Phoenix M50

Service Manual

Document no. BDDSSGFS7410 Rev. 03

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Table of Contents

1 Service Manual Introduction

1.1 Service Manual Overview

This service manual, in seven chapters, is for BD associates and contains information to support Phoenix M50.

Acronyms in the Manual

Acronym	Expansion
AST	Antimicrobial Susceptibility Testing
ID	Identification
PCB	Printed Circuit Board
CCD	Charge Coupled Device
LED	Light Emitting Diode
RTD	Resistive Temperature Device
AIO	All In One
LIS	Laboratory Information System
USB	Universal Serial Bus
FCDB	Falcon Control and Distribution Board
ESD	Electrostatic Discharge
PPE	Personal Protection Equipment
PUD	Phoenix Update Data
RSS	Remote Support Services
LSDB	Light Source Driver Board
FRU	Field Replaceable Unit
CV	Coefficient of Variance

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Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

1.2 Dangerous Procedure Warnings

Throughout the service manual, important information is presented in boxes offset from the regular text and is labeled **Note**, **Caution**, or **Warning**. These messages are formatted as shown below and bear the following significance:

Note: Important information about system use and worthy of special attention is presented as a **Note**.

Caution: Information on an activity which potentially could cause the application 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**.

1.3 Instrument Description

The Phoenix M50 system consists of the following sub systems.

- Carousel drive system
- Optical testing system
  - Normalization
- Panel status and internal barcode system
- Incubation system

All In One (AIO) tablet computer

The Phoenix M50 consists of either one or two instruments connected to an AIO tablet computer. The AIO runs on an embedded Windows operating system that is largely invisible to the end user. Log in and select the appropriate function from the AIO touch screen to initiate user sessions with the instrument.

Multiple major pieces of software are run on this system.

- The system software is the primary interface though which users interact with the instrument. This interface supports different levels of access via administrative and user log accounts. The field service account provides access to various field service maintenance menus and options not available to normal or administrative users.
- The Phoenix M50 Toolkit is accessible only by the field service user. The Toolkit provides service associates with tools to align, test, and validate instrument functionalities.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
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Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

- Third party applications (terminal emulator, SQL Studio) can be used by an engineer when servicing and maintaining an instrument.

1.3.1 Phoenix Panels

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

1.3.1.1 Capacity

A maximum of 50 identification and antimicrobial susceptibility tests can be performed at a time in the Phoenix M50 instrument using Phoenix combination panels (100 tests in a stack of two instruments).

1.3.1.2 Design

A self-inoculating molded polystyrene tray with 136 micro-wells containing dried reagents serves as the 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, and growth and fluorescent controls at appropriate well locations. The Phoenix system utilizes an optimized colorimetric redox indicator for AST and a variety of colorimetric and fluorometric indicators for ID. The AST broth is adjusted to optimize susceptibility testing performance.

The Phoenix panel has a 51-well ID side (left side when looking at the panel from the front) and an 85-well AST side. The ID side contains wells with dried biochemical substrates as well as fluorescent control wells. The AST side potentially contains up to 84 wells with dried antimicrobial

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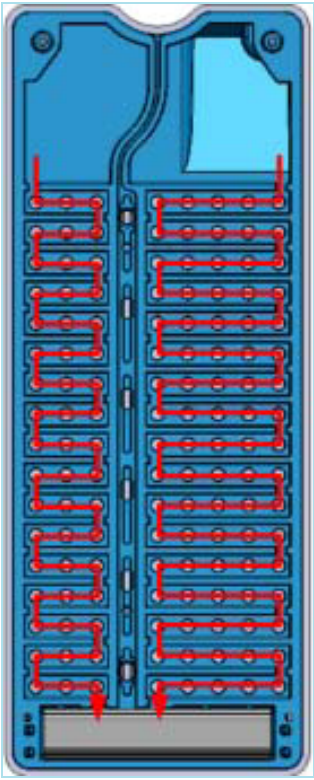
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

agents and one growth control well. Panels are available as ID only, AST only, or a combination of ID/AST.

The panel is held at an angle and inoculated from the top with solutions containing the samples being tested. The top of the panel is physically higher than the bottom. The inoculum flows through the panel filling all the wells. Each well holds approximately 50 µl. The solution inoculated in the AST side of the panel has a much lower concentration of the organism than the ID side of the panel.



When inoculated, panels are placed into 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. The Phoenix panels are read only by Phoenix instruments and cannot be read manually.

1.3.1.3 Panel Types

Note: Emerge are AST-only panels that have antimicrobials on both sides of the panel.

Panel Types	Gram Positive	Gram Negative	Strep	Yeast
ID	√	√	√	√

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
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Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Panel Types	Gram Positive	Gram Negative	Strep	Yeast
AST	√	√	√	
ID/AST	√	√	√	

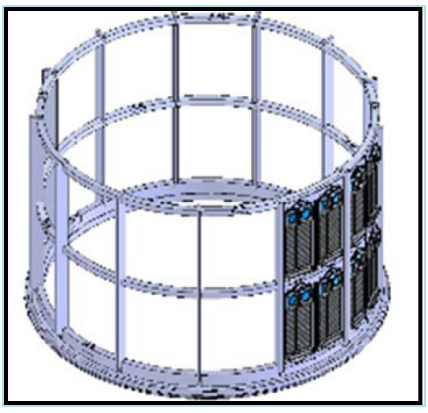
1.3.1.4 Testing Process

To inoculate the panel, a biochemical reaction between the contents of each well on the panel and the broth is used. Phoenix M50 tests each well of each panel with visible and ultraviolet light every 20 minutes. The readings are processed using algorithms and the test results are determined.

1.3.2 Sub Systems

1.3.2.1 Carousel

The carousel assembly consists of aluminum rings and ribs bolted to a drive ring to form a cylindrical cage that holds 52 injection-molded panel carriers in two tiers. Each tier holds one normalizer panel in location 00 and 25 sample panels. Tiers of the carousel are labeled A and B from top to bottom (or A, B, C, D top to bottom in a stack). Within each tier, panel locations are numbered 1 through 25, counterclockwise. Location 00 holds the normalizer panel and is inaccessible to the user during the normal workflow.



1.3.2.2 Panel Carriers

The panel carriers are designed for simple user installation of sample panels. Each panel carrier incorporates a molded-on panel flag. The panel carriers are keyed to prevent improperly oriented panels from fully seating in the carrier. This gives immediate visual and tactile feedback to the user. If the panel insertion error is not noticed, the panel prevents the carousel from rotating

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
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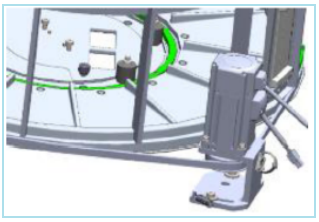
when the door is closed. The system alarms and instructs the operator to open the door and clear the jam.

1.3.2.3 Drive System

The carousel is driven by a servo motor. The motor is attached to the frame and a spring sets proper drive tension. A toothed drive plate is attached to the bottom of the carousel. This plate rests on a 12” race bearing on which the carousel rotates. A toothed drive belt transfers motor rotation to the carousel. During normal operation, the carousel is driven at a velocity of 4 rpm for inventory, and at 1 or 2 rpm for data collection. The carousel rotates counter clockwise and can accelerate to 10 rpm to index quickly to the appropriate location for loading or unloading panels.



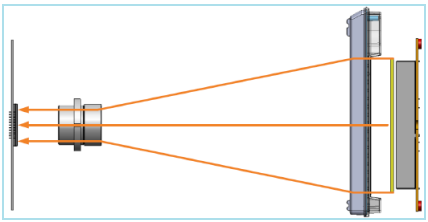
1.3.2.4 Optical Test System

The carousel is divided into two tiers. Each tier functions as an independent optical source and detection system for panels on the tier. Each tier has a microcontroller to control data acquisition and transmission.

Optical components

Each optical system consists of:

- A source PCB capable of projecting colors of visible RGB light (Red, Green and Blue) and UV light.
- A lens assembly that passes through the test panel.
- A CCD mounted on a printed circuit board that receives the light levels and provides the corresponding output.



Visible illumination in the red, green, and blue spectral regions of each tier is due to a series of LEDs on the source board. The source board is programmable.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
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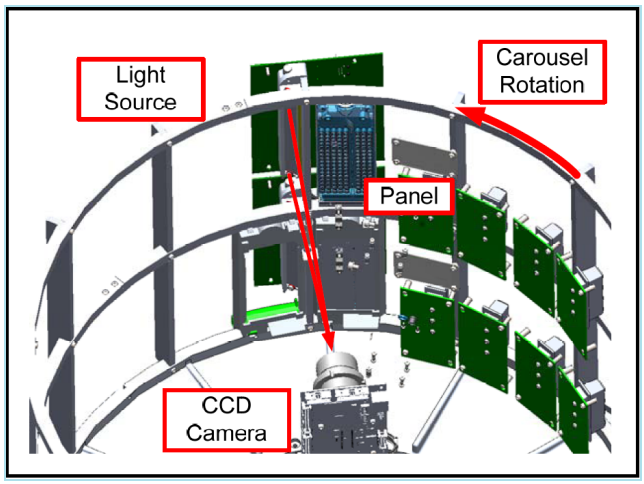
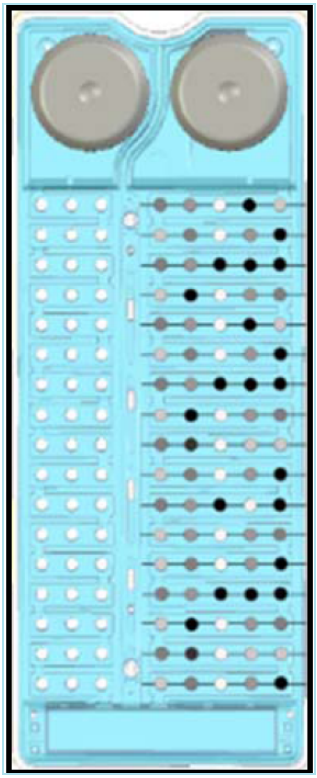
Optical system operation

As the carousel rotates, the panels pass in front of the light source. The three different frequencies of light (RGB) are attenuated by the panel wells. The UV light causes fluorogens in the well to generate a blue-green visible light that passes through the lens assembly mounted in front of the CCD sensor. The lens focuses the red, green, blue light, and any florescence generated by the UV light onto the CCD sensor.



The CCD sensor does not read color. It reads the intensity of each light source through the AST panel wells which is affected by biochemical reactions. The result is a value representing the received amount of light. When the UV light illuminates the panel, it causes the material in the wells to fluoresce. The CCD sensor reads the UV fluorescence in the ID wells. Light generates voltage levels on the CCD comparable to the attenuation caused by the panel wells. The CCD only detects light levels, and not color, so the RGB values are combined to determine color.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

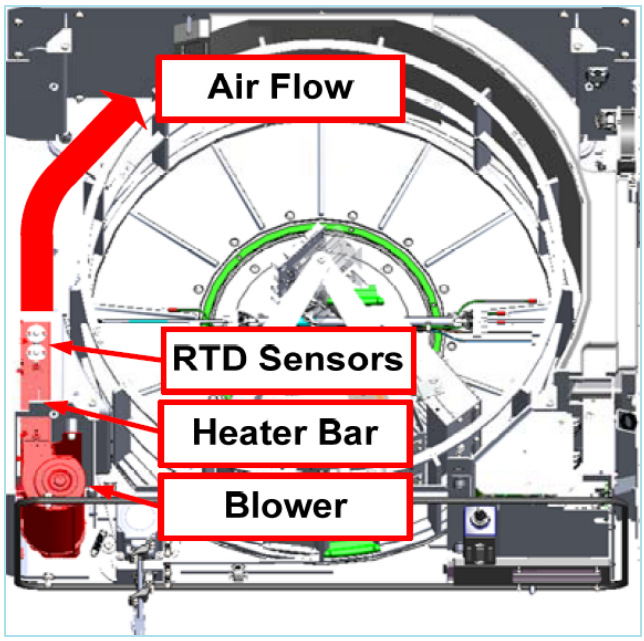


The system software compares the values of the red, green, and blue light as well as the UV fluorescence levels. Each well is analyzed through algorithms to determine test results and provide usable information to the end user. The Phoenix optics system functions in a manner similar to a flatbed scanner.

1.3.2.5 Incubation System

The incubation system maintains the carousel, light tower, panel carriers, and panels at a constant nominal temperature of 35° C. The system is a re-circulating forced-air convection design and does not require any makeup air. The system consists of a squirrel cage blower, a heater element, two Resistive Temperature Devices (RTDs), and ductwork.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



1.3.2.6 Panel Status and Internal Barcode Scanner Assembly

- Panel status indication and panel identification are achieved on the same tower in the instrument, mounted directly behind the carousel in the door area.
- Four columns of the two-tier carousel are exposed to the user when the instrument door is open. There are eight LED boards with four LED indicators on each.
- The I/O board controls the indicators. The LEDs light per the panel status and indicates the door open status.
- Two barcode scanners capable of reading Code-128 numeric information are supported on the same tower as the indicators. Each scanner reads panel barcode on its respective tier of the carousel.
- Panel barcodes are affixed at the top of the panel on the base (bottom) side of the panel, facing inward on the carousel when placed in the instrument.

