

**Smart Sensor  
ZFX-C10/C15**

**Vision Sensor with  
built-in LCD monitor**

**COMMUNICATION  
MANUAL**

**OMRON**

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# Communication Interface Specifications

You can use the USB port or RS-232C/422 connector of the Controller to perform serial communication with external devices such as a personal computer or programmable controller.

Serial communication functions in the RUN mode. Communication cannot be performed in the ADJ or MENU modes.

## <USB>

This interface allows Full speed (12 Mbps) communications compliant with USB2.0 with a PC equipped with the same USB interface.

Synchronization method	Start-stop
Transmission code	ASCII (Binary format can be selected only when outputting measurement values set at [Setup] - [Support] - [Calculation] - [Data].)
Communication speed	USB2.0-compliant
Data length	-
Parity	-
Stop bit	-
Delimiter	CR, LF, CR+LF
Transmission protocol	XMODEM

## <RS-232C/422>

This interface allows data communications compliant with the EIA RS-232C/422 standards up to a maximum speed of 115200 bps.

Synchronization method	Start-stop
Transmission code	ASCII (Binary format can be selected only when outputting measurement values set at [Setup] - [Support] - [Calculation] - [Data].)
Communication speed	9600, 19200, 38400, 57600, 115200
Data length	7 bits, 8 bits
Parity	None, even, odd
Stop bit	1 bit, 2 bits
Delimiter	CR, LF, CR+LF
Transmission protocol	XMODEM



For details on how to set the communication specifications, refer to the User's Manual.

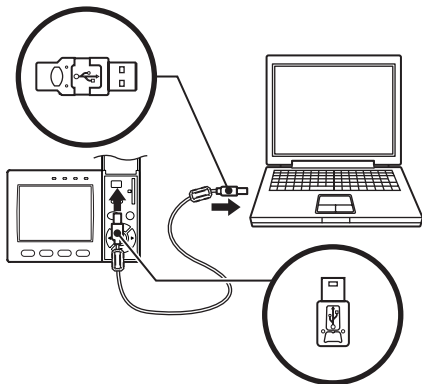
## <Ethernet>

Communication protocol	TCP/IP
Transmission mode	Peer to Peer

# Connection

## Connecting a PC

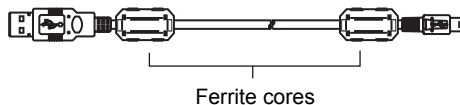
### <USB>



Use a USB cable (ZFX-XUSB) to connect the Controller to the PC.

#### Important

- When connecting the PC, refer to the Instruction Manual for the PC.
- Attach the ferrite cores supplied to both ends of the USB cable.

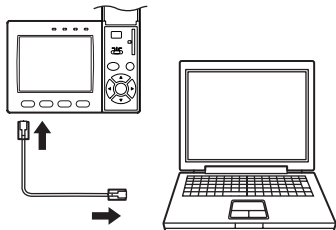


#### Note

Installation of the USB driver is necessary only when connecting an external device to the USB interface for the first time.

For the USB driver, please contact your OMRON representative.

### <Ethernet>



Use a commercially available LAN cable to connect the Controller to the PC.

There are two ways of making the LAN connection to the PC, directly to the PC or via a hub.

#### Important

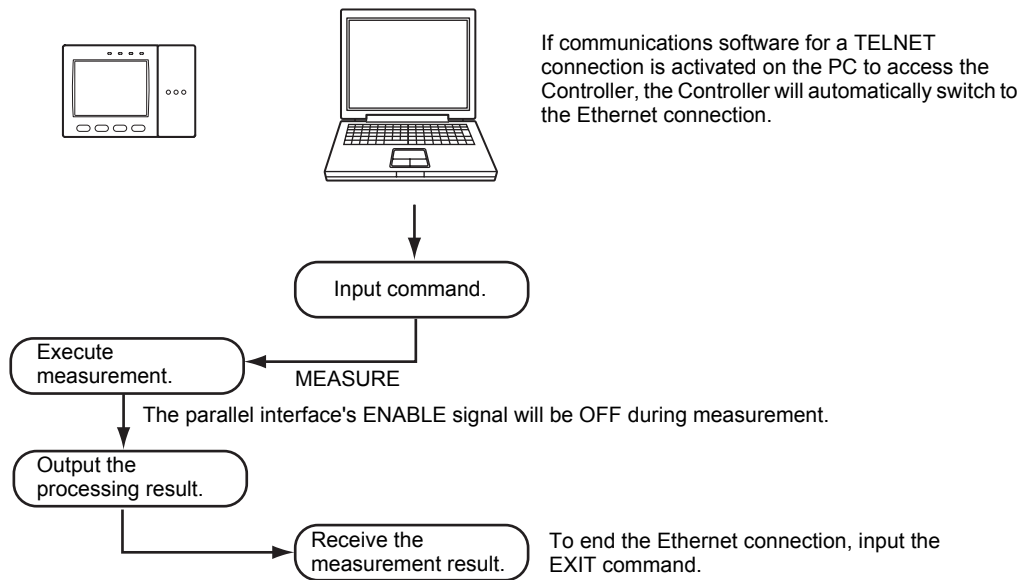
The following communications are not possible:

- Communications with the Controller from outside the LAN
- Communications between the Controller and two or more PCs
- Communications between Controllers
- Communications between the Controller and the PLC

• 1:1 Connection

When connecting the Controller directory to the PC, use a 10BASE-T or 100BASE-TX cross cable (Category 5 or higher). Limit the cable length to 30 m.

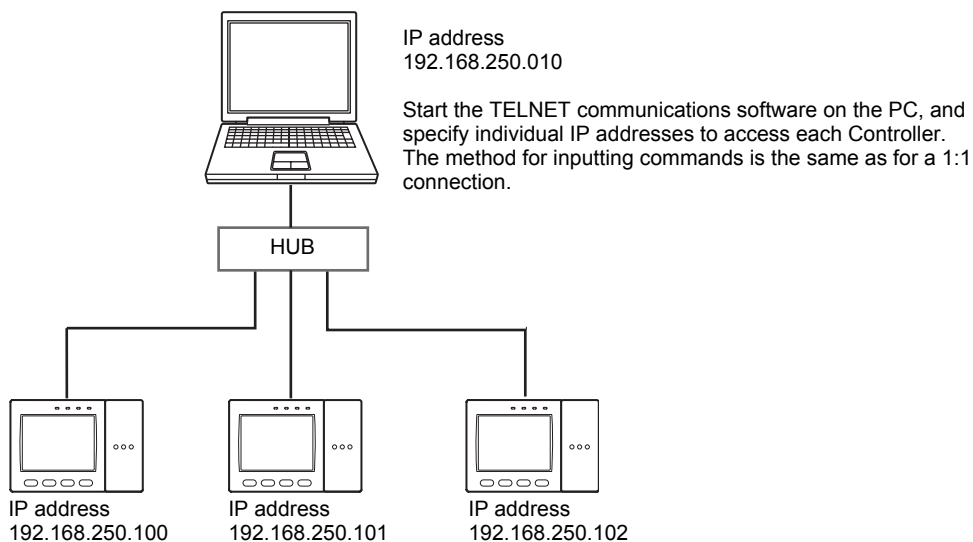
Example: A measurement command is input and the result is acquired.



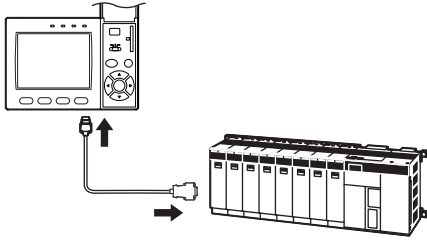
• 1:N Connection

When connecting two or more Controllers to one PC via a hub, use a 10BASE-T or 100BASE-TX straight cable (Category 5 or higher). Also, limit the cable lengths between the PC and the hub, and the Controllers and the hub to 30 m, respectively. Be sure to set unique IP addresses to each Controller. Do not set duplicate IP addresses to Controllers.

Example:



# Connecting a PLC



Use the exclusive RS-232C cable (ZFX-XPT2A) / RS-422 cable (ZFX-XPT2B) to connect the Controller to a PLC.

### Important

When connecting to a PLC, refer to the Instruction Manual for the PLC.

# About Communication Commands

## Command/Response Format

### < Command >

Command data	Delimiter
--------------	-----------

### < Response >

When processing ends successfully

Response data	Record separator
---------------	------------------

O	K	Record separator
---	---	------------------

When processing fails

E	R	Record separator
---	---	------------------

Command data	Specifies the command and parameters in ASCII code.
Response data	Stores the acquired data.
Delimiter	This control code indicates the end of the data.
Record separator	This delimiter is appended to one session's worth of output data. (default delimiter: CR)

## Configuration of Measurement Value Data

The following explains the output format of measurement values.

To output measurement values by serial communication, the following items must be set.

### Note

#### Output content

Set the output content as an expression.


Set the output content at [Setup] - [Support] - [Calculation] - [Data].

#### Output destination

Specify [RS-232C/422] or [USB] at [System] - [Output] - [Data output].

