

Mindray

Patient Data Share Protocol

Programmer's Guide


mindray

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Intended Use

This manual describes data transfer, networking mode and network configuration about Mindray patient monitor, anesthesia machine, HYPERVIO SR VI Central Monitoring System and Patient Data Share Gateway, and providing guidelines for third-party developers to connect to the aforementioned products.

Besides, how to install and use Mindray gateway software is described in Chapter 6.

Intended Audience

This manual is intended for professional software developers. Professional software developers are expected to have a working knowledge of software development and application, network basics and network product development.

Warranty

This warranty is exclusive and is in lieu of all other warranties, expressed or implied, including warranties of merchantability or fitness for any particular purpose.

The physiological parameters and alarm information outputted from products designed by Mindray using Patient Data Share Protocol are for doctors' reference only and cannot be directly used as basis for clinical treatment. Before giving intervention treatment to a patient, you must go to the corresponding monitor to confirm the patient's condition.

Revision History

This document has a revision number. This revision number is subject to change without prior notice whenever this document is updated due to software or technical specification change. Revision 1.0 is the initial release of this document:

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Conventions

- *Italic* text is used in this document to quote the referenced chapters or sections.
- [] is used to enclose screen texts.
- → is used to indicate operational procedures.

Safety Information

WARNING

- Indicates a potential hazard or unsafe practice that, if not avoided, could result in serious injury or property damage.
-

CAUTION

- Indicates a potential hazard or unsafe practice that, if not avoided, could result in minor personal injury or product/property damage.
-

NOTE

- Calls attention to an important point in the text.
-

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1 Overview

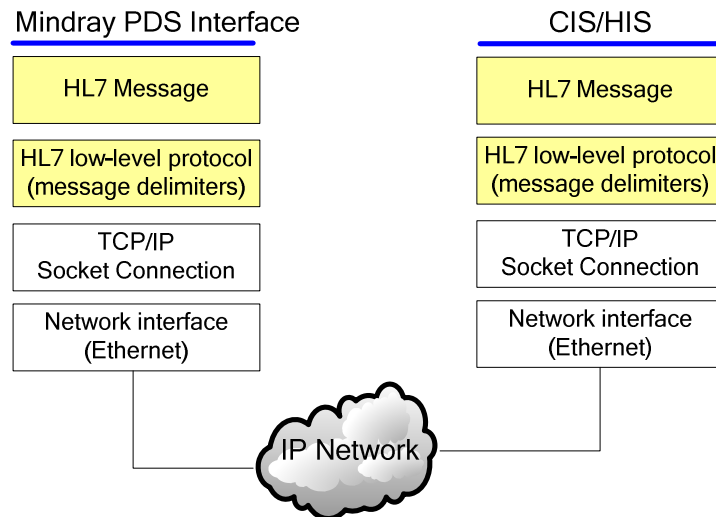
Note

- Before start work with this document, please read “Mindray Patient Data Share Solution Guide” at first.
-

1.1 Communication Layers

Mindray Patient Data Share Protocol (hereinafter called PDS Protocol) is defined above TCP/IP layer.

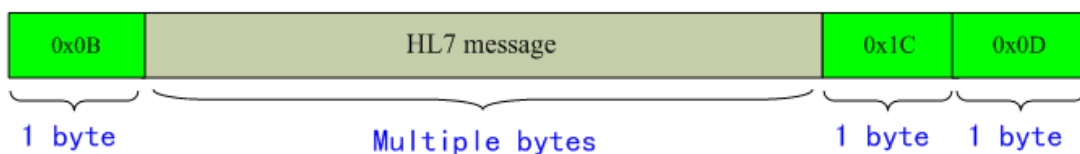
The following diagram shows the communication layers involved in the communication between a Mindray monitor and a client PC. The layers in yellow color are defined in this document.



1.1.1 HL7 Low-Level Protocol

TCP/IP is a byte-stream protocol and does not provide messaging boundaries. HL7, which belongs to application layer protocol, defines message format but does not provide a mechanism to detect message start and end. To mark message boundaries, the Minimal Lower Layer Protocol is used (as described in *HL7 Interface Standards Version 2.3.1*).

On the network, a message is transmitted in the following format:



Where,

- Message start mark (1 byte) that corresponds to ASCII <VT>. Its hexadecimal value is <0x0B>.
- HL7 message of multiple bytes.
 1. It includes only ISO 8859-1 characters (hexadecimal values between 0x20 and 0xFF) and <CR>. must not contain other control/non-printable characters.
 2. There is no special treatment for forbidden control characters in the messages received by the server side.
- Message end mark (2 bytes) that respectively corresponds to ASCII <FS> and <CR>. Their respective hexadecimal values are <0x1C> and <0x0D>.

1.1.2 HL7 Protocol Layer

HL7 is a communication protocol for data exchange between medical systems. Initially defined in the United States, the HL7 protocol is now used in many countries.

Mindray PDS protocol is based on HL7 protocol version 2.3.1. It uses only part of it, including:

- Chapter 2: ‘Control/Query’
- Chapter 3: ‘Patient Administration’
- Chapter 7: ‘Observation Reporting’

For a detailed description of HL7 V2.3.1, refer to the HL7 standard.

Appendix A gives a simple description of the syntax of HL7 V2.3.1.

1.2 Character Set

Mindray PDS protocol supports multiple character sets. It does not support Unicode. The default character set is ISO8859_1. Character sets are defined in segment MSH. For example, MSH|^~\&|||||ORU^R01|154155500|P|2.3.1|||||ISO8859_1|

The ISO8859_1 character set can be omitted if it is default.

The following character sets are supported: GB2312, from ISO8859_1 to ISO8859_16.

1.3 Message Separator and Escape character

The following table lists the separators used in HL7 message.

Table A-1 Element & Separator

Element	Separator
Segment	<cr> The hexadecimal value is 0x0D
Field	

Field Repetition	~
Component	^
Sub Component	&

If the HL7 message do uses the above separator characters in field content (i.e. the patient demographics), please use the escape character “\” before them.

For example, string “A & B” should be transfer to “A\&B”.

Special wide char type transfer string:

Special char	Transfer string
WCHAR(916)	{#}
WCHAR(9651)	

1.4 Coding System

Mindray PDS protocol uses Mindray HL7 coding system (Mindray HL7 Code, hereinafter called MHC.) Please refer *Appendix B*.

1.5 Interface introduction

1.5.1 Unsolicited Results Interface

This interface listens to the client side’s connection as the server side of TCP socket. Once the connection is established, this interface will send data unsolicitedly at a configured transmit interval.

The main characteristics of the interface are:

1. The transmit interval can be set through configuration user interface. The minimum interval is 15s.
2. Multiple patients’ data can sent through one TCP connection in each interval.
3. One or more types of following data can be selected for sending: vital sign parameter, physiological alarm, technical alarm, alarm setting and “module settings and device status”.
4. Aperiodic parameters shall also be sent when they are changed.

1.5.2 Solicited Results Interface

This interface listens to the client side’s connection as the server side of TCP socket. Once the connection is established, this interface waits for results requests. Upon receiving a request it sends the current results data to the requesting results data consumer. This is all done via the same TCP connection.

The main characteristics of the interface are:

1. The client side can send query message and request the interface to send one or more types

of following data: vital sign parameter, physiological alarm, technical alarm, alarm setting and “module settings and device status”.

2. Multiple patients’ data can be returned through the same TCP connection upon request.
3. This interface will not send any data unsolicitedly unless by requesting.
4. The minimum interval of this interface can accept requesting is 15s. Only the first request will be acknowledged and the others will be dispatched if they come within 15s.

1.5.3 ADT Net Query Interface

This interface as client side connects the hospital’s HIS or EMR system and queries specific patient’s detailed information based on the PID.

The main characteristics of the interface are:

1. Only one patient’s information will be queried at one time from HIS/EMR.
2. The keyword for querying is PID.
3. Does not process any other patient data except for receiving the queried patient.

1.5.4 ADT DB interface

This interface as client side connects the hospital’s HIS or EMR system and stores all the ADT messages received from HIS or EMR.

The main characteristics of the interface are:

1. Receives all the HL7 ADT messages from HIS/EMR and stores them in a local small database. The Central Monitoring System can query patient demographics from this database.
2. When the patient demographics on patient monitor changes, a HL7 ADT message will be sent outwards.
3. Does not send a query message outwards.

1.5.5 Realtime Results Interface

This interface listens to the client side’s connection as the server side of TCP socket. Once the connection is established, the interface will send data every second.

The main characteristics of the interface are:

1. The time interval of data sending is fixed to 1 second, causing a great network throughput.
2. Only one patients’ data can sent through one TCP connection in each interval.
3. Specific vital sign parameter can be sent every second only after receiving query message from client side.
4. Physiological alarms and technical alarms are sent every second unsolicitedly without query.
5. Detailed device configuration and status information are sent unsolicitedly upon connection is established or they are changed.
6. Aperiodic data, device configuration and status information shall also be sent when they are changed.

7. For this interface on bedside device, dynamically, the client side can request this interface to change to send different vital sign parameters at runtime by resent different query messages.
8. For this interface on Central Monitoring System and PDS Gateway, dynamically, the client side can request this interface to change to send different vital sign parameters from different bedside monitors at runtime by resent different query messages.

This interface also provides two functions using UDP connection or other TCP connection:

1. Broadcast online message using UDP connection.
2. Bedside monitors list can be queried from Central Monitoring System or PDS Gateway.

Note

-
- **Mindray will no longer update and maintain Realtime Results Interface. Please make cautious decision for using it.**
-

1.6 Application scope

Please refer to “Mindray patient data sharing solution” for finding out which bedside devices or products support the above interfaces.

1.7 Patient unique identification

CIS can receive different patient’s results data in one TCP connection, so unique patient identification should be used.

Mindray bedside devices and Central Monitoring System are not able to insure the patient identification (i.e. Medical Record Number/MRN or name or bed number) is unique. After the patient is discharged, all his demographics are clear, and there is no mechanism to make different patient’s MRN, name or bed number are unique.

Hospital and services personal should carry out some means to make the patient identification is unique. At least, the bed number should be unique.

Notes, the patient Medical Record Number is present in the OBX segment on “Realtime Results Interface” (refer to *Appendix B.4*), while it is present in the field PID-3 on other interfaces (refer to section 2.2.4).

1.8 Valid value of results data

The valid range of normal vital sign parameters is positive, except these:
The valid range of ST is from -2 to 2; The valid range of IBP is from -50.
-100 or -10 are used to indicate a invalid value normally.

2 Unsolicited Results Interface

2.1 Communication Process

2.1.1 Network Connection

The unsolicited results interface acts as TCP server socket and always listens for connections on the client socket. Once the number of connected client sockets reaches the maximum, new client socket connection will be rejected. The client socket listened to can be set via the configuration screen.

The unsolicited results interface doesn't break TCP connection spontaneously. In case of unexpected network interruption, connection needs to be reestablished between the server socket and the client socket. But the unsolicited results interface will not resend data occurred during the network disconnection period.

Two methods are optional to break or close the connection. One is that the client socket turns off Socket spontaneously to break the connection. The other is that the client socket sends HL7 message containing a network disconnection command to the unsolicited results interface which then turns off Socket.

If interruption of network physical connection occurs, TCP Socket of Windows operating system may be unable to notify the unsolicited results interface or the client socket of network disconnection in time, which results in Socket being considered to have normal connection by both the unsolicited results interface and the client socket. However, the network physical connection has been disconnected, which finally makes data unable to be sent and received properly. Therefore, it is suggested that the client socket reestablish the connection spontaneously if it doesn't receive any data sent from the unsolicited results interface at the set time interval. If connection can't be established, measures should be taken to solve network faults.

2.1.2 Data Communication

2.1.2.1 Unsolicited Sending

The unsolicited results interface sends data (ORU^R01 message) to the client socket when TCP connection has been established (within 1 second after TCP connection is established) and the set time interval has reached.

The sending interval is configurable in the configuration screen.

This interface doesn't handle any data sent from the client socket except for the network disconnection message (See Section 2.3).

The data of all the bedside monitors is sent at each set time interval when connection is established. With network data traffic and computer performance considered, the interface

will send data of one bed after another about every 200 milliseconds after starting to send data. Therefore, based on the number of bedside monitors, the lasting time of data transmission at each set time interval may amount to several seconds.

The sent data of each bedside monitor is the most recent data points at current time.

Upon receiving data sent by this interface, the client socket can respond by sending either ACK or NACK, but they will be ignored by the unsolicited results interface.

This interface will not send data of the bedside monitor, when any of the three conditions occurs:

Network disconnection occurs between a bedside monitor and CMS or between a bedside monitor and PDS gateway;

The bedside monitor is turned off;

A patient is discharged from the bedside monitor.

Aperiodic parameters like NIBP, C.O., and CCO will also be sent at the set time interval. The value sent is the most recent manual measurement value at next transfer interval.

2.1.2.2 Sent Data Contents

Once configured in the configuration screen, the following data can be sent.

1. Vital sign parameters
2. Physiological alarms
3. Technical alarms
4. Alarm setups including the upper and lower limits of each parameter, alarm on/off, and alarm priority
5. Module configuration and device status that include:
 - (1) ECG lead type
 - (2) HR alarm source
 - (3) PR source
 - (4) Whether the equipment is in standby state
 - (5) Currently highest alarm priority of the equipment
 - (6) Type of currently highest alarm priority of the equipment: physiological alarm or technical alarm
 - (7) Whether alarms of the equipment are in one of these statuses: alarm off, alarm pause, audio alarm off, alarm silence, or none of above statuses (i.e. in normal alarming status).

NOTE

-
- **If the patient monitor uses the ‘CMS protocol’ to connect Central Monitor System or PDS Gateway, the point 7 above is invalid and the receiver should ignore this content. About ‘CMS protocol’, please refer to the document Mindray patient data**
-

sharing solution .

(8) If the equipment is telemetry equipment, is **Nurse Call** or **Event** available?

The data sent is the most recent data at the time of data sending. Data measurement time is indicated by the OBR segment of HL7 message.

2.1.2.3 Data Sent when Triggered

Once triggered, the following contents will be sent by the interface.

1. Aperiodic parameters like NIBP, C.O., and CCO measurement completion. When network connection between bedside monitors and gateway is established and only when the option of **Physiological Parameter** in the configuration screen is selected, aperiodic parameters are sent to CIS client socket.
2. State of a monitor entering or exiting standby. Even though the data contents to be sent are not selected from the configuration screen, when a monitor enters or exits standby state, this event (a monitor entering/exiting standby state) is also sent.
3. Event of network disconnection between a bedside monitor and this interface or a monitor turned off. Even though the data contents to be sent are not selected from the configuration screen, when a monitor enters or exits standby state, this event is also sent via HL7 message. When a monitor is not networked to this interface, it will no longer receive any data from this interface.
4. The message ADT^A03 is sent only when a patient is discharged from a bedside monitor and the option **Device Configuration and Status Information** is selected.

2.1.2.4 Data Sent when a Bedside Monitor Is in Standby state

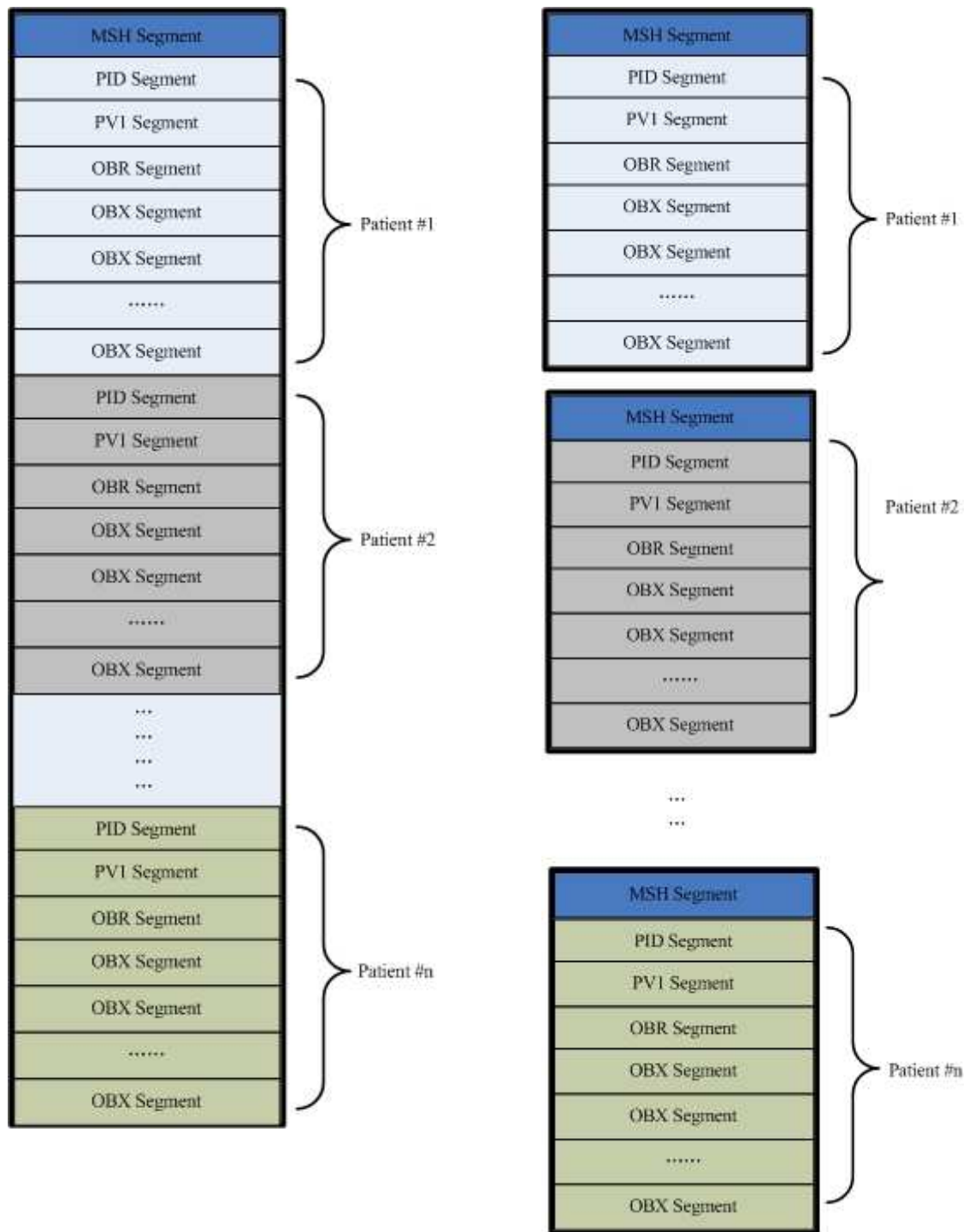
1. Standby state change: whatever data contents to be sent is selected from the configuration screen, when a bedside monitor accesses or exits standby state, this interface will send standby state change via HL7 message.
2. Unsolicited sending: If a bedside monitor is in standby state currently, this interface only sends patient information and standby state at each interval. Even if other data contents are selected from the configuration screen, these contents will not be sent at all. If the bedside monitor is in normal monitoring mode and the option of **Module Configuration and Device Status** is selected from the configuration screen, this interface will send the status information of “Being Monitored” to the client socket.

For the format and contents of HL7 message when a bedside monitor is in standby state, see *Appendix B.4*.

2.2 ORU^R01 Message

2.2.1 Format

There are two methods to send results data. First is to send out all patient data in one HL7 message. Second is to send out one patient data per one HL7 message. One of them can be selected from the user configuration dialog.



2.2.2 Example

1. At each time interval

```

MSH|^~\&|Mindray|Gateway||||ORU^R01|2|P|2.3.1| <CR>
PID||M1015_00010||John^||20091112|M||^| <CR>
PV1||I|^ICU&Bed5&3232241659&0&0|||||A|||||20091201111211 <CR>
OBR||Mindray Monitor||20091203121631| <CR>
OBX||NM|52^Height|169.0||||F <CR>
OBX||NM|51^Weight|59.0||||F <CR>
OBX||CE|2302^BloodType|1^A||||F <CR>
OBX||CE|2303^PACE_Switch|0^Off||||F <CR>
OBX||NM|101^HR|2101|60||||F <CR>
OBX||NM|151^RR|2102|20||||F <CR>
OBX||NM|200^T1|2104|37.00||||F <CR>
OBX||NM|201^T2|2104|37.20||||F <CR>
OBX||NM|202^Td|2104|0.20000||||F <CR>
OBX||NM|160^SpO2|2103|98||||F <CR>
OBX||NM|213^TB|2108|37.20||||F <CR>
OBX||NM|500^ART-Sys|2116|120||||F <CR>
OBX||NM|501^ART-Mean|2116|93||||F <CR>
OBX||NM|502^ART-Dia|2116|80||||F <CR>
OBX||NM|503^PA-Sys|2117|20||||F <CR>
OBX||NM|504^PA-Mean|2117|12||||F <CR>
OBX||NM|505^PA-Dia|2117|8||||F <CR>
OBX||NM|506^Ao-Sys|2130|120||||F <CR>
OBX||NM|507^Ao-Mean|2130|93||||F <CR>
OBX||NM|508^Ao-Dia|2130|80||||F <CR>
OBX||NM|515^FAP-Sys|2133|120||||F <CR>
OBX||NM|516^FAP-Mean|2133|93||| <CR>
OBX||NM|171^Dia|2105|80||||F||APERIODIC|20091203120508 <CR>
OBX||NM|172^Mean|2105|93||||F||APERIODIC|20091203120508 <CR>
OBX||NM|170^Sys|2105|120||||F||APERIODIC|20091203120508 <CR>
OBX||CE|2|1|10033^**SpO2 Too High||||F||PHY_ALM|20091203120540| <CR>
OBX||CE|2|1|10043^**RR Too High||||F||PHY_ALM|20091203120540| <CR>
OBX||CE|3|457^NIBP Communication Error||||F||TECH_ALM| <CR>
OBX||CE|2404^Lead_Type|2^Lead_5||||F <CR>
OBX||CE|2415^HR_PR_Alm_Src|1^HR||||F <CR>
OBX||CE|3902^PR_Source|1^SPO2||||F <CR>
OBX||CE|2306^HighestAlmLevel|3^LowLevel||||F <CR>
OBX||CE|2307^HighestAlmType|2^Tech||||F <CR>
OBX||CE|2032^AlarmSetting|0^AlmNormal||||F <CR>
OBX||CE|2305^WorkState|0^Monitoring||||F <CR>

```

2. After the bedside device enters “Standby” status

```
MSH|^~\&|Mindray|Gateway|||ORU^R01|19|P|2.3.1| <CR>
PID||M1015_00010|Jhon^|20091112|M||^| <CR>
PV1||I|^ICU&Bed5&3232241659&0&0|||||A|||||20091201111211 <CR>
OBR|||Mindray Monitor||20091203121631| <CR>
OBX||NM|52^Height|169.0||||F <CR>
OBX||NM|51^Weight|59.0||||F <CR>
OBX||CE|2302^BloodType|1^A||||F <CR>
OBX||CE|2303^PACE_Switch|0^Off||||F <CR>
OBX||CE|2305^WorkState|1^Standby||||F <CR>
```

3. After the NIBP measurement is finished

```
MSH|^~\&|Mindray|||ORU^R01|3|P|2.3.1| <CR>
PID||M1015_00010|John^|20091112|M||^| <CR>
PV1||I|^ICU&Bed5&3232241659&0&0|||||A|||||20091201111211 <CR>
OBR|||Mindray Monitor||20091203121631| <CR>
OBX||NM|52^Height|169.0||||F <CR>
OBX||NM|51^Weight|59.0||||F <CR>
OBX||CE|2302^BloodType|1^A||||F <CR>
OBX||CE|2303^PACE_Switch|0^Off||||F <CR>
OBX||NM|171^Dia|2105|89||||F||APERIODIC|20091203115457 <CR>
OBX||NM|172^Mean|2105|99||||F||APERIODIC|20091203115457 <CR>
OBX||NM|170^Sys|2105|129||||F||APERIODIC|20091203115457 <CR>
```

4. After the C.O. measurement is finished.

```
MSH|^~\&|Mindray|||ORU^R01|3|P|2.3.1|
PID||M1015_00010|John^|20091112|M||^| <CR>
PV1||I|^ICU&Bed5&3232241659&0&0|||||A|||||20091201111211 <CR>
OBR|||Mindray Monitor||20091203121631| <CR>
OBX||NM|52^Height|169.0||||F <CR>
OBX||NM|51^Weight|59.0||||F <CR>
OBX||CE|2302^BloodType|1^A||||F <CR>
OBX||CE|2303^PACE_Switch|0^Off||||F <CR>
OBX||NM|210^C.O.|2108|5.400||||F||APERIODIC|20091203114943 <CR>
OBX||NM|212^C.I.|2108|2.0000||||F||APERIODIC|20091203114943 <CR>
```

5. After the bedside device is offline or power off.

MSH|^~\&|Mindray||||ORU^R01|7|P|2.3.1| <CR>

PID||M1015_00010|John^|20091112|M||^| <CR>

PV1||I|^ICU&Bed5&3232241659&0&0|||||A|||||20091201111211 <CR>

OBR|||Mindray Monitor||20091203121631| <CR>

OBX||NM|52^Height||169.0||||F <CR>

OBX||NM|51^Weight||59.0||||F <CR>

OBX||CE|2302^BloodType||1^A||||F <CR>

OBX||CE|2303^PACE_Switch||0^Off||||F <CR>

OBX||CE|2394^Connect_State||1^Disconnected||||F <CR>

2.2.3 MSH Segment

MSH segment is first segment of HL7 message, it defines the message type.

