APPENDIX A   TECHNICAL INFORMATION

1. HOST COMPUTER INTERFACE SPECIFICATIONS

1.1 HARDWARE SPECIFICATONS

The LASC-HST (1LSC1 Ver. B00-XX) for SP-1000*i* has an RS-232C port 1ch and an Ethernet (RJ45) port for host input and output. Either of them can be selected in the settings of the LASC-HST.

1.1.1 RS-232C Communication

(1) Transmission Format

The transmission format is the half-duplex asynchronous communication.

(2) Connector

An AT-compatible personal computer is used for the LASC-HST.
A 9-pin D-Sub male connector is used for the serial port for the host computer.

(3) Connector Pin Allocation

Allocation of connector pins at serial port for a typical AT-compatible computer is shown below.

Pin No.	Signal Name		Signal Direction
1			
2	Receive Data	(RxD)	To LASC-HST from HOST
3	Transmit Data	(TxD)	From LASC-HST to HOST
4	Data Terminal Ready	(DTR)	From LASC-HST to HOST
5	Signal Ground	(SG)	
6	Data Set Ready	(DSR)	To LASC-HST from HOST
7	Request to Send	(RTS)	From LASC-HST to HOST
8	Clear to Send	(CTS)	To LASC-HST from HOST
9			

(4) Signal Level

The signal identification levels are shown below.

Level	Data Signal	Control Signal
+3 V or more	Logic "0", Start Bit	ON
-3 V or less	Logic "1", Stop Bit	OFF

(5) Control Signal

The DTR and DSR signals are not controlled, and always ON when the power is switched ON. The LASC-HST will not send data when the DTR signal is OFF.
The CTS and RTS signals are not controlled, and always ON when the power is switched ON. The LASC-HST will not send data when the CTS signal is OFF.

1.1.2 TCP/IP Communication

(1) Network interface layer
The network interface conforms to IEEE802.3.
Communication is performed by 10Base-T or 100Base-TX.
The RJ45 socket is used as a hub for LASC-HST connection.
The cable of UTP category 5 or higher grade should be used.

(2) TCP/IP
Before communication, the text format including STX and ETX is set to the TCP's data unit.
The IP address of LASC-HST is fixed. (The default value is 128.1.100.1, and this value may be changed.)
The IP address for LASC-HST's host communication is fixed. (The default value is 128.1.100.11.)
The TCP port number for LASC-HST's host communication is fixed. (The default value is 3011.)

(3) TCP connection
The host computer is defined as a server, and the LASC-HST as a client for connection.
The LASC-HST checks the connection when the system starts. When the connection fails, the LASC-HST repeats the connection at regular intervals.
If the server shuts down after the connection has been established, the LASC-HST will not automatically perform the connection again.

(4) Application layer
Communication is performed according to the bit serial interface class A.

CAUTION:	• During TCP/IP communication, make sure to use class A for the communication protocol. If class B or class C is used, communication will not be performed correctly.

1.2. SOFTWARE SPECIFICATIONS

1.2.1 Parameters

(1)RS-232C

The RS-232C (voltage type) for serial communication is used for the communication interface between the LASC-HST and the host computer.

The communication protocol uses bit serial interface (Class A, Class B, or Class C). The communication parameters are as follows.

Parameter	Set Value
Class	Class A, Class B, *Class C
Baud Rate (bps)	1200, 2400, 4800, *9600
Start Bit	1 bit
Data Length	*7 bits, 8 bits
Stop Bit	1 bit, *2 bits
Parity	NONE, *EVEN, ODD

- Class C is specified in "1.6. Class C" in this chapter.
- Unless otherwise specified, the parameters marked by asterisk marks (*) are selected as factory defaults.

(2)TCP/IP

Communication is performed according to the bit serial interface class A.

CAUTION:	• During TCP/IP communication, make sure to use class A for the communication protocol. If class B or class C is used, communication will not be performed correctly.

1.2.2 Exchange Code

ASCII codes are used for interface exchange codes.

Control Character	Hexadecimal
ACK	06H
NAK	15H
ENQ	05H
EOT	04H
STX	02H
ETX	03H

1.2.3.   Text Format

"STX" is sent at the beginning of data, and "ETX" is sent at the end of data.

S T X			E T X

Order of transmission→

The maximum length for one text is 253 bytes (not including STX and ETX).

1.3. Exchanging Text

1.3.1   Format List

(1) Order Information Format from the Host to LASC-HST

Format type	Format	For XE discrete order
Order Information	Group Order Format	-
	Individual Order Format	O

(2) Results Information Format from LASC-HST to the Host
It is possible to set whether to output each format or not in the settings of the LASC-HST.

