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## 1. OBJECTIVES

- 1). Send local(Urit equipment) sample result to the remote LIS/HIS Server.
- 2). Request sample information from the remote LIS/HIS Server.
- 3). LISHL7Interface.dll can be used for 8030/8060/8021A/8031 and later other series.

## 2. INTRODUCTION

### 2.1 Introduction to HL7 version

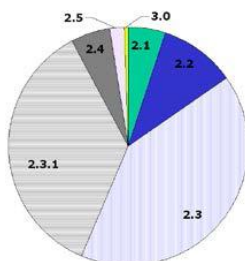


Figure 1: Real-world usage of HL7 messaging standards (approximate). The vast majority of HL7 messaging is done using HL7 2.3 or HL7 2.3.1. Newer releases of HL7 (2.6, 2.7, and 3.0) represent a very small portion of interfaces.

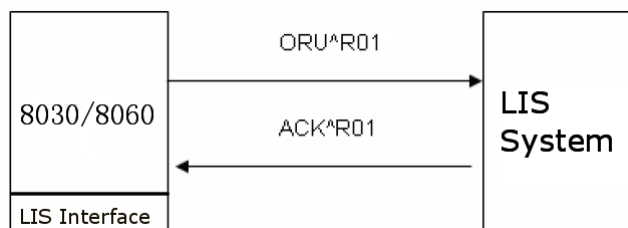
Notes: LISHL7Interface.dll based on HL7 V2.3.1.

### 2.2 MESSAGE SCOPE

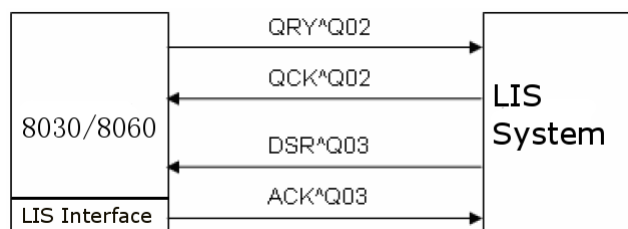
- ✓ ORU
- ✓ ACK
- ✓ QRY
- ✓ QCK
- ✓ DSR

### 2.3 COMMUNICATION MODEL

Upload:



Download:



#### 2.3.1 Observation Reporting(ORU/ACK)

Used to send sample result to LIS/HIS server.

ORU\_R01 - Unsolicited transmission of an observation message

- MSH - MSH - message header segment

- {GROUP} - Patient result
  - [GROUP] - Patient
    - PID - PID - patient identification segment
    - PD1 - Patient Additional Demographic
    - [{NK1}] - NK1 - next of kin / associated parties segment
    - [{NTE}] - NTE - notes and comments segment
    - [GROUP] - Visit
      - PV1 - PV1 - patient visit segment
      - PV2 - PV2 - patient visit - additional information segment
  - {GROUP} - Order observation
    - ORC - ORC - common order segment
    - OBR - OBR - observation request segment
    - [{NTE}] - NTE - notes and comments segment
    - {GROUP} - Observation
      - OBX - OBX - observation/result segment
      - [{NTE}] - NTE - notes and comments segment
    - [{CTI}] - CTI - clinical trial identification segment
- DSC - DSC - Continuation pointer segment

**ACK** - General acknowledgment message

- MSH - MSH - message header segment
- MSA - MSA - message acknowledgment segment
- ERR - ERR - error segment

### 2.3.2 Query(QRY/QCK)

Used to request sample information from the remote LIS/HIS server, request condition can be barcode or time.

#### QRY\_Q02 - Query sent for deferred response

- MSH - MSH - message header segment
- QRD - QRD - original-style query definition segment
- QRF - QRF - original style query filter segment
- DSC - DSC - Continuation pointer segment

#### QCK\_Q02 - Deferred query

- MSH - MSH - message header segment
- MSA - MSA - message acknowledgment segment
- ERR - ERR - error segment
- QAK - Query Acknowledgement

### 2.3.3 Query Response(DSR/ACK)

When the remote server receives the QRY message, the server must acknowledge DSR message to the client. DSR message include sample information, just like barcode, test items and so on.

**DSR\_Q03 - Deferred response to a query**

- MSH - MSH - message header segment
- MSA - MSA - message acknowledgment segment
- ERR - ERR - error segment
- QAK - Query Acknowledgement
- QRD - QRD - original-style query definition segment
- QRF - QRF - original style query filter segment
- {DSP} - DSP - display data segment
- [DSC] - DSC - Continuation pointer segment

**Notes:**

[GROUP]GROUP number can be 0..1;

{GROUP}GROUP number can be 1..unbounded;

[{SFT}]SFT number can be 0..unbounded;

**3. Segment****3.1 MSH - Message header segment**

Defines the intent, source, destination, and some specifics of the syntax of a message.

| Mnemonic | Description                                                                                                                     | Type               | Optionality | Length | Table | Repetition |
|----------|---------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------|--------|-------|------------|
| MSH.1    | Field Separator<br>Used to separate fields.                                                                                     | <a href="#">ST</a> | Required    | 1      |       | No         |
| MSH.2    | Encoding Characters<br>Contains component separator, repetition, separator, escape character, and subcomponent separator(^~\&). | <a href="#">ST</a> | Required    | 4      |       | No         |
| MSH.3    | Sending Application<br>Uniquely identifies the sending application(Urit).                                                       | <a href="#">HD</a> | Optional    | 180    |       | No         |
| MSH.4    | Sending Facility<br>Uniquely identifies the sending facility(8030/8060/8021A).                                                  | <a href="#">HD</a> | Optional    | 180    |       | No         |
| MSH.5    | Receiving Application<br>Uniquely identifies the receiving application.<br><b>Empty</b>                                         | <a href="#">HD</a> | Optional    | 180    |       | No         |
| MSH.6    | Receiving Facility<br>Uniquely identifies the receiving facility.<br><b>Empty</b>                                               | <a href="#">HD</a> | Optional    | 180    |       | No         |
| MSH.7    | Date/Time Of Message<br>Date/time when the sending system created the message.                                                  | <a href="#">TS</a> | Optional    | 26     |       | No         |
| MSH.8    | Security<br>Used to implement security features.                                                                                | <a href="#">ST</a> | Optional    | 40     |       | No         |

