BD

LIS
Vendor Interface
Document

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Change History

Revision	Date	Pages/Sections	Reason
(A)	10/99	All	New manual release
(B)	3/00	All	New fields added to EpiCenter interface to support Phoenix ID/AST instrument data. Added Isolate results reporting for EpiCenter. Added additional results for tests. And changed Patient and Specimen user defined fields 4 & 5 to free text fields.
(C)	3/01	All	Added BD Phoenix 100 section. Updated list of antibiotic and organism codes. EpiCenter uploads chartable rules and special messages. EpiCenter allows blanking of a field. EpiCenter adds fields for excluding isolates from statistics and test complete DT.
(D)	5/01	2, 17, 18, 22, 28, 61-63, 65	Updated orders record to incorporate critical panel specification. Updated result record to include resistance markers 4 – 10. Changed 'resistance mechanism' to 'resistance marker' throughout. Changed "BACTEC9000" to "BT9000" in instrument type result field. Fix Phoenix resistance marker result upload example.
(E)	10/01	All	Formatting changes
(F)	3/02	All	Various updates throughout the document to cleanup references/definitions and lists of information.
(G)	12/03	All	Updates for EpiCenter Version 4 Features
(H)	12/03	18,31,63,65-76	Updates for Phoenix Version 4
(I)	-	-	Skipped
(J)	4/14/04	All	Phoenix Version 4.01Z and EpiCenter 4.10A updates, BD ProbeTec ET and Viper SP updates for new configuration options, status, and assay type list.
(K)	03/14/05	All	Various updates throughout the document to cleanup examples.
(L)	04/28/08	13, 16, 22, 25, 28, 31, 32, 38, 39, 41, 42	Updates for FX , Emulating BACTEC 9000, addition of ID test source field, addition of isolate upload examples
(M)	9/11/2008	83--98	Added section 14.4 describing BACTEC FX standalone

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(N)	2/25/2009	22, 30, 66-69	Added new Viper XTR assay codes for HSV1 and HSV2
(O)	7/02/2010	25, 27, 37	Add additional value to Time Qualifier field, add note to Admission Date/Time, Collection Date/Time and Received Date/Time fields
	06/06/2011	23, 30, 33-35, 41,47, 101-109	Updates for Innova instrument
(P)	07/27/2012	72	Added new Viper XTR assay codes for HPV and TVQx
(Q)(17)	10/24/2013	69-75	Added additional information for Viper LT
18	10//2016	Preface; sections 8, 12, 13, 14	Added information for BD Phoenix M50

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1. Purpose

This document is intended to provide the information necessary for an LIS to exchange medical data with Becton Dickinson instruments. This document was written to include the specifications for the BD data management system as well as all future BD instruments. Any differences between instrument and data management communication are outlined in this document's appendices.

2. Scope

This document details the interface between a Laboratory Information System and Becton Dickinson instruments and the Becton Dickinson data management system. The interface uses the ASTM E_1381 protocol at the physical layer and the ASTM E_1394 protocol at the logical layer.

3. Definitions

LIS – Laboratory Information System; Computer system present in most microbiology labs responsible for collecting patient and test data.

ASTM – American Society for Testing and Materials; Committee responsible for publishing specification on communication between lab instruments and lab computer systems.

ASTM E_1381 – Protocol published by ASTM describing low-level data exchange across a serial port.

ASTM E_1394 – Protocol published by ASTM describing the logical level formatting of patient and test data.

EpiCenter – Data Management System produced by Becton Dickinson that collects microbiology test results.

LIS Interface Library – Common module responsible for implementing communication protocols. This module is used by both the BD instruments and the EpiCenter for LIS communication.

Date/Time – All times will be represented in local time unless otherwise specified.

4. Overview

Becton Dickinson (BD) has released several instruments that perform automated microbiology testing. BD has also released a data management workstation that communicates with these instruments and collects test results. It is BD's intention to communicate these results up to the LIS, if one is present in the microbiology lab. The protocols and specifications for exchanging data between BD instruments and an LIS are described in this and subsequent sections.

It is Becton Dickinson's expectation that an LIS vendor will implement the specifications in this document in their entirety. The proper functioning of the EpiCenter and BD instruments is dependent on the proper exchange of information with an LIS. An agreement to support LIS communication with BD instruments should be considered an agreement to implement all aspects of this specification.

4.1. Physical Cable Interface

The BD instruments and data management system communicate to the LIS using an RS232 serial port interface. The serial port interface used by the instruments uses only 3 signals in the interface cable, Transmit Data (Pin 2), Receive Data (Pin 3), and Signal Ground (Pin 5). Becton Dickinson does not believe that the inclusion of additional signals will cause any problems for the interface; however, Becton Dickinson has not tested this case.

4.2. Communication Protocols

The American Society for Testing and Materials (ASTM) has published standards for how information should be exchanged between a clinical instrument and lab computer system. BD has implemented communication software to adhere to these specifications. In system configurations that include the BD data management system, the EpiCenter plays the role of the instrument.

The ASTM committee has produced standards describing both the logical level formatting and the physical exchange of data across a serial port. The logical level formatting describes how to place individual pieces of medical information into a record string, and how to combine record strings into a properly formatted message string. The physical level protocol describes how logical level message strings can be partitioned and passed across an RS232 line to an LIS.

ASTM E_1394 is the publication that outlines the logical formatting of medical information. This is the logical protocol BD uses to read/write data exchanged with the LIS. The ASTM E_1394 publication should be referred to for implementation details. A later section in this document discusses any deviations from that specification.

ASTM E_1381 is the publication that outlines the physical communication of medical information. This is the physical protocol BD uses to read/write data exchanged with the LIS. A later section in this document discusses any deviations from that specification.

4.3. System Configurations

The BD data management system is designed to communicate with several different types of BD instruments. The system configuration of these instruments is outlined in figure 1. New generation BD instruments have a TCP/IP network capability and use a local network to communicate to the EpiCenter. These results are then passed up to an LIS via the protocols described in this document.

Since the EpiCenter collects results from several different types of BD instruments, it passes several types of test results up to the LIS. This document specifies several different types of result records (per ASTM E_1394) for handling all of the various types of result data.

BD also has implemented LIS interface software in each of its new generation instruments. This allows the instruments to pass results directly up to the LIS, when an EpiCenter is not present in the lab. This configuration is illustrated in figure 2. Each of the instruments sends up the results that they acquire. The types of result messages that they produce (per ASTM E_1394) are expected to be the same as those for the EpiCenter.

Any specifications that relate only to a BD instrument are included in an appendix to this document.
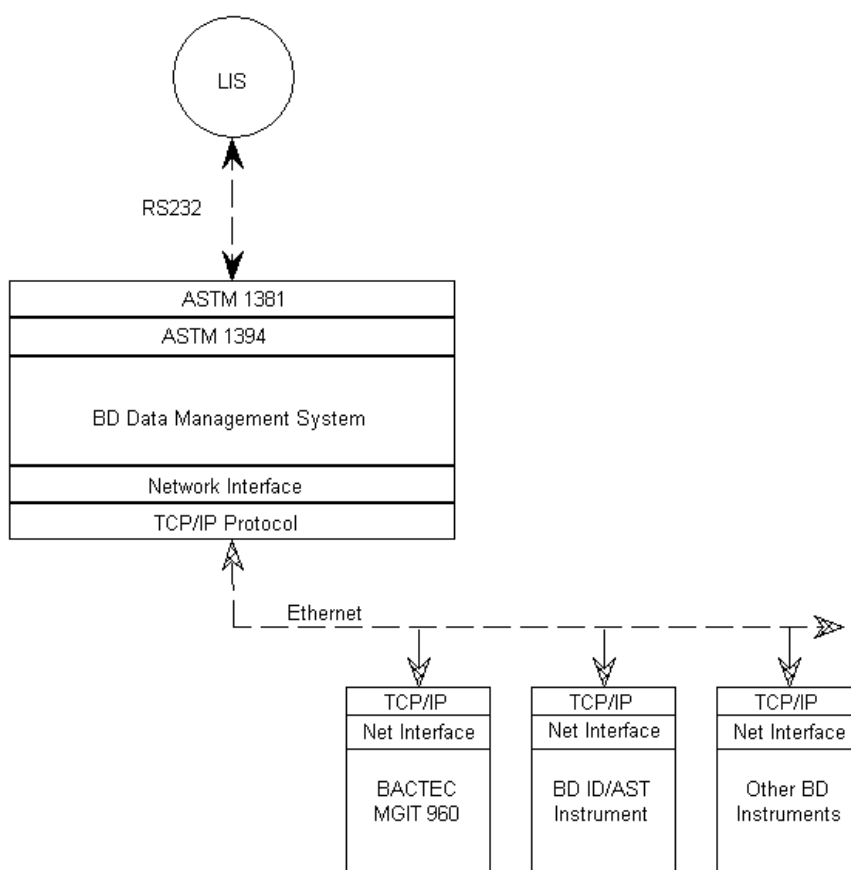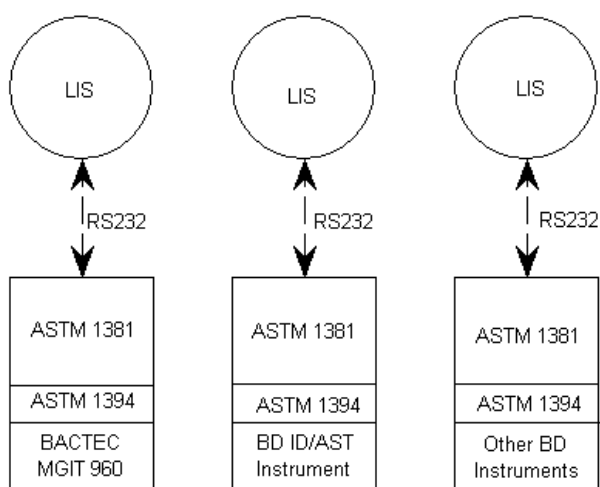
Figure #1

Figure #2

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4.4. EpiCenter- LIS Communication

The EpiCenter is designed to handle results from several different types of microbiology tests. BD instruments produce a varied set of results including growth and detection, ID, and AST results. In addition, manual off-line tests are often required to supplement the instrumented results. The EpiCenter is designed to manage these off-line test results as well as instrumented results.

The EpiCenter expects to upload test results, both instrumented and manual, to the LIS. The EpiCenter also expects to receive downloaded patient demographics and supplemental test information from the LIS. The test information that is exchanged with an LIS is configurable by the user, as is described in a later section of this document.

The EpiCenter is designed to use coded values for communicating data with an LIS. Most fields in the BD database are associated with an "LIS Code" that is configurable at the EpiCenter. This is a 20-character string that contains an LIS defined value that uniquely identifies that item. "LIS Codes" are used to represent patient demographic fields, tests, and test results in LIS communications. Later sections of this document outline the fields represented by LIS codes and how they are mapped in an LIS communication.

The most efficient way to implement this interface would be an exchange of configuration information between BD and the LIS vendor. The LIS vendor can provide BD with the LIS Codes necessary to translate message data. The list of tests and results currently defined in the EpiCenter database is included in Appendix B of this document. The EpiCenter can also import coded list information (Body site, Hospital Service, Ordering Physician, etc.) The EpiCenter can accept this information as a text based comma separated value file or other similar format.

However, most BD instruments are not able to change their LIS codes for LIS vendor convenience. Instead they pass hard coded literal strings for test id's, test status values, etc. The literal values passed by the instruments are restricted to fields related to that instrument. These literal strings used by the instruments are outlined in later sections of this document.

5. Workflow

The EpiCenter has a more sophisticated workflow with regard to an LIS than any instrument. Therefore this section concentrates more heavily on EpiCenter workflow. Details about BD instrument workflow are provided in an appendix in this document.

5.1. Uploaded Test Results

Each test in the EpiCenter database, both manual and instrumented, has a set of results defined for that test. Each test result has a configurable field determining if that status is reportable to the LIS. This field can be set to one of three values, always report to LIS, never report to LIS and report only when finalized. When a test result is changed to a new value, the EpiCenter checks this field to determine if the result should be uploaded to the LIS. A status configured to be "Auto Upload only when finalized" is only uploaded when the user has finalized the test. By using the "Auto Upload to LIS" field, the user can tailor the LIS interface to upload only the tests and results the LIS has defined. This configuration option also allows the EpiCenter to mimic any LIS workflow defined by a particular instrument.

Test results can be forced over these upload restrictions by first enabling the LIS Forced Upload feature of the BD EpiCenter. Then initiating a manual upload of the test results via the EpiCenter user interface, or querying for the associated specimen or test will result in the test results being uploaded to the LIS despite the upload restrictions. The EpiCenter can be configured to enable or disable unsolicited uploads from the EpiCenter. If unsolicited uploads are enabled, then when a test is assigned an uploadable status, an upload message is generated to the LIS. If the unsolicited upload option is disabled, then test status changes do not generate upload messages. Instead, the LIS has to query the EpiCenter for test information, and only those tests with an uploadable status are included in the response message. If LIS Forced Uploads is enabled at the EpiCenter, all test

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results matching the query will be uploaded regardless of whether their status is uploadable.

5.2. Uploaded Isolate Results

In an attempt to characterize an organism, a lab may run more than one ID/AST test on a particular isolate. Multiple ID/AST tests may produce conflicting results for either an organism id or antibiotic susceptibility. The EpiCenter identifies when two or more tests produce conflicting results and alerts the user that they must select the appropriate results for that isolate. Once the conflict has been resolved, the EpiCenter saves the ID and AST results for that isolate separate from the test results. On the EpiCenter, these are called Isolate Level Results.

Figure 3 depicts the basic record structures within the EpiCenter.
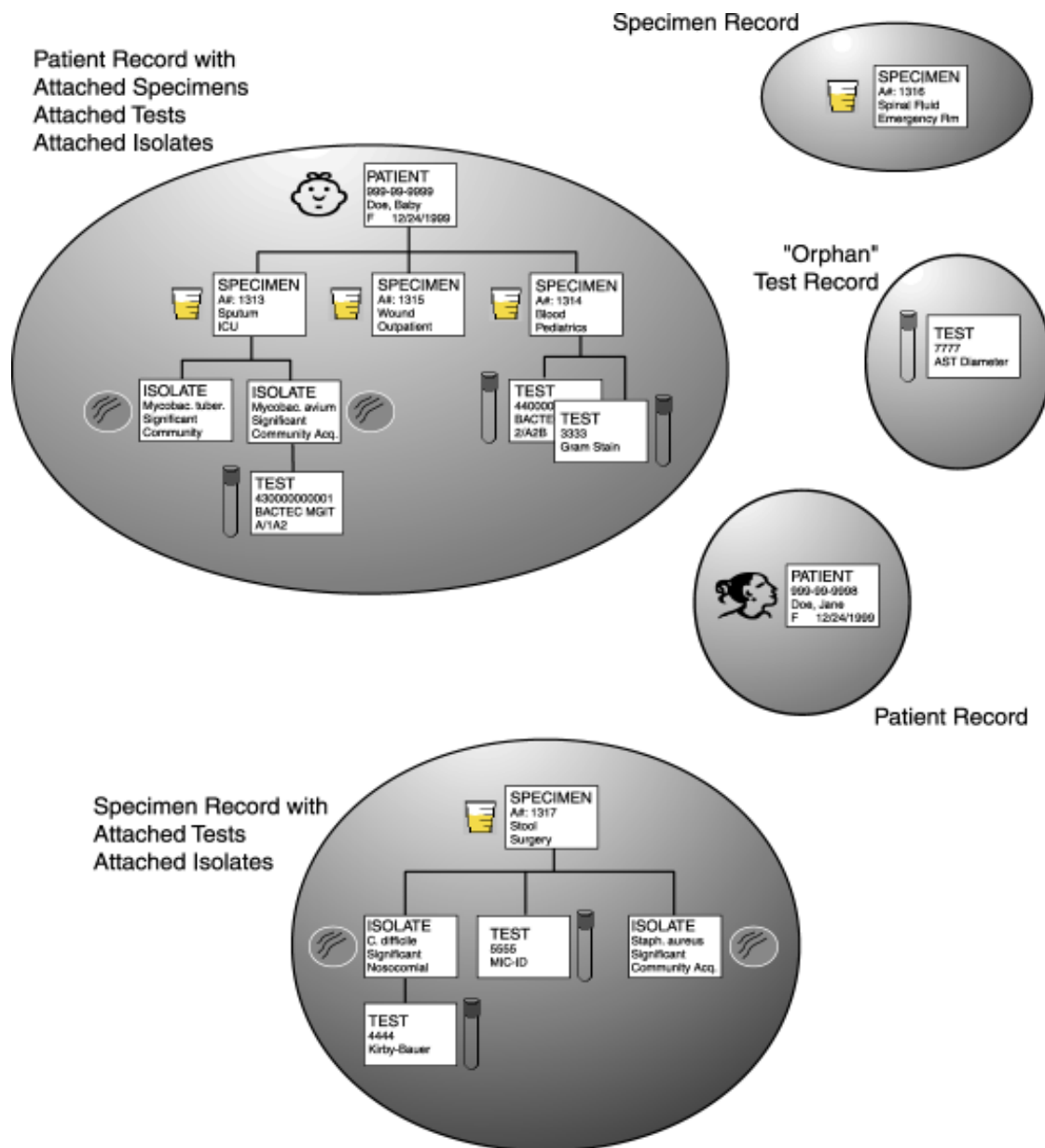
Figure 3

The relationships and hierarchy of the finalization scheme in the EpiCenter is depicted in Figure 4.
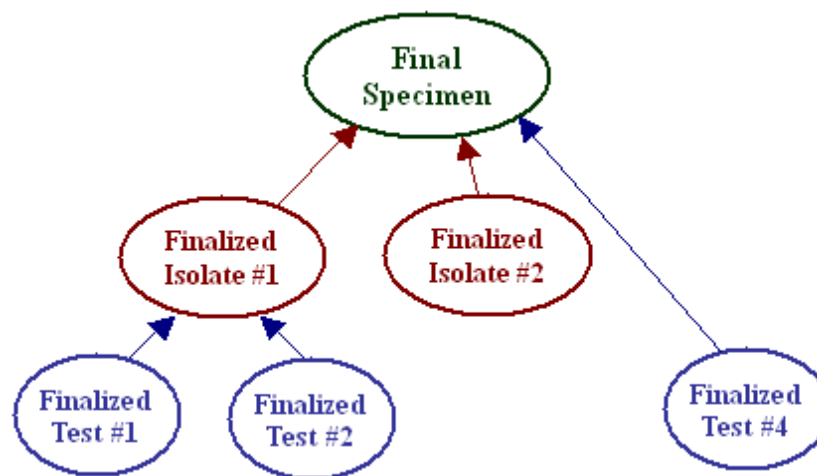
Figure 4

The EpiCenter also includes an expert system, which evaluates ID/AST results. The input to the expert system is the results from any ID/AST test. The output of the expert system may be a different isolate AST result. Any expert system changes to AST results are maintained as a separate field, but are included as part of the isolate results. So isolate results provide both the test result and the expert system result, as described in a later section.

Isolate results may be a compilation of several ID/AST results. They are also free of any conflicts. Expert system evaluations are also available with isolate level results. For these reasons, some LIS sites may find isolate level results more valuable than test level results. The EpiCenter therefore provides a mechanism for uploading isolate level results, test level results, or both.

The configuration section of the EpiCenter allows the user to set an LIS Auto Uploadable field for isolates. This field can be set to Always "Auto Upload" to LIS, "Never Auto Upload" to LIS, "Auto Upload When Specimen Finalized" or "Auto Upload When Isolate Finalized". This works in a similar way as test status results do for tests. When the isolate Auto Upload field is set to "Auto Upload When Specimen Finalized", isolate level results are only uploaded once the specimen has been finalized by the user. When the isolate Auto Upload field is set to "Auto Upload When Isolate Finalized", isolate level results are only uploaded once the isolate has been finalized by the user.

Isolate results can be forced over these upload restrictions by first enabling the LIS Forced Upload feature of the BD EpiCenter. Then initiating a manual upload of isolate results via the EpiCenter user interface, or querying for the associated specimen will result in the isolate results being uploaded to the LIS despite the upload restrictions.

Isolate results are differentiated from test results as follows:

- The Test Id in Order field (O, 5, 1, 4) is set to "ISOLATE RESULT" instead of a real test id.

- The first result record of an isolate result is always an ID record regardless of test types.

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- The ID record will contain the ID test source in field (R, 4, 1, 9).

- Unlike test uploads whch have a fixed number of results, the number of results included in an isolate can flucutuate until the isolate is finalized.

- Isolate level AST result records will contain Interpreted (R, 4, 1, 4), Expert (R, 4, 1, 5) and Final (R, 4, 1, 3) AST susceptibility values whereas test level results only contain Interpreted (R, 4, 1, 4) AST susceptibility values.

- Isolate level AST result records will contain the AST test source in field (R, 4, 1, 6).

It is possible to dictate the upload order of individual antimicrobial isolate results from the BD EpiCenter through the use of Antimicrobial Ordering feature.

5.3. Unsolicited Downloads

The EpiCenter accepts unsolicited download data from the LIS containing patient demographics and supplemental test information. The fields that the EpiCenter are interested in receiving are outlined in section 8 (Message Content) of this document.

Supplemental tests and results are expected to be transmitted in the same logical placement as tests and results that are uploaded. The time/date fields for test results are used to identify LIS test results more recent than EpiCenter test results. Also a test/consumable sequence number field can be used as an identifier for a test. This allows the LIS or EpiCenter to distinguish between two tests of the same type ordered against a specimen.

An LIS Test Order can also be accepted via unsolicited download without a test/consumable sequence number. In this way the LIS can order tests on specific specimens and isolates without having to format a valid BD instrumented sequence number. These orders will be automatically associated with matching tests in the EpiCenter database as they are detected. These orders can also be manually associated with orphan tests by the EpiCenter user.

The EpiCenter does not accept edits from the LIS to key fields used to identify patients and specimen. A patient ID is the key field identifying a patient. An accession number is the key field identifying a specimen. If either of these fields is received in a download message to the EpiCenter, and these values are not matched in the EpiCenter database, they are considered new entries. Re-association of a test to a new specimen, or re-association of a specimen to a new patient, must be done at the EpiCenter.

For test order and result information, the EpiCenter evaluates the time stamps associated with that data to determine which results are more current. If the LIS information is more current, than it is used to override the EpiCenter information.

For all other data downloaded from the LIS, which does not include a time stamp, the LIS data is considered correct and overrides any EpiCenter data.

Isolate level results are not accepted in a download from the LIS.

5.4. File Import

The EpiCenter has the ability to import LIS files containing downloaded information. The user can access a screen in the EpiCenter to manually select files to import. Import files must be text files that follow the ASTM 1394 protocol, which describes the serial line interface. The import file text is sent through the same message parser that regular serial communications go through, processing the same fields that are configured for the serial interface.

Currently the EpiCenter does not export any upload information to a file.

5.5. Queries

The EpiCenter is able to generate request messages (or queries) to the LIS for information. When the EpiCenter sees a new accession number, either from user entry or an instrument, the EpiCenter uploads a request message. EpiCenter request messages, (as outlined in section 8 - Message Content), are sent for only a single specimen at a time. Requests for information from the EpiCenter should be interpreted as requests for both patient demographics and supplemental test information for that specimen.

The EpiCenter can be configured to enable or disable queries sent to the LIS. If EpiCenter queries are enabled then the EpiCenter generates request messages to the LIS for information. If LIS queries are disabled, then no request messages are uploaded to the LIS.

The EpiCenter is also able to respond to a request generated by the LIS. The ASTM E_1394 specification describes several qualifying fields that can be included in the request for a particular set of results. The qualifying fields that the EpiCenter can process are a subset of those and are outlined in section 8 (Message Content) of this document.

The fields that are included in an uploaded response message are the same fields that are included in an n unsolicited upload message.

The EpiCenter only requests information from the LIS one specimen at a time. The EpiCenter does not use many of the qualifying fields provided for in the ASTM specifications. An example of a request from the EpiCenter is provided in section 8.2.6, outlining request record fields.

5.6. Error Reporting

The LIS interface implemented by Becton Dickinson adheres to all of the error detection and recovery outlined in the physical level protocol. The ASTM E_1381 protocol defines the use of check sums, time outs, etc., for the proper exchange of information. The rules described in that specification should be used to indicate whether or not data was properly sent between the LIS and the BD instruments. In the EpiCenter, any errors detected at the physical protocol level are also reported to the user and recorded in an error log.

Information transfers can also contain logical level formatting problems, or errors in message content. These logical errors may be determined after the physical receipt of the message has been acknowledged. The ASTM protocols do not describe a mechanism for reporting logical level errors. Instead any logical level errors are reported to the user by the EpiCenter. The Epicenter has an error log that contains any problems that occurred during the processing of an LIS download. It is the user's responsibility to recognize and resolve logical level problems.

6. Protocol Specifications

Most of the specifications needed for implementing the communication protocols are contained in the published documents referred to Overview Section of this document. The following sections contain any clarifications or deviations to those specifications.

6.1. Physical Protocols

The BD LIS interface implements the ASTM E_1381 physical level protocol as outlined in the published specification except for the deviations described below.

6.1.1. Memory limitations

The ASTM E_1381 protocol does not place a limit on the total size of the message that can be received by the instrument. Since the EpiCenter is software resident on a standard PC, it does not have any significant restrictions on download message sizes. The EpiCenter expects to be able to handle any reasonably sized messages downloaded from the LIS. Should any download

message exceed the maximum capacity of the EpiCenter, the message is rejected during transmission and an error notification is displayed to the user.

6.1.2. Unpacked Frames

Becton Dickinson interprets the ASTM E_1381 specification to imply that an intermediate frame of a message should be packed to be 240 characters in length. The only frame that should be less than 240 bytes in size is the last frame of a message.

However BD has had feedback from several LIS vendors who interpreted the ASTM E_1381 specification differently. These vendors have requested that the BD LIS interface be able to send and receive frames that contain only a single logical record. (i.e. Header, Patient, Order, Result and Terminator records all are sent in separate frames). This implies that most frames are less than 240 bytes in length. However it is still possible that a single logical record could be longer than the 240 bytes limit for a frame. In this case a single logical record is sent in several consecutive intermediate frames. All but the last frame are packed to 240 bytes and the last frame containing that logical record is less than 240 bytes.

The BD LIS interface is configurable to send either packed frames or unpacked frames, which contain a single record per frame. (The BD simulator described in a later section also has this configurable option).

6.1.3. BDMODEM

The BD LIS Interface can be configured to use the BDMODEM physical layer protocol. This customized protocol has been implemented by BD instrumemtation already out in the field. In order to maintain backwards compatibilty, the data management system supports this protocol. However, this protocol is not intended to be used for any new LIS connections. BD strongly suggests implementing the industry standard ASTM 1381 protocol for all new LIS connections. A full description of the BDMODEM protocol is provided in other BD documentation. If needed, please contact Becton Dickinson for more information.

6.1.3.1. Emulate BACTEC 9000 LIS Interface

The Emulate BACTEC 9000 LIS Interface option is available when BDMODEM is the selected physical protocol.

This option provides backwards compatibility when an EpiCenter is being installed where a BACTEC instrument is currently connected directly to an LIS per the BACTEC 9000 LIS Vendor Interface Specification.

6.1.3.1.1. Field Map Changes

The following field mappings are changed when the Emulate BACTEC 9000 LIS Interface option is enabled.

EpiCenter Default Value	Corresponding BDModem/Emulate 9000 Value
Test Code to O, 5, 1, 4	Test Sequence Number to O, 5, 1, 4 Used for Vial Sequence Number 1
Isolate Source Test 1 to O, 14, 1, 1	Isolate Source Test 1 to O, 5, 2, 4 Used for Vial Sequence Number 2
Isolate Source Test 2 to O, 14, 2, 1	Isolate Source Test 2 to O, 5, 3, 4 Used for Vial Sequence Number 3
Specimen User Text 1 to O, 19, 4, 1	Specimen User Text 1 to O, 5, 4, 4 Used for Vial Sequence Number 4
Specimen User Text 2 to O, 19, 5, 1	Specimen User Text 2 to O, 5, 5, 4 Used for Vial Sequence Number 5

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EpiCenter Default Value	Corresponding BDModem/Emulate 9000 Value
Result Type to R, 3, 1, 4 and enabled	Result Type to R, 3, 1, 3 and disabled
Sequence Number to R, 3, 1, 5	Sequence Number to R, 3, 1, 4
Media Type to R, 14, 1, 2	Media Type to R, 3, 1, 5
Instrument Type to R, 14, 1, 1	Instrument Type to R, 14, 1, 5
Instrument Location to R, 14, 1, 5	Instrument Location to R, 14, 1, 1
Request Test Status Code to Q, 5, 1, 2	Request Test Status Code to Q, 5, 1, 4
Request Instrument Number Q, 5, 1, 4	Request Instrument Number to Q, 5, 1, 2
Comment Text C, 4, 1, 1	Comment Text C, 3, 1, 1

6.1.3.1.2. Test Status LIS Codes

Duplicate LIS Codes are permitted for BACTEC and FX tests when the Emulate BACTEC 9000 LIS Interface option is enabled.

6.2. Logical Protocols

The BD LIS interface implements the ASTM E_1394 logical level protocol as outlined in the published specification except for the deviations described below.

6.2.1. Unprocessed Records

The ASTM E_1394 logical level specification describes the use of Scientific and Manufacturer records. The BD LIS interface accepts these records in a download message, however it does not evaluate the content of these record types. These records are extracted from any messages downloaded from the LIS. Messages generated by a BD LIS interface do not contain any of these records.

6.2.2. Download Only Fields

The ASTM E_1394 specification describes several fields that are divided into components, such as patient address field and patient name. For example, the address field is defined to have the street address, city, state, country, and zip code all separated by component delimiters. However these fields are saved as a single string in the EpiCenter database. The BD LIS interface reads those individual components from a download message and concatenate them for storage.

The BD LIS interface does parse these fields into their components for upload messages. If a concatenated field is selected for upload, the entire string is placed in the fist component of the field. For example, a Patient's address, including city, state and zip code, are all included in the string in the Street Address field of the Patient record. Currently the only two fields that are handled this way are Patient Name and Patient Address.

6.2.3. Communication Errors

The ASTM E_1394 protocol defines a hierarchical relationship to logical records. This protocol states that if a complete message is not successfully transmitted, then only the logical records that complete the hierarchical relationship must be resent. For example, if a message containing several patient records is not received by the instrument properly, then only the logical records from the latest Patient record on must be resent in a new message.

However the ASTM E_1381 protocol, in section 6.5.2.3, states that if a message is not received properly, the complete message is resent. The BD LIS interface follows the specification as outlined in the ASTM E_1381 physical level protocol. If a message is not transmitted successfully the BD LIS interface expects the whole message to be resent.

6.2.4. LIS Codes

The EpiCenter uses "LIS Codes" to represent many fields in an LIS communication. "LIS Codes" are values defined by the LIS that uniquely identify a field. BD uses these codes for any information that can be configured by the user. These fields include many patient demographic fields, such as Hospital Service. "LIS Codes" are also used as test ID values, and as test status values, as described in the overview section.

"LIS Codes" are used for field values instead of full names, as described in the ASTM E_1394 specification. If an LIS does not have abbreviated codes for these fields, then the "LIS Codes" can be configured to be the same as the field name text. A complete list of fields associated with an LIS code can be found in section 8 (Message Content) of this document.

Again, instruments generally do not communicate using LIS Codes. They send pre-defined literal strings in their ASTM messages. The strings used by the instruments when reporting their results are outlined in the instrument specific Appendices of this document.

LIS codes are NOT case sensitive and have a maximum length of 20 characters, except resistance markers that have a maximum length of 16 characters.

6.2.5. Blanking fields

As per the ASTM 1394 specification, the EpiCenter will accept the "" string as an indication that the value of a field should be blanked. Key fields, like Patient Id and Accession Number do not support this feature. When any coded list field in the EpiCenter, for example Hospital Service, gets blanked by the LIS, its value will change to the default value of "Unspecifed".

The EpiCenter can exchange fields with an LIS that include a list of possible values, for example Resistance Markers. When the EpiCenter receives data in a download it will replace its entire list with the list provided in the download. And in order to blank out all entries of that list, the "" string should be placed in the first field designated for that data.

7.   Configurable Options

There are several aspects of the BD LIS interface that are configurable by the user. This allows the BD instruments to tailor their connection to the local LIS. The configurable parts of the BD LIS interface are described below.

In some cases, configuration options are specific to the EpiCenter. An appendix at the end of this document lists configuration options specific to each instrument.

7.1.   Port parameters

The BD LIS interface is based on serial port communication. The parameters for initializing the serial port are configurable by the user to allow for proper communication. The configurable parameters include the following fields.

Comm Port Number – acceptable values range from 1 to 4.

Baud Rate – acceptable values include 300, 600, 1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600, and 115200.

Data Bits – acceptable values range from 5 to 8.

Stop Bits – acceptable values include 1 and 2.

Parity – acceptable values include ODD, EVEN, and NONE.

7.2. Auto-Populating Lists

The EpiCenter has a configurable option to allow new entries detected in a downloaded message to be automatically added to the BD database. If an unrecognized "LIS Code" is found in a download field, a new entry is made to the database containing that translation code. A notification is then presented to the user suggesting that they complete the proper name, and other fields, for that list entry. This is designed to provide a mechanism for initializing the EpiCenter database with all of the relevant values needed for proper LIS communication.

Antibiotics and organisms are considered coded list fields by the EpiCenter and have an LIS translation code associated with them. For antibiotics and organisms the LIS codes are defaulted to Becton Dickinson defined abbreviations. The user has the ability to modify these codes if they do not agree with codes used by the LIS, however the Organism and Antimicrobial coded lists do not support the auto-populate feature. A listing of antibiotics and corresponding BD abbreviations can be found in Appendix C. A listing of organisms and corresponding BD abbreviations can be found in Appendix D.

7.3. Logical Protocol Parameters

The ASTM E_1394 protocol specifies four types of characters to be used to delimit fields in a record, (field, repeat, component, and escape delimiters). The user is able to configure which characters are used as delimiter characters. These characters are defaulted to the ones used in the ASTM E_1394 publication, '|', '\', '^', and '&' respectively.

The user is able to configure whether packed or unpacked frames are uploaded to the LIS. Unpacked frames contain a single logical record per frame.

At the EpiCenter, the user is able to configure whether or not a logical record is terminated by a CR character only, or both a CR – LF character sequence.

7.4. ASTM Field Mapping

There are a number of fields contained in the EpiCenter database that need to be exchanged with the LIS. BD has made an effort to properly map these fields, per the ASTM E_1394 specification, to a field position in an appropriate record. However, some LIS vendors may interpret the meaning of these ASTM fields differently. The BD LIS interface allows the user to update the location of any field. This should allow the user to compensate for any inconsistencies between BD and LIS interfaces.

The user is able to identify each field in the BD database as an upload or download field. Fields enabled for upload messages are included in result messages passed up to the LIS. Fields enabled for download messages are parsed from any download messages from the LIS. This allows the BD LIS interface to be tailored to the specific needs of the LIS environment.

Several fields appear to be mapped into multiple locations, including test/consumable sequence number and Organism Code. These fields are mapped into the Order record because they may be needed to define a specific ordered test. These fields are also mapped into the Result record because they may be considered a result of an ID test. These fields are looked for and extracted from either location.

7.5. User Defined Fields

The EpiCenter contains 5 patient and 5 specimen fields that can be defined by the user. The EpiCenter makes no assumptions about what type of information is maintained in

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these fields.   The user is able to use these fields to contain any data that the EpiCenter did account for with its other fields.

Three patient fields and three specimen fields are managed as coded list fields. These are fields whose value is one from a pre-configured list. For example the Specimen Type field can be set to a value from a determined list. The user is able to configure the entries listed in each field and define a label for that field.

Two more patient and 2 more specimen fields are free text fields that need not come from a pre-defined list of values. For example, these fields could be used for data such as a patient's Social Security Number. The user can also define a label for these fields.

Since the EpiCenter has no knowledge of the type of information being maintained in these fields, it cannot assign a meaningful default mapping in an ASTM record. These fields are mapped by default to an unused ASTM location. They are also disabled by default for both upload and download messages. The user can populate these fields and re-map them to an ASTM location agreed upon with the local LIS.

8.   Message Content

The following sections describe which fields are exchanged with each instrument and the EpiCenter.

8.1.   Field List

This section lists all of the fields by name EpiCenter can exchange with the LIS.