Format type	Format	Note
Pool Information	Default Format	Sample ID No. (15 digits)
	Old Format	Sample ID No. (13 digits)
Smear Information	Smear Information Format	
Dyeing Information	Dyeing Information Format	

In order to perform analysis with the HST system as requested by the host computer, orders must be sent to the LASC-HST before the following timings.
- When the rack ID or TUBE Pos. information is not used: Before the sample ID is read by the analyzer
- When the rack ID or TUBE Pos. information is used: Before the rack starts from the STY in the HST system

A request to send orders is not necessary, and orders are sent automatically from the host computer to the LASC-HST. (LASC-HST can receive communications at any time.)

CAUTION: • When sending a series of orders, use the following intervals.
When a sample has not been analyzed, the host computer sends orders at intervals of 500 msec or more.
When normal analysis is performed, the host computer sends orders at intervals of 2 seconds or more.

1.4. Data Format

1.4.1 Field Definition

The parameters used in the order format and their usage are described below.

(1) Registry No.
The numbers "0" to "9" can be used.
The registry number is a 8-digit numeral. When the number of digits is less than 8, "0" is added to the upper digits.
> (Example) When a registry number is "12345," set it as "00012345."
> When registry number is not used, "0" is set to all the digits.

(2) Sample ID No. (when space padding is set)
This definition is used when space padding is set for the sample ID No. in the LASC-HST.
To have it be compatible with the older LASC-HST formats 7 and 8, zero padding can be set for the sample ID No. However, space padding specifications is used for the XE series and SP-1000*i*.
In addition, since there are restrictions when setting zero padding, the space padding setting is normally used.

Up to 15 alphanumeric characters and hyphens can be used for the sample ID No. However, if SE or R-3500 unit is connected to the HST system, up to 13-digit numerals and hyphens are used.

It is a 15-digit numeral. When the number of digits is less than 15, "Δ (space)" (20h) is added to the upper digits.
> (Example) When a sample ID number is "012345678," it is set as
> "ΔΔΔΔΔΔ012345678."

However, the result sent from the LASC-HST is sometimes expressed by alphabetic capital letters (41h - 5Ah).
> (Example) Error sample ID No.: ΔΔERR1000000001

When the Od Format for pool information is used, the sample ID No. can be set to only 13 digits or less, regardless of whether the space or zero padding setting is used. (This is because the Old Format uses the 13 digit specifications.)

(3) **Sample ID No. (when zero padding is set)**

This definition is used when zero padding is set for the sample ID No. in the LASC-HST. When zero padding is set, the LASC-HST uses a fixed digit for the sample ID No. Therefore, it is necessary to set a fixed number of digits for the sample ID No. label to be used. (This does not include ID reading error numbers or special samples such as quality control samples.)

Up to 15 alphanumeric characters and hyphens can be used for the sample ID No. However, if SE or R-3500 unit is connected to the HST system, up to 13-digit numerals and hyphens are used.

It is a 15-digit numeral. When the number of digits is less than 15, "0" (30h) is added to the upper digits.

    (Example) When a sample ID number is "12345678," it is set as
           "000000012345678."

However, the result sent from the LASC-HST is sometimes expressed by alphabetic capital letters (41h - 5Ah).

    (Example) Error sample ID No.: 00ERR1000000001

When the Old Format for pool information is used, the sample ID No. can be set to only 13 digits or less, regardless of whether the space or zero padding setting is used. (This is because the Old Format uses the 13 digit specifications.)

(4) **Rack ID, TUBE Pos.**

If the optional rack barcode reader (RBU-1) is connected to the HST system, the rack ID and TUBE Pos. can be used in the order information.
If rack ID and TUBE Pos. are used, they will be inquired by the HST system.
If the inquiry results indicate that there is no CVR analysis order on the relevant rack, the HST system will skip the rack and deliver to the line.
However, in order to skip the rack and proceed to the line, it must be determined that all 10 samples on the rack can be skipped.

If the optional rack barcode reader (RBU-1) is not connected, or if the inquiry mentioned above is not necessary, this information is not used, and an "*" (2AH) is entered for this setting.

The rack ID label is designated by "0" - "9" of the ASCII code.
The rack ID is 6 digits, so if there are less than 6 digits, "0" is used for the leading digits.

    (Example) If the rack ID is "1234", it is changed to "001234".
           If the TUBE Pos. is "Pos.2", it is changed to "02".
           If the rack ID and TUBE Pos. are not used, all digits are set to "*".