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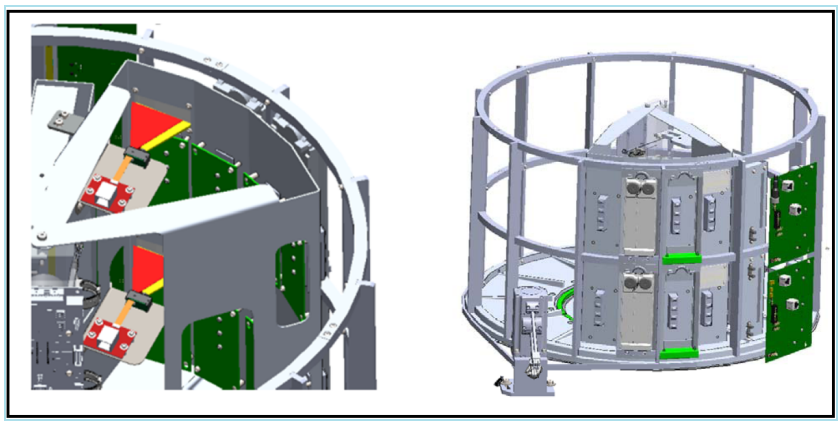

1.3.3 Normalization

A normalizer panel is used as a reference to calibrate the measurement system, ensure proper adjustments of the detection system, and measure optical information.

Normalizer panels

Normalizer panels expire after five years of use in an instrument. All installed customer instruments use gold (6%) normalizer panels. Silver (10%) normalizers are only used in manufacturing. A normalizer panel consists of a standard Phoenix panel fitted with a specially manufactured polystyrene lid containing carbon black and silver doped zinc sulfide. Normalizer lids do not have serpentine flow channels. The normalizer panel has a fixed value. This allows any data collected from sample panels to be corrected (normalized) against the last set of normalizer readings, compensating for any changes to the optical system.

Normalizer panels reside in position zero on any given tier of a carousel. Location zero uses special panel carriers with screw mountings instead of the standard panel carrier. Normalizer panel positions can be easily identified and panels cannot be accidently moved.

1.3.4 Operational Mode

During normal operations, the carousel spins counter clockwise at 1 rpm and the incubation system maintains a temperature of 35º C.

Scanning cycle

1. Measure CCD dark currents of all tiers.
2. Turn UV LEDs on for 2 seconds.
3. Ramp UV LEDs to 100% intensity.
4. Warm up UV LEDs 1 revolution at 1 rpm.

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Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

5. Ramp UV LEDs down to reading set-point intensity. Wait for the remainder of revolution.
6. Take UV reading of all tiers, 1 revolution at 1 rpm.
7. Turn off UV LEDs.
8. Take red readings, all tiers for 1 revolution at 2 rpm.
9. Turn red LEDs off. Turn green LEDs on at 2 rpm. Wait for the remainder of revolution.
10. Take green readings, all tiers for 1 revolution at 2 rpm.
11. Turn green LEDs off. Change drum speed to 1 rpm.
12. Turn blue LEDs on. Wait for the remainder of revolution.
13. Take blue readings, all tiers at 1 rpm.
14. Turn blue LEDs off.

1.3.5 Isolation Mode

The instrument enters isolation mode if it cannot communicate with the AIO. In this mode, the instrument collects data. When the instrument detects the AIO, it uploads the data and the AIO analyzes the results. The testing data in isolation mode is stored for up to five days. The database of the AIO must match for recovering testing data. If the database does not match, data recovery is not possible. New panels can be entered during isolation mode. If panels are inserted during isolation mode, the data storage time limit is reduced from five days to two days.

1.3.6 User Interface

The Phoenix M50 consists of either one or two instruments connected to an AIO tablet computer. The AIO runs on an embedded Windows operating system and is invisible to the end user. To initiate user sessions, log in and select a function from the AIO touch screen.

The system software user interface is the primary interface for users. The interface supports different access levels. It has an administrative account, a user account, and a field service account that provides access to field service maintenance menus and options not available to normal or administrative users. The Falcon Toolkit is accessible only to the field service user. The Toolkit provides service associates with tools to align, test, and validate instrument functionality.

1.3.7 Instrument Configuration

The Phoenix M50 can be configured as either a single instrument, or as a stack (of two instruments) that operates through a single AIO tablet computer. A single instrument configuration has tiers A and B. A stack has four tiers (two in each instrument). Tiers A and B are

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Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

in the top instrument in the stack. Tiers C and D are in the lower instrument in the stack. The M50 can connect to an EpiCenter system or a LIS support.

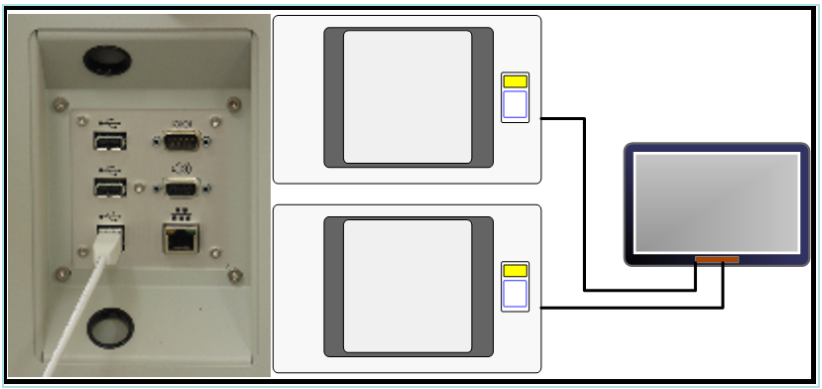
Instrument components

1. Swing arm

   A swing arm from either a single instrument or the lower instrument in a stack is on the right side (facing the front of the instrument).

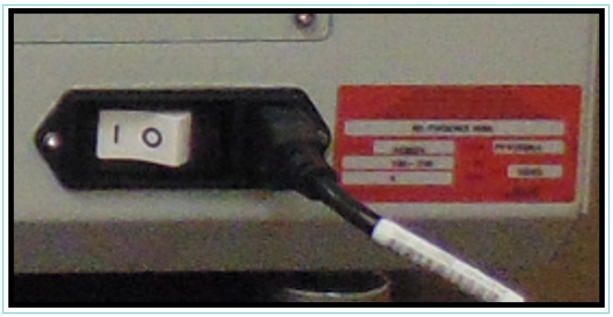
2. Connector plate

   This plate contains remote alarms connector, one USB B connector, and two USB A connectors. The ethernet port and the LIS port are not currently active.



3. Power switch and plug

   The power switch and plug are located on the rear right side of the instrument beside the name plate.



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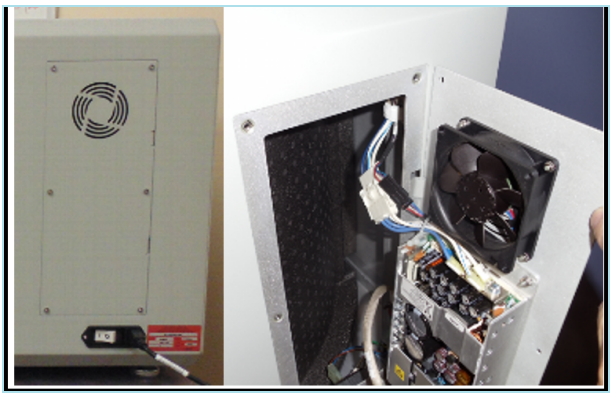
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

4. Power supply module

   The power supply module is directly above the power switch. It contains the power supply and the cooling fan for the electronics bay.



5. Instrument alert indicator

   The alert indicator is located on the front to the right of the door. The upper amber indicator reports display.

- Off: Indicates that the instrument is connected to the computer and has no outstanding alerts.
- Blinking: Indicates that the instrument is not connected to the computer and is in isolation mode.
- Solid: Indicates outstanding alerts.

The lower blue indicator is for the door lock status and control.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

- Off: Indicates that the panel In/Out button is not available and the door is locked.
- Blinking: Indicates that the door is unlocked.
- Solid: Indicates that the panel In/Out button is active and the door is locked.

6. AIO tablet

   The AIO tablet computer is mounted to the swing arm and controls the instrument. It runs the user software and the maintenance Toolkit.

7. Door access

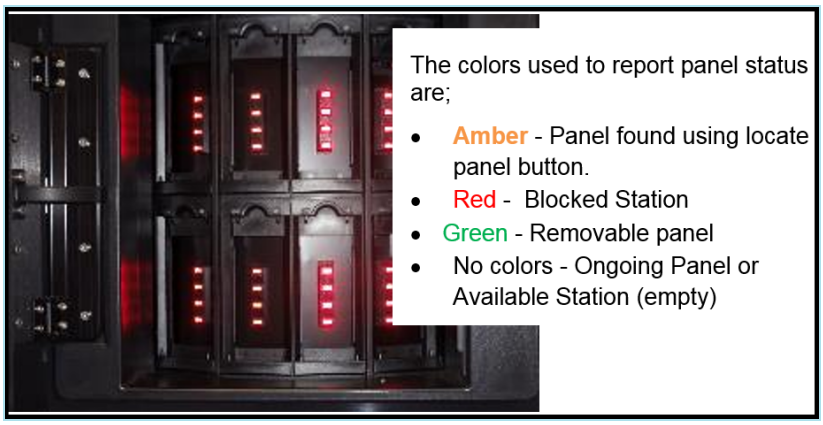
   The instrument door is held close by a magnet locking mechanism. A sensor built into the latch indicates the open or the close status. When the instrument doors are open, only 4 of the 26 panel positions are exposed on each tier. Each tier handles 25 panels.

   The 00 position is reserved for the normalizer panel. A majority of parts within the instrument can be replaced from the front. Some parts are easier to replace if the top access is available.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

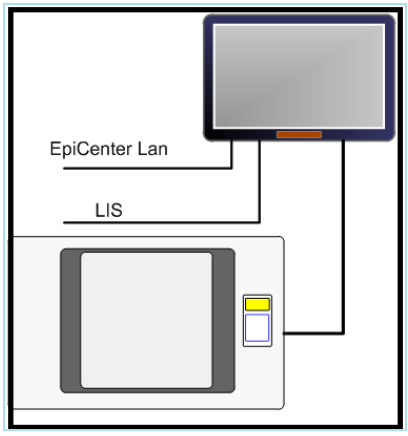
8. Station status

   Eight sets of panel status indicators are visible when the door is open. These are synced to a particular panel in front of them and glow through the panel.



9. Internal barcode scanners

   Two internal barcode scanners are located to the right (from the front of the instrument) of the panel indicators. These barcode scanners are not visible without disassembling the instrument. An external barcode scanner is connected to the instrument through the USB interface on the right side.



1.3.8 User Work Flow

1.3.8.1 Panel Inoculation

Procedure to dilute a Phoenix ID tube

Use this procedure to dilute the Phoenix ID broth if the suspension in the Phoenix ID broth is higher than the McFarland target. Indicate the level of the liquid accurately in the tube.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

1. Use a marker to mark the broth level in the over inoculated tube.
2. Use a sterile pipette to aseptically add fresh Phoenix ID broth to the inoculum. Use only Phoenix ID broth to dilute the inoculum.
3. Vortex the tube.
4. Place the tube in the Nephelometer and re-measure the turbidity of the Phoenix ID broth suspension.
5. If the reading is over the target range, repeat **steps 2 - 4** of this procedure.
6. If the reading is within the target range, go to **step 5**.
7. Use a sterile pipette to aseptically remove excess broth to the original level indicated by the mark on the tube created in **step 1**.
8. Remove excess broth to avoid overfilling the panel. Do not remove too much broth. Fill panels with adequate broth.
9. Use broth to inoculate the Phoenix AST-S broth and/or the Phoenix panel.

The procedure is the same for setting yeast and strep panels with these exceptions:

- Yeast turbidity must be 2.00 - 2.40
- Strep turbidity must be 0.50 - 0.60
- AST-S indicator is used in AST broth for strep panels

Set up panels manually (described below) or by using the BD Phoenix™ AP.

Step	Action
Prepare ID Inoculum	1. Label a Phoenix ID broth tube with the patient's specimen number. 2. Pick colonies of the same morphology using aseptic technique, with the tip of a sterile cotton swab or wooden applicator stick from one of the recommended media. 3. Isolates should be 18-24 hours old. 4. Fastidious organisms and yeast can be up to 48 hours old. 5. Suspend the colonies in the Phoenix ID broth. 6. Cap the tube and vortex for five seconds. 7. Allow approximately ten seconds for air bubbles to surface. 8. Gently tap the tube to aid in eliminating bubbles. 9. Use PhoenixSpec to measure turbidity. 10. 0.50 – 0.60 is the acceptable range for standard inoculum. 11. 0.20-0.30 is the acceptable range for low inoculum. 12. Use standardized suspension within 60 minutes of preparation.

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Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Step	Action
Prepare AST Inoculum (only for NMIC/ID or PMIC/ID panels)	1. Add 1 free-falling drop of the AST indicator solution to the Phoenix AST broth. 2. Mix AST tube by inverting several times. Do not vortex. 3. If an inoculum density of 0.50 – 0.60 is used, transfer 25 µL of the bacterial suspension from the ID broth tube into the AST broth tube. 4. If an inoculum density of 0.20 – 0.30 is used, transfer 50 µL (make 2 transfers if utilizing a 25 µL pipettor) of the bacterial suspension from the ID tube into the AST broth tube. Cap AST broth tube and mix by inverting several times. Do not vortex.
Prepare Panel	1. Remove panel from pouch and discard desiccant. 2. Use panel within 2 hours of removing from the pouch. 3. Place panel on the inoculation station with the port at the top and the pad on the bottom. 4. Place the panel at 24° angle during inoculation. Attach accession barcode or write patient information on the panel closure.
Inoculate Panel	1. Place the ID broth tube in the left side of the Phoenix inoculation station. 2. Fill the ID side of the panel. Retain the ID tube for purity check. 3. Place the closure(s) securely on both sides of the panel to seal. 4. Visually inspect panels to ensure proper filling. 5. Place inoculated panel(s) into the panel transport caddy. 6. Load panels into Phoenix M50. Load panels into the instrument within 30 minutes of inoculation.
Prepare Purity Plate	1. Using a sterile loop, recover a small drop from the ID broth either before or after inoculating the panel. 2. Inoculate broth onto appropriate agar plates such as TSA w/ 5% Sheep blood Incubate plates for 24 – 48 hours at 35° C under appropriate conditions.

