

## 16.3 Output Format to Host Computer

The bit serial voltage type, which conforms to the RS-232C interface, is used for host computer output of XT-2000i/XT-1800i. The serial interface port for the connection with the host computer is on the rear panel of the IPU.

The specifications conform to Standard for Bit Serial Interface of Japan Clinical Instrument automation Society.

### 1. Serial Communication

#### Connector

- Connect to the host computer output connector on the rear panel of the IPU.
- Use a 9-pin, D-SUB female connector.
- Pitch of connector fixing screws adopts the size in inch.

#### Connector Signal

Pin No.	Signal Name	Signal Direction
1		
2	Receive Data (RxD)	To XT-2000i/XT-1800i from HOST
3	Transmit Data (TxD)	From XT-2000i/XT-1800i to HOST
4	Data Terminal Ready (DTR)	From XT-2000i/XT-1800i to HOST
5	Signal Ground (SG)	
6	Data Set Ready (DSR)	To XT-2000i/XT-1800i from HOST
7	Request to Send (RTS)	From XT-2000i/XT-1800i to HOST
8	Clear to Send (CTS)	To XT-2000i/XT-1800i from HOST
9		

#### Communication Format

The format is start-stop asynchronous half duplex (asterisk indicates setting at shipment from factory), and adjustment can be made as follows.

Baud Rate	600, 1200, 2400, 4800, *9600, 14400, 19200, 38400 (BPS)
Code	7-bit, *8-bit
Stop Bit	*1-bit, 2-bit
Parity Bit	*None, Even, Odd
Class	Class A, *Class B
Interval	0, 1, *2, 3, 5, 7, 10, 15 (seconds)

## Signal Level

Signal level of the RS-232C conforms to EIA RS-232C V.24.

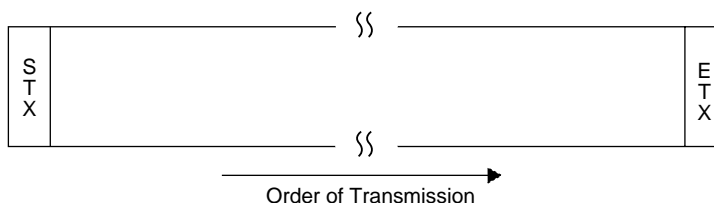
Level	Data Signal	Control Signal
+3V or Higher	Logic "0," Start Bit	ON
-3V or Lower	Logic "1," Stop Bit	OFF

## Communication Format

### 1) Code

ASCII codes are used for all the output to the computer.

### 2) Text Format



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

### 3) Transmission Procedure

Two classes are prepared and can be selected depending on the system status.

(Class B is selected at the shipment from factory.)

- Class A  
One-way data transmission which requires no response from the computer.
- Class B  
Two-way communication which requires response (ACK, NAK) from the computer.

[XT-2000i/XT-1800i]		[Computer]
Sends data (1 text)	→	
	←	Sends ACK (06H) if there is no error, or NAK (15H) if there is an error
In case of ACK, sends next text. In case of NAK, resends (up to 3 times)	→	

**4) Transmission Error**

If an error is detected, the transmission is interrupted and the error message is displayed on the IPU. The operator must recover the error. Cases of errors are as follows.

Error name	Descriptions	IPU Action to be taken
Transmission Error	Detects Frame Error, Parity Error or Over-run Error, when receiving.	Interrupt
Off-line	HC's control signal "DSR" is OFF.	Interrupt
ACK Time-out	After data transmission, no response was received from HC in 15 seconds. (Class B only)	Interrupt
(No error)	After data transmission, NAK was received from HC. (Class B only)	Re-send
(No error)	After data transmission, a response other than ACK and NAK was received from HC. (Class B only)	Re-send
No. of re-send over	After data transmission, the 4th response other than ACK was received from HC. (Class B only)	Interrupt
Transmission Time-out	When sending, control signal CTS does not become active in 5 seconds. (only when RTS/CTS control is activated)	Interrupt
STX Time-out	(1) After HC's requested to send, STX was not received from HC in 15 seconds. (Class A only) (2) After HC's requested to send, STX was not received from HC 15 seconds after ACK was received. (Class B only) (3) Within 15 seconds after receiving the sub-text in the previous text, STX of the following sub-text was not received. (Class A only) (4) Within 15 seconds upon sending ACK after receiving the sub-text in the previous text, STX of the following sub-text was not received. (Class B only)	Interrupt
ETX Time-out	ETX was not received within 15 seconds after receiving STX.	Interrupt

**5) Transmission Timing**

Selection between the transmission for every analysis cycle and the batch transmission of stored data is possible by the IPU settings. The data transmission interval can be set (from zero second) also.

**6) Transmission Interval**

The transmission interval of sample data can be set on the IPU. The interval is a time period after the ACK/NAK response until the next data transmission in the case of class B.

**2. TCP/IP Communication**

The network interface conforms to IEEE802.3, is used for host computer output of XT-2000i/XT-1800i. The network port for the connection with the host computer is on the rear panel of the IPU.

**Network interface layer**

The network interface conforms to IEEE802.3.  
 Communication is performed by 10Base-T.  
 The RJ45 socket is used as a hub for XT-2000i/XT-1800i connection  
 The cable of UTP category 5 is used for communication.

**TCP/IP**

- Before communication, the text format including STX and ETX is set to the TCP's data unit.
- The IP address of XT-2000i/XT-1800i's Main unit is set (The default value is 192.168.28.142 and this value may be changed on Windows networking setting and Main unit by service engineer.)
- The IP address for XT-2000i/XT-1800i's host communication is set. ( This value may be changed on IPU setting screen and we have to use other IP address without 192.168.28.\* )
- The TCP port number for XT-2000i/XT-1800i's host communication is set. (The default value is 5000 and this value may be changed on IPU setting screen.)

