A Laboratory Information System (LIS) is primarily used for processing and reporting data related to individual patients in a clinical setting. An analyzer LIS interface enables the exchange of queries, orders, and results between the analyzer and the LIS.

In general, an LIS interface provides a two-way digital transmission of queries, orders, and results between requesters (for example, hospital information systems, clinical workstations, office practice computers) and producers (instruments).

Each analyzer interface specifies the logical format and encoding rules for messages needed to interchange clinical information. Most clinical analyzers follow ASTM standards such as ASTM 1394. ASTM 1394 deals not only with general information about diagnostic testing, but specific details useful for clinical practice, administration, and research in a comprehensive, but flexible, convention. Note that ASTM 1394-97 was superseded by LIS2-A when the standard was taken over by NCCLS.

The flexibility of ASTM 1394 made it easy to support a verity of instruments for over 30 years. This flexibility also means that implementations vary across manufactures and their instruments. Therefore, it is the responsibility of the instrument manufacturer to define the specific content of ASTM messages supported and required by their instruments.

The structure and content of messages (orders, results, and queries) exchanged between the LIS and VISION™ is described in the VISION™ LIS MTS and BioVue guides. VISION™ LIS messages are based on the ASTM E 1394-97 and LIS2-A standards. These standards describe the general message structure and content whereas the VISION™ LIS guide describes VISION™’s implementation of these standards.

The ASTM E 1394-97 (and LIS2-A) standard covers the bidirectional exchange of messages between an LIS and a clinical instrument. It documents the common conventions message content required for the interchange of clinical results and patient data. The standard specifies the conventions for structuring the content of messages and for the representation of information within the message.

**Definitions:**

|  |  |
| --- | --- |
| **Message** | A message consists of a header (H-Record) through a termination record (L-Record). |
| **Profile** | A name given to one or more tests. A Profile name is used by the LIS to order tests. The Profile name is also used to identify test results. |
| **Field** | One specific attribute of a record (patient name). |
| **Component** | A single data element within a field (first name). |
| **Repeated Field** | One field that contains multiple vaules (multiple profiles). |
| **Record** | A collection of fields. |
| **Download** | Message sent from the LIS to the instrument. |
| **Upload** | Message sent from the instrument to the LIS. |

**Delimiters:**

Delimiters are the glue that binds all of the parts of a message together.

* Record Delimiter – A carriage return (13) marks the end of a record.
* Field Delimiter – marks the end of a field (defined in the header).
* Repeat Delimiter – marks the beginning of a repeated field (defined in the header).
* Component Delimiter – marks the beginning of a field component (defined in the header).
* Escape Delimiter – identifies an escape sequence (defined in the header).

Delimiters are define in the header (H) record and are constant within a message. The first four characters after the H in the header (H) record define the delimiters of a message.

H|\^&|||Mini LIS||||||||LIS2-A|20140818135244

The header record above defines the following delimiters:

* Field Delimiter (|)
* Repeat Delimiter (\)
* Component Delimiter (^)
* Escape Delimiter (&)

**Fields:**

Fields are defined by their position. The following record contains 5 fields numbered by their position:

1|2|3|4|5

Field 1 is always the record type ID such as H for the Header Record or P for the Patient Record.

Field 2 is the Record Sequence Number and is required for record types that may occur multiple times within a message.

An empty field is called a null field.

**Escape Sequences** – Escape sequences are used to represent certain special characters within text fields of ASTM messages. Some characters are not allowed in ASTM text fields and escape sequences are used to convert them into a valid sequence of characters. The sender of an ASTM message converts restricted characters to an escape sequence and the receiver of the message converts escape sequences back to the original text. Refer to the LIS Guide for a detailed description of escape sequences.

In the following Order record (O):

O|1|SID005||ABO-D\ABScr|N|20140818140221|||||N||||CENTBLOOD

Field 1 contains the Order record type ID (O).

Field 2 is the record sequence number (1).

Field 3 is the sample ID (SID005). Field 3 of an Order record is written as “O.3”.

Field 4, O.4 is a null field. All the fields after O.16 are also null fields.

Field 5 contains a 2nd Profile in a repeat field.

Field 7 is a Date/Time field. Date/Time fields can be in one of the following formats:

* YYYYMMDD
* YYYYMMDDHHMM
* YYYYMMDDHHMMSS

**MTS Example Messages:**

3.4.12 **Host Query**

H|\^&|||OCD^VISION^0.94.0.41254^J123456|||||||P|LIS2-A|20140818142841

Q|1|^SID001||||||||||O

L

3.4.13 **Example Order**

H|\^&|||Mini LIS||||||||LIS2-A|20140818135244

P|1|PID123456||NID123456^MID123456^OID123456|Brown^Bobby^B|White|196501020304|U|||||PHY1234^Kildare^James^P|||||||||||||||||||||

