

ASTM interface

C

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ASTM protocol (LIS2 - A2)

The low-level definition of ASTM

This chapter presents the lower layers of the ASTM protocol, as used by **cobas IT 3000**.

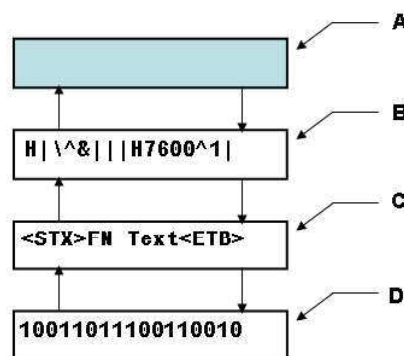
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Background to the ASTM protocol

ASTM (American Society of Testing and Materials) has a plan for communications between automatic analyzers and host computers for standards E1381-91 (Specification for Low-Level Protocol to Transfer Messages Between Clinical Laboratory Instruments and Computer Systems) and E1394-91 (Standard Specifications for Transferring Information Between Clinical Instruments and Computer Systems). The basic specifications of the standards are regulated on X12 of ANSI.

Communication processing layers

The communication process between the system and the host is divided into four layers as shown below. This specification explains the processing and operation methods for the application layer.



A Application Layer. Server specification of host communication.

B ASTM Upper Layer. ASTM E1394-91

C ASTM Lower Layer. ASTM E1381-91

D Physical Layer.

Figure C-1 Host Communication Processing Layers

Details of the ASTM protocol can be found in the *Annual Book of ASTM Standards*. Copyright American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, USA.

- ASTM E1381-91 Low Level Protocol
Specification for Low Level Protocol to Transfer Messages Between Clinical Laboratory Instruments and Computer Systems
- ASTM E1394-91 High Level Protocol
Standard Specification for Transferring Information Between Clinical Instruments and Computer Systems

ASTM lower layer

ASTM lower layer receives messages for a transmission request from the upper layer. These messages are then split into frames and sent to a communication medium to be transmitted to other parties. ASTM lower layer also constructs frames received from a communication medium to recreate messages to be transferred to the ASTM upper layer as reception messages. Configuration and communication procedures for transmission and reception of frames are explained in the following sections.

Item	Method	Explanation
Frame Configurations	For Middle Frame	<ul style="list-style-type: none"> Control character (characters enclosed in <>):
	<STX> FN text <ETB>	<STX> is control character (HEX 02)
	C1 C2 <CR><LF>	<ETB> is control character (HEX 17)
	For Last Frame	<CR> is control character (HEX 0D)
	<STX> FN text <ETX>	<LF> is control character (HEX 0A)
Frame Character Configuration of Text	C1 C2 <CR><LF>	<ETX> is control character (HEX 03)
		<ul style="list-style-type: none"> FN: Frame Number. The frame number is an ASCII digit ranging from 0 to 7. The frame number begins at 1 with the first frame of the Transfer phase. The frame number is incremented by one for every new frame transmitted. After 7, the frame number rolls over to 0, and continues in this fashion. (i.e. modulus 8) Text: the data content of a frame (maximum 240 characters). Records are subdivided into intermediate (middle) frames with 240 or fewer characters. Text is part of a split message. C1 and C2: Checksum as a two-digit hexadecimal number. The checksum permits the receiver to detect a defective frame. The checksum is encoded as two characters which are sent after the <ETB> or <ETX> character. The checksum is computed by adding the binary values of the characters, keeping the least significant eight bits of the result.
		C1 = most significant character of checksum 0 to 9 and A to F
		C2 = least significant character of checksum 0 to 9 and A to F
	Characters other than	<SOH> is control character (HEX 01)
Maximum Length of the Frame	<SOH><STX><ETX>	<EOT> is control character (HEX 04)
	<EOT><ENQ><ACK>	<ENQ> is control character (HEX 05)
	<DLE><NAK><SYN>	<ACK> is control character (HEX 06)
	<ETB><CR><LF>	<DLE> is control character (HEX 10)
	<DC1><DC2><DC3><DC4>	<NAK> is control character (HEX 15)
		<SYN> is control character (HEX 16)
		<DC1> ~ <DC4> are control characters (HEX 11 ~ 14)
	247 characters	<p>For one frame, maximum of 240 characters for text, plus 7 characters for frame control characters.</p> <p>Messages equal to or less than 240 characters are transmitted as one final frame. Messages greater than 240 characters are split into frames that have character lengths that fall within the 240-character limit. The only or final remaining frame becomes the last frame and is indicated by <ETX>. All others are intermediate (middle) frames and are indicated by <ETB>.</p> <p>Intermediate Frame</p> <p><STX> FN text <ETB> C1 C2 <CR><LF></p> <p>Last Frame</p> <p><STX> FN text <ETX> C1 C2 <CR><LF></p>

ASTM syntax

The structure of the messages to be transferred, according to ASTM Communication Regulation, is explained in this section. Between **cobas IT 3000** and the host, various data such as Test Requests and Results are transferred back and forth. All of these data conform to this syntax.

Message	A message is constructed with an arrangement of several records (refer to the next item). It is the smallest unit of information transferred between a host and an analyzer. Messages begin with a 'Message Header Record' that indicates the beginning of a message and end with a 'Message Termination Record' that indicates the end of a message.
Record	A record is constructed from several fields and expresses a single purpose (such as to specify result reports or test requests). A record may be repeated or used singularly in a message. Code that indicates the purpose of a record is noted in the first character of that record.
Field	A field is the ASTM's smallest element to construct information. Attributes for a field (name, format, and meanings) are defined in units in a record.

Coding rules for the messages

This section deals with message coding rules as well as special characters, such as delimiters, used to develop messages provided by records and fields.

End of Record character

The ASCII CR character (HEX 0D) is always used to indicate the end of a record.

Field Delimiter = vertical bar '|'

A Field delimiter is a character used to separate fields that are next to each other in a record. This is also a delimiter for the first Record ID (character that appears in the beginning of a record) and the next field. According to the 2nd character that appears in the Message Header Record (record that appears in the front of a message), a Field delimiter can be defined with an optional character through the Message Header Record; however, it is recommended that a vertical bar '|' be used.

Repeat Delimiter = backslash '\'

When a field is constructed by the same data repeated several times, it is referred to as a Repeated Field. The delimiter between the repeated items for the Repeated Field is called the Repeat delimiter. Repeat delimiters can be defined with an optional character through the Message Header Record; however, it is recommended that a backslash '\' be used.

Component Delimiter = caret '^'

When a field is constructed by several elements, it is referred to as a Component Field. The delimiter between these elements is the Component delimiter. The

Component delimiter can be defined with an optional character through the Message Header Record; however, it is recommended that a caret '^' be used.

Escape Character = ampersand '&'

An Escape character is provided to indicate a delimiter for the fields that include general text. When this character occurs in a relevant field, the next character holds a special meaning (discussed below). An Escape character can be defined with an optional character through the Message Header Record, however, it is recommended that an ampersand '&' be used.

Expression of special characters with Escape Character

The following escape sequence (starting with & and ending with &) is defined. When this sequence is detected in a field, it is changed to a corresponding character and deleted.

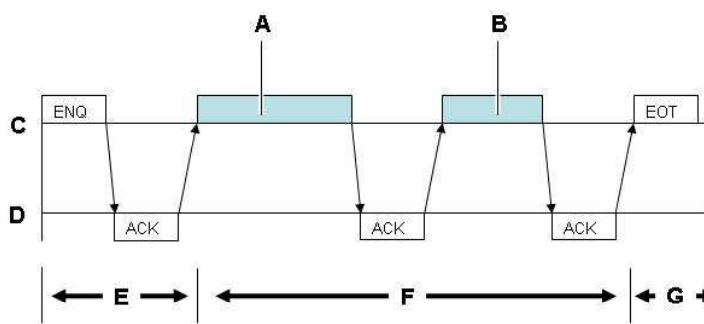
Escape sequences other than these are skipped and treated as NULL values.

&F&	Indicates field delimiter
&S&	Indicates component delimiter
&R&	Indicate Repeat delimiter
&E&	Indicates Escape

Message Transmission Phases

To establish which system sends and which system receives information and to assure the actions of sender and receiver are well coordinated, there are three distinct phases in transferring information.

- Establishment phase
- Transfer phase
- Termination phase



A Intermediate frame	E Establishment phase
B End frame	F Transfer phase
C Sender	G Termination phase
D Receiver	

Figure C-2 Message Transaction Phases

Within the transfer phase, all records of the corresponding message are grouped into longer frames to increase speed. The records are separated through a [CR] character.

Therefore, to obtain pure ASTM records again, the receiver must concatenate all the frames and wait for a [EOT] character. Then, the receiver can process the frame and split it into different records using the [CR] as the separator.

Checksum Calculation / Message Frame



Figure C-3 The intermediate frame



Figure C-4 The end frame

[STX]	The ASCII code 2, indicating the beginning of a frame transmission.
FN	The frame number modulus 8. Frames of a single Transmission Phase are consecutively numbered beginning with 1. So FN runs from 1 to 7, continues with 0, 1, and so on. Use ASCII codes for the digits '0' to '7' (48-55).
Text	The data content of a frame (max. 240 characters). Records are sub-divided into intermediate frames with 240 characters. Maximum is indicated by [ETB]. The only or last remaining frame is indicated by [ETX]. Different records must be sent in different frames.
[ETB]	The ASCII code 23 (17hex), indicating the end of the text block of an intermediate frame.
[ETX]	The ASCII code 3, indicating the end of the text block of an end frame.
CH, CL	Represents the high nibble (= most significant 4 bit) respectively, the low nibble (=least significant 4 bit) of the 8-bit checksum. CH and CL are represented as two digits of hex numbers. The checksum is the modulus 8 of the sum of ASCII values of the frame characters starting with and including 'FN' and completing with [ETX] respectively [ETB].

