HL7 Protocol Specifications

The document explains in detail the technical specifications required for connecting the Biossays C Series and MAGLUMI M/X Series software system to the Laboratory Information System.

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1. Overview

For SNIBE analyzer softwares such as Biossays C Series Software, MAGLUMI M/X Series Software, etc ., we use the HL7 protocol to implement communication.

This article takes MAGLUMI X8 Software(X8 for short) as an example to describe in detail the interface specifications of the software system and LIS, including hardware connection, communication technology, and data format.

2. Hardware connection

X8 is physically connected to the LIS through a hub via an Ethernet card and twisted pairs. Its underlying communications follow IEEE802.3, TCP/IP and other protocols.

3. Software interfaces

- A large amount of data is exchanged between X8 and LIS. LIS sends sample orders to X8, and X8 returns test results.
- The data is in the HL7 format.
- The communication is empowered by the Socket technology, with LIS set as the server and X8 set as the client.

4. HL7 basics

4.1 HL7 syntax

For a complete description of HL7, please refer to the documentation on relevant standards. This article only presents a brief introduction.

1. Each HL7 message consists of several segments, and each segment ends with a carriage return character;

2. Each segment consists of a three-character segment name and a variable number of fields. A field is composed of components and sub-components;

3. The MSH segment of each message defines the separator of each composite;

4. An example of HL7 message is as follows (LIS refers to the Laboratory Information System):

MSH|^~\&|LIS||X8||20191025105016||OML^O33|1111|P|2.5|||NE|NE||UTF-8
PID|1||10011012||Li Mu||19960222|1|||||||||||||Han||||||China|||||||||||23^1
PV1|1|Outpatient|Internal Medicine^201^10^Second Facility||||Wang Miao
DG1|1|Upper respiratory infection
SPM|1|20251122553^1556^^N0002^2||1|||||||P|||Yao An^Wang Yang
^^^|||20191021112250|20191021122250
ORC|NW||||||2||20190124102516|||Wang Miao
OBR|1|||FT3
OBR|2|||TG
OBR|3|||TSH

Specifically, the five characters after "MSH" define the separators to distinguish each field, component and sub-component. "|" is the field separator, "^" is the component delimiter, "~" is the repeat delimiter, "\" is the escape character, and "&" is the sub-component delimiter.

4.2 HL7 format

1. The underlying messaging format of HL7 is: starting character + message string + ending character + carriage return character. Where:

- Starting character: the 11th character in the ASCII table, a control character, represented by #11’ in the description.
- Ending character: the 28th character in the ASCII table, a control character, represented by #28’ in the description.
- Carriage return character: the 13th character in the ASCII table, a control character, represented by #13’ in the description.
- Message string: consists of any visible and carriage return characters in the Unicode characters set.

2. ASCII table (partial)

Binary	Decimal	Hexadecim	Abbreviation or	Explanation
0000 0000	0	00	NUL	Null character
0000 0010	10	0A	LF	Line feed
0000 1011	11	0B	VT	Vertical tab character
0000 1100	12	0C	FF	Form feed
0000 1101	13	0D	CR	Carriage return

0001 1101	27	1B	ESC	Escape character
0001 1110	28	1C	FS	File separator
0100 0001	65	41	A	
0100 0010	66	42	B	
0111 1111	127	7F	DEL	Delete

3. An example of HL7 messaging format is as follows:

   #11'MSH|^~\&|LIS||X8||20191025105016||OML^O33|201910251050161|P|2.5|||NE|NE||
   UTF-8#13' PID|1||10011012||Li
   Mu||19960222|1|||||||||||||Han||||||China|||||||||23^1#13'
   PV1|1|Outpatient|Internal Medicine^201^10^Second Facility||||Wang Miao#13'
   DG1|1|Upper respiratory infection#13'
   SPM|1|20251122553^1556^^N0002^2||1|||||||P|||Yao An^Wang Yang
   ^^^|||20191021112250|20191021122250#13'ORC|NW||||||2||20190124102516|||
   Wang Miao#13'OBR|1|||FT3#13'OBR|2|||TG#13'OBR|3|||TSH#13'#28'#13'

   Specifically, #11', #28', and #13' must be converted into corresponding ASCII control characters.

