HL7 LIS Protocol Interface Manual

V1.0

Contents

1. Overview

The LIS interface described in this document is used for data exchange between VISION Pro and the laboratory information system (LIS). This interface allows the instrument to download sample request information from the LIS server by various query methods, and send single or batch real-time sample results and QC results to the LIS server manually, or automatically. The LIS server can actively send sample request information to the instrument.

For the convenience of description, the instrument mentioned in the following text refers to VISION Pro and LIS refers to the hospital laboratory information system.

1.1. Scope of Application

This interface applies to VISION Pro.

1.2. Supported LIS Functions

The instrument equipped with this LIS interface supports the following functions:

- ✓ Support automatic upload of real-time sample results to the LIS server in the test process;
- ✓ Allow users to upload single or batch sample results to the LIS server through query of historical results;
- ✓ Allow users to upload QC results to the LIS server through query of QC results;
- ✓ Support active query of patient information from the LIS server.

1.3. Supported Physical Connections to LIS

Support physical TCP/IP connection.

1.4. Supported HL7 Protocol Versions

This interface is defined based on the HL7 v2.3.1 protocol. For complete content of the standard, please refer to the HL7 Interface Standards Version 2.3.1.

1.5. Supported LIS Messages

HL7 messages used by this interface only include ORU, ACK, QRY, QCK and DSR.

1.6. Basic Formats in HL7 Protocol

According to the Minimal Lower Layer Protocol (MLLP), the definition is as follows by reference to the description in the HL7 Interface Standards Version 2.3.1.

HL7 messages are sent in the following formats:

<SB> ddddd <EB><CR>

Where:

- **<SB>**

  <SB>=Start Block character (1 byte)

  1 byte, hexadecimal characters <0x0B>, ASCII<VT>.

- **ddddd**

  ddddd = Data (variable number of bytes)

  ddddd is the content of HL7 message. It only consists of ISO 8859-1 characters (hexadecimal values 20 - FF) and <CR>, and does not include other characters that are controlled and cannot be printed.

- <**EB**>

  <EB>= End Block character (1 byte)

  1 byte refers to hexadecimal characters <0x1C >, ASCII <FS>.

- **<CR> = Carriage Return (1 byte)**

  <CR> = Carriage Return (1 byte)

  1 byte refers to hexadecimal characters <0x0D >, ASCII <CR>.

1.7. Syntax of HL7 Messages

Each HL7 message consists of several segments ended with <CR>.

Each segment consists of a segment name containing three characters and a fixed number of field consisting of components and subcomponents; the MSH segment in each message defines the characters to be used as separators for the composition units.

For example:

MSH|^~\&|YHLO|iFlash3000|||20160101235959||ORU^R01|1|P|2.3.1||||0||ASCII|||

Where:

The five characters following MSH are defined as the characters to be used as separators for fields, components and subcomponents. The HL7 standard uses characters listed in the table below:

Character	Meaning
|	Field separator
^	Component separator
&	Subcomponent separator
~	Repetition separator
\	Escape character

The 1st field of MSH contains separators. Some consequent fields are null since they are optional. Those which are currently not used by the HL7 interface are left null.

Field 9:	Contains message type and event (ORU, R01)
Field 10:	Contains a unique message ID that identifies this message
Field 11:	Contains the processing ID (P stands for product)
Field 12:	Defines the HL7 version (2.3.1) used by the message

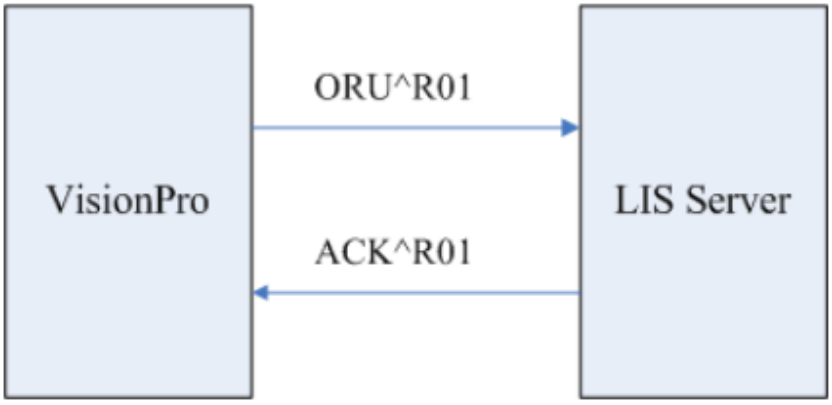
For any type of message, the sequence of segments following MSH is subject to certain rule. The following sections will detail such sequence, and the syntactic structures below are used to indicate whether a segment is optional or repeatable:

[ ] indicates the segment contained therein is optional.

{ } indicates each segment contained therein can be repeated zero, one or more times.

2. Session Process

2.1. Upload Test Results to LIS Server



Abbreviations:

ORU: Observational Results (Unsolicited)

ACK: Acknowledgment

Description:

ORU: It is used for the instrument to upload test results and triggers event R01

ACK: It is used for the LIS server to respond to ORU messages

2.1.1. ORU

Patient sample (including QC sample) test results/response.