However, results transmitted from LASC-HST may include special rack ID that uses capital letters (41h - 5Ah).

    (Example) Error rack ID: EH1001

(5) Analysis Order
As for the parameters which can be analyzed by the HST system, set analysis order information to the analysis order.

Analysis order of each ordered analysis parameter is specified as follows:
When analysis is ordered: "1" (ASCII code)
When analysis is not ordered: "0" (ASCII code)

For SC (Screening) analysis orders, SP measurement occurs when measurement at XE/ SE is POSITIVE.

NOTE:	• When an order to analyze only DIFF is made, the LASC-HST converts the analysis order to CBC+DIFF. • When the analysis orders of SP and SC parameters are "1," the LASC-HST converts the analysis order to SP.

(6) XE Order (discrete order)
The Individual Order Format can be used to set analysis orders for each parameter corresponding to the XE discrete measurement.
The order for each parameter is specified as follows:
When analysis is ordered: "1" (ASCII code)
When analysis is not ordered: "0" (ASCII code)

CAUTION:	• The order (Individual) is applied to XE only. • You cannot select Individual Order Format if both XE and SE are in the system.

Relation between the existing RET order and analyzer

Order Format	RET Order
Group Order Format	• When the LASC RET order setting is set to [HOST], LASC follows the instructions (RET or RET(XE)) of the HOST order. • Setting the LASC RET order to [R] or [XE] decides whether LASC performs measurement of the RET order at XE or R-3500. Orders set to RET(XE) are ignored.
Individual Order Format (For XE discrete order)	• RET-related items in order (individual) (XE) are measured at XE. • Analysis order RET is used at R-3500.

(7) Order: OTHER
The OTHER1 to OTHER5 are set for the LASC-HST.
When there is an OTHER order, set "1."
When there is no OTHER order, set "0."

This order is not analyzed by the HST system, and is used for display or search in the pool list.

(8) Print Number (13 digits x 3)
Specify the print number for SP.

When SP print number is not used, input "0" to all the digits.

> The SP print numbers are set in the order of HOST selection.
> (Example) Data specified by a print number:
>   "1234567890123" (1st line)
>   "ABCDEFGHIJKLM" (2nd line)
>   "NOPQRSTUVWXYZ" (3rd line)
> Depending on the print setting (1st line: HOST, 2nd: Sample ID No., 3rd: HOST)
> of the LASC-HST, the SP prints the following data:
>   1st line: 1234567890123
>   2nd line: (Sample ID No.)
>   3rd line: ABCDEFGHIJKLM

(9) Number of Films

When 1 smear is produced	"1"	(ASCII code)
When 2 smears are produced	"2"	(ASCII code)
When no smear is produced	"0"	If other than "0" and "2" is input, the number of smear is regarded as 1.

(10) Slide glass
The slide glass is specified as follows:

"0"	Either slide glass can be used.
"1"	Slide glass 1 is used.
"2"	Slide glass 2 is used.

First specification: The upper 1 bite
Second specification: The lower 1 bite
* The second specification is effective when two samples are produced.

(11) Patient ID

The patient ID indicates the sample's patient ID number.

"20h" to "7Eh" of the ASCII code can be used.

However, this should be used within the applicable range of the analyzer connected to the HST system.

Right-justify the characters, and add spaces to the upper digits.

When this information is not used, input "*" (2Ah) to all the digits.

(Example) When a patient ID is "ABCDE12345," set it as
"ΔΔΔΔΔABCDE12345."

When patient ID is not used, "*" is set to all the digits.

(12) Sex

The sex indicates the patient's sex.

Only the figures "1," "2," and "3" can be used.

"1":   Male

"2":   Female

"3":   Unknown

When this information is not used, input "*" (2Ah) to all the digits.

(13) Date of birth

The date of birth indicates the patient's date of birth.

It is indicated as "YYYYMMDD."

"YYYY": Year

"MM":   Month

"DD":   Day

(Example) When date of birth is May 19, 1969, it is indicated as "19690519."

When this information is not used, input "*" (2Ah) to all the digits.

(14) HCT/WBC/RBC
Since the data used with the SP (HCT/WBC/RBC) is acquired through SP host inquiry, generally this field is not used. This field is used only when the SP makes no inquiries, and you wish to apply the information from XE/SE that is not connected to this HST.

Enter an "*" (2Ah) for this setting if this information is not to be used.

1) HCT
The HCT value is in the pre-fixed units, regardless of any unit settings in the analyzer.

OOO.O [%]
"O":   "0" to "9"
   (Example) When value of HCT is 42.3 [%], it is indicated as "0423."
              When this information is not used, input "****" to all the digits.

