Roche

PSM Process Systems Manager

Host Interface Manual
V2.01.00

includes
Roche Diagnostics ASTM 2.0

Prepared by: Luis Suárez
Approved by: Dr. Uwe Anders   04.11.2005

DISCLAIMER

COPYRIGHT

VERSION HISTORY

Version	Date	Modifications
1.0	September 1999	
1.5	May 2000	
1.7	October 2000	Modifications to comply with Roche Diagnostics ASTM+ 2.0
1.7B	November 2000	Additional support of HL7 V2.4
1.7C	May 2001	Adapted to development state of PSM V1.7C
1.8	October 2001	ASTM 10.1.3, HL7; ASTM 11.1.3; Chap. 4.3.2.3, 4.3.11.9;
1.09.01	July 2002	Chap. , 4.3.2.1-3, 4.3.4.2, 4.3.11.9, 6.3.6, 6.3.9, 6.3.10, 6.4.1.3, 6.4.2.1-3, 6.5.1.3, 6.5.2.1-3 ASTM 9.4.16, ASTM 10.1.9, HL7 000249, HL7 00579, 6.4.3.1, 6.5.4.1
1.09.01 Patch 01	September 2002	Chap. 6.3.9 Actions, 6.4.1.4 – 6.4.1.6, 6.5.1.4 – 6.5.1.6
2.00.00	October 2002	Chap 4.2.4 ASTM 8.1.10 and 8.1.26, Chap. 4.2.5 ATSM 9.4.14, Chap. 6.3.6 Hl7 00125, Chap. 6.3.7., Chap. 6.3.8
2.01.00	November 2005	Change of product name from "Preanalytical Systems Manager" to "Process Systems Manager". Adaptation to new supported fields of PSM 2.01.00

Roche Diagnostics, Information Technology
Omega Development

0. Contents

1. Preface

This documents describes the Online connection (through some different protocols) of the Roche Diagnostics Process Systems Manager (PSM) to the host.

PSM is a Process Systems Manager that is especially designed to do sample flow control. One single standard Host connection is needed to connect Preanalytic and analytical instruments. In this way, PSM is provides data buffering, sample distribution and archiving tools.

The next chapters are going to describe how the communication between PSM and the Host takes place through different protocols: ASTM, HL7, etc. and through different physicals interfaces: TCP/IP and RS-232 Serial Link.

PSM offers various modes of communication with the HOST. In the following we will explain which communication protocols and modes are required for each type of connection model.

The preferred host protocols supported are Roche Diagnostics ASTM 2.0 and HL7v2.4. All other host protocols implemented in PSM do not offer the full range of possibilities.

1.1.   PSM with instruments connected

Whenever instruments (.i.e. pre-analytical devices and / or analyzers) are connected to PSM the unsolicited batch-download by the Host (ref. Chapter 4.3.1) or 'Query All' by PSM (ref. Chapter 4.3.10) of orders are the possible modes of operation. In this case the unsolicited batch-download of orders by the Host is the preferred mode of operation. The protocols used are either ASTM (refer to Chapter 4) or HL7 (refer to Chapter 6) other protocols or modes of operations are not supported by PSM when instruments are connected to PSM (refer to the table on page 1-4).
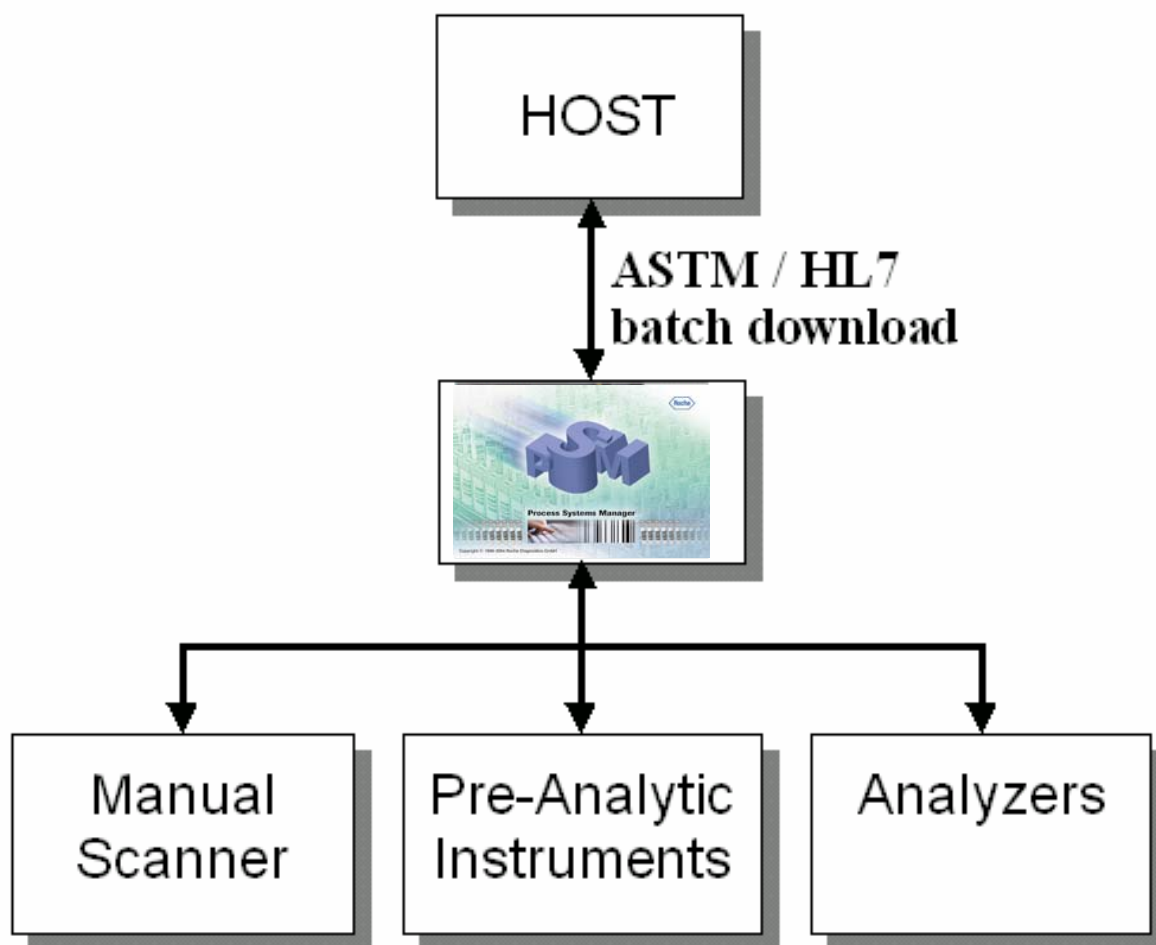
1.2.   PSM without instruments connected

When NO instruments are connected neither pre-analytical devices nor analyzers, all of PSM's communication protocols and connection modes may be used. However, it must be pointed out that the use of the PSD-protocol does not allow the connection of any instruments to PSM due to the mode of operation of PSM ('Manual Scan') and the limitations of the employed PSD-protocol itself.

As in the case of instruments connected to PSM, the preferred communication protocols of PSM are ASTM and HL7 when no instruments are connected to PSM. The host can download all orders unsolicited (preferred mode, ref. Chapter 4.3.1) or PSM can send a 'Query All' message to query for orders (ref. Chapter 4.3.10).

In addition to these general communication protocols and modes, PSM offers the possibility to do a specific query to the host by the sample ID scanned on PSM's 'Manual Scan Place'. It must be pointed out that using this "Single Query mode" it is required to scan the sample tubes **manually** on PSM's 'Manual Scan Place'.
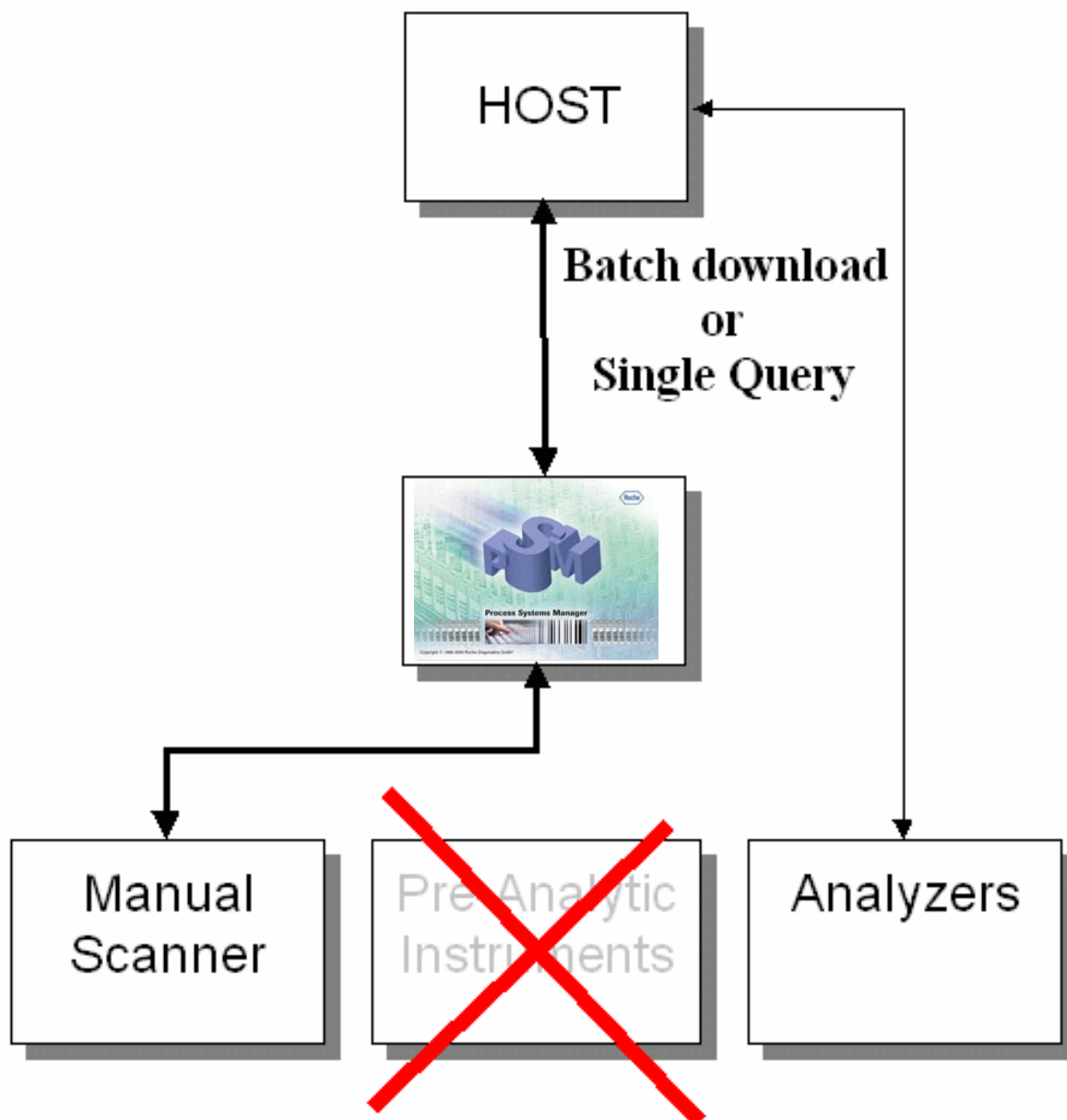
The following table gives an overview of the modes of work supported by the communication protocols of PSM:

Protocol	Mode of operation	Instruments Connected	Manual Scan Place
ASTM	Batch download Query ALL[1]	Yes	Yes
HL7	Batch download Query ALL[1]	Yes	Yes
ASTM-SF[2]	Single Query	**NO**	Required
PSD-protocol[3]	Single Query	**NO**	Required

1) The batch download is the preferred mode.
2) Refer to Chapter 4.1.2.2 ASTM-SF Low Level Transfer Phase.
3) Refer to Chapter 5 PSD protocol definition.

The 'Single Query Mode' can only be used when samples are distributed via the 'Manual Scan' place of PSM. In this mode all sample tubes <u>have to be</u> scanned **manually** within PSM.

The 'PSD protocol' can only be used when samples are distributed via the 'Manual Scan' place of PSM. In this mode all sample tubes <u>have to be</u> scanned **manually** within PSM.

It is NOT POSSIBLE to connect ANY analyzer to PSM when the PSD protocol is used due to the limitations of the protocol itself.

2. Description of the interface

2.1   Configuration

There are three possible groups of options for the Host configuration: the <u>connection method</u> is related to the physical connection that joins the Host and PSM, the <u>protocol</u> refers to how this information is structured and the complete description of its fields, and the <u>uploading options</u> can set up some different possibilities referring to when this information has to be sent to the Host.

2.1.1.   Connection method

There are two basic physical ways of connecting two computers: via serial and via network. Each method has different characteristics to configure and a different way to implement dialogue and acknowledgement between the two systems. Of course, the physical layer is different but the protocol is exactly the same in the network or serial method.

There are two cases for network method, through sockets and through batch files. We strongly recommend the sockets implementation because is fully on-line and it is perfectly clear what to do in case of error in any of two systems. So, for the network method through sockets or the serial method, the protocol specifies completely when and how a system has to send or receive an information from the other and how to acknowledge this information. For the network method through batch files the dialogue is a bit more complex: one system sends a file to the other and executes a remote command in this system. The remote execution returns a result that can be an acknowledgement or an error message to the first system.

In the screen configuration we will have to provide the following characteristics:

- Serial

    Speed
    Data byte size
    Parity
    Flow Control

- Network

    Transfer Type: Sockets or Files

    - Sockets
    Socket number

    - Files
    Host Internet address
    Incoming files path
    Output files path
    Updating Host entry point
    Remote user
    Remote user password

2.1.2.   Protocol

We are going to consider two basic protocols: ASTM and HL7. The basic characteristics of both protocols are described below.

* ASTM

ASTM is the most extended protocol for exchanging data between laboratory systems. We have developed a complete specification for ASTM regarding all fields that can be involved in laboratory processes. The implementation is based on ASTM E1394-91 specifications. Chapter 4.2 contains the structure of ASTM data including all possible fields. Some of these fields are not going to be used for PSM but can be used for further purposes. For serial purposes, we follow Low level ASTM E1381-91 specification. Depending on PSM configuration, we can find a different implementation of ASTM, what we call ASTM Single Frame or ASTM-SF. This implementation is based on Roche ASTM+ and is faster than "normal" ASTM and is compliant with the ASTM low level specification E1381-91.

* HL7

HL7 is a high level protocol which is becoming a standard for all health information exchange. We are going to implement version 2.3 which is the current version. The low level specification is not included in the official specification but there is a suggested document which we are going to follow.

2.1.3.   Uploading Options

We have to consider different options in which PSM is going to send data to the Host. Apart from manual sending and resending, which is going to be included as an option in the connections tab in WORKARE screen, PSM can send results to Host in different moments, depending on what the user wants. The options can be:

- Send a particular result automatically as soon as we have the value.
- Send a result automatically when all tests of a sample are finished
- Send a result automatically when a analyzer has finished a specific work.
- Never send automatically. The user will send manually results whenever he wants or the Host will ask for them.

2.1.4.   Operation Mode (Enable/Disable Single Query Mode)

There is one important configuration option in PSM operation mode: if we activate Single Query Mode for PSM, PSM is going to ask for each individual sample in the **manual** distribution process. Otherwise PSM is going to behave in 'normal' mode i.e. 'batch' mode.

When we select the *Single Query Mode* option, we have to define different options: a Read Interval, which can increase priority for reading from the Host, a Timeout which tells you the maximum time to wait in 'Manual Scan Place' in case of no response from Host and the protocol for this query. This can be:

ASTM: which means normal ASTM, as described in chapter 4.2.
ASTM-SF: ASTM Single Frame based in ASTM+ specification. Its only difference with ASTM standard protocol is located in the Low Level Protocol and is described in chapter 4.1.2.2 ASTM-SF Low Level Transfer Phase Low Level Transfer Phase.
PSD: Based in PSD-1 protocol, as described in chapter 5.

The 'Single Query Mode' can only be used when samples are distributed via the 'Manual Scan' place of PSM. In this mode all sample tubes <u>have to be</u> scanned **manually** within PSM.

The 'PSD protocol' can only be used when samples are distributed via the 'Manual Scan' place of PSM. In this mode all sample tubes <u>have to be</u> scanned **manually** within PSM.
    It is NOT POSSIBLE to connect ANY analyzer to PSM when the PSD protocol is used due to the limitations of the protocol itself.

3. Basic Operation

3.1. General

There are two different communication processes in PSM: the processes originated by the Host which are going to give some orders or send some data to PSM and the processes of returning data to the Host originated by PSM.

In the serial method, when PSM is not sending anything, it will remain in an idle status, so the Host will be able to initiate a process communication like sending requests or querying for some specific sample. In the network connection, the Host musts send a message to PSM (a remote command which will be provided in specifications). This message may or may not be sent with a data file. For example, in the case of sending requests, the Host musts send a file containing requests and, afterwards, send a message to PSM requesting it to process this file. Nevertheless, in the case of querying about a sample, the Host will send only a message to PSM asking some information. PSM will answer these messages with a result code which will inform the Host of the successful completion of the command and, in some cases, will send to the Host a file containing the requested information.

3.2. Basic Actions

As we discussed in the chapter 2.1.4 Operation Mode, PSM can switch between two operation modes: Normal (Batch) Mode or Query Mode. We are going to describe the different workflows for both situations.

3.2.1. Normal (Batch) Mode

The normal workflow for PSM is: the Host has to send the requests to PSM to be analyzed in batch mode. Afterwards, depending on the uploading option chosen by the user, PSM will send results to the Host and/or the controls. In addition, the Host can query at any moment for the status or for the results of an specific sample.

There are seven different communication processes which can take place in this mode of operation of PSM.

- Download of requests (from Host to PSM)
- Upload of results (from PSM to Host)
- Upload of controls (from PSM to Host)
- Upload of working lists (from PSM to Host-not available in version 1.0-)
- Query about situation (initiated by Host and answered by PSM)
- Upload of message 'Sample Seen' from PSM to Host
- Query about samples (initiated by PSM requesting orders to the Host)

3.2.2. Single Query Mode

If PSM is configured in Single Query Mode, the workflow is quite different than the Normal Mode. PSM queries for each individual sample to the Host, and the Host answers with all the tests programmed for this sample. Normally in this configuration PSM does not send back results to the Host since is behaving mainly as a distributor. Nevertheless, PSM can send results to the Host in this configuration as well but not automatically because the Query process needs the highest priority to shorten the response time. The sending of results when PSM is in *Single Query Mode* is only supported by the ASTM and ASTM-SF protocols but not by the PSD protocol.

The basic action in this mode is:

- Query about single request (from PSM to Host, only in Single Request Mode)

The 'Single Query Mode' can only be used when samples are distributed via the 'Manual Scan' place of PSM. In this mode all sample tubes have to be scanned **manually** within PSM.

The 'PSD protocol' can only be used when samples are distributed via the 'Manual Scan' place of PSM. In this mode all sample tubes have to be scanned **manually** within PSM.
   It is NOT POSSIBLE to connect ANY analyzer to PSM when the PSD protocol is used due to the limitations of the protocol itself.

4. ASTM protocol definition

This standard covers the two-way digital transmission of remote requests and results between clinical instruments and computer systems. It is intended to document the common conventions required for the interchange of clinical results and patient data between clinical instruments and computer systems. This standard specifies the message content for transferring information between a clinical instrument and a computer system.

Since both serial and network link are supported in this interface, we have to distinguish between the low level ASTM protocol (as specified in ASTM E1381-91), related to serial link, and the high level ASTM protocol (as specified in ASTM E1394-91) which only describes the fields and not the flow control information. In general, the low level part of the protocol describes how to add some control information to real data, described by the high level part of the protocol, in order to conform the final serial packet of information. Therefore, we are going to describe briefly the complete structure of the serial packet and, afterwards, it will be enough to explain the high level packet information.

The old fashioned ASTM 1238-88 protocol must not be used for new PSM installations. It is only intended for backwards compatibility. The description of this implementation is not part of this host interface manual.

4.1.   Low level protocol

4.1.1.   Establishment Phase (Link Connection)

The establishment phase determines the direction of information flow and prepares the receiver to accept information.
The sender notifies the receiver that information is available. The receiver responds that it is prepared to receive before information is transmitted.

The Preanalytic System Manager can act as a sender or as a receiver. The system with information available initiates the establishment phase. After the sender determines the data link is in a neutral state, it transmits the <ENQ> transmission control character to the intended receiver.

Upon receiving the <ENQ>, the receiver prepares to receive information. All other characters are ignored. It replies with the <ACK> transmission control character signifying it is ready. With this sequence of events, the establishment phase ends and the transfer phase begins.

A receiver that cannot immediately receive information, replies with the <NAK> transmission control character. Upon receiving <NAK>, the sender must wait at least 10 s before transmitting another <ENQ>.

4.1.2.   Transfer Phase
4.1.2.1.   ASTM standard Low Level Transfer Phase

During the transfer phase, the sender transmits messages to the receiver. The transfer phase continues until all messages are sent. Messages are sent in frames, each frame contains a maximum of 247 characters (including frame overhead). Messages longer than 240 characters are divided between two or more frames. Multiple messages are never combined in a single frame. Every message must begin in a new frame. Although standard ASTM transmission is limited to 240 characters frames, frames sent to PSM could contain up to a maximum of 6900 characters (including frame overhead). This may be useful in the case the host does not support ASTM frame partition. But, anyway, it is recommended that messages are divided into smaller frames, upon ASTM specifications.

A frame is one of two types, an intermediate frame or an end frame. Intermediate frames terminate with the characters <ETB>, checksum, <CR> and <LF>. End frames terminate with the characters <ETX>, checksum, <CR> and <LF>. A message containing 240 characters or less is sent in a single end frame. Longer messages are sent in intermediate frames with the last part of the message sent in an end frame. The frame structure is illustrated as follows:

<STX> FN text <ETB> C1 C2 <CR> <LF> intermediate frame
<STX> FN text <ETX> C1 C2 <CR> <LF> end frame

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 checksum 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 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.

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. The checksum is initialized to zero with the <STX> character. The first character used in computing the checksum is the frame number. Each character in the message text is added to the checksum (modulo 256). The computation for the checksum does not include <STX>, the checksum characters, or the trailing <CR> and <LF>.

The checksum is an integer represented by eight bits, it can be considered as two groups of four bits. The groups of four bits are converted to the ASCII characters of the hexadecimal representation. The two ASCII characters are transmitted as the checksum, with the most significant character first.

4.1.2.2.   ASTM-SF Low Level Transfer Phase

In ASTM-SF, frames follow exactly the same structure as described above with only one difference, standard ASTM messages are grouped into longer frames to increase speed. These standard ASTM frames are separated through a <CR> character. Therefore, to obtain pure ASTM frames, the receiver must concatenate all the frames and wait for a <EOT> character. Then, finally, he can process the frame and split it into different standard ASTM frames using the <CR> as separator. There is an example of ASTM-SF protocol in the examples section (ref. chapter 4.4.1.2).

4.2.   High level protocol

4.2.1.   General considerations

The high level ASTM protocol defines different record types and a list of fields for each of them. The fields are separated by delimiters. The five ASCII characters that immediately follow the Message Header Record define the delimiters to be used throughout the subsequent records of the message. For PSM we are going to use the default delimiters:

Field delimiter: |
Repeat delimiter: \
Component delimiter: ^
Escape character: &

Within text data fields, only the ASCII characters 32-126 and the undefined characters 128-254 are permitted as usable characters (excluding those who are used as delimiter characters (|, \, & and ^). The sender is responsible for screening all text data fields to ensure that the text does not contain those delimiters. Unless otherwise stated, contents of data fields shall be case sensitive.

This specification assumes that all fields are variable in length. No storage is allocated (except for the delimiter) for a null field. This specification does not define a maximum length for any field or record and relies upon the receiver's buffering capabilities, and the logical layer's transport facilities, to parse information into workable lengths for transmission and processing purposes.

Data shall be exchanged in records of different types. Each record is introduced by field (number one) identifying the record type, and terminated by a carriage return. The following record types are defined.

Message Header Record .... H
Patient Identifying Record .... P
Test Order Record .... O
Result Record .... R
Comment Record C
Request Information Record .... Q
Message Terminator Record L

4.2.2.   Data Records and Fields

Used Notification:

"Data Type" Column

Char	Single character. Content specified by "Received from Host" or "Transmitted to Host" field.
Text	String. PSM supports variable length (according to ASTM 6.2). Instrument specific truncation.
Pos_int	Positive integer (0 to 65535).
D_t	Date and time. Format specified by ASTM 6.6.2.
Date	Date as specified by ASTM 6.6.2
Num	Measurement. Format specified by ASTM 6.6.4 $\rightarrow$ floating point number, number of characters before and after the period variable, sign optional, no exponential representation.

"Received from Host" / "Transmitted to Host" Column

R	Required / mandatory key information (unique processing key required to identify the information). In transmission from PSM to Host, this indicates information that is sent unconditionally.
C	Conditional information, that is, information which is required in certain circumstances
O	Optional information, processed on the Host if applicable, transmitted if available on PSM.
—	Not processed / not required

4.2.3. H - MESSAGE HEADER RECORD (Level 0)

ASTM field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
7.1.1	Record type ID (H)	Char	1	R	R		Identifier for Header record (H)
7.1.2	Delimiter Definition: Field Repeat Component Escape	 Char Char Char Char	 1 1 1 1	 R R R R	 R R R R		PSM accepts any valid delimiter (specified by ASTM 6.4) in the header record. PSM uses the following delimiters: | : Field delimiter = vertical bar [124] \ : Repeat delimiter = backslash [92] ^ : Component delimiter = caret [94] & : Escape delimiter = ampersand [38] (Though Escape delimiters are accepted, the contents is ignored. Roche instruments do not transmit Escape sequences.)
7.1.3	Message control	Text	15	O	O		This is a unique number or other ID that uniquely identifies the transmission for use in network
7.1.4	Password	Text	10	O	O		
7.1.5	Sender ID	Text	10	R	R		Name^Manufacturer^Type^Software Version (for example `PSM^Roche·Diagnostics^PSM^1.7`)
7.1.6	Sender Street Addr.			---	—		Not supported
7.1.7	Reserved Field			---	—		Not supported
7.1.8	Sender Tel. Number			---	—		Not supported
7.1.9	Characteristics of Sender			---	—		Not supported
7.1.10	Receiver ID	Text	10	O	O		O - OK, W - warning, E - error
7.1.11	Comment or Special Instructions			---	C		Events (e.g. SSU^U03) in case of HL7v2.4 based messages sent by Roche Diagnostics ASTM 2.0.
7.1.12	Processing ID	Text	1	O	O		indicates how this message is to be processed: P – Production: (Default value) Treat message as an active message to be completed according to standard processing. Q – Quality Control: Message is initiated for the purpose of transmitting quality control/quality assurance or regulatory data
7.1.13	Version No.			---	---		Not supported
7.1.14	Date and Time	d_t	14	R	R		Date and time together shall be specified as up to a fourteen-character string: YYYYMMDDHHMMSS.

4.2.4.   P - PATIENT RECORD (Level 1)

ASTM field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
8.1.1	Record type ID (P)	Char	1	R	R		Identifier for Patient record (P)
8.1.2	Sequence number	Pos_int	4	R	R		This is a required field used in record types that may occur multiple times within a single message. The number used defines the i'th occurrence of the associated record type at a particular hierarchical level and is reset to one whenever a record of a greater hierarchical significance (lower number) is transmitted or if the same record is used at a different hierarchical level (for example, comment records).
8.1.3	Practice Patient ID (Sample ID)	Text	12	O	R		The content can be configured in Parameters/Host/ASTM to be: - Empty, - Sample ID, or - Patient ID
8.1.4	Lab. Patient ID (History number)	Text	15	O	O		The content can be configured in Parameters/Host/ASTM to be: - Empty, - Sample ID, or - Patient ID
8.1.5	Patient ID No. 3		25	O	O		This field shall be optionally used for additional defined identifiers. It is stored by PSM in Additional Patient field 2 and sent back to the Host. This field depend on the PSM "Mantenance/Host/Configratioj/Demographics "
8.1.6	Patient Name	Text	63				When used, this field has the following components: The format depends on the PSM Parameter/Host/General: "*Standard patient format (Name^First name)*"
	either Last Name ^First Name			 O O	 O O		parameter **activated**: Last Name First Name
	or Last Name 1 ^Last Name 2 ^First Name			 O O O	 O O O		parameter **deactivated**: Last Name 1 Last Name 2 First Name The Information is necessary to allow querying by name within PSM.
8.1.7	Mother's Maiden Name			---	—		Not supported

ASTM field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
8.1.8	Birthdate	Date	**8**	**O**	**O**		This date shall be represented as YYYYMMDD. It can be sent to PSM in addition to Patient name and sex to identify uniquely a patient.
8.1.9	Patient Sex	Char	**1**	**O**	**O**		This field shall be represented by M (man), F (female), or U (unknown). It can be sent to PSM in addition to Patient name and birthdate to identify uniquely a patient.
8.1.10	Patient Race-Ethnic Origin			**O**	**---**		W – White, B – Black, O – asian/pacific islander, NA – native american/alaskan native, H - hispanic
8.1.11	Patient Address		25	O	**O**		When used, this field has the following components: Street address (max. length 25) City (max length 25) State (max length 25) … They are stored by PSM in Additional Patient field 3 (street), Additional Patient field 4 (City) and Additional Patient field 5 (State) . They sent back to the Host. The field depends on the PSM "Mantenance/Host/Configratioj/Demographics "
8.1.12	Reserved Field		25	O	**O**		This field is reserved. It is stored by PSM in Additional Patient field 1 and sent back to the Host. This field depend on the PSM "Mantenance/Host/Configratioj/Demographics "
8.1.13	Patient Telephone Number			**---**	**---**		Not supported
8.1.14	Attending Physician ID			O	O		It is stored by PSM in Additional Sample field 1 and sent back to the Host. This field depend on the PSM "Mantenance/Host/Configratioj/Demographics "
8.1.15	Special Field 1			O	—		
8.1.16	Special Field 2			O	—		Host Codes to upload the results in the format: HCode1^HCode2^…
8.1.17	Patient Height			---	—		Not supported
8.1.18	Patient Weight			---	—		Not supported
8.1.19	Diagnose	Text	**32**	**O**	**O**		Patient's known or suspected diagnose. It is stored by PSM and sent back to the Host.
8.1.20	Patient Active Medications			---	—		Not supported
8.1.21	Patient's Diet			---	—		Not supported

ASTM field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
8.1.22	Pratice Field No. 1			O	O		It is stored by PSM in Additional Sample field 4 and sent back to the Host. This field depend on the PSM "Mantenance/Host/Configratioj/Demographics "
8.1.23	Practice Field No. 2			O	O		It is stored by PSM in Additional Sample field 3 and sent back to the Host. This field depend on the PSM "Mantenance/Host/Configratioj/Demographics "
8.1.24	Registered Date and Time	D_t	**14**	**O**	**R**		Used to identify the sample uniquely together with the sample ID[1]. The format is YYYYMMDDHHMMSS. According to same criteria of Sample ID, this field can be filled here in the patient record if possible. If not, can be left empty and use the Requested/Ordered Date and Time field of the order record.
8.1.25	Admission Status			O	**O**		Admission Status It is stored by PSM in Additional Sample field 5 and sent back to the Host. This field depend on the PSM "Mantenance/Host/Configratioj/Demographics "
8.1.26	Location			**O**	**O**		Requester or Ward
8.1.27	Nature of Alternative Diagnostic Code and Classifiers			---	—		Not supported
8.1.28	Alternative Diagnostic Code and Classification			---	—		Not supported
8.1.29	Patient Religion			---	—		Not supported
8.1.30	Marital Status			---	—		Not supported
8.1.31	Isolation Status			---	—		Not supported
8.1.32	Language			---	—		Not supported
8.1.33	Area	Text	**32**	**O**	**O**		Hospital service. It is stored by PSM and sent back to the Host.
8.1.34	Hospital Institution	Text		O	**O**		Hospital Institution It is stored by PSM in Additional Sample field 2 and sent back to the Host. This field depend on the PSM "Mantenance/Host/Configratioj/Demographics "
8.1.35	Dosage Category			---	—		Dosage Category

---

[1] If the Sample ID is provided the Registered Date/Time has to be provided as well! Alternatively, Requested Date&Time can be given in TEST ORDER RECORD instead. In PSM it is possible that two or more orders with identical Sample ID can be registered at a time if only one is active. There the Date/Time of an order is an index in the Database.

