Capsule Medical Device Information Platform

HL7 Interface Guide

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Legal Notice

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CONTENTS

1 Introduction

This document describes the format and processing of inbound (ADT) and outbound (ORU) messages by the Capsule Medical Device Information Platform (MDIP). Messages primarily conform to the HL7 2.3 standard and are exchanged over TCP/IP in the HL7 Minimal Lower Layer Protocol (MLLP). TCP/IP socket configuration is configurable and will be determined during implementation.

Capsule MDIP can also send IHE-compliant outbound HL7 if your deployment has this feature. This guide does not cover IHE HL7. For more information on IHE-compliant IHE, including a reference to IHE messages, refer to the *IHE Integration Guide*.

1.1 Prerequisites

This document is intended principally for integrators and assumes detailed knowledge of HL7, particularly ADT (Admission Discharge and Transfer) and ORU (Observation Results Unsolicited) messages.

1.2 Interface Types

The Capsule System supports the following interface types.

Type	Description	Described in
Outbound Message Types	An outbound ORU interface for sending device data from the Capsule MDIP. The outbound interface supports multiple profiles to adapt the outbound HL7 depending on the downstream system.	Chapter 2, “Outbound (ORU) Interface”
Inbound Message Types	An inbound ADT interface for population of the Capsule MDIP patient census, required when you deploy: • Chart Xpress, or • Vitals Plus, or • Vitals Stream with Secure Association	Chapter 3, “Inbound (ADT) Interface”

1.3 Definitions

Term	Definition
Source IDs	The Source ID specifies either the position on the body that the measurement was taken or the type of anesthesia administered. Possible values are device specific and described in detail within each DDI help file.
Channel IDs	The Channel ID specifies the module or channel on the device that the data originated from. The format and possible values are device specific. More detail can be found within each DDI help file. Channel ID can be configured to be sent either in OBR-13 or in OBX-4. By default it is sent in OBR-13.

Term	Definition
Node IDs	Node IDs represent the specific device behind a Gateway from which a message was generated. This field is used to associate data to either a specific patient or assigned patient location.
Timestamps	There are multiple timestamps present in every message gathered from medical devices. The Capsule MDIP has multiple configuration options to determine what timestamp to use for specific fields in the outbound interface: - Computer Time – The time data was collected by either a Neuron, Capsule Client, or Capsule Server. - Device Time – The time at which the device issued a message, based on the device clock. - Measurement Time – The time reported by the medical device when the measurement was generated. **Note**: DDIs do not provide Measurement Time or Device Time for all variables. As a result, the only timestamp guaranteed to be present for any given variable is Computer Time. Consult the DDI help file for the device in question for details of which timestamps are available.

2 Outbound (ORU) Interface

2.1 Default Profile

The default profile is selected by default and all other outbound profiles are based on it. It is the profile used for the majority of downstream systems. The sections in this document that describe other profiles describe only the differences from the default profile.

2.1.1 Configuration Options

The configuration options described in the tables below impact the format and data of Capsule ORU^R01 messages and can be set for each outbound data feed in a Capsule installation that supports multiple outbound feeds. As a result, the ORU messages from different feeds can have different data and formats.

2.1.2 Message Type

`ORU^R01`

2.1.3 Message Structure

```
MSH PID PV1 OBR {OBX}
```

2.1.4 Default Profile – MSH Segment

Field	Field Name	Value/Description
MSH-1	Field Separator	|
MSH-2	Encoding characters	^~\&
MSH-3	Sending Application	• The value specified in the HL7 Connector that output the message ('DATACAPTOR' by default)
MSH-4	Sending Facility	• The value specified in the HL7 Connector that output the message • Empty otherwise
MSH-5	Receiving Application	• The value specified in the HL7 Connector that output the message • Empty otherwise
MSH-6	Receiving Facility	• The value specified in the HL7 Connector that output the message • Empty otherwise
MSH-7	Date/Time of Message	The Computer Time (refer to Timestamps) of the variables in the message.
MSH-9	Message Type	ORU^R01
MSH-10	Message Control ID	Unique ID with a maximum length of 20 characters
MSH-11	Processing ID	P

Field	Field Name	Value/Description
MSH-12	Version ID	2.3
MSH-18	Character Set	8859/1

2.1.5 Default Profile – PID Segment

Field	Field Name	Value/Description
PID-3	Patient ID (Internal ID)	The value of the OutboundDataID variable defined in the ADT interface (Corepoint). OutboundDataID can take the following values: • PID-2 (Patient ID (External ID)) • PID-3 (Patient ID (Internal ID)) [default] • PID-4 (Alternate Patient ID) • PID-5 (Patient Name) • PID-7 (Date/Time of Birth) • PID-18 (Patient Account Number) • PID-19 (SSN Number – Patient) **Note:** This field can also be populated using the HL7 Mapping DMM. **Note**: This field can be empty.
PID-5	Patient Name	• Family Name (PID-5-1)^Given Name (PID-5-2) (for example Smith^John). The subcomponent separator is always the default separator (^) specified in the HL7 standard. **Note:** This field can also be populated using the HL7 Mapping DMM. **Note**: This field can be empty.
PID-7	Date/Time of Birth	Output in the format YYYYMMDD.
PID-8	Sex	• The value stored in the patient census. **Note**: The patient census stores the first character only of the patient sex received in the ADT message.
PID-9	Patient Alias	PID-9-1 (Family Name) and PID-9-2 (Given Name) only are valued when the Capsule Server is configured to display patient aliases in the clinical application.
PID-15	Primary Language	The value in the patient census.
PID-18	Patient Account Number	• The value in the patient census. **Note:** This field can also be populated using the HL7 Mapping DMM.

