Sysmex

XT-2000*i*/XT-1800*i*

ASTM Host Interface Format

Revision 2.1

Note : The standard specification is under discussion in NCCLS. This specification may be modified to match the standard when it will be published.

Revised on March 23, 2007

SYSMEX CORPORATION

Revision History

Revision	Date	Major contents of changes
1.0	12th March, 2002	Initial version of Revision 1.0 is created
1.1	25th May, 2002	Revision 1.1 to add XT-1800*i* descriptions
1.2	25th March, 2005	Revision 1.2 to correct typing mistakes (No software updates)
1.3	19th April, 2006	Revision 1.3 to change description of the inquiry sample number and rack number (No software updates)
2.0	5th September, 2007	·Compatibility with the XT IG master and XT RET master is additionally described. · "Products and Additional Software" is added, and the description on XT IG master and XT RET master is added. · "IG#", "IG%" and "RET-H$_e$" are added to the measurement item ID in request records. · "IG#", "IG%" and "RET-H$_e$" are added to the measurement item list and QC measurement item list in result records. · "IG Present" is added to the IP message (abnormal) list in result records.
2.1	23th March, 2007	· Compatibility with the ASTM E1381-02 is additionally described. · Erroneous descriptions are corrected in transmission and reception examples in comment records.

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1. Products and Additional Software

1.1 XT-2000*i* and XT-1800*i*

Because the XT-1800*i* is not equipped with the RET channel, it does not output the following items.
Refer to the instruction manual for explanation of the following items.
  • RET#, RET%, HFR, MFR, LFR and IRF

The following items are not handled in accuracy control.
  • RBC-O, PLT-O, RBC-X, RBC-Y, d-RBC, d-PLT, Dw/X and Dw/Y

1.2 Additional software

1.2.1 Upgrade Software for Automated Hematology Analyzer XT IG master

Installing Upgrade Software for Automated Hematology Analyzer XT IG master enables output of the following items.
Contact a dealer or agency near you for the XT IG master.
  • IG#
  • IG%
  • IG Present (IP message)

> **Note:** • When "IG#" and "IG%" are reliable (that is, when "*" is not attached), the XT judges "IG Present". When the condition for "IG Present" is satisfied as a result of judgment, the XT outputs "IG Present". (In this case, the XT does not output "Immature Gran?".)
>
>   • When "IG#" and "IG%" are not reliable (that is, when "*" is attached), the XT cannot judge "IG Present". It judges "Immature Gran?" instead. When the condition for "Immature Gran?" is satisfied as a result of judgment, the XT outputs "Immature Gran?". (In this case, the XT does not output "IG Present".)

1.2.2 Upgrade Software for Automated Hematology Analyzer XT RET master

Installing Upgrade Software for Automated Hematology Analyzer XT RET master enables output of the following item. However, this upgrade software is not applicable to the XT-1800*i*.
Contact a dealer or agency near you for the XT RET master.
  • RET-H$_e$

1.3 XT for North America

The XT for North America does not output the following items in measurement result output and real-time accuracy control data output.
  • PDW
  • P-LCR
  • PCT
  • HFR
  • MFR
  • LFR

1.4 Holland SI units

When the XT is set to Holland SI units, it outputs data items "HGB", "MCH", "MCHC" and "RET-H$_e$" with the following units.

Item	Holland SI unit
HGB	10^{-1}mmol/L
MCH	amol
MCHC	10^{-1}mmol/L
RET-H$_e$	amol

2. Scope

This document describes the Data Communication Specifications for XT-2000*i*/XT-1800*i* using ASTM E1394-97, E1381-02.

[Note]
ASTM (America Society for Testing and Materials), one of the world largest volunteer non-profit organizations, founded in 1898 for the purpose of creating standard regulations for materials, products and system services. This specification conforms to the following two standards:

ASTM E 1381-02:
Specifications for low-level protocols to transfer data between clinical laboratory instruments and computer systems

ASTM E 1394-97:
Standard specifications for transferring data between clinical instruments and computer systems

[Note]
The Information Processing Unit (IPU) of the XT-2000*i*/XT-1800*i* supports connection by the RS-232C and Ethernet. For the Ethernet connection, only the presentation layer conforms to ASTM E 1394-97. All other layers conform to the IEEE 802.3.

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3. Communication Specifications

Communication specifications are based on a layer protocol.

1. Physical layer
   Specifies the sending and receiving of signals between the IPU and the host computer through physical and electrical connections. See the subsequent section, Physical layer (hardware).

2. Data link layer
   Specifies the sending and receiving of data by link connections and for each frame between the IPU and the host computer.

3. Presentation layer
   Specifies the messages that are sent and received by the IPU and the host computer. See the subsequent section, Presentation layer (XT-2000*i*/XT-1800*i* communication).

Presentation layer	← Specifies message specifications.
Data link layer	← Specifies link connection and frame specifications.
Physical layer	← Specifies mechanical and electrical specifications.

Note:

The Information Processing Unit (IPU) of the XT-2000*i*/XT-1800*i* supports connection by the RS-232C and Ethernet.

For the RS-232C connection, the presentation layer conforms to ASTM E 1381-02/ASTM E 1394-97.

For the Ethernet connection, following two modes are supported to output data with ASTM E 1394-97 format.

1. ASTM E 1381-02 mode
   The presentation layer conforms to ASTM E 1394-97.
   The data link layer conforms to ASTM E 1381-02.
   The physical layer conforms to the IEEE 802.3.

2. ASTM E 1381-95 mode
   The presentation layer conforms to ASTM E 1394-97.
   The data link layer and the physical layer conform to the IEEE 802.3.

	Serial Connection	TCP/IP Connection	
		ASTM E 1381-95 mode (*1)	ASTM E 1381-02 mode (*1)
Presentation layer	ASTM E 1394-97	ASTM E 1394-97	ASTM E 1394-97
Data link layer (*2)	ASTM E 1381-02	IEEE 802.3	ASTM E 1381-02
Physical layer (*2)	ASTM E 1381-02	IEEE 802.3	IEEE 802.3

*1: When the "format" in the IPU host computer settings is set to "ASTM 1381-<u>02</u>/1394-97" with the TCP/IP connection, the IPU will run in the ASTM E 1381-02 mode. When set to "ASTM 1381-<u>95</u>/1394-97", the IPU will run in the ASTM E 1381-95 mode.

*2: The IEEE 802.3 specifications in the data link layer and the physical layer are not described in this document.

3.1 Physical Layer (Hardware)

3.1.1 Connectors

Although the ASTM standard specifies a DB-25-pin male connector as standard, a DB-9-pin male I/O connector, which is located on the rear of the instrument, is used to communicate. Use a DB 9-pin female connector on the cable. The fixing screw for the connector is inch size screw. Use an RS-232C cross cable with a DB 9-pin connector.

Table 1: Connector pin assignment

Pin No.	Signal name		Signal direction
1		NC	
2	Receive data	RxD	To XT from host
3	Transmit data	TxD	From XT to host
4	Data terminal ready	DTR	From XT to host
5	Signal ground	SG	-
6	Data set ready	DSR	To XT from host
7	Request to send	RTS	From XT to host
8	Clear to send	CTS	To XT from host
9		NC	

[Note]   The control signals are not used with ASTM specifications.
For this reason, do not make connections to unused pins.

3.1.2 Signal identification level

Table 2: Signal identification level

Level	Data signal	Control signal
+3V or more	Logic "0", start bit	ON
-3V or less	Logic "1", stop bit	OFF

[Note 1]   The ASTM communication will not use these control signals.

3.1.3   Connection cable

The XT-2000i/XT-1800i uses a cable with a DB-9-pin female connector, in accordance with the following connection chart.

```
┌─────────────────────────────────────────────────────────────────────────────┐
│   XT-2000i/XT-1800i                           Host computer                   │
│      DB-9                                        DB-9        DB-25             │
│  ═══════════════════════════════════════════════════════════════════════════ │
│                                                                               │
│      TxD      3  ──────────┐    ┌──────────  3         2         TxD          │
│                             ╲  ╱                                              │
│      RxD      2  ──────────┐ ╲╱ ┌────────── 2         3         RxD           │
│                            ╱ ╱╲ ╲                                             │
│      SG       5  ──────────    ───────────  5         7         SG            │
│                                                                               │
│      RTS      7  ───────┐                   7         4         RTS           │
│                         │                 ┌────                               │
│      CTS      8  ───────┘                 │ 8         5         CTS           │
│                                                                               │
│      DTR      4  ───────┐                   4        20         DTR           │
│                         │                 ┌────                               │
│      DSR      6  ───────┘                 │ 6         6         DSR           │
│                                                                               │
│      NC       1  ──────────                                                   │
│      NC       9  ──────────                                                   │
│                                                                               │
└─────────────────────────────────────────────────────────────────────────────┘
```

3.1.4   Interface parameters

Table 3: Interface Parameters

Parameter	Selection of Settings
Baud rate	1200, 2400, 4800, **9600**, 19200, 38400 bps
Data length	7 bits, **8 bits**
Stop bit	**1 bit**, 2 bits
Parity	**None**, Even, Odd

Establishing the settings underlined allows conformance with the ASTM standard.

[Note]   However, 7-bit data length, even or odd parity, and two stop bits are recognized by the ASTM standard for use with special applications.

3.1.5   Standard specifications (ASTM E 1381-02)

The physical layer of the XT-2000i/XT-1800i conforms to ASTM E 1381-02 "5. Physical Layers," except for the connector type. The XT-2000i/XT-1800i uses a D-SUB-9-pin male connector. (The ASTM standard specifies a 25-pin male connector.)

3.2 Data Link Layer (Transmission Protocol)

The data link layer transfers data between systems using a character-based protocol in accordance with ASTM E 1381-02 "6. Data Link Layers". This section describes communications control procedures. For details, refer to ASTM E 1381-02.

When the ASTM E 1381-02 mode is intended to use, the TCP connection is established in prior to the communication. To establish the TCP connection, the host computer acts as a server and the IPU acts as a client. The IPU establishes a connection by requesting a connection for the IP address and the port number that are provided by the host computer.

3.2.1   Communication Status

The data link layer is consisted of following two state.

- Neutral Status
- Linked Status

Transition to each status is accomplished through the following three phases.
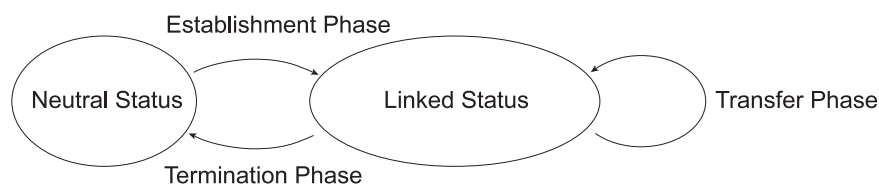
1)   Establishment Phase

Establishes a communication line, and determines the direction of data transfer. In this way, the sender and receiver are identified, and the change is made from neutral status to linked status.