1.3.8.2 Panel Login

When setting up a panel, the suspension in the ID broth must reach inoculum density of either 0.5 or 0.25. The instrument must know the inoculum density to correctly identify the organism used. The **Inoculum Density** setting in the **Configuration** tab facilitates this.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Set the inoculum density to the value to be used most. The inoculum density cannot be changed during panel Login. If the panel is set up using an inoculum density different from what was configured in the system, blacken the A17 well on the panel. For an AST-only panel, manually enter an organism ID for SIR interpretation.

1. Press the panel **Login** tab.


2. Scan or type the panel sequence number.
3. Scan or type an accession number.
4. Type the isolate number (or) press ▲ or ▼ to increase or decrease the number.
The **isolate #** field defaults to isolate number 1. Valid isolate numbers range from 1 to 20.
5. For yeast panel type, press ▼ to select the primary isolation media.

   If a default media type has been configured, it automatically appears in the field and a media type need not be selected.

   Media types:

   - CHOC **:** Chocolate AgarCOLSB – Columbia with 5% Sheep Blood Agar
   - SABDX**:** Sabouraud Dextrose Agar
   - SABEM**:** Sabouraud Dextrose Emmons
   - SABHI**:** Sab Brain Heart Infusion Deep
   - TSASB**:** Trypticase Soy Agar with 5% Sheep Blood

   A Media type is required if the **Save** button is pressed without selecting a **Media** type (error W204 - Missing Media Type occurs and **unspecified** appears in the header).
6. Press **Save**.

Loading panels into the instrument

1. Press the load panels  button.
2. When the door unlocked icon  appears, open the instrument door.
3. Place panel into an empty panel holder that has no illuminated LEDs. When placing a panel into the instrument, the panel closures should face outward.
4. Place the bottom part of the panel in the panel holder and press downward.
5. Do not snap the panel up against the holder.
6. Pivot the top of the panel back into the panel holder. Make sure that the panel moves upward into place.

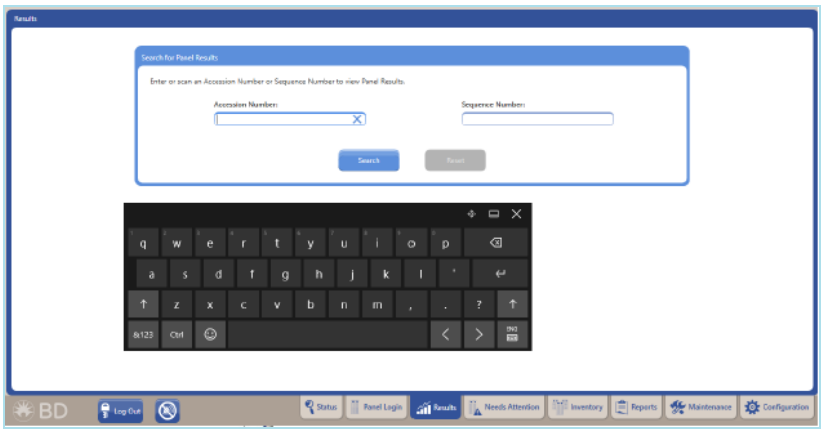
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

7. Close door after all panels have been loaded.
8. Additional panels may be loaded when the **System Alert** indicator is green.

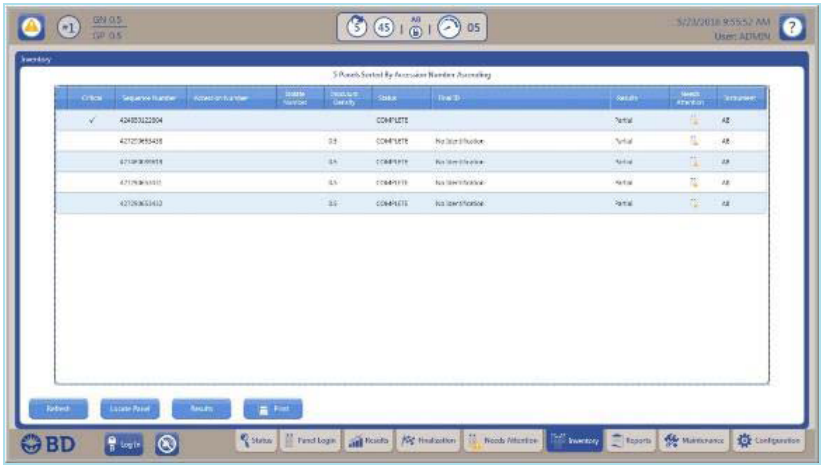
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

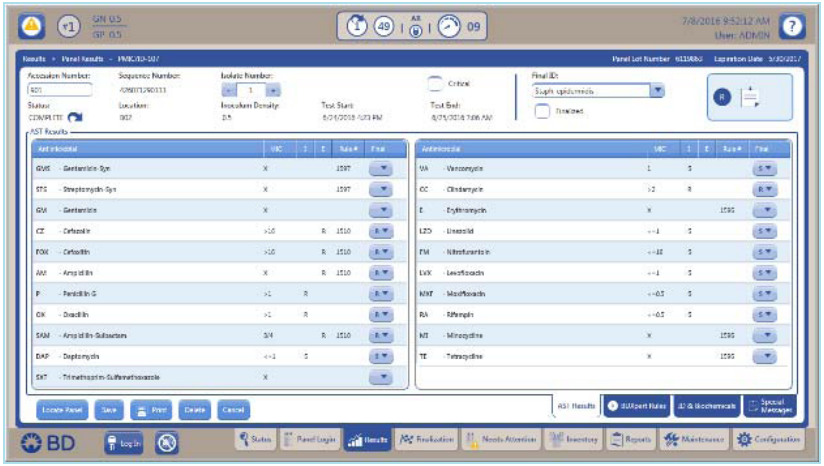
1.3.8.3 Results

1. Select the **Results** tab and enter the **Accession Number** or **Sequence Number** or both to retrieve results.



2. Select the **Inventory** tab and highlight a test. Special messages provide information about panels and results.





Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential

1.3.8.4 Needs Attention

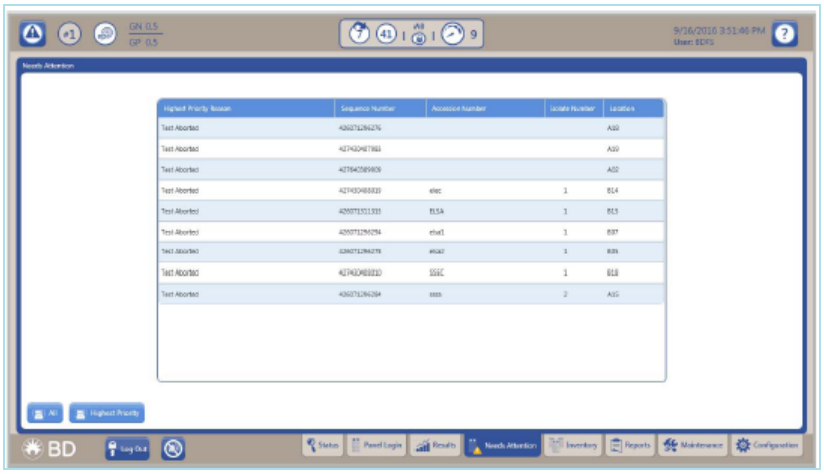
All panels, tests, and isolates that require user intervention, and the highest priority reason for such an intervention are listed on the **Needs Attention** display. Some **Needs Attention** conditions occur shortly after the panel is placed in the Phoenix instrument. Other **Needs Attention** conditions occur after testing is complete. **Needs Attention** conditions should be resolved as soon as they occur so the panels can be set up again if warranted. One panel can have more than one **Needs Attention** condition.

The reason codes on the **Needs Attention** tab are Test Aborted, Invalid AST Results, and No Growth on Panel.

- Press  for a list of the highest priority for each panel.
- Press  for a list of all the **Needs Attention** conditions for each panel.

To view Needs Attention

1. Select the **Needs Attention** tab on the **Status** tab. All the panels with **Needs Attention** conditions get listed. Highlight a panel. The **Results** screen is displayed.

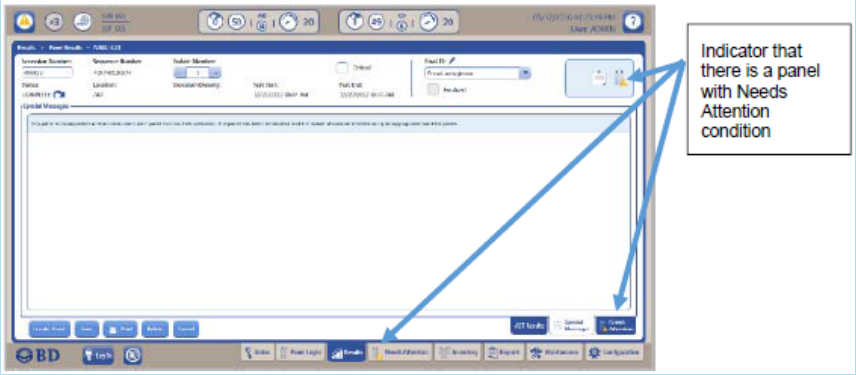


2. Select the **Needs Attention** tab from the **Results** screen after a panel is recalled.

> **Note:** The **Needs Attention** tab is not visible unless the panel has a **Needs Attention** condition.

Example of three instances of **Needs Attention** conditions on **Results.**

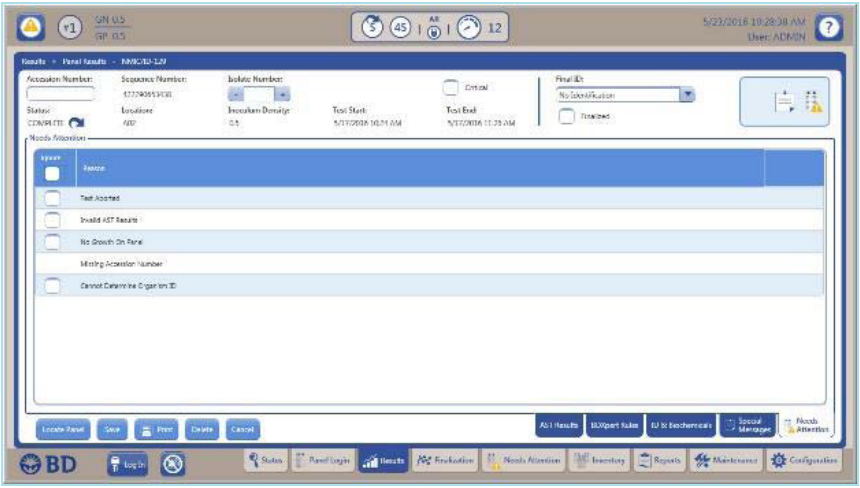
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



Resolving Needs Attention

Note: If the Phoenix instrument is connected to EpiCenter, the **Needs Attention** conditions can also be resolved at EpiCenter.

The **Needs Attention** tab of the **Results** display shows the Reason, Sequence #, Accession Number, Isolate Number and Location for each **Needs Attention** condition.



Key	Function
Ignore Checkbox	Check to remove the panel from the **Needs Attention** list but keep the results information in the Phoenix database for reports.
Locate Panel	Press to locate panel in the instrument. The door unlocks, the panel is indicated by amber lights.
Save	Press to save the **Ignore** selections.
Print	Press to print the **Lab Report** for the panel currently displayed on the **Results** display.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Key	Function
Delete	Press to delete the panel. The panel should be physically removed from the instrument before **Delete** is selected.
Cancel	Press to **Cancel**.

Needs Attention resolution

To resolve issues focus on one panel at a time.

Condition/Reason	Cause(s)/Resolution
Test Aborted A condition occurred which caused the panel to be invalid.	• Ongoing panel not tested for more than 1 hour • Instrument turned off for more than 1 hour • Instrument door open more than 1 hour Panel moved to a different tier / instrument • Incubator temperature too high or too low • System software did not execute testing algorithms for more than one hour. Yeast ID panel placed directly into instrument without logging in the panel while the default media type is blank. **Resolution:** Delete the panel or ignore **Needs Attention** if the ID is retained. Repeat testing. **Note:** Look for **Special Messages** which may indicate the abort reason.
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.	**Causes**: Barcode label obscured or missing. Unknown panel type was placed into the instrument **Resolution:** Locate the panel in the instrument and examine the barcode If the barcode is obscured, the panel must be discarded and another inoculated 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 **Needs Attention** tab does not appear, the internal scanner can now read the barcode.
Cannot read panel wells	**Causes:** Panel not seated properly

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Condition/Reason	Cause(s)/Resolution
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.	**Resolution:** Locate panel, remove it and replace it. After the next inventory, check the **Panel Needs Attention** screen. If the **Needs Attention** does not appear, the panel has been detected.
Panel lot expired A panel was logged in (or has a test start date) with a panel lot number that has already expired.	**Causes:** Panel logged in or placed in the instrument is from an expired lot **Resolution:** Discard panel, reinoculate isolate using unexpired panel lot.
Invalid AST results At least one MIC cannot be interpreted. (Excludes QC panels.)	**Causes:** Refer to Table 5-1 in the User's Manual **Resolution:** 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.	**Causes:** Panel removed before the test was completed. Internal scanner failure and the sequence number can no longer be read. **Resolution:** 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.)	**Causes:** Instrument did not detect growth in the growth well of the panel. **Resolution:** Subculture the organism (to ensure that it is viable) and inoculate a new panel. Panel has been aborted. From the **Needs Attention** screen, delete or ignore the panel.
Panel Lot Undefined A panel has been entered whose lot number is undefined (non QC panel)	**Causes:** Panel is from an undefined lot. **Resolution:** Delete panel lot or ignore.
Review QC Results Status of a completed QC panel is "Fail" ("Review" if QC Lot Support is enabled)	**Causes:** QC panel which yielded an incorrect ID or incorrect AST result for at least one antibiotic or has no growth in Growth Control well. **Resolution:** Repeat QC organisms. Check culture purity, inoculum density.
Missing Accession Number	**Causes:** Failure to enter accession or isolate information.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Condition/Reason	Cause(s)/Resolution
Panel is missing accession or isolate information. (Orphan panel).	**Resolution:** Tap the accession field and enter an accession number using the barcode scanner or by typing it in. Tap the **Isolate** field and add the isolate number. Press **Save.**
Missing Organism ID Panel has no organism ID. (ID required to determine SIR results. Excludes QC panels.)	**Causes:** For AST only panel, no ID has been entered. The panel has an unresolved tie or triplet instrument ID and has no related panel with an ID. **Resolution:** Press the **Results** tab. Enter the organism ID -or- Tap the drop-down and select the organism name. Any BDXpert rules triggered by the given ID will automatically be presented at this point. Select or ignore the rules. When completed, press **Save.**
Can Not Determine Organism ID Panel has an Instrument ID of **No identification** or has a related panel with **No identification** as final ID.	**Causes:** Panel has been in test for 12 hours and the instrument cannot determine the identification. **Resolution:** Repeat testing. Check: • Culture purity • Inoculum density, correct panel used? • Organism may not be in the Phoenix database
Invalid Organism ID Organism ID is not in Phoenix database.	**Causes:** Panel received download information of an organism ID that is not in the Phoenix database. **Resolution:** Use alternate method.
Organism ID Conflict Panel completes testing for an isolate and has at least one related unfinalized panel that contains a different Final ID. Excludes QC panels.	**Causes:** Completed panel has at least one related panel that contains a different ID. **Resolution:** Select **Results** tab and choose an organism. Selecting the organism may trigger BDXpert rules. If the rules are configured as manual they are visible on the **View Expert Triggered Rules** screen in the **Isolate** tab in EpiCenter.
Pending Too Long Panel has not been found during an inventory count within 30	**Causes:** Panel was logged into the instrument but was not placed in the instrument within 2 reading cycles (approximately 30 minutes).

