

BS-400/BS-420

Chemistry Analyzer

HL7 Interface Manual



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Foreword

Who Should Read This Manual


This manual is written for LIS (Laboratory Information Management System) developers and those who need to learn the HL7 interface used by Mindray. Instructions are provided in this manual for LIS developers to guide them to develop LIS interface that enables their LIS to communicate with the BS-400/BS-420 of Mindray. The developers are expected to have knowledge of LIS and HL7 standards, and capacity of network programming. The communication protocol is TCP/IP for network layer and HL7 version 2.3.1 for application layer. LIS developers are recommended to develop the LIS interface using Visual C++, Visual Basic, etc. in the Windows operating system.

What Can You Find in This Manual

This manual introduces the HL7 interface protocols used by Mindray. Chapter 1 introduces the Mindray HL7 interface generally. Chapter 2 illustrates the bidirectional communication between the BS-400/BS-420 and the LIS host, which means the BS-400/BS-420 can not only send test results to LIS but also download sample request information from LIS. Chapter 3 describes the communication process and provides you with several message examples.

Conventions Used in This Manual

This chart explains the symbols used in this manual.

When you see...	Then...
 NOTE	Read the statement following the symbol. The statement is alerting you to information that requires your attention.

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1 *Mindray HL7 Interface*

HL7 interface is developed by Mindray for the BS-400/BS-420 Chemistry Analyzer to adapt to the prevailing Laboratory Information Management System (LIS). It provides a channel for BS-400/BS-420 and other IP-based networks. With TCP/IP, the LIS host can receive test results from chemistry analyzers, 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. All data are transmitted in format of HL7 v2.3.1. This interface enables bidirectional communication between the BS-400/BS-420 and the LIS host.

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. Mindray HL7 interface is defined based upon HL7 v2.3.1. Refer to *HL7 Interface Standards Version 2.3.1* for details.

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

1.2 HL7 Lower Layer Protocol

TCP/IP is a 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, we have employed the minimal lower layer protocol. Refer to *HL7 Interface Standards Version 2.3.1* for details.

Communication Layer

The messages are transmitted in format of:

<SB> dddd <EB><CR>

Where,

- **<SB> = Start Block character (1 byte)**

ASCII <VT>, namely <0x0B>, must not be confused with the SOH or STX in ASCII.

- **dddd = Data (variable number of bytes)**

dddd is an HL7 message, which only includes ISO 8859-1 characters (hexadecimal 20-FF) and <CR>, exclusive of other control characters and those that cannot 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>

2 *Bidirectional 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.

2.1 Introduction

This chapter introduces the message types (Ver. 2.3.1) used by Mindray HL7 interface.



NOTE

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

The following sections introduce the common grammars in detail.

2.2 Message Grammar

This section introduces the general grammar of Mindray 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|^~\&|Mindray|BS-400|||20060427194802||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

MSH has the first field include all separators with most of the other fields empty that are optional and not used by Mindray HL7 interface.

Field 9:	Includes message types (ORU, R01)
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 (2.3.1) 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:

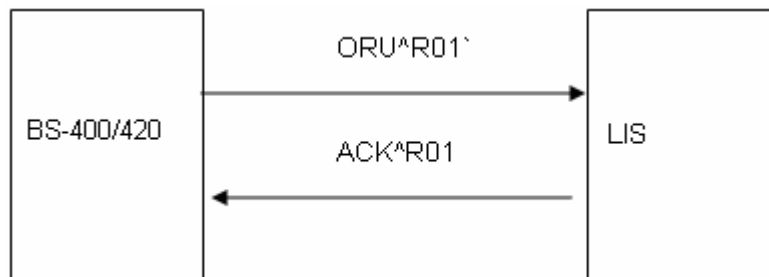
[] indicates the segment in it is optional.

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

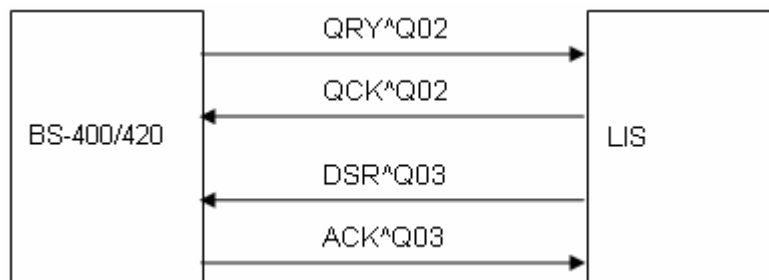
2.3 Compatible HL7 Messages

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 test results (sample test, calibration test and QC test) to the LIS host.

- An ORU^R01 message for sample test result includes:
 - Patient information (patient name, sample ID, etc)
 - Doctor's order (sample type, sender, tester, clinical diagnosis, etc)
 - Test results

Each message corresponds to a sample, which may have multiple tests. The LIS host is able to choose any of the information in the message as needed.