|        |                                                                                                                                          |                     |          |     |     |     |
|--------|------------------------------------------------------------------------------------------------------------------------------------------|---------------------|----------|-----|-----|-----|
|        | Empty                                                                                                                                    |                     |          |     |     |     |
| MSH.9  | <b>Message Type</b><br>Contains the message type and trigger event.<br>Used to identify message structure.<br>For example ORU^R01        | <a href="#">MSG</a> | Required | 7   |     | No  |
| MSH.10 | <b>Message Control ID</b><br>Contains identifier that uniquely identifies the message.                                                   | <a href="#">ST</a>  | Required | 20  |     | No  |
| MSH.11 | <b>Processing ID</b><br>Indicates that message should be processed according to HL7 Application (level 7) Processing rules.<br>Using "P" | <a href="#">PT</a>  | Required | 3   |     | No  |
| MSH.12 | <b>Version ID</b><br>Identifies message version.<br>Default "2.3.1"                                                                      | <a href="#">VID</a> | Required | 60  |     | No  |
| MSH.13 | <b>Sequence Number</b><br>A non-null value implies that the sequence number protocol is in use.<br>Empty                                 | <a href="#">NM</a>  | Optional | 15  |     | No  |
| MSH.14 | <b>Continuation Pointer</b><br>Used to define continuations in application-specific ways.<br>Empty                                       | <a href="#">ST</a>  | Optional | 180 |     | No  |
| MSH.15 | <b>Accept Acknowledgment Type</b><br>Identifies the conditions under which accept acknowledgments are required.<br>Empty                 | <a href="#">ID</a>  | Optional | 2   | 155 | No  |
| MSH.16 | <b>Application Acknowledgment Type</b><br>Used in enhanced acknowledgment mode.<br>Using "0"                                             | <a href="#">ID</a>  | Optional | 2   | 155 | No  |
| MSH.17 | <b>Country Code</b><br>Contains the country of message origin.<br>Empty                                                                  | <a href="#">ID</a>  | Optional | 2   |     | No  |
| MSH.18 | <b>Character Set</b><br>Character set used in message. Using ASCII                                                                       | <a href="#">ID</a>  | Optional | 16  | 211 | Yes |
| MSH.19 | <b>Principal Language Of Message</b><br>Principal language used in the message.<br>Empty                                                 | <a href="#">CE</a>  | Optional | 60  |     | No  |
| MSH.20 | <b>Alternate Character Set Handling Scheme</b><br>Alternative character set when special handling required.                              | <a href="#">ID</a>  | Optional | 20  | 356 | No  |

|  |       |  |  |  |  |  |
|--|-------|--|--|--|--|--|
|  | Empty |  |  |  |  |  |
|--|-------|--|--|--|--|--|

### 3.2 MSA - Message acknowledgment segment

Contains information sent while acknowledging another message.

| Mnemonic | Description                                                        | Type | Optionality | Length | Table | Repetition |
|----------|--------------------------------------------------------------------|------|-------------|--------|-------|------------|
| MSA.1    | Acknowledgement Code<br>AA:Accept, AE:Error, AR:Reject             | ID   | Required    | 2      | 8     | No         |
| MSA.2    | Message Control ID<br>Same as MSH-10                               | ST   | Required    | 20     |       | No         |
| MSA.3    | Text Message<br>Using for error detail, such as "Message accepted" | ST   | Optional    | 80     |       | No         |
| MSA.4    | Expected Sequence Number<br>Empty                                  | NM   | Optional    | 15     |       | No         |
| MSA.5    | Delayed Acknowledgment Type<br>Empty                               | ID   | Optional    | 1      | 102   | No         |
| MSA.6    | Error Condition<br>Default "0"                                     | CE   | Optional    | 100    |       | No         |

### 3.3 PID - Patient identification segment

Contains patient identifying and demographic information.

| Mnemonic | Description                               | Type | Optionality | Length | Table | Repetition |
|----------|-------------------------------------------|------|-------------|--------|-------|------------|
| PID.1    | Set ID – PID                              | SI   | Optional    | 4      |       | No         |
| PID.2    | Patient ID<br>sam.InHospitalNo            | CX   | Optional    | 20     |       | No         |
| PID.3    | Patient Identifier List sam.OutHospitalNo | CX   | Required    | 20     |       | Yes        |
| PID.4    | Alternate Patient ID – PID<br>sam.Bed_No  | CX   | Optional    | 20     |       | Yes        |
| PID.5    | Patient Name<br>sam.Name                  | XPN  | Required    | 48     |       | Yes        |
| PID.6    | Mother s Maiden Name<br>Empty             | XPN  | Optional    | 48     |       | Yes        |
| PID.7    | Date/Time Of Birth<br>sam.Age             | TS   | Optional    | 26     |       | No         |
| PID.8    | Sex<br>sam.Sex,M/F/O                      | IS   | Optional    | 1      | 1     | No         |
| PID.9    | Patient Alias<br>Empty                    | XPN  | Optional    | 48     |       | Yes        |
| PID.10   | Race<br>Empty                             | CE   | Optional    | 80     |       | Yes        |
| PID.11   | Patient Address<br>Empty                  | XAD  | Optional    | 106    |       | Yes        |
| PID.12   | County Code, Using as Age unit            | IS   | Optional    | 4      | 289   | No         |