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Condition/Reason	Cause(s)/Resolution
minutes of logging in Panel Login.	**Resolution:** Set up a new panel.

1.3.8.5 Finalization

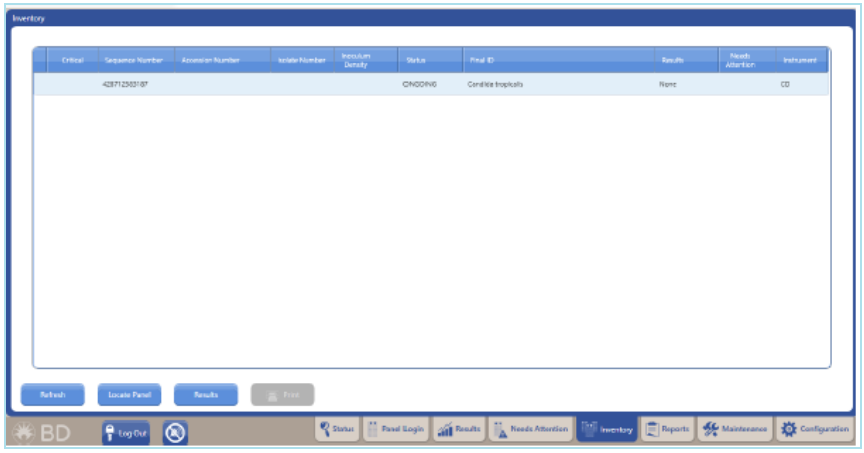
Technicians review and finalize the panel results to upload to the LIS and/or print. This tab does not appear when the Phoenix M50 is connected to EpiCenter. When the system is connected to EpiCenter, panel/result finalization is handled by EpiCenter.

Button	Description
Finalized	Select to print finalized lab reports
Summary	Select to print a summary of panels finalized
Finalize	Select to finalize all panels selected
Finish	Select to close out the window

1.3.8.6 Inventory

Press the **Inventory** tab to display all panels in the instrument, the status of each panel, and the ID results, if complete. Use this tab to access individual panel results.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



Button	Description
Refresh	Press to update the display.
Locate Panel	Press to find a certain panel in the instrument.
Results	Press to view the panel results.
Print	Press to print lab report for every panel displayed on the list.

1.3.8.7 Reports

Several reports are available under **Reports** tab. Press **print** to print the report.

Report	Location	Description
Accession Lab	Reports Tab	Provides information for a specified accession number
Completed Lab	Reports Tab	Contains information for all panels whose status is **Complete**

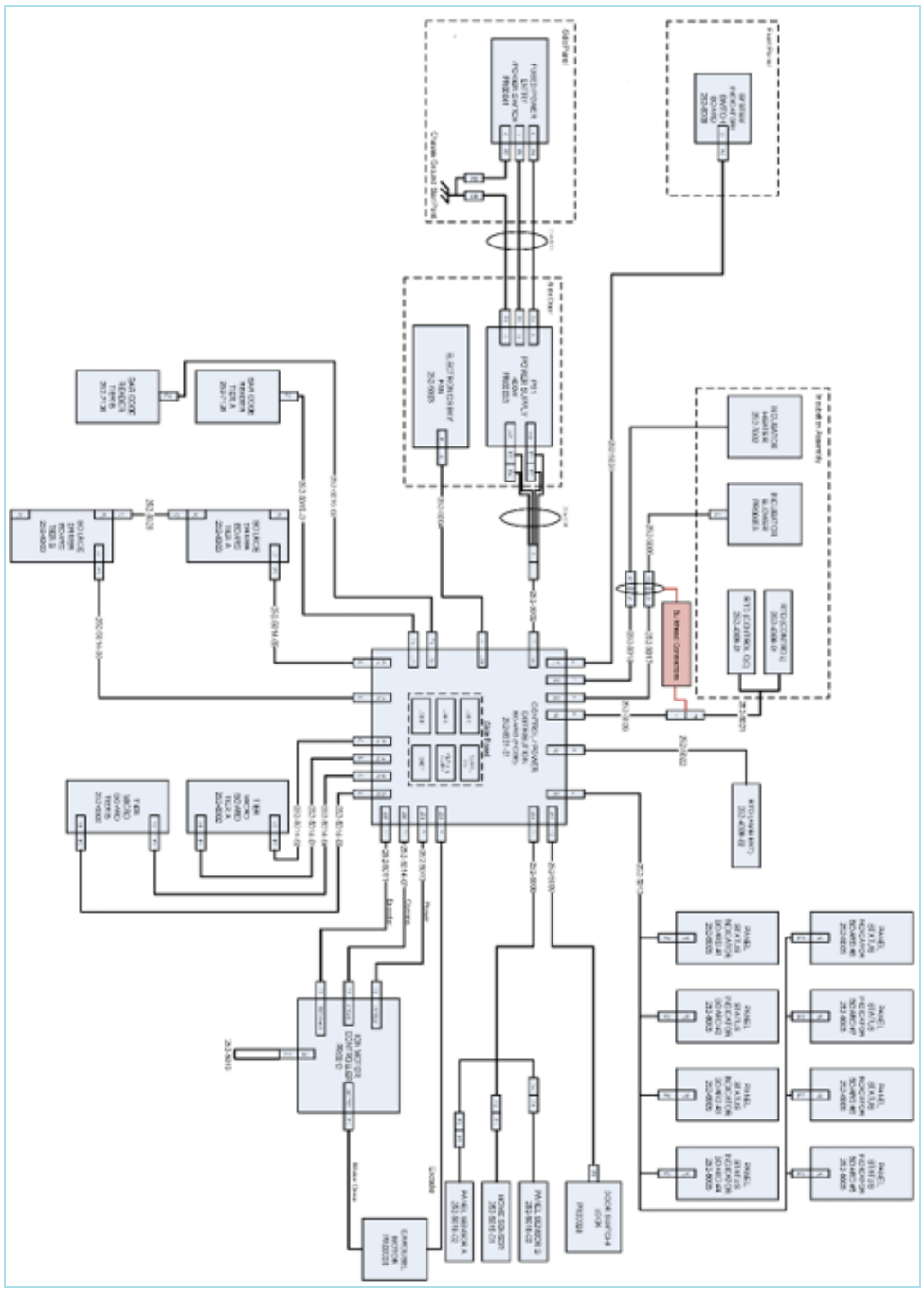
Report	Location	Description
		during the time period (up to the past 48 hours) you select
Finalization Summary	Finalization display	This report can be printed if there is at least one panel displayed on the **Finalization** screen.
Lab	Panel Results or Finalization displays	Contains all information for a panel sequence number that exists in the Phoenix database, including all information in the Panel Results display, any special messages, BDXpert Rules that triggered, or **Needs Attention** Reasons if they exist
Needs Attention List	Reports Tab	Lists all panels in the instrument's database that have a **Needs Attention** flag set that have not been ignored
Resident Panel	Reports Tab	Lists the panels contained in stations 1 – 25 for each tier
Panel Inventory Lab	Panel Inventory display	Prints a **Lab** report for all panels in the instrument
QC Reports		
Cumulative QC Report	Only available when EpiCenter is not enabled	Provides information on quality control testing of all panel types
Current QC Panel Lot Report	Panel Lot Definition display	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
Historical QC Panel Lot Report	Panel Lot Definition display	Contains information on all tests for a strain for the current instrument, up to 200 tests
Panel Lot Database Report		Lists all the defined panel lots in the current instrument, and provides statistical and reference information of those lots
Panel Lot Report		Lists all the panel records for any panel lot number in the current instrument
QC Lab Report	Panel Results display. Only	Contains all information for a QC panel sequence number that exists in the Phoenix Database Lists all Test Strain organisms that have completed testing and

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Report	Location	Description
	available when EpiCenter is not enabled	all biochemical and/or antimicrobial MIC results (for a specified Panel Lot #) that exist in the Phoenix databases when the report is requested
Maintenance		
Daily Instrument Report	Reports Tab	Lists the status of the instrument at the time the report is generated and displays maintenance checklist
Configuration		
Antimicrobial Code Report	Reports Tab Not visible if system is connected to EpiCenter	Displays all antimicrobials, BD and LIS codes for all antimicrobials that exist in the Phoenix database from all panel configurations
BDXpert Rule Set Database Report	Reports Tab Not visible if system is connected to EpiCenter	Lists each BDXpert rule number and the test describing the rule, whether each rule is enabled/disabled and whether each rule shall trigger automatically/manually in the system
Custom Breakpoint Difference Report	Reports Tab Not visible if system is connected to EpiCenter	Prints a listing of differences between old Custom breakpoints and new Custom breakpoints after a Phoenix Update Disk or Install/Upgrade operation
Interpretation Rule Set Report	Reports Tab Not visible if system is connected to EpiCenter	Lists the antimicrobial breakpoints of the Interpretation Rule Set defined as the default Rule Set in the Rule Set display
Organism ID Code List Report	Reports Tab Not visible if system is connected to EpiCenter	Displays all Organism Names, BD and LIS codes for all Organism Names that exist in the Phoenix database

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

1.3.9 Architecture and Functions



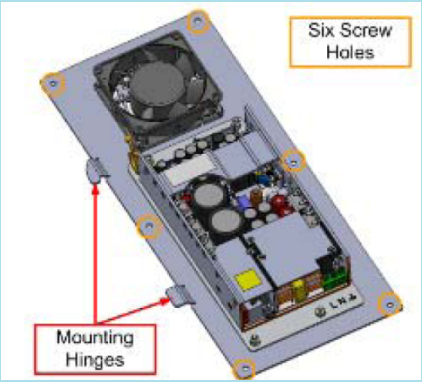
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

1.3.9.1 Power Supply

The Phoenix M50 uses a single voltage (24V DC) power supply. The other required voltages are generated on the Falcon Control and Power Distribution Board (FCDB), tier micro board and light source driver board.

Component	Voltage
Panel Status Indicator	5V DC
Door Switch Lock	24V DC
Panel Sensors	5V DC
Ion Controller	24V DC
Tier Micro	24V DC
Light Source Driver Board	24V DC

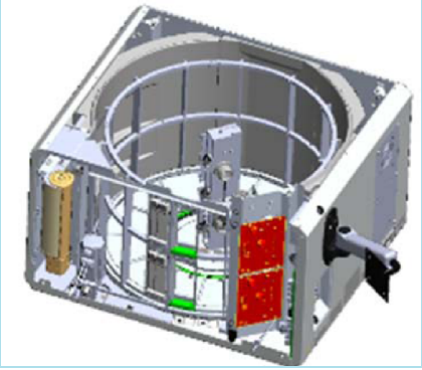
The power supply assembly consists of the power supply and a blower fan mounted to a plate. It is secured to the back right side (from the front) of the instrument.



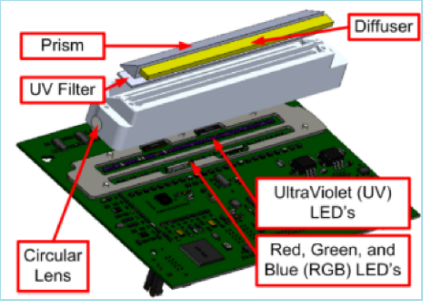
1.3.9.2 Light Source Driver Board

Two light source driver boards, one for each tier, are located in the front right side of the instrument. The source module provides red, green, blue, and ultraviolet light. The light from the source module is directed through the carousel illuminating the panel wells, which attenuates the light. The attenuated light passes through the lenses in front of the charge coupled device (CCD)s on the tier micro boards.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



The source module contains an optical array of two columns of LEDs. One column contains the red, green, and blue LEDs. The second column contains the ultra violet (UV) LEDs.



An optical housing is mounted above these LEDs. On one side of the optical housing, over the column of UV LEDs, are cylindrical lens UV filter, and a prism. On the other side of the housing, over the RGB LEDs, is a light diffuser. The light from the RGB LEDs, one color at a time, is projected through the diffuser. The diffuser mixes the light from multiple LEDs producing a coherent bar of light.