SEQ	LEN	DT	OPT	Used	Field Name	Description
1	1	ST	R	Yes	Field Separator	Always ' '
2	4	ST	R	Yes	Encoding Characters	Always '^~\&'
3	30	HD	O	Yes	Sending Application	Mindray
4	30	HD	O	Yes	Sending Facility	
9	7	CM	R	Yes	Message Type	ORU^R01
10	20	ST	R	Yes	Message Control ID	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	3	PT	R	Yes	Processing ID	Always 'P'
12	60	VID	R	Yes	Version ID	Always '2.3.1'

2.2.4 PID Segment

SEQ	LEN	DT	OPT	Used	Field NAME	Description
3	20	CX	R	Yes	Patient Identifier List	Patient Medical Record Number as populated in the HY-VI CMS or bedside monitor.
5	24	XPN	R	Yes	Patient Name	<First Name>^<Last Name>
7	24	TS	O	Yes	Date/Time of Birth	Format: YYYYMMDD
8	1	IS	O	Yes	Sex	Contains the sex of the patient as entered at the Information Center. The format is: Male: M Female: F Unknown: U
11	128	XAD	O	Yes	Patient Address	<Address>^^^<Zip Code>
13	16	XTN	O	Yes	Phone Number - Home	

2.2.5 PV1 Segment

SEQ	LEN	DT	OPT	Used	Field Name	Description
2	1	IS	R	Yes	Patient Class	'I' for Inpatient. 'O' for Outpatient.
3	60	PL	O	Yes	Assigned Patient Location	Only the third component (bed) is used. The firsttwo components are empty.. Format: <point of care>^<room>^<bed>. The <bed> component divides into the following subcomponents: <Office Name>&<bed id>&<IP>&<IPSeq>&0 The <IP> is the bedside device IP Address and the <IPSeq> is the telemetry transmitter's sequence number.
7	30	XCN	O	Yes	Attending Doctor	
18	2	IS	O	Yes	Patient Type	"N": Neonate "A": Adult "P": Pediatric "U": Unknown
44	24	DTM	O	Yes	Admit Date/Time	Format: YYYYMMDDHHmmss

2.2.6 OBR Segment

The OBR Segment is used to carry the measurement time of real-time vital sign parameter.

SEQ	LEN	DT	OPT	Used	Field Name	Description
4	200	CE	R	Yes	Universal Service ID	Always "Mindray Monitor"
7	26	TS	C	Yes	Observation Date/Time	YYYYMMDDhhmmss

2.2.7 OBX Segment

2.2.7.1 Patient demographics

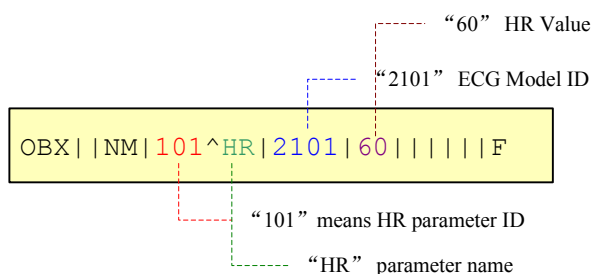
Some patient demographics are carried in PID segment and PV1 segment. The others are carried through OBX segment, including patient height, patient weight, blood type and pace switch.

Patient height and weight are defined in section

2.2.7.2 Periodic Parameter

SEQ	LEN	DT	OPT	Used	Field Name	Description
2	2	ID	R	No	Value Type	“NM”
3	80	CE	R	Yes	Observation Identifier	The format is:<ID>^<text>. <ID>: Parameter ID. It cannot be empty. Refer to Appendix B.1 <text>: Parameter name. It cannot be empty. The parameter name is defined by the server side.
4	20	ST	O	Yes	Observation Sub-ID	ID of the module to which the parameter belongs. Refer to Appendix B.3.
5	65K		R	Yes	Observation Results	Parameter value.
6	60	CE	O	Yes	Units	Omitted. The default unit is used. Refer to Appendix B.1.
7	60	ST	O	Yes	Reference Range	Omitted.
11	1	ID	R	Yes	Observation Results Status	“F”, representing “Final”.

The HR parameter is shown below:



Example:

- OBX||NM|101^HR|2101|60|||||F
- OBX||NM|102^PVCs|2101|0|||||F
- OBX||NM|151^RR|2102|20|||||F
- OBX||NM|200^T1|2104|37.0|||||F
- OBX||NM|201^T2|2104|37.2|||||F
- OBX||NM|202^TD|2104|0.2|||||F

2.2.7.3 Aperiodic parameter

SEQ	LEN	DT	OPT	Used	Field Name	Description
2	2	ID	R	No	Value Type	"NM"
3	80	CE	R	Yes	Observation Identifier	The format is: <ID>^<text>. <ID>: Parameter ID. It cannot be empty. Refer to Appendix B.1 . <text>: Parameter name. It cannot be empty. The parameter name is defined by the server side.
4	20	ST	O	Yes	Observation Sub-ID	ID of the module to which the parameter belongs. Refer to Appendix B.3.
5	65K		R	Yes	Observation Results	Parameter value.
6	60	CE	O	Yes	Units	Omitted. The default unit is used. Refer to Appendix B.1.
7	60	ST	O	Yes	Reference Range	Omitted.
11	1	ID	R	Yes	Observation Results Status	"F", representing "Final".
13	20	ST	O	Yes	User Defined Access Checks	Parameter type: "APERIODIC": aperiodic parameter.
14	26	TS	O	Yes	Date/Time of the Observation	Omitted by default. The format is: YYYYMMDDHHMMSS. Only used for aperiodic parameters, indicating measurement time.

Example:

1. NIBP module

OBX||NM|171^Dia|2105|80|||||F||APERIODIC|20070106191915

OBX||NM|172^Mean|2105|93|||||F||APERIODIC|20070106191915

OBX||NM|170^Sys|2105|120|||||F||APERIODIC|20070106191915

2. C.O. module

OBX||NM|210^C.O.|2108|5.400|||||F||APERIODIC|20091203114943

OBX||NM|212^C.I.|2108|2.0000|||||F||APERIODIC|20091203114943

3. CCO module

OBX||NM|652^C.O.|2108|5.400|||||F||APERIODIC|20091203162913

OBX||NM|653^C.I.|2108|2.0000|||||F||APERIODIC|20091203162913

Notes: In continuous measurement mode of CCO module, the parameters CCO and CCI are belong to 'Periodic Parameter'.

2.2.7.4 Physiological Alarm

If the message has no OBX segment about physiological alarm, it indicates that there is no physiological alarm currently.

SEQ	LEN	DT	OPT	Used	Field Name	Description
2	2	ID	R	No	Value Type	“CE”
3	80	CE	R	Yes	Observation Identifier	“1”: high-level alarm “2”: medium-level alarm “3”: low-level alarm “4”: message
4	20	ST	O	Yes	Observation Sub-ID	Not defined.
5	65K		R	Yes	Observation Results	The format is:<ID>^<text>. <ID>: alarm ID <text>: alarm text. It cannot be empty. Multiple languages are displayed based on different character sets.
6	60	CE	O	Yes	Units	Omitted.
7	60	ST	O	Yes	Reference Range	Omitted.
11	1	ID	R	Yes	Observation Results Status	“F”, representing “Final”.
13	20	ST	O	Yes	User Defined Access Checks	“PHY_ALM”
14	26	TS	O	Yes	Date/Time of the Observation	The format is: YYYYMMDDHHMMSS , indicating the time when the alarm occurs.

Example:

```
OBX||CE|2|1|10033^**SpO2 Too High|||||F||20070106193145|
```

```
OBX||CE|2|1|10002^**HR Too low|||||F||20070106193145|
```

2.2.7.5 Technical Alarm

If the message has no OBX segment, it indicates that there is no physiological alarm currently.

The format and definition is similar with physiological alarm, except these:

1. OBX-13: the value is “TECH_ALM”.
2. OBX-14: this field is null without time of alarm occurrence.

Example:

```
OBX||CE|3|457^NIBP Communication Error|||||F||TECH_ALM|
```

2.2.7.6 Parameter Alarm Limits

SEQ	LEN	DT	OPT	Used	Field Name	Description
2	2	ID	R	No	Value Type	"NM"
3	80	CE	R	Yes	Observation Identifier	"2002": upper limit "2003": lower limit
4	20	ST	O	Yes	Observation Sub-ID	Parameter ID
5	65K		R	Yes	Observation Results	Upper/lower limits
11	1	ID	R	Yes	Observation Results Status	"F", representing "Final".

Example:

```
OBX||NM|2002^|101|200|||||F
OBX||NM|2003^|101|100|||||F
OBX||NM|2002^|102|10|||||F
OBX||NM|2003^|102|0|||||F
OBX||NM|2002^|105|0.20|||||F
OBX||NM|2003^|105|-0.20|||||F
```

2.2.7.7 Parameter Alarm Level

SEQ	LEN	DT	OPT	Used	Field Name	Description
2	2	ID	R	No	Value Type	"CE"
3	80	CE	R	Yes	Observation Identifier	"2009"
4	20	ST	O	Yes	Observation Sub-ID	Parameter ID
5	65K		R	Yes	Observation Results	Alarm level: 0:Unknown 1:High 2:Middle 3:Low
11	1	ID	R	Yes	Observation Results Status	"F", representing "Final".

Example:

```
OBX||CE|2009^|101|2^|||||F
OBX||CE|2009^|102|2^|||||F
OBX||CE|2009^|105|2^|||||F
OBX||CE|2009^|106|2^|||||F
OBX||CE|2009^|107|2^|||||F
```

2.2.7.8 Parameter Alarm Switch

SEQ	LEN	DT	OPT	Used	Field Name	Description
2	2	ID	R	No	Value Type	“CE”
3	80	CE	R	Yes	Observation Identifier	“2004”
4	20	ST	O	Yes	Observation Sub-ID	Parameter ID
5	65K		R	Yes	Observation Results	Alarm Switch: 0:OFF 1:ON 2:Unknown
11	1	ID	R	Yes	Observation Results Status	“F”, representing “Final”.

Example:

OBX||CE|2004^|101|1^|||||F

OBX||CE|2004^|102|0^|||||F

2.2.7.9 Others

Please refer to the Appendix.

2.3 ACK Message

After the Unsolicited Results Interface receives ACK message, it will close the TCP connection.

2.3.1 Format

MSH	Message Header
MSA	Message Acknowledgement

Example:

MSH|^~\&|CIS|Charting|||||ACK|2|P|2.3.1 <CR>

MSA|AR|0|Close <CR>

2.3.2 MSH Segment

Please refer to the section 2.2.3.

2.3.3 MSA Segment

SEQ	LEN	DT	OPT	Used	Field Name	Description
1	2	ID	R	Yes	Acknowledgement Code	<ul style="list-style-type: none"> • AR: Application Reject (negative acknowledgement) Must be 'AR' with case sensitive.
2	20	ST	R	Yes	Message Control ID	Always '0'
3	80	ST	O	Yes	Text Message	Must be 'Close' with case sensitive.

MSA-1: The value should be 'AR' with case sensitive.

MSA-3: The value should be 'Close' with case sensitive.

2.4 ADT^A03 Message

Please refer to section 5.2.

3 Solicited Results Interface

3.1 Communication Process

3.1.1 Network Connection

The network connection here is the same as that for the unsolicited results interface. For network connection, see section 2.1.1 *Network Connection*.

3.1.2 Data Communication

The solicited results interface adopts the method of request and response. It doesn't send data until it receives the query message (QRY^R02) from the client socket.

The client socket can query data of one, multiple, or all bedside monitors each time and can designate the data type needed. Upon receiving the query message, the interface returns ACK as a reply and then returns the message ORF^R04 containing the query results.

The interface returns NACK message, if the bed number or the data type that needs to be queried is not designated in the query message

If connection between the queried bedside monitor and this interface is not established or information of current patient admitted by the bedside monitor is not allowed to be sent, this interface can't send data of this bedside monitor.

Upon receiving data sent by this interface, the client socket will send ACK or NACK as a reply, but the reply will be ignored by the interface.

When the interface is replying the previous query, if the client socket sends a new query, this interface saves the last query information, responds to previous query, and then replies the buffered query information.

With network data traffic and computer performance considered, the interface will send data of one bed after another every 200 milliseconds after starting to send data. Therefore, the lasting time of data transmission at each set time interval may amount to several seconds. The sent data of each bedside monitor is the most recent value at current time.

3.1.2.1 Sent Data Contents

This interface returns query data only after receiving the query message (QRY^R02) from the client socket.

No such conditions exist:

This interface sends data to client socket spontaneously upon completion of aperiodic parameter measurement.

This interface sends data to client socket spontaneously after patient monitor status changes.

The client socket can request the interface to send one or several of the following data types

via the QRY information.

1. Vital sign parameters
2. Physiological alarms
3. Technical alarms
- 4; Alarm setups including the upper and lower alarm limits of each parameter, alarm on/off, and alarm priority
5. Equipment configuration and status information that include
 - (1) ECG lead type
 - (2) HR alarm source
 - (3) PR source
 - (4) Whether the equipment is in standby state
 - (5) Currently highest alarm priority
 - (6) Type of currently highest alarm priority: physiological alarm or technical alarm
 - (7) Whether alarms of the equipment are in one of these statuses: alarm off, alarm pause, audio alarm off, alarm silence, or none of above statuses (i.e. in normal alarming status).

NOTE

- **If the patient monitor uses the ‘CMS protocol’ to connect Central Monitor System or PDS Gateway, the point 7 above is invalid and the receiver should ignore this content. About ‘CMS protocol’, please refer to the document Mindray patient data sharing solution .**
-

(8) If the equipment is telemetry equipment, is **Nurse Call** or **Event** available?

3.1.2.2 Data Transmission when a Bedside Monitor in Standby State

If the equipment queried by the client socket is in standby state, returned ORF message only contains patient information and standby state and excludes anything else.

For the format and contents of HL7 message when a bedside monitor is in standby state, refer to *Appendix B.4*.

3.2 QRY^R02 Message

3.2.1 Format

MSH		Message Header
QRD		Query definition
{		
	QRF	Query filter
}		

3.2.2 Example

```
MSH|^~\&|CIS|Charting||||QRY^R02|2|P|2.3.1 <CR>
QRD|20091207140713|R|I|MRQry2||||RES <CR>
QRF|MON||||168370462&0^16^0^0 <CR>
QRF|MON||||168370423&0^16^0^0 <CR>
```

3.2.3 MSH Segment

Please refer to section 2.2.3.

Here, message type is QRY^R02.

Example:

```
MSH|^~\&|||||QRY^R02|Q12|P|2.3.1<CR>
```

3.2.4 QRD Segment

SEQ	LEN	DT	OPT	Used	Field Name	Description
1	26	TS	R	Yes	Date/Time of Query	Format: YYYYmmDDhhMMs s000
2	1	ID	R	Yes	Query format mode	Must always be R for record-oriented
3	1	ID	R	Yes	Query Priority	Must always be I for immediate
4	10	ST	R	Yes	Query ID:Some unique identifier	Can not be Null. Byte count < 16 Bytes
9	3	PT	R	Yes	What subject filter	Must be RES for results in query and in response

Example:

```
QRD|19970731145557|R|I|Q839572||||RES<CR>
```

Message processing rules:

- The 1st field must be in valid time format. Otherwise, an error message is returned.
- The 2nd field must be 'R'. Otherwise, an error message is returned.
- The 3rd field must be 'I'. Otherwise, an error message is returned.
- The 4th field cannot be empty. It should be less than 16 bytes. But this interface does not judge the uniqueness of the ID.
- The 9th field must be 'RES'. Otherwise, an error message is returned.

3.2.5 QRF Segment

The QRF segment defines the detailed contents to be queried. There can be 0 (zero) to multiple QRF segments.

SEQ	LEN	DT	OPT	Used	Field Name	Description
1	20	ST	R	Yes	Where subject filter	Must always be MON for monitoring data in queries and in responses.
5	1000	ST, repeatable	O	Yes	Other query subject filter	Query Filter pecifies list with ID of interest. Refer to section 3.2.5.1

Example:

QRF|MON|||3232241478&11^8^0^0<CR>

Message processing mechanism:

- The field QRF-1 must be 'MON'. Otherwise, an error message is returned.
- The field QRF-5 defines query conditions. It cannot be empty. Otherwise, an error message is returned.

3.2.5.1 Field QRF-5 (Query Filter)

The Query Filter format is below:

<IP>&<IPSeq>^<SendType>^0^0

The following table resolves all the components of the segment.

Component	Data type	Value range	Description
<IP>	Integer	0 to 4294967295	Because the CMS or PDS Gateway is simultaneously connected to multiple bedside monitors, so uses the IP address to identify the unique bedside monitor or telemetry receiver. The IP address is the 32-bit integer in the order of network byte. For details, refer to <i>Section 6.5.1.6</i> .
<IPSeq>	Integer	0 to 255	Serial number of the telemetry transmitter minus one. It is used in case when connect to the Central Monitoring System.. Note: This is not TCP port number.
<SendType>	Integer	0 to 5	What kind of data to be sent. Value with bit mask: Physiological parameter: bit 1 values

			<p>one.</p> <p>Physiological alarms: bit 2 values one.</p> <p>Technical alarms: bit 3 values one.</p> <p>Alarm settings: bit 4 values one.</p> <p>Device status: bit 5 values one.</p> <p>Example:</p> <p>When query only ‘Alarm settings’, the decimal value is 8, and the binary value is “1000”</p>
--	--	--	--

NOTE

- The value of <SendType> of each QRF segment shall be same.
- The value of <IPSeq> shall be the serial number of the telemetry transmitter minus one.

3.2.6 Example

```
MSH|^~\&|||||QRY^R02|1203|P|2.3.1|<CR>
QRD|20060713103045000|R|I|Q839572||||RES<CR>
QRF|MON|||3232241453&1^1^0^0<CR>
QRF|MON|||3232241453&2^1^0^0<CR> QRF|MON|||3232241478&0^1^0^0<CR>
```

Analysis:

Querying three bedside devices data of physiological parameter:

The first one is a telemetry transmitter whose serial number is 2 (value of <IPSeq> is 1); the second one whose serial number is 3 (value of <IPSeq> is 2); both of them are belong to one telemetry receiver whose IP address is “192.168.23.45” (value of <IP> is 3232241453).

The third is a bedside monitor with IP address “192.168.23.70” (value of <IP> is 3232241478).

3.3 ACK Message

For Solicited Interface, there are two types of ACK messages.

1. After receives a QRY^R02 message from CIS, this interface return a ACK message to CIS.
2. After receives a ACK message from CIS, this interface will close the TCP connection.

3.3.1 Format

MSH	Message Header
MSA	Message Acknowledgement
{[ERR]}	Warning or Information

3.3.2 Example

1. Send to CIS

```
MSH|^~\&|Mindray|Gateway||||ACK|3|P|2.3.1| <CR>
MSA|AA|Q002 <CR>
```

```
MSH|^~\&|Mindray|Gateway||||ACK|2|P|2.3.1| <CR>
MSA|AE|1|Incorrect Message Syntax. Error code = -13 <CR>
```

2. Receive from CIS

```
MSH|^~\&|CIS|Charting||||ACK|2|P|2.3.1 <CR>
MSA|AR|0|Close <CR>
```

3.3.3 MSH Segment

Please refer to section 2.2.3.

3.3.4 MSA Segment

SEQ	LEN	DT	OPT	Used	Field Name	Description
1	2	ID	R	Yes	Acknowledgement Code	<ul style="list-style-type: none"> • AA: Application Accept (positive acknowledgement) • AE: Application Error (negative acknowledgement) • AR: Application Reject (negative acknowledgement)
2	20	ST	R	Yes	Message Control ID	Contains the message control ID that came with the requesting QRY query message. This allows the client to map a response message to the corresponding request.
3	80	ST	O	Yes	Text Message	<p>In case of errors or rejects, the text message contains a textual description of the reason for this event. Typical texts would be:</p> <ul style="list-style-type: none"> • “Message type not supported” • “Incorrect message syntax”

If the format of the QRY^R02 message is correct, the field ACK-1 will be value of “AA”. When the bedside device is off-line or unauthorized, the ERR segment will be used to indicate these situation, but the field ACK-1 will still be value of “AA”.

3.3.5 ERR Segment

ERR segment is used in two messages: ACK and ORF^R04. When the bedside device is off-line or unauthorized, the ERR segment will be used to indicate these situation.

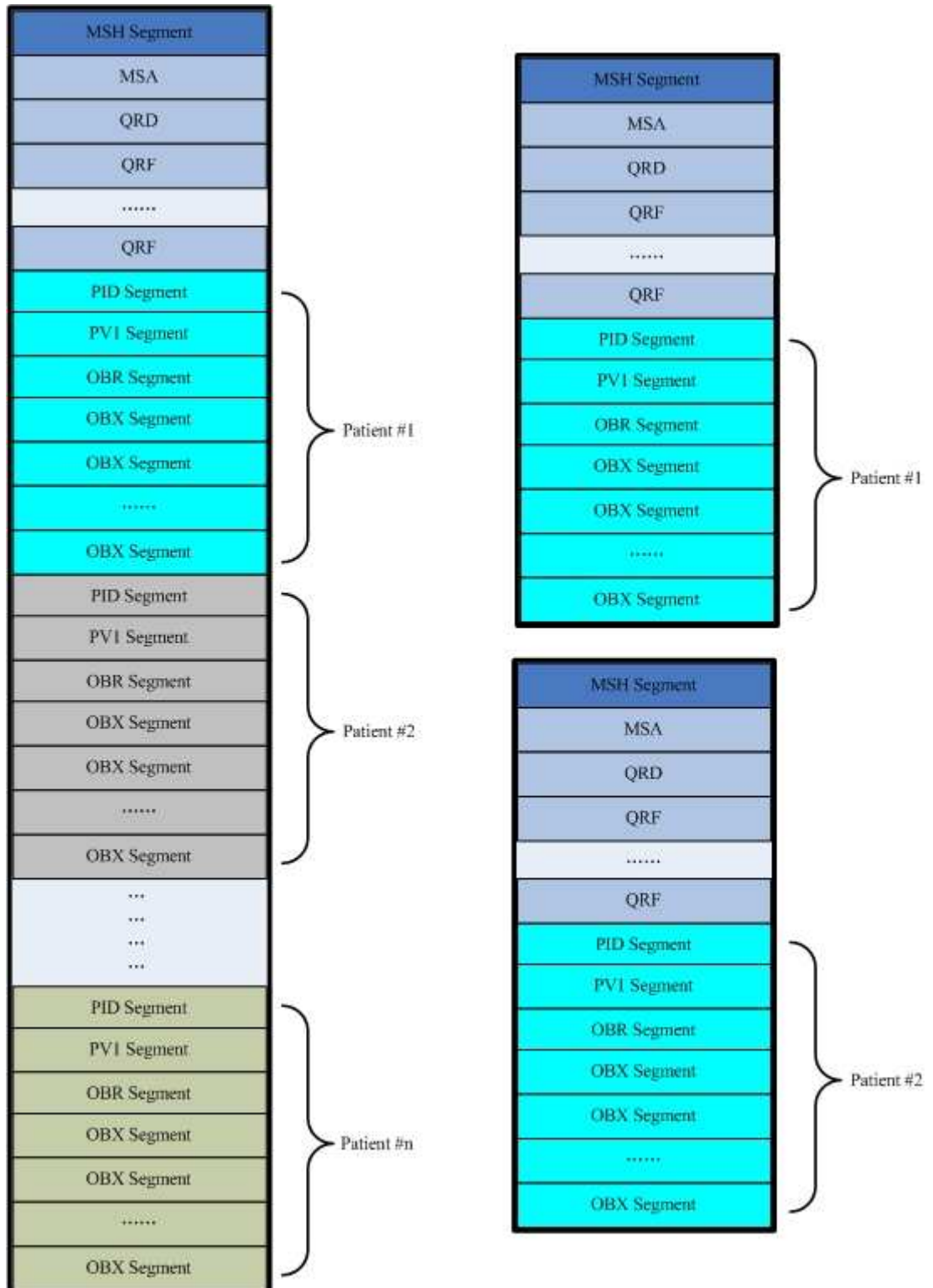
SEQ	LEN	DT	OPT	Used	Field Name	Description
1	493	ELD	B	No	Error Code and Location	
2	18	ERL	O	No	Error Location	
3	705	CWE	R	Yes	HL7 Error Code	0: Message accepted
4	2	ID	R	Yes	Severity	W: Warning I: Information E: Error F: Fatal Error
5	705	CWE	O	Yes	Application Error Code	1: Disconnected 2: NotAuthorized
6	80	ST	O	Yes	Application Error Parameter	<IP>,<IPSeq> Please refer to section 3.2.5.1 for defination of <IP> and <IPSeq>

Example:

```
MSH|^~\&|Mindray|Gateway|||ACK|18|P|2.3.1|
MSA|AA|10
ERR|||0|W|1^Disconnected|3232241659,0
ERR|||0|I|2^NotAuthorized|3232241657,2
ERR|||0|W|1^Disconnected|3232241656,0
ERR|||0|W|1^Disconnected|3232241655,0
```

3.4 ORF^R04 Message

3.4.1 Format



There are two methods to send results data. First is to send out all patient data in one HL7 message. Second is to send out one patient data per one HL7 message. One of them can be selected from the user configuration dialog.

3.4.2 Example

1. CIS queries for six bedside devices, but three of them are not returned any results data because they are disconnected or unauthorized.

