RAC-1800 Host Interface Manual

Brief Introduction

This Manual for HL7 Interface is developed by our company for Coagulation Analyzer RAC-1800 to adapt to the prevailing Laboratory Information Management System (LIS). It provides a channel for RAC-1800 and other IP-based networks. With TCP/IP, the LIS host can receive test results from RAC-1800, which also send patient information, sample information and test results to LIS in real-time or batch mode. Therefore, users can identify samples by both scanning sample bar code and downloading from LIS host. This chapter describes the two communication modes
(sending and downloading). All data are transmitted in format of HL7 v2.3. This interface enables bidirectional communication between the analyzer and the LIS host.

Chapter 1: HL7 Interface Summary

1.1 Messages Compatible with HL7 Interface

HL7, a transmission standard for electronic data and providing nurse for inpatients, was first defined by Americans and now has been applied by many countries. The HL7 interface is defined based upon HL7 v2.3. Refer to *HL7 Interface Standards Version 2.3.* for details.

Only portion of the messages, segments and other data defined are used for HL7 interface that needs only part of these data.

1.2 HL7 Lower Layer Protocol

TCP/IP is the byte stream protocol, which does not provide message border. HL7 is a higher layer protocol that is based upon messages but provides no message termination mechanism. To determine the message border, the minimal lower layer protocol is used. Refer to *HL7 Interface Standards Version 2.3* for details.

Communication Layer
Messages are transmitted in format of:
<SB> *ddddd* <EB><CR>

Where,
■<SB> = Start Block character (1 byte)
ASCII <VT>, namely <0x0B>, must not be confused with the SOH or STX in ASCII.
■ *ddddd* = Data (variable number of bytes)
ddddd is an HL7 message, which only includes ISO 8859-1 characters (hexadecimal 20-FF) and <CR>, exclusive of other control characters and those that can't be printed out.
■ <EB> = End Block character (1 byte)
ASCII <FS>, namely <0x1C >, must not be confused with the ETX or EOT in ASCII.
■<CR> = Carriage Return (1 byte)
Enter character in ASCII is <0x0D>.

1.3 **Minimal Lower Layer Protocol（MLLP）**

This interface is compatible with the Minimal Lower Layer Protocol (MLLP) of HL7. MLLP, an encapsulation of HL7 messages, is defined in the HL7 standard. HL7 messages are encapsulated with a

single character at the beginning and a dual character at the end. The characters used by the HL7 interface are default in the HL7 standard.
Start character: Hexadecimal <0B>
End character: Hexadecimal <1C><0D>

Chapter 2: Dural way Communication

Communication here concerns result sending and sample information downloading.
The former means the analyzer transmits the measurement data to an external system (such as the LIS). There are two types of transmission: real-time and batch. Batch-mode transmission is not allowed in two conditions: 1) Real-time mode is enabled; 2) The system is in testing status. The latter means the analyzer downloads sample information from LIS in real-time or batch mode. Real-time mode can be achieved only if a sample bar code reader is equipped. Batch-mode downloading refers to retrieving samples in certain period of the day.
This chapter introduces the message types (Ver. 2.3) used by HL7 interface.

NOTE:
HL7 supports many types of messages, but only 5 of them are employed on the HL7 interface.

2.1 Message Grammar

This section introduces the general grammar of HL7 interface.

NOTE:
For complete and detailed descriptions of HL7 message grammar, refer to the HL7 standard written by the HL7 standard committee.

Each HL7 message is composed of segments that end with <CR>.
Each segment consists of a name (three characters) and variable fields that are composed of components and subcomponents. The separators of each element are defined in the MSH segment in every message.
For instance,
MSH|^~\&| analyzer ||AAA|RAC-1800|20110317153213||ORU^R01|1|P|2.3.1||||0||ASCII|||

Where, the five characters following MSH are defined as delimiters to separate the fields, components and subcomponents. Although the characters can be any non-text ones, the HL7 standard recommends you to use the following:

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

The first field of MSH includes all separators and most of other fields are empty.
These fields are optional and not used by HL7 interface.

