

GE Medical Systems *Information*
Technologies HL7 Interface
Reference Manual

Software Version 5D

2006660-030

Revision B

GE Medical Systems *Information Technologies*
HL7 Interface

Reference Manual

Software Version 5D
2006660-030 Revision B



GE Medical Systems
Information Technologies

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Contents

1

Introduction	1-1
Manual Information	1-3
Revision History	1-3
Related Manuals	1-3
Conventions	1-4
Safety Messages	1-4
Definitions	1-5
Manual Purpose	1-5
Manual Content	1-6
Introduction	1-6
GE Medical Systems <i>Information Technologies</i> HL7 Interface	1-6
HL7 Inbound Implementation	1-6
HL7 Outbound Implementation	1-6
HL7 Query Implementation	1-6
GE Medical Systems <i>Information Technologies</i> System Data Fields	1-6
HL7 Data Segment Definitions	1-6
HL7 Implementation FAQs	1-6
Appendix A	1-6
Appendix B	1-7
Appendix C	1-7
Appendix D	1-7
Safety Information	1-8
Responsibility of the Manufacturer	1-8
General	1-8
Service Information	1-9
Service Requirements	1-9
Warranty	1-9
Equipment Identification	1-10

2

GE's HL7 Interface	2-1
HL7 Standard Background	2-3
GE's HL7 Implementation	2-5
Interaction with the GE System	2-6
ADT Interface	2-6
Order Interface	2-6
Result Interface	2-7

Financial Interface	2-7
ADT, Order, and Result Data Storage	2-8
Graphical Result Reporting Messages	2-8

3

HL7 Inbound Implementation 3-1

General Description	3-3
Introduction	3-3
Low Level Communications	3-4
Interface Data Content	3-4
Transactions to the GE HL7 Interface	3-5
GE System Incoming HL7 Message Configuration Options	3-6
General Setup	3-6
General Setup Advanced Message Processing	3-7
HIS Interface Setup	3-8
Function Mapping	3-9
Field Mapping	3-10
ADT Messages	3-13
ADT Message Composition	3-14
ADT Messages A01, A03, A04, A05, A08, A11, A13, A23	3-14
ADT Messages A02, A06, A07, A12	3-14
ADT Messages A18, A34, A35, A36	3-14
ADT Message A17	3-14
ADT Message Examples	3-15
ADT Example, Admit a Patient	3-15
ADT Example, Discharge a Patient	3-15
ADT Example, Merge a Patient	3-15
ADT Example, Merge a Patient Account	3-16
ADT Example, Swap Patients	3-16
Order Messages	3-16
Order Message Composition	3-17
Order Message Examples	3-18
Order Example, New Order 1	3-18
Order Example, New Order 2	3-18
Order Example, Update Order	3-18
Application High Level Acknowledgment Messages	3-19
Acknowledgment Message Composition	3-19
Acknowledgment Message Examples	3-20
Acknowledgment Example, Normal Acknowledgment	3-20
Acknowledgment Example, Error Acknowledgment	3-20
Acknowledgment Example, Reject Acknowledgment	3-20
HL7 Sequence Number Protocol	3-21

4

HL7 Outbound Implementation 4-1

General Description	4-3
Introduction	4-3
Low Level Communications	4-4
Interface Data Content	4-4
Transactions from the GE HL7 Interface	4-5
GE System Outgoing HL7 Message Configuration Options	4-6
Global System Parameters	4-6
Report Setup	4-8
Result Reporting Messages	4-15
Preliminary Test Status Message Composition	4-16
Test Result Message Composition (Preliminary and Final)	4-16
Test Result Message Examples (Preliminary and Final)	4-16
Option 1	4-18
Option 2	4-19
Option 3	4-20
Optional Financial Transaction Messages	4-36
Financial Message Composition	4-37
Application High Level Acknowledgment Messages	4-38
Acknowledgment Message Composition	4-38
HL7 Sequence Number Protocol	4-40
Batch Data Transfer	4-40
Batch Data Transfer Messages	4-40
Batch Message Composition	4-41
Batch Result Message Example	4-41
Batch Financial Message Example	4-42

5

HL7 Query Implementation 5-1

General Description	5-3
Introduction	5-3
Low Level Communications	5-4
Interface Data Content	5-4
GE's HL7 Outbound ADT Query Interface	5-5
GE's System Incoming HL7 Message Configuration Options	5-6
Outbound Query Setup	5-6
ADT Query Message from the GE System	5-7
ADT Query Message Composition	5-7
ADT Query Message Example	5-7
ADT Query Response Message Composition	5-8
ADT Query Response Example	5-8
GE's HL7 Inbound Result Query Interface	5-9

GE's System Incoming HL7 Result Query Message Configuration Options	5-9
Inbound Query Setup	5-10
Result Query Message from the Host System	5-11
Result Query Message Composition	5-11
Result Query Message Example	5-11
Result Query Response Message Composition for Test Results	5-11
Result Query Response Example for Test Results	5-12
Result Query Response Message Composition for Test List	5-13
Result Query Response Example for Test List	5-14

6

GE System Data Fields 6-1

System Data Field Definitions	6-3
ADT Database Fields	6-3
Account Database Fields	6-5
Order Database Fields	6-7

7

HL7 Data Segment Definitions 7-1

Data Segment Definitions	7-3
MSH – Message Header Segment	7-4
MSA – Message Acknowledgment Segment	7-5
PID – Patient Identification Segment	7-6
PV1 – Patient Visit Segment	7-7
EVN – Event Type Segment	7-8
MRG – Merge Patient Information Segment	7-9
ORC – Common Order Segment	7-10
OBR – Observation Request Segment (From Host)	7-11
OBR – Observation Request Segment (To Host)	7-13
OBX – Observation Result Segment	7-15
QRD – Query Definition Segment (from GE system for ADT Query)	7-16
QRF – Query Filter Segment (from GE system for ADT Query)	7-16
QRD – Query Definition Segment (From Host system for Result Query)	7-17
DRF – Query Filter Segment (From Host system for Result Query)	7-18
ADD – Addendum Segment (To Host)	7-18
DSC – Continuation Pointer Segment (To Host)	7-19
FT1 – Financial Transaction Segment	7-19
BHS – Batch Header Segment	7-20
BTS – Batch Trailer Segment	7-20
FHS – File Header Segment	7-21
FTS – File Trailer Segment	7-21
Ethnic Group	7-22
GE System Physician / User Name and ID	7-23
Location Room Bed	7-23
GE System Results Status	7-24
Patient Sex	7-24
Patient Address	7-24

Order Quantity/Timing	7-25
-----------------------------	------

8

HL7 Implementation FAQs 8-1

Frequently Asked Questions	8-3
ADT Fields and Functions	8-3
Orders Fields and Functions	8-5
Result and Financial Messages Fields and Functions	8-7
Communication Protocol Options	8-9

Appendix A – Abbreviations In ManualA-1

Abbreviation List	A-3
-------------------------	-----

Appendix B – ECG Sample ReportsB-1

Appendix C – HL7 Continuation MessagesC-1

HL7 Continuation Messages	C-3
Maximum Segment	C-4
Maximum Segment Length Message Composition	C-4
Maximum Message	C-5
Maximum Message Length Message Composition	C-5
Combined Maximum Segment and Message	C-7
Combined Maximum Message Length and Maximum Segment Length Message Composition	C-7

Appendix D – HL7 Sequence Number ProtocolD-1

Sequence Number Protocol	D-3
Requirements	D-3
Functionality	D-3
Initial Link Startup	D-3
Initiating System Restarts the Link	D-4
Initiating System Restarts Link but Expected Sequence Number is Out of Queue Range	D-5
Server System Rejects the Message for a Sequence Error	D-6

For your notes

1 Introduction

For your notes

Manual Information

Revision History

Each page of the document has the document part number and a revision letter at the bottom of the page. This letter identifies the document's update level. The latest letter of the alphabet corresponds to the most current revision of the document.

The revision history of this document is summarized in the table below.

Table 1. Revision History PN 2006660-030

Revision	Date	Comment
A	7 November 2001	Initial release of document, corresponds with MUSE software version 005D.
B	15 May 2003	Document revised to correspond with MUSE software version 005D.10. HL7 waveform information was added.

Related Manuals

Check these documents if you need additional information on GE Medical Systems *Information Technologies*' interface.

Table 2. Related Manuals

Part Number	Name
408542-018	Functional Description of HIS Interface
2002783-013	MUSE CV Information System Interface Manager Operator's Manual
408542-003	MUSE Cardiology Management System Interface options for Data Transmission Worksheet

Conventions

These are the conventions used in this manual.

Safety Messages

DANGER

DANGER safety messages indicate an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.

WARNING

WARNING safety messages indicate a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.

CAUTION

CAUTION safety messages indicate a potentially hazardous situation which, if not avoided may result in minor or moderate injury.

NOTE: NOTE messages provide additional user information.

Definitions

- Items shown in **Bold** text are keys on the keyboard, text to be entered, or hardware items such as buttons or switches on the equipment.
- Items shown in *Italicized* text are software terms which identify menu items, buttons, or options in various windows.
- To perform an operation which appears with a plus (+) sign between the names of two keys, you press and hold the first key while pressing the second key once. This is called a keystroke combination. For example, “Press Ctrl+Esc” means to press and hold down the Ctrl key while pressing the Esc key.
- When instructions are given for typing a precise text string with one or more spaces, the point where the spacebar must be pressed is indicated as: <Space>. The purpose of the < > brackets is to ensure you press the spacebar when required.
- Enter means to press the “Enter” or “Return” key on the keyboard. Do not type “enter.”

Manual Purpose

GE Medical Systems *Information Technologies*’ systems can be connected to hospital information systems by the Health Level Seven Standard Interface (HL7). This document is intended to be a technical reference to GE customers implementing the HL7 interface. It contains data formats for the transmission of data and describes the requirements for interfacing to the GE system using the HL7 standard. This document does not describe how transactions are processed by the GE system or the clinical impact of using some of the features described here. That information can be found in the Functional Description of HIS Interface document.

This document is not intended to provide instructions for implementing and using the HL7 Standard. Details of the HL7 standard can be found in the Health Level Seven Version 2.2 or later.

NOTE: This document details all options within the GE HL7 interface. Not all of the features and functions described in this manual are included with a standard interface. The purchase of additional modules in conjunction with the GE HL7 Standard Interface may be required to obtain the desired functionality.

Manual Content

This manual is organized into the following chapters and appendices.

Introduction

Describes the manual and chapter contents. Provides general information on safety and service requirements.

GE Medical Systems *Information Technologies*' HL7 Interface

Provides Health Level Seven Standard (HL7) background information and briefly describes GE's implementation of the HL7 standard.

HL7 Inbound Implementation

Describes the HL7 Standard Interface implementation requirements for inbound interfaces to GE's systems. Contains a description of the supported HL7 inbound interface transactions and defines the various message data segments.

HL7 Outbound Implementation

Describes the HL7 Standard Interface implementation requirements for outbound interfaces from GE's systems. Contains a description of the supported HL7 outbound interface transactions and defines the various message data segments. This chapter also contains information on batching outbound transactions.

HL7 Query Implementation

Describes the HL7 Standard Interface implementation requirements for Queries to and from the GE systems. Contains a description of the supported Results Query Inbound interface transactions and defines the various message data segments.

GE Medical Systems *Information Technologies* System Data Fields

Describes the GE System Database Field definitions and requirements.

HL7 Data Segment Definitions

Describes the HL7 Standard Data Segment Definitions for each Field as it corresponds to the GE systems. Contains tables detailing each field in each HL7 Segment as used in the HL7 messages for inbound and outbound interfaces.

HL7 Implementation FAQs

Lists some of the Frequently Asked Questions from customers as they have implemented the GE's HL7 Interface.

Appendix A

Contains abbreviations used in this manual.

Appendix B

Contains sample EKG reports. The reports correspond to the sample HL7 messages found in Chapter 4 of this document.

Appendix C

Provides information regarding GE's implementation of HL7 Continuations, including sample message layouts when the maximum HL7 segment or message lengths are reached.

Appendix D

Provides information regarding GE's implementation of the HL7 Sequence Number Protocol.

Safety Information

Responsibility of the Manufacturer

GE Medical Systems *Information Technologies* is responsible for the effects of safety, reliability, and performance only if:

- Assembly operations, extensions, readjustments, modifications, or repairs are carried out by persons authorized by GE.
- The electrical installation of the relevant room complies with the requirements of the appropriate regulations.
- The equipment is used in accordance with the instructions for use.

General

Please refer to the documentation delivered with your GE system(s) for safety precautions and warnings.

Service Information

Service Requirements

Refer equipment servicing to GE's authorized service personnel only. Any unauthorized attempt to repair equipment under warranty voids that warranty.

It is the user's responsibility to report the need for service to GE or to one of their authorized agents.

Failure on the part of the responsible individual, hospital, or institution using this equipment to implement a satisfactory maintenance schedule may cause undue equipment failure and possible health hazards.

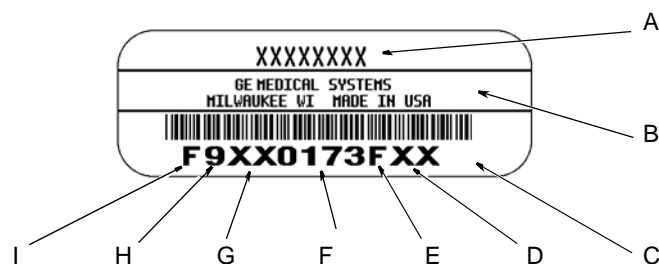
Regular maintenance, irrespective of usage, is essential to ensure that equipment will always be functional when required.

Warranty

Please refer to the documentation delivered with your MUSE CV Information System for your warranty information.

Equipment Identification

Every GE device has a unique serial number for identification. The serial number appears on the product label on the base of each unit.



MD1113-022D

Table 3. Equipment Identifications

Item	Name	Description
A	name of device	Product Name
B	manufacturer	GE Medical Systems <i>Information Technologies</i>
C	serial number	Unique identifier
D	device characteristics	One or two letters that further describe the unit, for example: P = prototype not conforming to marketing specification; R = refurbished equipment; S = special product documented under Specials part numbers; U = upgraded unit.
E	division	F = Cardiology G = Monitoring J = GW Labs
F	product sequence number	Manufacturing number (of total units manufactured)
G	product code	Two-character product descriptor. Refer to documentation that came with the hardware.
H	year manufactured	4 = 1994, 5 = 1995, 6 = 1996, (and so on)
I	month manufactured	A = January, B = February, C = March, D = April, E = May, F = June, G = July, H = August, J = September, K = October, L = November, M = December

2 GE's HL7 Interface

For your notes

HL7 Standard Background

The Health Level Seven Standard (HL7) is used to exchange data between computer systems. It does not require a specific computer operating system, programming language, or communication protocol for its implementation.

The goal of the HL7 Standard is to standardize message content and usage, while allowing user-specific variations within the standard. To accomplish this, the HL7 Standard specifies encoding rules used to create the message format. Based on these rules, the messages generally consist of data fields and data segments.

A message is comprised of multiple segments. While some of the segments are required to create a message, others are optional. Each segment within the HL7 message is separated by special segment separator characters.

Each segment contains a number of data elements. The data elements may be of varying lengths. Like the segments, they are separated from each other by special separator characters. A number of data elements and their separators are logically grouped together to create a data segment such as the Message Header Segment or the Patient Identification Segment. With the exception of the segment separator characters, the data contained in HL7 messages consists of displayable ASCII characters.

Each data segment begins with a three character value, for example "MSH" for the Message Header Segment. These three characters uniquely identify the segment within a given message. Segments are identified as either required or optional, and some may be repeated. Similar to data fields, data segments are separated from each other by segment separator characters.

Based on the HL7 encoding rules, each message within the HL7 protocol has a known structure. The data segments and data fields that comprise a given message are always the same. As a result, an individual data field can be found within a message simply by knowing its configured position in a segment.

HL7 messages are passed between computer systems whenever a valid transaction occurs. For example, admitting a patient on the Hospital Information System (HIS), or receiving a completed test result on the GE system would cause an HL7 message to be generated and sent. After a message is sent, the receiving system processes the message. When processing is complete, the receiving system can process the next message, or it can optionally generate an application level acknowledgment that is returned to the sending system.

Since the HL7 Standard provides flexibility in message content and format, and in communication protocol options, its implementation requires mutual agreement between the sending and receiving computer systems on the following items:

- message formats
- acknowledgment protocol
- communication protocol, and
- data handling.

Communication between Hospital Information Systems personnel and GE interface personnel is therefore essential to determine the customer-specific use of the HL7 Standard.

NOTE: This document is not intended to provide instructions for implementing and using the HL7 Standard. Details of the HL7 standard can be found in the Health Level Seven Version 2.2 or later.

GE's HL7 Implementation

GE's HL7 Interface is designed to meet the goals of the HL7 Standard. It provides the flexibility to easily support user-specific differences in the HL7 message formats, and also supports a variety of communication protocols for the exchange of messages.

The GE HL7 interface supports only the HL7 Standard message types that have an equivalent function on the GE system. Message types which do not have an equivalent function on the GE system are not supported.

The MUSE CV system only supports immediate processing rules for these types of messages. deferred processing is not supported. Batch transactions are supported for Results and Billing messages only. Batch transactions are not supported for ADT and Order messages.

Message restrictions are outlined below:

- ◆ Total ADT/Order message length – 16384 characters
- ◆ Maximum number of segments per message – 150
- ◆ Maximum number of fields per segment – 128
- ◆ Maximum number of components per field – 50

Adding to the flexibility of GE's interface is a table-driven application that maps the user-specific HL7 message content to GE data fields. Once the message content is defined (via the table driven application) and the communication link is functioning, the hospital computer system and the GE computer system can exchange the HL7 messages needed to create, update, and share patient and test information.

NOTE: The implementation of one or more of the interfaces will affect the operations of the respective department(s) and its personnel. Changes will occur that affect how patient information is entered and/or how billing is completed for a test. These changes are necessary in order to achieve the interface's end goal of higher productivity, increased accuracy, and wider availability of computerized data.

Interaction with the GE System

The GE HL7 Interface consists of four standard components: ADT (Admit/Discharge/Transfer), order, result, and financial interfaces. Each component is a purchasable option. The complete interface may include one or any combination of these interfaces; however, an ADT interface is required with an Order interface. We also highly recommend that an order interface be included with every financial interface.

Another option that can be purchased with the GE interface is a batch data transfer application for results or for financial messages.

ADT Interface

The GE HL7 Interface accepts unsolicited messages for ADT transactions from the host system. The messages must include data for only one patient. The GE HL7 Interface can respond with an application level acknowledgment if required by the host system. This acknowledgment indicates that the message was received and processed. Once the messages are processed on the GE system, entries are made in GE's ADT databases and GE system users can then access the data.

Optionally, the GE HL7 Interface can be configured to query the host system for ADT information based on the Patient Identification number (PID) associated with the test. The ADT Query can be configured to occur when the test is first acquired into the GE system or when the test is Edited at the GE system.

NOTE: The GE HL7 interface does not support batch processing of ADT messages.

Order Interface

The GE HL7 Interface receives and processes real time order transaction messages from the host system. Like the ADT messages, each order message must include data for only one patient. Furthermore, the order message must contain an order for only one test. The GE HL7 Interface can respond with an application level acknowledgment if required by the host system. This acknowledgment indicates that the message was received and processed. Once the messages are processed on the GE system, entries are made in GE's order database and GE system users can then access the data.

NOTE: The GE HL7 interface does not support batch processing of order messages. The GE Order interface cannot be configured to query the host system for orders, nor does it create order numbers.

Result Interface

The GE HL7 Interface can deliver result messages to the host system. The messages are sent unsolicited to the host as the data becomes available on the GE system. If necessary the confirmed messages can be regenerated and resent to the host by a user. Unconfirmed messages may be updated through the interface, and therefore may not be regenerated exactly as they were initially acquired into the GE system. The GE HL7 Interface can pause to wait for an application level acknowledgment from the host or it can continuously process and send result messages.

With the addition of the optional batch data transfer application, the interface can be further customized to store individual result messages as generated throughout the day and send a batch result message to the host system at a specified time once each day.

The HIS can use the result messages in either of the following ways:

- To make test results available for access on the hospital computer system.
- To generate charges for completed tests.

Optionally, the GE HL7 Interface can be configured to accept queries from the host system for either a list of tests or for test results based on the Patient Identification number and the test date or date range for a specific test type or all test types.

The GE HL7 interface does not send formatted text and does not support HL7 DSP segments.

Financial Interface

The GE HL7 Interface can be configured to send separate optional financial messages to the host system. The messages are sent unsolicited to the host as the data becomes available on the GE system. If necessary the confirmed messages can be regenerated and resent to the host by a user. Unconfirmed messages may be updated through the interface, and therefore may not be regenerated exactly as they were initially acquired into the GE system. The GE HL7 Interface can pause to wait for an application level acknowledgment or it can continuously process and send financial messages.

With the addition of the optional batch data transfer application, the interface can be further configured to store individual financial messages as generated throughout the day and send a batch financial message to the host system at a specified time once each day.

The HIS can use the financial messages in either of the following ways:

- To generate professional fee charges for completed tests.
- To generate technical fee charges for completed tests.

ADT, Order, and Result Data Storage

The ADT and order data is stored on the GE system in three interface databases: ADT, order, and account. The interface databases are short-term databases which are maintained on the GE system for a configured length of time.

The Test Result data is stored on the GE system, separate from the interface databases. The Test Result data is first acquired into the GE system as unconfirmed data and stored short-term on the Edit List. The confirmed tests are stored long-term in the patient's test database on the GE system.

As a test is acquired into the GE system, information from the interface databases is incorporated into the unconfirmed test data. While the test remains unconfirmed on the Edit list, the interface information may be updated and the test data may be edited. Once the test is confirmed to the patient's test database, the interface information does not change and the confirmed test data is stored long-term on the GE system.

Graphical Result Reporting Messages

The GE HL7 interface supports reporting of waveform data in an HL7 result message. Only 12-lead resting ECGs are supported for generating HL7 messages that include the actual waveform data points.

GE also has incorporated graphical information in the HL7 test results. GE has defined a series of special Z segments to support graphical results. The format of the graphical result data will include Postscript Level 2, Fax Image, and Raw Data formats. The data is encoded in order to send ASCII type data via the HL7 Standard.

3 HL7 Inbound Implementation

For your notes

General Description

Introduction

The HL7 Standard Interface is used to connect a hospital's information system to the GE system for the transfer of data. GE inbound implementation of the HL7 interface protocol incorporates the admit/discharge/transfer (ADT) and order entry functions. The HL7 ADT and order entry interfaces process unsolicited, real-time ADT and order data messages from the host system.

Optionally, HL7 ADT query can be implemented to generate HL7 query messages for admit/discharge/transfer data to the host system as needed. Please refer to the HL7 Query Implementation section of this manual for details on this option. HL7 Order Query is not available.

One or any combination of the ADT or order entry functions may be implemented. The ADT and order entry options do not support a Batch mode.

Low Level Communications

The specific installation will determine which low level communication protocol will be used. The HL7 interface standard is designed to accommodate a wide variety of communication methodologies, from message based communications to file transfer schemes. Because of this flexibility, implementation of the low level communication protocol does not directly affect the HL7 interface message content and functionality. Keep in mind, however, that not all low level communication protocols support high level acknowledgments and/or sequence protocol. Therefore if high level acknowledgments and/or sequence protocol are desired, a low level protocol that supports them must be selected.

The HL7 interface assumes that the low level communication protocol ensures that the data arrives error free. As a result, no data integrity checking is done at the application level. The GE HL7 interface allows only TCP/IP socket communication for receiving inbound HL7 transactions.

Interface Data Content

For HL7 ADT and order messages, the individual HL7 data fields are mapped to the GE system data fields according to the configured position in the HL7 segment structures. Data mapping is accomplished through the GE HL7 Interface Configuration programs.

The configuration programs use data tables to determine how to process incoming HL7 messages. The configuration programs provide the flexibility to match the HL7 fields and functions specified by a customer to the GE data fields.

The following pages provide the general format of the various HL7 data messages recognized by the GE system for inbound interfaces. This document describes only the data fields and segments that are required by the GE system. Fields and segments not listed here will be ignored by the GE system, unless optionally configured with a customized setup. Some customers may incorporate a special "Z segment" in the HL7 message format. The GE system may support the information contained in the Z segment, as determined on a case by case basis. The GE HL7 Interface is capable of parsing information in a special segment as long as the information corresponds to the GE system database information.

For information regarding the interaction of the GE system data with the interface data, please refer to the Functional Description of HIS Interface for details on the GE system functionality.

NOTE: The GE system message processing follows the HL7 "Immediate" processing rules. It does not support "Deferred" processing.

Transactions to the GE HL7 Interface

The HIS sends ADT and/or order messages to the GE HL7 Interface. Once the messages enter the GE system, a task executes that parses the message data and creates or alters entries in GE's patient ADT database, account database, and/or order database. Users on the GE system may then view the information in these databases. An inbound interface may consist of ADT only or ADT and orders.

The HL7 ADT transactions are used to transmit patient demographic and patient visit information from the hospital's ADT system to the GE system. New or updated patient information is entered into the hospital's ADT system and sent to the GE system as an unsolicited transaction. GE system users can then view the patient information received from the HIS. Note that the GE system will not accept batch ADT messages.

The order entry transactions are used to transfer the order information for a scheduled test from a hospital's order entry system to the GE system. All orders originate on the host system and are sent to the GE system as unsolicited transactions. The GE HL7 Interface does not originate orders, create order numbers, query for orders, cancel orders to the HIS, or accept batch order messages. In HL7 terminology, the GE HL7 Interface is considered a "filler" of orders. It receives orders from the hospital's order entry system, allows users to view the order information, and tracks order status as tests are completed on the GE system.

Please refer to the Functional Description of HIS Interface document for details on system processing of the various message types.

GE System Incoming HL7 Message Configuration Options

The GE HL7 Interface maps incoming HL7 ADT and order message segment data fields to the corresponding GE database fields. The mapping is based on known message configurations, and is done through GE's data mapping tables. The flexibility provided by these tables allows the GE HL7 Interface to accommodate differences in HL7 ADT and order message implementation.

Not all HL7 data fields are supported by the GE HL7 Interface. The HL7 segments and data fields supported by the GE HL7 Interface are tabulated in the Data Definitions section of this manual.

The following sections describe GE Medical System's data mapping tables and message configurations for inbound interfaces.

General Setup

General Setup is used to define the global functionality for a given interface. The General Setup parameters apply to all sites on the GE system that are configured to have an inbound interface. The General Setup parameters affect both HL7 message processing and GE system clinical processing. For more details on the GE system clinical processing, please refer to the Functional Description of HIS Interface document.

Following are the parameters defined in General Setup for inbound interfaces affecting HL7 Message processing:

HL7 Site field – This is the field of the Message Header segment (MSH) used to locate the ADT, Account, and Order databases on the GE system. Multiple sites on the GE system equate to multiple ADT, Account and order databases. Typically this is the receiving facility field of the message header segment. If only one site exists on the GE system or only one site is to be interfaced, this field is not required.

Remove Trailing Spaces from HL7 Fields – Used to check and remove trailing spaces from all HL7 fields prior to translating the fields.

Use HL7 Sequence Number Protocol – Used to generate and verify HL7 Sequence Number Protocol as used in the MSH segment.

Zero Values Equals Default – Used to translate zero values sent in numeric fields in the HL7 messages to Null values on the GE system. For example, height or weight field that is filled in with a zero (0) value is converted to a null (default) value on the GE system.

NULL Field Definition – Specifies the characters used to indicate NULL fields in the HL7 messages. The default is two adjacent double quotation marks. See the HL7 specification's discussion of NULL versus no data fields.

Segment Separator Character – Specifies the character used to indicate the end of a segment. The default is the Carriage Return character, 13 decimal. The interface can use an alternate character, but escape characters are not supported. The character used as the segment separator may not be used in the data fields of the message.

HL7 Processing ID: Accept Production (P) Messages, Accept Test (T) Messages, Accept Demonstration (D) Messages – Allows the GE inbound interface to accept any combination of HL7 messages as defined in the MSH segment Processing ID field.

HL7 Version ID – Used to indicate the HL7 version of the incoming messages. Invalid versions will be rejected.

Reject Undefined Transaction/Event Types – This option will return a rejected acknowledgment message to the host system when an unknown HL7 Event is received. The unknown message is also logged in the Interface Reject List. Normally this is not turned on and unknown event types are ignored.

General Setup Advanced Message Processing

Following are the parameters defined in General Setup Advanced Message Processing for inbound interfaces affecting GE system clinical processing:

Update Unconfirmed Tests in MUSE Edit List – This option allows unconfirmed tests in the GE system (held on the Edit List) to be updated with ADT and Order information as it is received from the host system. This option requires special consideration and understanding of the effects to the unconfirmed tests, and should be requested or agreed upon by the GE system users.

Update Master MUSE Patient List – This option allows confirmed tests in the GE system to be updated with ADT and Order information as it is received from the host system. This option requires special consideration and understanding of the effects to the confirmed tests, and should be requested or agreed upon by the GE system users.

Merge IDs in Tests in the MUSE CV Information System Database – This option allows merging of Patient IDs and confirmed tests in the GE system when HL7 merge messages are received from the host system. This option requires special consideration and understanding of the effects to the Patient IDs confirmed tests, and should be requested or agreed upon by the GE system users.

Admit Patients from Updates – Allows patients, who are not currently in the GE databases, to be admitted when a Patient Update transaction is received.

New Orders from Order Update – Allows an order to be created on the GE system when an Order Update message is received for an order that does not exist on the GE system.

Update Patient information from Merge Messages – Allows any patient related fields to be updated in the GE databases when a merge message is received.

