Automated Chemiluminescence Analyzer

HL7 LIS Protocol

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Chapter 1HL7Interface Overview

1.1 Messages Supported by HL7 Interface

HL7 is an electronic data exchange standard providing care for inpatients. It was initially defined by the US and is now adopted by many countries. This interface is defined based on HL7 v2.3.1. For details, refer to *HL7Interface Standards Version 2.3*.1.

As HL7 interface uses part of the data only, only some message types, segment types and other data specified in HL7 are used in this interface.

Note: Besides Lumiray1200, This HL7 protocol is also applied to Lumiray 1600, Lumiray600, Lumiray630, Lumiray680,

1.2 HL7Lower Layer Protocol

TCP/IP is a bytestream protocol and does not provide message boundaries. As an upper layer protocol, HL7 is based on messages, but it does not provide the message termination mechanism. In order to determine the message boundaries, we use the minimal lower layer protocol (*HL7 Interface Standards Version 2.3.1* has the corresponding description).

Communication Layer

Messages are sent in the following format:

<SB>*ddddd*<EB><CR>

In which:

<SB> = Start Block character (1 byte)

ASCII <VT>, i.e.<0x0B>. Do not confuse it with the character SOH or STX in ASCII.

ddddd= Data (variable number of bytes)

*dddddis*a HL7 message,including ISO 8859-1 characters (Hexadecimal Value 20 - FF) and <CR> only and not including other control characters or characters that cannot be printed.

<EB> = End Block character (1 byte)

ASCII <FS>, i.e. <0x1C>. Do not confuse it with the character ETX or EOT in ASCII.

<CR> = Carriage Return (1 byte)

ASCII carriage return,i.e.<0x0D>.

1.3 Minimal Lower Layer Protocol (MLLP)

This interface supports HL7's Minimal Lower Layer Protocol (MLLP). This protocol is a way of package of HL7 messages. MLLP is defined by the HL7 standard specification. The way of package of HL7 is: the message adopts a single character at the beginning and adopts the two-character pattern at the end. The characters used by the HL7 interface are the default characters of the HL7 standard.

Beginning Character: Hexadecimal <0B>

Ending Character: Hexadecimal <1C><0D>

Chapter 2 Duplex Communication

It includes 2 aspects: transmission of test results and obtaining of sample application information. Transmission of test results mainly realizes transmission of testing data to an external system (such as LIS). The ways of data transmission include real-time transmission during a test and batch transmission of historic results. We stipulate that, in system setup, real-time transmission is allowed and batch transmission is not allowed when a test is in progress; in other cases, batch transmission is allowed. Obtaining of sample application information means obtaining the sample application information required from LIS to the local for testing.

2.1 Introduction

This chapter describes the several HL7 (Version 2.3.1) messages used by the HL7 interface.

The general syntax rules will be described below.

2.2 Message Syntax

This section will introduce the general syntax of the HL7 interface.

Each HL7 message is composed of some segments. A segment ends with <CR>.

Each segment is composed of the segment name of 3 characters and a variable number of fields. A field is composed of components and sub-components. The MSH segment of each message defines the delimiters of the various constitutional units.

Example:

MSH|^~\&|Rayto|Lumiray1200|||20060427194802||ORU^R01|1|P|2.3.1||||0||Unicode |||

In which:

The 5 characters after MSH defines the delimiters used to distinguish the fields, components and sub-components. Although these characters may be any non-textual characters, the HL7 standard recommends the characters listed in the table below:

Character	Meaning
|	Field delimiter
^	Component delimiter
&	Sub-component delimiter
~	Repeating delimiter
\	Escape character

The first field of MSH includes the various delimiters. Some fields following it are blank, because they are optional and the HL7 interface does not use them. The detailed definitions and selection of fieldswill be described below.

|	
Field 9:	Includes message types and events (ORU, R01)
Field 10:	Includes a unique message ID identifying the message
Field 11:	Includes the processing ID (P represents products)
Field 12:	Defines the HL7 version (2.3.1) used by messages

For any type of message, the sequences after the MSH segmenthave been specified. The sections below will detail these sequences. Use these syntactic structures to indicate that the segments are optional or repeatable:

[ ] indicates that the segments inside it are optional.