|        |                                            |                     |          |    |     |     |
|--------|--------------------------------------------|---------------------|----------|----|-----|-----|
| PID.13 | Phone Number – Home<br>Empty               | <a href="#">XTN</a> | Optional | 40 |     | Yes |
| PID.14 | Phone Number – Business<br>Empty           | <a href="#">XTN</a> | Optional | 40 |     | Yes |
| PID.15 | Primary Language<br>Empty                  | <a href="#">CE</a>  | Optional | 60 |     | No  |
| PID.16 | Marital Status<br>Empty                    | <a href="#">CE</a>  | Optional | 80 |     | No  |
| PID.17 | Religion<br>Empty                          | <a href="#">CE</a>  | Optional | 80 |     | No  |
| PID.18 | Patient Account Number<br>Empty            | <a href="#">CX</a>  | Optional | 20 |     | No  |
| PID.19 | SSN Number – Patient<br>Empty              | <a href="#">ST</a>  | Optional | 16 |     | No  |
| PID.20 | Driver's License Number – Patient<br>Empty | <a href="#">DLN</a> | Optional | 25 |     | No  |
| PID.21 | Mother's Identifier<br>Empty               | <a href="#">CX</a>  | Optional | 20 |     | Yes |
| PID.22 | Ethnic Group<br>Empty                      | <a href="#">CE</a>  | Optional | 80 |     | Yes |
| PID.23 | Birth Place<br>Empty                       | <a href="#">ST</a>  | Optional | 60 |     | No  |
| PID.24 | Multiple Birth Indicator<br>Empty          | <a href="#">ID</a>  | Optional | 1  | 136 | No  |
| PID.25 | Birth Order<br>Empty                       | <a href="#">NM</a>  | Optional | 2  |     | No  |
| PID.26 | Citizenship<br>Empty                       | <a href="#">CE</a>  | Optional | 80 |     | Yes |
| PID.27 | Veterans Military Status<br>Empty          | <a href="#">CE</a>  | Optional | 60 |     | No  |
| PID.28 | Nationality<br>Empty                       | <a href="#">CE</a>  | Optional | 80 |     | No  |
| PID.29 | Patient Death Date and Time<br>Empty       | <a href="#">TS</a>  | Optional | 26 |     | No  |
| PID.30 | Patient Death Indicator<br>Empty           | <a href="#">ID</a>  | Optional | 1  | 136 | No  |

### 3.4 OBR - Observation request segment

Used to transmit order information for a diagnostic study or observation.

| Mnemonic | Description  | Type               | Optionality | Length | Table | Repetition |
|----------|--------------|--------------------|-------------|--------|-------|------------|
| OBR.1    | Set ID – OBR | <a href="#">SI</a> | Optional    | 4      |       | No         |

|        |                                                    |                     |          |     |    |                              |
|--------|----------------------------------------------------|---------------------|----------|-----|----|------------------------------|
| OBR.2  | Placer Order Number<br>sam.Barcode                 | <a href="#">EI</a>  | Optional | 22  |    | No                           |
| OBR.3  | Filler Order Number<br>sam.ID                      | <a href="#">EI</a>  | Optional | 22  |    | No                           |
| OBR.4  | Universal Service ID<br>Urit^8030/8060/8021A       | <a href="#">CE</a>  | Required | 200 |    | No                           |
| OBR.5  | Priority-OBR<br>sam.Emergency, Default "N"         | <a href="#">ID</a>  | Optional | 2   |    | No                           |
| OBR.6  | Requested Date/time<br>Empty                       | <a href="#">TS</a>  | Optional | 26  |    | No                           |
| OBR.7  | Observation Date/Time<br>sam.CheckDate, Check Date | <a href="#">TS</a>  | Optional | 26  |    | No                           |
| OBR.8  | Observation End Date/Time<br>Empty                 | <a href="#">TS</a>  | Optional | 26  |    | No                           |
| OBR.9  | Collection Volume *<br>Empty                       | <a href="#">CQ</a>  | Optional | 20  |    | No                           |
| OBR.10 | Collector Identifier *<br>Empty                    | <a href="#">XCN</a> | Optional | 60  |    | Yes                          |
| OBR.11 | Specimen Action Code *<br>Empty                    | <a href="#">ID</a>  | Optional | 1   | 65 | No                           |
| OBR.12 | Danger Code<br>Empty                               | <a href="#">CE</a>  | Optional | 60  |    | No                           |
| OBR.13 | Relevant Clinical Info.<br>sam.Note                | <a href="#">ST</a>  | Optional | 300 |    | No                           |
| OBR.14 | Specimen Received Date/Time *<br>Empty             | <a href="#">TS</a>  | Optional | 26  |    | No                           |
| OBR.15 | Specimen Source<br>sam.SampleType                  | <a href="#">SPS</a> | Optional | 300 |    | No                           |
| OBR.16 | Ordering Provider<br>sam.Doctor                    | <a href="#">XCN</a> | Optional | 120 |    | Yes                          |
| OBR.17 | Order Callback Phone Number<br>sam.Department      | <a href="#">XTN</a> | Optional | 40  |    | Yes, less or equal<br>2times |
| OBR.18 | Placer Field 1<br>Empty                            | <a href="#">ST</a>  | Optional | 60  |    | No                           |
| OBR.19 | Placer Field 2<br>Empty                            | <a href="#">ST</a>  | Optional | 60  |    | No                           |
| OBR.20 | Filler Field 1 +<br>Empty                          | <a href="#">ST</a>  | Optional | 60  |    | No                           |
| OBR.21 | Filler Field 2 +<br>Empty                          | <a href="#">ST</a>  | Optional | 60  |    | No                           |