5. LIS sends or responds to a test order

5.1 Message

LIS uses this message under the following circumstances:

1. When LIS actively sends an order to X8;
2. When LIS responds to an order query by X8

5.2 Message structure

OML^O33	Test order
MSH	Message header segment
[PID]	Patient identification segment
[PV1]	Patient visit segment

[DG1]	Patient diagnosis segment
SPM	Specimen segment
ORC	Order common segment
{OBR}	Observation request segment

5.3 Examples

5.3.1 LIS sends a new order

When there is only one order, the message string contains only one message. For example, to send a regular serum test order with an ID of 20251122553, with assays being FT3, TG, and TSH, sample rack ID being N0002 and the sample located at the 2nd position of the rack, the content of the message string is as follows:

MSH|^~\&|LIS||X8||20191025105016||OML^O33|201910251050161|P|2.5|||NE|NE||UTF-8
PID|1||10011012||Li Mu||19960222|1|||||||||||||Han||||||China|||||||||23^1
PV1|1|Outpatient|Internal Medicine^201^10^Second Facility||||Wang Miao
DG1|1|Upper respiratory infection
SPM|1|20251122553^1556^^N0002^2||1|||||||P|||Yao An^Wang Yang
^^^|||20191021112250|20191021122250
ORC|NW||||||2||20190124102516|||Wang Miao
OBR|1|||FT3
OBR|2|||TG
OBR|3|||TSH

When multiple orders coexist, the message string contains multiple messages. For example, to send regular serum testing orders with IDs of 20251122553, 20251122554, and 20251122555, with samples located at the 2nd, 3rd and 4th positions, respectively, on the same rack with an ID of N0002, and assays all being FT3, TG, and TSH, the content of the message string is as follows:

MSH|^~\&|LIS||X8||20191025105016||OML^O33|201910251050161|P|2.5|||NE|NE||UTF-8
PID|1||10011012||Li Mu||19960222|1|||||||||||||Han||||||China|||||||||23^1
PV1|1|Outpatient|Internal Medicine^201^10^Second Facility||||Wang Miao
DG1|1|Upper respiratory infection
SPM|1|20251122553^1556^^N0002^2||1|||||||P|||Yao An^Wang Yang
^^^|||20191021112250|20191021122250
ORC|NW||||||2||20190124102516|||Wang Miao
OBR|1|||FT3
OBR|2|||TG
OBR|3|||TSH
MSH|^~\&|LIS||X8||20191025105016||OML^O33|201910251050161|P|2.5|||NE|NE||UTF-8
PID|1||10011012||Wu Xiao||19970222|1|||||||||||||Han||||||China|||||||||22^1

PV1|1|Outpatient|Internal Medicine^303^15^First Facility||||Xiao Yong
DG1|1|Acute gastroenteritis
SPM|1|20251122554^1532^^N0002^3||1|||||||P|||Yao An^Wang Yang
^^^|||20191021112250|20191021122250
ORC|NW||||||2||20190124102516|||Xiao Yong
OBR|1|||FT3
OBR|2|||TG
OBR|3|||TSH
MSH|^~\&|LIS||X8||20191025105016||OML^O33|201910251050161|P|2.5|||NE|NE||UTF-8
PID|1||10011012||Liu Lin||20011012|2|||||||||||||Han||||||China|||||||||18^1
PV1|1|Outpatient|Internal Medicine^201^10^Second Facility||||Zhang Li
DG1|1|Upper respiratory infection
SPM|1|20251122555^1463^^N0002^4||1|||||||P|||Yao An^Wang Yang
^^^|||20191021112250|20191021122250
ORC|NW||||||2||20190124102516|||Zhang Li
OBR|1|||FT3
OBR|2|||TG
OBR|3|||TSH

5.3.2 Software responds

X8 does not need to respond to LIS after receiving the order message.

5.3.3 Instructions

1. Whether it sends test orders to X8 in the active mode or replies to X8 about the test orders in the passive mode, LIS must include all the ordered assays in the NW message.
2. Before a sample starts testing, the LIS can only send one NW message to X8 under ordinary circumstances; but the LIS can continue to send NW messages to X8 under exceptional circumstances such as when the samples increase or the assays decrease, or even when all assays are canceled. X8 will save the last NW message and treat it as the first test order and test the sample accordingly.
3. After a sample starts testing, X8 will not process any other NW messages sent by the LIS.