{ } indicates that the segments inside it can be repeated 0 or oneor more times

2.3 HL7 Messages Supported

1. The schematic diagram of the main machine's directly sending testing results (or QC data information) to LIS is as follows:
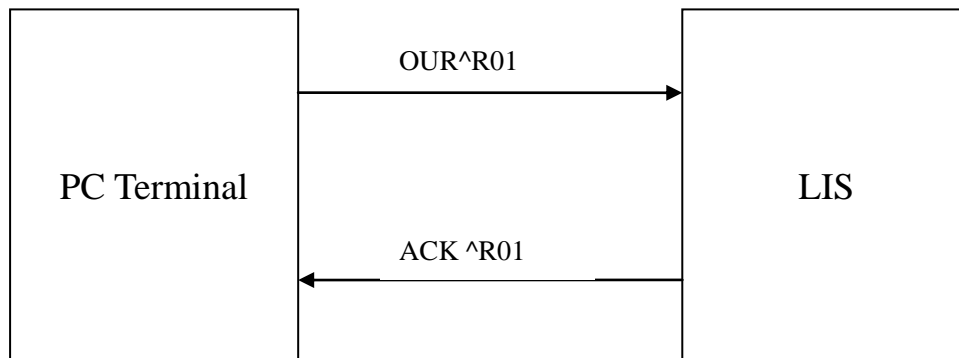
2.The schematic diagram of obtaining sample application information from the LIS server is as follows:
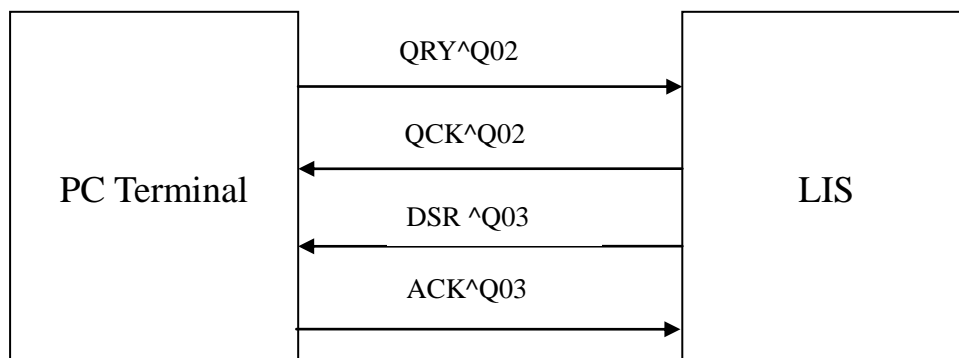
The details are as follows:

ORU/ACK: Not requesting for an observation report/response

The ORU^R01message is mainly used to deliver laboratory results in HL7. We use it to

transmit patient sample test results, calibration results and QC results to LIS.

Patient sample test results include:

－ Patient information (patient's name, sample number, etc.) required by network data
－ Information of doctor's advice (sample type, submitting physician, examining physician, clinical diagnosis, etc.)
－ Testing results

The detailed structure is as follows:

ORU	Observational Results (Unsolicited)	Description
MSH		Message header
PID		Patient ID
OBR		Observation report
{OBX}		Testing results

The ACK^R01message is used to respond to the ORU message. The structure is as follows:

ACK	Acknowledgment	Description
MSH		Message header
MSA		Message acknowledgment

QRY/QCK: Query observational results/responses

The QRY^Q02message queries the current data. It is used to query the sample application information required with LIS. Its trigger event is Q02. The detailed structure is as follows:

QRY	Query	Description
MSH		Message header
QRD		Query definition
QRF		Query screening

The QCK^Q02message is used to respond to the QRY message. The structure is as follows:

QCK	Query Acknowledgment	Description
MSH		Message header
MSA		Message acknowledgment
ERR		Error message
QAK		Query acknowledgment

