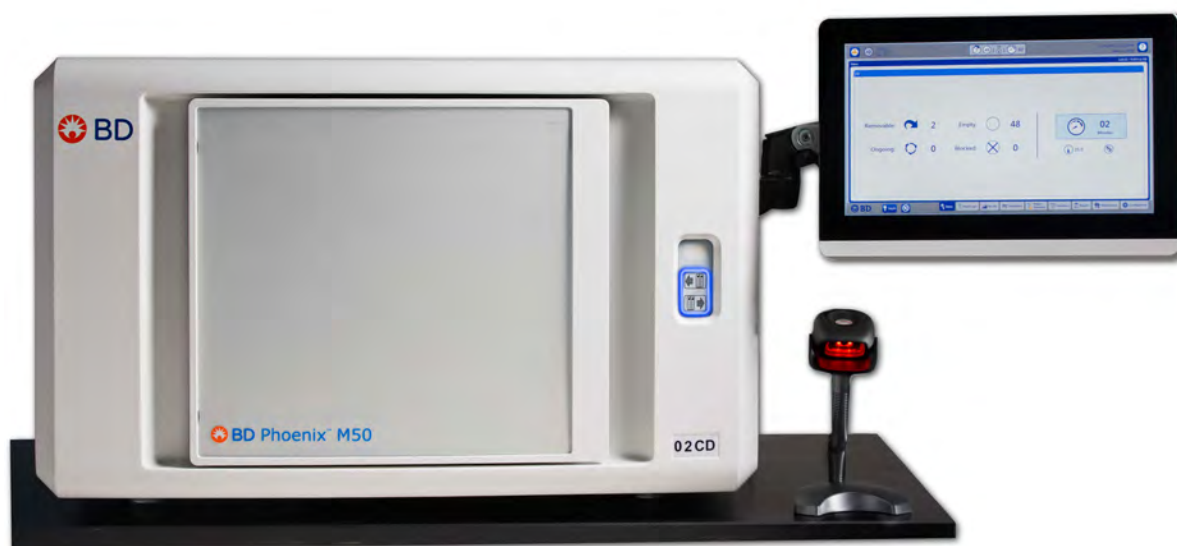




# Phoenix™ M50

## Automated Microbiology System User's Manual



Not for sale in USA

For in vitro diagnostic use

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English



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## Change History

Revision	Date	Change Summary
08	2021-11	Updated ECREP address, eIFU symbol, and added instrument catalog number 443624 and CHREP symbol with address to the cover page. Updated Section 1.2 ISO symbols. Updated Section 2.1 Intended Use, Section 2.5.1 Summary of Cautions and Warnings with Safe Disposal statement, and Section 2.7 Bibliography. Updated Section 6.2 Preparing Panels—clarified instructions for pure cultures and updated Figure 44 Cotton Swabs. Updated Sections 6.2.1 Materials Required That Are Provided and 6.2.2 Materials Required But Not Provided. Updated Section 6.2.7 with volume for low inoculum option. Updated Section 6.2.8 with EMERGE panels and clarified instructions for using inoculum broth. Updated Section 9.1 Performance Characteristics—clarified definition of categorical agreement. Updated Section 9.1.1 with performance of low inoculum identification, added performance for identification reproducibility, and updated AST performance for ertapenem, imipenem and meropenem. Updated Sections 9.1.2 and 9.1.3 with performance for identification reproducibility and removed telithromycin from the table. Updated Section 9.1.4 with identification reproducibility. Updated Section 10.1 with concentration for aztreonam and removed Telithromycin from the table. Added a new Section 11 BD Phoenix™ Broths and Indicators. Added new Catalog Numbers in Section 12 Replacement Parts. Updated numbering of the subsequent sections. Added Technical Information statement, Serious Incident statement, and CHREP address in Section 14 International Contacts.
09	2024-01	Updated to incorporate BD Synapsys™ Informatics Solution. General editorial updates were made.
10	2024-06	Updated Sections 9.1.1 Gram-Negative Performance and 10.1 List of Antimicrobial Agents in BD Phoenix™ Panels.

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# 1 Instructions for use guidance

Before using the product, it is recommended that all users become thoroughly familiar with the contents of the instructions for use.

These instructions for use are a reference tool for trained laboratory personnel who operate and maintain the product on a regular basis. Every attempt has been made to include all information which would be required during normal use and maintenance.

EU Only: Users shall report any serious incident related to the device to the Manufacturer and National Competent Authority.

Outside EU: Contact your local BD representative for any incident or inquiry related to this device.

Technical Service and Support: In the United States contact BD at 1.800.638.8663 or [bd.com](http://bd.com).

For regions outside of the United States, contact your local BD representative or [bd.com](http://bd.com).

Should a question arise that is not answered in these instructions, please contact BD. See [12 Contacts](#).

## 1.1 Customer release notes

Customer release notes (in English) are available at [bd.com/e-labeling](http://bd.com/e-labeling).

## 1.2 Conventions

The following conventions are used in this guide:

Convention	Example
Bold type is used for software options and to indicate a menu path.	Select <b>Save</b> and select <b>OK</b> .
	Select <b>File &gt; Save As</b> .
Italics type is used for names of documents.	For more information, refer to the <i>Example Instrument User's Manual</i> .

## 1.3 Notes, cautions, and warnings

Throughout the instructions for use, important information is presented in boxes offset from the regular text that are labeled as a NOTE, CAUTION, or WARNING. These messages are formatted as follows:

**NOTE**

Information worthy of special attention is presented as a NOTE.




















**CAUTION**

Information on an activity which potentially could cause a product to malfunction is presented as a CAUTION.




**WARNING**

INFORMATION ON AN ACTIVITY WHICH POTENTIALLY COULD CAUSE INJURY TO THE USER IS PRESENTED AS A WARNING.

## 1.4 Symbols Used

Meaning	Symbol
	CE marking; Signifies European technical conformity
	In vitro diagnostic medical device
	This only applies to US: "Caution: Federal Law restricts this device to sale by or on the order of a licensed practitioner."
	Manufacturer
	Authorized representative in the European Community
	Authorised representative in Switzerland
	Catalogue Number
	Consult instructions for use or consult electronic instructions for use.
	Collect separately. Indicates separate collection for waste of electrical and electronic equipment required.
	Serial Number
	Temperature Limit
	Batch Code
	Use-by date
	Caution
	Contains sufficient for <n> tests
	Do not use if package is damaged and consult instructions for use
	Do not re-use
	Keep away from light
	This Way Up

### Symbols on BD Phoenix™ M50 Instrument

Meaning	Symbol
  	<ol style="list-style-type: none"> <li>1. Biohazard</li> <li>2. Electrical Recycling required</li> <li>3. On/Off</li> </ol>

## 1.5 Depiction of patient information

Patient names, identification numbers, and medical information presented in the instructions for use, including those within images of the graphical user interface (GUI), are provided as examples only, and do not represent actual patients or clinical information.

## 2 Introduction

This section provides the following functions:

- [2.1 Intended Use](#)
- [2.2 Summary and Explanation of the Test](#)
- [2.3 Principles of the Procedure](#)
- [2.4 System Overview](#)
- [2.5 Safety and Precautions](#)
- [2.6 Bibliography](#)

### 2.1 Intended Use

The BD Phoenix™ Automated Microbiology System is intended for the rapid identification (ID) and antimicrobial susceptibility testing (AST) of clinically significant bacteria. The BD Phoenix™ System provides rapid results for most aerobic and facultative anaerobic gram-positive bacteria as well as most aerobic and facultative anaerobic gram-negative bacteria of human origin. The BD Phoenix™ System is also intended for the rapid identification of yeast and yeast-like organisms.

#### Additional Information

The BD Phoenix™ Automated Microbiology System provides qualitative identification and quantitative susceptibility test results using pure culture isolates from patients suspected of having a bacterial, streptococcal, or yeast infection.

### 2.2 Summary and Explanation of the Test

Micromethods for the biochemical identification of microorganisms were reported in 1918.<sup>1</sup> Several publications reported on the use of the reagent-impregnated paper disks and micro-tube methods for differentiating enteric bacteria.<sup>1-9</sup> The interest in miniaturized identification systems led to the introduction of several commercial systems in the late 1960s, and they provided advantages in requiring little storage space, extended shelf life, standardized quality control, and ease of use.

The modern broth microdilution test used today has origins in the tube dilution test used in 1942 by Rammelkamp and Maxon to determine in vitro antimicrobial susceptibility testing of bacterial isolates from clinical specimens.<sup>12</sup> The broth dilution technique involves exposing bacteria to decreasing concentrations of antimicrobial agents in liquid media by serial two-fold dilution. The lowest concentration of an antimicrobial agent in which no visible growth occurs is defined as the minimal inhibitory concentration (MIC).

In 1956, the introduction of a microtitrator system (using calibrated precision spiral wire loops and droppers for making accurate dilutions) rapidly allowed Marymont and Wentz to develop a serial dilution AST test.<sup>13</sup> The microtitrator system was accurate and allowed the reduction in volumes of antimicrobial agents. The term microdilution appeared in 1970 to describe the MIC tests performed in volumes of 0.1 mL or less of antimicrobial solution.<sup>14</sup>

## 2.3 Principles of the Procedure

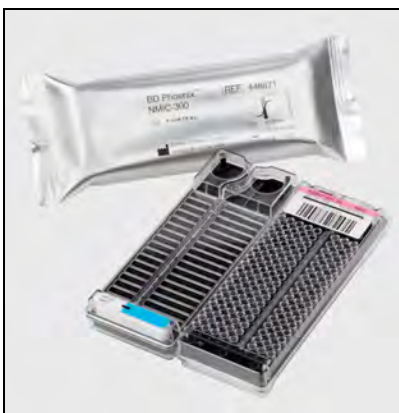
Many of the tests used in the BD Phoenix™ ID panels are modifications of the classical methods. These include tests for fermentation, oxidation, degradation and hydrolysis of various substrates. In addition to these, the BD Phoenix™ System utilizes chromogenic and fluorogenic substrates as well as single carbon source substrates in the identification of organisms.<sup>10, 11, 26-28</sup>

The BD Phoenix™ AST is a modified miniaturized version of the micro-broth doubling dilution technique. Susceptibility testing in the BD Phoenix™ System is performed through determination of bacterial growth in the presence of various concentrations of the antimicrobial agent tested with the aid of the AST indicator in continuously incubated and read micro-wells in the BD Phoenix™ panels.

### 2.3.1 Overview of the BD Phoenix™ ID/AST System

A maximum of 50 identification and antimicrobial susceptibility tests can be performed in the BD Phoenix™ M50 Instrument at a time using BD Phoenix™ combination panels. A sealed and self-inoculating molded polystyrene tray with 136 micro-wells containing dried reagents, serves as the BD Phoenix™ disposable. The combination panel includes an ID side with dried substrates for bacterial or yeast identification and an AST side with varying concentrations of antimicrobial agents, growth and fluorescent controls at appropriate well locations. The BD Phoenix™ System utilizes an optimized colorimetric redox indicator for AST, and a variety of colorimetric and fluorometric indicators for ID. The AST broth is cation-adjusted (e.g., Ca<sup>++</sup> and Mg<sup>++</sup>) to optimize susceptibility testing performance.

Figure 1 Example of ID/AST Panel



The BD Phoenix™ combination panel is comprised of a 51 well ID side and an 85 well AST side. The ID side contains 45 wells with dried biochemical substrates and 2 fluorescent control wells for bacterial or yeast identification. The AST side contains up to 84 wells with varying concentrations of antimicrobial agents and 1 growth control well. Panels are available as Emerge, ID only, AST only, or ID/AST combination. Unused wells are reserved for future use. BD Phoenix™ panels are inoculated with an organism suspension adjusted to a specific McFarland standard. Organism suspensions must be prepared only with the BD PhoenixSpec™ Nephelometer or the BD Phoenix™ AP Instrument.

Once inoculated, panels are placed inside the instrument and continuously incubated at 35 °C. The instrument tests panels every 20 minutes: on the hour, at 20 minutes past the hour, and again at 40 minutes past the hour for up to 16 hours if necessary. BD Phoenix™ panels are read only by the BD Phoenix™ M50 Instrument. BD Phoenix™ panels cannot be read manually.

### 2.3.1.1 Organism Identification

The ID side of the BD Phoenix™ panel utilizes a series of conventional, chromogenic, and fluorogenic biochemical tests to determine the identification of the organism. Both growth-based and enzymatic substrates are employed to cover the different types of reactivity within the range of taxa. The tests are based on microbial utilization and degradation of specific substrates detected by various indicator systems. Acid production is indicated by a change in phenol red indicator color (from red to yellow) when an isolate is able to utilize a carbohydrate substrate. Chromogenic substrates produce a yellow color upon enzymatic hydrolysis of either *p*-Nitrophenyl or *p*-Nitroanilide compounds. Enzymatic hydrolysis of fluorogenic substrates results in the release of a fluorescent coumarin derivative. Organisms that utilize a specific carbon source reduce the resazurin-based indicator. In addition, there are other tests that detect the ability of an organism to hydrolyze, degrade, reduce, or otherwise utilize a substrate.

#### NOTE

A complete list of taxa that comprises the BD Phoenix™ Database is provided in [10.3 Taxa for ID/AST Determination](#). Reactions employed by various substrates and a brief explanation of the principles employed in the BD Phoenix™ Gram Negative, Gram Positive, Streptococcus, and Yeast ID reactions are described in [10.2 List of Reagents and Principles Employed in the BD Phoenix™ System](#)

### 2.3.1.2 Antimicrobial Susceptibility Testing

The AST method used by the BD Phoenix™ M50 System is a broth-based microdilution test. The system utilizes a redox indicator for the detection of organism growth in the presence of an antimicrobial agent.<sup>15</sup> Continuous measurements of changes to the indicator as well as bacterial turbidity are used in the determination of bacterial growth. Each AST panel configuration contains several antimicrobial agents with a wide range of two-fold doubling dilution concentrations. Organism identification is used in the interpretation of the MIC (Minimum Inhibitory Concentration) values of each antimicrobial agent.

#### NOTE

A complete list of taxa for which the BD Phoenix™ panels can provide AST results is shown in [10.3 Taxa for ID/AST Determination](#). The list of antimicrobial agents and concentrations available for susceptibility testing in the BD Phoenix™ System is provided in [10.2 List of Reagents and Principles Employed in the BD Phoenix™ System](#).

## Principles of BD Phoenix™ AST Tests for the Detection of Resistance Markers

The following sections outline the principles of the BD Phoenix™ AST System in the detection of resistance markers in gram-negative or gram-positive organisms, including:

1. detection of ESBL production among species of Enterobacterales;
2. detection of vancomycin resistance in *Enterococcus* species (VRE);
3. detection of high-level aminoglycoside resistance in *Enterococcus* and *Streptococcus* species (HLAR);
4. detection of methicillin-resistance in staphylococci (MRS);
5. detection of  $\beta$ -lactamase production in *Staphylococcus* species (BL);
6. detection of macrolide resistance in *Streptococcus* species (MLSb);
7. detection of *mecA*-mediated Resistance with *S. aureus* and *S. lugdunensis* (*mecA*);
8. detection of Vancomycin Resistant *Staphylococcus aureus* (VRSA);
9. detection of BD Phoenix™ Inducible Macrolide Resistance (iMLSb) in *Staphylococcus* spp.
10. detection of BD Phoenix™ high level Mupirocin resistance (HLMUPH);
11. detection of Carbapenemase-Producing Organism (CPO) detect test for Enterobacterales, *Pseudomonas aeruginosa* and *Acinetobacter baumannii*;

### BD Phoenix™ Extended Spectrum $\beta$ -Lactamase (ESBL) Test<sup>16</sup>

The BD Phoenix™ ESBL test evolved from published data of known ESBL antibiogram patterns in the current literature.<sup>18-21</sup> Selected strains of various species with known  $\beta$ -lactamase genotype/phenotypes in the family Enterobacterales, including *Escherichia coli*, *Klebsiella* species (spp.), *Citrobacter* spp., *Enterobacter* spp., *Proteus* spp., and *Serratia* spp., were used to develop the BD Phoenix™ ESBL test. The BD Phoenix™ ESBL test is based on the principle of a differential response between the inhibitory effect of selected second or third generation cephalosporins in the presence or absence of a  $\beta$ -lactamase inhibitor, clavulanic acid. The principles of BD Phoenix™ ESBL test is similar to the CLSI ESBL broth microdilution confirmatory test.<sup>22</sup> The BD Phoenix™ ESBL test is applied to *E. coli*, *K. pneumoniae* and *K. oxytoca*. When a test result of ESBL is positive, the categorical interpretation of all penicillins, cephalosporins (except cephamycins), and aztreonam on the same BD Phoenix™ panel will be changed to **R**(resistant) with BD Xpert Rule 1529.<sup>22</sup> Carbapenem results will not change for positive ESBL tests. Customers can enable specific rules to report listed drugs as tested.

### BD Phoenix™ Vancomycin Resistant Enterococci (VRE) Test

The BD Phoenix™ VRE test is based on the SIR interpretation of vancomycin. The breakpoint selected in the instrument configuration is used for the categorical interpretation. The BD Phoenix™ VRE test was developed and optimized to match the CLSI standard broth microdilution test.<sup>22, 23</sup> Selection of a breakpoint other than CLSI may result in less than optimal performance due to differences in categorical interpretations. Only *Enterococcus faecalis* and *E. faecium* with acquired resistance (*vanA* or *vanB*) will be reported as positive.<sup>22</sup>

### **BD Phoenix™ High-Level Aminoglycoside Resistance (HLAR) Tests**

The BD Phoenix™ HLAR tests for *Enterococcus* are based on the growth response in a single well containing either a high-level concentration of gentamicin or streptomycin. These tests were developed and optimized against both the CLSI standard broth microdilution and the CLSI screening agar test.<sup>22</sup> The BD Phoenix™ HLAR tests for *Streptococcus* are based on the growth response in a single well containing gentamicin, kanamycin, or streptomycin. These tests were developed and optimized using the CLSI recommended standard broth microdilution.

### **BD Phoenix™ Methicillin-Resistance in Staphylococci (MRS) Test**

The BD Phoenix™ MRS test is based on the SIR interpretation of oxacillin with *Staphylococcus* species. When an MRS test result is positive, several BDxpert Rules are designed to handle the reporting and the interpretations of all beta-lactam drugs. A special BDxpert Rule is designed to report MRS using ceftiofur results for *Staphylococcus aureus*. The surrogate drug, ceftiofur, has been validated as a better indicator for the presence of *mecA* in staphylococci. The breakpoint selected in the instrument configuration is used for the categorical interpretation.

### **BD Phoenix™ Gram-Positive β-lactamase (BL) Test<sup>16</sup>**

The BL test available in the BD Phoenix™ AST System is a nitrocefin-based β-lactamase test. The nitrocefin-based test is a direct detection method located on the ID side of the BD Phoenix™ panel. The performance of this test was established against the results of testing with BD BBL™ Cefinase™ Discs (Catalog Number 231650) as the reference method. Currently, only *Staphylococcus* species will be evaluated with these tests. When the result of BL test is positive, the categorical interpretation of all penicillinase labile penicillins on the same BD Phoenix™ panels will be changed to resistant.<sup>22</sup>

### **BD Phoenix™ Macrolide Resistance in Streptococci (MLSb) Test**

The BD Phoenix™ Macrolide Resistance test is based on SIR interpretation of erythromycin and clindamycin. The breakpoint selected in the instrument configuration is used for the categorical interpretation. Erythromycin resistant and clindamycin resistant *Streptococcus* isolates will be reported as macrolide/lincosamide/streptogramin B (MLSb) phenotype.

### **BD Phoenix™ *mecA*-mediated Resistance Marker for *Staphylococcus aureus* (*mecA*) Test**

The BD Phoenix™ *mecA* test is used to predict *mecA*-mediated resistance in *Staphylococcus aureus* and *S. lugdunensis*. The principle is similar to the CLSI-recommended Disk Diffusion test, which uses a ceftiofur (FOX) disk to predict *mecA*-mediated resistance. The performance of the test was established against multiplex PCR methods<sup>25</sup> as well as the Disk Diffusion test. With the BD Phoenix™ *mecA* test, the *mecA*-specific FOX breakpoints used for detection of the resistance marker will be configured in the instrument. When the *mecA* resistance marker is detected, the interpretations for all beta-lactam drugs on the same BD Phoenix™ panel are changed to resistant,<sup>22</sup> and the BD Phoenix™ *mecA* resistance marker is set.

### **BD Phoenix™ Vancomycin Resistant *Staphylococcus aureus* (VRSA) Test**

The BD Phoenix™ VRSA detection is based on the SIR interpretation of vancomycin when testing *Staphylococcus aureus*. The breakpoint selected in the instrument configuration is used for the categorical interpretation. The BD Phoenix™ VRSA test was developed and optimized to match the CLSI standard broth microdilution test, and verified with known VRSA isolates. Selection of a breakpoint other than those found in CLSI M100 may result in less than optimal performance due to differences in categorical interpretations. Only *Staphylococcus aureus* with true resistance (isolates containing resistance marker such as *vanA* gene) will be reported as VRSA. Strains of *S. aureus* with vancomycin intermediate results (GISA/VISA) will be identified and reported by separate BDXpert Rules. The BD Phoenix™ gram-positive AST panel detected vancomycin resistance in the VRSA *S. aureus* strains available at the time of comparative testing. The ability to detect resistance in other *S. aureus* strains is unknown due to the limited number of resistant strains available for comparative testing.

### **BD Phoenix™ Inducible Macrolide Resistance (iMLSb) Test in *Staphylococcus* species**

The BD Phoenix™ Inducible Macrolide Resistance (iMLSb) Test is used to detect inducible macrolide lincosamide-streptogramin B (iMLSb) resistance in *Staphylococcus* species. iMLSb resistance, usually encoded by *ermA* or *ermC* genes, may be either constitutive (always expressed) or inducible after exposure to a macrolide antibiotic (e.g. erythromycin, clarithromycin, etc.). The BD Phoenix™ Inducible Macrolide Resistance Test is based on the same principle as the CLSI-recommended Disk Approximation Test (D-Test) for the detection of inducible clindamycin resistance. When the BD Phoenix™ Inducible Macrolide Resistance Test result is positive, the categorical interpretation of clindamycin on the same BD Phoenix™ panel will be reported as resistant and accompanied by a separate BDXpert™ message. *Staphylococcus* isolates resistant to both erythromycin and clindamycin on initial testing will be reported as constitutive iMLSb resistance to distinguish them from isolates that are resistant to macrolides alone by efflux mechanism.

### **BD Phoenix™ high level Mupirocin resistance (HLMUPH):**

The BD Phoenix™ high level Mupirocin resistance test is based on the growth response in a single well containing 256 mcg/mL of the topical antibiotic Mupirocin that is frequently used for eradication of *Staphylococcus* colonization, particularly for nasal carriage of MRSA. The breakpoint selected in the instrument configuration is used for the categorical interpretation of Susceptible (no growth in 256 mcg/mL well) or Resistant (growth in 256 mcg/mL well). High level Mupirocin resistant *Staphylococcus* isolates will be reported as the (HLMUPH) phenotype resistance marker.

### **BD Phoenix™ CPO Detect Test**

Intended Use:

BD Phoenix™ CPO detect is a qualitative confirmatory test that uses a growth-based algorithm intended to phenotypically detect carbapenemase production in Enterobacteriales, *Pseudomonas aeruginosa*, and *Acinetobacter baumannii* on gram-negative ID/AST or AST only BD Phoenix™ panels. The test also provides the Ambler classification (Class A, Class B, and Class D) of the carbapenemase produced. One of three test configurations is available per panel for carbapenemase detection with or without Ambler classification for the target organism groups. BD Phoenix™ CPO detect does not report multiple classes of carbapenemases from a single isolate.

**Description:**

Carbapenem non-susceptibility among Enterobacterales, *Pseudomonas aeruginosa*, and *Acinetobacter baumannii* can result from two main mechanisms: production of a  $\beta$ -lactamase (carbapenemase) or production of a  $\beta$ -lactamase (cephalosporinase or ESBL) coupled with decreased permeability through porin mutations.<sup>1, 2</sup> Worldwide, the most common Ambler classification of carbapenemases with corresponding genes in the Enterobacterales are: Class A (*blaKPC*), Class B (*blaNDM*, *blaVIM*, *blaIMP*), and Class D (*blaOXA-48*).<sup>2</sup> The most common in *Pseudomonas aeruginosa* are Class B (*blaVIM* and *blaIMP*).<sup>3, 4</sup> The most common in *Acinetobacter baumannii* are Class D (*blaOXA-23*, *blaOXA-24*, *blaOXA-58*).<sup>2, 5</sup>

The BD Phoenix™ CPO detect test uses the principles of Ambler-class specific  $\beta$ -lactamase inhibition and Ambler-class specific antibiotic resistance to detect the presence of a carbapenemase and to derive the Ambler class of the carbapenemase. In some isolates, the presence of multiple resistance mechanisms, including more than one carbapenemase, may result in a “CPO Positive” test result with no Ambler classification (i.e., “unclassified”).

Test performance was established utilizing multiple reference methods, which included, but was not limited to, the modified Carbapenem Inactivation Method (mCIM), MIC Screen (utilizing carbapenem threshold values), and multiplex PCR testing. Multiplex PCR testing for Enterobacterales included *blaKPC*, *blaNDM*, *blaIMP*, *blaVIM*, and OXA-48-like genes. Multiplex PCR testing for *P. aeruginosa* and *A. baumannii* included *blaKPC*, *blaNDM*, *blaIMP*, *blaVIM*, OXA-23-like, OXA-24-like, OXA-48-like, and OXA-58-like genes.

The test is offered on BD Phoenix™ gram-negative panels in one of three configurations:

- CPO 2 well configuration – provides detection of carbapenemase-producing organisms (CPO) in Enterobacterales, *Pseudomonas aeruginosa*, and *Acinetobacter baumannii*.
- CPO 6 well configuration – provides detection of carbapenemase-producing organisms (CPO) in Enterobacterales, *Pseudomonas aeruginosa*, and *Acinetobacter baumannii* and Ambler classification of the carbapenemase in Enterobacterales.
- CPO 9 well configuration – provides detection and Ambler classification of the carbapenemase in Enterobacterales, *Pseudomonas aeruginosa*, and *Acinetobacter baumannii*.

**References for BD Phoenix™ CPO detect test**

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## 2.4 System Overview

### 2.4.1 Instrument Optical System and Drive Mechanism

Other than the incubation blower and electronics cooling fan, the cylindrical carousel and its drive are the only moving parts within the main instrument incubation bay. The carousel is divided vertically into two tiers, each of which functions as an independent optical source and detection system for panels placed on that tier. Each tier has its own microcontroller to control data acquisition and transmission. The two microcontrollers communicate with the central processor over a serial communications link. The carousel speed, acceleration and deceleration are controlled by the central processor.

Visible illumination in the red, green and blue spectral regions for each tier is provided by a Light Emitting Diode (LED) source board (see [Figure 17 Station Indicators](#)). The LED source currents are programmable in order to compensate for signal loss at the panel extremes due to parallax and other factors. A source monitor system averages signal from two onboard photodiodes to monitor visible source output. UV (ultraviolet) LEDs provide UV excitation for fluorescent measurements.

For detailed information see [3 System Components](#).

### 2.4.2 Carousel Assembly

The Carousel Assembly is a cage-like structure comprising of aluminum rings and vertical ribs bolted together to form a circular cylinder. The carousel has 52 panel holders in two tiers, where each tier has one normalizer panel and 25 sample panels. The carousel rotates counterclockwise. Following a door closure, an inventory scan is performed to identify panels within the instrument.

Under normal conditions, the carousel is driven at either 1.0 RPM or 2.0 RPM for the current/ongoing operation. During panel location, it can rotate at up to 10.0 RPM. A complete test cycle requires 7 minutes.

### 2.4.3 Incubation System

The Incubation System maintains the carousel, panel carriers, and panels at a constant nominal temperature of 35 °C. The system is a recirculating forced-air convection design. There is a single filter to remove dust from the electronics bay. The system consists of a cross-flow/ incubation blower powered by a brushless DC motor, a resistance style heater bar with automatic over-temperature shut-off, thermoformed inlet and return ductwork, and a user-replaceable polyester fiber air filter.

### 2.4.4 Panel Status and Internal Barcode Scanner Assembly

Panel Status is indicated by red, green, and amber LEDs mounted on a panel behind the carousel that shine through the light pipes and panels. Eight panel carriers are exposed when the instrument door is open. See [Figure 17 Station Indicators](#).

Two barcode scanners, one for each tier, are located inside of the carousel. These scanners read the BD panel sequence barcode located on the back top of the BD Phoenix™ panel.

## 2.4.5 External Barcode Scanner

The external barcode scanner can be used to read barcoded accession numbers that have been placed on the panels, as well as the panel's own sequence number barcodes. The accession barcodes can be used to link specimen identification information to specific panels in the instrument.

Figure 2 External Barcode Scanner



### NOTE

The placement of customer barcode labels must not interfere with panel reading.

## 2.4.6 Panel Overview

The BD Phoenix™ panel is available in four formats: Emerge™, ID only, AST only, and combination ID/AST testing. The “pour and seal” serpentine design is optimized for safety and leak-resistance. Each well in the disposable contains approximately 50 µL of inoculum in an environment that prevents significant evaporation during the course of incubation.

Figure 3 Components Used for Panel Inoculation



**Table 1 Components Required for Panel Inoculation**

Panel Inoculation Components	
Number	Description
1	ID and AST broth tubes
2	Panels
3	Empty Inoculation Station

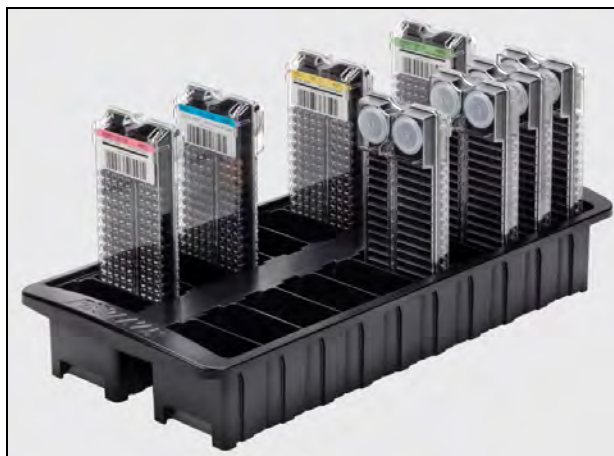
A Panel inoculation station holds six tubes of broth (ID, AST) and three panels held at an angle of 24° in order to provide proper gravity-driven inoculum flow through the panel. See [Figure 4 Panel Inoculation Station](#).

**Figure 4 Panel Inoculation Station**



A Panel Transportation Caddy is a molded plastic tray used to transport filled and sealed BD Phoenix™ panels from the preparation bench to the BD Phoenix™ M50 Instrument. The caddy capacity is 20 panels. See [Figure 5 Panel Transportation Caddy](#).

**Figure 5 Panel Transportation Caddy**



## 2.4.7 Testing Overview

After the panels are loaded into the carousel, and the door is closed, the instrument reads the panel barcode labels, and performs a scan using the red LEDs. Here, it is determined if panels are actually present in the holders, and well positions are mapped and located. Panel reading occurs immediately after the test cycle begins and readings are taken every 20 minutes for up to 16 hours. The instrument test sequence begins with the system checking that the door is locked and the current time is read. Tiers perform dark readings, then the UV LEDs are turned on and allowed to warm up. UV readings are then taken for one complete revolution. The UV LEDs are turned off. Next the red LEDs are turned on, allowed to warm up, and red LED readings are taken. Then the green LEDs go through the same sequence. Finally, the blue LEDs go through this sequence.

If the test cycle completes successfully, the time is recorded and saved.

A successful test cycle occurs when there are no carousel errors and the user does not preempt the test by initiating any of the following operations:

- Load Panels
- Unload Panels
- Locate Panel

When the user initiates these operations, the current time is compared to the last test cycle's start time. If 30 minutes or more have not elapsed, the requested operation (for example: Load Panels, Unload Panels) is performed.

If more than 30 minutes have elapsed since the last test cycle's start time, the user must allow the test cycle to successfully complete before starting an operation (Load Panels, Unload Panels, or Locate Panel). The Panel In/Out indicator is off and a "cannot get into instrument" tone sounds when a panel operation is requested.

After each test:

- The summary counters on the Status screen are adjusted to indicate current statuses
- Panels/records that require user action have a Needs Attention set
- System alerts are reported in the System Alerts list
- Auto Association occurs

The screen displays the icon below when a panel test is taking place. The number next to the icon indicates the number of minutes remaining in the test cycle.



## 2.4.8 Normalizers

Normalizers serve as reference panels for adjustment of the instrument's optical detection system and they are used for adjustment of the LEDs (red, green, blue and UV). For Red, Green, and Blue correction, data from the normalizer panels are used to correct for variations in optical channel gain and to compensate for well-to-well parallax. Raw signals are source monitor corrected and then ratioed to the value of the corresponding well of the normalizer panel. This ratio is multiplied by a correction factor, which is the expected transmittance level of the normalizer, to scale the resultant values. The UV signal from the Normalizer is used to ensure that the UV intensity reaching the panel is within the acceptable range for proper interrogation of the fluorescent ID substrates on the BD Phoenix™ panel. If the UV level is either too high or too low at the Normalizer, a UV adjust is performed at the next time period when there are no ongoing panels. Extreme deviations from the normal UV signal will cause a system alert, resulting in the aborting of panels in the offending tier(s), followed by an attempt to perform a UV adjustment.

A system alert will occur before expiration to allow for scheduling replacement. When the number of days before normalizers are set to expire are less than 60 and more than 30, the alert appears once every week. When only 30 days are left for the normalizers to expire, the message appears every day.

The normalizer panels are always located in station number 0 of each tier. These panels are not presented to the user during normal workflow operations. The normalizer panel is constrained in its carrier to prevent inadvertent removal.

### Automatic Adjustment of Light Sources

Automatic light source adjustment attempts to bring normalizer readings within acceptable ranges. It is performed when the instrument is:

- warmed up
- idle
- there are no ongoing panels

UV and RGB light source adjustment process prohibits access to the instrument for activities such as entering panels into unaffected tiers, removing panels, and performing maintenance checks.

Based on the results of the system's Built-In-Test (BIT), as well as time and power cycling factors, the system is capable of detecting if readings from the ultraviolet (UV) and visible light sources (testing LEDs) are out of tolerance. There are two main levels to this condition:

1. The deviation is great enough that panel results are invalidated (panel testing for the tier is aborted), the tier's stations are blocked and an automatic light source adjustment is performed as soon as all panels in the instrument complete testing.
2. The deviation is within limits that do not affect panel results; however available stations are blocked; as soon as all panels on the tier complete testing or are removed, and an automatic light source adjustment is performed.

If any of the above conditions occur, E type error codes, and sub-codes will provide information for each of the tiers.

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## 2.5 Safety and Precautions

For in vitro diagnostic use.

All patient specimens and microbial cultures are potentially infectious and should be treated with universal precautions. Please refer to CDC manual *Biosafety in Microbiological and Biomedical Laboratories*, 5th Edition, 2009, as well as other recommended literature.

Panels once inoculated should be handled carefully until placed in the instrument.

### 2.5.1 Summary of Cautions and Warnings

- Protection provided by this equipment may be impaired if the equipment is used in a manner not consistent with the instructions in this manual.
- Due to the size and weight of the BD Phoenix™ M50 Instrument, two people are required to lift the instrument in the absence of mechanical lifting devices.
- All system users should become thoroughly familiar with all controls and indicators before attempting to operate the instrument.
- Observe established precautions against microbiological hazards throughout all procedures. All specimens should be handled according to CDC-NIH recommendations, CLSI guidelines, or local institution guidelines for any potentially infectious human serum, blood, or other body fluids. Prior to discarding, sterilize specimen containers and other contaminated materials by autoclaving.
- In addition to wearing gloves, the use of disposable lab coats or gowns and protective glasses or goggles is recommended when working around the instrument.
- The instrument door is electromagnetically latched and is controlled by the instrument software. Never attempt to defeat the door latching mechanism, or to open the door when the unlocked icon is not displayed. Serious injury can be caused by the rotating carousel manually. If the carousel is not completely stopped when the door is opened, immediately contact BD for service. Never attempt to rotate the carousel manually or serious injury may result.
- When the system displays alerts and errors, immediately respond to the condition.
- All maintenance and repair other than the procedures described in [7 Maintenance](#) must be performed by qualified service personnel. Non-compliance with this warning may result in personal injury or instrument malfunction.
- All portions of the body that could possibly come into contact with the affected instrument surfaces must be completely covered before beginning the decontamination process.
- If any error sub-codes other than those listed here appear, note the sub-code and contact BD for assistance.
- If the recommended corrective actions do not solve the problem, contact BD.
- Dispose of all used reagents and any other contaminated disposable materials following procedures for infectious or potentially infectious waste. It is the responsibility of each laboratory to handle solid and liquid waste according to their nature and degree of hazardousness and to treat and dispose of them (or have them treated and disposed of) in accordance with any applicable regulations.

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## 3 System Components

This section describes the following components and functions:

- [3.1 BD Phoenix™ M50 System](#)
- [3.2 Navigating Touchscreen Fields](#)
- [3.3 Switches, Ports, Buttons, and Panels](#)

### 3.1 BD Phoenix™ M50 System

The BD Phoenix™ M50 System comprises several parts. The figure below describes the system in detail.

Figure 6 BD Phoenix™ M50 Instrument



The table below lists all the components of the BD Phoenix™ M50 System.

Item Number	Description
1	AIO PC
2	BD Phoenix™ M50 Instrument*
3	Barcode Scanner

\* The BD Phoenix™ M50 Instrument and the AIO PC together form the BD Phoenix™ M50 System.

#### 3.1.1 AIO PC

The All-in-one PC (AIO PC) allows you to perform all the tasks in the BD Phoenix™ M50 System. There are several control icons (see [3.3.2 All-in-one \(AIO\) PC Function Keys](#)) that you can access with the help of the AIO PC.

### 3.1.2 Printer

For an explanation of controls and indicators on the printer, refer to the manufacturer's operating instructions which is furnished separately. Note that a local printer should be connected to one of the instrument's USB ports. One printer can serve two BD Phoenix™ M50 instruments connected via one AIO PC.

### 3.1.3 Barcode Scanners

The external hand-held barcode scanner can be used to read barcoded accession numbers that have been placed on the panels, as well as the panel's own sequence number barcodes. The accession barcodes can be used to link specimen identification information to specific panels in the instrument.

To scan a barcode press the trigger on the bottom side of the scanner. A single beep indicates a successful scan. Press the trigger to scan each additional barcode.

### 3.1.4 Touchscreen Keyboard

A touchscreen keyboard is available on the AIO PC for typing data directly into screen fields. To access the touchscreen keyboard touch the field where data is to be entered. Then touch the keyboard icon that appears to expose a full-size touchscreen keyboard. When all data is entered via the touchscreen, touch the return key to close the touchscreen keyboard.

## 3.2 Navigating Touchscreen Fields

The user cannot enable or disable any field via touch. The fields are enabled/disabled by the actions taken by the user with respect to the panels. If a field is disabled, it appears grayed out as opposed to the active fields that are blue. When the user touches an active (enabled) field, the virtual keypad appears, thus allowing the user to type in data.

#### **To enter data to a field:**

1. Touch the field where you intend to enter data. The virtual keypad appears.
2. Type in the data from this keypad.
3. Touch outside the field when you are done and have saved the data.

### 3.3 Switches, Ports, Buttons, and Panels

The BD Phoenix™ M50 System has several buttons, ports, controls, indicators, and icons that will be discussed in the following sections.

#### 3.3.1 Power Switch, Inputs / Outputs, and Connector Plate

Figure 7 BD Phoenix™ M50 Connector Plate and Power Switches

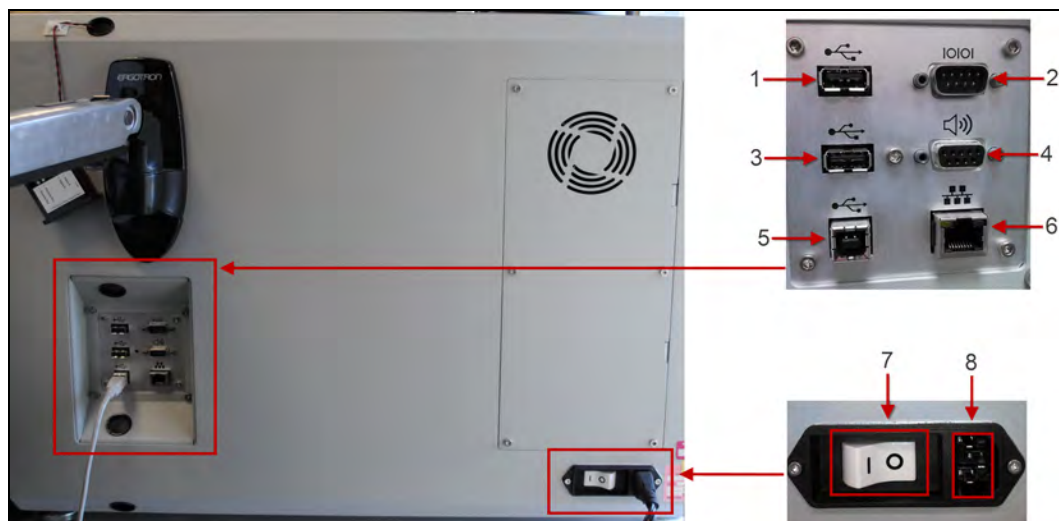


Table 2 List of BD Phoenix™ M50 Power Ports and Switches

Item Number	Description
1	USB Connector
2	Not Used
3	USB Connector
4	Remote Alarm Connector
5	USB Host Connector (to All-in-one Computer)
6	Not Used
7	Power On/Off Switch
8	Power Cord Connector

### 3.3.2 All-in-one (AIO) PC Function Keys

The AIO icons are located on the lower front portion of the PC. The control buttons can be found directly under each icon on the bottom portion of the AIO PC.

Figure 8 All-in-one Controls

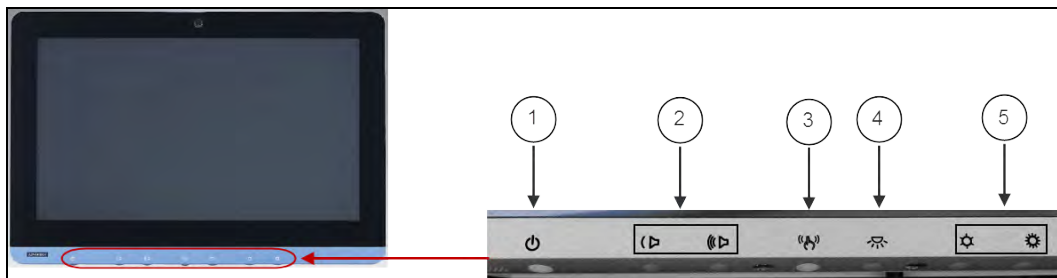


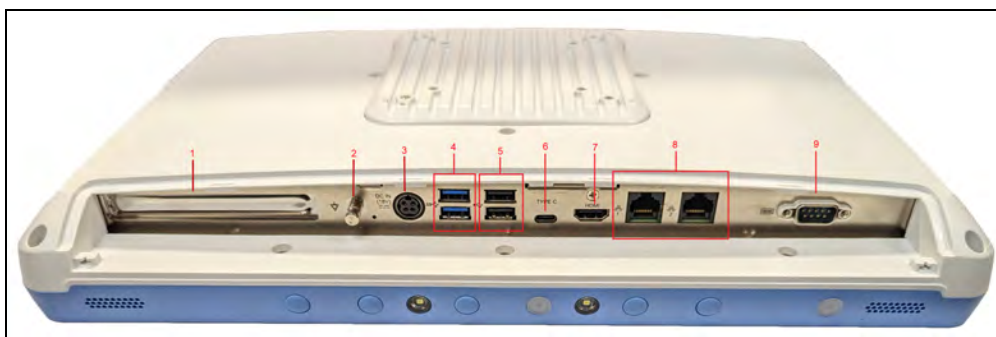
Table 3 AIO PC Function Keys

Number	Description
1	Power
2	Decrease/Increase Volume
3	Touchscreen Status Control
4	Light On/Off
5	Decrease/Increase Screen Intensity

### 3.3.3 AIO PC I/O Ports

The AIO PC has the following input output ports at the bottom:

**Figure 9 I/O Ports in the AIO PC**



**Table 4 Input/Output Ports in the AIO PC**

Item Number	Description
1	PCIe (x4) card slot
2	Equipotential Terminal Pin
3	Power DC-in
4	2 x USB 3.0 ports
5	2 x USB 2.0 ports
6	USB Type-C port
7	HDMI-out port
8	2 x Gigabit Ethernet Interfaces (RJ-45)
9	COM port

### 3.3.4 Instrument Indicators

On the right side of the instrument door, there are the following indicators:

**Figure 10 Alert Light on BD Phoenix™ M50 Instrument Door**



**Table 5 Light Indicators on BD Phoenix™ M50 Instrument Door**

Item Number	Description	Action
1	Alert Indicator	LED appearance changes
2	Panels In Button	Lights up to indicate Panel operations available or Door Latch status
3	Panel Out Button	

For more information see [4.3.1 Instrument Alert Indicator](#).

### 3.3.5 Other Indicators

Figure 11 Symbols on Body of BD Phoenix™ M50 Instrument



Table 6 Description of Indicators Used in the BD Phoenix™ M50 Instrument

Item Number	Description
1	Biohazard
2	Electrical Recycling required
3	On/Off



## 4 System Configuration and User Interface

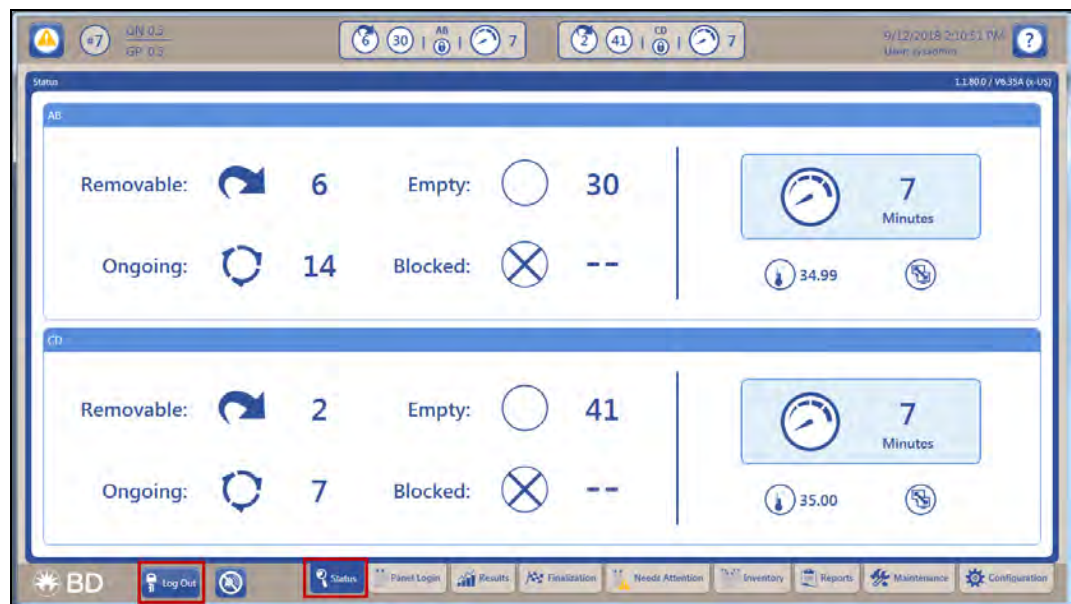
This section describes the following components and functions:

- [4.1 User Access Management](#)
- [4.2 Software Setup](#)
- [4.3 Indicators](#)
- [4.4 Isolation Mode](#)
- [4.5 BDxpert Rules](#)
- [4.6 LIS Operations](#)

### 4.1 User Access Management

In order to access **User Login**, select **Log In** on the Status screen of the BD Phoenix™ M50 Instrument application.

Figure 12 Log In changes to Log Out once logged in



When a user is logged in, the text changes to **Log Out**. The current user name is displayed in the upper right corner of application header region.

## 4.1.1 Log On

1. Select **Log In** to access the user log in screen. The user name is the full user name.

**WARNING**

**THE TECH ID WILL NOT BE ACCEPTED AS THE USER NAME FOR LOGGING IN. IF IMPROPER CREDENTIALS ARE SUBMITTED, THE SYSTEM WILL INITIATE AN ALERT AND PROMPT FOR RETRY. AFTER 5 UNSUCCESSFUL LOGIN ATTEMPTS, THE USER ACCOUNT WILL BE LOCKED.**

2. Select **Cancel** from the main screen if the user lands at this screen inadvertently or intends to exit without logging in.

**NOTE**

If the Administrator has logged in, but the screen is idle for 15 minutes, the user will be logged out and any unsaved data will be lost.

For General users (see below) this time is configurable for a span of 15 through 240 minutes in increments of 5 minutes.

## 4.1.2 User Role Summary

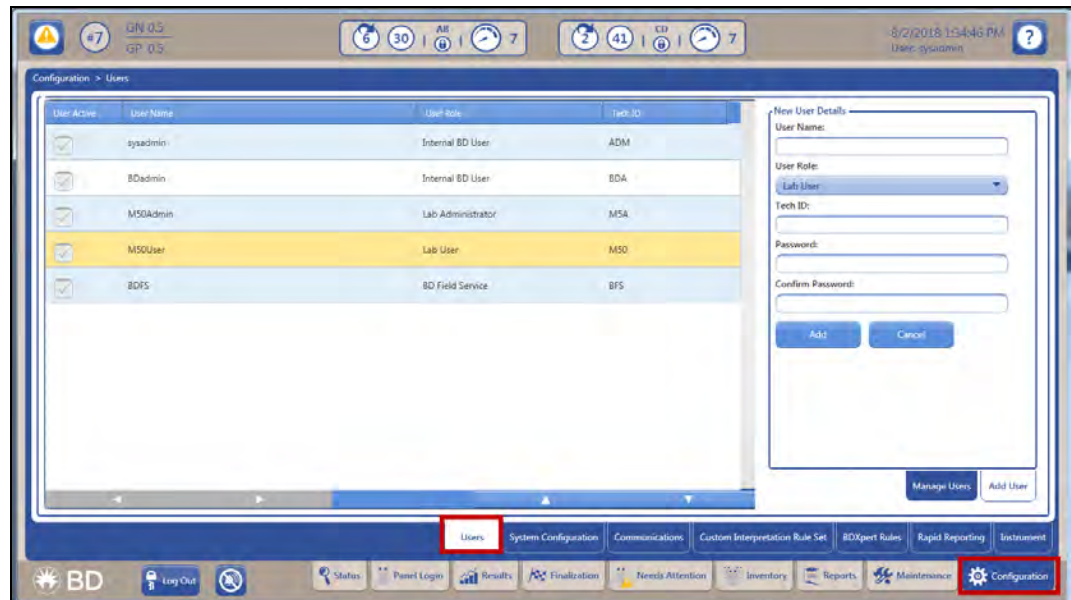
There are two types of user roles that can be assigned:

- Administrator: Lab administrator for lab location. All system functionality is accessible including system configuration. Administrators can create and delete other lab administrators and general lab users.
- General User: All system functionality is accessible except system configuration, which is read only. Users can reset their own password.

## 4.1.3 User Management

Navigate to the **Configuration** tab to access the user management features. On the Configuration screen, the **Users** tab is the first to appear on the tab list.

Figure 13 Configuration Tab Selected



### 4.1.3.1 Lab Administrator Users

Users who are at the Lab Administrator level will be able to access the full set of user management features.

A list of both active and inactive users of the system is displayed for Lab Administrators. User Details show the User ID Role, and Tech ID for the selected user.

Administrators can select a user from the list and perform one of the following actions:

- Reset a user's password.
- Deactivate/disable a user account. Deactivated User accounts still appear in the list.
- Add new users to the system.

### 4.1.3.2 General Lab Users

The only management feature available to General Lab users is the ability to change their passwords. All users must change their passwords at certain intervals.

### 4.1.3.3 To change passwords (for Lab Administrators and General Lab Users)

1. Enter the new password and enter it again in the confirm field.
2. Select **Update Password**.

NOTE

If the password is changed by an administrator or BD for an alternate user, the user will be prompted to reset their password upon initial login.

## 4.1.4 Username Management

While creating a username, the user must make sure that the username:

- contains at least 8 alphanumeric characters
- must not exceed 90 alphanumeric characters
- can have a combination of uppercase and lowercase alphabets and numbers
- can have special characters like dash(-), underscore(\_), apostrophe('), period(.)
- must not have any special character not mentioned above or two periods in a row

## 4.1.5 Password Management

Each account has a password cache of the last 10 passwords used.

### To change password:

1. Enter the new password and enter it again in the confirm field.
2. Select **Update Password**; the password has been updated.

### 4.1.5.1 Password Management Criteria

The password that the user creates must have:

- a minimum of 8 and a maximum of 100 characters appropriate for the selected language
- at least 1 lowercase and 1 uppercase alphabet
- at least 1 number and
- at least 1 special character [dash(-), underscore(\_), apostrophe('), period(.)]

NOTE

Passwords cannot have two periods in a row.

It must be remembered that:

- The user will not be allowed to reuse the 10 most recent passwords.
- Every 120 days, the password must be changed and the user will receive a notification for the same, each day, for 15 days prior to the due date.
- In case the password has been created by the system administrator, the user must change the password after the first login.

**WARNING**

**USERS MUST CHANGE THE FIRST PASSWORD AFTER THEIR FIRST LOGIN;  
THIS PASSWORD WILL BE VALID FOR THE NEXT 120 DAYS.**

## 4.1.6 Log Off

1. Select **Log Out** from the Status screen; a confirmation will appear verifying that the user wishes to log out.
2. Select **Cancel** to navigate back to the main application screen to remain logged in.

## 4.2 Software Setup

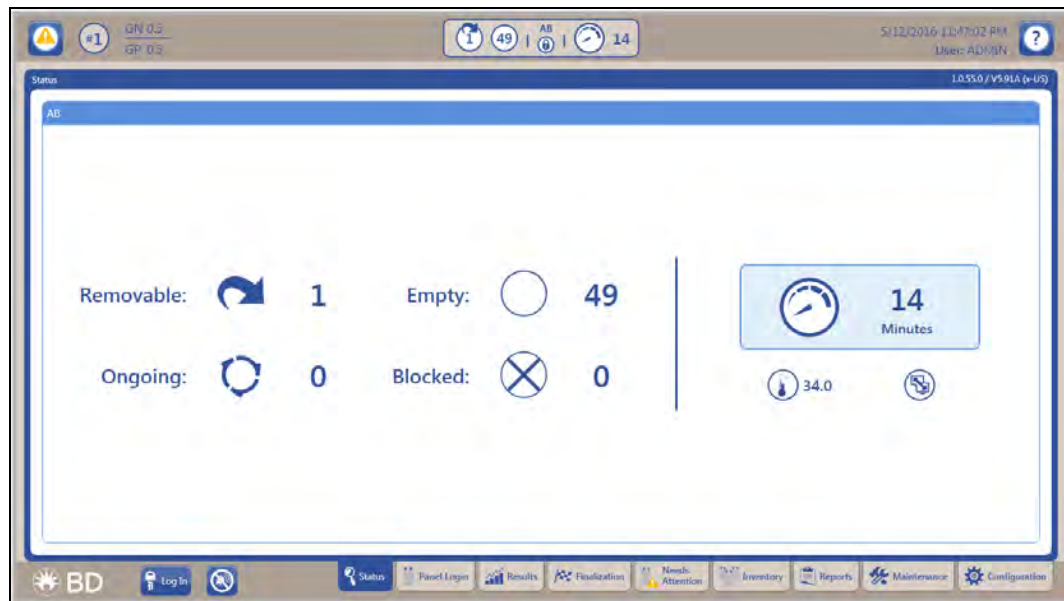
The system ships with all setup parameters preset to factory default values. However, before using the instrument for panel testing, review the setup parameters to see if they are suitable for the laboratory. When the BD Phoenix™ M50 System is connected to a BD informatics solution (i.e., BD EpiCenter™ or BD Synapsys™ Informatics Solution), features like BDxpert Rules, Custom Interpretation Rule Set and certain functions of Rapid Reporting are not available to the user.

These parameters are grouped in the following categories:

- User Management ([4.1.4 Username Management](#))
- System Configuration ([5.9.2 System Configuration Sub-Tab](#))
- Communications Configuration ([5.9.3 Communications Sub-Tab](#))
- Custom Interpretation Rule Set ([5.9.6 Custom Interpretation Rule Set Sub-Tab](#))
- BDxpert Rule Configuration ([5.3.6 BDxpert Rules Sub-Tab](#))
- Rapid Reporting Configuration ([5.9.8 Rapid Reporting Sub-Tab](#))
- Panel Lot Definition ([5.9.9 Panel Lot Definition Sub-Tab](#))

Instrument setup parameters are explained below. The Status screen, which is the default screen when no activity has been initiated, is active immediately after instrument startup, and is shown in [Figure 14 Status Screen](#). This screen's tabs are explained in detail in [5 Instrument Operations](#).

Figure 14 Status Screen



## 4.2.1 Software Updates

Software updates are user installable. Insert the BD provided USB key in the USB connector on the AIO PC. On the **Maintenance** tab, select Task Category: **Software**, Task: **Upgrade Tap Button: Execute**. The software update will be recorded on the Daily Instrument Report for reference. See [5.8 Maintenance Tab](#) for step by step instructions.

### NOTE

The local BD services department is responsible for governing the policies that are required to maintain the software of the instrument. Currently, none of the regions allow the end user to update the software in the device.

## 4.2.2 BD Informatics Solutions

The BD Phoenix™ M50 can connect to either BD EpiCenter™ data management system or BD Synapsys™ Informatics Solution, allowing a lab to consolidate ID/AST test results from one or more M50 instruments, and integrate the ID/AST results with other BD instrument solutions. Some advantages of connecting to a BD informatics solution include:

- Isolate level AST interpretation and expert rule evaluation
- Software to support and guide test preparation setup
- Workflow automation (BD Synapsys™ Informatics only)
- Patient test history for all connected platforms available to support decision making
- Single point of LIS connectivity for all instruments
- Long term data retention (BD Phoenix™ M50 is limited to 31 days of data on the instrument)
- Custom reporting and data analytics tools.

## 4.3 Indicators

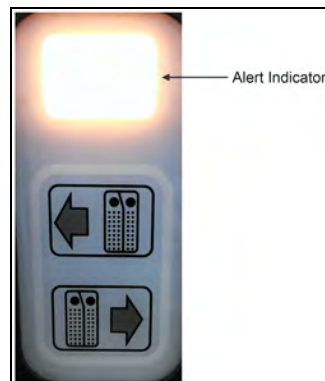
There are light and sound indicators in the BD Phoenix™ M50 Instrument along with several icons (that appear on the AIO PC) that alert the user of various conditions and status. They are:

- [4.3.1 Instrument Alert Indicator](#)
- [4.3.2 Instrument Door/Panel Button Status Indicator](#)
- [4.3.3 Audible Tones and Alarms](#)
- [4.3.4 System Alerts](#)
- [4.3.5 Station Indicators](#)
- [4.3.6 Software Icons](#)

### 4.3.1 Instrument Alert Indicator

The instrument alert indicator represents the current alert status.

Figure 15 Instrument Alert indicator



See the table below for status details.

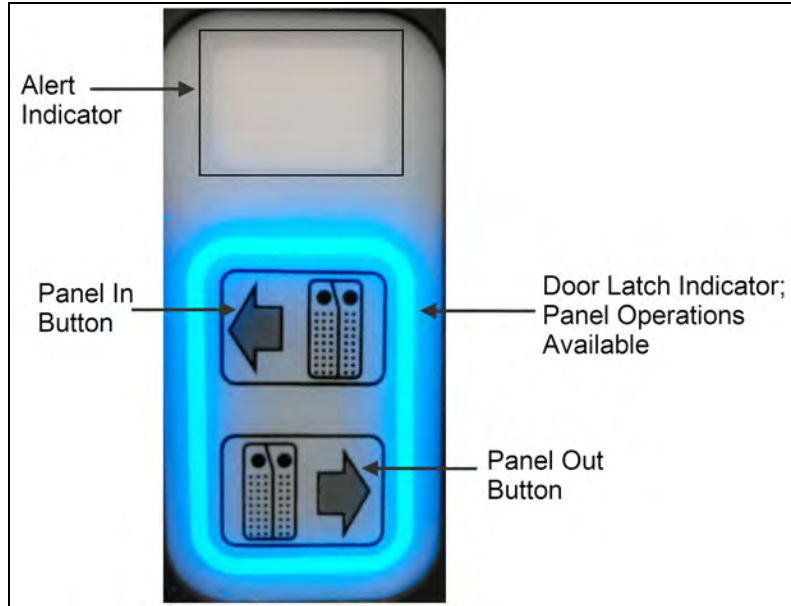
Table 7 Instrument Alert Indicator Conditions

Instrument Alert Indicator		
LED Appearance	State	Meaning
Off	No Alerts / Instrument Communicating	The instrument does not have any outstanding alerts at this time and is connected to the AIO PC.
Blinking	Instrument not connected	The instrument is not connected or it is not communicating with the AIO PC showing the instrument to be in Isolation Mode (see <a href="#">4.4 Isolation Mode</a> ).
Solid On	Instrument Alert	The instrument has outstanding alerts. Details are available via the alert screen. The instrument is connected to the AIO PC.

### 4.3.2 Instrument Door/Panel Button Status Indicator

The instrument has an indicator that provides the current panel button and door status to the user.

Figure 16 Door Status Indicator



See the table below for status details.

Table 8 Panel Indicator Description

Panel In/Out Indicator		
LED Appearance	State	Meaning
Off	Panels In/Panels Out not available	If the instrument is powered: Panels In/Panels Out are not available at this time. The door is locked and may not be opened by the user. The indicator is off when the instrument is performing an operation that may not be interrupted by a Panels In or Panels Out operation.
Blinking	The door on the instrument is unlocked	The door is unlocked and the user may open the door to access the panels.
Solid On	Panels In/Panels Out active	The Door is locked and may not be opened by the user. The user may press either the Panels In or Panels Out button.

### 4.3.3 Audible Tones and Alarms

Audible tones and alarms sound to inform the user of various operational states of the instrument. The table below provides a detailed description of such tones and alarms.

Sound	Example	Type
		<b>Informational</b>
Single short high beep	Scanning a barcode	Acknowledge
Three tones progressing from high to low ("Figaro")	In Configuration mode, the audible alert volume was adjusted	Sample audible alert
Three tones progressing from low to high	The carousel has stopped, the door can be opened	Carousel halted
Two short high beeps	The door has been completely closed and latched	Door closed
Three short high beeps	An operation has been completed	Activity completed
		<b>Alarm</b>
Short high beep then short low beep – sequence repeated four times	Incorrect barcode scanned	Activity error (volume configurable)
Single medium beep – 1 second on, 3 seconds off, repeating	Optical failure	System alert (volume configurable)
Short high beep then short low beep	The attempted action cannot be performed	Error tone
Continuous shrill trill	Door has remained open longer than 5 minutes	Door open alarm
Single low beep	A higher priority activity prevents user access to the instrument	Cannot get into instrument
Tone 1 (Medium frequency): Long beep, short beep, long beep, short beep; Tones 2 (low frequency) and 3 (very high frequency): Long beep, short beep, long beep, long beep	Critical Panel: partial results, panel completes, or ID is determined; Resistance Marker: marker has been triggered	Critical Panel/Resistance Marker notification
High pitched trill	Carousel motion is impeded	Carousel jammed

## 4.3.4 System Alerts

When the BD Phoenix™ M50 Instrument is in use, and as testing progresses, system alerts and errors may occur. Different types of alerts and errors are flagged by one or more of the following:

- E error codes (see [8.2 System Alerts \(E error codes\)](#))
- W error codes (see [8.3 Workflow Alerts \(W error codes\)](#))
- Audible tones (see [4.3.3 Audible Tones and Alarms](#))

When these errors occur, the system Alert icon appears on the LCD screen, or the instrument's System Alert indicator flashes.



The appearance of a System Alert icon in the upper left corner of the screen indicates the presence of a system alert. Touch the icon to display the System Alerts screen. This screen enables the user to review any existing system alerts that may have occurred or that may still exist in the instrument.

The list of system alerts will appear only when the user is logged in.

Touch the >> Error / Alert Messages. Detailed information about the error is provided in this space. All the E type errors are listed under E error codes (see [8.2 System Alerts \(E error codes\)](#)). The user will not be able to address or resolve all error sub-codes.

Contact your local BD service representative to resolve the errors.

## 4.3.5 Station Indicators

Each accessible station has a set of LED indicators that provide the station or panel's status. The station indicators are located in the center of the station (see [Figure 17 Station Indicators](#)) and their colors vary between green, amber, or red indicating the conditions for a given station. The table below describes the condition indicated by each color.