**TCP Connection**

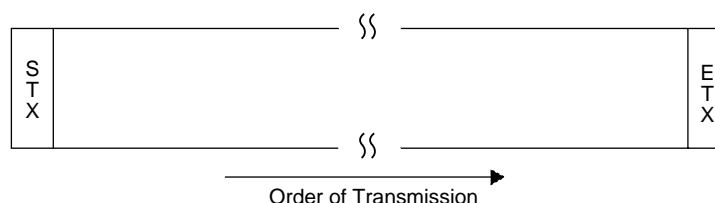
The host computer is defined as server, and the XT-2000i/XT-1800i as client for connection.  
 The XT-2000i/XT-1800i checks the connection when the system starts. When the connection fails, the XT-2000i/XT-1800i repeats the connection at regular intervals.  
 If the server shuts down after the connection, the XT-2000i/XT-1800i does not perform the connection again.

**Application Layer**

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

**Text and Communication Protocol****1) Communication Control Character**

ASCII codes are used for all the output to the computer.

**2) Text Format**

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

## Communication Error Processing

When a communication error occurs, the communication is stopped and the error is displayed on the IPU. The restoration of communication can be made by the operator. A communication error occurs in the case mentioned below.

- No response is made from the computer within 30 seconds after the data transmission.

## Communication Timing

Depending on the settings of the IPU, it is possible to select between communication per analysis cycle and communication of the stored data in a batch.

## 3. Data Format

The output to host computer consists of sample data and QC data, and they differ in length and content of the text. (They are classified by the sample class codes.)

- Output of analysis results is the text data only, and the text class I is always "D."
- The text distinction II is usually "1." But when the text length is 255 bytes or more, the text is divided into two or more for transmission, and the text block order is expressed by the numeral of the text distinction II. (ETB code is not used.)
- Sample distinction code is "U" in the case of sample data, and is "C" in the case of QC data.
- The QC data is output in the QC format. This data can be output by the cursor range designation in the QC menu of the IPU.

## 4. Analysis Data Format

### 1) Output Order

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 carried out.

### 2) Decimal Point

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

### 3) Date

The order of Year/Month/Day is fixed. Zero-suppression is not carried out.

### 4) Rack No.

This is the number assigned to a sample rack, and consists of 6-digit number. Zero-suppression is not carried out.

**5) Tube Position**

This indicates the analysis position of aimed sample in a sample rack, and consists of number from 1 to 10. Zero-suppression is not carried out.

**6) Sequence No.**

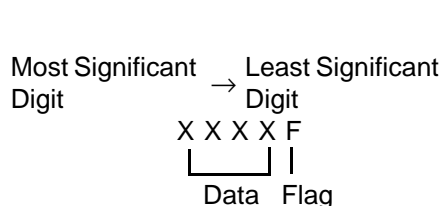
This indicates the sequence number of the sample analyzed on the same day, and consists of 10-digit number. Zero-suppression is not carried out.

**7) Sample ID Number**

This number consists of 15 digits in numeral or alphabet which may include a hyphen "-" (2HD) between numerals as needed. A hyphen "-" have to be included in 15 digits. Zero suppression is not carried out.

**8) Construction and Flag of Numerical Value**

The numerical value is constructed as follows. Zero suppression is not carried out.  
For the RESERVED parameters, "0" is output.

**Details of Flag**

- 0: Normal
- 1: Analysis data is greater than the preset Upper Patient Mark Limit.
- 2: Analysis data is less than the preset Lower Mark Limit.
- 3: Out of linearity limit.
- 4: Analysis data is less reliable

**9) Abnormal Value Data**

When the value data is displayed with "----," the data is output in the form of "\*0000." However, in case that analysis for that data is not ordered, it is reported as " " (all spaces).

**10) Instrument Name**

This is the information to identify each instrument, and consists of alpha-numeric (capital). It can be used when more than one XT-2000i/XT-1800i is connected to one host computer.

It can be set up in the IPU, and the one for 16-character of the head is outputted. The space is put at the back when the number of the characters is under 16-character.

**11) Analysis Information**

This is to display the analysis status of a sample.

- 0: Normal analysis
- 1: Abnormal analysis

**12) Sample Judgment Information**

This is to display the judgment information of aimed sample whether re-analysis is necessary.

- 0: Negative
- 1: Positive only
- 2: Error only
- 3: Positive+Error
- Q: QC data

**13) Order Information**

This indicates the analysis order information for each analysis parameter.

- "0": Not analyze
- "1": Analyze

**14) Sample Information (Flag)**

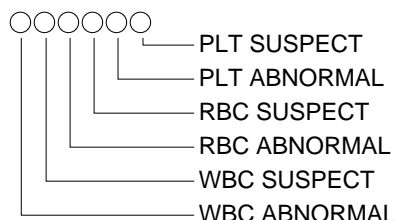
The existence of the IP message of WBC, RBC or PLT is indicated.

- 0: None
- 1: Existing

**15) Sample ID Information**

This displays the implication of the sample number.

- 4: Sample number was read by the ID barcode reader
- 2: Sample number failed in reading by the ID barcode reader
- 0: Other

**16) Analysis Mode**

This is to show the one of following.

- 1: Manual analysis
- 2: Sampler analysis
- 3: Closed analysis
- 4: Capillary analysis

**17) Patient ID**

This number consists of maximum 16 digits in numeral or alphabet. The space is put at the back when the number of the characters is under 16-character.

**18) Positive (Diff)**

When a blood cell differentiation value is abnormal, output "1," if not, output "0."

**19) Positive (Morph)**

When a blood cell morphology is abnormal, output "1," if not, output "0."

**20) Positive (Count)**

When a blood cell count value is abnormal, output "1," if not, output "0."

**21) Error (Func)**

When an analysis error other than the ID bar code read error has occurred, output "1," if not, output "0."

