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# User's Manual

Laser Bar Code Reader

# *BL-500 Series*



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# Safety Precautions

This User's Manual describes the operation and functions of the BL-500. Read this manual carefully to ensure safe use and maximum performance from your BL-500.

The BL-500 uses a semiconductor laser as the light source. Before using the product, see "Laser Safety Precautions" on page 3 to learn the safe and correct method of using the reader.

## Symbols

The following symbols alert you to important messages. Be sure to read these messages carefully.

**WARNING** Failure to follow instructions may lead to injury. (electric shock, burn, etc.)

**CAUTION** Failure to follow instructions may lead to product damage.

**Note** Provides additional information on proper operation.

Any reference to the BL-500 in this manual refers to information on all products in the BL-500 series. When refering to specific product information, the product name exclusively will be used.

## General precautions

- The BL-500 uses a semiconductor laser as the light source. Before using the product, see "Handling a Laser Product" on page 3 to learn the safe and correct method of using the reader.
- Do not use the BL-500 as a controller for equipment which could potentially harm a person.
- Be sure to match the polarities (+ and -) of the power supply when soldering the connections. Reversing the polarities will damage the unit.
- Do not disassemble the BL-500. Doing so may make repair impossible.
- The BL-500 is a precision instrument. Dropping the unit could damaged it. Exercise caution when moving or installing.
- Be sure that there is no water, oil or dust on the optical pickup. Such obstructions can cause read errors. Clean the pickup by gently wiping with a soft lens cloth soaked with water.



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# Laser Safety Precautions

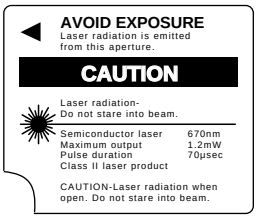
## Classification

| Model | BL-500(H) | BL-501(H) | BL-550(H) | BL-551(H) |
|---|---|---|---|---|
| FDA | Class II | | | |
| IEC 825-1, 11 1993 | Class 2 | | | |
| DIN EN 60825-1 07.1994 | Klasse 2 | | | |

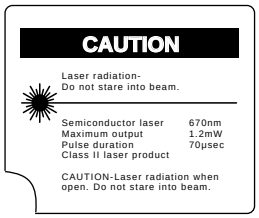
## Warning labels

### FDA Class II

BL-500/501/500H/501H




BL-550/551/550H/551H

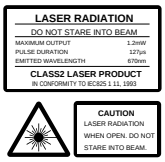



### IEC Class 2

BL-500/501/500H/501H




BL-550/551/550H/551H




### DIN Klasse 2

BL-500/501/500H/501H

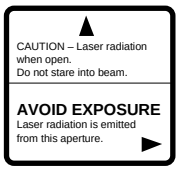



BL-550/551/550H/551H




## Aperture label

FDA Class II




IEC Class 2




DIN Klasse 2




## Protective housing label

IEC Class 2




DIN Klasse 2






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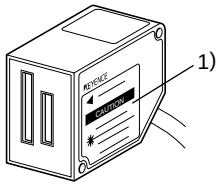
## Label location

The following label positions are recommended.

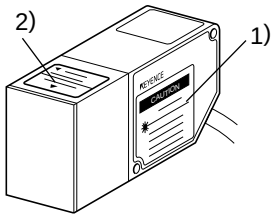
FDA Warning labels are attached to the sensor head as shown below. The IEC/DIN Warning labels are packaged with the BL-500 series. Affix the Warning labels on the sensor head as shown below.

**FDA**

BL-500/501/500(H)/501(H)

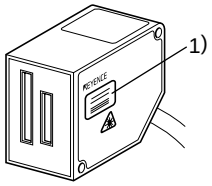



BL-550/551/550(H)/551(H)

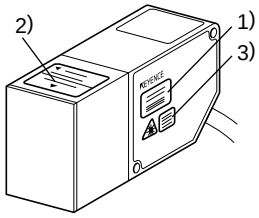



**IEC**

BL-500/501/500(H)/501(H)




BL-550/551/550(H)/551(H)




## Safety consideration

**CAUTION**

Use of controls or adjustment, or the performance of procedures other than those specified herein, may result in hazardous radiation exposure.

The laser beam is not harmful to the skin. There is, therefore, no danger in exposing arms or hands to the beam. The only possible health hazard is in exposing the eyes to the laser beam. Damage to the eyes can occur if the operator stares directly into the beam.

**WARNING**

Following the safety precautions below to ensure operator safety:

- **Operate the BL-500 series only according to the procedures described in this instruction manual.**
  Otherwise, injury may occur due to exposure to the laser beam.
- **Do not disassemble the sensor head.**
  Laser emission from the BL-500 series is not automatically stopped if the sensor head is disassembled. If you disassemble the sensor head for inspection or repair, you may be exposed to the laser beam. If the BL-500 series malfunctions, contact KEYENCE immediately.
- **Do not look directly at the laser beam.**
  Looking directly at the laser beam may result in serious eye injury.
- **Protective enclosure**
  We recommend that you install a protective enclosure around the sensor head to prevent any person from getting near the sensor head during operation.
- **Protective goggles**
  We recommend that you wear protective goggles when using the BL-500 series.
- **Stop laser emissions before cleaning the laser emission port.**
  Failure to stop the laser emission may expose eyes to the laser beam.
- **Chek the laser beam path.**
  To prevent exposure to the laser beam due to specular or diffuse reflection, install a screen which offers the appropriate reflectance and temperature characteristics to interrupt the reflected laser beam. Do not install the BL-500 series in such a way that the laser beam passes at eye height.



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## Safety features

The BL series is provided with the following safety features. Make sure these features function correctly before making any measurement.

**1. LASER ON alarm LED**

A visible LED that informs you that the laser beam is being emitted, or is about to be emitted, at least 3 seconds after power is provided to the amplifier and the sensor head.

**2. Laser emission delay**

Laser emission only starts when the LED has been ON/lit for at least 3 seconds, thus decreasing the possibility of laser exposure.

**3. Laser Stop function**

By sending the laser stop command (see page 18) to the BL-500, you can disabled laser emission. When working near the laser pickup, use the laser can disabled laser emission. When working near the laser pickup, use the laser stop command to protect you from direct exposure to laser beam. When this command is activated, the top LED of the STABILITY LEDS blinks.

**How to use the Laser Stop command**

Laser stop mode can be invoked by transmitting the serial command from the host computer to the unit.

To execute the Laser stop command, use the following instruction.
LOCK [CR]

To cancel Laser stop, use the following instruction.
UNLOCK [CR]

When either above instruction is properly processed, the BL-500 series returns the following message to the host computer.
OK [CR]

# Unpacking

There are two packages: A BL-500 package and a software package.

Each package contains the following components. Be sure to check the items against the checklist below:

**BL-500 package**

| | |
|---|---|
| BL-500 unit | 1 |
| Mounting bracket | 1 |
| Mounting bracket screw (32 mm) | 2 |
| Laser warning label | 1 |
| Instruction manual | 1 |

**Setup software (BL-50H1E) and user's manual**

| | |
|---|---|
| Setup software floppy disk (3.5-inch) | 1 |
| User's Manual (this document) | 1 |

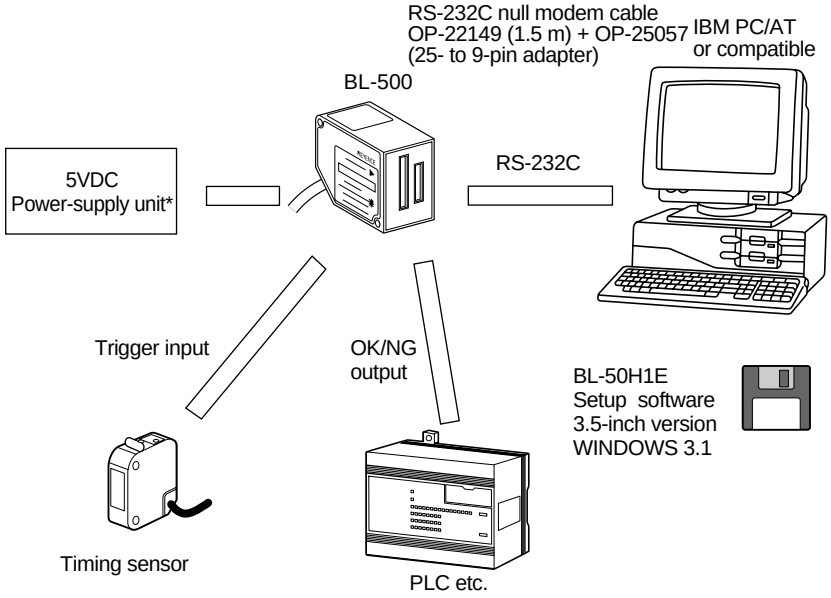



The setup software and user's manual are not included in the BL-500 package. You can order the software package, free of charge, separately.



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# System Configuration




Note The 5 VDC power supply unit must be purchased separately.

The optional BL-U1 or BL-U2 power supply is also available.

## Laser Bar-Code Reader Model Types:

| Model | Reading direction | Scanning method | Readable bar width |
|---|---|---|---|
| BL-500 | Front | Single | 0.25 to 1.0 mm (Standard type) |
| BL-501 | | Raster | |
| BL-550 | Side | Single | |
| BL-551 | | Raster | |
| BL-500H | Front | Single | 0.125 to 0.5 mm (High-resolution type) |
| BL-501H | | Raster | |
| BL-550H | Side | Single | |
| BL-551H | | Raster | |

The readable bar width is the range in which narrow-group bar codes can be read.

## Other Options

BL-U1: ..... 5 VDC power supply (100 to 240 VAC input)
(with built-in RS-232C, RS-422A, RS-485 ports)
See page 79 for details.

OP-22149: ..... RS-232C null modem cable (1.5 m) for BL-U1

OP-25057 ..... 25- to 9-pin adapter

BL-U2: ..... 5VDC power supply (24 VDC input)
(with built-in RS-232C port)
See the BL-U2 manual for details.

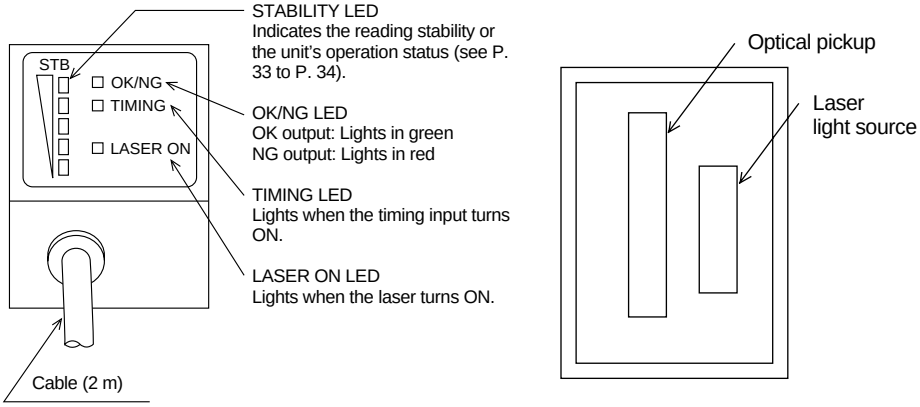
OP-27937: ..... RS-232C null modem cable (2 m) with 9-pin connector for BL-U2



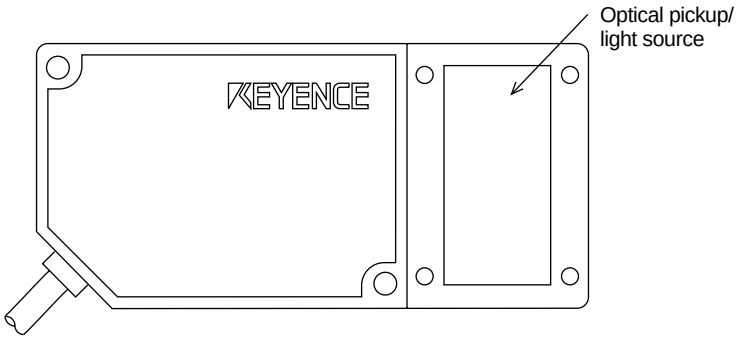
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# Parts and Functions

## BL-500/501/500H/501H




## BL-550/551/550H/551H




For LED names, see the BL-500/501(H) User's Manual.



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# Chapter 1

## Connection and Installation

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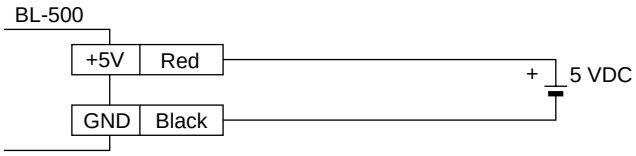
# 1.1 BL-500 Connections

## 1.1.1 Wire colors and signal types

The following wires extend from the BL-500. Solder the required wires to a connector to connect the BL-500 to a computer/controller.

| Wire Color | Symbol | | Description | Signal Direction |
|---|---|---|---|---|
| Shield | Shield | | Connect to ground (SG) | —— |
| Purple | RS-232C | SD (TXD) | Send data | Output |
| Brown | | RD (RXD) | Receive data | Input |
| Pink | | RS (RTS) | Request to send (always on) | Output |
| Blue | | CS (CTS) | Request to receive | Input |
| Black | GND (SG) | | Ground (common ground for respective signals) | —— |
| Yellow | TIM | | Trigger input | Input |
| White | OK | | OK output | Output |
| Gray | NG | | NG output | Output |
| Red | + 5V | | + 5V power supply input | Input |

## 1.1.2 Power supply wiring

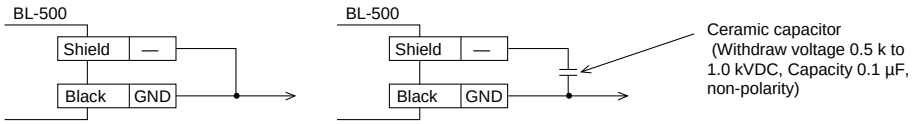



**CAUTION**

- Be sure to match the polarities of the power supply when soldering the connections. Reversing the polarities will damage the unit.
- Make sure that the power supply provides a stable 5 VDC ± 5%. If the power supply does not function in the above range, it can damage the unit.
- Do not use a power cable longer that 2 meters. A long power cable can cause a voltage drop, preventing the BL-500 from starting properly.
- If the power supply is UL rated, it must provide Class 2 output.

## 1.1.3 Connecting shielded cables

For optimum reading performance, connect the BL-500's shielded cable to GND (black) directly or through a condenser.

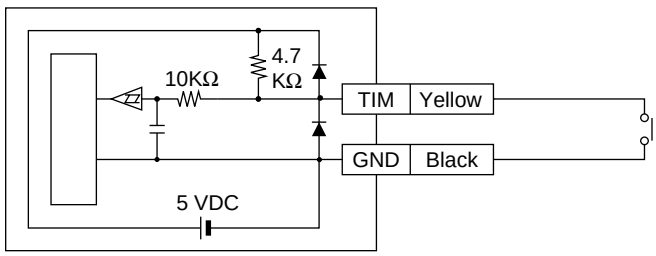



- Using a capacitor provides a more stable operation.

## 1.1.4 Wiring I/O

**Trigger (TIM) input**

The trigger input is used to signal the BL-500 to start reading (Start laser emission).
The trigger input is a non-voltage input (TTL input is also available).

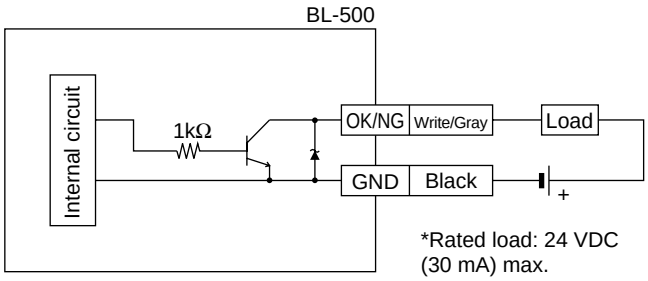





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**OK/NG output**

This output signals whether the readout data is the same as the preset data. When no preset data has been registered, the signal indicates bar code read status. It is an NPN open-collector output.

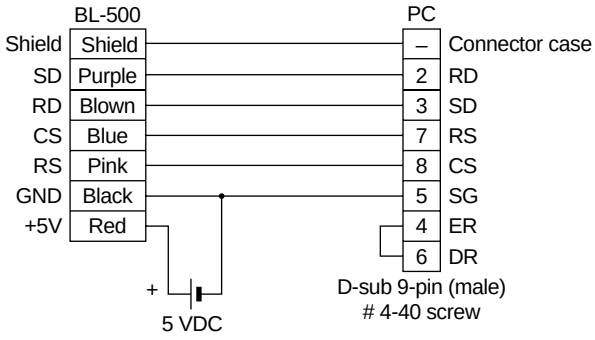



## 1.1.5 RS-232C Connections

Note This BL-500 setup software applies to port 1 and port 2 only.

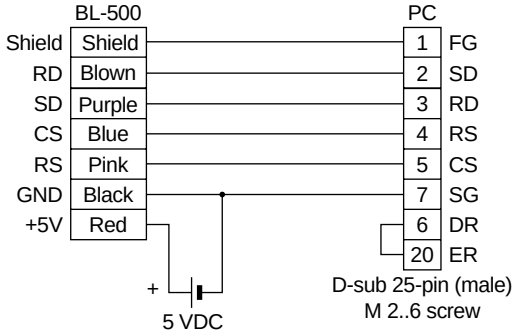
Communication cannot be performed with other ports.

**When using a D-sub 9-pin connector:**




Use a metallic connector housing for the D-sub 9-pin connector. Connect the shielded cable with the connector housing.

**When using a D-sub 25-pin connector:**




Note Be sure the BL-500's shielded cable is properly connected. Refer to "1.1.3 Connecting shielded cables" in the User's Manual.



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## Hints on correct use

### Trigger (TIM) input

Set the trigger input to be long enough to allow the laser beam to cover the entire bar code.

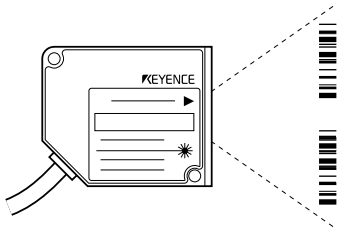
If the trigger input needs to be on for only a short period of time, select one-shot mode.

### Influence from mirror surface

If a mirror surface (metallic surface) is near the bar code and the laser beam reflects off the mirror, the BL-500 may cause a read error. Protect the unit from the influence of a mirror surface by covering the surface or changing the bar code label position.

### Bar code pitch

Do not place several bar codes in the field of the laser beam, unless you are in multi-label read mode (Multi 3).

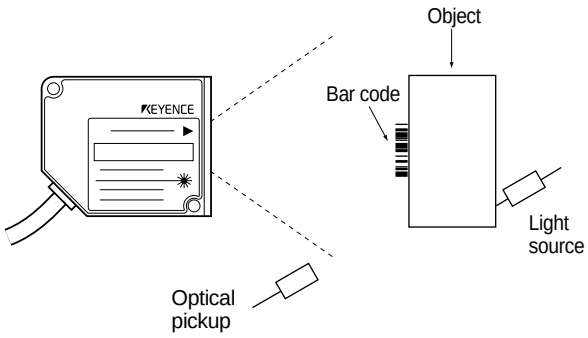



If you use multi-label read mode (multi 3), the BL-500 can simultaneously read 2 to 4 bar codes in the field of the laser beam.

### Influence from photoelectric sensor

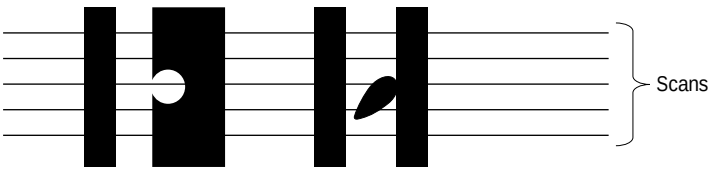
When using a photoelectric sensor to control trigger, block the sensor beam so it does not enter the BL-500 optical pickup.

The beam from the photoelectric sensor can interfere with the BL-500, deteriorating reading performance. If this case, reposition the photoelectric sensor.




### When a bar code is stained or partially missing

Use a raster scan reader (BL-501/551(H)) when a bar code is stained or partially missing. This raster scan readers scan several portions of the bar code. Normal portions of the bar code, even with stained or missing portions, can be read by the BL-501/551(H).






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# 1.2 Installing the BL-500 Series

## Installation method

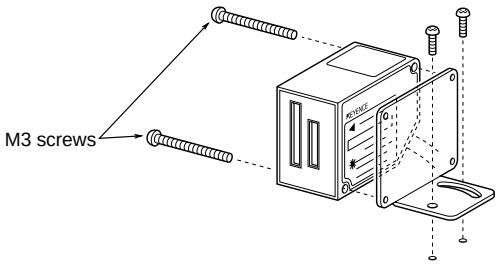
Use the mounting holes on the side panel to install the unit.

### Using the supplied mounting brackets

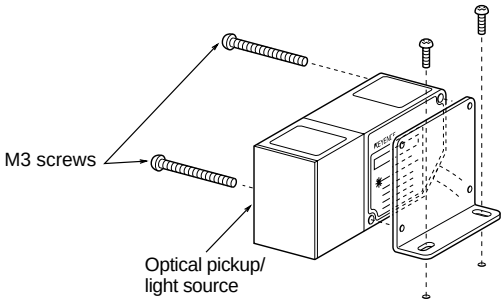
Install the BL-500 Series as shown in the figures below.

- Select screws of the proper length by checking the thickness of the plate used for mounting. (The screws provided are for use with the mounting bracket.)
- For the mounting hole diameter, see page 66.

(BL-500/501/500H/501H)



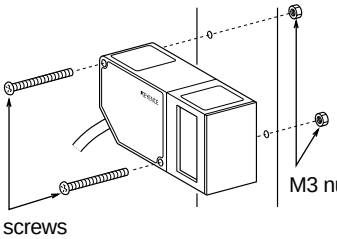

(BL-550/551/550H/551H)

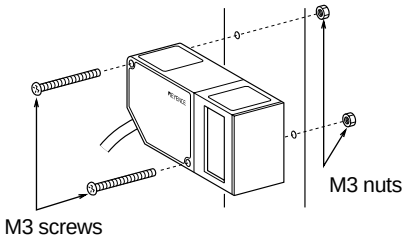



- Use the set screw to secure the mounting bracket to the unit.
- See page 68 for mounting bracket dimensions.
- The mounting bracket for the front type (BL-500/501(H)) differs from that for the side type (BL-550/551(H)). The correct bracket is provided with your unit.

### Installation with no mounting bracket

- (BL-500/501/500H/501H)(BL-550/551/550H/551H)Prepare M3 male screws




separately.

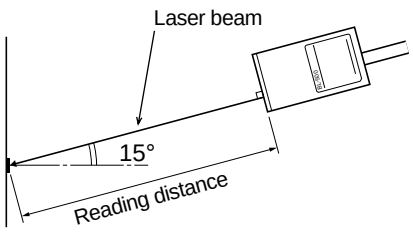
- Although the mounting holes are on both sides of the unit, only one side should be mounted.
- For the mounting hole diameter, see page 66.



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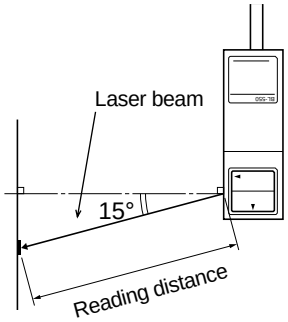
## Mounting angle and mounting distance

BL-500/501/500H/501H




*Reading distance = 120 mm

BL-550/551/550H/551H




*Reading distance = 95 mm

Set the angle and reading distance by referring to the read range characteristics and angle characteristics described on page 62 and 66.

The allowable reading distance and angle may vary depending on the narrow bar width of the bar code, the bar code size, and the readability of the bar code. Set these parameters after performing a test read of the required bar code using the unit.

Note

Do not set the unit at an angle at which the laser beam is perpendicular to the surface of the bar code. The beam will be fully reflected into the reader, making correct reading impossible (see page 66).

The laser radiation angle differs between the front and side type units. The optimal mounting angle differs depending on the type.

The reading check test mode (see page 15) allows you to set the optimal reading position.



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# Chapter 2

## Functions for Reading Operation

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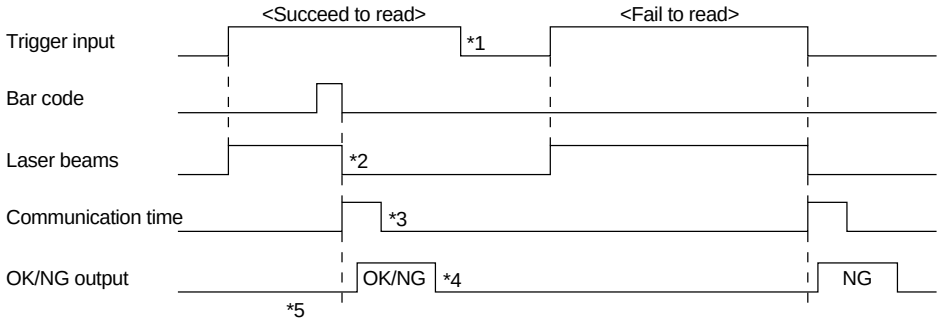
# 2.1 Read Operation

## 2.1.1 Scanning method

There are two methods for triggering the BL-500 to read bar codes; the “Level signal” method and the “One-shot signal” method. The example given for these two methods uses the “single label read mode” (see page 10), which reads one bar code while trigger input turns on once, and uses the “after read” as the data-send mode (see page 9).

### Level signal trigger

When the trigger input turns on, laser emission begins and the the unit begins reading. The laser turns off after reaching the specified decode count. Then, the unit sends the readout data.




1. Set trigger input so that it stays on long enough for the laser beam to cover the entire bar code.
2. After the trigger input exceeds the preset input time, the laser begins to emit.
3. The communication time can be obtained from the following expression:

$$\frac{\text{Data bits + (1: If parity is used) + Start/stop bit}}{\text{Baud rate}} \times \text{(code length of data to be sent + Header/ number of characters in delimeter)}$$

4. The length of time that the OK/NG output is on can be changed to between 10 ms and 2.55 s.
5. The OK/NG output turns on 5 ms after the data has been read (or trigger input turns off in case of reading failure).

**CAUTION**

5 seconds after the power switch turns on or an UNLOCK command (see page 50) is sent, the unit will not start reading a bar code by turning on the trigger input.

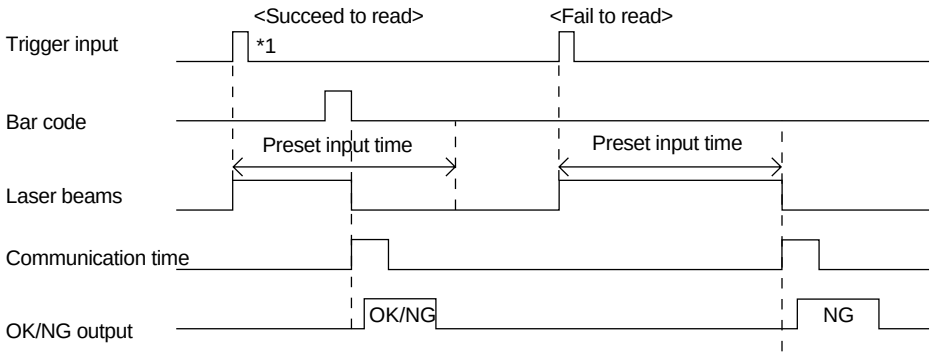


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### One-shot signal trigger

The unit detects the rising edge of the trigger input and starts reading bar codes for the preset input time. The laser beam turns off after reaching the specified decode count and the unit sends the readout data.

