



XS series Data Communication Specifications

Revision 2.7

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1. Scope

The host communication format in this document is applied to the communication between the host computer and the XS series (hereinafter called “XS”) via the RS-232C serial communication and TCP/IP communication.

2. General

The XS can be connected to the host computer using the serial port or the LAN port in the rear panel of the IPU (Information Processing Unit). It will become possible to output the analysis results including the IP messages to the host computer and to inquire the analysis order to the host computer.

3. Terminology

The definition of the terminology used in this document is described in the following.

1) Numeric:

Indicates ASCII codes ‘0’ (30h) through ‘9’ (39h).

2) Alphabet:

Indicates ASCII codes ‘A’ (41h) through ‘Z’ (5Ah) and ‘a’ (61h) through ‘z’ (7Ah).

3) Alpha-numeric:

Indicates numerical or alphabetical character.

4. Analysis Result Output Specifications

4.1 Serial Communication (RS-232C)

4.1.1 Hardware Specifications

(1) Connector

- Connect the RS-232C cable to the host output connector on the rear panel of the IPU (an AT-compatible personal computer).
- A 9-pin D-Sub male connector is used in the IPU for the serial port for the host computer. Thus, the cable side should be 9-pin D-Sub female connector.
- Fixture screws are the inch-size and inch pitch screws.

(2) Connector Pin Allocation

Table 1: Pin Assignment at the Serial Port

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

(3) Signal Level

The signal identification levels conform to the JIS C6361 and are shown below.

Table 2: Signal Level

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

4.1.2 Software Specifications

(1) Setting Communication Parameters

The transmission format is the half-duplex asynchronous communication, and following communication parameters can be set.

Table 3: Communication parameters

Parameter	Set Value
Baud Rate (bps)	600, 1200, 2400, 4800, <u>*9600</u> , 14400, 19200, 38400 (bps)
Data Length	7 bits, <u>*8 bits</u>
Stop Bit	<u>*1 bit</u> , 2-bits
Parity	<u>*None</u> , Even, Odd
Class	Class A, <u>*Class B</u>
Interval	0, 1, <u>*2</u> , 3, 5, 7, 10, 15 (seconds)

Note*: Unless otherwise specified, the parameters marked by bold, underlined, and asterisk marks (*) are selected as factory defaults.

(2) Exchaniging Code and Text Format

Code used to exchange the information is all ASCII codes.

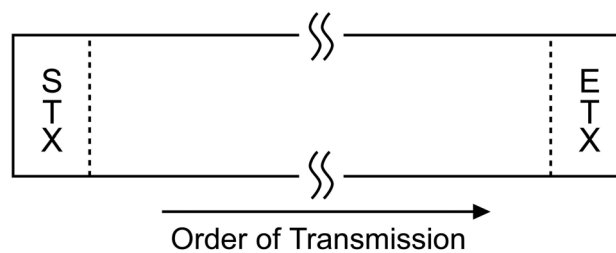


Figure 1: Text Format

“STX” (02H) is sent at the beginning of data, and “ETX” (03H) is sent at the end of data.

(3) Transmission Protocol

There are two transmission protocols, and one of them can be selected depending on the system usage.

- Class A

This is unidirectional transmission which does not utilize responses from the host computer.

- Class B

Two way communication which requires acknowledgement response ACK (06H) or NAK (15H) from the host computer. The factory default setting is Class B.

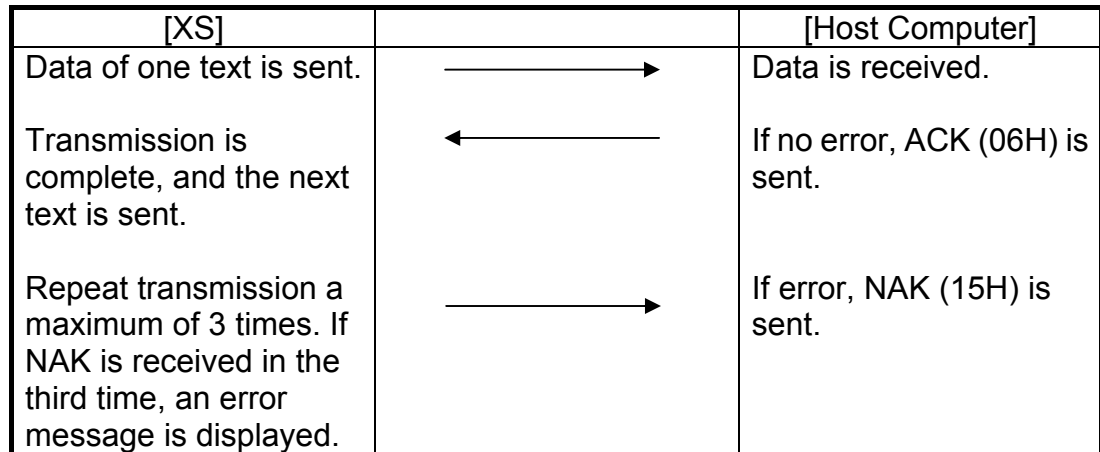


Figure 2: Transmission Protocol

(4) Transmission errors

If an error occurs during transmission, transmission is interrupted and an error message is displayed on the IPU screen. Recovery of transmission is performed by the operator's input.

A transmission error occurs in the following cases.

Table 4: Treatment of the Transmission Errors

Cause	Error Message	Description	Treatment
Transmission Error	"Communication time-out with host computer has occurred."	When data is received, data contains one of the errors; Frame Error, Parity Error, Over-run Error.	Terminate transmission
Off-line	"DSR is off."	The host computer does not make the control signal DSR active.	Terminate transmission
Response Time Out	"Communication time-out with host computer has occurred."	The host computer does not respond within 30 seconds after data is sent. (Class B only)	Terminate transmission
(Re-transmission)	"Retry error has occurred."	The host computer sends NAK after data is sent. (Class B only)	Re-send
Response Code Error	"ACK / NAK receive has failed."	The host computer sends anything other than [ACK] or [NAK] after data is sent. (Class B only)	Terminate transmission
Retry Over	"Send data to host computer has failed. (serial port)."	The host computer sends fourth response anything other than [ACK] after data is sent. (Class B only)	Terminate transmission
STX Time Out	"Communication time-out with host computer has occurred."	1) STX is not received within 30 seconds after requesting to send text. (Class A only) 2) STX is not received within 30 seconds after requesting to send text and ACK is received. (Class B only) 3) STX of the following sub-text is not received within 30 seconds after the previous sub-text was received. (Class A only) 4) STX of the following sub-text is not received within 30 seconds after the previous sub-text was received and ACK was sent. (Class B only)	Terminate transmission
ETX Time Out	"Communication time-out with host computer has occurred."	ETX is not received within 30 seconds after STX is received.	Terminate transmission

(5) Transmission timing

By setting in the IPU, it is possible to select an automatic transmission each time the analysis is complete, or in a batch transmission from the stored data. The interval of the data transmission can also be set from 0 second.

(6) Transmission Interval

Data transmission interval can be set by the IPU. The interval is defined in the Class B as the time after sending ACK or NAK response until initiating transmission of the next data.

4.2 TCP/ IP Communication

4.2.1 Hardware Specifications

Network interface layer is described, as follows.

- The network interface conforms to IEEE802.3.
- Communication is performed by 10Base-T.
- The RJ45 socket is used as a hub for XS connection.
- The cable of UTP category 5 should be used for communication.

4.2.2 Software Specifications

(1) Data Link/ Network/ Transport Layers

- These are based on the TCP/ IP Protocol.
- The IP address of XS can be assigned manually (static). This value may be changed, and set anything other than 192.168.28.150, and 192.168.28.151 which are assigned to the IPU and the Main Unit.
- The TCP port number for XS host communication can be assigned manually (static). The default value is 6000. This value may be changed in the IPU setting screen.

(2) Session Layer

Connection is established with the host computer as a server and the XS as a client. The connection is established when the XS is started up.

If connection is failed, the XS retries to establish connection in a certain interval. When the server becomes down after once the connection was established, no retry is performed.

(3) Presentation Layer

[STX] (02H) is sent at the beginning of data, and [ETX] (03H) is sent at the end of data.

Note: In the presentation layer, any definitive response protocol such as ACK and NAK is not performed.

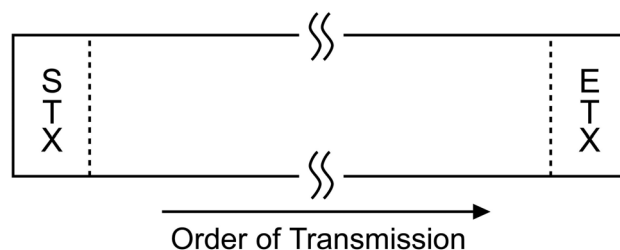


Figure 3: Text Format

(4) Transmission Error Treatment

If an error occurs during transmission, transmission is interrupted and an error message is displayed on the IPU screen. Recovery of transmission is performed by the operator's input. A transmission error occurs in the following cases.