The instrument sends test results to the LIS using an ORU message. After successfully receiving the test results, the LIS must respond to the instrument with an ACK message; otherwise it will be deemed by the instrument that the LIS has not successfully received the test results.

2.1.1.1. Sample Test Results

For sample test results, the specific structure of an ORU message is described as follows:

ORU	Description
MSH	Message header
PID	Patient information (e.g., patient's name, sample ID)
OBR	Observation report (sample type, requesting physician, examining physician, clinical diagnosis, etc.)
{OBX}	Examination result

One sample involves results of several test items. In case of a large number of results, the message length will increase accordingly. In order to improve the reliability of communication, the device will automatically send messages in several sets for samples with more than 50 item results.

2.1.1.2. QC Test Results

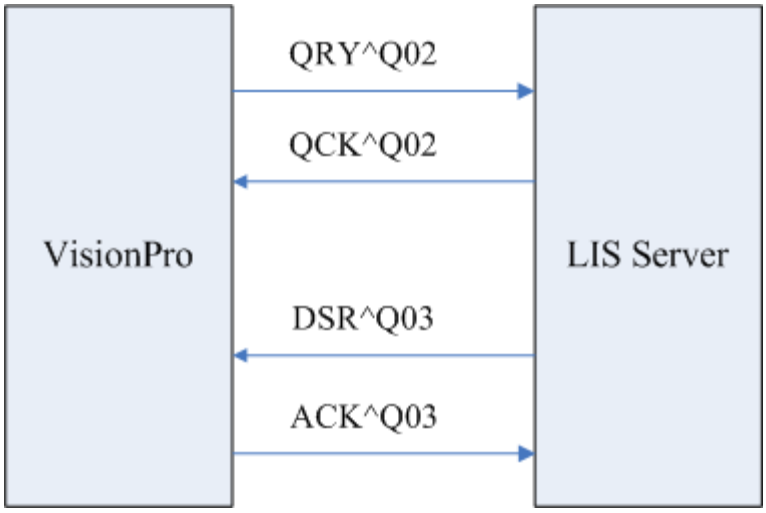
For QC test results, the specific structure of an ORU message is described as follows:

ORU	Description
MSH	Message header
OBR	1. Item information (item No., item name) 2. Observation report (information related to QC liquid: lot No., expiry date, mean value) 3. QC time, test result (concentration value)

2.1.2. ACK

ACK	Description
MSH	Message header
MSA	Message acknowledgment

2.2. Get Sample Information from LIS Server



Abbreviations:

QRY: Query

QCK: Query Acknowledgment

DSR: Display Response

ACK: Acknowledgment

Description:

A **QRY** message is used to query current data and query the desired sample request information against the LIS; it triggers event Q02.

A **QCK** message is used to respond to a QRY message.

A **DSR** message is mainly used to send and display query results, i.e., ask the LIS to send the desired sample request information to the instrument.

An **ACK** message is used to respond to a DSR message.

2.2.1.QRY

The structure of a QRY message is described as follows:

QRY	Description
MSH	Message header
QRD	Query definition
QRF	Query filtering

2.2.2.QCK

The structure of a QCK message is described as follows:

QCK	Description
MSH	Message header
MSA	Message acknowledgment
ERR	Error information
QAK	Query acknowledgment

2.2.3.DSR

The structure of a DSR message is described as follows:

DSR	Description
MSH	Message header
MSA	Message acknowledgment
ERR	Error information
QAK	Query acknowledgment
QRD	Query definition
QRF	Query filtering
{DSP}	Display data
DSC	Continuous pointer

2.2.4.ACK

The structure of an ACK message is described as follows:

ACK	Description
MSH	Message header
MSA	Message acknowledgment
ERR	Error information

3. Message Segments

Each message segment is detailed as follows. Fields with “#” symbol in the “No.” column are required by HL7, and other fields are optional. Since this interface is subsequently extensible, the optional fields should be left null instead of being omitted even if they are not needed.

3.1. MSH - Message Header

MSH is the initial message segment of a HL7 message, and all messages begin with the MSH segment. Generally, it is placed at the forefront of a message. This message segment is used to define the intention, source and purpose of a message and some syntactic details of the message.

The MSH segment of HL7 interface uses the following fields:

No.	Field name	Length	Description
1#	Field Separator	1	Contains the separator between the segment ID and the first real field, and defines the character (|) that is used as a separator for the rest of the message.
2#	Encoding Characters	4	Contains component separator, repetition separator, escape character, and subcomponent separator (^~\&)
3	Sending Application	180	The sending application, which takes YHLO as the value
4	Sending Facility	180	The sending facility, which takes the device model as the value, such as VISIONPro
5	Receiving Application	180	Left null and reserved. The receiving application
6	Receiving Facility	180	Left null and reserved. The receiving facility
7	Date/Time of Message	26	Time of current message. Calls time information of the system
8	Security	40	Left null and reserved. Security
9#	Message Type	7	The message type, such as ORU^R01
10#	Message Control ID	20	The message control ID that uniquely identifies a message, which increases from 1 with the number of message
11#	Processing ID	3	The processing ID, which always takes P (standing for product) as the value
12#	Version ID	60	The version ID of HL7 protocol: 2.3.1
13	Sequence Number	15	Left null and reserved. The sequence number
14	Continuation Pointer	180	Left null and reserved. The continuous pointer

