LIAISON NES®

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LIS Communication Specification

Revision history

Revision	Detail
A	Initial Version Updated OUL Event R22 section throughout for the following: OBR segment moved prior to OBX segments. Date/Time fields are in local time with timezone offset. PID segment patient name field changed to unknown. Added SAC segment for cartridge. Added INV segments for cartridge and QC swab. Operator ID added to MSH segment. SPM segment specimen role field location corrected.
B	Cover artwork added (Cover page). Updated Figure 4 and Figure 5 artwork (Pages 7–8). Corrected and reformatted HL7 protocol examples (Pages 12–24). Normalized spacing and converted protocol examples to monospaced font for readability (Pages 12–24). Corrected OUL^R22 segment ordering so OBR precedes OBX segments (Pages 11, 18–19, 23–24). Updated HL7 field usage and examples, including timezone offsets and operator ID handling (Pages 12–20, 23–24). Added SAC and INV segment documentation and examples (Pages 16–18, 23–24). Clarified TLS certificate handling behavior and related documentation wording (Pages 6–8). Removed internal-only “HL7 Test Result Overview” section and associated diagram (Page 25).

Contents

Introduction

This document defines the LIS Interface Specification for the LIAISON NES® instrument. It details the LIS Protocols used to communicate between the LIAISON NES® and the LAB Information System (LIS). The LIS Interface is the mechanism by which the test results are uploaded to the LIS.

References

[1]	IHE, IHE Pathology and Laboratory Medicine (PaLM) 5, Technical Framework Volume 1 10 (PaLM TF-1) Profiles 15, Revision 10.0 - Final Text 20, August 20, 2019.
[2]	IHE, IHE Pathology and Laboratory Medicine (PaLM) 5, Technical Framework Volume 2b 10 (PaLM TF-2b) Transactions (cont.) 15, Revision 9.0 - Final Text 20, August 7, 2018.
[3]	ANSI, HL7 Messaging Standard Version 2.8, An Application Protocol for Electronic Data Exchange in Healthcare Environments, Chapter 2: Control, 2014 Health Level Seven International, ANSI/HL7 v2 8-2014, February 21, 2014.
[4]	ANSI, HL7 Messaging Standard Version 2.8, An Application Protocol for Electronic Data Exchange in Healthcare Environments, Chapter 2A: Control – Data Types, 2014 Health Level Seven International, ANSI/HL7 v2 8-2014, February 21, 2014.
[5]	ANSI, HL7 Messaging Standard Version 2.8, An Application Protocol for Electronic Data Exchange in Healthcare Environments, Chapter 3: Patient Administration, 2014 Health Level Seven International, ANSI/HL7 v2 8-2014, February 21, 2014.
[6]	ANSI, HL7 Messaging Standard Version 2.8, An Application Protocol for Electronic Data Exchange in Healthcare Environments, Chapter 7: Observation Reporting, 2014 Health Level Seven International, ANSI/HL7 v2 8-2014, February 21, 2014.
[7]	ANSI, HL7 Messaging Standard Version 2.8, An Application Protocol for Electronic Data Exchange in Healthcare Environments, Chapter 4: Order Entry, 2014 Health Level Seven International, ANSI/HL7 v2 8-2014, February 21, 2014.
[8]	RFC, RFC 8446 The Transport Layer Security (TLS) Protocol Version 1.3, August 2018.
[9]	ANSI, HL7 Messaging Standard Version 2.8, An Application Protocol for Electronic Data Exchange in Healthcare Environments, Chapter 2C: Control – Code Tables, 2014 Health Level Seven International, ANSI/HL7 v2 8-2014, February 21, 2014.
[10]	ANSI, HL7 Messaging Standard Version 2.8, An Application Protocol for Electronic Data Exchange in Healthcare Environments, Chapter 13: Clinical Laboratory Automation, 2014 Health Level Seven International, ANSI/HL7 v2 8-2014, February 21, 2014.

LIAISON NES® to LIS Interface

The LIAISON NES® to LIS Interface has the following responsibilities:

Establish a connection to LIS server: The LIAISON NES® will retrieve the LIS server connection settings entered by the user to attempt to establish a connection to upload test results.

Manage upload of test results: The LIAISON NES® will manage the upload of test results to the remote LIS server. The LIAISON NES® will also update the status of the test results and any changes are displayed on the user interface.

Report LIAISON NES® status: The LIAISON NES® provides information about its current status, such as connection and upload status, on the user interface.

Handle interrupted uploads: The LIAISON NES® will suspend and reschedule on-going uploads whenever this is required, for example on a power down event or when the connection to the LIS server is unavailable.

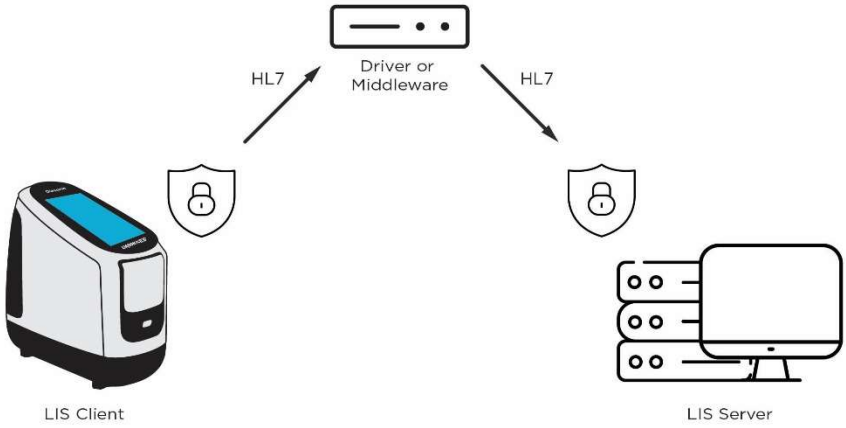

Figure 1 LIAISON NES® Interface Block Diagram

Communication Protocol

Messaging framework

The standard supported by the LIAISON NES® for data transfer is HL7, this is a message standard used for electronic data transfer between healthcare software applications. The HL7 standard defines how the messages should be structured and classifies the type of messages by what trigger events they fall under.