The diffusion of light has the beneficial effect of maintaining a constant light column. The light column remains constant, even if several LEDs are weak or defective. If the operational LEDs are effectively adjusted in intensity, operation is not impacted. The light bar appears uniform to operational to the CCD. To the CCD, the light appears as a solid bar attenuated by the colors in panel wells. As the LEDs are activated one color at a time, the CCD reports a gray scale equivalent to each color.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
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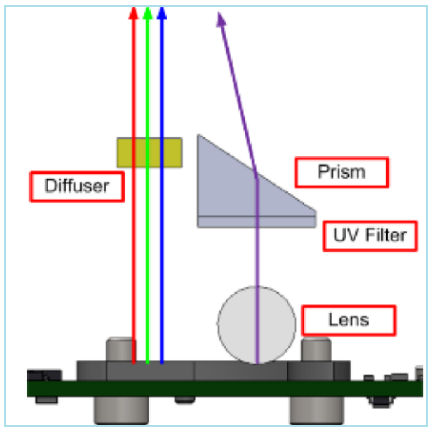
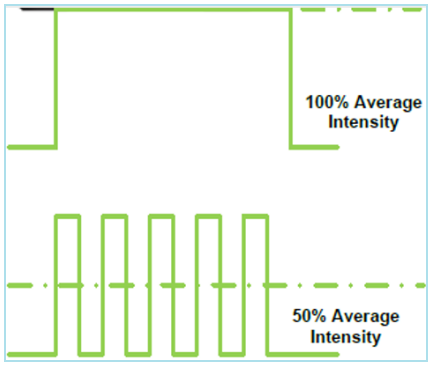


The second column on the source module contains UV LEDs. The UV light from the UV LEDs passes through a cylindrical lens and a UV Filter. As the UV LED column is offset from the RGB LED column, the UV light passes through a prism which causes the light to bend at a small angle to illuminate the same spot on the lid of the panels as the RGB light. The UV light causes certain wells in a panel to fluoresce at a different wavelength of visible light. This intensity of the secondary light from the fluorescence within the wells of the panel is read by the CCD on the tier micro board.

1.3.9.3 Pulse Width Modulation (PWM)

Some Light Emitting Diodes (LED) have two factors that are sensitive to drive current, Intensity and Wavelength. PWM is a technique for varying the average intensity of an LED while maintaining a stable frequency and drive current.

The LED is pulsed on and off during this cycle. This reduces the average intensity of light though the diffuser without affecting the wavelength of the light. The drive current, and frequency, is set at time of manufacture. PWM is used to control the intensity of the LED.



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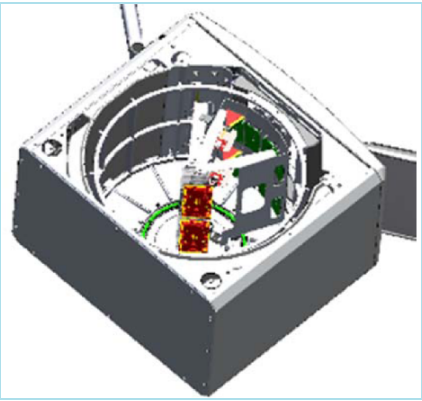
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

1.3.9.4 Tier Micro Board

Location and purpose

Two tier micro boards, one for each tier, are located on the central light tower behind the lenses. It contains the CCD or digital imaging device (camera). The CCD on the tier micro board receives light from the corresponding tier source board attenuated by the panel wells.

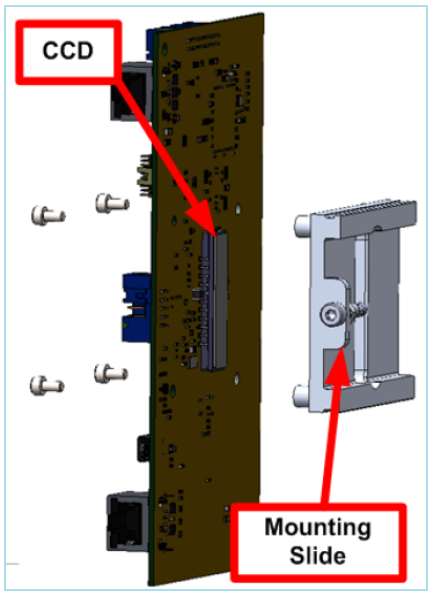


Functionality

The CCD is a single vertical column. As the carousel rotates and the panel passes in front of the CCD, thin vertical slices are read from the panel. These vertical slices can be lined up next to each other providing an image of the panel wells. The CCD only identifies light intensity. Multiple images are made using red, green, and blue light sources on the source board. These images are then combined to create an actual color image.

The CCD is hard mounted to the tier-micro board. The board is mounted on a slide with a single thumb-screw to adjust the X position of the CCD squarely in front of the light source driver board. The X position of the tier board is adjusted to maximize light signals from the light source driver board. The X position of the tier board is adjusted to achieve maximum light signals from the source board.

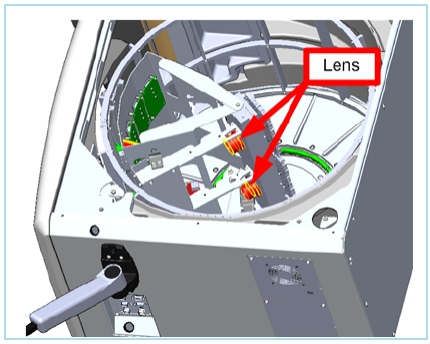
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



1.3.9.5 Lenses

Location and purpose

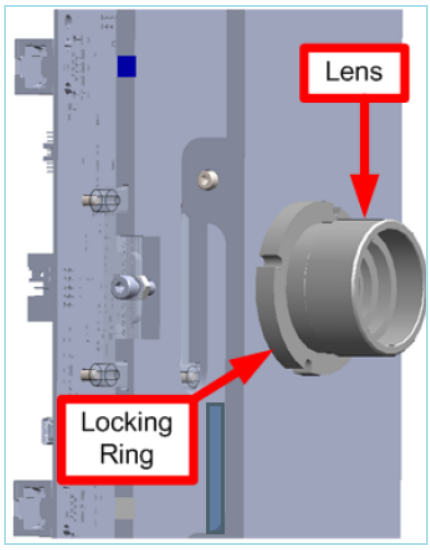
Two custom lens assemblies, one for each tier, are located on the front side of the measurement tower in the center of the carousel. Each lens has a 50 mm focal length (f2.8) threaded into the front side of the measurement tower. Lenses are on the optical access between the tier source board and the CCD on the tier detector board and is used to focus the light from the source board.



Functionality

The light from the LEDs on the source board is attenuated as it passes through a phoenix panel. The lens assembly focuses the light on the CCD. The lens can be adjusted by first loosening the locking ring and then rotating the lens until the light is in sharp focus. Lens adjustment may be required during the CCD Fine Focus step of the optical alignment procedure. Refer to "CCD Fine Focus" on page 218. When focus is achieved, the locking ring is tightened down. This ensures that the lens does not move and maintains its optical focus.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



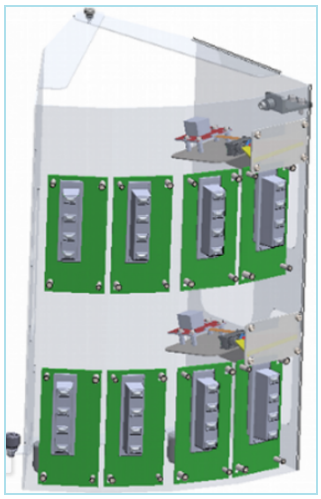
1.3.9.6 Panel Status Indicator

Location and purpose

Eight panel status indicators are mounted on the panel status assembly daisy-chained together. Their positions are determined by the order of connection to the chain. Each panel status indicator consists of a circuit card with red, green, and amber LEDs.

Functionality

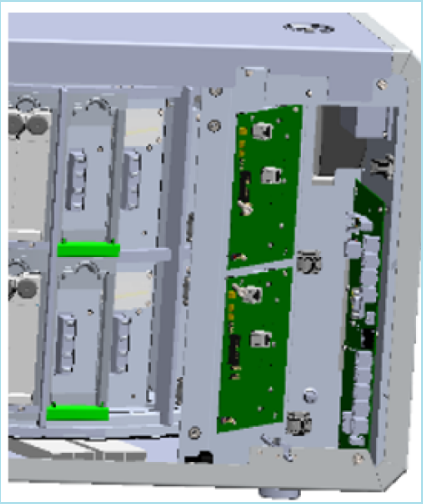
During normal operations when the user software unlocks the door, each panel status indicator receives a signal indicating the panel state directly in front of it. The panel state indication colors are **amber** (user located panel), **red** (blocked station), **green** (removable panel).



Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential

1.3.9.7 Falcon Control and Distribution Board (FCDB)

The FCDB manages the operation of all the other boards in the instrument and communicates with the AIO. All other voltages are developed on this board from the 24V DC power supply. All instrument signals are routed through this board and instrument functionality is programmed into this board.



1.4 Important Service Principles

The BD Phoenix M50™ automated microbiology system is intended for rapid identification (ID) and Antimicrobial Susceptibility Testing (AST) of clinically significant bacteria (e.g. for most aerobic and facultative anaerobic Gram-positive bacteria as well as most aerobic and facultative anaerobic Gram-negative bacteria) of human origin. The Phoenix system is also intended for rapid identification of yeast and yeast-like organisms.

Configurations

The Phoenix M50 can be configured as a single standalone instrument capable of testing upto 50 panels at a time. Two instruments can be stacked with a single tablet to increase the capacity to 100 panels at a time.

A Laboratory Information System (LIS) can be connected to the Phoenix M50 through the on-board serial ASTM interface. The Phoenix M50 can be connected to a BD EpiCenter system through a standard ethernet connection.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

1.5 Service Safety Considerations

Electrical safety

The Phoenix M50 instrument uses electrical voltage and power levels that are potently lethal. During normal operations, these voltages are internal to the instrument and do not present a hazard. During testing, troubleshooting, and performing maintenance it is necessary to remove parts of the instrument enclosure exposing electrically charged circuits. Observe electrical safety instructions.

Note: To disconnect the instrument from the main power, turn the power switch off and unplug the power cord to guarantee disconnection.

Three pronged power connection must be utilized where available. Phoenix ground lift type 3 to 2-prong adapters should not be used in any circumstance.

Warning: Phoenix M50 maintenance must be done only by BD certified personnel.

Mechanical safety

The Phoenix M50 instrument contains moving parts. During normal operations, these parts are enclosed and present no danger to the operator. While testing, troubleshooting, and performing maintenance it is necessary to remove parts of the instrument enclosure exposing moving parts. While working on the instrument observe mechanical safety perceptions.

Electrostatic Discharge (ESD)

- The Phoenix M50 instrument contains electrostatic sensitive electronic components. When servicing the instrument, proper ESD protection must be utilized to prevent possible damage to sensitive components. Failure to follow proper ESD precautions can induce intermittent and/or catastrophic failures.
- The use of a portable field service static kit, such as those manufactured by 3M™, is recommended to service the Phoenix instrument. This kit provides a wrist strap and coil cable, ground strap and a portable anti-static mat for servicing and staging components.
- Any replacement electronic modules should be stored and transported in an ESD shielded container or bag. These components should only be opened on a grounded ESD work surface.

Personal Protection Equipment (PPE) and contamination

- To protect the individual and reduce chances of contamination, personal protection equipment should always be used when performing maintenance on the Phoenix M50 instrument.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

- Proper use of lab coats and latex gloves protect both the engineer and instrument from contamination. Some of the chemicals used in the extraction process have high Ph values and can burn exposed skin.
- Safety glasses protect the eyes from reagents and cleaning agents. As with any moving mechanical devices, there is the chance of flying debris.
- Tools and equipments used while working on the instrument must be properly cleaned and decontaminated with a 5% bleach solution (or other approved decontamination agent) before and after each use.
- Use industry standard precautions for disposal of bio-hazardous waste.

1.6 EHS and Onsite Safety Protocols

BD is committed to providing all authorized individuals on BD property with a safe environment in which to work, and proper tools with which to do the work. Please refer to the safety procedures that pertain to your specific locations. The onsite safety protocols must address safety requirements and safe environment at the customer site.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

2 Instrument Installation

This chapter contains the procedures to install the Phoenix M50 instrument, and the systems that interface with the Phonenix M50.

2.1 Pre Installation Procedure

Install Phoenix M50 on a level surface (± 0.5°) in an area free from undue vibration, direct sunlight, high humidity, dust, extreme temperatures, and corrosive or explosive vapors or gases.

Materials required

- Tape measure
- Level

Physical size

Height	21 in (535 mm)
Width	32 in (815 mm)
Depth	30 in (765 mm)
Stack Height (2 instruments)	42 in (1070 mm)
Stacking Height M50 with FX40	40 in (1016 mm)
Tablet and Arm Swing	22 in (560 mm)
Door Swing	18 in (457 mm)

Clearance requirements

Clearance – Right	21.5 in (546 mm)
Clearance - Left and rear	2 in (51 mm)
Clearance – Front	18 in (457 mm)

Weight

Weight – Empty	118 lb (53.5 kg)
Weight – Full	127 lb (57.6 kg)

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Instrument Delivery Path

Validate that all instruments and associated items can be safely transported from the shipping/receiving area to the installation location.