2.1.6 Default Profile – PV1 Segment

Field	Field Name	Description
PV1-2	Patient Class	• If a patient is associated, outputs the value in the patient census or, 'U' if there is no value in the patient census. • If there is no patient associated, outputs 'I'. **Note:** "U" (Unknown) is not contained in the HL7 2.3 standard. This value was introduced in HL7 2.4.
PV1-3	Assigned Patient Location	If the outbound interface is configured to send the patient location in PV1-3 and the originating Capsule application adds patient context, this field contains the full patient location from the Capsule census expressed in the Person Location (PL) data type. The following subfields are valued if they have corresponding values in the Capsule patient census: • PV1-3-1 (Point of Care) • PV1-3-2 (Room) • PV1-3-3 (Bed) • PV1-3-4 (Facility) • PV1-3-7 (Building) • PV1-3-8 (Floor) • The other subfields are never valued **Note**: PV1-3.9 is usually used to send the DIM tag when the system is configured to do so. (refer below for further details.) **Note**: PV1-3-4 contains the facility as received in MSH-4 (Sending Facility) by the inbound ADT interface. (The Capsule system considers MSH-4 as the single source of truth for the name of the facility.) It is therefore possible that the facility sent in PV1-3-4 will be different from the facility received PV1-3-4 if the MSH-4 and PV1-3-4 values were different in the inbound feed. --- When the originating application is Chart Xpress or Vitals Plus and PV1-3 is not explicitly configured to output the patient location in Person Location (PL) format, this field is output as <Facility><separator><Unit>. • <separator> is configurable. Its default is the underscore ("_"). --- When the ORU message contains continuous data and the Capsule system is not explicitly configured to output the patient location in PV1-3 in Person Location (PL) format, PV1-3-1 contains a value that identifies one of: 1) the Capsule device that sent the data 2) the medical device that sent the data 3) the host on which the Capsule software that sent the data was running. This identifier can be: • The configurable Neuron ID (Neuron Location).

Field	Field Name	Description
		• The DDI identifier (from network devices that send data directly to the Capsule server). • The node ID (usually from network devices behind a gateway, although some local devices can send a node ID). **Note**: Node IDs are often expressed in a format similar to Person Location (PL) data, with default HL7 subfield separators (^) between the subfields of the location. As such, the node ID typically occupies multiple PV1-3 subfields depending on the exact format. • The hostname of the computer running the Capsule software that sent the data (Capsule Client or Capsule Server) or a configurable alias for this hostname (Capsule Client only). --- Any PV1-3 subfield can potentially contain the DIM tag of the device that measured the data if the outbound interface is configured to send it in the PV1-3 field. The Capsule administrator must ensure that the DIM tag is sent in PV1-3-9 (default and recommended), PV1-3-6 or PV1-3-5, which are never otherwise valued. **Note**: PV1-3-1 can also be populated using the HL7 Mapping DMM.
PV1-6 PV1-11 PV1-42 PV1-43	Prior Patient Location Temporary Location Pending Location Prior Temporary Location	One of these fields can be configured to send the patient location in PL (Person Location) format when the patient location is required but the PV1-3 (Assigned Patient Location) field is already taken by a device identifier. For more information on the field content, refer above to the first point in the description of the PV1-3 field.

2.1.7 Default Profile – OBR Segment

Field	Field Name	Description
OBR-7	Observation Date/Time	• The Computer Time, Device Time or Measurement Time (refer to Timestamps) of the variables in the message, as determined by the Timestamp Manager DMM or Timestamp Policy setting in the HL7 connector that output the message. • Output in YYYYMMDDHHMMSS format.
OBR-10	Collector Identifier	• Populated according to the same rules as PV1-3. • Can also be populated using the HL7 Mapping DMM.
OBR-13	Relevant Clinical Info	• The channel ID if the HL7 connector that output the message is configured to write it to this field, or • A unique identifier for the device/application that generated the data: - Configurable Neuron ID (Neuron Location). - The hostname of the Capsule Server or Capsule Client, or an alias for the Client hostname. - The Node ID if the data comes from a device behind a gateway. - The DDI identifier if the data comes from a DDI that sends its data directly to the Capsule Server.
OBR-20	Filler Field 1	A number indicating the type of message if the data comes from Vitals Plus or Chart Xpress: • 1 – **Spot**: Vitals sent manually by a clinician immediately after the clinician has taken the vitals. This is the only value sent by Chart Xpress; all other values are sent by Vitals Plus only. • 2 **- Saved then sent**: Vitals that are saved on the Neuron when first measured (either during auto-intervals or a clinician workflow), then later sent manually by a clinician. • 3 – **Auto-sent intervals**: Vitals sent automatically as soon as they are measured at intervals. • 4 – **Alarms**: Technical or physiological alarms. • 5 – **Continuous output**: Continuous send of vitals, alarms and settings available currently on the monitoring device (from Vitals Plus only) • **Empty**: The Capsule system does not identify the type of message. OBR-20 is empty if the message was not generated by Vitals Plus or Chart Xpress.

2.1.8 Default Profile – OBX Segments

The OBX segment can contain the following:

- Vital signs
- DIM Tag
- Alarms
- Upper and lower alarm limits
- Total early warning scores (EWS) for a vitals submission. (Individual scores by vital sign are not supported.)