No.	Field name	Length	Description
15	Accept Acknowledgment Type	2	The acceptance acknowledge type, only valid for DSR^Q03 messages. Take P as the value, representing sample information actively sent by the LIS. Other values represent sample information in response to LIS query, which can be left null.
16	Application Acknowledgment Type	2	The application acknowledgment type, used as the type of result sent. 0 - patient sample test result; 2 - QC result
17	Country Code	2	Left null and reserved. The country code
18	Character Set	10	The character set, which takes ASCII as the value
19	Principal Language of Message	60	Left null and reserved. The principal language of a message
20	Alternate Character Set Handling Scheme	20	Left null and reserved. The alternate character set handling scheme

Remark: This segment appears in all messages. In a HL7 message that the LIS sends to the instrument, the 3rd and 4th fields respectively take “YHLO” and the device model as the values, and the values of the 5th and 6th fields are specified by the LIS developer.

3.2. MSA - Message Acknowledgment Segment

The MSA segment of HL7 interface uses the following fields:

No.	Field name	Length	Description
1#	Acknowledgment Code	2	The acknowledgment code. AA represents acceptance; AE represents error; AR represents rejection; It should be noted that, if the LIS sends a message in response to the test result sent by the instrument (i.e., a ACK^R01 message), and if the LIS uses AE or AR, it will be deemed by the instrument that the LIS has not processed the result sent and the instrument will resend the test result for at most two times. Therefore, it is suggested that the LIS should use AA only instead of AE or AR

2#	Message Control ID	20	The message control ID, which is identical to the message control ID of MSH and also to MSH-10 of the sender
3	Text Message	80	The text message, which describes the event in text in case of error or rejection. Corresponds to the 6th field, It can be used to write to the error log
4	Expected Sequence Number	15	Left null and reserved. The expected serial number
5	Delayed Acknowledgment Type	1	Left null and reserved. The delayed acknowledgment type
6	Error Condition	100	The error condition (status code)

Description: See the table below for the values of MSA-6 field

Status code (MSA-6)	Status text (MSA-3)	Description/remark
Success:		AA
0	Message accepted	Success
Error status code:		AE
100	Segment sequence error	The segment sequence in a message is incorrect, or a required field is missing
101	Required field missing	A required field in a segment is missing
102	Data type error	The data type of a field is wrong; for example, characters are misused for digits
103	Table value not found	The table value is not found; it is temporarily not used
Rejection status code:		AR
200	Unsupported message type	The message type is not supported
201	Unsupported event code	The event code is not supported
202	Unsupported processing id	The processing ID is not supported
203	Unsupported version id	The version ID is not supported
204	Unknown key identifier	The key identifier is unknown; for example, information of a patient that does not exit is transmitted

Status code (MSA-6)	Status text (MSA-3)	Description/remark
205	Duplicate key identifier	The key identifier already exists
206	Application record locked	The transaction could not be performed at the application storage level, e.g., database locked.
207	Application internal error	Other unknown internal error of the application

Remark: This message segment can appear in ACK^R01, QCK^Q02 and ACK^Q03 messages. The 4th and 6th fields use integer data type; all other fields use string data type.

3.3. PID - Patient Identification

The PID segment is mainly used to create personal information about the patient. This segment in the HL7 interface uses the following fields:

No.	Field	Length	Description
1	Set ID – PID	10	Determine different patient message segments
2	Patient ID	20	The patient's admission number
3#	Patient Identifier List	20	Medical record number
4	Alternate Patient ID – PID	20	Bed No.
5#	Patient Name	48	The patient's name
6	Mother's Maiden Name	48	The inpatient ward
7	Date/Time of Birth	26	The patient's birth date (format: YYYYMMDDHHmmSS, for example, 19830512000000); it can be left null.
8	Sex	1	The patient's sex Male: send M Female: send F Other: Send O Unknown: Send U
9	Patient Alias	48	Blood group (take "A" as the value for blood group A, "B" for blood group B, "AB" for blood group AB, and "O" for blood group O; other values are defined by platform users)
10	Race	80	Left null and reserved. The race
11	Patient Address	106	The patient's address
12	County Code	4	The county code (zip code)
13	Phone Number - Home	40	The phone number
14	Phone Number -	40	Left null and reserved. The phone

No.	Field	Length	Description
	Business		number - company
15	Primary Language	60	Left null and reserved. The principal language
16	Marital Status	80	Left null and reserved. The marital status
17	Religion	80	Left null and reserved. The religion
18	Patient Account Number	20	The patient type
19	SSN Number - Patient	16	The social security number
20	Driver's License Number – Patient	25	Fee type
21	Mother's Identifier	20	Left null and reserved. The mother's identifier
22	Ethnic Group	80	The ethnic group
23	Birth Place	60	The birth place (native place)
24	Multiple Birth Indicator	1	Left null and reserved. The multiple birth indicator; "Y" for yes, and "N" for no
25	Birth Order	2	Left null and reserved. The birth order, which is an integer greater than 0
26	Citizenship	80	Remark
27	Veterans Military Status	60	Left null and reserved. The veterans military status
28	Nationality	80	The nationality
29	Patient Death Date and Time	26	Left null and reserved. The date and time of patient death
30	Patient Death Indicator	1	Left null and reserved. The patient death indicator; "Y" for yes, and "N" for no

Remark: This message segment is only used in ORU^R01 messages. The 1st and 25th fields use integer type; the 24th and 30th fields use Boolean data type; all other fields use string data type.