Each field is displayed with its default mapping in the ASTM E_1394 records. This position consists of a record type (Patient, Order, Result, Query, or Comment), a field delimiter counter, repeat delimiter counter, and component delimiter counter. The fields are grouped according to the ASTM E_1394 record type they are mapped to.

The field list also indicates if that field is defaulted as an upload (U) or download (D) field, or both (U/D). A blank column indicates that the field is not to be exchanged with an LIS. Fields not configured to be exchanged with the LIS are ignored in a download message.

The first two fields of every record include the Record Type indicator and a record index value. These fields are considered part of every record but are not listed in these tables. The following section describes these fields in more detail, including the expected values for each field.

Result records have data fields with multiple definitions, such as Result Data 1, Result Data 2, etc. The data contained in these fields depends on the type of results being reported. ID tests may have organism data in those fields, while AST tests have antibiotic data in those fields. The following sections describe in more detail what data can be expected in a result record.

Header Record Field Name	ASTM Pos.	Direction
Sender Name	H, 5, 1, 1	U
Version Number	H, 13, 1, 1	U
Message Date/Time	H 14, 1, 1	U

Patient Record Field Name	ASTM Pos.	Direction
Patient ID	P, 4, 1, 1	U/D
Patient Name (Last)	P, 6, 1, 1	U/D
Patient Name (First)	P, 6, 1, 2	D
Patient Name (Middle)	P, 6, 1, 3	D
Patient Name (Suffix)	P, 6, 1, 4	D
Patient Name (Title)	P, 6, 1, 5	D
Date of Birth	P, 8, 1, 1	U/D

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Patient Record Field Name	ASTM Pos.	Direction
Patient Sex	P, 9, 1, 1	U/D
Address (Street)	P, 11, 1, 1	U/D
Address (City)	P, 11, 1, 2	D
Address (State)	P, 11, 1, 3	D
Address (Zip Code)	P, 11, 1, 4	D
Address (Country)	P, 11, 1, 5	D
Patient Phone Number	P, 13, 1, 1	U/D
Admitting Physician	P, 14, 1, 1	U/D
Patient User Field 1	P, 15, 1, 1	
Patient User Field 2	P, 15, 2, 1	
Patient User Field 3	P, 15, 3, 1	
Patient User Field 4	P, 15, 4, 1	
Patient User Field 5	P, 15, 5, 1	
Patient Diagnosis	P, 19, 1, 1	U/D
Patient Therapy (1-5)	P, 20, 1-5,1	U/D
Admit Date/Time	P, 24, 1, 1	U/D
Room Number	P, 26, 1, 1	U/D
Hospital Service	P, 33, 1, 1	U/D
Hospital Client	P, 34, 1, 1	U/D

Order Record Field Name	ASTM Pos.	Direction
Accession Number	O, 3, 1, 1	U/D
Isolate Number	O, 3, 1, 2	U/D
Organism	O, 3, 1, 3	U/D
Exclude Isolate from Statistics	O, 3, 1, 4	U/D
Test ID	O, 5, 1, 4	U/D
Test/Consumable Sequence Number	O, 5, 1, 5	U/D
Priority	O, 6, 1, 1	U/D
Collection Date/Time	O, 8, 1, 1	U/D
Collected By	O, 11, 1, 1	U/D
Received By	O, 11, 1, 2	U/D
Specimen Action Code	O, 12, 1, 1	U
Isolate Source Test (1-3)	O, 14,1-3,1	U/D
Isolate Source Test Start Time (1-3)	O, 14,1-3,2	U/D
Receipt Date/Time	O, 15, 1, 1	U/D
Specimen Type	O, 16, 1, 1	U/D
Body Site	O, 16, 1, 2	U/D
Ordering Physician	O, 17, 1, 1	U/D
Ordering Physician Phone	O, 18, 1, 1	U
Ordering Physician Fax	O, 18, 1, 2	U
Ordering Physician Pager	O, 18, 1, 3	U
Specimen User Field 1	O, 19, 1, 1	
Specimen User Field 2	O, 19, 2, 1	
Specimen User Field 3	O, 19, 3, 1	
Specimen User Field 4	O, 19, 4, 1	
Specimen User Field 5	O, 19, 5, 1	
Finalized Date/Time*	O, 23, 1, 1	U/D
Specimen Reimbursement Value	O, 24, 1, 1	U
Test Reimbursement Value	O, 24, 2, 1	U
Isolate Classification/Nosocomial	O, 29, 1, 1	U/D

Result Record Field Name	ASTM Pos.	Direction
Result Type Code	R, 3, 1, 4	U/D
Test/Consumable Sequence Number	R, 3, 1, 5	U/D
Antibiotic	R, 3, 1, 6	U/D
Antibiotic Concentration	R, 3, 1, 7	U/D
Antibiotic Concentration Units	R, 3, 1, 8	U/D
Test Status	R, 4, 1, 1	U/D
Result Data 1		
BACTEC MGIT 960 Growth Units	R, 4, 1, 2	U
ProbeTecET/Viper XTR Alg.Results	R, 4, 1, 2	
AST MIC for AST MIC test	R, 4, 1, 2	U/D
AST Diameter for AST Dia. test	R, 4, 1, 2	U/D
Organism ID for ID test	R, 4, 1, 2	U/D
Result Data 2		
AST susceptibility (Final)	R, 4, 1, 3	U/D
Profile Number for ID Test	R, 4, 1, 3	U/D
Profile Number for Isolate ID	R, 4, 1, 3	U/D
Result Data 3		
AST susceptibility (Interpreted)	R, 4, 1, 4	U
Resistance Marker 1	R, 4, 1, 4	U
Result Data 4		
AST susceptibility (Expert)	R, 4, 1, 5	U
Resistance Marker 2	R, 4, 1, 5	U
Result Data 5		
AST Source test	R, 4, 1, 6	U
Resistance Marker 3	R, 4, 1, 6	U
Result Data 6		
Resistance Marker 4	R, 4, 1, 7	U
Result Data 7		
Resistance Marker 5	R, 4, 1, 8	U
Result Data 8		
ID Source Test	R, 4, 1, 9	U
Preliminary/Final Status	R, 9, 1, 1	U/D
Test Start Date/Time	R, 12, 1, 1	U/D
Result/Status Date/Time	R, 13, 1, 1	U/D
Test Complete Date/Time	R, 13, 2, 1	U
Media Setup Date/Time	R, 13, 1, 2	U
Instrument Type	R, 14, 1, 1	U
Media/Assay Type	R, 14, 1, 2	U
Protocol Length	R, 14, 1, 3	U
Instrument Number	R, 14, 1, 4	U
Instrument Location	R, 14, 1, 5	U
Protocol Name	R, 14, 1, 8	U
Additional Result Quantity (1-5)	R, 15, 1-5,1	U/D
Additional Result (1-5)	R, 15,1-5,2	U/D

Comment Record Field Name	ASTM Pos.	Direction
Comment Text	C, 4, 1, 1	U/D
Comment Type	C, 5, 1, 1	U/D

Request Record Field Name	ASTM Pos.	Direction
Request Starting Patient Id	Q, 3, 1, 1	D
Request Starting Accession Number	Q, 3, 1, 2	U/D
Request Starting Sequence Number	Q, 3, 1, 3	D
Request Ending Patient Id	Q, 4, 1, 1	D
Request Ending Accession Number	Q, 4, 1, 2	D
Request Ending Sequence Number	Q, 4, 1, 3	D
Request Test Id	Q, 5, 1, 1	D
Request Test Status	Q, 5, 1, 2	D
Request Instrument Type	Q, 5, 1, 3	D
Request Instrument Number	Q, 5, 1, 4	D
Request Result Qualifier	Q, 5, 1, 5	D
Request Time Qualifier	Q, 6, 1, 1	D
Starting Date/Time	Q, 7, 1, 1	D
Ending Date/Time	Q, 8, 1, 1	D
Request Information Status Code	Q, 13, 1, 1	U/D

Terminator Record Field Name	ASTM Pos.	Direction
Termination Code	L, 3, 1, 1	U/D

8.2. Field Descriptions

This section provides detailed information for each field listed in the previous section.

8.2.1. Header Fields

The header records that start each logical message are the same from all BD instruments. An example record is provided below. For examples of Header records used in the context of a message, please refer to Appendix A of this document.

H|\^&| | |Becton Dickinson| | | | | | | |V1.00|19981019184200

Delimiter Fields (H, 2, 1, 1) – These single characters can be used to process the remainder of the message. These characters denote the field, repeat, component and escape delimiters as described in the ASTM E_1394 specification. These fields are defaulted to "|", "\", "^", and "&" respectively, as shown above.

Sender Name (H, 5, 1, 1) – Messages coming from a Becton Dickinson instrument have the BD identifier in this field as shown above.

Version Number (H, 13, 1, 1) – This version number represents the version of the BD LIS interface used for communications.

Message Date/Time (H, 14, 1, 1) – BD includes the current time and date when constructing his message, formatted as described in the ASTM E_1394 specification in section 6.6.2.

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8.2.2. Patient Fields

A full patient record is shown below. The fields used in this example are referred to in the field explanations. For examples of Patient records used in the context of a message, please refer to Appendix A of this document.

P|1| |PatId123| |Doe^John^R^Jr.^Dr.| |19651029|M| |2 Main St.^Baltimore^ MD^21211^USA| |(410) 316 - 4000|JSMITH| | | | |PNEU|P\AM\AMX| | | |19981015120000| |324| | | | | | |ER|St. Josephs Hospital

Patient ID (P, 4, 1, 1) - Identifier that uniquely identifies a patient**. This is a required field for patient demographic downloads**. This field can be up to 16 characters long. (e.g. PatId123)

Patient Name (P, 6, 1, 1-5) – Patient name is divided into 5 components in the ASTM E_1394 specification. The BD EpiCenter stores these fields as a single string in its database. Therefore the BD LIS Interface concatenates these fields from a download message. The patient name can be up to 40 characters long. If these fields are selected for upload on the EpiCenter the whole name is placed in the first component of this field (P, 6, 1, 1). Patient name shown in the sample record is Dr. John R Doe Jr.

Date of Birth (P, 8, 1, 1) – Patient date of birth formatted as described in ASTM E_1394 section 6.6.2. The date shown in the sample record is Oct. 29, 1965.

Patient Sex (P, 9, 1, 1) – There are 3 predefined values accepted for this field in the BD EpiCenter database, Male, Female, and Unspecified. If the value does not match the code for either Male or Female then the sex is set to Unspecified. (This is an LIS coded field for the EpiCenter).

Patient Address (P, 11, 1, 1-5) – The ASTM E_1394 specification suggests that the address field be divided into 5 separate components. The EpiCenter concatenates all 5 address fields into one before saving it in the database. The patient address can be up to 255 characters long. If this field is selected for upload on the EpiCenter, the whole address is placed in the first component of this field (P, 11, 1, 1).

Patient Phone Number (P, 13, 1, 1) – This field is defined as a free text field that can be up to 25 characters long.

Admitting Physician (P, 14, 1, 1) – The physician admitting the patient into the hospital. In the example above "JSMITH" could be used as an LIS defined abbreviation for Dr. Jane T. Smith, who may work in the hospital. (This is an LIS coded field for the EpiCenter).

Patient Diagnosis (P, 19, 1, 1) – The diagnosis assigned to the patient for the current visit. In the example above "PNEU" could be used as an LIS defined abbreviation for Pneumonia. (This is an LIS coded field for the EpiCenter).

Patient Therapy (P, 20, 1-5, 1) – This field contains up to 5 antibiotics that the patient may be receiving at the time the specimen is being processed. A repeat delimiter as per ASTM E_1394 specifications separates each antibiotic. The above example indicates that the patient is currently receiving Penicillin (P), Ampicillin (AM), and Amoxicillin (AMX). (This is an LIS coded field for the EpiCenter).

Admission Date/Time (P, 24, 1, 1) – This is the time and date that the patient was admitted to the hospital. This field is formatted as specified in the ASTM E_1394 specification, in section 6.6.2. The time portion of this field is assumed to be local time. The optional time zone is deemed unnecessary and is not evaluated.

Note: If the Date/Time string is less than fourteen-characters, the time shall be set to 12:00:00 AM.

Room Number (P, 26, 1, 1) – This is a text field containing the patient's room number and can be up to 10 characters long.

Hospital Service (P, 33, 1, 1) – The ward or hospital service involved in caring for this patient. (This is an LIS coded field for the EpiCenter). (e.g. ER may represent the Emergency Room).

Hospital Client (P, 34, 1, 1) – This field is used by reference laboratories that accept specimens from client hospitals. (This is an LIS coded field for the EpiCenter).

User Defined Patient Fields 1-3 (P, 15, 1-3, 1) – In the EpiCenter, the user has the ability to configure the values for 3 coded lists related to patient fields. These fields are mapped to unused fields in the patient record by default. The user may fill these fields and remap them to a field agreed upon by the local LIS. (These are LIS coded fields for the EpiCenter).

User Defined Patient Fields 4-5 (P, 15, 4-5, 1) – In the EpiCenter, the user has 2 free text fields that can hold any alpha-numeric information. These fields are mapped to unused fields in the patient record by default. The user may fill these fields and remap them to a field agreed upon by the local LIS.

8.2.3. Order Fields

A full order record is shown below to provide examples for the content of each field. For examples of Order records used in the context of a message, please refer to Appendix A of this document.

O|1|Acc123^1^MYCBTUB | | ^ ^ ^ MGIT_960_GND ^Seq123| | |19981019023300| | |SJB^MMF|A| | |19981019045200 |Blood^Arm|MJones|(410) 555 – 1234^(410) 555 – 9876^(410) 555 – 7777| | | | |19981020053400|62| |O| | |Nos

Accession Number (O, 3, 1, 1) – The unique alphanumeric string that identifies a specimen. This field can be up to 20 characters long. (e.g. Acc123) This is a required field for processing specimen and test information.

Isolate Number (O, 3, 1, 2) – The number associated with an isolate that the test should be performed on.. This field should only be used when ordering isolate based tests, otherwise this field should be left blank. Isolate numbers can range from 1 to 20.

Organism (O, 3, 1, 3) – The organism assigned to a particular isolate. The organism code shown in the example above, MYCBTUB, is the code for Mycobacterium tuberculosis. (This is an LIS coded field for the EpiCenter).

> If an organism is indicated when ordering a BD Phoenix 100 or BD Phoenix M50 ID/AST combo panel, then the ID portion of the panel will automatically be disabled. As a result, only the AST portion of the panel will report results.

Exclude Isolate from Statistics (O, 3, 1, 4) – This field will explicitly indicate if this isolate should be included or excluded from statistic reporting. If this field contains an "I", then the isolate will be included in statistical reporting. If this field contains an "E", then the isolate will be excluded from statistical reporting. If this field is left empty, then the EpiCenter will use its internal logic to make this decision.

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Test Id (O, 5, 1, 4) – The unique code used to represent a particular test. This is an LIS coded field for the EpiCenter. For BD instrumented tests, the test ID is the pre-defined test name provided in appendix B. (e.g. MGIT_960_GND)

> **For isolate level results coming from the EpiCenter, this field will contain the string "ISOLATE RESULT".**

> **As noted in Appendix B, tests common to the BACTEC 9000 and BACTEC FX have the same LIS code.**

Test/Consumable Sequence Number (O, 5, 1, 5) – The value that identifies a test ordered. For tests originating from an instrument, this field is set with the consumable id value. For manual tests ordered at the EpiCenter, this field contains any test id entered by the user at test order time. In downloads from the LIS, this field is used to distinguish between multiple tests (of the same type) ordered against a specimen. If this field is blank, the EpiCenter assumes that this is an LIS Test Order and creates a blank test in the EpiCenter database. These orders will be automatically associated with matching tests in the EpiCenter database as they are detected. These orders can also be manually associated with orphan tests by the EpiCenter user**.**

This value can be up to 17 characters long.

Priority (O, 6, 1, 1) – This field is defined in the ASTM E_1394 specification. Currently only the values 'A' for Critical, 'R' for Normal and blank for default normal or no change are supported.

Collection Date/Time (O, 8, 1, 1) – Date and time that the specimen was collected from the patient, formatted as described in ASTM E_1394 section 6.6.2. The date/time shown in the sample record is 2:33 am on Oct. 19, 1998.

Note: If the Date/Time string is less than fourteen-characters, the time shall be set to 12:00:00 AM.

Collected By (O, 11, 1, 1) – The hospital personnel that collected the specimen from the patient. The example above shows that the specimen was collected by SJB which could be the initials for Sarah J Baker. (This is an LIS coded field for the EpiCenter).

Received By (O, 11, 1, 2) – The lab technician that received the specimen. The example above shows that the specimen was received by MMF, which could be the initials for Mike M Ferris. (This is an LIS coded field for the EpiCenter).

Specimen Action Code (O, 12, 1, 1) – This field is defined in the ASTM E_1394 specification. Currently only the value Q is supported, for QC tests. Normal tests leave this field blank.

Isolate Source Test (1-3) (O, 14, 1-3, 1) – The isolate source test is the specimen level test that produced the isolate. Often growth and detection tests are sub-cultured to produce several isolates. This field will contain test ids for up to 3 tests that yielded an isolate. This field only applies to Order records containing isolate information.

Isolate Source Test Start Time (1-3) (O, 14, 1-3, 2) – This is the start date and time of the isolate source test described above. It is possible that two of the same test type will be run on a specimen. This field is used to uniquely identify the isolate source test. This field only applies to Order records containing isolate information. This field is formatted as described in ASTM E_1394 section 6.6.2.

Receipt Date/Time (O, 15, 1, 1) – Date and time that the specimen was received into the lab, formatted as described in ASTM E_1394 section 6.6.2. The date/time shown in the sample record is 2:33 am on Oct. 19, 1998.

Note: If the Date/Time string is less than fourteen-characters, the time shall be set to 12:00:00 AM.

Specimen Type (O, 16, 1, 1) – The type of specimen collected from the patient. (This is an LIS coded field for the EpiCenter). (e.g. Blood)

Body Site (O, 16, 1, 2) – The body area that the specimen was taken from. (This is an LIS coded field for the EpiCenter). (e.g. Arm)

Ordering Physician (O, 17, 1, 1) – The physician that ordered this test. (This is an LIS coded field for the EpiCenter). (e.g. MJones could represent Mark Jones).

Ordering Physician Phone Numbers (O, 18, 1, 1-3) – The phone numbers that can be used to reach the ordering physician. Three numbers are accepted in this field, phone number, fax number and pager number. A component delimiter separates each phone number. These fields are free text fields that can be up to 25 characters in length.

User Defined Specimen Fields 1-3 (O, 19, 1-3, 1) – In the EpiCenter, the user has the ability to configure the values for 3 coded lists related to specimen fields. These fields are mapped to unused fields in the patient record by default. The user may fill these fields and remap them to a field agreed upon by the local LIS. (This is an LIS coded field for the EpiCenter).

User Defined Specimen Fields 4-5 (O, 19, 4-5, 1) – In the EpiCenter, the user has 2 free text fields that can hold any alphanumeric information. These fields are mapped to unused fields in the order record by default. The user may fill these fields and remap them to a field agreed upon by the local LIS.

Finalized Date/Time (O, 23, 1, 1) – The ASTM specification describes this field as containing the time the results were last modified. The EpiCenter places this information in the result record to be evaluated for each result. This field contains the date/time, formatted as described in ASTM E_1394 section 6.6.2, that the results for this test were finalized.. This field is blank if the test results are not yet finalized. The time shown in the example record is 5:34 am on Oct 20, 1998.

For isolate level results, this field contains the date/time the specimen was finalized.

Specimen Reimbursement Value (O, 24, 1, 1) – The value used for insurance reimbursement based on the specimen type. This number can be between 0 and 10,000. The value of 62 is used in the example record above.

Test Reimbursement Value (O, 24, 2, 1) – The value used for insurance reimbursement based on this test type. This number can be between 0 and 10,000. The example record above does not have a test reimbursement value.

Report Type (O, 26, 1, 1) – This field is defined in the ASTM E_1394 specification. When a cancelled order is sent back to the LIS the report type is 'X'.

Isolate Classification/Nosocomial (O, 29, 1, 1) – This field contains the EpiCenter LIS code for the isolate classification. The EpiCenter has a pre-defined list of classifications for an isolate. The complete list is as follows (Significant/Nosocomial, Significant/Community Acquired, Significant/Unknown, Contaminate, Not Determined). If a downloaded code is not recognized, then the Isolate Classification is set as Significant/Unknown.

8.2.4. Result Fields

The EpiCenter uploads results from several different types of tests. This causes several different types of result records to be passed to the LIS. The information contained in the generic "Data Fields" depends on the type of result being reported. AST Result records contain antibiotic and susceptibility information. ID Result records contain organism and Resistance Marker information. Growth and Detection result records contain a Positive or Negative status. Below are several different examples of result records, each one passing up a different type of result.

For AST sets, several result records may be sent to the LIS in a single message. Each result record would report the results for a single drug in the AST set. For ID/AST combo tests, an ID result record is sent as the first result record, and the AST result records follow. An example AST set result message is shown in the Appendix A of this document.

Isolate results are also exchanged using these records. Isolate results are exchanged using the same format as an ID/AST combo tests with an ID record first, then followed by several AST result records. **Since isolate results are not associated with a particular test, the test code field in the Order record is replaced with the literal string "ISOLATE_RESULT".**

For examples of Results records used in the context of a message, please refer to Appendix A of this document.

BACTEC MGIT 960 growth and detection test level result example

R|1| ^ ^ ^GND_MGIT^430100001234|INST_POSITIVE ^87| | | | |P| | |19981019153400|19981020145000| MGIT960^^42^3^B/A12

BACTEC MGIT 960 AST test level result example:

R|1| ^ ^ ^AST_MGIT^439400005678^P^0.5^ug/ml| INST_COMPLETE^105^^S| | | | |P| | |19981019153400| 19981020145000|MGIT960^^42^3^ B/A12

Phoenix AST MIC test level result example:

R|1| ^ ^ ^AST_MIC^429530000002^P| INST_COMPLETE^0.5^^S| | | | | F| | |19981019153400| 19981020145000

Diameter based AST test level result example:

R|1|^^^AST_DIA^Seq123^P^0.5|COMPLETE^15^^S| | | | |F| | |19981019153400| 19981020145000

Identification test level result example:

R|1| ^ ^ ^ID^Seq123|Complete^MYCBTUB^45678^RM_VRE| | | | |F| | |19981019153400|19981020145000

For all other tests:

R|1| ^ ^ ^OTHER^Seq123|Complete| | | | |F| | |19981019153400|19981020145000| |Many^GPOS_Bac\Few^GNEG_Rods

Isolate level result example:

R|1| ^^^AST^^P^100.0^ug/mL| ^^R^R^^MGIT_960_AST92| | | | |F

"Universal Test ID" ASTM E_1394 Result field 3

Result ID Code (R, 3, 1, 4) – This is a BD defined code that indicates the type of information being exchanged in the result record. The interpretation of several fields may vary depending on which type of result is being passed. The possible values for this field include the following.

GND – indicates results for an FX, BACTEC 9000 or generic growth and detection test.

GND_MGIT – indicates results for a BACTEC MGIT 960growth and detection test.

GND_PROBETEC – indicates results for a BD ProbeTec ET test.

AST – indicates results for a generic AST test not included in the other AST categories.

AST_MGIT – indicates results for a BACTEC MGIT 960 Antibiotic Susceptibility Test.

AST_MIC – indicatesresults for an MIC based Antibiotic Susceptibility Test.

AST_DIA – indicates results for a diameter based Antibiotic Susceptibility Test. (e.g. Kirby Bauer tests).

ID – indicates identification results.

STREAK – indicates Innova Protocol results

OTHER – indicates test results not included in the above categories.

Test/Consumable Sequence Number (R, 3, 1, 5) – The value that identifies the media/consumable used for generating these results. This field may be blank for manual test results where a sequence number is not known. This value can be up to 17 characters long. The example records above show the results being reported for sequence number "Seq123".

A test/consumable sequence number is required for all instrumented test results downloaded to the EpiCenter. For manual or supplemental test results downloaded to the EpiCenter this field is optional. If no sequence number is included with the results the EpiCenter searches on the current access number for any test matching the test code provided in the order record. If a match is found, the EpiCenter updates the results for that test. If no test match is found, then the EpiCenter orders a new test. **Be aware that unwanted consequences could occur if more than one of a particular test type are ordered for an access number and test sequence numbers are not used.**

Antibiotic (R, 3, 1, 6) (_AST Results_) – The antibiotic tested in this AST test. The antibiotic code shown in the above AST examples is "P" for Penicillin. (This is an LIS coded field for the EpiCenter).

Concentration (R, 3, 1, 7) (_AST Results_) – Several AST tests, such as Kirby Bauer tests, are done with antibiotics at a specific concentration. For these tests the antibiotic concentration is needed to define the test that results are being provided for. When no concentration units are provided it is assumed to be in ug/ml. This field can be up to 15 characters long. The antibiotic concentration shown in the AST (MGIT960) example above is "0.5".

Concentration Units (R, 3, 1, 8) (_AST Results_) – The BACTEC MGIT 960 results include the concentration units of the concentration provided in the previous field. This field can be up 15 characters long. The concentration units shown in the AST example

above is "ug/ml" for micrograms per milliliter. This is also assumed to be the default if no other value is provided.

"Data or Measurement Values" ASTM E_1394 Result field 4

The contents of the Result Data fields vary depending on the type of test result being reported, as described below.

Test Status (R, 4, 1, 1) – The status value for a particular test. This field is filled for all test results. This is an LIS coded field for the EpiCenter. For BD instrumented tests, the status code is one of the pre-defined values listed in Appendix B of this document. The GND example record shown above has a test status value of INST_POSITIVE.

Result Data Field 1

Growth Units (R, 4, 1, 2) (_BACTEC MGIT 960 Results Only_) – See Appendix E for instrument specific information. The Positive GND tube listed above indicates 87 growth units. The AST example record shows a growth value of 105. This field is never more than 5 characters long.

ProbeTecET Algorithmic Result (R, 4, 1, 2) (_BD ProbeTec ET/Viper XTR Result Only_) – See Appendix E for instrument specific information. (future)

Minimum Inhibitory Concentration (R, 4, 1, 2) (_MIC based AST Result_) – For AST tests that produce MIC values, this field contains the minimum antibiotic concentration that inhibits growth of the tested organism. The example above for an MIC based AST test contains an MIC value of "0.5". This field can be up to 20 characters long and is assumed to contain a number in ug/ml.

> This field may contain signed MIC values such as "<=4" or ">8", MIC values for compound antimicrobials such as "0.5/4"or "<=0.5/16" as well as the following:
> **"?"** - Ongoing
> **"C"** - Antimicrobial is Rapid Completed *(For nonQC tests in EpiCenter V4 and later)*
> **"X"** - Error

Diameter (R, 4, 1, 2) (_Diameter based AST Results_) – For Kirby Bauer type tests, this field contains the diameter of the inhibited growth region caused by the antibiotic. The diameter based AST example above shows a diameter value of 15. This number is assumed to be in millimeters.

Organism (R, 4, 1, 2) (_ID Results Only_) – The organism assigned to a particular isolate. The organism code shown in the example above, MYCBTUB, is the code for Mycobacterium tuberculosis. (This is an LIS coded field for the EpiCenter).

Result Data Field 2

AST Susceptibility, Final (R, 4, 1, 3) (_Isolate AST results only_) – This is a code that indicates is the organism is susceptible to the antibiotic specified in this record. The acceptable values for this field are **S**, **I**, **R, N**, and **X**, representing susceptible, intermediate, resistant, not-susceptible and error respectively. This field is only uploaded by the EpiCenter as part of an isolate level result (see earlier section). The isolate AST example record shows that the user decided to override the expert system results and say that the organism was susceptible to the antibiotic, indicated by "S" in the Final field.

Profile Number (R, 4, 1, 3) (_ID results and Isolate ID results_) – This is a text field that holds the profile number associated with an ID test. This value can be up to 16 characters long. The ID result record example above indicates a profile number of 45678.

Result Data Field 3

AST Susceptibility, Interpreted (R, 4, 1, 4) (*All AST results* **)** – This is a code that indicates is the organism is susceptible to the antibiotic specified in this record. The acceptable values for this field are **S**, **I**, **R, N**, and **X**, representing susceptible, intermediate, resistant, not-susceptible and error respectively. This field contains the AST interpretation from the instrument or user before being processed by the Expert System. The isolate AST example record shows that the organism has intermediate susceptibility to the specified antibiotic, indicated by "I".

Resistance Marker 1 (R, 4, 1, 4) (*Isolate ID results* **)** – This represents a Resistance Marker associated with the organism identified in the ID result record. The EpiCenter generates this data as part of the expert system and are only included for Isolate uploads. The first Resistance Marker in the ID example above is RM_VRE, which may be an LIS code used for Vancomycin resistant Enterococci. (This is an LIS coded field for the EpiCenter).

Result Data Field 4

AST Susceptibility, Expert (R, 4, 1, 5) (*Isolate AST results only* **)** – This is a code that indicates if the organism is susceptible to the antibiotic specified in this record. The acceptable values for this field are **S**, **I**, **R, N**, and **X**, representing susceptible, intermediate, resistant, not-susceptible and error respectively. This field is only uploaded by the EpiCenter as part of an isolate level result (see earlier section). The BD Phoenix 100, the BD Phoenix M50, and the EpiCenter have an expert system that can produce a secondary evaluation of susceptibility. The isolate AST example record shows that the expert system decided that the organism is resistant to the specified antibiotic, indicated by "R".

Resistance Marker 2 (R, 4, 1, 5) (*Isolate ID results* **)** – This represents a Resistance Marker associated with the organism identified in the ID result record. The EpiCenter generates this data as part of the expert system and are only included for Isolate uploads. The example record above contains only one Resistance Marker. (This is an LIS coded field for the EpiCenter).

Result Data Field 5

AST Source Test (R, 4, 1, 6) (*Isolate AST results* **)** – This represents the Test Id for the source test that included this AST result. This is included because Isolate results may be compiled from several different AST tests. The example Isolate upload record above contains the Test Id of MGIT_960_AST. (This is an LIS coded field for the EpiCenter).

It is possible that there can be results on the isolate upload that have been inferred by the EpiCenter BDXpert system and are not associated with a test. When this condition occurs, EpiCenter uploads a "blank", or an empty field in the AST Source Test field(R, 4, 1, 6) as well as the MIC field(R, 4, 1, 2).

Results example with AST Source Test:

R|2|^^^AST^^CTX|^<=1^S^S^^**NMICID4** | | | | | |F

Inferred results example without AST Source Test:

R|3|^^^AST^^CZ|^^R^^R| | | | |F

Resistance Marker 3 (R, 4, 1, 6) (*Isolate ID results* **)** – This represents a Resistance Marker associated with the organism identified in the ID result record. The EpiCenter generates this data as part of the expert system and are only included for Isolate uploads. The example record above contains only one Resistance Marker. (This is an LIS coded field for the EpiCenter).

Result Data Field 6

Resistance Marker 4 (R, 4, 1, 7) (*Isolate ID results*) – This represents a Resistance Marker associated with the organism identified in the ID result record. The EpiCenter generates this data as part of the expert system and are only included for Isolate uploads. The example record above contains only one Resistance Marker. (This is an LIS coded field for the EpiCenter).

Result Data Field 7

Resistance Marker 5 (R, 4, 1, 8) (*Isolate ID results*) – This represents a Resistance Marker associated with the organism identified in the ID result record. The EpiCenter generates this data as part of the expert system and are only included for Isolate uploads. The example record above contains only one Resistance Marker. (This is an LIS coded field for the EpiCenter).

Result Data Field 8

ID Source Test (R, 4, 1, 9) (*Isolate ID results*) – This represents the Test Id for the source test that produced this ID result. (This is an LIS coded field for the EpiCenter).**Preliminary/Final Status (R, 9, 1, 1)** – This field contains either a "P" or an "F" as defined in the ASTM E_1394 specification. The result status shown in the examples above are final. *For isolate level results, this indicates the status of the isolate.*

Start Date/Time (R, 12, 1, 1) – This is the date and time that the test was first started or entered into an instrument. This field is formatted as described in the ASTM E_1394 specification in section 6.6.2. The test start time shown above is 3:34 pm on Oct 19, 1998. **This field has special significance for BACTEC MGIT 960 AST tests. Please read the instrument specific section for more details.**

Result/Status Date/Time (R, 13, 1, 1) – This is the date and time that the test received the status being reported in this record. This is a required field and is used to identify when results downloaded from the LIS are more recent than those contained in the EpiCenter. This field is formatted as described in the ASTM E_1394 specification in section 6.6.2. The test status time shown above is 2:50 p.m. on Oct 20, 1998.

Test Complete Date/Time (R, 13, 2, 1) – This is the date and time that an instrumented test finished its results. This is different than the Result Date/Time in that this time will not change if the user assigns a new status to a test. For a growth and detection result record, this field will hold the Positivity Date/Time. For an ID result record, this field will hold the time that the Id portion of a BD Phoenix 100 or BD Phoenix M50 panel completed. For an AST result from a BD Phoenix 100 or BD Phoenix M50 panel, this field will hold the time that a valid MIC was produced. This field is formatted as described in the ASTM E_1394 specification in section 6.6.2.

Media Setup Date/Time (R, 13, 1, 2) – For Innova tests this field indicates the time that the specimen was successfully streaked. If the specimen was not successfully streaked, this field will be blank.

Instrument Type (R, 14, 1, 1) (*Instrumented Results Only*) – This field indicates which BD instrument produced the result. This field is filled with one of several BD defined values listed below.

> **"BT9000"** – BACTEC 9000 series instrument
>
> **"MGIT960"** – BACTEC MGIT 960 instrument
>
> **"PHOENIX"** – BD ID/AST instrument
>
> **"PROBETEC"** – BD ProbeTec ET instrument
>
> **"BACTECFX"** - FX instrument

"INNOVA" – Innova instrument

Media Type (R, 14, 1, 2) *(Instrumented Results Only)* – This field indicates the type of media or consumable used to perform this test. See Appendix E for instrument specific information.

Protocol Length (R, 14, 1, 3) *(Instrumented Results Only)* – this field indicates the length of time (in hours or days) required to complete the test. For growth and detection tests, this number represents the number of days before a tube can be considered negative.

Instrument Number (R, 14, 1, 4) *(Instrumented Results Only)* – This is the user number assigned to the instrument that ran the test. This value can be between 1 and 99.

Instrument Location (R, 14, 1, 5) *(Instrumented Results Only)* – This value indicates the position inside of the instrument where the test was performed.

For BACTEC MGIT 960 tests this value indicates a drawer number, row number and well number. In the GND example above, the location B/A12 indicates that the test was performed in drawer B, row A well number 12.

For Innova tests this value indicates a drawer number, canoe number, and position in canoe and is represented as `3-1-8.`

BD ProbeTec ET QC Type (R, 14, 1, 6) *(BD ProbeTec ET Result Only)* – See Appendix E for instrument specific information.

Test Protocol (R, 14, 1, 8) - This value indicates the name of the protocol with which the specimen was processed on the Innova instrument.

BD ProbeTec ET QC Kit Lot Number (R, 14, 1, 7) *(BD ProbeTec ET Result Only)* – See Appendix E for instrument specific information.

Additional Results Quantity 1-5 (R, 15, 1-5, 1) *(EpiCenter Additional Results Only)* – This field contains a text value that associates a quantity to the additional result reported in the next ASTM component field. The quantities Many and Few are used in the example record for other tests. See the Additional Results field description for more detail. (This is an LIS coded field for the EpiCenter).

Additional Results (R, 15, 1-5, 2) *(EpiCenter Additional Results Only)* – There are several tests that can be assigned multiple results at one time. An example of such a test is a Gram Stain test, which can be assigned results such as "Gram Negative Rod Seen" AND "Gram Positive Bacillus Seen". These results differ from GnD test results of simply Positive or Negative. The EpiCenter maintains a user configurable list of additional test results that can apply to a test. Each additional result can also be associated with a quantity value, which precedes the additional result in the record. In the example above for other tests, the additional results and quantities reported are Many GP_BAC and Few GN_RODS. (These are LIS coded fields for the EpiCenter).

8.2.5. Comment Fields

The EpiCenter accepts and sends comment strings for patients, specimen, and isolates. Patient comments are exchanged in a comment record following a patient record, and include the patient type identifier. Specimen and isolate comments are exchanged in a comment record following the order record, and include either the specimen or isolate type identifier. An order record with both a specimen and isolate comment is shown below.