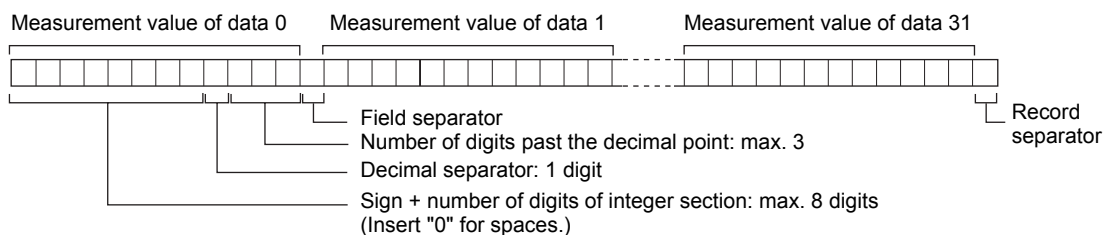
#### Output format

Set the output format at [System] - [Output] - [Serial output].

 For detailed settings, refer to the User's Manual.

## ASCII Format

Up to 32 results are output as a data structure of fixed length of up to 12 characters including the sign.



Sign	The sign of the measurement value is stored. Plus: 0/Minus: -
Number of digits of integer section	"0" is inserted in spaces in the integer section and digits past the decimal point.
Number of digits past the decimal point	When a value is greater than the preset number of digits, all digits other than the sign digit become "9".
Decimal separator	Output range: -9999999.999 to 09999999.999
Field separator	
Record separator	

Example: Number of digits of integer section: 7, number of digits past the decimal point: 3,  
decimal separator: period

< Measurement value > < Data structure >

123456.789      

0	1	2	3	4	5	6	.	7	8	9	CR
---	---	---	---	---	---	---	---	---	---	---	----

4567.8            

0	0	0	4	5	6	7	.	8	0	0	CR
---	---	---	---	---	---	---	---	---	---	---	----

-4567.8           

-	0	0	4	5	6	7	.	8	0	0	CR
---	---	---	---	---	---	---	---	---	---	---	----

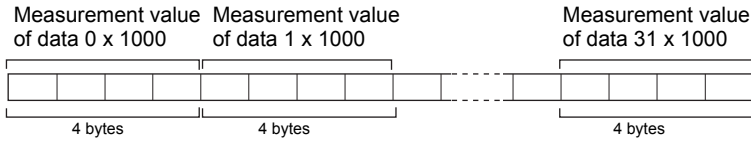


## Binary Format

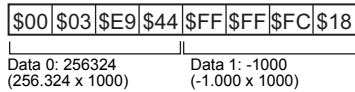
The value obtained by multiplying the measurement value by 1000 is output continuously as four bytes per single data item. Minus values are output as 2's complement. Up to 32 results can be output.

The binary format differs from the ASCII format in that data separators, such as field separator or record separator, do not exist.

Output range: -2147483.648 to 2147483.647



Example: Data 0 "256.324" and data 1 "-1.000"



### Note

- A value obtained by multiplying by 1000 also is output as the judgment result (JG).  
OK: 0  
NG: -1000 (-1 x 1000)
- When the measurement value is less than -2147483.648, "-2147483.648" is output.  
When the measurement value is greater than 2147483.647, "2147483.647" is output.

# Available Commands

## Bank Control Commands

Command name	Description	Page
BANK (or BK)	This command acquires the current bank No.	p.10
	This command switches the bank to be used.	p.11
BANKGROUP (or BG)	This command acquires the current bank group No.	p.12
	This command switches the bank group to be used.	p.12

## Measurement Control/Measurement Value Acquisition Commands

Command name	Description	Page
MEASDATA (or MD)	This command acquires the measurement result of the measurement item.	p.13
MEASURE (or M)	This command executes a single measurement.	p.14
	This command starts continuous measurement.	p.14
	This command ends continuous measurement.	p.14

## Setting Acquisition/Change Commands

Command name	Description	Page
DATE (or DT)	This command acquires the date and time of the calendar timer incorporated into the Controller.	p.16
	This command changes the date and time of the calendar timer incorporated into the Controller.	p.16
MODELSET (or MS)	This command re-registers the model of the specified item. It does not reset filters, etc.	p.17
PASSWORD (or PW)	This command acquires the currently set password.	p.17
	It sets and changes the password character string.	p.18
VERGET (or VR)	This command acquires the version information of the Controller.	p.18

## Backup/Restore Commands

Command name	Description	Page
BGRLOAD (or GL)	This command uploads bank group data to the Controller from an external device.	p.19
	This command uploads bank group data to the Controller from an SD card.	p.19
BGRSAVE (or GS)	This command backs up bank group data to an external device from the Controller.	p.20
	This command backs up bank group data to an SD card from the Controller.	p.20
BNKLOAD (or BL)	This command uploads bank data to the Controller from an external device.	p.21
	This command uploads bank data to the Controller from an SD card.	p.21
BNKSAVE (or BS)	This command backs up bank data to an external device from the Controller.	p.22
	This command backs up bank data to an SD card from the Controller.	p.22
DATASAVE (or SV)	This command saves the current settings to the Controller.	p.23
SYSLOAD (or SL)	This command uploads system data to the Controller from an external device.	p.23
	This command uploads system data to the Controller from an SD card.	p.24

Command name	Description	Page
SYSSAVE (or SS)	This command backs up system data to an external device from the Controller.	p.24
	This command backs up system data to an SD card from the Controller.	p.25

### Utility Commands

Command name	Description	Page
RESET (or RS)	This command restarts the Controller.	p.25
EXIT	This command ends the TELNET connection for Ethernet communications and disconnects the line.	p.25

## Bank Control Commands

### Acquiring/Switching the Bank No. < BANK command >

#### Acquiring a bank No.

This command acquires the current bank No.