**22) Error (Result)**

When an analysis error which one of "cannot absorb blood," "insufficient amount of blood," or "sample innate error" has been occurred, output "1," if not, output "0."

**23) The Unit Information**

When the Dutch SI unit is being used, output "1," if others, output "0."

**24) PLT Information**

When PLT-O is adopted as a PLT value, output "1," if others, output "0." In case of XT-1800i, output "0".

**25) Instrument ID**

A manufacturer has an instrument ID composed of 22 fixed characters with the information to identify the instrument.



**Analysis Data Format 1 <4-digit of year>**

Parameter	No. of Chars.	Example
STX	1	(02H)
Text Distinction Code 1	1	"D"
Text Distinction Code 2	1	"1"
Sample Distinction Code	1	"U"
Instrument Name	16	XX-XX
Sequence No.	10	XX-XX
RESERVED	3	"000"
Sample ID No.	15	XX-XX
Year	4	XXXX
Month	2	XX
Day	2	XX
Hour	2	XX
Minute	2	XX
RESERVED	2	"00"
Rack No.	6	XXXXXX
Tube Position	2	XX
Sample ID Information	1	X
Analysis Mode	1	X
Patient ID	16	XX-XX
Analysis Information	1	X
Sample Judgment Information	1	X
Positive (Diff)	1	X
Positive (Morph)	1	X
Positive (Count)	1	X
Error (Func)	1	X
Error (Result)	1	X
Order Information	1	X
Sample Information (INTERPRETATION)	6	XXXXXX
The Unit Information	1	X
RESERVED	1	"0"
PLT Information	1	X
RESERVED	63	"00~00"
RESERVED (Instrument ID: Fixed)	22	"XT- 2000^01325318^A1001 **"
ETX	1	(03H)
Total	191	

\* XT-2000i only - "XT-1800^02305316^A1001" for XT-1800i example)

**Analysis Data Format 2 (XT-2000i)**

Parameter	No. of Chars.	Example
STX	1	(02H)
Text Distinction Code 1	1	"D"
Text Distinction Code 2	1	"2"
Sample Distinction Code	1	"U"
Instrument Name	16	XX~XX
Sequence No.	10	XX~XX
RESERVED	3	"000"
Sample ID No.	15	XX~XX
WBC ( $\times 10^3/\mu\text{L}$ )	6	XXX.XXF
RBC ( $\times 10^6/\mu\text{L}$ )	5	XX.XXF
HGB (g/dL)	5	XXX.XF
HCT (%)	5	XXX.XF
MCV (fL)	5	XXX.XF
MCH (pg)	5	XXX.XF
MCHC (g/dL)	5	XXX.XF
PLT ( $\times 10^3/\mu\text{L}$ )	5	XXXXF
LYMPH% (%)	5	XXX.XF
MONO% (%)	5	XXX.XF
NEUT% (%)	5	XXX.XF
EO% (%)	5	XXX.XF
BASO% (%)	5	XXX.XF
LYMPH# ( $\times 10^3/\mu\text{L}$ )	6	XXX.XXF
MONO# ( $\times 10^3/\mu\text{L}$ )	6	XXX.XXF
NEUT# ( $\times 10^3/\mu\text{L}$ )	6	XXX.XXF
EO# ( $\times 10^3/\mu\text{L}$ )	6	XXX.XXF
BASO# ( $\times 10^3/\mu\text{L}$ )	6	XXX.XXF
RDW-CV (%)	5	XXX.XF
RDW-SD (fL)	5	XXX.XF
PDW (fL)	5	XXX.XF
MPV (fL)	5	XXX.XF
P-LCR (%)	5	XXX.XF
RET% (%%)	5	XXX.XF
RET# ( $\times 10^4/\mu\text{L}$ )	5	XX.XXF
IRF (%)	5	XXX.XF
LFR (%)	5	XXX.XF
MFR (%)	5	XXX.XF
HFR (%)	5	XXX.XF
PCT (%)	5	XX.XXF
RESERVED	5	"00~00"
RESERVED	6	"00~00"
RESERVED	17	"00~00"
RESERVED (Instrument ID: Fixed)	22	"XT-2000XXX---X"
ETX	1	(03H)
Total	255	

Revised July 2002

**Analysis Data Format 2 (XT-1800i)**

Parameter	No. of Chars.	Example
STX	1	(02H)
Text Distinction Code 1	1	"D"
Text Distinction Code 2	1	"2"
Sample Distinction Code	1	"U"
Instrument Name	16	XX-XX
Sequence No.	10	XX-XX
RESERVED	3	"000"
Sample ID No.	15	XX-XX
WBC ( $\times 10^3/\mu\text{L}$ )	6	XXX.XXF
RBC ( $\times 10^6/\mu\text{L}$ )	5	XX.XXF
HGB (g/dL)	5	XXX.XF
HCT (%)	5	XXX.XF
MCV (fL)	5	XXX.XF
MCH (pg)	5	XXX.XF
MCHC (g/dL)	5	XXX.XF
PLT ( $\times 10^3/\mu\text{L}$ )	5	XXXXF
LYMPH% (%)	5	XXX.XF
MONO% (%)	5	XXX.XF
NEUT% (%)	5	XXX.XF
EO% (%)	5	XXX.XF
BASO% (%)	5	XXX.XF
LYMPH# ( $\times 10^3/\mu\text{L}$ )	6	XXX.XXF
MONO# ( $\times 10^3/\mu\text{L}$ )	6	XXX.XXF
NEUT# ( $\times 10^3/\mu\text{L}$ )	6	XXX.XXF
EO# ( $\times 10^3/\mu\text{L}$ )	6	XXX.XXF
BASO# ( $\times 10^3/\mu\text{L}$ )	6	XXX.XXF
RDW-CV (%)	5	XXX.XF
RDW-SD (fL)	5	XXX.XF
PDW (fL)	5	XXX.XF
MPV (fL)	5	XXX.XF
P-LCR (%)	5	XXX.XF
RESERVED	5	"00-00"
RESERVED	5	"00-00"
RESERVED	5	"00-00"
RESERVED	5	"00-00"
RESERVED	5	"00-00"
RESERVED	5	"00-00"
PCT (%)	5	XX.XXF
RESERVED	5	"00-00"
RESERVED	6	"00-00"
RESERVED	17	"00-00"
RESERVED (Instrument ID: Fixed)	22	"XT-1800XXX---X"
ETX	1	(03H)
Total	255	

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## 5. QC Data Format

The QC data format is used to output to  $\bar{X}$ M control file, and  $\bar{X}$ /L-J control files.