2)   Transfer Phase

The sender transmits messages to the receiver until all messages are transferred.

3)   Termination Phase

Releases the communication line. Changes both the sender and receiver from linked status to neutral status. The sender notifies the receiver that all messages have been transferred.

3.2.2   Establishment Phase

1) The sender (IPU) sends an [ENQ] signal to the receiver (host computer). To respond to the sender, the receiver performs the following action:

- Returns an [ACK] signal when communications are enabled.
- Returns a [NAK] when communications are disabled.

The sender waits for at least 10 seconds before attempting to send an [ENQ] signal again.
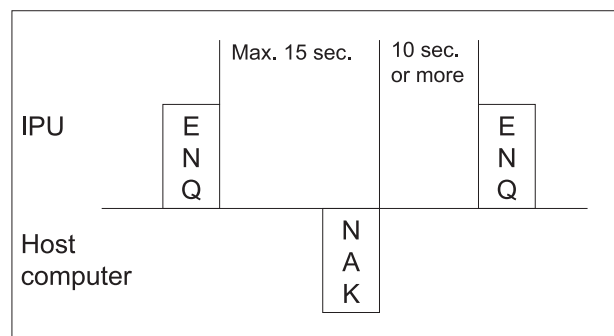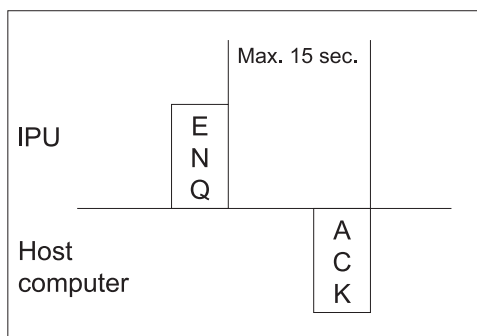
2) When both sender and receiver send [ENQ] signals, the host computer must yield control authority to the IPU.
   - The IPU sends [ENQ] again after 1 second.
   - The host computer must wait for 20 seconds before sending [ENQ] again.

3.2.3   Transfer Phase

During the transfer phase, the sender sends messages to the receiver. The transfer phase continues until all messages have been sent.
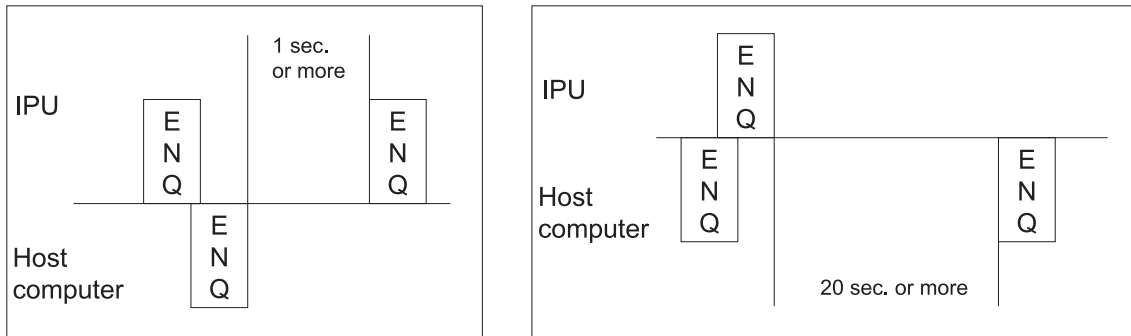
1) Messages are sent in each record with multiple frames. Each frame contains a maximum of 64000 characters (*3) (including frame overhead). If the record is longer than 63993 characters, it is divided into two or more frames.

Note *3: To keep the compatibility with the ASTM E 1381-95, the maximum number of characters in each record is set to 240 characters in the RS-232C connection. To keep fully compatible to ASTM E 1381-02, the maximum number of characters in each record should be set to 63993 characters. Please consult with Sysmex Technical Representative for the setting procedures. The maximum number of characters is set to 63993 characters in the TCP/IP connection.

2) Multiple records cannot be included in a single frame.

3) If the record contains the maximum number of characters or less, a frame with the following structure will be transferred.
   [STX] [F#] [Text] [ETX] [CHK1] [CHK2] [CR] [LF]

   If the record is longer than the maximum number of characters, it is divided into 2 or more frames. The intermediate frame text termination code is [ETB], and the final frame text termination code is [ETX], as shown below.

   [STX] [F#] [Text] [ETB] [CHK1] [CHK2] [CR] [LF]
   [STX] [F#] [Text] [ETB] [CHK1] [CHK2] [CR] [LF]
   ...
   [STX] [F#] [Text] [ETX] [CHK1] [CHK2] [CR] [LF]

where:

Code	Explanation
[STX]	Start of a frame
[F#]	Frame number. One of the numbers 0 to 7 is used, starting with 1 and repeating 2, 3, 4, 5, 6, 7, 0. In case of retransmission, the same frame number is sent.
[Text]	ASTM E 1394-97 records are used. (See the subsequent section 2.3, Presentation layer.) For this reason the codes below will not be used. 0x00 - 0x06, 0x08, 0x0A, 0x0E - 0x1F, 0x7F, 0xFF
[ETB]	Control code indicating end of text (for intermediate frame)
[ETX]	Control code indicating end of text (for final frame)
[CHK1], [CHK2]	Expressed by characters "0" - "9" and "A" - "F". Characters beginning from the character after [STX] and until [ETB] or [ETX] (including [ETB] or [ETX]) are added in binary. The 2-digit numbers, which represent the least significant 8 bits in hexadecimal code, are converted to ASCII characters "0" - "9" and "A" - "F". The most significant digit is stored in CHK1 and the least significant digit in CHK2.
[CR] [LF]	Control codes indicating end of frame

4) If the receiver has successfully received the frame, and is prepared to receive the next frame, receiver responds with [ACK]. After the sender receives [ACK], sender advances the frame number and sends either a new frame or transitions to the termination phase.

5) If the receiver fails to receive the frame and is prepared to receive the same frame again, the receiver responds with [NAK]. After sender receives [NAK], sender sends the most recent frame again, using the same frame number. If a total of 6 attempts to send the frame failed, sender transitions to the termination phase and must end sending of the message.
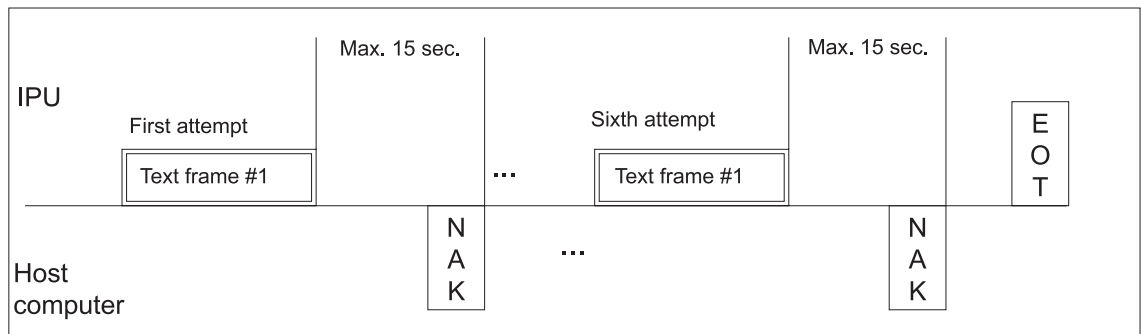
6) The IPU processes the response of [EOT] from the host computer as [ACK]. (Response of [EOT] from the receiver is usually a request of transmission to the sender. However, IPU does not support this function.)

3.2.4   Termination Phase

During the termination phase, the status returns to neutral.
The sender sends the [EOT] to inform the receiver that the message transmission has been completed. When the sender sends [EOT], sender transitions to neutral status. When the receiver receives [EOT], receiver transitions to neutral status.

3.2.5   Timeout

The timer is used to detect a failure to coordinate between the sender and receiver. The timer is used as a mean of recovery for communication line and communication destination device failures.

1) During the establishment phase, the timer is set when the sender sends [ENQ]. Time out results if a response of [ACK], [NAK], or [ENQ] is not received within 15seconds. After time out, the sender transitions to the termination phase.

2) During the transfer phase, the timer is sets when the sender sends the final character of a frame. Time out results if no response is received within 15 seconds. After time out, the sender transitions to the termination phase.
   The receiver sets a 30-second timer when first entering the transfer phase or when responding (either [ACK] or [NAK]) to a frame. Time out results if the receiver does not receive a frame or [EOT] from the sender within 30 seconds. After time out, the receiver discards the latest incomplete message and transitions to the termination phase.

3.3 Presentation Layer

3.3.1   Messages, Records and Fields

1.   Messages
  In the presentation layer, all data is transmitted using messages. Messages are composed of
  record arrays that start with the message header record (H) and end with message
  termination record (L).

2.   Records
A record is a series of text, beginning with an ASCII alphabet character referred to as the
identifier, and ending with [CR] complete message. Records are end by record delimiter.

Table 4: Records

Record Type	Record Identifier	Level	Contents
Header Record	H	0	Contains the sender and receiver information
Patient Information Record	P	1	Contains the patient information
Inquiry Record	Q	1	Contains test order inquiry information requesting to the host computer
Test Order Record	O	2	Contains the test order information
Test Result Record	R	3	Contains analysis result information
Comment Record	C	1-4	Contains the specimen comment and patient comment information
Manufacturer Information Record	M	1-4	Not used
Scientific Information Record	S	N/A	Not used
Message Terminator Record	L	0	Indicates the end of the message

• A smaller level number indicates a higher level.

• A higher-level record contains information that is common to all lower-level records.

• All levels other than 0 must be located after higher levels. However, the manufacturer
information record (not used) and the comment record can be inserted at any level. They are
considered to be one level lower than the preceding record.
Example of transmission
        H->P->O->R->L .... Correct
        H->R->L .... Incorrect, because P and O must be transmitted in prior to R.

3. Fields

A record is further divided into multiple fields by field delimiters.

A field is identified by its position within a record, and has a variable length.

The followings are used as delimiters.

