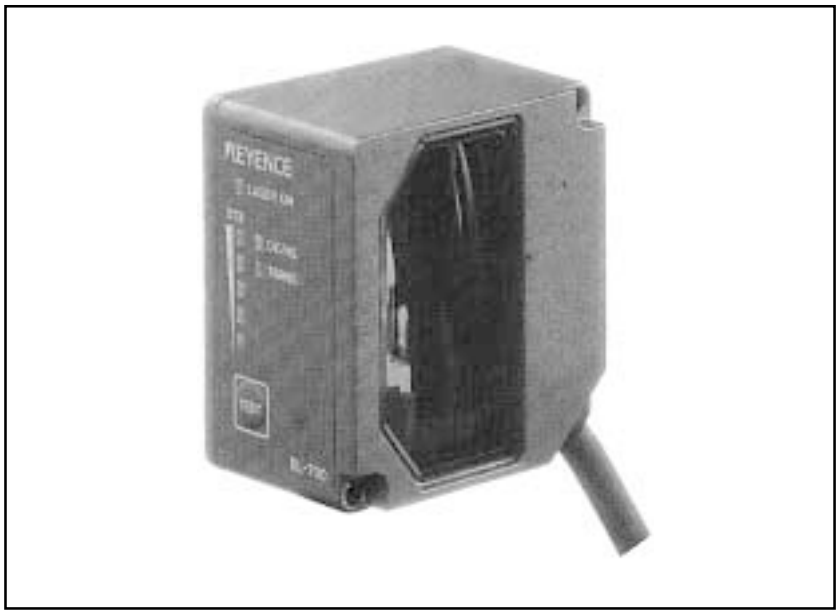
KEYENCE

96M0351

User's Manual

Laser Bar Code Reader

BL-700 Series



Safety Precautions

This instruction manual describes the operation and function of the BL-700. Read this manual carefully to ensure safe use and maximum performance from your BL-700. The BL-700 series uses a semiconductor laser as light source. Before using the product, see "Laser Safety Precautions" on page 1 to learn the safe and correct method of using the BL-700 series.

Symbols

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

WARNING Failure to follow instruction 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.

General Precautions

- At startup and during operation, be sure to monitor the functions and performance of the BL-700.
- We recommend that you take substantial safety measures to avoid any damage in the event a problem occurs.
- Do not open or modify the BL-700 or use it in any way other than described in the specifications.
- When the BL-700 is used in combination with other instruments, functions and performance may be degraded, depending on operating conditions and the surrounding environment.
- Do not use the BL-700 for the purpose of protecting the human body.

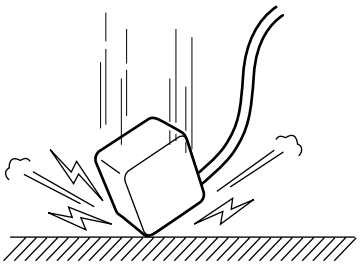
Warnings and Cautions Specific to the BL-700

⚠ CAUTION

- ***The BL-700 uses a 5 VDC power supply. Using a different voltage level may damage the unit.***
  When using the KEYENCE power supply unit BL-U1, BL-U2, N-42 or N-48, select the voltage level which can be supplied by the power supply unit. If a nonconforming power supply is connected, the BL-700 may be damaged.

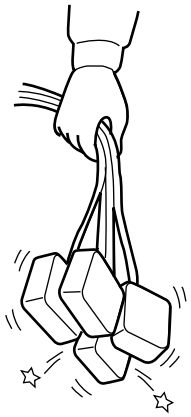
- ***The BL-700 is a precision instrument. If the unit is dropped or shocked, it may be damaged. Take due consideration when transporting or installing the unit.***

Incorrect



- ***Do not hold the cables when carrying the units. The units may hit each other and become damaged.***

Incorrect



- Before installing the BL-700, read “2.4 Installation” of this manual carefully to select a suitable installation site.

- You cannot perform any operation for 5 seconds after turning ON the BL-700. During this time, the motor rotation stabilizes. Wait for a while after turning ON the BL-700, then start reading or another operation.

- At shipment, the protective seals are affixed to the transmitter and receiver to avoid fingerprints when mounting the unit. Be sure to remove the seals before use.

- Do not allow water, oil or dust to adhere to the transmitter and receiver. Adhesion of these materials may cause a reading error. If the surface is contaminated, gently wipe it with a soft cloth moistened with alcohol.

Package Contents List

The package contains the following components. Be sure to check the package contents against the checklist before use.

■ **BL-700 package**

- BL-700 unit 1
- Mounting bracket 1
- Mounting screw 2
- Insulating spacer 4
- Washer 4
- Laser warning label (Japanese/English/German) ..... 1 set

■ **BL-U1 package**

- BL-U1 unit 1

■ **BL-U2 package**

- BL-U2 unit 1
- D-sub 9-pin connector, connector case 1
- Instruction manual 1

■ **N-42 package**

- N-42 unit 1
- Instruction manual 1

■ **Setup software, user's manual (BL-H1WE)**

- Setup software (3.5-inch, 1.44 MB) 1
- User's manual (this manual) 1

BL Series Lineup

■ Laser bar code reader

Model	Scanning method	Readable bar width	Reading distance
BL-700	Single	0.15 to 1.0 mm	160 to 370 mm
BL-701	Raster		(When narrow width is 0.5 mm)
BL-740	Single	0.25 to 2.0 mm	150 to 750 mm
BL-741	Raster		(When narrow width is 1.0 mm)
BL-780	Single	0.32 to 2.0 mm	200 to 1200 mm
BL-781	Raster		(When narrow width is 2.0 mm)

■ Power supply

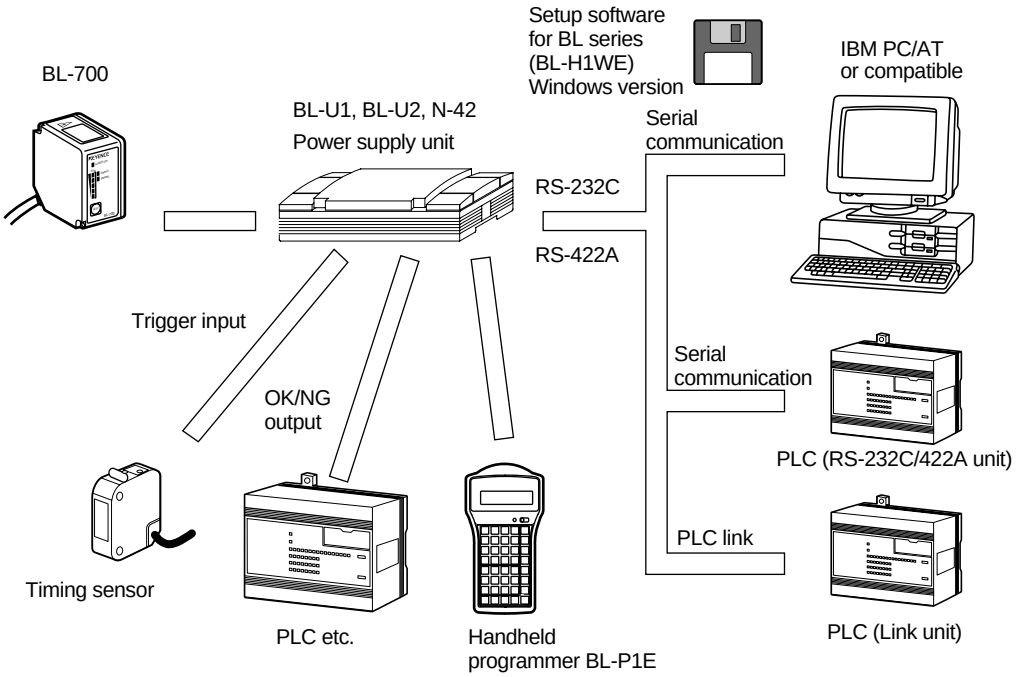
Model	Supply voltage	Interface
BL-U1	100 to 240 VAC	RS-232C, RS-422A, RS-485 multi-drop * Select one of these.
BL-U2	24 VDC	RS-232C
N-42	24 VDC	RS-422A
N-48	24 VDC	RS-485 multi-drop

■ Other options

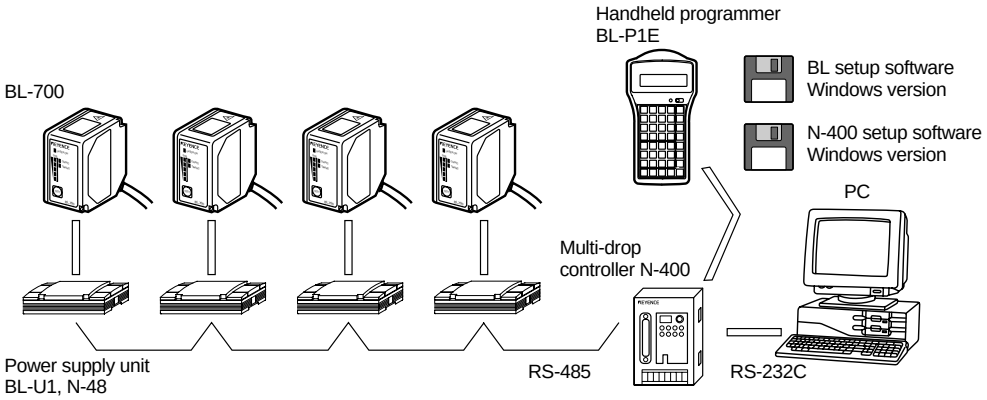
- N-400: Multi-drop controller
  Used as the master unit when multi-drop linking with the BL series.
- BL-P1E: Handheld programmer specially designed for the BL series.
  Used when changing the BL-series or N-400 settings.
- OP-22149 : D-sub 25-pin (male) — D-sub 25-pin (male) RS-232C cross cable
  Connects the BL-U1 to the PC (use with OP-25057).
- OP-25057 : D-sub 25-pin — D-sub 9-pin conversion connector
  Used in conjunction with OP-22149 when connecting the BL-U1 to the DOS PC.
- OP-27937: D-sub 9-pin — D-sub 9-pin RS-232C cross cable
  Connects the BL-U2 to the DOS PC.

System Configuration

■ **When using RS-232C or RS-422A**



* Use the BL setup software or the handheld programmer BL-P1E to set the BL series.



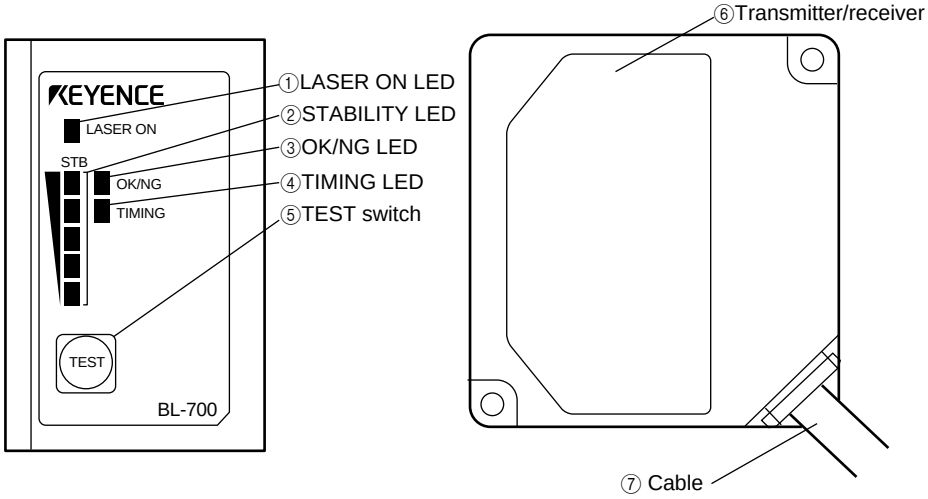
■ **When using the RS-485 multi-drop link**

* Use the N-400 setup software or handheld programmer BL-P1E to set the multi-drop controller N-400.

* For system configuration for the multi-drop link, see the “N-400 User’s Manual”. Also, for connection and operation of the multi-drop link controller, see the “N-400 User’s Manual”. The BL-700 User’s Manual does not cover these subjects.

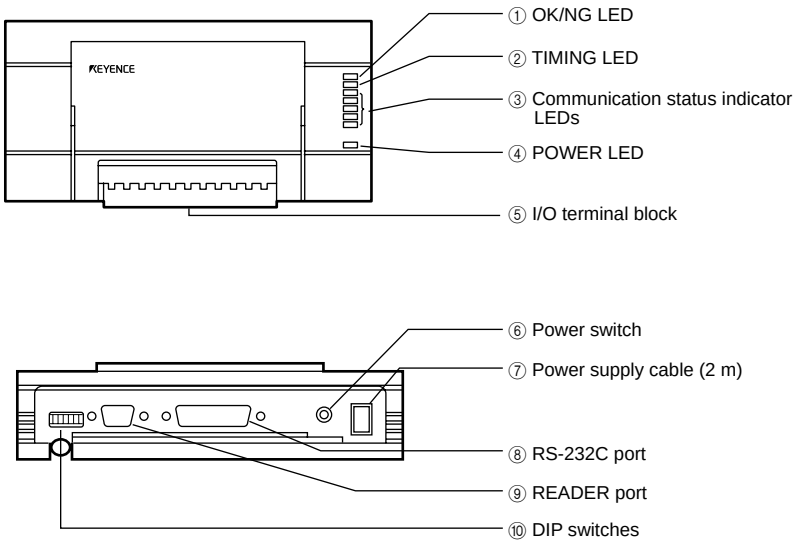
Parts and Functions

BL-700



No.	Name	Function
①	LASER ON LED	Lit when laser beams are emitted.
②	STABILITY LED	Displays the reading stability and the BL-700 operating status. ➪ *See P. 64 to P. 65*
③	OK/NG LED	• When OK output is ON: The green LED lights. • When NG output is ON: The red LED lights.
④	TIMING LED	Lit when trigger input is ON.
⑤	TEST SWITCH	This switch allows the following operations: • Start the test mode. • Pressing the switch once reads the bar code once. • Sets the communication protocol to the initial values when sending the settings. ➪ *See P.75* • Reset the error status. ➪ *See P.45*
⑥	Transmitter/receiver	Window to emit laser beams and receive reflected lights.
⑦	Cable	Cable length is 1.8 m.

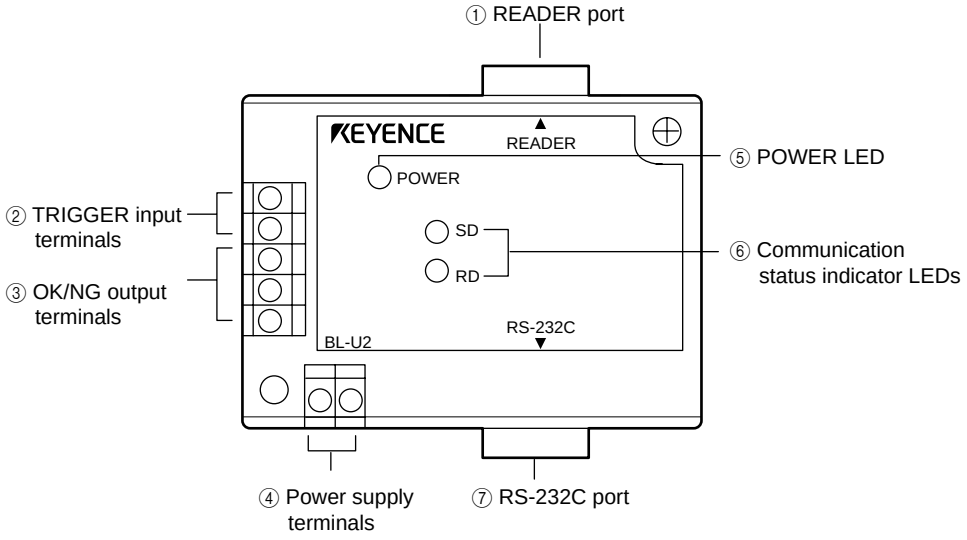
BL-U1



No.	Name	Function
①	OK/NG LED	• When OK output is ON: The green LED lights. • When NG output is ON: The red LED lights.
②	TIMING LED	Lit when trigger input is ON.
③	Communication status indicator LEDs	• Allows you to monitor the communication status of the RS-232C port. • The SD, RD, RS and CS indicators are provided in this order from the top.
④	POWER LED	Lit when power is ON.
⑤	I/O terminal block	Includes the trigger input terminal, OK/NG output terminals, RS-422A terminal and RS-485 terminal.
⑥	Power switch	Turns the power ON/OFF.
⑦	Power supply cable (2 m)	Use a 100 to 240 VAC (50/60 Hz) power supply.
⑧	RS-232C port	Connect a personal computer to this port. This port is unused in multi-drop link mode.
⑨	READER port	Connect the BL series to this port.
⑩	DIP switches	Switches the communication port, and turns the terminator ON/OFF.

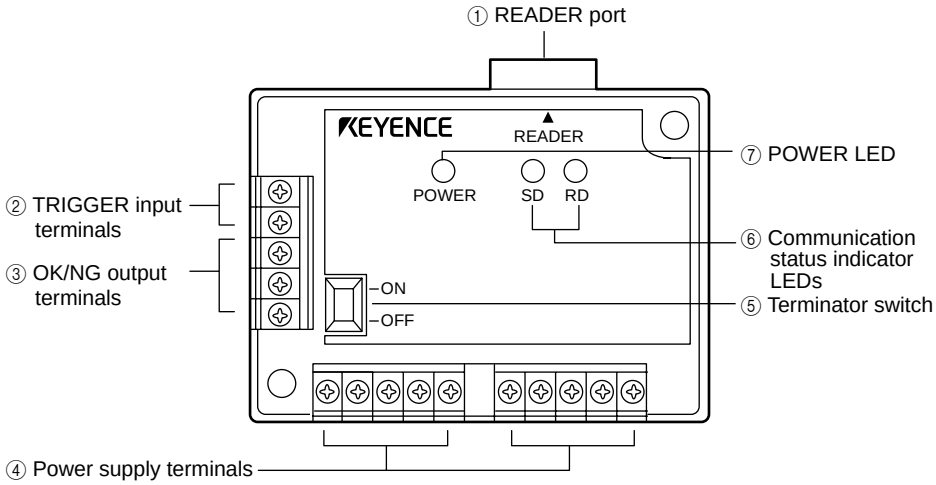
Note: This product does not comply with EC directives.

BL-U2



No.	Name	Function
①	READER port	Connects to a BL series bar code reader.
②	TRIGGER	Connect to a sensor for input terminals trigger input.
③	OK/NG output terminals	Output OK/NG signals.
④	Power supply terminals	Connect to a 24 VDC power supply.
⑤	POWER LED	Turns on when the power is on.
⑥	Communication status indicator LEDs	Indicate the communication status of the RS-232C.
⑦	RS-232C port	Connects to a personal computer, etc.

N-42



No.	Name	Function
①	READER port	Connects to a BL series or RS-232C equipment.
②	TRIGGER input terminals	Connect to a sensor for trigger input.
③	OK/NG output terminals	Output OK/NG signals.
④	Power supply/ interface terminal block	The 24 VDC power supply terminal and communication interface (RS-422A or RS-485) terminal are provided.
⑤	Terminator switch	Turns ON/OFF the terminator resistor: 100 Ω).
⑥	Communication status	Indicates the RS-422A or RS-485 communication status.
⑦	POWER LED	Lights when the power is turned ON

Using the Manual

Purpose	Reference page
Turn on the trigger timing or wire the RS-232C cable.	P.6 to 24
Mount the bar code reader.	P.25 to 29
Perform the simple read test.	P.40
Check the test mode reading rate or readout count on the PC screen.	P.81
Change the BL-700 settings using the setup software.	P.51 –
Change the BL-700 settings through the handheld programmer BL-P1E.	See the BL-P1E User's Manual.
Communicate with a PC.	P.105 –
Control the BL-700 with the PLC link.	P.121 –
Use the BL-700 with the multi-drop link.	See the N-400 User's Manual.
Troubleshooting	P.136
PLC link communication setup.	P.118

* This manual uses the expression "BL-700" for the BL-700/701/740/741/780/781 unless otherwise specified.

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Chapter 2 Connection and Installation

Chapter 3 Functions for Reading Operation

Chapter 4 Setup Software

Chapter 5 Serial Communication

Chapter 6 PLC Link

Appendices

Warranties

Chapter 1

Laser Safety Precautions

1.1 Classification

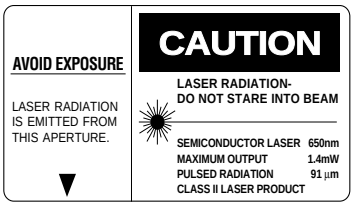
Model	BL-700/701	BL-740/741	BL-780/781
FDA	Class II		
IEC 825-1 11.1993	Class 2		
DIN EN 60825-1 07.1994	Klasse 2		

1.2 Warning Labels

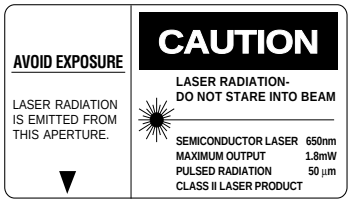
1) Warning labels

■ **FDA**

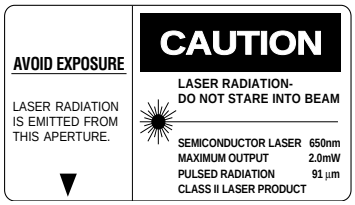
BL-700/701



BL-740/741

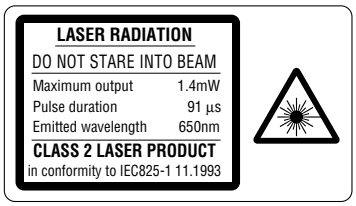


BL-780/781

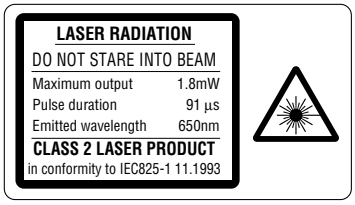


■ **IEC**

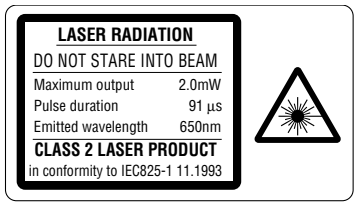
BL-700/701



BL-740/741

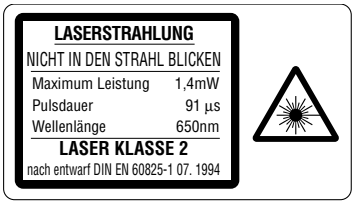


BL-780/781

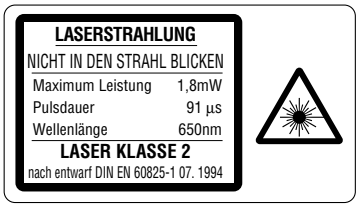


■ **DIN**

BL-700/701



BL-740/741



BL-780/781

2) Protective housing label

■ **FDA**

CAUTION— LASER RADIATION
WHEN OPEN.
DO NOT
STARE INTO BEAM.

■ **IEC**

CAUTION
Laser radiation when open. Do not stare into beam.

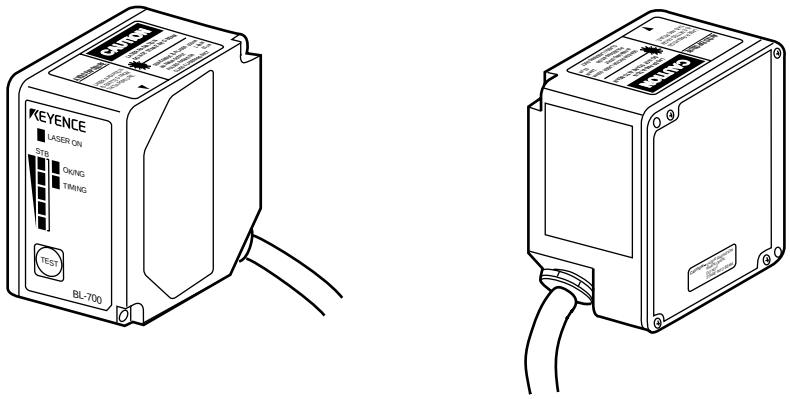
■ **DIN**

VORSICHT
Laserstrahlung wenn Abdeckung geöffnet. Nicht in den strahl blicken.

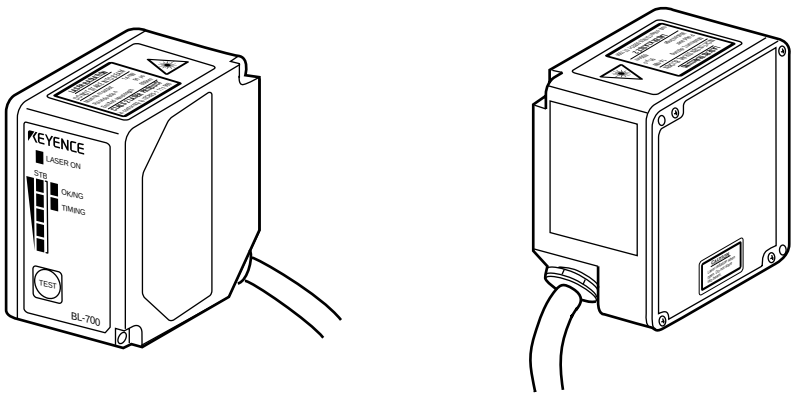
1.3 Labels Location

FDA Warning labels are attached to the sensor head as shown below.
The IEC/DIN Warning labels are packaged with the BL-700 Series. Affix the Warning labels on the sensor head as shown below.

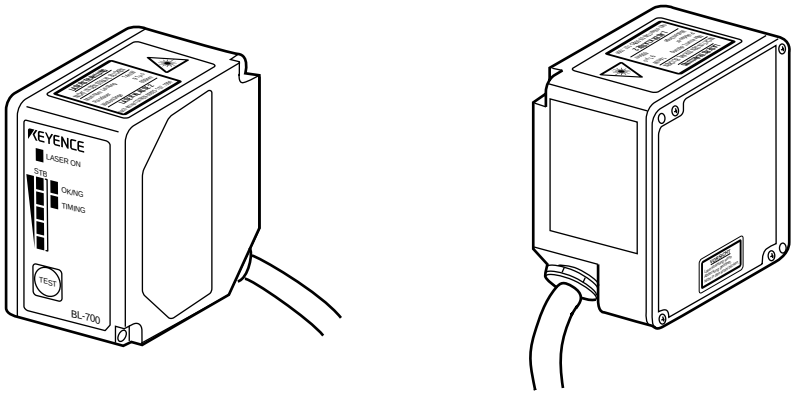
■ **FDA**



■ **IEC**



■ **DIN**



1.4 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.

Follow the safety precautions below to ensure operator safety:

- **Operate the BL-700 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-700 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-700 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-700 Series.

- **Stop laser emissions before cleaning the laser emission port.**
  Failure to stop the laser emission may expose eyes or skin to the laser beam.

- **Check 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-700 Series in such a way that the laser beam passes at eye height.

1.5 Safety Features Provided with the BL-700 Series

The BL-700 Series is provided with the following safety features. Make sure these features function correctly before operating.

- **Laser emission caution LED (LASER ON LED)**

During laser emission, the LASER ON LED illuminates. The LED ON status can be checked through the laser protective glasses.

- **Laser forced OFF command**

Sending the laser forced OFF command (LOCK, see P.92) to the BL-700 can inhibit emission of laser beams. When working near the laser transmitter, be sure to use the laser forced OFF command to avoid looking into the laser beams.

When this command is selected, the bottom STABILITY LED flashes.

Chapter 2

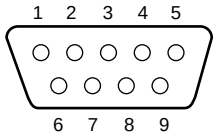
Connection and Installation

2.1 BL-700 Connections

This section describes connections when a KEYENCE power supply unit is not used.

2.1.1 Connector pin assignment

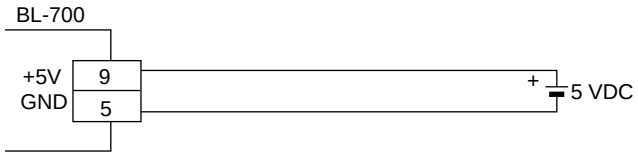
The BL-700 connector has the following pin assignment.



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

Pin No.	Cable color	Symbol	Description	Signal direction
Connector case	Shield	FG	Frame ground	—
1	Yellow	TIM	Trigger input	Input
2	Brown	RD (RXD)	Receives RS-232C data	Input
3	Purple	SD (TXD)	Sends RS-232C data	Output
4	White	OK	OK output	Output
5	Black	GND (SG)	Ground (common ground for respective signals)	—
6	Gray	NG	NG output	Output
7	Pink	RS (RTS)	Request to send RS-232C data (always ON)	Output
8	Blue	CS (CTS)	Enable to send data through RS-232C	Input
9	Red	+5 V	+5 V DC power supply	Input

2.1.2 Power supply connections



CAUTION

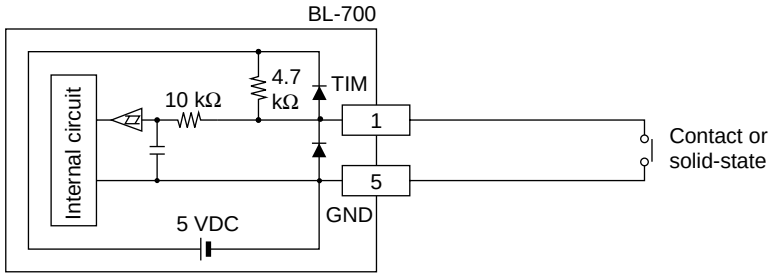
- ***Be sure to match the polarities of the power supply when soldering the connections. Reversing the polarities will damage the unit.***
- ***Make sure that the power supply provides a stable 5 VDC ± 5%. If the power supply does not function in the above range, it can damage the unit.***
- ***Do not extend the power cable. A long power cable can cause a voltage drop, preventing the BL-700 from starting properly.***

Note: If the power supply is UL rated, it must provide Class 2 output.

