

**NIDEK**

AUTO REF/KERATOMETER  
**ARK-1/ARK-1a/ARK-1s**

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**INTERFACE MANUAL**

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Original instructions

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## Before Use

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This Interface Manual describes data communication for the ARK-1/ARK-1a/ARK-1s.

If you encounter any problems or have questions about the device, please contact NIDEK or your authorized distributor.

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# RS-232C COMMUNICATION

1

## 1.1 Outline of RS-232C Communication

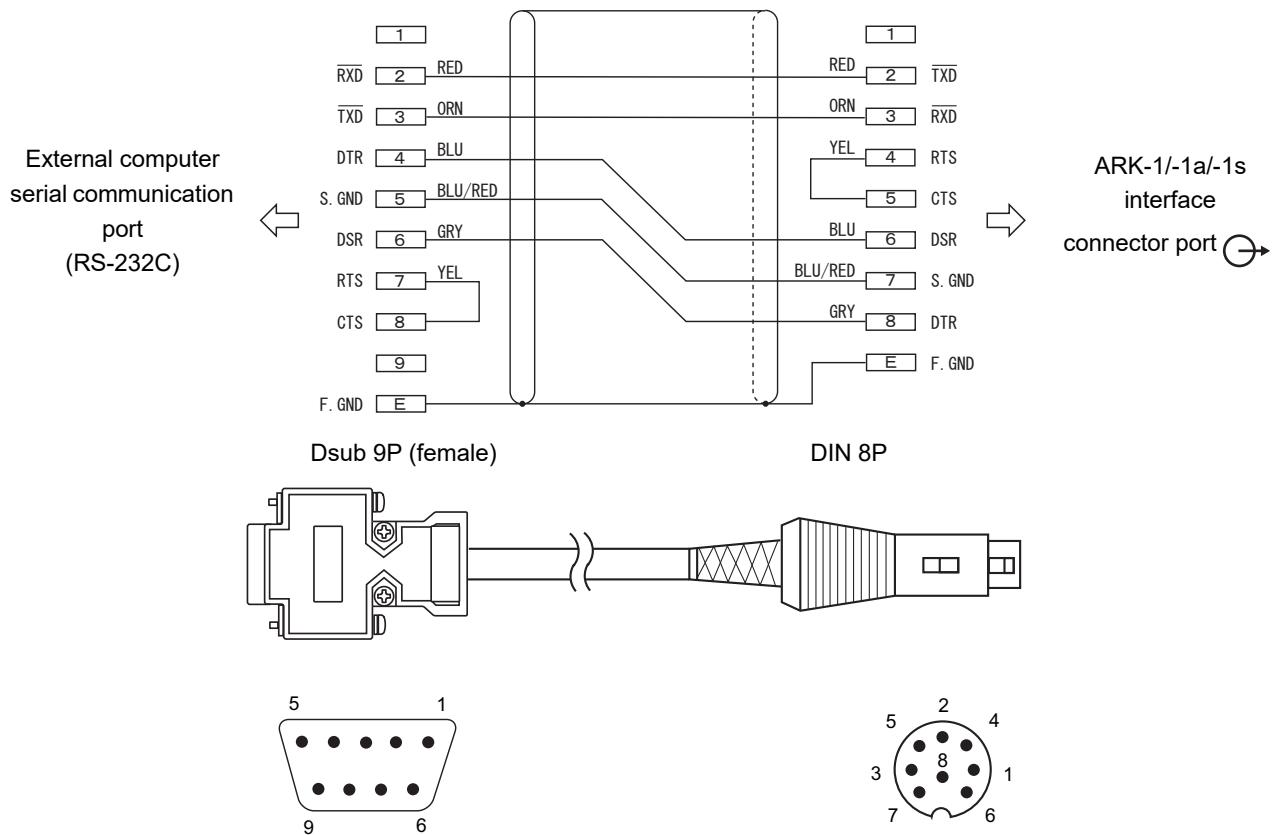
The ARK-1/ARK-1a/ARK-1s comes equipped with an RS-232C interface to transmit measurement data to an external computer and NIDEK refractor. This chapter provides the method of receiving measurement data of the ARK-1/-1a/-1s through this interface.

### 1.1.1 Basic interface specifications

1	Basic specifications	In accordance with RS-232C standards
2	Connector	DIN 8-pin
3	Transmission method	Asynchronous
4	Transmission system	Half duplex
5	Baud rate	<u>9600</u> /4800/2400/1200 bit/s
6	Bit length	8/7 bits
7	Parity check	ODD parity
8	Stop bit length	1 bit
9	Data code	ASCII code
10	CR code	YES (added) / NO (not added)

As the transmission system, a parity check and stop bit length are fixed as above, it is necessary for the external computer to conform to these specifications.

## 1.1.2 Cable connection



Connect the ARK-1/-1a/-1s interface connector port  and the serial communication port (RS-232C) of the external computer with the above interface cable (Model: OPIF-15).

This interface cable can be used when the “71. I/F MODE” parameter is set to either “NIDEK” or “NCP10”.

For connection to the external computer by any means other than that specified above (Dsub 9P), a conversion adapter is required.

### 1.1.3 Communication sequence

Two types of communication sequences, “NIDEK” and “NCP10”, can be selected by setting the “71. I/F MODE (communication mode)”.

Communication sequence	NIDEK	NCP10
DTR/DSR control	Performed	Not performed
RS/SD command control	Performed	Not performed
Data transmission in response to a request from the PC	Possible	Not possible
Checksum data	Not present	Present

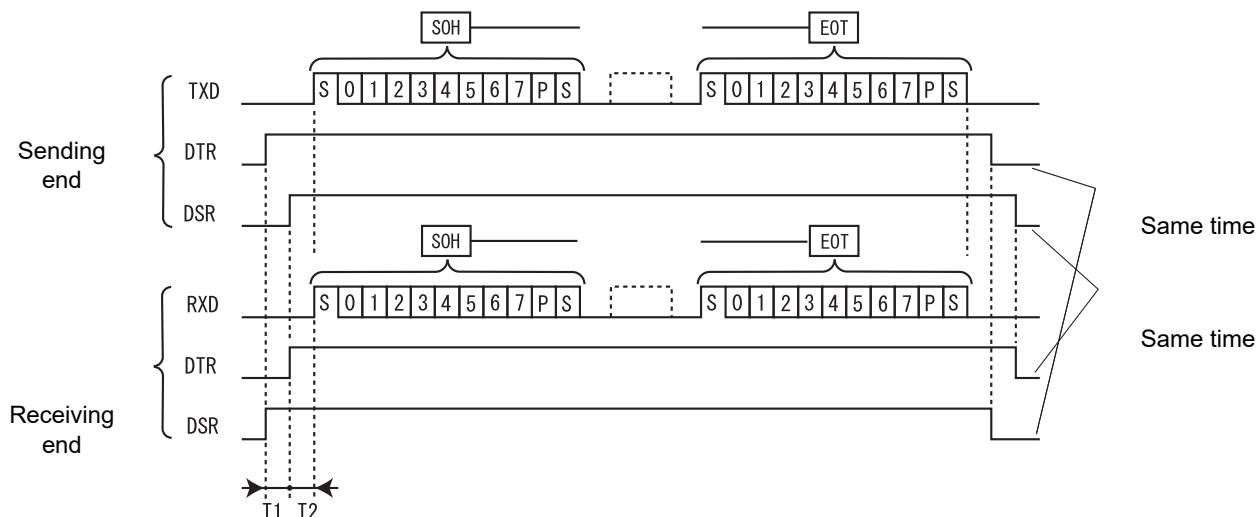
With “NIDEK”, the communication sequence is the same as the conventional transmission sequence.

With “NCP10”, press the print  button to transmit data. Because “NCP10” does not need complicated controls such as the DTR control, DSR control, RS command control, or SD command control, it allows easier communication compared with “NIDEK”. However, with “NCP10”, data transmission requested from the PC is not supported.

Select a communication sequence that suits your needs or purposes.

#### O For “NIDEK”

The DTR/DSR control is as follows:



T1, T2 ≤ 0.1 s

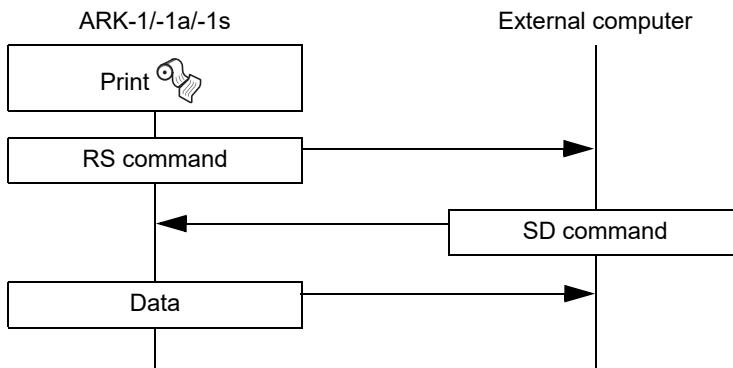
(Time-out period: T1, T2 > 0.1 s)

Decrease DTR except during transmission or reception.

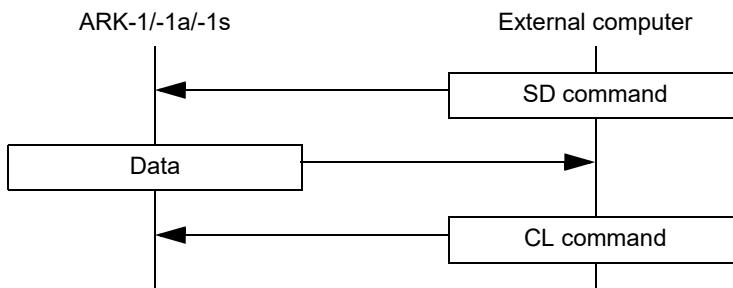
Decrease DTR as soon as possible after the transmission and reception of EOT.

The RS/SD control is as follows:

- When the print  button is pressed



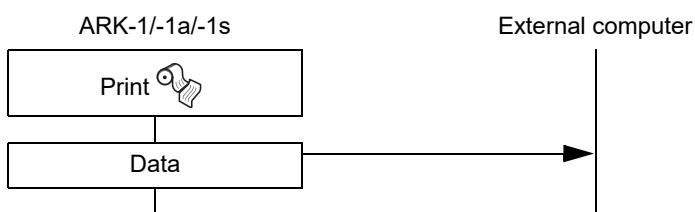
- When data is requested from the external computer



## ○ For “NCP10”

The DTR/DSR control is not performed. The DTR signal of the ARK-1/-1a/-1s is constantly at a low state on a line. The DTR signal of the external computer does not affect the communication under either condition.

In addition, since the RS/SD command control is not performed, pressing the print button () sends the data directly.



## 1.2 Data Format

### 1.2.1 Command format (for “NIDEK”)

ASCII characters are used for data transmission or reception.

#### 1) RS command

Sends a request for the 2) SD command to the external computer from the ARK-1/-1a/-1s.

SOH	C	*	*	STX	R	S	ETB	EOT
01H	43H	2AH	2AH	12H	52H	53H	17H	04H

“H” indicates HEX (hexadecimal).

#### 2) SD command

Sends a request to transmit measurement data to the ARK-1/-1a/-1s from the external computer.

For requesting AR measurement data

SOH	C	R	M	STX	S	D	ETB	EOT
-----	---	---	---	-----	---	---	-----	-----

For requesting KM measurement data

SOH	C	K	M	STX	S	D	ETB	EOT
-----	---	---	---	-----	---	---	-----	-----

For requesting AR and KM measurement data

SOH	C	R	K	STX	S	D	ETB	EOT
-----	---	---	---	-----	---	---	-----	-----

#### 3) CL command

Sends a request to clear measurement data to the ARK-1/-1a/-1s from the external computer.

SOH	C	R	M	STX	C	L	ETB	EOT
-----	---	---	---	-----	---	---	-----	-----

SOH	C	K	M	STX	C	L	ETB	EOT
-----	---	---	---	-----	---	---	-----	-----

SOH	C	R	K	STX	C	L	ETB	EOT
-----	---	---	---	-----	---	---	-----	-----

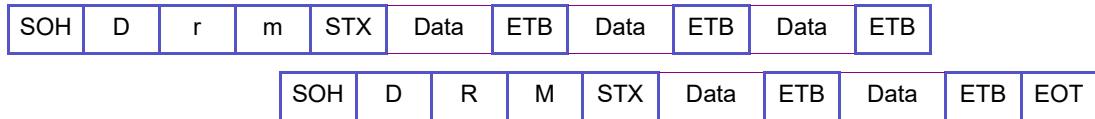
The process clears all the above commands. This is the equivalent of pressing the print button(  ), after which preparations for the next measurement are made.

When measurement is started after preparation, the previous data is cleared and the next patient is measured.

## 1.2.2 Data format

### O Basic format

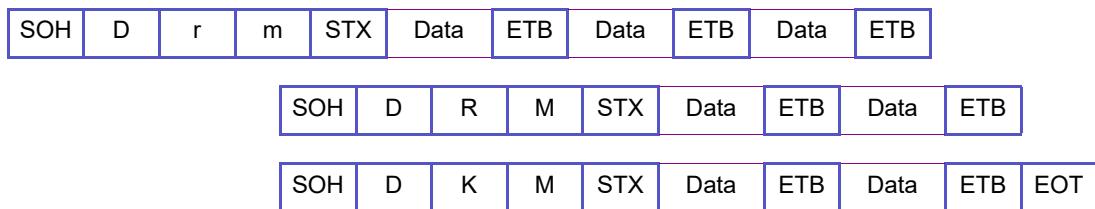
- For AR measurement data



- For KM measurement data



- For AR and KM measurement data

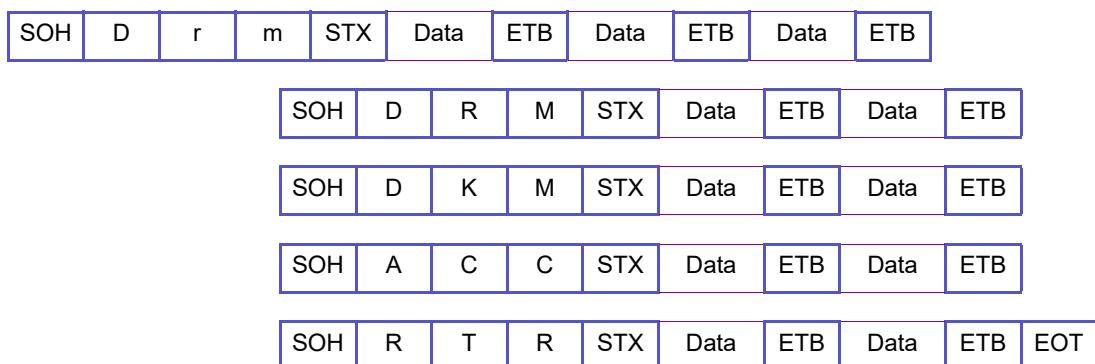


When the ARK-1/-1a/-1s receives the SD command, data transmission is started in this format.

When the “71. I/F MODE” parameter is set to “NCP10”, four digits of checksum are added behind “EOT” in each data format.

When accommodation measurement “ACC” and/or retroillumination image capture “RTR” has been performed, data transmission is performed in succession to AR and KM measurement data. (except for the ARK-1)

Example of AR and KM measurement data



## O Transmission data

Drm	1	Company name / Model name	
	2	Patient number	
	3	Patient ID	
	4	Date and time of measurement	
	5	Vertex distance	
	6	Near working distance	
	7	Large area objective measurement value (L.DATA)	
	8	Large area differentiation value (differentiation between central measured values and large area measured values)	
DRM	1	Company name / Model name	
	2	Patient number	
	3	Patient ID	
	4	Date and time of measurement	
	5	Vertex distance	
	6	Near working distance	
	9	Objective refractive error measurement value (center)	
	10	LM value	
	11	LM addition power	
	12	Subjective refractive error measurement value	ARK-1s only
	13	Contact lens conversion value	
	14	Optimum trial lens value	
	15	Near addition power	ARK-1s only
	16	Uncorrected VA value	ARK-1s only
	17	Corrected VA values	ARK-1s only
	18	Low contrast VA value	ARK-1s only
	19	Glare VA value	ARK-1s only
	20	Near VA value	ARK-1s only
	21	Near working distance (during near visual acuity measurement)	ARK-1s only
	22	Pupillary distance measurement value	
DKM	23	KM measurement value	
	24	Corneal size measurement value	
	25	Pupil size measurement value	
	26	Sagittal measurement data	
ACC	27	Accommodation	except for ARK-1
	28	Maximum pupil size (maximum size during accommodation measurement)	except for ARK-1
	29	Minimum pupil size (minimum size during accommodation measurement)	except for ARK-1
RTR	30	Central Opacity Index Height (COI.H)	except for ARK-1
	31	Central Opacity Index Area (COI.A)	except for ARK-1
	32	Peripheral Opacity Index (POI)	except for ARK-1
	33	Checksum	For "NCP10"

"Drm" is output when the "78. L.DATA" parameter is set to "YES".

"1. Company name / Model name" to "6. Near working distance" are output repeatedly in "Drm" and "DRM".

## O Data

The number inside the parentheses indicates the number of characters transmitted.

### 1 Company name / Model name

I	D	N	I	D	E	K	/	A	R	K	-	1	s
ID code	Company name					Model name (ARK-1s)							

When the "72. I/F FORMAT (communication format)" is set to "SHORT" and a request for KM data only is set (see "2) SD command" of "1.2.1 Command format (for "NIDEK")" (page 5)), the company name and model name are not transmitted.