The remaining actions are the same as those for level signal trigger.




1. After the trigger input exceeds the preset input times, the laser begins to emit.

Note

- The BL-500 can read up to 4 types of bar codes without changing the bar code type setting (see page 30).
- For general operation, see "Level signal trigger"
- Choose “One-shot signal trigger” when the trigger input signal is very short or you want to set the input time.

## 2.1.2 Data-send mode

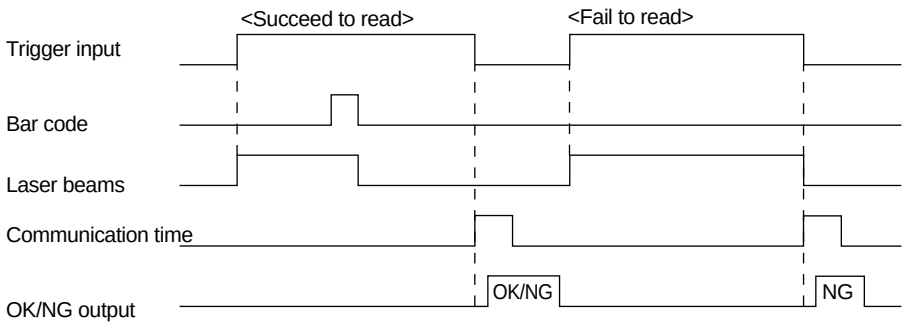
In the single label read mode only, you can select from the two data send modes (OK/NG output on trigger) described below: In the multi-label read mode, you can only select the “send after reading” mode.

#### Send after read

The unit outputs the communication and OK/NG signals after a sucessful read (trigger output turns on as many times as the preset decode count). This is the same operation as in the time chart described in “1.1 Scanning method”. Normally, this is the method you should use.

#### Send at trigger input

The unit outputs the communication and OK/NG signal when the trigger input turns off (or the preset input time has passed if one-shot signal trigger is selected).






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# 2.2 Read modes

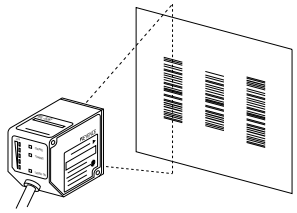
The BL-500 provides 4 types of read modes.

## 2.2.1 Single label read mode

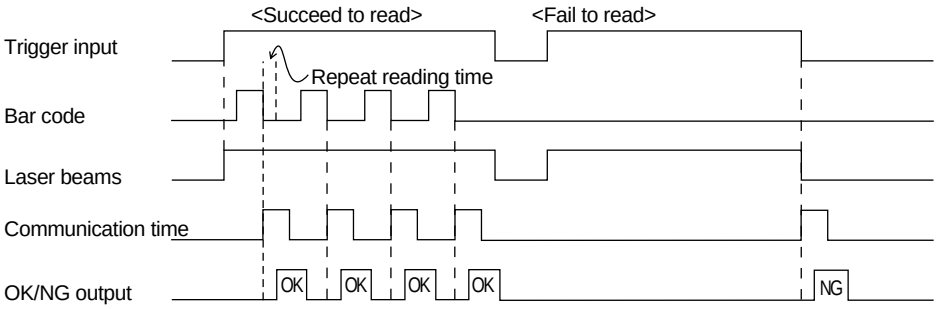
This mode allows the unit to read one bar code during one trigger input signal. The operation and timing chart are described on page 8.

## 2.2.2 Multi-label read mode 1 (Multi 1)

This mode allows the unit to read several bar codes printed on one label as shown below during one trigger input signal. The unit outputs the readout data sequentially.



### Multi-label read mode 1 operation




In the multi-label read mode 1, the unit reads several bar codes continuously, and outputs them sequentially as it reads while laser beam remains on and trigger input turns on after bar codes have been read (or during the preset input time if one-shot signal trigger is selected).

To prevent the unit from reading the same bar code twice, the time for one bar code to pass across the laser beam's field and read, plus the repeat reading time must be set (100 ms to 25.5 s). During the repeat reading time, the unit cannot read the same bar code repeatedly, but can read different bar codes.

A reading error is issued only when the unit cannot read any bar code while the trigger input is on.

For OK/NG output, "OK" turns on every time the unit reads a bar code and "NG" turns on if the unit fails to read a bar code. (Comparison to the preset data is not performed.)

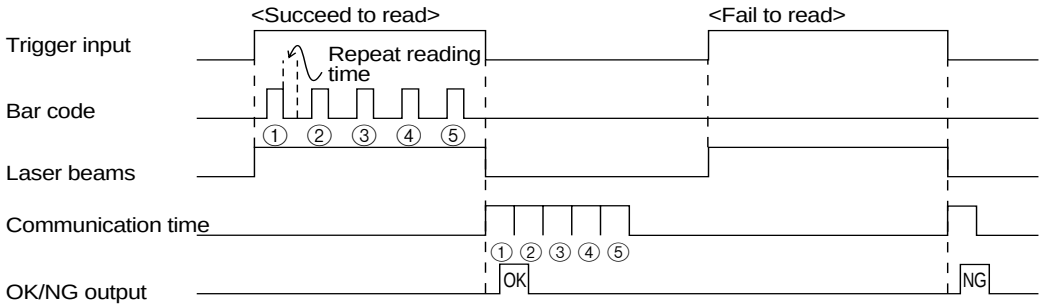


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## 2.2.3 Multi-label read mode 2 (Multi 2)

As with multi 1 mode, this mode allows the unit to read several bar codes continuously while the trigger input is on. (The number of bar codes that can be read depends on the buffer capacity. See page 46.) The difference between the two modes is that multi 2 modesends all the readout data at one time after the trigger input turns off.

### Multi-label read mode 2 operation




Multi 2 mode allows the unit to read several bar codes while the trigger input is on (or during the preset input time if one-shot signal trigger is selected) and sends all the readout data at one time after the trigger input turns off (or after the preset input time is expired if one-shot signal trigger is selected).

To prevent the unit from reading the same bar code twice, the time for one bar code to pass across the laser beam's field and read, plus the repeat reading time must be set (100 ms to 25.5 s). During the repeat reading time, the unit cannot read the same bar code repeatedly, but can read different bar codes.

For OK/NG output, after trigger input turns off, "OK" turns on if the unit reads at least one bar code and "NG" turns on if the unit fails to read a bar code. (Comparison to the preset data is not performed.)

### Reading data format

| Header | 1st data | , | 2nd data | , | 3rd data | , | 4th data | , | Delimeter |
|---|---|---|---|---|---|---|---|---|---|

Each data packet is separated by a comma (, : 2CH) (intermediate delimiter).

The unit sends as many data packets the number of bar codes read.

See page 46 for "header string" and "delimeter".

## 2.2.4 Multi-label read mode 3 (Multi 3)

As described in multi-label read modes 1 and 2, this mode also allows the unit to read several bar codes (up to 4 codes) while the trigger input is on.

The unit sends the readout data at one time according to a specified sequence after the trigger input turns off. When up to 4 codes are in the laser beam's field, the unit can simultaneously reads all of them.

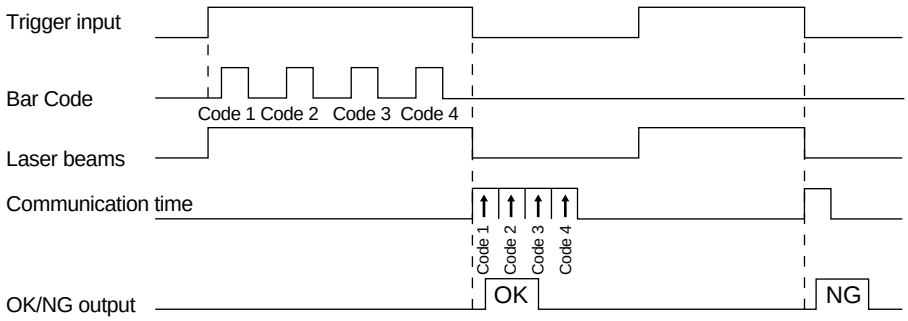


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## Operation of multi-label read mode 3

This mode allows the unit to continuously read each one of 4 bar code types “Code 1”, “Code 2”, “Code 3”, and “Code 4” as specified in the “code setup” of the setup software (see page 30). If 3 types are specified in the “code setup”, the unit reads 3 bar codes (each of 3 types). If 2 types are specified, the unit reads 2 bar codes.

The following time chart is given.




The above example chart is with all four codes specified in the “code setup” of the setup software.

- The bar code reading sequence is not fixed.
- The unit communicates the readout data in the order of Code 1 to Code 4. After the trigger input turns off, the unit sends all the data at one time.
- For OK/NG output, “OK” turns on if the unit reads all the specified Codes 1 to 4 and “NG” turns on if the unit fails to read at least one bar code. (Comparison to the preset data is not performed.)

## Reading data format

| Header | Data read from Code 1 | , | Data read from Code 2 | , | Data read from Code 3 | , | Data read from Code 4 | , | Delimeter |
|---|---|---|---|---|---|---|---|---|---|

- Each data packet is separated by a comma (, : 2CH) (intermediate delimiter).
- If an read error occurs on any one of Codes 1 to 4, or the corresponding bar code does not exist, “ERROR” (see page 47 for the reading error codes), instead of the read data is sent.
- See page 46 for “header string” and “delimeter”.

**Example** Suppose that the following codes are specified:

Code 1 --- CODE39, 10 digits
Code 2 --- EAN/UPC, 13 digits
Code 3 --- None
Code 4 --- CODE39, 8 digits

When the unit successfully reads all 3 types of codes:

| Header | ABCDE12345 | , | 4901234567894 | , | KEYENCE | Delimeter |
|---|---|---|---|---|---|---|

When the unit fails to read Code 1 (CODE39, 10 digits)

| Header | ERROR | , | 4901234567894 | , | KEYENCE | Delimeter |
|---|---|---|---|---|---|---|

When the unit fails to read Code 1 (CODE39, 10 digits) and Code 4 (CODE39, 8 digits)

| Header | ERROR | , | 4901234567894 | , | ERROR | Delimeter |
|---|---|---|---|---|---|---|

When the same type of data having the same digits is specified to all Codes 1 to 4, the unit sends the data in the reading order.



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Example

Suppose that the following codes are specified:

Code 1 --- CODE39, 7 digits
Code 2 --- CODE39, 7 digits
Code 3 --- CODE39, 7 digits
Code 4 --- CODE39, 7 digits

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Header | ABCD123 | , | XYZ3333 | , | 1234567 | , | KEYENCE | , | Delimeter |

Note

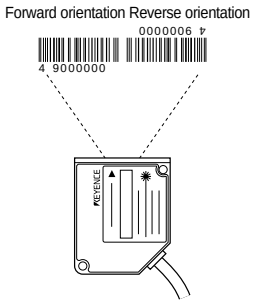
The unit cannot read the bar code having the same content twice while trigger input turns on once.



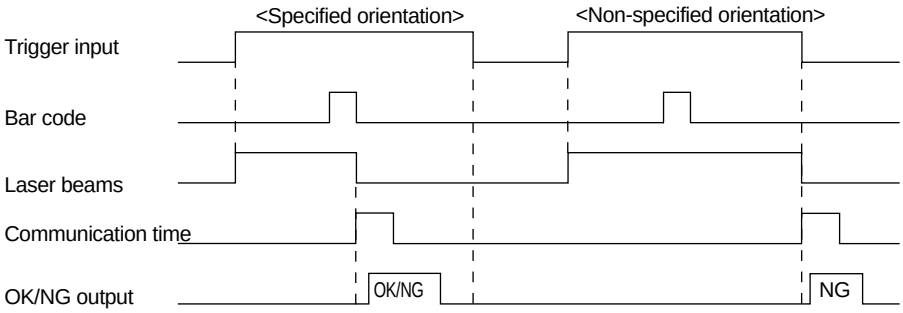
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# 2.3 Label orientation mode

As shown below, this mode allows the unit to read bar codes only in the specified orientation when bar code labels are moving both in the forward and reverse orientations.




Normally, the unit can read bar codes regardless of the orientation.




An reading error is issued when the unit reads a bar code label running in the orientation which is not specified.

The above chart applies to the single label read mode. You can also use this mode together with the desired multi-label read mode. However, in any case, the unit reads bar codes running in the specified orientation only.

You can specify the orientation individually for Codes 1 to 4, such as specifying “forward orientation” for Code 1, and “reverse orientation” for Code 2.



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# 2.4 Test Mode

Test mode can be used for the bar code reading test. Because trigger input is not required, this mode allows you to perform a reading test easily. You can select one of the following 3 methods to enter the test mode.

**Send the command**

Enter test mode by sending the serial command for the test mode (TEST1, TEST2). Commands should be entered in all uppercase characters.

**Turning on trigger input**

You can use the BL-500 to switch to test mode by turning on the trigger input (see page 35). If you select this method to enter the test mode, trigger input is disabled to ensure normal operation.

**Turning on power supply**

You can set the BL-500 to enter test mode by turning on the power supply (see page 35).

Note When you try to enter the test mode by turning on trigger input, you cannot use the serial command to enter the test mode.

The following 2 types of test modes are available:

## Reading rate check mode

The unit scans a bar code100 times and analyzes how many times it can decode the scanned data (reading rate). This mode is useful in the following cases:

- When adjusting the mounting distance and angle
- When verifying the reading stability of the bar code to be used
- The analyzed result will be output anytime (every 100 scans) using the following format:

| | | Delimiter | |
|---|---|---|---|
| Readout data | : | m | % |

m = 0 to 100 (zero-suppressed)

- Although an OK/NG signal is not output, the OK/NG LED lights (see page 17).

## Tact check mode

In this test mode, the unit counts how many scans can be decoded (the decode count) while reading one bar code.

This mode is useful when testing which line speed can be expected when actually implementing the BL-500 system on the line.

- The analyzed data is output using the following format 0.2 seconds after the bar code has passed the laser beam's field.

| | Delimiter | |
|---|---|---|
| Readout data | : | m |

m = 1 to 999 (zero-suppressed)

- The unit continues to read a bar code while the code is in the laser beam's field and does not output the result. If the laser beam does not detect a bar code for 0.2 seconds, the unit stops scanning and outputs the result.
- If the unit reads the same bar code twice within the 0.2 seconds, the unit cannot separate the bar codes and will add to the read count. However, the unit can continuously reads different bar codes within the 0.2 seconds by recognizing the delimiter.



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- The read count can be up to 9999.
- Although an OK/NG signal is not output, the OK/NG LED lights (see page 17).

Note

When the unit is running in test mode, the laser beam remains on, which can shorten the laser's service life.
Select the test mode only when you need to perform a test read.

Avoid long emission times.

When using the "additional information" (see page 20 to 21) in the test mode, the selected data is added in the same manner as in the normal operation mode. However, only when selecting the reading rate check mode, the decode count and scan count are not added to the analyzed results.



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# 2.5 STABILITY LEDs

STABILITY LEDs allow you to easily check reading stability and operation status.

## Indication of reading stability

### When reading rate check mode is selected

STABILITY LEDs light according to the reading rate shown in the table below. Although, in the test mode, the unit does not output an OK/NG singnal, the OK/NG LED lights as below. (Comparison to the preset data is not performed.)

| Reading rate | STABILITY LED | OK/NG LED |
|---|---|---|
| 81 to 100% | 5 LEDs light | Green |
| 61 to 80% | 4 LEDs light | Green |
| 41 to 60% | 3 LEDs light | Green |
| 21 to 40% | 2 LEDs light | Green |
| 1 to 20% | 1 LED lights | Green |
| 0% | —— | Red |

### When tact check mode is selected

STABILITY LEDs light according to the scan count (decode count), which indicates the number of successful reads, as shown in the table below.

Although, in the test mode, the unit does not output an OK/NG signal, OK/NG LED lights as below. (Comparison to the preset data is not performed.)

| Decode count | STABILITY LED | OK/NG LED |
|---|---|---|
| 100 or more | 5 LEDs light | Green (decode counts are equal to or greater than the preset match count) Red (decode counts are less than the preset match count) |
| 50 to 99 | 4 LEDs light | |
| 10 to 49 | 3 LEDs light | |
| 5 to 9 | 2 LEDs light | |
| 1 to 4 | 1 LED lights | |
| 0 | —— | Red |

### When normal read mode is selected

When you select multi-label read mode 1 or 2 (see page 10 to 11), or the send mode is set to “after trigger input” (see page 9), or you select the decode count adding function (see page 20), STABILITY LEDs light according to the decode count as shown in the table below.

However, If you do not select “use STABILITY LED” in the setup software (see page 37), STABILITY LEDs do not light in normal read mode.

ON/NG output (ON/NG LED) turns on/off normally according to the result of a comparison to the preset data.

| Decode count | STABILITY LED |
|---|---|
| 100 or more | 5 LEDs light |
| 50 to 99 | 4 LEDs light |
| 10 to 49 | 3 LEDs light |
| 5 to 9 | 2 LEDs light |
| 1 to 4 | 1 LED lights |
| 0 | —— |



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## Unit operation status display

STABILITY LEDs indicate the following information in addition to reading stability.

**Power-on**

LEDs turn on sequentially from the bottom. The unit cannot read bar codes while STABILITY LEDs are lit (for 5 seconds).

**During setup (see page 49)**

All the STABILITY LEDs blink.

**Using “Laser stop” function (by sending LOCK; see page 50)**

The top LED blinks. When resetting “laser stop” (by sending UNLOCK ), the LEDs light in the same manner as at power-on.

**Unit error**

The 2nd or 3rd LED from the top blinks. The unit may have failed. Contact your nearest KEYENCE office or distributor.



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# 2.6 Preset Function (Compare with:)

## 2.6.1 What is the preset function?

The BL-500 can store one bar codeas preset data. It compares the preset data to the bar code data actually read and outputs an OK/NG signal to whether there is a match.

Using the BL-500 preset function, you can prevent the wrong products from entering the line without using a PC.

If no preset data is registered, the unit outputs OK when it successfully reads a bar code and NG when it fails to read a bar code.

- See page 8 to 14 for output timing.
- Use the setup software and serial command to register the preset data (see page 37 and page 58).

Note

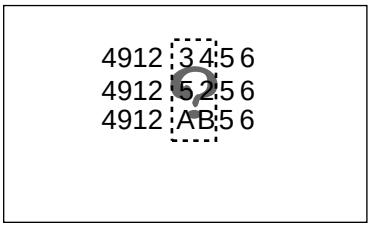
- The bar code actually read can be compared to the preset data only in the single label read mode.
- See page 72 if you want to use CODE128.

## 2.6.2 Wildcard symbols (“!” and “?”)

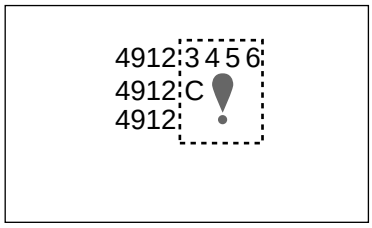
Using “!” and “?” in the preset data allows for flexible settings.

**?:** Does not define numeric values (characters) of certain digit(s) of the bar code.

**!:** Ignores numeric values and symbols within the dot box and recognizes the bar codes as the same group.




When using “?” data as “4912??56”, 2 digits positioned in “??” can contain any numeric values (or characters), expanding the allowable range. Identifies all the bar codes to be OK as long as the beginning or ending strings match.




When using “!” as “4912!”, any bar code which begins with “4912” will be OK. When using “!” as “!4912”, any bar code which ends with “4912” will be OK.

**Setting examples**

| | | | | | |
|---|---|---|---|---|---|
| 1. “ABC?” | ABCD (OK), | ABC3 (OK), | ABC (NG), | ABCDE (NG) | |
| 2. “ABC!” | ABCD (OK), | ABC3 (OK), | ABC (OK), | ABCDE (OK), | AB (NB) |
| 3. “?????” | Any 5-digit bar code will be OK. | | | | |
| 4. “!CDE” | ABCDE (OK), | 3CDE (OK), | CDE (OK), | ABBDE (NG), | ADE (NG) |
| 5. “A!E” | ABCDE (OK), | A3CE (OK), | ABCD (NG), | AE (OK) | |

Note

You can use “!” only once in the setting.

If you do not register preset data, “!” is automatically registered. Therefore, when the unit sucessfully reads a bar code, “OK” is output; when the unit fails to read, “NG” is output.

You cannot use the “*” character as a wild card symbol with the BL series.



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# 2.7 Additional Information

When sending the bar code data, you can add the following data to the readout data.

## Additional information types

### Decode match count add function

Adds the number of successful scans during one bar code reading (decode count) to the end of the readout data (up to 9999 count). However, this decode count is never less than the preset decoding match count.

- This function can be used to check reading stability and code label quality.

Delimiter

| Readout data | : | d |
|---|---|---|

d = [Decoding match count] to 9999: Decode count

The value is zero-suppressed.

When using this function, output turns on at a different time from normal operation.

- In single label read mode, output turns on after one bar code has been read (after trigger input turns off). Even if you set the data-send to “after read”, the data is forced sent after trigger input turns off.
- In multi-label read mode 1, a bar code passes across the laser beam’s field, after repeat read time, and is finally output.
- In multi-label read mode 2 or 3, operation is the same as when you do not use the decode match count adding function.

### Scan count add function (valid only when using the read count add function)

Adds the number of scans, including when no bar code exists, to the end of the decode count (up to 9999).

Delimiters

| Readout data | : | d | / | s |
|---|---|---|---|---|

m = 1 to 999 (zero-suppressed)

The value is zero-suppressed.

## Code type add function

Adds the bar code type before the readout data .

Delimiter

| t | : | Readout data |
|---|---|---|

| | |
|---|---|
| t = 0 | :Code39 |
| 1 | :ITF |
| 2 | :Industrial 2 of 5 |
| 3 | :Codabar |
| 4 | :EAN/UPC (A•E) |
| 5 | :CODE 128 |
| 6 | :COOP 2 of 5 |
| 7 | :Read error |



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**label orientation add function**

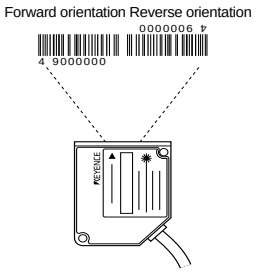
Adds the orientation of bar code travel before the readout data.

Delimiter

| r | : | Readout data |
|---|---|---|

r = F :Forward
R :Reverse

If an read error occurs, this information is not added.




## Order of additional information

If you select to include all the additional information functions, they appear in the following order:

| Code type | : | label orientation | : | Readout data | : | Decode match count | : | Scan count |
|---|---|---|---|---|---|---|---|---|

Note

You can change the delimiter as desired (one character), except the delimiter of the scan count.



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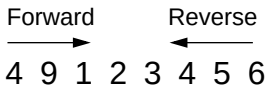
# 2.8 Max. Code Length (Designated Digit ) Output Function

This function allows you to output the designated digit(s) as desired from the readout bar code data. For example, from bar code data “49123456”, you can extract “1234” for output.

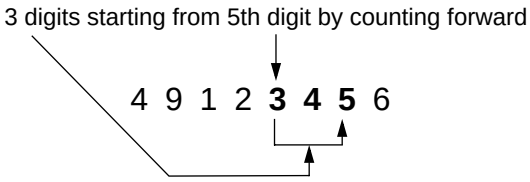
## Setting digits to be output

Set the digits to be output as shown below. Individually set the digits for codes 1 to 4.

1. Set the direction to designate.
   Set from which direction you want to start counting.

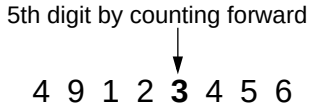



2. Set how many digits you want to designate for output starting from the designation start digit in (2) (designation effective digits).

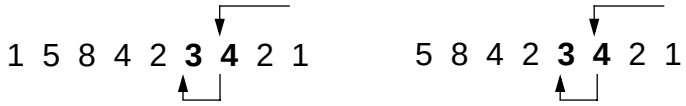



   The actual setting order is (1) (3) (2).

3. Set from which digit you want to begin designation (destination start digit).




**Example** Designating and outputting “34” from bar codes “158423421” and “58423421”




Designate 2 digits starting from 3rd digit by counting reversely.

Note

- Regardless of the designated direction, the data is output forward in the communication application.
- When the bar code group includes those having different digits, take special care on the designated direction when setting the digits to be output.
- When comparing to the preset data, all the digits of the bar code are used.



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# Chapter 3
## Setup Software

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# 3.1 Controlling the BL-500

The BL-500 can be controlled by computer using an RS-232C serial communication with Windows™ Terminal software or using BL-500 Setup Software. This chapter describes how to set the BL-500 using the BL-500 setup software. For more information on using the serial communication, see “Chapter 4” on page 43.

## 3.1.1 Setup Software Requirements

The BL-500 Setup Software for Windows operates in the following environments:

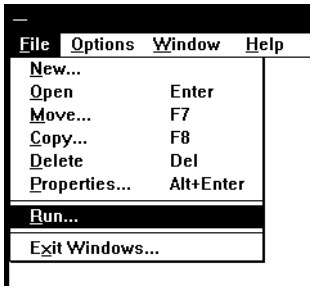
**Personal Computer**

IBM PC/AT or compatible model (100% compatible)
CPU: 80386 or higher
Memory: 4 MB or more
Floppy drive: One or more 3.5 inch drives
RS-232C: One serial port (COM 1 or COM 2)
DOS: Windows 3.1

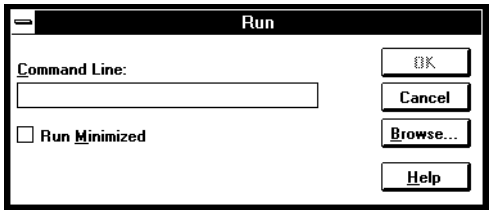
* The BL-500 Setup Software applies to COM 1 and COM 2 only.

### Starting the setup software

1. Prepare the following items before starting.
   - BL-500
   - Power supply unit for BL-500 (5 VDC) or the BL-U1/BL-U2
   - RS-232C cable described on p. 2 to 4 in this manual
   - Setup software
   - Personal computer
   - Mouse
2. Connect the PC with the BL-500 or BL-U1/BL-U2 using the RS-232C cable.
3. Set the DIP switches on the BL-U1 to RS-232C when you use the BL-U1.
4. Install the setup software.
   Turn the PC’s power switch ON to start Windows.
5. Insert the setup software into the floppy disk drive.
6. Select **File** - **Run** on the menu bar of the program manager.




7. When the following screen appears, type the name of the floppy disk drive and the name of the installed file “SETUP” in the “Command Line”. After typing the above, click on the *OK* button.