Update Patient information from Order Messages – Allows any patient related fields to be updated in the GE databases when an order message is received.

HIS Interface Setup

HIS Interface Setup provides the ability to configure each site on the GE system with an inbound interface. The following parameters are not specific to HL7, but are specific to the functionality of the GE system and its inbound interfaces.

The GE HL7 Interface provides the following functions (please refer to the Functional Description of HIS Interface for details on GE Interface functionality):

MUSE system receives patient account numbers – Optional interface configuration “MUSE system receives patient account numbers” used to match HIS account based system functionality. If this option is turned off, the GE databases use the unique Patient Identification number as the account number.

Patients have multiple accounts – Optional interface configuration “Patients have multiple accounts” is used to match HIS system account functionality. If this option is turned off, the GE databases allow only one account record per patient ADT record.

Allow cancellation of orders with in the Interface Manager – Optional interface configuration; if this option is turned off, orders cannot be cancelled from within the Interface Manager application.

MUSE system receives non-unique order numbers – Optional interface configuration “MUSE system receives non-unique order numbers” is used to match HIS system order entry functionality. If this option is turned off, an order interface is required to provide a unique order number up to 9 characters in length for every order sent to the GE system. If this option is turned on, the order interface is required to provide any order number up to 9 characters in length for every order sent to the GE system.

Merge test reason from HIS – a special configuration for customers implementing orders. If on, the HIS reason for test that accompanies an order will display in the *MUSE test reason* field in the MUSE Editor.

Time of Day to run HIS Database Management – GE system configuration parameter that sets the Time of Day to run the database cleanup task.

Number of Days to retain accounts after Discharge – Used to determine how long used and discarded order records are maintained in the GE databases.

Number of Days to retain Open/Completed orders – Used to determine how long open order records are maintained in the GE databases.

Number of Days to retain if no Discharge is sent (according to patient class) – Used to configure hold times for patient data based on the patient class, as sent in the HL7 message.

Number of Days to retain if no Discharge is sent (without a patient class) – Default time used to determine how long to maintain open account records in the GE databases that are not classified according to patient class.

Function Mapping

Function Mapping provides the ability to change how the GE supported HL7 functions are processed by the inbound HL7 Interface for each site. For example, one customer may want Order Cancellations to delete the order record, while another customer may want the Order Cancellation to mark the order as canceled. Function Mapping allows GE to easily accommodate both situations.

The GE HL7 Interface provides the following functions (please refer to the Functional Description of HIS Interface for details on GE Interface functionality):

Admit Patient – Admits a patient to the GE databases.

Update Patient – Updates an existing patient record in the GE databases.

Discharge Patient – Closes an existing patient account in the GE databases.

Delete Patient – Removes an existing patient from the GE databases.

Cancel Discharge – Resets the closed patient account to open in the GE databases.

Cancel Admit – Removes an existing patient account from the GE databases.

Transfer Patient – Updates the patient's Serving facility, location, room and bed.

Transfer In to Out Patient – Changes the patient class to outpatient as sent in the Transfer message, and updates the admit date/time, Serving facility, location, room and bed. Note that the patient class is based on the patient class sent in the HL7 message.

Transfer Out to In Patient – Changes the patient class to inpatient as sent in the Transfer message, and updates the admit date/time, Serving facility, location, room and bed. Note that the patient class is based on the patient class sent in the HL7 message.

Change Patient ID – Modifies the current patient ID to new patient ID.

Merge Patient Account – Modifies the current patient account to the new patient account.

Merge Patient ID and Account – Modifies the current patient ID and account to the new patient ID and account.

Swap Patients – Exchanges the bed and location information between two different patients.

New Order – Adds an order to the GE databases.

Update Order – Updates order information in the GE databases.

Reset Order Status – Moves an existing order to the Open Status on the GE system.

Cancel Order – Moves an order to the Cancel Status on the GE system.

Delete Order – Removes an order from the GE databases.

Function Mapping also includes the ability to separately Configure HL7 Event Locations for ADT and ORM messages. The Event Location is the HL7 segment and field which holds the HL7 Event type. Only one Event Location is configured for all ADT messages, and only one Event Location is configured for all ORM messages.

Field Mapping

Field Mapping provides access to the HL7 Field and Segment mapping tables. Field Mapping provides the ability to change how the HL7 message segment and field data is matched to the corresponding GE data field for each site. Each HL7 message segment and field must be matched to its corresponding GE data field. The matching may be completed in one of the following ways: without translations, through translation tables, with constant values, or by applying standard functions.

No translation – used when the HL7 message field data directly corresponds to the GE field data. Please refer to the Data Segment Tables at the end of this manual for details on the GE database fields.

Translation Table – -used for one to one mapping of the HL7 field values to the GE field values. Translation tables are needed since the HL7 standard uses different values to represent field entries such as Patient Sex and Race than those that are stored internally on the GE system.

Standard Translation Functions – exist to map values that are received from the HIS system to the GE internal values. Standard functions are needed for entries that are defined by customer specific values on the HIS system and GE specific values on the GE system. The Standard Functions provided with the GE HL7 Interface are:

- *CALCAGE* - calculates the Patient's Age based on the Date of Birth sent in the HL7 message. The HL7 field being mapped must contain a date of birth. The result is stored in the ADT database.
- *CALCORDERTIME* - calculates the Order Requested Time based on the order time sent in the HL7 message. The HL7 field being mapped must contain the order time. The result is stored in the Order database.
- *CALCORDEREXPDATE* - if you do not include an Order Expiration Date in your HL7 message, then this function MUST be used to calculate an Order Expiration Date.

The Order Expiration Date is calculated by adding the number of days to retain an open order (as specified in the MUSE CV system) to

the order time contained in your HL7 message. The result is the Order Expiration Date, the date at which the order will be removed from the system.

To use this function, the HL7 field being mapped must contain the order date. The result is stored in the Order database.

- *LOCATIONMAP* - uses the HIS to GE Location mapping table to convert HIS locations to the corresponding GE MUSE CV system locations. (The GE interface can be configured to display either the HIS locations, or the MUSE CV system location when displaying patient information.)
The location mapping table is configured in *System Setup* on your MUSE CV system.
- *MONLOCKEY* - this function is used only in conjunction with a GE patient monitor ADT Interface. This interface allows the monitor to utilize ADT information from the HIS. Please contact your GE sales representative if you are interested in this application.
- *PADPID* - fills the patient identification number (PID) received from the HIS with zeros, to match the patient identification field length used on the GE system. Patient ID's in the ADT, Account, and Order records are affected. The HL7 field being mapped must contain a patient ID.
- *PADACCTTOPID* - when account numbers are not provided in inbound messages, the GE system uses the patient ID (PID) as the account number. In this situation, the *PADACCTTOPID* function adds zeros to the account number field to ensure it exactly matches the patient ID found in the other records. The HL7 field being mapped must contain a patient ID.
- *PADOLDCHGPID* - fills the patient identification number (PID) received from the HIS with zeros in the *Old Patient ID* field of the *PID/Name Change* record to match the patient identification field length used on the GE system. The HL7 field being mapped must contain a Prior Patient ID in an MRG segment.
- *PADSWAPPATA* - fills the patient identification number (PID) received from the HIS with zeros in the *Patient A ID* field of the *Swap* record to match the patient identification field length used on the GE system. The HL7 field being mapped must contain a patient ID.
- *PADSWAPPATB* - fills the patient identification number (PID) received from the HIS with zeros in the *Patient B ID* field of the *Swap* record to match the patient identification field length used on the GE system. The HL7 field being mapped must contain a patient ID.
- *PATIENTCLASS* - this function must be used to calculate a closure date. The closure date determines when a patient's visit information will be purged from the HIS databases. The *PATIENTCLASS* function calculates the closure date based on either an admit date or a discharge date.

The closure date is calculated as follows.

- ◆ If your HL7 message contains a discharge date, then the discharge date is added to the "number of days to retain a closed account" (as specified in the MUSE CV system). The result is the

closure date.

- ◆ If your HL7 message does not contain a discharge date, then the patient's classification is used to calculate the closure date. In the MUSE CV system setup, each patient classification used in your system is assigned a value which indicates the number of days to retain a patient of that classification after a discharge notice is sent. This value is added to the admit date in your HL7 message to determine the closure date.

To use this function, the HL7 field being mapped must contain either a discharge date or an admit date.

- *TESTTEXTMAP* - use this function if your HL7 inbound order message contains a textual description of the test type. This function maps your description to the appropriate *Test Type* based on the information provided in your *HL7 to GEMS IT Test Type Mapping* window.

If your HL7 message contains both a textual description of the test type as well as a procedure code, you may use either the *TESTTEXTMAP* or *TESTTYPEMAP* function.

- *TESTTYPEMAP* - use this function if your HL7 inbound order message contains a procedure code, rather than a textual description, to identify the test type. This function maps your *HIS Procedure Code* to the appropriate *GEMS IT Test Type* based on the information provided in your *HL7 to GEMS IT Test Type Mapping* window.

If your HL7 message contains both a textual description of the test type as well as a procedure code, you may use either the *TESTTEXTMAP* or *TESTTYPEMAP* function.

Custom Functions – if a custom function has been developed, select the function name from the *Function Name* list box. If no custom functions have been developed, the *Function Name* list box will be empty.

- *MeditechOrderNumber* - this function is used to accommodate Meditech order transactions that are larger than the *GEMS IT Test Type* 9-character limitation. This function reduces the larger number to a smaller order number.
- *AddBedToRoom* - this function will allow or enable the room and bed to be stored in the bed field, as long as the length of the bed field can accommodate the addition of the room field.
- *AssignReqNumber* - this function is used for those customers sending HL7 order transactions that do not contain an order/requisition number. This function creates a unique order number that is stored with the order transaction.

ADT Messages

The following HL7 event types are supported by the GE HL7 Interface for ADT messages:

A01 Admit a Patient – a patient is admitted.

A02 Transfer a Patient – a patient is moved from one location to another.

A03 Discharge a Patient – a patient visit ends.

A04 Register a Patient – a patient is registered, includes emergency room patients and outpatients.

A05 Pre-admit a Patient – a patient is pre-admitted.

A06 Transfer Outpatient to Inpatient – a patient is transferred from outpatient to inpatient.

A07 Transfer Inpatient to Outpatient – a patient is transferred from inpatient to outpatient.

A08 Update Patient Information – patient data has changed, but no other trigger event has occurred.

A11 Cancel Admit – admission is canceled.

A12 Cancel Transfer – a patient transfer is canceled, the new location shows the location of the patient prior to the transfer.

A13 Cancel Discharge – a patient discharge is canceled, the new location shows the location of the patient prior to the discharge.

A17 Swap Patients – used when two patients will exchange beds.

A18 Merge Patient Information – moves all information in the system to a different Patient ID.

A23 Delete a Patient Record – deletes visit specific patient information.

A34-Merge Patient Information – Patient ID only-moves all information in the system to a different Patient ID.

A35-Merge Patient Information – Account number only-changes all prior Account data to new Account number.

A36-Merge Patient Information – Patient ID & Account number-changes all information for prior Patient ID and Account number to new Patient ID and Account number.

All other ADT functions are unsupported and will be discarded by the HL7 interface application. The GE system error logs are updated with an error message when an unsupported ADT function is sent to the interface if configured to “Reject Unknown Event Types”. Please refer to the Functional Description of HIS Interface for details on system processing of the various message types.

NOTE: In order to maximize the performance of the interface the unsupported functions should be “filtered out” so they are not transmitted to the GE HL7 Interface.

ADT Message Composition

The general format for the various ADT messages is given below. Segments enclosed by square brackets, [], are optional. Note that the GE HL7 Interface allows only one Patient Identification Segment per transaction, with the exception of the A17 Swap transaction. A tabulation of all the HL7 segments and data fields as supported by the GE HL7 Interface is included in the Data Definitions section of this manual.

In general, these are the only HL7 ADT message segments supported by the GE HL7 Interface. GE HL7 Interface message configuration may allow the use of additional standard HL7 segments, or special Z segments, for specific data that is supported on the GE system. HL7 segments that do not appear below, or that are not set up in the GE HL7 Interface configuration programs, are ignored by the GE HL7 Interface when received in an HL7 ADT message. The GE HL7 Interface supports fields for Patient Height, Patient Weight, and Admitting Diagnosis which do not directly correlate with fields defined by HL7 ADT messages.

ADT Messages A01, A03, A04, A05, A08, A11, A13, A23

- MSH-Message Header Segment
- EVN-Event Type Segment
- PID-Patient Identification Segment
- [PV1-Patient Visit Segment]

ADT Messages A02, A06, A07, A12

- MSH-Message Header Segment
- EVN-Event Type Segment
- PID-Patient Identification Segment
- PV1-Patient Visit Segment

ADT Messages A18, A34, A35, A36

- MSH-Message Header Segment
- EVN-Event Type Segment
- PID-Patient Identification Segment
- MRG-Merge Information Segment
- [PV1-Patient Visit Segment]

ADT Message A17

- MSH-Message Header Segment

- EVN-Event Type Segment
- PID-Patient 1 Identification Segment (with Sequence number 1, required)
- PV1-Patient 1 Visit Segment (with Sequence number 1, required)
- PID-Patient 2 Identification Segment (with Sequence number 2, required)
- PV1-Patient 2 Visit Segment (with Sequence number 2, required)

ADT Message Examples

Following are examples of ADT transactions: an Admit Patient message, a Discharge Patient message, a Merge Patient message, a Merge a Patient Account message, and a Swap Patients message:

ADT Example, Admit a Patient

```
MSH|^~&^|OUTPAT~ADT|CARDIOLOGY|CIS|19971004170052||ADT~A01|17005|P|2.2||<cr>

EVN|A01|19971004170321||003<cr>

PID|||999999999|9999999|LNAME~FNAME||19421002|M|||XXXX Z AVE
APT XX~MILWAUKEE~WI~53223|||(414)355-5000|||999999955|000000000|<cr>

PV1||O|452~0001~01|||SPY|||199710041702|199710041702|||<cr>
```

ADT Example, Discharge a Patient

```
MSH|^~&^|OUTPAT~ADT|CARDIOLOGY|CIS|19971004170053||ADT~A03|17006|P|2.2||<cr>

EVN|A03|19971004170321||003<cr>

PID|||999999999|9999999|LNAME~FNAME||19421002|M|||XXXX Z AVE
APT XX~MILWAUKEE~WI~53223|||(414)355-5000|||999999955|000000000|<cr>
```

ADT Example, Merge a Patient

```
MSH|^~&^|OUTPAT~ADT|CARDIOLOGY|CIS|19971004170054||ADT~A18|17007|P|2.2||<cr>

EVN|A18|19971004170321||003<cr>

PID|||888888888|8888888|LNAME~FNAME||19421002|M|||XXXX Z AVE
APT XX~MILWAUKEE~WI~53223|||(414)355-5000|||999999955|000000000|<cr>

PV1||O|452~0001~01|||SPY|||199710041702|199710041702|||<cr>

MRG|999999999|<cr>
```

ADT Example, Merge a Patient Account

```
MSH|^~&^|OUTPAT~ADT||CARDIOLOGY|CIS|19971004170055||ADT~A35|17008|P|2.2||<cr>

EVN|A35|19971004170321||003<cr>

PID|||888888888|8888888|LNAME~FNAME||19421002|M|||XXXX Z AVE
APT XX~MILWAUKEE~WI~53223|||(414)355-5000|||999999956|000000000||<cr>

MRG|888888888||999999955||<cr>
```

ADT Example, Swap Patients

```
MSH|^~&^|OUTPAT~ADT||CARDIOLOGY|CIS|19971004170056||ADT~A17|17009|P|2.2||<cr>

EVN|A17|19971004170321||003<cr>

PID|1||888888888|8888888|LNAME1~FNAME1||19421002|M|||YYYY Z
AVE APT YY~MILWAUKEE~WI~53223|||(414)355-5555|||999999956|000000000||<cr>

PV1|1|O|452~0001~01|||SPY|||199710041702|199710041702|||<cr>

PID|2||999999999|0000001|LNAME2~FNAME2||19321012|F|||XXXX Z
AVE APT XX~MILWAUKEE~WI~53223|||(414)355-5000|||445599956|333000000||<cr>

PV1|2|O|452~0001~02|||SPY|||199710041702|199710041702|||<cr>
```

Order Messages

The following HL7 order functions are supported by the GE HL7 Interface:

NW New Order – a new order is placed.

CA Cancel Order Request – an existing order is canceled.

DC Discontinue Order Request – an existing order is discontinued.

XO Change Order Request – an existing order is changed.

All other order functions are unsupported and will be rejected by the HL7 interface application. The GE system error logs are updated with an error message when an unsupported order function is sent in to the interface if configured to “Reject Unknown Event Types”. Please refer to the Functional Description of HIS Interface for details on system processing of the various message types.

NOTE: In order to maximize the performance of the interface the unsupported functions should be “filtered out” so they are not transmitted to the GE HL7 Interface.

Order Message Composition

The general format of an order message is given below. Segments enclosed in square brackets, [], are optional. Note that the GE HL7 Interface allows only one Common Order Segment per message, that is, only one order is allowed per HL7 order message. A tabulation of all the HL7 segments and data fields supported by the GE HL7 Interface is included in the Data Definitions section of this manual.

In general, these are the only HL7 order message segments supported by the GE HL7 Interface. GE HL7 Interface message configuration may allow the use of additional standard HL7 segments, or special Z segments, for specific data that is supported on the GE system. HL7 segments that do not appear below or that are not set up in the GE HL7 Interface configuration program are ignored by the GE HL7 Interface when received in a HL7 order message.

Although the PV1 segment is shown as an optional segment in the HL7 Order message, the GE system supports fields which may store information in the GE databases specifically from the Order messages PV1 segment. The GE HL7 Interface also supports fields for Ordering Comments which do not directly correlate with fields defined by HL7 ADT messages.

- MSH-Message Header Segment
- PID-Patient Identification Segment
- [PV1-Patient Visit Segment]
- ORC-Common Order Segment
- OBR-Observation Request Segment

Order Message Examples

Following are sample order transaction messages for New Orders and Update Order messages:

Order Example, New Order 1

```
MSH|^~\&|R1810901||ECG|MUSE|199711140958||ORM|3669253|P|2.2<cr>
>

PID|||03669253||Olson^John^^Mr.||19310501|M||B|||||M||123456
77|502241839<cr>

PV1||O|^PULM^E18|||||||A0<cr>

ORC|NW|123456789^SPC|||||199711140955|KATK||0047413^SAMPLE^S
AMUEL S.^MAIN^E18<cr>

OBR||123456789^SPC||1005^12 Lead
ECG|||||||059|||||||^^199711141500^^|MAIN^E18<cr>
```

Order Example, New Order 2

```
MSH|^~/&|MEI
MUSE|01|MIS|01|19970110144317||ORM^O01|012278498248366J042|
P|2.2<cr>

PID|||98248366|004094892|FARMER^JOAN^NMN||19350801|F|C|||||M
||56770000|333341839<cr>

PV1||O|0828^PRE^|||00268^CAMPBELL^CAM^C.|||||||4<cr>

ORC|NW|0122784^HOSP|||N|^199701101443^^S||19970110144317|15
8119^E||00268^CAMPBELL^CAM^C.|PRE<cr>

OBR||0122784^HOSP||4180700^STAT PREOP/
OVERREAD^L|||||||594^4180701|PAT|||EC|||^1997011
01443^^S||WALK|89.52^PREOP FOR SURGERY<cr>
```

Order Example, Update Order

```
MSH|^~/&|MEI
MUSE|01|MIS|01|19970110144317||ORM^O01|012278498248366J042|
P|2.2<cr>

PID|||98248366|004094892|FARMER^JOAN^NMN||19350801|F|C|||||M
||64757446|518393443<cr>

PV1||O|0828^PRE^|||00268^CAMPBELL^CAM^C.|||||||4<cr>

ORC|XO|0122784^HOSP|||N|^199701101443^^S||19970110144317|15
8119^E||00268^CAMPBELL^CAM^C.|PRE<cr>

OBR||0122784^HOSP||4180700^ROUT|||||||594^4180701|PAT||
||EC|||^199701101443^^S||WALK|89.52^PREOP FOR
SURGERY<cr>
```

Application High Level Acknowledgment Messages

The GE Inbound HL7 Interface supports application level message acknowledgments formatted as HL7 original mode acknowledgments. This function allows an application to acknowledge that it has received data and has processed it successfully. The acknowledgment message returned to the sending application is used to determine whether to initiate a resend of the transaction, to abort the transaction, or to continue processing with the next transaction.

Implementation of the high level acknowledgment function is configurable. The GE HL7 Interface can either be configured to send or not to send an HL7 Acknowledgment message to the host system after receiving an ADT or Order message.

The GE interface does not support single character or ACK/NACK acknowledgment responses.

Application level acknowledgments are not supported by all communication options. Only conversational type protocols, such as TCP/IP sockets, support high level acknowledgments. File transfer protocol (FTP) communications and file copy or mapped drive connections do not support high level acknowledgments.

Acknowledgment Message Composition

Acknowledgment messages contain the following HL7 interface segments:

- MSH-Message Header Segment
- MSA-Message Acknowledgment Segment

HL7 acknowledgment messages may contain one of three statuses from the receiving system: Application Accept (AA), Application Error (AE), or Application Reject (AR). According to the HL7 specification, AE messages are those that contain an error and are not to be retransmitted. AR messages are those that may be retransmitted based on local agreement between all parties involved in the interface implementation.

The GE Inbound HL7 Interface allows AE, AR, or AA to be configured to be sent for Data Errors and AR or AE to be configured to be sent for MSH validation errors.

When an AE or AR message is generated by the GE HL7 interface, the error is logged in the GE system error log and/or the interface reject log.

The GE HL7 Interface returns the ADT or Order message MSH segment Control ID field as sent by the HIS in the MSA segment of the acknowledgment response.

Acknowledgment Message Examples

Following are samples of the acknowledgment messages: a Normal Acknowledgment, an Error Acknowledgment, and a Reject Acknowledgment message.

Acknowledgment Example, Normal Acknowledgment

```
MSH|^~\&|MEI MUSE|MEI MUSE|HBOC-  
  HQ|5|199710221049||ACK|19971022104924|P|2.2|<cr>  
  
MSA|AA|135145040N158705792<cr>
```

Acknowledgment Example, Error Acknowledgment

```
MSH|^~\^|OUTPAT~ADT||CARDIOLOGY|CIS|19971004170052168||ACK|160  
  1|P|2.2||<cr>  
  
MSA|AE|17005|Error-Invalid HL7 Message<cr>
```

Acknowledgment Example, Reject Acknowledgment

```
MSH|^~\^|OUTPAT~ADT||CARDIOLOGY|CIS|19971004170052168||ACK|160  
  2|P|2.2||<cr>  
  
MSA|AR|17005|Patient ID Missing<cr>
```


HL7 Sequence Number Protocol

The HL7 sequence number protocol forces the client and the server side of an interface to be synchronized. In the event that a message is lost or the acknowledgment is lost, the protocol allows the message to be resent or not to be resent. This eliminates lost and redundant data transfers.

For more information on GE Medical System's implementation of the HL7 Sequence Number Protocol, please refer to Appendix D.

For your notes

4 HL7 Outbound Implementation

For your notes

General Description

Introduction

The HL7 Standard Interface is used to connect a hospital's information system (HIS) to the GE system for the transfer of data. Using the HL7 interface, the GE system can return result and financial messages to the HIS.

GE's outbound implementation of the HL7 interface protocol may provide result and/or financial messages. The HL7 result reporting interface formats the textual test results and transmits them to the host system. The HL7 financial interface formats the textual financial files and transmits them to the host system for charging. Credits cannot be generated with the financial message interface. Result and financial messages may be sent as individual message files or optionally in batch message files.

Another option, HL7 Result Query, can be implemented to accept result query messages from the host. The Result Query responds by transmitting HL7 result messages to the host system. The Result Query can respond with either a list of tests or test results, based on the parameters of the particular query. Please refer to the HL7 Query Implementation section of this manual for details on this option. HL7 Financial Query is not available.

One or any combination of the result, result query, or financial functions may be implemented.

NOTE: A financial interface is only recommended with an established order interface which ensures patient data matches the host computer system data.

Low Level Communications

The specific installation will determine which low level communication protocol will be used. The HL7 interface standard is designed to accommodate a wide variety of communication methodologies, from message based communications to file transfer schemes. Because of this flexibility, implementation of the low level communication protocol does not directly affect the HL7 interface message content and functionality. Keep in mind, however, that not all low level communication protocols support high level acknowledgments and/or sequence protocol. Therefore if high level acknowledgments and/or sequence protocol are desired, a low level protocol that supports them must be selected.

The HL7 interface assumes that the low level communication protocol ensures that the data arrives error free. As a result, no data integrity checking is done at the application level. Examples of possible communication methods are: FTP using TCP/IP, TCP/IP sockets, and shared drives.

Interface Data Content

For HL7 Outbound messages, the test data gathered from the GE system is mapped to the configured data field positions in the HL7 segment structures to create result and/or optional financial messages. Data mapping is accomplished through the GE HL7 Interface Configuration programs.

The configuration programs use data tables to determine how to format outgoing HL7 messages. The configuration programs provide the flexibility to match the HL7 fields and functions specified by a customer to the GE data fields.

The following pages provide the general format of the various HL7 data messages recognized by the GE system for outbound interfaces. This document describes only the data fields and segments that are provided by the GE system. Fields and segments not listed here are not typically sent by the GE system.

For information regarding the interaction of the GE system data with the interface data, please refer to the Functional Description of HIS Interface for details on the GE system functionality.

NOTE: The implementation of one or more of the interfaces will affect the operations of the respective department(s) and its personnel. Changes will occur that affect how patient information is entered and/or how charging is completed for a test. These changes are necessary in order to achieve the interface's end goal of higher productivity, increased accuracy, and wider availability of computerized data.

Transactions from the GE HL7 Interface

The GE system maintains patient tests. Initially, the test results are performed on ancillary GE systems and then acquired into the main GE system for processing. At this stage, the tests are generally Unconfirmed which means the results have not been interpreted or read by a doctor. After the tests are interpreted or read by a doctor, changes are incorporated into the test as needed. The test results are then finalized as a Confirmed test. The final results are stored long term in the GE database. The stored results can be retrieved and/or re-edited as necessary. The results are then considered to be Corrected/Revised.

A report distribution list is used on the GE system to configure the HL7 message format type that is to be sent to the HIS. Each type of test on the GE system has its own report distribution list, which is based on the Preliminary and/or Final result state of the test. Corrected/Revised test results are included in the Final results distribution list. Corrected/Revised financial reports require a privileged user on the GE system to request a second distribution of the financial message. The distribution list includes the message type and the corresponding recipient of the report. For HL7 reports, the message format types may be immediate (ASAP) result, batch result, immediate (ASAP) billing, and/or batch billing. The GE HL7 Interface has three different result message formats that can be used for either immediate (ASAP) or batch messages. There are also three different immediate (ASAP) billing message formats and three different batch billing message formats available as an option on the GE HL7 Interface. For HL7 result and financial messages, the recipient of the file in the distribution list is the communication link to the HIS system. Users on the GE system view the communication link as an HL7 print device.

When the Preliminary (unconfirmed) test result is acquired by the GE system, the distribution list is used to generate the configured messages. For Preliminary results, the GE HL7 Interface can generate Test Status messages and/or Test Result messages to be sent to the HIS system. The Test Status message is generated at the same time the Result message is generated and indicates a test has been performed. Optionally, batch messages may also be generated in the Preliminary test distribution list for Test Results or Test Status. Each batch message format type is sent in its own batch transaction once each day. The Preliminary result messages can be used to update the patient's test data on the HIS system. Use of Financial messages based on Preliminary tests is not recommended.

After the test is Final (confirmed) on the GE system, the distribution list is used to generate the configured messages. For Final results, the GE HL7 Interface can generate Test Status messages, Test Result messages, and/or Financial messages to be sent to the HIS system. The Test Status message is generated at the same time the Result message is generated and indicates the test has been completed. Optionally, batch messages may also be generated in the Final (confirmed) test distribution list for Test Results, Test Status, and/or Financial messages. Each batch messages format type is sent in its own batch transaction once each day. The Final messages can be used to update that patient's data and/or to charge the patient for services on the HIS system.

GE System Outgoing HL7 Message Configuration Options

The GE HL7 Interface maps the GE test result database fields to the outgoing HL7 message segment formats. The mapping is based on known message configurations and is completed with GE's data mapping tables. The flexibility provided by the mapping tables allows the GE HL7 Interface to accommodate differences in HL7 message composition.

Not all HL7 data fields are supported by the GE HL7 Interface. The HL7 segments and data fields as supported by the GE HL7 Interface are tabulated in the Data Definitions section of this manual. The GE HL7 Interface does not support formatted text layouts or DSP segments for Result reporting.

The following sections describe GE's data mapping tables and message configurations.

Global System Parameters

Global System Parameters are used to define the global functionality for the outgoing interface. The following parameters are defined in Global System Parameters:

HL7 Separators – Allows the characters used to define the HL7 field, component, sub-component, repetition, and escape fields in the HL7 message format to be configured per customer specifications. Default separators are |, ^, &, ~, and \ for field, component, sub-component, repetition, and escape.

HL7 NULL Field – Used to enable and disable the use of NULL field processing and to define the characters indicating NULL fields in the HL7 messages. The default NULL field value is two adjacent double quotation marks. See the HL7 specification's discussion of NULL versus no data fields.

Enable Esc Sequencing – Supports the generic HL7 character sequences. This allows the text message to contain characters that are designated separators for HL7 by using the standard HL7 defined sequences.