2) WBC
The WBC value is in the pre-fixed units, regardless of any unit settings in the analyzer.

OOOO.OΔ [$x10^2/\mu L$]
"O":   "0" to "9"
"Δ":   "Δ" (20h)
   (Example) When value of WBC is 63.5 [$x10^2/\mu L$], it is indicated as "00635Δ."
              When this information is not used, input "******" to all the digits.

3) RBC
The RBC value is in the pre-fixed units, regardless of any unit settings in the analyzer.

OOOOΔ [$x10^4/\mu L$]
"O":   "0" to "9"
"Δ":   "Δ" (20h)
   (Example) When value of RBC is 512 [$x10^4/\mu L$], it is indicated as "0512Δ."
              When this information is not used, input "*****" to all the digits.

(15) SP Print Number (Smear information format)
The Print Number indicates the number printed on the SP slide glass. However, if the actual printed number is 15 digits (x 3 rows), only the last 13 digits of each row are sent. Enter "Δ (space)" for the setting if the printed data are blank characters.

(16) Line ID
The number set for "Line ID" in the LASC-HST is set.
It can be selected optionally within the range from "00" to "20." The default value is "00."

(17) SP Number
The SP unit number on the HST line are counted as the 1st from the right, and the 2nd to the left. ("01" and "02" are set.)

(18) Rack Number (Pool Information Format)
The numbers are set in the order in which they are pooled in the pool area.
   (Example) The pooled Rack Number for the rack pooled in the first position is set to "0001".

1.4.2   Order Information Format

(1)   Group Order Format

Parameter	No. of Characters	C/(O)	Example
STX	1	C	(02H)
[1] Text Distinction Code 1	1	C	Fixed to "S"
[2] Registry Number	8	(O)	If not used, fill the column with "0" (30h)
[3] Sample ID Number	15	C	
[4] Rack ID	6	(O)	If not used, fill the column with "*" (2Ah)
[5] TUBE Pos.	2	(O)	If not used, fill the column with "*" (2Ah)
[6] Analysis Order: CBC	1	C	
[7] Analysis Order: DIFF	1	C	
[8] Analysis Order: RET	1	C	See Section 1.4.1 (5) and (6) in this chapter.
[9] Analysis Order: SP	1	C	
[10] Analysis Order: SC	1	C	
[11] Analysis Order: RET(XE)	1	C	See Section 1.4.1 (5) and (6) in this chapter.
[12] Analysis Order: NRBC	1	C	
[13] Order: OTHER1	1	C	
[14] Order: OTHER2	1	C	
[15] Order: OTHER3	1	C	
[16] Order: OTHER4	1	C	
[17] Order: OTHER5	1	C	
[18] Print Number: 1st	13	(O)	
[19] Print Number: 2nd	13	(O)	
[20] Print Number: 3rd	13	(O)	
[21] Number of Films	1	C	
[22] Slide Glass	2	(O)	If not used, fill the column with "0" (30H)
[23] Patient ID	16	(O)	If not used, fill the column with "*" (2Ah)
[24] Sex	1	(O)	If not used, fill the column with "*" (2Ah)
[25] Date of Birth	8	(O)	If not used, fill the column with "*" (2Ah)
[26] HCT	4	(O)	If not used, fill the column with "*" (2Ah) For details, See 1.4.1 (14): HCT/WBC/RBC.
[27] WBC	6	(O)	If not used, fill the column with "*" (2Ah) For details, See 1.4.1 (14): HCT/WBC/RBC.
[28] RBC	5	(O)	If not used, fill the column with "*" (2Ah) For details, See 1.4.1 (14): HCT/WBC/RBC.
ETX	1	C	(03H)
Total	128		

C: Be sure to set a value.
(O):   This parameter is optional. If it is not used, set the default value.