5.3.4 LIS sends a re-test order

If the LIS needs to send a regular serum retest order with an ID of 20251122553, with the test assays being FT3 and FT4 and the retest assay being FT3 and the follow-up test assay being FT4, the rack ID being N0002, and the sample located at the 2nd position of the rack, the message is as follows:

MSH|^~\&|LIS||X8||20191025105016||OML^O33|201910251050161|P|2.5|||NE|NE||UTF-8
PID|1||10011012||Li Mu||19960222|1|||||||||||||Han||||||China|||||||||23^1
PV1|1|Outpatient|Internal Medicine^201^10^Second Facility||||Wang Miao
DG1|1|Upper respiratory infection

SPM|1|20251122553^1556^^N0002^2||1|||||||P|||Yao An^Wang Yang
^^^|||20191021112250|20191021122250
ORC|RF||||||2||20190124102516|||Wang Miao
OBR|1|||FT3
OBR|2|||FT4

5.3.5 Software responds

X8 does not need to respond to LIS after receiving the retest order message.

5.3.6 Instructions

1. Whether it sends retest orders to X8 in the active mode or replies to X8 about the retest orders in the passive mode, LIS must include all the ordered assays in the RF message.
2. Before a sample starts testing, X8 will not process any other RF messages sent by the LIS.
3. After a sample starts testing, LIS can send one or more RF messages to X8 and X8 will save the last RF message and retest the sample accordingly.

6. **LIS** inquires about a test result

6.1 Message

LIS uses this message to inquire of X8 about the regular and emergency test results.

6.2 Message structure

RSREQ	Results inquiry
MSH	Message header segment
QPD	Query parameter definition
RCP	Response control parameter

6.3 Examples

6.3.1 LIS makes a query

If the LIS needs to inquire about the test result of a regular sample with an ID of 20251122553, with the sample rack ID being N0002, and the sample located at the 2nd position of the rack, the message is as follows:

MSH|^~\&|LIS||X8||20191025105016||RSTEQ|201910251050161|P|2.5|||NE|NE||UTF-8
QPD|RSREQ||20251122553^1523^N0002^2|1
RCP|I||R

6.3.2 Software finds a hit

If X8 finds a sample meeting the conditions and the sample has three results, namely 3.56 for FT3, 20 for TG, and 22.5 for TSH, the message is as follows:

MSH|^~\&|X8||LIS||20191025105016||OUL^R22|201910251050161|P|2.5|||NE|NE||UTF-8
PID|1||10011012||Li Mu||19960222|1|||||||||||||Han||||||China|||||||||23^1
PV1|1|Outpatient|Internal Medicine^201^10^Second Facility||||Wang Miao
DG1|1|Upper respiratory infection
SPM|1|20251122553^1523^^N0002^2||1|||||||P|||Yao An^Wang Yang
^^^|||20191021112250|20191021122250
ORC|RF||||||2||20190124102516|||Wang Miao
OBR|1|||FT3
OBX|1||FT3||3.56^|mmol/L|1.23-5.25|N|||F|||20191021112250||Zhang Shun^Li Xiao||
Module1^X8|20191021212250
NTE|1
OBR|2|||TG
OBX|2||TG||20^|mmol/L|30-100|L|||F|||20191021112250||Zhang Shun^Li Xiao||
Module1^X8|20191021212250
NTE|2
OBR|3|||TSH
OBX|3||TG||22.5^|mmol/L|6-8.5|H|||F|||20191021112250||Zhang Shun^Li Xiao||
Module1^X8|20191021212250
NTE|3

Note: If there are *n* results, there will be *n* groups of OBR, OBX, and NTE segments; if there are no results, there will be no OBR, OBX, and NTE segments.

6.3.3 Software finds no hits

If X8 doesn't find any sample meeting the conditions, the message is as follows:

MSH|^~\&|X8||LIS||20191025105016||OUL^R22|201910251050161|P|2.5|||NE|NE||UTF-8
SPM|1|20251122553^1523^^N0002^2|||||||||P|||||||

Note: There are no samples, so only MSH and SPM segments exist.

