CS-2000i/ CS-2100i
Host Online Specification

2009/12/9 Ver.1.60

Sysmex Corporation

Revision History

Version	Date	Description
1.00	11.09.2006	Initial Version
1.10	31.05.2007	The reserved parameter in the analyzed data format and the order information text format is changed to the patient name.
1.20	29.08.2007	1) The difference between CA-1500 format and CA-1000 format is described in 5. Text Format. The number of characters of CA-1000 format is added in the description of each format. 2) When the Barcode Reading Error occurs, the assigned sample No. is changed to 13-digit or 15-digit beginning with "□□ERR0000000001" or "ERR000000000001" respectively. It is added that Sample No. in Barcode Reading Error is selectable from 13-digit or 15-digit in the System Settings screen.
1.30	06.11.2007	It is added that the response text in class B can be sent between STX and ETX.
1.40	02.09.2008	The CS-2000i format is added. The description of the sample information text supported only in the CS-2000i format is added.
1.50	14.01.2009	It is added that the CS-2000i format consists of the CA-1500 format and sample information text.
1.60	09.12.2009	It is added thet Sample Volume flag in the sample information text. It is added thet “7.Examples of Communication” Parameter Codes are added.

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1. Scope of Application

This specification applies in the serial data communication (based on RS-232C) and the TCP/IP communication (Ethernet) between CS-2000i/CS-2100i and the host computer.

2. Overview

The following functions can be performed by means of the communication between the CS-2000i/CS-2100i and the host computer:

1. Receives analysis orders from the host computer.
2. Sends analysis results to the host computer.
3. Sends reference information about samples to the host computer.

3. Serial Data Communication

The bit serial voltage type, which conforms to RS-232C interface, is used for the serial data communication. The CS-2000i can be connected to the host computer via the serial interface port on the right panel of the main unit.

3.1 Hardware

3.1.1. Connector

- The connector to the host computer is located on the right panel of the main unit.
- A 9-pin D-SUB, female connector is used. (A male connector is used in the main unit.)

3.1.2. Connector Signals

Pin No.	Signal Name		Signal Direction
1		NC	
2	Receive Data	RxD	IN
3	Transmit Data	TxD	OUT
4	Data Terminal Ready	DTR	OUT
5	Signal Ground	SG	―
6	Data Set Ready	DSR	IN
7	Request to Send (Note*1)	RTS	OUT
8	Clear to Send (Note*1)	CTS	IN
9		NC	

(Note*1)
Whether to perform flow control for CTS/RTS can be selected according to the settings.
When “None” is selected for in the flow control, the signals of CTS/RTS are ignored.

3.1.3. Communication Format

The data is communicated in the asynchronous, half duplex mode. The following items can be defined as follows: (Asterisk mark “*” indicates the factory default.)

Baud Rate : 300, 600, 1200, 2400, 4800, *9600, 14400, 19200 (bps)
Code : 7 bit, *8 bit
Stop Bit : 1 bit, *2 bit
Parity : *None, Even, Odd
Interval : 0, *2, 3, 5, 7, 10, 15 (sec)

3.1.4. Signal Level

Level	Data Signal	Control Signal
+3V or higher	Logic “0”, Start bit	ON
-3V or lower	Logic “1”, Stop bit	OFF

3.2. Software

3.2.1. Communication Format

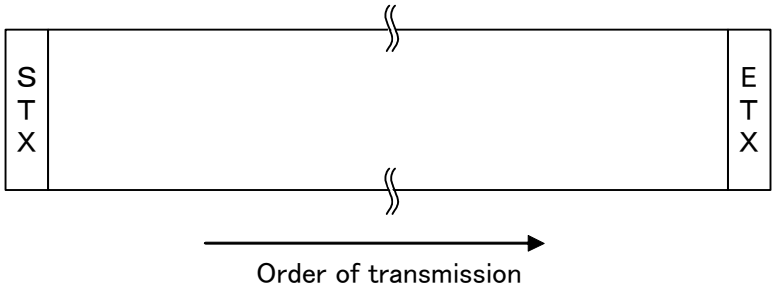
1) Code

ASCII codes are used for output.

2) Structure of Text

“STX” is sent prior to data and “ETX” is sent at the end of data.

One block should contain 255 characters or less. The analysis data is divided for transmission so that one block contains 255 or less characters.



3.2.2. Communication Protocol

The following 2 protocols are provided in the system.

(In the factory default, “Class A” is specified.)

- Class A:

  One way transmission without requiring any response text from the host computer

- Class B:

  Transmits data and then waits for the response text (ACK or NAK) from the host computer.

  ACK: 06H, NAK: 15H

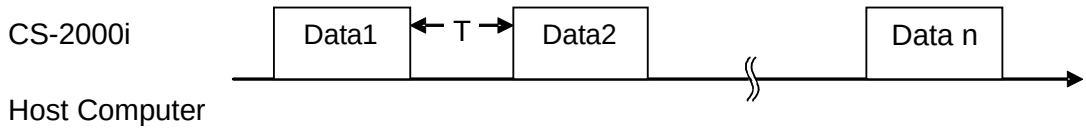
  ACK and NAK can be sent between STX and ETX according to the settings.

  The format of the response text can be defined in Response Text -Serial Port - System Settings - Settings.

3.2.2.1 Outputting Analysis Result

1) Communication Protocol (Class A)

The analysis result is output to the host computer taking the interval specified as T or longer interval. The interval can be selected from 0, 2, 3, 5, 7, 10 or 15 sec according to the software settings.