O|1|SID005||ABO-D|N|20140818140221|||||N||||CENTBLOOD|||||||||||||||

L||

3.4.14 **Example Result Message**

H|\^&|||OCD^VISION^0.94.0.41254^J123456|||||||P|LIS2-A|20140818140426

P|1|PID123456||NID123456^MID123456^OID123456|Brown^Bobby^B|White|19650102030400|U|||||PHY1234^Kildare^James^P|||||||||||||||||||||

O|1|SID005||ABO-D|N|20140818140229|||||||||CENTBLOOD|||||||20140818140426|||F|||||

R|1|ABO|AB|||||F||Automatic||20140818140421|J123456

M|1|Anti-A|A/B/D Monoclonal and Reverse Grouping^1^16301^210711037-02^20171231235959^20140818\_140413Grey.jpg^20140818\_140413Color.jpg|MTS Diluent 2 Plus^363^20171229235959|30^A

M|2|Anti-B|A/B/D Monoclonal and Reverse Grouping^2^16301^210711037-02^20171231235959^20140818\_140413Grey.jpg^20140818\_140413Color.jpg|MTS Diluent 2 Plus^363^20171229235959|20^A

M|3|Ctrl|A/B/D Monoclonal and Reverse Grouping^4^16301^210711037-02^20171231235959^20140818\_140413Grey.jpg^20140818\_140413Color.jpg|MTS Diluent 2 Plus^363^20171229235959|0^A

M|4|A1-Cells|A/B/D Monoclonal and Reverse Grouping^5^16301^210711037-02^20171231235959^20140818\_140413Grey.jpg^20140818\_140413Color.jpg|0.8% A1 Cells^363^20171229235959|0^A

M|5|B-Cells|A/B/D Monoclonal and Reverse Grouping^6^16301^210711037-02^20171231235959^20140818\_140413Grey.jpg^20140818\_140413Color.jpg|0.8% B Cells^363^20171229235959|0^A

R|2|Rh|NEG|||||F||Automatic||20140818140421|J123456

M|1|Anti-D|A/B/D Monoclonal and Reverse Grouping^3^16301^210711037-02^20171231235959^20140818\_140413Grey.jpg^20140818\_140413Color.jpg|MTS Diluent 2 Plus^363^20171229235959|0^A

M|2|Ctrl|A/B/D Monoclonal and Reverse Grouping^4^16301^210711037-02^20171231235959^20140818\_140413Grey.jpg^20140818\_140413Color.jpg|MTS Diluent 2 Plus^363^20171229235959|0^A

L

**BioVue Example Messages:**

**3.4.9 Host Query**

H|\^&|||OCD^VISION^3.5.0.45521^J123456|||||||P|LIS2-A|20160224095235

Q|1|^SID106||||||||||O

L||

**3.4.10 Simple Order**

H|\^&|||Mini LIS||||||||LIS2-A|20160301111053

P|1|PID123456||NID123456^MID123456^OID123456|Brown^Bobby^B|White|196501020304|U|||||PHY1234^Kildare^James^P|Blaine||||||||||||||||||||

O|1|SID305||ABO-D|N|20160301111053|||||N||||CENTBLOOD|||||||||||||||

L||

**3.4.11 Result**

H|\^&|||OCD^VISION^3.5.0.45521^J123456|||||||P|LIS2-A|20160301111127

P|1|PID123456||NID123456^MID123456^OID123456|Brown^Bobby^B|White|19650102030400|U|||||PHY1234^Kildare^James^P|Blaine||||||||||||||||||||

O|1|SID305||ABO-D|N|20160301111103|||||||||CENTBLOOD|||||||20160301111127|||F|||||

R|1|ABO|A|||||F||Automatic||20160301111115|J123456

M|1|Anti-A|ABO-Rh/Reverse^1^100002^00001^20171231235959^20160301\_111113Grey.jpg^20160301\_111113Color.jpg||40^A

M|2|Anti-B|ABO-Rh/Reverse^2^100002^00001^20171231235959^20160301\_111113Grey.jpg^20160301\_111113Color.jpg||0^A

M|3|Ctrl|ABO-Rh/Reverse^4^100002^00001^20171231235959^20160301\_111113Grey.jpg^20160301\_111113Color.jpg||0^A

R|2|Rh|NEG|||||F||Automatic||20160301111115|J123456

M|1|Anti-D|ABO-Rh/Reverse^3^100002^00001^20171231235959^20160301\_111113Grey.jpg^20160301\_111113Color.jpg||0^A

M|2|Ctrl|ABO-Rh/Reverse^4^100002^00001^20171231235959^20160301\_111113Grey.jpg^20160301\_111113Color.jpg||0^A