Communication protocol

Each test result will be converted to the HL7 data transmission standard and will be communicated using Minimal Lower Layer Protocol on top of the TCP/IP network protocol with TLS protocol for securing the data.

Encryption using the TLS protocol is optional in the system settings, however for cybersecurity reasons, it is strongly encouraged to enable this option.

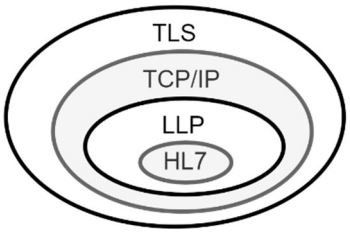

Figure 2 Message Layers

HL7 Message Formats

The LIAISON NES® will support parsing test results into HL7 version 2.8.
Message formats prescribed in HL7 Version 2.8 consist of:

- Segments
- Composites
- Subfields

Segments are variable length that begin with a three-character identifier and terminate with a carriage return (\r). Each segment may contain one or more composites.

Composites are delimited by a pipe character (|). A composite may contain one or more subfields. Composites may be nested.

Subfields are delimited by the caret character (^). A sub-field may contain composites (sub-sub-composites) which are delimited by the (&) character, these must be primitive data types.
The primitive data types are typically a string of ASCII characters although it is possible to send UTF-8 data by specifying the code page in a message header segment. The HL7 data types are defined in [4].

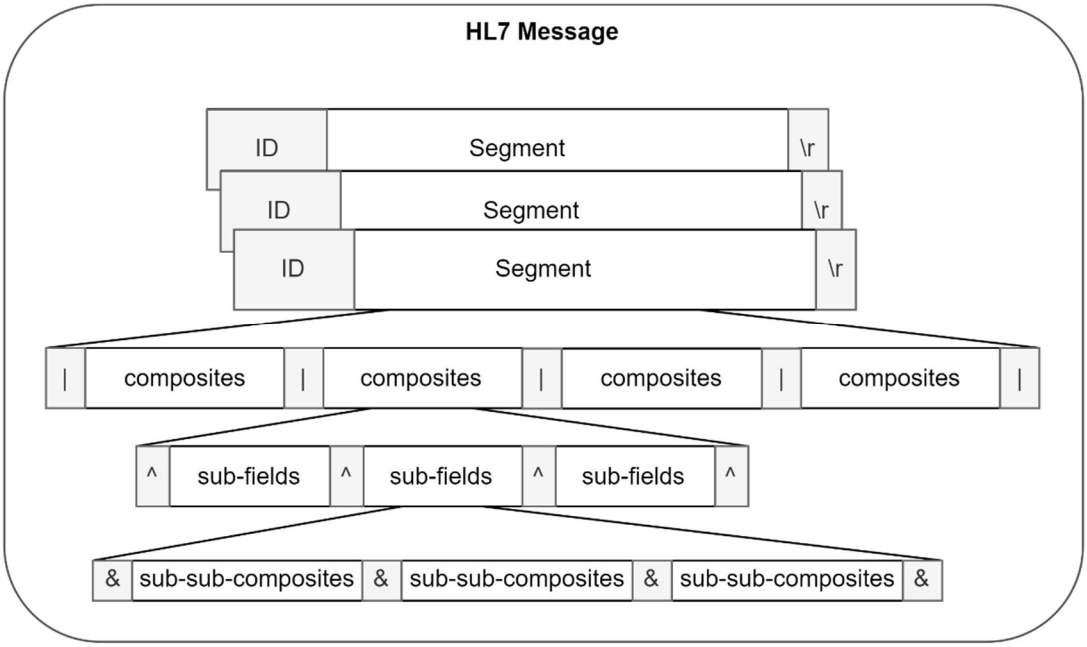

Figure 3 Components of an HL7 Message

A primitive data type may exist in one of three states:

- **Populated**
- **Not populated**
- **Null**

The ID of the segment is comprised of three characters and the first segment in the message will have the message header ID "MSH". The specific HL7 messages sent by the LIAISON NES® for uploading test results are described later in this document in the section titled OUL Event R22.

LLP Lower Layer Protocol

HL7 messages are transmitted over TCP/IP using sockets. Since TCP/IP is a continuous stream of bytes, a wrapping protocol is required for communications code to be able to recognize the start and the end of each message. Lower Layer Protocol (LLP) is a common wrapping protocol used for HL7 messaged and will be used by this instrument.

LLP (sometimes called Minimal Lower Layer Protocol – MLLP) is a simple protocol. HL7 Messages are used to wrapped with a Header and Footer and terminated by a carriage return as described in the following table.