(2)   Individual Order Format

Parameter	No. of Characters	C/(O)	Example
STX	1	C	(02H)
[1] Text Distinction Code 1	1	C	Fixed to "S"
[2] Registry Number	8	(O)	If not used, fill the column with "0" (30h)
[3] Sample ID Number	15	C	
[4] Rack ID	6	(O)	If not used, fill the column with "*" (2Ah)
[5] TUBE Pos.	2	(O)	If not used, fill the column with "*" (2Ah)
[6] Analysis Order: RET	1	C	See Section 1.4.1 (5) and (6) in this chapter.
[7] Analysis Order: SP	1	C	
[8] Analysis Order: SC	1	C	
[9] XE Order: WBC	1	C	
[10] XE Order: RBC	1	C	
[11] XE Order: HGB	1	C	
[12] XE Order: HCT	1	C	
[13] XE Order: MCV	1	C	
[14] XE Order: MCH	1	C	
[15] XE Order: MCHC	1	C	
[16] XE Order: PLT	1	C	
[17] XE Order: LYMPH%	1	C	
[18] XE Order: MONO%	1	C	
[19] XE Order: NEUT%	1	C	
[20] XE Order: EO%	1	C	
[21] XE Order: BASO%	1	C	
[22] XE Order: LYMPH#	1	C	
[23] XE Order: MONO#	1	C	
[24] XE Order: NEUT#	1	C	
[25] XE Order: EO#	1	C	
[26] XE Order: BASO#	1	C	
[27] XE Order: RDW-CV	1	C	
[28] XE Order: RDW-SD	1	C	
[29] XE Order: PDW	1	C	
[30] XE Order: MPV	1	C	
[31] XE Order: P-LCR	1	C	
[32] XE Order: (Reserve)	1	(O)	Fill the column with "0" (30H) as a fixed value.
[33] XE Order: (Reserve)	1	(O)	Fill the column with "0" (30H) as a fixed value.
[34] XE Order: RET%	1	C	See Section 1.4.1 (5) and (6) in this chapter.
[35] XE Order: RET#	1	C	See Section 1.4.1 (5) and (6) in this chapter.
[36] XE Order: IRF	1	C	See Section 1.4.1 (5) and (6) in this chapter.

[37] XE Order: LFR	1	C	See Section 1.4.1 (5) and (6) in this chapter.
[38] XE Order: MFR	1	C	See Section 1.4.1 (5) and (6) in this chapter.
[39] XE Order: HFR	1	C	See Section 1.4.1 (5) and (6) in this chapter.
[40] (Reserve)	1	(O)	Fill the column with "0" (30H) as a fixed value.
[41] XE Order: PCT	1	C	
[42] XE Order: NRBC%	1	C	
[43] XE Order: NRBC#	1	C	
[44] (Reserve)	14	(O)	Fill the column with "0" (30H) as a fixed value.
[45] Order: OTHER1	1	C	
[46] Order: OTHER2	1	C	
[47] Order: OTHER3	1	C	
[48] Order: OTHER4	1	C	
[49] Order: OTHER5	1	C	
[50] Print Number: 1st	13	(O)	
[51] Print Number: 2nd	13	(O)	
[52] Print Number: 3rd	13	(O)	
[53] Number of Films	1	C	
[54] Slide Glass	2	(O)	If not used, fill the column with "0" (30H)
[55] Patient ID	16	(O)	If not used, fill the column with "*" (2Ah)
[56] Sex	1	(O)	If not used, fill the column with "*" (2Ah)
[57] Date of Birth	8	(O)	If not used, fill the column with "*" (2Ah)
[58] HCT	4	(O)	If not used, fill the column with "*" (2Ah) For details, See 1.4.1 (14): HCT/WBC/RBC.
[59] WBC	6	(O)	If not used, fill the column with "*" (2Ah) For details, See 1.4.1 (14): HCT/WBC/RBC.
[60] RBC	5	(O)	If not used, fill the column with "*" (2Ah) For details, See 1.4.1 (14): HCT/WBC/RBC.
ETX	1	C	(03H)
Total	173		

C: Be sure to set a value.
(O):   This parameter is optional. If it is not used, set the default value.

NOTE:
- XE order is applied only to XE.
- You cannot select Individual Order Format if both XE and SE are in the system.

1.4.3 Smear Information Format

(1) Smear Information Format

Parameter	No. of Characters	Example
STX	1	(02H)
[1] Text Distinction Code 1	3	Fixed to "DSU"
[2] Sample ID Number	15	
[3] Rack ID	6	
[4] TUBE Pos.	2	
[5] SP Print Number	39	
[6] Line ID	2	
[7] SP Number	2	
[8] Smear Result	1	"0": Normal end, "1": Abnormal end
ETX	1	(03H)
Total	72	

NOTE:	• If the automatic send function for smear information in the LASC-HST is set to "Yes(ALL)", the analysis results for the manual analysis samples, barcode reading error samples, and analysis error samples can be output in addition to the results for normal samples.

1.4.4 Dyeing Information Format

Parameter	No. of Characters	Example
STX	1	(02H)
[1] Text Distinction Code 1	1	Fixed to "M"
[2] Sample ID Number	15	
[3] Rack ID	6	
[4] TUBE Pos.	2	
[5] Line ID	2	
[6] (Reserve)	2	"00"
[7] Dyeing Result	1	"0": Normal end, "1": Abnormal end
ETX	1	(03H)
Total	31	

NOTE:	• If the automatic send function for dyeing information in the LASC-HST is set to "Yes(ALL)", the analysis results for the manual analysis samples, barcode reading error samples, and analysis error samples can be output in addition to the results for normal samples.