Figure 17 Station Indicators








Table 9 Station Indicators and Status Descriptions









Station Status Indicators	
LED Appearance	Meaning
Off	Ongoing Panel (if panel is in station) or Available Station (if station is empty)
Green	Removable Panel
Amber	Panel found using locate panel function
Red	Blocked Station (also Temperature Standard Panel)



### 4.3.6 Software Icons









\*Icon does not appear when connected to a BD informatics solution













\*\* Icon does not appear when in standalone mode






GENERAL				
				
Collapsed	Expanded	Enabled	Print	Help

STATUS SCREEN			
			
Log In/ Log Out	Silence Alarm	Status	Panel Login
			
Results	*Finalization	Inventory	Reports

ALERTS/NOTIFICATIONS			STATUS STATION	
				
*Cannot Finalize	System Alert	Special Message	Blocked Station	Empty Station

PANELS					NEEDS ATTENTION		
							
Ongoing Panel	Removable Panels, Complete	Final ID Edited, AST Result Edited	Resistance Marker	Rapid Complete	Active Alert	Not Active Needs Attention	Active Needs Attention

INSTRUMENT STATUS					
					
Door Locked	Door Unlocked	Idle	Processing Data	Warming Up	Temperature
					
Testing	Instrument Number	Light Source Adjustment (RBG, UV)	Inventory Scan	Isolation Recovery (Uploading Data)	**BD informatics solution Configured and Connected

INSTRUMENT STATUS				
				
**BD informatics solution Configured but not Connected	*LIS Configured and Connected	*LIS Configured but Disconnected	Instrument Connection Status – Connected (All-in-One PC to Instrument)	Instrument Connection Status – Disconnected (All-in-One PC to Instrument)

## 4.4 Isolation Mode

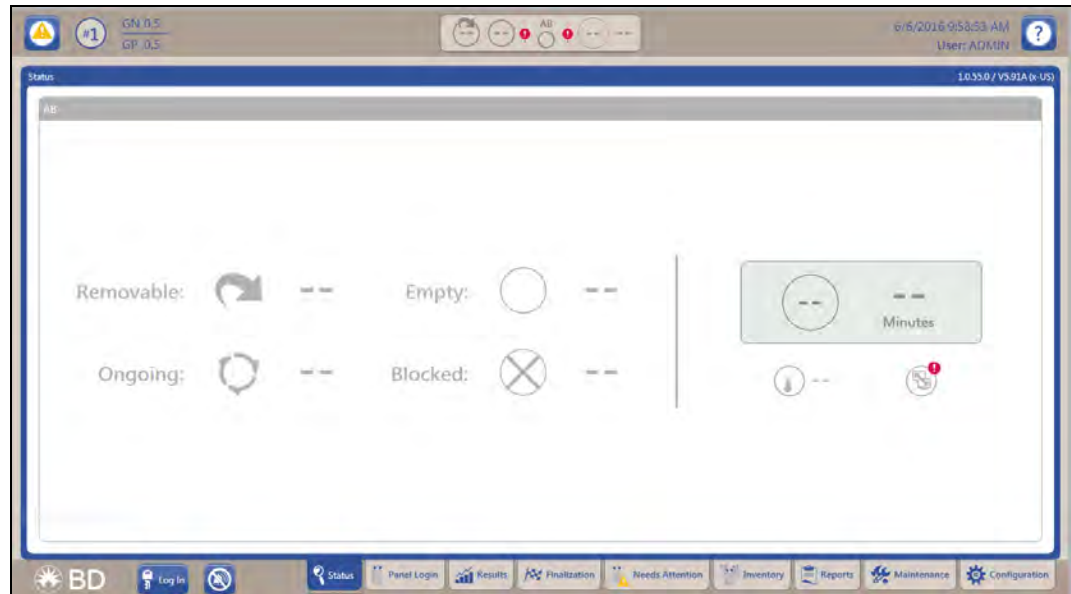
Isolation Mode is the condition that exists when communication between the BD Phoenix™ M50 Instrument and the AIO PC is lost. It is designed to allow the ID/AST system to avoid test cycle gaps when the AIO PC is temporarily disconnected from the instrument. During this time the instrument continues to collect panel test cycle data and incubate the panels.

During isolation mode, the user can log in panels. The system holds data for approximately 5 days when in Isolation Mode. Hence most routine workflows such as unloading and discarding panels (see [5.2.4 Unloading and Discarding Panels](#)) are stopped. Since panel result analysis occurs at the AIO PC, no panel results are available for completed panels while the system is in Isolation Mode.

The following conditions about Isolation Mode are related to system operation:

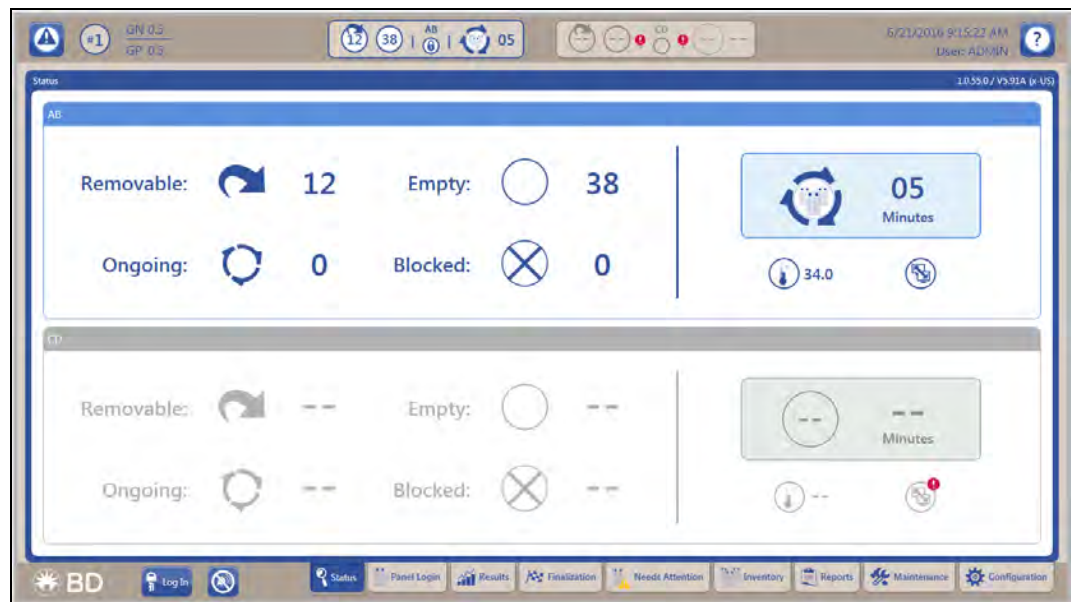
- The yellow light will blink when the instrument is in Isolation Mode (see [4.3.1 Instrument Alert Indicator](#)).
- The AIO PC displays errors when communication is lost with the instrument. On the Status screen, instrument status is not available.

Figure 18 Isolation Mode



- For a stack of BD Phoenix™ M50 instruments connected to the same AIO PC, each instrument can be in Isolation Mode independent of the other instrument.

Figure 19 Isolation Mode for One Instrument



- The AIO PC handles the transition of each instrument into and out of Isolation Mode independently.
- In Isolation Mode, when you open the instrument door, no station status indicators are lit. Routine workflow is not supported in Isolation Mode.

- The instrument and the AIO PC both return to normal operations when communication between the two is reestablished. During transition, test cycle data collected by the instrument while in Isolation Mode, is transferred to the AIO PC and processed. Panel results are evaluated at this time for all panels that are still in the instrument when recovering from Isolation Mode.

**WARNING**

**PANELS SHOULD NOT BE REMOVED OR LOADED WHEN THE INSTRUMENT IS IN THE ISOLATION MODE.**

### 4.4.1 Isolation Mode Troubleshooting

Isolation Mode can be caused by the following conditions:

- AIO PC power or communication (USB) cable disconnected
- BD Phoenix™ M50 Instrument application on the AIO PC has stopped working
- AIO PC malfunction

**To return to normal operating mode:**

1. Check the USB and power cables and reconnect if needed.
2. Reboot the AIO PC and/or instrument if necessary.

If these actions do not correct the problem, contact your local BD representative.

### 4.5 BDXpert Rules

The BDXpert™ System is a rule-based software tool that provides expert advice based on organism ID and AST results obtained by broth micro-dilution in the BD Phoenix™ System. In addition, ID/AST results obtained from other systems can be expertized via a BD informatics solution. BDXpert Rule development is based on published information available through standard organizations and current scientific literature. Reference standards organizations include:

- CLSI (Clinical and Laboratory Standards Institute)
- SFM (Antibiotic Committee of the French Society for Microbiology)
- EUCAST (European Committee on Antimicrobial Susceptibility Testing)

BDXpert Rules interpret isolate ID and corresponding Minimum Inhibitory Concentration (MIC) data to the user-selected standard. The resulting instrument report contains necessary and actionable information. Patient management is further enhanced by the application of specimen source and/or patient demographics information contained in a BD informatics solution database. Distribution of the expertized final report through the Laboratory Information System (LIS) interface facilitates timely communication to assist the clinician in selection of appropriate antimicrobial agent therapy.

Expert analysis takes place in two stages:

1. In the first stage, a susceptible, intermediate, or resistant (SIR) result is determined based on specific standard-driven interpretive breakpoints applicable for the organism ID and MIC.
2. In the final stage of analysis, the BDxpert Rule logic is applied to the SIR result. When rule logic criteria are met, the rule is triggered. The outcome is the “BDxpert interpretation” of the AST.

For more information on BDxpert Rules, refer to the following materials:

- BDxpert™ System *User's Manual*
- BDxpert™ System *Customer Release Notes*
- BD Synapsys™ instructions for use
- BD EpiCenter™ System Help

## 4.6 LIS Operations

The Laboratory Information System (LIS) communications feature enables the BD Phoenix™ M50 Instrument to exchange information with a compatible LIS. These communications can be configured to exchange Order records and Results records at a variety of times.

Order records can be downloaded from the LIS to the BD Phoenix™ M50 Instrument. These Order records can include the information listed below. If all this information is sent from the LIS, then the panel is automatically logged in just as if the login were done at the instrument. If the panel sequence number is omitted, the Order record can be associated to a specific panel manually in Panel Login. Order records can also be configured to be uploaded to the LIS.

The LIS Communications function is based on the American Society of Testing and Materials (ASTM) LIS Communications Standards (1381 and 1394), and is compatible with a number of popular LIS systems. For specific information on which LIS systems are compatible, contact your local BD representative. The LIS Vendor Interface Specification (available upon request) provides complete details on the BD Phoenix™ implementation of LIS Communications.

### NOTE

If the BD Phoenix™ M50 Instrument is connected to an LIS, it cannot be connected to a BD informatics solution. However, if the BD Phoenix™ M50 Instrument is connected to a BD informatics solution, then an LIS connection can be established via the BD informatics solution.

### 4.6.1 Results Upload Records

Results records are uploaded from the BD Phoenix™ M50 Instrument to the LIS. These records consist of:

- Header record (Delimiter fields, sender name, version number, message date/time)
- Order record (Accession number, Isolate number, Organism, Test ID, Sequence number, Priority, Report type)
- Comment record (contains Special Messages and/or BDxpert Rules)

## 4.6.2 Results Record

These records have the following information:

- Panel sequence number
- Instrument number
- Instrument type
- Instrument location (Station)
- Time to result for identification or MIC produced
- Test start time
- Test end time
- Test status (ongoing, complete, partial complete, complete with needs attention reason, complete with all ignored needs attention reasons, complete QC Pass, complete QC Review, pending, or rapid complete)
- Result type
- Antimicrobial code
- MIC value
- S / I / R / No Interp / Error value
- Resistance marker
- ID or Final ID
- Results status (finalized or unfinalized)

## 4.6.3 Key Concepts About LIS

LIS communication is able to send

- Results records from the instrument to the LIS (upload),
- Order records when panels are placed into the instrument, and
- queries to (and from) the LIS for Order records.

Results upload can be configured to include or exclude Interpretation (SIR) results. The instrument can be set up to upload Results records only when the LIS requests them (solicited upload) or at one of the following unsolicited upload times:

- when panels are finalized;
- when panels complete testing or when complete panel records change;
- when ID or AST results are determined;
- at a fixed time.

QC panels and orphan panels are uploaded only when solicited by the LIS. If the instrument is configured for unsolicited upload, it still responds to requests from the LIS for results (solicitations or queries). If the instrument is configured for unsolicited uploads, the LIS must always be ready to receive data from the instrument.

Organism Configuration and Antimicrobial Configuration enable the user to enter the specific codes required by your LIS for the organisms and antimicrobials uploaded in Results records. These functions are available only in the BD informatics solution when BD Phoenix™ M50 is connected. See [5.9.2 System Configuration Sub-Tab](#) for additional information. LIS configuration settings are independent of critical panel configuration settings (e.g., if LIS configuration is set to send results only when the panel is complete, the results are not uploaded if the panel is critical and rapid reporting configuration is set for notification on ID results or partial results).

#### **4.6.4 Routine System Operation**

The routine operations of the BD Phoenix™ M50 have very minor differences from the operations of the system when it is connected to an LIS interface. The one difference that should be noted is the ability to enter panel/accession data via the LIS into the system. With LIS communications, patient information can be logged in at the LIS and transferred to the BD Phoenix™ M50 Instrument. Consult your LIS manufacturer's operation manual for complete instructions on data entry and downloading records.

LIS systems operate either in real-time mode, where the system automatically downloads each Order as it is logged in, or in batch mode where multiple Orders in a group are logged in and downloaded by the user. After patient records are logged in, download them to the BD Phoenix™ M50 Instrument. Any data sent to the instrument that does not directly correlate to one of the fields defined as the Order record is ignored by the system. Any information sent from the LIS for a Finalized panel is rejected.

After the Order records have been downloaded, and the panels have been attached to those records, routine system operation does not differ in any way. For example, the user can continue to perform tasks such as: loading the instrument, printing reports, monitoring the system for complete panels, and performing maintenance; however, it is recommended that the user be especially alert and quickly respond to any system or activity alerts that occur.



## 5 Instrument Operations

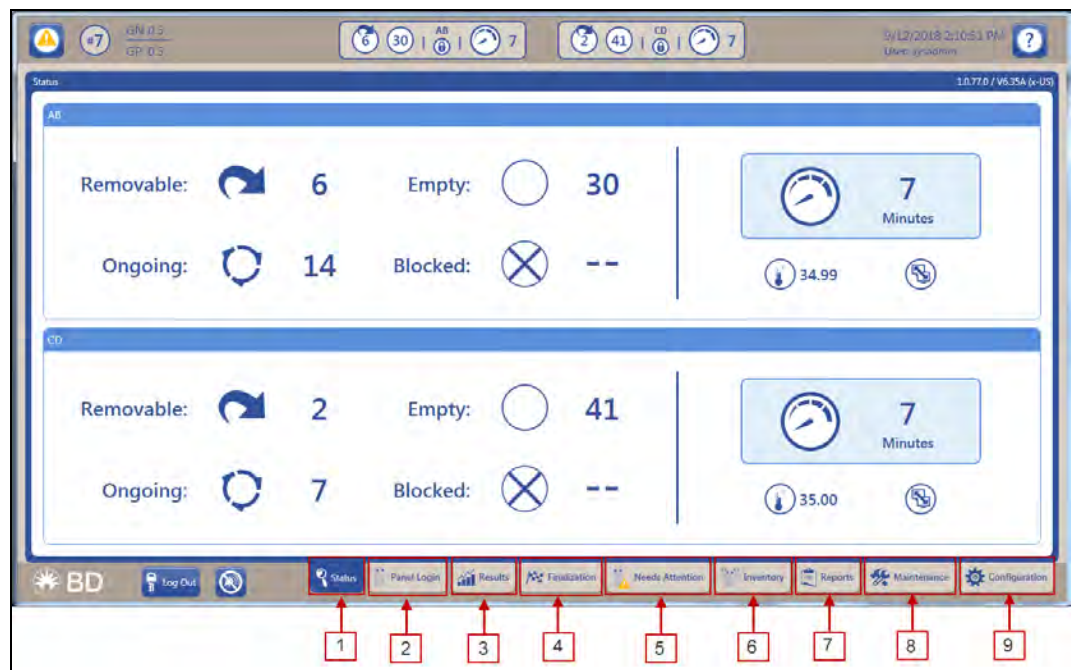
The touchscreen presents all of the information needed to:

- monitor instrument status
- log in panels
- configure the instrument
- print reports
- perform routine instrument maintenance

For more information on how to use the touchscreen see [3.2 Navigating Touchscreen Fields](#).

Operations are presented in the form of tabs which, when selected, produce functional, interactive screens, as well as icons that graphically represent the information (e.g., a thermometer indicates the current temperature). The screen's application header presents instrument status information that is updated every few seconds. The middle region of the screen initially presents station status information. Display regions are discussed in greater detail in [3.1.1 AIO PC](#).

Figure 20 Tabs available for instrument operations



**Table 10 Tab Identification**

<b>Number</b>	<b>Tab Name</b>
1	Status Tab
2	Panel Login Tab
3	Results Tab
4	Finalization Tab
5	Needs Attention Tab
6	Inventory Tab
7	Reports Tab
8	Maintenance Tab
9	Configuration Tab

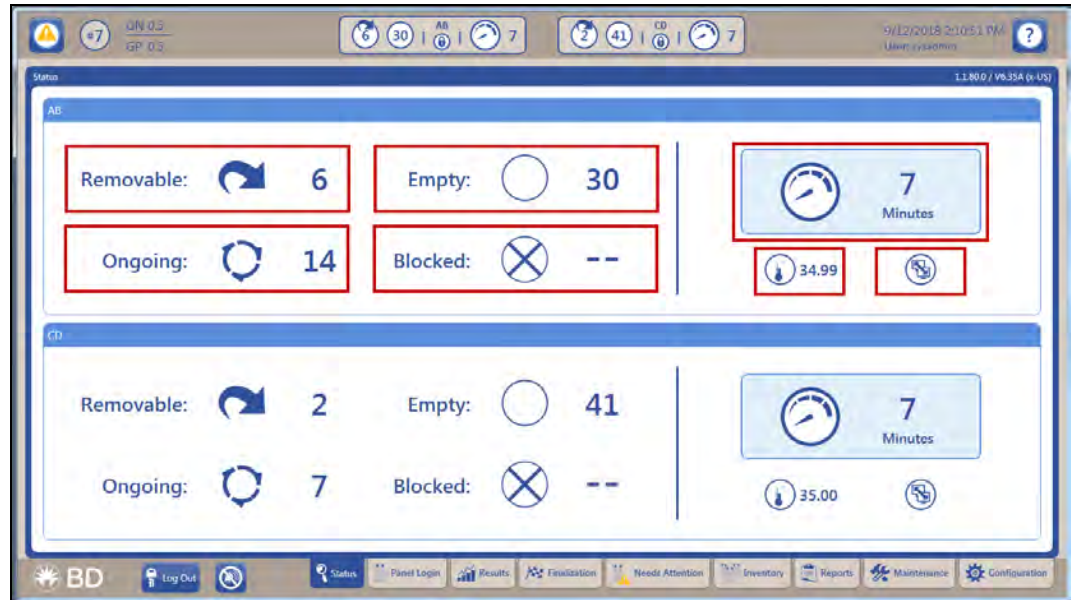
This section describes in detail the following:

- [\*\*5.1 Status Tab\*\*](#)
- [\*\*5.2 Panel Login Tab\*\*](#)
- [\*\*5.3 Results Tab\*\*](#)
- [\*\*5.4 Finalization Tab\*\*](#)
- [\*\*5.5 Needs Attention Tab\*\*](#)
- [\*\*5.6 Inventory Tab\*\*](#)
- [\*\*5.7 Reports Tab\*\*](#)
- [\*\*5.8 Maintenance Tab\*\*](#)
- [\*\*5.9 Configuration Tab\*\*](#)

## 5.1 Status Tab

The status tab shows the status for each configured instrument and displays the following information:

**Figure 21 Status Screen Description**



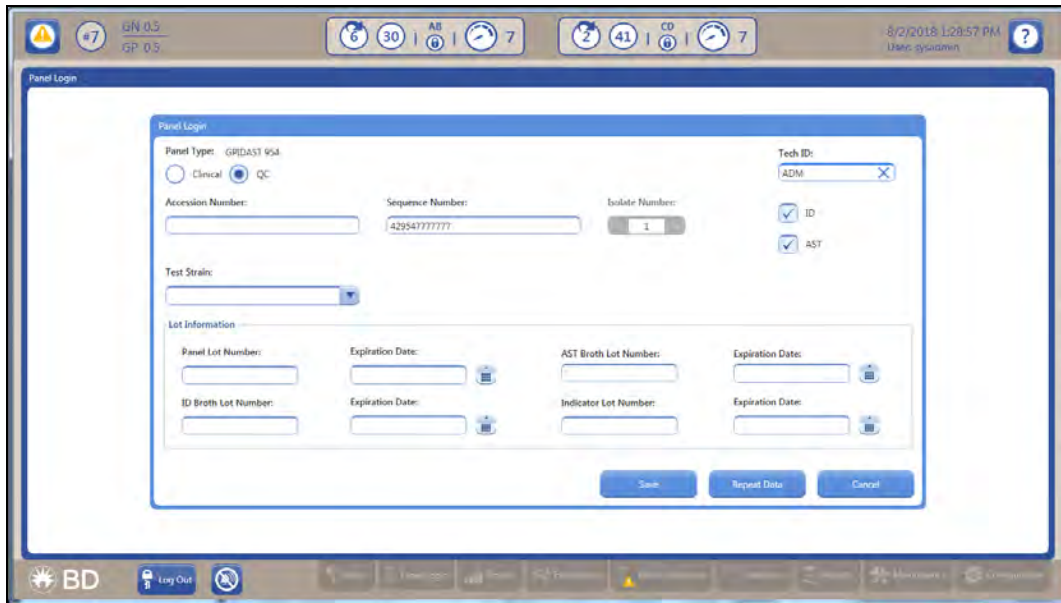
**Table 11 Status Screen Description**

Item Number	Name	Description
1	Removable	number of panels ready for removal
2	Ongoing	number of panels in testing progress
3	Empty	number of empty panels
4	Blocked	available stations that cannot be used due to the presence of a temperature panel or due to a system error.
5	Time	time remaining for test cycle time or remaining until the start of the next test cycle
6	Temperature	incubator temperature
7	Connection status	status of AIO connection to instrument

## 5.2 Panel Login Tab

The Panel Login tab enables the user to log in panel and demographic information. Depending on the type of panel being used, not all fields listed below may appear on the screen. For information on logging in QC panels, see [5.2.2 Logging in Panels](#). More than one of the same panel type may be logged in for an accession number, but the system displays a notification for duplication with an activity error message.

Figure 22 Panel Login Tab



### 5.2.1 Panel Login Fields

#### Accession Number

Type in or scan an accession number, up to 20 alphanumeric characters. If the accession barcode was scanned to access Panel Login, the Accession Number is completed automatically. Spaces at the beginning or end of the number are ignored, but spaces within the number are valid. The following characters CANNOT be used in accession numbers: \* ? [ ] ! # |. The accession barcode may not both begin with the numbers “42” OR “5” AND be 12 digits long, which is the format of a panel sequence barcode. Accession number is not required for QC panels.

**NOTE**

Characters that are greater than ASCII code 256 (e.g., Japanese, Korean characters) are not accepted and are considered invalid. Users will receive a notice when they enter invalid characters.

**Sequence Number**

Type in or scan the panel's sequence number. (If the Sequence Number was scanned to access Panel Login, this field is completed automatically.) The sequence number contains digits that identify the panel type. Valid sequence numbers are 12 digits long and must conform to BD panel sequence number specifications. Enter a panel sequence number to save a record. If an existing sequence number is entered, the system displays the Panel Results screen.

**Isolate Number**

Default isolate number is 1. Valid isolate numbers are 1 to 20. If an accession number has been entered, an isolate number must also be entered. If the isolate number is changed from 1 to another value, an accession number must be entered. Isolate number is not required for QC panels.

**Critical Checkbox**

By default the Critical checkbox is disabled. The system can be configured ([5.9.8 Rapid Reporting Sub-Tab](#)) to provide a notification of critical panel results (ID results obtained, partial panel results, or complete panel results) by sounding an audible alarm and/or printing a Lab Report automatically (or neither).

**ID Checkbox**

By default, the ID checkbox is enabled if a combination panel sequence number is scanned. This field appears only when a combination panel is used.

**AST Checkbox**

By default the AST checkbox is selected if a combination panel sequence number is scanned. This checkbox appears only when a combination panel is used.

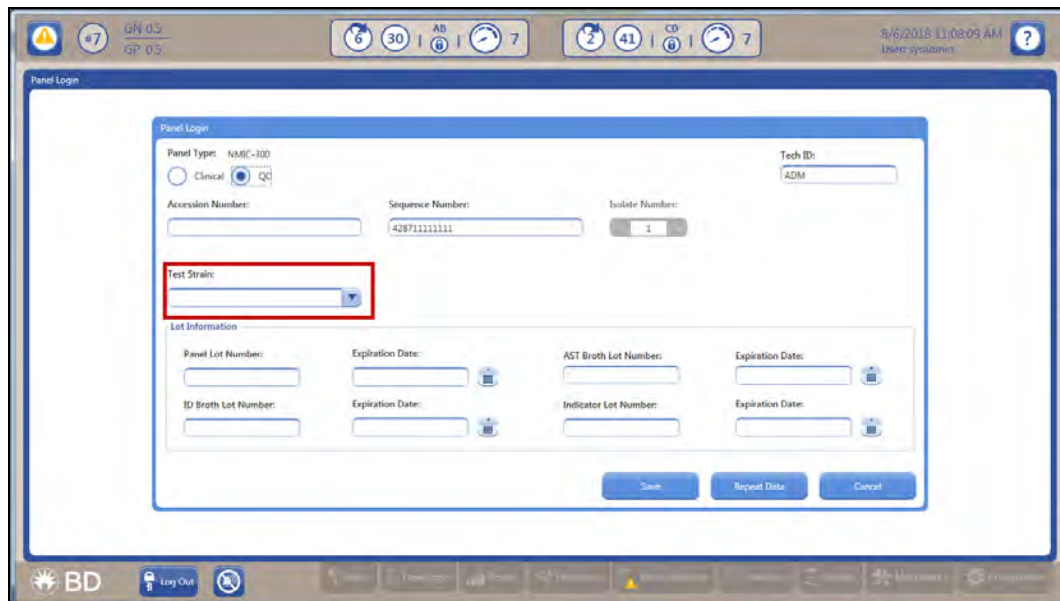
**Organism ID/Test Strain**

Use the drop-down list to select the organism ID. Organisms are listed in alphabetical order. Enter the first few characters of the organism name to jump to that portion of the list quickly.

This field appears only for AST-only panels or when using the AST side of a Combination panel.

For QC panels, this field is named Test Strain, and lists only the strains of organisms predefined in the database, sorted by strain number (alphanumerically). A test strain must be entered to save a QC panel.

Figure 23 Test Strain ID for QC Panels in Panel Login



**Tech ID**

This field appears for QC panels. Enter the identification for the technologist performing the QC test. Up to three alphanumeric characters are accepted. A tech ID must be entered to save a QC panel.

**NOTE**

If the user login has been created with a tech ID, this field will be auto-populated with the tech ID of the logged in user.

**Panel Lot Number**

This field appears for QC panels. Type in or scan the panel's lot number. Lot numbers must be seven digits. A lot number must be entered to save a QC panel. (When the QC Lot Support feature is enabled, this field is completed automatically when the Sequence number barcode is scanned.)

**Expiration Date (Panel Lot)**

This field appears for QC panels. An expiration date must be entered to save a QC panel. (When the QC Lot Support feature is enabled, this field is completed automatically when the Sequence number barcode is scanned.)

**NOTE**

If a BD informatics solution is enabled, the Panel Lot Number and the Expiration Date fields will not be displayed. However, the other lot number fields will be available.

**ID Broth Lot Number**

This field appears for QC panels. Type in or scan the broth lot number. Lot numbers can be up to seven characters.

**Expiration Date (ID Broth)**

This field appears for QC panels. An expiration date must be entered to save a QC panel.

**AST Broth Lot Number**

This field appears for QC panels. Type in or scan the broth lot number. Lot numbers can be up to seven characters.

**Expiration Date (AST Broth)**

This field appears for QC panels. An expiration date must be entered to save a QC panel.

**Indicator Lot Number**

This field appears for QC panels. Type in or scan the indicator lot number. Lot numbers can be up to seven characters.

**Expiration Date (Indicator Lot)**

This field appears for QC panels. An expiration date must be entered to save a QC panel.

## 5.2.2 Logging in Panels

The inoculum density of the panel is set in Configuration. The density setting cannot be changed during Panel Login. The only way to use a different inoculum density is by blackening well A-17 as described in [6.2 Preparing Panels](#).

In order to ensure optimal system performance for Yeast ID panels only, select the correct media type from the drop-down menu or use the default media setting. The media type selection only applies to Yeast ID panels and is not displayed for other panel types. Log the panel into the instrument as follows:

1. Select the **Panel Login** tab.
2. Select **Clinical**.
3. To receive a special notification (audible alarm and/or automatic printing of a Lab Report) when panel results are obtained (ID only, partial, or complete), select **Critical**. More information about critical panels is provided in [5.9.8 Rapid Reporting Sub-Tab](#).
4. In the Accession Number field, type in or scan an accession number.
5. In the Sequence Number field, type in or scan the panel's sequence number.
6. In the Isolate Number field the default isolate number is 1. Type in the isolate number, or touch the **+/-** to increase/decrease the number. Valid isolate numbers are 1 to 20. Enter an isolate number if an accession number has been entered.

7. For Yeast ID panels, the user must specify a media type in the Media field. If a media type has not been specified, a workflow error is generated when the user attempts to save the panel. If a Yeast ID panel is not logged in before placing it in the instrument for testing, the panel aborts after the first reading because no media has been specified. A default media type can be configured (see [5.9.2.2 OPTIONS](#) under [5.9.2 System Configuration Sub-Tab](#)) which appears when a Yeast ID panel sequence number is scanned during login. Select a different media from the drop down menu, where all media types (abbreviations sorted alphabetically) are listed.
8. If either the ID or AST portion of a combination panel is only being used, disable the part of the panel you are not using.
9. If the user disables ID on a combination panel, or if an AST-only or BD Phoenix™ Emerge™ panel is not being used, the Organism ID field appears. If the system is not performing the organism identification, an organism ID for SIR interpretation must be provided. (If an AST panel is being tested and an organism ID is not entered, the panel will go to **Needs Attention** when the instrument completes reading. An organism ID will have to be provided in order for the BDXpert™ System to interpret MIC results.) Highlight the desired organism from the drop-down box. Organisms are listed in alphabetical order. Enter the first few characters of the organism name to move up to that portion of the list quickly. Select the desired organism. The desired organism can also be scanned from the barcode list of organisms found in the Quick Reference Guide.
10. Select **Save** to save the information.
11. Place the panel in the instrument (see [5.2.3 Inserting Panels in the Instrument](#)). The user can perform the following functions from Panel Login:
  - Save** – to save the information displayed
  - Repeat Data** – enter the last accession number and media types for panels, or media type and lot information for QC panels as follows:
    - if QC Lot Support is disabled (Panel Lot plus Expiration, ID Broth Lot plus Expiration, AST Broth Lot plus Expiration, Indicator Lot plus Expiration),
    - if QC Lot Support is enabled (ID Broth Lot plus Expiration, AST Broth Lot plus Expiration, Indicator Lot plus Expiration)
  - Cancel** – to clear the displayed record from the screen

## 5.2.3 Inserting Panels in the Instrument

Insert the panel with the sequence barcode label and reaction wells side facing the interior of the instrument.

1. Select **Panel In.** (see [Figure 24 Inserting Panels](#)).
2. When the blue light is blinking on the door, open the instrument door. An audible tone will sound and the unlock icon will be visible.



### WARNING

- **THE INSTRUMENT DOOR IS ELECTROMECHANICALLY LATCHED AND IS CONTROLLED BY THE INSTRUMENT SOFTWARE.**
- **NEVER ATTEMPT TO DEFEAT THE DOOR LATCHING MECHANISM, OR TO OPEN THE DOOR WHEN THE DOOR LOCKED ICON IS DISPLAYED.**
- **IF THE CAROUSEL IS NOT COMPLETELY STOPPED WHEN THE DOOR IS OPENED, IMMEDIATELY CONTACT BD FOR SERVICE. NEVER ATTEMPT TO ROTATE THE CAROUSEL MANUALLY OR SERIOUS INJURY MAY RESULT.**

3. Select a panel holder where there is no panel in place and no LEDs are illuminated. Place the bottom part of the panel in the panel holder.
4. Press downward.
5. Pivot the top of the panel back into the panel holder.
6. Allow the panel and spring clip to move upward into place.
7. Close the instrument door. If more panels need to be inserted than there are available holders in the current section, close the door, and wait for a moment for the carousel to rotate to provide additional available holders and repeat **Steps 2 through 7**.
8. The system performs an inventory scan to locate any newly inserted panels and reads the barcodes of these panels.

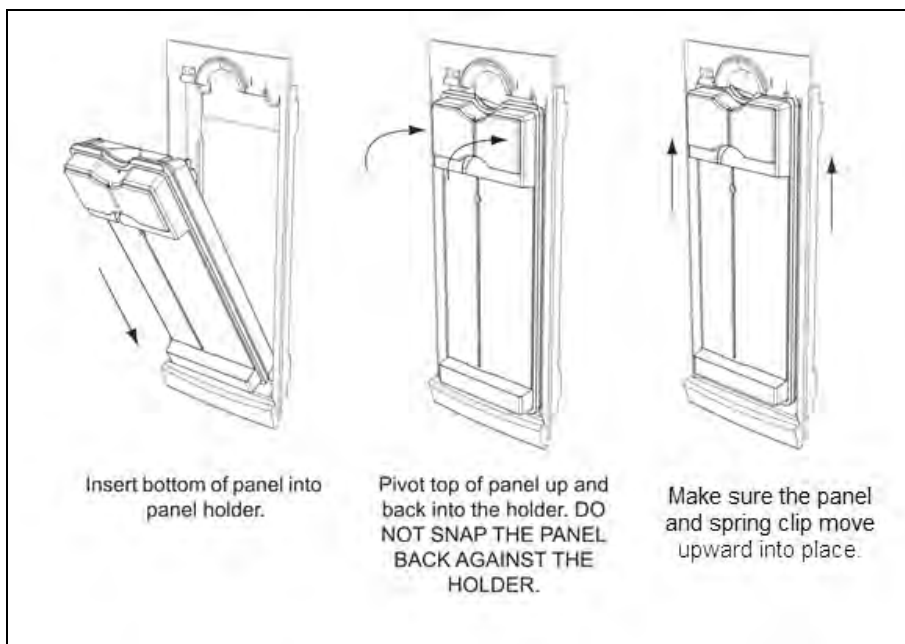
### NOTE

Do not snap the panel back into the holder. This may result in splashing of the inoculum which may cause inaccurate results.

Do not load panels when the Testing icon is live.



**Figure 24 Inserting Panels**



**NOTE**

Check to see if panel closure fits properly before closing the door, as this may lead to jamming of the carousel.

## 5.2.4 Unloading and Discarding Panels

When panel testing is completed, panels should be removed from the instrument and discarded.

### WARNING





- **THE INSTRUMENT DOOR IS ELECTROMECHANICALLY LATCHED AND IS CONTROLLED BY THE INSTRUMENT SOFTWARE.**
- **NEVER ATTEMPT TO DEFEAT THE DOOR LATCHING MECHANISM, OR TO OPEN THE DOOR WHEN THE UNLOCKED ICON IS NOT DISPLAYED. SERIOUS INJURY CAN BE CAUSED BY THE ROTATING CAROUSEL.**
- **IF THE CAROUSEL IS NOT COMPLETELY STOPPED WHEN THE DOOR IS OPENED, IMMEDIATELY CONTACT BD FOR SERVICE. NEVER ATTEMPT TO ROTATE THE CAROUSEL MANUALLY OR SERIOUS INJURY MAY RESULT.**



#### To remove panels:

1. Press the **PANELS OUT** button on the instrument door.
2. When the blue Panel In/Out indicator blinks, open the instrument door.
3. All panels that are ready to be removed are indicated by a solid green LED indicator.
4. Remove the panels by pushing the panel down, pivoting the top of the panel outward, and pulling the panel out of the panel holder.
5. If there are completed panels that are not in the accessible stations, close the door and allow the instrument to reposition the carousel to provide access to those panels. Open the door and continue removing completed panels.
6. Discard the panels in a biohazard container.

## 5.3 Results Tab

The Results tab enables the review and modification of panel test results. Results can be used for the following functions:

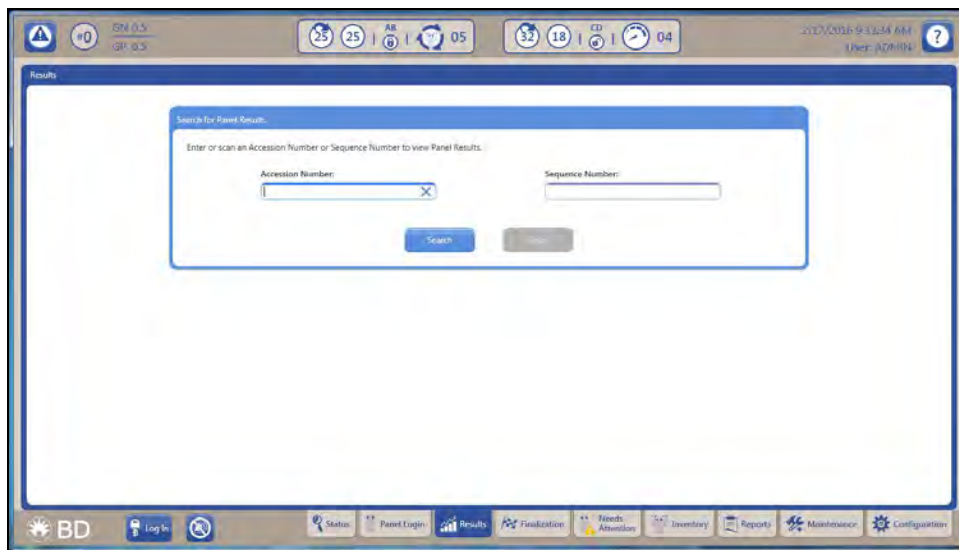
- to display a panel whose data is stored in the BD Phoenix™ database
- to modify the information for a panel in the BD Phoenix™ database 
- to mark a panel as critical 
- to print a Lab Report on any panel that can be recalled or displayed on the screen 
- to locate a panel resident in the instrument
- to delete panel information from the BD Phoenix™ database
- to answer or display any triggered BDXpert Rules
- to display any special messages 

- to finalize a panel 
- to view Needs Attention items (they can also be resolved from the Results tab) 

Results can be accessed in several ways:

- Scan a known panel sequence number or accession number with the external scanner while the Status screen is displayed.
- Select **Results** from the Status screen (see [Figure 25 Results Screen](#)).
- Scan or enter a known panel sequence number while the Panel Login screen is displayed.
- Select **Results** from Inventory (see [5.6 Inventory Tab](#)).

Figure 25 Results Screen



Typical Panel Results are shown in the figure below ([Figure 26 Panel Results Screen](#)).

If a panel is recalled by accession number only, and there is more than one panel attached to the accession, the Results List screen appears. From this screen, select the specific panel to review/modify.

Figure 26 Panel Results Screen



Actions available from all sub-tabs are:

**Locate Panel** – causes the instrument to locate, unlock the door, and indicate the current panel

**Save** – saves any changes

**Print** – prints a copy of the Lab Report for the current panel

**Delete** – deletes the panel results

**Cancel** – returns user to initial Search for Panel Results screen or whichever the last screen the user was in

Panel Results (clinical panels) are retained for 31 days (possibly longer depending on number of QC panels tested). QC panel results are retained for at least 6 months.

The type of panel is shown in the title area of the screen. The inoculum density used for the identification (if applicable) is shown on the Results screen.

The user will be able to see different sub-tabs, depending on the type of panel that the instrument reads or the type that the user has logged in. For example, the BDXpert Rules sub-tab appears only when the BDXpert™ functionality is enabled. The Special Messages and the Needs Attention sub-tabs appear only when these are messages that need user intervention.

## 5.3.1 Panel Results Fields

**NOTE**

Modifying the Accession Number or Isolate Number may invoke Auto Association which can change results.

### **Accession Number**

Type in or scan the accession number to recall. If only an accession number is entered, and there is more than one panel attached to the accession, the Results List screen appears.

This field can be modified for unfinalized panels. Enter up to 20 alphanumeric characters for the accession, excluding \* ? [ ] ! # |. Modifying an accession number does not affect the accession number of any related panels.

### **Sequence Number**

This field cannot be edited.

### **Isolate Number**

Valid isolate numbers are 1 to 20. This field can be modified for unfinalized panels, however an existing isolate number cannot be changed to a blank number.

### **Media**

This field is editable only before the first test cycle completes.

Shows the media type selected during Panel Login for Yeast ID panels only. The following values can appear in this field: blank for Unspecified Media Type; INVLD (Invalid Media Type); SABDX (Sabouraud Dextrose Agar); TSASB (BD Trypticase™ Soy Agar w/5% SB); COLSB (Columbia Agar w/5% SB); CHOC (Chocolate II Agar); SABEM (Sabouraud Dextrose Emmons); SABHI (Sab Brain Heart Inf Ag Deep).

### **Critical**

Select and enable this field to mark the panel as critical. The user can configure an audible alarm and/or an automatically printed Lab Report (or neither) as notification (See [5.9.8 Rapid Reporting Sub-Tab](#)) for critical panel results (ID results have been obtained, partial panel results, or complete panel results).

Previously marked critical panels can be disabled.

This field does not appear for QC panels.

### **Status**

This Read-only field shows the panel's testing status:

- Pending
- Ongoing
- Complete
- Rapid Complete (if enabled).

Rapid Complete panels have not finished testing and show BDxpert™ results. If a Rapid Complete panel is removed from the instrument, it then becomes Complete. If it is left in the instrument, Rapid Complete MICs are replaced by actual MIC results as they are determined.

### Location

This Read-only field shows the location of the panel, in the form Tst, where “T” is the Tier, and “st” is the station number.

### Inoculum Density

This field cannot be edited.

### Test Start

This Read-only field shows the date and time that panel testing was started.

### Test End

This Read-only field shows the date and time that panel testing was completed.

### Final ID

The user can automatically complete the Final ID on the system from a single instrument-based ID or by selecting among 1, 2 or 3 tie instrument-based IDs.

#### NOTE

If the Modify Related Panels checkbox is selected, the ID in the database of all related panels (those with the same accession and isolate number) is set with the same organism ID through the Auto Association function (see [6.4 Automatic Association of Panels](#)).

Organisms are listed alphabetically. Enter the first few characters of the organism name to find that portion of the list quickly.

When the field is modified, the system re-evaluates each antimicrobial's instrument SIR value, as well as re-evaluating BDxpert™ information. The field cannot be modified if the panel is finalized.

For QC panels, this field is named *Test Strain*, and lists only the ATCC® strains of organisms predefined in the database, sorted by strain number.

### Finalized

Select the checkbox to finalize the panel. The *Finalized* field is displayed as a read-only field when the BD Phoenix™ System is connected and communicating with the BD informatics solution. In this case, all Finalization is done at the BD informatics solution. *Finalized* is not displayed for QC panels.

The panel cannot be finalized if there are any outstanding Needs Attention messages.

If a panel with Rapid Complete status is finalized, MIC results processing stops, and the panel status becomes Complete. Any drugs that did not complete testing maintain their current MIC value (e.g., C in MIC column remains C, X remains X, etc.).

### Modify Final ID of Related Panels

This checkbox appears when the Final ID field has been modified irrespective of whether there are related panels or not. If the ID for any unfinalized related panels is NOT to be modified, uncheck the box. This field does not affect related QC panels. This option is not available if a BD informatics solution is connected to the BD Phoenix™ M50 System.

### Special Messages icon

There are several conditions that can generate a Special Message and then the icon appears. The user must select the **Special Messages Sub-Tab** (see [5.3.8 Special Messages Sub-Tab](#)) to see what the message is.

### Needs Attention icon

There are several conditions that can generate a Needs Attention alert and then the icon appears. The user must select the **Needs Attention Sub-Tab** (see [5.3.9 Needs Attention Sub-Tab](#)) to see what the message is. For details on these conditions, see [5.5 Needs Attention Tab](#).

### Panel Lot Number

This Read-only field displays the panel lot number and this field is active only when the QC Lot Support feature is enabled.

### Expiration Date

This Read-only field shows the date and time when the panel lot expires. This field is active only for QC panels and only when the QC Lot Support feature is enabled.

### QC Status

This field shows the status of a QC panel. The field is blank until the panel status becomes Complete. Statuses are initially PASS or REVIEW. Review indicates that the panel has not passed. Check any panels with Review status and determine why the panel did not pass.

The status is REVIEW if any of the following conditions occur:

- QC strain was identified incorrectly
- The test on a QC panel is aborted
- At least one of the antimicrobial results fail

From a status of REVIEW, the final status may be set to REPEAT if it is determined that the panel failed due to error in preparation or handling of the panel. If it is not determined that a panel preparation/handling error was made, the final status should be set to FAIL. Select REPEAT or FAIL to clear the Review QC Results Needs Attention condition.

## 5.3.2 Adding/Modifying ID Results

ID Results can be added and modified directly from the Results tab and this option is available to the user no matter which sub-tab is selected.

The user can manually enter an organism ID to the system, or in case the instrument identifies an organism, it can be overridden. In some cases, the system is not able to make a single identification determination based on panel results. In these cases, two or three organisms may appear in the Instrument ID field. When more than one organism appears as the Instrument ID, the system does NOT automatically populate an identification in the Final ID field. Select the desired organism at that time. The actual organism may be determined either through supplemental tests, which are recommended in the Instrument ID window and/or the Special Messages screen (accessible via **Special Messages**), or through other tests performed.

### To add/modify the Final ID

1. Select **Final ID** field in the Results header
2. Highlight the desired organism.
3. Select **Save**; the following icon appears:



## 5.3.3 AST Results Sub-Tab

AST or Combination panel types (with at least the AST side enabled) each contain a set of antimicrobials. The instrument reports a result for each antimicrobial on the panel. Each antimicrobial reports an individual MIC value. Once an antimicrobial has a MIC value, the instrument calculates an Instrument susceptibility (SIR) value for each MIC value that has been determined. (The instrument requires the panel to have an Organism ID defined to interpret MIC values into Instrument SIR values).

### NOTE

SIR values are not calculated by the instrument if it is connected to and communicating with a BD informatics solution.

If Rapid Completion is enabled, the instrument provides BDXpert AST results (SIR) before determining actual MIC values. The instrument MIC values are provided as soon as they can be accurately determined. Within a test panel, some MIC values may be available earlier than others. The Rapid Completion feature can be used to predict resistance for uncompleted antibiotics using the ID alone (intrinsic resistance), or ID with completed MICs of related antibiotics, or resistance marker tests (BL, ESBL). The BDXpert™ System is used to make these predictions. This can be useful in situations where, for example, the results for drugs that have not yet received MICs would be of no clinical value based on the other results that are already available. Antimicrobials with Rapid Complete BDXpert™ interpretations are indicated by a C in the MIC column on Results screens and Lab reports.

## NOTE

BD Synapsys™ Informatics does not support Rapid Completion.

When both a MIC value and Instrument SIR value have been determined for an antimicrobial, the instrument executes the BDXpert Rules (providing the BDXpert™ System is enabled). The instrument reports a value in the BDXpert SIR field if an enabled BDXpert Rule triggered and the reported BDXpert SIR value is different from the value in the Instrument SIR field.

Different results appear depending on which tab is selected. The header information remains the same no matter which tab is selected.

This sub-tab displays read-only fields like:

**Antimicrobial**

This Read-only field shows the abbreviation and name for the antimicrobial.

**MIC**

The Minimum Inhibitory Concentration value determined by the instrument. The following values may also appear in this field:

Value	Meaning
>	growth occurred for all concentrations of the antimicrobial
≤	no growth occurred in all of the concentrations of the antimicrobial
?	MIC determination is pending (SIR values remain blank)
X	MIC value cannot be produced; or Final ID is not claimed in the Taxa listing (see <a href="#">10.3 Taxa for ID/AST Determination</a> for AST testing; or the panel's drug dilution series does not cover the BD Phoenix™ reportable MIC range, or for additional causes, (see <a href="#">Table 12 MIC/SIR Values and Causes</a> ). Check the Special Messages displayed on the screen (see <a href="#">5.3.8 Special Messages Sub-Tab</a> ) for an explanation.
C	Rapid Complete (MIC is pending, BDXpert SIR is based on ID and completed drug and/or resistance marker results). These values are replaced by actual MIC values as they are determined.

For QC Panels, the following values may appear in this field:

Actual MIC Value	Expected MIC Range	Status
number,?, or X for error	Appears, if defined	P (the actual MIC value is within the expected MIC range)
		F (the actual MIC value is not within the expected MIC range)
		R (repeat: the actual MIC value is X)
		blank (no range is defined for the antimicrobial/organism combination)

**(Instrument SIR)**

This field is the instrument interpretation for the MIC based on the breakpoints currently running in the system (selected in the System Configuration Sub-Tab). See [5.9.2 System Configuration Sub-Tab](#) for more information.

The SIR value is blank for antimicrobials that require an ID to perform the SIR interpretation. In this case, the BDXpert SIR field (if present) and the Final SIR field are also blank.

The following represent the interpretation values:

Value <sup>1</sup>	Interpretation
S	Susceptible
I	Intermediate
R	Resistant
N	Not Susceptible <sup>2</sup>
X	Cannot produce interpretation
Blank	No SIR (missing or invalid Final ID; MIC = ?, C, or X; unclaimed organism for Final ID)

<sup>1</sup> S, I, R, N, or X value does not display if a BD informatics solution is attached and communicating. If communications with the BD informatics solution is lost, the field automatically displays.

<sup>2</sup> N indicates that the antimicrobial/organism does not have an upper breakpoint. When there is no upper breakpoint there are no criteria for calling an organism intermediate or resistant. This often occurs when there is an absence or rare occurrence of resistant strains of an organism. In this case, if the MIC is below the lower breakpoint the SIR results can be reported as susceptible but if the MIC is above the lower breakpoint the only result that can be reported is N or not susceptible.

**(BD)E(Xpert SIR)**

Possible field values are: Blank, S, I, R, N, and X.

The BDXpert SIR field is not shown when the BDXpert™ System is disabled. The BDXpert SIR field is not displayed when the BD Phoenix™ M50 System is connected to a BD informatics solution. It is also not shown for QC, ID, or ID/AST panels with AST disabled. This field contains the results calculated by the BDXpert™ System based on the execution of all enabled BDXpert Rules. Values appear in this field only if a BDXpert Rule triggered and caused the BDXpert SIR value to differ from the instrument interpretation.

**Rule #**

This Read-only field shows the numeric designation of the highlighted rule. It does not display when the BD Phoenix™ M50 System is connected to a BD informatics solution.

**(Final SIR)**

Field values are the same as (Instrument SIR) above. The Final SIR can be one of the following (from highest to lowest priority): a user-entered SIR value; the BDXpert SIR value; the instrument SIR value; or blank.

Final SIR values are produced when a MIC value or error is determined, AND there are no pending manual BDXpert Rules (if the BDXpert™ System is enabled).

When a BD informatics solution is not connected and the BDXpert™ System is disabled, the Final SIR field is not displayed for an antimicrobial until the MIC value is something other than ?.

The following table provides explanations of different combinations of blank and X results. Detailed explanations for actual results are provided as Special Messages (see [5.3.8 Special Messages Sub-Tab](#)).

**Table 12 MIC/SIR Values and Causes**

Antimicrobial	MIC	Instrument SIR	BDXpert SIR	Final SIR	Possible Cause Examples
Any Drug	?	[Blank]	[Blank]	[Blank]	Results pending.
Any Drug	BD Phoenix™ MIC Result	S, I, R	[Blank]	S, I, R	Instrument SIR = Final SIR (No BDXpert Rule SIR).
Any Drug	BD Phoenix™ MIC Result	S or I	R	R	Final SIR = BDXpert SIR if rule accepted.
Any Drug	BD Phoenix™ MIC Result	[Blank]	[Blank]	[Blank]	No breakpoints for this drug/organism combination within the chosen standard (CLSI, SFM, EUCAST, Custom).
Any Drug	BD Phoenix™ MIC Result	X	[Blank]	X	MIC value is outside the breakpoints for the selected standard. Example: Panel drug range = 1–16 µg/mL, susceptible breakpoint = 0.5 µg/mL
Any Drug	BD Phoenix™ MIC Result	X	[Blank]	X	SIR is suppressed by a BDXpert Rule. User must provide Final SIR based on manual interpretation or additional testing.
Any Drug	X	[Blank]	[Blank]	[Blank]	The MIC for this drug and organism combination is not reported by the BD Phoenix™ System. An alternative method should be used.
All Drugs	X	[Blank]	[Blank]	[Blank]	This species is not included in the BD Phoenix™ AST taxonomy; perform an alternative method. An excessive amount of indicator was detected in the panel. The AST portion of the panel has been terminated and the isolate should be retested.

Antimicrobial	MIC	Instrument SIR	BDXpert SIR	Final SIR	Possible Cause Examples
Any Drug	X	[Blank]	[Blank] or R	[Blank] or R	The MIC for this antibiotic is not reported (see Special Message). Interpretation based on BDXpert Rule.
Any Drug	C	[Blank]	R	R	Rapid Completion SIR (BDXpert SIR based on ID and/or another completed drug and/or resistance marker result).

### 5.3.3.1 Modifying AST Results

There may be times when the Final SIR results for a panel need modification.

#### NOTE

The user cannot modify Final SIR results if there are manual BDXpert Rules pending. First accept or reject the pending rules, which allows the system to perform its final results processing. After the final processing is complete, the SIR results can be modified manually.

#### To modify the Final SIR results:

1. Select **AST Results** from the Results tab.
2. Select **FINAL SIR** for the desired antimicrobial. The following selections are available:
  - S(usceptible)
  - I(ntermediate)
  - R(esistant)
  - X = Invalid, cannot interpret
  - N (not Susceptible)\*
  - Blank (indicates ID is required)

\* N indicates that the antimicrobial/organism does not have an upper breakpoint. When there is no upper breakpoint there are no criteria for calling an organism intermediate or resistant. This often occurs when there are no known resistant strains of an organism. In this case, if the MIC is below the lower breakpoint the SIR results can be reported as susceptible but if the MIC is above the lower breakpoint the only result that can be reported is N or not susceptible.

### 5.3.4 ID and Biochemicals Sub-Tab

This sub-tab displays the organisms (up to three organisms) identified by the instrument based on biochemical results in an ID or ID/AST panel. In some cases the system will not be able to make a single identification determination based on panel results. In these cases, two or three organisms may appear in this field. The user must select the desired organism to enter into the Final ID field.

#### Confidence

The Confidence value computed by the system is based on the actual biochemical results versus the expected results. The Confidence value is a percentage from 0 to 99.

#### Supplemental Tests

Supplemental Tests are displayed if there is more than one Organism listed. Up to five tests are displayed if the panel was set up using low inoculum. Once these tests have been performed, the results of the tests will help to distinguish which organism ID to associate to the AST results. At this point, a single organism ID can be selected from the Final ID field.

#### Biochemical Results

This read-only list shows the biochemical results used to determine the ID.

#### Biochemical

This read-only field shows the biochemical abbreviation. Refer to [10.2 List of Reagents and Principles Employed in the BD Phoenix™ System](#) for full descriptions of the biochemicals.

#### Actual

This read-only field shows the observed biochemical result at the time when the organism ID was determined:

Result	Meaning
+	positive
-	negative
?	the biochemical result is pending or that the test was aborted prior to ID results being determined
X	error

#### Expected

This read-only field shows the expected biochemical result according to the Instrument Organism ID:

+ or – for the organism.

The letter V indicates that the result can be variable. This field is blank when the actual results are ? (for non-QC panels), or until an Organism ID has been determined, or when more than one organism is listed in the Instrument Organism ID field.

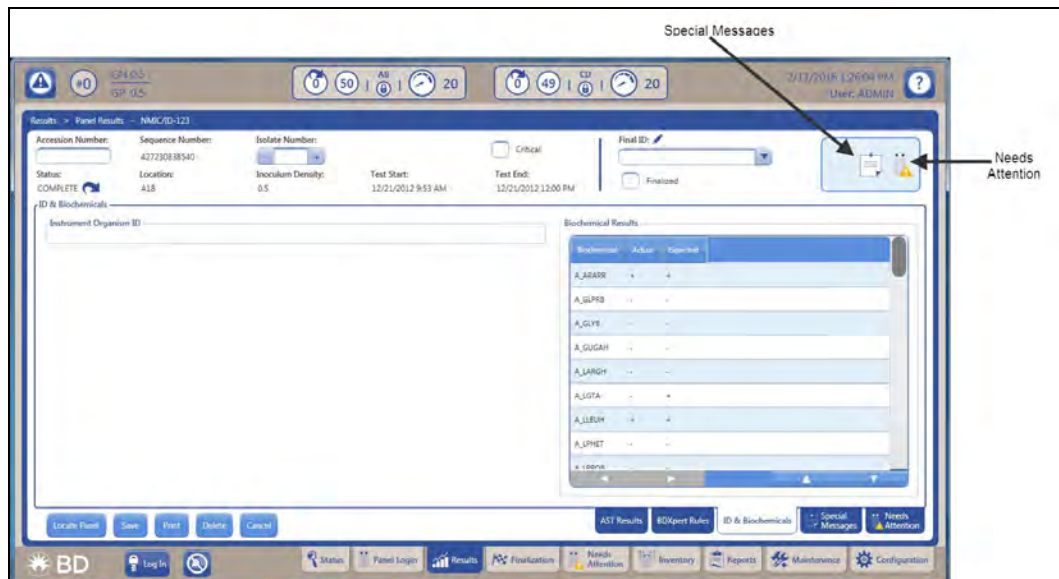
#### Special Messages Icon

If a Special Message (see [5.3.8 Special Messages Sub-Tab](#)) exists for the panel, an icon  is displayed in the results header area.

## Needs Attention Icon

If a Needs Attention (see [5.3.9 Needs Attention Sub-Tab](#)) exists for the panel, an icon  is displayed in the results header area.

Figure 27 ID and Biochemical Results



### 5.3.5 Modify Panel Usage Sub-Tab

The Results tab will display the Modify Panel Usage sub-tab when the currently recalled panel:

- is an ID/AST Combination panel type and both sides of the panel are enabled
- status is not complete
- has no instrument organisms determined for the panel
- does not have any AST Complete set on its AST side

The user can disable the ID or the AST side of the panel when no other changes have been made to the panel on the Results screen. When the user disables the ID or AST side of the panel, no other tab will be accessible. If the user attempts to leave the tab, a message will be displayed instructing the user to save or cancel the panel usage change.

#### To modify panel usage:

1. Select **Results**.
2. Enter or scan the panel barcode sequence number of the panel whose usage you wish to modify. The system automatically completes the Accession # and Isolate # fields, which are read-only.
3. Select **Modify Panel Usage**. The following screen appears:

**Table 13 Modify Panel Usage Screen**



4. Select **ID** or **AST** for the side of the panel to be disabled. If both are selected then workflow alert code W305 will be displayed. The screen data will be maintained and the save attempt will be stopped.
5. Select **Save** to save the panel modification.

**NOTE**

The following conditions are applicable for panel usage modification:

- No information for related panels is modified when panel usage is changed.
- If there is no user-entered Final ID and the ID side is disabled, the Instrument ID, Biochemical Results, Confidence Values, SIR Values, and ID Special Messages are removed from the record.
- If there IS a user-entered Final ID and the ID side is disabled, this ID is retained, as are SIR Values. However, Instrument ID, Biochemical Results, Confidence Values, and ID Special Messages are removed from the record.

### 5.3.6 BDXpert Rules Sub-Tab

When the user selects the BDXpert Rule sub-tab, the following are displayed:

- Rule Number
- Status
- Resistance Marker
- Name
- Rule Description

**NOTE**

All fields may not be displayed depending on the type of panel.

The BDXpert Triggered Rules screen provides a view of the BDXpert™ System rules that have been triggered for a panel (the panel currently selected in the Results tab). Other views available are:

- a listing of rules that have been triggered,
- the text of those rules,
- the effect that the rules have on Final SIR values, and
- the ability to accept or reject pending (manual) rules.

Additionally, all rules can be re-run. After all rules have been reviewed and Accepted/Rejected, save any change made.

If a BD informatics solution is attached and communicating with the BD Phoenix™ M50 Instrument, the BDXpert Rules tab does not appear. However, if communication with the BD informatics solution is lost, and the BDXpert™ System is reactivated in Configuration (see [5.9 Configuration Tab](#)), the BDXpert Rules tab reappears and the screen can be accessed.



When communication with the BD informatics solution is restored, BDXpert Rules interpretations are once again performed at the BD EpiCenter™ System.

#### Rules Field

##### Rule #

This Read-only field shows the numeric designation of the highlighted rule.

##### Status

Shows the status of the rule. The initial status of **Automatic** (a rule that executes automatically without user intervention) or **Manual** (a rule that must be manually accepted or rejected) is set in the BDXpert Rule Configuration screen ([5.9.7 BDXpert Rules Sub-Tab](#)). Statuses are:

Status	Meaning
Automatic	rule is enabled and set to Automatic
Pending	rule is enabled and set to Manual; Manual rules must be Accepted or Rejected; only the first Manual rule shows as Pending
Accepted	rule is enabled and set to Manual and has been Accepted by the user
Rejected	rule is enabled and set to Manual and has been Rejected by the user

Pending rules can be accepted or rejected via **Accept** or **Cancel**. Once a rule is accepted or rejected, the status can only be changed by re-running the rules.

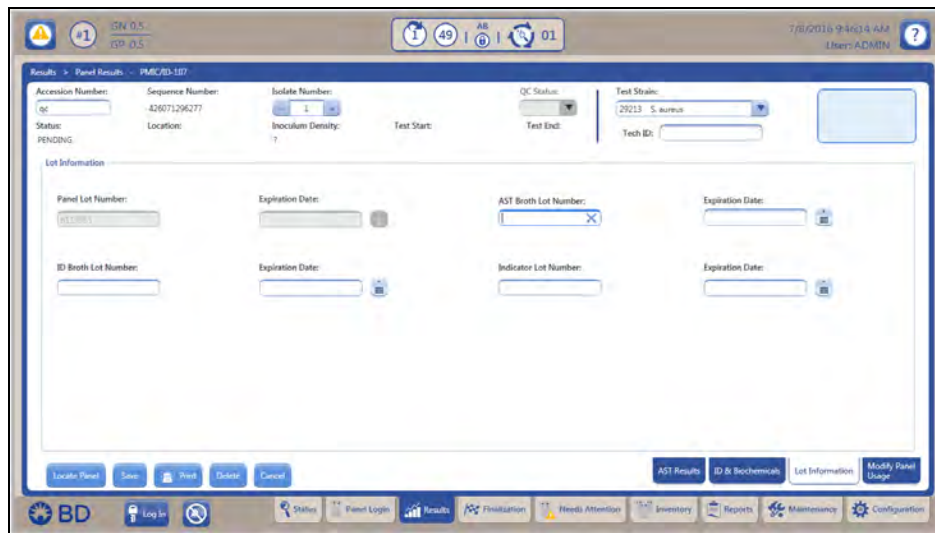
### 5.3.7 Lot Information Sub-Tab

This sub-tab provides a listing of disposables used in the setup of QC panels. It is not available to the user when the system is connected to a BD informatics solution.

**To access this sub-tab:**

1. Enable QC Lot Support (see [5.9.2 System Configuration Sub-Tab](#)).
2. Go to Panel Lot Definition (see [5.9.9 Panel Lot Definition Sub-Tab](#)) and scan in the barcodes.
3. Go to Results and enter an Accession Number.
4. Select Search; Lot Information Sub-tab appears (see [Figure 28 Lot Information Sub-Tab Screen](#)).

Figure 28 Lot Information Sub-Tab Screen



**NOTE**

For a QC panel, the Panel Lot Number and the Panel Expiration Date are displayed on a separate tab. However, for a Clinical panel, they are displayed at the top right side of the Results screen.

### 5.3.8 Special Messages Sub-Tab

The user can access information about certain panel ID and AST results, as well as some panel readings from Special Messages. These special messages are triggered and are available for viewing regardless of whether the BDxPert™ System is enabled or disabled. If a recalled panel has an associated **Special Message**, an icon is displayed in the header area of the results screen.

Special Messages on a recalled panel are shown according to hierarchy on the Special Messages window.

The Special Messages screen reflects messages that exist at the time the screen is accessed. It is not updated dynamically with messages that are triggered after the screen has been accessed. To view newly triggered messages, recall the panel again, and select **Special Messages** again.

### 5.3.9 Needs Attention Sub-Tab

This sub-tab displays any Needs Attention conditions for the recalled panel. These conditions generally represent problems with the panel or with the information related to the panel. For additional information on Needs Attention and how to resolve a condition, see [5.5 Needs Attention Tab](#).

### 5.3.10 Lab Report

Lab Report can be printed from the Results or Finalization screens. It contains all information for a panel sequence number that exists in the BD Phoenix™ database, including all information in the Results screen, any special messages, BDxPert Rules that triggered, or Needs Attention reasons if they exist.

Regular and QC Clinical panel reports can be printed from the Reports tab. As the reports are printed based on accession numbers, one or more panels will be printed. The QC Lab Report is accessible from the Reports menu and Results screen. It provides similar information to the Lab Report, but prints when a QC panel is being displayed and a report is requested.