Table 5: Field Delimiters

Type	Code	Description
Field Delimiter	Vertical bar (|) [7Ch]	Separates adjacent fields in a record.
Repeat Delimiter	Backslash (\) [5Ch]	Separates multiple number of descriptors in a field.
Component delimiter	Caret (^) [5Eh]	Separates data elements within a field that has a hierarchical or qualifier nature.
Escape Delimiter	Ampersand (&) [26h]	Is used within a text field to identify special case operations.
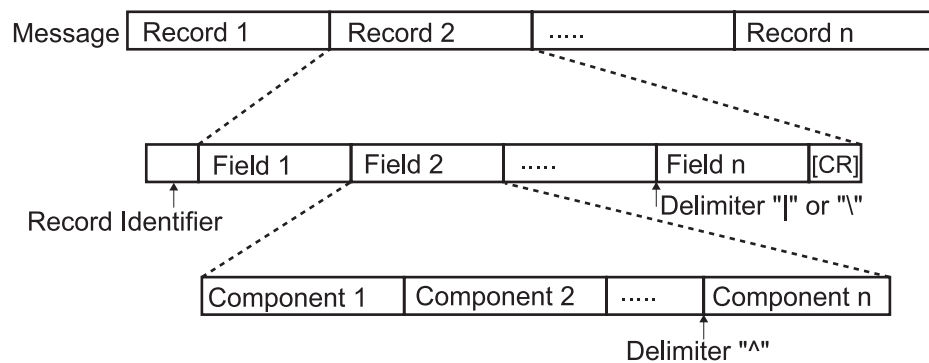
3.3.2 Communication Protocol

3.3.2.1 Analysis Order Inquiry (IPU → Host computer)

This protocol is used for XT-2000*i*/XT-1800*i* to inquire to the host computer an analysis order information to obtain the sample information. Inquiry can be made with keyword of either the sample ID No. or the combination of Rack No. and Tube Position No.

Table 6: Analysis Order Inquiry

IPU	Direction	Host Computer
ENQ	→	
	←	ACK
H (Header Record)	→	
	←	ACK
Q (Request Record)	→	
	←	ACK
L (Message Terminator Record)	→	
	←	ACK
EOT	→	

Note: This table describes the Data Link Layer compatible with the E1381. In case of TCP/IP communication in the ASTM E1381-95, no treatment is performed for ENQ, ACK and EOT codes.

3.3.2.2 Analysis Information (Host computer → IPU)

This protocol is used for the host computer to respond analysis information against the inquiry made by the IPU. Comment record may be omitted.

Table 7: Analysis Information

IPU	Direction	Host Computer
	←	ENQ
ACK	→	
	←	H (Header Record)
ACK	→	
	←	P (Patient Record)
ACK	→	
	←	C (Patient Comment Record)
ACK	→	
	←	O (Test Order Record)
ACK	→	
	←	C (Specimen Comment Record)
ACK	→	
	←	L (Message Terminator Record)
ACK	→	
	←	EOT

Note: This table describes the Data Link Layer compatible with the E1381. In case of TCP/IP communication in the ASTM E1381-95, no treatment is performed for ENQ, ACK and EOT codes.

3.3.2.3   Analysis Results & QC Data (IPU → Host computer)

This protocol is used for the IPU to transmit the analysis results, the QC data in a real-time mode (QC sample No. is QC-xxxxxx and transmitted as similar to the regular sample data), and the QC data in a manual batch mode (selected QC data is output in the QC Chart screen). When the QC data is to be output, the patient record contains nothing, thus an empty patient record is transmitted. Comment record may be omitted.

Table 8: Analysis Results and QC Data

IPU	Direction	Host Computer
ENQ	→	
	←	ACK
H (Header Record)	→	
	←	ACK
P (Patient Record)	→	
	←	ACK
C (Patient Comment Record)	→	
	←	ACK
O (Test Order Record)	→	
	←	ACK
C (Specimen Comment Record)	→	
	←	ACK
R (Result Record)	→	
	←	ACK
L (Message Terminator Record)	→	
	←	ACK
EOT	→	

Repeating the No. of parameters *(bracket around R (Result Record) and its ACK row)*

Note: This table describes the Data Link Layer compatible with the E1381. In case of TCP/IP communication in the ASTM E1381-95, no treatment is performed for ENQ, ACK and EOT codes.

3.3.3 Details of Record
3.3.3.1   Header Record

[Example of transmission]

■ IPU → Host computer

H|\^&|||XT-2000i^00-04^11001^^^^01325318||||||||E1394-97[CR]

■ Host computer → IPU

H|\^&|||||||||||E1394-97[CR]

Table 9: Details of Header Record

ASTM Field	Field Name	IPU → Host	Host → IPU	Max. Size (Bytes)	Remarks
7.1.1	Record type	H	H	1	Fixed
7.1.2	Delimiter definition	|\^&	|\^&	4	Fixed
7.1.3	Message control ID	Not used	Not used	-	
7.1.4	Access password	Not used	Not used	-	
7.1.5	Sender name or ID	Analyzer name^ Software version^ Analyzer serial No.^^^^ PS code	Not used	8^ 13^ 5^^^^ 8	
7.1.6	Sender street address	Not used	Not used	-	
7.1.7	Reserved field	Not used	Not used	-	
7.1.8	Sender Telephone No.	Not used	Not used	-	
7.1.9	Sender characteristics	Not used	Not used	-	
7.1.10	Receiver ID	Not used	Not used	-	
7.1.11	Comment	Not used	Not used	-	
7.1.12	Processing ID	Not used	Not used	-	
7.1.13	ASTM Version No.	E1394-97	E1394-97	8	Fixed
7.1.14	Date and Time of message	Not used	Not used	-	

Detailed Explanation of the fields:

7.1.2   Delimiter definition

"|\^&" is used as a fixed character string. No field delimiter is required between 7.1.1 and 7.1.2

7.1.5   Sender name or ID

Analyzer name is fixed either XT-2000*i* or XT-1800*i*, and software version is referred to the software version the analyzer is working with.

3.3.3.2 Patient Information Record

[Example of transmission]

■ IPU → Host computer

P|1|||123456|^Jim^Brown||20010820|M|||||^Dr. M|||||||||||||^^^West[CR]

■ Host computer → IPU

P|1|||100|^Nancy^Brown||20010820|F|||||^Dr. N|||||||||||||^^^East[CR]

Table 10: Details of Patient Information Record

ASTM Field	Field Name	IPU→Host	Host→IPU	Max. size (Bytes)	Remarks
8.1.1	Record type	P	P	1	Fixed
8.1.2	Sequence No.	Sequence No.	Sequence No.	4	Sequence No. of records
8.1.3	Practice assigned patient ID	Not used	Not used	-	
8.1.4	Laboratory assigned patient ID	Not used	Not used	-	
8.1.5	Patient ID No.	Patient ID	Patient ID	16	
8.1.6	Patient name	^ Given name ^ Family name	^ Given name ^ Family name	^20 ^20	
8.1.7	Mother's maiden name	Not used	Not used	-	
8.1.8	Birth date	YYYYMMDD	YYYYMMDD	8	Ex) 20020802 for 2nd of August 2001
8.1.9	Patient sex	M, F or U	M, F or U	1	Male, Female, or Unknown
8.1.10	Patient race	Not used	Not used	-	
8.1.11	Patient address	Not used	Not used	-	
8.1.12	Reserved	Not used	Not used	-	
8.1.13	Patient telephone No.	Not used	Not used	-	
8.1.14	Attending physician ID	^Physician name	^Physician name	^20	
8.1.15	Special field 1	Not used	Not used	-	
8.1.16	Special field 2	Not used	Not used	-	
8.1.17	Patient height	Not used	Not used	-	
8.1.18	Patient weight	Not used	Not used	-	
8.1.19	Patient's known or suspected diagnosis	Not used	Not used	-	
8.1.20	Patient active medications	Not used	Not used	-	
8.1.21	Patient diet	Not used	Not used	-	
8.1.22	Practice field 1	Not used	Not used	-	
8.1.23	Practice field 2	Not used	Not used	-	
8.1.24	Admission and discharge dates	Not used	Not used	-	
8.1.25	Admission status	Not used	Not used	-	
8.1.26	Location	^^^Ward	^^^Ward	^^^20	
8.1.27	DRG or AVG	Not used	Not used	-	
8.1.28	DRG or AVG 2	Not used	Not used	-	
8.1.29	Patient religion	Not used	Not used	-	
8.1.30	Marital status	Not used	Not used	-	
8.1.31	Isolation status	Not used	Not used	-	
8.1.32	Language	Not used	Not used	-	
8.1.33	Hospital service	Not used	Not used	-	

ASTM Field	Field Name	IPU→Host	Host→IPU	Max. size (Bytes)	Remarks
8.1.34	Hospital institution	Not used	Not used	-	
8.1.35	Dosage category	Not used	Not used	-	

Detailed Explanation of the fields:

8.1.2   Sequence No.

The sequence number starts with 1 and indicates the sequence position in which the record appeared in the message. This number is reset to 1 when a higher-level record appears in the message.

8.1.5   Patient ID No.

The patient ID is a unique patient identification and may contain a maximum of 16 digits of alpha-numerics and a hyphen "-" (2D h).

8.1.6   Patient Name

The first name and the family name may be 20 characters each with consisting of alpha-numerics.

8.1.8   Birth date

The birthrate is the date of birth of the patient, and the date format is fixed with "YYYYMMDD". Here, YYYY indicates the year, MM the month, and DD the day.

8.1.9   Patient Sex

The patient sex is indicated with M, F or U. Here, M indicates male, F female, and U unknown.

8.1.14   Attending Physician ID

The attending physician ID may be entered with a maximum of 20 characters of alpha-numerics.

8.1.26   Location

The patient ward name may be entered a maximum of 20 characters of alpha-numerics.

3.3.3.3   Request Information Record

[Example of transmission]

■ IPU → Host computer

     Q|1|1^1^1234567890^B||||20010905150959[CR]

■ Host computer → IPU

     Not used

Table 11: Details of Request Information Record

ASTM Field	Field Name	IPU→Host	Host→IPU	Max. Size (Bytes)	Remarks
12.1.1	Record Type	Q	Not used	1	Fixed
12.1.2	Sequence No.	Sequence No.	Not used	4	Sequence No. of records
12.1.3	Starting Range ID No.	Rack No.^ Tube position^ Sample No.^ Sample No. attribute	Not used	6^ 2^ 15^ 1	Sample No. attribute is one of followings: M: Manual entry A: Automatic assign- ment by analyzer B: Barcode reader input
12.1.4	Ending Range ID No.	Not used	Not used	-	
12.1.5	Universal test ID	Not used	Not used	-	
12.1.6	Nature of request time limit	Not used	Not used	-	
12.1.7	Beginning request results date and time	YYYYMMDD HHMMSS	Not used	14	
12.1.8	Ending request results date and time	Not used	Not used	-	
12.1.9	Requesting physician name	Not used	Not used	-	
12.1.10	Requesting physician telephone No.	Not used	Not used	-	
12.1.11	User field No. 1	Not used	Not used	-	
12.1.12	User field No. 2	Not used	Not used	-	
12.1.13	Requested information status code	Not used	Not used	-	

Detailed Explanation of the fields:

12.1.2   Sequence No.
The sequence number starts with 1 and indicates the sequence position in which the record appeared in the message. This number is reset to 1 when a higher-level record appears in the message.