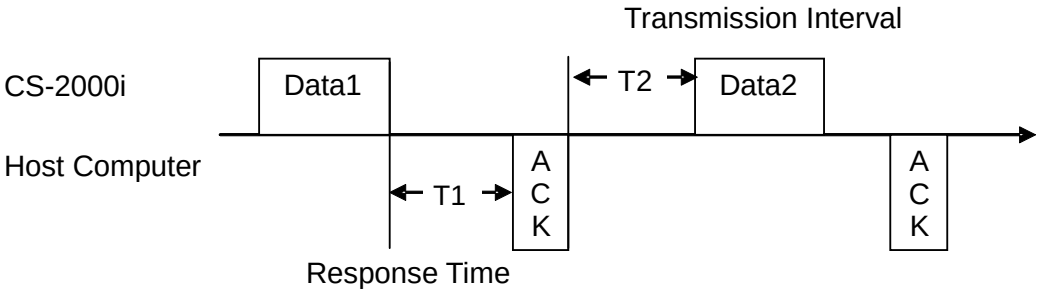


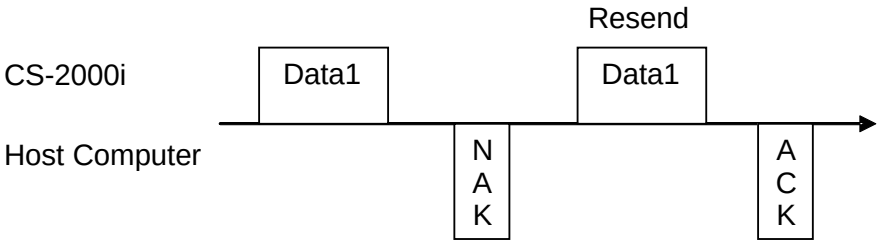
2) Communication Protocol (Class B)

(1)The CS-2000i sends an analysis result text.

(2) The host computer sends ACK (06H) when successfully receiving the analysis result text or sends NAK (15H) when an error occurs.

(3) The CS-2000i completes the transmission when receiving ACK (06H). When receiving NAK (15H), the CS-2000I resends the same text. However, the transmission is completed when receiving NAK after 3 retries.





Analysis Data Transmission

Final Data (Final Report) and All Data

In this system, the automatic repeat analysis such as redilution analysis and reflex test can be performed when the analysis result exceeds the prescribed limit values. In that case, the results of first analysis and repeat analysis are integrated to produce the final data (final report). When the first analysis result does not exceed the limit values, it will be the final data.

However, when the repeat analysis is performed for all of the parameters in the first analyses, the repeat analysis results will be the final data.

Similarly, when the analysis is performed for the parameter whose replication setting is 2, the averaged result of the fist and second analyses will be the final data. When the analysis whose replication setting is 1 is included the simultaneous analysis of multiple parameters, the result is included in the averaged result of the other parameters.

When another repeat analysis is performed for the averaged result, the data into which this repeat analysis result is integrated will be the final data (final report).

When the output target is Final Data, only the final data (final report) are output.

When the output target is All Data, it includes the analysis results before the final report. (Note*1)

The data output to the host computer from the IPU per sample depends on the number of analysis parameters or analysis conditions. When the output target is set to “Final Data”, the analysis results of all the parameters are output to the host computer at one time when all the analyses are completed. In the case of “All Data”, the data transmission frequency per sample depends on the analysis conditions (replications and repeat analysis conditions).

Pattern 1

Analysis Condition	PT	APTT
Replication	1	1
Repeat analysis(dilution)	-	-
Reflect Analysis	-	-

Content of Analysis Data Format

Text Distinction Code Ⅱ

				Setting for transmission		
	PT	APTT	Text Distinction Code Ⅱ	All Data	Final Data	
Transmission Data1	●(First time)	●(First time)	"1"	★	★	F（Final）

Pattern 2(In the case of two replications)

Analysis Condition	PT	APTT
Replication	2	1
Repeat analysis(dilution)	-	-
Reflect Analysis	-	-

				Setting for transmission		
	PT	APTT	Text Distinction Code Ⅱ	All Data	Final Data	
Transmission Data1	●(First time)	●(First time)	"1"	★		
Transmission Data2	●(Second time)		"1"	★		
Transmission Data3	◎(Average)	◎(First time)	"2"	★	★	F（Final）

Pattern 3 (In the case of repeat analysis)

Analysis Condition	PT	APTT
Replication	1	1
Repeat analysis(dilution)	ON	-
Reflect Analysis	-	-

				Setting for transmission		
	PT	APTT	Text Distinction Code Ⅱ	All Data	Final Data	
Transmission Data1	●(First time)	●(First time)	"1"	★		
Transmission Data2	●(Repeat analysis)		"1"	★		
Transmission Data3	◎(Repeat analysis)	◎(First time)	"1"	★	★	F（Final）

Pattern 4 (In the case of repeat analysis on plural prrameters)

Analysis Condition	PT	APTT
Replication	1	1
Repeat analysis(dilution)	ON	ON
Reflect Analysis	-	-

				Setting for transmission		
	PT	APTT	Text Distinction Code Ⅱ	All Data	Final Data	
Transmission Data1	●(First time)	●(First time)	"1"	★		
Transmission Data2	●(Repeat analysis)	●(Repeat analysis)	"1"	★	★	F（Final）

Pattern 5 (In the case of repeat analysis 1 with two replications)

Analysis Condition	PT	APTT
Replication	2	1
Repeat analysis(dilution)	ON	-
Reflect Analysis	-	-