7. Software sends or returns a test result

7.1 Message

X8 uses this message under the following circumstances:

1. When X8 actively sends the result of a regular or emergency test to LIS;
2. When X8 responds to LIS's query about the result of a regular or emergency test.

7.2 Message structure

OUL^R22	Test result
MSH	Message header segment
[PID]	Patient identification segment
[PV1]	Patient visit segment
[DG1]	Patient diagnosis segment
SPM	Specimen segment
ORC	Order common segment
{OBR	Observation request segment
OBX	Observation result segment
[NTE]	Comment segment
[SID]}	Substance identifier segment
{[ZAV]}	Automatic verify

7.3 Examples

7.3.1 Software sends a message

If the X8 needs to send three test results of a regular serum sample with an ID of 20251122553, namely 3.56 for FT3, 20 for TG, and 22.5 for TSH, with the sample rack ID being N0002, and the sample located at the 2nd position of the rack, the message is as follows:

MSH|^~\&|X8||LIS||20191025105016||OUL^R22|201910251050161|P|2.5|||NE|NE||UTF-8
PID|1||10011012||Li Mu||19960222|1|||||||||||||Han||||||China|||||||||23^1
PV1|1|Outpatient|Internal Medicine^201^10^Second Facility||||Wang Miao
DG1|1|Upper respiratory infection
SPM|1|20251122553^1556^^N0002^2||1|||||||P|||Yao An^Wang Yang
^^^|||20191021112250|20191021122250
ORC|RF||||||2||20190124102516|||Wang Miao
OBR|1|||FT3
OBX|1||FT3||3.56^|mmol/L|1.23-5.25|N|||F|||20191021112250||Zhang Shun^Li Xiao||
Module1^X8|20191021212250
NTE|1
OBR|2|||TG
OBX|2||TG||20^|mmol/L|30-100|L|||F|||20191021112250||Zhang Shun^Li Xiao||
Module1^X8|20191021212250
NTE|2
OBR|3|||TSH
OBX|3||TG||22.5^|mmol/L|6-8.5|H|||F|||20191021112250||Zhang Shun^Li Xiao||
Module1^X8|20191021212250
NTE|3

7.3.2 LIS responds

No responses required

8. Software sends a QC result

8.1 Message

X8 uses this message when it actively sends a QC result to LIS.

8.2 Message structure

OUL^R22	QC results
MSH	Message header segment
SPM	Sample segment
{OBR	Observation request segment
OBX	Observation result segment
[NTE]	Comment segment
[SID]}	Substance identifier segment

8.3 Examples

8.3.1 Software sends a message

If X8 needs to send the QC results of a sample named Bole, with a lot no. of 65318 and a control material ID of 1001, with the QC assays being FT3, TG, and TSH, the sample rack ID being N0002, and the sample located at the 2nd position of the rack, the message is as follows:

MSH|^~\&|X8||LIS||20191025105016||OUL^R22|201910251050161|P|2.5|||NE|NE||UTF-8
SPM|1|Bole^65318^1001^N0002^2|||||||||Q
OBR|1||| FT3
OBX|1|| FT3||3.56^|mmol/L|||||F||||||| Module1^X8|20191021154122
NTE|1
OBR|2||| TG
OBX|2|| TG ||30^|mmol/L|||||F||||||| Module1^X8|20191021154122
NTE|2
OBR|3||| TSH
OBX|3|| TSH ||22.5^|mmol/L|||||F||||||| Module1^X8|20191021154122
NTE|3

8.3.2 LIS responds

No responses required.

9. Software inquires about a test order

9.1 Message

X8 uses this message when inquiring of LIS about a test order.