3.4. OBR - Observation Request

The OBR segment is used to transmit medical order information related to the examination report.

3.4.1. Patient Sample Test Results

When transmitting patient sample test results (MSH-16 takes 0 as the value), the following fields are used in the HL7 interface:

No.	Field	Length	Description
1	Set ID – OBR	10	Set different OBR fields
2	Placer Order Number	22	The placer's order number. Left null and reserved.

No.	Field	Length	Description
3	Filler Order Number	22	The filler's order number, used as the sample ID
4#	Universal Service ID	200	The universal service ID; use manufacturer's name ^ model
5	Priority	2	Whether it is an emergency; "Y" for yes (plug and play test result), and "N" for no (batch test result)
6	Requested Date/time	26	The requested date/time, used as the sample collection time
7	Observation Date/Time	26	The observation date/time, used as the examination time
8	Observation End Date/Time	26	Left null and reserved.
9	Collection Volume	20	Left null and reserved. Used as the initial blood height
10	Collector Identifier	60	Left null and reserved. The collector identifier, used as the sample position
11	Specimen Action Code	1	Left null and reserved. The specimen action code
12	Danger Code	60	Left null and reserved. The danger code
13	Relevant Clinical Info.	300	Relevant clinical information, used as clinical diagnosis information of the patient
14	Specimen Received Date/Time	26	The requesting time
15	Specimen Source	300	Left null and reserved. The specimen source
16	Ordering Provider	120	The medical order provider, used as the requesting physician
17	Order Callback Phone Number	40	The requesting department
18	Placer Field 1	60	Left null and reserved. The sample character
19	Placer Field 2	60	The blood bag number
20	Filler Field 1	60	The attending physician
21	Filler Field 2	60	The treatment department
22	Result Rpt/Status Change – Date/Time	26	Left null and reserved. The result report/status change - date/time
23	Charge to Practice	40	Left null and reserved. The charge to practice
24	Diagnostic Serv Sect ID	10	Left null and reserved. The diagnostic section ID
25	Result Status	1	Left null and reserved. The result status
26	Parent Result	200	Left null and reserved. The parent order result
27	Quantity/Timing	200	Left null and reserved. The quantity/timing
28	Result Copies To	150	Left null and reserved. The result is copied to...

No.	Field	Length	Description
29	Parent	150	Left null and reserved. The parent order
30	Transportation Mode	20	Left null and reserved. The transportation mode
31	Reason for Study	300	Left null and reserved. The reason for study
32	Principal Result Interpreter	200	Left null and reserved. The principal result interpreter
33	Assistant Result Interpreter	200	Left null and reserved. The assistant result interpreter
34	Technician	200	Left null and reserved. The technician
35	Transcriptionist	200	Left null and reserved. The transcriptionist
36	Scheduled Date/Time	26	Left null and reserved. The scheduled date/time
37	Number of Sample Containers	4	Left null and reserved. The number of sample containers
38	Transport Logistics of Collected Sample	60	Left null and reserved. The transport logistics of collected sample
39	Collector's Comment	200	Left null and reserved. The collector's comment
40	Transport Arrangement Responsibility	60	Left null and reserved. The transport arrangement responsibility
41	Transport Arranged	30	Left null and reserved. Whether transport is arranged
42	Escort Required	1	Left null and reserved. Escort is required
43	Planned Patient Transport Comment	200	Left null and reserved. The comment on the planned patient transport
44	Ordering Facility Name	60	Left null and reserved. The name of ordering facility
45	Ordering Facility Address	106	Left null and reserved. The address of ordering facility
46	Ordering Facility Phone Number	48	Left null and reserved. The phone number of ordering facility
47	Ordering Provider Address	106	Left null and reserved. The address of ordering provider

Remark: This message segment is only used in ORU^R01 messages. The 1st, 3rd and 37th fields use integer data type; the 9th field uses floating point data type; all other fields use string data type.