(At first, Solicited Interface returns an ACK message)

```
MSH|^~\&|Mindray|Gateway|||ACK|7|P|2.3.1|
MSA|AA|4
ERR|||0|W|1^Disconnected|3293316383,0|
ERR|||0|I|2^NotAuthorized|3293316385,0|
ERR|||0|W|1^Disconnected|3293316387,0|
```

(Secondly, Solicited Interface returns a ORF^R04 message if there are some bedside device results data will be returned.)

```
MSH|^~\&|Mindray|Gateway|||ORF^R04|8|P|2.3.1|
MSA|AA|4
ERR|||0|W|1^Disconnected|3293316383,0|
ERR|||0|I|2^NotAuthorized|3293316385,0|
ERR|||0|W|1^Disconnected|3293316387,0|
QRD|20091209162514|R|I|MRQry4|||RES
QRF|MON|||3293316382&0^1^0^0
QRF|MON|||3293316383&0^1^0^0
QRF|MON|||3293316384&0^1^0^0
QRF|MON|||3293316385&0^1^0^0
QRF|MON|||3293316386&0^1^0^0
QRF|MON|||3293316387&0^1^0^0
PID|||M1015_00022||JONES^MARY||19791015|M|||^|^|^|^|
PV1|||I|^ICU&22&3293316382&0&0|||DoctorA|||A|||
|||||20091015000000
OBR|||Mindray Monitor|||20091209162514|
OBX||NM|52^Height||147.0|||||F
OBX||NM|51^Weight||67.0|||||F
OBX||CE|2302^BloodType||3^AB|||||F
OBX||CE|2303^PACE_Switch||0^OFF|||||F
OBX||NM|160^SpO2|2103|98|||||F
OBX||NM|101^HR|2101|60|||||F
OBX||NM|105^ST I|2101|0.1000|||||F
OBX||NM|102^PVCs|2101|8|||||F
OBX||NM|220^CO2|2109|52|||||F
```

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OBX|NM|221^INS|2109|20|||||F
OBX|NM|222^AWRR|2109|32|||||F
OBX|NM|151^RR|2102|20|||||F
OBX|NM|200^T1|2104|37.70|||||F
OBX|NM|201^T2|2104|37.20|||||F
OBX|NM|202^Td|2104|0.5000|||||F
PID||M1015_00089||JONES^JAYNE||F||^|^|^||
PV1||I|^ICU&24&3293316384&0&0|||||||A|||||||
|||||||0000000000
OBR||Mindray Monitor||20091209162514|
OBX|NM|52^Height||0.0|||||F
OBX|NM|51^Weight||0.0|||||F
OBX|CE|2302^BloodType||1^A|||||F
OBX|CE|2303^PACE_Switch||1^On|||||F
OBX|NM|160^SpO2|2103|98|||||F
OBX|NM|101^HR|2101|60|||||F
OBX|NM|105^ST I|2101|0.1000|||||F
OBX|NM|102^PVCs|2101|8|||||F
OBX|NM|220^CO2|2109|52|||||F
OBX|NM|221^INS|2109|20|||||F
OBX|NM|222^AWRR|2109|32|||||F
OBX|NM|151^RR|2102|20|||||F
OBX|NM|200^T1|2104|37.70|||||F
OBX|NM|201^T2|2104|37.20|||||F
OBX|NM|202^Td|2104|0.5000|||||F
PID||M1015_00181||JONES^WILLIAM||M||^|^|^||
PV1||I|^ICU&26&3293316386&0&0|||||||A|||||||
|||||||0000000000
OBR||Mindray Monitor||20091209162514|
OBX|NM|52^Height||0.0|||||F
OBX|NM|51^Weight||0.0|||||F
OBX|CE|2302^BloodType||2^B|||||F
OBX|CE|2303^PACE_Switch||1^On|||||F
OBX|NM|160^SpO2|2103|98|||||F
OBX|NM|101^HR|2101|60|||||F
OBX|NM|105^ST I|2101|0.1000|||||F
OBX|NM|102^PVCs|2101|8|||||F
OBX|NM|220^CO2|2109|52|||||F
OBX|NM|221^INS|2109|20|||||F
OBX|NM|222^AWRR|2109|32|||||F
OBX|NM|151^RR|2102|20|||||F
OBX|NM|200^T1|2104|37.70|||||F
OBX|NM|201^T2|2104|37.20|||||F
OBX|NM|202^Td|2104|0.5000|||||F

2. The bedside monitor queried is in Standby status.

```
MSH|^~\&|Mindray|Gateway||||ORF^R04|4|P|2.3.1| <CR>
MSA|AA|2 <CR>
QRD|20091207140713|R|I|MRQry2||||RES <CR>
QRF|MON||||168370462&0^16^0^0 <CR>
PID|||M1015_00010||JONES^WILLIAM||20091112|M|||^^^| <CR>
PV1||I|^ICU&Bed5&168370462&0&0|||||A|||||
|||||20091201111211 <CR>
OBR|||Mindray Monitor|||20091203121631| <CR>
OBX||NM|52^Height||169.0|||||F <CR>
OBX||NM|51^Weight||59.0|||||F <CR>
OBX||CE|2302^BloodType||1^A|||||F <CR>
OBX||CE|2303^PACE_Switch||0^Off|||||F <CR>
OBX||CE|2305^WorkState||1^Standby|||||F <CR>
```

3.4.3 Definition of segments

QRD and QRF segments are the same as QRY^R02 message, please refer to section 3.2.

Please refer to section 3.3.4 for MSA segment definition.

Please refer to section 3.3.5 for ERR segment definition.

Please refer to Chapter 2 for other segments definition.

4 ADT Net Query Interface

4.1 Communication Process

4.1.1 Network Connection

This interface is the client side to establish a TCP connection and the HIS/CIS system is the server side for listening. The IP address and the port number of the server side can be set on the User Maintain Page of Central Monitoring System.

This interface does not take the initiative to close the connection after TCP connection is set up.

TCP connection stays no matter whether a query is required currently. If TCP connection is interrupted, this interface will re-connect within the fixed time automatically.

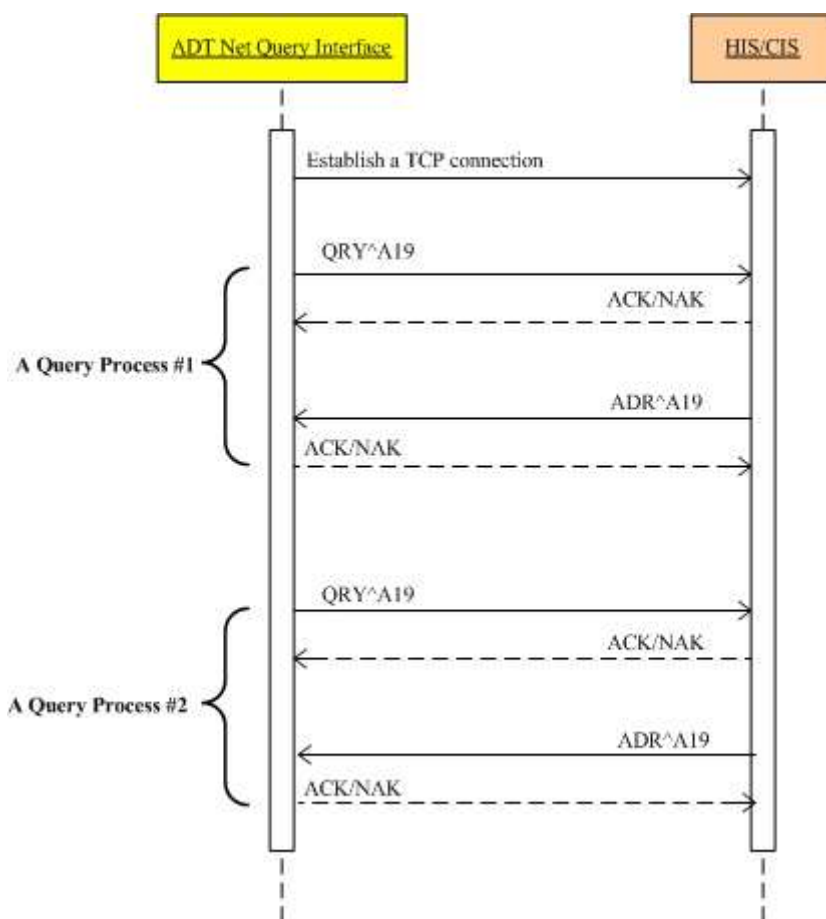
4.1.2 Data Communication

The query ADT message sent and the result returned by the HIS/CIS system should be performed in a same TCP connection.

This interface sends a query message in QRY^A19 format. The QRY^A19 message contains a Medical Record Number (MRN) as a unique query condition.

Accurate query is performed by the HIS/CIS system and an ADR^A19 message based on the query condition is returned. If patient information in line with the query condition is found, only one patient record is returned. If no patient information in line with the query condition is found, the returned message does not contain any patient information. If the HIS/CIS system does not return any message within the limited time, the interface treatments it as query timeout.

After receives a HL7 message, this interface will return an ACK message to indicate whether the format is correct or not. This interface will not do anything when receives an ACK message.



4.2 QRY^A19 Message

4.2.1 Format

MSH	Message Header
QRD	Query definition (from QRY message)

4.2.2 Example

```

MSH|^~\&|Mindray|Gateway| |||QRY^A19|2|P|2.3.1|
QRD|20090925134901000|D|D|1| ||1^RD|M2129|^DEM|^MindrayGateway|
<CR>
    
```

4.2.3 MSH Segment

Please refer to the section 2.2.3. Here the message type is “QRY^A19”.

4.2.4 QRD Segment

SEQ	LEN	DT	OPT	Used	Field Name	Description
1	26	TS	R	Yes	Date/Time of Query	Format: YYYYmmDDhhMMs s000
2	1	ID	R	Yes	Query format mode	Must always be D for display format
3	1	ID	R	Yes	Query Priority	Must always be D for Deferred
4	10	ST	R	Yes	Query ID:Some unique identifier	Can not be Null. Byte count < 16 Bytes
7	10	CQ	R	Yes	Quantity Limited Request	Must be 1^RD
8	60	XCN	R	Yes	Who Subject Filter	Patient PID/MRN
9	3	PT	R	Yes	What subject filter	Must be DEM for Demographics in query and in response
10			R		What Department Data Code	'MindrayGateway'

4.3 ADR^A19 Message

4.3.1 Format (Patient queried is found)

MSH	Message Header
MSA	Message
Acknowledgment	
QRD	Query definition
[
PID	Patient
Identification	
PV1	Patient Visit
[OBR]	
{	
OBX	
}	
]	

4.3.2 Format (Patient queried is not found)

MSH	Message Header
MSA	Message
Acknowledgment	
QRD	Query definition

4.3.3 Example

```
MSH|^~\&|Mindray|ADTServer|||||ADR^A19|2|P|2.3.1| <CR>
MSA|AA|2|The Patient is Found <CR>
QRD|20090925134901000|D|D|1||||1^RD|M2129|^DEM|^MindrayGateway|
<CR>
PID|||M2129||Jones^Eunice||19780924|F|||1634 J
St^^^^95616|| (530) 555-4325| <CR>
PV1|||I^^^ICU&Bed23&&0||||Frank|||||||||||||||||||||
||||||20090924000000 <CR>
OBR||||||20091203121631| <CR>
```

```
OBX||NM|52^Height||169.0|||||F <CR>
OBX||NM|51^Weight||59.0|||||F <CR>
OBX||CE|2302^BloodType||3^|||||F <CR>
OBX||CE|2303^PACE_Switch||1^|||||F <CR>

MSH|^~\&|Mindray|ADTServer||||ADR^A19|3|P|2.3.1|
MSA|AA|2|The Patient is not found!
QRD|20091016161233000|D|D|1|||1^RD|QQQQ|^DEM|^MindrayGateway|
```

4.3.4 MSH Segment

Please refer to the section 2.2.3. Here the message type is “ADR^A19”.

4.3.5 MSA Segment

SEQ	LEN	DT	OPT	Used	Field Name	Description
1	2	ID	R	Yes	Acknowledgement Code	<ul style="list-style-type: none"> • AA: Application Accept (positive acknowledgement) • AE: Application Error (negative acknowledgement) • AR: Application Reject (negative acknowledgement) <p>If the QRY^A19 message is in correct format, this field is "AA", otherwise is "AE".</p>
2	20	ST	R	Yes	Message Control ID	<p>Contains the message control ID that came with the requesting QRY query message. This allows the client to map a response message to the corresponding request.</p>
3	80	ST	O	Yes	Text Message	<p>In case of the queried patient is found, typical texts would be "The patient is found!". If the queried patient is not found, the typical text would be "The patient is not found".</p> <p>In case of errors or rejects, the text message contains a textual description of the reason for this event. Typical texts would be:</p> <ul style="list-style-type: none"> • "Message type not supported" • "Incorrect message syntax"

4.3.6 QRD Segment

The format and content is the same as in QRY^A19 message received.

4.3.7 PID Segment

Please refer to section 2.2.4.

4.3.8 PV1 Segment

SEQ	LEN	DT	OPT	Used	Field Name	Description
2	1	IS	R	Yes	Patient Class	'I' for Inpatient. 'O' for Outpatient.
3	60	PL	O	Yes	Assigned Patient Location	Only the third component (bed) is used. The firsttwo components are empty.. Format: <point of care>^<room>^<bed>. The <bed> component divides into the following subcomponents: <Office/Department>&<bed number>&0&0&0
7	30	XCN	O	Yes	Attending Doctor	
18	2	IS	O	Yes	Patient Type	"N": Neonate "A": Adult "P": Pediatric "U": Unknown
44	24	DTM	O	Yes	Admit Date/Time	Format: YYYYMMDDHHmmss

4.3.9 OBR Segment

This interface will not handle this segment as it is optional.

4.3.10 OBX Segment

Some patient demographics are carried in PID segment and PV1 segment. The others are carried through OBX segment, including patient height, patient weight, blood type and pace switch. Please refer to section 2.2.7.1.

4.4 ACK Message

4.4.1 Format

MSH	Message Header
MSA	Message Acknowledgement

4.4.2 Example

```
MSH|^~\&|Mindray|Gateway||||ACK|3|P|2.3.1| <CR>  
MSA|AA|2 <CR>
```

4.4.3 MSH Segment

Please refer to section 2.2.3. Here the message type is “ACK”.

4.4.4 MSA Segment

Please refer to section 4.3.5

5 ADT DB Interface

5.1 Communication Process

5.1.1 Network Connection

This interface is the client side to establish a TCP connection and the HIS/CIS system is the server side for listening.

This interface does not take the initiative to turn off the connection after TCP connection is set up. If the TCP connection is interrupted or turned off, this interface will re-connect TCP within the fixed time automatically.

All the ADT messages from both sides are transmitted within the same TCP connection.

The following two sections detail the data communication processes in the two transmission directions.

5.1.2 Data Communication (Input direction)

HIS/CIS system unsolicitedly sends ADT messages related with all patient information to the this interface.

This interface maintains a local database to save all the received patient information. The patient database saves only limited information. When the database is full, they are treated as per the FIFO (first in first out) method.

Through the User Maintain Page of the CMS, a patient can be identified uniquely in the patient database, such as identified by MRN or by name.

After receiving the patient information which the HIS/CIS system unsolicitedly sends, this interface will take the following three types of actions:

- Add-type

- If the interface does not find the corresponding patient in the database according to the MRN or name, the patient information received will be added into the database. If the patient already exists in the database, his information will be updated.

- ◆ A01 Admit
 - ◆ A04 Register
 - ◆ A05 Pre-Admit
 - ◆ A13 Cancel Discharge/End Visit
 - ◆ A14 Pending Admit
 - ◆ A25 Cancel Pending Discharge
 - ◆ A28 Add Person or Patient Information

- Update-type

If the interface finds the corresponding patient in the database according to the MRN or name, the information of that patient will be updated. If not, the patient information will be added into the database.

 - ◆ A02 Transfer
 - ◆ A06 Change an Outpatient to an Inpatient
 - ◆ A07 Change an Inpatient to an Outpatient
 - ◆ A08 Update Patient Information
 - ◆ A12 Cancel Transfer
 - ◆ A15 Pending Transfer
 - ◆ A26 Cancel Pending Transfer
 - ◆ A31 Update Person Information
- Delete-type

If the interface finds the corresponding patient in the database, the patient information is deleted. If not, no treatment is made.

 - ◆ A03 Discharge/End Visit
 - ◆ A11 Cancel Admit/Visit Notification
 - ◆ A16 Pending Discharge
 - ◆ A27 Cancel Pending Admit
 - ◆ A38 Cancel Pre-Admit

In addition, there are three special messages. The processing methods and formats of these three messages are different from the above patient information. They are:

- ◆ A17 Swap Patients

This message contains the information about the two patients who beds are swapped. The CMS will update the information of the two patients simultaneously. If the two patients is not found in the local database, their information received will be added into the database.
- ◆ A40 Merge patient - patient identifier list

This message contains old PID to be merged and new merged PID. The CMS will delete the patient with old PID from the local database and update the patient information corresponding to the new PID. If the patient of the new merged PID is not found, add one record.
- ◆ A47 Change patient identifier list

This message contains old PID to be modified and new PID. If the CMS finds the patient to which the old PID corresponds in the local database and there is no record to which the new PID corresponds, it will change the PID of the patient to which the old PID corresponds into the new PID. Other patient information is not changed. The CMS does not make any processing in other cases.

If the patient demographics like PID, Bed number, or department can be changed at the same time, it is recommended to sent ADT^A02 and ADT^A08 messages in sequence. Please do not use one ADT message to convey different changed information.

The interaction between this interface and the HIS/CIS system is shown as below:

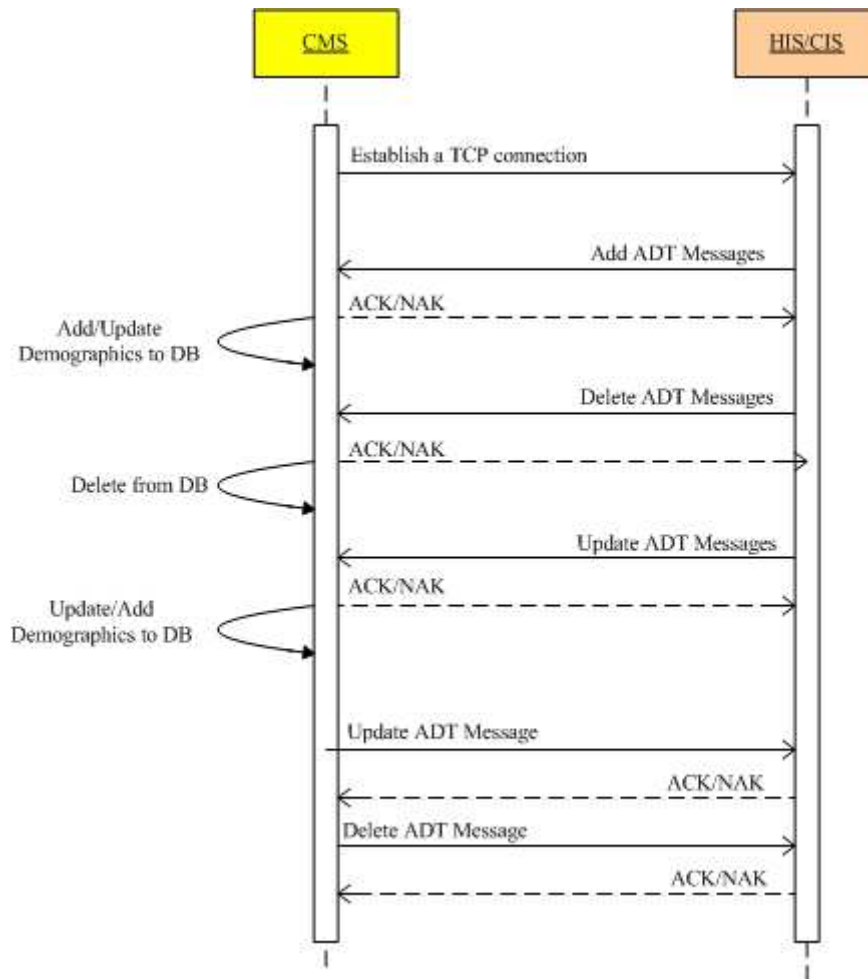


Figure Unsolicited ADT Interface communications

5.1.3 Data Communication (Output direction)

When changing patient information on the monitor network side, the interface will send ADT messages to the outside information system.

They are:

- Update-type.
 - ◆ A02 Transfer
 - ◆ A08 Update Patient Information
 - ◆ A47 Change patient identifier list

- Delete-type
 - ◆ A03 Discharge/End Visit

However, there are some exceptions:

1. When none of the Patient MRN, first name and last name is populated in CMS, there is no ADT message will be sent.
2. When the updated location (department and bed number) are null, no A02 message will be sent.
3. When the MRN, department, bed number and any other patient information are modified at the same time on CMS, three ADT messages (A47, A02 and A08) will be sent in turn. Of course, only when the new patient information meets the two restrictions above, the ADT messages would be sent.
4. After the patient monitor device connects to the CMS (i.e. after network reconnected or power on), an A08 message will be sent no matter whether any of the patient information is modified or not.

5.1.4 ACK

After receives a HL7 message, this interface will return an ACK/NACK message to indicate whether the format is correct or not.

Also, the other side can send an ACK/NACK message when receive HL7 message from this interface; but this interface will not do anything when receives an ACK message.

5.2 ADT Message

This section involves the following types of ADT messages whose formats are the same:

- Add-type
 - A01 Admit
 - A04 Register
 - A05 Pre-Admit
 - A13 Cancel Discharge/End Visit
 - A14 Pending Admit
 - A25 Cancel Pending Discharge
 - A28 Add Person or Patient Information

- Update-type
 - A02 Transfer
 - A06 Change an Outpatient to an Inpatient
 - A07 Change an Inpatient to an Outpatient
 - A08 Update Patient Information
 - A12 Cancel Transfer
 - A15 Pending Transfer

A26 Cancel Pending Transfer
 A31 Update Person Information

■ Delete-type

A03 Discharge/End Visit
 A11 Cancel Admit/Visit Notification
 A16 Pending Discharge
 A27 Cancel Pending Admit
 A38 Cancel Pre-Admit

Note:

1. For A02, A15 or other relevant transfer messages, the fields included when this message is sent should be the fields pertinent to communicate this event. When other important fields change, it is recommended that the A08 (update patient information) event be used in addition. If the transfer function of your Patient Administration system allows demographics to change at the same time as the transfer (for example an address change), we recommend (but do not require) sending two messages (an A02 followed by an A08).

2. The formats of the following three messages are different from those of the above messages.

- A17 Swap Patients: refer to section 5.3.
- A47 Change Patient ID: refer to section 5.4.
- A40 Merge patient - patient identifier list: refer to section 5.5.

5.2.1 Format

MSH	Message Header
EVN	Event Type
PID	Patient Identification
PV1	Patient Visit
{	
OBX	Observation/Result
}	

5.2.2 Example

```
MSH|^~\&|Mindray|ADTServerDemo|||ADT^A01|1|P|2.3.1| <CR>
EVN|A01| <CR>
PID||M0925_00009||family name^first
name||20090925|F||address^^^post code||telephone| <CR>
PV1||I|^department&6&&0|||doctor|||N|||
|||20090925000000 <CR>
OBX||NM|52^Height||169.0|||F <CR>
OBX||NM|51^Weight||59.0|||F <CR>
```



```
OBX||CE|2302^BloodType||3^|||||F <CR>
OBX||CE|2303^PACE_Switch||1^|||||F <CR>
```

5.2.3 MSH Segment

Please refer to section 2.2.3. Here the message type is “ADT^A01”.

5.2.4 EVN Segment

SEQ	LEN	DT	OPT	Used	Field Name	Description
1	26	TS	R	Yes	Event Type Code	A01 , A02 ...

5.2.5 PID Segment

Please refer to section 2.2.4.

5.2.6 PV1 Segment

SEQ	LEN	DT	OPT	Used	Field Name	Description
2	1	IS	R	Yes	Patient Class	‘I’ for Inpatient. ‘O’ for Outpatient. (i.e. ADT^A07)
3	60	PL	O	Yes	Assigned Patient Location	Only the third component (bed) is used. The first two components are empty. Format: <point of care>^<room>^<bed>. The <bed> component divides into the following subcomponents: <Office/Department>&<bed number>&0&0&0
6	60	PL	O	Yes	Prior Patient Location	The same as PV1-3 field. Used in the transfer type ADT messages (A02, A15...), represent the old patient location.
7	30	XCN	O	Yes	Attending Doctor	
18	2	IS	O	Yes	Patient Type	“N”: Neonate “A”: Adult “P”: Pediatric “U”: Unknown
44	24	DTM	O	Yes	Admit Date/Time	Format: YYYYMMDDHHmmss

5.2.7 OBR Segment

Incoming direction

For this direction, this segment is optional, so this segment is ignored.

Outgoing direction

Please refer to section 2.2.6.

5.2.8 OBX Segment

Some patient demographics are carried in PID segment and PV1 segment. The others are carried through OBX segment, including patient height, patient weight, blood type and pace switch. Please refer to section 2.2.7.1.

5.3 ADT^A17 Message (Swap Patients)

5.3.1 Format

MSH	Message Header
EVN	Event Type
PID	Patient Identification
PV1	Patient Visit
{	
OBX	Observation/Result
}	
PID	Patient Identification
PV1	Patient Visit
{	
OBX	Observation/Result
}	

Two groups of PID PV1 OBX segments are used to describe the information of the two patients whose beds are swapped. The location or bed information (department and bed number) the message contains is the content after swap.