2.1.3 Wiring I/O

■ Trigger input

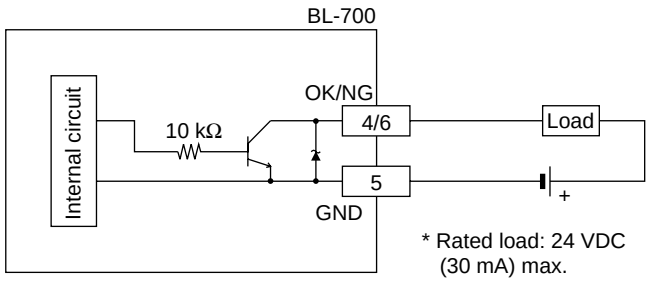
The trigger input is used to signal the BL-700 to start reading (start laser emission). The trigger input is a non-voltage input (TTL input is also available with negative logic).



■ OK/NG output

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

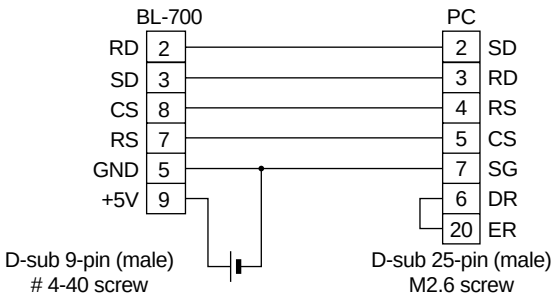
➪ *See P. 44*



2.1.4 RS-232C connection

Wire the RS-232C as indicated below when connecting the BL-700 to a PC.

■ Connecting the computer with 25-pin



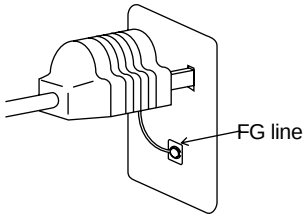
2.2 Connecting BL-U1 and Wiring

Note: This product does not comply with EC directives.

To use the BL-U1 AC power supply, connect it as described below.

2.2.1 Connecting the power supply

Plug the BL-U1 power cable into an outlet.



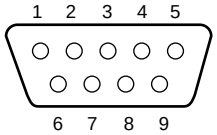
CAUTION

Use a power supply with 100 to 240 VAC ± 10% (50/60 Hz).

2.2.2 Connecting the BL-700

Connect the BL-700 to the READER port of the BL-U1.
The BL-U1 READER port pin assignment is as described below.

■ **BL-U1 READER port pin assignment**



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

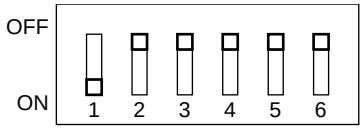
Pin No.	Symbol	Function	Signal direction
1	TIM	Trigger input	Output
2	RD (RXD)	Receives RS-232C data.	Output
3	SD (TXD)	Sends RS-232C data.	Input
4	OK	OK	Input
5	GND (SG)	Ground (Common ground for respective signal)	—
6	NG	NG	Input
7	RS (RTS)	Ready to send RS-232C data.	Input
8	CS (CTS)	Request to send RS-232C data. (Control method can be selected with the DIP switches.) ☞ *See p. 9.*	Output
9	+5 V	+5 V power supply	Output

Note: Do not extend a power cable. A long power cable can cause a voltage drop, preventing the BL-700 from starting properly.

Note: This product does not comply with EC directives.

2.2.3 Setting BL-U1 DIP switches

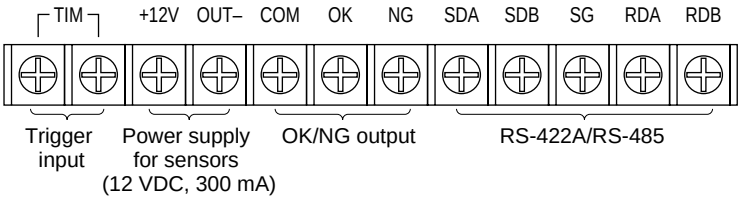
Change the DIP switch settings depending on the selected interface and trigger input method.



* The figure on the left shows the default settings.

DIP Switch No.		1	2	3	4	5	6
Interface selection	RS-232C	ON	OFF	OFF			
	RS-422A	OFF	ON	OFF			
	RS-485 multidrop	OFF	OFF	ON			
RS-422A terminator	OFF				OFF		
(Termination resistance: 100 Ω)	ON				ON		
RS-485 terminator	OFF					OFF	
(Termination resistance: 100 Ω)	ON					ON	
Selection of READER port CS control method	ON or OFF according to the RS-232C port CS signal status.						OFF
	Normally ON						ON

2.2.4 Terminals of I/O terminal block and wiring



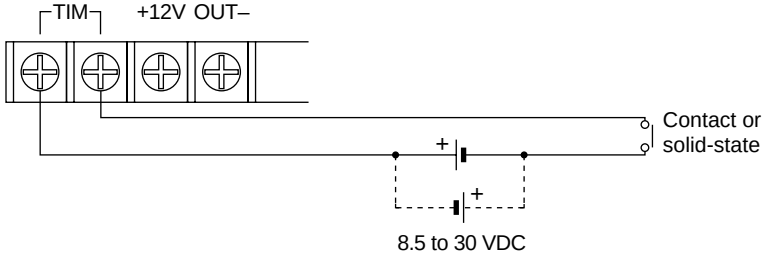
Symbol	Description	Signal direction
TIM	Trigger input	Input
		Input
+12 V OUT-	+ terminal of power supply for sensor (12 VDC, 300 mA)	Output
	– terminal of power supply for sensor (0 V)	Output
COM	Common terminal for OK/NG output	—
OK	OK output	Output
NG	NG output	Output
SDA	+ terminal for RS-422A data transmission/ RS-485 + terminal	Output, Input/Output
SDB	– terminal for RS-422A data transmission/ RS-485 - terminal	Output, Input/Output
SG	Signal ground	—
RDA	+ terminal for RS-422A data reception	Input
RDB	– terminal for RS-422A data reception	Input

* Viewed from the left of the terminal block

- M3.0 screws are used for the terminal block.
- Use the following crimp terminals for connections.

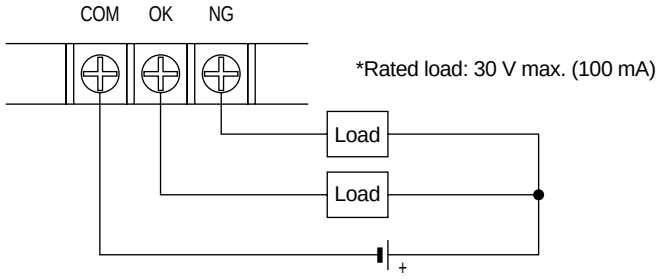
■ Connecting trigger input

The trigger input allows the BL-700 series to start reading bar codes (turn on the laser beam).
The trigger input is turned ON when 8.5 to 30 VDC input is activated between the trigger input terminals.
The BL-U1 power supply for the sensor can be used as the input power supply.



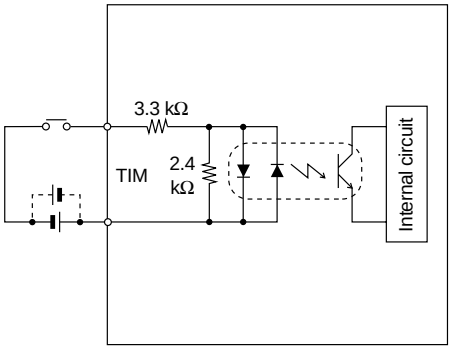
■ Connecting OK/NG output

The OK/NG output is used to differentiate between acceptable and unacceptable results based on the comparison with the preset data, and to indicate whether or not the BL-700 series successfully read bar codes. ☞ *See P.44.*
The OK/NG output is an open-collector output.

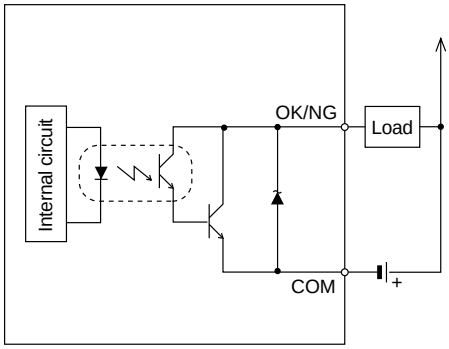


■ I/O circuit diagram

• Input circuit diagram

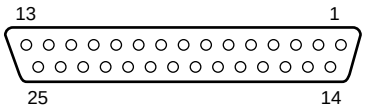


• Output circuit diagram



2.2.5 Connecting RS-232C

Pin assignment



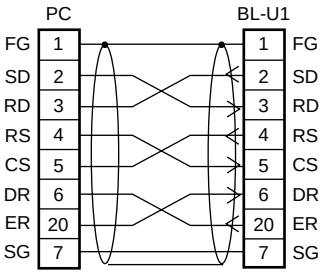
D-sub 25-pin (female)
DCE specification (defined as terminal)
M2.6 screw (female)

Pin No.	Symbol	Function	Signal direction
1	FG	Frame ground	—
2	SD (TXD)	Sends RS-232C data	Output
3	RD (RXD)	Receives RS-232C data	Input
4	RS (RTS)	Ready to send RS-232C data (always ON)	Output
5	CS (CTS)	Request to send RS-232C data	Input
6	DR (DSR)	Connected to pin No. 20 inside.	Input
7	GND (SG)	Signal ground	—
20	ER (DTR)	Connected to pin No. 6 inside.	Output

Wiring the RS-232C cable

■ Connecting a PC

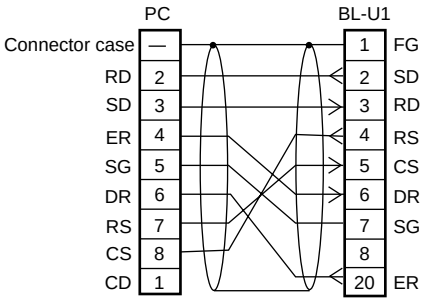
25-pin serial port



D-sub 25-pin (male) M2.6 screw — D-sub 25-pin (male) M2.6 screw

* KEYENCE option OP-22149 (1.5 m) or commercially available cross cable can be used.

9-pin serial port

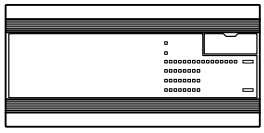


D-sub 9-pin (female) #4-40 screw — D-sub 25-pin (male) M2.6 screw

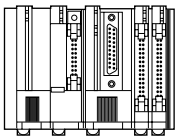
* KEYENCE option OP-22149 (1.5 m) and OP-25057 (conversion connector) can be used.

■ Connecting KV series/Handheld programmer port

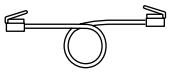
Use the optional cable manufactured by KEYENCE.



KV-10, 16, 24
KV-40, 80

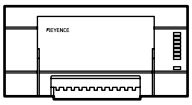


KV-300*



OP-96368 (2.5 m)

OP-96369

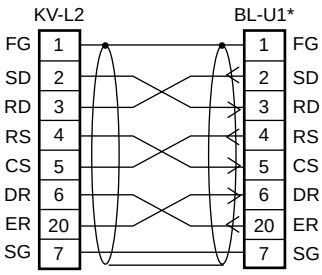


BL-U1*

Note: KV-300 and BL-U1 are not available in Europe.

■ Connecting KV-L2*

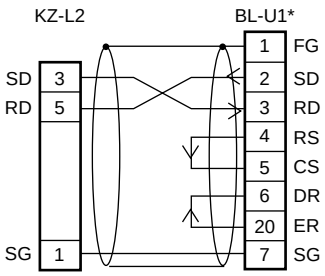
Port 1



D-sub 25-pin (male) M2.6 screw — D-sub 25-pin (male) M2.6 screw

* KEYENCE option OP-22149 (1.5 m) or commercially available cross cable can be used.

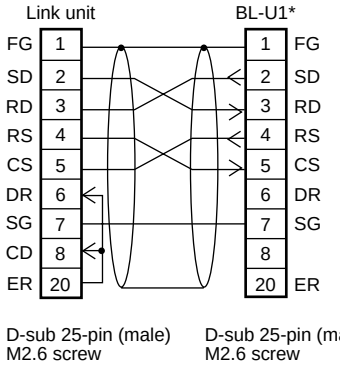
Port 2



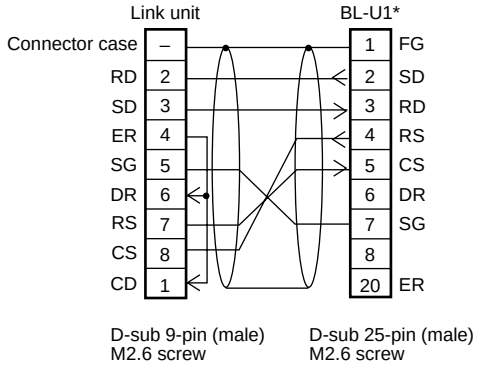
Terminal block — D-sub 25-pin (male) M2.6 screw

■ Connecting MELSEC-A series

Connection with AJ71C24,
AL71C24-S□,
A0J2-C214-S1,
AJ71UC24

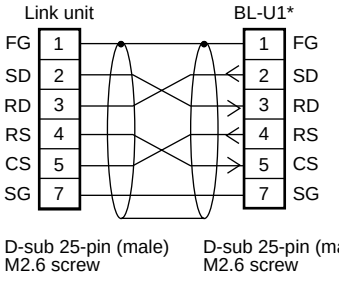


Connection with A1SJ71(U)C24-R2/PRF,
A2CCPUC24,
A2CCPUC24-PRF

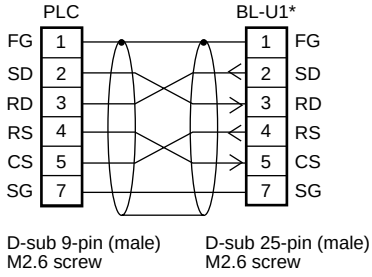


■ SYSMAC-C series

Connection with C-200H-LK201(-V1),
C-500-LK203,
C-500-LK201-V1,
C120-LK201-V1



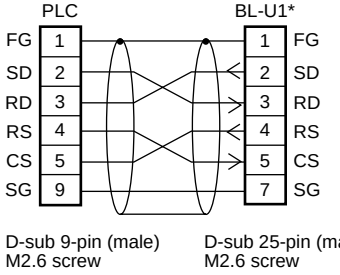
Connection with C-20H,
C-28H,
C-40H,
C-60H



* KEYENCE option OP-22149 (1.5 m) or commercially available cross cable can be used.

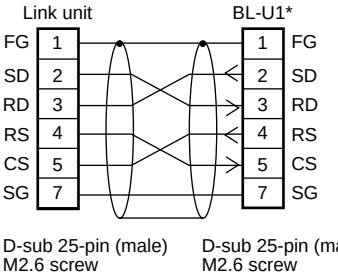
Note: KV-L2 and BL-U1 are not available in Europe.

Connection with C-200HS(CPU21/23/31/33),
CQM1(CPU21/41/42/43/44),
C-200HE(CPU42),
C200HG(CPU43/63),
C200HX(CPU44/64),
C200HW-COM02/COM04/COM05/COM06

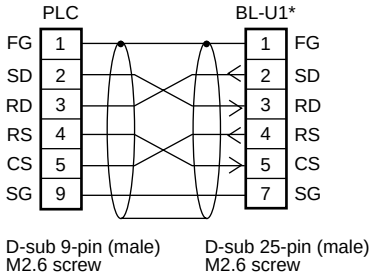


■ **SYSMAC-CV series**

Connection with CV500-LK201 (Port 1)



Connection with CV500-LK201 (Port 2), CV500, CV1000, CVM1



* KEYENCE option OP-22149 (1.5 m) or commercially available cross cable can be used.

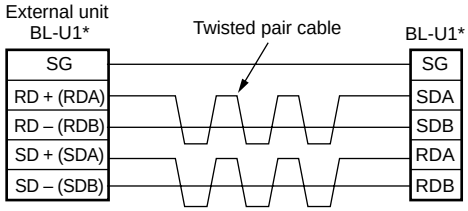
Note: BL-U1 is not available in Europe.

2.2.6 Wiring the RS-422A

Wire the RS-422A as indicated below.

■ **Connecting a general RS-422A unit**

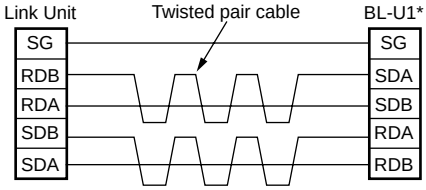
Use the same wiring when connecting the BL-U1 to the BL-U1*.



- Turn ON the terminators (BL-U1/external unit terminal resistance: 100 Ω).
  ➪ *See P.35.*
- The cable can be extended to within 1.2 km.

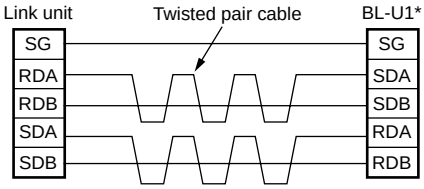
■ **Connecting KV-L2***

Connecting the unit to RS-422A port 2



■ Connecting the MELSEC-A series

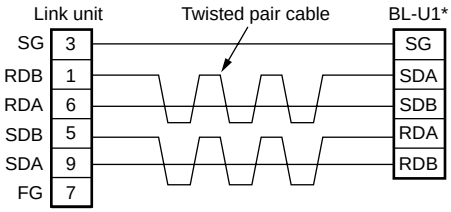
Connecting with AJ71C24,
AJ71C24-S□,
AJ71UC24,
A0J2-C214-S1,
A1SJ71(U)C24-R4



Note: BL-U1 and KV-L2 are not available in Europe.

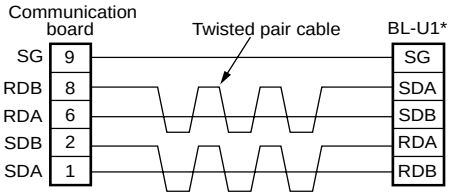
■ Connecting SYSMAC-C series

Connecting with C200H-LK202 (-V1),
C500-LK201-V1,
C500-LK203,
C120-LK202-V1



D-sub 9-pin (male)
M2.6 screw

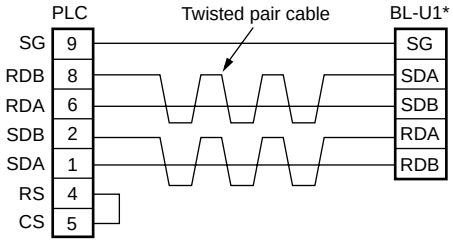
Connecting with C200HW-COM03/
COM06



D-sub 9-pin (male)
M2.6 screw

■ Connecting SYSMAC-CV series

Connecting with CV-500-LK201,
CV500,
CV1000,
CVM1



D-sub 9-pin (male)
M2.6 screw

Note: BL-U1 is not available in Europe.

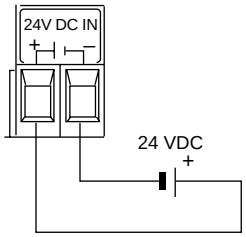
2.3 Wiring the KEYENCE Power Supply Unit BL-U2/N-42

To use the BL-U2/N-42, connect as indicated below.

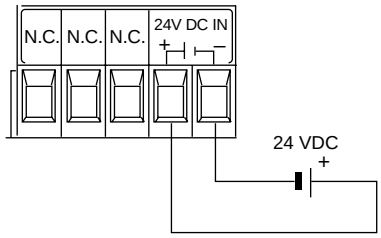
2.3.1 Connecting the power supply

Connect BL-U2/N-42 to a 24 VDC power supply.

BL-U2



N-42

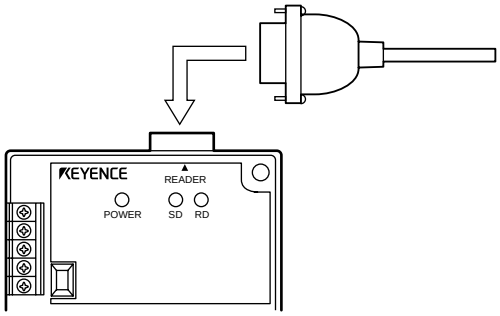


CAUTION ***Make sure that the power supply provides 24 VDC. If the power supply output is not 24 VDC, it can damage the unit.***

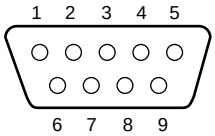
Note: If the power supply is UL rated, it must provide Class 2 output.

2.3.2 Connecting the BL-700 to BL-U2/N-42

Connect the BL-700 to the READER port of the BL-U2/N-42.



■ **READER port pin assignment**

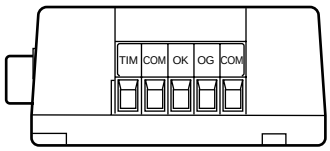


D-sub 9-pin (male)
DCE specification (defined as terminal)
#4-40 screw (female)

Pin No.	Symbol	Function	Signal direction
1	TIM	Trigger input	Output
2	RD (RXD)	Receives RS-232C data	Output
3	SD (TXD)	Sends RS-232C data	Input
4	OK	OK signal	Input
5	GND (SG)	Ground (Common ground for respective signal)	—
6	NG	NG signal	Input
7	RS (RTS)	Ready to send RS-232C data	Input
8	CS (CTS)	Request to send RS-232C data	Output
9	+5 V	5 V power supply output	Output

Note: Do not extend a power cable. A long power cable can cause a voltage drop, preventing the BL-700 from starting properly.

2.3.3 Terminals of I/O terminal block and connections

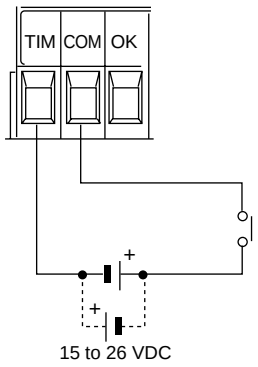


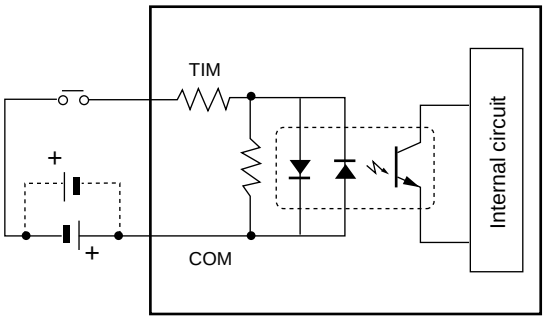
* Viewed from the left of the unit

Symbol	Description	Signal direction
TIM	Trigger input	Input
COM	Common terminal for trigger input	Input
OK	OK output	Output
NG	NG output	Output
COM	Common terminal for output	Output

■ Connecting trigger input

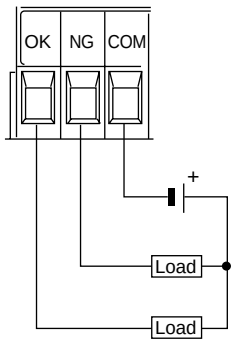
The trigger input allows the BL-700 to start reading bar codes (turn on the laser beam).
To turn ON the trigger input, supply 15 to 26 VDC between the trigger input terminals.

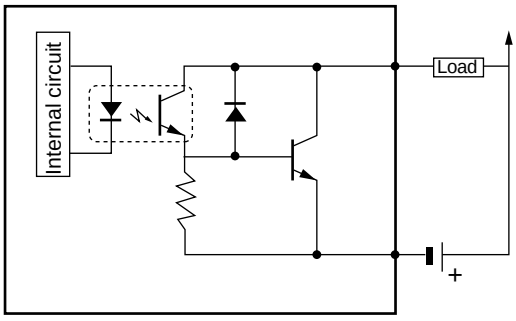




■ Connecting OK/NG output

The OK/NG output indicates the result of the comparison with preset data, or indicates whether reading is successful or not.

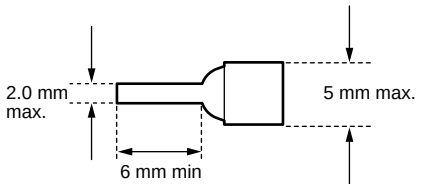




* Rated load: 30 V max. (100 mA)

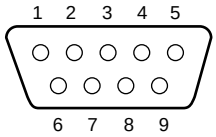
2.3.4 Terminal

A solderless contact pin, as shown below, is available for connection.



2.3.5 Connecting RS-232C (BL-U2)

Pin assignment



D-sub 9-pin (male)
DTE specification (defined as terminal)
#4-40 screw

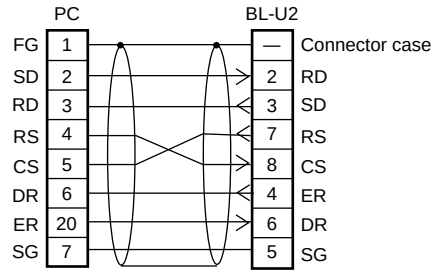
Pin No.	Symbol	Description	Signal direction
2	RD (RXD)	Receive data	Input
3	SD (TXD)	Send data	Output
4	ER (DTR)	Connected to pin No.6 inside.	Output
5	SG	Signal ground	—
6	DR (DSR)	Connected to pin No.4 inside.	Input
7	RS (RTS)	Request to send data (always ON)	Output
8	CS (CTS)	Enable to send data	Input

* One connector is provided.

Wiring the RS-232C cable

■ **Connecting a PC**

25-pin serial port

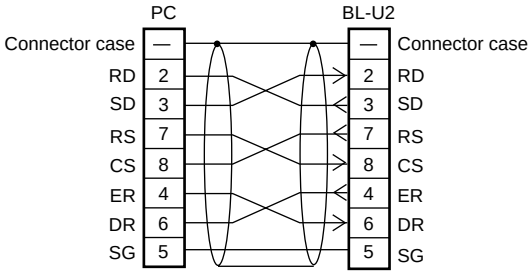


D-sub 25-pin (male)
M2.6 screw

D-sub 9-pin (female)
#4-40 screw

* KEYENCE option OP-22149 (1.5 m) or OP-25057 (conversion connector) can be used.

9-pin serial port



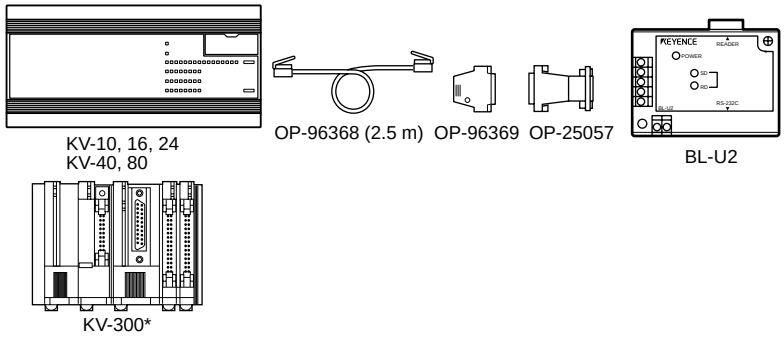
D-sub 9-pin (female)
#4-40 screw

D-sub 9-pin (female)
#4-40 screw

* KEYENCE option cable OP-27937 (1.5 m) can be used.

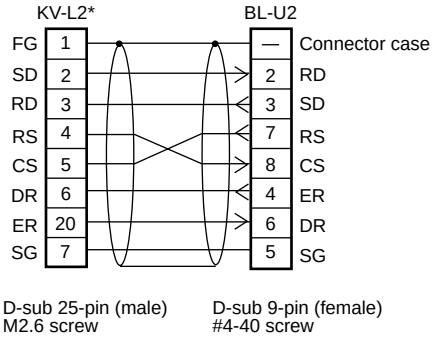
■ Connecting KV series/Handheld programmer port

Use the optional cable manufactured by KEYENCE.

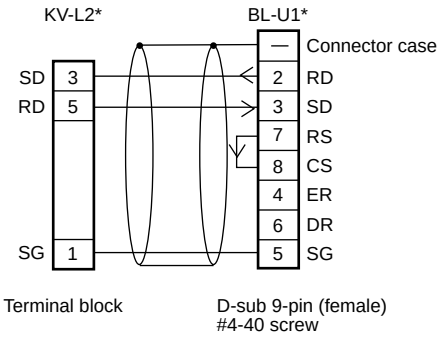


■ Connecting KV-L2*

Port 1



Port 2

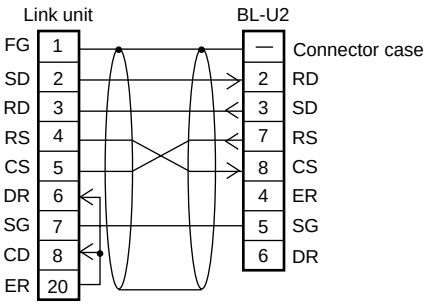


* KEYENCE option OP-22149 (1.5 m) or the OP-25057 (conversion connector) can be used.

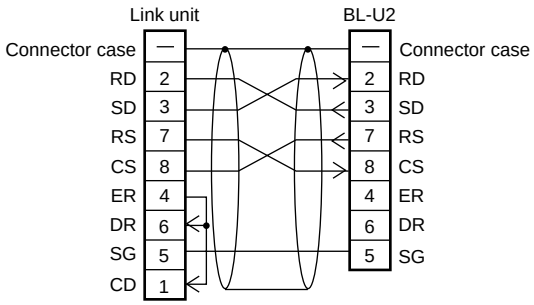
Note: KV-300, KV-L2 and BL-U1 are not available in Europe.

■ Connecting MELSEC-A series

Connection with AJ71C24,
AL71C24-S□,
A0J2-C214S1,
AJ71UC24



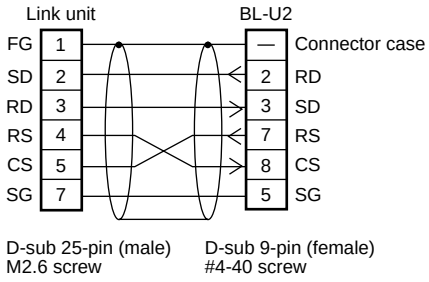
Connection with A1SJ71(U)C24-R2/PRF,
A2CCPUC24,
A2CCPUC24-PRF



2

■ SYSMAC-C series

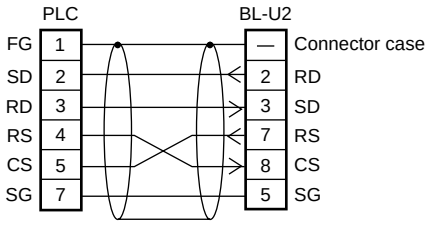
Connection with C-200H-LK201(-V1),
C-500-LK203,
C-500-LK201-V1,
C120-LK201-V1



D-sub 25-pin (male)
M2.6 screw

D-sub 9-pin (female)
#4-40 screw

Connection with C-20H,
C-28H,
C-40H,
C-60H



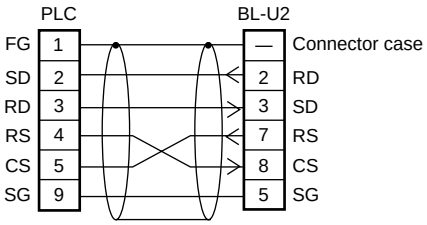
D-sub 9-pin (male)
M2.6 screw

D-sub 9-pin (female)
#4-40 screw

* KEYENCE option OP-22149 (1.5 m) or the OP-25057 (conversion connector) can be used.