The QC numbers indicate the following QC files.

### QC Data Format 1 (XT-2000i) <4-digit of year>

Parameter	No. of Chars.	Example
STX	1	(02H)
Text Distinction Code 1	1	"D"
Text Distinction Code 2	1	"1"
Sample Distinction Code	1	"C"
Quality Control No.	1	X
Year	4	XXXX
Month	2	XX
Day	2	XX
Hour	2	XX
Minute	2	XX
Instrument Name	16	XX-XX
RBC ( $\times 10^6/\mu\text{L}$ )	4	XX.XX
HGB (g/dL)	4	XXX.X
HCT (%)	4	XXX.X
MCV (fL)	4	XXX.X
MCH (pg)	4	XXX.X
MCHC (g/dL)	4	XXX.X
RDW-CW (%)	4	XXX.X
RDW-SD (fL)	4	XXX.X
PLT ( $\times 10^3/\mu\text{L}$ )	4	XXXX
PDW (fL)	4	XXX.X
MPV (fL)	4	XXX.X
P-LCR (%)	4	XXX.X
PCT (%)	4	XXX.X
WBC ( $\times 10^3/\mu\text{L}$ )	5	XXX.XX
NEUT% (%)	4	XXX.X
LYMPH% (%)	4	XXX.X
MONO% (%)	4	XXX.X
EO% (%)	4	XXX.X
BASO% (%)	4	XXX.X
NEUT# ( $\times 10^3/\mu\text{L}$ )	5	XXX.XX
LYMPH# ( $\times 10^3/\mu\text{L}$ )	5	XXX.XX
MONO# ( $\times 10^3/\mu\text{L}$ )	5	XXX.XX
EO# ( $\times 10^3/\mu\text{L}$ )	5	XXX.XX

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Parameter	No. of Chars.	Example
BASO# ( $\times 10^3/\mu\text{L}$ )	5	XXX.XX
RESERVED	5	"00-00"
RET# ( $\times 10^4/\mu\text{L}$ )	4	XX.XX
RET% (%%)	4	XX.XX
HFR (%)	4	XX.XX
MFR (%)	4	XX.XX
LFR (%)	4	XX.XX
IRF (%)	4	XX.XX
RESERVED	5	"00-00"
RESERVED	62	"00-00"
Closed/Manual	1	X
RESERVED (Instrument ID)	22	"XT-2000XXX---X"
ETX	1	(03H)
Total	255	

\* A decimal point is not contained in the output data.

**QC Data Format 1 (XT-1800i) <4-digit of year>**

Parameter	No. of Chars.	Example
STX	1	(02H)
Text Distinction Code 1	1	"D"
Text Distinction Code 2	1	"1"
Sample Distinction Code	1	"C"
Quality Control No.	1	X
Year	4	XXXX
Month	2	XX
Day	2	XX
Hour	2	XX
Minute	2	XX
Instrument Name	16	XX-XX
RBC ( $\times 10^6/\mu\text{L}$ )	4	XX.XX
HGB (g/dL)	4	XXX.X
HCT (%)	4	XXX.X
MCV (fL)	4	XXX.X
MCH (pg)	4	XXX.X
MCHC (g/dL)	4	XXX.X
RDW-CW (%)	4	XXX.X
RDW-SD (fL)	4	XXX.X
PLT ( $\times 10^3/\mu\text{L}$ )	4	XXXX
PDW (fL)	4	XXX.X
MPV (fL)	4	XXX.X
P-LCR (%)	4	XXX.X
PCT (%)	4	XXX.X

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Parameter	No. of Chars.	Example
WBC ( $\times 10^3/\mu\text{L}$ )	5	XXX.XX
NEUT% (%)	4	XXX.X
LYMPH% (%)	4	XXX.X
MONO% (%)	4	XXX.X
EO% (%)	4	XXX.X
BASO% (%)	4	XXX.X
NEUT# ( $\times 10^3/\mu\text{L}$ )	5	XXX.XX
LYMPH# ( $\times 10^3/\mu\text{L}$ )	5	XXX.XX
MONO# ( $\times 10^3/\mu\text{L}$ )	5	XXX.XX
EO# ( $\times 10^3/\mu\text{L}$ )	5	XXX.XX
BASO# ( $\times 10^3/\mu\text{L}$ )	5	XXX.XX
RESERVED	5	"00~00"
RESERVED	4	"0000"
RESERVED	4	"0000"
RESERVED	4	"0000"
RESERVED	4	"0000"
RESERVED	4	"0000"
RESERVED	4	"0000"
RESERVED	4	"0000"
RESERVED	5	"00~00"
RESERVED	62	"00~00"
Closed/Manual	1	X
RESERVED (Instrument ID)	22	"XT-1800XXX---X"
ETX	1	(03H)
Total	255	

\* A decimal point is not contained in the output data.