#### < Command format >

`B|A|N|K|CR` or `B|K|CR`

#### < Response format >

When processing ends successfully

`| |CR`

└── Bank No. (max. 2 digits)

`O|K|CR`

When processing fails

`E|R|CR`

#### < Explanation of parameters >

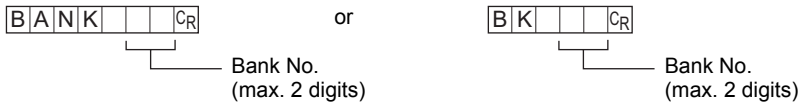
Bank No.	The acquired bank No. is returned. (0 to 31)
----------	--

## Switching to another bank

---

This command switches the bank to be used.

### < Command format >



### < Response format >

When processing ends successfully

O	K	C <sub>R</sub>
---	---	----------------

When processing fails

E	R	C <sub>R</sub>
---	---	----------------

### < Explanation of parameters >

Bank No.	Specifies the bank No. after the bank is switched. (0 to 31)
----------	--

## Acquiring/Switching the Bank Group No. < BANKGROUP command >

### Acquiring a bank group No.

This command acquires the current bank group No.

#### < Command format >

BANKGROUP<sub>CR</sub> or BG<sub>CR</sub>

#### < Response format >

When processing ends successfully

		CR
--	--	----

Bank group No. (max. 2 digits)

OK<sub>CR</sub>

When processing fails

ER<sub>CR</sub>

#### < Explanation of parameters >

Bank group No.	The acquired bank group No. is returned. (0 to 31)
----------------	--

### Switching bank group Nos.

This command switches the bank group to be used.

#### < Command format >

BANKGROUP 

		CR
--	--	----

 or BG 

		CR
--	--	----

Bank group No. (max. 2 digits)      Bank group No. (max. 2 digits)

#### < Response format >

When processing ends successfully

OK<sub>CR</sub>

When processing fails

ER<sub>CR</sub>

#### < Explanation of parameters >

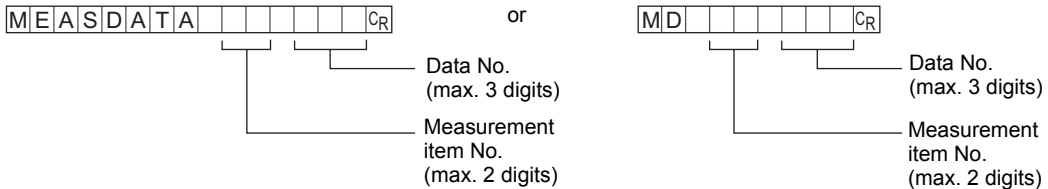
Bank group No.	Specifies the bank group No. after the bank group is switched. (0 to 31)
----------------	--

# Measurement Control/Measurement Value Acquisition Commands

## Acquiring the Measurement Result of the Measurement Item < MEASDATA command >

This command acquires the measurement result of the measurement item.

### < Command format >



### < Response format >

When processing ends successfully

Measurement value `CR`

`OK` `CR`

When processing fails

`ER` `CR`

### < Explanation of parameters >

Measurement item No.	Specifies the measurement item No. (0 to 31)
Data No.	Specifies the data No. (0 to 127) For details, see "Parameter List (p.26)."
Measurement value	The acquired measurement value is returned in ASCII code. The measurement value is not dependent on the format (ASCII/binary) specified in the output conditions. <ul style="list-style-type: none"> <li>• Minus sign: -, plus sign: none</li> <li>• The size of the integer section is variable.</li> <li>• The decimal point is indicated by a period ".".</li> <li>• The maximum number of digits past the decimal point is three.</li> </ul>

## Executing Measurement < MEASURE command >

### Executing a Single Measurement

This command executes a single measurement.

#### < Command format >

MEASURE<sub>CR</sub> or M<sub>CR</sub>

#### < Response format >

When processing ends successfully


Measurement value <sub>CR</sub>

OK<sub>CR</sub>

When processing fails

ER<sub>CR</sub>

#### < Explanation of parameters >

Measurement value	The acquired measurement value is returned. The measurement value is output in the format (ASCII/binary) specified in the output conditions.  Configuration of Measurement Value Data p.7
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#### Important

Measurement values are output only when an expression is set at [Setup] - [Support] - [Calculation] - [Data], and [RS-232C/422] or [USB] is specified at [System] - [Output] - [Data output].