Field	Field Name	Description
OBX-1	Set ID	A unique numeric identifier
OBX-2	Value Type	NM | ST | SN depending on the type of data in OBX-5 and the configuration of the HL7 connector that output the message.
OBX-3	Observation Identifier	• The variable ID and optional source ID if the segment contains a vital sign or alarm. - Refer to OBX-3 (Observation Identifier) Values for Vital Signs for values sent for vital signs. - Refer to Technical Alarms and Physiological Alarms for alarm values sent by Vitals Plus. - Vital sign variables appear as variable ID-Source ID if there is a source ID in the data. - Alarm limits appear as variable ID-UpperAlarmLimit/Variable ID-LowerAlarmLimit - Alarm lmits appear as variableID-LowerAlarmLimit-sourceID/VariableID-UpperAlarmLimit-SourceID if alarm limits have a source ID. • The DIM tag if the HL7 connector is configured to send the DIM tab in an OBX segment.
OBX-4	Observation Sub-ID	The Channel ID if the HL7 connector is configured to output the channel ID in this field
OBX-5	Observation Value	• The variable value if the segment contains a variable value o If the variable is a simple-choice modifier, the value is the modifier if selected. o If the variable is a multiple-choice modifier, the value is a list of all the selected modifiers, separated by the ^ character. o “” if the variable has no value. • 1 (activated) or 0 (inactivated) if the segment contains an alarm. • The lower alarm limit if the segment contains a lower alarm limit. • The upper alarm limit if the segment contains an upper alarm limit. • The DIM tag if the segment contains a DIM tag. • The early warning score (EWS) if one was calculated from the vitals submission.
OBX-6	Unit	The Capsule-specific unit code as defined by the DDI that sent the data. Refer to the DDI help file for details. **Note**: The HL7 standard recommends a set of unit codes based on ISO 2955-83, but permits other coding systems.

Field	Field Name	Description
OBX-11	Observation Results Status	"F" or "R", depending on **the Send all OBX segments as Review (R) instead of Final (F)** setting in the HL7 Connector that output the message.
OBX-13	User-Defined Access Checks	• "APERIODIC" if the segment contains the value of an aperiodic variable. • "SETTING" if the segment contains a device setting • Empty otherwise.
OBX-14	Date/Time of Observation	The Computer Time/Device Time or Measurement Time of the variable, depending on the Timestamp Manager DMM or Timestamp Policy setting in the HL7 connector that sent the message, and the timestamps available for the variable in the data.
OBX-15	Producer's ID	• Neuron ID (Chart Xpress/Vitals Plus message only). • Empty otherwise.

OBX-16	Responsible Observer	The Nurse ID appears if you configure:
		• DMM Data Selection rule as an empty value
		• DMM Data Selection rule in Remove mode
		• At least one DMM Data Selection rule:
		  ○ In Selection mode
		  ○ In Selection mode for variable 9619 (Nurse ID)
		Otherwise, if no DMM Data Selection rule is configured, the OBX-16 value is empty

OBX-18	Equipment Instance Identifier	The Neuron Location.

2.1.9 OBX-3 (Observation Identifier) Values for Vital Signs

When the OBX segment contains a vital sign, the OBX-3 (Observation Identifier) field contains the variable number sent by the DDI.

The variables sent from Vitals Stream depend on the device, the device configuration and the DDI. Consult the DDI help file for more information.

The table below gives the variables sent by default from Chart Xpress (CX) and Vitals Plus (VP).

Variable	ID	Source
Temperature	2907	CX/VP
Temperature (modifier)	9232	CX/VP
Pulse	1	CX/VP
Pulse (modifier)	2463	CX/VP
Respiration	22	CX/VP
Respiration (modifier)	9580	CX/VP
Systolic blood pressure	2	CX/VP
Diastolic blood pressure	3	CX/VP

Variable	ID	Source
Blood pressure (modifier)	9574	CX/VP
Blood pressure (location modifier)	1280	CX/VP
MAP	1225	CX/VP
O2Sat/SpO2	14	CX/VP
O2Sat/SpO2 (modifier)	2008	CX/VP
O2 Flow rate	2377	VP
O2 Concentration	3747	VP
Weight	757	VP
Custom fields	1,000,000 + value configured in Capsule Command Console	CX/VP
Early warning score	1,000,000 + value configured in Capsule Command Console	CX/VP
SpO_2 Perfusion Index (PI)	560	VP
End Tidal CO2 (EtCO2)	20	VP
Inspired CO2 (InCO2)	21	VP
Last Clinical Measurement	4299	VP

2.2 Vitals Plus Alarm Messages

Vitals Plus generates an alarm message whenever an active alarm or alarms become inactive, or an inactive alarm or alarms become active. Vitals Plus also generates an alarm message every three seconds when at least one alarm is active.

A Vitals Plus alarm message has the following characteristics:

- OBR-20 has the value 4.
- The message contains:
    - An OBX segment for each alarm whose state has changed (active to inactive or inactive to active).
    - An OBX segment for each alarm that was already active when the message was generated.
    - An upper alarm limit segment for each active alarm in the message.
    - A lower alarm limit segment for each active alarm in the message.
    - OBX segments for the vital signs.

2.2.1 Alarm Reference

The following tables list the alarms generated by the Vitals Plus application. The **ID** column shows the value sent in the OBX-3 (Observation Identifier) field for the alarm.

2.2.2 Alarm IDs and HL7 output

All Vitals Plus alarms appear in the default HL7 format (the HL7 format covered by this guide) sent by the Capsule system.

2.2.2.1 IHE-compliant alarms

As a general rule, alarms must have an ID that conforms to the Capsule Data Standard in order to appear in IHE-compliant HL7. Most Vitals Plus alarm IDs are natively compatible with the CDS, but there are some exceptions that are described in the notes after the following tables.

IHE-compliant HL7 is a separate subject and is covered, along with the Capsule Data Standard, in the *IHE Integration Guide*.

2.2.2.2 Technical alarms

Vitals Plus sends all technical alarms in the outbound HL7 but groups some alarms under the same text in the application. The Display in Vitals Plus Application column maps the HL7 to the alarm text in the Vitals Plus UI.