				Setting for transmission		
	PT	APTT	Text Distinction Code Ⅱ	All Data	Final Data	
Transmission Data1	●(First time)	●(First time)	"1"	★		
Transmission Data2	●(Second time)		"1"	★		
Transmission Data3	◎(Average)	◎(First time)	"2"	★		
Transmission Data4	●(Repeat analysis first time)		"1"	★		
Transmission Data5	●(Repeat analysis second time)		"1"	★		
Transmission Data6	◎(Repeat analysis Average)		"2"	★		
Transmission Data7	◎(Repeat analysis Average)	◎(First time)	"1"	★	★	F（Final）

Pattern 6 (In the case of repeat analysis 2 with two replications)

Analysis Condition	PT	APTT
Replication	2	1
Repeat analysis(dilution)	-	ON
Reflect Analysis	-	-

	PT	APTT	Text Distinction Code Ⅱ	Setting for transmission: All Data	Setting for transmission: Final Data	
Transmission Data1	●(First time)	●(First time)	"1"	★		
Transmission Data2	●(Second time)		"1"	★		
Transmission Data3	◎(Average)	◎(First time)	"2"	★		
Transmission Data4		●(Repeat analysis)	"1"	★		
Transmission Data5	◎(Average)	◎(Repeat analysis)	"1"	★	★	F(Final)

Pattern 7 (In the case of reflext analysis)

Analysis Condition	PT	APTT	Fbg
Replication	1	1	1
Repeat analysis(dilution)	-	-	-
Reflect Analysis	ON→Fbg	-	-

	PT	APTT	Fbg	Text Distinction Code Ⅱ	Setting for transmission: All Data	Setting for transmission: Final Data
Transmission Data1	●(First time)	●(First time)		"1"	★	
Transmission Data2			●(Reflect Analysis)	"1"	★	
Transmission Data3	◎(First time)	◎(First time)	◎(Reflect Analysis)	"1"	★	★

F(Final)

The data marked with ★ is transmitted to the host computer.

●: Data which was actually analyzed

◎: Data which was averaged or belong to one sample

3.2.2.2 Receiving Analysis Order

- Sending Order inquiry from the IPU to the host computer

(1) The CS-2000i sends an order inquiry text.

(2) The host computer sends ACK (06H) when successfully receiving the order inquiry text or sends NAK (15H) when an error occurs.

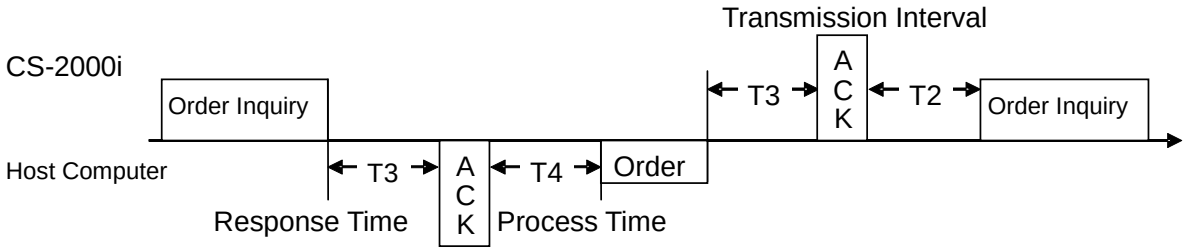
(3) The CS-2000i waits for the order information text when receiving ACK (06H). When receiving NAK (15H), the CS-2000i resends the same text. However, the transmission is completed when receiving NAK after 3 retries.

- Sending order information from the host computer to the IPU

(1) When receiving the order inquiry text, the host computer sends the order information text with an interval for 1 or more seconds after sending ACK (06H).

(2) The CS-2000i sends ACK (06H) when successfully receiving the order information text. When an error occurs, the CS-2000i sends NAK (15H).

(3) The host computer completes the communication when receiving ACK (06H). When receiving NAK (15H), the host computer resends the same text. However, more than three retries completes the transmission without sending NAK from the IPU to the host computer.



Order Inquiry and Order Information Texts Transmission

Transmission Interval:

The order information is output to the IPU taking the interval specified as T2 or longer interval. The interval can be selected from 0, 2, 3, 5, 7, 10 or 15 sec according to the software settings.

Time-Out Period:

When the response time T1/T3 or the process time T4 times out, the transmission is completed. The time-out period should be 15 sec.

Process Time:

The process time, T4 must take an interval of 1 or more sec.

If no control signal line is used with a delay time of 0.2 sec or more.

(Note*2)

If no analysis parameter for the sample inquired by the IPU is available in the host computer, set “000”.

When there is no analysis parameter for the inquired sample and the later samples, set “999”. The IPU does not perform order inquiry for the samples in the subsequent tube positions after receiving “999”.

3.2.3. Transmission Error

When a transmission error occurs, the transmission is interrupted and the error message is displayed in the IPU. Re-transmission is carried out by the operator. Transmission errors occur in the following situations:

Error Message	Explanation	Action
Transmission error in the host computer	Frame error, parity error or overrun error is detected when a text is received. Interrupt the transmission	Check the host computer as well as the connector cable
HC Off-line	The control signal, DSR in the host computer is not activated. Interrupt the transmission	Check the host computer as well as the connector cable
HC ACK Time-Out	After the data is t transmitted, no response is sent from the host computer within 15 seconds. Interrupt the transmission (Class B only)	Check the host computer as well as the connector cable
HC ACK Code Error	After the data is transmitted, a response code other than ACK/NAK is sent from the host computer. Interrupt the transmission (Class B only)	Check the host computer as well as the connector cable
HC Transmission Count Error	When the data is transmitted, NAK is received 4 times. Interrupt the transmission (Class B only)	Check the host computer as well as the connector cable
HC CTS Time-Out	After the data is output, the control signal CTS is not turned on within 5 seconds. Interrupt the transmission (only for RTS/CTS control)	Check the host computer as well as the connector cable