**File Corresponding to QC No.**

Analysis Mode	Lot	Control Material	Level	QC File No.	QC No.	Closed/ Manual
Manual	Current	e-CHECK	Level 1	1	1	0
			Level 2	2	2	0
			Level 3	3	3	0
		Other1	—	7	7	0
		Other2	—	8	8	0
	New	e-CHECK	Level 1	11	B	0
			Level 2	12	C	0
			Level 3	13	D	0
		Other1	—	17	b	0
		Other2	—	18	c	0
Closed	Current	e-CHECK	Level 1	21	1	1
			Level 2	22	2	1
			Level 3	23	3	1
		Other1	—	27	7	1
		Other2	—	28	8	1
	New	e-CHECK	Level 1	31	B	1
			Level 2	32	C	1
			Level 3	33	D	1
		Other1	—	37	b	1
		Other2	—	38	c	1
XbarM	—	—	—	0	M	0

(Note: In the Closed/Manual column, “0” indicates “Manual,” and “1” indicates “Closed.”)

**QC Data Format 2 (XT-2000i) <4-digit of year>**

Parameter	No. of Chars.	Example
STX	1	(02H)
Text Distinction Code 1	1	"D"
Text Distinction Code 2	1	"2"
Sample Distinction Code	1	"C"
Quality Control No.	1	X
Year	4	XXXX
Month	2	XX
Day	2	XX
Hour	2	XX
Minute	2	XX
Instrument Name	16	XX~XX
WBC/BASO-X (CH)	4	XX.XX
WBC/BASO-Y (CH)	4	XX.XX
DIFF-X (CH)	4	XX.XX
DIFF-Y (CH)	4	XX.XX
RESERVED	5	"00~00"
RESERVED	4	"0000"
RESERVED	4	"0000"
RESERVED	5	"00~00"
RESERVED	4	"0000"
RESERVED	4	"0000"
RBC-O ( $\times 10^6/\mu\text{L}$ )	4	XX.XX
PLT-O ( $\times 10^3/\mu\text{L}$ )	4	XXXX
RBC-X (CH)	4	XXX.X
RBC-Y (CH)	4	XXX.X
d-RBC ( $\times 10^{-1}/\%$ )	4	XXX.X
d-PLT ( $\times 10^{-1}/\%$ )	4	XXXX
Dw/X ( $\times 10^{-1}/\%$ )	4	XXX.X
Dw/Y ( $\times 10^{-1}/\%$ )	4	XXX.X
RESERVED	125	"00~00"
RESERVED (Instrument ID)	22	"XT-2000XXX---X"
ETX	1	(03H)
Total	255	

\*A decimal point is not contained in the output data.



**QC Data Format 2 (XT-1800i) <4-digit of year>**

Parameter	No. of Chars.	Example
STX	1	(02H)
Text Distinction Code 1	1	"D"
Text Distinction Code 2	1	"2"
Sample Distinction Code	1	"C"
Quality Control No.	1	X
Year	4	XXXX
Month	2	XX
Day	2	XX
Hour	2	XX
Minute	2	XX
Instrument Name	16	XX-XX
WBC/BASO-X (CH)	4	XX.XX
WBC/BASO-Y (CH)	4	XX.XX
DIFF-X (CH)	4	XX.XX
DIFF-Y (CH)	4	XX.XX
RESERVED	5	"00-00"
RESERVED	4	"0000"
RESERVED	4	"0000"
RESERVED	5	"00-00"
RESERVED	4	"0000"
RESERVED	4	"0000"
RESERVED	4	"0000"
RESERVED	4	"0000"
RESERVED	4	"0000"
RESERVED	4	"0000"
RESERVED	4	"0000"
RESERVED	4	"0000"
RESERVED	4	"0000"
RESERVED	4	"0000"
RESERVED	4	"0000"
RESERVED	4	"0000"
RESERVED	125	"00-00"
RESERVED (Instrument ID)	22	"XT-1800XXX---X"
ETX	1	(03H)
Total	255	

\*A decimal point is not contained in the output data.

**File Corresponding to QC No.**

Analysis Mode	Lot	Control Material	Level	QC File No.	QC No.	Closed/Manual
Manual	Current	e-CHECK	Level 1	1	1	0
			Level 2	2	2	0
			Level 3	3	3	0
		Other1	—	7	7	0
		Other2	—	8	8	0
	New	e-CHECK	Level 1	11	B	0
			Level 2	12	C	0
			Level 3	13	D	0
		Other1	—	17	b	0
		Other2	—	18	c	0
Closed	Current	e-CHECK	Level 1	21	1	1
			Level 2	22	2	1
			Level 3	23	3	1
		Other1	—	27	7	1
		Other2	—	28	8	1
	New	e-CHECK	Level 1	31	B	1
			Level 2	32	C	1
			Level 3	33	D	1
		Other1	—	37	b	1
		Other2	—	38	c	1
XbarM	—	—	—	0	M	0

(Note: In the Closed/Manual column, “0” indicates “Manual,” and “1” indicates “Closed.”)

## 16.4 Communication Specifications of Analysis Information with Host Computer

### 1. Outline

XT-2000i/XT-1800i has a function to load analysis information (analysis order information and patient information) from the host computer, and perform the analysis automatically according to the information.

### Analysis Information Inquiry Method

XT-2000i/XT-1800i has the following two inquiry methods.

- Real-time inquiry is performed just before an analysis, using the sample ID number, as a key word, read from the bar code label attached to a sample tube.
- Batch inquiry is performed before an analysis by specifying a rack number. The key words in this case are the rack number and the tube position.

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## Sample Information Inquiry Setting

Key: Sample ID Rack No./Tube Pos.  
 Real-time Inquiry (Manual Mode): **[Sample ID]**  
 Real-time Inquiry (Sampler Mode): **[Key]**

## 2. Serial Communication

The bit serial voltage type, which conforms to the RS-232C interface, is used for host computer output of XT-2000i/XT-1800i. The serial interface port for the connection with the host computer is on the rear panel of the IPU.

### Connector

- Connect to the host computer output connector on the rear panel of the IPU.
- Use a 9-pin, D-SUB female connector.
- Pitch of connector fixing screws adopts the size in inch.