Field 9	Includes message types (ORU)
Field 10	Includes an unique text string to indicate message ID
Field 11	Includes processing ID (P refers to product)
Field 12	Defines the version of HL7 (2.3) for the message

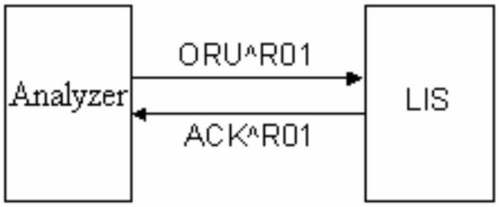
The order of the segments following MSH in every message is specially specified.

NOTE:
A segment is defined as optional or to be repeated by using the following grammar:

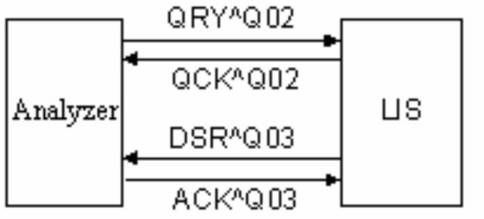
[ ] indicates the segment in it is optional.
{ } indicates the segment in it can be repeated for 0 or 1 time or more.

2.2 Compatible HL7 Messages

All messages used for HL7 interface include ORU, ACK, QRY, QCK and DSR.
Test results are transferred as follows:



Sample information is downloaded from LIS as follows:



ORU/ACK: Observe result (unsolicited)/Acknowledgment

ORU^R01 is used to transmit sample result, QC result and calibration results to the LIS host. (Transmission of calibration results is not allowed on the analyzer)

An **ORU^R01** message includes:
- Patient information (patient name, sample ID, etc)
- Doctor's order (sample type, sender, tester, clinical diagnosis, etc)
- Test results (test No., concentration, unit, reference, etc)

When the test information reaches the LIS server, you can select desired items as needed.

On the analyzer, each ORU^R01 message transmits one test, which could be routine test, ISE Analyte, off-system test or calculation test. A sample with multiple tests will be transmitted via multiple ORU messages.

The structure of an **ORU** message is as follows:

ORU	Description
MSH	Message header
PID	Patient identification
OBR	Observation report ID
OBX	Observation/Result

■ Calibration result includes the following information:
-Test information (test No. and test name)
-Calibration rule and date/time
-Calibrator information (quantity, sequence number, name, lot No., expiration date, concentration, etc)
-Calibration result (response, number of calibration parameters, parameter value)

All calibration results of a test can be transmitted via one message. The above-mentioned information can be applied as needed. Refer to following contents for details.

■ QC result includes the following information:
-Test information (test No. and test name)
-Control information (name, lot No., expiration date, concentration level, mean value)
-Date/time and QC result (concentration and unit)
The above-mentioned information can be applied as needed. Refer to following contents for details.

On the analyzer, each ORU^R01 message carries the result of one QC run.The message structure for calibration and QC results are show below:

ORU Observational Results (Unsolicited)	Description
MSH	Message Header
OBR	Observation report(calibration and QC)

ACK^R01 message responds to ORU message and is as follows:

ACK Acknowledgment	Description
MSH	Message Header
MSA	Message Acknowledgment

QRY/QCK: Query/Query acknowledgment

QRY^Q02 message is used for sample information query on LIS and has an event Q02. The structure of **QRY** message is as follows:

QRY	**Description**
MSH	Message Header
QRD	Query Definition
QRF	Query Filter

QCK^Q02 message responds to QRY^Q02 message and is as follows:

QCK	**Description**
MSH	Message Header
MSA	Message Acknowledgment
ERR	Error
QAK	Query Acknowledgment

DSR/ACK: Display response/ Acknowledgment

DSR^Q03 message sends and displays searched results, i.e. send sample information from LIS to the analyzer. The structure of **DSR** message is as follows:

DSR	**Description**
MSH	Message Header
MSA	Message Acknowledgment
ERR	Error

QAK	Query Acknowledgment
QRD	Query Definition
QRF	Query Filter
{DSP}	Display Data
DSC	Continuation Pointer

ACK^Q03 responds to DSR^Q03 message and is as follows:

ACK	Description
MSH	Message Header
MSA	Message Acknowledgement
ERR	Error

Message Segment

This section describes the components of each segment: field name, field length and description.
All fields used in message segment are listed in following tables. The numbers followed by a '#' symbol indicate that the fields are required for the message.