Table 5: Treatment of the Transmission Errors

Cause	Error Message	Description	Treatment
Socket Error	"TCP/ IP connection with host computer has failed."	TCP/ IP communication error was occurred due to cable cut or any other cause.	Terminate transmission
Time Out Error	"Communication time-out with host computer has occurred."	STX of the following text is not received within 30 seconds after the previous text was received.	Terminate transmission

(5) Transmission Timing

By setting in the IPU, it is possible to select an automatic transmission each time the analysis is complete, or in a batch transmission from the stored data.

4.3 Data Format

4.3.1 General

The host computer output format is consisted of the Analysis Data Format and the QC (Quality Control) Data Format, which have different text length and contents. These two formats are distinguished by the “Text Distinction Code”.

- The Analysis Data Format is used to output the patient analysis data, and the Text Distinction Code 1 is always ‘D’.
- The Text Distinction Code 2 is usually ‘1’. However, when the text length exceeds 255 bytes, the text is split into 2 or more blocks and the contents in the Text Distinction Code 2 indicate the order of the blocks. The [ETB] code is not used.
- The Sample Distinction Code for the Analysis Data Format is ‘U’, and that for the QC Data Format is ‘C’.
- The Sample Distinction Code for the QC Data Format is only ‘C’ when sent manually from the control diagram. When sent automatically, the Code is ‘U’
- The QC Data Format is used to output the QC data. This data can be output by specifying the data range with cursors using the QC menu in the IPU.

4.3.2 Error Treatment when receiving text

When the text contents have an error or abnormality, transmission is interrupted and an error message is displayed on the IPU screen. Recovery of transmission is performed by the operator’s input.

A transmission error occurs in the following case.

Table 6: Treatment of the Transmission Errors

Cause	Error Message	Description	Treatment
STX Error	“STX receive has failed.”	When a text is received, the heading of text is any other character than STX.	Terminate transmission
ETX Error	“ETX receive has failed.”	When a text is received, the end of text is any other character than ETX.	Terminate transmission

4.4 Analysis Data Format

(1) Order of Transmission

The order of transmission is from the top parameter to the bottom. The data sent is the most significant digit first and the least significant digit last.

(2) Decimal Point

Decimal point is not sent. Therefore, it is necessary to convert and add decimal point specified for each parameter at the host computer.

(3) Date Format

The date format is fixed in the order of year, month and day. If the number of digits is short, zero-padding is performed.

(4) Rack No.

This is the number assigned to a sample rack, and consists of 6-digit number. If the number of digits is short, zero-padding is performed. However, in case that Analysis mode is other than the Sampler mode, it is reported as all spaces (" " 20h).

(5) Tube Position No.

This indicates the position "01" through "10" within the rack. If the number of digits is short, zero-padding is performed. However, in case that Analysis mode is other than the Sampler mode, it is reported as "00".

(6) Sequence No.

This indicates the sequence number of the sample analyzed on the same day, and consists of 10-digit number. If the number of digits is short, zero-padding is performed.

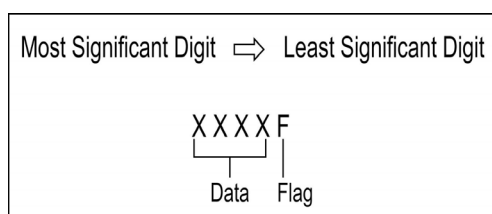
(7) Sample ID No.

The Sample ID No. consists of 15-digit alpha-numeric which may include a hyphen "-" (2Dh) between digits depending on the usage. A hyphen "-" is included in 15 digits. If the number of digits is short, space-padding is performed. (Zero-padding may be performed depending on the setting.

(8) Structure of Numerical Value and Flag

The numerical value and flag are structured as shown below. If the number of digits is short, zero-padding is performed. Any parameter indicating "Reserved" will transmit all zeros "0".

Details of Flag



'0': Normal

'1': Data is greater than the upper patient mark limit.

'2': Data is less than the lower patient mark limit.

'3': Data is out of the linearity limit.

'4': Data has less reliable due to the flags.

- (9) **Abnormal Numerical Data**
When the displayed numerical value is “----” or “++++”, the data is output as “*0000”. Any parameter that is not ordered is output as “ ” (all spaces).
- (10) **Instrument ID**
This instrument ID is a unique nick name for the analyzer. This is consisted of 16-digit alpha-numeric, and is useful if multiple analyzers are running and transmitting the data to the host computer. If the number of digits is short, right-aligned and space-padding are performed.
- (11) **Analysis Information**
This indicates the analysis status of the sample.
‘0’: Analyzed without any error
‘1’: Analyzed with an error
- (12) **Sample Judgment Information**
This indicates the sample judgment information whether re-analysis of the sample is required.
‘0’: Negative
‘1’: Positive
‘2’: Error
‘3’: Positive + Error
‘Q’: QC data
- (13) **Order Information**
This indicates whether an analysis order was placed when analyzing the sample.
‘0’: Analyzed without an order
‘1’: Analyzed by an order
- (14) **IP Flag Information**
- ```

graph TD
 C1(()) --- L1[PLT SUSPECT]
 C2(()) --- L2[PLT ABNORMAL]
 C3(()) --- L3[RBC SUSPECT]
 C4(()) --- L4[RBC ABNORMAL]
 C5(()) --- L5[WBC SUSPECT]
 C6(()) --- L6[WBC ABNORMAL]

```
- This indicates whether the sample is flagged with IP messages.  
‘0’: No IP flag  
‘1’: With some IP flag
- (15) **Sample No. Attribute**  
This indicates where and how the sample number was obtained.  
‘4’: Sample number was read by the ID Bar Code Reader  
‘2’: Sample number was automatically assigned since the ID Bar Code Read Error occurred  
‘0’: Other than the above

- (16) Analysis Mode  
This indicates the analysis mode.  
‘1’: Manual mode  
‘2’: Sampler mode  
‘4’: Capillary mode
- (17) Patient ID No.  
This indicates a unique Patient ID No. that is consisted of 16-digit alpha-numeric. If the number of digits is short, left-aligned and space-padding are performed. When there is no patient ID available, all spaces (“ ” 20h) are output
- (18) Positive (Diff)  
This indicates whether the blood cell differential data is abnormal.  
‘0’: Normal  
‘1’: Abnormal
- (19) Positive (Morph)  
This indicates whether the blood cell morphological data is abnormal.  
‘0’: Normal  
‘1’: Abnormal
- (20) Positive (Count)  
This indicates whether the blood cell count data is abnormal.  
‘0’: Normal  
‘1’: Abnormal
- (21) Error (Func)  
This indicates whether an analysis error other than the ID bar code read error occurred.  
‘0’: No analysis error occurred  
‘1’: Analysis error other than the ID bar code read error occurred
- (22) Error (Result)  
This indicates whether one of the sample-aspiration related errors occurred, such as “Sample Not Asp Error”, “Low Blood Volume” and “Low Count Error”.  
‘1’: One of the sample-aspiration related errors occurred, such as “Sample Not Asp Error”, “Low Blood Volume” and “Low Count Error”  
‘0’: No such error occurred
- (23) Units Information  
This indicates whether the Holland SI unit system is used.  
‘1’: Holland SI unit system is used  
‘0’: Other unit than Holland SI unit system is used
- (24) Reserved for Manufacturer  
This indicates a unique identification code of each instrument, and consisted of the pre-fixed 22-digit alpha-numerical and capital characters.
- (25) Reserved  
This indicates that this area is not currently used, but reserved for the future use. All zeros or all spaces (“ ” 20h) are set currently. Please do not check the data in this area, as it may be changed in the future.