ID	Alarm	Display in Vitals Plus Application
90714	Low battery	Less than 30 minutes remaining. Plug in to continue.
90713	Very low battery	Less than 5 minutes remaining. Plug in to continue.
90861	Main speaker error	Main speaker error. Reboot or call service.
90871	Advanced Monitoring Module communication error	Alarm Hub communication error.
90851	Monitoring abruptly terminated	Previous patient monitoring session ended unexpectedly.
6207	NIBP intervals mode stopped	Intervals ended unexpectedly. Restart intervals.
90101	NIBP - communication error	NIBP module communication error.
90102	NIBP - error	NIBP module error.
90122	NIBP - cuff overpressure	Overpressure detected. Check hose and cuff.
90125	NIBP - measurement timeout	NIBP measurement timed out. Check cuff or limit motion.
90127	NIBP - safety pressure timeout	
90126	NIBP - inflation timeout	Inflation time-out. Check hose and cuff.
90128	NIBP - pneumatic blockage	Pneumatic blockage. Check hose.
90113	NIBP - no oscillometric signal	Weak or no oscillation. Check hose and cuff.
90114	NIBP - erratic oscillometric signal	Erratic oscillations. Check cuff or limit motion.
90109	NIBP - out of range	NIBP out of range. Repeat measurement.

ID	Alarm	Display in Vitals Plus Application
90151	SpO2 - pulse oximeter communication error	Pulse oximeter communication error.
90152	SpO2 - pulse oximeter error	Pulse oximeter error.
90155	SpO2 - sensor disconnection	No SpO2 sensor connected.
90156	SpO2 - incompatible sensor	Incompatible SpO2 sensor.
90157	SpO2 - sensor error	SPO2 sensor error. Change sensor.
90162	SpO2 -low signal quality	SpO2 low signal quality.
90165	SpO2 - interference	SpO2 interference detected.
90171	SpO2 - sensor off patient	SPO2 sensor off patient.
90172	Pulse Timeout	Pulse search timeout. Check patient and sensor.
2538	SpO2 measurement delayed	Pulse search... Check SpO2 sensor.
1741	Pulse Rate measurement delayed	
7831	Pulse lost	Pulse Search…Check patient and sensor.
90181	SpO2 – Low Perfusion	SpO2 – Low Perfusion
90202	Thermometer – internal error	Thermometer error. Try again or call service.
90208	Thermometer – patient ADC channel calibration error	
90238	Thermometer – heater ADC channel calibration error	
90225	Thermometer – very low battery	Thermometer battery is low. Replace battery.
90226	Thermometer – low battery	
90209	Thermometer – temperature out of range	Temperature is out of range. Repeat measurement.
90221	Thermometer – ambient temperature too low	Ambient temp too high/low. Repeat TEMP measurement later.
90222	Thermometer – ambient temperature too high	
90205	Thermometer – probe disconnected	TEMP probe/chamber disconnected.
90231	Thermometer – probe error	TEMP probe error. Repeat measurement.
90201	Thermometer – communication error	TEMP communication error.
90207	Thermometer – measurement error	TEMP measurement error. Repeat measurement.
2029	Capno module communication error.	Capno module communication error.
2093	CO2 sampling line disconnected.	CO2 sampling line disconnected.
830	CO2 sampling line occluded or blocked.	CO2 sampling line occluded or blocked.
844	Capno ambient temp out-of-range	Capno ambient temp out-of-range
2056	Ambient pressure too high/low. Capno accuracy reduced.	Ambient pressure too high/low. Capno accuracy reduced.

ID	Alarm	Display in Vitals Plus Application
7037	CO2 Module Calibration Alarm	Capno module defective.
4290	Software Failure Alarm	Capno module defective.
2122	Device Hardware Error	Capno module defective.
2177	Sensor Motor Fail Alarm	Capno module defective.
5909	Capno values outside accuracy range	Capno values outside accuracy range
535	Capno module not supported.	Capno module not supported.
1742	Capno monitoring ended unexpectedly. Check patient or sampling line.	Capno monitoring ended unexpectedly. Check patient or sampling line.

Note: All Vitals Plus technical alarms appear in IHE output, even if their IDs do not correspond to the Capsule Data Standard.

2.2.2.3 Physiological alarms

Note: Vitals Plus distinguishes all physiological alarms in the application user interface.

ID	Alarm
31103	Low respiration rate
71103	High respiration rate
31104	Low systolic blood pressure
71104	High systolic blood pressure
31105	Low diastolic blood pressure
71105	High diastolic blood pressure
31106	Low MAP
71106	High MAP
31107	Low SpO2
71107	High SpO2
31102	Low temperature
71102	High temperature
31101	Low pulse rate
71101	High pulse rate
32515	Low EtCO2
72515	High EtCO2
72517	FiCO2 too high.
2053	No breath detected.

Note: Variables 31101, 31102, 31103, 71101, 71102 and 71103 have IDs that do not currently conform to IDs in the Capsule Data Standard. By default, and unlike non-standard technical alarms, these alarms do not appear in IHE output and require IHE-specific configuration. For more information on configuring the system to make these alarms available in IHE output, see the section “Vitals Plus variable mappings" in the *IHE Integration Guide*.

2.2.2.4 *Alarm Limits*

Vitals Plus alarm limit IDs appear in the standard format for alarm limits:

variableID-LowerAlarmLimit or *variableID-UpperAlarmLimit*

ID	Alarm Limit
1-LowerAlarmLimit	Pulse Rate Lower Alarm Limit
1-UpperAlarmLimit	Pulse Rate Upper Alarm Limit
2907-LowerAlarmLimit	Temperature Lower Alarm Limit
2907-UpperAlarmLimit	Temperature Upper Alarm Limit
2-LowerAlarmLimit	NIBP Systolic Lower Alarm Limit
2-UpperAlarmLimit	NIBP Systolic Upper Alarm Limit
3-LowerAlarmLimit	NIBP Diastolic Lower Alarm Limit
3-UpperAlarmLimit	NIBP Diastolic Upper Alarm Limit
1225-LowerAlarmLimit	NIBP MAP Lower Alarm Limit
1225-UpperAlarmLimit	NIBP MAP Upper Alarm Limit
14-LowerAlarmLimit	SpO2 Lower Alarm Limit
14-UpperAlarmLimit	SpO2 Upper Alarm Limit
20-UpperAlarmLimit	End Tidal CO2 Upper Alarm Limit
20-LowerAlarmLimit	End Tidal CO2 Lower Alarm Limit
21-UpperAlarmLimit	Inspired CO2 Upper Alarm Limit
22-UpperAlarmLimit	Respiration Rate Upper Alarm Limit
22-LowerAlarmLimit	Respiration Rate Lower Alarm Limit

2.3 ICCA and ICCA with Manufacturer Name Profiles

2.3.1 ICCA Profile - PID segment

Field	Field Name	Description
PID-5	Patient Name	The ICCA interface sets the value of PID5-1 (Family Name) and PID5-2 (Given Name) to 'UNKNOWN' because ICCA requires these sub-fields to be valued even though it does not process them.