Error Message	Explanation	Action
HC STX Time-out	1. STX is not received within 15 seconds after the text transmission is required. Interrupt the transmission (Class A) 2. STX is not received within 15 seconds after ACK when the text transmission is required. Interrupt the transmission (Class B) 3. STX for the subsequent subtext is not received within 15 seconds after the last subtext is received. Interrupt the transmission (Class A) 4. STX for the subsequent subtext is not received within 15 seconds after ACK is transmitted when the last subtext is received (Class B)	Check the host computer as well as the connector cable
HC ETX Time-Out	ETX is not received within 15 seconds after STX is received. Interrupt the transmission	Check the host computer as well as the connector cable
（Resend）	After the data is transmitted, NAK is sent from the host computer (Class B only)	Resend

3.2.4. Transmission Interval

The transmission interval time between the data can be selected. The interval time in the case of class B means the period after receiving the response of ACK/NAK until starting the next data transmission.

3.2.5. Process Time

If no control signal lines are used, the response to the IPU must be sent with a delay of 0.2 second or more.

4. TCP/IP Communication

4.1 Hardware

The following describes the network interface layer.

- Conforms to IEEE802.3.
- Use a communication cable of UTP category 5

4.2 Software

4.2.1 Data Link/Network/Transport Layer

- Conforms to TCP/IP protocol
- The IP address for the communication must be set by using the value defined in TCP/IP-HC IP Address-System Settings-Settings. Select a value that differs from the address used in the IPU-main unit.
- The TCP port no. the communication must be set by using the value defined in TCP/IP-HC Port No.-System Settings-Settings

4.2.2 Session Layer

The IPU, which is a server, is connected to the host computer, which is a server. The IPU confirms the connection at the time of startup. When the connection fails, it is retried at regular intervals. If the server becomes down after the connection succeeded, the IPU does not retry the connection.

4.2.3 Presentation Layer

"STX" (02H) is sent prior to data and "ETX" (03H) is sent at the end of data.

Note) In the presentation layer, an explicit response such as ACK and NAK is not given.

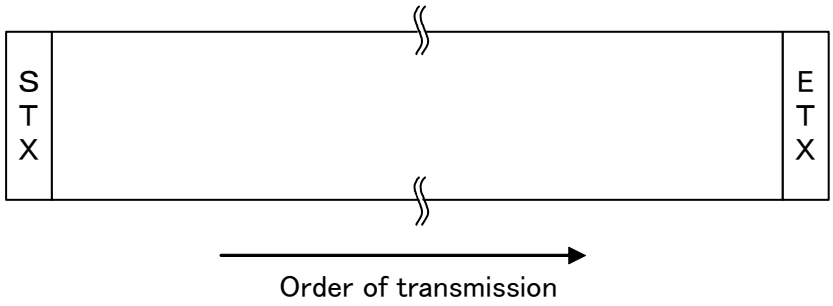


Figure 1 Text Format

4.2.4 Actions in the case of transmission error

When a transmission error occurs, the transmission is interrupted to display the error message in the IPU.

Re-transmission is carried out by the operator. Transmission errors occur in the following situations:

Table 1 Action for Transmission Error

Error Message	Explanation	Action
Could not confirm the TCP/IP connection with the host computer	Connect Error: Create error of the socket. Interrupt the transmission.	Check the host computer as well as the connector cable
TCP/IP receive error occurred in the host computer.	Receive Error: The size actually received (returned value from Receive) does not correspond to the required size. Interrupt the transmission	Check the host computer as well as the connector cable.
TCP/IP send error occurred in the host computer.	Send Error: The size actually sent (returned value from Send) does not correspond to the required size. Interrupt the transmission	Check the host computer as well as the connector cable.

5. Text Format

The HC communications with the host computer are performed using the following text formats. They are common in the serial data and TCP/IP communications. The text formats of CA-1000, CA-1500 format and CS-2000i format are described in this specification. Select the format corresponding to the host computer in the System Settings screen.

The CS-2000i format consists of the CA-1500 format and sample information text.

> Note:
> When CA-1000 format is selected, up to 13-digit of Sample No. and up to 4-digit of Rack No. are displayed from the right and up to 11-digit of Patient name is displayed from the left in the sent data.

- Analysis Data Text (Output)

The analysis data is output.

There are two methods for output: Automatic transmission (real-time basis) after each analysis is completed.

- Sample Information Text (Output) (Only for the CS-2000i format)

The sample information checked by the analyzer before an analysis is output. The sample information text is output only when the CS-2000i format is selected as Format of Host Computer in the system settings. It is sent after the analysis data text of the final result is sent.

- Order Inquiry Text (Output)

The analysis parameters, or the sample No. and analysis parameters are inquired for prior to an analysis.

- Order Information Text (Input)

After transmitting the order inquiry text, order information text is received from the host computer for an order instruction.

* Class B communication is required to use the function of order inquiry/analysis order instruction by means of the serial-type communication.

5.1 Analysis Data Format

The number in ( ) indicates the number of characters when CA-1000 format is used.

Parameter	Number of characters		
STX	1	(02H)	
Text Distinction Code I	1	Fixed to “D”	Header Block
Text Distinction Code II	1	"1", "2" The value is defined depending on the analysis condition.	Header Block
Text Distinction Code III	2	Fixed to “21”	Header Block
Block Number	2	"01" - "99"	Header Block
Total Number of Blocks	2	"01" - "99"	Header Block
Sample Distinction Code	1	"U", "E", "S", "C"	Header Block
Date	6	(○○○○○○)	Header Block
Time	4	(○○○○)	Header Block
Rack Number	6 (4)	(○○○○○○)	Header Block
Tube Position Number	2	(○○)	Header Block
Sample ID Number	15 (13)	(○○…○○)	Header Block
ID Information	1	"M", "A", "B"	Header Block
PatientName	15 (11)	(○○…○○)	Header Block
Analysis Parameter, Data 1	9		Data Block
Analysis Parameter, Data 2	9		Data Block
			Data Block
Analysis Parameter Data N	9		Data Block
ETX	1	(03H)	

- Order of Transmission

The order of transmission is from the top parameter to the bottom; the most significant digit first and the least significant digit last. Zero suppression is not performed.