#### 4.4.1 Analysis Data Format 1

Table 7: Analysis Data Format 1

| Parameter                   | Size (byte) | Remarks                                                                                                                                                                                         |
|-----------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| STX                         | 1           | (02H)                                                                                                                                                                                           |
| Text Distinction Code 1     | 1           | 'D' (fixed)                                                                                                                                                                                     |
| Text Distinction Code 2     | 1           | '1' (fixed)                                                                                                                                                                                     |
| Sample Distinction Code     | 1           | 'U' (fixed)                                                                                                                                                                                     |
| Instrument ID               | 16          | Right-aligned and space-padding<br>Ex: "___XS-1000i^A1001" for XS and the Serial No. A1001<br>"___XS-800i^A1001" for XS-800i and the Serial No. A1001<br>(The underline " " indicates a space.) |
| Sequence No.                | 10          | Right-aligned and zero-padding<br>Ex: "0000012345"                                                                                                                                              |
| Reserved                    | 3           | "000" (fixed)                                                                                                                                                                                   |
| Sample ID No.               | 15          | Right-aligned and space-padding<br>Ex: "____12345678901" (The underline " " indicates a space.)<br>Note: By the setting, zero-padding is possible.                                              |
| Year                        | 4           | Ex: "2002" (4-digit year in A.D.)                                                                                                                                                               |
| Month                       | 2           | Ex: "07" (2-digit month)                                                                                                                                                                        |
| Day                         | 2           | Ex: "04" (2-digit day)                                                                                                                                                                          |
| Hour                        | 2           | Ex: "18" (2-digit hour in 24-hour system)                                                                                                                                                       |
| Minute                      | 2           | Ex: "09" (2-digit minute)                                                                                                                                                                       |
| Reserved                    | 2           | "00" (fixed)                                                                                                                                                                                    |
| Rack No.                    | 6           | Right-aligned and zero-padding (or space-padding in Manual mode)<br>Ex: "001234"                                                                                                                |
| Tube Position No.           | 2           | Right-aligned and zero-padding (or "00" in Manual mode)<br>Ex: "08"                                                                                                                             |
| Sample No. Attribute        | 1           | '4': Sample No. was read by the ID Bar Code Reader<br>'2': Sample No. was not read by the ID Bar Code Reader<br>'0': Other than the above                                                       |
| Analysis Mode               | 1           | '1': Manual mode<br>'2': Sampler mode<br>'4': Capillary mode                                                                                                                                    |
| Patient ID No.              | 16          | Left-aligned and space-padding<br>Ex: "123-456-7890A___" (The underline " " indicates a space.)                                                                                                 |
| Analysis Information        | 1           | '0': Analyzed without any error<br>'1': Analyzed with an error                                                                                                                                  |
| Sample Judgment Information | 1           | '0': Negative<br>'1': Positive<br>'2': Error,<br>'3': Positive + Error<br>'Q': QC data                                                                                                          |
| Positive (Diff.)            | 1           | '0': Normal blood cell Diff data<br>'1': Abnormal blood cell Diff data                                                                                                                          |
| Positive (Morph.)           | 1           | '0': Normal blood cell Morphological data<br>'1': Abnormal blood cell Morphological data                                                                                                        |
| Positive (Count)            | 1           | '0': Normal blood cell numerical count data<br>'1': Abnormal blood cell numerical count data                                                                                                    |
| Error (Func.)               | 1           | '0': No analysis error<br>'1': Analysis error occurred                                                                                                                                          |
| Error (Result)              | 1           | '0': No aspiration-related error<br>'1': Aspiration-related error occurred                                                                                                                      |

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|                           |     |                                                                         |
|---------------------------|-----|-------------------------------------------------------------------------|
| Order Information         | 1   | '0': Analyzed without an order<br>'1': Analyzed by an order             |
| WBC Abnormal              | 1   | '0': Not flagged, '1': Flagged                                          |
| WBC Suspect               | 1   | '0': Not flagged, '1': Flagged                                          |
| RBC Abnormal              | 1   | '0': Not flagged, '1': Flagged                                          |
| RBC Suspect               | 1   | '0': Not flagged, '1': Flagged                                          |
| PLT Abnormal              | 1   | '0': Not flagged, '1': Flagged                                          |
| PLT Suspect               | 1   | '0': Not flagged, '1': Flagged                                          |
| Unit Information          | 1   | '0': Other unit than Holland SI is used<br>'1': Holland SI unit is used |
| Reserved                  | 1   | '0' (fixed)                                                             |
| Reserved                  | 1   | '0' (fixed)                                                             |
| Reserved                  | 63  | "00.....00" All zeros (fixed)                                           |
| Reserved for Manufacturer | 22  |                                                                         |
| ETX                       | 1   | (03H)                                                                   |
| Total                     | 191 |                                                                         |

#### 4.4.2 Analysis Data Format 2

Table 8: Analysis Data Format 2

| Parameter               | Size (byte) | Remarks                                                                                                                                                                                         |
|-------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| STX                     | 1           | (02H)                                                                                                                                                                                           |
| Text Distinction Code 1 | 1           | 'D' (fixed)                                                                                                                                                                                     |
| Text Distinction Code 2 | 1           | '2' (fixed)                                                                                                                                                                                     |
| Sample Distinction Code | 1           | 'U' (fixed)                                                                                                                                                                                     |
| Instrument ID           | 16          | Right-aligned and space-padding<br>Ex: "___XS-1000i^A1001" for XS and the Serial No. A1001<br>"___XS-800i^A1001" for XS-800i and the Serial No. A1001<br>(The underline "_" indicates a space.) |
| Sequence No.            | 10          | Right-aligned and zero-padding<br>Ex: "0000012345"                                                                                                                                              |
| Reserved                | 3           | "000" (fixed)                                                                                                                                                                                   |
| Sample ID No.           | 15          | Right-aligned and space-padding<br>Ex: "____12345678901" (The underline "_" indicates a space.)<br>Note: By the setting, zero-padding is possible.                                              |
| WBC                     | 6           | Output data ( $\times 10^1/\mu\text{L}$ )                                                                                                                                                       |
| RBC                     | 5           | Output data ( $\times 10^4/\mu\text{L}$ )                                                                                                                                                       |
| HGB                     | 5           | Output data (g/L),<br>or in case of Holland SI ( $10^{-1}\text{mmol/L}$ )                                                                                                                       |
| HCT                     | 5           | Output data ( $10^{-1}\%$ )                                                                                                                                                                     |
| MCV                     | 5           | Output data ( $10^{-1}\text{fL}$ )                                                                                                                                                              |
| MCH                     | 5           | Output data ( $10^{-1}\text{pg}$ ),<br>or in case of Holland SI (amol)                                                                                                                          |
| MCHC                    | 5           | Output data (g/L),<br>or in case of Holland SI ( $10^{-1}\text{mmol/L}$ )                                                                                                                       |
| PLT                     | 5           | Output data ( $\times 10^3/\mu\text{L}$ )                                                                                                                                                       |
| LYMPH%                  | 5           | Output data ( $10^{-1}\%$ )                                                                                                                                                                     |
| MONO%                   | 5           | Output data ( $10^{-1}\%$ )                                                                                                                                                                     |
| NEUT%                   | 5           | Output data ( $10^{-1}\%$ )                                                                                                                                                                     |
| EO%                     | 5           | Output data ( $10^{-1}\%$ )                                                                                                                                                                     |
| BASO%                   | 5           | Output data ( $10^{-1}\%$ )                                                                                                                                                                     |

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|                           |     |                                                                                                                                                                                    |
|---------------------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LYMPH#                    | 6   | Output data ( $\times 10^1/\mu\text{L}$ )                                                                                                                                          |
| MONO#                     | 6   | Output data ( $\times 10^1/\mu\text{L}$ )                                                                                                                                          |
| NEUT#                     | 6   | Output data ( $\times 10^1/\mu\text{L}$ )                                                                                                                                          |
| EO#                       | 6   | Output data ( $\times 10^1/\mu\text{L}$ )                                                                                                                                          |
| BASO#                     | 6   | Output data ( $\times 10^1/\mu\text{L}$ )                                                                                                                                          |
| RDW-CV                    | 5   | Output data ( $10^{-1}\%$ )                                                                                                                                                        |
| RDW-SD                    | 5   | Output data ( $10^{-1}\text{fL}$ )                                                                                                                                                 |
| PDW                       | 5   | Output data ( $10^{-1}\text{fL}$ )<br>Note: In the North American specifications, this parameter is not output.<br>Fixed to "00000" or " " (all spaces), depending on the setting. |
| MPV                       | 5   | Output data ( $10^{-1}\text{fL}$ )                                                                                                                                                 |
| P-LCR                     | 5   | Output data ( $10^{-1}\%$ )<br>Note: In the North American specifications, this parameter is not output.<br>Fixed to "00000" or " " (all spaces), depending on the setting.        |
| Reserved                  | 5   | "00000" or " " (fixed), depending on the setting.                                                                                                                                  |
| Reserved                  | 5   | "00000" or " " (fixed), depending on the setting.                                                                                                                                  |
| Reserved                  | 5   | "00000" or " " (fixed), depending on the setting.                                                                                                                                  |
| Reserved                  | 5   | "00000" or " " (fixed), depending on the setting.                                                                                                                                  |
| Reserved                  | 5   | "00000" or " " (fixed), depending on the setting.                                                                                                                                  |
| Reserved                  | 5   | "00000" or " " (fixed), depending on the setting.                                                                                                                                  |
| PCT                       | 5   | Output data ( $10^{-2}\%$ )<br>Note: In the North American specifications, this parameter is not output.<br>Fixed to "00000" or " " (all spaces), depending on the setting.        |
| Reserved                  | 6   | "000000" or " " (fixed), depending on the setting.                                                                                                                                 |
| Reserved                  | 6   | "000000" or " " (fixed), depending on the setting.                                                                                                                                 |
| Reserved                  | 6   | " " All spaces (fixed)                                                                                                                                                             |
| Reserved                  | 5   | " " All spaces (fixed)                                                                                                                                                             |
| Reserved                  | 5   | "00000" (fixed)                                                                                                                                                                    |
| Reserved for manufacturer | 22  |                                                                                                                                                                                    |
| ETX                       | 1   | (03H)                                                                                                                                                                              |
| Total                     | 255 |                                                                                                                                                                                    |



## 4.5 QC Data Format

QC Data Format is used to transmit the XbarM control data and Xbar or L-J control data to the host computer.