■ SYSMAC-C series

Connection with C-200HS(CPU21/23/31/33),
CQM1(CPU21/41/42/43/44),
C-200HE(CPU42),
C200HG(CPU43/63),
C200HX(CPU44/64),
C200HW-COM02/COM04/COM05/COM06

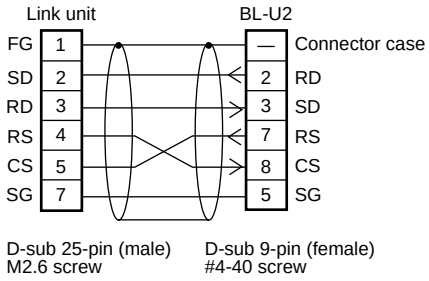


D-sub 9-pin (male)
M2.6 screw

D-sub 9-pin (female)
#4-40 screw

■ SYSMAC-CV series

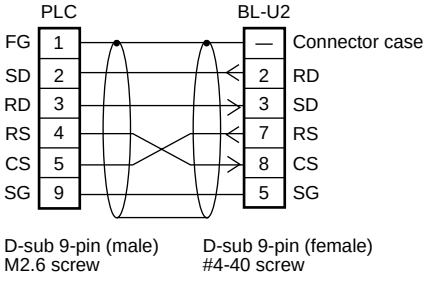
Connection with CV500-LK201
(Port 1)



D-sub 25-pin (male)
M2.6 screw

D-sub 9-pin (female)
#4-40 screw

Connection with CV500-LK201
(Port 2),
CV500,
CV1000,
CVM1



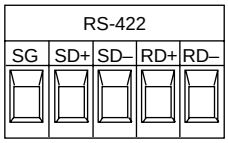
D-sub 9-pin (male)
M2.6 screw

D-sub 9-pin (female)
#4-40 screw

* KEYENCE option OP-22149 (1.5 m) or the OP-25057 (conversion connector) can be used.

2.3.6 Connecting the N-42 to RS-422A

RS-422 terminal block assignment

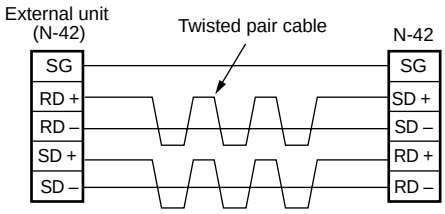


Code	Description	Signal direction
SG	Ground	—
SD+	Sends data to + terminal.	Output
SD-	Sends data to - terminal.	Output
RD+	Receives data from + terminal.	Input
RD-	Receives data from - terminal.	Input

Connecting external equipment

■ Connecting N-42 to external unit

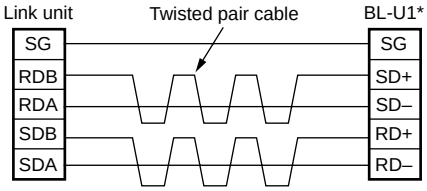
Use the same wiring when connecting the N-42 to the N-42.



- Turn ON the terminators (BL-U1/external unit terminal resistance: 100 Ω).
  ➪ *See P. viii.*
- The cable can be extended to within 1.2 km.

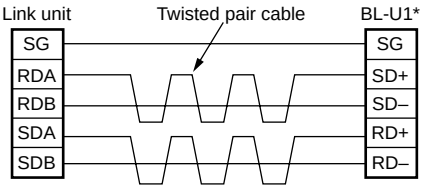
■ Connecting KV-L2*

Connecting the unit to RS-422A port 2



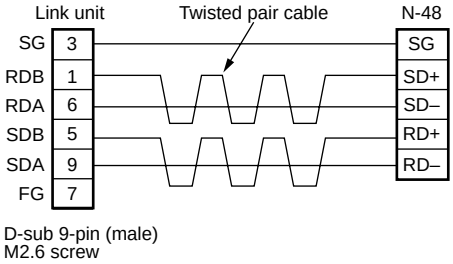
■ Connecting the MELSEC-A series

Connecting with AJ71C24,
AJ71C24-S□,
AJ71UC24,
A0J2-C214-S1,
A1SJ71(U)C24-R4

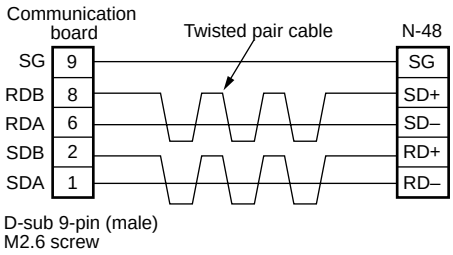


■ Connecting SYSMAC-C series

Connecting with C200H-LK202 (-V1),
C500-LK201-V1,
C500-LK203,
C120-LK202-V1

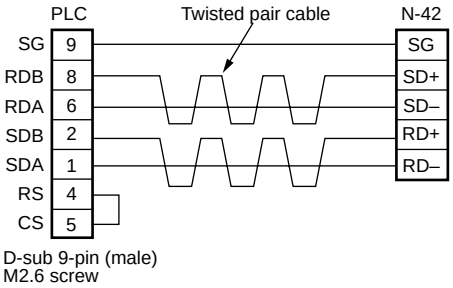


Connecting with C200HW-COM03/
COM06



■ Connecting SYSMAC-CV series

Connecting with CV-500-LK201,
CV500,
CV1000,
CVM1



Note: BL-U1 and KV-L2 are not available in Europe.

2.4 Installation

2.4.1 Operating environment precautions

Ambient environments

This unit is a precision instrument and you must take care in choosing the operating environment. Do not install the unit in place as shown below:

- The unit is exposed to direct sunlight, or the ambient temperature may fall below 0°C (32°F) or exceed 40°C (104°F) (Power supply: 0 to 50°C (32 to 122°F));
- The relative humidity may exceed the range of 35 to 85%, or condensation may occur due to rapid temperature changes;
- Corrosive gas or inflammable gas is present, or a high level of dust, salt, iron particles or soot is present;
- The unit is subject to vibration or impact;
- Water, oil or chemicals may splash the unit;
- A strong magnetic field or electric field is generated.
- The ambient illumination intensity exceeds the range defined in the specification in P.120.

In-panel installation

To mount the power supply unit BL-U1, BL-U2 or N-42, carefully observe the following instructions.

- Provide enough ventilation space.
- If the ambient temperature may fall below 0°C (32°F) or exceed 50°C (122°F), provide a fan or air conditioner.
- Do not mount this unit in a panel where a high voltage device is installed.
- Place this unit as far away from power lines as possible.

Note: The BL-700 conforms to the protective structure defined in IP-65 (excluding the power supply unit connected). Although installation environments subject to dust and water will not affect the BL-700, adhesion of dust or water drops to the transmitter/receiver may disable readout of bar codes.

Hints on correct use

- **Trigger (TIM) input**

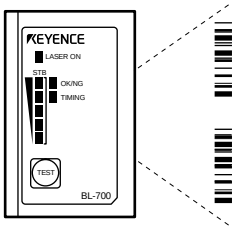
Set the trigger input to be long enough to allow the laser beam to cover the entire bar code.
If the trigger input needs to be on for only a short period of time, select one-shot mode.

- **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-700 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**

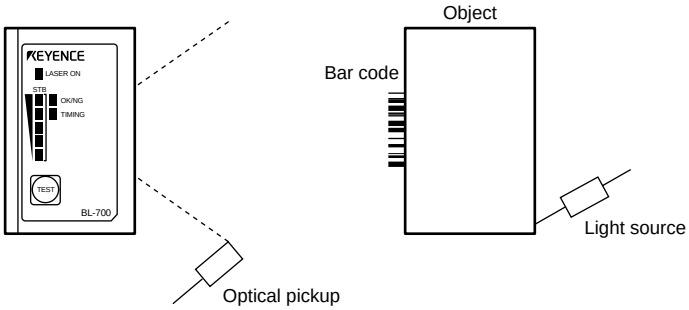
Do not place several bar codes in the field of the laser beam, unless you are in multi-label read mode (Multi 3).



If you use multi-label read mode (multi 3), the BL-700 can simultaneously read 2 to 4 bar codes in the field of the laser beam.

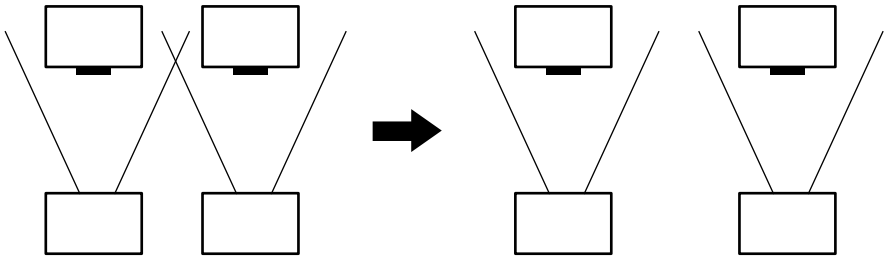
- **Influence from photoelectric sensor**

When using a photoelectric sensor to control trigger, block the sensor beam so it does not enter the BL-700 optical pickup.
The beam from the photoelectric sensor can interfere with the BL-700, deteriorating reading performance. If this case, reposition the photoelectric sensor.



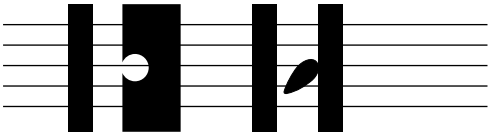
- **Interference between the BL-700 units**

When two BL-700 units are placed adjacent to each other with only a small separation, the mutual laser beams result in interference and will cause a readout error. To avoid interference, place the units as far apart as possible.



• When a bar code is stained or partially missing

Use a raster scan reader (BL-701/741/781) 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-700.

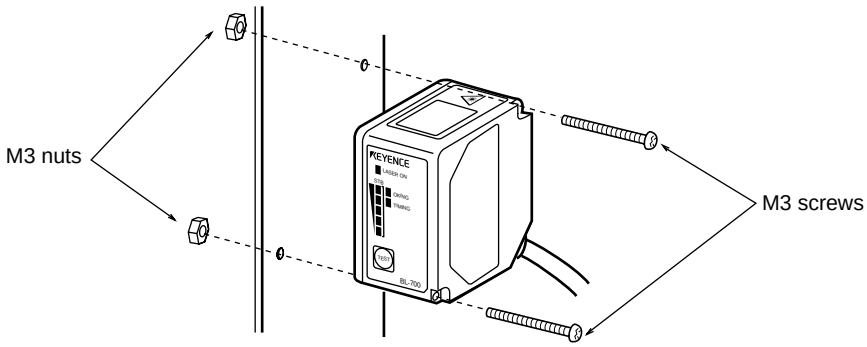


2.4.2 Installing the BL-700 series

Installation method

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

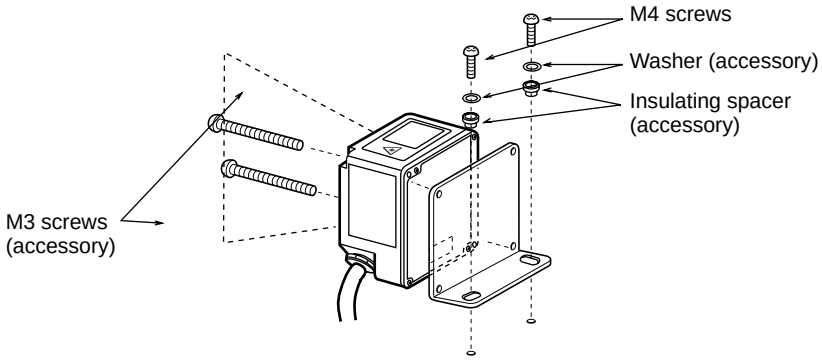
■ **Installation with no mounting bracket**



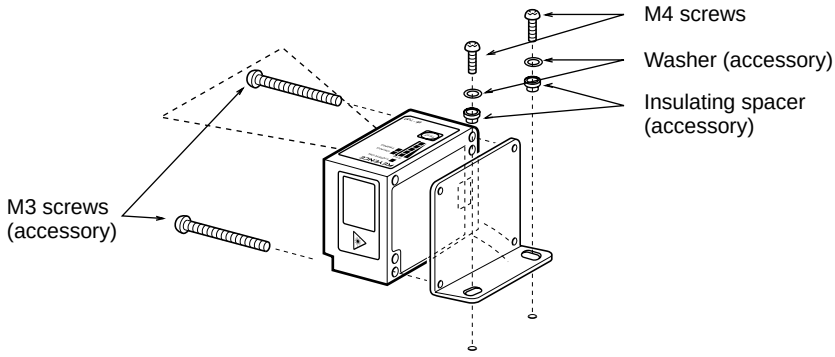
- Select screws of the proper length by checking the thickness of the plate used for mounting. (The screws provided are for use with the mounting bracket.)
- For the mounting hole diameter, see P.127.

■ **Using the supplied mounting brackets**

Vertical scanning

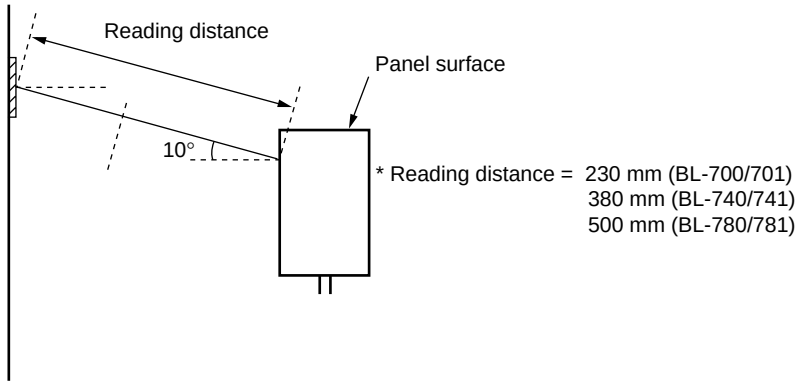


Horizontal scanning



- Use the set screw to secure the mounting bracket to the unit.
- For the mounting hole diameter, see P.127.
- When the insulating spacer is mounted, it can reduce the influence of noise from the mounting bracket.

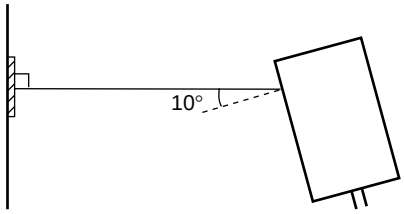
Mounting angle and mounting distance



Set the angle and reading distance by referring to the read range characteristics and angle characteristics described on P.122 to P.124.
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 P.124*).

Incorrect



Tips

The reading check test mode allows you to set the optimal reading position.

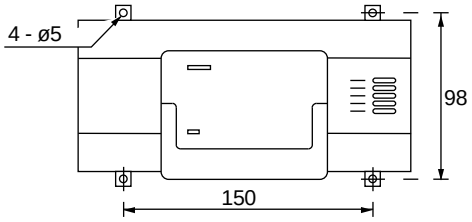
➪ *To use the test mode, see P. 38.*

2.4.3 Installing the BL-U1*

There are 2 methods for installing the BL-U1:

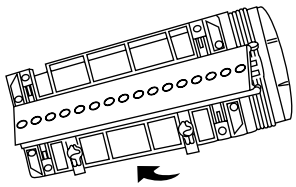
■ **When installing the BL-U1 directly**

Pull out the 4 screw slots on the rear panel and screw them to the base.

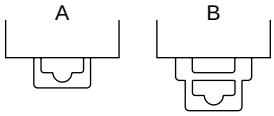


■ **When installing the BL-U1 to the DIN rail**

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.



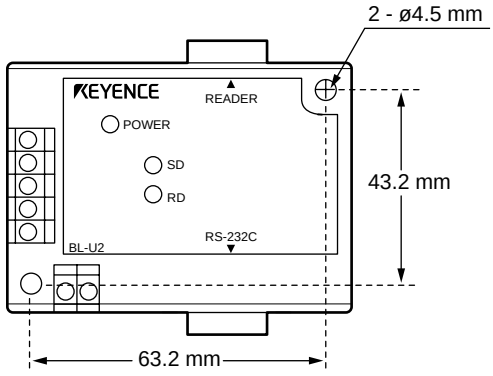
3. To remove the BL-U1 from the DIN rail, pull out the notch until its shape turns from Fig. B to Fig. A. Then, disengage the BL-U1 from the DIN rail.

4. When you want to reinstall the BL-U1 to the DIN rail, return the notch from that of Fig. A to Fig. B.

Note: BL-U1 is not available in Europe.

2.4.4 Installing the BL-U2, N-42

Install the BL-U2 or N-42 using the mounting hole.



* The BL-U2 is 21 mm thick and the N-42 is 26 mm thick.

Chapter 3

Functions for Reading Operation

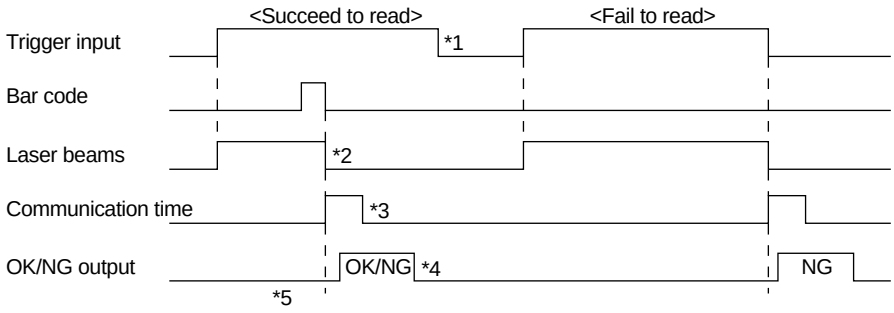
3.1 Read Operation

3.1.1 Scanning method

There are two methods for triggering the BL-700 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 P.33*), which reads one bar code while trigger input turns on once, and uses the “after read” as the data-send mode (➪ *see P.32*).

■ Level signal trigger

When the trigger input turns on, laser emission begins and 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.
➪ *See note on the next page.*

*3. The communication time can be obtained from the following expression:

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

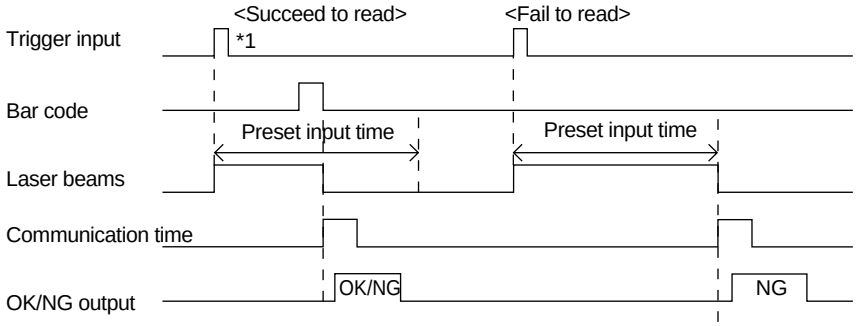
*4. The length of time that the OK/NG output is on can be changed to between 10 ms and 2.55 s.

*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).

Note: 5 seconds after the power switch turns on or an UNLOCK command (➪ *see P.90*) is sent, the unit will not start reading a bar code by turning on the trigger input.

■ 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.

   Trigger input minimum ON time:
   4 ms (when the trigger input value is 2 ms)
   13 ms (when the trigger input value is 10 ms)

Tips

- The BL-700 can read up to 4 types of bar codes without changing the bar code type setting (➪ *see P.61*).
- 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.
- To use a one-shot trigger signal instead of trigger input, gently press the TEST switch once (for less than 3 seconds) (➪ *see P.vi*).

NOTE: The BL-700 has a built-in AGC (auto gain control) circuit. It requires a maximum of 3 scans (4.3 ms) to adjust gain. The BL-700 generates a maximum of 4.3 ms delay until starting to read the data after the laser beam turns ON.

3.1.2 Data-send mode

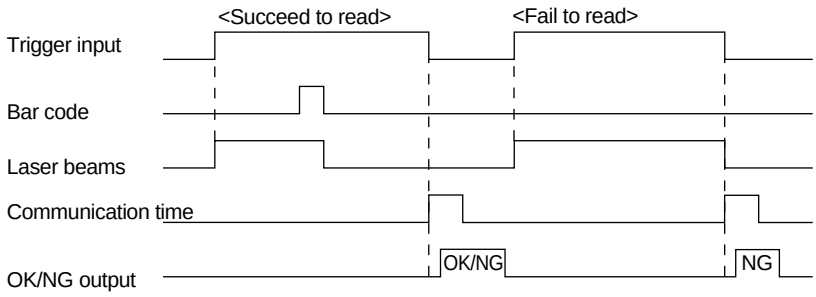
In the single label read mode only, you can select from the two data send modes (OK/NG output on trigger) described below: In the multi-label read mode, you can only select the “send after reading” mode.

- **Send after read**

The unit outputs the communication and OK/NG signals after a successful 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 “3.1.1 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).



3.2 Read Modes

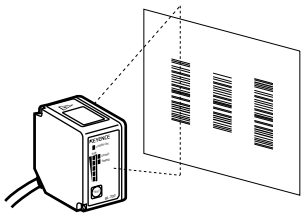
The BL-700 provides 4 types of read modes.

3.2.1 Single label read mode

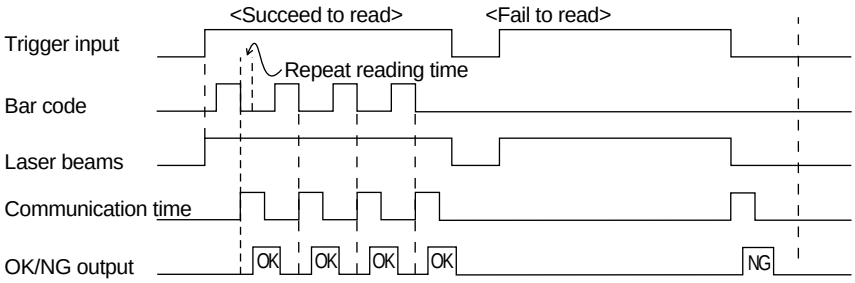
This mode allows the unit to read one bar code during one trigger input signal. The operation and timing chart are described on page 30 to 32.

3.2.2 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

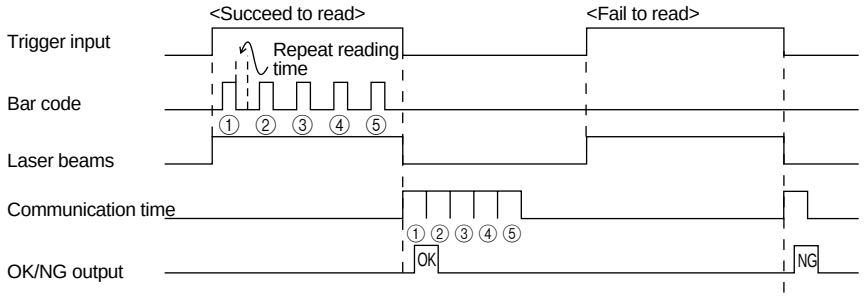


- In the multi-label read mode 1, the unit reads several bar codes continuously, and outputs them sequentially as it reads while laser beam remains on and trigger input turns on after bar codes have been read (or during the preset input time if one-shot signal trigger is selected).
- To prevent the unit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

3.2.3 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 P.86.) The difference between the two modes is that multi 2 mode sends 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.
- A reading error is issued only when the unit cannot read any bar code while the trigger input is on.
- 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	,	•••••••	Delimiter

- 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 P.87 for "header string" and "delimeter".*

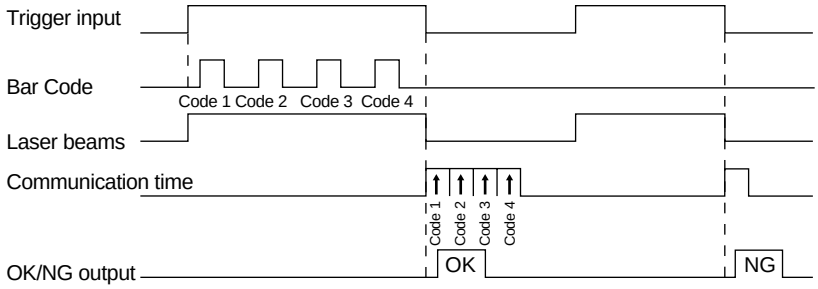
3.2.4 Multi-label read mode 3 (Multi 3)

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.

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 P.61*). 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 4 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	Delimiter

- 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 P.87 for the reading error codes*), instead of the read data is sent.

➪ *See P.87 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	,	KEYENCE1	Delimiter

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

Header	ERROR	,	4901234567894	,	KEYENCE1	Delimiter

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

Header	ERROR	,	4901234567894	,	ERROR	Delimiter

- 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.

Example

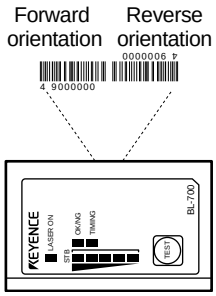
Suppose that the following codes are specified:
Code 1: CODE39, 7 digits
Code 2: CODE39, 7 digits
Code 3: CODE39, 7 digits
Code 4: CODE39, 7 digits

Header	ABCD123	,	XYZ3333	,	1234567	,	KEYENCE	,	Delimiter

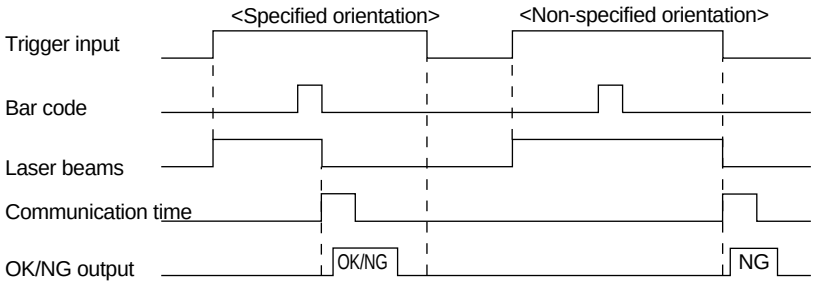
Note: The unit cannot read the bar code having the same content twice while trigger input turns on once.

3.3 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.

3.4 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.

3.4.1 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

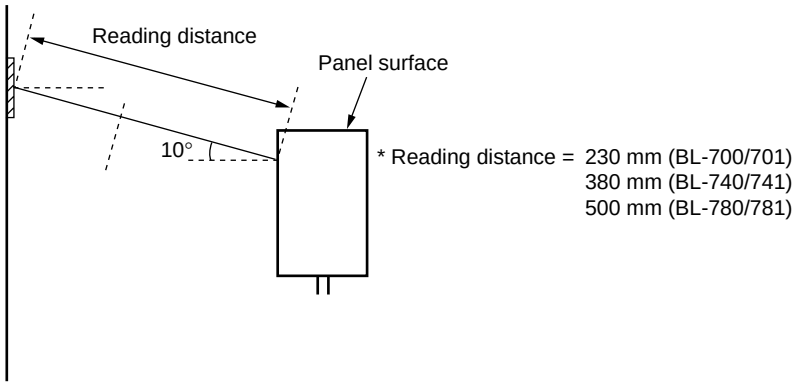
This mode is enabled when the bar code label stays in the given position.

■ **Operation**

Follow the instructions below:

1. Hold down the TEST switch for 3 seconds. (Release the switch when one STABILITY LED illuminates.)

2. The BL-700 then enters the mode in which the laser emission is always ON. Attempt to use the BL-700 to read bar codes.

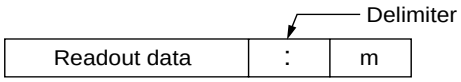


3. Depending on the reading rate, the BL-700 displays the STABILITY LEDs as listed. By checking the display, adjust the reading distance and angle so that the reading rate reaches the highest level.

Reading rate	STABILITY LED	OK/NG LED
81 to 100 %	5 LEDs ON	Green
61 to 80 %	4 LEDs ON	Green
41 to 60 %	3 LEDs ON	Green
21 to 40 %	2 LEDs ON	Green
1 to 20 %	1 LED ON	Green
0 %	–	Red

4. In the test mode, the unit outputs the serial communication data in the following format every 100 scans. By connecting the BL-700 to a PC and using a BL setup software terminal, the following data can be displayed on the PC screen.

☞ See P.79 for details of operation.



* m = 0 to 100 (zero-suppressed)

* ON/NG LED turns ON but OK/NG output does not turn ON.

5. Press the TEST switch again to exit the test mode.

Tips Gently pressing the TEST switch once (for less than 3 seconds) will cause the BL-700 to read a bar code once. (It also performs serial output and OK/NG output.)

3.4.2 Tact check mode

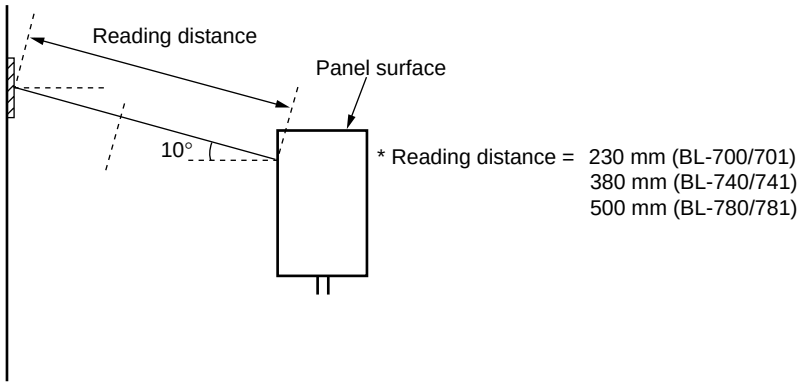
In this test mode, the unit counts how many scans can be decoded (the decode count) while reading one bar code.
This mode is useful when testing which line speed can be expected when actually implementing the BL-700 system on the line.
This is enabled when the bar code label is moving.