If multiple comment records are received for a patient, specimen, or isolate, then all comments of the same type are appended together and saved in the EpiCenter.

The EpiCenter can upload the description for chartable rules. This is the descriptive text for expert system rules that have been run against an isolate. The user has the ability to

configure individual rules as reportable on a patient's chart report. If a rule is configured to be chartable, the rule description will be included in an upload Comment record. These comment records will follow after an Order record. Since the EpiCenter expert system rules only apply to isolates, these types of comments will only be part of Isolate Uploads as described in section 5.2.

The following is an example of a comment record containing a rule where <310> is the rule number and (AMX, ATM, CAZ) is a list of the affected antimicrobials.

C|1| |<310> BDXpert Rule 310 text.(AMX, ATM, CAZ)|E

Special Messages are messages that indicate a special condition for a BD Phoenix 100 or BD Phoenix M50 panel. These will be uploaded in a Comment record as part of the test results for the panel. The following is an example of a comment record containing a special message with a list of the affected antimicrobials.

C|1| | Special message text. (AM, CAZ)|T

Comment records not appearing after the Patient or Order records are ignored. Comments not containing the appropriate type indicator are ignored.

O|1|Acc123^1^MYCBTUB|

C|1| |This is a specimen comment |S

C|2| |This is an isolate comment |I

Comment Text (C, 4, 1, 1) – The text to be used for the patient, specimen or isolate comment. This field can be up to 1600 characters long.

Comment Type (C, 5, 1, 1) – The type of comment record. This field should be a **P, S, I, E, T or R** for patient, specimen, isolate, chartable rule, special message or result comment respectively.

8.2.6. Request Fields

The ASTM E_1394 defines a Request record with several fields for qualifying the requested data. Data requests can be made by specifying ranges of patient IDs, accession numbers, or sequence numbers. Data requests can also be qualified by date/time ranges.

All of these fields are supported by the BD EpiCenter interface for requests originating FROM the LIS.The field mapping table on the previous pages correctly indicates the support query fields. Examples can also be found in the Sample Messages section of this document.

Q|1|^Acc123||MGIT_960_GND^INST_POSITIVE^MGIT_960 ^2|R|19981019120000|19981020120000

The sample record shown above is evaluated to request the result information for positive MGIT_960_GND tests, on instrument 2, for the specimen with an accession number of Acc123 between the dates specified. Note that all query criteria are ANDed together, so that only records that meet ALL criteria will be uploaded in response to a query from the LIS.

The EpiCenter only requests information from the LIS on a per specimen basis. The request records generated by the EpiCenter contains only the accession number as a qualifying field as shown below. The EpiCenter request should be interpreted as requesting both patient demographics and all ordered tests for that specimen.

Q|1|^Acc123| | |R

Starting Patient ID (Q, 3, 1, 1) – A patient ID value. This field should be filled if the data request is for either a single patient or for a range of patients. If patient ID is not to be used as a search criterion for requested data, then this field can be left blank. This field can be up to 16 characters long. In the example above, a range of patients is specified, beginning with patient ID "Pat123".

Starting Access Number (Q, 3, 1, 2) – A specimen ID value. This field should be filled if the data request is for either a single specimen or for a range of specimen. If accession number is not to be used as a search criterion for requested data, then this field can be left blank. This field can be up to 20 characters long. In the example above, a range of specimen is specified, beginning with Accession number "Acc123".

Starting Sequence Number (Q, 3, 1, 3) – A consumable ID value. This field should be filled if the data request is for either a single test or for a range of tests. If sequence number is not to be used as a search criterion for requested data, then this field can be left blank. This field can be up to 17 characters long. In the example above, no specific sequence numbers are requested.

Ending Patient ID (Q, 4, 1, 1) – The patient ID that ends the alphanumeric range of ID values requested. If only data for a single patient ID is requested, then this field can be left blank. This field can be up to 16 characters long. This field contains "Pat456" in the example shown above.

Ending Accession Number (Q, 4, 1, 2) – The specimen ID that ends the alphanumeric range of ID values requested. If only data for a single accession number is requested, then this field can be left blank. This field can be up to 20 characters long. This field contains "Acc456" in the example shown above.

Ending Sequence Number (Q, 4, 1, 3) – The consumable ID that ends the alphanumeric range of ID values requested. If only data for a single test is requested, then this field can be left blank. This field can be up to 17 characters long. In the example above, no specific sequence numbers are requested.

Test ID (Q, 5, 1, 1) – This is the code used to represent a particular test, and is used to request the results for this test type. This is an LIS coded field for the EpiCenter. For BD instrumented tests, the test id is the pre-defined test name listed in appendix B.

Test Status (Q, 5, 1, 2) – The status for a particular test. This field is only evaluated if the Test ID field contains valid data. This is an LIS coded field for the EpiCenter. For BD instrumented tests the status value is one of the pre-defined values listed in Appendix B. The example record requests result information for XXX tests with a status of INST_POSITIVE.

Instrument Type (Q, 5, 1, 3) – This field indicates the type of instrumented test requested by the LIS. The EpiCenter may be connected to several instruments of different types. This field allows the LIS to request all tests run in a particular instrument type. The appropriate values for this field are listed for the Instrument Type in the result record (R, 14, 1, 1). If the value MGIT960 is used in this field, all MGIT_960_GND and all MGIT_960_AST tests are returned.

Instrument Number (Q, 5, 1, 4) – This field allows the LIS to request results for a particular instrument number. This field is only evaluated if the instrument type field is also set.

Result Qualifier (Q, 5, 1, 5) – This field allows the LIS to request results that have been modified since the last request. The only acceptable value for this field is MOD, to indicate modified results. If this field is left blank, all results that meet the remaining criteria are included. The BD EpiCenter will not accept other criteria in a query containing the MOD result qualifier.

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Time Qualifier (Q, 6, 1, 1) – The use of this field is described in the ASTM E_1394 specification. The acceptable values for this field are **S**, **R,** and **T** which identify the content in the Starting and Ending Date/Time fields as follows:.

      (S) - Specimen Collection Time

      (R) – Result Time

      (T) – Test Start Time

      EpiCenter NOTE: If no Time Qualifier is specified, the Starting and Ending Times will, by default, refer to Result times.

      In the example record times refer to result dates.

Starting Date/Time (Q, 7, 1, 1) – The starting date/time (inclusive) of the data requested. This field is formatted as specified in ASTM E_1394 specifications section 6.6.2. The date/time requested in example above is 12 pm on Oct 19, 1998.

      EpiCenter NOTE: If a Starting Date/Time is specified and no Ending Date/Time is specified, data will be delivered whose Collection or Result Time is **since** the specified Starting Date/Time.

      EpiCenter NOTE: If a Starting Date/Time specifies only the Date portion, the time will default to midnight 00:00:00.

Ending Date/Time (Q, 8, 1, 1) – The ending date/time (inclusive) of the data requested. This field is formatted as specified in ASTM E_1394 specifications section 6.6.2. The date/time requested in example above is 12 pm on Oct 20, 1998.

      EpiCenter NOTE: If an Ending Date/Time specifies only the Date portion, the time will default to 23:59:59.

Request Information Status Code (Q, 13, 1, 1) – This field cancels an outstanding query. The only acceptable value for this field is 'A'. The EpiCenter will ignore any other Request criteria fields when they appear in the same query record as a Query Cancel command.

If the string 'ALL" appears in any Request Field, and no other Criteria are present, the EpiCenter will attempt to upload all test data in its database to the LIS.

If the string 'ALL" appears in any Request Field, and any other Criteria are present, the EpiCenter will ignore it because an empty criteria field is an implied 'ALL'.

8.2.7. Terminator Fields

Below is an example terminator record.

L|1|N

Termination Code (L, 3, 1, 1) – The termination code provides an explanation of the end of session as described in the ASTM E_1394 specification. The EpiCenter supports codes of N, Q, F and I in request responses downloaded from the LIS, as described in the ASTM specifications. However the EpiCenter and all of the BD instruments upload either N, Q or F. All other codes are ignored and treated as a normal message. Normal result uploads are indicated with N and request response uploads are indicated by F. Requests that contain an error are replied to with an empty message containing the code 'Q' in the terminator record. Requests that have no data satisfying the request, are responded to with a message containing only a Header and Terminator record.

The BD interface sends the results for a single test in a message. However there may be several tests that satisfy a data request downloaded by the LIS. In this instance, the BD interface uploads all tests but the last as single tests in separate messages marked as normal uploads (N). Only the last test that satisfies the request is marked as query

response (F). Once the LIS receives the query response indicator (F), it has received all of the data it requested.

9.   Simulator

Becton Dickinson has developed a simulator for testing the physical level LIS interface. This simulator can be configured to emulate either the LIS or instrument in the ASTM E_1381 protocol.

The simulator accepts ASTM E_1394 message strings from a file and transmit them across the serial port interface. The simulator also receives messages across the serial port interface and save the message text into a file. A full description of the simulators specifications can be found in a separate document. Becton Dickinson intends to make the simulator and supporting document available to LIS vendors to help facilitate interface development.

10. Appendix A - Sample EpiCenter Messages

10.1. LIS Order

BACTEC MGIT 960 GND tube ordered at the LIS for a new patient. Patient and test information is downloaded to the EpiCenter.

```
H|\^&|||||||||||||19981019184200
P|1||PatId123||Doe^John^R^Jr.^Dr.||19651029|M||2 Main
St.^Baltimore^ MD^21211^USA||(410) 316 - 4000|JSMITH|||||
|P\AM\AMX||||19981015120000||324|||||||ER|St. Josephs
Hospital
O|1|Acc123^ ^ ^Seq123|| ^ ^ ^MGIT_960_GND||
|19981019023300|||SJB^MMF|A|||19981019045200
|Blood^Arm|MJones|(410)555-1234^(410)555-9876^(410)555-
7777||||||19981020053400|62||O||Nos
L|1|N
```

10.2. Host Query

The EpiCenter can receive a new accession number from a barcode on an instrumented test. The EpiCenter requests information from the LIS about that specimen.

```
H|\^&|||Becton Dickinson||||||||V1.00|19981019184200
Q|1|^Acc123|||R
L|1|N
```

The LIS should respond to this request with patient demographics and ordered test information. Patient Demographics may not be included if they are not yet known. The terminator record should indicate that this is a message in response to a request.

```
H|\^&|||||||||||||19981019184200
P|1||PatId123||Doe^John^R^Jr.^Dr.||19651029|M||2 Main
St.^Baltimore^ MD^21211^USA||(410) 316 - 4000|JSMITH|||||
|P\AM\AMX||||19981015120000||324|||||||ER|St. Josephs
Hospital
O|1|Acc123^ ^ ^Seq123|| ^ ^ ^MGIT_960_GND||
|19981019023300|||SJB^MMF|A|||19981019045200
|Blood^Arm|MJones|410)555-1234^410)555-9876^(410)555-
7777||||||19981020053400|62||O||Nos
L|1|F
```

10.3. LIS Requests Results

The LIS can request result information from the EpiCenter.

```
H|\^&|||||||||||||19981019184200
Q|1|^Acc123|^Acc125|MGIT_960_GND^INST_POSITIVE^MGIT960^2|R
L|1|N
```

10.4. Results

EpiCenter will report results to the LIS in response to a request for results or asan unsolicited upload message. When results are uploaded in response to a request, the termination code in the terminator record will indicate that this is a message in response to a request.

```
H|\^&|||Becton Dickinson||||||||| V1.00 |19981019184200
P|1||PatId123
O|1|Acc123||^^^MGIT_960_GND^430100065178
R|1|^^^GND^430100065178|INST_POSITIVE^87|||||P||
|19981019153400|19981020145000|MGIT960^^42^3^B/A12
L|1|F
```

10.4.1. BACTEC G&D Test results

```
H|\^&|||Becton Dickinson|||||||||V1.0|20060223115749
P|1||P0001||Patient
Name||20040229|M|||||ADMIT_PHYS|||||||||||20060221092800||||
||||||HOSP_SERV|CLIENT
O|1|20060223001||^^^PLUSAEF^449200917642|R||20060222092300|
||COLL_BY^RECD_BY|||||20060223092300|SAMP_TYPE^BODY|ORD_PHYS
|||||||20060223105527
R|1|^^^GND^449200917642|INST_NEGATIVE|||||F|||2005020112304
6|20050208124106|BT9000^92^32^7^A1
L|1|N
```

10.4.2. MGIT 960 G&D Test results:

```
H|\^&|||Becton Dickinson|||||||||V1.0|20050316152953
P|1||PatXYZ||Mr. Fred A. Stare
O|1| Acc456||^^^MGIT_960_GND^430100065177|R||
20041104082700|||||||20041104082750|||||||||20050316152949
R|1|^^^GND_MGIT^430100065177|INST_NEGATIVE^0|||||F|
||20041029112243|20041103110237|MGIT960^^5^1^B/C17
L|1|N
```

10.4.3. MGIT AST Test Results

```
H|\^&|||Becton Dickinson||||||||| V1.00 |19981019184200
P|1||PatId123
O|1|Acc123||^^^MGIT_960_AST
R|1|^^^AST_MGIT^439400001234^P^0.5^ug/ml|
INST_COMPLETE^105^^S|||||||||19981019153400|19981020145000|
MGIT960^^42^3^ B/A13
R|2|^^^AST_MGIT^439400001234^AMX^0.5^ug/ml|
INST_COMPLETE^142^^I|||||||||19981019153400|19981020145000|
MGIT960^^42^3^ B/A14
R|3|^^^AST_MGIT^439400001234^AM^0.5^ug/ml|
INST_COMPLETE^130^^R|||||||||19981019153400|19981020145000|
MGIT960^^42^3^B/A15
L|1|N
```

10.4.4. Innova Results

```
H|\^&|||Becton Dickinson|||||||||V1.0|20110512155503

P|1||PatID1||Smith Billy Bob
B||20110405|M||||||||||||||||||||||||||||ER|Client

O|1|Acc055||^^^INNOVA|R||20110422010000|||collecby^recby|||
|20110423102935|RESP^bdysite|phys||||||20110512113329

R|1|^^^STREAK|INST_COMPLETE|||||F|||20110512113327|
20110512113329|INNOVA^^^^1-1-1^^^Protocol 2_1

L|1|N
```

10.4.5. Isolate Results

Isolate results are different from test results as follows:

- The Test Id in Order field (O, 5, 1, 4) is set to "ISOLATE RESULT" instead of a real test id.

- The first result record of an isolate result is always an ID record regardless of test types.

- The ID record will contain the ID test source in field (R, 4, 1, 9).

- Unlike test uploads whch have a fixed number of results, the number of results included in an isolate can flucutuate until the isolate is finalized.

- Isolate level AST result records will contain Interpreted (R, 4, 1, 4), Expert (R, 4, 1, 5) and Final (R, 4, 1, 3) AST susceptibility values whereas test level results only contain Interpreted (R, 4, 1, 4) AST susceptibility values.

- Isolate level AST result records will contain the AST test source in field (R, 4, 1, 6).

```
H|\^&|||Becton Dickinson|||||||||V1.0|20060223111210
P|1||P0001||Patient Name||20040229|M|||||ADMIT_PHYS|||
|||||||||20060221092800||||||||||HOSP_SERV|CLIENT
O|1|20060223001^1^ESCCOL||^^^ISOLATE RESULT|
||20060222092300||||COLL_BY^RECD_BY|||
|20060223092300|SAMP_TYPE^BODY|ORD_PHYS|
||||||20060223105534||||||UNK
R|1|^^^ID|^ESCCOL^0000031BF0000021^^^^^^NMIC/ID-14|||||F
R|2|^^^AST^^AM|^8^S^S^^NMIC/ID-14|||||F
R|3|^^^AST^^AMC|^8/4^S^S^^NMIC/ID-14|||||F
R|4|^^^AST^^AN|^<=2^S^S^^NMIC/ID-14|||||F
R|5|^^^AST^^ATM|^<=2^S^S^^NMIC/ID-14|||||F
R|6|^^^AST^^CAZ|^<=1^S^S^^NMIC/ID-14|||||F
R|7|^^^AST^^CIP|^<=0.25^S^S^^NMIC/ID-14|||||F
R|8|^^^AST^^CTX|^<=2^S^S^^NMIC/ID-14|||||F
R|9|^^^AST^^CXM|^8^S^S^^NMIC/ID-14|||||F
L|1|N
```

10.4.5.1. **Isolate with Expert system changes - Blank MIC, modified SIR**

The BDXpert system may change either the MIC value or the SIR value calculated on the instrument based on rules that implement generally accepted microbiology principles or suppressed reporting requirements. In the example below, 4 result values have been impacted.

Result record 2 and 14 have had the MIC removed and the SIR value set to "R" due to intrinsic resistance of this organism to the drugs. Note that the MIC field is empty. A blank value should be posted in the LIS system for this MIC.

Result record 5 has had the SIR value modified from S to X indicating that the drug result can not be reported.

Result record 17 has had the SIR value modified from S to R, indicating the drug should be reported as resistant even though it appeared susceptible in vitro.

```
H|\^&||||Becton Dickinson|||||||||V1.0|20060223111330
P|1||P0001||Patient Name||20040229|M|||||ADMIT_PHYS
|||||||||||20060221105100||Room|||||||HOSP_SERV|CLIENT
O|1|20060223002^2^STAWAR||^^^ISOLATE RESULT|||
20060222105100|||COLL_BY^RECD_BY||||20060223105100|
SAMP_TYPE^BODY|ORD_PHYS||||||20060223105622||||||UNK
R|1|^^^ID|^STAWAR^00000010002DD000^^^^^^PMIC/ID-14||||||F
R|2|^^^AST^^AM|^^R^^R^PMIC/ID-14||||||F
R|3|^^^AST^^AMC|^8/4^R^R^^PMIC/ID-14||||||F
R|4|^^^AST^^C|^4^S^S^^PMIC/ID-14||||||F
R|5|^^^AST^^CC|^<=0.25^X^S^X^PMIC/ID-14||||||F
R|6|^^^AST^^CIP|^<=0.5^S^S^^PMIC/ID-14||||||F
R|7|^^^AST^^E|^>4^R^R^^PMIC/ID-14||||||F
R|8|^^^AST^^FM|^<=16^S^S^^PMIC/ID-14||||||F
R|9|^^^AST^^GM|^<=2^S^S^^PMIC/ID-14||||||F
R|10|^^^AST^^LVX|^<=1^S^S^^PMIC/ID-14||||||F
R|11|^^^AST^^LZD|^2^S^S^^PMIC/ID-14||||||F
R|12|^^^AST^^MXF|^<=1^S^S^^PMIC/ID-14||||||F
R|13|^^^AST^^OX|^>2^R^R^^PMIC/ID-14||||||F
R|14|^^^AST^^P|^^R^^R^PMIC/ID-14||||||F
R|15|^^^AST^^RA|^<=0.5^S^S^^PMIC/ID-14||||||F
R|16|^^^AST^^SXT|^<=0.5/9.5^S^S^^PMIC/ID-14||||||F
R|17|^^^AST^^VA|^2^R^S^R^PMIC/ID-14||||||F
L|1|N
```

10.4.5.2. **Isolate with Resistance Markers**

If an organism is identified with resistance mechanism, then the resistance mechanism code is reported as part of the identification result. Up to 5 resistance marker codes can be sent.

```
H|\^&|||Becton Dickinson|||||||||V1.0|20060223111330
P|1||P0001||Patient Name
||20040229|M|||||ADMIT_PHYS|||||||||||20060221105100||Room||
|||||||HOSP_SERV|CLIENT
O|1|20060223002^2^STAWAR||^^^ISOLATE RESULT
|||20060222105100|||COLL_BY^RECD_BY||||20060223105100|
SAMP_TYPE^BODY|ORD_PHYS||||||20060223105622||||||UNK
R|1|^^^ID|^STAWAR^00000010002DD000^RM_MRSA^RM_GP_BL^^^^
PMIC/ID-14 ||||||F
R|2|^^^AST^^AM|^^R^^R^PMIC/ID-14||||||F
R|3|^^^AST^^AMC|^8/4^R^R^^PMIC/ID-14||||||F
R|4|^^^AST^^C|^4^S^S^^PMIC/ID-14||||||F
```

```
L|1|N
```

10.4.5.3. Isolate with Expert Comments

Certain rules in EpiCenter can produce chartable comments. These comments appear after the Order record and have a Comment Type of "E"".

```
There is no limit to the number of comments that could be
reported.
H|\^&|||Becton Dickinson|||||||||V1.0|20060223115915
P|1||P0001||Patient Name
||20040229|M|||||ADMIT_PHYS|||||||||||20060221105100||Room||
|||||| HOSP_SERV|CLIENT
O|1|20060223002^2^STAWAR||^^^ISOLATE
RESULT|||20060222105100|||COLL_BY^RECD_BY||||20060223105100
| SAMP_TYPE^BODY|ORD_PHYS||||||20060223112842||||||UNK
C|1||<132>Staphylococcal isolates that are resistant to
oxacillin (MRS) should not be treated with penicillins,
beta-lactam/beta-lactamase inhibitor combinations,
cephalosporins and carbapenems.( AM, P )|E
C|2||<335>Macrolide-resistant staphylococci with an
interpretation of susceptible or intermediate for
clindamycin may have inducible resistance to clindamycin
(MLSb resistance) or may be resistant only to macrolides
(efflux-mechanism). User must perform a clindamycin
induction test (disk approximation test). If positive,
isolate should be reported as clindamycin resistant.
However, clindamycin may still be effective in some
patients. If "D" zone is not observed, isolate should be
reported as susceptible.( CC )|E
R|1|^^^ID|^STAWAR^00000010002DD000^RM_MRSA^^^^^
PMIC/ID-14|||||F
R|2|^^^AST^^AM|^^R^^R^PMIC/ID-14|||||F
R|3|^^^AST^^AMC|^8/4^R^R^^PMIC/ID-14|||||F
R|4|^^^AST^^C|^4^S^S^^PMIC/ID-14|||||F
R|5|^^^AST^^CC|^<=0.25^X^S^X^PMIC/ID-14|||||F
R|6|^^^AST^^CIP|^<=0.5^S^S^^PMIC/ID-14|||||F
R|7|^^^AST^^P|^^R^^R^PMIC/ID-14|||||F
L|1|N
```

10.4.5.4. Isolate with inferred results

The Expert system is able report results for drugs that were not actually tested on the instrument. This may be used where the drug on the test is not commonly prescribed, but is used as an indicator for drugs available in the pharmacy.

In this case, because the drug was not rested in the instrument, the inferred result records do not have MIC or test source values. In this case a blank should be posted for the MIC. Result record 6 is an inferred result in the example below.

```
H|\^&|||Becton Dickinson|||||||||V1.0|20060223115845
P|1||P0001||Patient Name
||20040229|M|||||ADMIT_PHYS|||||||||||20060221105100||Room||
|||||HOSP_SERV|CLIENT
O|1|20060223002^1^ENTCFAA||^^^ISOLATE
RESULT|||20060222105100|||COLL_BY^RECD_BY||||20060223105100
|SAMP_TYPE^BODY|ORD_PHYS||||||20060223112842||||||UNK
```

```
R|1|^^^ID|^ENTCFAA^000017F82CD064C0^^^^^^PMIC/ID-14|||||F
R|2|^^^AST^^AM|^<=2^S^S^^PMIC/ID-14|||||F
R|3|^^^AST^^C|^8^S^S^^PMIC/ID-14|||||F
R|4|^^^AST^^E|^2^I^I^^PMIC/ID-14|||||F
R|5|^^^AST^^GMS|^<=500^S^S^^PMIC/ID-14|||||F
R|6|^^^AST^^IPM|^^S^^S|||||F
R|7|^^^AST^^LVX|^<=1^S^S^^PMIC/ID-14|||||F
R|8|^^^AST^^LZD|^2^S^S^^PMIC/ID-14|||||F
R|9|^^^AST^^MXF|^<=1^S^S^^PMIC/ID-14|||||F
L|1|N
```

10.4.5.5. Isolate with multiple test sources

The Isolate results in EpiCenter are a consolidation of all AST results for an organism. As a result, if more than one test is used to generate these susceptibility results, more than one test source code could be reported back to the LIS system.

In the example below, the result record 16 is a drug not available on the panels tested, and was thus a supplemental test with test code "KB".

```
H|\^&||||Becton Dickinson|||||||||V1.0|20060223120400
P|1||P0001||Patient Name
||20040229|M|||||ADMIT_PHYS|||||||||||20060221092800|||||||||
|HOSP_SERV|CLIENT
O|1|20060223003^1^KLEPNEP||^^^ISOLATE
RESULT|||20060222092300|||COLL_BY^RECD_BY||||20060223092300
|SAMP_TYPE^BODY|ORD_PHYS||||||20060223120336||||||UNK
R|1|^^^ID|^KLEPNEP^000012DFF9412020^^^^^^ NMIC/ID-14|||||F
R|2|^^^AST^^AM|^>16^R^R^^NMIC/ID-14|||||F
R|3|^^^AST^^AMC|^16/8^I^I^^NMIC/ID-14|||||F
R|4|^^^AST^^AN|^32^I^I^^NMIC/ID-14|||||F
R|5|^^^AST^^ATM|^<=2^S^S^^NMIC/ID-14|||||F
R|6|^^^AST^^CF|^<=1^S^S^^NMIC-2|||||F
R|7|^^^AST^^CIP|^2^I^I^^NMIC/ID-14|||||F
R|8|^^^AST^^CTX|^<=2^S^S^^NMIC/ID-14|||||F
R|9|^^^AST^^CXM|^16^I^I^^NMIC/ID-14|||||F
R|10|^^^AST^^CZ|^16^I^I^^NMIC/ID-14|||||F
R|11|^^^AST^^FOX|^<=1^S^S^^NMIC-2|||||F
R|12|^^^AST^^FM|^64^I^I^^NMIC/ID-14|||||F
R|13|^^^AST^^LVX|^2^S^S^^NMIC/ID-14|||||F
R|14|^^^AST^^MEM|^<=1^S^S^^NMIC/ID-14|||||F
R|15|^^^AST^^NN|^8^I^I^^NMIC-2||||||F
R|16|^^^AST^^OX|^4^R^R^^KB|||||F
R|17|^^^AST^^PIP|^>64^R^R^^NMIC/ID-14|||||F
L|1|N
```

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10.4.5.6.**Isolate with multiple instruments**

An EpiCenter is configured with mixed instruments, Phoenix and MGIT 960.

```
H|\^&|||Becton Dickinson|||||||||V1.0|20050316152604
P|1||PatXYZ||Mr. Fred A. Stare
O|1|Acc456^2^STACOH||^^^ISOLATE RESULT|||
20041104082700||||||||| 20041104082750|||||||||||||||||UNK
R|1|^^^ID|^STACOH^00001C71C71C71C7^^^^^^GPIDAST 954|||||F
R|2|^^^AST^^AM|^^X^^X^GPIDAST 954|||||F
R|3|^^^AST^^AMC|^>16/8^X^R^X^GPIDAST 954|||||F
R|4|^^^AST^^CF|^>0.125^X^R^X^GPIDAST 954|||||F
R|5|^^^AST^^CIP|^<=2^S^S^^GPIDAST 954|||||F
R|6|^^^AST^^CRO|^>1^X^X^^GPIDAST 954|||||F
R|7|^^^AST^^FEP|^<=4^X^S^X^GPIDAST 954|||||F
R|8|^^^AST^^GM|^>32^R^R^^GPIDAST 954|||||F
R|9|^^^AST^^INH^0.10 ug/mL|^^R^R^^MGIT_960_AST94|||||F
R|10|^^^AST^^INH^0.40 ug/mL|^^S^S^^MGIT_960_AST94|||||F
R|11|^^^AST^^IPM|^4^X^S^X^GPIDAST 954|||||F
R|12|^^^AST^^LVX|^^S^^S|||||F
R|13|^^^AST^^MEM|^<=1^X^S^X^GPIDAST 954|||||F
R|14|^^^AST^^OFX|^^S^^S|||||F
R|15|^^^AST^^P|^>1^X^X^^GPIDAST 954|||||F
R|16|^^^AST^^RA^1.0 ug/mL|^^I^I^^MGIT_960_AST94|||||F
R|17|^^^AST^^SXT|^^^^^GPIDAST 954|||||F
R|18|^^^AST^^TE|^^^^^GPIDAST 954|||||F
R|19|^^^AST^^TZP^0.5|^^R^R^^ASTDIA1|||||F
L|1|N
```

11.   Appendix B – Tests and Results

The following appendix lists test names and test status values. If the LIS code for a test name or test status is different than the name, it is in parenthesis next to the name. Instrumented tests and their status values appear in **bold**. At the EpiCenter the non-instrumented tests can be reconfigured by the user. *Note: This list is not intended to be an exhaustive list, for example only some of the Test Names are listed for the Phoenix Gram Negative and Gram Positive panel types.*

Test Type	Test Name (LIS Code)	Test Status (LIS Code)
Growth and Detection Tests	30 degree MGIT 960 G&D Tube (30MGT)	False Positive
		Incomplete
		Negative
		Positive
	Acid Fast Smear (AFS)	Incomplete
		Acid Fast Bacilli Seen (AFB Seen)
		No Acid Fast Bacilli Seen (No AFB Seen)
	ProbeTec ET Assay (BD_PROBETEC_GND)	**Positive (INST_POSITIVE)**
		Negative (INST_NEGATIVE)
		Indeterminate (INST_INDETERMINATE)
		Equivocal (INST_EQUIVOCAL)
		QC Pass (INST_QC_PASS)
		QC Fail (INST_QC_FAIL)
	Colistin (COLIS)	Incomplete
	Gram Stain (GRMSTN)	Negative

Test Type	Test Name (LIS Code)	Test Status (LIS Code)
	Lowenstein-Jensen Medium (LJ)	Positive
	Myco/F Lytic (MYFLTC)	
	MGIT 960 G&D Tube (MGIT_960_GND)	**Pending (Pending)**
		False Positive (False Positive)
		Manual Negative (Manual Negative)
		Manual Positive (Manual Positive)
		Threshold Positive (Threshold Positive)
		Negative (INST_NEGATIVE)
		Ongoing (INST_ONGOING)
		Removed Ongoing (INST_REMOVED)
		Positive (INST_POSITIVE)
		Complete (INST_COMPLETE)
	Middlebrook 7H11 Medium (7H11)	Contaminate
		Incomplete
		Negative
		Positive
ID Tests	Indirect Acid Fast Smear (INDAFS)	Complete
	Indirect Gram Stain (INDGRMSTN)	Incomplete
	ProbeTec ET MAC (ETMAC)	
	ProbeTec ET Mtb (ETMTB)	
AST – Diameter Tests	Ampicillin Disk (AMDISK)	Complete
	Cephalothin Disk (CFDISK)	Incomplete
	Gentamicin Disk (GMDISK)	
	Penicillin Disk (PDISK)	

Test Type	Test Name (LIS Code)	Test Status LIS Code
AST – MGIT 960	**MGIT 960 AST Carrier Set (MGIT_960_AST)**	**Pending (Pending)**
		Manual Complete (Manual Complete)
		AST Error (INST_ERROR)
		Complete (INST_COMPLETE)
		Ongoing (INST_ONGOING)
AST-MIC Tests	460TB AST (460TB)	Complete
	Ethambutol AST Test (ETHM)	Incomplete
	Isoniazid AST Test (INH)	
	Pyrazinmide AST Test (PZA)	
	Rifampin AST Test (RIF)	
	Streptomycin AST Test (STREPM)	
Phoenix Gram Negative	**NID**	Complete (INST_COMPLETE)
	NQC01	Rapid Complete (INST_RAPID_COMPLETE)
	NMIC/ID-1	Ongoing (INST_ONGOING)
	NMIC/ID-13	Partially Complete (INST_PARTIAL_COMPLETE)
	NMIC/ID-14	In Attention Complete (INST_ATTN_COMPLETE)
	NMIC/ID-15	In Attention Ignored (INST_ATTN_IGNORED)
		Pending (INST_PENDING)
		QC Status see section 14.3.3
Phoenix Gram Positive	**PID**	Complete (INST_COMPLETE)
	PQC01	Rapid Complete (INST_RAPID_COMPLETE)
	PMIC/ID-1	Ongoing (INST_ONGOING)
	PMIC/ID-17	Partially Complete (INST_PARTIAL_COMPLETE)
	PMIC/ID-18	In Attention Complete

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Test Type	Test Name (LIS Code)	Test Status LIS Code
	PMIC/ID-20	(INST_ATTN_COMPLETE) In Attention Ignored (INST_ATTN_IGNORED) Pending (INST_PENDING) QC Status see section 14.3.3
BD Sceptor Panels		Complete (COMPLETE)
BACTEC 9000	DVE PLUS Aerobic/F (96AER) DVE PLUS Anaerobic/F (97ANA) Lytic/10 Anaerobic/F (LYTIC10ANF) Myco/F Lytic (MYCFLYTIC) Mycosis-IC/F (MYCOSISIC) PEDS Plus/F (PEDPLUSF) PLUS Aerobic/F (PLUSAEF) Plus Aerobic/F (82) (PLUS_A) Plus Aerobic/F(DVE)(80) (DVE_A) Plus Anaerobic/F (PLUSANF) Plus Anaerobic/F(83) (PLUS_N) Plus Anaerobic/F(DVE)(81) (DVE_N) Standard 10 Aerobic/F (STD10AEF) Standard Aerobic/F(90) (STDAER) Standard Anaerobic/F (STDANF)	Confirmed Positive(Confirmed Positive) Manual Negative(Manual Negative) Manual Positive(Manual Positive) Negative(INST_NEGATIVE) Ongoing (INST_ONGOING) Pending (Pending) Positive(INST_POSITIVE) Removed Ongoing(INST_REMOVED)
BACTEC FX	Lytic/10 Anaerobic/F (LYTIC10ANF) Myco/F Lytic (MYCFLYTIC) Mycosis-IC/F (MYCOSISIC) PEDS Plus/F (PEDPLUSF) PLUS Aerobic/F (PLUSAEF) Plus Anaerobic/F (PLUSANF) Standard 10 Aerobic/F (STD10AEF) Standard Anaerobic/F (STDANF)	Confirmed Positive(Confirmed Positive) Manual Negative(Manual Negative) Manual Positive(Manual Positive) Negative(INST_NEGATIVE) Ongoing (INST_ONGOING) Pending (Pending) Positive(INST_POSITIVE) Removed Ongoing(INST_REMOVED)
Innova	Innova Protocol (INNOVA)	Complete (INST_COMPLETE) Error (INST_ERROR)
Other Tests	Blood Agar Plate (TSA) Blood Agar Plate Anaerobic (BAPANA) CDC Anaerobe 5% Sheep Blood Agar (CDC) CDC Anaerobe Laked Sheep Blood Agar with KV (KV) Cefinase (CEFINASE) Choc Plate (CHOC) Indole (INDOLE) MacConkey II Agar (MAC)	Complete Incomplete

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12. Appendix C – Antibiotic Abbreviations

The following is a list of the antibiotics in the BD database, with the associated LIS Code. On the EpiCenter, BD Phoenix 100, and BD Phoenix M50, these codes are configurable by the user. However on the MGIT and ProbeTec ET instruments these values are not configurable. Therefore a direct instrument interface sends these values as AST results.