4.2.5.   O - TEST ORDER RECORD (Level 2)

ASTM field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
9.4.1	Record type ID (O)	Char[1]	1	R	R		Identifier for Patient record (O)
9.4.2	Sequence number	Pos_int	4	R	R		Ordering number (see description in Patient record).
9.4.3	Sample ID	Text	12	R	R		Sample identification for the case of Upload of results (from PSM to Host) and for Download of requests (from Host to PSM). For Upload of controls this field will be the Control Code instead of sample ID.
9.4.4	Position: Order ID/ Sequence #			---	---		Not used in Roche Diagnostics ASTM 2.0
	^Rack ID/ Carrier ID	Pos_int	7	---	O		Not supported
	^Position on Rack/Carrier	Pos_int	5	---	O		Rotor or Rack number
	^Format	Pos_int	10	---	O		Position within the rack Number of rows and columns
9.4.5	Universal Test ID:					YES	PSM is sending "ALL" when uploading test results.
	^^^Test ID	Text	10	R	R		Test code
	^Treatment Type (and value)	Text	15	O	---		Dilution for analyser automatic dilution With analyser fixing: e.g. 284.1.50 With analyser group fixing: e.g. 284..50 Without analyser fixing: e.g. ..50
	^Pre-Treatment Type (and value)			O	---		Rerun flag (see detailed description below)
	^Result Evaluation Type (and value)			---	---		Not supported
	^IID	Text	30	O	O		Instrument ID (see description below) When a valid IID is sent from the host along with a test code, the test is forced to be done on the specified instrument (ref. to example 4.3.1.5). The IID is not transmitted to host in Roche Diagnostics ASTM 2.0, the same information is transmitted in field 10.1.14)

ASTM field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments

9.4.6	Priority	Char[1]	**1**	**O**	**O**		Priority codes:
							  R routine (default)
							   S STAT

9.4.7	Requested Date and Time	D_t	14	**O**	**O**		Not required if parameter "*Requested/ Ordered Date&Ttime not transmitted by Host?*" is **activated** in PSM. Otherwise used to identify the sample uniquely together with the sample ID. The format is YYYYMMDDHHMMSS. If the field *Registered Date and Time* of Patient Record was present this field can be left empty. If not, this filed must be filled in order to identify the sample. If neither this field nor the *Registered Date and Time* field of Patient Record is filled, an error will be generated[2].
9.4.8	Specimen Collection Date & Time			**O**	**O**		....
9.4.9	Collection End Time			---	---		Not supported
9.4.10	Collection Volume			---	---		Not supported
9.4.11	Collector ID			---	—		Not supported
9.4.12	Action Code	Char[1]	**1**	**R**	**R**		This field shall indicate the action to be taken with respect to the specimens that accompany or precede this request. Codes are detailed below.
9.4.13	Danger Code			---	---		Not supported
9.4.14	Relevant Clinical Information Expected date of birth ^Menstruation Cycle			 **O** **O**	 — —		 Expected Date of Birth (Gestational age (in days) = 280 - (EDOB - Collection Date)) OVU Menstruation Cycle / Post-Menopause (PRE, FOL, OVU, LUT, POST)
9.4.15	Date/Time Specimen Received	D_t		---	**O**		This field contains the date and time each instrument was presented with the sample. If the option 'Send message Sample Seen to Host' is activated, PSM will send this field to the Host when the sample is seen. The contents of this field will be ignored if sent from the Host.

---

[2] Requested Date&Time has be given in TEST ORDER RECORD if the Sample ID and Registered Date/Time is not provided in the PATIENT RECORD! In PSM it is possible that two or more orders with identical Sample ID can be registered at a time if only one is active. There the Date/Time of an order is an index in the Database.

ASTM field	Field Name	Data Type	Max. Length	From Host	To Host	Repe at	Comments
9.4.16	*Specimen Descriptor:*						Specimen Descriptor
	Specimen Type	**Text**	*8*	**O**	**R**		Specimen type, e.g. serum, urine, ... The type has to be given as the PSM specimen code: 1, 2, ... This code must be valid for the tests ordered, otherwise PSM will not accept the tests not valid for this specimen! ***(Not a recommended parameter.)*** The PSM specimens can be mapped to the hosts specimens descriptions. The global ^LUMOSH should be set like Serum ^LUMOSH(1)="SER" Urine ^LUMOSH(2)="UR" CSF ^LUMOSH(3)="CSF" Supernatant: ^LUMOSH(4)="SUPER" Other: ^LUMOSH(5)="ORH" for the most common specimen types. The index of ^LUMOSH is the "Specimen code" defined in PSM. If ^LUMOSH(n) is not defined for "n", the number "n" is transmitted to the host. **NOTE: In case test results for more than one specimen types are uploaded for one sample ID, only the first type (by number) is sent in these field.**
	^Specimen Source			**---**	**---**		Specimen Source
9.4.17	Ordering Physician			---	—		Not supported
9.4.18	Physician 's Telephone Number			---	—		Not supported
9.4.19	User login signature			---	**O**		PSM will send the user login signature if it is configured to do that.
9.4.20	Users Field No. 2			---	—		Not supported
9.4.21	Specimen Quality (Lab. Field No. 1)	Char[1]	1	O	**O**		Quality Code of the specimen (nothing for normal, I for Icteric, L for Lipemic, etc.) It the Host knows this information, it can be sent from Host to PSM. PSM can change this value and send it back if not normal.
9.4.22	Rerun Flag (Lab. Field No. 2)	Char[1]	**1**	**O**	**---**		If used in combination with Action Code "A" and Report Type "C" means Rerun. The Host can order a rerun using this flag or, alternatively, the Pre-Treatment Type test flag.
9.4.23	Date/Time Results Reported or Last Modified			---	—		Not supported
9.4.24	Instrument Charge to Computer System			---	—		Not supported

ASTM field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
9.4.25	Instrument Code	Text	**8**	**O**	**O**		It can be sent from the Host to PSM. It identifies an analyzer with the format: nnnn.nn (Analyzer code. Analyzer number). These numbers have to be defined in PSM.
9.4.26	Report Type	Char[1]		**R**	**R**		See detailed description below.

ASTM field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments

*Position (Field **9.4.4**):* Identifies the position of the sample within the analyzer. It is sent from PSM to the Host as a response from a query about situation (not used in Roche Diagnostics ASTM 2.0). It has not to be sent by the Host. The format is:

Component	Comments	Format
{Sequence No.}	- Not used -	
^{Rotor/RackID}	Rotor or Rack Number	Integer [7]
^{Absolute (linear) Position in the Carrier}	Position within the rack	Integer [5]
^(format)	Number of rows and columns	^Row_number.Col_number[3]

*Test ID (Field **9.4.5**):* Test Code. In the case of upload of results from PSM to the Host, PSM is going to send always the string 'ALL'. The components for this field, in other cases, are:

Component	Comments	Format
Universal Test ID Name	- Not used -	
^Universal Test ID Name	- Not used -	
^Universal Test ID Type	- Not used -	
^Test Code	Code of the test for the Host	Alphanumeric [10]
^A. Dil. Factor	- not used -	
^PreD. Factor	If used in combination with Action Code "A" and Report Type "C" means Rerun.	
^Endog Cont	- not used -	
^IID	Instrument ID (see table below for detailed explanation of this field)	Alphanumeric [30]

PSM is going to ignore AutoDilFactor, PreDilFactor and Endogen Code. Instrument ID is an optional flag: it can be sent from the Host to PSM. If the Host sends this field PSM will select this analyzer as the correspondent target for the test. In the case of worklists uploading, PSM will not send this field in this position but in ASTM 9.4.25 (Instrument Section ID) in order to optimize performance.

Instrument Identification (IID)
In the case of response to a tracking query this IID identifies a PSM target where the sample is located and it is answered from PSM to the Host. Typically it corresponds to an analyzer, but can be Archive or Manual Scanplace also. These numbers have to be defined in PSM. In this case, this IID can have 4 different parts separated by a '.' separator. The complete format for this IID component field is:

Component Field#8 IID (1st part)	Component Field#8 IID (2nd part)	Component Field#8 IID (3rd part)	Component Field#8 IID (4th part)
Instrument Code	Instrument Number	Tray Number	Location information

Following there are some samples of IIDs as responses to tracking query from a specified sample:

---

[3] Format of the Carrier (Number of Rows.Number of Columns)

Sample is on	Unit	Instrument Code	Instrument Number	Tray number (10 digits)	Additional Location description Text[25]
IID for Archive No. 1	**Archive**	**0**	**.1**	Nnn	.Shelf2 Fridge3
IID for Archive No. 2.	**Archive**	**0**	**.2**	Nnnnn	
IID for manual scan place No. 1.	**Logical Unit**	**999**	**.1**		
IID for manual scan place No. 2.	**Logical Unit**	**999**	**.2**		
IID for PSD No. 1.	**Logical Unit**	**190**	**.1**		
IID for PSD No. 2, Channel "C".	**Logical Unit**	**190**	**.2**	**.**	**.C**
IID for VS250 No. 1.	**Logical Unit**	**160**	**.1**		
IID for manual aliquoting No. 3.	**Logical Unit**	**998**	**.3**		
IID for MODULAR ANALYTICS No. 1	**Instrument**	**225**	**.1**	**.**	**.Module**
IID for MODULAR ANALYTICS No. 1 Module "P1"	**Instrument**	**225**	**.1**	**.**	**.P1**
IID for Elecsys2010 No. 1	**Instrument**	**141**	**.1**	**[NONE]**	**[NONE]**
IID for ES300 No. 3	**Instrument**	**19**	**.3**	**[NONE]**	**[NONE]**

*Action Code (Field **9.4.12**)*: This field shall indicate the action to be taken with respect to the specimens that accompany or precede this request. The following codes shall be used:

From Host to PSM:

Action Code	Description
C	Cancel request for the battery or tests named
A	Add the requested tests or batteries to the existing specimen with the patient and specimen identifiers and date-time given in this record
X	Specimen or test already in process.
N	New action code for updating the sample. It means recreate completely the sample, therefore, subtracting not present tests and adding the new ones.

If the Host sends an 'A' flag to a test request, PSM will try to add this test to this sample. If this test is already created, PSM will do nothing. For the 'C' flag, PSM will remove this test from the sample but, if the analyzer is already processing this test and it uploads the results to PSM, PSM is going to send these results back to the Host.

From PSM to Host (PSM sends results):

Action Code	Description
X	Normal Sample
X\Q	Quality control

Report type (Field 9.4.26): If the Host does not send this field an 'O' value is assumed. If PSM is not sending this field, an 'F' flag is assumed. The following record types are available:

From Host to PSM:

- O - order record (default value); user asking that analysis be performed
- C - correction of previously transmitted results. If the Host sends this flag, PSM is going to repeat this test and send again results.
- X - request cancelled. If this code is present in conjunction to Action Code "C", the complete Sample is deleted.

So, in the case of downloading requests from the Host to PSM, depending on the different combinations of these flags, the following actions from the Host to PSM are possible:

Action	Action Code Flag ASTM 9.4.12	Rerun Flag ASTM 9.4.22	Report Type Flag ASTM 9.4.26
Add Test Order	**A**		**O**
Delete Test Order	**C**		**O**
Rebuild New Sample[4]	**N**		**O**
Delete all test of sample	**C**		**X**
Change in Instrument Fixing (Changed: fixed, released, deleted, re-fixed)	**A**		**C**
Change in PID (added, deleted, changed)	**N**		**C**
Rerun Orders[5]	**A**	**R**	**C**

From PSM to Host:

- P - preliminary results
- F - final results (default value)
- X - results cannot be done, request cancelled
- I - in instrument pending. If PSM is sending this flag, the following result record is omitted.
- Y - no order on record for this test (in response to query)
- Z - no record of this patient (in response to query)

---

[4] Updating the sample: it means recreate completely the sample, therefore, subtracting not present tests and adding the new ones

[5] Difference between Rerun and Change in Instrument Fixing is that the Rerun Flag in Test ID field must be something different than nothing for Rerun

4.2.6.   R - RESULT RECORD (Level 3)

ASTM field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
10.1.1	Record type ID (R)	Char[1]	1	---	R		Identifier for Result record (R)
10.1.2	Sequence number	Pos_int	4	---	R		Ordering number (see description in Patient record).
10.1.3	Universal Test ID:						
	^^^Test ID	Text	10	---	R		Test code
	^Treatment Type (and value)			---	O		Dilution as received from analyser
	^Pre-Treatment Type (and value)			---	---		Not supported
	^Result Evaluation Type (and value)			---	---		Not supported
	^IID	Text	30	---	O		Instrument Identification (IID) (p. 4-14)
10.1.4	Results (Data or Measurement Value)	Text	20	---	O		The last two results of the test. If numeric the maximum length is 7. If alphanumeric results can have up to 20 characters each.
10.1.5	Units			---	O		Units of the results
10.1.6	Reference Ranges			---	---		Not supported
10.1.7	Alarm (Result Abnormal Flags)	Text	2	---	O		ASTM result abnormal flags. See detailed description below.
10.1.8	Nature of Abnormality Testing			---	---		Not supported
10.1.9	Result Type	Char[1]	1	---	R		The following codes shall be used: P: Preliminary results. If PSM is sending two different results of a test, the first one will be sent with the 'P' flag and the second one with the 'F' flag. F: Final results C: Correction of previous result. X: Test cannot be completed: Used to indicate an error during processing (e.g. the result has been blocked by instrument)
10.1.10	Date of Change in Instrument Normative Values or Units			---	---		Not supported
10.1.11	Operator Identification			---	O		Operator
	Operator ^Validation User			---	O		Validation User
10.1.12	Date/Time Test Started			---	—		Not supported
10.1.13	Date/Time Test Completed	D_t	14	---	R		Date and time the instrument completed the test results being reported. Date and times should be reported as YYYYMMDDHHMMSS.

ASTM field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
10.1.14	Instrument identification	Text	8	**O**	**O**		Instrument Identification (IID) (ref. p. 4-14) It identifies an analyzer. The format is: Analyzer code dot Analyzer number (nnnn**.**nn). These numbers depend on the analyzer definition in PSM. In the result record identifies which analyzer has performed the test.

Alarm (Field 10.1.7): This field shall indicate the normalcy status of the last result. The characters for representing significant changes either up or down or abnormal values shall be:

L	-	below low normal
H	-	above high normal
LL	-	below panic normal
HH	-	above panic high
<	-	below absolute low that is off low scale on an instrument
>	-	above absolute high, that is off high scale on an instrument
N	-	normal
A	-	abnormal
U	-	significant change up
D	-	significant change down
B	-	better, use when direction not relevant or not defined
W	-	worse, use when direction not relevant or not defined

In PSM there will be a correspondence between analyzers alarms and standard ASTM alarms. In addition there is a switch in PSM to choose either upload to the Host non-defined alarms or ignore them. If an alarm from an analyzer is not defined in the correspondence of alarms, this alarm will be uploaded to the Host as a comment to the result record.

4.2.7. Q - QUERY RECORD (Level 2)

ASTM field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
12.1.1	Record type ID (Q)	Char[1]	**1**	**R**	**R**		Identifier for Query record (Q)
12.1.2	Sequence number	Pos_int	**4**	**R**	**R**		Ordering number (see description in Patient record).
12.1.3	Starting Range ID	Text	**15**	**R**	**R**		Initial sample or patient ID sample to query for. The format is: * *From Host to PSM:* PID^SID Where PID is Patient ID and SID is Sample ID. If SID is filled, PSM will answer for SID although there is some PID. If PID is filled and no SID is filled, PSM will answer all samples for this PID. • *From PSM to Host* *:* If the PSM parameter "*PSM query all samples?*" and the corresponding timer "*Interval for Query all samples (s)*" is set, PSM will query for ALL sample IDs. The Host shall respond with all pending test orders.
12.1.4	Ending Range ID number			**---**	**---**		Not supported
12.1.5	Universal Test ID	Text	**15**	**R**	**R**		* *From Host to PSM:* Test Code. The first three components are reserved for ASTM naming conventions, so the string should be ^^^Code. If the string ALL is placed in this field, PSM will answer with all the current test selections for this sample ID. * *From PSM to Host:* If the PSM parameter "*PSM query all samples?*" and the corresponding timer "*Interval for Query all samples (s)*" is set, PSM will query for ALL test codes. The Host shall respond with all pending test orders.
12.1.6	Nature of Request Time Limits			**---**	**---**		Not supported
12.1.7	Beginning Request Results Date and Time	D_t	**14**	**O**	**---**		(Only from Host to PSM) This field shall represent either a beginning (oldest) sample registering date and time for which results are being requested or a single date and time.
12.1.8	Ending Request Results Date and Time			**---**	**---**		Not supported

ASTM field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
12.1.9	Requesting Physician Name			---	---		Not supported
12.1.10	Requesting Physician Telephone Number			---	---		Not supported
12.1.11	User Field No. 1			---	---		Not supported
12.1.12	User Field No. 2			---	—		Not supported
12.1.13	Request Information Status Codes	Char[1]	1	R	R		*From Host to PSM:* The following codes shall be used: O: requesting test orders and Demographics only (no results) A: abort/cancel last request Criteria *From PSM to Host:* The following code is used: O: requesting test orders and Demographics only (no results)

4.2.8. L - MESSAGE TERMINATOR RECORD (Level 0)

ASTM field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
13.1.1	Record type ID (L)	Char[1]	1	R	R		Identifier for Terminator record (T)
13.1.2	Sequence number	Pos_int	4	R	R		Ordering number (see description in Patient record).
13.1.3	Termination Code	Char[1]	1	R	R		Provides explanation of end of session: Nil,N: normal termination T: sender aborted R: receiver requested Abort E: unknown system error Q: error in last request for Information I: no information available from last query F: last request for information process

4.2.9. C - COMMENT RECORD (Level n)

ASTM field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
11.1.1	Record type ID (C)	Char[1]	1	R	R		Identifier for Comment record (C)
11.1.2	Sequence number	Pos_int	4	R	R		Ordering number (see description in Patient record).
11.1.3	Comment Source	Char[1]	1	R	R		Comment origination point: L: Instrument comments or PSM Rules I: clinical instrument system
11.1.4	Comment Text	Text	800	O	O		Comments to specific level (patient, test or result)
11.1.5	Comment Type	Char	1	---	R		G: Generic/free text comment I: Instrument alarm or comment

4.2.10. M -RECORD

Manufacturer records messages are used when PSM is configured to work with the Roche Diagnostics ASTM 2.0 implementation. The Messages are based on Health level 7 version 2.4 (HL7v2.4), chapter 13, messages.

ASTM field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
	Record type ID (C)	Char[1]	1	R	R		Identifier for Manufacturer Record (M)
	Sequence number	Pos_int	4	R	R		Ordering number (see description in Patient record).
	Record type sub ID						
		Text	3	R	R		Roche specific record identifier
		Text	---	---	R		^RO
		Text	---	---	R		^PSM
		Text	---	---	R		^2.0 (Version Number of protocol implementation)
	Manufacturer defined fields	any		C	C		Manufacturer defined fields

4.2.10.1.   M –RECORD – EQU

The equipment detail segment contains the data necessary to identify and maintain the equipment that is being used throughout the Laboratory Automation System. This type of segment is used in SSU - specimen status update (event U03) messages sent from PSM to the host (Roche Diagnostics ASTM 2.0 only).

ASTM field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
EQU-1	Record type ID (C)	Char[1]	1	R	R		Identifier for Manufacturer Record (M)
EQU-2	Sequence number	Pos_int	4	R	R		Ordering number (see description in Patient record).
EQU-3	Record type sub ID						
		Text	3	R	R		EQU
		Text	---	---	R		^RO
		Text	---	---	R		^PSM
		Text	---	---	R		^2.0 (Version Number of protocol implementation)
EQU-4	Equipment Identifier						The format is:
	<entity identifier>	Text	10	---	R		Instrument Identification (IID) (p. 4-14)
	^<namespace ID>	Text		---	---		Not used
	^<universal ID>	Text		---	---		Not used
	^<universal ID type>	Text		---	---		Not used
EQU-5	Event Date/Time	D_t	14	---	R		Date and time when the action took place.
EQU-6	Equipment State			---	---		Not used
EQU-7	Local/Remote Control State			---	---		Not used
EQU-8	Alert Level			---	---		Not used

4.2.10.2.   M –RECORD – SAC

The container detail segment is the data necessary to maintain the containers that are being used throughout the Laboratory Automation System. This type of segment is used in SSU - specimen status update (event U03) messages sent from PSM to the host (Roche Diagnostics ASTM 2.0 only).

ASTM field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
SAC-1	Record type ID (C)	Char[1]	1	R	R		Identifier for Manufacturer Record (M)
SAC-2	Sequence number	Pos_int	4	R	R		Ordering number (see description in Patient record).
SAC-3	Record type sub ID	Text	3	R	R		SAC
		Text	---	---	R		^RO
		Text	---	---	R		^PSM
		Text	---	---	R		^2.0 (Version Number of protocol implementation)
SAC-4	External Accession Identifier	Text	22	---	---		Not used
SAC-5	Accession Identifier (User login signature)	Text	22	---	O		PSM will send the user login signature if it is configured to do that.
SAC-6	Container Identifier	Text	13	---	R		Specimen ID. This ID should define uniquely a tube in the lab. If PSM is working in the mode 'Many specimen types by ID', sometimes there is a prefix or suffix which distinguishes between the primary container ID and the specimen ID. If there are many tubes but only one ID the field 'Specimen Source' must be considered.
SAC-7	Parent (primary) Container Identifier	Text	13	---	C		Parent Specimen ID or Sample ID. Only in case container (SAC-6) is not the Parent Container.
SAC-8	Equipment Container Identifier	Text	22	---	-		Not used
SAC-9	Specimen Source	Text	15	---	R		Specimen descriptor number according to the 'Specimens' defined
SAC-10	Registration Date/Time	D_t	14	---	R		Date and time when the sample was last seen.
SAC-11	Container Status	Text	1	---	R		PSM is going to use the following codes: U - Unknown I - Identified O - In Process R - Process Completed
SAC-12	Carrier Type			---	---		Not used
SAC-13	Carrier Identifier	Pos_int	10	---	C		Carrier ID where the sample is located. In PSM this ID corresponds to the Rack or Rotor identifier.
SAC-14	Position in Carrier	Pos_int	4	---	C		Position within the carrier. Typically this is a number from 0 to 5 if working with the standard Roche rack.
SAC-15	Tray Type			---	C		Not used
SAC-16	Tray Identifier	Text	80	---	C		Tray ID. The absolute PSM position of a tube is given by this field plus the fields Carrier Identifier and Position in Carrier.
SAC-17	Position in Tray			---	---		Not used
SAC-18	Location	Text	15	---	C		This is an optional field which contains the physical location of the tray only in the case of the PSM archive.

ASTM field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
SAC-19	Container Height	NM	20	-	-		Not used
SAC-20	Container Diameter	NM	20	-	-		Not used
SAC-21	Barrier Delta	NM	20	-	-		Not used
SAC-22	Bottom Delta	NM	20	-	-		Not used
SAC-23	Container Height/Diameter Units	CE	80	-	-		Not used
SAC-24	Container Volume	NM	20	-	-		Not used
SAC-25	Available Volume	NM	20	-	-		Not used
SAC-26	Initial Specimen Volume	NM	20	-	-		Not used
SAC-27	Volume Units	CE	80	-	-		Not used
SAC-28	Separator Type	CE	80	-	-		Not used
SAC-29	Cap Type	CE	80	-	-		Not used
SAC-30	Additive	CE	80	-	-	Y	Not used
SAC-31	Specimen Component	CE	80	-	-		Not used
SAC-32	Dilution factor	SN	20	-	-	Y	Not used
SAC-33	Treatment	CE	80	-	-		Not used
SAC-34	Temperature	NM	80	-	-		Not used
SAC-35	Hemolysis Index	NM	20	-	-		Not used
SAC-36	Hemolysis Index Units	CE	80	-	-		Not used
SAC-37	Lipemia Index	20	NM	-	-		Not used
SAC-38	Lipemia Index Units	80	CE	-	-		Not used
SAC-39	Icterus Index	20	NM	-	-		Not used
SAC-40	Icterus Index Units	80	CE	-	-		Not used
SAC-41	Fibrin Index	20	NM	-	-		Not used
SAC-42	Fibrin Index Units	80	CE	-	-		Not used
SAC-43	System Induced Contaminants	80	CE	-	-		Not used
SAC-44	Drug Interference	80	CE	-	-		Not used
SAC-45	Artificial Blood	80	CE	-	-		Not used
SAC-46	Special Handling Considerations	80	CE	-	-		Not used
SAC-47	Other Environmental Factors	200	CE	-	-		Not used

4.3.   DESCRIPTION OF BASIC WORKFLOWS

We are going to describe the basic workflows for Normal (Batch) Mode of PSM. The syntax used to show optional records and repetitions will be:

> […]   means 0 to 1
> {…}   means 1 to many
> [{…}]   means 0 to many

4.3.1.   Unsolicited test order from host

The action is initiated by the Host which sends one or many requests to PSM.

Host -> PSM	Request
H	Header Segment
{	
P	Patient Record
{O}	Order Record
}	
L	Terminator Record

Depending on PSM configuration, the Host can send either one Order record by sample or one Order record by test. The first case is, of course, faster, but the second one supports more different types of hosts. PSM supports as well receiving one Patient record for each sample or one Patient record for several different samples.

PSM does not answer anything to the Host if the sample is successfully updated. Only in the case there were some errors (for example, some tests were not defined), PSM is answering with the following message.

PSM -> Host	Request
H	Header Segment
{	
P	Patient Record
{O}	Order Record
}	
L	Terminator Record

In the Download of Requests process, PSM receives from the Host the requests which has to perform including patient information and all their correspondent tests. The minimum information for each sample will be:

- Sample ID (in field #3 from Test Order Record or in field #3 from Patient Record optionally)
- Registered Date and Time (in field #7 from Test Order Record or optionally in field #24 in Patient Record optionally) if the parameter [Host – General] "*Requested/ Ordered Date&Time not transmitted by Host?*" is **not activated** in PSM.
- The list of tests, which can be downloaded either in the mode one-test-by-record or in the mode many-tests-by-record using the repeat character (\)

The Action Code and Report Type flags for each record, which determines the process to be performed with each sample.

4.3.1.1.   Modes of Download of New Order

New test order (or complete modification)

```
H|...
    P|...
        O|1|SID1||^^^T₁^^^^I₁\^^^T₂^^^^I₂\...\^^^Tₙ^^^^Iₙ|R|||||N....|O
L|1|N
```

Sample ID	Tests	Action Code	Report Type
SID1	^^^T$_1$^^^^I$_1$\...\ ^^^T$_n$^^^^I$_n$	N	O

This combination of flags has to be used for downloading new samples or for complete re-creation of the sample.

Sample ID does not exist in PSM:
— The new sample ID with associated test orders is created.

Sample ID does already exist:
— Sample ID processing not yet started:
   Delete previous sample ID and associated tests and create new sample ID with associated test orders.
   Test orders already defined are indicated as follows to the host:

```
H|...
    P|1|SID1
        O|1|SID1||^^^Tₘ^^^^Iₘ|||||||C....|X
L|1|N
```

— Sample being in process:
   Delete previously ordered tests. Test orders already in process are not deleted in PSM. The deletion is rejected as follows:

```
H|...
    P|1|SID1
        O|1|SID1||^^^Tₘ^^^^Iₘ|||||||C....|X
    P|2|SID1
        O|1|SID1||^^^Tₙ^^^^Iₙ|||||||C....|X
L|1|N
```

Add test order

```
H|...
    P|...
        O|1|SID1...||^^^T₁^^^^I₁\^^^T₂^^^^I₂\...\^^^Tₙ^^^^Iₙ|R|||||A....|O
L|1|N
```

Sample ID	Tests	Action Code	Report Type
SID1	^^^T$_1$^^^^I$_1$\...\ ^^^T$_n$^^^^I$_n$	A	O

Using these flags, PSM will add the list of tests to the sample if not present yet.

Sample ID does not exist in PSM:
— The new sample ID with associated test orders is created (same as *New Test Order*)

Sample ID does already exist:
— Add new test orders to the existing sample ID (existing test orders remain; new test orders are added)
— Reject previously ordered tests as follows:

```
H|...
   P|1|SID1
      O|1|SID1||^^^Tm^^^^Im||||||C....|X
   P|2|SID1
      O|1|SID1||^^^Tn^^^^In||||||C....|X
L|1|N
```

Delete / cancel single test order

```
H|...
   P|...
      O|1|SID1...||^^^T1^^^^I1\^^^T2^^^^I2...\^^^Tn^^^^In|R|||||C....|O
L|1|N
```

Sample ID	Tests	Action Code	Report Type
SID1	^^^T$_1$^^^^I$_1$\...\ ^^^T$_n$^^^^I$_n$	C	O

Using these flags, PSM will remove the list of tests to the sample if they were previously loaded in PSM's database.

- Parameter [Host – General] "*Preserve results in sample removal*" **not activated**:

  Sample ID or test order does not exist:
  — No action

  Test order exists:
  — Delete test orders from the database

  Sample being processed:
  — Delete test orders **and results** from the database!