- Text Distinction Code

A text distinction code is assigned to distinguish each text. There are three types of text distinction codes; from 1 to 3.

- Text Distinction Code 1 Fixed to “D”

- Text Distinction Code 2 1: Normal result data or final dataSample No.
  2: Averaged result

- Text Distinction Code 3 Fixed to “21”
- Block Number, Total Number of Blocks

A text consists of one header block and 22 data block. When more than 22 data blocks exist, the text is divided for transmission so that it contains 255 or less characters.
The Block Number is the sequential number of the divided text. 01 through 99 is serially assigned.
The number of blocks is the sequential number of the divided text. 01 through 99 is serially assigned.
When the text is not divided, “01” is assigned to both.

- Sample Distinction Code

  The types of analysis data are shown.
  U: Routine analysis data
  E: STAT analysis data
  S: Calibration curve analysis data
  C: Quality control analysis data

- Date and Time

  The date and time when the analysis was performed are shown. The date format conforms to the system settings. Zero is appended for date and time by zero padding.

- Rack Number

  Rack number is assigned to each sample rack.
  Ordinary Sample : Consists of 6-digit alphanumeric characters. (When it consists of less than 6 digits, zero padding is performed to the right.)
  STAT Sample : STAT is assigned.
  Reagent Table : REAG00 is assigned. (When CA-1000 format is used, REAG is assigned.)

- Tube Position Number

  The tube position number indicates the sample tube position in the sample rack.
  Ordinary Sample 01-10
  STAT Sample 01-05
  Reagent Table □□ (The symbol “□” indicates a space character.)

- Sample ID Number

  The sample ID number consists of 15 (13) digit numeric characters. A hyphen “-“(2DH) may be inserted between numerals. The hyphen is included in the 15 (13) digits. Zero suppression is not performed. When it consists of less than 15 (13) digits, flush right is performed and blank digits are replaced with space characters (20H). When the Barcode Reading Error occurs, the

sample No. beginning with "□□ERR0000000001" or "ERR000000000001" is sequentially assigned to the sample No. (The symbol "□□" indicates a space character. (20H))

Note: In the System Settings screen, Sample No. in Barcode Reading Error is selectable from 13-digit ("□□ERR0000000001") or 15-digit ("ERR000000000001") to output. When CA-1000 format is used, select 13-digit.

- ID Information

  The ID information indicates how the sample number is registered.

  M: Manual entry

  B: Read by barcode reader

  A: Automatically assigned by the instrument

- Patient Name

  The patient name consists of 15 characters with character codes including spaces but excluding control codes.

- Analysis Parameter, Data

Parameter	Number of characters	
Parameter Code	3	(○○○)
Data	5	(○○○○○)
Flag	1	“□”, “+”, “—“, “*”, “!”, “<”, “>”

The symbol "□"indicates a space character.

1) Parameter Code

The parameter code consists of two-digit host ID number defined in Basic Settings of Assay Group Definition and one-digit host ID number defined in Assay Parameter Settings of Assay Group Definition.

Refer to the parameter code list shown in the last part of this document.

2) Data

The analysis result consists of the digits (up to 5 digits) as defined in the assay parameter settings. The decimal point is not transmitted. The data as displayed in the Joblist is transmitted without the decimal point.

When the total number of the defined digits (integral part and decimal part) is less than 5 digits, space characters are inserted prior to the numeric value. When the analysis result consists of less than 5 digits, space characters are inserted prior to the numeric value. When the analysis result was not obtained due to analysis errors, "*" is entered

for the defined number of digits. When the averaged result could not be calculated, "/" is entered for the defined number of digits. When exceeding the number of display digits, "+" is entered for the defined number of digits. When the calculation parameter could not be calculated, "-" is indicated for the defined number of digits. When no validated calibration curve is available for the calculation parameter, "X" is entered for the defined number of digits.

NOTE) When the result exceeds the report limit, the limit value is output together with the flag as the result data.

Example)

Defined No. of digits	Normal analysis result		Analysis Result Error	Could not calculate averaged result	Exceeding the number of display digits	Could not calculate calculation parameter	No validated calibration curve is available for calculation parameter
4 digits for integral, 1 for decimal	□□□□1	99999	*****	/////	+++++	-----	XXXXX
2 digits for integral, 2 for decimal	□□□□1	□9999	□****	□////	□++++	□----	□XXXX
1 digit for integral, 2 for decimal	□□□□1	□□999	□□***	□□///	□□+++	□□---	□□XXX

The symbol "□" indicates a space character.

3) Flags

Space : No error
+ : Over the upper control limit
- : Under the lower control limit
* : Analysis error or difference in averaged data occurred
! : Coagulation time was obtained by re-dilution analysis
< : Under the lower report limit
> : Over the upper report limit

* The flags marked on the data conform to the display in the Joblist.