■ Operation

Follow the instructions below.

1. Hold down the TEST switch for 5 seconds. (Release the switch when two STABILITY LEDs illuminate.)

2. The BL-700 then enters the mode in which the laser emission is always ON. Attempt to use the BL-700 to read bar codes moving on the line.

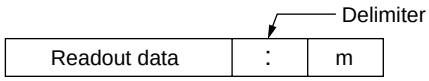


3. Depending on the decode count, the BL-700 displays the STABILITY LEDs as listed below 0.2 seconds after the last bar code has passed the laser emission range. By checking the display, you can recognize how much stability the BL-700 ensures during readout. To display the readout count, follow the procedure in 4 to display the data on the PC screen.

Reading rate	STABILITY LED	OK/NG LED
100 or more	5 LEDs ON	Green (The readout count equals or exceeds the matching decode count.)
50 to 99	4 LEDs ON	
10 to 49	3 LEDs ON	Red (The readout count is below the matching decode count.)
5 to 9	2 LEDs ON	
1 to 4	1 LED ON	
0	–	Red

The BL-700 continues to read the data while the laser beams scan the bar codes. Thus, the STABILITY LEDs are not ON. When the bar code reading stops for 0.2 seconds, the BL-700 stops scanning and turns ON the STABILITY LEDs.

4. In the serial communication mode, the BL-700 outputs the data in the following format.
   By connecting the unit to a PC and using the BL setup software terminal, the following data can be displayed on the PC screen.
   ➪ *See P.77 for details of operation.*



* m = 1 to 9999 (zero-suppressed)

* ON/NG LED turns ON but OK/NG output does not turn ON.

* A value greater than 9999 cannot be added.

5. When reading the same bar codes continuously within 0.2 seconds, the BL-700 cannot separate the data and continues scanning to add the readout count. When reading different bar codes within 0.2 seconds, continuous scanning is enabled.

6. Press the TEST switch again to exit the test mode.

Note 1: 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.

Note 2: When using the "additional information" (➪ *see P.46 to 47*) 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.

Tips

To start the test mode, the following alternative method is available in addition to the method of using the TEST switch.

- Start the test mode using the serial commands (➪ *see P.89*)
  Send the test mode start command (TEST1, TEST2) to start the test command. By entering TEST1 or TEST2 and pressing **[RETURN]** from the provided setup software terminal, the test mode is started.

- Start the test mode by turning the trigger input ON (➪ *see P.58*)
  Turning the timing input ON enables the setting to start the test mode. When this is set, the trigger input cannot function normally. Also, startup using the serial command is disabled.
  Use the setup software to perform the settings.

- Start the test mode by turning power ON (➪ *see P.58*)
  Setting is available to start the test mode immediately at power-ON.
  Use the setup software to perform the settings.

3.4.3 Online test mode

When the BL-700 always reads the bar codes, the reading stability can be displayed in real time using the STABILITY LEDs. This mode is called online test mode.

■ **Setting**

1. To set the online test mode, send the following command from the BL setup software terminal. To use the terminal, *see P.77*.

   Command to be sent: #TEST1
   Send-data: OK

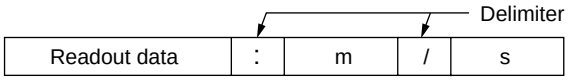
   When OK is returned to the command sent, it indicates the mode is set. This setting is valid only when power is ON. The setting data is reset after power is turned OFF.

2. According to the setting, start the BL-700 to read bar codes normally. In the online test mode, the send-data and STABILITY LEDs are displayed after the trigger input turns OFF.

3. The STABILITY LEDs turn ON as shown below, indicating how many times the unit can read the data correctly.

Reading rate	STABILITY LED
100 or more	5 LEDs ON
50 to 99	4 LEDs ON
10 to 49	3 LEDs ON
5 to 9	2 LEDs ON
1 to 4	1 LED ON
0	–

4. The BL-700 sends the data in the following format.
   The information on the scan count during one trigger-ON and the correct readout count is appended to the data. The scan count includes the cases where no bar code is set.



* m = 1 to 9999: Readout count (zero-suppressed)
s = 1 to 9999: Scan count (zero-suppressed)

5. To quit the online test mode, send the following command.

   Command to be sent: #QUIT
   Send-data: OK

   When OK is returned to the command sent, it indicates the mode is canceled.

Tips

Online test mode operation is the same as when setting the following from the BL-700 setup software. To save the online test mode setting in the BL-700, set the following using the setup software.

- Data adding function — Add decode count.
  Add scan count.
- STABILITY LED — Display the data.

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.
Commands should be entered in all uppercase characters.

3.5 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 signal, 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 light	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 light	
0	—	Red

■ When normal read mode is selected

When you select multi-label read mode 1 or 2 (⇨ *See P.33 to 34*), or the send mode is set to “after trigger input” (⇨ *See P.32*), or you select the decode count adding function (⇨ *See P.47*), 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 P.68*), 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.

The following also appears in the online test mode.

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 light
0	—

■ Unit operation status display

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

Operation status	STABILITY LED display	Action to be taken
Power-on	LEDs turn on sequentially from the bottom.	———
During setup (⇨ *see P.92*)	All the LEDs flash.	———
Waiting for setting data send/receive (⇨ *see P.73*)	The 1st, 3rd and 5th LEDs from the top flash simultaneously.	In this status, send the settings from the setup software. (Hold down the TEST switch for 8 seconds to set the data.)
Laser forced OFF (⇨ *with LOCK command, see P.90*)	The bottom LED flashes.	When resetting laser forced OFF (with UNLOCK command), the unit returns to the initial operation at power-on.
Unit error	Either of the 2nd, 3rd, or 4th LEDs from the top flashes.	The unit may have failed or supply voltage may have dropped. If supply voltage is normal, the unit may have failed. Contact the nearest KEYENCE office or distributor.
PLC link error (⇨ *see P.117*)	The top LED flashes.	The error is reset by pressing the TEST switch again. ⇨ *See P.116 for troubleshooting.*

3.6 Preset Function (Compare with:)

3.6.1 What is the preset function?

The BL-700 can store one bar code as 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-700 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 P.30 to 37 for output timing.*

Use the setup software and serial command to register the preset data (➪ *See P.68 and P.101*).

Note: The bar code actually read can be compared to the preset data only in the single label read mode.

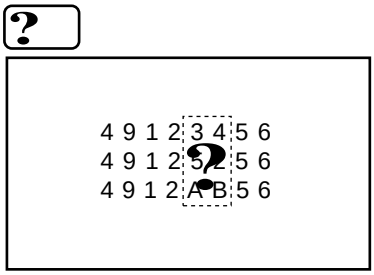
➪ *See P.136 if you want to use CODE93.*
➪ *See P.137 if you want to use CODE128.*

3.6.2 Wildcard Symbols (“!” and “?”)

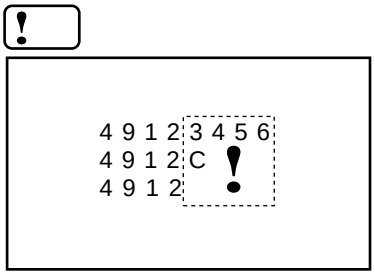
Using “!” and “?” in the preset data allows for flexible settings.

?: 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.

Tips

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

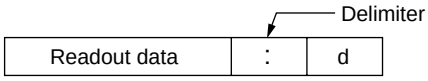
3.7 Additional Information

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.



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

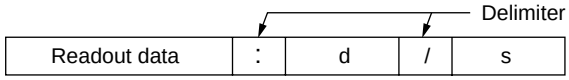
* The value is zero-suppressed.

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).

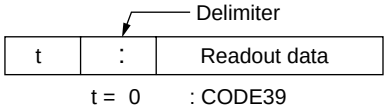


s = 1 to 999 (zero-suppressed)

* The value is zero-suppressed.

■ Code type add function

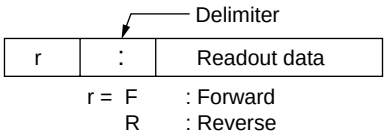
Adds the bar code type before the readout data .



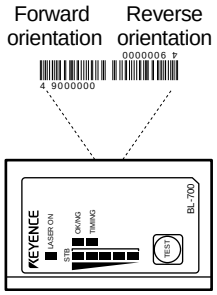
t = 0 : CODE39
1 : ITF
2 : Industrial 2of5
3 : Codabar
4 : EAN/UPC (A•E)
5 : CODE 128
6 : COOP 2 of 5
7 : Read error
8 : CODE93

■ Label orientation add function

Adds the orientation of bar code travel before the 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

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

3.8 Max. Code Length (Designated Digit) Output Function

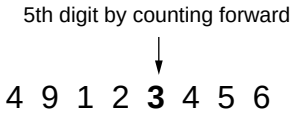
This function allows you to output the designated digit(s) as desired from the readout bar code data. For example, from bar code data “49123456”, you can extract “1234” for output.

Setting digits to be output

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

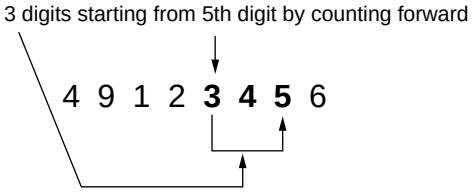
1. Set the direction to designate.
   * Set from which direction you want to start counting.

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



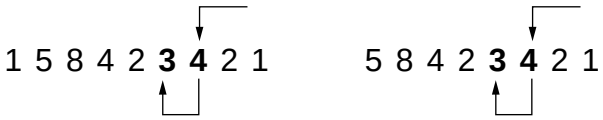
   * The actual setting order is (1) (3) (2).

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.

Tips

- 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.

Chapter 4

Setup Software

4.1 Installing the Setup Software

This section describes the operating environment of the setup software and the software installation.

4.1.1 Installing setup software

■ **Hardware requirements**

IBM PC/AT 100% compatible
CPU: 486 SX or higher
Memory: 4 MB or more
Floppy disk drive: 3.5 inch floppy disk drive (1.44 MB compatible)
Display: Resolution 640 x 480 or higher
Serial port: A minimum of one RS-232C port is required.

■ **OS requirements**

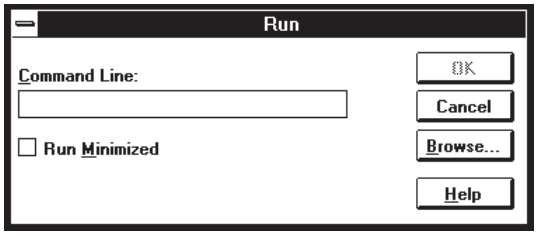
- MS-Windows 3.1
- MS-Windows 95

4.1.2 Installation procedure

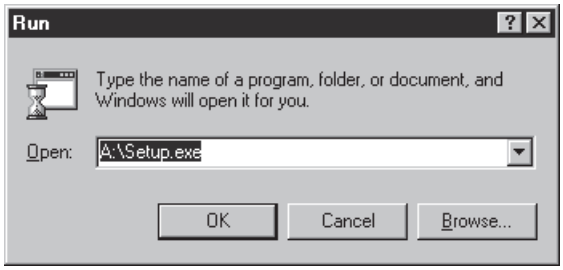
1. Insert the BL-700 setup software system disk into the floppy drive.

2. Perform the following procedure.

- Windows 3.1:
  Execute “Run...” in the icon menu of the program manager.



- Windows 95:
  Select “Run” from the "Start" menu.



3. Run the “SETUP” file from the floppy disk drive.
   (This step is common to both the Windows 3.1 and Windows 95.)

   Type in as follows:
   A: \SETUP

4. The BL-700 setup software installer starts. Follow the instructions in the install window. (Typically, the installation procedure can be completed simply by pressing [Next (N)] twice.)

5. The setup software is normally installed in the following directory:

   C: \KEYENCE\BLSET

   If this directory is correct, click on [Next (N)]. If you wish to change the directory, click on [Browse (R)..], and select the desired directory.

6. When installation starts, the file copy process is displayed as a graph. When the installation is completed, the following message appears.

7. For Windows 3.1, double-click on the [BL] icon in the [KEYENCE] group to start the setup software.
   For Windows 95, start the program from the "Start" menu.

4.2 Setup Software Operating Procedure

4.2.1 Operating procedure

To set up the BL using the setup software, follow the procedure below.

1. Connect the BL to the host computer using a null modem cable.
   For the recommended cable, see P. 12 and P. 19.

2. Start the BL setup software.

3. In “Select Model” of “File/etc...”, select the model to be connected (“BL-700”).

4. Select a setup item, and set it to the desired condition.

5. Before sending the updated settings to the BL-700, click on [COM PORT] to match the communication parameters of the personal computer with the current settings of the BL.

   The default settings of the BL are as follows:
   - Baud rate: 9600 bit/s
   - Data length: 7 bit
   - Parity: Even
   - Stop bit length: 1 bit
   - PLC link: Don’t use
   - Multi-drop link: Disabled

   Immediately after you purchase the BL, set [COM PORT] to the above settings.

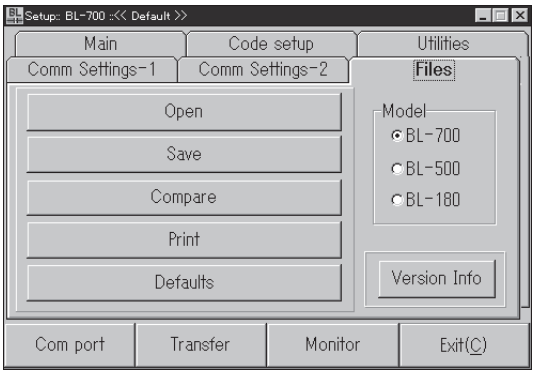
   If you do not know the current settings of the BL, press the BL TEST switch for approximately 8 seconds. The 1st, 3rd and 5th STABILITY LEDs from the top will flash simultaneously. The settings listed above are fixed. Execute (6) “Send/receive settings”.

6. Click on [Transfer] to send the updated settings to the BL.
   (The current settings of the BL can also be read.)

7. Select [FILES] to save or print the settings, as required.

8. After the setup procedure is completed, click on [Exit] to close the setup software.

4.2.2 Description on each setup screen



Displays the name of the setup file currently being edited. If the file has been read from the setup file, the file name is specified as “File: ...”. If the file has been read from the BL, the file name is marked with “BL”. If the file name is the initial setting, “default” is displayed.

If the file name has been changed from the initial setting (the condition immediately after it is read from the file), “changed” is displayed.

Select the model to be set.

Main (Operation setting:)
- Read mode and its setup
- Data addition function
- Decoding match count
- Read error code
- Scanning method, trigger ON/OFF command

Comm Settings-1 (Communication parameters 1:)
- Baud rate, data length, parity, stop bit
- RTS/CTS protocol
- Multi-drop, ID number

Comm Settings-2 (Communication parameters 2:)
- Communication protocol
- Header and terminator
- PLC link settings
- Delimiter, semi-delimiter

Code setup (Bar code setting:)
- Type of bar code to be read, number of digits
- Fixed-digit output function, label orientation function

Utilities:
- OK/NG output ON time
- Preset data registration

Files...:
Saving, readout and printout of settings, selection of model

COM Port:
Sets the communication parameters (baud rate, etc.) of the host computer according to the settings of the BL before communication starts between the BL and host computer.

TRANSFER:
Sends updated settings to the BL, or reads the current settings of the BL.

MONITOR:
Checks if the BL can operate normally.

EXIT:
Quits the BL setup software.

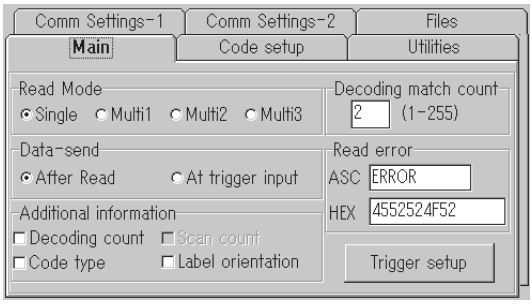
4.2.3 Outline of operation

This section describes the basic operations of the BL setup software.
To enter settings, place the mouse pointer on the item to be changed, and click the left mouse button.

Mouse pointer

■ **Clicking on [•••] (tabs)**

Used to select the item to be changed.

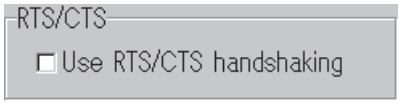


■ **Clicking on ○ (radio button)**

Used to select any of several options.
The selected item is marked with ◉.

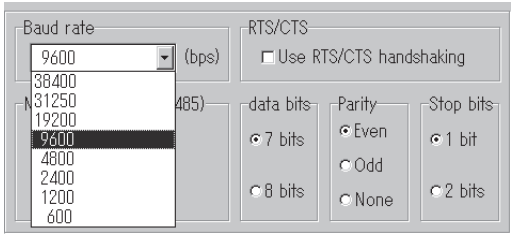
■ **Clicking on a □ (box)**

Used to select whether to enable or disable this function.
To enable this function, the □ mark is checked with " ". (For the Windows Ver. 3.1, it is checked with "x".)



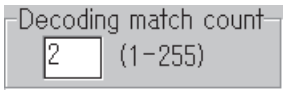
■ **Clicking on ▼ (arrow)**

Used to select any of several options.



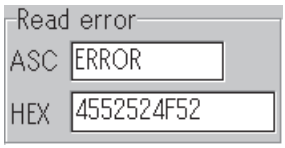
■ Entering a value

After clicking in the frame, enter a value using the keyboard.
If the entered value exceeds the setting range, an error message is displayed.
➪ *See P.82.*



■ Entering characters

When you click in the frame labeled “ASC”, you can enter characters using the keyboard.
When you click in the frame labeled “HEX”, you can enter characters using hexa-decimal numbers (00 to 7F). This function is used to enter control characters (00 to 21h ASCII codes, such as [CR] and [STX]).

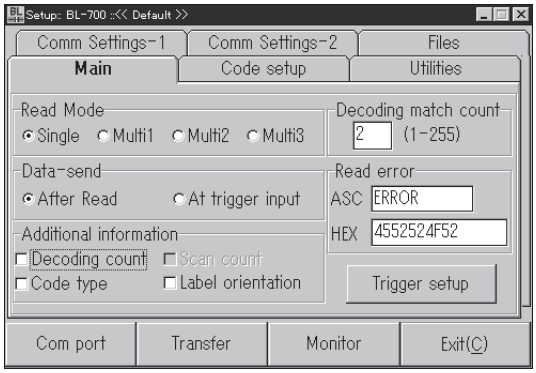


4.3 Details of Setup

4.3.1 Setup procedure

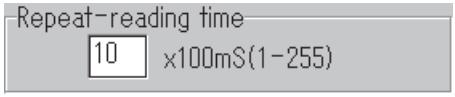
Main (Operation setting)

Set read mode, additional data function and trigger input.



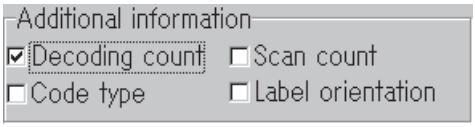
1. When “Single” is selected in “Read Mode”, the following appears:

When “Multi 1” or “Multi 2” is selected, the following appears:



Set the data to a number from 1 to 255 (100 ms to 25.5 s).
When “Multi 3” is selected, these setting menus will not appear.

2. Multiple data can be selected in “Additional data function”. “Scan count” appears only when “Decode count” is selected.



3. Enter the “Read error code” from the keyboard. The code can be changed as desired (within 8 characters).
   Normally, the initial setting (ERROR) should be used as provided.
   If a blank is specified for the setting, the BL-700 will not send the read error code.

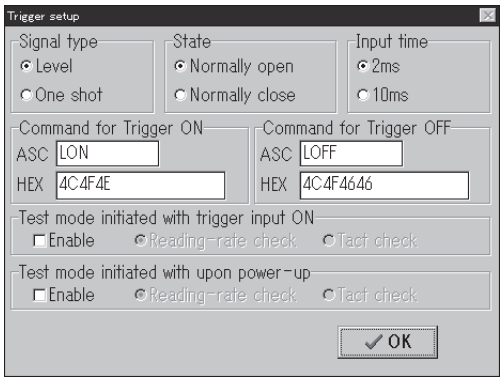
4. Click “Trigger input setting” to set the trigger input.

Tips

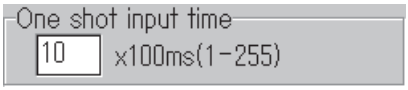
- Read mode ⇨ P.35 to 38
- Data transmission trigger ⇨ P.34
- Double reading prevention time ⇨ P.35 to 36
- Decoding match count ⇨ P. 32
- Additional data function ⇨ P.48 to 49
- Read error code ⇨ P.89

Trigger input setting

Set the trigger input, scanning method and trigger ON/OFF command.



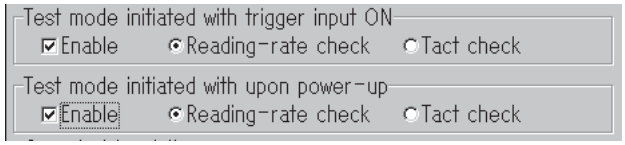
1. For the scanning method, select either “Level signal trigger” or “One-shot signal trigger”. If “One-shot signal trigger” is selected, the scanning time setting menu also appears.



   Set the scanning time to a number from 1 to 255 (100 ms to 25.5 s).

2. Enter the “Trigger ON/OFF command” from the keyboard. The command name can be changed as desired (within 8 characters).
   Normally, the initial setting (LON, LOFF) should be used as provided.

3. Enable either “Start the test mode with trigger input ON” or “Start the test mode at power-on”.



When “Start the test mode with trigger input ON” is enabled, the trigger input cannot be used during normal operation.
If both functions are selected, “Start the test mode with trigger input ON” has priority.

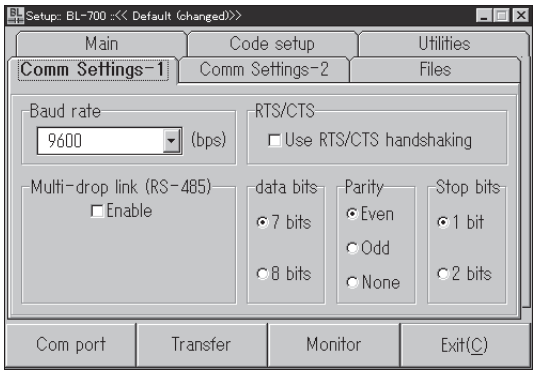
Tips

- Scanning method ⇨ P.32 to 33
- Trigger ON/OFF command ⇨ P.91
- Starting the test mode ⇨ P.40 to 43

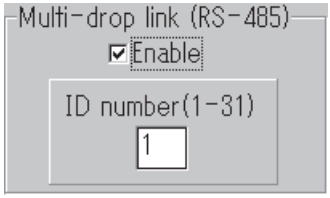
4

Comm Settings-1 (Communication parameters 1)

Set the communication parameters.



When “Multi-drop (RS-485)” is enabled, the ID number setup menu also appears. Set the ID number to a value from 1 to 31. “RTS/CTS protocol” is then disabled.



Tips

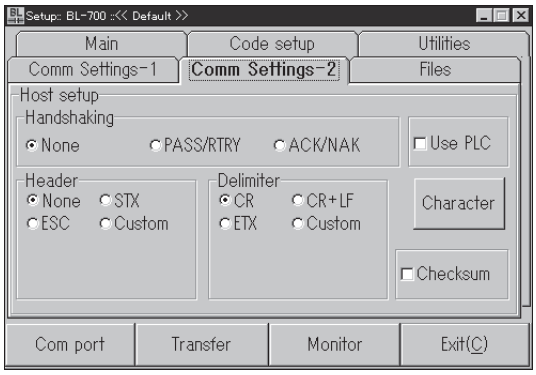
- RTS/CTS protocol ⇨ P.88
- Multi-drop ⇨ See the Multi-drop Controller N-400 User’s Manual.

Comm Settings-2 (Communication parameters 2)

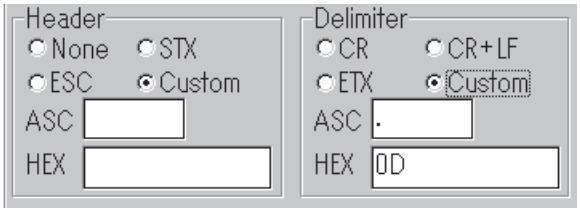
The following settings depend on the use of “PLC link”.

■ When the PLC link is not used

The menu screen allows setup of communication protocol, header and terminator.

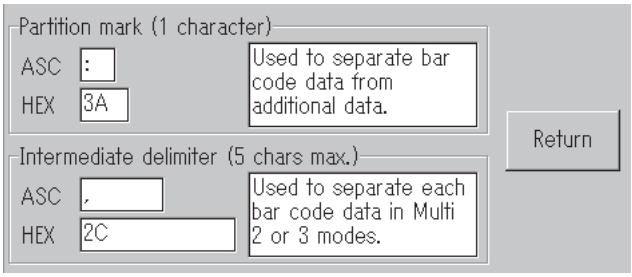


1. Select the header and terminator from the items provided. When the header and terminator are set, only the read data format can be changed.
   When “Set” is clicked, the following menu appears:



   Enter the desired data from the keyboard up to a maximum of 5 characters.

2. When “Character” is clicked, the following menu appears:



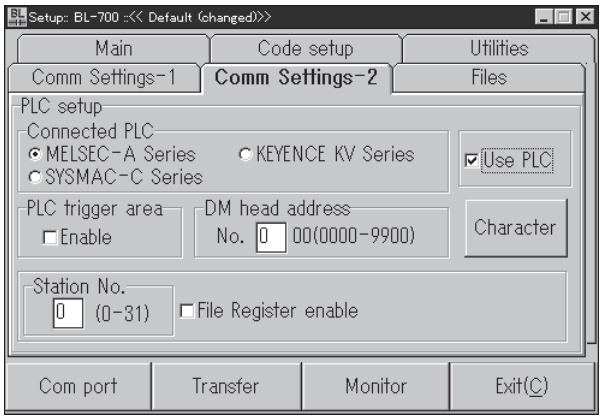
   Enter the delimiter and semi-delimiter from the keyboard and then click **[Return]**.

Tips

- (Communication) protocol ⇨ P.87 to 88
- Header, terminator ⇨ P.89
- Checksum ⇨ P.140
- Delimiter character ⇨ P.48 to 49
- Semi-delimiter ⇨ P.37 to 38

■ When using the PLC link

To enable the "Use PLC", set each item as follows:



The setting of the station number is not displayed when “KV Series” is selected.

The setting of the file register is displayed only when “MELSEC-A” is selected.

- Set “Connected PLC”, “DM head address” and “Station No.”.
  To set “DM head address”, enter a value (0000 to 9900) using the keyboard.
- To send a trigger signal to the BL series when the PLC link is enabled, set “PLC trigger area”.
- To use “File Register”, set “File Register” to “Enable”. When “File Register” is enabled, the following screen appears. The “File Register” can be used with the Mitsubishi MELSEC-A series only.

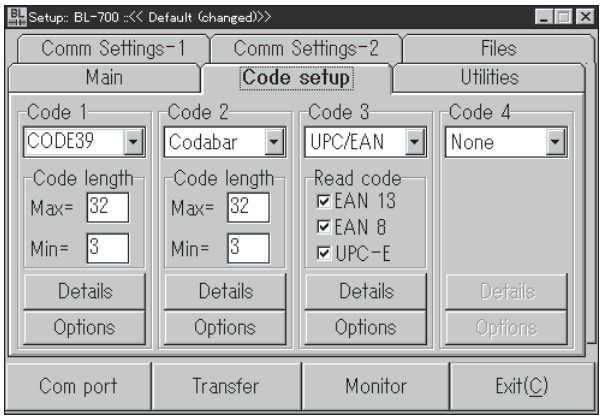
Enter the block number (000 to 255) of the file register using the keyboard.

Tips

- PLC link ⇨ P.106
- PLC trigger area ⇨ P.113 to 115
- DM head address ⇨ P.111
- File register ⇨ P.107

Code Setup (Bar code setting)

Set the readout digits, detail data and special functions for each code type.



1. Set the code.
   Set the type and number of digits of the bar codes to be read in codes 1 to 4. If four different types of codes are specified in 1 to 4, the BL-700 can read 4 types of bar codes without changing the settings.

2. Click [Details] to set “Send start/stop character” and “Check digit test”.

3. Click [Options] to set “Fixed-digit output function” and “Label orientation function” (☞ *see P.69*).

* Be sure to set the ITF digits to an even number.

* For UPC/EAN, set whether each of the 13-digit EAN, 8-digit EAN and UPC-E is enabled to read.

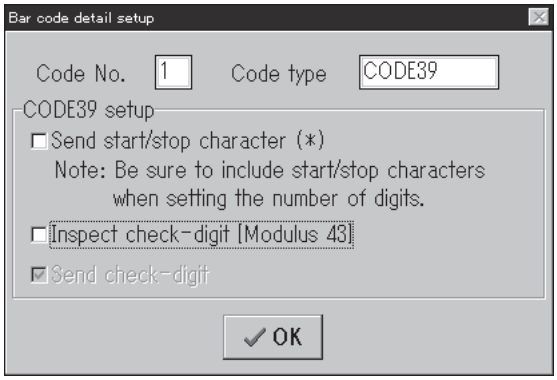
* CDE128 varies depending on the type of the start/stop character (CODE-A to CODE-C)

CODE-A/B: 1 to 31
CODE-C: 1 to 64

The start/stop character and check digit are not included in the number of digits. Also, FUN 1 to 4 (function codes), SHIFT and CODE-A to CODE-C are not included in the number of digits.

CODE 39 detail settings

When “CODE 39” is set for any of the 4 codes in the bar code setting and then [Detail] is clicked, the following screen appears.



