

U-WAM-LIS Transport Information ASTM Host Interface Specifications

Revision 4.0

Sysmex Corporation

Revision History

Revision	Date	Major Contents of Changes
1.00	December 26, 2016	Initial version
2.00	May 17, 2017	<ul style="list-style-type: none"> · 1 Scope An error description (incorrect description of the ASTM-related specifications) was deleted. · 2 General An error description (incorrect XN-9000-related description) was deleted. · 4 Communication Specifications An error description (incorrect description of the ASTM-related specifications) was deleted. · 4.2.2 Establishment Phase An error description (time required until [ENQ] signal is transmitted after the receiver responded [NAK] signal - 10 sec, or more 10 sec) was corrected. · 4.2.3 Transfer Phase An error description (maximum number of characters in each frame) was corrected: With frame overhead 64000 247 Without frame overhead 63993 240 · 4.3.1.2 Records An error description was corrected (records that will not be used were stated). · 4.3.3.3 Test Order Record An error description was corrected (fields that will not be used were stated).
3.00	January 21, 2019	<ul style="list-style-type: none"> · 4.3.3 Details of Record An error description was corrected (Sample No. attribute always sets B).
4.00	September 29, 2021	<ul style="list-style-type: none"> · 4.3.3.2 Patient Information Record Added patient record details.

1	Scope	4
2	General	5
3	Terminology	5
4	Communication Specifications	6
4.1	Physical Layer (Hardware)	7
4.1.1	TCP/IP Connection	7
4.2	Data Link Layer (Transmission Protocol)	7
4.2.1	Communication Status	7
4.2.2	Establishment Phase	8
4.2.3	Transfer Phase	9
4.2.4	Termination Phase	10
4.2.5	Timeout	10
4.3	Presentation Layer	11
4.3.1	Messages, Records and Fields	11
4.3.2	Communication Protocol	13
4.3.3	Details of Record	15
5	Examples of Communication	25
5.1	Transportation Order Inquiry (U-WAM→Host computer)	25
5.1.1	When a Transportation Order Inquiry (sample exists in Pos1 and Pos3)	25
5.2	Transportation Order Information (Host Computer → U-WAM)	26
5.2.1	When a Transportation Order exists	26
5.2.2	When no Transportation Order exists	27

1 Scope

This document is intended to supply the information that the U-WAM communicates with the host computer using ASTM protocol.

ASTM (the American 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 E1381-02

Specifications for low-level protocols to transfer data between clinical laboratory instruments and computer systems.

ASTM E1394-97

Standard specifications for transferring data between clinical instruments and computer systems.

<p>Note:</p>

<p>The U-WAM supports only the Ethernet connection.</p>

2 General

U-WAM issues transfer destination queries to the host computer for samples set in sample racks, and receives transfer destination information.

3 Terminology

(1) Numerics:

Indicates ASCII codes “0” (30H) through “9” (39H)

(2) Alphabet:

Indicates ASCII codes “A” (41H) through “Z” (5AH) and “a” (61H) through “z” (7AH)

(3) “*”

Indicates ASCII codes “*” (2AH)

(4) “△”

Indicates ASCII codes “ ” (20H)

(5) “_”

Indicates ASCII codes “-” (2DH)

4 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 mechanical and electrical connections. See the section “4.1 Physical layer (hardware)”.
- (2) **Data link layer**
Specifies the sending and receiving of data by link connections and for each frame between the CP-90 and the host computer. See the section “4.2 Data Link Layer (Transmission Protocol)”.
- (3) **Presentation layer**
Specifies the messages that are sent and received by the IPU and the host computer. See the section “4.3 Presentation layer”.

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

4.1 Physical Layer (Hardware)

4.1.1 TCP/IP Connection

TCP/IP connection conforms to IEEE802.3u. The communication cable uses UTP Category 5 or higher cable.

Prepare the connector and cable which apply to the TCP/IP connector of the U-WAM.

4.2 Data Link Layer (Transmission Protocol)

The data link layer transfers data between systems using a character-based protocol in accordance with ASTM E1381-02 "6. Data Link Layers". This section briefly describes communication control procedures. For details, refer to ASTM E1381-02.