NOTE:

Some fields, though without values, are provided in HL7 protocol for function extension in future.

■MSH Message Header

All HL7 messages begin with MSH, which is the first segment of an HL7 message and always located at the beginning of the message. The MSH segment defines the intention, source, purpose and grammar of the message.
The MSH segment of HL7 interface message uses the following fields:

No.	Field Name	Length	Explanation
1	Field Separator	1	Includes Field ID and the first real field separator (|)
2	Encoding Characters	4	Include component separator, repetition separator, escape character separators and sub-assemblies separators（a～\&)
3	Sending Application	180	Sending Application，Use Rayto
4	Sending Facility	180	Sending Facility, Use Chemray 240
5	Receiving Application	180	Blank, retained. Receiving Application
6	Receiving Facility	180	Blank, retained. Receiving Facility
7	Date/Time Of Message	26	Data/Time of current Message, Call the system time message
8	Security	40	Empty, Reserved. Security
9	Message Type	7	Message type, e.g.:ORUAR01
10	Message Control ID	20	Message Control ID， Uniquely identifies a Message, It increase by 1 along with the increasing of Message number.
11	Processing ID	3	Processing ID, set as P.

12	Version ID	60	Version ID, HL7 Version is 2.3.1
13	Sequence Number	15	Blank, retained. SN.
14	Continuation Pointer	180	Blank, retained. Continuous pointer
15	Accept Acknowledgment Type	2	Blank, retained. Receiving Response type.
16	Application Acknowledgment Type	2	Application response type, the type of results as the sender. 0 - patient sample test results; 1 - Calibration Results 2 - quality control results
17	Country Code	2	Blank, retained. Country code
18	Character Set	10	Character set, using ASCII code.
19	Principal Language Of Message	60	Blank, retained. Message principal language
20	Alternate Character Set Handling Scheme	20	Blank, retained. Alternate character set handling scheme

Comments: MSH segment applies to all messages. Fields 3 and 4 are determined by LIS manufacturer; fields 5 and 6 are set to “Rayto” and “RAC-1800”; fields 10 and 16 are integers; others are strings.

MSA - message acknowledgment segment

The MSA segment of HL7 interface message uses the following fields:

No.	**Field**	Code **Length**	**Description**
1#	Acknowledgment	2	Acknowledgment code. AA stands for accepted, AE for error and AR for rejected.
2#	Message Control ID	20	Message control ID, corresponding to MSH-10.
3	Text Message	80	Text message, a description of error or reject event, corresponding to field 6. It can be written into error logs.
4	Expected Sequence Number	15	Void and reserved. Expected sequence number.
5	Delayed Acknowledgment Type	1	Void and reserved. Delayed acknowledgment type.
6	Error Condition	100	Error condition (status code).

The status code list is shown as the figure below.

Status Code (MSA-6)	Status Text(MSA-3)	Description/Comment
Succeed:		AA
0	Message accepted	Succeed
Error code:		AE
100	Segment sequence error	Segment sequence is incorrect or required segment is missed.
101	Required field missing	Required field in a segment is missed.
102	Data type error	Data type of a field is incorrect.
103	Table value not found	Table value is not found, therefore not used temporarily.
Reject code:		AR
200	Unsupported message type	Message type is not supported.
201	Unsupported event code	Event code is not supported.
202	Unsupported processing id	Processing ID is not supported.
203	Unsupported version id	Version ID is not supported.
204	Unknown key identifier	Key identifier is unknown, such as inexistent patient information.
205	Duplicate key identifier	The key identifier already exists.
206	Application record locked	The transaction could not be performed at the application storage level, such as locked database.
207	Application internal error	Unknown application internal error.

Comments: MSA segment applies to ACK^R01, QCK^Q02 and ACK^Q03 messages. Fields 4 and 6 are integers, while others are strings.