L||

**ASTM 1381-02/LIS1-A Protocol:**

RX:<ENQ>

TX:<ACK>

RX:<STX>1H-Record<CR><ETX>11<CR><LF>

TX:<ACK>

RX:<STX>2P-Record<CR><ETX>90<CR><LF>

TX:<ACK>

RX:<STX>3O-Record<CR><ETX>91<CR><LF>

TX:<ACK>

RX:<STX>4R-Record<CR><ETX>E5<CR><LF>

TX:<ACK>

RX:<STX>5M-Record<CR><ETX>B7<CR><LF>

TX:<ACK>

RX:<STX>6M-Record<CR><ETX>88<CR><LF>

TX:<ACK>

RX:<STX>7M-Record<CR><ETX>26<CR><LF>

TX:<ACK>

RX:<STX>0M-Record<CR><ETX>5F<CR><LF>

TX:<ACK>

RX:<STX>1M-Record<CR><ETX>35<CR><LF>

TX:<ACK>

RX:<STX>2R-Record<CR><ETX>65<CR><LF>

TX:<ACK>

RX:<STX>3M-Record<CR><ETX>87<CR><LF>

TX:<ACK>

RX:<STX>4M-Record<CR><ETX>22<CR><LF>

TX:<ACK>

RX:<STX>5L-Record<CR><ETX>91<CR><LF>

TX:<ACK>

RX:<EOT>

**ASTM 1381-02/LIS1-A Low Level Log:**

RX:<ENQ>

TX:<ACK>

RX:<STX>1H|\^&|||OCD^VISION^1.2.10.44070^JNumber|||||||P|LIS2-A|20151021104146<CR><ETX>11<CR><LF>

TX:<ACK>

RX:<STX>2P|1|||||||U||||||||||||||||||||||||||<CR><ETX>90<CR><LF>

TX:<ACK>

RX:<STX>3O|1|SID001||Z-US-ABO|N|20151021103705|||||||||CENTBLOOD|||||||20151021104000|||R|||||<CR><ETX>91<CR><LF>

TX:<ACK>

RX:<STX>4R|1|ABO|A|||T||R||Automatic||20151021103726|JNumber<CR><ETX>E5<CR><LF>

TX:<ACK>

RX:<STX>5M|1|Anti-A|A/B/D<SP>Monoclonal<SP>and<SP>Reverse<SP>Grouping^1^16301^210711037-02^20171231235959^20151021\_103720Grey.jpg^20151021\_103720Color.jpg|MTS<SP>Diluent<SP>2<SP><SP>Plus^363^20171229235959|30^A<CR><ETX>B7<CR><LF>

TX:<ACK>

RX:<STX>6M|2|Anti-B|A/B/D<SP>Monoclonal<SP>and<SP>Reverse<SP>Grouping^2^16301^210711037-02^20171231235959^20151021\_103720Grey.jpg^20151021\_103720Color.jpg|MTS<SP>Diluent<SP>2<SP><SP>Plus^363^20171229235959|0^A<CR><ETX>88<CR><LF>

TX:<ACK>

RX:<STX>7M|3|Ctrl|A/B/D<SP>Monoclonal<SP>and<SP>Reverse<SP>Grouping^4^16301^210711037-02^20171231235959^20151021\_103720Grey.jpg^20151021\_103720Color.jpg|MTS<SP>Diluent<SP>2<SP><SP>Plus^363^20171229235959|0^A<CR><ETX>26<CR><LF>

TX:<ACK>

RX:<STX>0M|4|A1-Cells|A/B/D<SP>Monoclonal<SP>and<SP>Reverse<SP>Grouping^5^16301^210711037-02^20171231235959^20151021\_103720Grey.jpg^20151021\_103720Color.jpg|0.8%<SP>A1<SP>Cells^363^20171229235959|0^A<CR><ETX>5F<CR><LF>

TX:<ACK>

RX:<STX>1M|5|B-Cells|A/B/D<SP>Monoclonal<SP>and<SP>Reverse<SP>Grouping^6^16301^210711037-02^20171231235959^20151021\_103720Grey.jpg^20151021\_103720Color.jpg|0.8%<SP>B<SP>Cells^363^20171229235959|30^A<CR><ETX>35<CR><LF>

TX:<ACK>

RX:<STX>2R|2|Rh|NEG|||T||R||Automatic||20151021103726|JNumber<CR><ETX>65<CR><LF>

TX:<ACK>

RX:<STX>3M|1|Anti-D|A/B/D<SP>Monoclonal<SP>and<SP>Reverse<SP>Grouping^3^16301^210711037-02^20171231235959^20151021\_103720Grey.jpg^20151021\_103720Color.jpg|MTS<SP>Diluent<SP>2<SP><SP>Plus^363^20171229235959|0^A<CR><ETX>87<CR><LF>

TX:<ACK>

RX:<STX>4M|2|Ctrl|A/B/D<SP>Monoclonal<SP>and<SP>Reverse<SP>Grouping^4^16301^210711037-02^20171231235959^20151021\_103720Grey.jpg^20151021\_103720Color.jpg|MTS<SP>Diluent<SP>2<SP><SP>Plus^363^20171229235959|0^A<CR><ETX>22<CR><LF>

TX:<ACK>

RX:<STX>5L<CR><ETX>91<CR><LF>

TX:<ACK>

RX:<EOT>