When the ASTM E1381-02 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 U-WAM acts as a client. The U-WAM establishes a connection by requesting a connection for the IP address and the port number that are provided by the host computer.

4.2.1 Communication Status

The data link layer is consisted of following two state.

- (1) Neutral Status
- (2) Linked Status

Transition to each status is accomplished through the following three phases.

(1) Establishment Phase

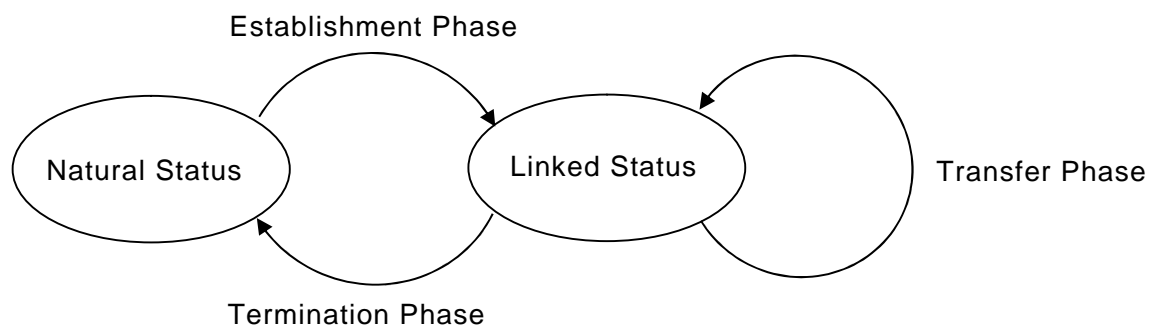
Establishes a communication line, and determines the direction of data transfer. In this way, the sender and the receiver are identified, and the change is made from neutral status to linked status.

(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 the receiver from linked status to neutral status.

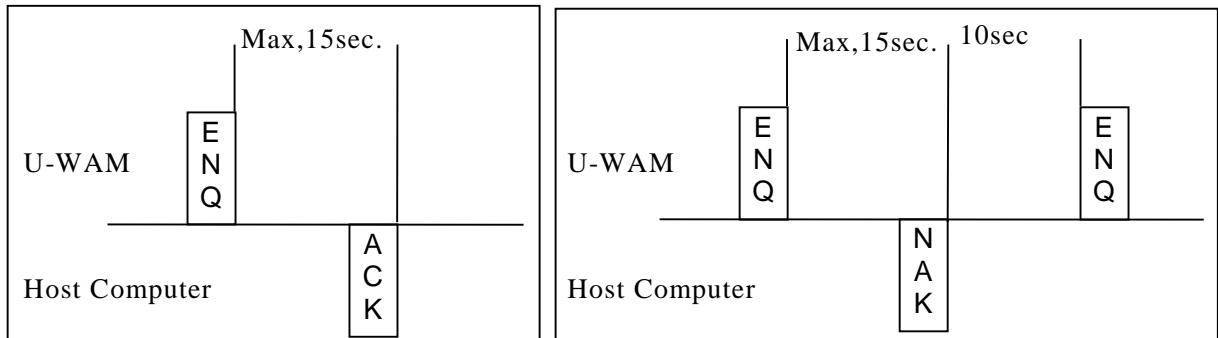


4.2.2 Establishment Phase

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

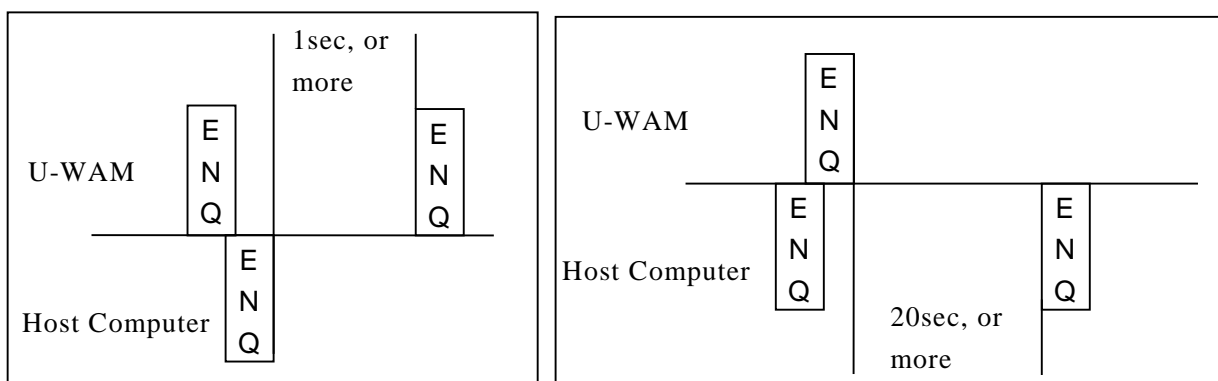
- Returns an [ACK] signal when the communication is enabled.
- Returns a [NAK] signal when the communication is disabled.