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

<u>ORU-Observational Results (Unsolicited)</u>	<u>Description</u>
MSH	Message header
PID	Patient identification
OBR	Observation report ID
{OBX}	Observation/Result

- An ORU^R01 message for calibration test result includes:
 - Test information (test No., test name)
 - Calibration rule, calibration date
 - Information related to calibrator (number, sequence No., name, lot No., expiration date, concentration, etc)
 - Calibration result (response, number of calibration parameters, calibration parameters)

All calibration test results of a test can be transferred via one message. The LIS host is able to choose any of the information in the message as needed.

- An ORU^R01 message for QC test result includes:
 - Test information (test No., test name)
 - Information related to control (number, sequence No., name, lot No., expiration date, mean concentration)
 - Test date, test results (concentration)

All QC test results of a test can be transferred via one message. The LIS host is able to choose any of the information in the message as needed.

The calibration and QC test results are transferred as follows:

<u>ORU-Observational Results (Unsolicited)</u>	<u>Description</u>
MSH	Message Header
OBR	Observation report(calibration and QC)

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

<u>ACK</u>	<u>Description</u>
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:

<u>QRY</u>	<u>Description</u>
MSH	Message Header
QRD	Query Definition
QRF	Query Filter

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

<u>QCK</u>	<u>Description</u>
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:

<u>DSR</u>	<u>Description</u>
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 message and is as follows:

<u>ACK-Acknowledgement</u>	<u>Description</u>
MSH	Error Header
MSA	Message Acknowledgement
ERR	Error

2.4 Message Segment

This section describes the components of each segment:

- Field length
- Description

All fields used in message segment are listed in following tables. The numbers followed by a '#' symbol indicate the optional fields according to the HL7 protocol.



NOTE

All fields of the Mindray HL7 interface are provided for function extension in future although some of the fields are void.

1. 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 Mindray HL7 interface message uses the following fields:

No.	Field	Length	Item
1#	Field Separator	1	Includes the separator between segment ID and the first real field, and defines the field separators () of the remaining part of the message.
2#	Encoding Characters	4	Includes component, repetition, escape and subcomponent separators (^~\&).
3	Sending Application	180	Sending application, set to Mindray.
4	Sending Facility	180	Sending facility, set to BS-400/BS-420.
5	Receiving Application	180	Void and reserved. Receiving application.
6	Receiving Facility	180	Void and reserved. Receiving facility.
7	Date/Time Message Of	26	Time of the current message. Calling the system time.
8	Security	40	Void and reserved. Security.
9#	Message Type	7	Type of the message, such as ORU^R01.
10#	Message Control ID	20	Message control ID. Indicates one message each and increases from 1 with message increasing.
11#	Processing ID	3	Processing ID. Always set to P (product).

12#	Version ID	60	Version ID. Version of HL7 protocol: 2.3.1.
13	Sequence Number	15	Void and reserved. Serial number
14	Continuation Pointer	180	Void and reserved. Continuation pointer
15	Accept Acknowledgment Type	2	Void and reserved. Type of accepted acknowledgment
16	Application Acknowledgment Type	2	Type of application response, used as result type. 0-Sample result; 1-Calibration result; 2-QC result.
17	Country Code	2	Void and reserved. Country code
18	Character Set	10	Character set. ASCII is used.
19	Principal Language Of Message	60	Void and reserved. Principle language of the message
20	Alternate Character Set Handling Scheme	20	Void and reserved. Handling scheme of alternate character

Comments: MSH segment applies to all messages. Fields 3 and 4 are determined by LIS manufacturer; fields 5 and 6 are set to "Mindray" and "BS-400/BS-420"; fields 10 and 16 are integers; others are strings.

2. MSA - message acknowledgment segment

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

No.	Field	Length	Description
1#	Acknowledgment Code	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).

Note: Fields of MSA-6 are introduced as follows.

Status Code (MSA-6)	Status Text(MSA-3)	Description/Comment
Succeeded:		AA
0	Message accepted	Succeeded
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.

3. PID - Patient Identification

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

No.	Field	Length	Description
1	Set ID – PID	10	Identifies different patient fields
2	Patient ID	20	Patient ID of patient.
3#	Patient Identifier List	20	Patient ID
4	Alternate Patient ID – PID	20	Bed No.