|        |                                                    |                     |          |     |     |                              |
|--------|----------------------------------------------------|---------------------|----------|-----|-----|------------------------------|
| OBR.22 | Results Rpt/Status Chng - Date/Time +<br>Empty     | <a href="#">TS</a>  | Optional | 26  |     | No                           |
| OBR.23 | Charge to Practice +<br>Empty                      | <a href="#">MOC</a> | Optional | 40  |     | No                           |
| OBR.24 | Diagnostic Serv Sect ID<br>Empty                   | <a href="#">ID</a>  | Optional | 10  | 74  | No                           |
| OBR.25 | Result Status +<br>Empty                           | <a href="#">ID</a>  | Optional | 1   | 123 | No                           |
| OBR.26 | Parent Result +<br>Empty                           | <a href="#">PRL</a> | Optional | 200 |     | No                           |
| OBR.27 | Quantity/Timing<br>Empty                           | <a href="#">TQ</a>  | Optional | 200 |     | Yes                          |
| OBR.28 | Result Copies To<br>Empty                          | <a href="#">XCN</a> | Optional | 150 |     | Yes, less or equal<br>5times |
| OBR.29 | Parent Number<br>Empty                             | <a href="#">EIP</a> | Optional | 200 |     | No                           |
| OBR.30 | Transportation Mode<br>Empty                       | <a href="#">ID</a>  | Optional | 20  | 124 | No                           |
| OBR.31 | Reason for Study<br>Empty                          | <a href="#">CE</a>  | Optional | 300 |     | Yes                          |
| OBR.32 | Principal Result Interpreter +<br>Empty            | <a href="#">NDL</a> | Optional | 200 |     | No                           |
| OBR.33 | Assistant Result Interpreter +<br>Empty            | <a href="#">NDL</a> | Optional | 200 |     | Yes                          |
| OBR.34 | Technician +<br>Empty                              | <a href="#">NDL</a> | Optional | 200 |     | Yes                          |
| OBR.35 | Transcriptionist +<br>Empty                        | <a href="#">NDL</a> | Optional | 200 |     | Yes                          |
| OBR.36 | Scheduled Date/Time +<br>Empty                     | <a href="#">TS</a>  | Optional | 26  |     | No                           |
| OBR.37 | Number of Sample Containers *<br>Empty             | <a href="#">NM</a>  | Optional | 4   |     | No                           |
| OBR.38 | Transport Logistics of Collected Sample *<br>Empty | <a href="#">CE</a>  | Optional | 60  |     | Yes                          |
| OBR.39 | Collector s Comment *<br>Empty                     | <a href="#">CE</a>  | Optional | 200 |     | Yes                          |
| OBR.40 | Transport Arrangement Responsibility<br>Empty      | <a href="#">CE</a>  | Optional | 60  |     | No                           |
| OBR.41 | Transport Arranged<br>Empty                        | <a href="#">ID</a>  | Optional | 30  | 224 | No                           |

|        |                                            |                    |          |     |     |     |
|--------|--------------------------------------------|--------------------|----------|-----|-----|-----|
| OBR.42 | Escort Required<br>Empty                   | <a href="#">ID</a> | Optional | 1   | 225 | No  |
| OBR.43 | Planned Patient Transport Comment<br>Empty | <a href="#">CE</a> | Optional | 200 |     | Yes |
| OBR.44 | Procedure Code<br>Empty                    | <a href="#">CE</a> | Optional | 80  |     | No  |
| OBR.45 | Procedure Code Modifier<br>Empty           | <a href="#">CE</a> | Optional | 80  |     | Yes |

### 3.5 OBX - Observation/result segment

Used to transmit observation information or report.

| Mnemonic | Description                                            | Type                   | Optionality | Length | Table | Repetition                   |
|----------|--------------------------------------------------------|------------------------|-------------|--------|-------|------------------------------|
| OBX.1    | Set ID – OBX                                           | <a href="#">SI</a>     | Optional    | 4      |       | No                           |
| OBX.2    | Value Type<br>Default “NM”                             | <a href="#">ID</a>     | Required    | 3      | 125   | No                           |
| OBX.3    | Observation Identifier<br>sam.ItemStru[index].ItemCode | <a href="#">CE</a>     | Required    | 80     |       | No                           |
| OBX.4    | Observation Sub-ID<br>sam.ItemStru[index].Item         | <a href="#">ST</a>     | Required    | 20     |       | No                           |
| OBX.5    | Observation Value<br>sam.ItemStru[index].Result        | <a href="#">VARIES</a> | Optional    | 65536  |       | Yes                          |
| OBX.6    | Units<br>sam.ItemStru[index].Unit                      | <a href="#">CE</a>     | Optional    | 60     |       | No                           |
| OBX.7    | References Range<br>sam.ItemStru[index].Range          | <a href="#">ST</a>     | Optional    | 60     |       | No                           |
| OBX.8    | Abnormal Flags<br>Default “N”                          | <a href="#">ID</a>     | Optional    | 5      | 78    | Yes, less or equal<br>5times |
| OBX.9    | Probability<br>Empty                                   | <a href="#">NM</a>     | Optional    | 5      |       | Yes, less or equal<br>5times |
| OBX.10   | Nature of Abnormal Test<br>Empty                       | <a href="#">ID</a>     | Optional    | 2      | 80    | No                           |
| OBX.11   | Observation Result Status<br>Default “F”               | <a href="#">ID</a>     | Required    | 1      | 85    | No                           |
| OBX.12   | Date Last Obs Normal Values<br>Empty                   | <a href="#">TS</a>     | Optional    | 26     |       | No                           |
| OBX.13   | User Defined Access Checks<br>sam.ItemStru[index].Abs  | <a href="#">ST</a>     | Optional    | 20     |       | No                           |
| OBX.14   | Date/Time of the Observation<br>sam.CheckDate          | <a href="#">TS</a>     | Optional    | 26     |       | No                           |
| OBX.15   | Producer's ID<br>Empty                                 | <a href="#">CE</a>     | Optional    | 60     |       | No                           |