### 2 Patient number

N	O	0	1	2	3
ID code	Patient number (4)				

### 3 Patient ID

Sent when patient ID is input by the barcode scanner.

I	P	0	1	2	3	4	5	6	7	8	9	A	B	C	D
IP code	Patient ID The number of input characters (a maximum of 14 characters) is sent.														

### 4 Date and time of measurement

When the time format is set to "AM/PM"

- 1) When the "38. DATE FORMAT" parameter is set to "Y/M/D"

D	A	2	0	0	7	.	0	5	.	1	2	.	0	1	:	2	3	P	M
Date code	Year (4)				Month (2)	Date (2)	Hour (2)	Minute (2)	AM/PM (2)										

- 2) When the "38. DATE FORMAT" parameter is set to "M/D/Y"

D	A	M	A	Y	/	1	2	/	2	0	0	7	.	0	1	:	2	3	P	M
Date code	Month (3)			Date (2)	Year (4)				Hour (2)	Minute (2)		AM/PM (2)								

- 3) When the "38. DATE FORMAT" parameter is set to "D/M/Y"

D	A	1	2	/	M	A	Y	/	2	0	0	7	.	0	1	:	2	3	P	M
Date code	Date (2)			Month (3)	Year (4)				Hour (2)	Minute (2)		AM/PM (2)								

When the time format is set to "24H"

- 1) When the "38. DATE FORMAT" parameter is set to "Y/M/D"

D	A	2	0	0	7	.	0	5	.	1	2	.	0	1	:	2	3
Date code	Year (4)				Month (2)	Date (2)		Hour (2)	Minute (2)								

- 2) When the "38. DATE FORMAT" parameter is set to "M/D/Y"

D	A	M	A	Y	/	1	2	/	2	0	0	7	.	0	1	:	2	3
Date code	Month (3)				Day (2)	Year (4)				Hour (2)	Minute (2)							

- 3) When the "38. DATE FORMAT" parameter is set to "D/M/Y"

D	A	1	2	/	M	A	Y	/	2	0	0	7	.	0	1	:	2	3
Date code	Date (2)				Month (3)	Year (4)				Hour (2)	Minute (2)							

## 5 Vertex distance

V	D	1	2	.	0	0
VD code	Vertex distance (5)					

## 6 Near working distance

W	D	4	0
WD code	Near working distance (2)		

## 7 Large area objective measurement value (night measurement data)

When the "78. L.DATA" parameter is set to "YES", the data is transmitted. It is used in the RT-5100 as night measurement data of AR measurements.

- 1) Left eye data

O	L	-	0	5	.	2	5	-	0	0	.	7	5	1	0	9
R/L ID code (2)	SPH (6)				CYL (6)				AXIS (3)							

- 2) Right eye data

O	R	-	0	5	.	0	0	-	0	0	.	5	0	0	3	4
R/L ID code (2)	SPH (6)				CYL (6)				AXIS (3)							

## 8 Large area differentiation value (differentiation between central measurement value and large area measurement value)

When the “78. L.DATA” parameter is set to “YES”, the data is transmitted.

The AXIS data are positive and negative whole numbers between -90 and +90.

### 1) Left eye data

d	L	-	0	5	.	2	5	-	0	0	.	7	5	+	1	0
R/L ID code (2)	SPH (6)				CYL (6)				AXIS (3)							

### 2) Right eye data

d	R	-	0	5	.	0	0	-	0	0	.	5	0	+	2	0
R/L ID code (2)	SPH (6)				CYL (6)				AXIS (3)							

## 9 Objective refractive error measurement value (center)

When median values have been obtained after three or more measurements, the median values are transmitted first and then respective items of data are transmitted (in order of acquisition time with the latest data first). The transmission is performed in the order of left eye data to right eye data.

When the “45. CAT MARK” parameter is set to “YES”, a CAT measurement mark “\*” is added to the data to indicate it was measured by the AR with the CAT measurement mode icon ( displayed).

### 1) Left eye data

O	L	-	0	5	.	2	5	-	0	0	.	7	5	1	0	9	*
R/L ID code (2)	SPH (6)				CYL (6)				AXIS (3)				Confidence index (1)	CAT measurement mark (1)			

### 2) Right eye data

O	R	-	0	5	.	0	0	-	0	0	.	5	0	0	3	4	8	*
R/L ID code (2)	SPH (6)				CYL (6)				AXIS (3)				Confidence index (1)	CAT measurement mark (1)				

### 3) Reference value (Confidence index is “E”)

When the “44. ERROR DATA” parameter is set to “YES”, the data whose confidence index (indicates the degree of reliance) is under 5 can be measured as a reference value. In this case, “E” is added to the end of the transmitted data.

O	R	-	0	5	.	0	0	-	0	0	.	5	0	0	3	4	E	*
R/L ID code (2)	SPH (6)				CYL (6)				AXIS (3)				Confidence index (1)	CAT measurement mark (1)				

#### 4) ERROR data

When the “46. ERROR PRINT” parameter is set to “YES”, the measurement errors are stored in memory and transmitted together with AR measurement values.

E	R	+	0
---	---	---	---

ERROR code	Type of error (2)
------------	-------------------

Type of error	Details
+O	Outside SPH positive range error
-O	Outside SPH negative range error
CO	Outside CYL range error

When the “72. I/F FORMAT” parameter is set to “SHORT”

Only median values are transmitted as objective measurement values.

When median values have not been obtained, only the latest one in the measurements excluding “3) Reference value” is transmitted.

When only “3) Reference value” exists, only the latest data in the reference values is transmitted.

Error data is not transmitted.

## 10 LM value

#### 1) Left eye data

L	L	-	0	5	.	2	5	-	0	0	.	7	5	1	0	9
R/L ID code (2)	SPH (6)				CYL (6)				AXIS (3)							

#### 2) Right eye data

L	R	-	0	5	.	0	0	-	0	0	.	5	0	0	3	4
R/L ID code (2)	SPH (6)				CYL (6)				AXIS (3)							

## 11 LM addition power

When the secondary addition power has been measured, the data is exported subsequently to the primary addition power.

#### 1) Left eye data

B	L	+	0	3	.	0	0	+	0	3	.	5	0		
R/L ID code (2)	ADD1 (6) Primary addition power				ADD2 (6) Secondary addition power										

#### 2) Right eye data

B	R	+	0	3	.	0	0	+	0	3	.	5	0		
R/L ID code (2)	ADD1 (6) Primary addition power				ADD2 (6) Secondary addition power										

## 12 Subjective refractive error measurement value (ARK-1s only)

### 1) Left eye data

S	L	-	0	5	.	2	5	-	0	0	.	7	5	1	0	9
R/L ID code (2)	SPH (6)				CYL (6)				AXIS (3)							

### 2) Right eye data

S	R	-	0	5	.	0	0	-	0	0	.	5	0	0	3	4
R/L ID code (2)	SPH (6)				CYL (6)				AXIS (3)							

## 13 Contact lens conversion value

### 1) For left eye data

C	L	-	0	5	.	2	5	-	0	0	.	7	5	1	0	9
R/L ID code (2)	SPH (6)				CYL (6)				AXIS (3)							

### 2) For right eye data

C	R	-	0	5	.	0	0	-	0	0	.	5	0	0	3	4
R/L ID code (2)	SPH (6)				CYL (6)				AXIS (3)							

When the "54. CL PRINT" parameter is set to "NO" or the "72. I/F FORMAT" parameter is set to "SHORT", data is not transmitted.

## 14 Optimum trial lens value

### 1) For left eye data

T	L	-	0	5	.	2	5	-	0	0	.	7	5	1	0	9
R/L ID code (2)	SPH (6)				CYL (6)				AXIS (3)							

### 2) For right eye data

T	R	-	0	5	.	0	0	-	0	0	.	5	0	0	3	4
R/L ID code (2)	SPH (6)				CYL (6)				AXIS (3)							

When the "53. TL PRINT" parameter is set to "NO", data is not transmitted.

When median values have not been obtained from the objective measurement results or the "72. I/F FORMAT" parameter is set to "SHORT", data is not transmitted.

## 15 Near addition power (ARK-1s only)

1) For left eye data

A	L	+	0	3	.	0	0
R/L ID code (2)	ADD(6)						

2) For right eye data

A	R	+	0	2	.	5	0
R/L ID code (2)	ADD(6)						

## 16 Uncorrected VA value (ARK-1s only)

1) For left eye data

U	L	0	.	3	0	Decimal (DEC.)	U	L	0	0	4	0	Fraction (FRAC.)
R/L ID code (2)	VA values (4)						R/L ID code (2)	VA values (4)					

2) For right eye data

U	R	<	.	1	0	Decimal (DEC.)	U	R	>	2	0	0	Fraction (FRAC.)
R/L ID code (2)	VA values (4)						R/L ID code (2)	VA values (4)					



- The unit of displaying the visual acuity can be set by the "94. VA DISPLAY" parameter.

## 17 Uncorrected VA value (ARK-1s only)

1) For left eye data

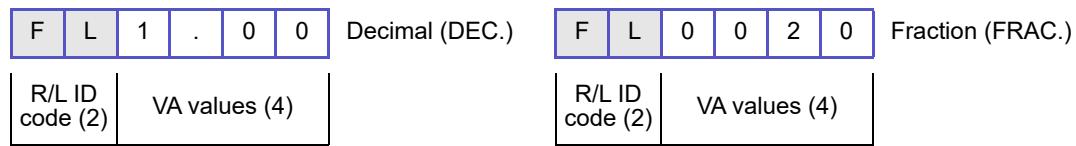
W	L	1	.	0	0	Decimal (DEC.)	W	L	0	0	2	0	Fraction (FRAC.)
R/L ID code (2)	VA values (4)						R/L ID code (2)	VA values (4)					

2) For right eye data

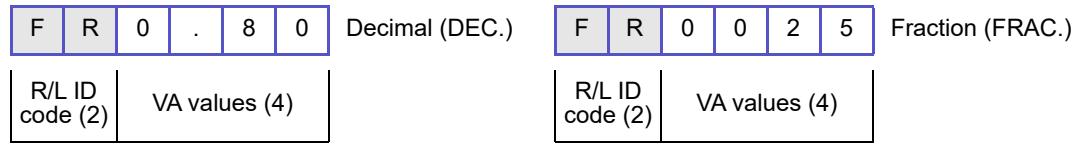
W	R	0	.	8	0	Decimal (DEC.)	W	R	0	0	2	5	Fraction (FRAC.)
R/L ID code (2)	VA values (4)						R/L ID code (2)	VA values (4)					

**18 Low contrast VA value (ARK-1s only)**

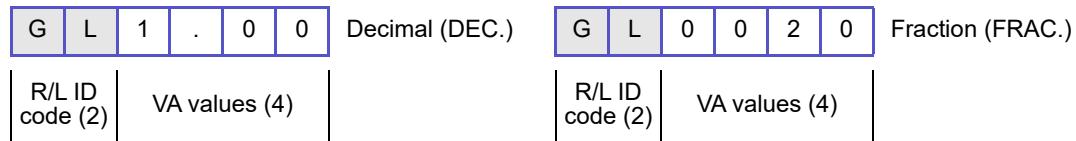
1) For left eye data



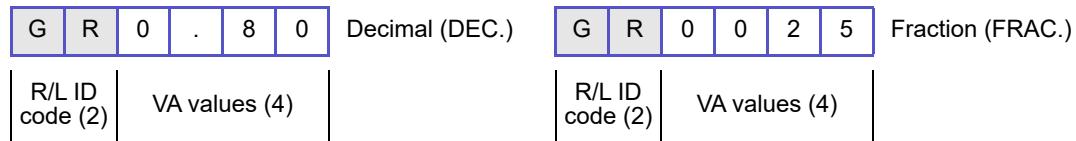
2) For right eye data

**19 Glare VA value (ARK-1s only)**

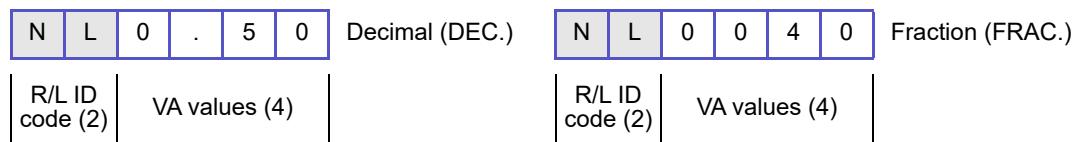
1) For left eye data



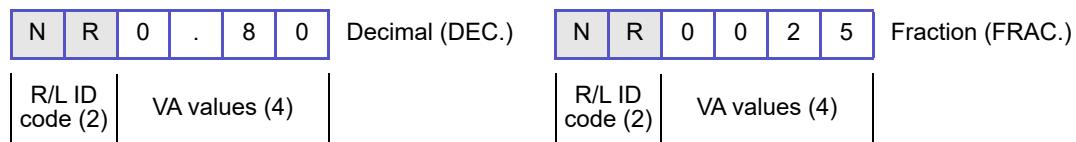
2) For right eye data

**20 Near VA value (ARK-1s only)**

1) For left eye data



2) For right eye data



## 21 Near working distance (during near visual acuity measurement) (ARK-1s only)

- 1) For left eye data

d	L	4	5
---	---	---	---

WD code	Near working distance (2)
---------	---------------------------

- 2) For right eye data

d	R	3	5
---	---	---	---

WD code	Near working distance (2)
---------	---------------------------

## 22 Pupillary distance measurement value

- 1) When both right and left PD values are measured

P	D	6	8	3	5	3	3	6	3
---	---	---	---	---	---	---	---	---	---

PD code (2)	Distance PD (2)	Right distance PD (2)	Left distance PD (2)	Near PD (2)
-------------	-----------------	-----------------------	----------------------	-------------

- 2) When only distance PD is measured

P	D	6	8	?	?	?	?	?	?
---	---	---	---	---	---	---	---	---	---

PD code (2)	Distance PD (2)	Right distance PD (2)	Left distance PD (2)	Near PD (2)
-------------	-----------------	-----------------------	----------------------	-------------

When the “55. NEAR PD PRINT” parameter is set to “NO”, “??” is transmitted.

When the PD value is measured more than one time, the measured PD data is transmitted in order of acquisition time with the latest PD data first. However, if the “72. I/F FORMAT” parameter is set to “SHORT”, only the latest PD value is transmitted.

## 23 KM measurement value

When median values have been obtained after three or more measurements, the median values are transmitted first and then respective items of data are transmitted (in order of acquisition time with the latest data first). The transmission is performed in the order of left eye data to right eye data.

When the “72. I/F FORMAT” parameter is set to “SHORT”

- Only median values are transmitted as KM measurements.
- When median values have not been obtained, only the latest one in the measurements is transmitted.
- Data (D: in diopter) is not transmitted.

- 1) For left eye data (mm)

	L	0	7	.	9	5	0	7	.	7	1	1	7	6	0	7	.	8	3
--	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

R/L ID code (2)	R1 (5)	R2 (5)	AXIS (3)	AVE (5)
-----------------	--------	--------	----------	---------

## 2) For left eye data (D)

D	L	4	2	.	4	5	4	3	.	7	7	1	7	6	4	3	.	1	1								
R/L ID code (2)	R1 (5)					R2 (5)					AXIS (3)			AVE (5)													
-	0	1	.	3	2																						
CYL (6)																											

## 3) For right eye data (mm)

	R	0	7	.	8	6	0	7	.	5	3	1	7	5	0	7	.	7	0
R/L ID code (2)	R1 (5)					R2 (5)					AXIS (3)			AVE (5)					

## 4) For right eye data (D)

D	R	4	2	.	9	4	4	4	.	8	2	1	7	5	4	3	.	8	8								
R/L ID code (2)	R1 (5)					R2 (5)					AXIS (3)			AVE (5)													
-	0	1	.	8	8																						
CYL (6)																											

**24 CS (Corneal Size) measurement value**

When the "72. I/F FORMAT" parameter is set to "SHORT", the data is not transmitted.

## 1) For left eye data

S	L	1	1	.	5
R/L ID code (2)	CS (4)				

## 2) For right eye data

S	R	1	1	.	0
R/L ID code (2)	CS (4)				

## **25 PS (Pupil Size) measurement value**

When the “72. I/F FORMAT” parameter is set to “SHORT”, the data is not transmitted.

- 1) For left eye data

P	L	0	6	.	0	F
R/L ID code (2)		PS (4)		Chart lamp (1)		

- 2) For right eye data

P	R	0	6	.	0	N
R/L ID code (2)		PS (4)		Chart lamp (1)		

The state of the chart lamp during PS measurement is transmitted.

N	Chart lamp ON
F	Chart lamp OFF

## 26 Sagittal measurement data

When the “72. I/F FORMAT” parameter is set to “SHORT”, the data is not transmitted.

