

Attachment II: NEO Iris Operator Manual

In This Attachment

This attachment describes the interface specifications and message structure to be used in the transfer of data from the NEO Iris to an LIS.

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Scope

This document describes the structure to be used in the transfer of data between the Immucor NEO Iris instrument to a Laboratory Information System (LIS).

To ensure industry standardization the popular ASTM protocol is used in formatting the data structure as well as data communication transfer. This is based on the American Society for Testing and Materials designations: **E1381-02 and E1394 – 97**. These standards are more recently recognized as LIS1-A and LIS2-A, respectively.

Essential Information for Communication

Connectivity for data transfer is accomplished with the industry standard LIS1-A (*Standard Specification for Low-Level Protocol to Transfer Messages Between Clinical Laboratory Instruments and Computer Systems ~ Formerly ASTM E1381*). Connectivity can be configured to use either Serial or Socket communication.

Serial Communication

For serial communication, connectivity will make use of an available 9-pin male serial port on the NEO Iris computer. The default connection properties for serial communication are:

Baud Rate	9600
Data Bits	8
Stop Bits	1
Parity	None

The contact pin assignments for serial communication are as follows:

Direction				
Contact No.	EIA Circuit	Description	Instrument	LIS
1	...	Shield	...	No Connection
2	BA	Receive Data	Input	Output
3	BB	Transmit Data	Output	Input
5	AB	Signal Ground

Socket Communication

For Socket communication, the traffic will traverse over a TCP/IP network, where the NEO Iris instrument will behave as the client in the connection relationship. It is expected that the LIS behave as the Server. The LIS Host/Server IP address and port number must be known prior to the NEO Iris configuration and the host must be ready (in listening mode) to establish a viable socket connection.

Important Note Regarding Network Connectivity

When connecting to a TCP/IP network, as with a socket connection, it is important that the NEO Iris instrument be protected from malicious network threats. Risk of vulnerability is greatly minimized with the use of a firewall device. A firewall device is a hardware component, supplied by Immucor as part of the NEO Iris instrument system, that will restrict access between the NEO Iris instrument and the facility network to block unwanted use or abuse. The NEO Iris instrument will connect to the firewall device, which in turn will connect to the facility network. Serial interface connectivity does not carry through the firewall device as serial communication is not TCP/IP traffic. Please note that antivirus or additional third party software cannot be loaded on the NEO Iris computer. Doing so may impact the safety and support of the NEO Iris.

General Communication Flow

In the setup for the NEO Iris to receive order messages from the LIS, an ASTM formatted host query is generated upon loading samples on the instrument and clicking on the “Download Requests” button from the Start Run Assistant. The LIS is expected to create a response (order) to the host query message should it find matching order(s) on the LIS system. The NEO Iris is not expecting a negative or blank response if no match is found. Order messages to the NEO Iris instrument will be processed upon receipt and the assay request(s) added to the instrument Worklist.

Once results are available on the NEO Iris, the user can approve and export the results. If desired, the auto-export feature can be implemented on the NEO Iris to automatically generate the export without user intervention. This process bypasses the approval step and immediately exports results when testing is complete. Auto-export is configured per assay by Immucor Technical Support.

Serial and Socket Data Transfer

There are three distinct phases in transferring information between the NEO Iris instrument and the LIS. In each phase, one system directs the operation and is responsible for continuity of the communication. The three phases assure that the actions of the sender and the receiver are coordinated. The three phases are establishment, transfer, and termination. Although they are briefly described here as an overview, the LIS1-A specification should be reviewed for complete details.

Establishment Phase (Link Connection)

The establishment phase determines the direction of information flow and prepares the receiver to accept information. The NEO Iris will notify the LIS receiver that information is available under the following circumstances: host query and result export.