5.3.2 Example

```

MSH|^~\&|Mindray|ADTServerDemo||||ADT^A17|21|P|2.3.1| <CR>
EVN|A17| <CR>
PID|||M0925_00009||family name^first
name||20090925|F||address^^^^post code||telephone| <CR>
PV1||I|^ICU&6&&&0||^SICU&8&&&0|doctor|||||||||N|||||||
|||||||||2009092500000 <CR>
OBX|NM|52^Height||169.0|||||F <CR>
OBX|NM|51^Weight||59.0|||||F <CR>
OBX|CE|2302^BloodType||3^|||||F <CR>
OBX|CE|2303^PACE_Switch||1^|||||F <CR>
PID||M9999||John^||20090924|F||address^^^^post
code||telephone| <CR>
PV1||I|^SICU &8&&&0||^ICU&6&&&0|doctor|||||||||N|||
|||||||||2009092400000 <CR>
OBX|NM|52^Height||169.0|||||F <CR>
OBX|NM|51^Weight||59.0|||||F <CR>
OBX|CE|2302^BloodType||3^|||||F <CR>
OBX|CE|2303^PACE_Switch||1^|||||F <CR>

```

5.3.3 Segments

The same as other ADT messages, please refer to section 5.2.

5.4 ADT^A47 Message (Change Patient ID)

5.4.1 Format

MSH	Message Header
EVN	Event Type
PID	Patient Identification
MRG	Prior Patient Identifier List

The patient ID inside the PID segment is new patient ID.

MRG-1 Field inside the MRG segment is prior patient ID before modification.

Except that the MRG segment is newly added segment, other segments are same as before.

5.4.2 Example

```
MSH|^~\&|Mindray|ADTServerDemo|||ADT^A47|23|P|2.3.1| <CR>
EVN|A47| <CR>
PID||M05_off9||family name9^first
name9||20090925|F||address9^^^^post code9||telephone9| <CR>
MRG|M20090925_00009| <CR>
```

5.4.3 MRG Segment

SEQ	LEN	DT	OPT	Used	Field Name	Description
1	64	ST	R	Yes	Prior Patient Identifier List	

5.5 ADT^A40 Message (Merge Patient ID)

5.5.1 Format

MSH		Message Header
EVN		Event Type
PID		Merge Target Patient Identification
MRG		Prior Patient Identifier List
PV1		Merge Target Patient Location
{		
	OBX	Merge Target Patient Information
}		

The patient ID inside the PID segment is the MRN of the merged target patient.

The information inside the PV1 and OBX segments are information about the merged target patient.

The Field MRG-1 inside the MRG segment is the original patient ID.

5.5.2 Example

```
MSH|^~\&|Mindray|ADTServerDemo|||ADT^A40|25|P|2.3.1| <CR>
EVN|A40| <CR>
PID||M2999999||uucfcc^||20090924|F||address^^^post
code||telephone| <CR>
MRG|M20090925_0V9| <CR>
PV1||I|^department66&66&&0|||doctor|||||N|||||
|||||20090924000000 <CR>
OBX||NM|52^Height||169.0|||||F <CR>
OBX||NM|51^Weight||59.0|||||F <CR>
OBX||CE|2302^BloodType||3^|||||F <CR>
OBX||CE|2303^PACE_Switch||1^|||||F <CR>
```

6 Realtime Results Interface

6.1 Data Content

This interface is combined with several TCP and UDP connections.
The table summarizes these connections.

Data	Time	Port	TCP/UDP	Direction	Chapter
Patient monitor online broadcast messages containing patient name, patient ID, department, bed No., monitor name and etc.	Periodic: 1s	4600	UDP	Export	<i>Section 6.3.1</i> <i>6.5</i>
CMS and PDS Gateway online broadcast messages containing CMS name or the name of PDS Gateway	Periodic: 1s	4679	UDP	Export	<i>Section 6.3.2</i> <i>6.5</i>
Bed list information only for CMS or PDS gateway	when the server side receives QRY message	4678	TCP	Export	<i>Section 6.6</i> <i>6.5.2</i>
TCP echo message	Periodic: 1s	4601& 4678	TCP	Import & export	<i>Section 6.7</i>
Patient information	1. After the TCP connection is established and the QRY message is received. 2. After patient information is changed.	4601	TCP	Export	<i>Section 6.8</i>
Query message (QRY)	Queried any time	4601 & 4678	TCP	Import	<i>Section 6.9</i>
Parameters	Periodic: 1s; Aperiodic: after	4601	TCP	Export	<i>Section 6.10.1&</i>

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	measurement.				6.10.2
Physiological alarms	Periodic: 1s	4601	TCP	Export	Section 6.10.3
Technical alarms	Periodic: 1s	4601	TCP	Export	Section 6.10.4
Alarm limits	1. After the TCP connection is established and the QRY message is received. 2. After the alarm limits are changed.	4601	TCP	Export	Section 6.10.6
Alarm level	1. After the TCP connection is established and the QRY message is received. 2. After the alarm level is changed.	4601	TCP	Export	Section 6.10.7
Module loading information containing: 1. Module name & ID; 2. Names & IDs of all parameters of the module.	1. After the TCP connection is established and the QRY message is received. 2. The module is reloaded.	4601	TCP	Export	Section 6.10.5
Module unloading information	When the module is unplugged or switched off.	4601	TCP	Export	Section 6.10.8
Parameter loading & unloading	Example: When the ECG module is switched from 12 lead to 5 lead, it is necessary to unload some parameters and then load new parameters. Or similar cases.	4601	TCP	Export	Section 6.10.9

6.2 Difference between Unsolicited Results Interface and Solicited Results Interface

1. Send only one patient's data within one TCP Connection. The patient demographics is not included in each HL7 message (that is to say, PID and PV1 segments are not present in each HL7 message), it is sent only after the connection is established or changed.
2. Different contents are sent in separate HL7 messages. For example, physiological alarms are sent in one ORU^R01 message, while technical alarms are sent in another ORU^R01 message. Periodic parameters of ECG module are sent in one ORU^R01 message, while periodic parameters of SPO2 module are sent in another ORU^R01 message.

6.3 Communication process

6.3.1 Broadcast Messages

The bedside monitor, CMS or PDS Gateway broadcast online notification messages every second, telling its existence to other hosts on the network. Then, the other hosts on the network can make connection dynamically based on the broadcast messages.

The following table lists various broadcast ports and broadcast data.

Product	Broadcast port	Broadcast data
Patient monitor	4600	Patient basic information
CMS	4679	CMS name
PDS Gateway	4679	Name of the PDS Gateway

6.3.2 Acquire Bed List

In case it is necessary to acquire the data from the bedside monitor through the CMS or PDS Gateway, the IP address of the corresponding bedside monitor, or the IP address of telemetry receiver with serial number of telemetry transmitter must be obtained first.

The bed list can be queried through CMS or PDS gateway on the port 4678. The bed list message contains the basic information of each bed, including the IP address and etc.

If the IP address of bedside device is fixed and available for CIS, there is no necessary to acquire bed list.

6.3.3 Acquire unsolicited realtime data from bedside device

1. After the connection is established from CIS, this interface will sent the patient demographics and all module settings (including parameter list, parameter alarm settings).
2. Physiological alarms and technical alarms are sent every one second.

3. Only when receives a QRY message from CIS, indicating which parameters to be sent, this interface will send what CIS needs every one second.
4. CIS can send a new QRY message to this interface dynamically to refresh the parameters to be sent.
5. When the measurement of Aperiodic parameters is finished, the results data will be sent immediately in ORU message.
6. An ORU^R01 message is sent to the client when changes occur to the patient information.
7. An ORU^R01 message is sent to the client when changes occur to the parameter alarm settings like alarm limits or alarm level.
8. A TCP echo message needs to be sent between the communication parties. If the sever does not receive TCP echo message from the client within 10 seconds, it considers that network fault occurs and then takes the initiative to interrupt network connection.

NOTE

- **If the query message from CIS is in wrong format, this interface will not return an ACK/NACK message.**
-

6.3.4 Acquire unsolicited realtime data from Central

Monitoring System or PDS Gateway

After connected to this interface via the TCP port 4601, the client side must send a query message to this interface at first, telling what data to be sent. Otherwise, this interface does not send any data.

The query message sent to the CMS or PDS Gateway must contain the IP address of the corresponding bedside monitor, or IP address of the telemetry receiver with the serial number of the telemetry transmitter. Otherwise, the CMS or PDS gateway does not know which bedside monitor or transmitter is required by the client.

If the query message sent by the client is correct in both contents and format, the server then sends data periodically based on the query contents.

NOTE

- **If the query message from CIS is in wrong format, this interface will not return an ACK/NACK message.**
-

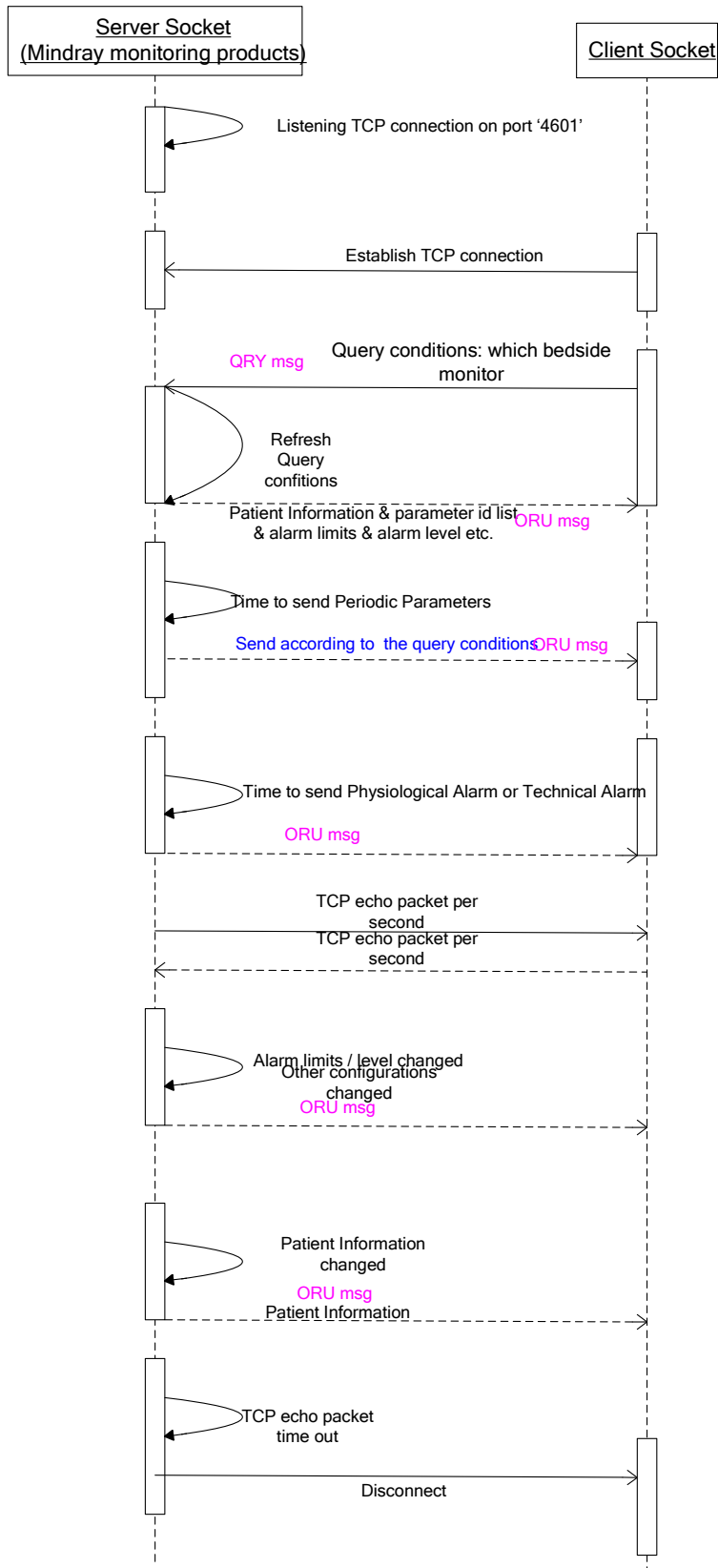
Figure below describes the whole network handshake process.

1. After TCP connections are established between the communication parties, the client side must send a query message (QRY) to this interface, telling what data (parameters, alarms, etc) are

expected. This interface then sends the required data to the client based on the query condition. If the client side re-sends new query conditions, the server will refresh the old query condition.

2. If the query message is in correct format, this interface returns the patient basic information (name, gender, birth date etc) and some initialized configuration information (such as parameter ID, alarm limits, alarm level). If the query message is not in correct format, no error message (ACK/NACK) would be sent.
3. If the client side resent a new query message of a different bedside monitor, this interface will change to send the new bedside monitor's data.
4. Physiological alarms and technical alarms are sent every one second.
5. The server sends real-time parameter data and alarm information periodically based on the query condition. The aperiodic parameters are sent when the measurement is completed. All the data above are sent by the ORU message.
6. An ORU^R01 message is sent to the client when changes occur to the patient information.
7. The server immediately sends an ORU message to the client when changes occur to the alarm limits or alarm level of the parameter.
8. A TCP echo packet needs to be sent between the communication parties. If the sever does not receive TCP echo packet from the client within 10 seconds, it considers that network fault occurs and then takes the initiative to interrupt network connection.

Realtime Results Interface



6.3.5 Disconnect

This interface takes the initiative to disconnect the network under the following circumstances:

1. This interface does not receive a TCP echo packet from the client side within 10 seconds in case of TCP connections (port 4601 and 4678).
2. This interface encounters socket abnormal.
3. The client side takes the initiative to interrupt network connection.
4. For the CMS or PDS Gateway, the connected bedside monitor discharges a patient.
5. For the CMS or PDS Gateway, the connected bedside monitor is disconnected from the network.

In case of 4 and 5, the CMS or PDS Gateway does not take the initiative to send a new bed list. Therefore, the client side is recommended to query the bed list periodically.

6.4 HL7 Message Type

6.4.1 Definition

One type of HL7 message contains only the specific data contents. For example, parameters and alarm are sent by two different types of HL7 message separately.

6.4.1.1 Definition of MSH Segment

The MSH segment is the 1st segment of HL7 message. It defines the message type. The following table defines the syntax of MSH segment.

SEQ	LEN	DT	OPT	Used	Field Name	Description
1	1	ST	R	Yes	Field Separator	Always ' '
2	4	ST	R	Yes	Encoding Characters	Always '^~\&'
9	7	CM	R	Yes	Message Type	See 6.4.1.2
10	20	ST	R	Yes	Message Control ID	See 6.4.1.3
11	3	PT	R	Yes	Processing ID	Always 'P'
12	60	VID	R	Yes	Version ID	Always '2.3.1'
18	16	ID	O	Yes	Character Set	Ignore default ISO8859_1.

The message type is jointly defined by 'Message Type' and 'Message Control ID' fields.

6.4.1.2 Message Type

The value of Message Type is defined by the HL7 protocol already.

The following table lists the message types used in Mindray PDS protocol.

Message	Description	Chapter	HL7 v2.3.1 Chapter
ADT	Patient Administration	<i>Chapter 6.5</i>	Chapter 3
QRY	Query	<i>Chapter 6.9</i>	Chapter 2
ORU	Unsolicited transmission of an observation message	<i>Chapter 6.10</i>	Chapter 11

6.4.1.3 Message Control ID

Every message has its unique Message Control ID. This ID is Arabic numerals defined by Mindray PDS protocol. For details, refer to the definition of each message.

6.4.2 Coding System

6.4.2.1 OBX Segment

The OBX segment is used for sending parameters, alarm, alarm limits, alarm level and other configuration information.

The following table defines the syntax of OBX segment.

SEQ	LEN	DT	OPT	Used	Field Name
2	2	ID	R	No	Value Type
3	80	CE	R	Yes	Observation Identifier
4	20	ST	O	Yes	Observation Sub-ID
5	65K		R	Yes	Observation Results
6	60	CE	O	Yes	Units
7	60	ST	O	Yes	Reference Range
11	1	ID	R	Yes	Observation Results Status
13	20	ST	O	Yes	User Defined Access Checks
14	26	TS	O	Yes	Date/Time of the Observation

In the table, the 3rd field ‘Observation Identifier’ identifies the unique OBX segment in the <ID>^<Text> format, where <Text> is a description of <ID>.

For example, if the 3rd field is ‘101^HR’, it means that the OBX segment describes the HR value and that the ID of OBX is ‘101’.

6.4.2.2 Mindray HL7 Code

Mindray HL7 Code (MHC) specifically describes the 3rd field of OBX segment. For details, refer to *Appendix B*.

6.5 Broadcast Message

6.5.1 Online Notification Message of the Patient Monitor

(ADT^A01)

6.5.1.1 Message Content

The message contains:

- Department name
- Bed No.
- Patient ID and Patient Name.
- IP address and port number of the bedside monitor or telemetry receiver.
- Flag for whether a patient is admitted
- Monitor name
- Monitor Standby status
- Serial number of the telemetry transmitter (only used for CMS or PDS Gateway)

6.5.1.2 Message Format

The message format is shown below:

MSH	Message Header
EVN	Event Type
PID	Patient Identification
PV1	Patient Visit
OBX	Monitor Name
OBX	Standby Status
OBX	Telemetry transmitter serial No.
.....	

Example:

```
MSH|^~\&|||ADT^A01|101|P|2.3.1|
EVN||00000000|
PID|||d3050dc2-3c53-650c-5c965ac302b2e85e||Li^Ming|
PV1||I|^ICU&33&3293316523&4601&1|||U|
OBX||ST|2304^MonitorName||ICUMON1|||F
OBX||CE|2305^||0^|||F
OBX||NM|2211^||0^|||F
```

6.5.1.3 MSH Segment

For the definition of MSH segment, refer to *Section 6.4.1.1*.

Here,

- Message Type: ADT^A01
- Message Control ID: 101

Example:

MSH|^~\&||| | | | | | ADT^A01 | 101 | P | 2.3.1 | <CR>

6.5.1.4 EVN Segment

SEQ	LEN	DT	OPT	Used	Field Name	Description
2	26	TS	R	Yes	Recorded Date/Time	Date when the patient is admitted as accurate as to day. It is 0 (zero) by default.

Example:

EVN| | 20060906 | <CR>

6.5.1.5 PID Segment

SEQ	LEN	DT	OPT	Used	Field Name	Description
3	20	CX	R	Yes	Patient Identifier List	Patient GUID
5	48	XPN	R	Yes	Patient Name	<First Name>^<Last Name>

Example:

PID| | | d3050dc2-3c53-650c-5c965ac302b2e85e | | Li^Ming | <CR>

6.5.1.6 PV1 Segment

SEQ	LEN	DT	OPT	Used	Field Name	Description
2	1	IS	R	Yes	Patient Class	Always 'I' (for Inpatient).
3	80	PL	O	Yes	Assigned Patient Location	Only the third component (bed) is used. The first two components are empty. Format: <point of care>^<room>^<bed>. The <bed> component divides into the following subcomponents: <Office Name>&<bed id>&<TCP Addr>&<TCP Connect Port>&<Patient IID>&<Patient Admitted Flag>. The <Patient IID> could possibly be empty. The < Patient Admitted Flag > is either '1' or '0'. '1' means admitted, and '0' means NOT admitted.
18	2	IS	O	Yes	Patient Type	"N": Neonate "A": Adult "P": Pediatric "U": Unknown

Example:

```
PV1 | | I | ^^CCU&12&3232241478&4601&&1 | | | | | | | | | | | | | | | | | | | | U |
```

Description:

The department name is "CCU". The bed No. is "12". TCP port number, is "4601". Patient IID is empty. Flag for admitting patient is "1" (indicating that a patient is already admitted).

The IP address is the 32-bit number in the order of network byte. The IP address to which "3232241478" corresponds is "192.168.23.70". "3232241478" is "1100000 10101000 00010111 01000110" in the binary format. From left to right, the 1st eight-bit "11000000" corresponds to "192" in the decimal format, the 2nd eight-bit "10101000" corresponds to "168" in the decimal format, the 3rd eight-bit "00010111" corresponds to "23" in the decimal format, and the 4th eight-bit "01000110" corresponds to "70" in the decimal format.

6.5.1.7 OBX Segment

Refer to *Appendix B.4*.

6.5.2 Online Broadcast Message of the CMS and PDS

Gateway(ORU^R01)

6.5.2.1 Message Content

Name of the CMS or PDS Gateway.

6.5.2.2 Message Format

The message format is shown below:

MSH	Message Header
OBX	CMS or PDS Gateway Name

Example:

```
MSH|^~\&|||||ORU^R01|1205|P|2.3.1|
OBX||ST|4523^|cms_name|||||F
```

6.5.2.3 MSH Segment

For the definition of MSH segment, refer to *Section 6.4.1.1*.

Here,

- Message Type: ORU^R01
- Message Control ID: 1205

6.5.2.4 OBX Segment

Refer to *Appendix B.4*.

6.6 Bed List

Bed list can be queried through CMS or PDS Gateway via the query port.

6.6.1 Query Message

QRY message is used. For details, refer to *Chapter 6.9*.

Here, MSH and QRD segments are used and QRF segment is omitted.

The format is shown below:

MSH Message Header
QRD Query definition

Example:

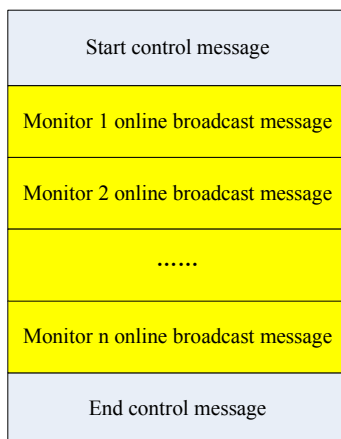
```
MSH|^~\&|||||QRY^R02|1203|P|2.3.1<CR>
QRD|19970731145557|R|I|Q839572|||||RES<CR>
```

6.6.2 Bed List Message

A bed list message is composed of the Online Notification Message of every bedside monitor and start & end control messages.

The start & end control messages are used to judge whether bed list is complete, as shown

below:



6.6.2.1 Control Message

Message Content

Amount of beds; start/end control flag.

Message Format

The message format is shown below:

MSH	Message Header
OBX	Bed Count
OBX	Message Begin/End Flag

Example:

```
MSH|^~\&||| || |ORU^R01|1204|P|2.3.1|<CR>
OBX||NM|4520^||2||| |F<CR>
OBX||CE|4521^||1^||| |F<CR>
```

MSH segment

For the definition of MSH segment, refer to *Section 6.4.1.1*.

Here,

- Message Type: ORU^R01
- Message Control ID: 1204

Example:

```
MSH|^~\&||| || |ORU^R01|1204|P|2.3.1|
```

OBX segment

For the definition of OBX segment, refer to *Appendix B.5*.

6.6.2.2 Online Notification Message

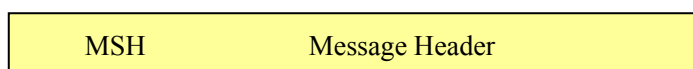
Refer to *Section 6.5.1*.

6.7 TCP Echo Message

Both of the communication parties must send messages in the following format every second to each other. If either party fails to receive the message within 10 seconds, it considers that network fault occurs and then takes the initiative to interrupt network connection.

6.7.1 Message Format

The message format is shown below:



Example:

```
MSH|^~\&|||||ORU^R01|106|P|2.3.1|
```

NOTE

- A TCP echo message must be in the above format.
-

6.7.2 Segment Definition

For the definition of MSH segment, refer to *Section 6.4.1.1*.

Here,

- Message Type: ORU^R01
- Message Control ID: 106

6.8 Patient Information Change Message (ORU^R01)

Mindray PDS protocol uses ORU^R01 message instead of ADT^A08 message to send patient information change notifications. The reason is that ADT^A08 message cannot send such information as patient height and weight.

6.8.1 Message Format

MSH	Message Header
PID	Patient Identification
PV1	Patient Visit
OBR	Observations Report ID
{	
OBX	Observation/Result
}	

The PID segment identifies patient basic information.

The PV1 segment identifies department and bed No.

The OBX segment transmits such information as patient height, weight, blood type, medical record number and paced status.

Example:

```
MSH|^~\&|||||ORU^R01|103|P|2.3.1|<CR>
PID||dad6fc23-e283-be16-1d56d3b15b885fe6||Family name^first name||20060913|M|<CR>
PV1||I|^ICU&23&3232241478&4601&0|||||||A|<CR>
OBR|||Mindray Monitor||0|<CR>
OBX||NM|52^||34.5|||||F<CR>
OBX||NM|51^||44.9|||||F<CR>
OBX||ST|2301^||medical record number|||||F<CR>
OBX||CE|2302^blood type||1^A|||||F<CR>
OBX||CE|2303^pacemaker||1^ON|||||F<CR>
```

6.8.2 MSH Segment

For the definition of MSH segment, refer to *Section 6.4.1.1*.