### 4.5.1 QC Data Format 1

Table 9: QC Data Format 1

| Parameter               | Size (byte) | Remarks                                                                                                                                                                                           |
|-------------------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| STX                     | 1           | (02H)                                                                                                                                                                                             |
| Text Distinction Code 1 | 1           | 'D' (fixed)                                                                                                                                                                                       |
| Text Distinction Code 2 | 1           | '1' (fixed)                                                                                                                                                                                       |
| Sample Distinction Code | 1           | 'C' (fixed)                                                                                                                                                                                       |
| QC Number               | 1           | '1' ~ '9', 'A' ~ 'F', 'a' ~ 'e', 'M'; See Table 11 for details.                                                                                                                                   |
| Year                    | 4           | Ex: "2002" (4-digit year in A.D.)                                                                                                                                                                 |
| Month                   | 2           | Ex: "07" (2-digit month)                                                                                                                                                                          |
| Day                     | 2           | Ex: "04" (2-digit day)                                                                                                                                                                            |
| Hour                    | 2           | Ex: "18" (2-digit hour in 24-hour system)                                                                                                                                                         |
| Minute                  | 2           | Ex: "09" (2-digit minute)                                                                                                                                                                         |
| Instrument ID           | 16          | Right-aligned and space-padding<br>Ex: "____XS-1000i^A1001" for XS and the Serial No. A1001<br>"____XS-800i^A1001" for XS-800i and the Serial No. A1001<br>(The underline " " indicates a space.) |
| RBC                     | 4           | Output data ( $\times 10^4/\mu\text{L}$ )                                                                                                                                                         |
| HGB                     | 4           | Output data (g/L),<br>or in case of Holland SI ( $10^{-1}\text{mmol/L}$ )<br>Note: "0000" (fixed) when HGB is set to 5 digits with Holland SI.                                                    |
| HCT                     | 4           | Output data ( $10^{-1}\%$ )                                                                                                                                                                       |
| MCV                     | 4           | Output data ( $10^{-1}\text{fL}$ )                                                                                                                                                                |
| MCH                     | 4           | Output data ( $10^{-1}\text{pg}$ ),<br>or in case of Holland SI (amol)                                                                                                                            |
| MCHC                    | 4           | Output data (g/L),<br>or in case of Holland SI ( $10^{-1}\text{mmol/L}$ )                                                                                                                         |
| RDW-CV                  | 4           | Output data ( $10^{-1}\%$ )                                                                                                                                                                       |
| RDW-SD                  | 4           | Output data ( $10^{-1}\text{fL}$ )                                                                                                                                                                |
| PLT                     | 4           | Output data ( $\times 10^3/\mu\text{L}$ )                                                                                                                                                         |
| PDW                     | 4           | Output data ( $10^{-1}\text{fL}$ )                                                                                                                                                                |
| MPV                     | 4           | Output data ( $10^{-1}\text{fL}$ )                                                                                                                                                                |
| P-LCR                   | 4           | Output data ( $10^{-1}\%$ )                                                                                                                                                                       |
| PCT                     | 4           | Output data ( $10^{-2}\%$ )                                                                                                                                                                       |
| WBC-D                   | 5           | Output data ( $\times 10^1/\mu\text{L}$ )<br>Note: WBC data is used when X-barM QC Chart is output.                                                                                               |
| NEUT%                   | 4           | Output data ( $10^{-1}\%$ )                                                                                                                                                                       |
| LYMPH%                  | 4           | Output data ( $10^{-1}\%$ )                                                                                                                                                                       |
| MONO%                   | 4           | Output data ( $10^{-1}\%$ )                                                                                                                                                                       |
| EO%                     | 4           | Output data ( $10^{-1}\%$ )                                                                                                                                                                       |
| BASO%                   | 4           | Output data ( $10^{-1}\%$ )                                                                                                                                                                       |
| NEUT#                   | 5           | Output data ( $\times 10^1/\mu\text{L}$ )                                                                                                                                                         |
| LYMPH#                  | 5           | Output data ( $\times 10^1/\mu\text{L}$ )                                                                                                                                                         |
| MONO#                   | 5           | Output data ( $\times 10^1/\mu\text{L}$ )                                                                                                                                                         |
| EO#                     | 5           | Output data ( $\times 10^1/\mu\text{L}$ )                                                                                                                                                         |
| BASO#                   | 5           | Output data ( $\times 10^1/\mu\text{L}$ )                                                                                                                                                         |
| Reserved                | 5           | "00000" or "_____" (fixed), depending on the setting.                                                                                                                                             |
| Reserved                | 4           | "0000" or "____" (fixed), depending on the setting.                                                                                                                                               |
| Reserved                | 4           | "0000" or "____" (fixed), depending on the setting.                                                                                                                                               |

(To continue to next page)

(Continued from previous page)

|                           |     |                                                                                                                                                   |
|---------------------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Reserved                  | 4   | "0000" or "____" (fixed), depending on the setting.                                                                                               |
| Reserved                  | 4   | "0000" or "____" (fixed), depending on the setting.                                                                                               |
| Reserved                  | 4   | "0000" or "____" (fixed), depending on the setting.                                                                                               |
| Reserved                  | 4   | "0000" or "____" (fixed), depending on the setting.                                                                                               |
| Reserved                  | 5   | "00000" or "_____" (fixed), depending on the setting.                                                                                             |
| Reserved                  | 5   | "00000" (fixed)                                                                                                                                   |
| Reserved                  | 4   | "0000" (fixed)                                                                                                                                    |
| Reserved                  | 5   | "00000" or "_____" (fixed), depending on the setting.                                                                                             |
| Reserved                  | 4   | "0000" or "____" (fixed), depending on the setting.                                                                                               |
| Reserved                  | 4   | "0000" or "____" (fixed), depending on the setting.                                                                                               |
| WBC-C                     | 5   | Output data ( $\times 10^1/\mu\text{L}$ )<br>Note: "00000" (fixed) when X-barM QC Chart is output.                                                |
| HGB                       | 5   | Output data ( $10^{-2}\text{mmol/L}$ )<br>Note: This data is used only when HGB is set to 5 digits with Holland SI.<br>Otherwise "00000" (fixed). |
| Reserved                  | 30  | "00.....00" All zeros (fixed)                                                                                                                     |
| Reserved                  | 1   | '0' (fixed).                                                                                                                                      |
| Reserved for manufacturer | 22  |                                                                                                                                                   |
| ETX                       | 1   | (03H)                                                                                                                                             |
| Total                     | 255 |                                                                                                                                                   |

## 4.5.2 QC Data Format 2

Table 10: QC Data Format 2

| Parameter                 | Size (byte) | Remarks                                                                                                                                                                                         |
|---------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| STX                       | 1           | (02H)                                                                                                                                                                                           |
| Text Distinction Code 1   | 1           | 'D' (fixed)                                                                                                                                                                                     |
| Text Distinction Code 2   | 1           | '2' (fixed)                                                                                                                                                                                     |
| Sample Distinction Code   | 1           | 'C' (fixed)                                                                                                                                                                                     |
| QC Number                 | 1           | '1' ~ '9', 'A' ~ 'F', 'a' ~ 'e', 'M'; See Table 11 for details.                                                                                                                                 |
| Year                      | 4           | Ex: "2002" (4-digit year in A.D.)                                                                                                                                                               |
| Month                     | 2           | Ex: "07" (2-digit month)                                                                                                                                                                        |
| Day                       | 2           | Ex: "04" (2-digit day)                                                                                                                                                                          |
| Hour                      | 2           | Ex: "18" (2-digit hour in 24-hour system)                                                                                                                                                       |
| Minute                    | 2           | Ex: "09" (2-digit minute)                                                                                                                                                                       |
| Instrument ID             | 16          | Right-aligned and space-padding<br>Ex: "___XS-1000i^A1001" for XS and the Serial No. A1001<br>"___XS-800i^A1001" for XS-800i and the Serial No. A1001<br>(The underline " " indicates a space.) |
| Reserved                  | 4           | "0000" or "____" (fixed), depending on the setting.                                                                                                                                             |
| Reserved                  | 4           | "0000" or "____" (fixed), depending on the setting.                                                                                                                                             |
| DIFF-X                    | 4           | Output data (10 <sup>-1</sup> ch)                                                                                                                                                               |
| DIFF-Y                    | 4           | Output data (10 <sup>-1</sup> ch)                                                                                                                                                               |
| FSC-X                     | 4           | Output data (10 <sup>-1</sup> ch)                                                                                                                                                               |
| Reserved                  | 1           | '0' (fixed)                                                                                                                                                                                     |
| Reserved                  | 4           | "0000" or "____" (fixed), depending on the setting.                                                                                                                                             |
| Reserved                  | 4           | "0000" or "____" (fixed), depending on the setting.                                                                                                                                             |
| Reserved                  | 5           | "00000" or "_____" (fixed), depending on the setting.                                                                                                                                           |
| Reserved                  | 4           | "0000" or "____" (fixed), depending on the setting.                                                                                                                                             |
| Reserved                  | 4           | "0000" or "____" (fixed), depending on the setting.                                                                                                                                             |
| Reserved                  | 4           | "0000" or "____" (fixed), depending on the setting.                                                                                                                                             |
| Reserved                  | 4           | "0000" or "____" (fixed), depending on the setting.                                                                                                                                             |
| Reserved                  | 4           | "0000" or "____" (fixed), depending on the setting.                                                                                                                                             |
| Reserved                  | 4           | "0000" or "____" (fixed), depending on the setting.                                                                                                                                             |
| Reserved                  | 4           | "0000" or "____" (fixed), depending on the setting.                                                                                                                                             |
| Reserved                  | 4           | "0000" or "____" (fixed), depending on the setting.                                                                                                                                             |
| Reserved                  | 4           | "0000" or "____" (fixed), depending on the setting.                                                                                                                                             |
| Reserved                  | 125         | "00.....00" All zeros (fixed)                                                                                                                                                                   |
| Reserved for manufacturer | 22          |                                                                                                                                                                                                 |
| ETX                       | 1           | (03H)                                                                                                                                                                                           |
| Total                     | 255         |                                                                                                                                                                                                 |