When either a host query or result message is available, the NEO Iris will initiate the establishment phase to notify the LIS that information is available. After the NEO Iris determines that the link is in a neutral state, it will transmit the <ENQ> transmission control character to the LIS. The NEO Iris will ignore all responses other than <ACK>, <NAK>, and <ENQ>. If the LIS responds with the <ACK> transmission control character, the establishment phase ends and the transfer phase begins.

When the LIS as a sender is ready to transmit order information to the NEO Iris in response to a host query, it is expected that the LIS will transmit the <ENQ> transmission control character. The NEO Iris will respond with the <ACK> transmission control character to move communication to the transfer phase.

Transfer Phase

During the transfer phase, the NEO Iris may transmit messages to or receive messages from the LIS. The transfer phase will continue until all messages are transmitted. Messages are comprised of Records which are expected to be transferred in frames, with each frame containing a maximum of 247 characters. Records longer than 240 characters are divided between two or more frames. Every record must begin a new frame. A frame is one of two types—an intermediate frame or an end frame. The frame structure is illustrated below; however, further explanation on the structure of the frame, including how the frame number and checksum are calculated, can be found in the LIS1-A specification.

Intermediate Frame	End Frame
<STX>FNTtext<ETB>C1C2<CR><LF>	<STX>FNTtext<ETX>C1C2<CR><LF>
Where	
<STX>	Start of Text transmission control character
FN	Single digit Frame Number 0 to 7
Text	Data Content of Message
<ETB>	End of Transmission Block transmission control character
<ETX>	End of Text transmission control character
C1	Most significant character of check sum 0 to 9 and A to F
C2	Least significant character of checksum 0 to 9 and A to F
<CR>	Carriage Return ASCII character
<LF>	Line Feed ASCII character

The NEO Iris follows the rules outlined for acknowledgements to each frame. An <ACK> signifies that the last frame was received successfully and indicates readiness to receive another frame. A <NAK> signifies that the last frame was not successfully received and indicates readiness to receive the frame again. An <EOT> signifies the last frame was received successfully, but an interrupt is requested.

Termination Phase (Link Release)

The termination phase returns the data link to the clear or neutral state. The NEO Iris will notify the LIS that all messages have been sent by sending the <EOT> transmission control character. At this point, the NEO Iris will regard the data link to be in a neutral state. Upon receiving <EOT>, the LIS should also regard the data link to be in the neutral state.

Data Characters

All data will be represented as eight-bit, single-byte, coded graphic character values as defined in ISO 8859-1:1987. The eight-bit values, within the range from 0 to 127 of ISO 8859-1987 correspond to the ASCII standard character set. Values from 0 to 31 are disallowed with the exception of 7 (BEL), 9 (Horizontal Tab), 11 (Vertical Tab), and 13 (CR), where 13 is reserved as a record terminator. Values from 32 to 126 and from 128 to 254 are allowed. Values 127 and 255 are also not allowed.

Allowed characters: 7, 9, 11, 12, 13, 32-126, 128-254

Disallowed characters: 0-6, 8, 10, 14-31, 127, 255

All records are to be terminated with character 13 (CR).

The message structure and the record structure are detailed in the sections that follow.

Result Message Structure

The following outlines the structure of result messages as they would be transmitted from the NEO Iris instrument. Result messages will contain the Header (H), Patient (P), Order (O), Result (R), and Terminator (L) records. Result messages for the IgG_XM assay will contain the Comment (C) record to supply the identification of the donor sample used in testing.

Header Record

Bolded items are fixed data, sub-components are numbered under 'Use' column.

Field	Field Name	Use	Description of use
1	Record type ID	H	Identifies record as a header record
2	Delimiter Definition	\^&	Definition of delimiters
3	Message Control ID	unused	
4	Access Password	unused	
5	Sender Name or ID	NEO	Fixed instrument ID
6	Sender Street Address	unused	
7	Reserved Field	unused	
8	Sender Telephone	unused	
9	Characteristic of Sender	unused	
10	Receiver ID	LIS	Fixed Receiver ID
11	Special Instructions	either Manual Edit or (null)	Test edited flag Manual Edit = test data has been edited Can be null
12	Processing ID	unused	
13	Version No.	nn	Reflects version level of the specification
14	Date and time of message	YYYYMMDDHHMMSS	Current date and time of message

Example:

```
H|\^&||||NEO||||LIS||||LIS2-A2|20100219083911
```

Patient Record

The Patient (P) Record is sent as a placeholder. The P Record will be blank.