**Example** When the floppy disk drive name is A, type as follows:

`A:\SETUP`

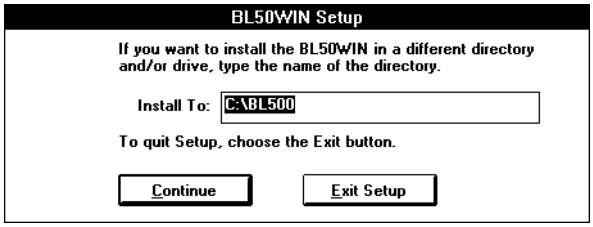
Then, the target directory for installation is displayed.

`“C:\BL500”` is displayed.



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8. To accept the directory name, click on the *OK* button.
   To change the directory name, click on the column displying the directory name, type a desired directory name using the keyboard, and click on the *OK* button.




9. After the installation is completed, the “KEYENCE Barcode Reader” window is created in the program manager. In this window, icon “BL50WIN” is created.
10. To start the setup software, double-click on the “BL50WIN” icon.




11. After the setup software gets started, the following screen appears:

Note When using a monochrome display on a laptop PC, the display appears in reverse video. To make the display clearer, set the laptop’s display to reverse video and then restart the setup software.



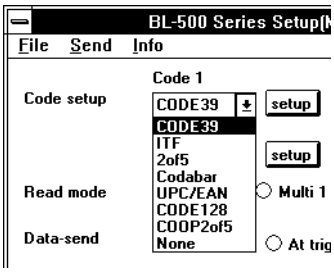
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# 3.2 Operating Procedure

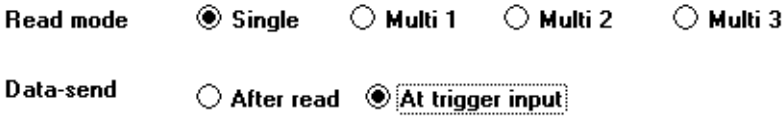
## 3.2.1 Outline of Operation

To operate the setup software, place the mouse pointer on the item to be changed, and click the left button of the mouse.

Use the *Down Arrow* button to select an item from a list. Place the mouse pointer on a desired item, and click on the item.

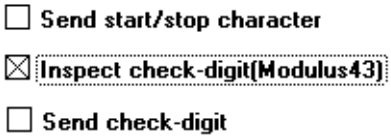



Click on the *Option* button to select one of several items.



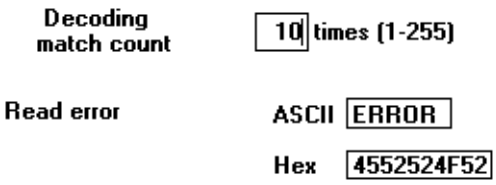

In the above settings, Read mode is set to “Single” and Data-send is set for “At trigger input.”

The *Check Box* is used to enable special functions. An “X” in the *Check Box* indicates that a function has been enabled.




In the above settings, “Inspect check-digit[Modulus43]” is enabled.

To enter characters or a value in a field, insert the mouse pointer over the field. The pointer will change to a cursor. Click inside the field and type in the desired value.




If the specified value exceeds the setting range, an error message will appear

To shift to a different screen, click the mouse cursor one of the buttons in the window. For example to return to the previous screen, click on the Return button.

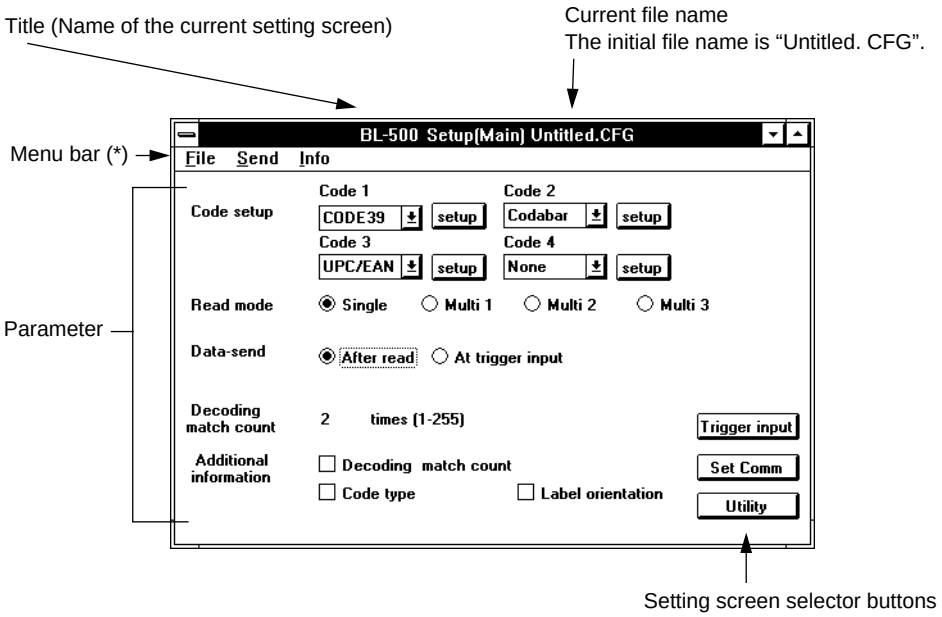


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# 3.3 Setup Software Operating Procedure

After the setup software is started, the following screen (main setting screen) is displayed.

The function of each display is as follows.




The setup software provides the following setting screens according to the parameters.

**Main setting [Main]**

- Type of the bar code to be read
- Read mode and its setup
- Decoding match count
- Additional information

**Setting details for the specified code type [Code setup]**

- Setting No. of bar code length, inspection of check-digit, etc.

**Trigger input setup [Setup Trigger input]**

- Setting the operation mode and the trigger input
- Selecting the test mode starting method
- Setting characters for the trigger ON/OFF command

**Communication parameters [Setup comm]**

- Setting the baud rate, data bits, stop bit and parity
- Setting the protocol
- Setting the Communication strings (header string, delimiter, read error code, etc.)

**Utility [Utility]**

- Indication of the STABILITY LED
- Duration of OK/NG output
- Registration of preset data

For the operating procedure, see “Setup Software Operating Procedure” on page 27.

For the error messages displayed during operation, see page 39.



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## Menu Bar

The following operations can be performed using the menu bar.

**File Menu** (Alt+F)

Specifies a file name/Saves a file.

Exits the setup software.

**Send Settings** (Alt+S)

Sends settings to the BL-500.

**Info** (Alt+I)

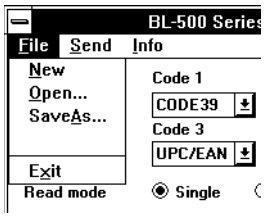
Indicates the version number of this software.

## 3.3.1 File Operation

The following is the procedure for specifying a file name, saving a file or exiting the setup software.

Click on **File** in the menu bar.

The following menu appears.




**New**

Cancels the current setting file and calls the initial setting.

**Open**

Calls the previously stored file.

**Save As**

Saves a file with a specified file name.

**Save**

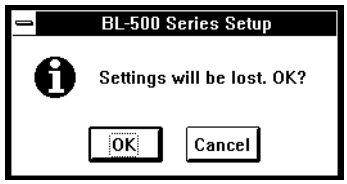
Saves a file.

**Exit**

Exits the setup software.

## New

1. Click on New.
   The following message appears.




2. To cancel the current settings and call the initial setting, click on the *OK* button. If you wish not to execute this operation, click on *Cancel*

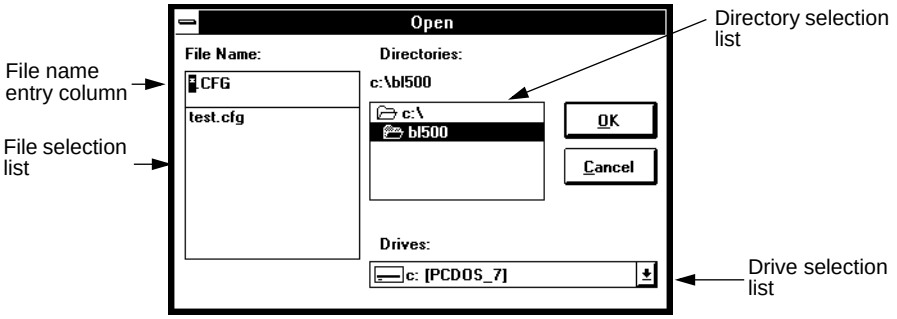
.



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## Open

1. Click on **Open**.
2. The following screen is displayed for selection of the file to be read.

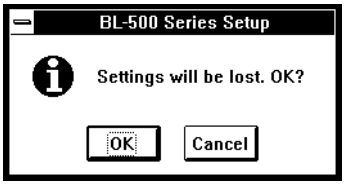



Select a desired file from those listed in the file selection column, and click on the *OK* button.

If you wish to cancel this operation, click on the *Cancel* button.

To change the directory or drive, select a desired directory or drive in the directory/drive selection column.

3. When you click on the *OK* button on the above screen, the following message appears.




To cancel the current setting and call a new file, click on the *OK* button. If you wish not to execute this operation, click on the *Cancel* button.

## Save As

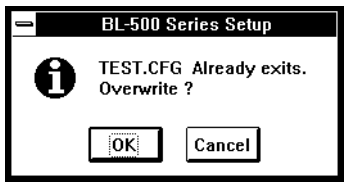
1. Click on **Save As** .
2. The “Save As” screen appears.
3. Click in the file name entry field and type a file name using the keyboard. Type a file name of up to 8 characters. Be sure to add extension “CFG” to the file name.



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**Example** When the file name is “TEST”:

1. Click on the file name entry column.
2. Enter “TEST. CFG” as the file name .
3. Click on the *OK* button.
   If you wish cancel this operation, click on the *Cancel* button.
   To change the directory or drive, select a desired directory or drive in the directory/drive selection column.
4. If the specified file name has already been stored, the following message will appear.



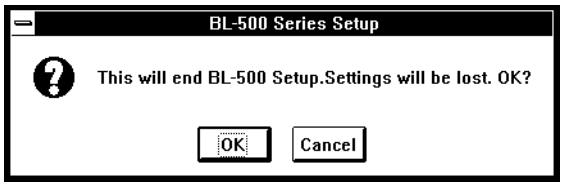

To save the setting by overwriting the existing file, click on the *OK* button. If you wish not to save the setting, click on the *Cancel* button.

**Save** A file name must be entered before the file can be saved

1. Click on **Save**. The file will be saved.

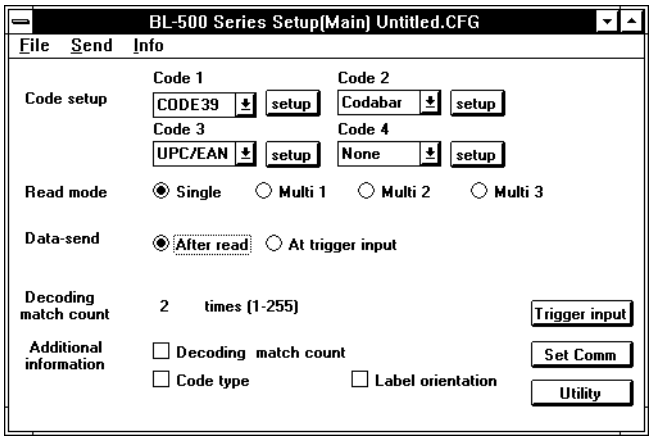
**Exit**

1. Click on **Exit**.
   The following message appears.




2. To exit the setup software, click on the *OK* button. If you wish cancel, click on *Cancel*.
   Save the current settings before exiting the setup software.

## 3.3.2 Main setting screen

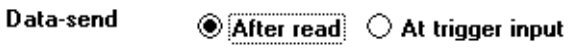



1. Place the mouse cursor at the item to be changed and click it, or move to the target item by pressing **[TAB]**. Then, change the setting using **[Space]**.
2. To codes 1 to 4, specify the types of bar codes to be read.
   If you specify 4 different types of bar codes, the BL-500 can read them without changing the settings.
3. To set the code length or the inspect for check-digit, click **Setup** or press **[ENTER]** to move to the setup screen for each code (see page 31 to 34).

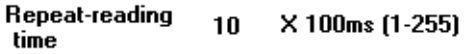


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4. When selecting Single for Read mode, the following appears on the screen:



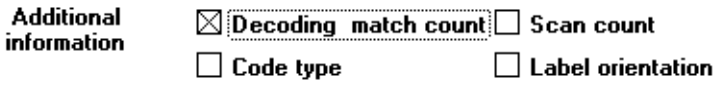

When selecting Multi 1 or Multi 2, the following appears on the screen:




Set the time within the range from 1 to 255 (100 ms to 25.5 s).

When selecting Multi 3, none of the above information appears.

5. In the Additional information field, you can select one or more items. However, the scan count is given only when the decode count is selected.

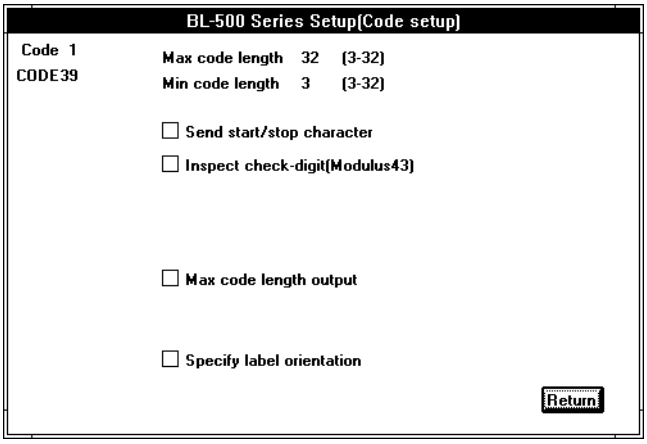



Note

Read mode --> Page 10
Data-send --> Page 9
Repeating-reading time --> Page 10
Decoding match count --> Page 8
Additional information --> Page 20

## 3.3.3 CODE39 setup

When setting CODE39 to any one of codes 1 to 4 and trying to set details, this setting screen appears.



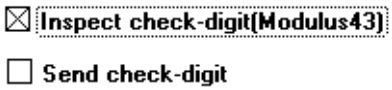

1. Place the mouse cursor at the item to be changed and click it, or move to the target item by pressing **[TAB]**. Then, change the setting using **[Space]**.
2. Setting Max code length and Min code length allows the BL-500 to read bar codes having the specified range of digits. If you want to read bar codes with the specific code length, set the same value to both Max code length and Min code length.

   The allowable setting range is 3 to 32 digits including the start/stop character.
3. When you select Send start/stop character, * is added to the data when being sent.



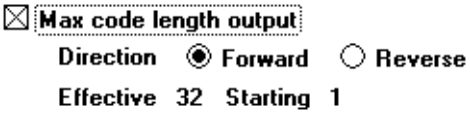
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4. When you select Inspect check-digit, the following information appears:



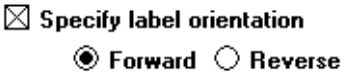

The above setting sends the data together with the check-digit.
Modulus 43 is used to calculate the check-digit.

5. When you select Max code length output, the following information appears:




Set Effective and Starting from 1 to 32.

6. When you select Specify label orientation, the following information appears:

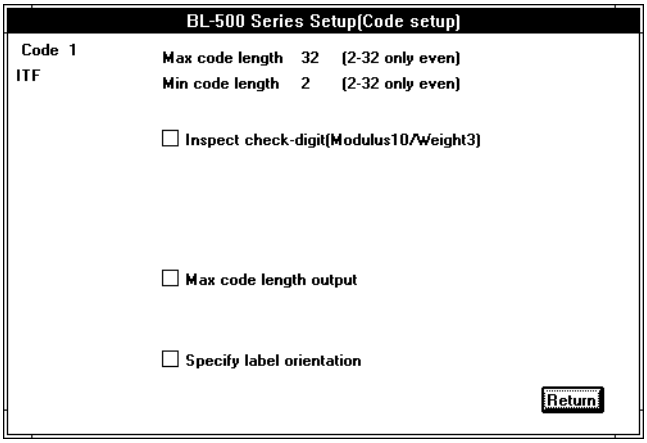



7. Click the *Return* button or press **[ENTER]** to return to the main setting screen.

Note

Max. code length output --> Page 22
Specify label orientation --> Page 14

## 3.3.4 ITF setup




1. Setup is the same as the CODE39 setup. However, ITF does not have Start/stop character.
2. Set code length using a even value within the range from 2 to 32.
3. Modulus 10/Weight3 is used to calculate the check-digit.

Note

When reading the standard distribution code (bar code on the corrugated fiber-board box), set the code length to 14 or 16 and select the Inspect check-digit.

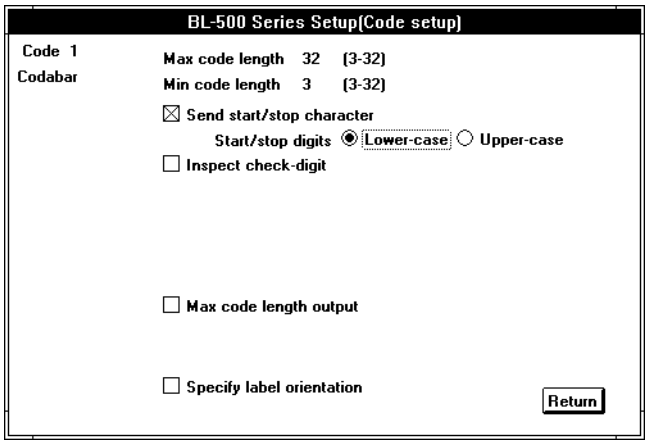
## 3.3.5 Setup for Industrial 2 of 5 and COOP 2 of 5

1. Setup is the same as the CODE39 setup. However, a start/stop character and Inspect check-digit are not provided.
2. Set code length within the range from 1 to 32.

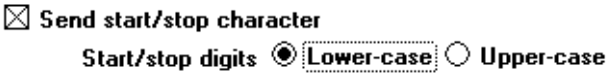


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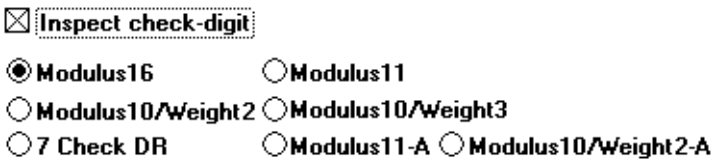
## 3.3.6 Codabar setup




1. Set code length from 3 to 32 including the start/stop character.
2. When you select Send start/stop character, A, B, C, and D are added to the data to be sent.
   In this case, the following information appears:

   You can select lowercase or uppercase for the start/stop character.
3. When you select Inspect check-digit, the following information appears:

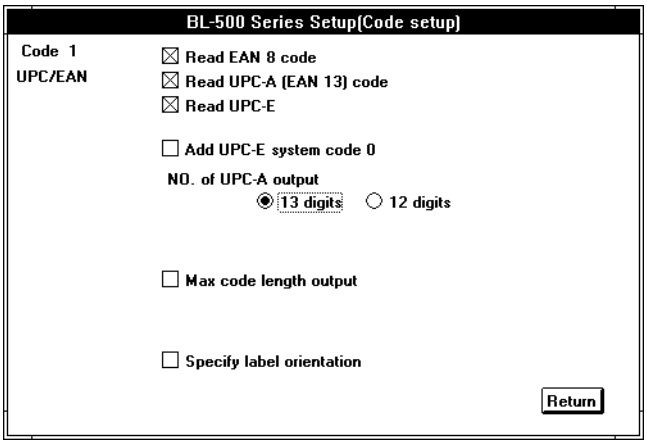
   
   

   Specify the check-digit calculation method and whether or not the check-digit is sent.
4. Set the other parameters in the same manner as for CODE39.

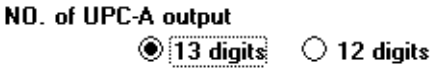


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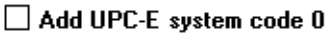
## 3.3.7 UPC/EAN setup




1. Select Read EAN 8 code, Read UPC-A[EAN13] code or Read UPC-E to enable to read.
   If you select Read UPC-A[EAN13] code, the following information appears, asking you to select which digits you want to output on UPC-A.



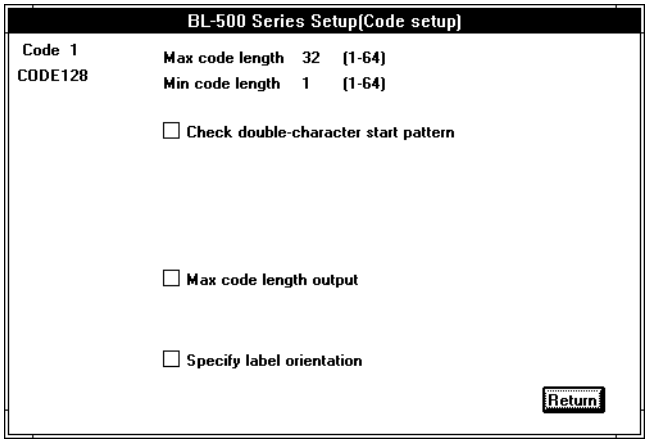

   If you select Read UPC-E, the following information appears, asking if you want to send data with the leading zero-suppressed.




2. You can use the same setting procedure as for CODE39 for Max code length output and Specify label orientation. However, the setting range of Effective and Starting in Max code length output is limited to the code length of the readout UPC/E code.

- Although the check-digit parameter is not provided on the screen, the system internally calculates it using modulus 10/Weight3. (The calculated data is sent.)

## 3.3.8 CODE128 setup




1. The setting range of code length depends on the start character type CODE-A to C (see page 72).
   - CODE-A and B --- 1 to 32
   - CODE-C --- 2 to 64

   The code length does not include the start/stop character or check-digit. Also, FNC1 to 4 (function codes), SHIFT, and CODE-A to C are excluded from the code length.



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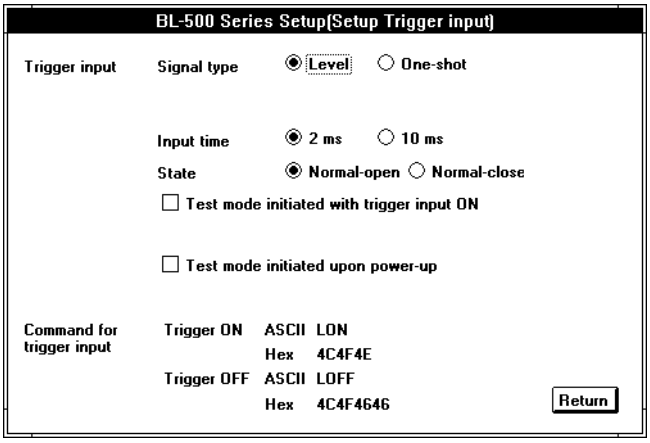
2. Check that the double-character start pattern is regulated in the UPC/EAN-128 standard. It means the combination of start character (CODE-C) and FNC1 (function code 1). The standard specifies that the UPC/EAN-128 bar codes should start with the double character start pattern.

   Using this parameter, you can specify that reading will not start without the double character start pattern.

3. You can use the same setting procedure as for CODE39 for Max code length output and Direction. However, the setting range of Effective and Starting in Max code length output is 1 to 64 if the start character is CODE-C.

- Although the check-digit parameter is not shown on the screen, the system internally calculates it using modulus 10/Weight3. (The calculated data is not sent.)

## 3.3.9 Trigger input setting




1. Place the mouse cursor at the item to be changed and click it, or move to the target item by pressing **[TAB]**. Then, change the setting using **[Space]**.

2. Select Level synchronization or One-shot synchronization as the scanning method. When you select One-shot, the following information appears, asking you to set the scanning time:

   One-shot input time
   10 X 100ms (1-255)

   Set the scanning time within the range from 1 to 255 (100 ms to 25.5 s).

3. When you select “Test mode initiated with trigger input ON” or “Test mode initiated at startup,” the following information appears, asking you which test mode you want to start:

   Test ◉ Reading-rate check ○ Tact check

   If you select both “Test mode initiated with trigger input ON” and “Test mode initiated upon power-up,” “Test mode initiated with trigger input ON” is used.

4. In the Command for trigger input parameter, you can freely change the characters for the Trigger ON/OFF command (within 8 characters).

   Normally, you should use the default setting (Lon, LOff).

5. Click the *Return* button or press **[ENTER]** to return to the main setting screen.

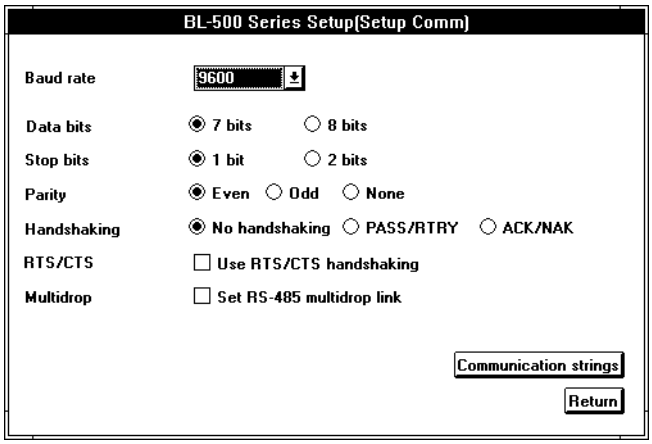
Note

Scanning method --> Page 8
Starting the test mode --> Page 15
Trigger ON/OFF command --> Page 49



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## 3.3.10 Communication setting




1. Place the mouse cursor at the item to be changed and click it, or move to the target item by pressing **[TAB]**. Then, change the setting using **[Space]**.
2. When setting the header string, delimeter, and read error, click [Communication strings] or press **[ENTER]** to move to the communication strings setting screen.
3. Click the *Return* button or press **[ENTER]** to return to the main setting screen.

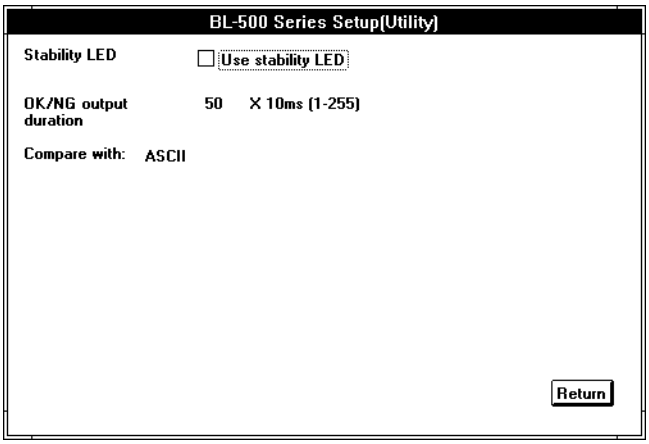
If you use multidrop link, click on “Set RS-485 multidrop link”. When you click this box, “ID No: [ ]” message will appear. Then specify the proper ID number for the BL connected. After that, transmit the setting to the BL. Then repeat the same procedure for the other BLs. Please change the ID number so that the ID numbers differ among all BL readers connected.