### Connector Signal

Pin No.	Signal Name	Signal Direction
1		
2	Receive Data (RxD)	To XT-2000i/XT-1800i from HOST
3	Transmit Data (TxD)	From XT-2000i/XT-1800i to HOST
4	Data Terminal Ready (DTR)	From XT-2000i/XT-1800i to HOST
5	Signal Ground (SG)	
6	Data Set Ready (DSR)	To XT-2000i/XT-1800i from HOST
7	Request to Send (RTS)	From XT-2000i/XT-1800i to HOST
8	Clear to Send (CTS)	To XT-2000i/XT-1800i from HOST
9		

### Communication Format

The format is start-stop asynchronous half duplex (asterisk indicates setting at shipment from factory), and adjustment can be made as follows.

Baud Rate	600, 1200, 2400, 4800, *9600, 14400, 19200, 38400 (BPS)
Code	7-bit, *8-bit
Stop Bit	*1-bit, 2-bit
Parity Bit	*None, Even, Odd
Class	Class A, *Class B
Interval	0, 1, *2, 3, 5, 7, 10, 15 (seconds)

**Signal Level**

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

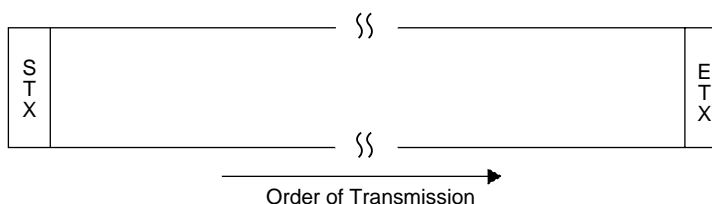
**Communication Format****1) Code**

ASCII codes are used for all the output to the computer.

**2) Text Format**

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

STX: 02H, ETX: 03H

**3) Transmission Procedure**

The transmission method is class B (fixed). Make sure to set it class B. If the class A is set, correct communication is not possible. The procedure to make inquiry on analysis information from XT-2000i/XT-1800i to the host computer is as follows:

- Analysis information inquiry text is sent from XT-2000i/XT-1800i.
- The host computer returns NAK if an error occurs with the data reception, and returns ACK when there is no error, and then send the analysis information corresponding to the inquiry.
- In the case of NAK, XT-2000i/XT-1800i resends the analysis information inquiry text. In the case of ACK, after receiving the analysis information text, XT-2000i/XT-1800i sends ACK when there is no error with the received data, or sends NAK if there is an error.
- The host computer closes the communication for one set of analysis information when the returned response is ACK, or resends the analysis parameter text if the response is NAK.

[XT-2000i/XT-1800i]		[Computer]
Sends sample information inquiry text.	→	
(Resends if NAK.)	←	
(Resends up to 3 times.)	←	
Sends NAK if there is an error.	→	
or ACK when there is no error.		Sends NAK if there is an error. or ACK when there is no error. Sends sample information text for the inquired samples. (Resends if NAK.) (Resends up to 3 times.)

ACK: 06H, NAK: 15H

#### 4) Transmission Error

If a transmission error is detected, the transmission is interrupted and the error message is displayed on the IPU. The operator must recover the error. Cases of errors are as follows.

Error name	Descriptions	IPU Action to be taken
Transmission Error	Detects Frame Error, Parity Error or Over-run Error, when receiving.	Interrupt
Off-line	HC's control signal "DSR" is OFF.	Interrupt
ACK Time-out	After data transmission, no response was received from HC in 15 seconds. (Class B only)	Interrupt
(No error)	After data transmission, NAK was received from HC. (Class B only)	Re-send
(No error)	After data transmission, a response other than ACK and NAK was received from HC. (Class B only)	Re-send
No. of re-send over	After data transmission, the 4th response other than ACK was received from HC. (Class B only)	Interrupt
Transmission Time-out	When sending, control signal CTS does not become active in 5 seconds. (only when RTS/CTS control is activated)	Interrupt
STX Time-out	(1) After HC's requested to send, STX was not received from HC in 15 seconds. (Class A only) (2) After HC's requested to send, STX was not received from HC 15 seconds after ACK was received. (Class B only) (3) Within 15 seconds after receiving the sub-text in the previous text, STX of the following sub-text was not received. (Class A only) (4) Within 15 seconds upon sending ACK after receiving the sub-text in the previous text, STX of the following sub-text was not received. (Class B only)	Interrupt
ETX Time-out	ETX was not received within 15 seconds after receiving STX.	Interrupt

#### 5) Inquiry Timing

- Real-time inquiry by sample ID number

At the time when a sample ID number is read from the bar code attached to the tube, the inquiry is performed. If XT-2000i/XT-1800i already has the analysis information, the inquiry is not performed. After sending out the analysis information inquiry text, wait while receiving ACK and receiving the analysis information text, then blood is absorbed after that.

- Batch inquiry by rack number and tube position  
At the time when a rack number is specified by the IPU program of XT-2000i/XT-1800i, the inquiry is made for the tube positions from 1 through 10 for the specified rack. There is not time limit to receive the analysis information text after sending the analysis information inquiry text.

#### **6) Transmission Interval**

The transmission interval from receiving analysis information text from the host computer and sending out ACK until the next sending of analysis information inquiry text, can be set by the IPU program of XT-2000i/XT-1800i. This transmission interval is common with that of analysis data.

#### **7) Note on Analysis Data Automatic Output**

When the analysis data is set to be output automatically by XT-2000i/XT-1800i, the communication of analysis information and the output of analysis data may be performed alternately. In this case when two different types of information are handled simultaneously, the response of the host computer may become slower. Therefore, set the instrument to make the batch output, not the automatic output to avoid slow response of the host computer.

### **3. TCP/IP Communication**

The network interface conforms to IEEE802.3, is used for host computer output of XT-2000i/XT-1800i. The network port for the connection with the host computer is on the rear panel of the IPU.