If the receiver responded [NAK] signal, the sender waits for at least 10 seconds before attempting to send an another [ENQ] signal.



(2) When both sender and receiver send [ENQ] signals, the host computer Must yield control authority to the U-WAM.

- The U-WAM sends [ENQ] signal again after 1 second.
- The host computer must wait for 20 seconds before sending [ENQ] signal again unless the host computer received [ENQ] signal from U-WAM.



4.2.3 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 247 characters (including frame overhead). If the record is longer than 240 characters, it is divided into two or more frames.
- (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]

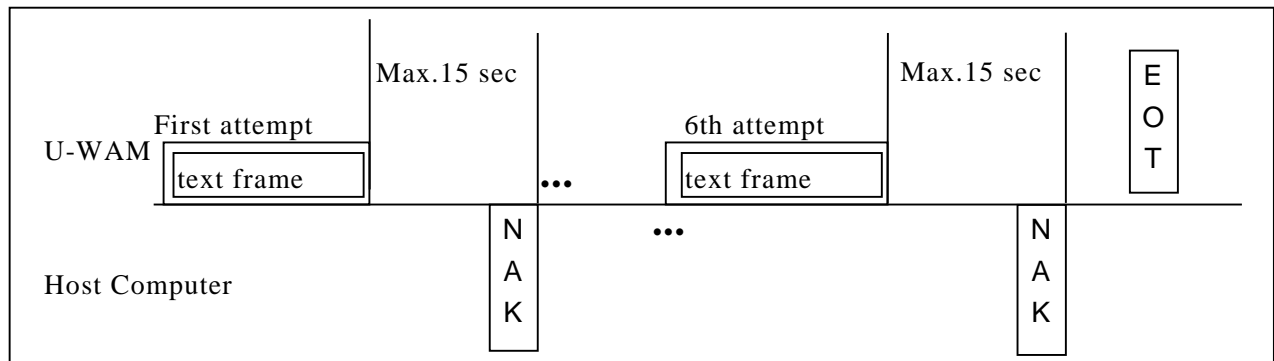
[STX] [F#] [Text] [ETB] [CHK1] [CHK2] [CR] [LF]

... ..

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

Symbol	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 E1394-97 records are used. 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 the final frame)
[CHK1] [CHK2]	Expressed by characters "0" - "9" and "A" - "F". Characters beginning from the character following [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, the receiver responds with [ACK]. After the sender receives [ACK], the sender advances the frame number and either sends 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 the sender receives [NAK], the sender sends the most recent frame again, using the same frame number. If a total of 6 attempts to send the frame failed, the sender transitions to the termination phase and Must end sending of the message.



- (6) The U-WAM processes the response of [EOT] from the host computer as [ACK]. (Response of [EOT] from the receiver is usually a request to suspend a transmission to the sender. However, the U-WAM does not support this function.)

4.2.4 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], the sender transitions to neutral status. When the receiver receives [EOT], the receiver transitions to neutral status.

4.2.5 Timeout

The timer is used to detect a failure to coordinate between the sender and the 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 15-second timer is set 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.

4.3 Presentation Layer

4.3.1 Messages, Records and Fields

4.3.1.1 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).

4.3.1.2 Records

A record is a series of text, beginning with an ASCII alphabet character referred to as the identifier, and ending with [CR].

Record Type	Record Identifier	Level	Contents
Header Record	H	0	Contains the sender and the 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	Not used
Comment Record	C	1-4	Not used
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 comment record can be inserted at any level. They are considered to be one level lower than the preceding record. However, a consecutive comment records are not allowed.