On the Results screen only the currently displayed panel report is printed. If the user changes information and does not save it then the unsaved information is printed and the following message appears at the bottom of the report:

"Report contains information as displayed on the Results screen"

The report provides the following information:

Header: Report Title, Preliminary indication (if Status is Ongoing, Pending, or Partial Complete; and/or if there are unignored Needs Attention conditions or a Needs Attention condition of Cannot Identify Barcode; and/or if the panel is not eligible for finalization), Laboratory Information (if configured), and Date and Time Printed, Software version/PUD version.

Body of Report: Top Region: Accession Number, Isolate Number, Sequence Number, Panel Type, Status (Ongoing, Complete), Critical panel indication, Test Start with time, Test End with time, Instr #/Station (location), Finalized status, Panel Lot # (if QC Lot Support is enabled), and Inoculum Density. The Lab Report is sorted by Accession # then by Isolate # within accessions.

Below this information the organism Final ID is listed. An asterisk next to the Final ID indicates that the ID was changed by the user. Below this, the Media Type (for Yeast ID panels only) appears.

Next any instrument ID results are listed, along with the Confidence Value for the result. In the lower region of the report, for ID tests, the Biochemical, Instr(ument) Result, and Expected Result are provided. For AST tests, the Antimicrobial, Instr(ument) MIC, Instr(ument) SIR, BDxpert SIR, Final SIR, and Rule # are printed. If any panels have Resistance Markers, BDxpert Rules, Needs Attention, or Special Messages, these are printed at the bottom of the report. ID and AST sections of combination panels print on separate pages of the report.

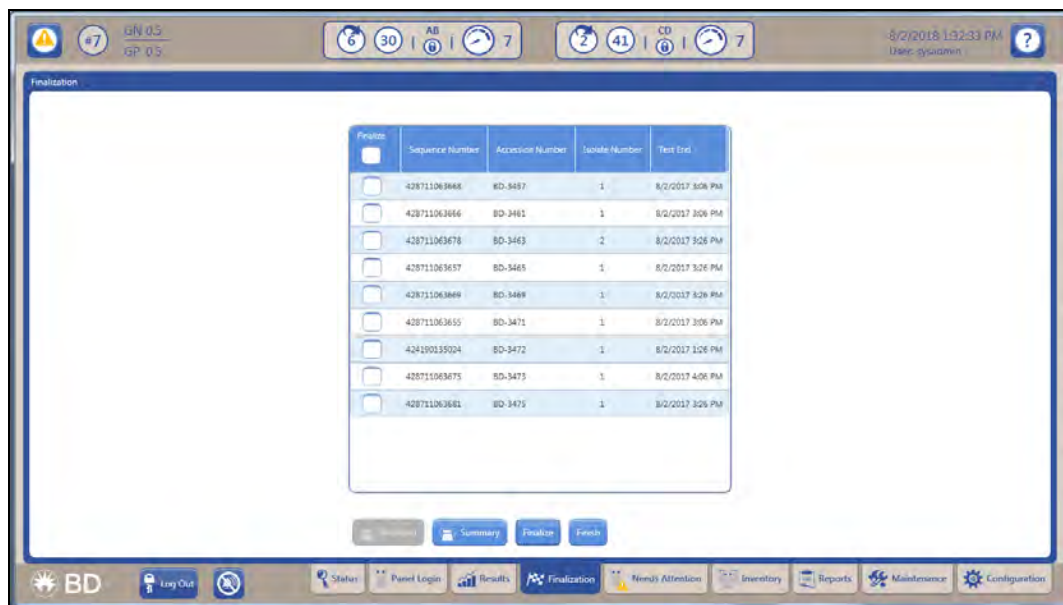
For QC panels, in addition to the information listed above, the following information is included: Panel Lot # and Expiration Date, Tech ID, ID Broth Lot # and Expiration Date, AST Broth Lot # and Expiration Date, Indicator Lot # and Expiration Date, and Test Strain. The QC Status of PASS, REVIEW, ERROR, or FAIL is indicated.

The system can be configured (see [5.9.2 System Configuration Sub-Tab](#)) to print an abbreviated lab report. The abbreviated report does not contain the individual biochemical results for ID or ID/AST panels. Press the **Print** button to print a report.

## 5.4 Finalization Tab

The Finalization tab enables the user to finalize and review panel test results. When the instrument is connected to a BD informatics solution, the Finalization screen is not available.

Figure 29 Finalization Tab



When the **Finalization** tab is selected, the instrument finds the records that are eligible for finalization. To be eligible, a panel must have a status of Removable, not be a QC panel, and have no unignored Needs Attention reasons. Eligible panels are sorted first by accession number and then by isolate number.

A maximum of 200 panels may be finalized in a given finalization session.

**To finalize/batch finalize panels:**

1. If there are no panels to be finalized, no data appears on the Finalization screen. If there ARE panels to finalize, the following options are possible:
  - a. To finalize ALL eligible panels, select **Finalize**.
  - b. To finalize panels one at a time, select the box next to the panel, then select **Finalize**.
  - c. To print a summary report of all panels eligible for finalization, select **Finalized**. This report shows the Accession Number (primary sort), Isolate Number (secondary sort), Test End date and time, Sequence Number, Instrument Number/Station, and Finalized status (\* if finalized, blank if not). Select the panel row to go to the **Results** tab.
  - d. If the user accesses **Results** to add or modify information before finalizing a panel, be sure to save the modifications, and return to the **Finalization** screen.
  - e. Once an individual (or batch of) panel(s) has been finalized, the **Finalized** button appears on the Finalization screen. This action enables the printing of Lab Reports for all panels that have been finalized during this session (up to 200 maximum).
  - f. Continue to review panel records and finalize until no additional panel records are displayed.

The user can print two types of report:

- Standard Lab Report(s)
- Finalization Summary Report.

The Lab Report can only be printed after one or more panels have been finalized. The Summary report may be printed any time.

**Finalization fields:****Sequence Number**

This Read-only field shows the panel's sequence number.

**Accession Number**

This Read-only field shows the panel's accession number.

**Isolate Number**

This Read-only field shows the panel's isolate number.

**Test End**

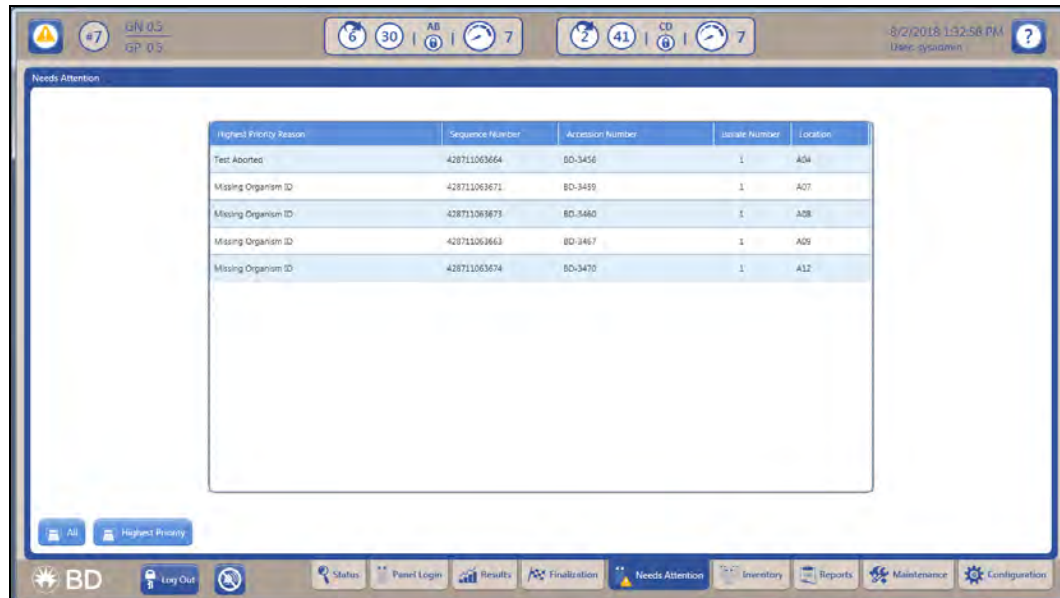
This Read-only field shows the panel's end of testing date and time.

## 5.5 Needs Attention Tab

The Needs Attention tab displays a list of panels in the instrument's database that have encountered a condition that requires operator attention. These conditions generally represent problems with the panels themselves, or with the information related to the panels. If the user is unable to see the **Ignore** checkbox alongside the Needs Attention Reason, then the user must correct that condition.

When viewing the Needs Attention panel list, the system provides the opportunity to resolve or ignore the condition that caused the panel to be placed on the list. If the panel was placed in the list due to missing or unresolved information (e.g., a tie), the instrument provides the ability to add or edit the information to resolve the condition. If the panel was placed in the list due to a software, panel, or hardware error, the instrument provides the ability to delete the panel to resolve the error condition. Deleting a panel that is still testing causes that panel's protocol to be aborted. Only panels whose Needs Attention reason has not been ignored are displayed on the screen.

Figure 30 Needs Attention Tab



The Needs Attention screen lists the highest priority reason that exists for a panel (see [Table 14 Needs Attention Resolutions](#)). Select a panel to open the results screen in the Needs Attention tab. It lists additional conditions if they exist. Two reports are available for printing:

- all Needs Attention reasons
- highest priority Needs Attention reasons

Table 14 Needs Attention Resolutions

Condition	Active Operations
Test Aborted	<ul style="list-style-type: none"> <li>ignore</li> <li>locate panel</li> <li>delete panel</li> </ul>
Cannot Identify Barcode	<ul style="list-style-type: none"> <li>ignore</li> <li>locate panel</li> </ul>
Cannot Read Panel Wells	<ul style="list-style-type: none"> <li>locate panel</li> <li>delete panel</li> </ul>
Panel Lot Expired	<ul style="list-style-type: none"> <li>ignore</li> <li>Ignore All</li> </ul>
Invalid AST Results	<ul style="list-style-type: none"> <li>ignore</li> </ul>
Panel Missing	<ul style="list-style-type: none"> <li>ignore</li> <li>delete panel</li> </ul>
No Growth on Panel	<ul style="list-style-type: none"> <li>ignore</li> <li>locate panel</li> <li>delete panel</li> </ul>
Panel Lot Undefined	<ul style="list-style-type: none"> <li>none to address condition</li> </ul>
Review QC results	<ul style="list-style-type: none"> <li>ignore</li> <li>locate panel</li> <li>delete panel</li> <li>panel results</li> </ul>
Missing Accession Number	<ul style="list-style-type: none"> <li>locate panel</li> <li>panel results</li> </ul>
Missing Organism ID	<ul style="list-style-type: none"> <li>panel results</li> </ul>
Cannot Determine Organism ID	<ul style="list-style-type: none"> <li>ignore</li> <li>panel results</li> </ul>
Invalid Organism ID	<ul style="list-style-type: none"> <li>ignore</li> <li>panel results</li> </ul>
Organism ID Conflict	<ul style="list-style-type: none"> <li>panel results</li> </ul>
BDXpert Rule Flagged (if enabled and manual)	<ul style="list-style-type: none"> <li>panel results</li> </ul>
Pending Too Long	<ul style="list-style-type: none"> <li>ignore</li> </ul>

The Needs Attention screen lists the first 100 panels with a Needs Attention status, sorted by reason code (in the same order as the list above) and then by accession number within each reason code. Panels without an accession number are listed first within each Needs Attention reason code. Even after panels have been removed from the Needs Attention list, the highest priority reason code in the Panel Results screen can still be viewed.

#### Needs Attention resolution options

**Reason** – The highest priority reason appears here. To view all the reasons with the Needs Attention status see [5.3.9 Needs Attention Sub-Tab](#).

**Locate panel** – This field is available only if the instrument cannot read the bar code. It causes the carousel to rotate to the panel's location and lights the station where the panel resides.

**Print** – The user can print all the panels and all the reasons with the Needs Attention status.

**Highest Priority** – Displays the highest priority reason of a panel.

Condition	Meaning	Possible Cause(s)	Resolution(s)
Test aborted	A condition occurred which caused the panel to be invalid	<ul style="list-style-type: none"> <li>Ongoing panel not tested for more than 1 hour</li> <li>Instrument turned off for more than 1 hour</li> <li>Instrument door open more than 1 hour</li> <li>Panel moved to a different tier/instrument</li> <li>Incubator temperature too high or too low</li> <li>System software did not execute testing algorithms for more than 1 hour</li> <li>Media type not specified for Yeast ID panel</li> </ul>	–
Cannot identify barcode	Internal barcode scanner could not read a panel barcode in a station where the instrument could determine that a panel was present	<ul style="list-style-type: none"> <li>Barcode label obscured or missing</li> <li>Unknown panel type was placed into the instrument</li> </ul>	<p>Locate the panel in the instrument and examine the barcode</p> <ul style="list-style-type: none"> <li>If the barcode is obscured, the panel must be discarded and another inoculated</li> <li>If the barcode appears to be intact, replace the panel and close the door. After the next inventory, check the Panel Needs Attention screen. If the panel does not appear, the internal scanner can now read the panel</li> </ul>
Cannot read panel wells	Internal barcode scanner has read a sequence number in a station but the instrument does not detect that a panel is present in that station	Panel not seated properly	Locate panel, remove it and replace it, as above
Panel lot expired	A panel was logged in (or has a test start date) with a panel lot number that has already expired	Panel being logged in or placed in the instrument is from an expired lot	Discard panel, reinoculate isolate using unexpired panel lot

Condition	Meaning	Possible Cause(s)	Resolution(s)
Invalid AST results	At least one MIC cannot be interpreted. (Excludes QC panels.)	See <a href="#">5.3.3 AST Results Sub-Tab MIC/SIR Values and Causes</a> table	Repeat testing of the antibiotic that cannot be interpreted
Panel missing	Internal barcode scanner read a sequence number on an Ongoing panel, but the panel is missing	<ul style="list-style-type: none"> <li>Panel removed before the test was completed</li> <li>Internal scanner failure and the sequence number can no longer be read</li> </ul>	If the panel is replaced on the same tier within 1 hour after removal, testing will resume. If the panel is not replaced, testing will abort
No growth on panel	No growth in growth control well. (Excludes ID only and QC panels.)	Instrument did not detect growth in the growth control well of the panel	<ul style="list-style-type: none"> <li>Subculture the organism (to ensure that it is viable) and inoculate a new panel. Panel has been aborted</li> <li>From the Needs Attention screen delete or ignore the panel</li> </ul>
Panel lot undefined	A panel has been entered whose lot number is undefined (non QC panel)	Panel is from an undefined lot	Define panel lot or ignore
Review QC results	Status of a completed QC panel is "Review"	QC panel which yielded an incorrect ID or incorrect AST result for at least one antibiotic, or has no growth in growth control well	Repeat QC organisms. Check: culture purity, inoculum density
Missing accession number	Panel is missing accession or isolate information. (Orphan panel.)	Failure to enter accession or isolate information	Press the "panel results" key. Add the accession number using the barcode reader or by typing it in
Missing organism ID	Panel has no organism ID. (ID required to determine SIR results. Excludes QC panels.)	<ul style="list-style-type: none"> <li>For AST only panel, no ID has been entered</li> <li>The panel has an unresolved tie or triplet instrument ID and has no related panel with an ID</li> </ul>	Select the organism ID. Any BDXpert Rules triggered by the given ID will automatically be presented at this point. Select or ignore the rules and save. When completed, exit to see complete test results.
Cannot determine organism ID	Panel has an Instrument ID of "No identification" or has a related panel with "No identification" as a final ID	Panel has been in test for 12 hours and the instrument cannot determine the identification	<p>Repeat testing. Check the following:</p> <ul style="list-style-type: none"> <li>Culture purity</li> <li>Inoculum density</li> <li>Correct panel used?</li> <li>Organism may not be in the BD Phoenix™ database</li> </ul>

Condition	Meaning	Possible Cause(s)	Resolution(s)
Invalid organism ID	Organism ID is not in BD Phoenix™ database	Panel received download information of an organism ID that is not in the BD Phoenix™ database	Use alternate method
Organism ID conflict	Panel completes testing and has at least one related unfinalized panel that contains a different Final ID. Excludes QC panels.	Completed panel has at least one related panel that contains a different ID	Select Results and choose an organism. Selecting the organism may trigger BDXpert Rules. If the rules are configured as manual, BDXpert appears
BDXpert Rule flagged	Panel triggered at least one BDXpert Rule and the rule is manually enabled in Configuration.	A BDXpert Rule needs to be invoked in order to determine AST results. A panel is flagged if BDXpert Rules are configured as enabled/manual. (Rules that are configured as enabled/automatic will automatically “trigger” and the panel will not be displayed in Needs Attention.	Each Expert rule is displayed individually in sequence. To accept the rule, select Accept. To reject the rule, select Reject. Use ReRun to delete BDXpert™ System decisions and start over. When all rules have been displayed and dispositioned, complete AST results show. After all rules have been invoked, select Special Messages (if present) to view Special messages about characteristics of the organism.
Pending too long	Panel has not been scanned (during an inventory count) within 30 minutes of logging in Panel Login.	Panel was logged into the instrument but was not placed in the instrument within 2 reading cycles (approximately 30 minutes).	Repeat testing. Delete the panel

## 5.6 Inventory Tab

The Inventory tab provides a list of all panels in the instrument (except temperature reference panels). This list can be sorted in ascending or descending order by the following fields:

- sequence number
- accession number
- results
- needs attention reason

Figure 31 Inventory Tab

Critical	Sequence Number	Accession Number	Isolate Number	Inoculum, Colony	Status	Final ID	Results	Needs Attention	Instrument
	428711063664	BD-3456	1		COMPLETE		Partial		AB
	428711063668	BD-3457	1		COMPLETE	Escherichia coli	Final		AB
	428711063688	BD-3458	1		ONGOING		Partial		AB
	428711063671	BD-3459	1		COMPLETE		Partial		AB
	428711063673	BD-3460	1		COMPLETE		Partial		AB
	428711063666	BD-3461	1		COMPLETE	Escherichia coli	Final		AB
	428711063667	BD-3462	1		ONGOING		Partial		AB
	428711063678	BD-3463	2		COMPLETE	Escherichia coli	Final		AB
	428711063670	BD-3464	1		ONGOING		Partial		AB
	428711063687	BD-3465	1		COMPLETE	Escherichia coli	Final		AB
	428711063683	BD-3467	1		COMPLETE		Partial		AB
	428711063690	BD-3468	1		ONGOING		Partial		AB

The initial default sort order is by accession/isolate number in ascending order. Subsequently, the list defaults to the last sort criteria and screen configuration (primary/secondary) used. If there are no panels in the instrument **No Data Available** appears on the screen.

The top of the Panel Inventory screen shows (see [Figure 31 Inventory Tab](#)):

1. the number of panels in the list (if there is more than one panel)
2. the sort field, and
3. whether the sort field is ascending or descending.

The following fields are shown on the Panel Inventory screen (if the information is known) (see [Figure 31 Inventory Tab](#)):

- An ! (exclamation mark) at the beginning of the row indicates that a critical panel or a panel with a resistance marker has not been acknowledged
- Critical - This checkbox is selected if panel has been marked as Critical at login
- Sequence Number (of the panel)

- Accession Number (panels without accession numbers are listed first)
- Isolate Number
- Inoculum Density (blank for AST panels; ? for ID panels until first test completes)
- Status (ongoing; complete; rapid if Rapid Completion is enabled and has been triggered for a panel)
- Final (Organism) ID
- Results
  - **(final** if panel is complete and there are no active Needs Attention conditions) [all MIC results are determined for an AST panel, or all MIC values *and* the organism ID are determined for a Combination panel, or the organism ID is determined for an ID panel];
  - **partial** if a panel is ongoing or complete but has an active (unignored) Needs Attention condition [at least one MIC value is determined for an AST or Combination panel, or the organism ID is determined for a Combination panel];
  - **none**, if no MIC values or organism ID is determined for any type of panel.
- Needs Attention - the active Needs Attention icon appears if an unresolved Needs Attention reason exists; it is **blank** when no Needs Attention reasons exist or they have all been ignored).
- Instrument - the instrument in which the panel is located.

After the list appears, highlight a panel and access the Results screen to:

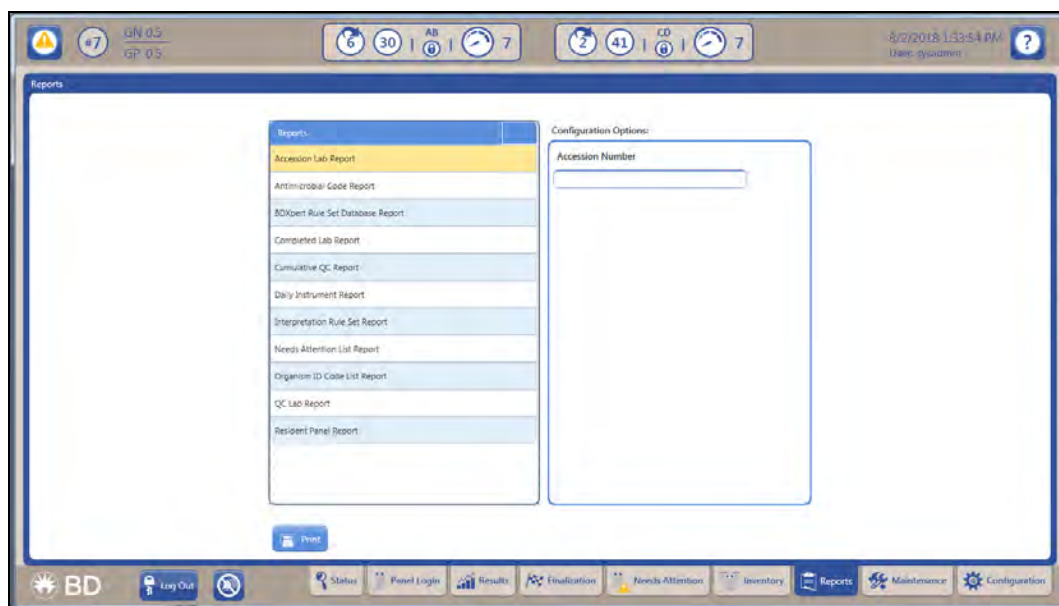
- view or edit panel information
- perform an instrument locate panel operation
- to print a Lab Report for panels with final or partial results

## 5.7 Reports Tab

The following instrument reports are available for printing from the Reports tab:

- [5.7.2 Completed Lab Report](#)
- [5.7.3 Accession Lab Report](#)
- [5.7.4 Needs Attention List Report](#)
- [5.7.5 Resident Panel Report](#)
- [5.7.6 QC Lab Report](#)
- [5.7.7 Cumulative QC Report](#)
- [5.7.8 Daily Instrument Report](#)
- [5.7.9 Interpretation Rule Set Report](#)
- [5.7.10 BDxpert Rule Set Database Report](#)
- [5.7.11 Organism ID Code List Report](#)
- [5.7.12 Antimicrobial Code Report](#)
- [5.7.13 Lab Report/QC Lab Report](#)
- [5.7.14 Finalization Summary Report](#)
- [5.7.15 Custom Breakpoint Difference Report](#)
- [5.7.16 Current QC Panel Lot Report](#)
- [5.7.17 Historical QC Panel Lot Report](#)
- [5.7.18 Panel Lot Report](#)
- [5.7.19 Panel Lot Database Report](#)
- [5.7.20 Panel Inventory Lab Report](#)

Figure 32 Reports Tab



## 5.7.1 How to Print Reports

### To print a report:

1. Select the **Reports** tab.
2. Highlight the desired report.
3. Complete any additional fields (such as an Accession Number for the Accession Lab Report) and select **Print Reports**.

Several reports can also be printed from the screens that relate to them (e.g., Needs Attention List Report).

Each of the reports is discussed in greater detail in the sections that follow.

## 5.7.2 Completed Lab Report

This report contains information for **all panels** whose status became **Complete** during the time period selected (up to the past 48 hours). The report provides the following information:

**Header:** Report Title, Preliminary indication (if Status is Ongoing, Pending, or Partial Complete; and/or if there are unignored Needs Attention conditions or a Needs Attention condition of Cannot Identify Barcode; and/or if the panel is not eligible for finalization), Laboratory Information (if configured), and Date and Time Printed, Software version / PUD version.

**Body of Report:** On top, the Accession #, Isolate #, Sequence #, Panel Type, Status (Ongoing, Complete), Critical panel indication, Test Start with time, Test End with time, Instr #/Station (location), Finalized status, Panel Lot # (if QC Lot Support is enabled), and Inoculum Density are displayed. The Completed Lab Report is sorted by Accession # then by Isolate # within accessions.

For QC panels, the following information is included (in addition to the information listed above):

- Panel Lot # and Expiration Date,
- Tech ID,
- ID Broth Lot # and Expiration Date,
- AST Broth Lot # and Expiration Date,
- Indicator Lot # and Expiration Date, and
- Test Strain
- The QC Status of PASS, REVIEW, ERROR, or FAIL is indicated.

Below this information, the organism Final ID is listed. An asterisk next to the Final ID indicates that the ID was changed by the user. Below this, the Media Type (for Yeast ID panels only) appears.

Next, Instrument ID results are listed, along with the Confidence Value for the result. In the lower region of the report, the following are provided:

For ID tests: the Biochemical, Instrument, and Expected results are provided.

For AST tests: the Antimicrobial, Instr(ument) MIC, Instr(ument) SIR, BDXpert SIR, Final SIR, and Rule # are provided.

If any panels have Resistance Markers, BDXpert Rules, Needs Attention, or Special Messages, these are printed at the bottom of the report. Any SIR values and Rule # are not reported for QC panels.

ID and AST sections of combination panels print on separate pages of the report.

### 5.7.3 Accession Lab Report

This report is a collection of lab reports for a specified accession number. It provides information for the specified accession number. Such information includes, as applicable:

- organism ID results, including specific biochemical reactions
- AST results including SIR interpretation and MIC
- QC pass/fail results
- any BDXpert Rules that were triggered

The report provides the following information:

**Header:** The header displays Report Title, Preliminary indication (if Status is Ongoing, Pending, or Partial Complete; and/or if there are unignored Needs Attention conditions or a Needs Attention condition of Cannot Identify Barcode; and/or if the panel is not eligible for finalization), Laboratory Information (if configured), Date and Time Printed, Software version / PUD version.

**Body of Report:** On top, the Accession #, Isolate #, Sequence #, Panel Type, Status (Ongoing, Complete), Critical panel indication, Test Start with time, Test End with time, Instr #/Station (location), Finalized status, Panel Lot # (if QC Lot Support is enabled), and Inoculum Density are displayed. The Completed Lab Report is sorted by Accession # then by Isolate # within accessions.

Below this information the organism Final ID is listed. An asterisk next to the Final ID indicates that the ID was changed by the user. Below this, the Media Type (for Yeast ID panels only) appears.

Next, any Instrument ID results are listed, along with the Confidence Value for the result. In the lower region of the report the following are provided:

- For ID tests: the Biochemical, Instrument, and Expected results are provided.
- For AST tests: the Antimicrobial, Instr(ument) MIC, Instr(ument) SIR, BDXpert SIR, Final SIR, and Rule # are provided.

If any panels have Resistance Markers, BDXpert Rules, Needs Attention, or Special Messages, these are printed at the bottom of the report. Any SIR values and Rule # are not reported for QC panels.

ID and AST sections of combination panels print on separate pages of the report.

For QC panels, in addition to the information listed above, the following information is included:

- Panel Lot # and Expiration Date
- Tech ID, ID Broth Lot # and Expiration Date
- AST Broth Lot # and Expiration Date
- Indicator Lot # and Expiration Date

- Test Strain
- The QC Status of PASS, REVIEW, ERROR, or FAIL is indicated.

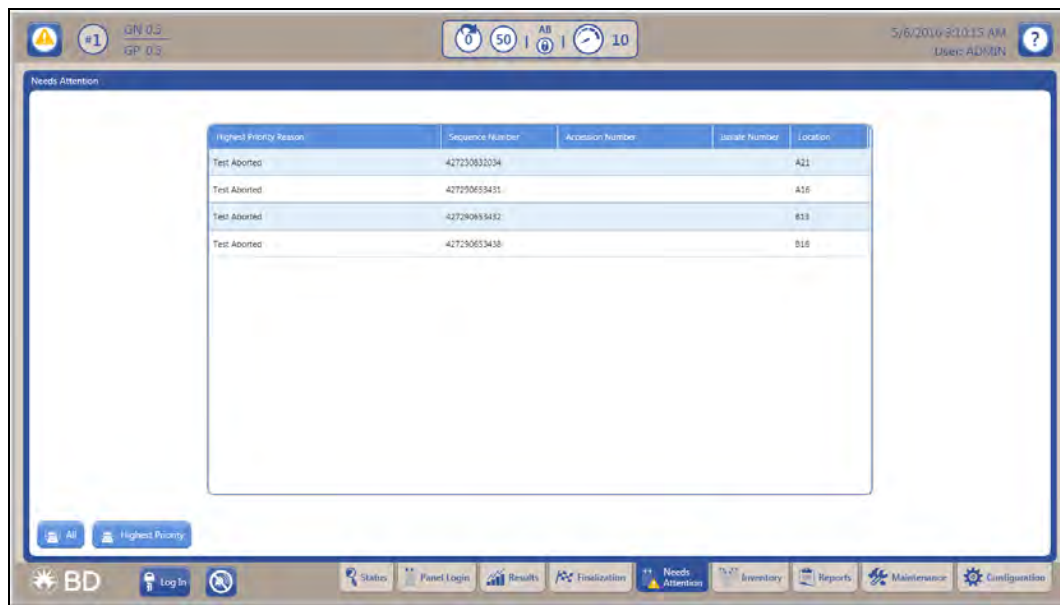
### 5.7.4 Needs Attention List Report

This report lists all the panels in the instrument’s database that have an unignored Needs Attention. This report can also be printed from the Needs Attention screen. The user is able to filter the reports on the highest priority reason by selecting the Filtered checkbox. If the checkbox is not selected, the report shows all reasons. The report provides the following information:

**Header:** The header displays Report Title, Filtered report notification (if selected), Laboratory Information (if configured), and Date and Time Printed.

**Body of Report:** The report displays Needs Attention Reason, Sequence #, Accession #, Isolate #, Instr #/Station (location), and Status (Ongoing, Complete). If the report is filtered (default selection), an asterisk appears to the left of the Reason for panels with multiple Needs Attention conditions. The report is sorted by the priority of the Needs Attention Reasons ([Figure 33 Needs Attention List Report](#)), and by Accession within each Reason type.

Figure 33 Needs Attention List Report



### 5.7.5 Resident Panel Report

This report lists the panels contained in stations 1–25 for each tier detected during the last inventory scan. The report provides the following information:

**Header:** The header displays Report Title, Laboratory Information (if configured), Date and Time Printed, and Instrument #.

**Body of Report:** The report contains the Accession #, Isolate #, Sequence #, QC (if panel is QC), Test Start with time, Inoculum Density, Panel Type, Status (Ongoing, Complete), and the highest priority Needs Attention Reason if one exists. The report is sorted by Accession # and then by Isolate # within each Accession.

## 5.7.6 QC Lab Report

This report lists all QC panels from the Test Start date entered to the current date. It lists all Test Strain Organisms that have completed testing and all biochemical and/or antimicrobial MIC results (for a specified panel lot number) that exist in the BD Phoenix™ database. The report provides the following information:

**Header:** The header displays the Report Title, Laboratory Information (if configured), and Date and Time Printed, Software version / PUD version.

**Body of Report:** The report contains the Panel Lot # and Expiration Date, Test Start and time, Test End and time, Panel Type, Instr #/Station (location), Status (Ongoing, Complete), Tech ID, ID Broth Lot # and Expiration Date, AST Broth Lot # and Expiration Date, Indicator Lot # and Expiration Date, Sequence #, Accession #, Isolate #, Test Strain, Inoculum Density, Media Type (Yeast ID panels only), Instrument ID(s), and QC Status of PASS/FAIL/REPEAT/REVIEW. At the bottom of the report, any Needs Attention reasons or Special Messages are printed. Each Biochemical, along with Instr(ument) Result, and Expected Result are provided, as well as Antimicrobials, Instr(ument) MICs, Expected MICs, and Pass/Fail status.

This report is only available when the BD informatics solution is disabled.

## 5.7.7 Cumulative QC Report

This report provides information on completed quality control testing of all panel types. It provides the following information:

**Header:** The header displays the Report Title, Laboratory Information (if configured), Date and Time Printed, and Instrument #.

**Body of Report:** The report contains the Selection Criteria: Panel Lot #, Panel Type, and Test Strains selected.

Below this, the panel Sequence # (sort order), QC Status (PASS, FAIL, REVIEW, ERROR), Test Strain, Test Start and Time, Panel Lot #, ID Broth Lot #, AST Broth Lot #, Indicator Lot #, and Tech ID are listed for each panel.

This report is only available when the BD informatics solution is disabled.

## 5.7.8 Daily Instrument Report

This report lists the status of the instrument at the time the report is generated, and provides areas to record maintenance activities. The Daily Instrument Report can be set to print automatically at a specified time. See [Figure 49 Daily Instrument Report](#).

The report provides the following information:

**Header:** The header displays Report Title, Laboratory Information (if configured), Date and Time Printed, and Software version/PUD version.

**Body of Report:** The report contains the Instrument #, Serial #, Instrument Temperature Pass/Fail status, Carousel Rotational Test Pass/Fail status, Power Supply Check Pass/Fail status, Normalizer Panels Sequence #, Pass/Fail status, and Expiration Status (date if expiration is more than 60 days; “expires on date” if expiration is between 60 and 0 days; and “EXPIRED” if the panel is expired) for each tier, and blanks to record the reading, Pass/Fail status, and Tech ID for each of the following maintenance checks: Daily: Instrument Temperature (Status screen), Standard Panel Temperature, Printer Paper Supply: Weekly:

Internal Green LEDs, Internal Red LEDs, Internal Amber LEDs, Alert Indicator, and Instrument Audible Alarm. An area is provided for comments at the bottom.

The instrument temperature is considered to have passed when there are no outstanding E01 temperature alerts.

For additional information on this report, see [Figure 49 Daily Instrument Report](#).

## 5.7.9 Interpretation Rule Set Report

This report lists the antimicrobial breakpoints of the currently selected Interpretation Rule Set (defined as the default Rule Set in the Instrument Configuration screen). The report provides the following information:

**Header:** The header displays the Report Title, Laboratory Information (if configured), and Date and Time Printed.

**Body of Report:** The report contains the Rule Set, Rule Version, and columns for Antimicrobial (sort order), Test Group, Organism Group, Organism Name, S(usceptible) value, and R(esistance) value. Each antimicrobial breakpoint is listed in a separate row of the report.

This sub-tab is not available if a BD informatics solution is connected to the BD Phoenix™ M50 System.

The Interpretation Rule Set is a large report. Spooling and printing the report can consume system resources such that other reports cannot be printed until the current one completes.

## 5.7.10 BDxpert Rule Set Database Report

This report lists each BDxpert Rule number and the text describing the rule, whether each rule is enabled/disabled and whether each rule shall trigger automatically/manually in the system. The report provides the following information:

**Header:** Report Title, Laboratory Information (if configured), Date and Time Printed, Rule Set (CLSI, SFM, EUCAST, or Custom), and Based On (CLSI, SFM, or EUCAST if Rule Set is Custom).

**Body of Report:** Rule #, text of the rule, Enabled/Disabled status, and Automatic/Manual status.

The BDxpert Rule Set Database is a large report. Spooling and printing the report can consume system resources such that other reports cannot be printed until the current one completes.

## 5.7.11 Organism ID Code List Report

This report prints all Organism Names and Abbreviations for all Organism Names that exist in the BD Phoenix™ database. It provides the following information:

**Header:** The header displays the Report Title, Laboratory Information (if configured), and Date and Time Printed.

**Body of Report:** The report contains the Organism name (sort order), BD Code (abbreviation), and LIS Code (if enabled).

The Organism ID Code List is a large report. Spooling and printing the report can consume system resources such that other reports cannot be printed until the current one completes.

## 5.7.12 Antimicrobial Code Report

This report prints all antimicrobials and abbreviations for all antimicrobials that exist in the BD Phoenix™ database from all panel configurations. The report provides the following information:

**Header:** Report Title, Laboratory Information (if configured), and Date and Time Printed.

**Body of Report:** Antimicrobial name (sort order), BD Code (abbreviation), and LIS Code (if enabled).

The Antimicrobial Code is a large report. Spooling and printing the report can consume system resources such that other reports cannot be printed until the current one completes.

## 5.7.13 Lab Report/QC Lab Report

This report (see [5.3.10 Lab Report](#)) contains all information for a panel sequence number that exists in the BD Phoenix™ database, including all information in the Panel Results screen, any special messages, BDxpert Rules that triggered, or Needs Attention Reasons if they exist.

**NOTE**

The Lab Report is not accessible from Reports. It can only be printed from Results or Finalization.

### Panel Inventory Lab Report

These reports print the same information for all panels listed in the Panel Inventory screen (i.e., resident in the instrument and with final or partial results).

The QC Lab Report (see [5.7.6 QC Lab Report](#)) is also accessible from the Results Tab (see [5.3 Results Tab](#)). It provides similar information to the Lab Report, but for QC panels.

## 5.7.14 Finalization Summary Report

This report contains a list of all the panels eligible for finalization at the time the report was requested, as well as finalization status. The Finalization Summary Report is not accessible from Reports; it can only be printed from Finalization. See [5.4 Finalization Tab](#) for more information.

## 5.7.15 Custom Breakpoint Difference Report

This report contains a list of differences between old breakpoints and new ones after a BD Phoenix™ Update Data or install/upgrade operation. The Custom Breakpoint Difference Report is not accessible from Reports. It can only be printed from the Custom Interpretation Rule Set (Configuration) tab by selecting the **Difference Report** button located at the bottom of the screen. Breakpoints that have been customized will not be overwritten with updates from the PUD. The Custom Breakpoint Difference Report will provide the appropriate data to determine if customized breakpoints need to be manually updated to reflect the currently installed PUD. See [Table 15 Rules Updates](#) for details on how breakpoints are updated.

## 5.7.16 Current QC Panel Lot Report

This report contains information on the most recent QC test for each of the required strains for a panel lot, up to a maximum of 20 strains. The report includes information for any instruments whose data has been restored to the current instrument. The Current QC Panel Lot Report cannot be printed from Reports. It can only be printed from Panel Lot Definition. See Section [5.9.9 Panel Lot Definition Sub-Tab](#).

This report is only available when the BD informatics solution is disabled and QC Lot Support is enabled.

## 5.7.17 Historical QC Panel Lot Report

This report contains information on all tests for a strain for the current instrument (only), up to 200 tests. The Historical QC Panel Lot Report cannot be printed from Reports. It can only be printed from Panel Lot Definition. See [5.9.9 Panel Lot Definition Sub-Tab](#).

This report is only available when the BD informatics solution is disabled and QC Lot Support is enabled.

## 5.7.18 Panel Lot Report

This report lists all the panel records for any panel lot number in the current instrument. The report first lists clinical panels, then QC panels. Within each of those groups, the report is sorted by Accession # then Isolate #.

The report provides the following information:

**Header:** The header displays the Report Title, Laboratory Information (if configured), Date and Time Printed, Instrument where printed.

**Body of Report:** The report contains the Panel Lot # and Panel Type; Accession #, Isolate #, Sequence #, QC (if panel is QC), Test Date, and Status (Pending, Ongoing, Complete) for each panel tested that belongs to the lot.

This report is only available when the BD informatics solution is disabled and QC Lot Support is enabled.

## 5.7.19 Panel Lot Database Report

This report lists all the defined panel lots in the current instrument, and provides statistical and reference information on those lots.

The report provides the following information:

**Header:** The header displays the Report Title, Laboratory Information (if configured), Date and Time Printed, Instrument where printed.

**Body of Report:** The report contains the Panel Lot # (sort order, descending); Panel Type; Expiration Date; Extension Date (if Expiration date was extended); Start and End Sequence #s (Range); Definition Date; First and Last Date Used; and number of Panels Used.

This report is only available when the BD informatics solution is disabled and QC Lot Support is enabled.

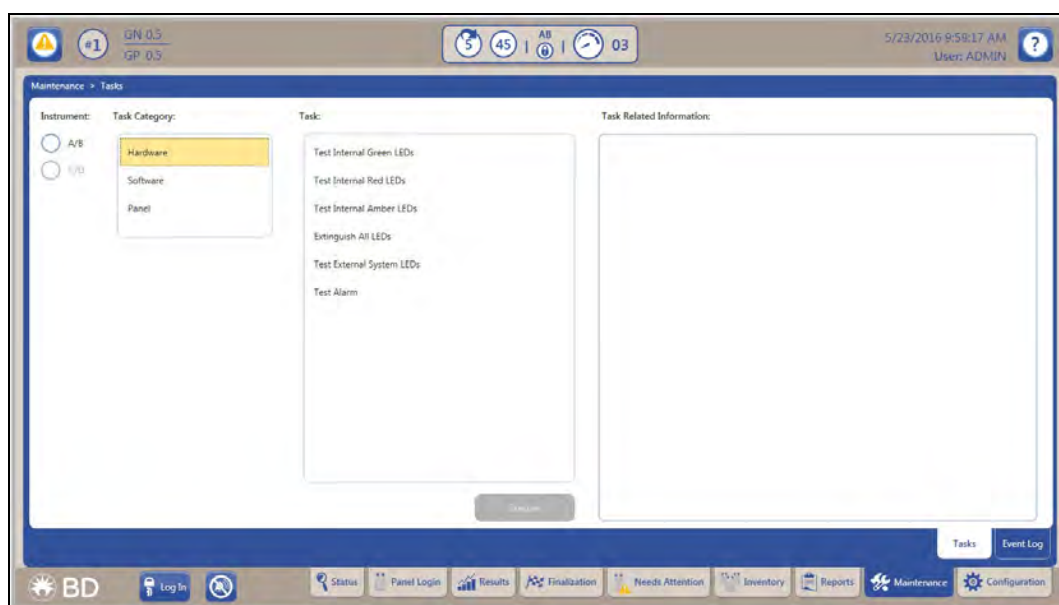
## 5.7.20 Panel Inventory Lab Report

This report prints the same information for all panels listed in the Panel Inventory screen (i.e., resident in the instrument and with final or partial results). Refer to [5.3.9 Needs Attention Sub-Tab](#) for additional information prints a Lab Report for all panels in the instrument. This report can only be printed from the Inventory tab.

## 5.8 Maintenance Tab

The Maintenance tab (see [Figure 34 Maintenance Screen](#)) provides several tasks for performing instrument maintenance. There are user tasks for weekly and as needed maintenance. There are other tasks for BD use only.

Figure 34 Maintenance Screen



Under Task Category, select the category of maintenance to be performed:

- Hardware
- Software
- LIS (will appear only if LIS is enabled)
- Panel

### 5.8.1 Maintenance Hardware Functions

For detailed information, see [7.1 Routine Maintenance](#).

To make sure that the instrument is functioning correctly, test the system indicators and the alarms (see [Table 17 Routine Maintenance: Time-frame and Procedure](#)).

## 5.8.2 Maintenance Software Functions

Each of the software functions is described in detail below. Unless otherwise specified, perform the following steps to save data after accessing each software function via the Maintenance tab.

1. Insert the USB key, BD Catalog Number 443866, into the AIO PC.
2. Select the Maintenance screen tab.
3. On the Maintenance screen select Software under the Task Category.
4. From the Task list select the function to be performed.
5. Select **Execute**; the **Are You Sure?** message is displayed.
6. Select **OK**.

### Save System Data Task

Under certain circumstances, BD may advise that system data be saved to a USB key. These circumstances include some error conditions and system malfunctions. The Save System Data function is NOT a backup and cannot be restored by the user.

### Save Event Log Task

Under certain circumstances, a BD representative may advise that the Event Log be saved to a USB key. These circumstances include some error conditions and system malfunctions. The Save Event Log function copies the system event log, which contains logged system messages about various system, instrument, and communications events. The instrument door must be closed, and the instrument must be idle to save the Event Log.

### Save Normalizer History Task

Save Normalizer History allows the users to save a normalizer history data file to removable USB media.

### De-anonymize PHI/PII Task

De-anonymize PHI/PII allows patient identifier data that was previously anonymized to be de-anonymized if it was anonymized within 90 days.

### Upgrade Task

Upgrade enables field service experts to upgrade the instrument and the AIO PC. The software update will be recorded on the Daily Instrument Report for reference. If the system is not connected to a BD informatics solution, customers can upgrade the system. For more information, contact the local BD representative.

To perform this operation, the instrument:

- door must be closed
- must be idle
- should not be taking readings
- must not run algorithms

Once the upgrade is complete, the system will reboot and the newly installed version of the application on the AIO PC will synchronize with the instrument. If the upgrade includes new software for internal components of the instrument, these updates will take place immediately and the use of the application will be temporarily blocked. Once the instrument software has been successfully updated, the application will be available for use.

If custom breakpoints are in place, print the Custom Breakpoint Difference Report (see [5.9.6 Custom Interpretation Rule Set Sub-Tab](#)).

#### NOTE

When the software is updated, or when the PUD install is performed, if any of the standard interpretation rule sets have changed, new rule sets are installed into the system database. Since custom rule sets are based on standard rule sets, a custom interpretation rule set will be merged with new standard rules. If custom breakpoints are used, be sure to print out the Custom Breakpoint Difference Report ([5.7.15 Custom Breakpoint Difference Report](#)) after each system update or PUD install.

### Save User Data Task

Save User Data allows the back up of Configuration parameters to a USB key. This includes Custom Interpretation Rule Set Configuration and BDXpert Rules Configuration. The information that is saved is for the current instrument only. However, information saved at one instrument can be restored on another instrument. It is recommended that Configuration parameters be stored on a USB key in the event of a system failure.

### Restore User Data Task

Restore User Data enables the restoration of the saved configuration parameters. This data includes: Custom Interpretation Rule Set Configuration, and BDXpert Rules Configuration. To restore, the instrument door must be closed.

### BD Phoenix™ Update Data (PUD)

A BD Phoenix™ Update Data may be provided from time to time to update BD Phoenix™ M50 Instrument databases and support files. These updates do not affect or change the basic instrument application software. For this reason, the Status screen shows both the software version and the PUD version near the top of the screen.

BD Phoenix™ Update Data (PUD) enables the update of numerous data files in the instrument, such as antimicrobial breakpoints and rules, QC data, drugs, organisms, etc.

#### NOTE

After a PUD upgrade, a Custom Breakpoint Difference Report should be printed and reviewed to determine if manual updates are required for custom breakpoints. See [5.7.15 Custom Breakpoint Difference Report](#) for additional information on this report. The report is available only if the BD Phoenix™ M50 System is not connected to BD EpiCenter™.

See [5.9.6 Custom Interpretation Rule Set Sub-Tab](#) information on how custom interpretation rules are updated with a PUD upgrade.

### Backup SQL Database Task

This feature provides data to BD Service for instrument troubleshooting purposes.

### **Save Binary Files Task**

Save Binary Files allows users to save binary data to removable USB media. Current binary files and archived binary files, created within the past 14 days, will be written to the removable media by default. The instrument must be idle and have an active connection with the All-In-One tablet. Also, there must be no ongoing panels in the instrument for this task to execute. If any of the above criteria is not met, an error message will be generated and displayed on the screen for the user, and the task will not be executed.

### **Reboot Task**

Reboot will execute a clean shutdown on the All-In-One tablet. A confirmation window will display on the screen to the user and the task will execute once the user confirms the action using the generated dialog box.

### **Save Specific Binary File Task**

This task allows users to save a specific binary data file to removable USB media. When Save Specific Binary File option is selected, the user will have the ability to specify up to 10 sequence number and select start and end dates. A binary data file will be saved to the removable media for each entered sequence number. An error message will be generated for the user on the screen for any panel that is not successfully saved to the removable media.

### **Install Software License Task**

This task allows the user to install a BD Phoenix™ M50 Software License from removable USB media. If a license file is not found on the removable media or a file is determined to be invalid, an error message will be generated on the screen for the user. If a valid license file is detected, the file will be installed on the system and the application will restart.

### **Install PUD License Task**

This task allows the user to install a PUD Software License from a removable USB media. If a license file is not found on the removable media or a file is determined to be invalid, an error message will be generated on the screen for the user. If a valid license file is detected, the file will be installed on the system and the application will restart.

## 5.8.3 Maintenance of LIS Functions

Each of these functions is described in detail below. Unless otherwise specified, perform the following steps to save data after accessing each software function via the Maintenance tab.

1. Insert the USB key, BD Catalog Number 443866, into the AIO PC.
2. Select the Maintenance screen tab.
3. On the Maintenance screen select LIS under the Task Category.
4. From the Task list select the function to be performed.
5. Select **Execute**; the **Are You Sure?** message is displayed.
6. Select **OK**.

### Save LIS Codes Task

Save LIS Codes enables all the Organism and Antimicrobial LIS codes you have defined to be saved. This produces a text file that can be edited on a PC, which might be quicker for some users who have many edits to perform. Then, the edited codes can be restored back to the BD Phoenix™ M50 Instrument. The function also enables codes to be copied from one instrument to another. Save LIS Codes appears on the Maintenance tab only if LIS Communications is enabled.

Entries in the text field consist of:

- Identifier (ORG, QC\_ORG, DRUG)
- BD Code
- Short Name/Drug
- LIS Code

Codes cannot be added or deleted, and only the LIS Code portion can be modified. If another field is changed, the instrument will not restore the codes.

### Restore LIS Codes Task

Restore LIS Codes enables the restoration of the Organism and/or Antimicrobial codes that were previously saved. The restore operation completely overwrites the existing Organism/Antimicrobial LIS Code database Codes will not be restored if any field other than LIS Code was modified, or if LIS Code was entered in an incorrect format. If this happens, an error log is written, and the file can be reviewed to see what caused the error. Restore LIS Codes appears on the Maintenance menu only if LIS Communications is enabled.

## 5.8.4 Maintenance Panel Functions

Each of these functions is described in detail below. Unless otherwise specified, perform the following steps to save data after accessing each software function via the Maintenance tab.

1. Insert the USB key into the AIO PC.
2. Select the Maintenance screen tab.
3. On the Maintenance screen select Panel under the Task Category.
4. From the Task list select the function to be performed.

5. Select **Execute**; the **Are You Sure?** message is displayed.
6. Select **OK**.

#### **Save Panel Lot Definitions Task (Panel lot definition is enabled and system is not connected to a BD informatics solution)**

This enables the transfer of lot definitions (and QC panel results) to other instruments so that the records can be viewed/used there. Save Panel Lot Definitions saves the defined panel and related data (Sequence #s, Expiration Dates, etc.), and QC results for any strains tested in those. Save Panel Lot Definitions only applies when QC Lot Support is enabled.

#### **Restore Panel Lot Definitions Task (Panel lot definition is enabled and system is not connected to a BD informatics solution)**

This makes Panel Lot definitions and QC panel results transferable in labs that use multiple instruments, so that a lot only has to be defined once using the box (carton) label. Restore Panel Lot Definitions only applies when QC Lot Support is enabled.

#### **Save Panel Configuration Task**

Save Panel Configuration enables the backup of the instrument's panel configuration. The information saved is for the current instrument only. However, information saved at one instrument can be installed at another instrument. This enables the presence of consistent panel configurations among all the instruments.

#### **Install Panel Configuration Task**

Install Panel Configuration enables the update of the instrument's panel configurations. To perform this operation, the instrument door must be closed.

#### **NOTE**

If using software prior to V1.1.110, this operation should not be performed while there are ongoing panels. If using software V1.1.110 or later, Panel Configuration and PUD can be installed while panels are ongoing.

### **5.8.5 Maintenance Field Service Functions**

For Field Service use only.

### **5.8.6 Maintenance Internal BD Use Functions**

For internal BD use only.

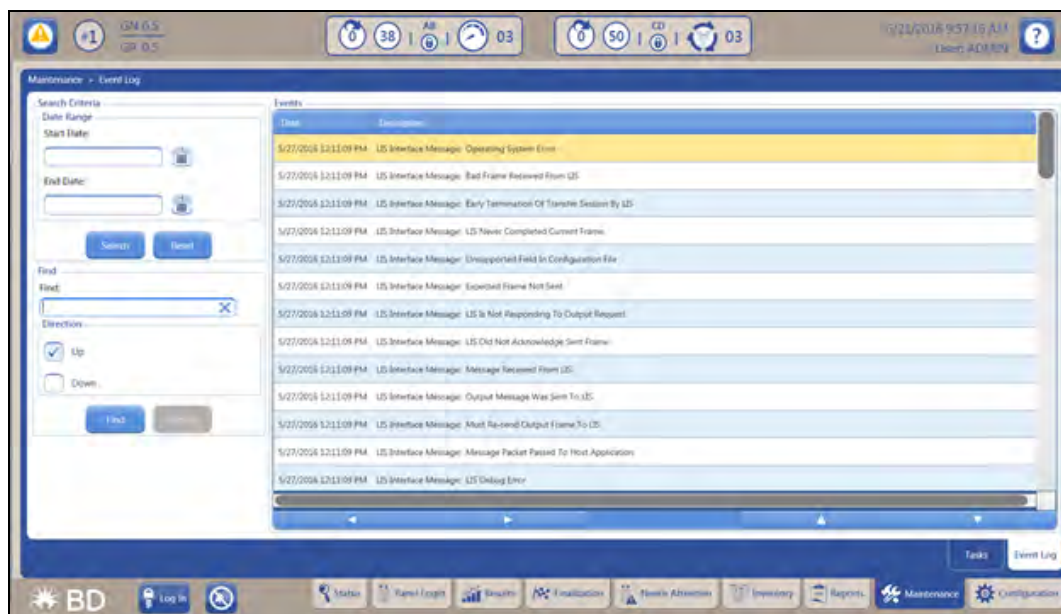
### **5.8.7 Maintenance Event Log Tab**

The Event Log provides a list of messages generated by LIS communications. Note that the screen (see [Figure 35 Event Log Screen](#)) will not contain messages if a BD informatics solution is connected. The messages represent status messages that have occurred during LIS communications such as:

- query messages,
- log entries,
- interface messages.

The Event Log list of LIS messages may be filtered based on date range. There is also a Find function to search for specific message content.

Figure 35 Event Log Screen

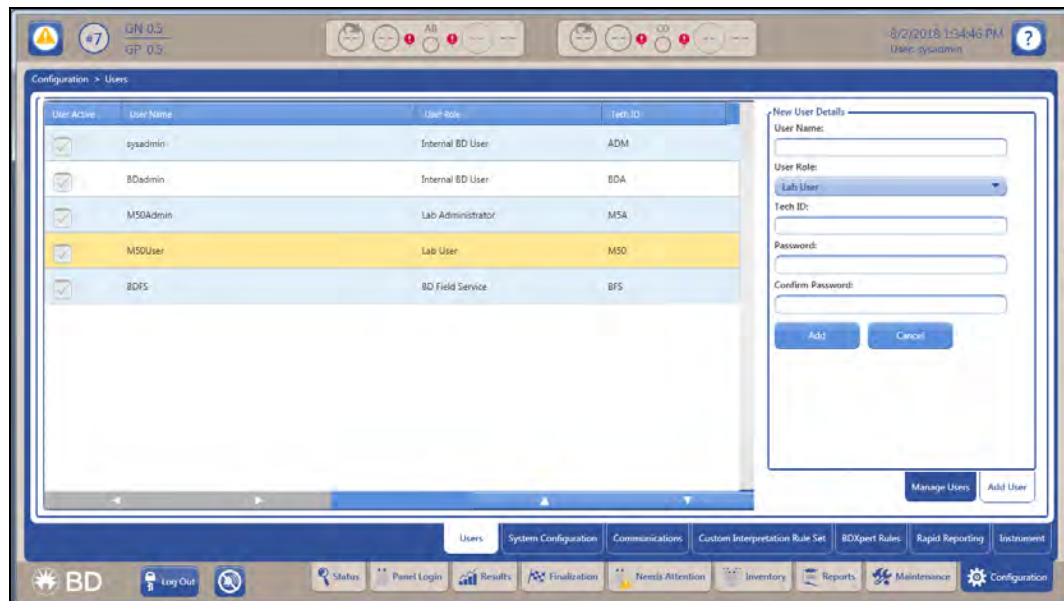


## 5.9 Configuration Tab

To access the configuration functions, select the **Configuration** tab. The configuration screen then appears with the following sub-tabs for each specific configuration:

- [5.9.1 Users Sub-Tab](#)
- [5.9.2 System Configuration Sub-Tab](#)
- [5.9.3 Communications Sub-Tab](#)
- [5.9.4 Organism Configuration Sub-Tab](#)
- [5.9.5 Antimicrobial Configuration Sub-Tab](#)
- [5.9.6 Custom Interpretation Rule Set Sub-Tab](#)
- [5.9.7 BDXpert Rules Sub-Tab](#)
- [5.9.8 Rapid Reporting Sub-Tab](#)
- [5.9.9 Panel Lot Definition Sub-Tab](#)
- [5.9.10 Instrument Sub-Tab](#)

Figure 36 Configuration Tab



When the desired configuration parameters have been entered or modified, select **Save** to make the changes permanent.

#### NOTE

The Custom Interpretation Rule Set and BDXpert Rules Configuration tabs do not appear if the BD Phoenix™ M50 Instrument is connected to and communicating with a BD informatics solution.

## 5.9.1 Users Sub-Tab

See [4.1 User Access Management](#) for details.

## 5.9.2 System Configuration Sub-Tab

It is not available to the user when the system is connected to a BD informatics solution. The following parameters can be set in System Configuration (see [5.9.2.2 OPTIONS](#)).

### 5.9.2.1 GENERAL System Settings

#### System Number

Select the system identification number. The default setting is 1. Choose a number from 1 to 99. If there is only one instrument, leave this value set at 1.

#### Rule Set

Select the rule set that the interpretation engine is to use. Only one rule set can be used. Choose from the following selections:

CLSI (Clinical and Laboratory Standards Institute)

EUCAST (European Committee on Antimicrobial Susceptibility Testing)

SFM (Société Française de Microbiologie)

Custom (defined in [5.9.6 Custom Interpretation Rule Set Sub-Tab](#))

### Rule Version

This read-only field shows the current version of the rule set selected in the previous field.

### Alarm (audible) Volume

Select the volume of the instrument's audible alarm. The default setting is 5. Select from 0 (audible alarm off) to 10 (loudest). Only the volume of Alert and Activity alarms (see [4.3.3 Audible Tones and Alarms](#)) is affected by this setting.

### Resistance Marker Notification

This field appears only when the BD Phoenix™ M50 Instrument is connected to a BD informatics solution but is not communicating with it. Enable the instrument to operate in a standalone mode when communications with the BD informatics solution is interrupted. When this field is enabled, the BDXpert™ System Active field appears.

### BDXpert™ System Active

This field activates the entire BDXpert™ System rules which includes CLSI, EUCAST, SFM, or Custom Interpretation Rules.

This field does not appear if a BD Informatics solution is attached and communicating. However, if communication with the BD Informatics solution is lost, the field reappears. This enables the activation of BDXpert Rules interpretations in the standalone BD Phoenix™ M50 Instrument. When communications with the BD Informatics solution is restored, BDXpert Rules interpretations are once again performed at the BD Informatics solution, and this field is removed from the screen.

#### NOTE

Disabling all BDXpert Rules also disables detection of Resistance Markers (e.g., ESBL), except those triggered by 1500-series rules.

### Rapid Completion

This field enables the instrument to provide BDXpert AST results (SIR) before determining actual MIC values. The instrument MIC values are provided as soon as they can be accurately determined. Within a test panel, some MIC values may be available earlier than others. The rapid completion feature can be used to predict resistance for uncompleted antibiotics using the ID alone (intrinsic resistance), or ID with completed MICs of related antibiotics, or resistance marker tests (BL, ESBL). The BDXpert™ System is used to make these predictions. This can be useful in situations where, for example, the results for drugs that have not yet received MICs would be of no clinical value based on the other results that are already available. Antimicrobials with Rapid Complete BDXpert interpretations are indicated by a **C** in the MIC column on Results screens and Lab reports.

If Rapid Completion is selected at the BD Phoenix™ M50 Instrument and the instrument is connected to BD EpiCenter™, then it must also be enabled (checked) at the BD EpiCenter™.

NOTE

BD Synapsys™ Informatics does not support Rapid Completion.

### 5.9.2.2 OPTIONS

#### Abbreviated Lab Report

Enabling this field causes the system to print a shortened version of the Lab Report. The shortened version does not contain results for the biochemical (ID) reactions. Disable this field to print the standard full-length Lab Report. The default is disabled (full length). Note that QC Reports always print standard full-length Lab Reports.

#### QC Lot Support

This field enables the QC Lot feature, which can be used to facilitate panel lot QC testing and tracking (see [5.3.7 Lot Information Sub-Tab](#)).

### 5.9.2.3 Daily Instrument Report Printing

#### System and BD EpiCenter™

The user can configure to auto print the Daily Instrument Report either at the instrument (System) or the BD EpiCenter™ for a predefined time each day. Only one of these checkboxes can be selected. Once either option is selected, the Hour and Minute fields will appear to specify when to print the report. If automatic printing is disabled, the report can still be printed at any time from Reports.

NOTE

If the BD EpiCenter™ is not connected to the BD Phoenix™ M50 System, then the user will not be able to see the BD EpiCenter™ checkbox.

### 5.9.2.4 Laboratory Information

Information entered in the Laboratory Information window prints in the header of system reports.

#### Name

Enter the laboratory name, up to 40 characters.

#### Address

Enter the address, up to 40 characters.

#### City

Enter the city (as well as state and zip code, if desired), up to 40 characters.

#### Director

Enter the name of the laboratory director, up to 40 characters.

## NOTE

Laboratory Information, Name, Address, City and Director can contain only the first 256 ASCII characters.

### 5.9.2.5 Printer Selection

This group contains a list of supported generic print drivers and any specific local printer drivers that are installed on the tablet and a “No Printer” option.

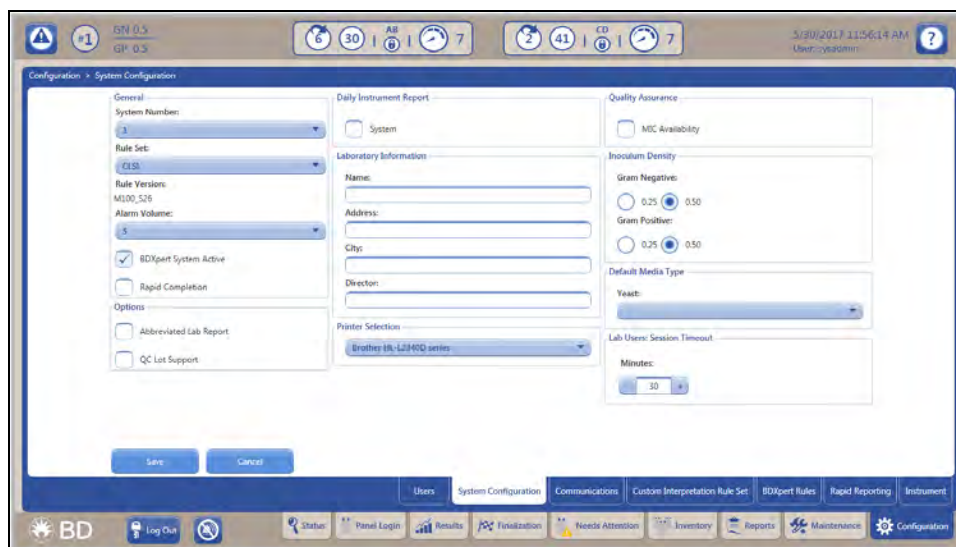
### 5.9.2.6 Inoculum Density

Inoculum Density enables the default McFarland concentration for inoculum to be set. Select 0.25 (acceptable density of 0.20–0.30) or 0.5 (acceptable density of 0.50–0.60) for gram-positive and gram-negative panels (Strep panels use only 0.5). The default density is 0.5 for gram-positive and gram-negative panel types. The density for Yeast ID panels is fixed at 2.0 McFarland (acceptable density of 2.00–2.40). Inoculum density is applicable only to panels that have an ID side.

### 5.9.2.7 Default Media Type

Yeast – This field enables the selection of a default media type that appears during Panel Login when a Yeast ID panel sequence number is scanned or typed in. From the drop-down box, highlight the desired media and select save to store the configuration setting. A default media type does not have to be specified, but a media type must be selected when logging in Yeast ID panels.

Figure 37 Systems Configuration Screen



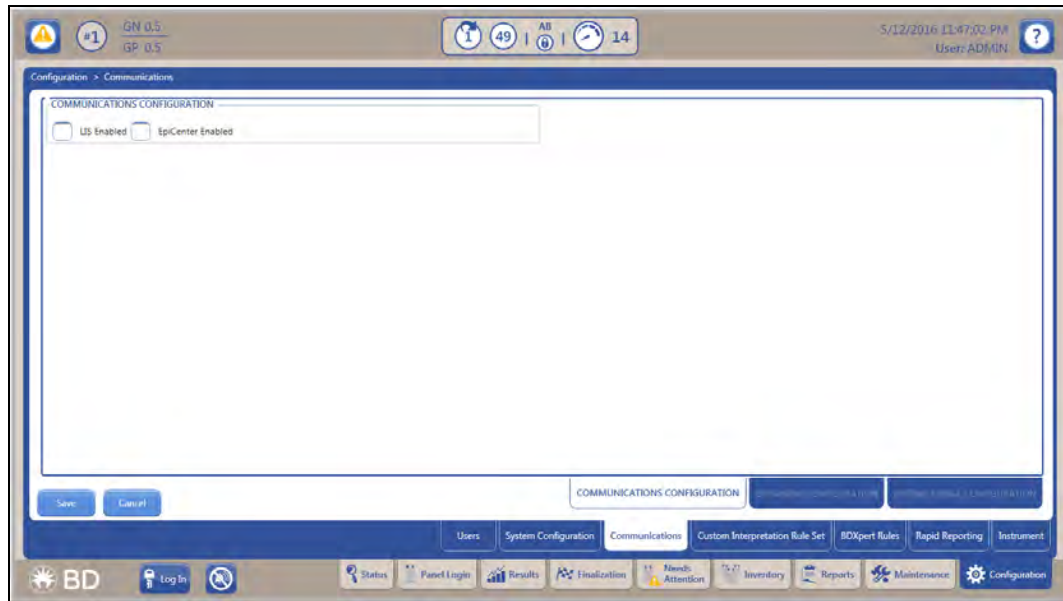
### 5.9.2.8 Lab Users: Session Timeout

Minutes – This field enables the user to configure when the session will be timed out. It ranges from 15 through 240 minutes.