12.1.3   Starting Range ID No.

Rack No.		A 6-digit number assigned to the rack. If the rack number entered is less than 6 digits, space padding will not be performed. If the most significant digit is zero such as "000123", zero suppression is performed as "123".
Tube Position No.		The sample position number within a rack, and is one of the numbers 1 through 10.
Sample ID number		Consisted of 15-digit of alpha-numerics and hyphen "-" (2D h). Sample number is space suppressed. In other words, the sample number entered is less than 15 digits, space padding will not be performed. Zero suppression of the leading zeros will not be performed. **Note 1:** In the real time inquiry in the manual mode, the sample number becomes the keyword. Zero will be output for each of the rack number and the tube position number. **Note 2:** In the batch inquiry from the work list, the rack number and the tube position number become the keywords, and no sample number nor the sample number attribute will be output.
Sample No. attribute	M	Sample ID No. is manually entered through the IPU keypad.
	A	Analyzer automatically assigned number and is started with "ERR". This is used when the ID Read Error occurred.
	B	Barcode reader read number

12.1.7   Beginning request result date and time
The date format is fixed with "YYYYMMDDHHMMSS".
Here, YYYY indicates the year, MM the month, DD the day, HH the hour in the 24-hour system (00-23), MM the minute (00-59), and SS the second (00-59).

3.3.3.4   Test Order Record

[Example of transmission]

■ IPU → Host computer

O|1||^^123-4567-890123^B|^^^^
WBC\^^^^RBC\^^^^HGB\^^^^HCT\^^^^MCV\^^^^MCH\^^^^MCHC\^^^^PLT\^^
^^LYMPH%\^^^^MONO%\^^^^NEUT%\^^^^EO%\^^^^BASO%\^^^^LYMPH#\^
^^^MONO#\^^^^NEUT#\^^^^EO#\^^^^BASO#\^^^^RDW-CV\^^^^RDW-SD\^^^^
PDW\^^^^MPV\^^^^P-LCR\^^^^RET%\^^^^RET#\^^^^IRF\^^^^LFR\^^^^MFR\^^
^^HFR\^^^^PCT||||||N|||||||||||||F[CR]

■ Host computer → IPU

O|1|^^123-4567-890123^C||^^^^
WBC\^^^^RBC\^^^^HGB\^^^^HCT\^^^^MCV\^^^^MCH\^^^^MCHC\^^^^PLT\^^
^^LYMPH%\^^^^MONO%\^^^^NEUT%\^^^^EO%\^^^^BASO%\^^^^LYMPH#\^
^^^MONO#\^^^^NEUT#\^^^^EO#\^^^^BASO#\^^^^RDW-CV\^^^^RDW-SD\^^^^
PDW\^^^^MPV\^^^^P-LCR\^^^^RET%\^^^^RET#\^^^^IRF\^^^^LFR\^^^^MFR\^^
^^HFR\^^^^PCT||20010807135909|||||N|||||||||||||Q[CR]

Table 12: Details of Test Order Record

ASTM Field	Field Name	IPU→Host	Host→IPU	Max. Size (Bytes)	Remarks
9.4.1	Record type	O	O	1	Fixed
9.4.2	Sequence No.	Sequence No.	Sequence No.	4	Sequence No. of records
9.4.3	Specimen ID	Not used	Rack No.^ Tube Position^ Sample No.^ Sample No. attribute	6^ 2^ 15^ 1	Sample No. attribute is one of the followings: M: Manual entry W: Work list
9.4.4	Instrument specimen ID	Rack No.^ Tube Position^ Sample No.^ Sample No. attribute	Not used	6^ 2^ 15^ 1	A: Automatic assignment by the analyzer B: Barcode reader C: Assigned by host Computer
9.4.5	Universal Test ID	^^^^Parameter	^^^^Parameter	^^^^6	Test Order of each analysis parameter
9.4.6	Priority	Not used	Not used	-	
9.4.7	Requested/order date and time	Not used	YYYYMMDD HHMMSS	14	
9.4.8	Specimen collection date and time	Not used	Not used	-	
9.4.9	Collection end time	Not used	Not used	-	
9.4.10	Collection volume	Not used	Not used	-	
9.4.11	Collector ID	Not used	Not used	-	
9.4.12	Action code	N, Q	N, Q	1	N: Normal sample Q: QC material
9.4.13	Danger code	Not used	Not used	-	
9.4.14	Relevant clinical information	Not used	Not used	-	
9.4.15	Date/time specimen received	Not used	Not used	-	
9.4.16	Specimen descriptor	Not used	Not used	-	
9.4.17	Ordering	Not used	Not used	-	

ASTM Field	Field Name	IPU→Host	Host→IPU	Max. Size (Bytes)	Remarks
	physician				
9.4.18	Physician's telephone No.	Not used	Not used	-	
9.4.19	User field No. 1	Not used	Not used	-	
9.4.20	User field No. 2	Not used	Not used	-	
9.4.21	Laboratory field No. 1	Not used	Not used	-	
9.4.22	Laboratory field No. 2	Not used	Not used	-	
9.4.23	Date/time results reported or last modified	Not used	Not used	-	
9.4.24	Instrument charge to computer system	Not used	Not used	-	
9.4.25	Instrument section ID	Not used	Not used	-	
9.4.26	Report type	F	Y, Q	1	F: Final results (Fixed) Y: No test order Q: Response to inquiry
9.4.27	Reserved field	Not used	Not used	-	
9.4.28	Location or ward of specimen collected	Not used	Not used	-	
9.4.29	Nosocomial infection flag	Not used	Not used	-	
9.4.30	Material service	Not used	Not used	-	
9.4.31	Material institution	Not used	Not used	-	

Detailed Explanation of the fields:

9.4.2   Sequence No.

The sequence number starts with 1 and indicates the sequence position in which the record appeared in the message. This number is reset to 1 when a higher-level record appears in the message.

9.4.3   Specimen ID

Rack No.	A 6-digit number assigned to the rack. Return the same number that was inquired.
Tube Position No.	The sample position number within a rack, and is one of the number 1 through 10. Return the same number that was inquired.
Sample ID number	Consisted of 15-digit of alpha-numerics and hyphen "-" (2D h). The sample ID number starting with "QC" is reserved for the quality control samples. If the sample number is less than 15 digits, the sample number should be aligned to the right and spaces are padded to the most significant digits.
Sample No. attribute	M Used for the sample ID number entered manually.
	A Used when the analyzer automatically assigned number or when a sample number starting with "ERR" is assigned as the ID Read Error occurred.
	B Used for the sample number read by the barcode reader.
	W Host computer will not use this.
	C Used when the host computer assigns the sample number for the batch inquiry made using the keywords of the rack number and the tube position number.

Note: For the real time inquiry with the keyword of the sample number, please return the same sample number and the sample number attribute as inquired.
For the real time inquiry with the keywords of the rack number and the tube position number, and for the batch inquiry from the work list, please return the sample number specified by the rack number and the tube position number, along with the sample number attribute "C".

9.4.4 Instrument Specimen ID

Rack No.   Is the sample rack number used for analysis, and is a maximum of 6 digits.

Tube Position No.   Is the sample position number in the rack used for analysis, and is one of the numbers 1 through 10.

Sample ID number   There are cases that Barcode read error No., QC sample No., or QC file No. may be set in addition to the usual 15-digit sample ID No.

    Usual sample No.   Consisted of 15-digit alpha-numerics and hyphen "-" (2D h). If the sample number is less than 15 digits, the sample number is aligned to the right and spaces are padded to the most significant digits.

    Barcode read error No. "ERR" is set to the most significant digits and set up to the remaining 12 digits with alpha-numerics and hyphen "-" (2D h).

    QC sample No.   "QC-" is set to the most significant digits and set up to the remaining 12 digits with alpha-numerics and hyphen "-" (2D h). This is also used to output the QC data in real-time.

    QC File No.   QC file No. "1" through "40" or "XbarM" is set, and is used to output the QC data manually. See the Table 13.

Sample No. attribute   M   Used for the Sample ID No. entered manually.
                       A   Used when the analyzer automatically assigned number or when a sample number starting with "ERR" is assigned as the ID Read Error occurred.
                       B   Used for the sample number read by the barcode reader.
                       C   Used when the host computer assigns the sample number.
                       W   Used when the sample number was assigned by the work-list.

Note: In the manual output of the QC data (QC Chart output) the rack number, the tube position number and the sample number attribute will not be output.

Table 13: QC File Number List

Analysis mode	Lot	Control Material	Level	QC File No.
Manual	Current	e-CHECK	Level 1	1
			Level 2	2
			Level 3	3
		Other 1	-	7
		Other 2	-	8
	New	e-CHECK	Level 1	11
			Level 2	12
			Level 3	13
		Other 1	-	17
		Other 2	-	18
Closed	Current	e-CHECK	Level 1	21
			Level 2	22
			Level 3	23
		Other 1	-	27
		Other 2	-	28
	New	e-CHECK	Level 1	31
			Level 2	32
			Level 3	33
		Other 1	-	37
		Other 2	-	38

9.4.5 Universal Test ID
When an order is sent from the host computer to the IPU, set the parameter that is to be ordered. When a multiple parameters are to be set, use a repeat delimiter (\).
For example, ^^^^parameter1\^^^^parameter2\^^^^parameter3

Table 14: Abbreviation of Universal Test ID

Abbreviated parameter name	Parameter name
WBC	Number of all leucocytes
RBC	Number of all erythrocytes
HGB	Hemoglobin concentration
HCT	Hematocrit value: Erythrocytes ratio of total blood volume
MCV	Mean erythrocyte volume in total sample
MCH	Mean hemoglobin volume per RBC
MCHC	Mean hemoglobin concentration of erythrocytes
PLT	Number of all platelets
NEUT%	Neutrophil Percent
LYMPH%	Lymphocyte Percent
MONO%	Monocyte Percent
EO%	Eosinophil Percent
BASO%	Basophil Percent
NEUT#	Neutrophil Count
LYMPH#	Lymphocyte Count
MONO#	Monocyte Count
EO#	Eosinophil Count
BASO#	Basophil Count
RDW-SD	Calculated distribution width of erythrocytes, standard deviation
RDW-CV	Calculated distribution width of erythrocytes, coefficient of variation
PDW	Calculated distribution width of platelets
MPV	Mean platelet volume
P-LCR	Platelet- Large Cell Ratio
PCT	Plateletcrit
RET% (XT-2000*i* only)	Reticulocyte Percent
RET# (XT-2000*i* only)	Reticulocyte Count
IRF (XT-2000*i* only)	Immature Reticulocyte Fraction
LFR (XT-2000*i* only)	Low Fluorescence Ratio
MFR (XT-2000*i* only)	Middle Fluorescence Ratio
HFR (XT-2000*i* only)	High Fluorescence Ratio

When the IPU sends analysis results to the host computer, analyzed parameters are set.