Field	Field Name	Use	Description of use
1	Record Type ID	P	Identifies Record as a Patient Information record
2	Sequence Number	1	Fixed sequence number

Example:

P | 1

Order Record

Bolded items are fixed data, sub-components are numbered under 'Use' column.

Field	Field Name	Use	Description of use	
1	Record type ID	O	Identifies record as an order record	
2	Sequence Number	1	Fixed sequence number	
3	Specimen ID	variable	Sample Number	
4	Instrument Specimen ID	unused		
5	Universal Test ID	1	^^^Assay Code	
		2		Universal Test ID Name
		3		Universal Test ID Type
		4		Instrument Code
6-31	Fields 6-31 are unused			

Example:

O | 1 | 002650 | | ^^^ABORH

Result Record

Bolded items are fixed data, sub-components are numbered under 'Use' column.



Note: Please refer to Table 1 for a listing of possible values for Field 3.4 – Assay Codes.



Note: Please refer to Table 2 for a listing of possible values for Field 4 (Measurement Value) of the Result Record.



Note: Refer to Table 3 for well identification of the result pattern.

Field	Field Name	Use		Description of use
1	Record type ID	R		Identifies record as a result record
2	Sequence Number	1		Fixed sequence number
3	Universal Test ID	1	Universal Test ID	Reserved by standard
		2	Universal Test ID Name	Reserved by standard
		3	Universal Test ID Type	Reserved by standard
		4	variable	Instrument Assay Code
4	Measurement Value	1	variable	Graded Well Reaction Pattern
		2	variable	Interpretation
5	Units	unused		
6	Reference Range	unused		
7	Result Abnormal Flags	unused		
8	Nature of Abnormality	unused		
9	Result Status	F		Fixed – denotes final result
10	Date of Change in Instrument	unused		
11	Operator Identification	1	variable	Performed by User Name
		2	variable	Exported by User Name
12	Date/Time test started	unused		
13	Date/Time test completed	YYYYMMDDHHMMSS		Date and time created
14	Instrument Identification	1	variable	Instrument Serial Number
		2	variable	Plate Name

Example:

```
R|1|^ABORH|--44-33^O Positive||||F||Melissa^Brent||20100219083911|
5030090002^UA5288913
```

Table 1 - Instrument Assay Codes

Field	Description	Instrument Codes			
		Blood Grouping	Antibody Screen/Panels	Antigen Phenotyping	Other
O Record 5.4 R Record 3.4	Assay Name	ABORH			
		ABORH_2		Ag_CcEe	
		ReflexABO		Ag_CcE	
		FWD_ABORH		Ag_C RH2	
		ReflexFWD		Ag_c RH4	
		Weak_D	Pool_Cell	Ag_E RH3	
		Weak_D_F	2_Cell	Ag_e RH5	
		Rev_ABO	3_Cell	Ag_Kell	DAT
		ABORH_AB	Ab_ID	QC_CcEe	CMV
		ABO_AB_2	ExtendDN	QC_CcE	IgG_XM
		RfxABO_AB	ExtendDP	QC_C RH2	
		FWDABO_AB	QC3_Cell	QC_c RH4	
		RfxFWD_AB		QC_E RH3	
		Wk_D_AB		QC_e RH5	
		Wk_D_F_AB		QC_Kell	
		QCTEST			
		QCTEST_AB			