## Starting Continuous Measurement

---

### < Command format >

`M|E|A|S|U|R|E| | / CCR` or `M| | / CCR`

### < Response format >

When processing ends successfully

`Measurement value` `CCR` (for number of continuous measurements)

`O|KCR`

When processing fails

`E|RCR`

## Ending Continuous Measurement

---

### < Command format >

`M|E|A|S|U|R|E| | / ECR` or `M| | / ECR`

### < Response format >

When processing ends successfully

`O|KCR`

When processing fails

`E|RCR`









# Backup/Restore Commands

## Uploading Bank Group Data < BGRLOAD command >

### Uploading bank group data to the Controller from an external device

This command uploads the bank group data to the Controller by XMODEM protocol. The bank group data is loaded to the specified bank group No. This command is not available in Ethernet communications.

#### < Command format >

B	G	R	L	O	A	D	0			CR
---	---	---	---	---	---	---	---	--	--	----

       or      

G	L	0							CR
---	---	---	--	--	--	--	--	--	----

Bank group No.  
(max. 2 digits)
Bank group No.  
(max. 2 digits)

#### < File transfer >

The bank group data is transferred by XMODEM (-CRC or SUM) after READY is received. XMODEM (-1K) is not supported.

#### < Response format >

READYCR

When processing ends successfully

OKCR

When processing fails

ERRCR

#### < Explanation of parameters >

Bank group No.	Specifies the bank group No. to upload. (0 to 31)
----------------	---

## Uploading bank group data to the Controller from an SD card

This command uploads bank group data to the Controller from an SD card.

#### < Command format >

B	G	R	L	O	A	D	1				.....	CR
---	---	---	---	---	---	---	---	--	--	--	-------	----

       or      

G	L	1									.....	CR
---	---	---	--	--	--	--	--	--	--	--	-------	----

File name  
Bank group No.  
(max. 2 digits)
File name  
Bank group No.  
(max. 2 digits)

#### < Response format >

When processing ends successfully

OKCR

When processing fails

ERRCR

#### < Explanation of parameters >

Bank group No.	Specifies the bank group No. to upload. (0 to 31)
File name	Specifies the file name within eight alphanumeric characters. (An extension is not required.)







## Saving the Current Settings to the Controller < DATASAVE command >

This command saves the current settings to the Controller.  
No parameters are provided for this command.

### < Command format >

D A T A S A V E C R or S V C R

### < Response format >

When processing ends successfully

O K C R

When processing fails

E R C R

## Uploading System Data < SYSLOAD command >

### Uploading system data to the Controller from an external device

This command uploads the system data to the Controller by XMODEM protocol.  
No parameters are provided for this command. This command is not available in Ethernet communications.

### < Command format >

S Y S L O A D 0 C R or S L 0 C R

### < File transfer >

The system data is transferred by XMODEM (-CRC or SUM) after READY is received. XMODEM (-1K) is not supported.

### < Response format >

R E A D Y C R

When processing ends successfully

O K C R

When processing fails

E R C R





## Backing up system data to an SD card from the Controller

This command backs up system data to an SD card from the Controller.

### < Command format >

`S Y S S A V E 1` `---` `CR` or `S S 1` `---` `CR`  
File name File name

### < Response format >

When processing ends successfully

`OK` `CR`

When processing fails

`ER` `CR`

### < Explanation of parameters >

File name	The file can be given any name within eight alphanumeric characters. (An extension is not required.)
-----------	--

## Utility Commands

### Restarting the Controller < RESET command >

This command restarts the Controller.

No parameters are provided for this command.

### < Command format >

`R E S E T` `CR` or `R S` `CR`

### < Response format >

When processing ends successfully

None

When processing fails

`ER` `CR`

### Ending Ethernet Communications < EXIT command >

This command ends the TELNET connection for Ethernet communications and disconnects the line.

No parameters are provided for this command.