[Analysis parameters are output (analysis results output, QC data real time output)]
WBC, RBC, HGB, HCT, MCV, MCH, MCHC, PLT, RDW-SD, RDW-CV, PDW[*1], MPV, P-LCR[*1], PCT[*1], NEUT#, LYMPH#, MONO#, EO#, BASO#, NEUT%, LYMPH%, MONO%, EO%, BASO%, RET#[*2], RET%[*2], IRF[*2], LFR[*1*2], MFR[*1*2], HFR[*1*2], IG#[*3], IG%[*3], RET-HE[*4]

[When QC chat parameters are output (QC data manual output)]
WBC, RBC, HGB, HCT, MCV, MCH, MCHC, PLT, RDW-SD, RDW-CV, PDW, MPV, P-LCR, PCT, NEUT#, LYMPH#, MONO#, EO#, BASO#, NEUT%, LYMPH%, MONO%, EO%, BASO%, RET#[*2], RET%[*2], IRF[*2], LFR[*2], MFR[*2], HFR[*2], IG#[*3], IG%[*3], RET-HE[*4], BASO-X, BASO-Y, DIFF-X, DIFF-Y, RBC-O[*2], PLT-O[*2], RBC-X[*2], RBC-Y[*2], d-RBC[*2], d-PLT[*2], Dw/X[*2], Dw/Y[*2]

Note that parameters with [*1] will not be used in the North American specifications.
*2 These parameters are not output on the XT-1800*i*.
*3 The XT outputs the measurement result when the XT IG master is installed and a measurement order is given to "NEUT#" or "NEUT%".
*4 The XT outputs the measurement result when the XT RET master is installed and a measurement order is given to "RET#", "RET%", "LFR", "MFR", "HFR" or "IRF".

9.4.7　Requested/Order data and time
　　　　Indicates the date and time of the analysis for the inquired sample.
　　　　Here, YYYY indicates the year, MM the month, DD the day, HH the hour in the 24-hour system
　　　　(00-23), MM the minute (00-59), and SS the second (00-59).

9.4.12　Action Code
　　　　Indicates the contents of the result record sent.
　　　　N　　　　Normal sample
　　　　Q　　　　QC sample

9.4.26　Report Type
　　　　Indicates the report type.
　　　　F　　　　Final result (Fixed. IPU will always output the final results.)
　　　　Y　　　　No test order exists. (Use this when no order exists for the inquiry.)
　　　　Q　　　　Response to the inquiry (Use this when an order exists for the inquiry.)
　　　　Note:　　When there is no order for a sample, such a sample is analyzed by the default order of the
　　　　　　　　analyzer. When "Q" is not set, no order is assumed.

3.3.3.5   Result Record

[Sending and receiving examples]

■ IPU → Host

R|1|^^^^WBC^1|4.60|10*3/uL||N||||||20011116101000[CR]
R|2|^^^^RBC^1|4.85|10*6/uL||A||||||20011116101000[CR]

    …

R|18|^^^^PCT_C(S)?|200|||A||||||20011116101000[CR]

■ Host → IPU

Not used

Table 15: Details of Result Record

ASTM Field	Field Name	IPU→Host	Host→IPU	Max. Size (Bytes)	Remarks
10.1.1	Record type	R	Not used	1	
10.1.2	Sequence No.	Sequence No.	Not used	4	Sequence No. of records
10.1.3	Universal Test ID	^^^^Parameter ^Dilution ratio ^^^Extended order result	Not used	^^^^27 ^1 ^^^1	Dilution ratio is one of followings: 1: Non-capillary mode 5: Capillary mode
10.1.4	Data or measurement value	Value	Not used	-	
10.1.5	Units	Unit	Not used	7	
10.1.6	Reference ranges	Not used	Not used	-	
10.1.7	Result abnormal flags	L, H, >, N, A, W	Not used	1	L: Lower than patient limit H: Higher than patient limit >: Out of linearity range N: Normal A: Analysis error or hardware problem W: Low reliability
10.1.8	Nature of abnormality testing	Not used	Not used	-	
10.1.9	Result status	Not used	Not used	-	
10.1.10	Date of change in instrument normative values	Not used	Not used	-	
10.1.1	Operator identification	Not used	Not used	-	
10.1.2	Date/time test started	Not used	Not used	-	
10.1.13	Date/time test completed	YYYYMMDD HHMMSS	Not used	14	
10.1.14	Instrument identification	Not used	Not used	-	

Detailed Explanation of the fields:

10.1.2   Sequence No.

The sequence number starts with 1 and indicates the sequence position in which the record appeared in the message. This number is reset to 1 when a higher-level record appears in the message.

2.1) Analysis data output

Table 16: Analysis Parameter List

10.1.3 Parameter name	Universal test ID Dilution ratio	Extended order	10.1.4 Data or measurement value *1	10.1.5 Units	10.1.7 Result abnormal flag	10.1.13 Date/time test completed
WBC	1 or 5	W or none	000.00	10*3/uL	L, H, >, N, A or W	YYYYMMDDHHMMSS
RBC	1 or 5	Not used	00.00	10*6/uL	L, H, >, N, A or W	YYYYMMDDHHMMSS
HGB *4	1 or 5	Not used	000.0	g/dL	L, H, >, N, A or W	YYYYMMDDHHMMSS
HCT	1 or 5	Not used	000.0	%	L, H, >, N, A or W	YYYYMMDDHHMMSS
MCV	1 or 5	Not used	000.0	fL	L, H, >, N, A or W	YYYYMMDDHHMMSS
MCH *4	1 or 5	Not used	000.0	pg	L, H, >, N, A or W	YYYYMMDDHHMMSS
MCHC *4	1 or 5	Not used	000.0	g/dL	L, H, >, N, A or W	YYYYMMDDHHMMSS
PLT	1 or 5	W or none	0000	10*3/uL	L, H, >, N, A or W	YYYYMMDDHHMMSS
NEUT%	1 or 5	W or none	000.0	%	L, H, >, N, A or W	YYYYMMDDHHMMSS
LYMPH%	1 or 5	Not used	000.0	%	L, H, >, N, A or W	YYYYMMDDHHMMSS
MONO%	1 or 5	Not used	000.0	%	L, H, >, N, A or W	YYYYMMDDHHMMSS
EO%	1 or 5	Not used	000.0	%	L, H, >, N, A or W	YYYYMMDDHHMMSS
BASO%	1 or 5	Not used	000.0	%	L, H, >, N, A or W	YYYYMMDDHHMMSS
NEUT#	1 or 5	W or none	000.00	10*3/uL	L, H, >, N, A or W	YYYYMMDDHHMMSS
LYMPH#	1 or 5	Not used	000.00	10*3/uL	L, H, >, N, A or W	YYYYMMDDHHMMSS
MONO#	1 or 5	Not used	000.00	10*3/uL	L, H, >, N, A or W	YYYYMMDDHHMMSS
EO#	1 or 5	Not used	000.00	10*3/uL	L, H, >, N, A or W	YYYYMMDDHHMMSS
BASO#	1 or 5	Not used	000.00	10*3/uL	L, H, >, N, A or W	YYYYMMDDHHMMSS
IG% *5	1 or 5	Not used	000.0	%	L, H, >, N, A or W	YYYYMMDDHHMMSS
IG# *5	1 or 5	Not used	000.00	10*3/uL	L, H, >, N, A or W	YYYYMMDDHHMMSS
RDW-SD	1 or 5	Not used	000.0	fL	L, H, >, N, A or W	YYYYMMDDHHMMSS
RDW-CV	1 or 5	Not used	000.0	%	L, H, >, N, A or W	YYYYMMDDHHMMSS
PDW *3	1 or 5	Not used	000.0	fL	L, H, >, N, A or W	YYYYMMDDHHMMSS
MPV	1 or 5	Not used	000.0	fL	L, H, >, N, A or W	YYYYMMDDHHMMSS
P-LCR *3	1 or 5	Not used	000.0	%	L, H, >, N, A or W	YYYYMMDDHHMMSS
PCT *3	1 or 5	Not used	00.00	%	L, H, >, N, A or W	YYYYMMDDHHMMSS
RET% *2	1 or 5	Not used	00.00	%	L, H, >, N, A or W	YYYYMMDDHHMMSS
RET# *2	1 or 5	Not used	0.0000	10*6/uL	L, H, >, N, A or W	YYYYMMDDHHMMSS
IRF *2	1 or 5	Not used	000.0	%	L, H, >, N, A or W	YYYYMMDDHHMMSS
LFR *2 *3	1 or 5	Not used	000.0	%	L, H, >, N, A or W	YYYYMMDDHHMMSS
MFR *2 *3	1 or 5	Not used	000.0	%	L, H, >, N, A or W	YYYYMMDDHHMMSS
HFR *2 *3	1 or 5	Not used	000.0	%	L, H, >, N, A or W	YYYYMMDDHHMMSS
RET-HE *4 *6	1 or 5	Not used	000.0	pg	L, H, >, N, A or W	YYYYMMDDHHMMSS

*1 Data or measurement value indicates the maximum number of digits and placement of the decimal point.
*2 These parameters are not output on the XT-1800*i*.
*3 These parameters are not output in case of the North American specifications.
*4 When using the Dutch SI unit system, data value and the unit are as shown below.

Parameter name	Data or measurement value	Units
HGB	000.0	mmol/L
MCH	0000	amol
MCHC	000.0	mmol/L
RET-HE	0000	amol

*5 The XT outputs the measurement result when the XT IG master is installed and a measurement order is given to "NEUT#" or "NEUT%".
*6 The XT outputs the measurement result when the XT RET master is installed and a measurement order is given to "RET#", "RET%", "LFR", "MFR", "HFR" or "IRF".

10.1.3   Universal Test ID
Parameter name, dilution ratio, and extended order result are output.
Parameter name: Parameter name is output.
Dilution ratio: "1" indicates either Manual mode, Sampler mode, or Closed mode.
                                  "5" indicates capillary mode.
Extended order result: "W" is set when PLT result was obtained from the optical detector.
                                  It is not set on XT-1800*i*.