1st gen cephalosporin	CEFG1	Framycetin	SO
1st gen cephalosporins	CEF_G1	Furazolidone	FX
1st gen cephalosporins w/ anti-pseudomona	CEF_H1AP	Fusidic Acid	FA
2nd gen cephalosporin; grp 1	GRP1	Gatifloxacin	GAT
2nd gen cephalosporin; grp 2 (cephamycins	GRP2	Gemifloxacin	GEM
2nd gen cephalosporin; grp 3	GRP3	Gentamicin	GM
2nd gen cephalosporins	CEF_G2	Gentamicin-Syn	GMS
3rd gen cephalosporin w/ aerobic GNR acti	CEF_MAP	Glycopeptides	GLYCPEP
3rd gen cephalosporin w/ anti-pseudomonal	CEF_AP	Grepafloxacin	GRX
3rd gen cephalosporins	CEF_G3	High level aminoglycosides	HLAR
4th gen cephalosporin	CEFG4	Hydrolyzable Penicillins	PEN_GRP
4th gen cephalosporins	CEF_G4	Imidazole	IMIDAZ
6' methoxypenicillin	MO_PEN	Imipenem	IPM
Amdinocillin	AMD	Isepamicin	ISP
amdinopenicillins	AMDINO_PEN	Isoniazid	INH
Amikacin	AN	Josamycin	JM
Aminocyclitols	AMNCYC	Kanamycin	K
Aminoglycosides	AMNGLY	Kanamycin Synergy	KS
aminopenicillins	AM_PEN	Levofloxacin	LVX
aminopenicillins w/ Beta-lact. Inhib.	AM_PEN_BLI	Lincomycin	L
Amoxicillin	AMX	Lincosamides	LINCO
Amoxicillin/Clavulanate	AMC	Linezolid	LZD
Amoxicillin/Clavulanate (f)	AXC	Lividomycin	LV
Ampicillin	AM	Lomefloxacin	LOM
Ampicillin/Sulbactam	SAM	Loracarbef	LOR
Ampicillin/Sulbactam (f)	SXA	Lymecycline	LYM
Antimycobacterial drugs	AMYCOB	Macrolides	MACRO
Apalcillin	APL	Macrolides Lincosam. Strepto	MLS
Apramycin	AP	Mecillinam	MEC
Arbekacin	ARB	Meropenem	MEM
Aspoxicillin	APX	Methacycline	MC
Astromycin	AST	Methicillin	DP
Azithromycin	AZM	Metronidazole	MET
Azlocillin	AZ	Mezlocillin	MZ
Aztreonam	ATM	Mezlocillin/Sulbactam	MZS
Bacitracin	B	Micronomycin	MCR
Benzylpenicillin	BZP	Midecamycin	MID
Beta-lactams	BETA_LAC	Minocycline	MI
Biapenem	BPM	Monobactams	MONOBAC
Capreomycin	CAP	Moxalactam	MOX
Carbacephem	CARBACEF	Moxifloxacin	MXF
Carbenicillin	CB	Mupirocin	MUP
Carbepenems	CARBAPEN	Nafcillin	NF
carboxypenicillins	CO_PEN	Nalidixic Acid	NA
carboxypenicillins w/ Beta-lact. Inhib.	CO_PEN_BLI	Neomycin	N
Carumonam	CAR	Netilmicin	NET
Cefaclor	CEC	Nifuroazide	NFX
Cefadroxil	CFR	Nifurzide	NZD
Cefamandole	MA	Nitrofurantoin	FM
Cefatrizine	FAT	Nitroxoline	NIT
Cefazolin	CZ	Non-hydrolyzable Penicillins	PEN_M
Cefbuperazone	CFB	Norfloxacin	NOR
Cefdinir	CDR	Novobiocin	NB
Cefditoren	CDN	Nystatin	NY
Cefditoren pivoxil	CDNp	Ofloxacin	OFX
Cefepime	FEP	Olandeomycin	OL
Cefepime/Sulbactam	SFP	Ornidazole	ORN
Cefetamet-pivoxil	CAT	Others	OTHER
Cefixime	CFM	Oxacillin	OX
Cefmenoxime	CMX	Oxolinic Acid	OA
Cefmetazole	CMZ	Oxytetracycline	T

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Cefminox	CNX	p-Aminosalicylic acid	PAS
Cefodizime	CDZ	Panipenem	PAN
Cefonicid	CID	Paromomycin	PAR
Cefoperazone	CFP	Pefloxacin	PEF
Cefoperazone/Sulbactam	SCP	Penamycin	PENAMYCIN
Ceforanide	CND	Penicillin G	P
Cefotaxime	CTX	Penicillin V	PV
Cefotaxime/Clavulanate	CCX	Penicillin w/ Beta-lact. inh	PEN_BLI
Cefotaxime/Sulbactam	SCT	Penicillins	PENS
Cefotetan	CTT	Penicillins w/ Beta-lact. in	PENS_BLI
Cefotiam	CFT	Phenoxymethylpenicillin	PXM
Cefotiam-hexiteil	CFTh	Pipemidic Acid	PI
Cefoxitin	FOX	Piperacillin	PIP
Cefozopran	CFZ	Piperacillin/Sulbactam	SPI
Cefpimazole	CPZ	Piperacillin/Tazobactam	TZP
Cefpiramide	CPM	Pirlimycin	PRL
Cefpirome	CPO	Piromidic Acid	PIR
Cefpirome/Sulbactam	SCO	Pivampicillim	PAM
Cefpodoxime-proxetil	CPD	Pivmecillinam	PMC
Cefpodoxime/Clavulanate	CCP	Polymyxin B	PB
Cefprozil	CPR	Primary aminoglycosides	PRI_AMN
Cefroxadine	CFX	Primary penicillin	PRI_PEN
Cefsulodin	CFS	Primary quinolones	PRI_QUIN
Ceftazadime/Sulbactam	SCZ	Pristinamycin	PR
Ceftazidime	CAZ	Pyrazinamide	PZA
Ceftazidime/Clavulanate	CCZ	Quinolones	QUIN
Cefteram	CEM	Quinupristin/dalfopristin	SYN
Ceftibuten	CTB	Rifabutin	RBN
Ceftiofur	XNL	Rifampin	RA
Ceftizoxime	ZOX	Rifamycin	RF
Ceftriaxone	CRO	Rifamycins	RIFAMYC
Ceftriaxone/Clavulanate	CCR	Rokitamycin	ROK
Cefuroxime sodium	CXM	Rosoxacin	R
Cefuroxime-axetil	CXMa	Roxithromycin	RXT
Cefuzonam	CZN	Sarafloxacin	SRF
Cephalexin	CN	Sisomycin	SIS
Cephaloridine	CD	Sparfloxacin	SPX
Cephalosporins	CEPHEM	Spectinomycin	SPT
Cephalosporins w/ Beta-lactamase inhib.	CEPHEM_BLI	Spiramycin	SP
Cephalosporins w/ Beta-lactamse inhib.	CEF_BLI	Streptogramins	STREPTO
Cephalothin	CF	Streptomycin	S
Cephapirin	CP	Streptomycin-Syn	STS
Cephradine	CH	Sulbenicillin	SBC
Chloramphenicol	C	Sulfadiazine	SD
Chlortetracycline	A	Sulfamethizole	TH
Cinoxacin	CIN	Sulfamethoxazole	SMZ
Ciprofloxacin	CIP	sulfapenicillin	SU_PEN
Clarithromycin	CLR	Sulfathiazole	ST
Clinafloxacin	CLX	Sulfisoxazole	G
Clindamycin	CC	Systemic fluoroquinilones	SYS_FQUIN
Clofazimine	CLO	Teicoplanin	TEC
Cloxacillin	CX	Telithromycin	TEL
Colistin	CL	Temafloxacin	TMA
Cyclic peptides	CYC_PEP	Temocillin	TEM
Cycloserine	CS	Tetracycline	TE
Daptomycin	DAP	Tetracyclines	TET
Dibekacin	DKB	Thiacetazone	TB1
Dicloxacillin	DX	Thiamphenicol	TP
Difloxacin	DFX	Ticarcillin	TIC
Dihydrofolate reductase inhibitor	DHFR_INH	Ticarcillin/Clavulanate	TIM
Dihydrofolate reduct./Dihydropteroate syn	DHFR_DHPS_INH	Tilmicosin	TIL
Dihydropteroate synthetase inhibitor	DHPS_INH	Tobramycin	NN
Dirithromycin	DTM	Tosufloxacin	TFX
Doxycycline	D	Trimeth/Sulfa (DIN)	STG
Enoxacin	ENX	Trimethoprim	TMP
Enrofloxacin	EFX	Trimethoprim/Sulfadiazine	SDT
Epicillin	EP	Trimethoprim/Sulfamethoxazol	SXT
Erythromycin	E	Triple Sulfa	SSS
Ethambutol	EM	Trospectinomycin	TRP
Ethionamide	EA	Trovafloxacin	TVA
Fleroxacin	FLE	Tylosin	TYL

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Flomoxef                              FLO         Unspecified                  UNS
Flucloxacillin                        FO          ureidopenicillins            UR_PEN
Flumequine                            FLQ         ureidopenicillins w/ B-lact.UR_PEN_BLI
Fluoroquinilones                      FQUIN       Urinary fluoroquinilones     UR_FQUIN
Folate antagonists                    FOL_ANT     Vancomycin                   VA
Fosfomycin w/G6PD                     FF          Virginiamycin                VRG
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13. Appendix D – Organism Abbreviations

The following is a list of the organisms in the BD database, with the associated LIS Code. On the EpiCenter, BD Phoenix 100, and BD Phoenix M50, these codes are configurable by the user. However on the MGIT and ProbeTec ET instruments these values are not configurable. Therefore a direct instrument interface sends these values as AST results.

Organism	Code	Organism	Code
Abiotrophia	ABI	Lactobacillus catenaformis	LACBCAT
Abiotrophia defectiva	STRDEF	Lactobacillus crispatus	LACBCRI
Acholeplasma	ACHO	Lactobacillus delbrueckii ssp bulgaricus	LACBDELB
Acholeplasma laidlawii	ACHOLAI	Lactobacillus delbrueckii ssp delbrueckii	LACBDELD
Achromobacter	ACHR	Lactobacillus delbrueckii ssp lactis	LACBDELL
Achromobacter piechaudii	ALCPIE	Lactobacillus fermentum	LACBFER
Achromobacter species	ACHRSPE	Lactobacillus gasseri	LACBGAS
Achromobacter xylosoxidans ssp denitrific	ALCDEN	Lactobacillus jensenii	LACBJEN
Achromobacter xylosoxidans ssp xylosoxida	ALCXYL	Lactobacillus johnsonii	LACBJOH
Acid Fast Bacilli	AFB	Lactobacillus kefiri	LACBKEF
Acid Fast Bacilli (Group)	AFBG	Lactobacillus paraplantarum	LACBPAR
Acidaminococcus	ACIA	Lactobacillus plantarum	LACBPLA
Acidaminococcus fermentans	ACIAFER	Lactobacillus reuteri	LACBREU
Acidovorax	ACID	Lactobacillus rhamnosus	LACBRHA
Acidovorax delafieldii	ACIDDEL	Lactobacillus salivarius	LACBSAL
Acidovorax facilis	ACIDFAC	Lactobacillus species	LACBSPE
Acidovorax temperans	ACIDTEM	Lactobacillus uli	LACBULI
Acinetobacter	ACIN	Lactococcus	LACC
Acinetobacter baumannii	ACINBAU	Lactococcus garvieae	LACCGAR
Acinetobacter baumannii/calcoaceticus com	ACINBCX	Lactococcus lactis ssp cremoris	LACCLACC
Acinetobacter baumannii/haemolyticus	ACINBAUHAE	Lactococcus lactis ssp hordniae	LACCLACH
Acinetobacter calcoaceticus	ACINCAL	Lactococcus lactis ssp lactis	LACCLACL
Acinetobacter haemolyticus	ACINHAE	Lactococcus plantarum	LACCPLA
Acinetobacter johnsonii	ACINJOH	Lactococcus raffinolactis	LACCRAF
Acinetobacter junii	ACINJUN	Lactococcus species	LACCSPE
Acinetobacter lwoffii	ACINLWO	Lautropia	LAU
Acinetobacter lwoffii/haemolyticus	ACINLWOHAE	Lautropia mirabilis	LAUMIR
Acinetobacter radioresistens	ACINRAD	Leclercia	LEC
Acinetobacter species	ACINSPE	Leclercia adecarboxylata	LECADE
Actinobacillus	ACTB	Legionella	LEG
Actinobacillus actinomycetemcomitans	ACTBACT	Legionella anisa	LEGANI
Actinobacillus capsulatus	ACTBCAP	Legionella birminghamensis	LEGBIR
Actinobacillus equuli	ACTBEQU	Legionella bozemaniae	LEGBOZ
Actinobacillus hominis	ACTBHOM	Legionella cincinnatiensis	LEGCIN
Actinobacillus lignieresii	ACTBLIG	Legionella dumoffii	LEGDUM
Actinobacillus muris	ACTBMUR	Legionella feeleii	LEGFEE
Actinobacillus pleuropneumoniae	ACTBPLE	Legionella gormanii	LEGGOR
Actinobacillus rossii	ACTBROS	Legionella hackeliae	LEGHAC
Actinobacillus seminis	ACTBSEM	Legionella israelensis	LEGISR
Actinobacillus species	ACTBSPE	Legionella jordanis	LEGJOR
Actinobacillus suis	ACTBSUI	Legionella lansingensis	LEGLAN
Actinobacillus ureae	ACTBURE	Legionella longbeachae	LEGLON
Actinobaculum	ACTC	Legionella maceachernii	LEGMAC
Actinobaculum schaalii	ACTCSCH	Legionella micdadei	LEGMIC
Actinobaculum suis	ACTMSUI	Legionella oakridgensis	LEGOAK
Actinomadura	ACTA	Legionella pneumophila	LEGPNE
Actinomadura madurae	ACTAMAD	Legionella pneumophila ssp fraseri	LEGPNEF
Actinomadura pelletieri	ACTAPEL	Legionella pneumophila ssp pascullei	LEGPNEPA
Actinomyces	ACTM	Legionella pneumophila ssp pneumophila	LEGPNEPN
Actinomyces bovis	ACTMBOV	Legionella sainthelensi	LEGSAI
Actinomyces denticolens	ACTMDEN	Legionella species	LEGSPE
Actinomyces europaeus	ACTMEUR	Legionella tucsonensis	LEGTUC
Actinomyces georgiae	ACTMGEO	Legionella wadsworthii	LEGWAD
Actinomyces gerencseriae	ACTMGER	Leifsonia	LEI
Actinomyces graevenitzii	ACTMGRA	Leifsonia aquatica	CORAQU
Actinomyces hordeovulneris	ACTMHOR	Leminorella	LEM
Actinomyces howelli	ACTMHOW	Leminorella grimontii	LEMGRI
Actinomyces hyovaginalis	ACTMHYO	Leminorella richardii	LEMRIC
Actinomyces israelii	ACTMISR	Leminorella species	LEMSPE
Actinomyces meyeri	ACTMMEY	Leptotrichia	LEP
Actinomyces naeslundii	ACTMNAE	Leptotrichia buccalis	LEPBUC
Actinomyces neuii ssp anitratus	ACTMNEUA	Leuconostoc	LEU
Actinomyces neuii ssp neuii	ACTMNEUN	Leuconostoc argentinum	LEUARG
Actinomyces odontolyticus	ACTMODO	Leuconostoc carnosum	LEUCAR
Actinomyces radingae	ACTMRAD	Leuconostoc citreum	LEUCIT
Actinomyces slackii	ACTMSLA	Leuconostoc gelidum	LEUGEL
Actinomyces species	ACTMSPE	Leuconostoc lactis	LEULAC
Actinomyces turicensis	ACTMTUR	Leuconostoc mesenteroides	LEUMES
Actinomyces viscosus	ACTMVIS	Leuconostoc mesenteroides ssp cremoris	LEUMESC
Aerococcus	AERC	Leuconostoc mesenteroides ssp dextranicum	LEUMESD
Aerococcus species	AERCSPE	Leuconostoc mesenteroides ssp mesenteroides	LEUMESM
Aerococcus urinae	AERCURI	Leuconostoc pseudomesenteroides	LEUPSE
Aerococcus viridans	AERCVIR	Leuconostoc species	LEUSPE
Aeromonas	AERM	Listeria	LIS
Aeromonas allosaccharophila	AERMALL	Listeria grayi	LISGRA
Aeromonas caviae	AERMCAV	Listeria innocua	LISINN
Aeromonas hydrophila	AERMHYD	Listeria ivanovii	LISIVA
Aeromonas hydrophila group	AERMHYDGR	Listeria ivanovii ssp ivanovii	LISIVAI
Aeromonas jandaei	AERMJAN	Listeria ivanovii ssp londoniensis	LISIVAL
Aeromonas media	AERMMED	Listeria monocytogenes	LISMON
Aeromonas salmonicida	AERMSAL	Listeria monocytogenes/innocua	LISMONINN

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Name	Code	Name	Code
Aeromonas salmonicida ssp achromogenes	AERMSALA	Listeria murrayi	LISMUR
Aeromonas salmonicida ssp masoucida	AERMSALM	Listeria murrayi/grayi	LISMURGRA
Aeromonas salmonicida ssp salmonicida	AERMSALSA	Listeria seeligeri	LISSEE
Aeromonas salmonicida ssp smithia	AERMSALSM	Listeria species	LISSPE
Aeromonas schubertii	AERMSCH	Listeria welshimeri	LISWEL
Aeromonas sobria	AERMVERS	Listonella	LISO
Aeromonas species	AERMSPE	Listonella anguillarum	LISOANG
Aeromonas trota	AERMTRO	Listonella pelagia	LISOPEL
Aeromonas veronii	AERMVERV	Macrococcus	MAC
Afipia	AFI	Macrococcus caseolyticus	STACAS
Afipia broomeae	AFIBRO	Malassezia	MAL
Afipia clevelandensis	AFICLE	Malassezia furfur	MALFUR
Afipia felis	AFIFEL	Malassezia globosa	MALGLO
Agrobacterium	AGR	Malassezia obtusa	MALOBT
Agrobacterium radiobacter	AGRRAD	Malassezia pachydermatis	MALPAC
Agrobacterium tumefaciens	AGRTUM	Malassezia restricta	MALRES
Alcaligenes	ALC	Malassezia sloofiae	MALSLO
Alcaligenes faecalis	ALCFAE	Malassezia species	MALSPE
Alcaligenes faecalis ssp faecalis	ALCFAEF	Malassezia sympodialis	MALSYM
Alcaligenes faecalis type II	ALCFAEII	Mannheimia	MAN
Alcaligenes species	ALCSPE	Mannheimia haemolytica	PASHAE
Alloiococcus	ALL	Megamonas	MEGM
Alloiococcus otitidis	ALLOTI	Megamonas hypermegale	MEGMHYP
Anaerobiospirillum	ANAB	Megasphaera	MEGS
Anaerobiospirillum succiniciproducens	ANABSUC	Megasphaera elsdenii	MEGSELS
Anaerobiospirillum thomasii	ANABTHO	Methylobacterium	MET
Anaerorhabdus	ANAR	Methylobacterium extorquens	METEXT
Anaerorhabdus furcosa	ANARFUR	Methylobacterium fujisawaense	METFUJ
Arcanobacterium	ARCA	Methylobacterium mesophilicum	METMES
Arcanobacterium bernardiae	ARCABER	Methylobacterium species	METSPE
Arcanobacterium haemolyticum	ARCAHAE	Microbacterium	MICB
Arcanobacterium pyogenes	ACTMPYO	Microbacterium arborescens	MICBARB
Arcobacter	ARCO	Microbacterium imperiale	MICBIMP
Arcobacter butzleri	ARCOBUT	Micrococcus	MIC
Arcobacter cryaerophilus	ARCOCRY	Micrococcus luteus	MICLUT
Arcobacter nitrofigilis	ARCONIT	Micrococcus lylae	MICLYL
Arcobacter skirrowii	ARCOSKI	Micrococcus species	MICSPE
Arthrobacter	ART	Micromonas	MICM
Arthrobacter agilis	ARTAGI	Micromonas micros	PEPSMIC
Arthrobacter creatinolyticus	ARTCRE	Mitsuokella	MIT
Arthrobacter cumminsii	ARTCUM	Mitsuokella multiacida	MITMUL
Arthrobacter woluwensis	ARTWOL	Mobiluncus	MOB
Aspergillus	ASP	Mobiluncus curtisii	MOBCUR
Aspergillus fumigatus	ASPFUM	Mobiluncus mulieris	MOBMUL
Aspergillus species	ASPSPE	Mobiluncus species	MOBSPE
Atopobium	ATO	Moellerella	MOE
Atopobium minutum	ATOMIN	Moellerella wisconsensis	MOEWIS
Atopobium parvulum	ATOPAR	Mogibacterium	MOG
Atopobium rimae	LACBRIM	Mogibacterium timidum	EUBTIM
Aureobacterium	AURC	Moraxella	MORA
Aureobacterium resistens	AURCRES	Moraxella (Branhamella) catarrhalis	MORABRACAT
Aureobasidium	AUR	Moraxella atlantae	MORAATL
Aureobasidium pullulans	AURPUL	Moraxella bovis	MORABOV
Bacillus	BACI	Moraxella canis	MORACAN
Bacillus amyloliquefaciens	BACIAMY	Moraxella caviae	MORACAV
Bacillus anthracis	BACIANT	Moraxella cuniculi	MORACUN
Bacillus cereus	BACICER	Moraxella lacunata	MORALAC
Bacillus circulans	BACICIR	Moraxella lincolnii	MORALIN
Bacillus coagulans	BACICOA	Moraxella nonliquefaciens	MORANON
Bacillus firmus	BACIFIR	Moraxella osloensis	MORAOSL
Bacillus licheniformis	BACILIC	Moraxella ovis	MORAOVI
Bacillus megaterium	BACIMEG	Moraxella species	MORASPE
Bacillus mycoides	BACIMYC	Morganella	MORG
Bacillus pasteurii	BACIPAS	Morganella morganii	MORGMOR
Bacillus pumilus	BACIPUM	Morganella morganii ssp morganii	MORGMORM
Bacillus species	BACISPE	Morganella morganii ssp morganii biogroup 1	MORGMORM1
Bacillus sphaericus	BACISPH	Morganella morganii ssp sibonii	MORGMORS
Bacillus stearothermophilus	BACISTE	Mycobacterium	MYCB
Bacillus subtilis	BACISUB	Mycobacterium abscessus	MYCBABS
Bacillus subtilis ssp spizizenii	BACISUBSP	Mycobacterium africanum	MYCBAFR
Bacillus subtilis ssp subtilis	BACISUBSU	Mycobacterium asiaticum	MYCBASI
Bacillus thuringiensis	BACITHU	Mycobacterium aurum	MYCBAUR
Bacteroides	BACT	Mycobacterium avium	MYCBAVI
Bacteroides caccae	BACTCAC	Mycobacterium avium complex	MYCBMAC
Bacteroides capillosus	BACTCAP	Mycobacterium avium ssp avium	MYCBAVIA
Bacteroides coagulans	BACTCOA	Mycobacterium avium ssp paratuberculosis	MYCBAVIP
Bacteroides distasonis	BACTDIS	Mycobacterium avium ssp silvaticum	MYCBAVIS
Bacteroides distasonis group	BACTDISGR	Mycobacterium bovis	MYCBBOV
Bacteroides eggerthii	BACTEGG	Mycobacterium branderi	MYCBBRA
Bacteroides forsythus	BACTFOR	Mycobacterium celatum	MYCBCEL
Bacteroides fragilis	BACTFRA	Mycobacterium chelonae	MYCBCHE
Bacteroides fragilis group	BACTFRAGR	Mycobacterium confluentis	MYCBCON
Bacteroides merdae	BACTMER	Mycobacterium farcinogenes	MYCBFAR
Bacteroides ovatus	BACTOVA	Mycobacterium flavescens	MYCBFLA
Bacteroides putredinis	BACTPUT	Mycobacterium fortuitum	MYCBFOR
Bacteroides splanchnicus	BACTSPL	Mycobacterium fortuitum complex	MYCBFORC
Bacteroides stercoris	BACTSTI	Mycobacterium gadium	MYCBGAD
Bacteroides tectus	BACTTEC	Mycobacterium gastri	MYCBGAS
Bacteroides thetaiotaomicron	BACTTHE	Mycobacterium genavense	MYCBGEN
Bacteroides uniformis	BACTUNI	Mycobacterium gordonae	MYCBGOR
Bacteroides ureolyticus	BACTURE	Mycobacterium haemophilum	MYCBHAE
Bacteroides vulgatus	BACTVUL	Mycobacterium heidelbergense	MYCBHEI
Balneatrix	BAL	Mycobacterium interjectum	MYCBINJ
Balneatrix alpica	BALALP	Mycobacterium intermedium	MYCBINM
Bartonella	BAR	Mycobacterium intracellulare	MYCBINC

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Organism	Code	Organism	Code
Bartonella bacilliformis	BARBAC	Mycobacterium kansasii	MYCBKAN
Bartonella clarridgeiae	BARCLA	Mycobacterium leprae	MYCBLEP
Bartonella elizabethae	BARELI	Mycobacterium malmoense	MYCBMAL
Bartonella henselae	BARHEN	Mycobacterium marinum	MYCBMAR
Bartonella quintana	BARQUI	Mycobacterium microti	MYCBMIC
Bartonella species	BARSPE	Mycobacterium mucogenicum	MYCBMUC
Bergeyella	BER	Mycobacterium neoaurum	MYCBNEO
Bergeyella zoohelcum	BERZOO	Mycobacterium nonchromogenicum	MYCBNON
Bifidobacterium	BIF	Mycobacterium obuense	MYCBOBU
Bifidobacterium adolescentis	BIFADO	Mycobacterium other than tuberculosis	MYCBMOTT
Bifidobacterium angulatum	BIFANG	Mycobacterium peregrinum	MYCBPER
Bifidobacterium bifidum	BIFBIF	Mycobacterium phlei	MYCBPHL
Bifidobacterium breve	BIFBRE	Mycobacterium rhodesiae	MYCBRHO
Bifidobacterium catenulatum	BIFCAT	Mycobacterium scrofulaceum	MYCBSCR
Bifidobacterium denticolens	BIFDEC	Mycobacterium shimoidei	MYCBSHI
Bifidobacterium dentium	BIFDEN	Mycobacterium simiae	MYCBSIM
Bifidobacterium gallicum	BIFGAL	Mycobacterium smegmatis	MYCBSME
Bifidobacterium infantis	BIFINF	Mycobacterium species	MYCBSPE
Bifidobacterium inopinatum	BIFINO	Mycobacterium szulgai	MYCBSZU
Bifidobacterium longum	BIFLON	Mycobacterium terrae	MYCBTER
Bifidobacterium pseudocatenulatum	BIFPSC	Mycobacterium terrae complex	MYCBTERC
Bifidobacterium pseudolongum ssp globosum	BIFPSEG	Mycobacterium thermoresistibile	MYCBTHE
Bifidobacterium pseudolongum ssp pseudolo	BIFPSEP	Mycobacterium triviale	MYCBTRI
Bifidobacterium species	BIFSPE	Mycobacterium tuberculosis	MYCBTUB
Bilophila	BIL	Mycobacterium tuberculosis complex	MYCBTUBC
Bilophila wadsworthia	BILWAD	Mycobacterium ulcerans	MYCBULC
Blastoschizomyces	BLA	Mycobacterium vaccae	MYCBVAC
Blastoschizomyces capitatus	BLACAP	Mycobacterium xenopi	MYCBXEN
Bordetella	BOR	Mycoplasma	MYCP
Bordetella avium	BORAVI	Mycoplasma (Group)	MYCOPG
Bordetella bronchiseptica	BORBROS	Mycoplasma (Group2)	MYCOP
Bordetella hinzii	BORHIN	Mycoplasma buccale	MYCPBUC
Bordetella holmesii	BORHOL	Mycoplasma faucium	MYCPFAU
Bordetella parapertussis	BORPAR	Mycoplasma fermentans	MYCPFER
Bordetella pertussis	BORPER	Mycoplasma gallisepticum	MYCPGAL
Bordetella trematum	BORTRE	Mycoplasma genitalium	MYCPGEN
Borrelia	BOI	Mycoplasma hominis	MYCPHOM
Borrelia species	BOISPE	Mycoplasma lipophilum	MYCPLIP
Brachyspira	BRAC	Mycoplasma orale	MYCPORA
Brachyspira aalborgi	BRACAAL	Mycoplasma penetrans	MYCPPEN
Brachyspira hyodysenteriae	BRACHYO	Mycoplasma pirum	MYCPPIR
Brachyspira innocens	BRACINN	Mycoplasma pneumoniae	MYCPPNE
Brachyspira pilosicoli	BRACPIL	Mycoplasma primatum	MYCPPRI
Bradyrhizobium	BRAD	Mycoplasma salivarium	MYCPSAL
Bradyrhizobium japonicum	BRADJAP	Mycoplasma spermatophilum	MYCPSPR
Brevibacillus	BRES	Mycoplasma synoviae	MYCPSYN
Brevibacillus brevis	BACIBRE	Myroides	MYR
Brevibacillus laterosporus	BACILAT	Myroides odoratimimus	MYRODI
Brevibacterium	BREI	Myroides odoratus	MYRODA
Brevibacterium casei	BREICAS	Myroides odoratus/odoratimimus	MYRODAODI
Brevibacterium epidermidis	BREIEPI	Neisseria	NEI
Brevibacterium linins	BREILIN	Neisseria canis	NEICAN
Brevibacterium mcbrellneri	BREIMCB	Neisseria cinerea	NEICIN
Brevibacterium species	BREISPE	Neisseria elongata	NEIELO
Brevundimonas	BREU	Neisseria elongata ssp elongata	NEIELOE
Brevundimonas diminuta	BREUDIM	Neisseria elongata ssp glycolytica	NEIELOG
Brevundimonas vesicularis	BREUVES	Neisseria elongata ssp nitroreducens	NEIELON
Brucella	BRU	Neisseria flavescens	NEIFLA
Brucella abortus	BRUABO	Neisseria gonorrhoeae	NEIGON
Brucella canis	BRUCAN	Neisseria iguanae	NEIIGU
Brucella melitensis	BRUMEL	Neisseria lactamica	NEILAC
Brucella neotomae	BRUNEO	Neisseria meningitidis	NEIMEN
Brucella ovis	BRUOVI	Neisseria mucosa	NEIMUC
Brucella species	BRUSPE	Neisseria polysaccharea	NEIPOL
Brucella suis	BRUSUI	Neisseria sicca	NEISIC
Budvicia	BUD	Neisseria species	NEISPE
Budvicia aquatica	BUDAQU	Neisseria subflava	NEISUB
Burkholderia	BUR	Neisseria subflava biovar flava	NEISUBF
Burkholderia caryophylli	BURCAR	Neisseria subflava biovar perflava	NEISUBP
Burkholderia cepacia	BURCEP	Neisseria subflava biovar subflava	NEISUBS
Burkholderia cepacia (CF)	BURCEPCF	Neisseria weaveri	NEIWEA
Burkholderia cepacia/Ralstonia pickettii	BURCEPRALPIC	Nesterenkonia	NES
Burkholderia gladioli	BURGLA	Nesterenkonia halobia	NESHAL
Burkholderia glathei	BURGLT	Nocardia	NOCA
Burkholderia graminis	BURGRA	Nocardia asteroides	NOCAAST
Burkholderia mallei	BURMAL	Nocardia brasiliensis	NOCABRA
Burkholderia multivorans	BURMUL	Nocardia brevicatena	NOCABRE
Burkholderia phenazinium	BURPHE	Nocardia carnea	NOCACAR
Burkholderia pseudomallei	BURPSE	Nocardia farcinica	NOCAFAR
Burkholderia pyrrocinia	BURPYR	Nocardia nova	NOCANOV
Burkholderia species/Ralstonia species	BURSPERALSPE	Nocardia otitidiscaviarum	NOCAOTI
Burkholderia/Ralstonia	BUR/RAL	Nocardia pseudobrasiliensis	NOCAPSE
Buttiauxella	BUTT	Nocardia seriolae	NOCASER
Buttiauxella agrestis	BUTTAGR	Nocardia species	NOCASPE
Buttiauxella ferragutiae	BUTTFER	Nocardia transvalensis	NOCATRA
Buttiauxella gaviniae	BUTTGAV	Nocardia vaccinii	NOCAVAC
Butyrivibrio	BUTY	Nocardiopsis	NOCO
Butyrivibrio crossotus	BUTYCRO	Nocardiopsis dassonvillei	NOCODAS
Butyrivibrio fibrisolvens	BUTYFIB	Obesumbacterium	OBE
Calymmatobacterium	CALY	Obesumbacterium proteus	OBEPRO
Campylobacter	CAM	Ochrobactrum	OCH
Campylobacter coli	CAMCOL	Ochrobactrum anthropi	OCHANT
Campylobacter concisus	CAMCON	Oenococcus	OEN
Campylobacter curvus	CAMCUR	Oenococcus oeni	OENOEN
Campylobacter fetus	CAMFET	Oerskovia	OER

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Campylobacter fetus ssp fetus	CAMFETF	Oerskovia species	OERSPE
Campylobacter fetus ssp venerealis	CAMFETV	Oerskovia xanthineolytica	OERXAN
Campylobacter gracilis	CAMGRA	Oligella	OLI
Campylobacter helveticus	CAMHEL	Oligella species	OLISPE
Campylobacter hyointestinalis ssp hyointe	CAMHYOH	Oligella ureolytica	OLIURO
Campylobacter hyointestinalis ssp lawsoni	CAMHYOL	Oligella urethralis	OLIURT
Campylobacter jejuni	CAMJEJ	Ornithobacterium	ORN
Campylobacter jejuni ssp doylei	CAMJEJD	Ornithobacterium rhinotracheale	ORNRHI
Campylobacter jejuni ssp jejuni	CAMJEJJ	Paenibacillus	PAE
Campylobacter lari	CAMLAR	Paenibacillus alvei	PAEALV
Campylobacter mucosalis	CAMMUC	Paenibacillus durus	PAEDUR
Campylobacter rectus	CAMRET	Paenibacillus macerans	PAEMAC
Campylobacter rectus/curvus	CAMRETCUR	Paenibacillus polymyxa	BACIPOL
Campylobacter showae	CAMSHO	Pantoea	PAN
Campylobacter species	CAMSPE	Pantoea agglomerans	PANAGG
Campylobacter sputorum ssp bubulus	CAMSPUB	Pantoea ananatis	ERWANA
Campylobacter sputorum ssp fecalis	CAMSPUF	Pantoea dispersa	PANDIS
Campylobacter sputorum ssp paraureolyticu	CAMSPUP	Pantoea stewartii ssp indologenes	PANSTEI
Campylobacter sputorum ssp sputorum	CAMSPUS	Pantoea stewartii ssp stewartii	PANSTES
Campylobacter upsaliensis	CAMUPS	Pasteurella	PAS
Candida	CAN	Pasteurella aerogenes	PASAER
Candida aaseri	CANAAS	Pasteurella bettyae	PASBET
Candida albicans	CANALB	Pasteurella caballi	PASCAB
Candida boidinii	CANBOI	Pasteurella canis	PASCAN
Candida catenulata	CANCAT	Pasteurella dagmatis	PASDAG
Candida ciferrii	CANCIF	Pasteurella gallinarum	PASGAL
Candida colliculosa	CANCOL	Pasteurella multocida	PASMUL
Candida dubliniensis	CANDUB	Pasteurella multocida ssp gallicida	PASMULG
Candida famata	CANFAM	Pasteurella multocida ssp multocida	PASMULM
Candida glabrata	TORGLA	Pasteurella multocida ssp septica	PASMULS
Candida guilliermondii	CANGUI	Pasteurella pneumotropica	PASPNE
Candida haemulonii	CANHAE	Pasteurella species	PASSPE
Candida holmii	CANHOL	Pasteurella stomatis	PASSTO
Candida inconspicua	CANINC	Pasteurella trehalosi	PASTRE
Candida kefyr	CANKEF	Pasteurella volantium	PASVOL
Candida krusei	CANKRU	Pediococcus	PED
Candida lambica	CANLAM	Pediococcus acidilactici	PEDACI
Candida lipolytica	CANLIP	Pediococcus damnosus	PEDDAM
Candida lusitaniae	CANLUS	Pediococcus dextrinicus	PEDDEX
Candida magnoliae	CANMAG	Pediococcus parvulus	PEDPAR
Candida melibiosica	CANMEL	Pediococcus pentosaceus	PEDPEN
Candida norvegensis	CANNOR	Pediococcus species	PEDSPE
Candida parakrusei	CANPARK	Peptococcus	PEPC
Candida parapsilosis	CANPARP	Peptococcus niger	PEPCNIG
Candida pelliculosa	CANPEL	Peptostreptococcus	PEPS
Candida pintolopesii	CANPIN	Peptostreptococcus anaerobius	PEPSANA
Candida pulcherrima	CANPUL	Peptostreptococcus asaccharolyticus	PEPSASA
Candida rugosa	CANRUG	Peptostreptococcus barnesae	PEPSBAR
Candida species	CANSPE	Peptostreptococcus harei	PEPSHAR
Candida sphaerica	CANSPH	Peptostreptococcus hydrogenalis	PEPSHYD
Candida stellatoidea	CANSTE	Peptostreptococcus indolicus	PEPSIND
Candida tropicalis	CANTRO	Peptostreptococcus ivorii	PEPSIVO
Candida utilis	CANUTI	Peptostreptococcus lacrimalis	PEPSLAR
Candida valida	CANVAL	Peptostreptococcus lactolyticus	PEPSLAT
Candida viswanathii	CANVIS	Peptostreptococcus octavius	PEPSOCT
Candida zeylanoides	CANZEY	Peptostreptococcus prevotii	PEPSPRE
Capnocytophaga	CAP	Peptostreptococcus species	PEPSSPE
Capnocytophaga canimorsus	CAPCAN	Peptostreptococcus tetradius	PEPSTET
Capnocytophaga cynodegmi	CAPCYN	Peptostreptococcus vaginalis	PEPSVAG
Capnocytophaga gingivalis	CAPGIN	Photobacterium	PHOB
Capnocytophaga granulosa	CAPGRA	Photobacterium damselae	PHOBDAM
Capnocytophaga haemolytica	CAPHAE	Photobacterium damselae ssp damselae	PHOBDAMD
Capnocytophaga ochracea	CAPOCH	Photobacterium damselae ssp piscicida	PHOBDAMP
Capnocytophaga species	CAPSPE	Photorhabdus	PHOR
Capnocytophaga sputigena	CAPSPU	Photorhabdus luminescens	PHORLUM
Cardiobacterium	CAR	Pichia	PIC
Cardiobacterium hominis	CARHOM	Pichia angusta	PICANG
Catonella	CATO	Pichia anomala	HANANO
Catonella morbi	CATOMOR	Pichia fermentans	PICFER
CDC	CDC	Plesiomonas	PLE
CDC group DF-3	CDCDF3	Plesiomonas shigelloides	PLESHI
CDC group EF-4	CDCEF4	Porphyromonas	POR
CDC group EF-4a	CDCEF4a	Porphyromonas asaccharolytica	PORASA
CDC group EF-4b	CDCEF4b	Porphyromonas canoris	PORCAN
CDC group EO-2	CDCEO2	Porphyromonas catoniae	PORCAT
CDC group EO-3	CDCEO3	Porphyromonas circumdentaria	PORCIR
CDC group II b	CDCIIb	Porphyromonas endodontalis	POREND
CDC group II g	CDCIIg	Porphyromonas gingivalis	PORGIN
CDC group II h	CDCIIh	Porphyromonas levii	PORLEV
CDC group II i	CDCIIi	Porphyromonas macacae	PORMAC
CDC group IV	CDCIV	Pragia	PRA
CDC group NO-1	CDCNO1	Pragia fontium	PRAFON
CDC group O-1	CDCO1	Prevotella	PRE
CDC group O-2	CDCO2	Prevotella albensis	PREALB
CDC group OFBA-1	CDCOFBA1	Prevotella bivia	PREBIV
CDC group Vb-3	CDCVb3	Prevotella brevis	PREBRE
CDC group WO-1	CDCWO1	Prevotella bryantii	PREBRY
Cedecea	CED	Prevotella buccae	PREBUE
Cedecea davisae	CEDDAV	Prevotella buccalis	PREBUL
Cedecea lapagei	CEDLAP	Prevotella corporis	PRECOR
Cedecea neteri	CEDNET	Prevotella dentalis	PREDEA
Cedecea species	CEDSPE	Prevotella denticola	PREDEI
Cedecea species 3	CEDSPE3	Prevotella disiens	PREDIS
Cedecea species 5	CEDSPE5	Prevotella enoeca	PREENO
Cellulomonas	CEL	Prevotella heparinolytica	PREHEP

