

RamSoft Inc.

RamSoft PACS 3.0 HL7 Conformance Statement



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RamSoft PACS 3.0 HL7 Conformance Statement	2
General	3
General message format	3
Sockets	4
Mandatory fields.....	4
Internal and External stations	4
Message Send Queue mechanism.....	4
Acknowledgements.....	5
Supported messages.....	6
Patient Update (ADT^A08)	6
ADT^A08 Example Message	6
Patient Merge (ADT^A39).....	6
ADT^A39 Example Message	6
Patient Delete (ADT^A23).....	6
ADT^A23 Example Message	6
Order UPDATE (ORM^O01).....	7
ORM^O01 Example Message.....	7
Report Update (ORU^R01).....	7
ORU^R01 Example Message	7
Field encoding	8
PID segment	8
PV1 segment	8
ORC segment	9
OBR segment	9
OBX segment.....	10



General

RamSoft HL7 Service is a bi-directional service. It receives messages on one or more specified ports, and sends queued HL7 messages to a number of registered HL7 stations, using TCP/IP sockets. Authorizations whether a particular station supports sending/receiving some message can be configured.

Some stations may send acknowledgement messages in response to a received message. HL7 stations can therefore be defined as those that expect acknowledgements, and those that don't. This property is also configurable.

This service was designed so to be compatible with typical RIS HL7 specifications (version 2.3.1).

Currently, the following HL7 events are supported within RSHL7Service:

Event	Message type	Event type
Patient update	ADT	A08
Patient merge	ADT	A39
Patient delete	ADT	A23
Order update	ORM	O01
Observation (interpretation) update	ORU	R01

When a patient record is modified in RamSoft PACS, a **Patient Update** message is queued in the HL7 message queue. If a record is deleted, a **Patient Delete** message is queued. **Patient Merge** message is queued when all items (e.g. study, series, image, report) pertaining to a patient are reassigned to some other patient.

When an exam record is created or modified in RamSoft PACS, an **Order Update** message is queued.

When a diagnostic report for an exam is created or updated in RamSoft PACS, a **Report Update** message is queued.

The listed messages are only *templates*. The system can actually be configured so to interpret any equivalent message. (e.g. SIU.S12 message as Order Update)

General message format

Ramsoft HL7 service uses the standard HL7 format for messages, thus starting and ending characters delimit each message. By default the starting character is \x0B (ASCII 11) and the ending characters are \x1C (ASCII 28) and \x0D (ASCII 13).

Each message segment ends with the character \x0D (ASCII 13).

Fields in the message segments are separated by "]" (\ xC0, ASCII 124).

Field sub-components are separated by "^" (\x5E, ASCII 94).

Note: for clarity \x0D will be written as <cr> in the sample messages.

Note: for clarity \x0A will be written as <lf> in the sample message.

To separate lines within the textual report '\n' is used. This line separator can be customized if such request arises.

The MSH segment of each message contains two identification fields.

MSH4 holds the sender information (SenderID^SenderName). SenderName is used to fill the Issuer of PatientID field, if it is missing.

MSH10 contains the message unique identifier. This piece of data is later used to identify incoming message acknowledgements.



Sockets

Each message is sent through a TCP/IP socket connection to an agreed upon port and IP address.

Mandatory fields

We consider these fields to be mandatory for all messages:

Patient ID	PID2
Patient Name	PID5

Mandatory for exam related messages (ORM, ORU):

Accession number	OBR2
Exam date/time	OBR7

Mandatory for report related messages (ORU):

Report identifier	OBX3
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Internal and External stations

Stations are described with IP address, port, and group attributes.

All stations that belong to the same group are internal to each other. The stations that belong to other groups are external stations.

Stations that communicate with external stations are called Master stations. Usually there is one master station per group.

If an event originates within the group, the station sends that message to all the other stations in the group. Only master station rebroadcasts this message to the external stations.

If a message comes from an external station, master station re-sends it to all the internal stations belonging to its group.

Message Send Queue mechanism

RamSoft PACS queues certain types of events as they occur in both the Windows and Web clients. The RSHL7Service, in turn, pushes these events to any number of systems in HL7 using TCP/IP sockets.