10.1.4 Data or measurement value

Analysis data of calculation parameter is output. When analysis data is subject to the masking due to the hardware problems, analysis data is masked in the same way that is applied to the IPU display.

"----"   Analysis error or hardware error
"++++"   Overflow from the display range or internal computer range.

10.1.5 Units

Unit for the analysis parameter is output.

10.1.7 Result abnormal flags

Abnormal flags of the analysis result are output.

L   indicates that the result is lower than the normal range.
H   indicates that the result is higher than the normal range.
>   indicates that the result is out of the linearity range.
N   indicates that the result is normal.
A   indicates that the result is abnormal, such as analysis error or hardware error.
W   indicates that the result is flagged with a low reliability mark.

10.1.13 Date/time test completed

Indicates the date and time the test was completed.
Here, YYYY indicates the year, MM the month, DD the day, HH the hour in the 24-hour system (00-23), MM the minute (00-59), and SS the second (00-59).

2.2) QC Chart data output
When QC Chart parameters are output, those parameters that were ordered are output. Each field is set differently due to the contents of transmission.

Table 17: QC Parameter List

10.1.3 Parameter name	Universal test ID Dilution ratio	Extended order	10.1.4 Data or measurement value [*1]	10.1.5 Units	10.1.7 Result abnormal flag	10.1.13 Date/time test completed
WBC	1	Not used	000.00	10*3/uL	N or A	YYYYMMDDHHMMSS
RBC	1	Not used	00.00	10*6/uL	N or A	YYYYMMDDHHMMSS
HGB [*3]	1	Not used	000.0	g/dL	N or A	YYYYMMDDHHMMSS
HCT	1	Not used	000.0	%	N or A	YYYYMMDDHHMMSS
MCV	1	Not used	000.0	fL	N or A	YYYYMMDDHHMMSS
MCH [*3]	1	Not used	000.0	pg	N or A	YYYYMMDDHHMMSS
MCHC [*3]	1	Not used	000.0	g/dL	N or A	YYYYMMDDHHMMSS
PLT	1	Not used	0000	10*3/uL	N or A	YYYYMMDDHHMMSS
NEUT%	1	Not used	000.0	%	N or A	YYYYMMDDHHMMSS
LYMPH%	1	Not used	000.0	%	N or A	YYYYMMDDHHMMSS
MONO%	1	Not used	000.0	%	N or A	YYYYMMDDHHMMSS
EO%	1	Not used	000.0	%	N or A	YYYYMMDDHHMMSS
BASO%	1	Not used	000.0	%	N or A	YYYYMMDDHHMMSS
NEUT#	1	Not used	000.00	10*3/uL	N or A	YYYYMMDDHHMMSS
LYMPH#	1	Not used	000.00	10*3/uL	N or A	YYYYMMDDHHMMSS
MONO#	1	Not used	000.00	10*3/uL	N or A	YYYYMMDDHHMMSS
EO#	1	Not used	000.00	10*3/uL	N or A	YYYYMMDDHHMMSS
BASO#	1	Not used	000.00	10*3/uL	N or A	YYYYMMDDHHMMSS
IG% [*4]	1	Not used	000.0	%	N or A	YYYYMMDDHHMMSS
IG# [*4]	1	Not used	000.00	10*3/uL	N or A	YYYYMMDDHHMMSS
RDW-SD	1	Not used	000.0	fL	N or A	YYYYMMDDHHMMSS
RDW-CV	1	Not used	000.0	%	N or A	YYYYMMDDHHMMSS
PDW	1	Not used	000.0	fL	N or A	YYYYMMDDHHMMSS
MPV	1	Not used	000.0	fL	N or A	YYYYMMDDHHMMSS
P-LCR	1	Not used	000.0	%	N or A	YYYYMMDDHHMMSS
PCT	1	Not used	00.00	%	N or A	YYYYMMDDHHMMSS
RET% [*2]	1	Not used	00.00	%	N or A	YYYYMMDDHHMMSS
RET# [*2]	1	Not used	0.0000	10*6/uL	N or A	YYYYMMDDHHMMSS
IRF [*2]	1	Not used	000.0	%	N or A	YYYYMMDDHHMMSS
LFR [*2]	1	Not used	000.0	%	N or A	YYYYMMDDHHMMSS
MFR [*2]	1	Not used	000.0	%	N or A	YYYYMMDDHHMMSS
HFR [*2]	1	Not used	000.0	%	N or A	YYYYMMDDHHMMSS
RET-HE [*3][*5]	1	Not used	000.0	pg	N or A	YYYYMMDDHHMMSS
BASO-X	1	Not used	000.0	ch	N or A	YYYYMMDDHHMMSS
BASO-Y	1	Not used	000.0	ch	N or A	YYYYMMDDHHMMSS
DIFF-X	1	Not used	000.0	ch	N or A	YYYYMMDDHHMMSS
DIFF-Y	1	Not used	000.0	ch	N or A	YYYYMMDDHHMMSS
RBC-O [*2]	1	Not used	00.00	10*6/uL	N or A	YYYYMMDDHHMMSS
PLT-O [*2]	1	Not used	0000	10*3/uL	N or A	YYYYMMDDHHMMSS
RBC-X [*2]	1	Not used	000.0	ch	N or A	YYYYMMDDHHMMSS
RBC-Y [*2]	1	Not used	000.0	ch	N or A	YYYYMMDDHHMMSS
d-RBC [*2]	1	Not used	000.0	%	N or A	YYYYMMDDHHMMSS
d-PLT [*2]	1	Not used	000.0	%	N or A	YYYYMMDDHHMMSS
Dw/X [*2]	1	Not used	000.0	%	N or A	YYYYMMDDHHMMSS
Dw/Y [*2]	1	Not used	000.0	%	N or A	YYYYMMDDHHMMSS

*1 Data or measurement value indicates the maximum number of digits and placement of the decimal point.
*2 These parameters are not output on the XT-1800*i*.
*3 When using the Dutch SI unit system, data value and the unit are as shown below.

Parameter name	Data or measurement value	Units
HGB	000.0	mmol/L
MCH	0000	amol
MCHC	000.0	mmol/L
RET-HE	0000	amol

*4 The XT outputs the measurement result when the XT IG master is installed.
*5 The XT outputs the measurement result when the XT RET master is installed.

10.1.3   Universal Test ID
Parameter name: QC parameter name is output.
Dilution ratio: Fixed to "1".
Extended order result: Not used.

10.1.4   Data or measurement value
QC parameter is output. When QC data is subject to the masking due to the hardware problems, QC data is masked in the same way that is applied to the IPU display.
"----"   Analysis error or hardware error
"++++"   Overflow from the display range or internal computer range.

10.1.5   Units
Unit for the QC parameter is output.

10.1.7   Result abnormal flags
Abnormal flags of the QC data are output.
N   indicates that the result is normal.
A   indicates that the result is abnormal, such as analysis error or hardware error.

10.1.13 Date/time test completed
Indicates the date and time the QC analysis was completed.
Here, YYYY indicates the year, MM the month, DD the day, HH the hour in the 24-hour system (00-23), MM the minute (00-59), and SS the second (00-59).

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2.3) Abnormal IP Message output
Only those parameters with IP Messages are output.

Table 18: Abnormal IP Message List

10.1.3 Parameter name	Universal test ID		10.1.4 Data or measurement value	10.1.5 Units	10.1.7 Result abnormal flag	10.1.13 Date/time test completed
	Dilution ratio	Extended order				
WBC_Abn_Scattergram	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Neutropenia	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Neutrophilia	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Lymphopenia	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Lymphocytosis	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Leukocytopenia	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Leukocytosis	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Monocytosis	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Eosinophilia	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Basophilia	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
IG_Present [2]	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
RBC_Abn_Distribution	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Dimorphic_Population	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Anisocytosis	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Microcytosis	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Macrocytosis	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Hypochromia	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Anemia	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Erythrocytosis	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
RET_Abn_Scattergram [1]	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Reticulocytosis [1]	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
PLT_Abn_Scattergram [1]	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
PLT_Abn_Distribution	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Thrombocytopenia	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Thrombocytosis	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS

*1 These parameters are not used on the XT-1800*i*.
*2 This item is output when the XT IG master is installed.

10.1.3   Universal Test ID
Parameter name: IP message is output.
Dilution ratio: Not used.
Extended order result: Not used.

10.1.4   Data or measurement value
Not used.

10.1.5   Units
Not used.

10.1.7   Result abnormal flags
A   indicates that the IP message is flagged.

10.1.13 Date/time test completed
Indicates the date and time the analysis was completed.
Here, YYYY indicates the year, MM the month, DD the day, HH the hour in the 24-hour system (00-23), MM the minute (00-59), and SS the second (00-59).

2.4) Suspect IP Message output
Only those parameters with Suspect IP message are output when the Q-Flag grade value is within the range.

Table 19: Suspect IP Message List

10.1.3 Parameter name	Universal test ID Dilution ratio	Extended order	10.1.4 Data or measurement value [*1]	10.1.5 Units	10.1.7 Result abnormal flag	10.1.13 Date/time test completed
Blasts?	Not used	Not used	000	Not used	A or none	YYYYMMDDHHMMSS
Immature_Gran?	Not used	Not used	000	Not used	A or none	YYYYMMDDHHMMSS
Left_Shift?	Not used	Not used	000	Not used	A or none	YYYYMMDDHHMMSS
NRBC?	Not used	Not used	000	Not used	A or none	YYYYMMDDHHMMSS
Atypical_Lympho?	Not used	Not used	000	Not used	A or none	YYYYMMDDHHMMSS
RBC_Lyse_Resistance?	Not used	Not used	000	Not used	A or none	YYYYMMDDHHMMSS
Abn_Lympho/Blasts?	Not used	Not used	000	Not used	A or none	YYYYMMDDHHMMSS
RBC_Agglutination?	Not used	Not used	000	Not used	A or none	YYYYMMDDHHMMSS
Turbidity/HGB_Interference?	Not used	Not used	000	Not used	A or none	YYYYMMDDHHMMSS
Iron_Deficiency?	Not used	Not used	000	Not used	A or none	YYYYMMDDHHMMSS
HGB_Defect?	Not used	Not used	000	Not used	A or none	YYYYMMDDHHMMSS
Fragments?	Not used	Not used	000	Not used	A or none	YYYYMMDDHHMMSS
PLT_Clumps?	Not used	Not used	000	Not used	A or none	YYYYMMDDHHMMSS
PLT_Clumps(S)?	Not used	Not used	000	Not used	A or none	YYYYMMDDHHMMSS

*1 Data or measurement value indicates the maximum number of digits.