- Parameter [Host – General] "*Preserve results in sample removal*" **activated**:

  Sample ID or test order does not exist:
  — No action.

  Test order exists:
  — Mark open test orders as "Closed" in the database.

  Sample being processed:
  — No action. Test orders with results are not deleted.

Delete / cancel all open or documented test orders of a specific sample or of all samples

```
H|...
   P|...
      O|1|SID1|||R|||||C....|X
L|1|N
```

Sample ID	Tests	Action Code	Report Type
SID1		C	X

Using these flags, PSM will completely delete all the tests of a sample from its database.

- Parameter [Host – General] "*Preserve results in sample removal*" **not activated**:

  Sample ID or test order does not exist:
  — No action

  Test order exists:
  — Delete all test orders of the specified sample ID from the database

  Sample being processed:
  — Delete all test orders **and results** of the specified sample ID from the database!

- Parameter [Host – General] "*Preserve results in sample removal*" **activated**:

  Sample ID or test order does not exist:
  — No action.

  Test order exists:
  — Mark all open test orders as "Closed" in the database.

  Sample being processed:
  — Mark all open test orders as "Closed" in the database. Test orders with results are not deleted.

4.3.1.2.   Example from Download of New Order

Minimum requirement when the parameter [Host – General]
"*Requested/ Ordered Date&Time not transmitted by Host?*" is **activated** in PSM.

```
H|\^&|||ASTM-Host|||||PSM||P||20000219111500
    P|1
        O|1|923501||^^^101\^^^102|||||||N
L|1|F
```

Minimum requirement when the parameter [Host – General]
"*Requested/ Ordered Date&Time not transmitted by Host?*" is **not activated** in PSM.

- Requested/ Ordered Date&Time transmitted in P-record

```
  H|\^&|||ASTM-Host|||||PSM||P||20000219123800
      P|1|20000219003|||||||||||||||||||||||20000219123700
          O|1|20000219003||^^^101|||||||N
  L|1|F
```

- Requested/ Ordered Date&Time transmitted in O-record

```
  H|\^&|||ASTM-Host|||||PSM||P||20000219123800
      P|1
          O|1|20000219005||^^^101||20000219123700|||||N
  L|1|F
```

4.3.1.3. Example from Download of Requests in the mode 'One Test per Record' (HOST -> PSM)

```
H|\^&|||ASTM-Host|||||PSM||P||20000219111500
    P|1|923500|20003484A84||López^Heredia^José||19630101|M|||||||||||Gastric⬚
    ulcer|||||20000218191500|||||||||||UCI
        O|1|923500||^^^101|||||||A
        O|2|923500||^^^102|||||||A|||||
        O|3|923500||^^^103|||||||A|||||||||||||||O
L|1|F
```

Note: The format of ASTM field 8.1.6. (Patient Name) is dependant of the PSM parameter setting [Host – General] "*Standard patient format (Name^First name)*"

- parameter deactivated: Last Name 1^Last Name 2^First Name
- parameter activated: Last Name^First Name

The patient name information is necessary to allow querying by name within PSM.

4.3.1.4. Example from Download of Requests in the mode 'One Record per Sample' (HOST -> PSM)

```
H|\^&|||ASTM-Host|||||PSM||P||20000219111500
    P|1|923501|4637463G66||Smith^John||19630101|M|||||||||||Diabetes|||||2000
    0218102000|||||||||||Urology
        O|1|923501||^^^102|||||||A|||||||||||||||O
    P|2|923502|||||||||||||||||||||||20000218102000
        O|1|923502||^^^104\^^^105\^^^^106\^^^107|||||||A
L|1|F
```

4.3.1.5. Example from Download of Requests forcing tests to targets (HOST -> PSM)

The test 101 has to be analyzed on instrument type 225 (Modular Analytics) No. 1

```
H|\^&|||ASTM-Host|||||PSM||P||20000219111500
    P|1
        O|1|923501||^^^101^^^^225.1|||||||A
L|1|F
```

4.3.1.6.   Example of reject of a test order

In this example the tests 102, 102 170 and 207 are requested as a new order. Later the tests 101, 102 and 170 are added to this order. As the tests 101 and 102 are already defined, PSM sends back a message.

The PSM parameter [Host – General] "*Send errors to Host*" has to be **activated** in order that PSM sends error messages to the Host.

```
HOST    H|\^&|||ASTM-Host|||||PSM||P||20000214133500
        P|1
          O|1|20000214101||^^^101\^^^102\^^^170 \^^^207|||||||N|||||||||||||||O
        L|1|F


HOST    H|\^&|||ASTM-Host|||||PSM||P||20000214133600
        P|1
          O|1|20000214101||^^^101\^^^102\^^^105|||||||A|||||||||||||||O
        L|1|F


PSM     1H|\^&|||PSM^Roche Diagnostics^PSM^1.7|||||||P||20000214131400
          P|1|20000214101||
              O|1|20000214101||^^^101||20000214133700|||||C||||||||||||||X
          P|2|20000214101||
              O|1|20000214101||^^^102||20000214133700|||||C||||||||||||||X
        L|1|E
```

4.3.1.7.   Delete / cancel single test order

The test 101 shall be deleted from the list of orders. The action depends on the parameter [Host – General] "*Preserve results in sample removal*"!

```
H|\^&|||ASTM-Host|||||PSM||P||20000214133600
    P|1
        O|1|20000214102||^^^101|||||||C||||||||||||||O
L|1|F
```

4.3.1.8.   Delete / cancel all open or documented test orders of a specific sample or of all samples

All tests of sample ID "20000214103" shall be deleted. The action depends on the parameter [Host – General] "*Preserve results in sample removal*"!

```
H|\^&|||ASTM-Host|||||PSM||P||20000214135000
        P|1
                O|1|20000214103|||||||||C|||||||||||||X
L|1|F
```

4.3.1.9.   Order a Rerun of a test

Reruns can be initiated in two different ways:

```
a)   H|\^&|||ASTM-Host|||||PSM||P||20000214140400
        P|1
             O|1|20000214105||^^^101|||||||A||||||||||R||||C
     L|1|F


b)   H|\^&|||ASTM-Host|||||PSM||P||20000214140400
        P|1
             O|1|20000214106||^^^136^^1|||||||A|||||||||||||||C
     L|1|F
```

4.3.2.   Upload of results

In this process, PSM sends results and all related information to the Host. PSM always initiates this process, depending on its configuration, when a test is finished, when all the sample is finished or when the battery of tests from an specific analyzer are finished.

The basic workflow is:

PSM -> Host	Results Information
H	Header Segment
{	
P	Patient Record
[{C}]	Comment to Patient Record
O	Order Record
[{C}]	Comment to Order Record
{R	Result Record
[{C}]	Generic Comment to Result Record
[C]}	Alarm Comment to Result Record
}	
L	Terminator Record

PSM will send one Patient Record for each sample ID. For the Order Record, in order to adapt to all hosts, it can be configured in PSM whether to send an order record for each result record or to send one order record for many result records.

The first case (one order record for one result record) is summarised in the following table:

Patient Record	P|SEQ1|SID1|PID1||Last Name^Name|||||||||||||||||||||REG. DATE & TIME
Order Record	O|SEQ11|SID1||^^^T1||REG. DATE & TIME|||||X|||||||||||SQ|||||REPORT TYPE
Result Record	R|SEQ111|^^^T1^^^^I1|RES1|||ALARM1||RESULT TYPE||||DATE & TIME COMPLETED|I1
Result Record	R|SEQ112|^^^T1^^^^I1|RES2|||ALARM2||RESULT TYPE||||DATE & TIME COMPLETED|I2
Order Record	O|SEQ12|SID1||^^^T2||REG. DATE & TIME||||X|||||||||||SQ|||||REPORT TYPE
Result Record	R|SEQ121|^^^T2^^^^I1|RES1|||ALARM1||RESULT TYPE||||DATE & TIME COMPLETED|I1
...	...
Order Record	O|SEQ1n|SID1||^^^Tn||REG. DATE & TIME||||X|||||||||||SQ|||||REPORT TYPE
Result Record	R|SEQ1n1|^^^Tn^^^^In|RES1|||ALARM1||RESULT TYPE||||DATE & TIME COMPLETED|In

The second case (one order record for many result record) is summarised in the following table:

Patient Record	P|SEQ1|SID1|PID1||Last Name^Name||||||||||||||||REG. DATE & TIME
Order Record	O|SEQ11|SID1||ALL||REG. DATE & TIME||||X|||||||||SQ|||||REPORT TYPE
Result Record	R|SEQ111|^^^T1^^^^I1|RES1|||ALARM1||RESULT TYPE||||DATE & TIME COMPLETED|I1
Result Record	R|SEQ112|^^^T1^^^^I1|RES2|||ALARM2||RESULT TYPE||||DATE & TIME COMPLETED|I2
Result Record	R|SEQ121|^^^T2^^^^I1|RES1|||ALARM1||RESULT TYPE||||DATE & TIME COMPLETED|I1
...	...
Result Record	R|SEQ1n1|^^^Tn^^^^In|RES1|||ALARM1||RESULT TYPE||||DATE & TIME COMPLETED|In

The information which PSM is sending for each sample with results to be sent will be:

- Sample ID (in field #3 from Test Order Record and in field #3 from Patient Record also)
- Registered Date and Time (in field #7 from Test Order Record and in field #24 in Patient Record also)
- The list of tests, which are being uploaded, in the Order Record #5 in the case of one order record by result record, or the single correspondent test in the other case.
- The results, the date and time of completion, the instrument which performed the test, the result type and the alarms for each test.

4.3.2.1.   Example of Upload of Final Results

In this example, for sample 1000, analyzer codes 141.1 and 141.2 correspond to two different Elecsys 2010 analyzers defined in PSM with the same analyzer type and different analyzer number. In the example the result for test 101 (21) would be associated to Elecsys 2010 number 1 and the result for test 105 (Neg) to Elecsys 2010 number 2. The third result is reported from analyzer 225.1 (MODULAR *ANALYTICS*). The last part of the Instrument Identification specifies that the result was measured on module "P1".

```
H|\^&|||PSM^Roche□Diagnostics^PSM^1.7|||||||P||20000208114600
    P|1|1000|60||ROMERO^ORTEGA^ELIZABET||19950101|F|||||||||||||||||2000020807
    3100|||||||||||UCI
        O|1|1000||ALL||||||||||||||||||||||||||F
            R|1|^^^101^^^^141.1|21|||||F||||20000208113400|141.1
            R|2|^^^105^^^^141.2|Neg|||LL||F||||20000208114500|141.2
            R|3|^^^222^^^^225.1..P1|5.01|||N||F||||20001012102000|225.1..P1
L|1|N
```

4.3.2.2.   Example of Upload of Preliminary and Final Results

Whenever a re-run/repeat is initiated due to a PSM 'Rule', a first run result is not transmitted to the host until the second result is received from the analyser. In this way both results are transmitted to the host at the same time. The test 263 has a preliminary result (P) and a final result (F). This behaviour is **not** influenced by the the PARAMETER / Host / General option "Re-send preliminary result together with final result".

```
Pre-liminary and Final results due to rerun initiated by PSM


H|\^&|||PSM^RocheⒹDiagnostics^PSM^1.09.00 BetaⒹ7|||||||P||20020604174200
    P|1|20020604102|4637463G66||Smith^John||19630101|M||||||||||||||||2002060
         4173600|||||||||
       O|1|20020604102||ALL|R|20020604173600|||||X||||1|||||||||||F
         R|1|^^^263^^^^225.1..P1|174.3|||HH||P||||200206041739|225.1..P1
             C|1|I|26|I
         R|2|^^^263^dec^^^225.1..P1|17.6|||N||F||||20020604174200|225.1..P1
L|1|N
```

4.3.2.3.   Example of Upload of Second Result

If a test is repeated or rerun either automatically by the analyser or as a manual repeat or rerun, a second result is transmitted to the host. The format depends on the PARAMETER / Host / General option "**Re-send preliminary result together with final result**". If the option is disabled, the result type of the second result is "C" for correction of result. However, if the option is enabled, the first result is re-transmitted to the host with result type "P" for preliminary result and the second result is transmitted with result type is "F" for final result.

```
Option "Re-send preliminary result together with final result" disabled


First result:

H|\^&|||PSM^RocheⒹDiagnostics^PSM^1.09.00 BetaⒹ7|||||||P||20020604170000
    P|1|20020604102|4637463G66||Smith^John||19630101|M||||||||||||||||2002060
         4173600|||||||||
       O|1|20020604102||ALL|R|20020604173600|||||X||||1|||||||||||F
         R|1|^^^205^^^^225.1..P1|234.1|||A||F||||200206041739|225.1..P1
             C|1|I|23|I
L|1|N


Second result:

H|\^&|||PSM^RocheⒹDiagnostics^PSM^1.09.00 BetaⒹ7|||||||P||20020604174400
    P|1|20020604102|4637463G66||Smith^John||19630101|M||||||||||||||||2002060
         4173600|||||||||
       O|1|20020604102||ALL|R|20020604173600|||||X||||1|||||||||||F
         R|1|^^^205^dec^^^225.1..P1|26.6|||N||C||||20020604174300|225.1..P1
L|1|N
```

Option "Re-send preliminary result together with final result" enabled

First result:

```
H|\^&|||PSM^Roche Diagnostics^PSM^1.09.00 Beta 7||||||||P||20020604170000
    P|1|20020604102|4637463G66||Smith^John||19630101|M||||||||||||||||2002060
            4173600||||||||||
        O|1|20020604102||ALL|R|20020604173600|||||X||||1||||||||||F
          R|1|^^^205^^^^225.1..P1|234.1|||A||F||||200206041739|225.1..P1
            C|1|I|23|I
L|1|N
```

First and second result:

```
H|\^&|||PSM^Roche Diagnostics^PSM^1.09.00 Beta 7||||||||P||20020604175200
    P|1|20020604102|4637463G66||Smith^John||19630101|M||||||||||||||||2002060
            4173600||||||||||
        O|1|20020604102||ALL|R|20020604173600|||||X||||1||||||||||F
          R|1|^^^205^^^^225.1..P1|234.1|||A||P||||200206041739|225.1..P1
            C|1|I|23|I
          R|2|^^^205^dec^^^225.1..P1|26.6|||N||F||||20020604175100|225.1..P1
L|1|N
```

4.3.2.4.   Example of Upload of Results with Comments and non standard Alarms

In the situation of sample 1002, note that there is an alarm directly from the analyser which is not associated in PSM to a standard ASTM flag. So, PSM, in the case that is configured to send this kind of alarms, is sending this alarm as a comment to this result.

```
H|\^&|||PSM^Roche Diagnostics^PSM^1.7||||||||P||20000208162400
    P|1|1002|62||Minguez^Carmen||19630907|F||||||||||||||||20000208154000
        C|1|L|This is the comment for Patient.\013\010This is a comment about
        the sample or the order.\013\010|G
            O|1|1002||ALL||||||||||||||||||||||||F
                R|1|^^^102^^^^90.1|100|||||F||||20000208162300|90.1
                    C|1|I|Low in reagent|I
                R|1|^^^184^^^^225.1..P1|180.1|||HH||P||||200110010852|225.1..P1
                    C|1|L|Over normal range.|G
                    C|2|I|26|I
                R|2|^^^HCV^^^^142.1|879|||N||F||||20011001085900|142.1
                    C|1|L|This is a comment about the result HCV.|G
                    C|2|L|And this is another comment about the result HCV.|G
L|1|N
```

4.3.2.5.   Example of Upload of Results together with Archive position

In PSM it is possible to transmit the archive position together with the results to the host. For this purpose a dummy test for archive has to be defined in PSM. In the following example the test "9999 – ARCH" was chosen. The test is mapped to the host as test "9999" and in the specimens screen of PSM this test is chosen as "Archive Test" for specimen 1 (serum/plasma).

When the host orders this test together with the other tests, PSM will send back the archive position (e.g. 4-1-2) of this sample tube together with it's results. Alternatively, the dummy test can be created in PSM automatically via the priority rules. Hence it is not required that the host sends the order for this dummy test.

```
Host   H|\^&|||ASTM-Host|||||PSM||P||20000215082600
          P|1|20000215003|20003484A84||López^Heredia^José||19630101|M|||||||||
          |Gastric□ulcer|||||20000218141500|||||||||||UCI
               O|1|20000215003||^^^126\^^^9999|||||||A||||||||||||||O
       L|1|N
```

```
PSM    H|\^&|||PSM^Roche□Diagnostics^PSM^1.7|||||||P||20000215084600
          P|1|20000215003|||López^Heredia^José||19630101|M|||||||||||||||20000
          215084600|||||||||
               O|1|20000215003||ALL||20000215084600|||||X|||||||||||||||F
                  R|1|^^^126^^^^225.1..P1|90|||N||F||||20000215084600|225.1..P1
                  R|2|^^^9999^^^^|4-1-2|||N||F||||00|
       L|1|N
```

4.3.2.6.   Example of Upload of Results together with positions

It is possible to transmit the position of a sample together with the results to the host. In the following example the results were obtain on MODULAR *ANALYTICS* No. 1 , module "P1". The sample was in position "1" of rack with the hole ID 7431 (H-ID).

The following parameters have to be set in Parameters / Host / ASTM:

√	ASTM upload (1:one test record/sample, 2:one test record/result)	2
√	Send positions when uploading results	

```
H|\^&|||PSM^Roche□Diagnostics^PSM^1.7|||||||P||20001012150100
    P|1|1200320|200010P002||Mustermann^Heinz||19630101|M||||||||||||||||20001
    012111800
        O|1|1200320|^7431^1|^^^196^^^^225.1..P1||20001012111800|||||X
            R|1|^^^196^^^^225.1..P1|356|||N||F||||20001012112300|225.1..P1
        O|2|1200320|^7431^1|^^^222^^^^225.1..P1||20001012111800|||||X
            R|1|^^^222^^^^225.1..P1|.016|||LL||F||||20001012112300|225.1..P1
                C|1|I|27|I
L|1|N
```

4.3.3. Upload of controls

In this process, PSM sends controls and all related information to the Host. PSM always initiates this process, depending on its configuration, either automatic or manual. The workflow is the same as in the upload of results:

PSM -> Host	Controls Information
H	Header Segment
{	
P	Patient Record
O	Order Record
{R}	Result Record
}	
L	Terminator Record

PSM will send one Patient Record for each sample ID. The only difference with the results upload is that Action Code (in Order Record) is set to X\Q instead of X, as it is for normal results, and the field of SID (in Order Record also) is filled with the Control Code.

So, we have an example for upload of controls in the following table:

Patient Record	P|SEQ1|
Order Record	O|SEQ11|CTRL1||ALL||||||X\Q|||||||||||||||REPORT TYPE
Result Record	R|SEQ111|^^^PRU1^^^^I1|RES1|||ALARM1||RESULT TYPE||||DATE & TIME COMPLETED|I1
Result Record	R|SEQ112|^^^PRU2^^^^I1|RES1|||ALARM1||RESULT TYPE||||DATE & TIME COMPLETED|I1
...	...
Result Record	R|SEQ1n1|^^^PRUn^^^^In|RES1|||ALARM1||RESULT TYPE||||DATE & TIME COMPLETED|In

 The information which PSM is sending for each sample with controls to be sent will be:

- Control Code (in field #3 from Test Order Record)
- The test related to each control, the results of controls, the date and time of completion, the instrument which performed the control, the result type and the alarms for each control..

4.3.3.1.   Example from Controls Upload (PSM -> HOST)

```
H|\^&|||PSM^Roche Diagnostics^PSM^1.7|||||||Q||20000215133600
    P|1|
        O|1|PNP||ALL||||||||X\Q|||||||||||||||F
            R|1|^^^128^^^^225.1..D1|-995.4|||L||F||||20000209162303|225.1..D1
            R|1|^^^222^^^^225.1..D1|0.1|||N||F||||20000209162303|225.1..D1
L|1|N
```

4.3.4.   Upload of 'Sample Seen' message' Roche Diagnostics ASTM 2.0

In this process, depending on configuration, PSM may send to the Host a message telling him that a specific sample was seen in PSM. This is, of course, an unsolicited message that will be uploaded to the Host as soon as PSM sees the tube in any analyzer or distribution device (Manual Scanplace, Manual Aliquotting, etc.). The workflow is:

PSM -> Host   Unsolicited Status Information

H   Header Segment
 [P]   Patient Record (optional)
  [O]   Order Record (optional)
    M-EQU   Manufacturer Record: Equipment detail
      M-SAC   Manufacturer Record: Container detail
L   Terminator Record

It is important to note that the Order Record for this message will contain the positions (rack/rotor number, position and sometimes tray ID), the device ID which saw the tube and the date and time when the action occurred.

4.3.4.1.   Example of Upload of 'Sample Seen' message (PSM -> HOST)

```
H|\^&|||PSM^Roche□Diagnostics^PSM^1.7|||||||P||20000215094700
    M|1|EQU^RO^PSM^2.0|225.1|20000215094700
         M|2|SAC^RO^PSM^2.0|||20000215006|20000215006||1|20000215094700
         |O||5210|2||
L|1|N
```

With option: Parameters/Host/ASTM-2.0: "Upload P and O records in worklist":

```
H|\^&|||PSM^Roche□Diagnostics^PSM^1.7|||||||P||20000215094700
    P|1|20000215006|||Spitz^Mark||19590510|M|||||||||||||||20000215095600|||||||||
         O|1|20000215006|||||||||X|||2000021595700|1|||||||||225.1|P
             M|1|EQU^RO^PSM^2.0|225.1|20000215094700
                 M|2|SAC^RO^PSM^2.0|||20000215006|20000215006||1|
                 20000215094700|O||5210|2||
L|1|N
```

4.3.4.2.   Example of Upload of 'Sample Seen' message for MPA(PSM -> HOST)

In case a MODULAR PRE-ANALYTICS is connected to PSM, there is a 'Sample Seen' message when the sample is scanned at the IBM:

```
H|\^&|||PSM^Roche□Diagnostics^PSM^1.09.00 Beta□7|||||||P||20020603155900
    M|1|EQU^RO^PSM^2.0|273.1|20020603155900<CR><ETX>92<CR><LF>
    M|2|SAC^RO^PSM^2.0|||0S020603205|0S020603205||1|20020603155900|O||2004|1
L|1|N
```

In addition to this message, a 'Sample Seen' message is generated for each sample sorted at the AQS. The format of the message depends on the option Parameters/Host/ASTM-2.0: "Upload P and O records in worklist". If this option is disabled, the messages are like

```
H|\^&|||PSM^Roche□Diagnostics^PSM^1.09.00 Beta□7|||||||P||20020603155900
  M|1|EQU^RO^PSM^2.0|273.1|20020603155900
  M|2|SAC^RO^PSM^2.0|||0S020603205|0S020603205||1|20020603155900|R|AQS-RACK|16|5||||1
L|1|N
```

With option: Parameters/Host/ASTM-2.0: "Upload P and O records in worklist" enabled:

```
H|\^&|||PSM^Roche□Diagnostics^PSM^1.09.00 Beta□7|||||||P||20020603155700
    P|1||3547266||Spitz^Mark||19590510|M|||||||||||||||20020604110200
      O|1|0S020603205||||||||X|||20020603155700|1|||||||||273.1|P
        M|1|EQU^RO^PSM^2.0|273.1|20020603155700
          M|2|SAC^RO^PSM^2.0|||0S020603205|0S020603205||1|20020603155700|R|
          AQS-RACK|16|5||||1
L|1|N
```

4.3.5.   Upload of 'Sample Seen' message <u>non</u> Roche Diagnostics ASTM 2.0

In this process, depending on configuration, PSM may send to the Host a message telling him that a specific sample was seen in PSM. This is, of course, an unsolicited message that will be uploaded to the Host as soon as PSM sees the tube in any analyzer or distribution device (Manual Scanplace, Manual Aliquotting, etc.). The workflow is:

PSM -> Host   Unsolicited Status Information

<u>H</u>   Header Segment
 <u>P</u>   Patient Record
  <u>O</u>   Order Record
<u>L</u>   Terminator Record

It is important to note that the Order Record for this message will contain the positions (rack/rotor number, position and sometimes tray ID), the device ID which saw the tube and the date and time when the action occurred.

4.3.5.1.   Example of Upload of 'Sample Seen' message' (PSM -> HOST)

```
H|\^&|||PSM^Roche Diagnostics^PSM^1.7|||||||P||20000215094700
    P|1|20000215006|||Spitz^Mark||19590510|M|||||||||||||||20000215095600|||||||||
        O|1|20000215006|^5210^2|^^^^^^^225.1|||||||X|||2000021595700|1|||||||||||
        225.1|P
L|1|N
```

4.3.6.   Upload of Work Lists Roche Diagnostics ASTM 2.0

This process, as the 'Sample Seen' message, is initiated by PSM and it consists of the upload of a list with the contents of the distribution list of a tray. Therefore, depending again on configuration, PSM may send to the Host tray by tray a list of positions and its correspondent samples.

The structure of the message is:

PSM -> Host   Unsolicited Distribution Information

H   Header Segment
{
 [P]   Patient Record (optional)
  [O]   Order Record (optional)
   M-EQU   Manufacturer Record: Equipment detail
    {M-SAC}   Manufacturer Record: Container detail
}
L   Terminator Record

4.3.6.1.   Example of 'Work Lists' message

In this example, PSM is uploading information of the distribution of tray number 2 of the **device** 225.1 (which will be associated to **Modular-Analytics**).

```
H|\^&|||PSM^Roche□Diagnostics^PSM^1.7|||||||P||20000215094700
    M|1|EQU^RO^PSM^2.0|225.1.2|20000215094700
        M|2|SAC^RO^PSM^2.0|||20000215013|20000215013||1|20000215094700|O||1|1||2
        M|3|SAC^RO^PSM^2.0|||20000215014|20000215014||1|20000215094700|O||1|2||2
        M|4|SAC^RO^PSM^2.0|||20000215015|20000215015||1|20000215094700|O||1|3||2
L|1|N
```

With option: Parameters/Host/ASTM-2.0: "Upload P and O records in worklist":

```
H|\^&|||PSM^Roche□Diagnostics^PSM^1.7|||||||P||20000215094700
  P|1|20000215013|||Smith^John||19630101|M|||||||||||||||20000215100900|||||||||
      O|1|20000215013||^^^126\^^^130|||||||X||||1||||||||||225.1.2|P
        M|1|EQU^RO^PSM^2.0|225.1.2|20000215094700
            M|2|SAC^RO^PSM^2.0|||20000215013|20000215013||1|20000215094700|O||1|
            1||2
  P|2|20000215014|||Spitz^Mark||19590510|M|||||||||||||||20000215100900|||||||||
      O|1|20000215014||^^^126\^^^130|||||||X||||1||||||||||225.1.2|P
        M|1|EQU^RO^PSM^2.0|225.1.2|20000215094700
            M|2|SAC^RO^PSM^2.0|||20000215014|20000215014||1|20000215094700|O||1|
            2||2
  P|3|20000215015|||Anders^Jennifer||19801129|F|||||||||||||||20000215100900|||||||||
      O|1|20000215015||^^^126\^^^130|||||||X||||1||||||||||225.1.2|P
        M|1|EQU^RO^PSM^2.0|225.1.2|20000215094700
            M|2|SAC^RO^PSM^2.0|||20000215015|20000215015||1|20000215094700|O||1|
            3||2
L|1|N
```

In this example, PSM is uploading information of the distribution of tray number 2 of the **virtual device** with the target code "**CA**".

```
H|\^&|||PSM^Roche□Diagnostics^PSM^1.7|||||||P||20000215094700
    M|1|EQU^RO^PSM^2.0|CA.2|20000215094700
        M|2|SAC^RO^PSM^2.0|||20000215005|20000215005||1|20000215094700|O||1|1||2
        M|3|SAC^RO^PSM^2.0|||20000215006|20000215006||1|20000215094700|O||1|2||2
        M|4|SAC^RO^PSM^2.0|||20000215007|20000215007||1|20000215094700|O||1|3||2
L|1|N
```

With option: Parameters/Host/ASTM-2.0: "Upload P and O records in worklist":

```
H|\^&|||PSM^Roche□Diagnostics^PSM^1.7|||||||P||20000215094700
   P|1|20000215005|||Smith^John||19630101|M|||||||||||||||20000215095600|||||||||
       O|1|20000215005||^^^126\^^^130|||||||X||||1|||||||||CA.2|P
           M|1|EQU^RO^PSM^2.0|CA.2|20000215094700
               M|2|SAC^RO^PSM^2.0|||20000215005|20000215005||1|20000215094700|O||1|
               1||2
   P|2|20000215006|||Spitz^Mark||19590510|M|||||||||||||||20000215095600|||||||||
       O|1|20000215006||^^^126\^^^130|||||||X||||1|||||||||CA.2|P
           M|1|EQU^RO^PSM^2.0|CA.2|20000215094700
               M|2|SAC^RO^PSM^2.0|||20000215006|20000215006||1|20000215094700|O||1|
               2||2
   P|3|20000215007|||Anders^Jennifer||19801129|F|||||||||||||||20000215095600||||||||||
       O|1|20000215007||^^^126\^^^130|||||||X||||1|||||||||CA.2|P
           M|1|EQU^RO^PSM^2.0|CA.2|20000215094700
               M|2|SAC^RO^PSM^2.0|||20000215007|20000215007||1|20000215094700|O||1|
               3||2
L|1|N
```

4.3.7.   Upload of Worklists <u>non</u> Roche Diagnostics ASTM 2.0

This process, as the 'Sample Seen' message, is initiated by PSM and it consists of the upload of a list with the contents of the distribution list of a tray. Therefore, depending again on configuration, PSM may send to the Host tray by tray a list of positions and its correspondent samples.