3.4.2.QC Test Results

If item QC test results are transmitted (MSH-16 is 2), the fields are defined as follows:

No.	Field	Length	Description
1	Set ID – OBR	10	Set different OBR fields
2	Placer Order Number	22	The placer's order number. Left null

No.	Field	Length	Description
			and reserved.
3	Filler Order Number	22	The filler's order number. Left null and reserved.
4#	Universal Service ID	200	The universal service ID; use manufacturer's name ^ model
5	Priority	2	Left null and reserved. The priority
6	Requested Date/time	26	Left null and reserved. The requested date/time
7	Observation Date/Time	26	The observation date/time, used as the QC time
8	Observation End Date/Time	26	Left null and reserved. The observation end date/time
9	Collection Volume	20	Left null and reserved. It is used as the QC rule: 0: Westguard multi-rule 1: cumulation and control rule 2: twin-plot rule Take 1 as the fixed value for VISIONPro
10	Collector Identifier	60	Left null and reserved. It is used as the QC type: 0: real-time 1: intra-day 2: inter-day Take 2 as the fixed value for VISIONPro
11	Specimen Action Code	1	Left null and reserved. The number of QC liquid. Take 1 as the fixed value for VISIONPro
12	Danger Code	60	Left null and reserved. Used as the blood height
13	Relevant Clinical Info.	300	The name of QC liquid
14	Specimen Received Date/Time	26	The lot No. of QC liquid
15	Specimen Source	300	Used as the QC validity
16	Ordering Provider	120	Left null and reserved.
17	Order Callback Phone Number	40	The concentration level of QC liquid. Take C1 or C2 as the value
18	Placer Field 1	60	The mean value of QC liquid
19	Placer Field 2	60	The standard deviation of QC liquid
20	Filler Field 1	60	The value of test result
21	Filler Field 2	60	Left null and reserved.
22	Result Rpt/Status Change – Date/Time	26	Left null and reserved. The result report/status change - date/time
23	Charge to Practice	40	Left null and reserved. The charge to practice
24	Diagnostic Serv Sect ID	10	Left null and reserved. The diagnostic section ID
25	Result Status	1	Left null and reserved. The result status
26	Parent Result	200	Left null and reserved. The parent

No.	Field	Length	Description
			order result
27	Quantity/Timing	200	Left null and reserved. The quantity/timing
28	Result Copies To	150	Left null and reserved. The result is copied to...
29	Parent	150	Left null and reserved. The parent order
30	Transportation Mode	20	Left null and reserved. The transportation mode
31	Reason for Study	300	Left null and reserved. The reason for study
32	Principal Result Interpreter	200	Left null and reserved. The principal result interpreter
33	Assistant Result Interpreter	200	Left null and reserved. The assistant result interpreter
34	Technician	200	Left null and reserved. The technician
35	Transcriptionist	200	Left null and reserved. The transcriptionist
36	Scheduled Date/Time	26	Left null and reserved. The scheduled date/time
37	Number of Sample Containers	4	Left null and reserved. The number of sample containers
38	Transport Logistics of Collected Sample	60	Left null and reserved. The transport logistics of collected sample
39	Collector’s Comment	200	Left null and reserved. The collector’s comment
40	Transport Arrangement Responsibility	60	Left null and reserved. The transport arrangement responsibility
41	Transport Arranged	30	Left null and reserved. Whether transport is arranged
42	Escort Required	1	Left null and reserved. Escort is required
43	Planned Patient Transport Comment	200	Left null and reserved. The comment on the planned patient transport
44	Ordering Facility Name	60	Left null and reserved. The name of ordering facility
45	Ordering Facility Address	106	Left null and reserved. The address of ordering facility
46	Ordering Facility Phone Number	48	Left null and reserved. The phone number of ordering facility
47	Ordering Provider Address	106	Left null and reserved. The address of ordering provider

Remark: This message segment is only used in ORU^R01 messages. The 1st, 11th and 37th fields use integer data type; all other fields use string data type. The 12th, 13th, 14th, 15th, 17th, 18th, 19th and 20th fields are all in the format of V1^V2^…Vi according to the number of QC liquid. It should be noted that, for inter-day QC, each QC test forms a message to be sent; for real-time and intra-day QC, several QC tests of each item form a message to be sent, but messages about QC tests for different lots are sent respectively.

3.5. OBX - Observation

OBX is mainly used to transmit observation information in the report message. If a patient's sample test information is transmitted (when MSH-16 is 0), since one patient may have several OBXs, this interface does not provides repeatability test of examination data, and data are processed by the customer system.

No.	Field	Length	Description
1	Set ID – OBX	10	Set different OBX fields
2	Value Type	3	The value type, used as the type of identifying test result NM (numeric) represents numeric value, used for quantitative items ST (string) represents string value, used for qualitative items BOTH represents both quantitative and qualitative results exist
3#	Observation Identifier	590	Check the examination item channel No.. In the operating software, it is the LIS channel No. of the item in the item parameter setup interface, which can be a numeric or alphabetic value. For test results received by the LIS from the instrument, this field must be used to match the item
4	Observation Sub-ID	20	The name of examination item
5	Observation Value	65536	The observation value, used as the quantitative examination result (ESR/KATZ/HCT); it is a string value in such formats as 1.23 and >100
6	Units	90	The units, used as the units of examination result values
7	References Range	90	The reference range, which is the normal range of examination result values
8	Abnormal Flags	5	The abnormal flags, indicating whether the examination results are normal (description) L - too low H - too high N - normal
9	Probability	5	The probability, used as the temperature and temperature deviation in the test process, connected with “^” (temperature^temperature deviation)
10	Nature of Abnormal Test	2	The reason for abnormal test, used as the ESR value with 18° correction. It is valid only when ESR results are transmitted, and left null for other results
11#	Observe Result Status	1	The observation result status. Take F-final results as the value
12	Date Last Observe Normal Values	26	Left null and reserved. The date of last observation of normal values

13	User Defined Access Checks	20	The user defined access checks, used as the raw results. It is a string value in such formats as 1.23 and >100
14	Date/Time of the Observation	28	The observation date/time, used as the examination time
15	Producer's ID	60	Left null and reserved. Used as the examining department
16	Responsible Observer	80	The responsible observer, used as the examining physician
17	Observation Method	60	Left null and reserved. The observation method

Remark: This message segment only appears in ORU^R01 messages. The 1st field uses integer data type; all other fields use string data type.

