connect your V550-A20 to a device that is using RS-422 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.

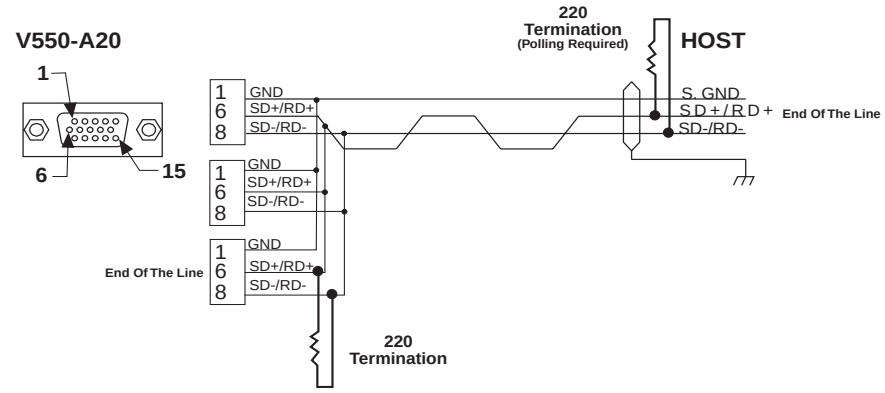
CABLE TYPE: ALPHA #5473C (OR EQUIVALENT).

You must enable communication types using the software. Refer to your BCSETUP Manual for more information.

RS-485 Multidrop

Use the following drawing as a guide when you want to connect your V550-A20 to a device that is using RS-485 Multidrop serial communication:

NOTE: All connectors are shown from the soldering side.



NOTE: RS-485 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.

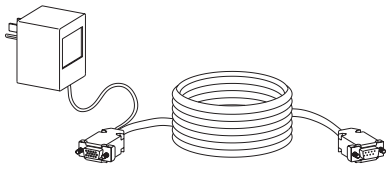
Cable type: Alpha #5473C (or equivalent)

Connecting Your V550-A20 To A PC

Omron recommends that you purchase the Programming Kit for your V550-A20. This kit provides you with the cables that you need to connect your Omron device to a PC. If you would like to purchase the Programming Kit, call your local Omron distributor with the following information:

Part Name	Part Number
Programming Kit	V559-A25C

Programming Kit



Programming Kit
110V AC part # V559-A25C

To connect your V550-A20 to most PCs using the Programming Kit:

Step 1 Plug in the 15 pin connector on the BCR-to-PC cable to the 15 pin connector on the back of your V550-A20.

Step 2 Plug in the 9 pin connector end of your BCR-to-PC cable to a 9 pin serial port on your PC.

Step 3 Use a small standard slotted screwdriver to tighten the screws on the strain reliefs at both ends.

Step 4 Plug the power supply unit into an appropriate wall socket.

Connecting To A PC Without Programming Kit

If you choose not to purchase the Programming Kit, you need to make your own cables. The following pinout diagrams show typical RS-232 communication cable pin connections from your PC to your V550-A20 with connector and cable specifications.

Specifications

15 pin connector - Assmann part # A-HDF15LL-T or equivalent

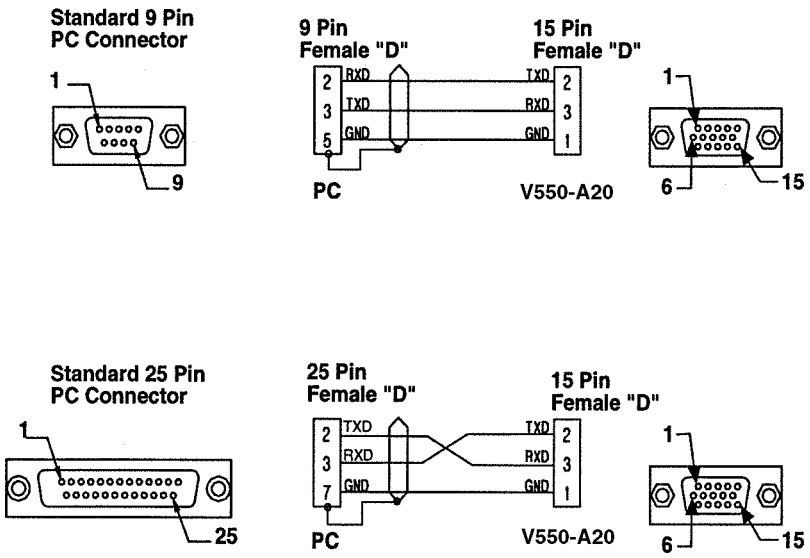
9 pin connector - CINCH part # DEM-9S or equivalent

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.



V550-A20 to PC Connections

Connecting Your V550-A20 To A Terminal

If you are using a Terminal to program your V550-A20, you need to make your own cables. The following pinout diagrams below show typical RS-232 communication cable pin connections from your Terminal to your V550-A20 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 # A-HDF15LL-T or equivalent

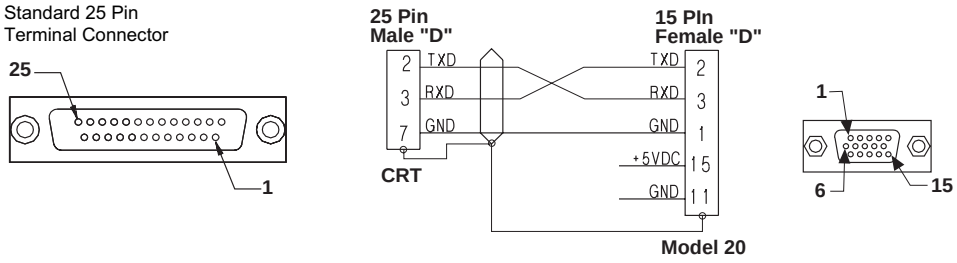
25 pin connector - CINCH part # DEM-25P or equivalent

Cable - Alpha part # 5473C, Manhattan Part #M3264, or equivalent

25 pin strain relief - Northern Technologies part # C88220004 or equivalent

15 pin strain relief - Northern Technologies part # C88300004 or equivalent

NOTE: All connectors are shown from the soldering side.



Terminal to Omron Bar Code Reader Connections

Supplying Power to Your V550-A20

You must supply power to the V550-A20 through the 15 pin connector at the rear of the unit. You can supply power using one of the following two methods: using an Omron local power supply or wiring power directly into the V550-A20 using one of your own methods.

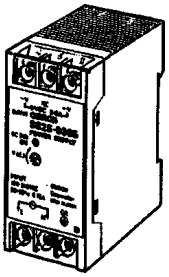
The V550-A20 must meet the following three requirements regardless of the method that you use to supply power:

- +5VDC must be supplied
  (range between +4.85VDC and +5.25VDC @ 500 mA typical, 600 mA max., 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 Omron's Power Supply For Power

You can use the Omron S82S-0305 power supply to supply power to the V550-A20 15 pin "D" connector. Note that a UL class 2 power supply should be used for UL approval. This power supply is shown below:



Omron power supply (not UL Class 2)
S82S-0305

CAUTION

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

If you use this power supply, you need to connect cable leads to the V550-A20 15 Pin "D" connector. Use the following information to make these connections:

110V and 220V Power Supply	V550-A20 Pin #
Ground	Pin 11
+5V	Pin 15

If no ground is available from another source, you can connect to the ground terminal of the power supply. This grounds the shell/case.

CAUTION

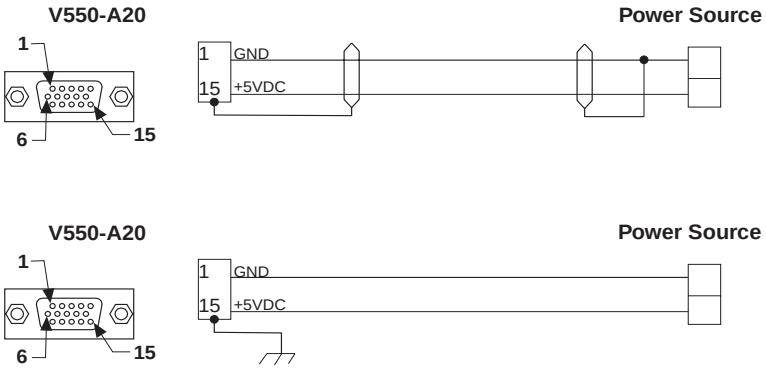
When you are providing power to the V550-A20 directly from another source, make sure the metal shell of the connector is grounded.