The structure of the message is:

PSM -> Host	Unsolicited Distribution Information
<u>H</u>	Header Segment
{	
<u>P</u>	Patient Record
<u>O</u>	Order Record
}	
<u>L</u>	Terminator Record

4.3.7.1.   Example of 'Work Lists' message

In this example, PSM is uploading information of the distribution of tray number 2 of the **device** 225.1 (which will be associated to **Modular-Analytics**).

```
H|\^&|||PSM^Roche Diagnostics^PSM^1.7||||||||P||20000215094700
   P|1|20000215013|||Smith^John||19630101|M|||||||||||||||20000215100900|||||||||
      O|1|20000215013|^1^1|^^^126^^^^225.1.2\^^^130|||||||X||||1|||||||||||225.1.2|P
   P|2|20000215014|||Spitz^Mark||19590510|M|||||||||||||||20000215100900|||||||||
      O|1|20000215014|^1^2|^^^126^^^^225.1.2\^^^130|||||||X||||1|||||||||||225.1.2|P
   P|3|20000215015|||Anders^Jennifer||19801129|F|||||||||||||||20000215100900||||||||||
      O|1|20000215015|^1^3|^^^126^^^^225.1.2\^^^130|||||||X||||1|||||||||||225.1.2|P
L|1|N
```

In this example, PSM is uploading information of the distribution of tray number 2 of the **virtual device** with the target code "**CA**".

```
H|\^&|||PSM^Roche Diagnostics^PSM^1.7||||||||P||20000215094700
   P|1|20000215005|||Smith^John||19630101|M|||||||||||||||20000215095600|||||||||
      O|1|20000215005|^1^1|^^^126^^^^CA.2\^^^^^^130|||||||X||||1|||||||||||CA.2|P
   P|2|20000215006|||Spitz^Mark||19590510|M|||||||||||||||20000215095600|||||||||
      O|1|20000215006|^1^2|^^^126^^^^CA.2\^^^^^^130|||||||X||||1|||||||||||CA.2|P
   P|3|20000215007|||Anders^Jennifer||19801129|F|||||||||||||||20000215095600||||||||||
      O|1|20000215007|^1^3|^^^126^^^^CA.2\^^^^^^130|||||||X||||1|||||||||||CA.2|P
L|1|N
```

4.3.8.   Status Query from the Host to PSM Roche Diagnostics ASTM 2.0

The Host can initiate this process whenever he wants. Through it, the Host can query PSM at any time the status of a specific sample. Th query can be done either by sample ID or by Patient ID. The structure of the message sent by the Host is:

Host -> PSM   Status Query

<u>H</u>   Header Segment
  <u>Q</u>   Query Record
<u>L</u>   Terminator Record

The response from PSM to the query is:

PSM -> Host   Response to Status Query

<u>H</u>   Header Segment
{
  [<u>P</u>]   Patient Record (optional)
   [{<u>O</u>}]   Order Record (optional)
    <u>M-EQU</u>   Manufacturer Record: Equipment detail
     <u>M-SAC</u>   Manufacturer Record: Container detail
}
<u>L</u>   Terminator Record

4.3.8.1.   Example of Status Query from the Host to PSM by Sample ID

Query for order information on sample 654123

```
H|\^&|||ASTM-Host|||||PSM||P|1|20000214162700
     Q|1|^654123||ALL|||||||||O
L|1|F
```

Query for order information on sample 654123 with date later than 20000214155900. The date and time given shall represent either a beginning (oldest) sample registering date and time for which results are being requested or a single date and time. This kind of query requires that the host knows the exact date and time when the sample was registered in PSM!

```
H|\^&|||ASTM-Host|||||PSM||P|1|20000214162700
     Q|1|^654123||ALL||20000214155900|||||||O
L|1|F
```

4.3.8.2.   Example of Status Query from the Host to PSM by Patient ID

```
H|\^&|||ASTM-Host|||||PSM||P|1|20000214162700
     Q|1|1234^||ALL|||||||||O
L|1|F
```

4.3.8.3.   Example of response to Status Query (from PSM to the Host)

Response to a query by Sample ID (SID):

```
H|\^&|||PSM^Roche Diagnostics^PSM^1.7|||||||P||20000214155400
    M|1|EQU^RO^PSM^2.0|141.1|20000214155400
        M|2|SAC^RO^PSM^2.0|||654123|654123||1|20000214155400|O||0|0||
L|1|F
```

Response to a query by Patient ID (PID):

```
H|\^&|||PSM^Roche Diagnostics^PSM^1.7|||||||P||20000214155400
    P|1|654123|||Smith^James||19630101|M|||||||||||||||20000214155900|||||||
    ||X
        M|1|EQU^RO^PSM^2.0|141.1|20000214155400
            M|2|SAC^RO^PSM^2.0|||654123|654123||1|20000214155400|O||0|0||
L|1|F
```

With option: Parameters/Host/ASTM-2.0: "Upload P and O records in worklist". This example corresponds to the situation where the response by PSM occurs when the sample has been seen by PSM (flags X and Q).

```
H|\^&|||PSM^Roche Diagnostics^PSM^1.7|||||||P||20000214155400
    P|1|654123|||Smith^James||19630101|M|||||||||||||||20000214155900|||||||
    ||X
        O|1|654123||||20000214155900|||||X||||||||||||||Q
            M|1|EQU^RO^PSM^2.0|141.1|20000214155400
                M|2|SAC^RO^PSM^2.0|||654123|654123||1|20000214155400
                |O||0|0||
L|1|F
```

This example corresponds to the situation where the response by PSM occurs when the sample has been sent to PSM but the sample was **not yet seen** by PSM (flags P and Q in P-record, flag U in M-SAC record)

```
H|\^&|||PSM^Roche Diagnostics^PSM^1.7|||||||P||20000214155400
    M|1|EQU^RO^PSM^2.0||20000214155300
        M|2|SAC^RO^PSM^2.0|||654123|654123||1|20000214155300|O|||||
L|1|F
```

With option: Parameters/Host/ASTM-2.0: "Upload P and O records in worklist":

```
H|\^&|||PSM^Roche Diagnostics^PSM^1.7|||||||P||20000214155400
    P|1|654123|||Smith^James||19630101|M|||||||||||||||20000214155900|||||||
    ||X
        O|1|654123||||20000214155900|||||P|||||||||||||||Q
            M|1|EQU^RO^PSM^2.0||20000214155300
                M|2|SAC^RO^PSM^2.0|||654123|654123||1|20000214155300|O|||||
L|1|F
```

4.3.8.4.   Example of empty response to Status Query from the Host to PSM

Query for information on sample ID "654125" but there is no information available on PSM.

```
H|\^&|||PSM^Roche Diagnostics^PSM^1.7|||||||P||20000214155400
    M|1|EQU^RO^PSM^2.0||
        M|2|SAC^RO^PSM^2.0|||654125|654125||||U|||||
L|1|I
```

With option: Parameters/Host/ASTM-2.0: "Upload P and O records in worklist":

```
H|\^&|||PSM^Roche Diagnostics^PSM^1.7|||||||P||20000214155400
    P|1|||||||||||||||||||
        O|1|654125|||||||||||||||||||||||||Z||
            M|1|EQU^RO^PSM^2.0||
                M|2|SAC^RO^PSM^2.0|||654125|654125||1||U|||||
L|1|I
```

4.3.9. Status Query from the Host to PSM <u>non</u> Roche Diagnostics ASTM 2.0

The Host can initiate this process whenever he wants. Through it, the Host can query PSM at any time the status of a specific sample. Th query can be done either by sample ID or by Patient ID. The structure of the message sent by the Host is:

Host -> PSM   Status Query

<u>H</u>   Header Segment
  <u>Q</u>   Query Record
<u>L</u>   Terminator Record

The response from PSM to the query is:

PSM -> Host   Response to Status Query

<u>H</u>   Header Segment
{
  <u>P</u>   Patient Record
   {<u>O</u>}   Order Record
}
<u>L</u>   Terminator Record

4.3.9.1. Example of Status Query from the Host to PSM by Sample ID

Query for order information on sample 654123

```
H|\^&|||ASTM-Host|||||PSM||P|1|20000214162700
     Q|1|^654123||ALL|||||||||O
L|1|F
```

Query for order information on sample 654123 with date later than 20000214155900. The date and time given shall represent either a beginning (oldest) sample registering date and time for which results are being requested or a single date and time. This kind of query requires that the host knows the exact date and time when the sample was registered in PSM!

```
H|\^&|||ASTM-Host|||||PSM||P|1|20000214162700
     Q|1|^654123||ALL||20000214155900||||||O
L|1|F
```

4.3.9.2. Example of Status Query from the Host to PSM by Patient ID

```
H|\^&|||ASTM-Host|||||PSM||P|1|20000214162700
     Q|1|1234^||ALL|||||||||O
L|1|F
```

4.3.9.3. Example of response to Status Query (from PSM to the Host)

This example corresponds to the situation where the response by PSM occurs when the sample has been seen by PSM (flags X and Q).

```
H|\^&|||PSM^Roche Diagnostics^PSM^1.7|||||||P||20000214155400
    P|1|654123|||Smith^James||19630101|M|||||||||||||||20000214155900|||||||
    ||X
        O|1|654123|^0^0^15.5^^|^^^^^^^141.1||20000214155900|||||X|||||||||||
        |||Q
L|1|F
```

This example corresponds to the situation where the response by PSM occurs when the sample has been sent to PSM but the sample was **not yet seen** by PSM (flags P and Q)


```
H|\^&|||PSM^Roche Diagnostics^PSM^1.7|||||||P||20000214155400
    P|1|654123|||Smith^James||19630101|M|||||||||||||||20000214155900|||||||
    ||X
        O|1|654123|^^^^^|^^^^^^^||20000214155900|||||P|||||||||||||||Q
L|1|F
```

4.3.9.4.   Example of empty response to Status Query from the Host to PSM

Query for information on sample ID "654125" but there is no information available on PSM.

```
H|\^&|||PSM^Roche Diagnostics^PSM^1.7|||||||P||20000214155400
    P|1||||||||||||||||||||
        O|1|654125||||||||||||||||||||||||||Z||
L|1|I
```

4.3.10. Query for Orders (from PSM to the Host)

This message is sent by PSM to the Host requesting him all orders to be sent to PSM. Some hosts are not able to send orders as soon as they are created, therefore, there is an option in PSM to ask for orders each definable period of time. The workflow is:

PSM -> Host   Query for Orders

H   Header Segment
 Q   Query Record
L   Terminator Record

The host must answer with the normal download of samples. There is no special message to answer this query but the starting of the download process from the Host.

4.3.10.1. Example of Query for Orders (from PSM to the Host)

```
H|\^&|||PSM^Roche Diagnostics^PSM^1.7||||||||P||20000214155400
     Q|1|ALL||ALL|||||||||O
L|1|N
```

4.3.10.2. Example of response to Query for Orders –Normal Download of requests- (from the Host to PSM)

```
H|\^&|||ASTM-Host
     P|1
          O|1|102001||^^^TSH\|R|20000214155500|||||A|||||||||||||||O
L|1|N
```

4.3.11. Examples of Traces

In this process, PSM sends results and all related information to the Host. PSM always initiates this

4.3.11.1.   Trace from Download of New Order

Minimum requirement when the parameter [Host – General]
"*Requested/ Ordered Date&Time not transmitted by Host?*" is **activated** in PSM.

```
Host -> <ENQ>
PSM  -> <ACK>
Host -> <STX>
Host -> 1H|\^&|||ASTM-Host|||||PSM||P||20000309155100<CR><ETX>AF<CR><LF>
PSM  -> <ACK>
Host -> 2P|1<CR><ETX>3F<CR><LF>
PSM  -> <ACK>
Host -> 3O|1|20000214004||^^^101|||||||N<CR><ETX>2E<CR><LF>
PSM  -> <ACK>
Host -> 4L|1|F<CR><ETX>FF<CR><LF>
PSM  -> <ACK>
Host -> <EOT>
```

Minimum requirement when the parameter [Host – General]
"*Requested/ Ordered Date&Time not transmitted by Host?*" is **not activated** in PSM.

```
Host -> <ENQ>
PSM  -> <ACK>
Host -> <STX>
Host -> 1H|\^&|||ASTM-Host|||||PSM||P||20000309155100<CR><ETX>AF<CR><LF>
PSM  -> <ACK>
Host -> 2P|1<CR><ETX>3F<CR><LF>
PSM  -> <ACK>
Host -> 3O|1|20000214005||^^^101||20000214123700|||||N<CR><ETX>E5<CR><LF>
PSM  -> <ACK>
Host -> 4L|1|F<CR><ETX>FF<CR><LF>
PSM  -> <ACK>
Host -> <EOT>
```

4.3.11.2.   Trace from Download of Requests in the mode 'One Test per Record' (HOST -> PSM)

```
Host -> <NULL>
Host -> <ENQ>
PSM  -> <ACK>
Host -> <STX>
Host -> 1H|\^&|||ASTM-Host|||||PSM||P||20000309155100<CR><ETX>AF<CR><LF>
PSM  -> <ACK>
Host ->
       2P|1|923500|20003484A84||López^Heredia^José||19630101|M||||||||||Gast
       ric□ulcer|||||20000218141500|||||||||||UCI<CR><ETX>C8<CR><LF>
PSM  -> <ACK>
Host -> 3O|1|923500||^^^101|||||||A<CR><ETX>37<CR><LF>
PSM  -> <ACK>
Host -> 4O|2|923500||^^^102|||||||A|||||1<CR><ETX>D7<CR><LF>
PSM  -> <ACK>
Host -> 5O|3|923500||^^^103|||||||A|||||1|||||||||||O<CR><ETX>85<CR><LF>
PSM  -> <ACK>
Host -> 6L|1|F<CR><ETX>01<CR><LF>
PSM  -> <ACK>
Host -> <EOT>
```

Note: The format of ASTM field 8.1.6. (Patient Name) is dependant of the PSM parameter setting [Host – General] "*Standard patient format (Name^First name)*"

- parameter deactivated: Last Name 1^Last Name 2^First Name
- parameter activated: Last Name^First Name

The patient name information is necessary to allow querying by name within PSM.

4.3.11.3.   Trace from Download of Requests in the mode 'One Record per Sample' (HOST -> PSM)

```
Host -> <ENQ>
PSM  -> <ACK>
Host -> <STX>
Host -> 1H|\^&|||ASTM-Host|||||PSM||P||20000309155100<CR><ETX>AF<CR><LF>
PSM  -> <ACK>
Host ->
       2P|1|923501|4637463G66||Smith^John||19630101|M||||||||||Diabetes|||||
       20000213102000|||||||||||Urology<CR><ETX>A8<CR><LF>
PSM  -> <ACK>
Host -> 3O|1|923501||^^^102|||||||A|||||1|||||||||||O<CR><ETX>81<CR><LF>
PSM  -> <ACK>
Host -> 4P|2|923502|||||||||||||||||||||||||||20000213102000<CR><ETX>CA<CR><LF>
PSM  -> <ACK>
Host -> 5O|1|923502||^^^104\^^^105\^^^^106\^^^107|||||||A<CR><ETX>C3<CR><LF>
PSM  -> <ACK>
Host -> 6L|1|F<CR><ETX>01<CR><LF>
PSM  -> <ACK>
Host -> <EOT>
```

4.3.11.4. Trace of reject of a test order

In this example the tests 102, 102 170 and 207 are requested as a new order. Later the tests 101, 102 and 170 are added to this order. As the tests 101 and 102 are already defined, PSM sends back a message.
       The PSM parameter [Host – General] "*Send errors to Host*" has to be **activated** in order that PSM sends error messages to the Host.

Host test order:

```
Host -> <ENQ>
PSM  -> <ACK>
Host -> <STX>
Host -> 1H|\^&|||ASTM-Host|||||PSM||P||20000309155100<CR><ETX>AF<CR><LF>
PSM  -> <ACK>
Host -> 2P|1<CR><ETX>3F<CR><LF>
PSM  -> <ACK>
Host -> 3O|1|20000214101||^^^101\^^^102\^^^170\^^^207|||||||N||||||||||||||
        |O<CR><ETX>69<CR><LF>
PSM  -> <ACK>
Host -> 4L|1|F<CR><ETX>FF<CR><LF>
PSM  -> <ACK>
Host -> <EOT>
```

Host add test order:

```
Host -> <ENQ>
PSM  -> <ACK>
Host -> <STX>
Host -> 1H|\^&|||ASTM-Host|||||PSM||P||20000309155100<CR><ETX>AF<CR><LF>
PSM  -> <ACK>
Host -> 2P|1<CR><ETX>3F<CR><LF>
PSM  -> <ACK>
Host -> 3O|1|20000214101||^^^101\^^^102\^^^105|||||||A|||||||||||||||O<CR>
        <ETX>4B<CR><LF>
PSM  -> <ACK>
Host -> 4L|1|F<CR><ETX>FF<CR><LF>
PSM  -> <ACK>
Host -> <EOT>
```

PSM reject certain test oders:

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  -> <STX>1H|\^&|||PSM^Roche Diagnostics^PSM^1.4B|||||||P||20000309155000
        <CR><ETX>16<CR><LF>
Host -> <ACK>
PSM  -> <STX>2P|1|20000214101||<CR><ETX>CE<CR><LF>
Host -> <ACK>
PSM  -> <STX>3O|1|20000214101||^^^101||20000309155000|||||C|||||||||||||||X
        <CR><ETX>FA<CR><LF>
Host -> <ACK>
PSM  -> <STX>4P|2|20000214101||<CR><ETX>D1<CR><LF>
Host -> <ACK>
PSM  -> <STX>5O|1|20000214101||^^^102||20000309155000|||||C|||||||||||||||X
        <CR><ETX>FD<CR><LF>
Host -> <ACK>
PSM  -> <STX>6L|1|E<CR><ETX>00<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

4.3.11.5.   Trace of delete / cancel single test order

The test 101 shall be deleted from the list of orders. The action depends on the parameter [Host – General] "*Preserve results in sample removal*"!

Host test order:

```
Host -> <ENQ>
PSM  -> <ACK>
Host -> <STX>
Host -> 1H|\^&|||ASTM-Host|||||PSM||P||20000309155100<CR><ETX>AF<CR><LF>
PSM  -> <ACK>
Host -> 2P|1<CR><ETX>3F<CR><LF>
PSM  -> <ACK>
Host ->
        3O|1|20000214102||^^^101\^^^102\^^^170\^^^207|||||||N||||||||||||||||O<
        CR><ETX>6A<CR><LF>
PSM  -> <ACK>
Host -> 4L|1|F<CR><ETX>FF<CR><LF>
PSM  -> <ACK>
Host -> <EOT>
```

Host delete test 101:

```
Host -> <ENQ>
PSM  -> <ACK>
Host -> <STX>
Host -> 1H|\^&|||ASTM-Host|||||PSM||P||20000309155100<CR><ETX>AF<CR><LF>
PSM  -> <ACK>
Host -> 2P|1<CR><ETX>3F<CR><LF>
PSM  -> <ACK>
Host -> 3O|1|20000214102||^^^101|||||||C||||||||||||||||O<CR><ETX>39<CR><LF>
PSM  -> <ACK>
Host -> 4L|1|F<CR><ETX>FF<CR><LF>
PSM  -> <ACK>
Host -> <EOT>
```

4.3.11.6. Trace of delete / cancel all open or documented test orders of a specific sample or of all samples

All tests of sample ID "20000214103" shall be deleted. The action depends on the parameter [Host – General] "*Preserve results in sample removal*"!

Host test order:

```
Host -> <ENQ>
PSM  -> <ACK>
Host -> <STX>
Host -> 1H|\^&|||ASTM-Host|||||PSM||P||20000309155100<CR><ETX>AF<CR><LF>
PSM  -> <ACK>
Host -> 2P|1<CR><ETX>3F<CR><LF>
PSM  -> <ACK>
Host ->
        3O|1|20000214103||^^^101\^^^102\^^^170\^^^207|||||||N||||||||||||||O<
        CR><ETX>6B<CR><LF>
PSM  -> <ACK>
Host -> 4L|1|F<CR><ETX>FF<CR><LF>
PSM  -> <ACK>
Host -> <EOT>
```

Host delete all tests of sample ID 20000214103:

```
Host -> <ENQ>
PSM  -> <ACK>
Host -> <STX>
Host -> 1H|\^&|||ASTM-Host|||||PSM||P||20000309155100<CR><ETX>AF<CR><LF>
PSM  -> <ACK>
Host -> 2P|1<CR><ETX>3F<CR><LF>
PSM  -> <ACK>
Host -> 3O|1|20000214103|||||||||C||||||||||||||||X<CR><ETX>97<CR><LF>
PSM  -> <ACK>
Host -> 4L|1|F<CR><ETX>FF<CR><LF>
PSM  -> <ACK>
Host -> <EOT>
```

4.3.11.7.   Trace of Order a Rerun of a test

Reruns can be initiated in two different ways:

A)

```
Host -> <NULL>
Host -> <NULL>
Host -> <ENQ>
PSM  -> <ACK>
Host -> <STX>
Host -> 1H|\^&|||ASTM-Host|||||PSM||P||20000309161800<CR><ETX>B3<CR><LF>
PSM  -> <ACK>
Host -> 2P|1<CR><ETX>3F<CR><LF>
PSM  -> <ACK>
Host -> 3O|1|923501||^^^102^^1|||||||A|||||||||||||||C<CR><ETX>31<CR><LF>
PSM  -> <ACK>
Host -> 4L|1|F<CR><ETX>FF<CR><LF>
PSM  -> <ACK>
Host -> <EOT>
```

B)

```
Host -> <ENQ>
PSM  -> <ACK>
Host -> <STX>
Host -> 1H|\^&|||ASTM-Host|||||PSM||P||20000309161800<CR><ETX>B3<CR><LF>
PSM  -> <ACK>
Host -> 2P|1<CR><ETX>3F<CR><LF>
PSM  -> <ACK>
Host -> 3O|1|923501||^^^102|||||||A|||||||||||R||||C<CR><ETX>96<CR><LF>
PSM  -> <ACK>
Host -> 4L|1|F<CR><ETX>FF<CR><LF>
PSM  -> <ACK>
Host -> <EOT>
```

4.3.11.8. Trace of Upload of Final Results

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  ->
        <STX>1H|\^&|||PSM^Roche▯Diagnostics^PSM^1.7||||||||P||20001012111200<C
        R><ETX>C9<CR><LF>
Host -> <ACK>
PSM  ->
        <STX>2P|1|923502|20001012P001||Aguado^Carmen||19630101|F||||||||||||||
        ||20001012111100|||||||||<CR><ETX>69<CR><LF>
Host -> <ACK>
PSM  ->
        <STX>3O|1|923502||ALL||20001012111100|||||X||||||||||||||||F<CR><ETX>35
        <CR><LF>
Host -> <ACK>
PSM  ->
        <STX>4R|1|^^^102^^^^225.1..D1|2.55|||N||F||||20001012111200|225.1..D1
        <CR><ETX>D3<CR><LF>
Host -> <ACK>
PSM  -> <STX>5L|1|N<CR><ETX>08<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

Transmission of a position in the archive

PSM is configured to transmit the position in the archive of a sample in the format of a result (pseudo result). The test 9996 – ARCHU is defined for this purpose.

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  ->
        <STX>1H|\^&|||PSM^Roche▯Diagnostics^PSM^1.4B|||||||P||20000310082100<
        CR><ETX>0E<CR><LF>
Host -> <ACK>
PSM  ->
        <STX>2P|1|29235022|||Smith^John^||19630101|M||||||||||||||||2000031008
        0900|||||||||<CR><ETX>C5<CR><LF>
Host -> <ACK>
PSM  ->
        <STX>3O|1|29235022||ALL||20000310080900|||||X||||||||||||||||F<CR><ETX>
        A6<CR><LF>
Host -> <ACK>
PSM  -> <STX>4R|1|^^^ARCHU^^^^|3-1-1|||N||F|||||00|<CR><ETX>FB<CR><LF>
Host -> <ACK>
PSM  -> <STX>5L|1|N<CR><ETX>08<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

Transmission of the sample's position together with the results:

The following parameters have to be set in Parameters / Host / ASTM:

√	ASTM upload (1:one test record/sample, 2:one test record/result)	2
√	Send positions when uploading results	

In the following example the results were obtain on MODULAR *ANALYTICS* No. 1 , module "P1". The sample was in position "1" of rack with the hole ID 7431 (H-ID).

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  -> <STX>1H|\^&|||PSM^Roche Diagnostics^PSM^1.7|||||||P||20001012150100
        <CR><ETX>CB<CR><LF>
Host -> <ACK>
PSM  -> <STX>2P|1|1200320|200010P002||Mustermann^Heinz||19630101|M|||||||||||
        |||||20001012111800|||||||||<CR><ETX>B9<CR><LF>
Host -> <ACK>
PSM  -> <STX>3O|1|1200320|^7431^1|^^^196^^^^225.1..P1||20001012111800|||||X|
        |||||||||||||F<CR><ETX>49<CR><LF>
Host -> <ACK>
PSM  -> <STX>4R|1|^^^196^^^^225.1..P1|356|||N||F||||20001012112300|225.1..P1
        <CR><ETX>CE<CR><LF>
Host -> <ACK>
PSM  -> <STX>5O|2|1200320|^7431^1|^^^222^^^^225.1..P1||20001012111800|||||X|
        |||||||||||||F<CR><ETX>42<CR><LF>
Host -> <ACK>
PSM  -> <STX>6R|1|^^^222^^^^225.1..P1|.016|||LL||F||||20001012112300|225.1..
        P1<CR><ETX>37<CR><LF>
Host -> <ACK>
PSM  -> <STX>7C|1|L|27|I<CR><ETX>A9<CR><LF>
Host -> <ACK>
PSM  -> <STX>0L|1|N<CR><ETX>03<CR><LF>
```

4.3.11.9.   Trace of Upload of Results with Comments and non Standard Alarms

In the situation of sample 923501, note that there is an alarm directly from the analyser MODULAR ANALYTICS DP (225.1) which is transmitted transmitted from PSM as a comment is only sent to the Host if PSM is configured to "Send non-standard alarms as comment".

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  ->
        <STX>1H|\^&|||PSM^Roche□Diagnostics^PSM^1.7|||||||P||20001012111000<C
        R><ETX>C7<CR><LF>
Host -> <ACK>
PSM  ->
        <STX>2P|1|923501|20001012P001||Aguado^Carmen||19630101|F|||||||||||||
        ||20001012110500|||||||||<CR><ETX>6B<CR><LF>
Host -> <ACK>

Host -> <ACK>
PSM  ->
        <STX>3O|1|923501||ALL||20001012110500|||||X|||||||||||||||F<CR><ETX>37
        <CR><LF>
Host -> <ACK>
PSM  ->
        <STX>4R|1|^^^102^^^^225.1..D1|2.55|||HH||F||||20001012110800|225.1..D
        1<CR><ETX>1A<CR><LF>
Host -> <ACK>
PSM  -> <STX>5C|1|I|26|I<CR><ETX>A3<CR><LF>
Host -> <ACK>
PSM  -> <STX>6L|1|N<CR><ETX>09<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

In the situation of sample 20020604102 there are results for two tests, i.e. number 205 and 263. Two general comments for the patient and the order is transmitted directly after the P-record.

The first result of test 20596 is abnormal and the original analysers' alarm code is transmitted as additional comment. The result type is "F" for final result. If this test is repeated or rerun either automatically by the analyser or as a manual repeat or rerun, this second result is transmitted to the host. The format depends on the PARAMETER / Host / General option "**Re-send preliminary result together with final result**". If the option is disabled, the result type of the second result is "C" for correction of result. However, if the option is enabled, the first result is re-transmitted to the host with result type "P" for preliminary result and the second result is transmitted with result type is "F" for final result.

Whenever a re-run/repeat is initiated due to a PSM 'Rule', a first run result is not transmitted to the host until the second result is received from the analyser. In this way both results are transmitted to the host at the same time. The test 263 has a preliminary result (P) and a final result (F). This behaviour is **not** influenced by the the PARAMETER / Host / General option "Re-send preliminary result together with final result".

The preliminary result of test 263 has two comments, one that has been added by the "Reflexive rules module" of PSM ("`C|1|L|This␣is␣a␣comment␣to␣test␣263.|G`") and the other that is passed from the instrument ("`C|2|I|26|I`"). Note that the alarm directly from the analyser MODULAR *ANALYTICS* DP (225.1 module "P1") which is transmitted from PSM as a comment is only sent to the Host if PSM is configured to "Send non-standard alarms as comment".

The there is a preliminary and a final result for test HCV which was received from instrument 142 (AMPLILINK). The both results have two comments each. Note that these comments are of the same type ("`C|1|L|Text received from instrument.|G`") as those added by the reflex rules of PSM.

First test result for test 205 with "non-standard" alarm as comment

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  -> <STX>1H|\^&|||PSM^Roche␣Diagnostics^PSM^1.09.00 Beta␣7|||||||P
            ||20020604174000<CR><ETX>8B<CR><LF>
Host -> <ACK>
PSM  -> <STX>2P|1|20020604102|4637463G66||Smith^John||19630101|M||||
            |||||||||||20020604173600|||||||||||<CR><ETX>1B<CR><LF>
Host -> <ACK>
PSM  -> <STX>3C|1|L|This␣is␣a␣comment␣to␣the␣patient␣or␣sample.|G
            <CR><ETX>AC<CR><LF>
Host -> <ACK>
PSM  -> <STX>4C|2|L|This␣is␣another␣comment␣to␣the␣patient␣or␣the␣
            sample.|G<CR><ETX>9F<CR><LF>
Host -> <ACK>
PSM  -> <STX>5O|1|20020604102||ALL|R|20020604173600|||||X||||1|||||
            |||||F<CR><ETX>BB<CR><LF>
Host -> <ACK>
PSM  -> <STX>6R|1|^^^205^^^^225.1..P1|234.1|||A||F||||20020604173900|
            225.1..P1<CR><ETX>29<CR><LF>
Host -> <ACK>
PSM  -> <STX>7C|1|I|23|I<CR><ETX>A2<CR><LF>
Host -> <ACK>
PSM  -> <STX>0L|1|N<CR><ETX>03<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

Second result for test 205
   Option "Re-send preliminary result together with final result" disabled

   "Correction" of result:


```
PSM  -> <ENQ>
Host -> <ACK>
PSM  -> <STX>1H|\^&|||PSM^Roche□Diagnostics^PSM^1.09.00 Beta□7|||||||
           P||20020604174400<CR><ETX>8F<CR><LF>
Host -> <ACK>
PSM  -> <STX>2P|1|20020604102|4637463G66||Smith^John||19630101|M||||
           |||||||||||20020604173600|||||||||<CR><ETX>1B<CR><LF>
Host -> <ACK>
PSM  -> <STX>3C|1|L|This□is□a□comment□to□the□patient□or□sample.|G
           <CR><ETX>AC<CR><LF>
Host -> <ACK>
PSM  -> <STX>4C|2|L|This□is□another□comment□to□the□patient□or□the□
           sample.|G<CR><ETX>9F<CR><LF>
Host -> <ACK>
PSM  -> <STX>5O|1|20020604102||ALL|R|20020604173600|||||X||||1|||||||
           ||||F<CR><ETX>BB<CR><LF>
Host -> <ACK>
PSM  -> <STX>6R|1|^^^205^dec^^^225.1..P1|26.6|||N||C||||
           20020604174300|225.1..P1<CR><ETX>2E<CR><LF>
Host -> <ACK>
PSM  -> <STX>7L|1|N<CR><ETX>0A<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```


Second result for test 205
   Option "Re-send preliminary result together with final result" enabled

   "Preliminary" and "Final" result:


```
PSM  -> <ENQ>
Host -> <ACK>
PSM  -> <STX>1H|\^&|||PSM^Roche□Diagnostics^PSM^1.09.00 Beta□7|||||||
           P||20020604175200<CR><ETX>8E<CR><LF>
Host -> <ACK>
PSM  -> <STX>2P|1|20020604102|4637463G66||Smith^John||19630101|M||||
           |||||||||||20020604173600|||||||||<CR><ETX>1B<CR><LF>
Host -> <ACK>
PSM  -> <STX>3C|1|L|This□is□a□comment□to□the□patient□or□sample.|G
           <CR><ETX>AC<CR><LF>
Host -> <ACK>
PSM  -> <STX>4C|2|L|This□is□another□comment□to□the□patient□or□the□
           sample.|G<CR><ETX>9F<CR><LF>
Host -> <ACK>
PSM  -> <STX>5O|1|20020604102||ALL|R|20020604173600|||||X||||1|||||||
           ||||F<CR><ETX>BB<CR><LF>
Host -> <ACK>
PSM  -> <STX>6R|1|^^^205^^^^225.1..P1|234.1|||A||P||||200206041739|
           225.1..P1<CR><ETX>D3<CR><LF>
Host -> <ACK>
```

```
PSM  -> <STX>7C|1|I|23|I<CR><ETX>A2<CR><LF>
Host -> <ACK>
PSM  -> <STX>0R|2|^^^205^dec^^^225.1..P1|26.6|||N||F||||
            20020604175100|225.1..P1<CR><ETX>2B<CR><LF>
Host -> <ACK>
PSM  -> <STX>1L|1|N<CR><ETX>04<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

Pre-liminary and Final results due to rerun initiated by PSM

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  -> <STX>1H|\^&|||PSM^Roche□Diagnostics^PSM^1.09.00 Beta□7|||||||
            P||20020604174200<CR><ETX>8D<CR><LF>
Host -> <ACK>
PSM  -> <STX>2P|1|20020604102|4637463G66||Smith^John||19630101|M||||
            |||||||||||20020604173600|||||||||<CR><ETX>1B<CR><LF>
Host -> <ACK>
PSM  -> <STX>3C|1|L|This□is□a□comment□to□the□patient□or□sample.|G
            <CR><ETX>AC<CR><LF>
Host -> <ACK>
PSM  -> <STX>4C|2|L|This□is□another□comment□to□the□patient□or□the□
            sample.|G<CR><ETX>9F<CR><LF>
Host -> <ACK>
PSM  -> <STX>5O|1|20020604102||ALL|R|20020604173600|||||X||||1|||||||
            ||||F<CR><ETX>BB<CR><LF>
Host -> <ACK>
PSM  -> <STX>6R|1|^^^263^^^^225.1..P1|174.3|||HH||P||||200206041739|
            225.1..P1<CR><ETX>2B<CR><LF>
Host -> <ACK>
PSM  -> <STX>7C|1|L|This□is□a□comment□to□test□263.|G<CR><ETX>32<CR><LF>
Host -> <ACK>
PSM  -> <STX>0C|2|I|26|I<CR><ETX>9F<CR><LF>
Host -> <ACK>
PSM  -> <STX>1R|2|^^^263^dec^^^225.1..P1|17.6|||N||F||||
            20020604174200|225.1..P1<CR><ETX>30<CR><LF>
Host -> <ACK>
PSM  -> <STX>2L|1|N<CR><ETX>05<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

The there is a preliminary and a final result for test HCV which was received from instrument 142 (AMPLILINK). The both results have two comments each. Note that these comments are of the same type ("`C|1|L`|Text received from instrument.|`G`") as those added by the reflex rules of PSM.