5#	Patient Name	48	Name of patient
6	Mother's Maiden Name	48	Patient area
7	Date/Time of Birth	26	Birth date/time of patient
8	Sex	1	Sex of patient M for male F for female O for others
9	Patient Alias	48	Blood type of patient
10	Race	80	Void and reserved. Race of patient
11	Patient Address	106	Address of patient
12	County Code	4	County code of patient(postal code)
13	Phone Number - Home	40	Phone number (home) of patient
14	Phone Number - Business	40	Void and reserved. Phone number (business) of patient
15	Primary Language	60	Void and reserved. Primary language of patient
16	Marital Status	80	Void and reserved. Marital status of patient
17	Religion	80	Void and reserved. Religion of patient
18	Patient Account Number	20	Patient type
19	SSN Number -Patient	16	Social security number of patient
20	Driver's License Number – Patient	25	Payment type of patient
21	Mother's Identifier	20	Void and reserved. Mother's identifier
22	Ethnic Group	80	Ethnic group the patient belongs to
23	Birth Place	60	Birth place of patient
24	Multiple Birth Indicator	1	Void and reserved. Multiple birth indicator, Y(yes) or N(no).
25	Birth Order	2	Void and reserved. Birth order, an integer greater than 0
26	Citizenship	80	Comments
27	Veterans Military Status	60	Void and reserved. Veterans military status of patient
28	Nationality	80	Nationality of patient
29	Patient Death Date and Time	26	Void and reserved. Patient death date and time
30	Patient Death	1	Void and reserved. Patient death

	Indicator		indicator, Y (yes) or N (no)
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Comments: The PID segment only applies to the ORU^R01 messages. The 1st and 25th fields are integers, the 24th and 30th fields are Booleans, and others are strings.

4. OBR - Observation Request

The OBR segment transmits the doctor's orders associated with the patient report and uses the following fields (MSH-16 is 0 when sample test results are transferred):

No.	Field	Length	Description
1	Set ID – OBR	10	Identifies different OBR fields
2	Placer Order Number	22	Order number of placer, used as sample bar code
3	Filler Order Number	22	Order number of filler, used as sample ID
4#	Universal Service ID	200	Universal service ID, set to Mindray^BS-400/BS-420
5	Priority	2	STAT. Y for yes and N for no.
6	Requested Date/time	26	Void and reserved. Requesting date/time
7	Observation Date/Time	26	Observation date/time, used as testing date/time
8	Observation End Date/Time	26	Void and reserved. Observation end date/time
9	Collection Volume	20	Void and reserved. Collection volume
10	Collector Identifier	60	Void and reserved. Collector identifier
11	Specimen Action Code	1	Void and reserved. Specimen action code
12	Danger Code	60	Void and reserved. Danger code
13	Relevant Clinical Info.	300	Clinical diagnosis
14	Specimen Received Date/Time	26	Specimen receiving date/time
15	Specimen Source	300	Sample source, such as blood, urine, etc
16	Ordering Provider	120	Order provider, used as sender
17	Order Callback Phone Number	40	Department from which sample is sent
18	Placer Field 1	60	Characteristic of sample (icterus, hemolysis and lipemia)
19	Placer Field 2	60	Blood bag No.
20	Filler Field 1	60	Attending doctor
21	Filler Field 2	60	Treating department

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
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 placer provider

Comments: The PID segment only applies to the ORU^R01 messages. The 1st, 3rd and 37th fields are integers, the 9th field is floating number, and others are strings.

When calibration test results are transferred (MSH-16 is 1), the applied fields include:

No.	Field	Length	Description
1	Set ID – OBR	10	Identifies different OBR fields
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 Mindray^BS-400/BS-420
5	Priority	2	Void and reserved. Priority
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	Used as calibration rule.0 - One-point linear; 1 – Two-point linear; 2 – Multi-point linear; 3 - Logistic-Log4P; 4 - Logistic-Log5P; 5 - Exponential 5P; 6 - Polynomial 5P; 7 – Parabola; 8 – Spline.
10	Collector Identifier	60	Void and reserved. Collector identifier
11	Specimen Action Code	1	Number of calibrators
12	Danger Code	60	Calibrator No.
13	Relevant Clinical Info.	300	Name of calibrator
14	Specimen Received Date/Time	26	Lot No. of calibrator
15	Specimen Source	300	Expiration date of calibrator
16	Ordering Provider	120	Standard concentration of calibrator
17	Order Callback Phone Number	40	Concentration level of calibrator. H for high; M for medium, L for low.
18	Placer Field 1	60	Response
19	Placer Field 2	60	Number of calibration parameters
20	Filler Field 1	60	Calibration parameter
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
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 placer provider

Comments: The PID segment only applies to the ORU^R01 messages. The 1st, 9th, 11th, 19th, and 37th fields are integers, the 10th field is floating number, and others are strings. Field 12-18 are respectively V1^V2^...Vi according to the number of calibrators. The different values of field 20 are separated by ^ according to the number of calibration parameters.

Different calibration rules have various parameters:

- Linear (one-point, two-point and multi-point): K and R0;
- Logit-Log4P: K, R0, a and b;
- Logit-Log5P: K, R0, a, b and c;
- Polynomial 5P: K, R0, a, b, c and d;
- Parabola: R0, a and b;
- Spline: 4*(n-1) parameters, which are R0i, ai, bi, ci. n is number of calibrators.

