APPENDIX B: TECHNICAL INFORMATION

1. OUTPUT FORMAT FOR HOST COMPUTER (OPTION)

The bit serial voltage type, which conforms to the RS-232C interface, is used for host computer output of the KX-21. The serial interface port for the connection with the host computer is on the rear panel of the main unit, when an option is incorporated.

NOTE: • When the optional serial interface function is intended to incorporate to this instrument, following optional part should be ordered in prior to the installation so that Sysmex service representative could install at once.
973-4531-1 OUTPUT UNIT NO. 1 KX-21

1.1 Hardware

1. Connector
- The connector for the output to the host computer is located on the rear panel.
- Use a 9-pin D-SUB, female connector.
- Fixing screws for this connector are in inch-specification.

2. Connector Signals

Pin No.	Signal Name		Signal Direction
1			
2	Receive data	(R×D)	From Host to KX-21
3	Transmit Data	(T×D)	To Host from KX-21
4	Data Terminal Ready	(DTR)	To Host from KX-21
5	Signal Ground	(SG)	
6	Data Set Ready	(DSR)	From Host to KX-21
7	Request to Send	(RTS)	To Host from KX-21
8	Clear to Send	(CTS)	From Host to KX-21
9			

Table B-1-1: Pin Assignment

3. Communication Format
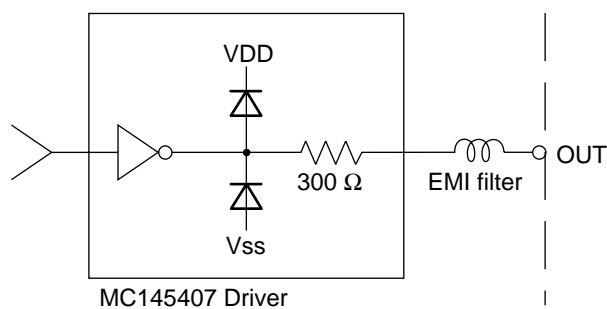The data is communicated in the asynchronous, half duplex mode.

4. Signal Level
Signal level conforms to JIS C6361.

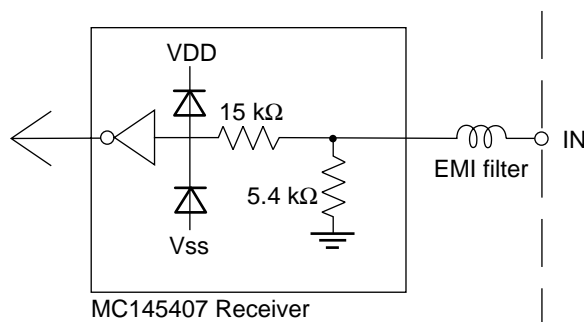| Level	Data signal	Control signal
+3V or higher	Logic "0", Start bit	ON
-3V or lower	Logic "1", Stop bit	OFF

Table B-1-2: Signal Level

5. **Interface Circuit**
- Output circuit

Figure B-1-1: Interface Output Circuit

- Input circuit

Figure B-1-2: Interface Input Circuit

1.2 Software

1.   Communication Format

1)   Code
ASCII codes are used for output.
(Except for K-DPS output)

2)   Structure of text
"STX" (02 H) is sent prior to data and "ETX" (03 H) is sent at the end of data.
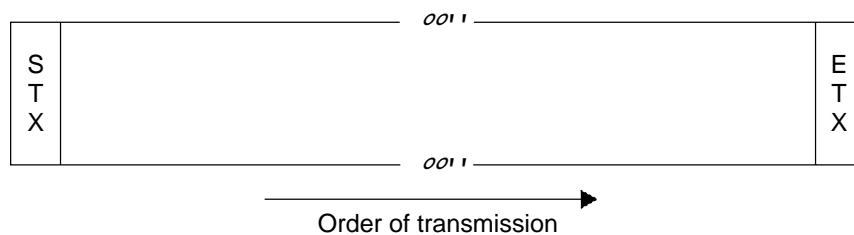(Except for K-DPS output)