3.6. QRD - Query Definition Segment

The QRD segment of HL7 interface uses the following fields:

No.	Field	Length	Description
1#	Query Date/Time	26	The date/time of current query. Take the system time
2#	Query Format Code	1	The query format code. Take R (record-oriented format) as the value
3#	Query Priority	1	The query priority. Take D (deferred) as the value
4#	Query ID	10	The query ID, which represents different queries and increases from 1 with the number of query
5	Deferred Response Type	1	Left null and reserved. The deferred response type
6	Deferred Response Date/Time	26	Left null and reserved. The deferred response date/time
7#	Quantity Limited Request	10	The quantity limited request. Take RD (records) as the value
8#	Who Subject Filter	60	The query person filter identifier, used as the patient's sample barcode
9#	What Subject Filter	60	The query content filter identifier, which is set to OTH for query
10#	What Department Data Code	60	Left null and reserved. The department data code
11	What Data Code Value Qual.	20	Left null and reserved. The data code value qualifier
12	Query Results Level	1	Left null and reserved. The level of query results. Take T (Full results) as the value

Remark: This message segment may appear in QRY^Q02 and DSR^Q03 messages. The 8th field is the sample barcode number in case of real-time acquisition, and is null in case of batch acquisition or acquisition by number. The 4st field uses integer data type; all other fields use string data type.

3.7. QRF - Query Filter Segment

The QRF segment is used in conjunction with QRD, which further defines the original query content. The QRF segment of HL7 interface uses the following fields:

No.	Field	Length	Description
1#	Where Subject Filter	20	The query person location filter identifier, which takes the device model as the value
2	When Data Start Date/Time	26	Record the start date/time, which is used as the start time of sample receipt during query
3	When Data End Date/Time	26	Record the end date/time, which is used as the end time of sample receipt during query
4	What User Qualifier	60	The initial sample ID, which is a string value
5	Other QRY Subject Filter	60	The final sample ID, which is a string value. When a single sample is queried, the value of this ID is identical to the initial ID
6	Which Date/Time Qualifier	12	The target type, which takes RCT (Specimen receipt date/time, receipt of specimen in filling ancillary (Lab)) as the value
7	Which Date/Time Status Qualifier	12	The target status, which takes COR (Corrected only (no final with corrections)) as the value
8	Date/Time Selection Qualifier	12	The date/time selection qualifier, which takes ALL (All values within the range) as the value
9	When Quantity/Timing Qualifier	60	Left null and reserved. The time interval field

Remark: This message segment appears in QRY^Q02 and DSR^Q03 messages. The 2nd and 3rd fields are zero o'clock on the date of query and the time when the query takes place, respectively, used as the time range condition for query. All fields use string data type. The 4th and 5th fields are respectively the initial sample ID and final sample ID for query, allowing query by number range. When the 4th field is null, query is carried out by time; when the 4th field is not null, query is carried out by sample ID.

3.8. ERR - Error Segment

The ERR segment is used to add error description to the acknowledgment message. The ERR segment of HL7 interface uses the following fields:

No.	Field	Length	Description
1#	Error Code and Location	80	The error code and location

Remark: This message segment may appear in QCK^Q02, DSR^Q03 or ACK^Q03 messages (see the Message Error Status Code List for details). This message segment has only one field which uses integer data type.

3.9. QAK - Query Acknowledgment Segment

The QAK segment contains some information following query response. The QAK segment of HL7 interface uses the following fields:

No.	Field	Length	Description
1	Query Tag	32	The query tag, which takes SR (sample request information) as the value
2	Query Response Status	2	The query response status OK: Data found, no errors NF: No data found, no errors AE: Application error AR: Application reject

Remark: This message segment appears in QCK^Q02 and DSR^Q03 messages. All fields use string data type.

3.10. DSP - Display Data Segment

The DSP segment is used to display sample request information and patient information obtained from query, which can be repeated. The DSP segment of HL7 interface uses the following fields:

No.	Field	Length	Description
1	Set ID - DSP	4	Set different DSP fields
2	Display Level	4	The display level
3#	Data Line	300	The data line, which displays the content obtained from query
4	Logical Break Point	2	The logical break point
5	Result ID	20	The result ID

Remark: This message segment only appears in DSR^Q03 messages. The 1st field uses integer data type; all other fields use string data type.

The 3rd field “Data Line” is used to display sample request information downloaded from the LIS server. See the table below for detailed entries and sequence of sample request information. Among them, the barcode number is mandatory, and other information can be left null. When the sample contains more than 1 item, fields will be added from the 29th field in the format same as the 29th field.