Example of transmission

H->P->O->R->L Correct

H->R->L Incorrect, because P and O must be transmitted in prior to R.

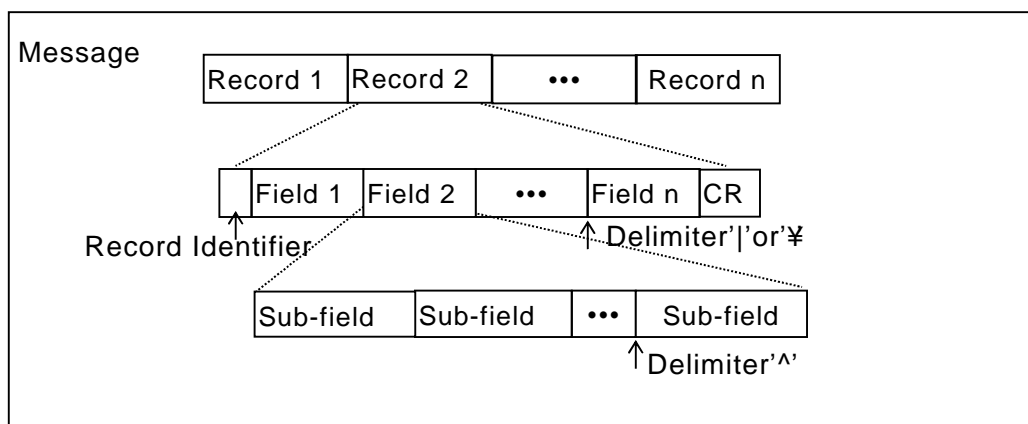
4.3.1.3 Fields

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.

Type	Code	Description
Field Delimiter	Vertical bar () [7Ch]	Separates adjacent fields within a record.
Repeat Delimiter	Backslash (¥) [5Ch]	Used when there are plural components of the same type in one field, to repeat the same field.
Component Delimiter	Caret (^) [5Eh]	Separates a single field into various sub-fields.
Escape Delimiter	Ampersand (&) [26H]	Used within a text field to identify special case operations. However, names and comments in Japanese are expressed with double-byte characters without escape delimiters. On the U-WAM, S-JIS are used for 2-byte character code sets. (' ' → &F&, '¥' → &R&, '^' → &S&, '&' → &E&, hexadecimal → &Xxxxx&)



4.3.2 Communication Protocol

4.3.2.1 Transportation Order Inquiry (U-WAM→Host computer)

This protocol is used for U-WAM to inquire to the host computer transportation order information to obtain the sample order information. Inquiry can be made with keyword of the sample ID Number.

Table 1: Transportation Order Inquiry

U-WAM	Direction	Host Computer
ENQ	→	
	←	ACK
H: Header Record	→	
	←	ACK
Q: Inquiry Record	→	
	←	ACK
L: Message Terminator Record	→	
	←	ACK
EOT	→	

4.3.2.2 Transportation Order Information (Host Computer→U-WAM)

This protocol is used for the host computer to respond a transportation order information against the inquiry made by the U-WAM.

'P' and 'O' are transmitted by the pair for the number of the specimen material when the inquiry was generated by 'Inquiry Record (Q)' of the 4.3.2.1 Transportation Order Inquiry.

'P' and 'O' are transmitted by the pair by 5 records when 5 samples are inquired, and when 10 samples are inquired, it transmits by 10 records.

Refer to Table 2: Transportation Order Information.

Table 2: Transportation Order Information

Must/ Skippable	U-WAM	Direction	Host Computer
Must		←	ENQ
	ACK	→	
		←	H: Header Record
	ACK	→	
Skippable		←	P: Patient Record (Pos.1)
	ACK	→	
		←	O: Order Record (Pos.1)
	ACK	→	
Skippable		←	P: Patient Record (Pos.2)
	ACK	→	
		←	O: Order Record (Pos.2)
	ACK	→	
(...omitted...)			
Skippable		←	P: Patient Record (Pos.9)
	ACK	→	
		←	O: Order Record (Pos.9)
	ACK	→	
Skippable		←	P: Patient Record (Pos.10)
	ACK	→	
		←	O: Order Record (Pos.10)
	ACK	→	
Must		←	L: Message Terminator Record
	ACK	→	
		←	EOT