Table 1: LLP Lower Layer Protocol

LLP Header	HL7 Message	LLP Footer	Terminator
0x0B	HL7	0x1C	0x0D

Network Security

Communications between the LIAISON NES® and the LIS server may be secured using the Transport Layer Security protocol

V1.3 [8]. Data encryption is an optional feature that can be enabled or disabled through the user interface. This protocol will be used for encrypting, securing, and authenticating communications between the LIS server and the LIAISON NES® (client).

The TLS communication relies on the server side having a pair of keys, one of them is private and only known by the server, the other is public and is sent to the client. The server also sends a Message Authenticating Code in order to confirm the identity of the server. The public key sent by the server is also known as an SSL Certificate, this certificate must be trusted by the client.

The LIAISON NES® will verify the certificate sent by the server against a trusted root CA certificate store. If the certificate is not trusted, the LIAISON NES® will display the certificate fingerprint. The user will then have the opportunity to inspect the certificate and decide whether they trust it. The user will be required to approve the certificate before it is used. Once the certificate is accepted, it is saved internally and the device automatically uses the saved certificate for future connections.

Once the certificate is trusted, the TLS communication starts with a handshake where the server sends its public key to the client. Data can then be encrypted by the client using the server's public key and it can only be decrypted using the private key held by the server. They then exchange randomly generated data which is used to create new keys. These new keys are temporary and are called session keys.

Session keys are used while the test results are being uploaded, once all test results have been sent and acknowledged the communication is terminated and the session keys are no longer valid.

Once the handshaking has been completed, all session messages can be encrypted. Full details of the handshaking transaction can be found in section 2 of [8].

In order to set up secure communication to the LIS server the configuration parameters need to be entered in the user interface, these are shown in *Figure* 4. The IP address may be entered numerically or as a string representing the Hostname.

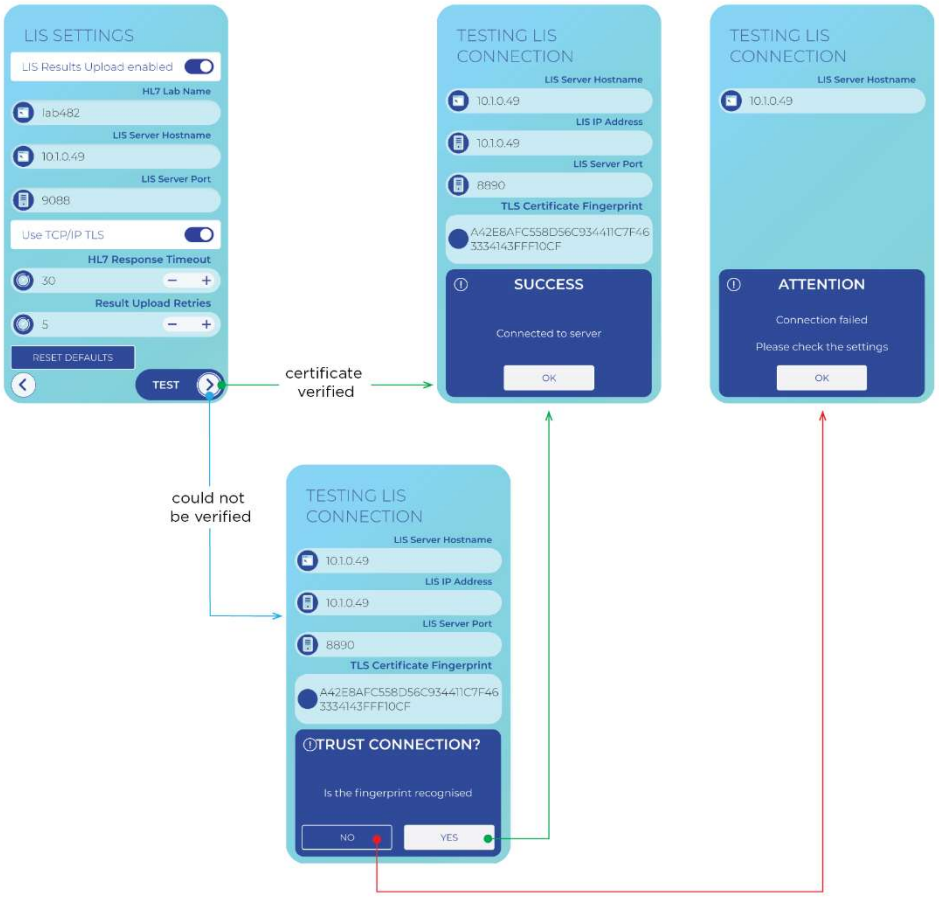

Figure 4 User Interface showing the LIS configuration settings when TLS is enabled.

If the user selects TLS encryption, the instrument will attempt to verify the certificate sent by the LIS server and establish a connection. If the certificate cannot be verified, then the fingerprint of the certificate is displayed on the UI, allowing the user to choose whether they trust the connection.
If TLS encryption is not selected, certificate verification is omitted. This is illustrated in figure 5.

Figure 5 LIS configuration settings when TLS is disabled.

HL7

LAW (Lab Analytical Workflow) Profile

The interface will be implemented in accordance with the Lab Analytical Workflow (LAW) Profile of the IHE PaLM (Pathology and Laboratory Medicine) Technical Framework. This is defined in section 5.4.2.4 of [1]. Only the AWOS Status Change [LAB-29] transaction is required for implementation on this device. LAB-29 is defined in section 3.29 of [2]. This transaction describes how to send test results and AWOS status changes from the Analyzer, in this case the LIAISON NES® to the Analyzer manager (hospital or laboratory LIS server).