1.4.5   Pool Information Format

For 2-line systems, if a rack is pooled in SKY of system 2, the pool data will be sent to the host computer.
In other words, the content of the data sent is that of the SKY pool data of system 2.
Since the transfer unit uses the final sample ID No. read for the pool information, if the final reading is an ID reading error, the pool information will be an error sample No.

(1)   Default Format

Parameter	No. of Characters	Example
STX	1	(02H)
[1] Text Distinction Code 1	3	Fixed to "DKU"
[2] Sample ID Number	15	
[3] Rack ID	6	
[4] TUBE Pos.	2	
[5] Line ID	2	
[6] Rack Number	4	
[7] Pool Destination	1	Fixed to "0"
[8] XE Analysis Result	1	"0": Normal end, "1": Other than normal end
[9] SE Analysis Result	1	"0": Normal end, "1": Other than normal end
[10] R Analysis Result	1	"0": Normal end, "1": Other than normal end
[11] SP Analysis Result	1	"0": Normal end, "1": Other than normal end
[12] System Number	1	Fixed to "0"
[13] (Reserve)	4	
ETX	1	(03H)
Total	44	

NOTE: • If the automatic send function for pool information in the LASC-HST is set to "Yes(ALL)", the analysis results for quality control samples and washed samples can be output in addition to the results for normal samples.

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(2) Old Format

With the Old Format, special samples such as quality control samples and washed samples are not output to the host computer.

Parameter	No. of Characters	Example
STX	1	(02H)
[1] Text Distinction Code 1	3	Fixed to "DKU"
[2] Sample ID Number	13	
[3] Rack Number	4	
[4] TUBE Pos.	2	
ETX	1	(03H)
Total	24	

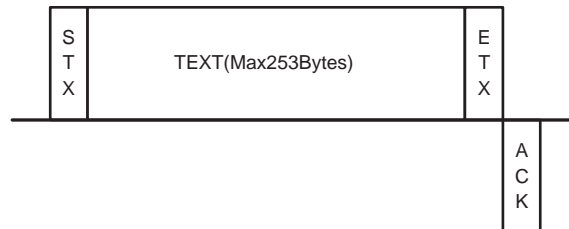|	
CAUTION:	• When the Old Format for pool information is used, the sample ID No. should be 13 digits or less. (This is because the Old Format uses the 13 digit specifications.)

1.5   Class B

1.5.1   Transmission Protocol

(1)   Transmission protocol
The transmission starts with STX and ends with ETX.

(Transmission procedure)
Transmitting side (Host computer)

```
┌───┬──────────────────────┬───┐
│ S │                      │ E │
│ T │    TEXT(Max253Bytes) │ T │
│ X │                      │ X │
└───┴──────────────────────┴───┤
                               │ A │
                               │ C │
                               │ K │
                               └───┘
```

Receiving side (LASC-HST)

**(2)   One text is sent for one sample at a time.**

CAUTION:	• When sending a series of orders, use the following intervals. When a sample has not been analyzed, the host computer sends orders at intervals of 500 msec or more. When normal analysis is performed, the host computer sends orders at intervals of 2 seconds or more.

1.5.2   Communication Error

(1)   When NAK is received
Transmitting side (When NAK is received three times, it is judged that there is a communication error.)
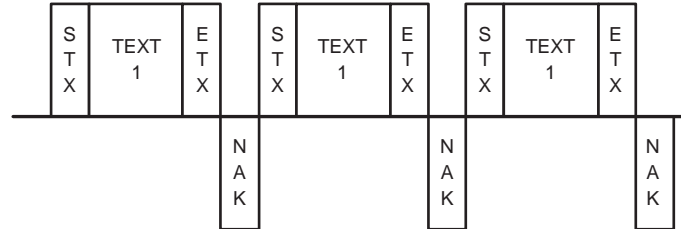
Receiving side (After sending NAK, sends data if necessary.)
*   The text with communication error will not be resent.

(2)   Time out
Transmitting side (When neither ACK nor NAK is received in 10 seconds after the text is sent out, it is judged that there is a communication error. When a signal other than ACK and NAK is received, it is judged that the text has collided, and the action against text collision is taken.)
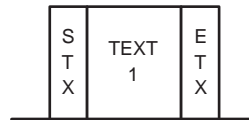
Receiving side (The text is not resent.)