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Cellulomonas humilata	ACTMHUM	Prevotella intermedia	PREINT
Cellulomonas turbata	OERTUR	Prevotella loescheii	PRELOE
Centipeda	CEN	Prevotella melaninogenica	PREMEL
Centipeda periodontii	CENPER	Prevotella nigrescens	PRENIG
Chromobacterium	CHRO	Prevotella oralis	PREORA
Chromobacterium violaceum	CHROVIO	Prevotella oris	PREORI
Chryseobacterium	CHRB	Prevotella oulorum	PREOUL
Chryseobacterium gleum	CHRBGLE	Prevotella ruminicola	PRERUM
Chryseobacterium indologenes	CHRBIND	Prevotella tannerae	PRETAN
Chryseobacterium meningosepticum	CHRBMEN	Prevotella veroralis	PREVER
Chryseobacterium scophthalmum	CHRBSCO	Prevotella zoogleoformans	PREZOO
Chryseomonas	CHRM	Propionibacterium	PROB
Citrobacter	CIT	Propionibacterium acidipropionici	PROBACI
Citrobacter amalonaticus	CITAMA	Propionibacterium acnes	PROBACN
Citrobacter braakii	CITBRA	Propionibacterium avidum	PROBAVI
Citrobacter farmeri	CITFAR	Propionibacterium avidum ssp granulosum	PROBAVIG
Citrobacter freundii	CITFRE	Propionibacterium freundenreichii ssp freundenr	PROBFREF
Citrobacter freundii complex	CITFRECX	Propionibacterium freundenreichii ssp shermanii	PROBFRES
Citrobacter gillenii	CITSPE10	Propionibacterium granulosum	PROBGRA
Citrobacter koseri	CITKOS	Propionibacterium jensenii	PROBJEN
Citrobacter murliniae	CITSPE11	Propionibacterium lymphophilum	PROBLYM
Citrobacter rodentium	CITSPE9	Propionibacterium propionicum	PROBPRO
Citrobacter sedlakii	CITSED	Propionibacterium species	PROBSPE
Citrobacter species	CITSPE	Propioniferax	PROF
Citrobacter werkmanii	CITWER	Propioniferax innocua	PROFINN
Citrobacter youngae	CITYOU	Proteus	PROT
Clostridium	CLO	Proteus mirabilis	PROTMIR
Clostridium acetobutylicum	CLOACO	Proteus myxofaciens	PROTMYX
Clostridium amniovalericum	CLOAMN	Proteus penneri	PROTPEN
Clostridium argentinense	CLOARG	Proteus species	PROTSPE
Clostridium aurantibutyricum	CLOAUR	Proteus vulgaris	PROTVUL
Clostridium baratii	CLOBAR	Proteus vulgaris/penneri	PROTVULPEN
Clostridium beijerinckii	CLOBEI	Prototheca	PROH
Clostridium bifermentans	CLOBIF	Prototheca wickerhamii	PROHWIC
Clostridium botulinum	CLOBOT	Prototheca zopfii	PROHZOP
Clostridium butyricum	CLOBUT	Providencia	PROV
Clostridium cadaveris	CLOCAD	Providencia alcalifaciens	PROVALC
Clostridium carnis	CLOCAR	Providencia heimbachae	PROVHEI
Clostridium celatum	CLOCEL	Providencia rettgeri	PROVRET
Clostridium cellobioparum	CLOCEO	Providencia rustigianii	PROVRUS
Clostridium chauvoei	CLOCHA	Providencia species	PROVSPE
Clostridium clostridioforme	CLOCLO	Providencia stuartii	PROVSTU
Clostridium cochlearium	CLOCOH	Providencia stuartii urea+	PROVSTUUR
Clostridium cocleatum	CLOCOL	Pseudomonas	PSE
Clostridium difficile	CLODIF	Pseudomonas aeruginosa	PSEAER
Clostridium fallax	CLOFAL	Pseudomonas aeruginosa (CF)	PSEAERCF
Clostridium felsineum	CLOFEL	Pseudomonas alcaligenes	PSEALC
Clostridium ghonii	CLOGHO	Pseudomonas fluorescens	PSEFLU
Clostridium glycolicum	CLOGLY	Pseudomonas fluorescens/putida	PSEFLUPUT
Clostridium haemolyticum	CLOHAE	Pseudomonas luteola	CHRMLUT
Clostridium hastiforme	CLOHAS	Pseudomonas mendocina	PSEMEN
Clostridium histolyticum	CLOHIS	Pseudomonas monteilii	PSEMON
Clostridium indolis	CLOIND	Pseudomonas oryzihabitans	FLAIORY
Clostridium innocuum	CLOINN	Pseudomonas pertucinogena	PSEPER
Clostridium irregulare	CLOIRR	Pseudomonas pseudoalcaligenes	PSEPSE
Clostridium leptum	CLOLEP	Pseudomonas pseudoalcaligenes ssp pseudoalcalig	PSEPSEP
Clostridium limosum	CLOLIM	Pseudomonas putida	PSEPUT
Clostridium malenominatum	CLOMAL	Pseudomonas species	PSESPE
Clostridium mangenotii	CLOMAN	Pseudomonas stutzeri	PSESTU
Clostridium nexile	CLONEX	Pseudonocardia	PSEN
Clostridium novyi	CLONOV	Pseudonocardia autotrophica	PSENAUT
Clostridium novyi A	CLONOVA	Pseudoramibacter	PSER
Clostridium novyi B	CLONOVB	Pseudoramibacter alactolyticus	EUBALA
Clostridium oceanicum	CLOOCE	Psychrobacter	PSY
Clostridium orbiscindens	CLOORB	Psychrobacter immobilis	PSYIMM
Clostridium oroticum	CLOORO	Psychrobacter phenylpyruvicus	MORAPHE
Clostridium paraputrificum	CLOPAR	Rahnella	RAH
Clostridium perfringens	CLOPER	Rahnella aquatilis	RAHAQU
Clostridium putrefaciens	CLOPUR	Ralstonia	RAL
Clostridium putrificum	CLOPUT	Ralstonia paucula	CDCIVC2
Clostridium ramosum	CLORAM	Ralstonia pickettii	BURPIC
Clostridium sardiniense	CLOSAR	Ralstonia pickettii biovar 1	BURPIC1
Clostridium sartagoforme	CLOSAT	Ralstonia pickettii biovar 2	BURPIC2
Clostridium scatologenes	CLOSCA	Ralstonia pickettii biovar 3	BURPIC3
Clostridium septicum	CLOSEP	Ralstonia solanacearum	BURSOL
Clostridium sordellii	CLOSOR	Rhodococcus	RHOC
Clostridium species	CLOSPE	Rhodococcus coprophilus	RHOCCOP
Clostridium sphenoides	CLOSPH	Rhodococcus equi	RHOCEQU
Clostridium spiroforme	CLOSPI	Rhodococcus erythropolis	RHOCERY
Clostridium sporogenes	CLOSPO	Rhodococcus fascians	RHOCFAS
Clostridium sporosphaeroides	CLOSPS	Rhodococcus globerulus	RHOCGLO
Clostridium subterminale	CLOSUB	Rhodococcus rhodochrous	RHOCRHO
Clostridium symbiosum	CLOSYM	Rhodococcus species	RHOCSPE
Clostridium tertium	CLOTER	Rhodotorula	RHOT
Clostridium tetani	CLOTET	Rhodotorula glutinis	RHOTGLU
Clostridium tyrobutyricum	CLOTYR	Rhodotorula mucilaginosa var mucilaginosa	RHOTMUCM
Collinsella	COLL	Rhodotorula rubra	RHOTRUB
Collinsella aerofaciens	EUBAER	Rhodotorula species	RHOTSPE
Comamonas	COM	Rickettsia	RICK
Comamonas terrigena	COMTER	Rickettsia (Group)	RICKG
Comamonas testosteroni	COMTES	Riemerella	RIE
Coprococcus	COP	Riemerella anatipestifer	RIEANA
Coprococcus catus	COPCAT	Rikenella	RIK
Coprococcus comes	COPCOM	Rikenella microfusus	RIKMIC
Coprococcus eutactus	COPEUT	Roseomonas	ROS

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Corynebacterium	COR	Roseomonas cervicalis	ROSCER
Corynebacterium accolens	CORACC	Roseomonas fauriae	ROSFAU
Corynebacterium afermentans	CORAFE	Roseomonas gilardii	ROSGIL
Corynebacterium afermentans ssp afermenta	CORAFEA	Roseomonas species	ROSSPE
Corynebacterium afermentans ssp lipophilu	CORAFEL	Rothia	ROT
Corynebacterium amycolatum	CORAMY	Rothia dentocariosa	ROTDEN
Corynebacterium amycolatum/minitissimum	CORAMYMIN	Rothia mucilaginosa	STOMUC
Corynebacterium amycolatum/striatum	CORAMYSTR	Ruminococcus	RUM
Corynebacterium argentoratense	CORARG	Ruminococcus albus	RUMALB
Corynebacterium auris	CORAUR	Ruminococcus bromii	RUMBRO
Corynebacterium bovis	CORBOV	Ruminococcus hansenii	STRHAN
Corynebacterium coyleae	CORCOY	Ruminococcus productus	RUMPRO
Corynebacterium cystitidis	CORCYS	Saccharomyces	SAC
Corynebacterium diphtheriae	CORDIP	Saccharomyces cerevisiae	SACCER
Corynebacterium diphtheriae ssp belfanti	CORDIPB	Saccharomyces pastorianus	SACPAS
Corynebacterium diphtheriae ssp gravis	CORDIPG	Saccharomyces uvarum	SACUVA
Corynebacterium diphtheriae ssp intermedi	CORDIPI	Salmonella	SAL
Corynebacterium diphtheriae ssp mitis	CORDIPM	Salmonella aberdeen	SALABE
Corynebacterium durum	CORDUR	Salmonella abortus-equi	SALABOE
Corynebacterium flavescens	CORFLA	Salmonella adelaide	SALADL
Corynebacterium genitalium	CORGEN	Salmonella aderike	SALADR
Corynebacterium genitalium biovar I	CORGENI	Salmonella agona	SALAGO
Corynebacterium genitalium biovar II	CORGENII	Salmonella alachua	SALALA
Corynebacterium genitalium biovar III	CORGENIII	Salmonella anatum	SALANA
Corynebacterium genitalium biovar IV	CORGENIV	Salmonella arizonae	SALARI
Corynebacterium genitalium biovar V	CORGENV	Salmonella avana	SALAVA
Corynebacterium genitalium biovar VI	CORGENVI	Salmonella bahrenfeld	SALBAH
Corynebacterium glucuronolyticum	CORGLC	Salmonella blockley	SALBLO
Corynebacterium imitans	CORIMI	Salmonella bongori	SALBON
Corynebacterium jeikeium	CORJEI	Salmonella braenderup	SALBRA
Corynebacterium kutscheri	CORKUT	Salmonella bredeney	SALBRE
Corynebacterium macginleyi	CORMAC	Salmonella bunn	SALBUN
Corynebacterium matruchotii	CORMAT	Salmonella california	SALCAL
Corynebacterium minutissimum	CORMIN	Salmonella carrau	SALCAR
Corynebacterium mucifaciens	CORMUC	Salmonella cerro	SALCER
Corynebacterium mycetoides	CORMYC	Salmonella champaign	SALCHA
Corynebacterium pilosum	CORPIL	Salmonella chittagong	SALCHI
Corynebacterium propinquum	CORPRO	Salmonella choleraesuis	SALCHO
Corynebacterium pseudodiphtheriticum	CORPSD	Salmonella choleraesuis ssp arizonae	SALCHOA
Corynebacterium pseudogenitalium	CORPSG	Salmonella choleraesuis ssp choleraesuis	SALCHOC
Corynebacterium pseudogenitalium biovar	CCORPSGC1	Salmonella choleraesuis ssp diarizonae	SALCHOD
Corynebacterium pseudogenitalium biovar	CCORPSGC2	Salmonella choleraesuis ssp houtenae	SALCHOH
Corynebacterium pseudogenitalium biovar	CCORPSGC3	Salmonella choleraesuis ssp indica	SALCHOI
Corynebacterium pseudogenitalium biovar	CCORPSGC4	Salmonella choleraesuis ssp salamae	SALCHOS
Corynebacterium pseudotuberculosis	CORPST	Salmonella cubana	SALCUB
Corynebacterium renale	CORREN	Salmonella dakar	SALDAK
Corynebacterium renale group	CORRENGR	Salmonella daressalaam	SALDAR
Corynebacterium riegelii	CORRIE	Salmonella derby	SALDER
Corynebacterium seminale	CORSEM	Salmonella dessau	SALDES
Corynebacterium singulare	CORSIN	Salmonella dublin	SALDUB
Corynebacterium species	CORSPE	Salmonella duesseldorf	SALDUE
Corynebacterium striatum	CORSTR	Salmonella enteritidis	SALENT
Corynebacterium thomssenii	CORTHO	Salmonella fresno	SALFRE
Corynebacterium ulcerans	CORULC	Salmonella gallinarum	SALGAL
Corynebacterium urealyticum	CORURE	Salmonella give	SALGIV
Corynebacterium variabile	CORVAR	Salmonella haardt	SALHAA
Corynebacterium vitaeruminis	CORVIT	Salmonella hadar	SALHAD
Corynebacterium xerosis	CORXER	Salmonella hamburg	SALHAM
Coxiella	COX	Salmonella heidelberg	SALHEI
Coxiella burnetii	COXBUR	Salmonella illinois	SALILL
Cryptococcus	CRY	Salmonella infantis	SALINF
Cryptococcus albidus	CRYALB	Salmonella inverness	SALINV
Cryptococcus albidus var aerius	CRYALBAE	Salmonella java	SALJAA
Cryptococcus albidus var albidus	CRYALBAL	Salmonella javiana	SALJAI
Cryptococcus albidus var diffluens	CRYALBD	Salmonella kirkee	SALKIR
Cryptococcus gastricus	CRYGAS	Salmonella kunduchi	SALKUN
Cryptococcus laurentii	CRYLAU	Salmonella kvittingfoss	SALKVI
Cryptococcus luteolus	CRYLUT	Salmonella lansing	SALLAN
Cryptococcus neoformans	CRYNEO	Salmonella litchfield	SALLIT
Cryptococcus neoformans var gattii	CRYNEOG	Salmonella liverpool	SALLIV
Cryptococcus neoformans var neoformans	CRYNEON	Salmonella london	SALLON
Cryptococcus species	CRYSPE	Salmonella luciana	SALLUC
Cryptococcus terreus	CRYTER	Salmonella manhattan	SALMAN
Cryptococcus uniguttulatus	CRYUNI	Salmonella meleagridis	SALMEL
Deinococcus	DEI	Salmonella memphis	SALMEM
Deinococcus radiodurans	DEIRAD	Salmonella michigan	SALMIC
Delftia	DELF	Salmonella minneapolis	SALMIA
Delftia acidovorans	COMACI	Salmonella minnesota	SALMIS
Dermabacter	DERB	Salmonella montevideo	SALMON
Dermabacter hominis	DERBHOM	Salmonella muenchen	SALMUE
Dermacoccus	DERC	Salmonella newington	SALNEI
Dermacoccus nishinomiyaensis	MICNIS	Salmonella newport	SALNEP
Dermatophilus	DERT	Salmonella nottingham	SALNOT
Dermatophilus congolensis	DERTCON	Salmonella ohio	SALOHI
Desulfomonas	DESM	Salmonella onderstepoort	SALOND
Desulfomonas pigra	DESMPIG	Salmonella oranienburg	SALORA
Desulfovibrio	DESV	Salmonella paratyphi A	SALPARA
Desulfovibrio species	DESVSPE	Salmonella paratyphi B	SALPARB
Dialister	DIA	Salmonella poona	SALPOO
Dialister pneumosintes	BACTPNE	Salmonella pullorum	SALPUL
Dichelobacter	DIC	Salmonella quinhon	SALQUI
Dichelobacter nodosus	DICNOD	Salmonella rubislaw	SALRUB
Dietzia	DIE	Salmonella saintpaul	SALSAI
Dietzia maris	DIEMAR	Salmonella schwarzengrund	SALSCH
DO NOT USE	STRINS	Salmonella senftenberg	SALSEN

Dolosigranulum	DOL	Salmonella species	SALSPE
Dolosigranulum pigrum	DOLPIG	Salmonella tallahassee	SALTAL
Edwardsiella	EDW	Salmonella thompson	SALTHO
Edwardsiella hoshinae	EDWHOS	Salmonella typhi	SALTYP
Edwardsiella ictaluri	EDWICT	Salmonella typhimurium	SALTYPM
Edwardsiella tarda	EDWTAR	Salmonella virginia	SALVIR
Edwardsiella tarda biogroup 1	EDWTAR1	Salmonella westerstede	SALWES
Eggerthella	EGG	Salmonella worthington	SALWOR
Eggerthella lenta	EUBLEN	Sarcina	SAR
Ehrlichia	EHR	Sarcina species	SARSPE
Ehrlichia chaffeensis	EHRCHA	Sarcina ventriculi	SARVEN
Ehrlichia equi	EHREQU	Sebaldella	SEB
Ehrlichia sennetsu	EHRSEN	Sebaldella termitidis	SEBTER
Eikenella	EIK	Selenomonas	SEL
Eikenella corrodens	EIKCOR	Selenomonas artemidis	SELART
Empedobacter	EMP	Selenomonas dianae	SELDIA
Empedobacter brevis	EMPBRE	Selenomonas flueggei	SELFLU
Enterobacter	ENTB	Selenomonas infelix	SELINF
Enterobacter aerogenes	ENTBAER	Selenomonas noxia	SELNOX
Enterobacter aerogenes/cloacae	ENTBAERCLO	Selenomonas sputigena	SELSPU
Enterobacter amnigenus	ENTBAMN	Serratia	SER
Enterobacter amnigenus biogroup 1	ENTBAMN1	Serratia entomophila	SERENT
Enterobacter amnigenus biogroup 2	ENTBAMN2	Serratia ficaria	SERFIC
Enterobacter asburiae	ENTBASB	Serratia fonticola	SERFON
Enterobacter cancerogenus	ENTBCAN	Serratia grimesii	SERGRI
Enterobacter cloacae	ENTBCLO	Serratia liquefaciens	SERLIQ
Enterobacter dissolvens	ENTBDIS	Serratia marcescens	SERMAR
Enterobacter gergoviae	ENTBGER	Serratia odorifera	SERODO
Enterobacter hormaechei	ENTBHOR	Serratia odorifera 1	SERODO1
Enterobacter intermedius	ENTBINT	Serratia odorifera 2	SERODO2
Enterobacter kobei	ENTBKOB	Serratia plymuthica	SERPLY
Enterobacter nimipressuralis	ENTBNIM	Serratia proteamaculans ssp proteamaculans	SERPROP
Enterobacter sakazakii	ENTBSAK	Serratia proteamaculans ssp quinovora	SERPROQ
Enterobacter species	ENTBSPE	Serratia rubidaea	SERRUB
Enterococcus	ENTC	Serratia species	SERSPE
Enterococcus avium	ENTCAVI	Shewanella	SHE
Enterococcus avium HRE	ENTCAVIHR	Shewanella algae	SHEALG
Enterococcus casseliflavus	ENTCCAS	Shewanella putrefaciens	SHEPUT
Enterococcus casseliflavus HRE	ENTCCASHR	Shewanella putrefaciens biovar 1	SHEPUT1
Enterococcus casseliflavus Van C	ENTCCASVC	Shewanella putrefaciens biovar 2	SHEPUT2
Enterococcus casseliflavus/gallinarum	ENTCCASGAL	Shewanella putrefaciens biovar 3	SHEPUT3
Enterococcus cecorum	ENTCCEC	Shigella	SHI
Enterococcus columbae	ENTCCOL	Shigella boydii	SHIBOY
Enterococcus dispar	ENTCDIS	Shigella dysenteriae	SHIDYS
Enterococcus durans	ENTCDUR	Shigella flexneri	SHIFLE
Enterococcus durans HRE	ENTCDURHR	Shigella sonnei	SHISON
Enterococcus durans/faecium	ENTCDURFAI	Shigella species	SHISPE
Enterococcus faecalis	ENTCFAA	Simonsiella	SIM
Enterococcus faecalis HRE	ENTCFAAHR	Simonsiella muelleri	SIMMUE
Enterococcus faecalis Van A	ENTCFAAVA	Skermania	SKE
Enterococcus faecalis Van B	ENTCFAAVB	Skermania piniformis	SKEPIN
Enterococcus faecalis VRE	ENTCFAAVR	Slackia	SLA
Enterococcus faecium	ENTCFAI	Slackia exigua	EUBEXI
Enterococcus faecium HRE	ENTCFAIHR	Slackia heliotrinireducens	PEPSHEL
Enterococcus faecium Van A	ENTCFAIVA	Sphingobacterium	SPHB
Enterococcus faecium Van B	ENTCFAIVB	Sphingobacterium multivorum	SPHBMUL
Enterococcus faecium VRE	ENTCFAIVR	Sphingobacterium multivorum/thalpophilum	SPHBMULTHA
Enterococcus flavescens	ENTCFLA	Sphingobacterium species	SPHBSPE
Enterococcus gallinarum	ENTCGAL	Sphingobacterium spiritivorum	SPHBSPI
Enterococcus gallinarum Van C	ENTCGALVC	Sphingobacterium thalpophilum	SPHBTHA
Enterococcus hirae	ENTCHIR	Sphingomonas	SPHM
Enterococcus hirae/faecium	ENTCHIRFAI	Sphingomonas capsulata	SPHMCAP
Enterococcus malodoratus	ENTCMAL	Sphingomonas paucimobilis	SPHMPAU
Enterococcus mundtii	ENTCMUN	Spirochete	SPRC
Enterococcus pseudoavium	ENTCPSE	Spirochete (Group)	SPRCG
Enterococcus raffinosus	ENTCRAF	Sporobolomyces	SPOB
Enterococcus raffinosus Van A	ENTCRAFVA	Sporobolomyces salmonicolor	SPOBSAL
Enterococcus saccharolyticus	ENTCSAC	Staphylococcus	STA
Enterococcus solitarius	ENTCSOL	Staphylococcus arlettae	STAARL
Enterococcus species	ENTCSPE	Staphylococcus aureus	STAAUE
Enterococcus sulfureus	ENTCSUL	Staphylococcus aureus MR	STAAUEMR
Erwinia	ERW	Staphylococcus aureus ssp anaerobius	STAAUEAN
Erwinia persicina	ERWPER	Staphylococcus aureus ssp aureus	STAAUEAU
Erysipelothrix	ERY	Staphylococcus aureus Van I	STAAUEVI
Erysipelothrix rhusiopathiae	ERYRHU	Staphylococcus aureus Van R	STAAUEVR
Erysipelothrix tonsillarum	ERYTON	Staphylococcus auricularis	STAAUI
Escherichia	ESC	Staphylococcus capitis	STACAI
Escherichia blattae	ESCBLA	Staphylococcus capitis ssp capitis	STACAIC
Escherichia coli	ESCCOL	Staphylococcus capitis ssp ureolyticus	STACAIU
Escherichia coli AD	ESCCOLAD	Staphylococcus caprae	STACAP
Escherichia coli atypical	ESCCOLATY	Staphylococcus carnosus	STACAR
Escherichia coli H2S+	ESCCOLHS	Staphylococcus carnosus ssp carnosus	STACARC
Escherichia coli inactive	ESCCOLINA	Staphylococcus carnosus ssp utilis	STACARU
Escherichia coli serotype O111	ESCCOL0111	Staphylococcus chromogenes	STACHR
Escherichia coli serotype O157	ESCCOL0157	Staphylococcus chromogenes/hyicus	STACHRHYI
Escherichia fergusonii	ESCFER	Staphylococcus coag negative	STACNEG
Escherichia hermannii	ESCHER	Staphylococcus cohnii	STACOH
Escherichia vulneris	ESCVUL	Staphylococcus cohnii ssp cohnii	STACOHC
Eubacterium	EUB	Staphylococcus cohnii ssp urealyticum	STACOHU
Eubacterium barkeri	EUBBAR	Staphylococcus delphini	STADEL
Eubacterium biforme	EUBBIF	Staphylococcus epidermidis	STAEPI
Eubacterium brachy	EUBBRA	Staphylococcus epidermidis MR	STAEPIMR
Eubacterium combesii	EUBCOM	Staphylococcus equorum	STAEQU
Eubacterium contortum	EUBCON	Staphylococcus felis	STAFEL
Eubacterium cylindroides	EUBCYL	Staphylococcus gallinarum	STAGAL

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Eubacterium dolichum	EUBDOL	Staphylococcus haemolyticus	STAHAE
Eubacterium eligens	EUBELI	Staphylococcus haemolyticus MR	STAHAEMR
Eubacterium formicigenerans	EUBFOR	Staphylococcus hominis	STAHOM
Eubacterium hadrum	EUBHAD	Staphylococcus hominis MR	STAHOMMR
Eubacterium hallii	EUBHAL	Staphylococcus hominis ssp hominis	STAHOMH
Eubacterium limosum	EUBLIM	Staphylococcus hominis ssp novobiosepticus	STAHOMN
Eubacterium minutum	EUBMIN	Staphylococcus hyicus	STAHYI
Eubacterium moniliforme	EUBMON	Staphylococcus intermedius	STAINT
Eubacterium multiforme	EUBMUL	Staphylococcus kloosii	STAKLO
Eubacterium nitritogenes	EUBNIT	Staphylococcus lentus	STALEN
Eubacterium nodatum	EUBNOD	Staphylococcus lugdunensis	STALUG
Eubacterium ramulus	EUBRAM	Staphylococcus lutrae	STALUT
Eubacterium rectale	EUBREC	Staphylococcus muscae	STAMUS
Eubacterium saburreum	EUBSAB	Staphylococcus pasteuri	STAPAS
Eubacterium saphenum	EUBSAP	Staphylococcus piscifermentans	STAPIS
Eubacterium siraeum	EUBSIR	Staphylococcus pulvereri	STAPUL
Eubacterium species	EUBSPE	Staphylococcus saccharolyticus	STASAC
Eubacterium sulci	FUSSUL	Staphylococcus saprophyticus	STASAP
Eubacterium tenue	EUBTEN	Staphylococcus saprophyticus MR	STASAPMR
Eubacterium tortuosum	EUBTOR	Staphylococcus saprophyticus ssp bovis	STASAPB
Eubacterium ventriosum	EUBVEN	Staphylococcus saprophyticus ssp saprophyticus	STASAPS
Eubacterium yurii ssp margaretiae	EUBYURM	Staphylococcus schleiferi	STASCH
Eubacterium yurii ssp schtitka	EUBYURS	Staphylococcus schleiferi ssp coagulans	STASCHC
Eubacterium yurii ssp yurii	EUBYURY	Staphylococcus schleiferi ssp schleiferi	STASCHS
Ewingella	EWI	Staphylococcus sciuri	STASCI
Ewingella americana	EWIAME	Staphylococcus sciuri ssp carnaticus	STASCIC
Exiguobacterium	EXI	Staphylococcus sciuri ssp rodentium	STASCIR
Exiguobacterium acetylicum	EXIACE	Staphylococcus sciuri ssp sciuri	STASCIS
Facklamia	FAC	Staphylococcus simulans	STASIM
Facklamia hominis	FACHOM	Staphylococcus simulans MR	STASIMMR
Fibrobacter	FIB	Staphylococcus species	STASPE
Fibrobacter succinogenes	FIBSUC	Staphylococcus species MR	STASPEMR
Filifactor	FILF	Staphylococcus vitulinus	STAVIT
Filifactor alocis	FUSALO	Staphylococcus warneri	STAWAR
Filobasidiella	FIL	Staphylococcus warneri MR	STAWARMR
Filobasidiella neoformans	FILNEO	Staphylococcus xylosus	STAXYL
Finegoldia	FIN	Stenotrophomonas	STE
Finegoldia magna	PEPSMAG	Stenotrophomonas africana	STEAFR
Flavimonas	FLAI	Stenotrophomonas maltophilia	STEMAL
Flavobacterium	FLAO	Stenotrophomonas maltophilia (CF)	STEMALCF
Flavobacterium mizutaii	FLAOMIZ	Stomatococcus	STO
Flavobacterium species	FLAOSPE	Stomatococcus species	STOSPE
Francisella	FRA	Streptobacillus	STRB
Francisella novicida	FRANOV	Streptobacillus moniliformis	STRBMON
Francisella philomiragia	FRAPHI	Streptococcus	STR
Francisella tularensis	FRATUL	Streptococcus acidominimus	STRACI
Francisella tularensis ssp holarctica	FRATULH	Streptococcus agalactiae	STRAGA
Francisella tularensis ssp tularensis	FRATULT	Streptococcus alactolyticus	STRALA
Fungi	FUNGI	Streptococcus anginosus	STRANG
Fungi (Group)	FUNGIG	Streptococcus bovis	STRBOV
Fusobacterium	FUS	Streptococcus bovis I	STRBOVI
Fusobacterium gonidiaformans	FUSGON	Streptococcus bovis II	STRBOVII
Fusobacterium mortiferum	FUSMOR	Streptococcus canis	STRCAN
Fusobacterium naviforme	FUSNAV	Streptococcus constellatus	STRCON
Fusobacterium necrogenes	FUSNEG	Streptococcus criceti	STRCRC
Fusobacterium necrophorum	FUSNEC	Streptococcus cristatus	STRCRS
Fusobacterium necrophorum ssp funduliform	FUSNECF	Streptococcus downei	STRDOW
Fusobacterium necrophorum ssp necrophorum	FUSNECN	Streptococcus dysgalactiae	STRDYS
Fusobacterium nucleatum	FUSNUC	Streptococcus dysgalactiae ssp dysgalactiae	STRDYSDY
Fusobacterium nucleatum ssp animalis	FUSNUCA	Streptococcus dysgalactiae ssp equisimilis	STRDYSEM
Fusobacterium nucleatum ssp fusiforme	FUSNUCF	Streptococcus equi	STREQU
Fusobacterium nucleatum ssp nucleatum	FUSNUCN	Streptococcus equi ssp equi	STREQUE
Fusobacterium nucleatum ssp polymorphum	FUSNUCP	Streptococcus equi ssp zooepidemicus	STREQUZ
Fusobacterium nucleatum ssp vincentii	FUSNUCV	Streptococcus equinus	STREQN
Fusobacterium perfoetens	FUSPEF	Streptococcus ferus	STRFER
Fusobacterium periodonticum	FUSPER	Streptococcus gordonii	STRGOR
Fusobacterium prausnitzii	FUSPRA	Streptococcus group C	STRGRC
Fusobacterium russii	FUSRUS	Streptococcus group C/G	STRGRCG
Fusobacterium ulcerans	FUSULC	Streptococcus group CFG	STRGRCFG
Fusobacterium varium	FUSVAR	Streptococcus group E	STRGRE
Gardnerella	GAR	Streptococcus group F	STRGRF
Gardnerella vaginalis	GARVAG	Streptococcus group G	STRGRG
Gemella	GEM	Streptococcus group L	STRGRL
Gemella bergeri	GEMBER	Streptococcus hyointestinalis	STRHYO
Gemella haemolysans	GEMHAE	Streptococcus iniae	STRINI
Gemella morbillorum	GEMMOR	Streptococcus intermedius	STRINR
Gemella sanguinis	GEMSAN	Streptococcus macedonicus	STRMAC
Gemella species	GEMSPE	Streptococcus milleri group	STRMILGR
Geotrichum	GEO	Streptococcus mitis	STRMIT
Geotrichum candidum	GEOCAN	Streptococcus mitis group	STRMITGR
Geotrichum species	GEOSPE	Streptococcus mitis/pneumoniae	STRMITPNE
Globicatella	GLO	Streptococcus mutans	STRMUT
Globicatella sanguinis	GLOSAN	Streptococcus mutans group	STRMUTGR
Gordonia	GOR	Streptococcus oralis	STRORA
Gordonia aichiensis	GORAIC	Streptococcus parasanguinis	STRPAR
Gordonia amarae	GORAMA	Streptococcus pleomorphus	STRPLE
Gordonia bronchialis	GORBRO	Streptococcus pneumoniae	STRPNE
Gordonia rubropertincta	GORRUB	Streptococcus pneumoniae Pen I	STRPNEPI
Gordonia sputi	GORSPU	Streptococcus pneumoniae Pen R	STRPNEPR
Gordonia terrae	GORTER	Streptococcus porcinus	STRPOR
Gram + Bacilli	G+B	Streptococcus pyogenes	STRPYO
Gram + Bacteria	+	Streptococcus ratti	STRRAT
Gram + Cocci	G+C	Streptococcus salivarius	STRSAL
Gram + Coccobacilli	G+CB	Streptococcus salivarius group	STRSALGR
Gram - Bacilli	G-B	Streptococcus sanguinis	STRSAN