2.3.2 ICCA Profile - PV1 segment

The ICCA interface contains no processing specific to the PV1-3 segment. However the following PV1-3 subfields must be valued:

- PV1-3-1
- PV1-3-3

In the case of an infusion pump, the following field may be valued with the name of the pump:

- PV1-3-4

It is the responsibility of the integrator to ensure that these values are sent by configuring the DDI identifier or Node ID appropriately. For example, the Node ID might be defined as Unit1^^Bed1 to ensure the correct values are sent.

2.3.3 ICCA Profile - OBR segment

Field	Field Name	Description
OBR-4	Universal Service Identifier	This field is valued as follows in the ICCA interface only when the device is an infusion pump or a feeding pump: ○ OBR-4-1: 16-495 ○ OBR-4-3: UMD It is empty otherwise.
OBR-13	User Defined Access Checks	The value "SETTING" never appears in the ICCA interface.

2.3.4 ICCA Profile - Additional OBX segments

There are two additional OBX segments immediately after the OBR segment in the ICCA interface. These segments identify the device that sent the data and the channel from which the data was collected.

2.3.5 ICCA Profile - OBX Addition Segment 1

Field	Field Name	Description
OBX-1	Set ID – OBX	1
OBX-2	Value Type	'ST' The same value is sent in OBX additional segment 2.
OBX-3	Observation Identifier	When the device that generated the data is an infusion pump or feeding pump, OBX-3 is valued as follows: OBX3-1: 16-495&DEV OBX-3-3: UMD When the device is neither an infusion pump nor a feeding pump, OBX-3 is valued as follows: OBX3-1:&DEV **Note**: The & is specifically the ampersand and not the default subcomponent separator.
OBX-5	Observation Value	For all device types, OBX-5 is valued as follows: <ddi-guid>^<ddi-full-name>^L, where • <ddi-GUID> is the GUID of the DDI that generated the data • When the selected HL7 profile is *ICCA*, <ddi-full-name> is the DDI name, followed by a comma, followed by the device name.

Field	Field Name	Description
		• When the selected HL7 profile is *ICCA with manufacturer name*, <ddi-full-name> is the manufacturer name, followed by a comma, followed by the device model name. • 'L' is a literal
OBX-6	Unit	For all device types, OBX-6 is valued as follows: OBX-6-1: 3-0 OBX-6-3: MIB This value is the same in OBX additional segment 2.
OBX-11	Observation Result Status	For all device types, OBX-11 is valued as 'F' This value is the same in OBX additional segment 2.

2.3.6 ICCA Profile - OBX Addition Segment 2

Field	Field Name	Description
OBX-1	Set ID – OBX	2
OBX-2	Value Type	'ST' The same value is sent in OBX additional segment 2.
OBX-3	Observation Identifier	When the device that generated the data is an infusion pump or feeding pump, OBX-3 is valued as follows: OBX-3-1: 16-495&SER OBX-3-3: UMD When the device is neither an infusion pump nor a feeding pump, OBX-3 is populated as follows: OBX-3-1: &SER **Note**: The & is specifically the ampersand and not the default subcomponent separator.
OBX-5	Observation Value	For all device types, OBX-5 is valued as follows: <ddi-GUID>:<node-id>_<channel-id> where • <ddi-GUID> is the GUID of the DDI that generated the data • <node-id> is the node ID if present in the data. If there is no node ID, the preceding colon is omitted. • <channel-id> is the channel ID if present in the data. If there is no channel ID, the preceding underscore is omitted. If the name of the pump is specified in PV1-3-4 (refer to PV1 segment) the field is valued as follows: <pump-name>:<node-id>_<channel-id> where • <pump-name> is the name of the pump from PV1-3-4 • <node-id> is the node ID if present in the data. If there is no node ID, the preceding colon is omitted. • <channel-id> is the channel ID if present in the data. If there is no channel ID, the preceding underscore is omitted.

Field	Field Name	Description
OBX-6	Unit	For all device types, OBX-6 is valued as follows: OBX-6-1: 3-0 OBX-6-3: UMD This value is the same in additional OBX segment 1.
OBX-11	Observation Result Status	For all device types, OBX-11 is valued as 'F' This value is the same in OBX additional segment 1.

2.4 Capsule with UTC Offset

This profile is used whenever the consuming system needs timestamps to the millisecond precision. Timestamps have the following format:

YYYYMMddHHmmss.sss±uuuu

where:

- YYYY is the year
- MM is the month
- dd is the day
- HH is the hour
- mm are the minutes
- ss.sss are the seconds and milliseconds
- YYYYMMddHHmmss.sss is expressed in local time.
- ±uuuu is UTC offset, where the first two digits are the hour and the last two digits are the minutes
- Examples: +0100 = one hour ahead of UTC, -0300 = three hours behind UTC

The following fields are impacted: MSH-7, OBR-7 and OBX-14.

2.5 Vital Sync Profile

This profile is used to send messages to Medtronic Vital Sync™.

This profile is available under licensing only.