Table 2 - Result Record Field 4 Measurement Values

SUB-COMPONENT 1		
Assay	Possible Values for Reaction Pattern	
All Assays	-, 1, 2, 3, 4, ?, X	
SUB-COMPONENT 2		
Assay	Interpretation Values	
	ABO Portion	Rh Portion
ABORH ABORH_2 ABORH_AB ABO_AB_2 FWD_ABORH FWDABO_AB	A, B, AB, O, NTD, *INV*	Positive, Negative, NTD, *INV*
ReflexABO ReflexFWD RfxABO_AB RfxFWD_AB	A, B, AB, O, NTD, *INV*, Offline, ReflexABO Pending or ReflexFWD Pending or RfxABO_AB Pending or RfxFWD_AB Pending	Positive, Negative, Pending, NTD, *INV*, Offline, RPT Weak_D Pending or Weak_D_F Pending or Wk_D_AB Pending or Wk_D_F_AB Pending, ReflexABO Pending or ReflexFWD Pending or RfxABO_AB Pending or RfxFWD_AB Pending
Rev_ABO	A, B, AB, O, NTD, *INV*	
SUB-COMPONENT 2		
Assay	Interpretation Values	
Weak_D Weak_D_F Wk_D_AB Wk_D_F_AB	Positive, Negative, NTD, *INV*	
Pool_Cell 2_Cell DAT	Positive, Negative, No_Int, *INV*	
3_Cell Ab_ID ExtendDN ExtendDP	Positive, Negative, No_Int, Ctrl Fail, *INV*	

SUB-COMPONENT 2		
Assay	Interpretation Values	
QCTEST QCTEST_AB QC3_Cell QC_CcEe QC_CcE QC_C RH2 QC_c RH4 QC_E RH3 QC_e RH5 QC_Kell	Qualified, Failed	
IgG_XM	IgG Comp (Check ABO Comp), Incompatible, No_Int, *INV*	
CMV	Positive, Negative, *INV*	
Ag_C RH2	C+, C-, NTD, *INV*	
Ag_c RH4	c+, c-, NTD, *INV*	
Ag_E RH3	E+, E-, NTD, *INV*	
Ag_e RH5	e+, e-, NTD, *INV*	
Ag_Kell	K+, K-, NTD, *INV*	
	C c Interpretations	E e Interpretations
Ag_CcEe	C+ c+, C+ c-, C- c+, C+ NTD, C-NTD, NTD c+, NTD c-, NTD NTD, *INV*	E+ e+, E+ e-, E- e+, E+ NTD, E- NTD, NTD e+, NTD e-, NTD NTD, *INV*
Assay	C c Interpretations	E Interpretations
Ag_CcE	C+ c+, C+ c-, C- c+, C+ NTD, C-NTD, NTD c+, NTD c-, NTD NTD, *INV*	E+, E-, NTD, *INV*

Table 3 - LIS Well Result Identification for Result Record Field 4 Measurement Values

Assay	Test phase		Assay	Test phase	
ABORH ABORH_2 ReflexABO	1	Anti-A	Ab_ID ExtendDN ExtendDP	1	Cell 1
	2	Anti-B		2	Cell 2
	3	Anti-D series 4		3	Cell 3
	4	Anti-D series 5		4	Cell 4
	5	Monoclonal Control		5	Cell 5
	6	A1-Cell		6	Cell 6
	7	B-Cell		7	Cell 7
ABORH_AB ABO_AB_2 RfxABO_AB	1	Anti-A		8	Cell 8
	2	Anti-B		9	Cell 9
	3	Anti-A,B		10	Cell 10
	4	Anti-D Series 4		11	Cell 11
	5	Anti-D Series 5		12	Cell 12
	6	A1-Cell		13	Cell 13
	7	B Cell		14	Cell 14
	8	Monoclonal Control		15	Positive Control
FWD_ABORH ReflexFWD	1	Anti-A		16	Negative Control
	2	Anti-B	Ag_CcEe	1	Anti-C
	3	Anti-D series 4		2	Anti-c
	4	Monoclonal Control		3	Anti-E
FWDABO_AB RfxFWD_AB	1	Anti-A		4	Anti-e
	2	Anti-B		5	Monoclonal Control
	3	Anti-A,B	Ag_C RH2	1	Monoclonal Control
	4	Anti-D Series 4		2	Anti-C
	5	Monoclonal Control	Ag_c RH4	1	Monoclonal Control
Rev_ABO	1	A1-Cell		2	Anti-c
	2	B-Cell	Ag_E RH3	1	Monoclonal Control
Weak_D Weak_D_F	1	Monoclonal Control		2	Anti-E
			Ag_e RH5	1	Monoclonal Control