(3)   Text collision
Host computer (After receiving NAK, resends the text 1.)
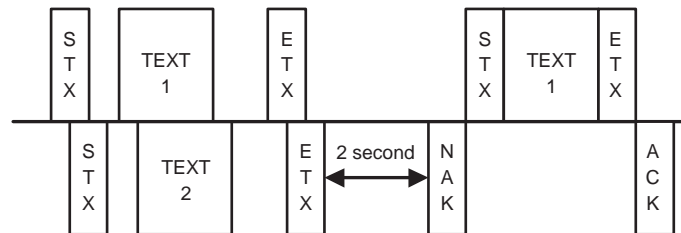
LASC-HST (When it is judged that the text has collided, sends NAK 2 seconds after sending the text, and waits for the data.)
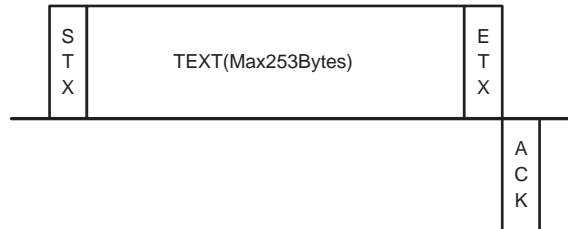The text 2, for which "send" was tried, will be resent.

1.6   Class C

1.6.1   Transmission Protocol

(1)   Transmission protocol
The transmission starts with ENQ and ends with EOT.

(Transmission procedure)
Transmitting side (Host computer)

```
┌───┬──────────────────────────┬───┐
│ S │                          │ E │
│ T │      TEXT(Max253Bytes)   │ T │
│ X │                          │ X │
└───┴──────────────────────────┴───┘
                                  ┌───┐
                                  │ A │
                                  │ C │
                                  │ K │
                                  └───┘
```

Receiving side (LASC-HST)

(2)   One text is sent for one sample at a time.

CAUTION:	• When sending a series of orders, use the following intervals. When a sample has not been analyzed, the host computer sends orders at intervals of 500 msec or more. When normal analysis is performed, the host computer sends orders at intervals of 2 seconds or more.

1.6.2 Communication Matrix

(1) Transmit Matrix

Event / Status	A Receive ACK	B Receive NAK	C Receive EOT	D Receive invalid code	E No response Time out
1 Waits for response after sending ENQ	→ 2	→ idle	→ idle	×	(*1) → 1
2 Waits for response after sending TEXT	Send EOT → idle	(*1) → 2	Send EOT → idle	×	(*1) → 2

*1: Sends EOT at the time of the third event, and becomes idle.

idle: Becomes idle.

×: Ignored (discarded)

(2) Receive Matrix

| Event / Status	A Receive ENQ	B Receive normal TEXT	C Receive abnormal TEXT	D Receive EOT	E Receive invalid code	F No response Time out
1 Waits for ENQ	→ 2	×	×	×	×	×
2 Waits for TEXT after sending ACK	→ 3	Send ACK → 4	→ 3	→ 1	→ 3	Send EOT → 1
3 Waits for TEXT after sending NAK	(*2) → 3	Send ACK → 4	(*2) → 3	→ 1	(*2) → 3	Send EOT → 1
4 Waits for EOT	(*2) Send NAK → 4	(*2) Send NAK → 4	(*2) Send NAK → 4	→ 1	(*2) Send NAK → 4	Send EOT → 1

*2: Sends EOT at the time of the third event, and returns to the status 1.

×: Ignored (discarded)

1.6.3   Communication Error

(1)   When NAK is received
Transmitting side (When NAK is received three times, it is judged that there is a communication error.)

E N Q		S T X	TEXT 1	E T X	S T X	TEXT 1	E T X	S T X	TEXT 1	E T X	E O T
	A C K				N A K		N A K			N A K	
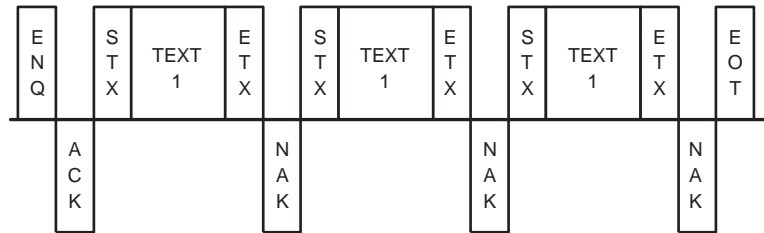
Receiving side (Waits for the data after receiving EOT.)