Here,

- Message Type: ORU^R01
- Message Control ID: 103

Example:

```
MSH|^~\&|||||ORU^R01|103|P|2.3.1|<CR>
```

6.8.3 PID Segment

Table 6-1 Definition of PID segment

SEQ	LEN	DT	OPT	Used	Field NAME	Description
3	20	CX	R	Yes	Patient Identifier List	Patient GUID

SEQ	LEN	DT	OPT	Used	Field NAME	Description
5	48	XPN	R	Yes	Patient Name	<First Name>^<Last Name>
7	26	TS	O	Yes	Date/Time of Birth	Format: YYYYMMDD
8	1	IS	O	Yes	Sex	Contains the sex of the patient as entered at the Information Center. The format is: Male: M Female: F Unknown: U

Example:

```
PID|||dad6fc23-e283-be16-1d56d3b15b885fe6||family name^first name||20060913|M|<CR>
```

NOTE

- The GUID here is different from the Patient Medical Record Number entered on the bedside monitor. It is come from background and meaningless. The Patient Medical Record Number is sent using OBX segment, refer to Appendix B.4.

6.8.4 PV1 Segment

Refer to *Section 6.5.1.6*.

Example:

```
PV1||I|^ICU&23&3232241478&4601&0||||||||||||||A|<CR>
```

6.8.5 OBR Segment

Table 6-2 Definition of OBR segment

SEQ	LEN	DT	OPT	Used	Field Name	Description
4	200	CE	R	Yes	Universal Service ID	Always "Mindray Monitor"
7	26	TS	C	Yes	Observation Date/Time	Always "0"

Example:

OBR||||Mindray Monitor||||0|

6.8.6 OBX Segment

For the definition of OBX segment, refer to *Appendix B.1* and *Appendix B.4*.

6.9 Query Message (QRY)

6.9.1 Introduction

The query message is used to:

1. Query the required data when bedside monitors are directly connected.
2. Acquire the bedside monitor or telemetry transmitter data through the CMS or PDS Gateway using 4601 TCP port.
3. Query bed list through the CMS or PDS Gateway using 4678 TCP port. Refer to *Chapter 6.6*

6.9.2 Message Format

The message format is shown below:

MSH	Message Header
QRD	Query definition
{	
[
QRF	Query filter
]	
}	

Example 1:

```
MSH|^~\&|||||QRY^R02|1203|P|2.3.1<CR>
QRD|19970731145557|R|I|Q839572||||RES<CR>
QRF|MON||||3232241478&5^1^1^0^101&102&103&104<CR>
QRF|MON||||3232241478&5^1^1^0^151&160&200<CR>
```

Example 2:

```
MSH|^~\&|||||QRY^R02|1203|P|2.3.1<CR>
QRD|20060731145557|R|I|Q895211||||RES<CR>
QRF|MON||||0&0^1^1^0^101&102&103&104<CR>
```

6.9.3 MSH Segment

For the definition of MSH segment, refer to *Section 6.4.1.1*.

Here,

- Message Type: QRY^R02
- Message Control ID: 1023

Example:

```
MSH|^~\&|||||QRY^R02|1203|P|2.3.1<CR>
```

NOTE

- The MSH segment must be in the above format. Moreover, the Message Control ID of the 10th field must be "1203" Otherwise, it cannot be resolved.

6.9.4 QRD Segment

Table 6-3 describes the definition of QRD segment.

Table 6-3 Definition of QRD segment in QRY

SEQ	LEN	DT	OPT	Used	Field Name	Description
1	26	TS	R	Yes	Date/Time of Query	Format: YYYYmmDDhhMMss000
2	1	ID	R	Yes	Query format mode	Must always be R for record-oriented
3	1	ID	R	Yes	Query Priority	Must always be I for immediate
4	10	ST	R	Yes	Query ID:Some unique identifier	Can not be Null. Byte count < 16 Bytes
9	3	PT	R	Yes	What subject filter	Must be RES for results in query and in response

Example:

```
QRD|19970731145557|R|I|Q839572|||RES<CR>
```

Message processing rules:

- The 1st field must be in valid time format. Otherwise, an error message is returned.
- The 2nd field must be 'R'. Otherwise, an error message is returned.
- The 3rd field must be 'I'. Otherwise, an error message is returned.

- The 4th field cannot be empty. It should be less than 16 bytes. The server side does not judge the uniqueness of the ID.
- The 9th field must be 'RES' . Otherwise, an error message is returned.

6.9.5 QRF Segment

The QRF segment defines the detailed contents to be queried. There can be 0 (zero) to multiple QRF segments.

For the definition of QRF segment, refer to *Table A-1*.

Table A-1 Definition of QRF segment in QRY

SEQ	LEN	DT	OPT	Used	Field Name	Description
1	20	ST	R	Yes	Where subject filter	Must always be MON for monitoring data in queries and in responses.
5	1000	ST, repeatable	O	Yes	Other query subject filter	Query Filter specifies list with ID of interest. Refer to section 6.9.5.1

Example:

QRF|MON|||3232241478&11^2^1^0^1101&1151&1152<CR>

Message processing mechanism:

- The 1st field must be 'MON'. Otherwise, an error message is returned.
- The 5th field defines query conditions. It cannot be empty. Otherwise, an error message is returned.

6.9.5.1 Query Filter

The Query Filter format is below:

<IP>&<IPSeq>^<SendType>^<SendFreq>^<SendAll>^<List>

The following table resolves all the components of the segment.

Component	Data type	Value range	Description
<IP>	Integer	0 to 4294967295	IP address of the bedside monitor connected with the CMS or PDS Gateway. Because the CMS or PDS

			Gateway is simultaneously connected to multiple bedside monitors, so uses the IP address to identify the unique bedside monitor or telemetry receiver. The IP address is the 32-bit integer in the order of network byte. For details, refer to <i>Section 6.5.1.6</i> .
<IPSeq>	Integer	0 to 255	Serial number of the telemetry transmitter minus one. Note: This is not TCP port number.
<SendType>	Integer	0 to 5	What kind of data to be sent. The indication of the value of this component is “0”: invalid value “1”: parameters “3”: physiological alarm “4”: technical alarm “5”: other configuration information Note:“2” is reserved
<SendFreq>	Integer	1 to 3600	Send frequency of periodic parameter. Unit: second.
<SendAll>	Integer	0 to 1	Whether to send all data specified by <SendType>. It is only valid for “parameters”. 0: No (Not all data of the specified type are sent. Data need to be filtered. What to be filtered is defined by <List>). 1: Yes (all data of the specified type are sent. Data are not filtered. <List> is omitted).
<List>	Integer	0 to 4294967295	<List> comprises multiple sub components in the following format: <ID>&<ID>&<ID>... 1. Here, <ID> is defined by MHC.

			<p>Every parameter has a unique ID. For details, refer to <i>Appendix B</i>.</p> <p>2. The amount of <ID> in each “Query Filter” is less than 5.</p> <p>3. If the value of <SendAll> is “1”, <List> is meaningless. It is omitted by the server side.</p> <p>4. The value of <ID> cannot have blank.</p>
--	--	--	--

NOTE

- As the amount of <ID> in each “Query Filter” is less than 5, so when the total count of <ID> is more than 5, multiple QRF segments should be used.
- The max amount of <ID> allowed is not the same from different model of products or version of software.
- If there are multiple “Query Filter” in one QRY message, the <IP> & <IPSeq> should have the same value.
- The component <SendFreq> must be the same for the same type of <SendType>.
- Every QRY message must contain all query conditions. When a new QRY message comes, the previous query condition will be refreshed.
- If the QRY message is not in correct format, the server side does not return an error message.

6.9.6 Example Analysis

Query the Bedside Monitor

Example 1:

```

MSH|^~\&|||||QRY^R02|1203|P|2.3.1<CR>
QRD|20060731145557|R|I|Q895211||||RES<CR>
QRF|MON|||0&0^1^1^0^101&102&103&104<CR>
QRF|MON|||0&0^1^1^0^151&160&170&171<CR>
QRF|MON|||0&0^1^1^0^172<CR>
QRF|MON|||0&0^3^1^1^<CR>
QRF|MON|||0&0^4^1^1^<CR>
    
```

Description:

Acquire only nine parameters of the bedside monitor. Their IDs are “101”, “102”, “103”, “104”, “151”, “160”, “170”, “171” and “172”. The send frequency is 1s.

Acquire all the physiological alarm and technical alarm of the bedside monitor. The send

frequency is 1s.

<IP> and <IPSeq> are not required for the bedside monitor. Therefore, the values of these two sub components are “0”.

Example 2:

```
MSH|^~\&|||||QRY^R02|1203|P|2.3.1<CR>
QRD|20060731145557|R||Q895211||||RES<CR>
QRF|MON|||0&0^1^1^1<CR>
QRF|MON|||0&0^3^1^1^1<CR>
QRF|MON|||0&0^4^1^1^1<CR>
```

Description:

Acquire all parameters, physiological alarm and technical alarm of the bedside monitor. The send frequency is 1s.

Query the CMS or PDS Gateway

Example 1:

```
MSH|^~\&|||||QRY^R02|1203|P|2.3.1|<CR>
QRD|20060713103045000|R||Q839572||||RES<CR>
QRF|MON|||3232241478&0^1^1^0^101&102&103&104<CR>
QRF|MON|||3232241478&0^1^1^0^151&160&200<CR>
```

Description:

The IP address of the bedside monitor is “192.168.23.70” (<IP> value is “3232241478”). Acquire the following parameters; IDs are “101”, “102”, “103”, “104”, “151”, “160” and “200”. The transmission frequency is 1s.

Example 2:

```
MSH|^~\&|||||QRY^R02|1203|P|2.3.1|<CR>
QRD|20060713103045000|R||Q839572||||RES<CR>
QRF|MON|||3232241453&1^1^1^0^101&102&103&104<CR>
QRF|MON|||3232241453&1^1^1^0^151&160&200<CR>
```

Description:

The IP address of the telemetry receiver is “192.168.23.45” (<IP> value is “3232241453”). The serial number of the telemetry transmitter is “1” (<IPSeq> value is “1”). Acquire the following parameters; IDs are “101”, “102”, “103”, “104”, “151”, “160” and “200”. The send frequency is 1s.

Query the Bed List

Example:

```
MSH|^~\&|||||QRY^R02|1203|P|2.3.1<CR>
```

QRD|19970731145557|R||Q839572||||RES<CR>

Only MSH and QRD segments are used. The QRF segment is omitted.

6.9.7 Query Response Message

If the content and format of the QRY message is correct, the data queried is returned, using ORU message, not ORF message. If the format is not correct, no ACK/NACK will be return.

6.10 Unsolicited Observation Reporting Message (ORU)

6.10.1 Periodic parameters

6.10.1.1 Message Content

Generally, a message contains the parameters of a same module. Parameters of different modules are sent in different messages.

6.10.1.2 Message Format

The message format is shown below:

MSH	Message Header
{	
OBX	Parameters
}	

6.10.1.3 MSH Segment

For the definition of MSH segment, refer to *Section 6.4.1.1*.

Here,

- Message Type: ORU^R01
- Message Control ID: 204

Example:

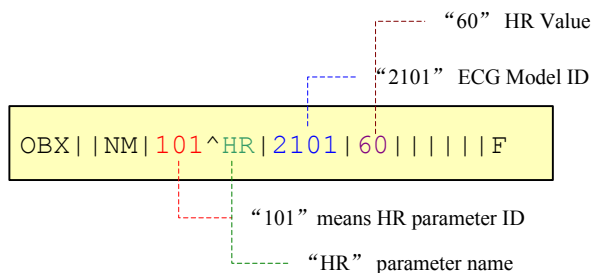
MSH|^~\&|||||ORU^R01|204|P|2.3.1|

6.10.1.4 OBX Segment

The following table describes the definition of OBX segment.

SEQ	LEN	DT	OPT	Used	Field Name	Description
2	2	ID	R	No	Value Type	"NM"
3	80	CE	R	Yes	Observation Identifier	The format is:<ID>^<text>. <ID>: Parameter ID. It cannot be empty. Refer to Appendix B.1 <text>: Parameter name. It cannot be empty. The parameter name is defined by the server side.
4	20	ST	O	Yes	Observation Sub-ID	ID of the module to which the parameter belongs. For details of module ID, refer to Appendix B.3 .
5	65K		R	Yes	Observation Results	Parameter value.
6	60	CE	O	Yes	Units	Omitted. The default unit is used. Refer to Appendix B.1.
7	60	ST	O	Yes	Reference Range	Omitted.
11	1	ID	R	Yes	Observation Results Status	"F", representing "Final".

The HR parameter is shown below:



6.10.1.5 Example

```
MSH|^~\&|||||ORU^R01|204P|2.3.1|
OBX||NM|101^HR|2101|60|||||F
OBX||NM|102^PVCs|2101|0|||||F
OBX||NM|105^I|2101|-100.00|||||F
OBX||NM|106^II|2101|-100.00|||||F
OBX||NM|107^III|2101|-100.00|||||F
OBX||NM|108^aVR|2101|-100.00|||||F
OBX||NM|109^aVL|2101|-100.00|||||F
OBX||NM|110^aVF|2101|-100.00|||||F
OBX||NM|117^ST-V|2101|-100.00|||||F
```

```
MSH|^~\&|||||ORU^R01|204P|2.3.1|
OBX||NM|151^RR|2102|20|||||F
```

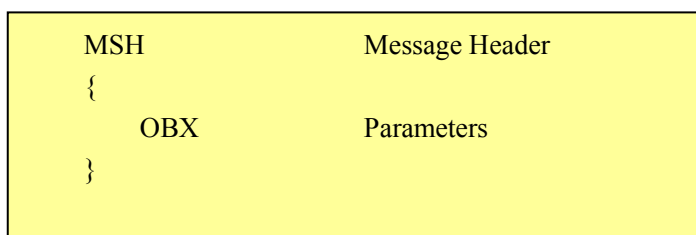
```
MSH|^~\&|||||ORU^R01|204|P|2.3.1|
OBX||NM|200^T1|2104|37.0|||||F
OBX||NM|201^T2|2104|37.2|||||F
OBX||NM|202^TD|2104|0.2|||||F
```

6.10.2 NIBP Parameter Message

As NIBP is aperiodic parameter, it is sent in a separate packet.

6.10.2.1 Message Format

The message format is shown below:



6.10.2.2 MSH Segment

For the definition of MSH segment, refer to *Section 6.4.1.1*.

Here,

- Message Type: ORU^R01
- Message Control ID: 503

Example:

```
MSH|^~\&|||||ORU^R01|503|P|2.3.1|
```

6.10.2.3 OBX Segment

The following table describes the definition of OBX segment.

SEQ	LEN	DT	OPT	Used	Field Name	Description
2	2	ID	R	No	Value Type	"NM"
3	80	CE	R	Yes	Observation Identifier	The format is :<ID>^<text>. <ID>: Parameter ID. It cannot be empty. Refer to Appendix B.1 <text>: Parameter name. It cannot be empty. The parameter name is defined by the server side.
4	20	ST	O	Yes	Observation Sub-ID	ID of the module to which the parameter belongs. Refer to Appendix B.3.
5	65K		R	Yes	Observation Results	Parameter value.
6	60	CE	O	Yes	Units	Omitted. The default unit is used. Refer to Appendix B.1.
7	60	ST	O	Yes	Reference Range	Omitted.
11	1	ID	R	Yes	Observation Results Status	"F", representing "Final".
13	20	ST	O	Yes	User Defined Access Checks	Parameter type: "APERIODIC": aperiodic parameter. "PERIODIC": periodic parameter. Default: "PERIODIC".
14	26	TS	O	Yes	Date/Time of the Observation	Omitted by default. The format is: YYYYMMDDHHMMSS. Only used for aperiodic parameters, indicating measurement time.

6.10.2.4 Example

```
MSH|^~\&|||||ORU^R01|503|P|2.3.1|
OBX||NM|171^Dia|2105|80|||||F||APERIODIC|20070106191915
OBX||NM|172^Mean|2105|93|||||F||APERIODIC|20070106191915
OBX||NM|170^Sys|2105|120|||||F||APERIODIC|20070106191915
```

6.10.3 Physiological Alarm Message

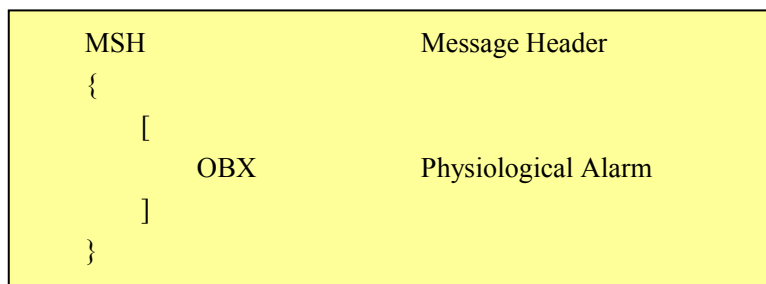
6.10.3.1 Message Content

The message contains physiological alarm information.

If the message has no OBX segment, it indicates that there is no physiological alarm currently.

6.10.3.2 Message Format

The message format is shown below:



6.10.3.3 MSH Segment

For the definition of MSH segment, refer to *Section 6.4.1.1*.

Here,

- Message Type: ORU^R01
- Message Control ID: 54

Example:

```
MSH|^~\&|||||ORU^R01|54|P|2.3.1|
```

6.10.3.4 OBX Segment

The following table describes the definition of OBX segment.

SEQ	LEN	DT	OPT	Used	Field Name	Description
2	2	ID	R	No	Value Type	"CE"
3	80	CE	R	Yes	Observation Identifier	"1": high-level alarm "2": medium-level alarm "3": low-level alarm "4": message
4	20	ST	O	Yes	Observation Sub-ID	Not defined.
5	65K		R	Yes	Observation Results	The format is:<ID>^<text>. <ID>: alarm ID <text>: alarm text. It cannot be empty. Multiple languages are displayed based on different character sets.
6	60	CE	O	Yes	Units	Omitted.
7	60	ST	O	Yes	Reference Range	Omitted.
11	1	ID	R	Yes	Observation Results Status	"F", representing "Final".
13	20	ST	O	Yes	User Defined Access Checks	Omitted.
14	26	TS	O	Yes	Date/Time of the Observation	The format is: YYYYMMDDHHMMSS , indicating the time when the alarm occurs.

6.10.3.5 Example

```

MSH|^~\&|||||ORU^R01|54|P|2.3.1|
OBX||CE|2|1|10033^**SpO2 TOO HIGH|||||F|||20070106193145|
OBX||CE|2|1|10170^**Art-Sys TOO HIGH |||||F|||20070106193145|
OBX||CE|2|1|10172^**Art-Mean TOO HIGH |||||F|||20070106193145|
OBX||CE|2|1|10174^**Art-Dia TOO HIGH |||||F|||20070106193145|
OBX||CE|2|1|10302^**CVP-Mean TOO HIGH |||||F|||20070106193145|
OBX||CE|2|1|10002^**HR TOO LOW|||||F|||20070106193145|
OBX||CE|2|1|10044^**RR TOO LOW|||||F|||20070106193145|
    
```

6.10.4 Technical Alarm Message

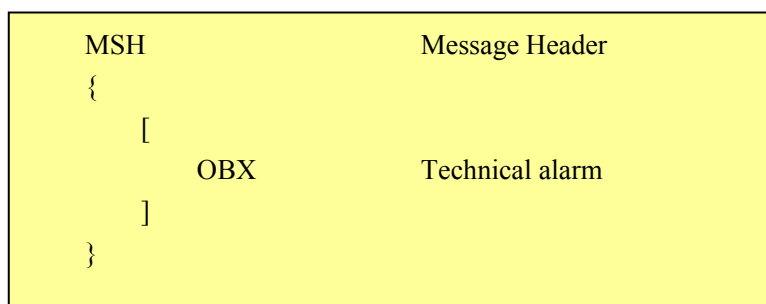
6.10.4.1 Message Content

The message contains technical alarm information.

If the message has no OBX segment, it indicates that there is no technical alarm currently.

6.10.4.2 Message Format

The message format is shown below:



6.10.4.3 MSH Segment

For the definition of MSH segment, refer to *Section 6.4.1.1*.

Here,

- Message Type: ORU^R01
- Message Control ID: 56

Example:

```
MSH|^~\&|||||ORU^R01|56|P|2.3.1|
```

6.10.4.4 OBX Segment

For the definition of OBX segment, refer to *Section 6.10.3.4*

6.10.4.5 Example

```
MSH|^~\&|||||ORU^R01|56|P|2.3.1|
OBX||CE|3||457^NIBP COMMUNICATION ERROR|||||F|
```

6.10.5 Module Loading Message

6.10.5.1 Message Content

Contains:

Module ID & name.

IDs & names of all the parameters of the module

6.10.5.2 Message Format

The message format is shown below:

MSH	Message Header
OBX	Module ID & Module Name
{	
OBX	Parameters ID & Name
}	

6.10.5.3 MSH Segment

For the definition of MSH segment, refer to *Section 6.4.1.1*.

Here,

- Message Type: ORU^R01
- Message Control ID: 11

Example:

MSH|^~\&|||||ORU^R01|11|P|2.3.1|

6.10.5.4 OBX Segment

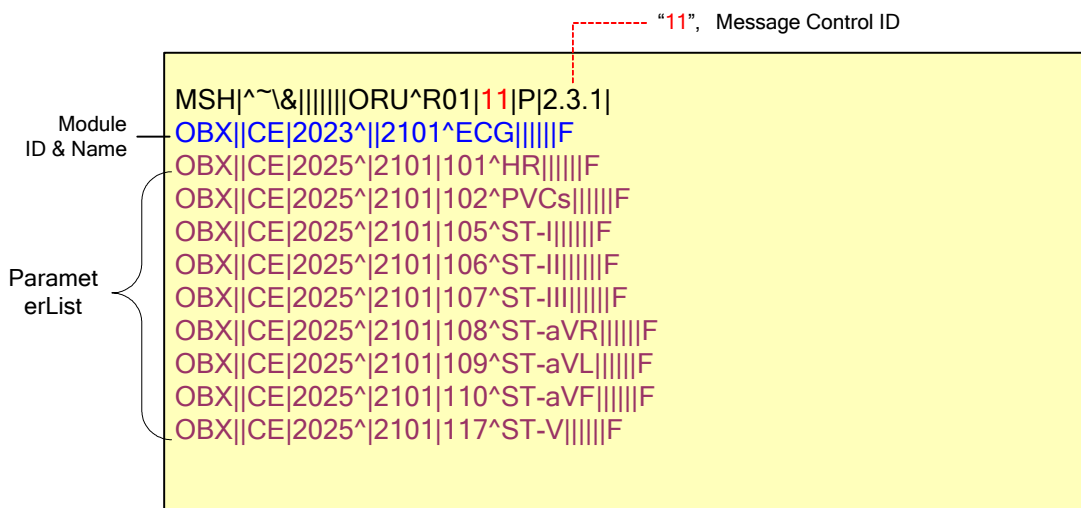
Module ID and name

SEQ	LEN	DT	OPT	Used	Field Name	Description
2	2	ID	R	No	Value Type	"CE"
3	80	CE	R	Yes	Observation Identifier	The format is:<ID>^<text>. <ID>: 2023 <text>: omitted
4	20	ST	O	Yes	Observation Sub-ID	Not defined
5	65K		R	Yes	Observation Results	The format is:<ID>^<text>. <ID>: module ID <text>: module name
11	1	ID	R	Yes	Observation Results Status	"F", representing "Final".

Parameter ID and name

SEQ	LEN	DT	OPT	Used	Field Name	Description
2	2	ID	R	No	Value Type	"CE"
3	80	CE	R	Yes	Observation Identifier	The format is: <ID>^<text>. <ID>: 2025 <text>: omitted
4	20	ST	O	Yes	Observation Sub-ID	Module ID
5	65K		R	Yes	Observation Results	The format is: <ID>^<text>. <ID>: parameter ID <text>: parameter name
11	1	ID	R	Yes	Observation Results Status	"F", representing "Final".

6.10.5.5 Example



6.10.6 Alarm Limits Message

6.10.6.1 Message Format

The message format is shown below:

MSH	Message Header
{	
OBX	Alarm upper limit
}	
{	
OBX	Alarm lower limit
}	

6.10.6.2 MSH Segment

For the definition of MSH segment, refer to *Section 6.4.1.1*.

Here,

- Message Type: ORU^R01
- Message Control ID: 51

Example:

```
MSH|^~\&|||||ORU^R01|51|P|2.3.1|
```

6.10.6.3 OBX Segment

The following table describes the definition of OBX segment.

SEQ	LEN	DT	OPT	Used	Field Name	Description
2	2	ID	R	No	Value Type	"NM"
3	80	CE	R	Yes	Observation Identifier	"2002": upper limit "2003": lower limit
4	20	ST	O	Yes	Observation Sub-ID	Parameter ID
5	65K		R	Yes	Observation Results	Upper/lower limits
11	1	ID	R	Yes	Observation Results Status	"F", representing "Final".

6.10.6.4 Example

```
MSH|^~\&|||||ORU^R01|51|P|2.3.1|
OBX||NM|2002^|101|200|||||F
OBX||NM|2003^|101|100|||||F
```

```
OBX||NM|2002^|102|10|||||F
OBX||NM|2003^|102|0|||||F
OBX||NM|2002^|105|0.20|||||F
OBX||NM|2003^|105|-0.20|||||F
```

6.10.7 Alarm Level Message

6.10.7.1 Message Format

The message format is shown below:

MSH	Message Header
{	
OBX	Alarm level
}	

6.10.7.2 MSH Segment

For the definition of MSH segment, refer to *Section 6.4.1.1*.

Here,

- Message Type: ORU^R01
- Message Control ID: 58

Example:

```
MSH|^~\&|||||ORU^R01|58|P|2.3.1|
```

6.10.7.3 OBX Segment

The following table describes the definition of OBX segment.