Coded Element, Time Stamp Check – Used to enable and disable the use of the HL7 time stamp (TS) OBX statement for coded elements. If enabled, the GE time date format is converted to a HL7 TS format in the result message.

Test Type Setup – Allows the following parameters to be uniquely set up for each GE system test type (EKG, Stress, Holter, etc.): send textual results in preliminary results OBX segments, configure the code to be used in all coded element diagnosis statements that are flagged as TX (text), and configure the code to be used in coded element diagnosis statements that are flagged as TS (time stamp).

Miscellaneous Setup – Miscellaneous Setup provides global definitions for formatting the HL7 message and for other special characters used in the messages.

- ◆ **Segment Separator Character** – Used to indicate the end of a HL7 segment (default is the Carriage Return character, 13 decimal).
- ◆ **Maximum Diagnosis Line Length** – Used to set the maximum diagnosis text line length to be sent in separate fields of a single OBX segment. When the maximum length is exceeded, the Single OBX Line Terminator is inserted between the diagnosis text of the single OBX segment.
- ◆ **Single OBX Line Terminator** – Allows configuration of the text used to separate lines of diagnosis text that are sent in one OBX statement. The default setup uses “~end~”. Used with the Maximum Diagnosis Line Length.
- ◆ **Maximum Segment Length** – Sets the maximum segment length for the HL7 message in 1K (1024) byte increments. If the Maximum Segment Length is exceeded, the segment is broken up with HL7 continuation segments. Refer to the Appendix C on Continuation messages for details. The Maximum Segment Length is turned off by default (set to zero).
- ◆ **Maximum Message Length** – Sets the maximum message length for the HL7 message in 1K (1024) byte increments. If the Maximum Message Length is exceeded, the message is broken up with HL7 continuation messages. Refer to the Appendix C on Continuation messages for details. The Maximum Message Length is turned off by default (set to zero).
- ◆ **Cath Measurement Separator** – Allows configuration of the separator used between elements of Cath hemodynamic measurement data sent in one OBX statement.
- ◆ **Send Deleted Reports** – Provides the option to route reports that are being deleted from the GE system to the HIS according to the distribution list for the deleted test.

Billing Information – This information is used to designate the billing purposes of the HIS interface on the GE system. The following options are available: No Billing, Bill off Results, and Bill off Billing. The Bill off Results, and Bill off Billing settings are used to set billing flags that allow the GE system to query the user about possible re-sending a financial message, that was already sent. Bill off Results is used when the HIS system uses Result messages to generate charges. Bill off Billing is used when a Billing interface is added to the GE HL7 interface to send financial transaction messages to the HIS system.

Report Setup

Report Setup provides the ability to create different HL7 outgoing message formats. Three different HL7 result report formats can be setup for each of the GE system data types. The three formats may be used for individual result reports or for batch result reports. Six different HL7 Financial report formats are available for outgoing message setup, three for individual financial messages and three for batch financial messages.

Within the Report Setup, each HL7 segment and field is individually configured according to the customer specifications. The Report Setup allows the HL7 Segment, Field, Component, Sub-Component, and Repetition value to be defined in placing each piece of data into the HL7 message. This flexibility allows the outbound messages to be formatted according to the HL7 specification or according to specific customer requirements. Each field can then be configured with the required data included as one of the following options:

HL7 Waveform – This format is intended to send the data points that make up the waveform of each of the ECG leads. This format leaves it up to the hospital information system to use the data points to draw the waveform image. This format reports resting ECG lead data using a set of three OBX segments for each lead of median or rhythm data. Each set includes channel, timing, and waveform data for each lead.

NOTE: HL7 waveforms are only available for 12-lead resting ECGs. Other data types cannot be reported using HL7 waveforms.

Waveform Images – This format sends the waveform images encoded in one of the following image formats to the hospital information system. With this format the hospital information system does not have to redraw the waveform. The image file information is imbedded in a special HL7 Z segment. To conform to ASCII coding, the waveform image is encrypted and UUENCODED. The supported image types are Postscript, Fax Image, JPEG, PCL-5, PDF, TIFF, TIFF FAX, Windows 16-bit Metafile, Windows 16-bit Metafile (Aldus), Windows 32-bit Metafile, and Windows bitmap.

Constant – set up when a data field in the HL7 message will always maintain a constant value.

Current Date and Time – places the current date and time in HL7 Date/Time format in the data field of the HL7 message.

Standard Functions – used to translate a GE system value to a HIS system value for data such as a test type or to extract and present GE system data for use in the HL7 message. The Standard Functions provided with the GE HL7 Interface are:

- ◆ **HISBILLINGCODE** – For systems with Orders, this function maps the Test Text stored with the Test to the corresponding HIS Billing code. The Mapping Table is setup on the GE system for each Test Type that will be ordered. The Test Text is send in the Order message from the HIS system and is stored in the Test. More than one Test Text description can be used for the same Test Type on a system with Orders. For example, an ECG test can be ordered and therefore charged differently as an ECG STAT ER or as an ECG CLINIC. For system without Orders, this function maps the GE Test Type stored with the test to the corresponding HIS Billing code as setup in the Mapping Table on the GE system. The Test Type stored in the Test is a GE specific field and can only be configured to map to one HIS Billing code.
- ◆ **HISBILLINGCODEFROMMEITYPE** – For systems without an Orders interface, this function retrieves the HIS Procedure Code from the MUSE-to-HIS Test Type mapping table by mapping the MUSE Test Type to the HIS Procedure Code.
- ◆ **HISTESTNAME** – For systems without an Interface Manager, this function retrieves the HIS Procedure Description from the MUSE to HIS Test Type mapping table by mapping the MUSE Test Type to the HIS Procedure Description.
- ◆ **HL7ACQDATETIME** – Converts the Test's Acquisition Date and Time (the time the test was performed) as stored on the GE system to the HL7 Date Time format (Time includes seconds).
- ◆ **HL7ACQDATE** – Converts the date the test was performed (the acquisition date) to the HL7 Date format.
- ◆ **HL7ACQTIME** – Converts the time the test was performed (the acquisition time) to the HL7 Time format.
- ◆ **HL7ADMITDATETIME** – Converts the Patient's Admit Date and Time as stored on the GE system to the HL7 Date Time format (Time includes seconds).
- ◆ **HL7ADMITDATE** – Converts the Patient's Admit Date (provided through the inbound message interface) to the HL7 Date format.
- ◆ **HL7ADMITTIME** – Converts the Patient's Admit Time (provided through the inbound message interface) to the HL7 Time format, including seconds.
- ◆ **HL7BIRTHDATE** – Converts the Patient's Birth Date as stored on the GE system to the HL7 Date Time format.

- ◆ **HL7DISCHARGEDATETIME** – Converts the Patient's Discharge Date and Time (provided through the inbound message interface) to the HL7 Date Time format, including seconds.
- ◆ **HL7DISCHARGEDATE** – Converts the Patient's Discharge Date (provided through the inbound message interface) to the HL7 Date format.
- ◆ **HL7DISCHARGETIME** – Converts the Patient's Discharge Time (provided through the inbound message interface) to the HL7 Time format, including seconds.
- ◆ **HL7ECGWAVECHNSENSITIVITY** – Converts the wave channel sensitivity to the HL7 format. This function is only valid for an ECG type test and when the Waveform Interface option is purchased.
- ◆ **HL7ECGWAVEMAXVALUE** – Converts the wave maximum value to the HL7 format. This function is only valid for an ECG type test and when the Waveform Interface option is purchased.
- ◆ **HL7ECGWAVEMINVALUE** – Converts the wave minimum value to the HL7 format. This function is only valid for an ECG type test and when the Waveform Interface option is purchased.
- ◆ **HL7EDITDATETIME** – Converts the Test's Edit Date and Time (the time the test was edited) as stored on the GE system to the HL7 Date Time format (Time includes seconds).
- ◆ **HL7EDITDATE** – Converts the date the test was edited (Edit Date) to the HL7 Date format.
- ◆ **HL7EDITTIME** – Converts the time the test was edited (Edit Time) to the HL7 Time format.
- ◆ **HL7HOLTER (MAXHEARTRATETIMEDATE, MINHEARTRATETIMEDATE)** – Two different functions used to convert the Holter Test Maximum Heart Rate Event Date and Time or the Holter Test Minimum Heart Rate Event Date and Time to the HL7 Date Time format, including seconds.
- ◆ **HL7MSGCONTROLID** – Gives a unique control identifier for each HL7 message
- ◆ **HL7ORDERDATETIME** – Converts the Test's Order Date and Time as stored on the GE system to the HL7 Date Time format. This function is only valid for a test that is associated with an Order on the GE system (Time includes seconds).
- ◆ **HL7ORDERDATE** – Converts the date the test was ordered (the Order Date) to the HL7 Date format. This function is only valid for a test that is associated with an Order on the GE system.

- ◆ **HL7ORDERTIME** – Converts the time the test was ordered (the Order Time) to the HL7 Time format. This function is only valid for a test that is associated with an Order on the GE system.
- ◆ **HOLTLONGVENTRATETIMEDATE** – Converts the Holter test's longest ventricular rate to HL7 Date Time Format.
- ◆ **HOLTFASTVENTRATETIMEDATE** – Converts the Holter test's fastest ventricular rate to HL7 Date Time Format.
- ◆ **HOLTLONGSUPRAVENTRATETIMEDATE** – Converts the Holter test's longest supraventricular rate to HL7 Date Time Format.
- ◆ **HOLTFASTSUPRAVENTRATETIMEDATE** – Converts the Holter test's fastest supraventricular rate to HL7 Date Time Format.
- ◆ **HOLTMAXSTLEVELCH1TIMEDATE** – Converts the Holter test's max ST level for channel 1 to HL7 Date Time Format.
- ◆ **HOLTMINSTLEVELCH1TIMEDATE** – Converts the Holter test's min ST level for channel 1 to HL7 Date Time Format.
- ◆ **HOLTMAXSTLEVELCH2TIMEDATE** – Converts the Holter test's max ST level for channel 2 to HL7 Date Time Format.
- ◆ **HOLTMINSTLEVELCH2TIMEDATE** – Converts the Holter test's min ST level for channel 2 to HL7 Date Time Format.
- ◆ **HOLTMAXSTLEVELCH3TIMEDATE** – Converts the Holter test's max ST level for channel 3 to HL7 Date Time Format.
- ◆ **HOLTMINSTLEVELCH3TIMEDATE** – Converts the Holter test's min ST level for channel 3 to HL7 Date Time Format.
- ◆ **HOLTMAXSTLEVELCH1** – Calculates the value for the holter test's max ST Level for channel 1.
- ◆ **HOLTMINSTLEVELCH1** – Calculates the value for the holter test's min ST Level for channel 1.
- ◆ **HOLTMAXSTLEVELCH2** – Calculates the value for the holter test's max ST Level for channel 2.
- ◆ **HOLTMINSTLEVELCH2** – Calculates the value for the holter test's min ST Level for channel 2.
- ◆ **HOLTMAXSTLEVELCH3** – Calculates the value for the holter test's max ST Level for channel 3.
- ◆ **HOLTMINSTLEVELCH3** – Calculates the value for the holter test's min ST Level for channel 3.
- ◆ **HOLTLONGESTRRRTIMEDATE** – Converts the Holter test's longest RR value to HL7 Date Time Format.

- ◆ **HOLTMEDICATIONS** – Returns the medications used during the holter test. Each medication will be separated with the configured HL7 repeat character.
- ◆ **JULIANDATE** – Calculates the Julian Calendar Date for the current day.
- ◆ **UNIQUEPTRNUMBER** – Assigns a Unique 8 digit number of the when the test is acquired into the MUSE system. Typically, only one test is acquired at a time making this number a unique value across all tests.
- ◆ **MEILOCATIONNAME** – Retrieves the GE system location name abbreviation which corresponds the test location identification number.
- ◆ **PATIENTAGE** – Gives patient age.
- ◆ **QUERYFIRSTNAME** – Used for getting first names when the ADT MON function is used.
- ◆ **QUERYLASTNAME** – Used for getting last names when the ADT MON function is used.
- ◆ **QUERYPID** – Used for getting patient identification numbers when the ADT MON function is used
- ◆ **REPORTSTATUS** – This function converts the GE test status to the HL7 codes for Preliminary (P), Final (F), or Corrected/ Revised (C) report status. An optional mapping table can be created to use non-standard HL7 codes for the three report statuses.
- ◆ **HL7HOLTER (MAXHEARTRATETIMEDATE, MINHEARTRATETIMEDATE)** – Two different functions used to convert the Holter Test Maximum Heart Rate Event Date and Time or the Holter Test Minimum Heart Rate Event Date and Time as stored on the GE system to the HL7 Date Time format (Time includes seconds).

STRESS (EXERTIMETEXT, MAXWORKLOAD, MAXWORKUNITS, PREDHEARTRATE, TARGHEARTRATE)

Five different functions used to retrieve the Stress Test data stored on the GE system for the HL7 message.

- **StressExerTimeText** – retrieves the appropriate text for the total exercise time or the total infusion time depending upon the test type.
- **StressMaxWorkLoad** – returns the maximum work load for a stress test.
- **StressMaxWorkUnits** – retrieves the maximum work units for a stress test.
- **StressPredHeartRate** – returns the predicted heart rate for a stress test.

- **StressTargHeartRate** – returns the target heart rate for a stress test.
- ◆ **STRIPPID** – If the Patient Identification (PID) string in an inbound message is padded with leading digits (zeroes or other characters) to match the length of the PID on the MUSE CV system, this function removes these leading digits from any corresponding messages before they are sent to the HIS. This function coincides with the value entered on the General Setup screen.
- ◆ **WAVEFORM** – Several different functions related to the GE's HL7 Z segment waveform image raw data capability are included with the Professional GE HL7 Interface Toolkit with waveform option:
 - **WaveMedianByteCountPerLead** – indicates the number in bytes of data for each median lead.
 - **WaveMedianNumChannels** – Indicates the number of median channels in the data.
 - **WaveMedianLeadOrder** – indicates the order of the median leads in the data.
 - **WaveLeadHighLimit** – indicates the highest data value possible for each rhythm lead.
 - **WaveLeadLowLimit** – indicates the lowest data value possible for each rhythm lead.
 - **WaveMedianLeadHighLimit** – indicates the highest data value possible for each median lead.
 - **WaveMedianLeadLowLimit** – indicates the lowest data value possible for each median lead.
 - **WaveLeadOrder** – indicates the order that the rhythm lead data is being presented. E.g. I,II,III.
 - **WaveMedianLeadStartTime** – the offset from the beginning of the test to the start of the median data for each lead.
 - **WaveMedianLeadSamplesPerLead** – indicates the number of A/D samples that were taken to collect the data for each median lead.
 - **WaveNumChannels** – indicates the number of rhythm channels of data that is being sent.
 - **WaveRhythmLeadsStartTimes** – the time offset from the beginning of the test to the start of the Rhythm data for each lead.
 - **WaveRhythmByteCountPerLead** – indicates the number of bytes of data for each rhythm lead.

- **WaveRhythmSamplesPerLead** – indicates the number of A/D samples that were taken to collect the data for each lead.
- **WaveSampleBaseRate** – indicates the sample rate that the data was acquired, either 250 Hz or 500 Hz.
- ◆ **WEBACQTIME** – This function is to be used only with systems that are running Version 5A and 5B MUSE software. If a system is using the HL7 messages to build URLs to retrieve tests from the MUSE system, this function will produce a partial URL string that can be used to build the date and time values that are required by MUSE Web. Note this string is sent in a non HL7 format.

HL7 Segment ID – used to setup the HL7 Segment ID fields.

Mapping Table – takes the GE data value and maps it to the appropriate HL7 data such as the patient sex or race. Mapping tables are needed since the HL7 standard uses different values to represent field entries such as Patient Sex and Race than those that are stored internally on the GE system.

GE Data Value – directly places the GE data value in the defined data field in the HL7 message. No translation is used when the GE data value directly corresponds to the HL7 message field data.

Medicare Provider ID – used to configure a HL7 data field with the Medicare Provider ID. The Medicare Provider ID is stored in the GE system User List and is maintained by the system administrator.

Continuation Pointer – identifies the HL7 data field to hold the continuation pointer used with the HL7 Message Continuation option. See the Maximum Message Length description under Miscellaneous Setup in the previous section and Appendix C for more details on Continuations.

Report Setup also allows each HL7 data field to be specified as a Required Field for the HIS system. If the data is not available for a HL7 data field marked required, the message will not be sent to the HIS system and it is rejected. For example, a HIS system may require the order requisition number to be present in result or financial messages. If the order requisition number is not entered on the test, the HL7 result or financial message will be rejected and subsequently, not sent to the HIS system.

OBX segments that contain the textual diagnosis or interpretation from a test can be configured as non-coded or coded segments. A non-coded segment is a TX (text) code statement. A coded segment implies that the diagnosis lines will be analyzed and a statement code of TX (text), TS (time stamp), or CE (coded element) will be assigned to the OBX line. The TX code indicates the statement was “free text”; the TS code indicates the statement was in the GE time date format; and the CE code indicates the statement was generated from the GE system acronym statement library. The diagnosis statements can also be configured to appear in single or multiple OBX lines. With the single OBX diagnosis statement, all of the textual diagnosis or interpretation statements are placed in one non-coded OBX line. With the multiple OBX diagnosis

statements, each line of textual diagnosis or interpretation is placed in its own OBX line which may be coded or non-coded. Please refer to the following result reporting examples which illustrate the various diagnosis configuration options.

Custom Functions – If a custom function has been developed, select the function name from the *Function Name* list box. If no custom functions have been developed, the *Function Name* list box will be empty.

- ◆ **DocumentStatus** – this function uses the report status to determine the appropriate HL7 document status of the report.
- ◆ **MUSEWEBTestDateTimeURL** – this function creates a URL that points back to the rest of the test stored on the MUSE system for use with MUSE Web.

Result Reporting Messages

Following is a description of the HL7 message types that are supported by the GE HL7 Interface for results:

Preliminary Test Status Message – This message indicates that a test has been performed. The message contains ADT and/or order information as entered at the peripheral test system. It does not contain any of the actual test result data.

Preliminary Test Result Message – This message indicates a test has been performed. The message contains ADT and/or order information as entered at the ancillary test system. It may include a combination of Preliminary test measurements and/or computer generated diagnosis statements.

Final Test Result Message – This message indicates a test has been performed, the test has been edited at the GE system, and the test results have been confirmed by an overreader. The message contains ADT and/or order information as updated during the editing session. It may include a combination of confirmed test measurements and/or diagnosis statements.

The format for each of these messages is given below. Notice that the format for the Preliminary Test Result Message and the Final Test Result Message is the same here, although it may be configured differently for a particular site and for each test type on the GE system. Please refer to the Functional Description of HIS Interface for details on system processing of the various message types.

Result Reporting from an interface system that does not include an order interface is available. This type of interface will not include all of the data found in the following examples. Without an order interface, the order number may not be available on the GE system to include in the result or financial messages. Other information such as the ordering physician may also not be available. Please refer to the tables in the Data Segment section at the end of this document for details on the data contained in the GE system order database.

Preliminary Test Status Message Composition

Preliminary Test Status Messages have the following format:

- MSH-Message Header Segment
- PID-Patient Identification Segment
- [PV1-Patient Visit Segment]
- OBR-Observation Request Segment

Preliminary Test Status Message Example

Following is a sample Preliminary Test Status message.

```
MSH|^~\&|MEI MUSE||HOSPITAL
      ECG||199712070743||ORU^R01|19971207074324|P|2.2<cr>
PID|||2742045||THOMAS^SETH||19590604|M||B|||||||12345677<cr>
OBR|||943036998|93000^12 LEAD
      ECG||199710091816|||||||199710092347|EC|P|||||||6
      717<cr>
```

Test Result Message Composition (Preliminary and Final)

All test result Messages have the same basic composition:

- MSH-Message Header Segment
- PID-Patient Identification Segment
- [PV1-Patient Visit Segment]
- OBR-Observation Request Segment
- OBX-Observation Result Segment(s)

Test Result Message Examples (Preliminary and Final)

Following are several examples of the many possible HL7 formatted test result messages. The GE HL7 Interface can generate countless variations of these examples. This is due to the flexibility built into the GE HL7 interface for reporting test measurements and diagnosis statement lines. More discussion of the flexibility provided for diagnosis statement layout is included in the previous section titled “GE System Outgoing HL7 Message Configuration Options”. Note that these examples do not show the PV1 segment due to the way the HL7 Configuration was set up. If the PV1 segment were required for the results messages, it could simply be added in the configuration.

Samples of some common format options are provided for EKG test types. These examples include all the measurements that the GE system is capable of storing for EKG tests. These measurements are optional and a subset of these measurements can be provided by the HL7 interface. All examples feature CPT4 codes with ASTM extensions in the OBX segments for measurements and GE system statement library numbers in the OBX segments for multiple diagnosis lines. All examples feature GE serial comparison statements. These features are optional.

The following options 1 through 6 show test measurements in separate OBX segments, unless otherwise noted. In the diagnosis portions, the ~END~ signals the end of a statement line as it had appeared on the GE system. This “~END~” is configurable to any desired character or string. In most cases, these examples use (((double quotation marks) to specify null fields. Options 1-6 contain order interface information in the result message, while option 7 shows examples with and without an order interface.

Option 1

- MSH-Message Header Segment
- PID-Patient Identification Segment
- [PV1-Patient Visit Segment]
- OBR-Observation Request Segment
- OBX-Observation Result Segment -ST- (Measurement 1)
- OBX-Observation Result Segment -ST- (Measurement 2)
- OBX-Observation Result Segment -ST- (Measurement n)
- OBX-Observation Result Segment -FT- (All Textual Diagnosis Lines)

Please refer to Appendix B for the EKG report that corresponds to this HL7 result message.

This example shows the diagnosis statements contained in one OBX FT formatted text segment. This example does not contain any extra user entered free text. This message is for a final result (F).

EKG Test Type Example 1

```
MSH|^~\&|MEI MUSE|HOSPITAL
ECG||19970710135006|ORU^R01|19970710135006|P|2.2<cr>
PID||589290320|DILLER^JANE||""|M|C|||||12345677<cr>
OBR||123456789|93000^12 LEAD
ECG||199706131408|||||||199707101349|EC|F|||||2
345^DOE^JOHN|""^""^""|""^""^""|2345^DOE^JOHN<cr>
OBX|1|ST|1002.2^Systolic Blood Pressure|""|mmHG||||F<cr>
OBX|2|ST|1002.3^Diastolic Blood Pressure|""|mmHG||||F<cr>
OBX|3|ST|93000.2^Ventricular Rate|68|BPM||||F<cr>
OBX|4|ST|93000.3^Atrial Rate|68|BPM||||F<cr>
OBX|5|ST|93000.4^P-R Interval|180|ms||||F<cr>
OBX|6|ST|93000.5^QRS Duration|68|ms||||F<cr>
OBX|7|ST|93000.6^QT|388|ms||||F<cr>
OBX|8|ST|93000.6&Calc^QTc^L&EKG|413|ms||||F<cr>
OBX|9|ST|93000.12^P Axis|74|degrees||||F<cr>
OBX|10|ST|93000.13^QRS Axis|64|degrees||||F<cr>
OBX|11|ST|93000.14^T Axis|63|degrees||||F<cr>
OBX|12|FT||NORMAL SINUS RHYTHM~END~NORMAL ECG~END~WHEN
COMPARED WITH ECG OF 13-JUN-1997 14:00,~END~NO SIGNIFICANT
CHANGE WAS FOUND||||F<cr>
```

Option 2

- MSH-Message Header Segment
- PID-Patient Identification Segment
- [PV1-Patient Visit Segment]
- OBR-Observation Request Segment
- OBX-Observation Result Segment -ST- (Measurement 1)
- OBX-Observation Result Segment -ST- (Measurement 2)
- OBX-Observation Result Segment -ST- (Measurement n)
- OBX-Observation Result Segment -TX- (All Textual Diagnosis Lines)

Please refer to Appendix B for the EKG report that corresponds to this HL7 result message.

The following example features the diagnosis contained in one OBX TX segment. It does not contain any extra user entered free text. This message is for a final result (F).

EKG Test Type Example 2

```
MSH|^~\&|MEI
MUSE||HOSPITAL ECG||19970710134717||ORU^R01|19970710134717|P
|2.2<cr>
PID||589290320||DILLER^JANE||""|M|C|||||||12345677<cr>
OBR||123456789|93000^12 LEAD
ECG||199706131408|||||||199707101347||EC|F|||||||2
345^DOE^JOHN|""^""^""|""^""^""|2345^DOE^JOHN<cr>
OBX|1|ST|1002.2^Systolic Blood Pressure|""|mmHG|||||F<cr>
OBX|2|ST|1002.3^Diastolic Blood Pressure|""|mmHG|||||F<cr>
OBX|3|ST|93000.2^Ventricular Rate|68|BPM|||||F<cr>
OBX|4|ST|93000.3^Atrial Rate|68|BPM|||||F<cr>
OBX|5|ST|93000.4^P-R Interval|180|ms|||||F<cr>
OBX|6|ST|93000.5^QRS Duration|68|ms|||||F<cr>
OBX|7|ST|93000.6^QT|388|ms|||||F<cr>
OBX|8|ST|93000.6&Calc^QTc^L&EKG|413|ms|||||F<cr>
OBX|9|ST|93000.12^P Axis|74|degrees|||||F<cr>
OBX|10|ST|93000.13^QRS Axis|64|degrees|||||F<cr>
OBX|11|ST|93000.14^T Axis|63|degrees|||||F<cr>
OBX|12|TX|||NORMAL SINUS RHYTHM~END~NORMAL ECG~END~WHEN
COMPARED WITH ECG OF 13-JUN-1997 14:00,~END~NO SIGNIFICANT
CHANGE WAS FOUND|||||F<cr>
```

Option 3

- MSH-Message Header Segment
- PID-Patient Identification Segment
- [PV1-Patient Visit Segment]
- OBR-Observation Request Segment
- OBX-Observation Result Segment -ST- (Measurement 1)
- OBX-Observation Result Segment -ST- (Measurement 2)
- OBX-Observation Result Segment -ST- (Measurement n)
- OBX-Observation Result Segment -TX- (All Textual Diagnosis Lines)

Please refer to the Appendix B for the EKG report that corresponds to this HL7 result message.

This example is similar to option 2 except that this result contains user entered free text. The diagnosis is contained in one OBX TX segment. Optionally, this could also be in an OBX FT segment. This message is for a corrected/revised result (C).

EKG Test Type Example 3

```
MSH|^~\&|MEI MUSE|HOSPITAL
ECG||19970710134751|ORU^R01|19970710134751|P|2.2<cr>
PID||589290320|DILLER^JANE||""|M|C|||||12345677<cr>
OBR||123456789|93000^12 LEAD
ECG||199706131408|||||||199707101347|EC|C|||||2
345^DOE^JOHN|""^""^""|""^""^""|2345^DOE^JOHN<cr>
OBX|1|ST|1002.2^Systolic Blood Pressure|""|mmHG||||C<cr>
OBX|2|ST|1002.3^Diastolic Blood Pressure|""|mmHG||||C<cr>
OBX|3|ST|93000.2^Ventricular Rate|68|BPM||||C<cr>
OBX|4|ST|93000.3^Atrial Rate|68|BPM||||C<cr>
OBX|5|ST|93000.4^P-R Interval|180|ms||||C<cr>
OBX|6|ST|93000.5^QRS Duration|68|ms||||C<cr>
OBX|7|ST|93000.6^QT|388|ms||||C<cr>
OBX|8|ST|93000.6&Calc^QTc^L&EKG|413|ms||||C<cr>
OBX|9|ST|93000.12^P Axis|74|degrees||||C<cr>
OBX|10|ST|93000.13^QRS Axis|64|degrees||||C<cr>
OBX|11|ST|93000.14^T Axis|63|degrees||||C<cr>
OBX|12|TX||NORMAL SINUS RHYTHM~END~NORMAL
ECG~END~TRIFASCICULAR BLOCK~END~ATRIAL FLUTTER~END~ST & T
WAVE ABNORMALITY, CONSIDER ANTEROLATERAL ISCHEMIA~END~THIS
IS USER ENTERED DIAGNOSIS TEXT~END~THE FIRST TWO LINES OF
THIS DIAGNOSIS~END~ARE COMPUTER GENERATED THE NEXT TWO
LINES ARE USER INSERTED LIBRARY STMTS AND~END~THESE NEXT
FIVE LINES ARE USER ENTERED FREE TEXT. THE LAST 2 LINES
ARE~END~COMPUTER GENERATED SERIAL COMPARISON LINES~END~WHEN
COMPARED WITH ECG OF 13-JUN-1997 14:00,~END~NO SIGNIFICANT
CHANGE WAS FOUND||||C<cr>
```

Option 4

- MSH-Message Header Segment
- PID-Patient Identification Segment
- [PV1-Patient Visit Segment]
- OBR-Observation Request Segment
- OBX-Observation Result Segment -ST- (Measurement 1)
- OBX-Observation Result Segment -ST- (Measurement 2)
- OBX-Observation Result Segment -ST- (Measurement n)
- OBX-Observation Result Segment -TX- (Diagnosis Line 1)
- OBX-Observation Result Segment -TX- (Diagnosis Line 2)
- OBX-Observation Result Segment -TX- (Diagnosis Line n)
- OBX-Observation Result Segment -TX- (All Diagnosis Lines)

Please refer to the Appendix B for the EKG report that corresponds to this HL7 result message.

In this example, the diagnosis lines are split into separate OBX TX segments. These are TX segments as opposed to CE segments because the lines are split according to the diagnosis text lines; diagnosis text lines may contain several GE system diagnosis statement library statements. In this example, OBX 16 is made up of two GE system statement library statements. Also note that with this type of textual diagnosis the serial comparison time stamp is not broken out into a separate OBX segment. The diagnosis is repeated in another format that includes the diagnosis lines in a single OBX TX segment. This example does contain user entered free text. This message is for a corrected/ revised result (C).