- 1) For left eye data

F	A	2	5														
FA code	Fix angle (2)																
L	S	0	7	.	8	6	0	8	.	5	3	+	0		1	6	A
R/L ID code (2)	SAGIT1 (5)			SAGIT2 (5)			ECC (5)			A/F (1)							

SUP side

L	I	0	7	.	8	6	0	8	.	5	3	+	0		1	6	A
R/L ID code (2)	SAGIT1 (5)	SAGIT2 (5)	ECC (5)	A/F (1)													

INF. side

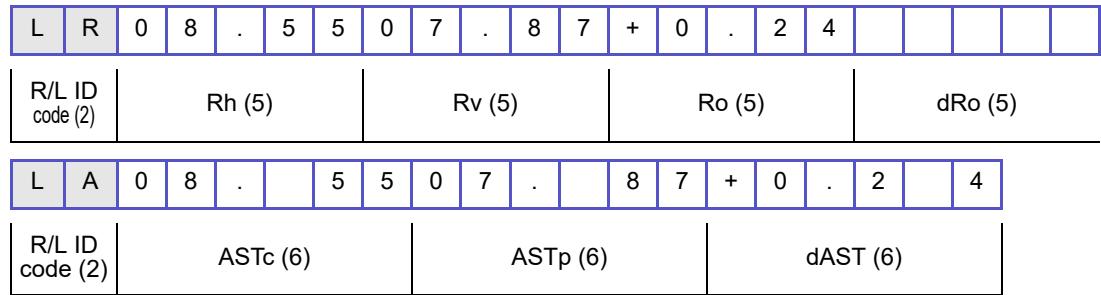
L	T	0	8	.	5	5	0	7	.	8	7	+	0	.	2	4	A
R/L ID code (2)	SAGIT1 (5)				SAGIT2 (5)				ECC (5)				A/F (1)				

TEM, side

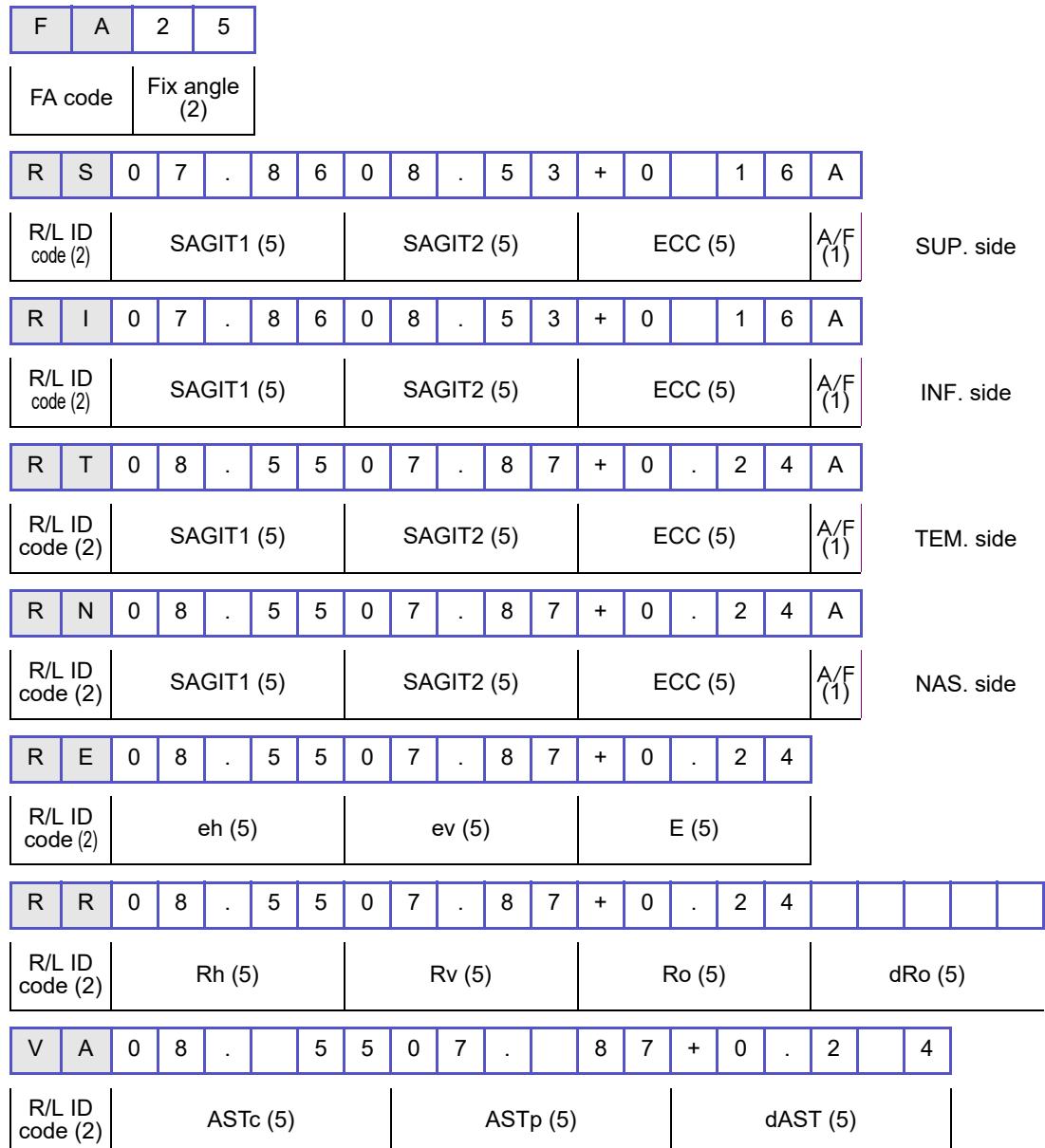
L	N	0	8	.	5	5	0	7	.	8	7	+	0	.	2	4	A
R/L ID code (2)	SAGIT1 (5)				SAGIT2 (5)				ECC (5)				A/F (1)				

NAS. side

L	E	0	8	.	5	5	0	7	.	8	7	+	0	.	2	4
R/L ID code (2)	eh (5)				ev (5)				E (5)							



## 2) For left eye data



When data are output, all data are printed out with the above format regardless the Sagittal printing format.

## ■ Abbreviations

SAGIT1	Measured value
SAGIT2	Measured value including dRO
ECC	Each eccentricity

A/F	Whether calculation for conversion axis is made or not. (A : Conversion of axis is made.)
-----	--

eh	Horizontal eccentricity
ev	Vertical eccentricity
E	Total eccentricity

Rh	Horizontal corneal radius average value
Rv	Vertical corneal radius average value
Ro	Central corneal radius average value
dRo	Central corneal radius differences

ASTc	Central corneal cylinder diopter
ASTp	Peripheral corneal cylinder diopter
dAST	Difference of corneal cylinder diopter between center and peripheral

## 27 Accommodation measurement value (except for ARK-1)

- 1) For left eye data

A	L	0	3	.	0	0
R/L ID code (2)	Accommodation (5)					

- 2) For right eye data

A	R	0	3	.	0	0
R/L ID code (2)	Accommodation (5)					

## 28 Maximum pupil size (maximum size during accommodation measurement) (except for ARK-1)

- 1) For left eye data

B	L	0	6	.	0
R/L ID code (2)	PS MAX (4)				

- 2) For right eye data

B	R	0	6	.	0
R/L ID code (2)	PS MAX (4)				

**29 Minimum pupil size (minimum size during accommodation measurement) (except for ARK-1)**

1) For left eye data

S	L	0	6	.	0
R/L ID code (2)	PS MIN (4)				

2) For right eye data

S	R	0	6	.	0
R/L ID code (2)	PS MIN (4)				

**30 Central Opacity Index Height (COI.H) (except for ARK-1)**

1) For left eye data

H	L	0	.	5	
R/L ID code (2)	COI.H (3)				

2) For right eye data

H	R	0	.	5	
R/L ID code (2)	COI.H (3)				

**31 Central Opacity Index Area (COI.A) (except for ARK-1)**

1) For left eye data

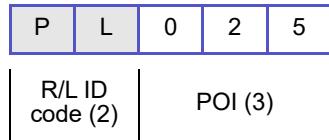
C	L	0	2	0	
R/L ID code (2)	COI.A (3)				

2) For right eye data

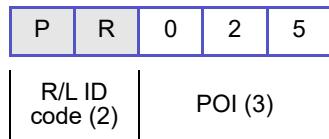
C	R	0	2	0	
R/L ID code (2)	COI.A (3)				

## 32 Peripheral Opacity Index (POI) (except for ARK-1)

- 1) For left eye data

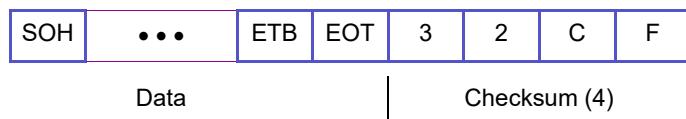


- 2) For right eye data



## 33 Checksum

When the “71. I/F MODE” parameter is set to “NCP10”, a checksum is added to the data format. It is added to the end of “EOT” of each data format.



The checksum is represented by four hexadecimal digits. The value of the checksum is the simple sum of “SOH” to “EOT” in the data format. However, the “CR” code is not included into the calculation of the checksum when the “CR” code is added.

### CAUTION

- Set the “74. BIT LENGTH” parameter to “8”.

When the parameter is set to “7”, the codes that correspond to kana-characters are not output successfully.

### 1.2.3 CR (carriage return) code

When a PC is used as the external computer to receive data, it may be necessary to add the CR code to the end of data to be transmitted in one line. The ARK-1/-1a/-1s allows the user to select whether or not to add the CR code to the end of data.

See Step 3 of “1.3.1 Interface between the ARK-1/-1a/-1s and external PC” (page 23).

The data to be transmitted when the CR code is added are as follows:

- 1) RS command with CR code added

SOH	C	*	*	STX	R	S	ETB	EOT	CR	
0DH										

The CR code is added to the end of the command statement.

- 2) Data with CR code (when the “71. I/F MODE” parameter is set to “NIDEK”)

SOH	D	R	M	STX	Data	ETB	CR	Data	ETB	CR	Data
ETB	CR	EOT	CR								

The CR code is added to the end of the ETB code and data statement.

- 3) Data with CR code (when the “71. I/F MODE” parameter is set to “NCP10”)

SOH	D	R	M	STX	Data	ETB	CR	Data	ETB	CR	Data
ETB	CR	EOT	C1	C2	C3	C4	CR				
Checksum											

The CR code is added to the end of the ETB code and data statement.

## 1.3 Communication Programs

### 1.3.1 Interface between the ARK-1/-1a/-1s and external PC

This section provides the actual transmission method using the attached sample program.

As the external computer, an IBM PC compatible (IBM100% COMPATIBLE) is used.

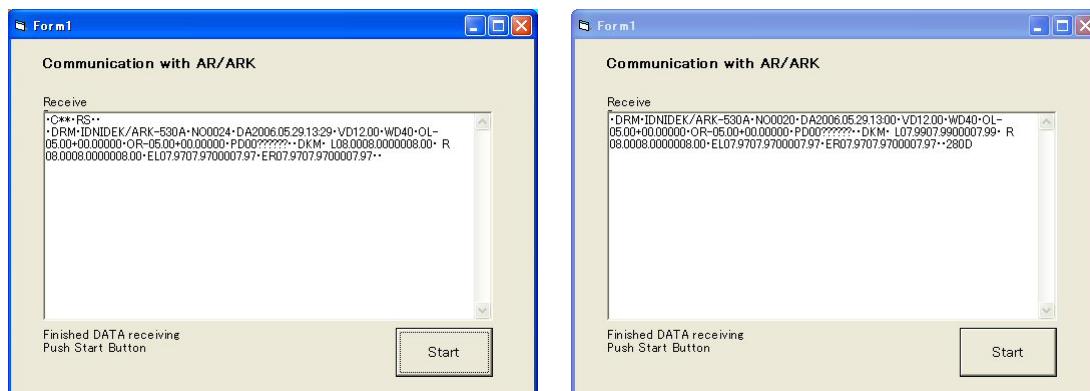
- 1** Connect the ARK-1/-1a/-1s interface connector port  and the serial communication port (RS-232C) of the external computer with the interface cable (OPIF-15).
- 2** Input a sample program of one of communication sequences to the external computer.  
Use Visual Basic as a BASIC application.
- 3** Set the ARK-1/-1a/-1s as follows:

I/F MODE (communication mode)	Depending on the sample program
BAUD-RATE	9600
BIT LENGTH	8
CR CODE	YES

See "Parameter Settings" in the Operator's Manual for the method of setting parameters.

- 4** Measure eyes with the ARK-1/-1a/-1s and press the print  button while the sample program is running.

When data is transmitted successfully, measurement data is displayed on the monitor of the computer.

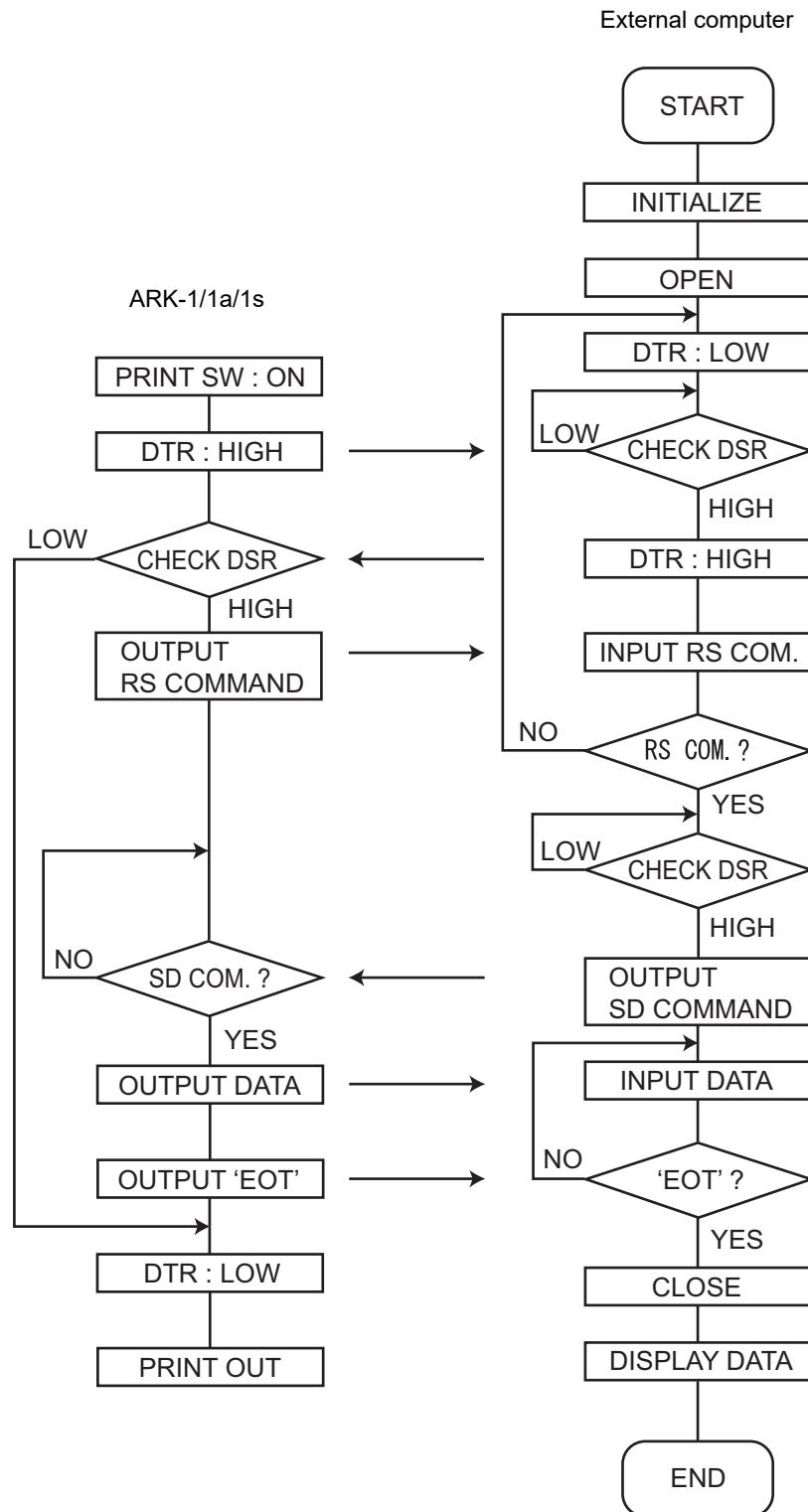


When the "I/F MODE" parameter is set to  
"NIDEK"

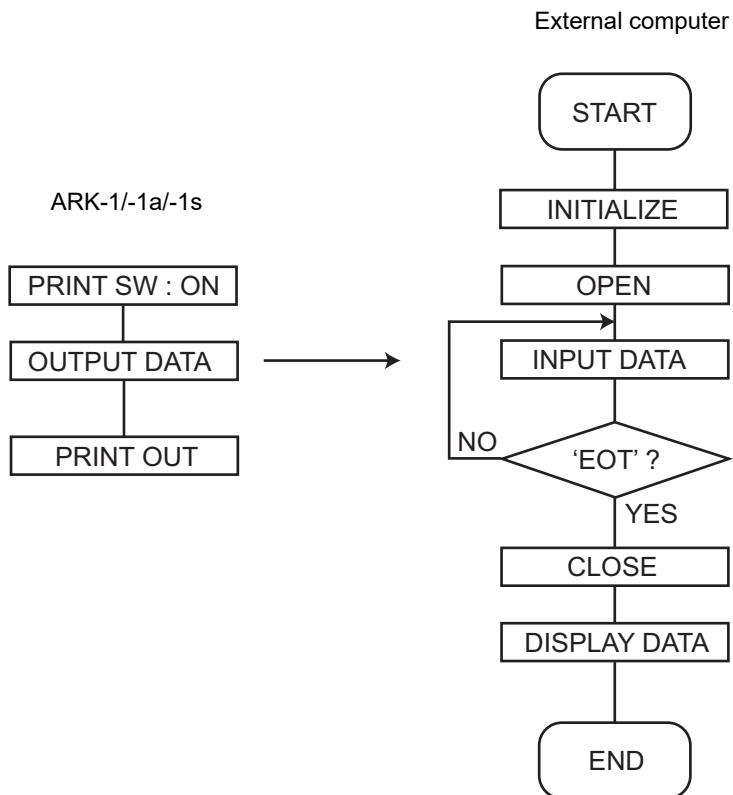
When the "I/F MODE" parameter is set to  
"NCP10"