#### **Network interface layer**

The network interface conforms to IEEE802.3.  
Communication is performed by 10Base-T.  
The RJ45 socket is used as a hub for XT-2000i/XT-1800i connection  
The cable of UTP category 5 is used for communication.

#### **TCP/IP**

- Before communication, the text format including STX and ETX is set to the TCP's data unit.
- The IP address of XT-2000i/XT-1800i's Main unit is set (The default value is 192.168.28.142 and this value may be changed on Windows networking setting and Main unit by service engineer.)
- The IP address for XT-2000i/XT-1800i's host communication is set. ( This value may be changed on IPU setting screen and we have to use other IP address without 192.168.28.\* )

- The TCP port number for XT-2000i/XT-1800i's host communication is set. (The default value is 5000 and this value may be changed on IPU setting screen.)

## TCP Connection

The host computer is defined as server, and the XT-2000i/XT-1800i as client for connection.

The XT-2000i/XT-1800i checks the connection when the system starts. When the connection fails, the XT-2000i/XT-1800i repeats the connection at regular intervals.

If the server shuts down after the connection, the XT-2000i/XT-1800i does not perform the connection again.

## Application Layer

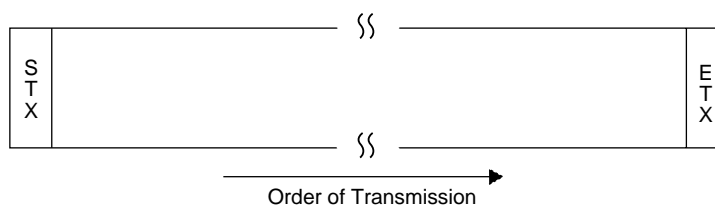
Communication is performed according to the bit serial interface class A.

## Text and Communication Protocol

### 1) Communication Control Character

ASCII codes are used for all the output to the computer.

### 2) Text Format



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

## Communication Error Processing

When a communication error occurs, the communication is stopped and the error is displayed on the IPU. The restoration of communication can be made by the operator. A communication error occurs in the case mentioned below.

- No response is made from the computer within 30 seconds after the data transmission.

## Communication Timing

Depending on the settings of the IPU, it is possible to select between communication per analysis cycle and communication of the stored data in a batch.

### 4. Text Format

There are text formats for "Analysis information inquiry" and "Analysis information" regarding the communication of analysis information between XT-2000i/XT-1800i and the host computer. And these are identified by Text Distinction Code I.

- The Text Distinction Code I of the "Analysis information inquiry" sent from XT-2000i/XT-1800i to the host computer is always "R."
- The Text Distinction Code I of the "Analysis information" sent from the host computer to XT-2000i/XT-1800i is always "S."

### 5. Analysis Information Inquiry Format

Parameter	No. of Chars.	
STX	1	(02H)
Text Distinction Code I	1	"R"
Inquiry Mode	1	(X)
RESERVED	3	"000"
Inquiry Sample ID No.	15	(XX~XX)
RESERVED	2	"00"
Rack No.	6	(XXXXXX)
Tube Position	2	(XX)
RESERVED	31	"00~00"
ETX	1	(03H)
Total	63	

#### 1) Output Order

The upper items are sent first, and upper digits of data are sent first. Zero-suppression is not carried out.

#### 2) Inquiry Mode

The mode of inquiry is indicated.

- "1": Real-time inquiry by sample ID number as the key word.
- "2": Batch inquiry by rack No. and tube position as the key words.

#### 3) Inquiry Sample ID Number

This parameter becomes effective with the real-time inquiry by sample ID number as the key word. It consists of 15-digit number, but may include hyphen "-" (2DH) between numerals 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 as the key words. This is the number assigned to a sample rack. It contains of 6-digit number.

**5) Tube Position**

This parameter becomes effective with the batch inquiry by rack No. and tube position as the key words. It consists of number from 1 to 10 for an analysis position on a sample rack.

## 6. Analysis Information Format

### Analysis Information Format 1 (XT-2000i)

Parameter	No. of Chars.	Example
STX	1	(02H)
Text Distinction Code 1	1	"S"
Text Distinction Code 2	1	"1"
Information Status	1	(X)
Date Ordered	8	(XXXXXXXX)
RESERVED	3	"000"
Sample ID No.	15	(XX~XX)
RESERVED	2	"00"
Rack No.	6	(XXXX)
Tube Position	2	(XX)
Inquiry Mode	1	(X)
Patient ID No.	16	(XX~XX)
Patient Name	40	(XX~XX)
Sex	1	(X)
Birthday	8	(XXXXXXXX)
Doctor	20	(XX~XX)
Ward	20	(XX~XX)
Sample Comments	40	(XX~XX)
RESERVED	18	"00~00"
WBC	1	(X)
RBC	1	(X)
HGB	1	(X)
HCT	1	(X)
MCV	1	(X)
MCH	1	(X)
MCHC	1	(X)
PLT	1	(X)
LYMPH%	1	(X)
MONO%	1	(X)
NEUT%	1	(X)
EO%	1	(X)
BASO%	1	(X)
LYMPH#	1	(X)
MONO#	1	(X)
NEUT#	1	(X)
EO#	1	(X)
BASO#	1	(X)
RDW-CV	1	(X)
RDW-SD	1	(X)
PDW	1	(X)
MPV	1	(X)
P-LCR	1	(X)

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Parameter	No. of Chars.	Example
RESERVED	2	"00"
RET%	1	(X)
RET#	1	(X)
IRF	1	(X)
LFR	1	(X)
MFR	1	(X)
HFR	1	(X)
RESERVED	1	"0"
PCT	1	(X)
RESERVED	1	"0"
RESERVED	1	"0"
RESERVED	15	"00~00"
ETX	1	(03H)
Total	255	