EKG Test Type Example 4

```
MSH|^~\&|MEI MUSE||HOSPITAL
ECG||19970710135739||ORU^R01|19970710135739|P|2.2<cr>
PID|||589290320||DILLER^JANE||""|M||C|||||||12345677<cr>
OBR|||123456789|93000^12 LEAD
ECG|||199706131408|||199707101357||EC|C|||||||2
345^DOE^JOHN|""^""^""|""^""^""|2345^DOE^JOHN<cr>
OBX|1|ST|1002.2^Systolic Blood Pressure||""|mmHG|||||C<cr>
OBX|2|ST|1002.3^Diastolic Blood Pressure||""|mmHG|||||C<cr>
OBX|3|ST|93000.2^Ventricular Rate||68|BPM|||||C<cr>
OBX|4|ST|93000.3^Atrial Rate||68|BPM|||||C<cr>
OBX|5|ST|93000.4^P-R Interval||180|ms|||||C<cr>
OBX|6|ST|93000.5^QRS Duration||68|ms|||||C<cr>
OBX|7|ST|93000.6^QT||388|ms|||||C<cr>
OBX|8|ST|93000.6&Calc^QTc^L&EKG||413|ms|||||C<cr>
OBX|9|ST|93000.12^P Axis||74|degrees|||||C<cr>
OBX|10|ST|93000.13^QRS Axis||64|degrees|||||C<cr>
OBX|11|ST|93000.14^T Axis||63|degrees|||||C<cr>
OBX|12|TX||NORMAL SINUS RHYTHM|||||C<cr>
OBX|13|TX||NORMAL ECG|||||C<cr>
OBX|14|TX||TRIFASCICULAR BLOCK|||||C<cr>
OBX|15|TX||ATRIAL FLUTTER|||||C<cr>
OBX|16|TX||ST & T WAVE ABNORMALITY, CONSIDER ANTEROLATERAL
ISCHEMIA|||||C<cr>
OBX|17|TX||THIS IS USER ENTERED DIAGNOSIS TEXT|||||C<cr>
OBX|18|TX||THE FIRST TWO LINES OF THIS DIAGNOSIS|||||C<cr>
```

```

OBX|19|TX||ARE COMPUTER GENERATED THE NEXT TWO LINES ARE USER
    INSERTED LIBRARY STMTS AND|||||C<cr>
OBX|20|TX||THESE NEXT FIVE LINES ARE USER ENTERED FREE TEXT.
    THE LAST 2 LINES ARE|||||C<cr>
OBX|21|TX||COMPUTER GENERATED SERIAL COMPARISON
    LINES|||||C<cr>
OBX|22|TX||WHEN COMPARED WITH ECG OF 13-JUN-1997
    14:00,|||||C<cr>
OBX|23|TX||NO SIGNIFICANT CHANGE WAS FOUND|||||C<cr>
OBX|24|TX||NORMAL SINUS RHYTHM~END~NORMAL
    ECG~END~TRIFASCICULAR BLOCK~END~ATRIAL FLUTTER~END~ST & T
    WAVE ABNORMALITY, CONSIDER ANTEROLATERAL ISCHEMIA~END~THIS
    IS USER ENTERED DIAGNOSIS TEXT~END~THE FIRST TWO LINES OF
    THIS DIAGNOSIS~END~ARE COMPUTER GENERATED THE NEXT TWO
    LINES ARE USER INSERTED LIBRARY STMTS AND~END~THESE NEXT
    FIVE LINES ARE USER ENTERED FREE TEXT. THE LAST 2 LINES
    ARE~END~COMPUTER GENERATED SERIAL COMPARISON LINES~END~WHEN
    COMPARED WITH ECG OF 13-JUN-1997 14:00,~END~NO SIGNIFICANT
    CHANGE WAS FOUND|||||C<cr>

```


Option 5

- MSH-Message Header Segment
- PID-Patient Identification Segment
- [PV1-Patient Visit Segment]
- OBR-Observation Request Segment
- OBX-Observation Result Segment -ST- (Measurement 1)
- OBX-Observation Result Segment -ST- (Measurement 2)
- OBX-Observation Result Segment -ST- (Measurement n)
- OBX-Observation Result Segment -TX- (All Diagnosis Lines)
- OBX-Observation Result Segment -CE or TX- (Diagnosis Line 1, formatted)
- OBX-Observation Result Segment -CE or TX- (Diagnosis Line 2, formatted)
- OBX-Observation Result Segment -CE or TX- (Diagnosis Line n, formatted)

Please refer to the Appendix B for the EKG report that corresponds to this HL7 result message.

In the following example, the diagnosis lines are included in a single OBX TX segment. The diagnosis is also repeated in another format in this example. The diagnosis lines are split up into separate OBX CE segments, one OBX CE segment per GE system library statement. Note that OBX 17 and 18 are separate GE system diagnosis statement library statements. These would appear on the GE system as one diagnosis text line. Note that GE system statement library diagnosis lines are coded in OBX CE segments, while user entered free text diagnosis lines are coded in OBX TX segments. The serial comparison time stamp in this example appears in HL7 coded format in an OBX TX segment. This message is for a corrected/revised result (C).

EKG Test Type Example 5

```
MSH|^~\&|MEI MUSE|HOSPITAL
ECG||19970710141132||ORU^R01|19970710141132|P|2.2<cr>
PID||589290320||DILLER^JANE||""|M||C|||||12345677<cr>
OBR||123456789|93000^12 LEAD
ECG||199706131408|||||||199707101411|EC|C|||||2
345^DOE^JOHN|""^""^""|""^""^""|2345^DOE^JOHN<cr>
OBX|1|ST|1002.2^Systolic Blood Pressure|""|mmHG||||C<cr>
OBX|2|ST|1002.3^Diastolic Blood Pressure|""|mmHG||||C<cr>
OBX|3|ST|93000.2^Ventricular Rate||68|BPM||||C<cr>
OBX|4|ST|93000.3^Atrial Rate||68|BPM||||C<cr>
OBX|5|ST|93000.4^P-R Interval||180|ms||||C<cr>
OBX|6|ST|93000.5^QRS Duration||68|ms||||C<cr>
OBX|7|ST|93000.6^QT||388|ms||||C<cr>
OBX|8|ST|93000.6&Calc^QTc^L&EKG||413|ms||||C<cr>
OBX|9|ST|93000.12^P Axis||74|degrees||||C<cr>
OBX|10|ST|93000.13^QRS Axis||64|degrees||||C<cr>
OBX|11|ST|93000.14^T Axis||63|degrees||||C<cr>
OBX|12|TX||NORMAL SINUS RHYTHM~END~NORMAL
ECG~END~TRIFASCICULAR BLOCK~END~ATRIAL FLUTTER~END~ST & T
WAVE ABNORMALITY, CONSIDER ANTEROLATERAL ISCHEMIA~END~THIS
IS USER ENTERED DIAGNOSIS TEXT~END~THE FIRST TWO LINES OF
THIS DIAGNOSIS~END~ARE COMPUTER GENERATED THE NEXT TWO
```

```

        LINES ARE USER INSERTED LIBRARY STMTS AND~END~THESE NEXT
        FIVE LINES ARE USER ENTERED FREE TEXT. THE LAST 2 LINES
        ARE~END~COMPUTER GENERATED SERIAL COMPARISON LINES~END~WHEN
        COMPARED WITH ECG OF 13-JUN-1997 14:00,~END~NO SIGNIFICANT
        CHANGE WAS FOUND|||||C<cr>
OBX|13|CE|||22^NORMAL SINUS RHYTHM|||||C<cr>
OBX|14|CE|||1684^NORMAL ECG|||||C<cr>
OBX|15|CE|||481^TRIFASCICULAR BLOCK|||||C<cr>
OBX|16|CE|||162^ATRIAL FLUTTER|||||C<cr>
OBX|17|CE|||1100^ST &|||||C<cr>
OBX|18|CE|||1180^T WAVE ABNORMALITY, CONSIDER ANTEROLATERAL
        ISCHEMIA|||||C<cr>
OBX|19|TX|||THIS IS USER ENTERED DIAGNOSIS TEXT|||||C<cr>
OBX|20|TX|||THE FIRST TWO LINES OF THIS DIAGNOSIS|||||C<cr>
OBX|21|TX|||ARE COMPUTER GENERATED THE NEXT TWO LINES ARE USER
        INSERTED LIBRARY STMTS AND|||||C<cr>
OBX|22|TX|||THESE NEXT FIVE LINES ARE USER ENTERED FREE TEXT.
        THE LAST 2 LINES ARE|||||C<cr>
OBX|23|TX|||COMPUTER GENERATED SERIAL COMPARISON
        LINES|||||C<cr>
OBX|24|CE|||1301^WHEN COMPARED WITH ECG OF|||||C<cr>
OBX|25|TX|||13-JUN-1997 14:00,|||||C<cr>
OBX|26|CE|||1305^NO SIGNIFICANT CHANGE WAS FOUND|||||C<cr>

```

Option 6

- MSH-Message Header Segment
- PID-Patient Identification Segment
- [PV1-Patient Visit Segment]
- OBR-Observation Request Segment
- OBX-Observation Result Segment -ST- (Measurement 1)
- OBX-Observation Result Segment -ST-(Measurement 2)
- OBX-Observation Result Segment -ST- (Measurement n)
- OBX-Observation Result Segment -TX- (All Diagnosis Lines)
- OBX-Observation Result Segment -CE or TX or TS- (Diagnosis Line 1, formatted)
- OBX-Observation Result Segment -CE or TX or TS- (Diagnosis Line 2, formatted)
- OBX-Observation Result Segment -CE or TX or TS- (Diagnosis Line n, formatted)

Please refer to the Appendix B for the EKG report that corresponds to this HL7 result message.

This example shows the diagnosis lines included in a single OBX TX segment. The diagnosis is also repeated in another format in this example. The diagnosis lines are split up into separate OBX segments. Note that GE system statement library diagnosis lines are coded in OBX CE segments, while user entered free text diagnosis lines are coded in OBX TX segments. The serial comparison time stamp in this example appears in HL7 coded format in an OBX TS segment. This example does not fill in null fields. This message is for a corrected/revised result (C).

EKG Test Type Example 6

```
MSH|^~\&|MEI MUSE|HOSPITAL
ECG||19970710150402||ORU^R01|19970710150402|P|2.2<cr>
PID||589290320||DILLER^JANE||M|C|||||12345677<cr>
OBR||123456789|93000^12 LEAD
ECG||199706131408|||||||199707101503|EC|C|||||23
45^DOE^JOHN|^|^2345^DOE^JOHN<cr>
OBX|1|ST|1002.2^Systolic Blood Pressure||mmHG||||C<cr>
OBX|2|ST|1002.3^Diastolic Blood Pressure||mmHG||||C<cr>
OBX|3|ST|93000.2^Ventricular Rate||68|BPM||||C<cr>
OBX|4|ST|93000.3^Atrial Rate||68|BPM||||C<cr>
OBX|5|ST|93000.4^P-R Interval||180|ms||||C<cr>
OBX|6|ST|93000.5^QRS Duration||68|ms||||C<cr>
OBX|7|ST|93000.6^QT||388|ms||||C<cr>
OBX|8|ST|93000.6&Calc^QTc^L&EKG||413|ms||||C<cr>
OBX|9|ST|93000.12^P Axis||74|degrees||||C<cr>
OBX|10|ST|93000.13^QRS Axis||64|degrees||||C<cr>
OBX|11|ST|93000.14^T Axis||63|degrees||||C<cr>
OBX|12|TX||NORMAL SINUS RHYTHM~END~NORMAL
ECG~END~TRIFASCICULAR BLOCK~END~ATRIAL FLUTTER~END~ST & T
WAVE ABNORMALITY, CONSIDER ANTEROLATERAL ISCHEMIA~END~THIS
IS USER ENTERED DIAGNOSIS TEXT~END~THE FIRST TWO LINES OF
THIS DIAGNOSIS~END~ARE COMPUTER GENERATED THE NEXT TWO
LINES ARE USER INSERTED LIBRARY STMTS AND~END~THESE NEXT
FIVE LINES ARE USER ENTERED FREE TEXT. THE LAST 2 LINES
ARE~END~COMPUTER GENERATED SERIAL COMPARISON LINES~END~WHEN
```

```

        COMPARED WITH ECG OF 13-JUN-1997 14:00,~END~NO SIGNIFICANT
        CHANGE WAS FOUND|||||C<cr>
OBX|13|CE|||22^NORMAL SINUS RHYTHM|||||C<cr>
OBX|14|CE|||1684^NORMAL ECG|||||C<cr>
OBX|15|CE|||481^TRIFASCICULAR BLOCK|||||C<cr>
OBX|16|CE|||162^ATRIAL FLUTTER|||||C<cr>
OBX|17|CE|||1100^ST &|||||C<cr>
OBX|18|CE|||1180^T WAVE ABNORMALITY, CONSIDER ANTEROLATERAL
        ISCHEMIA|||||C<cr>
OBX|19|TX|||THIS IS USER ENTERED DIAGNOSIS TEXT|||||C<cr>
OBX|20|TX|||THE FIRST TWO LINES OF THIS DIAGNOSIS|||||C<cr>
OBX|21|TX|||ARE COMPUTER GENERATED THE NEXT TWO LINES ARE USER
        INSERTED LIBRARY STMTS AND|||||C<cr>
OBX|22|TX|||THESE NEXT FIVE LINES ARE USER ENTERED FREE TEXT.
        THE LAST 2 LINES ARE|||||C<cr>
OBX|23|TX|||COMPUTER GENERATED SERIAL COMPARISON
        LINES|||||C<cr>
OBX|24|CE|||1301^WHEN COMPARED WITH ECG OF|||||C<cr>
OBX|25|TS|||199706131400|||||C<cr>
OBX|26|CE|||1305^NO SIGNIFICANT CHANGE WAS FOUND|||||C<cr>

```

Option 7

- MSH-Message Header Segment
- PID-Patient Identification Segment
- PV1-Patient Visit Segment
- OBR-Observation Request Segment
- OBX-Observation Result Segment ST for all measurement data
- OBX-Observation Result Segment -TX multiple diagnosis lines
- OBX-Observation Result Segment -CE multiple diagnosis lines
- OBX-Observation Result Segment -TX single diagnosis line

The following examples are generic message layouts for each of the standard GE HL7 interface test types. The examples include the PV1 segment and the measurement data available for each test type. The diagnosis is contained in one OBX TX segment. The ~ signals the end of a statement line as it had appeared on the GE system. This “~” is configurable to any desired character or string. This example does not contain any extra user entered free text. These examples are not configured to use null fields.

EKG Test Type Example 7

```
MSH|^~\&|MEI MUSE|HIS
SYSTEM||19970917172600||ORU^R01|19970917172600|P|2.2<cr>
PID|1|999999999||EXAMPLE^SEVEN|0|19710403|F||C|||||1234567
7<cr>
PV1|1|P|^2306|||^Attendedby^|^Referredby^|||||P|||||
|||||19970817170910<cr>
OBR|1||22222222|93000^ECG||19970917172600|19900412105300||||
|||^^|||19970917172600||C|||||^DOE^JOHN|^|^<cr>
OBX|1|ST|1002.2^Systolic Blood Pressure|120|mmHG|||C<cr>
OBX|2|ST|1002.3^Diastolic Blood Pressure|67|mmHG|||C<cr>
OBX|3|ST|93000.2^Ventricular Rate|84|BPM|||C<cr>
OBX|4|ST|93000.3^Atrial Rate|84|BPM|||C<cr>
OBX|5|ST|93000.4^P-R Interval|140|ms|||C<cr>
OBX|6|ST|93000.5^QRS Duration|100|ms|||C<cr>
OBX|7|ST|93000.6^QT|432|ms|||COBX|8|ST|93000.???^QTc|511|m
s|||C<cr>
OBX|9|ST|93000.12^P Axis|67|degrees|||C<cr>
OBX|10|ST|93000.13^R Axis|55|degrees|||C<cr>
OBX|11|ST|93000.14^T Axis|60|degrees|||C<cr>
OBX|12|TX|^Diagnosis Line^CPT4|Normal sinus rhythm||||C<cr>
OBX|13|TX|^Diagnosis Line^CPT4|Prolonged QT||||C<cr>
OBX|14|TX|^Diagnosis Line^CPT4|No previous ECGs
available||||C<cr>
OBX|15|CE|^CPT4|22^Normal sinus rhythm||||C<cr>
OBX|16|CE|^CPT4|1143^Prolonged QT||||C<cr>
OBX|17|CE|^CPT4|1300^No previous ECGs available||||C<cr>
OBX|18|TX|^Diagnosis Line^CPT4|Normal sinus rhythm~Prolonged
QT~No previous ECGs available||||C<cr>
Hi Resolution Test Type Example 7
MSH|^~\&|MEI MUSE|HIS
SYSTEM||19970917173110||ORU^R01|19970917173110|P|2.2<cr>
PID|1|999999999||EXAMPLE^SEVEN|19710403|F||C|||||12345677
<cr>
PV1|1|^POS|||^Attendedby^|^Referredby^|||||
|||||19970817170910<cr>
```

```

OBR|1|||93000^SIGNAL_AVG_EKG||19970917173110|19910417150200|||
|||^^|||19970917173110||C|||^^^DOE^JOHN^^^<cr>
r>
OBX|1|ST|5000.52^Std. QRS Duration
(unfiltered)||101|ms|||C<cr>
OBX|2|ST|5000.53^Total QRS Duration
(filtered)||121|ms|||C<cr>
OBX|3|ST|5000.50^Number of Beats Averaged||253|||C<cr>
OBX|4|ST|5000.51^Number of Beats Detected||253|||C<cr>
OBX|5|ST|5000.56^Duration of HFLA signals<40
uV||48|ms|||C<cr>
OBX|6|ST|5000.54^RMS Voltage in terminal||19|uV|||C<cr>
OBX|7|ST|5000.???^Mean Voltage in terminal||15|uV|||C<cr>
OBX|8|TX|^Diagnosis Line^CPT4|THIS IS A LINE OF FREE TEXT
DIAGNOSIS|||C<cr>
OBX|9|TX|^CPT4|THIS IS A LINE OF FREE TEXT
DIAGNOSIS|||C<cr>
OBX|10|TX|^Diagnosis Line^CPT4|THIS IS A LINE OF FREE TEXT
DIAGNOSIS|||C<cr>

```

Pacemaker Test Type Example 7

```

MSH|^~\&|MEI MUSE|HIS
SYSTEM||19970917172611||ORU^R01|19970917172611|P|2.2<cr>
PID|1|999999999||52|EXAMPLE^SEVEN||19710403|F||C|||123456
77<cr>
PV1|1|P|^MAC15|||^Attendedby^|^Referredby^|||P|||
|||||19970817170910<cr>
OBR|1|333333333|93000^||19970917172612|19890630093500||Fello
w_Number|||Tech_Number^SHOW^MERVIN|||19970917172612||
F|||||^DOE^JOHN^^|Fellow_Number^FELLOW^JOE^^<cr>
OBX|1|ST|93000.???^Int 1-1 (No Magnet)||916|ms|||F<cr>
OBX|2|ST|93000.???^Int 1-2 (No Magnet)||ms|||F<cr>
OBX|3|ST|93000.???^PW Type 1 (No Magnet)||0.250|ms|||F<cr>
OBX|4|ST|93000.???^PW Type 2 (No Magnet)||ms|||F<cr>
OBX|5|ST|93000.???^Amp Type 1 (No
Magnet)||302.000|mV|||F<cr>
OBX|6|ST|93000.???^Amp Type 2 (No Magnet)||mV|||F<cr>
OBX|7|ST|93000.???^T/L Ratio Type 1 (No
Magnet)||1.000|||F<cr>
OBX|8|ST|93000.???^T/L Ratio Type 2 (No Magnet)|||F<cr>
OBX|9|ST|93000.???^Rate||65.5|PPM|||F<cr>
OBX|10|ST|93000.???^Int 1-1 (Magnet)||916|ms|||F<cr>
OBX|11|ST|93000.???^Int 1-2 (Magnet)||ms|||F<cr>
OBX|12|ST|93000.???^PW Type 1 (Magnet)||0.250|ms|||F<cr>
OBX|13|ST|93000.???^PW Type 2 (Magnet)||ms|||F<cr>
OBX|14|ST|93000.???^Amp Type 1 (Magnet)||301.000|mV|||F<cr>
OBX|15|ST|93000.???^Amp Type 2 (Magnet)||mV|||F<cr>
OBX|16|ST|93000.???^T/L Ratio Type 1
(Magnet)||1.000|||F<cr>
OBX|17|ST|93000.???^T/L Ratio Type 2 (Magnet)|||F<cr>
OBX|18|ST|93000.???^Rate||65.5|PPM|||F<cr>
OBX|19|ST|93000.???^Systolic BP||88|mmHG|||F<cr>
OBX|20|ST|93000.???^Diastolic BP||88|mmHG|||F<cr>
OBX|21|TX|^Diagnosis Line^CPT4|Transtelephonic
check|||F<cr>
OBX|22|TX|^Diagnosis Line^CPT4|DIAGNOSIS TEXT HERE|||F<cr>
OBX|23|CE|^CPT4|122^Transtelephonic check|||F<cr>
OBX|24|TX|^CPT4|DIAGNOSIS TEXT HERE|||F<cr>

```

```
OBX|25|TX|^Diagnosis Line^CPT4||Transtelephonic
check~DIAGNOSIS TEXT HERE||||F<cr>
```

Stress Test Type Example 7

```
MSH|^~\&|MEI MUSE||HIS
SYSTEM||19970917172538||ORU^R01|19970917172538|P|2.2<cr>
PID|1|999999999||678|EXAMPLE^SEVEN||19710403|F||C||||||12345
677<cr>
PV1|1|P|^||||^Attendedby^|^Referredby^|||||||PREADMIT|||||
|||||||19970817170910<cr>
OBR|1|||93000^Stress_Echo||19970917172538|19920827153543|||||
||^DRBASHIR^|||||19970917172538||F|||||PREDISCHARGE,
POST-MI|^DOE^JOHN|^TJB^<cr>
OBX|1|ST|93000.???^Protocol||LB CATH |||||F<cr>
OBX|2|ST|93000.???^Total Exercise Time||243|||||F<cr>
OBX|3|ST|93000.???^Max Heart Rate||103|BPM|||||F<cr>
OBX|4|ST|93000.???^Max Predicted Heart Rate||161|BPM|||||F<cr>
OBX|5|ST|93000.???^Target Heart Rate||64|percent|||||F<cr>
OBX|6|ST|93000.???^Max Systolic BP||110|mmHG|||||F<cr>
OBX|7|ST|93000.???^Max Diastolic BP||80|mmHG|||||F<cr>
OBX|8|ST|93000.???^Max Work Load||4.0|METs|||||F<cr>
OBX|9|TX|^Diagnosis Line^CPT4||Reasons for
termination|||||F<cr>
OBX|10|TX|^Diagnosis Line^CPT4||PATIENT REQUEST|||||F<cr>
OBX|11|TX|^Diagnosis Line^CPT4||ST DEPRESSION |||||F<cr>
OBX|12|TX|^Diagnosis Line^CPT4||Impressions|||||F<cr>
OBX|13|TX|^Diagnosis Line^CPT4||INTENTIONAL SUBMAXIMAL TEST,
PRE-DISCHARGE, ONE WEEK AFTER MI. |||||F<cr>
OBX|14|TX|^Diagnosis Line^CPT4||BLUNTED HR RESPONSE, DUE TO
BETA BLOCKER THERAPY. |||||F<cr>
OBX|15|TX|^Diagnosis Line^CPT4||HORIZONTAL ST DEPRESSION IN
V4, V5, AND V6. |||||F<cr>
OBX|16|TX|^Diagnosis Line^CPT4||WORST ST DEPRESSION IN V5,
2.0MM. |||||F<cr>
OBX|17|CE|^CPT4||2^Reasons for termination|||||F<cr>
OBX|18|TX|^CPT4||PATIENT REQUEST|||||F<cr>
OBX|19|TX|^CPT4||ST DEPRESSION |||||F<cr>
OBX|20|CE|^CPT4||1^Impressions|||||F<cr>
OBX|21|TX|^CPT4||INTENTIONAL SUBMAXIMAL TEST, PRE-DISCHARGE,
ONE WEEK AFTER MI. |||||F<cr>
OBX|22|TX|^CPT4||BLUNTED HR RESPONSE, DUE TO BETA BLOCKER
THERAPY. |||||F<cr>
OBX|23|TX|^CPT4||HORIZONTAL ST DEPRESSION IN V4, V5, AND
V6. |||||F<cr>
OBX|24|TX|^CPT4||WORST ST DEPRESSION IN V5, 2.0MM. |||||F<cr>
OBX|25|TX|^Diagnosis Line^CPT4||Reasons for
termination~PATIENT REQUEST~ST DEPRESSION
~Impressions~INTENTIONAL SUBMAXIMAL TEST, PRE-DISCHARGE,
ONE WEEK AFTER MI. ~BLUNTED HR RESPONSE, DUE TO BETA BLOCKER
THERAPY.~HORIZONTAL ST DEPRESSION IN V4, V5, AND V6.~WORST
ST DEPRESSION IN V5, 2.0MM. |||||F<cr>
```

Holter Test Type Example 7

```

MSH|^~\&|MEI MUSE|HIS
SYSTEM||19970917172527||ORU^R01|19970917172527|P|2.2<cr>
PID|1|999999999||54656|EXAMPLE^SEVEN||19710403|F||C|||||||123
45677|<cr>
PV1|1|P|^||||^Attendedby^|^Referredby^|||||||P|||||||
|||||||19970817170910<cr>
OBR|1||444444444|93000^Holter||19970917172527|19970110151500||
|||||^|^|||19970917172527||F|||||ARRHYTHMIA|^DOE^JOHN
|^|^MC^|^<cr>
OBX|1|ST|93226.^Hookup Date||10-Jan-1997||||F<cr>
OBX|2|ST|93226.^Hookup Time||15:15:00||||F<cr>
OBX|3|ST|93226.32^Recording Duration||24:56:17||||F<cr>
OBX|4|ST|93226.???^# OF QRS COMPLEXES||66832||||F<cr>
OBX|5|ST|93226.42^# OF VENTRICULAR ECTOPICS||146||||F<cr>
OBX|6|ST|93226.???^# OF VENTRICULAR ISOLATED
BEATS||146||||F<cr>
OBX|7|ST|93226.???^# OF VENTRICULAR BIGEMINAL
CYCLES||0||||F<cr>
OBX|8|ST|93226.???^# OF VENTRICULAR COUPLETS||0||||F<cr>
OBX|9|ST|93226.43^# OF VENTRICULAR RUNS||0||||F<cr>
OBX|10|ST|93226.???^# OF VENTRICULAR BEATS IN
RUNS||0||||F<cr>
OBX|11|ST|93226.???^# OF LONGEST VENTRICULAR
BEATS||0||||F<cr>
OBX|12|ST|93226.???^LONGEST VENTRICULAR
RATE||123|BPM||||F<cr>
OBX|13|ST|93226.???^# OF FASTEST VENTRICULAR
BEATS||0||||F<cr>
OBX|14|ST|93226.39^FASTEST VENTRICULAR RATE||145|BPM||||F<cr>
OBX|15|ST|93226.???^# OF SUPRAVENTRICULAR
ECTOPICS||37||||F<cr>
OBX|16|ST|93226.???^# OF SUPRAVENTRICULAR ISOLATED
BEATS||37||||F<cr>
OBX|17|ST|93226.???^# OF SUPRAVENTRICULAR
COUPLETS||0||||F<cr>
OBX|18|ST|93226.43^# OF SUPRAVENTRICULAR RUNS||0||||F<cr>
OBX|19|ST|93226.???^# OF SUPRAVENTRICULAR BEATS IN
RUNS||0||||F<cr>
OBX|20|ST|93226.???^# OF LONGEST SUPRAVENTRICULAR
BEATS||0||||F<cr>
OBX|21|ST|93226.???^LONGEST SUPRAVENTRICULAR
RATE||0|BPM||||F<cr>
OBX|22|ST|93226.???^# OF FASTEST SUPRAVENTRICULAR
BEATS||0||||F<cr>
OBX|23|ST|93226.39^FASTEST SUPRAVENTRICULAR
RATE||0|BPM||||F<cr>
OBX|24|ST|93226.34^Avg. Heart Rate||73|BPM||||F<cr>
OBX|25|ST|93226.35^Max. Heart Rate||130|BPM||||F<cr>
OBX|26|ST|93226.36^Min. Heart Rate||56|BPM||||F<cr>
OBX|27|TS|93226.37^Max. Heart Rate Time/
Date||19970111114124||||F<cr>
OBX|28|TS|93226.38^Min. Heart Rate Time/
Date||19970110183054||||F<cr>
OBX|29|TX|^Diagnosis Line^CPT4||INTERPRETATION:||||F<cr>
OBX|30|TX|^Diagnosis Line^CPT4||SINUS RHYTHM WITH RATES
BETWEEN 56-120 BPM. AVERAGE RATE 73 BPM.||||F<cr>
OBX|31|TX|^Diagnosis Line^CPT4||OCCASIONAL ISOLATED
PVC'S.||||F<cr>