SEQ	LEN	DT	OPT	Used	Field Name	Description
2	2	ID	R	No	Value Type	"CE"
3	80	CE	R	Yes	Observation Identifier	"2009"
4	20	ST	O	Yes	Observation Sub-ID	Parameter ID
5	65K		R	Yes	Observation Results	Alarm level: 0:Unknown 1:High 2:Middle 3:Low
11	1	ID	R	Yes	Observation Results Status	"F", representing "Final".

6.10.7.4 Example

```
MSH|^~\&|||||ORU^R01|58|P|2.3.1|
OBX||CE|2009^|101|2^|||||F
OBX||CE|2009^|102|2^|||||F
OBX||CE|2009^|105|2^|||||F
OBX||CE|2009^|106|2^|||||F
OBX||CE|2009^|107|2^|||||F
OBX||CE|2009^|108|2^|||||F
OBX||CE|2009^|109|2^|||||F
OBX||CE|2009^|110|2^|||||F
OBX||CE|2009^|117|2^|||||F
```

6.10.8 Module Unloading Message

6.10.8.1 Message Content

Specifies the ID of the module to be unloaded.

6.10.8.2 Message Format

The message format is shown below:

MSH	Message Header
{	
OBX	Module ID Unloaded
}	

6.10.8.3 MSH Segment

For the definition of MSH segment, refer to *Section 6.4.1.1*.

Here,

- Message Type: ORU^R01
- Message Control ID: 12

Example:

```
MSH|^~\&|||||ORU^R01|12|P|2.3.1|
```

6.10.8.4 OBX Segment

The following table describes the definition of OBX segment.

SEQ	LEN	DT	OPT	Used	Field Name	Description
2	2	ID	R	No	Value Type	"CE"
3	80	CE	R	Yes	Observation Identifier	2024
5	65K		R	Yes	Observation Results	Module ID
11	1	ID	R	Yes	Observation Results Status	"F", representing "Final".

6.10.8.5 Example

To unload the ECG module:

```
MSH|^~\&|||||ORU^R01|12|P|2.3.1|
```

```
OBX||CE|2024^||2101^|||||F
```

6.10.9 Parameter Loading & Unloading Messages

6.10.9.1 Message Content

Lists the parameters to be unloaded, then the parameters to be loaded of the same module.

6.10.9.2 Message Format

The message format is shown below:

MSH	Message Header
{	
OBX	Parameters unloaded
OBX	Parameters loading
}	

6.10.9.3 MSH Segment

For the definition of MSH segment, refer to *Section 6.4.1.1*.

Here,

- Message Type: ORU^R01
- Message Control ID: 1202

Example:

```
MSH|^~\&|||||ORU^R01|1202|P|2.3.1|
```

6.10.9.4 OBX Segment

The following table describes the definition of OBX segment.

Unloading

SEQ	LEN	DT	OPT	Used	Field Name	Description
2	2	ID	R	No	Value Type	"ST"
3	80	CE	R	Yes	Observation Identifier	4502: unload parameter
5	65K		R	Yes	Observation Results	Format:<ID>^<ID>^<ID> <ID>: parameter ID
11	1	ID	R	Yes	Observation Results Status	"F", representing "Final".

Parameter loading

SEQ	LEN	DT	OPT	Used	Field Name	Description
2	2	ID	R	No	Value Type	"CE"
3	80	CE	R	Yes	Observation Identifier	2025
5	65K		R	Yes	Observation Results	Format:<ID>^<text> <ID>: parameter ID. <text>: parameter name.
11	1	ID	R	Yes	Observation Results Status	"F", representing "Final".

6.10.9.5 Example

When the ECG module is switched from 12 lead to 5 lead, it is necessary to unload some parameters and then load new parameters.

```

MSH|^~\&|||||ORU^R01|1202|P|2.3.1|
OBX||ST|4502^||105^106^107^108^109^110|||||F
OBX||ST|4502^||111^112^113^114^115^116|||||F
OBX||ST|4502^||117|||||F
OBX||CE|2025^||105^ST-I|||||F
OBX||CE|2025^||106^ST-II|||||F
OBX||CE|2025^||107^ST-III|||||F
OBX||CE|2025^||108^ST-aVR|||||F
OBX||CE|2025^||109^ST-aVL|||||F
OBX||CE|2025^||110^ST-aVF|||||F
OBX||CE|2025^||117^ST-V|||||F
    
```

A Introduction to HL7 Syntax

For a detailed description of HL7 syntax, refer to the HL7 protocol officially provided. Here only the main points are listed.

A.1 Message Packaging Format

HL7 messages are in text format.

As shown below, each HL7 message consists of multiple segments in sequence. Each segment consists of multiple fields in sequence. Every field can be repetitive. Thus, each field contains varying number of field repetitions. Each field repetition consists of multiple components in sequence, which in turn can contain multiple sub components in sequence.

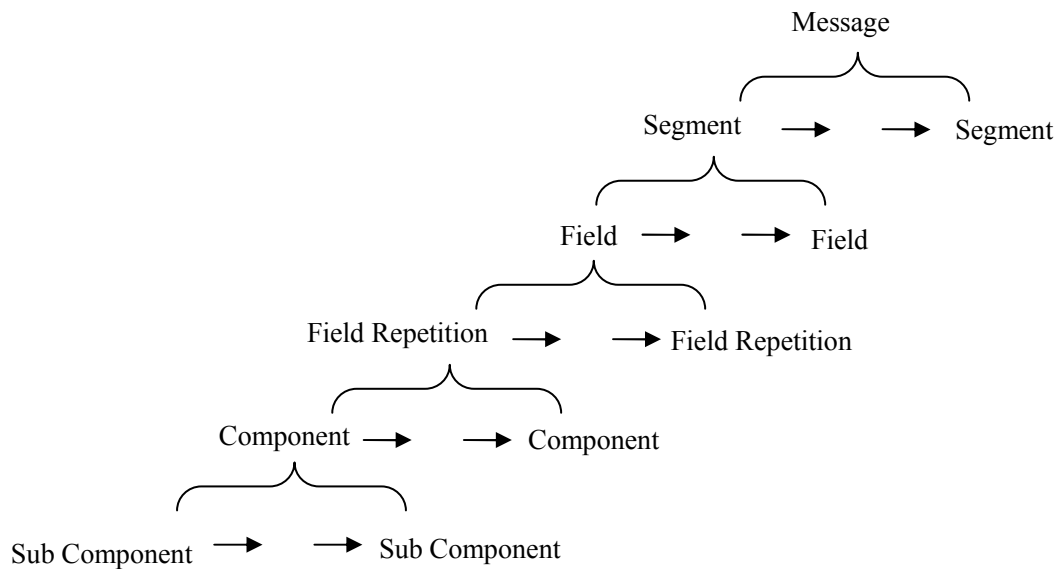


Figure A-1 Logical structure of an HL7 message

The following table lists the separators between the above elements.

Table A-1 Element & Separator

Element	Separator
Segment	<cr> The hexadecimal value is 0x0D
Field	
Field Repetition	~
Component	^
Sub Component	&

Example:

```
0x0BMSH|^~\&|||||QRY^R02|||2.3.1<cr>QRD|19970731145557|R|I|Q839572||||RES<cr>QR
F|MON|||3232241478&5^1^1^0^151&160&200<cr>0x1C0x0D
```

The following diagram shows the complete message packaging in TCP transmission.

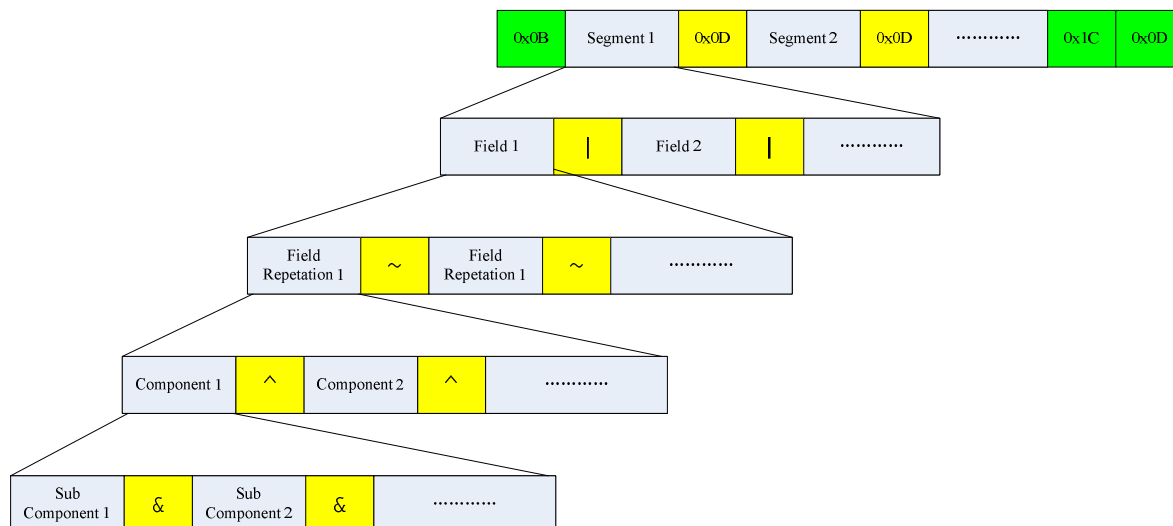


Figure A-2 HL7 message packing

A.2 Message Creation Rules

Write into a message every segment in the specified order. To create a segment, do as follows:

1. The first three characters of every segment is the segment ID to uniquely identify the segment such as “MSH” and “PID”.
2. Insert fields into the segment as per the following procedure:
 - (1) Insert a field separator “|”.
 - (2) If the field value does not exist, you do not need to insert any character.
 - (3) If the field value exists but is “empty” logically, insert “” (two consecutive double quotation marks).
 - (4) If the field value exists, insert the corresponding character string.
 - (5) If the definition of the field can be divided into components, do as follows:
 - (A) If there are two or more than two components, the components are separated by “^”.
 - (B) If the component does not exist, do not insert any character.
 - (C) If the component exists but its value is empty, insert “” (two consecutive double quotation marks).
 - (D) If a component can be further divided into sub components, do as follows:
 - a) If there are two or more than two sub components, the components are separated by “&”.
 - b) If the sub component does not exist, do not insert any character.
 - c) If the sub component exists but its value is empty, insert “” (two consecutive double quotation marks).

A.3 Message Definition

An HL7 message is uniquely identified by message type ID and trigger event ID. Expressed in the format of three capital letters, message type ID is placed in the corresponding field, such as ORU message, indicating that the measured value is sent from one system to the other.

Data exchange is triggered by the corresponding trigger event, whose ID is composed of three capital letters and figures, to indicate data exchange events triggered by such events as admitting, transferring and discharging patients. For example, A01 stands for patient admittance notification and A08 for modified patient information.

Message ID and trigger event ID are in one-to-multiple relationship. Generally, the combination of message type ID and trigger event ID is used to uniquely identify a message. For example, ADT^A01 means patient admittance notification message.

Mindray PDS protocol defines the following messages.

A.4 Message Format

Every message is composed of a set of segments arranged in the specified order. Every segment is uniquely identified by a segment ID which is expressed in the format of three capital letters such as MSH and PV1.

As shown in the following figure, a message is defined, where “{}” means that the set of segments inside the {} must occur one or multiple times and “[]” means that the set of segments inside the [] is optional. If a set of segments is both optional and repetitive, it is indicated by {[]} or [{}]. Both forms are equivalent.

The message in the figure comprises more than two segments. The first segment is MSH and the second PV1.

The words after message ID are for description purpose, such as “Message Header”.

MSH	Message Header
{	
PV1	Patient Visit
}	

Figure A-3 Protocol message format

A.5 Segment Definition

Every segment is composed of a set of fields arranged in the specified order.

The following table defines the format of a segment.

Table A-2 Segment definition

SEQ	LEN	DT	OPT	Used	Field Name	Description
1	1	ST	R	Yes	Field Separator	Always ' '
2	4	ST	R	Yes	Encoding Characters	Always '^~\&'
9	7	CM	R	Yes	Message Type	Here is ADT^A01
10	20	ST	R	Yes	Message Control ID	
11	3	PT	R	Yes	Processing ID	Always 'P'
12	60	VID	R	Yes	Version ID	Always '2.3.1'

In which,

The SEQ column indicates the order of the field in the segment.

The LEN column indicates the maximum number of characters of the field value.

The DT column indicates the data type of the field value.

The OPT column indicates that the value of the field is mandatory. "R" stands for mandatory and "O" for optional.

The Used column indicates whether the field is used in Mindray PDS protocol. "Yes" stands for used and "No" for not used.

The Field Name column indicates the name of the field.

The Description column indicates the description of the field.

The fields not included in the table are optional in the HL7 protocol and are not used in Mindray PDS protocol.

B Mindray HL7 Code (MHC)

B.1 Parameter ID Part

Note

- The parameter names and module names below are for reference only. The actual ones are subject to what the server side sends.
-

ID	Text	Module Name	Description	Default Unit
0	Unknown	/	Unknown Alarm	/
1	Red	/	Red Alarm, critical alarm, high level	/
2	Orange	/	Orange Alarm, serious alarm, medium level	/
3	Yellow	/	Yellow Alarm, general alarm, low level	/
4	Message	/	Common Message	/
51	Weight	/	Patient Weight	kg

52	Height	/	Patent Height	cm
101	HR	ECG	Heart Rate	bpm
102	PVCs	ECG	PVC sum	/min
103	ST1	ECG	ST parameter - value ST1	mv
104	ST2	ECG	ST parameter - value ST2	mv
105	ST_I	ECG	ST parameter - value ST_I	mv
106	ST_II	ECG	ST parameter - value ST_II	mv
107	ST_III	ECG	ST parameter - value ST_III	mv
108	ST_aVR	ECG	ST parameter - value ST_aVR	mv
109	ST_aVL	ECG	ST parameter - value ST_aVL	mv
110	ST_aVF	ECG	ST parameter - value ST_aVF	mv
111	ST_V1	ECG	ST parameter - value ST_V1	mv
112	ST_V2	ECG	ST parameter - value ST_V2	mv
113	ST_V3	ECG	ST parameter - value ST_V3	mv
114	ST_V4	ECG	ST parameter - value ST_V4	mv
115	ST_V5	ECG	ST parameter - value ST_V5	mv
116	ST_V6	ECG	ST parameter - value ST_V6	mv
117	ST_V	ECG	ST parameter - value ST_V	mv

151	RR	RESP	Respiration wave/rate	rpm
160	SPO2	SPO2	Percent Oxyhemoglobin Saturation - Arterial	%
161	PR	SPO2	Pulse Rate	bpm
170	NIBP S	NIBP	Non-invasive Blood Pressure Systolic	mmHg
171	NIBP D	NIBP	Non-invasive Blood Pressure Diastolic	mmHg
172	NIBP M	NIBP	Non-invasive Blood Pressure Mean	mmHg
174	IBP1_M	IBP CH1	Invasive Blood Pressure Mean: Channel 1	mmHg
175	IBP1_S	IBP CH1	Invasive Blood Pressure Systolic: Channel 1	mmHg
176	IBP1_D	IBP CH1	Invasive Blood Pressure Diastolic: Channel 1	mmHg
178	IBP2_M	IBP CH2	Invasive Blood Pressure Mean: Channel 2	mmHg
179	IBP2_S	IBP CH2	Invasive Blood Pressure Systolic: Channel 2	mmHg
180	IBP2_D	IBP CH2	Invasive Blood Pressure Diastolic: Channel 2	mmHg
182	IBP3_M	IBP CH3	Invasive Blood Pressure Mean: Channel 3	mmHg
183	IBP3_S	IBP CH3	Invasive Blood Pressure Systolic: Channel 3	mmHg
184	IBP3_D	IBP CH3	Invasive Blood Pressure Diastolic: Channel 3	mmHg

186	IBP4_M	IBP CH4	Invasive Blood Pressure Mean: Channel 4	mmHg
187	IBP4_S	IBP CH4	Invasive Blood Pressure Systolic: Channel 4	mmHg
188	IBP4_D	IBP CH4	Invasive Blood Pressure Diastolic: Channel 4	mmHg
200	T1	TEMP	Non-specific temperature 1	°C
201	T2	TEMP	Non-specific temperature 2	°C
202	TD	TEMP	Delta Temperature between non-specific temperature labels	°C
203	Temp	TEMP	temperature	°C
210	C.O.	C.O.	Cardiac output	L/min
211	TI	C.O.		°C
212	C.I.	C.O.	Aperiodic parameter, Cardiac Index	L/min/m ²
213	TB	C.O.	Aperiodic parameter, Blood temperature - delivered by C.O.	°C
220	CO2	CO2	End of Tidal CO2	mmHg
221	INS	CO2	Inspired Minimum CO2	mmHg
222	AWRR	CO2	Airway Respiration Rate	rpm

250	CO2Et	AG	End tidal Carbon Dioxide	mmHg
251	CO2Fi	AG	Inspired C2O	mmHg
253	O2Et	AG	End-Tidal O2	mmHg
254	O2Fi	AG	Inspired O2	mmHg
256	N2OEt	AG	End-Tidal N2O	%
257	N2OFi	AG	Inspired N2O	%
259	AAEt	AG	End-Tidal Anesthetic	%
260	AAFfi	AG	Inspired Anesthetic Agent	%
262	HALEt	AG	End-Tidal Heathen	%
263	HALFi	AG	Inspired Heathen	%
265	ENFEt	AG	Inspired Enflurane	%
266	ENFFi	AG	End-Tidal Enflurane	%
268	ISOEt	AG	End-Tidal Isoflurane	%
269	ISOFi	AG	Inspired Isoflurane	%

271	SEVEt	AG	End-Tidal Sevoflurane	%
272	SEVFi	AG	Inspired Sevoflurane	%
274	DESEt	AG	End-Tidal Desflurane	%
275	DESFi	AG	Inspired Desflurane	%
280	AgAwRR	AG		rpm
281	MAC	AG		/
301	Pmean	VENT	Mean airway pressure	cmH ₂ O
302	PEEP	VENT	Positive end-expiratory pressure	cmH ₂ O
303	Pplat	VENT	Plateau pressure	cmH ₂ O
304	Pmax	VENT	Maximum airway pressure	cmH ₂ O
305	MV	VENT	Minute volume	l/min
306	VTE	VENT	Expired tidal volume	ml
307	VTI	VENT	Inspired tidal volume	ml
308	I:E	VENT	Inspiratory time:Expiratory time ratio	/
309	Freq	VENT	Breath rate	BPM
310	FiO ₂	VENT	Fractional concentration of O ₂ in inspired gas	%
311	Compliance	VENT	Compliance	ml/cmH ₂ O
312	Resistance	VENT	Resistance	cmH ₂ O/ (l/s)

313	SIMV Total Frequency	VENT	(SIMV) Total breath rate	BPM
314	Spontaneous Frequency in SIMV	VENT	(SIMV) Spontaneous breath rates	BPM
315	Spoutaneous MV in SIMV	VENT	(SIMV) Spontaneous minute volume	l/min
350	BIS	BIS	BIS Parameters	
351	SQI	BIS	BIS Parameters	%
352	SR	BIS	BIS Parameters	%
353	SEF	BIS	BIS Parameters	Hz
354	EMG	BIS	BIS Parameters	dB
355	TP	BIS	BIS Parameters	dB
357	BIS_L	BISX4	BISX4 Parameters	/
358	BIS_R	BISX4	BISX4 Parameters	/
359	SQI_L	BISX4	BISX4 Parameters	%
360	SQI_R	BISX4	BISX4 Parameters	%
361	SR_L	BISX4	BISX4 Parameters	%
362	SR_R	BISX4	BISX4 Parameters	%
363	SEF_L	BISX4	BISX4 Parameters	Hz
364	SEF_R	BISX4	BISX4 Parameters	Hz
365	EMG_L	BISX4	BISX4 Parameters	dB
366	EMG_R	BISX4	BISX4 Parameters	dB

367	TP_L	BISX4	BISX4 Parameters	dB
368	TP_R	BISX4	BISX4 Parameters	dB
369	BC_L	BISX4	BISX4 Parameters	/
370	BC_R	BISX4	BISX4 Parameters	/
371	sBIS_L	BISX4	BISX4 Parameters	/
372	sBIS_R	BISX4	BISX4 Parameters	/
373	sEMG_L	BISX4	BISX4 Parameters	/
374	sEMG_R	BISX4	BISX4 Parameters	/
375	ASYM	BISX4	BISX4 Parameters	%
400	RR	RM	RM Parameters	rpm
401	MVE	RM	RM Parameters	L/min
402	PEEP	RM	RM Parameters	cmH2O
403	PIP	RM	RM Parameters	cmH2O
404	I:E	RM	RM Parameters	/
405	FEV1.0	RM	RM Parameters	%
406	Pmean	RM	RM Parameters	cmH2O
407	Tvi	RM	RM Parameters	ml
408	Tve	RM	RM Parameters	ml
409	Mvi	RM	RM Parameters	L/min
410	PEF	RM	RM Parameters	L/min

411	PIF	RM	RM Parameters	L/min
412	Pplat	RM	RM Parameters	cmH2O
413	WOB	RM	RM Parameters	J
414	Compl	RM	RM Parameters	ml/cmH2O
415	Raw	RM	RM Parameters	cmH2O/L/s
416	RSBI	RM	RM Parameters	rpm/L
417	NIP	RM	RM Parameters	cmH2O
418	APNEA	RM	RM Parameters	
450	C.I.	ICG	ICG Parameters	L/min/m ²
451	C.O.	ICG	ICG Parameters	L/min
452	SV	ICG	ICG Parameters	ml
453	SI	ICG	ICG Parameters	ml/m ²
454	SVR	ICG	ICG Parameters	DS/cm ⁵
455	SVRI	ICG	ICG Parameters	DS·m ² /cm ⁵
456	PVR	ICG	ICG Parameters	DS/cm ⁵
457	PVRI	ICG	ICG Parameters	DS·m ² /cm ⁵
458	TFC	ICG	ICG Parameters	/kΩ
459	TFI	ICG	ICG Parameters	Ω
460	EF	ICG	ICG Parameters	%
461	ACI	ICG	ICG Parameters	/100s ²

462	VI	ICG	ICG Parameters	/1000s
463	LCW	ICG	ICG Parameters	kg·m
464	LCWI	ICG	ICG Parameters	kg·m/m ²
465	LVSW	ICG	ICG Parameters	g·m
466	LVSWI	ICG	ICG Parameters	g·m/m ²
467	RCW	ICG	ICG Parameters	kg·m
468	RCWI	ICG	ICG Parameters	kg·m/m ²
469	RVSW	ICG	ICG Parameters	g·m
470	RVSWI	ICG	ICG Parameters	g·m/m ²
471	STR	ICG	ICG Parameters	
472	PEP	ICG	ICG Parameters	ms
473	LVET	ICG	ICG Parameters	ms
474	HR	ICG	ICG Parameters	bpm
475	BSA	ICG	ICG Parameters	m ²
476	VEPT	ICG	ICG Parameters	ml
500	Sys	ART	Art Module Invasive Blood Pressure Systolic	mmHg
501	Mean	ART	Art Module Invasive Blood Pressure Mean	mmHg
502	Dia	ART	Art Module Invasive Blood Pressure Diastolic	mmHg
503	Sys	PA	PA Module Invasive Blood Pressure Systolic	mmHg

504	Mean	PA	PA Module Invasive Blood Pressure Mean	mmHg
505	Dia	PA	PA Module Invasive Blood Pressure Diastolic	mmHg
506	Sys	Ao	Ao Module Invasive Blood Pressure Systolic	mmHg
507	Mean	Ao	Ao Module Invasive Blood Pressure Mean	mmHg
508	Dia	Ao	Ao Module Invasive Blood Pressure Diastolic	mmHg
509	Sys	UAP	UAP Module Invasive Blood Pressure Systolic	mmHg
510	Mean	UAP	UAP Module Invasive Blood Pressure Mean	mmHg
511	Dia	UAP	UAP Module Invasive Blood Pressure Diastolic	mmHg
512	Sys	BAP	BAP Module Invasive Blood Pressure Systolic	mmHg
513	Mean	BAP	BAP Module Invasive Blood Pressure Mean	mmHg
514	Dia	BAP	BAP Module Invasive Blood Pressure Diastolic	mmHg
515	Sys	FAP	FAP Module Invasive Blood Pressure Systolic	mmHg
516	Mean	FAP	FAP Module Invasive Blood Pressure Mean	mmHg
517	Dia	FAP	FAP Module Invasive Blood Pressure Diastolic	mmHg
518	Sys	IBP P1	IBP P1 Module Invasive Blood Pressure Systolic	mmHg
519	Mean	IBP P1	IBP P1 Module Invasive Blood Pressure Mean	mmHg
520	Dia	IBP P1	IBP P1 Module Invasive Blood Pressure Diastolic	mmHg
521	Sys	IBP P2	IBP P2 Module Invasive Blood Pressure Systolic	mmHg
522	Mean	IBP P2	IBP P2 Module Invasive Blood Pressure Mean	mmHg
523	Dia	IBP P2	IBP P2 Module Invasive Blood Pressure Diastolic	mmHg