```
PSM  ->  <ENQ>
HOST ->  <ACK>
PSM  ->  <STX>1H|\^&|||  PSM^Roche·Diagnostics^PSM^1.8.04|||||||P
             ||20020604123400<CR><ETX>69<CR><LF>
HOST ->  <ACK>
PSM  ->  <STX>2P|1||20021001P001||Aguado^Carmen||19630101|F|||||||||||
             |||||20020604000000|||||||||<CR><ETX>38<CR><LF>
HOST ->  <ACK>
PSM  ->  <STX>3C|1|L|This·is·the·comment·for·Patient.|G<CR><ETX>CC<CR><LF>
HOST ->  <ACK>
PSM  ->  <STX>4O|1|20021001001|^0^0|^^^HCV^^^^142.1||20011001084700|
             ||||X||||1|||||||||||F<CR><ETX>03<CR><LF>
HOST ->  <ACK>
PSM  ->  <STX>5R|1|^^^HCV^^^^142.1|883|||N||P||||200110010857|142.1
             <CR><ETX>0D<CR><LF>
HOST ->  <ACK>
PSM  ->  <STX>6C|1|L|This·is·a·comment·about·the·result·HCV.|G
             <CR><ETX>EF<CR><LF>
HOST ->  <ACK>
PSM  ->  <STX>7C|2|L|And·this·is·another·comment·about·the·result·HCV.|G
             <CR><ETX>D4<CR><LF>
HOST ->  <ACK>
PSM  ->  <STX>0R|2|^^^HCV^^^^142.1|879|||N||F||||20011001085900|142.1
             <CR><ETX>66<CR><LF>
HOST ->  <ACK>
PSM  ->  <STX>1C|1|L|This·is·a·comment·about·the·repeat·result·HCV.|G
             <CR><ETX>8B<CR><LF>
HOST ->  <ACK>
PSM  ->  <STX>2C|2|L|And·this·is·another·comment·about·the·repeat·
             result·HCV.|G<CR><ETX>70<CR><LF>
HOST ->  <ACK>
PSM  ->  <STX>3L|1|N<CR><ETX>06<CR><LF>
HOST ->  <ACK>
PSM  ->  <EOT>
```

4.3.11.10. Trace of Upload of 'Sample Seen' message' (PSM -> HOST)[6]

Roche Diagnostics ASTM 2.0

Sample was seen at Modular 1 (225.1)

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  -> <STX>1H|\^&|||PSM^Roche⬛Diagnostics^PSM^1.7|||||||P||20001012120500
        <CR><ETX>CC<CR><LF>
Host -> <ACK>
PSM  -> <STX>2M|1|EQU^RO^PSM^2.0|225.1|20001012120500<CR><ETX>7C<CR><LF>
Host -> <ACK>
PSM  -> <STX>3M|2|SAC^RO^PSM^2.0|||1200322|1200322||1|20001012120500|O||7431
        |2||<CR><ETX>FB<CR><LF>
Host -> <ACK>
PSM  -> <STX>4L|1|N<CR><ETX>07<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

Sample was seen at the manual scan place

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  -> <STX>1H|\^&|||PSM^Roche⬛Diagnostics^PSM^1.7|||||||P||20001012121200
        <CR><ETX>CA<CR><LF>
Host -> <ACK>
PSM  -> <STX>2M|1|EQU^RO^PSM^2.0|999.1|20001012121200<CR><ETX>8C<CR><LF>
Host -> <ACK>
PSM  -> <STX>3M|2|SAC^RO^PSM^2.0|||1200322|1200322||1|20001012121200|O||1
        |2||<CR><ETX>5B<CR><LF>
Host -> <ACK>
PSM  -> <STX>4L|1|N<CR><ETX>07<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

Sample was seen at Modular 1 (225.1) with option: Parameters/Host/ASTM-2.0: "Upload P and O records in worklist":

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  -> <STX>1H|\^&|||PSM^Roche⬛Diagnostics^PSM^1.7|||||||P||20001012124000
        <CR><ETX>CB<CR><LF>
Host -> <ACK>
PSM  -> <STX>2P|1|00123A490|000209A01||Meier^||19630101|M||||||||||||||||||
        20001012123500|||||||||||<CR><ETX>C7<CR><LF>
Host -> <ACK>
PSM  -> <STX>3O|1|00123A490|||||||||X|||20001012124000|1||||||||||225.1|P
        <CR><ETX>31<CR><LF>
Host -> <ACK>
PSM  -> <STX>4M|1|EQU^RO^PSM^2.0|225.1|20001012124000<CR><ETX>7D<CR><LF>
Host -> <ACK>
PSM  ->
        <STX>5M|2|SAC^RO^PSM^2.0|||00123A490|00123A490||1|20001012124000|O||6
        030|1||<CR><ETX>E9<CR><LF>
Host -> <ACK>
PSM  -> <STX>6L|1|N<CR><ETX>09<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

---

[6] Roche Diagnostics ASTM 2.0 format

Sample was seen at MODULAR PRE-ANALYTICS (273.1) with option: Parameters/Host/ASTM-2.0:
"Upload P and O records in worklist":

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  -> <STX>1H|\^&|||PSM^Roche□Diagnostics^PSM^1.09.00 Beta□7|||||||P
            ||20020603155700<CR><ETX>90<CR><LF>
Host -> <ACK>
PSM  -> <STX>2P|1||3547266||Anders^Marion||19750101|F|||||||||||||
            ||20020604110200|||||||||<CR><ETX>65<CR><LF>
Host -> <ACK>
PSM  -> <STX>3O|1|0S020603205|||||||||X|||20020603155700|1||||||||
            ||273.1|P<CR><ETX>B7<CR><LF>
Host -> <ACK>
PSM  -> <STX>4M|1|EQU^RO^PSM^2.0|273.1|20020603155700<CR><ETX>92<CR><LF>
Host -> <ACK>
PSM  -> <STX>5M|2|SAC^RO^PSM^2.0|||0S020603205|0S020603205||1
            |20020603155700|O||2004|1||<CR><ETX>DA<CR><LF>
Host -> <ACK>
PSM  -> <STX>6L|1|N<CR><ETX>09<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

A sample was sorted at the AQS of MODULAR PRE-ANALYTICS (273.1) with option:
Parameters/Host/ASTM-2.0: "Upload P and O records in worklist":

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  -> <STX>1H|\^&|||PSM^Roche□Diagnostics^PSM^1.09.00 Beta□7|||||||P
            ||20020603155700<CR><ETX>90<CR><LF>
Host -> <ACK>
PSM  -> <STX>2P|1||3547266||Anders^Marion||19750101|F|||||||||||||
            ||20020604110200|||||||||<CR><ETX>65<CR><LF>
Host -> <ACK>
PSM  -> <STX>3O|1|0S020603205|||||||||X|||20020603155700|1||||||||
            ||273.1|P<CR><ETX>B7<CR><LF>
Host -> <ACK>
PSM  -> <STX>4M|1|EQU^RO^PSM^2.0|273.1|20020603155700<CR><ETX>92<CR><LF>
Host -> <ACK>
PSM  -> <STX>5M|2|SAC^RO^PSM^2.0|||0S020603205|0S020603205||1
            |20020603155700|R|**AQS-RACK**|16|5||||1<CR><ETX>DE<CR><LF>
Host -> <ACK>
PSM  -> <STX>6L|1|N<CR><ETX>09<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

4.3.11.11. Trace of 'Work Lists' message[7]

Roche Diagnostics ASTM 2.0

In this example, PSM is uploading information of the distribution of tray number 2 of the **device** 225.1 (which will be associated to **Modular-Analytics**).

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  -> <STX>1H|\^&|||PSM^Roche□Diagnostics^PSM^1.7|||||||P||20001012121700
          <CR><ETX>CF<CR><LF>
Host -> <ACK>
PSM  -> <STX>2M|1|EQU^RO^PSM^2.0|225.1|20001012121700<CR><ETX>7F<CR><LF>
Host -> <ACK>
PSM  -> <STX>3M|3|SAC^RO^PSM^2.0|||923501|923501||2|20001012121700|O||1|2||2
          <CR><ETX>48<CR><LF>
Host -> <ACK>
PSM  -> <STX>4M|4|SAC^RO^PSM^2.0|||923502|923502||2|20001012121700|O||1|3||2
          <CR><ETX>4D<CR><LF>
Host -> <ACK>
PSM  -> <STX>5M|5|SAC^RO^PSM^2.0|||1200320|1200320||1|20001012121700|O||1|4||2
          <CR><ETX>95<CR><LF>
Host -> <ACK>
PSM  -> <STX>6M|6|SAC^RO^PSM^2.0|||1200321|1200321||1|20001012121700|O||1|5||2
          <CR><ETX>9A<CR><LF>
Host -> <ACK>
PSM  ->
          <STX>7M|2|SAC^RO^PSM^2.0|||00123A457|00123A457||1|20001012121700|O||1
          |1||2<CR><ETX>8F<CR><LF>
Host -> <ACK>
PSM  -> <STX>0L|1|N<CR><ETX>03<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

In this example, PSM is uploading information of the distribution of tray number 4 of the **device** 225.1 (which will be associated to **Modular-Analytics**) with option: Parameters/Host/ASTM-2.0: "Upload P and O records in worklist":

By activating this option, the list of tests that have to be done on the target instrument are transmitted back to the host with each information about the sample's position.

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  -> <STX>1H|\^&|||PSM^Roche□Diagnostics^PSM^1.7|||||||P||20001012130000
          <CR><ETX>C8<CR><LF>
Host -> <ACK>
PSM  -> <STX>2P|1|1003|P20001002||Mueller^Martin||19600101|M|||||||||||||||||
          20001012125700|||||||||||<CR><ETX>0F<CR><LF>
Host -> <ACK>
PSM  -> <STX>3O|1|1003||^^^196^^^^225.1.4|||||||X||||1||||||||||225.1.4|P
          <CR><ETX>62<CR><LF>
Host -> <ACK>
PSM  -> <STX>4M|1|EQU^RO^PSM^2.0|225.1.4|20001012125900<CR><ETX>E9<CR><LF>
Host -> <ACK>
PSM  -> <STX>5M|2|SAC^RO^PSM^2.0|||1003|1003||1|20001012125900|O||1|1||4
          <CR><ETX>6F<CR><LF>
Host -> <ACK>
PSM  -> <STX>6P|2|1005|P20001002||Mueller^Martin||19600101|M|||||||||||||||||
          20001012125700|||||||||||<CR><ETX>16<CR><LF>
Host -> <ACK>
PSM  -> <STX>7O|1|1005||^^^196^^^^225.1.4|||||||X||||1||||||||||225.1.4|P
```

---

[7] Roche Diagnostics ASTM 2.0 format

```
              <CR><ETX>68<CR><LF>
Host -> <ACK>
PSM  -> <STX>0M|1|EQU^RO^PSM^2.0|225.1.4|20001012125900<CR><ETX>E5<CR><LF>
Host -> <ACK>
PSM  -> <STX>1M|2|SAC^RO^PSM^2.0|||1005|1005||1|20001012125900|O||1|3||4
              <CR><ETX>71<CR><LF>
Host -> <ACK>
PSM  ->
              <STX>2P|3|1006|P20001002||Mueller^Martin||19600101|M||||||||||||||||20
              001012125700|||||||||<CR><ETX>14<CR><LF>
Host -> <ACK>
PSM  ->
              <STX>3O|1|1006||^^^193^^^^225.1.4||||||||X||||1||||||||||||225.1.4|P<CR><
              ETX>62<CR><LF>
Host -> <ACK>
PSM  -> <STX>4M|1|EQU^RO^PSM^2.0|225.1.4|20001012125900<CR><ETX>E9<CR><LF>
Host -> <ACK>
PSM  -> <STX>5M|2|SAC^RO^PSM^2.0|||1006|1006||1|20001012125900|O||1|4||4
              <CR><ETX>78<CR><LF>
Host -> <ACK>
PSM  -> <STX>6P|4|1011|P20001003||Meier^Hans||19500201|M|||||||||||||||
              20001012125700|||||||||<CR><ETX>51<CR><LF>
Host -> <ACK>
PSM  -> <STX>7O|1|1011||^^^196^^^^225.1.4||||||||X||||1||||||||||225.1.4|P
              <CR><ETX>65<CR><LF>
Host -> <ACK>
PSM  -> <STX>0M|1|EQU^RO^PSM^2.0|225.1.4|20001012125900<CR><ETX>E5<CR><LF>
Host -> <ACK>
PSM  -> <STX>1M|2|SAC^RO^PSM^2.0|||1011|1011||1|20001012125900|O||1|2||4
              <CR><ETX>6A<CR><LF>
Host -> <ACK>
PSM  -> <STX>2P|5|1200321|200010P002||Mustermann^Heinz||19630101|M|||||||||||
              |||||20001012112700|||||||||<CR><ETX>BE<CR><LF>
Host -> <ACK>
PSM  -> <STX>3O|1|1200321||^^^193^^^^225.1.4\^^^196\^^^222|||||||X||||1|||||
              ||||225.1.4|P<CR><ETX>16<CR><LF>
Host -> <ACK>
PSM  -> <STX>4M|1|EQU^RO^PSM^2.0|225.1.4|20001012125900<CR><ETX>E9<CR><LF>
Host -> <ACK>
PSM  -> <STX>5M|2|SAC^RO^PSM^2.0|||1200321|1200321||1|20001012125900|O||1|5|
              |4<CR><ETX>9D<CR><LF>
Host -> <ACK>
PSM  -> <STX>6P|6|1200322|200010P002||Mustermann^Heinz||19630101|M|||||||||||
              |||||20001012120300|||||||||<CR><ETX>BF<CR><LF>
Host -> <ACK>
PSM  -> <STX>7O|1|1200322||^^^193^^^^225.1.4\^^^196\^^^222|||||||X||||1|||||
              ||||225.1.4|P<CR><ETX>1B<CR><LF>
Host -> <ACK>
PSM  -> <STX>0M|1|EQU^RO^PSM^2.0|225.1.4|20001012125900<CR><ETX>E5<CR><LF>
Host -> <ACK>
PSM  -> <STX>1M|2|SAC^RO^PSM^2.0|||1200322|1200322||1|20001012125900|O||2|1|
              |4<CR><ETX>98<CR><LF>
Host -> <ACK>
PSM  -> <STX>2P|7|00123M456|0002090P01||Mustermann^Marion||19590101|F|||||||
              ||||||||20001012105000|||||||||<CR><ETX>B1<CR><LF>
Host -> <ACK>
PSM  -> <STX>3O|1|00123M456||^^^193^^^^225.1.4\^^^222|||||||X||||1|||||||||
              225.1.4|P<CR><ETX>89<CR><LF>
Host -> <ACK>
PSM  -> <STX>4M|1|EQU^RO^PSM^2.0|225.1.4|20001012125900<CR><ETX>E9<CR><LF>
Host -> <ACK>
PSM  -> <STX>5M|2|SAC^RO^PSM^2.0|||00123M456|00123M456||1|20001012125900|O||
              2|2||4<CR><ETX>AD<CR><LF>
Host -> <ACK>
PSM  -> <STX>6L|1|N<CR><ETX>09<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

4.3.11.12.   Trace of Status Query from the Host to PSM by Sample ID

```
Host -> <ENQ>
PSM  -> <ACK>
Host -> <STX>
Host -> 1H|\^&|||||||||ASTM-Host<CR><ETX>C5<CR><LF>
PSM  -> <ACK>
Host -> 2Q|1|^00123M456||ALL|||||||||O<CR><ETX>FC<CR><LF>
PSM  -> <ACK>
Host -> 3L|1|N<CR><ETX>06<CR><LF>
PSM  -> <ACK>
Host -> <EOT>
```

4.3.11.13.   Trace of response to Status Query (from PSM to the Host)[8]

Roche Diagnostics ASTM 2.0

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  ->
       <STX>1H|\^&|||PSM^Roche␣Diagnostics^PSM^1.7||||||||P||20001012105000<C
       R><ETX>CA<CR><LF>
Host -> <ACK>
PSM  -> <STX>2M|1|EQU^RO^PSM^2.0||20001012105000<CR><ETX>82<CR><LF>
Host -> <ACK>
PSM  ->
       <STX>3M|2|SAC^RO^PSM^2.0|||00123M456|00123M456||1|20001012105000|O|||
       ||<CR><ETX>08<CR><LF>
Host -> <ACK>
PSM  -> <STX>4L|1|F<CR><ETX>FF<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

4.3.11.14.   Trace of empty response to Status Query from the Host to PSM[9]

Roche Diagnostics ASTM 2.0

Query for information on sample ID "00123A459" but there is no information available on PSM.

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  ->
       <STX>1H|\^&|||PSM^Roche␣Diagnostics^PSM^1.7||||||||P||20001012104700<C
       R><ETX>D0<CR><LF>
Host -> <ACK>
PSM  -> <STX>2M|1|EQU^RO^PSM^2.0||<CR><ETX>D6<CR><LF>
Host -> <ACK>
PSM  ->
       <STX>3M|2|SAC^RO^PSM^2.0|||00123A459|00123A459||||U|||||<CR><ETX>1F<C
       R><LF>
Host -> <ACK>
PSM  -> <STX>4L|1|F<CR><ETX>FF<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

---

[8] Roche Diagnostics ASTM 2.0 format
[9] Roche Diagnostics ASTM 2.0 format

Query for information on Patient ID " 000209A01" but there is no information available on PSM.

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  ->
        <STX>1H|\^&|||PSM^Roche Diagnostics^PSM^1.7|||||||P||20001012122600<C
        R><ETX>CF<CR><LF>
Host -> <ACK>
PSM  -> <STX>2P|1||000209A01|||||||||||||||||||<CR><ETX>C4<CR><LF>
Host -> <ACK>
PSM  -> <STX>3M|1|EQU^RO^PSM^2.0||<CR><ETX>D7<CR><LF>
Host -> <ACK>
PSM  -> <STX>4M|2|SAC^RO^PSM^2.0||||||||U|||||<CR><ETX>6E<CR><LF>
Host -> <ACK>
PSM  -> <STX>5L|1|F<CR><ETX>00<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

4.3.11.15. Trace of Upload of 'Sample Seen' message' (PSM -> HOST)

Sample was seen at Modular 1 (225.1)

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  ->
        <STX>1H|\^&|||PSM^Roche Diagnostics^PSM^1.4B|||||||P||20000309160700<
        CR><ETX>19<CR><LF>
Host -> <ACK>
PSM  ->
        <STX>2P|1|923501|||Aguado^Mínguez^Carmen||19630101|F|||||||||||||||20
        000309155000|||||||||<CR><ETX>D1<CR><LF>
Host -> <ACK>
PSM  ->
        <STX>3O|1|923501|^5110^1|^^^^^^^225.1|||||||X|||20000309160700|1|||||
        ||||225.1|P<CR><ETX>DE<CR><LF>
Host -> <ACK>
PSM  -> <STX>4L|1|N<CR><ETX>07<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

Sample was seen at the manual scan place

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  ->
        <STX>1H|\^&|||PSM^Roche Diagnostics^PSM^1.4B|||||||P||20000310082100<
        CR><ETX>0E<CR><LF>
Host -> <ACK>
PSM  ->
        <STX>2P|1|29235022|||Smith^John^||19630101|M|||||||||||||||||2000031008
        0900|||||||||<CR><ETX>C5<CR><LF>
Host -> <ACK>
PSM  ->
        <STX>3O|1|29235022|^1^1|^^^^^^^999.1|||||||X|||2000031082100|1||||||||
        ||999.1|P<CR><ETX>96<CR><LF>
Host -> <ACK>
PSM  -> <STX>4L|1|N<CR><ETX>07<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

4.3.11.16. Trace of 'Work Lists' message

In this example, PSM is uploading information of the distribution of tray number 1 of the **device** 225.1 (which will be associated to **Modular-Analytics**).

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  ->
        <STX>1H|\^&|||PSM^Roche□Diagnostics^PSM^1.4B|||||||P||20000309170500<
        CR><ETX>18<CR><LF>
Host -> <ACK>
PSM  ->
        <STX>2P|1|20000214105|||^|||||||||||||||||||||20000309155000|||||||||<CR
        ><ETX>79<CR><LF>
Host -> <ACK>
PSM  ->
        <STX>3O|1|20000214105|^1^2|^^^101^^^^225.1.1\^^^136|||||||X||||1|||||
        ||||225.1.1|P<CR><ETX>D8<CR><LF>
Host -> <ACK>
PSM  ->
        <STX>4P|2|20000214106|||^|||||||||||||||||||||20000309155000|||||||||<CR
        ><ETX>7D<CR><LF>
Host -> <ACK>
PSM  ->
        <STX>5O|1|20000214106|^1^1|^^^136^^^^225.1.1|||||||X||||1|||||||||225
        .1.1|P<CR><ETX>D2<CR><LF>
Host -> <ACK>
PSM  -> <STX>6L|1|N<CR><ETX>09<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

4.3.11.17. Trace of Status Query from the Host to PSM by Sample ID

```
Host -> <ENQ>
PSM  -> <ACK>
Host -> <STX>
Host -> 1H|\^&|||ASTM-Host|||||PSM||P||20000309155100<CR><ETX>AF<CR><LF>
PSM  -> <ACK>
Host -> 2Q|1|^923501||ALL|||||||||O<CR><ETX>4E<CR><LF>
PSM  -> <ACK>
Host -> 3L|1|F<CR><ETX>FE<CR><LF>
PSM  -> <ACK>
Host -> <EOT>
```

4.3.11.18. Trace of response to Status Query (from PSM to the Host)

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  ->
        <STX>1H|\^&|||PSM^Roche□Diagnostics^PSM^1.4B|||||||P||20000309160100<
        CR><ETX>13<CR><LF>
Host -> <ACK>
PSM  ->
        <STX>2P|1|923501|||Aguado^Mínguez^Carmen||19630101|F||||||||||||||||20
        000309155000|||||||||X<CR><ETX>29<CR><LF>
Host -> <ACK>
PSM  ->
        <STX>3O|1|923501||||20000309155000|||||P||||||||||||||||Q<CR><ETX>6D<CR
        ><LF>
Host -> <ACK>
PSM  -> <STX>4L|1|F<CR><ETX>FF<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

4.3.11.19. Trace of empty response to Status Query from the Host to PSM

Query for information on sample ID " 123456" but there is no information available on PSM.

```
Host -> <EOT>
PSM  -> <ENQ>
Host -> <ACK>
PSM  ->
        <STX>1H|\^&|||PSM^Roche□Diagnostics^PSM^1.4B|||||||P||20000310092100<
        CR><ETX>0F<CR><LF>
Host -> <ACK>
PSM  -> <STX>2P|1|||||||||||||||||||||||<CR><ETX>F7<CR><LF>
Host -> <ACK>
PSM  -> <STX>3O|1|123456||||||||||||||||||||||||||||||Z||<CR><ETX>66<CR><LF>
Host -> <ACK>
PSM  -> <STX>4L|1|I<CR><ETX>02<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

Query for information on Patient ID "923501" but there is no information available on PSM.

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  ->
        <STX>1H|\^&|||PSM^Roche□Diagnostics^PSM^1.4B|||||||P||20000309160000<
        CR><ETX>12<CR><LF>
Host -> <ACK>
PSM  -> <STX>2P|1||923501||||||||||||||||||<CR><ETX>2B<CR><LF>
Host -> <ACK>
PSM  -> <STX>3O|1|||||||||||||||||||||||||Z||<CR><ETX>31<CR><LF>
Host -> <ACK>
PSM  -> <STX>4L|1|I<CR><ETX>02<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

4.4. Single Query Mode

⚠ The 'Single Query Mode' can only be used when samples are distributed via the 'Manual Scan' place of PSM. In this mode all sample tubes <u>have to be</u> scanned **manually** within PSM.

As we discussed in chapter 3.2.2, if PSM operates in Query mode there is one main process between PSM and the Host: the PSM Single Query. In this query PSM asks to the Host for the tests from a specific sample. As this process is related to a manual interaction in Manual Scanplace PSM screen, this process has the highest priority and, after PSM query, PSM waits a definable timeout for the answer from the Host.

The other communication processes (Batch Download of Requests, Upload of results from PSM to the Host, etc.) are also allowed in both ASTM protocols (ASTM and ASTM-SF) but it is strongly recommended that they are not executed at the same time that the Single Query. In PSD protocol, the only supported process is the Single Query, all other communication processes are not supported for it.

PSM Query mode can work with three different protocols: ASTM, ASTM-SF (ASTM Single Frame) and PSD. This protocol has to be selected in PSM options. Following there is a description of the this process for both ASTM protocols (ASTM and ASTM-SF). The PSD protocol is defined in detail in Chapter 5.

4.4.1. Single Query from Manual Scanplace (ASTM and ASTM-SF protocols)

In this process, PSM queries the Host for a individual sample and the Host must answer with the tests for this specific sample. In the case of ASTM protocol, the frame would be:

<u>PSM -> Host</u>   Single Query

<u>H</u>   Header Segment
 <u>Q</u>   Query Record
<u>L</u>   Terminator Record

The mandatory fields to be filled in this process are:

PSM queries the Host for SID1

Patient Record	P|SEQ1|
Order Record	Q|SEQ1|^SID1||ALL|||||||||O

The answer from the Host will be in the same format as the normal Download of Requests (see Chapter 4.3.1).

Host -> PSM	Request

<u>H</u>	Header Segment
{	
<u>P</u>	Patient Record
{<u>O</u>}	Order Record
}	
<u>L</u>	Terminator Record

The mandatory fields to be filled in this process are:

Host answers to a query by PSM for SID1

Patient Record	P|SEQ1|**SID1**

The only difference between ASTM and ASTM-SF will be in the Low Level part of ASTM (see chapter 4.1.2 for detailed description).

4.4.1.1.   Example Trace of Query Mode (ASTM)

PSM queries to Host, Host has tests to order.

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  ->.<STX>1H|\^&|||PSM^RocheDiagnostics^PSM^0.87|||||||P||
        19990723102000<CR><ETX>00<CR><LF>
Host -> <ACK>
PSM  ->.<STX>2Q|1|^823502||ALL|||||||||O<CR><ETX>4E<CR><LF>
Host -> <ACK>
PSM ->.<STX>3L|1|F<CR><ETX>FE<CR><LF>
Host -> <ACK>
PSM  -> <EOT>


Host -> <ENQ>
PSM  -> <ACK>
Host -> <STX>
Host -> 1H|\^&|||<CR><ETX>59<CR><LF>
PSM  -> <ACK>
Host -> 2P|1|823502<CR><ETX>EF<CR><LF>
PSM  -> <ACK>
Host -> 3O|1|823502||^^^AFMA^^^\^^^LDH\^^^GOT\^^^GPT\^^^YGT\^^^ALKF^^^\
        ^^^BILT^^^\^^^BILD^^^\^^^AMYL^^^\^^^LIPA^^^\^^^FERR^^^\^^^CRP\
        ^^^IGG\^^^IGA\^^^IGM\^^^U\^^^U1\^^^U2\^^^FE\^^^CA|||||||A|||||||||||||
        |||O<CR><ETX>B2<CR><LF>
Host -> 4L|1|F<CR><ETX>FF<CR>
PSM  -> <ACK>
Host -> <EOT>
```

PSM queries to Host, but Host has no Test Orders pending.

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  -> <STX>1H|\^&|||PSM^Roche□Diagnostics^PSM^0.87|||||||P||
         19990723101900<CR><ETX>28<CR><LF>
Host -> <ACK>
PSM  -> <STX>2Q|1|^823501||ALL|||||||||O<CR><ETX>4D<CR><LF>
Host -> <ACK>
PSM  -> <STX>3L|1|F<CR><ETX>FE<CR><LF>
Host -> <ACK>
PSM  -> <EOT>


Host -> <ENQ>
PSM  -> <ACK>
Host -> <STX>1H|\^&||||<CR><ETX>59<CR><LF>
PSM  -> <ACK>
Host -> <STX>2P|1|823501<CR>EE<CR><LF>
PSM  -> <ACK>
Host -> <STX>3L|1|F<CR><ETX>FE<CR><LF>
PSM  -> <ACK>
Host -> <EOT>
```

4.4.1.2.   Example Trace of Query Mode (ASTM-SF)

PSM is set not to give back ANY error !