4.3.3 Details of Record

4.3.3.1 Header Record

[Example of transmission]

■ U-WAM → Host Computer

H|¥&|||U-WAM^00-01^11001^^^12345678|||||E1394-97|20100822100525<CR>

■ Host Computer → U-WAM

H|¥&|||||||E139→4-97|20100822100525<CR>

ASTM Field	Field Name	U-WAM → Host	Host → U-WAM	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	5^ 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	YYYYMMDDHHMMSS	YYYYMMDDHHMMSS	14	

1) 7.1.1 Record type

“H” is used as a fixed character string.

2) 7.1.2 Delimiter definition

“|¥&” is used as a fixed character string. No field delimiter is required between Record type and Delimiter definition.

3) 7.1.5 Sender name or ID

Each sub-field such as analyzer name, software version, analyzer serial number and PS code is delimited by “^”.

3-1) Analyzer name

Analyzer name is fixed as “U-WAM”.

3-2) Software version

Software version is fixed with the version of the application program of U-WAM.

3-3) Analyzer serial No.

Analyzer serial number is a unique serial number which is consisted of maximum of 5 characters of alphanumeric character.

3-4) PS code

PS code is fixed with "AU501736".

4) 7.1.13 ASTM Version No.

ASTM Version number is fixed with “E1394-97”.

5) 7.1.14 Date and time of message

Date and time of message format is fixed with “YYYYMMDDHHMMSS”.

YYYY: Christian year in 4 digits

MM: Month in 2 digits, right-aligned, with zero padding

DD: Date of the month in 2 digits, right-aligned, with zero padding

HH: Hour in the 24-hour system (“00”-“23”) in 2 digits, right-aligned, with zero padding

MM: Minute in 2 digits (“00”-“59”), right-aligned, with zero padding

SS: Second in 2 digits (“00”-“59”), right-aligned, with zero padding

Example:

“20050101090530” means January 1, 2005, 09:05:30.

4.3.3.2 Patient Information Record

[Example of transmission]

- U-WAM → Host Computer

P|1<CR>

- Host Computer → U-WAM

P|1<CR>

ASTM Field	Field Name	U-WAM → Host	Host → U-WAM	Max. Size (Bytes)	Remarks
7.1	Record type	P	P	1	Fixed
7.2	Sequence number	Sequence number	Sequence number	4	Sequence number of records

1) 7.1 Record type

“P” is used as a fixed character string.

2) 7.2 Sequence number

The sequence number starts at 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.

4.3.3.3 Inquiry Record

[Example of transmission]

■ U-WAM → Host Computer

Q|1|123456^01^1234567890123456789012^B||||20010905150000|||||<CR>

■ Host Computer → U-WAM

Not used

ASTM Field	Field Name	U-WAM ↓ Host	Host ↓ U-WAM	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 ID number^ Sample No. attribute	Not used	6^ 2^ 22^ 1	Sample No. attribute always sets B. Maximum 10 sample IDs can be specified by using repeat code ¥(5Ch).
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	YYYYMMDDHHMMSS	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	-	

1) 12.1.1 Record type

“Q” is used as a fixed character string.

2) 12.1.2 Sequence No.

The sequence number starts with 1 in a maximum of 4 digits, 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.

3) 12.1.3 Starting Range ID No.

Each sub-fields of Rack No., tube position, sample No., and sample No. attribute are placed by separating with a delimiter “^”.

Maximum 10 sample IDs can be specified by using repeat code ¥(5Ch).

1 rack is set, minimum 1 sample, maximum 10 samples.

Ex.) To inquire for 2 samples:

Rack No.1^Tube Position No.1^Sample ID number1^Sample No. attribute1^Rack No.2^Tube Position No.2^Sample ID number2^Sample No. attribute2

3-1) Rack No.

Rack No. that was used to analyze, and is maximum of 6-digit alpha-numeric(alpha-numeral). A hyphen “-” (2Dh) may be inserted between characters. Hyphens are counted in 6 digits. Rack No. is set Right-align and space padding of 6 digits when the Sample No. is less than 6 digits.