Assay	Test phase	
Wk_D_AB Wk_D_F_AB	2	Anti-D Series 4
Pool_Cell	1	Cell 1
2_Cell	1	Cell 1
	2	Cell 2
3_Cell	1	Cell 1
	2	Cell 2
	3	Cell 3
	4	Positive Control
IgG_XM	1	IgG Compatibility
DAT	1	DAT result
CMV	1	CMV result
QCTEST	1	Anti-A & A1-Cell
	2	Anti-A & B-Cell
	3	Anti-B & B-Cell
	4	Anti-B & A1-Cell
	5	Anti-D series 4 & QC Cell
	6	Anti-D series 4 & A1-Cell
	7	Anti-D series 5 & QC Cell
	8	Anti-D series 5 & B-Cell

Assay	Test phase	
	2	Anti-e
	1	Monoclonal Control
Ag_Kell	2	Anti-Kell
	1	Anti-C / C positive cells
QC_CcEe	2	Anti-c / c positive cells
	3	Anti-E / E positive cells
	4	Anti-e / e positive cells
	5	Anti-C / C negative cells
	6	Anti-c / c negative cells
	7	Anti-E / E negative cells
	8	Anti-e / e negative cells
	QC_Kell	1
2		Anti-Kell / K negative cells
QCTEST_AB	1	Anti-A & A1 Cell
	2	Anti-A & B Cell
	3	Anti-B & B Cell
	4	Anti-B & A1 Cell
	5	Anti-D series 4 & QC Cell
	6	Anti-D series 4 & A1 Cell
	7	Anti-D series 5 & QC Cell
	8	Anti-D series 5 & B Cell
	9	Anti-A,B & A1 Cell
	10	Anti-A,B & B Cell
	11	Anti-A,B & QC Cell

Assay	Test phase	
Ag_CcE	1	Anti-C
	2	Anti-c
	3	Anti-E
	4	Monoclonal Control
QC_CcE	1	Anti-C / C positive cells
	2	Anti-C / C negative cells
	3	Anti-c / c positive cells

Assay	Test phase		Assay	Test phase
	4	Anti-c / c negative cells		
	5	Anti-E / E positive cells		
	6	Anti-E / E negative cells		
QC_C RH2	1	Anti-C / C positive cells		
	2	Anti-C / C negative cells		
QC_c RH4	1	Anti-c / c positive cells		
	2	Anti-c / c negative cells		
QC_E RH3	1	Anti-E / E positive cells		
	2	Anti-E / E negative cells		
QC_e RH5	1	Anti-e / e positive cells		
	2	Anti-e / e negative cells		

Comment Record

The Comment (C) Record is sent with the IgG_XM assay. The purpose of the C Record is to contain the ID of the donor unit used in the IgG_XM assay.

Bolded items are fixed data, sub-components are numbered under 'Use' column.

Field	Field Name	Use		Description of use
1	Record type ID	C		Identifies record as a comment record
2	Sequence Number	1		Fixed sequence number
3	Comment source	I		Fixed text
4	Comment Text	1	Donor	Fixed text
		2	variable	Donor ID used in IgG_XM assay
5	Comment Type	unused		

Example:

C|1|I|Donor^W037908150261

Terminator Record

Bolded items are fixed data.