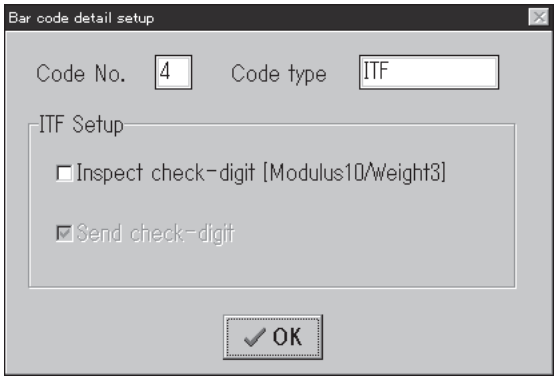
1. When “Send start/stop character (*)” is set, the BL-700 adds an * (asterisk) to the data and sends it.

2. When “Check digit test” is set, the following appears:

When “Send check digit” is set, the BL-700 sends the data including the check digit.
To calculate the check digit, the BL-700 uses Modulus 43.

ITF detail settings

When “ITF” is set for any of the 4 codes in the bar code setting and then [Detail] is clicked, the following screen appears.



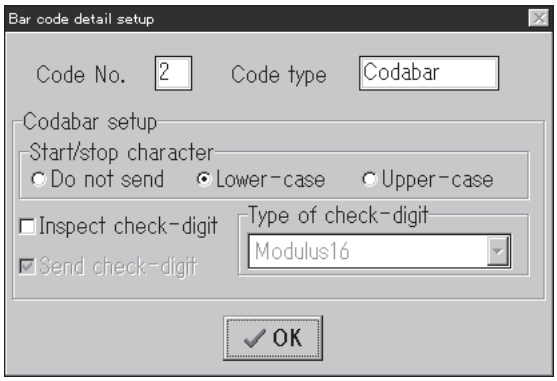
1. When “Check digit test” is set, the following appears:

When “Send check digit” is set, the BL-700 sends the data including the check digit.
To calculate the check digit, the BL-700 uses Modulus 10/3 weight.

Tips When reading the standard distribution code (bar code on the carton box), set 14 digits or 16 digits in the bar code setting and set “Check digit test”.

Codabar detail settings

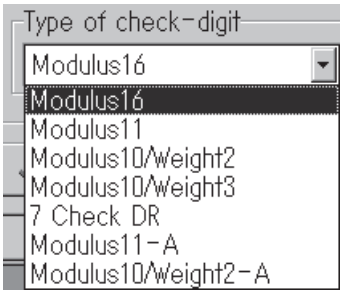
When “Codabar” is set for any of the 4 codes in the bar code setting and then [Detail] is clicked, the following screen appears.



1. When “Lowercase” or “Uppercase” is set in “Start/stop character”, the BL-700 adds “A, B, C, D” (lowercase or uppercase) to the data and sends it.

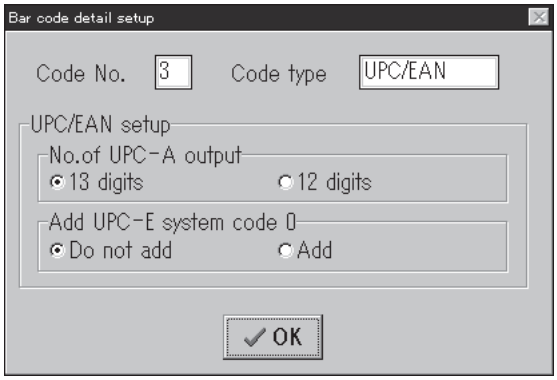
2. When “Check digit” is set, the following appears:

When “Send check digit” is set, the BL-700 sends the data including the check digit.
Select the type of check digit to be used.



UPC/EAN detail settings

When “UPC/EAN” is set for any of the 4 codes in the bar code setting and then [Detail] is clicked, the following screen appears.



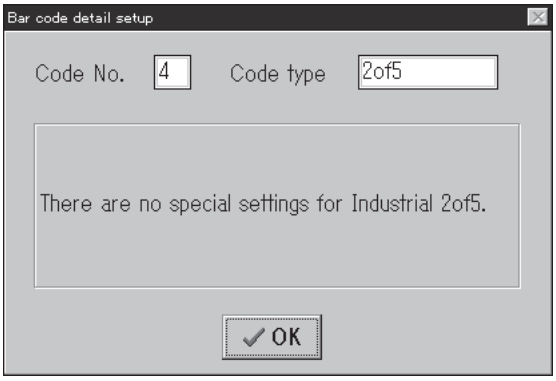
1. “UPC-A output digits” sets whether the 13-digit or 12-digit output format is used when reading the UPC-A data.

2. When “Yes” is set in “Add UPC-E system code [0]”, the BL-700 adds 0 to the beginning of the system code and sends the code. (This parameter appears only when “UPC-E” is set to enable reading in the bar code setting.)

* The check digit setting is not provided on the screen but the BL-700 calculates it using the modulus 10/3 weight. (The data is sent.)

(Industrial) 2of5, COOP2of5 and CODE93 detail settings

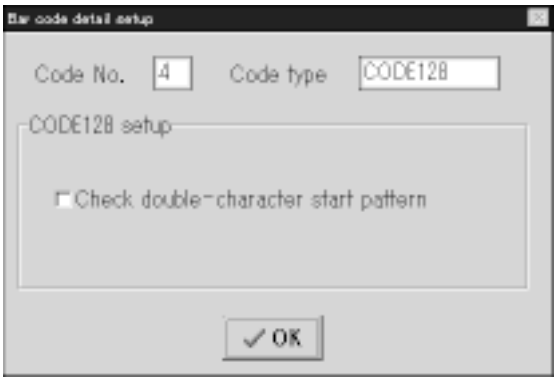
When “2of5”, “COOP2of5” or “CODE93” is set for any of the 4 codes in the bar code setting and then [Detail] is clicked, the following screen appears.



For industrial 2of5, COOP2of5, and CODE93, detail setting parameters are not provided.

CODE128 detail settings

When “CODE128” is set for any of the 4 codes in the bar code setting and then [Detail] is clicked, the following screen appears.



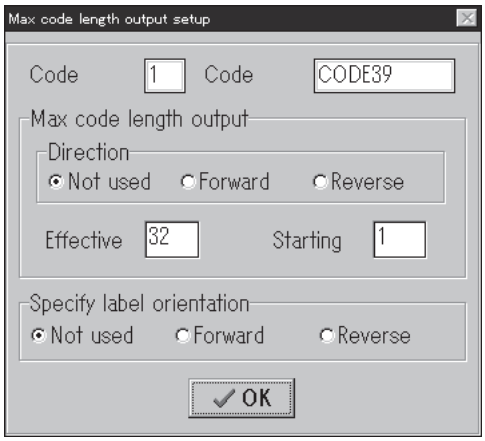
1. “Double character start pattern” is defined in the UCC/EAN-128 standard. This is a combination of the start character (CODE-A to CODE-C) and FUN1 (function code 1). The UPC/EAN-128 bar code must start with the double character start pattern.

   If this is not set, the BL-700 will not be able to read the data.

* The check digit setting is not provided on the screen but the BL-700 calculates it using the modulus 103 weight. (The data is not sent.)

Options setting

When [Options] is clicked in the bar code setting, the following screen appears.



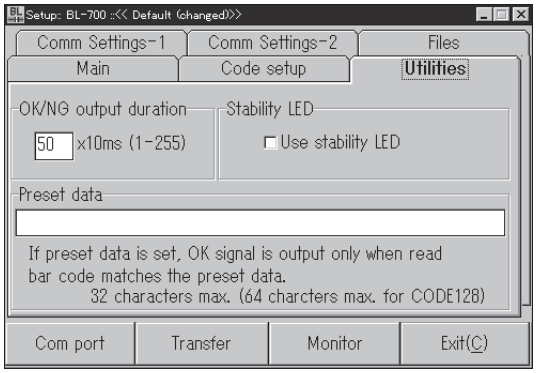
Set “Max code length output function” and “Label orientation function”.

Tips

- Fixed-digit output function ⇨ P.50
- Label orientation mode ⇨ P.39

Utilities settings

The settings of OK/NG output ON time and preset data registration are available.



1. To set “OK/NG output ON time”, enter a numeric value from the keyboard from 1 to 255 (10 ms to 2.55 s).

2. When “Display STABILITY LEDs” is set, the BL-700 displays the STABILITY LEDs which indicate the reading stability during normal reading operation.

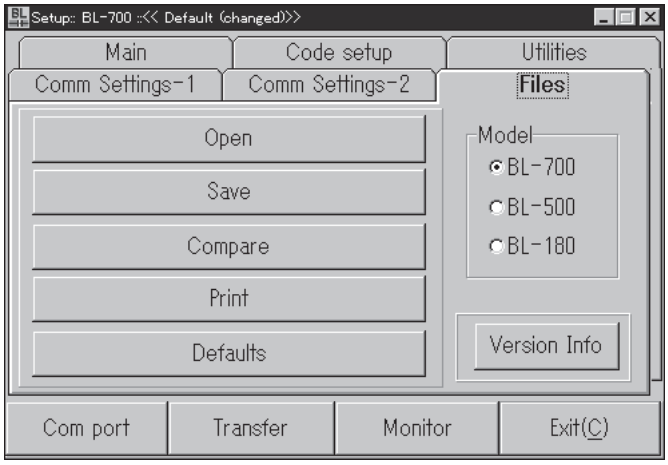
3. To set “Preset data”, enter the preset data to be registered from the keyboard. Normally, the data should be set within 32 characters. If CODE-C is set for CODE128, up to 64 characters can be set.

Tips

- OK/NG output ON time ⇨ P.32
- STABILITY LED ⇨ P.44
- Preset data ⇨ P.46

4.3.2 Reading/Saving/Printing File

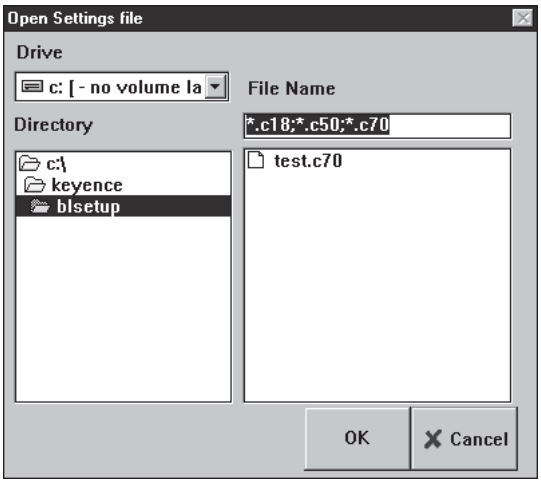
The FILES screen is used to save updated settings in a file, to read a saved setting file, and to print the contents of a setting file.



- **Model:** Select the model to be set.
- **Open:** Reads a saved setting file.
- **Save:** Saves updated settings in a file.
- **Compare:** Compares the settings currently edited with a file previously saved.
- **Print:** Prints contents of a setting file.
- **Defaults (Initialize settings):** Restores updated settings to the default settings.
- **Version info:** Displays the version information of this software.

Reading a previously saved setting file

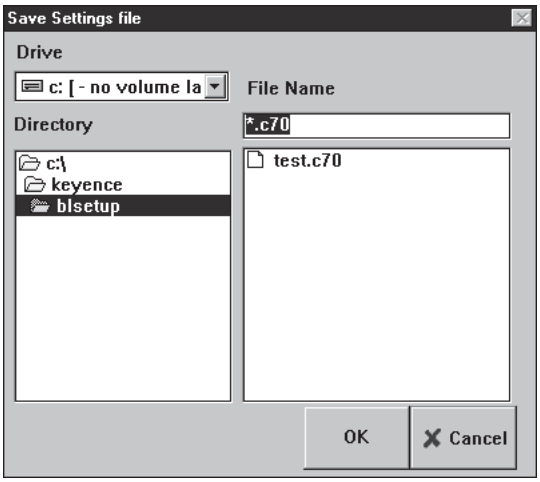
1. To read a previously saved setting file, click on [Open]. The following screen will appear.



2. When you click on [OK] after selecting a file, the selected file can be opened.

Saving updated settings in a file

1. To save updated settings in a file, click on [Save]. The following screen will appear.



2. Click on the file name entry field, and enter a file name using the keyboard. Specify a file name within eight characters. Be sure to add the extension “NCF”. After entering the file name, click on [OK] to save the file.

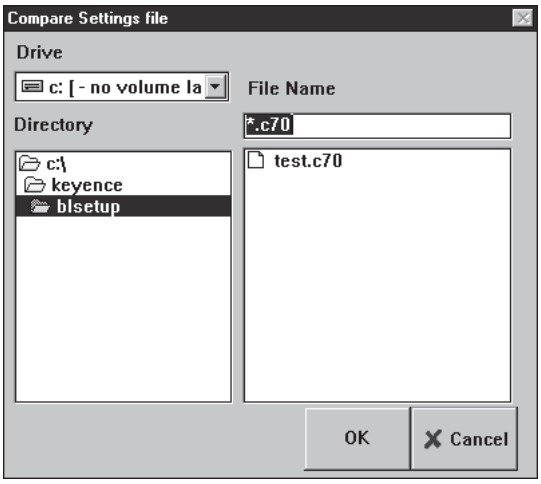
Note: This software cannot accept a long file name in Windows 95.

Tips

When the saved setting file is sent to the BL-700, the name of the file is simultaneously sent to the BL-700. When you read the settings of the BL-700 using this software, the file name is also read. It is convenient for maintenance since you can find the file that stores the settings.
To enter a file name, use alphanumerics (letters and numbers) only. Otherwise, the file name cannot be sent to the BL-700, because it can only recognize alphanumerics. To send a file name, be sure to enter the file name using alphanumerics and then save it. (If the file name is not saved, it cannot be sent to the BL-700.)

Comparing the settings currently edited with a saved file

1. To compare the settings currently edited with the setting file previously saved, click on [Compare].



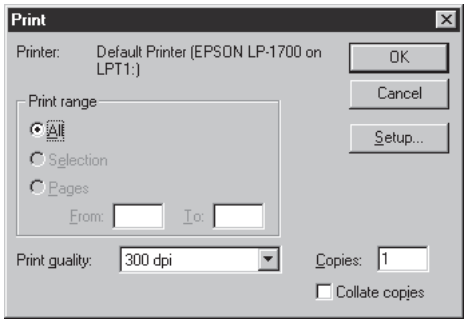
2. Select a file to be compared, and click on [OK]. Then, the system compares the selected file with the settings currently edited, and displays the result.

Matched

Not matched

Printing contents of a setting file

1. To print settings, click on [Print]. The following screen will appear.

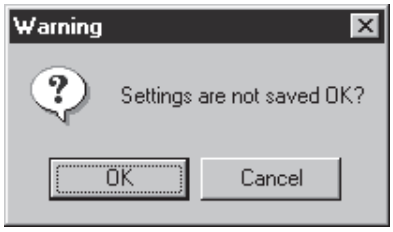


2. Adjust “Printer Setup” as required, and click on [OK]. Printing will then start.

Restoring the settings currently edited to the default (initial) settings

1. To restore the settings currently being edited to the default settings, click on [Defaults (Initialize settings)].

2. If you try to initialize the settings currently being edited without saving them, the following message appears. If you wish to execute initialization, click on [OK].



Note: The initialization procedure described in this section is used to initialize the settings being edited with the setup software. The settings on the BL-700 cannot be initialized.

4.4 Sending/Receiving Settings

To send the updated settings to the BL-700 and to read the settings from the BL-700, perform the following procedure.

Sending updated settings to the BL-700

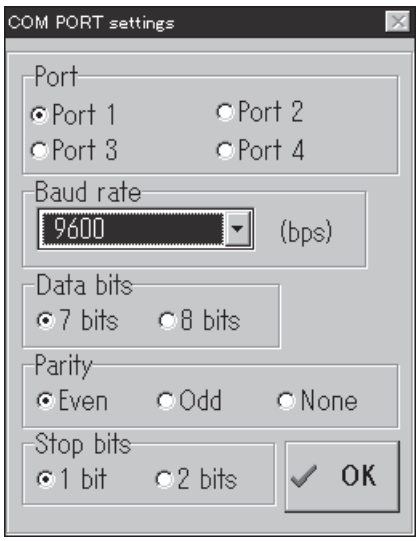
To send updated settings to the BL-700, perform the following procedure.

1. Press the BL-700 TEST switch for 8 seconds. When the 1st, 3rd and 5th STABILITY LEDs from the top flash simultaneously, the communication protocol is temporarily set as indicated below (this status is called “setting data send/receive waiting status”).

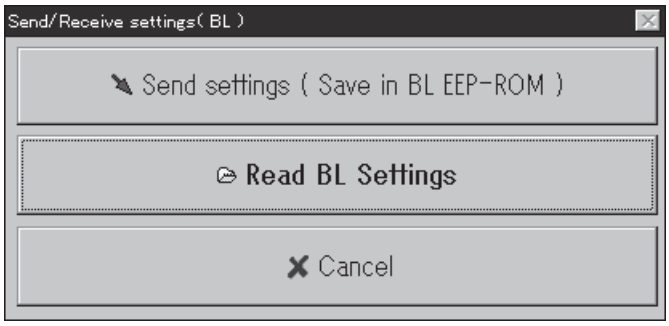
   - Baud rate: 9600 bits/s
   - Data length: 7 bits
   - Parity: Even
   - Stop bit length: 1 bit
   - PLC link: Disabled
   - Multi-drop link: Disabled

Tips If you know the current communication parameter settings of the BL-700, this step is not necessary. You can send data to the BL-700 by setting the communication parameters of the host computer using [COM PORT] so that they conform to the current settings of the BL-700. However, if PLC link is enabled, you cannot send data to the BL-700 without performing this step because the handshaking protocol is set for PLC link only.

2. Click on [COM PORT] to set the communication parameters of the host computer according to the values listed in the step 1. (above procedure). Select an RS-232C port, and click on [OK].



3. Click on [Send settings (Save in BL EEP-ROM)]. The updated settings are then sent to the BL-700.



4. If the settings were successfully sent to the BL-700, the following message appears.

If the host computer failed to send the data to the BL-700, the following message appears.

If this message is displayed, check the following points:

- Check that [COM PORT] is set as shown in (1) when the 1st, 3rd and 5th STABILITY LEDs from the top flash simultaneously (when in “setting data send/receive waiting status”).
- Check that the power to the BL-700 is ON.
- Check that the RS-232C cable pin assignment of the BL-700 is the same as that of the host computer.

Reading the current settings of the BL-700

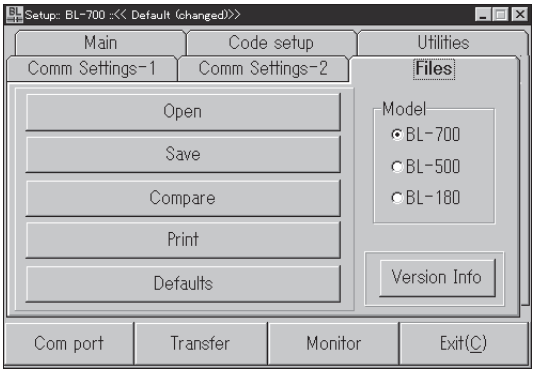
To read the current settings of the BL-700, perform the following procedure. (This procedure is almost the same as the procedure for sending settings.)

1. Press the BL-700 TEST switch for 8 seconds. When the 1st, 3rd and 5th STABILITY LEDs from the top flash simultaneously, the communication protocol is temporarily set as indicated below (this status is called “setting data send/receive waiting status”).

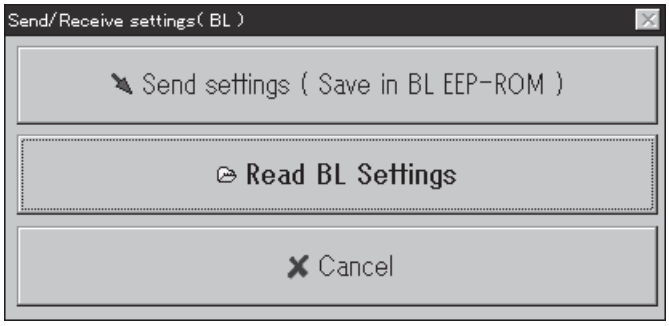
   - Baud rate: 9600 bits/s
   - Data length: 7 bits
   - Parity: Even
   - Stop bit length: 1 bit
   - PLC link: Disabled
   - Multi-drop link: Disabled

Tips If you know the current communication parameter settings of the BL-700, step 1. is not necessary. You can send data to the BL-700 by setting the communication parameters of the host computer using [COM PORT] so that they conform to the current settings of the BL-700. However, if PLC link is enabled, you cannot send data to the BL-700 without performing step 1., because the handshaking protocol is set for PLC link only.

2. Click on [COM PORT] to set the communication parameters of the host computer according to the values listed in step 1. Select an RS-232C port and click on [OK].

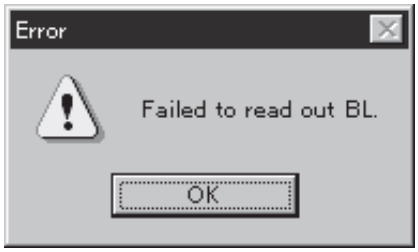


3. Click on [Send settings (Save in BL EEP-ROM)].
   When you click on [Read BL settings], the settings of the BL-700 can be read on the host computer.



4. If the settings of the BL-700 were successfully read, the following message appears.

If the host computer failed to read the data, the following message appears.



If this message is displayed, check the following points:

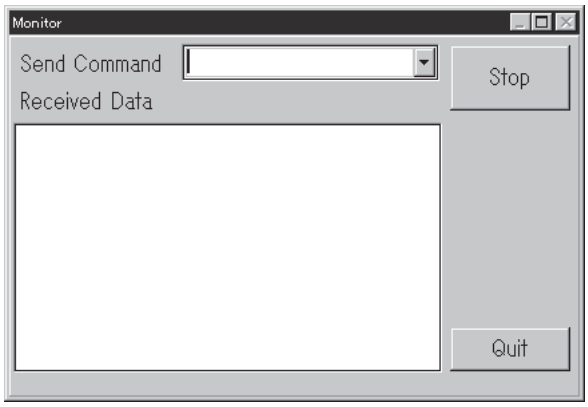
- Check that [COM PORT] is set as shown in (1) when the 1st, 3rd and 5th STABILITY LEDs from the top flash simultaneously (when in “setting data send/receive waiting status”).
- Check that the power to the BL-700 is ON.
- Check that the RS-232C cable pin assignment of the BL-700 is the same as that of the host computer.

4.5 Using Monitor

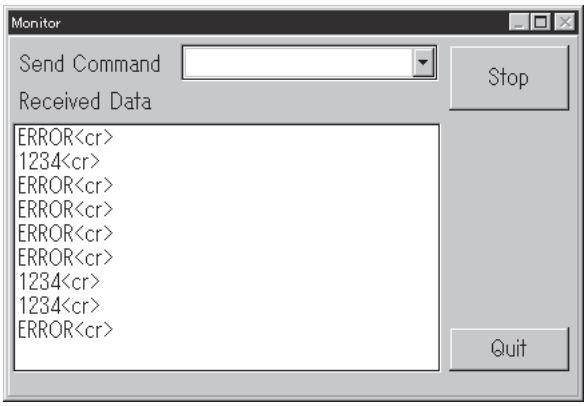
This setup software provides the “Monitor” program to check if the BL-700 can send data properly. The “Monitor” program allows you to display the data read by the BL series on the host computer’s monitor screen, and also to send a command from the host computer to the BL-700 or BL series.

1. Click on [COM PORT] to set the communication parameters of the host computer according to the current settings of the BL-700.

2. Click on [Monitor]. The MONITOR screen will appear.



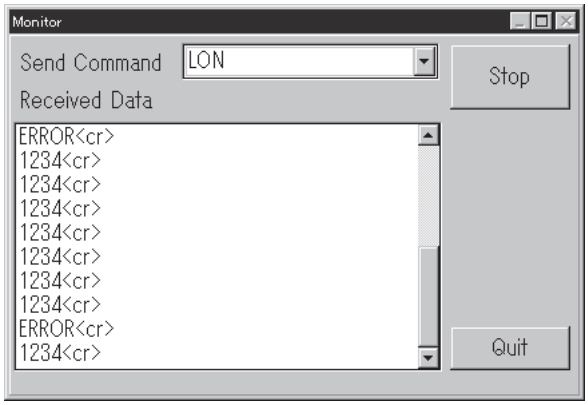
3. When the BL series reads bar codes, the data read by the BL series is listed on the screen (in the [Received Data] field). A record of up to 1000 lines of data can be obtained. Using the scroll bar at the right of the [Received Data] field, you can see the previous data.



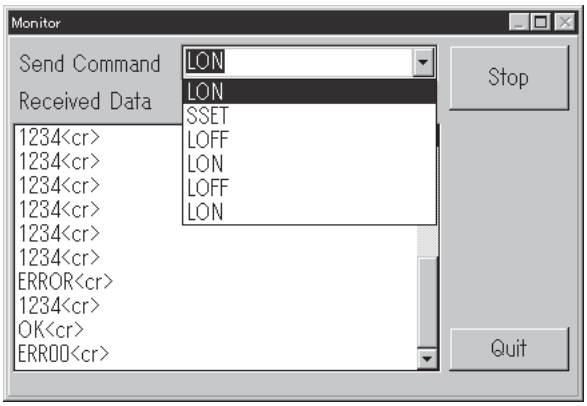
Note: All commands should be entered in all uppercase characters. The BL cannot accept lowercase characters.

4. If you click [Stop], received data is not listed. (The button name is changed to [Start].) If you try to display received data again, click on [Start].

5. When you enter a command in the “Send command” field, you can send the command to the BL-700 (or BL series). The format of the command to be sent is “[Command] + [CR]”. Typing command and pressing **[ENTER]** key sends the command.



6. When you click on the **[ARROW]** button in the “Send command” field, the commands previously sent are listed. (Up to 100 commands can be listed.)



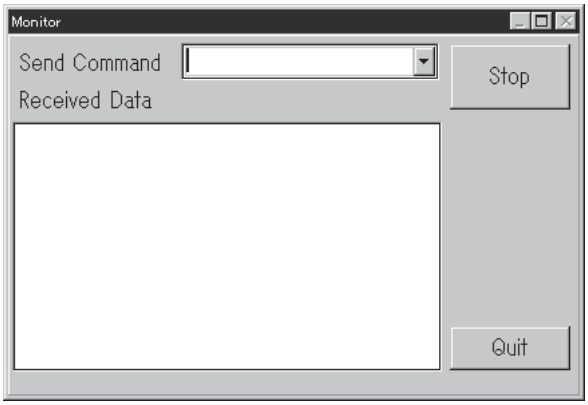
7. Click on [Quit] to quit this mode.

Starting the test mode from the Monitor

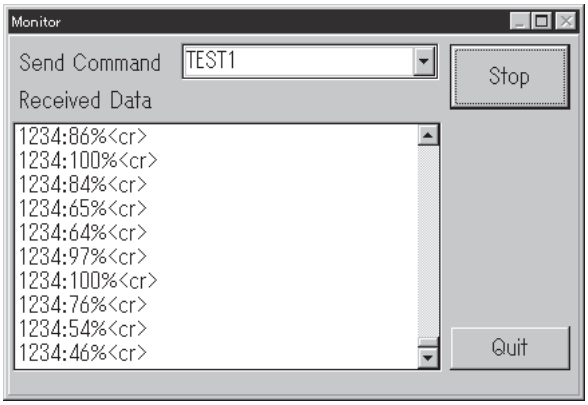
Follow the procedure below to start the test mode from the Monitor.

1. Click [COM PORT] to match the computer's communication protocol with the current BL-700 communication protocol.

2. Click [Monitor] to display the monitor screen.



3. Enter "TEST1" (uppercase) in the send command column and press the **[RETURN]** key. Readout rate measurement mode starts and the readout data is listed sequentially.



4. To quit the test mode, enter "QUIT" in the send command column and press the **[RETURN]** key.

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.
Commands should be entered in all uppercase characters.

4.6 List of Error Messages

The following table lists the error messages which may occur during operation of the setup software.

	Error message	Contents
Errors during setup	"Entered data is incorrect. [OK]"	The entered data is incorrect. Re-enter the correct data.
Errors during communication	"Communication with BL-700 failed. [OK]"	Error during communication with the BL-700 (for sending settings).
	"Readout from BL-700 failed. [OK]"	Error during communication with the BL-700 (for reading settings).
	"The specified model is incorrect. [OK]"	The model set in the setup software is not the same as the model that is connected.
Errors file editing	"Accessing file during rejected. [OK]"	No floppy disk is inserted. The floppy disk is write-protected. The floppy disk is full.
	"File not found. [OK]"	The file name is incorrect. Enter a correct file name.
	"File name incorrect. [OK]"	

4.7 Example of printing from the setup software

When “Print” is executed from the setup software, the following data is printed.