PID Patient Identification

The PID segment constitutes patient information and uses the following fields:

No.	Field	Length	Explanation
1	Set ID - PID	10	Message segment identified for different patients
2	Patient ID	20	The patient's hospital number

3	Patient Identifier List	20	Blank, retained. Medical record number
4	Alternate Patient ID - PID	20	Bed No.
5	Patient Name	48	Patient Name
6	Mother’s Maiden Name	48	Ward
7	Date/Time of Birth	26	Blank, retained. Patient’s birth date/time.
8	Sex	1	Sex, Male, send M; Female, Send F; other send O.
9	Patient Alias	48	Blank, retained.Blood type.
10	Race	80	Blank, retained. Race
11	Patient Address	106	Blank, retained. Patient Address
12	County Code	4	Blank, retained. County code (Post Zip)
13	Phone Number - Home	40	Blank, retained.。Phone No.-Home
14	Phone Number - Business	40	Blank, retained. Mobile Phone No.-Business
15	Primary Language	60	Blank, retained. Primary Language
16	Marital Status	80	Blank, retained. Marital status
17	Religion	80	Blank, retained.Religion
18	Patient Account Number	20	Blank, retained. Patient Account type
19	SSN Number -Patient	16	Blank, retained. Patient’s Medical care ID
20	Driver's License Number — Patient	25	Blank, retained.
21	Mother's Identifier	20	Blank, retained.

22	Ethnic Group	80	Blank, retained.
23	Birth Place	60	Blank, retained.
24	Multiple Birth Indicator	1	Blank, retained. Y means Yes, N means No.
25	Birth Order	2	Blank, retained. an integer greater than 0
26	Citizenship	80	Note: sample identification information, such as: jaundice, chyle, hemolysis
27	Veterans Military Status	60	Blank, retained.
28	Nationality	80	Blank, retained.
29	Patient Death Date and Time	26	Blank, retained.
30	Patient Death Indicator	1	Blank, retained. Y means Dead, N means Alive.

Comments: PID segment only applies to ORU^R01 message. Fields 1 and 25 are integers; fields 24 and 30 are Booleans; others are strings.

OBR Observation Request

The OBR segment transmits the doctor's orders associated with the patient report. If MSH-16 is 0, HL7 interface uses the following fields:

No.	Field Name	Length	Explanation
1	Set ID — OBR	10	Identify different OBR segments
2	Placer Order Number	22	Blank, retained. Sample NO.
3	Filler Order Number	22	Sample Serial No.
4	Universal Service ID	200	Universal Service ID, Rayto^Chemray 240
5	Priority (Stat Sample)	2	Stat status，Y means Yes，N means N
6	Requested Date/time	26	Blank, retained. Request Date/time
7	Observation Date/Time	26	Observation Date/Time
8	Observation End Date/Time	26	Blank, retained. Observation End Date/Time

9	Collection Volume	20	Blank, retained.
10	Collector Identifier	60	Blank, retained.
11	Specimen Action Code	1	Blank, retained.
12	Danger Code	60	Blank, retained. Danger Code
13	Relevant Clinical Info.	300	Blank, retained. Related Clinic Information
14	Specimen Received Date/Time	26	Inspection time
15	Specimen Source	300	Blank, retained. Sample type: serum, urine, plasma, etc.
16	Ordering Provider	120	Sending doctor
17	Order Callback Phone Number	40	Sending Department
18	Placer Field 1	60	Sample status, such as, icterus、hemolysis、lipemia
19	Placer Field 2	60	Blank, retained. Blood bag No.
20	Filler Field 1	60	Blank, retained.Doctor Name
21	Filler Field 2	60	Blank, retained. Department Name
22	Result Rpt/Status Change — Date/Time	26	Blank, retained.
23	Charge to Practice	40	Blank, retained.
24	Diagnostic Serv Sect ID	10	Blank, retained.
25	Result Status	1	Blank, retained.
26	Parent Result	200	Blank, retained.
27	Quantity/Timing	200	Blank, retained.
28	Result Copies To	150	Blank, retained.
29	Parent	150	Blank, retained.
30	Transportation Mode	20	Blank, retained.
31	Reason for Study	300	Blank, retained.
32	Principal Result Interpreter	200	Blank, retained.
33	Assistant Result Interpreter	200	Blank, retained.
34	Technician	200	Blank, retained.
35	Transcriptionist	200	Blank, retained.