DSR/ACK: Display of/response to observational results

The DSR^Q03message is mainly used to send and display the query results, that is, allowing LIS to send the sample application information required to the system. In accordance with the HL7 standard, the following structure is used:

DSR	Display Response	Description
MSH		Message header
MSA		Message acknowledgment
ERR		Error message
QAK		Queryacknowledgment
QRD		Querydefinition
QRF		Queryscreening
PID		Patient information
OBR		Observation report

The ACK^Q03message is used to respond to the DSR message. The structure is as follows:

ACK	Acknowledgment	Description
MSH		Message header
MSA		Message acknowledgment
ERR		Error message

2.4 Message Segment

The detailed definition of the fields included in the various message segments will be described in the list below. Each row in the list corresponds to one field in themessage segment. The meanings of the various columns of the list are as follows:

1. S/N: The beginning of the HL7 message segment is a message segment name of 3 characters. Each following field delimiter is followed by the content of a field. The serial number is the sequential location of the field in the HL7 message segment.
    Example:

PID | 1| 101|20160009||Tom ||19860101|M|||||||26Y|||||||||||||||

↑↑↑

Messagesegment nameField 1   Field 3

Note: The MSHmessage segment is slightly different. The field delimiter immediately after the message segment name is regarded as the 1st field, used to describe the value of the field delimiter used by the whole message.

2. Field Name: The logical meaning of the field and the interpretation of the field given by HL7.
3. Data Type: The type of the field specified in the HL7 standard. Its structure will be described in "Definitions of HL7 Data Types".
4. Max. Length Recommended by HL7: The length recommended by the HL7 standard. However, in the actual message transmission, the length will be longer than this value. Therefore, when parsing the message, the message fields should be read with the delimiter as identification.
5. Description: Description of the content of the actual value of the field.
6. Example: Example of the actual value of the field.

Note: In the support of the HL7 interface protocol, for future expansion, the operational software does not omit any field in the message segment. If the field does not have a value, it is left blank.

MSH

The MSH (Message Header) message segment includes the basic information of the HL7 message, including the value of the message delimiter, type of the message, coding scheme of the message, etc. It is the 1st field of each HL7 message.

Message example:

MSH|^~\&|Rayto|Lumiray1200|||20160805150307||ORU^R01|201608051|P|2.3.1||||S||Unicode |||

For the definitions of the fields used in the MSH message segment, see Table 1.

Table 1   MSH Field Definition Table

S/N	Field Name	Max. Length Recommended by HL7	Description	Example
#1	Field Delimiter	1	Including the delimiter of the 1st field after the message segment, used to specify the value of the field delimiter of other parts of the message.	|
#2	Encoding Characters	4	Including the component delimiter, repeating delimiter, escape delimiter and sub-component delimiter	^~\&
3	Sending Application	180	Application at the sending end	Rayto
4	Sending Facility	180	Facility at the sending end	Lumiray1200
5	Receiving Application	180	Left blank, reserved. Application at the receiving end	
6	Receiving Facility	180	Left blank, reserved. Facility at the receiving end	
7	Date/Time Of Message	26	Time of the current message. Time information of the calling system	20160805150307
8	Security	40	Left blank, reserved. Security	
#9	Message Type	7	Type of message	ORU^R01
#10	Message Control ID	20	Message control ID, the unique identification of the message. As the number of messages increases, the format is date + number	201608051
#11	Processing ID	3	Processing ID. The value is always P which represents products	P
#12	Version ID	60	Version ID, the version of the	2.3.1

			HL7 protocol	
13	Sequence Number	15	Left blank, reserved. Sequence number	
14	Continuation Pointer	180	Left blank, reserved. Continuation pointer	
15	Accept Acknowledgment Type	2	Left blank, reserved. Accept acknowledgment type	
16	Application Acknowledgment Type	2	Application acknowledgment type, as the type of the results sent. S:(Sample) patient sample test results,C(Calibration) calibration results ,Q (QC Result) QC results	S
17	Country Code	2	Left blank, reserved. Country code	
18	Character Set	10	Character set	Unicode
19	Principal Language Of Message	60	Left blank, reserved. Principal language of message	
20	Alternate Character Set Handling Scheme	20	Left blank, reserved. Alternate character set handling scheme	

MSA

The MSA (Message Acknowledgement) message segment includes message acknowledgment information.