2.5.1 Vital Sync Profile - OBR segment

Field	Field Name	Description
OBR-13	Relevant Clinical Information	The device identifier in the following format: <type>^<manufacturer>^<model>^<ddi-GUID> <manufacturer> and <ddi-GUID> are DDI metadata <type> and <model> are filled in by the profile depending on the values of <manufacturer> and <ddi- GUID>

2.5.2 VitalSync Profile - OBX segment

Field	Field Name	Description
OBX-4	Observation Sub ID	VitalSync expects the channel ID in OBX-4, and uses OBR-13 (the other possible field for the channel ID) as described in VitalSync Profiile - OBR segment above. As a result, the **Write Channel IDs to OBX-4** option must be selected in the HL7 Connector.
OBX-6	Units	The variable unit, or empty if the variable unit is “null”.

2.6 BedMasterEx Profile

This profile is used to send messages to the BedMasterEx solution.

This HL7 profile impacts the OBR and OBX segments of the outbound HL7 as shown in the table below. All other segments are unchanged.

This profile is available under licensing only.

2.6.1 BedMasterEx Profile - OBR segment

Field	Field Name	Description
OBR-4	Collection Volume	This field contains the DIM tag of the DDI producing the HL7 message if available. Otherwise, it is empty.

2.6.2 BedMasterEx Profile - OBX segment

Field	Field Name	Description
OBX-2	Data type	This field always contains “ST”.

2.7 Device Info Profile

This profile is used to provide additional data to uniquely identify a device, and to distinguish IV pumps and feeding pumps from other devices.

2.7.1 Device Info profile – OBR Segment

Field	Field Name	Description
OBR-9	Collection Volume	• "PUMP" when the device category in the DDI help file is "Infusion Pump". • "Feeding Pump" when the device category in the DDI help file is "Pumps, Enteral Feeding". • "FPUMP" when the device category in the DDI help file is "Feeding Pump". • Empty otherwise.
OBR-10.1	Collector Identifier	The DDI GUID, including the opening and closing braces {}.
OBR-10.2		The device name as displayed in the DDI help file.

3 Inbound (ADT) Interface

3.1 Overview

The Capsule system uses a data-based rather than ADT event-based approach when processing inbound ADT messages. In most cases it looks at the data in the message rather than the message type and synchronizes the patient census with that data. For example, if the system receives any ADT message containing a new patient in the PID segment, it admits this patient.

Because of this approach, we refer to “processed” rather than “supported” messages. For example, although the Capsule system can update any patient data in response to an ADT^O6 (Change Outpatient to Inpatient) message, it does not change the patient class from outpatient to inpatient unless that change is included in the message data.

The system performs some message-specific processing for the ADT^A03 (Discharge Patient), ADT^A08 (Update Patient), ADT^A11 (Cancel Admit) and ADT^A18 (Merge Patient) messages. This processing is described below.

The system cannot process the following messages: A21, A30, A34, A36, A38.

Some of the data processed by the ADT interface is stored in the patient census but not output in ORU^RO1 messages. This data is available for custom outbound processing.

Note: The default configuration of the ADT interface is not compatible with Secure Association with automatic association. Contact your Philips technical support if you want to use automatic association.

3.2 Message Structure

`MSH EVN PID PV1` (All messages except ADT^A18 - Merge Patient Information)

`MSH EVN PID MRG PV1` (ADT^A18 - Merge Patient Information)

3.3 Admits and Updates

By default, whenever the system receives a message containing a new patient or account, it admits the patient or account to the Capsule census. Whenever the system receives a message for an existing patient or account, it updates the patient or account.

The system can be configured to ignore A08 messages if the account is not already admitted in the same facility. This is helpful to prevent unnecessary re-admits when the account is not identified as discharged in PV1-41, and required when a deployment uses Secure Association with automatic association. For more information, refer to ADT and Secure Association with Automatic Association.

Note: The system continues to update discharged (inactive) accounts in this way if they are still stored in the patient census because the patient has other accounts that are still active. These accounts are not visible in the clinical applications, but if they are subsequently re-activated, they become visible and reflect any changes made while they were inactive.

3.3.1 Examples of Admits and Updates

The following sequence illustrates how the Capsule ADT interface admits and updates patients:

- If patient John Smith (PID-3: MRN01) does not exist in the patient census and the system receives any ADT message except ADT^A03 with PID-3: MRN01 and PID-18: ACC01, the system admits John Smith with PID-3 = MRN and creates account ACC01 for the patient.

PID-3	PID-5	PID-18
MRN01	John Smith	ACC01

- If the system then receives any message except ADT^03 with PID-3 = MRN01, PID-5 = John Jones, the system updates the patient name from John Smith to John Jones.

PID-3	PID-5	PID-18
MRN01	John Jones	ACC01

- If the system receives any message except ADT^A03 with PID-3 = MRN01, PID-5 = John Smith and PID-18 = ACC02, the system 1) updates the patient name to John Smith 2) creates account ACC02 for patient John Smith.

PID-3	PID-5	PID-18
MRN01	John Smith	ACC01 ACC02

Note: The ADT^A18 event can also trigger data updates in addition to performing a merge. For more information, refer to A Note on Updates.

3.4 Moving Accounts

The ADT^A08 (Update Patient) message can be used to move an account from one patient to another. When the system receives an ADT^08 message with an existing account number in PID-18, and a different patient ID in PID-3, the system moves the account to the new patient.

3.4.1 Examples

If the patient census already contains accounts ACC01 and ACC02 for John Smith (MRN01) and the system receives an ADT^08 message with patient Sarah Smith (MRN02) and account ACC02, the system:

- Creates patient Sarah Smith if the patient does not already exist
- Moves account ACC02 to Sarah Smith

Before (Sarah Smith already exists):

PID-3	PID-5	PID-18
MRN01	John Smith	ACC01 ACC02
MRN02	Sarah Smith	ACC03

After:

PID-3	PID-5	PID-18
MRN01	**John Smith**	**ACC01**
MRN02	**Sarah Smith**	**ACC02** **ACC03**

3.5 Discharging Patients and Accounts

There are several ways to discharge an account:

1. With an ADT^A03 (Discharge/End Visit) message – the account in PID-18 is discharged.
2. With an ADT^A11 (Cancel Admit) message – the account in PID-18 is discharged.
3. By sending a value in PV1-41 (Account Status) that tells the system to discharge the account. By default, the system discharges the account if PV1-41 is "DIS" or "CAN", but the list of discharge values is configurable.
4. Automatically, when a new account is admitted to a location while a previous account is still admitted. In this case, the previously-admitted account is discharged.