Environmental requirements

Non – Operational storage	
Temperature	-17.7°C – 65°C (0° F – 149° F)
Humidity	20 – 80% RH, non-condensing
Operational storage	
Temperature	18°C – 30°C (64.4°F – 86°F)
Humidity	20 – 80% RH, non-condensing
Altitude	Location altitude is less than or equal to 2000 meters

Electrical requirements

Input Voltage	110/220V AC
Input Current	6 Amp (@ 110)
Input Line Frequency	50/60 Hz

Heat output

Ambient temperature	BTU/hr
18°C	648
24°C	464
30°C	287

Printers

1. Printers connect to the system via USB port. The distance between the instrument and the printer is limited by the length of the USB cable. A 15 feet USB cable is available under catalog number 441478.
2. Typical printer dimensions are H - 11 inches (28 cm), W - 17 inches (43 cm), D - 15 inches (38 cm).

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Power requirements

Input Voltage	110/220V AC
Input Current	6 Amp (@ 110)
Input Line Frequency	50/60 Hz

Installation configurations

1. Determine the required install configuration, FDA vs. Non FDA.
2. BDDS252-0011 identifies five BD approved configurations for the Phoenix M50 instrument. Multiple instruments in multiple configurations is possible. Use the table below to determine the configuration types. Multiply the configuration required parts by the number of configurations to determine total install parts kits requirements. Use adaptor kit 443873 to stack a FX 40 with the M50.

Part ID	Single M50 on Table or Bench	M50 Stack on Table or Bench	M50 Stack on Shallow Bench	Single M50 Anchored	M50 Stack Seismic Anchored
443624 M50 Instrument	1	2	2	1	2
443625 M50 Starter Kit	1	1	1	1	1
443991 BD Seismic Table	1[a]	1[a]		1	1
443910 Stacking Kit		1	1		0[b]
443918 Seismic Kit				1	1

a - Table is optional, depending on customer needs.

b - The seismic kit (443918) comes with heavy stacking straps specifically for seismic anchoring of a stacked install.

Connectivity

1. Determine if direct connect LIS will be used for this installation. If so, perform the following actions.
   a. Determine if onsite local LIS support is available.
   b. Determine if remote LIS support is available.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

c. Confirm an LIS network drop will be in place at the time of install.
d. Provide a copy of the LIS Vendor Interface document (L-005933) to the customer.
e. Make the customer aware of the requirement for an RS-232 Interface.
f. Make the customer aware of the ASTM format.
g. Determine if LIS queries for data.

2. Determine if EpiCenter will be used with this installation.
   a. If a new EpiCenter installation is occuring along with the Phoenix M50 install, confirm the EpiCenter pre-install has been performed.
3. If possible, capture the LIS vendor information and LIS support staff contact information.

2.2 Installation Safety Warnings

Note: Use a three-man lift to move the instrument.

Warning: Do not connect or disconnect any internal cable without first turning off the power to the instrument.

2.3 Installation Procedure

Materials required

- Most recent software version and PUD
- Blank USB key
- USB keyboard
- M50 specialty Toolkit (SAP 443859)
- Assortment of cable ties
- Hand tools
  - 5 mm hex key
  - 4 mm hex key
  - 3 mm hex key
  - 12 mm open end wrench
  - Level
  - Philips head screwdriver

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Warning: Do not connect or disconnect any internal cable without first turning off the power to the instrument.

Note: The field service password is provided to field associates by Technical Services.

2.3.1 Check Shipment

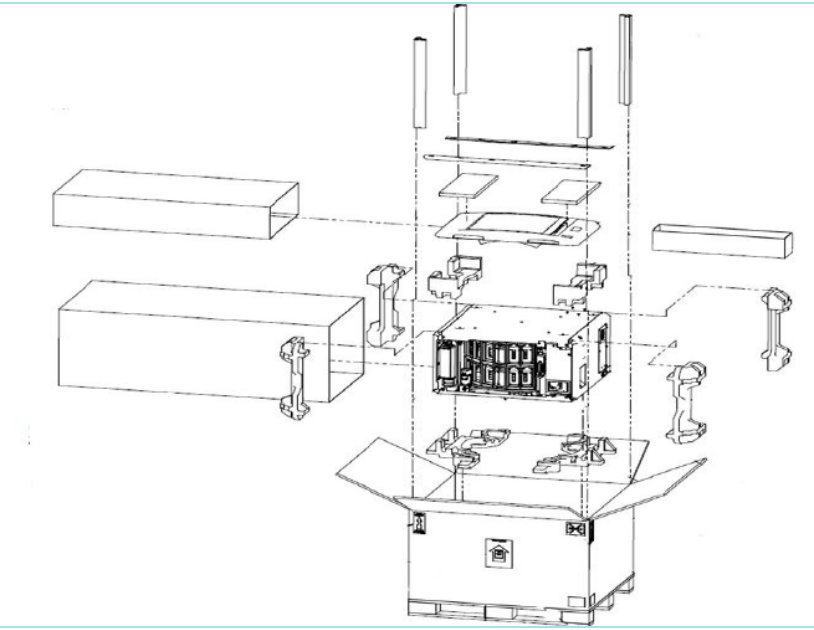
1. Unbox the instrument.

   Note: The front and the rear fascia are shipped on top of the instrument.

2. Unbox the starter kit, sales BOM, and materials shipped with the instrument.
3. Review the site pre installation checklist. Refer to "Pre Installation Checklist" on page 270. Review the Phoenix M50 configuration and installation drawing (**BDDS252-0011**).
4. Inventory all materials.
5. Inspect all items for damage.

   Note: Include missing and damaged items in the service report. Report irregularities to the supervisor.

6. Ensure proper disposal of the packaging material.



Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential

2.3.2 Transport Instrument and Associated Parts

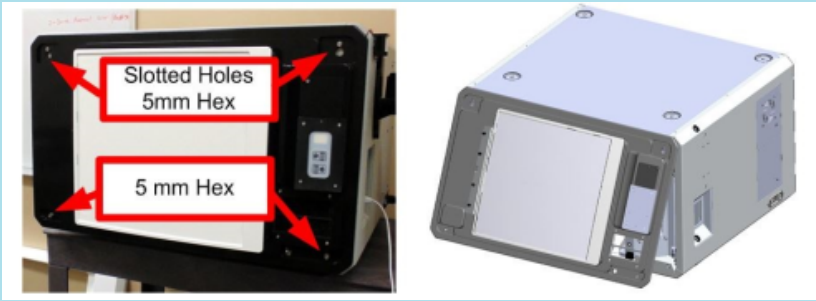
1. The instrument weighs more than 100 lbs (45 kg). In the absence of mechanical means, at least three people are needed to move it safely. Use a cart to transport the instrument from the loading dock to its final destination.

   Note: Four finger detents for lifting are provided, two on the left side and two on the right side of the instrument.

2. The instrument has front fascia, rear fascia, swing arm, and AIO.
3. Ensure that the instrument location is away from direct sunlight, other heat sources, and not located close to vents.
4. Per the configuration(s) identified in the pre installation checklist and the instructions for configuration and installation (**BDDS252-0011**), install or mount the instrument. Refer to "Pre Installation Checklist" on page 270.
5. Use a 12 mm open-end wrench to adjust the feet of the instrument so that front to back and side to side the instrument is within ± 0.5° of level. Tighten the jam nuts when the feet are adjusted.

2.3.3 Assemble the Instrument

1. Attach the rear fascia.

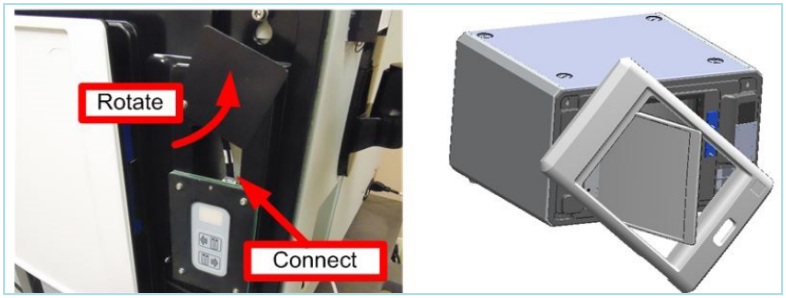


   a. Install two long 5 mm hex screws and washers in the upper left and right holes. Do not screw them all the way in. The screw heads should extend approximately 0.5” (12 mm) from the front of the instrument.
   b. Install the rear fascia by angling the top towards the instrument and place the left and right slotted holes over the two 5 mm screws. Ensure washers are on the outside of the rear fascia. Slowly move the bottom towards the instrument. The ambient RTD must go through the small hole on the bottom right of the rear fascia. Support the rear fascia from the bottom until all screws are tightened.
   c. Install the bottom two 5 mm hex screws and washers. Do not tighten yet.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

d. Rotate the right hand panel and connect the system status indicator cable.

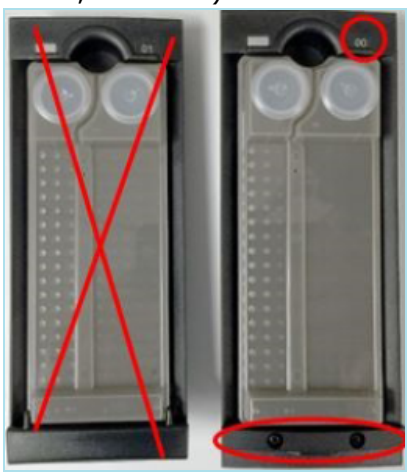
e. Tighten the four 5 mm hex screws.



2. Attach the front fascia.
   a. Open the door all the way.
   b. Rotate the front fascia to 45° with respect to the door.
   c. Slide the fascia over the door. Turn it level to the instrument and push the top in place.
   d. Push the bottom in place to secure the fascia.

2.3.4 Normalizer Panels

1. Open the instrument(s) door and rotate the carousel until position 00 is visible.
2. Verify that normalizer panels are installed in position 00 on all tiers (2, if a single instrument and 4, if a stack).



3. Close the instrument door.
4. Attach the instrument power cord and power on the instrument to start warming up the incubation chamber. The instrument takes approximately one minute to fully start and up to 40 minutes for the incubation chamber to stabilize at operating temperature.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

2.3.5 Attach the AIO and Swing Arm

1. Protect the face of the monitor while laying it flat on a level surface. Connect the VESA plate of the swing arm to the back of the monitor with four screws.
2. Attach the swing arm mounting bracket to the right side of the instrument (bottom instrument in a stack installation) with four 4 mm hex screws. Snap the two swing arm mount covers in place.
3. Lift up the monitor and the swing arm and slide the circular opening at the end of the swing arm over the post on the mounting bracket.
4. A small 3 mm Allen screw is in the side of the swing arm mount to adjust the tension of the rotational swing, if required.
5. Set the vertical tension of the swing arm by adjusting the 4 mm hex screw at the upper end of the arm so the AIO stays in place after vertical adjustment.

2.3.6 Connect the Cables

1. For a single instrument, connect **A** to **B** USB cable between a USB **A** port on the bottom of the AIO and the **B** USB connector on the instrument. Route cables along swing arm.
2. For a stack (two instruments), **connect only the bottom** (Tier C/D) instrument **A** to **B** USB cable between a USB **A** port on the bottom of the AIO and the **B** USB connector on the instrument.

> **Note:** Any USB port on the AIO or the instrument can be used for connecting either instruments or peripherals. If power is turned **OFF** on an instrument, any device connected to that instrument's USB port disconnects.

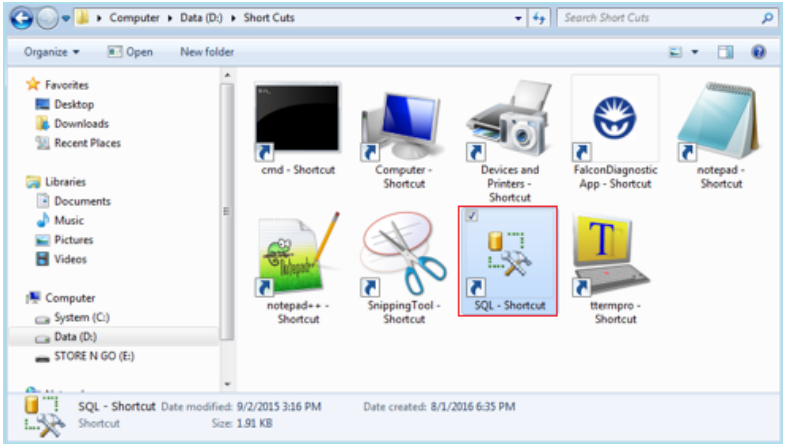
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

2.3.7 Start AIO Computer

1. Turn on the AIO computer.
2. Validate that the AIO boots to the Phoenix M50 user software.

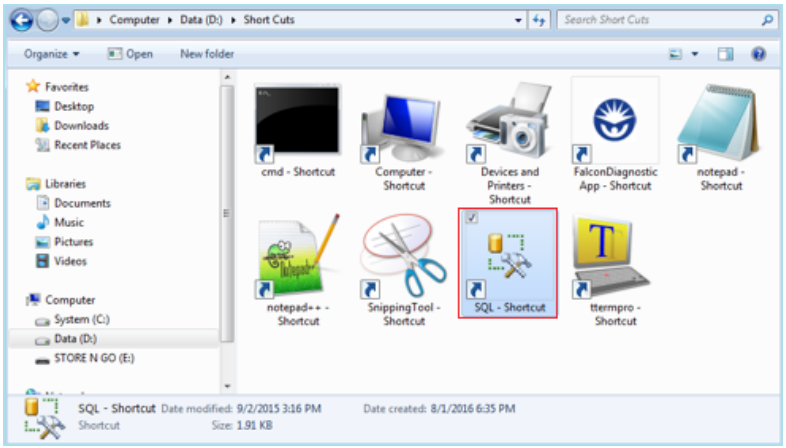
2.3.8 Configure the Instruments

1. For a single instrument go to **step 3**. For a stack (two instruments connected to one AIO) follow the steps below.
   a. Log in with the user name **BDFS** (BD Field Service).
   b. Navigate to **Tasks > Maintenance** > **Field Service** > **Exit Application**



Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential

c. Navigate to **Tasks > Maintenance** > **Field Service** > **Exit Application**



d. Navigate to **File Explorer**.