```



```

OBX|32|TX|^Diagnosis Line^CPT4|VERY RARE ISOLATED
PAC'S.|||||F<cr>
OBX|33|TX|^Diagnosis Line^CPT4|THIS IS DAY 1 OF 72 HOURS OF
RECORDING.|||||F<cr>
OBX|34|TX|^Diagnosis Line^CPT4||||||F<cr>
OBX|35|TX|^Diagnosis Line^CPT4||||||F<cr>
OBX|36|TX|^Diagnosis Line^CPT4|SCANNED BY: C. BUTLER,
C.C.T.|||||F<cr>
OBX|37|TX|^Diagnosis Line^CPT4|HOOK UP: MICHELLE
CRAWFORD|||||F<cr>
OBX|38|TX|^Diagnosis Line^CPT4|LOCATION: OSL5|||||F<cr>
OBX|39|TX|^Diagnosis Line^CPT4|READ BY: PAUL KESSLER, M.D.
(92)|||||F<cr>
OBX|40|TX|^CPT4|INTERPRETATION :|||||F<cr>
OBX|41|TX|^CPT4|SINUS RHYTHM WITH RATES BETWEEN 56-120 BPM.
AVERAGE RATE 73 BPM.|||||F<cr>
OBX|42|TX|^CPT4|OCCASIONAL ISOLATED PVC'S.|||||F<cr>
OBX|43|TX|^CPT4|VERY RARE ISOLATED PAC'S.|||||F<cr>
OBX|44|TX|^CPT4|THIS IS DAY 1 OF 72 HOURS OF
RECORDING.|||||F<cr>
OBX|45|TX|^CPT4|SCANNED BY: C. BUTLER, C.C.T.|||||F<cr>
OBX|46|TX|^CPT4|HOOK UP: MICHELLE CRAWFORD|||||F<cr>
OBX|47|TX|^CPT4|LOCATION: OSL5|||||F<cr>
OBX|48|TX|^CPT4|READ BY: PAUL KESSLER, M.D. (92)|||||F<cr>
OBX|49|TX|^Diagnosis Line^CPT4|INTERPRETATION :~SINUS RHYTHM
WITH RATES BETWEEN 6-120 BPM. AVERAGE RATE 73
BPM.~OCCASIONAL ISOLATED PVC'S.~VERY RARE ISOLATED
PAC'S.~THIS IS DAY 1 OF 72 HOURS OF RECORDING.~ ~ ~SCANNED
BY: C. BUTLER, C.C.T.~HOOK UP: MICHELLE CRAWFORD~LOCATION:
OSL 5~READ BY: PAUL KESSLER, M.D. (92)|||||F<cr>

```

[illegible]

[illegible]

```

OBX|65|NA|93000&WAV^^CPT4|18|15^15^13^11^10^9^6^4^3^2^1^-1^-
1^-1^-3^-4^-4^-3^... UU Encoded Data ...
OBX|66|TS|93000&TIM^^CPT4|19|20010119101357|||||C
OBX|67|CD|93000&CHN^^CPT4|19|18&V1^V1^4883&nV^^500^-
32767&32768|||||C
OBX|68|NA|93000&WAV^^CPT4|19|12^11^11^9^8^7^6^6^5^4^4^4^2^2^2^
2^0^0^0^0^... UU Encoded Data ...
OBX|69|TS|93000&TIM^^CPT4|20|20010119101357|||||C
OBX|70|CD|93000&CHN^^CPT4|20|19&V2^V2^4883&nV^^500^-
32767&32768|||||C
OBX|71|NA|93000&WAV^^CPT4|20|30^29^27^24^20^17^16^14^10^7^7^6^
5^2^2^2^1^... UU Encoded Data ...
OBX|72|TS|93000&TIM^^CPT4|21|20010119101357|||||C
OBX|73|CD|93000&CHN^^CPT4|21|20&V3^V3^4883&nV^^500^-
32767&32768|||||C
OBX|74|NA|93000&WAV^^CPT4|21|49^46^44^40^35^30^26^24^19^15^13^
12^10^8^7^7^4^2^... UU Encoded Data ...
OBX|75|TS|93000&TIM^^CPT4|22|20010119101357|||||C
OBX|76|CD|93000&CHN^^CPT4|22|21&V4^V4^4883&nV^^500^-
32767&32768|||||C
OBX|77|NA|93000&WAV... UU Encoded Data ...
OBX|78|TS|93000&TIM^^CPT4|23|20010119101357|||||C
OBX|79|CD|93000&CHN^^CPT4|23|22&V5^V5^4883&nV^^500^-
32767&32768|||||C
OBX|80|NA|93000&WAV^^CPT4|23|32^30^28^26^22^19^18^16^12^9^8^8^
7^4^4^4^3^2^2^2^2^1^1^... UU Encoded Data ...
OBX|81|TS|93000&TIM^^CPT4|24|20010119101357|||||C
OBX|82|CD|93000&CHN^^CPT4|24|23&V6^V6^4883&nV^^500^-
32767&32768|||||C
OBX|83|NA|93000&WAV^^CPT4|24|27^25^24^22^19^17^15^13^11^9^7^7^
6^5^5^5^4^3^3^3^3^2^... UU Encoded Data ...
OBX|84|TX|^Diagnosis Line^CPT4|Normal sinus rhythm~Normal
ECG~No previous ECGs available|||||C

```

HL7 Waveform Option 2 — Waveform Image Raw Data Points

- MSH-Message Header Segment
- PID-Patient Identification Segment
- {PV1-Patient Visit Segment}
- OBR-Observation Request Segment
- OBX-Observation Result Segment -ST for all measurement data
- OBX-Observation Result Segment -TX for single diagnosis
- OBX-Observation Result Segment -CE for multiple diagnosis
- ZRD-Special GE Raw Data Segment for Rhythm Data (data is UUencoded and must be decoded by the receiving system)
- ZRD-Special GE Raw Data Segment for Median Data (data is UUencoded and must be decoded by the receiving system)

The ZRD segment layout by HL7 field is: 1-Set ID, 2-Waveform Type, 3-Number of Channels, 4-Sample Type, 5-Samples Rate Base, 6-Sample Rate Exponent, 7-Counts per Unit Base, 8-Counts per Unit Exponent, 9-Encoding Method, 10-Start Time, 13-Number of Samples per Lead, 14-Lead Order, 15-High Limit Per Lead, 16-Low Limit per Lead, 17-Number of Encrypted bytes in data ^ Number of Un-encrypted bytes in data ^ UU Encoded Data.

EKG Test Type Raw Data Special Example 1

```
MSH|^~\&|MEI MUSE||HIS
SYSTEM||19971209100538||ORU^R01|19971209100538|P|2.2<cr>
PID|1|000000001|||Picard^John Luc||M|C| |||||12345677<cr>
PV1|1||LVNU^<cr>
OBR|1||93000^ECG^1001|||19970229190449| |||||^^ |||||199712
09100539|||F<cr>
OBX|1|ST|1002.2^Systolic Blood Pressure||mmHG|||F<cr>
OBX|2|ST|1002.3^Diastolic Blood Pressure||mmHG|||F<cr>
OBX|3|ST|93000.2^Ventricular Rate||69|BPM|||F<cr>
OBX|4|ST|93000.3^Atrial Rate||69|BPM|||F<cr>
OBX|5|ST|93000.4^P-R Interval||140|ms|||F<cr>
OBX|6|ST|93000.5^QRS Duration||100|ms|||F<cr>
OBX|7|ST|93000.6^QT||386|ms|||F<cr>
OBX|8|ST|93000.???^QTc||413|ms|||F<cr>
OBX|9|ST|93000.12^P Axis||75|degrees|||F<cr>
OBX|10|ST|93000.13^R Axis||72|degrees|||F<cr>
OBX|11|ST|93000.14^T Axis||72|degrees|||F<cr>
OBX|12|TX|All Diagnosis|Normal sinus rhythm~Normal
ECG|||F<cr>
OBX|13|CE|Coded^^CPT4||22^Normal sinus rhythm|||F<cr>
OBX|14|CE|Coded^^CPT4||1684^Normal ECG|||F<cr>
ZRD|1|Rhythm Data|8|CS|250|0|5|-
6|UU|0~0~0~0~0~0~0~0||2500~2500~2500~2500~2500~2500~2500~2
500|I~II~V1~V2~V3~V4~V5~V6|32768~32768~32768~32768~32768~32
768~32768~32768|-32767~-32767~-32767~-32767~-32767~-32767~-
32767~-32767|70494^56030^... UU Encoded Data ... <cr>
ZRD|2|Median Data|8|CS|250|0|5|-
6|UU|0~0~0~0~0~0~0~0||300~300~300~300~300~300~300~300|I~II
~V1~V2~V3~V4~V5~V6|32768~32768~32768~32768~32768~32768~3276
8~32768|-32767~-32767~-32767~-32767~-32767~-32767~-32767~-
32767|7860^6748^... UU Encoded Data ... <cr>
```

Optional Financial Transaction Messages

If a financial interface is required, the GE HL7 Outbound interface can be optionally configured to send financial transactions. Financial transactions can be accomplished in several ways. Financial on the HIS system, may be based upon real-time Test Result messages from the GE system. Charges on the HIS system may also be performed with the use of real-time billing messages from the GE system. Financial messages may also be batched and sent to the HIS system at scheduled times. Financial messages are an addition to the standard interface that can be purchased if needed. The GE HL7 Interfaces do not produce credits.

Real-time Result messages can be sent when a test is acquired on the GE system as a preliminary result and when at test is completed on the GE system as a final result. The distribution list determines which message types are sent to the HIS for each test type. If the host system includes an order interface, the messages can be configured to include the order requisition number for any result sent to the HIS. The messages can also be configured to include the account number for any result sent to the HIS. When a test is taken, the preliminary results may not contain the correct patient information, account number, or order requisition number, thus the preliminary results may not provide the best option for HIS generated billing. Final results are generally recommended for financial transactions. Please refer to the previous section titled Result Reporting Messages for details.

Optionally, real-time Financial messages can be added to GE's standard outgoing HL7 interface. The distribution list on the GE system is modified to include the format desired for each test type similar to the result reporting configuration. The GE system is also configured to recognize financial transactions are being sent to the HIS. When the GE system is configured for financial messages, it queries the user about re-sending tests that have been previously sent to the HIS. This gives the user the option not to generate another financial message. Should the user choose to generate another financial message, the HIS system must handle duplicate financial messages. The GE system users must have Re-Bill Privilege option activated in order to generate the additional financial message.

The GE HL7 Interface attempts to prevent sending multiple financial transactions, however, duplicate financial messages may still occur. For example, a duplicate financial message will occur when a test is re-edited on the GE system and resent to the HIS as a corrected/revised message per a user request. Therefore, the HIS system must handle duplicate financial messages. Ultimately it is the responsibility of the host system to insure proper charges and credits. The GE HL7 Interface does not generate credits.

Financial Message Composition

Financial messages may contain the following message format. The format of the financial message is configurable.

- MSH-Message Header Segment
- PID-Patient Identification Segment
- FT1-Financial Transaction. This an optional segment only used for ancial transactions; this is not part of the standard Result interface.

Billing Message Example

```
MSH|^~\&|MEI MUSE|HIS  
SYSTEM||19971109105538||CHG^P03|19971109105538|P|2.2<cr>  
PID|1|004433001||Pittafarari^Tony|19560907|M|C|||||39045  
677<cr>  
FT1||||199709231103|CHG|93000|ECG|1||MUSE|||||1^DOE^JOHN|  
34^DORICH^JANE|990099001<cr>
```

NOTE: OBX segments are not allowed on financial transactions.

Application High Level Acknowledgment Messages

The GE Outbound HL7 Interface supports application level message acknowledgments formatted as HL7 original mode acknowledgments. This function allows the receiving application to acknowledge that it has received data and has processed it successfully. The acknowledgment message returned to the sending application is used to determine whether to initiate a resend of the transaction, to abort the transaction, or to continue processing with the next transaction.

The GE interface does not support single characters or ACK/NACK acknowledgement responses.

Implementation of the high level acknowledgment function is configurable. The GE HL7 Interface can be configured to either wait or not to wait for an HL7 Acknowledgment message from the host system after sending a result or financial message.

Application level acknowledgments are not supported by all communication options. Only conversational type protocols, such as TCP/IP sockets, support high level acknowledgments. File transfer protocol (FTP) communications and file copy or mapped drive connections do not support high level acknowledgments.

Acknowledgment Message Composition

Acknowledgment messages contain the following HL7 interface segments:

- MSH-Message Header Segment
- MSA-Message Acknowledgment Segment

HL7 acknowledgment messages may contain one of three statuses from the receiving system: Application Accept (AA), Application Error (AE), or Application Reject (AR). According to the HL7 specification, AE messages are those that contain an error and are not to be retransmitted. AR messages are those that may be retransmitted based on local agreement between all parties involved in the interface implementation.

When an AE message is processed by the GE HL7 interface, the error is logged in the GE system error log and the message is not re-transmitted. When an AR message is processed by the GE HL7 interface, the error is logged in the GE system error log. If the interface is configured to retry on reject acknowledgments, the message is re-transmitted up to a configured number of times. If the interface is not configured to retry on reject acknowledgments, the message is not re-sent.

The GE HL7 Interface expects to match the MSH segment Control ID field that was sent in the result or financial message with the Control ID returned in the MSA segment of the Acknowledgment message.

Acknowledgment Message Examples

Following are samples of the acknowledgment messages: a Normal Acknowledgment, an Error Acknowledgment, and a Reject Acknowledgment message.

Normal Acknowledgment

```
MSH|^~\&|OCF|OCF|MEI MUSE|MEI
      MUSE|19971020091123||ACK|19971020091123|P|2.2<cr>
MSA|AA|19971020091123|HL7 Message Acknowledged by DataGate<cr>
```

Error Acknowledgment

```
MSH|^~\&|OCF|OCF|MEI= MUSE|MEI
      MUSE|19971020091123||ACK|19971020091123|P|2.2<cr>
MSA|AE|19971020091123|Patient ID Not Valid<cr>
```

Reject Acknowledgment

```
MSH|^~\&|OCF|OCF|MEI MUSE|MEI
      MUSE|19971020091123||ACK|19971020091123|P|2.2<cr>
MSA|AR|19971020091123|Patient ID Not Valid<cr>
```

HL7 Sequence Number Protocol

The HL7 sequence number protocol forces the client and the server side of an interface to be synchronized. In the event that a message is lost or the acknowledgment is lost, the protocol allows the message to be resent or not to be resent. This eliminates lost and redundant data transfers.

For more information on GE's implementation of the HL7 Sequence Number Protocol, please refer to Appendix D.

Batch Data Transfer

Outbound Batch files can be set up as an addition to the standard outgoing HL7 interface. Individual result or financial files are generated as described above. At a preset time once each day, the batch message is created by gathering the individual files into a single file and sent to the HIS.

Batch Data Transfer Messages

Batch Data Transfer is an addition to the GE HL7 Outbound Interfaces. Batch Data Transfer can optionally be used for either result or Financial messages. This option includes a management tool for the batch file queue and batch file log entries on the GE system.

At a preset time once each day, the batch message is created by gathering the individual files into a single file. The format of the Batch message content is configurable. Each Result format type or Billing format type will be sent in its own batch file. Only one set of FHS/FTS and/or BHS/BTS segments are sent in a batch file. The GE HL7 Interface does not support multiple FHS/FTS or BHS/BTS segment sets in one batch file.

High level acknowledgment messages can be supported by the GE HL7 Interface for batch messages, but an acknowledgment for each individual message contained within the batch message is not supported.

The batch files are maintained on the GE system for 1 week and may be resent if needed during that time.

Batch Message Composition

Batch Messages have the following format:

- FHS-File Header Segment
- BHS-Batch Header Segment
- Individual HL7 Result Messages (one or more HL7 messages, optionally separated by a user defined field)
- BTS-Batch Trailer Segment
- FTS-File Trailer Segment

Batch Result Message Example

Following is a sample Batch Result message which contains 3 results. Note that the BTS segment in this example includes a count of the number of individual result files (3) that were compiled for this report.

Batch Result File example-contains 3 results

```
FHS|^~\&|MEI MUSE||HOSPITAL ECG||19970710135006||RESULT BATCH<cr>
BHS|^~\&|MEI MUSE||HOSPITAL ECG||19970710135006|||BATCH FREE TEXT<cr>
MSH|^~\&|MEI MUSE||HOSPITAL
ECG||19970710135006||ORU^R01|19970710135006|P|2.2<cr>
PID||589290320||DILLER^JANE||""|F||B|||12345677<cr>
OBR||123456789|93000^12^ LEAD
ECG||199706131408|||199707101349||EC|F|||2345^DOE
^JOHN|""^""^""|""^""^""|2345^DOE^JOHN<cr>
OBX|1|ST|1002.2^Systolic Blood Pressure||""|mmHG|||F<cr>
OBX|2|ST|1002.3^Diastolic Blood Pressure||""|mmHG|||F<cr>
OBX|3|ST|93000.2^Ventricular Rate||68|BPM|||F<cr>
OBX|4|ST|93000.3^Atrial Rate||68|BPM|||F<cr>
OBX|5|ST|93000.4^P-R Interval||180|ms|||F<cr>
OBX|6|ST|93000.5^QRS Duration||68|ms|||F<cr>
OBX|7|ST|93000.6^QT||388|ms|||F<cr>
OBX|8|ST|93000.6&Calc^QTc^L&EKG||413|ms|||F<cr>
OBX|9|ST|93000.12^P Axis||74|degrees|||F<cr>
OBX|10|ST|93000.13^QRS Axis||64|degrees|||F<cr>
OBX|11|ST|93000.14^T Axis||63|degrees|||F<cr>
OBX|12|FT||NORMAL SINUS RHYTHM~END~NORMAL ECG~END~WHEN COMPARED WITH
ECG OF 13-JUN-1997 14:00,~END~NO SIGNIFICANT CHANGE WAS
FOUND|||F<cr>
MSH|^~\&|MEI MUSE||HOSPITAL
ECG||19970710135136||ORU^R01|19970710135136|P|2.2<cr>
PID||589290284||DOE^JOHN||""|M||A|||12345677<cr>
OBR||123456724|93000^12 LEAD
ECG||199706130719|||199707101349||EC|F|||2345^DOE
^JOHN|""^""^""|""^""^""|2345^DOE^JOHN<cr>
OBX|1|ST|1002.2^Systolic Blood Pressure||""|mmHG|||F<cr>
OBX|2|ST|1002.3^Diastolic Blood Pressure||""|mmHG|||F<cr>
OBX|3|ST|93000.2^Ventricular Rate||70|BPM|||F<cr>
OBX|4|ST|93000.3^Atrial Rate||70|BPM|||F<cr>
OBX|5|ST|93000.4^P-R Interval||175|ms|||F<cr>
OBX|6|ST|93000.5^QRS Duration||69|ms|||F<cr>
OBX|7|ST|93000.6^QT||400|ms|||F<cr>
OBX|8|ST|93000.6&Calc^QTc^L&EKG||400|ms|||F<cr>
OBX|9|ST|93000.12^P Axis||70|degrees|||F<cr>
OBX|10|ST|93000.13^QRS Axis||60|degrees|||F<cr>
OBX|11|ST|93000.14^T Axis||60|degrees|||F<cr>
OBX|12|FT||NORMAL SINUS RHYTHM~END~NORMAL ECG|||F<cr>
MSH|^~\&|MEI MUSE||HOSPITAL
ECG||19970710135456||ORU^R01|19970710135456|P|2.2<cr>
PID||589290200||KRUMP^JOE||""|M||C|||12345677<cr>
```

```

OBR|||123456650|93000^12 LEAD
   ECG|||199706131208|||||||199707101349|EC|F|||||2345^DOE
   ^JOHN|""^""^""|""^""^""|2345^DOE^JOHN<cr>
OBX|1|ST|1002.2^Systolic Blood Pressure|""|mmHG||||F<cr>
OBX|2|ST|1002.3^Diastolic Blood Pressure|""|mmHG||||F<cr>
OBX|3|ST|93000.2^Ventricular Rate|65|BPM||||F<cr>
OBX|4|ST|93000.3^Atrial Rate|65|BPM||||F<cr>
OBX|5|ST|93000.4^P-R Interval|185|ms||||F<cr>
OBX|6|ST|93000.5^QRS Duration|72|ms||||F<cr>
OBX|7|ST|93000.6^QT|390|ms||||F<cr>
OBX|8|ST|93000.6&Calc^QTc^L&EKG|420|ms||||F<cr>
OBX|9|ST|93000.12^P Axis|80|degrees||||F<cr>
OBX|10|ST|93000.13^QRS Axis|66|degrees||||F<cr>
OBX|11|ST|93000.14^T Axis|65|degrees||||F<cr>
OBX|12|FT|||NORMAL SINUS RHYTHM~END~NORMAL ECG~END~WHEN COMPARED WITH
   ECG OF 13-JUN-1997 14:00,~END~NO SIGNIFICANT CHANGE WAS
   FOUND||||F<cr>
BTS|3|BATCH FREE TEXT<cr>
FTS|1|RESULT BATCH<cr>

```

Batch Financial Message Example

Following is a sample Batch Financial message which contains 3 results. This message is a compilation of multiple financial messages in a batch format. The FHS, FTS, BHS, and BTS segments are optional parts of the message format. The individual financial messages contained within the Batch Financial Message may optionally be separated by a user defined field. Note that the BTS segment in this example includes a count of the number of individual financial files (3) that were compiled for this report.

Batch Financial File example-contains 3 financial messages

```

FHS|^~\&|MEI MUSE|HOSPITAL ECG|19970710135006|BILLING BATCH<cr>
BHS|^~\&|MEI MUSE|HOSPITAL ECG|19970710135006||BATCH FREE TEXT<cr>
MSH|^~\&|MEI MUSE|HOSPITAL
   ECG|19970710115006|CHG^P03|19970710115006|P|2.2<cr>
PID|1|004433001||PITTAFAARI^TONY|19560907|M|C|||||39045677<cr>
FT1||||19970710114312|CHG|93000|ECG|1||MUSE|||||1^DOE^JOHN|34^DOR
   ICH^JANE|990099001<cr>
MSH|^~\&|MEI MUSE|HOSPITAL
   ECG|19970710105035|CHG^P03|19970710105035|P|2.2<cr>
PID||589290284|DOE^JOHN|""|M|C|||||12345677<cr>
FT1||||19970710090300|CHG|93000|ECG|1||MUSE|||||1^DOE^JOHN|34^DOR
   ICH^JANE|990099001<cr>
MSH|^~\&|MEI MUSE|HOSPITAL
   ECG|19970710085106|ORU^P01|19970710085106|P|2.2<cr>
PID||589290200|KRUMP^JOE|""|M|C|||||12345677<cr>
FT1||||19970710080106|CHG|93000|ECG|1||MUSE|||||1^DOE^JOHN|34^DOR
   ICH^JANE|990099001<cr>
BTS|3|BATCH FREE TEXT<cr>
FTS|1|BILLING BATCH<cr>

```

5 HL7 Query Implementation

For your notes

General Description

Introduction

The HL7 Standard Interface is used to connect a hospital's information system to the GE system for the transfer of data. Using the HL7 interface, the GE system can send HL7 Query messages for ADT data or it can receive HL7 Query messages for a patient's Test Results or List of Tests.

The GE HL7 ADT Query option generates HL7 ADT Query messages to the host system based on test information acquired into the GE system. The host system responds with an admit/discharge/transfer (ADT) acknowledgment message. The GE system processes the ADT information, updating the test information and the GE databases. The HL7 ADT Query message from the GE system must include the patient ID, and optionally the last name, and/or the first name depending on the data contained within the test. At a minimum, the patient ID must be present to generate a query message.

The host systems's query response must include the patient's ID that matches the patient ID from the GE system. Patient ID/name mismatches will be indicated on the MUSE system. The MUSE operator may also be notified if no data is sent from the HIS for the desired patient ID.

The GE HL7 ADT Query option is not supported in a Batch mode.

The GE HL7 Result Query option accepts result query messages from the host system for a specific patient's test results or list of tests. The list of tests or test results on the GE system are transmitted to the host system in a single HL7 message and will only include tests that have been confirmed on the GE system. The Result Query may request all test types or a specific test type for the patient. The date and time range of the Result Query may also be specified. The Result Query minimally requires the patient's patient ID on the GE system. The GE HL7 Result Query option does not support a Batch mode.

Either Query option combines parts of the GE standard Outbound and Inbound HL7 Implementation. This section describes special query components that are additions to the standard interface functionality. Please refer back to previous sections for more details.

Low Level Communications

The implementation of the low level communication protocol does not directly affect the HL7 interface message content and functionality. However, the GE HL7 Query Implementation requires a low level communication protocol which supports high level acknowledgments. At this time, the GE HL7 ADT and Result Query Implementations require the use of TCP/IP sockets communications with high level acknowledgments.

The HL7 interface assumes that the low level communication protocol ensures that the data arrives error free. As a result, no data integrity checking is done at the application level.

Interface Data Content

For HL7 ADT Query messages to and the ADT acknowledgment responses from the host computer system, the individual HL7 data fields are mapped to the GE system data fields according to the configured position in the HL7 segment structures. For HL7 Results Query messages to and the Result acknowledgment responses from the GE system, the individual HL7 data fields are mapped to the GE system data fields according to the configured position in the HL7 segment structures. Data mapping is accomplished through the GE HL7 Interface Configuration programs.

The configuration programs use data tables to determine how to process incoming HL7 messages and how to format outgoing HL7 messages. The configuration programs provide the flexibility to match the HL7 fields and functions specified by a customer to the GE data fields.

The following pages provide the general format of the various HL7 data messages recognized by the GE system for Query interfaces. This section documents only the data fields and segments that are required by the GE system for Queries. More details on the complete inbound and outbound HL7 messaging data fields and segments can be found in previous sections of this document.

For information beyond the GE HL7 Interface implementation, please refer to the Functional Description of HIS Interface for details on the GE system functionality.

NOTE: The GE system message processing follows the HL7 “Immediate” processing rules. It does not support “Deferred” processing.

GE's HL7 Outbound ADT Query Interface

The GE HL7 Interface option for Outbound ADT Query provides the ability for the GE system to query remote systems for Patient Demographic Information (ADT). The Outbound ADT Query is based on the query mechanism described in the Health Level Seven Version 2.2 interface specification.

The GE system provides the mechanism to edit and analyze patient test data, functioning as a long term repository for patient test results. Tests are performed on ancillary GE systems and are later acquired into the main GE system for processing. At this point, the tests are Unconfirmed, which means the results have not been interpreted or over-read by a physician. The patient information contained in the tests must include the patient ID, and optionally the patient last name, and/or patient first name. For systems without an Order interface, this data is entered by the technicians performing the test.

When the test is acquired into the main GE system, it goes through a process called "Normalization". During Normalization, an ADT Query may be generated and sent to the host system. After the test is acquired, a transcriptionist may edit the test to add physician interpretation or to modify patient data. Another Query may occur when the test is edited on the GE system. The ADT information returned from the Query is used to update the patient data in the test.

HL7 Outbound ADT Queries must minimally be based on the patient ID of the GE system as it exists in the test data. If the test does not contain a patient ID, a query is not generated. Additionally, the patient last name and/or first name can be sent in the query message as entered in the test data. Batch is not supported.

When the ADT Query is received, the host system responds immediately with an acknowledgment to the query which also contains the requested ADT information. Once the ADT Query response message enters the GE system, a task executes that parses the message data, creates or alters entries in the MUSE system's ADT patient databases, and updates the test data with the latest ADT information. Users on the GE system may then view the ADT information through the Interface Manager application and will see the updated information in the test data.

GE's System Incoming HL7 Message Configuration Options

The GE HL7 Interface maps the GE query fields to the outgoing ADT query HL7 message segment formats. The mapping is based on known message configurations and is completed with GE's data mapping tables. The flexibility provided by the mapping tables allows the GE HL7 Interface to accommodate differences in HL7 query message composition.

Not all HL7 data fields are supported by the GE HL7 Interface. The HL7 segments and data fields as supported by the GE HL7 Interface are tabulated in the Data Definitions section of this manual.

The following sections describe additions to GE's message configurations for outbound ADT query.

Outbound Query Setup

Query Setup provides the ability to configure HL7 outgoing ADT Query on the GE system. ADT Query can be configured to occur at Normalization, at Edit, or both. The ADT Query can also be configured to check local ADT databases for an ADT entry before querying the host system.

Query Setup, also provides the ability to configure each HL7 segment and field according to the customer specifications. The setup allows the HL7 Segment, Field, Component, Sub-Component, and Repetition value to be defined in placing each piece of data into the HL7 message. This flexibility allows the ADT Query message to be formatted according to the HL7 specification and/or according to specific customer requirements.

The following HL7 event type supports the GE HL7 Interface for ADT Query messages:

A19 ADT Query – This is an optional ADT function for querying the HIS system for ADT information. This is not part of the standard unsolicited ADT interface but can be implemented along with an unsolicited interface. Typical application of implementing both unsolicited and solicited (queried) ADT interfaces would exist if a hospital sends unsolicited ADT transmissions for inpatients but not for outpatients. Outpatient information may be received via the query.

ADT Query Message from the GE System

The GE system generates ADT Query messages to the host system. The HIS sends ADT acknowledgments to the GE HL7 Interface. The HL7 ADT Query acknowledgments are used to transmit ADT information from the hospital's ADT system to the GE system. Once the messages enter the GE system, a task executes that parses the message data and creates or alters entries in GE's ADT patient databases and in the test data. Users on the GE system may then view the information in the ADT database.