**Analysis Information Format 1 (XT-1800i)**

Parameter	No. of Chars.	Example
STX	1	(02H)
Text Distinction Code 1	1	"S"
Text Distinction Code 2	1	"1"
Information Status	1	(X)
Date Ordered	8	(XXXXXXXX)
RESERVED	3	"000"
Sample ID No.	15	(XX~XX)
RESERVED	2	"00"
Rack No.	6	(XXXX)
Tube Position	2	(XX)
Inquiry Mode	1	(X)
Patient ID No.	16	(XX~XX)
Patient Name	40	(XX~XX)
Sex	1	(X)
Birthday	8	(XXXXXXXX)
Doctor	20	(XX~XX)
Ward	20	(XX~XX)
Sample Comments	40	(XX~XX)
RESERVED	18	"00~00"
WBC	1	(X)
RBC	1	(X)
HGB	1	(X)
HCT	1	(X)
MCV	1	(X)
MCH	1	(X)
MCHC	1	(X)

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Parameter	No. of Chars.	Example
PLT	1	(X)
LYMPH%	1	(X)
MONO%	1	(X)
NEUT%	1	(X)
EO%	1	(X)
BASO%	1	(X)
LYMPH#	1	(X)
MONO#	1	(X)
NEUT#	1	(X)
EO#	1	(X)
BASO#	1	(X)
RDW-CV	1	(X)
RDW-SD	1	(X)
PDW	1	(X)
MPV	1	(X)
P-LCR	1	(X)
RESERVED	2	"00"
RESERVED	1	"0"
RESERVED	1	"0"
RESERVED	1	"0"
RESERVED	1	"0"
RESERVED	1	"0"
RESERVED	1	"0"
RESERVED	1	"0"
PCT	1	(X)
RESERVED	1	"0"
RESERVED	1	"0"
RESERVED	15	"00~00"
ETX	1	(03H)
Total	255	

**Analysis Information Format 2**

Parameter	No. of Chars.	Example
STX	1	(02H)
Text Distinction Code 1	1	"S"
Text Distinction Code 2	1	"2"
Information Status	1	(X)
Date Ordered	8	(XXXXXXXX)
RESERVED	3	"000"
Sample ID No.	15	(XX-XX)
RESERVED	2	"00"
Rack No.	6	(XXXX)
Tube Position	2	(XX)
Inquiry Mode	1	(X)
Patient ID No.	16	(XX-XX)
Patient Comments (PIM only)	100	(XX-XX)
RESERVED	97	"00-00"
ETX	1	(03H)
Total	255	

**1) Output Order**

The upper items are sent first, and upper digits of data are sent first. Zero-suppression is not carried out.

**2) Information Status**

This parameter indicates if the inquired analysis information is registered. If the required sample is not registered, make sure to return "0" (No order registered) in the analysis information text.

"0": No order registered

"1": Order registered

"2": Quality control

**3) Date Ordered**

This parameter indicates the requested date of analysis of the inquired sample.

"YYYYMMDD"

YYYY: Year, MM: Month, DD: Day

**4) Sample ID Number**

In the case of real-time inquiry by sample ID number as the key word, this number becomes the same with that in the inquiry text. In the case of batch inquiry by rack No. and tube position as the key words, the sample ID number corresponding to the specified rack No. and tube position will be assigned.

It consists of 15-digit number or alphabet, but may include hyphen "-" (2DH) between numerals depending on the usage. The hyphen "-" is included in 15 digits.

**5) Rack No.**

In the case of batch inquiry by rack No. and tube position as the key words, this number becomes the same with that in the inquiry text. In the case of real-time inquiry by sample ID number as the key word, no particular setting is used.

This number is assigned to a sample rack, and consists of 6 digit number.

**6) Tube Position**

In the case of batch inquiry by rack No. and tube position as the key words, this number becomes the same with that in the inquiry text. In the case of real-time inquiry by sample ID number as the key word, no particular setting is used.

This is the analysis position of the inquired sample in the sample rack, and consists of number from 1 to 10.

**7) Inquiry Mode**

The mode of inquiry is indicated.

“1”: Real-time inquiry by sample ID number as the key word.

“2”: Batch inquiry by rack No. and tube position as the key words.

**8) Patient ID No.**

This parameter is the patient ID for the inquired sample, and is unique to a patient.

It consists of 16-digit number or alphabet, but may include hyphen “-” (2DH) between numerals depending on the usage. The hyphen “-” is included in 16 digits.

When no patient ID No. is available, enter a space (20H).

**9) Patient Name**

This is the patient name for the inquired sample. Last name and first name (20 characters max. for each) can be entered in alphabet characters. A space “ ” (20H) is needed between First and Last name as a separator. When the First name exceeds 20 characters, the first 20 characters will be taken as the First name. Last name will start after the space (20H) and first 20 characters will be used.

**Note:**

Due to space character “ ” (20H) Last name can only use 19 characters (normally 20 characters), when First name uses all 20 characters.

**10) Sex**

This is the sex of the patient.

“1”: Male

“2”: Female

“3”: Unknown

**11) Birthday**

This is the birthday of the patient.

“YYYYMMDD”

YYYY: Year, MM: Month, DD: Day

When no date-of-birth information is available, enter a space (20H).

**12) Doctor**

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

When no doctor information is available, enter a space (20H).

**13) Ward**

This is the ward (medical section) in which the patient is staying, and consists of up to 20 alphabets.

When no ward information is available, enter a space (20H).

**14) Sample Comments**

This is the comments for the inquired sample, and consists of up to 40 alphabets.

When no sample comment is available, enter a space (20H).

**Note:**

Sample comments cannot be used in the real-time order inquiry.

**15) Patient Comments**

This is the comments of the patient for the inquired sample, and consists of up to 100 alphabets.

When no patient comment is available, enter a space (20H).

**16) Order Information**

This indicates the analysis order information for each analysis parameter.

“0”: Not analyze

“1”: Analyze