/ / / New setting data [Untitled] / / /

< < Model = BL-700 > >

[x] Selected
[_] ----------
=> Changed

1) Main

[Read mode]	[x] Single [_] Multi 1 [_] Multi 2 [_] Multi 3
[Data-send]	[x] After read [_] At trigger input
[Repeat-reading time]	[10] x 100 ms
[Decoding match count]	[2] times
[Read error]	ERROR [4552524F52]
[Add Decoding match count]	[_] Enable
[Add scan count]	[_] Enable
[Add code type]	[_] Enable
[Add label orientation]	[_] Enable

2) Trigger setup

[Signal type]	[x] Level [_] One shot
[One shot input time]	[10] x 100 ms
[Input time]	[x] 2 ms [_] 10 ms
[State]	[x] Nomally open [_] Nomally close
[Command for Trigger ON]	LON [4C4F4E]
[Command for Trigger OFF]	LOFF [4C4F4646]
[Test mode initiated with input ON]	[x] OFF [_] Reading-rate check [_] Tact check
[Test mode initiated upon power-up]	[x] OFF [_] Reading-rate check [_] Tact check

3) Comm Settings–1

[Baud rate]	9600 bps.
[Data bits]	[x] 7 bits [_] 8 bits
[Parity]	[x] Even [_] Odd [_] None
[Stop bits]	[x] 1 bit [_] 2 bits
[RTS/CTS]	[_] Use RTS/CTS handshaking
[Multi-drop link(RS-485)]	[_] Enable
[ID number]	No. [1]

4) Comm Settings–2

[Use PLC]	[_] Enable
[Handshaking]	[x] None [_] PASS/RTRY [_] ACK/NAK
[Header]	[x] None [_] STX [_] ESC [_] Custom
[Delimiter]	[x] CR [_] CR + LF [_] ETX [_] Custom
[Partition mark]	: [3A]
[Intermediate delimiter]	, [2C]
[Checksum]	[_] Enable

5) Utility

[Stability LED]	[_] Use stability LED
[OK/NG output duration]	[50] x 10 ms
[Preset data] = [no data]	

(1/2)

[Code 1 setup]	Bar code = CODE39
[Main code length]	[32]
[Min code length]	[3]
[Send start/stop character (*)]	[_] Enable
[Inspect check-digit [Modulus 43]	[_] Enable
[Send check-digit]	[x] Enable
-----Options setup------	
[Max code length output]	[x] Not used [_] Forward [_] Reverse
[Effective]	[32]
[Starting]	[1]
[Specify label orientation]	[x] Not used [_] Forward [_] Reverse

[Code 2 setup]	Bar code = Codabar
[Max code length]	[32]
[Min code length]	[3]
[Start/stop character]	[_] Do not send [x] Lower-case [_] Upper-case
[Inspect check-digit]	[_] Enable
[Send check-digit]	[x] Enable
[Type of check-digit]	Modulus 16
-----Options setup------	
[Max code length output]	[x] Not used [_] Forward [_] Reverse
[Effective]	[32]
[Starting]	[1]
[Specify label orientation]	[x] Not used [_] Forward [_] Reverse

[Code 3 setup]	Bar code = UPC/EAN
[Read EAN 13(UPC-A)]	[x] Enable
[Read EAN 8]	[x] Enable
[Read UPC-E]	[x] Enable
[No. of UPC-A output]	[x] 13 digits [x] 12 digits
[Add UPC-E system code 0]	[x] Do not add [_] Add
-----Options setup-----	
[Max code length output]	[x] Not used [_] Forward [_] Reverse
[Effective]	[32]
[Starting]	[1]
[Specify label orientation]	[x] Not used [_] Forward [_] Reverse

[Code 4 setup]	Bar code = None

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(2/2)

Chapter 5

Serial Communication

5.1 Serial Communication

The BL-700 communicates with the PC via the RS-232C serial port. This enables you to change the BL-700's settings from your PC.

Communication types

The BL-700 provides the following two communication types:

- Data communication
  Sends read bar code data from the BL-700 to the PC.

- Command communication
  Changes the BL-700's settings by sending a command from the PC to the BL-700.

* All communication is performed using ASCII codes.

Communication setup

Configure the setup for BL-700 and the PC before attempting serial communication.

- Setup of BL-700
  Set the following parameters for the BL-700 using the setup software.
  • Baud rate, Data bits, Parity, Stop bit
  • Communication protocol
  • Header/Delimiter
  • Read error code

- PC setup
  Based on the BL-700's settings, set the communication parameters on the PC using the "Ports" setting in the Windows Control Panel/System/Device Manager.

Tips

- The following communication parameters are the default settings for the BL-700:
  • 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-700 is set, temporarily, to the default settings for 5 seconds after the power switch is turned on.

  When the current settings of BL-700 is not certain, send the command "SSET" and a [CR] to the BL-700 from your PC with 5 seconds after power-up. This causes the BL-700 to remain at its default settings and you can communicate with the BL-700 at the default settings.
  For information on checking the BL-700's current settings, see "Details on Parameter Setting Commands" on page 92.
  For information on changing the above communication parameters see "Description of Parameter Setting Commands" on page 94.
  When the BL-700 TEST switch is pressed for 8 seconds, the 1st, 3rd and 5th STABILITY LEDs from the top flash, indicating that the communication parameters are set as above. (Press the TEST switch again to reset the settings.)

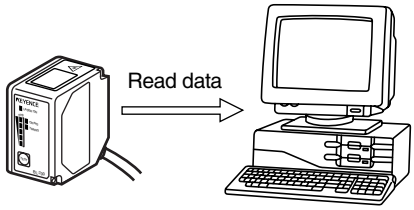
Note: All commands should be entered in all uppercase characters. The BL cannot accept lowercase characters.

5.2 Details on Data Communication

Communication protocols (Hardware handshaking)

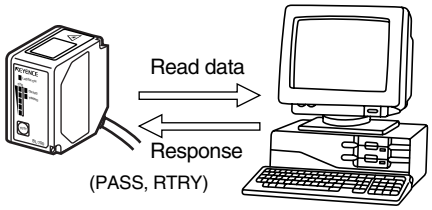
The BL-700 supports the following four handshaking protocols.

■ No Handshaking



- The BL-700 sends read data to the PC without using any handshaking protocol.

■ PASS/RTRY Handshaking



- After sending the read data, the BL-700 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-700 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-700 to re-send the data. The BL-700 sends the same data again and then waits for the response.

  After the BL-700 once receives PASS, the BL-700 sends back no data even if RTRY is sent to the BL-700.

- The BL-700 can continue to read while waiting for the PASS command. The data is stored in the BL-700's transmission buffer.
  For the capacity of the transmission buffer, see P.86.

  If the amount of stored data exceeds the capacity of the transmission buffer, the BL-700 sends back [Header]OVER[Delimiter] to the PC, and clears all data stored in the transmission buffer.
  The BL-700 stops operation while clearing data. It recovers by sending PASS to [Header]OVER[Delimiter].

- PASS and RTRY can be received in either communication format: PASS <CR> or <STX> pass <ETX>. You can also add <ESC> to the beginning, or <LF> to the end of the format.

Note 1: The BL-700 can receives other commands while waiting for the PASS command. In this case, the BL-700 sends back an immediate response (e.g. OK).

Note 2: When the SSET command (*see P.92*) is sent to the BL-700 while the BL-700 is waiting for the PASS command, the BL-700 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-700 sends back different characters, but performs the same operation.

■ RTS/CTS Handshaking

- When the PC's RTS (BL-700's CTS) signal turns off, the BL-700 becomes ready for data transmission. When the PC's RTS signal turns on, the BL-700 starts data transmission.

- When the PC's RTS signal is off, the BL-700 can still read. In this case, data is stored in the BL-700's transmission buffer (see below).
  If the amount of stored data exceeds the capacity of the transmission buffer, the BL-700 sends back [Header]OVER[Delimiter] to the PC, and clears all data stored in the transmission buffer.
  The BL-700 stops operation while clearing data. It recovers when the RTS of the computer turns ON.

Note 1: The RTS/CTS handshaking cannot be used for RS-422A communication.

Note 2: The RTS/CTS protocol can be used together with other handshaking protocols.

Note 3: When the PC's RTS signal is off, the BL-700 does not sends back a response to the PC.

5

Capacity of transmission buffer

The BL-700' 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.

Read Data Format

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

Header	Read data	Delimiter

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>** (0DH), **<CR>** (0DH) **<LF>** (0AH), **<ETX>** (03H)

Read Error Code

If the BL-700 fails to read a bar code, the BL-700 sends back a read error code. The initial setting of the read error code is as follows:

Header	ERROR	Delimiter

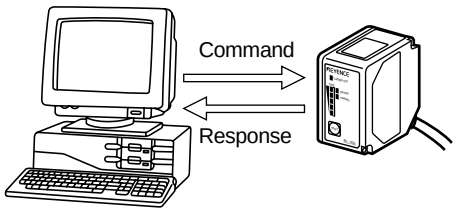
The read error code can freely be changed (within 8 characters).
The BL-700 can be set to send no error code.
➪ *See P.57.*

5.3 Command Communication

The BL-700 includes commands to directly operate the BL-700 (direct control commands) and the commands used to change or confirm the BL700's settings (parameter setting commands).

5.3.1 Setup of Direct Control Commands

Communication procedure



1. Send a direct control command from the PC to the BL-700.

2. After receiving the command, the BL-700 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-700, the BL-700 sends back no response.

3. When an incorrect command is sent to the BL-700, the BL-700 sends back no response.

Communication format

When the command format is **[Command][CR]**, the response format is **[Response][CR]**. When the command format is **[STX][Command][ETX]**, the response format is **[STX][Response][ETX]**.

Command	Response
Command CR	Response CR
STX Command ETX	STX Response ETX

Tips

- **<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-700's command receiving buffer are cleared.

- If the BL-700'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-700 cancels the received characters.

Explanation of Direct Control Commands

The following describe direct control commands in details.

Read operation control
This command specifies the data read timing.

● **Trigger on**

Command: LON
Response: None

● **Trigger off**

Command: LOFF
Response: None

- Even when the read operation is controlled with these commands, the BL-700 performs the same operation as with the trigger input (⇨ *see P.30 to 36*). "Trigger input: on" corresponds to LON, and "trigger input: off" corresponds to LOFF.
- The BL-700 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.

● **Reading rate check**

Command: TEST1
Response: None

● **Tact check**

Command: TEST2
Response: None

● **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.

● **Turning the OK output on**

Command: OKON
Response: OK

● **Turning the NG output on**

Command: NGON
Response: OK

● **Turning the OK/NG outputs off**

Command: ALLOFF
Response: OK

Online test mode
Sets to online test mode (*see P. 60*).

● **Online test ON**

Command: #TEST1
Response: OK

● **Online test OFF**

Command: #QUIT
Response: OK

● **Online test check**

Command: #TEST
Response: #TESTn
n = 0: Online test OFF
1: Online test ON

Clearing transmission buffer
Clears data stored in the transmission buffer.

Command: BCLR
Response: OK

Shift to setting mode
Enters the setting mode (*see P.4*).

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 P.2)*.

● **Laser off**

Command: LOCK
Response: OK

● **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.

Reset
Resets the BL-700 software.

Command: RESET
Response: OK

Readout history check
Outputs the readout OK and NG counts during trigger input ON.

Command: NUM
Response: aaaaa/bbbbb/ccccc
aaaaa = 00000 to 65535: Readout OK count
bbbbb = 00000 to 65535: Readout NG count
ccccc = 00000 to 65535: Trigger input ON count
Description: These counts are reset to zero by turning the power OFF or sending the RESET command.

5.3.2 Details on Parameter Setting Commands

The following describes how to change the BL-700's settings through command communication.

You can use the setup software to change the BL-700's settings instead of these commands.

Communication Details

1. Send the direct control command SSET to the BL-700.
   The BL-700 will shift to setting mode.
   After successfully executing the command, the BL-700 sends back an OK.

2. After the BL-700 shifts to setting mode, send the command (setting change command) corresponding to the item to be changed to the BL-700.
   After successfully executing the command, the BL-700 sends back an OK.
   If an error occurs with this command, the BL-700 sends back ERRnn. (nn sttands for error code numbers.)

3. To confirm the current settings, send a setting confirmation command.
   After successfully executing the command, the BL-700 sends back an OK.
   If an error occurs with this command, the BL-700 sends back ERRnn.

4. To save the current settings in the EEP-ROM, send SAVE to the BL-700.
   Once you save the settings in the EEP-ROM, the BL-700 will start with these settings when the BL-700 is turned on next.
   After successfully executing the command, the BL-700 sends back an OK.
   If an error occurs with this command, the BL-700 sends back ERRnn.

5. To quit the setting mode and perform the normal bar code reading, send SEND to the BL-700.
   After successfully executing the command, the BL-700 sends back an OK.
   If an error occurs with this command, the BL-700 sends back ERRnn.

Communication format

When the command format is **[Command][CR]**, the response format is **[Response][CR]**. When the command format is **[STX][Command][ETX]**, the response format is **[STX][Response][ETX]**.

Command		Response
Command CR	➡	Response CR
STX Command ETX	➡	STX Response ETX

Tips

- **<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-700's command receiving buffer are cleared.
- If the BL-700's command receiving buffer contains erroneous characters due to a 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-700 cancels the received characters.

Response Error Code

When an incorrect command is sent to set parameters, the BL-700 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. ☞ *See P.94*. 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. Settings are automatically initialized.
17	\ is not followed by !, ? or \ in preset data. ☞ *See P.137 to 138*.
18	Two !s exist in preset data. ☞ *See P.100*.
99	The BL-700 may malfunction. Contact KEYENCE.

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 92.	–
Initializes settings.	DFLT	OK	Returns to the default-settings, and saves the settings in the EEP-ROM.	00, 05, 14, 15
Quits the setting mode.	SEND	OK	See page 92.	–

■ 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.

* 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	00, 01, 03, 05, 08, 14
	Confirm	CODEm	mn	n=0: CODE 39 1: ITF 2: Industrial2of5 3: Codabar 4: UPC/EAN 5: CODE128 6: COOP2of5 7: None 8: CODE93	
Setting Max. No. of readable digits	Change	MAXm=nn	OK	m=0 to 3: Codes 1 to 4 nn=01 to 32 * For CODE39, Codabar: 03 to 32 * For ITF: 02 to 32 * For CODE128: 01 to 64 **Note:** With EAN code, this command causes error.	00, 01, 03, 04, 05, 09, 14
	Confirm	MAXm	mnn		
Setting Min. No. of readable digits	Change	MINm=nn	OK		
	Confirm	MINm	mnn		
CODE39 Sending start/stop character.	Change	WCm00n	OK	m=0 to 3: Codes 1 to 4 n=0: Disable 1: Enable	00, 02, 03, 04, 05, 07, 14
	Confirm	RCm00	00n		
CODE39 Inspection of check digit (Modulus 43)	Change	WCm01n	OK	m=0 to 3: Codes 1 to 4 n=0: Disable 1: Enable	
	Confirm	RCm01	01n		

Function	Command being sent		Response	Description	Error code
CODE39 Sending check digit.	Change	WCm02n	OK	m=0 to 3: Codes 1 to 4	00, 02, 03, 04, 05, 07, 14
	Confirm	RCm02	02n	n=0: Disable 1: Enable	
ITF Inspection of check digit (Modulus 10/ Wait 3)	Change	WCm10n	OK	m=0 to 3: Codes 1 to 4	
	Confirm	WCm10	10n	n=0: Disable 1: Enable	
ITF Sending check digit.	Change	WCm11n	OK	m=0 to 3: Codes 1 to 4	
	Confirm	RCm11	11n	n=0: Disable 1: Enable	
Codabar Sending start/stop character.	Change	WCm30n	OK	m=0 to 3: Codes 1 to 4	
	Confirm	RCm30	30n	n=0: Disable 1: Enable	
Codabar Start/Stop character type	Change	WCm31n	OK	m=0 to 3: Codes 1 to 4	
	Confirm	RCm31	31n	n=0: Lower case 1: Upper case	
Codabar Inspection of check digit	Change	WCm32n	OK	m=0 to 3: Codes 1 to 4	
	Confirm	RCm32	32n	n=0: Disable 1: Enable	
Codabar Sending check digit	Change	WCm33n	OK	m=0 to 3: Codes 1 to 4	
	Confirm	RCm33	33n	n=0: Disable 1: Enable	
Codabar Setting check digit type	Change	WCm34n	OK	m=0 to 3: Codes 1 to 4	00, 02, 03, 04, 05, 08, 14
	Confirm	RCm34	34n	n=0: Mudulus16 1: Modulus 11 2: Modulus 10/Wait 2 3: Modulus 10/Wait 3 4: 7 Check DR 5: Modulus 11-A 6: Modulus 10/ Wait 2-A	
EAN/UPC (A•E) Reading UPC-E	Change	WCm40n	OK	m=0 to 3: Codes 1 to 4	00, 02, 03, 04, 05, 07, 14
	Confirm	RCm40	40n	n=0: Disable 1: Enable	
EAN/UPC (A•E) Reading EAN 8 digits	Change	WCm41n	OK	m=0 to 3: Codes 1 to 4	
	Confirm	RCm41	41n	n=0: Disable 1: Enable	

Function	Command being sent		Response	Description	Error code
EAN/UPC(A•E) Reading JAN 13 digits	Change	WCm42n	OK	m=0 to 3: Codes 1 to 4 n=0: Disable 1: Enable	00, 02, 03, 04, 05, 07, 14
	Confirm	RCm42	42n		
EAN/UPC(A•E) No. of UPC-A output digits	Change	WCm43n	OK	m=0 to 3: Codes 1 to 4 n=0:Output in 13 digits 1:Output in 12 digits	
	Confirm	RCm43	43n		
EAN/UPC(A•E) Adding "0" to UPC-E system code	Change	WCm44n	OK	m=0 to 3: Codes 1 to 4 n=0: Disable 1: Enable	
	Confirm	RCm44	44n		
CODE128 Checking double character start pattern ⇨ *See p. 32.*	Change	WCm51n	OK	m=0 to 3: Codes 1 to 4 n=0: Disable 1: Enable	
	Confirm	RCm51	51n		
Setting max. code length output function	Change	WCm83n	OK	m=0 to 3: Codes 1 to 4 n=0: Disable 1: Enable	
	Confirm	RCm83	83n		
Setting direction for max. code length output	Change	WCm84n	OK	m=0 to 3: Codes 1 to 4 n=0: Forward 1: Reverse	
	Confirm	RCm84	84n		
Setting effective digits for max. code length output	Change	WCm85nn	OK	m=0 to 3: Codes 1 to 4 nn=01 to 32 : Effective digits	00, 02, 03, 04, 05, 09, 14
	Confirm	RCm85	85nn		
Setting starting digit for max. code length output	Change	WCm86nn	OK	m=0 to 3: Codes 1 to 4 nn=01 to 32 : Starting digit	
	Confirm	RCm86	86nn		
Setting label orientation specified reading	Change	WCm81n	OK	m=0 to 3: Codes 1 to 4 n=0: Disable 1: Enable	00, 02, 03, 04, 05, 07, 14
	Confirm	RCm81	81n		
Setting orientation for orientation-specified reading	Change	WCm82n	OK	m=0 to 3: Codes 1 to 4 n=0: Forward 1: Reverse	
	Confirm	RCm82	82n		

■ Setting Reading Mode/Data Addition Functions

Function	Command being sent		Response	Description	Error code
Setting reading mode	Change	WP12n	OK	n=0: Single label 1: Multi label 1 2: Multi label 2 3: Multi label 3	00, 02, 05, 08, 14
	Confirm	RP12	12n		
Setting data send timing	Change	WP13n	OK	N=0: Sends data after reading 1: Sends after timing input turns off	00, 02, 05, 07, 14
	Confirm	RP13	13n		
Setting repeat-read time in multi label reading mode 1 or 2	Change	WP41nnn	OK	nnn=001 to 225 (by 100 ms step)	00, 02, 05, 09, 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 1: Add	00, 02, 05, 07, 14
	Confirm	RP10	10n		
Setting scans in additional information	Change	WP11n	OK	n=0: No addition 1: Add **Note:** Effective only when No. of decodings are added.	
	Confirm	RP11	11n		
Setting label orientation in additional information	Change	WP14n	OK	n=0: No addition 1: Add	
	Confirm	RP14	14n		
Setting code type in additional information	Change	WP17n	OK	n=0: No addition 1: Add	
	Confirm	RP17	17n		
Setting reading error code	Change	WP55hhh...	OK	hhh ... = Reading error code (within 8 characters) * Specify the characters in HEX (hexadecimal) code. * If the reading error code is not specified, hhh... = FF.	00, 02, 05, 06, 10, 12, 14
	Confirm	RP55	55hhh...		

Tips

To set the reading error code, send the following command:

Example 1

Set the reading error code to "BR".

B R

WP554252

* B = 42h, R = 52h

Example 2

Set no reading error code.

WP55FF

■ Setting Trigger Input (Starting Test Mode)

Function	Command being sent		Response	Description	Error code
Setting signal type	Change	WP05n	OK	n=0: Level 1: One-shot	00, 02, 05, 07, 14
	Confirm	RP05	05n		
Setting one-shot input time	Change	WP42nnn	OK	nnn=001 to 225 (by 100 ms step)	00, 02, 05, 09, 14
	Confirm	RP42	42nnn		
Setting time constant of trigger input	Change	WP04n	OK	n=0: 2 ms 1: 10 ms	00, 02, 05, 07, 14
	Confirm	RP04	04n		
Setting state of trigger input	Change	WP03n	OK	n=0: Normal-open 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 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 2: Tact check mode	00, 02, 05, 08, 14
	Confirm	TRGT	TRGTn		
Starting test mode when power is turned on.	Change	TESTn	OK	n=0: Reset 1: Reading rate check mode 2: Tact check mode	
	Confirm	TEST	TESTn		
Setting characters of trigger on command	Change	WP56hhh...	OK	hhh...=Trigger on command (Up to 8 characters) * Specify characters in HEX (hexadecimal) code.	00, 02, 05, 11, 14
	Confirm	RP56	56hhh...		
Setting characters of trigger off command	Change	WP57hhh...	OK	hhh...=Trigger off command (Up to 8 characters) * Specify characters in HEX (hexadecimal) code.	
	Confirm	RP57	57hhh...		

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

Example 1

Change the trigger on command to S.

S

WP5653

* S=53h

■ Setting Communication Parameters 1

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

■ Setting communication parameters 2 (When the PLC link is not used)

Function	Command		Response	Description	Error code
Handshaking protocol 1	Change	WP07n	OK	n = 0: No handshaking n = 1: Use protocol *To set details of the protocol, use handshaking protocol 2.	00, 02, 05, 07, 14
	Confirm	RP07	07n		
Handshaking protocol 2	Change	WP08n	OK	n = 0: PASS/RTRY protocol n = 1: ACK/NAK protocol	
	Confirm	RP08	08n		
Adding checksum	Change	WP39n	OK	n = 0: Do not add n = 1: Add	
	Confirm	RP39	39n		
Header	Change	WP51hhh...	OK	hhh... = Header (up to five characters) * To set a header, use HEX (hexadecimal) codes. * hhh... = FF: Header is not set.	00, 02, 05, 06, 10, 12, 14
	Confirm	RP51	51hhh...		
Delimiter	Change	WP52hhh...	OK	hhh... = Delimiter (up to five characters) * To set a delimiter, use HEX (hexadecimal) codes. * hhh... = FF: Delimiter is not set.	
	Confirm	RP52	52hhh...		

Tips

To set the header and delimiter, send the following command:

Example

Set the communication data format to <SOH> 01 bar code data A <CR>.

SOH 0 1 A CR

WP51013031 WP52410D

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

■ Setting communication parameters 2 (only when PLC link is used)

Function	Command		Response	Description	Error code
PLC link model	Change	WP36n	OK	n = 0: PLC link disabled n = 1: SYSNAC-C n = 2: MELSEC-A n = 3: KV n = 4: MELSEC-A (File register is used.)	00, 02, 05, 07, 14
	Confirm	RP36	36n		
Trigger input through PLC link	Change	WP37n	OK	n = 0: Disable n = 1: Enable	
	Confirm	RP37	37n		
DM head address	Change	WP45nn	OK	nn = 00 to 99 (0000 to 9900)	00, 02, 05, 09, 14
	Confirm	RP45	45nn		
PLC / station number	Change	WP47nn	OK	nn = 00 to 31	
	Confirm	RP47	47nn		
File register block number	Change	WP46nnn	OK	nnn = 000 to 255	
	Confirm	RP46	46nnn		

■ Setting communication strings

Function	Command		Response	Description	Error code
Setting partition mark when additional information is used.	Change	WP50hh	OK	hh = Partition mark (1 character) * Specify the mark in HEX (hexadecimal) code.	00, 02, 05, 06, 10, 12, 14
	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) * Specify the mark in HEX (hexadecimal) code. * To set no intermediate delimiter, hhh = FF.	
	Confirm	RP54	54hhh...		

■ 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 1: Enable	00, 02, 05, 07, 14
	Confirm	RP09	09n		
Setting OK/NG output duration	Change	WP40nnn	OK	nnn= 001 to 255 (by 10 ms step)	00, 02, 05, 09, 14
	Confirm	RP40	40nnn		
Registration of preset data for compare	Change	WP68aaa...	OK	aaa...= Preset data (Up to 32 characters) * For CODE128, see P.136 to 137. * To delete the preset data, send WP68.	00, 02, 05, 12, 13, 14, 17, 18
	Confirm	RP68	68aaa...		

Tips

To register the preset data, send the following command.

Example

Register "ABC123" as preset data.

WP68ABC123

Chapter 6

PLC Link

6.1 PLC Link

The PLC link enables read data to be directly stored in the internal memory of a PLC (programmable logic controller).

Since the BL-700 directly controls the PLC's memory, no program is required for data communication, resulting in a reduced number of programming steps.

As compared with the serial communication using a computer, the PLC link involves the following limitations:

- The BL-700 settings cannot be changed because the PLC link cannot send a command to the BL-700. However, the PLC link provides a reading control address to start/end reading.
- The PLC link cannot start the test mode.

6.1.1 List of PLCs used for PLC link

KEYENCE **KV series**	(Built-in CPU port) KV-10/16/24/40/80 KV-300* (Serial interface module) KV-L2*
Mitsubishi **MELSEC-A series**	(Built-in CPU port) A2CCPU24 A2CCPU24-PRF (Calculator link unit) AJ71C24 AJ71C24-Sx AJ71UC24 A0J2-C214-S1 A1SJ71(U)C24-R2/PRF/R4
OMRON **SYSMAC-C series**	(Built-in CPU port) C20H/28H/40H/60H C200HS(CPU21/23/31/33) C200HE(CPU42) C200HG(CPU43/63) C200HX(CPU44/64) (High-order link unit) C200H-LK201(-V1) C500-LK203 C500-LK201-V1 C120-LK201-V1 C200H-LK202(-V1) C120-LK202-V1 (Communication board) C200HW-COM02 C200HW-COM03 C200HW-COM04 C200HW-COM05 C200HW-COM06
OMRON **SYSMAC-CQM1 series**	(Built-in CPU port) CQM1(CPU21/41/42/43/44)
OMRON **SYSMAC-CV series**	(Built-in CPU port) CV500 CV1000 CV-M1 (High-order link unit) CV500-LK201

Note: KV-300 and KV-L2 are not available in Europe.

6.1.2 Devices used for PLC link

The BL-700 supports the following PLC devices.
To use MELSEC-A series, select the data register or file register.

The available memory areas of the MELSEC-A or SYSMAC-C may be smaller than the following data.
For details, see the instruction manual for the PLC being used.

PLC	Device name	Memory area
KV-10/16	Data memory	DM0000 to DM0999
KV-24/40/80	Data memory	DM0000 to DM1999
KV-300*	Data memory	DM0000 to DM8999
MELSEC-A	Data register	DM0000 to D8191
	File register	DM0000 to R8191 (according to the setting)
SYSMAC-C	Data memory	DM0000 to DM6143

The MELSEC-A series provides an extension file register.

When a block number is specified during the BL-700 setup, the specified extension file register is used.

When “0” is specified for the block number, the extension file register of the block number specified in the PLC program is used.

If no block number is specified (during the BL-700 setup and PLC programming), the file register incorporated in the CPU is used.

Note: KV-300 is not available in Europe.

6.2 Setting the BL-700 and PLC

6.2.1 Setting the BL-700 series

Use the BL-700 setup software to set the following. For the differences in setting due to the link unit or PLC type, see the next subsection “Setting the PLC”.

1. In “Comm settings-1”, set the following data.

- Match the baud rate, data length, parity and stop bits of the BL-700 to those of the PLC.
- Disable the RTS/CTS protocol.
- Disable the multi-drop link.

2. In “Comm settings-2”, set the following data.

- Type of the PLC
  When using the KV-L2* in Display Iinterface mode, set “SYSMAC-C” in the BL-700 settings.
- PLC trigger input area
- DM head address
- PLC unit No./station No.
- Set whether or not the final register is used.

Note: KV-L2 is not available in Europe.

6.2.2 Setting the PLC

Set the PLC or link unit as follows:

Setting KV series/handheld programmer port

1. The KV series’ RS-232C port must always be set to the following values:

   • Baud rate : 9600 bps
   • Data length: 8 bits
   • Parity: Even
   • Stop bit length: 1 bit

   Set the RS-232C communication parameters of the BL-700 according to the above settings. Set the BL-700’s communication mode to “KV”.

2. No other parameters need to be set.

Settings for KV-L2/KV mode*

1. Set the KV-L2's communication mode to "KV mode".
   Set the BL-700's communication mode to "KV".

2. The KV mode must be always set to the following values:

   • Baud rate : 9600 bps
   • Data length: 8 bits
   • Parity: Even
   • Stop bit length: 1 bit

   Set the RS-232C communication parameters of the BL-700 according to the above settings.

3. Set the station number to "00".

4. To use the KV-L2 port 2, set the port 2 selector switch to "RS-232C" or "RS-422A".

5. No other parameters need to be set.

Note: KV-L2 is not available in Europe.

Settings for KV-L2/Display Interface mode

1. Set the KV-L2's communication mode to "Display Interface" mode. To use link mode, select "SYSMAC-C" for the BL-700's setting.

2. Set the baud rate, data length, parity and stop bit length according to the RS-232C communication parameters of the BL-700.

3. Set the station number to "00".

4. To use the KV-L2 port 2, set the port 2 selector switch to "RS-232C" or "RS-422A".

5. No other parameters need to be set.

Setting MELSEC-A series

1. Set the RS-232C communication parameters (baud rate, data length, parity and stop bit length) according to the BL-700's settings.

2. Set the station number according to the BL-700's setting.

3. Set the mode to "Protocol Type 4 ".

4. Set the main channel to "RS-232C".

5. Set "Checksum" to "Enable".

6. Set "Write during running" to "Enable".

7. Set "Selecting computer link/multi-drop" to "Computer link" (for the AJ71UC24 only).

Setting SYSMAC-C series

1. Set the RS-232C communication parameters (baud rate, data length, parity and stop bit length) according to the BL-700's settings.
2. Set the unit number according to the BL-700's setting.
3. Set the command level to "Level 1, 2, 3".
4. Set "1:1/1:N" to "1:N".
5. Set "I/O port" to "RS-232C".
6. Set "Trigger input" to "Internal".
7. Set "Supply 5 V" to "Disable".
8. Set "CTS" to "0 V (Normally ON)."

* The "I/O port", "Trigger input", "Supply 5 V" and "CTS" parameters may not be provided depending on the type of link unit.