### **1.3.2 Flow of sample program**

- #### ○ When the “I/F MODE” parameter is set to “NIDEK”



## ○ When the “I/F MODE” parameter is set to “NCP10”



### 1.3.3 Sample program

#### O When the “I/F MODE” parameter is set to “NIDEK”

```
*****
'* Input DATA from ARK/AR for PC/AT      *
'* Sample Program for I/F Mode = NIDEK   *
'* (Visual Basic Ver6.0)                  *
*****  

' Setting of ARK/AR
' I/F Mode  = NIDEK
' Baud-Rate = 9600
' Bit Length = 8
' CR Code   = YES  

'  

Dim TimeupFlag, RecEotFlag As Integer
Dim Buf, L_Buf As String  

Private Sub Form_Load()
    ' Initialize Display Message
    Text1.Text = ""
    Label1.Caption = "Receive Data"
    Label2.Caption = "Communication with AR/ARK"
    Label3.Caption = "Push Start Button"
    Command1.Caption = "Start"
    ' Initialize MSComm Control
    MSComm1.CommPort = 1
    MSComm1.Settings = "9600,o,8,1"
    MSComm1.RThreshold = 1  

End Sub  

Private Sub Command1_Click()
    CRM_SD = Chr(1) + "CRM" + Chr(2) + "SD" + Chr(23) + Chr(4) ' SD command for AR
    CRK_SD = Chr(1) + "CRK" + Chr(2) + "SD" + Chr(23) + Chr(4) ' SD command for ARK
    CXX_RS = Chr(1) + "C***" + Chr(2) + "RS" + Chr(23) + Chr(4) ' RS Command  

    Text1.Text = ""
    Label3.Caption = "Initializing..."
    ' Open COM1 Port
    If MSComm1.PortOpen = False Then
        MSComm1.PortOpen = True
        MSComm1.DTREnable = False
        Timer1.Enabled = False
        Timer1.Interval = 2000
        Timer1.Enabled = True: TimeupFlag = False
        Do ' Waiting for DSR turn off
            DoEvents
        Loop Until TimeupFlag = True
    End If
    Label3.Caption = "Waiting for RS command (DSR)"
    L_Buf = "": RecEotFlag = False
    Do ' Check DSR
        DoEvents
    Loop Until MSComm1.DSRHolding = True
    Label3.Caption = "Waiting for RS command (Text)"
    Timer1.Interval = 5000
    Timer1.Enabled = True: TimeupFlag = False
    MSComm1.DTREnable = True
    Do ' Waiting for RS command
        DoEvents
        If TimeupFlag = True Then
            Exit Do
        End If
    Loop Until RecEotFlag = True
    If L_Buf = CXX_RS Then
        Label3.Caption = "Waiting for SD command transmitting (DSR)"
        L_Buf = "": RecEotFlag = False
        Do ' Check DSR
            DoEvents
        Loop Until MSComm1.DSRHolding = True
        MSComm1.Output = CRM_SD 'Send SD command for ARK
        Label3.Caption = "Waiting for DATA (TEXT)"
        Timer1.Interval = 5000
    End If
End Sub
```

```

Timer1.Enabled = True: TimeupFlag = False
Do ' Waiting for Data
    DoEvents
    If TimeupFlag = True Then
        Exit Do
    End If
Loop Until RecEotFlag = True
If RecEotFlag = True Then
    Label3.Caption = "Finished DATA receiving" & vbCrLf & "Push Start Button"
Else
    Label3.Caption = "EOT Error!!" & vbCrLf & "Push Start Button"
End If
Else
    Label3.Caption = "RS Command Error (Terminated)" & vbCrLf & "Push Start Button"
End If
If MSComm1.PortOpen = True Then
    MSComm1.PortOpen = False
End If
End Sub

```

```

Private Sub MSComm1_OnComm()
    Select Case MSComm1.CommEvent      ' Receive
        Case comEvReceive
            Buf = MSComm1.Input
            L_Buf = L_Buf + Buf
            Text1.Text = Text1.Text + Buf
            If Right$(L_Buf, 1) = Chr(4) Then ' Check end of data
                RecEotFlag = True
                Text1.Text = Text1.Text + vbCrLf
            End If
        Case comEvCTS
        Case comEvDSR
        Case comEvCD
        Case comEvRing
        Case comEvEOF
        Case Else
            MsgBox "Error", vbCritical
    End Select
End Sub

```

```

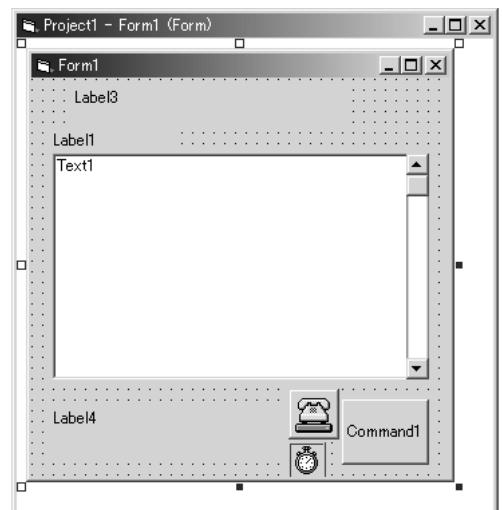
Private Sub Form_Unload(Cancel As Integer)
    If MSComm1.PortOpen = True Then
        MSComm1.PortOpen = False
    End If
End Sub

```

```

Private Sub Timer1_Timer()
    TimeupFlag = True
    Timer1.Enabled = False
End Sub

```



## O When the “I/F MODE” parameter is set to “NCP10”

```
*****
'*      Input DATA from ARK/AR for PC/AT      *
'*      Sample Program for I/F Mode = NCP10  *
'*      (Visual Basic Ver6.0)                  *
*****
```

```
' Setting of ARK/AR
' I/F Mode   = NCP10
' Baud-Rate  = 9600
' Bit Length = 8
' CR Code    = YES
```

```
Dim TimeupFlag, RecEotFlag As Integer
Dim Buf, L_Buf As String
```

```
Private Sub Form_Load()
    ' Initialize Display Message
    Text1.Text = ""
    Label1.Caption = "Receive Data"
    Label2.Caption = "Communication with AR/ARK"
    Label3.Caption = "Push Start Button"
    Command1.Caption = "Start"
    ' Initialize MSComm Control
    MSComm1.CommPort = 1
    MSComm1.Settings = "9600,o,8,1"
    MSComm1.RThreshold = 1
```

```
End Sub
```

```
Private Sub Command1_Click()
```

```
    Text1.Text = ""
    Label3.Caption = "Initializing..."
    ' Open COM1 Port
    If MSComm1.PortOpen = False Then
        MSComm1.PortOpen = True
    End If
    L_Buf = ""
    RecEotFlag = False
    TimeupFlag = False
    Timer1.Enabled = False
    Label3.Caption = "Waiting for DATA receiving"
    Do ' Waiting for Data
        DoEvents
        If RecEotFlag = True Then
            Exit Do
        End If
    Loop Until TimeupFlag = True
```

```
    If RecEotFlag = True Then
        Label3.Caption = "Finished DATA receiving" & vbCrLf & "Push Start Button"
    Else
        Label3.Caption = "EOT Error!!" & vbCrLf & "Push Start Button"
    End If
    If MSComm1.PortOpen = True Then
        MSComm1.PortOpen = False
    End If
End Sub
```

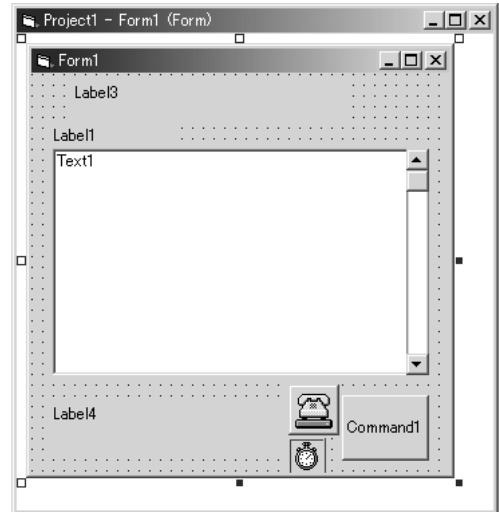
```
Private Sub MSComm1_OnComm()
    Select Case MSComm1.CommEvent
        Case comEvReceive      ' Receive Data
            Buf = MSComm1.Input
            L_Buf = L_Buf + Buf
            Text1.Text = Text1.Text + Buf
            If TimeoutFlag = False Then
                Timer1.Enabled = True ' Timer Start
            End If
            Timer1.Interval = 1000  ' Set interval time
            s = Len(L_Buf)
            If s > 4 Then
                If Mid$(L_Buf, s - 4, 1) = Chr(4) Then ' Search EOT before checksum
                    RecEotFlag = True
                End If
            End If
        End Select
End Sub
```

```
    Timer1.Enabled = False
End If
End If
Case comEvCTS
Case comEvDSR
Case comEvCD
Case comEvRing
Case comEvEOF
Case Else
    MsgBox "Error", vbCritical
End Select
End Sub
```

```
Private Sub Form_Unload(Cancel As Integer)
If MSComm1.PortOpen = True Then
    MSComm1.PortOpen = False
End If
End Sub
```

```
Private Sub Timer1_Timer()
    TimeupFlag = True
    Timer1.Enabled = False
End Sub
```

1



## 1.4 Examples of Measurement Data Received by PC

### 1.4.1 When various measurements are performed

#### ○ Sample printout

-----0005-----	.....	Patient number
ID 12345678901234567890	.....	Patient ID
NAME	.....	Name, sex
FEB/28/2013 10:50 AM	.....	Date and time of measurement
VD=12.00mm	.....	Vertex distance
WD=40cm	.....	Near working distance
<R> S C A	.....	
+ 0.25 -0.37 83 9	.....	Right eye: 1st, Number of AR measurements
Err co	.....	Right eye: 2nd, Measurement error (outside CYL range error)
+ 0.25 -0.50 84 8	.....	Right eye: 3rd, Number of AR measurements
+ 0.25 -0.50 95 8	.....	Right eye: 4th, Number of AR measurements
+ 0.25 -0.37 86 9	.....	Right eye: 5th, Number of AR measurements
<+ 0.25 -0.37 84>	.....	Right eye: AR median values
TL + 0.00 +0.25 175	.....	Right eye: Trial lens data
CL + 0.25 -0.25 85	.....	Right eye: Contact lens data
+ 0.00 SE	.....	Right eye: SE value for contact lens data
L. DATA	.....	
+ 0.25 -0.50 95	.....	Right eye: AR large area measurement values
PS 4.5	.....	Right eye: Pupil size
ACC 0.50	.....	Right eye: Accommodation measurement values
MIN- 1.75 MAX- 2.25	.....	Right eye: AR measurement minimum value, AR measurement maximum value (during accommodation measurement)
(PS MIN 4.6 MAX 5.5)	.....	Right eye: Pupil size minimum value, pupil size maximum value (during accommodation measurement)
RETRO	.....	
COI. H 0.1mm	.....	Right eye: Central Opacity Index Height (COI.H)
COI. A 5%	.....	Right eye: Central Opacity Index Area (COI.A)
POI 23%	.....	Right eye: Peripheral Opacity Index (POI)
<L> S C A	.....	
- 4.12 -0.00 0 8	.....	Left eye: 1st, Number of AR measurements
- 4.25 -0.25 93 9	.....	Left eye: 2nd, Number of AR measurements
Err -o	.....	Left eye: 3rd, Measurement error (outside SPH negative range error)
- 4.37 -0.37 90 9	.....	Left eye: 4th, Number of AR measurements
<- 4.25 -0.25 93>	.....	Left eye: AR median values
TL - 4.00 -0.75 95	.....	Left eye: Trial lens data
CL - 4.00 -0.75 95	.....	Left eye: Contact lens data
- 4.25 SE	.....	Left eye: SE value for contact lens data
L. DATA	.....	
- 4.25 -0.50 93	.....	Left eye: AR large area measurement values
PS 4.5 (LAMP=OFF)	.....	Left eye: Pupil size
ACC 0.50	.....	Left eye: Accommodation measurement values
MIN- 1.75 MAX- 2.25	.....	Left eye: AR measurement minimum value, AR measurement maximum value (during accommodation measurement)
(PS MIN 4.6 MAX 5.5)	.....	Left eye: Pupil size minimum value, pupil size maximum value (during accommodation measurement)
RETRO	.....	
COI. H 0.1mm	.....	Left eye: Central Opacity Index Height (COI.H)
COI. A 5%	.....	Left eye: Central Opacity Index Area (COI.A)
POI 23%	.....	Left eye: Peripheral Opacity Index (POI)
PD 67 N 62	.....	Pupillary distances Distance PD, Near PD
PD 68 (R 35 L 33) N 63	.....	Pupillary distances Distance PD (with monocular PD), Near PD

UCVA (R 0.1 L 0.3)	..... Uncorrected VA values
SUBJ R + 0.25 - 0.25 85 L - 4.00 - 0.75 95	..... Right eye: Subjective refractive error measurement values ..... Left eye: Subjective refractive error measurement values
BCVA (R 1.0 L 1.0) LOW (R 0.7 L 0.7) GLARE (R 0.8 L 0.8)	..... Corrected VA values ..... Low contrast VA values ..... Glare VA values
ADD R + 2.50 VA 0.6 WD35 L + 3.00 VA 0.6 WD45	..... Right eye: Near addition power, near VA value, near working distance (near visual acuity measurement) ..... Left eye: Near addition power, near VA value, near working distance (near visual acuity measurement)
LM R + 0.50 - 0.00 0 L - 3.50 - 0.50 90	..... Right eye: LM values ..... Left eye: LM values
LM ADD R + 3.00 + 3.50 L + 3.00 + 3.50	..... Right eye: LM addition powers (ADD1, ADD2) ..... Left eye: LM addition powers (ADD1, ADD2)
<R> mm D deg R1 7.86 42.94 175 R2 7.53 44.82 85 AVE 7.70 43.88 CYL -1.88 175 R1 7.86 42.94 175 R2 7.53 44.82 85 AVE 7.70 43.88 CYL -1.88 175 R1 7.87 42.88 174 R2 7.53 44.82 84 AVE 7.70 43.85 CYL -1.94 174 <R1 7.86 42.94 175> <R2 7.53 44.82 85> <AVE 7.70 43.88 > <CYL -1.88 175> CS 11.0	..... KM measurements ..... Right eye: 1st, Number of KM measurements  ..... Right eye: 2nd, Number of KM measurements  ..... Right eye: 3rd, Number of KM measurements  ..... Right eye: KM median values  ..... Right eye: Corneal size
<L> mm D deg R1 7.96 42.40 177 R2 7.74 43.60 87 AVE 7.85 43.00 CYL -1.20 177 R1 7.95 42.45 176	..... KM measurements ..... Left eye: 1st, Number of KM measurements
<R1 7.95 42.45 176> <R2 7.71 43.77 86> <AVE 7.83 43.11 > <CYL -1.32 176> CS 11.5	..... Left eye: KM median values  ..... Left eye: Corneal size
***** NIDEK ARK-1s	..... Comments

○ Data to be transmitted for the above sample printout

[SOH] Drm [STX]	Header for AR large area measurement
IDNIDEK/ARK-1s [ETB]	Company name and model name
NO0006 [ETB]	Patient number
IP012345678901234 [ETB]	Patient ID
DAFEB/28/2013.10:50AM [ETB]	Date and time of measurement
VD12.00 [ETB]	Vertex distance
WD40 [ETB]	Near working distance
OL-04.25-00.25093 [ETB]	Left eye: AR large area measurement value (L.DATA)
OR-04.25-00.25093 [ETB]	Right eye: AR large area measurement value (L.DATA)
dL-04.25-00.25093 [ETB]	Left eye: Large area differentiation value (L.DIFF)
dR-04.25-00.25093 [ETB]	Right eye: Large area differentiation value (L.DIFF)
[SOH] DRM [STX]	Header for AR measurement
IDNIDEK/ARK-1s [ETB]	Company name and model name
NO0006 [ETB]	Patient number
IP012345678901234 [ETB]	Patient ID
DAFEB/28/2013.10:50AM [ETB]	Date and time of measurement
VD12.00 [ETB]	Vertex distance
WD40 [ETB]	Near working distance
OL-04.25-00.25093 [ETB]	Left eye: AR median values 4th: Normal data
OL-04.37-00.370909 [ETB]	3rd: Measurement error (outside SPH negative range error)
EL-O [ETB]	2nd: Normal data
OL-04.25-00.250939 [ETB]	1st: Normal data
OL-04.12-00.000008 [ETB]	Right eye: AR median values 5th: Normal data
OR+0.25-00.37084 [ETB]	4th: Normal data
OR+0.25-00.370869 [ETB]	3rd: Normal data
OR+0.25-00.500958 [ETB]	2nd: Measurement error (outside CYL range error)
OR+0.25-00.500848 [ETB]	1st: Normal data
ERCO [ETB]	Left eye: LM values
OR+0.25-00.370839 [ETB]	Right eye: LM values
LL-03.50-00.50090 [ETB]	Left eye: LM addition power
LR+00.50-00.00000 [ETB]	Right eye: LM addition power
BL+03.00+03.50 [ETB]	Left eye: Contact lens data
BR+03.00+03.50 [ETB]	Right eye: Contact lens data
SL-04.00-00.75095 [ETB]	Left eye: Subjective refractive error measurement value
SR+00.25-00.25085 [ETB]	Right eye: Subjective refractive error measurement value
CL-04.00-00.75095 [ETB]	Left eye: Trial lens data
CR+00.25-00.25085 [ETB]	Right eye: Trial lens data
TL-04.00-00.75095 [ETB]	Left eye: Near addition power
TR+00.00+00.25175 [ETB]	Right eye: Near addition power
AL+03.00 [ETB]	Left eye: Uncorrected VA value
AR+02.50 [ETB]	Right eye: Uncorrected VA value
UL0.30 [ETB]	Left eye: Corrected VA value
UR0.10 [ETB]	Right eye: Corrected VA value
WL1.00 [ETB]	Left eye: Low contrast VA value
WR1.00 [ETB]	Right eye: Low contrast VA value
FL0.70 [ETB]	Left eye: Glare VA value
FR0.70 [ETB]	Right eye: Glare VA value
GL0.80 [ETB]	Left eye: Near VA value
GR0.80 [ETB]	Right eye: Near VA value
NL0.60 [ETB]	Left eye: Near working distance (during near visual acuity measurement)
NR0.60 [ETB]	Right eye: Near working distance (during near visual acuity measurement)
dL45 [ETB]	
dR35 [ETB]	