When QC test results are transferred (MSH-16 is 2), the applied fields include:

No.	Field	Length	Description
1	Set ID – OBR	10	Identifies different OBR fields
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 Mindray^BS-400/BS-420
5	Priority	2	Void and reserved. Priority
6	Requested Date/time	26	Void and reserved. Requesting date/time
7	Observation Date/Time	26	Observation date/time, used as QC 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	Number of controls
12	Danger Code	60	Control No.
13	Relevant Clinical Info.	300	Control name
14	Specimen Received Date/Time	26	Lot No. of control
15	Specimen Source	300	Expiration date of control
16	Ordering	120	Void and reserved.

	Provider		
17	Order Callback Phone Number	40	Concentration level of control. H for high; M for medium, L for low.
18	Placer Field 1	60	Mean value (mean concentration)
19	Placer Field 2	60	Standard deviation of control
20	Filler Field 1	60	Test result (concentration)
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
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	60	Void and reserved. Transport

	Logistics of Collected Sample		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 placer provider

Comments: The PID segment only applies to the ORU^R01 messages. Fields 1, 11 and 37 are integers, while others are strings. Fields 12-15, and 17-20 are in the format of V1^V2^...Vi according to the number of controls. Please note that each day-to-day QC result is transferred via one message, while multiple real-time and daily QC results for each test are transferred via a message, and the QC results in different batches should be transferred separately.

5. 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 BS-400/BS-420, 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 Mindray 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(+), etc).
6	Units	90	Unit of test result.
7	References Range	90	Reference range for test result.
8	Abnormal Flags	5	Abnormity flag to indicate whether the test result is normal or not. L - Low H - High N - Normal
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. Producer's ID
16	Responsible Observer	80	Responsible observer, used as tester.
17	Observation Method	60	Void and reserved. Observation method.

Comments: The OBX segment only applies to the ORU^R01 messages. Fields 1, 3 and 9 are integers; fields 5 and 13 are floating numbers; others are strings. Please note that fields 5 and 13 are in the format of Result1 ^ Result2 ^ Result3 when SI(serum index) test is run. Result 1 is turbidity(L), result 2 is hemolysis(H), and result 3 is icterus(I).

6. QRD - query definition segment

The QRD segment of Mindray 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
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.

7. 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 BS-400/BS-420.
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	Object type. RCT(Specimen receipt date/time, receipt of specimen in filling

			ancillary (Lab))
7	Which Date/Time Status Qualifier	12	Object status. COR(Corrected only (no final with corrections))
8	Date/Time Selection Qualifier	12	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.

8. 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.

9. 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.

10. 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.

Field 3 "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. If a sample contains more than one test, corresponding test fields should be added following field 29 and in the same format as field 29.

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
17	Driver License Number	String. It includes Own and Insurance.
18	Ethnic Group	String
19	Birth Place	String

Sequence	Data	Data Type and Value
20	Nationality	String
21	Bar Code	String
22	Sample ID	int
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, as well as the sample types configured by the user.
27	Fetch Doctor	string
28	Fetch Department	string
29	Test ID^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 open the ItemID.ini file in the folder where the executive file of operating software locates and configure the test number. The test settings on the BS-400/BS-420 are the same with that on the LIS by default.

11. 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.

3 *Communication Process and Message Example*

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.

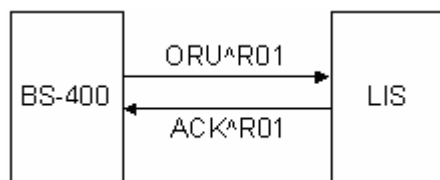
<EB> means the end of the message and is <FS> in ASCII, that is 0x1C.

<CR> acts as acknowledgement of message end and is used to separate different messages, that is, 0x0D.

dddddd 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.

1. **The chemistry analyzer sends test results to the LIS host by samples, that is, all tests of a sample are transferred via one message. The LIS host responds 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|^~\&|Mindray(Manufacturer)|BS-400(Device model)|||20070423101830(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)|||

Note: In all message examples, if the time segment is of 14 digits, it means YYYYMMDDHHMMSS; if the time segment is of 8 digits, it means YYYYMMDD.