Example for Checksum
calculation

[STX]1Test[ETX]

Character	Value (hex)	Sum (hex)
[STX]	02	00
'1'	31	31
'T'	+54	85
'e'	+65	EA
's'	+73	15D
't'	+74	1D1
[ETX]	+03	1D4
	= 1D4	
	Mod 100	
	= D4	

Thus the message to be sent is:

[STX]1Test[ETX]D4[CR][LF]

Description of the ASTM Interface

This part of the document shows the different message types available to communicate between a Laboratory Information System (LIS) and **cobas IT 3000** as well as between instruments and **cobas IT 3000** using the ASTM protocol.

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ASTM communications

Roche Diagnostics' **cobas IT 3000** can manage a group of instruments for a laboratory information system (LIS). The **cobas IT 3000**'s module connects as a client to the LIS server, and communicates over TCP/IP. Thus the **cobas IT 3000** provides a single interface through which the LIS can communicate with a group of instruments.

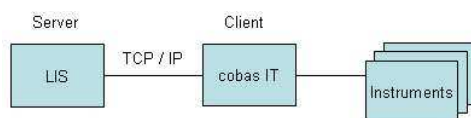


Figure C-5 **cobas IT 3000** managing a group of instruments.

The LIS system can send and receive messages in ASTM format to and from the **cobas IT 3000**. Roche Diagnostics' **cobas IT 3000** handles all further communication with its group of instruments.

Message flow

Roche Diagnostics' **cobas IT 3000** handles a number of basic message types, which normally occur in the following order.

1. Query message.

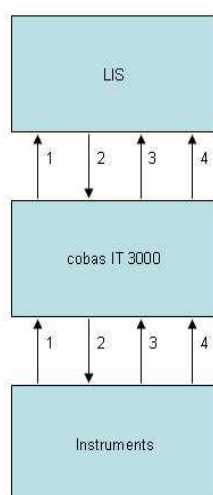
An instrument sends this message to the LIS. It says that the instrument is waiting for orders information, and what kinds of orders it is waiting for.

2. Order.

LIS sends this message to an instrument, along with a sample. It tells the instrument what test the LIS wants done on the sample.

3. Order result.

An instrument sends this message to the LIS. It gives the results of the test done on the sample.



A Query	C Result
B Order	D Quality control or Sample Event messages

Figure C-6 The order of message flows.

Other messages Other messages which may occur at specific times include:

- Quality control result.

An instrument sends this message to the LIS. It notifies the LIS of the status of the quality checks done on the instrument. On the instrument or in **cobas IT 3000**, it is possible to configure at what time Quality Control tests are performed.

- Sample Event message.

The Sample Event message notifies the LIS that a certain sample is present on the instrument or in pre-analytic device or an archive, but without making a query for an order.

Sample Event example

cobas IT 3000 uses the Sample Event message to notify the LIS of the presence of the location of a sample, without making an order query. A typical example is the following scenario:

1. LIS/HIS sends sample and order information to **cobas IT 3000**.
2. The laboratory staff place the sample on the analyzer.
3. The analyzer queries **cobas IT 3000** for details of tests to be done on the sample, sending the sample ID, rack number and position.
4. **cobas IT 3000** replies to the analyzer with details of the tests to be done.
5. **cobas IT 3000** sends a "Sample Event" message to the LIS, notifying the LIS of the sample's rack number and position.

Batch mode

In batch mode, the LIS sends orders without waiting for an instrument to send a Query message. The **cobas IT 3000** stores the orders until the appropriate instrument registers, and then forwards the order to it.

ASTM message structure

This section describes the structure and use of ASTM messages.

ASTM is a protocol defined by the Clinical and Laboratory Standards Institute (formerly NCCLS) to provide a method for the two-way digital transmission of remote requests and results between clinical laboratory instruments and information systems.

The standard is described in the publication, *Specification for Transferring Information Between Clinical Laboratory Instruments and Information Systems; Approved Standard—Second Edition*. NCCLS document LIS2-A2 (ISBN 1-56238-550-X). NCCLS, 940 West Valley Road, Suite 1400, Wayne, Pennsylvania 19087-1898 USA, 2004.

Message structure

An **ASTM message** contains the following segments:

Segment	Segment name	Description
H	Message header record	General information about message, including the message type
{ ^(a)		
[^(b) P	Patient record	Patient information such as ID, name and first name, etc. (incl. information about the visit)
{O	Order record	General information about order and the requested tests
{[R]	Result record	Test result
[C]]]]	Comment record	Comments about the result and its interpretation
{[Q]}	Query record	Requests information or orders from a remote system.
}		
}		
L	Terminator record	

Table C-1 Structure of an ASTM message

(a) {} = segments which can be repeated.

(b) [] = optional segments.

Query message

Roche Diagnostics **cobas IT 3000** sends this message to the laboratory information system (LIS). The message says that **cobas IT 3000** is ready to take order requests of a specified kind.

This message will only be sent when the option QUERY_ALWAYS=YES is set in the instrument.ini file. Then, the instrument queries **cobas IT 3000** for tests and **cobas IT 3000** forwards the request to the host. For further details, see *The cobas IT 3000 Service Manual*.

Message structure

An Query message contains the following segments:

Segment	Segment name	Description
H	Message header record	General information about message, including the message type
Q	Query record	Requests information or orders from a remote system.
L	Terminator record	Ends the message.

Table C-2 Structure of a QC result message

Field mappings

This list contains the ASTM fields generated by **cobas IT 3000** and provides a short description for each field.

H - Message Header Record (Level 0)

Position in record	Data type ^(a)	Max length	Description	XML tag/Attribute
1	Char	1	Identifier for Header record (H)	
2			Delimiter definition. The following standard delimiters are recommended: \ ^ &	
	Char	1	: Field delimiter = vertical bar [124]	
	Char	1	\: Repeat delimiter = backslash [92]	
	Char	1	^: Component delimiter = caret [94]	
	Char	1	&: Escape delimiter = ampersand [38]	
5	ST		Sending application	<MSH SENDING_APPLICATION>
10	ST		Receiving application	<MSH RECEIVING_APPLICATION>
12	Char	1	Processing ID, which indicates how the message is to be processed. Only P = "Production" is currently supported.	
14	ST		Date message generated, in YYYYMMDDHHMMSS format.	<MSH DATE>

(a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

Q - Message Query Record (Level 2)

Position in record	Data type ^(a)	Max length	Description	XML tag/Attribute
1	Char	1	Identifier that starts a Query record (Q)	
2	NM		Identifier for Query records. This is set to the digit 1 for the first record, and then increments by one for each record in the message. In this case, set to 1.	
3.2	ST		The sample ID. This is the information system specimen ID number. Note that multiple sample IDs can be sent using the repeat delimiter (backslash: \).	<QRD SAMPLEID>
5	ST		Universal Test ID. This is set to ALL . This requests all tests for the specimens specified in section 3.2.	
13	ST		The Request Information Status Code. This is set to the letter O , signifying “requesting orders and demographics”.	

(a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

L - Message Terminator Record (Level 0)

This is the last record, and identifies the end of the message.

Position in record	Data type ^(a)	Max length	Description
1	Char	1	Identifier for Terminator record (L)
2	Char	1	A row counter. Always set to 1, as there is only ever one Terminator record.
3	ID	1	Code that gives an explanation of the reason for ending the message. Set to N , signifying normal termination.

(a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

In this example, the **cobas IT 3000** says it is ready to take an order.

```
H|\^&|||P242|||GWI-LIS|P|20080110161156<CR>
Q|1|^10000072|ALL|||O<CR>
L|1|N
```

Figure C-7 Sample query message.

Order requests (and patient data)

Order requests transfer the following data from a host (LIS) to **cobas IT 3000**:

- New orders (test requests)
- Changes to an existing order
- Deletion of an existing order
- Patient data (with every order request, patient data included in the order is updated and patients who do not yet exist are created)

Message structure

An Order request contains the following segments:

Segment	Segment name	Description
H	Message header record	General information about message, including the message type (mandatory)
P	Patient record	Information about patient and visit (mandatory)
O	Order record	General information about order and required test(s) (mandatory)
L	Terminator record	Indicates the end of a message

Table C-3 Structure of an order request

Configuring the interface with parameters

You can configure the host interface by using the parameters in **Workplaces > Administration > Clients > [your client] > Configuration**. The default stylesheet provides the following for test request messages sent to **cobas IT 3000**:

Parameter	Type	Default value	Other possible values	Instruction to cobas IT 3000:
acks	Boolean	true	false	Respond to application and accept acknowledgement instructions. (Not used in the default templates.)
patid	Integer	3	4, 5	Which field in the P record segment contains the patient ID.
sampleid	Integer	3	4	Which field in the O segment contains the sample ID.
ordernr	Integer	3	4	Which field in the O segment contains the order number. By default, cobas IT 3000 only reads the first ten digits of this field.

Table C-4 Parameters used for incoming messages.

Field mappings

This list contains all supported ASTM fields. By default, all other fields contained in an ASTM order request are ignored.