Gram - Bacteria	-	Streptococcus sanguinis group	STRSANGR
Gram - Cocci	G-C	Streptococcus sobrinus	STRSOB
Gram - Coccobacilli	G-CB	Streptococcus species	STRSPE
Gram - Diplococci	G-DC	Streptococcus suis	STRSUI
Granulicatella	GRAN	Streptococcus thermophilus	STRTHE
Granulicatella adiacens	STRADJ	Streptococcus uberis	STRUBE
Haemophilus	HAE	Streptococcus vestibularis	STRVES
Haemophilus aphrophilus	HAEAPH	Streptococcus viridans group	STRVIRGR
Haemophilus aphrophilus/paraphrophilus	HAEAPHPAR	Succinivibrio	SUC
Haemophilus ducreyi	HAEDUC	Succinivibrio dextrinosolvens	SUCDEX
Haemophilus haemoglobinophilus	HAEHAG	Sutterella	SUTE
Haemophilus haemolyticus	HAEHAL	Sutterella wadsworthensis	SUTEWAD
Haemophilus influenzae	HAEINF	Suttonella	SUT
Haemophilus influenzae biogroup aegyptius	HAEINFA	Suttonella indologenes	SUTIND
Haemophilus influenzae biotype I	HAEINFI	Tatumella	TAT
Haemophilus influenzae biotype II	HAEINFII	Tatumella ptyseos	TATPTY
Haemophilus influenzae biotype III	HAEINFIII	Tetragenococcus	TET
Haemophilus influenzae biotype IV	HAEINFIV	Tetragenococcus halophilus	TETHAL
Haemophilus influenzae biotype V	HAEINFV	Tissierella	TIS
Haemophilus influenzae biotype VI	HAEINFVI	Tissierella praeacuta	TISPRA
Haemophilus influenzae biotype VIII	HAEINFVIII	Torulopsis	TOR
Haemophilus parahaemolyticus	HAEPAH	Torulopsis candida	TORCAN
Haemophilus parainfluenzae	HAEPAI	Torulopsis pintolopesii	TORPIN
Haemophilus parainfluenzae biotype I	HAEPAII	Trabulsiella	TRA
Haemophilus parainfluenzae biotype II	HAEPAIII	Trabulsiella guamensis	TRAGUA
Haemophilus parainfluenzae biotype III	HAEPAIIII	Trichosporon	TRI
Haemophilus parainfluenzae biotype IV	HAEPAIIV	Trichosporon aquatile	TRIAQU
Haemophilus paraphrophilus	HAEPAP	Trichosporon beigelii	TRIBEI
Haemophilus parasuis	HAEPAS	Trichosporon pullulans	TRIPUL
Haemophilus segnis	HAESEG	Tsukamurella	TSU
Haemophilus somnus	HAESOM	Tsukamurella inchonensis	TSUINC
Haemophilus species	HAESPE	Tsukamurella paurometabola	TSUPAU
Hafnia	HAF	Tsukamurella pulmonis	TSUPUL
Hafnia alvei	HAFALV	Tsukamurella tyroinosolvens	TSUTYR
Hafnia alvei group 1	HAFALV1	Tsukamurella wratislaviensis	TSUWRA
Hallella	HAL	Turicella	TUR
Hallella seregens	HALSER	Turicella otitidis	TUROTI
Halomonas	HALO	Unidentified organism	UNIORG
Halomonas aquamarina	ALCFAEH	Unspecified	UNS
Hansenula	HAN	Ureaplasma	URE
Hansenula polymorpha	HANPOL	Ureaplasma urealyticum	UREURE
Hansenula saturnas	HANSAT	Vagococcus	VAG
Helcococcus	HELC	Vagococcus species	VAGSPE
Helcococcus kunzii	HELCKUN	Veillonella	VEI
Helicobacter	HELI	Veillonella atypica	VEIATY
Helicobacter acinonychis	HELIACI	Veillonella dispar	VEIDIS
Helicobacter cinaedi	HELICIN	Veillonella parvula	VEIPAR
Helicobacter felis	HELIFEL	Veillonella species	VEISPE
Helicobacter fennelliae	HELIFEN	Vibrio	VIB
Helicobacter muridarum	HELIMUR	Vibrio alginolyticus	VIBALG
Helicobacter mustelae	HELIMUS	Vibrio cholerae	VIBCHO
Helicobacter nemestrinae	HELINEM	Vibrio cincinnatiensis	VIBCIN
Helicobacter pullorum	HELIPUL	Vibrio fluvialis	VIBFLU
Helicobacter pylori	HELIPYL	Vibrio furnissii	VIBFUR
Histoplasma	HIS	Vibrio harveyi	VIBHAR
Histoplasma capsulatum	HISCAP	Vibrio hollisae	VIBHOL
Issatchenkia	ISS	Vibrio metschnikovii	VIBMET
Issatchenkia orientalis	ISSORI	Vibrio mimicus	VIBMIM
Johnsonella	JOH	Vibrio parahaemolyticus	VIBPAR
Johnsonella ignava	JOHIGN	Vibrio species	VIBSPE
Jonesia	JON	Vibrio vulnificus	VIBVUL
Jonesia denitrificans	JONDEN	Weeksella	WEE
Kingella	KIN	Weeksella virosa	WEEVIR
Kingella denitrificans	KINDEN	Weeksella virosa/Bergeyella zoohelcum	WEEVIRBERZOO
Kingella kingae	KINKIN	Weeksella/Bergeyella	WEE/BER
Kingella oralis	KINORA	Weissella	WEI
Kingella species	KINSPE	Weissella confusa	WEICON
Klebsiella	KLE	Weissella paramesenteroides	WEIPAR
Klebsiella granulomatis	CALYGRA	Wolinella	WOLI
Klebsiella ornithinolytica	KLEORN	Wolinella succinogenes	WOLISUC
Klebsiella oxytoca	KLEOXY	Xenorhabdus	ZEN
Klebsiella oxytoca/pneumoniae	KLEOXYPNE	Xenorhabdus beddingii	XENBED
Klebsiella planticola	KLEPLA	Xenorhabdus bovienii	XENBOV
Klebsiella pneumoniae ssp ozaenae	KLEPNEO	Xenorhabdus nematophilus	XENNEM
Klebsiella pneumoniae ssp pneumoniae	KLEPNEP	Xenorhabdus poinarii	XENPOI
Klebsiella pneumoniae ssp rhinoscleromati	KLEPNER	Yamadazyma	YAM
Klebsiella species	KLESPE	Yamadazyma guilliermondii	YAMGUI
Klebsiella terrigena	KLETER	Yarrowia	YAR
Kloeckera	KLO	Yarrowia lipolytica	YARLIP
Kloeckera apiculata	KLOAPI	Yeast	YST
Kluyvera	KLU	Yeast (Group)	YSTG
Kluyvera ascorbata	KLUASC	Yeast-like	YSTL
Kluyvera cryocrescens	KLUCRY	Yeast-like (Group)	YSTLG
Kluyvera georgiana	KLUGEO	Yersinia	YER
Kluyvera species	KLUSPE	Yersinia aldovae	YERALD
Kluyveromyces	KLUM	Yersinia bercovieri	YERBER
Kluyveromyces lactis	KLUMLAC	Yersinia enterocolitica	YERENT
Kluyveromyces marxianus	KLUMMAR	Yersinia enterocolitica group	YERENTGR
Kocuria	KOC	Yersinia frederiksenii	YERFRE
Kocuria kristinae	MICKRI	Yersinia intermedia	YERINT
Kocuria rosea	MICROS	Yersinia kristensenii	YERKRI
Kocuria varians	MICVAR	Yersinia mollaretii	YERMOL
Kurthia	KUR	Yersinia pestis	YERPES
Kurthia gibsonii	KURGIB	Yersinia pseudotuberculosis	YERPSE
Kurthia zopfii	KURZOP	Yersinia rohdei	YERROH

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Kytococcus                    KYT       Yersinia ruckeri              YERRUC
Kytococcus sedentarius        MICSED    Yersinia species              YERSPE
Lactobacillus                 LACB      Yokenella                     YOK
Lactobacillus acidophilus     LACBACI   Yokenella regensburgei        YOKREG
Lactobacillus brevis          LACBBRE   Zygosaccharomyces             ZYG
Lactobacillus buchneri        LACBBUC   Zygosaccharomyces bailli      ZYGBAI
Lactobacillus casei           LACBCAS   Zygosaccharomyces species     ZYGSPE
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14. Appendix E – BD Instrument Specifics

14.1. BACTEC MGIT 960

BACTEC MGIT 960 supports ASTM E_1394 Logical Protocol and ASTM E_1381 Physical Protocol.

14.1.1. Configurable Options

LIS Enable –acceptable values are ENABLE or DISABLE. Used to enable the LIS interface within the instruments. The instrument defaults to DISABLE.

Baud Rate – acceptable values are 1200, 2400, 4800, 9600, 19200. The instrument defaults to 9600.

Data Bits – acceptable values are 7 and 8. The instrument defaults to 8.

Stop Bits – acceptable values are 1 and 2. The instrument defaults to 1.

Parity - acceptable values are ODD, EVEN, and NONE. The instrument defaults to NONE.

Upload Results – acceptable values are SOLICITED and UNSOLICITED. The instrument defaults to UNSOLICITED. In unsolicited mode the instrument automatically uploads results as tests are completed. The instrument in solicited mode waits for LIS to request the results.

Consumable Tracking – acceptable values include ENABLE or DISABLE. The instrument defaults to DISABLE. Enabling this option causes the instrument to automatically send a specimen's test status to the LIS when a specimen has been scanned-in the instrument for the first time (ONGOING) or scanned-out of the instrument (REMOVED) (automatic transfer when UPLOAD_RESULT option set to UNSOLICITED).

Orphan Result – acceptable values include ENABLE and DISABLE. The instrument defaults to DISABLE. Enabling this option causes the instrument to report results for tests that do NOT have an accession number associated with them.

Packed Frames – acceptable values include ENABLE and DISABLE. The instrument defaults to ENABLE. Enabling this option allows message frames sent to the LIS to support multiple records per frame ("packed"). When Disabled, only one record is tranmitted per frame.

14.1.2. Message Content

Field List

The BACTEC MGIT 960 shall exchange fields with the LIS per the following table:

Header Record Field Name	ASTM Pos.	Direction
Sender Name	H, 5, 1, 1	U
Version Number	H, 13, 1, 1	U
Message Date/Time	H 14, 1, 1	U

Order Record Field Name	ASTM Pos.	Direction
Accession Number	O, 3, 1, 1	U
Isolate Number	O, 3, 1, 2	U
Test ID	O, 5, 1, 4	U

Result Record Field Name	ASTM Pos.	Direction
Result Type Code	R, 3, 1, 4	U
Test/Consumable Sequence Number	R, 3, 1, 5	U
Antibiotic	R, 3, 1, 6	U
Antibiotic Concentration	R, 3, 1, 7	U
Antibiotic Concentration Units	R, 3, 1, 8	U
Test Status	R, 4, 1, 1	U
Result Data 1		
BACTEC MGIT 960 Growth Units	R, 4, 1, 2	U
Result Data 3		
AST susceptibility (Interpreted)	R, 4, 1, 4	U
Preliminary/Final Status	R, 9, 1, 1	U
Test Start Date/Time	R, 12, 1, 1	U
Result/Status Date/Time	R, 13, 1, 1	U
Instrument Type	R, 14, 1, 1	U
Protocol Length	R, 14, 1, 3	U
Instrument Number	R, 14, 1, 4	U
Instrument Location	R, 14, 1, 5	U

Request Record Field Name	ASTM Pos.	Direction
Request Starting Patient Id	Q, 3, 1, 1	
Request Starting Accession Number	Q, 3, 1, 2	D
Request Starting Sequence Number	Q, 3, 1, 3	D
Request Ending Patient Id	Q, 4, 1, 1	
Request Ending Accession Number	Q, 4, 1, 2	
Request Ending Sequence Number	Q, 4, 1, 3	
Request Test Id	Q, 5, 1, 1	D
Request Test Status	Q, 5, 1, 2	D
Request Instrument Type	Q, 5, 1, 3	
Request Instrument Number	Q, 5, 1, 4	
Request Result Qualifier	Q, 5, 1, 5	D
Request Time Qualifier	Q, 6, 1, 1	
Starting Date/Time	Q, 7, 1, 1	D
Ending Date/Time	Q, 8, 1, 1	D
Request Information Status Code	Q, 13, 1, 1	

Terminator Record Field Name	ASTM Pos.	Direction
Termination Code	L, 3, 1, 1	U/D

Field Descriptions

Header Fields

General

Patient Fields

BACTEC MGIT 960 does not support patient information and therefore always transmits an empty Patient record.

Order Fields

Accession Number (O, 3, 1, 1) – The unique alphanumeric string that identifies a specimen. This field can be up to 20 characters long. (e.g. Acc123).

Isolate Number (O, 3, 1, 2) – Specimen's assigned isolate number.

Test Id (O, 5, 1, 4) –MGIT 960 transmits **MGIT_960_GND** for Growth and Detection specimens or **MGIT_960_AST** for AST sets.

Result Fields

Result Id Code (R, 3, 1, 4) – transmits **GND_MGIT** for growth and Detection specimens or **AST_MGIT** for AST sets.

Test Sequence Number (R, 3, 1, 5) – specimen's assigned sequence number (barcode) that is always be 12 digits.

Drug Abbreviation (R, 3, 1, 6) – Antibiotic abbreviation used for a drug within an AST set.

Drug Concentration (R, 3, 1, 7) – Drug concentration used for a drug within an AST set.

Drug Units of Measurement (R, 3, 1, 8) – Drug units of measurement used for a drug within an AST set.

Test Status LIS Code (R, 4, 1, 1) – BACTEC MGIT 960 transmits the following specimen status:

    INST_ONGOING
    INST_POSITIVE
    INST_NEGATIVE
    INST_COMPLETE
    INST_REMOVED   (for Ongoing Removed only)
    INST_ERROR

It should be noted that Result records are not transmitted for G&D specimens that are in error. However, Result records are transmitted for AST set specimens that are in error because an AST set in error is considered a completed status. An AST set in error cannot return to an Ongoing state. A G&D specimen in error requires the users to resolve the before it returns to an Ongoing or Completed state.

Result Data (R, 4, 1, 2) – The BACTEC MGIT 960 instrument measures Mycobacterial growth. The instrument assigns a numerical value to quantify the amount of growth in a tube. This growth value is placed in the second component for any results generated by this instrument, one of either **GND_MGIT** or **AST_MGIT** tests. This field is never more than 5 characters long.

AST SIR Status (R, 4, 1, 4) – The BACTEC MGIT 960 instrument transmits an **'S'** for susceptible, **'I'** for Indeterminate (not currently used), or an **'R'** for resistant.

Result Status Code (R, 9, 1, 1) – Always a **'P'** for Premliminary result.

Start Date/Time (R, 12, 1, 1) – This is the date and time that the test was first started or entered into an instrument. This field is formatted as described in the ASTM E_1394 specification in section 6.6.2.

The BACTEC MGIT 960 AST tests are run in reusable plastic carriers. The plastic carrier contains a sequence number that uniquely identifies the tube carrier. This is the sequence number transmitted with results up to the LIS. However, it is possible that a single plastic carrier could be used more than once for a particular access number. If the LIS intends to allow these carriers to be used more than once for the same access number, then the LIS should take note of the test start date/time. The test start date/time, with the sequence number, uniquely identifies a test and its result.

MGIT AST test information downloaded from the LIS is checked for this start date/time. If this field is filled, meaning that existing results are being copied back to the EpiCenter, the EpiCenter tries to use it to match an existing test in its database. New test orders should not fill this field. If the test sequence number and entry date/time don't match an existing test, or are blank, then the EpiCenter considers it a new test order.

Test Result Date/Time (R, 13, 1, 1) – The instrument's date and time that the specimen completed its test.

- For an INST_ONGOING specimen this field is empty.
- For an INST_POSITIVE specimen this is the time the specimen went positive.
- For an INST_NEGATIVE specimen this is the time the specimen went negative (calculated by adding the protocol length with the start time).
- For an INST_REMOVED specimen, this is the time the specimen was removed from the instrument.
- For an INST_COMPLETE specimen this is the time the AST set completed.
- For an INST_ERROR specimen this is the time the AST set went into error (this is considered a completed status).

Instrument Type (R, 14, 1, 1) – transmits a **'MGIT960'**.

Protocol Length (R, 14, 1, 3) – the specimen's assigned protocol length.

Instrument Number (R, 14, 1, 4) –the user configured instrument number that ranges from 1 to 99.

Instrument Location (R, 14, 1, 5) – the specimen's location within the instrument. For example, Drawer A, Row D, Column 12 would be represented as "A/D12".

Request Fields

The ASTM 1394 protocol defines this as a Request Information Record message. A download Request record is also known as a "Query". The only type of download "Query" request that the Firefly instrument accepts is a request for test results. A Terminator record with a termination code of "F" or "Q" is used to signal the last packet of a query response. If a query request was invalid, the instrument interface responds with only the Terminator record with a termination code of "Q". If the instrument interface can not locate any specimens in the active or history databases that meet the query criteria, it responds with only the Terminator record with a termination code of "F". **Note, that the BACTEC MGIT 960 instrument does NOT request data from an LIS.**

A query contains a set of request parameters that are used to determine which specimen(s) to access. The following tables define the ASTM 1394 Request record fields that are transmitted from the LIS in an Download message and the MGIT 960 statuses that correspond to the StatusId field.

Accession Number (Q, 3, 1, 2) – The unique alphanumeric string that identifies a specimen. This field can be up to 20 characters long. (e.g. Acc123). The use of "**ALL**" or no definition indicates that the Accession # is not used as a search parameter in the query.

Sequence Number (Q, 3, 1, 3) – specimen's assigned sequence number (barcode) that is always be 12 digits. The use of "**ALL**" or no definition indicates that the Sequence # is not used as a search parameter in the query.

Test ID (Q, 5, 1, 1) – The BACTEC 960 instrument accepts the test ids **MGIT_960_GND**, **MGIT_960_AST**, or **ALL** and return the test results for those test types currently in the instrument. The keyword **ALL** returns both GND and AST test results that are currently in the instrument.

Test Status Id (Q, 5, 1, 2) – The status of the specimens being requested. This field is only evaluated if the Test ID field contains valid data. No definition indicates that the specimen status is not used as a search parameter.

The following Test Statuses are used when requesting test results for specimens:

> **INST_ONGOING** (G&D and AST)
> **INST_POSITIVE**
> **INST_NEGATIVE**
> **INST_COMPLETE** (G&D and AST)

Qualifier (Q, 5, 1, 5) – optional qualifier '**MOD**' that indicates that the request is for specimen results that have been modified/changed since last request.

Beginning Time (Q, 7, 1, 1) – the beginning time and date used when requesting data that occurred within a specified time range.

End Time (Q, 8, 1, 1) – the ending time and date used when requesting data that occurred within a specified time range.

When a "Time Range" has been specified in a Query (Begin Time and/or End Time fields), the time field from the instrument's database that is used for comparison is dependent upon the Query's "TestId" field as follows,

> INST_ONGOING   - Time the specimen was scanned into instrument.
> INST_POSITIVE   - Time the specimen went positive.
> INST_NEGATIVE - Time the specimen went negative.
> INST_REMOVED   - Time the specimen was removed.
> INST_COMPLETE - Time the AST set specimen completed.
> INST_ERROR   - Time the AST set specimen went into error.

Terminator Fields

General

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14.1.3. Example ASTM 1394 Protocol

The following are examples of various instrument message transmissions that conform to the Becton Dickinson Common LIS Interface using the ASTM 1394 protocol.

MGIT960 G&D specimen that has been entered into an instrument, but has NOT been tested:

```
H|\^&|||Becton Dickinson|7 Loveton Circle^Sparks^MD^21152||410 316-
4000||||P|V1.00|19981019184200
P|1
O|1|0970038018||^^^MGIT_ 960_GND
R|1|^^^GND_MGIT^430109967349|INST_ONGOING^0||||||P|||||MGIT960^^42^1^B/A01
L|1|N
```

MGIT960 G&D specimen that has been tested and is still active in the instrument:

```
H|\^&|||Becton Dickinson|7 Loveton Circle^Sparks^MD^21152||
410 316-4000||||P|V1.00|19981019184200
P|1
O|1|0970038018||^^^MGIT_960_GND
R|1|^^^GND_MGIT^430109967349|INST_ONGOING^123||||||P|||19960502115414|
19960507115414|MGIT960^^42^1^B/A01
L|1|N
```

MGIT960 G&D specimen that has been tested POSITIVE:

```
H|\^&|||Becton Dickinson|7 Loveton Circle^Sparks^MD^21152||
410 316-4000||||P|V1.00|19981019184200
P|1
O|1|0970038018||^^^MGIT_960_GND
R|1|^^^GND_MGIT^430109967349|INST_POSITIVE^1234||||||P|||19960502115414|
19960509123456|MGIT960^^42^1^B/A01
L|1|N
```

MGIT960 G&D specimen that has been tested NEGATIVE:

```
H|\^&|||Becton Dickinson|7 Loveton Circle^Sparks^MD^21152||
410 316-4000||||P|V1.00|19981019184200
P|1
O|1|0970038018||^^^MGIT_960_GND
R|1|^^^GND_MGIT^430109967349|INST_NEGATIVE^12||||||P|||19960502115414|
19960509123456|MGIT960^^42^1^1B/A01
L|1|N
```

MGIT960 AST specimens that have been entered into an instrument, but has NOT been tested:

```
H|\^&|||Becton Dickinson|7 Loveton Circle^Sparks^MD^21152||
410 316-4000||||P|V1.00|19981019184200
P|1
O|1|0970038018^1||^^^MGIT_960_AST
R|1|^^^AST_MGIT^439309967349^EMB^5.0^ug/ml|INST_ONGOING^0||||||P||||| 
MGIT960^^^13^B/A02
R|2|^^^AST_MGIT^439309967349^RIF^1.0^ug/ml|INST_ONGOING^0||||||P||||| 
MGIT960^^^13^B/A03
L|1|N
```

MGIT960 AST specimens from an AST set that have been tested and are still active in the instrument:

```
H|\^&|||Becton Dickinson|7 Loveton Circle^Sparks^MD^21152||
410 316-4000|||||P|V1.00|19981019184200
P|1
O|1|0970038018^1||^^^MGIT_960_AST
R|1|^^^AST_MGIT^439309967349^EMB^5.0^ug/ml|INST_ONGOING^123|||||P|||
19960502115414|19960502115414|MGIT960^^^13^B/A02
R|2|^^^AST_MGIT^439309967349^RIF^1.0^ug/ml|INST_ONGOING^12|||||P|||
19960502115414|19960502115414|MGIT960^^^13^B/A03
L|1|N
```

MGIT960 AST specimens that have completed testing:

```
H|\^&|||Becton Dickinson|7 Loveton Circle^Sparks^MD^21152||
410 316-4000|||||P|V1.00|19981019184200
P|1
O|1|0970038018^1||^^^MGIT_960_AST
R|1|^^^AST_MGIT^439309967349^EMB^5.0^ug/ml|INST_COMPLETE^1234^R|||||P|||
19960502115414|19960502115414|MGIT960^^^13^B/A02
R|2|^^^AST_MGIT^439309967349^RIF^1.0^ug/ml|INST_COMPLETE^12^S|||||P|||
19960502115414|19960502115414|MGIT960^^^13^B/A03
L|1|N
```

A Request Record (Query) sent from an LIS to a MGIT960 instrument **requesting all specimen results for a period of time**.

```
H|\^&|||||||||||||19990208000001
Q|1|^ALL^ALL||ALL||19980502123000|19980613123000
L|1|N
```

A Request Record (Query) sent from an LIS to a MGIT960 instrument **requesting only ONGOING specimen results for a period of time**.

```
H|\^&|||||||||||||19990208000001
Q|1|^ALL^ALL||INST_ONGING||19980502123000|19980613123000
L|1|N
```

A Request Record (Query) sent from an LIS to a MGIT960 instrument **requesting all specimen results which have been assigned the specified Accession #.**

```
H|\^&|||||||||||||19990208000001
Q|1|^Access1234||ALL
L|1|N
```

A Request Record (Query) sent from an LIS to a MGIT960 instrument **requesting a specimen result which has been assigned the specified Sequence #.**

```
H|\^&|||||||||||||19990208000001
Q|1|^^430109967349||ALL
L|1|N
```

A Request Record (Query) sent from an LIS to a MGIT960 instrument **requesting all specimen results which have been modified/changed since the last request.**

```
H|\^&|||||||||||||19990208000001
Q|1|||ALL^^^^MOD
L|1|N
```

A Request Record (Query) sent from an LIS to a MGIT960 instrument **requesting all G&D specimen results that went Positive between January 2, 1999 at 15:34:00 and January 3, 1999 at 15:34:00.**

```
H|\^&|||||||||||||19990208000001
Q|1|||MGIT_GND^INST_POSITIVE||19990102123400|19990103123400
L|1|N
```

14.2. BD ProbeTec ET, Viper XTR, & Viper LT

BD ProbeTec ET supports ASTM E_1394 Logical Protocol and ASTM E_1381 Physical Protocol.

BD ProbeTec ET does not send results for specimens without accession or specimen numbers. As such the instrument does not allow LIS communication to be enabled unless the instrument Specimen Tracking/Accession Barcoding feature is enabled. The feature is enabled from a configuration screen.

14.2.1. Configurable Options

Comm Port Number – is a dedicated communication port on the instrument and therefore is not configurable.

Baud Rate – acceptable values are 2400, 4800, 9600, 14400, 19200, 38400. The instrument defaults to 9600. Viper LT will support Baud Rates of 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 7200, 9600, 14400, 19200, 28800, 38400, 57600, 115200.

Data Bits – acceptable values are 7 and 8. The instrument defaults to 8.

Stop Bits – acceptable values are 1 and 2. The instrument defaults to 1.

Parity - acceptable values are ODD, EVEN, and NONE. The instrument defaults to NONE.

Upload Mode – acceptable values are SOLICITED and UNSOLICITED. The instrument defaults to UNSOLICITED. The instrument in unsolicited mode uploads results as tests are completed. The instrument in solicited mode waits for the LIS to request the results.

Low Positive Status Upload – select 1 to enable the option or 0 to disable the option on BD ProbeTec ET. Check to enable the option on Viper XTR. If the option is enabled, a MOTA value greater than or equal to 2,000 and less than 10,000 will produce an **INST_LOW_POS Test Status LIS Code (R,4,1,1)**. Disabled is the default.

This feature is not supported for Viper LT.

Upload Algorithm Results – (Viper XTR & Viper LT) – Select check box to upload calculated algorithm value to the LIS.

Packed/Unpacked Frames – (Viper XTR & Viper LT) – Select checkbox to upload frames in Packed format.

14.2.2. Message Content

Field List

Header Record Field Name	ASTM Pos.	Direction
Sender Name	H, 5, 1, 1	U
Version Number	H, 13, 1, 1	U
Message Date/Time	H 14, 1, 1	U

Order Record Field Name	ASTM Pos.	Direction
Accession Number	O, 3, 1, 1	U
Test ID	O, 5, 1, 4	U
Specimen Action Code	O, 12, 1, 1	U

Result Record Field Name	ASTM Pos.	Direction
Result Type Code	R, 3, 1, 4	U
Test/Consumable Sequence Number	R, 3, 1, 5	U
Test Status	R, 4, 1, 1	U
Result Data 1		
ProbeTecET/Viper XTR/Viper LT Alg.Results	R, 4, 1, 2	U
Test Start Date/Time	R, 12, 1, 1	U
Result/Status Date/Time	R, 13, 1, 1	U
Instrument Type	R, 14, 1, 1	U
Media/Assay Type	R, 14, 1, 2	U
Instrument Number	R, 14, 1, 4	U
Instrument Location	R, 14, 1, 5	U
QC Type	R, 14, 1, 6	U
QC Kit Lot Number	R, 14, 1, 7	U

Request Record Field Name	ASTM Pos.	Direction
Request Starting Patient Id	Q, 3, 1, 1	
Request Starting Accession Number	Q, 3, 1, 2	
Request Starting Sequence Number	Q, 3, 1, 3	
Request Ending Patient Id	Q, 4, 1, 1	
Request Ending Accession Number	Q, 4, 1, 2	
Request Ending Sequence Number	Q, 4, 1, 3	
Request Test Id	Q, 5, 1, 1	D
Request Test Status	Q, 5, 1, 2	
Request Instrument Type	Q, 5, 1, 3	
Request Instrument Number	Q, 5, 1, 4	
Request Result Qualifier	Q, 5, 1, 5	D
Request Time Qualifier	Q, 6, 1, 1	
Starting Date/Time	Q, 7, 1, 1	
Ending Date/Time	Q, 8, 1, 1	
Request Information Status Code	Q, 13, 1, 1	

Terminator Record Field Name	ASTM Pos.	Direction
Termination Code	L, 3, 1, 1	U/D

Field Descriptions

Header Fields

General

Patient Fields

BD ProbeTec ET does not support patient information and therefore always transmits an empty Patient record.
P|1

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Document: L-005933   **Doc Type: ZLU**   **Status: Released EFFECTIVE**
Valid From: 28-Dec-2016 To: 31-Dec-9999   **Doc Part: EN**   **Revision: 18**   **Change #: 500000083091**
Print Date: 07-Feb-2017 12:23:05 GMT Standard Time   **Usage: Production Usage**   **Version: B**   **Classification: Restricted**

Order Fields

Accession Number (O, 3, 1, 1) – The unique alphanumeric string that identifies a specimen. This field can be up to 20 characters long. (e.g. Acc123) This is a required field for processing specimen and test information. The instrument excludes the following special characters from being entered in the accession / specimen number field and therefore never transmits them: * ? [ ] #. Viper LT excludes the following additional characters: !|.

Test Id (O, 5, 1, 4) –BD ProbeTec ET transmits **BD_PROBETEC_GND** for the test id code field.

       Specimen Action Code (O, 12, 1, 1) - In the special case when no accession / specimen number is transmitted then the Specimen Action Code is designated 'Q' as an indicator to treat the result as a QC result.

       P|1
       O|1|Accession_789 | | ^ ^ ^BD_PROBETEC_GND

       P|1
       O|1| | | ^ ^ ^BD_PROBETEC_GND| | | | | | |Q

Result Fields

Result Id Code (R, 3, 1, 4) – BD ProbeTec ET always transmits '**GND_PROBETEC**' for the result id code.

Test Sequence Number (R, 3, 1, 5) – Designates the assay kit lot number and is always 7 digits.

Test Status LIS Code (R, 4, 1, 1) – BD ProbeTec ET transmits the following specimen status:
    INST_POSITIVE
    INST_LOW_POS   (If enabled, see Configurable Options. Not sent by Viper LT)
    INST_NEGATIVE
    INST_INDETERMINATE
    INST_EQUIVOCAL (Not sent for Viper LT)

The instrument transmits the following QC status:
    INST_QC_PASS
    INST_QC_FAIL

Algorithmic Results (R, 4, 1, 2) – If enabled, see Configurable Options.

Test Start Date/Time (R, 12, 1, 1) – BD ProbeTec ET transmits the instrument's date and time that the specimen started its test. Time zone is not included.

Test Result Date/Time (R, 13, 1, 1) – BD ProbeTec ET transmits the instrument's date and time that the specimen ended its test. Time zone is not included. Typically, the test result date and time are 1 hour after the test start date and time.

Instrument Type (R, 14, 1, 1) – BD ProbeTec ET transmits a **'PROBETEC'** for its instrument type.

Media (Assay) Type (R, 14, 1, 2) – BD ProbeTec ET transmits the following assay types:

1 – CT assay	(Viper XTR)
2 – GC assay	(Viper XTR)
3 – Intentionally skipped	
4 – DTB assay	
5 – ctb assay	
6 – mac assay	
7 – kan assay	
8 – Intentionally skipped	
9 – CF assay	
10 – LP assay	
11 – MP assay	
12 – tCF assay	
13 – tMP assay	
14 – dCT assay	(Viper XTR, Viper LT)
15 – dGC assay	(Viper XTR, Viper LT)
16 – SCV assay	
17 – HSV1 assay	(Viper XTR)
18 – HSV2 assay	(Viper XTR)
19 – HPV assay	(Viper XTR – HR for Viper LT)
20 – TV assay	(Viper XTR)
200 – HPV 16	(Viper LT)
201 – HPV 18	(Viper LT)
202 – HPV 45	(Viper LT)
203 – HPV 31	(Viper LT)
204 – HPV 51	(Viper LT)
205 – HPV 52	(Viper LT)
206 – HPV 33/58	(Viper LT)
207 – HPV 56/59/66	(Viper LT)
208 – HPV 35/39/68	(Viper LT)
209 – GT	(Viper LT)

The list of assay types will expand as further assays are supported on the BD ProbeTec ET instrument.

Protocol Length (R, 14, 1, 3) – BD ProbeTec ET currently has a 1 hour test time and therefore does not transmit a protocol length.

Instrument Number (R, 14, 1, 4) – BD ProbeTec ET transmits the user configured instrument number that ranges from 1 to 99.

Instrument Location (R, 14, 1, 5) – BD ProbeTec ET transmits a plate number from 1 to 30, followed by a 96 microwell location of row (A-H), then column (1-12)

Viper XTR transmits a plate number from 1 to 60, followed by a 96 microwell location of row (A-H), then column (1-12).

Viper LT transmits a rack number from 1 to 30, followed by a 96 microwell location of row (A-H), then column (1-12).

QC Type (R, 14, 1, 6) – BD ProbeTec ET transmits a '+' or '-' if the parent Order record designates a QC result to indicate what type of QC, positive or negative QC.

QC Kit Lot Number (R, 14, 1, 7) – BD ProbeTec ET transmits a value only if parent order record is designated as a QC test.

```
P|1
O|1|Accession_789||^^^BD_PROBETEC_GND
R|1|^^^GND_PROBETEC^000120299|INST_NEGATIVE|||||||
|19981019153400|19981019163400| PROBETEC ^1^^3^14A10
```

P|1
O|1|||^ ^ ^BD_PROBETEC_GND||||||||Q
R|1|^ ^ ^ GND_PROBETEC ^000120299|INST_QC_PASS||||||||
|19981019153400|19981019163400| PROBETEC ^1^^3^14H12^+^000031500

Request Fields

The ASTM 1394 protocol defines this as a Request Information Record message. A download Request record is also known as a "Query". The only type of download "Query" request that the BD ProbeTec ET instrument accepts is a request for test results. The BD Probetec ET instrument will accept "query" requests in either the SOLICITED or UNSOLICITED settings for the Upload Mode as described above under Configurable Options. **Note, that the BD PROBETEC ET instrument does NOT request data from an LIS.**

For an ALL request, Viper LT will send up to 30 of the most recently completed racks.

Test ID (Q, 5, 1, 1) – BD ProbeTec ET accepts the following test name: **BD_PROBETEC_GND**. The keyword **ALL** can also be used to return all of the test results currently in the instrument.

> Q|1| | |BD_PROBETEC_GND

> Q|1| | |ALL

Result Qualifier (Q, 5, 1, 5) – BD ProbeTec ET accepts the following result qualifiers:

MOD – All available results that have not been previously transmitted to the LIS.

> Q|1| | |BD_PROBETEC_GND^^^^MOD

Terminator Field

General

14.2.3. Example ASTM 1394 Protocol

The following are examples of valid requests for test results from the LIS to the BD PROBETEC ET instrument that conform to the Becton Dickinson Common LIS Interface using the ASTM 1394 protocol:

A Request Record (Query) sent from an LIS to a BD PROBETEC ET instrument **r equesting all test results currently in the instrument**.

For an ALL request, Viper LT will send up to 30 of the most recently completed racks.

> **H|\^&**

> **Q|1|||ALL**

> **L|1|N**

A Request Record (Query) sent from an LIS to a BD PROBETEC ET instrument **requesting all available test results that have not been previously transmitted to the LIS.**

> **H|\^&**

> **Q|1||| BD_PROBETEC_GND^^^^MOD**

> **L|1|N**

14.2.4. Unsolicited Demographics Download (Viper LT)

Viper LT shall accept patient demographic fields from the LIS per the following tables:

Header Record Field Name	ASTM Pos.	Direction
Sender Name	H, 5, 1, 1	U/D
Version Number	H, 13, 1, 1	U/D
Message Date/Time	H 14, 1, 1	U/D

Patient Record Field Name	ASTM Pos.	Direction
Patient ID	P, 4, 1, 1	D
Date of Birth	P, 8, 1, 1	D
Patient Sex	P, 9, 1, 1	D
Hospital Service	P, 33, 1, 1	D
Hospital Client	P, 34, 1, 1	D

Order Record Field Name	ASTM Pos.	Direction
Accession Number	O, 3, 1, 1	D
Collection Date Time	O, 8, 1, 1	D

Terminator Record Field Name	ASTM Pos.	Direction
Termination Code	L, 3, 1, 1	U/D

14.2.4.1.**Patient Fields**

Patient ID (P, 4, 1, 1) - Identifier that uniquely identifies a patient. **This is a required field for patient demographic downloads**. This field can be up to 16 characters long (e.g. PatId123). If the field is blank, the record is ignored.