3-2) Tube Position

The Tube Position number within a rack used for the analysis, and is maximum 2-digit alpha-numeric(alpha-numeral). Right-align and space padding of 2 digits.

Tube position No. is filled with zero in the most significant digit to fill up to 2 digits.

3-3) Sample ID number

Indicates the Sample ID No. of the inquiry, and is the maximum 22-digit of alpha-numeric(alpha-numeral). And also can insert hyphen “-” (2Dh) between the characters. Hyphens are counted in 22 digits. Sample ID No. is less than 22 digits, the number is aligned to the right and spaces are padded to fill up 22 digits.

3-4) Sample No. attribute

Indicates the way how the sample ID number was determined.

‘B’: Sample ID number was read by the barcode reader.

‘A’: Sample ID number was automatically assigned by the analyzer.

This is used when barcode reading error occur and put sample ID number starting from ERR” or when sequential sample ID number is put by the analyzer automatically.

4) 12.1.7 Beginning request results date and time

Beginning request results date and time format is fixed with “YYYYMMDDHHMMSS”. Can not change the format.

YYYY: Christian year in 4 digits

MM: Month in 2 digits, right-aligned, with zero padding

DD: Date of the month in 2 digits, right-aligned, with zero padding

HH: Hour in the 24-hour system (“00”-“23”) in 2 digits, right-aligned, with zero padding

MM: Minute in 2 digits (“00”-“59”), right-aligned, with zero padding

SS: Second in 2 digits (“00”-“59”, right-aligned, with zero padding

Example: “20050102090530” means January 2 2005, 09:05:30

4.3.3.4 Test Order Record

[Example of transmission]

■ Host Computer → U-WAM

O|1|123456^05^1234567890123456789012^B^O||^CHM^UF||20040807101000||||N|||||Q<CR>

ASTM Field	Field Name	U-WAM ↓ Host	Host ↓ U-WAM	Max. size (Bytes)	Remarks
9.4.1	Record type	Not used	O	1	Fixed
9.4.2	Sequence No.	Not used	Sequence No.	4	Sequence No. of records
9.4.3	Specimen ID	Not used	Rack No.^ Tube Position No.^ Sample ID number^ Sample No. attribute^	6^ 2^ 22^ 1	Sample No. attribute always sets B.
9.4.4	Instrument specimen ID	Not used	Not used	-	
9.4.5	Analysis parameter ID	Not used	^^^^Parameter	^^^^8	Presence of order for analysis parameter
9.4.6	Priority	Not used	Not used	-	
9.4.7	Requested/order date and time	Not used	YYYYMMDDHHMMSS	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	Not used	N	1	N: Normal sample
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 doctor	Not used	Not used	-	
9.4.18	Doctor 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	-	

ASTM Field	Field Name	U-WAM ↓ Host	Host ↓ U-WAM	Max. size (Bytes)	Remarks
9.4.26	Report Type	Not used	Y,Q	1	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	-	

1) 9.4.1 Record type

“O” is transmitted.

2) 9.4.2 Sequence No.

The sequence number starts with 1 in a maximum of 4 digits, 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.

3) 9.4.3 Specimen ID

Sub-fields of Rack No., tube position., sample No., and sample No. attribute are placed by separating with a delimiter “^”.

3-1) Rack No.

Rack No. that was used to analyze, and is maximum of 6-digit alpha-numeric (alpha-numeral). A hyphen “-” (2DH) may be inserted between characters. Hyphens are counted in 6 digits. Rack No. is set Right-align and space padding of 6 digits when the Sample No. is less than 6 digits.

3-2) Tube Position

The tube position number within a rack used for the analysis, and is maximum 2-digit alpha-numeric (alpha-numeral).

When the tube position number is less than 2 digits, tube position No. is filled with zero in the most significant digit to fill up to 2 digits.

3-3) Sample ID number

Consisted of the maximum 22-digit of alpha-numeric (alpha-numeral). And also can insert hyphen “-” (2DH) between the characters. Hyphens are counted in 22 digits. Sample ID No. is less than 22 digits, the number is aligned to the right and spaces are padded to fill up 22 digits.

3-4) Sample No. attribute

Indicates the way how the sample ID number was determined.

‘C’: Sample ID number was assigned by the host computer.