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

Wiring Other Sources Of Power Directly

To supply power to the V550-A20 15 pin "D" connector, you can use many other sources than previously mentioned. You must comply with the V550-A20 power requirements, mentioned in the beginning of this section, to ensure proper operation.

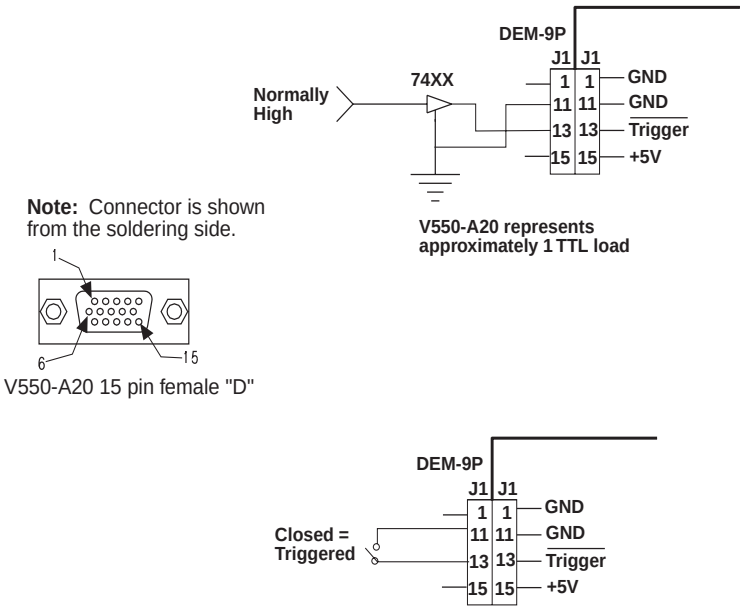
The drawings below show alternate ways of wiring power into the V550-A20:



Alternative Wiring Methods for Supplying Power to The V550-A20

Supplying A Trigger Input To Your V550-A20

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. You can wire a triggering device directly to the V550-A20 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 V550-A20.



Two Different Ways To Wire A Triggering Device To Your V550-A20 (Top-TTL Method, Bottom-Dry Contact Method)

Using V550-A20 Parallel Outputs

The V550-A20 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 V550-A20 15 pin connector. Both of these outputs are controlled by software. (Refer to your BCSETUP 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.

The Go/Match (out 1) output can not be enabled when RTS/CTS protocol is enabled. (Refer to your BCSETUP Manual.)

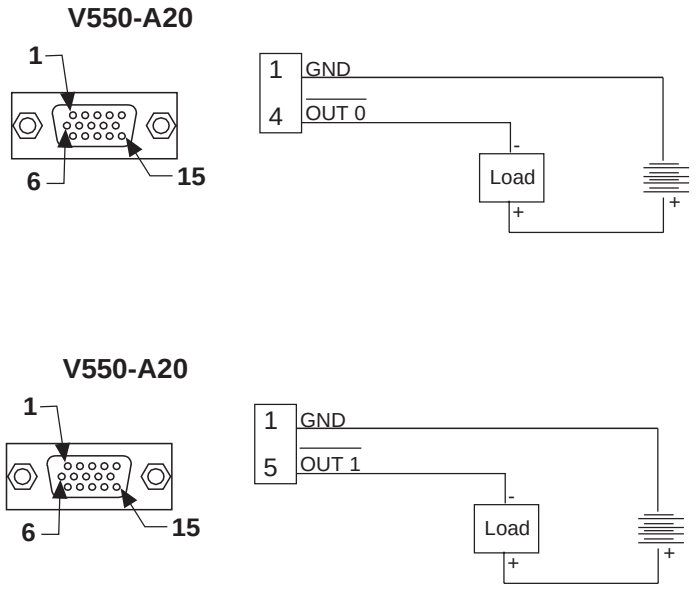
How The Outputs Work

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 output 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

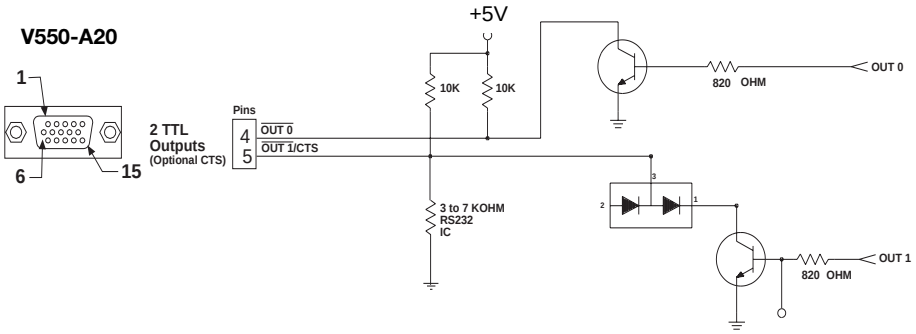
The following diagrams show the proper connections that you need to ensure that the outputs function properly.



Output Connections

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

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



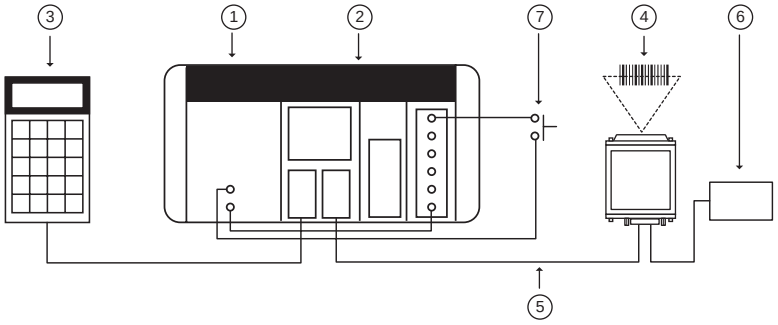
The V550-A20 Output Circuitry

PLC Connection Examples

SYSMAC Series CQM1 Controller with RS-232 Connection

Operation

Switch ON the trigger switch (7) shown above to execute V550-A20 to read and send data to the data memory area of CQM1. Use the program console (3) to confirm the data. In the event the data were not read, press "?" after the trigger switch is OFF.



1	Power supply unit	CQM1-PA206
2	CPU unit	CQM1-CPU21
3	Programming console	CQM1-PRO
4	Bar code reader	V550-A20
5	Connecting cable	V559-A32A-2M
6	BCR power supply	S82S-0305 (5V 0.6A) (see note)
7	Trigger switch	relay or switch

NOTE: Not rated for UL class II operation.