Note

(Communication) protocol --> Page 45

The setup software does not allow you to set the baud rate to 19200 to 38400 bit/s. If you want to set the baud rate within this range, use the serial commands (see page 57).

## 3.3.11 Communication strings setup




1. Place the mouse cursor at the item to be changed and click it, or move to the target item by pressing **[TAB]**. Then, change the setting using **[Space]**.
2. Select appropriate values for Header string and Delimiter from among the displayed items. When you select Custom, the following appears:

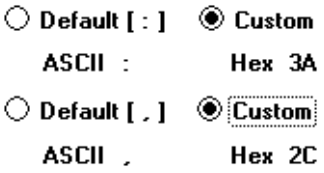
   ASCII [ ] Hex [ ]

   Then, you can enter the desired value from the keyboard (within 5 characters).

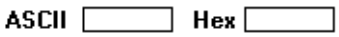


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3. When you select *Default[:]* for Partition mark and Intermediate delimiter, these parameters are set as below:




When you select Custom, the following appears:




Then, you can enter the desired value from the keyboard (using one character for the partition mark and 5 characters or less for the intermediate delimiter).

4. Input the Read error using the keyboard.

   You can change the code as desired (within 8 characters).

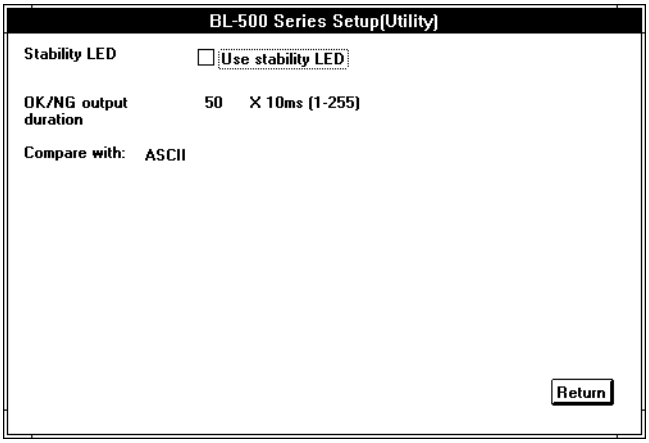
   Normally, you should use the default setting (ERROR). You can chose not to send the read error by selecting a null value for the read error.

5. Click the *Return* button or press **[ENTER]** to return to the communication setting screen.

Note

Header string, delimeter --> Page 46
Partition mark --> Page 20
Intermediate delimiter --> Page 11
Read error --> Page 46

## 3.3.12 Other setting




1. Place the mouse cursor at the item to be changed and click it, or move to the target item by pressing **[TAB]**. Then, change the setting using **[Space]**.
2. By setting STABILITY LED, STABILITY LED turns on which indicates reading stability during the normal reading operation.
3. To set OK/NG output duration, enter the appropriate numeric value from the keyboard. The setting range is from 1 to 255 (10 ms to 2.55 s).
4. To set Compare with, enter the preset data to be registered from the keyboard.

   Usually, specify the data within 32 characters. If you are using CODE128 and the start character is CODE-C, you can set the data using up to 64 characters.
5. Click the *Return* button or press **[ENTER]** to return to the main setting screen.

Note

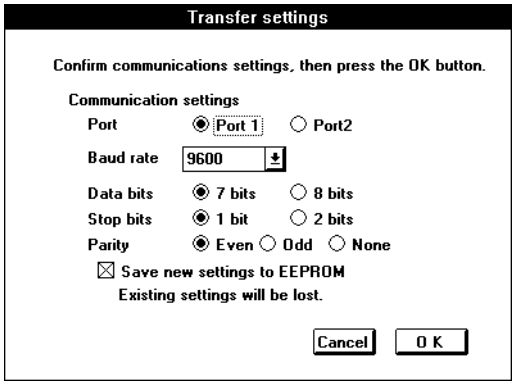
STABILITY LED --> Page 17
OK/NG output duration --> Page 8
Preset data --> Page 19



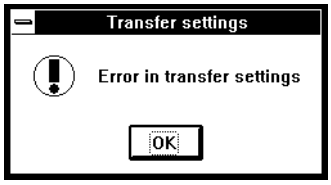
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## 3.3.13 Sending Settings

1. Choose **Send** from the menu bar. The following screen appears.




2. Set the baud rate, data bits, stop bit and parity according the BL-500's settings. The BL-500's default settings are shown above.
3. Specify whether the parameter settings are to be saved in the EEPROM or not. If the current settings are not saved in the EEPROM, the setup software will start with the previous settings when the power is turned on again.
4. After setting the communication parameters, click on **OK**. Data transmission will begin. If a communication error occurs, the following message will appear.



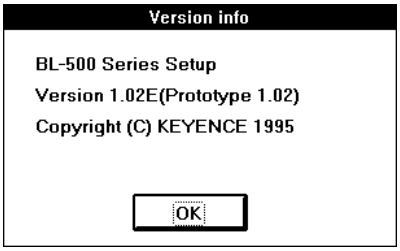

   If you are not sure of the communication parameter settings of the BL-500, turn ON the BL-500's power switch before executing data transmission, and set the communication parameters as shown in step 1.

   * The BL-500's communication parameters are set as shown above for 5 seconds after the power is turned ON. (see page 44.)

5. If the setup software is normally exited, it will return to the main setting screen.

## 3.3.14 Version Display

1. Click on **Info** on the menu bar.
2. The following screen appears, where you can confirm the version of this setup software.






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# 3.4 List of Error Messages

If an error occurs, the following messages will appear on the screen.

Click on *OK* and delete the error message. Then, take the necessary corrective action.

| | Error message | Cause of error |
|---|---|---|
| Error during file operation | File not found. | The file specified for Open Setting does not exist. |
| | Drive is not ready. | The specified disk is not prepared. |
| | Write protected. | Overwrite protection is set to the disk. |
| | Insufficient disk space. | The remaining disk capacity is insufficient. Replace the disk. |
| | Illegal filename (must be in format of xxxxxxxx.CFG.) | The file name does not have extension CFG. Enter the file name correctly. |
| | Illegal file. | Use a correct file name. |
| | Path not found. | The pass for the specified file is invalid. |
| | Device not ready. | The specified drive is invalid. |
| | Insufficient memory. | The main memory capacity is insufficient. |
| | Device I/O error | The disk may be damaged or unformatted. |
| | This is not BL-500 setting file. | The stored file data are incorrect. Specify a correct file name.<br>Data of the BL-500 setup file are different from that of the BL-180. These files are not for common use. |
| | Error in detailed code data. | The stored file data are damaged. Specify a new file name. |
| Error during setup | Communication error | An error occurred during communication.<br>The parameter settings (e.g. baud rate) may not be matched, or the connection may be incorrect. |
| | Value out of range. | The specified value is exceeding the setting range. Enter a correct value. |
| | Min. code length is set larger than Max. code length. | The minimum code length is set larger than the maximum code length. Enter a correct number. |
| | Device is unavailable. | The serial port is being used for a device other than the BL or else “Terminal” is running. |



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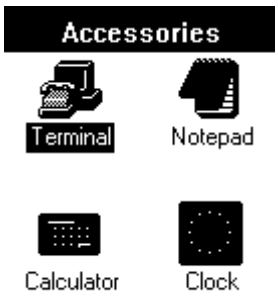
# 3.5 How to Use Terminal Software

The terminal software allows bar code data to be displayed on a Windows-based personal computer and allows serial commands to be sent to the BL-500.

You can use the standard terminal software included in Windows Ver. 3.1. This section describes how to use the terminal software to confirm the operation of the BL-500.

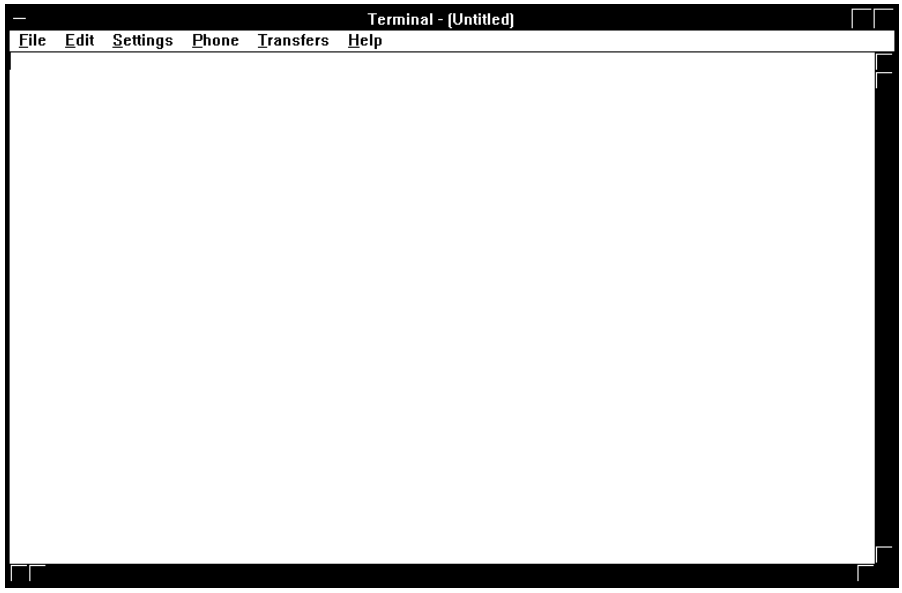
For more information on the terminal software and its functions, please refer to theWindows manual.

1. Double-click on the Terminal icon in the Accessory Group.

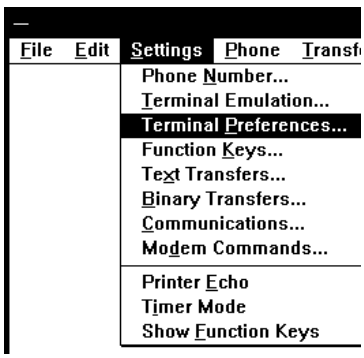



The terminal software starts up.

2. When the terminal software is started, the following screen appears.



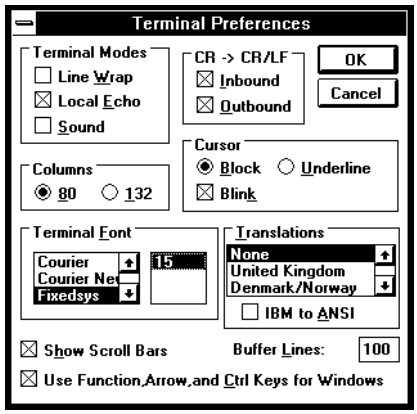

3. First, set the terminal software.
When you click on **Settings**, the following menu appears.



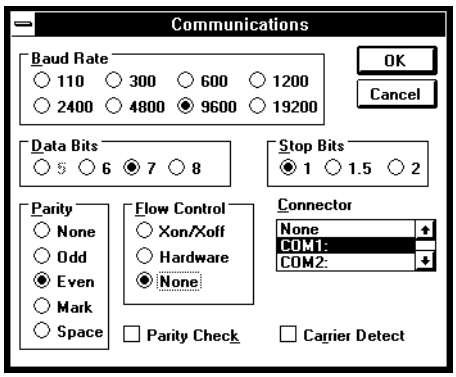



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4. When you click on **Terminal Preferences** , the setting screen is displayed. Set the displayed parameters as shown below. After setting the parameters, click on *OK*.




5. Then, Click on **Settings** then **Communications**.
The following screen appears.




After setting “Connector” to COM1 or COM2, set the baud rate, data bits, stop bits and parity according to the BL-500’s settings. When the data bits is set to “8 bits”, the parity can only be set to “None.”

After setting the communication parameters, click on [OK].

6. When the BL-500 reads a bar code, the read data is displayed on the screen. (When the BL-500’s delimiter is set to *CR*, data will be displayed with carriage returns. Control codes cannot be displayed.)

7. To send a command, type TEST 1/TEST 2 using the keyboard, and then press **[ENTER]**. All commands should be entered in all upppercase characters. Refer to pages 49 to 51 for available commands and descriptions of each command.
In read rate display test mode (TEST 1 mode), the entered command is difficult to see on the screen because the BL-500 is displaying the read data. However, the command will be correctly sent.

8. To exit the terminal software, click on **File** then **Exit**.

Note

Multi drop link commands cannot be sent.

RTS/CTS protocol commands cannot be confirmed.

When you start up “Terminal”, you cannot send the setting to BL using SETUP software. Quit on close “Terminal” before you send the setting.



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# Chapter 4

## Serial Communication (RS-232C/RS-422A)

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# 4.1 Serial Communication

The BL-500 communicates with the PC via the RS-232C serial port. This enables you to change the BL-500's settings from your PC.

## Communication Types

The BL-500 provides the following two communication types:

**Data communication**

Sends read bar code data from the BL-500 to the PC.

**Command communication**

Changes the BL-500's settings by sending a command from the PC to the BL-500.

All communication is performed using ASCII codes.

## 4.1.1 Communication Setup

Configure the setup for BL-500 and the PC before attempting serial communication.

**Setup of BL-500**

Set the following parameters for the BL-500 using the setup software.

Baud rate, Data bits, Parity, Stop bit, Communication protocol, Header/Delimiter, Read error code

**PC setup**

Based on the BL-500's settings, set the communication parameters on the PC using the "Ports" setting in the Windows Control Panel.




The following communication parameters are the default settings for the BL-500:

| | |
|---|---|
| Baud rate: | 9600 bps |
| Data bits: | 7 bits |
| Parity: | Even |
| Stop bit: | 1 bit |

Set the PC according to the above settings before attempting communication.

The BL-500 is set, temporarily, to the default settings for 5 seconds after the power switch is turned on.

When the current settings of BL-500 is not certain, send the command "SSET" and a [CR] to the BL-500 from your PC with 5 seconds after power-up. This causes the BL-500 to remain at its default settings and you can communicate with the BL-500 at the default settings.

For information on checking the BL-500's current settings, see "Details on Parameter Setting Commands" on page 50. For information on changing the above communication parameters see "Description of Parameter Setting Commands" on page 52.




All commands should be entered in all uppercase characters. The BL cannot accept lowercase characters.



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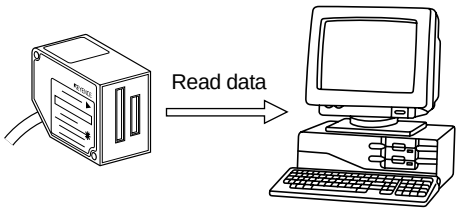
# 4.2 Details on Data Communication

## 4.2.1 Communication Protocols(Hardware handshaking)

The BL-500 supports the following four handshaking protocols.

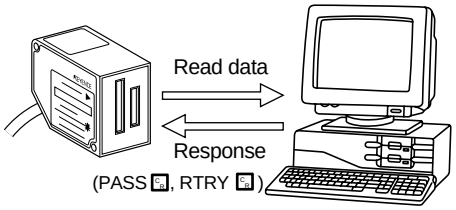
### No Handshaking

The BL-500 sends read data to the PC without using any handshaking protocol.




### PASS/RTRY Handshaking

After sending the read data, the BL-500 waits for a response from the PC. The response is either a PASS command or a RTRY command.




The PASS command (quit) indicates that the PC has successfully received one data packet. The BL-500 then prepares for the next data transmission.

The RTRY command (request to re-send) indicates that the data was not transmitted successfully. The command is a request to the BL-500 to re-send the data. The BL-500 sends the same data again and then waits for the response.

After the BL-500 once receives PASS, the BL-500 sends back no data even if RTRY is sent to the BL-500.

The BL-500 can continue to read while waiting for the PASS command. The data is stored in the BL-500's transmission buffer (For the capacity of the transmission buffer, see page 46).

If the amount of stored data exceeds the capacity of the transmission buffer, the BL-500 sends back <Header>*OVER*<Delimiter> to the PC, and clears all data stored in the transmission buffer. For more information, see "Capacity of Transmission Buffer" on page 46.

Note

The BL-500 can receives other commands while waiting for the PASS command. In this case, the BL-500 sends back an immediate response (e.g. OK).

When the SSET command (see "4.3.3" on page 50) is sent to the BL-500 while the BL-500 is waiting for the PASS command, the BL-500 clears the data stored in the transmission buffer, and enters the setting mode.

### ACK/NAK Handshaking

The ACK/NAK handshaking uses ACK (06H) and NAK (15H) instead of PASS and RTRY used in the PASS/RTRY handshaking, respectively. With these protocols, the BL-500 sends back different characters, but performs the same operation.



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### RTS/CTS Handshaking

When the PC's RTS (BL-500's CTS) signal turns off, the BL-500 becomes ready for data transmission. When the PC's RTS signal turns on, the BL-500 starts data transmission.

When the PC's RTS signal is off, the BL-500 can still read. In this case, data is stored in the BL-500's transmission buffer (see 4.2.2 below).

If the amount of stored data exceeds the capacity of the transmission buffer, the BL-500 sends back <Header>OVER<Delimiter> to the PC, and clears all data stored in the transmission buffer.

Note

The RTS/CTS handshaking cannot be used for RS-422A communication.

The RTS/CTS protocol can be used together with other handshaking protocols.

When the PC's RTS signal is off, the BL-500 does not sends back a response to the PC.

## 4.2.2 Capacity of Transmission Buffer

The BL-500' s transmission buffer can store 400 bytes (400 characters).

The number of characters stored in the transmission buffer for each data packet is the number of characters in the data (including additional data such as the number of decoding match count) plus an additional five characters indicating the data's attributes.

When multi label reading mode 2 or 3 is used, these five attribute characters are added to each data packet.

**Example 1**

When the number of bar code digits is 10 (with no additional data)

400 ÷ (10 + 5) = 26

The transmission buffer can store 26 pieces of data.

**Example 2**

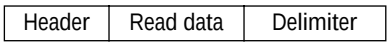
When the number of bar code digits is 20 (with no additional data)

400 ÷ (20 + 5) = 16

The transmission buffer can store 16 pieces of data.

## 4.2.3 Read Data Format

Set the data format of the Header and Delimiter, respectively.




With the setup software, the following formats can be selected. Other than the following formats, you can freely set up to 5 characters.

**Header**

ESC (1BH)/STX (02H)/None

**Delimiter**

CR (ODH)/CR (ODH) LF (OAH)/ETX (O3H)



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### 4.2.4 Read Error Code

If the BL-500 fails to read a bar code, the B-500 sends back a read error code.

The initial setting of the read error code is as follows:

| Header | ERROR | Delimiter |
|---|---|---|

The read error code can freely be changed (within 8 characters).

The BL-500 can be set to send no error code (see page 36).



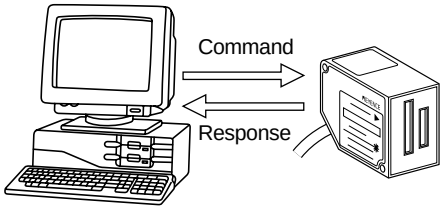
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# 4.3 Command Communication

The BL-500 includes commands to directly operate the BL-500 (direct control commands) and the commands used to change or confirm the BL-500's settings (parameter setting commands).

## 4.3.1 Setup of Direct Control Commands

### Communication procedure




1. Send a direct control command from the PC to the BL-500.
2. After receiving the command, the BL-500 sends back an *OK* response and executes the required operation.
   When the read operation control command or test mode control command is sent to the BL-500, the BL-500 sends back no response.
3. When an incorrect command is sent to the BL-500, the BL-500 sends back no response.

**Note**

*LF* can be added after the command being sent. In this case, however, *LF* is not added to the response data.

When *ESC* is inserted before the command being sent, characters in the BL-500's command receiving buffer are cleared.

If the BL-500's command receiving buffer contains erroneous characters due to data transmission error during communication, add *ESC* to the command being sent.

**Note**

For command communication, set the time duration between transmission of each character (byte) to up to 30 seconds. If this duration exceeds 30 seconds, the BL-500 cancels the received characters.



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## 4.3.2 Explanation of Direct Control Commands

The following describe direct control commands in details.

### Read operation control

This command specifies the data read timing.

**[LON] Trigger on**

Command: *LON*
Response: None

**[LOFF] Trigger off**

Command: *LOFF*
Response: None

- Even when the read operation is controlled with these commands, the BL-500 performs the same operation as with the trigger input (see page 8 to 10).
- “Trigger input: on” corresponds to *LON*, and “trigger input: off” corresponds to *LOFF*.
- The BL-500 starts read operation on receipt of *LON* and stops it on receipt of *LOFF*.
- When a bar code can be correctly read and the read data has already been set, you need not send *LOFF*.
- The command characters can be freely changed (within 8 characters).

### Test mode control

Starts or quits the test mode.

**[TEST1] Reading rate check**

Command: *TEST1*
Response: None

**[TEST2] Tact check**

Command: *TEST2*
Response: None

**[QUIT] Resetting test**

Command: *QUIT*
Response: None

- After using the test mode, be sure to reset it.

### OK/NG output control

Directly turns on/off the OK/NG output.
This enables you to easily check wiring.

**[OKON] Turning the OK output on**

Command: *OKON*
Response: *OK*

**[NGON] Turning the NG output on**

Command: *NGON*
Response: *OK*

**[ALLOFF] Turning the OK/NG outputs off**

Command: *ALLOFF*
Response: *OK*



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### Clearing transmission buffer

**[BCLR]** Clears data stored in the transmission buffer.

Command: *BCLR*
Response: *OK*

### Shift to setting mode

**[SSET]** Enters the setting mode (see page 49).

Command: *SSET*
Response: *OK*

### Laser off/Resetting Laser off

Turns off the laser emission when the laser beam may cause injury to an operator (see page x).

**[LOCK]** **Laser off**

Command: *LOCK*
Response: *OK*

**[UNLOCK]** **Resetting Laser off**

Command: *UNLOCK*
Response: *OK*

- When the Laser off command is executed, bar code read operation (laser emission) is disabled until the Laser off command is reset by using UNLOCK command.
- The Laser off command is retained even after the power is turned off.

## 4.3.3 Details on Parameter Setting Commands

The following describes how to change the BL-500's settings through command communication.

You can use the setup software to change the BL-500's settings instead of these commands.

### Communication Details

1. Send the direct control command *SSET* to the BL-500.
   The BL-500 will shift to setting mode.
   After successfully executing the command, the BL-500 sends back an *OK*.
2. After the BL-500 shifts to setting mode, send the command (setting change command) corresponding to the item to be changed to the BL-500.
   After successfully executing the command, the BL-500 sends back an *OK*.
   If an error occurs with this command, the BL-500 sends back $ERR^{nn}$. (nn sttands for error code numbers.)
3. To confirm the current settings, send a setting confirmation command.
   After successfully executing the command, the BL-500 sends back an *OK*.
   If an error occurs with this command, the BL-500 sends back $ERR^{nn}$.
4. To save the current settings in the EEP-ROM, send *SAVE* to the BL-500.
   Once you save the settings in the EEP-ROM, the BL-500 will start with these settings when the BL-500 is turned on next.
   After successfully executing the command, the BL-500 sends back an *OK*.
   If an error occurs with this command, the BL-500 sends back $ERR^{nn}$.
5. To quit the setting mode and perform the normal bar code reading, send *SEND* to the BL-500.
   After successfully executing the command, the BL-500 sends back an *OK*.
   If an error occurs with this command, the BL-500 sends back $ERR^{nn}$.



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**Note** *[LF]* can be added at the end of the command being sent. In this case, however, *[LF]* is not added to the response data.

When *[ESC]* is added before the command being sent, characters in the BL-500's command receiving buffer are cleared.

If the BL-500's command receiving buffer contains erroneous characters due to a data transmission error during communication, add *[ESC]* to the command being sent.




For command communication, set the time duration between transmission of each character (byte) to up to 30 seconds. If this duration exceeds 30 seconds, the BL-500 cancels the received characters.



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## 4.3.4 Response Error Code

When an incorrect command is sent to set parameters, the BL-500 sends back data indicating the cause of the error (error code). For the commands corresponding to the error codes, see the error code column given in the table on the following pages.

| Error code | Cause of error |
|---|---|
| 00 | Undefined command. |
| 01 | Command format is incorrect. |
| 02 | Nothing corresponds to the number in the command. |
| 03 | “m” value (codes 1 to 4) is other than 0 to 3. |
| 04 | “Bar code type setting command” was not sent first.<br>Sending “No. of readable digits setting command” is invalid for UPC/EAN code. |
| 05 | The number in the command is too long. |
| 06 | “hhh...” data is too short. |
| 07 | “n” value is not 0 or 1. |
| 08 | “n” value is exceeding the setting range. |
| 09 | “nnn” or “nn” value is exceeding the setting range. |
| 10 | “hhh...” is not specified in HEX (hexadecimal) code. |
| 11 | “hhh...=FF” cannot be set. |
| 12 | “hhh...” or “aaa...” contains more than the specified number of characters. |
| 13 | Characters of “aaa...” are invalid. |
| 14 | Data in the EEPROM may be damaged. Perform initial setup. |
| 15 | Error in the area storing initial settings.<br>Settings are automatically initialized. |
| 17 | \ is not followed by !, ? or \ in preset data. (See page 72.) |
| 18 | Two !s exist in preset data. (See page 19.) |
| 99 | The BL-500 may malfunction. Contact KEYENCE. |

## 4.3.5 Description of Parameter Setting Commands

### Saving/Initializing Settings/Quitting Setting Mode

| Function | Command being sent | Response | Description | Error Code |
|---|---|---|---|---|
| Saves settings in the EEP-ROM. | SAVE | OK | See page 49. | - |
| Initializes settings. | DFLT | OK | Returns to the default-settings, and saves the settings in the EEP-ROM. | 00,05<br>14,15 |
| Quits the setting mode. | SEND | OK | See page 49. | - |



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## Setting Bar Code Type and Number of Readable Digits for Codes 1 to 4

The following describes the parameter setting commands for Codes 1 to 4.

Be sure to send “Bar code type setting command” first before setting other parameters.

Note

When “Bar code type setting command” is newly sent, all other parameters for the specified code will return to the default settings.

In this case, set all other parameters again.