Message example:

MSA|AA|201608051||||0|

For the definitions of the fields used, see Table 2.

Table 2   MSA Field Definition Table

S/N	Field Name	Max. Length Recommended by HL7	Description	Example
#1	Acknowledgment Code	2	Acknowledgment code. AA indicates accept; AE indicates error; AR indicates rejection	AA
#2	Message Control ID	20	Message control ID, the same as MSH-10 of the sender	201608051
3	Text Message	80	Text message. A text description of the event in case of error or rejection. Corresponding to the 6th field. Can be used to write the error log	
4	Expected Sequence Number	15	Left blank, reserved. Expected sequence number	
5	Delayed Acknowledgment Type	1	Left blank, reserved. Delayed acknowledgment type	
6	Error Condition	100	Error condition (status code)	0

Table 3　MSA-6 Field Error Code Table

Status Code (**MSA-6**)	Status Text (**MSA-3**)	Description/Remarks
Successful:		AA
	Message accepted	Successful
Error status code:		AE
100	Segment sequence error	The sequence of segments in the message is incorrect or the required field is lost
101	Required field missing	The required field in a segment is lost
102	Data type error	The data type of the field is wrong, for example, characters, other than the correct one - digits
103	Table value not found	The table value is not found. Not used for the time being
Rejection status code:		AR
200	Unsupported message type	The message type is unsupported
201	Unsupported event code	The event code is unsupported
202	Unsupported processing id	The processing ID is unsupported
203	Unsupported version id	The version ID is unsupported
204	Unknown key identifier	Unknown key identifier, for example, theinformation ona patient that does not exist is transmitted
205	Duplicate key identifier	The key identifieralready exists
206	Application record locked	The transaction cannot be executed on the storage level of the application, for

		example, the database is locked
207	Application internal error	Other unknown internal errors of the application

PID

The PID (Patient Identification) message segment includes the basic information of the patient.

Message example:

PID|1|101|2001|12|Tom|5|19900504|M|||||||22Y|||CL||O|||||||||||

For the definitions of the fields used, see Table 4.

Table 4   PID Field Definition Table

S/N	Field Name	Max. Length Recommended by HL7	Description	Example
1	Set ID – PID	10	Sequence number, used to identify the different PID message segments in a message.	1
2	Patient ID	20	Department	101
3	Patient Identifier List	20	Medical history number	2001
4	Alternate Patient ID – PID	20	Bed number	12
5	Patient Name	48	Patient name	Tom
6	Mother's	48	Inpatient area	5

	Maiden Name			
7	Date/Time of Birth	26	Patient's date of birth	19900504
8	Sex	1	Sex: Male: Send M; Female: Send F; Others: Send O	M
9	Patient Alias	48	Left blank, reserved. Patient's alias	
10	Race	80	Left blank, reserved. Race	
11	Patient Address	106	Left blank, reserved. Patient's address	
12	County Code	4	Left blank, reserved. County code	
13	Phone Number-Home	40	Left blank, reserved. Phone number- home	
14	Phone Number - Business	40	Left blank, reserved. Phone number - business	
15	Primary Language	60	Age, with unit. Y indicates year; M indicates month; D indicates day; H indicates hour; O indicates others	22Y
16	Marital Status	80	Left blank, reserved. Marital status	
17	Religion	80	Left blank, reserved. Religious belief	
18	Patient Account Number	20	Patient Category Outpatient: Send CL Emergency Treatment: Send	CL