#### 4.5.3 QC Number Corresponding to QC File Number (QC File Table)

Table 11: QC Number Table

| QC Number | QC File Number |
|-----------|----------------|
| 1         | 1              |
| 2         | 2              |
| 3         | 3              |
| 4         | 4              |
| 5         | 5              |
| 6         | 6              |
| 7         | 7              |
| 8         | 8              |
| 9         | 9              |
| A         | 10             |
| B         | 11             |
| C         | 12             |
| D         | 13             |
| E         | 14             |
| F         | 15             |
| a         | 16             |
| b         | 17             |
| c         | 18             |
| d         | 19             |
| e         | 20             |
| M         | XbarM          |

## 5. Data Exchange Specifications on the Analysis Information

XS has a function to receive the analysis information such as analysis order and patient information from the host computer, and to analyze automatically according to the received information.

There are two methods to inquire the analysis information to the host computer, as follows.

- A real-time inquiry is made right before the analysis using the Sample ID No. read from the bar code label as the keyword.
- A batch inquiry is made in prior to the analysis using the Rack No. and the Tube Position No. as the keywords.

Settings are required to inquire the analysis information, as follows.

### Analysis ordering

| Key                             | Sample ID   | Rack No. /Tube Pos. |
|---------------------------------|-------------|---------------------|
| Realtime Request (Manual Mode)  | [Sample ID] |                     |
| Realtime Request (Sampler Mode) | [Key]       |                     |

## 5.1 Serial Communication (RS-232C)

### 5.1.1 Hardware Specifications

This is the same as described in “4.1 Serial Communication (RS-232C)” in this document.

### 5.1.2 Software Specifications

(1) Settings Communication Parameters

This is the same as described in “4.1 Serial Communication (RS-232C)” in this document.

(2) Exchanging Code and Text Format

- Exchanging Code

This is the same as described in “4.1 Serial Communication (RS-232C)” in this document.

- Exchanging Text Format

This is the same as described in “4.1 Serial Communication (RS-232C)” in this document.

(3) Transmission Protocol

Transmission protocol is fixed to Class B. If the transmission protocol is set to the Class A, correct communication cannot be performed and you have to set to Class B. The procedures that XS inquires the analysis information to the host computer is shown as follows.

- XS sends the Analysis Inquiry Text to the host computer.
- The host computer sends NAK if an error is detected in the received data, or ACK if no error is detected. Then, the host computer sends the Analysis Order Text for the inquired sample.
- XS re-sends the same text if the response is NAK. When the XS receives ACK, XS then receives the Analysis Order Text and sends ACK if there is no error or NAK if there is an error.
- The host computer terminates the communication of one sample if ACK is received. The host computer re-re-sends the Analysis Order Text if NAK is received.

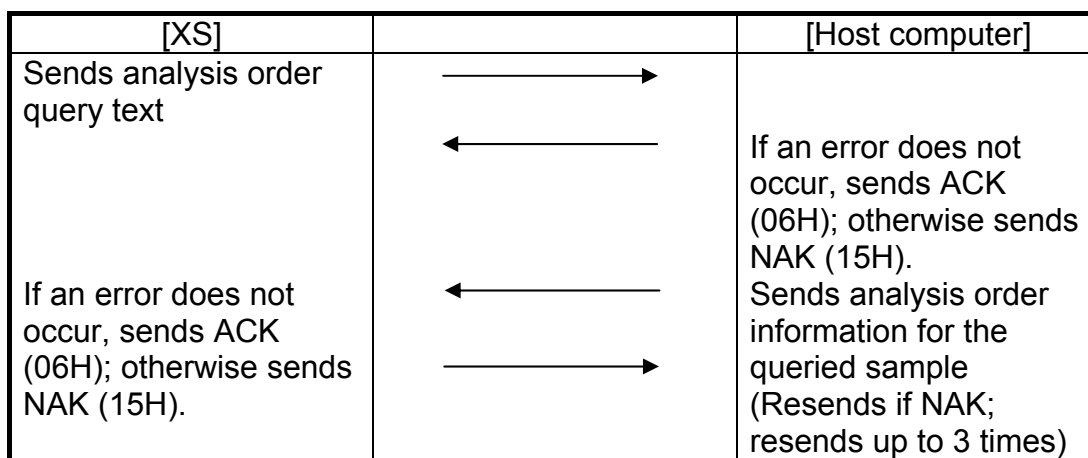


Fig. 4 Communication Procedure

(4) Treatment of the transmission errors

If an error occurs during transmission, transmission is interrupted and an error message is displayed on the IPU screen. Recovery of transmission is performed by the operator's input.

A transmission error occurs, as described in the Table 4.

(5) Inquiry Timing

- In the Real-time Inquiry using the Sample ID No.;

The inquiry is made at the time when the Sample ID No. is read from the bar code label affixed on the tube by the bar code reader. However, if the XS has the Analysis Information, no inquiry is made. After sending the Analysis Inquiry Text to the host computer and receiving ACK from the host computer, the XS will wait until receiving the Analysis Order Text. After the Analysis Order Text is received, the XS starts aspirating the whole blood.

- In the Batch Inquiry using the Rack No. and the Tube Position No.;

The inquiry is made at the time when the Rack No. is set in the IPU software, the Analysis Inquiry Text is sent to the host computer starting from the Tube Position No. 1 through 10 one after another. There is no limitation for the time after sending the inquiry text until receiving the Analysis Order Text.

(6) Transmission Interval

The interval time after XS receives the Analysis Order Text and sends ACK until the next Analysis Inquiry Text is sent out can be set using the XS IPU software. This interval time is common to the one for transmitting the analysis data.

(7) Notes when analysis data is auto output

When the XS is set to "AUTO OUTPUT", it is suspected that the analysis data output and analysis information exchange are overlapped. If it is suspected that the host computer will be overlapped and the response will be delayed, it is suggested not to send the analysis data automatically but to send in a batch upon completion of the analysis.

## 5.2 TCP/ IP Communication

### 5.2.1 Hardware Specifications

This is the same as described in “4.2 TCP/IP Communication” in this document.

### 5.2.2 Software Specifications

This is the same as described in “4.2 TCP/IP Communication” in this document.

## 5.3 Data Format

### 5.3.1 General

The host computer output format is consisted of the Analysis Data Format and the QC (Quality Control) Data Format, which have different text length and contents. These two formats are distinguished by the “Text Distinction Code”.

- The Analysis Data Format is used to output the patient analysis data, and the Text Distinction Code 1 is always ‘D’.
- The Text Distinction Code 2 is usually ‘1’. However, when the text length exceeds 255 bytes, the text is split into 2 or more blocks and the contents in the Text Distinction Code 2 indicate the order of the blocks. The [ETB] code is not used.
- The Sample Distinction Code for the Analysis Data Format is ‘U’, and that for the QC Data Format is ‘C’.
- The QC Data Format is used to output the QC data. This data can be output by specifying the data range with cursors using the QC menu in the IPU.

### 5.3.2 Error Treatment when receiving text

When the text contents have an error or abnormality, transmission is interrupted and an error message is displayed on the IPU screen. Recovery of transmission is performed by the operator’s input.

A transmission error occurs in the following case.

Table 12: Treatment of the Transmission Errors

| Cause                                          | Error Message                                                                                         | Description                                                                                                                                                                                   | Treatment              |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| STX Error                                      | “STX receive has failed.”                                                                             | When a text is received, the heading of the text is any other character than STX.                                                                                                             | Terminate transmission |
| ETX Error                                      | “ETX receive has failed.”                                                                             | When a text is received, the end of the text is any other character than ETX.                                                                                                                 | Terminate transmission |
| Inquiry Key Check Error (Sample ID No.)        | “Sample No. from host computer is invalid. Sample No. of Analyzer is used.”                           | When the inquiry key is the Sample ID No., this error occurs when the host computer returned the Sample ID No. that is different from the one inquired.                                       | Terminate transmission |
| Inquiry Key Check Error (Rack No. & Tube Pos.) | “Rack No./ Tube position from host computer is invalid. Rack No./ Tube position of Analyzer is used.” | When the inquiry key is the Rack No. and the Tube Position No., this error occurs when the host computer returned the Rack No. and Tube Position No. that is different from the one inquired. | Terminate transmission |



## 5.4 Analysis Order Inquiry Format

The Text Distinction Code 1 is always 'R' in the Analysis Order Inquiry Format sent from the XS.