### 5.9.3 Communications Sub-Tab

The Communications Configuration screen (see [Figure 38 Communications Configuration Screen](#)) enables/disables and configures communications for the BD Phoenix™ M50 Instrument with a compatible LIS (Laboratory Information System). It also enables BD representatives to enable/ disable/adjust communications with the BD informatics solution.

**Figure 38 Communications Configuration Screen**



The AIO PC displays the LIS connection status icon the upper left side of status screen. (See [4.6 LIS Operations](#) for details.)

#### LIS Enabled

Touch the **LIS Enabled** field to establish a connection. When LIS Enabled is checked, the following sections appear: Communications Configuration, Options, and Results Upload Options.

#### EpiCenter Enabled

Touch the **EpiCenter Enabled** field if there is a BD EpiCenter™ System or BD Synapsys™ Informatics Solution connected, and communications with an LIS system is required.

#### 5.9.3.1 Communications Configuration

The following fields appear under the Communications Configuration section:

##### Baud

Available choices are: 2400, 4800, 9600 (default), 14400, 19200, 38400, 57600, 115200.

##### Data Bits

Available choices are: 7, 8 (default).

**Parity**

Available choices are: None (default), odd, even.

**Stop Bits**

Available choices are: 1 (default), 2.

**Packed Frames**

Select whether packed frames can be used for serial communications with the LIS system. Enable this field to allow the BD Phoenix™ M50 Instrument to send multiple records per frame. A disabled field indicates that one record per frame is uploaded to the LIS.

**5.9.3.2 Options****Send Interpretation Results**

Enabling this option causes the final SIR values for antimicrobials to be included in the Results record uploaded to the LIS. Its default value is enabled.

**Unsolicited Queries**

Enabling this option causes the BD Phoenix™ M50 Instrument to request panel information from the LIS if the panel is placed into the instrument lacking an organism ID for AST panels or Combination panels with only the AST portion of the panel enabled.

This field's default value is disabled, which means the BD Phoenix™ M50 Instrument will NOT request missing information from the LIS.

**Send When Placed in Instrument**

Enabling this option causes the BD Phoenix™ M50 Instrument to send a Results upload to the LIS when the panel is placed into the instrument. This field's default value is enabled.

**ASTM Byte Mode Comments**

This field only appears when Japanese is selected for the language and causes the ASTM standard to be followed (when enabled) or not followed (when disabled). When the ASTM standard is not followed, escape sequence characters that are usually rejected are instead accepted.

This field's default value is enabled.

**5.9.3.3 Results Upload Options**

Only one option from the list below can be selected.

**Solicited**

Enabling this option causes the BD Phoenix™ M50 Instrument to upload Results records only when the LIS requests the information. Its default value is disabled.

QC panels and orphan panels are uploaded only when solicited by the LIS.

**Send on Finalization**

Enabling this option causes the BD Phoenix™ M50 Instrument to upload Results records only when the panel is finalized. Its default value is disabled.

**Send on Completion**

Enabling this option causes the BD Phoenix™ M50 Instrument to upload Results records only when the panel status becomes complete or when a change is made to a complete panel. Its default value is enabled.

**Send at Available**

Enabling this option causes the BD Phoenix™ M50 Instrument to upload Results records at the following times: when an ID is determined; when an AST result is determined; when there is a change to a panel record that already has at least partial results. Its default value is disabled.

**Send at Fixed Time**

Enabling this option causes the BD Phoenix™ M50 Instrument to upload Results records for a panel with partial results at a fixed, specified time. The default value is disabled.

**NOTE**

Send as Available and Send at Fixed Time results should be considered PRELIMINARY until the panel is complete.

Results records are uploaded from the BD Phoenix™ M50 Instrument to the LIS system. These records are covered in detail in [4.6.1 Results Upload Records](#).

## 5.9.4 Organism Configuration Sub-Tab

**NOTE**

This sub-tab is unavailable when the instrument is connected to a BD informatics solution.

The Organism Configuration screen enables the user to edit the LIS codes for the organisms in the BD Phoenix™ M50 Instrument database. LIS codes for organisms must be unique.

The Organism Configuration screen enables the selection of the organism (or Test Strain for QC organisms) to be edited.

**To edit an organism LIS code:**

1. In the Organism Configuration screen, select the name in the list and type in the new LIS Code in the Modify LIS Code area at the bottom of the screen.
2. Select **Save LIS Code** to save the changes.
3. When all modifications to the LIS codes have been completed, save and exit the Communications Configuration screen.

## 5.9.5 Antimicrobial Configuration Sub-Tab

### NOTE

This sub-tab is unavailable when the instrument is connected to a BD informatics solution.

The Antimicrobial Configuration screen enables the user to edit the LIS codes for the antimicrobials in the BD Phoenix™ M50 Instrument database. LIS codes for antimicrobials must be unique.

This screen also enables the selection of the antimicrobial to be edited. Antimicrobials are presented alphabetically by antimicrobial name.

#### To edit an antimicrobial LIS code:

1. In the Antimicrobial Configuration screen, select the antimicrobial.
2. In the Modify LIS Code window at the bottom of the list, type in the new LIS code.
3. Select **Save LIS Code** to save the modifications.
4. When all modifications to the LIS codes are complete, save and exit the Communications Configuration screen.

## 5.9.6 Custom Interpretation Rule Set Sub-Tab

Custom Interpretation Rule Set Configuration enables interpretation rules to be tailored to the specific needs or requirements of your laboratory. The current rule set (whether default or already customized) is used as the basis for custom rules. The current interpretation rule set from Reports can be printed (see [5.7 Reports Tab](#)). Note that this configuration function is not available if the BD Phoenix™ M50 Instrument is connected to and communicating with a BD informatics solution. A Custom Breakpoint Difference report is generated only if the BD Phoenix™ M50 System is not connected to a BD informatics solution.

Periodically, a software update or BD Phoenix™ Update Data (PUD) operation may install new breakpoints. When a software or PUD update has been performed, print a Custom Breakpoint Difference Report by selecting the Difference Report button at the bottom of the screen. Breakpoints that have been customized will not be overwritten with updates from the PUD. The Custom Breakpoint Difference Report will provide the appropriate data to determine if customized breakpoints need to be manually updated to reflect the currently installed PUD. See [5.7.15 Custom Breakpoint Difference Report](#) for additional details on this report and how breakpoints are updated.

#### Rules (Standards) Updates

The chart below depicts the logic of updates to Rules Sets. The top of the chart shows the effect of rules changes when a customized rule set is present. The bottom of the chart shows the rest of the cases for rules updates.

In the chart, the letters A, B, and C represent the entirety of a rule set (standard). For example, CLSI Rule Version M100\_S27 might be indicated by value A. An update, delivered via PUD, might install CLSI Rule Version M100\_S28, which might be indicated by the value B. The customization of A might be represented by C. Therefore, by following the chart below, the effect of the update is that value C (the customized rules based on Version M100\_S27) would be retained.

**Table 15 Rules Updates**

	Old Standard	New Standard	Old Custom	Result after PUD (New Custom)
Custom rules are present	A	A	B	B
	A	B	C	C
	–	–	A	A
	–	A	A	A
	–	A	B	A
	A	–	B	B
No custom rules	A	A	A	A
	A	B	A	B
	–	A	–	A
	A	A	–	A
	A	B	–	B
	A	–	A	–

**NOTE**

An interpretation rule is considered custom if any of the following are modified:  
Susceptible Breakpoint, Resistant Breakpoint, DTG.

**NOTE**

To use the custom rule set for interpretation, see [5.9.2 System Configuration Sub-Tab](#) and select **Custom** from the Rule Set drop-down menu.

**Custom Interpretation Rule Set – Based On**

The Based On drop-down list selects the standard rule upon which the custom rules are to be based. The standard rule sets are: CLSI, EUCAST, and SFM.

**NOTE**

If a rule set other than the current rule set is selected, the currently defined custom interpretation rules are deleted.

## Custom Rule Set Table

The main window on this screen shows the current rules in the rule set. The following values are shown from left to right (items are explained below under To modify a rule):

Checkbox next to a rule (indicates the rule is marked for deletion)

Antimicrobial

DTG (Drug Test Group - see information below)

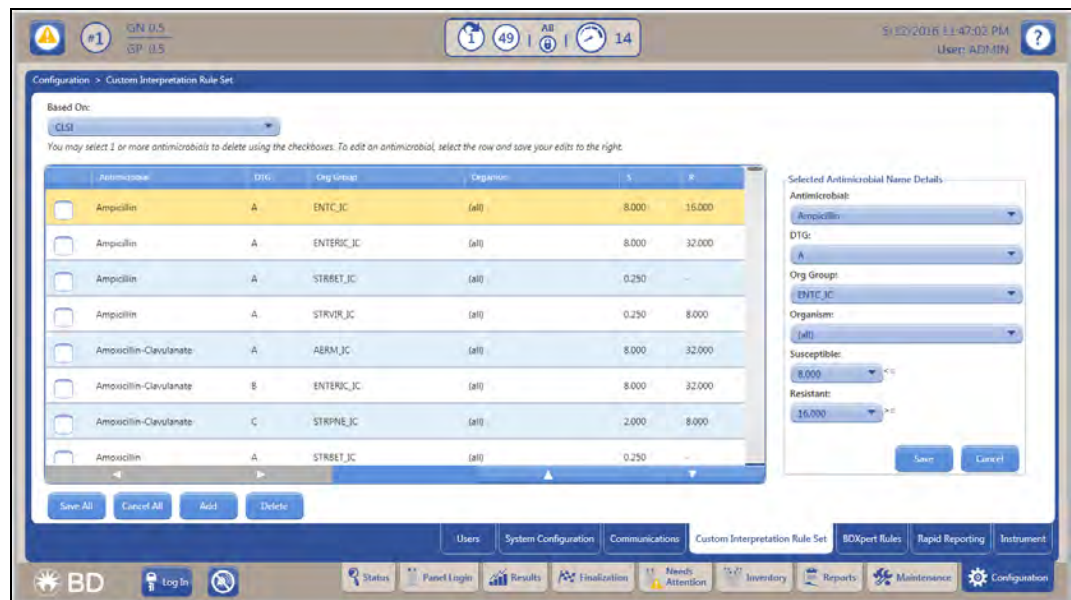
Org (anism) Group

Organism

S (susceptible Value)

R (resistant Value)

Figure 39 Custom Interpretation Rule Set Screen



### To add a rule

1. Select **Add**. A new rule is added to the end of the list and selected for modification.
2. Modify the rule attributes in the Selected Antimicrobial Name Details window and then save.
3. Once all new rules have been added select **Save All** to save the new rules and exit the custom interpretation rule set configuration screen.

### To modify a rule

1. Select the row containing the rule to be modified. The row will be highlighted and the rule attributes will be populated in Selected Antimicrobial Name Details.

**NOTE**

Do not check the field next to the rule. This is used to delete rules.

2. Modify the rules attributes and save when all modifications are complete.

DTGs are derived from the AST Standards and are used to categorize antibiotics into distinct groups. For each drug, the groups are specific to the organism group and the recommended utilization for that drug.

DTGs have no significance in the BD Phoenix™ System alone. They are used in conjunction with the BDXpert Rules and are necessary for interface with the BD informatics solution.

Generally, these are divided into seven groups shown below. Only the A, B, C and U codes may be reported on the Lab report(s). B and C groups are only reported when they are promoted to A by the BDXpert™ System.

Code	Details
A	Always tested and always reported
B	Usually tested, but not always reported
C	Sometimes tested and not always reported
U	Urinary tract specific drug; tested and reported for source urinary tract.
O	Other drugs that may be tested; will not be reported unless changed by user
I	Investigational drugs; drugs not approved for clinical use are never reported
N	Not grouped by standard; will not be reported unless changed by user

These drug testing codes are used for two purposes in the BD Phoenix™ M50 Instrument. First, drug testing codes can be altered to more closely match the antibiotic formulary and drug utilization guidelines within an institution. The initial codes will be determined by the AST interpretive standard that have been selected. Allowable changes are shown below.

Starting Code	Allowable (Recommended) Changes
A	B, C, U, O
B	A, C, U, O
C	A, B, U, O
U	A, B, C, O
O	A, B, C, U
I	None
N	A, B, C, U

The second application of the drug testing codes is for the promotion or suppression of drug results for the chartable report. This application is driven by the rules in the BDXpert™ System. If the rules alter the drug testing codes, these will be reflected on the Lab Report generated by the BD Phoenix™ M50 Instrument. The promotion and suppression actions are shown below. The drug testing codes will be used to determine which drug results actually appear on the chartable report (BD EpiCenter™), or are sent to the LIS (BD EpiCenter™ or BD Synapsys™ Informatics Solution).

Starting Code	Promotion	Suppression
A	Not applicable	C
B	A	C
C	A	Not applicable
U	Not applicable	C
O	Not allowed	Not allowed
I	Not allowed	Not allowed

When the desired rules have been modified, select **Save All** to save modifications to the rule set and exit Custom Interpretation Rule Set Configuration.

**To delete a rule:**

1. Check the field next to the rule to be deleted.
2. Select **Delete**.
3. Select **OK** in the Are you sure message box.
4. Select **Save All** to save the modifications and exit the Custom interpretation rule set screen.

## 5.9.7 BDXpert Rules Sub-Tab

**NOTE**

This configuration function is not available if the BD Phoenix™ M50 Instrument is connected to, and communicating with a BD informatics solution. See [Figure 40 BDXpert Rule Configuration Screen](#).

BDXpert Rule Configuration presents a summary of the status of each of the BDXpert Rules and enables users to select rules for modification. Individual BDXpert Rules can be enabled or disabled, or triggered automatically or manually according to the specific needs or requirements of each laboratory. The existing BDXpert Rule set can be printed by selecting BDXpert Rule Set Database Report from the Reports Tab (see [5.7 Reports Tab](#)). For more information on BDXpert Rules, refer to the following materials:

- BDXpert™ System instructions for use
- BDXpert™ System *Customer Release Notes*
- BD Synapsys™ instructions for use
- BD EpiCenter™ System Help.

**BDXpert Rule Set fields:**

**Rule Set**

The rule set currently being displayed is shown in this field. Values are CLSI, SFM, EUCAST, or Custom. Only rules in the selected set appear in the Rule Set field.

**Based On**

If the rule set is Custom, the rule set on which custom values are based is shown in this field.

## Rule Description

The Rule Description field shows the text of the rule selected.

**Figure 40 BDxpert Rule Configuration Screen**



To enable or disable a rule, Select **Enable/Disable** to toggle the status. When disabled, a rule is not available for use in the system.

To set the rule to automatic or manual trigger, select Automatic/Manual to toggle the status. When set to Automatic, a rule will be triggered automatically by the system. When set to manual, the rule must be accepted by the user before it is applied to results.

While 1500 series rules can be selected for viewing, they are fixed as enabled and automatic. These settings cannot be changed. When all parameters have been modified, select **Save**.

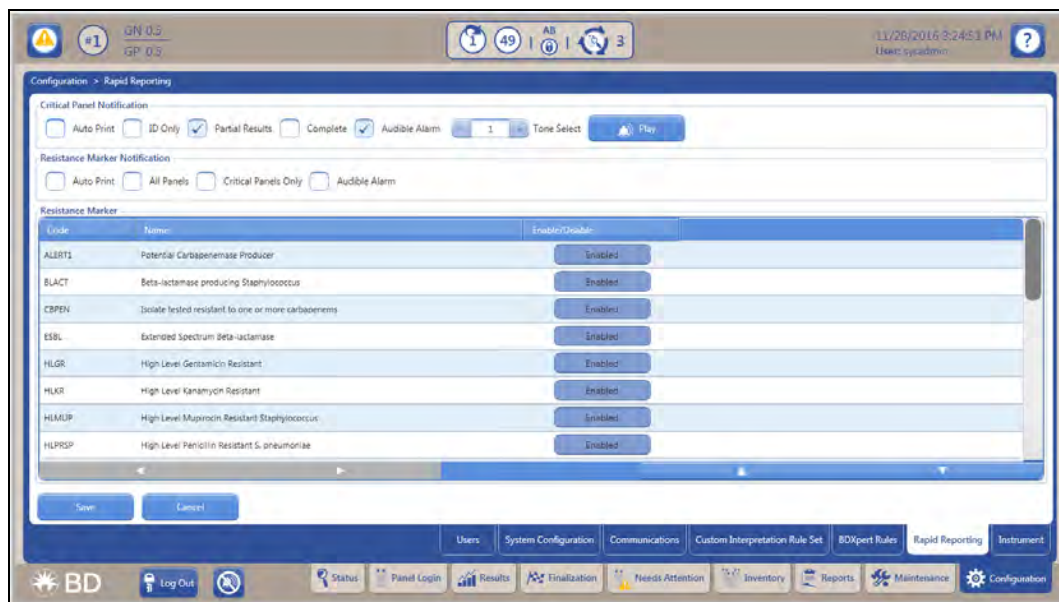
### 5.9.8 Rapid Reporting Sub-Tab

The Rapid Reporting configuration specifies the criteria for notification of critical panels and resistance markers. Notifications for critical panels can originate from:

- an automatic Lab Report printing
- an audible alarm
- an upload to the LIS when certain types of results are obtained in non-QC panels.

The types of results, which are selected, are ID only, partial results, and complete results. For Resistance Markers, designate the type of notification desired when resistance markers (that are enabled) are triggered. For both, disabling both printing and audible alarms can be chosen. In this case, the only notification is that the panel is shown in red text on the Panel Inventory screen.

Figure 41 Rapid Reporting Configuration Screen



Rapid reporting alarms exist in two states: unacknowledged and acknowledged. Unacknowledged alarm panels continue to display a red ! (exclamation mark) on the Inventory screen. Acknowledgment is achieved when an automatic Lab Report for the panel prints or when the panel is viewed in Results. Audible alarms continue to sound for unacknowledged alarms until the Silence Alarm button is pressed.

### 5.9.8.1 Critical Panel Notification

The Critical Panel Notification field allows the user to set parameters for notification on critical panels. Any panel where special notification occurs when results become available is called a Critical Panel. Notification can be audible and/or by immediate printing of a Lab Report (or neither). Panels can be marked as critical when they are logged in via Panel Login, or subsequently on the Results screen.

#### Auto Print

When enabled, the system prints a Lab Report whenever the selected results parameters occur (ID Only, Partial, or Complete – see below). This field is disabled by default (auto print off). Both Auto Print and Audible Alarm may be enabled simultaneously.

#### Upload to LIS

This only appears if LIS Communications is enabled. The default value is disabled. When enabled, the system uploads results records whenever the selected results parameters occur (ID Only, Partial, or Complete – see below). This field overrides the results upload values set in Communications Configuration.

#### Audible Alarm

When enabled, the system sounds an audible alarm whenever the selected results parameters occur (ID Only, Partial, or Complete – see below). This field is enabled by default (audible alarm on). Both Auto Print and Audible Alarm may be enabled simultaneously.

### **Tone Select**

This field allows the selection of the tones sounded by the critical panel audible alarm. It appears only if Audible Alarm is checked (enabled). This field is set to Tone 1 by default. The system sounds a sample tone each time the field is selected or its contents are changed.

**NOTE**

Enable one of the following three fields in order to receive any critical panel notifications.

### **ID Only**

When enabled, critical panel notification is performed only when an organism ID is detected on a panel. This field is set to disabled by default (alarm/report on partial results). If this field is enabled, Partial Results and Complete cannot be enabled.

### **Partial Results**

When enabled, critical panel notification is performed when partial panel results are obtained. This field is set to enabled by default (alarm/report on partial results). If this field is enabled, ID Only and Complete cannot be enabled.

### **Complete**

When enabled, critical panel notification is performed only when complete panel results are obtained. This field is set to disabled by default (alarm/report on partial results). If this field is enabled, ID Only and Partial Results cannot be enabled.

## **5.9.8.2 Resistance Marker Notification**

### **Auto Print**

When enabled, the system prints a Lab Report whenever a resistance marker is triggered. This field is set to disabled by default.

### **Upload to LIS**

This appears only if LIS Communications is enabled. The default value is disabled. When enabled, the system uploads results records whenever the selected results parameters occur (ID Only, Partial, or Complete – see above).

This field overrides the results upload values set in Communications Configuration ([5.9.3 Communications Sub-Tab](#)).

**NOTE**

Enable one of the following two fields in order to receive any resistance marker notifications.

### **Audible Alarm**

When enabled, the system sounds an audible alarm whenever the selected results parameters occur (All Panels or Critical Panels Only – see below). This field is enabled by default (audible alarm on). Both Auto Print and Audible Alarm may be enabled simultaneously.

### **Tone Select**

This field allows the selection of the tones sounded by the resistance marker audible alarm. It appears only if Audible Alarm is checked (enabled). This field is set to Tone 1 by default. The system sounds a sample tone each time the field is selected or its contents are changed.

### **All Panels**

When enabled, resistance marker alarms are generated for all panels in which markers occur. This field is disabled by default. If this field is enabled, Critical Panels Only cannot be enabled.

### **Critical Panels Only**

When enabled, resistance marker alarms are generated only for critical panels in which markers occur. This field is enabled by default. If this field is enabled, All panels cannot be enabled.

When enabled, critical panel notification is performed only when complete panel results are obtained. This field is set to disabled by default (alarm/report on partial results). If this field is enabled, ID Only and Partial Results cannot be enabled.

## **5.9.8.3 Resistance Marker**

This field enables or disables the notification of individual resistance markers. The field shows the abbreviation and text of the Marker, as well as whether it is currently enabled or disabled. By default, all resistance markers are enabled. Resistance marker alarm notification occurs only for enabled markers.

## **5.9.9 Panel Lot Definition Sub-Tab**

Panel Lot Definition sub-tab is visible when QC Lot Support is enabled within System Configuration. Panel Lot Definition enables the definition of panel lots to facilitate QC testing and tracking. Panel lot definition saves the lot number, beginning and ending panel sequence numbers, definition date, and first and last used dates for a lot. Current and historical QC results can be viewed and printed. Note that this configuration function is not available if the BD Phoenix™ M50 Instrument is connected to and communicating with a BD informatics solution.

This tab's activities are:

- Define new panel lots
- Recall existing panel lots
- Review current and historical QC results for panel lots
- Print Panel Lot (current, historical) reports

When a panel lot definition is saved, any Test Strain recommendations that exist are displayed in the Current QC Results window. There is a toggle feature between Current and Historical QC Results windows. Current results show a summary of the most recent test for each strain for all instruments, up to 20 entries. Historical results show all tests for a strain for the current instrument only, up to 200 entries. In order to display results from other instruments, Panel Lots must be saved at those instruments and restored to the current instrument (see [Restore Panel Lot Definitions Task \(Panel lot definition is enabled and system is not connected to a BD informatics solution\)](#) in [5.8.4 Maintenance Panel Functions](#)).

Field contents of these windows are explained below.

### **Panel Lot Number**

This field shows the lot number for the panel. To enter a new panel lot number, scan the lot number barcode (next to the L symbol) on the box. The panel lot number is encoded in the barcode. The lot number cannot be typed in this field when defining new panel lots.

To recall a panel lot definition, select a panel lot from the drop-down list, or type the first few numbers of the panel lot number to jump to that portion of the list, or scan the panel lot barcode.

### **Expiration Date**

This field shows the lot's expiration date. This information is encoded in the panel lot barcode and is filled in automatically when the panel lot barcode is scanned. The expiration date cannot be typed in when defining new panel lots. This date can only be changed by scanning a new panel lot barcode provided by the BD Quality department (only if an administrator is logged in).

### **Start Sequence Number**

This field shows the starting barcode sequence number for the panel lot. To enter a new Start Sequence number, scan the lowest sequence number in the lot (next to the symbol on the box). This field can only be completed by scanning the panel sequence barcode; the sequence number cannot be typed in this field.

### **End Sequence Number**

This field shows the ending barcode sequence number for the panel lot. To enter a new End Sequence number, scan the highest sequence number in the lot (next to the symbol on the box). This field can only be completed by scanning the panel sequence barcode; the sequence number cannot be typed in this field.

### **Definition Date**

This field shows the date on which the panel lot was defined. It is completed automatically when the panel lot definition is saved. This is a read-only field that cannot be changed by the user.

### **First Used Date**

This field shows the first date on which a panel from this lot was used. It is completed automatically when the panel is placed in the instrument. This is a read-only field that cannot be changed by the user.

### **Last Used Date**

This field shows the last date on which a panel from this lot was used. It is completed automatically when the panel is placed in the instrument. This is a read-only field that cannot be changed by the user.

### **Where Defined**

This field appears only if the panel lot was defined at a different number instrument than the current one. It shows the instrument number where the panel lot was defined. Panel lot definitions can be saved at one instrument and restored to another instrument through the Save/Restore Panel Lot Definitions functions found on the [5.8 Maintenance Tab](#).

### Current QC Results

This window appears only after a panel lot is saved. When a panel lot definition is saved, any QC Test Strain recommendations that exist are displayed in the Current QC Results window. Only the most recent QC test is shown for each test strain, up to a maximum of 20 tests. Results for other instruments can be shown in this window by saving those results at that instrument and restoring them at the current one (see [Save Panel Configuration Task](#) and [Restore Panel Lot Definitions Task \(Panel lot definition is enabled and system is not connected to a BD informatics solution\)](#) in [5.8 Maintenance Tab](#)).

The following read-only fields are shown in the Current Results window: Test Strain (sort order by name); Test Date; Sequence Number; (Test) Type (ID, AST, or ID/AST); QC Status (None for uncompleted test; Pass, Fail, Review, or Error for completed tests).

A Current QC Panel Lot Report is available by exiting the Panel Lot Definition tab and selecting the Reports tab. In addition to the fields listed above, the report includes standard report header information (Report Title, Laboratory Information (if configured), Date and Time Printed, and Instrument number where the report was printed); Panel Lot number; Panel Type; Expiration Date; Instrument number for each strain tested (blank if instrument is the same); and Tech ID.

### Historical QC Results

This appears only after a panel lot is saved. Historical results show all tests for a strain for the current instrument only, up to 200 entries. When the desired panel is highlighted, move to the QC Panel Results screen, or print a Historical QC Panel Lot Report.

The following read-only fields are shown in the Historical Results window: Test Strain (drop-down selection box); Test Date (sort order); Sequence #; (Test) Type (ID, AST, or ID/AST); QC Status (None, Pass, Fail, Review, Error); Tech ID.

A Historical QC Panel Lot Report is available by exiting the Panel Lot Definition tab and selecting the Reports tab. In addition to the fields listed above, the report includes standard report header information (Report Title, Laboratory Information (if configured), Date and Time Printed, and Instrument number where the report was printed); Panel Lot number; Panel Type; and Expiration Date.

## 5.9.10 Instrument Sub-Tab

BD field service only.



## 6 Routine Panel Operation

This section describes the following routine panel operations:

- [6.1 Storage and Handling](#) of the panels
- [6.2 Preparing Panels](#)
- [6.3 Quality Control](#)
- [6.4 Automatic Association of Panels](#)

For more information, refer to the *BD Phoenix™ AP Instrument User's Manual*.

### 6.1 Storage and Handling

#### BD Phoenix™ Panels

Panels are individually pouched and packaged in a box of 25. They must be stored unopened at room temperature (15–25 °C). Visually inspect the packaging for holes or cracks in the foil package.

Figure 42 BD Phoenix™ Panels



**CAUTION**

**Do Not:**

- refrigerate or freeze.
- use if the packaging appears to be damaged.
- use the panel if there is no desiccant or if the desiccant pouch is torn.

If stored as recommended, the panels will retain expected reactivity until the date of expiration.

**BD Phoenix™ ID Broth**

**Figure 43 ID and AST Broth and BD Phoenix™ AST Indicator Solution**



Tubes are packaged as 100 tube packs. Visually inspect the tubes for cracks, leaks, etc.

**CAUTION**

**Do not use if there appears to be a leak, tube or cap damage or visual evidence of contamination (i.e., haziness, turbidity).**

Store BD Phoenix™ ID Broth tubes at 2–25 °C and keep them away from direct light. Expiration dating is shown on the tube label.

### BD Phoenix™ AST Broth and BD Phoenix™ AST-S Broth

Tubes are packaged as 100 tube packs. Visually inspect the tubes for cracks, leaks, etc.

**CAUTION**

**Do not use if there appears to be a leak, tube or cap damage or visual evidence of contamination (i.e., haziness, turbidity).**

Store BD Phoenix™ AST Broth tubes at 2–25 °C and keep them away from direct light. Expiration dating is shown on the tube label.

### BD Phoenix™ AST Indicator Solution and BD Phoenix™ AST-S Indicator Solution

The indicator solution is individually pouched and packaged as a pack of 10 dropper bottles. Visually inspect the bottle for cracks and/or leaks.

**CAUTION**

**Do not use if there appears to be a leak, bottle or cap damage, or any change from a dark blue color.**

Store the BD Phoenix™ AST Indicator Solution at 2–8 °C. Each bottle contains enough solution to test up to 100 panels. Expiration date is shown on the box, pouch, and bottle label and is applicable for unopened bottles. An opened bottle will be stable for up to 14 days if stored at 2–8 °C. Be sure the bottle is held vertically when dispensing the AST Indicator Solution.

## 6.2 Preparing Panels

The BD Phoenix™ System is not used directly with clinical specimens. Only pure culture isolates of aerobic and/or facultatively anaerobic gram-negative, gram-positive, and yeast organisms are acceptable for testing. Make sure the test isolate is a pure culture. It is recommended that cultures be 18–24 hours old for gram-negative and gram-positive organisms and 18–48 hours old for yeast organisms unless additional incubation is required to achieve sufficient growth.

For AST testing in the BD Phoenix™ System, isolates must be recovered from nonselective media. Media containing antibiotics should not be used for organisms to be tested in the BD Phoenix™ System except those specifically claimed in the table below. Selective media may inhibit some strains of bacteria and yeast, therefore use caution when selecting isolated colonies from these media. Use isolates from a blood agar plate such as BD Trypticase™ Soy Agar with 5% Sheep Blood. The Media selected during login of Yeast ID panels refers to the media on which the organism was grown.

Other recommended media are included in the table below:

Table 16 Recommended Media

Recommended Media	Approved Use			
	ID	AST	Strep	Yeast ID
BD BBL™ CHROMagar™ Orientation	Yes	Yes <sup>1</sup>	X	X
Bromothymol Blue (BTB) Lactose Agar	Yes <sup>4</sup>	Yes	X	X
Chocolate Agar	Yes	Yes	Yes <sup>2</sup>	Yes
Columbia Agar with 5% Horse Blood	Yes	Yes	Yes <sup>3</sup>	X
Columbia Agar with 5% Sheep Blood	Yes	Yes	Yes	Yes
Columbia CNA Agar with 5% Sheep Blood (Gram Positives)	Yes	X	Yes	X
Cystine-Lactose-Electrolyte-Deficient (CLED) Agar	Yes <sup>5</sup>	Yes	X	X
Dey/Engley (D/E) Neutralizing Agar (Gram Negatives)	Yes	X	X	X
Eosin Methylene Blue (Gram Negatives)	Yes	Yes	X	X
Hektoen Enteric Agar (Gram Negatives)	Yes	X	X	X
MacConkey Agar (Gram Negatives)	Yes	Yes	X	X
Phenylethyl Alcohol Agar (Gram Positives)	Yes	X	Yes	X
Sabouraud Brain Heart Infusion Agar - SAB HI (Yeast)	X	X	X	Yes
Sabouraud Dextrose Agar (Yeast)	X	X	X	Yes
Sabouraud Dextrose Agar-Emmons (Yeast)	X	X	X	Yes
BD Trypticase™ Soy Agar with 5% Sheep Blood	Yes	Yes	Yes	Yes
BD Trypticase™ Soy Agar with Lecithin and Tween® 80	Yes	X	X	X
BD Trypticase™ Soy Agar without Blood	Yes	X	X	X
Xylose Lysine Desoxycholate Agar (Gram Negatives)	Yes	X	X	X

<sup>1</sup> The use of CHROMagar™ Orientation may produce false susceptibility results when testing erythromycin with gram-positive organisms. Antimicrobial susceptibility test results should be confirmed using BD Trypticase™ Soy Agar with 5% Sheep Blood.

<sup>2</sup> This media type should not be used for Streptococcal identification with SMIC/ID panels. Chocolate Agar may be used for Streptococcal susceptibility testing only.

<sup>3</sup> The use of Columbia Agar with 5% Horse Blood may produce significantly higher MIC for SXT with *Streptococcus* species, which may result in false resistance. Antimicrobial susceptibility test results should be confirmed using BD Trypticase™ Soy Agar with 5% Sheep Blood.

<sup>4</sup> The use of Bromothymol Blue Lactose Agar with gram-positive organisms should be restricted to Staphylococci for both the 0.5 and 0.25 GP systems.

<sup>5</sup> The use of Cystine-Lactose-Electrolyte-Deficient Agar with gram-positive organisms should be restricted to Staphylococci for the 0.25 GP system.

The applicator swabs should be sterile cotton swabs; polyester swabs are not recommended. The quality of applicator swabs may vary from vendor to vendor and on occasion, loose fibers may dislodge from the swab affecting McFarland readings.

**Figure 44 Cotton Swabs**



The usefulness of the BD Phoenix™ System or any other diagnostic procedure performed on clinical specimens is directly influenced by the quality of the specimens themselves. Laboratories must employ methods discussed in the *Manual of Clinical Microbiology*<sup>17</sup> for specimen collection, transport, and placement on primary isolation media.

Due to variations in inoculum concentrations prepared with McFarland standards, use the BD PhoenixSpec™ Nephelometer or the BD Phoenix™ AP Instrument for adjusting the test inoculum prior to using them in the BD Phoenix™ System.

Instructions for an optional purity check are provided at the end of this subsection.

#### **WARNING**

- **OBSERVE ESTABLISHED PRECAUTIONS AGAINST MICROBIOLOGICAL HAZARDS THROUGHOUT ALL PROCEDURES.**
- **ALL SPECIMENS SHOULD BE HANDLED ACCORDING TO CDC-NIH RECOMMENDATIONS, CLSI GUIDELINES, OR LOCAL INSTITUTION GUIDELINES FOR ANY POTENTIALLY INFECTIOUS HUMAN SERUM, BLOOD, OR OTHER BODY FLUIDS.**
- **PRIOR TO DISCARDING SPECIMEN CONTAINERS AND OTHER CONTAMINATED MATERIALS BY AUTOCLAVING, STERILIZE THEM.**
- **IN ADDITION TO WEARING GLOVES, USE DISPOSABLE LAB COATS OR GOWNS AND PROTECTIVE GLASSES OR GOGGLES WHEN WORKING AROUND THE INSTRUMENT.**

### **6.2.1 Materials Required That Are Provided**

- BD Phoenix™ Inoculation Station
- BD Phoenix™ Transport Caddy

- BD PhoenixSpec™ Nephelometer or the BD Phoenix™ AP Instrument
- 25 µL pipettor and tips
- 50 µL pipettor and tips
- Barcode Scanner (external)
- Printer

## 6.2.2 Materials Required But Not Provided

- BD Phoenix™ Panels
- BD Phoenix™ ID Broth or BD Phoenix™ Inoculum Broth
- BD Phoenix™ AST and/or BD Phoenix™ AST-S Broth
- BD Phoenix™ AST Indicator Solution and/or BD Phoenix™ AST-S Indicator Solution
- BD Phoenix™ Panel closures
- Gram Stain Reagents
- Sterile Cotton Swabs, Inoculation Loops or Needles
- Nonselective Culture Plated Media (see [6.2 Preparing Panels](#))
- Incubators
- Vortex Mixer

### NOTE

- Exercise care in handling BD Phoenix™ panels. Handle panels by the sides only to avoid marking, smudging, or obscuring the bottom or top of the panel in any way.
- Accession barcode labels affixed to a BD Phoenix™ panel must not be of fluorescent material, should not cover any BD Phoenix™ panel reaction wells, and should not cover the BD Phoenix™ sequence number (panel) barcode.
- The procedure that follows describes all the steps in preparing a combination panel for both identification and susceptibility testing. If a combination panel is being used for only ID or only AST testing, note that certain steps are not applicable in the procedure.

## 6.2.3 General Panel Preparation

If the BD Phoenix™ AP Instrument is being used, refer to the *BD Phoenix™ AP Instrument User's Manual* for panel preparation.

BD Phoenix™ Strep panels, BD Phoenix™ Yeast ID panels, BD Phoenix™ Emerge™ panels, BD Phoenix™ Inoculum Broth, and BD Phoenix™ MIC panels have separate instructions that appear after these General Panel Preparation instructions.

### NOTE

Before proceeding with the inoculum preparation for use in the BD Phoenix™ M50 Instrument, confirm the Gram stain reaction of the isolate.

1. Once the Gram stain reaction is confirmed, select the appropriate BD Phoenix™ panel for inoculation. Do not use the panel if the pouch is punctured or opened.
2. Remove the panel from the pouch. Discard the desiccant. Do not use the panel if there is no desiccant or if the desiccant pouch is torn. Use panel within 2 hours of removal from the pouch.

**NOTE**

Panels must be inoculated within 2 hours of being removed from the pouch.

3. Place the panel on the Inoculation Station so that the inoculation ports are on top, and the pad is at the bottom.
4. Label a BD Phoenix™ ID broth tube with the patient's specimen number.
5. Using aseptic technique, pick colonies of the same morphology with the tip of a sterile cotton swab (do not use a polyester swab) or a wooden applicator stick from one of the recommended media.
6. Suspend the colonies in the BD Phoenix™ ID broth (4.5 mL).
7. Cap the tube and vortex for 5 seconds.
8. Allow approximately 10 seconds for air bubbles to surface. Tap the tube gently to aid in eliminating bubbles.
9. Insert the tube into the BD PhoenixSpec™ Nephelometer. Make sure the tube is inserted as far as it will go. (Refer to the BD PhoenixSpec™ Nephelometer product insert for correct usage instructions).
10. If the inoculum density is set to 0.5 McFarland for the panel type being run, then a range of 0.50–0.60 is acceptable. If the inoculum density is set to 0.25 McFarland for the panel type being run, then a range of 0.20–0.30 is acceptable.

If the density of organisms is low, colonies can be added from the isolate. Re-vortex the sample and reread to confirm that the correct McFarland has been achieved. If the density of organisms exceeds 0.6 McFarland, follow the steps below to dilute the broth. It is very important to accurately indicate the level of the liquid in the tube since this volume is needed to adequately fill the wells in the panel.

- a. Using a marker, mark the broth level in the over-inoculated BD Phoenix™ ID Broth tube.
- b. Using a sterile pipette, aseptically add fresh BD Phoenix™ ID Broth to the inoculum. Only BD Phoenix™ ID Broth may be used to dilute the inoculum.
- c. Vortex the tube and allow to sit for 10 seconds.
- d. Place the tube in the nephelometer and remeasure the turbidity of the suspension.
  - If the reading is greater than 0.6, repeat Steps b–d.
  - If the reading is 0.5–0.6, go to Step e.
- e. Using a sterile pipette, aseptically remove excess broth to the original level indicated by the mark on the tube created in Step a.

Remove excess broth to avoid overfilling the panel. Also, do not remove too much broth, as there may be insufficient broth to adequately fill the panel.

- f. Broth may now be used to inoculate the BD Phoenix™ AST Broth and/or the BD Phoenix™ Panel.

NOTE

- Yeast ID panels must be inoculated using a 2.00–2.40 McFarland inoculum density.
- Confirm current instrument settings for inoculum density before inoculating panels.
- See instructions below, ID Inoculum Density Flexibility, for information on using alternate densities.
- Only the BD PhoenixSpec™ Nephelometer and BD Phoenix™ AP Instrument can be used to make inoculum densities of 0.25 McFarland
- Standardized bacterial suspension in ID Broth or Inoculum Broth must be used within 60 minutes of preparation.

11. If the test is for identification only, proceed to Step 16 and continue the procedure with the exception of Step 17 (which pertains to AST panels). If a BD Phoenix™ Emerge™ Panel is being inoculated, see [6.2.7 Preparing BD Phoenix™ Emerge™ Panels](#).
12. Label a BD Phoenix™ AST broth tube (8.0 mL) with the patient's specimen number. Add one free falling drop of AST Indicator solution to the AST broth tube. Invert to mix. DO NOT VORTEX.

NOTE

- Allow AST Indicator Solution to warm to room temperature before dispensing into AST broth.
- Return the unused portion of the indicator to 2–8 °C as soon as possible. Do not store at room temperature for more than 2 hours. Discard opened bottles after 14 days from initial opening.
- If volume other than one drop is added inadvertently, discard the tube and use a fresh tube of AST broth.
- After adding the Indicator to AST broth, store the mixed solution in the dark, at room temperature, for as long as 8 hours.
- After adding AST Indicator Solution, if it is exposed to light, use the tubes within 2 hours.

13. If an inoculum density of 0.50–0.60 was used, transfer 25 µL of the bacterial suspension from the ID tube into the AST broth tube. If an inoculum density of 0.20–0.30 was used, transfer 50 µL (use 2 shots if utilizing a 25 µL pipettor) of the bacterial suspension from the ID tube into the AST broth tube.

## NOTE

Inoculate panels within 30 minutes of the time that the AST broth inoculum is prepared.

14. Cap the AST tube and invert several times to mix.
15. Wait a few seconds for air bubbles to surface. Tap the tube gently to aid in eliminating bubbles.
16. Pour the ID tube inoculum into the fill port on ID side of the panel (51-well side). Allow the fluid to traverse down the tracks before moving the panel. If an AST (only) panel is being used, DO NOT inoculate the ID side of the panel. Retain the ID tube for an optional purity check (see below).
17. Pour the AST broth inoculum into the fill port on AST side of the panel (85-well side). Allow the fluid to traverse down the tracks before moving the panel.
18. Before placing panel closures check for residual droplets of inoculum on the edge of the fill ports. If a droplet is present remove the droplet with absorbent material. The used absorbent material must be decontaminated before discarding.
19. Snap on the panel closures. Make sure that the closures are fully seated. Use two closures regardless of panel type.
20. Visually inspect panels to be sure each of the wells is full. Look at both sides of the panel. Make certain that the wells are not overfilled. If any of the wells are unfilled or overfilled, inoculate a new panel.

## NOTE

See NOTE above

- Panels must be loaded into the instrument within 30 minutes of inoculation.
- Panels must be kept in the inoculation station after inoculation until the excess fluid has been completely absorbed by the pad.
- Panels should stay vertical in the caddy until loaded.
- Inoculated panels should be handled with care. Avoid knocking or jarring the panel.

## NOTE

## OPTIONAL PURITY CHECK

It is highly recommended that the purity of both ID and AST inocula be checked by preparing a purity plate.

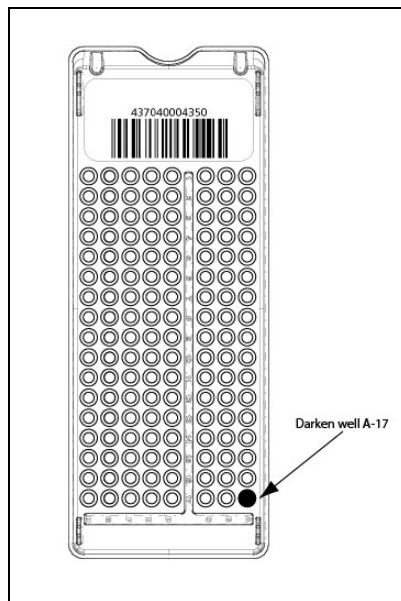
To perform a purity check, using a sterile loop, recover a small drop from the inoculum fluid tube either before or after inoculating the panel and inoculate an agar plate (any appropriate medium) for purity check. Discard inoculum fluid tube and cap in a biohazard disposal container. Incubate the plate for 24–48 hours at 35 °C under appropriate conditions.

## 6.2.4 ID Inoculum Density Flexibility

An ID portion of a panel may be run in the opposite mode from what is configured by darkening well A-17 on the back of a panel before placing the panel in the instrument. This allows a panel to be run at an inoculum density of 0.20–0.30 even if a density of 0.5 is configured for that particular panel type. Likewise, a panel can be run at an inoculum density of 0.50–0.60 if a density of 0.25 is configured.

There is no way to alter the density setting during Panel Login. To use a panel in the opposite density mode, using a black permanent marker blacken the entire A-17 well as shown in the figure below.

Figure 45 Panel wells



Inoculum densities sent from the BD Phoenix™ AP Instrument (via a BD informatics solution) cannot be changed by darkening well A-17. Inoculum densities sent from the BD Phoenix™ AP Instrument are invalid if they are received after the completion of the first test cycle, or if the ID portion of the panel is disabled, or if the panel type does not support the inoculum density. If the instrument receives an invalid inoculum density for an ID panel that differs from the panel's determined inoculum density, the ID side of the panel fails, a Needs Attention code is triggered (Cannot Determine Organism ID), and a Special Message is triggered.

The following table outlines how to run the opposite mode from the density for which the instrument is configured.

Current Instrument Inoculum Density Configuration	Inoculum Concentration Desired for Test Panel	Amount of ID Inoculum to Add to AST Broth**	Well A-17
0.50	0.25	50 µL	Blackened
0.25	0.50	25 µL	Blackened
** If also running AST			

## 6.2.5 Preparing BD Phoenix™ Strep Panels

BD Phoenix™ Strep panels are for the identification and antimicrobial susceptibility testing of most *Streptococcus* species. Although *Streptococcus* species may be identified in the gram-positive panels, antimicrobial susceptibility cannot be reported when using these panels. The BD Phoenix™ Strep panels, which must be used with BD Phoenix™ AST-S Broth and BD Phoenix™ AST-S Indicator Solution, provide the conditions required for rapid AST testing of most *Streptococcus* species.

1. Follow Steps 1–10 from [6.2.3 General Panel Preparation](#) to prepare the suspension of bacteria using a 0.5 McFarland inoculum density.
2. Label a BD Phoenix™ AST-S broth tube (8.0 mL) with the patient's specimen number. Add one drop of the BD Phoenix™ AST-S Indicator to the AST-S broth tube. Invert to mix. DO NOT VORTEX.

### NOTE

- AST-S Broth and AST-S Indicator Solution are for use with the BD Phoenix™ Strep panels (SMIC/ID, SMIC) only. These reagents are not interchangeable with the AST Broth and AST Indicator Solution used with BD Phoenix™ gram-positive and gram-negative panels.
- Allow AST-S Indicator Solution to warm to room temperature before dispensing into AST-S broth.
- Make sure the unused portion of the indicator return to 2–8 °C as soon as possible. Do not store at room temperature for more than 2 hours. After 14 days from opening, discard the bottles.
- If volume other than one drop is added inadvertently, discard the tube and use a fresh tube of AST-S broth.
- After the addition of the Indicator to AST-S broth, the mixed solution can be stored in the dark, at room temperature, for as long as 8 hours.
- After the addition of AST-S Indicator Solution, if the tubes are exposed to light, they must be used within 2 hours.

3. Using a pipettor, transfer 25 µL of the standardized bacterial suspension from the ID tube into the AST-S broth tube.

### NOTE

Panels must be inoculated within 30 minutes of the time that the AST-S broth inoculum is prepared.

4. Cap the AST-S tube and invert several times to mix.
5. Wait a few seconds for air bubbles to surface. Tap the tube gently to aid in eliminating bubbles.
6. Pour the ID tube inoculum into the fill port on ID side of the panel (51-well side). Allow the fluid to traverse down the tracks before moving the panel. If a BD Phoenix™ Strep MIC

only panel is being used, DO NOT inoculate the ID side of the panel. Retain the ID tube for an optional purity check (see below).

7. Pour the AST-S broth inoculum into the fill port on AST side of the panel (85-well side). Allow the fluid to traverse down the tracks before moving the panel.
8. Before placing panel closures, check for residual droplets of inoculum on the edge of the fill ports. If a droplet is present, remove the droplet with absorbent material. The used absorbent material must be discarded with biohazard waste.
9. Snap on the panel closures. Make sure that the closures are fully seated.
10. Visually inspect panels to be sure each of the wells is full. Look at both sides of the panel. Make certain that the wells are not overfilled. If any of the wells are unfilled or overfilled, inoculate a new panel.

NOTE

- Panels must be loaded into the instrument within 30 minutes of inoculation.
- Panels must be kept in the inoculation station after inoculation until the excess fluid has been completely absorbed by the pad.
- Panels should stay vertical in the caddy until loaded.
- Inoculated panels should be handled with care. Avoid knocking or jarring the panel.

NOTE

OPTIONAL PURITY CHECK

It is highly recommended that the purity of both ID and AST-S inocula be checked by preparing a purity plate.

To perform a purity check, using a sterile loop, recover a small drop from the inoculum fluid tube either before or after inoculating the panel and inoculate an agar plate (any appropriate medium) for purity check. Discard inoculum fluid tube and cap in a biohazard disposal container. Incubate the plate for 24–48 hours at 35 °C under appropriate conditions.

## 6.2.6 Preparing BD Phoenix™ Yeast ID Panels

BD Phoenix™ Yeast ID panels are for the identification of most clinically relevant yeast and yeast-like species.

1. Follow Steps 1–9 ([6.2.3 General Panel Preparation](#)) to prepare the suspension of yeast.
2. The inoculum density is set to 2.0 McFarland for Yeast ID panels, with a range of 2.00–2.40 as acceptable. If the density of organism is low or the density of organisms exceeds 2.40 McFarland, follow the steps discussed in Step 10 of [6.2.3 General Panel Preparation](#) to obtain the correct McFarland density and then proceed to the steps below.
3. Pour the ID tube inoculum into the fill port on the ID side of the panel (51-well side). Allow the fluid to traverse down the tracks before moving the panel.

4. Before placing panel closures, check for residual droplets of inoculum on the edge of the fill ports. If a droplet is present remove the droplet with absorbent material. The used absorbent material must be discarded with biohazard waste.
5. Snap on the panel closures. Make sure that the closures are fully seated. Use two closures regardless of panel type.
6. Visually inspect panels to be sure each of the wells is full. If any of the wells are unfilled or overfilled, inoculate a new panel.

**NOTE**

Yeast ID panels must be inoculated using a 2.00–2.40 McFarland inoculum density. Standardized bacterial suspension in ID Broth or Inoculum Broth must be used within 60 minutes of preparation.

**NOTE**

Load panels into the instrument within 30 minutes of inoculation. Keep panels in the inoculation station after inoculation until the excess fluid has been completely absorbed by the pad. Panels should stay vertical in the caddy until loaded. Handle inoculated panels with care. Avoid knocking or jarring the panel.

**NOTE****OPTIONAL PURITY CHECK**

It is highly recommended that the purity of ID inoculum be checked by preparing a purity plate.

To perform a purity check, using a sterile loop, recover a small drop from the inoculum fluid tube either before or after inoculating the panel and inoculate an agar plate (any appropriate medium) for purity check. Discard inoculum fluid tube and cap in a biohazard disposal container. Incubate the plate for 24–48 hours at 35 °C under appropriate conditions.

## 6.2.7 Preparing BD Phoenix™ Emerge™ Panels

BD Phoenix™ Emerge™ panels are designed to perform susceptibility testing on an expanded number of antimicrobial agents. To accomplish these susceptibilities, antimicrobial agents are present on both sides of the BD Phoenix™ panel. These panels do not have the ability to perform bacterial identification. Because of the design, the inoculation technique is unique and is outlined below.

**OPTION 1: Two tubes of AST broth will be required.**

1. Follow Steps 1–10 (see [6.2.3 General Panel Preparation](#)) to prepare the suspension of bacteria.

2. Label two BD Phoenix™ AST broth tubes (8.0 mL) with the patient's specimen number. Add one drop of the BD Phoenix™ AST Indicator to each AST broth tube. Invert to mix. DO NOT VORTEX.

## NOTE

- Allow AST Indicator Solution to warm to room temperature before dispensing into AST broth.
- Return the unused portion of the indicator to 2–8 °C as soon as possible. Do not store at room temperature for more than 2 hours. Discard opened bottles after 14 days from initial opening.
- If volume other than one drop is added inadvertently, discard the tube and use a fresh tube of AST broth.
- After adding the Indicator to AST broth, store the mixed solution in the dark, at room temperature, for as long as 8 hours.
- After adding AST Indicator Solution, if it is exposed to light, use the tubes within 2 hours.

3. Transfer 25 µL (50 µL if low inoculum option is used) of the bacterial suspension from the ID tube to two BD Phoenix™ AST broth tubes. Cap and gently invert. Wait a few seconds for air bubbles to surface. Tap the tube gently to aid in eliminating bubbles.

## NOTE

Inoculate panels within 30 minutes of the time that the AST broth inoculum is prepared.

4. Using sterile technique, remove 3.5 mL of broth from one of the inoculated BD Phoenix™ AST broth tubes and discard in an appropriate container.
5. Pour the remaining 4.5 mL into the left side of the BD Phoenix™ Emerge™ panel. Allow the fluid to traverse down the tracks before moving the panel. Pour the other BD Phoenix™ AST broth tube into the right side of the BD Phoenix™ Emerge™ panel. Allow the fluid to traverse down the tracks before moving the panel.
6. Follow steps 18–20 in [6.2.3 General Panel Preparation](#). Follow the normal panel login procedure.

**OPTION 2: BD Phoenix™ Emerge™ AST Broth (12.5 mL) and BD Phoenix™ Emerge™ AST Indicator are required.**

1. Follow Steps 1–10 (see [6.2.3 General Panel Preparation](#)) to prepare the suspension of bacteria.

## NOTE

For MIC only and Emerge panel set up, Inoculum broth (2.2 mL) can be utilized in place of ID Broth (4.5 mL) in Steps 4, 5, and 9 (see [6.2.8 Using BD Phoenix™ Inoculum Broth](#))

2. Label a BD Phoenix™ Emerge™ AST Broth tube (12.5 mL) with the patient's specimen number. Add one free-falling drop of BD Phoenix™ Emerge™ AST indicator into the BD Emerge™ AST Broth (12.5 mL). Cap the BD Emerge™ AST broth tube and invert to mix. DO NOT VORTEX.

NOTE

- Allow AST Indicator Solution to warm to room temperature before dispensing into AST broth.
- Return the unused portion of the indicator to 2–8 °C as soon as possible. Do not store at room temperature for more than 2 hours. Discard opened bottles after 14 days from initial opening.
- If volume other than one drop is added inadvertently, discard the tube and use a fresh tube of AST broth.
- After adding the Indicator to AST broth, store the mixed solution in the dark, at room temperature, for as long as 8 hours.
- After adding AST Indicator Solution, if it is exposed to light, use the tubes within 2 hours.

3. Pipette 39 µL (78 µL if low inoculum option is used) of the prepared 0.5–0.6 bacterial suspension from the ID tube using an adjustable pipettor and sterile tip, to the BD Phoenix™ Emerge™ AST broth with indicator.

NOTE

Inoculate panels within 30 minutes of the time that the AST broth inoculum is prepared.

4. Cap the BD Emerge™ AST broth tube and invert several times to mix. DO NOT VORTEX. Wait a few seconds for air bubbles to surface. Tap the tube gently to aid in eliminating bubbles.
5. Pipette 4.5 mL of inoculated AST broth using an appropriate pipettor and sterile tip and insert into the 51-well side (left hand side) of the BD Phoenix™ Emerge™ panel. Allow the fluid to traverse down the tracks before moving the panel.
6. Aseptically pour the remaining inoculated BD Emerge™ AST broth into the 85-well side (right hand side) of the BD Phoenix™ Emerge™ panel. Allow the fluid to traverse down the tracks before moving the panel.
7. Follow Steps 18–20 (see [6.2.3 General Panel Preparation](#)). Follow the normal panel login procedure.

## 6.2.8 Using BD Phoenix™ Inoculum Broth

BD Phoenix™ Inoculum Broth can be used to make the initial McFarland suspension of microorganisms when utilizing BD Phoenix™ MIC only panels (PMIC, NMIC, SMIC) or BD Phoenix™ Emerge™ panels. The BD Phoenix™ Inoculum Broth is filled with 2.2 mL of BD Phoenix™ ID Broth and will reach the correct inoculum density by using fewer bacterial colonies.

1. Follow Steps 1–10 (described in [6.2.3 General Panel Preparation](#)) to prepare the suspension of bacteria using the BD Phoenix™ Inoculum Broth rather than the BD Phoenix™ ID Broth.
2. Continue to appropriate steps based upon the type of panel being utilized:
  - For BD Phoenix™ Strep Panels, follow the instructions in [6.2.5 Preparing BD Phoenix™ Strep Panels](#) starting with Step 2.
  - For BD Phoenix™ Emerge™ Panels, follow the instructions in [6.2.7 Preparing BD Phoenix™ Emerge™ Panels](#) starting with Step 2.
  - For other BD Phoenix™ MIC only panels (PMIC or NMIC), continue with the below steps.
3. Label a BD Phoenix™ AST broth tube (8.0 mL) with the patient's specimen number.
4. Add one drop of the BD Phoenix™ AST Indicator to the BD Phoenix™ AST broth tube.
5. Invert to mix. DO NOT VORTEX.
6. When using BD Phoenix™ AST broth tubes (8.0 mL), transfer 25 µL (50 µL if low inoculum option is used) of the BD Phoenix™ Inoculum Broth suspension to the BD Phoenix™ AST tube.
7. Follow Steps 14–20 (described in [6.2.3 General Panel Preparation](#)). Follow the normal panel log in procedure.

## 6.3 Quality Control

Refer to the panel package insert for information on ID/AST Quality Control. QC panels cannot be marked as critical.

Quality Control testing is recommended for each lot of panels. The QC Lot Support feature can facilitate QC panel tracking and testing. If the QC Lot Support feature is enabled, then the panel lot number must be defined prior to logging in QC panels.

1. Inoculate a panel with one of the organisms listed in the package insert.

**NOTE**

All microbial cultures, including QC organisms, are potentially infectious and should be treated with universal precautions. QC organisms are prepared for panel inoculation as specified in [6.2 Preparing Panels](#).

2. Log the panel in as a QC panel as follows:

**NOTE**

For most reliable results, it is recommended that the QC organisms be subcultured at least twice on two consecutive days onto TSA with 5% Sheep Blood agar before use in the BD Phoenix™ M50 Instrument. Use only well-isolated colonies.

For Yeast ID QC, the use of Sabouraud Dextrose Agar as the subculture media is also acceptable.

- a. Select Panel Login and then select QC.
- b. Enter Tech ID. By default, the entry is the same as the logged in user's assigned tech ID. The user can edit the value.
- c. In the Accession Number field, type in or scan an accession number (optional).
- d. In the Sequence Number field, type in or scan the panel's sequence number. If an invalid Sequence Number is entered, message W100 appears. For information on Invalid Panel Sequence Number (see [8.3 Workflow Alerts \(W error codes\)](#)).
- e. The Isolate Number field defaults to isolate number 1. Type in the isolate number, or select the + or the – to increase or decrease the number. Valid isolate numbers are 1 to 20.
- f. For Yeast ID panels, the Media field appears to the right of the isolate number field. If a media type is not specified, a workflow error is generated when the panel is attempted to be saved. If a Yeast ID panel is not logged in before placing it in the instrument for testing, the panel aborts after the first reading because no media has been specified. A default media type can be configured (see [5.9.2 System Configuration Sub-Tab](#)), which appears when a Yeast ID panel sequence number is scanned during login.
- g. To select a different media, select a media type from the drop-down box. When the media type is selected, the full name appears at the top right of the screen. Highlight the desired media. Select Save.
- h. In the Test Strain field, select QC organism from the drop-down menu. Only the predefined, required test strains appear (if available), otherwise all of the test strains appear. If a Sequence number has not been entered, No Data Available is displayed. Highlight and select the desired QC organism.
- i. In the Panel Lot Number field, type in or scan the panel's lot number. Lot numbers must be seven numeric digits. Press Tab to advance to the next field. (If the QC Lot Support feature is enabled, this field is completed automatically when the Sequence Number barcode is scanned.)
- j. In the Expiration Date field, select the calendar icon to enter the expiration month, day, or year. (If the QC Lot Support feature is enabled, then once the lot number barcode is scanned, both the serial number and the expiration date are automatically populated.)
- k. In the ID Broth Lot Number field, type in or scan the broth lot number (optional). Lot numbers must be seven numeric digits.
- l. In the Expiration Date field, press the calendar icon to select the expiration month, day, or year (Optional).
- m. In the AST Broth Lot Number field, type in or scan the broth lot number (optional). Lot numbers must be seven numeric digits.
- n. In the Expiration Date field, press the calendar to select the expiration month, month, or year (optional).
- o. In the Indicator Lot Number field, type in or scan the broth lot number (optional). Lot numbers must be seven numeric digits.
- p. In the first Expiration Date field, press the calendar to select the expiration month, day, or year (optional).
- q. Select Save to save the information.
- r. Place the panel in the instrument (see [5.2.3 Inserting Panels in the Instrument](#)).

Figure 46 QC Panel Login Screen

The Panel Lot Number field does not display when communication with a BD informatics solution is enabled. The user can enter information in all the other fields when a BD informatics solution is configured.

## 6.4 Automatic Association of Panels

The purpose of Automatic Association of Panels is to associate ID results from one panel (an ID or Combination panel) to the AST panels that are related to it and that lack an ID. Panels are related by virtue of having the same accession and isolate number. Thus panels with the same accession number and different isolate numbers are NOT related, and Auto Association does not occur between such panels.

Auto Association often involves the initial stage of Organism ID Conflict Checking. Conflict Checking is the process where the system verifies that the panel which has triggered the process does not have a related panel with a Final ID that is different from its own. If there is a conflict, Auto Association does not occur between related panels. The circumstances where Conflict Checking occurs are described below.

Auto Association can help eliminate unnecessary work such as the need to manually enter an organism ID for related panels. In addition, the Conflict Checking function helps to ensure that the same organism ID is made for all the panels related to a patient specimen. Auto Association does not set the critical panel attribute for related panels.

### 6.4.1 Panel Types

The panel types whose ID information is associated to related panels are:

- ID panels
- Combination panels (with both ID and AST sides enabled)
- Combination panels with only the ID side enabled

Auto Association uses the Final ID.

The related panels whose IDs are set by Auto Association are:

- AST panels
- Combination panels with only the AST side enabled

## 6.4.2 When Auto Association Is Not Performed

Auto Association is NOT performed under the following circumstances:

- When an organism ID conflict exists within an accession/isolate
- To a related AST panel that has been finalized or deleted, or that already has a Final ID
- Between related ID-type panels
- Between related AST-type panels
- Between QC and regular panels
- Between related QC panels

If the Instrument ID field contains a tie/triplet, this information is not associated to any related AST panels, however the Final ID information IS auto associated.

## 6.4.3 Organism ID Conflict Checking

Organism ID Conflict checking is performed using the Final ID for panels within the same accession/ isolate (i.e., related panels) that are not finalized (and are not QC panels). If both panels have a Final ID (both are not blank) and they do not match exactly, an Organism ID Conflict is considered to exist. When an Organism ID Conflict exists, no Auto Association is performed. All the panels involved in the conflict have a Needs Attention set indicating that there is an organism conflict. Once the conflict is resolved (and provided that all other conditions for Auto Association are met), then Auto Association does occur.

Organism ID Conflict checking is not performed on QC panels.

## 6.4.4 Auto Association and Related Actions

The trigger events that invoke Auto Association are:

- an ID or Combination panel status transitioning to Removable
- accession/isolate information being modified

If there are no unresolved tie/ triplet conditions and no Organism ID Conflicts exist:

1. The instrument searches for the first unfinalized related ID or Combination panel with a Final ID. If a panel with these criteria is found, the instrument performs Auto Association.
2. If a panel with the above criteria is not found, the instrument then searches for the first finalized related ID or Combination panel. If a finalized panel is found, the instrument performs Auto Association.
3. If there are related ID panels with no Final ID when an AST panel invokes Auto Association (and no Organism ID Conflict condition exists), the instrument sets a Missing Organism ID Needs Attention reason for the AST panel if its status is Removable.

4. Auto Association is performed for any related AST panels that do not have information in their Final ID fields if the AST panel's status is either ongoing or Removable (Auto Association is not performed on AST panels with a status of Pending).
5. Auto Association is the action of modifying an AST panel's Final ID field (when this field is blank) to contain the same information as a related ID panel's information.
6. The instrument ID information is only associated provided it is a single Organism ID and not a Tie/Triplet condition.
7. A Combination panel with both sides enabled uses its ID result to perform interpretations on the AST side of the panel.
8. When Auto Association is performed successfully, any existing Missing Organism ID Needs Attention reasons are automatically cleared from the AST panels.