			EM	
			Hospitalized: Send HO	
			Physical Examination: Send EX	
			Unknown: Send UN	
19	SSN Number-Patient	16	Left blank, reserved. Patient's SSN	
20	Driver's License Number – Patient	25	Charge Type Self-paying: Send O Insurance: Send I Public Health Service: Send P Unknown: Send U	O
21	Mother's Identifier	20	Left blank, reserved. Mother's identifier	
22	Ethnic Group	80	Left blank, reserved. Ethnic group	
23	Birth Place	60	Left blank, reserved. Place of birth	
24	Multiple Birth Indicator	1	Left blank, reserved. Multiple birth indicator	
25	Birth Order	2	Left blank, reserved. Birth order	
26	Citizenship	80	Remarks	
27	Veterans Military Status	60	Left blank, reserved. Veterans military status	
28	Nationality	80	Left blank, reserved. Nationality	
29	Patient Death	26	Left blank, reserved. Date and time of death of patient	
30	Patient Death	1	Left blank, reserved. Patient	

	Indicator		death indicator	

OBR

The OBR (Observation Request) message segment mainly includes the information of the test report.

Message example:

OBR|1|10|8|0|||20160805121000||| ||101,104,113|Cold|201608051210||
SE||N|||||||||||||||||||||||||

For the definitions of the fields used, see Table 5.

Table 5   OBR Field Definition Table

S/N	Field Name	Max. Length Recommended by HL7	Description	Example
1	Set ID – OBR	10	Sequence number, used to determine the different OBR message segments in the message.	1
2	Placer Order Number	22	Used as the sample number	10
3	Filler Order Number	22	Sample position (1-60)	8
#4	Universal Service ID	200	Cup type (0: standard cup 1: small cup)	0
5	Priority	2	Left blank, reserved. Priority	
6	Requested Date/time	26	In Sample Results: Left blank, reserved. In QC Results: Create a date/time	
7	Observation Date/Time	26	Date/time of test	20160805121000

8	Observation End Date/Time	26	Left blank, reserved. The date/time when the observation is ended	
9	Collection Volume	20	Left blank, reserved. Collection volume	
10	Collector Identifier	60	Left blank, reserved. Collector identifier	
11	Specimen Action Code	1	Left blank, reserved. Code of specimen treatment measure	
12	Danger Code	60	Number of test item	101,104,113
13	Relevant Clinical Info.	300	Clinical diagnosis	Cold
14	Specimen Received Date/Time	26	The date/time when the specimen is submitted for testing	201608051210
15	Specimen Source	300	Submitter	
16	Ordering Provider	120	Sample type Serum: Send SE Plasma: Send PL Urine: Send UR	SE
17	Order Callback Phone Number	40	Left blank, reserved.	
18	Placer Field1	60	Used as the sample type Normal Sample: Send N Stat Sample: Send E Standard: Send S QC: Send Q	N
19	Placer Field 2	60	Left blank, reserved.	
20	Filler Field1	60	Left blank, reserved.	
21	Filler Field2	60	Left blank, reserved.	
22	Result Rpt/Status	15	Left blank, reserved. The date/time when the result report/status is changed	

	Change –Date/Time			
23	Charge to Practice	40	Left blank, reserved.	
24	Diagnostic Serv Sect ID	10	Left blank, reserved.	
25	Result Status	1	Left blank, reserved.	
26	Parent Result	200		
27	Quantity/Timin g 2	00	Left blank, reserved.	
28	Result Copies To	150	Left blank, reserved.	
29	Parent	150	Left blank, reserved.	
30	Transportation Mode	20	Left blank, reserved.	
31	Reason for Study	300	Left blank, reserved. Reason for study	
32	Principal Result Interpreter	200	Left blank, reserved. Principal result interpreter	
33	Assistant Result Interpreter	200	Left blank, reserved. Assistant result interpreter	
34	Technician	200	Left blank, reserved. Technician	
35	Transcriptionist	200	Left blank, reserved. Transcriptionist	
36	Scheduled Date/Time	26	Left blank, reserved. Scheduled date/time	
37	Number of Sample Containers	4	Left blank, reserved. Number of sample containers	
38	Transport Logistics of	60	Left blank, reserved. Transport logistics of collected sample	