9.2 Message structure

TSREQ	Test selection inquiry
MSH	Message header segment
QPD	Query parameter definition
RCP	Response control parameter

9.2.1 Examples

9.2.2 Software sends a query

If X8 needs to inquire about the assay information of a regular sample with an ID of 20251122553, with the sample rack ID being N0002, and the sample located at the 2nd position of the rack, the message is as follows:

MSH|^~\&|X8||LIS||20191025105016|| TSREQ |201910251050161|P|2.5|||NE|NE||UTF-8
QPD| TSREQ ||20251122553^1556^N0002^2|2
RCP |I||R

9.2.3 LIS finds a hit

If TCS/LIS finds a sample meeting the conditions and the sample has three assays, namely FT3, TG and TSH, the message is as follows:

MSH|^~\&|LIS||X8||20191025105016||OML^O33|201910251050161|P|2.5|||NE|NE||UTF-8
PID|1||10011012||Li Mu||19960222|1|||||||||||||Han||||||China|||||||||23^1
PV1|1|Outpatient|Internal Medicine^201^10^Second Facility||||Wang Miao
DG1|1|Upper respiratory infection
SPM|1|20251122553^1556^^N0002^2||1|||||||P|||Yao An^Wang Yang
^^^|||20191021112250|20191021122250

ORC|NW||||||2||20190124102516|||Wang Miao
OBR|1|||FT3
OBR|2|||TG
OBR|3|||TSH

Note: If there are *n* assays, there will be *n* OBR segments; if there are no assays, there will be no OBR segments.

9.2.4 LIS finds no hits

If TCS/LIS doesn't find any sample meeting the conditions, the message is as follows:

MSH|^~\&|LIS||X8||20191025105016||OML^O33|201910251050161|P|2.5|||NE|NE||UTF-8
SPM|1|20251122553^1556^^N0002^2|||||||||P|||||||

Note: There are no orders, so only MSH and SPM segments exist.

10. Message type

No.	Message name	Message label	Direction	Instructions
1	Test order	OML^O33	LIS > X8	Used to return test assays
2	Test selection inquiry	TSREQ	X8 > LIS	Used to inquire about test assays
3	Test result	OUL^R22	X8 > LIS	Used to send test results
4	Results inquiry	RSREQ	LIS > X8	Used to inquire about test results

11. Message segment

11.1 MSH (Message Header Segment)

Position	Field	Purpose	Type	Maximum length	Required	Content
1	Field Separator	Field separator	String	1	Yes	|
2	Encoding Characters	Encoding characters	String	4	Yes	^~\&
3	Sending App	Sending app	String	180	Yes	X8
4	Sending Facility	Sending device	String	180		
5	Receiving App	Receiving app	String	180	Yes	LIS
6	Receiving Facility	Receiving device	String	180		
7	Date/Time Of Message	Message time	Time	14	Yes	20191021154455
9	Message Type	Message type	String	7	Yes	TSREQ
10	Message Control ID	Message control ID	String	20	Yes	Unique identifier
11	Processing ID	Processing ID	String	3	Yes	P
12	Version ID	Version ID	String	8	Yes	2.5
15	Accept Acknowledgment	Message acknowledgment	String	2	Yes	NE
16	Application Acknowledgment	App acknowledgment	String	2	Yes	NE
18	Character Set	Character set	String	16	Yes	UTF-8

MSH-1: fixed to "|".

MSH-2: fixed to "^~\&".

MSH-3: one of the options of "LIS", "X8", etc.

MSH-4: left in empty.

MSH-5: one of the options of "LIS", "X8", etc.

MSH-6: left in empty.

MSH-7: in format of "yyyyMMddHHmmss".

MSH-9: one of the four options of "OML^O33", "OUL^R22", "RSREQ", and "TSREQ".

MSH-10: unique identifier generated by the system.

MSH-11: fixed to "P".

MSH-12: fixed to "2.5".

MSH-15: fixed to "NE".

MSH-16: fixed to "NE".

MSH-18: fixed to "UTF-8".

11.2 PID (Patient Identification Segment)

Position	Field	Purpose	Type	Maximum length	Required	Content
1	Set ID-PID	No.	Positive integer	1	Yes	1
3	Patient Identifier List	Patient ID	String	20		10011012
5	Patient Name	Patient name	String	50	Yes	Li Mu
7	Date/Time of Birth	Date/time of birth	Time	8		19960222
8	Sex	Sex	Positive integer		Yes	1
22	Ethnic Group	Ethnic group	String	10		Han
28	Nationality	Nationality	String	30		China
38	Product Class Code	Age and age unit				8^1
38.1	Age	Age	Positive integer	3	Yes	8
38.2	Unit of Age	Age unit	Positive integer	1	Yes	1

PID-1: fixed to "1".