Note: The Capsule ADT interface is not configured to perform automatic discharges by default. Automatic discharge is required when a deployment uses Secure Association with automatic association. For more information, refer to ADT and Secure Association with Automatic Association.

The system deletes the patient and all its accounts from the census when the last account is discharged.

3.5.1.1 Examples

John Smith (MRN01) has one account, ACC01, and the system receives:

- An ADT^A03 message with PID-3: MRN01 and PID-18: ACC01, or
- Any ADT message with PID-3: MRN01, PID-18: ACC01, PV1-41: DIS or CAN

John Smith is discharged from the patient census because his only account is discharged.

Note: To prevent re-admission of patients who have been discharged from the Capsule patient census and who should not be re-admitted, ADT messages received by the Capsule system for these patients must contain the value DIS or CAN (or whatever values are configured in Corepoint) in PV1-41 (Account Status), or the ADT interface must be configured to ignore A08 messages that relate to accounts that are not already admitted in the census. (Consult the *System Administrator's Guide* for more information.)

3.6 Merging Patients

The ADT interface can merge patients within the same facility. Whenever the system receives an ADT^A18 message it:

1. Moves all accounts from the patient whose identifier is in MRG-1 to the patient in the PID segment.
2. Creates a new patient with the patient in the PID segment, if this patient does not already exist.

3. Creates a new account with the account ID in PID-18, if this account number does not already exist in the list of accounts attached to the patient in the PID segment.

4. Discharges the patient in the MRG segment.

Note: The identifier in MRG-1 must be the patient's PID-3 identifier.

3.6.1 Examples

If Sarah Smith (MRN02) has two accounts ACC02 and ACC03 and the system receives an ADT^18 with new patient Johnny Dee (PID3 - MRN03, PID18 - ACC04) and MRN02 in MRG-1, the system:

1. Creates patient Johnny Dee.

2. Creates account ACC04 for patient Johnny Dee.

3. Moves accounts ACC02 and ACC03 to Johnny Dee.

4. Discharges Sarah Smith.

Before:

PID-3	PID-5	PID-18
MRN02	Sarah Smith	ACC02 ACC03

After:

PID-3	PID-5	PID-18
MRN03	Johnny Dee	ACC02 ACC03 ACC04

3.7 A Note on Updates

In general, all events can perform updates in addition to event-specific processing. Examples:

Message	Result
In addition to moving an account (refer to Moving accounts), an ADT^A08 message also contains an update to the patient name.	• The account is moved. • The patient name is updated.
In addition to performing a merge, an ADT^A18 message also updates the surviving patient's date of birth	• The accounts are moved from the non-surviving patient to the surviving patient. • The non-surviving patient is discharged. • The surviving patient's date of birth is updated.

3.8 ADT and Secure Association with Automatic Association

The default ADT interface is not compatible with Secure Association with automatic association, because automatic association requires a single visit (at most) to be admitted to bed. The default interface does not guarantee this.

For compatibility with automatic association, configure the ADT interface as follows:

- A08 messages must be ignored if they do not refer to an existing visit in the same facility.

  This prevents visits being spuriously readmitted following post-discharge activity in the HIS when PV1-41 in the visit does not identify it as discharged.
- Visits(s) already admitted to a bed must be discharged when a new visit is admitted to the bed.

  This prevents multiple visits accumulating in the same bed when, for example, the Capsule ADT interface does not receive a discharge message from the hospital ADT system.
- The definition of a bed must be configured to ensure that automatic discharges do not occur in outpatient locations, where it is normal to have multiple visits admitted to the same location at the same time. By default, the interface assumes that a bed is any location where the PV1-3.3 (Bed) subfield has a value and that value is different from the PV1-3.2 (Room) value.

The Capsule ADT interface contains options to configure this behavior. Consult the *System Administrator's Guide* for more information.

3.9 MSH Segment - Processed Fields

Field	Field Name	Description	Required?
MSH-1	Field Separator	• Separates the segment ID from the first field containing data. • Determines the field separator to use when parsing the message.	Yes
MSH-2	Encoding Characters	Determines the characters to use for the component separator, repletion separator, escape characters and subcomponent separator when parsing the message.	Yes
MSH-4-1	Sending Facility	• Determines the facility to which the patient belongs. • Stored in the patient census in the `Location` table. • Also stored in the patient census in the `PatientIdentifiers` table as the Assigning Authority for patient IDs if the patient IDs do not have their own Assigning Authority specified.	No. If the Sending Facility is not specified, the Facility associated with the visit in the message is empty in the census. If the Sending facility is not Specified and the Assigning Facility of the patient ID (PID-3-4) is not specified, the census stores 'U' for the Assigning Facility of the patient ID.

3.10 EVN Segment – Processed Fields

Field	Field Name	Description	Required?
EVN-1	Event Type Code	Used to determine whether the event is an ADT^A03 (Discharge/End Visit), ADT^A08 (Update Patient Information), ADT^A11 (Cancel Admit), or ADT^A18 (Merge Patient Information) event to trigger custom processing.	No. If the field is not present the system treats the message as an admit/update.