New entries are queued on the bottom of the queue (FIFO queue).

When the RSHL7Service is started, it periodically (every 5 seconds, but this can be configured) queries HL7 messages queue. If it finds an entry, it composes HL7 message and sends it separately to the addresses specified in its list of HL7 stations, in one of three ways:

- send to all stations
- send to internal stations only
- send to external stations only

The additional condition for sending to external stations is that they have to be authorized for the specific message.



Acknowledgements

RSHL7Service sends an acknowledgement when it receives an incoming message, if the remote station is declared as one that needs acknowledgement.

RSHL7Service does the following when it encounters a message that has been queued for broadcast:

- It attempts to establish a socket connection the recipient system on the designated port number
- It sends the message string
- It waits for an acknowledgement

If the an acknowledgement is not received within the time-out interval (1 minute), or if the acknowledgement string does not contain the message unique identifier (MSH10 field), then the queued message is removed and reinserted at the end of the queue. The broadcaster will try to send it later only to those stations which haven't returned an acknowledgement.

When acknowledgements from all the destination stations are received for a message that has just been sent, the Event Broadcaster removes the message from the outgoing queue, and proceeds to the next message on the queue.

If acknowledgements are not expected from a remote station, message is immediately removed from the queue upon sending.



Supported messages

Patient Update (ADT^A08)

A Patient Update message is queued whenever a patient record is modified in RamSoft PACS.

ADT^A08 Example Message

```
MSH|^~\&|^RAMSOFT||||ADT^A08|0|<cr>
EVN||<cr>
PID||17694^^^^RAMSOFT||LAMOUREUX^TERRI^A||19610412000000-0500|F||123
Anchorage St.^Dover^NY^14538-1423|US|(714) 165-2342|(714) 333-
4632|English|M||123-45-6789|
```

Patient Merge (ADT^A39)

A Patient Merge message is queued whenever a patient merge occurs in RamSoft PACS.

ADT^A39 Example Message

```
MSH|^~\&|^RAMSOFT||||ADT^A39|0|<cr>
EVN||<cr>
PID||17694^^^RAMSOFT||LAMOUREUX^TERRI^A||19610412000000-0500|F||123 Anchorage
St.^Dover^NY^14538-1423|US|(714) 165-2342|(714) 333-4632|English|M||123-45-
6789|<cr>
MRG|20352^^^RAMSOFT|
```

The first field in the MRG segment is the MRN of the patient that was deleted as a result of the merge. The service will not queue an additional Patient Delete message for the patient that was deleted.

Patient Delete (ADT^A23)

A Patient Delete message is queued whenever a patient record is deleted in RamSoft PACS.

ADT^A23 Example Message

```
MSH|^~\&|^RAMSOFT||||ADT^A23|0|<cr>
EVN||<cr>
PID||17694^^^^RAMSOFT||LAMOUREUX|
```



Order UPDATE (ORM^O01)

An Order Update message is queued whenever exam attributes are changed, or when an exam is created.

ORM^O01 Example Message

```

MSH|^~\&|^RAMSOFT||||ORM^O01|0|<cr>
PID||002519^^^RAMSOFT||RIPPEE^BARBARA^S||19680221000000-0500|F|||345 Holland
Drive^Fernandino^CA^94244-2720|US|(614) 345-2243||English, French|M|<cr>
PV1|||12^Orthopaedic dept.^4^Room 202|<cr>
ORC||200112178||1.2.124.113540.0.0.3.1886256558|30|||||52712^DR. SCHULLY|<cr>
OBR||200105062||73115^RT ANKLE||20011217152723-
0500|||||||||||||||||^20|||||^CARTER^FRED^M.SC.^MR.||^ROBERT^HIGGINS|^M
ary^Lee|

```

Report Update (ORU^R01)

A Report Update message is queued when a diagnostic report is added or modified.