## 6.4.5 Typical Auto Association Examples

### Instrument ID Is Associated

ID and AST panels are logged with the same Accession/Isolate number. (The AST panel is not logged in with an Organism ID.) They are both placed into the instrument at the same time. The ID panel finishes testing. The panels look like the following:

Panel	Instrument ID	Final ID
ID	Org A	Org A
AST	–	–

When the ID panel has completed testing, it looks for related panels. It sees the AST panel with no Final ID. The ID panel checks for Organism ID Conflicts. There is no Organism ID Conflict condition, so the ID panel associates its Instrument ID to the AST panel record's Instrument ID field (regardless of the AST panel's status).

The panels look like the following:

Panel	Instrument ID	Final ID
ID	Org A	Org A
AST	Org A	Org A

### Instrument ID and Final ID Are Associated

The ID panel is logged in with an Accession/Isolate number. It is placed into the instrument to test. It completes testing and looks like the following:

Panel	Instrument ID	Final ID
ID	Org A	Org A

The user changes the Final ID for this panel. It now looks like the following:

Panel	Instrument ID	Final ID
ID	Org A	Org B

The user then logs in an AST panel with the same Accession/Isolate number as the ID panel. (The AST panel is not logged in with an Organism ID.) The AST panel completes testing and looks for related panels. It sees the ID panel and checks to make sure that there is no Organism ID Conflict within the Isolate. There is no Organism ID Conflict, so the AST panel associates the ID panel's ID to itself. The panels now look like the following:

Panel	Instrument ID	Final ID
ID	Org A	Org B
AST	Org A	Org B

#### Final ID Is Associated

An ID panel is logged in with an Accession/Isolate number. The panel is placed in the instrument to test. The ID panel finishes testing first with a tie /triplet condition. When this situation occurs, the panel looks like the following:

Panel	Instrument ID	Final ID
ID	Org A	–
–	Org B	–
–	Org C	–

When the tie/triplet is resolved (by the user selecting one of the organisms listed or another organism), the ID panel will look like the following:

Panel	Instrument ID	Final ID
ID	Org A	–
–	Org B	–
–	Org C	Org A

The user then logs in an AST panel with the same Accession/Isolate number as the ID panel. (The AST panel is not logged in with an Organism ID.) The AST panel completes testing and looks for related panels. It sees the ID panel and checks to make sure that there is no Organism ID Conflict within the Isolate. There is no Organism ID Conflict, so the AST panel associates the ID panel's Final ID to itself. The panels now look like the following:

Panel	Instrument ID	Final ID
ID	Org A	–
–	Org B	–
–	Org C	Org A
AST	–	Org A

## 6.4.6 BDXpert Triggered Rules Screen

By default, the BDXpert Rules are enabled and set to trigger automatically when test results are processed. However, there is an option in the BDXpert Rule Configuration to disable some rules (which means they would not be applied to results) or to set BDXpert Rules to trigger manually. Any rules set to trigger manually must be accepted or rejected by the user before any additional rule processing or Final SIR determination occurs.

#### To access BDxpert Triggered Rules:

1. Select **BDxpert Rules** from the Results screen.
2. The first pending rule is highlighted.
3. The effect of the rule is displayed on Final SIR values in the AST Results screen.
4. Select one of the following:
  - **Accept** to accept the pending rule
  - **Reject** to reject the rule
  - **Re-Run** to cause all interpretation rules to be reapplied to the raw data

### 6.4.7 Resistance Markers

If Resistance Markers have triggered on a particular panel, they are listed with the BDxpert Rules.

The following information is displayed:

- The BDxpert Rule number that triggered the Resistance Marker
- The Resistance Marker code (abbreviation)
- The Resistance Marker Name
- The BDxpert Rule Description: Accept, Reject, Re-execute or Exit

## 7 Maintenance

The BD Phoenix™ M50 Instrument requires little maintenance from the user to provide reliable performance. Daily activities include checking the instrument temperature and printer paper supply. On a weekly basis check the operation of the station status indicators (LEDs), the audible alarm, and the alert indicator. Routine preventive maintenance consists of a monthly check of the ambient air filter. All other procedures are on an as needed basis. Any maintenance or repair not described in this section should be performed by BD personnel only.

### WARNING

**ALL MAINTENANCE AND REPAIR OTHER THAN THE PROCEDURES DESCRIBED IN SECTION 7.1 ROUTINE MAINTENANCE AND SECTION 7.2 MODULE REPLACEMENT, MUST BE PERFORMED BY QUALIFIED SERVICE PERSONNEL. NON-COMPLIANCE WITH THIS WARNING MAY RESULT IN PERSONAL INJURY OR INSTRUMENT MALFUNCTION.**

No yearly preventative maintenance is required to be performed by BD authorized service personnel.

For normalizer replacement, see [2.4.8 Normalizers](#).

This section describes the following functions:

- [7.1 Routine Maintenance](#)
- [7.2 Module Replacement](#)
- [7.3 Software Update](#)

## 7.1 Routine Maintenance

Table 17 Routine Maintenance: Time-frame and Procedure

Time Frame	Procedure
Daily The results of maintenance checks can be recorded on the Daily Instrument Report.	<ul style="list-style-type: none"> <li>• Check paper supply.</li> <li>• Record temperature from the Status screen. The temperature should be from 35 °C ±1.5 °C. Record temperature standard panel. The temperature standard panel can be brought into view by selecting one of the instrument LED check functions on the Maintenance tab. The temperature should be 35 °C ±1.5 °C.</li> <li>• Perform Daily Verification on BD PhoenixSpec™. See Nephelometer Calibration in the BD PhoenixSpec™ package Insert.</li> </ul>
Weekly	<ul style="list-style-type: none"> <li>• Test Internal Green LEDs</li> <li>• Test Internal Red LEDs</li> <li>• Test Internal Amber LEDs</li> <li>• Extinguish all LEDs</li> <li>• Test External System LED</li> <li>• Test Alarm</li> <li>• Perform the tasks listed under the Maintenance Hardware category. See below for task description.</li> </ul>
Every 3 Months	<ul style="list-style-type: none"> <li>• Perform calibration of BD PhoenixSpec™. See Nephelometer Calibration in BD PhoenixSpec™ package Insert.</li> </ul>

Time Frame	Procedure
As Needed	<p>Clean panel stations if they become contaminated by a leaking panel.</p> <p>The priority in this situation is to first limit the extent of the contamination and then to decontaminate the panel location(s) and other accessible instrument areas receiving the spill.</p> <ul style="list-style-type: none"> <li>• The contamination procedure applies only to accessible areas.</li> </ul> <p style="padding-left: 40px;">If the spill extends into regions of the carousel that are not accessible, contact your local BD Service representative.</p> <ul style="list-style-type: none"> <li>• The solution recommended to clean the affected surfaces should be at least a 10% household bleach solution.</li> </ul> <p style="padding-left: 40px;">All surfaces must be thoroughly washed with the freshly prepared bleach solution, so that the surfaces are glistening wet. If the extent of the contamination is uncertain, thoroughly wash the exposed portions of the carousel and cabinet with the freshly prepared bleach solution.</p> <p>See <a href="#">7.1.5 Cleaning / Decontamination</a> for a detailed cleaning procedure.</p> <p>Replacing the Barcode Scanner</p> <ol style="list-style-type: none"> <li>1. Locate the cable connecting the barcode scanner to the instrument.</li> <li>2. Unplug the cable.</li> <li>3. Plug in the new scanner cable.</li> <li>4. Verify the proper operation of the new scanner by scanning a panel sequence number at the Login screen.</li> <li>5. Check to see if the sequence number is correct.</li> <li>6. Select <b>Cancel</b> to exit the screen without saving the panel.</li> </ol>

## 7.1.1 Cleaning and Checking the Air Filter

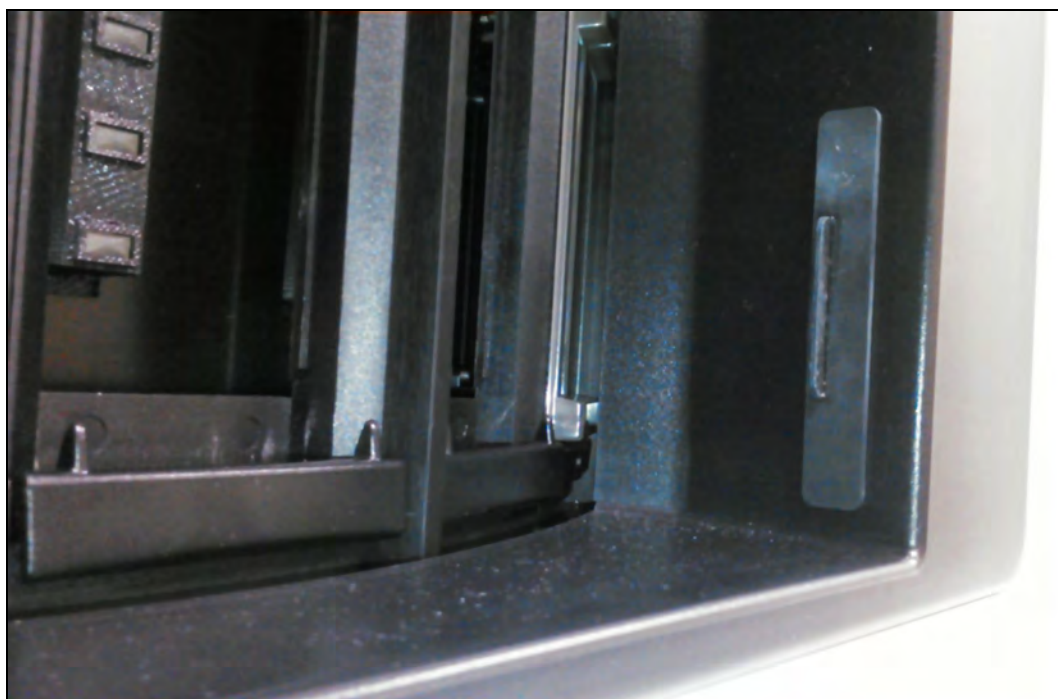
Check the filter monthly and clean/replace if needed (see [7.1.3 Cleaning the Air Filter](#)).

If the instrument's environment is especially dusty, check the air intake filter more frequently and clean or replace if needed. The filter must remain clean and unobstructed; restricted airflow from a dirty filter may cause the instrument interior to reach excessive temperatures, which can affect results and possibly cause hardware malfunctions or failures. The filter can be cleaned and reused.

The instrument's filter is located inside the panel access area on the lower right. The filter can be removed without tools.

## 7.1.2 Removing the Air Filter

Figure 47 Air Filter Location



1. Press the Panels in or Panels out button to access panel entry area. The filter is located on the lower right side of the opening.
2. Grasp the black tab and slide towards the left side of the panel access area to remove the filter.
3. Remove the old filter, and clean and dry it before replacing it back into the instrument, or place a new filter in the housing while the old one is cleaned and dried.
4. To insert a clean filter, grasp the black tab on the side of the filter and slide to the right until filter flange is flush with right side of instrument access area.
5. Close the instrument door.

### 7.1.3 Cleaning the Air Filter

1. Wash the dirty filter in a bactericidal disinfectant.
2. Place the filter on a paper towel and dry it thoroughly (if it is going to be reused immediately).
3. To save time, replace the dirty filter with a spare clean filter. Wash, dry, and set aside the removed dirty filter for the next filter replacement.

Figure 48 Air Filter



### 7.1.4 Daily Instrument Report

The Daily Instrument Report can automatically print at a user defined time or it can be printed upon request (see [Figure 49 Daily Instrument Report](#)).

For instructions on configuring the report to automatically print at a certain time, see the Instrument Configuration section of this manual.

The Daily Instrument Report has three sections:

Section	Description
Top	Lists information that was configured when the system was set-up: <ul style="list-style-type: none"> <li>• Facility name and address</li> <li>• Date and Time the report was printed</li> <li>• Instrument Number</li> <li>• Serial Number</li> </ul>
Middle	Lists information about the internal operation of the Phoenix as well as the Normalizer Panels. <ul style="list-style-type: none"> <li>• This section should be reviewed on a daily basis to make sure that these operations have passed testing.</li> </ul>
Bottom	Lists the maintenance items that need to be checked and recorded on a Daily and Weekly basis.

Figure 49 Daily Instrument Report

### Daily Instrument Report

7/8/2016 3:20 PM  
1 0.85 0 / V5 91A (FDA)

**System Number** 56  
**AB Serial Number** PFVV0015  
**Instrument Temperature** Pass  
**Carousel Rotational Test** Pass  
**Power Supply Check** Pass

**Normalizer Panels**

Tier	Sequence Number	Status	Expiration Status	FDA
A	429932154527	Pass	7/9/2018	
B	429932154528	Pass	7/9/2018	

**Daily**

	Pass	Fail	Tech ID
Record Instrument Temperature From Main Screen Range: (33.5 - 36.5)	_____	_____	_____
Record Standard Panel Temperature Range: (33.5 - 36.5)	_____	_____	_____
Check Printer Paper Supply	_____	_____	_____

**Weekly**

Instrument Internal Green LEDs	_____	_____	_____
Instrument Internal Red LEDs	_____	_____	_____
Instrument Internal Amber LEDs	_____	_____	_____
Instrument System Alert Indicator	_____	_____	_____
PC Audible Alarm	_____	_____	_____

**Comments**

This report may contain PHI and/or PII, handle appropriately.

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## 7.1.5 Cleaning / Decontamination

A situation requiring biological decontamination of one or more panel locations can occur if a panel should leak while in the instrument. The priority in this situation is to first limit the extent of the contamination and then to decontaminate the panel location(s) and other accessible instrument areas receiving the spill. If the spill extends into regions of the carousel not accessible for topical decontamination, contact your local BD representative for further instructions.

### Decontaminating Carousel Panel Locations

The solution recommended to clean the affected surfaces should be at least a 10% household bleach solution. All surfaces must be thoroughly washed with the freshly prepared bleach solution, so that the surfaces are glistening wet. If the extent of the contamination is uncertain, thoroughly wash the exposed portions of the carousel and cabinet with the freshly prepared bleach solution.

### Required Materials

- 10% bleach solution
- Personal protection equipment, including gloves, gown, eye protection (e.g., face shield, goggles, etc.)
- Gauze pads or paper towels
- Tap water

### Cleaning Procedures

1. Wear gloves and a gown, completely covering any body surfaces that could possibly come into contact with the affected instrument surfaces.
2. Turn off power to the instrument. Unplug the instrument power cord before proceeding.
3. Completely absorb the contaminated spill (gauze pads are most effective).
4. Apply the bleach solution to the affected surfaces, so that the surfaces are glistening wet. Let stand for approximately 15 minutes.
5. Absorb the applied solution with gauze pads or paper towels.
6. Dampen a clean cloth with water. Wipe down the decontaminated surfaces.
7. Thoroughly dry all wet surfaces.
8. Discard all cleanup materials as biohazardous waste.

#### **WARNING**

**ALL PORTIONS OF THE BODY THAT COULD POSSIBLY COME INTO CONTACT WITH THE AFFECTED INSTRUMENT SURFACES MUST BE COMPLETELY COVERED BEFORE BEGINNING THE DECONTAMINATION PROCESS.**

### To Clean Monitors

During normal use, the AIO PC may become dirty and should be cleaned regularly. The solution recommended for cleaning the monitor is 70% alcohol.

### Required Materials

- 70% alcohol

### Cleaning Procedures

1. Prepare a cleaning agent per manufacturer's instruction or hospital protocol.
2. Prepare a clean cloth that has been moistened in a cleaning solution.
3. Wipe the AIO PC thoroughly with a clean wipe.

**CAUTION**

**Do not:**

- immerse or rinse a POC terminal or its peripherals
- spray cleaning agents on the chassis
- use disinfectants containing phenol

## 7.2 Module Replacement

The BD Phoenix™ M50 Instrument has been designed and tested for trouble-free performance. In the event of malfunction, contact BD for service under existing contract terms or warranty. Only the external barcode scanner is user-replaceable.

Replacement modules may be exchanged. Only replacement parts supplied by BD should be used in the procedures described in this section.

### 7.2.1 Thermometer Removal

If the fluid in the thermometer of the temperature standard panel has separated, follow the procedure below to remove the thermometer and replace it.

#### To Remove/Replace the Thermometer

1. Remove the temperature standard panel from the BD Phoenix™ M50 Instrument.
2. Using the small access hole at the bottom of the panel, gently push the thermometer upward through the large slotted opening at the top of the temperature panel.
3. Manually pull the thermometer completely out of the temperature standard panel through the slotted opening at the top of the temperature panel.
4. Reunite the separated fluid column per the instructions below.
5. Install the thermometer in the reverse order described above.

---

## 7.2.2 Reuniting Separated Liquid in the Thermometer

If the fluid in the thermometer of the temperature standard panel has separated, follow the procedure below to reunite the liquid.

### To Reunite Separated Liquid

1. Should there be a separation in the capillary or in the expansion chamber at the top of the thermometer, heat the bulb of the thermometer in a hot liquid which exceeds the range of the thermometer until the separation and main liquid column enter the expansion chamber and unite with each other.
2. Quickly remove the thermometer from the liquid, so that the liquid does not completely fill the expansion chamber which could possibly harm the thermometer.
3. Check the thermometer against a certified, traceable thermometer or an ice bath to assure the thermometer is reading correctly.

## 7.3 Software Update

The user will receive the system with setup parameters that are preset to factory default values. But it is necessary to test and review these settings to see if they are compatible with the laboratory where the instrument will be housed.

Software updates are user installable. Insert the BD provided USB key in the USB connector on the AIO PC.

On the Maintenance tab select **Software** (as Task Category), and **Upgrade Execute** (as Task).

The software update should be recorded on the Daily Instrument Report for reference. See [Table 17 Routine Maintenance: Time-frame and Procedure](#) for details.

Each software function is accessed via the Maintenance tab. BD recommends that the users save the system data to a USB key in case some error occurs or the system malfunctions. For more information on maintenance of software functions, see [5.8.2 Maintenance Software Functions](#).

For more information of software setup, see [4.2 Software Setup](#).



## 8 System Alert Messages

This section describes the following functions:

- [8.1 Error / Alert Messages](#)
- [8.2 System Alerts \(E error codes\)](#)
- [8.3 Workflow Alerts \(W error codes\)](#)
- [8.4 Event Log Messages](#)

### 8.1 Error / Alert Messages

**CAUTION**

**When the system displays alerts and errors, immediately respond to the condition.**

When the system encounters an alert or error condition, the error code (EXX or WXXX, where XX or XXX is a number) is either displayed on the screen or written into the system alert list. The error code is an abbreviation for the conditions described in the listing below.

Different types of alerts and errors behave in different ways. There are three basic types of alert conditions:

- Self-Clearing – these alerts are removed from the System Alert Screen after they have been displayed and the screen has been exited. No other intervention is required.
- Persistent – these alerts remain in the System Alert Screen (even after displaying the alert code) until the instrument determines that the error causing the alert has been corrected. Correction can be accomplished with or without user intervention, depending on the alert.
- Auto Clear – these alerts are removed from the System Alert Screen as soon as the condition causing the error has been cleared. There is no requirement to display the alert code on the System Alerts List Screen. If the alert is still present when reviewing the Alert list, it will be displayed.

Each error code called out in this chapter will contain one of these three types of alerts and errors.

W error codes are displayed on the screen when they occur. (They also cause the Workflow Error tone to sound [sequence of short high beep and short low beep repeated four times].) These are activity (or workflow) types of errors. In most cases, this means that some action that was performed was not what the system expected, but the correct action can usually be performed, as recommended below, without exiting the current operation. These activity errors are flagged by a Workflow Error (see [Figure 50 Workflow Error](#)).

Figure 50 Workflow Error

The screenshot shows a 'Panel Login' window with the following fields and controls:

- Panel Type:** Radio buttons for 'Clinical' (selected) and 'QC'. A 'Critical' checkbox is also present.
- Accession Number:** An empty text input field with a clear 'X' button.
- Sequence Number:** A text input field containing '4234'. A red arrow points to this field with the error message 'W100 Invalid Panel Sequence Number'.
- Isolate Number:** An empty text input field.
- Buttons:** 'Save', 'Repeat Data', and 'Cancel' buttons are located at the bottom right.

W error codes are grouped as follows and full descriptions can be found in [8.3 Workflow Alerts \(W error codes\)](#):

W1XX Problem with the Sequence Number

W2XX Problem with the Accession, Isolate Number, or Media type

W3XX Problem with a QC panel only

W4XX Action to get into the instrument is not allowed

W5XX Configuration/Maintenance screen activity not allowed (as long as it is not an instrument action)

W6XX Screen activity is not allowed

W7XX LIS errors

W8XX QC Lot Support errors

## 8.2 System Alerts (E error codes)

System alerts (each shown in separate tables below), comprise of all **E** type error codes and are reported in the system alert list. These errors cause the Alert tone (medium beep on for 1 second, off for 3 seconds, repeating) to sound (if it is enabled). Also the System Alert icon appears on the Status screen and the Alert indicator is illuminated. The errors must be reviewed to clear the system alert condition. The system alert list can be viewed from the Status screen by touching the alert icon on the upper left corner of the display.

The **E** error codes are listed in numerical order. Error sub-codes are 8-digit numeric codes that appear below the EXX readout in the system alert list. The sub-codes indicate specific conditions detected and many are listed in the associated alert tables below.

### CAUTION

**If any error sub-codes other than those listed here appear, note the sub-code and contact BD for assistance. If the recommended corrective actions do not solve the problem, contact BD.**

E01 Incubator Temperature*			
Sub-code	Alert Type	Possible Causes	Corrective Actions
00000001	Persistent	Average temperature too high (>36.5 °C)	For all sub-codes, causes include: room temperature is not within recommended range, or other environmental specification is not being met (such as instrument sitting in direct sunlight or too close to HVAC air register). Make sure environmental specifications are met (see <a href="#">14.4 Instrument Specification Charts</a> ). Clean and/or repair air filters to permit fresh air intake.
00000002		Average temperature too low (<33.5 °C)	
00000004		Communication with the incubator temperature sensor is lost	
00000010		Average temperature too high for more than one hour (>36.5 °C)	
00000020		Average temperature too low for more than one hour (<33.5 °C)	
00000040		Absolute high temperature (>38.5 °C)	
00000080		Control and QC temperatures disagree	
00000100		QC temperature is out of range	

\*Temperature readings are taken every 5 seconds for 10 minutes and these readings are averaged. Note that if the instrument temperature reaches 38.5 °C, the instrument disables the heater.

E05 Carousel Alert			
Sub-code	Alert Type	Possible Causes	Corrective Actions
00000001	Persistent	Carousel RPM is below specification	The instrument reports these alerts if something is impeding the motion of the carousel. This can be attributed to one of the following: the reported RPM is below spec, certain flag readings are incorrect, or the carousel is jammed or stalled. It is detected during any carousel rotation. Any inventory scan or panel test in progress is aborted and the instrument ignores any data received from the test or scan. Open the door, look for and remove any obstructions such as a panel that is ajar or a panel closure that is not seated. Do not manually rotate the carousel. Close the door. If message reoccurs, contact your local BD representative.
00000080		Carousel is jammed (no panel flags detected, drum not moving)	

E06 Tier Alert*			
Sub-code	Alert Type	Possible Causes	Corrective Actions
00000001	Persistent	This is the general alert condition for problems related to specific tiers including: incorrect flag readings, optical errors, timeout conditions, and normalizer problems.	Tier alerts are detected during a test cycle or inventory scan. The instrument ignores any data received from the test or scan for the tier that has sustained the error. Data received from good tiers is retained. All locations in the bad tier are automatically blocked. Some conditions reported for the E05 alert are also detected by the tier micro and reported with the E06 alert. They include missing/extra panel flags, home flag, etc. Follow screen instructions to correct the alert.
00000002			
00000004			
00000008			
00000010			
00000040			
00000080			
00000100			
00000200			
00000400			
00004000			
00020000			
00040000			
00080000			
00100000			
00200000			
00400000			

\* The first line of the error represents Tier A, the second line represents Tier B, the third line represents Tier C, and the fourth line represents Tier D. A code of 00000000 indicates that there is no error condition for that tier.

E09 Test Aborted Sub-code			
Sub-code	Alert Type	Possible Causes	Corrective Actions
20000000	Self-clearing	Panel testing has not occurred for more than one hour because the instrument was off, the door was open for more than an hour, the system clock was set ahead one hour or more or the test cycle had not occurred in more than an hour.	All ongoing panels are set to Needs Attention, and their status is set to Removable. Some results may be incomplete, and all affected panel results should be reviewed.

<b>E10 System Database Corruption</b>			
<b>Sub-code</b>	<b>Alert Type</b>	<b>Possible Causes</b>	<b>Corrective Actions</b>
00000002	Self-clearing	System Parameters Database Corrupted	Check your settings in the Configuration screens (see <a href="#">5.9.2 System Configuration Sub-Tab</a> ) and reset them to your preferences. Save data to a USB key and contact your local BD representative.
00000008		BDXpert Rules Database Corrupted	Check your settings for BDXpert Rule Configuration (see <a href="#">5.9.7 BDXpert Rules Sub-Tab</a> ) and reset them to your preferences. Save data to a USB key and contact your local BD representative.
00000020		Custom Breakpoint Database Corrupted	Check your breakpoint settings for Custom Interpretation Rule Set Configuration and reset them to your preferences. Save data to a USB key and contact your local BD representative.
00000040		User Codes Database Corrupted	Check your settings in the Organism and Antimicrobial Configuration screens see <a href="#">5.9.4 Organism Configuration Sub-Tab</a> and <a href="#">5.9.5 Antimicrobial Configuration Sub-Tab</a> ) and reset them to your preferences. Save data to a USB key and contact your local BD representative.

<b>E10 System Database Corruption (Continued)</b>			
<b>Sub-code</b>	<b>Alert Type</b>	<b>Possible Causes</b>	<b>Corrective Actions</b>
00000001	Self-clearing	Database corruption: Panel, Panel Lot, Alert / Event Log. Corruption of instrument configuration record, instrument history, system parameters, light source, etc.	Save data to a USB key and contact your local BD representative.
00000010			
00000080			
00001000			
00002000			
00004000			
00008000			
00010000			
00020000			
00040000			
00080000			
00100000			
00200000			
00400000			

<b>E11 Printer Error</b>			
<b>Sub-code</b>	<b>Alert Type</b>	<b>Possible Causes</b>	<b>Corrective Actions</b>
20000000	Self-clearing	Paper jam or power condition	Check printer paper (jammed or out), cable connection, power on, and/or online indicator.

<b>E13 Power Failure</b>			
<b>Sub-code</b>	<b>Alert Type</b>	<b>Possible Causes</b>	<b>Corrective Actions</b>
0x20000000	Self-clearing	Power removed from instrument	Message is informational. If multiple power failures have occurred, only the latest one is reported in the alert list. Note the power failure and restore times in your instrument log. Note that power fail events are not recognized until the instrument user interface has successfully loaded.

<b>E14 CCD Underrun*</b>			
<b>Sub-code</b>	<b>Alert Type</b>	<b>Possible Causes</b>	<b>Corrective Actions</b>
00000000	Persistent	Scanning of a panel stopped prematurely during a test cycle	The instrument ignores any data received from the test for the panel/station that has sustained the error. Data received from good panels is retained, unless the station sustaining the error was the normalizer station. All error stations are automatically blocked. If the normalizer has this error, the whole tier is blocked. To clear, re-boot the instrument.

\*The first line of the error represents stations with errors in Tier A, the second line represents stations with errors in Tier B, the third line represents stations with errors in Tier C, and the fourth line represents stations with errors in Tier D. A code of 00000000 indicates that there is no error condition for that tier.

<b>E18 Normalizer Row Averages*</b>			
<b>Sub-code</b>	<b>Alert Type</b>	<b>Possible Causes</b>	<b>Corrective Actions</b>
00000001 00000002 00000004 00000008 00000010 00000020 00000040 00000080	Self-clearing	The tier had a problem with normalizer panel data averages	A source adjustment can only be performed when all panels in an instrument are no longer ongoing. Normalizer errors are detected during a test cycle. Test data received may be discarded or retained depending on the error sub-code. All available stations in the bad tier are automatically blocked; ongoing stations become blocked as testing completes or panels are removed. Do not enter any new panels or move an ongoing panels into any tier reporting this error. The instrument may be able to correct this error via the light source adjustment process.

\* The first line of the error represents Tier A, the second line represents Tier B, the third line represents Tier C, and the fourth line represents Tier D. A code of 00000000 indicates that there is no error condition for that tier.

<b>E20 Barcode Scanner Not Communicating</b>			
<b>Sub-code</b>	<b>Alert Type</b>	<b>Possible Causes</b>	<b>Corrective Actions</b>
00000001 00000002 00000004 00000008 00000010	Self-clearing	Tier barcode scanner (or handheld scanner) is not communicating and all the tier stations are automatically blocked	Reboot the instrument.

E21 Level 2 Rotor Step Warning*			
Sub-code	Alert Type	Possible Causes	Corrective Actions
00000000	Persistent	The instrument has sensed that rotor rotation was not ideal but still acceptable	Check for a panel protruding from its carrier, an improperly seated closure, or user applied label peeling off. If no obvious visible cause for the error exists, contact your local BD representative.

\* The first line of the error represents stations with errors in Tier A, the second line represents stations with errors in Tier B, the third line represents stations with errors in Tier C, and the fourth line represents stations with errors in Tier D. A code of 00000000 indicates that there is no error condition for that tier.

E22 Level 3 Rotor Step Error*			
Sub-code	Alert Type	Possible Causes	Corrective Actions
00000000	Persistent	The instrument has sensed that rotor rotation was out of specification	The instrument ignores any data received from the test for the panel/station that has sustained the error. Data received from good panels is retained, unless the station sustaining the error was the normalizer station. All error stations are automatically blocked. If the normalizer has this error, the whole tier is blocked. Check for a panel protruding from its carrier, an improperly seated closure, or user applied label peeling off. If no obvious visible cause for the error exists, contact your local BD representative.

\* The first line of the error represents stations with errors in Tier A, the second line represents stations with errors in Tier B, the third line represents stations with errors in Tier C, and the fourth line represents stations with errors in Tier D. A code of 00000000 indicates that there is no error condition for that tier.

E30 Normalizer Expiration Alert*			
Sub-code	Alert Type	Possible Causes	Corrective Actions
00000001	Self-clearing	The tier's normalizer panel expiration date is between 60 and 30 days away	The instrument issues a weekly alert beginning when Normalizer panel expiration is 60 days away, which progresses to a daily alert when expiration is 30 days away. Schedule Normalizer panel replacement for the affected tiers before they expire (expiration date is shown on Daily Instrument report.)  Contact your local BD representative.
00000002		The tier's normalizer panel expiration date is less than 30 days away but has not expired	

\*The first line of the error represents Normalizers in Tier A, the second line represents Normalizers in Tier B, the third line represents Normalizers in Tier C, and the fourth line represents Normalizers in Tier D. A code of 00000000 indicates that there is no error condition for that tier.

<b>E31 Normalizer Expired*</b>			
<b>Sub-code</b>	<b>Alert Type</b>	<b>Possible Causes</b>	<b>Corrective Actions</b>
00000001	Persistent	Normalizer panel expiration date has passed. Stations in all affected tiers are blocked	Schedule normalizer replacement immediately to resume testing.

\* The first line of the error represents Normalizers in Tier A, the second line represents Normalizers in Tier B, the third line represents Normalizers in Tier C, and the fourth line represents Normalizers in Tier D. A code of 00000000 indicates that there is no error condition for that tier.

<b>E44 LIS Fatal Operating System Error</b>			
<b>Sub-code</b>	<b>Alert Type</b>	<b>Possible Causes</b>	<b>Corrective Actions</b>
00000001	Persistent	The instrument is not able to send data to the LIS due to a fatal software exception that occurs within the LIS library at the instrument	Start LIS system. Look for obvious source of problem such as disconnected cable. If no obvious source exists, contact your local BD representative.
00000008		A fatal operating error was detected by the LIS_IM	Contact your local BD representative.

<b>E50 Internal Software Error</b>			
<b>Sub-code</b>	<b>Alert Type</b>	<b>Possible Causes</b>	<b>Corrective Actions</b>
00000001	Self-clearing	System encountered a software general protection error.	Save data to USB key (see <a href="#">5.8.1 Maintenance Hardware Functions</a> ) and contact your local BD representative.
00000002		Internal software error	

<b>E51 Duplicate Panel Barcode Detected</b>			
<b>Sub-code</b>	<b>Alert Type</b>	<b>Possible Causes</b>	<b>Corrective Actions</b>
00000000	Self-clearing	Duplicate barcodes have been detected.	Carefully examine the reported stations for duplicate barcodes. All panels with duplicate barcodes have been aborted. If duplicates are found, then remove the panels from your system and contact your local BD representative immediately. If no duplicates are found, then the alert may be a result of moving an existing panel between instruments. Avoid moving panels across instruments as they will be aborted. If the alert reoccurs, contact your local BD representative.

<b>E52 Instrument Communications Application Layer (ICAL) Alert</b>			
<b>Sub-code</b>	<b>Alert Type</b>	<b>Possible Causes</b>	<b>Corrective Actions</b>
00000001	Self-clearing	Instrument is not registered	Configure the instrument in the system.
00000002		Instrument history purged because instrument was in isolation mode too long.	Reconnect the instrument and Tablet PC or contact your local BD representative.
00000004		Extra Device Alert: three or more instruments are plugged into the application.	Remove the instrument(s) that are not configured in the system.

<b>E98 PC Alert</b>			
<b>Sub-code</b>	<b>Alert Type</b>	<b>Possible Causes</b>	<b>Corrective Actions</b>
00000001	Persistent	The IDS layer timed out	If the condition reoccurs, contact your local BD representative.
00000002		The IDS system received an invalid parameter	Contact your local BD representative.
00000004		The IDS system rejected a message	
00000008		An invalid alert sub-code was detected	

## 8.3 Workflow Alerts (W error codes)

Field level alerts are displayed when data, entered into a specific field, is invalid. These errors (such as attempting to enter an invalid Sequence Number in the Panel Login screen) cause workflow error messages to appear on the displayed screen. They do not put the system into an alert condition. These errors can frequently be cleared by simply performing the activity correctly (such as entering a valid Sequence Number). When the error is corrected, the field level alert is removed from the display. All other workflow alerts are displayed in a dialog with two or more buttons.

W100 Invalid Panel Sequence Number		
Message Type	Alert Cause	Alert Corrective Action
Field Level	The panel sequence number typed or scanned does not meet the required number format.	Panel sequence number barcode is located at the top of the reaction side of the panel. Scan or type in the correct panel sequence number. Check panel carton for panel update barcodes if they are present.

W101 Missing Panel Sequence Number		
Message Type	Alert Cause	Alert Corrective Action
Field Level	Panel sequence number field empty when save is pressed.	Type in or scan the correct panel sequence number before attempting the operation again.

W102 Unknown Panel Sequence Number		
Message Type	Alert Cause	Alert Corrective Action
Field Level	An attempt was made to save or select a panel sequence number that is not in the BD Phoenix™ database.	Verify that the correct panel sequence number was entered. If error reoccurs, the panel may need to be logged in if it is a new panel. Older, completed, finalized panels eventually age out of the database.

W103 Invalid Panel Type for Region		
Message Type	Alert Cause	Alert Corrective Action
Field Level	An attempt was made to log in a panel barcode that is not valid for the region.	Verify that the correct panel barcode was entered.

W200 Invalid Accession Number		
Message Type	Alert Cause	Alert Corrective Action
Field Level	An attempt was made save, find, or print information for an invalid accession number.	Enter a valid accession number, up to 20 characters excluding : * ? [ ] ! #. The accession barcode may not both begin with the numbers "42" OR "5" AND be 12 digits long, which is the format of a panel sequence barcode.

W201 Missing Accession Number		
Message Type	Alert Cause	Alert Corrective Action
Field Level	An operation (find, save, print) was attempted and the value in the Accession Number field was invalid or blank. This can include: a record with a valid panel Sequence Number and an Isolate Number greater than 1 with no Accession Number; an orphan panel with just an Isolate Number, or trying to change a saved record to a blank Accession Number.	Type in or scan the correct accession number before attempting the operation again.

W202 Unknown Accession Number		
Message Type	Alert Cause	Alert Corrective Action
Field Level	At attempt was made to find data or print a report for an accession number that is not located in the BD Phoenix™ database.	Verify that the correct accession number was entered. If error recurs, the record may need to be logged in if it is new. Older, completed, finalized records eventually age out of the database.

W203 Missing Isolate Number		
Message Type	Alert Cause	Alert Corrective Action
Field Level	An attempt was made to save a record when an accession number is present without an isolate number.	To save a record, if you enter an accession number, you must also enter an isolate number

W204 Missing Media Type		
Message Type	Alert Cause	Alert Corrective Action
Field Level	An attempt was made to save a Yeast ID panel during Panel Login and no Media is specified.	To save a record, if you enter a Yeast ID panel sequence number, you must select a media type.

W205 Panel Not Found		
Message Type	Alert Cause	Alert Corrective Action
OK Print Screen	An attempt was made to find a Sequence and Accession combination that is not in the BD Phoenix™ database.	The Sequence and Accession combination does not exist in the database.

W300 Missing Test Strain for a QC Panel		
Message Type	Alert Cause	Alert Corrective Action
OK Print Screen	An attempt was made to save a QC panel without an organism ID (Test Strain).	You must select an organism (Test Strain) to save a QC panel. Advance to the Test Strain field to drop-down a box listing the available test strains. Highlight the desired organism. <b>Select</b> the highlighted organism.

W301 Missing Tech ID for a QC Panel		
Message Type	Alert Cause	Alert Corrective Action
Field Level	An attempt was made to save a QC panel without a Tech ID.	You must enter a Tech ID to save a QC panel. Advance to the Tech ID field and enter a Tech ID, up to three alphanumeric characters excluding: * ? [ ] ! #  .

W302 Invalid Tech ID for a QC Panel		
Message Type	Alert Cause	Alert Corrective Action
Field Level	An attempt was made to save a QC panel with an invalid Tech ID.	Enter up to three alphanumeric characters excluding: * ? [ ] ! #   for the Tech ID.

W303 Invalid Lot Number		
Message Type	Alert Cause	Alert Corrective Action
Field Level	An attempt was made to save a record or print a report for an invalid panel lot number, ID broth lot number, AST broth lot number, or indicator lot number.	Enter the correct lot number. Lot numbers can be up to seven characters. The lot number is shown on the item carton.

W304 Missing Lot Number		
Message Type	Alert Cause	Alert Corrective Action
Field Level	An attempt was made to save or print a report for a QC panel without a panel lot number, or an expiration date has been entered for one of the optional lot number fields (ID Broth, AST Broth, Indicator) with no corresponding lot number.	You must enter a panel lot number to save a QC panel. Advance to the Panel Lot # field and enter a lot number, up to seven digits. The lot number is shown on the panel carton.

W305 ID or AST Must be Enabled		
Message Type	Alert Cause	Alert Corrective Action
OK Print Screen	An attempt was made to save a panel or QC panel, and both the ID and AST fields are enabled.	The ID/AST fields are enabled or disabled based on the type of panel, according to the panel sequence number. At least one field must be enabled for the panel record to be saved and for testing to occur.

W400 Door Already Open		
Message Type	Alert Cause	Alert Corrective Action
OK Print Screen	A request was made to perform a task that requires the door to be opened when the door is already open.	Select <b>OK</b> .

W401 Cannot Perform Panel Locate		
Message Type	Alert Cause	Alert Corrective Action
OK Print Screen	The panel you are trying to locate is not in the instrument, or you cannot access the instrument using the Normalizer Panel Replacement function (e.g., because there are ongoing panels).	Verify that the correct panel sequence number is entered or that the instrument can be accessed (for Normalizer Panel Replacement activity, ongoing panels render the instrument inaccessible for this activity).

<b>W500 Upgrade Error</b>		
<b>Message Type</b>	<b>Alert Cause</b>	<b>Alert Corrective Action</b>
OK Print Screen	The USB key does not contain a readable, same, or newer version of instrument software. Causes include: older version of instrument software; USB key was removed before the update completed, or the USB key contains a corrupted or missing file.	Attempt the update operation again. If error reoccurs, contact your local BD representative.

<b>W502 Removable Media Error</b>		
<b>Message Type</b>	<b>Alert Cause</b>	<b>Alert Corrective Action</b>
Retry Cancel Print Screen	The USB key is not in the drive, full, write protected or it was removed before completion of the task.	Attempt the update operation again. If error reoccurs, contact your local BD representative.

<b>W503 Duplicate Rule</b>		
<b>Message Type</b>	<b>Alert Cause</b>	<b>Alert Corrective Action</b>
OK Print Screen	The data contained in the Antimicrobial, Org(anism) Group, and Organism fields is the same for the rule being saved as a different rule already defined in the Rule Set.	One of the parameters (Antimicrobial, Organism Group, or Organism) must be unique for the record to be saved.

<b>W506 Instrument Not Idle</b>		
<b>Message Type</b>	<b>Alert Cause</b>	<b>Alert Corrective Action</b>
OK Print Screen	An attempt to execute an upgrade failed because the instrument was not idle.	Wait until instrument is idle (or correct carousel jam) before performing this activity.

<b>W507 Invalid Password</b>		
<b>Message Type</b>	<b>Alert Cause</b>	<b>Alert Corrective Action</b>
OK Print Screen	An invalid (or no) password was entered to access a Configuration screen.	Enter the correct password and perform the action again.

W511 Battery Mode		
Message Type	Alert Cause	Alert Corrective Action
OK Print Screen	An attempt to install or restore data while the tablet is unplugged and working in battery mode.	Retry the install or restore data when battery mode is not in progress.

W600 Panel Cannot Be Deleted		
Message Type	Alert Cause	Alert Corrective Action
OK Print Screen	An attempt was made to delete a panel that is still physically in the instrument or a non-pending QC panel that is not physically in the instrument (if QC Lot Support is enabled).	Remove the panel from the instrument. You can use the find panel tab to make the carousel present the panel when the door is opened. If you know you have already removed the panel, then close the instrument door and allow the instrument to complete an inventory scan before attempting to delete the panel.

W601 Cannot Finalize		
Message Type	Alert Cause	Alert Corrective Action
Field Level	An attempt was made to finalize a panel either whose status is not Removable or that has an unignored Needs Attention set.	If panel is Ongoing, wait until it becomes Removable before attempting to finalize it. If panel has a Needs Attention set, resolve the reason before attempting to finalize the panel.

W602 Invalid Date		
Message Type	Alert Cause	Alert Corrective Action
Field Level	An attempt was made to save a record containing, or to print a report specifying, an invalid date. Or, a panel lot barcode containing an invalid expiration date was scanned.	Enter a valid date.

W604 Panel Still Testing		
Message Type	Alert Cause	Alert Corrective Action
Field Level	An attempt was made to save a Final ID to an ID or Combination panel that has not reported an Instrument organism ID.	A Final ID cannot be selected and saved until the instrument ID results are obtained. Wait until the instrument calculates an ID before attempting to select a Final ID.

<b>W606 Cannot Modify Date for a Finalized Panel</b>		
<b>Message Type</b>	<b>Alert Cause</b>	<b>Alert Corrective Action</b>
OK Print Screen	An attempt was made to save a panel without a panel lot number expiration date or without expiration dates for other lot number fields IF panel lot numbers have been entered.	If information for a finalized panel must be modified, recall the panel and un-finalize it by disabling the Finalize field. Make the required changes and save the information.

<b>W607 Missing Date</b>		
<b>Message Type</b>	<b>Alert Cause</b>	<b>Alert Corrective Action</b>
Field Level	An attempt was made to save a panel without a panel lot number expiration date or without expiration dates for other lot number fields IF panel lot numbers have been entered.	A valid panel lot number expiration date must be entered for panels. If other lot number fields are completed, their corresponding expiration dates must be entered.

<b>W608 Improper Barcode Scan</b>		
<b>Message Type</b>	<b>Alert Cause</b>	<b>Alert Corrective Action</b>
OK Print Screen	The barcode number scanned is too long for the current active field, or is not the correct type of barcode for the field (e.g., scanning a lot number in a non-lot number field).	Verify which field is currently active and check what type of barcode you are trying to scan.

<b>W609 Database Full</b>		
<b>Message Type</b>	<b>Alert Cause</b>	<b>Alert Corrective Action</b>
OK Print Screen	An attempt was made to log in a new panel and 50 panels exist in the instrument database with a pending record status, with no panels eligible for deletion.	Pending panels should be placed in the instrument and allowed to complete an inventory scan before you attempt to log in any new panels.

<b>W700 Invalid LIS Code</b>		
<b>Message Type</b>	<b>Alert Cause</b>	<b>Alert Corrective Action</b>
OK Print Screen	An invalid LIS code was entered in the Organism Configuration or Antimicrobial Configuration screen.	LIS Codes can be up to 20 alphanumeric characters.

W701 Duplicate LIS Code		
Message Type	Alert Cause	Alert Corrective Action
OK Print Screen	A duplicate LIS code was entered in the Organism Configuration or Antimicrobial Configuration screen.	LIS Codes must be unique in the system.

W800 Panel Lot Undefined		
Message Type	Alert Cause	Alert Corrective Action
Field Level	An attempt was made to log in a QC panel but the panel sequence number is not within the range of a defined/saved Panel Lot.	When QC Lot Support is enabled in Configuration, all QC panels must belong to a defined/saved panel lot. Clinical panels may be from an undefined panel lot and still be logged in, though such panels generate a Panel Lot Undefined Needs Attention condition.

W801 Panel Lot Range Incomplete		
Message Type	Alert Cause	Alert Corrective Action
Field Level	During Panel Lot Definition, an attempt was made to save a panel lot but one or both panel sequence number fields were blank.	Both a starting sequence number (lowest) and ending sequence number (highest) must be scanned for any panel lot to be saved. The sequence numbers can be scanned in any order, but both must be scanned. You cannot type in a sequence number on the Panel Lot Definition screen.

W802 Panel Lot Range Invalid		
Message Type	Alert Cause	Alert Corrective Action
Field Level	During Panel Lot Definition, an attempt was made to save a panel lot but the two panels scanned were different panel types.	Both panels must be the same type for any panel lot to be saved.

W803 Panel Lot Range Conflict		
Message Type	Alert Cause	Alert Corrective Action
Field Level	During Panel Lot Definition, an attempt was made to save a panel lot but one or both panel sequence numbers conflicted with an existing panel lot definition.	A panel sequence number can only belong to one defined/saved panel lot. Contact your local BD representative.

<b>W806 Panel Lot Expired</b>		
<b>Message Type</b>	<b>Alert Cause</b>	<b>Alert Corrective Action</b>
OK Print Screen	A panel lot number barcode is scanned containing an expired expiration date.	Enter an unexpired panel log number barcode.

<b>W900 Commission Duplicate Serial Number</b>		
<b>Message Type</b>	<b>Alert Cause</b>	<b>Alert Corrective Action</b>
OK Print Screen	There is an instrument with the same serial number already commissioned.	Enter a unique serial number.

<b>W901 Commission Duplicate Instrument Identifier</b>		
<b>Message Type</b>	<b>Alert Cause</b>	<b>Alert Corrective Action</b>
OK Print Screen	There is an instrument with the same designation already commissioned.	Check for instrument designation duplication.

<b>W904 Commission Invalid Serial Number</b>		
<b>Message Type</b>	<b>Alert Cause</b>	<b>Alert Corrective Action</b>
OK Print Screen	The serial number must be a minimum of six characters.	The serial number must be six characters.

<b>W905 Decommission of Connected Instrument</b>		
<b>Message Type</b>	<b>Alert Cause</b>	<b>Alert Corrective Action</b>
OK Print Screen	An attempt is being made to decommission an instrument.	Disconnect the instrument prior to decommissioning.

## 8.4 Event Log Messages

### 8.4.1 LIS Related Messages

The Event Log tab, located on the bottom right of the Maintenance screen enables the user to see messages that the instrument writes to the Event Log. The messages are in the following format:

*date time message type: message text*

where *date* represents the day, month, and year in the format you have chosen

*time* represents the time in the format you have chosen

*message type* is one of the following:

- LIS Interface Message
- LIS Unsolicited Message
- LIS Order Cancelled
- LIS Query Assembly
- LIS Receiving Query
- LIS Configuration Change

*message text* is the actual text message that appears

Below is a list of the messages, along with a description of the message and any actions that may be performed to correct the problem. These messages are grouped by the message type listed above.

#### LIS Interface Messages

LIS Interface Messages are library messages generated by the LIS manager. They are listed below in alphabetical order.

Bad Frame Received From LIS
DESCRIPTION – This error is generated when the LIS downloads a frame that has not been properly formatted. The error type is listed as LIS_NON_FATAL.
CORRECTIVE ACTION(S) – The solution to this problem is to review the information that is being sent to the instrument via a communications line monitor. Compare the information captured with the specifications found in the BD – LIS Vendor Interface Document. Any discrepancies observed should be corrected and then the transmission should be attempted again.

Detailed Download Message Attached to Notification
DESCRIPTION – These notifications are generated whenever a complete message is sent or received across the port. The error types are LIS_NOTIFY. The detailed description is not displayed.
CORRECTIVE ACTION(S) – Message is informational – no action required.

**Detailed Upload Message Attached to Notification**

DESCRIPTION – These notifications are generated whenever a complete message is sent or received across the port. The error types are LIS\_NOTIFY. The detailed description is not displayed.

CORRECTIVE ACTION(S) – Message is informational – no action required.

**Detailed Upload Message Attached to Notification**

DESCRIPTION – These notifications are generated whenever a complete message is sent or received across the port. This provides the Host Application with the complete ASTM message string that was exchanged. The error types are LIS\_NOTIFY and the detailed descriptions contain the ASTM message string.

CORRECTIVE ACTION(S) – Message is informational – no action required.

**Disallowed Characters Contained in Field**

DESCRIPTION – This error is generated when an upload field contains characters that are not allowed in an upload message. These characters differ based on logical protocol and will be stripped from the upload field. This error type is LIS\_NON\_FATAL. The detailed description is not displayed.

CORRECTIVE ACTION(S) – If this error is reported the problem should be reported to your local BD representative for further investigation.

**Download Field Was Concatenated**

DESCRIPTION – This notification is generated when a download field is larger than the maximum size set by the Host Application. The field will be concatenated to the maximum size. This error type is listed as LIS\_LOG. The detailed description is not displayed.

CORRECTIVE ACTION(S) – In this case the content that is being assembled needs to be reviewed. Review the BD – Vendor Interface Specification for limitations on field lengths in the message. Then the LIS code should be updated so that the information sent to the instrument remains within the defined limits.

**Download Message Has a Bad or Missing Header Record**

DESCRIPTION – This error is generated when a download message does not have a properly formatted header record. The LIS IM cannot continue processing the message and it will be deleted. This error type is listed as LIS\_NON\_FATAL, and the detailed description holds the ASTM message received from the LIS.

CORRECTIVE ACTION(S) – Check the header line for errors. Correct the header error and resend the message.

**Download Physical Communication with LIS Has Begun**

DESCRIPTION – This notification is generated when the download thread in the physical layer is actively downloading a message.

CORRECTIVE ACTION(S) – Message is informational – no action required.

**Download Physical Communication with LIS Has Completed**

DESCRIPTION – This notification is generated when the download thread in the logical layer has completed processing a download message.

CORRECTIVE ACTION(S) – Message is informational – no action required.

**Download Record is Out Of Sequence Or Has Bad Sequence Number**

DESCRIPTION – This error is generated when a download record contains records with a bad sequence number, or violates the record hierarchy for the logical level protocol. This will cause the message to be deleted from the download queue. This error type is listed as LIS\_NON\_FATAL.

CORRECTIVE ACTION(S) – Appropriate updates should be made to the application generating the logical message so the structure conforms to the ASTM specifications for the interface. Most questions concerning the message content can be addressed by referencing the BD – Vendor Interface Specifications and the ASTM specifications for the interface.

**Early Termination of Transfer Session By LIS**

DESCRIPTION – This error is generated when there is an error in LIS communication. The control character to end a transfer session was received before the appropriate number of characters for the frame were received.

CORRECTIVE ACTION(S) – Review the frames being exchanged between the instrument and the LIS to assure that the proper number of characters are contained within the packets that are being exchanged. If the correct number of characters is not in the packet, update the code so that the correct number of characters is included in each frame.

**Expected Frame Not Sent**

DESCRIPTION – This error is generated when there is an error in LIS communication. The LIS initiated a transfer session but did not send any data before a time-out occurred. This error type is listed as LIS\_NON\_FATAL.

CORRECTIVE ACTION(S) – Connect a communications line monitor and restart the transmission. Observe the transmission to determine if the complete transmission occurs or if the transmission is interrupted early. If the transmission appears to be complete or the LIS appears to be attempting to send the transmission contact your local BD representative for assistance. If the transmission appears to be incomplete from the LIS side of the transmission then the LIS code should be investigated for problems that could terminate the transmission early.

**Internal Assert Condition Found in LIS Library**

DESCRIPTION – This message indicates that the Instrument has encountered an error that should not occur. This error will result in the instrument rebooting.

CORRECTIVE ACTION(S) – Contact your local BD representative. At the time the problem occurs the application writes data to the log file that indicates the nature of the Assert. The BD representative should instruct you on the appropriate procedure to collect the data for the condition.

**LIS Debug Error**

DESCRIPTION – This error is generated when there has been a problem internally to the instrument physical layer. This error may be triggered for an index out of bounds, or unsupported memory area IDs, etc. This error type is listed as LIS\_FATAL.

CORRECTIVE ACTION(S) – This error is a Fatal Error. If this error appears in the log file, contact your local BD representative. The sequence of events that produced this message should be documented so that BD representatives can reproduce the error and then provide an appropriate course of action to address the problem.

**LIS Did Not Acknowledge Sent Frame**

DESCRIPTION – This error is generated when the instrument has sent a frame to the LIS but has not received an acknowledgment before a time-out occurred. This error type is listed as LIS\_NON\_FATAL.

CORRECTIVE ACTION(S) – This message should not occur during normal operation of the instrument interface. If this error is being encountered during development of the interface then the LIS development group should connect a data communication monitor to the serial interface cable and review the information that is being exchanged between the two devices. It is likely that the LIS is not generating the appropriate response to the message that the instrument has sent.

**LIS Is Not Responding To Output Request**

DESCRIPTION – This error is generated when the instrument is trying to establish a transfer session but the LIS is not responding. When this error is sent, the instrument is assuming the LIS connection is broken or the LIS is down. This error type is listed as LIS\_NON\_FATAL.

CORRECTIVE ACTION(S) – Check to assure that the LIS interface is active and ready to receive messages from the instrument. If the LIS is operating correctly, connect a communications line monitor and review the information that has been captured. If the instrument is attempting to establish communications with the LIS, it would be appropriate to review the code that has been written to interface with the instrument and assure that the code is appropriate to receive the information sent by the instrument.

**LIS Never Completed Current Frame**

DESCRIPTION – This error is generated when there is an error in LIS communication. The control characters expected to end a transmitted frame were never received.

**LIS Never Completed Current Frame**

**CORRECTIVE ACTION(S)** – Review the frames being exchanged between the instrument and the LIS via line monitor. Be sure to review all frames included in the transmission. If any frames do not contain the appropriate termination characters make appropriate changes to the interface code to correct the problem.

**Logical Processing of LIS Data Has Begun**

**DESCRIPTION/CORRECTIVE ACTION(S)** – Message is informational – no action required.

**Logical Processing of LIS Data Has Completed**

**DESCRIPTION/CORRECTIVE ACTION(S)** – Message is informational – no action required.

**Message Packet Passed to Host Application**

**DESCRIPTION** – This notification is generated when the LIS IM has successfully passed a message on to the Host Application. This notification exists mostly as a debug message. This error type is listed as LIS\_LOG.

**CORRECTIVE ACTION(S)** – No action required by user. Information is included to help LIS manufacturers debug and implement their interface.

**Message Received By LIS**

**DESCRIPTION** – This notification is generated after the LIS has received and acknowledged a message from the instrument.

**CORRECTIVE ACTION(S)** – Message is informational – no action required.

**Message Received From LIS**

**DESCRIPTION** – This notification is generated when a download message has been properly received by the Physical Interface from the LIS. This error type is listed as LIS\_LOG.

**CORRECTIVE ACTION(S)** – This message is an informational message and requires no action to be taken. The transmission was successful. This message will be generated even if the message contained content errors.

**Must Re-send Output Frame to LIS**

**DESCRIPTION** – This notification is generated when a frame sent by the LIS IM was not properly received by the LIS. The message frame will be resent, according to low level protocol specifications. This error type is listed as LIS\_LOG.

**Must Re-send Output Frame to LIS**

**CORRECTIVE ACTION(S)** – If this message appears infrequently and the messages that are being exchanged are completed correctly, it is likely that no action is required. If the message above is encountered frequently, there is likely a problem in the interface. The LIS manufacturer and BD representative should be contacted to diagnose the interface to assure that it is operating properly. When the link is operating optimally this message should not appear in the log.

**No Queue Memory for Download Messages**

**DESCRIPTION** – The BD Phoenix™ M50 Instrument is designed to operate in a limited amount of memory (as defined in the configuration structure). When these memory resources are full with download or upload messages, this notification will be generated. The notification may be common if the LIS tries to download too much information at once. The BD Phoenix™ M50 Instrument will NAK data for which it cannot allocate memory, and the LIS will have to resend the data.

**CORRECTIVE ACTION(S)** – Resend the messages that were rejected by the instrument.

**No Queue Memory for Upload Messages**

**DESCRIPTION** – The BD Phoenix™ M50 Instrument is designed to operate in a limited amount of memory (as defined in the configuration structure). When these memory resources are full with download or upload messages, this notification will be generated. This message should not be encountered when using the instrument LIS interface.

**CORRECTIVE ACTION(S)** – If this message is encountered, the problem should be reported to the BD representative. It will be helpful if the process that generated the problem is documented.

**No Response Received From Previous LIS Request Message**

**DESCRIPTION** – This notification is generated when the LIS IM has uploaded a query but no response is received. This notification indicates that the original query was cancelled. This notification should occur sometime after the query, as determined by the value in the configuration structure. The error type is listed as LIS\_LOG. The detailed description is not displayed in the current version.

**CORRECTIVE ACTION(S)** – Validate that the LIS system is correctly connected to the instrument and that the LIS interface has been activated.

**Operating System Error**

**DESCRIPTION** – This error is generated when the operating system class encounters an error in one of its routines. This could be caused by a number of OS errors, including not properly initializing a port or not properly creating an event handle, and others. These errors should not occur under normal conditions and the LIS IM cannot recover from them. The error type is listed as LIS\_FATAL.

**CORRECTIVE ACTION(S)** – If this error is reported the problem should be reported to your local BD representative for further investigation.

**Output Message Was Sent To LIS**

DESCRIPTION – This notification is generated when an upload message has been successfully transmitted to the LIS. This error type is listed as LIS\_NOTIFY. Notification sent when the instrument begins sending a message to the LIS. Receiving this notification does not signify the message was accepted by the LIS.

CORRECTIVE ACTION(S) – Message is informational – no action required.

**Queue Memory for Download Messages Free**

DESCRIPTION – This notification is used in pairs with the No Queue Memory For Download Messages above. When memory has previously been determined to be full, and now has been released, this notification will be generated.

CORRECTIVE ACTION(S) – This is an indication to a user of a batch-oriented interface that the instrument is capable of receiving the next group of messages.

**Queue Memory for Upload Messages Free**

DESCRIPTION – This notification is used in pairs with the No Queue Memory For Upload Messages above. When memory has previously been determined to be full, and now has been released, this notification will be generated.

CORRECTIVE ACTION(S) – This message should not appear in the log during operation of the interface. If this message appears in the log, contact your local BD representative.

**Response Message Received**

DESCRIPTION – This notification is generated when the LIS has downloaded a response to a BD generated query. This is also an indication that the LIS IM can upload another query to the LIS. The error type is LIS\_NOTIFY. The detailed description is not displayed in the current version.

CORRECTIVE ACTION(S) – Message is informational – no action required.

**Unsupported Field in Configuration File**

DESCRIPTION – This error is generated during startup when a field in the configuration structure does not match one of the supported configurations of the LIS IM. This error type is listed as LIS\_FATAL.

CORRECTIVE ACTION(S) – If this error is reported the problem should be reported to your local BD representative for further investigation.

**Upload Physical Communication With LIS Has Begun**

DESCRIPTION – This notification is generated when the upload thread in the physical layer is actively uploading a message.

CORRECTIVE ACTION(S) – Message is informational – no action required.

**Upload Physical Communication With LIS Has Completed**

DESCRIPTION – This notification is generated when the upload thread in the physical layer has completed sending a message to the LIS.

CORRECTIVE ACTION(S) – Message is informational – no action required.

**LIS Unsolicited Message**

The following sections contain the possible messages associated with Event Log entries in response to unsolicited download requests. They are listed below in alphabetical order.

**LIS Response Error**

DESCRIPTION – This message is set after the LIS sends an incorrectly formatted query message to the instrument. We will respond by sending a response error message to the LIS.

CORRECTIVE ACTION(S) – If the interface is operating correctly, this message should not be present in the log. If this message is found in the log during validation or development of the interface, the code responsible for generating the queries should be reviewed and adjusted so that the query is assembled without the invalid field. The invalid field will be the last “LIS Query Assembly” message listed before this message in the log file.

**LIS Sent Query Before Previous Query Completed**

DESCRIPTION – This message is set if the LIS initiates a query and while the instrument is busy with this query, the LIS cancels the first query and immediately starts another.

CORRECTIVE ACTION(S) – If the interface is operating correctly this message should not be present in the log. If this message is found in the log during validation or development of the interface, the code responsible for generating the queries should be reviewed and adjusted so that it will not send another query while it is waiting for an outstanding query to be canceled.

## LIS Order Canceled Messages

(Message consists of a field name shown below at * and invalid field contents.)	
DESCRIPTION	The validation for the noted field failed.
	*Invalid Sequence Number Field
	Missing Accession Number Field
	Invalid Accession Number Field cannot be 12 digits and begin with 42 or 50–59; see <a href="#">5.2 Panel Login Tab</a> for other requirements.
	Missing Isolate Field
	Invalid Isolate Field
	Invalid Panel Usage
	Invalid Test ID Field
	Invalid Test Strain for this QC Panel Type
	Mismatch Sequence Number and Test ID
	Missing Test ID Field
	Invalid Organism ID Field
	Invalid Priority Field
	Problem Storing Record to Database

When an error is detected, the message for that error is logged and the remainder of the message checking is terminated. There could be other errors in the order that were not reported. The error checking priority depends upon whether the order contains a sequence number or not.

**CORRECTIVE ACTION(S)** – In an operational interface it is possible to encounter these errors if the LIS implementation allows entry of data into the fields that violate the Instrument field rules. In this case the user of the LIS should limit the characters entered into the fields sent to the instrument to those characters noted in the System User's Manual as valid for the field. Once the information has been updated to conform with the instrument's rules the order should be sent to the instrument again.

If the interface is under development the developer of the interface should limit the data being sent to the instrument to those characters that are appropriate for the fields.

### LIS Query Assembly Messages

All of the following messages are written to the log file regardless of whether they are invalid or valid. They are placed in the log so that they can be used in conjunction with the messages that follow them. If an error is found in one of the fields, the contents of the field in error will be logged.

<b>(Message consists of a field name shown below at **.)</b>	
DESCRIPTION	The message is logged when the instrument uploads a query to the LIS.
	**Accession Number
	Sequence Number
	Test ID
	Test Status
	Result Qualifier
	Time Qualifier
	Start Date/Time
End Date/Time	
CORRECTIVE ACTION(S) – If the query is valid, the message is informational – no action required. If the query is invalid, then review the field in error, correct, and resend the query.	

<b>(Message consists of a field name and value shown below at ***)</b>
DESCRIPTION – This message is logged when the instrument uploads a query to the LIS.
*** Sequence Number and the value
CORRECTIVE ACTION(S) – Message is informational – no action required.

### LIS Configuration Change Messages

<b>(Message consists of a configuration value shown below at ** with old and new values.)</b>	
DESCRIPTION	The message is logged when the LIS configuration is changed.
	**LIS Enabled Value Changed
	Send Interpretation Results Option Changed
	Unsolicited Queries Option Changed
	Send When Placed In Instrument Option Changed
	Results Upload Options Changed
	Baud Value Changed
	Data Bits Value Changed
	Parity Value Changed
	Stop Bits Value Changed
Packed Frames Value Changed	
CORRECTIVE ACTION(S) – Message is informational – no action required.	



## 9 Performance and Limitations

This section describes the following:

- [9.1 Performance Characteristics](#)
- [9.2 Limitations of the Procedure](#)
- [9.3 Limitations of the BD Phoenix™ CPO detect test](#)

### 9.1 Performance Characteristics

#### Definitions:

Essential Agreement (EA): Essential agreement occurs when the MIC of the BD Phoenix™ System and the CLSI Reference Broth Microdilution are identical or within  $\pm 1$  dilution of each other.

Category Agreement (CA): Category agreement occurs when the BD Phoenix™ System results and the CLSI Reference Broth Microdilution results falls within the same categorical interpretive criteria as established by the CLSI.

#### 9.1.1 Gram-Negative Performance

##### Gram-Negative Identification

In two internal studies, the performance of the BD Phoenix™ Gram-Negative Identification was evaluated. The 0.5 inoculum density configuration and the 0.25 inoculum density configuration were tested with 721 strains (0.5) and 784 strains (0.25) respectively. Enteric and non-enteric isolate results were evaluated against commercial and noncommercial methods.