H - Message Header Record (Level 0)

Position in record	Data type ^(a)	Max length	Required/ optional?	Description	XML tag/Attribute
1	Char	1	Required	Identifier for Header record (H)	
2				Delimiter definition. The following standard delimiters are recommended: ^&	
	Char	1	Required	: Field delimiter = vertical bar [124]	
	Char	1	Required	\: Repeat delimiter = backslash [92]	
	Char	1	Required	^: Component delimiter = caret [94]	
	Char	1	Required	&: Escape delimiter = ampersand [38]	

(a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

P - Patient Record (Level 1)

Position in record	Data type ^(a)	Max length	Required/ optional?	Description	XML tag/Attribute
1	Char	1	Required	Identifier for Patient record (P)	
2	Char	1	Required	Sequence number. Single digit counting P records.	
4	ST	20	Required	Laboratory Patient ID. It is possible to reconfigure this in cobas IT 3000 (Administration > Location > [Location:Name] > Configuration), so that it is read from any one of fields 3, 4 or 5.	<PID PATID>
6.1	ST	48 in total for 6	Required	Patient name: Surname - use component delimiter to separate all components in position (field) 6	<PID LASTNAME>
6.2	ST	48 in total for 6	Required	Patient name: First name - use component delimiter to separate all components in position (field) 6	<PID FIRSTNAME>
8	TS	14	Required	Date of birth (format: YYYYMMDD)	<PID DOB>
9	Char	1	Required	Sex: F=Female; W=Female; M=Male; U = Unknown. Any other value = Unknown	<PID SEX>

(a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

Order requests (and patient data)

O- Order Record (Level 2)

Position in record	Data type ^(a)	Max length	Required/ optional?	Description	XML tag/Attribute
1	Char	1	Required	Identifier for Order record (O)	
2	Char	1	Required	Sequence number. Single digit counting consecutive O records.	
3	NM	22	Required	Order ID or Sample ID It is possible to configure cobas IT 3000 to read either the sample ID or the Order number from field 4 instead, (Administration > Location > [Location_Name] > Configuration > ASTM_IN). <i>The first 10 digits to <ORC ORDERNR>. The whole number to <ORC SAMPLEID></i>	
5.4	ST		Required	Host Test ID, i.e. Required test code. This is the local code that identifies the analyte.	<OBR TESTCODE>
6	ID	1	Optional	Priority. • S = stat (short turn-around time). • R = routine. Any other values defaults to "routine".	<ORC PRIORITY>
7	ID	1	Required	The date and time the order was sent in YYYYMMSSHHMMSS format.	<ORC ORDERDATE>
8	ID	1	Optional	The date and time the sample was obtained in YYYYMMSSHHMMSS format.	<ORC WITHDRAWDATE>
12	ID	2	Required	Action code. In any one order, tests with the same test code (O-5.4) must all have the same action code. The supported values are: • A=Add test; • C=Delete existing test; • N=Delete existing test; • R=Delete test; • G=Repeat test. 👁 For more details, see <i>Handling different actions in the order</i> on page C-27.	<OBR ACTION>
16	ST		Optional	Code for the specimen type (indicating blood, urine etc.). (Note that version 2.03.08 and earlier of cobas IT 3000 placed this data in field 15.)	<ORC SPECIMEN>

Position in record	Data type ^(a)	Max length	Required/ optional?	Description	XML tag/Attribute
17	ST		Optional	Code for the doctor or department that ordered the test.	<ORC ORDERER>
21	ST		Optional	<p>Order status. Supported values are:</p> <ul style="list-style-type: none"> A = Add test to order. CA = Sample was deleted (to cancel an order, all samples in the order must be deleted). SC = Order is in process, scheduled. R = Order has been replaced, or rerun order. RP = Order has been replaced, or rerun order. U = Update order. This recreates the order with specified tests, plus any previous tests that fulfil the conditions specified in the option HIS_UPDATE_DELETE_LEVEL. <p>👁 For details of HIS_UPDATE_DELETE_LEVEL, see <i>Update delete level</i> on page C-27.</p> <p>This value is used in conjunction with the Order Control ID, passed in O-26, and the Action Code, passed in O-12, to instruct cobas IT 3000 how to handle the order.</p> <p>👁 For more details, see <i>Handling different actions in the order</i> on page C-27.</p>	<ORC STATUS>
26	ST		Optional	<p>Report type. Permitted values are:</p> <ul style="list-style-type: none"> O = new order. X = cancel order, delete sample. C = change or delete previously sent order. <p>👁 For more details, see <i>Handling different actions in the order</i> on page C-27.</p>	<ORC CONTROL>

(a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

L - Message Terminator Record (Level 0)

This is the last record, and identifies the end of the message.

Position in record	Data type ^(a)	Max length	Required/ optional?	Description
1	Char	1		Identifier for Terminator record (L)
2	Char	1		Sequence number. A row counter. Always set to 1, as there is only ever one Terminator record.
3	ID	1		Code that gives an explanation of the reason for ending the message.

(a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

Values not mapped by default

There are further values that the host can send to **cobas IT 3000** in an order request, but are not transferred by the default XSL templates. To use these values, a service engineer will need to edit the XSL templates to support them.

👁 For details of how the XSL templates control the data passed between **cobas IT 3000** and the host, see *Transformation of an ASTM message* on page D-11.

Order requests (and patient data)

Position in record	Data type ^(a)	Max length	Required/ optional?	Description
-	ST	30	Optional	It is possible to use an alphanumeric alternative for the order number of sample number. In this case, the host should send the alphanumeric code identifying the order. Up to 30 characters are supported. This is suggested as a value for field O-3, component 1 "Specimen ID". <ORC HOST_ORDER_ID>
	ST		Required	The host's code identifying the physician dealing with the patient. This value is required if the other values are used. This is suggested as a value for the Patient record, field 14, component 1 "Attending physician code ID". <ORC PHYSICIAN_CODE>
	ST			The name of the physician. This is suggested as a value for Patient record, field 14, component 2 "Attending physician name". Note that currently, cobas IT 3000 does not support dividing the name into last name, first name, title, etc. <ORC PHYSICIAN_NAME>
	ST			A boolean value Y or N, telling cobas IT 3000 to add the physician's details to its database, if the details are not already there. The default setting is Y. To find the physician's preexisting details, cobas IT 3000 searches for a match using the physician's host code. If the code is not supplied, cobas IT 3000 searches by name for a match. <ORC PHYSICIAN_CREATE>

(a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

Example messages

In this example, at 16:20 on 10th January 2008, the host requests the **cobas IT 3000** for six measurements on a serum sample from Mary Nesbitt, born 4th April 1957:

```
H|\^&|200801101620544936
P|1|0001214173|0001214173||Nesbitt^Mary||19570404|F
O|1|500101999||102|||||A|||Serum|S0003|||
O|2|500101999||103|||||A|||Serum|S0003|||
O|3|500101999||106|||||A|||Serum|S0003|||
O|4|500101999||107|||||A|||Serum|S0003|||
O|5|500101999||108|||||A|||Serum|S0003|||
O|6|500101999||109|||||A|||Serum|S0003|||
L|1|N
```

Figure C-8 New order message for six tests on a serum sample

This shows a similar new order message. This message will successfully pass the order to **cobas IT 3000**, but the data in the unsupported fields will not be read.

```
H|\^&||ASTM-Host||||PSM|P|20000219111500
P|1|923506|4637463G66||Smith^John|19630101|M|||||Diabetes||||20000218102000|||||Urology
O|1|923506|92350601|^^^33|R|20090907121223|20090907121223||A|A|||||||O
O|2|923506|92350601|^^^36|R|20090907121223|20090907121223||A|A|||||||O
O|3|923506|92350603|^^^1|R|20090907121223|20090907121223||A|A|||||||O
L|1|F
```

Figure C-9 New order message

This shows a similar order message in batch mode.


```
H|\^&||ASTM-Host|||PSM|P|20000219111500
P|1|923507|4637463XXX|Smith^John|19630101|M|||Diabetes|||20000218102000|||Urology
O|1|923507|923507|^^^260\^^^2\^^^1|R|20090907121223|20090907121223|||A|||O
L|1|F
```

Figure C-10 New order message in batch mode

This shows a Delete Test message. (C/A/R) This deletes tests without results. Tests with results, not released as well as released, will be kept.

```
H|\^&||ASTM-Host|||PSM|P|20000219111500
P|1|923506|4637463G66|Smith^John|19630101|M|||Diabetes|||20000218102000|||Urology
O|1|923506|923506|^^^33|R|20090907121223|20090907121223|||R|||A|||C
O|2|923506|923506|^^^36|R|20090907121223|20090907121223|||R|||A|||C
L|1|F
```

Figure C-11 Delete Test of an Order (C/A/R)

This shows a Delete Test of an Order message (C/A/R) in batch mode. This deletes tests without results. Tests with results, not released as well as released, will be kept.

```
H|\^&||ASTM-Host|||PSM|P|20000219111500
P|1|923506|4637463G66|Smith^John|19630101|M|||Diabetes|||20000218102000|||Urology
O|1|923506|923506|^^^33\^^^36\^^^1|R|20090907121223|20090907121223|||R|||A|||C
L|1|F
```

Figure C-12 Delete Test of an Order (C/A/R) in batch mode

This shows a Delete sample message. To implement this, set SAMPLE_CREATE_RULE=1 (i.e. ORDERID != SAMPLEID) for testing of following dataset (samples with specimen 01 and 02).

```
H|\^&||ASTM-Host|||PSM|P|20000219111500
P|1|923506|4637463G66|Smith^John|19630101|M|||Diabetes|||20000218102000|||Urology
O|1|923506|92350601|^^^33|R|20090907121223|20090907121223|||R|R|||CA|||C
O|2|923506|92350602|^^^36|R|20090907121223|20090907121223|||R|R|||CA|||C
L|1|F
```

Figure C-13 Delete sample message

This shows an alternative Delete sample message. This example is valid, as long as you have different samples per message (and ORDERID != SAMPLEID).

```
H|\^&||ASTM-Host|||PSM|P|20000219111500
P|1|923506|4637463G66|Smith^John|19630101|M|||Diabetes|||20000218102000|||Urology
O|1|923506|92350601|^^^^R|20090907121223|20090907121223|||R|R|||X
O|2|923506|92350603|^^^^R|20090907121223|20090907121223|||R|R|||X
L|1|F
```