V550-A20 Setup

- Communication Condition (Setup):
  - Baud Rate: 9600 bps
  - Word Length: 7 bit
  - Parity: EVEN
  - Stop Bit: 2 bit
- Trigger Requirements:
  - Start Code: S
  - Stop Code: E
  - Data Output Mode: Single Output
  - Scan Trigger Type: Serially Controlled
  - Trigger Stage: Standard

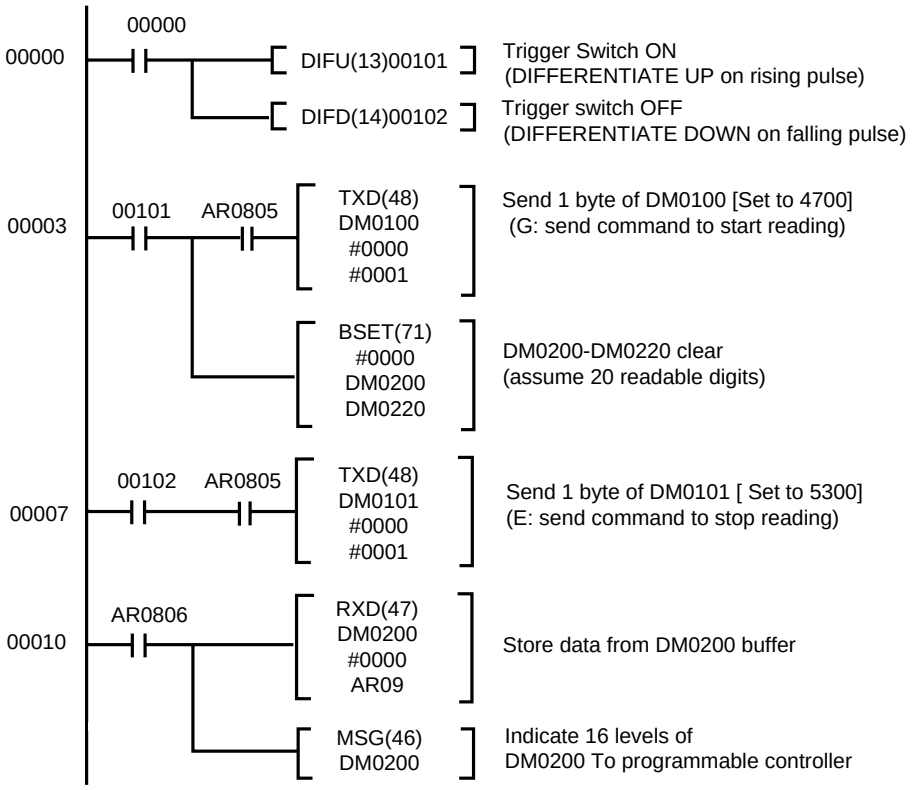
CQM1 Setup

- Communication Condition:
  Set OFF the dip switch 5 of CQM1 and set [1000] on DM6645 to match the communication condition with BCR (refer to the CQM1 Programming Manual for the detailed way to change the condition).
- Setting of Start Code & Stop Code:
  Set [1000] on DM6648, and set [0D00] on DM6649.
- On the DM, set the ASCII Code [S] to Start Reading, and [E] to Stop Reading.
- Connection of Trigger Switch:
  Connect the trigger switch to the Input Port [00000] Terminal on the CPU unit to enable to send [S] or [E] through the RS232C line when the BCR is ON or OFF, respectively.
- Save the received data from the BCR in order from upper digit, DM0200 must be the top, to down.

Confirmation of Operation

- After programming, set RUN mode and set the trigger switch ON to execute the reading with the LED on the BCR lighting.
- Press the key in the order below in order to confirm the data with the console:
  ① CLEAR → ② FUN → ③ MONITOR
- The "?" is indicated, in the event that the data can't be read until the trigger is OFF.

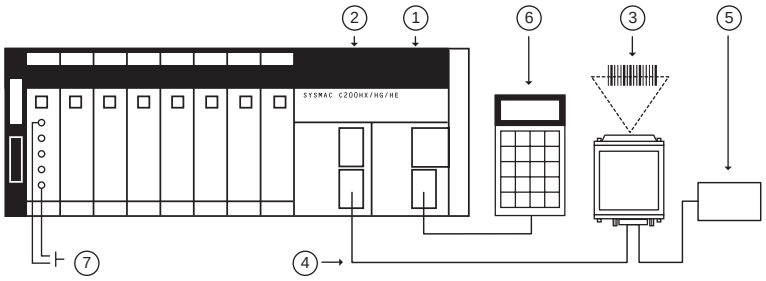
CQM1 Programming



SYSMAC Series C200HS or C200H Alpha with RS-232 Connections

Operation

Switch ON the trigger switch (7) shown above to execute V550-A20 to read and send data to the data memory area of C200□. Use the program console (6) to confirm the data. In the event the data were not read, press "?" after the trigger switch is OFF.



1	CPU unit	C200HS-CPU21
2	Built-in RS232 port	
3	Bar code reader	V550-A20
4	Connecting cable	V509-A32A-2M
5	Power supply	S82S-0305 (5V 0.6A) (see note)
6	Programming console	C200HS-PRO27
7	Trigger switch	

NOTE: Not rated for UL class II operation.

V550-A20 Setup

- Communication Condition (Setup):
  - Baud Rate: 9600 bps
  - Word Length: 7 bit
  - Parity: EVEN
  - Stop Bit: 2 bit
- Trigger Requirements:
  - Start Code: S
  - Stop Code: E
  - Data Output Mode: Single Output
  - Scan Trigger Type: Serially Controlled
  - Trigger Stage: Standard

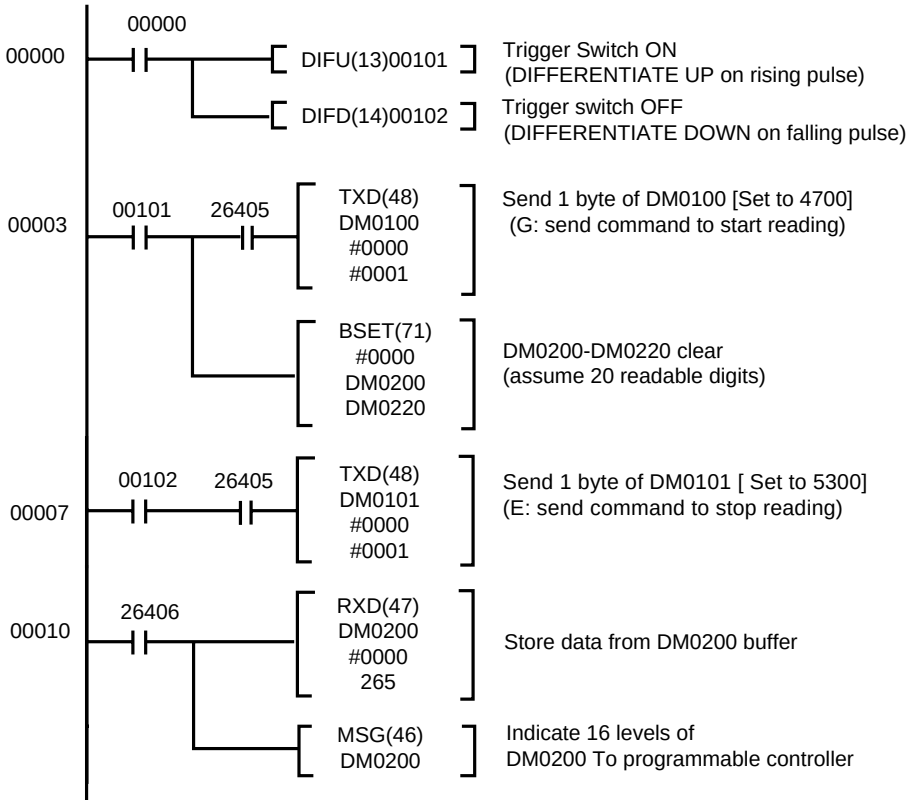
C200HS or C200H Alpha Setup

- Communication Condition:
  Set OFF the dip switch 5 of C200HS or C200H Alpha and set [1000] on DM6645 to match the communication condition with BCR (refer to the Reference Manual for the detailed way to change the condition).
- Setting of Start Code & Stop Code:
  Set [1000] on DM6648, and set [0D00] on DM6649.
- On the DM, set the ASCII Code [S] to Start Reading, and [E] to Stop Reading.
- Connection of Trigger Switch:
  Connect the trigger switch to the Input Port [00000] Terminal on the CPU unit to enable to send [S] or [E] through the RS232C line when the BCR is ON or OFF, respectively.
- Save the received data from the BCR in order from upper digit, DM0200 must be the top, to down.