The BD Phoenix™ Gram-Negative Identification performance is outlined below:

	Inoculum Density (McFarland)	Agreement	No Agreement	No ID
Genus Level	0.5	97.2%	1.9%	0.8%
	0.25	98.3%	1.1%	0.5%
Species Level	0.5	95.6%	3.6%	0.8%
	0.25	98.1%	1.4%	0.5%

Additionally, testing was performed at multiple sites to demonstrate reproducibility. The identification results obtained using the BD Phoenix™ System were compared with expected results. This performance testing demonstrated inter-site reproducibility of  $\geq 90\%$ .

##### Gram-Negative Susceptibility

The performance of the BD Phoenix™ Gram-Negative AST System was evaluated at multiple trial sites. Comparisons were made to AST results generated from reference testing according to CLSI standard guidelines. Discrepant results were arbitrated by duplicate repeat testing in both test and reference methods.

### BD Phoenix™ Confirmatory ESBL Test

To determine the accuracy of the BD Phoenix™ Confirmatory ESBL test, accuracy testing was performed at multiple sites using Clinical and Challenge isolates. The results from the ESBL test resident on the BD Phoenix™ panels were compared to the results obtained from the reference confirmatory ESBL test. For Challenge organisms, this result is an expected result, and for Clinical isolates, this result was obtained from concurrent testing in the CLSI reference broth microdilution method.

#### Positive/Negative Detection:

Positive Percent Agreement =  $340/360 = 94.4\%$   
 Negative Percent Agreement =  $847/882 = 96.0\%$   
 Overall Percent Agreement =  $1,187/1,242 = 95.6\%$

### BD Phoenix™ Confirmatory CPO Detect Test

The BD Phoenix™ CPO detect test uses the principles of Ambler-class specific beta-lactamase inhibition and Ambler-class specific antibiotic resistance to detect the presence of a carbapenemase and to derive the Ambler class of the carbapenemase. In some isolates, the presence of multiple resistance mechanisms, including more than one carbapenemase, may result in a “CPO Positive” test result with no Ambler classification (i.e., “unclassified”). The frequency of these isolates may vary regionally.

To determine the accuracy of the CPO detect test with Enterobacteriales, *P. aeruginosa*, and *A. baumannii*, testing was performed at multiple sites using Clinical and Challenge isolates. For clinical isolates a composite reference method was used, which included, but was not limited to, the modified Carbapenem Inactivation Method (mCIM), MIC Screen (utilizing carbapenem threshold values) and multiplex PCR testing. Multiplex PCR testing for Enterobacteriales included *blaKPC*, *blaNDM*, *blaIMP*, *blaVIM*, and OXA-48-like genes. Multiplex PCR testing for *P. aeruginosa* and *A. baumannii* included *blaKPC*, *blaNDM*, *blaIMP*, *blaVIM*, OXA-23-like, OXA-24-like, OXA-48-like, and OXA-58-like genes. Challenge isolates were compared to previously established results.

#### Positive/Negative Detection:

Positive Percent Agreement =  $465/473 = 98.3\%$   
 Negative Percent Agreement =  $538/562 = 95.7\%$   
 Overall Percent Agreement =  $1,003/1,035 = 96.9\%$

#### Ambler Classification (A,B,D):

Overall Accuracy =  $914/944 = 96.8\%$

Of the 473 isolates identified as carbapenemase-producers during the clinical trial by the composite reference method, the BD Phoenix™ CPO detect test did not assign an Ambler classification to 69 isolates.

ANTIMICROBIAL	CODE	EA N	EA %	CA N	CA %	**Bias %
Amikacin	AN	974	94.3	974	99.2	N/A
Amoxicillin	AMX	725	95.9	839	96.9	N/A
Amoxicillin-Clavulanate	AMC	636	97.8	749	97.1	N/A
Amoxicillin-Clavulanate (f)	AXC	364	96.4	411	97.6	N/A

ANTIMICROBIAL	CODE	EA N	EA %	CA N	CA %	**Bias %
Ampicillin	AM	639	97.5	753	98.0	N/A
Ampicillin-Sulbactam	SAM	848	96.8	962	96.9	N/A
Ampicillin-Sulbactam (f)	SXA	1,682	92.3	1,682	94.5	N/A
Arbekacin	ARB	2,083	94.1	2,083	99.2	N/A
Aztreonam	ATM	1,488	97.8	1,431	98.5	N/A
Cefazolin	CZ	634	97.0	752	97.1	N/A
Cefdinir	CDR	633	92.7	747	94.5	N/A
Cefditoren	CDN	1,270	97.2	1,270	98.4	N/A
Cefepime	FEP	1,463	97.8	1,463	98.6	N/A
Cefetamet	CAT	629	96.0	746	97.7	N/A
Cefixime	CFM	1,454	96.7	1,454	98.1	N/A
Cefmetazole	CMZ	608	94.7	718	96.4	N/A
Cefoperazone	CFP	854	95.1	972	97.7	N/A
Cefoperazone-Sulbactam	SCP	1,921	93.1	1,921	96.0	N/A
Cefotaxime	CTX	849	96.9	970	97.2	N/A
Cefotetan	CTT	627	96.2	748	96.4	N/A
Cefotiam	CFT	1,428	94.9	1,428	97.6	N/A
Cefoxitin	FOX	628	96.7	748	97.6	N/A
Cefpirome	CPO	846	96.2	964	97.0	N/A
Cefpodoxime	CPD	616	94.5	737	97.0	N/A
Cefsulodin	CFS	55	98.2	56	98.2	N/A
Ceftaroline	CPT	1,343	93.9	1,078	95.9	N/A
Ceftazidime	CAZ	2,388	96.6	2,388	94.7	N/A
Ceftazidime-Avibactam	CZA	1,528	96.8	1,413	99.2	N/A
Ceftibuten	CTB	590	90.5	708	95.9	N/A
Ceftizoxime	ZOX	854	97.3	971	97.2	N/A
Ceftolozane-Tazobactam	CT	1,446	94.8	1,310	96.9	N/A
Ceftriaxone	CRO	2,416	96.1	2,416	91.6	N/A
Cefuroxime	CXM	623	97.0	744	98.5	N/A
Cephalexin	CN	319	97.8	366	96.5	N/A
Cephalothin	CF	613	98.0	731	98.5	N/A
Chloramphenicol	C	978	97.7	978	98.7	N/A
Ciprofloxacin	CIP	977	99.4	977	99.7	N/A
Ciprofloxacin ( <i>Salmonella</i> only)	CIP	127	98.4	N/A	N/A	36.7
Colistin	CL	467	97.9	467	98.7	N/A

ANTIMICROBIAL	CODE	EA N	EA %	CA N	CA %	**Bias %
Ertapenem*	ETP	1,632	97.7	1,264	99.4	N/A
Fosfomycin	FF	446	93.0	446	96.9	N/A
Garenoxacin	GRN	1,977	98.1	1,977	99.4	N/A
Gatifloxacin	GAT	752	99.5	752	99.6	N/A
Gemifloxacin	GEM	2,096	98.6	2,096	99.0	N/A
Gentamicin	GM	973	95.8	973	99.8	N/A
Imipenem	IPM	1,549	94.8	1,470	99.0	N/A
Imipenem-Relebactam	IMR	1,313	95.2	N/A	N/A	6.2
Isepamicin	ISP	468	93.8	468	99.4	N/A
Kanamycin	K	735	95.8	735	99.9	N/A
Levofloxacin	LVX	972	99.6	972	100.0	N/A
Levofloxacin ( <i>Salmonella</i> only)	LVX	126	99.2	N/A	N/A	8.4
Lomefloxacin	LOM	976	99.1	976	99.6	N/A
Mecillinam	MEC	345	95.7	345	94.8	N/A
Meropenem	MEM	1,451	96.9	1,315	98.3	N/A
Meropenem-Vaborbactam	MEV	1,530	96.8	1,247	99.8	N/A
Minocycline	MI	2,094	93.8	2,094	98.3	N/A
Moxalactam	MOX	2,063	96.9	2,063	98.3	N/A
Moxifloxacin	MXF	746	98.5	747	99.7	N/A
Nalidixic Acid	NA	750	94.0	750	99.1	N/A
Netilmicin	NET	974	96.7	974	99.3	N/A
Nitrofurantoin	FM	744	98.4	744	98.8	N/A
Norfloxacin	NOR	976	98.9	976	99.6	N/A
Ofloxacin	OFX	971	99.3	971	99.7	N/A
Pefloxacin	PEF	469	98.5	469	99.4	N/A
Piperacillin	PIP	860	94.7	973	97.1	N/A
Piperacillin-Tazobactam	TZP	856	92.9	970	96.2	N/A
Temocillin	TEM	1,410	96.1	1,410	98.9	N/A
Tetracycline	TE	975	95.6	975	98.5	N/A
Ticarcillin	TIC	859	94.8	973	97.8	N/A
Ticarcillin-Clavulanate	TIM	534	92.7	589	94.6	N/A
Tigecycline	TGC	1,428	97.1	1,110	96.7	N/A
Tobramycin	NN	977	94.2	977	99.4	N/A
Trimethoprim	TMP	752	96.0	752	99.6	N/A
Trimeth-Sulfa (DIN)	STG	463	97.8	463	97.8	N/A

ANTIMICROBIAL	CODE	EA N	EA %	CA N	CA %	**Bias %
Trimethoprim-Sulfamethoxazole	SXT	976	95.5	976	97.3	N/A

\*Ability to Detect Resistance Unknown.

\*\*The second edition of ISO 20776-2:2021 only specifies assessment of the overall essential agreement (EA) and Bias. Therefore, categorical agreement (CA) data will not be included in the performance section for new drug additions.

### Performance Notes

DRUG	
Ciprofloxacin ( <i>Salmonella</i> only)	BD Phoenix™ ciprofloxacin MIC values tended to be in exact agreement or at least one doubling dilution higher when testing <i>Salmonella</i> compared to the reference broth microdilution method.

## 9.1.2 Gram-Positive Performance

### Gram-Positive Identification

In two internal studies, the performance of the BD Phoenix™ Gram-Positive Identification was evaluated. The 0.5 inoculum density configuration and the 0.25 inoculum density configuration were tested with 696 strains (0.5) and 755 strains (0.25) respectively. Results were evaluated against commercial and non-commercial methods.

The BD Phoenix™ Gram-Positive Identification performance is outlined below:

	Inoculum Density (McFarland)	Agreement	No Agreement	No ID
Genus Level	0.5	99.0%	0.3%	0.7%
	0.25	99.6%	0.0%	0.4%
Species Level	0.5	95.4%	3.9%	0.7%
	0.25	98.0%	1.6%	0.4%

Additionally, testing was performed at multiple sites to demonstrate reproducibility. The identification results obtained using the BD Phoenix™ System were compared with expected results. This performance testing demonstrated inter-site reproducibility of ≥90%.

### Gram-Positive Susceptibility

The performance of the BD Phoenix™ Gram-Positive AST System was evaluated at multiple trial sites. Comparisons were made to AST results generated from reference testing according to CLSI standard guidelines. Discrepant results were arbitrated by duplicate repeat testing in both test and reference methods.

ANTIMICROBIAL	CODE	EA N	EA %	CA N	CA %
Amikacin	AN	487	95.7	487	95.7
Amoxicillin	AMX	395	90.6	659	97.1
Amoxicillin-Clavulanate	AMC	180	97.8	446	97.5

ANTIMICROBIAL	CODE	EA N	EA %	CA N	CA %
Amoxicillin-Clavulanate (f)	AXC	397	96.7	664	97.6
Ampicillin	AM	402	94.0	667	98.7
Ampicillin-Sulbactam	SAM	179	96.7	445	97.1
Ampicillin-Sulbactam (f)	SXA	1,449	94.6	1,449	95.2
Arbekacin	ARB	973	96.2	973	99.9
Azithromycin	AZM	702	95.7	702	97.7
Cefaclor	CEC	182	91.8	449	95.6
Cefazolin	CZ	180	97.2	441	97.5
Cefdinir	CDR	182	94.5	434	96.8
Cefditoren	CDN	944	96.2	944	97.8
Cefepime	FEP	181	97.2	446	97.5
Cefmetazole	CMZ	174	96.6	430	97.2
Cefoperazone	CFP	184	95.7	447	97.8
Cefotaxime	CTX	185	96.2	446	97.8
Cefotetan	CTT	183	94.5	439	96.6
Cefotiam	CFT	965	91.5	965	94.0
Cefoxitin	FOX	184	96.2	445	97.5
Cefozopran	CFZ	1,130	89.8	1,130	89.6
Cefpirome	CPO	183	100.0	446	97.5
Cefpodoxime	CPD	185	91.4	451	95.6
Ceftaroline*	CPT	1,313	94.5	866	99.7
Ceftazidime	CAZ	183	95.1	448	97.1
Ceftizoxime	ZOX	184	93.5	447	96.2
Ceftriaxone	CRO	184	95.1	447	97.3
Cefuroxime	CXM	184	94.6	447	98.2
Cephalexin	CN	185	90.3	452	97.4
Cephalothin	CF	182	97.8	441	97.3
Chloramphenicol	C	705	92.8	705	95.3
Ciprofloxacin	CIP	686	96.4	686	97.4
Clarithromycin	CLR	485	96.3	485	98.1
Clindamycin	CC	703	98.2	703	98.3
Daptomycin*	DAP	1,361	97.6	1,361	99.8
Doxycycline	D	1,211	96.5	1,211	99.8
Ertapenem	ETP	670	91.6	670	95.4
Erythromycin	E	474	95.4	474	95.8

ANTIMICROBIAL	CODE	EA N	EA %	CA N	CA %
Fosfomycin	FF	472	97.0	472	98.3
Fusidic Acid	FA	477	96.7	477	99.0
Garenoxacin	GRN	1,212	97.1	1,212	99.0
Gatifloxacin	GAT	481	98.8	481	100.0
Gemifloxacin	GEM	1,400	96.2	1,400	97.4
Gentamicin	GM	487	98.4	487	99.2
Gentamicin-Syn	GMS	NA	NA	198	97.5
Gentamicin-Syn (SFM)	GMF	NA	NA	87	100.0
Imipenem	IPM	185	100.0	448	97.5
Inducible Macrolide Resistance (iMLSb) Test	ECC	NA	NA	295	97.6
Kanamycin	K	463	92.2	464	97.4
Kanamycin Synergy	KS	501	100.0	501	96.6
Levofloxacin	LVX	698	96.9	698	98.6
Lincomycin	L	696	98.3	696	98.7
Linezolid	LZD	474	99.4	474	100.0
Lomefloxacin	LOM	486	97.7	486	99.2
Meropenem	MEM	185	98.4	447	97.5
Minocycline	MI	1,448	98.5	1,448	99.2
Moxalactam	MOX	935	95.9	935	96.0
Moxifloxacin	MXF	486	99.0	486	99.6
Mupirocin	MUP	938	96.6	938	99.7
Mupirocin High Level	MUH	968	100.0	968	99.9
Netilmicin	NET	488	93.9	488	96.3
Nitrofurantoin	FM	707	98.3	707	98.3
Norfloxacin	NOR	674	96.0	674	97.8
Ofloxacin	OFX	487	99.2	488	99.8
Oxacillin	OX	449	95.8	449	97.8
Pefloxacin	PEF	706	97.9	706	98.0
Penicillin	P	401	96.0	662	98.0
Piperacillin	PIP	382	81.7	639	98.0
Piperacillin-Tazobactam	TZP	386	100.0	649	98.3
Rifampin	RA	700	84.0	700	88.3
Streptomycin-Syn	STS	NA	NA	198	99.0
Streptomycin-Syn (SFM)	STF	NA	NA	87	98.8
Teicoplanin	TEC	671	97.6	671	99.4

ANTIMICROBIAL	CODE	EA N	EA %	CA N	CA %
Tetracycline	TE	707	96.3	707	98.6
Ticarcillin	TIC	395	95.4	659	98.2
Ticarcillin-Clavulanate	TIM	396	97.5	656	97.9
Tigecycline*	TGC	1,356	96.8	1,044	100.0
Tobramycin	NN	473	97.0	473	97.3
Trimethoprim	TMP	479	95.4	479	97.9
Trimeth-Sulfa (DIN)	STG	645	91.0	646	92.7
Trimethoprim-Sulfamethoxazole	SXT	654	89.5	654	93.0
Vancomycin	VA	702	99.3	702	99.9

\* Ability to Detect Resistance Unknown

### 9.1.3 Streptococci Performance (with BD Phoenix™ SMIC/ID, SMIC Panels)

#### Streptococci Identification (SMIC/ID only)

In an internal study, the performance of the BD Phoenix™ Streptococci Identification was evaluated. Results from 655 isolates were evaluated against commercial and noncommercial methods.

The BD Phoenix™ Streptococci Identification performance is outlined below:

	Agreement	No Agreement	No ID
<b>Species Level</b>	96.3%	2.4%	1.2%

Additionally, testing was performed at multiple sites to demonstrate reproducibility. The identification results obtained using the BD Phoenix™ System were compared with expected results. This performance testing demonstrated inter-site reproducibility of ≥90%.

#### Streptococci Susceptibility

The performance of the BD Phoenix™ Streptococci AST System was evaluated at four clinical trial sites using clinical isolates. Comparisons were made to AST results generated from reference broth microdilution panels prepared according to CLSI standard guidelines. Discrepant results were arbitrated by duplicate repeat testing in both systems.

ANTIMICROBIAL	CODE	EA N	EA %	CA N	CA %
Amoxicillin	AMX	1,576	99.2	1,576	99.7
Amoxicillin-Clavulanate	AMC	1,564	97.9	1,564	99.3
Ampicillin	AM	1,569	98.0	1,569	99.4
Cefepime	FEP	1,571	97.6	1,571	99.7
Cefotaxime	CTX	1,578	98.5	1,578	99.6
Ceftriaxone	CRO	1,579	98.5	1,579	99.8

ANTIMICROBIAL	CODE	EA N	EA %	CA N	CA %
Cefuroxime	CXM	1,581	97.7	1,581	98.8
Chloramphenicol	C	1,587	97.4	1,587	99.6
Clindamycin	CC	1,591	94.0	1,591	97.4
Daptomycin	DAP	1,566	93.1	1,566	99.9
Ertapenem*	ETP	1,585	97.9	1,585	99.6
Erythromycin	E	1,577	93.2	1,577	98.2
Garenoxacin*	GRN	1,515	95.5	1,515	99.7
Gatifloxacin	GAT	1,587	95.1	1,587	99.5
Gemifloxacin*	GEM	1,592	98.9	1,592	99.7
Gentamicin-Syn	GMS	1,032	99.6	1,032	99.6
Imipenem	IPM	1,581	98.0	1,581	99.6
Kanamycin-Syn	KS	1,032	99.6	1,032	99.6
Levofloxacin	LVX	1,595	97.4	1,595	99.8
Linezolid	LZD	1,586	97.1	1,586	99.4
Meropenem	MEM	1,579	97.4	1,579	99.7
Moxifloxacin*	MXF	1,590	95.8	1,590	99.6
Ofloxacin	OFX	1,594	98.2	1,594	98.7
Penicillin	P	1,585	93.9	1,585	98.5
Streptomycin-Syn	STS	1,031	99.9	1,031	99.9
Teicoplanin*	TEC	1,593	99.8	1,593	99.9
Tetracycline	TE	1,589	93.3	1,589	97.6
Trimethoprim-Sulfamethoxazole	SXT	1,008	93.8	1,008	98.3
Vancomycin*	VA	1,588	98.2	1,588	99.9

\* Ability to Detect Resistance Unknown

### 9.1.4 Yeast Performance

The performance of the BD Phoenix™ Yeast identification was evaluated across multiple sites using pure colonies isolated from Sabouraud Dextrose Agar (SAB) and BD Trypticase™ Soy Agar with 5% Sheep Blood (TSA). Results from 532 (SAB) and 523 (TSA) clinical and challenge isolates were evaluated against conventional and molecular methods.

The BD Phoenix™ Yeast identification performance is outlined below:

	Source Media	Agreement	No Agreement	No ID
<b>Genus/Species Level</b>	SAB	95.3%	3.8%	0.9%
	TSA	96.6%	2.7%	0.8%

Additionally, testing was performed at multiple sites to demonstrate reproducibility. The identification results obtained using the BD Phoenix™ system were compared with expected results. This performance testing demonstrated inter-site reproducibility of ≥90%.

## 9.2 Limitations of the Procedure

See panels package insert for specific organism/antimicrobial limitations.

### General

A Gram stain test is required for the selection of the appropriate BD Phoenix™ panel types. Accurate identification and/or AST results may not be made without this test.

Use only well-isolated bacterial or yeast colonies from one of the recommended primary isolation media. Use of mixed colonies could result in inaccurate identification and/or AST interpretations.

If the instrument inoculum density (for the panel type being used) is configured to 0.5, an inoculum density of 0.50–0.60 McFarland must be met. Only the BD PhoenixSpec™ Nephelometer can be used to measure the inoculum density.

If the instrument inoculum density (for the panel type being used) is configured to 0.25, an inoculum density of 0.20–0.30 McFarland must be met. Only the BD PhoenixSpec™ Nephelometer can be used to measure the inoculum density for this range.

For identification of yeast, a suspension equivalent of 2.00–2.40 McFarland standard must be met and prepared only with the BD PhoenixSpec™ Nephelometer. Use of alternate methods for suspension preparation may cause erroneous identification results.

BD Phoenix™ panels can be read only by the BD Phoenix™ M50 Instrument. Visual interpretation of the BD Phoenix™ panels is not possible. Any attempt to manually interpret results from the panel may lead to misidentification and/or inaccurate AST interpretations.

Panels must be placed into the BD Phoenix™ M50 Instrument within 30 minutes of inoculation.

For the most reliable results, it is recommended that the QC organisms be subcultured at least twice on two consecutive days onto TSA with 5% Sheep Blood before use in the BD Phoenix™ System.

### Identification

The unique panel environment combined with the shortened incubation time may result in BD Phoenix™ panel reactions varying from those obtained using conventional biochemical media.

### Antimicrobial Susceptibility Testing

AST Indicator solution may be added to the AST broth tubes and stored in the dark for up to 8 hours prior to use. Use only one free-falling drop of the AST Indicator solution from the dropper bottle. If more than one drop is added inadvertently, discard the tube and use a fresh tube of AST broth.

After the addition of BD Phoenix™ AST Indicator Solution to the AST broth tubes, mix by inversion. DO NOT VORTEX. Vortexing may cause air bubbles to form in the AST broth, which can result in inappropriate filling of the BD Phoenix™ panel during inoculation.

Because of the low probability of occurrence some organisms included in the ID taxa are not included in the AST database. These organisms will display the message Organism not included in the AST database, perform alternate method.

For some organism/antimicrobial combinations, the absence of resistant strains precludes defining any result categories other than susceptible. For strains yielding results suggestive of a nonsusceptible category, organism identification and antimicrobial susceptibility test results

should be confirmed. Subsequently, the isolates should be saved and submitted to a reference laboratory that will confirm the result using the CLSI reference microbroth dilution method.

The use of CHROMagar™ Orientation may produce false susceptibility results when testing erythromycin with gram-positive organisms. Antimicrobial susceptibility results should be confirmed using BD Trypticase™ Soy Agar with 5% Sheep Blood.

This media type (Chocolate Agar) should not be used for Streptococcal identification with SMIC/ID panels. Chocolate Agar may be used for Streptococcal susceptibility testing only.

The use of Columbia Agar with 5% Horse Blood may produce significantly higher MIC for SXT with *Streptococcus* species, which may result in false resistance. Antimicrobial susceptibility test results should be confirmed using BD Trypticase™ Soy Agar with 5% Sheep Blood.

#### NOTE

MIC results for isolates without a genus and species identified in the BD Phoenix™ results Final ID field may not be valid.

When changing the BD Phoenix™ Final ID from an organism not claimed in the AST Taxa list to an organism that is claimed in the AST Taxa, the MIC and Interpretation results will be based on the Final ID that is claimed in the AST Taxa.

### 9.3 Limitations of the BD Phoenix™ CPO detect test

Due to the small number of tested isolates identified as harboring carbapenemases from multiple Ambler classes there is limited information on the performance of the BD Phoenix™ CPO detect with organisms co-producing different classes of carbapenemases.

Carbapenemase positive isolates that are carbapenem susceptible (*Enterobacterales*, *Pseudomonas aeruginosa*, or *Acinetobacter baumannii*) are rare, as encountered in the clinical study. Please conduct additional confirmatory testing before reporting carbapenemase activity in a susceptible isolate.

Certain bacterial species have been shown to exhibit resistance to carbapenems by resistance mechanisms other than carbapenemase production.

*In silico* analysis of carbapenemase gene variants was assessed in the validation of the PCR multiplex method for the reference method. Performance of isolates harboring specific carbapenemase gene variants expressing enzymes from various Ambler classes by BD Phoenix™ CPO detect was not determined.

The specificity of the BD Phoenix™ CPO detect when testing isolates with known carbapenem non-susceptibility by cephalosporinase or ESBL coupled with decreased permeability through porin mutations among *Enterobacterales*, *Pseudomonas aeruginosa*, and *Acinetobacter baumannii* has not been fully evaluated.



## 10 Panel Information

The topics discussed in this section are:

- [10.1 List of Antimicrobial Agents in BD Phoenix™ Panels](#)
- [10.2 List of Reagents and Principles Employed in the BD Phoenix™ System](#)
- [10.3 Taxa for ID/AST Determination](#)

### 10.1 List of Antimicrobial Agents in BD Phoenix™ Panels

Antimicrobial			Available Concentrations		
			Gram Negative	Gram Positive	Strep
Aminoglycoside	Amikacin	AN	0.5–64	0.5–64	N/A
Beta-lactam	Amoxicillin	AMX	0.5–32	0.25–32	0.125–32
Beta-lactam	Amoxicillin-Clavulanate (f)	AXC	0.5/2–32/2	0.25/2–32/2	N/A
Beta-lactam	Amoxicillin-Clavulanate	AMC	0.5/0.25–32/16	0.25/0.125–32/16	0.125/0.06–32/16
Beta-lactam	Ampicillin	AM	0.5–32	0.0625–32	0.0625–32
Beta-lactam	Ampicillin-Sulbactam (f)	SXA	0.5/8–32/8	0.5/8–32/8	N/A
Beta-lactam	Ampicillin-Sulbactam	SAM	1/0.5–32/16	0.5/0.25–32/16	N/A
Aminoglycoside	Arbekacin	ARB	0.25–16	0.25–16	N/A
Macrolides Lincosamides Streptogramins	Azithromycin	AZM	N/A	0.06–8	N/A
Beta-lactam	Aztreonam	ATM	0.25–64	N/A	N/A
Beta-lactam	Cefaclor	CEC	N/A	0.5–32	N/A
Beta-lactam	Cefazolin	CZ	0.5–32	0.5–32	N/A
Beta-lactam	Cefdinir	CDR	0.125–4	0.125–4	N/A
Beta-lactam	Cefditoren	CDN	0.125–8	0.125–8	N/A
Beta-lactam	Cefepime	FEP	0.125–64	1–64	0.0625–4
Beta-lactam	Cefetamet	CAT	0.25–16	N/A	N/A
Beta-lactam	Cefixime	CFM	0.125–8	N/A	N/A
Beta-lactam	Cefmetazole	CMZ	2–64	1–64	N/A
Beta-lactam	Cefoperazone	CFP	0.5–64	1–64	N/A
Beta-lactam	Cefoperazone-Sulbactam	SCP	0.5/8–64/8	N/A	N/A

Antimicrobial			Available Concentrations		
			Gram Negative	Gram Positive	Strep
Beta-lactam	Cefotaxime	CTX	0.5–64	1–64	0.0625–4
Beta-lactam	Cefotetan	CTT	2–64	1–64	N/A
Beta-lactam	Cefotiam	CFT	0.5–64	0.5–64	N/A
Beta-lactam	Cefoxitin	FOX	0.5–64	1–64	N/A
Beta-lactam	Cefozopran	CFZ	N/A	1–64	N/A
Beta-lactam	Cefpirome	CPO	0.5–64	0.5–64	N/A
Beta-lactam	Cefpodoxime	CPD	0.125–8	0.5–8	N/A
Beta-lactam	Cefsulodin	CFS	1–64	N/A	N/A
Beta-lactam	Ceftaroline	CPT	0.015625–4	0.0625–4	N/A
Beta-lactam	Ceftazidime	CAZ	0.5–64	1–64	N/A
Beta-lactam	Ceftazidime-Avibactam	CZA	0.25/4–32/4	N/A	N/A
Beta-lactam	Ceftibuten	CTB	0.5–32	N/A	N/A
Beta-lactam	Ceftizoxime	ZOX	0.5–64	1–64	N/A
Beta-lactam	Ceftolozane-Tazobactam	CT	0.25/4–32/4	N/A	N/A
Beta-lactam	Ceftriaxone	CRO	0.5–64	1–64	0.0625–4
Beta-lactam	Cefuroxime	CXM	1–64	1–64	0.125–4
Beta-lactam	Cephalexin	CN	1–64	0.5–64	N/A
Beta-lactam	Cephalothin	CF	1–64	0.5–64	N/A
Phenicol	Chloramphenicol	C	1–32	1–32	1–32
Quinolone	Ciprofloxacin	CIP	0.125–4 For organisms except <i>Salmonella</i> spp.	0.125–4	N/A
	Ciprofloxacin	CIP	0.015625–4 For <i>Salmonella</i> spp.		
Macrolides Lincosamides Streptogramins	Clarithromycin	CLR	N/A	0.06–8	N/A
Macrolide Lincosamide	Clindamycin	CC	N/A	0.12–8	0.03–4
Cyclic peptide	Colistin	CL	0.5–4	N/A	N/A
Cyclic lipopeptide	Daptomycin	DAP	N/A	0.125–32	0.03–16
Tetracycline	Doxycycline	D	N/A	0.25–16	N/A
Beta-lactam	Ertapenem	ETP	0.0625–4	0.25–32	0.0625–4
Macrolide Lincosamide	Erythromycin	E	N/A	0.125–8	0.015–4

Antimicrobial			Available Concentrations		
			Gram Negative	Gram Positive	Strep
Fosfomycin	Fosfomycin	FF	16–256	8–256	N/A
Fusidane	Fusidic Acid	FA	N/A	0.5–32	N/A
Quinolone	Garenoxacin	GRN	0.125–16	0.25–8	0.03125–4
Quinolone	Gatifloxacin	GAT	0.25–8	0.25–8	0.0625–8
Quinolone	Gemifloxacin	GEM	0.125–8	0.125–2	0.0625–8
Aminoglycoside	Gentamicin	GM	0.5–16	0.5–16	N/A
Aminoglycoside	Gentamicin-Syn	GMS	N/A	500	250–1,000
Aminoglycoside	Gentamicin-Syn (SFM)	GMF	N/A	250	N/A
Beta-lactam	Imipenem	IPM	0.0625–16	0.5–16	0.015–4
Beta-lactam	Imipenem-Relebactam	IMR	0.0625/4–16/4	N/A	N/A
Aminoglycoside	Isepamycin	ISP	0.5–32	N/A	N/A
Aminoglycoside	Kanamycin	K	0.5–64	0.5–64	N/A
Aminoglycoside	Kanamycin-Syn	KS	N/A	250	250–1,000
Quinolone	Levofloxacin	LVX	0.25–8 For organisms except <i>Salmonella</i> spp.	0.25–8	0.25–16
			0.03125–8 For <i>Salmonella</i> spp.		
Macrolides Lincosamides Streptogramin	Lincomycin	L	N/A	0.5–16	N/A
Oxazolidinone	Linezolid	LZD	N/A	0.25–32	0.25–16
Quinolone	Lomefloxacin	LOM	0.25–8	0.25–8	N/A
Beta-lactam	Mecillinam	MEC	0.5–32	N/A	N/A
Beta-lactam	Meropenem	MEM	0.125–32	0.5–16	0.03125–2
Beta-lactam	Meropenem-Vaborbactam	MEV	0.125/8–32/8	N/A	N/A
Tetracycline	Minocycline	MI	0.5–16	1–32	N/A
Beta-lactam	Moxalactam	MOX	1–64	1–64	N/A
Quinolone	Moxifloxacin	MXF	0.125–8	0.25–8	0.0625–8
Pseudomonic acid	Mupirocin	MUP	N/A	0.0625–8	N/A
Pseudomonic acid	Mupirocin High level	MUH	N/A	256	N/A

Antimicrobial			Available Concentrations		
			Gram Negative	Gram Positive	Strep
Quinolone	Nalidixic Acid	NA	1–32	N/A	N/A
Aminoglycoside	Netilmicin	NET	0.5–32	0.5–32	N/A
Nitrofurantoin	Nitrofurantoin	FM	8–512	16–512	N/A
Quinolone	Norfloxacin	NOR	0.25–16	0.25–16	N/A
Quinolone	Ofloxacin	OFX	0.25–8	0.25–8	0.5–16
Beta-lactam	Oxacillin	OX	N/A	0.06–4	N/A
Quinolone	Pefloxacin	PEF	0.25–8	0.25–8	N/A
Beta-lactam	Penicillin G	P	N/A	0.0625–32	0.03125–8
Beta-lactam	Piperacillin	PIP	0.5–128	1–128	N/A
Beta-lactam	Piperacillin-Tazobactam	TZP	0.5/4–128/4	1/4–128/4	N/A
Rifamycin	Rifampin	RA	N/A	0.25–32	N/A
Aminoglycoside	Streptomycin-Syn	STS	N/A	1,000	250–1,000
Aminoglycoside	Streptomycin-Syn (SFM)	STF	N/A	250	N/A
Glycopeptide	Teicoplanin	TEC	N/A	0.5–32	1–32
Beta-lactam	Temocillin	TEM	2 – 32	N/A	N/A
Tetracycline	Tetracycline	TE	0.5–16	0.5–16	0.0625–16
Beta-lactam	Ticarcillin	TIC	1–128	1–128	N/A
Beta-lactam	Ticarcillin-Clavulanate	TIM	1/2–128/2	1/2–128/2	N/A
Glycylcycline	Tigecycline	TGC	1–16	0.03125–4	N/A
Aminoglycoside	Tobramycin	NN	0.12–16	1 –16	N/A
Folate Antagonist	Trimeth-Sulfa (DIN)	STG	0.4/7.6–12.8/243.2	0.4/7.6–12.8/243.2	N/A
Folate Antagonist	Trimethoprim	TMP	0.5–16	1–16	N/A
Folate Antagonist	Trimethoprim-Sulfamethoxazole	SXT	0.5/9.5–16/304	0.5/9.5–16/304	0.06/1.19–16/304
Glycopeptide	Vancomycin	VA	N/A	0.5–32	0.0625–32

## NOTE

MIC dilutions appearing in this manual are actual serial 2-fold dilution concentrations. MIC values appearing on reports may be rounded.

In general, the BD Phoenix™ M50 Instrument provides a MIC for all organisms at any of the concentrations defined on a specific panel. For certain drug and organism combinations in the following tables, a specific minimum/maximum MIC is reported even if there is a lower/higher concentration on the panel.

Antimicrobial	Organism	Min MIC (µg/mL)	Max MIC (µg/mL)
<b>Gram Negative</b>			
Amikacin	<i>Morganella morganii</i>	2	64
Amoxicillin-Clavulanic Acid (fixed clav. acid conc.)	<i>Proteus mirabilis</i>	1/2	32/2
Amoxicillin-Clavulanic Acid (variable clav. acid conc.)	<i>Proteus mirabilis</i>	2/1	32/16
Arbekacin	<i>Klebsiella aerogenes</i>	1	16
	<i>Morganella morganii</i>	1	16
	<i>Providencia</i> spp.	1	16
Cefdinir	<i>Proteus mirabilis</i>	0.25	4
Cefixime	<i>Proteus mirabilis</i>	0.5	8
	<i>Providencia</i> spp.	0.5	8
Cefotiam	<i>Citrobacter freundii</i>	2	64
	<i>Proteus mirabilis</i>	4	64
	<i>Providencia</i> spp.	4	64
Ceftaroline	<i>Aeromonas</i> spp.	0.0625	4
	<i>Plesiomonas</i> spp.	0.0625	4
Ceftazidime-Avibactam	<i>Acinetobacter</i> spp.	0.25/4	8/4
	<i>Hafnia alvei</i>	1/4	32/4
	<i>Mixta</i> spp.	2/4	32/4
	<i>Pantoea</i> spp.	2/4	32/4
Ceftolozane-Tazobactam	<i>Aeromonas</i> spp.	0.5/4	32/4
	<i>Plesiomonas</i> spp.	0.5/4	32/4
	<i>Proteus</i> spp. except <i>P. mirabilis</i>	1/4	32/4
	<i>Providencia stuartii</i>	0.5/4	32/4
	<i>Yersinia</i> spp.	0.5/4	32/4
Ciprofloxacin	For organisms except <i>Salmonella</i> spp.	0.125	4
Fosfomicin w/G6P	<i>Pseudomonas aeruginosa</i>	16	64
Fosfomicin w/G6P	<i>Serratia</i> spp. except <i>Serratia marcescens</i>	32	256
Garenoxacin	<i>Stenotrophomonas maltophilia</i>	1	16
Imipenem	<i>Achromobacter</i> spp.	2	16
Kanamycin	<i>Proteus mirabilis</i>	4	64
Levofloxacin	For organisms except <i>Salmonella</i> spp.	0.25	8

Antimicrobial	Organism	Min MIC (µg/mL)	Max MIC (µg/mL)
Meropenem	<i>Aeromonas</i> spp.	0.25	32
	<i>Burkholderia</i> spp.	0.5	32
	<i>Plesiomonas</i> spp.	0.25	32
	<i>Proteus mirabilis</i>	0.5	32
Meropenem-Vaborbactam	<i>Aeromonas</i> spp.	0.5/8	32/8
	<i>Plesiomonas</i> spp.	0.5/8	32/8
	<i>Proteus mirabilis</i>	0.5/8	32/8
	<i>Providencia</i> spp.	2/8	32/8
Ticarcillin	<i>Proteus mirabilis</i>	4/8	128/8
<b>Gram Positive</b>			
Amikacin	<i>Staphylococcus epidermidis</i>	8	64
	<i>Staphylococcus</i> other*	8	64
Amoxicillin	<i>Staphylococcus aureus</i>	2	32
	<i>Staphylococcus epidermidis</i>	2	32
Ampicillin	<i>Staphylococcus aureus</i>	0.0625	1
	<i>Enterococcus</i> other**	1	32
Ampicillin-Sulbactam (f) (SXA)	<i>Staphylococcus epidermidis</i>	1/8	32/8
Ampicillin-Sulbactam (SAM)	<i>Enterococcus</i> other**	2/1	32/16
Cefotetan	<i>Staphylococcus epidermidis</i>	8	64
Ceftriaxone	<i>Staphylococcus aureus</i>	2	64
Cephalexin	<i>Staphylococcus epidermidis</i>	1	64
Daptomycin	<i>Enterococcus casseliflavus/gallinarum</i>	2	32
Lincomycin	<i>Enterococcus</i> other**	1	8
Minocycline	<i>Enterococcus</i> spp.	1	32
	<i>Staphylococcus</i> spp.	1	32
Netilmicin	<i>Staphylococcus epidermidis</i>	2	32
Norfloxacin	<i>Enterococcus</i> other**	2	16
Penicillin	<i>Staphylococcus aureus</i>	0.0625	1
	<i>Staphylococcus epidermidis</i>	0.0625	1
	<i>Enterococcus</i> other**	2	32
Piperacillin	<i>Staphylococcus epidermidis</i>	2	128
Teicoplanin	<i>Staphylococcus epidermidis</i>	2	32
Ticarcillin	<i>Staphylococcus epidermidis</i>	4	128
	<i>Staphylococcus</i> other*	4	128
Ticarcillin/Clavulanate	<i>Staphylococcus aureus</i>	4/2	128/2

Antimicrobial	Organism	Min MIC (µg/mL)	Max MIC (µg/mL)
Trovafloxacin	<i>Enterococcus faecium</i>	1	8
<b>Streptococci</b>			
Daptomycin	<i>Viridans</i> group	0.25	16

\* Coagulase negative *Staphylococcus* other than *S. epidermidis*

\*\* *Enterococcus* sp. other than *E. faecalis* and *E. faecium*

## 10.2 List of Reagents and Principles Employed in the BD Phoenix™ System

### 10.2.1 Gram Negative

SUBSTRATE NAME	CODE	PRINCIPLE
L-PHENYLALANINE-AMC	A_LPHET	Enzymatic hydrolysis of the amide or glycosidic bond results in the release of a fluorescent coumarin or 4-methylumbelliferone derivative.
4MU-N-ACETYL-BD-GLUCOSAMINIDE	M_NAG	
L-GLUTAMIC ACID-AMC	A_LGTA	
L-TRYPTOPHAN-AMC	A_LTRY	
L-PYROGLUTAMIC ACID-AMC	A_LPYR	
L-PROLINE-AMC	A_LPROB	
L-ARGININE-AMC	A_LARGH	
ARGININE-ARGININE-AMC	A_ARARR	
GLYCINE-AMC	A_GLYB	
L-LEUCINE-AMC	A_LLEUH	
LYSINE-ALANINE-AMC	A_LYALD	
GLUTARYL-GLYCINE-ARGININE-AMC	A_GUGAH	
GLYCINE-PROLINE-AMC	A_GLPRB	
COLISTIN	C_CLST	Resistance to the antimicrobial agent results in a reduction of the resazurin-based indicator.
POLYMYXIN B	C_PXB	

SUBSTRATE NAME	CODE	PRINCIPLE
D-MANNITOL	C_DMNT	Utilization of a carbon source results in a reduction of the resazurin-based indicator.
CITRATE	C_CIT	
ACETATE	C_ACT	
ADONITOL	C_ADO	
MALONATE	C_MLO	
ALPHA-KETOGLUTARIC ACID	C_KGA	
TIGLIC ACID	C_TIG	
FLUORESCENT POSITIVE CONTROL	FLR_CTL	Control to standardize fluorescent substrate results.
L-PROLINE-NA	N_LPROT	Enzymatic hydrolysis of the colorless amide substrate releases yellow p-nitroaniline.
GAMMA-L-GLUTAMYL-NA	N_LGGH	
BIS (PNP) PHOSPHATE	P_BPHO	Enzymatic hydrolysis of the colorless aryl substituted glycoside releases yellow p-nitrophenol.
PNP-BD-GLUCOSIDE	P_BDGLU	
BETA-ALLOSE	R BALL	Utilization of carbohydrate results in lower pH and change in indicator (phenol red).
N-ACETYL-GALACTOSAMINE	R_NGA	
N-ACETYL-GLUCOSAMINE	R_NGU	
SORBITOL	R_DSBT	
SUCROSE	R_DSUC	
GALACTURONIC ACID	R_GRA	
MALTULOSE	R_MTU	
L-RHAMNOSE	R_LRHA	
BETA-GENTIOBIOSE	R_BGEN	
DEXTROSE	R_DEX	
D-GALACTOSE	R_DGAL	
D-FRUCTOSE	R_DFRU	
D-GLUCONIC ACID	R_DGUA	
D-MELIBIOSE	R_DMLB	
L-ARABINOSE	R_LARA	
METHYL-B-GLUCOSIDE	R_MBGU	
ORNITHINE	S_ORN	
UREA	S_URE	Hydrolysis of urea and the resulting ammonia change results in pH rise and change in fluorescent indicator.
ESCULIN	T_ESC	Hydrolysis of esculin results in a black precipitate in the presence of ferric ion.

## 10.2.2 Gram Positive

SUBSTRATE NAME	CODE	PRINCIPLE
4MU-BD-CELLOBIOSIDE	M_BDCEL	Enzymatic hydrolysis of the amide or glycosidic bond results in the release of a fluorescent coumarin or 4-methylumbelliferone derivative.
L-ALANINE-AMC	A_LALT	
4MU-BD-GLUCOSIDE	M_BDGLU	
L-PROLINE-AMC	A_LPROB	
L-PYROGLUTAMIC ACID-AMC	A_LPYR	
L-PHENYLALANINE-AMC	A_LPHET	
L-TRYPTOPHAN-AMC	A_LTRY	
4MU-PHOSPHATE	M_PHOS	
METHIONINE-AMC	A_META	
4MU-AD-GLUCOSIDE	M_ADGLU	
ARGININE-ARGININE-AMC	A_ARARR	
GLYCINE-PROLINE-AMC	A_GLPRB	
4MU-BD-GLUCURONIDE	M_BDGLC	
L-LEUCINE-AMC	A_LLEUH	
4MU-N-ACETYL-BD-GLUCOSAMINIDE	M_NAG	
L-ARGININE-AMC	A_LARGH	
4MU-PHOSPHATE (with Trehalose)	M_PHOT	
L-HISTIDINE-AMC	A_LHIST	
L-ISOLEUCINE-AMC	A_LISO	
4MU-BD-GALACTOSIDE	M_BDGAL	Utilization of a carbon source results in a reduction of the resazurin-based indicator.
COLISTIN	C_CLST	
POLYMYXIN B	C_PXB	
D-GLUCONIC ACID	C_DGUA	
3-METHYL GLUTARIC ACID	C_3MGA	
D-FRUCTOSE	C_DFRU	
IMINODIACETIC ACID	C_IMN	
ALPHA-KETOGLUTARIC ACID	C_KGA	
D-MANNITOL	C_DMNT	
3-METHYLADIPIC ACID	C_MAA	
THYMIDINE	C_THY	Control to standardize fluorescent substrate results.
FLUORESCENT POSITIVE CONTROL	FLR_CTL	

SUBSTRATE NAME	CODE	PRINCIPLE
ALANINE-ALANINE-PNA	N_ALALH	Enzymatic hydrolysis of the colorless amide substrate releases yellow p-nitroaniline.
L-PROLINE-PNA	N_LPROT	
VALINE-ALANINE-PNA	N_VAALA	
PNP-AD-GLUCOSIDE	P_ADGLU	Enzymatic hydrolysis of the colorless aryl substituted glycoside releases yellow p-nitrophenol.
PNP-PHOSPHATE	P_PHOL	
BETA-GENTIOBIOSE	R_BGEN	Utilization of carbohydrate results in lower pH and change in indicator (phenol red).
D-SUCROSE	R_DSUC	
MALTOTRIOSE	R_MTT	
N-ACETYL-GLUCOSAMINE	R_NGU	
D-TREHALOSE	R_DTRE	
D-TAGATOSE	R_DTAG	
MALTOSE	R_MAL	
DEXTROSE	R_DEX	
METHYL- $\alpha$ -D-GLUCOSIDE	R_MGP	
UREA	S_URE	
ESCULIN	T_ESC	Hydrolysis of esculin results in a black precipitate in the presence of ferric ion.
NITROCEFAN	L_NCF	Enzymatic hydrolysis of the $\beta$ -Lactam ring results in a color change.

### 10.2.3 Streptococci

SUBSTRATE NAME	CODE	PRINCIPLE
AMYGDALIN	R_AMY	Utilization of carbohydrate results in lower pH and change in indicator (Phenol red).
D-GALACTOSE	R_DGAL	
D-MANNITOL	R_DMTL	
D-RAFFINOSE	R_DRAF	
D-SORBITOL	R_DSBT	
D-TREHALOSE	R_DTRE	
DEXTRIN	R_DXN	
N-ACETYL-GLUCOSAMINE	R_NGU	
PHENYL GLUCOSIDE	R_PHG	
SALICIN	R_SAL	
ONP-BD-GLUCOSIDE	O_BOGLU	
PNP-AD-GALACTOSIDE	P_ADGAL	
PNP-BD-CELLOBIOSIDE	P_CELB	
PNP-BD-GALACTOSIDE	P_GALB	
PNP-AD-GLUCOSIDE	P_PAGLU	
PNP-PHOSPHATE	P_PHOL	
ALANINE-ALANINE-PNA	N_ALALH	Enzymatic hydrolysis of the colorless amide substrate releases yellow p-nitroanilide.
VALINE-ALANINE-PNA	N_VAALA	
L-LYSINE-PNA	N_LLYSB	
FLUORESCENT POSITIVE CONTROL	FLR_CTL	Control to standardize fluorescent substrate results.
THYMIDINE	C_THY	Utilization of a carbon source resulting in a reduction of the indicator (Resazurin-based).
PULLULAN	C_PUL	
D-TREHALOSE	C_TRL	
D-LACTOSE	C_DLAC	

SUBSTRATE NAME	CODE	PRINCIPLE
LYSINE-AMC	A_LYSA	Enzymatic hydrolysis of the amide or glycosidic bond results in the release of a fluorescent coumarin or 4-methylumbelliferone derivative.
SERINE-TYROSINE-AMC	A_SETY	
L-CITRULLINE-AMC	A_LCTU	
L-PYROGLUTAMIC ACID-AMC	A_LPYR	
ISOLEUCINE-AMC	A_LISO	
L-TRYPTOPHAN-AMC	A_LTRY	
L-VALINE-AMC	A_LVAL	
ARGININE-ARGININE-AMC	A_ARARR	
LYSINE-ALANINE-AMC	A_LYALD	
ASPARAGINE-AMC	A_APGT	
L-ARGININE-AMC	A_LARGH	
L-HISTIDINE-AMC	A_LHIST	
ALANINE-AFC	Z_ALFT	
4MU-BD-CELLOBIOSIDE	M_BDCEL	
4MU-BD-GLUCOSIDE	M_BDGLU	
4MU-PHOSPHATE	M_PHOS	
4MU-AD-GLUCOSIDE	M_ADGLU	
4MU-BD-GLUCURONIDE	M_BDGLC	
4MU-N-ACETYL-BD-GLUCOSAMINE	M_NAG	
4MU-PHOSPHATE (with trehalose)	M_PHOT	
4MU-BD-GALACTOSIDE	M_BDGAL	
ESCULIN	T_ESC	Hydrolysis of esculin results in a black precipitate in the presence of ferric ion.

## 10.2.4 Yeast

SUBSTRATE NAME	CODE	PRINCIPLE
PNP-BD-GLUCOSIDE	P_BDGLU	Enzymatic hydrolysis of the colorless aryl substituted glycoside releases yellow p-nitrophenol.
PNP-AD-GLUCOSIDE	P_PAGLU	
ONP-BD-GLUCOSIDE	O_BOGLU	
L-SORBOSE	C_LSBO	Utilization of a carbon source results in a reduction of the resazurin-based indicator.
DEXTROSE	C_DEX	
D-MANNITOL	C_DMNT	
D-SUCROSE	C_DSUC	
METHYL-AD-GLUCOPYRANOSIDE	C_MGP	
N-ACETYL-BD-GLUCOSAMINIDE	C_NAG	Utilization of carbohydrate results in lower pH and change in indicator (phenol red).
DEXTROSE	R_DEX	
D-FRUCTOSE	R_DFRU	
D-GALACTOSE	R_DGAL	
SUCROSE	R_DSUC	
D-TREHALOSE	R_DTRE	
MALTOTRIOSE	R_MTT	Hydrolysis of esculin results in a black precipitate in the presence of ferric ion.
ESCULIN	T_ESC	
FLUORESCENT POSITIVE CONTROL	FLR_CTL	Control to standardize fluorescent substrate results.
GAMMA-L-GLUTAMYL-NA	N_LGGH	Enzymatic hydrolysis of the colorless amide substrate releases yellow p-nitroaniline.
L-PROLINE-PNA	N_LPROT	

SUBSTRATE NAME	CODE	PRINCIPLE
ASPARAGINE-AMC	A_APGT	Enzymatic hydrolysis of the amide or glycosidic bond results in the release of a fluorescent coumarin or 4-methylumbelliferone derivative.
L-ARGININE-AMC	A_LARGH	
L-GLUTAMINE-AMC	A_LGLNB	
L-TYROSINE-AMC	A_LTYO	
L-HISTIDINE-AMC	A_LHIST	
ORNITHINE-AMC	A_ORN	
THREONINE-AMC	A_THR	
HYDROXY PROLINE-AMC	A_LHYP	
4MU-N-ACETYL-BD-GLUCOSAMINE	M_NAG	
4MU-AD-GLUCOSIDE	M_ADGLU	
4MU-PHOSPHATE	M_PHOS	
LYSINE-ALANINE-AMC	A_LYALD	
GLYCINE-ARGININE-AMC	A_GLARH	
ALANINE-AFC	Z_ALFT	
GLYCINE-AMC	A_GLYB	
L-CITRULLINE-AMC	A_LCTU	
L-GLUTAMIC ACID-AMC	A_LGTA	
L-VALINE-AMC	A_LVAL	
L-ALANINE-AMC	A_LALT	
L-PROLINE-AMC	A_LPROB	
L-TRYPTOPHAN-AMC	A_LTRY	
H-B-ALANINE-AMC	A_HBALT	
4MU-BD-CELLOBIOSIDE	M_BDCEL	
4MU-BD-GLUCOSIDE	M_BDGLU	
GLYCINE-PROLINE-AMC	A_GLPRB	
LYSINE-PROLINE-AMC	A_LYPRA	
BENZYL-L-CYSTEINE-AMC	A_BZLCY	
AMINO ACID	S_GTN	
UREA	S_URE	Hydrolysis of urea and the resulting ammonia change results in pH rise and change in fluorescent indicator.

## 10.3 Taxa for ID/AST Determination

### 10.3.1 Gram Negative (0.5 McFarland)

GRAM NEGATIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Achromobacter denitrificans</i>	AST
<i>Achromobacter insolitus</i>	AST
<i>Achromobacter mucicolens</i>	AST
<i>Achromobacter piechaudii</i>	AST
<i>Achromobacter ruhlandii</i>	AST
<i>Achromobacter spanius</i>	AST
<i>Achromobacter</i> species	ID/AST
<i>Achromobacter xylosoxidans</i>	AST
<i>Acinetobacter baumannii</i>	ID/AST
<i>Acinetobacter baumannii/calcoaceticus</i> complex <sup>2</sup>	ID/AST
<i>Acinetobacter baumannii/haemolyticus</i>	AST
<i>Acinetobacter bereziniae</i>	AST
<i>Acinetobacter calcoaceticus</i>	AST
<i>Acinetobacter colistiniresistens</i>	AST
<i>Acinetobacter dijkshoorniae</i>	AST
<i>Acinetobacter guillouiae</i>	AST
<i>Acinetobacter haemolyticus</i>	ID/AST
<i>Acinetobacter johnsonii</i>	AST
<i>Acinetobacter junii</i>	AST
<i>Acinetobacter lactucae</i>	AST
<i>Acinetobacter lwoffii</i>	ID/AST
<i>Acinetobacter lwoffii/haemolyticus</i>	ID/AST
<i>Acinetobacter nosocomialis</i>	AST
<i>Acinetobacter parvus</i>	AST
<i>Acinetobacter pittii</i>	AST
<i>Acinetobacter pseudolwoffii</i>	AST
<i>Acinetobacter radioresistens</i>	AST
<i>Acinetobacter schindleri</i>	AST
<i>Acinetobacter seifertii</i>	AST
<i>Acinetobacter</i> species	ID/AST
<i>Acinetobacter ursingii</i>	AST
<i>Actinobacillus lignieresii</i>	ID

GRAM NEGATIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Actinobacillus suis</i>	ID
<i>Actinobacillus ureae</i>	ID
<i>Aeromonas allosaccharophila</i>	AST
<i>Aeromonas caviae</i>	ID/AST
<i>Aeromonas eucrenophila</i>	AST
<i>Aeromonas hydrophila</i>	ID/AST
<i>Aeromonas hydrophila</i> group	AST
<i>Aeromonas jandaei</i>	AST
<i>Aeromonas media</i>	AST
<i>Aeromonas salmonicida</i>	AST
<i>Aeromonas salmonicida</i> ssp. <i>achromogenes</i>	AST
<i>Aeromonas salmonicida</i> ssp. <i>masoucida</i>	ID/AST
<i>Aeromonas salmonicida</i> ssp. <i>pectinolytica</i>	AST
<i>Aeromonas salmonicida</i> ssp. <i>salmonicida</i>	ID/AST
<i>Aeromonas salmonicida</i> ssp. <i>smithia</i>	ID/AST
<i>Aeromonas schubertii</i>	ID/AST
<i>Aeromonas</i> species	AST
<i>Aeromonas trota</i>	AST
<i>Aeromonas veronii</i> bv <i>sobria</i>	ID/AST
<i>Aeromonas veronii</i> bv <i>veronii</i>	ID/AST
<i>Agrobacterium radiobacter</i>	ID
<i>Alcaligenes faecalis</i>	ID/AST
<i>Alcaligenes faecalis</i> ssp. <i>faecalis</i>	AST
<i>Alcaligenes</i> species	AST
<i>Bergeyella zoohelcum</i>	ID
<i>Bordetella bronchiseptica</i>	ID
<i>Brevundimonas diminuta</i>	ID/AST
<i>Brevundimonas</i> species	AST
<i>Brevundimonas vesicularis</i>	ID/AST
<i>Burkholderia caryophylli</i>	AST
<i>Burkholderia cepacia</i> complex	ID/AST
<i>Burkholderia cepacia</i> / <i>Ralstonia pickettii</i>	ID/AST
<i>Burkholderia diffusa</i>	AST
<i>Burkholderia gladioli</i>	ID/AST
<i>Burkholderia glathei</i>	AST
<i>Burkholderia graminis</i>	AST

GRAM NEGATIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Burkholderia latens</i>	AST
<i>Burkholderia metallica</i>	AST
<i>Burkholderia multivorans</i>	AST
<i>Burkholderia phenazinium</i>	AST
<i>Burkholderia pyrrocinia</i>	AST
<i>Burkholderia seminalis</i>	AST
<i>Burkholderia</i> species	AST
<i>Burkholderia</i> species/ <i>Ralstonia</i> species	ID/AST
<i>Cardiobacterium hominis</i>	ID
CDC group Vb-3	ID
<i>Cedecea davisae</i>	ID/AST
<i>Cedecea lapagei</i>	ID/AST
<i>Cedecea neteri</i>	ID/AST
<i>Cedecea</i> species	AST
<i>Cedecea</i> species 3	AST
<i>Cedecea</i> species 5	AST
<i>Chromobacterium violaceum</i>	ID
<i>Chryseobacterium gleum</i>	ID/AST
<i>Chryseobacterium indologenes</i>	ID/AST
<i>Chryseobacterium scophthalmum</i>	AST
<i>Chryseobacterium</i> species	AST
<i>Citrobacter amalonaticus</i>	ID/AST
<i>Citrobacter braakii</i>	ID/AST
<i>Citrobacter farmeri</i>	ID/AST
<i>Citrobacter freundii</i>	ID/AST
<i>Citrobacter gillenii</i>	AST
<i>Citrobacter koseri</i>	ID/AST
<i>Citrobacter murlinae</i>	AST
<i>Citrobacter rodentium</i>	AST
<i>Citrobacter sedlakii</i>	ID/AST
<i>Citrobacter</i> species	AST
<i>Citrobacter werkmanii</i>	ID/AST
<i>Citrobacter youngae</i>	ID/AST
<i>Comamonas terrigena</i>	ID
<i>Comamonas testosteroni</i>	ID
<i>Cronobacter sakazakii</i> complex	ID/AST

GRAM NEGATIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Cupriavidus gilardii</i>	AST
<i>Cupriavidus pauculus</i>	ID/AST
<i>Delftia acidovorans</i>	ID/AST
<i>Edwardsiella hoshinae</i>	ID/AST
<i>Edwardsiella ictaluri</i>	ID/AST
<i>Edwardsiella</i> species	AST
<i>Edwardsiella tarda</i>	ID/AST
<i>Edwardsiella tarda</i> biogroup 1	AST
<i>Eikenella corrodens</i>	ID
<i>Elizabethkingia anophelis</i>	AST
<i>Elizabethkingia meningoseptica</i>	ID/AST
<i>Elizabethkingia miricola</i>	AST
<i>Empedobacter brevis</i>	ID
<i>Enterobacter asburiae</i>	ID/AST
<i>Enterobacter bugandensis</i>	AST
<i>Enterobacter cancerogenus</i>	ID/AST
<i>Enterobacter cloacae</i> <sup>2</sup>	ID/AST
<i>Enterobacter cloacae</i> ssp. <i>dissolvens</i>	AST
<i>Enterobacter hormaechei</i>	ID/AST
<i>Enterobacter kobei</i>	AST
<i>Enterobacter ludwigii</i>	AST
<i>Enterobacter</i> species	AST
<i>Escherichia albertii</i>	AST
<i>Escherichia coli</i> <sup>2</sup>	ID/AST
<i>Escherichia coli</i> serotype O111	AST
<i>Escherichia coli</i> serotype O157	AST
<i>Escherichia fergusonii</i>	ID/AST
<i>Escherichia hermannii</i>	ID/AST
<i>Escherichia</i> species	AST
<i>Ewingella americana</i>	ID
Gram-negative rod unidentified enteric	AST
Gram-negative rod unidentified nonfermenter	AST
<i>Grimontia hollisae</i>	ID
<i>Hafnia alvei</i>	ID/AST
<i>Hafnia alvei</i> group 1	AST
<i>Kingella denitrificans</i>	ID

GRAM NEGATIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Kingella kingae</i>	ID
<i>Klebsiella aerogenes</i> <sup>2</sup>	ID/AST
<i>Klebsiella granulomatis</i>	AST
<i>Klebsiella oxytoca</i> <sup>2</sup>	ID/AST
<i>Klebsiella pneumoniae</i> ssp. <i>ozaenae</i>	ID/AST
<i>Klebsiella pneumoniae</i> ssp. <i>pneumoniae</i> <sup>2</sup>	ID/AST
<i>Klebsiella pneumoniae</i> ssp. <i>rhinoscleromatis</i>	ID/AST
<i>Klebsiella</i> species	AST
<i>Klebsiella variicola</i>	AST
<i>Kluyvera ascorbata</i>	ID/AST
<i>Kluyvera cryocrescens</i>	ID/AST
<i>Kluyvera georgiana</i>	AST
<i>Kluyvera intermedia</i>	ID/AST
<i>Kluyvera</i> species	AST
<i>Leclercia adecarboxylata</i>	ID/AST
<i>Lelliottia amnigena</i>	AST
<i>Lelliottia amnigena</i> biogroup 1	ID/AST
<i>Lelliottia amnigena</i> biogroup 2	ID/AST
<i>Lelliottia nimipressuralis</i>	AST
<i>Leminorella grimontii</i>	ID
<i>Leminorella richardii</i>	ID
<i>Mannheimia haemolytica</i>	ID
<i>Methylobacterium extorquens</i>	ID
<i>Mixta calida</i>	AST
<i>Mixta calida/gaviniae</i>	AST
<i>Mixta gaviniae</i>	AST
<i>Moellerella wisconsensis</i>	ID/AST
<i>Moraxella (Branhamella) catarrhalis</i>	ID
<i>Moraxella</i> species	ID
<i>Morganella morganii</i> <sup>2</sup>	ID/AST
<i>Morganella morganii</i> ssp. <i>morganii</i>	AST
<i>Morganella morganii</i> ssp. <i>morganii</i> biogroup 1	AST
<i>Morganella morganii</i> ssp. <i>sibonii</i>	AST
<i>Morganella</i> species	AST
<i>Myroides ceti</i>	AST

GRAM NEGATIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Myroides injenensis</i>	AST
<i>Myroides odoratimimus</i>	AST
<i>Myroides odoratus</i>	AST
<i>Myroides odoratus/odoratimimus</i>	ID/AST
<i>Myroides species</i>	AST
<i>Neisseria animaloris</i>	ID
<i>Neisseria zoodegmatis</i>	ID
<i>Ochrobactrum anthropi</i>	ID/AST
<i>Oligella ureolytica</i>	ID
<i>Oligella urethralis</i>	ID
<i>Pantoea agglomerans</i>	ID/AST
<i>Pantoea ananatis</i>	AST
<i>Pantoea brenneri</i>	AST
<i>Pantoea conspicua</i>	AST
<i>Pantoea dispersa</i>	AST
<i>Pantoea eucrina</i>	AST
<i>Pantoea septica</i>	AST
<i>Pantoea species</i>	AST
<i>Pantoea stewartii</i>	AST
<i>Pantoea stewartii ssp. indologenes</i>	AST
<i>Pantoea stewartii ssp. stewartii</i>	AST
<i>Paracoccus yeei</i>	ID
<i>Pasteurella aerogenes</i>	ID
<i>Pasteurella multocida</i>	ID
<i>Photobacterium damsela</i>	ID
<i>Plesiomonas shigelloides</i>	ID/AST
<i>Plesiomonas species</i>	AST
<i>Pluralibacter gergoviae</i>	ID/AST
<i>Pragia fontium</i>	ID
<i>Proteus hauseri</i>	AST
<i>Proteus mirabilis</i> <sup>2</sup>	ID/AST
<i>Proteus penneri</i>	ID/AST
<i>Proteus species</i>	AST
<i>Proteus vulgaris</i>	ID/AST
<i>Proteus vulgaris/penneri</i>	ID/AST
<i>Providencia alcalifaciens</i>	ID/AST

GRAM NEGATIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Providencia heimbachae</i>	AST
<i>Providencia rettgeri</i>	ID/AST
<i>Providencia rustigianii</i>	ID/AST
<i>Providencia species</i>	AST
<i>Providencia stuartii</i>	ID/AST
<i>Pseudescherichia vulneris</i>	ID/AST
<i>Pseudomonas aeruginosa</i> <sup>2</sup>	ID/AST
<i>Pseudomonas alcaligenes</i>	AST
<i>Pseudomonas fluorescens</i>	ID/AST
<i>Pseudomonas fluorescens/putida</i>	AST
<i>Pseudomonas luteola</i>	ID/AST
<i>Pseudomonas massiliensis</i>	AST
<i>Pseudomonas mendocina</i>	ID/AST
<i>Pseudomonas monteilii</i>	AST
<i>Pseudomonas nosocomialis</i>	AST
<i>Pseudomonas oryzihabitans</i>	ID/AST
<i>Pseudomonas pertucinogena</i>	AST
<i>Pseudomonas pseudoalcaligenes</i>	ID/AST
<i>Pseudomonas pseudoalcaligenes</i> ssp. <i>pseudoalcaligenes</i>	AST
<i>Pseudomonas putida</i>	ID/AST
<i>Pseudomonas species</i>	ID/AST
<i>Pseudomonas stutzeri</i>	ID/AST
<i>Pseudomonas veronii</i>	AST
<i>Rahnella aquatilis</i>	ID
<i>Ralstonia insidiosa</i>	AST
<i>Ralstonia pickettii</i>	ID/AST
<i>Ralstonia solanacearum</i>	AST
<i>Ralstonia species</i>	AST
<i>Raoultella ornithinolytica</i>	ID/AST
<i>Raoultella planticola</i>	AST
<i>Raoultella species</i>	AST
<i>Raoultella terrigena</i>	AST
<i>Rodentibacter pneumotropicus</i>	ID
<i>Salmonella enterica</i> ssp. <i>arizonae</i>	ID/AST
<i>Salmonella enterica</i> ssp. <i>diarizonae</i>	AST

GRAM NEGATIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Salmonella enterica</i> ssp. <i>enterica</i> serovar Choleraesuis	ID/AST
<i>Salmonella enterica</i> ssp. <i>enterica</i> sv Gallinarum bv Gallinarum	ID/AST
<i>Salmonella enterica</i> ssp. <i>enterica</i> sv Gallinarum bv Pullorum	ID/AST
<i>Salmonella enterica</i> ssp. <i>enterica</i> sv Paratyphi A	ID/AST
<i>Salmonella enterica</i> ssp. <i>enterica</i> sv Typhi	ID/AST
<i>Salmonella enterica</i> ssp. <i>houtenae</i>	AST
<i>Salmonella enterica</i> ssp. <i>indica</i>	AST
<i>Salmonella enterica</i> ssp. <i>salamae</i>	AST
<i>Salmonella</i> species	ID/AST
<i>Serratia entomophila</i>	AST
<i>Serratia ficaria</i>	ID/AST
<i>Serratia fonticola</i>	ID/AST
<i>Serratia grimesii</i>	AST
<i>Serratia liquefaciens</i>	ID/AST
<i>Serratia marcescens</i> <sup>2</sup>	ID/AST
<i>Serratia odorifera</i>	AST
<i>Serratia odorifera</i> 1	ID/AST
<i>Serratia odorifera</i> 2	ID/AST
<i>Serratia plymuthica</i>	ID/AST
<i>Serratia proteamaculans</i> ssp. <i>proteamaculans</i>	AST
<i>Serratia proteamaculans</i> ssp. <i>quinovora</i>	AST
<i>Serratia rubidaea</i>	ID/AST
<i>Serratia</i> species	AST
<i>Shewanella algae</i>	AST
<i>Shewanella algicola</i>	AST
<i>Shewanella atlantica</i>	AST
<i>Shewanella colwelliana</i>	AST
<i>Shewanella corallii</i>	AST
<i>Shewanella dokdonensis</i>	AST
<i>Shewanella gaetbuli</i>	AST
<i>Shewanella halifaxensis</i>	AST
<i>Shewanella indica</i>	AST

GRAM NEGATIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Shewanella japonica</i>	AST
<i>Shewanella kaireitica</i>	AST
<i>Shewanella putrefaciens</i>	ID/AST
<i>Shewanella</i> species	AST
<i>Shewanella woodyi</i>	AST
<i>Shewanella xiamenensis</i>	AST
<i>Shigella boydii</i>	ID/AST
<i>Shigella dysenteriae</i>	ID/AST
<i>Shigella flexneri</i>	ID/AST
<i>Shigella sonnei</i>	ID/AST
<i>Shigella</i> species	ID/AST
<i>Sphingobacterium multivorum</i>	ID/AST
<i>Sphingobacterium multivorum/thalpophilum</i>	ID/AST
<i>Sphingobacterium</i> species	AST
<i>Sphingobacterium spiritivorum</i>	ID/AST
<i>Sphingobacterium thalpophilum</i>	ID/AST
<i>Sphingomonas aerolata</i>	AST
<i>Sphingomonas paucimobilis</i>	ID/AST
<i>Sphingomonas paucimobilis</i> group	AST
<i>Sphingomonas sanguinis</i>	AST
<i>Stenotrophomonas maltophilia</i> <sup>2</sup>	ID/AST
<i>Suttonella indologenes</i>	ID
<i>Tatumella ptyseos</i>	ID
<i>Vibrio alginolyticus</i>	ID
<i>Vibrio cholerae</i>	ID
<i>Vibrio fluvialis</i>	ID
<i>Vibrio metschnikovii</i>	ID
<i>Vibrio mimicus</i>	ID
<i>Vibrio parahaemolyticus</i>	ID
<i>Vibrio vulnificus</i>	ID
<i>Weeksella virosa</i>	ID
<i>Yersinia aldovae</i>	AST
<i>Yersinia bercovieri</i>	AST
<i>Yersinia enterocolitica</i>	ID/AST
<i>Yersinia enterocolitica</i> group	AST
<i>Yersinia frederiksenii</i>	ID/AST

GRAM NEGATIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Yersinia intermedia</i>	ID/AST
<i>Yersinia kristensenii</i>	ID/AST
<i>Yersinia mollaretii</i>	AST
<i>Yersinia pseudotuberculosis</i>	ID/AST
<i>Yersinia rohdei</i>	AST
<i>Yersinia ruckeri</i>	ID/AST
<i>Yersinia</i> species	AST
<i>Yokenella regensburgei</i>	ID
*Taxa for AST interpretation may vary depending on the user-selected Interpretation Rule Set (see <a href="#">5.9.6 Custom Interpretation Rule Set Sub-Tab</a> ).	
<sup>1</sup> Not all species encountered during clinical performance evaluations.	
<sup>2</sup> Organism encountered in clinical trials and ≥ 20 strains available for antimicrobial/organism performance analysis.	