Order of transmission
Figure B-1-3: Order of Transmission

3)   Communication protocol
The following 2 protocols are provided in the system, and can be selected according to the system status.
- **Class A**
  One-way transmission to the host computer without requiring ACK nor NAK from host computer.
- **Class B**
  The KX-21 transmits data and then waits for ACK or NAK to complete the data transmission.
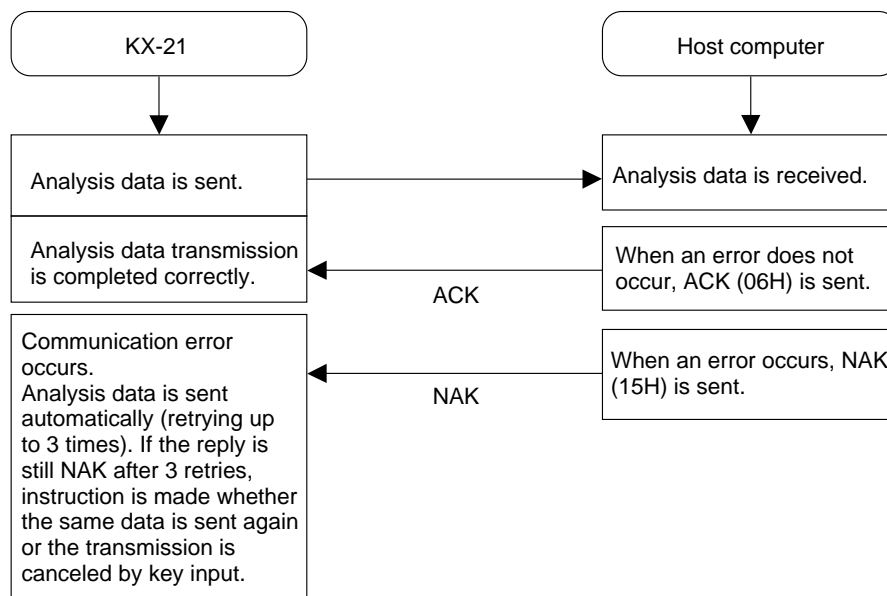

Figure B-1-4: Data Transmission

4) Transmission errors
If the KX-21 detects a transmission error, the data transmission is canceled and an error message is displayed. Re-transmission of the data ([1] key) or cancellation of the transmission ([3] key) can be selected. Transmission errors occur in the following situations.

- The computer is off line.
- The control signal DSR is off.
- After the data is transmitted, there is no response from the computer in 15 seconds. (Class B only)
- After the data is transmitted, other than ACK or NAK is sent from the computer. (Class B only)
- After the data is transmitted, the fourth NAK is sent. (Class B only. The KX-21 resends the data automatically up to 3 times when NAK is sent.)

5) Timing, subject, and content of transmission

	Serial interface ↓ Host computer
Normal analysis	Analysis data (A)
Quality control	QC data (A)

Table B-1-3: Content of Transmission

- Analysis data includes the date, sample ID No., 18-parameter data, and the flag.
- QC data is $\overline{X}$ or L-J data.
- The setting of the connecting device is changed in the setting program.

2. Text Format
The following two types of formats are used for computer output.
- K-1000:   Format for connecting to the host computer
- K-DPS: Special format for connecting to K-DPS

NOTE:	• K-1000 format is selected at the time of shipping from the factory.

The details of K-1000 format are as follows.
- K-1000 format
K-1000 format has two formats; one is "analysis data format" for output of the sample data, and the other is "QC data format" for output of the QC data. They differ in length and content of the text. (They are distinguished by the sample distinction code.)
The text distinction code Ⅱ is fixed at "1".
However, when the text exceeds 256 bytes in a future modification, the text is divided into 2 or more blocks. The number in text distinction code Ⅱ shows the order of the blocks. The ETB (17 H) is not used.

B-5

(1)   Analysis data format (121 characters)

Parameter		No. of Characters	Example
STX		1	(02 H)
Text distinction code I		1	"D"
Text distinction code ll		1	"1"
Sample distinction code		1	"U"
Year (Month or Day)		2	"97"
Month (or Day)		2	"09"
Day (or Year)		2	"30"
Analysis information		1	(O)
Sample ID No.		12	(OOOOOOOOOOO)
PDA information		6	(OOOOO)
PDW select information		1	"S" or "C"
WBC	$[\times 10^3/\mu L]$	5	XXX.XF
RBC	$[\times 10^6/\mu L]$	5	XX.XXF
HGB	[g/dL]	5	XXX.XF
HCT	[%]	5	XXX.XF
MCV	[fL]	5	XXX.XF
MCH	[pg]	5	XXX.XF
MCHC	[g/dL]	5	XXX.XF
PLT	$[\times 10^3/\mu L]$	5	XXXXF
LYM% (W-SCR)	[%]	5	XXX.XF
MXD% (W-MCR)	[%]	5	XXX.XF
NEUT% (W-LCR)	[%]	5	XXX.XF
LYM# (W-SCC)	$[\times 10^3/\mu L]$	5	XXX.XF
MXD# (W-MCC)	$[\times 10^3/\mu L]$	5	XXX.XF
NEUT# (W-LCC)	$[\times 10^3/\mu L]$	5	XXX.XF
RDW-SD/CV	[fL/%]	5	XXX.XF
PDW	[fL]	5	XXX.XF
MPV	[fL]	5	XXX.XF
P-LCR	[%]	5	XXX.XF
ETX		1	(03 H)

Table B-1-4: Analysis Data Format

(2)   QC data format (99 characters)