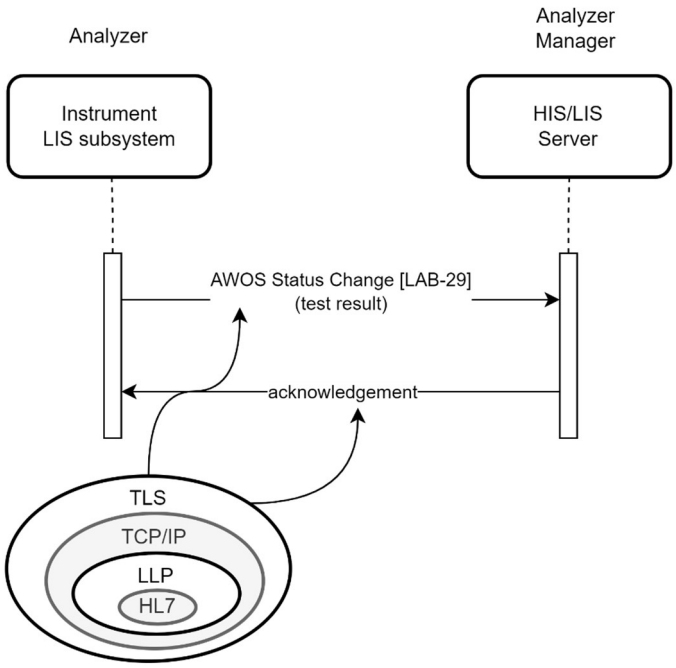

Figure 6 LAB-29 AWOS Status Change

The LIAISON NES® notifies the LIS server of the test results using the HL7 ORU message. This message can contain between one and five observations for a single specimen. Each specimen is in one container. If the patient is known, then all results/specimens in the message must be for one patient. A specimen relates to a single test run on the LIAISON NES®. The LIS server responds to the LIAISON NES® using the HL7 ACK message. The LIAISON NES® will support receiving this acknowledgement message from the LIS server.

LIS Server reply

Once the LIAISON NES® (client) sends the result to the LIS server, the LIS server should process the message and reply with an acknowledgement.

Once the test result message is received by the LIS server, and the message validated, the server must determine whether the message can be accepted. For example, if the message syntax was correct. If the message is accepted, then a reply is sent to the client indicating acknowledgement. Likewise, if there are errors in the message the LIS server replies with acknowledgement error codes. See Figure 7.

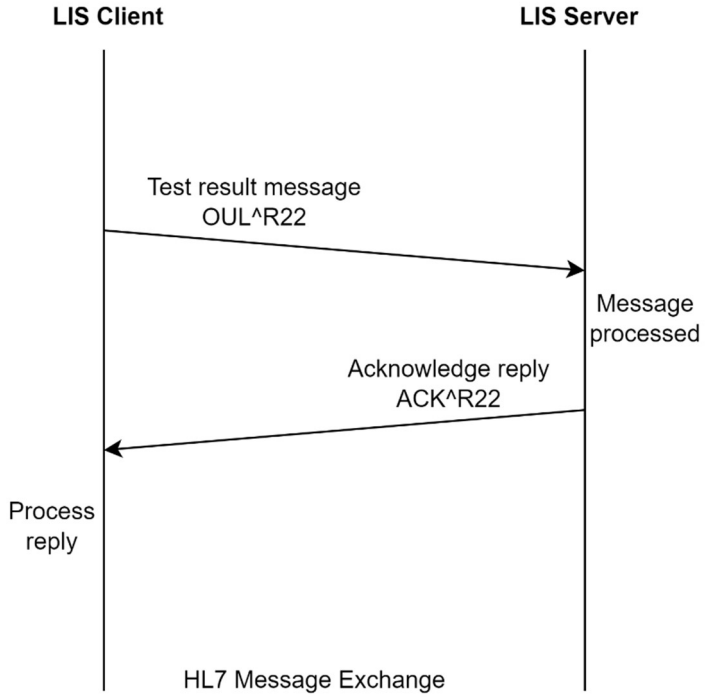

Figure 7 HL& messages between LIAISON NES® and the LIS Server

OUL Event R22

The LIAISON NES® will support sending the specimen test result within the HL7 Unsolicited Specimen Oriented Observation Message (OUL Event R22).

The message static definition supported by this application is shown in the following table. The full message static definition is defined in [2] section 3.29.4.1.2.1.

Message OUL^R22 Static Definition

(Level 0) MSH – Message Header
(Level 1) PID – Patient Identification
(Level 1) SPM – Specimen Information
(Level 2) SAC – Specimen Container Detail
(Level 2) INV 1 – Inventory Detail
(Level 2) INV 2 – Inventory Detail
(Level 2) OBR – Observation Request
(Level 2) OBX 1 – Observation Result
:
:
(Level 2) OBX 5 – Observation Result

MSH – Message Header Segment

The MSH segment is defined in section 2.14.9 of [3]. The following fields are supported by this instrument, and the recommended values for the OUL^R22 message are provided.

The MSH-8 field will be populated with the instrument operator ID.