*   The text with communication error will not be resent.
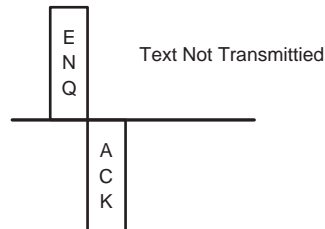
(2)   Time out 1
Transmitting side (Waits for ACK for 3 seconds after sending ENQ. When no response is received, it is judged that there is a communication error, and EOT is sent.)

E N Q	E O T

Receiving side (No response)

(3)   Time out 2
Transmitting side

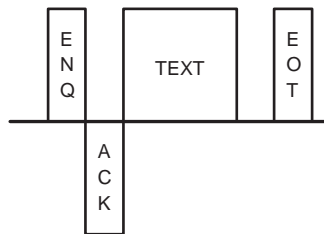| E N Q	Text Not Transmittied
A C K	

Receiving side (When no text is received in 3 seconds after ACK is sent out, it is judged that there is a communication error.)
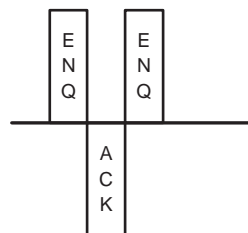
(4)   Time out 3
Transmitting side (When neither ACK nor NAK is received in 3 seconds after the text is sent out, it is judged that there is a communication error.)

```
 ┌───┐       ┌───────┐   ┌───┐
 │ E │       │       │   │ E │
 │ N │       │ TEXT  │   │ O │
 │ Q │       │       │   │ T │
─┴───┴───────┴───────┴───┴───┴─
     │   │
     │ A │
     │ C │
     │ K │
     └───┘
```

Receiving side (When no text is received in 3 seconds after ACK is sent out, it is judged that there is a communication error.)
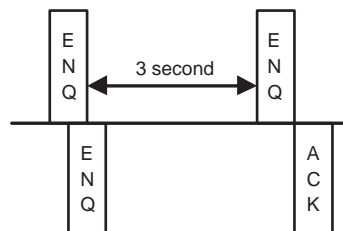
(5)   Command error
Transmitting side

```
 ┌───┐       ┌───┐
 │ E │       │ E │
 │ N │       │ N │
 │ Q │       │ Q │
─┴───┴───────┴───┴─
     │   │
     │ A │
     │ C │
     │ K │
     └───┘
```

Receiving side (When ENQ is received again after the ENQ response, it is judged that there is a communication error. When a signal other than ENQ is received while waiting for ENQ, it is discarded as invalid data.)

(6)   ENQ collision
Host computer

```
 ┌───┐                 ┌───┐
 │ E │   3 second      │ E │
 │ N │ ◄──────────►    │ N │
 │ Q │                 │ Q │
─┴───┴─────────────────┴───┴─
     │   │             │   │
     │ E │             │ A │
     │ N │             │ C │
     │ Q │             │ K │
     └───┘             └───┘
```

LASC-HST (Waits for ENQ.)
The ENQ 3 will be resent 3 seconds after an ENQ transmission.

1.7 Notice

1.   Analysis orders from the host computer must be sent before analysis begins in the transfer unit.

2.   With RS-232C, bit serial (class A) cannot be used when smear information, dyeing information, and pool information are output to the host computer.

2. TERMINOLOGY

• Terms regarding analysis

Terms	Explanation
Process Result	Indicates the process result of the analysis in the transportation system. The analyzer notifies the transportation system whether the analysis has been completed normally or abnormally.
Analysis Data	Indicates the data of each order of the samples analyzed by the analyzer.
Orders	Indicates the analysis request information of CBC, Diff, Ret, and NRBC.
Orders (Individual)	Indicates the individual request information such as RBC and WBC included in CBC, Diff, Ret, and NRBC. Analysis by this unit can be performed by XE-2100 only.
Remained	Indicates the sample having items not analyzed. List of the samples whose analysis has not been performed or resulted in error.
Not Measured	Indicates only the sample having items not analyzed. The samples which have not been loaded to the analysis line, or not been analyzed by the applicable numbers due to an ID reading error are included.
Analysis Error	Indicates the sample whose analysis resulted in the analysis error due to an aspiration error or other problems in the analyzer.

• Terms regarding rack transportation

Terms	Explanation
(Rack)	Indicates the control number given to each sample rack by the transportation system. The number is given in the order of the loaded sample racks. However, when the rack is inserted, the number is given starting from 9000 to 9999.
Rack SEQ.	Indicates the number given in the order of loading of the rack to the starting pool.
Pool No.	Indicates the number given in the order of storing of the rack to the finishing pool.