PSM queries to Host, Host has got a single Test to order .

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  -> <STX>1H|\^&|||PSM^Roche□Diagnostics^PSM^0.86|||||||P||
         19990701140800<CR>Q|1|^123460||ALL|||||||||O<CR>L|1|F<CR><ETX>02<CR><
         LF>
Host -> <ACK>
PSM  -> <EOT>


Host -> <ENQ>
PSM  -> <ACK>
Host -> <STX>
Host -> 1H|\^&|||<CR>P|1|123460<CR>O|1|123460||^^^TSHB^^^|||||||A||||
         ||||||||||O<CR>L|1|F<CR><ETX>A5<CR><LF>
PSM  -> <ACK>
Host -> <EOT>
```

PSM queries to Host, Host has got many Tests to order

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  -> <STX>1H|\^&|||PSM^Roche□Diagnostics^PSM^0.86|||||||P||
         19990701144300<CR>Q|1|^123462||ALL||||||||||O<CR>L|1|F<CR><ETX>03<CR><
         LF>
Host -> <ACK>
PSM  -> <EOT>


Host -> <ENQ>
PSM  -> <ACK>
Host -> <STX>
Host -> 1H|\^&|||<CR>P|1|123462<CR>O|1|123462||^^^AFMA^^^\^^^LDH\
         ^^^GOT\^^^GPT\^^^YGT\^^^ALKF^^^\^^^BILT^^^\^^^BILD^^^\
         ^^^AMYL^^^\^^^LIPA^^^\^^^FERR^^^\^^^CRP\^^^IGG\^^^IGA\
         ^^^IGM\^^^U\^^^U1\^^^U2\^^^FE\^^^CA|||||||A||||||||||||||||O<CR>L|1|F<
         CR><ETX>53<CR><LF>
PSM  -> <ACK>
Host -> <EOT>
```

PSM queries to Host, but Host has no Test Orders pending.

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  -> <STX>1H|\^&|||PSM^Roche□Diagnostics^PSM^0.86|||||||P||
         19990701142700<CR>Q|1|^100077||ALL||||||||||O<CR>L|1|F<CR><ETX>02<CR><
         LF>
Host -> <ACK>
PSM  -> <EOT>


Host -> <ENQ>
PSM  -> <ACK>
Host -> <STX>
Host -> 1H|\^&|||<CR>P|1|100077<CR>L|1|F<CR><ETX>D6<CR><LF>
PSM  -> <ACK>
Host -> <EOT>
```

PSM is set to give back errors !

Ordered test is not defined in PSM .

```
PSM  -> <ENQ>
Host -> <ACK>
PSM  -><STX>1H|\^&|||PSM^Roche Diagnostics^PSM^0.86|||||||P||
        19990701145800<CR>Q|1|^234593||ALL||||||||||O<CR>L|1|F<CR><ETX>11<CR><
        LF>
Host -> <ACK>
PSM  -> <EOT>


Host -> <ENQ>
PSM  -> <ACK>
Host -> <STX>
Host -> 1H|\^&<CR>P|1|234593<CR>O|1|234593||^^^XXXX|R||||||A||
        |||||||||||||O<CR>L|1|N<CR><ETX>B4<CR><LF>
PSM  -> <ACK>
Host -> <EOT>


PSM  -> <ENQ>
Host -> <ACK>
PSM  -> <STX>1H|\^&|||PSM^Roche Diagnostics^PSM^0.86|||||||P||
        19990701145100<CR><ETX>23<CR><LF>
Host -> <ACK>
PSM  -> <STX>2P|1|234593||<CR><ETX>ED<CR><LF>
Host -> <ACK>
PSM  -> <STX>3O|1|234593||^^^XXXX||19990701145800|||||C|||||||||
        ||||||X<CR><ETX>05<CR><LF>
Host -> <ACK>
PSM  -> <STX>4L|1|E<CR><ETX>FE<CR><LF>
Host -> <ACK>
PSM  -> <EOT>
```

5. PSD protocol definition

! The 'PSD protocol' can only be used when samples are distributed via the 'Manual Scan' place of PSM. In this mode all sample tubes <u>have to be</u> scanned **manually** within PSM.

It is NOT POSSIBLE to connect ANY analyzer to PSM when the PSD protocol is used due to the limitations of the protocol itself.

5.1. Overview

The PSD protocol for PSM follows the protocol defined for Roche PSD1 Sorter / Decapper System. The communication between PSM and the Host is done by means of a so-called ACK-NAK-Protocol, i. e. an Acknowledge / Not-Acknowledge-Protocol. Each correctly received data record becomes acknowledged by "ACK". Only then a data record can be sent back in reply. If a data record has been identified as non-correct an "NAK" is sent back in return; as a consequence the message must be transmitted anew. Correct transmission of the message must take place within a period of time ("Timeout") which is predefined as 10 s.

The basic workflow consists only of a INIT packet from PSM to the Host followed by a Host answer and, after that, PSM queries to the Host for each individual sample and the Host answers with tests.

5.2. Workflow

In the following we give you a typical example for the transmission of data between PSM and the Host from the beginning to the end. In the next figure only basics are displayed and therefore "ACKs" are ignored.

PSM (Master)		**HOST (Slave)**
Start of Communication. For synchronization purposes PSM always starts up with the Enquiry Packet.	Packet 1 (ENQUIRY) ---------> Packet 2 (INIT) ---------->	
	<-------------- Packet 2 (INIT)-	HOST answers with the appropriate INIT string
The Barcode is sent.	Packet 4: Identification of Barcode ------------>	
	Packet 5: <-----------------Test Requisitions	The tests, which can be found on the basis of the sample barcode are sent.

5.3.   Description of records

5.3.1.   Record 1: Enquiry Packet:

Start <STX>	Packet-Length (3 spaces)	Packet-Number (2 spaces)	Packet-type „E"	Space	Check-Sum	End <ETX>
1	3	2	1	1	2	1

The Enquiry Packet serves synchronization purposes and is sent by PSM when communication starts.

5.3.2.   Record 2: Init Packet:

Start <STX>	Packet-Length (3 spaces)	Packet-Number (2 spaces)	Packet-type „I"	Flags (Space)	Check-Sum	End <ETX>
1	3	2	1	1	2	1

This packet is sent immediately after the Enquiry packet when the communication starts. The Host must answer with the same packet. The Flags field is assumed as space in PSM.

5.3.3.   Record 3: Data Packet "Barcode Identification":

Start <STX>	Packet-Length	Packet-number	Packet-type„D"	Space	Data type „BI"	Barcode	Rack-number (4 spaces)	Rack-position (0)	Check-Sum	End <ETX>
1	3	2	1	1	2	12	4	4	2	1

This data packet is used to transmit the scanned barcode from the PSM to the Host. The expected reply is "Test Requisition" data packet.

The field „Racknumber" is not used and filled up with blanks (20_{hex}).The field „Rackposition" is not used, too. It is assumed a "0" value in PSM. After this „DBI" packet a „DDW" packet is expected from the HOST EDP. Every other packet received results in a „NAK" answer. The „Barcode" field has a length of 12 bytes.

5.3.4.   Record 4: Data Packet "Test Requisition"

Start <STX>	Packet-length	Packet-number	Packet-type„D"	Sp ace	Data type „DW"	Barcode	Sequence number	Lab.-number (12 spaces)	Tets	Check-Sum	End <ETX>
1	3	2	1	1	2	12	16	12	[0..971] ,,,[0..959]	2	1

This packet contains the test requisitions (specimen request profile) which are transmitted from the Host to PSM. The „Barcode" field has a length of 12 bytes. The Host has to respond with the same length of barcode as sent by "Barcode Identification" record.

 "Sequencenumber" and "Lab.-number" are not used by PSM Software. They can be kept empty. „Tests" includes the short form for the test requisitions of each specimen. The <u>fixed length</u> of each request is 8 bytes. All signs except blanks (20_{hex}) are valid. Blanks within these eight characters proceeding or succeeding the request short are ignored.
Ex.:   <   GOT>   becomes   <GOT>
          <T3   >   becomes <T3>
          <T3 T4 >   becomes <T3T4>.

Usually requests with fewer than 8 characters are sent with leading spaces.
Depending on the length of the barcode it is possible to sent 121 or 119 requests by use of one packet (1024 bytes per packet are possible).

In the next chapter it is possible to find some traces which describe this protocol.

5.4.   Examples of communication

5.4.1.   Basic Query

In this process, PSM queries the Host for a individual sample and the Host must answer with the tests for this specific sample. In the case of PSD protocol, the records would be:

PSM queries the Host for SID1 (PSD protocol)

Barcode Identification record	.....D.BI0000000SID1....

5.4.2.   Trace sample
The character "space" [32] has been replaced by "␣" for clarity.