|        |                                      |                     |          |    |  |     |
|--------|--------------------------------------|---------------------|----------|----|--|-----|
| OBX.16 | Responsible Observer<br>sam.Operator | <a href="#">XCN</a> | Optional | 80 |  | Yes |
| OBX.17 | Observation Method<br>Empty          | <a href="#">CE</a>  | Optional | 60 |  | Yes |

### 3.6 QRD - Original-style query definition segment

| Mnemonic | Description                                              | Type                | Optionality | Length | Table | Repetition |
|----------|----------------------------------------------------------|---------------------|-------------|--------|-------|------------|
| QRD.1    | Query Date/Time                                          | <a href="#">TS</a>  | Required    | 26     |       | No         |
| QRD.2    | Query Format Code<br>record-oriented format, default "R" | <a href="#">ID</a>  | Required    | 1      | 106   | No         |
| QRD.3    | Query Priority<br>Default "D"                            | <a href="#">ID</a>  | Required    | 1      | 91    | No         |
| QRD.4    | Query ID                                                 | <a href="#">ST</a>  | Required    | 10     |       | No         |
| QRD.5    | Deferred Response Type<br>Empty                          | <a href="#">ID</a>  | Optional    | 1      | 107   | No         |
| QRD.6    | Deferred Response Date/Time<br>Empty                     | <a href="#">TS</a>  | Optional    | 26     |       | No         |
| QRD.7    | Quantity Limited Request<br>Empty                        | <a href="#">CQ</a>  | Required    | 10     |       | No         |
| QRD.8    | Who Subject Filter<br>BarCode                            | <a href="#">XCN</a> | Required    | 60     |       | Yes        |
| QRD.9    | What Subject Filter<br>Default "OTH"                     | <a href="#">CE</a>  | Required    | 60     |       | Yes        |
| QRD.10   | What Department Data Code<br>Empty                       | <a href="#">CE</a>  | Required    | 60     |       | Yes        |
| QRD.11   | What Data Code Value Qual.<br>Empty                      | <a href="#">VR</a>  | Optional    | 20     |       | Yes        |
| QRD.12   | Query Results Level<br>Default "T"                       | <a href="#">ID</a>  | Optional    | 1      | 108   | No         |

### 3.7 QRF - Original style query filter segment

| Mnemonic | Description                                 | Type               | Optionality | Length | Table | Repetition |
|----------|---------------------------------------------|--------------------|-------------|--------|-------|------------|
| QRF.1    | Where Subject Filter<br>8030/8060/8021A     | <a href="#">ST</a> | Required    | 20     |       | Yes        |
| QRF.2    | When Data Start Date/Time<br>QueryStartTime | <a href="#">TS</a> | Optional    | 26     |       | No         |
| QRF.3    | When Data End Date/Time<br>QueryEndTime     | <a href="#">TS</a> | Optional    | 26     |       | No         |
| QRF.4    | What User Qualifier<br>Empty                | <a href="#">ST</a> | Optional    | 60     |       | Yes        |
| QRF.5    | Other QRY Subject Filter<br>Empty           | <a href="#">ST</a> | Optional    | 60     |       | Yes        |

|       |                                                                                                                         |                    |          |    |     |     |
|-------|-------------------------------------------------------------------------------------------------------------------------|--------------------|----------|----|-----|-----|
| QRF.6 | Which Date/Time Qualifier<br>Default “RCT” (Specimen receipt date/time, receipt of specimen in filling ancillary (Lab)) | <a href="#">ID</a> | Optional | 12 | 156 | Yes |
| QRF.7 | Which Date/Time Status Qualifier<br>Default “COR” (Corrected only (no final with corrections))                          | <a href="#">ID</a> | Optional | 12 | 157 | Yes |
| QRF.8 | Date/Time Selection Qualifier<br>Default “ALL” (All values within the range)                                            | <a href="#">ID</a> | Optional | 12 | 158 | Yes |
| QRF.9 | When Quantity/Timing Qualifier<br><b>Empty</b>                                                                          | <a href="#">TQ</a> | Optional | 60 |     | No  |

### 3.8 ERR - Error segment

| Mnemonic | Description                            | Type                | Optionality | Length | Table | Repetition |
|----------|----------------------------------------|---------------------|-------------|--------|-------|------------|
| ERR.1    | Error Code and Location<br>Default “0” | <a href="#">ELD</a> | Required    | 80     |       | Yes        |

### 3.9 QAK - Query Acknowledgement

| Mnemonic | Description                                                                                                                           | Type               | Optionality | Length | Table | Repetition |
|----------|---------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------|--------|-------|------------|
| QAK.1    | Query Tag<br>Default “SR”                                                                                                             | <a href="#">ST</a> | Optional    | 32     |       | No         |
| QAK.2    | Query Response Status<br>OK: Data found, no errors<br>NF: No data found, no errors<br>AE: Application error<br>AR: Application reject | <a href="#">ID</a> | Optional    | 2      | 208   | No         |