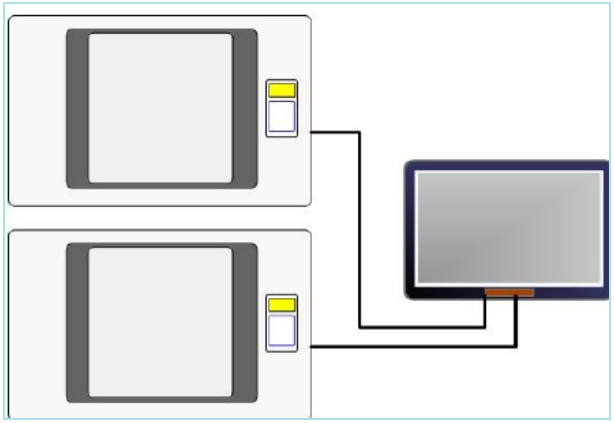
e. Navigate to **D:\Short Cuts.** Launch **FalconDiagnosticApp**. Wait for the Toolkit to connect to the instrument in **Diag** mode (green balls in the left window). Long press the **FalconDiagnosticApp.exe** icon until the gray square appears. Select **Run as Administrator** to open the Falcon Toolkit.

f. Navigate to **Config** > **Set Instrument IP Address**.

g. Instruments are assigned the tier A/B IP address 169.254.1.20 by default. For instruments running tier C/D, select IP address 169.254.1.21 and **Start Test.**

h. Power cycle the M50 instrument and then restart the Toolkit. The instrument should now display the IP address 192.168.1.21. If not, repeat the step.

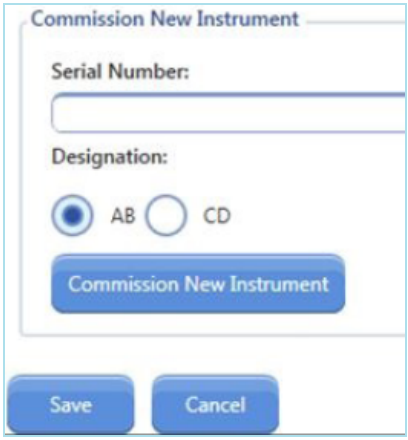
2. Connect the top instrument (Tier A/B) to the tablet.



3. If the **Task Manager** is open, close it and let the instrument reboot to user software.
4. Log in with the user name **BDFS** (BD Field Service).
5. Select **Configuration** > **Instrument**.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

6. For an **AB** instrument, in the **Commission New Instrument** section, enter the **Serial Number**, select AB for a single instrument, or the top instrument in a stack. Then, select **Commission Instrument**.
7. For a stack, then for the **CD** instrument enter the **bottom instrument serial number**, select **CD**, and **Commission New Instrument**.



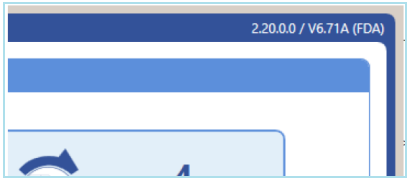
8. Select **Save**. The **Are You Sure? Instrument will reboot after update** prompt is displayed. Select **OK**. The tablet reboots after the instruments are commissioned.
9. The upper left screen panel displays instruments commissioned with this **AIO**.

Set up scanner

1. Attach the scanner to a USB Port.
2. Program the scanner per **BALT443809 Attachment E**.

Set mode and language/Locale settings

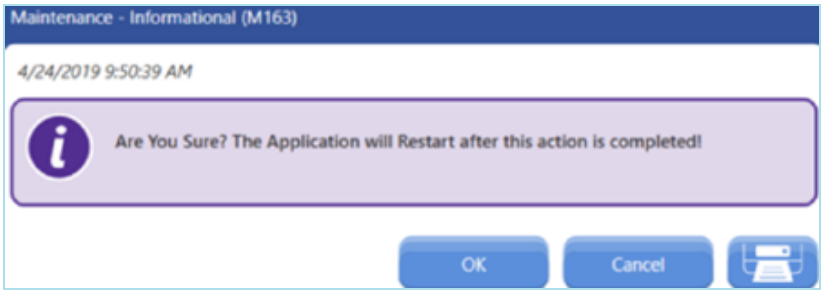
1. Log in with the user name **BDFS** (BD Field Service).
2. View the upper right corner of the screen to determine the FDA mode.



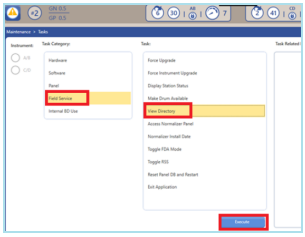
3. If the mode of operation is incorrect, navigate to **Maintenance** > **Tasks** > **Field Service** > **Toggle FDA Mode**. Click **Execute**.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

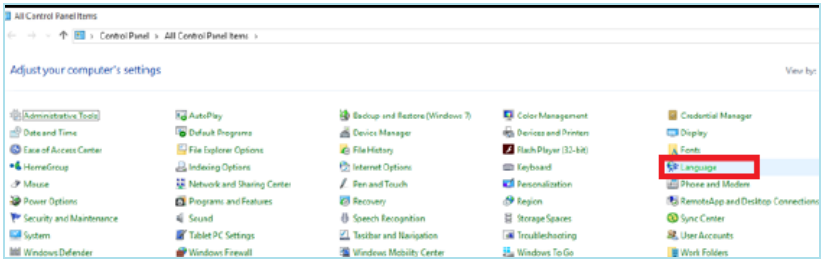
4. The **Maintenance - Informational** screen is displayed. Click **OK**. The application restarts.



5. To set the correct display language and locale (time display format), navigate to **Maintenance** > **Tasks** > **Field Service** > **View Directory**. Click **Execute**.

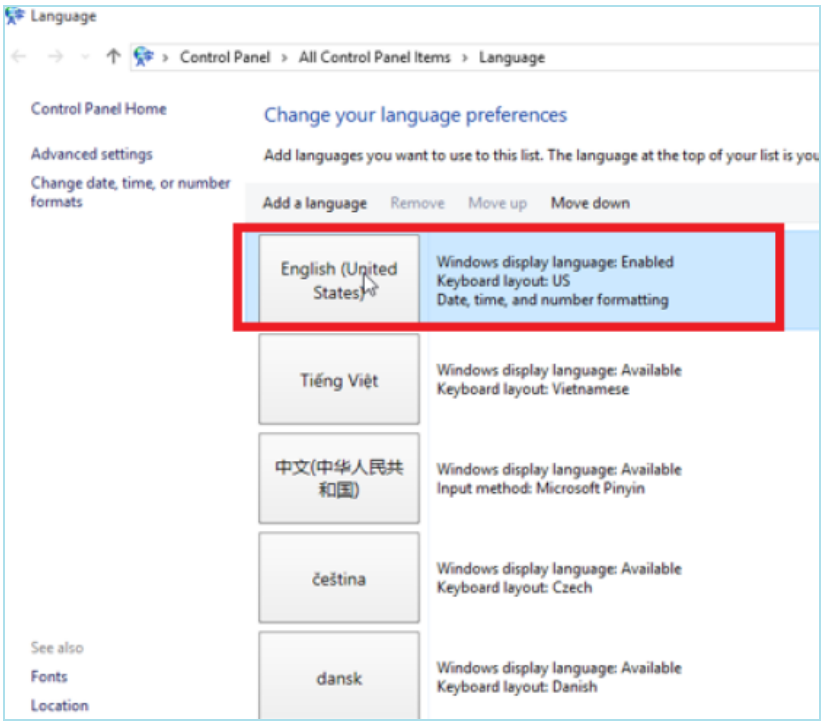


6. From the **Explorer** window, navigate to **D:/Short Cuts** directory > select the **cmd prompt** shortcut, right-click and select **Run as administrator**.
7. Type **control** at the prompt to display **Control Panel**. Select Language.

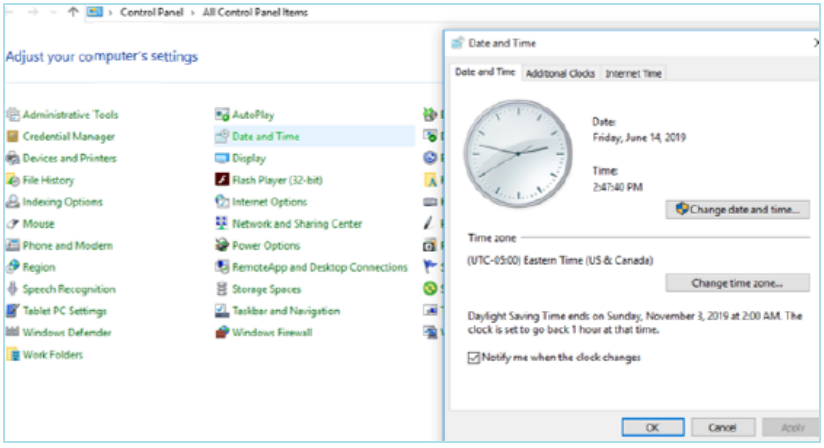


8. Set the required language and locale setting for the site.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



9. To adjust time and date, use **Date and Time** in **Control Panel**.



10. Close all windows and restart.

> **Note:** If the instrument connects to an EpiCenter, some region specific settings must match the implementation on the EpiCenter.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Setup printer in operating system

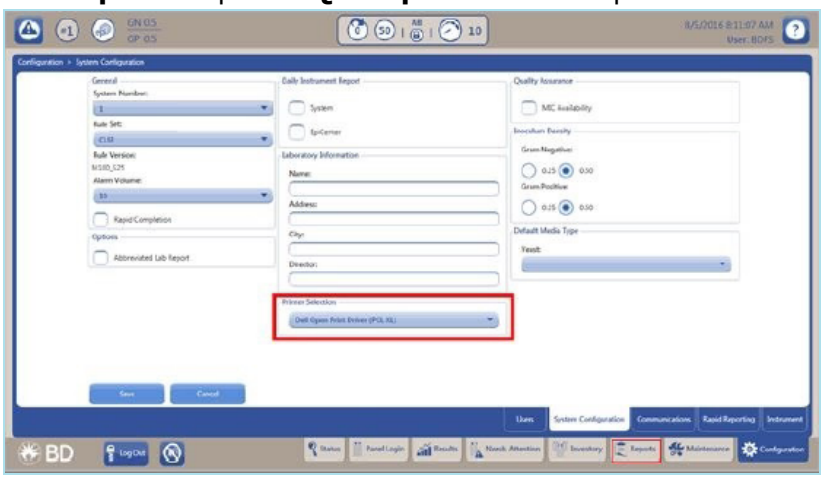
1. Ensure the supplied printer (PN 443431) works with one of the pre-installed drivers.

Brother HL - L2340DW
Dell B2360 dn
Brother HL - 5440D
Brother HL - L2365DW
Brother HL - L5100DN
Dell 2350
HP Laser Jet P2035
Brother HL - L5000D
HP Laser Jet Pro P1102W
HL -L2350DW

2. Plug in the printer and connect it to the instrument.
3. Select **View Devices and Printers**. The printer driver is visible in the **Devices and Printers** window. If not, contact your supervisor.

Set up printer in application

1. Close the **Task Manger** window. The instrument reboots into user software with **EWF ON**. Log in as **BDFS**.
2. If a printer is attached, select it from **Configuration** > **System Configuration**. If the printer is unavailable, contact your supervisor.
3. Use **Reports** to print a **QC Report** to test the printer.



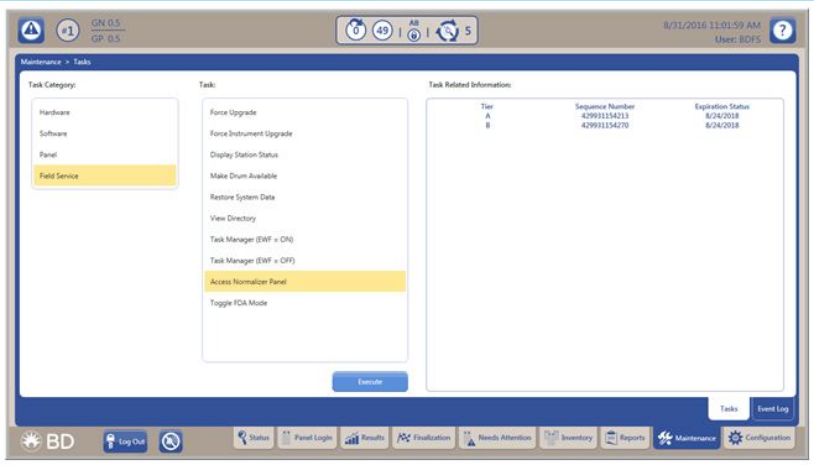
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Set instrument system number

Use **Configuration** > **System Configuration** to set the system number in the upper left hand corner.

Set normalizer install date

1. Select **Maintenance > Tasks** > **Field Service > Access Normalizer Panel.**



2. Wait for inventory to be complete.
3. Select **Execute** to set the **Normalizer Expiration** date.

> **Note:** Set the date five years into the future.

Apply system decals

- On the lower right front of the instrument, apply the white decals with black lettering, tier letters and system number. For example, **AB 01**.
- On the inside of the instrument, apply the black decals with white lettering indicating the tier letter.

Finish scanner setup

- Scan the supplied lot number barcode.
- If the scan is successful, the scanner is functioning correctly.

Finish install

- Use cable ties to dress all cables as required.
- Remove all packaging materials.
- Turn over additional materials to the customer.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Qualify the instrument

Reboot the AIO and perform system qualification. Refer to "Instrument Qualification and Software Upgrade Procedure" on page 204.

2.4 Interfacing Instruments

Interfacing includes connecting Phoenix M50 to an EpiCenter v7.0 or higher, and connectivity for LIS, Epicenter, and printers.