4) 9.4.5 Analysis parameter ID

When the host computer replies order, please set the Analyzer which it is necessary to measure.

example: “^^^^CHM^Y^^^^UF^Y^^^^UD”

Table10: List of order

List of order	
Parameter	Remark
CHM	Measurement of Chemistry Analyzer
UF	Measurement of UF-3000/4000/5000 Analyzer
UD	Measurement of UD-10 Analyzer

5) 9.4.7 Requested/Order date and time

Requested/order date and time format is fixed with “YYYYMMDDHHMMSS”.

YYYY: Christian year in 4 digits

MM: Month in 2 digits, right-aligned, with zero padding

DD: Date of the month in 2 digits, right-aligned, with zero padding

HH: Hour in the 24-hour system (“00”-“23”) in 2 digits, right-aligned, with zero padding

MM: Minute in 2 digits (“00”-“59”), right-aligned, with zero padding

SS: Second in 2 digits (“00”-“59”, right-aligned, with zero padding

Example: “20050102090530” means January 2, 2005, 09:05:30

6) 9.4.12 Action Code

“N” is used as a fixed character string.

7) 9.4.26 Report Type

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.)

4.3.3.5 Message Terminator Record

[Example of transmission]

- U-WAM → Host Computer
L|1|N<CR>
- Host Computer → U-WAM
L|1|N<CR>

ASTM Field	Field Name	U-WAM ↓ Host	Host ↓ U-WAM	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

1) 13.1.1 Record type

“L” is used as a fixed character string.

2) 13.1.2 Sequence No.

The sequence number starts with 1 in a maximum of 4 digits, 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.

3) 13.1.3 Terminator code

“N” is usually used as a character string.

5 Examples of Communication

5.1 Transportation Order Inquiry (U-WAM→Host computer)

5.1.1 When a Transportation Order Inquiry (sample exists in Pos1 and Pos3)

U-WAM	<ENQ>
Host	<ACK>
U-WAM	<STX>1H¶& U-WAM^00-01^11001^^^AU501736 E1394-97 20090324100447<CR> <ETX><CHK1><CHK2><CR><LF>
Host	<ACK>
U-WAM	<STX>2Q 1 123456^01^ 1234^B¶123456^03^ 1239^B 20090324214154 <CR><ETX><CHK1> <CHK2><CR><LF>
Host	<ACK>
U-WAM	<STX>3L 1 N<CR><ETX><CHK1><CHK2><CR><LF>
Host	<ACK>
U-WAM	<EOT>

5.2 Transportation Order Information (Host Computer → U-WAM)

5.2.1 When a Transportation Order exists

Host	<ENQ>
U-WAM	<ACK>
Host	<STX>1H¶& E1394-97 20090324210847<CR> <ETX><CHK1><CHK2><CR><LF>
U-WAM	<ACK>
Host	<STX>3O 1 123456^01^1234^B ^U¶^UD 20090324210847 N Q<CR><ETX><CHK1><CHK2><CR><LF>
U-WAM	<ACK>
Host	<STX>5O 1 123456^03^1239^B^S ^U¶^UD 20090324210847 N Q<CR><ETX><CHK1><CHK2><CR><LF>
U-WAM	<ACK>
Host	<STX>6L 1 N<CR><ETX><CHK1><CHK2><CR><LF>
U-WAM	<ACK>
Host	<EOT>

5.2.2 When no Transportation Order exists

Host	<ENQ>
U-WAM	<ACK>
Host	<STX>1H P& E1394-97 20090324210847<CR> <ETX><CHK1><CHK2><CR><LF>
U-WAM	<ACK>
Host	<STX>3O 1 123456^01^ 1234^B^O 20090324210847 N Y<CR><ETX><CHK1><CHK2><CR><LF>
U-WAM	<ACK>
Host	<STX>5O 1 123456^03^ 1239^B^O 20090324210847 N Y<CR><ETX><CHK1><CHK2><CR><LF>
U-WAM	<ACK>
Host	<STX>6L 1 N<CR><ETX><CHK1><CHK2><CR><LF>
U-WAM	<ACK>
Host	<EOT>

A.1 Transmission Timing

Indicates the transmission timing of U-WAM in the following picture.

- When the system is configured with the feeder section on the right and the collection section on the left side