Field	Field name	HL7 standard values	Optionality	LIAISON NES® use
MSH-1	Field Separator	|	Required	
MSH-2	Encoding Characters	^~\&	Required	
MSH-3	Sending Application	<Namespace ID ^ Universal ID ^ Universal ID Type>	Optional	Liaison NES^Serial Number
MSH-4	Sending Facility	<Namespace ID> ^ <Universal ID> ^ <Universal ID Type>	Optional	*Lab name* entered by the user in the instrument LIS configuration
MSH-5	Receiving Application	<Namespace ID> ^ <Universal ID> ^ <Universal ID Type>	Optional	Not used
MSH-6	Receiving Facility	<Namespace ID> ^ <Universal ID> ^ <Universal ID Type>	Optional	Not used
MSH-7	Date / Time the message was created	YYYYMMDDHHMMSS[+/-ZZZZ]	Required	Local time with timezone offset
MSH-8	Security	Not specified	Optional	Instrument Operator ID
MSH-9	Message Type	<Message Code (ID)> ^ <Trigger Event (ID)> ^ <Message Structure (ID)> See [9]: 2.C.2.45 Table 0076, 2.C.2.3 Table 0003, 2.C.2.279 Table 0354	Required	OUL^R22^OUL_R22
MSH-10	Message Control ID	Unique Message ID	Required	MSGIDxxxx
MSH-11	Processing ID	D – Debugging P – Production T – Training	Required	P
MSH-12	Version ID	HL7 Version	Required	2.8
…			Optional	Not used

Example:

```
MSH|^~\&|Liaison NES^NES12345|ACME Corp|||20250923155329-0600|admin|OUL^R22^OUL_R22|MSGID0002|P|2.8<CR>
```

Patient Section

PID – Patient Identification Segment

The PID segment is defined in section 3.3.2 of [5].

The PID-3 field will be populated from the Patient Order Number that was entered when setting up the test (either using the on-screen keyboard displayed on the LIAISON NES® user interface or by scanning a Patient ID or Test Order barcode).
The PID-5 field will always be populated with the Unknown code value, "^^^^^^U".

The PID segment is optional and therefore will not be sent for QC sample test results.

Field	Field name	HL7 standard values	Optionality	LIAISON NES® use
PID-1	Set ID – PID	Sequence number	Optional	Sequence number
PID-2	Patient ID	Empty	Withdrawn	Not Used
PID-3	Patient Identifier List	List of identifiers to uniquely identify patient separated by ^	Required	Sample ID string entered by the user when initiating test, as patient internal identifier
PID-4	Alternate Patient ID – PID	Copied from Order, or if no Order exists: empty	Withdrawn	Not used
PID-5	Patient Name	Copied from Order, or if no Order exists: "^^^^^^U"	Required	Unknown
…			Optional	Not used
PID-40	Patient Telecommunication Information		Optional	Not used

Example (patient sample)**:**

```
PID|1||Patient1234^^^^PI||^^^^^^U<CR>
```

Specimen Section

SPM – Specimen Information Segment

This segment describes the characteristics of a specimen and is defined in [6] section 7.4.3.

A single SPM segment will be sent for a single OUL^R22 message.

Field	Field name	HL7 standard values	Optionality	LIAISON NES® use
SPM-1	Set ID – SPM	Transaction identifier, starts at 1	Optional	
SPM-2	Specimen ID	Unique identifier for specimen. Copied from Order if it exists.	Optional	Patient sample ID as Filler Assigned ID
SPM-3	Specimen Parent IDs	Identifiers for the specimen(s) that contributed to this specimen	Optional	Not used
SPM-4	Specimen Type	Describes the precise nature of the entity that will be the source material for the observation. See 2.C.2.400 Table 0487 of [9] or use “”.	Required	See table
…			Optional	Not used
SPM-11	Specimen Role	Role of the sample. Q – Control specimen See 2.C.2.294 Table 0369 of [9].	Optional	QC samples only, otherwise not used.
…			Optional	Not used
SPM-19	Specimen Expiration Date/Time	This field is the date and time the specimen can no longer be used for the purpose implied by the order.	Optional	QC samples only, indicates sample expiration.
…			Optional	Not used

Specimen codes are defined in section 2.C.2.400 Table 0487 of [9]. The specimen types supported by this instrument are specified in the following table:

Supported specimen	Specimen Type HL7 Table 0487 Value	HL7 Table 0487 Description	SPM-4
Nasal Swab	NSECR	Nasal	NSECR^Nasal swab
Saliva Sample	SAL	Saliva	SAL
Urine	UR	Urine	UR
CSF	LSAC	Lumbar Sac Fluid	LSAC^Cerebrospinal fluid
Blood	WB	Whole Blood	WB
Nasopharyngeal Swab	NSECR	Nasal	NSECR^Nasopharyngeal swab
Sputum Sample	SPT	Sputum	SPT
Vaginal Swab	GENV	Genital vaginal	GENV^Vaginal swab
Throat Swab	FLD	Other fluid	FLD^Throat swab
Buccal Swab	FLD	Other fluid	FLD^Buccal swab
Rectal Swab	FLD	Other fluid	FLD^Rectal swab
Mucocutaneous Swab	ORH	Other	ORH^Mucocutaneous swab
Positive QC	ORH	Other	ORH^QC-POS
Negative QC	ORH	Other	ORH^QC-NEG

Example 1 (Patient Sample):

```
SPM|1|^Sample1234||NSECR^Nasal swab<CR>
```

Example 2 (QC Sample):

```
SPM|1|||ORH^QC-POS|||||||Q|||||||20250925<CR>
```

For a Patient Sample result, the SPM-4 value is the result of a fixed table lookup based on the "Sample Type" selected/displayed during the run setup. The SPM-2 value is the sample ID as a Filler Assigned Identifier.