Date of Birth (P, 8, 1, 1) – patient date of birth formatted as described in ASTM E_1394 section 6.6.2. This field is optional.

Patient Sex (P, 9, 1, 1) – There are 3 predefined values accepted for this (**M**)ale, (**F**)emale, and (**U**)nspecified. If the value does not match the code for either Male or Female then the sex is set to Unspecified. This field is optional.

Hospital Service (P, 33, 1, 1) – An acronym or abbreviation for the ward or hospital department involved in caring for this patient (e.g. ER may represent the Emergency Room). This field can be up to 20 characters long.

Hospital Client (P, 34, 1, 1) – This is the facility that the specimen came from, for instance Smith Radiology or Central Labs. This field is optional. This field can be up to 20 characters long.

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14.2.4.2.Order Fields

Accession Number (O, 3, 1, 1) - Maximum field length: 20 characters. A unique alphanumeric string that identifies a specimen. If the field is blank, the record is ignored.

Collection Date Time (O, 8, 1, 1) Date and time that the specimen was collected from the patient, formatted as described in ASTM E_1394 section 6.6.2.

```
H|\^&|||||||||||||20130215184200
P|1||PatId123||^^^^||19651029|M||^^^^||||||
|||||||||||||||ER|St. Josephs Hospital
O|1|Acc123||^^^^|||20130214023300||||||| |^||^^|||||||||||
L|1|N
```

14.3. BD Phoenix 100 and BD Phoenix M50

BD Phoenix 100 and BD Phoenix M50 support ASTM E_1394 Logical Protocol and ASTM E_1381 Physical Protocol.

14.3.1. Configurable Options

The BD Phoenix 100 and BD Phoenix M50 provide 3 groups of Configurable Options for customizing the LIS Interface.

> General Options
>
> Results Upload Options
>
> Communications Setup

The instruments also provide an Organism Configuration Screen and an Antimicrobial Configuration Screen for editing LIS Codes.

14.3.1.1. General Options

Send Interpretation Results

Acceptable values are CHECKED and UNCHECKED. When CHECKED, final SIR values are included in the AST result record. The instrument defaults to CHECKED.

Unsolicited Queries

Acceptable values are CHECKED and UNCHECKED. When CHECKED, the instrument shall issue a query to the LIS at the time the panel is physically placed in the instrument if the panel is missing an organism id. The instrument defaults to UNCHECKED.

Send When Placed In Instrument

Acceptable values are CHECKED and UNCHECKED. When CHECKED, the instrument shall send a result upload to the LIS at the time the panel is physically placed in the instrument. The instrument defaults to CHECKED.

14.3.1.2. Results Upload Options

There are five results upload options, only one of which can be CHECKED at a time. The BD Phoenix M50 makes use of radio buttons which are SELECTED instead of CHECKED.

Solicited

Acceptable values are CHECKED and UNCHECKED. When CHECKED the instrument waits for the LIS to request the results The instrument defaults to UNCHECKED.

Send On Finalization

Acceptable values are CHECKED and UNCHECKED. When CHECKED the instrument shall send results to the LIS when the panel is finalized or a modification has been made to a finalized panel. The instrument defaults to UNCHECKED.

Send On Completion

Acceptable values are CHECKED and UNCHECKED. When CHECKED the instrument shall send results to the LIS when the panel's status transitions to COMPLETE or a modification has been made to a COMPLETE panel . The instrument defaults to CHECKED.

Send as Available

Acceptable values are CHECKED and UNCHECKED. When CHECKED the instrument shall send results to the LIS when the panel's status transitions to COMPLETE or the panel has partial results. Partial results are when at least one MIC value is determined for an AST or ID/AST panel or the organism ID is determined for an ID/AST panel. The instrument defaults to UNCHECKED.

Send at Fixed Time

Acceptable values are CHECKED and UNCHECKED. When CHECKED the instrument shall send results to the LIS when the panel's status transitions to COMPLETE and send panels with partial results to the LIS at the Fixed Time. When the Fixed Time is reached, any panel that is ONGOING and has partial results shall be uploaded to the LIS with a Test Status of INST_PARTIAL_COMPLETE. The instrument defaults to UNCHECKED.

14.3.1.3. **Communications Setup**

NOTE: Modifying any of the following options will result in the BD Phoenix 100 or BD Phoenix M50 rebooting.

Baud Rate

Acceptable values are 2400, 4800, 9600, 14400,19200,38400. The BD Phoenix 100 and BD Phoenix M50 default to 9600. The BD Phoenix M50 also supports 57600 and 115200 baud rates.

Data Bits

Acceptable values are 7 and 8. The instrument defaults to 8.

Parity

Acceptable values are ODD, EVEN, and NONE. The instrument defaults to NONE.

Stop Bits

Acceptable values are 1 and 2. The instrument defaults to 1.

Packed Frames

Acceptable values for BD Phoenix 100 are YES and NO. Acceptable values for BD Phoenix M50 are CHECKED for YES and UNCHECKED for NO. Selecting YES allows message frames sent to the LIS to support multiple records per frame ("packed"). When NO is selected, only one record is transmitted per frame. The instrument defaults to YES.

14.3.1.4. Organism and Antimicrobial Configuration Screens

Except for antimicrobials listed in special messages and BDXpert Rules within comment fields, all referrals to organism IDs and antimicrobials in LIS communications use the LIS Codes stored in the instrument which are set to default values per Appendix C and Appendix D. These codes can be edited to a different value. The values in Appendix C and Appendix D represent most organisms and antimicrobials. The currently supported lists that can be edited are found on the EpiCenter, BD Phoenix 100, and BD Phoenix M50 configuration screens.

14.3.2. Modes of Communications

Download refers to communications from the LIS to the instrument and upload refers to communications from the instrument to the LIS. NOTE: The total size of a message downloaded to the instrument should not exceed 100k characters.

Note: New in version V5.02, results for orphan panels and QC panels are not uploaded to the LIS unless the panels satisfy the criteria of an LIS query.

The BD Phoenix 100 and BD Phoenix M50 shall support the following modes of communications with an LIS:

Result Uploads

The BD Phoenix 100 and BD Phoenix M50 shall upload results according to the CHECKED Results Upload Option. For AST sets, several result records shall be sent in a single message. Each result record shall report the results for a single drug in the AST set. For ID/AST combo tests, an ID result record is sent as the first result record, and the AST result records follow.

Query Uploads

The BD Phoenix 100 and BD Phoenix M50 shall upload queries if the Unsolicited Queries Option is CHECKED.

Order Downloads

The BD Phoenix 100 and BD Phoenix M50 shall accept order downloads. All orders must include either a Test ID or a Sequence Number, a valid Accession number and a valid Isolate Number. An order consisting of a valid Consumable Sequence Number and valid Accession\Isolate Number shall be saved to the instrument database as a PENDING panel. Orders without the Consumable Sequence Number shall be saved in the instrument, BUT must be associated to a Consumable Sequence Number via the LIS Login Screen prior to being saved to the instrument database on the BD Phoenix 100. Orders without the Consumable Sequence Number on the BD Phoenix M50 shall be ignored. Orders with invalid data shall be rejected by the instrument. See the Phoenix User Manual (RE: LIS Order Cancelled Messages) for more information regarding cancelled LIS orders.

If an order is received with an organism ID that is either unknown to the instrument or is an unclaimed organism, the order will still be saved to the database or saved for future association with a Consumable Sequence Number, BUT the organism ID will be replaced with Invalid Organism Received.

If an order is downloaded with a sequence number that already exists in the instrument and all populated order fields are valid, the panel record is populated/overwritten with the order fields. Modifications shall not be accepted for Finalized panels.

An order field with all spaces will be treated as "missing". Leading or trailing spaces are trimmed.

Query Downloads

The BD Phoenix 100 and BD Phoenix M50 shall accept download queries. The instrument shall accept queries on the following fields: Result Qualifier, Start Time, End Time, Request Time Qualifier, Sequence Number, Test ID, Status and Accession. Queries with invalid data shall be rejected by the instrument. See the Phoenix User Manual (RE: LIS Query Assembly Messages) for more information regarding invalid queries.

14.3.3. Message Content

The BD Phoenix 100 and BD Phoenix M50 shall exchange fields with the LIS per the following table:

Field List

The BD Phoenix 100 and BD Phoenix M50 shall exchange fields with the LIS per the following table:

Header Record Field Name	ASTM Pos.	Direction
Sender Name	H, 5, 1, 1	U
Version Number	H, 13, 1, 1	U
Message Date/Time	H 14, 1, 1	U

Order Record Field Name	ASTM Pos.	Direction
Accession Number	O, 3, 1, 1	U/D
Isolate Number	O, 3, 1, 2	U/D
Organism	O, 3, 1, 3	U/D
Test ID	O, 5, 1, 4	U/D
Test/Consumable Sequence Number	O, 5, 1, 5	U/D
Priority	O, 6, 1, 1	U/D
Report Type	O, 26, 1, 1	U

Result Record Field Name	ASTM Pos.	Direction
Result Type Code	R, 3, 1, 4	U
Test/Consumable Sequence Number	R, 3, 1, 5	U
Antibiotic	R, 3, 1, 6	U
Test Status	R, 4, 1, 1	U
Result Data 1		
AST MIC for AST MIC Result	R, 4, 1, 2	U
Organism ID for ID Result	R, 4, 1, 2	U
Result Data 2		
AST susceptibility (Final)	R, 4, 1, 3	U
Profile Number for ID Test	R, 4, 1, 3	U
Result Data 3		
Resistance Marker 1	R, 4, 1, 4	U
Result Data 4		
Resistance Marker 2	R, 4, 1, 5	U
Result Data 5		
Resistance Marker 3	R, 4, 1, 6	U
Result Data 6		
Resistance Marker 4	R, 4, 1, 7	U
Result Data 7		
Resistance Marker 5	R, 4, 1, 8	U
Resistance Marker 6	R, 4, 1, 9	U

Result Record Field Name	ASTM Pos.	Direction
Resistance Marker 7	R, 4, 1, 10	U
Resistance Marker 8	R, 4, 1, 11	U
Resistance Marker 9	R, 4, 1, 12	U
Resistance Marker 10	R, 4, 1, 13	U
Preliminary/Final Status	R, 9, 1, 1	U
Test Start Date/Time	R, 12, 1, 1	U
Result/Status Date/Time	R, 13, 1, 1	U
Test Complete Date/Time	R, 13, 2, 1	U
Instrument Type	R, 14, 1, 1	U
Instrument Number	R, 14, 1, 4	U
Instrument Location	R, 14, 1, 5	U

Comment Record Field Name	ASTM Pos.	Direction
Comment Text	C, 4, 1, 1	U
Comment Type	C, 5, 1, 1	U

Request Record Field Name	ASTM Pos.	Direction
Request Starting Accession Number	Q, 3, 1, 2	U/D
Request Starting Sequence Number	Q, 3, 1, 3	U/D
Request Test Id	Q, 5, 1, 1	D
Request Test Status	Q, 5, 1, 2	D
Request Result Qualifier	Q, 5, 1, 5	D
Request Time Qualifier	Q, 6, 1, 1	D
Starting Date/Time	Q, 7, 1, 1	D
Ending Date/Time	Q, 8, 1, 1	D

Terminator Record Field Name	ASTM Pos.	Direction
Termination Code	L, 3, 1, 1	U/D

Field Descriptions

Patient Fields

BD Phoenix 100 and BD Phoenix M50 do not support patient demographics and therefore shall send an empty Patient record.

Order Fields

Accession Number (O, 3, 1, 1) - Maximum field length: 20 characters. A unique alphanumeric string that identifies a specimen.

Isolate Number (O, 3, 1, 2) - Maximum field length: 2 characters. Allowable range: 1-20. The number associated with an isolate.

Organism (O, 3, 1, 3) - Maximum field length: 20 characters. LIS code of the organism ID. The organism ID for an ID panel or an ID/AST panel is the User ID if it exists or if a User ID does not exist and the panel has a single Instrument ID it is the Instrument Organism ID. The organism ID for an AST panel is the User ID if it exists or if a User ID does not exist and the panel has been auto associated it is the Instrument Organism ID. Organism IDs and their corresponding LIS codes can be viewed/edited in the instrument's Organism Configuration Screen

For QC Panels the organism ID shall be the Test Strain.

Test ID (O, 5, 1, 4) - Maximum field length: 20 characters. Populated with the panel format abbreviation as shown on the panel's barcode label. Appendix B contains a sample list.

Test/Consumable Sequence Number (O, 5, 1, 5) - 12 digit numeric string identifying the instrument consumable.

Priority (O, 6, 1, 1) - Maximum field length: 1 character. This field is defined in the ASTM E_1394 specification. Currently only the values 'A' for Critical, 'R' for Normal and blank for default normal or no change are supported.

Report Type (O, 26, 1, 1) – This field is defined in the ASTM E_1394 specification. When a cancelled order is sent back to the LIS the report type is 'X'.

Result Fields

The BD Phoenix 100 and BD Phoenix M50 uploads shall consist of AST results and ID results. The information contained in the generic "Data Fields" depends on the type of result being reported. AST Result records contain antimicrobial and susceptibility information. ID Result records contain organism and Resistance Marker information.

Result ID Code (R, 3, 1, 4) A BD defined code that indicates the type of information in the result record. The keyword **AST_MIC** indicates results for a MIC based Antimicrobial Susceptibility Test and the keyword **ID** indicates identification results.

Test/Consumable Sequence Number (R, 3, 1, 5) – 12 digit numeric string identifying the instrument consumable. **Antimicrobial (R, 3, 1, 6) (_AST Results_) Populated** with the LIS code corresponding to the antimicrobial. Antimicrobials and their corresponding LIS codes can be viewed/edited in the instrument's Antimicrobial Configuration Screen. This field can be up to 20 characters long.

Test Status LIS Code (R, 4, 1, 1) For non QC panels this field is populated with one of the statuses listed in Appendix B. For QC panels that are ONGOING or PENDING , the status is reported as for non QC panels, however, for COMPLETED panels the status is INST_QC_PASS or INST_QC_FAIL.

Result Data Field 1

The contents of the Result Data fields vary depending on the type of result being reported, as described below.

Minimum Inhibitory Concentration (R, 4, 1, 2) (_MIC based AST Result_) For AST tests that produce MIC values; this field contains the minimum antibiotic concentration that inhibits growth of the tested organism. This field can be up to 20 characters long and is assumed to contain a number in ug/ml.

This field may contain signed MIC values such as "<=4" or ">8", MIC values for compound antimicrobials such as "0.5/4"or "<=0.5/16" as well as the following:

> **"?"** - Ongoing
> **"C"** - Antimicrobial is Rapid Completed (*For nonQC tests in V4.01 and later*)
> **"X"** - Error

Note: For QC panels, MIC values of X will be uploaded to the LIS for V4.01. The uploaded MIC values for QC panels are 'blank' in previous software versions.

Organism (R, 4, 1, 2) (_ID Results Only_) LIS code of the organism ID. The organism ID for an ID panel or an ID/AST panel is the User ID if it exists or if a User ID does not exist and the panel has a single Instrument ID it is the Instrument Organism ID. The organism ID for an AST panel containing a resistance marker, otherwise the organism ID is only included in the order record. Organism IDs and their corresponding LIS codes can be viewed/edited in the instrument's Organism Configuration Screen. This field can be up to 20 characters long.

Result Data Field 2

AST Susceptibility, Final (R, 4, 1, 3) (*AST results only***)** This is a code that indicates the organism's susceptibility to the antibiotic specified in this record. The acceptable values for this field are, blank, S, I, R, N, X representing MIC is pending, susceptible, intermediate, resistant, not susceptible and error respectively.

Result Data Field 3

Resistance Marker 1 (R, 4, 1, 4) (*ID results***)** This represents a Resistance Marker associated with the organism identified in the ID result record. This field can be up to 8 characters long. Examples of Resistance Markers and their corresponding LIS codes are listed below.

Extended Spectrum B-Lactamase	**RM_ESBL**
Methicillin Resistant Staphylococcus	**RM_MRSA**
Streptomycin HLAR	**RM_HLSR**
B-Lactamase in Gram Positive Cocci	**RM_GP_BL**
Vancomycin Resistant Enterococci	**RM_VRE**
Gentamicin HLAR	**RM_HLGR**
High Level Kanamycin Resistant	**RM_HLKR**
Streptococcus MLSb Phenotype	**RM_MLSB**
Streptococcus Macrolide Efflux Phenotype	**RM_MEFF**
High Level Penicillin Resistant S. Pneumoniae	**RM_HLPRSP**
Low Level Penicillin Resistant S. Pneumoniae	**RM_LLPRSP**
High Level Mupiricin Resistant Staphylococcus	**RM_HLMUP**

Result Data Field 4

Resistance Marker 2 (R, 4, 1, 5) (*ID results***)** This represents a Resistance Marker associated with the organism identified in the ID result record. This field can be up to 8 characters long. Examples of Resistance Markers and their corresponding LIS codes are listed under **Result Data Field 3**.

Result Data Field 5

Resistance Marker 3 (R, 4, 1, 6) (*ID results***)** This represents a Resistance Marker associated with the organism identified in the ID result record. This field can be up to 8 characters long. . Examples of Resistance Markers and their corresponding LIS codes are listed under **Result Data Field 3**.

Resistance Marker 4-10 (R, 4, 1, 7-13) (*ID results***)** This represents a Resistance Marker associated with the organism identified in the ID result record. This field can be up to 8 characters long. . Examples of Resistance Markers and their corresponding LIS codes are listed under **Result Data Field 3**.

Preliminary/Final Status (R, 9, 1, 1) This field contains either a "**P**" for preliminary status or an "**F**" for final status, which occurs when the panel is finalized at the instrument.

Start Date/Time (R, 12, 1, 1) This is the date and time that the panel was physically placed in the instrument. This field is represented in the YYYYMMDDHHMMSS format.

Result/Status Date/Time (R, 13, 1, 1) This is the date and time that the panel's status transitioned to COMPLETE. This field is represented in the YYYYMMDDHHMMSS format.

Test Complete Date/Time (R, 13, 2, 1) (_ID results_) This is the date and time that the ID panel obtained an ID. **(AST results)** This is the date & time that a drug obtained a valid MIC. This field is represented in the YYYYMMDDHHMMSS format.

Instrument Type (R, 14, 1, 1) Identifies the instrument with the keyword PHOENIX.

Instrument Number (R, 14, 1, 4) Instrument number between 1 and 99.

Instrument Location (R, 14, 1, 5) Indicates the panel position inside the instrument as a 3 character string represented in TierStation format. Tier values are A-D and station values are 1-25. This field is empty for PENDING panels.

Request Fields**Starting Access Number (Q, 3, 1, 2)** - Maximum field length: 20 characters. This field should be populated if the request is for either a single specimen or for a range of specimens. If accession number is not to be used as a search criterion for requested data, then this field can be left blank. Populating this field with the keyword ALL queries for all panels in the instrument database that meet the remaining criteria.

Starting Sequence Number (Q, 3, 1, 3) - Required field length: 12 digit consumable ID value. This field should be populated if the request is for a single panel. If sequence number is not to be used as a search criterion for requested data, then this field can be left blank. Populating this field with the keyword ALL queries for all panels in the instrument database that meet the remaining criteria.

Test ID (Q, 5, 1, 1) - Maximum field length: 20 characters. This field should be populated with the test type (ID, AST_MIC). The BD Phoenix 100 and BD Phoenix M50 accept the keywords **ID** and **AST_MIC** as valid test types as well as the pre-defined test names. See appendix B for examples. Populating this field with the keyword **ALL** queries for all panels in the instrument database that meet the remaining criteria.

Test Status (Q, 5, 1, 2) The BD Phoenix 100 and BD Phoenix M50 accept queries for panels with a status as follows:

- **INST_ONGOING**, panels with an onging status that may or may not yet contain results.

- **INST_COMPLETE**, panels with a complete, rapid complete, in attention ignored, in attention complete, QC pass, or QC fail status

- **INST_RAPID_COMPLETE,** panels with a rapid complete status

- **INST_PARTIAL_COMPLETE,** panels with an onging status that have obtained results.

- **INST_QC_PASS**, QC panels with a passed QC status

- **INST_QC_FAIL**, QC panels with a failed QC status

Result Qualifier (Q, 5, 1, 5) The only acceptable value for this field is the keyword **MOD** to request only results that have been modified since the last request.

Time Qualifier (Q, 6, 1, 1) - Maximum field lenth: 1 character. The acceptable values for this field are **'S'** which indicate the following date time fields refer to test start times or **'R'** which indicate the following date time fields can refer to result/status times.

Starting Date/Time (Q, 7, 1, 1) The starting date/time (inclusive) of the data requested represented in the YYYYMMDDHHMMSS format.

Ending Date/Time (Q, 8, 1, 1) The ending date/time (inclusive) of the data requested represented in the YYYYMMDDHHMMSS format.

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Comment Fields

The BD Phoenix 100 and BD Phoenix M50 send comment strings for BDXpert rule text and special messages.

The following is an example of a comment record containing a rule where <310> is the rule number and (AMX, ATM, CAZ) is a list of the affected antimicrobials.

C|1| |<310> BDXpert Rule 310 text.(AMX, ATM, CAZ)|E

Special Messages are messages that indicate a special condition for a BD Phoenix 100 panel.

The following is an example of a comment record containing a special message with a list of the affected antimicrobials.

C|1| | Special message text.(AM, CAZ)|T

Comment Text (C, 4, 1, 1) – The text to be used for the patient, specimen or isolate comment. This field can be up to 1600 characters long.

Comment Type (C, 5, 1, 1) – The type of comment record. This field should be an **E, or T** for BDXpert rule, or special message comments respectively.

Terminator Field

General

14.3.4. Example ASTM 1394 Protocol

Result Upload Examples

Example of a rejected order

H|\^&|||Becton Dickinson||||||||V1.0|20031110093857

P|1

O|1|~!@#$^1||^^^CT04N|||||||||||||||||||||||X

C|1||LIS Order Cancelled: Invalid Accession Number Field|T

L|1|N

Example of a "Send When Placed in Instrument" result upload

H|\^&|||Becton Dickinson||||||||V1.0|20031110101102

P|1

O|1|IDAST 1^1||^^^GNIDAST 951^429510000001|R

R|1|^^^ID^429510000001|INST_ONGOING|||||P|||20031110101102||PHOENIX^^^1^C7

R|2|^^^AST_MIC^429510000001^AM|INST_ONGOING^?^ |||||P|||
20031110101102||PHOENIX^^^1^C7

R|3|^^^AST_MIC^429510000001^AN|INST_ONGOING^?^ |||||P|||
20031110101102||PHOENIX^^^1^C7

R|4|^^^AST_MIC^429510000001^AMC|INST_ONGOING^?^ |||||P|||
20031110101102||PHOENIX^^^1^C7

L|1|N

Example of a result upload for an ID panel

H|\^&|||Becton Dickinson||||||||V1.0|20031110102747

P|1

O|1|ID 1^1^ALCPIE||^^^GNID 952^429520000001|R

R|1|^^^ID^429520000001|INST_COMPLETE^ALCPIE|||||P|||20031110101102|
20031110102747\20031110102747|PHOENIX^^^1^D7

L|1|N

Example of result uploaded to an LIS with the Send Interpretation Results option UNCHECKED

H|\^&|||Becton Dickinson||||||||V1.0|20031110114736

P|1

O|1|IDAST 1^1^SHISPE||^^^GNIDAST 951^429510000001|R

R|1|^^^ID^429510000001|INST_COMPLETE^SHISPE|||||P|||20031110112648|
20031110114736\20031110114735|PHOENIX^^^1^A7

R|2|^^^AST_MIC^429510000001^AM|INST_COMPLETE^<=4^S|||||P|||
20031110112648|20031110114736\20031110114735|PHOENIX^^^1^A7

R|3|^^^AST_MIC^429510000001^AN|INST_COMPLETE^<=4^S|||||P|||
20031110112648|20031110114736\20031110114735|PHOENIX^^^1^A7

R|4|^^^AST_MIC^429510000001^AMC|INST_COMPLETE^<=4/2^S|||||P|||
20031110112648|20031110114736\20031110114735|PHOENIX^^^1^A7

L|1|N

Example of a result upload for an ID/AST panel with special messages, resistance markers and the Send Interpretation Results option UNCHECKED

H|\^&|||Becton Dickinson||||||||V1.0|20031110150803

P|1

O|1|ABC^1^ENTCFAA||^^^CT01P^424940000029|R

C|1||The MICs for this antibiotic and species combination are not reported by the Phoenix system. An alternate method should be utilized.(RA)|T

C|2||Fill failures were detected with this antibiotic and no MIC can be determined. The isolate should be retested.(CF)|T

R|1|^^^ID^424940000029|INST_IN_ATTN_COMPLETE^ENTCFAA^^**RM_VRE^RM _HLSR^RM_HLGR**|||||P|||20031110145645|20031110150803|PHOENIX^^^1^C5

R|2|^^^AST_MIC^424940000029^AM|INST_IN_ATTN_COMPLETE^>32|||||P|||200311 10145645|20031110150803\20031110150802|PHOENIX^^^1^C5

R|3|^^^AST_MIC^424940000029^AZM|INST_IN_ATTN_COMPLETE^>8|||||P|||20031 110145645|20031110150803\20031110150802|PHOENIX^^^1^C5

R|4|^^^AST_MIC^424940000029^CAZ|INST_IN_ATTN_COMPLETE^>64|||||P|||20031 110145645|20031110150803\20031110150802|PHOENIX^^^1^C5

R|5|^^^AST_MIC^424940000029^CC|INST_IN_ATTN_COMPLETE^>8|||||P|||2003111
0145645|20031110150803\20031110150802|PHOENIX^^^1^C5

L|1|N

Query Upload Examples

Example of an Unsolitcited Query uploaded due to a missing organism id

H|\^&|||Becton Dickinson||||||||V1.0|20031110151943

Q|1|^InvOrg^429530000072

L|1|N

Order Download Examples

Example of a download order for a critical panel

H|\^&|||

P|1

O|1|Critical^1||^^^GNID 952|A

L|1|N

Query Download Examples

For test start times between Nov 10,2003 at 09:00:00 and Nov 10,2003 at 16:00:00
H|\^&

Q|1||||S|20031110090000|20031110160000

L|1|N

For test result times after Nov 10,2003 at 09:00:00

H|\^&

Q|1||||S|20031110090000||

L|1|N

For panels that have partial results and have been modded since the last request

H|\^&

Q|1|||^INST_PARTIAL_COMPLETE^^^MOD

L|1|N

For the panel with 429530000072 sequence number

H|\^&

Q|1|^^429530000072||

L|1|N

For ALL accession numbers

H|\^&

Q|1|||ALL|||

L|1|N

14.4. BACTEC FX

14.4.1. BACTEC FX LIS Configuration Screen

The BACTEC FX LIS Configuration Screen allows the user to specify the configurable behavior of the LIS interface. To navigate to the BACTEC FX LIS Configuration Screen select the Configuration Tab then the LIS Tab. The configurable options on the BACTEC FX LIS Configuration Screen are somewhat different than the parameters specified within the BACTEC 9000 Configuration File but are intended to give the user most of the same LIS interface functionality.

The BACTEC FX LIS interface is configured by enabling and defining fields within the LIS tab on the BACTEC FX Configuration screen. If parameters are changed on the LIS configuration screen, the new configuration will take effect immediately after the SAVE button is pressed. The BACTEC FX doesn't need to and will not restart after the LIS configuration parameters are changed (BACTEC 9000 requires reboot after configuration changes). However BD recommends that the host LIS be inactive during the reconfiguration period. An LIS download transaction could be lost during the reconfiguration of the BACTEC FX LIS interface. In addition the BACTEC FX's response to an active LIS query will not be transmitted or cancelled.

14.4.2. BACTEC FX Configurable Options

14.4.2.1. LIS ENABLE Group

The options for this group are mutually exclusive.

Possible parameters:

ENABLED

DISABLED

Default: DISABLED

14.4.2.2. Port Parameters Group

Parameters defined in this group control the communication parameters assign to the serial communications port on the BACTEC FX that is connected to the LIS

14.4.2.2.1. BAUD

The BAUD parameter allows the adjustment of the speed of the communications link between the LIS system and the BACTEC FX.

Possible parameters:

1200

2400

4800

9600

19.2K

Default: 9600

14.4.2.2.2. **PARITY**

The PARITY parameter allows for the adjustment of the error check that can be performed on every character that is received and transmitted.

Possible parameters:

NONE

ODD

EVEN

Default: NONE

14.4.2.2.3. **DataBits**

The Databits parameter allow for the adjustment of the size of the character that is transmitted and received by the Physical Protocol Layer.

Possible parameters:

7 DataBits

8 DataBits

Default: 8 DataBits

14.4.2.2.4. **STOPBits**

The STOPS parameter allow for the adjustment of the number of stop bits that are appended to the characters that are transmitted by the Physical Protocol Layer.

Possible parameters:

1 StopBit

2 StopBits

Default: 1 StopBit

14.4.2.3. Physical Layer Group

This group allows the user to select between the physical communications protocols thst the LIS interface will use.

The options for this group are mutually exclusive.

Possible parameters:

ASTM 1381

BDMODEM

Default: BDMODEM

NOTE: If the ASTM physical layer is to be used for LIS communication, refer to the BD LIS interface specification for ASTM interfaces, document number L–005933.

14.4.2.4. LIS Options Group

This group allows the user to define the LIS/LAB specific workflow(dictating when data is sent to the LIS) and the types of data that will be sent to the LIS.

14.4.2.4.1. Upload Pos Result

When this checkbox is enabled (checked), Positive results will be uploaded to the LIS, whenever a Results Upload to the LIS occurs (see LIS Solicit Results section 6.3.1.4.2)

Default: Disabled

14.4.2.4.2. LIS Solicited Results

If LIS Solicit Results is enabled (checked) Negative Results will be sent only when the LIS requests results. If Upload Positive Results is enabled Positive results will also be sent to the LIS when solicted.

If LIS Solicit Results is disabled (unchecked) Negative results will be sent automatically when the vial goes out of protocol. If Upload Positive Results is enabled Positive results will also be sent to the LIS when the vial turns Positive. If Vial Tracking is enabled then Vial Tracking information will also be sent automatically to the LIS when the vial's location changes.

Default: Solicit

14.4.2.4.3. Vial Tracking

When this function is enabled (checked) Vial Tracking information will be sent to the LIS when the vial location changes (INST_NEW, INST_REMOVED, INST_REENTERED). This function is disabled when the LIS solicited Results checkbox is enabled (checked) so therefore, Vial Tracking information will only be sent unsolicited. The BACTEC FX will report INST_REENTERED for all vials that have been removed and reentered. The workflow for BACTEC FX allows the operator to remove an ongoing vial and reenter it.

Default: Disabled

14.4.2.4.4. Host Query Mode

The BACTEC FX will perform a Host Query to request patient demographics information from the LIS for any vial without a patient name/id that has an associated accession number. This option only works if Accession Barcoding is enabled on the Configuration screen and the LIS Solicited Results (is not selected) is operating in the Unsolicited mode.

Possible parameters:

MANUAL

User initiated Batch Host Query. When this option is selected the user can initiate a Batch Host Query via the Maintenance\Test tab by pressing the LIS button. A Batch Host Query consists of multiple individual SINGLE Host Queries for all vials in the BACTEC FX database without Patient Demographics. When this option is selected the parameter Query Timeout can also be adjusted within the LIS Options Group. The Query Timeout dictates how long the BACTEC FX will wait for the LIS to respond to a Host Query before sending the next Host Query requesting Patient data for the next vial.

SINGLE

A Single Host Query is initiated when a new vial with an accession number is entered. When this option is selected the parameter Query Timeout can also be adjusted within the LIS Options Group. The Query Timeout dictates how long the BACTEC FX will wait for the LIS to respond to a Host Query before sending the next Single Host Query requesting Patient data for the next newly entered vial.

AUTO

In Auto Mode the BACTEC FX will perform a Single Host Query when a new vial with an accession number is entered. It will also initiate a Batch Host Query based on the frequency defined in the Auto HQ Interval field. So if the LIS doesn't respond to the Single Host Query when a vial is loaded, the BACTEC FX will automatically gather the missing patient information via a Batch Host Query sent at the next Auto HQ Interval. In AUTO mode the parameter Query Timeout can also be adjusted within the LIS Options Group. The Query Timeout dictates how long the BACTEC FX will wait for the LIS to respond to a Single Host Query before sending the next Single Host Query requesting the demographic for the next vial.

DISABLED

Do not initiate a Host Query of any kind due to instrument workflow.

Default: AUTO

Query Timout

Query Timeout is enabled for AUTO, SINGLE and MANUAL Host Query modes. It can be set from 1 – 99 seconds. The Query Timeout dictates how long the BACTEC FX will wait for the LIS to respond to a Single Host Query before sending the next Single Host Query requesting the demographic associated with the next vial.

14.4.2.4.5.Auto HQ Interval

Auto HQ Interval can be set for AUTO mode. It can be set from 1 – 999 minutes. This parameter dictates the frequency the BACTEC FX will perform an AUTO Batch Host Query.

14.4.2.4.6.Log Comms Checkbox

The Log Comms checkbox is used as a tool for BD personnel in order to assist in troubleshooting LIS communication issues. When enabled and a USB key is present, additional low-level messages are logged to a file on the USB key. These messages, when used in tandem with the LIS messages from the event log, will assist in deciphering any communications issues.

14.4.2.4.7.Force Upload Checkbox

The Force Upload checkbox is to be used as a troubleshooting mechanism for LIS communication issues. When checked (and saved via the <Save> button on the LIS configuration tab) the Save button on the Culture Screen Vial Tab shall be disabled and the 'Send' button shall be displayed and enabled in its place when non-modified vial data is recalled into the Vial Tab. Pressing the 'Send' button will transmit a Result record of the recalled vial on the Culture screen to the LIS

14.4.2.5.ASTM 1381 Group

Not applicable for the BDModem Protocol. This group allows the user to specify Packed Frames or Unpacked Frames

Packed Frames ON/OFF

Default: ON

14.4.2.6.**BD Modem Group**

The parameters defined within this group are used to determine where specific data is located in the LIS records. and to define the expected characters in a message to determine specific information.

14.4.2.6.1.**New Sequence Position**

To ensure backwards-compatibility with LIS interfaces written prior to this specification, this option indicates where barcodes would be found in an Order record, regardless if they are downloaded or not. The NEW parameter should only be used if an LIS interface is being written or updated to this specification.

Possible parameters:

OLD

NEW

Default: NEW

14.4.2.6.2.**Hospital Service Field (33)**

This parameter allows the selection of the field for placement of the Hospital Service Code in the Patient Record, for both download and upload. This parameter allows vendors who have implemented the old BD DMC LIS interface to use code that they already have. The DMC LIS (OLD interface) interface calls for the Hospital Service Code to be placed in field 26 of the record. The BACTEC 9000 LIS (NEW interface) interface calls for the Hospital Service Code to be placed in field 33 of the record. This option should be set to match the location that the LIS vendor will be using to provide the Hospital Service Code. If the dialog box is checked the Hospital Service Code is in field 33. If it is not checked the Hospital Service Code will be in field 26

Possible parameters: 26 or 33

Default: 33

14.4.2.6.3.**SOH**

The SOH parameter allows the selection of the character that will be used to indicate the Start Of Header for a message. The values are specified in hex.

Possible parameters: 00hex..FFhex

Default: 01hex

14.4.2.6.4.**EOT**

The EOT parameter allows the selection of the character that will be used to indicate the End Of Text for a message. The values are specified in hex. The value that is used by the LIS vendors could be one of two possible values. The protocol has been implemented with EOT set to 2 or 4. When the LIS system is configured the LIS vendor should indicate the value that they are using for EOT. The EOT value in the configuration file should be set accordingly.

Possible parameters: 00hex..FFhex

Default: 04hex

14.4.2.6.5.**ACK**

The ACK parameter allows the selection of the character that will be used to indicate the Acknowledgement for a message. The values are specified in hex.

Possible parameters: 00hex..FFhex

Default: 06hex

14.4.2.6.6.**NAK**

The NAK parameter allows the selection of the character that will be used to indicate the Negative Acknowledgement for a message. The values are specified in hex.

Possible parameters: 00hex..FFhex

Default: 15hex

14.4.2.6.7.**CAN**

The CAN parameter allows the selection of the character that will be used to indicate the Cancellation for a message. The values are specified in hex.