6.3 Device Assignment

The data areas used to control the BL-700 are provided in the PLC's internal memory (D areas or DM areas).
When a device head address is specified on the "PLC SETUP" screen in the BL-700 setup software, the device numbers are automatically assigned based on the specified head address.

Data memory head address

[Specified head address] +00 indicates the area where the bar code data is stored.
[Specified head address] +01 to +03 are reserved areas and cannot be assigned for the bar code data.
[Specified head address] +04 to +06 are the areas used by the PLC to send a reading trigger to the BL-700. The method for using the areas varies depending on the BL-700 scan method, "Level signal trigger" or "One-shot signal trigger". These areas are not assigned if you set "Reading trigger input area" to "Disable" in the BL-700 setup software. (In this case, these areas can be used for other purposes.)

Address	Description	Reference page
+00	Data memory head address for Code 1	P.111
+01	Reserved area for Code 2	P.111
+02	Reserved area for Code 3	P.111
+03	Reserved area for Code 4	P.111
+04	Reading trigger area	P.111 to 113
+05	Reading trigger response area * Only when "Level signal trigger" is selected.	
+06	One-shot trigger time setup area * Only when "One-shot signal trigger" is selected.	

When using the BL-700 in multi-label read mode 3, addresses +00 to +03 are used as the data memory head addresses for Codes 1 to 4, respectively. Data is not stored in the areas for which the code type is not set.

Data memory areas

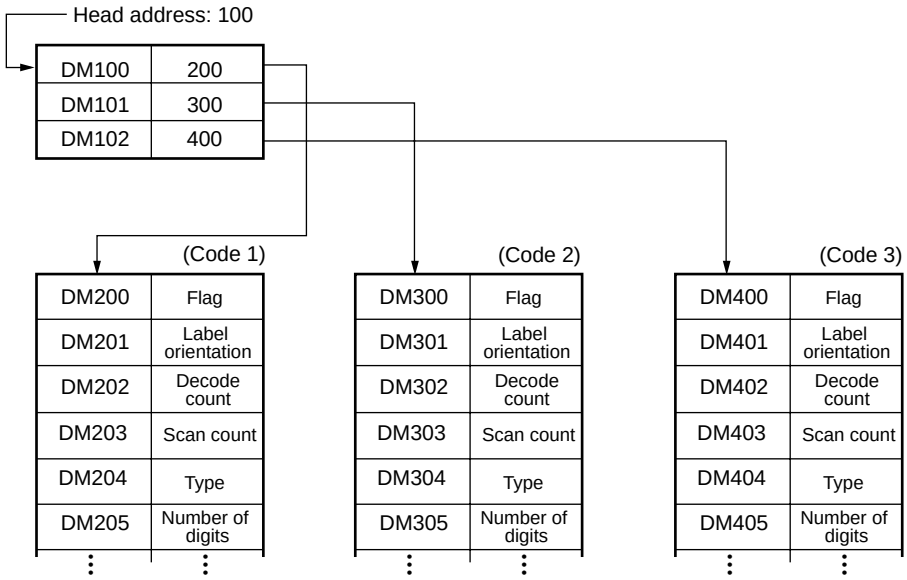
Bar code data read by the BL-700 is stored in the areas starting from “+00”. (Based on the specified data memory head address). In the following table, “A” indicates the data memory head address.

Address	Description	Reference page
A+00	Data memory flag area	P.113
A+01	Label orientation	P.114
A+02	Decode count	
A+03	Scan count	
A+04	Bar code type	
A+05	Number of digits of bar code data	P.114
A+06	1st digit of bar code data	
A+07	2nd digit of bar code data	
A+08	3rd digit of bar code data	
⋮	⋮	
A+69	64th digit of bar code data	

Note: These data areas accept up to 64 digits. However, the BL-700 series can read only 32 digits. When the bar code type is CODE128 and the start character is CODE-C, up to 64 digits can be read.

Example

When the bar code types are set in Codes 1 to 3 in multi-label read mode 3 (Code 4 is not set)



Detailed description of device assignment

+00 to +03
Data memory head address

Specify the head address of the areas where the read data is stored. (Specify the head address as binary data.)

When using the BL-700 in multi-label read mode 3, +00 to +03 are used as the data memory head address for Codes 1 to 4, respectively. However, data is not stored in the area for which the code type is not set.

+04 to +06
Reading trigger area

These areas are used to send the trigger input signal to the BL-700 to start reading bar code data.
When connecting a photoelectric sensor for trigger input in the BL-700 series, do not use these areas.
These areas are not assigned if you set “Reading trigger input area” to “Disable” in the BL-700 setup software. (In this case, these areas can be used for other purposes.)

The method for using the areas varies depending on the BL-700 scan method, “Level signal trigger” or “One-shot signal trigger”. Each case is described below.

■ When “Level signal trigger” is set

“Reading trigger area” at the +04 address is used to trigger the BL-700 to start reading the data (turn on the laser beams).
“Trigger input response area” at the +05 address is used to check whether the data at +04 was sent correctly to the BL-700. When the BL-700 recognizes the +04 address (which means that the process has been completed), it returns a “1” to the +05 address.

Address	Description	Data
+04	Reading trigger area	1 ... Trigger ON 0 ... Trigger OFF
+05	Trigger input response area	1 ... Process completed 0 ... Process not completed
+06	Reserved	Reserved

● **Operating procedure**

1. Set the +05 address to “0”.

2. To trigger the BL-700 to start reading (to turn the trigger ON), set the +04 address to “1”.

3. When the BL-700 recognizes the change in the +04 address, it returns a “1” to the +05 address. The BL-700 then starts reading the data.

4. When a “1” is returned to the +05 address, it indicates that the BL-700 succeeded in the trigger ON function. If a “1” is not returned, the BL-700 has not recognized the +04 address yet. Do not immediately reset the +04 address to “0”.
   After confirming that a “1” has been returned to the +05 address, reset the address to “0”.

5. After reading the bar code data, the BL-700 writes new data in A+05 to A+69.

6. To turn the trigger OFF, reset the +04 address to “0”.

7. When the BL-700 recognizes the change in the +04 address, it returns a “1” to the +05 address. The trigger then turns OFF.

8. When a “1” is returned to the +05 address, it indicates that the BL-700 has successfully turned the trigger OFF. If a “1” is not returned, the BL-700 has not recognized the +04 address yet. Do not immediately set the +04 address to “1”. After confirming that the +05 address has been set to “1”, reset the address to “0”.

9. If a reading error occurs, a reading error code is written in A+05 to A+69.

Note: The +05 address monitors whether or not the BL-700 successfully recognized the +04 address. When quickly turning the trigger ON/OFF at the +04 address, the BL-700 may overlook the change in the +04 address and fail to turn the trigger ON/OFF. If this occurs, change the program so that the +05 address can confirm that the BL-700 recognized the +04 address.

If your system does not have the problem described above, monitoring by the +05 address is not required.

■ **One-shot signal trigger**

The +04 address “Reading trigger area” triggers the BL-700 to start reading (turn ON the laser).
The +05 address “One-shot signal trigger time setup area” sets the scan time in one-shot signal mode (⇨ *see P.31*). When “0” is set for this address, the value set by the BL-700 setup software is used as the scan time.

Address	Description	Data
+04	Reading trigger area and response area	1: Trigger ON 0: Trigger OFF
+05	Reserved	Reserved
+06	One-shot signal trigger time setup area	0: Use the value set by the BL-700 setup software. 1 to 255 (binary) : 100 ms to 25.5 s

* When the BL-700 recognizes “1”, “0” is set to the +04 address.

● **Operating procedure**

1. To trigger the BL-700 to start reading, set the +04 address to “1”.

2. When the BL-700 recognizes the +04 address, it returns a “0” to the +04 address. The BL-700 then starts reading the data.

3. The BL-700 continues reading for the “one-shot signal trigger time” set at the +06 address.

4. When the BL-700 has read all the bar codes, it writes the new data in A+05 to A+69. If a reading error occurs, the BL-700 writes a reading error code in A+05 to A+69.

A+00 (A is the head address in which the data specified in +00 to +03 is stored.)
Memory data flag areas

These areas are used to flag that the bar code data has been stored. The following two methods are available depending on the application.

■ **Real time control**

- To specify the flag areas, use “0” or “1”.
- While the BL-700 is reading and writing the bar code data in the PLC’s memory, the flag area is set to “1”.
- When data writing is completed, the flag area becomes “0”. This indicates that new data has been stored in the A+05 to A+69 addresses. When the A+00 address is “0”, the stored data is effective.
- When the interval of bar code reading with the BL-700 is shorter than that of communication with the connected PLC, data that has not been written into the specified area is retained in the BL-700 transmission buffer. (For the capacity of the transmission buffer, see p.86.) If the amount of retained data exceeds the buffer capacity, the entire contents of the buffer is cleared and an “OVER” code is stored in the memory data area (A+05 to A+09). If a buffer “OVER” error occurs, the BL-700 halts operation, but then restores operation once the “OVER” code has been stored.

Example 1

Normally, the A+00 address is set to “0”.
While the BL-700 is writing data, the flag area is “1”. When the flag area becomes “0”, the data stored in the A+05 to A+69 addresses can be processed.

Example 2

Normally, the A+00 address is set to “1”.
When data writing is completed, the flag area becomes “0”. The data stored in the A+05 to A+69 addresses can be processed.
Set the A+00 address to “1” immediately after data processing is completed. This enables the BL-700 to use the point at which the A+00 address becomes “0” as the trigger for writing new data.

Note: When the BL-700 continuously reads bar codes, the real time processing mode may replace stored data with new data before the new data is processed in the PLC. To prevent this, use the sequential processing mode as shown below.

■ **Sequential processing**

- To specify the flag areas, use “2” and “3”.
- When the A+00 address is “2”, new data can be stored.
- When data writing is completed, the flag area becomes “3”, and new data has been stored in the A+05 to A+69 addresses.

- After data processing is completed, set the flag area to “2”. Writing new data is impossible until the flag area is set to “2”.
- Data that cannot be stored in the specified areas is retained in the BL-700 transmission buffer. (For the capacity of the BL-700 transmission butter, see p.88.) If the amount of retained data exceeds the buffer capacity, the entire contents of the buffer is cleared and an “OVER” code is stored in the memory data area (A+05 to A+09). If a buffer “OVER” error occurs, the BL-700 halts operation, but then restores operation once the “OVER” code has been stored.

A+01 to A+04
Additional data area

The label orientation, decode count and other additional data are stored in these areas.

Address	Description	Data
A+01	Label orientation	0: Reading error 1: Normal orientation 2: Reverse orientation
A+02	Decode count	0 to 9999 (binary)
A+03	Scan count	0 to 9999 (binary)
A+04	Bar code type	0: CODE 39 1: ITF 2: Industrial 2of5 3: Coda bar 4: EAN/UPC 5: CODE128 6: COOP 2of5 7: Reading error 8: CODE 93

A+05 to A+69
Data memory area

- The number of digits of the data is stored in the +05 address.
- The read bar code data is stored in the A+06 to A+69 addresses using the ASCII codes (hexadecimal numbers in two digits) by the digit.

  ➪ *See the ASCII code table in P.140.*
- If a read error occurs, the “ERROR” code is stored in the corresponding area. (The reading error code can be easily changed in the BL-700 settings.)
- If a buffer overflow error occurs with the BL-700, the “OVER” code is stored in the corresponding area.

  ➪ *See P.113.*
- If an error occurs in the main unit, the “MOTOR” code is stored in the corresponding area.

Address	Description	Data
A+05	Number of digits of bar code data (1 to 64)	1 to 64 (binary) ... Number of digits
A+06	1st digit of read data	A single ASCII code
A+07	2nd digit of read data	A single ASCII code
⋮	⋮	⋮
A+69	64th digit of read data	A single ASCII code

Note 1: When test mode is enabled, the BL-700 does not write data.

Note 2: These data areas accept up to 64 digits. However, the BL-700 can read only 32 digits. When the bar code type is CODE128 and the start character is CODE-C, up to 64 digits can be read.

Example

When the BL-700 reads the bar code “KE12”

A+05	4	← Number of digits
A+06	$004B	Stored in ASCII codes (hexadecimal)
A+07	$0045	
A+08	$0031	
A+09	$0032	

Example

When the BL-700 generates a reading error (ERROR)

A+05	5	← Number of digits
A+06	$0045	Stored in ASCII codes (hexadecimal)
A+07	$0052	
A+08	$0052	
A+09	$004F	
A+10	$0052	

6.4 PLC Link Error

When a communication error occurs during PLC link, the BL-700 stops communications. In this case the bottom STABILITY LED flashes.

When this error occurs with the PLC link, check the following points:

1. Check if the RS-232C communication parameters (baud rate, data length, parity and stop bit) for the PLC are matched with the N-400's settings.

2. Check if the PLC link is set to "Use" in the communication parameters 2 setup.

3. Check if the PLC's settings are correct. (☞ *See P.106.*)

4. Check if the cable connections are correct, or if any cable is disconnected. Referring to pp.12 to 14 or pp.20 to 22 of this manual, check the connections using a multimeter.

5. Check if the device setting range does not exceed the available data memory areas of the PLC.
   If the data memory areas used for the BL-700 do not exist in the PLC, communication is impossible.

6. Check if the link unit operates normally.

To re-start the PLC link, press the test switch.

For the settings of the link unit, see the instruction manual for the link unit being used.

6.5 Communication Time

■ Time required data transmission

The time required for data transmission from the BL-700 to the PLC is as follows: This communication time may change depending on the PLC's scan time and the model of the PLC.

* When the RS-232C communication baud rate is 9600 bps:

Number of data digits	MELSEC-A	SYSMAC-C	KV (KV mode)
10	Approx. 220 ms	Approx. 330 ms	Approx. 440 ms
20	Approx. 270 ms	Approx. 380 ms	Approx. 680 ms
32	Approx. 320 ms	Approx. 460 ms	Approx. 920 ms

■ Communication time to start reading using reading trigger area

To control the BL series' reading operation using the reading trigger area, enter the trigger ON command on the PLC, and obtain the time duration until the command is received by the BL-700.

* When the RS-232C communication baud rate is 9600 bps:

MELSEC-A	SYSMAC-C	KV (KV mode)
Approx. 60 ms	Approx. 80 ms	Approx. 30 ms

Appendices

Appendix A Specifications

Appendix A.1 Specifications

BL-700/701/740/741/780/781

Model			BL-700	BL-701	BL-740	BL-741	BL-780	BL-781
Type			High-resolution		Middle-distance		Long-distance	
Light source			Visible red semiconductor laser (wavelength 650 nm)					
	Maximum output		1.4 mW		1.8 mW		2.0 mW	
	Pulse width		FDA: 50 µs, IEC: 91 µs					
	Class	FDA	Class II					
		IEC 825-1 11.1993	Class 2					
		DIN EN 60825-1 07.1994	Klasse 2					
Scan method			Single	Raster	Single	Raster	Single	Raster
Reading distance			160 to 370 mm (When narrow width is 0.5 mm)		150 to 750 mm (When narrow width is 1.0 mm)		200 to 1200 mm (When narrow width is 2.0 mm)	
Reading bar width [1]			0.15 to 1.0 mm * 0.19 to 1.0 mm for CODE 93 and CODE 128		0.25 to 2.0 mm * 0.33 to 2.0 mm for CODE 93 and CODE 128		0.5 to 2.0 mm * 0.5 to 2.0 mm for CODE 93 and CODE 128	
Maximum reading label width [2]			310 mm (When reading distance is 335 mm)		600 mm (When reading distance is 680 mm)		1010 mm (When reading distance is 1080 mm)	
PCS			0.6 or more (white reflection rate 75% or more)					
Scan count			700 scans/second					
Supported codes			CODE39, ITF, Industrial 2-of-5, COOP 2-of-5, Codabar CODE128, CODE93, EAN / UPC(A•E)					
Reading digit			32 digits max. [3]					
Timing input			Non-voltage input (relay contact, solid state) * TTL input is also available.					
OK/NG output	Output type		NPN open collector					
	Rating load		24 VDC, 30 mA					
	Leakage current at OFF		0.1 mA max.					
	Residual voltage at ON		0.5 V max.					
Serial interface	Applied standard		In accordance with RS-232C					
	Synchronization		Start-stop synchronization					
	Transmission code		ASCII code					
	Baud rate		600, 1200, 2400, 4800, 9600, 19200, 31250, 38400 bit/s					
	Data length		7/8 bits					
	Parity check		None/even/odd					
	Stop bit length		1/2 bits					
Enclosure rating			IP-65					
Ambient light			Sunlight: 10000 lx Incandescent lamp: 6000 lx		Sunlight: 10000 lx Incandescent lamp: 4000 lx		Sunlight: 8000 lx Incandescent lamp: 3000 lx	
Ambient temperature			0 to 40°C (32 to 104°F), No freezing					
Relative humidity			35 to 85%, No condensation					
Operating atmosphere			No dust or corrosive gas present					
Vibration			10 to 55 Hz, amplitude 1.5 mm, 2 hours each in X, Y and Z directions.					
Power supply voltage			5 VDC ±5%					
Power consumption			510 mA max.					
Weight			Approx. 300 g (including cable)					

1. Reading bar width indicates the range of readable narrow bar width when the bar code type is CODE39.
2. Maximum reading label width includes the bar code margin (quiet zone).
3. When start/stop character of CODE128 is CODE-C, up to 64 digits are allowed.

Note: The internal BL settings are written to the built-in EEPROM (erasable up to 100,000 times).

Raster width specification

In raster scan mode, the BL-700 scans multiple positions of the bar code by swinging the laser beams up and down. Thus, the bar code can be read even if it has a stain or missing part.
For the up-down width of raster scan (raster width), see the table below:

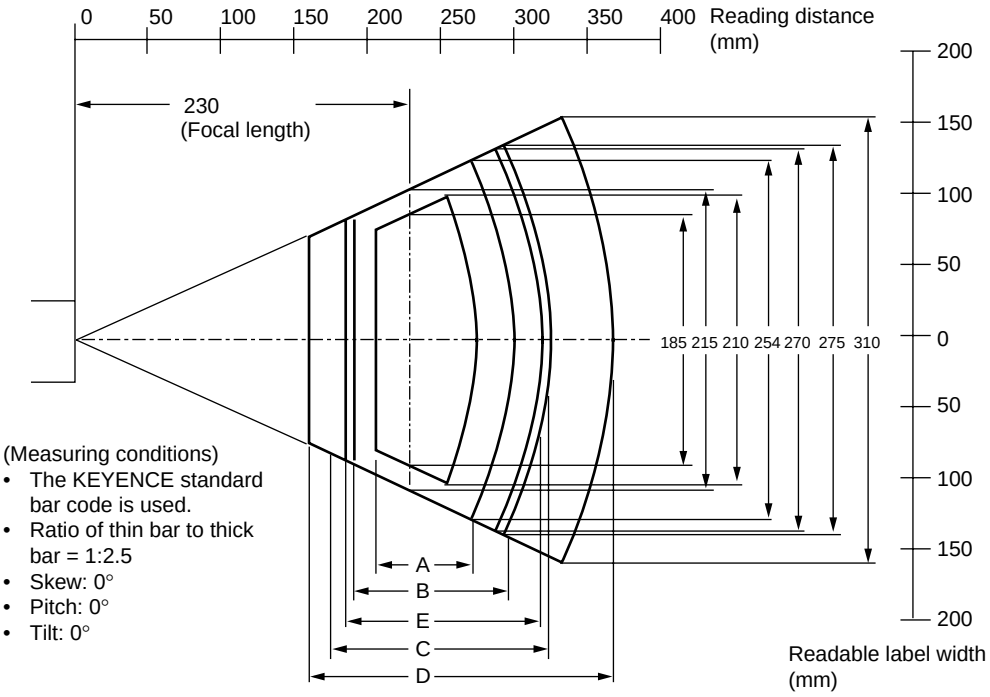
Model	Reading distance	Raster width
BL-701	200 mm	10±1 mm
BL-741	300 mm	20±2 mm
BL-781	450 mm	30±3 mm

Appendix A.2 Reading Range Characteristics (Typical)

■ **BL-700/701**

Unit: mm

	Bar code type	Narrow bar width	Reading distance	Max. readable label width
A	CODE39	0.15	205 to 275	210
B	CODE39	0.19	190 to 300	254
C	CODE39	0.25	175 to 325	275
D	CODE39	0.5	160 to 370	310
E	UPC/EAN1x	0.33	185 to 320	270



* For the reading distance measuring reference, see P.26.

Note 1: The readable label width means a bar code length including the right and left margins (quiet zones) of a bar code.

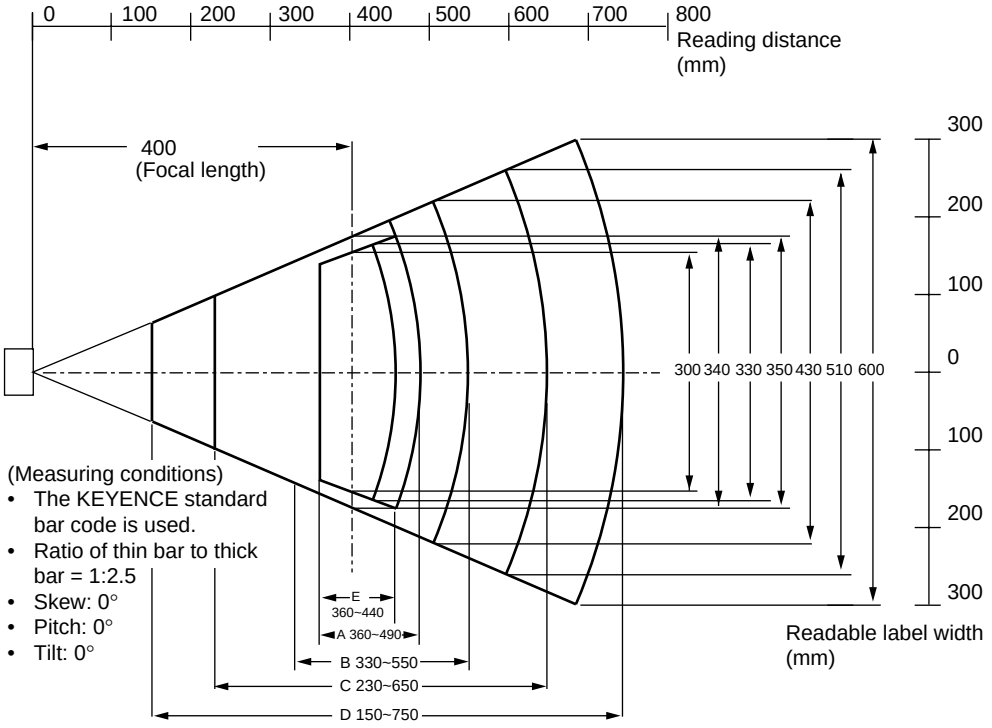
Note: 2 Even if a bar code is within the above reading range, it may not be read depending on the bar code quality. Set the optimum reading position based on enough reading tests.

Note 3: Normally, the reading distance should be set to 230 mm (focal length). In this case, the maximum readable label width is 215 mm (when the narrow bar width is 0.19 mm or more).

■ **BL-740/741**

Unit: mm

	Bar code type	Narrow bar width	Reading distance	Max. readable label width
A	CODE39	0.25	360 to 440	330
B	CODE39	0.32	360 to 490	350
C	CODE39	0.5	330 to 550	430
D	CODE39	1	230 to 650	510
E	UPC/EAN1x	1 time	150 to 750	600



Note 1: The readable label width means a bar code length including the right and left margins (quiet zones) of a bar code.

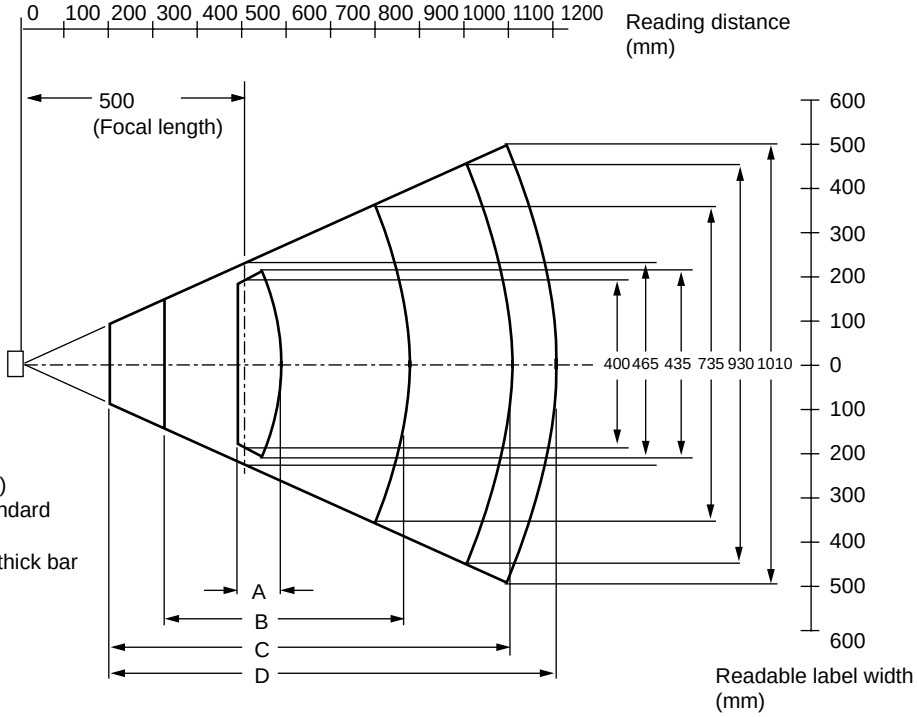
Note: 2 Even if a bar code is within the above reading range, it may not be read depending on the bar code quality. Set the optimum reading position based on enough reading tests.

Note 3: Normally, the reading distance should be set to 230 mm (focal length). In this case, the maximum readable label width is 215 mm (when the narrow bar width is 0.19 mm or more).

■ BL-780/781

Unit: mm

	Bar code type	Narrow bar width	Reading distance	Max. readable label width
A	CODE39	0.32	480 to 580	435
B	CODE39	0.5	320 to 870	735
C	CODE39	1.0	200 to 1100	930
D	CODE39	2.0	200 to 1200	1010



(Measuring conditions)
- The KEYENCE standard bar code is used.
- Ratio of thin bar to thick bar = 1:2.5
- Skew: 0°
- Pitch: 0°
- Tilt: 0°

* For the reading distance measuring reference, see P.28.

Note 1: The readable label width means a bar code length including the right and left margins (quiet zones) of a bar code.

Note: 2 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.

Note 3: Normally, the reading distance should be set to 500 mm (focal length). In this case, the maximum readable label width is 465 mm (when the narrow bar width is 0.5 mm or more).

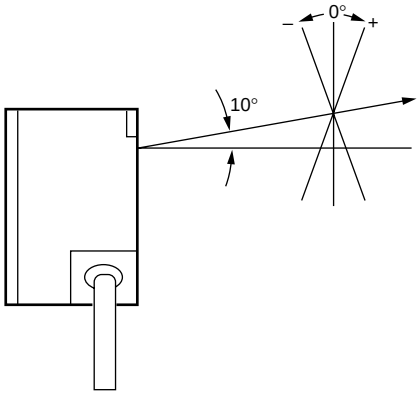
Appendix A.3 Angular Characteristics (Typical)

Model	Narrow bar width	Skew	Pitch	Tilt
BL-700/701	0.15 mm	-70° to -20°, -5° to +55°	±35°	±50°
	0.19 mm	-70° to -20°, -5° to +55°	±45°	±50°
	0.25 mm	-70° to -20°, -5° to +55°	±50°	±50°
	0.5 mm	-70° to -20°, -5° to +55°	±55°	±50°
BL-740/741	0.25 mm	-70° to -20°, -5° to +55°	±35°	±30°
	0.32 mm	-70° to -20°, -5° to +55°	±45°	±50°
	0.5 mm	-70° to -20°, -5° to +55°	±55°	±50°
	1.0 mm	-70° to -20°, -5° to +55°	±55°	±30°
BL-780/781	0.32 mm	-60° to -20°, -5° to +45°	±20°	±15°
	0.5 mm	-70° to -20°, -5° to +50°	±40°	±50°
	1.0 mm	-70° to -20°, -5° to +50°	±50°	±50°

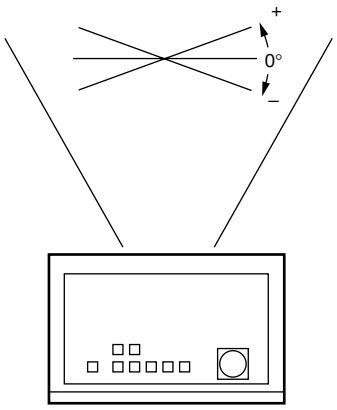
Measuring conditions
- Bar code: KEYENCE standard bar code
- Reading distance: 230 mm (BL-700/701)
  380 mm (BL-740/741)
  500 mm (BL-780/781)

Note: The skew angle of -20° to -5° is the specular reflection range. In this range, bar codes cannot be read, or reading error may occur. Be sure not to mount the BL-700 series at the above skew angles.

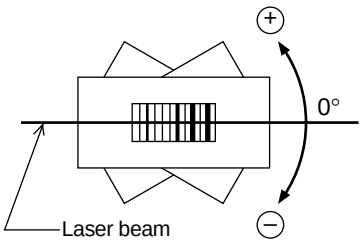
Skew



Pitch



Tilt



Appendix B 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	0.5 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 (Up to 31 units can be connected. Max. cable extension: 1.2 km)
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, 2 hours respectively
Noise immunity		1000 V p-p, 1 μs (Power line)
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)

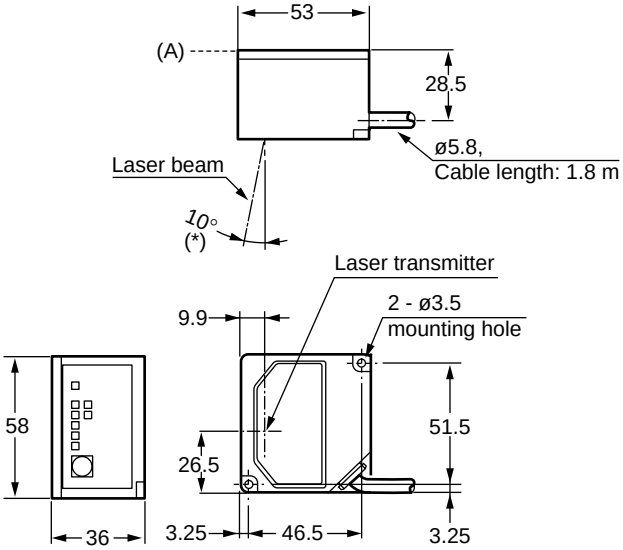
Note: This product is not available in Europe.