Confirmation of Operation

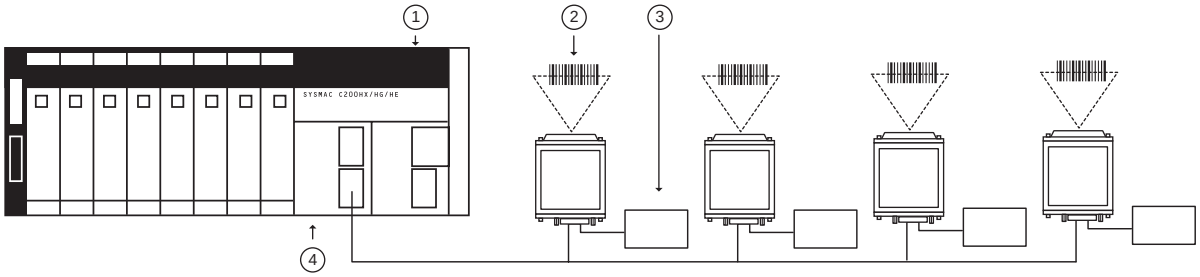
- After programming, set RUN mode and set the trigger switch ON to execute the reading with the LED on the BCR lighting.
- Press the key in the order below in order to confirm the data with the console:
  ① CLEAR → ② FUN → ③ MONITOR
- The "?" is indicated, in the event that the data can't be read until the trigger is OFF.

C200HS or C200H Alpha Programming



PLC Master/Slave System

SYSMAC Series C200H Alpha…RS-485 Multidrop:



1	CPU	C200H…
2	Bar code reader	V550-A20
3	Power supply unit	S82S-0305 (5V, 0.6A) (see note)
4	Communications Board	C200HW-COM06-E

NOTE: Each bar code reader requires a minimum of 500 mA to operate. If your system contains more than 1 bar code reader in parallel, select a power supply rated for a higher output current.

Connection with Multiple Readers:

Up to 32 slaves can be connected for each serial port on the master (depending upon line length and required response time).

- Operation:
  The master device, C200H…, sends poll messages to the slave BCRs requesting them to respond with data. The BCRs respond to the polls. There is no response if they are not polled by the master.
- Message Formats:

V550-A20 Communication Setting

Basic Setting	READ Trigger	Level Trigger
	Read Mode	Single
Communication	Baud Rate	9600 bps
Condition (Default)	Word Length	7 bits
	Parity	EVEN
	Stop Bits	2 bits
	Header	STX
	Footer	CR
	RS/CS Control	OFF

Framing for all messages sent by any device on the multidrop line:

FF STX ID TYPE SEQ DATA LRC CR

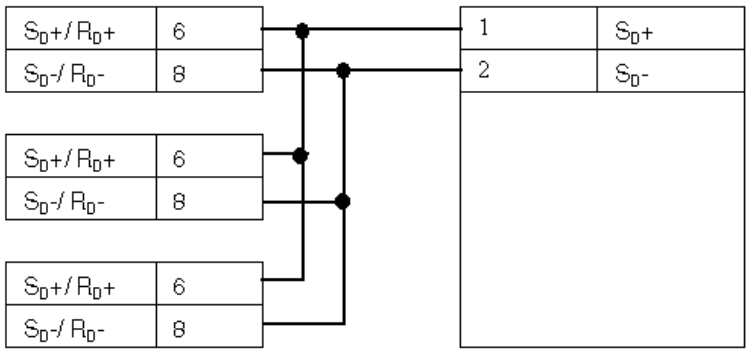
FF (hex)	Guard character	Ignored by receiver.
STX (02hex)	Start of text character	Indicates start of a message.
ID (2 ASCII digits)	Unit identifier	Indicates BCR identification number.
TYPE (2 ASCII digits)	Message type	Describes purpose of the message.
SEQ	Sequence number	Starts at 0 at power up; incremented by 1 for each data message sent.
DATA	Content of data field	May or may not contain characters.
LRC (2 ASCII digits)	Linear redundancy checks	Checks to ensure that message is valid.
CR	Carriage return	Indicates end of message.

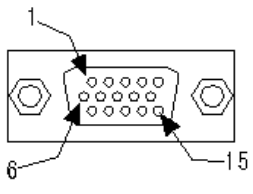
C200H Alpha Communications Board Connections:

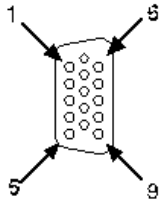
The connections from the bar code reader connectors to the C200H Alpha COM board are shown below.

V550-A20
Bar Code Reader

C200HX/C200HG/C200HE
Communications Board







V550-A20 Pin Configuration

C200H Alpha COM Board Pinout

Note: The above connection is shown using the C200H Alpha PLC with protocol macro function. Contact OMRON for the latest V550-A20 Protocol macro.

Section 4

Basic Troubleshooting and Maintenance

The V550-A20 hardware was specifically designed for the tough industrial environment. The unit does not need anything more than some basic cleaning and a checkup every once and awhile. This chapter provides you with a cleaning procedure and some troubleshooting techniques.

Cleaning Procedure

The V550-A20 enclosure is tightly sealed to prevent dust or dirt from entering the unit. Nothing inside the V550-A20 needs to be cleaned on a regular basis. If the V550-A20 needs repair, do not open the unit. The V550-A20 is designed to be shipped back for repair. Refer to your Omron distributor for more information.

To clean the V550-A20:

Step 1: Slightly dampen a lint-free cloth with a solution made of mild detergent and water.

Step 2: Gently wipe the enclosure of the V550-A20. Be careful to avoid the exit window.

Step 3: Dry the enclosure of the V550-A20 with a dry lint-free cloth.

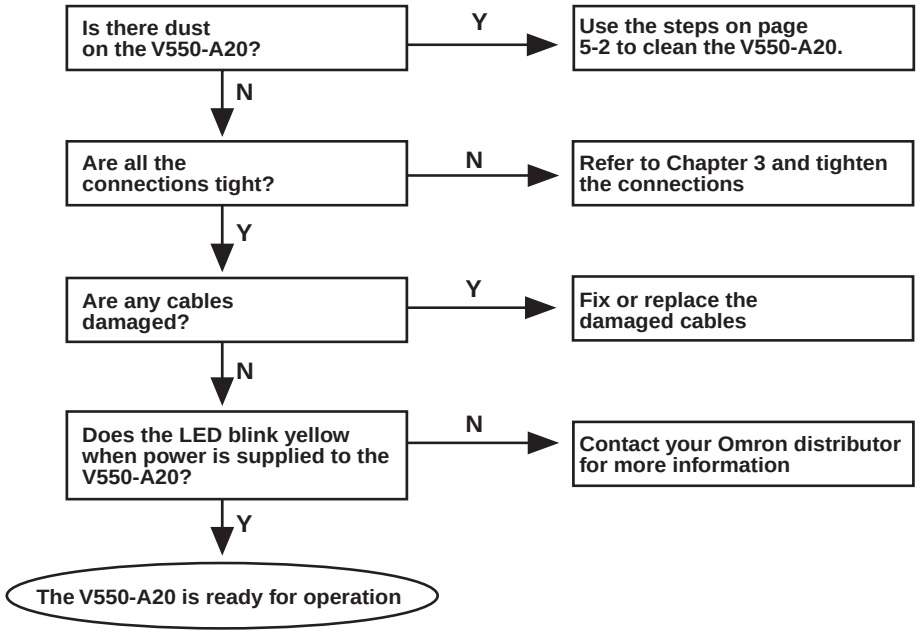
To clean the V550-A20 exit window:

Step 1: Dampen a lint-free tissue with distilled water and wipe off any dust particles.

Step 2: Dry the exit window with a dry lint-free tissue.

Troubleshooting Your V550-A20

Use the following chart to help troubleshoot the V550-A20. If your V550-A20 is damaged, please contact your Omron distributor.



Problem/Solution List

The following is a list of problems that could occur with your scanning system. Listed below each event is a cause and solution.

Problem: The Status LED turns red for and extended period of time or it blinks.
Cause: The V550-A20 detects a failure.
Solution: Call your Omron distributor.

Problem: There is no laser beam exiting from the scanner when power is supplied.
Cause: No power is applied to the V550-A20.
Solution: Check to ensure power is plugged in and power is applied to the interface connector.

Problem: The V550-A20 is not reading bar codes.
Cause: Code type is not enabled or is the wrong code length.
Solution: Enable code type or correct code length.
(Refer to section 5-6 of the BCSETUP Programming Manual.)