ORU^R01 Example Message

```

MSH|^~\&|^RAMSOFT||||ORU^R01|0|<cr>
PID||000226^^^RAMSOFT||JAMES^ROBIN||19610915000000-0500|||345 Holland
Drive^Fernandino^CA^93264-2310|US|(234) 342-3433||English|S|<cr>
PV1||I|<cr>
ORC|||1.2.124.113540.0.0.3.1886256564|30|||||^FEDOROV^IVAN|<cr>
OBR||200105034||71015^Chest X-ray||20010503102200-
0500|||||||||||||||||^WONG^CHRIS||^SIMON^ALICE|<cr>
OBX||255435||No abnormalities detected, except: <lf>Terminal ileum not
opacified||||P||20030103000000-0500||1046^Baker^Robert|

```

Note1: all '\` characters will be removed from the report text before it is stored in the DB

Note2: If ORC7 (Priority) field is empty, the service will use OBR5 (Urgent priority) as priority value.



Field encoding

PID segment

Field	Seq	Example	Notes
External patient ID	2	12345^^^Ramsoft	ID^^^IssuerOfID
Patient name	5	Hewitt^Dustin^S	Last^First^Middle^Prefix^Suffix
Date of birth	7	19660217	
Sex	8	M	M – Male F - Female U - Unknown
Patient address	11	12 Adams Road^Richmond^WI^53965-1423	Street Address^City^State^ZIP Code
Country	12	US	US - United States CA - Canada
Home phone	13	(514)123-4567	
Business phone	14	(514)123-4567	
Primary language	15	English	
Marital status	16	M	S – Single M - Married D – Divorced W – Widowed U - Unknown
Patient account number	18	2536	
Social Security number	19	123-45-6789	

PV1 segment

Field	Seq	Example	Notes
Set ID	1		
Patient class	2	I	I – Admitted patient O – Out patient E – Emergency patient S – Patient admitted at another facility
Patient location	3	16^Ultrasound 2^6^Clyde^20^Emergency	Room code ^ room description ^ facility code ^ facility description ^ patient location code ^ patient location description



ORC segment

Field	Seq	Example	Notes
Order UID	4	1.2.124.113540.0.0.3.1886256564	
Order status	5	30	10 StatusReferred 20 StatusScreened 30 StatusScheduled 40 StatusCalled 50 StatusConfirmed 60 StatusReminded 70 StatusCancelled 80 StatusArrived 90 StatusNoShow 100 StatusStarted 110 StatusTerminated 120 StatusCompleted 130 StatusPrior 140 StatusMatched 150 StatusVerified 160 StatusPreliminary 170 StatusHold 180 StatusRead 190 StatusReported 200 StatusAuthorized 210 StatusDistributed 220 StatusBilled 230 StatusCollected 240 StatusDelinquent
Ordering provider	12	12345^Smith^Steve	Referring physician license # & name

OBR segment

Field	Seq	Example	Notes
Placer order number	2	12345	Accession number
Universal service ID	4	73115^ radiographic arthrography left wrist	Procedure code ^ procedure description
Observation date/time	7	200107181530	YYYYMMDDHHMM±ZZZZ Y-year, M-month, D-day, H-hour, M-minute, Z-zone offset
Relevant clinical info	13		Comments
Specimen source	15	LEFT^^WRIST	Scheduled Laterality^^BodyStructure
Diagnostic service sect ID	24		Scheduled Modality
Order priority	27	^^^^20	0-4 STAT 5-9 High 10-19 Medium >19 Low
Reason for study	31		Suspected diagnosis ^ Symptom ^ Clinical notes
Principle result interpreter	32	54321^Jones^Fred	RadiologistID^Lname^Fname^Mname^Prefix^Suffix
Technician	34	87654^Brown^Bill	TechnicianID^Lname^Fname^Mname^Prefix^Suffix
Transcriptionist	35	78764^Williams^Irene	TranscriptionistID^Lname^Fname^Mname^Prefix^Suffix



OBX segment

Field	Seq	Example	Notes
Observation identifier	3	12345	A unique numeric identifier for the report
Observation value	5		Body of the report
Observation result status	11	P or F	P – Preliminary F – Final
Date/time of observation	14		YYYYMMDDHHMM±ZZZZ Y-year, M-month, D-day, H-hour, M-minute, Z-zone offset
Responsible observer	16	12345^Smith^John	RadiologistID^LastName^FirstName^Mname^Prefix^Suffix