Setting change commands and setting confirmation commands are described on the following pages.

| Function | command being sent | | Response | Description | Error Code |
|---|---|---|---|---|---|
| Setting bar code type for codes 1 to 4. | Change | CODEm=n | OK | m= 0 to 3:Codes 1 to 4<br>n= 0:CODE 39<br>1:ITF<br>2:Industrial2-of-5<br>3: Codabar<br>4: UPC/EAN<br>5: CODE128<br>6: COOP2-of-5<br>7: None | 00, 01<br>03, 05<br>08, 14 |
| | Confirm | CODEm | mn | | |
| Setting Max. No. of readable digits | Change | MAXm=nn | OK | m= 0 to 3: Codes 1 to 4<br>nn= 01 to 32<br>* For CODE39, Codabar: 03 to 32<br>* For ITF: 02 to 32<br>* For CODE128: 01 to 64<br>Note:<br>With EAN code, this command causes error. | 00, 01<br>03, 04<br>05, 09<br>14 |
| | Confirm | MAXm | mnn | | |
| Setting Min. No. of readable digits | Change | MINm=nn | OK | | |
| | Confirm | MINm | mnn | | |
| CODE39<br>Sending start/stop character. | Change | WCm00n | OK | m= 0 to 3: Codes 1 to 4<br>n= 0: Disable<br>1: Enable | 00, 02<br>03, 04<br>05, 07<br>14 |
| | Confirm | RCm00 | 00n | | |
| CODE39<br>Inspection of check digit (Modulus 43) | Change | WCm01n | OK | m= 0 to 3: Codes 1 to 4<br>n= 0: Disable<br>1: Enable | |
| | Confirm | RCm01 | 01n | | |

| Function | Command being sent | | Response | Description | Error Code |
|---|---|---|---|---|---|
| CODE39<br>Sending check digit. | Change | WCm02n | OK | m= 0 to 3: Codes 1 to 4<br>n= 0: Disable<br>1: Enable | 00, 02<br>03, 04<br>05, 07<br>14 |
| | Confirm | RCm02 | 02n | | |
| ITF<br>Inspection of check digit (Modulus 10) | Change | WCm10n | OK | m= 0 to 3: Codes 1 to 4<br>n= 0: Disable<br>1: Enable | |
| | Confirm | WCm10 | 10n | | |
| ITF<br>Sending check digit. | Change | WCm11n | OK | m= 0 to 3: Codes 1 to 4<br>n= 0: Disable<br>1: Enable | |
| | Confirm | RCm11 | 11n | | |
| Codabar<br>Sending start/stop character. | Change | WCm30n | OK | m= 0 to 3: Codes 1 to 4<br>n= 0: Disable<br>1: Enable | |
| | Confirm | RCm30 | 30n | | |
| Codabar<br>Start/Stop character type | Change | WCm31n | OK | m= 0 to 3: Codes 1 to 4<br>n= 0: Lower case<br>1: Upper case | |
| | Confirm | RCm31 | 31n | | |
| Codabar<br>Inspection of check digit | Change | WCm32n | OK | m= 0 to 3: Codes 1 to 4<br>n= 0: Disable<br>1: Enable | |
| | Confirm | RCm32 | 32n | | |
| Codabar<br>Sending check digit | Change | WCm33n | OK | m= 0 to 3: Codes 1 to 4<br>n= 0: Disable<br>1: Enable | |
| | Confirm | RCm33 | 33n | | |



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| Function | Command being sent | | Response | Description | Error Code |
|---|---|---|---|---|---|
| Codabar<br>Setting check digit type | Change | WCm34n | OK | m= 0 to 3: Codes 1 to 4<br>n= 0: Mudulus16<br>1: Modulus 11<br>2: Modulus 10/Wait 2<br>3: Modulus 10/Wait 3<br>4: 7 Check DR<br>5: Modulus 11-A<br>6: Modulus 10/Wait 2-A | 00, 02<br>03, 04<br>05, 08<br>14 |
| | Confirm | RCm34 | 34n | | |
| UPC(A-E)/EAN<br>Reading UPC-E | Change | WCm40n | OK | m= 0 to 3: Codes 1 to 4<br>n= 0: Disable<br>1: Enable | 00, 02<br>03, 04<br>05, 07<br>14 |
| | Confirm | RCm40 | 40n | | |
| UPC(A-E)/EAN<br>Reading EAN 8 digits | Change | WCm41n | OK | m= 0 to 3: Codes 1 to 4<br>n= 0: Disable<br>1: Enable | |
| | Confirm | RCm41 | 41n | | |

| Function | Command being sent | | Response | Description | Error Code |
|---|---|---|---|---|---|
| UPC(A-E)/EAN<br>Reading JAN 13 digits | Change | WCm42n | OK | m= 0 to 3: Codes 1 to 4<br>n= 0: Disable<br>1: Enable | 00, 02<br>03, 04<br>05, 07<br>14 |
| | Confirm | WCm42 | 42n | | |
| UPC(A-E)/EAN<br>No. of UPC-A output digits | Change | WCm43n | OK | m= 0 to 3: Codes 1 to 4<br>n= 0:Output in 13 digits<br>1:Output in 12 digits | |
| | Confirm | RCm43 | 43n | | |
| UPC(A-E)/EAN<br>Adding “0” to UPC-E system code | Change | WCm44n | OK | m= 0 to 3: Codes 1 to 4<br>n= 0: Disable<br>1: Enable | |
| | Confirm | RCm44 | 44n | | |
| CODE128<br>Checking double character start pattern<br>(See p. 34.) | Change | WCm51n | OK | m= 0 to 3: Codes 1 to 4<br>n= 0: Disable<br>1: Enable | |
| | Confirm | RCm51 | 51n | | |
| Setting max. code length output function | Change | WCm83n | OK | m= 0 to 3: Codes 1 to 4<br>n= 0: Disable<br>1: Enable | |
| | Confirm | RCm83 | 83n | | |
| Setting direction for max. code length output | Change | WCm84n | OK | m= 0 to 3: Codes 1 to 4<br>n= 0: Forward<br>1: Reverse | |
| | Confirm | RCm84 | 84n | | |
| Setting effective digits for max. code length output | Change | WCm85nn | OK | m= 0 to 3: Codes 1 to 4<br>nn= 01 to 32: Effective digits | 00, 02<br>03, 04<br>05, 09<br>14 |
| | Confirm | RCm85 | 85nn | | |
| Setting starting digit for max. code length output | Change | WCm86nn | OK | m= 0 to 3: Codes 1 to 4<br>nn= 01 to 32:<br>Starting digit | |
| | Confirm | RCm86 | 86nn | | |
| Setting label orientation specified reading | Change | WCm81n | OK | m= 0 to 3: Codes 1 to 4<br>n= 0: Disable<br>1: Enable | 00, 02<br>03, 04<br>05, 07<br>14 |
| | Confirm | RCm81 | 81n | | |
| Setting orientation for orientation- specified reading | Change | WCm82n | OK | m= 0 to 3: Codes 1 to 4<br>n= 0: Forward<br>1: Reverse | |
| | Confirm | RCm82 | 82n | | |



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## Setting Reading Mode/Data Addition Functions

| Function | Command being sent | | Response | Description | Error Code |
|---|---|---|---|---|---|
| Setting reading mode | Change | WP12n | OK | n= 0: Single label<br>1: Multi label 1<br>2: Multi label 2<br>3: Multi label 3 | 00, 02<br>05, 08<br>14 |
| | Confirm | RP12 | 12n | | |
| Setting data send timing | Change | WP13n | OK | N= 0: Sends data after reading<br>1: Sends after timing input turns off | 00, 02<br>05, 07<br>14 |
| | Confirm | RP13 | 13n | | |
| Setting repeat-read time in multi label reading mode 1 or 2 | Change | WP41nnn | OK | nnn=001 to 225<br>(by 100 ms step) | 00, 02<br>05, 09<br>14 |
| | Confirm | RP41 | 41nnn | | |
| Setting decoding match count | Change | WP43nnn | OK | nnn=001 to 225 | |
| | Confirm | RP43 | 43nnn | | |
| Setting decoding match count in additional information | Change | WP10n | OK | n= 0: No addition<br>1: Add | 00, 02<br>05, 07<br>14 |
| | Confirm | RP10 | 10n | | |
| Setting scans in additional information | Change | WP11n | OK | n= 0: No addition<br>1: Add<br>Note:<br>Effective only when No. of decodings are added. | |
| | Confirm | RP11 | 11n | | |
| Setting label orientation in additional information | Change | WP14n | OK | n= 0: No addition<br>1: Add | |
| | Confirm | RP14 | 14n | | |
| Setting code type in additional information | Change | WP17n | OK | n= 0: No addition<br>1: Add | |
| | Confirm | RP17 | 17n | | |



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## Setting Trigger Input (Starting Test Mode)

| Function | Command being sent | | Response | Description | Error Code |
|---|---|---|---|---|---|
| Setting signal type | Change | WP05n | OK | n= 0: Level<br>1: One-shot | 00, 02<br>05, 07<br>14 |
| | Confirm | RP05 | 05n | | |
| Setting one-shot input time | Change | WP42nnn | OK | nnn=001 to 225<br>(by 100 ms step) | |
| | Confirm | RP42 | 42nnn | | |
| Setting time constant of trigger input | Change | WP04n | OK | n= 0: 2 ms<br>1: 10 ms | |
| | Confirm | RP04 | 04n | | |
| Setting state of trigger input | Change | WP03n | OK | n= 0: Normal-open<br>1: Normal-close | |
| | Confirm | RP03 | 03n | | |
| Starting test mode when trigger input turns on. (To specify the test mode, use the command below.) | Change | WP06n | OK | n= 0: Disable<br>1: Enable | |
| | Confirm | RP06 | 06n | | |
| Specifying the test mode to be started when trigger input turns on. | Change | TRGTn | OK | N= 1: Reading rate check mode<br>2: Tact check mode | 00, 02<br>05, 08<br>14 |
| | Confirm | TRGT | TRGTn | | |
| Starting test mode when power is turned on. | Change | TESTn | OK | n= 0: Reset<br>1: Reading rate check mode<br>2: Tact check mode | |
| | Confirm | TEST | TESTn | | |
| Setting characters of trigger on command | Change | WP56hhh... | OK | hhh...=Trigger on command (Up to 8 characters)<br>* Specify characters in HEX (hexadecimal) code. | 00, 02<br>05, 11<br>14 |
| | Confirm | RP56 | 56hhh... | | |
| Setting characters of trigger off command | Change | WP57hhh... | OK | hhh...=Trigger off command (Up to 8 characters)<br>* Specify characters in HEX (hexadecimal) code. | |
| | Confirm | RP57 | 57hhh... | | |

Note To set characters of the trigger on/Off command, send the following command.

Example 1: Change the trigger on command to S.

S
**WP5653** *CR* S=53h



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## Setting Communication Parameters

| Function | command being sent | | Response | Description | Error Code |
|---|---|---|---|---|---|
| Setting baud rate | Change | WP35n | OK | N= 0: 9600 bps<br>1: 4800 bps<br>2: 2400 bps<br>3: 1200 bps<br>4: 600 bps<br>5: 38400 bps<br>6: 31250 bps<br>7: 19200 bps | 00, 02<br>05, 08<br>14 |
| | Confirm | RP35 | 035n | | |
| Setting data bit length | Change | WP30n | OK | n= 0: 7 bits<br>1: 8 bits | 00, 02<br>05, 07<br>14 |
| | Confirm | RP30 | 30n | | |
| Setting parity check<br>* To set the parity type, use the command below. | Change | WP31n | OK | n= 0: Disable<br>1: Enable | |
| | Confirm | RP31 | 31n | | |
| Setting parity type | Change | WP32n | OK | n= 0: Even<br>1: Odd | |
| | Confirm | RP32 | 32n | | |
| Setting Stop bit | Change | WP33n | OK | n= 0:1 bit<br>1: 2 bits | |
| | Confirm | RP33 | 33n | | |
| Setting handshaking protocol 1<br>* To specify the protocol, use the command below. | Change | WP07n | OK | n= 0: No protocol<br>1: Set protocol | |
| | Confirm | RP07 | 07n | | |
| Setting handshaking protocol 2 | Change | WP08n | OK | n= 0: PASS/RTRY handshaking<br>1: ACK/NAK handshaking | |
| | Confirm | RP08 | 08n | | |
| Setting RTS/CTS handshaking | Change | WP22n | OK | n= 0: Disable<br>1: Enable | |
| | Confirm | RP22 | 22n | | |
| Setting RS-485 multi drop link | Change | WP34n | OK | n= 0: Disable<br>1: Enable | |
| | Confirm | RP34 | 34n | | |
| Setting ID No. for RS-485 multi drop link. | Change | WP44nn | OK | nn=01 to 31 | 00, 02<br>05, 09<br>14 |
| | Confirm | RP44 | 44nn | | |

## Special Commands for Reading Reversed Bar Codes

| Function | command being sent | | Response | Description |
|---|---|---|---|---|
| Reading reversed bar codes (white bars on a black base) | Change | WP0Rn | OK | n= 0: Reverse OFF (Default)<br>1: Reverse ON |
| | Confirm | RP0R | 0Rn | |

**⚠ CAUTION**

Because the white area of a reversed bar code is smaller than a regular bar code, reflection on a reversed bar code is weaker. This often makes it difficult to read reversed bar codes. Therefore, the BL may not perform at the levels described in the specifications.

Run a series of read tests to ensure that the BL correctly reads the targeted reversed bar codes.



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## Setting Communication strings

| Function | command being sent | | Response | Description | Error Code |
|---|---|---|---|---|---|
| Setting header | Change | WP51hhh... | OK | hhh...= Header (Up to 5 characters)<br>* Specify characters in HEX (hexadecimal) code.<br>* To set no header, hhh...=FF. | 00, 02<br>05, 06<br>10, 12<br>14 |
| | Confirm | RP51 | 51hhh... | | |
| Setting delimiter | Change | WP52hhh... | OK | hhh...= Delimiter (Up to 5 characters)<br>* Specify characters in HEX (hexadecimal) code.<br>* To set no delimiter, hhh...=FF. | |
| | Confirm | RP52 | 52hhh... | | |
| Setting partition mark when additional information is used. | Change | WP50hh | OK | hh= Partition mark(1 character)<br>* Specify the mark in HEX (hexadecimal) code.<br>* To set no mark, hh=FF. | |
| | Confirm | RP50 | 50hh | | |
| Setting intermediate delimiter when multi label reading mode 2 or 3 is used. | Change | WP54hhh... | OK | hhh...=Intermediate delimiter (Up to 5 characters)<br>* Specify characters in HEX (hexadecimal) code.<br>* To set no intermediate delimiter, hhh...=FF. | |
| | Confirm | RP54 | 54hhh... | | |
| Setting read error code | Change | WP55hhh... | OK | hhh...= Read error code (Up to 8 characters)<br>* Specify characters in HEX (hexadecimal) code.<br>* To set no read error code, hhh...=FF. | |
| | Confirm | RP55 | 55hhh... | | |

Note

To set communication strings, send the following command.

Example 1: Set the communication data format to *SOH* 01 Bar Code Data A*CR* .

*SOH* 0 0 A *CR*

**WP51013031** *CR* **WP52410D** *CR*

*SOH*=01h, 0=30h, 1=31h, A=41h, *CR*=0Dh

Example 2: Set the read error code to “BR”.

B R

**WP554252** *CR* B=42h, R=52h

Example 3: Set no read error code.

**WP55FF** *CR*

## Utility Setting (Stability LED, OK/NG output duration, Preset data for compare)

| Function | command being sent | | Response | Description | Error Code |
|---|---|---|---|---|---|
| Indication of Stability LED | Change | WP09n | OK | n=0: Disable<br>1: Enable | 00, 02<br>05, 07<br>14 |
| | Confirm | RP09 | 09n | | |
| Setting OK/NG output duration | Change | WP40nnn | OK | nnn= 001 to 255<br>(by 10 ms step) | 00, 02<br>05, 09<br>14 |
| | Confirm | RP40 | 40nnn | | |
| Registration of preset data for compare | Change | WP68aaa... | OK | aaa...= Preset data (Up to 32 characters)<br>* For CODE128, see page 72.<br>* To delete the preset data, send WP68. | 00, 02<br>05, 12<br>13, 14<br>17, 18 |
| | Confirm | RP68 | 68aaa... | | |

Note

To register the preset data, send the following command.

Example: Register “ABC123” as preset data.

**WP68ABC123** *CR*



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# APPENDIX

# A.1 Specifications

## BL-500/501/550/551

| Model | | | BL-500 | BL-501 | BL-550 | BL-551 | BL-500H | BL-501H | BL-550H | BL-551H |
|---|---|---|---|---|---|---|---|---|---|---|
| Model (with connector) | | | BL-500SO (7034) | BL-501SO (7035) | BL-550SO (7036) | BL-551SO (7037) | BL-500HSO (7038) | BL-501HSO (7039) | BL-550HSO (7040) | BL-551HSO (7041) |
| Type | | | Standard | | | | High-resolution | | | |
| Reading direction | | | Front | | Side | | Front | | Side | |
| Scanning method[1] | | | Single | Raster | Single | Raster | Single | Raster | Single | Raster |
| Light source | | | Visible semiconductor laser | | | | | | | |
| | Wavelength | | 670 nm | | | | | | | |
| | Class | FDA | Class II | | | | | | | |
| | | IEC 825-1 11. 1993 | Class 2 | | | | | | | |
| | | DIN EN 60825-1 07. 1994 | Klasse 2 | | | | | | | |
| Reading distance[2] | | | 80 to 240 mm | | 50 to 200 mm | | 35 to 170 mm | | 15 to 140 mm | |
| Readable bar width[3] | | | 0.25 to 1.0 mm | | | | 0.125 to 0.5 mm | | | |
| Maximum readable label width[4] | | | 194 mm (At 220 mm reading distance) | | 145 mm (At 175 mm reading distance) | | 137 mm (At 150 mm reading distance) | | 100 mm (At 115 mm reading distance) | |
| PCS | | | 0.6 or more (Reflectance of white part: 75% or more) | | | | | | | |
| Scanning rate | | | 500 scans/sec | | | | | | | |
| Target code | | | CODE39, ITF, Industrial2-of-5, COOP2-of-5, Codabar, CODE128, EAN/UPC(A-E) | | | | | | | |
| No. of readable digits | | | 32 digits | | | | | | | |
| Trigger input | | | Non-voltage input (contact or solid-state) *TTL input is also possible. | | | | | | | |
| Rated load | | | 24 VDC, 30 mA | | | | | | | |
| Enclosure rating | | | IP-64 | | | | | | | |
| Ambient light | | | Sunlight: 10,000 lux, , Incandescent lamp: 7,000 lux. | | | | | | | |
| Current consumption | | | 320 mA max. | | | | | | | |
| Weight | | | Approx. 210 g | | Approx. 260 g | | Approx. 210 g | | Approx. 260 g | |

1. BL-501 raster width: 8.5 ± 1 mm(reading distance: 135 mm), BL-551 raster width: 8.5 ± 1 mm (reading distance: 110mm)
   For the raster widths of the BL-501H and BL-551H, please refer to Instruction Manual.
2. For the reading distances and Maximum readable label widths of the BL-500H, BL-501H, BL-550H, and BL-551H, please refer to Instruction Manual.
3. Readable bar width indicates the range of the narrowest readable bar.
4. For the reading distances and Maximum readable label widths of the BL-500H, BL-501H, BL-550H, and BL-551H, please refer to Instruction Manual.



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| | | |
|---|---|---|
| OK/NG output | Output type | NPN open collector ouptput |
| | Leakage current (at off) | 0.1 mA max. |
| | Residual voltage (at on) | 0.5 V max. |
| Ambient temperature | | 0 to 40°C (32 to 104°F), No freezing |
| Relative humidity | | 35 to 85%, No condensation |
| Vibration | | 10 to 55 Hz, Double amplitude in X, Y and Z directions, 2 hours respectively |
| Power supply voltage | | 5 VDC±5%[1] |
| Serial interface | Applied standard | EIA RS-232C port |
| | Synchronization | Start-stop |
| | Transmission code | ASCII |
| | Baud rate | 600 tp 38,400 bits |
| | Data length | 7 bits/8 bits |
| | Parity check | None/even/odd |
| | Stop bit | 1/2 bit |

1. Use a stable power supply of 5 VDC±5%. The BL-U1 Special Power Unit is available as an option.

Note The internal settings of the BL-500 series are stored in the EEPROM. (Rewritable up to 10,000 times)

## A.1.1 Raster Scan Specifications

The raster scanning method scans several portions of a bar code by swinging the laser beam optical axis vertically. This enables stable reading unaffected by a stain or defect of a bar code.

For the raster width (vertical width for raster scanning), see the following table.

| Model | Reading distance | Raster width |
|---|---|---|
| BL-501/501H | 135 mm | 8.5 ±1 mm |
| BL-551/551H | 110 mm | |

### Operating Environments

The BL-500 Setup Software for Windows operates in the following environments:

**Personal Computer**

IBM PC/AT or compatible model (100% compatible)

CPU: 80386 or higher

Memory: 4 MB or more

Floppy drive: One or more 3.5 inch drives

RS-232C: COM1 or COM2 port

* The BL-500 Setup Software must communicate through COM1 or COM2 port.



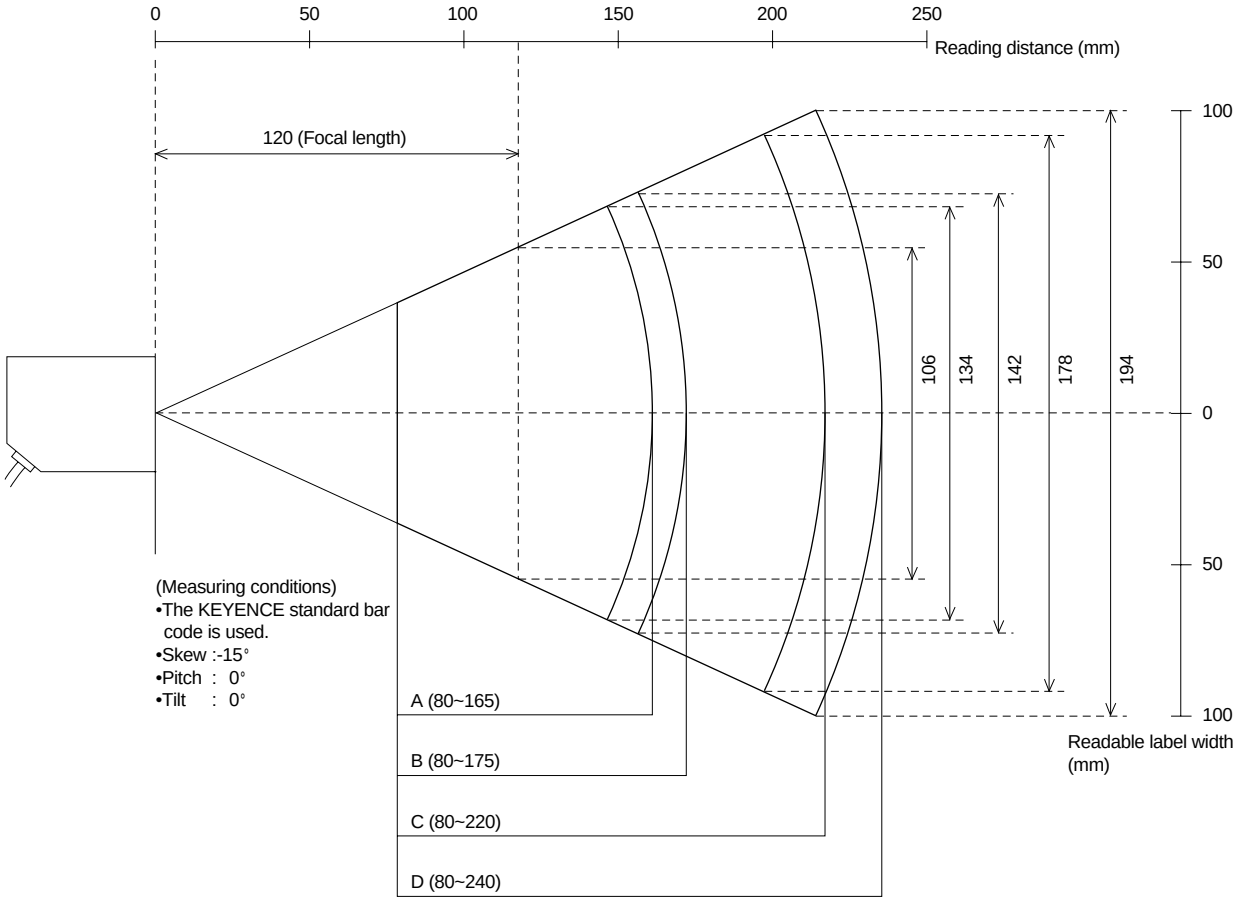
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# A.2 Reading Range Characteristics (Typical)

## BL-500/501

Unit: mm

| | Narrow bar width | Reading distance | Max. readable label width |
|---|---|---|---|
| A | 0.25 | 80 to 165 | 134 |
| B | 0.33 | 80 to 175 | 142 |
| C | 0.5 | 80 to 220 | 178 |
| D | 1.0 | 80 to 240 | 194 |




* For the reading distance measuring reference, see page 6.

Note

The readable label width means a bar code length including the right and left margins (quiet zones) of a bar code.

Even if a bar code is within the above reading range, it may not be read depending on the bar code quality. Set the optimum reading position based on enough reading tests.

Normally, set the reading distance to 120 mm (focal length). In this case, the maximum readable label width is 106 mm.

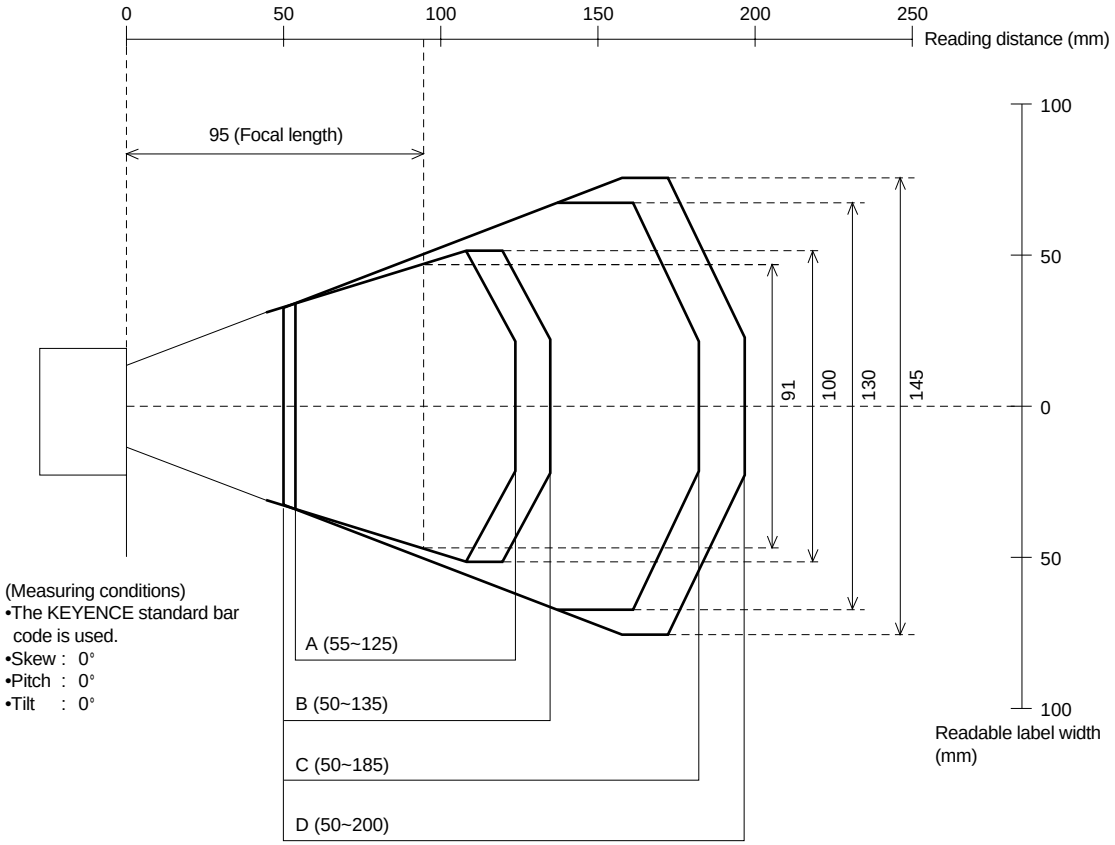


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## BL-550/551

Unit: mm

| | Narrow bar width | Reading distance | Max. readable label width |
|---|---|---|---|
| A | 0.25 | 55 to 125 | 100 |
| B | 0.33 | 50 to 135 | 100 |
| C | 0.5 | 50 to 185 | 130 |
| D | 1.0 | 50 to 200 | 145 |




* For the reading distance measuring standard, see page 6.