```
PSM  -> <STX>␣␣␣␣␣E␣07<ETX>->
Host -> <ACK>
PSM  -> <STX>␣␣␣␣␣I␣0;<ETX>->
Host -> <ACK>
Host -> <STX>␣␣␣␣␣I␣0;<ETX>
PSM  -> <ACK>
PSM  -> <STX>␣␣␣␣␣D␣BI000099099996    00004=<ETX>
Host -> <ACK>
Host -> <STX>␣␣␣␣␣D␣DW0000990999960000990999996                         TSHB␣␣␣␣
         4:<ETX>
PSM  -> <ACK>
PSM  -> <STX>␣␣␣␣␣D␣BI000099099997    00004><ETX>
Host -> <ACK>
Host -> <STX>␣␣␣␣␣D␣DW0000990999970000990999997                         FERRIT␣␣
         CEAB␣␣␣␣32<ETX>
PSM  -> <ACK>
PSM  -> <STX>␣␣␣␣␣D␣BI000099099998    00004?<ETX>
Host -> <ACK>
Host -> <STX>␣␣␣␣␣D␣DW0000990999980000990999998                         ALFA␣␣␣␣
         MA␣␣␣␣␣␣DHEAS␣␣␣ATRYP␣␣␣APOA1    APOB␣␣␣␣OROSO␣␣␣LDH␣␣␣␣␣GOT␣␣␣␣␣GPT␣
         ␣␣␣␣YGT␣␣␣␣␣ALKFOS␣␣BILTOT␣␣BILDIR␣␣AMYL␣␣␣␣CHE␣␣␣␣␣LIPASE␣␣GLDH␣␣␣␣␣
         FERRIT␣␣TRANS␣␣␣IGG␣␣␣␣␣IGA␣␣␣␣␣IGM␣␣␣␣␣FE␣␣␣␣␣␣␣T
PSM  -> <ACK>
```

6. HL7 Protocol Definition

6.1.   Overview

HL7 or "Health Level 7" is one the widest and most common protocols in the healthcare environment. Nevertheless, the standard is so wide and complex that we are going to use only a reduced subset of it.

The HL7 Standard currently addresses the interfaces among various systems that send or receive patient admissions/registration, discharge or transfer (ADT) data, queries, resource and patient scheduling, orders, results, clinical observations, billing, master file update information, medical records, scheduling, patient referral, and patient care. It does not try to assume a particular architecture with respect to the placement of data within applications but is designed to support a central patient care system as well as a more distributed environment where data resides in departmental systems.

In PSM version 1.7 and onwards, HL7 v2.3 and v2.4 is implemented. When receiving PSM understands HL7 v2.3 and 2.4 messages if they are properly coded. For the transmission either HL7 v2.3 or v2.4 have to be selected. However, some of the messages will only be transmitted in v2.4 style (i.e. SSU^U03 messages).

6.2.   Low Level Protocol

6.2.1.   Physical communication

The standard HL7 refers to the highest level of the Open System Interconnection (OSI) model of the International Standards Organization (ISO). This is not to say that HL7 conforms to ISO defined elements of the OSI's seventh level. Also, HL7 does not specify a set of ISO approved specifications to occupy layers 1 to 6 under HL7's abstract message specifications.

The HL7 Standard is primarily focused on the issues that occur within the seventh, or application, level. These are the definitions of the data to be exchanged, the timing of the exchanges, and the communication of certain application-specific errors between the applications. However, there are some recommendations that we followed to implement HL7 for PSM.

Therefore, we decided to implement the primary physical link only through Ethernet network interface. PSM HL7 interface is going to work always as a socket server process with a definable socket number which will allow other client process to link to it.

6.2.2. Minimal Low-Level Protocol

In order to introduce message orientation to a stream-oriented TCP/IP protocol, a Minimal Low-Level Protocol (MLLP) was proposed. This subchapter contains a very brief overview of MLLP. HL7 messages are enclosed by special characters to form a block. The format is as follows:

<SB>dddd<EB><CR>

<SB> =   Start Block character (1 byte)
                ASCII <VT>, i.e., <0x0B>. This should not be confused with the ASCII characters
                SOH or STX.

dddd =   Data (variable number of bytes)
                This is the HL7 data content of the block. The data can contain any displayable ASCII
                characters and the carriage return character, <CR>.

<EB> =   End Block character (1 byte)
                ASCII <FS>, i.e., <0x1C>. This should not be confused with the ASCII characters ETX or EOT.

<CR> =   Carriage Return (1 byte)
                The ASCII carriage return character, i.e., <0x0D>.

The characters used for begin and end of the message is configurable in the [Host-HL7] section of the Parameters folder in PSM. By default, the values are <VT> for <SB> and <FS> for <EB>.

6.3. High Level Protocol

6.3.1.   General definitions

In this chapter, we are going to define the HL7 concepts that we are going to use all over the document.

6.3.1.1.   HL7 Messages

A HL7message is the atomic unit of data transferred between systems. It is comprised of a group of segments in a defined sequence. Each message has a message type that defines its purpose. A three-character code contained within each message identifies its type. These are listed in the Message Type list, Appendix A of HL7 2.3 Definition.

The real-world event that initiates an exchange of messages is called a trigger event. HL7 2.3 Appendix A contains the codes that represent all defined trigger events. These codes represent values such as a patient is admitted or a order event occurred.

There is a one-to-many relationship between message types and trigger event codes. The same trigger event code may not be associated with more than one message type; however a message type may be associated with more than one trigger event.

All message types and trigger event codes beginning with the letter "Z" are reserved for locally-defined messages. No such codes will be defined within the HL7 Standard.

6.3.1.2.   HL7 Segments

A segment is a logical grouping of data fields. Segments of a message may be required or optional. They may occur only once in a message or they may be allowed to repeat. Each segment is given a name. For example, the ORU message may contain the following segments: Message Header (MSH), Patient ID (PID), Observation Request (OBR), and one or multiple Observation/Result (OBX). Each segment is identified by a unique three-character code known as the Segment ID.

All segment ID codes beginning with the letter **Z** are reserved for locally-defined messages. No such codes will be defined within the HL7 Standard.

6.3.1.3.   HL7 Fields

A field is a string of characters. HL7 does not care how systems actually store data within an application. When fields are transmitted, they are sent as character strings. Except where noted, HL7 data fields may take on the null value. Sending the null value, which is transmitted as two double quote marks (""), is different from omitting an optional data field. The difference appears when the contents of a message will be used to update a record in a database rather than create a new one. If no value is sent, (i.e., it is omitted) the old value should remain unchanged. If the null value is sent, the old value should be changed to null.

Position (sequence within the segment)
Ordinal position of the data field within the segment. This number is used to refer to the data field in the text comments that follow the segment definition table. In the segment attribute tables this information is in a column labeled "Seq".

Maximum length
Maximum number of characters that one occurrence of the data field may occupy. It is calculated to include the component and subcomponent separators that are defined below. Because the maximum length is that of a single occurrence, the repetition separator is not included in calculating the maximum length. In the segment attribute tables this information is in a column labeled "Max. Length".

Data type
Restrictions on the contents of the data field. There are a number of data types defined by HL7. These are explained in chapter "6.3.1.4 Data Records and Fields". In the segment attribute tables this information is in a column labeled "Data Type".

Optionality
Whether the field is required, optional, or conditional in a segment. The designations are:

    R   -   required by PSM, or sent unconditionally by PSM
    O   -   optional
    C   -   conditional on the trigger event or on some other field(s)
    -      -   not used

In the segment attribute tables this information is in the column labeled "From Host" for information sent from the host to PSM and in the column labeled "To Host" for information sent from PSM to the host.

Repetition

Whether the field may repeat. The designations are:

N   -   no repetition
Y   -   the field may repeat an indefinite or site determined number of times
(integer) -   the field may repeat up to the number of times specified in the integer

Each occurrence may contain the number of characters specified by the field's maximum length. In the segment attribute tables this information is in a column labeled "Repeat".

6.3.1.4.   Data Records and Fields

HL7 defines many data types. The table below contains only some examples of data types used in this specification. For details please refer to HL7 2.3 documentation chapter *2.8 Data Types.*

Data Type Category/ Data type	Data Type Name	Notes/Format
Alphanumeric		
ST	String	
Numerical		
NM	Numeric	
SI	Sequence ID	
SN	Structured numeric	\<comparator\> ^ \<num1 (NM)\> ^ \<separator/suffix\> ^ \<num2 (NM)\>
NA	Numeric Array	\<value1 (NM)\> ^ \<value2 (NM)\> ^ \<value3 (NM)\> ^ ...
Identifier		
ID	Coded values for HL7 tables	
IS	Coded value for user-defined tables	
HD	Hierarchic designator	\<namespace ID (IS)\> ^ \<universal ID (ST)\> ^ \<universal ID type (ID)\> Used only as part of EI and other data types.
EI	Entity identifier	\<entity identifier (ST)\> ^ \<namespace ID (IS)\> ^ \<universal ID (ST)\> ^ \<universal ID type (ID)\>
PT	Processing type	\<processing ID (ID)\> ^ \<processing mode (ID)\>
Date/Time		
TS	Time stamp	YYYY[MM[DD[HHMM[SS[.S[S[S[S]]]]]]]][+/-ZZZZ] ^ \<degree of precision\>
Code Values		
CX	Extended composite ID with check digit	\<ID (ST)\> ^ \<check digit (ST)\> ^ \<code identifying the check digit scheme employed (ID)\> ^ \< assigning authority (HD))\> ^ \<identifier type code (IS)\> ^ \< assigning facility (HD)
XCN	Extended composite ID number and name	\<ID number (ST)\> ^ \<family name (ST)\> ^ \<given name (ST)\> ^ \<middle initial or name (ST)\> ^ \<suffix (e.g., JR or III) (ST)\> ^ \<prefix (e.g., DR) (ST)\> ^ \<degree (e.g., MD) (ST)\> ^ \<source table (IS)\> ^ \<assigning authority (HD)\> ^ \<name type code (ID)\> ^ \<identifier check digit (ST)\> ^ \<code identifying the check digit scheme employed (ID)\> ^ \<identifier type code (IS)\> ^ \<assigning facility (HD)\>
Generic		
CM	Composite	
Demographics		
XPN	Extended person name	\<family name (ST)\> ^ \<given name (ST)\> ^ \<middle initial or name (ST)\> ^ \<suffix (e.g., JR or III) (ST)\> ^ \<prefix (e.g., DR) (ST)\> ^ \<degree (e.g., MD) (ST)\> ^ \<name type code (ID) \>
XTN	Extended telecommunications number	[**N**NN] [(999)]999-9999 [X99999] [B99999] [C any text] ^ \<telecom-munication use code (ID)\> ^ \<telecommunication equipment type (ID)\> ^ \<email address (ST)\> ^ \<country code (NM)\> ^ \<area/city code (NM)\> ^ \<phone number (NM)\> ^ \<extension (NM)\> ^ \<any text (ST)\>
Time Series:		
TQ	Timing/quantity	\<quantity (CQ)\> ^ \<interval (*)\> ^ \<duration (*)\> ^ \<start date/time (TS)\> ^ \<end date/time (TS)\> ^ \<priority (ID)\> ^ \<condition (ST)\> ^ \<text (TX)\> ^ \<conjunction (ID)\> ^ \<order sequencing (*)\>

6.3.2.   MSH – message header segment

The MSH segment defines the intent, source, destination, and some specifics of the syntax of a message.

Seq/HL7 field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
	Message Header Segment	**ST**	**3**	**R**	**R**		Identifier for MSH segment (MSH)
1 00001	Field Separator	ST	1	R	R		This field contains the separator between the segment ID and the first real field, MSH-2- encoding characters. As such it serves as the separator and defines the character to be used as a separator for the rest of the message. Recommended value is |, (ASCII 124).
2 00002	Encoding Characters	ST	4	R	R		This field contains the four characters in the following order: the component separator, repetition separator, escape character, and subcomponent separator. Recommended values are ^~\&, (ASCII 94, 126, 92, and 38, respectively).
3 00003	Sending Application	HD	180	O	R		This field uniquely identifies the sending application among all other applications within the network enterprise. The network enterprise consists of all those applications that participate in the exchange of HL7 messages within the enterprise.
4 00004	Sending Facility	HD	180	O	R		This field contains the address of one of several occurrences of the same application within the sending system. Absent other considerations, the Medicare Provider ID might be used with an appropriate sub-identifier in the second component.
5 00005	Receiving Application	HD	180	O	R		This field uniquely identifies the receiving application among all other applications within the network enterprise. The network enterprise consists of all those applications that participate in the exchange of HL7 messages within the enterprise.
6 00006	Receiving Facility	HD	180	O	R		This field identifies the receiving application among multiple identical instances of the application running on behalf of different organizations.
7 00007	Date/Time Of Message	TS	14	O	R		This field contains the date/time that the sending system created the message. If the time zone is specified, it will be used throughout the message as the default time zone.
8 00008	Security	ST	40	-	-		Not used

Seq/HL7 field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
9 00009	Message Type	CM	7	R	R		This field contains the message type and trigger event for the message. The first component is the message type and the second is the trigger event code. We are going to work with: HL7v2.3: 　ORM^O01 (Order message) 　ORU^R01 (Result/unsolicited) 　ORR^O02 (Order Acknowledgment) HL7v2.4: 　OML^O21 (Order Message) 　OUL^R21 (Unsolicited Result upload) 　ORL^O22 (Order Acknowledgement) All versions: 　SSU^U03 (Sample Seen Message, Worklists or Response to SSR^U04) 　ACK^(repeats the event of the Acknowledged message) 　SSR^U04 (Specimen Status Request)
10 00010	Message Control ID	ST	20	R	R		This field contains a number or other identifier that uniquely identifies the message. The receiving system echoes this ID back to the sending system in the Message acknowledgment segment (MSA).
11 00011	Processing ID	PT	3	R	R		This field is used to decide whether to process the message as defined in HL7 Application (level 7) Processing rules,. The first component defines whether the message is part of a production, training, or debugging system. In PSM is only supported P value. .The second component defines whether the message is part of an archival process or an initial load . This allows different priorities to be given to different processing modes.
12 00012	Version ID	ID	8	R	R		This field is matched by the receiving system to its own HL7 version to be sure the message will be interpreted correctly. Can be 2.3 or 2.4 according to the types of messages used. For sending: Parameters/Host/HL7: 'Use version (1: v2.3, 2: v2.4) when sending''
13 00013	Sequence Number	NM	15	-	-		A non-null value in this field implies that the sequence number protocol is in use. This numeric field is incremented by one for each subsequent value.
14 00014	Continuation Pointer	ST	180	-	-		

Seq/HL7 field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
15 00015	Accept Acknowledgment Type	ID	2	O	R		This field identifies the conditions under which accept acknowledgments are required to be returned in response to this message. Required for enhanced acknowledgment mode. Possibilities are: AL Always NE Never ER Error/reject conditions only (default) SU Successful completion only PSM is going to send results always with the ER flag.
16 00016	Application Acknowledgment Type	ID	2	O	R		This field contains the conditions under which application acknowledgments are required to be returned in response to this message. Possibilities are: AL Always NE Never ER Error/reject conditions only (default) SU Successful completion only PSM is going to send results always with the ER flag.
17 00017	Country Code	ID	2	-	-		
18 00692	Character Set [Hl7-575]	ID	6	O	R		This field contains the character set for the entire message. PSM is going to assume 8859/1 character set as default.
19 00693	Principal Language Of Message	CE	60	-	-		

6.3.3.   MSA – message acknowledgment segment

Seq/HL7 field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
	Message Acknowledgement Segment	ST	3	R	R		Identifier for MSA segment (MSA)
1 00018	Acknowledgment Code	ID	2	R			This field contains an acknowledgment code:
					-		AA Application acknowledgment: Accept
					-		AE Application acknowledgment: Error
					-		AR Application acknowledgment: Reject
					R		CA Accept acknowledgment: Commit Accept
					R		CE Accept acknowledgment: Commit Error
					-		CR Accept acknowledgment: Commit Reject
2 00010	Message Control ID	ST	20	R	R		This field contains the message control ID of the message sent by the sending system. It allows the sending system to associate this response with the message for which it is intended.
3 00020	Text Message	ST	80	C	C		This optional field further describes an error condition.
4 00021	Expected Sequence Number	NM	15	-	-		Not used
5 00022	Delayed Acknowledgment Type	ID	1	-	-		Not used
6 00023	Error Condition	CE	100	C	-		This field allows the acknowledging system to use a user-defined error code to further specify acknowledgments.

6.3.4.   ERR – error segment

The ERR segment is used to add error comments to acknowledgment messages. PSM is going to send an explanation of the error in the field 00020 (third field of the MSA segment)

6.3.5.   NTE – notes and comments segment

The NTE segment can include any comment to any HL7 segment. PSM is going to send this record when it has comments to some test results.

Seq/HL7 field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
	Comment Segment	**ST**	**3**	**R**	**R**		Identifier for NTE segment (NTE)
1 00096	Set ID – NTE	SI	4	-	-		This field can be used for supporting many NTE segments within the same message.
2 00097	Source of Comment	ID	8	-	R		This field is used when source of comment must be identified. PSM uses L for sending comments.
3 00098	Comment	FT	64k	-	R	Y	This field contains the comment contained in the segment.

6.3.6.   PID – patient identification segment

It contains the patient information. This is sent from the Host to PSM when sending orders and it is sent back from PSM to Host when returning test results.

Seq/HL7 field	Field Name	Data Type	Max. Length	From Host	To Host	Repe at	Comments
	Patient Identification Segment	**ST**	**3**	**R**	**R**		Identifier for PID segment (PID)
1 00104	Set ID – Patient ID	SI	4	O	R		This field contains the number that identifies this transaction. For the first occurrence of the segment, the sequence number shall be one, for the second occurrence, the sequence number shall be two, etc.
2 00105	Patient ID (External ID)	CX	20	O	R		The content can be configured in Mantenance/Host/Configuration/HL7options to be: ‐ Empty, ‐ Sample ID, or ‐ Patient ID
3 00106	Patient ID (Internal ID)	CX	20	O	R	Y	The content can be configured in Mantenance/Host/Configuration/HL7options to be: ‐ Empty, ‐ Sample ID, or ‐ Patient ID
4 00107	Alternate Patient ID – PID	CX	20	O	O	Y	The content can be activated in Mantenance/Host/Configuration/Demographics/Aditional Patient Demog. 2
5 00108	Patient Name	XPN	42	O	R	Y	Patient name with the format: Family name^Given name^ Middle or initial name^Suffix^Prefix e.g. Dr^Degree^Name type Only Family name and Name are stored in the database, the other fields are ignored
6 00109	Mother's Maiden Name	XPN	48	-	-		Not used
7 00110	Date/Time of Birth	TS	14	O	R		Contains the patient's date and time of birth. Format: YYYY[MM[DD[HHMM[SS]]]]
8 00111	Sex	IS	1	O	R		This field contains the patient's sex. Sex for suggested values are: F - Female M - Male O - Other U - Unknown
9 00112	Patient Alias	XPN	48	-		Y	Not used
10 00113	Race	IS	1	-			Not used

11
00114
	Patient Address	XAD	106	O	O	Y	The content can be activated in Mantenance/Host/Configuration/Demographics
							  Component 1: Aditional Patient Demog. 3
							  Component 3: Aditional Patient Demog. 4
							  Component 4: Aditional Patient Demog. 5

12 00115	County Code	IS	4	-			Not used
13 00116	Phone Number – Home	XTN	40	-		Y	Not used
14 00117	Phone Number – Business	XTN	40	-		Y	Not used
15 00118	Primary Language	CE	60	-			Not used
16 00119	Marital Status	IS	1	-			Not used
17 00120	Religion	IS	3	-			Not used
18 00121	Patient Account Number	CX	20	-			Not used
19 00122	SSN Number – Patient	ST	16	-			The content can be activated in Mantenance/Host/Configuration/Demographics/ Aditional Patient Demog. 1
20 00123	Driver's License Number – Patient	DLN	25	-			Not used
21 00124	Mother's Identifier	CX	20	-		Y	Not used
22 00125	Ethnic Group	IS	3	O	O		W – White, B – Black, O – asian/pacific islander, NA – native american/alaskan native, H - hispanic
23 00126	Birth Place	ST	60	-			Not used
24 00127	Multiple Birth Indicator	ID	2	-			Not used
25 00128	Birth Order	NM	2	-			Not used
26 00129	Citizenship	IS	4	-		Y	Not used
27 00130	Veterans Military Status	CE	60	-			Not used
28 00739	Nationality	CE	80	-			Not used
29 00740	Patient Death Date and Time	TS	26	-			Not used
30 00741	Patient Death Indicator	ID	1	-			Not used

6.3.7.   ZPD or PCD – patient code details segment

In HL7 v2.3 the segment is named PCD while in HL7 v2.4 the segment is named ZPD. Both names are accepted by PSM. This segment is only received by PSM.

Seq/HL7 field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
	Patient Details Segment	**ST**	**3**	**R**	**R**		Identifier for PCD or ZPD segment
1	Expected Date of Birth	TS	8	O	-		Expected Date of Birth (Gestational age (in days) = 280 - (EDOB - Collection Date)
2	Menstruation Cycle / Menopause	CE	80	O	-		Menstruation Cycle / Post-Menopause (PRE, FOL, OVU, LUT, POST)
3	Active Medication	CE	200	-	-	Y	Not used
4	Species	CE	80	-	-		Not used

6.3.8.   PV1 – patient visit segment

This segment gives information about the patient. This segment is only received by PSM.

Seq/HL7 field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
	Patient Visit Segment	**ST**	**3**	**R**	**R**		Identifier for PV1 segment
1 00131	Set ID - PV1	SI	4	O	-		Set ID, only a single set is supported
2 00132	Patient Class	IS	1	-	-		Not used
3 00133	Assigned Patient Location (Ward)	PL	80	O	-		Assigned Patient Location (Ward)
4 00134	Admission Type	IS	2	-	-		Not used
5 00135	Preadmit Number	CX	20	-	-		Not used
6 00136	Prior Patient Location	PL	80	-	-		Not used
7 00137	Attending Doctor (Requester)	XCN	60	-	-	Y	Not used
8 00138	Referring Doctor	XCN	60	-	-	Y	Not used
9 00139	Consulting Doctor	XCN	60	-	-	Y	Not used
10 00140	Hospital Service	IS	3	O	-	Y	Hospital Service

6.3.9.   ORC – common order segment

The Common Order segment (ORC) is used to transmit fields that are common to all orders. It is used to transmit orders from Host to PSM and, eventually, by PSM as a error response to an order from Host.

Seq/HL7 field	Field Name	Data Type	Max. Length	From Host	To Host	Repe at	Comments
	Common Order Segment	**ST**	**3**	**R**	**R**		Identifier for ORC segment (ORC)
1 00215	Order Control	ID	2	R	R		Determines the function of the order segment. Detailed description is shown below.
2 00216	Placer Order Number	EI	13	R/O	R		Sample ID. This is the same ID that PSM sends in PID segment (Patient external ID, HL7 00105) and the same that the Host should send in OBR segment (HL7 00216). Optional in HL7v2.4.
3 00217	Filler Order Number	EI	22	-	-		Not used
4 00218	Placer Group Number	EI	22	-	-		Not used
5 00219	Order Status	ID	2	O	C		This field is the status of an order. The purpose of this field is to report the status of an order either upon request (solicited), or when the status changes (unsolicited). CM Order is completed HD Order on hold IP In process. Unspecified SC In process, scheduled CA Sample cancelled ER Sample not found RP Order has been replaced (repeat)
6 00220	Response Flag	ID	1	-	-		Not used
7 00221	Quantity/Timing	TQ	200	O	R		The format is: Components: <quantity (CQ)> ^ <interval (CM)> ^ <duration (ST)> ^ <start date/time (TS)> ^ <end date/time (TS)> ^ **<priority (ID)>** ^ <condition (ST)> ^ <text (TX)> ^ <conjunction (ID)>^ <order sequencing (CM)> PSM is going to support only Priority flag with two flags allowed: R Routine (default) S STAT If any other value is encountered, routine value is assumed.
8 00222	Parent	CM	200	-	-		Not used
9 00223	Date/Time of Transaction	TS	14	-	C		Date and time where the transaction took place. Format is Yyyymmddhhmmss
10 00224	Entered By	XCN	120	-	-		Not used
11 00225	Verified By	XCN	120	-	-		Not used

Seq/HL7 field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
12 00226	Ordering Provider	XCN	120	O	O		The content can be activated in Mantenance/Host/Configuration/Demographics/Aditional Sample Demog. 1
13 00227	Enterer's Location	PL	80	-	-		Not used
14 00228	Call Back Phone Number	XTN	40	-	-	Y/2	Not used
15 00229	Order Effective Date/Time	TS	26	-	-		Not used
16 00230	Order Control Code Reason	CE	200	O	O		The content can be activated in Mantenance/Host/Configuration/Demographics/Aditional Sample Demog. 3
17 00231	Entering Organization	CE	60	-	-		Not used
18 00232	Entering Device	CE	60	-	-		Not used
19 00233	Action By	XCN	120	-	-		Not used

Field Order Control (HL7 00215)

From Host to PSM:

Value	Description
NW	New order
CA	Cancel order request
XO	Change order request
RE	Observations to follow

From PSM to Host:

Value	Description
OK	Order accepted & OK
UA	Unable to Accept Order
OC	Order canceled
CR	Canceled as requested
UC	Unable to cancel
UX	Unable to change
XR	Changed as requested
RE	Observations to follow
SC	Status changed

6.3.10.   OBR – observation request segment

The Observation Request segment defines the attributes of a particular request for diagnostic services or clinical observations. When a placer requests a given set of observations, always include an order segment. For lab tests, the information in the order segment usually applies to a single specimen. However, there is not a one-to-one relationship between specimen and tests ordered.

Different test batteries will usually require their own order segments even when they can be performed on a single specimen. In this case, the specimen information must be duplicated in each of the order segments that employ that specimen.

In PSM, OBR segments must go after ORC segments in order to order requests when sending from Host to PSM and, when sending from PSM to Host, OBR segments are going to be used in addition to PID and OBX segments.

Seq/HL7 field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
	Observation Request Segment	ST	3	R	R		Identifier for OBR segment (OBR)
1 00237	Set ID – OBR			R	R		Sequence number (1 for the first 2 for the second, etc.)
2 00216	Placer Order Number			O	R		Sample ID. Must be identical to ORC 00216. PSM is going to put the same number to PID 00105 when sending to the Host.
3 00217	Filler Order Number +			-	-		Not used
4 00238	Universal Service ID			R	R		Components: **<identifier (ST)> ^** <text (ST)> **^** <name of coding system (ST)> ^ <alternate identifier (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (ST)> This field is the identifier code for the requested observation/test/battery. This can be based on local and/or "universal" codes. In PSM we are going to consider only local codes (<identifier (ST)>). When uploading results from PSM to the Host, PSM is going to fill in this field with string 'ALL'.
5 00239	Priority	ID	2	-	-		Same as HL7 00221 in ORC segment (Quantity/Timing).

Seq/HL7 field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
6 00240	Requested Date/time	TS	26	O	R		Depending on PSM flag 'Requested/ Ordered Date&Time not submitted by Host?' can be optional or required to Host. If the check is not marked, PSM will expect a valid Date and Time to uniquely specify a sample within the lab. If not marked, PSM will assign the current Date and Time to a sample. PSM will always fill this field when sending results.
7 00241	Observation Date/Time #	TS	14	-	-		This field shall represent the date and time the specimen was collected or obtained.
8 00242	Observation End Date/Time #	TS	26	-	-		Not supported
9 00243	Collection Volume *	CQ	20	-	-		Not supported
10 00244	Collector Identifier *	XCN	60	-	-		Not supported
11 00245	Specimen Action Code *	ID	1	O	-		The possibilities are: A Add ordered tests to the existing Specimen R Revised order S Schedule the tests specified below See below a complete description of all combinations of flags generating the different PSM actions.
12 00246	Danger Code	CE	60	-	-		Not used
13 00247	Relevant Clinical Info.	ST	300	-	-		Not used
14 00248	Specimen Received Date/Time *	TS	26	-	-		Not used

Seq/HL7 field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
15 00249	Specimen Source *	CM	300	-	R		Specimen descriptor. The PSM specimens can be mapped to the hosts specimens descriptions. The global ^LUMOSH should be set like Serum ^LUMOSH(1)="SER" Urine ^LUMOSH(2)="UR" CSF ^LUMOSH(3)="CSF" Supernatant: ^LUMOSH(4)="SUPER" Other: ^LUMOSH(5)="ORH" for the most common specimen types. The index of ^LUMOSH is the "Specimen code" defined in PSM. If ^LUMOSH(n) is not defined for "n", the number "n" is transmitted to the host. **NOTE: In case test results for more than one specimen types are uploaded for one sample ID, only the first type (by number) is sent in these field.** The 7th component indicates the role of the sample: • P or blank — Patient • Q — Control specimen e.g. SER^^^^^^Q is serum control
16 00226	Ordering Provider	XCN	80	-	-	Y	Not used
17 00250	Order Callback Phone Number	XTN	40	-	-	Y/2	Not used
18 00251	Placer field 1	ST	50	O	O		The content can be activated in Mantenance/Host/Configuration/Demographics/Aditional Sample Demog. 2
19 00252	Placer field 2	ST	50	O	O		The content can be activated in Mantenance/Host/Configuration/Demographics/Aditional Sample Demog. 4
20 00253	Filler Field 1 +	ST	60	O			Host Codes to upload the results in the format: HCode1^HCode2^…
21 00254	Specimen Quality (Filler Field 2 +)	ST	1	-	C		Quality Code of the specimen (nothing for normal, I for Icteric, L for Lipemic, etc.) It the Host knows this information, it can be sent from Host to PSM. PSM can change this value and send it back if not normal.
22 00255	Results Rpt/Status Chg Time+	TS	26	-	-		Not used
23 00256	Charge to Practice +	CM	40	O	O		The content can be activated in Mantenance/Host/Configuration/Demographics/Aditional Sample Demog. 5
24 00257	Diagnostic Serv Sect ID	ID	100	O	O		Patient's known or suspected diagnose. It is stored by PSM and sent back to the Host.
25 00258	Result Status +	ID	1	-	-		Not used
26 00259	Parent Result +	CM	400	-	-		Not used

Seq/HL7 field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
27 00221	Quantity/Timing	TQ	200	C	R	Y	Not used
28 00260	Result Copies To	XCN	150	-	-	Y/5	Not used
29 00261	Parent	CM	150	-	-		Not used
30 00262	Transportation Mode	ID	20	-	-		Not used
31 00263	Reason for Study	CE	300	-	-	Y	Not used
32 00264	Principal Result Interpreter +	CM	200	-	-		Not used
33 00265	Assistant Result Interpreter +	CM	200	-	-	Y	Not used
34 00266	Technician + (User login signature)	CM	200	-	O		PSM will send the user login signature if it is configured to do that.
35 00267	Transcriptionist +	CM	200	-	-	Y	Not used
36 00268	Scheduled Date/Time +	TS	26	-	-		Not used
37 01028	Number of Sample Containers *	NM	4	-	-		Not used
38 01029	Transport Logistics of Collected Sample *	CE	60	-	-	Y	Not used
39 01030	Collector's Comment *	CE	200	-	-	Y	Not used
40 01031	Transport Arrangement Responsibility	CE	60	-	-		Not used
41 01032	Transport Arranged	ID	30	-	-		Not used
42 01033	Escort Required	ID	1	-	-		Not used
43 01034	Planned Patient Transport Comment	CE	200	-	-	Y	Not used

Field Action Code (HL7 00245)

The value of this field, if sent after the fields Order Control and Order Status from ORC segment, determines different actions when the Host is downloading samples to PSM.

From Host to PSM:

Action	Order Control (ORC 1 – 00215)	Order Status (ORC 5 – 00219)	Action Code (OBR 11 - 00245)
Add Test Order	NW	-	A
Delete Test Order	XO	A	R
Rebuild New Sample	XO	-	R
Delete the complete sample	XO	CA	R
Delete the complete sample	CA	-	R
Change in PID (added, deleted, changed)	XO	SC	R
Rerun	XO	RP	G

From PSM to Host:

Action	Order Control (ORC 2 – 00215)	Order Status (ORC 5 – 00219)	Action Code (OBR 11 - 00245)
Upload Sample Seen message	RE	IP	-
Upload results	RE	-	-
Answer to Query	SR	IP	-
Action cancelled: no tests found associated to sample	UA	CA	-
Upload controls	RE	IP	-
Answer to Query: sample not found	SR	-	-
Sample not found	SR	ER	-

6.3.11.   TCD – test code details segment

The TCD segment is used to give any further details about a test measure. PSM is going to send this record when it has dilution information to test results.

Seq/HL7 field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
	Comment Segment	**ST**	**3**	**-**	**C**		Identifier for TCD segment (TCD)
1 00096	Set ID – TCD	SI	4	-	-		This field can be used for supporting many TCD segments within the same message.
2 00238	Universal Service Identifier	CE	8	-	R		Components: **<identifier (ST)> ^** <text (ST)> **^** <name of coding system (ST)> ^ <alternate identifier (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (ST)> This field is the identifier code for the requested observation/test/battery. This can be based on local and/or "universal" codes. In PSM we are going to consider only local codes (<identifier (ST)>).
3 01420	Auto-Dilution Factor	ST	15	O	C		From Host: Automatic Dilution applied to the sample by the analyser. With analyser fixing: e.g. 284**.**1**.**50 With analyser group fixing: e.g. 284**..**50 Without analyser fixing: e.g. **..**50
4 01421	Rerun Dilution Factor	ST	3	-	-		
5 01422	Pre-Dilution Factor	ST	3		-		
6 01413	Endogenous Content of Pre-Dilution Diluent	NM	20	-	-		
7 01423	Automatic Rerun Allowed	ID	1	-	-		
8 01424	Reflex Allowed	ID	1	-	-		
9 01425	Analyte Repeat Status	CE	200	-	-		

6.3.12.   OBX – observation/ result segment

The OBX segment is used to transmit a single observation for a test result. It is used by PSM to upload results to Host. When sent by the Host as part of an observation order PSM ignores it.

Seq/HL7 field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
	Observation Result Segment	**ST**	**3**	**R**	**R**		Identifier for OBX segment (OBX)
1 00569	Set ID – OBX	SI	10	O	O		Sequence number (1 for the first 2 for the second, etc.)
2 00570	Value Type	ID	2	C	C		Not used by PSM. PSM does not distinguish between different value result types.
3 00571	Observation Identifier	CE	590	R	R		Universal Test ID (same as ORC #4, field 00238)
4 00572	Observation Sub-ID	ST	20	-	-		Not used
5 00573	Observation Value	*	65536 [10]	-	R	Y[11]	Data/Measurement value
6 00574	Units	CE	60	-	O		Units of the results
7 00575	References Range	ST	10	-	-		Not used

[10] **The length of the observation value field is variable, depending upon value type. See OBX-2-value type.**

[11] **May repeat for multipart, single answer results with appropriate data types, e.g., CE, TX, and FT data types.**

Seq/HL7 field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
8 00576	Abnormal Flags	ID	5	-	R	Y/5	This field shall indicate the normalcy status of the last result. The characters for representing significant changes either up or down or abnormal values shall be: Null - No range defined, or normal Ranges don't apply L - below low normal H - above high normal LL - below panic normal HH - above panic high < - below absolute low that is off low scale on an instrument > - above absolute high, that is off high scale on an instrument N - normal A - abnormal U - significant change up D - significant change down B - better, use when direction not Relevant or not defined W - worse, use when direction not Relevant or not defined In PSM there will be a correspondence between analysers alarms and standard ASTM alarms. In addition there is a switch in PSM to choose either upload to the Host non-defined alarms or ignore them. If an alarm from an analyser is not defined in the correspondence of alarms, this alarm will be uploaded to the Host in HL7 OBX 00581.
9 00577	Probability	NM	5	-	-		Not used
10 00578	Nature of Abnormal Test	ID	2	-	-	Y	Not used
11 00579	Observ Result Status	ID	8	R	R		This field contains the observation result status. Following status codes can be used by PSM: F - Final results; Can only be changed with a corrected result. C - Correction of final results P - Preliminary results X - Results cannot be obtained for this observation
12 00580	Date Last Obs Normal Values	TS	26	-	-		Not used
13 00581	User Def. Access Checks	ST	20	-	R	Y	If an alarm from an analyser is not defined in the correspondence of alarms, this alarm will be uploaded to the Host in this field.
14 00582	Date/Time of Observation	TS	26	-	R		*The relevant date-time is the specimen's collection date-time (received in OBR-7).* PSM will repeat the date and time when the analyzer executed the test here.

Seq/HL7 field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
15 00583	Producer's ID	CE	20	-	R		The fourth component contains the identifier of the analyser upon the table listed below. The first three components are reserved. The format is: ^^^IID
16 00584	Responsible Observer	XCN	8	-	O		Person who performed or verified the test
17 00936	Observation Method	CE	60	-	-	Y	Not used
18 01479	Equipment Instance Identifier	EI	22	-	R		Instrument Identifier IID (HL7 v2.4)
19 01480	Date/Time of the Analysis	TS	26	-	R		Date and time when the analyser executed the test. (HL7 v2.4)

Field Producer's ID (HL7 00583) and Equipment Instance Identifier (HL7 01479)

The Analyzer ID identifies a PSM target where the test was performed. Although this information could be given through the SAC segment, PSM will use this field when uploading results to optimize the results transference speed. Typically this ID corresponds to an analyzer, but can be Archive or Manual Scanplace also. These numbers have to be defined in PSM. In this case, this IID can have 4 different parts separated by a '.' separator. The complete format for this IID component field is:

Component Field#8 IID (1st part)	Component Field#8 IID (2nd part)	Component Field#8 IID (3rd part)	Component Field#8 IID (4th part)
Instrument Code	Instrument Number	Tray Number	Location information

Following there are some samples of IIDs as responses to tracking query from a specified sample:

Sample is on	Unit	Instrument Code	Instrument Number	Tray number (10 digits)	Additional Location description Text[25]
IID for Archive No. 1	**Archive**	0	.1	Nnn	.Shelf2 Fridge3
IID for Archive No. 2.	**Archive**	0	.2	Nnnnn	
IID for manual scan place No. 1.	**Logical Unit**	999	.1		
IID for manual scan place No. 2.	**Logical Unit**	999	.2		
IID for PSD No. 1.	**Logical Unit**	190	.1		
IID for PSD No. 2, Channel "C".	**Logical Unit**	190	.2	.	.C
IID for VS250 No. 1.	**Logical Unit**	160	.1		
IID for manual aliquotting No. 3.	**Logical Unit**	998	.3		
IID for Elecsys2010 No. 1	**Instrument**	141	.1	[NONE]	[NONE]
IID for ES300 No. 3	**Instrument**	19	.3	[NONE]	[NONE]

6.3.13.   EQU - Equipment Detail Segment

This segment contains information related to the Equipment which produced the information. It is used by PSM to upload to the Host the 'Sample Seen' message and the worklists.

Seq/HL7 field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
	Equipment Detail Segment	ST	3	R	R		Identifier for EQU segment (EQU)
1	Equipment Identifier	EI	80	R	R		The format is:
	<entity identifier> ^<namespace ID> ^<universal ID> ^<universal ID type>						Analyzer ID (IID) Not used Not used Not used
2	Event Date/Time	TS	26	R	R		Date and time when the action took place.
3	Equipment State	CE	80	-	-		Not used
4	Local/Remote Control State	CE	80	-	-		Not used
5	Alert Level	CE	80	-	-		Not used

6.3.14.   SAC – Specimen and Container Detail Segment

According to NCCLS standards, the SAC segment gives extended information about the container. The container can be considered as a tube in PSM and must be unique in the laboratory. PSM will use this segment to upload sample specific information like 'Sample Seen' message or worklists.

Seq/HL7 field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
	Specimen and Container Detail Segment	ST	3	R	R		Identifier for SAC segment (SAC)
1 01329	External Accession Identifier	EI	22	-	-		Not used
2 01330	Accession Identifier	EI	22	-	-		Not used
3 01331	Container Identifier	EI	13	-	C		Specimen ID. This ID should define uniquely a tube in the lab. If PSM is working in the mode 'Many specimen types by ID', sometimes there is a prefix or suffix which distinguishes between the primary container ID and the specimen ID. If there are many tubes but only one ID the field 'Specimen Source' must be considered.
4 01332	Parent (primary) Container Identifier	EI	13	-	C		Parent Specimen ID or Sample ID. Only in case container (Seq. 3) is not the Parent Container.
5 01333	Equipment Container Identifier	EI	22	-	-		Not used
6 00249	Specimen Source	CM	300	-	R		Specimen descriptor as defined in OBR segment #15 (field 00249).
7 01334	Registration Date/Time	TS	14	-C	R		Date and time when the sample was last seen. (Only from Host to PSM) This field shall represent either a beginning (oldest) sample registering date and time for which results are being requested or a single date and time.
8 01335	Container Status	CE	80	-	C		PSM is going to use the following codes: I - Identified O - In Process R - Process Completed
9 01336	Carrier Type	CE	80	-	-		Not used
10 01337	Carrier Identifier	CE	80	-	C		Carrier ID where the sample is located. In PSM this ID corresponds to the Rack or Rotor identifier.
11 01338	Position in Carrier	NA	4	-	C		Position within the carrier. Typically this is a number from 0 to 5 if working with the standard Roche rack.
12 01339	Tray Type	CE	80	-	C		Not used
13 01340	Tray Identifier	CE	80	-	C		Tray ID. The absolute PSM position of a tube is given by this field plus the fields Carrier Identifier and Position in Carrier.
14 01341	Position in Tray	NA	80	-	-		Not used

Seq/HL7 field	Field Name	Data Type	Max. Length	From Host	To Host	Repeat	Comments
15 01342	Location	CE	200	-	C		This is an optional field which contains the physical location of the tray only in the case of the PSM archive.
16 01343	Container Height	NM	20	-	-		Not used
17 01344	Container Diameter	NM	20	-	-		Not used
18 01345	Barrier Delta	NM	20	-	-		Not used
19 01346	Bottom Delta	NM	20	-	-		Not used
20 01347	Container Height/Diameter Units	CE	80	-	-		Not used
21 00644	Container Volume	NM	20	-	-		Not used
22 01349	Available Volume	NM	20	-	-		Not used
23 01350	Initial Specimen Volume	NM	20	-	-		Not used
24 01351	Volume Units	CE	80	-	-		Not used
25 01352	Separator Type	CE	80	-	-		Not used
26 01353	Cap Type	CE	80	-	-		Not used
27 00647	Additive	CE	80	-	-	Y	Not used
28 01355	Specimen Component	CE	80	-	-		Not used
29 01356	Dilution factor	SN	20	-	-	Y	Not used
30 01357	Treatment	CE	80	-	-		Not used
31 01358	Temperature	NM	80	-	-		Not used
32 01359	Hemolysis Index	NM	20	-	-		Not used
33 01360	Hemolysis Index Units	CE	80	-	-		Not used
34 01361	Lipemia Index	20	NM	-	-		Not used
35 01362	Lipemia Index Units	80	CE	-	-		Not used
36 01363	Icterus Index	20	NM	-	-		Not used
37 01364	Icterus Index Units	80	CE	-	-		Not used
38 01365	Fibrin Index	20	NM	-	-		Not used

6.4.   DESCRIPTION OF BASIC ACTIONS HL7 V2.3
6.4.1.   Download of requests

In this process, PSM receives from the Host the requests which has to perform including patient information and all their correspondent tests. The Host always initiates this process whenever he wants and PSM will be responsible for accepting these requests.

The syntax used to detail Segments Optionality and Repetition for Workflows is:

        […]   means 0 to 1
        {…}   means 1 to many
        [{…}]   means 0 to many

The workflow for this General Order Message is:

ORM   General Order Message   HL7 V2.3

MSH   Message Header
PID   Patient Identification
  [PCD]   Patient Details
{
  ORC   Common Order (New)
    OBR   Observation Request (New)
      [TCD]   Test Details
        [{NTE}]   Notes and Comments (to Order)
}
[{
  [ORC]   Common Order (Previous)
    OBR   Observation Request (Previous)
}]

In the MSH it has to be specified under which condition an acknowledgement message is transferred from PSM/TSM to LIS:

ACK   General acknowledgment   HL7 V2.3

MSH   Message Header
MSA   Message acknowledgment
    [ERR]   Error

The general response message (ORR) is the application acknowledgement to an ORM message:

ORR   General Order Acknowledgment Message   HL7 V2.3

MSH   Message Header
MSA   Message acknowledgment
PID   Patient Identification
    [PCD]   Patient Details
{
    ORC   Common Order (New)
      [OBR]   Observation Request (New)
}

6.4.1.1.   Example of Download of a New Order from the Host to PSM with minimum information

```
MSH|^~\&|||||20000525091426||ORM^O01|20000525091426|P|2.3|||ER|ER||8859/1|<CR
>
     PID|1<CR>
          ORC|NW|000218T016<CR>
               OBR|1|000218T016||101~102||20000524195900|||||A<CR>
```

6.4.1.2.   Example of Download of a New Order from the Host to PSM with full Patient information

```
MSH|^~\&|HL7_Host|HL7_Office|PSM|PSM_LAB|20000525094630||ORM^O01|
    20000525094630|P|2.3|||ER|ER||8859/1|<CR>
      PID|1||00100M56016||Smith^Harry||19500412|M<CR>
          ORC|NW|000218T018|||||^^^^^R||20000525094400<CR>
               OBR|1|000218T018||101~102||20000524195900|||||A||||<CR>
```

6.4.1.3.   Download of New Order that is erroneous (Accept Acknowledgement Error)

Order from Host to PSM

```
<VT>MSH|^~\&|Host||||20020424093804||ORM^O01|1302|P|2.3|||ER|ER||8859/1<CR>
      PID|1||4747389792||WHITTAKER^JAMES||19221007|M<CR>
           ORC|NW|||||||^^^^^R<CR>
                 OBR|1|W52632||NA-S||200204240938|||||A||||1||||<CR>
                 OBR|2|W52632||K-S||200204240938|||||A||||1<CR>
```
No <FS><CR>

Answer from PSM to Host

```
<VT>MSH|^~\&|||||20020718111800||ORR^O01|20020718111800|P|2.3|||ER|ER||
   8859/1|<CR>
        MSA|CE|1302|Incomplete Message received.|||<CR>
<FS><CR>
```

6.4.1.4.   Example of Download of a Modification of an existing order from the Host to PSM

As long tests are not in progress on PSM, the host can modify a previous order. The same Order Control and Action Code can as well be used to order tests for samples not previously known to PSM.

```
MSH|^~\&|HL7_Host|HL7_Office|PSM|PSM_LAB|20000525094630||ORM^O01|
    20000525094630|P|2.3|||ER|ER||8859/1|<CR>
    PID|1||00100M56016||Smith^Harry||19500412|M<CR>
        ORC|XO|000218T018|||||^^^^^R||20000525094400<CR>
          OBR|1|000218T018||101||20000524195900|||||R||||<CR>
          OBR|2|000218T018||102||20000524195900|||||R||||<CR>
```

6.4.1.5.   Example of Download of a sample deletion of an existing order from the Host to PSM

The host can delete a complete order if the order is not in progress on PSM. Note that the OBR record with the sample ID needs to be present in the message!

```
MSH|^~\&|HL7_Host|HL7_Office|PSM|PSM_LAB|20000525094630||ORM^O01|
    20000525094630|P|2.3|||ER|ER||8859/1|<CR>
    PID|1||00100M56016||Smith^Harry||19500412|M<CR>
        ORC|CA|000218T018|||||^^^^^R||20000525094400<CR>
            OBR|1|000218T018||||20000524195900|||||R||||<CR>
```

6.4.1.6.   Example of Download of a Rerun order for an existing order from the Host to PSM

Reruns / repeats can be ordered by the host if a sample is currently active (i.e. not completed) in PSM and the test to be repeated has a result. This message cannot be used to order a test (add test).

```
MSH|^~\&|HL7_Host|HL7_Office|PSM|PSM_LAB|20000525094630||OML^O21|
20000525094630|P|2.4|||ER|ER||8859/1|<CR>
    PID|1||00100M56016||Smith^Harry||19500412|M<CR>
        ORC|XO|000218T018|||RP||^^^^^R||20000525094400<CR>
            OBR|1|000218T018||101||20000524195900|||||G||||<CR>
```

6.4.2.   Upload of results

From PSM to Host

ORU   Observational Results (Unsolicited)

MSH   Message Header
PID   Patient Identification
 [{NTE}]   Notes and Comments (to Patient or Order)
{
   [ORC]   Common Order (New)
        OBR   Observation Request (New)
          {
            OBX   Observation/Result (Previous)
                [TCD]   Test Details
                [{NTE}]   Notes and Comments (to Results)
          }
}]

In the MSH it has to be specified under which condition an acknowledgement message is transferred
from LIS to PSM. PSM is going to specify always an ER condition which means that the Host should
send back a message only in case of error.

ACK   General acknowledgment

MSH   Message Header
  MSA   Message acknowledgment
        [ERR]   Error

6.4.2.1.   Example of Upload of Final Results from PSM to Host

In this example, for sample 20020604101, analyser codes 141.1 and 141.2 correspond to two different
Elecsys 2010 analysers defined in PSM with the same analyser type and different analyser number. In
the example the result for test 196 (35.6) would be associated to Elecsys 2010 number 1 and the result
for test 207 (++) to Elecsys 2010 number 2. The third result is reported from analyser 225.1 (MODULAR
ANALYTICS). The last part of the Instrument Identification specifies that the result was measured on
module "P1".