PID-3: string of a specific range of length.

PID-5: string of a specific range of length.

PID-7: in format of "yyyyMMdd".

PID-8: 1: male, 2: female, 3: unknown.

PID-22: string of a specific range of length.

PID-28: string of a specific range of length.

PID-38.1: positive integer of a specific range of length.

PID-38.2: 1: year, 2: month, 3: day, 4: hour.

11.3 PV1 (Patient Visit)

Position	Field	Purpose	Type	Maximum length	Required	Content
1	Set ID-PV1	No.	Positive integer	4	Yes	1
2	Patient Class	Patient type	String	10	Yes	Outpatient
3	Assigned Patient Location	Patient location				Internal Medicine ^201^10^Second Facility
3.1	Point of Care	Department name	String	20	Yes	Internal Medicine
3.2	Room	Room number	String	10		2001
3.3	Bed	Bed number	String	10		15
3.4	Facility	Facility name	String	20		Second Ward
7	Attending Doctor	Doctor name	String	50	Yes	Wang Miao

PV1-1: fixed to "1".

PV1-2: string of a specific range of length.

PV1-3.1: string of a specific range of length.

PV1-3.2: string of a specific range of length.

PV1-3.3: string of a specific range of length.

PV1-3.4: string of a specific range of length.

PV1-7: string of a specific range of length.

11.4 DG1 (Diagnosis)

Position	Field	Purpose	Type	Maximum length	Required	Content
1	Set ID-DG1	No.	Positive integer	4	Yes	1
2	Diagnosis Description	Diagnosis description	String	50	Yes	Upper respiratory infection

DG1-1: fixed to "1".

DG1-2: string of a specific range of length.

11.5 SPM (Specimen Segment)

Position	Field	Purpose	Type	Maximum length	Required	Content
1	Set ID-SPM	No.	Positive integer	1	Yes	1
2	Sample ID	Sample ID, sample no. and QC material ID			Yes	
2.1	Sample ID	Sample ID	String	22		20251122553
2.2	Sequence Number	Sample no.	Positive integer	5		1
2.3	Control ID	QC material ID	String	22		1001
2.4	Rack ID	Sample rack ID	String	22		N0001
2.5	Rack Pos	Sample rack positions	Positive integer	5		2
4	Specimen Type	Specimen type	Positive integer	1	Yes	0
11	Specimen Role	Specimen role		1	Yes	P
14	Specimen Description	Specimen description				Yao An ^Wang Yang^^^
14.1	Collector	Collector	String	50		Yao An
14.2	Specimen Receiver	Receiver	String	50		Wang Yang

14.3	Verification	Verification status	String	2		1
14.4	Reserved	Reserved	String	45		
14.5	Reserved	Reserved	String	45		
17	Collection Date/Time	Collection time	Time	14		20191021112250
18	Specimen Received Date/Time	Time when the specimen was received	Time	14		20191021112250

SPM-1: fixed to "1".

SPM-2: sample information (2.1-2.3) and sample rack information (2.4, 2.5) cannot be empty at the same time. Refer to the "SPM-2 value table" below.

SPM-2.1: string of a specific range of length. Refer to the "SPM-2 value table" below.

SPM-2.2: positive integer of a specific range of length. Refer to the "SPM-2 value table" below.

SPM-2.3: string of a specific range of length. Refer to the "SPM-2 value table" below.

SPM-2.4: string of a specific range of length.

SPM-2.5: positive integer of a specific range of length.

SPM-4: 0: serum; 1: plasma; 2: urine; 3: pleuroperitoneal fluid; 4: cerebrospinal fluid; 5: others.

SPM-11: P: patient specimen; Q: QC material.

SPM-14.1: string of a specific range of length.

SPM-14.2: string of a specific range of length.

SPM-14.3: 0: not verified; 1: auto verification conditions are not met; 2: auto verification passed; 3: auto verification passed but with alarms; 4: auto verification not passed; 5: manual verification passed.

SPM-14.4: reserved.

SPM-14.5: reserved.

SPM-17: in format of "yyyyMMddHHmmss".