5.2 Sample Information Text Format

Parameter	Number of characters		
STX	1	(02H)	
Text Distinction Code I	1	Fixed to “D”	Header Block
Text Distinction Code II	1	Fixed to "S"	
Text Distinction Code III	2	Fixed to “21”	
Block Number	2	"01" - "99"	
Total Number of Blocks	2	"01" - "99"	
Sample Distinction Code	1	"U", "E", "S", "C"	
Date	6	(○○○○○○)	
Time	4	(○○○○)	
Rack Number	6	(○○○○○○)	
Tube Position Number	2	(○○)	
Sample ID Number	15	(○○…○○)	
ID Information	1	"M", "A", "B"	
Patient Name	15	(○○…○○)	
H Flag	1	"H", "□", "*"	Data Block
I Flag	1	"I", "□", "*"	
L Flag	1	"L", "□", "*"	
Sample Volume Flag	1	“V”, "□", "-"	
Reserved	87	Fixed space (20H)	
ETX	1	(03H)	

- Order of Transmission

The order of transmission is from the top parameter to the bottom; the most significant digit first and the least significant digit last. Zero suppression is not performed.

- Text Distinction Code

A text distinction code is assigned to distinguish each text. There are three types of text distinction codes; from I to III.

- Text Distinction Code I Fixed to “D”
- Text Distinction Code II Fixed to "S"
- Text Distinction Code III Fixed to “21”

- Block Number, Total Number of Blocks

A text consists of one header block and 22 data blocks. When more than 22 data blocks exist, the text is divided for transmission so that it contains 255 or less characters.

The Block Number is the sequential number of the divided text. 01 through 99 is serially assigned.
The number of blocks is the sequential number of the divided text. 01 through 99 is serially assigned.
When the text is not divided, “01” is assigned to both.

- Sample Distinction Code
  The types of analysis data are shown.
  U: Routine analysis data
  E: STAT analysis data
  S: Calibration curve analysis data
  C: Quality control analysis data

- Date and Time
  The date and time when the analysis was performed are shown. The date format conforms to the system settings. Zero is appended for the date and time by zero padding.

- Rack Number
  The rack number is assigned to each sample rack.
  Ordinary Sample: Consists of 6-digit alphanumeric characters. (When it consists of less than 6 digits, zero padding is performed to the right.)
  STAT Sample: STAT□□ (The symbol “□” indicates a space character.) is assigned.
  Reagent Table: REAG00 is assigned.

- Tube Position Number
  The tube position number indicates the sample tube position in the sample rack.
  Ordinary Sample: 01-10
  STAT Sample: 01-05
  Reagent Table: □□ (The symbol “□” indicates a space character.)

- Sample ID Number
  The sample ID number consists of 15-digit numeric or alphabetical characters. A hyphen “-“ (2DH) may be inserted between characters. The hyphen is included in the 15 digits. Zero suppression is not performed. When it consists of less than 15 digits, flush right is performed and blank digits are replaced with space characters (20H). When the Barcode Reading Error occurs, the sample number beginning with "□□ERR0000000001" or "ERR000000000001" is sequentially assigned to the sample number. (The symbol "□□” indicates a space character. (20H))

Note: In the System Settings screen, Sample No. in Barcode Reading Error is selectable from 13-digit ("□□ERR0000000001") or 15-digit ("ERR000000000001") to output.

- ID

  Information

  The ID information indicates how the sample number is registered.

  M: Manual entry

  B: Read by barcode reader

  A: Automatically assigned by the instrument

- Patient Name

  The patient name consists of 15 characters with character codes including spaces but excluding control codes.

- H Flag

  The result that the Hemolytic check gives is output. When the result is positive, "H" is output. When it is negative, space character (20H) is output. When it is out of analysis range of the detector unit, "*" is output.

- I Flag

  The result that the Icteric check gives is output. When the result is positive, "I" is output. When it is negative, space character (20H) is output. When it is out of analysis range of the detector unit, "*" is output.

- L Flag

  The result that the Lipemic check gives is output. When the result is positive, "L" is output. When it is negative, space character (20H) is output. When it is out of analysis range of the detector unit, "*" is output.

- Sample Volume Flag

  The result that the Sample Volume check gives is output. When the result is abnormal, "V" is output. When it is normal, space character (20H) is output. When it is not Sample Volume check, "-" is output.

  * A space character (20H) is always output for Sample Volume Flag of QC Analysis and Calib. Curve Analysis. It is same as IPU display,

5.3 Order Inquiry Text Format

The number in ( ) indicates the number of characters when CA-1000 format is used.

Parameter	Number of characters		
STX	1	(02H)	
Text Distinction Code I	1	“R” (Fixed)	Header Block
Text Distinction Code II (Order inquiry key)	1	“2” (Sample No.)	
Text Distinction Code III	2	“21” (Fixed)	
Block Number	2	"01" - "99"	
Total Number of Blocks	2	"01" - "99"	
Sample Distinction Code	1	Fixed space (20H)	
Date	6	(○○○○○○)	
Time	4	(○○○○)	
Rack Number	6 (4)	(○○○○○○)	
Tube Position Number	2	(○○)	
Sample ID Number	15 (13)	(○○…○○)	
ID Information	1	"M", "A", "B", "□"	
Reserved	15 (11)	All Space (20H)	
Analysis Parameter, Data 1	9		Data Block
Analysis Parameter, Data 2	9		
:	:		
Analysis Parameter N, Data N	9		
ETX	1	(03H)	

- Order of Transmission

The order of transmission is from the top parameter to the bottom; the most significant digit first and the least significant digit last. Zero suppression is not performed.

- Text Distinction Code

A text distinction code is assigned to distinguish each text. There are three types of text distinction codes; from 1 to 3.

- Text Distinction Code 1 “R” (Fixed)

- Text Distinction Code 2 (Order inquiry key)

"2" : Sample No.