There is a patient, who has the following information:

Field	Value
Name of patient	Mike
Sex of patient	Male
Birth date	October 1, 1985
Sample bar code	12345678
Sample type	Serum
Sample ID	10
STAT	Yes
Test No.	2, 5, 6
Test name	TBil, ALT, AST
Test results	100, 98.2, 26.4
Result units	umol/L, umol/L, umol/L

The BS-400/BS-420 sends the test results to LIS via ORU^R01 message as follows:

```

<SB> MSH|^~\&|Mindray|BS-400||20070415110202||ORU^R01|1|P|2.3.1|||0|ASCII|||<CR>
  Corp. name | Device Model | System date/time | Message Type | Product | HL7 Version | Sample Test Result
  Message ID, which increases from 1, is unique to each message and returned unchanged in the response message.

PID|1||Mike||19851001000000|M|||<CR>
  Patient Name | Birthday | Gender

OBR|1|12345678|10|Mindray^BS-400|Y||20070413093253|||serum|||<CR>
  Sample Barcode | Sample ID is for internal use and must not be analyzed by the server | Emergency | Test Time | Sample Type

OBX|1|NM|2|TBil|100|umol/L|||100|20070413093253|||<CR>
OBX|2|NM|5|ALT|98.2|umol/L|||98.2|20070413093253|||<CR>
  
```

OBX|3|NM|6|AST|26.4|umol/L|||||26.4|20070413093253|||<CR>

Quantitative test

Test No., a string, has been converted for use on the server.

Test Result

Result Unit

Original Result

Test Time

Test name functions as a note and must not be analyzed.

<EB> <CR>

When receiving the message, the LIS host first judges the legality and type of the message and then replies accordingly. The following is a standard reply by LIS.

<SB>MSH|^~\&||Mindray|BS-400|20070415110202||ACK^R01|1|P|2.3.1|||0||ASCII|||<CR>

Message Type: Response of ORU

MSA|AA|1|Message accepted|||0|<CR>

Message Is received

Text information, which functions as notes.

Error code

<EB> <CR>

If error is included in the ORU message, it can be returned in the MSA segment, and the BS-400/BS-420 will handle it properly and trigger alarms. When a reject error of 206 occurs on the LIS host, the ACK message for reply is as follows:

<SB>MSH|^~\&||Mindray|BS-400|20070415110202||ACK^R01|1|P|2.3.1|||0||ASCII|||<CR>

Message Type: Response of ORU

MSA|AR|1|Application record locked|||206|<CR>

Message Is rejected

Text Information

Error code

<EB> <CR>

2. The chemistry analyzer sends calibration results to the LIS host, that is, all calibration tests of a test are transferred via one ORU message.

The segments and their meanings in ORU message for calibration result transfer are significantly different from that for sample test result transfer. The former ORU message only includes two segments: MSH and OBR.

For example: A calibration test is requested as follows.

Field	Value
Test No.	6
Test name	ASO
Calibration method	Spline
Calibrator No.	1, 2, 3

Name of calibrator	WATER, CALIB1, CALIB2
Lot No. of calibrator	1111, 2222, 3333
Expiration date of calibrator	January 1, 2030; January 1, 2030; January 1, 2030;
Standard concentration of calibrator	0, 2, 3
Concentration level of calibrator	Low(L), Low(L), Low(L)
Response	797.329332, 843.143762, 1073.672512
Calibration parameters (RO, a, b, c)	797.329332, 22.907215, -69.207178, 34.603589 and 843.143762, 161.321571, 138.414356, -69.207178

The BS-400/BS-420 sends the test results to LIS via ORU^R01 message as follows:

<SB>MSH|^~\&|Mindray|BS-400||20070330143737||ORU^R01|1|P|2.3.1||1||ASCII||| <CR>

Calib. Result

OBR|1|6|ASO|Mindray^BS-400||20070330120156||8||3|1^2^3|WATER^CALIB1^CALIB2

Test ID

Test Name

Calib. Time

Calib. Rule,
8 means
Spline

Number of
Calibrators

Calibrator
Name

Calibrator No., which is separated from each other by '^' and respectively corresponds to the following fields.

|1111^2222^3333|20300101^20300101^20300101

Calibrator
lot No.

Expiration date

|0.000000^2.000000^3.000000|L^L^L|797.329332^843.143762^1073.672512|8

Std. Conc. Of
Calibrator

Conc. Level
of Calibrator

Response

Number of
Cali. Para

|797.329332&22.907215&-69.207178&34.603589^843.143762&161.321571&138.414356&-69.207178

Cali. Value(RO&a&b&c)

||||||| <CR>

<EB><CR>

The LIS host replies as follows:

<SB> MSH|^~\&||Mindray|BS-400|20070330143737||ACK^R01|1|P|2.3.1||1||ASCII||| <CR>

MSA|AA|1|Message accepted|||0|<CR>

<EB><CR>

3. The chemistry analyzer sends QC test results to the LIS host. On the BS-400/BS-420, each day-to-day QC test result is sent via one message, and multiple real-time and daily QC results of a test are sent via one message.

The ORU message for QC result transfer is similar to that for calibration result in segments and meanings.

For example: A QC test is requested as follows.