Problem: V550-A20 has poor read rate.
Cause: V550-A20 window is dirty, label is not within reading range, or label quality is poor.
Solution: Clean V550-A20 window, check reading range or label, or check code quality.

Problem: V550-A20 has poor read rate in hardware trigger.
Cause: Trigger switch not adjusted, or it is misaligned.
Solution: Adjust the triggering device.

Problem: V550-A20 has poor read rate in serial or trigger.
Cause: Serial trigger is not timed properly with the arrival of the bar code.
Solution: Adjust the timing of your serial trigger so it turns on before the bar code and turns off after the bar code.

Problem: No communication to host.
Cause: Host communication to scanner does not match.
Solution: Connect the V550-A20 to a PC and use BCSETUP to confirm communications parameters.

Section 5

Appendices

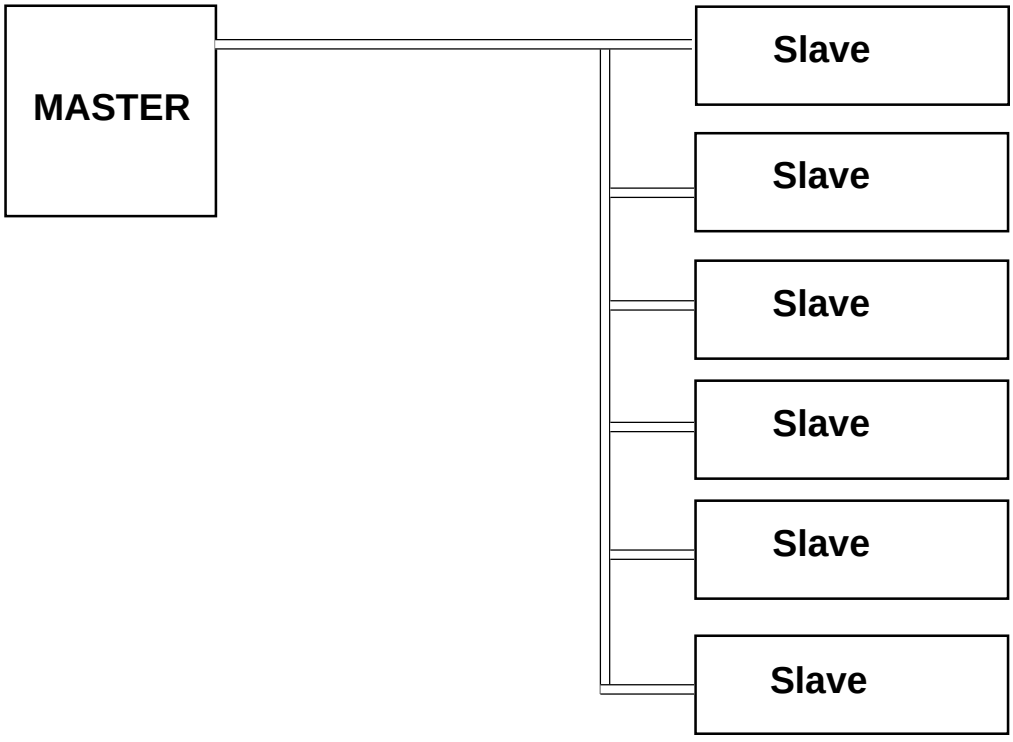
Standard RS-485 Multidrop Communications

RS-485 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 RS-485 communications works:

NOTE: 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).



The remainder of this section defines the message formats and timing requirements for the protocol used on RS-485 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, then 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:

FFH 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 the 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-

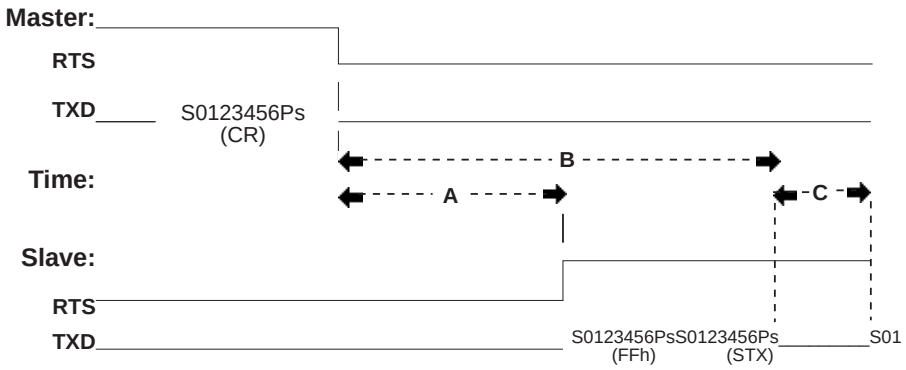
Timing

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.

NOTE: 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.



"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").

NOTE: The slave's "FF" may be replaced with a 1 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 spending a message to a slave. While the slave must respond within a very short time window, there are not 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 acknowledgment.

Error: The master does not understand the slave’s acknowledgment of a data message.
Recovery: The master will retransmit the data message after timing out while waiting for the acknowledgment. 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 acknowledgment 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 acknowledgment 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 acknowledgment 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 acknowledgment 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 acknowledgment 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)

NOTE: 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

NOTE: 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 RS-232 and RS-422

RTS/CTS (Used with only RS-232)
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.

Appendix B: ASCII Chart

Appendix B: 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

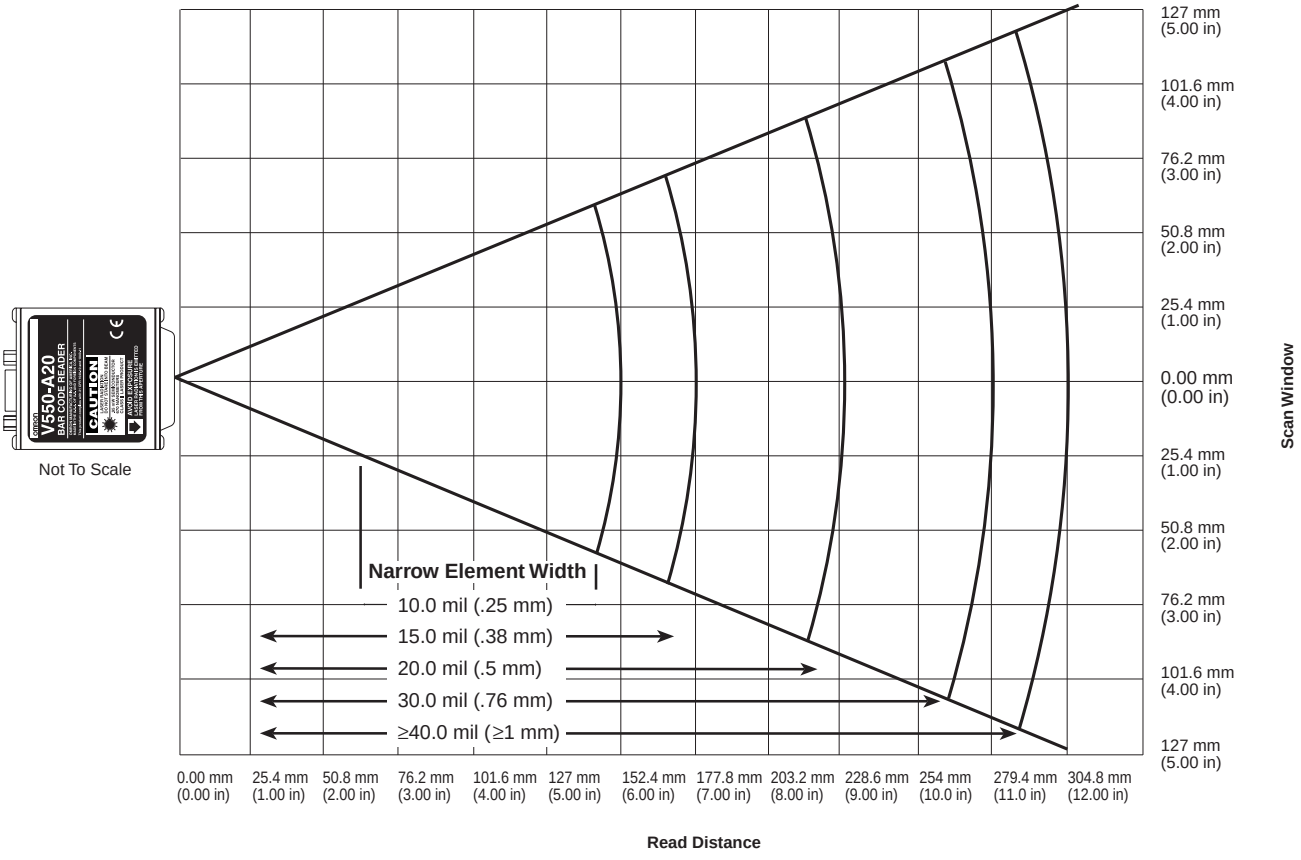
Appendices

Appendix C: V550-A20 Read Distance Charts

Standard Reader - Optical Performance (Model V550-A20)