10.1.3   Universal Test ID
Parameter name: IP message is output.
Dilution ratio: Not used.
Extended order result: Not used.

10.1.4   Data or measurement value
The Q-Flag grade value of 0 to 300 is output.

10.1.5   Units
Not used.

10.1.7   Result abnormal flags
A   indicates that the IP message is flagged.

10.1.13   Date/time test completed
Indicates the date and time the analysis was completed.
Here, YYYY indicates the year, MM the month, DD the day, HH the hour in the 24-hour system (00-23), MM the minute (00-59), and SS the second (00-59).

2.5) Action Message output
  Action message is output.

Table 20: Action Message List

10.1.3 Parameter name	Universal test ID Dilution ratio	Extended order	10.1.4 Data or measurement value	10.1.5 Units	10.1.7 Result abnormal flag	10.1.13 Date/time test completed
ACTION_MESSAGE_RET [*1]	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
ACTION_MESSAGE_Delta	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS

*1: These parameters are not used on the XT-1800*i*.

10.1.3   Universal Test ID
  Parameter name: Action message is output.
                           "ACTION_MESSAGE_RET"   Re-analyze Ret.
                           "ACTION_MESSAGE_Delta"   Delta Check Error
  Dilution ratio: Not used.
  Extended order result: Not used.

10.1.4   Data or measurement value
  Not used.

10.1.5   Units
  Not used.

10.1.7   Result abnormal flags
  A   indicates that the action message is flagged.

10.1.13 Date/time test completed
  Indicates the date and time the analysis was completed.
  Here, YYYY indicates the year, MM the month, DD the day, HH the hour in the 24-hour system
  (00-23), MM the minute (00-59), and SS the second (00-59).

2.6) Positive/Error output

Positive/Error information is output.

Table 21: Positive and Error Information List

10.1.3 Parameter name	Universal test ID Dilution ratio	Extended order	10.1.4 Data or measurement value	10.1.5 Units	10.1.7 Result abnormal flag	10.1.13 Date/time test completed
Positive_Diff	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Positive_Morph	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Positive_Count	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Error_Func	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS
Error_Result	Not used	Not used	Not used	Not used	A	YYYYMMDDHHMMSS

10.1.3　Universal Test ID

Parameter name:　　Positive/Error information is output.

"Positive_Diff"　　indicates that the differential value has an abnormality.

"Positive_Morph"　indicates that the cell morphology has an abnormality.

"Positive_Count"　indicates that the count value has an abnormality.

"Error_Func"　　indicates an analysis error other than ID read error occurred.

"Error_Result"　　indicates one of analysis errors "Blood not asp.", "Short sample", or "Low count" occurred.

Dilution ratio:　　Not used.

Extended order result:　Not used.

10.1.4　Data or measurement value

Not used.

10.1.5　Units

Not used.

10.1.7　Result abnormal flags

A　　indicates that a Positive or Error is flagged.

10.1.13　Date/time test completed

Indicates the date and time the analysis was completed.

Here, YYYY indicates the year, MM the month, DD the day, HH the hour in the 24-hour system (00-23), MM the minute (00-59), and SS the second (00-59).

2.7) Output of File path to image data
   When image data exists, the file path to the image data is output.

Table 22: Scattergram Information List

| 10.1.3 Parameter name | Universal test ID | | 10.1.4 Data or measurement value | 10.1.5 Units | 10.1.7 Result abnormal flag | 10.1.13 Date/time test completed |
	Dilution ratio	Extended order				
SCAT_DIFF	Not used	Not used	File path	Not used	N	YYYYMMDDHHMMSS
SCAT_WBC/BASO	Not used	Not used	File path	Not used	N	YYYYMMDDHHMMSS
SCAT_RET *1	Not used	Not used	File path	Not used	N	YYYYMMDDHHMMSS
SCAT_PLT-O *1	Not used	Not used	File path	Not used	N	YYYYMMDDHHMMSS
DIST_RBC	Not used	Not used	File path	Not used	N	YYYYMMDDHHMMSS
DIST_PLT	Not used	Not used	File path	Not used	N	YYYYMMDDHHMMSS

*1: These parameters are not used on the XT-1800*i*.

10.1.3   Universal Test ID
   Parameter name: Type of image data set in the "data or measurement value" is output.
                         "SCAT_DIFF"   DIFF scattergram image data
                         "SCAT_WBC/BASO"   WBC/BASO scattergram image data
                         "SCAT_RET"   RET scattergram image data
                         "SCAT_PLT-O"   PLT-O scattergram image data
                         "DIST_RBC"   RBC histogram data
                         "DIST_PLT"   PLT histogram data
   Dilution ratio: Not used.
   Extended order result: Not used.

10.1.4   Data or measurement value
   The file path to the image data is output. The symbol "\" used in the file path is converted to the escape sequence "&R&" to output. The actual image data is written in the folder "C:\shared\PNG\YYYYMMDD" folder, where YYYYMMDD is the calendar date when the data is obtained. Data value is output with the "PNG" and following path. The filename is determined with the date (date format is fixed with YYYYMMDD), sample ID number and type of image data.
   [Example] "PNG&R&20030930&R&2003_09_30_12_00_1234567890_DIFF.PNG"

   In this case, the image data file is stored in the folder C:\Sahred\PNG\20030930 with the filename 2003_09_30_12_00_1234567890_DIFF.PNG.
   The image data is kept stored for total 3 days including the today's data.

10.1.5   Units
   Not used.

10.1.7   Result abnormal flag
   "N" is always output.

10.1.13 Date/time test completed
   Indicates the date and time the analysis was completed.
   Here, YYYY indicates the year, MM the month, DD the day, HH the hour in the 24-hour system (00-23), MM the minute (00-59), and SS the second (00-59).

3.3.3.6   Comment Record
[Example of transmission]
■ IPU → Host computer
        C|1||patient comments[CR]
■ Host computer → IPU
        C|1||patient comments[CR]

Table 23: Details of Comment Record

ASTM Field	Field Name	IPU→Host	Host→IPU	Max. Size (Bytes)	Remarks
11.1.1	Record type	C	C	1	
11.1.2	Sequence No.	Sequence No.	Sequence No.	4	Sequence No. of records
11.1.3	Comment source	Not used	Not used	-	
11.1.4	Comment text	Comments	Comments	100: Patient comments 40: Specimen comments	Patient comments Specimen comments
11.1.5	Comment type	Not used	Not used	-	

Detailed Explanation of the fields:
11.1.2   Sequence No.
        The sequence number starts with 1 and indicates the sequence position in which the record appeared in
        the message. This number is reset to 1 when a higher-level record appears in the message.

11.1.4   Comment text
        For the Comment Record following the Patient Information Record:
            This contains the patient comments, and could include a maximum of 100 alpha-numeric
            characters.
        For the Comment Record following the Test Order Record:
            This contains the specimen comments, and could include a maximum of 40 alpha-numeric
            characters.

3.3.3.7   Message Terminator Record

[Sending and receiving examples]

■ IPU → Host computer

   L|1|N[CR]

■ Host computer → IPU

   L|1|N[CR]

Table 24: Message Terminator Record

ASTM Field	Field Name	IPU→Host	Host→IPU	Max. Size (Bytes)	Remarks
13.1.1	Record type	L	L	1	Fixed
13.1.2	Sequence No.	1	1	4	Always 1.
13.1.3	Terminator code	N	N	1	N: Normal termination

4. Examples of Communication

4.1 Inquiry of Analysis Order (IPU → Host Computer)

4.1.1   In the batch inquiry from the work list:

IPU	`<ENQ>`
HC	`<ACK>`
IPU	`<STX>1H|\^&|||XT-2000i^00-01^11001^^^^12345678|||||||| E1394-97<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>2Q|1|2^1||||20011001153000 <CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>3L|1|N<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<EOT>`

4.1.2   In the real time inquiry for the manual mode analysis:

IPU	`<ENQ>`
HC	`<ACK>`
IPU	`<STX>1H|\^&|||XT-2000i^00-01^11001^^^^12345678|||||||| E1394-97<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>2Q|1|^^1234567890^B||||20011001153000 <CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>3L|1|N<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<EOT>`

4.1.3   In the real time inquiry for the sampler mode analysis:

IPU	`<ENQ>`
HC	`<ACK>`
IPU	`<STX>1H|\^&|||XT-2000i^00-01^11001^^^^12345678|||||||| E1394-97<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>2Q|1|2^1^1234567890^B||||20011001153000 <CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>3L|1|N<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<EOT>`

4.2 Analysis Information (Host Computer → IPU)

4.2.1   When an Analysis Order exists:

HC	`<ENQ>`
IPU	`<ACK>`
HC	`<STX>1H|\^&||||||||||||E1394-97<CR><ETX><CHK1><CHK2><CR><LF>`
IPU	`<ACK>`
HC	`<STX>2P|1|||100|^Jim^Brown||20010820|M|||||^Dr.1` `||||||||||||^^^WEST<CR><ETX><CHK1><CHK2><CR><LF>`
IPU	`<ACK>`
HC	`<STX>3C|1||patient_comments<CR><ETX><CHK1><CHK2><CR><LF>`
IPU	`<ACK>`

HC	`<STX>4`
	`O|1|2^1^    1234567890^B||^^^^WBC\^^^^RBC\^^^^HGB`
	`\^^^^HCT\^^^^MCV\^^^^MCH\^^^^MCHC\^^^^PLT\^^^^NEUT`
	`%\^^^^LYMPH%\^^^^MONO%\^^^^EO%\^^^^BASO%\^^^^NEUT#`
	`\^^^^LYMPH#\^^^^MONO#\^^^^EO#\^^^^BASO#\^^^^RDW-SD`
	`\^^^^RDW-CV\^^^^PDW\^^^^MPV\^^^^P-LCR\^^`
	`<ETB><CHK1><CHK2><CR><LF>`

IPU	`<ACK>`

HC	`<STX>5`
	`^^PCT||20010807101000|||||N||||||||||||||Q<CR>`
	`<ETX><CHK1><CHK2><CR><LF>`

IPU	`<ACK>`
HC	`<STX>6C|1||specimen_comments<CR><ETX><CHK1><CHK2><CR><LF>`
IPU	`<ACK>`
HC	`<STX>7L|1|N<CR><ETX><CHK1><CHK2><CR><LF>`
IPU	`<ACK>`
HC	`<EOT>`

4.2.2   When no Analysis Order exists:

HC	`<ENQ>`
IPU	`<ACK>`
HC	`<STX>1H|\^&||||||||||||E1394-97<CR><ETX><CHK1><CHK2><CR><LF>`
IPU	`<ACK>`
HC	`<STX>2P|1<CR><ETX><CHK1><CHK2><CR><LF>`
IPU	`<ACK>`