Field	Value
Test No.	7
Test name	AST
Control No.	1, 2
Control name	QUAL1, QUAL2
Lot No. of control	1111, 2222
Expiration date of control	January 1, 2030; January 1, 2030
Concentration level of control	Low(L), High(H)
Mean value (mean concentration)	45, 55
Standard deviation of control	5, 5
Test result (concentration)	0.130291, 0.137470

The BS-400/BS-420 sends the test results to LIS via ORU^R01 message as follows:

<SB>MSH|^~\&|Mindray|BS-400|||20070416085858||ORU^R01|1|P|2.3.1|||2||ASCII||| <CR>

[Quality Control]

OBR|1|7|AST|Mindray^BS-400|||20070416085729|||2|1^2|QUAL1^QUAL2

[Test ID] [Test name] [Date/time] [Number of controls] [Control No.] [Control name]

|1111^2222|20300101^20300101||L^M

[Lot No.] [Expiration date] [Concentration level]

|45.000000^55.000000|5.000000^5.000000|0.130291^0.137470|||||||||||||||<CR>

[Mean concentration] [SD] [QC result (concentration)]

<EB><CR>

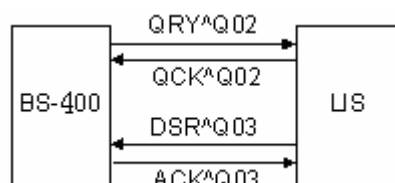
The LIS host replies as follows:

```
<SB>MSH|^~\&||Mindray|BS-400|20070416085858||ACK^R01|1|P|2.3.1|||2||ASCII||| <CR>
```

```
MSA|AA|1|Message accepted|||0| <CR>
```

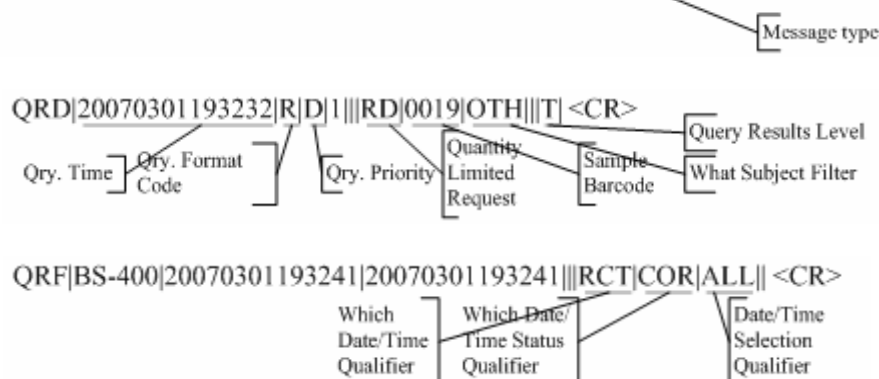
```
<EB><CR>
```

4. The BS-400/BS-420 sends query request to the LIS host, and also downloads sample information, patient demographics and test information of specified bar code from LIS.



For example: To download a sample of 0019(bar code) from LIS, the BS-400/BS-420 sends a QRY^Q02 message as follows:

```
<SB> MSH|^~\&|Mindray|BS-400|||20070301193232||QRY^Q02|1|P|2.3.1|||ASCII||| <CR>
```



```
<EB><CR>
```

When receiving the message, the LIS returns the QCK^Q02 message and replies as follows if the sample of the bar code exists:

```
<SB>MSH|^~\&||Mindray|BS-400|20070301193232||QCK^Q02|1|P|2.3.1|||ASCII||| <CR>
```

```
MSA|AA|1|Message accepted|||0| <CR>
```

```
ERR|0| <CR>
```

Error Code and Location

```
QAK|SR|OK| <CR>
```

Query Tag Query Response Status

<EB><CR>

If the sample of the bar code does not exist, the LIS replies as follows:

<SB> MSH|^~\&||Mindray|BS-400|20070301193232||QCK^Q02|1|P|2.3.1|||||ASCII||| <CR>

MSA|AA|1|Message accepted|||0| <CR>

ERR|0| <CR>

QAK|SR|NF| <CR>

No data found

<EB><CR>

When the sample of the specified bar code exists on LIS, the LIS returns the QCK^Q02 message and sends the data message DSR^Q03, which contains the patient demographics, sample and test information.

Field	Value
Name of patient	Tommy
Sex of patient	Male
Birth date	August 24, 1962
Blood type of patient	O
Patient type	Outpatient
Payment type of patient	Self-pay
Patient ID	1212
Bed No.	27
Sample bar code	0019
Sample ID	3
Sample receiving date/time	18:35 March 1, 2007
STAT	No
Sample type	Serum
Sending doctor	Mary
Sending department	Dept1
Test No.	1, 2, 5

The DSR^Q03 message is as follows:

<SB> MSH|^~\&||Mindray|BS-400|20070301193232||DSR^Q03|1|P|2.3.1|||||ASCII||| <CR>

Message Type(data)

MSA|AA|1|Message accepted|||0| <CR>

ERR|0| <CR>

QAK|SR|OK| <CR>

QRD|20070301193237|R|D|1||RD|0019|OTH||T| <CR>

QRF|BS-400|20070301193241|20070301193241||RCT|COR|ALL| <CR>

DSP|1||1212|| <CR>

Serial
No. Hospital No.