Figure C-14 Delete sample message

This shows a Change in patient ID (added, deleted or changed) message. To implement this, the option MODUL/HIS_ALLOW_CHANGE_ORDER must be switched on

```
H|\^&||ASTM-Host|||PSM|P|20000219111500
P|1|923506|4637463XXX|Smith^John|19630101|M|||Diabetes|||20000218102000|||Urology
O|1|923506|923506|^^^33|R|20090907121223|20090907121223|||R|R|||SC|||C
O|2|923506|923506|^^^36|R|20090907121223|20090907121223|||R|R|||SC|||C
L|1|F
```

Figure C-15 Change in patient ID message

Order requests (and patient data)

This shows a Repeat message. This overwrites results, even if they were already released.

```
H|\^&||ASTM-Host|||PSM|P|20000219111500
P|1|923506|4637463XXX|Smith^John|19630101|M| |||||Diabetes|||20000218102000| |||||Urology
O|1|923506|923506|^^^33|R|20090907121223|20090907121223||G|G| |||||RP| |||C
O|2|923506|923506|^^^36|R|20090907121223|20090907121223||G|G| |||||R| |||C
L|1|F
```

Figure C-16 Repeat message

This shows a Repeat message in batch. This overwrites results, even if they were already released.

```
H|\^&||ASTM-Host|||PSM|P|20000219111500
P|1|923506|4637463XXX|Smith^John|19630101|M| |||||Diabetes|||20000218102000| |||||Urology
O|1|923506|923506|^^^33\^^^36\^^^1|R|20090907121223|20090907121223||G|G| |||||RP| |||C
L|1|F
```

Figure C-17 Repeat message in batch

This shows a Delete all tests from order message. This deletes tests independently of their result status (also deleted if result already released). It adds the last test of the message (here it would delete all but add test with code 36 only).

```
H|\^&||ASTM-Host|||PSM|P|20000219111500
P|1|923506|4637463XXX|Smith^John|19630101|M| |||||Diabetes|||20000218102000| |||||Urology
O|1|923506|923506|^^^33|R|20090907121223|20090907121223||R|R| ||||| |||C
O|2|923506|923506|^^^36|R|20090907121223|20090907121223||R|R| ||||| |||C
L|1|F
```

Figure C-18 Delete all tests from order

This shows an alternative Delete all tests from order message. This deletes tests independently of their result status (also deleted if result already released) and it adds all the tests which are part of the message.

```
H|\^&||ASTM-Host|||PSM|P|20000219111500
P|1|923506|4637463XXX|Smith^John|19630101|M| |||||Diabetes|||20000218102000| |||||Urology
O|1|923506|923506|^^^33\^^^36\^^^1|R|20090907121223|20090907121223||R|R| ||||| |||C
L|1|F
```

Figure C-19 Delete all tests from order

This shows an update order message. This deletes tests that have not yet returned results, and adds all the tests which are part of the message.

```
H|\^&||PG-MLS|||P|20080805152127
P|1|923506|4637463XXX|Smith^John|19630101|M| |||||Diabetes|||20000218102000| |||||Urology
O|1|923506|^^^Aa| ||||U| ||||| |||O
O|1|923506|^^^Ab| ||||U| ||||| |||O
L|1|F
```

Figure C-20 Update order

Handling different actions in the order

This table explains how to instruct **cobas IT 3000** to perform actions on the order, using the fields in the Order record.

	Field O-12 (Action code)	Field O-21 (Order status)	Field O-26 (Report type)
Add test	A		O
Delete test	R	A	C
Rebuild new sample (delete all tests for the sample and add the new ones)	R		C
Delete sample (delete all tests for the sample and delete the sample itself)	R	CA	C
Delete sample (as above)	R		X
Change in PID	R	SC	C
Rerun / reflex	G	RP	C
Update order	A	U	C

Update delete level

When an update order message is sent, the order is recreated with the new tests specified. The order's previous tests are deleted, except those that meet the criteria specified in the parameter HIS_UPDATE_DELETE_LEVEL. This parameter is set in **cobas IT 3000** in Administration > Options > MODUL > HIS_UPDATE_DELETE_LEVEL.

The parameter HIS_UPDATE_DELETE_LEVEL is a bitwise binary flag. It consists of an 8-digit binary number, each digit of which can be either 1 or 0. Each digit sets a different flag, as detailed in the following chart.

Do not delete if test: (Never delete)	Binary flag	Code
Has been transferred	10000000	DEL_LVL_NEVER
Has been scanned	01000000	DEL_LVL_TRANSFERRED
Has been put on work list	00100000	DEL_LVL_SCANNED
Has been seen	00010000	DEL_LVL_WORK_LIST
Has been processed by SDI	00001000	DEL_LVL_SEEN
Has a result	00000100	DEL_LVL_DONE_BY_SDI
Has a released result	00000010	DEL_LVL_RESULT
	00000001	DEL_LVL_RELEASED_RESULT

As a binary flag, these values can be combined. For example the setting 00011011 tells **cobas IT 3000** not to delete any pre-existing tests that meet one or more of the following criteria:

- tests that have been added to the worklist (00010000)
- tests that have been seen by **cobas IT 3000** and sent to the instrument (00001000)
- tests that have a result (00000100)
- tests that have a released result (00000001)

The default value of HIS_UPDATE_DELETE_LEVEL is 00011011.

Automatic creation of orderer

If using the default templates, you must pre-program **cobas IT 3000** with the orderers that will send orders. If you send an orderer which **cobas IT 3000** does not know of, it cannot return test results. The default templates read the orderer information from the ASTM Order record, field 17, and assign it to ORC/@ORDERER.

However, you can configure **cobas IT 3000** to automatically create a new orderer, whenever it receives an order from a new source. In this case, you must configure **cobas IT 3000** to read the orderer information from the ORDERER element. The ASTM Order Request message must be transformed into an XML document similar to the following example:

```
<?xml version="1.0" encoding="UTF-8"?>
<OrderRequest>
<MSH SENDER="TEST"/>
<PID PATID="TH" LASTNAME="HARRY" FIRSTNAME="TEST" DOB="19010101" SEX="M">
<ORC ORDERNR_ORG="1453376" ORDERNR="453376" SAMPLEID="1453376" SPECIMEN="" PRIORITY="R" STATUS=""
CONTROL="NW">
<ORDERER DEFAULT_AUFGCD="?" HOSTCODE="WARD1" NAME="WARD1" WARDID="WARD1" WARD="J"/>
<OBR TESTCODE="NA" ACTION="A"/>
<OBR TESTCODE="K" ACTION="A"/>
<OBR TESTCODE="CREAT" ACTION="A"/>
<OBR TESTCODE="MG" ACTION="A"/>
</ORC>
</PID>
</OrderRequest>
```

Figure C-21 Example Order Request message for automatic creation of orderer

To implement this, you must edit the XSLT stylesheets for the Order Request.

👁 For details of how to find and edit the XSLT stylesheets, see *Making extensive reconfigurations* on page A-15.



How to edit XSLT

To edit the XSLT stylesheets, you should to learn at least some basic XSLT and XPath. You can find tutorials and reference information on XSLT and XPath on the internet, for example at <http://www.w3schools.com>. Please note that Roche Diagnostics is not responsible for the content of this or any other external website.

► To implement automatic creation of orderer in ASTM

- 1 Confirm in what ASTM field the host sends the orderer (or sender) information. Typically this will be in O-17, but some sites send it in P-26 or another field.
- 2 Navigate to **Administration > Client (or Location) > [Name of Location] > Configuration**, and double click the template for order requests, by default **OrderRequest**. A dialog box opens, containing the Order Request XSLT.
- 3 Copy and paste all the content of the dialog box to your preferred XML editor (such as Stylus Studio or Altova XML Spy), or to your preferred text editor (such as Notepad or Notepad++). Make a backup copy, and then edit the file in your chosen editor.

- 4 Find and delete the section in the template that assigns a value to the attribute "ORDERER".

- 5 Find the definition of the last attribute of the ORC element. The ORC element starts with the tag:

```
<xsl:element name="ORC">
```

It ends with

```
</xsl:element>
```

Inside this element there are several attributes, defined with tags:

```
<xsl:attribute ...> ... </xsl:attribute>
```

There is also a sub-element, OBR, defined with the tags:

```
<xsl:element name="OBR"> ... </xsl:element>
```

Put your new commands between the last `</xsl:attribute>` tag and the `<xsl:element name="OBR">` that starts the OBR element.

- 6 Enter the XSLT commands to assign the orderer information to the ORDERER element. For example, if the orderer information is sent in ASTM field O-17, add, as the first sub-element in the ORC element:

```
<xsl:for-each select="FIELD[@NO='17']/DATA/COMP[@NO='1']">
  <xsl:element name="ORDERER">
    <xsl:attribute name="DEFAULT_AUFGCD"?></xsl:attribute>
    <xsl:attribute name="HOSTCODE"><xsl:value-of select="@TEXT"/></xsl:attribute>
    <xsl:attribute name="NAME"><xsl:value-of select="@TEXT"/></xsl:attribute>
    <xsl:attribute name="WARDID"><xsl:value-of select="@TEXT"/></xsl:attribute>
    <xsl:attribute name="WARD">J</xsl:attribute>
  </xsl:element>
</xsl:for-each>
```

Figure C-22 Example XSLT to read automatic orderer creation data from ASTM O-17.