Note

The readable label width means a bar code length including the right and left margins (quiet zones) of a bar code.

Even if a bar code is within the above reading range, it may not be read depending on the bar code quality. Set the optimum reading position based on enough reading tests.

Normally, set the reading distance to 95 mm (focal length). In this case, the maximum readable label width is 91 mm.

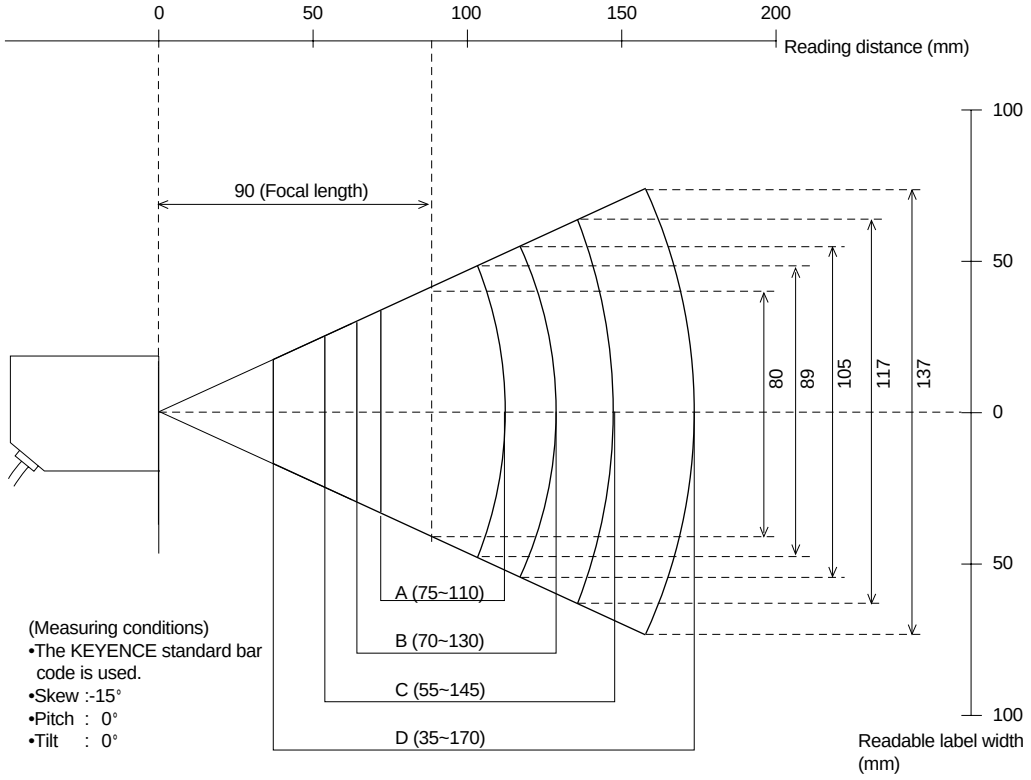


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## BL-500H/501H

Unit: mm

| | Narrow bar width | Reading distance | Ma. Readable label width |
|---|---|---|---|
| A | 0.125 | 75 to 110 | 89 |
| B | 0.19 | 70 to 130 | 105 |
| C | 0.25 | 55 to 145 | 117 |
| D | 0.5 | 35 to 170 | 137 |




* For the reading distance measuring reference, see page 6.

Note

The readable label width means a bar code length including the right and left margins (quiet zones) of a bar code.

Even if a bar code is within the above reading range, it may not be read depending on the bar code quality. Set the optimum reading position based on enough reading tests.

Normally, set the reading distance to 90 mm (focal length). In this case, the maximum readable label width is 80 mm.

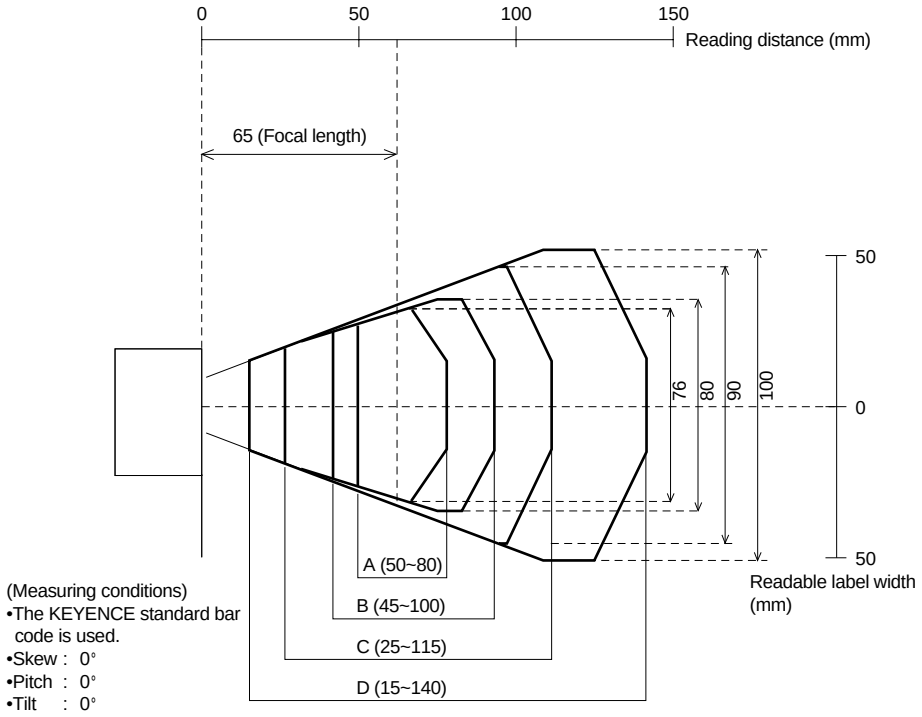


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## BL-550H/551H

Unit: mm

| | Narrow bar width | Reading distance | Max. readable label width |
|---|---|---|---|
| A | 0.125 | 50 to 80 | 80 |
| B | 0.19 | 45 to 100 | 90 |
| C | 0.15 | 25 to 115 | 90 |
| D | 0.5 | 15 to 140 | 100 |




* For the reading distance measuring standard, see page 6.

Note

The readable label width means a bar code length including the right and left margins (quiet zones) of a bar code.

Even if a bar code is within the above reading range, it may not be read depending on the bar code quality. Set the optimum reading position based on enough reading tests.

Normally, set the reading distance to 65 mm (focal length). In this case, the maximum readable label width is 76 mm.



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# A.3 Angular Characteristics (Typical)

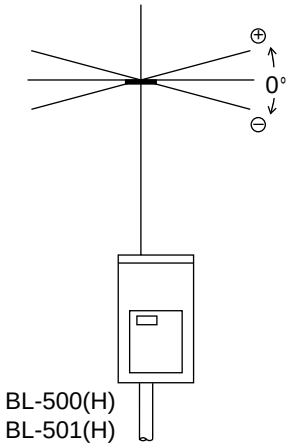
| Model | Narrow bar width | Skew | Pitch | Tilt |
|---|---|---|---|---|
| BL-500/501 | 0.25 mm | -50° to -10°, +10° to +50° | ±30° | ±45° |
| | 0.5 mm | -60° to -10°, +10° to +60° | ±50° | ±45° |
| BL-550/551 | 0.25 mm | -60° to -25°, -5° to +30° | ±25° | ±45° |
| | 0.5 mm | -70° to -25°, -5° to +40° | ±50° | ±45° |
| BL-500H/501H | 0.125 mm | -55° to -10°, +10° to +60° | ±35° | ±15° |
| | 0.25 mm | -60° to -10°, +10° to +65° | ±55° | ±35° |
| BL-550H/551H | 0.125 mm | -70° to -25°, -5° to +50° | ±35° | ±15° |
| | 0.25 mm | -70° to -25°, -5° to +50° | ±55° | ±35° |

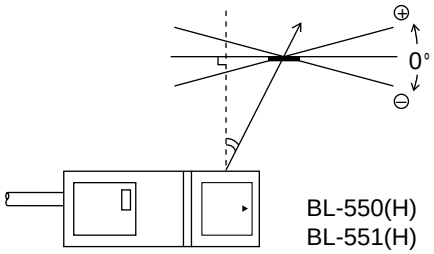
(Measuring conditions)
Bar code: KEYENCE standard bar code
Reading distance: 120 mm (BL-500/501)/95 mm (BL-550/551)
90 mm (BL-500H/501H)/65 mm (BL-550H/551H)

**CAUTION**

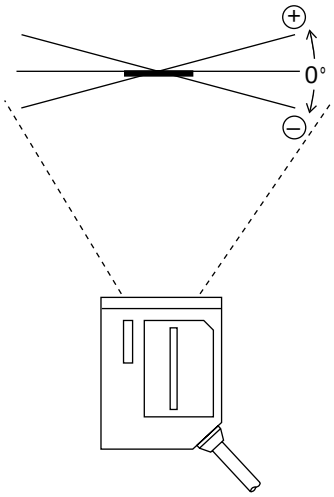
The skew angles of -10° to +10° (BL-500/501(H)) or -25° to -5° (BL-550/551(H)) are the specular reflection range. In this range, bar codes cannot be read, or reading error may occur. Be sure not to mount the BL500 series at the above skew angles.

**Skew**

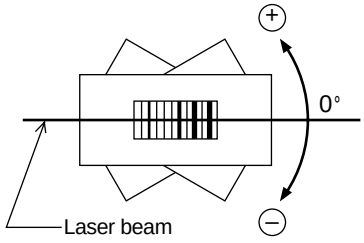



**Pitch**




**Tilt**

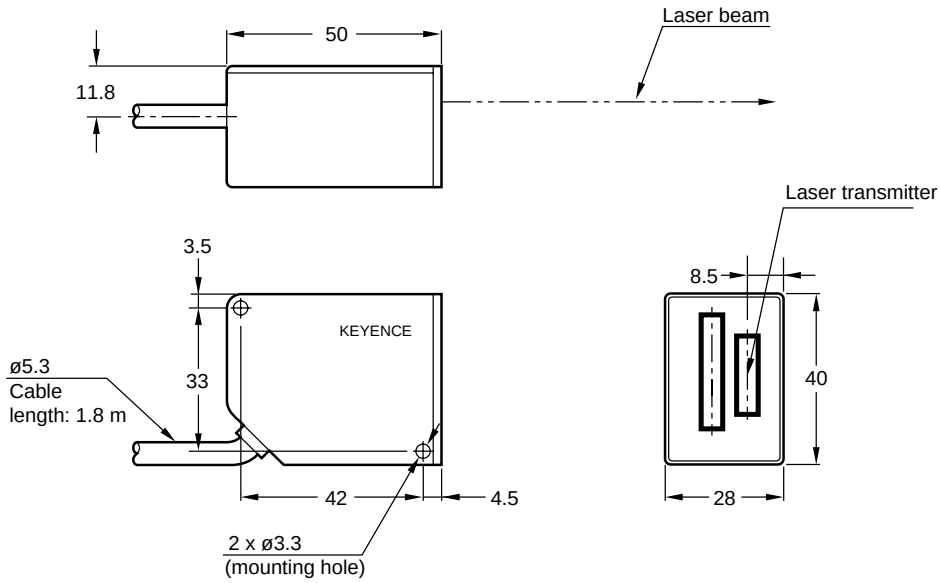




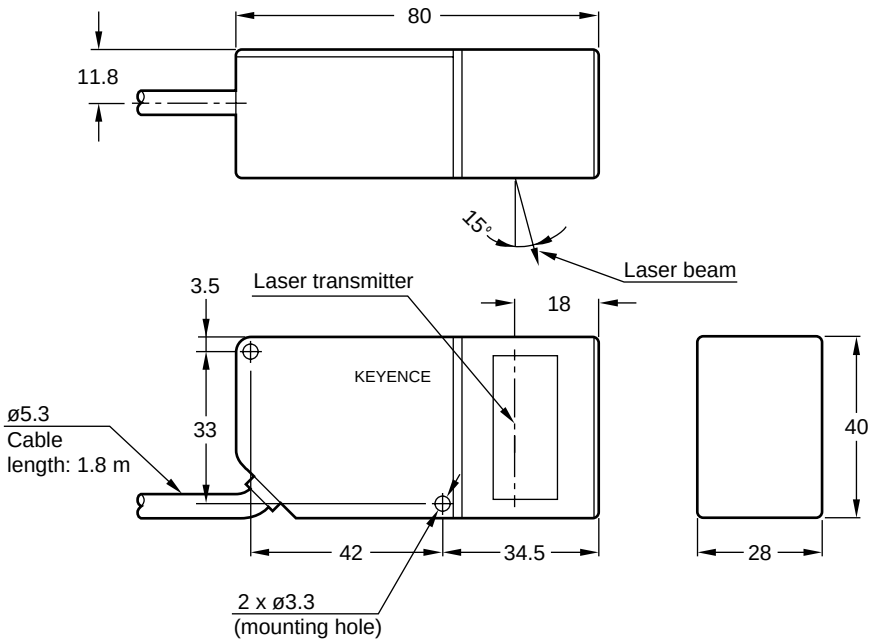

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# A.4 Dimensions

**BL-500/501/500H/501H**



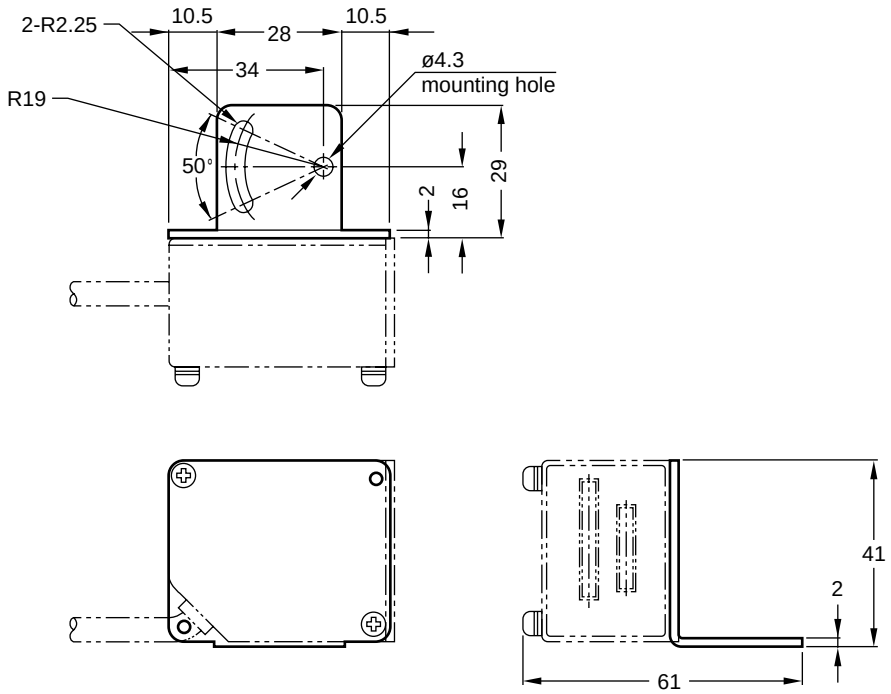

**BL-550/551/550H/551H**



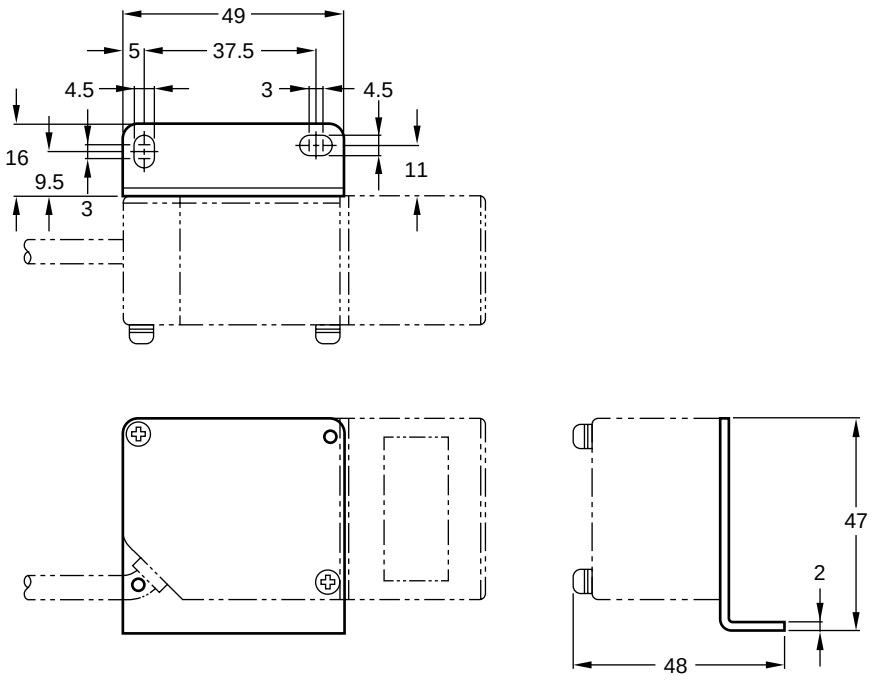



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**BL-500/501/500H/501H (with mounting bracket)**




**BL-550/551/550H/551H (with mounting bracket)**






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# A.5 Example Program for Serial Communication

The following is a example program that allows data communication and command communication. Type in a command and press **[Enter]** to send the data to the BL-500.

Only the *QUIT* command can be sent by pressing **[Q]**.

Set the BL-500 as follows:

- Header: [STX] Delimiter: [ETX]
- Handshaking protocol: No handshaking or PASS/RTRY handshaking

```
100 '***BL-500 SAMPLE PROGRAM*****************************************
110   CLS 3
120   DAT$="":RD$="":CM$=""
130   OPEN "COM1:" AS #1
140 *BUFFCLR :'***CLEAR BUFFER****************************************
150   A=LOC(1)
160   IF A<>0 THEN R$=INPUT$(1,#1) :GOTO *BUFFCLR
200   '
210 *MAIN :'***MAIN ROUTINE*******************************************
220   K$=INKEY$
230     IF K$<>"" THEN GOSUB *COMMAND
240   A=LOC(1)
250     IF A<>0 THEN GOSUB *RECEIVE
260   GOTO *MAIN
300   '
310 *Receive :'***RECEIVE DATA
320   RD$=INPUT$(1,#1)
330     IF RD$=CHR$(&H02) THEN RD$=""                        :'RECEIVE STX
340     IF RD$=CHR$($H03) THEN GOSUB *BARCODE :RETURN        :'RECEIVE ETX
350     IF RD$=CHR$($H0D) THEN GOSUB *RESPONSE :RETURN       :'RECEIVE CR
360   DAT$=DAT$+RD$
370 RETURN
400 '
410 *COMMAND :'***SEND COMMAND****************************************
420   IF K$=CHR$(&H0D) THEN *SEND
430   IF K$="Q" AND CM$="" THEN CM$="QUIT":GOTO *SEND
440     PRINT K$;
450     CM$=CM$+K$
460   RETURN
470 *SEND
480   PRINT #1, CM$;CHR$(&H0D);                             :'SEND COMMAND
490   PRINT:PRINT CM$;"COMMAND IS SENT"
500   CM$=""
510 RETURN
600 '
610 *RESPONSE :'***DISPLAY RESPONSE DATA TO THE COMMAND******************
620   PRINT DAT$ ;"IS SENT BACK"
630   DAT$=""
640 RETURN
700 '
710 *BARCODE :'***DISPLAY BAR CODE DATA*********************************
720   PRINT DAT$ ;"IS READ"
730   DAT$$=""
740 RETURN
```



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# A.6 Troubleshooting

If a problem occurs during operation, please check the following troubleshooting notes first. If you cannot fix the problem, contact KEYENCE or your nearest dealer.

## Bar codes cannot be read.

**Check whether power is applied to the unit.**

Confirm that the power supply voltage and capacity is 5 VDC±5% and 320 mA (340 mA for the BL-500H series). Check the wiring of the power supply unit and the trigger input terminal (see page 2).

**CAUTION**

Connecting the power supply unit with the reverse polarity may damage the BL series.
If the BL-500 does not operate, contact KEYENCE.

**Check whether the laser is emitting**

- Check whether the laser stop command (LOCK, see page 50) has been sent to the BL series. If so, send the laser stop reset command (UNLOCK).
  If a laser stop command has been executed, the top LED on the STABILITY indicator will be flashing.

**Check the bar code setting (type, No. of digits).**

Check the following parameters using the setup software.

- Bar code type, No. of digits.
- Setting of the check digit inspection (enabled or disabled)
- Setting of the label orientation-specified reading

Note

When using CODE39 or Codabar, include the start/stop characters and check digit in the number of digits.

For Code128, see page 72.

**Check the distance and angle between the BL-500 and bar code.**

Check the distance and angle while referring to “Mounting angle and mounting distance” on page 6.

**Check the bar code margins (quiet zones).**

A bar code requires the right and left margins to be at least 10 times wider than the narrow bar width.

If the bar code margins are too narrow, it may not be read.

**Check the bar code label length.**

The bar code label length is the lateral length of a bar code including the right and left margins (quiet zones).

The readable bar code label length is limited depending on the reading distance. See “Reading Range Characteristics (Typical)” on page 62 to 65.

**Check the bar code.**

A bar code with blurred sections, defects or stains may not be read correctly.

Bar codes printed with dot matrix or ink jet printers are prone to such problems.



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**Check whether the transmitter (light source) and the receiver (optical pickup) are clean.**

If moisture, oil or dust adheres to the transmitter or the receiver, wipe the units using a soft cloth and a mild plastic cleaner.

**Check the environmental conditions.**

See “Hints on correct use” on page 4.

## Reading rate check mode is not 100%.

Check the previous item “Bar codes cannot be read”.




The Read rate indicates the number of acceptable decodings (reads) during 10 scans of a bar code. When a bar code has stains or defects, the read rate is reduced.

However, even when the read rate is 20%, 2 decodings are possible during 10 scans. Therefore, if the number of decode matches is 2, the bar code can be read.

If the trigger input can be set enough long, the read operation is not affected.

## Initial settings cannot be sent to the BL-500 series using the setup software.

- Check whether the communication parameters such as baud rate and data length conform to the settings of the BL-500.
- Check whether the pin assignment of RS-232C cable conforms to those of the BL-500 and the PC. Check that the cable isn’t disconnected. Also check the BL-U1’s connection.
- Check whether the BL-500’s or BL-U1’s power switch is on.
- Check whether the PC’s RS-232C interface is “enabled”.
- If you are using the BL-U1, check that its DIP switches are set to RS-232C.



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# A.7 CODE128 Specifications

**Setting No. of Digits**

- The start/stop character and check digit are not included in the number of digits.
- FNC1 to 4 (Function codes), SHIFT, and CODE-A to -C should not be added to the number of digits.
- The number of digits setting range varies depending on the start character (CODE-A to -C).

  CODE-A, B: 1 to 32
  CODE-C: 2 to 64

One digit of CODE-A or CODE-B represents two digits of CODE-C.

**Data Transmission**

- The start/stop character and check digit cannot be sent.
- FNC1 to 4 (Function codes), SHIFT, and CODE-A to -C cannot be sent.
- Control codes are sent.

Note Do not use CODE128 with control codes when you build a multidrop link. Communication errors may occur.

**Registration of Preset Data**

The number of characters that can be registered as preset data is up to 32 digits for CODE-A or CODE-B, and up to 64 digits for CODE-C, as described above.

When ! or ? is registered as preset data, it functions as the Preset “!” “?” Function, as described on page 19 .

Since CODE128 can represent all ASCII codes as bar code data, ! or ? can also be represented as bar code data.

To register ! or ? as preset data, send \! or \? to differentiate it from the Preset “!” “?” function.

To register \ as preset data, send \\.

**Example:** To register 123 \!?ABC as preset data, send the following command (see page 58).

WP68123 \\!\?ABC

Control codes (00h to 2Fh of the ASCII code table, such as  and <STX>), start/stop character, check digit, FNC1 to 4 (function codes), SHIFT or CODE-A to-C cannot be registered as preset data. (Data comparison is also impossible.)



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# A.8 ASCII Code Table

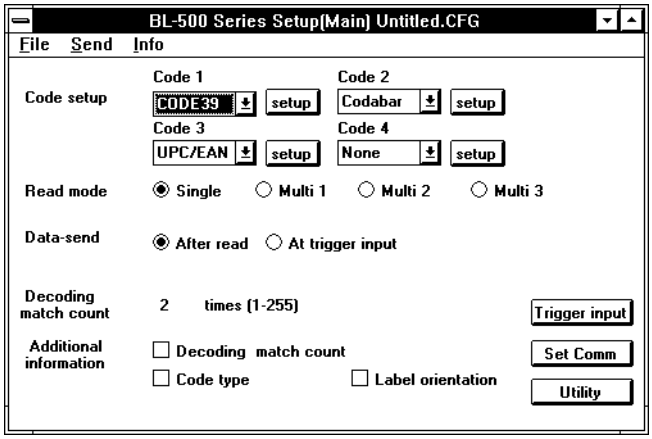
| | | | Upper 4 bits | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HEX | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | | Binary | 0000 | 0001 | 0010 | 0011 | 0100 | 0101 | 0110 | 0111 |
| Lower 4 bits | 0 | 0000 | | DLE | (SP) | 0 | @ | P | ‘ | p |
| | 1 | 0001 | SOH | DC1 | ! | 1 | A | Q | a | q |
| | 2 | 0010 | STX | DC2 | “ | 2 | B | R | b | r |
| | 3 | 0011 | ETX | DC3 | # | 3 | C | S | c | s |
| | 4 | 0100 | EOT | DC4 | $ | 4 | D | T | d | t |
| | 5 | 0101 | ENQ | NAK | % | 5 | E | U | e | u |
| | 6 | 0110 | ACK | SYN | & | 6 | F | V | f | v |
| | 7 | 0111 | BEL | ETB | ‘ | 7 | G | W | g | w |
| | 8 | 1000 | BS | CAN | ( | 8 | H | X | h | x |
| | 9 | 1001 | HT | EM | ) | 9 | I | Y | i | y |
| | A | 1010 | LF | SUB | * | : | J | Z | j | z |
| | B | 1011 | HM | ESC | + | ; | K | [ | k | { |
| | C | 1100 | CL | → | , | < | L | \ | l | \| |
| | D | 1101 | CR | ← | - | = | M | ] | m | } |
| | E | 1110 | SO | ↑ | . | > | N | ^ | n | ~ |
| | F | 1111 | SI | ↓ | / | ? | O | _ | o | del |



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# A.9 Default Settings

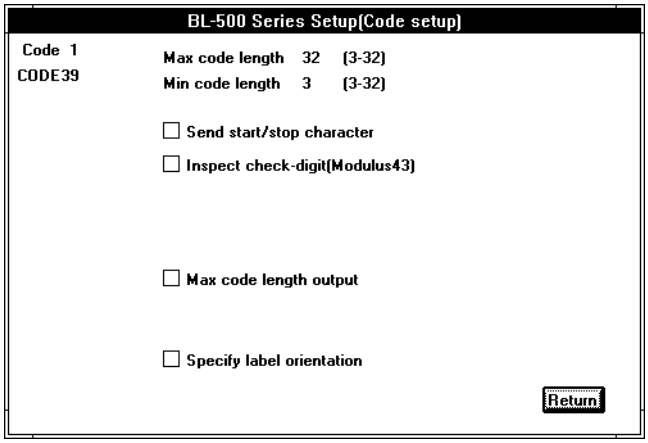
In the main setting screen, the default bar code selections for the four bar code fields are as shown below.