	Collected Sample			
39	Collector's Comment	200	Left blank, reserved. Collector's comment	
40	Transport Arrangement Responsibility	60	Left blank, reserved. Transport arrangement responsibility	
41	Transport Arranged	30	Left blank, reserved. Is the transport arranged?	
42	Escort Required	1	Left blank, reserved. Escort required	
43	Planned Patient Transport Comment	200	Left blank, reserved. Comment on planned patient transport	
44	Ordering Facility Name	60	Left blank, reserved. Ordering facility's name	
45	Ordering Facility Address	106	Left blank, reserved. Ordering facility's address	
46	Ordering Facility Phone Number	48	Left blank, reserved. Ordering facility's phone number	
47	Ordering Provider Address	106	Remarks	

OBX

The OBX (Observation/Result) message segment mainly includes the parameter information of the various testing results.

Message example:

OBX|1|NM|2|PCNA|12.98660|RU/mL|1||1||0|160501|688290|20160805153000|160226|20160805093000|R|

For the definitions of the fields used, see Table 6.

Table 6　OBX Field Definition Table

S/N	Field Name	Max. Length Recommended by HL7	Description	Example
1	Set ID – OBX	4	Sequence number, used to identify the different OBX message segments in the message.	1
2	Value Type	2	Data type of testing results. The value "ST" indicates character strings; "NM" indicates numbers; "ED"; "IS", etc.	NM
#3	Observation Identifier	250	Test number. The number of time of the test	2
4	Observation Sub-ID	20	Used as the item name	PCNA
5	Observation Value	65536	Concentration	12.98660
6	Units	250	Unit of the test item.	RU/mL
7	References Range	60	References range set	1
8	Abnormal Flags	5	Left blank, reserved. Flag of testing results	
9	Probability	5	ID of the reagent vial used	1
10	Nature of Abnormal Test	2	Left blank, reserved. Reason for abnormal test	
#11	Observe Result	1	Is the result editable?(0: Not editable; 1: Editable)	0

S/N	Field Name		Description	Example
	Status			
12	Date Last Observe Normal Values	26	Batch number of the reagent used	160501
13	User Defined Access Checks	20	Photon quantity	688290
14	Date/Time of the Observation	26	Time of test	20160805153000
15	Producer's ID	250	Batch number of the calibration material used	160226
16	Responsible Observer	250	Date of calibration	20160805093000
17	Observation Method	250	Result flag (R: Positive; NR: Negative;RRN.There may be multiple combinations, which are separated with comma, such as R, RRN or NR, RRN)	R

QRD

The QRD - query definition segment is used to query sample information according to the conditions.

Message example:

QRD|20160805113020|R|D|1|||RD|18|OTH|||T|

For the definitions of the fields used, see Table 7.

Table 7   QRD Field Definition Table

S/N	Field Name	Max. Length Recommended by HL7	Description	Example
#1	Query Date/Time	26	The time when this query is produced. It is the system time	20160805113020

#2	Query Format Code	1	Query the format code. The value is R (record-oriented format)	R
#3	Query Priority	1	Query the priority. The value is D (deferred)	D
#4	Query ID	10	Query the ID. Queries of different representations. It increases from 1 with the increase of the number of queries	1
5	Deferred Response Type	1	Left blank, reserved. Deferred response type	
6	Deferred Response Date/Time	26	Left blank, reserved. Date/time of deferred response	
#7	Quantity Limited Request	10	Quantity limited request. The value isRD (Records)	RD
#8	Who Subject Filter	60	Querier filter, used as the patient's sample number	18
#9	What Subject Filter	60	Query contentsfilter. Set to OTH in query	OTH
#10	What Department Data Code	60	Left blank, reserved.Departmentdata code	
11	What Data Code Value Qual.	20	Left blank, reserved. Data code valuequalifier	
12	Query Results Level	1	Left blank, reserved. Query the results level The value is T (Full results)	T

QRF

The segment QRF is used with the segment QRD to further refine the original query contents.