PD68353363	[ETB]	Pupillary distances Distance PD (with monocular PD), Near PD
PD67????62	[ETB]	Pupillary distances Distance PD, Near PD
[SOH] DKM	[STX]	Header for KM measurement
L07.9507.7117607.83	[ETB]	Left eye: KM median values (mm)
DL42.4543.7717643.11-01.32	[ETB]	KM median values (D)
L07.9507.7117607.83	[ETB]	3rd: KM data (mm)
DL42.4543.7717643.11-01.32	[ETB]	KM data (D)
L07.9507.7117607.83	[ETB]	2nd: KM data (mm)
DL42.4543.7717643.11-01.32	[ETB]	KM data (D)
L07.9607.7417707.85	[ETB]	1st: KM data (mm)
DL42.4043.6017743.00-01.20	[ETB]	KM data (D)
R07.8607.5317507.70	[ETB]	Right eye: KM median values (mm)
DR42.9444.8217543.88-01.88	[ETB]	KM median values (D)
R07.8707.5317407.70	[ETB]	3rd: KM data (mm)
DR42.8844.8217443.85-01.94	[ETB]	KM data (D)
R07.8607.5317507.70	[ETB]	2nd: KM data (mm)
DR42.9444.8217543.88-01.88	[ETB]	KM data (D)
L07.8607.5317507.70	[ETB]	1st: KM data (mm)
DR42.9444.8217543.88-01.88	[ETB]	KM data (D)
SL11.5	[ETB]	Left eye: Corneal size
PL06.0F	[ETB]	Left eye: Pupil size
SR11.0	[ETB]	Left eye: Corneal size
PR06.0N	[ETB]	Left eye: Pupil size
[SOH] ACC	[STX]	Header for accommodation measurement
AL00.50	[ETB]	Left eye: Accommodation
AR00.50	[ETB]	Right eye: Accommodation
BL05.50	[ETB]	Left eye: Maximum pupil size (during accommodation measurement)
BR05.50	[ETB]	Right eye: Maximum pupil size (during accommodation measurement)
SL04.60	[ETB]	Left eye: Minimum pupil size (during accommodation measurement)
SR04.60	[ETB]	Right eye: Minimum pupil size (during accommodation measurement)
[SOH] RTR	[STX]	Header for retroillumination image opacity indexes
HL0.1	[ETB]	Left eye: Central Opacity Index Height (COI.H)
HR0.1	[ETB]	Right eye: Central Opacity Index Height (COI.H)
CL005	[ETB]	Left eye: Central Opacity Index Area (COI.A)
CR005	[ETB]	Right eye: Central Opacity Index Area (COI.A)
PL023	[ETB]	Left eye: Peripheral Opacity Index (POI)
PR023	[ETB] [EOT]	Right eye: Peripheral Opacity Index (POI)

The following symbols represent the control codes as below:

[SOH] = SOH 01H    [ETB] = ETB 17H    [STX] = STX 02H    [EOT] = EOT 04H

When the CR code parameter is set to YES, ETB is followed by CR.

When the "71. I/F MODE" parameter is set to "NCP10", [EOT] is followed by four digits of checksum.



- In the data-communications output, data is output in a fixed order regardless of a printing setting with the "47. PRINT FORMAT" parameter.

## 1.4.2 Sample printout of KM data when the “I/F FORMAT” parameter is set to “SHORT”

### ○ Sample printout

<pre>-----0 0 0 5----- NAME M/F FEB/28/2013 10:50 AM</pre> <pre>&lt;R&gt; mm D deg &lt;R1 7. 8 6 4 2. 9 4 1 7 5&gt; &lt;R2 7. 5 3 4 4. 8 2 8 5&gt; &lt;AVE 7. 7 0 4 3. 8 8 &gt; &lt;CYL -1. 8 8 1 7 5&gt; CS 11. 0</pre> <pre>&lt;L&gt; mm D deg &lt;R1 7. 9 5 4 2. 4 5 1 7 6&gt; &lt;R2 7. 7 1 4 3. 7 7 8 6&gt; &lt;AVE 7. 8 3 4 3. 1 1 &gt; &lt;CYL -1. 3 2 1 7 6&gt; CS 11. 5</pre> <pre>===== N I D E K   A R K - 1 s</pre>	<p>..... Patient number</p> <p>..... Name, sex</p> <p>..... Date and time of measurement</p> <p>..... Right eye: KM median values</p> <p>..... Right eye: Corneal size</p> <p>..... Left eye: KM median values</p> <p>..... Left eye: Corneal size</p> <p>..... Comments</p>
--	---

### ○ Data to be transmitted for the above sample printout

<b>[SOH] DKM [STX]</b>	.....	Header for KM measurements
<b>NO0006 [ETB]</b>	.....	Patient number
<b>DAFEB/28/2013.10:50AM [ETB]</b>	.....	Date and time of measurement
<b>L07.9507.7117607.83 [ETB]</b>	.....	Left eye: KM median values (mm)
<b>R07.8607.5317507.70 [ETB] [EOT]</b>	.....	Right eye: KM median values (mm)

The above sample example is produced when the SD command is CKM (see “1.2.1 Command format (for “NIIDEK”)” (page 5)).

Because the “72. I/F FORMAT” parameter is set to “SHORT”, only KM median values (mm) are transmitted.

The company name, model name, corneal size, and pupil size data are not transmitted.

### 1.4.3 Transmission of Sagittal Measurement Data

The transmission format of each data of Sagittal measurement is described hereunder.

Sagittal measurement data are shown in the print out sample as below from (6) following to KM measurement data.

Printed data by ARK-1s		Transmission format
2	-----0001-----	1 [SOH] DKM [STX]
3	NAME M/F DEC/18/2013 10:50 AM VD=12.00mm	2 NO.0001 [ETB] [CR]
4 5	<L> mm D deg	3 DADEC/18/2013.10:50AM [ETB] [CR]
4 5	<R1> 8.51 39.66 100>	4 L08.5107.8410008.18 [ETB] [CR]
4 5	<R2> 7.84 43.05 10>	5 DL39.6643.0510041.36-03.39 [ETB] [CR]
5	<AVE> 8.18 41.36 >	6 FA25 [ETB] [CR]
6	<CYL> -3.39 100>	7 LS07.8608.53+0.16A [ETB] [CR]
7 8 9 10	<SAGITTAL> FIX ANGLE=25 SUP. INF. TEM. NAS. A 7.86 7.86 8.55 8.55	8 LI07.8608.53+0.16A [ETB] [CR]
7 8 9 10	<TOPOMETRY OF CORNEA> SUP. INF. TEM. NAS. S 8.53 8.53 7.88 7.88	9 LT08.5507.87+0.24A [ETB] [CR]
7 8 9 10	e+0.16 +0.16 +0.24 +0.24	10 LN08.5507.87+0.24A [ETB] [CR]
11	e h = +0.24 Rh = 7.87	11 LE+0.24+0.16+0.20 [ETB] [CR]
11	e V = +0.16 Rv = 8.52	12 LR07.8708.5208.18+0.67 [ETB] [CR]
11	E = +0.20 Ro = 8.18	13 LA-03.39-03.26-00.13 [ETB] [CR] [EOT] [CR]
13	AST c= -1.39 dRo = +0.67	
13	AST p= -3.26 dAST = -0.13	
N IDEK ARK-1s		

1

The following marks represent the following control codes:

[SOH] = 01H SOH

[STX] = 02H STX

[ETB] = 17H ETB

[EOT] = 04H EOT

[SOH] = 0DH CR

[SOH] is added in accordance with setting.

1	Header: This signifies KM measurement data to be transmitted.								
2	Patient number								
3	Measurement date and time								
4	KM measurement (mm) data: R1(5), RS(5), AXIS(3), AVE(5)								
5	KM measurement (D) data: R1(5), AXIS(3), AVE(5), CYL(6)								
6	Fixed angle in Sagittal measurement: FIXED ANGLE(2)								
7	Sagittal value for SUP. direction: SAGIT1(5), SAGIT2(5), ECC(5), A/F(1)								
8	Sagittal value for INF. direction: SAGIT1(5), SAGIT2(5), ECC(5), A/F(1)								
9	Sagittal value for TEM. direction: SAGIT1(5), SAGIT2(5), ECC(5), A/F(1)								
10	Sagittal value for NAS. direction: SAGIT1(5), SAGIT2(5), ECC(5), A/F(1)								
	<table border="1"> <tr><td>SAGIT1</td><td>Measured value</td></tr> <tr><td>SAGIT2</td><td>Measured value including dRO</td></tr> <tr><td>ECC</td><td>Each eccentricity</td></tr> <tr><td>A/F</td><td>Whether calculation for conversion axis is made or not. (A : Conversion of axis is made.)</td></tr> </table>	SAGIT1	Measured value	SAGIT2	Measured value including dRO	ECC	Each eccentricity	A/F	Whether calculation for conversion axis is made or not. (A : Conversion of axis is made.)
SAGIT1	Measured value								
SAGIT2	Measured value including dRO								
ECC	Each eccentricity								
A/F	Whether calculation for conversion axis is made or not. (A : Conversion of axis is made.)								
11	Horizontal, Vertical and Total eccentricity: eh(5), ev(5), E(5)								
	<table border="1"> <tr><td>eh</td><td>Horizontal eccentricity</td></tr> <tr><td>ev</td><td>Vertical eccentricity</td></tr> <tr><td>E</td><td>Total eccentricity</td></tr> </table>	eh	Horizontal eccentricity	ev	Vertical eccentricity	E	Total eccentricity		
eh	Horizontal eccentricity								
ev	Vertical eccentricity								
E	Total eccentricity								
12	Each corneal radius values: Rh(5), Rv(5), Ro(5), dRo(5)								
	<table border="1"> <tr><td>Rh</td><td>Horizontal corneal radius average value</td></tr> <tr><td>Rv</td><td>Vertical corneal radius average value</td></tr> <tr><td>Ro</td><td>Central corneal radius average value</td></tr> <tr><td>dRo</td><td>Central corneal radius differences</td></tr> </table>	Rh	Horizontal corneal radius average value	Rv	Vertical corneal radius average value	Ro	Central corneal radius average value	dRo	Central corneal radius differences
Rh	Horizontal corneal radius average value								
Rv	Vertical corneal radius average value								
Ro	Central corneal radius average value								
dRo	Central corneal radius differences								
13	Cylindrical diopters and its differences at center and peripheral: ASTc(6), ASTp(6), dAST(6)								
	<table border="1"> <tr><td>ASTc</td><td>Central corneal cylinder diopter</td></tr> <tr><td>ASTp</td><td>Peripheral corneal cylinder diopter</td></tr> <tr><td>dAST</td><td>Difference of corneal cylinder diopter between center and peripheral</td></tr> </table>	ASTc	Central corneal cylinder diopter	ASTp	Peripheral corneal cylinder diopter	dAST	Difference of corneal cylinder diopter between center and peripheral		
ASTc	Central corneal cylinder diopter								
ASTp	Peripheral corneal cylinder diopter								
dAST	Difference of corneal cylinder diopter between center and peripheral								

## 1.5 RS-232C Interface Error Messages

The error code table regarding the RS-232C interface is provided as below. When an error message is displayed, refer to this table.

Error message	Description	Details
ERR011 COM (OUT) ERR	Time-out error in characters (OUT)	Communication breaks during data reception.
ERR012 COM (OUT) ERR	Reception start time-out (OUT)	Timeout after DTR-DSR is established
ERR013 COM (OUT) ERR	Reception error (OUT)	Parity and framing error
ERR014 COM (OUT) ERR	Received code error (OUT)	Received code is abnormal.
ERR015 COM (OUT) ERR	Reply time-out (OUT)	Time-out error between sending and receiving
ERR016 COM (OUT) ERR	DTR-DSR error (OUT)	Timeout between DTR and DSR
ERR017 COM (OUT) ERR	Data error (OUT)	Data error (improper received data)
ERR018 COM (OUT) ERR	Command error (OUT)	Data error (improper command)
NO DAT	Data empty (OUT)	No measurement data
ERR021 COM (IN) ERR	Time-out error in characters (IN)	DSR is not flagged while SD command is received.
ERR022 COM (IN) ERR	Reception start time-out (IN)	DSR is not flagged while data is sent.
ERR023 COM (IN) ERR	Reception error (IN)	Received data does not come.
ERR024 COM (IN) ERR	Received code error (IN)	Received buffer is full.
ERR025 COM (IN) ERR	Reply time-out (IN)	Unreadable command was input.
ERR026 COM (IN) ERR	DTR-DSR error (IN)	-
ERR027 COM (IN) ERR	Data error (IN)	-
ERR028 COM (IN) ERR	Command error (IN)	-





## LAN COMMUNICATION

### 2.1 Outline of LAN Communication

The ARK-1/ARK-1a/ARK-1s creates XML (measurement results and information) and JPEG (image) files of the measurement data to be used in electronic filing systems for ophthalmology, and it comes equipped with a LAN interface that outputs those created files to shared folders in external computers using CIFS (Common Internet File System).

#### ■ Basic interface specifications

1	Basic specifications	CIFS
2	Connector	RJ-45
3	Standard	100Base-TX
4	Cable	Straight
5	Supported OS	Windows 2000, XP, Vista, 7

## 2.2 Device Connection

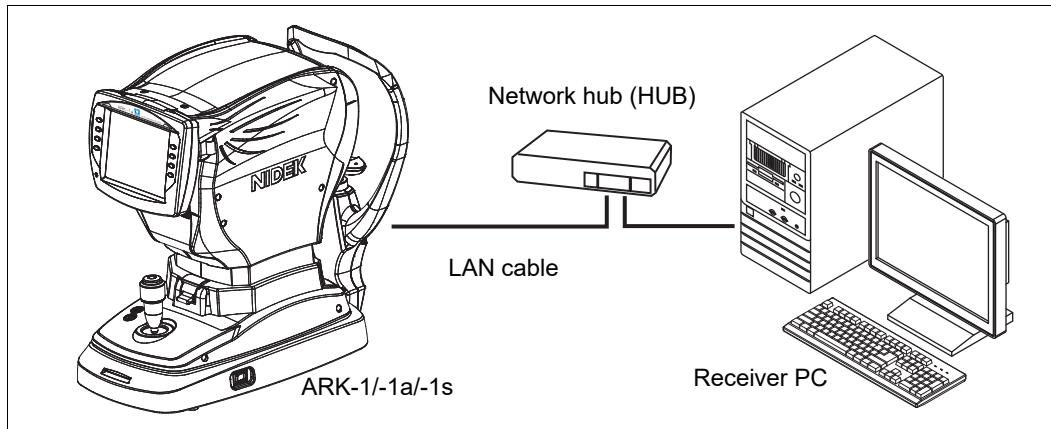
### 2.2.1 Connecting LAN cables

Connect the LAN cable to the LAN connector on the underside of the device.

Connect the other end of the LAN cable to the hub to which the receiver PC is connected.

#### **⚠ CAUTION**

- Be sure to connect to the PC via a network hub.  
Do not connect to the PC directly. Connection failure may result.



### 2.2.2 Connecting the barcode scanner / magnetic card reader

Turn off the main body and then connect the barcode scanner or magnetic card reader to the USB-A connector on the underside of the device.

#### **⚠ CAUTION**

- Do not connect or disconnect cables while power to the main body is on.  
An error may result.