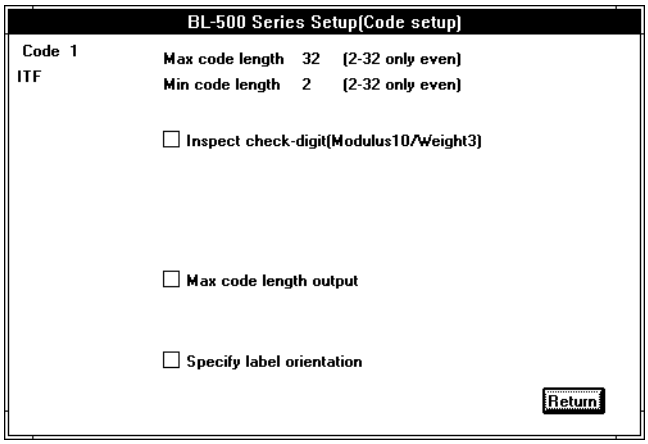

## Bar Code Default Settings

Below are the default settings for each bar code setting screen.

**CODE 39**



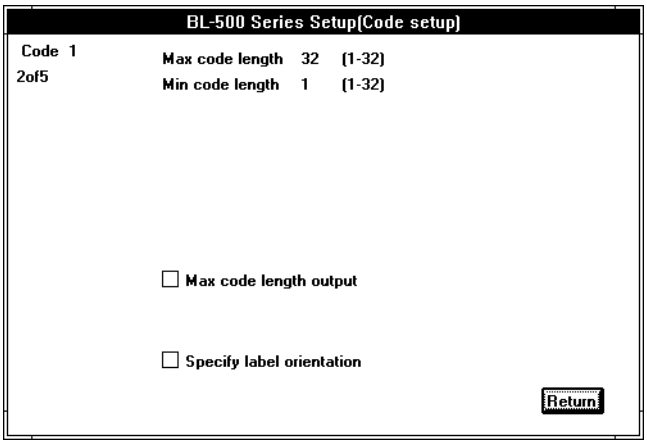

**ITF**



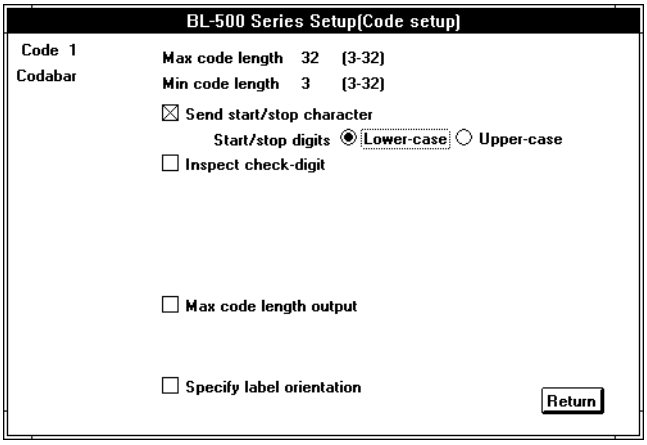



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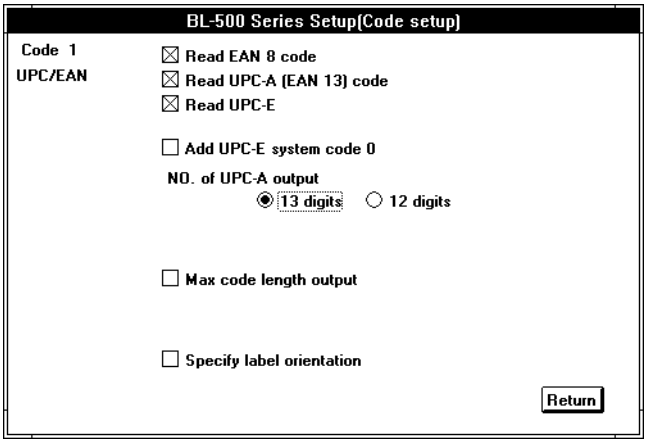
### 2of5




### Codabar



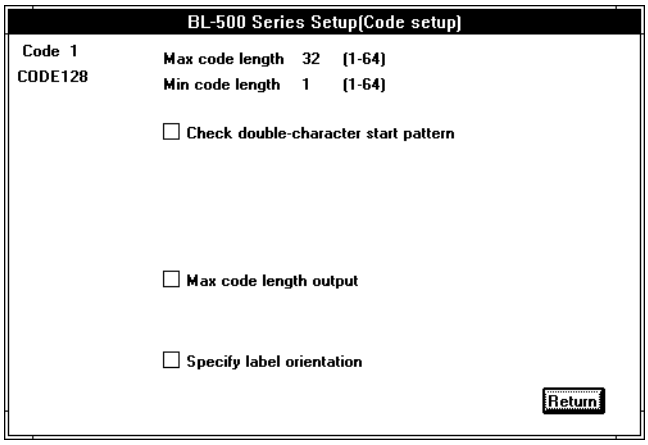

### UPC-EAN



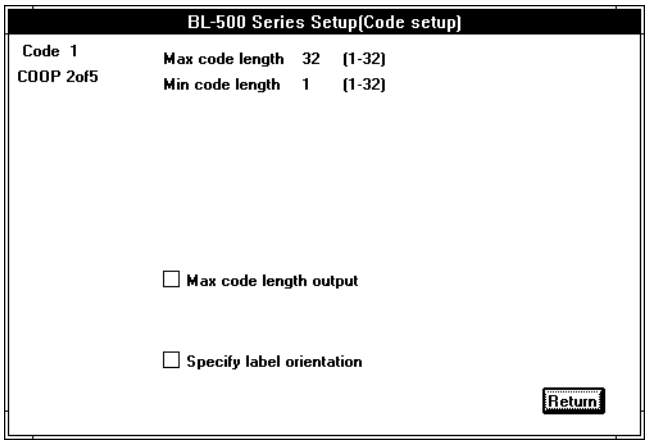



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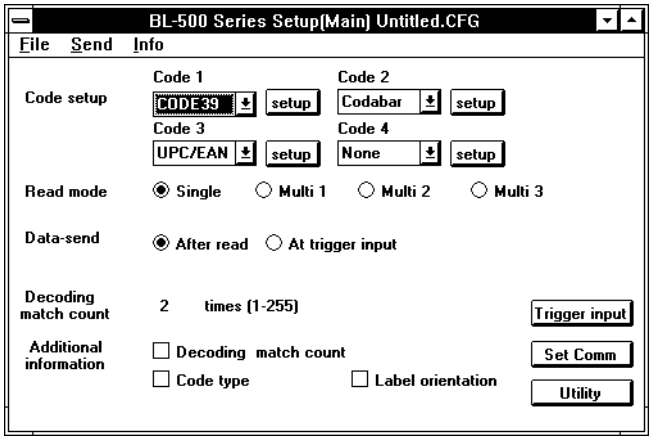
### COOP 2opf5




### CODE 128



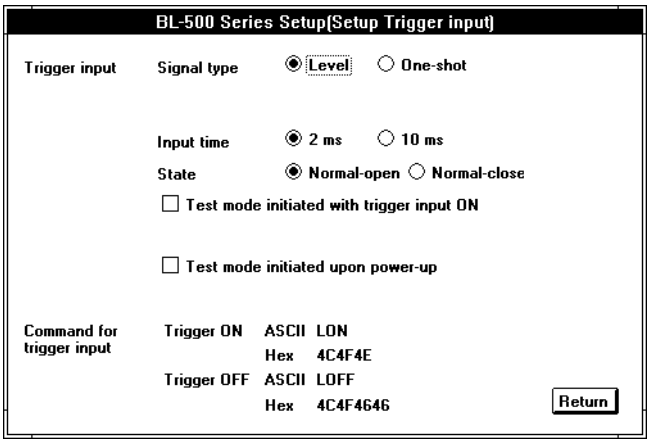

### Read Mode/Data Addition Functions default settings



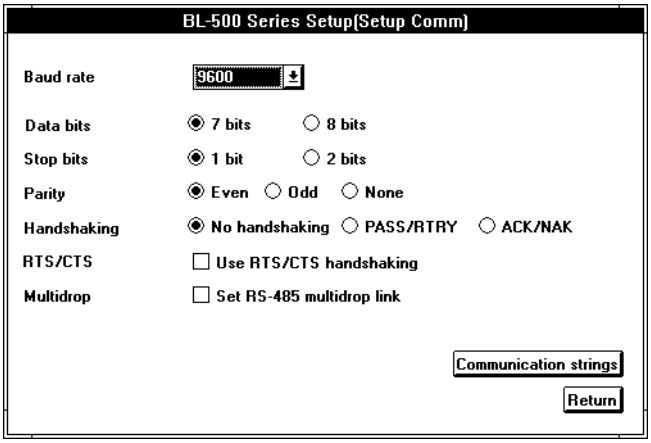



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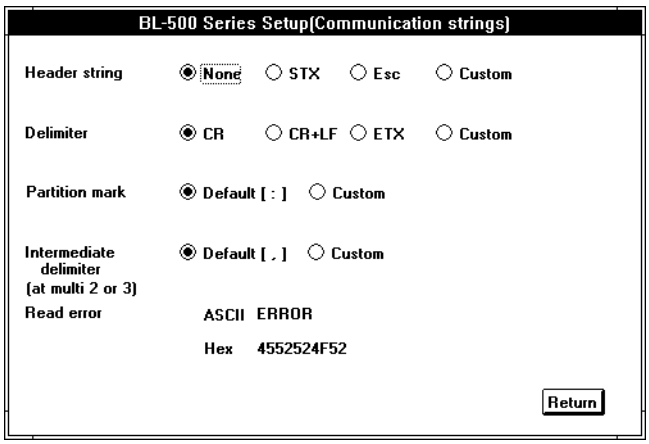
### Trigger input default settings




### Communication Parameters default settings



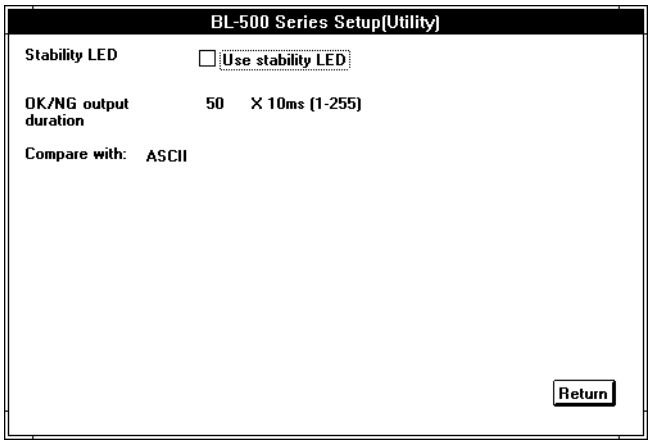

### Communication strings default settings






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### Utility default settings






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# BL-U1 Power Supply

# Introduction

This User's Manual describes the operation and functions of the BL-U1. Read this manual carefully to ensure safe use and maximum performance from your BL-U1.

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# Conventions

This document uses the following conventions to help you easily recognize important and useful information.

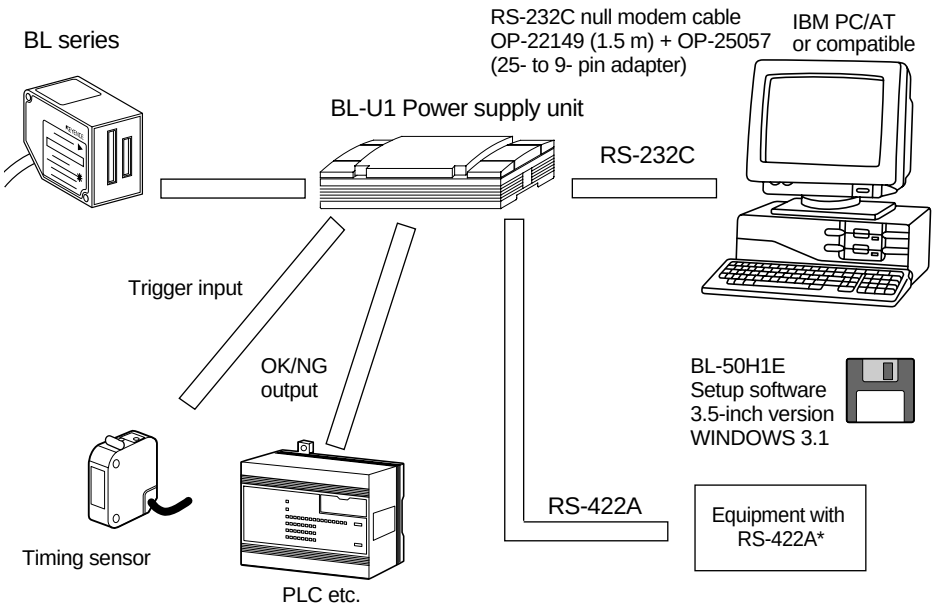
**CAUTION** Important information which must be read to avoid damaging the unit.

Note Provides information for effective use of the unit. Read as required.

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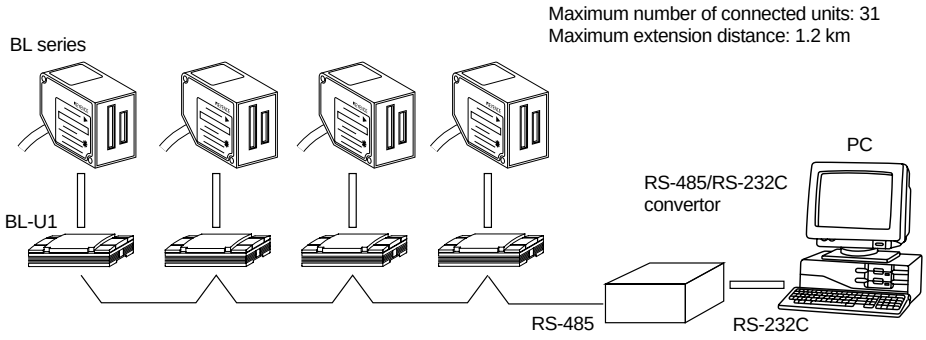
# System Configuration

## Using the RS-232C and RS-422A




- If not using the BL-U1, prepare an equivalent 5 VDC power supply unit separately.
- To communicate through the RS-422A, you need a BL-U1 in your system.

## Using the RS-485 multidrop link




- To communicate through the RS-485, you need a BL-U1 in your system.
- Prepare a RS-485/RS-232C convertor separately.
- When using the RS-485 multidrop link, you cannot use the Windows™ Setup software.

## Other Options

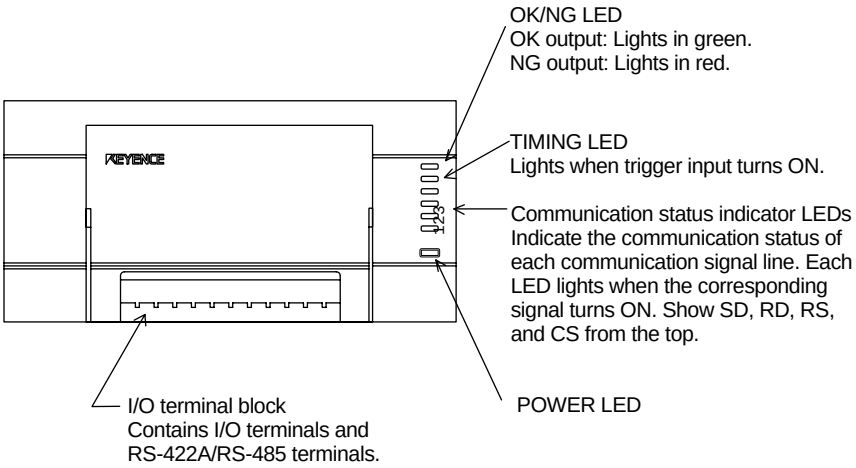
**OP-22149**

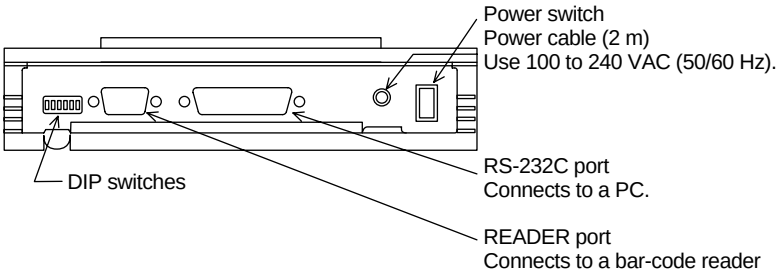
RS-232C null modem cable with D-sub 25-pin connector (1.5 m).
To connect the BL-U1 to a IBM PC/AT compatible using the RS-232C port, use a 25- to 9-pin adapter (OP-25057).



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# BL-U1



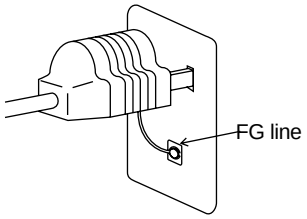



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# 1 BL-U1 Connections

## 1.1 Connecting the AC power supply

Plug the BL-U1 power cable into the power receptacle. At the same time, ground the frame ground wire.



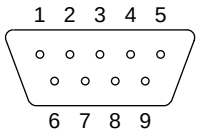

**CAUTION** Make sure that the power supply provides 100 to 240 VAC ± 10%.

## 1.2 Connecting the BL-U1 to a BL series

Use the READER port on the BL-U1.

The pin assignment is shown in the table below:

**UL-U1 READER port pin assignment**




D-sub 9-pin (male)
DCE specification (defined as modem)
#4-40 screw (female)

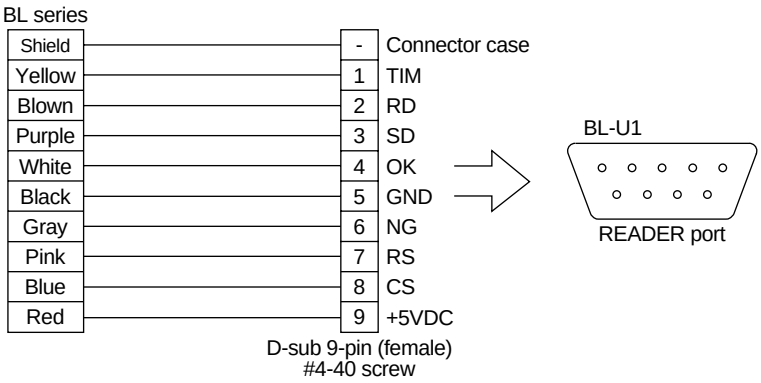
| Pin No. | Symbol | Description | Signal direction |
|---|---|---|---|
| 1 | TIM | Trigger input | Output |
| 2 | RD (RXD) | Send data through RS-232C | Output |
| 3 | SD (TXD) | Receive data through RS-232C | Input |
| 4 | OK | OK uotput | Input |
| 5 | GND (SG) | Ground (common ground for respective signals) | —— |
| 6 | NG | NG uutput | Input |
| 7 | RS (RTS) | Enable to send data through RS-232C (always ON) | Input |
| 8 | CS (CTS) | Request to send data through RS-232C (control method can be selected by DIP switches) | Output |
| 9 | +5V | + 5VDC power supply | Output |



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Prepare the BL series for connection to the BL-U1 by soldering a D-sub 9-pin connector to the BL series cable. Then connect the cable to READER port of the BL-U1.

Prepare the D-sub 9-pin connector and its connector case separately.




Use a metallic connector case for the D-sub 9-pin connector and connect the shielded line to the connector case. This allows connection to the earth ground of the AC power cable.

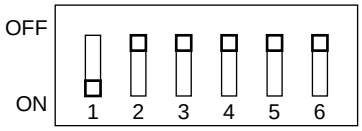
**CAUTION**

Take special care when soldering pin 5 (GND) and pin 9 (+5VDC). A wrong connection will damage the unit.

Do not use a power cable over 2 meters long. A long power cable can cause a drop in voltage, preventing the BL series from starting up properly.

## 1.3 Setting the BL-U1 DIP switches

According to the selected interface and timing input, change the DIP switch settings.



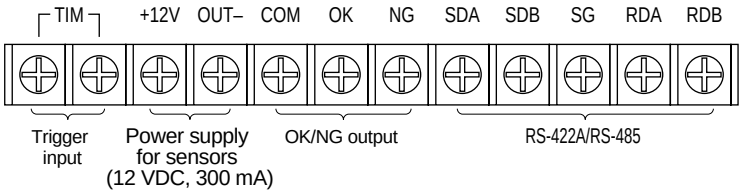

The switch settings at left are the factory default settings.

| DIP switch setting | | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| Interface select | RS-232C | ON | OFF | OFF | | | |
| | RS-422A | OFF | ON | OFF | | | |
| | RS-485 multidrop | OFF | OFF | ON | | | |
| RS-422A terminator (terminal resistance 100 Ω) | OFF | | | | OFF | | |
| | ON | | | | ON | | |
| RS-485 terminator (terminal resistance 100 Ω) | OFF | | | | | OFF | |
| | ON | | | | | ON | |
| READER port CS control method select | Reflect ON/OFF of CS at RS-232C port | | | | | | OFF |
| | Always ON | | | | | | ON |



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## 1.4 Function and wiring on the I/O terminal block




| Symbol | Description | Signal Direction |
|---|---|---|
| TIM | Timing input | Input |
| | | Input |
| +12V OUT | Power supply for sensors (+) (+12 VDC, 300 mA) | Output |
| | Power supply for sensors (-) (0 V) | Output |
| COM | Common for OK/NG output | —— |
| OK | OK output | Output |
| NG | NG output | Output |
| SDA | Send RS-422A data (+)/RS-485 (+) | Output/Input and output |
| SDB | Send RS-422A data (-)/RS-485 (-) | Output/Input and output |
| SG | Signal ground | —— |
| RDA | Receive RS-422A data (+) | Input |
| RDB | Receive RS-422A data (-) | Input |

The above list starts from the left edge terminal on the terminal block and sequentially goes to the right.

- M 3.0 screws are used on the terminal block.
- Use the clips shown below when wiring.

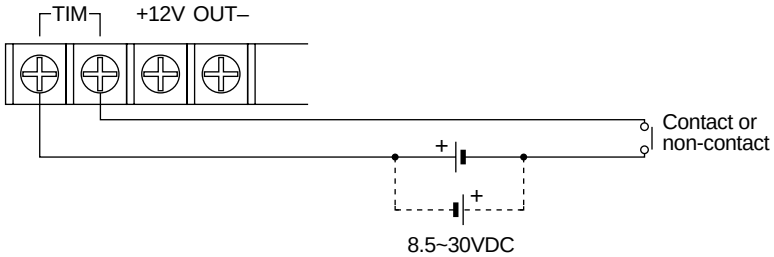



### Wiring the trigger input

The trigger input signals the BL series to start reading.

Turn on the trigger input by supplying 8.5 to 30 VDC between the trigger input terminals.

You can use the “power supply for sensors” terminals of the BL-U1 as the input power supply.

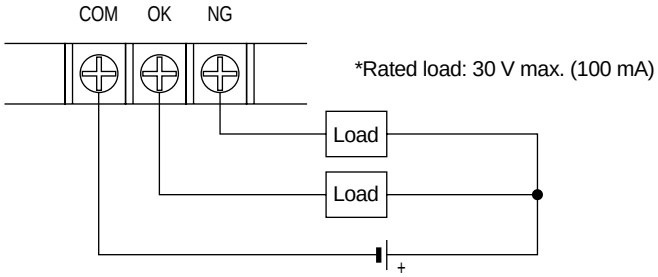





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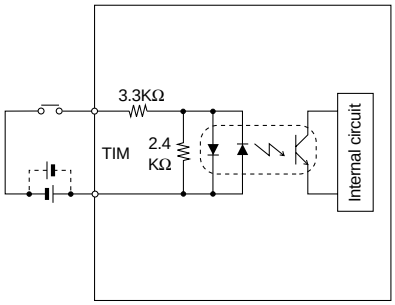
### Wiring the OK/NG output

Use this output to determine OK/NG status by comparing the readout data with the preset data. It is NPN open-collector output.

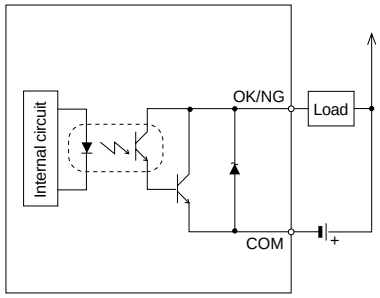



### Input/output circuit diagram

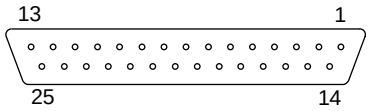
**Input circuit**




**Output circuit**




## 1.5 RS-232C port pin assignment




D-sub 25-pin connector (female)
DTE specification (defined as terminal)
N 2.6 screw (female)

| Pin No. | Symbol | Description | Signal direction |
|---|---|---|---|
| 1 | Shield | Shield | —— |
| 2 | SD (TXD) | Send data through RS-232C | Output |
| 3 | RD (RXD) | Receive data through RS-232C | Input |
| 4 | RS(RTS) | Request to send data through RS-232C (Always ON) | Output |
| 5 | CS(CTS) | Enable to send to RS-232C | Input |
| 6 | DR(DSR) | Connect to pin 20 internally | Input |
| 7 | GND(SG) | Signal Ground | —— |
| 20 | ER(DTR) | Connect to pin 6 internally | Output |

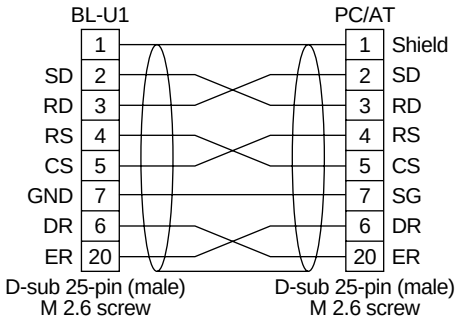


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## 1.6 RS-232C port wiring

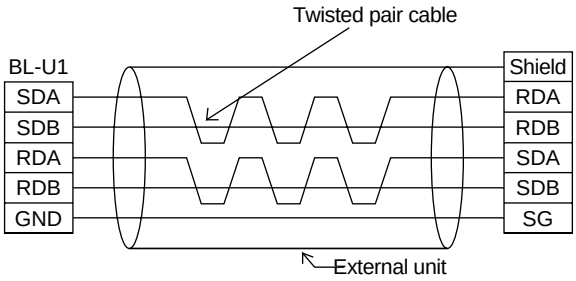
When you want to connect the BL-U1 to a PC through the RS-232C port, the wiring is as shown below.