If the orderer information is sent in another ASTM field, edit this example to meet your specific needs. For example if the orderer information is sent in P-26, the first line of this code should read:

```
<xsl:for-each select="..FIELD[@NO='26']/DATA/COMP[@NO='1']">
```

- 7 Save your changes in the editor, paste the contents of the edited file back into **cobas IT 3000**, and save your changes in **cobas IT 3000**.
- 8 Test your host interface thoroughly before implementing it live.

The fields available in the ORDERER element

The ORDERER element is not used by the default **cobas IT 3000** templates. By editing the templates, the following fields are available. For more details on these fields see the online help for the dialog in **Workplaces > Parameter > Orderer > Insert new orderer**.

HL7 Segment	Pos. in HL7	Data type ^(a)	Max length	Required/optional?	Description	XML tag/Attribute
-	-	ST		Optional	.	<ORDERER DEFAULT_AUFGCD>
-	-	ST	5	Required	The code used in the host for the orderer.	<ORDERER HOSTCODE>
-	-	ST		Required	The name of the orderer.	<ORDERER NAME>
-	-	ST		Optional	Text description of the orderer, to help a user with identification in reports.	<ORDERER REMARK>
-	-	ST		Optional	The cost center associated with the orderer.	<ORDERER COSTCENTER>
-	-	ST		Optional	The code that determines the order in which orderers appear on reports.	<ORDERER SORT>
-	-	ST		Optional		<ORDERER TITLE1>
-	-	ST		Optional		<ORDERER TITLE2>
-	-	ST		Optional		<ORDERER ZIP>
-	-	ST		Optional		<ORDERER CITY>
-	-	ST		Optional		<ORDERER BILLINGCODE>
-	-	ST		Optional	A pseudo-boolean value. Optional, but must be set to “J” in production environments, or else results are not returned.	<ORDERER WARD>
-	-	ST		Optional	(This functionality is not currently supported.)	<ORDERER TOUR>
-	-	ST		Optional	The orderer group defined in cobas IT 3000 , in which to place the new orderer.	<ORDERER ORDERERGROUP>
-	-	ST		Optional	The organization to associate the orderer with in cobas IT 3000	<ORDERER ORGANIZATION>
-	-	ST		Optional	The code to give to the orderer in cobas IT 3000 .	<ORDERER ABBREVIATION>
-	-	ST		Optional		<ORDERER PHONE>
-	-	ST		Optional		<ORDERER FAX>
-	-	ST		Required	The ward ID for the new orderer, used in ward communication.	<ORDERER WARDID>

(a) Data type abbreviations: ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for HL7-defined tables

Test results

Roche Diagnostics **cobas IT 3000** sends this message to the laboratory information system (LIS). This message gives the results of the tests on the specimens.

Message structure

A **result message** contains the following segments:

Segment	Segment name	Description
H	Message header record	General information about message, including the message type
P	Patient record	Patient information such as ID, name and first name, etc. (incl. information about the visit)
O	Order record	General information about order and the requested tests
R	Result record	Test result
C	Comment record	Comments about the result and its interpretation
L	Terminator record	Ends the message.

Table C-5 Structure of an observation result

Configuring the interface with parameters

You can configure the host interface by using the parameters in **Workplaces > Administration > Clients > [your client] > Configuration**. The default stylesheet provides the following for result messages sent from **cobas IT 3000**:

Parameter	Type	Default value	Other possible values	Instruction to cobas IT 3000:
transferComments	Boolean	false	true	If set, the NTE comment segments are included in the result message.
test	Boolean	false	true	Set this field to "false" in production environments.

Table C-6 Parameters used for result messages.

Field mappings

This list contains the ASTM fields generated by **cobas IT 3000** and provides a short description for each field.

H - Message Header Record (Level 0)

Position in record	Data type ^(a)	Max length	Description	XML tag/Attribute
1	Char	1	Identifier for Header record (H)	
2			Delimiter definition. The following standard delimiters are recommended: \ ^ &	
	Char	1	: Field delimiter = vertical bar [124]	
	Char	1	\: Repeat delimiter = backslash [92]	
	Char	1	^: Component delimiter = caret [94]	
	Char	1	&: Escape delimiter = ampersand [38]	
5	ST		Sending application	<MSH SENDING_APPLICATION>
10	ST		Receiving application	<MSH RECEIVING_APPLICATION>
12	Char	1	Processing ID, which indicates how the message is to be processed. In this case, P = "Production".	
14	ST		Date message generated, in YYYYMMDDHHMMSS format.	<MSH DATE>

(a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

P - Message Patient Record (Level 1)

Position in record	Data type ^(a)	Max length	Description	XML tag/Attribute
1	Char	1	Identifier that starts a Patient record (P)	
2	NM		Identifier for Patient records. Set to 1 for the first patient record in the message, and then increments by one for each subsequent record. In the current version (2.03.07) only one patient record is supported.	<PID SET>
3	ST		The sample identifier. Note that the ASTM definitions put a practice-defined identifier for the patient in this field.	<OBR SAMPLEID>
6.1	ST		The patient's surname.	<PID LASTNAME>
6.2	ST		The patient's first name.	<PID FIRSTNAME>
8	ST		The patient's date of birth in YYYYMMDD format.	<PID DOB>
9	Char		The patient's sex. Takes either M, F, or U.	<PID SEX>

(a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

O - Message Order Record (Level 2)

Position in record	Data type ^(a)	Max length	Description	XML tag/Attribute
1	Char	1	Identifier that starts an Order record (O)	
2	NM		Identifier for Order records. Set to 1 for the first order record per patient, and the increments by 1 for each subsequent order for that patient.	<ORC SET>
3	ST		Identifier for the sample or specimen.	<ORC SAMPLEID>
4.2	ST		The tray number, of the sample, as the first part of the Instrument Specimen ID.	<OBX TRAY>
4.3	ST		The position of the sample on the tray, as the second part of the Instrument Specimen ID.	<OBX POSITION>
5	ST		The Universal Test ID. Set to ALL meaning that all the associated results are following in the result records of the message.	
7	ST		The date and time the test was ordered, in YYYYMMDDHHMMSS format.	<ORC REQUESTDATE>
26	Char		Report Type. In this case, F = final results.	

(a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

R - Message Result Record (Level 2)

Position in record	Data type ^(a)	Max length	Description	XML tag/Attribute
1	Char	1	Identifier that starts a Result record (R)	
2	NM		Identifier for Result records. Set to 1 for the first result record for the patient, and increments by one for each further result for the same patient.	<OBX SET>
3.4	ST		Test Code. (Manufacturer's local code in Universal Test ID).	<OBX ID>
4	ST		Data or measurement value.	<OBX VALUE>
5	ST		Units of measurement. (ISO 2955).	<OBX UNITS>
9	Char		Field that indicates the status of the result. In this case, F = final results.	

Test results

12	ST	The instrument timestamp. This is considered to be the time the test started. <OBX INSTRUMENT_MEASUREMENT_TIME>
13	ST	Date and time that cobas IT 3000 received the test result, considered to be the time the test was completed. <OBX COMPLETEDATE>
22	Char	The confidentiality of the test result. This is set for the test, by a parameter in cobas IT 3000 : <ul style="list-style-type: none"> • C = confidential test • N = normal test <OBX CONFIDENTIAL>

- (a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

C - Message Comment Record (Level 2)

Position in record	Data type ^(a)	Max length	Description	XML tag/Attribute
1	Char	1	Identifier that starts a Comment record (C).	
2	NM		Identifier for Comment records. Set to 1 for the first comment record for the result, and increments by one for each further comment for the same result. <NTE SET>	
4	ST		Text of the comment. <NTE TEXT>	

- (a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

L - Message Terminator Record (Level 0)

Position in record	Data type ^(a)	Max length	Description
1	Char	1	Identifier that starts a Terminator record (L)
2	Char	1	This is always set to 1.
3	Char	1	The record termination code. Set to <i>N</i> = normal termination.

- (a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

Sample message This example shows the result of Mary Nesbitt's tests that **cobas IT 3000** returns to the host:

```
H|\^&|||ROCHE|||PSM|P|20090511145230|
P|1|500101999|||Nesbitt^Mary|19570404|W|
O|1|500101999|^^^^^|ALL||20090511121008|||F|
R|1|^^^102|23|U/L|||F|||20090511145204|20090511145213|
R|2|^^^103|34|U/L|||F|||20090511145207|20090511145216|
R|3|^^^106|45|umol/L|||F|||20090511145208|20090511145218|
R|4|^^^107|23,00|mmol/L|||F|||20090511121900|20090511121908|
R|5|^^^108|24|mmol/L|||F|||20090511121901|20090511121911|
R|6|^^^109|25,0|mmol/L|||F|||20090511121905|20090511121915|
L|1|N|
```

Figure C-23 Results of tests returned to host

Values not mapped by default

There are further values that **cobas IT 3000** can send to the host in test result message, but are not transferred by the default XSL templates. If you wish to use these values, you will need to edit the XSL templates to support them.

👁 For details of how the XSL templates control the data passed between **cobas IT 3000** and the host, see *Reading the ASTM or HL7 messages* on page A-10.