SPM-18: in format of "yyyyMMddHHmmss".

SPM-2 value table:

Conditions	SPM-2.1	SPM-2.2	SPM-2.3
SPM-11 is "P" and IDs are used to identify the specimens.	Sample ID	Left empty or sample no.	Left empty

SPM-11 is "P" and no.'s are used to identify the specimens.	Left empty or sample ID	Sample no.	Left empty
SPM-11 is "Q"	Left empty or QC material name	Left empty or QC material lot no.	QC material ID

11.6 ORC (Order Common Segment)

Position	Field	Purpose	Type	Maximum length	Required	Content
1	Order Control	Order control	String	2	Yes	NW
7	Quantity/Timing	Priority	Positive integer	1	Yes	1
9	Date/Time of Transaction	Order time	Time	14		20191021112250
12	Ordering Provider	Ordering doctor	String	50		Wang Miao

ORC-1: NW: newly generated advice of the doctor; RF: a second request for the order.

ORC-7: 0: regular; 1: emergency.

ORC-9: in format of "yyyyMMddHHmmss".

ORC-12: string of a specific range of length, the same as PV1-7.

11.7 OBR (Observation Request Segment)

Position	Field	Purpose	Type	Maximum length	Required	Content
1	Set ID-OBR	No.	Positive integer	4	Yes	1
4	Universal Service ID	Assay abbreviation and dilution ratio				
4.1	Observation Identifier	Channel no. of reagent	String	10	Yes	FT3
4.2	Dilution	Dilution ratio	String	10		1:5

OBR-1: message segment no., starting from 1.

OBR-4.1: Channel no. of reagent.

OBR-4.2: Dilution ratio of assay.

11.8 OBX (Observation Result Segment)

Position	Field	Purpose	Type	Maximum length	Required	Content
1	Set ID-OBX	No.	Positive integer	4	Yes	1
3	Observation Identifier	Channel no. of reagent	String	10	Yes	FT3
5	Observation Value	Test result			Yes	5.9^+
5.1	Quantitative Result	Quantitative result	Real number	10		5.9
5.2	Qualitative Result	Qualitative result	String	10		+
6	Units	Unit	String	10		pg/mL
7	References Range	Reference range	String	100		1.21-4.8
8	Abnormal Flags	Abnormal flags	String	6		H
11	Observation Result Status	Result status	String	1	Yes	F
14	Date/Time of Observation	Time of test start	Time	14	Yes	20191021112250
16	Responsible Observer	Responsible person				Zhang Shun ^ Li Xiao
16.1	Performed By	Tester	String	50		Zhang Shun
16.2	Verified By	Verifier	String	50		Li Xiao
18	Equipment Instance Identifier	Equipment name, module name				Module1^X8
18.1	Equipment Module	Module name	String	20	Yes	Module1
18.2	Equipment Name	Equipment name	String	20	Yes	X8
19	Date/Time of Analysis	Time of test end	Time	14	Yes	20191021212250
20	Recheck Flag	Recheck flag	Positive integer	1	Yes	0
21	Send Type	Messaging type	Positive integer	1	Yes	0

OBX-1: message segment no., starting from 1.

OBX-3: reagent name abbreviation.

OBX-5: 5.1 and 5.2 cannot be left empty at the same time.

OBX-5.1: real number of a specific range of length.

OBX-5.2: string of a specific range of length.

OBX-6: string of a specific range of length.

OBX-7: string of a specific range of length.

OBX-8: H: higher than the normal value; HH: higher than the linear range; L: lower than the normal value; LL: lower than the linear range; N: no flag.

OBX-11: fixed to "F", indicating the final result.

OBX-14: in format of "yyyyMMddHHmmss".

OBX-16.1: string of a specific range of length.

OBX-16.2: string of a specific range of length.

OBX-18.1: X8 equipment module name.

OBX-18.2: X8 equipment name.

OBX-19: in format of "yyyyMMddHHmmss".

OBX-20: 0: regular result; 1: recheck result.

OBX-21: 0: auto messaging; 1: manual messaging.