### < Command format >

`E X I T` `CR`

## < Response format >

When processing ends successfully  
None

When processing fails

E R C R

# Parameter List

## MEASDATA Command

### Shape inspection parameters

#### Pattern search

Data No.	Parameter	Output Range
0	Judgment result	0: OK -1: NG -2: not measured
1	Correlation	0 to 100
2	Measurement position X	-9999.999 to 9999.999
3	Measurement position Y	-9999.999 to 9999.999
4	Measurement angle	-180 to 180
5	Search number	0 to 99
6	Reference position X	-9999.999 to 9999.999
7	Reference position Y	-9999.999 to 9999.999
8	Reference angle	-180 to 180
9	Position difference X	-9999.999 to 9999.999
10	Position difference Y	-9999.999 to 9999.999
11	Angle difference	-180 to 180

#### Sensitive search

Data No.	Parameter	Output Range
0	Judgment result	0: OK -1: NG -2: not measured
1	Correlation	0 to 100
2	Measurement position X	-9999.999 to 9999.999
3	Measurement position Y	-9999.999 to 9999.999
4	Measurement angle	-180 to 180
5	Solid color rate	0 to 100

## Size inspection parameters

### Area

Data No.	Parameter	Output Range
0	Judgment result	0: OK -1: NG -2: not measured
1	Area	0 to 9999999.999
2	Gravity position X	-9999.999 to 9999.999
3	Gravity position Y	-9999.999 to 9999.999
4	Axis angle	-9999.999 to 9999.999
5	Reference area	0 to 9999999.999
6	Reference position X	-9999.999 to 9999.999
7	Reference position Y	-9999.999 to 9999.999
8	Reference axis angle	-180.0 to 180.0
9	Area difference	-9999999.999 to 9999999.999
10	Position difference X	-9999.999 to 9999.999
11	Position difference Y	-9999.999 to 9999.999
12	Axis angle difference	-180.0 to 180.0

## Edge inspection parameters

### Position

Data No.	Parameter	Output Range
0	Judgment result	0: OK -1: NG -2: not measured
1	Edge position X	-9999.999 to 9999.999
2	Edge position Y	-9999.999 to 9999.999
3	Reference position X	-9999.999 to 9999.999
4	Reference position Y	-9999.999 to 9999.999
5	Position difference X	-9999.999 to 9999.999
6	Position difference Y	-9999.999 to 9999.999

### Width

Data No.	Parameter	Output Range
0	Judgment result	0: OK -1: NG -2: not measured
1	Edge width	0 to 9999.999
2	Edge position X1	-9999.999 to 9999.999

Data No.	Parameter	Output Range
3	Edge position Y1	-9999.999 to 9999.999
4	Edge position X2	-9999.999 to 9999.999
5	Edge position Y2	-9999.999 to 9999.999
6	Reference edge width	0 to 9999.999
7	Reference edge position X1	-9999.999 to 9999.999
8	Reference edge position Y1	-9999.999 to 9999.999
9	Reference edge position X2	-9999.999 to 9999.999
10	Reference edge position Y2	-9999.999 to 9999.999
11	Width difference	-9999.999 to 9999.999
12	Position difference X1	-9999.999 to 9999.999
13	Position difference Y1	-9999.999 to 9999.999
14	Position difference X2	-9999.999 to 9999.999
15	Position difference Y2	-9999.999 to 9999.999

### Count

Data No.	Parameter	Output Range
0	Judgment result	0: OK -1: NG -2: not measured
1	Number of edges	0 to 255
2	Average pitch	0 to 9999.999
3	Minimum pitch	0 to 9999.999
4	Maximum pitch	0 to 9999.999
5	Average width	0 to 9999.999
6	Minimum width	0 to 9999.999
7	Maximum width	0 to 9999.999
8	Pitch 1	0 to 9999.999
9	Width 1	0 to 9999.999
10	Pitch 2	0 to 9999.999
11	Width 2	0 to 9999.999
:	:	0 to 9999.999
506	Pitch 255	0 to 9999.999
507	Width 255	0 to 9999.999

## Brightness and color inspection parameters

### Brightness

Data No.	Parameter	Output Range
0	Judgment result	0: OK -1: NG -2: not measured
1	Density average	0 to 255.0
2	Density deviation	0 to 127.0
3	Reference density average	0 to 255.0
4	Reference density deviation	0 to 127.0
5	Density average difference	0 to 255.0
6	Density deviation difference	0 to 127.0

### Hue

Data No.	Parameter	Output Range
0	Judgment result	0: OK -1: NG -2: not measured
1	Hue	0 to 360.0
2	Saturation	0 to 100.0
3	Value	0 to 100.0
4	Hue deviation	0 to 180.0
5	Saturation deviation	0 to 50.0
6	Value deviation	0 to 50.0
7	Reference hue	0 to 360.0
8	Reference saturation	0 to 100.0
9	Reference value	0 to 100.0
10	Hue difference	-360.0 to 360.0
11	Saturation difference	-100.0 to 100.0
12	Value difference	-100.0 to 100.0
13	Reference hue deviation	0 to 180.0
14	Reference saturation deviation	0 to 50.0
15	Reference value deviation	0 to 50.0
16	Hue deviation difference	-180.0 to 180.0
17	Saturation deviation difference	-50.0 to 50.0
18	Value deviation difference	-50.0 to 50.0
19	Maximum hue	0 to 360.0
20	Minimum hue	0 to 360.0
21	Maximum saturation	0 to 100.0
22	Minimum saturation	0 to 100.0