### 3.10 DSP - Display data segment

| Mnemonic | Description                                                                              | Type               | Optionality | Length | Table | Repetition |
|----------|------------------------------------------------------------------------------------------|--------------------|-------------|--------|-------|------------|
| DSP.1    | Set ID – DSP                                                                             | <a href="#">SI</a> | Optional    | 4      |       | No         |
| DSP.2    | Display Level<br><b>Empty</b>                                                            | <a href="#">SI</a> | Optional    | 4      |       | No         |
| DSP.3    | Data Line<br>Member of HL7SamInfo Data Struct, such as sam.Barcode, sam.ItemStru[i].Item | <a href="#">TX</a> | Required    | 300    |       | No         |
| DSP.4    | Logical Break Point<br><b>Empty</b>                                                      | <a href="#">ST</a> | Optional    | 2      |       | No         |
| DSP.5    | Result ID<br><b>Empty</b>                                                                | <a href="#">TX</a> | Optional    | 20     |       | No         |

### 3.11 DSC - Continuation pointer segment

DSC mark the DSR^Q03 message index, **DSC|-1|** means that it's the last DSR^Q03 message.

| Mnemonic | Description          | Type               | Optionality | Length | Table | Repetition |
|----------|----------------------|--------------------|-------------|--------|-------|------------|
| DSC.1    | Continuation Pointer | <a href="#">ST</a> | Optional    | 180    |       | No         |

#### 4. Minimal lower layer protocol(MLLP)

Minimal Lower Layer Protocol (MLLP) defines the leading and trailing delimiters for an HL7 message. These delimiters help the receiving application to determine the start and end of an HL7 message that uses Internet Protocol network as transport.

Message format as follow:

<SB> dddd <EB><CR>

<SB> = Start Block character (1 byte), char 0x0B

dddd = Data (variable number of bytes)

<EB> = End Block character (1 byte), char 0x1C

<CR> = Carriage Return (1 byte), char 0x0D

#### 5. Message

##### 5.1 ORU\_R01

**Example:**

```
<SB>MSH|^~\&|urit|8030|||20120830103931||ORU^R01|201208300001|P|2.3.1|||0||ASCII|||<CR>
PID|1|||null||0|M|||||||||||||||||<CR>
OBR|1|null|201208290001|urit^8030|N|||2012-08-29|||||other0|||||||||||||||||<CR>
OBX|1|NM|1|ALB|11.8|g/L|35.0-55.0|N||F||0.3279|2012-08-29||Server||<CR>
OBX|2|NM|2|APOA_1|1.43|g/L|0.73-1.69|N||F||0.3767|2012-08-29||Server||<CR>
OBX|3|NM|3|LDL_C|4.47|mmol/L|2.07-3.10|N||F||0.7833|2012-08-29||Server||<CR>
OBX|4|NM|4|GGT|7939|U/L|0-50|N||F||-7.0474|2012-08-29||Server||<CR>
<EB><CR>
```

##### 5.2 ACK

**Example:**

```
<SB>MSH|^~\&|urit|8030|||20120830105821||ACK^Q03|201208300001|P|2.3.1|||0||ASCII|||<CR>
MSA|AA|201208300001|Message accepted|||0|<CR>
<EB><CR>

<SB>MSH|^~\&|urit|8030|||20120830103931||ACK^R01|201208300002|P|2.3.1|||0||ASCII|||<CR>
MSA|AA|201208300002|Message accepted|||0|<CR>
<EB><CR>
```

##### 5.3 QRY\_Q02

```
<SB>MSH|^~\&|urit|8030|||20120830104844||QRY^Q02|20120830104843|P|2.3.1|||0||ASCII|||<CR>
QRD|20120830104844|R|D|14||RD||OTH||T|<CR>
QRF|8030|20120821000000|20120821235959||RCT|COR|ALL||<CR>
<EB><CR>
```

## 5.4 QCK\_Q02

```
<SB>MSH|^~\&|urit|8030|||20120830104844||QCK^Q02|20120830104843|P|2.3.1|||0||ASCII|||<CR>
MSA|AA|20120830104843|Message accepted|||0|<CR>
ERR|0|<CR>
QAK|SR|OK|<CR>
<EB><CR>
```

## 5.5 DSR\_Q03

```
<SB>MSH|^~\&|urit|8030|||20120830104845||DSR^Q03|201201010006|P|2.3.1|||0||ASCII|||<CR>
MSA|AA|201201010006|Message accepted|||0|<CR>
ERR|0|<CR>
QAK|SR|OK|<CR>
QRD|20120830104845|R|D|11||RD|1111|OTH|||T|<CR>
QRF|8030|20120821000000|20120821235959||RCT|COR|ALL||<CR>
DSP|1||201201010006|||<CR>
DSP|2||1111|||<CR>
DSP|3||other0|||<CR>
DSP|4|||<CR>
DSP|5|||<CR>
DSP|6||0||<CR>
DSP|7||0||<CR>
DSP|8|||<CR>
DSP|9|||<CR>
DSP|10|||<CR>
DSP|11||Laboratory|||<CR>
DSP|12||Server|||<CR>
DSP|13||123||<CR>
DSP|14|||<CR>
DSP|15||2012-08-21||<CR>
DSP|16||N||<CR>
DSP|17||7||<CR>
DSP|18||1^ALB^~0.2779^10.0^g/l^35.0-55.0|||<CR>
DSP|19||2^TP^0.3927^44.5^g/l^60.0-85.0|||<CR>
DSP|20||3^GLU^0.0340^0.54^mmol/L^3.90-6.10|||<CR>
DSP|21||4^GGT^~5.7496^6477^U/L^0-50|||<CR>
DSP|22||5^LDH^~8.6731^45504^UL/L^114-240|||<CR>
DSP|23||6^A/G^~0.29^~0.00-10.00|||<CR>
DSP|24||7^GLB^~34.5^g/L^0.0-45.0|||<CR>
DSC|-1|<CR>
<EB><CR>
```