Usable barcode scanner / magnetic card reader

Barcode scanner

NAV-3 (NAVIS-CL) 19701-E006	USB barcode scanner (OPL-5850-USB, ROLAN)
NAV-2 (NAVIS-HP) 36120-E122	USB barcode scanner (USBee-1000, WELCOM DESIGN)

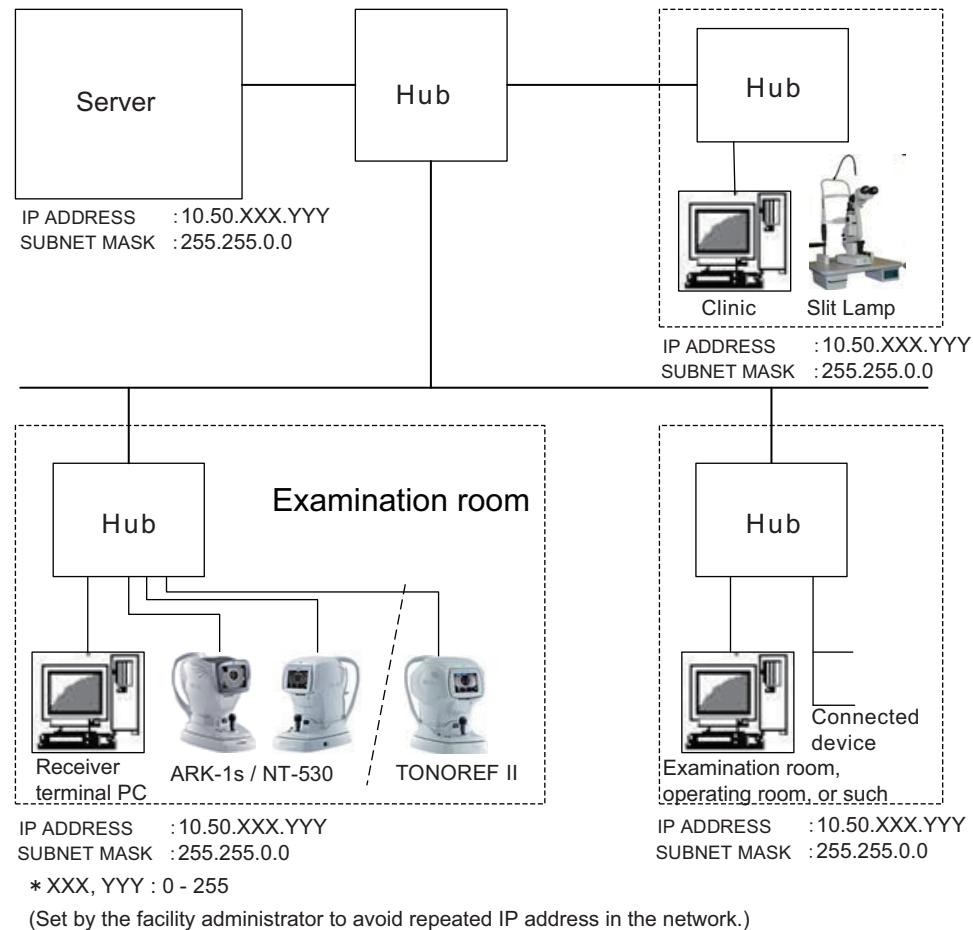
Magnetic card reader

US10OP-1 (Option for US-4000) 14631-E001	Magnetic stripe card reader (MS240-2U MSR track I, II, UNITEK JAPAN)
---	---

## 2.2.3 System diagram example

The diagram shown below illustrates the connection of an actual system.

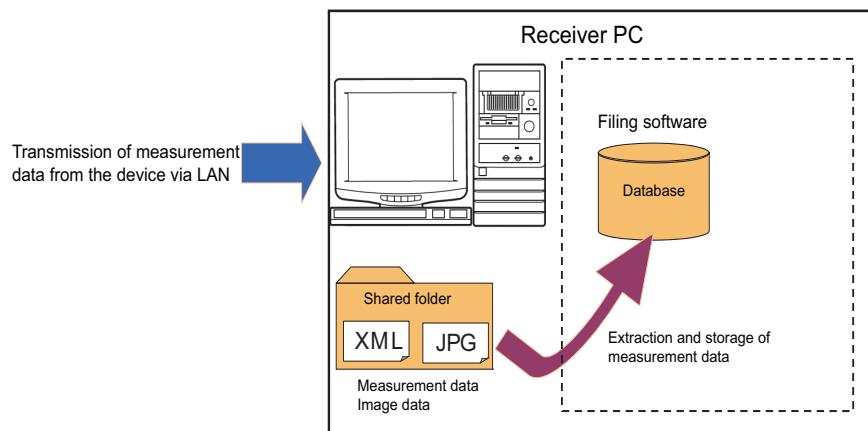
The system diagram below is only an example. It may change significantly depending on the connection network scale. To confirm the system diagram, contact the network administrator of the facility.



## 2.3 Confirmation and Setting of Receiver PC

### 2.3.1 Reception structure of measurement data

Measurement data transmitted from the ARK-1/-1a/-1s is imported into the receiver PC as shown in the illustration below.



Measurement data transmitted via LAN are written in the shared folder set in the receiver PC. XML format for measurement data and JPEG format files for image data are written in the shared folder. Then, measurement data is extracted by filing software and saved in the database.

### 2.3.2 Setting the shared folder

Set up a shared folder to save measurement data transmitted from the ARK-1/-1a/-1s.



- Do not set measurement data in an external storage such as an external hard disk.
- Be sure that no shared folders have the same name. (see the screen sample in Step 2)).

The device cannot discern the folder and measurement data cannot be transmitted properly.

\* The name of the shared folder is the initial setting of the share name. (The share name is changeable.)

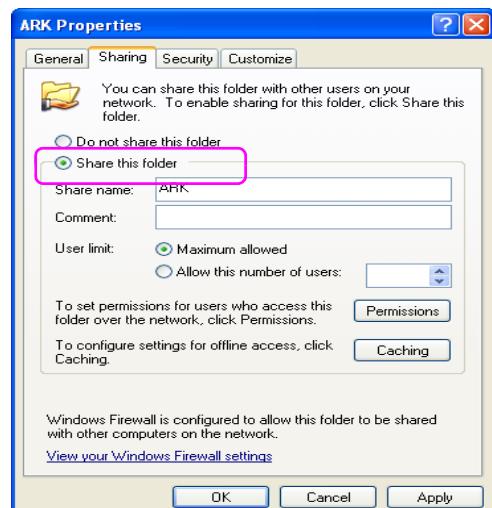
The shared folder (folder path) specified here must be set in the parameter of the device and software of the receiver PC.

Setting a shared folder (folder name: ARK) to the desktop of the receiver PC

1) Newly create a folder on desktop and name the folder with “ARK”.

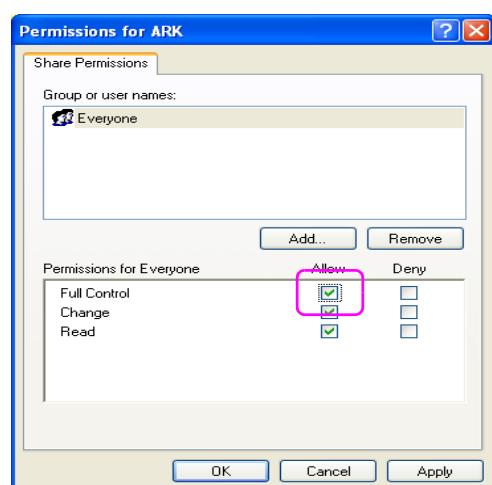
2) Open the “ARK Properties” dialog box of the ARK folder and select “Share this folder” in the Sharing tab.

The illustration to the right is an example from Windows XP.

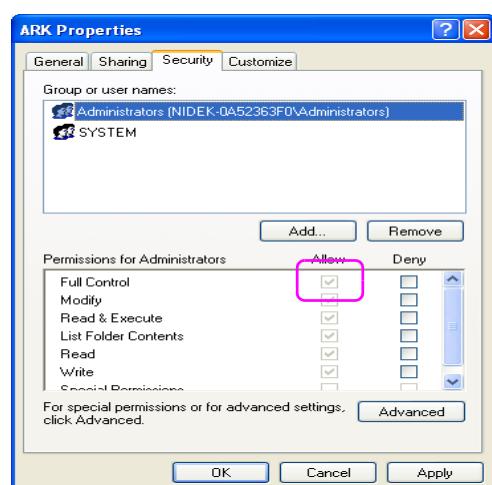


3) Click the “Permissions” button to display the “Permission for ARK” dialog box and then check the “Allow” box for Full Control in “Permissions for Everyone”.

4) Click the OK button to return to the “ARK Properties” dialog box.



5) In the Security tab, check the “Allow” box for Full Control in “Permissions for Administrators”.



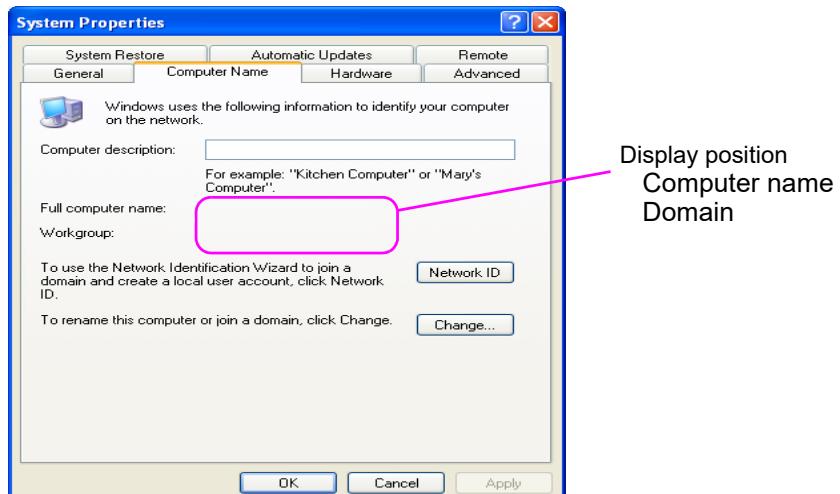
6) Click the OK button to return to the desktop.

### 2.3.3 Confirming Items Necessary for Other Settings

Confirm the following settings necessary for device connection.

(If necessary, confirm to the network administrator.)

- Login user name of the receiver PC
- Login password of the receiver PC
- Domain name of the receiver PC (domain name of the connected network)  
(If no domain exists, confirm the work group name.)
- Computer name of the receiver PC (or IP address of the receiver PC)  
(Confirm the computer name and domain using System Properties of the PC.)
- Shared folder name (see “2.3.2 Setting the shared folder” (page 42) for setting.)
- IP address of the device (issued by the network administrator)
- Subnet mask of the device (issued by the network administrator)
- Usable or unusable of DHCP (Confirm to the network administrator.)



ex.) Confirmation of each setting

Login user name	NIDEK
Login password	NIDEK
Domain name	NAVIS
Computer name (IP address of receiver PC)	10. 50. 1. 1 (IP address of the receiver PC)
Shared folder name	ARK
IP address of receiver PC	10. 50. 1. 10
Subnet mask of device	255. 255. 255. 0

## 2.4 Confirmation and Setting of Device

### 2.4.1 Setting the Device Transmission

Set the network parameters of the device based on the information of “*2.3.3 Confirming Items Necessary for Other Settings*” (page 44).

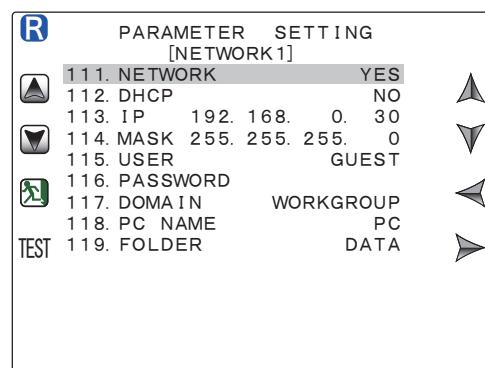
**1** Turn on the device to enter the PARAMETER SETTING screen.

**2** Select “NETWORK1” from the parameter items.

The NETWORK1 setting screen appears.

**3** Set the “111. NETWORK” parameter to “YES”.

For connection to NAVIS, set “ACK”.



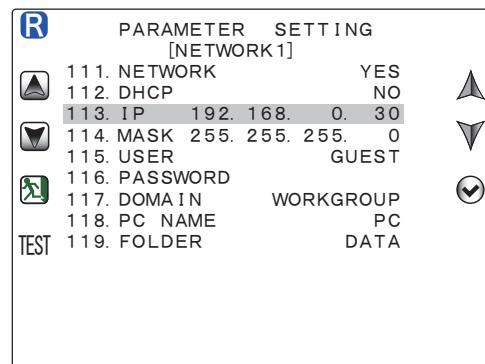
**4** Set the “112. DHCP” parameter to “YES” or “NO”.

For cases where an IP address is automatically assigned, use the DHCP parameter (select “YES”).

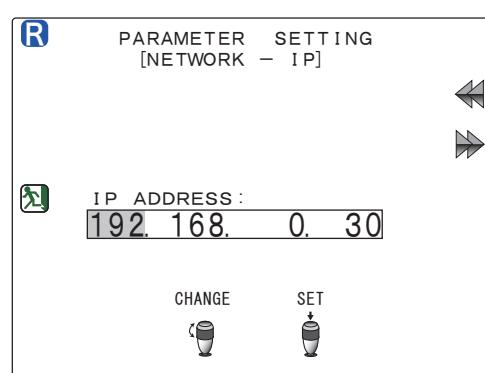
When the “112. DHCP” parameter is set to “YES”, Steps 5 to 10 are not necessary to be conducted. Proceed to Step 11.

When an IP address is issued, select “NO”.

**5** When the “113. IP” parameter is selected, the enter button is displayed.



**6** Press the enter button to display the IP address setting screen.

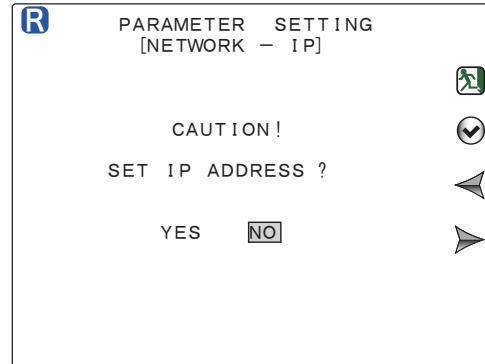


- 7** Input the IP address based on the information of “*2.3.3 Confirming Items Necessary for Other Settings*” (page 44) by the following button operation.

(ex.: 10. 50. 1. 10)

 Forward movement /  Backward movement or pressing the start button	Moves the cursor to the right or left. Pressing the start button moves the cursor to the right.
Rotating the upper part of the joystick	Increases/decreases the numeric value.

- 8** Pressing the exit  button displays a screen to confirm the input IP address.



- 9** Select “YES” and press the enter  button.

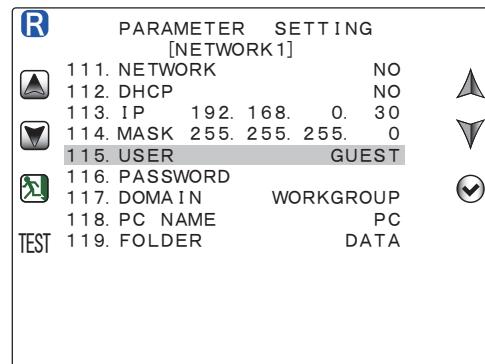
Select “YES” or “NO” by pressing the / button or rotating the joystick.

The screen returns to the “NETWORK 1” setting screen.

- 10** Select the “114. MASK” parameter and set the subnet mask in the same manner as Steps 5 to 9.

(ex.: 255. 255. 255. 0)

- 11** Select the “115. USER” parameter.



- 12** When the “115. IP” parameter is selected, the enter  button is displayed.

- 13** Press the enter  button to display the user setting screen.



- 14** Input the login user name based on the information of “*2.3.3 Confirming Items Necessary for Other Settings*” (page 44) by the following button operation.

\* Entry is case insensitive. Input all with uppercase letters.

(ex.: NIDEK)

 Forward movement /  Backward movement	Moves the character to be input (cursor) in the character list field to the right or left.
Rotating the upper part of the joystick	Moves the cursor in the input field to the right or left.
Pressing the start button	Determines the character to be input and moves the cursor to the next position in the character list field.
 Clear	Erases the character at the cursor position in the character list field.

- 15** Pressing the exit  button displays a screen to confirm the input user name.

- 16** Select “YES” and press the enter  button.

The screen returns to the “NETWORK 1” setting screen.

- 17** Select the “116. PASSWORD” parameter and then set the login password name in the same manner as Steps 11 to 16 based on the information of “*2.3.3 Confirming Items Necessary for Other Settings*” (page 44).

\* Entry is case sensitive. Input uppercase and lowercase letters correctly.

(ex.: NIDEK)

- 18** Select the “117. DOMAIN” parameter and then set the domain name in the same manner as Steps 11 to 16 based on the information of “*2.3.3 Confirming Items Necessary for Other Settings*” (page 44).

(ex.: NAVIS)

(If no domain exists, confirm the work group name.) (ex.: WORKGROUP)

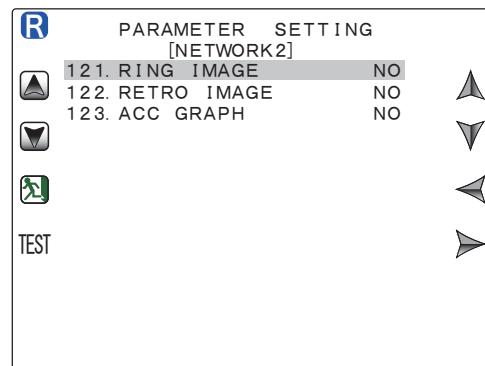
- 19** Select the “118. PC NAME” parameter and then set the PC name in the same manner as Steps 11 to 16 based on the information of “*2.3.3 Confirming Items Necessary for Other Settings*” (page 44).

(ex.: 10. 50. 1. 1)

- 20** Select the “119. DOMAIN” parameter and then set the shared folder of the PC to which measurement data is sent in the same manner as Steps 11 to 16 based on the information of “*2.3.3 Confirming Items Necessary for Other Settings*” (page 44).

(ex.: ARK)

- 21** Select “NETWORK2” from the parameter items and then set the “121. RING IMAGE”, “122. RETRO IMAGE”, and “123. ACC GRAPH” parameters for transmission of image data.