You can use the optional OP-22149 cable (1.5 m) and OP-25057 (25- to 9-pin adapter).




## 1.7 RS-422A port wiring

When you want to communicate using the RS-422A port, the wiring is as shown below. Use the BL-U1 input/output terminal block.




- Set both terminators (terminal resistance 100 Ω) of the BL-U1 and external unit to ON (see P. 13).
- The extended cable length must be within 1.2 km.

You can prepare an equivalent cable which meets the following specifications:

| Item | Specification |
|---|---|
| Cable type | Shielded cable |
| Logarithm | 3P |
| Conductor resistance (20°C) | 88.0 Ω/km or less |
| Insulator resistance | 10,000 MΩ.km or more |
| Withdraw voltage | 500 VDC/minute |
| Static capacity (1 kHz) | 60 nF/km or less (average) |
| Characteristic impedance (100 kHz) | 110 ± 10 Ω |

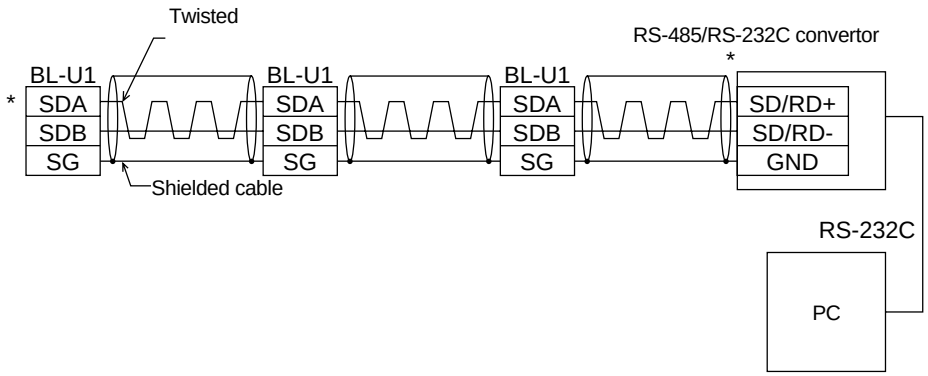


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## 1.8 Wiring the RS-485 (multidrop link)

Multidrop link is a method to connect multiple BL series units to a single PC. See P. 82 of this document for details. Use the terminal blocks SDA and SDB.

**Twisted pair cable**

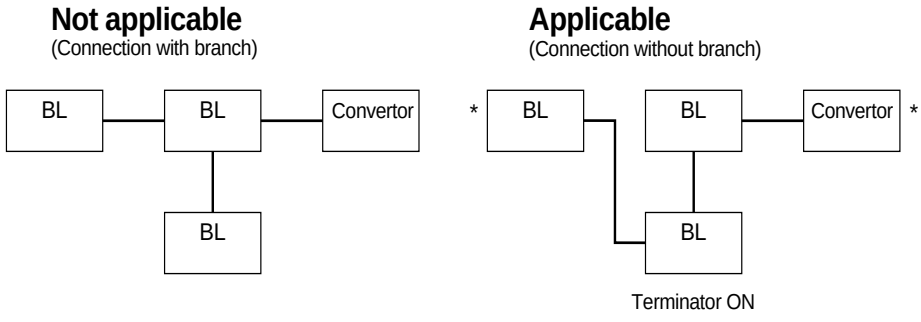



- Up to 31 BL-U1 (BL series) units can be connected in multidrop link.
- The extended cable length must be within 1.2 km.
- Connect the BL-U1 (BL series) to a PC using a commercially available RS-485/RS-232C convertor.
- For units between the RS-485 (those marked with * in the above figure), turn ON the terminator.

  You can turn the BL-U1 terminator on and off using DIP switch 5. For the terminator of the RS-485/RS-232C convertor, see the instruction manual for the convertor.

**⚠ CAUTION**

- Do not connect the RS-485 cable through the terminal block.
- Do not connect the multidrop link cables together with the power cable.
- Avoid connection including branch of the BL-U1 and RS-485/RS-232C convertor as shown below.






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# 2 Installation

## 2.1 Precautions before use

**Operating environment**

The BL-U1 is a precision instrument. Be sure to install the unit in the proper operating environment, and avoid using the unit under any of the following conditions.

- Exposed to direct sunlight, or where the ambient temperature is below 0°C or above 50°C for the BL-U1.
- Where the relative humidity is below 35% or above 85%, or where the temperature changes drastically, causing condensation.
- Where corrosive gases, flammable gases, dust, salt, iron particles or oily smoke may be present.
- Where shock or vibration may occur to the BL unit.
- Where water, oil or chemicals may be spilled or splashed.
- Near any strong magnetic field.

**Installing the BL-U1**

When installing the BL-U1 at the site, consider the following points:

- Reserve sufficient ventilation space at the site.
- If the ambient temperature rises above 50°C during operation, be sure to install a ventilation fan or cooler.
- Avoid installing the BL-U1 near any high-voltage equipment.
- Keep the BL-U1 away from the power cable.



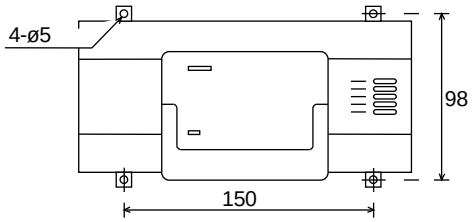
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## 2.2 Installing the BL-U1

There are two methods for installing the BL-U1:

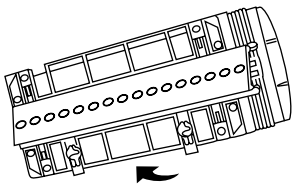
**When installing the BL-U1 directly**

Pull out the four screw slots on the rear panel and screw them to the base.




**When installing the BL-U1 to the DIN rail**

1. Hook the BL-U1 to the DIN rail groove from its top. Push the BL-U1 bottom against the DIN rail until you hear a click.



2. Check that the DIN rail mounting notch is shaped like notch A below. If not, push the BL-U1 further.

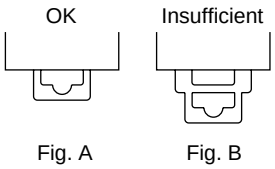



Fig. A Fig. B

3. To remove the BL-U1 from the DIN rail, pull out the notch until its shape turns from Fig. B to Fig. A. Then, disengage the BL-U1 from the DIN rail.
4. When you want to re-install the BL-U1 to the DIN rail, return the notch from that of Fig. A to Fig. B.



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# 3 Outline of Multidrop Link

## 3.1 Multidrop Link

The multidrop link is a communication method to control several BL series readers simultaneously with one host computer as shown in the system configuration on page 81.
Using the RS-485 cable as the communication path, the multidrop link offers high noise immunity and enables long-distance transmission. The multidrop link allows easy wiring using twisted-pair cables (2-wire).

## 3.2 System Configuration

To use the multidrop link, a BL series reader plus the following equipment is required.

**BL-U1**

To use the multidrop link, be sure to use this power supply unit.

**RS-485/RS-232C converter**

To connect a BL series reader to the host computer, the RS-485 signal must be converted into an RS-232C signal.

**Host computer**

Use a personal computer with an RS-232C interface.

When several BL readers are reading several bar codes, the amount of data to be processed may exceed the host computer's capacity.

To prevent this, reduce the number of the BLs connected to the host computer, or replace the host computer with another one which provides higher data throughput (including processing of the programming language).

**2-wire twisted-pair cable for the RS-485 interface.**

Prepare the specified cable (see page 88).

**RS-232 cable**

Cable used to connect the host computer to the RS-485/RS-232C converter.
Use a cable whose pin assignment conforms to those of the RS-232C connector of the host computer and the RS-485/RS-232C converter.



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# 4 Setup and Connection Procedures

1. BL series setup
   Using the Setup software, set the BL series as described below:
   - Set the multidrop link to “Enable”.
   - Assign ID number 1 to 31 to the connected BL series. Do not assign the same ID number to different BL series.
   - Set the baud rate, data length, parity and stop bit length.
2. RS-485/RS-232C converter setup
   Referring to the instruction manual of your RS-485/RS-232C converter, set the following parameters.

**Example**

| | |
|---|---|
| Baud rate: | Conforms to the setting of the BL series. |
| Driver active: | AUTO |
| Terminater: | See p. 17. |
| DTE/DCE | selector switch: DTE |

3. PC setup
   Set the baud rate, data length, parity and stop bit length according to the BL series’ settings.
4. Connection between the BL series (BL-U1) and the RS-485/RS-232C converter.
   To connect the equipment, use the specified cable (see page 88).
5. Connection between the RS-485/RS-232C converter and the host computer
   Use a cable whose pin assignment conforms to those of the RS-232C connector of the host computer and the RS-485/RS-232C converter.

**Example** When the host computer is an IBM PC/AT compatible, use the KEYENCE OP-22149 cable (1.5 m).

6. Confirmation of operation
   Send a command to the BL series to confirm its operation.



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# 5 Communication

## 5.1 Outline of Communication types

You can perform all multidrop link communication by sending commands from the host computer to the BL series.

The communication of the multidrop link is classified into the following two types:

**Data communication**

For sending read data from the BL-series to the host computer. When data receive commands (polling commands) are sequentially sent to each BL series connected to the host computer, the read data is sent to the host computer.
The read data is stored in the BL series' transmission buffer, and the data stored in the transmission buffer is called using the polling command.

**Command communication**

Using serial communication commands allows direct control of the BL series or change/confirmation of the BL series' settings.

## 5.2 Communication Format

All multidrop link communication is in the following format.

| STX | mmm | nn | Data/Command/Response | cc | ETX |
|---|---|---|---|---|---|

1. mmm = No. of data byte
   No. of characters of data (1) to (4)

**Example** To send

| STX | mmm | 03 | SSET | cc | ETX |
|---|---|---|---|---|---|

mmm = 011.

2. nn = BL series' ID number (01 to 31)
3. Read data, Command and Response to command
   To perform data communication using the multidrop link, the following commands are provided.

| Name | Command | Response | | | Description |
|---|---|---|---|---|---|
| Polling command | P | Data is stored. | No data | Buffer is full. | Command to ask whether the BL series' transmission buffer contains any data. |
| | | Data | e | OVER | |
| Data clear command | C | Data clear is complete | | Data has already been cleared. | This command clears one piece of the sent data, and completes a series of data communication. |
| | | OK | | NG | |

4. cc= Checksum (00 to FF)
   Calculate each bit of data (1) to (3) based on exclusive OR logic, and convert the result into a hexadecimal number.
   Used to check data transmission error during communication.



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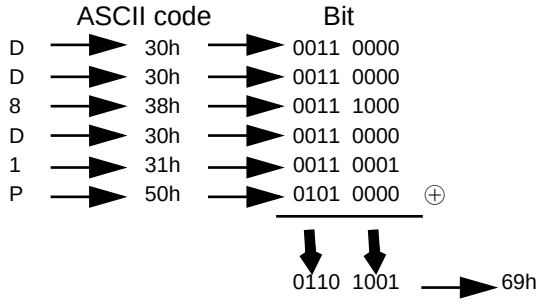
## Checksum Calculation Method

Calculate the checksum (cc) for

| [STX] | 008 | 01 | P | cc | [EXT]. |
|---|---|---|---|---|---|

Convert each character to its equivalent ASCII code as shown below, and represent it as 8-bit binary number.

Calculate each bit based on exclusive OR logic.




With exclusive OR logic, data including an odd number of 1s will produce a result of 1, and data including an even number of 1s will result in 0.

The hexadecimal number calculated using the above logic is a checksum. Therefore, cc = 69.

### Examples

To send

| [STX] | 008 | 01 | C | cc | [ETX]. |
|---|---|---|---|---|---|

cc = 7A

To send

| [STX] | 013 | 11 | ABC876 | cc | [ETX]. |
|---|---|---|---|---|---|

cc = 4B

To send

| [STX] | 010 | 31 | LON | cc | [ETX]. |
|---|---|---|---|---|---|

cc = 7E.

### Point

**Exclusive OR calculation formula**

Calculate each bit using the following formula.

0 ⊕ 0 =0
0 ⊕ 1 =1
1 ⊕ 0 =1
1 ⊕ 1 =0

⊕ Exclusive OR operator

**Conversion form hexadecimal number into binary number**

Convert ASCII codes into binary numbers referring to the following table.

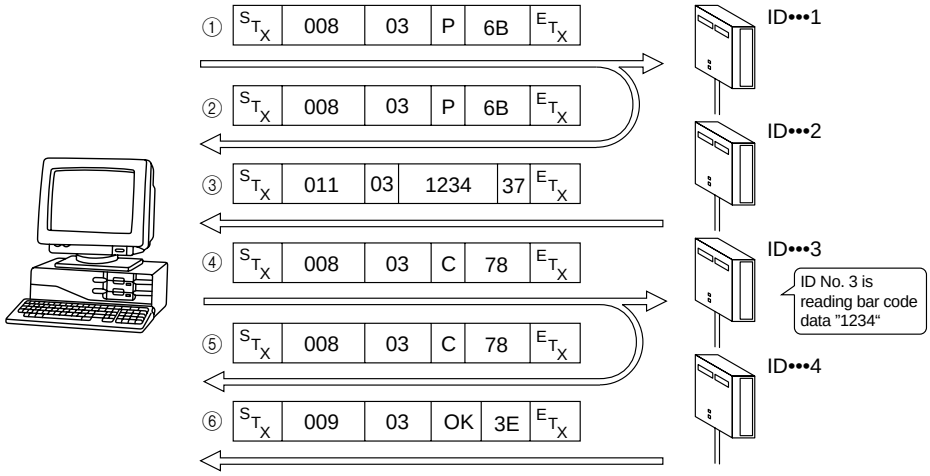
| Hexadecimal | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| Binary | 0000 | 0001 | 0010 | 0011 | 0100 | 0101 | 0110 | 0111 |
| Hexadecimal | 8 | 9 | A | B | C | D | E | F |
| Binary | 1000 | 1001 | 1010 | 1011 | 1100 | 1101 | 1110 | 1111 |



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## 5.3 Details on Data Communication

### Communication Procedure




1. Send a polling command (P) to the BL series whose data you wish to receive.

| [STX] | mmm | nn | P | cc | [ETX] |
|---|---|---|---|---|---|

mmm=008

2. The RS-485 uses a 2-wire cable which sends data and receives data along the same wire. Therefore, the command sent from the host computer loops back to the host computer.

   In this example, immediately after the above command is sent to the BL series, the following data loops back to the host computer.

| [STX] | mmm | nn | P | cc | [ETX] |
|---|---|---|---|---|---|

mmm=008

To detect data conflict, compare the command sent from the host computer with the loopback data.

However, data collision will not occur if you follow the procedure described here. Normally, you need not compare the command sent from the host computer with the loopback data.

3. When the BL series' transmission buffer contains any data, the BL series sends back the read data, and waits for the clear command (C).

| [STX] | mmm | nn | Read Data | cc | [ETX] |
|---|---|---|---|---|---|

When the BL series' transmission buffer contains no data, the BL series sends back the following response (e: empty), and does not wait for the clear command.

| [STX] | mmm | nn | e | cc | [ETX] |
|---|---|---|---|---|---|

When the BL series' transmission buffer is full, the BL series sends back the following response (OVER), clears all data stored in the transmission buffer, and waits for the clear command.

| [STX] | mmm | nn | OVER | cc | [ETX] |
|---|---|---|---|---|---|



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4. After sending data, the BL series waits for the clear command (C).
   When the clear command is sent to the BL series, the BL series clears one piece of data received with the polling command.

| [STX] | mmm | nn | C | cc | [ETX] |
|---|---|---|---|---|---|

   When the polling command is sent to the BL series again while the BL series is waiting for the clear command, the BL series sends back the same data again, and waits for the clear command.

| [STX] | mmm | nn | P | cc | [ETX] |
|---|---|---|---|---|---|

5. The same data sent in step 4 loops back to the host computer.

| [STX] | mmm | nn | C | cc | [ETX] |
|---|---|---|---|---|---|

6. The BL series sends back OK in response to the clear command.

| [STX] | mmm | nn | OK | cc | [ETX] |
|---|---|---|---|---|---|

   If the clear command is sent to the BL series when the BL series is not waiting for the clear command (one piece of data has already been cleared), the BL series sends back NG.

| [STX] | mmm | nn | NG | cc | [ETX] |
|---|---|---|---|---|---|

**⚠ CAUTION**

If an incorrect ID number is specified, an incorrect format is used to send a command, or a data transmission error occurs (checksum is incorrect), the BL series sends back no response. You will need to design a program so that the same command is sent again (Retry) if the BL series sends back no response within a specified period (Timeout).

If the amount of stored data exceeds the capacity of the transmission buffer, the BL series stops the read operation. To re-start the read operation, turn on the timing input again, or send the trigger ON command to the BL series again.

If you retry the clear command when the response data has been improperly transmitted (when the checksum is incorrect), the BL series may send back NG in response to the retried command since the clear command previously sent has already cleared one piece of data.You will need to design a program so that both OK and NG are regarded as acceptable responses to the clear command.

When using CODE128, do not include the control code (e.g. <STX>, <ETX>).

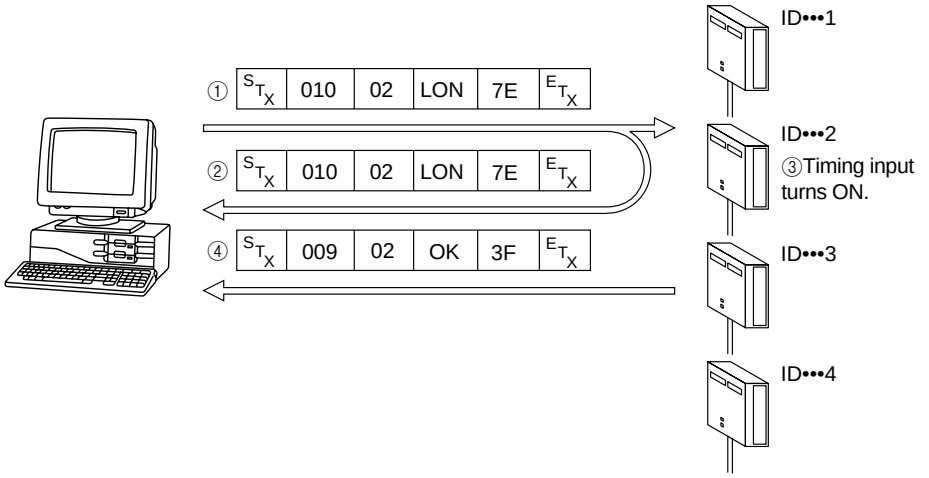


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## 5.4 Details of Command Communication

All RS-232C and RS-422A serial communication commands can be used.

### Communication Procedure




1. Send a command from the host computer to the BL series you wish to operate.

| [STX] | mmm | nn | Command | cc | [ETX] |
|---|---|---|---|---|---|

2. Data, including the same command, loops back to the host computer.

| [STX] | mmm | nn | Command | cc | [ETX] |
|---|---|---|---|---|---|

3. The specified BL series receives the command and performs the required operation.
4. The BL series sends back the following data in response to the command.

| [STX] | mmm | nn | Response | cc | [ETX] |
|---|---|---|---|---|---|

Response to the direct control command or the setting change command: OK

Response to the setting confirmation command: Current settings

If an error occurs with the specified command, the BL series sends back the following response.

| [STX] | mmm | nn | ERR** | cc | [ETX] |
|---|---|---|---|---|---|

** indicates an error code (see p. 70).

If incorrect characters are specified for the data communication commands (P, C), the BL series sends back ERR**.



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**Example:** When the command to shift to the setting mode (SSET) is sent to the BL series of ID No. 3:

1. From the host computer:

| | | | | | |
|---|---|---|---|---|---|
| [STX] | 011 | 03 | SSET | 22 | [ETX] |

2. Loopback data:

| | | | | | |
|---|---|---|---|---|---|
| [STX] | 011 | 03 | SSET | 22 | [ETX] |

3. From the BL series:

| | | | | | |
|---|---|---|---|---|---|
| [STX] | 009 | 03 | OK | 3E | [ETX] |

**CAUTION**

If an incorrect ID number is specified, an incorrect format is used to send a command, or a data transmission error occurs (checksum is incorrect), the BL series sends back no response. You will need to design a program so that the same command is sent again (Retry) if the BL series sends back no response within a specified period (Timeout).

With RS-232C or RS-422A communication, the BL series sends back no data in response to some of the direct control commands (e.g. LOG<CR>). With the multidrop link, however, the BL series sends back the following data in response to those commands.

During normal processing: OK

When error occurs: ERR**

** indicates an error code (see p. 70).



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# 6 Precautions for Programming

- Since the multidrop link requires communication of many commands, the host computer must have high processing ability.

  As the number of connected BL series increases, the host computer needs higher data processing speed.

  When the host computer's processing speed is insufficient, the BL series' transmission buffer will become full, and the BL series will send back the following response.

| | | | | | |
|---|---|---|---|---|---|
| [STX] | 011 | 03 | OVER | 22 | [ETX] |

  The BL series clears all data stored in the transmission buffer.

  To prevent this, replace the host computer with a higher performance unit (including processing of the programming language), or reduce the number of the BL series connected to the host computer.

- If an incorrect ID number is specified, an incorrect format is used to send a command, or a data transmission error occurs (checksum is incorrect), the BL series sends back no response. You will need to design a program so that the same command is sent again (Retry) if the BL series sends back no response within a specified period (Timeout).



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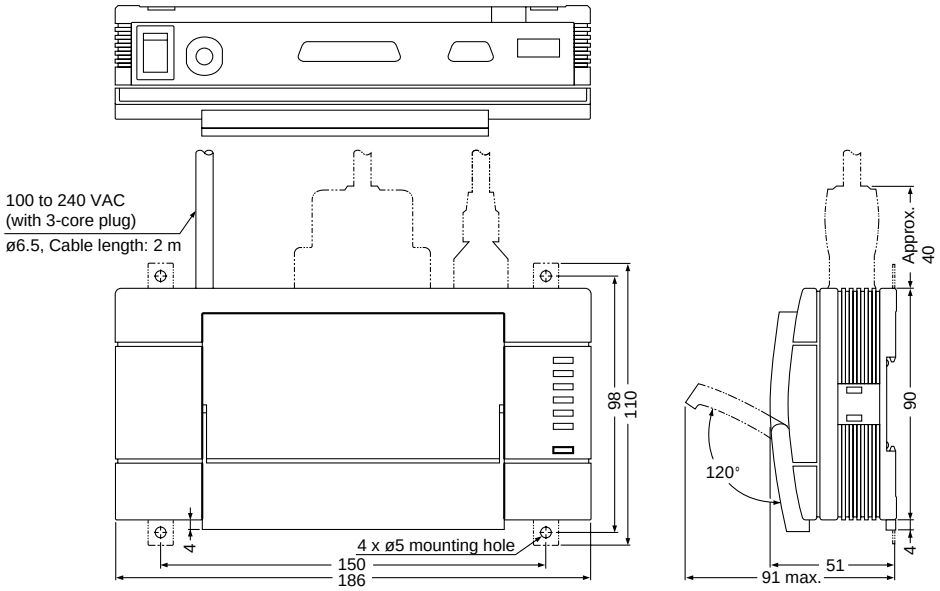
# 7 BL-U1 Specifications

| Model | | BL-U1 |
|---|---|---|
| Power supply for bar code reader | | 5 VDC±5% (1.5 A) |
| Power supply for sensor | | 12 V ±10% (300 mA) |
| Trigger input | Input rating | 8.5 to 30 VDC, 10 mA max. |
| | Max. OFF current | 1.0 mA |
| OK/NG output | Output type | NPN open-collector |
| | Rated load | 30 VDC, 100 mA |
| | Leakage current (at OFF) | 0.1 mA max. |
| | Residual voltage (at ON) | 1 V max. |
| Interface | | RS-232C, RS-422A, RS-485 multidrop<br>(Up to 31 units can be connected.<br>Max. cable extension: 1.2 km) |
| Environment | Ambient temperature | 0 to 50°C (32 to 122°F), No freezing |
| | Relative humidity | 35 to 85%, No condensation |
| | Ambient atmosphere | No dust, no corrosive gas |
| | Vibration | 10 to 55 Hz, 1.5 mm double amplitude in X, Y and Z directions, two hours respectively |
| | Noise immunity | 1000 V p-p, 1 µs (Power line) |
| | Insulation resistance | At least 100 MΩ across earth ground and AC power supply terminals (by 500 VDC Megger) |
| | Insulation withstand voltage | 1500 VAC across earth ground and AC power supply terminals, for 1 minute |
| Rating | Power supply voltage | 100 to 240 VAC (50/60 Hz) |
| | Current consumption | 40 VA (100 VAC), 50 VA (240 VAC) |
| Weight | | Approx. 615 g (including cable) |



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## BL-U1



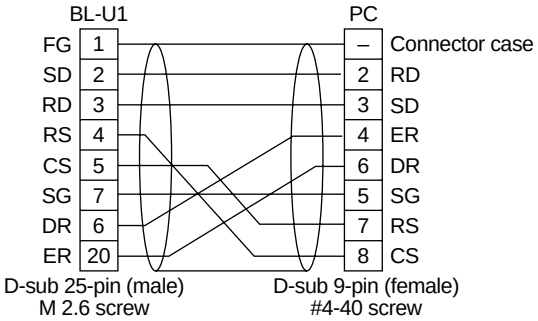



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## When using the BL-U1

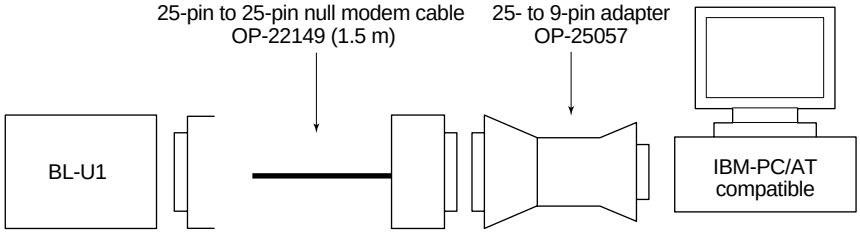
For a PC with a 9-pin D-sub RS-232C connector

If the RS-232C interface of your personal computer uses a D-sub 9-pin connector, prepare a cable as described below.




Be sure to use a metal connector case for the 9-pin D-sub connector. Connect the connector case to the shield wire.

The BL-U1 can also be connected to a personal computer using a 25-pin to 9-pin adapter and a 25-pin to 25-pin null modem cable as described below. The optional OP-22149 null modem cable (1.5 m) is available from KEYENCE.






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