### 10.3.2 Gram Negative (0.25 McFarland)

GRAM NEGATIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Achromobacter</i> species	ID/AST
<i>Acinetobacter baumannii/calcoaceticus</i> complex	ID/AST
<i>Acinetobacter haemolyticus</i>	ID/AST
<i>Acinetobacter lwoffii</i>	ID/AST
<i>Actinobacillus lignieresii</i>	ID
<i>Actinobacillus suis</i>	ID
<i>Actinobacillus ureae</i>	ID
<i>Aeromonas caviae</i>	ID/AST
<i>Aeromonas hydrophila</i>	ID/AST
<i>Aeromonas salmonicida</i> ssp. <i>masoucida</i>	ID/AST
<i>Aeromonas salmonicida</i> ssp. <i>salmonicida</i>	ID/AST
<i>Aeromonas salmonicida</i> ssp. <i>smithia</i>	ID/AST
<i>Aeromonas schubertii</i>	ID/AST
<i>Aeromonas veronii</i> bv <i>sobria</i>	ID/AST
<i>Aeromonas veronii</i> bv <i>veronii</i>	ID/AST
<i>Agrobacterium radiobacter</i>	ID
<i>Alcaligenes faecalis</i>	ID/AST
<i>Bergeyella zoohelcum</i>	ID
<i>Bordetella bronchiseptica</i>	ID

GRAM NEGATIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Brevundimonas diminuta</i>	ID/AST
<i>Brevundimonas vesicularis</i>	ID/AST
<i>Burkholderia cepacia</i> complex	ID/AST
<i>Burkholderia gladioli</i>	ID/AST
<i>Cardiobacterium hominis</i>	ID
CDC group Vb-3	ID
<i>Cedecea davisae</i>	ID/AST
<i>Cedecea lapagei</i>	ID/AST
<i>Cedecea neteri</i>	ID/AST
<i>Chromobacterium violaceum</i>	ID
<i>Chryseobacterium gleum</i>	ID/AST
<i>Chryseobacterium indologenes</i>	ID/AST
<i>Citrobacter amalonaticus</i>	ID/AST
<i>Citrobacter braakii</i>	ID/AST
<i>Citrobacter farmeri</i>	ID/AST
<i>Citrobacter freundii</i>	ID/AST
<i>Citrobacter koseri</i>	ID/AST
<i>Citrobacter sedlakii</i>	ID/AST
<i>Citrobacter werkmanii</i>	ID/AST
<i>Citrobacter youngae</i>	ID/AST
<i>Comamonas terrigena</i>	ID
<i>Comamonas testosteroni</i>	ID
<i>Cronobacter sakazakii</i> complex	ID/AST
<i>Cupriavidus pauculus</i>	ID/AST
<i>Delftia acidovorans</i>	ID/AST
<i>Edwardsiella hoshinae</i>	ID/AST
<i>Edwardsiella ictaluri</i>	ID/AST
<i>Edwardsiella tarda</i>	ID/AST
<i>Eikenella corrodens</i>	ID
<i>Elizabethkingia meningoseptica</i>	ID/AST
<i>Empedobacter brevis</i>	ID
<i>Enterobacter asburiae</i>	ID/AST
<i>Enterobacter cancerogenus</i>	ID/AST
<i>Enterobacter cloacae</i>	ID/AST
<i>Enterobacter hormaechei</i>	ID/AST
<i>Escherichia coli</i>	ID/AST

GRAM NEGATIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Escherichia fergusonii</i>	ID/AST
<i>Escherichia hermannii</i>	ID/AST
<i>Ewingella americana</i>	ID
<i>Grimontia hollisae</i>	ID
<i>Hafnia alvei</i>	ID/AST
<i>Klebsiella aerogenes</i>	ID/AST
<i>Klebsiella oxytoca</i>	ID/AST
<i>Klebsiella pneumoniae</i> ssp. <i>ozaenae</i>	ID/AST
<i>Klebsiella pneumoniae</i> ssp. <i>pneumoniae</i>	ID/AST
<i>Klebsiella pneumoniae</i> ssp. <i>rhinoscleromatis</i>	ID/AST
<i>Kluyvera ascorbata</i>	ID/AST
<i>Kluyvera cryocrescens</i>	ID/AST
<i>Kluyvera intermedia</i>	ID/AST
<i>Leclercia adecarboxylata</i>	ID/AST
<i>Lelliottia amnigena</i> biogroup 1	ID/AST
<i>Lelliottia amnigena</i> biogroup 2	ID/AST
<i>Leminorella grimontii</i>	ID
<i>Leminorella richardii</i>	ID
<i>Mannheimia haemolytica</i>	ID
<i>Moellerella wisconsensis</i>	ID/AST
<i>Morganella morganii</i>	ID/AST
<i>Myroides odoratus/odoratimimus</i>	ID/AST
<i>Neisseria animaloris</i>	ID
<i>Neisseria zoodegmatis</i>	ID
<i>Ochrobactrum anthropi</i>	ID/AST
<i>Oligella ureolytica</i>	ID
<i>Oligella urethralis</i>	ID
<i>Pantoea agglomerans</i>	ID/AST
<i>Paracoccus yeei</i>	ID
<i>Pasteurella aerogenes</i>	ID
<i>Pasteurella multocida</i>	ID
<i>Photobacterium damsela</i>	ID
<i>Plesiomonas shigelloides</i>	ID/AST
<i>Pluralibacter gergoviae</i>	ID/AST
<i>Pragia fontium</i>	ID
<i>Proteus mirabilis</i>	ID/AST

GRAM NEGATIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Proteus penneri</i>	ID/AST
<i>Proteus vulgaris</i>	ID/AST
<i>Proteus vulgaris/penneri</i>	ID/AST
<i>Providencia alcalifaciens</i>	ID/AST
<i>Providencia rettgeri</i>	ID/AST
<i>Providencia rustigianii</i>	ID/AST
<i>Providencia stuartii</i>	ID/AST
<i>Pseudescherichia vulneris</i>	ID/AST
<i>Pseudomonas aeruginosa</i>	ID/AST
<i>Pseudomonas fluorescens</i>	ID/AST
<i>Pseudomonas luteola</i>	ID/AST
<i>Pseudomonas mendocina</i>	ID/AST
<i>Pseudomonas oryzihabitans</i>	ID/AST
<i>Pseudomonas putida</i>	ID/AST
<i>Pseudomonas stutzeri</i>	ID/AST
<i>Rahnella aquatilis</i>	ID
<i>Ralstonia pickettii</i>	ID/AST
<i>Raoultella ornithinolytica</i>	ID/AST
<i>Rodentibacter pneumotropicus</i>	ID
<i>Salmonella enterica</i> ssp. <i>arizonae</i>	ID/AST
<i>Salmonella enterica</i> ssp. <i>enterica</i> serovar Choleraesuis	ID/AST
<i>Salmonella enterica</i> ssp. <i>enterica</i> sv Gallinarum bv Gallinarum	ID/AST
<i>Salmonella enterica</i> ssp. <i>enterica</i> sv Gallinarum bv Pullorum	ID/AST
<i>Salmonella enterica</i> ssp. <i>enterica</i> sv Paratyphi A	ID/AST
<i>Salmonella enterica</i> ssp. <i>enterica</i> sv Typhi	ID/AST
<i>Salmonella</i> species	ID/AST
<i>Serratia ficaria</i>	ID/AST
<i>Serratia fonticola</i>	ID/AST
<i>Serratia liquefaciens</i>	ID/AST
<i>Serratia marcescens</i>	ID/AST
<i>Serratia odorifera</i> 1	ID/AST
<i>Serratia odorifera</i> 2	ID/AST
<i>Serratia plymuthica</i>	ID/AST

GRAM NEGATIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Serratia rubidaea</i>	ID/AST
<i>Shewanella putrefaciens</i>	ID/AST
<i>Shigella boydii</i>	ID/AST
<i>Shigella dysenteriae</i>	ID/AST
<i>Shigella flexneri</i>	ID/AST
<i>Shigella sonnei</i>	ID/AST
<i>Sphingobacterium multivorum</i>	ID/AST
<i>Sphingobacterium spiritivorum</i>	ID/AST
<i>Sphingobacterium thalpophilum</i>	ID/AST
<i>Sphingomonas paucimobilis</i>	ID/AST
<i>Stenotrophomonas maltophilia</i>	ID/AST
<i>Suttonella indologenes</i>	ID
<i>Tatumella ptyseos</i>	ID
<i>Vibrio alginolyticus</i>	ID
<i>Vibrio cholerae</i>	ID
<i>Vibrio fluvialis</i>	ID
<i>Vibrio metschnikovii</i>	ID
<i>Vibrio mimicus</i>	ID
<i>Vibrio parahaemolyticus</i>	ID
<i>Vibrio vulnificus</i>	ID
<i>Weeksella virosa</i>	ID
<i>Yersinia enterocolitica</i>	ID/AST
<i>Yersinia frederiksenii</i>	ID/AST
<i>Yersinia intermedia</i>	ID/AST
<i>Yersinia kristensenii</i>	ID/AST
<i>Yersinia pseudotuberculosis</i>	ID/AST
<i>Yersinia ruckeri</i>	ID/AST
<i>Yokenella regensburgei</i>	ID
* Taxa for AST interpretation may vary depending on the user-selected Interpretation Rule Set (see <a href="#">5.9.6 Custom Interpretation Rule Set Sub-Tab</a> ).	
<sup>1</sup> Not all species encountered during clinical performance evaluations.	

### 10.3.3 Gram Positive (0.5 McFarland)

GRAM POSITIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Aerococcus urinae</i>	ID
<i>Aerococcus viridans</i>	ID
<i>Alloiococcus otitis</i>	ID
<i>Arcanobacterium haemolyticum</i>	ID
<i>Bacillus cereus</i>	ID
<i>Bacillus licheniformis</i>	ID
<i>Bacillus pumilus</i>	ID
<i>Bacillus subtilis</i>	ID
<i>Bacillus thuringiensis</i>	ID
<i>Brevibacillus brevis</i>	ID
<i>Brevibacterium</i> species	ID
<i>Cellulosimicrobium cellulans</i>	ID
<i>Corynebacterium amycolatum</i>	ID
<i>Corynebacterium amycolatum/ minutissimum</i>	ID
<i>Corynebacterium amycolatum/ striatum</i>	ID
<i>Corynebacterium bovis</i>	ID
<i>Corynebacterium diphtheriae</i>	ID
<i>Corynebacterium jeikeium</i>	ID
<i>Corynebacterium kutscheri</i>	ID
<i>Corynebacterium matruchotii</i>	ID
<i>Corynebacterium minutissimum</i>	ID
<i>Corynebacterium propinquum</i>	ID
<i>Corynebacterium pseudodiphtheriticum</i>	ID
<i>Corynebacterium pseudotuberculosis</i>	ID
<i>Corynebacterium renale</i>	ID
<i>Corynebacterium striatum</i>	ID
<i>Corynebacterium ulcerans</i>	ID
<i>Corynebacterium urealyticum</i>	ID
<i>Corynebacterium xerosis</i>	ID
<i>Dermabacter hominis</i>	ID
<i>Dermacoccus nishinomiyaensis</i>	ID
<i>Enterococcus asini</i>	AST
<i>Enterococcus avium</i>	ID/AST
<i>Enterococcus casseliflavus</i>	ID/AST

GRAM POSITIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Enterococcus casseliflavus/gallinarum</i>	ID/AST
<i>Enterococcus cecorum</i>	AST
<i>Enterococcus columbae</i>	AST
<i>Enterococcus dispar</i>	AST
<i>Enterococcus durans</i>	ID/AST
<i>Enterococcus durans/faecium</i>	AST
<i>Enterococcus faecalis</i>	ID/AST
<i>Enterococcus faecalis/faecium</i>	AST
<i>Enterococcus faecium</i>	ID/AST
<i>Enterococcus flavescens</i>	AST
<i>Enterococcus gallinarum</i>	ID/AST
<i>Enterococcus gilvus</i>	AST
<i>Enterococcus haemoperoxidus</i>	AST
<i>Enterococcus hirae</i>	ID/AST
<i>Enterococcus hirae/faecium</i>	AST
<i>Enterococcus malodoratus</i>	AST
<i>Enterococcus moraviensis</i>	AST
<i>Enterococcus mundtii</i>	AST
<i>Enterococcus pallens</i>	AST
<i>Enterococcus pseudoavium</i>	AST
<i>Enterococcus raffinosus</i>	ID/AST
<i>Enterococcus raffinosus/avium</i>	AST
<i>Enterococcus ratti</i>	AST
<i>Enterococcus saccharolyticus</i>	AST
<i>Enterococcus species</i>	AST
<i>Enterococcus sulfureus</i>	AST
<i>Erysipelothrix rhusiopathiae</i>	ID
<i>Gardnerella vaginalis</i>	ID
<i>Gemella haemolysans</i>	ID
<i>Gemella morbillorum</i>	ID
<i>Globicatella sanguinis</i>	ID
<i>Helcococcus kunzii</i>	ID
<i>Kocuria rosea</i>	ID
<i>Kocuria varians</i>	ID
<i>Kytococcus sedentarius</i>	ID
<i>Lactococcus garvieae</i>	ID

GRAM POSITIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Lactococcus lactis</i> ssp. <i>cremoris</i>	ID
<i>Lactococcus lactis</i> ssp. <i>hordniae</i>	ID
<i>Lactococcus lactis</i> ssp. <i>lactis</i>	ID
<i>Lactococcus plantarum</i>	ID
<i>Lactococcus raffinolactis</i>	ID
<i>Lapidilactobacillus dextrinicus</i>	ID
<i>Leifsonia aquatica</i>	ID
<i>Leuconostoc citreum</i>	ID
<i>Leuconostoc lactis</i>	ID
<i>Leuconostoc mesenteroides</i> ssp. <i>cremoris</i>	ID
<i>Leuconostoc mesenteroides</i> ssp. <i>mesenteroides</i>	ID
<i>Leuconostoc pseudomesenteroides</i>	ID
<i>Listeria grayi</i>	ID
<i>Listeria innocua</i>	ID
<i>Listeria ivanovii</i>	ID
<i>Listeria monocytogenes</i>	ID
<i>Listeria monocytogenes/innocua</i>	ID
<i>Listeria welshimeri</i>	ID
<i>Lysinibacillus sphaericus</i>	ID
<i>Macrococcus caseolyticus</i>	ID
<i>Micrococcus luteus</i>	ID
<i>Micrococcus lylae</i>	ID
<i>Niallia circulans</i>	ID
<i>Oerskovia turbata</i>	ID
<i>Paenibacillus alvei</i>	ID
<i>Paenibacillus macerans</i>	ID
<i>Pediococcus acidilactici</i>	ID
<i>Pediococcus damnosus</i>	ID
<i>Pediococcus parvulus</i>	ID
<i>Pediococcus pentosaceus</i>	ID
<i>Priestia megaterium</i>	ID
<i>Rhodococcus equi</i>	ID
<i>Rothia dentocariosa</i>	ID
<i>Rothia kristinae</i>	ID
<i>Rothia mucilaginoso</i>	ID

GRAM POSITIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Staphylococcus argenteus</i>	AST
<i>Staphylococcus arlettae</i>	AST
<i>Staphylococcus aureus</i>	ID/AST
<i>Staphylococcus aureus</i> ssp. <i>anaerobius</i>	AST
<i>Staphylococcus aureus</i> ssp. <i>aureus</i>	AST
<i>Staphylococcus auricularis</i>	ID/AST
<i>Staphylococcus borealis</i>	AST
<i>Staphylococcus capitis</i>	ID/AST
<i>Staphylococcus capitis</i> ssp. <i>capitis</i>	ID/AST
<i>Staphylococcus capitis</i> ssp. <i>urealyticus</i>	ID/AST
<i>Staphylococcus caprae</i>	ID/AST
<i>Staphylococcus carnosus</i>	ID/AST
<i>Staphylococcus carnosus</i> ssp. <i>carnosus</i>	AST
<i>Staphylococcus carnosus</i> ssp. <i>utilis</i>	AST
<i>Staphylococcus chromogenes</i>	ID/AST
<i>Staphylococcus chromogenes/hyicus</i>	ID/AST
<i>Staphylococcus coagulans</i>	ID/AST
<i>Staphylococcus</i> coagulase-negative	AST
<i>Staphylococcus</i> coagulase-positive	AST
<i>Staphylococcus cohnii</i>	ID/AST
<i>Staphylococcus cohnii</i> ssp. <i>cohnii</i>	ID/AST
<i>Staphylococcus condimenti</i>	AST
<i>Staphylococcus delphini</i>	AST
<i>Staphylococcus devriesei</i>	AST
<i>Staphylococcus epidermidis</i>	ID/AST
<i>Staphylococcus equorum</i>	ID/AST
<i>Staphylococcus felis</i>	ID/AST
<i>Staphylococcus fleurettii</i>	AST
<i>Staphylococcus gallinarum</i>	ID/AST
<i>Staphylococcus haemolyticus</i>	ID/AST
<i>Staphylococcus haemolyticus/lugdunensis</i>	ID
<i>Staphylococcus hominis</i>	ID/AST
<i>Staphylococcus hominis</i> ssp. <i>hominis</i>	AST
<i>Staphylococcus hominis</i> ssp. <i>novobiosepticus</i>	AST
<i>Staphylococcus hyicus</i>	ID/AST

GRAM POSITIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Staphylococcus intermedius</i>	ID/AST
<i>Staphylococcus kloosii</i>	ID/AST
<i>Staphylococcus lentus</i>	ID/AST
<i>Staphylococcus lugdunensis</i>	ID/AST
<i>Staphylococcus lutrae</i>	AST
<i>Staphylococcus massiliensis</i>	AST
<i>Staphylococcus muscae</i>	AST
<i>Staphylococcus pasteurii</i>	ID/AST
<i>Staphylococcus petrasii</i>	AST
<i>Staphylococcus pettenkoferi</i>	ID/AST
<i>Staphylococcus piscifermentans</i>	AST
<i>Staphylococcus pseudintermedius</i>	AST
<i>Staphylococcus pulvereri</i>	AST
<i>Staphylococcus saccharolyticus</i>	AST
<i>Staphylococcus saprophyticus</i>	ID/AST
<i>Staphylococcus saprophyticus</i> ssp. <i>bovis</i>	AST
<i>Staphylococcus saprophyticus</i> ssp. <i>saprophyticus</i>	AST
<i>Staphylococcus schleiferi</i>	ID/AST
<i>Staphylococcus schleiferi</i> ssp. <i>schleiferi</i>	ID/AST
<i>Staphylococcus sciuri</i>	ID/AST
<i>Staphylococcus sciuri</i> ssp. <i>carnaticus</i>	AST
<i>Staphylococcus sciuri</i> ssp. <i>rodentium</i>	AST
<i>Staphylococcus sciuri</i> ssp. <i>sciuri</i>	AST
<i>Staphylococcus simulans</i>	ID/AST
<i>Staphylococcus</i> species	AST
<i>Staphylococcus succinus</i>	AST
<i>Staphylococcus succinus</i> ssp. <i>casei</i>	AST
<i>Staphylococcus succinus</i> ssp. <i>succinus</i>	AST
<i>Staphylococcus ureilyticus</i>	ID/AST
<i>Staphylococcus vitulinus</i>	ID/AST
<i>Staphylococcus warneri</i>	ID/AST
<i>Staphylococcus warneri/pasteurii</i>	AST
<i>Staphylococcus xylosum</i>	ID/AST
<i>Streptococcus acidominimus</i>	ID
<i>Streptococcus agalactiae</i> (Strep. group B)	ID

GRAM POSITIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Streptococcus anginosus</i>	ID
<i>Streptococcus canis</i>	ID
<i>Streptococcus constellatus</i>	ID
<i>Streptococcus cristatus</i>	ID
<i>Streptococcus dysgalactiae</i> ssp. <i>dysgalactiae</i>	ID
<i>Streptococcus dysgalactiae</i> ssp. <i>equisimilis</i>	ID
<i>Streptococcus equi</i>	ID
<i>Streptococcus equi</i> ssp. <i>equi</i>	ID
<i>Streptococcus equi</i> ssp. <i>zooepidemicus</i>	ID
<i>Streptococcus equinus</i>	ID
<i>Streptococcus gallolyticus</i> ssp. <i>gallolyticus</i>	ID
<i>Streptococcus gallolyticus</i> ssp. <i>pasteurianus/infantarius</i>	ID
<i>Streptococcus gallolyticus/infantarius</i>	ID
<i>Streptococcus gordonii</i>	ID
<i>Streptococcus</i> group C/G (large colony)	ID
<i>Streptococcus intermedius</i>	ID
<i>Streptococcus mitis</i>	ID
<i>Streptococcus mitis/pneumoniae</i>	ID
<i>Streptococcus mutans</i>	ID
<i>Streptococcus oralis</i>	ID
<i>Streptococcus parasanguinis</i>	ID
<i>Streptococcus pneumoniae</i>	ID
<i>Streptococcus porcinus</i>	ID
<i>Streptococcus pyogenes</i> ( <i>Strep.</i> group A)	ID
<i>Streptococcus salivarius</i>	ID
<i>Streptococcus sanguinis</i>	ID
<i>Streptococcus sobrinus</i>	ID
<i>Streptococcus uberis</i>	ID
<i>Streptococcus vestibularis</i>	ID
<i>Trueperella pyogenes</i>	ID
<i>Weizmannia coagulans</i>	ID
Taxa for AST interpretation may vary depending on the user-selected Interpretation Rule Set (see <a href="#">5.9.6 Custom Interpretation Rule Set Sub-Tab</a> ).	
<sup>1</sup> Not all species encountered during clinical performance evaluations.	

### 10.3.4 Gram Positive (0.25 McFarland)

GRAM POSITIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Aerococcus urinae</i>	ID
<i>Aerococcus viridans</i>	ID
<i>Alloiococcus otitis</i>	ID
<i>Dermacoccus nishinomiyaensis</i>	ID
<i>Enterococcus avium</i>	ID/AST
<i>Enterococcus casseliflavus</i>	ID/AST
<i>Enterococcus durans</i>	ID/AST
<i>Enterococcus faecalis</i>	ID/AST
<i>Enterococcus faecium</i>	ID/AST
<i>Enterococcus gallinarum</i>	ID/AST
<i>Enterococcus hirae</i>	ID/AST
<i>Enterococcus raffinosus</i>	ID/AST
<i>Gemella haemolysans</i>	ID
<i>Gemella morbillorum</i>	ID
<i>Globicatella sanguinis</i>	ID
<i>Helcococcus kunzii</i>	ID
<i>Kocuria rosea</i>	ID
<i>Kocuria varians</i>	ID
<i>Kytococcus sedentarius</i>	ID
<i>Lactococcus lactis</i> ssp. <i>cremoris</i>	ID
<i>Lactococcus lactis</i> ssp. <i>hordniae</i>	ID
<i>Lactococcus plantarum</i>	ID
<i>Lapidilactobacillus dextrinicus</i>	ID
<i>Leuconostoc citreum</i>	ID
<i>Leuconostoc lactis</i>	ID
<i>Leuconostoc mesenteroides</i> ssp. <i>mesenteroides</i>	ID
<i>Listeria innocua</i>	ID
<i>Listeria monocytogenes</i>	ID
<i>Macrococcus caseolyticus</i>	ID
<i>Micrococcus luteus</i>	ID
<i>Micrococcus lylae</i>	ID
<i>Pediococcus acidilactici</i>	ID
<i>Pediococcus damnosus</i>	ID

GRAM POSITIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Pediococcus parvulus</i>	ID
<i>Pediococcus pentosaceus</i>	ID
<i>Rothia kristinae</i>	ID
<i>Rothia mucilaginosa</i>	ID
<i>Staphylococcus aureus</i>	ID/AST
<i>Staphylococcus auricularis</i>	ID/AST
<i>Staphylococcus capitis</i>	ID/AST
<i>Staphylococcus caprae</i>	ID/AST
<i>Staphylococcus carnosus</i>	ID/AST
<i>Staphylococcus chromogenes</i>	ID/AST
<i>Staphylococcus coagulans</i>	ID/AST
<i>Staphylococcus cohnii</i> ssp. <i>cohnii</i>	ID/AST
<i>Staphylococcus epidermidis</i>	ID/AST
<i>Staphylococcus equorum</i>	ID/AST
<i>Staphylococcus felis</i>	ID/AST
<i>Staphylococcus gallinarum</i>	ID/AST
<i>Staphylococcus haemolyticus</i>	ID/AST
<i>Staphylococcus hominis</i>	ID/AST
<i>Staphylococcus hyicus</i>	ID/AST
<i>Staphylococcus intermedius</i>	ID/AST
<i>Staphylococcus kloosii</i>	ID/AST
<i>Staphylococcus lentus</i>	ID/AST
<i>Staphylococcus lugdunensis</i>	ID/AST
<i>Staphylococcus pasteurii</i>	ID/AST
<i>Staphylococcus saprophyticus</i>	ID/AST
<i>Staphylococcus schleiferi</i> ssp. <i>schleiferi</i>	ID/AST
<i>Staphylococcus sciuri</i>	ID/AST
<i>Staphylococcus simulans</i>	ID/AST
<i>Staphylococcus ureilyticus</i>	ID/AST
<i>Staphylococcus vitulinus</i>	ID/AST
<i>Staphylococcus warneri</i>	ID/AST
<i>Staphylococcus xylosus</i>	ID/AST
<i>Streptococcus agalactiae</i> (Strep. group B)	ID
<i>Streptococcus anginosus</i>	ID
<i>Streptococcus constellatus</i>	ID
<i>Streptococcus cristatus</i>	ID

GRAM POSITIVE TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Streptococcus equi</i>	ID
<i>Streptococcus gallolyticus</i> ssp. <i>gallolyticus</i>	ID
<i>Streptococcus gallolyticus</i> ssp. <i>pasteurianus/infantarius</i>	ID
<i>Streptococcus gallolyticus/infantarius</i>	ID
<i>Streptococcus gordonii</i>	ID
<i>Streptococcus</i> group C/G (large colony)	ID
<i>Streptococcus intermedius</i>	ID
<i>Streptococcus mitis</i>	ID
<i>Streptococcus mutans</i>	ID
<i>Streptococcus oralis</i>	ID
<i>Streptococcus parasanguinis</i>	ID
<i>Streptococcus pneumoniae</i>	ID
<i>Streptococcus porcinus</i>	ID
<i>Streptococcus pyogenes</i> ( <i>Strep.</i> group A)	ID
<i>Streptococcus salivarius</i>	ID
<i>Streptococcus sanguinis</i>	ID
<i>Streptococcus sobrinus</i>	ID
<i>Streptococcus uberis</i>	ID
<i>Streptococcus vestibularis</i>	ID
*Taxa for AST interpretation may vary depending on the user-selected Interpretation Rule Set (see <a href="#">5.9.6 Custom Interpretation Rule Set Sub-Tab</a> ).	
<sup>1</sup> Not all species encountered during clinical performance evaluations.	

### 10.3.5 Streptococci

STREPTOCOCCI TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Streptococcus acidominimus</i>	ID/AST
<i>Streptococcus agalactiae</i> (Strep. group B)	ID/AST
<i>Streptococcus alactolyticus</i>	AST
<i>Streptococcus</i> alpha-hemolytic	AST
<i>Streptococcus anginosus</i>	ID/AST
<i>Streptococcus anginosus</i> (previously <i>milleri</i> ) group	ID/AST
<i>Streptococcus australis</i>	AST
<i>Streptococcus</i> beta-hemolytic ACG (large colony)	AST
<i>Streptococcus canis</i>	ID/AST
<i>Streptococcus constellatus</i>	ID/AST
<i>Streptococcus constellatus</i> ssp. <i>constellatus</i>	AST
<i>Streptococcus constellatus</i> ssp. <i>pharyngis</i>	AST
<i>Streptococcus criceti</i>	AST
<i>Streptococcus cristatus</i>	ID/AST
<i>Streptococcus downei</i>	AST
<i>Streptococcus dysgalactiae</i>	AST
<i>Streptococcus dysgalactiae</i> ssp. <i>dysgalactiae</i>	ID/AST
<i>Streptococcus dysgalactiae</i> ssp. <i>equisimilis</i>	ID/AST
<i>Streptococcus dysgalactiae/canis</i>	ID/AST
<i>Streptococcus equi</i>	ID/AST
<i>Streptococcus equi</i> ssp. <i>equi</i>	ID/AST
<i>Streptococcus equi</i> ssp. <i>zooepidemicus</i>	ID/AST
<i>Streptococcus equinus</i>	ID/AST
<i>Streptococcus ferus</i>	AST
<i>Streptococcus gallolyticus</i>	AST
<i>Streptococcus gallolyticus</i> ssp. <i>gallolyticus</i>	ID/AST
<i>Streptococcus gallolyticus</i> ssp. <i>macedonicus</i>	AST
<i>Streptococcus gallolyticus</i> ssp. <i>pasteurianus</i>	AST
<i>Streptococcus gallolyticus</i> ssp. <i>pasteurianus/infantarius</i>	ID/AST
<i>Streptococcus gallolyticus/infantarius</i>	AST
<i>Streptococcus gordonii</i>	ID/AST

<b>STREPTOCOCCI TAXA<sup>1</sup></b>	<b>ID, AST, ID/AST*</b>
<i>Streptococcus</i> group A (small colony)	AST
<i>Streptococcus</i> group A ( <i>Strep. pyogenes</i> )	AST
<i>Streptococcus</i> group B ( <i>Strep. agalactiae</i> )	AST
<i>Streptococcus</i> group C (large colony)	AST
<i>Streptococcus</i> group C (small colony)	AST
<i>Streptococcus</i> group C/G (large colony)	ID/AST
<i>Streptococcus</i> group C/G (small colony)	AST
<i>Streptococcus</i> group CFG (small colony)	AST
<i>Streptococcus</i> group D (non-enterococcus)	AST
<i>Streptococcus</i> group E	AST
<i>Streptococcus</i> group F	AST
<i>Streptococcus</i> group G (large colony)	AST
<i>Streptococcus</i> group G (small colony)	AST
<i>Streptococcus</i> group L	AST
<i>Streptococcus hyointestinalis</i>	AST
<i>Streptococcus infantarius</i>	AST
<i>Streptococcus infantarius</i> ssp. <i>coli</i>	AST
<i>Streptococcus infantarius</i> ssp. <i>infantarius</i>	AST
<i>Streptococcus infantis</i>	AST
<i>Streptococcus iniae</i>	AST
<i>Streptococcus intermedius</i>	ID/AST
<i>Streptococcus lutetiensis</i>	AST
<i>Streptococcus massiliensis</i>	AST
<i>Streptococcus milleri</i> group	AST
<i>Streptococcus minor</i>	AST
<i>Streptococcus mitis</i>	ID/AST
<i>Streptococcus mitis</i> group	ID/AST
<i>Streptococcus mitis/oralis</i>	AST
<i>Streptococcus mitis/pneumoniae</i>	ID/AST
<i>Streptococcus mutans</i>	ID/AST
<i>Streptococcus mutans</i> group	AST
<i>Streptococcus oralis</i>	ID/AST
<i>Streptococcus parasanguinis</i>	ID/AST
<i>Streptococcus peroris</i>	AST
<i>Streptococcus pneumoniae</i>	ID/AST
<i>Streptococcus porcinus</i>	ID/AST

STREPTOCOCCI TAXA <sup>1</sup>	ID, AST, ID/AST*
<i>Streptococcus pseudopneumoniae</i>	AST
<i>Streptococcus pseudoporcinus</i>	AST
<i>Streptococcus pyogenes</i> (Strep. group A)	ID/AST
<i>Streptococcus rattii</i>	AST
<i>Streptococcus salivarius</i>	ID/AST
<i>Streptococcus salivarius</i> group	AST
<i>Streptococcus sanguinis</i>	ID/AST
<i>Streptococcus sanguinis</i> group	AST
<i>Streptococcus sinensis</i>	AST
<i>Streptococcus sobrinus</i>	ID/AST
<i>Streptococcus</i> species	AST
<i>Streptococcus suis</i>	AST
<i>Streptococcus thermophilus</i>	AST
<i>Streptococcus thoraltensis</i>	AST
<i>Streptococcus uberis</i>	ID/AST
<i>Streptococcus urinalis</i>	AST
<i>Streptococcus vestibularis</i>	ID/AST
<i>Streptococcus viridans</i> beta-hemolytic (small colony)	AST
<i>Streptococcus viridans</i> group	AST
* Taxa for AST interpretation may vary depending on the user-selected Interpretation Rule Set (see <a href="#">5.9.6 Custom Interpretation Rule Set Sub-Tab</a> ).	
<sup>1</sup> Not all species encountered during clinical performance evaluations.	

### 10.3.6 Yeast

YEAST TAXA <sup>2</sup>	SABDX SABEM SABHI	CHOC COLSB TSASB
<i>Apiotrichum loubieri</i>	√	–
<i>Candida albicans</i>	√	√
<i>Candida apicola</i>	√	√
<i>Candida boidinii</i>	√	–
<i>Candida bracarensis</i>	√	–
<i>Candida ciferrii</i>	√	√
<i>Candida dubliniensis</i>	√	√
<i>Candida firmetaria</i>	√	√
<i>Candida freyschussii</i>	√	√

YEAST TAXA <sup>2</sup>	SABDX SABEM SABHI	CHOC COLSB TSASB
<i>Candida glabrata</i>	√	√
<i>Candida guilliermondii</i>	√	√
<i>Candida guilliermondii</i> var <i>membranaefaciens</i>	√	√
<i>Candida haemulonii/auris</i>	√	√
<i>Candida inconspicua</i>	√	√
<i>Candida kefyr</i>	√	√
<i>Candida krusei</i>	√	√
<i>Candida lipolytica</i>	√	√
<i>Candida lusitaniae</i>	√	√
<i>Candida melibiosica</i>	√	√
<i>Candida membranifaciens</i>	√	√
<i>Candida parapsilosis</i> complex	√	√
<i>Candida pelliculosa</i>	√	√
<i>Candida pulcherrima</i>	√	√
<i>Candida sake</i>	√	√
<i>Candida sphaerica</i>	√	–
<i>Candida tropicalis</i>	√	√
<i>Candida utilis</i>	√	√
<i>Candida viswanathii</i>	√	√
<i>Candida zeylanoides</i>	√	√
<i>Cryptococcus humicola</i>	√	√
<i>Cryptococcus luteolus</i>	√	√
<i>Cryptococcus neoformans</i>	√ <sup>1</sup>	√
<i>Cryptococcus uniguttulatus</i>	√	√
<i>Cutaneotrichosporon mucoides</i>	√	√
<i>Cystobasidium minutum</i>	√	√
<i>Diutina catenulata</i>	√	√
<i>Diutina rugosa</i>	√	√
<i>Exophiala dermatitidis</i>	√	√
<i>Exophiala</i> species	√	√
<i>Geotrichum</i> species	√	√
<i>Hortaea werneckii</i>	√	√

YEAST TAXA <sup>2</sup>	SABDX SABEM SABHI	CHOC COLSB TSASB
<i>Hyphopichia burtonii</i>	√	√
<i>Kloeckera</i> species	√	–
<i>Magnusiomyces capitatus</i>	√	√
<i>Malassezia furfur</i> complex	√	–
<i>Malassezia pachydermatis</i>	√	–
<i>Malassezia sympodialis</i>	√	–
<i>Millerozyma farinosa</i>	√	√
<i>Naganishia albida</i>	√	√
<i>Papiliotrema laurentii</i>	–	√
<i>Pichia norvegensis</i>	√	√
<i>Prototheca wickerhamii</i>	√	√
<i>Prototheca zopfii</i>	√	√
<i>Rhodotorula glutinis</i>	√	√
<i>Rhodotorula mucilaginosa</i> var <i>mucilaginosa</i>	√	√
<i>Saccharomyces cerevisiae</i>	√	√
<i>Solicoccozyma terrea</i>	√	–
<i>Sporobolomyces salmonicolor</i>	√	√
<i>Starmerella magnoliae</i>	√	√
<i>Trichosporon asahii</i>	√	√
<i>Trichosporon inkin</i>	√	–
<i>Trichosporon ovoides</i>	√	–
<i>Wickerhamiella pararugosa</i>	√	√
<i>Zygosaccharomyces bailii</i>	√	–

<sup>1</sup>With an ID result of *Cryptococcus neoformans* and a substrate profile that may be indicative of *C. gattii*, the following message will print: The instrument produced an ID result of *Cryptococcus neoformans* with a profile that may be indicative of *C. gattii*. Recommend testing to rule out *C. gattii*.

<sup>2</sup>Not all species encountered during clinical performance evaluations.

# 11 BD Phoenix™ Broths and Indicators

This section describes information regarding composition for the following:

- [11.1 List of contents in BD Phoenix™ ID, AP ID, and Inoculum Broth](#)
- [11.2 List of contents in BD Phoenix™ AST, Emerge™ AST, and AST-S Broth](#)
- [11.3 List of contents in BD Phoenix™ AST, Emerge™ AST, AP AST, and AST-S Indicator Solution](#)

## 11.1 List of contents in BD Phoenix™ ID, AP ID, and Inoculum Broth

Catalog Number	Product Name	Broth Volume (mL)	Contents (per liter of purified water)
246001	BD Phoenix™ ID Broth	4.5	Potassium chloride, 7.5 g; Calcium chloride, 0.5 g; Tricine glycine, 0.895 g; Polysorbate 80, 0.025%
448012	BD Phoenix™ AP ID Broth*	800	
246005	BD Phoenix™ Inoculum Broth	2.2	

\*BD Phoenix™ AP ID Broth is only for use with the BD Phoenix™ AP Instrument. Refer to the *BD Phoenix™ AP Instrument User's Manual* for more information.

## 11.2 List of contents in BD Phoenix™ AST, Emerge™ AST, and AST-S Broth

Catalog Number	Product Name	Broth Volume (mL)	Contents (per liter of purified water)
246011	BD Phoenix™ AST Broth, 4.5 mL*	4.5	Mueller Hinton Broth, 22 g; Polysorbate 80, 0.01%
246003	BD Phoenix™ AST Broth	8	
246016	BD Phoenix™ Emerge™ AST Broth	12.5	
246007	BD Phoenix™ AST-S Broth	8	Pancreatic Digest of Casein, Peptones, and Supplements, 29.2 g; Thymidine Phosphorylase, 100 IU; Polysorbate 80, 0.1 g

\*BD Phoenix™ AST Broth, 4.5 mL is only for use with the BD Phoenix™ AP Instrument. Refer to the *BD Phoenix™ AP Instrument User's Manual* for more information.

### 11.3 List of contents in BD Phoenix™ AST, Emerge™ AST, AP AST, and AST-S Indicator Solution

Catalog Number	Product Name	Solution Volume (mL)	Contents (per liter of purified water)
246004	BD Phoenix™ AST Indicator Solution	6	Redox Indicator, less than 3 g; Redox stabilizers, less than 20 g
246015	BD Phoenix™ Emerge™ AST Indicator Solution	6	
246006	BD Phoenix™ AP AST Indicator Solution*	15	
246009	BD Phoenix™ AST-S Indicator Solution	6	Redox Indicator, less than 1.5 g; Redox stabilizers, less than 20 g

\*BD Phoenix™ AP AST Indicator Solution is only for use with the BD Phoenix™ AP Instrument. Refer to the *BD Phoenix™ AP Instrument User's Manual* for more information.

## 12      **Contacts**



Becton, Dickinson and Company  
7 Loveton Circle  
Sparks, Maryland 21152 USA  
Voice: 1-800-638-8663  
Mail: [Technical.Services@bd.com](mailto:Technical.Services@bd.com)  
[bd.com](http://bd.com)

BD Kiestra B.V.  
Marconilaan 6  
9207 JC Drachten, The Netherlands  
Voice: +31 (0)512 540 623  
Mail: [Lab\\_Automation\\_phone\\_support@bd.com](mailto:Lab_Automation_phone_support@bd.com)



Becton Dickinson Ireland Ltd.  
Donore Road, Drogheda  
Co. Louth, A92 YW26  
Ireland



BD Switzerland Sàrl  
Route de Crassier 17  
Business Park Terre-Bonne  
Bâtiment A4  
1262 Eysins  
Switzerland



Becton Dickinson Distribution Center NV  
Laagstraat 57  
9140 Temse, Belgium



Becton Dickinson AG  
Binnerstrasse 94  
4123 Allschwil  
Switzerland

Australian and New Zealand Sponsors:  
Becton Dickinson Pty Ltd.  
66 Waterloo Road  
Macquarie Park NSW 2113  
Australia  
Customer Service: 1800 656 100  
Technical Service: 1800 804 094

Becton Dickinson Limited  
14B George Bourke Drive  
Mt. Wellington Auckland 1060  
New Zealand  
Customer Service: 0800 572 468  
Technical Service: 0800 445 392

2100 Derry Road West  
Suite 100  
Mississauga, ON  
Canada L5N 0B3  
Voice: 866-979-9408  
Fax: 800-565-0897

Akasaka DS Building  
5-26 Akasaka 8-chome  
Minato-ku, Tokyo 107-0052  
Japan  
Voice: (81) 3 54138181  
Fax: (81) 3 54138144

Monte Pelvoux 111 • 9th Floor  
Col. Lomas de Chapultepec  
11000 Mexico D.F.  
Voice: 52 5 237 1200  
Fax: 52 5 237 1287

11 Rue Aristide Bergès BP4  
38800 Le Pont de Claix France  
Voice: 33 476 68 36 36  
Fax: 33 476 68 34 95

Rua Alexandre Dumas 1976  
04717-004 Sao Paulo, S.P. Brazil  
Voice: (55) 11 5459833  
Fax: (55) 11 2478644

30 Tuas Avenue 2  
Singapore 639461  
Voice: (65) 8610633  
Fax: (65) 8601590



## 13 Limited warranty

This warranty gives you specific legal rights. Additionally, you may have other rights that vary by region.

The BD Phoenix™ M50 Automated Microbiology System is warranted to the original purchaser to be free from defects in materials and workmanship for a period of one year following installation. BD's sole responsibility under this warranty shall be to repair or replace any module or its components (except for expendable supplies) which under normal operating conditions, prove to be defective within one year of delivery.

BD will furnish new or remanufactured components upon its option. All replacements shall meet new part specifications and shall be warranted as above for the remainder of the one year period. Replaced modules or components become the property of BD.

It is understood that the equipment covered by this Agreement has been installed in accordance with installation instructions approved by BD. Any damage to a BD Phoenix™ M50 Instrument resulting from the insertion or removal of cables that connect a module to systems other than those approved or supplied by BD or the failure of the owner to maintain reasonable care and precautions in the operation and maintenance of the module will void this warranty and terminate the obligations of the manufacturer as stated herein.

This warranty is in lieu of all other warranties, whether expressed or implied, including but not limited to, warranties of merchantability or fitness for a particular use. In no event will BD be liable for indirect, incidental, special or consequential damages regardless of whether BD has been advised of such.



# 14 Installation requirements

This section describes the following:

- [14.1 Instrument Installation](#)
- [14.2 System Startup](#)
- [14.3 Language Selection](#)
- [14.4 Instrument Specification Charts](#)

## WARNING

PROTECTION PROVIDED BY THIS EQUIPMENT MAY BE IMPAIRED IF THE EQUIPMENT IS USED IN A MANNER NOT CONSISTENT WITH THE INSTRUCTIONS IN THIS MANUAL.

## CAUTION

The intake filter at the lower front right corner of the BD Phoenix™ M50 Instrument must remain unobstructed at all times. Restricted air flow may cause excessive temperatures in the instrument, which can affect test results and possibly cause hardware malfunctions

## 14.1 Instrument Installation

The BD Phoenix™ M50 Instrument must be installed only by BD representatives.

### CAUTION

**Due to the size and weight of the BD Phoenix™ M50 Instrument, at least two people are required to lift the instrument in the absence of a mechanical lifting device.**

The BD Phoenix™ M50 Instrument should be installed in an area that is free from undue vibration, direct sunlight, high humidity, dust, temperature extremes, and corrosive or explosive vapors or gases. The system will operate within specifications in room temperatures between 18–30 °C (64.4–86 °F). Relative humidity should be between 20% and 80% (non-condensing). The left, rear, and right sides of the instrument should be placed at least three inches from any wall. Environments which exceed these limits could adversely affect the performance of the system components.

The carousel should maintain its temperature to within plus or minus 1.5 °C of the temperature controller's setting (35 °C). This accuracy can be assured only if the room temperature meets the requirements given above.

Use of earthquake anchoring is strongly recommended in areas susceptible to earthquake activity.

A stacking kit is required when stacking two instruments on top of one another. (Installation Category II and Pollution Degree 2 as per IEC 664.)

**Figure 51 Example to Two Phoenix M50 Instruments Stacked**



## 14.2 System Startup

Whenever power is applied to the system, it is initialized, performs self-diagnostics, and reports any problems to the user through alerts. If any files are missing or corrupted which would prevent proper operation of the system, the startup process is aborted. If not, the computer loads the operating system and user interface, and begins the warmup period (indicated by the Instrument is warming up icon). Afterwards, the system awaits the initiation of panel testing.

The temperature standard panel should be left in the instrument at least 45 minutes before reading it when the instrument is first powered up.

## 14.3 Language Selection

A BD representative performs the language setting at installation. Supported languages include:

- Chinese
- Czech
- Danish
- English
- French
- German
- Hungarian
- Italian
- Japanese
- Korean
- Norwegian
- Polish
- Portuguese
- Russian
- Slovak
- Spanish
- Swedish
- Thai
- Turkish
- Vietnamese

## 14.4 Instrument Specification Charts

Physical Dimensions	
Height	21 in. (535 mm)
Width	32 in. (815 mm)

<b>Physical Dimensions</b>	
Depth	30 in. (765 mm)
Clearance–Right	21.5 in. (546 mm)
Clearance–Left, Rear	3 in. (76 mm)
Clearance–Front	18 in. (457 mm)
Weight–Empty	118 lb (53.5 kg)
Weight–Full	127 lb (57.6 kg)

<b>Environmental Requirements</b>	
<b>Non-Operating Storage</b>	
Temperature	-17.8 °C – 65 °C (0–149 °F)
Humidity	20–80% RH, non-condensing
<b>Operating Conditions</b>	
Temperature	18–30 °C (64.4–86 °F)
Humidity	20–80% RH, non-condensing
Locations	Level surface, No direct sunlight, No direct heat
Altitude (evaluated for safety)	2,000 m
Noise	at 1 m ≤ 55 dBA using ANSI Type 2 sound meter

<b>Electrical Requirements</b>	
Input Voltage	100–240 VAC
Input Current	6 Amp
Input Line Frequency	50/60 Hz

<b>Instrument Heat Output at Input Voltage = 120 VAC</b>	
<b>Ambient Temperature</b>	<b>BTU/hr</b>
18 °C	648
24 °C	464
30 °C	287

<b>Optical Specifications</b>	
<b>Peak Wavelengths</b>	
428 nm to 623 nm, visible spectrum	
375 nm, UV Excitation	
410–640 nm Bandpass, UV Emission	

## 15 Ordering information

The following items may be ordered by contacting your local BD representative (see [12 Contacts](#)).

Catalog Number	Item
443809	Barcode Scanner (external)
443866	System Software
441107	BD Phoenix™ Update Data (PUD) Software
443390	Barcode Scanner Stand
443842	Air Filter
443575	BD Phoenix™ M50 System User's Manual
443894	Quick Reference Guide
443431	Laser Printer
448984	Temperature Standard Panel
246001	BD Phoenix™ ID Broth
246003	BD Phoenix™ AST Broth
246004	BD Phoenix™ AST Indicator Solution
246005	BD Phoenix™ Inoculum Broth
246006	BD Phoenix™ AP AST Indicator Solution*
246007	BD Phoenix™ AST-S Broth
246009	BD Phoenix™ AST-S Indicator Solution
246011	BD Phoenix™ AST Broth, 4.5 mL*
246015	BD Phoenix™ Emerge™ AST Indicator Solution
246016	BD Phoenix™ Emerge™ AST Broth
448012	BD Phoenix™ AP ID Broth*

\*For use with BD Phoenix™ AP Instrument only.



## 16 Definitions

The topics in this section are:

- [16.1 Organism Names and Abbreviations](#)
- [16.2 Supplemental ID Test Abbreviations](#)
- [16.3 Interpretation Codes](#)

### 16.1 Organism Names and Abbreviations

Long Name	Short Name	Abbreviation
<i>Achromobacter denitrificans</i>	<i>Achr. denitrificans</i>	ALCDEN
<i>Achromobacter insolitus</i>	<i>Achr. insolitus</i>	ACHRINS
<i>Achromobacter mucicolens</i>	<i>Achr. mucicolens</i>	ACHRMUC
<i>Achromobacter piechaudii</i>	<i>Achr. piechaudii</i>	ALCPIE
<i>Achromobacter ruhlandii</i>	<i>Achr. ruhlandii</i>	ACHRRUH
<i>Achromobacter spanius</i>	<i>Achr. spanius</i>	ACHRSPA
<i>Achromobacter</i> species	<i>Achr. species</i>	ACHRSPE
<i>Achromobacter xylosoxidans</i>	<i>Achr. xylosoxidans</i>	ALCXYL
<i>Acinetobacter baumannii</i>	<i>Acinet. baumannii</i>	ACINBAU
<i>Acinetobacter baumannii/calcoaceticus</i> complex	<i>Acinet. baumannii/calco. cplx</i>	ACINBCX
<i>Acinetobacter baumannii/haemolyticus</i>	<i>Acinet. baumannii/haemolyticus</i>	ACINBAUHAE
<i>Acinetobacter bereziniae</i>	<i>Acinet. bereziniae</i>	ACINGSP10
<i>Acinetobacter calcoaceticus</i>	<i>Acinet. calcoaceticus</i>	ACINCAL
<i>Acinetobacter colistiniresistens</i>	<i>Acinet. colistiniresistens</i>	ACINCOL
<i>Acinetobacter dijkshoorniae</i>	<i>Acinet. dijkshoorniae</i>	ACINDIJ
<i>Acinetobacter guillouiae</i>	<i>Acinet. guillouiae</i>	ACINGSP11
<i>Acinetobacter haemolyticus</i>	<i>Acinet. haemolyticus</i>	ACINHAE
<i>Acinetobacter johnsonii</i>	<i>Acinet. johnsonii</i>	ACINJOH
<i>Acinetobacter junii</i>	<i>Acinet. junii</i>	ACINJUN
<i>Acinetobacter lactucae</i>	<i>Acinet. lactucae</i>	ACINLAC
<i>Acinetobacter lwoffii</i>	<i>Acinet. lwoffii</i>	ACINLWO
<i>Acinetobacter lwoffii/haemolyticus</i>	<i>Acinet. lwoffii/haemol.</i>	ACINLWOHAE
<i>Acinetobacter nosocomialis</i>	<i>Acinet. nosocomialis</i>	ACINNOS
<i>Acinetobacter parvus</i>	<i>Acinet. parvus</i>	ACINPAR
<i>Acinetobacter pittii</i>	<i>Acinet. pittii</i>	ACINPIT

Long Name	Short Name	Abbreviation
<i>Acinetobacter pseudolwoffii</i>	<i>Acinet. pseudolwoffii</i>	ACINPSE
<i>Acinetobacter radioresistens</i>	<i>Acinet. radioresistens</i>	ACINRAD
<i>Acinetobacter schindleri</i>	<i>Acinet. schindleri</i>	ACINSCH
<i>Acinetobacter seifertii</i>	<i>Acinet. seifertii</i>	ACINSEI
<i>Acinetobacter</i> species	<i>Acinet. species</i>	ACINSPE
<i>Acinetobacter ursingii</i>	<i>Acinet. ursingii</i>	ACINURS
<i>Actinobacillus lignieresii</i>	<i>Actinob. lignieresii</i>	ACTBLIG
<i>Actinobacillus suis</i>	<i>Actinob. suis</i>	ACTBSUI
<i>Actinobacillus ureae</i>	<i>Actinob. ureae</i>	ACTBURE
<i>Aerococcus</i> species	<i>Aeroc. species</i>	AERCSPE
<i>Aerococcus urinae</i>	<i>Aeroc. urinae</i>	AERCURI
<i>Aerococcus viridans</i>	<i>Aeroc. viridans</i>	AERCVIR
<i>Aeromonas allosaccharophila</i>	<i>Aerom. allosaccharophila</i>	AERMALL
<i>Aeromonas caviae</i>	<i>Aerom. caviae</i>	AERMCAV
<i>Aeromonas eucrenophila</i>	<i>Aerom. eucrenophila</i>	AERMEUC
<i>Aeromonas hydrophila</i>	<i>Aerom. hydrophila</i>	AERMHYD
<i>Aeromonas hydrophila</i> group	<i>Aerom. hydrophila</i> gr.	AERMHYDGR
<i>Aeromonas jandaei</i>	<i>Aerom. jandaei</i>	AERMJAN
<i>Aeromonas media</i>	<i>Aerom. media</i>	AERMED
<i>Aeromonas salmonicida</i>	<i>Aerom. salmonicida</i>	AERMSAL
<i>Aeromonas salmonicida</i> ssp. <i>achromogenes</i>	<i>Aerom. salmonic. ssp. ach.</i>	AERMSALA
<i>Aeromonas salmonicida</i> ssp. <i>masoucida</i>	<i>Aerom. salmonic. ssp. mas.</i>	AERMSALM
<i>Aeromonas salmonicida</i> ssp. <i>pectinolytica</i>	<i>Aerom. salmonic. ssp. pec.</i>	AERMSALPE
<i>Aeromonas salmonicida</i> ssp. <i>salmonicida</i>	<i>Aerom. salmonic. ssp. sal.</i>	AERMSALSA
<i>Aeromonas salmonicida</i> ssp. <i>smithia</i>	<i>Aerom. salmonic. ssp. smit.</i>	AERMSALSM
<i>Aeromonas schubertii</i>	<i>Aerom. schubertii</i>	AERMSCH
<i>Aeromonas</i> species	<i>Aerom. species</i>	AERMSPE
<i>Aeromonas trota</i>	<i>Aerom. trota</i>	AERMTRO
<i>Aeromonas veronii</i> bv <i>sobria</i>	<i>Aerom. veronii</i> bv <i>sobria</i>	AERMVERS
<i>Aeromonas veronii</i> bv <i>veronii</i>	<i>Aerom. veronii</i> bv <i>veronii</i>	AERMVERV
<i>Agrobacterium radiobacter</i>	<i>Agro. radiobacter</i>	AGRRAD
<i>Alcaligenes faecalis</i>	<i>Alc. faecalis</i>	ALCFAE
<i>Alcaligenes faecalis</i> ssp. <i>faecalis</i>	<i>Alc. faecalis</i> ssp. <i>faecalis</i>	ALCFAEF
<i>Alcaligenes</i> species	<i>Alc. species</i>	ALCSPE
<i>Alloiococcus otitis</i>	<i>All. otitis</i>	ALLOTI

Long Name	Short Name	Abbreviation
<i>Apiotrichum loubieri</i>	<i>Apiotr. loubieri</i>	APILOU
<i>Arcanobacterium haemolyticum</i>	<i>Arcan. haemolyticum</i>	ARCAHAE
<i>Bacillus cereus</i>	<i>Baci. cereus</i>	BACICER
<i>Bacillus licheniformis</i>	<i>Baci. licheniformis</i>	BACILIC
<i>Bacillus pumilus</i>	<i>Baci. pumilus</i>	BACIPUM
<i>Bacillus subtilis</i>	<i>Baci. subtilis</i>	BACISUB
<i>Bacillus thuringiensis</i>	<i>Baci. thuringiensis</i>	BACITHU
<i>Bergeyella zoohelcum</i>	<i>Ber. zoohelcum</i>	BERZOO
<i>Bordetella bronchiseptica</i>	<i>Bord. bronchiseptica</i>	BORBROS
<i>Brevibacillus brevis</i>	<i>Brevs. brevis</i>	BACIBRE
<i>Brevibacterium</i> species	<i>Brevm. species</i>	BREISPE
<i>Brevundimonas diminuta</i>	<i>Brevu. diminuta</i>	BREUDIM
<i>Brevundimonas</i> species	<i>Brevu. species</i>	BREUSPE
<i>Brevundimonas vesicularis</i>	<i>Brevu. vesicularis</i>	BREUVES
<i>Burkholderia caryophylli</i>	<i>Burk. caryophylli</i>	BURCAR
<i>Burkholderia cepacia</i> complex	<i>Burk. cepacia</i> complex	BURCEP
<i>Burkholderia cepacia/Ralstonia pickettii</i>	<i>Burk. cepacia/Ral. pickettii</i>	BURCEPRALPIC
<i>Burkholderia diffusa</i>	<i>Burk. diffusa</i>	BURDIF
<i>Burkholderia gladioli</i>	<i>Burk. gladioli</i>	BURGLA
<i>Burkholderia glathei</i>	<i>Burk. glathei</i>	BURGLT
<i>Burkholderia graminis</i>	<i>Burk. graminis</i>	BURGRA
<i>Burkholderia latens</i>	<i>Burk. latens</i>	BURLAT
<i>Burkholderia metallica</i>	<i>Burk. metallica</i>	BURMET
<i>Burkholderia multivorans</i>	<i>Burk. multivorans</i>	BURMUL
<i>Burkholderia phenazinium</i>	<i>Burk. phenazinium</i>	BURPHE
<i>Burkholderia pyrrocinia</i>	<i>Burk. pyrrocinia</i>	BURPYR
<i>Burkholderia seminalis</i>	<i>Burk. seminalis</i>	BURSEM
<i>Burkholderia</i> species	<i>Burk. species</i>	BURSPE
<i>Burkholderia</i> species/ <i>Ralstonia</i> species	<i>Burk. species/Ral. species</i>	BURSPERALSPE
<i>Candida albicans</i>	<i>Can. albicans</i>	CANALB
<i>Candida apicola</i>	<i>Can. apicola</i>	CANAPI
<i>Candida boidinii</i>	<i>Can. boidinii</i>	CANBOI
<i>Candida bracarensis</i>	<i>Can. bracarensis</i>	CANBRA
<i>Candida ciferrii</i>	<i>Can. ciferrii</i>	CANCIF
<i>Candida dubliniensis</i>	<i>Can. dubliniensis</i>	CANDUB