### DSP segment definition:

```
DSP|1||Sam ID|||<CR>
```

DSP|2||Sam Barcode|||<CR>  
 DSP|3||Sam Type|||<CR>  
 DSP|4||Sam Name|||<CR>  
 DSP|5||Sam Sex|||<CR>  
 DSP|6||Sam Age|||<CR>  
 DSP|7||Sam Age Unit|||<CR>  
 DSP|8||Sam In Hospital No.|||<CR>  
 DSP|9||Sam Out Hospital No.|||<CR>  
 DSP|10||Sam Bed No.|||<CR>  
 DSP|1|1|Sam Department|||<CR>  
 DSP|12||Sam Doctor|||<CR>  
 DSP|13||Sam Operator|||<CR>  
 DSP|14||Sam Clinical Diagnosis|||<CR>  
 DSP|15||Sam Check Date|||<CR>  
 DSP|16||Sam Is Stat Or Not|||<CR>  
 DSP|17||Sam Total Item Number|||<CR>  
 DSP|18||ItemIndex1^ItemName1^ItemAbs1^ItemResult1^ItemResultUnit1^ItemRange1|||<CR>  
 DSP|19||ItemIndex2^ItemName2^ItemAbs2^ItemResult2^ItemResultUnit2^ItemRange2|||<CR>

## 6. Algorithm Introduction

### 6.1 Server side

#### Pseudo code:

```

Messagetype = GetHL7MessageType(g_HL7Msg.GetBuffer(0));
if (messagetype is ORU^R01)
{
    Acknowledgement for ORU^R01
    ACKmsgHL7("R01", sam->ID, MSA_AA, "Message accepted", 0))
    ParseHL7((char*)(LPCSTR)g_HL7Msg, *sam, iDsc);
    //After ParseHL7, we got the sample info-"sam". Server side can save the sample data to centre database.
}
else if (messagetype is QRY^Q02)
{
    GetQRYQ02HL7(msg, QRYControlID, QryBarCode, QryStartTime, QryEndTime);
    Acknowledgement for DSR^Q03
    if (QryBarCode.length() == 0 && QryStartTime.length() > 0)
    {
        //query by time.
        //The LIS/HIS server may query the centre database by time.
        If (query is ok)
        {
            QCK_Q02msgHL7("Q02", QRYControlID.c_str(), QAK_OK);
            SendMessage(DSR^Q03, query result-HL7Saminfo);
        }
    }
}
  
```

```

        else
        {
            QCK_Q02msgHL7("Q02", QRYControlID.c_str(), QAK_NF);
        }
    }
    else if (QryBarcode.length() > 0 && QryStartTime.length() == 0)
    {
        //query by barcode.
        //The LIS/HIS server may query the centre database by barcode.
        If (query is ok)
        {
            QCK_Q02msgHL7("Q02", QRYControlID.c_str(), QAK_OK);
            SendMessage(DSR^Q03, query result-HL7Saminfo);
        }
        else
        {
            QCK_Q02msgHL7("Q02", QRYControlID.c_str(), QAK_NF);
        }
    }
    else
    {
        //query by barcode and time.
        //The LIS/HIS server may query centre database by barcode and time.
        If (query is ok)
        {
            QCK_Q02msgHL7("Q02", QRYControlID.c_str(), QAK_OK);
            SendMessage(DSR^Q03, query result-HL7Saminfo);
        }
        else
        {
            QCK_Q02msgHL7("Q02", QRYControlID.c_str(), QAK_NF);
        }
    }
}

```

## 6.2 Client side

### Pseudo code:

### Query message:

OnBnClickedBtnTaskLoad()

```

{
    if (query mode is on way)
    {
        //one way can not exec query.
        Return;
    }
}

```

```

    }
    else If (query mode is two way)
    {
        If (system is run, but not get sample info in realtime)
        {
            Return;
        }
    }
    Query by barcode, time, barcode&&time
    QRY_Q02msgHL7(iQueryID++, (LPTSTR)(LPCTSTR)strHL7BarCode, starTime, strEndTime, curtime);
}

Send message:
Get HL7SampleInfo
ORU_R01SAMmsgHL7(*sam, index))

Receive message:
Messagetype = GetHL7MessageType(pSocketHL7->m_ReceiveMsg.GetBuffer(0))
if (messagetype is ACK^R01)
{
    GetACKHL7(char *Msg, char *MessageControlID, char *StatusConfirmCode, char *StatusText, int
&ErrorCode);
    Mark the sample that had been sent.
}

If (query mode is two way)
{
    If (system is run, but not get sample info in realtime)
    {
        Return;
    }
    if (messagetype is QCK^Q02)
    {
        GetQAKHL7(m_ReceiveMsg, MessageControlID, status);
        //get query status, success or not.
    }
    if (messagetype is DSR^Q03)
    {
        ParseHL7(m_ReceiveMsg.GetBuffer(0), *sam, iDsc);
        if (iDsc == -1) //last dsr message
        {
            //add the sample list to cache list(grid).
        }
        ACKmsgHL7("Q03", sam->ID, MSA_AA, "Message accepted", 0));
    }
}