11.9 NTE (Comment Segment)

Position	Field	Purpose	Type	Maximum length	Required	Content
1	Set ID-NTE	No.	Positive integer	4	Yes	1
3	Comment	Comment				
3.1	Alarm Code	Flag symbol	String	10		*
3.2	Output Character	Reserved	String	200		
3.3	Alarm Description	Alarm description	String	200		Analyzer fault

NTE-1: message segment no., starting from 1.

NTE-3.1: string of a specific range of length.

NTE-3.2: string of a specific range of length.

NTE-3.3: string of a specific range of length.

11.10 SID (Substance Identifier Segment)

Position	Field	Purpose	Type	Maximum length	Required	Content
1	Set ID-SID	No.	Positive integer	4	Yes	1
2	Lot No	Reagent lot no.				
2.1	Lot No of R1	R1 reagent lot no.	String	25		20191012
2.2	Lot No of R2	R2 reagent lot no.	String	25		20191012
2.3	Lot No of R3	R3 reagent lot no.	String	25		20191012
2.4	Lot No of R4	R4 reagent lot no.	String	25		20191012
3	Container ID	Reagent container ID				
3.1	ID of R1	R1 reagent container ID	String	25		101
3.2	ID of R2	R2 reagent container ID	String	25		102
3.3	ID of R3	R3 reagent container ID	String	25		103
3.4	ID of R4	R4 reagent container ID	String	25		104
4	Manufacture ID	Reagent position no.				
4.1	R1 Manufacture ID	R1 reagent position no.	Positive integer	4		1
4.2	R2 Manufacture ID	R2 reagent position no.	Positive integer	4		1
4.3	R3 Manufacture ID	R3 reagent position no.	Positive integer	4		1
4.4	R4 Manufacture ID	R4 reagent position no.	Positive integer	4		1

SID-1: message segment number, starting from 1, consistent with OBR-1 and OBX-1.

SID-2: string of a specific range of length.

SID-3: string of a specific range of length.

SID-4: string of a specific range of length. 0 is the main reagent, 1 is the No. 1 backup reagent, 2 is the No. 2 backup reagent, and so on.

11.11 QPD (Query Parameter Segment)

Position	Field	Purpose	Type	Maximum length	Required	Content
1	Message Query Name	Message query name	String	7	Yes	RSREQ
3	Sample ID				Yes	
3.1	Sample ID	Sample ID	String	22		10011012
3.2	Sequence Number	Sample no.	Positive integer	5		2
3.3	Rack ID	Sample rack ID	String	22		N0001
3.4	Rack Pos	Sample rack positions	Positive integer	5		2
4	Quantity/Timing	Priority	Positive integer		Yes	1

QPD-1: one of the two options of "RSREQ" and "TSREQ".

QPD-3: sample information (3.1, 3.2) and sample rack information (3.3, 3.4) cannot be empty at the same time.

QPD-3.1: string of a specific range of length.

QPD-3.2: positive integer of a specific range of length.

QPD-3.3: string of a specific range of length.

QPD-3.4: positive integer of a specific range of length.

ORC-4: 0: regular; 1: emergency.

11.12 RCP (Response Control Parameter Segment)

Position	Field	Purpose	Type	Maximum length	Required	Content
1	Query Priority	Query priority	String	4	Yes	I
3	Response Modality	Response modality	String	10	Yes	R

RCP-1: fixed to "I", indicating immediate queries.

RCP-3: fixed to "R", indicating real-time responses.

11.13 ZAV (Automatic Verify)

Position	Field	Purpose	Type	Maximum length	Required	Content
1	Set ID-ZAV	Set ID	Positive integer	4	Yes	1
2	Rule Code	Rule code	String	10	Yes	
3	Rule Name	Rule name	String	50	Yes	
4	Description	Rule description	String	200	Yes	
5	Status	Verification status	String	1	Yes	

ZAV-1: message segment no., starting from 1.

ZAV-2: string of a specific range of length.

ZAV-3: string of a specific range of length.

ZAV-4: string of a specific range of length.

ZAV-5: 3: auto verification passed but with alarms; 4: auto verification not passed.

12. Revision History

Revised Edition	Prepared by/Revised by	Prepared/Revised on	Change Description
V1.0	Shujuan Chen Peinan Yao Jinhong Wu	2020.3.20	First Issue