Appendix C BL-U2, N-42 Specifications

Model		BL-U2	N-42
Connectable bar code reader		BL-500 series, BL-180 series, BL-700 series	
Power supply for bar code reader		5 VDC ±5% (630 mA)	
Trigger input	Input rating	15 to 26VDC, 10 mA max.	
	Maximum 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		Conforms to EIA RS-232C.	RS-422A (Maximum extension distance: 1.2 km)
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, 2 hours respectively	
Power supply voltage		24 VDC $^{+10\%}_{-20\%}$	
Current consumption		250 mA	260 mA max
Weight		Approx. 80 g	Approx. 100 g

Appendix D Dimensions

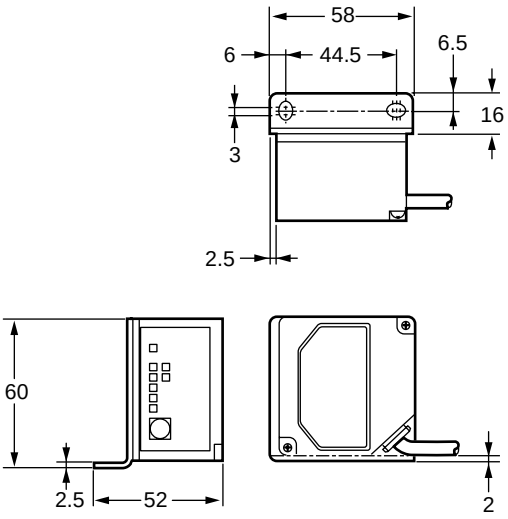
■ BL-700/701/740/741/780/781



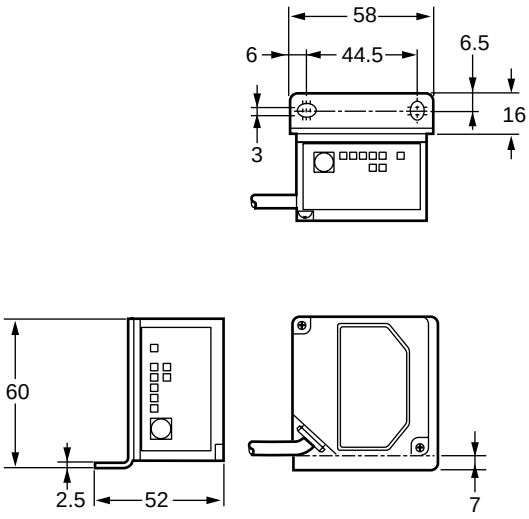
* Laser beam emission angle is 10°±0.5° from perpendicular to plane (A).

■ BL-700/701/740/741/780/781 (Mounting bracket)

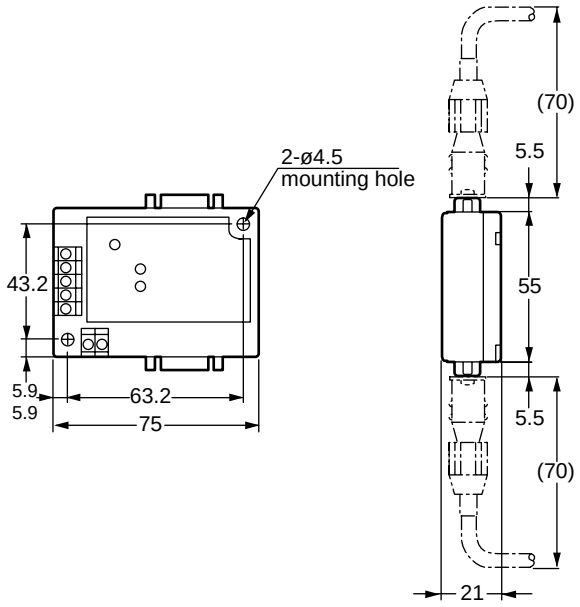
• Vertical scanning



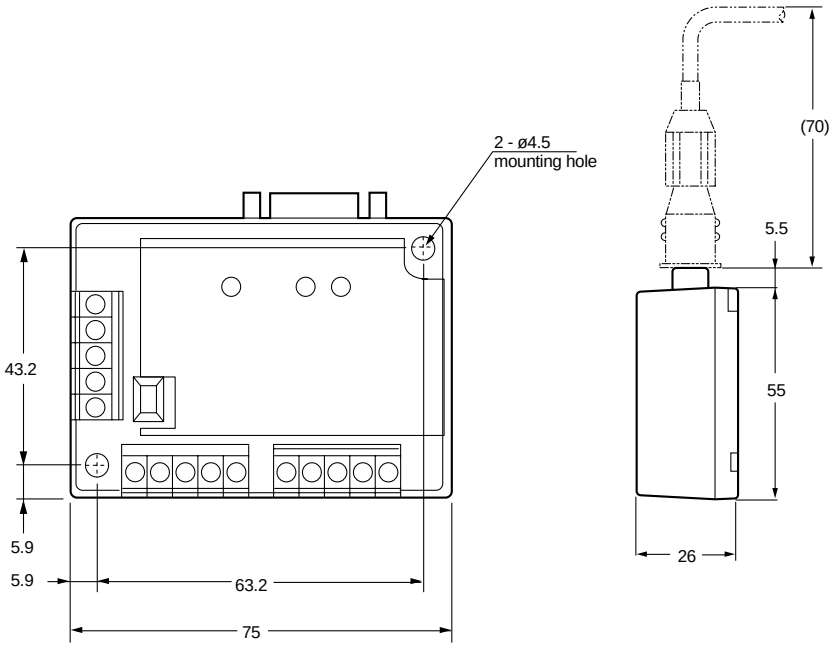
• Horizontal scanning



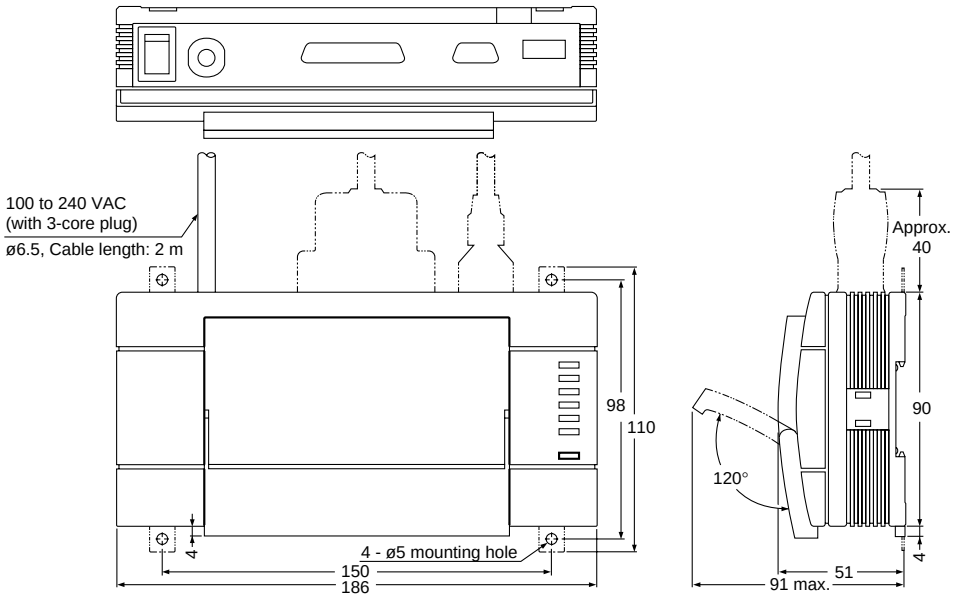
■ **BL-U2**


2-ø4.5
mounting hole
43.2
5.9
5.9
63.2
75
(70)
5.5
55
5.5
(70)
21

■ **N-42**


2 - ø4.5
mounting hole
43.2
5.9
5.9
63.2
75
(70)
5.5
55
26

■ **BL-U1***



Note: BL-U1 is not available in Europe.

Appendix E 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-700.
Only the QUIT command can be sent by pressing **[Q]**.
Set the BL-700 as follows:

- Header: [STX]
- Delimiter: [ETX]
- Handshaking protocol: No handshaking or PASS/RTRY handshaking
- Baud rate: 9600 bps, 7 bit, 1 stop bit, Even parity

```
100 '***BL-700 Sample Program ********************************************
110  CLS 3
120  DAT$="":RD$="":CM$=""
130  OPEN "COM1:9600, E, 7, 1, RS, CS, DS, CD " FOR RANDOM AS #1
140  '***Clear Buffer*********************************************
150  A=LOC(1)
160  IF A<>0 THEN R$=INPUT$(1,#1) :GOTO 140
200  '
210 '***Main Routine**********************************************
220  K$=INKEY$
230    IF K$<>"" THEN GOSUB 410
240  A=LOC(1)
250    IF A<>0 THEN GOSUB 320
260  GOTO 210
310 '
320 '***Receive Data**********************************************
330    IF RD$=CHR$(&H02) THEN RD$=""
340    IF RD$=CHR$($H03) THEN GOSUB 710 :RETURN  :GOTO 210
350    IF RD$=CHR$($H0D) THEN GOSUB 610  :RETURN  :GOTO 210
360  DAT$=DAT$+RD$
370 RETURN
400 '
410 '***Send Command*********************************************
420  IF K$=CHR$(&H0D) THEN 470
430  IF K$="Q" AND CM$="" THEN CM$="QUIT":GOTO 470
440    PRINT K$;
450    CM$=CM$+K$
460  RETURN
470  '
480  PRINT #1, CM$;CHR$(&H0D);
490  PRINT:PRINT CM$;"command is sent"
500  CM$=""
510 RETURN
600 '
610 '***Display response data to the command*******************
620  PRINT DAT$ ;"is sent back"
630  DAT$=""
640 RETURN
700 '
710 '***Display Bar Code Data*********************************
720  PRINT DAT$ ;"is read"
730  DAT$$=""
740 RETURN
```

Note: This sample program is shown for your reference only. Please note that this may not work correctly depending on the version of BASIC you use.

Appendix F Sample Program for the PLC Link

The sample program stores the read data in D105 (DM105) and subsequent DMs. You can change the program to suit your application.
Before using the sample program, check that your system meets the following requirements.

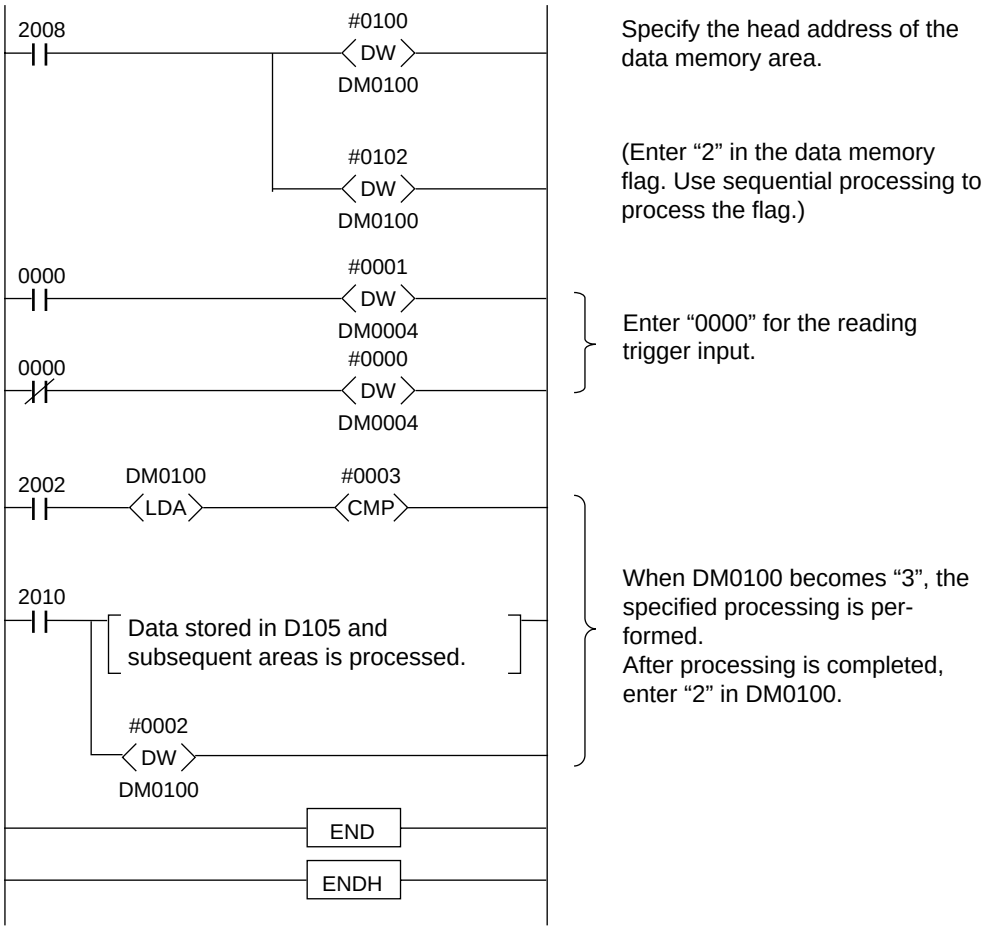
■ BL-700 settings

- The scan method is “level signal trigger”.
- Use the “PLC trigger area”.
- The DM head address is “0000”.

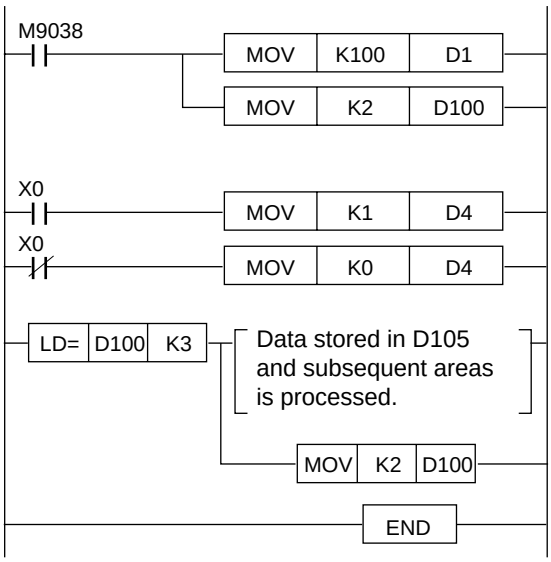
■ Processing of data memory flag ... Sequential processing

* This sample program uses the level signal trigger. However, it does not use the +05 trigger input response area to check if the BL-700 successfully recognized the +04 reading trigger area.

■ Program for the KV Series



■ Program for the MELSEC-A Series

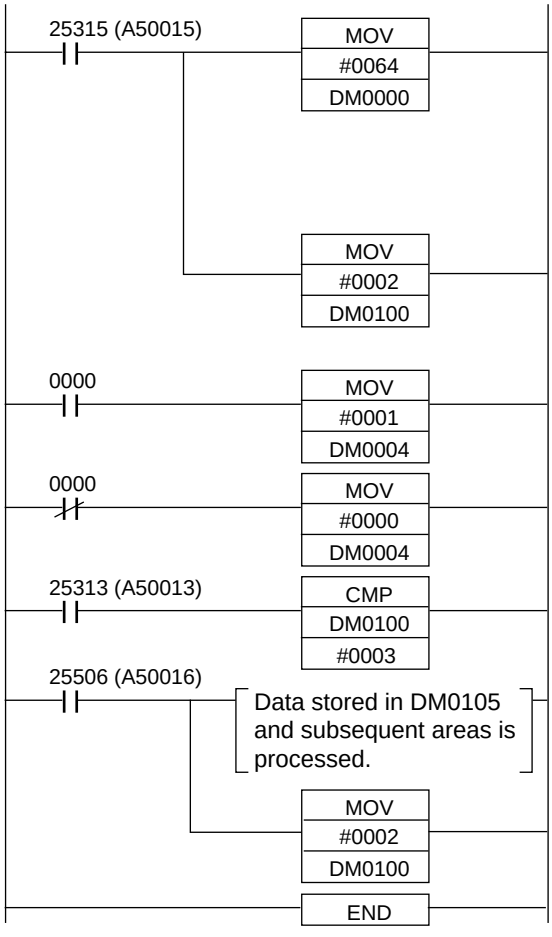


Specify the head address of the data memory area.
(Enter “2” in the data memory flag. Use sequential processing to process the flag.)

Enter “X0” for the reading trigger input.

When D100 becomes “3”, the specified processing is performed. After processing is completed, enter “2” in D100.

■ Program for the SYSMAC-C



Specify the head address of the data memory area (DM100).
The BL-700 processes data as binary data. Specify each DM number in binary format.

(Enter “2” in the data memory flag. Use sequential processing to process the flag.)

Enter “0000” for the reading trigger input.

When DM0100 becomes “3”, the specified processing is performed. After processing is completed, enter “2” in DM0100.

( ) Shows the value for CV Series.

Appendix G 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 510 mA. Check the wiring of the power supply unit and the trigger input terminal.
  ➪ *See P.6 to 7.*

  Connecting the power supply unit with the reverse polarity may damage the BL series.
  If the BL-700 does not operate, contact KEYENCE.

- When using the power supply unit BL-U1, BL-U2, N-42 or N-48, check wiring of the power supply unit, power switch (for the BL-U1 only) and wiring of trigger input (see P.8 to 22).

- Check whether the laser stop command (LOCK, see P.92) 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 bottom 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 CODE93, see P.136.*
➪ *For CODE128, see P.137.*

Check the distance and angle between the BL-700 and bar code.

Check the distance and angle while referring to “Mounting angle and mounting distance” on page 26.

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 122 to 123.

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.

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 P. 23 to 25.*

Reading rate check mode is not 100%.

Check the previous item "Bar codes cannot be read".

Note: 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.

The setting data cannot be sent to the BL-700 using the BL-700 setup software.

Is the BL-700 set to "setting data send/receive waiting status"?

Press the TEST switch for 8 seconds to enter setting data send/receive waiting status. (The 1st, 3rd and 5th STABILITY LEDs from the top flash.) The BL-700 setup software [COM PORT] must be set as below:

- Baud rate: 9600 bit/s
- Data length: 7 bits
- Parity: Even
- Stop bits: 1 bit

Does the RS-232C pin assignment of the BL-700 (BL-U1 or BL-U2) match that of the PC? Are the cables firmly attached?

Is power supplied to the BL-700, BL-U1 or BL-U2?

Is RS-232C used for the interface of the BL-U1 DIP switches? (➪ *See P.9.*)

Cannot communicate successfully when using the PLC link.

For details, *see P.116.*

Appendix H CODE93 Specifications

■ Setting of No. of Digits

- The start/stop character and check digit are not included in the number of digits.

■ Data Transmission

- The start/stop characters and check digit cannot be sent.
- Control codes are sent.

Note: Do not use CODE93 with control codes when using a multi-drop link. Communication errors may occur.

■ Registration of Preset Data

- When ! or ? is registered as preset data, it functions as the Preset "!" "?" Function, as described in P.45.
  Since CODE93 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 them from the preset "!" "?" function.
  To register \ as preset data, send \\.

  Example

  To register 123 \!?ABC as preset data, send the following command.
  ➪ *See P.102.*

  WP68123 \\\!\?ABC<CR>

- Control codes (data in 00h to 2Fh of the ASCII code table, such as <CR> and <STX>), the start/stop characters, and the check digit cannot be registered as preset data. (Data comparison is also impossible.)

Appendix I 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 18.
  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 P.102.*

  WP68123 \\\!\?ABC <CR>

- Control codes (data in 00h to 2Fh of the ASCII code table, such as <CR> 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.)

Appendix J Checksum Calculation Method

You can add a checksum to transmitted data. (The checksum cannot be added to a command or a response to a command.)

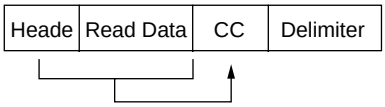
Adding a checksum enables incorrect data translation to be detected in the RS-232C communication. If the checksum does not match when the PASS/RTRY or ACK/NAK protocol is used, modify the program so that the “Request to resend” (RTRY or <NAK>) command is sent to the BL-700. To set the checksum, use the “PROTOCOL SETUP” screen of the BL-700 setup software. (The checksum cannot be added when the PLC link is used.)

Checksum calculation range and the position to add checksum

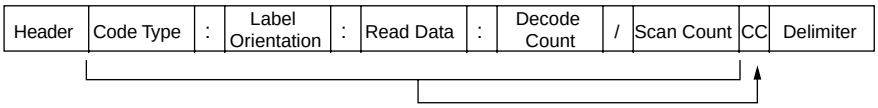
The checksum calculation is performed with all characters except for the header and delimiter. The checksum is added immediately before the delimiter.

CC = Checksum (2 ASCII code characters)

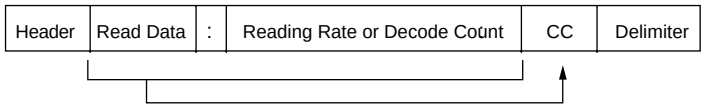
- Read data



- When using the data addition function



- Test mode



Checksum calculation method

Heade	ABC123	CC	Delimiter

Calculate the checksum (CC) in the above example.

Convert each character into the ASCII code as shown below, and express the result as 8-bit binary numbers.

Calculate the “Exclusive-OR” of the binary numbers of each bit.

ASCII code	Bit	
A → 41h →	0100	0001
B → 42h →	0100	0010
C → 43h →	0100	0011
1 → 31h →	0011	0001
2 → 32h →	0011	0010
3 → 33h →	0011	0011 ⊕
⇩	⇩	
0111	0000 ⇨	70h

* Based on the “Exclusive OR” logic, when an odd number of “1”s are present, the calculation result is “1”, and when an even number of “1”s are present, the calculation result is “0”.

Convert the calculated hexadecimal number into an ASCII code in two digits. The result obtained is the checksum.
Therefore, the checksum for the above example is “cc =70 (37h 30h).

Example

Header	ERROR	CC	Delimiter	CC=58

Header	KEYENCE	:	100 %	CC	Delimiter	CC=74

Tips

- Exclusive OR calculation formula
  Calculate the numbers of each bit, referring to the following formula:

  0 ⊕ 0 = 0
  0 ⊕ 1 = 1
  1 ⊕ 0 = 1
  1 ⊕ 1 = 0
  * ⊕ : Operator of Exclusive OR

- Conversion from hexadecimal number into binary number
  To convert ASCII codes into binary numbers, refer to the following table.

Hexadecimal number	0	1	2	3	4	5	6	7
Binary number	0000	0001	0010	0011	0100	0101	0110	0111

Hexadecimal number	8	9	A	B	C	D	E	F
Binary number	1000	1001	1010	1011	1100	1101	1110	1111

Appendix K ASCII Code Table

			High-order 4 bits							
	Hexadecimal		0	1	2	3	4	5	6	7
		Binary	0000	0001	0010	0011	0100	0101	0110	0111
Low-order 4 bits	0	0000	NUL	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	\	I	|
	D	1101	CR	←	–	=	M	]	M	}
	E	1110	SO	↑	.	>	N	^	n	~
	F	1111	SI	↓	/	?	O	_	o	del

Appendix L Setup Parameter List

Fill in the specified data for each parameter.
Copy the list for daily operation.

■ **Bar code setup**

Setup parameter		Code 1	Code 2	Code 3	Code 4
Code type		( )	( )	( )	( )
Maximum number of digits		( )	( )	( )	( )
Minimum number of digits		( )	( )	( )	( )
Send start/stop character (CODE39, Coda bar)		☐ Don't send ☐ Send	☐ Don't send ☐ Send	☐ Don't send ☐ Send	☐ Don't send ☐ Send
Start/stop character type (Coda bar)		☐ Lowercase ☐ Uppercase	☐ Lowercase ☐ Uppercase	☐ Lowercase ☐ Uppercase	☐ Lowercase ☐ Uppercase
Test check digit (CODE39, Coda bar, ITF)		☐ Don't test ☐ Test	☐ Don't test ☐ Test	☐ Don't test ☐ Test	☐ Don't test ☐ Test
Check digit type (Coda bar)		( )	( )	( )	( )
Send check digit (CODE39, Coda bar, ITF)		☐ Don't send ☐ Send	☐ Don't send ☐ Send	☐ Don't send ☐ Send	☐ Don't send ☐ Send
Read EAN (More than one can be selected.)		☐ EAN 13-digit ☐ EAN 8-digit ☐ UPC-E	☐ EAN 13-digit ☐ EAN 8-digit ☐ UPC-E	☐ EAN 13-digit ☐ EAN 8-digit ☐ UPC-E	☐ EAN 13-digit ☐ EAN 8-digit ☐ UPC-E
	Number of output digits of UPC-A	☐ 13 digits ☐ 12 digits	☐ 13 digits ☐ 12 digits	☐ 13 digits ☐ 12 digits	☐ 13 digits ☐ 12 digits
	Add "0" to UPC-E system code	☐ Don't add ☐ Add	☐ Don't add ☐ Add	☐ Don't add ☐ Add	☐ Don't add ☐ Add
CODE 128	**Check double character start pattern**	☐ Don't check ☐ Check	☐ Don't check ☐ Check	☐ Don't check ☐ Check	☐ Don't check ☐ Check
Set specified-digit output function		☐ Don't set ☐ Set	☐ Don't set ☐ Set	☐ Don't set ☐ Set	☐ Don't set ☐ Set
	Specified direction	☐ Forward ☐ Backward	☐ Forward ☐ Backward	☐ Forward ☐ Backward	☐ Forward ☐ Backward
	Number of effective digits	( )	( )	( )	( )
	Start digit	( )	( )	( )	( )
Set label reading in the specified direction		☐ Don't set ☐ Set	☐ Don't set ☐ Set	☐ Don't set ☐ Set	☐ Don't set ☐ Set
	Specified direction	☐ Normal ☐ Reverse	☐ Normal ☐ Reverse	☐ Normal ☐ Reverse	☐ Normal ☐ Reverse

■ Main setup

Read mode	☐ Single	Data send trigger	☐ After reading ☐ After trigger OFF
	☐ Multi 1 ☐ Multi 2	Double reading prevention time	( )
	☐ Multi 3		
Decode match count	( )		
Data addition function (more than one can be selected)	☐ Decode count ☐ Scan count (available only when decode count is added) ☐ Label orientation ☐ Code type		
Reading error code	( )		

■ Trigger Input Setup

Trigger input	**Selection method**	☐ Level signal trigger ☐ One-shot signal trigger	
	One-shot signal trigger time	( )	
	Input time	☐ 2 ms ☐ 10 ms	
	Input polarity	☐ N.O. ☐ N.C.	
	Start test mode at trigger input ON	☐ Don't start ☐ Start	☐ Reading rate measurement ☐ Tact measurement
	Start test mode at power ON	☐ Don't start ☐ Start	☐ Reading rate measurement ☐ Tact measurement
Command	**Trigger ON command**	( )	
	Trigger OFF command	( )	

■ Comm Settings-1

Baud rate	( )				
Data length	☐ 7 bits ☐ 8 bits	☐ Stop bits	☐ 1 bit ☐ 2 bits	☐ Parity	☐ None ☐ Even ☐ Odd
RTS/CTS protocol	☐ Don't use ☐ Use				
Multi-drop link	☐ Don't use				
	☐ Use	☐ ID No.	( )		

■ Communication parameters 2

PLC link	☐ **Don't use**	**Protocol**	☐ Non-procedure ☐ PASS/RTRY ☐ ACK/NAK
		Header	☐ None ☐ STX ☐ ESC ☐ Specify ( )
		Delimiter	☐ None ☐ CR+LF ☐ ETX ☐ Specify ( )
		Checksum	☐ Don't add ☐ Add
	☐ **Use**	**PLC type**	☐ SYSMAC-C ☐ MELSEC-A ☐ KV
		PLC trigger area	☐ Don't use ☐ Use
		DM head address	( ) 00
		PLC station/Unit No.	( )
		File register	☐ Don't use ☐ Use
		File register block No.	( )

■ Communication character

Delimiter character	( )
Semi-delimiter	( )

■ Utilities

Display STABILITY LEDs	☐ Don't display ☐ Display
OK/NG output ON time	( )
Preset data	( )

Appendix M Default Setting List

■ Bar code setup

Parameter	Code 1	Code 2	Code 3	Code 4
Code type	CODE39	Coda bar	UPC/EAN	None
Maximum number of digits	32	32		–
Minimum number of digits	03	03		–
Send start/stop character	Don't send	Send		–
Start/stop character type		Lowercase		–
Test check digit	Don't test	Don't test		–
Read JAN (More than one can be selected.)			All EAN 13-digit, EAN 8-digit and UPC-E are readable.	
Number of output digits of UPC-A			13 digits	
Add "0" to UPC-E system code			Don't add	
Set specified-digit output function	Don't set	Don't set	Don't set	–
Set label reading in the specified direction	Don't set	Don't set	Don't set	–

■ Main setup

Read mode	Single
Data send trigger	After reading
Decode match count	2
Data addition function	None
Reading error code	ERROR

■ Trigger input setup

Selection method	Level signal trigger
Input time	2 ms
Input polarity	Normal Open
Start test mode at trigger input ON	Don't start
Start test mode at power ON	Don't start
Trigger ON command	LON
Trigger OFF command	LOFF

■ Comm Settings-1

Baud rate	9600 bit/s
Data length	7 bits
Parity	Even
Stop bits	1 bit
RTS/CTS protocol	Don’t use
Multi-drop link	Don’t use

■ Comm Settings-2

PLC link	Don’t use
Protocol	Non-procedure
Header	None
Delimiter	CR
Checksum	Don’t add

■ Communication character

Delimiter character	: [3A]
Semi-delimiter	, [2C]

■ Utilities

OK/NG output ON time	500 ms
STABILITY LEDs	Don’t display
Preset data	Don’t set

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