36	Scheduled Date/Time	26	Blank, retained.
37	Number of Sample Containers	4	Blank, retained.
38	Transport Logistics of Collected Sample	60	Blank, retained.
39	Collector's Comment	200	Blank, retained.
40	Transport Arrangement Responsibility	60	Blank, retained.
41	Transport Arranged	30	Blank, retained.
42	Escort Required	1	Blank, retained.
43	Planned Patient Transport Comment	200	Blank, retained.
44	Ordering Facility Name	60	Blank, retained.
45	Ordering Facility Address	106	Blank, retained.
46	Ordering Facility Phone Number	48	Blank, retained.
47	Ordering Provider Address	106	Blank, retained.

Comments: OBR segment only applies to ORU^R01 message. Fields 1, 3 and 37 are integers; field 9 is a floating number; others are strings.

To transmit calibration result (MSH-16 is 1), HL7 interface uses the following fields: (Calibration result transmission is not allowed on the analyzer)

No.	Field	Length	Description
1	Set ID – OBR	10	Identifies different OBR segments.
2	Placer Order Number	22	Order number of placer, used as test No.
3	Filler Order Number	22	Order number of filler, used as test name.
4	Universal Service ID	200	Universal service ID, set to "Manufacturer" ^ "Model".
5	Priority	2	STAT or not. Y for yes and N for no.

No.	Field	Length	Description
6	Requested Date/time	26	Void and reserved. Requesting date/time.
7	Observation Date/Time	26	Observation date/time, used as calibration date/time.
8	Observation End Date/Time	26	Void and reserved. Observation end date/time.
9	Collection Volume	20	Calibration rule. It includes **0 is One point Linear, 1 is 2-Point linear** **2 is Multipoint Non-Linear 3 is Log-Log 4P**
10	Collector Identifier	60	K factor
11	Specimen Action Code	1	Number of calibrators
12	Danger Code	60	Calibrator No.
13	Relevant Clinical Info.	300	Calibrator name
14	Specimen Received Date/Time	26	Lot No.
15	Specimen Source	300	Expiration date
16	Ordering Provider	120	Standard concentration
17	Order Callback Phone Number	40	Concentration level. High-H, Medium-M, Low-L
18	Placer Field 1	60	Response
19	Placer Field 2	60	Number of calibration parameters
20	Filler Field 1	60	Calibration value
21	Filler Field 2	60	Void and reserved.
22	Result Rpt/Status Change – Date/Time	26	Void and reserved. Result report/status change-date/time.
23	Charge to Practice	40	Void and reserved. Charge to practice.
24	Diagnostic Serv Sect ID	10	Void and reserved. Diagnosis ID.
25	Result Status	1	Void and reserved. Status of result.
26	Parent Result	200	Void and reserved. Parent result.
27	Quantity/Timing	200	Void and reserved. Quantity/time.
28	Result Copies To	150	Void and reserved. Result copies to.
29	Parent	150	Void and reserved. Parent order.
30	Transportation Mode	20	Void and reserved. Transportation mode.
31	Reason for Study	300	Void and reserved. Reason for study.
32	Principal Result Interpreter	200	Void and reserved. Principal result interpreter.

33	Assistant Result Interpreter	200	Void and reserved. Assistant result interpreter.
34	Technician	200	Void and reserved. Technician.
35	Transcriptionist	200	Void and reserved. Transcriptionist.
36	Scheduled Date/Time	26	Void and reserved. Scheduled date/time.
37	Number of Sample Containers	4	Void and reserved. Number of sample containers.
38	Transport Logistics of Collected Sample	60	Void and reserved. Transport logistics of collected sample.
39	Collector's Comment	200	Void and reserved. Collector's comment.
40	Transport Arrangement Responsibility	60	Void and reserved. Transport arrangement responsibility.
41	Transport Arranged	30	Void and reserved. Transport arranged.
42	Escort Required	1	Void and reserved. Escort required.
43	Planned Patient Transport Comment	200	Void and reserved. Planned patient transport comment.
44	Ordering Facility Name	60	Void and reserved. Name of placer.
45	Ordering Facility Address	106	Void and reserved. Address of placer.
46	Ordering Facility Phone Number	48	Void and reserved. Phone number of placer.
47	Ordering Provider Address	106	Void and reserved. Address of provider.