No.	Content	Type	Value
1	Admission No.	String	Null
2	Bed No.	String	Null
3	Patient name	String	At most 32 characters
4	Date of birth	String	Date format: YYYYMMDDHHmmSS (Year-Month-Day-Hour-Minute-Second) For example: 20160101235959
5	The patient’s sex	String	Male = M; Female = F; Other = 0
6	Blood group	String	O, A, B, AB
7	Race	String	Null
8	Address	String	Null
9	Zip code	String	Null
10	Home phone number	String	Null
11	Sample position	String	The sample position, which can be left null
12	Sample collection time	String	Date format: YYYYMMDDHHmmSS (Year-Month-Day-Hour-Minute-Second) For example: 20160101235959
13	Unused		Null
14	Unused		Null
15	The patient type	String	Outpatient = outpatient; Inpatient = inpatient; Other = other
16	Social security number	String	Null
17	Fee type	String	Out-of-pocket = own; Social insurance = insurance
18	The ethnic group	String	Null
19	Native place	String	Null
20	Country	String	Null

21#	Sample barcode	String	Sample ID
22#	Sample ID	int	Left null and reserved.
23	Requesting time	String	Date format: YYYYMMDDHHmmSS (Year-Month-Day-Hour-Minute-Second) For example: 20160101235959
24#	Whether it is an emergency	String	Yes = Y No = N If it is null, the default value is N
25	Unused	String	Null
26#	Sample type	String	Serum; Plasma; Urine; Cerebrospinal fluid; Other
27	Requesting physician	String	Null
28	Requesting department	String	Null
29#	Test item	string	Left null and reserved.

3.11. DSC - Continuation Pointer Segment

DSC - Continuation pointer segment

The DSC segment is used to indicate whether it is the last data message in a response message.

No.	Field	Length	Description
1	Continuation pointer	180	The continuous pointer

Remark: This message segment is only used in DSR^Q03 messages. When a DSR^Q03 message is used to respond to batch query, except that the value of the unique field of this segment in the last DSR message of sample request information is null (symbolizing the completion of data transmission), the unique field of this segment in other DSR messages are not null. This message segment has only one field which uses integer data type.

For example, the LIS needs to send information of 5 samples in batch:

The 1st sample DSC|1|

The 2nd sample DSC|2|

The 3rd sample DSC|3|

The 4th sample DSC|4|

The 5th sample DSC||

4. Examples

Note: In the following examples, the item channel No. uses the English name of each item

4.1. Upload Test Results to LIS Server

4.1.1. Sample Test Results

Send sample results which include 3 item results, namely, ESR, KATZ and HCT

- The instrument sends: **ORU^R01**

<SB>MSH|^~\&|YHLO|VisionPro|||20171111135126||ORU^R01|1|P|2.3.1||||0||ASCII|||<CR>
PID|1|HosNo12|MedicalRecordSN10|BedNo13|Name|Area11|19800101000000|M|B||Address5|ZipCode6|TelNo4|||||PatientType7|SecuritySN9|FeeType8|AnimalType15|Nation2|Native3|||Remark14||Country1|||<CR>
OBR|1||SampleNO|YHLO^VisionPro|Y|20171111135126|20171111135126||0.000000|11||||20171111135126||||||||||||||||||||||||||||||||<CR>
OBX|1|BOTH|0|ESR|78|mm/h|0.000000-0.000000|H|30\S\5|80|F||0.000000|20171111135126||||<CR>
OBX|2|BOTH|1|KATZ|7888|mm/h||N|30\S\5|0|F||0.000000|20171111135126||||<CR>
OBX|3|BOTH|2|HCT|788|mm/h||N|30\S\5|0|F||0.000000|20171111135126||||<CR>
<EB><CR>

- **The LIS responds with: ACK^R01**

<SB>MSH|^~\&|Manufacturer|Model|||20171111135126||ACK^R01|1|P|2.3.1||||0||ASCII|||<CR>
MSA|AA|1|Message accepted|||0|<CR>
<EB><CR>

4.1.2. QC Test Results

Send QC results.

- **The instrument sends: ORU^R01**

<SB>MSH|^~\&|YHLO|VisionPro|||20171111135706||ORU^R01|4|P|2.3.1||||2||ASCII|||<CR>
OBR|1|||YHLO^VisionPro|||20171111135706||1|2|1||QC|SampleNO|20181111135706||M|0.000000|0.000000|78.000000||||||||||||||||||||||||||<CR>
<EB><CR>

- **The LIS responds with: ACK^R01**

<SB>MSH|^~\&|Manufacturer|Model|||20171111135706||ACK^R01|4|P|2.3.1||||2||ASCII|||<CR>
MSA|AA|4|Message accepted|||0|<CR>

<EB><CR>

4.2. Get Sample Information from LIS Server

4.2.1. Query by Sample ID

Query barcode: sample of BarCode1

- **The instrument sends: QRY^Q02**

<SB>MSH|^~\&|YHLO|VisionPro|||20160122110540||QRY^Q02|14|P|2.3.1||||||ASCII|||<CR>
QRD|20160122110540|R|D|1|||RD|BarCode1|OTH|||T|<CR>
QRF|VisionPro|||||RCT|COR|ALL||<CR>
<EB><CR>