	Data type ^(a)	Max length	Description
-	ST	30	It is possible to use an alphanumeric alternative for the order number of sample number. In this case, the host should send the alphanumeric code identifying the order. Up to 30 characters are supported. This is suggested as a value for field O-3, component 1 "Specimen ID". <div><ORC HOST_ORDER_ID></div>
	ST		The host's code identifying the physician dealing with the patient. This value is required if the other values are used. This is suggested as a value for the Patient record, field 14, component 1 "Attending physician code ID". <div><ORC PHYSICIAN_CODE></div>
	ST		A boolean value Y or N, telling cobas IT 3000 to add the physician's details to its database, if the details are not already there. The default setting is Y. To find the physician's preexisting details, cobas IT 3000 searches for a match using the physician's host code. If the code is not supplied, cobas IT 3000 searches by name for a match. <div><ORC PHYSICIAN_CREATE></div>
	ST		The name of the physician. This is suggested as a value for Patient record, field 14, component 2 "Attending physician name". Note that currently, cobas IT 3000 does not support dividing the name into last name, first name, title, etc. <div><ORC PHYSICIAN_NAME></div>
-	ST		The dilution factor for result. <div><OBX VERDFAKT></div>
-	NM		A numeric boolean flag to say if there is a comment for the result: <ul style="list-style-type: none"> 0 = no comment 1 = result comment <div><OBX COMMENT></div>
-			A graphical display of result compared to the normal range defined for the analyte. <div><OBX GRAPH></div>

Table C-7 Values accepted by **cobas IT 3000**, but not mapped by default, in a test result message

Test results

	Data type ^(a)	Max length	Description	
-	ST		The Location that handles the message, as defined in Administration > Location > [Location Name] or Administration > Client > [Client Name] .	<OBX LOCATION>
-	ST		This is a number that distinguishes an order from other orders sent on the same day. For each order sent during the course of a day, this number increments by 1. Every day at midnight the number is reset to zero. The number cannot be set manually, but increments up to a maximum of 999999 per day.	<OBX DAYNUMBER>
-	ST		The abbreviated analyte synonym, as shown in the field in Parameter > analytes/ref. ranges > Abbr.	<OBX SYNONYM>
-	ST		The name of the analyte.	<OBX NAME>
-	NM	10	The code for the analyte used by the host system. This is the value in the field of Administration > KIS > [LISDB interface] > analyte assignment: External Analyte (Out) .	<OBX HOSTCODE>

Table C-7 Values accepted by **cobas IT 3000**, but not mapped by default, in a test result message

(a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

Quality control results

Roche Diagnostics **cobas IT 3000** sends quality control messages to the laboratory information system (LIS). These messages give the results of the tests on the quality control samples.

Message structure

An **Quality control message** contains the following segments:

Segment	Segment name	Description
H	Message header record	General information about message, including the message type
P	Patient record	Patient information such as ID, name and first name, etc. (incl. information about the visit)
O	Order record	General information about order and the requested tests
R	Result record	Test result
L	Terminator record	Ends the message

Table C-8 Structure of a QC result message

Configuring the interface with parameters

There are no parameters for configuring ASTM quality control results.

Field mappings

This list contains the ASTM fields generated by **cobas IT 3000** and provides a short description for each field.

H - Message Header Record (Level 0)

Position in record	Data type ^(a)	Max length	Description	XML tag/Attribute
1	Char	1	Identifier for Header record (H)	
2			Delimiter definition. The following standard delimiters are recommended: ^ &	
	Char	1	: Field delimiter = vertical bar [124]	
	Char	1	\: Repeat delimiter = backslash [92]	
	Char	1	^: Component delimiter = caret [94]	
	Char	1	&: Escape delimiter = ampersand [38]	
5	ST		Sending application	<MSH SENDING_APPLICATION>
10	ST		Receiving application	<MSH RECEIVING_APPLICATION>
12	Char	1	Processing ID. Set to P = Production.	
14	ST		Date message generated, in YYYYMMDDHHMMSS format.	<MSH DATE>

Quality control results

- (a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

P - Message Patient Record (Level 1)

Position in record	Data type ^(a)	Max length	Description	XML tag/Attribute
1	Char	1	Identifier that starts a Patient record (P)	
2	NM		Identifier for Patient records. Set to 1.	<PID SET>

- (a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

O - Message Order Record (Level 2)

Position in record	Data type ^(a)	Max length	Description	XML tag/Attribute
1	Char	1	Identifier that starts an Order record (O)	
2	NM		Identifier for Order records. In this case, set to 1.	
3	ST		The control ID. String identifying the control.	<ORC CONTROLID>
26	Char		Report type. In this case, F = Final results.	

- (a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

R - Message Result Record (Level 2)

Position in record	Data type ^(a)	Max length	Description	XML tag/Attribute
1	Char	1	Identifier that starts a Result record (R)	
2	NM		Identifier for Result records. Set to 1 for the first result record for the same test, and increments by one for each further result for the same test.	<OBX SET>
3.4	ST		Test Code. This is the external test code, i.e. the host's code, for the analyte, for example 102, 103, 106 etc., or K, NA, CL etc., depending values set.	<OBR ID>
3.5	ST		Test Code. This is the external test code, i.e. the host's code, for the analyte, for example 102, 103, 106 etc.	<OBX ANALYTNR>
4	ST		Data or measurement value.	<OBX VALUE>
5	ST		Units of measurement. (ISO 2955).	<OBX UNITS>
7	Char		The normalcy of the result. In this case, set to N = normal.	

12	ST	The instrument timestamp. This is considered to be the time the test started. <OBX INSTRUMENT_MEASUREMENT_TIME>
13	ST	Date and time cobas IT 5000 completed the test, in YYYYMMDDHHMMSS format. Note that in version 2.03.08 and earlier of cobas IT 3000 , this value was sent in field 12. <OBX COMPLETEDATE>
14	ST	Identifier for the instrument that performed the test. <OBR INSTRUMENT>

- (a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

L - Message Terminator Record (Level 0)

This is the last record, and identifies the end of the message.

Position in record	Data type ^(a)	Max length	Description
1	Char	1	Identifier for a Terminator record (L)
2	Char	1	A row counter. Always set to 1, as there is only ever one Terminator record.
3	ID	1	Code that gives an explanation of the reason for ending the message. This is hard-coded to N for Normal.

- (a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

Sample message This example shows the cholesterol test result on a low-normal sample that **cobas IT 3000** returns to the host:

```
H|^&~\|||P242|||GWI-LIS|Q|20080110171838<CR>
P|1|<CR>
O|1|||F<CR>
R|1|^HDL^132|1.0|mmol/L||F||200704165021|BOEHLIM 20.04.07<CR>
R|2|^LDL^133|2.60|mmol/L||F||200704165021|BOEHLIM 20.04.07<CR>
L|1|N
```

Figure C-24 Example quality control result message.

Values not mapped by default

There are further values that **cobas IT 3000** can send to the host with a quality control result, but are not transferred by the default XSL templates. If you wish to use these values, you will need to edit the XSL templates to support them.

👁 For details of how the XSL templates control the data passed between **cobas IT 3000** and the host, see *Reading the ASTM or HL7 messages* on page A-10.

Position	Data type ^(a)	Max length	Required/ optional?	Description	XML tag/Attribute
-	ST		Optional	The name of the control, for example PNU or PPU. This is a suggested value for the Order record, field 3, component 1, instead of the patient sample ID.	<ORC CONTROL_NAME>
-	NM		Optional	The lot number of the control material. This is a suggested value for the Order record, field 3, component 2, instead of the patient sample ID.	<ORC CONTROL_LOT>
-	IS		Optional	The ID number used by the host to identify the control. This is a suggested value for the Order record, field 3, component 3, instead of the patient sample ID.	<ORC CONTROL_HOST>
-	IS		Optional	An alternative ID number used by the host to identify the control. This is a suggested value for the Order record, field 3, component 3, instead of the patient sample ID.	<ORC CONTROL_HOST_ID>
-	ST		Optional	This is ID for the instrument and the module that performed the quality control test. This is suggested as a value for the Result record, field 14.	<OBX GERNAME>

(a) Data type abbreviations: ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for HL7-defined tables

Sample Event message

Roche Diagnostics **cobas IT 3000** sends this message to the laboratory information system (LIS). This informs the HIS/LIS about the location of a specimen, but without making a query for orders.

Message structure

A **Sample Event message** contains the following segments:

Segment	Segment name	Description
H	Message header record	General information about message, including the message type
[
P	Patient record	Patient information such as ID, name and first name, etc. (incl. information about the visit)
O	Order record	General information about order and the requested tests
]		
M 1 EQU	Equipment detail record	Data necessary to identify and maintain the equipment that is being used throughout the Laboratory Information System, and to notify the host or Hospital Information System of the status of the sample.
M 2 SAC	Container detail record	Data necessary to maintain the containers, such as sample tubes, that are being used throughout the Laboratory Information System.
L	Terminator record	Ends the message.

Table C-9 Structure of Sample Event message

Configuring the interface with parameters

You can configure the host interface by using the parameters in **Workplaces > Administration > Clients > [your client] > Configuration**. The default stylesheet provides the following for messages with sample event messages from **cobas IT 3000**:

Parameter	Type	Default value	Other possible values	Instruction to cobas IT 3000:
ASTM_20	Boolean	true	false	Send the Patient and Order records in the message.
SENDING_APPLICATION	String		(any)	The value to write in MSH-3, for the “sending application”. MSH-3. If set, this value overrides any value configured in cobas IT 3000 .
SENDING_FACILITY	String		(any)	The value to write in MSH-4, for the “sending facility”. If set, this value overrides any value configured in cobas IT 3000 .
RECEIVING_APPLICATION	String		(any)	The value to write in MSH-5, for the “receiving application”. If set, this value overrides any value configured in cobas IT 3000 .
RECEIVING_FACILITY	String		(any)	The value to write in MSH-6, for the “receiving facility”. If set, this value overrides any value configured in cobas IT 3000 .

Table C-10 Parameters used for incoming messages.

Sample Event message

Parameter	Type	Default value	Other possible values	Instruction to cobas IT 3000:
SEND_ONCE	String			Not used in default template
SEND_INSTRUMENTS	String	ALL		Not used in default template
SEND_LOCATION	String	ALL		Not used in default template

Table C-10 Parameters used for incoming messages.

Field mappings

This list contains the ASTM fields generated by **cobas IT 3000** and provides a short description for each field.