Long Name	Short Name	Abbreviation
<i>Candida firmetaria</i>	<i>Can. firmetaria</i>	CANLAM
<i>Candida freyschussii</i>	<i>Can. freyschussii</i>	CANFRE
<i>Candida glabrata</i>	<i>Can. glabrata</i>	TORGLA
<i>Candida guilliermondii</i>	<i>Can. guilliermondii</i>	CANGUI
<i>Candida guilliermondii</i> var <i>membranaefaciens</i>	<i>Can. guillier. var membranaef.</i>	CANGUIM
<i>Candida haemulonii/auris</i>	<i>Can. haemulonii/auris</i>	CANHAEUR
<i>Candida inconspicua</i>	<i>Can. inconspicua</i>	CANINC
<i>Candida kefyr</i>	<i>Can. kefyr</i>	CANKEF
<i>Candida krusei</i>	<i>Can. krusei</i>	CANKRU
<i>Candida lipolytica</i>	<i>Can. lipolytica</i>	CANLIP
<i>Candida lusitanae</i>	<i>Can. lusitanae</i>	CANLUS
<i>Candida melibiosica</i>	<i>Can. melibiosica</i>	CANMEL
<i>Candida membranifaciens</i>	<i>Can. membranifaciens</i>	CANMEM
<i>Candida parapsilosis</i> complex	<i>Can. parapsilosis</i> complex	CANPARPX
<i>Candida pelliculosa</i>	<i>Can. pelliculosa</i>	CANPEL
<i>Candida pulcherrima</i>	<i>Can. pulcherrima</i>	CANPUL
<i>Candida sake</i>	<i>Can. sake</i>	CANSAK
<i>Candida sphaerica</i>	<i>Can. sphaerica</i>	CANSPH
<i>Candida tropicalis</i>	<i>Can. tropicalis</i>	CANTRO
<i>Candida utilis</i>	<i>Can. utilis</i>	CANUTI
<i>Candida viswanathii</i>	<i>Can. viswanathii</i>	CANVIS
<i>Candida zeylanoides</i>	<i>Can. zeylanoides</i>	CANZEY
<i>Cardiobacterium hominis</i>	<i>Card. hominis</i>	CARHOM
CDC group Vb-3	CDCVb-3	CDCVb3
<i>Cedecea davisae</i>	<i>Ced. davisae</i>	CEDDAV
<i>Cedecea lapagei</i>	<i>Ced. lapagei</i>	CEDLAP
<i>Cedecea neteri</i>	<i>Ced. neteri</i>	CEDNET
<i>Cedecea</i> species	<i>Ced. species</i>	CEDSPE
<i>Cedecea</i> species 3	<i>Ced. species 3</i>	CEDSPE3
<i>Cedecea</i> species 5	<i>Ced. species 5</i>	CEDSPE5
<i>Cellulosimicrobium cellulans</i>	<i>Cellulo. cellulans</i>	CLLCEL
<i>Chromobacterium violaceum</i>	<i>Chrom. violaceum</i>	CHROVIO
<i>Chryseobacterium gleum</i>	<i>Chryseob. gleum</i>	CHRBGLE
<i>Chryseobacterium indologenes</i>	<i>Chryseob. indologenes</i>	CHRBIND
<i>Chryseobacterium scophthalmum</i>	<i>Chryseob. scophthalmum</i>	CHRBSCO

Long Name	Short Name	Abbreviation
<i>Chryseobacterium</i> species	<i>Chryseob.</i> species	CHRBSPE
<i>Citrobacter amalonaticus</i>	<i>Cit. amalonaticus</i>	CITAMA
<i>Citrobacter braakii</i>	<i>Cit. braakii</i>	CITBRA
<i>Citrobacter farmeri</i>	<i>Cit. farmeri</i>	CITFAR
<i>Citrobacter freundii</i>	<i>Cit. freundii</i>	CITFRE
<i>Citrobacter gillenii</i>	<i>Cit. gillenii</i>	CITSPE10
<i>Citrobacter koseri</i>	<i>Cit. koseri</i>	CITKOS
<i>Citrobacter murlinae</i>	<i>Cit. murlinae</i>	CITSPE11
<i>Citrobacter rodentium</i>	<i>Cit. rodentium</i>	CITSPE9
<i>Citrobacter sedlakii</i>	<i>Cit. sedlakii</i>	CITSED
<i>Citrobacter</i> species	<i>Cit. species</i>	CITSPE
<i>Citrobacter werkmanii</i>	<i>Cit. werkmanii</i>	CITWER
<i>Citrobacter youngae</i>	<i>Cit. youngae</i>	CITYOU
<i>Comamonas terrigena</i>	<i>Coma. terrigena</i>	COMTER
<i>Comamonas testosteroni</i>	<i>Coma. testosteroni</i>	COMTES
<i>Corynebacterium amycolatum</i>	<i>Cory. amycolatum</i>	CORAMY
<i>Corynebacterium amycolatum/ minutissimum</i>	<i>Cory. amycolatum/ minutissimum</i>	CORAMYMIN
<i>Corynebacterium amycolatum/ striatum</i>	<i>Cory. amycolatum/ striatum</i>	CORAMYSTR
<i>Corynebacterium bovis</i>	<i>Cory. bovis</i>	CORBOV
<i>Corynebacterium diphtheriae</i>	<i>Cory. diphtheriae</i>	CORDIP
<i>Corynebacterium jeikeium</i>	<i>Cory. jeikeium</i>	CORJEI
<i>Corynebacterium kutscheri</i>	<i>Cory. kutscheri</i>	CORKUT
<i>Corynebacterium matruchotii</i>	<i>Cory. matruchotii</i>	CORMAT
<i>Corynebacterium minutissimum</i>	<i>Cory. minutissimum</i>	CORMIN
<i>Corynebacterium propinquum</i>	<i>Cory. propinquum</i>	CORPRO
<i>Corynebacterium pseudodiphtheriticum</i>	<i>Cory. pseudodiphth.</i>	CORPSD
<i>Corynebacterium pseudotuberculosis</i>	<i>Cory. pseudotuberc.</i>	CORPST
<i>Corynebacterium renale</i>	<i>Cory. renale</i>	CORREN
<i>Corynebacterium striatum</i>	<i>Cory. striatum</i>	CORSTR
<i>Corynebacterium ulcerans</i>	<i>Cory. ulcerans</i>	CORULC
<i>Corynebacterium urealyticum</i>	<i>Cory. urealyticum</i>	CORURE
<i>Corynebacterium xerosis</i>	<i>Cory. xerosis</i>	CORXER
<i>Cronobacter sakazakii</i> complex	<i>Cronob. sakazakii</i> complex	ENTBSAK
<i>Cryptococcus gattii</i>	<i>Cryp. gattii</i>	CRYNEOG
<i>Cryptococcus humicola</i>	<i>Cryp. humicola</i>	CRYHUM
<i>Cryptococcus luteolus</i>	<i>Cryp. luteolus</i>	CRYLUT

Long Name	Short Name	Abbreviation
<i>Cryptococcus neoformans</i>	<i>Cryp. neoformans</i>	CRYNEO
<i>Cryptococcus uniguttulatus</i>	<i>Cryp. uniguttulatus</i>	CRYUNI
<i>Cupriavidus gilardii</i>	<i>Cup. gilardii</i>	RALGIL
<i>Cupriavidus pauculus</i>	<i>Cup. pauculus</i>	CDCIVC2
<i>Cutaneotrichosporon mucoides</i>	<i>Cutaneotrich. mucoides</i>	CUTTMUC
<i>Cystobasidium minutum</i>	<i>Cystobas. minutum</i>	CYSBMIN
<i>Delftia acidovorans</i>	<i>Delf. acidovorans</i>	COMACI
<i>Dermabacter hominis</i>	<i>Dermab. hominis</i>	DERBHOM
<i>Dermacoccus nishinomiyaensis</i>	<i>Derm. nishinomiyaen.</i>	MICNIS
<i>Diutina catenulata</i>	<i>Diut. catenulata</i>	DIUCAT
<i>Diutina rugosa</i>	<i>Diut. rugosa</i>	DIURUG
<i>Edwardsiella hoshinae</i>	<i>Ed. hoshinae</i>	EDWHOS
<i>Edwardsiella ictaluri</i>	<i>Ed. ictaluri</i>	EDWICT
<i>Edwardsiella species</i>	<i>Ed. species</i>	EDWSPE
<i>Edwardsiella tarda</i>	<i>Ed. tarda</i>	EDWTAR
<i>Edwardsiella tarda</i> biogroup 1	<i>Ed. tarda</i> biogr. 1	EDWTAR1
<i>Eikenella corrodens</i>	<i>Eik. corrodens</i>	EIKCOR
<i>Elizabethkingia anophelis</i>	<i>Eliz. anophelis</i>	ELIANO
<i>Elizabethkingia meningoseptica</i>	<i>Eliz. meningosept.</i>	CHRBMEN
<i>Elizabethkingia miricola</i>	<i>Eliz. miricola</i>	ELIMIR
<i>Empedobacter brevis</i>	<i>Emp. brevis</i>	EMPBRE
<i>Enterobacter asburiae</i>	<i>Enterob. asburiae</i>	ENTBASB
<i>Enterobacter bugandensis</i>	<i>Enterob. bugandensis</i>	ENTBBUG
<i>Enterobacter cancerogenus</i>	<i>Enterob. cancerogenus</i>	ENTBCAN
<i>Enterobacter cloacae</i>	<i>Enterob. cloacae</i>	ENTBCLO
<i>Enterobacter cloacae</i> ssp. <i>dissolvens</i>	<i>Enterob. cloacae</i> ssp. <i>dissolven</i>	ENTBDIS
<i>Enterobacter hormaechei</i>	<i>Enterob. hormaechei</i>	ENTBHOR
<i>Enterobacter kobei</i>	<i>Enterob. kobei</i>	ENTBKOB
<i>Enterobacter ludwigii</i>	<i>Enterob. ludwigii</i>	ENTBLUD
<i>Enterobacter species</i>	<i>Enterob. species</i>	ENTBSPE
<i>Enterococcus asini</i>	<i>Enteroc. asini</i>	ENTCASI
<i>Enterococcus avium</i>	<i>Enteroc. avium</i>	ENTCAVI
<i>Enterococcus casseliflavus</i>	<i>Enteroc. casseliflavus</i>	ENTCCAS
<i>Enterococcus casseliflavus/gallinarum</i>	<i>Enteroc. cassel./gallin.</i>	ENTCCASGAL

Long Name	Short Name	Abbreviation
<i>Enterococcus cecorum</i>	<i>Enteroc. cecorum</i>	ENTCCEC
<i>Enterococcus columbae</i>	<i>Enteroc. columbae</i>	ENTCCOL
<i>Enterococcus dispar</i>	<i>Enteroc. dispar</i>	ENTCDIS
<i>Enterococcus durans</i>	<i>Enteroc. durans</i>	ENTCDUR
<i>Enterococcus durans/faecium</i>	<i>Enteroc. durans/faecium</i>	ENTCDURFAI
<i>Enterococcus faecalis</i>	<i>Enteroc. faecalis</i>	ENTCFAA
<i>Enterococcus faecalis/faecium</i>	<i>Enteroc. faecalis/faecium</i>	ENTCFAAFAI
<i>Enterococcus faecium</i>	<i>Enteroc. faecium</i>	ENTCFAI
<i>Enterococcus flavescens</i>	<i>Enteroc. flavescens</i>	ENTCFLA
<i>Enterococcus gallinarum</i>	<i>Enteroc. gallinarum</i>	ENTCGAL
<i>Enterococcus gilvus</i>	<i>Enteroc. gilvus</i>	ENTCGIL
<i>Enterococcus haemoperoxidus</i>	<i>Enteroc. haemoperoxidus</i>	ENTCHAE
<i>Enterococcus hirae</i>	<i>Enteroc. hirae</i>	ENTCHIR
<i>Enterococcus hirae/faecium</i>	<i>Enteroc. hirae/faecium</i>	ENTCHIRFAI
<i>Enterococcus malodoratus</i>	<i>Enteroc. malodoratus</i>	ENTCMAL
<i>Enterococcus moraviensis</i>	<i>Enteroc. moraviensis</i>	ENTCMOR
<i>Enterococcus mundtii</i>	<i>Enteroc. mundtii</i>	ENTCMUN
<i>Enterococcus pallens</i>	<i>Enteroc. pallens</i>	ENTCPAL
<i>Enterococcus pseudoavium</i>	<i>Enteroc. pseudoavium</i>	ENTCPSE
<i>Enterococcus raffinosus</i>	<i>Enteroc. raffinosus</i>	ENTCRAF
<i>Enterococcus raffinosus/avium</i>	<i>Enteroc. raffinosus/avium</i>	ENTCRAFAVI
<i>Enterococcus ratti</i>	<i>Enteroc. ratti</i>	ENTCRAT
<i>Enterococcus saccharolyticus</i>	<i>Enteroc. saccharolyticus</i>	ENTCSAC
<i>Enterococcus species</i>	<i>Enteroc. species</i>	ENTCSPE
<i>Enterococcus sulfureus</i>	<i>Enteroc. sulfureus</i>	ENTCSUL
<i>Erysipelothrix rhusiopathiae</i>	<i>Ery. rhusiopathiae</i>	ERYRHU
<i>Escherichia albertii</i>	<i>Esch. albertii</i>	ESCALB
<i>Escherichia coli</i>	<i>Esch. coli</i>	ESCCOL
<i>Escherichia coli</i> serotype O111	<i>Esch. coli</i> O111	ESCCOL0111
<i>Escherichia coli</i> serotype O157	<i>Esch. coli</i> O157	ESCCOL0157
<i>Escherichia fergusonii</i>	<i>Esch. fergusonii</i>	ESCFER
<i>Escherichia hermannii</i>	<i>Esch. hermannii</i>	ESCHER
<i>Escherichia species</i>	<i>Esch. species</i>	ESCSPE
<i>Ewingella americana</i>	<i>Ew. americana</i>	EWIAME
<i>Exophiala dermatitidis</i>	<i>Exo. dermatitidis</i>	EXODER
<i>Exophiala species</i>	<i>Exo. species</i>	EXOSPE

Long Name	Short Name	Abbreviation
<i>Gardnerella vaginalis</i>	<i>Gard. vaginalis</i>	GARVAG
<i>Gemella haemolysans</i>	<i>Gem. haemolysans</i>	GEMHAE
<i>Gemella morbillorum</i>	<i>Gem. morbillorum</i>	GEMMOR
<i>Gemella</i> species	<i>Gem. species</i>	GEMSPE
<i>Geotrichum</i> species	<i>Geo. species</i>	GEOSPE
<i>Globicatella sanguinis</i>	<i>Glob. sanguinis</i>	GLOSAN
Gram-negative rod unidentified enteric	GNR unident. enteric	GNRUNIE
Gram-negative rod unidentified nonfermenter	GNR unident. NF	GNRUNINF
<i>Grimontia hollisae</i>	<i>Grim. hollisae</i>	VIBHOL
<i>Hafnia alvei</i>	<i>Haf. alvei</i>	HAFALV
<i>Hafnia alvei</i> group 1	<i>Haf. alvei</i> gr. 1	HAFALV1
<i>Helcococcus kunzii</i>	<i>Helco. kunzii</i>	HELCKUN
<i>Hortaea werneckii</i>	<i>Hor. werneckii</i>	HORWER
<i>Hyphopichia burtonii</i>	<i>Hyphop. burtonii</i>	HYPBUR
<i>Kingella denitrificans</i>	<i>King. denitrificans</i>	KINDEN
<i>Kingella kingae</i>	<i>King. kingae</i>	KINKIN
<i>Klebsiella aerogenes</i>	<i>Kleb. aerogenes</i>	KLEAER
<i>Klebsiella granulomatis</i>	<i>Kleb. granulomatis</i>	CALYGRA
<i>Klebsiella oxytoca</i>	<i>Kleb. oxytoca</i>	KLEOXY
<i>Klebsiella pneumoniae</i> ssp. <i>ozaenae</i>	<i>Kleb. ozaenae</i>	KLEPNEO
<i>Klebsiella pneumoniae</i> ssp. <i>pneumoniae</i>	<i>Kleb. pneumoniae</i>	KLEPNEP
<i>Klebsiella pneumoniae</i> ssp. <i>rhinoscleromatis</i>	<i>Kleb. rhinoscleromatis</i>	KLEPNER
<i>Klebsiella</i> species	<i>Kleb. species</i>	KLESPE
<i>Klebsiella variicola</i>	<i>Kleb. variicola</i>	KLEVAR
<i>Kloeckera</i> species	<i>Kloeck. species</i>	KLOSPE
<i>Kluyvera ascorbata</i>	<i>Kluyvera ascorbata</i>	KLUASC
<i>Kluyvera cryocrescens</i>	<i>Kluyvera cryocres.</i>	KLUCRY
<i>Kluyvera georgiana</i>	<i>Kluyvera georgiana</i>	KLUGEO
<i>Kluyvera intermedia</i>	<i>Kluyvera intermedia</i>	ENTBINT
<i>Kluyvera</i> species	<i>Kluyvera species</i>	KLUSPE
<i>Kocuria rosea</i>	<i>Koc. rosea</i>	MICROS
<i>Kocuria varians</i>	<i>Koc. varians</i>	MICVAR
<i>Kytococcus sedentarius</i>	<i>Kyto. sedentarius</i>	MICSED
<i>Lactococcus garvieae</i>	<i>Lactoc. garvieae</i>	LACCGAR
<i>Lactococcus lactis</i> ssp. <i>cremoris</i>	<i>Lactoc. lactis</i> ssp. <i>crem.</i>	LACCLACC

Long Name	Short Name	Abbreviation
<i>Lactococcus lactis</i> ssp. <i>hordniae</i>	<i>Lactoc. lactis</i> ssp. <i>hord.</i>	LACCLACH
<i>Lactococcus lactis</i> ssp. <i>lactis</i>	<i>Lactoc. lactis</i> ssp. <i>lactis</i>	LACCLACL
<i>Lactococcus plantarum</i>	<i>Lactoc. plantarum</i>	LACCPLA
<i>Lactococcus raffinolactis</i>	<i>Lactoc. raffinolactis</i>	LACCRAF
<i>Lactococcus</i> species	<i>Lactoc. species</i>	LACCSPE
<i>Lapidilactobacillus dextrinicus</i>	<i>Lapidilact. dextrinicus</i>	LAPDEX
<i>Leclercia adecarboxylata</i>	<i>Lec. adecarboxylata</i>	LECADE
<i>Leifsonia aquatica</i>	<i>Leif. aquatica</i>	CORAQU
<i>Lelliottia amnigena</i>	<i>Lell. amnigena</i>	LELAMN
<i>Lelliottia amnigena</i> biogroup 1	<i>Lell. amnigena</i> biogr. 1	LELAMN1
<i>Lelliottia amnigena</i> biogroup 2	<i>Lell. amnigena</i> biogr. 2	LELAMN2
<i>Lelliottia nimipressuralis</i>	<i>Lell. nimipressuralis</i>	LELNIM
<i>Leminorella grimontii</i>	<i>Lem. grimontii</i>	LEMGRI
<i>Leminorella richardii</i>	<i>Lem. richardii</i>	LEMRIC
<i>Leuconostoc citreum</i>	<i>Leu. citreum</i>	LEUCIT
<i>Leuconostoc lactis</i>	<i>Leu. lactis</i>	LEULAC
<i>Leuconostoc mesenteroides</i> ssp. <i>cremoris</i>	<i>Leu. mesenter. ssp. crem.</i>	LEUMESC
<i>Leuconostoc mesenteroides</i> ssp. <i>mesenteroides</i>	<i>Leu. mesenter. ssp. mes.</i>	LEUMESM
<i>Leuconostoc pseudomesenteroides</i>	<i>Leu. pseudomesenter.</i>	LEUPSE
<i>Leuconostoc</i> species	<i>Leu. species</i>	LEUSPE
<i>Listeria grayi</i>	<i>Lis. grayi</i>	LISGRA
<i>Listeria innocua</i>	<i>Lis. innocua</i>	LISINN
<i>Listeria ivanovii</i>	<i>Lis. ivanovii</i>	LISIVA
<i>Listeria monocytogenes</i>	<i>Lis. monocytogenes</i>	LISMON
<i>Listeria monocytogenes/innocua</i>	<i>Lis. monocytogenes/innocua</i>	LISMONINN
<i>Listeria</i> species	<i>Lis. species</i>	LISSPE
<i>Listeria welshimeri</i>	<i>Lis. welshimeri</i>	LISWEL
<i>Lysinibacillus sphaericus</i>	<i>Lysini. sphaericus</i>	BACISPH
<i>Macrococcus caseolyticus</i>	<i>Macroc. caseolyticus</i>	STACAS
<i>Magnusiomyces capitatus</i>	<i>Magnus. capitatus</i>	MAGCAP
<i>Malassezia furfur</i> complex	<i>Mal. furfur</i> complex	MALFURX
<i>Malassezia pachydermatis</i>	<i>Mal. pachydermatis</i>	MALPAC
<i>Malassezia sympodialis</i>	<i>Mal. sympodialis</i>	MALSYM
<i>Mannheimia haemolytica</i>	<i>Mann. haemolytica</i>	PASHAE

Long Name	Short Name	Abbreviation
<i>Methylobacterium extorquens</i>	<i>Methylob. extorquens</i>	METREXT
<i>Micrococcus luteus</i>	<i>Microc. luteus</i>	MICLUT
<i>Micrococcus lylae</i>	<i>Microc. lylae</i>	MICLYL
<i>Millerozyma farinosa</i>	<i>Mill. farinosa</i>	MILFAR
<i>Mixta calida</i>	<i>Mix. calida</i>	MIXCAL
<i>Mixta calida/gaviniae</i>	<i>Mix. calida/gaviniae</i>	MIXCALGAV
<i>Mixta gaviniae</i>	<i>Mix. gaviniae</i>	MIXGAV
<i>Moellerella wisconsensis</i>	<i>Moel. wisconsensis</i>	MOEWIS
<i>Moraxella (Branhamella) catarrhalis</i>	<i>Morax. (Bran.) cat.</i>	MORABRACAT
<i>Moraxella</i> species	<i>Morax. species</i>	MORASPE
<i>Morganella morganii</i>	<i>Morg. morganii</i>	MORGMOR
<i>Morganella morganii</i> ssp. <i>morganii</i>	<i>Morg. morg. ssp. morg.</i>	MORGMORM
<i>Morganella morganii</i> ssp. <i>morganii</i> biogroup 1	<i>Morg. morg. ssp. morg. biog. 1</i>	MORGMORM1
<i>Morganella morganii</i> ssp. <i>sibonii</i>	<i>Morg. morg. ssp. sibonii</i>	MORGMORS
<i>Morganella</i> species	<i>Morg. species</i>	MORGSPE
<i>Myroides ceti</i>	<i>Myr. ceti</i>	MYRCET
<i>Myroides injenensis</i>	<i>Myr. injenensis</i>	MYRINJ
<i>Myroides odoratimimus</i>	<i>Myr. odoratimimus</i>	MYRODI
<i>Myroides odoratus</i>	<i>Myr. odoratus</i>	MYRODA
<i>Myroides odoratus/odoratimimus</i>	<i>Myr. odoratus/odoratimimus</i>	MYRODAODI
<i>Myroides</i> species	<i>Myr. species</i>	MYRSPE
<i>Naganishia albida</i>	<i>Nag. albida</i>	NAGALB
<i>Neisseria animaloris</i>	<i>Nei. animaloris</i>	NEIANI
<i>Neisseria zoodegmatis</i>	<i>Nei. zoodegmatis</i>	NEIZOO
<i>Niallia circulans</i>	<i>Nia. circulans</i>	NIACIR
<i>Ochrobactrum anthropi</i>	<i>Och. anthropi</i>	OCHANT
<i>Oerskovia turbata</i>	<i>Oers. turbata</i>	OERTUR
<i>Oligella ureolytica</i>	<i>Olig. ureolytica</i>	OLIURO
<i>Oligella urethralis</i>	<i>Olig. urethralis</i>	OLIURT
<i>Paenibacillus alvei</i>	<i>Paen. alvei</i>	PAEALV
<i>Paenibacillus macerans</i>	<i>Paen. macerans</i>	PAEMAC
<i>Pantoea agglomerans</i>	<i>Pan. agglomerans</i>	PANAGG
<i>Pantoea ananatis</i>	<i>Pan. ananatis</i>	ERWANA

Long Name	Short Name	Abbreviation
<i>Pantoea brenneri</i>	<i>Pan. brenneri</i>	PANBRE
<i>Pantoea conspicua</i>	<i>Pan. conspicua</i>	PANCON
<i>Pantoea dispersa</i>	<i>Pan. dispersa</i>	PANDIS
<i>Pantoea eucrina</i>	<i>Pan. eucrina</i>	PANEUC
<i>Pantoea septica</i>	<i>Pan. septica</i>	PANSEP
<i>Pantoea</i> species	<i>Pan. species</i>	PANSPE
<i>Pantoea stewartii</i>	<i>Pan. stewartii</i>	PANSTE
<i>Pantoea stewartii</i> ssp. <i>indologenes</i>	<i>Pan. ste. ssp. indologenes</i>	PANSTEI
<i>Pantoea stewartii</i> ssp. <i>stewartii</i>	<i>Pan. ste. ssp. stewartii</i>	PANSTES
<i>Papiliotrema laurentii</i>	<i>Pap. laurentii</i>	PAPLAU
<i>Paracoccus yeei</i>	<i>Parac. yeei</i>	PARCYEE
<i>Pasteurella aerogenes</i>	<i>Past. aerogenes</i>	PASAER
<i>Pasteurella multocida</i>	<i>Past. multocida</i>	PASMUL
<i>Pediococcus acidilactici</i>	<i>Ped. acidilactici</i>	PEDACI
<i>Pediococcus damnosus</i>	<i>Ped. damnosus</i>	PEDDAM
<i>Pediococcus parvulus</i>	<i>Ped. parvulus</i>	PEDPAR
<i>Pediococcus pentosaceus</i>	<i>Ped. pentosaceus</i>	PEDPEN
<i>Pediococcus</i> species	<i>Ped. species</i>	PEDSPE
<i>Photobacterium damsela</i>	<i>Photob. damsela</i>	PHOBDAM
<i>Pichia norvegensis</i>	<i>Pic. norvegensis</i>	PICNOR
<i>Plesiomonas shigelloides</i>	<i>Ples. shigelloides</i>	PLESHI
<i>Plesiomonas</i> species	<i>Ples. species</i>	PLESPE
<i>Pluralibacter gergoviae</i>	<i>Plural. gergoviae</i>	PLUGER
<i>Pragia fontium</i>	<i>Prag. fontium</i>	PRAFON
<i>Priestia megaterium</i>	<i>Priest. megaterium</i>	PRIMEG
<i>Proteus hauseri</i>	<i>Prot. hauseri</i>	PROTHAU
<i>Proteus mirabilis</i>	<i>Prot. mirabilis</i>	PROTMIR
<i>Proteus penneri</i>	<i>Prot. penneri</i>	PROTPEN
<i>Proteus</i> species	<i>Prot. species</i>	PROTSPE
<i>Proteus vulgaris</i>	<i>Prot. vulgaris</i>	PROTVUL
<i>Proteus vulgaris/penneri</i>	<i>Prot. vulgaris/penneri</i>	PROTVULPEN
<i>Prototheca wickerhamii</i>	<i>Protot. wick.</i>	PROHWIC
<i>Prototheca zopfii</i>	<i>Protot. zopfii</i>	PROHZOP
<i>Providencia alcalifaciens</i>	<i>Prov. alcalifaciens</i>	PROVALC

Long Name	Short Name	Abbreviation
<i>Providencia heimbachae</i>	<i>Prov. heimbachae</i>	PROVHEI
<i>Providencia rettgeri</i>	<i>Prov. rettgeri</i>	PROVRET
<i>Providencia rustigianii</i>	<i>Prov. rustigianii</i>	PROVRUS
<i>Providencia species</i>	<i>Prov. species</i>	PROVSPE
<i>Providencia stuartii</i>	<i>Prov. stuartii</i>	PROVSTU
<i>Pseudescherichia vulneris</i>	<i>Pseudes. vulneris</i>	PSEEVUL
<i>Pseudomonas aeruginosa</i>	<i>Pseud. aeruginosa</i>	PSEAER
<i>Pseudomonas alcaligenes</i>	<i>Pseud. alcaligenes</i>	PSEALC
<i>Pseudomonas fluorescens</i>	<i>Pseud. fluorescens</i>	PSEFLU
<i>Pseudomonas fluorescens/putida</i>	<i>Pseud. fluorescens/putida</i>	PSEFLUPUT
<i>Pseudomonas luteola</i>	<i>Pseud. luteola</i>	CHRMLUT
<i>Pseudomonas massiliensis</i>	<i>Pseud. massiliensis</i>	PSEMAS
<i>Pseudomonas mendocina</i>	<i>Pseud. mendocina</i>	PSEMEN
<i>Pseudomonas monteilii</i>	<i>Pseud. monteilii</i>	PSEMON
<i>Pseudomonas nosocomialis</i>	<i>Pseud. nosocomialis</i>	PSEKOS
<i>Pseudomonas oryzae</i>	<i>Pseud. oryzae</i>	FLAIORY
<i>Pseudomonas pertucinogena</i>	<i>Pseud. pertucinogena</i>	PSEPER
<i>Pseudomonas pseudoalcaligenes</i>	<i>Pseud. pseudoalcaligenes</i>	PSEPSE
<i>Pseudomonas pseudoalcaligenes ssp. pseudoalcaligenes</i>	<i>Pseud. pseudoal. ssp. pseud.</i>	PSEPSEP
<i>Pseudomonas putida</i>	<i>Pseud. putida</i>	PSEPUT
<i>Pseudomonas species</i>	<i>Pseud. species</i>	PSESPE
<i>Pseudomonas stutzeri</i>	<i>Pseud. stutzeri</i>	PSESTU
<i>Pseudomonas veronii</i>	<i>Pseud. veronii</i>	PSEVER
<i>Rahnella aquatilis</i>	<i>Rah. aquatilis</i>	RAHAQU
<i>Ralstonia insidiosa</i>	<i>Ral. insidiosa</i>	RALINS
<i>Ralstonia pickettii</i>	<i>Ral. pickettii</i>	BURPIC
<i>Ralstonia solanacearum</i>	<i>Ral. solanacearum</i>	BURSOL
<i>Ralstonia species</i>	<i>Ral. species</i>	RALSPE
<i>Raoultella ornithinolytica</i>	<i>Rao. ornithinolytica</i>	KLEORN
<i>Raoultella planticola</i>	<i>Rao. planticola</i>	KLEPLA
<i>Raoultella species</i>	<i>Rao. species</i>	RAOSPE
<i>Raoultella terrigena</i>	<i>Rao. terrigena</i>	KLETER
<i>Rhodococcus equi</i>	<i>Rhodoc. equi</i>	RHOCEQU
<i>Rhodotorula glutinis</i>	<i>Rhodot. glutinis</i>	RHOTGLU

Long Name	Short Name	Abbreviation
<i>Rhodotorula mucilaginosa</i> var <i>mucilaginosa</i>	<i>Rhodot. mucilag. var mucilag.</i>	RHOTMUCM
<i>Rodentibacter pneumotropicus</i>	<i>Rod. pneumotropicus</i>	RODPNE
<i>Rothia dentocariosa</i>	<i>Roth. dentocariosa</i>	ROTDEN
<i>Rothia kristinae</i>	<i>Roth. kristinae</i>	MICKRI
<i>Rothia mucilaginosa</i>	<i>Roth. mucilaginosa</i>	STOMUC
<i>Saccharomyces cerevisiae</i>	<i>Sac. cerevisiae</i>	SACCER
<i>Salmonella enterica</i> ssp. <i>arizonae</i>	<i>Salm. enterica</i> ssp. <i>arizonae</i>	SALCHOA
<i>Salmonella enterica</i> ssp. <i>diarizonae</i>	<i>Salm. enterica</i> ssp. <i>diarizonae</i>	SALCHOD
<i>Salmonella enterica</i> ssp. <i>enterica</i> serovar Choleraesuis	<i>Salm. enterica</i> sv Choleraesuis	SALCHOC
<i>Salmonella enterica</i> ssp. <i>enterica</i> sv Gallinarum bv Gallinarum	<i>Salm. Gallinarum</i>	SALGAL
<i>Salmonella enterica</i> ssp. <i>enterica</i> sv Gallinarum bv Pullorum	<i>Salm. Pullorum</i>	SALPUL
<i>Salmonella enterica</i> ssp. <i>enterica</i> sv Paratyphi A	<i>Salm. Paratyphi A</i>	SALPARA
<i>Salmonella enterica</i> ssp. <i>enterica</i> sv Typhi	<i>Salm. Typhi</i>	SALTYP
<i>Salmonella enterica</i> ssp. <i>houtenae</i>	<i>Salm. enterica</i> ssp. <i>houtenae</i>	SALCHOH
<i>Salmonella enterica</i> ssp. <i>indica</i>	<i>Salm. enterica</i> ssp. <i>indica</i>	SALCHOI
<i>Salmonella enterica</i> ssp. <i>salamae</i>	<i>Salm. enterica</i> ssp. <i>salamae</i>	SALCHOS
<i>Salmonella</i> species	<i>Salm. species</i>	SALSPE
<i>Serratia entomophila</i>	<i>Ser. entomophila</i>	SERENT
<i>Serratia ficaria</i>	<i>Ser. ficaria</i>	SERFIC
<i>Serratia fonticola</i>	<i>Ser. fonticola</i>	SERFON
<i>Serratia grimesii</i>	<i>Ser. grimesii</i>	SERGRI
<i>Serratia liquefaciens</i>	<i>Ser. liquefaciens</i>	SERLIQ
<i>Serratia marcescens</i>	<i>Ser. marcescens</i>	SERMAR
<i>Serratia odorifera</i>	<i>Ser. odorifera</i>	SERODO
<i>Serratia odorifera</i> 1	<i>Ser. odorifera</i> 1	SERODO1
<i>Serratia odorifera</i> 2	<i>Ser. odorifera</i> 2	SERODO2
<i>Serratia plymuthica</i>	<i>Ser. plymuthica</i>	SERPLY
<i>Serratia proteamaculans</i> ssp. <i>proteamaculans</i>	<i>Ser. proteamac. ssp. proteam.</i>	SERPROP
<i>Serratia proteamaculans</i> ssp. <i>quinovora</i>	<i>Ser. proteamac. ssp. quino.</i>	SERPROQ
<i>Serratia rubidaea</i>	<i>Ser. rubidaea</i>	SERRUB
<i>Serratia</i> species	<i>Ser. species</i>	SERSPE
<i>Shewanella algae</i>	<i>Shew. algae</i>	SHEALG

Long Name	Short Name	Abbreviation
<i>Shewanella algicola</i>	<i>Shew. algicola</i>	SHEALGC
<i>Shewanella atlantica</i>	<i>Shew. atlantica</i>	SHEATL
<i>Shewanella colwelliana</i>	<i>Shew. colwelliana</i>	SHECOL
<i>Shewanella corallii</i>	<i>Shew. corallii</i>	SHECOR
<i>Shewanella dokdonensis</i>	<i>Shew. dokdonensis</i>	SHEDOK
<i>Shewanella gaetbuli</i>	<i>Shew. gaetbuli</i>	SHEGAE
<i>Shewanella halifaxensis</i>	<i>Shew. halifaxensis</i>	SHEHAL
<i>Shewanella indica</i>	<i>Shew. indica</i>	SHEIND
<i>Shewanella japonica</i>	<i>Shew. japonica</i>	SHEJAP
<i>Shewanella kaireitica</i>	<i>Shew. kaireitica</i>	SHEKAI
<i>Shewanella putrefaciens</i>	<i>Shew. putrefaciens</i>	SHEPUT
<i>Shewanella species</i>	<i>Shew. species</i>	SHESPE
<i>Shewanella woodyi</i>	<i>Shew. woodyi</i>	SHEWOO
<i>Shewanella xiamenensis</i>	<i>Shew. xiamenensis</i>	SHEXIA
<i>Shigella boydii</i>	<i>Shig. boydii</i>	SHIBOY
<i>Shigella dysenteriae</i>	<i>Shig. dysenteriae</i>	SHIDYS
<i>Shigella flexneri</i>	<i>Shig. flexneri</i>	SHIFLE
<i>Shigella sonnei</i>	<i>Shig. sonnei</i>	SHISON
<i>Shigella species</i>	<i>Shig. species</i>	SHISPE
<i>Solicoccozyma terrea</i>	<i>Solicocco. terrea</i>	SOLITER
<i>Sphingobacterium multivorum</i>	<i>Sphingob. multivorum</i>	SPHBMUL
<i>Sphingobacterium multivorum/thalpophilum</i>	<i>Sphb. multivorum/thalpophilum</i>	SPHBMULTHA
<i>Sphingobacterium species</i>	<i>Sphingob. species</i>	SPHBSPE
<i>Sphingobacterium spiritivorum</i>	<i>Sphingob. spiritivorum</i>	SPHBSPI
<i>Sphingobacterium thalpophilum</i>	<i>Sphingob. thalpophilum</i>	SPHBTHA
<i>Sphingomonas aerolata</i>	<i>Sphingom. aerolata</i>	SPHMAER
<i>Sphingomonas paucimobilis</i>	<i>Sphingom. paucimobilis</i>	SPHMPAU
<i>Sphingomonas paucimobilis</i> group	<i>Sphingom. paucimobilis</i> gr.	SPHMPAUGR
<i>Sphingomonas sanguinis</i>	<i>Sphingom. sanguinis</i>	SPHMSAN
<i>Sporobolomyces salmonicolor</i>	<i>Sporobol. salmonicolor</i>	SPOBSAL
<i>Staphylococcus argenteus</i>	<i>Staph. argenteus</i>	STAARG
<i>Staphylococcus arlettae</i>	<i>Staph. arlettae</i>	STAARL

Long Name	Short Name	Abbreviation
<i>Staphylococcus aureus</i>	<i>Staph. aureus</i>	STAAUE
<i>Staphylococcus aureus</i> ssp. <i>anaerobius</i>	<i>Staph. aureus</i> ssp. <i>anaerob.</i>	STAAUEAN
<i>Staphylococcus aureus</i> ssp. <i>aureus</i>	<i>Staph. aureus</i> ssp. <i>aureus</i>	STAAUEAU
<i>Staphylococcus auricularis</i>	<i>Staph. auricularis</i>	STAAUI
<i>Staphylococcus borealis</i>	<i>Staph. borealis</i>	STABOR
<i>Staphylococcus capitis</i>	<i>Staph. capitis</i>	STACAI
<i>Staphylococcus capitis</i> ssp. <i>capitis</i>	<i>Staph. capitis</i> ssp. <i>capitis</i>	STACAIC
<i>Staphylococcus capitis</i> ssp. <i>urealyticus</i>	<i>Staph. capitis</i> ssp. <i>urealyt.</i>	STACAIU
<i>Staphylococcus caprae</i>	<i>Staph. caprae</i>	STACAP
<i>Staphylococcus carnosus</i>	<i>Staph. carnosus</i>	STACAR
<i>Staphylococcus carnosus</i> ssp. <i>carnosus</i>	<i>Staph. carn.</i> ssp. <i>carn.</i>	STACARC
<i>Staphylococcus carnosus</i> ssp. <i>utilis</i>	<i>Staph. carn.</i> ssp. <i>utilis</i>	STACARU
<i>Staphylococcus chromogenes</i>	<i>Staph. chromogenes</i>	STACHR
<i>Staphylococcus chromogenes/hyicus</i>	<i>Staph. chromogenes/hyicus</i>	STACHRHUI
<i>Staphylococcus coagulans</i>	<i>Staph. coagulans</i>	STACOAG
<i>Staphylococcus</i> coagulase-negative	<i>Staph. coag. neg.</i>	STACNEG
<i>Staphylococcus</i> coagulase-positive	<i>Staph. coag. pos.</i>	STACPOS
<i>Staphylococcus cohnii</i>	<i>Staph. cohnii</i>	STACOH
<i>Staphylococcus cohnii</i> ssp. <i>cohnii</i>	<i>Staph. cohnii</i> ssp. <i>cohnii</i>	STACOHC
<i>Staphylococcus condimentii</i>	<i>Staph. condimentii</i>	STACON
<i>Staphylococcus delphini</i>	<i>Staph. delphini</i>	STADEL
<i>Staphylococcus devriesei</i>	<i>Staph. devriesei</i>	STADEV
<i>Staphylococcus epidermidis</i>	<i>Staph. epidermidis</i>	STAEPI
<i>Staphylococcus equorum</i>	<i>Staph. equorum</i>	STAEQU
<i>Staphylococcus felis</i>	<i>Staph. felis</i>	STAFEL
<i>Staphylococcus fleurettii</i>	<i>Staph. fleurettii</i>	STAFLE
<i>Staphylococcus gallinarum</i>	<i>Staph. gallinarum</i>	STAGAL
<i>Staphylococcus haemolyticus</i>	<i>Staph. haemolyticus</i>	STAHAE
<i>Staphylococcus haemolyticus/lugdunensis</i>	<i>Staph. haemol./lugdun.</i>	STAHAE LUG
<i>Staphylococcus hominis</i>	<i>Staph. hominis</i>	STAHOM
<i>Staphylococcus hominis</i> ssp. <i>hominis</i>	<i>Staph. hom.</i> ssp. <i>hom.</i>	STAHOMH
<i>Staphylococcus hominis</i> ssp. <i>novobiosepticus</i>	<i>Staph. hom.</i> ssp. <i>novo.</i>	STAHOMN
<i>Staphylococcus hyicus</i>	<i>Staph. hyicus</i>	STAHYI
<i>Staphylococcus intermedius</i>	<i>Staph. intermedius</i>	STAINI

Long Name	Short Name	Abbreviation
<i>Staphylococcus kloosii</i>	<i>Staph. kloosii</i>	STAKLO
<i>Staphylococcus lentus</i>	<i>Staph. lentus</i>	STALEN
<i>Staphylococcus lugdunensis</i>	<i>Staph. lugdunensis</i>	STALUG
<i>Staphylococcus lutrae</i>	<i>Staph. lutrae</i>	STALUT
<i>Staphylococcus massiliensis</i>	<i>Staph. massiliensis</i>	STAMAS
<i>Staphylococcus muscae</i>	<i>Staph. muscae</i>	STAMUS
<i>Staphylococcus pasteurii</i>	<i>Staph. pasteurii</i>	STAPAS
<i>Staphylococcus petrasii</i>	<i>Staph. petrasii</i>	STAPER
<i>Staphylococcus pettenkoferi</i>	<i>Staph. pettenkoferi</i>	STAPET
<i>Staphylococcus piscifermentans</i>	<i>Staph. piscifermentans</i>	STAPIS
<i>Staphylococcus pseudintermedius</i>	<i>Staph. pseudintermedius</i>	STAPSI
<i>Staphylococcus pulvereri</i>	<i>Staph. pulvereri</i>	STAPUL
<i>Staphylococcus saccharolyticus</i>	<i>Staph. saccharolyticus</i>	STASAC
<i>Staphylococcus saprophyticus</i>	<i>Staph. saprophyticus</i>	STASAP
<i>Staphylococcus saprophyticus</i> ssp. <i>bovis</i>	<i>Staph. sap. ssp. bovis</i>	STASAPB
<i>Staphylococcus saprophyticus</i> ssp. <i>saprophyticus</i>	<i>Staph. sap. ssp. saprophyticus</i>	STASAPS
<i>Staphylococcus schleiferi</i>	<i>Staph. schleiferi</i>	STASCH
<i>Staphylococcus schleiferi</i> ssp. <i>schleiferi</i>	<i>Staph. schleiferi</i> ssp. <i>schleif.</i>	STASCHS
<i>Staphylococcus sciuri</i>	<i>Staph. sciuri</i>	STASCI
<i>Staphylococcus sciuri</i> ssp. <i>carnaticus</i>	<i>Staph. sciuri</i> ssp. <i>carnaticus</i>	STASCIC
<i>Staphylococcus sciuri</i> ssp. <i>rodentium</i>	<i>Staph. sciuri</i> ssp. <i>rodentium</i>	STASCIR
<i>Staphylococcus sciuri</i> ssp. <i>sciuri</i>	<i>Staph. sciuri</i> ssp. <i>sciuri</i>	STASCIS
<i>Staphylococcus simulans</i>	<i>Staph. simulans</i>	STASIM
<i>Staphylococcus species</i>	<i>Staph. species</i>	STASPE
<i>Staphylococcus succinus</i>	<i>Staph. succinus</i>	STASUC
<i>Staphylococcus succinus</i> ssp. <i>casei</i>	<i>Staph. suc. ssp. casei</i>	STASUCCA
<i>Staphylococcus succinus</i> ssp. <i>succinus</i>	<i>Staph. suc. ssp. succinus</i>	STASUCSU
<i>Staphylococcus ureilyticus</i>	<i>Staph. ureilyticus</i>	STAURE
<i>Staphylococcus vitulinus</i>	<i>Staph. vitulinus</i>	STAVIT
<i>Staphylococcus warneri</i>	<i>Staph. warneri</i>	STAWAR
<i>Staphylococcus warneri/pasteurii</i>	<i>Staph. warneri/pasteurii</i>	STAWARPAS
<i>Staphylococcus xylosus</i>	<i>Staph. xylosus</i>	STAXYL
<i>Starmarella magnoliae</i>	<i>Starmar. magnoliae</i>	STARMAG
<i>Stenotrophomonas maltophilia</i>	<i>Sten. maltophilia</i>	STEMAL

Long Name	Short Name	Abbreviation
<i>Streptococcus acidominimus</i>	<i>Strep. acidominimus</i>	STRACI
<i>Streptococcus agalactiae</i> (Strep. group B)	<i>Strep. agalactiae</i> (Str. gr. B)	STRAGA
<i>Streptococcus alactolyticus</i>	<i>Strep. alactolyticus</i>	STRALA
<i>Streptococcus</i> alpha-hemolytic	<i>Strep. alpha-hemolytic</i>	STRAHE
<i>Streptococcus anginosus</i>	<i>Strep. anginosus</i>	STRANG
<i>Streptococcus anginosus</i> (previously <i>milleri</i> ) group	<i>Strep. anginosus (milleri)</i> gr.	STRANGGR
<i>Streptococcus australis</i>	<i>Strep. australis</i>	STRAUS
<i>Streptococcus</i> beta-hemolytic ACG (large colony)	<i>Strep. beta-hemo</i> ACG (lg col)	STRBHE
<i>Streptococcus canis</i>	<i>Strep. canis</i>	STRCAN
<i>Streptococcus constellatus</i>	<i>Strep. constellatus</i>	STRCON
<i>Streptococcus constellatus</i> ssp. <i>constellatus</i>	<i>Strep. con</i> ssp. <i>constellatus</i>	STRCONCO
<i>Streptococcus constellatus</i> ssp. <i>pharyngis</i>	<i>Strep. con</i> ssp. <i>pharyngis</i>	STRCONPH
<i>Streptococcus criceti</i>	<i>Strep. criceti</i>	STRCRC
<i>Streptococcus cristatus</i>	<i>Strep. cristatus</i>	STRCRS
<i>Streptococcus downei</i>	<i>Strep. downei</i>	STRDOW
<i>Streptococcus dysgalactiae</i>	<i>Strep. dysgalactiae</i>	STRDYS
<i>Streptococcus dysgalactiae</i> ssp. <i>dysgalactiae</i>	<i>Strep. dysgal.</i> ssp. <i>dysgal.</i>	STRDYSDY
<i>Streptococcus dysgalactiae</i> ssp. <i>equisimilis</i>	<i>Strep. dysgal.</i> ssp. <i>equis.</i>	STRDYSEM
<i>Streptococcus dysgalactiae/canis</i>	<i>Strep. dysgal./canis</i>	STRDYSCAN
<i>Streptococcus equi</i>	<i>Strep. equi</i>	STREQU
<i>Streptococcus equi</i> ssp. <i>equi</i>	<i>Strep. equi</i> ssp. <i>equi</i>	STREQUE
<i>Streptococcus equi</i> ssp. <i>zooepidemicus</i>	<i>Strep. equi</i> ssp. <i>zooepid.</i>	STREQUZ
<i>Streptococcus equinus</i>	<i>Strep. equinus</i>	STREQN
<i>Streptococcus ferus</i>	<i>Strep. ferus</i>	STRFER
<i>Streptococcus gallolyticus</i>	<i>Strep. gallolyticus</i>	STRGAL
<i>Streptococcus gallolyticus</i> ssp. <i>gallolyticus</i>	<i>Strep. galloly.</i> ssp. <i>galloly.</i>	STRGALGAL
<i>Streptococcus gallolyticus</i> ssp. <i>macedonicus</i>	<i>Strep. galloly.</i> ssp. <i>macedon.</i>	STRGALMAC
<i>Streptococcus gallolyticus</i> ssp. <i>pasteurianus</i>	<i>Strep. galloly.</i> ssp. <i>pasteur.</i>	STRGALPAS
<i>Streptococcus gallolyticus</i> ssp. <i>pasteurianus/infantarius</i>	<i>Strep. galloly.</i> ssp. <i>pas./infa.</i>	STRGALPASINA
<i>Streptococcus gallolyticus/infantarius</i>	<i>Strep. galloly./infa.</i>	STRGALINA
<i>Streptococcus gordonii</i>	<i>Strep. gordonii</i>	STRGOR
<i>Streptococcus</i> group A (small colony)	<i>Strep. group A</i> (sm col)	STRGRAS
<i>Streptococcus</i> group A ( <i>Strep. pyogenes</i> )	<i>Strep. group A</i> ( <i>Str. pyogenes</i> )	STRGRA

Long Name	Short Name	Abbreviation
<i>Streptococcus</i> group B ( <i>Strep. agalactiae</i> )	<i>Strep. group B (Str. agalact.)</i>	STRGRB
<i>Streptococcus</i> group C (large colony)	<i>Strep. group C (lg col)</i>	STRGRC
<i>Streptococcus</i> group C (small colony)	<i>Strep. group C (sm col)</i>	STRGRCS
<i>Streptococcus</i> group C/G (large colony)	<i>Strep. group C/G (lg col)</i>	STRGRCG
<i>Streptococcus</i> group C/G (small colony)	<i>Strep. group C/G (sm col)</i>	STRGRCSGS
<i>Streptococcus</i> group CFG (small colony)	<i>Strep. group CFG (sm col)</i>	STRGRCFG
<i>Streptococcus</i> group D (non-enterococcus)	<i>Strep. group D (non-enteroc.)</i>	STRGRDNE
<i>Streptococcus</i> group E	<i>Strep. group E</i>	STRGRE
<i>Streptococcus</i> group F	<i>Strep. group F</i>	STRGRF
<i>Streptococcus</i> group G (large colony)	<i>Strep. group G (lg col)</i>	STRGRG
<i>Streptococcus</i> group G (small colony)	<i>Strep. group G (sm col)</i>	STRGRGS
<i>Streptococcus</i> group L	<i>Strep. group L</i>	STRGRL
<i>Streptococcus hyointestinalis</i>	<i>Strep. hyointestinalis</i>	STRHYO
<i>Streptococcus infantarius</i>	<i>Strep. infantarius</i>	STRINA
<i>Streptococcus infantarius ssp. coli</i>	<i>Strep. infa ssp. coli</i>	STRINACO
<i>Streptococcus infantarius ssp. infantarius</i>	<i>Strep. infa ssp. infantarius</i>	STRINAIN
<i>Streptococcus infantis</i>	<i>Strep. infantis</i>	STRINF
<i>Streptococcus iniae</i>	<i>Strep. iniae</i>	STRINI
<i>Streptococcus intermedius</i>	<i>Strep. intermedius</i>	STRINR
<i>Streptococcus lutetiensis</i>	<i>Strep. lutetiensis</i>	STRLOT
<i>Streptococcus massiliensis</i>	<i>Strep. massiliensis</i>	STRMAS
<i>Streptococcus milleri</i> group	<i>Strep. milleri gr.</i>	STRMILGR
<i>Streptococcus minor</i>	<i>Strep. minor</i>	STRMIN
<i>Streptococcus mitis</i>	<i>Strep. mitis</i>	STRMIT
<i>Streptococcus mitis</i> group	<i>Strep. mitis gr.</i>	STRMITGR
<i>Streptococcus mitis/oralis</i>	<i>Strep. mitis/oralis</i>	STRMITORA
<i>Streptococcus mitis/pneumoniae</i>	<i>Strep. mitis/pneum.</i>	STRMITPNE
<i>Streptococcus mutans</i>	<i>Strep. mutans</i>	STRMUT
<i>Streptococcus mutans</i> group	<i>Strep. mutans gr.</i>	STRMUTGR
<i>Streptococcus oralis</i>	<i>Strep. oralis</i>	STRORA
<i>Streptococcus parasanguinis</i>	<i>Strep. parasanguinis</i>	STRPAR
<i>Streptococcus peroris</i>	<i>Strep. peroris</i>	STRPER
<i>Streptococcus pneumoniae</i>	<i>Strep. pneumoniae</i>	STRPNE
<i>Streptococcus porcinus</i>	<i>Strep. porcinus</i>	STRPOR
<i>Streptococcus pseudopneumoniae</i>	<i>Strep. pseudopneumoniae</i>	STRPSE
<i>Streptococcus pseudoporcinus</i>	<i>Strep. pseudoporcinus</i>	STRPPO

Long Name	Short Name	Abbreviation
<i>Streptococcus pyogenes</i> (Strep. group A)	Strep. pyogenes (Str. gr. A)	STRPYO
<i>Streptococcus ratti</i>	Strep. ratti	STRRAT
<i>Streptococcus salivarius</i>	Strep. salivarius	STRSAL
<i>Streptococcus salivarius</i> group	Strep. salivarius gr.	STRSALGR
<i>Streptococcus sanguinis</i>	Strep. sanguinis	STRSAN
<i>Streptococcus sanguinis</i> group	Strep. sanguinis gr.	STRSANGR
<i>Streptococcus sinensis</i>	Strep. sinensis	STRSIN
<i>Streptococcus sobrinus</i>	Strep. sobrinus	STRSOB
<i>Streptococcus</i> species	Strep. species	STRSPE
<i>Streptococcus suis</i>	Strep. suis	STRSUI
<i>Streptococcus thermophilus</i>	Strep. thermophilus	STRTHE
<i>Streptococcus thoraltensis</i>	Strep. thoraltensis	STRTHO
<i>Streptococcus uberis</i>	Strep. uberis	STRUBE
<i>Streptococcus urinalis</i>	Strep. urinalis	STRURI
<i>Streptococcus vestibularis</i>	Strep. vestibularis	STRVES
<i>Streptococcus viridans</i> beta-hemolytic (small colony)	Strep. vir. beta-hemo (sm col)	STRBHES
<i>Streptococcus viridans</i> group	Strep. viridans gr.	STRVIRGR
<i>Suttonella indologenes</i>	Sutto. indologenes	SUTIND
<i>Tatumella ptyseos</i>	Tat. ptyseos	TATPTY
<i>Trichosporon asahii</i>	Tric. asahii	TRIASA
<i>Trichosporon inkin</i>	Tric. inkin	TRIINK
<i>Trichosporon ovoides</i>	Tric. ovoides	TRIOVO
<i>Trueperella pyogenes</i>	True. pyogenes	ACTMPYO
<i>Vibrio alginolyticus</i>	Vib. alginolyticus	VIBALG
<i>Vibrio cholerae</i>	Vib. cholerae	VIBCHO
<i>Vibrio fluvialis</i>	Vib. fluvialis	VIBFLU
<i>Vibrio metschnikovii</i>	Vib. metschnikovii	VIBMET
<i>Vibrio mimicus</i>	Vib. mimicus	VIBMIM
<i>Vibrio parahaemolyticus</i>	Vib. parahaemolyticus	VIBPAR
<i>Vibrio vulnificus</i>	Vib. vulnificus	VIBVUL
<i>Weeksella virosa</i>	Week. virosa	WEEVIR
<i>Weizmannia coagulans</i>	Weizman. coagulans	WEIZCOA
<i>Wickerhamiella pararugosa</i>	Wickerham. pararugosa	WICPARR
<i>Yersinia aldovae</i>	Yer. aldovae	YERALD

<b>Long Name</b>	<b>Short Name</b>	<b>Abbreviation</b>
<i>Yersinia bercovieri</i>	<i>Yer. bercovieri</i>	YERBER
<i>Yersinia enterocolitica</i>	<i>Yer. enterocolitica</i>	YERENT
<i>Yersinia enterocolitica</i> group	<i>Yer. enterocolitica</i> gr.	YERENTGR
<i>Yersinia frederiksenii</i>	<i>Yer. frederiksenii</i>	YERFRE
<i>Yersinia intermedia</i>	<i>Yer. intermedia</i>	YERINT
<i>Yersinia kristensenii</i>	<i>Yer. kristensenii</i>	YERKRI
<i>Yersinia mollaretii</i>	<i>Yer. mollaretii</i>	YERMOL
<i>Yersinia pseudotuberculosis</i>	<i>Yer. pseudotuberculosis</i>	YERPSE
<i>Yersinia rohdei</i>	<i>Yer. rohdei</i>	YERROH
<i>Yersinia ruckeri</i>	<i>Yer. ruckeri</i>	YERRUC
<i>Yersinia</i> species	<i>Yer. species</i>	YERSPE
<i>Yokenella regensburgei</i>	<i>Yok. regensburgei</i>	YOKREG
<i>Zygosaccharomyces bailii</i>	<i>Zyg. bailii</i>	ZYGBAI

## 16.2 Supplemental ID Test Abbreviations

Test	Description	Test	Description
10C	Growth at 10 °C	LAC	Lactose
42C	Growth at 42 °C	LYS	Lysine
45C	Growth at 45 °C	MAC	Growth in MacConkey
50C	Growth at 50 °C	MAL	Maltose
ACE	MBM + Acetate	MEL	Melibiose
ALC	a-Lactose	MNS	Mannose
ANR	Anaerobic growth	MNT	Mannitol
ARA	Arabinose	MOR	Morphology
ARG	Arginine	MOT	Motility
BE	Bile esculin	MR	Methyl Red
BSO	Bile solubility	NIT	Nitrate
CAM	CAMP with <i>Staphylococcus aureus</i>	NVR	Novobiocin Resistance
CAT	Catalase	OPS	Optochin susceptibility
CEL	Cellobiose	ORN	Ornithine
CIT	Citrate	OX	Oxidase
COA	Coagulase	PXR	Polymyxin Resistance
DNA	Dnase	PXS	Polymyxin Susceptibility
ESC	Esculin	PYR	Pyrrolidonyl arylamidase
FRU	Fructose	RAF	Raffinose
GAS	Gas from Glucose	SBT	Sorbitol
GEL	Gelatin	SLT	Growth in 6.5% NaCl
GLC	Beta glucuronidase	SOR	Sorbose
GLU	Glucose	SUC	Sucrose
H <sub>2</sub> S	Hydrogen Sulfide	TRE	Trehalose
HGN	Hemolysis - Gram Negative	URE	Urea
HGP	Hemolysis - Gram Positive	VAN	Vancomycin
HIP	Hippurate	VP	Voges Proskauer
IND	Indole	XYL	Xylose
KCN	Growth in KCN	YEL	Yellow/orange pigment

## 16.3 Interpretation Codes

Interpretation Code	Interpretation Name
ACIN_IC	<i>Acinetobacter</i> spp.
AERM_IC	<i>Aeromonas</i> spp.
BURCEP_IC	<i>Burkholderia cepacia</i> complex
ENTC_IC	<i>Enterococcus</i> spp.
ENTERIC_IC	Enterobacterales
NFGNROTH_IC	Nonfermentative GNR, other than ACIN_IC, BURCEP_IC, PSEAER_IC, STEMAL_IC, ACTBACT_IC, CARHOM_IC, EIKCOR_IC
PSEAER_IC	<i>Pseudomonas aeruginosa</i>
STAAUE_IC	<i>Staphylococcus aureus</i>
STAOTH_IC	<i>Staphylococcus</i> spp., other than STAAUE_IC
STEMAL_IC	<i>Stenotrophomonas maltophilia</i>
STRBET_IC	<i>Streptococcus</i> beta-hemolytic
STROTH_IC	<i>Streptococcus</i> spp., other than STRBET_IC, STRPNE_IC, STRVIR_IC
STRPNE_IC	<i>Streptococcus pneumoniae</i>
STRVIR_IC	<i>Streptococcus viridans</i> group

# 17 Glossary

## A

### AIO

All-in-one

### Alert Indicator

LED indicator that represents the current alert status. It may stay off, blink or remain on to indicate various conditions of the instrument.

### Antibiogram

A representation of the antimicrobial susceptibility of particular bacterial organisms to certain antimicrobial agents.

### AST

Antimicrobial Susceptibility Test(ing)

### ATCC

American Type Culture Collection

## B

### BD informatics solution

One of two informatics solutions, BD EpiCenter or BD Synapsys Informatics Solution, to which the BD Phoenix M50 can connect for data management and workflow integration.

### BD Phoenix AST Indicator

An oxidation-reduction indicator used to signify microbial metabolism in the BD Phoenix panels. The indicator changes from blue to pink as initial reduction occurs. Further reduction causes the indicator to change from pink to colorless.

### breakpoint

An interpretation of panel MIC data that which produces Susceptible, Intermediate, or Resistant result classifications. Breakpoints in the MIC data are established by the Clinical and Laboratory Standards Institute (CLSI) and other groups.

## C

### caddy

Accessory device used to transport inoculated panels to the instrument for loading.

### CLSI

Clinical and Laboratory Standards Institute

### CNA

Colistin Nalidixic Acid agar

## D

### **demographic data**

Accession information for a panel record

### **DTG**

Drug Test Group

## E

### **EMB**

Eosin Methylene Blue agar

### **error station**

Station that has sustained an optical or electromechanical error and has been blocked.

### **EUCAST**

European Committee on Antimicrobial Susceptibility Testing

## H

### **HE**

Hektoen Enteric media agar

## I

### **ID**

Microbial Identification

### **ID/AST combination (combo) panel**

The disposable device that contains all reagents needed for both ID and AST.

### **IFU**

Instructions for Use. Refers to product instructions in printable form (e.g., user's manual PDF) or digital (e.g., online help).

### **inoculation station**

The inoculation station holds three BD Phoenix panels at the appropriate angle for optimal fill. The station also holds six broth tubes total, two per organism tested. One tube is for dilution of colony growth for Identification, the other for AST.

### **Instrument Door/Panel Button Status**

The instrument has an indicator that provides the current panel button and door status to the user.

**Instrument Summary Group**

This is the information that appears in the center of the header which appears on all screens of the BD Phoenix M50 instrument.

**instrument test cycle**

A complete test of all sample panels located in the carousel, resulting in color and/or fluorescence data values being recorded for each pertinent well of each panel.

**Isolation Mode**

The condition that exists when communication between the BD Phoenix M50 instrument and the AIO PC is lost. Isolation Mode is designed to allow the ID/AST system to avoid test cycle gaps when the AIO PC is temporarily disconnected from the instrument.

**L****LIS**

Laboratory Information System. Software that tracks patient and associated test order and result data for clinical laboratories. Depending on its configuration, the LIS can query and be queried, and data can be downloaded from it and uploaded to it.

**M****MIC**

Minimum Inhibitory Concentration; the lowest concentration of an antimicrobial which prohibits continued growth of the tested organism.

**N****Needs Attention**

Panels in the instrument's database that have encountered a condition that requires operator attention.

**normalizer**

A reference panel for use in the BD Phoenix M50 instrument. The Normalizer panel contains a matrix of visible light absorber and fluorescent material in panel-well format, which is used to correct individual well signals for losses occurring in the optical system.

**O****orphan**

A panel with a valid sequence number, but no associated accession number and isolate number.

## P

### **panel carrier**

The plastic carousel insert, which clips each BD Phoenix sample panel into place. The carousel contains 52 inserts, 26 in each of 2 tiers.

### **panel dataset**

Each panel's set of color and fluorescence measurements, the panel's position identifier, test time stamps, and error flags are recorded for each test cycle throughout the test protocol. The test parameters determining each well's results are keyed by the individual barcode label signifying the panel type, and hence the type of test.

### **Panel In/Out Indicator**

An indicator on the instrument that provides the current panel button and door status to the user.

### **panel presence detection threshold**

Each inventory scan or test cycle, the instrument looks for both the barcode label of a panel in each carousel position and panel well data, color or fluorescence. If either is detected the instrument declares a panel logically present in that location. A panel without a valid barcode to provide panel type information will not be processed, but will be flagged as a Needs Attention candidate.

### **PB**

Blood plate

### **PEA**

Phenylethyl Alcohol agar

### **PHI**

Protected Health Information

### **PII**

Personally Identifiable Information

### **PLC**

Programmable Logic Controller

### **position**

The station. The physical location of the BD Phoenix panel within the instrument. This identifier includes instrument number, carousel tier letter, and numeric position on that tier.

## R

### **rapid results**

AST Result obtained within 16 hours of panel inoculation.

### **related panel**

Panels with the same accession number and isolate number are related.

**Resistance Marker**

Condition that is triggered when specific results indicate antimicrobial resistance. The action of some BDxpert rules is to trigger Resistance Markers; other rules may be called as a result of a specific Resistance Marker being triggered.

**RGB**

Red, Green and Blue. A shorthand representation of the visible light sources / wavelength regions used to interrogate the BD Phoenix panel.

**S****sample**

A specimen contained in a BD Phoenix panel. In practice, this would be a processed and resuspended dilution of microbiological growth from primary isolation culture in either ID diluent or AST broth which is then poured into the test panel.

**Sample**

A specimen that has been prepared for diagnostic testing

**sequence number**

A count of the number of readings taken by the instrument for a given sample well in a particular test panel, initialized to zero at the time of panel entry.

**SFM**

Société Française de Microbiologie

**SIR**

Susceptible, Intermediate, or Resistant; refers to breakpoint AST categories. See also Breakpoint.

**Specimen**

Biological material obtained from a patient for the purposes of a diagnostic test

**station**

The instrument carousel is divided vertically into two tiers (A:B; or C:D), each of which holds 26 panels. With one location occupied by a Normalizer panel, 25 locations per tier can accommodate test panels. This means that test panels can populate 50 total locations. Each location is assigned a tier letter and a number to determine the location on the tier. Indicator LEDs located behind each panel indicate station status (see Station Indicators).

**T****TSA II**

BD Trypticase Soy Agar

## U

### **UPS**

Uninterruptible Power Supply

### **USB**

Universal Serial Bus

## X

### **XLD**

Xylose Lysine Deoxycholate agar

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