3.11 PID Segment – Processed fields

Field	Field Name	Description	Required?
PID-3	Patient ID (Internal ID)	• Determines the ID from the ID (PID-3-1) subcomponent • Determines the assigning authority from the Assigning Authority component (PID-3-4) if this component is present. If it is not, MSH-4-1 is stored as the assigning authority. • If the assigning authority component contains subcomponents, only the first subcomponent is stored. • Determines the identifier type code from the Identifier Type Code component (PID-3-5) if present. If it is not, "U" is stored as the identifier type code. • Values are stored in the `PatientIdentifiers` table in the patient census.	Yes

PID-5	Patient Name	• The following components are stored in the patient census:
		  ○ Family Name (PID-5-1)
		  ○ Given Name (PID-5-2)
		  ○ Middle Initial (PID-5-3)
		  ○ Suffix (PID-5-4)
		  ○ Prefix (PID-5-5)
		  ○ Degree (PID-5-6)
		  ○ Name Type Code (PID-5-7)
		• If no value is specified for Name type code, "U" is stored in the patient census
		• Only the following components are output in the ORU message (refer to ORU Patient Name):
		  ○ Family name
		  ○ Given name
		• If the repetition operator is used to specify multiple patient names of different types, all names are stored in the patient census, and the census can be configured to output a name of a specific type.
		• Values are stored in the `PatientNames` table in the patient census.
			No

PID-7	Date/Time of Birth	Determines the patient date of birth from the first eight characters in the field and stores it in the `PatientIdentification` table.	No
PID-8	Sex	Stores the first character in the `PatientIdentification` table in the patient census.	No
PID-9	Patient Alias	Processed in the same way as PID-5 (Patient Name).	No

Field	Field Name	Description	Required?
PID-15	Primary Language	Stored in the `PatientAttributes` table.	No
PID-18	Patient Account Number	Stored in the `PatientIdentifiers` table.	Yes

3.12 PV1 Segment – Processed Fields

Field	Field Name	Description	Required?
PV1-2	Patient Class	• Stored in the `VisitAttributes` table. • Displayed in the clinical applications in the list of accounts.	No Defaults to 'I' in outbound HL7 if no value is provided.
PV1-3	Assigned Patient Location	• The following components are stored in the `Location` table: - PV1-3-1 Point of Care - PV1-3-2 Room - PV1-3-3 Bed - PV1-3-7 Building - PV1-3-8 Floor **Note**: PV1-3-4 Facility is not used to determine the patient facility. The system uses MSH-4 (Sending Facility).	PV1-3-1 is required. All other subcomponents are optional.
PV1-10	Hospital Service	• Stored as the default value of the Additional Account Identifier in the `VisitAttributes` table. **Note**: The Additional Account Identifier can be modified to take the value of any field in the ADT message.	No
PV1-19	Visit Number	Stored in the `PatientVisits` table.	No
PV1-41	Account Status	Discharges an account if set to certain values (refer to Discharging patients and accounts).	No
PV1-44	Admit Date	• Stored in the `VisitAttributes` table. • Displayed in the clinical application in the list of accounts.	No

3.13 Example ADT Messages

The following are ADT messages accepted by the Capsule system. Note that the system accepts many combinations of data and this section cannot provide an example of every combination. At the bare minimum, the system requires MSH-1, MSH-2, an EVN segment (which can be empty), PID-3, PID-18 and PV1-3-1 to add a patient to the census.

3.13.1 Admit

```
MSH|^~\&|DATACAPTOR|CAPSCONNECT|||200810221552||ADT^A01|QA1AGTADM.1.1490
73|D|2.1
EVN|A01|201204031038
PID|1||IHERED-993^^^IHERED
||MOORE^RALPH||19510706|M|||||||EN|||VN6727^^^IHEPAM
PV1|1|I|UnitC^RoomC1^BedC11|||||||||||||||VN6727
```

3.13.2 Update

```
MSH|^~\&|DATACAPTOR|CAPSCONNECT|||200810221552||ADT^A08|QA1AGTADM.1.1490
73|D|2.1
EVN|A08|201204031038
PID|1||IHERED-993^^^IHERED
||MOORE^RALPH||19510707|M|||||||EN|||VN6727^^^IHEPAM
PV1|1|I|UnitC^RoomC1^BedC11|||||||||||||||VN6727
```

3.13.3 Discharge

```
MSH|^~\&|DATACAPTOR|CAPSCONNECT|||200810221552||ADT^A03|QA1AGTADM.1.1490
73|D|2.1
EVN|A03|201204031038
PID|1||IHERED-993^^^IHERED
||MOORE^RALPH||19510706|M|||||||EN|||VN6727^^^IHEPAM
PV1|1|I|UnitC^RoomC1^BedC11|||||||||||||||VN6727
```

3.13.4 Merge

```
MSH|^~\&|SA|SF|||200810221552||ADT^A18|QA1AGTADM.1.149073|D|2.1
EVN|A18|201204031038
PID|1||MRN03||DEE^JOHNNY||19380223|F|||||||EN|||ACC4
MRG|MRN02
PV1|1|I|CCA
```

4 Acknowledgements

4.1 Sent Acknowledgements

The Capsule system sends acknowledgements in the following format:

4.1.1 Message Structure

```
MSH MSA
```

4.1.2 MSA Segment

Field	Field Name	Description
MSA-1	Acknowledgement Code	Supported codes: “AA” “AE” “AR”, “CA”
MSA-2	Message Control ID	20-character string

4.2 Received Acknowledgments

Acknowledgements received from downstream systems must conform to the following rules to be recognized by the Capsule system:

4.2.1 Message Structure

```
MSH MSA
```

4.2.2 MSH Segment

The following fields must be populated:

MSH-2 (Encoding Characters), MSH-7 (Date/Time of Message), MSH-9 (Message Type), MSH-10 (Message Control ID), MSH-11 (Processing ID), MSH-12 (Version ID)

4.2.3 MSA Segment

Field	Field Name	Description
MSA-1	Acknowledgement Code	“AA” or “AC” – the Capsule system considers that the downstream system has successfully processed the message specified in MSA-2. Any other value – the Capsule system considers that the downstream system has not successfully processed the message specified in MSA-2.

Field	Field Name	Description
MSA-2	Message Control ID	The MSH-10 (Message Control ID) value in the acknowledged message from the Capsule system.