H - Message Header Record (Level 0)

Position in record	Data type ^(a)	Max length	Description	XML tag/Attribute
1	Char	1	Identifier for Header record (H)	
2			Delimiter definition. The following standard delimiters are recommended: \ ^ &	
	Char	1	: Field delimiter = vertical bar [124]	
	Char	1	\: Repeat delimiter = backslash [92]	
	Char	1	^: Component delimiter = caret [94]	
	Char	1	&: Escape delimiter = ampersand [38]	
5.1	ST		Sending application. It is possible to configure the value of this field in the setting: Administration > Location > [Location_Name] > Configuration > SampleSeen_Astm. If nothing is specified, cobas IT 3000 generates an automatic value.	<MSH SENDING_APPLICATION>
5.2	ST		Sending facility. It is possible to configure the value of this field in the setting: Administration > Location > [Location_Name] > Configuration > SampleSeen_Astm. If nothing is specified, cobas IT 3000 generates an automatic value.	<MSH SENDING_FACILITY>
5.3	ST		The receiving application. It is possible to configure the value of this field in the setting: Administration > Location > [Location_Name] > Configuration > SampleSeen_Astm. If nothing is specified, cobas IT 3000 generates an automatic value.	<MSH RECEIVING_APPLICATION>
5.4	ST		The receiving facility. It is possible to configure the value of this field in the setting: Administration > Location > [Location_Name] > Configuration > SampleSeen_Astm. If nothing is specified, cobas IT 3000 generates an automatic value.	<MSH RECEIVING_FACILITY>
12	Char	1	Processing ID, which indicates how the message is to be processed.	<MSH PROCESSING_ID>
14	ST		Date message generated, in YYYYMMDDHHMMSS format.	<MSH EVENT_DATE_TIME>

(a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

P - Message Patient Record (Level 1)

Position in record	Data type ^(a)	Max length	Description	XML tag/Attribute
1	Char	1	Identifier that starts a Patient record (P)	
2	NM		Identifier for Patient records. Set to 1 for the first patient record in the message, and then increments by one for each subsequent record.	<PID SET>
3	ST		Practice-defined Identifier for the patient.	<PID EXTERNAL_PATIENT_ID>
4	ST		Laboratory-defined Identifier for the patient.	<PID PATIENT_ID>
6.1	ST		The patient's surname.	<PID LAST_NAME>
6.2	ST		The patient's first name.	<PID FIRST_NAME>
8	ST		The patient's date of birth in YYYYMMDD format.	<PID DATE_OF_BIRTH>
9	Char		The patient's sex. Takes either M, F, or U.	<PID SEX>

(a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

O - Message Order Record (Level 2)

Position in record	Data type ^(a)	Max length	Description	XML tag/Attribute
1	Char	1	Identifier that starts an Order record (O)	
2	NM		Identifier for Order records. Set to 1 for the first order record per patient, and the increments by 1 for each subsequent order for that patient.	
3	ST		Identifier for the sample or specimen.	<SAC CONTAINER_IDENTIFIER>
8	ST		The date and time the specimen was collected, in YYYYMMDDHHMMSS format. This is presumed to be the same time as that specified in O-15 below.	<PID ORDER_DATE>
12	ST		The Action Code, indicating action to be taken. Set to x indicating that the specimen or test is already in process.	
15	Char		The date and time the specimen was received, in YYYYMMDDHHMMSS format.	<PID ORDER_DATE>
16	Char		Specimen Type. Descriptor of the specimen, for example SE or 01 for Serum.	<SAC SPECIMEN_SOURCE>
26	Char		Report Type. In this case, I = in instrument, pending.	

(a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

M|1|EQU - Equipment Detail Record (Level 3)

Position in record	Data type ^(a)	Max length	Description	XML tag/Attribute
1	M	1	Identifier that starts an Manufacturer-defined record (M)	
2	NM		Identifier for the Manufacturer-defined record. In the case of the Equipment Detail Record, this is set to 1, to signify the first Manufacturer-defined record.	
3	ST		Identifier for the Equipment Detail Record. Set to EQU.	
4.4	ST		The name of the instrument. In the case of an archive message, this field shows instead the user logged into cobas IT 3000 . (Optional).	<EQU EQUIPMENT_IDENTIFIER_NAME>
4.5	ST		Location, as defined in cobas IT 3000 , from which the sample came, such as the hospital or laboratory. (Optional).	<EQU EQUIPMENT_IDENTIFIER_CLIENT>
4.6	ST		The function call. Set to SAMPLEEVENT.	<EQU EQUIPMENT_IDENTIFIER_MODULE>
4.7	ST		The content of the message, identifying the event. This parameter is optional. Permitted values are: <ul style="list-style-type: none"> SEEN This identifies a Sample viewed message. DISPOSE This identifies a Sample disposed of message. LOESCH This identifies a Sample deleted message. NEU This identifies a Sample entered message. RESULT This identifies a Sample analyzed message. RETRIEVE This identifies a Sample retrieved message. SCAN This identifies a Sample scanned message. ARCHIV This identifies a Sample archived message. 	<EQU EQUIPMENT_IDENTIFIER_EVENT>
5	ST		This field is the date and time that the event (e.g., state transition, issuing of command, finishing of command execution) occurred. (Format: YYYYMMDDHHMMSS).	<EQU EVENT_DATE_TIME>

(a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

M|1|SAC - Container Detail Record (Level 3)

Position in record	Data type ^(a)	Max length	Description	XML tag/Attribute
1	M	1	Identifier that starts an Manufacturer-defined record (M)	
2	NM		Identifier for the Manufacturer-defined record. In the case of the Container Detail Record, this is set to 2, to signify the second Manufacturer-defined record.	
3	ST		Identifier for the Container Detail Record. Set to <i>SAC</i> .	
6	ST		Sample id. Identifier for the sample or specimen. For an aliquot, this contains the identifier for the aliquoted sample or specimen.	<SAC CONTAINER_IDENTIFIER>
7	ST		Parent sample id. For an aliquot, the identifier for the parent sample or specimen from which the aliquot was made. In other cases, this field is empty.	<SAC PRIMARY_CONTAINER_IDENTIFIER>
9	Char		Specimen Type. Descriptor of the specimen, for example <i>SE</i> or <i>01</i> for Serum.	<SAC SPECIMEN_SOURCE>
10	TS		This field is the date and time that the container was last registered with the Laboratory Information System, e.g., reading of a container bar code by a device. (Format: YYYYMMDDHHMMSS).	<SAC REGISTRATION_DATE_TIME>
11.1	ID		<p>This field contains a single character HL7 code that identifies the status of the unique container in which the specimen resides at the time that the transaction was initiated.</p> <ul style="list-style-type: none"> I Identified. The container has been received. P In Position. The container is in position for specimen transfer (e.g., container removal from track, pipetting, etc.). O In Process. The container is being processed by the equipment. It is useful as a response to a query about Container Status, when the specific step of the process is not relevant. R Process Completed. Processing has been completed, but the container has not been released. L Left Equipment. The container has been released from that system. M Missing. The container did not arrive at its next expected location. X Container Unavailable. The container is no longer available within the scope of the system (e.g., tube broken or discarded). U Unknown. The container has not been identified. 	<SAC CONTAINER_STATUS>
11.4	ST		The error code returned by the instrument, if applicable.	<SAC SPECIFIC_CONTAINER_STATUS>

Sample Event message

12	ST	The carrier type, for example the size of the tray e.g. 20x5. <SAC CARRIER_TYPE>
13	ST	The tray number, of the sample, as the first part of the Instrument Specimen ID. <SAC CARRIER_IDENTIFIER>
14	ST	The position of the sample on the tray, as the second part of the Instrument Specimen ID. If the tray is configured by column and row, this field shows the column. Otherwise, it shows the number that identifies the position of the sample. <SAC POSITION_IN:CARRIER>

- (a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

L - Message Terminator Record (Level 0)

This is the last record, and identifies the end of the message.

Position in record	Data type ^(a)	Max length	Description
1	Char	1	Identifier for a Terminator record (L)
2	Char	1	A row counter. Always set to 1, as there is only ever one Terminator record.
3	ID	1	Code that gives an explanation of the reason for ending the message. This value is currently not read, but is set to N for "Normal termination".

- (a) Data type abbreviations: Char=Single character; ST=Alphanumeric string; NM=number; TS=Time stamp; IS=Coded value for user-defined tables; ID=Coded value for ASTM-defined tables

Sample message This example shows an archive message that **cobas IT 3000** returns to the host:

```
H|\^&||CITSOLUTION^RD^IT3000^2.05.01|||||P|20000215094700
O|1|100000025001|||R|20080620122509|||X||20080620124700|01|||||||I
M|1|EQU|^RSD800A^80^SAMPLEEVENT^ARCHIVE|20000215094700
M|2|SAC||100000025001|100000025001|01|20000215094700|P|ARCHIVE|ARCHIVE-1|1|
L|1|N
```

Figure C-25 Sample Event, archive message.

This example shows a sample seen message that **cobas IT 3000** returns to the host:

```
H^~\&||ROCHE^ROCHE-LAB^IT3000^2.05.01|||||||
P|1|10774373|Brösel^Rainer|19871122|M|
O|1|100000103|||20090511|||X||20090511|01|||||||I|
M|1|EQU|^EMBLA^LAB1^SAMPLEEVENT^SEEN|20090518084751|
M|2|SAC||100000103||01|P^^cobas 6000|0230|1^|
L|1|N
```

Figure C-26 Sample Event, sample seen message.

Appendix

D

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Example messages

This chapter gives some example messages following the ASTM and HL-7 protocol, as used by **cobas IT 3000**.

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HL7 messages

This section gives an example of a group of HL7 messages sent between the host and **cobas IT 3000** concerning a group of samples for a test.