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

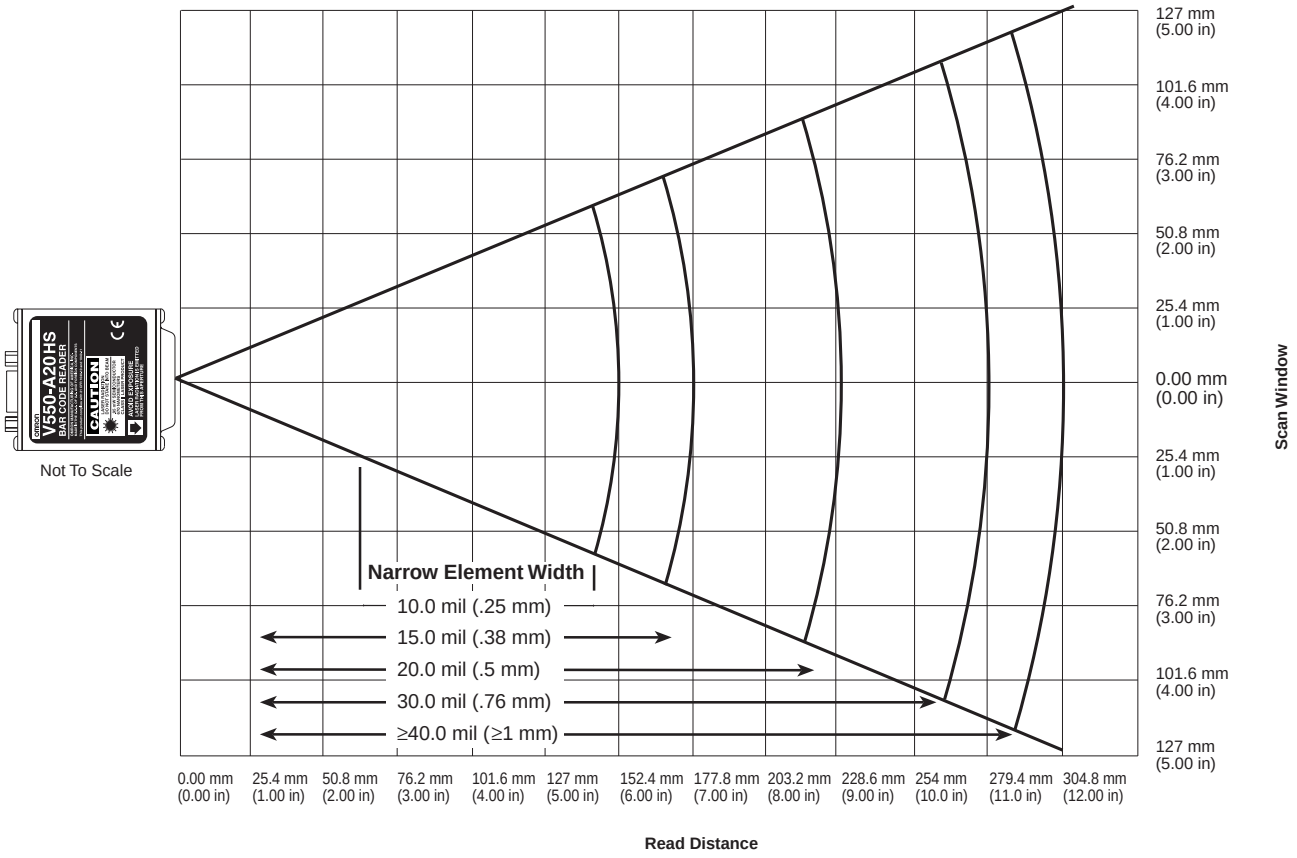


NOTE: These read ranges were obtained using quality bar codes (rated 'A' by ANSI standards). Results may vary depending on quality of bar codes.

High Speed Reader - Optical Performance (Model V550-A20HS)

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

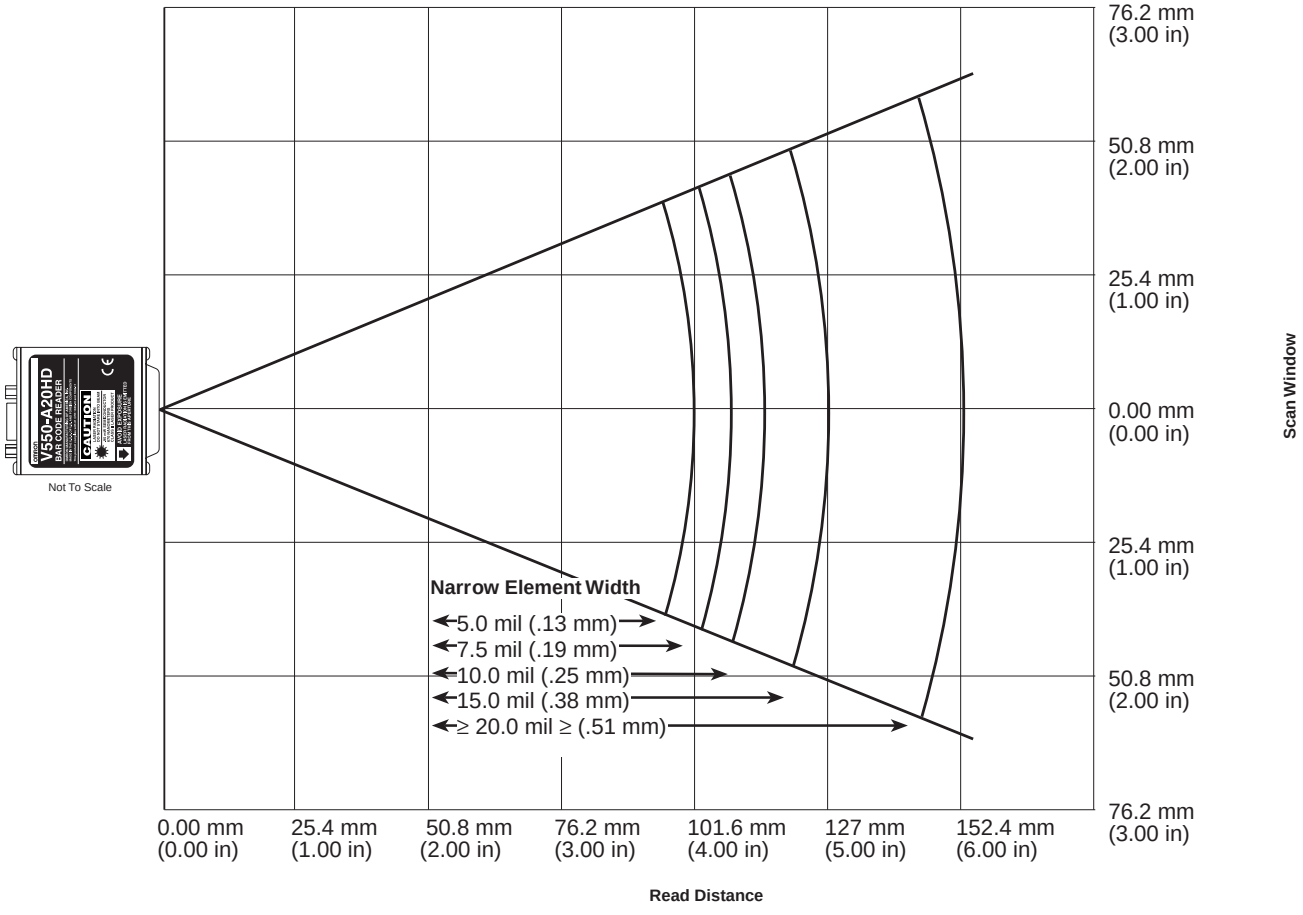


NOTE: These read ranges were obtained using quality bar codes (rated 'A' by ANSI standards). Results may vary depending on quality of bar codes.