HC	`<STX>3O|1|`
	`2^1^    1234567890^B||||20010910101000|||||||||||||||||||||Y<CR>`
	`<ETX><CHK1><CHK2><CR><LF>`

IPU	`<ACK>`
HC	`<STX>4L|1|N<CR><ETX><CHK1><CHK2><CR><LF>`
IPU	`<ACK>`
HC	`<EOT>`

4.3 Analysis Results and QC Results (IPU → Host Computer)
4.3.1   Transmitting Analysis Results:

IPU	`<ENQ>`
HC	`<ACK>`
IPU	`<STX>1H|\^&|||XT-2000i^00-01^11001^^^^12345678||||||||` `E1394-97<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>2P|1|||100|^Jim^Brown||20010820|M|||||^Dr.1` `||||||||||||^^^WEST<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>3C|1||patient_comments<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`

IPU	`<STX>4`
	`O|1||2^1^    1234567890^B|^^^^WBC\^^^^RBC\^^^^HGB`
	`\^^^^HCT\^^^^MCV\^^^^MCH\^^^^MCHC\^^^^PLT\^^^^NEUT`
	`%\^^^^LYMPH%\^^^^MONO%\^^^^EO%\^^^^BASO%\^^^^NEUT#`
	`\^^^^LYMPH#\^^^^MONO#\^^^^EO#\^^^^BASO#\^^^^RDW-SD`
	`\^^^^RDW-CV\^^^^PDW\^^^^MPV\^^^^P-LCR\^^`
	`<ETB><CHK1><CHK2><CR><LF>`

	HC

IPU	`<STX>5`
	`^^PCT|||||||N|||||||||||||Q<CR>`
	`<ETX><CHK1><CHK2><CR><LF>`

HC	`<ACK>`
IPU	`<STX>6C|1||specimen_comments<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>7R|1|^^^^WBC^1^^^W|7.81|10*3/uL||N|||||20010806120000<CR>` `<ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>0R|2|^^^^RBC^1|----|10*6/uL||A|||||20010806120000<CR>` `<ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>1R|3|^^^^HGB^1|20.5|g/dL||W|||||20010806120000<CR>` `<ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>2R|4|^^^^HCT^1|40.3|%||W|||||20010806120000<CR>` `<ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
	(Omitted)
IPU	`<STX>7R|33|^^^^PLT_Abn_Distribution||||A|||||20010806120000` `<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>0R|34|^^^^Blasts?|0||||||||||20010806120000<CR>` `<ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>1R|35|^^^^Immature_Gran?|40||||||||||20010806120000` `<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>2R|36|^^^^Left_Shift?|0||||||||||20010806120000` `<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>3R|37|^^^^Atypical_Lympho?|0||||||||||20010806120000` `<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>4R|38|^^^^RBC_Lyse_Resistance?|10||||||||||20010806120000` `<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>5R|39|^^^^Abn_Lympho/Blasts?|100|||A||||||20010806120000` `<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
	(Omitted)
IPU	`<STX>4R|46|^^^^ACTION_MESSAGE_Delta||||A<CR><ETX><CHK1><CHK2>` `<CR><LF>`
HC	`<ACK>`

IPU	`<STX>5R|47|^^^^SCAT_DIFF|PNG&R&20010806&R&2001_08_06_`
	`12_00_1234567890_DIFF.PNG|||N||||||20010806120000`
	`<CR><ETX><CHK1><CHK2><CR><LF>`

HC	`<ACK>`
	(Omitted)
IPU	`<STX>5L|1|N<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<EOT>`

4.3.2 Transmitting QC Result in real-time mode:

IPU	`<ENQ>`
HC	`<ACK>`
IPU	`<STX>1H|\^&|||XT-2000i^00-01^11001^^^^12345678||||||||` `E1394-97<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>2P|1<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`

IPU	`<STX>3`
	`O|1||^^   QC-12345678^B|^^^^WBC\^^^^RBC\^^^^HGB`
	`\^^^^HCT\^^^^MCV\^^^^MCH\^^^^MCHC\^^^^PLT\^^^^NEUT`
	`%\^^^^LYMPH%\^^^^MONO%\^^^^EO%\^^^^BASO%\^^^^NEUT#`
	`\^^^^LYMPH#\^^^^MONO#\^^^^EO#\^^^^BASO#\^^^^RDW-SD`
	`\^^^^RDW-CV\^^^^PDW\^^^^MPV\^^^^P-LCR\^^^^`
	`<ETB><CHK1><CHK2><CR><LF>`

HC	`<ACK>`

IPU	`<STX>4`
	`PCT|||||||Q|||||||||||||F<CR>`
	`<ETX><CHK1><CHK2><CR><LF>`

HC	`<ACK>`
IPU	`<STX>5R|1|^^^^WBC^1|7.58|10*3/uL||N||||||20010806120000<CR>` `<ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>6R|2|^^^^RBC^1|4.49|10*6/uL||N||||||20010806120000<CR>` `<ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>7R|3|^^^^HGB^1|13.3|g/dL||N||||||20010806120000<CR>` `<ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>0R|4|^^^^HCT^1|37.3|%||N||||||20010806120000<CR>` `<ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
	(Omitted)

IPU	`<STX>5R|33|^^^^SCAT_DIFF|PNG&R&20010806&R&2001_08_06_12_00_1234`
	`567890_DIFF.PNG|||N||||||`
	`20010806120000<CR><ETX><CHK1><CHK2><CR><LF>`

HC	`<ACK>`
	(Omitted)
IPU	`<STX>1L|1|N<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<EOT>`

4.3.3 Transmitting QC Result in a manual batch mode:

IPU	`<ENQ>`
HC	`<ACK>`
IPU	`<STX>1H|\^&|||XT-2000i^00-01^11001^^^^12345678|||||||||` `E1394-97<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>2P|1<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`

IPU	`<STX>3`
	`O|1||^^1|^^^^WBC\^^^^RBC\^^^^HGB\^^^^HCT\^^^^MCV\^`
	`^^^MCH\^^^^MCHC\^^^^PLT\^^^^NEUT%\^^^^LYMPH%\^^^^M`
	`ONO%\^^^^EO%\^^^^BASO%\^^^^NEUT#\^^^^LYMPH#\^^^^MO`
	`NO#\^^^^EO#\^^^^BASO#\^^^^RDW-SD\^^^^RDW-CV\^^^^PD`
	`W\^^^^MPV\^^^^P-LCR\^^^^PCT\DIFF-X\DIFF-`
	`<ETB><CHK1><CHK2><CR><LF>`

HC	`<ACK>`

IPU	`<STX>4`
	`Y\DIFF-WBC|||||||Q|||||||||||||||F<CR>`
	`<ETX><CHK1><CHK2><CR><LF>`

HC	`<ACK>`
IPU	`<STX>5R|1|^^^^WBC^1|7.58|10*3/uL||N||||||20010806120000<CR>` `<ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>6R|2|^^^^RBC^1|4.49|10*6/uL||N||||||20010806120000<CR>` `<ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>7R|3|^^^^HGB^1|13.3|g/dL||N||||||20010806120000<CR>` `<ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<STX>0R|4|^^^^HCT^1|37.3|%||N||||||20010806120000<CR>` `<ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
	(Omitted)
IPU	`<STX>0L|1|N<CR><ETX><CHK1><CHK2><CR><LF>`
HC	`<ACK>`
IPU	`<EOT>`

Appendix A.   TCP/IP Communication

A.1   Network interface layer
The network interface conforms to IEEE802.3.
Communication is performed by 10Base-T.
The RJ45 socket is used in a hub to connect with the IPU of XT-2000*i* or XT-1800*i*.
The cable of UTP category 5 should be used for communication.

A.2   TCP/IP
The IP address of the IPU for XT-2000*i* or XT-1800*i* is fixed. The default value is 192.168.28.150. When this value is to be changed, please contact a Sysmex service representative.

The IP address for the host computer can be set using the setting screen in the IPU of XT-2000*i*'s or XT-1800*i*. This IP address is fixed but can be changed by the setting screen in the IPU. The IP address may be selected other than "192.168.28.*" that is used to communicate with the IPU of the analyzer.

The TCP port number of the IPU of XT-2000*i*'s or XT-1800*i* for host communication is fixed. The default value is 5000. This value may be changed in the IPU setting screen.

A.3   Transmission timing
The transmission timing can be selected by the IPU setting screen; either transmission upon completion of each analysis, or batch transmission from the stored data.

A.4   Transmission Messages
In case of ASTM E 1381-95 mode, based on the TCP/IP protocol, records defined by the presentation layer are transmitted to exchange messages. When transmitting, TCP connection has to be established. If not established, the IPU will start communication session in prior to the transmission. Messages exchanged are the records defined in the presentation layer, as listed in the following example.

(Example)   Real-Time Inquiry:

IPU→HC	`H|\^&|||XT-2000i^00-01^11001^^^^12345678||||||||E1394-97<CR>`
	`Q|1|2^1^1234567890^B||||20011001153000<CR>`
	`L|1|N<CR>`

HC→IPU	`H|\^&||||||||||||E1394-97<CR>`
	`P|1|||100|^Jim^Brown||20010820|M|||||^Dr.`
	`1||||||||||||^^^WEST<CR>`
	`C|1||patient_comments<CR>`
	`O|1|2^1^      1234567890^B||^^^^WBC\^^^^RBC\^^^^HGB`
	`\^^^^HCT\^^^^MCV\^^^^MCH\^^^^MCHC\^^^^PLT\^^^^NEUT`
	`%\^^^^LYMPH%\^^^^MONO%\^^^^EO%\^^^^BASO%\^^^^NEUT#`
	`\^^^^LYMPH#\^^^^MONO#\^^^^EO#\^^^^BASO#\^^^^RDW-SD`
	`\^^^^RDW-CV\^^^^PDW\^^^^MPV\^^^^P-LCR\^^^^PCT\\||200`
	`10807101000|||||N|||||||||||||||Q<CR>`
	`C|1||specimen_comments<CR>`
	`L|1|N<CR>`

Note: The <CR> symbol indicates a carriage return code (0D h), and any place where a word is intentionally wrapped does not have a carriage return code.

In case of ASTM E 1381-02 mode:
The record defined in the presentation layer is exchanged, according to the transmission protocol based on the Section "3.2 Data Link Layer". In prior to the data exchange, the TCP connection has to be established. If not, the IPU will automatically start session in prior to the data exchange. Refer to the Section "4: Example of Communication" of this document for the examples of the communication control procedures.

[end of document]