Field	Field Name	Use		Description of use
1	Record type ID	L		Identifies record as a terminator
2	Sequence Number	1		Fixed at 1
3	Termination Code	N		Fixed at N – normal termination

Example:

L|1|N

Host Query Message Structure

The following outlines the structure of host query from the NEO Iris instrument. Host Query messages will contain Header (H), Request (Q), and Terminator (L) Records.

Header Record

Bolded items are fixed data.

Field	Field Name	Use	Description of use
1	Record type ID	H	Identifies record as a header record
2	Delimiter Definition	\^&	Definition of delimiters
3	Message Control ID	unused	
4	Access Password	unused	
5	Sender Name or ID	BBX	Fixed text
6	Sender Street Address	unused	
7	Reserved Field	unused	
8	Sender Tel.	unused	
9	Characteristic of Sender	unused	
10	Receiver ID	AURORA	Fixed text
11	Special Instructions	unused	
12	Processing ID	unused	
13	Version No.	nn	Reflects version level of the specification
14	Date and time of message	YYYYMMDDHHMMSS	Date and time order generated

Example:

```
H|\^&|||BBX||||AURORA|||LIS2-A2|20100219083911
```

Request Record

Bolded items are fixed data.

Field	Field Name	Use	Description of use
1	Record type ID	Q	Identifies record as a request record
2	Sequence Number	1	Query Sequence number 1 – n
3	Starting Range ID No.	aaannn	Multiple sample barcodes separated with repeat delimiter.
4	Ending Range ID No.	unused	
5	Universal test ID	ALL	Will always be requesting all tests requested for a sample.
6	Nature of request time limit	unused	
7	Beginning request date/time	unused	
8	Ending request date/time	unused	
9	Requesting Physician name	unused	
10	Requesting Physician telephone	unused	
11	User Field 1	unused	
12	User Field 2	unused	
13	Request information status code	O	Test order request

Example:

- **Single**

```
Q|1|W126987||ALL|||||||O
```

- **Multiple**

```
Q|1|0790048\\0790032\0790016\0790003||ALL|||||||O
```

Terminator Record

Bolded items are fixed data.

Field	Field Name	Use	Description of use
1	Record type ID	L	Identifies record as a terminator
2	Sequence Number	1	Fixed at 1
3	Termination Code	N	Fixed at N = Normal termination

Example:

```
L|1|N
```

Order Message Structure

The following outlines the structure of order messages to the NEO Iris instrument. Order messages shall contain Header (H), Patient (P), Order (O), and Terminator (L) Records.

Header Record

Bolded items are fixed data.

Field	Field Name	Use	Description of use
1	Record type ID	H	Identifies record as a header record
2	Delimiter Definition	\&	Definition of delimiters
3	Message Control ID	unused	
4	Access Password	unused	
5	Sender Name or ID	LIS	Fixed text
6	Sender Street Address	unused	
7	Reserved Field	unused	
8	Sender Tel.	unused	
9	Characteristic of Sender	unused	
10	Receiver ID	BBX	Fixed text
11	Special Instructions	unused	
12	Processing ID	unused	
13	ASTM Version No.	nn	Aurora file version number
14	Date and time of message	YYYYMMDDHHMMSS	Date and time order generated

Patient Record

At minimum, an empty Patient (P) Record should be sent to maintain the hierarchal message structure. The LIS can optionally send data in the P Record, however, data sent in the P Record is currently ignored by NEO.

Field	Field Name	Use	Description of use
1	Record Type ID	P	Identifies Record as a Patient Information record
2	Sequence Number	1	Sequence number (1-n)

Order Record

Bolded items are fixed data, sub-components are numbered under 'Use' column.



Note: Please refer to Table 1 for a listing of possible values for Assay Codes.