Data No.	Parameter	Output Range
23	Maximum value	0 to 100.0
24	Minimum value	0 to 100.0


## Parameters for inspection by individual application

### Defect

Data No.	Parameter	Output Range
0	Judgment result	0: OK -1: NG -2: not measured
1	Defect	0 to 255
2	Maximum density	0 to 255
3	Minimum density	0 to 255
4	Number of defects	0 to 255
5	Defect position X	-9999.999 to 9999.999
6	Defect position Y	-9999.999 to 9999.999
7	Reference position X	-9999.999 to 9999.999
8	Reference position Y	-9999.999 to 9999.999
9	Position difference X	-9999.999 to 9999.999
10	Position difference Y	-9999.999 to 9999.999

## Position parameters

### 1model, 2 model

 Pattern search p.26

### Area

 Area p.27

### Position

 Position p.27

# Example of Usage

The following describes an example procedure to communicate by non-procedural commands using Windows standard tool HyperTerminal.

## 1 Start up HyperTerminal.

HyperTerminal is located under [Program]-[Accessory]-[Communication].

1-1 Enter an appropriate project name, and select OK.

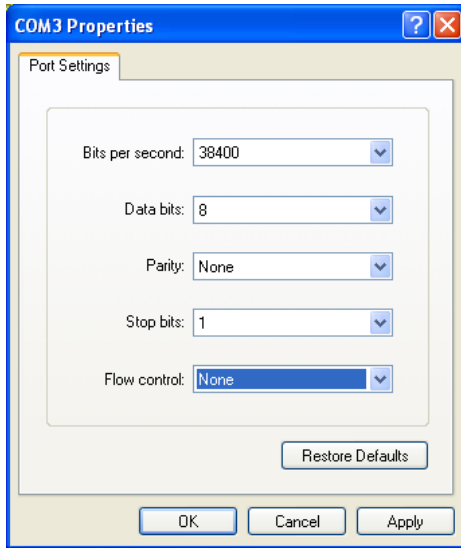


1-2 Select the COM port connected to the ZFX-C in the Connect using field.