High Density Reader - Optical Performance (Model V550-A20HD)

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



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

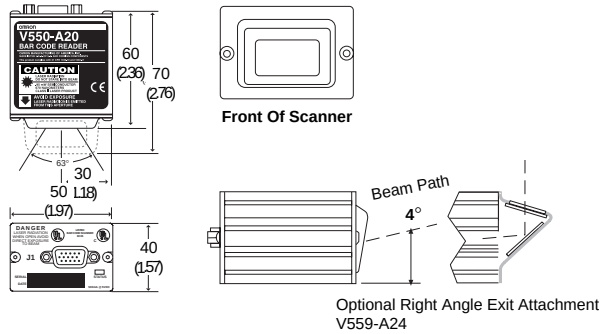
Appendix D:

Dimensions

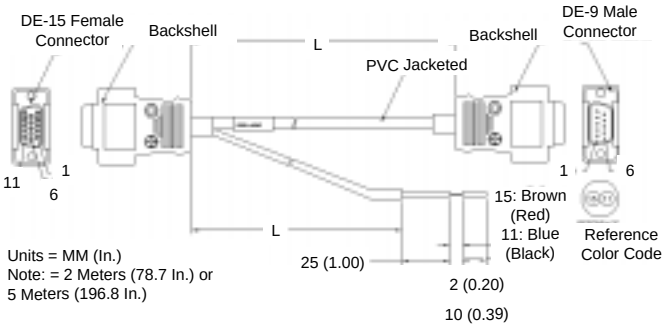
UNIT: MM (INCH)

■ READERS AND ACCESSORIES

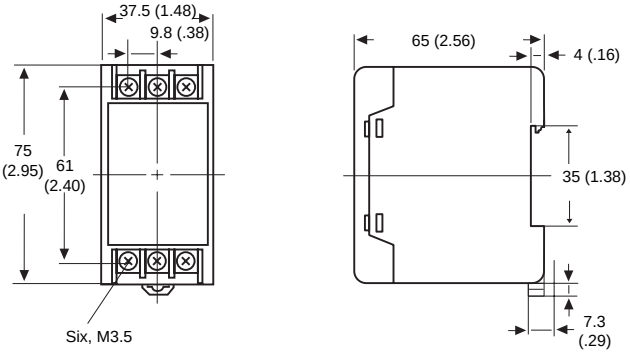
V550-A20 Bar Code Reader



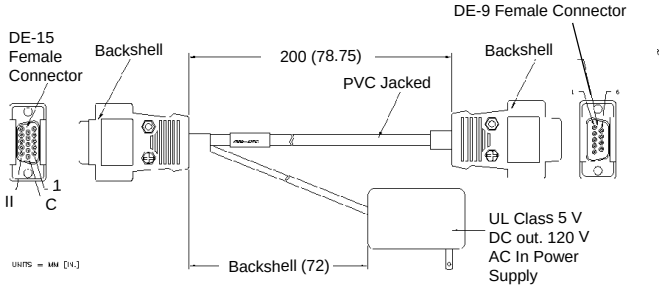
V559-A32-A-❑M BCR to OMRON PLC RS-232 Port Cable



S82S-0305 Power Supply

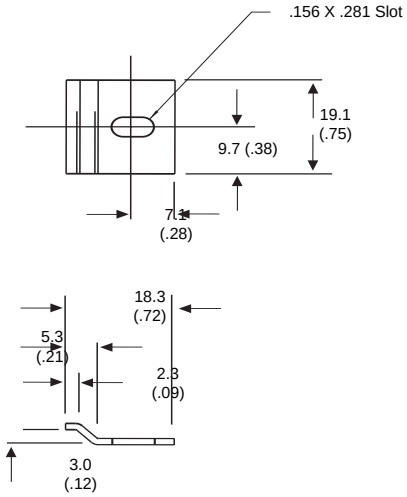


V559-A25C Programming Kit

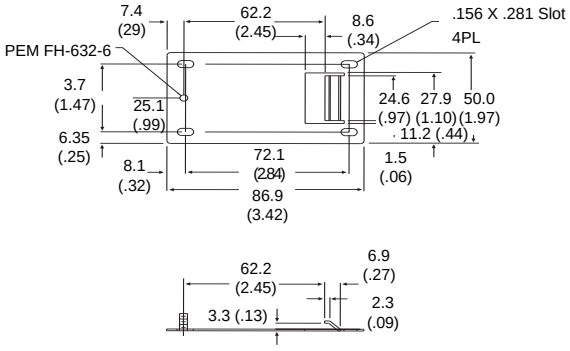


■ MOUNTING BRACKETS

V559-A26F Mounting Clip

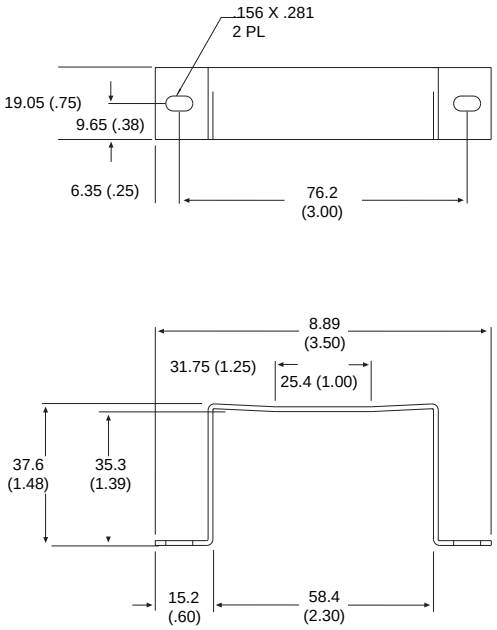


V559-A26A Mounting Plate

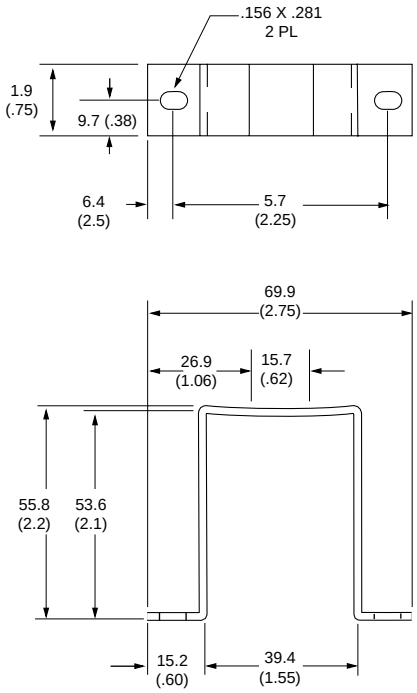


Appendices

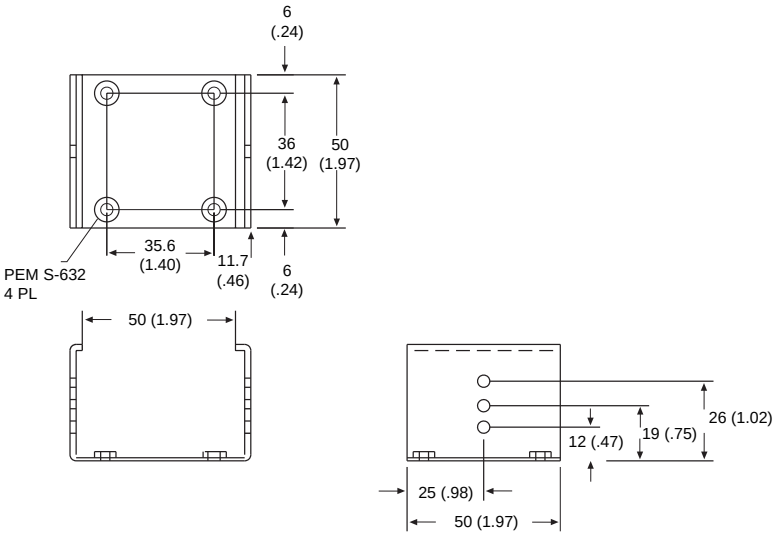
V559-A26D Picket Fence Mounting Bracket



V559-A25C BCR-to-PC Cable



V559-A26ZB Cradle Mounting Bracket



Appendix E:

Precautions

■ LASER BEAM SAFETY

"Low power" lasers are by definition incapable of causing eye injury within the duration of the blink, or aversion response (0.25 s), and must be visible (400 nm to 700 nm). Therefore, an ocular hazard can only exist if an individual overcomes his/her natural aversion to bright light and stares directly into the laser beam. The product requirements for these lasers are two: to have a CAUTION label and to have an indicator light to indicate laser emission.

The two operational safety rules are:
- Do not permit a person to stare at the laser from within the beam.
- Do not point the laser at a person's eye at close range.

Follow the instructions on this datasheet for the adjustment and mounting of the V550-A20.

Make sure that the laser beam will not be directly or indirectly reflected into human eyes. The safety distance is approximately 1 m for the V550-A20. If there is a possibility of laser beam reflection by any objects around the emitter at the time of adjustment, apply paint with a low light reflection ratio to the objects.

The sensor incorporates laser emission warning light and 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 emanate from the scan head.

FDA, IEC Laser Class	I	IIa	II	IIIa	IIIb	IV
Remote interlock connector	N/A	N/A	N/A	N/A	R	R
Key control	N/A	N/A	N/A	N/A	R	R
Emission indicator	N/A	N/A	R	R	R	R
Beam attenuator	N/A	N/A	N/A	R	R^1	R^1

Note: In the chart above: R = Require; N/A = Not applicable; R^1 = Delay required between indication and emission.

■ LASER CONTROL REGULATIONS

The V550-A20 Bar Code Reader meets the standards required by the U.S. Food and Drug Administration (FDA). This reader also has been reported to the Center for Devices and Radiological Health (CDRH). Any service performed on this device should be done so as to not violate compliance with the *Code of Federal Regulations, Title 21, Part 1040, Section 10* (21 CFR 1040.10).

Labels (FDA Regulations)

Laser radiation warning and information labels are located on the top side of the bar code reader.

■ INSTALLATION

Install the bar code reader in a location where the laser beam will not enter the operator's eyes directly or from reflection by a mirror surface. Also, mount the operation indicator (LED) in a clearly visible location. Avoid interference from ambient light shining into BCR's window. Avoid excessive dust on window. Avoid scratching window. Avoid subjecting the bar code reader to heavy vibration.

■ MAINTENANCE AND REPAIR

DANGER!
Never disassemble the reader. Users expose themselves to the risk of laser radiation if they disassemble the device.

Do not attempt repairs or maintenance of the V550-A20. The V550-A20 contains no user serviceable parts. Refer all servicing to an authorized Omron representative.

Appendices

Glossary of Terms

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

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, a trade association.

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

Alphanumeric - The character set which contains letters, digits and other characters such as punctuation marks.

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.

ASCII (American Standard Code for Information Interchange) - A seven bit plus parity code 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 ˚ 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.

Bar - The dark elements of a printed bar code symbol.

Bar Code - An array of rectangular bars and spaces that are 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 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.

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

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”.

CDRH - (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. Omron is in compliance with the CDRH regulations.

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.

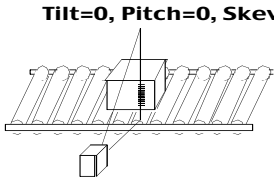
Check Character - A character (usually at the end of the code) that is used to perform a mathematical check to ensure the accuracy of a scan of the bar code.

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

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

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 variations 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.

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

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.

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

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

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.

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.

DRX (Data Reconstruction) - A technology that collects, reconstructs, and decodes partial scans to provide valid bar code data.

DSR (Data Set Ready) - An RS-232 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.

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.

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. (^[)

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.

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

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.

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 - The type of laser most 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.

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 laser printing:** Its main restriction is that ink jet printing is usually capable of printing only low density codes. **Benefits of laser 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.
Omron PLC modules are available as input and output versions. Maximum current is limited by the input modules. Input modules can be used for photoelectric trigger inputs. Output modules are commonly used to control diverters, alarms, external relays, etc.

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

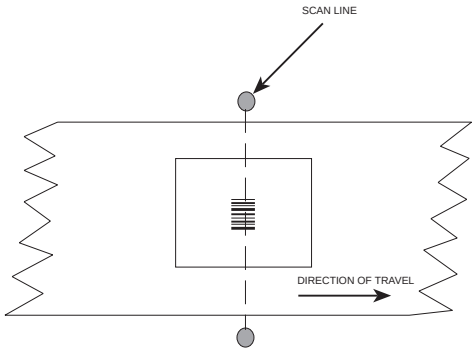
Interface - A shared boundary defined by common physical interconnection characteristics, signal characteristics and meanings of interchanged signals.

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.

I/O (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 - Presentation to the scanner of a bar code such that the 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.



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)

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

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. 1 mil = 0.0254 mm.

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

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.

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. Omron 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 (National Electrical Manufacturers Association) - In order to rate the quality of an enclosure, NEMA has developed a system for rating all enclosures. A partial list of NEMA enclosure types is shown below:

NEMA 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 noncorrosive liquids.
13 Enclosures are intended for indoor use primarily to provide a degree of protection against dust, spraying of water, oil, noncorrosive coolant.

NVC (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.

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).

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).

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

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

Hardware Trigger - This is an electrical signal from a relay, photoelectric or proximity sensor, or limit switch indicating that an object is passing by the scanner.

Start and End of Trigger - The trigger cycle begins when the photoelectric sensor is blocked and continues until the photoelectric sensor is unblocked. Relay decisions and data communication take place after the end of the trigger signal.

Serially Controlled Trigger - A serial message from an external device that controls the trigger cycle.

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

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`*.

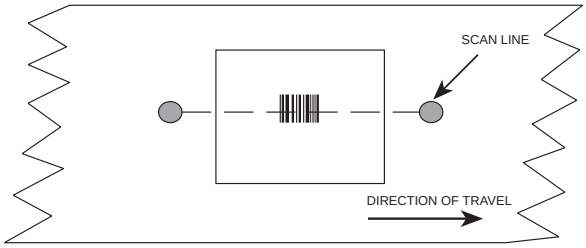
Parity Bit - A bit that is set at "0" or "1" in a character to ensure that the total number of 1 bits in the data field is even or odd.

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.

Photoelectric Sensor - Used as a presence detector to identify objects in the bar code reader's reading zone. A retroreflective photoelectric sensor 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 TRIGGER is sent to the bar code reader.

Picket Fence Orientation - Presentation of a bar code such that the 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 - Data held in a buffer 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.

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 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.

Request To Send (RTS) - An RS-232 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.

RPM - Revolutions per minute.

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

RS-422 - The Electronic Industries Association standard that specifies the electrical characteristics of balanced voltage digital interface circuits.

RS-485 - 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.

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

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

SERIAL ASYNCHRONOUS TRANSMISSION OF DATA: The V550-A20 is capable of communicating via the following interfaces: RS-232, RS-422, and RS-485.

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 available for the V550-A20 are: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, and 57600. 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.

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.

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 - A signal, typically provided by a photoelectric or proximity sensor, that informs the bar code reader of the presence of an object within its reading zone.

UCC (Uniform Code Council) - The organization that 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).

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.

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.

"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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