Comments: This segment only applies to ORU^R01 message. Fields 1, 9, 11, 19 and 37 are integers; field 10 is a floating number; others are strings. Fields 12-18 vary with the number of calibrators in the format of V1^V2^…Vi. Field 20 varies with the number of calibration parameters and is also separated by ^.

To transmit QC result (MSH-16 is 2), HL7 interface uses the following fields:

No.	Field	Length	Description
1	Set ID – OBR	10	Identifies different OBR segments.
2	Placer Order Number	22	Order number of placer, used as test No..
3	Filler Order Number	22	Order number of filler, used as test name.
4#	Universal Service ID	200	Universal service ID, set to "Manufacturer" ^ "Model".
5	Priority	2	STAT or not. Y for yes and N for no.
6	Requested Date/time	26	Requesting date/time, used as QC date/time
7	Observation Date/Time	26	Void and reserved. Observation date/time
8	Observation End Date/Time	26	Void and reserved. Observation end date/time
9	Collection Volume	20	Void and reserved
10	Collector Identifier	60	Void and reserved
11	Specimen Action Code	1	Void and reserved
12	Danger Code	60	Void and reserved
13	Relevant Clinical Info.	300	Control name
14	Specimen Received Date/Time	26	Lot No.
15	Specimen Source	300	Expiration date
16	Ordering Provider	120	Void and reserved
17	Order Callback Phone Number	40	Concentration level. High-H, Medium-M, Low-L
18	Placer Field 1	60	Mean value (mean concentration)
19	Placer Field 2	60	Standard deviation
20	Filler Field 1	60	Test result (concentration)
21	Filler Field 2	60	Unit
22	Result Rpt/Status Change – Date/Time	26	Void and reserved. Result report/status change-date/time.
23	Charge to Practice	40	Void and reserved. Charge to practice.
24	Diagnostic Serv Sect ID	10	Void and reserved. Diagnosis ID.
25	Result Status	1	Void and reserved. Status of result.
26	Parent Result	200	Void and reserved. Parent result.
27	Quantity/Timing	200	Void and reserved. Quantity/time.
28	Result Copies To	150	Void and reserved. Result copies to.
29	Parent	150	Void and reserved. Parent order.
30	Transportation Mode	20	Void and reserved. Transportation mode.
31	Reason for Study	300	Void and reserved. Reason for study.
32	Principal Result Interpreter	200	Void and reserved. Principal result interpreter.
33	Assistant Result Interpreter	200	Void and reserved. Assistant result interpreter.

34	Technician	200	Void and reserved. Technician.
35	Transcriptionist	200	Void and reserved. Transcriptionist.
36	Scheduled Date/Time	26	Void and reserved. Scheduled date/time.
37	Number of Sample Containers	4	Void and reserved. Number of sample containers.
38	Transport Logistics of Collected Sample	60	Void and reserved. Transport logistics of collected sample.
39	Collector's Comment	200	Void and reserved. Collector's comment.
40	Transport Arrangement Responsibility	60	Void and reserved. Transport arrangement responsibility.
41	Transport Arranged	30	Void and reserved. Transport arranged.
42	Escort Required	1	Void and reserved. Escort required.
43	Planned Patient Transport Comment	200	Void and reserved. Planned patient transport comment.
44	Ordering Facility Name	60	Void and reserved. Name of placer.
45	Ordering Facility Address	106	Void and reserved. Address of placer.
46	Ordering Facility Phone Number	48	Void and reserved. Phone number of placer.
47	Ordering Provider Address	106	Void and reserved. Address of provider.

Comments: This segment only applies to ORU^R01 message. Fields 1, 11 and 37 are integers; others are strings. Each QC run is transmitted in one message.

OBX Observation

The OBX segment transmits the observations. If sample results are to be transmitted (MSH-16 is 0)—Each patient may have multiple test results, then more than one OBX segment will be used to transmit the results. On the analyzer, all test results of a patient are transmitted separately. The HL7 interface does not check the repeatability of the test results, which should be performed by the user system.