Possible parameters: 00hex..FFhex

Default: 18hex

14.4.2.6.8.**SYN**

The SYN parameter allows the selection of the character that will be used to indicate the Synchronization request for the start of a message. This control character has been implemented using two different values. The LIS vendor should be queried as to the value they used in the implementation and the option set accordingly. The two values that have been used are 26 and 16 hex. The values are specified in hex.

Possible parameters: 00hex..FFhex

Default: 16hex

14.4.2.7.**Send Button**

When vial information for a non-pending, non-orphan sequenced vial is recalled onto the Culture screen, the <Send> button shall become enabled – when the Force Upload Checkbox is enabled (see section 14.4.2.4.7).

Touching the <Send> button shall cause the displayed vial data to be transmitted as an LIS message immediately. Since this is used as a troubleshooting mechanism, the information will be formulated into the appropriate LIS message format and the LIS message to be transferred to the attached LIS.

Once any data on the Culture Screen Vial Tab has been modified, the 'Send' button shall be removed from the display and the 'Save' button shall be displayed and disabled.

14.4.2.8.**Print Button**

The Print button on the Maintenance/Configuration/Lis tab shall be displayed and enabled when the LIS interface is enabled.

When enabled, the Print button shall be accessible by all users; no password or enabling of the Log Comm checkbox is required in order for this button to be operational.

Touching the Print button shall cause all of the LIS messages that are contained in the event log to be printed to the selected printer in the selected language. This will include the messages time stamp in order for the timing of these messages as well as the low-level messages being saved on the USB key to be coordinated.

14.4.3. Message Content

14.4.3.1. Field List

The BACTEC FX shall exchange fields with the LIS per the following table:

Header Record Field Name	ASTM Pos.	Direction
Sender Name	H, 5, 1, 1	U
Version Number	H, 13, 1, 1	U
Message Date/Time	H 14, 1, 1	U

Patient Record Field Name	ASTM Pos.	Direction
Patient ID	P, 4, 1, 1	U/D
Patient Last Name	P, 6, 1, 1	U/D
Patient First Name	P, 6, 1, 2	D
Patient Middle Name	P, 6. 1, 3	D
Patient Name Suffix	P, 6, 1, 4	D
Patient Name Title	P, 6, 1, 5	D
Old Hospital Service	P, 26, 1, 1	U/D
Hospital Service	P, 33, 1, 1	U/D

Order Record Field Name	ASTM Pos.	Direction
Accession Number	O, 3, 1, 1	U/D
Old Sequence 1	O, 3, 1, 3	D
Old Sequence 2	O, 3, 2, 3	D
Old Sequence 3	O, 3, 3, 3	D
Old Sequence 4	O, 3, 4, 3	D
Old Sequence 5	O, 3, 5, 3	D
Old Sequence 6	O, 3, 6, 3	D
Old Sequence 7	O, 3, 7, 3	D
Old Sequence 8	O, 3, 8, 3	D
Old Sequence 9	O, 3, 9, 3	D
Old Sequence 10	O, 3, 10, 3	D
Test ID	O, 5, 1, 4	U
Sequence 1	O, 5, 1, 5	D
Sequence 2	O, 5, 2, 5	D
Sequence 3	O, 5, 3, 5	D
Sequence 4	O, 5, 4, 5	D
Sequence 5	O, 5, 5, 5	D
Sequence 6	O, 5, 6, 5	D
Sequence 7	O, 5, 7, 5	D
Sequence 8	O, 5, 8, 5	D
Sequence 9	O, 5, 9, 5	D
Sequence 10	O, 5, 10, 5	D
Collection Date Time	O, 8, 1, 1	U/D

Result Record Field Name	ASTM Pos.	Direction
Result ID Code	R, 3, 1, 4	U
Result Sequence Number	R, 3, 1, 5	U
Test Status	R, 4, 1, 1	U
Prelim Status	R, 9, 1, 1	U
Start Date Time	R, 12, 1, 1	U
End Date Time	R, 13, 1, 1	U
Instrument Type	R, 14, 1, 1	U

Result Record Field Name	ASTM Pos.	Direction
Media Type	R, 14, 1, 2	U
Protocol Length	R, 14, 1, 3	U
Instrument Number	R, 14, 1, 4	U
Instrument Location	R, 14, 1, 5	U

Request Record Field Name	ASTM Pos.	Direction
Request Starting Accession Number	Q, 3, 1, 2	U
Request Test Status	Q, 5, 1, 2	D
Starting Date/Time	Q, 7, 1, 1	D
Ending Date/Time	Q, 8, 1, 1	D
Request Information Status Code	Q, 13, 1, 1	U/D

Terminator Record Field Name	ASTM Pos.	Direction
Termination Code	L, 3, 1, 1	U/D

14.4.3.2. Field Descriptions

14.4.3.2.1. Header Fields

General – Same as EpiCenter (see section 8.2.1)

14.4.3.2.2. Patient Fields

Patient ID (P, 4, 1, 1) - Identifier that uniquely identifies a patient. **This is a required field for patient demographic downloads**. This field can be up to 16 characters long. (e.g. PatId123)

Patient Name (P, 6, 1, 1-5) – Patient name is divided into 5 components in the ASTM E_1394 specification. The BACTEC FX stores these fields as a single string in its database. Therefore the BD LIS Interface concatenates these fields from a download message. The patient name can be up to 40 characters long. If these fields are selected for upload on the BACTEC FX the whole name is placed in the first component of this field (P, 6, 1, 1). Patient name shown in the sample record is Dr. John R Doe Jr.

Patient Last Name (P, 6, 1, 1)

Patient First Name (P, 6, 1, 2)

Patient Middle Name (P, 6, 1, 3)

Patient Name Suffix (P, 6, 1, 4)

Patient Name Title (P, 6, 1, 5)

Old Hospital Service (P, 26, 1, 1) – (Do Not Use unless the LIS vendor has previously implemented the old BD DMC LIS interface and that code is reused) An acronym or abbreviation for the ward or hospital department involved in caring for this patient. (e.g. ER may represent the Emergency Room). (Old Hospital Service field only for compatibility with older BACTEC 9000 LIS interfaces).

Hospital Service (P, 33, 1, 1) – **An** acronym or abbreviation for the ward or hospital department involved in caring for this patient. (e.g. ER may represent the Emergency Room).

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Accession Number (O, 3, 1, 1) - Maximum field length: 20 characters. A unique alphanumeric string that identifies a specimen.

Old Sequence1 (O, 3, 1, 3) –(Do Not Use unless the LIS vendor has previously implemented the old BD DMC LIS interface and that code is reused) 12 digit numeric string identifying the instrument consumable.

Old Sequence2 (O, 3, 2, 3) –(Do Not Use unless the LIS vendor has previously implemented the old BD DMC LIS interface and that code is reused) 12 digit numeric string identifying the instrument consumable.

Old Sequence3 (O, 3, 3, 3) –(Do Not Use unless the LIS vendor has previously implemented the old BD DMC LIS interface and that code is reused) 12 digit numeric string identifying the instrument consumable.

Old Sequence4 (O, 3, 4, 3) –(Do Not Use unless the LIS vendor has previously implemented the old BD DMC LIS interface and that code is reused) 12 digit numeric string identifying the instrument consumable..

Old Sequence5 (O, 3, 5, 3) –(Do Not Use unless the LIS vendor has previously implemented the old BD DMC LIS interface and that code is reused) 12 digit numeric string identifying the instrument consumable.

Old Sequence6 (O, 3, 6, 3) –(Do Not Use unless the LIS vendor has previously implemented the old BD DMC LIS interface and that code is reused) 12 digit numeric string identifying the instrument consumable.

Old Sequence7 (O, 3, 7, 3) –(Do Not Use unless the LIS vendor has previously implemented the old BD DMC LIS interface and that code is reused) 12 digit numeric string identifying the instrument consumable.

Old Sequence8 (O, 3, 8, 3) –(Do Not Use unless the LIS vendor has previously implemented the old BD DMC LIS interface and that code is reused) 12 digit numeric string identifying the instrument consumable.

Old Sequence9 (O, 3, 9, 3) –(Do Not Use unless the LIS vendor has previously implemented the old BD DMC LIS interface and that code is reused) 12 digit numeric string identifying the instrument consumable.

Old Sequence10 (O, 3, 10, 3) –(Do Not Use unless the LIS vendor has previously implemented the old BD DMC LIS interface and that code is reused) 12 digit numeric string identifying the instrument consumable.

Test Id (O, 5, 1, 4) –BACTEC FX transmits "**BACTECFX_GND"** for the Test ID.

Sequence1 (O, 5, 1, 5) -- 12 digit numeric string identifying the instrument (BACTEC FX) consumable.

Sequence2 (O, 5, 2, 5) -- 12 digit numeric string identifying the instrument (BACTEC FX) consumable.

Sequence3 (O, 5, 3, 5) -- 12 digit numeric string identifying the instrument (BACTEC FX) consumable.

Sequence4 (O, 5, 4, 5) -- 12 digit numeric string identifying the instrument (BACTEC FX) consumable.

Sequence5 (O, 5, 5, 5) -- 12 digit numeric string identifying the instrument (BACTEC FX) consumable.

Sequence6 (O, 5, 6, 5) -- 12 digit numeric string identifying the instrument (BACTEC FX) consumable.

Sequence7 (O, 5, 7, 5) -- 12 digit numeric string identifying the instrument (BACTEC FX) consumable.

Sequence8 (O, 5, 8, 5) -- 12 digit numeric string identifying the instrument (BACTEC FX) consumable.

Sequence9 (O, 5, 9, 5) -- 12 digit numeric string identifying the instrument (BACTEC FX) consumable.

Sequence10 (O, 5, 10, 5) -- 12 digit numeric string identifying the instrument (BACTEC FX) consumable.

Collection Date Time (O, 8, 1, 1) Date and time that the specimen was collected from the patient, formatted as described in ASTM E_1394 section 6.6.2.

14.4.3.2.3.**Result Fields**

Result ID Code (R, 3, 1, 4) The BACTEC FX transmits a "**GND"** as the Result ID Code.

Result Sequence Number (R, 3, 1, 5) – 12 digit numeric string identifying the instrument (BACTEC FX) consumable.

Test Status LIS Code (R, 4, 1, 1) -- This describes the Status of a BACTEC FX vial. The possible values are:

- INST_NEW

- INST_POSITIVE

- INST_NEGATIVE

- INST_REMOVED

- INST_REENTERED

- INST_ONGOING

Preliminary Status (R, 9, 1, 1) -- We always put a P in this field, because all results from BACTEC FX are preliminary.

Start Date/Time (R, 12, 1, 1) This is the date and time that the vial was physically placed in the instrument. This field is represented in the YYYYMMDDHHMMSS format.

End Date/Time (R, 13, 1, 1) This is the date and time that the panel's status transitioned to POSITIVE or OUT OF PROTOCOL. This field is represented in the YYYYMMDDHHMMSS format.

Instrument Type (R, 14, 1, 1) The BACTEC FX transmits **BACTECFX** for the instrument Type.

Media Type(R, 14, 1, 2) 2 digit code representing the type of media contained within a BACTEC vial.

Protocol Length(R, 14, 1, 3) this field indicates the length of time required to complete the BACTEC GND test. For BACTEC FX(a growth and detection test), this number represents the number of days before a vial can be considered negative.

Instrument Number (R, 14, 1, 4) Instrument number between 1 and 99.

Instrument Location (R, 14, 1, 5) Indicates the vial position inside the instrument as an 8 character string = ii-d-rcc

where:

ii = instrument number(1-99)

d = drawer letter(A-D)

r = row letter(A-K with no I)

cc= column number (1-10)

14.4.3.2.4. **Request Fields**

The ASTM 1394 protocol defines this as a Request Information Record message. A download Request record is also known as a "Query". The only type of download "Query" request that the BACTEC FX instrument accepts is a request for test results. A Terminator record with a termination code of "F"(processed) or "Q"(error) is used to signal the last packet of a query response. If a query request was invalid, the instrument interface responds with only the Terminator record with a termination code of "Q". If the instrument interface cannot locate any specimens in the active or history databases that meet the query criteria, it responds with only the Terminator record with a termination code of "F".

A query contains a set of request parameters that are used to determine which specimen(s) to access. The following tables define the ASTM 1394 Request record fields that can be transmitted from the LIS in a Download message and are accepted and acted upon by the BACTEC FX.

Test Status (Q, 5, 1, 2) The BACTEC FX instrument accepts queries for vials with a status as follows:
INST_POSITIVE = POSITIVE & Manual Positive vials
INST_NEGATIVE = NEGATIVE & Manual Negative vials
ALL = POSTIVE & NEGATIVE & ONGOING & Manuals Positive & Manual Negative vials
AWL = (Do Not Use unless the LIS vendor has previously implemented the BD DMC LIS interface and that code is reused) POSTIVE & NEGATIVE & ONGOING & Manuals Positive & Manual Negative vials

Starting Date\Time (Q, 7, 1, 1) – Requested starting time for query -- the beginning of the Date/Time range to gather data for. If it is null the BACTEC FX will use the Date 1/1/1970.

End Date\Time (Q, 8, 1, 1) – Requested Ending time for the query -- the ending of the Date \Time range to gather data for. It must be greater than the Starting Date\Time or the query will be rejected. If it is null, the BACTEC FX will use the current date time.

When a "Time Range" has been specified in a Query (Begin Time and/or End Time fields), the time field from the instrument's database that is used for comparison is dependent upon the Query's "Test Status" field as follows,

INST_POSITIVE -- Time the specimen went positive.
INST_NEGATIVE -- Time the specimen went out of protocol.
INST_ONGOING – The time the specimen was entered into the BACTEC FX.
MANUAL vials – Time the user set the Status.

14.4.3.2.5.**Terminator Fields**

General – Same as EpiCenter (see section 8.2.7)

14.4.4. Example ASTM 1394 Protocol

The following are examples of various BACTEC FX message transmissions that conform to the Becton Dickinson Common LIS Interface using the ASTM 1394 protocol.

BACTEC FX G&D specimen that has been entered into an instrument as a new vial: (note: whether the vial has received a first test or not is not relevant in the BACTEC FX instrument.) – sent from the BACTEC FX instrument to the LIS.

```
H|\^&|||Becton Dickinson|||||||V1.0|20081017105509
P|1
O|1|ACC-001||^^^BACTECFX_GND|||19700101000000
R|1|^^^GND^446500000000|INST_NEW||||P|||20081017105508||BACTECFX^65^5^01^A-
G01
L|1|N
```

BACTEC FX G&D specimen that has been tested POSITIVE – sent from the BACTEC FX instrument to the LIS:

```
H|\^&|||Becton Dickinson|||||||V1.0|20081024064721
P|1||PATID||LastName FirstName
O|1|ACC-001||^^^BACTECFX_GND|||19700101000000
R|1|^^^GND^446500000000|INST_POSITIVE||||P|||20081017105508|20081017110031|B
ACTECFX^65^5^01^A-G01
L|1|N
```

BACTEC FX G&D specimen that has been tested NEGATIVE – sent from the BACTEC FX instrument to the LIS:

```
H|\^&|||Becton Dickinson|||||||V1.0|20081017110336
P|1||PATID2||LastName2 FirstName2
O|1|DAG||^^^BACTECFX_GND|||19700101000000
R|1|^^^GND^446504178134|INST_NEGATIVE||||P|||20080918155201|20080923160143|B
ACTECFX^65^28^01^A-A02
L|1|N
```

A Request Record (Query) sent from an LIS to a BACTEC FX instrument **requesting all specimen results (all positive, negative, and ongoing vials records will be sent**).

```
H|\^&
C|1|This is a request for POSITIVE, NEGATIVE AND ONGOING vials from the LIS
Q|1|ALL^ALL||^ALL|||||||P
L|1
```

A Request Record (Query) sent from an LIS to a BACTEC FX instrument **requesting only POSITIVE specimen results for a period of time (vials that had a positive result called between 9/23/2008 4:01:43 p.m. and 10/17/2008 10:55:08 a.m.**)

```
H|\^&
C|1|This is a request for POSITIVE vials from the LIS
Q|1|ALL^ALL||^INST_POSITIVE||20080923160143|20081017105508|||||P
L|1
```

A Patient Record sent from an LIS to a BACTEC FX instrument

```
H|\^&
C|1|L|Patient information from LIS to BACTEC FX
P|1||PATID3||LastName^FirstName^Middle^Suffix^Title|||||||||||||||||||||||||||||
|HosSer|
O|1|Acc-003| |^^^\^^^\^^^\^^^\^^^\^^^\^^^\^^^\^^^\^^^\^^^|||20081025120000
L|1
```

14.5. Innova

14.5.1. LIS Connection

The instrument attempts to connect to an LIS server when processing of a batch begins. If a connection to the LIS server has not yet been established or has been disconnected, the instrument will attempt to establish a connection when processing of subsequent batches begin.

The instrument connects to the LIS via Ethernet TCP/IP using a configurable IP address and port. Configuring the IP address and port is done via a CSV file.

The instrument exchanges data with the LIS per the protocol specified in the Data Link Section of ASTM E_1381.

The instrument formats the content of the data exchanged as messages containing a collection of records per ASTM E_1394.

The instrument will send and receive frames that contain only a single logical record (i.e. Header, Patient, Order, Result and Terminator records all are sent in separate frames).

The instrument will not respond to queries generated by the LIS.

The instrument will not accept unsolicited data sent from the LIS.

The implemented LIS Interface specification is selectable to be either the legacy interface or the preferred BD ASTM interface. The interface is configurable via a CSV file.

Selecting the BD ASTM Interface will result in the following changes:

- Queries to the LIS will not contain a confirmation record.

- Specimen plating status will be sent separately formatted as an H/P/O/R/L message.

The instrument will expect a query response from the LIS within a configurable amount of time. The timeout value is configurable via a CSV file. The default time is 15 seconds.

14.5.2. BD ASTM Interface

14.5.2.1. Overview

The instrument will default to the BD ASTM Interface.

When the instrument reads a new container ID barcode from a container, a query for patient demographics and test orders is sent to the LIS.

When processing has successfully completed for a container, the instrument will send a result message to the LIS containing H/P/O/R/L records.

Sending of the result message can be enabled or disabled via a CSV file. The default setting is enabled.

14.5.2.2. Valid Characters

The following characters are valid at the Innova instrument.

A – Z, a – z, 0 – 9,: : , . / @ $ % ( ) _ + - ` =

14.5.2.3. Invalid Characters

The following characters are invalid at the Innova instrument.

" * ? [ ] ! # | ' & < > { } ~ ^ \

These characters cannot be entered at the Innova instrument but could be supplied by and LIS/EpiCenter Server download.

If these characters are encountered in the Patient Information record that has been received from the LIS/EpiCenter server, the following will occur :

- If an illegal character is contained in the container barcode field (O, 3, 1, 1), the illegal character will be replaced with a "$". The barcode will be passed on for further validation. When the "Mismatched barcode" check is performed, the check will fail and the container will be rejected.

If an illegal character is contained in any other field of the record, the field will be "nulled out." This will result in several potential scenarios:

- If the Innova is operating in LIS/EpiCenter Protocol Defined Source mode and if the Specimen Type/Body Site field has been nulled out, the specimen will be rejected with a protocol not found.

- If the field that has been nulled out is contained in the label configuration, this field will be null on the plate label.

- If the field is not printed on the plate label and it is not the barcode field or the Specimen Type/Body Site field in LIS/EpiCenter Protocol Defined Source mode, then the user will never see this nulled - out field.

- The result record that is echoed back to the LIS will contain the nulled - out field. This should cause no issues in either the LIS or the EpiCenter Server sites.

14.5.2.4. Message Content

The following sections describe which fields are exchanged with the Innova instrument.

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14.5.2.5. **Field List**

Each field is displayed with its default mapping in the ASTM E_1394 records. This position consists of a record type (Patient, Order, Result, Query, or Comment), a field delimiter counter, repeat delimiter counter, and component delimiter counter. The fields are grouped according to the ASTM E_1394 record type they are mapped to.

The field list also indicates if that field is defaulted as an upload (U) field, download (D) field, or both (U/D).

The first two fields of every record include the Record Type indicator and a record index value. These fields are considered part of every record but are not listed in these tables.

Header Record Field Name	ASTM Pos.	Direction
Delimiter Field	H, 2, 1, 1	U/D
Sender Name	H, 5, 1, 1	U/D
Processing ID	H, 12, 1, 1	U/D
Version Number	H, 13, 1, 1	U/D
Message Date/Time	H 14, 1, 1	U/D

Patient Record Field Name	ASTM Pos.	Direction
Patient ID	P, 4, 1, 1	U/D
Patient Name (Last)	P, 6, 1, 1	U/D
Patient Name (First)	P, 6, 1, 2	U/D
Patient Name (Middle)	P, 6, 1, 3	U/D
Date of Birth	P, 8, 1, 1	U/D
Patient Sex	P, 9, 1, 1	U/D
Hospital Service	P, 33, 1, 1	U/D
Hospital Client	P, 34, 1, 1	U/D

Order Record Field Name	ASTM Pos.	Direction
Accession Number / Container ID*	O, 3, 1, 1	U/D
Culture ID	O, 3, 1, 2	U/D
Barcode Number / Accession Number*	O, 5, 1, 5	U/D
Collection Date/Time	O, 8, 1, 1	U/D
Specimen Type	O, 16, 1, 1	U/D
Body Site	O, 16, 1, 2	U/D

Order Record Field Name	ASTM Pos.	Direction
Ordering Physician	O, 17, 1, 1	U/D
Server Free Text	O, 19, 5, 1	U/D
Report Type	O, 26, 1, 1	U/D

*See Field Descriptions - Order Fields Subsection

Result Record Field Name	ASTM Pos.	Direction
Result ID Code	R, 3, 1, 4	U
Test Status	R, 4, 1, 1	U
Mode	R, 4, 1, 9	U
Preliminary/Final Status	R, 9, 1, 1	U
Media Setup Date/Time	R, 13, 1, 2	U
Instrument Type	R, 14, 1, 1	U
Machine Instrument Number	R, 14, 1, 4	U
Instrument Location	R, 14, 1, 5	U
Protocol Name	R, 14, 1, 8	U

Request Record Field Name	ASTM Pos.	Direction
Accession Number	Q, 3, 1, 2	U
Container Barcode Number	Q, 3, 1, 3	U
Request Instrument Number	Q, 5, 1, 4	U
Request Information Status Code	Q, 13, 1, 1	U

Comment Record Field Name	ASTM Pos.	Direction
Comment Text	C, 4, 1, 1	U
Comment Type	C, 5, 1, 1	U

Terminator Record Field Name	ASTM Pos.	Direction
Termination Code	L, 3, 1, 1	U/D

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14.5.2.6. Field Descriptions

This section provides detailed information for each field listed in the previous section.

14.5.2.6.1. Header Fields

The header record that starts each logical message is the same from all BD instruments. An example record is provided below.

H|\^&| | |Becton Dickinson| | | | | | |P |X1.00|20100901184200

Delimiter Fields (H, 2, 1, 1) – These single characters can be used to process the remainder of the message. These characters denote the field, repeat, component and escape delimiters as described in the ASTM E_1394 specification.

These fields are defaulted to "|", "\", "^", and "&" respectively, as shown above.

Sender Name (H, 5, 1, 1) – Messages coming from a Becton Dickinson instrument have the BD identifier in this field as shown above.

Processing ID (H, 12, 1, 1) – Indicates how this message is to be processed. The following codes will be used:

> P – Treat message as an active message to be completed according to standard processing.

Version Number (H, 13, 1, 1) – This version number represents the version of the LIS interface used for communications. For the Innova instrument, the version number will begin with X1.00.

Message Date/Time (H, 14, 1, 1) – BD includes the current time and date when constructing his message, formatted as described in the ASTM E_1394 specification in section 6.6.2.

14.5.2.6.2. Patient Fields

P | 1 | | PatId123 | | Last Name ^ First Name^ MI| |19651029 |M||||||||||||||||||||||||Hospital Service|Hospital Client

Patient ID (P, 4, 1, 1) - Identifier that uniquely identifies a patient. This field can be up to 16 characters long (e.g. PatId123). This field is optional.

Patient Name (P, 6, 1, 1-3) – Patient name is divided into 5 components in the ASTM E_1394 specification. The Innova instrument will accept the first 3 components of this field. The instrument stores these fields as a single string in its database. The patient name can be up to 40 characters long. When uploaded, the whole name is placed in the first component of this field (P, 6, 1, 1). This field is optional.

Date of Birth (P, 8, 1, 1) – Patient date of birth formatted as described in ASTM E_1394 section 6.6.2. The date shown in the sample record is Oct. 29, 1965. This field is optional.

Patient Sex (P, 9, 1, 1) – There are 3 predefined values accepted for this (**M**)ale, (**F**)emale, and (**U**)nspecified. If the value does not match the code for either Male or Female then the sex is set to Unspecified. This field is optional.

Hospital Service (P, 33, 1, 1) – This is the location within the hospital that the specimen came from, for instance ER (emergency room), OR1 (operating room 1). This field is optional.

Hospital Client (P, 34, 1, 1) – This is the facility that the specimen came from, for instance Smith Radiology or Central Labs. This field is optional.

14.5.2.6.3. Order Fields

O | 1 | Access1^331316^ACC123| | ^^^^ | | | 20090108080510 | | | | | | | | URINE^CleanCatch | Dr. Ameigh | | \ \ \ \Server Free Text | | | | | | | | O

Accession Number (O, 3, 1, 1) – A unique alphanumeric string that identifies a specimen. This field can be up to 16 characters long. This field is required.

NOTE: if "CONTAINER_BC_INSTEAD_OF_ACC" flag is set to 1 (one – CID Mode 1), this field will contain the container barcode that was queried for to obtain the accession number.

Culture ID (O, 3, 1, 2) – An alphanumeric string that identifies a culture. This field is optional.

Barcode Number (O, 5, 1, 5) – An alphanumeric string to be included on the printed plate label. This field is optional.

NOTE: if "CONTAINER_BC_INSTEAD_OF_ACC" flag is set to 1 (one – CID Mode 1), this field will contain the accession that is to be associated to the CID that was queried for in Q, 3, 1, 3 field.

For additional information on "CONTAINER_BC_INSTEAD_OF_ACC" functionality, see the CONTAINER_BC_INSTEAD_OF_ACC section.

Collection Date/Time (O, 8, 1, 1) – Date and time that the specimen was collected from the patient, formatted as described in ASTM E_1394 section 6.6.2. This field is optional.

Specimen Type (O, 16, 1, 1) – The type of specimen collected from the patient. This field is optional.

For LIS/EpiCenter Defined Protocol Source, this field must exactly match the field at the Innova associated to a protocol. This field is a maximum of 14 characters at the Innova.

Body Site (O, 16, 1, 2) – The body site for the source of the specimen collected from the patient. This field is optional.

For LIS/EpiCenter Defined Protocol Source, this field must exactly match the field at the Innova associated to a protocol. This field is a maximum of 14 characters at the Innova.

Ordering Physician (O, 17, 1, 1) – The physician that has ordered the test. This field is optional. This field has a maximum of 16 characters when it is printed on the label at the Innova.

Server Free Text (O, 19, 5, 1) – This field contains free text that can hold any alphanumeric information (such as special instructions to look for fungi on the plate, etc.). This field will have a maximum of 16 characters when printed on the label. This field is optional.

Report Types (O, 26, 1, 1) – If the Report Types field contains an "X", "Y", or "Z", the specimen is rejected. Any other value will be ignored. This field is optional. (From ASTM 1384 specifications)

> X – request cancelled
> Y – no order on record for this test (in response to query)
>
> Z – no record of this patient (in response to query)

14.5.2.6.4. Result Fields

R | 1 | ^^^STREAK|INST_COMPLETE^^^^^^^^MANAGED | | | | | P | | | |^20110817130534 | INNOVA^^^1^1-1-1^^^Urine

Result ID Code (R, 3, 1, 4) – This is a BD defined code that indicates the type of information being exchanged in the result record. This field contains the value, "STREAK", to indicate the results are from an automated plate streaking instrument.

Test Status (R, 4, 1, 1) – The status value for a particular specimen. This field is the pre-defined value INST_COMPLETE for specimens that have completed successfully. For specimens that have not completed successfully, the value is INST_ERROR.

Mode (R, 4, 1, 9) – The mode indicates whether the specimen was run with the "User Defined Protocol" mode of operation (UD) or the LIS Defined Protocol mode of operation (LD).

This field will contain the following values:

> **"MANAGED"** – specimen processed in LD mode.

> **"BATCH"** - specimen processed in UD mode

Preliminary/Final Status (R, 9, 1, 1) – This field contains a "P" to indicate the results should be considered Preliminary Results.

Media Setup Date/Time (R, 13, 1, 2) – This field indicates the time the specimen was successfully streaked. If the specimen was not successfully streaked, this field will be blank.

Instrument Type (R, 14, 1, 1) – This field indicates which BD instrument produced the result. This field contains the value, "INNOVA".

Machine Instrument Number (R, 14, 1, 4) – This is the number assigned to the instrument.

Instrument Location (R, 14, 1, 5) – Indicates the location of the container in the instrument. Represented as drawer number - canoe number - position in canoe.

Protocol Name (R, 14, 1, 8) – This is the protocol used to plate the specimen. It is derived from the Specimen Type/Body Site supplied by the LIS or selected by the user for a User Defined specimen.

14.5.2.6.5. **Request Fields**

Standard Query

Q | 1 | ^0123456| |^^^1 | | | | | | | |O|

CID Mode 1 Query

Q | 1 | ^^0123456| |^^^1 | | | | | | | |O|

Accession Number (Q, 3, 1, 2) – The unique alphanumeric string that identifies a specimen. This field can be up to 16 characters long. In the example above, the Accession number is "0123456".

Container Barcode Number (Q, 3, 1, 3) – The unique alphanumeric string that identifies a container. This field can be up to 16 characters long.

This field will ONLY be populated when the Innova has its "CONTAINER_BC_INSTEAD_OF_ACC" flag set to 1 (one – CID Mode 1).

NOTE: when this field is used, its value MUST be returned in O, 3, 1, 1 so that the Innova can verify the accession number that is returned is intended for the container barcode that was queried.

Request Information Status Code (Q, 13, 1, 1) – The following codes will be used:
> O – Requesting test orders and demographics only (no results)
> A – abort/cancel last request criteria (allows a new request to follow, sent from Innova if query result not received before timeout)

14.5.2.6.6. **Comment Fields**

The comment record in the Innova will immediately follow the result record if the result is INST_ERROR. It will contain the enum value associated to the specimen's result and the associated string that is displayed to the user on the DB Log screen and on the Batch Results screen. If there is more than one result enum value associated to the Specimen, then more than one comment record will be sent to the LIS/EpiCenter, one for each result enum value and string.

C | 1 | |<4> No Barcode | R

C | 2 | |<28> Low Liquid Level | R

Comment Text (C, 4, 1, 1) – The text to be used for the patient, specimen or isolate comment. This field can be up to 1600 characters long.
The number between the < > will be the enum value that is associated to the Innova ContainerProcessingStatusMask. The text that follows in this field will be the string that is displayed to the user at the Innova and that is associated to the ContainerProcessingStatusMask enum value.

Comment Type (C, 5, 1, 1) – The type of comment record. This field should be a **P, S, I, E, T, or R** for patient, specimen, isolate, chartables rule, special message comments, or result comment respectively.
For the Innova, this field will contain an "R".

14.5.2.7. **Examples**

14.5.2.7.1. **Query - Standard**

H|\^&|||Becton Dickinson|||||||P|X1.00|20100816171740

Q|1|^10467||^^^ALL||||||||O

 L|1|N

14.5.2.7.2. **LIS Query Response - Standard**

H|\^&|||LIS|||||||P|1|20100806093245

P|1||PatID1||Clark^John| |19800806 |M||||||||||||||||||||||ER|Universal Labs

O|1|10467|||||20100805093245| | | | | | | |URINE^Clean Catch|

L|1|F

14.5.2.7.3. **Query - CID Mode 1**

H|\^&|||Becton Dickinson|||||||P|X1.00|20100816171740

Q|1|^^10467||^^^ALL||||||||O

 L|1|N

14.5.2.7.4. **LIS Query Response – CID Mode 1**

H|\^&|||LIS|||||||P|1|20100806093245

P|1||PatID1||Clark^John| |19800806 |M||||||||||||||||||||||ER|Universal Labs

O|1|10467 ||^^^^PatAccession|||20100805093245| | | | | | | |URINE^Clean Catch|

L|1|F

14.5.2.7.5. **LIS Query Response with no information**

H|\^&|||LIS|||||||P|1|20100806093245

L|1|I

14.5.2.7.6. **Confirmation Message Upload**

H|\^&|||Becton Dickinson|||||||P|X1.00|20100816172135

P|1||PatID1||John Clark| |19800806 | M ||||||||||||||||||||||||ER|Universal Labs

O|1|10467||^|||20100805093245|||||||URINE ^ Clean Catch

R|1|^^^STREAK|INST_COMPLETE| | | | |P| | | | |INNOVA^^^1^3-2-6^^^Plate Protocol

L|1|N

14.5.2.7.7. **Confirmation Message Upload Error Status**

H|\^&|||Becton Dickinson|||||||P|X1.00|20100816172135

P|1||PatID1||John Clark| |19800806 | M ||||||||||||||||||||||ER|Universal Labs

O|1|10467||^|||20100805093245|||||||URINE ^ Clean Catch

R|1|^^^STREAK|INST_ERROR| | | | |P| | | | |INNOVA^^^1^3-2-6^^^Plate Protocol

C | 1 | |<4> No Barcode | R

C | 2 | |<28> Low Liquid Level | R

L|1|N

14.5.2.7.8. **Host Reject Messages**

14.5.2.7.8.1. Report Type X

Test was deleted do not plate.

H | \ ^ & | | | HOST | | | | | | | P | 1 | 20090109100400

P | 1 | | 13099844202 | |^| | |

O | 1 | 13099844202 ^ ^ | | ^ ^ ^ | | | | | | | | | | | | | | | | | | | | | | **X**

L | 1 |N

14.5.2.7.8.2. Report Type Y

 No specimen information found – if this is LIS Driven mode, do not plate no protocol information available.

H | \ ^ & | | | HOST | | | | | | | P | 1 | 20090109100400

P | 1 | | 13099844202 | |^| | |

O | 1 | 13099844202 ^ ^ | | ^ ^ ^ | | | | | | | | | | | | | | | | | | | | | | **Y**

L | 1 |N

14.5.2.7.8.3. Report Type Z

No patient information found – if this is LIS Driven mode and there is no associated Specimen information, do not plate no protocol information available.

H | \ ^ & | | | HOST | | | | | | | P | 1 | 20090109100400

P | 1 | | 13099844202 | |^| | |

O | 1 | 13099844202 ^ ^ | | ^ ^ ^ | | | | | | | | | | | | | | | | | | | | | | **Z**

L | 1 |N

14.5.2.8. CONTAINER_BC_INSTEAD_OF_ACC Barcode

This section describes the CONTAINER_BC_INSTEAD_OF_ACC barcode functionality that will be available in a Post-V3.10 release. This functionality gives the user the ability to read a barcode on the specimen container and query the LIS for the associated Accession barcode.

A new parameter will be added to the MachineGeneralAttributes.csv file. This parameter will be named CONTAINER_BC_INSTEAD_OF_ACC. Its default value will be "0" for standard container barcode query. If the barcode on the container is not the accession and the user desires to have the accession returned, this parameter should be configured to have a value of 1 (one).

14.5.2.8.1. Standard Container Barcode is Accession Functionality

If the barcode that is on the container IS the Accession barcode, the LIS/EpiCenter will be queried for Patient Information by sending the container barcode that was read in Q, 3,1, 2. When the LIS/EpiCenter returns the Patient Information, it must return the same barcode that was queried for in O, 3, 1, 1. If the same barcode is not returned in this O, 3, 1, 1; the Patient Information will be rejected with a "Mismatched Barcode" error.

14.5.2.8.2. CONTAINER_BC_INSTEAD_OF_ACC Functionality – CID Mode 1

If the barcode that is on the container IS the Container barcode and NOT the Accession barcode, the LIS (and in a future EpiCenter release), will be queried for Patient Information by sending the container barcode that was read in Q, 3, 1, 3. When the Patient Information is returned, the barcode that was queried for must be returned in O, 3, 1, 1 and the associated accession must be returned in O, 5, 1, 5. If the same barcode is not returned in this O, 3, 1, 1; the Patient Information will be rejected with a "Mismatched Barcode" error.