- (1) Order of Transmission  
The order of transmission is from the top parameter to the bottom. The data sent is the most significant digit first. Zero-suppression is not performed.
- (2) Inquiry Mode  
The inquiry mode is indicated.  
'1': Real-time inquiry by Sample ID No. as the key word.  
'2': Batch inquiry by Rack No. and Tube Position No. as the key words.
- (3) Inquiry Sample ID No.  
This parameter becomes effective with the real-time inquiry by Sample ID No. as the keyword. It consists of 15-digit alpha-numerical character, and may include hyphen "-" (2Dh) between characters depending on the usage. The hyphen "-" is included in 15 digits.
- (4) Rack No.  
This parameter becomes effective with the batch inquiry by Rack No. and Tube Position No. as the keywords. This is the number assigned to the sample rack. It contains of 6-digit number.
- (5) Tube Position No.  
This parameter becomes effective with the batch inquiry by Rack No. and Tube Position No. as the keywords. It consists of number from 01 to 10 for an analysis position on a sample rack.
- (6) Reserved  
This parameter is currently not used, and is a reserved area where a future enhancement is subjected. Currently all zeros "00 ... 00" or all spaces (" " 20h) are set, but please do not check the data in this area at the host computer side.

Table 13: Analysis Information Inquiry Format

| Parameter               | Size (byte) | Remarks                                                                                                                                            |
|-------------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| STX                     | 1           | (02H)                                                                                                                                              |
| Text Distinction Code 1 | 1           | 'R'                                                                                                                                                |
| Inquiry Mode            | 1           | '1': Real-time inquiry<br>'2': Batch inquiry                                                                                                       |
| Reserved                | 3           | "000" (fixed)                                                                                                                                      |
| Inquiry Sample ID No.   | 15          | Right-aligned and space-padding<br>Ex: "____12345678901" (The underline "_" indicates a space.)<br>Note: By the setting, zero-padding is possible. |
| Reserved                | 2           | "00" (fixed)                                                                                                                                       |
| Rack No.                | 6           | Right-aligned and zero-padding<br>Ex: "001234"                                                                                                     |
| Tube Position No.       | 2           | Right-aligned and zero-padding<br>Ex: "08"                                                                                                         |
| Reserved                | 31          | "00 ... 00" (fixed)                                                                                                                                |
| ETX                     | 1           | (03H)                                                                                                                                              |
| Total                   | 63          |                                                                                                                                                    |

## 5.5 Analysis Order Information Text Format

The Text Distinction Code 1 is always 'S' in the Analysis Order Format sent from the host computer to the XS.

- (1) Order of Transmission  
The order of transmission is from the top parameter to the bottom. The data sent is the most significant digit first. Zero-suppression is not performed.
- (2) Information Status  
This parameter indicates if the inquired analysis information is registered. If the inquired sample is not registered, make sure to return '0' (Not registered) in the analysis order information text.  
'0': Not registered  
'1': Registered  
'2': Quality Control
- (3) Date Ordered  
This parameter indicates the requested date of analysis of the inquired sample.  
"YYYYMMDD" format is pre-fixed.  
where YYYY: Year in A.D., MM: Month, DD: Day
- (4) Sample ID No.  
In the case of real-time inquiry by Sample ID No. as the keyword, this number should be the same with that in the inquiry text. In the case of batch inquiry by Rack No. and Tube Position No. as the keywords, the Sample ID No. corresponding to the specified Rack No. and Tube Position No. will be assigned. When the Sample ID No. is not assigned by the host computer, make sure to return the Sample ID No. that was sent in the Analysis Order Inquiry Text.  
It consists of 15-digit alpha-numeric which may include hyphen "-" (2Dh) between digits depending on the usage. A hyphen "-" is included in 15 digits.  
Please note that the Sample ID No. starting with "QC" is reserved for the QC samples. If no QC samples are to be analyzed, please do not assign any number starting with "QC".  
For more detailed information, please refer to the Instructions for Use manual.
- (5) Rack No.  
In the case of batch inquiry by Rack No. and Tube Position No. as the keywords, please return the same number as that in the inquiry text. In the case of real-time inquiry by Sample ID No. as the keyword, please return the same number as that in the inquiry text.
- (6) Tube Position No.  
In the case of batch inquiry by Rack No. and Tube Position No. as the keywords, please return the same number as that in the inquiry text. In the case of real-time inquiry by Sample ID No. as the keyword, this number becomes the same with that in the inquiry text. The Tube Position No. is the position "01" through "10" within the rack

(7) Inquiry Mode

The inquiry mode is indicated.

‘1’: Real-time inquiry by Sample ID No. as the keyword.

‘2’: Batch inquiry by Rack No. and Tube Position No. as the keywords.

(8) Patient ID No.

This parameter is the Patient ID No. for the inquired sample, and is unique to a patient.

This number consists of 16-digit alpha-numerical characters, and may include hyphen “-” (2Dh) between characters depending on the usage. The hyphen “-” is included in 16 digits.

When no Patient ID No. is available, please enter all spaces (20h).

**NOTE:** When handling the patient information, it is required to assign a unique Patient ID No. for each patient.

(9) Patient Name

This is the patient name for the inquired sample. The order for patient name should be

Given name (20 characters or less), then Family name (20 characters or less). A space “ ” (20h) is needed between Given and Family name as a separator.

When no patient name is available, please enter all spaces (20h).

**NOTE:** The space between the Given and Family names is included in 40 characters. For example, when the Given name needs 20 characters, the number of characters used for the Family name is 19 characters or less.

(10) Sex

This is the sex of the patient.

‘1’: Male

‘2’: Female

‘3’: Unknown

(11) Date of Birth

This is the date of birth of the patient.

“YYYYMMDD” format is pre-fixed.

where YYYY: Year in A.D., MM: Month, DD: Day

When no date-of-birth information is available, please enter all spaces (20h).

(12) Doctor Name

This is the doctor name in charge, and consists of up to 20 alphabetical characters.

When no doctor name information is available, please enter all spaces (20h).

- (13) Ward  
This is the ward (medical section) in which the patient is admitting, and consists of up to 20 alphabetical characters.  
When no ward information is available, please enter all spaces (20h).
- (14) Sample Comments  
This is the comments of the inquired sample, and consists of up to 40 alphabetical characters.  
When no sample comment is available, please enter all spaces (20h).
- (15) Patient Comments  
This is the patient comments of the inquired sample, and consists of up to 100 alphabetical characters.  
When no patient comment is available, please enter all spaces (20h).
- (16) Order Information  
This indicates the analysis order for each analysis parameter.  
‘0’: Not analyze  
‘1’: Analyze
- (17) Reserved  
This parameter is currently not used, and is a reserved area where a future enhancement is subjected. Currently all zeros “00 ... 00” are set.

### 5.5.1 Analysis Order Information Format 1

Table 14: Analysis Order Information Format 1

| Parameter               | Size (byte) | Remarks                                                                                           |
|-------------------------|-------------|---------------------------------------------------------------------------------------------------|
| STX                     | 1           | (02H)                                                                                             |
| Text Distinction Code 1 | 1           | 'S' (fixed)                                                                                       |
| Text Distinction Code 2 | 1           | '1' (fixed)                                                                                       |
| Information Status      | 1           | '0': Not registered<br>'1': Registered<br>'2': Quality Control                                    |
| Date Ordered            | 8           | "YYYYMMDD" format<br>Ex: "20030103" (Jan. 3, 2003)                                                |
| Reserved                | 3           | "000" (fixed)                                                                                     |
| Sample ID No.           | 15          | Right-aligned and space-padding<br>Ex: "      12345678901" (The underline " " indicates a space.) |
| Reserved                | 2           | "00" (fixed)                                                                                      |
| Rack No.                | 6           | Ex: "001234"                                                                                      |
| Tube Position No.       | 2           | Ex: "02"                                                                                          |
| Inquiry Mode            | 1           | '1': Real-time inquiry<br>'2': Batch inquiry                                                      |
| Patient ID No.          | 16          | Left-aligned and space-padding<br>Ex: "1234567890A      " (The underline " " indicates a space.)  |
| Patient Name            | 40          | Left-aligned and space-padding<br>Ex: "James_Thomas      " (The underline " " indicates a space.) |
| Sex                     | 1           | '1': Male<br>'2': Female<br>'3': Unknown                                                          |
| Date of Birth           | 8           | "YYYYMMDD" format<br>Ex: "19800205" (Feb. 5, 1980)                                                |
| Doctor Name             | 20          | Left-aligned and space-padding<br>Ex: "Doctor1....      " (The underline " " indicates a space.)  |
| Ward                    | 20          | Left-aligned and space-padding<br>Ex: "Ward1....      " (The underline " " indicates a space.)    |
| Sample Comments         | 40          |                                                                                                   |
| Reserved                | 18          | "000.....000" All zeros (fixed)                                                                   |
| WBC                     | 1           | '0': Not analyze, '1': Analyze                                                                    |
| RBC                     | 1           | '0': Not analyze, '1': Analyze                                                                    |
| HGB                     | 1           | '0': Not analyze, '1': Analyze                                                                    |
| HCT                     | 1           | '0': Not analyze, '1': Analyze                                                                    |
| MCV                     | 1           | '0': Not analyze, '1': Analyze                                                                    |
| MCH                     | 1           | '0': Not analyze, '1': Analyze                                                                    |
| MCHC                    | 1           | '0': Not analyze, '1': Analyze                                                                    |
| PLT                     | 1           | '0': Not analyze, '1': Analyze                                                                    |
| LYMPH%                  | 1           | '0': Not analyze, '1': Analyze                                                                    |
| MONO%                   | 1           | '0': Not analyze, '1': Analyze                                                                    |
| NEUT%                   | 1           | '0': Not analyze, '1': Analyze                                                                    |
| EO%                     | 1           | '0': Not analyze, '1': Analyze                                                                    |
| BASO%                   | 1           | '0': Not analyze, '1': Analyze                                                                    |
| LYMPH#                  | 1           | '0': Not analyze, '1': Analyze                                                                    |
| MONO#                   | 1           | '0': Not analyze, '1': Analyze                                                                    |
| NEUT#                   | 1           | '0': Not analyze, '1': Analyze                                                                    |
| EO#                     | 1           | '0': Not analyze, '1': Analyze                                                                    |
| BASO#                   | 1           | '0': Not analyze, '1': Analyze                                                                    |
| RDW-CV                  | 1           | '0': Not analyze, '1': Analyze                                                                    |
| RDW-SD                  | 1           | '0': Not analyze, '1': Analyze                                                                    |