The OBX segment of HL7 interface uses the following fields:

No.	Field	Length	Description
1	Set ID – OBX	10	Identifies different OBX segments.
2	Value Type	3	Value type, identifies the test result. **NM** (numeric), numeric value, for quantitative tests **ST** (string), for qualitative tests
3#	Observation Identifier	590	Observation identifier, used as test ID.
4	Observation Sub-ID	20	Observation Sub-ID, used as test name.
5	Observation Value	65536	Observation value, used as test result (concentration, negative(-), positive(+), weak positive(+-), etc).

6	Units	90	Unit of test result.
7	References Range	90	Reference range for test result. It is qualitative reference for qualitative tests.
8	Abnormal Flags	5	Abnormal flag to indicate whether the test result is normal or not. User can define the flags via the data dictionary on the operation software of analyzer.
9	Probability	5	Void and reserved. Probability.
10	Nature of Abnormal Test	2	Void and reserved. Reason of abnormal test.
11#	Observe Result Status	1	Status of observation result, set to F-final results.
12	Date Last Observe Normal Values	26	Void and reserved. Date of last normal observation value.
13	User Defined Access Checks	20	User-defined access check, used as original result.
14	Date/Time of the Observation	28	Observation date/time, used as testing date/time.
15	Producer's ID	60	Void and reserved. Used as test department.
16	Responsible Observer	80	Responsible observer, used as tester.
17	Observation Method	60	Void and reserved. Observation method.

Comments: OBX segment only applies to ORU^R01 message. Fields 1, 3 and 9 are integers; fields 5 and 13 are floating numbers; others are strings.

QRD - query definition segment

The QRD segment of HL7 interface uses the following fields:

No.	Field	Length	Description
1#	Query Date/Time	26	Query date/time, i.e. system date/time.
2#	Query Format Code	1	Query format code, set to R (record-oriented format).
3#	Query Priority	1	Query priority, set to D (deferred).
4#	Query ID	10	Query ID, indicates different queries and increases from 1.
5	Deferred Response Type	1	Void and reserved. Deferred response type.
6	Deferred Response Date/Time	26	Void and reserved. Deferred response date/time.
7#	Quantity Limited Request	10	Quantity limited request, set to RD (records).
8#	Who Subject Filter	60	Subject filter, used as sample bar code.
9#	What Subject Filter	60	Subject filter. OTH for query and CAN for canceling
10#	What Department Data Code	60	Void and reserved. Department data code.
11	What Data Code Value Qual.	20	Void and reserved. Data code value qualifier.
12	Query Results Level	1	Void and reserved. Query results level. T for Full results

Comments: QRD segment may appear in QRY^Q02 and DSR^Q03 messages. Field 8 is bar code for real-time downloading and null for group downloading; field 4 is an integer, while others are strings.

QRF - query filter segment

The QRF segment is used together with the QRD segment and uses the following fields:

No.	Field	Length	Description
1#	Where Subject Filter	20	Subject address filter, set to "Model".
2	When Data Start Date/Time	26	Data start date/time, used as start receipt date/time.
3	When Data End Date/Time	26	Data end date/time, used as end receipt date/time.
4	What User Qualifier	60	Void and reserved. User qualifier.
5	Other QRY Subject Filter	60	Void and reserved. Other QRY subject filter.
6	Which Date/Time Qualifier	12	Void and reserved. Object type. RCT(Specimen receipt date/time, receipt of specimen in filling ancillary (Lab))
7	Which Date/Time Status Qualifier	12	Void and reserved. Object status. COR(Corrected only (no final with corrections))
8	Date/Time Selection Qualifier	12	Void and reserved. Date/time selection qualifier. ALL(All values within the range)
9	When Quantity/Timing Qualifier	60	Void and reserved. Time interval.

Comments: QRF segment only applies to QRY^Q02 message. Fields 3 and 4 are 0 o'clock and query time of the day, and used as search conditions. All fields are strings.

ERR - error segment

The ERR segment adds error description to acknowledgment message and uses the following fields:

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

Comments: ERR segment may appear in QCK^Q02, DSR^Q03 or ACK^Q03 message. The only field of this segment is an integer.

QAK - query acknowledgment segment

The QAK segment includes query response information and uses the following fields:

No.	Field	Length	Description
1	Query Tag	32	Query tag, set to SR (sample request information).
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

Comments: QAK segment applies to QCK^Q02 and DSR^Q03 messages. All fields of this segment are strings.