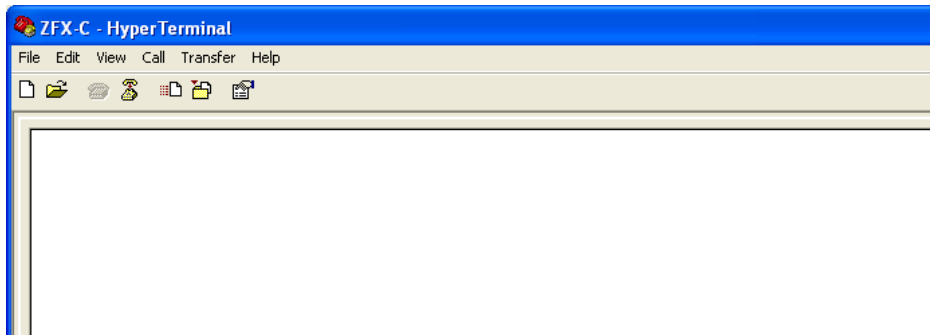




**1-3** Set the communication conditions.

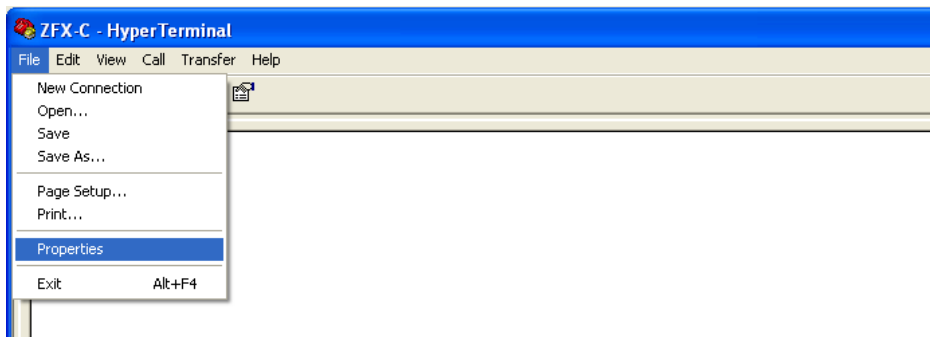


**1-4** HyperTerminal is started up.

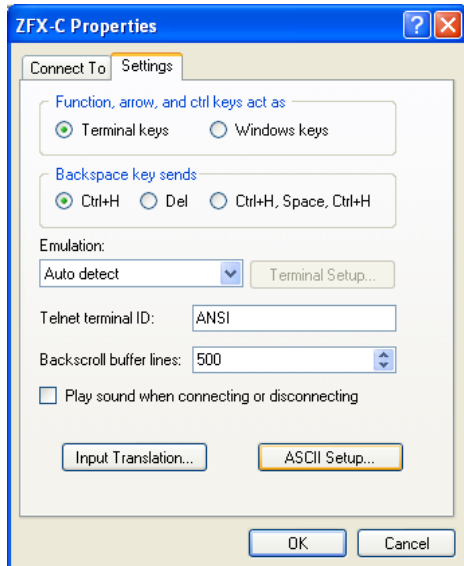


**2** To facilitate command transactions, set echo and other communication conditions.

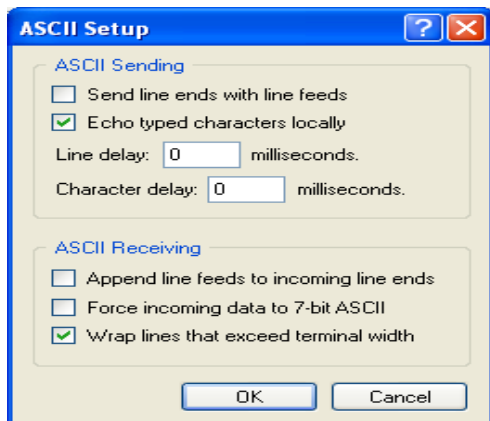
**2-1** Open [Property].



**2-2** Select the Settings tab, and then [ASCII Setup].



**2-3** Mark the following checkboxes, and click OK to complete the setting.

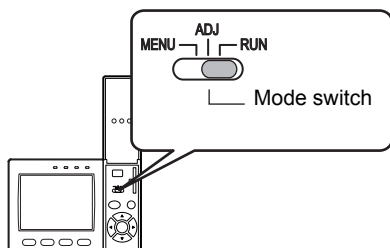


### **3** Set the communication conditions for the ZFX-C.

Set [System]-[Comm] to match the above settings.

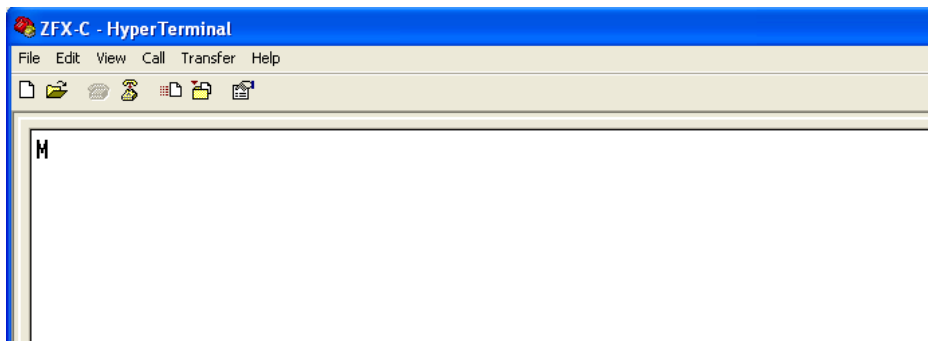
 For details on how to set the communication specifications, refer to the User's Manual.

### **4** Switch the ZFX-C to the RUN mode.

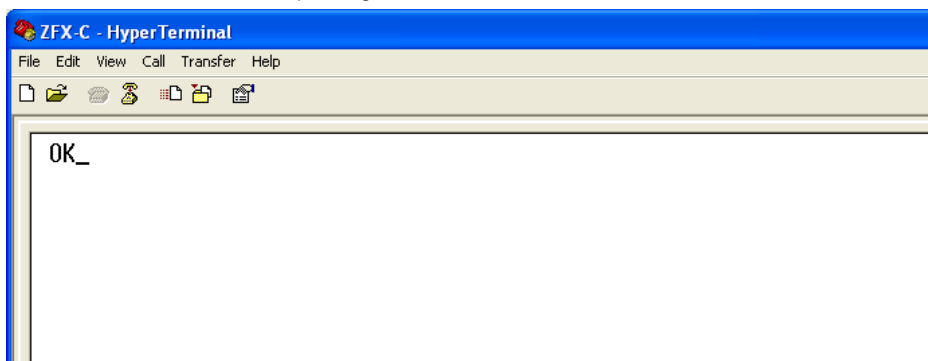


## 5 Execute non-procedural communication.

5-1 Enter a command, and then press the return key.



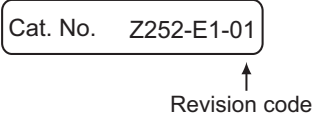
5-2 The returned value corresponding to the command is returned from the Controller.



MEMO

# Revision History

A manual revision code appears as a suffix to the catalog number at the bottom of the front and back covers of this manual.



Revision code	Date	Revised contents
01	April 2007	Original production