Message example:

QRF| Lumiray1200|20160805120000|20160805180000|||RCT|COR|ALL||

For the definitions of the fields used by QRF - query filter segment, see Table 8.

Table 8   QRF Field Definition Table

S/N	Field Name	Max. Length Recommended by HL7	Description	Example
#1	Where Subject Filter	20	Filter of location of the querier. The value isLumiray1200	Lumiray1200
2	When Data Start Date/Time	26	Start date/time of the record. Used as the start time when the sample is receivedin a query	20160805120000
3	When Data End Date/Time	26	End date/time of the record. Used as the end time when the sample is received in a query	20160805180000
4	What User Qualifier	60	Left blank, reserved. User qualifier	
5	Other QRY Subject Filter	60	Left blank, reserved. OtherQRF acceptance filter	
6	Which Date/Time Qualif	12	Target type. The value is RCT (Specimen receipt date/time, receipt of specimenin filling ancillary (Lab))	RCT
7	Which Date/Time Status Qualifier	12	Target status. The value is COR (Correctedonly (no final with corrections))	COR
8	Date/Time Selection Qualifier	12	Date/time selection qualifier. The value is ALL (All values within the range)	ALL
9	When Quantity/Timing Qualifier	60	Left blank, reserved. Time interval	

ERR

The ERR - error segment is used to add error description to the acknowledgment message

Table 9   ERR Field Definition Table

S/N	Field Name	Max. Length Recommended by HL7	Description	Example
#1	Error Code and Location	80	Error code and location	For details, see the Message Error Status Code Table

QAK

The QAK - query acknowledgment segment includes some information following query response
Message example:

QAK|SR|OK|

Table10QAK Field Definition Table

S/N	Field Name	Max. Length Recommended by HL7	Description	Example
1	Query Tag	32	Query tag. The value is SR (indicating that it is the sample application information)	SR
2	Query Response Status	2	Query response status OK: Data found, no errors NF: No data found, no errors AE: Application error AR: Application reject	OK

Chapter 3Examples of Complete Messages

3.1 Sample Message

Takes the calculation results message of a sample as an example:

MSH|^~\&|Rayto|Lumiray1200|||20160805150307||ORU^R01|201608051|P|2.3.1||||S||Unicode |||

PID|1|101|2001|12|Tom|5|19900504|M|||||||22Y|||CL||O|||||||||||

OBR|1|10|8|0|||20160805121000||||||101,105,111||Cold|
|201608051210||SE||N|||||||||||||||||||||||||||||

OBX|1|NM|1|dsDNA|20.5634|IU/mL|1||1||0|160501|688234|20160805153000|
160226|20160805093000|R|

OBX|2|NM|1|PCNA|12.98660|RU/mL|1||1||0|160522|688290|20160805153000|
160226|20160805093000|R|

OBX|3|NM|1|SS-B/La|19.0946|RU/mL|1||1||0|160541|688215|20160805153000|
160226|20160805093000|R|

3.2 Sample Response Message

Whenever a sample result is received, a sample response message should be sent. A sample response message includes two message segments, i.e. MSH and MSA. For correct response messages, pay attention to the following two points: the content of the field MSH-9 should be ACK^R01, which indicates that the type of the message is sample response message; the value of the field MSA-2 is the same as that of the field MSH-10 of the calculation result received, which indicates which calculation result the response message responds to. In this example, the value of the field MSA-2 is 201608051.

MSH|^~\&|Rayto|Lumiray1200|||20160805170000||ACK^R01|1|P|2.3.1||||S||Unicode |||

MSA|AA|201608051|||||

3.3 Query Messages

1. The system sends a query request to the LIS server and obtains the corresponding sample information, patient information and item information according to the specified sample number.