Parameter		No. of Characters	Example
STX		1	(02 H)
Text distinction code I		1	"D"
Text distinction code II		1	"1"
Sample distinction code		1	"C"
Data distinction code		1	"X" or "L"
Year (Month or Day)		2	"97"
Month (or Day)		2	"09"
Day (or Year)		2	"30"
Hour		2	"09"
Minute		2	"59"
QC File Number		1	"5"
Not used		1	"0"
RDW select information		1	"C"
WBC	$[\times 10^3/\mu L]$	4	XXX.X
LYM% (W-SCR)	[%]	4	XXX.X
MXD% (W-MCR)	[%]	4	XXX.X
NEUT% (W-LCR)	[%]	4	XXX.X
LYM# (W-SCC)	$[\times 10^3/\mu L]$	4	XXX.X
MXD# (W-MCC)	$[\times 10^3/\mu L]$	4	XXX.X
NEUT# (W-LCC)	$[\times 10^3/\mu L]$	4	XXX.X
RBC	$[\times 10^6/\mu L]$	4	XX.XX
HGB	[g/dL]	4	XXX.X
HCT	[%]	4	XXX.X
MCV	[fL]	4	XXX.X
MCH	[pg]	4	XXX.X
MCHC	[g/dL]	4	XXX.X
RDW-(CV/SD)	[%/fL]	4	XXX.X
PLT	$[\times 10^3/\mu L]$	4	XXXX
PDW	[fL]	4	XXX.X
MPV	[fL]	4	XXX.X
P-LCR	[%]	4	XXX.X
W-SMV	[fL]	4	XXX.X
W-LMV	[fL]	4	XXX.X
ETX		1	(03 H)

Table B-1-5: QC data format

(3)   Details of the analysis data output in K-1000 format

1)   The order of output is from the top parameter to the bottom. The data is sent from the upper line without performing zero suppression.

2)   Because the decimal point is not sent, the decimal point specified in each parameter has to be added and represented by numeric value at the host computer.

3)   The order of the date conforms to the format in the setting program in the setting program.

4)   Analysis information shows the following content of the analysis.

	Manual No. input
WB mode analysis	"0"
Pre-diluted mode analysis	"5"

Table B-1-6: Analysis Information

5)   The sample ID No. is 6-digit numerals, but 12 digits are output in this format. The upper 6 digits are 0's (zeros). Depending on the usage, "-" (2D H) may be inserted in the numeral column. In this case, "-" is included in the 12 digits.

6)   PDA information consists of the following 6 items.

Item	No. of Characters
WBC histogram information	1
WBC histogram flag	1
RBC histogram information	1
RBC histogram flag	1
PLT histogram information	1
PLT histogram flag	1

Table B-1-7: PDA Information

Code	Description
"0"	Histogram is normal.
"1"	Histogram is abnormal.
"2"	Manually discriminated

Table B-1-8: Histogram Information

Code	Description
"0"	Normal WBC/RBC/PLT
"1"	(L) discriminator degree is high. WBC/RBC/PLT
"2"	(U) discriminator degree is high. WBC/RBC/PLT
"3"	Analysis is impossible because there is no pair of intersection on the 20% degree level for calculation of DW. RBC/PLT
"4"	Two peaks are recognized in the particle distribution. RBC/PLT
"5"	(T1) discriminator cannot be determined. WBC
"6"	(T2) discriminator cannot be determined. WBC
"7"	(T1) discriminator level is high, and the data is not reliable. WBC
"8"	(T1) or (T2) discriminator level is high, and the data is not reliable. WBC
"9"	(T2) discriminator level is high, and the data is not reliable. WBC

Table B-1-9: Histogram Flag

The histogram flag corresponds to the flagging characters of the LCD and the built-in printer as follows.

| Particle distribution	Flagging characters of LCD and built-in printer		
FLAG	WBC	RBC	PLT
"0"			
"1"	WL	RL	RL
"2"	WU	RU	RU
"3"		DW	DW
"4"		MP	MP
"5"	T1		
"6"	T2		
"7"	F1		
"8"	F2		
"9"	F3		

Table B-1-10: Flagging Character

7)   RDW select information
     It shows whether RDW-CV or RDW-SD is output.
        "C": RDW-CV
        "S": RDW-SD

NOTE: • RDW-SD is selected at the time of shipping from the factory.
                   • To output RDW-CV, refer to *Chapter 10, Section 2: System Setup.*

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8)   The numerical data configuration in the Analysis Data Format is as follows.

Upper digit   Lower digit

Data   Flag
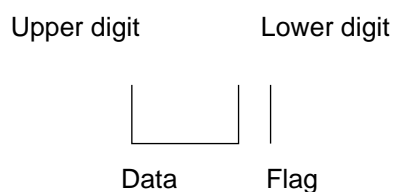
Figure B-1-5: Numerical Data Configuration

Code	Description
"0"	Normal
"1"	Abnormality judgment is "+."
"2"	Abnormality judgment is "-."
"3"	Out of linearity limit
"4"	Reliability is low.

Table B-1-11: Details of Flag

9)   If the data over-flows, it is indicated as follows:
        *0003

10) In case of analysis error, or if the data lacks some data such as the
     calculation parameter in pre-diluted mode, the data is transmitted as
     follows:
        *0000