```

## 7. APPENDIX

### 7.1 ORU^R01 Sequence Diagram

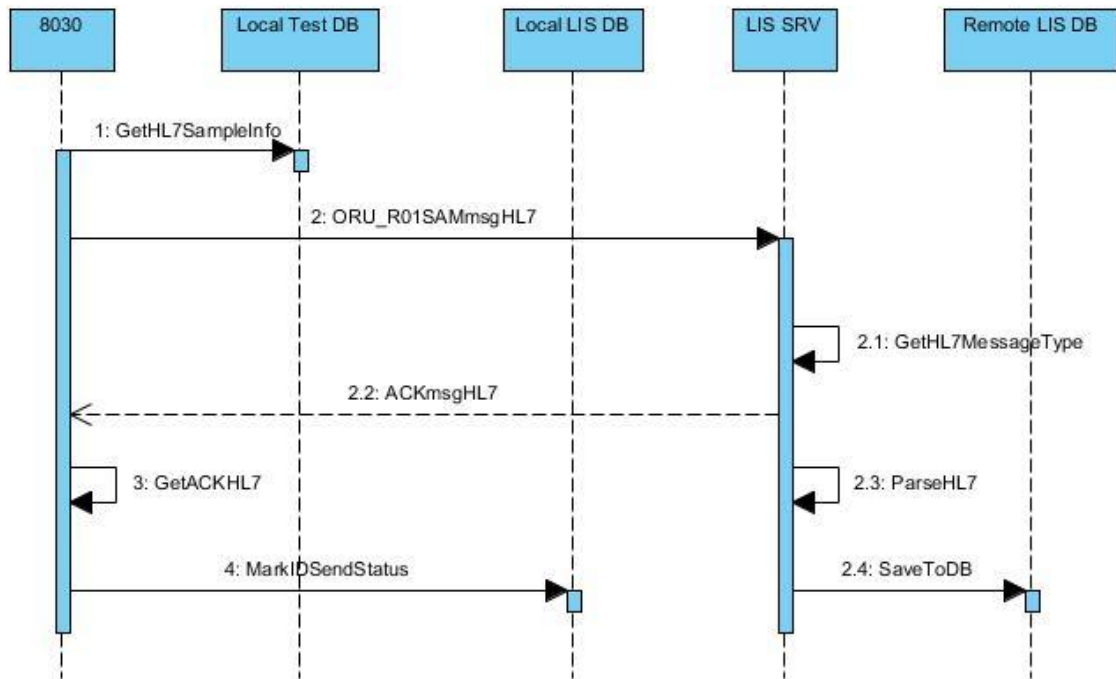


Figure 9.2 ORU^R01 Sequence Diagram

## 7.2 QRY^Q02 Sequence Diagram

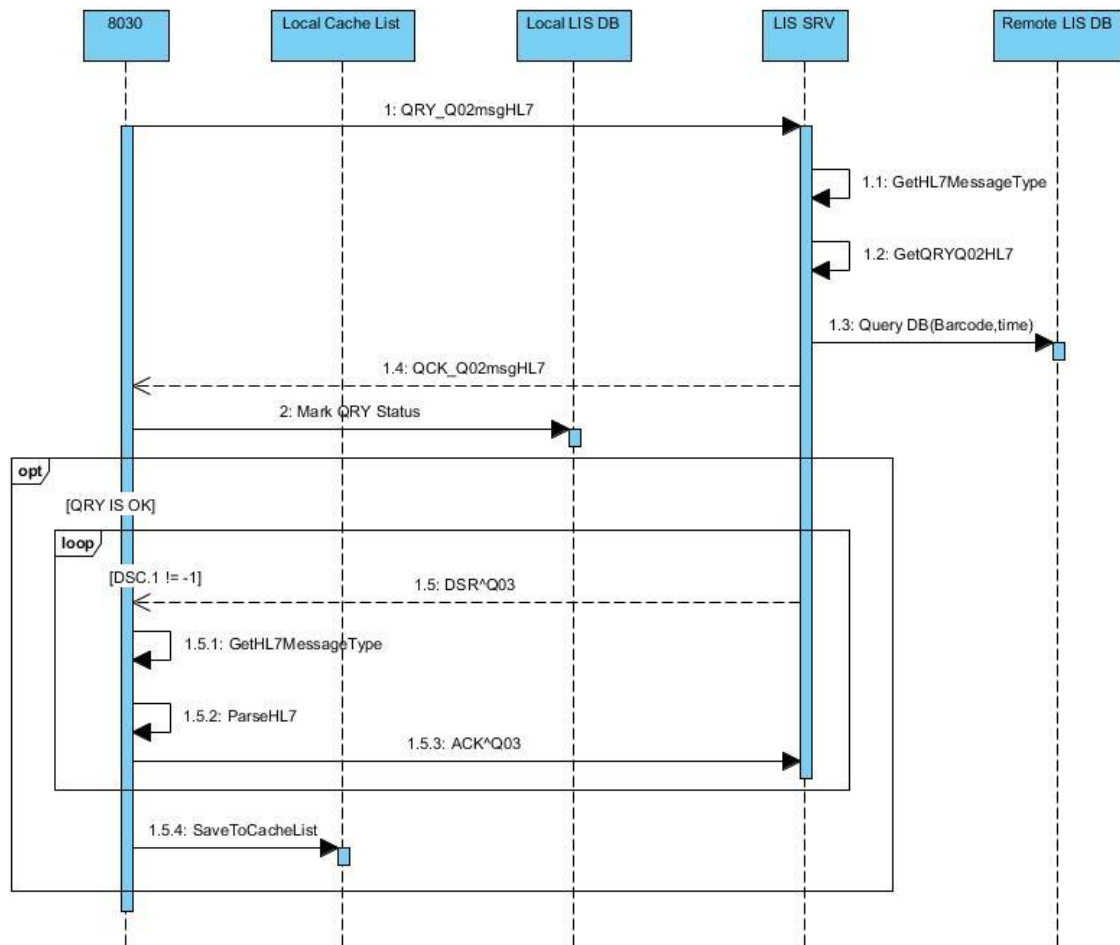


Figure 9.3 QRY^Q02 Sequence Diagram