For example, query the sample information of sample 18

MSH|^~\&|Rayto|Lumiray1200|||20160805170000||QRY^Q02|201608052|P|2.3.1||||S||Unicode|||

QRD|20160805113020|R|D|1|||RD|18|OTH|||T|

QRF| Lumiray1200|20160805160000|20160805160000|||RCT|COR|ALL||

After receiving the message, the LIS server will return the QCK^Q02 message as response. If the response has the corresponding sample, the message is:

MSH|^~\&|Rayto|Lumiray1200|||20160805170000||QCK^Q02|1|P|2.3.1||||S||Unicode|||

MSA|AA|201608052||||0|

ERR|0|

QAK|SR|OK|

If the response does not have the corresponding sample, the message returned is:

MSH|^~\&|Rayto|Lumiray1200|||20160805170000||QCK^Q02|1|P|2.3.1||||S||Unicode|||
MSA|AA|201608052||||0|

ERR|0|

QAK|SR|NF |

When the LIS server has the corresponding sample, after the query response message QCK^Q02 has been returned, the LIS server will send the data message DSR^Q03

MSH|^~\&|Rayto|Lumiray1200|||20160805170000||DSR^Q03|1|P|2.3.1||||S||Unicode|||

MSA|AA|201608052||||0|

ERR|0|

QAK|SR|OK |

QRD|20160805113020|R|D|1|||RD|18|OTH|||T|

QRF| Lumiray1200|20160805160000|20160805160000|||RCT|COR|ALL||

PID|1|101|2001|12|Tom|5|19900504|M|||||||22Y|||CL||O|||||||||||

OBR|1|18|8|0|||20160805121000||| ||101,104,113|Cold|201608051210||
SE||N|||||||||||||||||||||||||||

If the QCK^Q02 message which indicates that there is no corresponding sample has been previously returned, the DSR message willnot be sent any longer.

After receiving the DSR message, the system will make response acknowledgement. The message is:

MSH|^~\&|Rayto|Lumiray1200|||20160805170000||ACK^Q03|1|P|2.3.1||||S||Unicode|||
MSA|AA|201608052||||0|
ERR|0|

2. The system sends a batch query request to the LIS server and obtains all samples for the date or the updated samples for the date

We distinguish these two request modes with duration (start time ~ end time), as shown in the table below:

Way to Obtain	Start Time	End Time
All for the date	00:00 on the date	The system time when therequest is sent
Updated for the date	End time of the last query	The system time when the request is sent

For example, a batch query request is made at 5pm on August 5, 2016 to obtain all samples for the date. The request message is:

MSH|^~\&|Rayto|Lumiray1200|||20160805170000||QRY^Q02|201608053|P|2.3.1||||S||Unicode|||

QRD|20160805113020|R|D|1|||RD||OTH|||T|

QRF| Lumiray1200|20160805000000|20160805170000|||RCT|COR|ALL||

Same as a single query according to the barcode, the LIS server will make a response about whether the query condition is met. If there is a response, after the query response has been returned, all samples meeting the condition will be sent. Each piece of sample information is sent with a DSR message. Assume that two samples are found, as follows:

MSH|^~\&|Rayto|Lumiray1200|||20160805170000||DSR^Q03|1|P|2.3.1||||S||Unicode|||
MSA|AA|201608053||||0|
ERR|0|
QAK|SR|OK |
QRD|20160805113020|R|D|1|||RD||OTH|||T|
QRF| Lumiray1200|20160805000000|20160805170000|||RCT|COR|ALL||
PID|1|101|2001|12|Jane |5|19960504|F|||||||22Y|||CL||O|||||||||||
OBR|1|13|8|0|||20160805121000||| ||101,104,113|Cold|201608051210||
SE||N||||||||||||||||||||||||||||

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MSH|^~\&|Rayto|Lumiray1200|||20160805170000||DSR^Q03|2|P|2.3.1||||S||Unicode|||
MSA|AA|201608053||||0|
ERR|0|
QAK|SR|OK |
QRD|20160805113020|R|D|1|||RD||OTH|||T|
QRF| Lumiray1200|20160805000000|20160805170000|||RCT|COR|ALL||
PID|1|108|3001|16|Jack |5|19930804|F|||||||28Y|||CL||O|||||||||||
OBR|1|10|8|0|||20160805121000||| ||111,118,120|Cold|201608051210||
SE||N||||||||||||||||||||||||||||
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