Field	Field Name	Use	Description of use
1	Record type ID	O	Identifies record as an order record
2	Sequence Number	1	Sequence number (1-n)
3	Specimen ID	1 aaannnn	Alphanumeric Sample ID
		2 aaannnn	Alphanumeric Donation ID when ordering crossmatch assay. NULL if not crossmatch assay
4	Instrument Specimen ID	unused	
5	Universal Test ID	1 Universal Test ID	Reserved by standard
		2 Universal Test ID Name	Reserved by standard
		3 Universal Test ID Type	Reserved by standard
		4 Instrument Code	Assay Code for the order
6	Priority	R	Fixed at R = Routine
7	Request Order Date	unused	
8	Specimen Collection Date	unused	
9	Collection End Time	unused	
10	Collection Volume	unused	
11	Collector ID	unused	
12	Action Code	unused	
13	Danger Code	unused	
14	Relevant Clinical Info	unused	
15	Date Specimen Received	unused	
16	Specimen Descriptor	a	S = Sample C = Crossmatch Request
17	Ordering Physician	unused	
18	Physician Tel No.	unused	
19	User Field 1	unused	
20	User Field 2	unused	
21	Laboratory Field 1	unused	
22	Laboratory Field 2	unused	
23	Report Date/Time	unused	
24	Instrument Charge	unused	
25	Instrument Section ID	unused	

Field	Field Name	Use	Description of use
26	Report Type	F	Fixed at F = Final
Remaining Fields are unused.			

Terminator Record

Field	Field Name	Use	Description of use
1	Record type ID	L	Identifies record as a terminator
2	Sequence Number	1	Sequence number
3	Termination Code	N	Fixed at N = Normal termination

Message Examples

The following illustrates examples of each of the three message types, Result, Host Query, and Order messages.

Result Messages:

ABORH

```
H|\^&|||NEO|||LIS||LIS2-A2|20100224194036
P|1
O|1|R142960|^ABORH
R|1|^ABORH|--44-33^O
Positive|||F|Donna^Brent||20100216151816|5030090012^UA5645409
L|1|N
```

IgG_XM

```
H|\^&|||NEO|||LIS||LIS2-A2|20100224194400
P|1
O|1|R38536|^IgG_XM
R|1|^IgG_XM|^IgG Comp (Check ABO Comp)|||F|Jimmy^Brent||20100202092230|5030090012^SC07901917
C|1|L|Donor^LS061504
L|1|N
```

2_Cell

```
H|\^&|||NEO|||LIS||LIS2-A2|20100224194255
P|1
O|1|24531R552567842999|^2_Cell
R|1|^2_Cell|41^Positive|||F|Stacy^Melissa||20100209103925|5030090012^X25702
688
L|1|N
```

FWD_ABORH

```
H|\^&|||NEO|||LIS||LIS2-A2|20100224194504
P|1
```

```
O|1|R112196||^FWD_ABORH
R|1|^FWD_ABORH|-44-^B
Positive|||F|Yolanda^Donna|20100202092221|5030090001^UA4431019
L|1|N
```

Host Query Message:

```
H|\^&|||BBX|||AURORA|||LIS2-A2|20100219083911
Q|1|Sample01\Sample02\Barcode0815\12345|ALL|||O
L|1|N
```

Order Messages:

Non-Crossmatch

```
H|\^&|||LIS|||BBX|||LIS2-A2|20100219083911
P|1
O|1|3467852^|^ABORH|R|||S|||F
L|1|N
H|\^&|||LIS|||BBX|||LIS2-A2|20100219083911
P|1
O|1|123456^|^2_Cell|R|||S|||F
L|1|N
```

Multiple Orders

```
H|\^&|||LIS|||BBX|||LIS2-A2|20100219083911
P|1
O|1|123456^|^ABORH|R|||S|||F
O|2|123456^|^2_Cell|R|||S|||F
P|2
O|1|123654^|^ABORH|R|||S|||F
O|2|123654^|^2_Cell|R|||S|||F
L|1|N
```

Crossmatch

```
H|\^&|||LIS|||BBX|||LIS2-A2|20100219083911
P|1
O|1|107216^GC18201|^IgG_XM|R|||C|||F
L|1|N
```