```
MSH|^\&|PSM^Roche Diagnostics^PSM^1.09.00 Beta 7|PSM_LAB|||20020605165700||
    ORU^R01|20020605165702|P|2.3|||ER|ER||8859/1<CR>
  PID|1||4637463G66||Smith^John||19630101|M<CR>
    NTE|1|L|This is a comment to the patient or sample.<CR>
    NTE|2|L|This is another comment to the patient or the sample.<CR>
        ORC|RE|20020604101|||||^^^^^R||20020604172100<CR>
         OBR|1|20020604101||ALL|R|20020604172100||||||||1^^^^^^P|||||||
            |||||^^^^^R<CR>
          OBX|1||196||35.6|||N|||F|||20020605144800|^^^141.1|||141.1|
               20020605144800<CR>
          OBX|2||207||++|||HH|||F||26|20020605144800|^^^141.2|||141.2|
               20020605144800<CR>
          OBX|3||263||174.3|||HH|||**F**||26|200206041730|^^^225.1..P1|||
               225.1..P1|200206041730<CR>
            TCD|263|dec||||||<CR>
              NTE|1|L|This is a comment to test 263.<CR>
```

6.4.2.2.   Example of Upload of Preliminary and Final Results

Whenever a re-run/repeat is initiated due to a PSM 'Rule', a first run result is not transmitted to the host until the second result is received from the analyser. In this way both results are transmitted to the host at the same time. The test 263 has a preliminary result (P) and a final result (F). This behaviour is **not** influenced by the PARAMETER / Host / General option "Re-send preliminary result together with final result".

Pre-liminary and Final results due to rerun initiated by PSM

```
MSH|^\&|PSM^Roche□Diagnostics^PSM^1.09.00 Beta□7|PSM_LAB|||20020605165700||
    ORU^R01|20020605165702|P|2.3|||ER|ER||8859/1<CR>
  PID|1||4637463G66||Smith^John||19630101|M<CR>
    NTE|1|L|This□is□a□comment□to□the□patient□or□sample.<CR>
    NTE|2|L|This□is□another□comment□to□the□patient□or□the□sample.<CR>
      ORC|RE|20020604101||||||^^^^^R||20020604172100<CR>
        OBR|1|20020604101||ALL|R|20020604172100|||||||||1^^^^^^P|||||||||||
            |||^^^^^R<CR>
          OBX|1||263||174.3|||HH|||P||26|200206041730|^^^225.1..P1|||
              225.1..P1|200206041730<CR>
            NTE|1|L|This□is□a□comment□to□test□263.<CR>
          OBX|2||263||17.1^26|||N|||F|||20020605145000|^^^225.1..P1|||
              225.1..P1|20020605145000<CR>
            TCD|263|dec|||||<CR>
            NTE|1|L|This□is□a□comment□to□test□263.<CR>
```

6.4.2.3.   Example of Upload of Second Result

If a test is repeated or rerun either automatically by the analyser or as a manual repeat or rerun, a second result is transmitted to the host. The format depends on the PARAMETER / Host / General option "**Re-send preliminary result together with final result**". If the option is disabled, the result type of the second result is "C" for correction of result. However, if the option is enabled, the first result is re-transmitted to the host with result type "P" for preliminary result and the second result is transmitted with result type is "F" for final result.

Option "Re-send preliminary result together with final result" disabled

First result:

```
MSH|^\&|PSM^Roche□Diagnostics^PSM^1.09.00 Beta□7|PSM_LAB|||20020605165700||
    ORU^R01|20020605165702|P|2.3|||ER|ER||8859/1<CR>
  PID|1||4637463G66||Smith^John||19630101|M<CR>
    NTE|1|L|This□is□a□comment□to□the□patient□or□sample.<CR>
    NTE|2|L|This□is□another□comment□to□the□patient□or□the□sample.<CR>
      ORC|RE|20020604101||||||^^^^^R||20020604172100<CR>
        OBR|1|20020604101||ALL|R|20020604172100|||||||||1^^^^^^P|||||||||||
            |||^^^^^R<CR>
          OBX|1||263||174.3|||HH|||F||26|200206041730|^^^225.1..P1|||
              225.1..P1|200206041730<CR>
            NTE|1|L|This□is□a□comment□to□test□263.<CR>
```

Second result:

```
MSH|^\&|PSM^Roche Diagnostics^PSM^1.09.00 Beta 7|PSM_LAB|||20020605165700||
    ORU^R01|20020605165704|P|2.3|||ER|ER||8859/1<CR>
  PID|1||4637463G66||Smith^John||19630101|M<CR>
    NTE|1|L|This is a comment to the patient or sample.<CR>
    NTE|2|L|This is another comment to the patient or the sample.<CR>
      ORC|RE|20020604101|||||^^^^^R||20020604172100<CR>
        OBR|1|20020604101||ALL|R|20020604172100|||||||||1^^^^^^P|||||||||
          |||^^^^^R<CR>
          OBX|1||263||17.1|||A|||C||23|20020605145200|^^^225.1..P1|||
            225.1..P1|20020605145200<CR>
            TCD|263|dec|||||<CR>
            NTE|1|L|This is a comment to test 263.<CR>
```

Option "Re-send preliminary result together with final result" enabled

First result:

```
MSH|^\&|PSM^Roche Diagnostics^PSM^1.09.00 Beta 7|PSM_LAB|||20020605165700||
    ORU^R01|20020605165702|P|2.3|||ER|ER||8859/1<CR>
  PID|1||4637463G66||Smith^John||19630101|M<CR>
    NTE|1|L|This is a comment to the patient or sample.<CR>
    NTE|2|L|This is another comment to the patient or the sample.<CR>
      ORC|RE|20020604101|||||^^^^^R||20020604172100<CR>
        OBR|1|20020604101||ALL|R|20020604172100|||||||||1^^^^^^P||||||||||
          |||^^^^^R<CR>
        OBX|1||263||174.3|||HH|||F||26|200206041730|^^^225.1..P1|||
            225.1..P1|200206041730<CR>
            NTE|1|L|This is a comment to test 263.<CR>
```

First and second result:

```
MSH|^\&|PSM^Roche Diagnostics^PSM^1.09.00 Beta 7|PSM_LAB|||20020605165700||
    ORU^R01|20020605165704|P|2.3|||ER|ER||8859/1<CR>
  PID|1||4637463G66||Smith^John||19630101|M<CR>
     NTE|1|L|This is a comment to the patient or sample.<CR>
     NTE|2|L|This is another comment to the patient or the sample.<CR>
       ORC|RE|20020604101|||||^^^^^R||20020604172100<CR>
         OBR|1|20020604101||ALL|R|20020604172100|||||||||1^^^^^^P|||||||||
           ||||^^^^^R<CR>
          OBX|1||263||174.3|||HH|||P||26|200206041730|^^^225.1..P1|||
             225.1..P1|200206041730<CR>
            NTE|1|L|This is a comment to test 263.<CR>
          OBX|2||263||17.1^26|||N|||F|||20020605145000|^^^225.1..P1|||
             225.1..P1|20020605145000<CR>
            TCD|263|dec|||||<CR>
            NTE|1|L|This is a comment to test 263.<CR>
```

6.4.3.   Upload of controls

The flows are exactly the same as in the above case of results but with only difference of the field 'Order Status – 00219' which will contain the flag 'IP' associated in PSM to upload of controls.

6.4.3.1.   Example of Upload of Controls from PSM to the Host

Each control material is sent as a separate message.

```
PSM  -> <VT>
         MSH|^\&|PSM^Roche Diagnostics^PSM^1.09.00 Beta 9|PSM_LAB|||
         20020610130100||ORU^R01|20020610130101|P|2.3|||ER|ER||8859/1<CR>
PSM  -> PID|1|<CR>
PSM  -> ORC|RE|PNU|||IP||^^^^^R||<CR>
PSM  -> OBR|1|PNU||ALL|||||||||||^^^^^^Q|||||||||||||^^^^^R<CR>
PSM  -> OBX|1||196||.7|||L|||F|||20020606164858|^^^225.1..D1|||225.1..D1|
         20020606164858<CR>
PSM  -> OBX|2||207||47.5|||L|||F|||20020606164858|^^^225.1..D1|||225.1..D1|
         20020606164858<CR>
PSM  -> OBX|3||222||-.03|||L|||F|||20020606164858|^^^225.1..D1|||225.1..D1|
         20020606164858<CR>
PSM  -> <FS><CR>
PSM  -> <VT>
         MSH|^\&|PSM^Roche Diagnostics^PSM^1.09.00 Beta 9|PSM_LAB|||
         20020610130100||ORU^R01|20020610130102|P|2.3|||ER|ER||8859/1<CR>
PSM  -> PID|2|<CR>
PSM  -> ORC|RE|PCU1|||IP||^^^^^R||<CR>
PSM  -> OBR|1|PCU1||ALL|||||||||||^^^^^^Q||||||||||||||^^^^^R<CR>
PSM  -> OBX|1||TSH||1.4|||N|||F||0|20020503110353|^^^284.1..E11|||284.1..E11
         |20020503110353<CR>
PSM  -> NTE|1|L|0<CR>
PSM  -> OBX|2||B12||930|||N|||F||0|20020503110353|^^^284.1..E11|||284.1..E11
         |20020503110353<CR>
PSM  -> NTE|1|L|0<CR>
PSM  -> <FS><CR>
PSM  -> <VT>
         MSH|^\&|PSM^Roche Diagnostics^PSM^1.09.00 Beta 9|PSM_LAB|||
         20020610130100||ORU^R01|20020610130103|P|2.3|||ER|ER||8859/1<CR>
PSM  -> PID|3|<CR>
PSM  -> ORC|RE|PCU2|||IP||^^^^^R||<CR>
PSM  -> OBR|2|PCU2||ALL|||||||||||^^^^^^Q||||||||||||||^^^^^R<CR>
PSM  -> OBX|1||TSH||7.9|||N|||F||0|20020503110354|^^^284.1..E11|||284.1..E11
         |20020503110354<CR>
PSM  -> NTE|1|L|0<CR>
PSM  -> OBX|2||B12||514|||N|||F||0|20020503110354|^^^284.1..E11|||284.1..E11
         |20020503110354<CR>
PSM  -> NTE|1|L|0<CR>
PSM  -> <FS><CR>
```

6.5.   DESCRIPTION OF BASIC ACTIONS HL7 V2.4
6.5.1.   Download of requests

In this process, PSM receives from the Host the requests which has to perform including patient information and all their correspondent tests. The Host always initiates this process whenever he wants and PSM will be responsible for accepting these requests.

The syntax used to detail Segments Optionality and Repetition for Workflows is:

        […]   means 0 to 1
        {…}   means 1 to many
        [{…}]   means 0 to many

The workflow for this General Order Message is:

ORM   General Order Message   HL7 V2.4

MSH   Message Header
PID   Patient Identification
   [ZPD]   Patient Details
     SAC   Specimen Container Detail
{
     ORC   Common Order (New)
         OBR   Observation Request (New)
             [TCD]   Test Details
                 [{NTE}]   Notes and Comments (to Order)
}
[{
     [ORC]   Common Order (Previous)
         OBR   Observation Request (Previous)
}]

In the MSH it has to be specified under which condition an acknowledgement message is transferred from PSM/TSM to LIS:

ACK   General acknowledgment   HL7 V2.4

MSH   Message Header
MSA   Message acknowledgment
     [ERR]   Error

The general response message (ORL) is the application acknowledgement to an OML message:

ORL   General Order Acknowledgment Message   HL7 V2.4

MSH   Message Header
MSA   Message acknowledgment
PID   Patient Identification
{
     SAC   Specimen Container Detail
         ORC   Common Order (New)
             [OBR]   Observation Request (New)
}

6.5.1.1. Example of Download of a New Order from the Host to PSM with minimum information

```
MSH|^~\&||||||20000525091426||OML^O21|20000525091426|P|2.4|||ER|ER||8859/1|<CR
>
    PID|1<CR>
        SAC|||000218T016|<CR>
            ORC|NW|<CR>
                OBR|1|||101~102||20000524195900|||||A<CR>
```

6.5.1.2. Example of Download of a New Order from the Host to PSM with full Patient information

```
MSH|^~\&|HL7_Host|HL7_Office|PSM|PSM_LAB|20000525094630||OML^O21|
20000525094630|P|2.4|||ER|ER||8859/1|<CR>
    PID|1||00100M56016||Smith^Harry||19500412|M<CR>
        SAC|||000218T018|<CR>
            ORC|NW|000218T018||||||^^^^^R||20000525094400<CR>
                OBR|1|000218T018||101~102||20000524195900|||||A||||<CR>
```

6.5.1.3. Download of New Order that is erroneous (Accept Acknowledgement Error)

<u>Order from Host to PSM</u>

```
<VT>MSH|^~\&|Host|||||20020424093804||OML^O21|1302|P|2.4|||AL|ER||8859/1<CR>
    PID|1||4747389792||WHITTAKER^JAMES||192210070817|M<CR>
        SAC|||W52632|<CR>
            ORC|NW|||||||^^^^^R<CR>
                OBR|1|W52632||NA-S||200204240938|||||A||||1||||<CR>
                OBR|2|W52632||K-S||200204240938|||||A||||1<CR>
```

No <FS><CR>

<u>Answer from PSM to Host</u>

```
<VT>MSH|^~\&||||||20020717234300||ACK^O21|20020717234300|P|2.4|||ER|ER||
   8859/1|<CR>
        MSA|CE|1302|Incomplete Message received.|||<CR>
<FS><CR>
```

6.5.1.4. Example of Download of a Modification of an existing order from the Host to PSM

As long tests are not in progress on PSM, the host can modify a previous order. The same Order Control and Action Code can as well be used to order tests for samples not previously known to PSM.

```
MSH|^~\&|HL7_Host|HL7_Office|PSM|PSM_LAB|20000525094630||OML^O21|
20000525094630|P|2.4|||ER|ER||8859/1|<CR>
    PID|1||00100M56016||Smith^Harry||19500412|M<CR>
        SAC|||000218T018|<CR>
            ORC|XO|000218T018||||||^^^^^R||20000525094400<CR>
                OBR|1|000218T018||101||20000524195900|||||R||||<CR>
                OBR|2|000218T018||102||20000524195900|||||R||||<CR>
```

6.5.1.5.   Example of Download of a sample deletion of an existing order from the Host to PSM

The host can delete a complete order if the order is not in progress on PSM. Note that the OBR record with the sample ID needs to be present in the message!

```
MSH|^~\&|HL7_Host|HL7_Office|PSM|PSM_LAB|20000525094630||OML^O21|
20000525094630|P|2.4|||ER|ER||8859/1|<CR>
    PID|1||00100M56016||Smith^Harry||19500412|M<CR>
        SAC|||000218T018|<CR>
            ORC|CA|000218T018|||||^^^^^R||20000525094400<CR>
                OBR|1|000218T018|||||20000524195900|||||R||||<CR>
```

6.5.1.6.   Example of Download of a Rerun order for an existing order from the Host to PSM

Reruns / repeats can be ordered by the host if a sample is currently active (i.e. not completed) in PSM and the test to be repeated has a result. This message cannot be used to order a test (add test).

```
MSH|^~\&|HL7_Host|HL7_Office|PSM|PSM_LAB|20000525094630||OML^O21|
20000525094630|P|2.4|||ER|ER||8859/1|<CR>
    PID|1||00100M56016||Smith^Harry||19500412|M<CR>
        SAC|||000218T018|<CR>
            ORC|XO|000218T018|||RP||^^^^^R||20000525094400<CR>
                OBR|1|000218T018||101||20000524195900|||||G||||<CR>
```

6.5.2.   Upload of results

From PSM to Host

ORU   Observational Results (Unsolicited)

MSH   Message Header
PID   Patient Identification
[{NTE}]   Notes and Comments (to Patient or Sample)
SAC   Specimen Container Detail
{
   ORC   Common Order
        OBR   Observation Request
      {
          OBX   Observation/Result
           [TCD]   Test Details
           [{NTE}]   Notes and Comments (to Results)
      }
}]

In the MSH it has to be specified under which condition an acknowledgement message is transferred
from LIS to PSM. PSM is going to specify always an ER condition which means that the Host should
send back a message only in case of error.

ACK   General acknowledgment

MSH   Message Header
  MSA   Message acknowledgment
        [ERR]   Error

6.5.2.1.   Example of Upload of Final Results from PSM to Host

In this example, for sample 20020604101, analyser codes 141.1 and 141.2 correspond to two different
Elecsys 2010 analysers defined in PSM with the same analyser type and different analyser number. In
the example the result for test 196 (35.6) would be associated to Elecsys 2010 number 1 and the result
for test 207 (++) to Elecsys 2010 number 2. The third result is reported from analyser 225.1 (MODULAR
ANALYTICS). The last part of the Instrument Identification specifies that the result was measured on
module "P1".

```
MSH|^\&|PSM^Roche Diagnostics^PSM^1.09.00 Beta 7|PSM_LAB|||20020605145000||
    OUL^R21|20020605145004|P|2.4|||ER|ER||8859/1<CR>
  PID|1||4637463G66||Smith^John||19630101|M<CR>
    NTE|1|L|This is a comment to the patient or sample.<CR>
    NTE|2|L|This is another comment to the patient or the sample.<CR>
    SAC|||20020604101|<CR>
      ORC|RE|20020604101||||||^^^^^R||20020604172100<CR>
        OBR|1|20020604101||ALL|R|20020604172100|||||||||1^^^^^^P||||||||||||
            ||^^^^^R<CR>
          OBX|1||196||35.6|||N|||F|||20020605144800|^^^141.1|||
            141.1|20020605144800<CR>
          OBX|2||207||++|||HH|||F|||26|20020605144800|^^^141.2|||
            141.2|20020605144800<CR>
          OBX|3||263||174.3|||HH|||F||26|200206041730|^^^225.1..P1|||
              225.1..P1|200206041730<CR>
            TCD|263|dec|||||||<CR>
            NTE|1|L|This is a comment to test 263.<CR>
```

6.5.2.2.   Example of Upload of Preliminary and Final Results

Whenever a re-run/repeat is initiated due to a PSM 'Rule', a first run result is not transmitted to the host until the second result is received from the analyser. In this way both results are transmitted to the host at the same time. The test 263 has a preliminary result (P) and a final result (F). This behaviour is **not** influenced by the PARAMETER / Host / General option "Re-send preliminary result together with final result".

```
Pre-liminary and Final results due to rerun initiated by PSM

MSH|^\&|PSM^Roche Diagnostics^PSM^1.09.00 Beta 7|PSM_LAB|||20020605145000||
     OUL^R21|20020605145004|P|2.4|||ER|ER||8859/1<CR>
    PID|1||4637463G66||Smith^John||19630101|M<CR>
       NTE|1|L|This is a comment to the patient or sample.<CR>
       NTE|2|L|This is another comment to the patient or the sample.<CR>
       SAC|||20020604101|<CR>
          ORC|RE|20020604101|||||^^^^^R||20020604172100<CR>
             OBR|1|20020604101||ALL|R|20020604172100|||||||||1^^^^^^P|||||||||
                ||||^^^^^R<CR>
               OBX|1||263||174.3|||HH|||P||26|200206041730|^^^225.1..P1|||
                   225.1..P1|200206041730<CR>
                 NTE|1|L|This is a comment to test 263.<CR>
               OBX|2||263||17.1^26|||N|||F|||20020605145000|^^^225.1..P1|||
                   225.1..P1|20020605145000<CR>
                 TCD|263|dec||||||<CR>
                 NTE|1|L|This is a comment to test 263.<CR>
```

6.5.2.3.   Example of Upload of Second Result

If a test is repeated or rerun either automatically by the analyser or as a manual repeat or rerun, a second result is transmitted to the host. The format depends on the PARAMETER / Host / General option "**Re-send preliminary result together with final result**". If the option is disabled, the result type of the second result is "C" for correction of result. However, if the option is enabled, the first result is re-transmitted to the host with result type "P" for preliminary result and the second result is transmitted with result type is "F" for final result.

```
Option "Re-send preliminary result together with final result" disabled

First result:

MSH|^\&|PSM^Roche Diagnostics^PSM^1.09.00 Beta 7|PSM_LAB|||20020605145000||
     OUL^R21|20020605145004|P|2.4|||ER|ER||8859/1<CR>
   PID|1||4637463G66||Smith^John||19630101|M<CR>
     NTE|1|L|This is a comment to the patient or sample.<CR>
     NTE|2|L|This is another comment to the patient or the sample.<CR>
     SAC|||20020604101|<CR>
        ORC|RE|20020604101|||||^^^^^R||20020604172100<CR>
          OBR|1|20020604101||ALL|R|20020604172100|||||||||1^^^^^^P|||||||||
             |||^^^^^R<CR>
            OBX|1||263||174.3|||HH|||F||26|200206041730|^^^225.1..P1|||
                225.1..P1|200206041730<CR>
              NTE|1|L|This is a comment to test 263.<CR>
```

Second result:

```
MSH|^\&|PSM^Roche□Diagnostics^PSM^1.09.00 Beta□7|PSM_LAB|||20020605145200||
   OUL^R21|20020605145203|P|2.4|||ER|ER||8859/1<CR>
  PID|1||4637463G66||Smith^John||19630101|M<CR>
    NTE|1|L|This□is□a□comment□to□the□patient□or□sample.<CR>
    NTE|2|L|This□is□another□comment□to□the□patient□or□the□sample.<CR>
    SAC|||20020604101|<CR>
      ORC|RE|20020604101|||||^^^^^R||20020604172100<CR>
        OBR|1|20020604101||ALL|R|20020604172100|||||||||1^^^^^^P|||||||||
          |||^^^^^R<CR>
          OBX|1||263||17.1||A|||C||23|20020605145200|^^^225.1..P1|||
            225.1..P1|20020605145200<CR>
            TCD|263|dec||||||<CR>
            NTE|1|L|This□is□a□comment□to□test□263.<CR>
```

Option "Re-send preliminary result together with final result" enabled

First result:

```
MSH|^\&|PSM^Roche□Diagnostics^PSM^1.09.00 Beta□7|PSM_LAB|||20020605145000||
    OUL^R21|20020605145004|P|2.4|||ER|ER||8859/1<CR>
  PID|1||4637463G66||Smith^John||19630101|M<CR>
    NTE|1|L|This□is□a□comment□to□the□patient□or□sample.<CR>
    NTE|2|L|This□is□another□comment□to□the□patient□or□the□sample.<CR>
    SAC|||20020604101|<CR>
      ORC|RE|20020604101|||||^^^^^R||20020604172100<CR>
        OBR|1|20020604101||ALL|R|20020604172100|||||||||1^^^^^^P|||||||||
          |||^^^^^R<CR>
        OBX|1||263||174.3|||HH|||F||26|200206041730|^^^225.1..P1|||
            225.1..P1|200206041730<CR>
            NTE|1|L|This□is□a□comment□to□test□263.<CR>
```

First and second result:

```
MSH|^\&|PSM^Roche□Diagnostics^PSM^1.09.00 Beta□7|PSM_LAB|||20020605145000||
    OUL^R21|20020605145004|P|2.4|||ER|ER||8859/1<CR>
   PID|1||4637463G66||Smith^John||19630101|M<CR>
    NTE|1|L|This□is□a□comment□to□the□patient□or□sample.<CR>
    NTE|2|L|This□is□another□comment□to□the□patient□or□the□sample.<CR>
    SAC|||20020604101|<CR>
      ORC|RE|20020604101|||||^^^^^R||20020604172100<CR>
        OBR|1|20020604101||ALL|R|20020604172100|||||||||1^^^^^^P|||||||||
          ||||^^^^^R<CR>
          OBX|1||263||174.3|||HH|||P||26|200206041730|^^^225.1..P1|||
              225.1..P1|200206041730<CR>
            NTE|1|L|This□is□a□comment□to□test□263.<CR>
          OBX|2||263||17.1^26|||N|||F|||20020605145000|^^^225.1..P1|||
              225.1..P1|20020605145000<CR>
            TCD|263|dec||||||<CR>
            NTE|1|L|This□is□a□comment□to□test□263.<CR>
```

6.5.3.   Upload of controls

The flows are exactly the same as in the above case of results but with only difference of the field 'Order Status – 00219' which will contain the flag 'IP' associated in PSM to upload of controls.

6.5.3.1.   Example of Upload of Controls from PSM to the Host

Each control material is sent as a separate message.

```
PSM  -> <VT>
        MSH|^\&|PSM^Roche☐Diagnostics^PSM^1.09.00 Beta☐9|PSM_LAB|||
        20020610125500||OUL^R21|20020610125501|P|2.4|||ER|ER||8859/1<CR>
PSM  -> PID|1|<CR>
PSM  -> SAC|||PCU1|||^^^^^^Q|20020610125546|R||""|""||""||""<CR>
PSM  -> ORC|RE|PCU1|||IP||^^^^^R||<CR>
PSM  -> OBR|1|PCU1||ALL|||||||||||^^^^^^Q|||||||||||||^^^^^R<CR>
PSM  -> OBX|1||TSH||1.4|||N|||F||0|20020610125546|^^^284.1..E11|||284.1..E11
        |20020610125546<CR>
PSM  -> NTE|1|L|0<CR>
PSM  -> OBX|2||B12||930|||N|||F||0|20020610125546|^^^284.1..E11|||284.1..E11
        |20020610125546<CR>
PSM  -> NTE|1|L|0<CR>
PSM  -> <FS><CR>
PSM  -> <VT>
        MSH|^\&|PSM^Roche☐Diagnostics^PSM^1.09.00 Beta☐9|PSM_LAB|||
        20020610125500||OUL^R21|20020610125502|P|2.4|||ER|ER||8859/1<CR>
PSM  -> PID|2|<CR>
PSM  -> SAC|||PCU2|||^^^^^^Q|20020610125546|R||""|""||""||""<CR>
PSM  -> ORC|RE|PCU2|||IP||^^^^^R||<CR>
PSM  -> OBR|2|PCU2||ALL|||||||||||^^^^^^Q|||||||||||||^^^^^R<CR>
PSM  -> OBX|1||TSH||7.9|||N|||F||0|20020610125546|^^^284.1..E11|||284.1..E11
        |20020610125546<CR>
PSM  -> NTE|1|L|0<CR>
PSM  -> OBX|2||B12||514|||N|||F||0|20020610125546|^^^284.1..E11|||284.1..E11
        |20020610125546<CR>
PSM  -> NTE|1|L|0<CR>
PSM  -> <FS><CR>
PSM  -> <VT>
        MSH|^\&|PSM^Roche☐Diagnostics^PSM^1.09.00 Beta☐9|PSM_LAB|||
        20020610125500||OUL^R21|20020610125503|P|2.4|||ER|ER||8859/1<CR>
PSM  -> PID|3|<CR>
PSM  -> SAC|||PNU|||^^^^^^Q|20020610125546|R||""|""||""||""<CR>
PSM  -> ORC|RE|PNU|||IP||^^^^^R||<CR>
PSM  -> OBR|3|PNU||ALL|||||||||||^^^^^^Q|||||||||||||^^^^^R<CR>
PSM  -> OBX|1||184||64|||N|||F||0|20020610125546|^^^284.1..P1|||284.1..P1|
        20020610125546<CR>
PSM  -> NTE|1|L|0<CR>
PSM  -> OBX|2||205||101|||N|||F||0|20020610125547|^^^284.1..P1|||284.1..P1|
        20020610125547<CR>
PSM  -> NTE|1|L|0<CR>
PSM  -> OBX|3||209||3.5|||N|||F||0|20020610125547|^^^284.1..P1|||284.1..P1|
        20020610125547<CR>
PSM  -> NTE|1|L|0<CR>
PSM  -> OBX|4||263||1.07|||N|||F||0|20020610125547|^^^284.1..P1|||284.1..P1|
        20020610125547<CR>
```

```
PSM  -> NTE|1|L|0<CR>
PSM  -> OBX|5||989||141|||N|||F||0|20020610125548|^^^284.1..ISE1|||
        284.1..ISE1|20020610125548<CR>
PSM  -> NTE|1|L|0<CR>
PSM  -> OBX|6||990||3.4|||N|||F||0|20020610125548|^^^284.1..ISE1|||
        284.1..ISE1|20020610125548<CR>
PSM  -> NTE|1|L|0<CR>
PSM  -> OBX|7||991||117|||N|||F||0|20020610125548|^^^284.1..ISE1|||
        284.1..ISE1|20020610125548<CR>
PSM  -> NTE|1|L|0<CR>
PSM  -> <FS><CR>
PSM  -> <VT>
        MSH|^\&|PSM^Roche Diagnostics^PSM^1.09.00 Beta 9|PSM_LAB|||
        20020610125500||OUL^R21|20020610125504|P|2.4|||ER|ER||8859/1<CR>
PSM  -> PID|4|<CR>
PSM  -> SAC|||PPU|||^^^^^^Q|20020610125547|R||""|""||""||""<CR>
PSM  -> ORC|RE|PPU|||IP||^^^^^R||<CR>
PSM  -> OBR|4|PPU||ALL|||||||||||^^^^^^Q||||||||||||||^^^^^R<CR>
PSM  -> OBX|1||184||200|||N|||F||0|20020610125547|^^^284.1..P1|||284.1..P1|
        20020610125547<CR>
PSM  -> NTE|1|L|0<CR>
PSM  -> OBX|2||205||240|||N|||F||0|20020610125547|^^^284.1..P1|||284.1..P1|
        20020610125547<CR>
PSM  -> NTE|1|L|0<CR>
PSM  -> OBX|3||209||3.21|||N|||F||0|20020610125547|^^^284.1..P1|||284.1..P1|
        20020610125547<CR>
PSM  -> NTE|1|L|0<CR>
PSM  -> OBX|4||263||4.6|||N|||F||0|20020610125547|^^^284.1..P1|||284.1..P1|
        20020610125547<CR>
PSM  -> NTE|1|L|0<CR>
PSM  -> OBX|5||989||148|||N|||F||0|20020610125548|^^^284.1..ISE1|||
        284.1..ISE1|20020610125548<CR>
PSM  -> NTE|1|L|0<CR>
PSM  -> OBX|6||990||6|||N|||F||0|20020610125548|^^^284.1..ISE1|||
        284.1..ISE1|20020610125548<CR>
PSM  -> NTE|1|L|0<CR>
PSM  -> OBX|7||991||108|||N|||F||0|20020610125548|^^^284.1..ISE1|||
        284.1..ISE1|20020610125548<CR>
PSM  -> NTE|1|L|0<CR>
PSM  -> <FS><CR>
```

6.5.4.   Upload of 'Sample Seen' message

This message is generated by PSM, in the case it is configured to do that, as an unsolicited upload of status information to the Host. The workflow is:

From PSM to Host

ORU   Observational Change Status (Unsolicited)

MSH   Message Header
{
  EQU   Equipment Detail Information
  {
    [PID]   Patient Identification
      [OBR]   Observation Request
        SAC   Specimen Detail Information
  }
}

As in the case of uploading of results, PSM is going to specify always an ER condition which means that the Host should send back a message only in case of error.

ACK   General acknowledgment

MSH   Message Header
  MSA   Message acknowledgment
      [ERR]   Error

6.5.4.1.   Example of Upload of 'Sample Seen' message from PSM to the Host

In this example, PSM informs the Host that sample 200206041016 was seen in MODULAR *ANALYTICS* 1 at 16:14 in rack 5030, position 2, no tray number.

```
MSH|^\&|PSM^Roche□Diagnostics^PSM^1.09|PSM_LAB|||20020606161400||SSU^U03|
    20020606161402|P|2.4|||ER|ER||8859/1<CR>
      EQU|225.1|20020606161400<CR>
        [PID|1||4637463G66||Smith^John||19630101|M<CR>]
          [OBR|1|20020604101||||||||||||||1^^^^^^P|||||||20020606161400||||
              |^^^^^R<CR>]
            SAC|||20020604101|20020604101||1|20020606161400|O||5030|2|
                |""||""<CR>
```

6.5.5.   Upload of Worklists

This message is generated by PSM, in the case it is configured to keep distribution information and to upload it , as an unsolicited upload of status information to the Host. The workflow is:

From PSM to Host

ORU   Observational Distribution Status (Unsolicited)

MSH   Message Header
{
   EQU   Equipment Detail Information
     [PID]   Patient Identification
       [OBR]   Observation Request
         SAC   Specimen Detail Information
}

As in the case of uploading of results, PSM is going to specify always an ER condition which means that the Host should send back a message only in case of error.

ACK   General acknowledgment

MSH   Message Header
  MSA   Message acknowledgment
     [ERR]   Error

6.5.5.1.   Example of Upload of Worklist from PSM to the Host

In this example, PSM is sending the worklist for the tray number 3 of Modular with the samples 2400, 2405, and 7802 assigned to positions 1-1, 1-2 and 1-3.

```
MSH|^\&|PSM^Roche Diagnostics^PSM^1.7|PSM_LAB|||20000525085100||SSU^U03|20000
525085101|P|2.4|||ER|ER||8859/1<CR>
     EQU|225.1|20000525085100<CR>
         [PID|1||6991||John^Smith||19500412|M<CR>]
             [OBR|1|2400||NA~K~CA||20000525082100|||||||||1||||||||||||
                 ||^^^^^R<CR>]
                 SAC|||2400|2400||1|20000525084900|I||1|1||3||""<CR>
         [PID|2||7802||Katherine^""||""|F<CR>]
             [OBR|1|2405||K||20000525082300|||||||||1|||||||||||||^^^^^R<CR>]
                 SAC|||2405|2405||1|20000525085000|I||1|2||3||""<CR>
         [PID|3||7802||Paul^Thompson||20000105|M<CR>]
             [OBR|1|8021||101~102~115||20000525082500|||||||||1|||||||
                 |||||^^^^^R<CR>]
                 SAC|||8021|8021||1|20000525085000|I||1|3||3|||""<CR>
```