- **The LIS responds with: QCK^Q02**

<SB>MSH|^~\&|||YHLO|VisionPro|20160122110540||QCK^Q02|14|P|2.3.1||||||ASCII|||<CR>
MSA|AA|14|Message accepted|||0|<CR>
ERR|0|<CR>
QAK|SR|OK|<CR>
<EB><CR>

- **The LIS responds with: DSR^Q03，information of the 1st sample**

<SB>MSH|^~\&|||||20160122110540||DSR^Q03|14|P|2.3.1||||||ASCII|||<CR>
MSA|AA|14|Message accepted|||0|<CR>
ERR|0|<CR>
QAK|SR|OK|<CR>
QRD|20160122110540|R|D|1|||RD||OTH|||T|<CR>
QRF|iFlash3000|||||RCT|COR|ALL||<CR>
DSP|1||HosNo000|||<CR>
DSP|2||BedNo000|||<CR>
DSP|3||Name000|||<CR>
DSP|4||20000101000000|||<CR>
DSP|5||M|||<CR>
DSP|6||BloodType000|||<CR>
DSP|7|||||<CR>
DSP|8||Address000|||<CR>
DSP|9||ZipCode0|||<CR>
DSP|10||TelNo0|||<CR>
DSP|11||1|||<CR>

DSP|12|||||<CR>
DSP|13|||||<CR>
DSP|14|||||<CR>
DSP|15||PatientType000|||<CR>
DSP|16||SecuritySN000|||<CR>
DSP|17||FeeType000|||<CR>
DSP|18||Nation000|||<CR>
DSP|19||Native000|||<CR>
DSP|20||Country000|||<CR>
DSP|21||BarCode1|||<CR>
DSP|22|||||<CR>
DSP|23|||||<CR>
DSP|24||N|||<CR>
DSP|25|||||<CR>
DSP|26||SampleType0|||<CR>
DSP|27||RequestDoctor0|||<CR>
DSP|28||RequestDept0|||<CR>
DSP|29|||||<CR>
DSC|1|<CR>
<EB><CR>

- **The instrument sends: ACK^Q03, acknowledging the receipt of information of the 1st sample**

<SB>MSH|^~\&|YHLO|VisionPro|||20160122110541||ACK^Q03|14|P|2.3.1||||||ASCII|||<CR>
MSA|AA|14|Message accepted|||0|<CR>
ERR|0|<CR>
<EB><CR>

- **The LIS responds with: DSR^Q03, information of the 2nd sample**

(Note: Assuming that there are more than one sample satisfying the query condition)

<SB>MSH|^~\&|||||20160122110540||DSR^Q03|14|P|2.3.1||||||ASCII|||<CR>
MSA|AA|14|Message accepted|||0|<CR>
ERR|0|<CR>
QAK|SR|OK|<CR>
QRD|20160122110540|R|D|1|||RD||OTH|||T|<CR>
QRF|iFlash3000|||||RCT|COR|ALL||<CR>
DSP|1||HosNo1|||<CR>
DSP|2||BedNo1|||<CR>
DSP|3||Name 1|||<CR>

DSP|4||19800101000000|||<CR>
DSP|5||F|||<CR>
DSP|6||B|||<CR>
DSP|7|||||<CR>
DSP|8||Address1|||<CR>
DSP|9||ZipCode1|||<CR>
DSP|10||TelNo1|||<CR>
DSP|11||1|||<CR>
DSP|12|||||<CR>
DSP|13|||||<CR>
DSP|14|||||<CR>
DSP|15||PatientType1|||<CR>
DSP|16||SecuritySN1|||<CR>
DSP|17||FeeType1|||<CR>
DSP|18||Nation1|||<CR>
DSP|19||Native1|||<CR>
DSP|20||Country1|||<CR>
DSP|21||BarCode1|||<CR>
DSP|22|||||<CR>
DSP|23|||||<CR>
DSP|24||N|||<CR>
DSP|25|||||<CR>
DSP|26||SampleType1|||<CR>
DSP|27||RequestDoctor1|||<CR>
DSP|28||RequestDept1|||<CR>
DSP|29|||||<CR>
DSC||<CR>
<EB><CR>

- **The instrument sends: ACK^Q03, acknowledging the receipt of information of the 2st sample**

<SB>MSH|^~\&|YHLO|VisionPro|||20160122110542||ACK^Q03|14|P|2.3.1||||||ASCII|||<CR>
MSA|AA|14|Message accepted|||0|<CR>
ERR|0|<CR>
<EB><CR>

4.2.2.Query by Time

Query of samples between 8:00 and 12:00 on January 22, 2016

- **The instrument sends: QRY^Q02**

<SB>MSH|^~\&|YHLO|VisionPro|||20160122112815||QRY^Q02|16|P|2.3.1||||||ASCII|||<CR>
QRD|20160122112815|R|D|1|||RD||OTH|||T|<CR>
QRF|VisionPro|20160122080000|20160122120000|||RCT|COR|ALL||<CR>
<EB><CR>

The remaining process is same as query by barcode.