For a QC Sample Result, the SPM-4 value is determined by the QC Swab Type (positive or negative) selected/displayed during the test run setup. The SPM-2 value is empty.

SAC – Specimen Container Detail Segment
The SAC segment is used to identify the cartridge consumable into which the QC Swab or Patient Sample has been placed, and is defined in section 13.4.3 of [13].

The LIAISON NES® will report the cartridge serial number and ID as Container and Parent Identifiers, respectively.
The combination of cartridge serial number and identifier will be unique.

Field	Field name	HL7 standard values	Optionality	LIAISON NES® use
SAC-1	External Accession Identifier	Externally assigned laboratory accession ID	Optional	Not used
SAC-2	Accession Identifier	Internally assigned laboratory accession ID	Optional	Not used
SAC-3	Container Identifier	Uniquely identify the primary specimen container in conjunction with other ID fields	Required	Cartridge consumable serial number
SAC-4	Primary (Parent) Container Identifier	Parent specimen ID	Optional	Cartridge consumable ID
…			Optional	Not Used

Example:
```
SAC|||SER0001|NES4451<CR>
```

INV – Inventory Detail Segment

The INV segment is used to track the inventory of substances on equipment, and is defined in section 13.4.3 of [13].

The LIAISON NES® uses this segment to indicate the expiration date and lot number of the cartridge consumable. An additional INV segment will be included to indicate the expiration date and lot number of a QC Swab, when used.

INV-1 is used to indicate whether the substance is a cartridge or QC swab.
INV-2 will always indicate that the substance is "OK", because the machine will not permit expired cartridges or swabs to be used.

Field	Field name	HL7 standard values	Optionality	LIAISON NES® use
INV-1	Substance Identifier	Manufacturer-specific identifier for a substance in inventory	Required	Indicates a Cartridge or QC Swab for a LIAISON NES®
INV-2	Substance Status	The status of an inventoried item	Required	OK
INV-3	Substance Type	The type of substance	Optional	Control for QC Swab, otherwise not used
…			Optional	Not used
INV-12	Expiration Date/Time	The expiration date/time of the substance	Optional	Expiration date of the cartridge or swab
…			Optional	Not used
INV-16	Manufacturer Lot Number	The manufacturer lot number of the substance	Optional	Lot number of the cartridge or swab
…			Optional	Not used

Example 1 (Cartridge):

```
INV|CART^Cartridge^99LIAISONNES|OK^OK Status^HL70383|||||||||20251230||||LOT123<CR>
```

Example 2 (QC Swab):

```
INV|QCSWAB^QC Swab^99LIAISONNES|OK^OK
Status^HL70383|CO^Control^HL70384|||||||||20251231||||LOT190<CR>
```

Note: Neither example contains a carriage return in "OK Status", although it may be printed across multiple lines.

OBR – Observation Request Segment

The Observation Request (OBR) segment is used to transmit information specific to an order for a diagnostic study or observation, physical exam, or assessment and is defined in section 4.5.3 of [7].

The LIAISON NES® will send one OBR segment per OUL^R22 message and populate this with details about the assay that was used to generate the result.

The <Name of Test> in the OBR-4 field shall be populated using the Assay Name which is defined in the Assay Recipe configuration file.

Field	Field name	HL7 standard values	Optionality	LIAISON NES® use
OBR-1	Set ID – OBR	Incrementing sequence number starting at 1	Optional	
…			Optional	Not used
OBR-4	Universal Service Identifier	<Test Identifier>^<Name of Test>	Required	Name of test
…			Optional	Not used
OBR-7	Observation Date/Time	YYYYMMDDHHMMSS[+/-ZZZZ]	Required	Date/time of the result in local time with timezone offset
…			Optional	Not used
OBR-25	Result Status	HL7 Table 0123 - Result Status	Optional	Test cancelation is indicated with an “X”, otherwise not used
…				Not used

Example 1 (patient sample):
```
OBR|1|||^FluA/B RSV COVID19|||20251222154757-0600<CR>
```

Example 2 (QC sample):
```
OBR|1|||^FluA/B RSV COVID19|||20251222153249-0600<CR>
```

Example 3 (Canceled test):
```
OBR|1|||^FluA/B RSV COVID19|||20251222154757-0600||||||||||||||||||X<CR>
```

OBX – Observation Result Segment

The OBX segment is used to transmit a single observation or observation fragment and is defined in section 7.4.2 of [6].

The LIAISON NES® will report between zero and five OBX segments for each OUL^R22 message.

For a Patient Sample Result there will be one OBX segment for each target result yielded by the assay.

The <Name of Test> in the OBX-3 field shall be populated using the Target Name which is defined in the Assay Recipe configuration file.

For a QC Sample Result, there will be a single OBX segment.

In the case of system or user cancellation of an assay, no OBX segments will be present, and cancelation will be indicated by a value of "X" for OBR-25.