- 22** After all “NETWORK1” to “NETWORK2” parameters are set, press the exit button twice to exit from the PARAMETERSETTING screen.

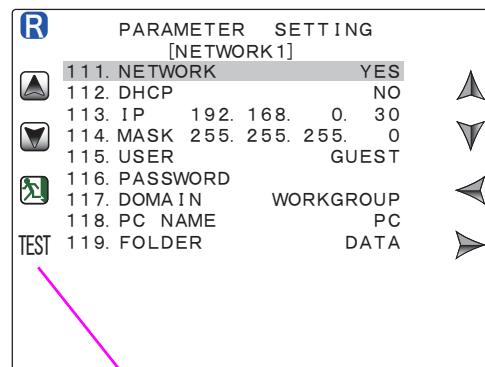
- Confirm that the PARAMETER SETTING screen is completely exited and the normal measurement screen is displayed.
- Unless the PARAMETER SETTING screen is exited, network settings are not saved.

- 23** Turn off the device and then turn it on again to reboot.

## 2.4.2 Testing the Device Network Setting

After completing up to Step 23 of “2.4.1 Setting the Device Transmission” (page 45) in the previous section and rebooting, enter the PARAMETER SETTING screen. Select “NETWORK1” as in the previous section to enter the NETWORK1 setting screen.

Press the TEST button shown to the right to perform LAN connection test. The test result is displayed on the screen for about 2 seconds accompanied by a beep.



2

### ■ When LAN connection test was successful

The following message appears indicating on the screen that the test was normally complete.

**CONNECTION OK**

LAN connection test result (test was normally complete)

### ■ When LAN connection test was failed

The following message appears with an error code on the screen indicating the test result was abnormal.

Including the shared folder setting of the receiver PC, the above setting may not be correct. Confirm the parameter settings again and set them correctly.

For details of error codes, see “2.6 LAN Communication Error Messages and Remedies” (page 65).

**771  
NO NETWORK CABLE**

LAN connection test result (test result was abnormal)

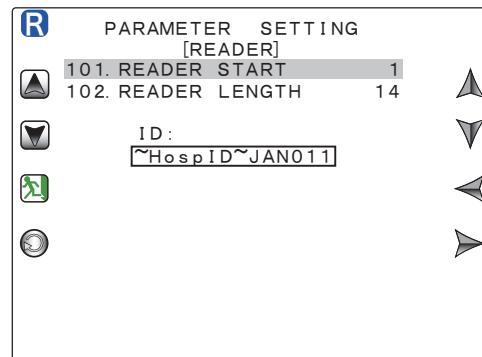
(The above indicates an error code for when the LAN cable is not connected.)

When LAN connection test is complete successfully, the device network setting is finished.

### 2.4.3 Setting the Barcode Reader / Magnetic Card Reader

Pressing the enter  button after selecting the “READER” parameter on the PARAMETER SETTING screen displays the read screen (READER screen) of the barcode scanner/ magnetic card reader.

When patient ID is read by the barcode scanner or magnetic card reader at the point, data read in the ID field of the READER screen is displayed. Use this to check whether correct reading is actually performed.



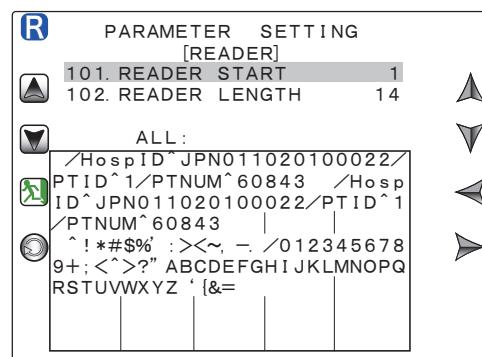
READER screen

#### ■ Changing the read position using the barcode scanner / magnetic card reader

ID used for display or data transmission on the device consists of up to 14-digit characters displayed on the READER screen (set by the READER LENGTH parameter). For magnetic card readers that have more data capacity, change the ID read start position with the “READER START” parameter.

Pressing the change  button enters the screen where all read data can be displayed. Use this to determine the position in which reading starts.

Pressing the change  button again returns to the original display.



All data display

#### ■ Changing the read length using the barcode scanner / magnetic card reader

The read length can be changed by the “READER LENGTH” parameter. When also reading characters other than ID, change this parameter together with the change of the read position above.

## 2.5 Data Format

Depending on the setting contents ("YES"/"ACK") of the "NETWORK" parameter, the data format differs in its contents.

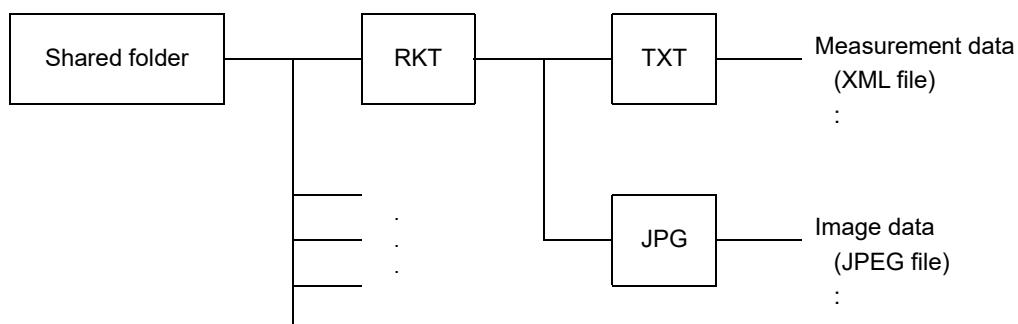
NO	Network communication does not occur.
YES	Network communication occurs in the NIDEK communications.
ACK	Network communication occurs with NAVIS. (reply) After the receiver (NAVIS) receives data, the file is deleted or renamed. If the file is not deleted within 5 seconds, an error occurs.

### 2.5.1 Data structure in the shared folder

Transmitted data is saved in the shared folder and lower levels in the folder structure shown below.

If data has not been captured in the receiver software, check whether data is written in any folder below including device error code.

When captured properly, transmitted measurement data is erased by the receiver software. Therefore, it cannot be checked.



## 2.5.2 Output file of measurement data (image data)

There are two types of output files normally produced: measurement data and image data (AR ring image / retroillumination image).

Measurement data	One file per patient All sets of data such as right and left eyes, AR, and KM are output to one XML file.
Image data (AR ring image)	One file for each eye, 2 files 480×480 8-bit gray scale, JPEG compression 75
Image data (Retroillumination image)	One file for each eye, 2 files 480×640 24-bit color, JPEG compression 75
Image data (Accommodation graph image)	One file for each eye, 2 files 480×640 24-bit color, JPEG compression 75

Style sheet file

NETWORK setting	Output of style sheet file
"YES"/"ACK"	When no style sheet file (RKT_style.xsl) is found in the TXT folder, a style sheet file is also output. When a style sheet file exists, a new file is not output.

### O File name

File names of measurement data (image data) transmitted from the device to the receiver PC are as follows:

ID characters that cannot be used for file names are all converted to tilde (~).

For file names, an underscore is used as a delimiter between data elements.

#### ■ Measurement data (XML file)

ARK \_ ABCDEFGHIJKLMNOP \_ 20130325 \_ 103057 . xml

(1)	Header 3 characters fixed (ARK)
(2)	ID14 characters fixed (For less than 14 characters, it is filled with space.)
(3)	Date 8 characters fixed (YYYYMMDD)
(4)	Time 6 characters fixed (HHMMSS)
(5)	XML extension (3 characters fixed)

#### ■ Image data (JPEG file)

ARK \_ ABCDEFGHIJKLMNOP \_ 20130325 \_ 103057 \_ LA1 . xml

(1)	Header 3 characters fixed (ARK)
(2)	ID14 characters fixed (For less than 14 characters, it is filled with space.)
(3)	Date 8 characters fixed (YYYYMMDD)
(4)	Time 6 characters fixed (HHMMSS)

(5)	Image type (R/L (right/left eye + A: ring image / I: retroillumination / C: accommodation graph + image number)
(6)	JPEG extension (3 characters fixed)

### 2.5.3 Response to data acquisition

There are two device modes. One is to write data to the shared folder and the other is to confirm data reception.

NETWORK setting	Confirmation to data acquisition
YES	Data acquisition is not confirmed. Only data writing to the shared folder is performed.
ACK	Whether the other end such as NAVIS receives data is confirmed. Data acquisition is checked by the device monitoring that the XML file of measurement data is no longer present. On the receiving end, after a data file is produced, the existing data is read out and deleted or renamed. The device indicates an error if the XML file remains present in 5 seconds of file writing.

## 2.5.4 XML file configuration

Tags for data which have not been measured are not output. For example, when only the right eye is measured, there are no left-eye tags. Regardless of the print format and communication format of the parameter, all output-enabled data are output.

Common data (No tags)	Version, date and time, or such Patient data Measurement conditions	
Right eye data	AR data	Measurement data (1 to 10) Median values Trial lens data Contact lens data
	VA data	Uncorrected visual acuity Distance visual acuity Near visual acuity
	SR data	Corrective lens data Addition power
	LM data	LM data Addition power 1, 2
	KM data	Measurement data (1 to 10) Median values Sagittal measurement data
	CS data (corneal size)	
	PS data (pupil size)	
	AC data (accommodation measurement)	
	RI data (retroillumination measurement)	
Left eye data	Same as right eye	
PD data (Pupillary Distance)		

## 2.5.5 Tag definition of XML output data

Sign in "Necessity" field	Meaning
No sign	No tags or values are necessary.
△	Tags are necessary even if no value is entered.
○	Tags and values are necessary.

- \* Indicates that lower tags are necessary when an upper tag exists.
- \* Does not depend on the print format or communication format. Data that can be produced are all output.

### O NIDEK format

#### Data tag

Tag name	Description	Data type	Necessity	Example
<Data>	Indicates the data area.	-	○	

#### Common data

Tag name	Description	Data type	Necessity	Example
<Company>	Company name	string (64 characters)	○	Nidek
<ModelName>	Model name	string (64 characters)	○	ARK-
<ROMVersion>	Device ROM version (for model differentiation)	string (64 characters)	△	1.00.01/1.00
<Version>	XML specification version (fixed)	string (64 characters)	○	1.0
<Date>	Date code (Y/M/D)	date	○	2011-01-01
<Time>	Time (H/M/S)	time	○	01:01:01
<Patient>	Patient	-	○	
<No.>	Patient No.	string (64 characters)	○	0008
<ID>	Patient ID	string (64 characters)	△	123
<Comment>	Comments	string (64 characters)	△	DATA1
<VD>	Parameter setting VD	string (64 characters)	△	12.00 mm
<WorkingDistance>	Parameter setting WD	string (64 characters)	△	40 cm
<AR DiopterStep>	Parameter setting AR D STEP	string (64 characters)	△	0.01D
<KM DiopterStep>	Parameter setting KM D STEP	string (64 characters)	△	0.01D
<ACCDiopterStep>	Parameter setting ACC D STEP	string (64 characters)	△	0.01D
<AxisStep>	Parameter setting angle STEP	string (64 characters)	△	1°
<CylinderMode>	Cylinder mode (-, +, mix)	string (-, +, mix only)	△	
<RefractiveIndex>	Corneal refractive index	double	△	1.3375

#### Measurement data

Tag name	Description	Data type	Necessity	Example
<R>	Right eye measurement value	-	△	
<AR>	Refractometer data	-	△	
<ARList No="1 to n">	Measurement value (1 to n times)	-	△	
<Sphere>	Spherical power (D)	double	△	

Tag name	Description	Data type	Necessity	Example
<Cylinder>	Cylindrical power (D)	double	△	
<Axis>	Cylinder axis (°)	int	△	
<ConfidenceIndex>	Confidence index	string (64 characters)	△	
<SE>	Spherical equivalent value (D)	double	△	
<ARList No="1 to n">	Error measurement value (1 to n times)	-	△	
<Error>	Error characters	string (64 characters)	△	BLK
<ARList No="1 to n">	Median values	-	△	
<Sphere>	Spherical power (D)	double	△	
<Cylinder>	Cylindrical power (D)	double	△	
<Axis>	Cylinder axis (°)	int	△	
<TrialLens>	Trial lens	-	△	
<Sphere>	Spherical power (D)	double	△	
<Cylinder>	Cylindrical power (D)	double	△	
<Axis>	Cylinder axis (°)	int	△	
<ContactLens>	Contact lens	-	△	
<Sphere>	Spherical power (D)	double	△	
<Cylinder>	Cylindrical power (D)	double	△	
<Axis>	Cylinder axis (°)	int	△	
<ARPeriData>	Peripheral composite data	-	△	
<Sphere>	Spherical power (D)	double	△	
<Cylinder>	Cylindrical power (D)	double	△	
<Axis>	Cylinder axis (°)	int	△	
<ARPeriDiff>	Peripheral differentiation data	-	△	
<Sphere>	Spherical power (D)	double	△	
<Cylinder>	Cylindrical power (D)	double	△	
<Axis>	Cylinder axis (°) -90 to +90	int	△	
<RingImage>	Ring image file name	string (256 characters)	△	
<VA>	Subjective measurement	-	△	
<UCVA>	Uncorrected VA value	double	△	
<BCVA>	Corrected distance VA value	double	△	
<LVA>	LOW CONTRAST VA value	double	△	
<GVA>	Glare VA value	double	△	
<NVA>	Corrected near VA value	double	△	
<WD>	Subjective WD	int	△	
<SR>	Subjective measurement value	-	△	
<Sphere>	Spherical power (D)	double	△	
<Cylinder>	Cylindrical power (D)	double	△	
<Axis>	Cylinder axis (°)	int	△	
<ConfidenceIndex>	Confidence index	string (64 characters)	△	
<ADD>	Addition power	double	△	
<WD>	Subjective WD	int	△	
<LM>	Lensmeter data	-	△	
<Sphere>	Spherical power (D)	double	△	
<Cylinder>	Cylindrical power (D)	double	△	
<Axis>	Cylinder axis (°)	int	△	
<ConfidenceIndex>	Confidence index	string (64 characters)	△	
<ADD>	Addition power	double	△	

Tag name	Description	Data type	Necessity	Example
<ADD2>	Addition power 2	double	△	
<KM>	Keratometer data	-	△	
< KMList No= "1 to n">	Measurement value (1 to n times)	-	△	
<R1>	R1 data	-	△	
<Radius>	Radius	double	△	
<Power>	Spherical value	double	△	
<Axis>	Cylinder axis	int	△	
<R2>	R2 data	-	△	
<Radius>	Radius	double	△	
<Power>	Spherical value	double	△	
<Axis>	Cylinder axis	int	△	
<Average>	Average value	-	△	
<Radius>	Radius	double	△	
<Power>	Spherical value	double	△	
<KMCylinder>	Cylinder data	-	△	
<Power>	Spherical value	double	△	
<Axis>	Cylinder axis	int	△	
<KMMedian>	Measurement value (1 to n times)	-	△	
<R1>	R1 data	-	△	
<Radius>	Radius	double	△	
<Power>	Spherical value	double	△	
<Axis>	Cylinder axis	int	△	
<R2>	R2 data	-	△	
<Radius>	Radius	double	△	
<Power>	Spherical value	double	△	
<Axis>	Cylinder axis	int	△	
<Average>	Average value	-	△	
<Radius>	Radius	double	△	
<Power>	Spherical value	double	△	
<KMCylinder>	Cylinder data	-	△	
<Power>	Spherical value	double	△	
<Axis>	Cylinder axis	int	△	
<Sagittal>	Sagittal data	-	△	
<FixationAngle>	Fixation target angle (25 fixed)	int	△	
<SagittalAxis>	Parameter sagittal angle	string (64 characters)	△	
<SUP>	Superior measurement value	double	△	
<INF>	Inferior measurement value	double	△	
<TEM>	Temporal measurement value	double	△	
<NAS>	Nasal measurement value	double	△	
<Topometry>	Measurement position	-	△	
<SUP>	Superior measurement value	double	△	
<INF>	Inferior measurement value	double	△	
<TEM>	Temporal measurement value	double	△	
<NAS>	Nasal measurement value	double	△	
<Rh>	Rh value	int	△	
<Rv>	Rv value	int	△	
<Ro>	Ro value	int	△	

Tag name	Description	Data type	Necessity	Example
<ASTc>	ASTc value	int	△	
<dRo>	dRo value	int	△	
<ASTp>	ASTc value	int	△	
<dAST>	dAST value	int	△	
<Eccentricity>	Eccentricity	-	△	
<SUP>	Superior measurement value	double	△	
<INF>	Inferior measurement value	double	△	
<TEM>	Temporal measurement value	double	△	
<NAS>	Nasal measurement value	double	△	
<eh>	eh value	double	△	
<ev>	ev value	double	△	
<E>	Total eccentricity	double	△	
<CS>	Corneal size data	-	△	
< CSList No= "1 to n">	Measurement value (1 to n times)	-	△	
<SIZE>	Corneal size	int	△	
<PS>	Pupil size data	-	△	
< PSList No= "1 to n">	Measurement value (1 to n times)	-	△	
<Lamp>	Lamp illumination state	"ON" or "OFF"	△	
<AC>	Accommodation measurement	-	△	
<Sphere>	Accommodation	double	△	
<MaxPS>	Maximum pupil size	double	△	
<MinPS>	Minimum pupil size	double	△	
<AcclImage>	Accommodation graph image file name	string (256 characters)	△	
<RI>	Retroillumination measurement	-	△	
<COIH>	Central Opacity Index Height	double	△	
<COIA>	Central Opacity Index Area	int	△	
<POI>	Peripheral Opacity Index	int	△	
<RetrolImage>	Retroillumination image file name	string (256 characters)	△	
<L>	Left eye measurement value	-	△	
<AR>	Refractometer data	-	△	
•				
• Same as right AR measurement value				
•				
<KM>	Keratometer data	-	△	
•				
• Same as right KM measurement value				
•				
<CS>	Corneal size data	-	△	
< CSList No= "1 to n">	Measurement value (1 to n times)	-	△	
<SIZE>	Corneal size	int	△	
<PS>	Pupil size data	-	△	
< PSList No= "1 to n">	Measurement value (1 to n times)	-	△	
<Lamp>	Lamp illumination state	"ON" or "OFF"	△	
<AC>	Accommodation measurement	-	△	
<Sphere>	Accommodation	double	△	
<MaxPS>	Maximum pupil size	double	△	

Tag name	Description	Data type	Necessity	Example
<MinPS>	Minimum pupil size	double	△	
<AcclImage>	Accommodation graph image file name	string (256 characters)	△	
<RI>	Retroillumination measurement	-	△	
<COIH>	Central Opacity Index Height	double	△	
<COIA>	Central Opacity Index Area	int	△	
<POI>	Peripheral Opacity Index	int	△	
<RetrolImage>	Retroillumination image file name	string (256 characters)	△	
<PD>	Pupillary distance	-	△	
<PDList No = "1 to n">	Measurement value (1 to n times)	-	△	
<FarPD>	Distance PD	double	△	
<RPD>	Right monocular PD	double	△	
<LPD>	Left monocular PD	double	△	
<NearPD>	Near PD	double	△	

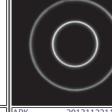
## 2.5.6 Display with style sheet

XML files are supported by a style sheet. They cannot be displayed in Internet Explorer without style sheet files (RKT\_style.xsl) in the TXT folder in which measurement data file (XML file) is produced. (Use a text editor to check the contents.)