ADT Query Message Composition

ADT Query Messages from the GE system have the following format:

- MSH-Message Header Segment
- QRD-Query Definition Segment
- [QRF-Query Filter Segment]

ADT Query Message Example

Following is a sample ADT Query message:

ADT Query

```
MSH|^~\&|MEI MUSE||HIS  
SYSTEM||19970123191222||QRY^Q01|19970123191222|P|2.1<cr>  
QRD|19970123191222|R|I|||1^RD|000626465^POST^WILLIAM|DEM<cr>  
QRF|MUSE<cr>
```

ADT Query Response Message Composition

ADT Query Message responses from the host system have the following format:

- MSH-Message Header Segment
- MSA-Message Acknowledgment Segment
- QRD-Query Definition Segment
- [QRF-Query Filter Segment]
- [EVN-Event Segment]
- PID-Patient Identification Segment
- [PV1-Patient Visit Segment]

ADT Query Response Example

Following is a sample ADT Query response:

ADT Query Response

```
MSH|^~\&|HIS SYSTEM FORM|MEI
MUSE||199701271245||ADT^A19|19970123191222|P|2.1|<cr>
MSA|AA|19970123191222|<cr>
QRD|19970123191222|R|I|||1^RD|000626465^POST^WILLIAM|DEM<cr>
EVN|A19|19971020|||<cr>
PID||4477010||KONTUS^POCA|headache and
nausea|19591208|F|C|||||00350013556<cr>
PV1||I|BIU^G432A|A||180513^CARPENTER1^CHARLES
W|||||||000000121217|||||||199601051
405<cr>
```

Please refer to the section on ADT messages for further detail about the ADT message composition and configuration options.

GE's HL7 Inbound Result Query Interface

The GE HL7 Interface option for Inbound Result Query provides the ability for the HIS system to query the GE system for Patient Test Results or List of Tests. The Inbound Result Query is based on the query mechanism described in the Health Level Seven Version 2.2 interface specification.

The GE system is a long term repository for cardiology patient test results. Tests are reviewed by an over-reading physician and edited by a transcriptionist before they are Confirmed. Once Confirmed, they are available for a Result Query from the HIS.

HL7 Inbound Result Queries must minimally be based on the patient ID used on the GE system in the test data and the GE system site for the patient. Additionally, the patient last name and/or first name can be sent in the query message from the host system. The Result Query is limited to one query per message, record oriented original mode queries. The response to the Result Query will only include confirmed tests on the GE system. Batch is not supported.

When the Result Query is received, the GE system searches the patient's database, based on patient ID, for the requested information and responds immediately with an acknowledgment to the query. The acknowledgment contains the requested Test Results or Test List information. The host system uses the results of the query as needed.

GE's System Incoming HL7 Result Query Message Configuration Options

The GE HL7 Interface maps the HIS Result Query fields as needed to search for a patient's test results or a list of tests. The mapping is based on known message configurations and is completed with GE's data mapping tables. The flexibility provided by the mapping tables allows the GE HL7 Interface to accommodate differences in HL7 query message composition without requiring custom interface changes.

Not all HL7 data fields are supported by the GE HL7 Interface. The HL7 segments and data fields as supported by the GE HL7 Interface are tabulated in the Data Definitions section of this manual.

The following sections describe additions to GE's message configurations for inbound Result Query. The standard GE outbound HL7 interface details are described in the previous section titled "HL7 Inbound Implementation" and are applicable to inbound Result Query as well. Please refer to this section for further details.

Inbound Query Setup

Query Setup provides the ability to configure HL7 Result Query response messages on the GE system. Three different HL7 result report formats can be setup for each of the GE system test types.

Within the Query Setup, each HL7 segment and field is individually configured according to the customer specifications. The setup allows the HL7 Segment, Field, Component, Sub-Component, and Repetition value to be defined in placing each piece of data into the HL7 message. This flexibility allows the result and billing messages to be formatted according to the HL7 specification or according to specific customer requirements.

The following HL7 event type supports the GE HL7 Interface for Result Query messages:

QRY^Q01-Result Query – This is an optional Result function for querying the GE system for Result information. This is not part of the standard Result interface. This function type is used in the Result Query message from the host system.

In addition to the standard functions included with the HL7 Result Interface, the following query functions are provided:

QUERY (FIRSTNAME, LASTNAME, PID) – Three different functions used in formatting the HL7 Query Result messages to include the Query Patient Last name, First name, and or Patient Identification number.

The GE Result Query option is capable of supporting the following Result Query parameters in the Query message:

What Subject Filter – PRO or RES. Describes the kind of information that is required to satisfy the query. The GE system responds to two filters. The GE query response returns a list of test(s) for the PRO (procedure) query filter or test result(s) for the RES (result) query filter.

Date/Time Selection Qualifier – 1ST, LST, ALL, REV. In addition to the high and low date/time ranges requested in the Query message, certain types of values can also be specified. 1ST results in a test list or test result for the first test found in the query criteria range. LST results in a test list or test result for the last test found meeting the query criteria range. ALL results in test lists or test results for ALL tests found within the query criteria range. REV results in test lists or test results for ALL tests found within the query criteria range in reverse chronological order.

Test Type – ALL, EKG, HOLTER, etc. The Test Type is configured with a mapping table on the GE system. ALL results in test lists or test results for all tests types. EKG results in test lists or test results for EKG tests, HOLTER results in test lists or test results for holter results, etc.

Result Query Message from the Host System

The host system generates Result Query messages to the GE system. Once the messages enter the GE system, a task executes that parses the message data and searches the patient databases for the requested patient test results or list of tests. The GE system formats the results of the search into a Result Query acknowledgment to the host system which includes the results of the search. The host system may then use the results as needed.

Result Query Message Composition

Result Query Messages from the host system have the following format:

- MSH-Message Header Segment
- QRD-Query Definition Segment
- QRF-Query Filter Segment

Result Query Message Example

Following are sample Result Query messages:

Result Query for Test Results

```
MSH|^~\&|||MUSESITE3||19970612132859||QRY^Q01||P|2.2|<cr>
QRD|199705140943|R|I|Q4477|||10|RD|111333555|RES<cr>
QRF||199607091500|199607091510|||<cr>
```

Result Query for Test List

```
MSH|^~\&|||MUSESITE3||19970612132859||QRY^Q01||P|2.2|<cr>
QRD|199705140943|R|I|Q4412|||10|RD|111333555|PRO<cr>
QRF||199607091500|199607091510|||<cr>
```

Result Query Response Message Composition for Test Results

Result Query message responses are configurable through the interface setup tables. One example of a Result Query Message response for Test Results from the GE system has the following format:

MSH – Message Header Segment

MSA – Message Acknowledgment Segment

QRD – Query Definition Segment

QRF – Query Filter Segment

PID – Patient Identification Segment

[PV1-Patient Visit Segment]

OBR – Observation Request Segment

OBX – Observation Result Segment -ST- (Measurement 1)

OBX – Observation Result Segment -ST- (Measurement 2)

OBX – Observation Result Segment- ST- (Measurement n)

OBX – Observation Result Segment- TX- (All Diagnosis Lines)

OBX – Observation Result Segment- CE or TX- (Diagnosis Line 1, formatted)

OBX – Observation Result Segment - CE or TX- (Diagnosis Line 2, formatted)

OBX – Observation Result Segment- CE or TX- (Diagnosis Line n, formatted)}

Note the repeating section includes PID, PV1, OBR, and OBX segments for each result fitting the query parameters.

Result Query Response Example for Test Results

Following is a sample Result Query response for Test Results:

Result Query Response for Test Results

```
MSH|^~\&|MUSESITE3|||199706121328||ACK|19970612132859|P|2.2|<
  cr>
MSA|AA|199705140943|<cr>
QRD|199705140943|R|I|Q4477|||10|RD|111333555|RES<cr>
QRF||199607091500|199607091510|||<cr>
PID|1||111333555|RESTING^ECG|||000000123<cr>
PV1|1||TEST ^|||^<cr>
OBR|1||93000^1||19960709150400|||199706121328
  48||C|||DOE^JOHN^<cr>
OBX|1|ST|1002.2^Systolic Blood Pressure||mmHG|||C<cr>
OBX|2|ST|1002.3^Diastolic Blood Pressure||mmHG|||C<cr>
OBX|3|ST|93000.2^Ventricular Rate|68|BPM|||C<cr>
OBX|4|ST|93000.3^Atrial Rate|68|BPM|||C<cr>
OBX|5|ST|93000.4^P-R Interval|142|ms|||C<cr>
OBX|6|ST|93000.5^QRS Duration|67|ms|||C<cr>
OBX|7|ST|93000.6^QT|400|ms|||C<cr>
OBX|8|ST|93000.??^QTc|425|ms|||C<cr>
OBX|9|ST|93000.12^P Axis|69|degrees|||C<cr>
OBX|10|ST|93000.13^R Axis|63|degrees|||C<cr>
OBX|11|ST|93000.14^T Axis|62|degrees|||C<cr>
OBX|12|TX|^Diagnosis Line^CPT4|NORMAL SINUS RHYTHM~NORMAL
  ECG|||C<cr>
OBX|13|CE|^CPT4|22^NORMAL SINUS RHYTHM|||C<cr>
OBX|14|CE|^CPT4|1684^NORMAL ECG|||C<cr>
PID|1||111333555|RESTING^ECG|||000000124<cr>
PV1|1||TEST ^|||^<cr>
OBR|1||93000^1||19960709145400|||199706121328
  48||C|||DOE^JOHN^<cr>
OBX|1|ST|1002.2^Systolic Blood Pressure||mmHG|||C<cr>
OBX|2|ST|1002.3^Diastolic Blood Pressure||mmHG|||C<cr>
... Results Continue...
PID|1||111333555|RESTING^ECG|||000000125<cr>
PV1|1||TEST ^|||^<cr>
OBR|1||93000^1||19960709144400|||199706121328
  49||C|||DOE^JOHN^<cr>
OBX|1|ST|1002.2^Systolic Blood Pressure||mmHG|||C<cr>
OBX|2|ST|1002.3^Diastolic Blood Pressure||mmHG|||C<cr>
... Results Continue ...
```



```

PID|1||111333555|RESTING^ECG|||||||000000124<cr>
PV1|1|TEST ^||||^<cr>
OBR|1||93000^1||19960709143400||||||^|199706121328
50||C|||||DOE^JOHN^<cr>
OBX|1|ST|1002.2^Systolic Blood Pressure||mmHG||||C<cr>
OBX|2|ST|1002.3^Diastolic Blood Pressure||mmHG||||C<cr>
... Results Continue ...
PID|1||111333555|RESTING^ECG|||||||000000123<cr>
PV1|1|TEST ^||||^<cr>
OBR|1||93000^1||19960709142400||||||^|199706121328
51||C|||||DOE^JOHN^<cr>
OBX|1|ST|1002.2^Systolic Blood Pressure||mmHG||||C<cr>
OBX|2|ST|1002.3^Diastolic Blood Pressure||mmHG||||C<cr>
... Results Continue ...
PID|1||111333555|RESTING^ECG|||||||000000125<cr>
PV1|1|TEST ^||||^<cr>
OBR|1||93000^1||19960709131300||||||^|199706121328
59||C|||||DOE^JOHN^<cr>
OBX|1|ST|1002.2^Systolic Blood Pressure||mmHG||||C<cr>
OBX|2|ST|1002.3^Diastolic Blood Pressure||mmHG||||C<cr>
OBX|3|ST|93000.2^Ventricular Rate|68BPM||||C<cr>
OBX|4|ST|93000.3^Atrial Rate|68BPM||||C<cr>
OBX|5|ST|93000.4^P-R Interval|142ms||||C<cr>
OBX|6|ST|93000.5^QRS Duration|67ms||||C<cr>
OBX|7|ST|93000.6^QT|400ms||||C<cr>
OBX|8|ST|93000.??^QTc|425ms||||C<cr>
OBX|9|ST|93000.12^P Axis|71degrees||||C<cr>
OBX|10|ST|93000.13^R Axis|63degrees||||C<cr>
OBX|11|ST|93000.14^T Axis|63degrees||||C<cr>
OBX|12|TX|^Diagnosis Line^CPT4|NORMAL SINUS RHYTHM~NORMAL
ECG||||C<cr>
OBX|13|CE|^CPT4|22^NORMAL SINUS RHYTHM||||C<cr>
OBX|14|CE|^CPT4|1684^NORMAL ECG||||C<cr>

```

Result Query Response Message Composition for Test List

Result Query message responses are configurable through the interface setup tables. An example of a Result Query Message response for test lists from the GE system has the following format:

MSH – Message Header Segment

MSA – Message Acknowledgment Segment

QRD – Query Definition Segment

QRF – Query Filter Segment

PID – Patient Identification Segment

[PV1] – Patient Visit Segment

OBR – Observation Request Segment}

Note the repeating section includes PID, PV1, and OBR segments for each test in the list fitting the query parameters.

Result Query Response Example for Test List

Following is a sample Result Query response for Test List:

Result Query Response for Test List

```

MSH|^~\&|MUSESITE3|||199706121328||ACK|19970612132859|P|2.2|<
cr>
MSA|AA|199705140943|<cr>
QRD|199705140943|R|I|Q4412|||10|RD|111333555|PRO<cr>
QRF||199607091500|199607091510|||<cr>
PID|1||111333555|RESTING^ECG|||000000121<cr>
PV1|1|TEST ^|||^^<cr>
OBR|1||93000^^1||19960709150400|||^^|199706121328
48||C|||DOE^JOHN^<cr>
PID|1||111333555|RESTING^ECG|||000000122<cr>
PV1|1|TEST ^|||^^<cr>
OBR|1||93000^^1||19960709145400|||^^|199706121328
48||C|||DOE^JOHN^<cr>
PID|1||111333555|RESTING^ECG|||000000123<cr>
PV1|1|TEST ^|||^^<cr>
OBR|1||93000^^1||19960709144400|||^^|199706121328
49||C|||DOE^JOHN^<cr>
PID|1||111333555|RESTING^ECG|||000000129<cr>
PV1|1|TEST ^|||^^<cr>
OBR|1||93000^^1||19960709143400|||^^|199706121328
50||C|||DOE^JOHN^<cr>
PID|1||111333555|RESTING^ECG|||000000120<cr>
PV1|1|TEST ^|||^^<cr>
OBR|1||93000^^1||19960709142400|||^^|199706121328
51||C|||DOE^JOHN^<cr>
PID|1||111333555|RESTING^ECG|||000000100<cr>
PV1|1|TEST ^|||^^<cr>
OBR|1||93000^^1||19960709141400|||^^|199706121328
51||C|||DOE^JOHN^<cr>

```

6 GE System Data Fields

For your notes

System Data Field Definitions

The GE system uses separate databases to store the patient demographic, account, and order information. Following are the definitions for the various database fields that are maintained on the GE system.

ADT Database Fields

Table 6-1. GE System ADT Database Fields		
ADT DATABASE - holds Patient Demographic information		
Type	Description	Len.
patient	Patient Identifier, unique alpha-numeric value	16
name	Patient first and last name	16 last, 10 first
OtherName	Other Patient Name (text string)	63
SSN	Social Security Number	19
age	Patient Age	n/a
age_units	Years or Months	n/a
DangerCode	Danger Code	16
dob	Date of Birth	n/a
gender	Patient Gender, mapped from HIS ADT message	n/a
race	Patient Race, mapped from HIS ADT message	n/a
height	Inches or centimeters	n/a
weight	pounds or kilograms	n/a
altpatient	Alternate Patient Identifier	16
PriorAltpatient	Prior Alternate Patient Identifier	16
PriorPID	Prior Patient Identifier	16
Extra ADT data1	Additional textual information field	32
Extra ADT data2	Additional textual information field	32
Extra ADT data3	Additional textual information field	32
Extra ADT data4	Additional textual information field	32
PhoneNumber1	Patient's First Phone Number	32
PhoneNumber2	Patient's Second Phone Number	32
MailAddress1	First Line of Mailing Address	32
MailAddress2	Second Line of Mailing Address	32

Table 6-1. GE System ADT Database Fields		
ADT DATABASE - holds Patient Demographic information		
MailAddress3	Third Line of Mailing Address	32
City	City	23
State	State	15
Country	Country	15
Zipcode	Zipcode	11

Account Database Fields

Table 6-2. GE System Account Database Fields		
ACCOUNT Database Layout - holds patient visit information		
Name	Description	Len.
patient	Patient Identifier, unique alpha-numeric value	16
HISAccountNum	HIS Account Number, must be unique for the patient	19
AltVisitNum	Alternate Visit/Account Identifier	19
HISDisposition	Patient Disposition/Patient Class text from HIS System	19
AdmitSource	Admitting Source from HIS System	32
AdmitDate	Date patient admit occurred/is scheduled	n/a
AdmitTime	Time patient admit occurred/is scheduled	n/a
DischargeDate	Date patient discharge occurred/is scheduled	n/a
DischargeTime	Time patient discharge occurred/is scheduled	n/a
location	MUSE Location abbreviation, mapped from HIS location	6
HIS_location	Patient Location as received from HIS System	20
room_id	Patient's room number	5
bed	Patient's Bed	12
PrimaryDiagnosis	Primary Diagnosis Code	15
SecondaryDiagnosis	Secondary Diagnosis Code	15
TertiaryDiagnosis	Tertiary Diagnosis Code	15
OtherDiagnosis	Other Diagnosis Code	15
AdmitDiagnosis	Admitting Diagnosis Text	80
CurrentDiagnosis	Current Diagnosis Text	80
DischargeDisp	Discharge Disposition (discharged to home, expired)	32
admitting_md_name	Admitting physician first and last name	16 last, 10 first
referring_md_name	Referring physician first and last name	16 last, 10 first
attending_md_name	Attending physician first and last name	16 last, 10 first
consulting_md_name	Consulting physician first and last name	16 last, 10 first
HIS_consulting_md_id	HIS System ID of Consulting physician, alpha-numeric value	32
HIS_admitting_md_id	HIS System ID of Admitting physician, alpha-numeric value	32
HIS_referring_md_id	HIS System ID of Referring physician, alpha-numeric value	32

Table 6-2. GE System Account Database Fields		
ACCOUNT Database Layout - holds patient visit information		
HIS_attending_md_id	HIS System ID of Attending physician, alpha-numeric value	32
HospitalService	Hospital Service expected for this account	19
AmbulatoryStatus	Ambulatory Status of patient	15
AcctStatus	Account Status (Open,Closed) value mapped from ADT message	n/a
ServiceFacility	Facility where service is being performed	16
AdmissionType	Admission Type (ER, Accident, L&D, Routine)	19
PriorAccountNumber	Prior HIS Account Number	19
Extra Data Field 1	Additional textual information field	32
Extra Data Field 2	Additional textual information field	32
Extra Data Field 3	Additional textual information field	32
Extra Data Field 4	Additional textual information field	32

Order Database Fields

Table 6-3. GE System Order Database Fields Table		
Order Database -Information for an order for a test occurrence		
Type	Description	Len.
patient	Patient ID, unique alpha-numeric value	16
req_num	Requisition Number for test, alpha-numeric value	9
altreq_num	Alternate Requisition Number, alpha-numeric value	32
order_num	Order Number, alpha-numeric value	9
HISAccountNum	HIS Account Number, alpha-numeric value	19
system_id	HIS System Identifier	17
order_time	Time the order is scheduled for test to be taken	n/a
exp_time	Time the order will expire on the MUSE system	n/a
ord_place_date	Date the order was placed on the HIS system	n/a
ord_place_time	Time the order was placed on the HIS system	n/a
status	Order Status, value mapped from order message	n/a
ordering_md_name	Ordering physician first and last name	16 last, 10 first
HIS_ordering_md_id	HIS System ID of ordering physician, alpha-numeric value	32
test_type	Type of Test (textual)	32
placers_his_id	HIS System ID of person who placed the order	32
placers_name	First and last name of person who placed the order on HIS system	16 last, 10 first
test_reason	Reason for Test (textual)	80
comments	Ordering Comments (textual)	80
episode	Episode/Occurance of the order	5
priority	Scheduled priority for order (STAT, Routine,...)	32
Extra Question1	Additional information in the form of question and answer	17
Extra Question2	Additional information in the form of question and answer	17
Extra Question3	Additional information in the form of question and answer	17
Extra Question4	Additional information in the form of question and answer	17
Extra Data Field 1	Additional textual information field	32
Extra Data Field 2	Additional textual information field	32

Table 6-3. GE System Order Database Fields Table		
Order Database -Information for an order for a test occurrence		
Extra Data Field 3	Additional textual information field	32
Extra Data Field 4	Additional textual information field	32

7 HL7 Data Segment Definitions

For your notes

Data Segment Definitions

Following are the definitions for the various data segments. The tables are shown with the standard HL7 message layout. With the GE HL7 Interface configuration programs, the data tables on the GE system can be used to support most cases of customer specific changes to the HL7 standard. For example, a customer that uses the PID segment field 2 for Patient ID versus field 3 in ADT messages could easily be accommodated with the configuration program mapping tables.

In some cases, the GE HL7 Interface Support/Req. may differ from the indication listed in the tables below depending upon the message type and/or interface combinations. This occurs because the GE system uses separate databases for the ADT, account, and order information. The PV1 segment is common to ADT and order messages, but some data that it contains will only be applicable from certain message types. Please refer to the footnotes for such cases.

NOTE: The lengths given for fields are the maximum lengths supported by the GE system, not the HL7 definitions for field lengths. When the GE HL7 Interface Support column indicates N, the data may be optionally sent in the message but it will be ignored by the GE HL7 Interface.

MSH – Message Header Segment

Table 1. Message Header Segment (MSH)

Seq	HL7 Item #	GE system Length	Data Type	GE system Support/Req. Field	Element Name
1	00001	1	ST	Y/R	Field Separator
2	00002	4	ST	Y/R	Encoding Characters
3	00003	15	ST	Y	Sending Application ¹
4	00004	20	ST	Y	Sending Facility
5	00005	15	ST	Y	Receiving Application ²
6	00006	20	ST	Y	Receiving Facility ³
7	00007	14	TS	Y	Date/Time of Message
8	00008			N	Security
9	00009	7	CM	Y/R	Message Type
10	00010	20	ST	Y/R	Message Control ID ⁴
11	00011	1	ID	Y	Processing ID ⁵
12	00012	8	ID	Y/R	Version ID
13	00013	15	NM	O ⁶	Sequence Number
14	00014	14	ST	O ⁷	Continuation Pointer
15	00015			N	Accept Acknowledgment type
16	00016			N	Application Acknowledgment type
17	00017			N	Country Code

1. The Sending Application Field value is dependent on the message originator.
2. The Receiving Application Field value is dependent on the message originator.
3. The Receiving Facility Field may be used to designate different sites on the GE system.
4. The format of the Message Control ID is determined by the originating application. The receiving system must be able to accept transactions regardless of the format of this field, and must return the Control ID in its original format. This field is not required when high level acknowledgments are not used.
5. If this field is not present, the interface will treat the message as "P" for production.
6. Used in inbound and outbound messages for Sequence Protocol Communications option. Please refer to the HL7 manual Sequence Number Protocol section and Appendix D of this manual for details.
7. Used in outbound messages only for Message Continuation option. Please refer to Appendix C of this manual for details. The GE system uses a unique HL7 Date/Time stamp for the Continuation Pointer value.

MSA – Message Acknowledgment Segment

Table 2. Message Acknowledgment Segment (MSA)

Seq	HL7 Item #	GE system Length	Data Type	GE system Support/Req. Field	Element Name
1	00002	2	ID	Y/R	Acknowledgment Code
2	00003	20	ST	Y/R	Message Control ID ¹
3	00004	80	ST	Y	Text Message
4	00598	15	NM	O ²	Expected Sequence Number
5	00632	1	ID	O ²	Delayed Acknowledgment Type
6	00632			N	Error Condition

1. The Message Control ID for the Acknowledgment must match the Control ID for the message being acknowledged.
2. Please refer to the HL7 manual Sequence Number Protocol section and Appendix D of this manual for details.

PID – Patient Identification Segment

Table 3. Patient Identification Segment (PID)

Seq	HL7 Item #	GE system Length	Data Type	GE system Support/Req. Field	Element Name
1	00104			N	Set ID-Patient ID
2	00105			N	Patient ID (External)
3	00106	16	ST	Y/R	Patient ID (Internal)
4	00107	16	ST	Y	Alternate Patient ID ¹
5	00108	26 ²	PN	Y/R	Patient Name
6	00109			N	Mother's Maiden Name
7	00110	8	DT	Y	Date of Birth
8	00111	1	ID	Y	Sex
9	00112			N	Patient Alias
10	00113	Table 7-22	ID	Y	Race
11	00114	Table 7-27	AD	Y	Patient Address
12	00115			N	County Code
13	00116	32	TN	Y	Phone Number-Home
14	00117	32	TN	Y	Phone Number-Business
15	00118			N	Language-Patient
16	00119			N	Marital Status
17	00120			N	Religion
18	00121	19	ST	Y	Patient Account Number
19	00122	19	ST	Y	SSN Number-Patient
20	00123			N	Drivers Lic. Num.-Patient
21	00124			N	Mother's Identifier
22	00125			N	Ethnic Group
23	00126			N	Birth Place
24	00127			N	Multiple Birth Identifier
25	00128			N	Birth Order
26	00129			N	Citizenship
27	00130			N	Veterans Military Status

1. Only one Alternate ID can be stored per patient.

2. See the Functional Description of HIS Interface for a description of how the GE system processes and stores name fields. The GE system is limited to First name 10 characters, Last name 16 characters.

PV1 – Patient Visit Segment

Table 4. Patient Visit Segment (PV1)

Seq	HL7 Item #	GE system Length	Data Type	GE system Support/Req. Field	Element Name
1	00131			N	Set ID-Patient Visit
2	00132	19	ST	Y	Patient Class ¹
3	00133	Table 7-24	CM	Y ²	Patient Location
4	00134	19	ID	Y	Admission Type
5	00135			N	Pre-Admit Number
6	00136			N	Prior Patient Location
7	00137	Table 7-23	CN	Y	Attending Physician ³
8	00138	Table 7-23	CN	Y	Referring Physician ³
9	00139	Table 7-23	CN	Y	Consulting Physician ³
10	00140	16	ID	Y	Hospital Service
11	00141			N	Temporary Location
12	00142			N	Pre-Admit Test Indicator
13	00143			N	Re-Admission Test Indicator
14	00144	32	ST	Y	Admit Source
15	00145	15	ST	Y	Ambulatory Status
16	00146			N	VIP Indicator
17	00147	Table 7-23	CN	Y	Admitting Doctor ³
18	00148			N	Patient Type
19	00148	19	NM	Y	Visit Number
20	00150			N	Financial Class
21	00151			N	Charge Price Indicator
22	00152			N	Courtesy Code
23	00153			N	Credit Rating
24	00154			N	Contract Code
25	00155			N	Contract Effective Date
26	00156			N	Contract Amount
27	00157			N	Contract Period
28	00158			N	Interest Code
29	00159			N	Transfer to Bad Debt Code
30	00160			N	Transfer to Bad Debt Date
31	00161			N	Bad Debt Agency Code
32	00162			N	Bad Debt Transfer Amount
33	00163			N	Bad Debt Recovery Amount

Seq	HL7 Item #	GE system Length	Data Type	GE system Support/Req. Field	Element Name
34	00164	32	ID	N	Delete Account Indicator
35	00165			N	Delete Account Date
36	00166			Y	Discharge Disposition
37	00167			N	Discharged to Location
38	00168			N	Diet Type
39	00169	16	ID	Y	Servicing Facility
40	00170			N	Bed Status
41	00171			N	Account Status
42	00172			N	Pending Location
43	00173			N	Prior Temporary Location
44	00174	14	TS	Y	Admit Date/Time
45	00175	14	TS	Y	Discharge Date/Time
46	00176			N	Current Patient Balance
47	00177			N	Total Charges
48	00178			N	Total Adjustments
49	00179			N	Total Payments
50	00180			N	Alternate Visit ID

1. Patient Class is configured in a mapping table on the GE system based on customer definitions. The Patient Class is used on the GE system to set the expiration time for patient ADT information.
2. Patient Location from the Host system maps to GE system Location, Room, and Bed Fields. Values for the host Nursing Station portion of the field MUST be mapped to one of the 599 possible GE system Locations. In results, the location returned is the GE system location indicating where the test was taken.
3. See the Functional Description of HIS Interface for details on how the GE system processes physicians.

EVN – Event Type Segment

Table 5. Event Type Segment (EVN)

Seq	HL7 Item #	GE system Length	Data Type	GE system Support/Req. Field	Element Name
1	00099	3	ID	Y/R	Event Type Code
2	00100			N	Date/Time of Event
3	00101			N	Date/Time of Planned Event
4	00102			N	Event Reason Code
5	00103			N	Operator ID

MRG – Merge Patient Information Segment

Table 6. Merge Patient Information Segment

Seq	HL7 Item #	GE system Length	Data Type	GE system Support/Req. Field	Element Name
1	00211	16	CM	Y/R	Prior Patient ID
2	00212	16	ST	Y/O ¹	Prior Alternate Patient ID
3	00213	19	ST	Y/O ²	Prior Patient Account Number
4	00214			N	Prior Patient ID-External

1. Use of the Prior Alternate Patient ID is dependent upon the type of Merge message. Please refer to the Inbound HL7 Interface section for details on Merge functions.
2. Use of the Prior Alternate Patient Account number is dependent upon the type of Merge message. Please refer to the Inbound HL7 Interface section for details on Merge functions.