524	Sys	IBP P3	IBP P3 Module Invasive Blood Pressure Systolic	mmHg
525	Mean	IBP P3	IBP P3 Module Invasive Blood Pressure Mean	mmHg
526	Dia	IBP P3	IBP P3 Module Invasive Blood Pressure Diastolic	mmHg
527	Sys	IBP P4	IBP P4 Module Invasive Blood Pressure Systolic	mmHg
528	Mean	IBP P4	IBP P4 Module Invasive Blood Pressure Mean	mmHg
529	Dia	IBP P4	IBP P4 Module Invasive Blood Pressure Diastolic	mmHg
530	Sys	IBP P5	IBP P5 Module Invasive Blood Pressure Systolic	mmHg
531	Mean	IBP P5	IBP P5 Module Invasive Blood Pressure Mean	mmHg
532	Dia	IBP P5	IBP P5 Module Invasive Blood Pressure Diastolic	mmHg
533	Sys	IBP P6	IBP P6 Module Invasive Blood Pressure Systolic	mmHg
534	Mean	IBP P6	IBP P6 Module Invasive Blood Pressure Mean	mmHg
535	Dia	IBP P6	IBP P6 Module Invasive Blood Pressure Diastolic	mmHg
536	Sys	IBP P7	IBP P7 Module Invasive Blood Pressure Systolic	mmHg
537	Mean	IBP P7	IBP P7 Module Invasive Blood Pressure Mean	mmHg
538	Dia	IBP P7	IBP P7 Module Invasive Blood Pressure Diastolic	mmHg
539	Sys	IBP P8	IBP P8 Module Invasive Blood Pressure Systolic	mmHg
540	Mean	IBP P8	IBP P8 Module Invasive Blood Pressure Mean	mmHg
541	Dia	IBP P8	IBP P8 Module Invasive Blood Pressure Diastolic	mmHg
542	Sys	IBP AUX1	IBP AUX1 Module Invasive Blood Pressure Systolic	mmHg
543	Mean	IBP AUX1	IBP AUX1 Module Invasive Blood Pressure Mean	mmHg

544	Dia	IBP AUX1	IBP AUX1 Module Invasive Blood Pressure Diastolic	mmHg
545	Sys	IBP AUX2	IBP AUX2 Module Invasive Blood Pressure Systolic	mmHg
546	Mean	IBP AUX2	IBP AUX2 Module Invasive Blood Pressure Mean	mmHg
547	Dia	IBP AUX2	IBP AUX2 Module Invasive Blood Pressure Diastolic	mmHg
548	Sys	IBP AUX3	IBP AUX3 Module Invasive Blood Pressure Systolic	mmHg
549	Mean	IBP AUX3	IBP AUX3 Module Invasive Blood Pressure Mean	mmHg
550	Dia	IBP AUX3	IBP AUX3 Module Invasive Blood Pressure Diastolic	mmHg
551	Sys	IBP AUX4	IBP AUX4 Module Invasive Blood Pressure Systolic	mmHg
552	Mean	IBP AUX4	IBP AUX4 Module Invasive Blood Pressure Mean	mmHg
553	Dia	IBP AUX4	IBP AUX4 Module Invasive Blood Pressure Diastolic	mmHg
554	Sys	IBP AUX5	IBP AUX5 Module Invasive Blood Pressure Systolic	mmHg
555	Mean	IBP AUX5	IBP AUX5 Module Invasive Blood Pressure Mean	mmHg
556	Dia	IBP AUX5	IBP AUX5 Module Invasive Blood Pressure Diastolic	mmHg
557	Sys	IBP AUX6	IBP AUX6 Module Invasive Blood Pressure Systolic	mmHg
558	Mean	IBP AUX6	IBP AUX6 Module Invasive Blood Pressure Mean	mmHg
559	Dia	IBP AUX6	IBP AUX6 Module Invasive Blood Pressure Diastolic	mmHg
560	Sys	IBP AUX7	IBP AUX7 Module Invasive Blood Pressure Systolic	mmHg
561	Mean	IBP AUX7	IBP AUX7 Module Invasive Blood Pressure Mean	mmHg
562	Dia	IBP AUX7	IBP AUX7 Module Invasive Blood Pressure Diastolic	mmHg
563	Sys	IBP AUX8	IBP AUX8 Module Invasive Blood Pressure Systolic	mmHg
564	Mean	IBP AUX8	IBP AUX8 Module Invasive Blood Pressure Mean	mmHg

565	Dia	IBP AUX8	IBP AUX8 Module Invasive Blood Pressure Diastolic	mmHg
566	Mean	IBP CVP	IBP CVP Module Invasive Blood Pressure Mean	mmHg
567	Mean	IBP RAP	IBP RAP Module Invasive Blood Pressure Mean	mmHg
568	Mean	IBP LAP	IBP LAP Module Invasive Blood Pressure Mean	mmHg
569	Mean	IBP ICP	IBP ICP Module Invasive Blood Pressure Mean	mmHg
570	Mean	IBP UVP	IBP UVP Module Invasive Blood Pressure Mean	mmHg
571	Mean	IBP LVP	IBP LVP Module Invasive Blood Pressure Mean	mmHg
573	Sys	IBP CVP	IBP CVP Module Invasive Blood Pressure Systolic	mmHg
574	Sys	IBP RAP	IBP RAP Module Invasive Blood Pressure Systolic	mmHg
575	Sys	IBP LAP	IBP LAP Module Invasive Blood Pressure Systolic	mmHg
576	Sys	IBP ICP	IBP ICP Module Invasive Blood Pressure Systolic	mmHg
577	Sys	IBP UVP	IBP UVP Module Invasive Blood Pressure Systolic	mmHg
578	Sys	IBP LVP	IBP LVP Module Invasive Blood Pressure Systolic	mmHg
580	Dia	IBP CVP	IBP CVP Module Invasive Blood Pressure Diastolic	mmHg
581	Dia	IBP RAP	IBP RAP Module Invasive Blood Pressure Diastolic	mmHg
582	Dia	IBP LAP	IBP LAP Module Invasive Blood Pressure Diastolic	mmHg
583	Dia	IBP ICP	IBP ICP Module Invasive Blood Pressure Diastolic	mmHg
584	Dia	IBP UVP	IBP UVP Module Invasive Blood Pressure Diastolic	mmHg

585	Dia	IBP LVP	IBP LVP Module Invasive Blood Pressure Diastolic	mmHg
586	ICP_CePP	IBP		mmHg
587	PPV	ART		%
588	PPV	AO		%
589	PPV	UAP		%
590	PPV	FAP		%
591	PPV	BAP		%
592	PPV	LVP		%
593	PPV	IBP1		%
594	PPV	IBP2		%
595	PPV	IBP3		%
596	PPV	IBP4		%
600	PR	PR	PR Module Parameter PR	bpm
601	Sys	IBP pART	IBP pART Module Invasive Blood Pressure Systolic	mmHg
602	Mean	IBP pART	IBP pART Module Invasive Blood Pressure Mean	mmHg
603	Dia	IBP pART	IBP pART Module Invasive Blood Pressure Diastolic	mmHg
604	Sys	IBP pCVP	IBP pCVP Module Invasive Blood Pressure Systolic	mmHg
605	Mean	IBP pCVP	IBP pCVP Module Invasive Blood Pressure Mean	mmHg
606	Dia	IBP pCVP	IBP pCVP Module Invasive Blood Pressure Diastolic	mmHg

650	CCO	CCO		L/min
651	CCI	CCO		L/min/m ²
652	C.O.	CCO	An aperiodic parameter	L/min
653	C.I.	CCO	An aperiodic parameter	L/min/m ²
654	RVEF	CCO		%
655	TB	CCO	Blood temperature - delivered by CCO Module	°C
656	SVR	CCO		DS/cm ⁵
657	SVRI	CCO		DS·cm ² /cm ⁵
658	SV	CCO		ml/b
659	SVI	CCO		ml/b/m ²
660	EDV	CCO		ml
661	EDVI	CCO		ml/m ²
662	ESV	CCO		ml
663	ESVI	CCO		ml/m ²
664	CVP	CCO		mmHg
665	MAP	CCO		mmHg
666	HR	CCO		bpm
667	SVV	CCO		%
668	GEDV	CCO		ml
669	GEDI	CCO		ml/m ²
670	ITBV	CCO		ml

671	ITBI	CCO		ml/m ²
672	PPV	CCO		%
673	EVLW	CCO		ml
674	ELWI	CCO		ml/Kg
675	CPO	CCO		W
676	CPI	CCO		W/m ²
677	PVPI	CCO		/
678	GEF	CCO		%
679	dPmx	CCO		mmHg/s
680	CFI	CCO		l/min
681	TI	CCO		°C
750	SvO2	SvO2		%
751	ScvO2	SvO2		%
752	SaO2	SvO2		%
753	VO2	SvO2		ml/min
754	O2EI	SvO2		%
755	DO2	SvO2		ml/min
756	SQI	SvO2		
757	DO2I	SvO2		/
758	VO2I	SvO2		/

759	Hb	SvO2		/
800	SpO2b	SPO2B		
801	Δ SpO2	SPO2B		
820	tcpCO2	TCGas		
821	tcpO2	TCGas		
822	SpO2	TCGas		
823	PR	TCGas		
824	Power	TCGas		
825	Tsensor	TCGas		
826	SR1	EEG1		
827	SEF1	EEG1		
828	MF1	EEG1		
829	PPF1	EEG1		
830	TP1	EEG1		
831	EMG1	EEG1		
832	Delta1	EEG1		
833	Theta1	EEG1		

834	Alpha1	EEG1		
835	Beta1	EEG1		
836	SR2	EEG2		
837	SEF2	EEG2		
838	MF2	EEG2		
839	PPF2	EEG2		
840	TP2	EEG2		
841	EMG2	EEG2		
842	Delta2	EEG2		
843	Theta2	EEG2		
844	Alpha2	EEG2		
845	Beta2	EEG2		
846	SR3	EEG3		
847	SEF3	EEG3		
848	MF3	EEG3		
849	PPF3	EEG3		
850	TP3	EEG3		
851	EMG3	EEG3		
852	Delta3	EEG3		

853	Theta3	EEG3		
854	Alpha3	EEG3		
855	Beta3	EEG3		
856	SR4	EEG4		
857	SEF4	EEG4		
858	MF4	EEG4		
859	PPF4	EEG4		
860	TP4	EEG4		
861	EMG4	EEG4		
862	Delta4	EEG4		
863	Theta4	EEG4		
864	Alpha4	EEG4		
865	Beta4	EEG4		
879	TOF-Ratio	NMT		%
880	TOF-Count	NMT		
881	ST_Ratio	NMT		%
882	ST_Count	NMT		
883	DBS_Ratio	NMT		%
884	DBS_Count	NMT		

885	PTC	NMT		
886	T1	NMT		
1024	DI_START	Device Integration		
10240	DI_END	Device Integration		

Note

- As for parameters of Anesthesia and Ventilator, HL7 codes of different parameters are calculated in a certain algorithm to divide into two separate parts, that is, Anesthesia [1024, 2048), and Ventilator [2048, 3072);
- These HL7 codes are translated from MD protocol. Considering different units and parameter sources, the same parameter can have two or more HL7 parameter IDs.

The algorithm is specified as follows:

Assume that: “iReserved” to be a controller variable of encoding, which is always 0; “iModuleID” to be the Device ID of Device Integration (currently only 0 for Anesthesia, and 1 for Ventilator); “iSourceID” to be the parameter IDs from MD protocol (as demonstrated in following table); then the encoding process of HL7 parameter code “iDestID” can be like this:

At first,

$$iDestID = iReserved \ll 14,$$

then,

$$iDestID = iDestID | ((iModuleID+1) \ll 10),$$

and then,

$$iDestID = iDestID | iSourceID$$

The original parameter IDs of MD protocol is as follows.

Source ID	Text	Module Name	Description	Default Unit
0	O2%	Anesthesia		%
1	PEEP	Anesthesia		cmH2O
2	PEEP	Anesthesia		cmH2O
3	Ppeak	Anesthesia		cmH2O
4	Pplat	Anesthesia		cmH2O
5	Pmean	Anesthesia		cmH2O
6	Paw	Anesthesia		cmH2O
7	VT	Anesthesia		ml
8	VT _e	Anesthesia		ml
9	VT _i	Anesthesia		ml
10	VT _i	Anesthesia		ml
11	MV	Anesthesia		L/min
12	MV _{spn}	Anesthesia		L/min
13	MV _e	Anesthesia		L/min
14	MV _i	Anesthesia		L/min
15	MVLEAK	Anesthesia		L/min
16	f	Anesthesia		bpm
17	f	Anesthesia		bpm

18	fmand	Anesthesia		bpm
19	ftot	Anesthesia		bpm
20	fspn	Anesthesia		bpm
21	fSIMV	Anesthesia		bpm
22	FreqMIN	Anesthesia		bpm
23	I:E	Anesthesia		
24	I:E	Anesthesia		
25	TIP:TI	Anesthesia		%
26	Tslope	Anesthesia		s
27	Tinsp	Anesthesia		s
28	Texp	Anesthesia		s
29	Trig Window	Anesthesia		%
30	Plimit	Anesthesia		cmH2O
31	Pinsp	Anesthesia		cmH2O
32	Psupp	Anesthesia		cmH2O
33	Pmax	Anesthesia		cmH2O
34	P-Trigger	Anesthesia		cmH2O
35	F-Trigger	Anesthesia		L/min
36	Insp Flow	Anesthesia		L/min
37	Exp Flow	Anesthesia		L/min
38	Exp%	Anesthesia		%

39	Compl	Anesthesia		ml/cmH2O
40	RAW	Anesthesia		cmH2O/L/s
41	Pmin	Anesthesia		cmH2O
42	Paux Min	Anesthesia		cmH2O
43	Paux Peak	Anesthesia		cmH2O
44	Paux Mean	Anesthesia		cmH2O
45	FRC	Anesthesia		ml
46	PEEPi	Anesthesia		cmH2O
47	PEEPe	Anesthesia		cmH2O
48	PEEPtot	Anesthesia		cmH2O
49	PEEPi time	Anesthesia		min
50	P0.1	Anesthesia		cmH2O
51	P0.1 time	Anesthesia		min
52	RRCO2	Anesthesia		bpm
53	EtCO2	Anesthesia		%
54	EtCO2	Anesthesia		mmHg
55	FiCO2	Anesthesia		%
56	FiCO2	Anesthesia		mmHg
57	FiO2	Anesthesia		%
58	FiO2	Anesthesia		mmHg
59	EtO2	Anesthesia		%

60	EtO2	Anesthesia		mmHg
61	△O2	Anesthesia		%
62	△O2	Anesthesia		mmHg
63	Tapnea	Anesthesia		s
64	FiN2O	Anesthesia		%
65	EtN2O	Anesthesia		%
66	FiDes	Anesthesia		%
67	EtDes	Anesthesia		%
68	FiSev	Anesthesia		%
69	EtSev	Anesthesia		%
70	FiEnf	Anesthesia		%
71	EtEnf	Anesthesia		%
72	FiIso	Anesthesia		%
73	EtIso	Anesthesia		%
74	FiHal	Anesthesia		%
75	EtHal	Anesthesia		%
76	FiAA	Anesthesia		%
77	EtAA	Anesthesia		%
78	FiAA 2nd	Anesthesia		%
79	EtAA 2nd	Anesthesia		%
80	Insp. MAC	Anesthesia		

81	Exp. MAC	Anesthesia		
82	MAC	Anesthesia		
83	ATMP	Anesthesia		mmHg
84	HALev	Anesthesia		ml
85	ENFLev	Anesthesia		ml
86	ISOLev	Anesthesia		ml
87	DESLev	Anesthesia		ml
88	SEVLev	Anesthesia		ml
89	VO2	Anesthesia		ml/min
90	VO2/m2	Anesthesia		ml/min/m2
91	VO2/kg	Anesthesia		ml/min/kg
92	VCO2	Anesthesia		ml/min
93	EE	Anesthesia		kcal/day
94	RQ	Anesthesia		
95	PO2	Anesthesia		kPa
96	PN2O	Anesthesia		kPa
97	Pair	Anesthesia		kPa
98	O2 cyl.	Anesthesia		kPa
99	O2 cyl.2nd	Anesthesia		kPa
100	N2O cyl.	Anesthesia		kPa
101	Air cyl.	Anesthesia		kPa

102	FG	Anesthesia		ml/min
103	N2O Flow	Anesthesia		L/min
104	Air Flow	Anesthesia		L/min
105	O2 Flow	Anesthesia		L/min
106	Des flow	Anesthesia		ml/h
107	Enf flow	Anesthesia		ml/h
108	Iso flow	Anesthesia		ml/h
109	Hal flow	Anesthesia		ml/h
110	Sev flow	Anesthesia		ml/h
111	IBW	Anesthesia		kg
112	BSA	Anesthesia		m2
113	BIS	Anesthesia		
114	SQI	Anesthesia		
115	SR	Anesthesia		
116	EMG	Anesthesia		dB
117	SEF	Anesthesia		Hz
118	TP	Anesthesia		dB
119	BC	Anesthesia		/min
120	SpO2	Anesthesia		%
121	PR	Anesthesia		bpm
122	MV	Anesthesia		L/min

123	Rise Time%	Anesthesia		%
124	T _{insp}	Anesthesia		%
125	T _{pause}	Anesthesia		%
126	T _{pause}	Anesthesia		s
127	PC above PEEP	Anesthesia		cmH2O
128	PS above PEEP	Anesthesia		cmH2O
129	T _i /T _{tot}	Anesthesia		
130	F-Trigger	Anesthesia		
131	O ₂ %	Anesthesia		%
0	O ₂ %	Ventilator		%
1	PEEP	Ventilator		cmH2O
2	PEEP	Ventilator		cmH2O
3	P _{peak}	Ventilator		cmH2O
4	P _{plat}	Ventilator		cmH2O
5	P _{mean}	Ventilator		cmH2O
6	P _{aw}	Ventilator		cmH2O
7	VT	Ventilator		ml
8	V _{Te}	Ventilator		ml
9	V _{Ti}	Ventilator		ml

10	VT/kg	Ventilator		ml/kg
11	VTe spn	Ventilator		ml
12	VTapnea	Ventilator		ml
13	MV	Ventilator		L/min
14	MVspn	Ventilator		L/min
15	MVe	Ventilator		L/min
16	MVi	Ventilator		L/min
17	ftot	Ventilator		bpm
18	fmand	Ventilator		bpm
19	fspn	Ventilator		bpm
20	fapnea	Ventilator		bpm
21	fCMV	Ventilator		bpm
22	fSIMV	Ventilator		bpm
23	f	Ventilator		bpm
24	I:E	Ventilator		
25	I:E	Ventilator		
26	fsigh	Ventilator		bpm
27	VTsigh	Ventilator		ml
28	Δ int.PEEP	Ventilator		cmH2O
29	MVLEAK	Ventilator		L/min
30	Leak Comp	Ventilator		%

31	FiO2	Ventilator		%
32	FiO2	Ventilator		mmHg
33	EtO2	Ventilator		%
34	EtO2	Ventilator		mmHg
35	Δ O2	Ventilator		%
36	Δ O2	Ventilator		mmHg
37	Rstat	Ventilator		cmH2O/L/s
38	Rdyn	Ventilator		cmH2O/L/s
39	Cstat	Ventilator		ml/cmH2O
40	Cdyn	Ventilator		ml/cmH2O
41	RSBI	Ventilator		1/(min·L)
42	WOB	Ventilator		J/L
43	WOBimp	Ventilator		J/min
44	O2 Flow	Ventilator		L/min
45	Air Flow	Ventilator		L/min
46	Insp Flow	Ventilator		L/min
47	Exp Flow	Ventilator		L/min
48	Base Flow	Ventilator		L/min
49	Tsupp	Ventilator		s
50	F-Trigger	Ventilator		L/min
51	Trigger	Ventilator		%

52	P-Trigger	Ventilator		cmH2O
53	Psupp	Ventilator		cmH2O
54	Plimit	Ventilator		cmH2O
55	Tplat	Ventilator		s
56	Tinsp	Ventilator		s
57	Texp	Ventilator		s
58	Pinsp	Ventilator		cmH2O
59	Papnea	Ventilator		cmH2O
60	Pause	Ventilator		s
61	Tpause	Ventilator		%
62	Trise	Ventilator		s
63	Rise Time%	Ventilator		%
64	Phigh	Ventilator		cmH2O
65	Plow	Ventilator		cmH2O
66	Thigh	Ventilator		s
67	Tlow	Ventilator		s
68	Exp%	Ventilator		%
69	Pmax	Ventilator		cmH2O
70	PC above PEEP	Ventilator		cmH2O
71	PS above PEEP	Ventilator		cmH2O
72	PEEP/CPAP	Ventilator		cmH2O

73	Paux Peak	Ventilator		cmH2O
74	Paux Mean	Ventilator		cmH2O
75	Paux Min	Ventilator		cmH2O
76	Base Press	Ventilator		cmH2O
77	Ri	Ventilator		cmH2O/L/s
78	Re	Ventilator		cmH2O/L/s
79	RCexp	Ventilator		s
80	RCinsp	Ventilator		s
81	PTP	Ventilator		cmH2O.s
82	Pmin	Ventilator		cmH2O
83	Vtrap	Ventilator		ml
84	PO2	Ventilator		kPa
85	Pair	Ventilator		kPa
86	O2 cyl.	Ventilator		kPa
87	O2 cyl.2nd	Ventilator		kPa
88	Air cyl.	Ventilator		kPa
89	FRC	Ventilator		ml
90	T	Ventilator		° C
91	NIF	Ventilator		cmH2O
92	P0.1	Ventilator		cmH2O
93	PEEPi	Ventilator		cmH2O

94	PEEPe	Ventilator		cmH2O
95	PEEPtot	Ventilator		cmH2O
96	EtCO2	Ventilator		%
97	EtCO2	Ventilator		mmHg
98	FiCO2	Ventilator		%
99	FiCO2	Ventilator		mmHg
100	RRCO2	Ventilator		bpm
101	Flow	Ventilator		L/min
102	Peak Flow	Ventilator		L/min
103	Ext. Flow	Ventilator		L/min
104	Tapnea	Ventilator		s
105	IBW	Ventilator		kg
106	Ti max	Ventilator		s
107	Tip	Ventilator		s
108	TRC	Ventilator		
109	ASB ramp	Ventilator		s
110	Ramp	Ventilator		ms
111	PASB	Ventilator		cmH2O
112	FlowAssist	Ventilator		mbar.s/L
113	Vol. Assist	Ventilator		mbar.s/L
114	Tdisconnect	Ventilator		s

115	FlowAcc	Ventilator		mbar/s
116	%MinVol	Ventilator		%
117	Vds	Ventilator		ml
118	EE	Ventilator		kcal/day
119	RQ	Ventilator		
120	VO2	Ventilator		ml/min
121	VCO2	Ventilator		ml/min
122	VO2/m2	Ventilator		ml/min/m2
123	VCO2/m2	Ventilator		ml/min/m2
124	VO2/kg	Ventilator		mL/min/kg
125	VCO2/kg	Ventilator		mL/min/kg
126	ATC	Ventilator		%
127	Tube ID	Ventilator		mm
128	PR	Ventilator		bpm
129	SpO2	Ventilator		%
130	O2%	Ventilator		%
131	MV	Ventilator		L/min
132	Tpause	Ventilator		s
133	Tpeep	Ventilator		s
134	VTCO2	Ventilator		ml
135	F-Trigger	Ventilator		

136	Ti/Ttot	Ventilator		

B.2 Parameter Attribute Part

ID	Sub ID	Text	Description	Value Range
2002	Parameter ID	Alarm upper limit	<p>Alarm upper limit.</p> <p>Uses Sub ID to specify parameter ID.</p> <p>Example: OBX NM 2002^Alarm Limit High 103 100 F</p> <p>In which, 103(Sub ID) is the ID of parameter ST1. Refer to <i>Appendix B.1</i>.</p> <p>Indication: The ST1 alarm upper limit is 100.</p>	/
2003	Parameter ID	Alarm lower limit	<p>Alarm low limit.</p> <p>Uses Sub ID to specify parameter ID.</p> <p>Example: OBX NM 2003^Alarm Limit Low 103 40 F</p> <p>In which, 103(Sub ID) is the ID of parameter ST1. Refer to <i>Appendix B.1</i>.</p> <p>Indication: The ST1 alarm lower limit is 40.</p>	/
2009	Parameter ID	Alarm Level	<p>Alarm level.</p> <p>Uses Sub ID to specify parameter ID.</p> <p>Example: OBX CE 2009^Alarm Level 101 3^Low F</p> <p>In which, 101 (Sub ID) is the ID of parameter HR. Refer to <i>Appendix B.1</i>.</p> <p>Indication: The alarm level of HR is "Low".</p>	0:Unknown 1:High 2:Middle 3:Low

2023	/	Module Load	<p>Module Load Event</p> <p>Example:</p> <p>OBX CE 2023^ModuleLoad 2102^RESP F</p> <p>Indication: RESP module is loaded.</p>	<p>Module ID</p> <p>Refer to</p> <p><i>Appendix B.3</i></p>
2024	/	Module UnLoad	<p>Module UnLoad Event</p> <p>Example:</p> <p>OBX CE 2024^ModuleUnLoad 2102^RESP F</p> <p>Indication: RESP module is unloaded.</p>	<p>Module ID</p> <p>Refer to</p> <p><i>Appendix B.3</i></p>
2025	Module ID	Module Load & Unload Parameter List	<p>Parameter list in case of module loaded & unloaded.</p> <p>Example: When the ECG module is loaded, the loaded parameters are:</p> <p>OBX CE 2025^ 2101 101^HR F</p> <p>OBX CE 2025^ 2101 102^PVCs F</p> <p>OBX CE 2025^ 2101 105^ST-I F</p> <p>OBX CE 2025^ 2101 106^ST-II F</p> <p>OBX CE 2025^ 2101 107^ST-III F</p> <p>.....</p>	<p>Parameter ID</p> <p>Refer to</p> <p><i>Appendix B.1</i></p>

B.3 Module ID Part

Note

-
- The module names below are for reference only. The actual ones are subject to what the server side sends.
-

ID	Text	Description
2101	ECG	ECG Module ID
2102	RESP	RESP Module ID
2103	SPO2	SPO2 Module ID
2104	TEMP	TEMP Module ID
2105	NIBP	NIBP Module ID
2106	AG	AG Module ID
2107	Vent	Ventilator Module ID(anaesthesia monitoring module)
2108	CO	CO Module ID
2109	CO2	CO2 Module ID
2110	IBP12	IBP12 Module ID
2111	IBP34	IBP34 Module ID

2112	BIS	BIS Module ID
2113	RM	RM Module ID
2114	ICG	ICG Module ID
2115	PR	PR Module ID
2116	ART	IBP ART Module ID
2117	PA	IBP PA Module ID
2118	CVP	IBP CVP Module ID
2119	RAP	IBP RAP Module ID
2120	LAP	IBP LAP Module ID
2121	ICP	IBP ICP Module ID
2122	IBP P1	IBP P1 Module ID
2123	IBP P2	IBP P2 Module ID
2124	IBP P3	IBP P3 Module ID
2125	IBP P4	IBP P4 Module ID
2126	IBP P5	IBP P5 Module ID
2127	IBP P6	IBP P6 Module ID
2128	IBP P7	IBP P7 Module ID
2129	IBP P8	IBP P8 Module ID
2130	Ao	IBP Ao Module ID
2131	UAP	IBP UAP Module ID
2132	BAP	IBP BAP Module ID

2133	FAP	IBP FAP Module ID
2134	UVP	IBP UVP Module ID
2135	IBP AUX1	IBP AUX1 Module ID
2136	IBP AUX2	IBP AUX2 Module ID
2137	IBP AUX3	IBP AUX3 Module ID
2138	IBP AUX4	IBP AUX4 Module ID
2139	IBP AUX5	IBP AUX5 Module ID
2140	IBP AUX6	IBP AUX6 Module ID
2141	IBP AUX7	IBP AUX7 Module ID
2142	IBP AUX8	IBP AUX8 Module ID
2143	LVP	IBP LVP Module ID
2144	CCO	CCO Module ID
2145	SvO2	SvO2 Module ID
2146	pART	PICCO ART Module ID
2147	pCVP	PICCO CVP Module ID
2148	Anesthesia	Anesthesia Module ID
2149	Ventilator	Ventilator Module ID
2150	SPO2B	Single SPO2 Module ID
2151	TCGas	TCGas Module ID
2153	EEG1	EEG Channel 1 Module ID
2154	EEG2	EEG Channel 2 Module ID

2155	EEG3	EEG Channel 3 Module ID
2156	EEG4	EEG Channel 4 Module ID
2157	NMT	NMT Module ID

B.4 Patient and Monitor Information Part

Note

- The Text to which ID corresponds is below is for reference only. The actual ones are subject to what the server side sends.