DSP - display data segment

The DSP segment displays searched sample information and patient information and uses the following fields:

No.	Field	Length	Description
1	Set ID - DSP	4	Identifies different DSP segments.
2	Display Level	4	Display level.
3#	Data Line	300	Data line, i.e. searched contents.
4	Logical Break Point	2	Logical break point.
5	Result ID	20	Result ID.

Comments: DSP segment only applies to DSR^Q03 message. Field 1 is an integer, while others are strings.

The third field "Data Line" displays the sample information downloaded from the LIS server. The sequence of the sample information is shown as follows. The bar code and test No. are required, while other items are optional.

Sequence	Data	Data Type and Value
1	Admission Number	String
2	Bed Number	String
3	Patient Name	String
4	Date of Birth	String. The format is YYYYMMDDHHmmSS, such as 20061122130540.
5	Sex	String. Male/M, Female/F, Other/O
6	Patient Alias	String. It includes O, A, B and AB.
7	Race	String, blank
8	Patient Address	String
9	County Code	String
10	Home Phone Number	String
11	Business Phone Number	String, blank
12	Primary Language	String, blank
13	Marital Status	String, blank
14	Religion	String, blank
15	Patient Account Number	String. It includes Outpatient, inpatient, other.
16	Social Security Number	String, It includes Own and Insurance.
17	Driver License Number	String
18	Ethnic Group	String
19	Birth Place	String
20	Nationality	String
21	Bar Code	String
22	Sample ID	Int

Sequence	Data	Data Type and Value
23	Sample Time	String. See item 4
24	STAT	String. It includes Y (yes), N(No) and void. N is default.
25	Collection Volume	Float, blank
26	Sample Type	String. It includes serum, plasma and urine.
27	Fetch Doctor	String
28	Fetch Department	String
29	Test Number^Test Name^Unit^Normal Range	String^string^string^string

The analyzer recognizes a test with its Test Number. For the same test, if the test number in the analyzer and that in the LIS server are not the same, you can set the Item No. on the Operation software to ensure they are the same.

Only if test correspondence is set, the test results can be transmitted and sample information be downloaded.

DSC - Continuation pointer segment

The DSC segment indicates whether the data message is the last one.

No.	Field	Length	Description
1	Continuation pointer	180	Continuation pointer

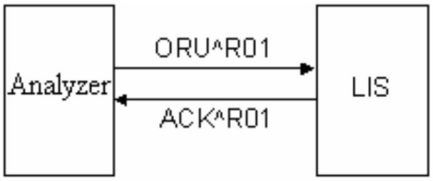
Comments: DSC segment only applies to DSR^Q03 message. The only field of this segment is void when DSR^Q03 message responds to group query and not void in other conditions. This field is an integer.

Chapter 3: Communication Process

In general, A message of HL7 protocol is the format of:
<SB> ddddd <EB><CR>

Where,
<SB> means the start of the message and is <VT> in ASCII, that is 0x0B.
<EB> means the end of the message and is <FS> in ASCII, that is 0x1C.
<CR> acts as acknowledgement of message end and is used to separate different messages, that is, 0x0D.
ddddd means what to be transferred and includes multiple segments, each of which ends with <CR>, that is, 0x0D.
The following lines list multiple message examples of the HL7 protocol.

The Coagualtion analyzer RAC-1800 sends test results to the LIS host by samples, that is, all tests of a sample are transferred via one message. The LIS host responses accordingly when receiving the message.



An ORU message may include the following segments: MSH, PID, OBR and OBX (multiple OBX segments may be contained if a sample has more than one test).MSH, standing for message header, is included in each message and in the format of: (The words in brackets are for explanation and not the segments)

MSH|^~\&|Corp.(Manufacturer)|product(Device model)|||20070423140610(System date/time, yyyymmddhhMMss)||ORU^R01(Message type)|1(Control ID, used to identify the message and increases from 1)|P(Fixed value, means the product)|2.3.1(Version of HL7 protocol)||||0(0 for sample test result, 1 for calibration result, 2 for QC result, void for others)||ASCII(Character set)|||