ORC – Common Order Segment

Table 7. Common Order Segment (ORC)

Seq	HL7 Item #	GE system Length	Data Type	GE system Support/Req. Field	Element Name
1	00215	2	ST	Y/R	Order Control
2	00216	9	ST	Y/R	Placer Order Number ¹
3	00217			N	Fillers Order Number ¹
4	00218			N	Placer Group Number
5	00219			N	Order Status
6	00220			N	Response Flag
7	00221	Table 7-28	CM	Y	Quantity / Timing ^{2 3}
8	00222			N	Parent
9	00223	14	TS	Y	Date/Time of Transaction
10	00224	Table 7-23	CN	Y	Entered by
11	00225			N	Verified By
12	00226	Table 7-23	CN	Y	Ordering Provider ⁴
13	00227			N	Enterer's Location
14	00228			N	Call Back Phone Number
15	00229			N	Order Effective Date/Time
16	00230			N	Order Control Code Reason
17	00231			N	Entering Organization
18	00232			N	Entering Device
19	00233			N	Action By

1. The GE system order interface requires that a 9 character order requisition number, generated by the Hospital Information System (HIS), be placed in either the Placers Order # field or the Fillers Order # field. Which field it is placed in is configurable. Depending on system configuration, the requisition number may be required to be unique across all orders.
2. Quantity is not supported by the GE system order interface. One order message equates to one order requisition number and one test. Note that this field may be used to set the requested test time, the priority of the test, and the requested expiration time on the GE system. When the expiration time is reached, the order is deleted from the GE system order interface.
3. This field is the same as field 27 of the OBR segment.
4. See the Functional Description of HIS Interface for details on how the GE system processes physicians.

OBR – Observation Request Segment (From Host)

Table 8. Observation Request Segment (From Host) (OBR)

Seq	HL7 Item #	GE system Length	Data Type	GE system Support/Req. Field	Element Name
1	00237	9	ST	N	Set ID-Observation Request
2	00216			Y/R	Placer Order Number ¹
3	00217			N	Filler Order Number ¹
4	00238	32	CE	Y/R	Universal Service ID (Test Type) ²
5	00239	16	CE	N ³	Priority
6	00240			N ⁴	Requested Date/Time
7	00241			N	Observation Date/Time
8	00242			N	Observation End Date/Time
9	00243			N	Collection Volume
10	00244			N	Collection Identifier
11	00245			N	Specimen Action Code
12	00246			Y	Danger Code
13	00247			N	Relevant Clinical Information
14	00248			N	Specimen Received Date/Time
15	00249			N	Specimen Source
16	00226			Y	Ordering Provider ⁵
17	00250			N	Order Call-back Phone Number
18	00251			N	Placers Field 1
19	00252			N	Placers Field 2
20	00253			N	Fillers Field 1
21	00254			N	Fillers Field 2
22	00255	Table 7-23	CN	N	Results Rpt/Status Chg Date/Time
23	00256			N	Charge to Practice
24	00257			N	Diagnostic Service Section ID
25	00258			N	Result Status
26	00259			N	Parent Result
27	00221			Y	Quantity/Timing ^{6 7}
28	00260			N	Result Copies To
29	00261			N	Parent Number
30	00262			N	Transportation Mode

Seq	HL7 Item #	GE system Length	Data Type	GE system Support/Req. Field	Element Name
31	00263			N	Reason For Study
32	00264			N	Principle Result Interpreter
33	00265			N	Assistant Result Interpreter
34	00266			N	Technician
35	00267			N	Transcriptionist
36	00268			N	Scheduled Date/Time

1. 26 The order number is required for an order interface, but it is configurable as to the field it is placed in. The GE system order interface does not create order numbers.
2. The Universal Svc ID contains the coded test type information from the Host. This is used to map the HIS test type to the GE system test type.
3. This field is not used in HL7 2.2. Information is now carried in the Timing/Quantity field 7 component 6 of the ORC segment or field 27 component 6 of the OBR segment.
4. This field is not used in HL7 2.2. Information is now carried in the Timing/Quantity field 7 component 4 of the ORC segment or field 27 component 4 of the OBR segment.
5. This field is the same as the Ordering Provider field 12 of the ORC segment.
6. Quantity is not supported by the GE system order interface. One order message equates to one order requisition number and one test. Note that this field may be used to set the requested test time, the priority of the test, and the requested expiration time on the GE system. When the expiration time is reached, the order is deleted from the GE system order interface.
7. This field is the same as field 7 of the ORC segment.

OBR – Observation Request Segment (To Host)

Table 9. Observation Request Segment (To Host) (OBR)

Seq	HL7 Item #	GE system Length	Data Type	GE system Support ¹	Element Name
1	00237			N	Set ID-Observation Request
2	00216			N	Placers Order Number ²
3	00217	9	ST	Y/O	Fillers Order Number ²
4	00238	32	CE	Y	Universal Service ID (Test Type) ³
5	00239			N	Priority ⁴
6	00240			N	Requested Date/Time ⁵
7	00241	14	TS	Y	Observation Date/Time ⁶
8	00242			N	Observation End Date/Time
9	00243			N	Collection Volume
10	00244			N	Collection Identifier
11	00245			N	Specimen Action Code
12	00246	16	CE	Y	Danger Code
13	00247			N	Relevant Clinical Information
14	00248			N	Specimen Received Date/Time
15	00249			N	Specimen Source
16	00226	Table 7-23	CN	Y	Ordering Provider
17	00250			N	Order Call-back Phone Number
18	00251			N	Placer Field 1
19	00252			N	Placer Field 2
20	00253			N	Filler Field 1
21	00254			N	Filler Field 2
22	00255	14	TS	Y	Results Rpt/Status Chg Date/Time ⁷
23	00256			N	Charge to Practice
24	00257			N	Diagnostic Serv Sect ID
25	00258	Table 7-25	ID	Y	Result Status
26	00259			N	Parent Result
27	00221	Table 7-28	CM	N	Quantity/timing
28	00260			N	Result Copies to
29	00261			N	Parent Number
30	00262			N	Transportation Mode
31	00263	80	ST	Y	Reason for Study

Seq	HL7 Item #	GE system Length	Data Type	GE system Support ¹	Element Name
32	00264	Table 7-23	CN	Y	Principle Result Interpreter
33	00265	Table 7-23	CN	Y	Assistant Result Interpreter ⁸
34	00266	Table 7-23	CN	Y	Technician
35	00267	Table 7-23	CN	Y	Transcriptionist
36	00268			N	Scheduled Date/Time

1. The customer determines which of the supported fields are required.
2. The Order Number returned in results matches the order number sent in the HIS order request. The GE system order interface does not create order numbers. The order number can be configured in the results in either OBR field 2 or field 3. If an order interface does not exist, this field is left blank.
3. The Universal Svc ID contains the coded test type information as mapped from the GE test type to the HIS system test type or billing code.
4. This field is not used in Health Level Seven 2.2. Information is now carried in the Timing/Quantity field 7 component 6 of the ORC segment or field 27 component 6 of the OBR segment.
5. This field is not used in Health Level Seven 2.2. Information is now carried in the Timing/Quantity field 7 component 4 of the ORC segment or field 27 component 4 of the OBR segment.
6. This is the Acquisition Date/Time of the test. The time the test was acquired by the GE system.
7. This is the Current Date/Time when the result message was formatted for the test.
8. The GE system's Fellow information is used to fill the Assistant Result Interpreter field.

OBX – Observation Result Segment

Table 10. Result Segment (OBX)

Seq	HL7 Item #	GE system Length	Data Type	GE system Support/Req. Field ¹	Element Name
1	00569			Y	Set ID-Observation Simple
2	00570	2	ID	Y	Value Type
3	00571	80	CE	Y	Observation Identifier
4	00572			N	Observation Sub-Id
5	00573	<64k	ST	Y	Observation Value
6	00574	20	ST	Y	Units
7	00575			N	References Range
8	00576			N	Abnormal Flags ²
9	00577			N	Probability
10	00578			N	Nature of Abnormal Results
11	00579	Table 7-25	ID	Y	Observation Result Status
12	00580			N	Date Last Obs Normal Values
13	00581			N	User Defined Access Checks
14	00582			N	Date/Time of the Observation
15	00583			N	Producer's ID
16	00584			N	Responsible Observer

1. The customer determines which of the supported fields are required.

2. The GE system does not individually rate each measurement and/or diagnosis statement in the test results. The complete test is categorized as Normal, Borderline Normal, Abnormal, and Borderline Abnormal based on the diagnosis statements in the test result. One Borderline or Abnormal statement results in the whole test being marked as such.

QRD – Query Definition Segment (from GE system for ADT Query)

Table 11. Query Definition Segment (QRD).

Seq	HL7 Item #	GE system Length	Data Type	GE system Support/Req. Field	Element Name
1	00025	14	TS	Y	Query Date/Time
2	00026	1	ID	Y	Query Format Code ¹
3	00027	1	ID	Y	Query Priority ²
4	00028			O	Query ID
5	00029			N	Deferred Response Type
6	00030			N	Deferred Response Date/Time
7	00031	10	CQ	Y	Quantity Limited Request ³
8	00032	20	ST	Y	Who Subject Filter
9	00033	3	ID	Y	What Subject Filter ⁴
10	00034			N	What Department Data Code
11	00035			N	What Data Code Value Qual.
12	00036			N	Query Results Level

1. The GE ADT Query interface only supports record-oriented Query Format (R).

2. The GE ADT Query interface only supports immediate response Query Priority (I).

3. The GE ADT Query interface only supports single record responses (1^RD).

4. The GE ADT Query interface only requests Demographic information in response to the Query (DEM).

QRF – Query Filter Segment (from GE system for ADT Query)

Table 12. Query Filter Segment (QRF)

Seq	HL7 Item #	GE system Length	Data Type	GE system Support/Req. Field	Element Name
1	00037	20	ST	Y/O	Where Subject Filter
2	00038			N	When Data Start Date/Time
3	00039			N	When Data End Date/Time
4	00040			N	What User Qualifier
5	00041			N	Other QRY Subject Filter
6	00042			N	Which Date/Time Qualifier
7	00043			N	Which Date/Time Status Qualifier
8	00044			N	Date/Time Selection Qualifier

QRD – Query Definition Segment (From Host system for Result Query)

Table 13. Query Definition Segment (QRD)

Seq	HL7 Item #	GE system Length	Data Type	GE system Support/Req. Field	Element Name
1	00025	14	TS	Y	Query Date/Time
2	00026	1	ID	Y	Query Format Code ¹
3	00027	1	ID	Y	Query Priority ²
4	00028	10	ST	Y	Query ID
5	00029			N	Deferred Response Type
6	00030			N	Deferred Response Date/Time
7	00031			N	Quantity Limited Request
8	00032	20	ST	Y	Who Subject Filter
9	00033	3	ID	Y	What Subject Filter ³
10	00034			N	What Department Data Code
11	00035			N	What Data Code Value Qual.
12	00036			N	Query Results Level

1. The GE Result Query interface only supports record-oriented Query Format (R).

2. The GE Result Query interface only supports immediate response Query Priority (I).

3. The GE Result Query interface supports Result or Test List query requests (RES or PRO).

DRF – Query Filter Segment (From Host system for Result Query)

Table 14. Query Filter Segment (QRF)

Seq	HL7 Item #	GE system Length	Data Type	GE system Support/Req. Field	Element Name
1	00037	20	ST	Y/O	Where Subject Filter
2	00038	14	TS	Y/O	When Data Start Date/Time
3	00039	14	TS	Y/O	When Data End Date/Time
4	00040			N	What User Qualifier
5	00041	20	ST	Y/O	Other QRY Subject Filter ¹
6	00042	12	ID	Y/O	Which Date/Time Qualifier ²
7	00043	12	ID	Y/O	Which Date/Time Status Qualifier ³
8	00044	12	ID	Y/O	Date/Time Selection Qualifier ⁴

1. The GE Result Query interface supports a locally defined Other Query Subject Filter to specify the GE system test type for the Query. A mapping table on the GE system is used to map the Other Query Subject Filter to the appropriate GE system test type.
2. The GE Result Query interface supports Which Date/Time Qualifier COL (Collection Date/Time which equates to the GE system Acquisition Date/Time) to specify the date/time referred to in QRF-2 and QRF-3.
3. The GE Result Query interface supports Which Date/Time Status Qualifiers CFN (Current Final Value, whether final or corrected) and ANY (any status) to indicate the status type of results selected in the date/time range in QRF-2 and QRF-3. The GE system only reports Confirmed (Final or Corrected) test results for Results Query.
4. The GE Result Query interface supports the following Date/Time Selection Qualifiers: 1ST (first value in range), ALL (all values in range), LST (last value in range), REV (all values in range, reverse chronological order), Z1P (locally defined, first previous), ZLP (locally defined, latest and first previous) to specify certain types of results in the date/time range in QRF-2 and QRF-3.

ADD – Addendum Segment (To Host)

Table 15. ADD – Addendum Segment (To Host) (ADD)

Seq	HL7 Item #	GE system Length	Data Type	GE system Support/Req. Field	Element Name
1	00066	0 to 64K	ST	Y ¹	Addendum Continuation Pointer

1. The ADD segment is only used in outbound messages from the GE interface; it is not supported in inbound messages to the GE system. Please refer to Appendix C of this manual for details on Continuation messages.

DSC – Continuation Pointer Segment (To Host)

Table 16. DSC – Continuation Pointer Segment (ToHost)

Seq	HL7 Item #	GE system Length	Data Type	GE system Support/Req. Field	Element Name
1	00060	14	ST	Y ¹	Continuation Pointer

1. The DSC segment is only used in outbound messages from the GE interface; it is not supported in inbound messages to the GE system. Please refer to Appendix C of this manual for details on Continuation messages.

FT1 – Financial Transaction Segment

Table 17. Financial Transaction Segment (FT1)

Seq	HL7 Item #	GE system Length	Data Type	GE system Support/Req. Field	Element Name
1	00355			N	Set ID - Financial Transaction
2	00356			N	Transaction ID
3	00357			N	Transaction Batch ID
4	00358	14	TS	Y	Transaction Date
5	00359	14	TS	Y	Transaction Posting Date
6	00360	8	ID	Y	Transaction Type ¹
7	00361	20	ID	Y	Transaction Code
8	00362			N	Transaction Description
9	00363			N	Transaction Description -alt
10	00364	1	Quantity=1	Y	Transaction Quantity ²
11	00365			N	Transaction Amount - extended
12	00366			N	Transaction Amount - unit
13	00367	60	CE	Y	Department Code
14	00368			N	Insurance Plan ID
15	00369			N	Insurance Amount
16	00133	Table 7-24	CM	Y	Assigned Patient Location
17	00370			N	Fee Schedule
18	00148			N	Patient Type
19	00371			N	Diagnosis Code
20	00372	Table 7-23	CN	Y	Performed By Code
21	00373	Table 7-23	CN	Y	Ordered By Code
22	00374			N	Unit Cost
23	00271	9	CM	Y	Filler Order Number

1. The GE interface only supports charge transaction types. Credits are not supported through the interface.

2. The GE interface reports financial information on a test by test basis, therefore the quantity field is always one (1).

BHS – Batch Header Segment

Table 18. Batch Header Segment (BHS)

Seq	HL7 Item #	GE system Length	Data Type	GE system Support/ Req. Field	Element Name
1	00081	1	ST	Y/R	Batch Field Separator
2	00082	4	ST	Y/R	Batch Encoding Characters
3	00083	15	ST	Y	Batch Sending Application ¹
4	00084	20	ST	Y	Batch Sending Facility ²
5	00085	15	ST	Y	Batch Receiving Application ³
6	00086	20	ST	Y	Batch Receiving Facility
7	00087	14	TS	Y	Batch Creation Date/Time
8	00088			N	Batch Security
9	00089	20	ST	Y	Batch Name/ID/Type
10	00090	80	ST	Y	Batch Comment
11	00091	20	ST	Y/R	Batch Control ID ⁴
12	00092			N	Reference Batch Control ID

1. The Batch Sending Application Field value is dependent on the message originator.
2. The Batch Sending Facility Field may be used to designate different sites on the GE system.
3. The Batch Receiving Application Field value is dependent on the message originator.
4. The format of the Batch Control ID is determined by the originating application. The receiving system must be able to accept transactions regardless of the format of this field, and must return the Control ID in its original format. This field is not required when high level acknowledgments are not used.

BTS – Batch Trailer Segment

Table 19. Batch Trailer Segment (BTS)

Seq	HL7 Item #	GE system Length	Data Type	GE system Support/Req. Field	Element Name
1	00093	6	ST	Y	Batch Message Count
2	00094	80	ST	Y	Batch Comment
3	00095			N	Batch Totals

FHS – File Header Segment

Table 20. File Header Segment (FHS)

Seq	HL7 Item #	GE system Length	Data Type	GE system Support/Req. Field	Element Name
1	00067	1	ST	Y/R	File Field Separator
2	00068	4	ST	Y/R	File Encoding Characters
3	00069	15	ST	Y	File Sending Application ¹
4	00070	20	ST	Y	File Sending Facility ²
5	00071	15	ST	Y	File Receiving Application ³
6	00072	20	ST	Y	File Receiving Facility
7	00073	14	TS	Y	File Create Date/Time
8	00074			N	File Security
9	00075			N	File Name/ID
10	00076	80	ST	Y	File Header Comment
11	00077	20	ST	Y/R	File Control ID ⁴
12	00078			N	Reference File Control ID

1. The File Sending Application Field value is dependent on the message originator.
2. The File Sending Facility Field may be used to designate different sites on the GE system.
3. The File Receiving Application Field value is dependent on the message originator.
4. The format of the File Control ID is determined by the originating application. The receiving system must be able to accept transactions regardless of the format of this field, and must return the Control ID in its original format. This field is not required when high level acknowledgments are not used.

FTS – File Trailer Segment

Table 21. File Trailer Segment (FTS)

Seq	HL7 Item #	GE system Length	Data Type	GE system Support/Req. Field	Element Name
1	00079	1	Quantity=1	Y	File Batch Count ¹
2	00080	80	ST	Y	File Trailer Comment

1. The GE Batch interface only supports one batch message (BHS/BTS) per file.

Ethnic Group

HL7 no longer defines a value for Ethnic group. The following list of values are only suggestions based on prior HL7 usage and may be modified to fit the needs of each site in the Race Mapping tables provided with the standard GE HL7 Interface. The column for GE system Value lists all options on the GE system for Ethnic group.

Table 22. Ethnic Group

HIS Value (configurable)	Description	GE system Value
A	Native American	American Indian
B	Black	Black
C	Caucasian	Caucasian
H	Hispanic	Hispanic
R	Oriental	Oriental
E	Eskimo	Eskimo
W	Hawaiian	Hawaiian
P	Pacific Islander	Pacific Islander
M	Mongolian	Mongolian
S	Asian	Asian
U	Unknown	Unknown

GE System Physician / User Name and ID

The GE system uses a user database for access to the GE system. Not all physicians will be part of the GE user database. Many physicians that are not part of the GE User database will be included in the HL7 messages for admitting patients and ordering tests. For physicians included in the GE user database, the External ID can be used to maintain the HIS ID. The Medicare Provider ID in the GE User list may also be used for HIS information needed in results. For physicians not included in the GE user database, the HIS ID sent in the HL7 message is stored and can be returned in result messages.

Table 23. Physician / User Name and ID

HL7 Component Number	GE system Length	Range	Definition
	4 digits	1-9999	GE User ID
	32	Alphanumeric	GE External ID (part of User database)
	15	Alphanumeric	GE Medicare Provider ID (part of User database)
	32	Alphanumeric	HIS ID Number
	16	Printable Chars.	Last Name
1			
2			
3	10	Printable Chars.	First Name

Location Room Bed

Table 24. Location Room Bed

HL7 segment PV1 Seq 3, Component Number	GE system Length	Range	Definition
Mapped from 1		0-599	GE Location Number
Mapped from 1	6	Alpha/Numeric	GE Location Abbreviation
1	20	Alpha/Numeric	HIS Location
2	5	Alpha/Numeric	Room Number
3	12	Alpha/Numeric	Bed

GE System Results Status

The following list of Result status values follows HL7 definitions. Modifications for site specific values can be handled in a mapping table with the standard GE HL7 Interface.

Table 25. Result Status

HL7 Value	GE system Description	GE System Action
P	Preliminary Results	Test taken, results loaded into GE system Edit List
F	Final Results-stored and verified	Test results overread and confirmed for the first time into GE system database
C	Correction of previous Final Results	Results retrieved from database and re-confirmed into GE system database
D	Deleted Results	Results deleted from GE system

Patient Sex

Table 26. Patient Sex

HL7 Value	HL7 Description	GE system Value
M	Male	Male
F	Female	Female
U	Unknown	Unknown
O ¹	Other	Unknown

1. The Patient Sex U and O will only be used for the inbound interfaces to the GE system. Outbound interfaces will use either U or O to indicate Unknown/Other. The GE system does not distinguish between an Unknown Sex and an Other Sex.

Patient Address

Table 27. Patient Address

HL7 segment PID Seq 11, Component Number	GE system Length	Definition
1	32	Address 1
1 (repetition) or 2, configurable	32	Address 2
1 (repetition) or 2 (repetition), configurable	32	Address 3
2	23	City
3	15	State
6	15	Country
4	11	Zip Code

Order Quantity/Timing

Table 28. Order Quantity/Timing

HL7 segment ORC Seq 7 or OBR Seq 27, Component Number	GE system Length	Required	Definition
1	1	Y	GE Quantity is always 1
4	14	Y/O ¹	Order Time
5	14	Y/O ²	Expiration Time
6	4	Y	Priority

1. If Order Time is not indicated in the Order message, the current date and time may be used for the order time.
2. If Order Expiration Time is not indicated in the Order message, the expiration time will be calculated using the order time and the default expiration time configured for the interface.

For your notes

8 HL7 Implementation FAQs

For your notes

Frequently Asked Questions

ADT Fields and Functions

My HIS system uses ADT function A18 as an Account Number Merge, is this compatible with the GE system?

The GE system normally maps the A18 transaction to a Patient ID merge. The mapping can be changed to perform a Patient ID and Account merge, but the Patient ID and the account number are required fields in the MRG Segment. Otherwise, the GE system can be configured to ignore the A18 transaction. Health Level Seven Version 2.2 defines new merge transactions that are also supported by the interface that may apply to this functionality. All merge transactions on the GE system require the Patient ID at a minimum.

My HIS system uses patient names larger than the GE system accepts, for example 30 characters for first and last name, or a 15 character first name. The original HIS name must be returned in result and billing messages. Will this work?

The GE system only supports 16 character last names and 10 character first names for a total of 26. GE systems will continue to use 16 character last names and 10 character first names and will truncate longer names. We can separately store the HIS name as sent in the ADT transaction and return it in the result and/or financial interfaces, if required.

At times, we admit patients under an alias that we want to send to the GE system. How does this work?

The GE interface and GE systems have no Patient Alias Support.

The ADT transactions A20 (patient bed status update), A21 (patient goes on a leave of absence), and A22 (patient returns from leave of absence) are not listed, does the GE interface support them?

No. Only the functions supported by the GE system are listed in this manual. A20, A21, and A22 transactions will be ignored.

The PR1, GT1, IN1, ACC, and UB1 segments are not listed. Does the GE interface support them?

No. Only the segments supported by the GE system are listed in this manual. Depending upon the particular data sent in the PR1, GT1, IN1, ACC, or UB1 segments, the GE system may be optionally configured to store the data. This must be determined on a case by case basis. The data may not be viewable by the GE system users. The data may not be available to return in result or financial messages. Also, see next FAQ.

Our system uses a special Z segment (Z02, ZPV, etc.). Is this accepted by the GE system?

Possibly. In general the GE system will ignore segments not listed in this manual. However, the GE system interface may be optionally configured to map data fields from any segment in the HL7 message to corresponding fields in the GE databases. If the special Z segment contains data that can be stored on the GE system, it can be used. For example, HL7 does not specify patient height and weight in the standard segments, but it can be sent in a special Z segment that the GE system can be configured to recognize for patient height and weight. Special fields mapped like this may not be viewable on the GE system and/or may not be available to be returned in result or financial messages. This must be determined on a case by case basis.

Our system uses system id and episode identifiers that are required in results. Can you store this information?

The GE interface has data fields for storing the system id and episode, but it must be associated with an order for the patient sent to the GE interface. These fields are viewable on the GE system through the Order Manager interface; they are not viewable during the test editing session.

Does the GE system update order information in the tests on the GE server?

An ADT interface will update ADT information on the GE system; an Order interface will update information on the GE system. Order Information from the Order interface is updated on the test only until the test is confirmed. This information is not updated after the test has been confirmed.

Orders Fields and Functions

Our order messages may contain multiple OBR segments. Can the GE system accept it?

No. The GE system only processes one procedure per patient per message, i.e. one OBR segment per order message with quantity 1 (one).

We order recurring tests, 1 every day for 5 days at a set time or 1 every hour for 5 hours. How does the GE system handle this?

The GE system only processes one procedure per patient per message, i.e. one OBR segment per order message with quantity 1 (one). For this example, the HIS system would generate 5 individual order messages for a single test with the requested date and time for each test.

The PV1 segment is listed as optional. What does that mean?

The GE system uses information in the PV1 segment to update ADT and Account database information. When the HIS system is sending Order messages only, more information can be gathered if the PV1 segment is sent with the Order message. For HIS systems sending both ADT and Order messages, the PV1 segment in the Order message could be used to update ADT and Account information if configured to do so.

Our order system uses a 15 digit requisition number. Can the GE system accept that?

No. The GE systems accept a maximum of 9 characters for requisition number, which is a key to the order database. Depending upon the structure of the HIS patient data, the requisition number can be required to be unique across all orders or duplicates may be accepted.

Our order system uses order number and occurrence number to identify patient tests. Does the GE system store this information?

The GE systems require a requisition number which is a key to the order database (maximum of 9 characters). Additionally, a 9 character field order number and a 5 character episode (or occurrence) number are available. Please refer to the section on GE System Data Fields for details on the interface database fields.

Can you create order numbers for tests on the GE system?

No. The GE system is considered a filler of orders, not a placer.

Does the GE order interface use control codes (NA, SN, OC, SS) for processing orders?

No. The only order control codes applicable to the GE system are NW (new order), CA (cancel order), DC (discontinue order), and XO (change order).

Can the GE order interface assign order numbers to order requests or create requests for orders?

No. The GE system is considered a filler of orders not a placer.

Does the GE system send cancel order messages to the HIS?

No. The GE system depends on the HIS order system to create, cancel, and change orders. The GE system can be configured to allow users to cancel orders locally on the GE system, but this does not affect the HIS order system and is not communicated to the HIS system. In general, orders should be canceled on the HIS order system, not on the GE system.

Can the GE system users edit orders?

No. Order information is only changed by the updates from the HIS order system.

Result and Financial Messages Fields and Functions

Does the Physician ID on the GE system match the HIS ID?

Generally, the GE ID and the HIS ID for physicians are not the same. The physicians on the GE system are given a User ID anywhere in the range from 0-9999. Not all physicians in the HIS system will have User ID's on the GE system.

We require the Hospital ID for physicians (over-reader, referring, ordering), transcriptionists, etc. Does the GE system use the Hospital ID?

The GE system uses the External 1 field in the User List to store Hospital ID or mnemonics that are needed for result and financial messages. This field is entered and maintained by the customer. Optionally the HIS system can maintain a lookup table that correlates the MUSE CV Information System User ID and the Hospital ID. Additionally, see the following FAQ.

Our ADT and Order messages include the physician's hospital ID. We want this information returned in the results/financial messages.

The Physician ID information sent in the ADT and/or Order messages is stored in the database HIS ID field up to 32 characters. When ADT and Order information is matched to a test, physician information will be stored with the test. If a test is edited and the physician information is changed, the External 1 field in the User List will be used to update the HIS ID. The HIS ID information cannot otherwise be edited.

The only allowable status values for our results are Pending and Draft.

The GE interface has three standard report statuses, Preliminary, Final, and Corrected/Revised Final. The interface can map the GE report status sent in the HL7 message to customer specifications.

Our HIS system only supports 1300 characters of Result text. Can the GE system follow these restriction?

The GE interface can be configured to use continuation messages based on a message length of 1K (1024) characters. Refer to the Appendix for GE's implementation details of HL7 Continuation messages. Continuations can be used for message length maximums ranging from 1K to 64K in 1K increments.

Can you send the transaction dollar amount in the financial message?

The GE interface does not support Transaction dollar amounts.

How does the GE system do credits?

The GE interface does not send credit messages.

What are the options for interfacing waveform image data?

GE is currently sending image data to a HIS through other means than HL7. Our Works in Progress include HL7 Graphical Results Reporting which will include PostScript Adobe Level 2, Windows Metafiles, Fax Images, and Bitmaps. All data in the HL7 message will be UUencoded and the HIS system will be responsible for decoding and displaying the graphics. HL7 Graphical Results Reporting will require Windows NT.

Do I need a Financial Interface and a Result Interface?

The GE HL7 interface option for sending HL7 Financial transactions can be purchased. These can be sent in real time or batch mode. Some HIS systems may be able to generate charges based on the result transactions, and would therefore not require the separate financial option.

How and when will I receive duplicate financial messages?

Within the editing process (the software which allows tests to be “confirmed”) on the GE system there is a procedure which sets a bit when formatting a financial message. This report is sent to the HIS, triggering the HIS charge process. If this procedure isn’t complete (the process of sending to the HIS system) and a confirm is performed a second time, a second financial transaction will be sent to the HIS system. The customer has the option to configure their outbound interfaces so we send either one or two outbound messages. A result message can be sent to the host for result data storage, while another result message is sent for the purpose of generating charges. Or they can receive one result message and send it to both systems themselves. If they choose to receive only one message, they must be able to determine when a result was canceled, or previously sent. Otherwise they could be generating charges multiple times based on the number of times the same patient’s results are edited/confirmed and sent.

Communication Protocol Options

Our Communication's protocol does not follow the HL7 standard; it uses a single character acknowledgment. Can the GE system be configured to accept this?

The GE supports standard HL7 original mode Acknowledgment messages, not a single character or ACK/NACK acknowledgment.

We use the HL7 Standard Acknowledgments and Sequence Protocol. Does GE Support Sequence protocol?

The GE interface can be configured to use Sequence Protocol. Please refer to the Appendix HL7 Sequence Number Protocol.