Field	Field name	HL7 standard values	Optionality	LIAISON NES® use
OBX-1	Set ID – OBX	Transaction identifier, starts at 1	Optional	
OBX-2	Value Type	See [6] HL7 Table 0125 ST – String data	Optional	String
OBX-3	Observation Identifier	<Identifier>^<Target name>	Required	Name of target
OBX-4	Observation Sub-ID		Optional	Not used
OBX-5	Observation Value	Value observed by the observation producer.	Optional	Target result
…			Optional	Not used
OBX-11	Observation Result Status	F -- final result	Required	Final
…			Optional	Not used

Example 1 (patient sample):

```
OBX|1|ST|^COVID-19||Negative||||||F<CR>
OBX|2|ST|^Flu_A||Negative||||||F<CR>
OBX|3|ST|^Flu_B||Negative||||||F<CR>
OBX|3|ST|^Flu_B||Negative||||||F<CR>
OBX|4|ST|^RSV||Invalid||||||F<CR>
```

Example 2 (patient sample):

```
OBX|1|ST|^COVID-19||Positive||||||F<CR>
OBX|2|ST|^Flu_A||Positive||||||F<CR>
OBX|3|ST|^Flu_B||Negative||||||F<CR>
OBX|4|ST|^RSV||Negative||||||F<CR>
```

Example 3 (QC sample):

```
OBX|1|ST|^Positive QC||Pass||||||F<CR>
```

LIS Acknowledgement Reply

This message is sent by the LIS server in response to the OUL^R22 message sent by the LIAISON NES®.

ACK^R22 Message Static Definition

The ACK ^ R22 message is defined in [2] section 3.29.4.1.2.2. It consists of the message in **Error! Reference source not found.**.

Table 2: ACK ^ R22 Message Segments

Segment	Description	Usage	Implementation
MSH	Message header	required	supported
MSA	Message acknowledgement	required	supported
ERR	Error	optional	Not implemented

MSH and MSA are mandatory and are supported by the LIAISON NES®. The ERR segment is optional and will not be supported by the LIAISON NES®. If the ERR segment is sent to the LIAISON NES® it will be ignored.

MSH – Message Header Segment

The MSH segment is defined in section 2.14.9 of [3]. The following fields are supported by this instrument, and the recommended values for the OUL^R22 message are provided.

Field	Field name	HL7 standard values	Optionality	LIS Server use
MSH-1	Field Separator	|	Required	
MSH-2	Encoding Characters	^~\&	Required	
MSH-3	Sending Application	<Namespace ID> ^ <Universal ID> ^ <Universal ID Type>	Optional	Name of the LIS server application In the example: "ReplyApp"
MSH-4	Sending Facility	<Namespace ID> ^ <Universal ID> ^ <Universal ID Type>	Optional	Lab or company name of the LIS server In the example: "ReplyLtd"
MSH-5	Receiving Application	<Namespace ID> ^ <Universal ID> ^ <Universal ID Type>	Optional	MSH-3 from initial message In the example: "Liaison NES^ NES12345"
MSH-6	Receiving Facility	<Namespace ID> ^ <Universal ID> ^ <Universal ID Type>	Optional	MSH-4 from initial message In the example: "ACME Corp"
MSH-7	Date / Time of Message	YYYYMMDDHHMMSS[+/-ZZZZ]	Required	Time stamp of this reply in local time with timezone offset
MSH-8	Security	Not defined	Optional	MSH-8 from original message
MSH-9	Message Type	<Message Code (ID)> ^ <Trigger Event (ID)> ^ <Message Structure (ID)>	Required	ACK^R22^ACK
MSH-10	Message Control ID	Unique Message ID	Required	message ID for the response, not echo of the initial message
MSH-11	Processing ID	D – Debugging P – Production T – Training	Required	MSH-11 from original message
MSH-12	Version ID	HL7 Version	Required	2.8
…			Optional	Not used

Example:

```
MSH|^~\&|ReplyApp|ReplyLtd|Liaison NES^NES12345|ACME Corp|20200923122120|admin|ACK^R22^ACK|MSGID2134|P|2.8<CR>
```

MSA – Message Acknowledgement Segment

MSA – Message Acknowledgement is defined in [3] 2.14.8.

MSA-1 Acknowledgement codes are defined in section 2.C.2.8 Table 0008 of [9]

- AA – Accept, the message has been accepted for processing.
- AE – Error, the message cannot be accepted.
- AR – Reject, incorrect values for message type, version ID or processing ID.

MSA-1 values of "AE" and "AR" are reflected as "Upload Failed" within the instrument software.

Field	Field name	HL7 standard values	Optionality	LIS Server use
MSA-1	Acknowledgement Code	AA – Application Accept AE – Application Error AR – Application Reject Defined in [9] 2.C.2.8	Required.	One of the following: AA AE AR
MSA-2	Message Control ID	Must be MSH-10 of the result message	Required	
…			Optional	Not used
MSA-8	Message Waiting Priority		Optional	Not used

Example:

```
MSA|AA|MSGID0002<CR>
```

Reply Examples:

Reply message accepted:

```
MSH|^~\&|ReplyApp|ReplyLtd|Liaison NES^NES12345|ACME Corp|20200923122120-0600|admin|ACK^R22^ACK|MSGID2134|P|2.8<CR>
MSA|AA|MSGID0002<CR>
```

Reply with application rejected error:

```
MSH|^~\&|ReplyApp|ReplyLtd|Liaison NES^NES12345|ACME Corp|20200923122120-0600|admin|ACK^R22^ACK|MSGID2134|P|2.8<CR>
MSA|AR|MSGID0002<CR>
```

Transaction Examples

Notes:

- These examples include the typically unprintable characters that are part of the HL7 and Lower Layer Protocols (LLP).
- The unprintable characters will be represented by angle-brackets containing a single hexadecimal character, with a light grey background.
    - `<0x0B>` - This is an ASCII Vertical Tab (VT) character.
        - This character indicates the beginning of the LLP frame beginning.
    - `<0x1C>` - This is an ASCII File Separator (FS) character.
        - This character is the first character of the LLP frame end.
    - `<0x0D>` - This is an ASCII Carriage Return (CR) character.
        - This character indicates the end of each HL7 segment.
        - This character is the second character of the LLP frame end.