- Text Distinction Code 3 Fixed to “21”

- Block Number, Total Number of Blocks

A text consists of one header block and 22 data block. When more than 22 data blocks exist, the text is divided for transmission so that it contains 255 or less characters.
The block No. is the sequential number of the divided text. 01 through 99 is serially assigned.
The number of blocks is the sequential number of the divided text. 01 through 99 is serially assigned.
When the text is not divided, “01” is assigned to both.

- Date and Time

The date and time when the order inquiry text was transmitted are shown. The date format conforms to the system settings. Zero is appended for date and time by zero padding.

- Rack Number

Rack number is assigned to each sample rack.

Ordinary Sample : Consists of 6-digit alphanumeric characters. (When it consists of less than 6 digits, zero padding is performed to the right.)
STAT Sample : STAT is assigned.
Reagent Table : REAG00 is assigned. (When CA-1000 format is used, REAG is assigned.)

- Tube Position Number

The tube position number indicates the sample tube position in the sample rack.

Ordinary Sample 01-10
STAT Sample 01-05
Reagent Table □□ (The symbol “□” indicates a space character.)

- Sample ID Number

The sample ID number consists of 15 (13) digit numeric characters. A hyphen “-“(2DH) may be inserted between numerals. The hyphen is included in the 15 (13) digits. Zero suppression is not performed. When it consists of less than 15 (13) digits, flush right is performed and blank digits are replaced with space characters (20H).
When the Barcode Reading Error occurs, the sample No. beginning with "□□ERR0000000001" or "ERR000000000001" is sequentially assigned to the sample No. (The symbol “□□” indicates a space character. (20H))

Note: In the System Settings screen, Sample No. in Barcode Reading Error is selectable from 13-digit ("□□ERR0000000001") or 15-digit ("ERR000000000001") to output. When CA-1000 format is used, select 13-digit.

- ID Information

This flag indicates the method in which the sample ID number is registered.

M : Manual entry

A : Read by barcode reading error or sequential number automatically assigned by the instrument.

B : B: Read by barcode reader

- Reserved

All spaces (20H)

- Analysis Parameter, Data

Parameter	Number of characters	
Parameter Code	3	(○○○)
Reserved	6	□□□□□□

The symbol "□"indicates a space character.

1) Parameter Code

The parameter code consists of the two-digit host ID Number defined in Basic Settings of Assay Group Definition and 0. The order inquiry can be performed for the analysis parameters that are defined as “Valid” in the Assay Group Settings. Refer to the parameter code list shown in the last part of this document.

* New analysis parameters may be added in the future. Please prepare a receive program that ignores the data when receiving the codes other than the above-mentioned codes.

2) Reserved

All spaces (20H)

5.4 Order Information Text Format

The same format as the Inquiry Text Format is used for the order information text format.

The number in ( ) indicates the number of characters when CA-1000 format is used.

Parameter	Number of characters		
STX	1	(02H)	
Text Distinction Code I	1	“S” (Fixed)	Header Block
Text Distinction Code II (Order inquiry key)	1	“2” (Sample No.)	
Text Distinction Code III	2	“21” (Fixed)	
Block Number	2	“01” - “99”	
Total Number of Blocks	2	"01" - "99"	
Sample Distinction Code	1	"U", "E", "C"	
Date	6	(○○○○○○)	
Time	4	(○○○○)	
Rack Number (4)	6 (4)	(○○○○○○)	
Tube Position Number	2	(○○)	
Sample ID Number (13)	15 (13)	(○○…○○)	
ID Information	1	"M", "A", "B", "C"	
Patient Name	15 (11)	(○○…○○)	
Analysis Parameter, Data 1	9		Data Block
Analysis Parameter, Data 2	9		
:	:		
Analysis Parameter N, Data N	9		
ETX	1	(03H)	

- Order of Transmission

The order of transmission is from the top parameter to the bottom; the most significant digit first and the least significant digit last. Zero suppression is not performed.

- Text Distinction Code

  A text distinction code is assigned to distinguish each text. There are three types of text distinction codes; from 1 to 3.

- Text Distinction Code 1 “S” (Fixed)

- Text Distinction Code 2 (Order inquiry key)

"2" : Sample No.

- Text Distinction Code 3 Fixed to “21”

- Block Number, Total Number of Blocks

A text consists of one header block and 22 data blocks. When more than 22 data blocks exist, the text is divided for transmission so that it contains 255 or less characters.
The block Number is the sequential number of the divided text. 01 through 99 is serially assigned.
The number of blocks is the total number of the divided text. 01 through 99 is serially assigned.
When the text is not divided, “01” is assigned to both.

- Sample Distinction Code

The types of analysis data are shown.

U : Routine analysis data
E : STAT analysis data
S : Calibration curve analysis data
C : Quality control analysis data

- Date and Time

Set the date and time when the order was performed. The date format conforms to the system settings. Zero is appended for date and time by zero padding.

- Rack Number

Rack Number is assigned to each sample rack.

Ordinary Sample : Consists of 6-digit alphanumeric characters. (When it consists of less than 6 digits, zero padding is performed to the right.)
STAT Sample : STAT is assigned.
Reagent Table : REAG00 is assigned. (When CA-1000 format is used, REAG is assigned.)

- Tube Position Number

The tube position number indicates the sample tube position in the sample rack.

Ordinary Sample 01-10
STAT Sample 01-05
Reagent Table □□ (The symbol “□” indicates a space character.)

- Sample ID Number

The sample ID number consists of 15 digit numeric characters. A hyphen “-“(2DH) may be inserted between numerals. The hyphen is included in the 15 digits. Zero suppression is not performed. When it consists of less than 15 digits, flush right is performed and blank digits are replaced with space characters (20H).

- ID Information

This flag indicates the method in which the sample ID number is registered.