Order message

This is an order sent from the host to **cobas IT 3000**.

```
MSH|^~\&|HL7SND|FAC1|HL7REC|FAC2|20090716094339||ORM^O01|20090716094339984|P|2.3|||AL|AL||8859 /1
PID|1||PatientID6||Dewar^Donald||19360324|M
ORC|NW||221122|||^^^^^S||HL7
OBR|1|22334488|CL||200907101344|||A|||SER
OBR|2|22334488|NA||200907101344|||A|||SER
OBR|3|22334488|K||200907101344|||A|||SER
```

Figure D-1 Example HL7 order message

Acknowledgement message

This is an acknowledgement of the order sent from **cobas IT 3000** to the host.

```
MSH|^&~\|ROCHE|ROCHE-LAB|PSM|20090716094340|ACK^|||||||
MSA|AA|20090716094339984||||
```

Figure D-2 Example HL7 acknowledgement

Result message

This is a result message sent from **cobas IT 3000** to the host, in response to the order.

```
MSH|^&~\|ROCHE|ROCHE-LAB|PSM|PSM-LAB|20090716094424||ORU^R01|||||||
PID|1||PatientID6||Dewar^Donald||19360324|M|
PV1|1|||||||||||||||||||||||||||||||||
ORC|1|221122|||||20090716094340|
OBR|1|221122|NA^100||20090716094408|
OBX|1|NA^100^|5^Critical·range·!|mmol/L|136·- ·145^136^145|LL||F||20090716094408|^|BOEHLIM^16-
JUL-09^^|
OBR|1|221122|K^101||20090716094408|
OBX|2|K^101^|6.0^Normal·range·!|mmol/L|3.7·- ·5.4^3.7^5.4|H||F||20090716094408|^|BOEHLIM^16-
JUL-09^^|
OBR|1|221122|CL^102||20090716094412|
OBX|3|CL^102^|9.0^Repetition|g/L|94.0·- ·110.0 ^94.0^110.0|LL||F||20090716094412|^|BOEHLIM^16-
JUL-09^^|
```

Figure D-3 Example HL7 result message

Messages with timestamps and with repeated results

This section shows a sequence of HL7 messages, with low-level non-printing characters, and with timestamps. It includes an alphanumeric order ID, and a message showing the results of a repeated test.

The first message is an order request sent to **cobas IT 3000** requesting tests to be done on a sample.

```
LIS 12:48:58,187 [VT]
LIS 12:48:58,218 MSH|^~\&|AS400|FAC1|HL7REC|FAC2|20100624124858||ORM^O01|
      20100624124858093|P|2.3|||ER|ER||8859/1[CR]
LIS 12:48:58,265 PID|1||2010994||Testus^SUN2^J||196303241225|F[CR]
LIS 12:48:58,296 ORC|NW|2010994|98765MM4FM|||^^^^^R[CR]
LIS 12:48:58,328 OBR|1|2010994|^^^^K-S||199808101444|||A|||SER[CR]
LIS 12:48:58,375 OBR|2|2010994|^^^^NA-S||199808101444|||A|||SER[CR]
LIS 12:48:58,421 OBR|3|2010994|^^^^LH||199808101444|||A|||SER[CR]
LIS 12:48:58,453 [FS] [CR]
```

Figure D-4 Order request for three tests

The next message is the result of the one of the tests.

```
HOST 12:52:46,218 [VT]
HOST 12:52:46,234 MSH|^~\&|PACMAN|PACMAN-LAB|PSM|PSM-LAB|20100624125246||ORU^R01|36937
      |P|2.4|||ER|NE||8859/1|[CR]
HOST 12:52:46,250 PID|1||2010994||Testus^Sun2|||W|[CR]
HOST 12:52:46,265 PV1|1||||||||||||||||||||||||||||||||||||| [CR]
HOST 12:52:46,265 ORC|1|2010994|98765MM4FM|||20100624124858|[CR]
HOST 12:52:46,281 OBR|1|2010994|K-S^101||20100624125243|[CR]
HOST 12:52:46,281 OBX|1||K-S^101^|2^No·normal·range·predefined!|·-·^^|||F|||
      20100624125243|^|BOEHLIM^24.06.10^^|[CR]
HOST 12:52:46,312 [FS] [CR]
```

Figure D-5 First of a single test.

The next message shows a further test result sent back from **cobas IT 3000**.

```
HOST 12:52:57,343 [VT]
HOST 12:52:57,375 MSH|^~\&|PACMAN|PACMAN-LAB|PSM|PSM-LAB|20100624125257||ORU^R01|36937
      |P|2.4|||ER|NE||8859/1|[CR]
HOST 12:52:57,390 PID|1||2010994||Testus^Sun2|||W|[CR]
HOST 12:52:57,390 PV1|1||||||||||||||||||||||||||||||||||||| [CR]
HOST 12:52:57,406 ORC|1|2010994|98765MM4FM|||20100624124858|[CR]
HOST 12:52:57,421 OBR|1|2010994|NA-S^100||20100624125235|[CR]
HOST 12:52:57,437 OBX|1||NA-S^100^|133^No·normal·range·predefined!|·-·^^|||F|||
      20100624125235|^|BOEHLIM^24.06.10^^|[CR]
HOST 12:52:57,484 [FS] [CR]
```

Figure D-6 First result of a further test

The next message sends the results of a repetition of the two tests sent previously.

```

HOST 13:19:08,703 [VT]
HOST 13:19:09,000 MSH|^~\&|PACMAN|PSM-LAB|PSM|PACMAN-LAB|20100624131907||ORU^R01|36937
      |P|2.4|||ER|NE||8859/1|[CR]
HOST 13:19:09,125 PID|1||2010994||Testus^Sun2|||W|[CR]
HOST 13:19:09,156 PV1|1|||||||||||||||||||||||||||||||||||||[CR]
HOST 13:19:09,171 ORC|1|2010994|98765MM4FM|||||20100624124858|[CR]
HOST 13:19:09,187 OBR|1|2010994|NA-S^100|||20100624131832|||||||||||||||||
      |||||||||N|[CR]
HOST 13:19:09,203 OBX|1|NA-S^100^|140^Repetition|. . . ^|||F|||20100624131832|^|
      BOEHLIM^24.06.10^^|[CR]
HOST 13:19:09,234 OBR|2|2010994|K-S^101|||20100624131857|||||||||||||||||
      |||||||||N|[CR]
HOST 13:19:09,250 OBX|2|K-S^101^|4^Repetition|. . . ^|||F|||20100624131857|^|
      BOEHLIM^24.06.10^^|[CR]
HOST 13:19:09,296 [FS] [CR]

```

Figure D-7 Results of repeated tests.

ASTM messages

This section gives an example of a group of ASTM messages sent between the host and **cobas IT 3000** concerning a group of samples for a test.

Order message

This is an order sent from the host to **cobas IT 3000**.

HOST	10:41:31,937	[ENQ]
cobas	10:41:32,046	[ACK]
HOST	10:41:32,062	[STX] 1H \^& ASTM-Host PSM P 20000219111500 [CR] [ETX] AB [CR] [LF]
cobas	10:41:32,156	[ACK]
HOST	10:41:32,171	[STX] 2P 1 923608 4637463G72 Jaynes^Jane 19630101 M Diabetes 20000218102000 Urology [CR] [ETX] 06 [CR] [LF]
cobas	10:41:32,265	[ACK]
HOST	10:41:32,281	[STX] 3O 1 923608 ^ ^NA\^ ^CL\^ ^K\^ ^AMYL A O [CR] [ETX] C3 [CR] [LF]
cobas	10:41:32,375	[ACK]
HOST	10:41:32,390	[STX] 4L 1 F [CR] [ETX] FF [CR] [LF]
cobas	10:41:32,484	[ACK]
HOST	10:41:32,484	[EOT]

Figure D-8 Example order message

Result message

This is a result message sent from **cobas IT 3000** to the host, in response to the order.

cobas	10:42:24,046	[ENQ]
HOST	10:42:24,046	[ACK]
cobas	10:42:24,156	[STX] 1H \^& ROCHE PSM P 20090716104223 [CR] [ETX] E6 [CR] [LF]
HOST	10:42:24,156	[ACK]
cobas	10:42:24,265	[STX] 2P 1 923608 Jaynes^Jane 19630101 M [CR] [ETX] 83 [CR] [LF]
HOST	10:42:24,265	[ACK]
cobas	10:42:24,375	[STX] 3O 1 923608 ^ ^ ^ ^ALL 20090716104132 F [CR] [ETX] 50 [CR] [LF]
HOST	10:42:24,375	[ACK]
cobas	10:42:24,484	[STX] 4R 1 ^ ^NA 133 mmol/L F 20090716104148 [CR] [ETX] 94 [CR] [LF]
HOST	10:42:24,484	[ACK]
cobas	10:42:24,593	[STX] 5R 2 ^ ^ ^K 4.0 mmol/L F 20090716104204 [CR] [ETX] 46 [CR] [LF]
HOST	10:42:24,593	[ACK]
cobas	10:42:24,703	[STX] 6R 3 ^ ^ ^CL 96.0 g/L F 20090716104210 [CR] [ETX] 76 [CR] [LF]
HOST	10:42:24,703	[ACK]
cobas	10:42:24,812	[STX] 7R 4 ^ ^ ^AMYL 5.0 U/L F 20090716104215 [CR] [ETX] D5 [CR] [LF]
HOST	10:42:24,812	[ACK]
cobas	10:42:24,921	[STX] 0L 1 N [CR] [ETX] 7F [CR] [LF]
HOST	10:42:24,921	[ACK]
cobas	10:42:25,031	[EOT]

Figure D-9 Example result message