Example 1:

Test result message sent by LIAISON NES® for the following recipe configuration:

- Operator ID = “admin”
- Assay Recipe Name = “FluA/B RSV COVID19”
- Assay Type = PATIENT
- Patient ID = “pat847”
- SampleType = Nasal swab
- QC Swab Type = None
- Four target interpretations
    - Target 1
        - Name = “COVID-19”
        - Result = “Positive”
    - Target 2
        - Name = "Flu_A”
        - Result = “Positive”
    - Target 3
        - Name = “Flu_B”
        - Result = “Negative”
    - Target 4
        - Name = “RSV”
        - Result = “Invalid”

```
<0x0B>MSH|^~\&|Liaison NES^NES00139|lab139|||20251222154757-0600|admin|OUL^R22^OUL_R22|MSGID0002|P|2.8<0x0D>
PID|1||pat847^^^^PI||^^^^^^U<0x0D>
SPM|1|^pat847||NSECR^Nasal swab<0x0D>
SAC|||SER0001|NES4451<0x0D>
INV|CART^Cartridge^99LIAISONNES|OK^OK Status^HL70383||||||||||20991230||||LOT123<0x0D>
OBR|1|||^FluA/B RSV COVID19|||20251222154757-0600<0x0D>
OBX|1|ST|^COVID-19||Positive||||||F<0x0D>
OBX|2|ST|^Flu_A||Positive||||||F<0x0D>
OBX|3|ST|^Flu_B||Negative||||||F<0x0D>
OBX|4|ST|^RSV||Invalid||||||F<0x0D><0x1C><0x0D>
```

LIS Server acknowledgement message:

```
<0x0B>MSH|^~\&|ReplyApp|ReplyLtd|Liaison NES^NES00139|lab139|20251222154757||ACK^R22^ACK|MSGID5679|P|2.8<0x0D>
MSA|AA|MSGID0002<0x0D><0x1C><0x0D>
```

Example 2:

Test result message sent by LIAISON NES® for the following recipe configuration:

- Operator ID = "operator"
- Assay Recipe Name = "FluA/B RSV COVID19"
- Assay Type = QC
- SampleType = None
- QC Swab Type = NEGATIVE
- Single QC Result
  - Name = "Negative QC"
  - Result = "Pass"

```
<0x0B>MSH|^~\&|Liaison NES^NES00139|lab139|||20251222153249-0600|operator|OUL^R22^OUL_R22|MSGID0003|P|2.8<0x0D>
SPM|1|||ORH^QC-NEG|||||||Q|||||||20991231<0x0D>
SAC|||SER0001|NES4451<0x0D>
INV|CART^Cartridge^99LIAISONNES|OK^OK Status^HL70383|||||||||20991230||||LOT123<0x0D>
INV|QCSWAB^QC Swab^99LIAISONNES|OK^OK Status^HL70383|CO^Control^HL70384|||||||||20991231||||19017N<0x0D>
OBR|1|||^FluA/B RSV COVID19|||20251222153249-0600<0x0D>
OBX|1|ST|^Negative QC||Pass||||||F<0x0D><0x1C><0x0D>
```

LIS Server acknowledgement message:

```
<0x0B>MSH|^~\&|ReplyApp|ReplyLtd|Liaison NES^NES00139|lab139|20251222153249||ACK^R22^ACK|MSGID5680|P|2.8<0x0D>
MSA|AA|MSGID0003<0x0D><0x1C><0x0D>
```

Example 3:

Test result message sent by LIAISON NES® for the following recipe configuration:

- Operator ID = "operator"
- Assay Recipe Name = "FluA/B RSV COVID19"
- Assay Type = QC
- SampleType = None
- QC Swab Type = NEGATIVE
- Test canceled by user, no results available

```
<0x0B>MSH|^~\&|Liaison NES^NES00139|lab139|||20251222153249-0600|operator|OUL^R22^OUL_R22|MSGID0004|P|2.8<0x0D>
SPM|1|||ORH^QC-NEG|||||||Q|||||||20991231<0x0D>
SAC|||SER0001|NES4451<0x0D>
INV|CART^Cartridge^99LIAISONNES|OK^OK Status^HL70383|||||||||20991230||||LOT123<0x0D>
INV|QCSWAB^QC Swab^99LIAISONNES|OK^OK Status^HL70383|CO^Control^HL70384|||||||||20991231||||19017N<0x0D>
OBR|1|||^FluA/B RSV COVID19|||20251222153249-0600||||||||||||||||||X<0x0D><0x1C><0x0D>
```

LIS Server acknowledgement message:

```
<0x0B>MSH|^~\&|ReplyApp|ReplyLtd|Liaison NES^NES00139|lab139|20251222153249||ACK^R22^ACK|MSGID5680|P|2.8<0x0D>
MSA|AA|MSGID0004<0x0D><0x1C><0x0D>
```