(To continue to next page)

(Continued from previous page)

|          |     |                                                                                                                                                                        |
|----------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PDW      | 1   | '0': Not analyze, '1': Analyze<br>When Forwarding (destination) is selected with North America during software installation, this is not available and please set '0'. |
| MPV      | 1   | '0': Not analyze, '1': Analyze                                                                                                                                         |
| P-LCR    | 1   | '0': Not analyze, '1': Analyze<br>When Forwarding (destination) is selected with North America during software installation, this is not available and please set '0'. |
| Reserved | 2   | "00" (fixed)                                                                                                                                                           |
| Reserved | 1   | '0' (fixed)                                                                                                                                                            |
| Reserved | 1   | '0' (fixed)                                                                                                                                                            |
| Reserved | 1   | '0' (fixed)                                                                                                                                                            |
| Reserved | 1   | '0' (fixed)                                                                                                                                                            |
| Reserved | 1   | '0' (fixed)                                                                                                                                                            |
| Reserved | 1   | '0' (fixed)                                                                                                                                                            |
| Reserved | 1   | '0' (fixed)                                                                                                                                                            |
| PCT      | 1   | '0': Not analyze, '1': Analyze<br>When Forwarding (destination) is selected with North America during software installation, this is not available and please set '0'. |
| Reserved | 1   | '0' (fixed)                                                                                                                                                            |
| Reserved | 1   | '0' (fixed)                                                                                                                                                            |
| Reserved | 15  | "000.....000" All zeros (fixed)                                                                                                                                        |
| ETX      | 1   | (03H)                                                                                                                                                                  |
| Total    | 255 |                                                                                                                                                                        |

## 5.5.2 Analysis Order Information Format 2

Table 15: Analysis Order Information Format 2

| Parameter               | Size (byte) | Remarks                                                                                          |
|-------------------------|-------------|--------------------------------------------------------------------------------------------------|
| STX                     | 1           | (02H)                                                                                            |
| Text Distinction Code 1 | 1           | 'S' (fixed)                                                                                      |
| Text Distinction Code 2 | 1           | '2' (fixed)                                                                                      |
| Information Status      | 1           | '0': Not registered<br>'1': Registered<br>'2': Quality Control                                   |
| Date Ordered            | 8           | "YYYYMMDD" format<br>Ex: "20010204" (February 4, 2001)                                           |
| Reserved                | 3           | "000" (fixed)                                                                                    |
| Sample ID No.           | 15          | Right-aligned and space-padding<br>Ex: "_____12345678901" (The underline "_" indicates a space.) |
| Reserved                | 2           | "00" (fixed)                                                                                     |
| Rack No.                | 6           | Ex: "001234"                                                                                     |
| Tube Position No.       | 2           | Ex: "02"                                                                                         |
| Inquiry Mode            | 1           | '1': Real-time inquiry<br>'2': Batch inquiry                                                     |
| Patient ID No.          | 16          | Left-aligned and space-padding<br>Ex: "1234567890A_____" (The underline "_" indicates a space.)  |
| Patient Comments        | 100         | Left-aligned and space-padding<br>Ex: "abcdef ...." (The underline "_" indicates a space.)       |
| Reserved                | 97          | "000.....000" All zeros (fixed)                                                                  |
| ETX                     | 1           | (03H)                                                                                            |
| Total                   | 255         |                                                                                                  |

## Appendix A. Analysis Data Format 1 (with IP Messages)

Analysis data with IP Messages can be output to the host computer by using the formats as follows.

**NOTE:** Abnormal and Suspect IP Messages shall be used only in the clinical laboratory. These are not intended for patient diagnosis. IP Messages will alert the operator a possibility of a specific sample abnormality that can be checked by examining analysis results.

Table 16: Analysis Data Format 1 (with IP Messages)

| Parameter                   | Size (byte) | Remarks                                                                                                                                                                                         |
|-----------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| STX                         | 1           | (02H)                                                                                                                                                                                           |
| Text Distinction Code 1     | 1           | 'D' (fixed)                                                                                                                                                                                     |
| Text Distinction Code 2     | 1           | '1' (fixed)                                                                                                                                                                                     |
| Sample Distinction Code     | 1           | 'U' (fixed)                                                                                                                                                                                     |
| Instrument ID               | 16          | Right-aligned and space-padding<br>Ex: "___XS-1000i^A1001" for XS and the Serial No. A1001<br>"___XS-800i^A1001" for XS-800i and the Serial No. A1001<br>(The underline " " indicates a space.) |
| Sequence No.                | 10          | Right-aligned and zero-padding<br>Ex: "0000012345"                                                                                                                                              |
| Reserved                    | 3           | Ex: "000" (fixed)                                                                                                                                                                               |
| Sample ID No.               | 15          | Right-aligned and space-padding<br>Ex: "____12345678901" (The underline " " indicates a space.)<br>Note: By the setting, zero-padding is possible.                                              |
| Year                        | 4           | "2002" (4-digit year in A.D.)                                                                                                                                                                   |
| Month                       | 2           | "07" (2-digit month)                                                                                                                                                                            |
| Day                         | 2           | "04" (2-digit day)                                                                                                                                                                              |
| Hour                        | 2           | "18" (2-digit hour in 24-hour system)                                                                                                                                                           |
| Minute                      | 2           | "09" (2-digit minute)                                                                                                                                                                           |
| Reserved                    | 2           | "00" (fixed)                                                                                                                                                                                    |
| Rack No.                    | 6           | Right-aligned and zero-padding (or space-padding in Manual mode)<br>Ex: "001234"                                                                                                                |
| Tube Position No.           | 2           | Right-aligned and zero-padding (or "00" in Manual mode)<br>Ex: "08"                                                                                                                             |
| Sample No. Attribute        | 1           | '4': Sample No. was read by the ID Bar Code Reader<br>'2': Sample No. was not read by the ID Bar Code Reader<br>'0': Other than the above                                                       |
| Analysis Mode               | 1           | '1': Manual, '2': Sampler, '4': Capillary                                                                                                                                                       |
| Patient ID No.              | 16          | Left-aligned and space-padding<br>Ex: "123-456-7890A__" (The underline " " indicates a space.)                                                                                                  |
| Analysis Information        | 1           | '0': Analyzed without any error, '1': Analyzed with an error                                                                                                                                    |
| Sample Judgment Information | 1           | '0': Negative, '1': Positive, '2': Error,<br>'3': Positive + Error, 'Q': QC data                                                                                                                |
| Positive (Diff)             | 1           | '0': Normal, '1': Abnormal                                                                                                                                                                      |
| Positive (Morph.)           | 1           | '0': Normal, '1': Abnormal                                                                                                                                                                      |
| Positive (Count)            | 1           | '0': Normal, '1': Abnormal                                                                                                                                                                      |
| Error (Func.)               | 1           | '0': No analysis error, '1': Analysis error occurred                                                                                                                                            |
| Error (Result)              | 1           | '0': No aspiration-related error, '1': Aspiration-related error                                                                                                                                 |
| Order Information           | 1           | '0': Analyzed without an order, '1': Analyzed by an order                                                                                                                                       |
| WBC Abnormal                | 1           | '0': Not flagged, '1': Flagged                                                                                                                                                                  |