ID	Text	Sub ID	Description	Value Range	Data Type
2301	Patient Medical ID	/	Patient medical number. OBX ST 2301^ Mindray23445 F Indication: Patient medical number is "Mindray23445".	< 64 bytes	ST
2302	Blood	/	Blood type. OBX CE 2302^Blood type 1^A F Indication: Blood type is "A".	0:Unknown 1:A 2:B 3:AB 4:O 5:NA	CE
2303	Pace Switch	/	Pace switch. OBX CE 2303^Pace 1^On F	0:Off 1:On 2:Unkown	CE

2304	MonitorName	/	Monitor name. OBX ST 2304 ^ MonitorName ICUMon1 F	< 32 bytes	ST
2305	Standby	/	Stand by state. OBX CE 2405 ^ Standby 1 ^ Standby F	0:No 1:Standby	CE
2211	IP Seq	/	Telemetry transmitter serial number OBX NM 2211 ^ 0 ^ F	0~255	NM
4523	/	/	Name of the CMS or PDS Gateway OBX ST 4523 ^ cms_name F	< 64 bytes	ST

B.5 Control and Setting Part

Note

- The Text to which ID corresponds is below is for reference only. The actual ones are subject to what the server side sends.

ID	Text	Sub ID	Description	Value Range	Data Type
2306	HighestAlmLevel	/	The highest alarm level of the patient monitor currently. OBX CE 2306^HighestAlmLevel 2^MiddleLevel F	0: unknown 1: High Level 2: Middle Level 3: Low Level 4: None	CE
2307	HighestAlmType	/	The type of highest alarm level of the patient monitor currently. OBX CE 2307^HighestAlmType 1^Phys F	0: None 1: physiological alarms (Phys) 2: Technical alarms (Tech) Notes: If there are physiological	CE

				alarms and technical alarms currently with the same alarm level, this filed is value of "Phys".	
2209	Tell_Call	/	If the bedside device is telemetry, this segment describes whether there is a Event or Nurse Call.	0: None 1: NurseCall 2: User Event 3: Event and Nurse Call 4: Stop Nurse Call 5: Stop User Event	CE
2032	AlarmSetting	/	Whether alarms of the equipment are in one of these statuses: alarm off, alarm pause, audio alarm off, alarm silence, or none of above statuses (i.e. in normal alarming status) OBX CE 2032^AlarmSetting 0^AlmNormal F	0: AlmNormal 1: AlmSilence 2: AlmSoundOFF 3、AlmPause 4、AlmOFF	CE
2404	Lead_Type	/	ECG lead type OBX CE 2404^Leed_Type 3^Lead_12 F	0: Unknown 1: 3 Lead 2: 5 Lead 3: 12 Lead	CE
3902	PR Source	/	The Source of PR parameter. OBX CE 3902^PR_Source 2^IBP F	0: Unknown 1: SPO2 2: IBP	CE

2415	HR_PR Alarm Source	/	Alarm source of the HR and PR parameter. OBX CE 2415^HR_PR_Alm_Src 3^HR(Auto) F	0: Unknown 1: HR (Manual) 2: PR (Manual) 3: HR (Auto) 4: PR (Auto)	CE
2394	Connect_State	/	The bedside monitor is disconnected or power off. OBX CE 2394^Connect_State 1^Disconnected F	1: Disconnected	CE
4520	/	/	Used for bed list information to specify the number of beds. OBX NM 4520^ 2 F	0 to 255	NM
4521	/	/	Used for bed list information to specify the start/end control flag of a bed list. OBX CE 4521^ 1^ F	“1” indicates start. and “2” for end.	CE
2213	RR Source	/	The Source of RR parameter. OBX CE 2213^RR_Source 2^CO2 F	0: Unknown 1: CO2 2: CO2 (GAS) 3: RM 4:ECG	CE

B.6 Physiological Alarm ID Part

Note

-
- The Text to which ID corresponds is below is for reference only. The actual ones are subject to what the server side sends.
-

ID	Text
10000	Unknown Phys. Alarm
10001	HR Too High
10002	HR Too Low
10003	ST1 Too High
10004	ST1 Too Low
10005	ST2 Too High
10006	ST2 Too Low
10007	ST-I Too High
10008	ST-I Too Low
10009	ST-II Too High
10010	ST-II Too Low
10011	ST-III Too High
10012	ST-III Too Low
10013	ST-aVR Too High
10014	ST-aVR Too Low
10015	ST-aVL Too High

10016	ST-aVL Too Low
10017	ST-aVF Too High
10018	ST-aVF Too Low
10019	ST-V1 Too High
10020	ST-V1 Too Low
10021	ST-V2 Too High
10022	ST-V2 Too Low
10023	ST-V3 Too High
10024	ST-V3 Too Low
10025	ST-V4 Too High
10026	ST-V4 Too Low
10027	ST-V5 Too High
10028	ST-V5 Too Low
10029	ST-V6 Too High
10030	ST-V6 Too Low
10031	PVCs Too High
10032	PVCs Too Low
10033	SpO2 Too High
10034	SpO2 Too Low
10035	PR Too High
10036	PR Too Low
10037	NIBP-Sys Too High
10038	NIBP-Sys Too Low
10039	NIBP-Mean Too High
10040	NIBP-Mean Too Low

10041	NIBP-Dia Too High
10042	NIBP-Dia Too Low
10043	RR Too High
10044	RR Too Low
10045	IBP1-Sys Too High
10046	IBP1-Sys Too Low
10047	IBP1-Mean Too High
10048	IBP1-Mean Too Low
10049	IBP1-Dia Too High
10050	IBP1-Dia Too Low
10051	IBP2-Sys Too High
10052	IBP2-Sys Too Low
10053	IBP2-Mean Too High
10054	IBP2-Mean Too Low
10055	IBP2-Dia Too High
10056	IBP2-Dia Too Low
10057	IBP3-Sys Too High
10058	IBP3-Sys Too Low
10059	IBP3-Mean Too High
10060	IBP3-Mean Too Low
10061	IBP3-Dia Too High
10062	IBP3-Dia Too Low
10063	IBP4-Sys Too High
10064	IBP4-Sys Too Low
10065	IBP4-Mean Too High

10066	IBP4-Mean Too Low
10067	IBP4-Dia Too High
10068	IBP4-Dia Too Low
10069	FiCO2 Too High
10070	FiCO2 Too Low
10071	EtCO2 Too High
10072	EtCO2 Too Low
10073	awRR Too High
10074	awRR Too Low
10075	T1 Too High
10076	T1 Too Low
10077	T2 Too High
10078	T2 Too Low
10079	Td Too High
10080	Td Too Low
10081	TB Too High
10082	TB Too Low
10083	EtCO2 Too High
10084	EtCO2 Too Low
10085	FiCO2 Too High
10086	FiCO2 Too Low
10087	EtO2 Too High
10088	EtO2 Too Low
10089	FiO2 Too High
10090	FiO2 Too Low

10091	EtN2O Too High
10092	EtN2O Too Low
10093	FiN2O Too High
10094	FiN2O Too Low
10095	EtAA Too High
10096	EtAA Too Low
10097	FiAA Too High
10098	FiAA Too Low
10099	EtHAL Too High
10100	EtHAL Too Low
10101	FiHAL Too High
10102	FiHAL Too Low
10103	EtENF Too High
10104	EtENF Too Low
10105	FiENF Too High
10106	FiENF Too Low
10107	EtISO Too High
10108	EtISO Too Low
10109	FiISO Too High
10110	FiISO Too Low
10111	EtSEV Too High
10112	EtSEV Too Low
10113	FiSEV Too High
10114	FiSEV Too Low
10115	EtDES Too High

10116	EtDES Too Low
10117	FiDES Too High
10118	FiDES Too Low
10119	AgAwRR Too High
10120	AgAwRR Too Low
10121	GAS Apnea
10122	ECG LOST
10123	No Pulse
10124	Apnea
10125	RESP Artifact
10126	CO2 Apnea
10127	Asystole
10128	Vfib/Vtac
10129	R ON T
10130	VT > 2
10131	Couplet
10132	PVC
10133	Bigeminy
10134	Trigeminy
10135	Tachy
10136	Brady
10137	PNC
10138	PNP
10139	Missed Beats
10140	SpO2 Desat

10141	FiO2 Too High
10142	FiO2 Too Low
10143	VTe Too High
10144	VTe Too Low
10145	MV Too High
10146	MV Too Low
10154	RMRR Too High
10155	RMRR Too Low
10156	PEEP Too High
10157	PEEP Too Low
10158	PIP Too High
10159	PIP Too Low
10160	MVe Too High
10161	MVe Too Low
10162	RM Apnea
10163	BIS Too High
10164	BIS Too Low
10165	C.I. Too High
10166	C.I. Too Low
10167	TFC Too High
10168	TFC Too Low
10169	PR Too High
10170	PR Too Low
10171	ART-Sys Too High
10172	ART-Sys Too Low

10173	ART-Mean Too High
10174	ART-Mean Too Low
10175	ART-Dia Too High
10176	ART-Dia Too Low
10177	PA-Sys Too High
10178	PA-Sys Too Low
10179	PA-Mean Too High
10180	PA-Mean Too Low
10181	PA-Dia Too High
10182	PA-Dia Too Low
10183	Ao-Sys Too High
10184	Ao-Sys Too Low
10185	Ao-Mean Too High
10186	Ao-Mean Too Low
10187	Ao-Dia Too High
10188	Ao-Dia Too Low
10189	UAP-Sys Too High
10190	UAP-Sys Too Low
10191	UAP-Mean Too High
10192	UAP-Mean Too Low
10193	UAP-Dia Too High
10194	UAP-Dia Too Low
10195	BAP-Sys Too High
10196	BAP-Sys Too Low
10197	BAP-Mean Too High

10198	BAP-Mean Too Low
10199	BAP-Dia Too High
10200	BAP-Dia Too Low
10201	FAP-Sys Too High
10202	FAP-Sys Too Low
10203	FAP-Mean Too High
10204	FAP-Mean Too Low
10205	FAP-Dia Too High
10206	FAP-Dia Too Low
10207	P1-Sys Too High
10208	P1-Sys Too Low
10209	P1-Mean Too High
10210	P1-Mean Too Low
10211	P1-Dia Too High
10212	P1-Dia Too Low
10213	P2-Sys Too High
10214	P2-Sys Too Low
10215	P2-Mean Too High
10216	P2-Mean Too Low
10217	P2-Dia Too High
10218	P2-Dia Too Low
10219	P3-Sys Too High
10220	P3-Sys Too Low
10221	P3-Mean Too High
10222	P3-Mean Too Low

10223	P3-Dia Too High
10224	P3-Dia Too Low
10225	P4-Sys Too High
10226	P4-Sys Too Low
10227	P4-Mean Too High
10228	P4-Mean Too Low
10229	P4-Dia Too High
10230	P4-Dia Too Low
10231	P5-Sys Too High
10232	P5-Sys Too Low
10233	P5-Mean Too High
10234	P5-Mean Too Low
10235	P5-Dia Too High
10236	P5-Dia Too Low
10237	P6-Sys Too High
10238	P6-Sys Too Low
10239	P6-Mean Too High
10240	P6-Mean Too Low
10241	P6-Dia Too High
10242	P6-Dia Too Low
10243	P7-Sys Too High
10244	P7-Sys Too Low
10245	P7-Mean Too High
10246	P7-Mean Too Low
10247	P7-Dia Too High

10248	P7-Dia Too Low
10249	P8-Sys Too High
10250	P8-Sys Too Low
10251	P8-Mean Too High
10252	P8-Mean Too Low
10253	P8-Dia Too High
10254	P8-Dia Too Low
10255	Cust IBP 1-Sys Too High
10256	Cust IBP 1-Sys Too Low
10257	Cust IBP 1-Mean Too High
10258	Cust IBP 1-Mean Too Low
10259	Cust IBP 1-Dia Too High
10260	Cust IBP 1-Dia Too Low
10261	Cust IBP 2-Sys Too High
10262	Cust IBP 2-Sys Too Low
10263	Cust IBP 2-Mean Too High
10264	Cust IBP 2-Mean Too Low
10265	Cust IBP 2-Dia Too High
10266	Cust IBP 2-Dia Too Low
10267	Cust IBP 3-Sys Too High
10268	Cust IBP 3-Sys Too Low
10269	Cust IBP 3-Mean Too High
10270	Cust IBP 3-Mean Too Low
10271	Cust IBP 3-Dia Too High
10272	Cust IBP 3-Dia Too Low

10273	Cust IBP 4-Sys Too High
10274	Cust IBP 4-Sys Too Low
10275	Cust IBP 4-Mean Too High
10276	Cust IBP 4-Mean Too Low
10277	Cust IBP 4-Dia Too High
10278	Cust IBP 4-Dia Too Low
10279	Cust IBP 5-Sys Too High
10280	Cust IBP 5-Sys Too Low
10281	Cust IBP 5-Mean Too High
10282	Cust IBP 5-Mean Too Low
10283	Cust IBP 5-Dia Too High
10284	Cust IBP 5-Dia Too Low
10285	Cust IBP 6-Sys Too High
10286	Cust IBP 6-Sys Too Low
10287	Cust IBP 6-Mean Too High
10288	Cust IBP 6-Mean Too Low
10289	Cust IBP 6-Dia Too High
10290	Cust IBP 6-Dia Too Low
10291	Cust IBP 7-Sys Too High
10292	Cust IBP 7-Sys Too Low
10293	Cust IBP 7-Mean Too High
10294	Cust IBP 7-Mean Too Low
10295	Cust IBP 7-Dia Too High
10296	Cust IBP 7-Dia Too Low
10297	Cust IBP 8-Sys Too High

10298	Cust IBP 8-Sys Too Low
10299	Cust IBP 8-Mean Too High
10300	Cust IBP 8-Mean Too Low
10301	Cust IBP 8-Dia Too High
10302	Cust IBP 8-Dia Too Low
10303	CVP-Mean Too High
10304	CVP-Mean Too Low
10305	RAP-Mean Too High
10306	RAP-Mean Too Low
10307	LAP-Mean Too High
10308	LAP-Mean Too Low
10309	ICP-Mean Too High
10310	ICP-Mean Too Low
10311	UVP-Mean Too High
10312	UVP-Mean Too Low
10314	ST-V Too High
10315	ST-V Too Low
10316	FiO2 Shortage
10317	VTAC
10318	VRT
10319	Multif. PVC
10320	Irr.Rhythm
10321	VFib
10322	Anesthetic Mixture's MAC>3
10333	LV-Mean Too High

10334	LV-Mean Too Low
10345	LV-Sys Too High
10346	LV-Sys Too Low
10357	LV-Dia Too High
10358	LV-Dia Too Low
10359	High Phys.Alarm
10360	Low Phys.Alarm
10361	High Phys.Alarm
10362	Low Phys.Alarm
10363	High Phys.Alarm
10364	Low Phys.Alarm
10365	Anesthetic Mixture
10366	BIS L Too High
10367	BIS L Too Low
10368	BIS R Too High
10369	BIS R Too Low
10370	Vent. Brady
10371	Extreme Tachy
10372	Extreme Brady
10373	Nonsus. Vtac
10374	Pause
10375	AFib
10385	CCO Too High
10386	CCO Too Low
10387	CCI Too High

10388	CCI Too Low
10389	C.O. Too High
10390	C.O. Too Low
10391	C.I. Too High
10392	C.I. Too Low
10393	RVEF Too High
10394	RVEF Too Low
10395	TB Too High
10396	TB Too Low
10397	SVR Too High
10398	SVR Too Low
10399	SVRI Too High
10400	SVRI Too Low
10401	SV Too High
10402	SV Too Low
10403	SVI Too High
10404	SVI Too Low
10405	EDV Too High
10406	EDV Too Low
10407	EDVI Too High
10408	EDVI Too Low
10409	ESV Too High
10410	ESV Too Low
10411	ESVI Too High
10412	ESVI Too Low

10413	CVP Too High
10414	CVP Too Low
10415	MAP Too High
10416	MAP Too Low
10417	HR Too High
10418	HR Too Low
10419	SVV Too High
10420	SVV Too Low
10468	SvO2 Too High
10469	SvO2 Too Low
10470	ScvO2 Too High
10471	ScvO2 Too Low
10472	SaO2 Too High
10473	SaO2 Too Low
10474	VO2 Too High
10475	VO2 Too Low
10476	O2EI Too High
10477	O2EI Too Low
10478	DO2 Too High
10479	DO2 Too Low
10480	SQI Too High
10481	SQI Too Low
10531	pART-Sys Too High
10532	pART-Sys Too Low
10533	pART-Mean Too High

10534	pART-Mean Too Low
10535	pART-Dia Too High
10536	pART-Dia Too Low
10537	pCVP-Sys Too High
10538	pCVP-Sys Too Low
10539	pCVP Too High
10540	pCVP Too Low
10541	pCVP-Dia Too High
10542	pCVP-Dia Too Low
10543	Alarm Pause
10544	Extra Circulation
10545	SPO2b Too High
10546	SPO2b Too Low
10547	Delta SPO2 Too High
10548	SPO2b Below Desat Limit
10549	TCGAS TCPCO2 OVER LINE
10550	TCGAS TCPO2 OVER LINE
10551	TCGAS SPO2 OVER LINE
10552	TCGAS PR OVER LINE
10592	Unknown Phys. Alarm
10593	Unknown Phys. Alarm
10594	Unknown Phys. Alarm
10595	Unknown Phys. Alarm
10596	Unknown Phys. Alarm
10597	Unknown Phys. Alarm

10598	Unknown Phys. Alarm
10599	Unknown Phys. Alarm
10609	PR Too High
10610	PR Too Low
10611	Temp Too High
10612	Temp Too Low
10613	RR Too High
10614	RR Too Low
10624	NMT Block Recovery

B.7 Technical Alarm ID Part

Note

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- The Text to which ID corresponds is below is for reference only. The actual ones are subject to what the server side sends.
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ID	Text
5	ECG Lead Off
6	ECG V Lead Off
7	ECG LL Lead Off

8	ECG LA Lead Off
9	ECG RA Lead Off
10	ECG V Lead Off
11	ECG LL Lead Off
12	ECG LA Lead Off
13	ECG RA Lead Off
14	ECG C Lead Off
15	ECG F Lead Off
16	ECG L Lead Off
17	ECG R Lead Off
18	ST Learning
19	Arrh. Learning
20	ECG Learning
21	ECG Initialization Error
22	ECG Initialization Error (1)
23	ECG Initialization Error (2)
24	ECG Initialization Error (3)
25	ECG Initialization Error (4)
26	ECG Initialization Error (5)
27	ECG Initialization Error (6)
28	ECG Initialization Error (7)
29	ECG Initialization Error (8)
30	ECG CH1 Selftest Error
31	ECG CH2 Selftest Error
32	ECG Communication Stopped

33	ECG Communication Error
34	HR Alarm Limit Error
35	PVCs Alarm Limit Error
36	ST Alarm Limit Error
37	ECG Noisy Signal
38	HR Out of Range
39	PVCs Out of Range
40	ST Out of Range
41	ST1 Out of Range
42	ST2 Out of Range
43	ST3 Out of Range
44	ST4 Out of Range
45	ST5 Out of Range
46	ST6 Out of Range
47	ST7 Out of Range
48	RR Alarm Limit Error
49	RR Out of Range
50	RESP Disturbed
51	ECG1 Signal Saturated
52	ECG2 Signal Saturated
53	Defib. Sync. On
54	ECG3 Signal Saturated
55	ECG1 Overloaded
56	ECG2 Overloaded
205	SpO2 Sensor Off

206	SpO2 Searching for Pulse
207	SpO2 Initialization Error
208	SpO2 Initialization Error (1)
209	SpO2 Initialization Error (2)
210	SpO2 Initialization Error (3)
211	SpO2 Initialization Error (4)
212	SpO2 Initialization Error (5)
213	SpO2 Initialization Error (6)
214	SpO2 Initialization Error (7)
215	SpO2 Initialization Error (8)
216	SpO2 Communication Stopped
217	SpO2 Communication Error
218	SpO2 Alarm Limit Error
219	SpO2 Out of Range
220	PR Alarm Limit Error
221	PR Out of Range
222	SpO2 Weak Pulse
223	SpO2 Weak Signal
224	SpO2 Check Sensor
225	SpO2 Sensor in Motion
226	SpO2 Interference
227	SpO2 Low Perfusion
228	SpO2 Too Much Light
229	SpO2 Unrecognized Sensor
230	SpO2 Board Fault

231	SpO2 Sensor Fault
232	SpO2 No Sensor
233	SpO2 Low Signal
234	SpO2 Incompatible Sensor
235	SpO2 Out of Track
236	SpO2 Pulse Error
237	SpO2 Marginal Perfusion
405	NIBP-Sys Alarm Limit Error
406	NIBP-Mean Alarm Limit Error
407	NIBP-Dia Alarm Limit Error
408	NIBP-Sys Out of Range
409	NIBP-Mean Out of Range
410	NIBP-Dia Out of Range
455	NIBP Initialization Error
456	NIBP Selftest Error
457	NIBP Communication Error
458	NIBP Loose Cuff
459	NIBP Air Leaf
460	NIBP Air Pressure Error
461	NIBP Weak Signal
462	NIBP Out of Range
463	NIBP Excessive Motion
464	NIBP Over Pressure
465	NIBP Signal Saturated
466	NIBP Pneumatic Leak

467	NIBP System Failure
468	NIBP Timed Out
469	NIBP Wrong Cuff Type
470	NIBP Measurement Failed
471	NIBP Reset Error
605	T1 Sensor Off
606	T2 Sensor Off
607	TEMP Board Failure
608	TEMP Initialization Error
609	TEMP Initialization Error (1)
610	TEMP Initialization Error (2)
611	TEMP Initialization Error (3)
612	TEMP Initialization Error (4)
613	TEMP Initialization Error (5)
614	TEMP Initialization Error (6)
615	TEMP Initialization Error (7)
616	TEMP Initialization Error (8)
617	T1 Alarm Limit Error
618	T2 Alarm Limit Error
619	TD Alarm Limit Error
620	T1 Out of Range
621	T2 Out of Range
622	TD Out of Range
623	TEMP Communication Error
624	TEMP Communication Stopped

625	TEMP Selftest Error
626	TEMP Calibration Error
627	TCM Low Battery
628	TCM Battery Depleted
629	TCM Temperature Too High
630	TCM Alert