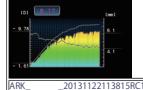
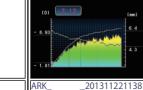
When there is no RKT\_style.xsl file in the TXT folder, it is automatically produced when measurement data is received. An existing RKT\_style.xsl file is not overwritten.

Please note that when the program is changed using the device, that style sheet does not become the new style sheet unless the existing RKT\_style.xsl file is manually deleted.

Creating a unique style sheet in the TXT folder allows data to be displayed in the unique format.

ARK-1s Examination Data																			
Company		NIIDEK																	
Model Name		ARK-1s																	
ROM Version		1.03.01 / 5.05																	
Format Version		1.02																	
Date		2013/11/22																	
Time		11:38:15																	
Patient	No.	0024																	
	ID																		
Comment		NIIDEK ARK-1s																	
Vertex Distance		12.00 mm																	
Working Distance		40 cm																	
AR Diopter Step		0.25D																	
KM Diopter Step		0.25D																	
ACC Diopter Step		0.01D																	
Axis Step		1°																	
Cylinder Mode		-																	
Refractive Index		1.3375																	
Right Eye					Left Eye														
AR	Sph	Cyl	Axis	C	SE	AR	Sph	Cyl	Axis	C	SE								
1	-1.75	-0.25	113	9	-1.75	1	-1.75	-0.25	51	9	-2.00								
2	-1.75	-0.25	113	9	-1.75	2	-1.75	-0.25	39	9	-2.00								
3	-1.75	-0.25	114	9	-1.75	3	-1.75	-0.25	60	9	-2.00								
M	-1.75	-0.25	113		-1.75	M	-1.75	-0.25	51		-2.00								
TL	-1.75	-0.25	113			TL	-1.75	-0.25	51										
CL	-1.75	-0.25	113		-1.75	CL	-1.75	-0.25	51		-2.00								
Data	-1.75	-0.25	110			Data	-2.00	-0.25	63										
Diff	+0.00	-0.00	-3			Diff	-0.25	-0.00	+12										
Ring Image					Ring Image														
																			
ARK_20131122113815RA1.jpg										ARK_20131122113815LA1.jpg									
VA		Visual Acuity			VA		Visual Acuity												
BCVA		0.8			BCVA		0.8												
LVA		0.7			LVA		0.7												
GVA		0.6			GVA		0.6												
SR	Sph	Cyl	Axis	SE	SR	Sph	Cyl	Axis	SE										
1	-1.75	-0.25	113	-1.75	1	-1.75	-0.25	51	-2.00										
Pupilary Distance										Far PD		Right PD		Left PD		Near PD			
1										65						61			
NIDEK CO., LTD.																			

KM	mm	Diopter	Axis	KM	mm	Diopter	Axis																
1	R1	7.77	43.50	143	R1	7.76	43.50	14															
	R2	7.72	43.75	53	R2	7.71	43.75	104															
	Avg	7.75	43.50		Avg	7.74	43.50																
	Cyl	-0.25		143	Cyl	-0.25		14															
2	R1	7.78	43.50	140	R1	7.76	43.50	15															
	R2	7.72	43.75	50	R2	7.70	43.75	105															
	Avg	7.75	43.50		Avg	7.73	43.75																
	Cyl	-0.25		140	Cyl	-0.25		15															
3	R1	7.78	43.50	141	R1	7.76	43.50	14															
	R2	7.73	43.75	51	R2	7.70	43.75	104															
	Avg	7.76	43.50		Avg	7.73	43.75																
	Cyl	-0.25		141	Cyl	-0.25		14															
Median	R1	7.78	43.50	141	R1	7.76	43.50	14															
	R2	7.72	43.75	51	R2	7.70	43.75	104															
	Avg	7.75	43.50		Avg	7.73	43.75																
	Cyl	-0.25		141	Cyl	-0.25		14															
Corneal				Size				Corneal				Size											
1				12.1				1				11.8											
Pupil				Size				Lamp				Pupil				Size				Lamp			
1				6.0				ON				1				6.1				ON			
Accommodation								Accommodation															
Sphere								Sphere															
Max PS								Max PS															
Min PS								Min PS															
Accommodation Graph								Accommodation Graph															
																							
ARK_20131122113815RC1.jpg								ARK_20131122113815LC1.jpg															
Retro Illumination								Retro Illumination															
COLH								COLH															
COLA								COIA															
POI								POI															
Retro Image								Retro Image															
																							
ARK_20131122113815RI1.jpg								ARK_20131122113815LI1.jpg															
Pupillary Distance				Far PD				Right PD				Left PD				Near PD							
1				65												61							

## 2.5.7 XML file sample

This is not a collection of actual measurement data but is only a sample for explanation.

<?xml version="1.0" encoding="UTF-16"?>	XML header
<?xmlstylesheet type="text/xsl" href="RKT_style.xsl"?>	Style sheet
DATA)	Data tag
<Company>NIDEK</Company>	Company name
<ModelName>ARK-1s</ModelName>	Model name
<ROMVersion>1.00.02 /5.05</ROMVersion>	ROM version (software/FPGA)
<Version>1.01</Version>	Format version (differs from software version)
<Date>2013/03/11</Date>	Date (Y/M/D)
<Time>16:03:07</Time>	Time (H/M/S)
<Patient>	Patient tag
<No.>0003</No.>	Patient No.
<ID>4902205625223</ID>	Patient ID
</Patient>	
<Comment> NIDEK ARK-1s </Comment>	Comments
<VD>12.00 mm</VD>	VD
<WorkingDistance>40 cm</WorkingDistance>	Working distance
<DiopterStep>0.01D</DiopterStep>	Diopter increments
<AxisStep>1°</AxisStep>	Angle increments
<CylinderMode>-</CylinderMode>	Cylinder mode (-, +, MIX)
<RefractiveIndex>1.3375</RefractiveIndex>	Refractive index (ARK only)
<R>	Tag for right eye
<AR>	AR data tag
<ARList No = "1">	Measurement data tag (1 to 10)
<Sphere>-6.38</Sphere>	SPH value
<Cylinder>-0.63</Cylinder>	CYL value
<Axis>179</Axis>	Angle
<CataractMode>ON</CataractMode>	CAT mode (does not exist for OFF)
<ConfidenceIndex>9</ConfidenceIndex>	Confidence index (9 to 5, E)
<SE>-6.70</SE>	SE value
</ARList>	
<ARList No = "2">	
<Error>COVR </Error>	Error
</ARList>	
⋮	(Repeated with the number of measurements)
<ARMedian>	Median value tag (3 or more measurements)
<Sphere>-6.38</Sphere>	SPH value
<Cylinder>-0.64</Cylinder>	CYL value
<Axis>177</Axis>	Angle
<SE>-6.70</SE>	SE value
</ARMedian>	
<TrialLens>	Trial lens tag
<Sphere>-6.25</Sphere>	SPH value
<Cylinder>-0.75</Cylinder>	CYL value
<Axis>177</Axis>	Angle
</TrialLens>	

<ContactLens>	Contact lens tag
<Sphere>-5.93</Sphere>	SPH value
<Cylinder>-0.54</Cylinder>	CYL value
<Axis>177</Axis>	Angle
<SE>-6.20</SE>	SE value
</ContactLens>	
<RingImage>	AR ring image file name
ARK_4902205625223 _20130311160307RA1.jpg	
</RingImage>	
</AR>	
<VA>	VA data tag
<UCVA>&lt;0.1</UCVA>	Uncorrected visual acuity
<BCVA>1.0</BCVA>	Distance visual acuity
<LVA>0.8</LVA>	Low contrast VA value
<GVA>0.5</GVA>	Glare VA value
<NVA>0.8</NVA>	Near visual acuity
<WorkingDistance>35 cm</WorkingDistance>	Working distance
</VA>	
<SR>	Subjective data tag
<Sphere>-6.25</Sphere>	SPH value
<Cylinder>-0.75</Cylinder>	CYL value
<Axis>177</Axis>	Angle
<SE>-6.75</SE>	SE value
<ADD>+1.75</ADD>	Addition power
<WorkingDistance>35 cm</WorkingDistance>	Working distance
</SR>	
<LM>	LM data tag
<Sphere>-0.50</Sphere>	SPH value
<Cylinder>-0.00</Cylinder>	CYL value
<Axis>0</Axis>	Angle
<ADD>+3.00</ADD>	Addition power
<ADD2>+3.50</ADD2>	Addition power 2
</LM>	
<KM>	KM data tag
<KMList No = "1">	Measurement data tag (1 to 10)
<R1>	R1 data tag
<Radius>7.56</Radius>	mm data
<Power>44.64</Power>	Diopter data
<Axis>179</Axis>	Angle
</R1>	
<R2>	R2 data tag
<Radius>7.29</Radius>	mm data
<Power>46.30</Power>	Diopter data
<Axis>89</Axis>	Angle
</R2>	
<Average>	Average data tag
<Radius>7.43</Radius>	mm data
<Power>45.42</Power>	Diopter data
</Average>	

2

```

<KMCylinder>
    <Power>-1.66</Power>
    <Axis>179</Axis>
</KMCylinder>
</KMList>
    .
    .
<KMMedian>
    <R1>
        <Radius>7.55</Radius>
        <Power>44.70</Power>
        <Axis>178</Axis>
    </R1>
    <R2>
        <Radius>7.29</Radius>
        <Power>46.30</Power>
        <Axis>88</Axis>
    </R2>
    <Average>
        <Radius>7.42</Radius>
        <Power>45.49</Power>
    </Average>
    <KMCylinder>
        <Power>-1.60</Power>
        <Axis>178</Axis>
    </KMCylinder>
</KMMedian>
</KM>
<CS>
    <CSList No = "1">
        <Size>12.1</Size>
    </CSList>
</CS>
<PS>
    <PSList No = "1">
        <Size>4.7</Size>
        <Lamp>ON</Lamp>
    </PSList>
</PS>
<AC>
    <Sphere>8.15</Sphere>
    <MaxPS>4.1</MaxPS>
    <MinPS>1.6</MinPS>
    <AccImage>ARK_4902205625223
        _20130311160307RC1.jpg</AccImage>
</AC>

```

Cylinder tag  
Diopter data  
Angle  
(Repeated with the number of measurements)

Median value tag  
R1 data tag  
mm data  
Diopter data  
Angle

R2 data tag  
mm data  
Diopter data  
Angle

Average data tag  
mm data  
Diopter data

Cylinder tag  
Diopter data  
Angle

CS (corneal size) tag  
LIST tag (currently 1 fixed)  
Corneal size

PS (pupil size) tag  
LIST tag (currently 1 fixed)  
Size  
Lamp (ON, OFF)

AC (accommodation measurement) tag  
Accommodation  
Maximum pupil size  
Minimum pupil size  
Accommodation graph image file name

```
<RI>
  <COIH>0.7</COIH>
  <COIA>1</COIA>
  <POI>0</POI>
  <RetroImage>ARK_4902205625223
    _20130311160307RI1.jpg</RetroImage>
</RI>
</R>
<L>
  ...
</L>
<PD>
  <PDLList No = "1">
    <FarPD>56</FarPD>
    <RPD>28</RPD>
    <LPD>28</LPD>
    <NearPD>53</NearPD>
  </PDLList>
  ...
</PD>
</Data>
```

RI (retroillumination tag)  
Central Opacity Index Height  
Central Opacity Index Area  
Peripheral Opacity Index  
Retroillumination image file name

Tag for left eye  
(same as right eye)

PD tag  
Measurement data tag (1 to 5)  
Distance vision  
Right distance vision  
Left distance vision  
Near distance

(Repeated with the number of measurements)

## 2.6 LAN Communication Error Messages and Remedies

The error code table regarding the LAN communication is provided as below. When an error message is displayed, refer to this table.

Error message	Cause and remedy
ERR700 CIFS ERR	<ul style="list-style-type: none"> <li>• Error related to Windows file sharing</li> <li>• Check that the IP address or subnet mask is correct on the NETWORK setting screen.</li> </ul>
ERR703 NETWORK ERR	<ul style="list-style-type: none"> <li>• Error related to the IC board (hardware error) IC was damaged by some cause such as electrostatic discharge.</li> <li>• If the same error code is displayed again even after the device is turned off and on again, shut off the device and contact NIDEK or your authorized distributor.</li> </ul>
ERR704 DHCP ERR	<ul style="list-style-type: none"> <li>• Error related to DHCP The IP address cannot be obtained.</li> <li>• Check the DHCP server.</li> </ul>
ERR750 CAN'T ACCESS NET	<ul style="list-style-type: none"> <li>• Error related to network access</li> <li>• Check the connection of the LAN cable. Check that the set IP address and subnet mask are correct.</li> </ul>
ERR751 CAN'T WRITE PC	<ul style="list-style-type: none"> <li>• Error related to network access (Writing to the PC is not allowed.)</li> <li>• Write-protection is enabled or no free space is left.</li> <li>• Check whether write permission is granted to the destination folder in the PC and sufficient free space is left.</li> </ul>
ERR754 NO PC NAME	<ul style="list-style-type: none"> <li>• PC with the specified name does not exist.</li> <li>• Check the connection of the LAN cable. Or check that the specified PC name is correct.</li> </ul>
ERR756 CAN'T LOGON PC	<ul style="list-style-type: none"> <li>• Logging on to the PC is not allowed. (The user name or password is incorrect.)</li> <li>• Check the user name and password and input correctly.</li> </ul>
ERR757 NO SHARED FOLDER	<ul style="list-style-type: none"> <li>• No shared folder exists in the PC. (The name of the shared folder is incorrect.)</li> <li>• Check the folder name and whether the folder is set to share.</li> </ul>
ERR758 NETWORK TIMEOUT	<ul style="list-style-type: none"> <li>• The PC did not finish the process in a specified time.</li> <li>• Send the data again.</li> <li>• Reduce the PC processing load. (Reduce the resident software.)</li> </ul>
ERR759 CAN'T DELETE PC	<ul style="list-style-type: none"> <li>• The data cannot be deleted. (Deletion was attempted for data with the read-only attribute.)</li> <li>• Disable write-protection.</li> </ul>
ERR760 NET INITIALIZING	<ul style="list-style-type: none"> <li>• Network initialization occurs. (This may require some time after the device start-up.)</li> <li>• Retry access to the network later.</li> </ul>
ERR761 ACCESS DENIED	<ul style="list-style-type: none"> <li>• The file sharing setting of the PC is not proper.</li> <li>• Check the file sharing setting of the shared folder.</li> </ul>
ERR762 ACOUNT DISABLED	<ul style="list-style-type: none"> <li>• The account is disabled. (The user setting is not proper.)</li> <li>• Check the network setting of the device.</li> <li>• Enable the account of the connected PC.</li> </ul>
ERR763 CAN'T READ PC	<ul style="list-style-type: none"> <li>• Data cannot be imported.</li> <li>• Check the setting of the PC.</li> </ul>

Error message	Cause and remedy
ERR766 SAME NAME ERR	<ul style="list-style-type: none"><li>Because a file with the same name exists in the PC, writing is not possible.</li><li>Change the file name or delete the file.</li></ul>
ERR771 NO NETWORK CABLE	<ul style="list-style-type: none"><li>The LAN cable is not connected.</li><li>Check the connection of the cable. Check the connection of the connector.</li></ul>
ERR772 NO RESPONSE	<ul style="list-style-type: none"><li>Reply error (There is no response from the PC.) The file is deleted within 5 seconds or not renamed.</li><li>Check whether the capture software on the PC is properly activated. If it occurs frequently, retry connection after setting the NETWORK parameter from ACK to YES.</li></ul>