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|                         |                      |   |                                                       |
|-------------------------|----------------------|---|-------------------------------------------------------|
| WBC Suspect             |                      | 1 | '0': Not flagged, '1': Flagged                        |
| RBC Abnormal            |                      | 1 | '0': Not flagged, '1': Flagged                        |
| RBC Suspect             |                      | 1 | '0': Not flagged, '1': Flagged                        |
| PLT Abnormal            |                      | 1 | '0': Not flagged, '1': Flagged                        |
| PLT Suspect             |                      | 1 | '0': Not flagged, '1': Flagged                        |
| Unit Information        |                      | 1 | '0': Other unit than Holland SI, '1': Holland SI unit |
| Reserved                |                      | 1 | '0' (fixed)                                           |
| Reserved                |                      | 1 | '0' (fixed)                                           |
| WBC Abnormal (16 bytes) | WBC Abn Scattergram  | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Neutropenia          | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Neutrophilia         | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Lymphopenia          | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Lymphocytosis        | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Leukocytosis         | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Monocytosis          | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Eosinophilia         | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Basophilia           | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Leukocytopenia       | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Reserved             | 1 | '0' (fixed)                                           |
|                         | Reserved             | 1 | '0' (fixed)                                           |
|                         | Reserved             | 1 | '0' (fixed)                                           |
|                         | Reserved             | 1 | '0' (fixed)                                           |
|                         | Reserved             | 1 | '0' (fixed)                                           |
|                         | Reserved             | 1 | '0' (fixed)                                           |
| WBC Suspect (16 bytes)  | Blasts?              | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Immature Gran?       | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Left Shift?          | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Reserved             | 1 | '0' (fixed)                                           |
|                         | NRBC?                | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Reserved             | 1 | '0' (fixed)                                           |
|                         | Reserved             | 1 | '0' (fixed)                                           |
|                         | Atypical Lympho?     | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Reserved             | 1 | '0' (fixed)                                           |
|                         | Abn Lympho?          | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Reserved             | 1 | '0' (fixed)                                           |
|                         | Reserved             | 1 | '0' (fixed)                                           |
|                         | Reserved             | 1 | '0' (fixed)                                           |
|                         | Reserved             | 1 | '0' (fixed)                                           |
|                         | Reserved             | 1 | '0' (fixed)                                           |
|                         | Reserved             | 1 | '0' (fixed)                                           |
| RBC Abnormal (16 bytes) | RBC Abn Distribution | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Dimorphic Population | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Anisocytosis         | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Microcytosis         | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Macrocytosis         | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Hypochromia          | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Anemia               | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Erythrocytosis       | 1 | '0': Not flagged, '1': Flagged                        |
|                         | Reserved             | 1 | '0' (fixed)                                           |
|                         | Reserved             | 1 | '0' (fixed)                                           |
|                         | Reserved             | 1 | '0' (fixed)                                           |
|                         | Reserved             | 1 | '0' (fixed)                                           |
|                         | Reserved             | 1 | '0' (fixed)                                           |
|                         | Reserved             | 1 | '0' (fixed)                                           |
|                         | Reserved             | 1 | '0' (fixed)                                           |
|                         | Reserved             | 1 | '0' (fixed)                                           |

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|                           |                        |     |                                                                                                                                                       |
|---------------------------|------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| RBC Suspect (16 bytes)    | RBC Agglutination?     | 1   | '0': Not flagged, '1': Flagged                                                                                                                        |
|                           | Turbidity/ HGB Interf? | 1   | '0': Not flagged, '1': Flagged                                                                                                                        |
|                           | Iron Deficiency?       | 1   | '0': Not flagged, '1': Flagged                                                                                                                        |
|                           | HGB Defect?            | 1   | '0': Not flagged, '1': Flagged                                                                                                                        |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Fragments?             | 1   | '0': Not flagged, '1': Flagged                                                                                                                        |
|                           | PRBC?                  | 1   | '0': Not flagged, '1': Flagged<br>*Only output when the version is Ver. 00-20 or later and the license key is valid. In other cases, is fixed at '0'. |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
| PLT Abnormal (16 bytes)   | PLT Abn Distribution   | 1   | '0': Not flagged, '1': Flagged                                                                                                                        |
|                           | Thrombocytopenia       | 1   | '0': Not flagged, '1': Flagged                                                                                                                        |
|                           | Thrombocytosis         | 1   | '0': Not flagged, '1': Flagged                                                                                                                        |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
| PLT Suspect (16 bytes)    | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | PLT Clumps?            | 1   | '0': Not flagged, '1': Flagged                                                                                                                        |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | PLT Clumps(S)?         | 1   | '0': Not flagged, '1': Flagged                                                                                                                        |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
|                           | Reserved               | 1   | '0' (fixed)                                                                                                                                           |
| Reserved                  |                        | 31  | "00.....00" All zeros (fixed)                                                                                                                         |
| Reserved for manufacturer |                        | 22  |                                                                                                                                                       |
| ETX                       |                        | 1   | (03H)                                                                                                                                                 |
| Total                     |                        | 255 |                                                                                                                                                       |

## Appendix B. Support Formats

XS supports the following data formats. Desired format can be set when the IPU software is to be installed for XS. For more detailed information about compatible formats other than XS, please refer to each Data Communication Specifications. When compatible formats other than XS is selected and if the number of digits is less than that required by the XS, following rules are applied.

- Sample ID No.: The least significant digits are used, and the most significant digits that are not fit will be discarded.
- Data: The least significant digit is rounded off to make the digits fit to the specification.

When a parameter that is not analyzed in the XS is defined in the compatible format other than XS, following rules are applied.

- In case of K-1000, data field is filled by “\*0000”.
- In case of any other model than K-1000, the data field will be filled by either “\_\_\_\_\_” (all spaces) or “00000” depending on the setting.

Since the XS has the QC parameters WBC-C and WBC-D, WBC-D is set to the WBC in the compatible data format in the other models than XS.

Table 17: Supported Formats

| Model     | Name of the Supported Formats             |
|-----------|-------------------------------------------|
| XS        | Analysis Data Format 1                    |
|           | Analysis Data Format 1 (with IP Messages) |
|           | Analysis Data Format 2                    |
|           | QC Data Format 1                          |
|           | QC Data Format 2                          |
|           | Analysis Information Inquiry Format       |
|           | Analysis Order Information Format 1       |
|           | Analysis Order Information Format 2       |
| XS DPS    | Analysis Data Format                      |
|           | Analysis Data Format 1                    |
|           | Analysis Data Format 2                    |
|           | Flag Format                               |
|           | RBC Distribution Format                   |
|           | PLT Distribution Format                   |
|           | Scattergram Format                        |
|           | WBC Distribution Format                   |
|           | Analysis Information Inquiry Format       |
|           | Analysis Order Information Format         |
|           | QC Data Format 1                          |
|           | QC Data Format 2                          |
| SF-3000   | Analysis Data Format                      |
|           | Analysis Order Inquiry Format             |
|           | Analysis Order Format                     |
|           | QC Data Format                            |
| NE-Series | Analysis Data Format                      |
|           | Extended Analysis Data Format             |
|           | Flag Format                               |
|           | QC Data Format                            |

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|         |                                                             |
|---------|-------------------------------------------------------------|
| SE-9000 | Analysis Data Format (12 digits of sample ID)               |
|         | Analysis Data Format (13 digits of sample ID)               |
|         | Flag Format (12 digits of sample ID)                        |
|         | Flag Format (13 digits of sample ID)                        |
|         | Analysis Order Inquiry Format                               |
|         | Analysis Order Format                                       |
|         | QC Data Format                                              |
| RAM-1   | Analysis Data Format (12 digits of sample ID)               |
|         | Analysis Data Format (13 digits of sample ID)               |
|         | Flag Format (12 digits of sample ID)                        |
|         | Flag Format (13 digits of sample ID)                        |
|         | Analysis Order Inquiry Format                               |
|         | Analysis Order Format                                       |
|         | QC Data Format                                              |
| XT      | Analysis Data Format 1 (4 digits of year)                   |
|         | Analysis Data Format 1 (4 digits of year, with IP Messages) |
|         | Analysis Data Format 1 (2 digits of year)                   |
|         | Analysis Data Format 1 (2 digits of year, with IP Messages) |
|         | Analysis Data Format 2 (4 digits of year)                   |
|         | QC Data Format 1 (4 digits of year)                         |
|         | QC Data Format 1 (2 digits of year)                         |
|         | QC Data Format 2 (4 digits of year)                         |
|         | QC Data Format 2 (2 digits of year)                         |
|         | Analysis Order Inquiry Format                               |
|         | Analysis Order Format 1                                     |
|         | Analysis Order Format 2                                     |
| XT DPS  | Analysis Data Format                                        |
|         | Analysis Data Format 1                                      |
|         | Analysis Data Format 2                                      |
|         | Flag Format                                                 |
|         | RBC Distribution Format                                     |
|         | PLT Distribution Format                                     |
|         | Scattergram Format                                          |
|         | Analysis Order Inquiry Format                               |
|         | Analysis Order Format                                       |
|         | QC Data Format 1                                            |
|         | QC Data Format 2                                            |
| K-1000  | Analysis Data Format                                        |
|         | QC Data Format                                              |
| K-4500  | Analysis Data Format (12 digits of sample ID)               |
|         | Analysis Data Format (13 digits of sample ID)               |
|         | QC Data Format                                              |
| NE-1500 | Analysis Data Format (12 digits of sample ID)               |
|         | Analysis Data Format (13 digits of sample ID)               |
|         | QC Data Format                                              |
| ASTM    | Host communication using ASTM protocol                      |

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