DSP|2||27|| <CR>

Bed No.

DSP|3||Tommy|| <CR>

Patient
Name

DSP|4||19620824000000|| <CR>

Birthday

DSP|5||M|| <CR>

Gender

DSP|6||O|| <CR>

Blood
Type

DSP|7|||| <CR>

DSP|8|||| <CR>

DSP|9|||| <CR>

DSP|10|||| <CR>

DSP|11|||| <CR>

DSP|12|||| <CR>

DSP|13|||| <CR>

DSP|14|||| <CR>

DSP|15||outpatient|| <CR>

Patient
Type

DSP|16|||| <CR>

DSP|17||own|| <CR>

Pay Type

DSP|18||| <CR>
 DSP|19||| <CR>
 DSP|20||| <CR>
 DSP|21||0019|| <CR>
 └─ Sample
 Barcode
 DSP|22||3|| <CR>
 └─ Sample ID
 DSP|23||20070301183500|| <CR>
 └─ Sending Time
 DSP|24||N|| <CR>
 └─ Emergency
 DSP|25||| <CR>
 DSP|26||serum|| <CR>
 └─ Sample Type
 DSP|27||Mary|| <CR>
 └─ Sender
 DSP|28||Dept1|| <CR>
 └─ Sending
 Dept.
 DSP|29||1^^^|| <CR>
 DSP|30||2^^^|| <CR>
 DSP|31||5^^^|| <CR>
 └─ Test ID
 DSC|| <CR>
 <EB> <CR>

No DSR message will be sent if a QCK^Q02 message has been sent indicating no corresponding sample on LIS.

When receiving the DSR message, the BS-400/BS-420 replies as follows:

<SB>MSH|^~\&|Mindray|BS-400||20070301193242||ACK^Q03|1|P|2.3.1|||||ASCII|| <CR>
 MSA|AA|1|Message accepted||0| <CR>
 ERR|0| <CR>
 <EB> <CR>

5. The BS-400/BS-420 sends group query request to LIS for downloading all or latest samples of the current day.

The two query modes are distinguished by the time period. See the table below.

Query Mode	Start Time	End Time
All samples of current day	0 o'clock of current day	System time when the query is sent
Latest samples of current day	End time of the latest query	System time when the query is sent

For example: A group query is sent to LIS at 15:00 on March 20, 2007 to download all samples of the current day. The query message is as follows:

```

<SB>MSH|^~\&|Mindray|BS-400||20070320170000||QRY^Q02|1|P|2.3.1||||ASCII||<CR>
      QRD|20070320170000|R|D|1||RD||OTH||T|<CR>
      QRF|BS-400|20070320000000|20070320170000||RCT|COR|ALL||<CR>
                                [Time interval (start)] [Time interval (end)]
<EB><CR>

```

Similarly to single sample query, the LIS host replies accordingly if corresponding samples exist. If yes, the LIS host sends all qualified samples to the BS-400/BS-420 after returning the query reply. Each sample is transferred via a DSR message, and the DSC segment of the last DSR message is void, indicating the end of the group transfer. For example: 3 qualified samples are found on LIS and are as follows:

Field	Values of Sample 1	Values of Sample 2	Values of Sample 3
Name of patient	Jacky	Jessica	Anata
Sex of patient	Male	Female	Female
Birth date	February 16, 1972	May 12, 1983	December 12, 1979
Sample bar code	1587120	1587121	1587125
Sample ID	2	3	9
Sample type	Serum	Plasma	Urine
STAT	No	Yes	Yes
No. of included tests	1, 4	2, 3, 6	8

The DSR messages are as follows:

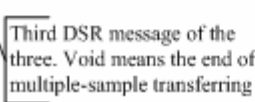
```
<SB> MSH|^~\&||Mindray|BS-400|20070320170000||DSR^Q03|1|P|2.3.1|||||ASCII||| <CR>
MSA|AA|1|Message accepted|||0| <CR>
ERR|0| <CR>
QAK|SR|OK| <CR>
QRD|20070320170000|R|D|1||RD||OTH|||T| <CR>
QRF|BS-400|20070320000000|20070320170000||RCT|COR|ALL|| <CR>
DSP|1|||| <CR>
DSP|2|||| <CR>
DSP|3||Jacky||| <CR>
DSP|4||19720216000000||| <CR>
DSP|5||M||| <CR>
DSP|6|||| <CR>
DSP|7|||| <CR>
DSP|8|||| <CR>
DSP|9|||| <CR>
DSP|10|||| <CR>
DSP|11|||| <CR>
DSP|12|||| <CR>
DSP|13|||| <CR>
DSP|14|||| <CR>
DSP|15|||| <CR>
DSP|16|||| <CR>
DSP|17|||| <CR>
DSP|18|||| <CR>
DSP|19|||| <CR>
DSP|20|||| <CR>
DSP|21||1587120||| <CR>
DSP|22||2||| <CR>
DSP|23|||| <CR>
DSP|24||N||| <CR>
DSP|25|||| <CR>
DSP|26||serum||| <CR>
DSP|27|||| <CR>
DSP|28|||| <CR>
DSP|29||1^^^||| <CR>
DSP|30||4^^^||| <CR>
DSC|1| <CR>
└─┬─┘
   │ First DSR message
   │ of the three
<EB> <CR>
<SB> MSH|^~\&||Mindray|BS-400|20070320170000||DSR^Q03|2|P|2.3.1|||||ASCII||| <CR>
MSA|AA|2|Message accepted|||0| <CR>
```



```

ERR|0| <CR>
QAK|SR|OK| <CR>
QRD|20070320170000|R|D|2||RD||OTH|||T| <CR>
QRF|BS-400|20070320000000|20070320170000||RCT|COR|ALL|| <CR>
DSP|1||| <CR>
DSP|2||| <CR>
DSP|3||Jessica|| <CR>
DSP|4||19830512000000|| <CR>
DSP|5||F|| <CR>
DSP|6||| <CR>
DSP|7||| <CR>
DSP|8||| <CR>
DSP|9||| <CR>
DSP|10||| <CR>
DSP|11||| <CR>
DSP|12||| <CR>
DSP|13||| <CR>
DSP|14||| <CR>
DSP|15||| <CR>
DSP|16||| <CR>
DSP|17||| <CR>
DSP|18||| <CR>
DSP|19||| <CR>
DSP|20||| <CR>
DSP|21||1587121|| <CR>
DSP|22||3|| <CR>
DSP|23||| <CR>
DSP|24||Y|| <CR>
DSP|25||| <CR>
DSP|26||plasma|| <CR>
DSP|27||| <CR>
DSP|28||| <CR>
DSP|29||2^^^|| <CR>
DSP|30||3^^^|| <CR>
DSP|31||6^^^|| <CR>
DSC|2| <CR>
    |
    | Second DSR message
    | of the three
<EB> <CR>
<SB> MSH|^~\&||Mindray|BS-400|20070320170000||DSR^Q03|3|P|2.3.1|||||ASCII|| <CR>
MSA|AA|3|Message accepted|||0| <CR>
ERR|0| <CR>

```

QAK|SR|OK| <CR>
 QRD|20070320170000|R|D|3||RD||OTH|||T| <CR>
 QRF|BS-400|20070320000000|20070320170000||RCT|COR|ALL|| <CR>
 DSP|1|||| <CR>
 DSP|2|||| <CR>
 DSP|3||Anata|| <CR>
 DSP|4||19791212000000|| <CR>
 DSP|5||F|| <CR>
 DSP|6|||| <CR>
 DSP|7|||| <CR>
 DSP|8|||| <CR>
 DSP|9|||| <CR>
 DSP|10|||| <CR>
 DSP|11|||| <CR>
 DSP|12|||| <CR>
 DSP|13|||| <CR>
 DSP|14|||| <CR>
 DSP|15|||| <CR>
 DSP|16|||| <CR>
 DSP|17|||| <CR>
 DSP|18|||| <CR>
 DSP|19|||| <CR>
 DSP|20|||| <CR>
 DSP|21||1587125|| <CR>
 DSP|22||9|| <CR>
 DSP|23|||| <CR>
 DSP|24||Y|| <CR>
 DSP|25|||| <CR>
 DSP|26||urine|| <CR>
 DSP|27|||| <CR>
 DSP|28|||| <CR>
 DSP|29||8^^|| <CR>
 DSC|| <CR>

 <EB> <CR>

The BS-400/BS-420 sends back an ACK message to LIS every time when receiving a DSR message. The ACK messages for the above-mentioned DSR messages are:

```
<SB> MSH|^~\&|Mindray|BS-400|||20070320170000||ACK^Q03|1|P|2.3.1|||||ASCII||| <CR>  
MSA|AA|1|Message accepted|||0| <CR>  
ERR|0| <CR>
```

```
<EB> <CR>
```

```
<SB> MSH|^~\&|Mindray|BS-400|||20070320170000||ACK^Q03|2|P|2.3.1|||||ASCII||| <CR>  
MSA|AA|2|Message accepted|||0| <CR>  
ERR|0| <CR>
```

```
<EB> <CR>
```

```
<SB> MSH|^~\&|Mindray|BS-400|||20070320170000||ACK^Q03|3|P|2.3.1|||||ASCII||| <CR>  
MSA|AA|3|Message accepted|||0| <CR>  
ERR|0| <CR>
```

```
<EB> <CR>
```