Our system uses TCP/IP. When our side goes down, we send a Shutdown message to our interfaces and want a Shutdown message sent when the GE side goes down.

The GE system will ignore shutdown messages. We do not send shutdown messages. Shutdown messages are not necessary for the GE system to function correctly. The GE inbound interface for ADT and Orders starts and opens a listening port, waiting for a connection from the HIS. When the connection from the HIS is released, the GE inbound side releases the connection and reopens a listening port, again waiting for a connection from the host. The GE outbound interface only makes a connection to the HIS when messages are available to send. If the connection is not accepted, the GE system maintains the messages as it continues to try the connection.

Who is the client and who is the server?

The GE system will be the server for ADT and Order transactions. The GE system will be the client for Result and Financial transactions. This follows "the sending application is the client" rule.

For your notes

A Appendix A – Abbreviations In Manual

For your notes

Abbreviation List

A

Addr, AD	address
ADT	Admit/Discharge/Transfer
ASCII	American Standard Code for Information
Interchange	
ADD	Addendum

B

BBS	Bulletin Board Service
-----	------------------------

C

CE	coded entry
CHAR	character
Chg	change
CM	composite
CN	composite name
CQ	composite quantity with units
CV	cardiovascular

D

DT	date
DSC	Continuation Pointer

E

ECG, EKG	electrocardiogram
EVN	Event Type

F

FTP	File Transfer Protocol
FAQs	Frequently Asked Questions

G

GE	General Electric Company
GEMS	GE Medical Systems

H

HL7	Health Level Seven Standard Interface
HIS	Hospital Information System

I

ID	identification
IS	Information Systems

K

1K 1024

L

Lic license

M

MUSE Marquette Universal System for
Electrocardiography

MRG Merge Patient Information

MSH Message Header Segment

MSA Message Acknowledgment

N

N no

NM numeric

Num number

O

OBR observation request

Obs observation

OBX observation result

O optional

ORC Common Order

P

PN part number, person name

PID Patient Identification

PV1 Patient Visit

Q

QRD Query Definition

QRF Query Filter

R

Req request

Req. Field required field

Rev revision

Rpt report

S

Seq sequence

ST string data

T

TCP/IP

Transmission Control Protocol/Internet Protocol

TN

telephone number

TS

time stamp

U

U

unknown

Y

Y/O

yes/optional

Y/R

yes/required

Y

yes

Z

ZPS

custom post script

ZSTRING

null terminated string

For your notes

B Appendix B – ECG Sample Reports


For your notes

DILLER, JANE		ID: 589290320	13-JUN-1994 14:08	THE FIRST SITE	ROUTINE RECORD
0 Yr	Male	Caucasian	Vent. rate	68 BPM	NORMAL SINUS RHYTHM
74:0	189lb		PR interval	180 ms	NORMAL ECG
Room: 12345			QRS duration	68 ms	WHEN COMPARED WITH ECG OF 13-JUN-1994 14:00,
Loc: 53	Option: 25		QT/QTc	388/413 ms	NO SIGNIFICANT CHANGE WAS FOUND
			P-R-T axes	74 64 63	
Technician ID: 55					
Med: Unknown		Referred by: DR. BRUCE			
		Confirmed by: JOHN DOE			
25mm/s		10mm/mV	100Hz	003A-003A	12SL 78 CID: 1
SID: 1234567891234567		EID: 1		EDT: 13:47 10-JUL-1995 ORDER: 123456789	
Page 1 of 1					

DILLER, JANE		ID: 589290320	13-JUN-1994 14:08	THE FIRST SITE-	ROUTINE RECORD
0 yr	Male	Caucasian	68 BPM	NORMAL SINUS RHYTHM	
74in	159lb		PR interval 180 ms	NORMAL ECG	
Room:12345			QRS duration 68 ms	TRIFASCICULAR BLOCK	
Loc:53	Option:25		QT/QTc 388/413 ms	ATRIAL FLUTTER	
			P-R-T axes 74 64 63	ST & T WAVE ABNORMALITY, CONSIDER ANTEROLATERAL ISCHEMIA	
Technician ID: 55		THIS IS USER ENTERED DIAGNOSIS TEXT ...			
Medic: Unknown		Referred by: DR. BRUCE Confirmed by: JOHN DOE			

25mm/s 10mm/mV 100Hz 003A-003A 12SL 78 CID: 1 SID: 1234567891234567 EID:1 EDT: 1347 10-JUL-1995 ORDER: 123456789

Page 1 of 2

DILLER, JANE		ID: 539290320	13-JUN-1994 14:08	THE FIRST SITE- ROUTINE RECORD
0 yr	Male	Caucasian	74in	189lb
Room:12345	Loc:53	Option:25		
Heart rate	PR interval	QRS duration	QT/QTc	P-R-T axes
68 BPM	180 ms	68 ms	388/413 ms	74 64 63
<p>...THE FIRST TWO LINES OF THIS DIAGNOSIS ARE COMPUTER GENERATED THE NEXT TWO LINES ARE USER INSERTED LIBRARY STMTS AND THESE NEXT FIVE LINES ARE USER ENTERED FREE TEXT. THE LAST 2 LINES ARE</p> <p>COMPUTER GENERATED SERIAL COMPARISON LINES WHEN COMPARED WITH ECG OF 13-JUN-1994 14:00, NO SIGNIFICANT CHANGE WAS FOUND</p> <p>Referred by: DR. BRUCE Confirmed by: JOHN DOE</p>				
<p>Technician ID: 55</p> <p>Medic: Unknown</p>				
				

For your notes

C Appendix C – HL7 Continuation Messages

For your notes

HL7 Continuation Messages

The Maximum HL7 Segment and the Maximum HL7 Message values are used by host systems that have limited segment and/or message lengths. The valid range of values for the maximum segment or message length is 1 to 64 K characters, in 1K increments only. Either one, or both, of the HL7 maximums can be defined for HL7 messages that are sent to the host. The following examples illustrate the use of the Maximum HL7 Segment and the Maximum HL7 Message values. The HL7 standard does not allow continuation of the MSH, MSA, DSC, PID, QRC, QRF, URD, or URS segments. Note that the examples shown the ADD segment, the DSC segment and the continuation pointer values in bold face in order to better illustrate the changes for the continued messages.

Example of Message Without Continuations (2239 byte message)

```
MSH|^~\&|MEI MUSE||HIS
SYSTEM||19970925123432||ORU^R01|19970925123432|P|2.2<cr>
PID|1||999999999|Example^Seven|19710403|F|C|||||||12345677<cr>
OBR|1||^SJMCA^1^ECG||19900412105300||1|||||^19970925123432
|EC|C|||||^DOE^JOHN|^|^DOE^JOHN<cr>
OBX|1|ST|93000.2^Ventricular Rate||84|BPM|||||C<cr>
OBX|2|ST|93000.3^Atrial Rate||84|BPM|||||C<cr>
OBX|3|ST|93000.4^P-R Interval||140|ms|||||C<cr>
OBX|4|ST|93000.5^QRS Duration||100|ms|||||C<cr>
OBX|5|ST|93000.6^QT||432|ms|||||C<cr>
OBX|6|ST|93000.12^P Axis||67|degrees|||||C<cr>
OBX|7|ST|93000.13^R Axis||55|degrees|||||C<cr>
OBX|8|ST|93000.14^T Axis||60|degrees|||||C<cr>
OBX|9|TX||Test Reason : ~Blood Pressure : 120/067 mmHG~Vent. Rate :
084 BPM Atrial Rate : 084 BPM~ P-R Int : 140 ms QRS
Dur : 100 ms~ QT Int : 432 ms P-R-T Axes : 067 055 060
degrees~ QTc Int : 511 ms~No previous ECGs available~THIS
DIAGNOSIS INFORMATION IS ENTERED AS FREE TEST. THE DIAGNOSIS WILL
BE~LONGER THAN 1k, CAUSING A CONTINUATION TO OCCUR IN THE obx
SEGMENT OF THE HL7~MESSAGE. THE REMAINING INFORMATION IS
CONTINUED IN THE IMMEDIATELY~FOLLOWING add SEGMENT. THE ADD
SEGMENT MAY OCCUR ONCE OR MORE THAN ONCE~DEPENDING UPON HOW LONG
THE ORIGINAL SEGMENT WOULD HAVE BEEN WITHOUT~CONTINUATIONS.~Basic
rhythm~Supraventricular tachycardia~Unusual P axis, possible
ectopic atrial bradycardia~Trifascicular block~Abnormal ECG~(RBBB
and left anterior fascicular block)~(RBBB and left posterior
fascicular block)~Manual comparison required, data off line and on
volume~Ventricular pre-excitation, WPW pattern type B~Marked T wave
abnormality, consider anterolateral ischemia~Multifocal atrial
tachycardia~Nonspecific T wave abnormality now evident in~ST
elevation consider lateral injury or acute infarct~Nonspecific T
wave abnormality~Serial comparison not performed, all previous
tracings are of poor data quality~Undetermined rhythm~Ventricular
tachycardia (ventricular or supraventricular with
aberration)~Right ventricular hypertrophy with repolarization
abnormality~Right bundle branch block -or- right ventricular
hypertrophy~Right ventricular hypertrophy with repolarization
abnormality~THE DIAGNOSIS STATEMENTS CONTINUE THIS IS FREE TEXT
ENETERED HERE AGAIN.~Referred By: Overread By: JOHN
DOE|||||C<cr>
```

Maximum Segment

When the Maximum HL7 Segment length is reached, HL7 ADD segment(s) are used to continue the segment data within a single HL7 message. If the segment requires multiple continuations based on the maximum segment length, multiple ADD segments will be used in the message to breakup the original segment.

Maximum Segment Length Message Composition

- MSH-Message Header Segment
- PID-Patient Identification Segment
- OBR-Observation Request Segment
- OBX-Observation Result Segment
- OBX-Observation Result Segment, up to maximum segment length
- ADD-Continuation of the maximum OBX segment (may be repeated)

Example of Maximum Segment Length Message, using 1K as maximum segment length (2244 byte message)

```
MSH|^~\&|MEI MUSE||HIS
SYSTEM||19970925123553||ORU^R01|19970925123553|P|2.2<cr>
PID|1||999999999|Example^Seven||19710403|F||C||||||12345677<cr>
OBR|1||^SJMC^1^^ECG||19900412105300||1|||||^19970925123553
|EC|C|||||^DOE^JOHN|^|^DOE^JOHN<cr>
OBX|1|ST|93000.2^Ventricular Rate||84|BPM||||C<cr>
OBX|2|ST|93000.3^Atrial Rate||84|BPM||||C<cr>
OBX|3|ST|93000.4^P-R Interval||140|ms||||C<cr>
OBX|4|ST|93000.5^QRS Duration||100|ms||||C<cr>
OBX|5|ST|93000.6^QT||432|ms||||C<cr>
OBX|6|ST|93000.12^P Axis||67|degrees||||C<cr>
OBX|7|ST|93000.13^R Axis||55|degrees||||C<cr>
OBX|8|ST|93000.14^T Axis||60|degrees||||C<cr>
OBX|9|TX||Test Reason : ~Blood Pressure : 120/067 mmHG~Vent. Rate :
084 BPM Atrial Rate : 084 BPM~ P-R Int : 140 ms QRS
Dur : 100 ms~ QT Int : 432 ms P-R-T Axes : 067 055 060
degrees~ QTc Int : 511 ms~No previous ECGs available~THIS
DIAGNOSIS INFORMATION IS ENTERED AS FREE TEST. THE DIAGNOSIS WILL
BE~LONGER THAN 1k, CAUSING A CONTINUATION TO OCCUR IN THE obx
SEGMENT OF THE HL7~MESSAGE. THE REMAINING INFORMATION IS
CONTINUED IN THE IMMEDIATELY~FOLLOWING add SEGMENT. THE ADD
SEGMENT MAY OCCUR ONCE OR MORE THAN ONCE~DEPENDING UPON HOW LONG
THE ORIGINAL SEGMENT WOULD HAVE BEEN WITHOUT~CONTINUATIONS.~Basic
rhythm~Supraventricular tachycardia~Unusual P axis, possible
ectopic atrial bradycardia~Trifascicular block~Abnormal ECG~(RBBB
and left anterior fascicular block)~(RBBB and left posterior
fascicular block)~Manual comparison required, data off line and on
volume~Ventricular pre-excitation, WPW pattern type B~Marked T wave
abnormality, consider anterolateral ischemia~Multifocal at<cr>
ADD|rial tachycardia~Nonspecific T wave abnormality now evident in-ST
elevation consider lateral injury or acute infarct~Nonspecific T
wave abnormality~Serial comparison not performed, all previous
tracings are of poor data quality~Undetermined rhythm~Ventricular
tachycardia (ventricular or supraventricular with
aberration)~Right ventricular hypertrophy with repolarization
abnormality~Right bundle branch block -or- right ventricular
hypertrophy~Right ventricular hypertrophy with repolarization
abnormality~THE DIAGNOSIS STATEMENTS CONTINUE THIS IS FREE TEXT
ENETERED HERE AGAIN.~Referred By: Overread By: JOHN
DOE|||||C<cr>
```

Maximum Message

When the Maximum HL7 Message length is reached, the HL7 ADD segment followed by the HL7 DSC segment occurs at the end of the current HL7 message. The HL7 ADD segment and continued data occurs after the MSH segment of a new HL7 message to indicate that the data is to be added on to the previous HL7 message. The continuation pointer in the DSC segment of the first message matches that of the MSH in the continued message. The continuation pointer (MSH field 14) must be configured in the Formatter setup of the MSH segment. It is only filled in when a message is continued.

Maximum Message Length Message Composition

Beginning of message, up to maximum message length

- MSH-Message Header Segment
- PID-Patient Identification Segment
- OBR-Observation Request Segment
- OBX-Observation Result Segment
- ADD-Continuation marker for the message
- DSC and pointer-Continuation pointer

Continuation of message:

- MSH-Message Header Segment and pointer
- ADD-Continuation of the message (other segments follow from this point)

Example of Maximum Message Length Messages, using 2K as maximum message length (2047 and 297 byte messages)

```
MSH|^~\&|MEI MUSE||HIS
SYSTEM||19970925123846||ORU^R01|19970925123846|P|2.2||<cr>
PID|1||999999999|Example^Seven||19710403|F||C||||||12345677<cr>
OBR|1||^SJMCA^1^ECG||19900412105300||1|||||^19970925123846
||EC|C|||||^DOE^JOHN|^|^DOE^JOHN<cr>
OBX|1|ST|93000.2^Ventricular Rate||84|BPM||||C<cr>
OBX|2|ST|93000.3^Atrial Rate||84|BPM||||C<cr>
OBX|3|ST|93000.4^P-R Interval||140|ms||||C<cr>
OBX|4|ST|93000.5^QRS Duration||100|ms||||C<cr>
OBX|5|ST|93000.6^QT||432|ms||||C<cr>
OBX|6|ST|93000.12^P Axis||67|degrees||||C<cr>
OBX|7|ST|93000.13^R Axis||55|degrees||||C<cr>
OBX|8|ST|93000.14^T Axis||60|degrees||||C<cr>
OBX|9|TX||Test Reason : ~Blood Pressure : 120/067 mmHG~Vent. Rate :
084 BPM Atrial Rate : 084 BPM~ P-R Int : 140 ms QRS
Dur : 100 ms~ QT Int : 432 ms P-R-T Axes : 067 055 060
degrees~ QTc Int : 511 ms~No previous ECGs available~THIS
DIAGNOSIS INFORMATION IS ENTERED AS FREE TEST. THE DIAGNOSIS WILL
BE~LONGER THAN 1k, CAUSING A CONTINUATION TO OCCUR IN THE obx
SEGMENT OF THE HL7~MESSAGE. THE REMAINING INFORMATION IS
CONTINUED IN THE IMMEDIATELY~FOLLOWING add SEGMENT. THE ADD
SEGMENT MAY OCCUR ONCE OR MORE THAN ONCE~DEPENDING UPON HOW LONG
THE ORIGINAL SEGMENT WOULD HAVE BEEN WITHOUT~CONTINUATIONS.~Basic
rhythm~Supraventricular tachycardia~Unusual P axis, possible
ectopic atrial bradycardia~Trifascicular block~Abnormal ECG~(RBBB
and left anterior fascicular block)~(RBBB and left posterior
fascicular block)~Manual comparison required, data off line and on
volume~Ventricular pre-excitation, WPW pattern type B~Marked T wave
abnormality, consider anterolateral ischemia~Multifocal atrial
```

```

tachycardia~Nonspecific T wave abnormality now evident in~ST
elevation consider lateral injury or acute infarct~Nonspecific T
wave abnormality~Serial comparison not performed, all previous
tracings are of poor data quality~Undetermined rhythm~Ventricular
tachycardia (ventricular or supraventricular with
aberration)~Right ventricular hypertrophy with repolarization
abnormality~Right bundle branch block -or- rig<cr>
ADD|<cr>
DSC|19970925123846<cr>

MSH|^~\&|MEI MUSE||HIS
SYSTEM||19970925123847||ORU^R01|19970925123847|P|2.2||199709251238
46<cr>
ADD|ht ventricular hypertrophy~Right ventricular hypertrophy with
repolarization abnormality~THE DIAGNOSIS STATEMENTS CONTINUE THIS
IS FREE TEXT ENTERED HERE AGAIN.~~Referred By:           Overread
By: JOHN DOE|||||C<cr>

```


Combined Maximum Segment and Message

When both the Maximum HL7 Segment and Message length are exceeded, both types of HL7 Continuations can occur together. A sample HL7 Message layout when maximum segment length and maximum message length are exceeded is given below. If the Continued Message(s) exceed the maximum message length, the message continues in additional continuation messages using the format of the Beginning Message with the ADD and DSC segments at the end.

Combined Maximum Message Length and Maximum Segment Length Message Composition

Beginning of Message, up to maximum message length

- MSH-Message Header Segment
- PID-Patient Identification Segment
- OBR-Observation Request Segment
- OBX-Observation Result Segment
- OBX-Observation Result Segment, up to maximum segment length
- ADD-Continuation of the maximum OBX segment (may be repeated)
- ADD-Continuation marker for the Message
- DSC and pointer-Continuation pointer

Continuation of Message

- MSH-Message Header Segment and continuation pointer
- ADD-Continuation of the Message (other segments follow from this point)

Example of Combined Maximum Message Length and Maximum Segment Length Messages, using 2K as maximum message length (2047 and 302 byte messages)

```
MSH|^~\&|MEI MUSE||HIS
SYSTEM||19970925123957||ORU^R01|19970925123957|P|2.2||<cr>
PID|1||999999999||Example^Seven||19710403|F||C||||||12345677<cr>
OBR|1||^SJMCA^1^ECG||19900412105300||1|||||^19970925123957
||EC|C|||||^DOE^JOHN|^|^DOE^JOHN<cr>
OBX|1|ST|93000.2^Ventricular Rate||84|BPM||||C<cr>
OBX|2|ST|93000.3^Atrial Rate||84|BPM||||C<cr>
OBX|3|ST|93000.4^P-R Interval||140|ms||||C<cr>
OBX|4|ST|93000.5^QRS Duration||100|ms||||C<cr>
OBX|5|ST|93000.6^QT||432|ms||||C<cr>
OBX|6|ST|93000.12^P Axis||67|degrees||||C<cr>
OBX|7|ST|93000.13^R Axis||55|degrees||||C<cr>
OBX|8|ST|93000.14^T Axis||60|degrees||||C<cr>
OBX|9|TX||Test Reason : ~Blood Pressure : 120/067 mmHG~Vent. Rate :
084 BPM      Atrial Rate : 084 BPM~   P-R Int : 140 ms      QRS
Dur : 100 ms~   QT Int : 432 ms      P-R-T Axes : 067 055 060
degrees~   QTc Int : 511 ms~~No previous ECGs available~THIS
DIAGNOSIS INFORMATION IS ENTERED AS FREE TEST. THE DIAGNOSIS WILL
BE~LONGER THAN 1k, CAUSING A CONTINUATION TO OCCUR IN THE obx
SEGMENT OF THE HL7~MESSAGE. THE REMAINING INFORMATION IS
CONTINUED IN THE IMMEDIATELY~FOLLOWING add SEGMENT. THE ADD
SEGMENT MAY OCCUR ONCE OR MORE THAN ONCE~DEPENDING UPON HOW LONG
THE ORIGINAL SEGMENT WOULD HAVE BEEN WITHOUT~CONTINUATIONS.~Basic
rhythm~Supraventricular tachycardia~Unusual P axis, possible
ectopic atrial bradycardia~Trifascicular block~Abnormal ECG~(RBBB
and left anterior fascicular block)~(RBBB and left posterior
```

```

fascicular block)~Manual comparison required, data off line and on
volume~Ventricular pre-excitation, WPW pattern type B~Marked T wave
abnormality, consider anterolateral ischemia~Multifocal at<cr>
ADD|rial tachycardia~Nonspecific T wave abnormality now evident in~ST
elevation consider lateral injury or acute infarct~Nonspecific T
wave abnormality~Serial comparison not performed, all previous
tracings are of poor data quality~Undetermined rhythm~Ventricular
tachycardia (ventricular or supraventricular with
aberration)~Right ventricular hypertrophy with repolarization
abnormality~Right bundle branch block -or<cr>
ADD|<cr>
DSC|19970925123957<cr>

MSH|^~\&|MEI MUSE||HIS
SYSTEM||19970925123958||ORU^R01|19970925123958|P|2.2||199709251239
57<cr>
ADD|- right ventricular hypertrophy~Right ventricular hypertrophy with
repolarization abnormality~THE DIAGNOSIS STATEMENTS CONTINUE THIS
IS FREE TEXT ENETERED HERE AGAIN.~~Referred By: Overread
By: JOHN DOE|||||C<cr>

```

D

Appendix D – HL7 Sequence Number Protocol

For your notes

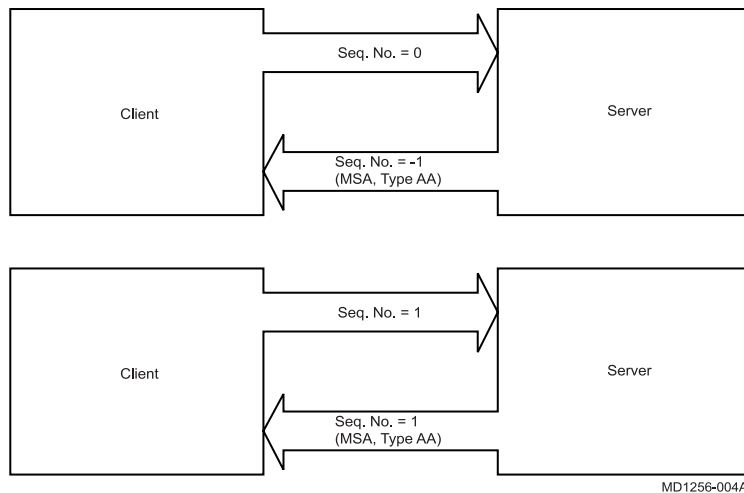
Sequence Number Protocol

Requirements

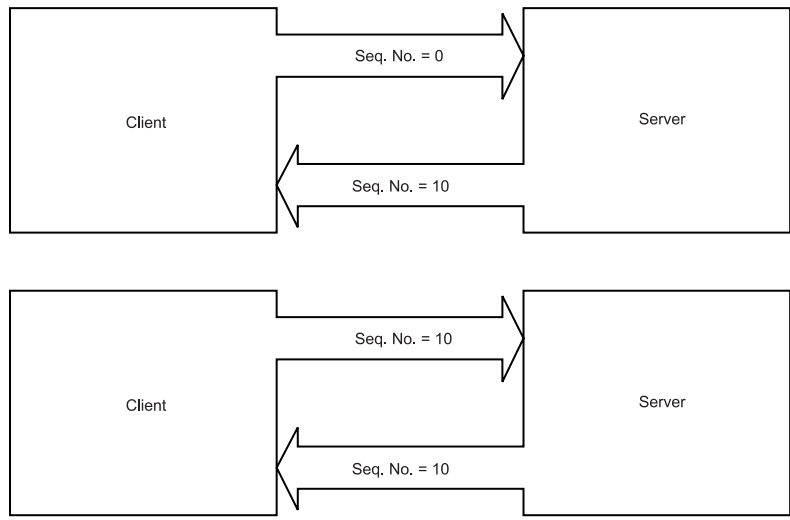
- The client side of the interface, outbound data transfer, must be able to store and send the proper sequence number.
- The server side, inbound data transfer, must be able to store and respond with the expected sequence number.
- The client side must be able to keep a queue of messages that have been sent, indexed by sequence number. The size of the queue is configurable from 0 to 9999. The queue size indicates the number of messages that can be rolled back.
- The client side must be able to optionally halt the interface and notify the system operator that a problem has occurred or to force a re-synchronization by sending a message with a sequence number of -1.

Functionality

Initial Link Startup



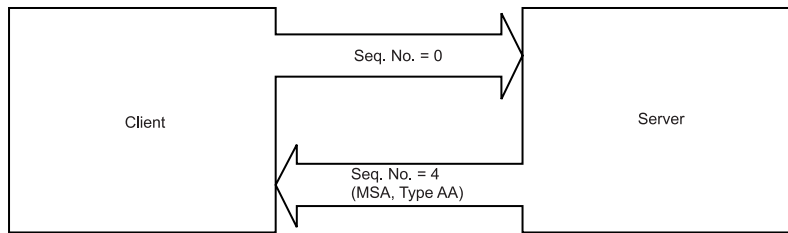
Initiating System Restarts the Link



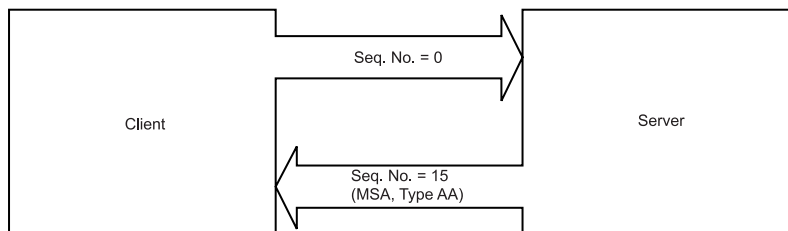
MD1256-005A

Note: If the Expected Sequence Number (ESN) is less than the last message transmitted by the Client, the remainder of the queued message will be transmitted.

Initiating System Restarts Link but Expected Sequence Number is Out of Queue Range

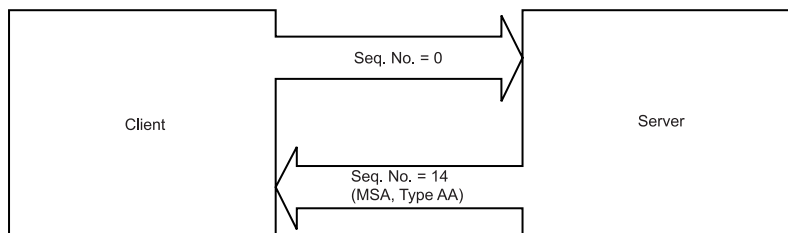


Client Freezes Link, manual intervention required
Initiating System Queue is 5 - 13
ESN of last accepted is 3



Initiating System Queue is 5 - 13
ESN of last accepted is 14

Client Freezes Link, manual intervention required

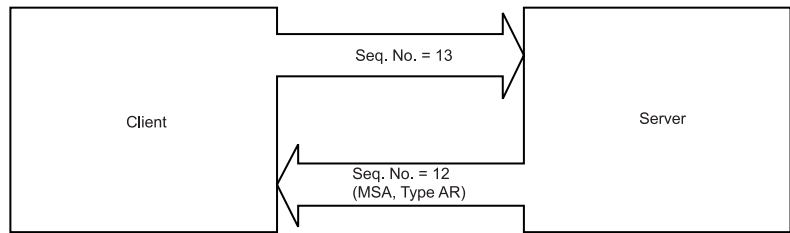


MD1256-006A

Initiating System Queue is 5 - 13
ESN of last accepted is 13

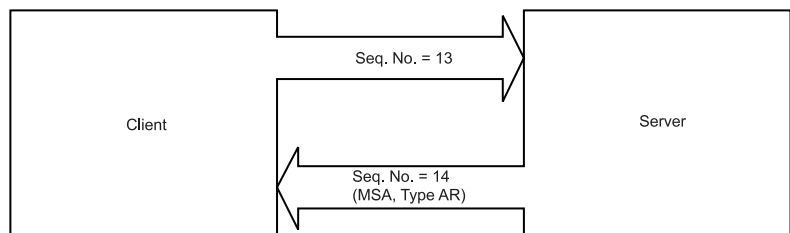
Client Sends Seq. No. 14, When Available

Server System Rejects the Message for a Sequence Error



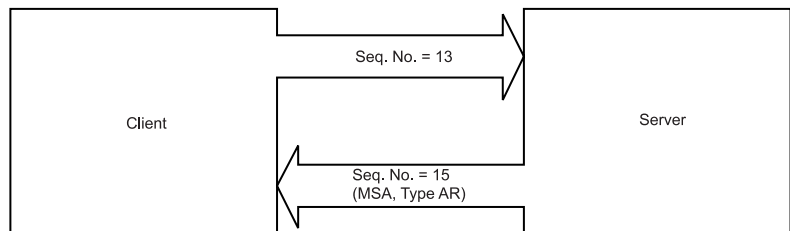
Client Sends Message 12, then 13

Initiating System Queue is 5 - 13
SN of last accepted is 11



Initiating System Queue is 5 - 13
SN of last accepted is 13

Client sends Number 14 when available, (ACK for 13 was lost)



MD1256-007A

Initiating System Queue is 5 - 13
ESN of last accepted is 14

Client Halts Interface, Manual Intervention Required



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