M : Manual entry

A : Read by barcode reading error or sequential number assigned automatically

B : Read by barcode reader

C : ID number assigned by the host computer

- Patient Name

The patient name consists of 15 characters with character codes including spaces but excluding control codes.

- Analysis Parameter, Data

Parameter	Number of characters	
Parameter Code	3	(○○○)
Reserved	6	□□□□□□

The symbol "□"indicates a space character.

1) Parameter Code

The parameter code consists of the two-digit host ID Number defined in Basic Settings of Assay Group Definition and 0.

Refer to the parameter code list shown in the last part of this document.

The parameter codes “000” and “999" indicate abnormal situations.

000: There is no analysis parameter for the inquired sample.

999: There is no information on the inquired sample.

*1 If the analysis parameter for the inquired sample is not available in the host computer, set “000”. When the order information text includes the parameter code “000”, the sample will not be analyzed.

*2 If there is no analysis parameter for the inquired sample and later samples, set “999” for the parameter code. When the IPU receives the parameter code “999”, the “No order information from HC” error occurs. When the order information text includes the parameter code “999”, the sample will not be analyzed. Furthermore, the order inquiries for the later samples in this batch are not performed This action is prepared for the assumable case when there is no order information, and no sample No. or rack-tube position for the inquired sample. The order information text will be resend at the time of the analysis start for the following batch.

2) Reserved

All spaces (20H)

6. Parameter Code List

Assay Group	Parameter Code
PT	04X
APTT	05X
Fbg	06X
TTO	08X
NT(Hpt)	09X
II	12X
V	15X
VII	17X
VIII	18X
IX	19X
X	20X
XI	21X
XII	22X
PCcl	25X
BXT	26X
LA1	27X
LA2	28X
PSAc	29X
AT3	30X
APL	31X
Plg	32X
PC(Chrom)	33X
Hep	34X
PAI	36X
C1 Inh	37X
VIII ch	39X
XIII ch	40X
LA	41X
PCAT	42X
PCAT1	43X
PCAT0	44X

Assay Group	Parameter Code
FVPCAT1	45X
FVPCAT0	46X
FVPCAT	47X
Reserved	50X
TT	51X
Reserved	52X
Reserved	60X
DDimer	61X
Reserved	62X
Reserved	63X
Reserved	64X
vWF.m	65X
vWF.l	66X
vWF.h	67X
vWF	68X
Reserved	70X
Reserved	71X
Reserved	72X
vWF-Rco	80X
ProC Ac R	81X
AcR Act	82X
AcR OVB	83X
Factor V Leiden	84X
FVL Act	85X
FVL OVB	86X
INNOVANCE vWF-Ac low	87X
INNOVANCE vWF-Ac medium	88X
INNOVANCE vWF-Ac high	89X
Reserved	000
Reserved	999

000: There is no analysis parameter for the inquired sample.

999: There is no information on the inquired sample.

“X” is replaced with a one-digit host ID defined in the Assay Parameter Definition in when transmitting

analysis results.

In the case of order inquiry, order information texts and the analysis data format of formula, “X” is replaced with 0.

New analysis parameters may be added in the future. Please prepare a receive program that ignores the data when receiving the codes other than the above-mentioned codes.

- New analysis parameters may be added in the future. Please prepare a receive program that ignores the data when receiving the codes other than the codes shown in the parameter code list .

The following shows the default Host ID for assay parameter defined in the Assay Group Settings.

1: Time, dOD
2: Activity %/Concentration
3: Ratio
4: INR
5:DFbg

- New analysis parameters may be added in the future. Please prepare a receive program that ignores the data when receiving the codes other than the codes shown above.

7. Examples of Communication

7.1 Inquiry of Analysis Order (IPU => Host Computer)

When the order inquity isperformed from IPU

IPU	<STX>R2210101 090805093000000101 1234567890B 040 050 060 <ETX>
Host	<ACK>

7.2 Analysis Oder (Host Computer => IPU)

When the host computer sends order to IPU

Host	<STX>S2210101U090805093000000101 1234567890B 040 <ETX>
IPU	<ACK>

7.3 Analysis Result (IPU => Host Computer)

7.3.1 When the analysis is performed 1 time

IPU	<STX>D1210101U090805093000000101 1234567890B 041 174 042 505 044 111 <ETX>
Host	<ACK>
IPU	<STX>D1210101U090805093000000101 1234567890B <ETX>
Host	<ACK>

7.3.2 When the analysis is performed 2 time

Analysis result (The first analysis)

IPU	<STX>D1210101U090805120000000203 1234567890B 041 204*042 401*044 144*051 962*<ETX>
Host	<ACK>

Analysis result (The second analysis)

IPU	<STX>D1210101U090805120000000203 1234567890B 041 206*042 399*044 143*<ETX>
Host	<ACK>

Analysis result (The final analysis)

IPU	<STX>D2210101U090805120000000203 1234567890B 041 205*042 400*044 144*051 962*<ETX>
Host	<ACK>
IPU	<STX>DS210101U090805120000000203 1234567890B HILV

	<ETX>
Host	<ACK>

7.3.3 When there is the re-analysis

Analysis result (The first analysis)

IPU	<STX>D1210101E090805173000000305 1234567890M 041 204*042 401*044 144*051 962*<ETX>
Host	<ACK>

Analysis result (The re-analysis)

IPU	<STX>D1210101E090805173000000305 1234567890M 051 444 <ETX>
Host	<ACK>

Analysis result (The final analysis)

IPU	<STX>D1210101E090805173000000305 1234567890M 041 205*042 400*044 144*051 444 <ETX>
Host	<ACK>
IPU	<STX>DS210101E090805173000000305 1234567890M *** <ETX>
Host	<ACK>