Physical connections

1. LIS

   LIS connection is via ASTM RS-232 DB9 connection currently at the bottom of the AIO computer used with the Phoenix M50. Refer to the **LIS Vendor Interface** document for details.

2. EpiCenter

   EpiCenter connectivity is via Ethernet RJ-45 connector currently at the bottom of the All-In-One computer used with the Phoenix M50.

   > **Note:** Meet these specifications prior to the installation date.

   If special conditions or considerations exist, contact the local field service engineer.

2.4.1 Phoenix M50 and BACTEC FX40 Stacking Adaptor

Material required

Stacking adaptor kit FX40 to Phoenix M50 kit

1. Install the extra leveling feet on Phoenix M50
2. Attach the mounting brackets to the top of Phoenix M50
3. Stack the BACTEC FX40 on the top of Phoenix M50

Material	SAP	Number	Graphic
Bracket FX40 Mounting Left	BDDS252-2110-01	1	

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Material	SAP	Number	Graphic
Bracket FX40 Mounting Right	BDDS252-2110-02	1	
BACTEC FX40 Tie Down	BDDS252-2111	4	
Screw Machine SHC,M5 X 0.8 X 16, SS PAS	8087275	4	
Screw Machine SHC, M5 X 0.8 X 10, SS PAS	8087273	8	
Washer Regular 5 mm SS	8087439	8	
3/8 – 16 Hex Nut	70-030-29	2	
Leveling Foot 3/8-16 THD	40-016-23	2	

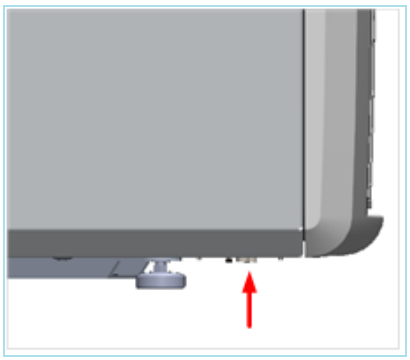
Tools

4 mm Long Arm Hex Key	
3/8 inch Open End Wrench	

Installing extra leveling feet on Phoenix M50

1. Stacking a BACTEC FX40 on top of a Phoenix M50 requires **40”** of vertical clearance (from the counter top to the top of the BACTEC FX40).
2. Phoenix M50 must be level (± 0.5° front to back and side to side).
3. Screw the 3/8” hex nuts (70-030-29) on the two additional leveling feet (40-016-23).
4. Remove the two screws from the holes in the front underside of the Phoenix M50 instrument and discard. Install the two leveling feet in the holes.

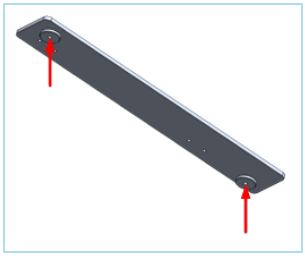
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



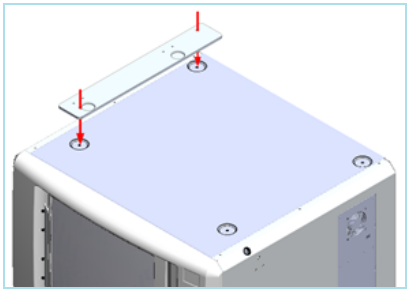
5. Adjust the new leveling feet so they rest solidly on the tabletop or counter top while not affecting instrument level. Tighten the locking hex nuts.

Attaching mounting brackets atop Phoenix M50

1. Examine the mounting brackets. It has a left and right bracket.
   - On the bottom of the adapter brackets are protuberances that line up with the foot indentations on top of the Phoenix M50.
   - On top of the plate are indentations that line up with the feet on a BACTEC FX40.



2. Remove the two screws (front and rear) from the left hand side of the Phoenix M50 top and discard. Align the left hand adapter bracket (**BDDS252-2110-01**) so the protuberances on the bottom fit into the foot indentations. Secure the bracket in place with two hex screws (8087275).



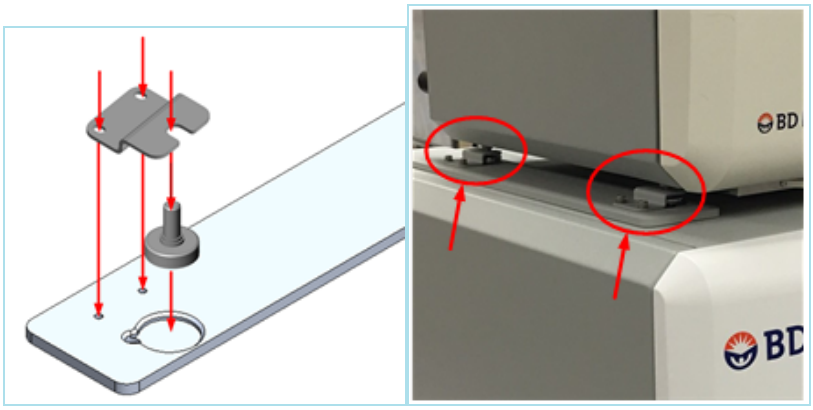
3. Install the right hand adapter plate (**BDDS252-2110-02**) in the same manner.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Stack BACTEC FX40 on top of Phoenix M50

Note: One person can lift the BACTEC FX40. To lift above shoulder height, two people are required. Install BACTEC FX40. Install Phoenix M50. Refer to the "Installation Checklist" on page 275.

1. Place the BACTEC FX40 on the top of Phoenix M50 with its feet sitting in the indentations on the upper side of the adapter brackets.
2. Adjust the leveling feet so that the BACTEC FX40 is level (± 0.5° left to right and front to back) and there is enough clearance to install the BACTEC FX40 tie downs (**BDDS252-2111**).
3. Insert the tie down plates from the sides over each BACTEC FX40 foot.



4. Place a washer (8087439) on each of the eight hex screws (8087273). Secure each plate with two hex screws or washers (four plates, eight screws).

2.4.2 Connecting M50 to EpiCenter v7.0 or Higher

The Phoenix M50 is compatible only with EpiCenter v7.0 or higher.

Note: Current service passwords must be retrieved from the IDS Software Repository as per BDLS6265 BD LS File Repository Guidelines. All BD instruments must be connected to EpiCenter on a private area network.

Materials required

- Ethernet switch
- CAT 5 ethernet cable (switch to EpiCenter)
- CAT 5 ethernet cable (switch to Phoenix M50)

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

- USB keyboard and mouse (optional)
- Latest EpiCenter and Phoenix M50 software

Note: Some of these materials come with the EpiCenter or may already be on site for existing EpiCenter installs.

Planning before arriving onsite

1. Download the latest versions of EpiCenter and Phoenix M50 software.
2. Refer to the latest downloaded versions of the **Phoenix M50 Service Manual** from the IDS Software Repository as per BDLS6265 BD LS File Repository Guidelines, **EpiCenter Service Guide**, and any other related documentation for more information.
3. Acquire the latest EpiCenter and Phoenix M50 passwords.
4. Carry all necessary software and documentation to site.

When onsite, complete the tasks described below.

- Connections between Phoenix M50 and switch
- Configure Phoenix M50
- EpiCenter setup
- EpiCenter setup for M50

Connections between Phoenix M50 and switch

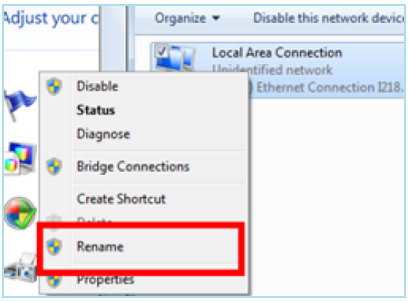
1. If this is a new switch, connect the power adapter and plug it. Connect an ethernet cable from the Phoenix M50 AIO ethernet port to the switch.
2. If this is an existing network
   a. Obtain a network map of devices' IP addresses on LAN. Use the **ipscan-win64-3.2.3** utility on EpiCenter PC. Locate it on **c:\BDSupport\NetTools**. Scan while all current devices are attached to the network and running.
   b. Use the in-use addresses from the network to reconcile the addresses with all devices currently connected to the LAN. For this, review the IP addresses found by the utility with the list of devices included in the EpiCenter configuration table. If addresses are not in the EpiCenter list, investigate to determine the origin of those unaccounted for IP Addresses.
   c. IP addresses 192.168.2.156 through 192.168.2.255 are reserved for the EpiCenter IP discovery process. IP addresses in this range should not be allowed in the configuration. If a device is in this range, identify it and update its IP address to one not in use in the remaining IP addresses.

Configure Phoenix M50

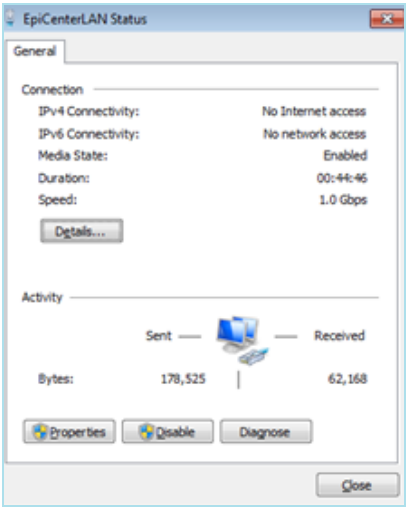
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

1. Log into the **Phoenix user software** as **BDFS**.
2. Go to **Maintenance > Tasks** at the bottom of the screen. Select **Field Service > Exit Application.**
3. Navigate to **Network and Sharing Center** and select **Change adapter settings**.

4. Rename the default **Local Area Connection** to **EpiCenterLAN**.



5. Double-tap the **EpiCenterLAN** icon on the touch screen. The **EpiCenterLAN Status** screen is displayed. Tap **Details**.



6. From the **Network Connection Details** screen, record the **Physical Address**
7. Select **OK**. The window closes. Select **Close** again.

> **Note:** The EpiCenterLAN network adapter on the AIO utilizes the 192.168.2.XXX subnet.

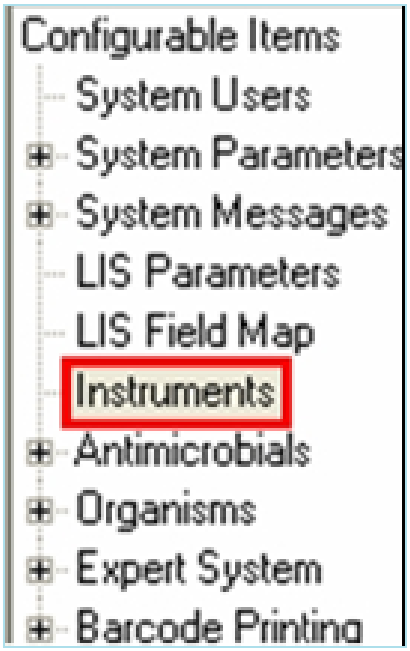
8. Close the **Task Manager** and the instrument reboots back into user software.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

EpiCenter setup

1. Log into EpiCenter as the **Administrator** using the backdoor password.
2. Select the **red-highlighted** icon.

3. Select **Instruments**.



4. Set **Instrument Type** to **Phoenix M50**.
5. Set **Instrument #** per local requirements.

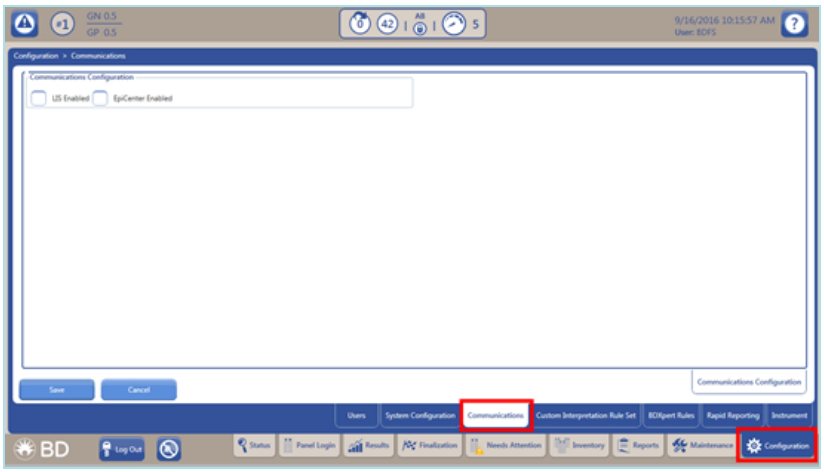
> **Note:** Phoenix M50 and Phoenix 100 instrument numbers must not conflict. If Phoenix 100 instruments are connected to EpiCenter, increment the new Phoenix M50 instrument number by 1 beyond the highest existing Phoenix 100 instrument number.

6. Enter the **NIC** address.
7. Enter **IP Address** per local requirements.
8. Save changes and close the window.
9. Connect an ethernet cable from the EpiCenter ethernet port to the switch.

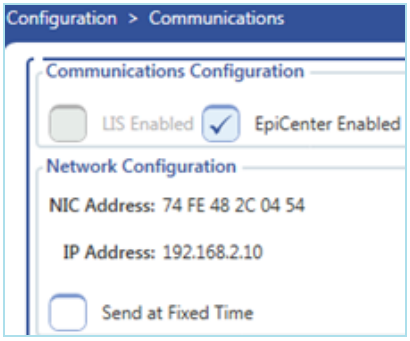
EpiCenter setup for M50

1. If required, log back into **User Software** as **BDFS**. Navigate to **Configuration > Communications Configuration.**

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



2. Select **EpiCenter Enabled > Save**



3. Confirm the instrument now syncs with EpiCenter.

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential

3 Software Overview

This chapter contains information about configuration and use of the Phoenix M50 system software.

3.1 Operating System

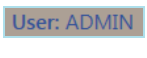
Phoenix M50 AIOs with software ≤1.1.110.0 operate on Windows 7. Phoenix M50 AIOs with software ≥2.20.0.0 operate on Windows 10.

3.2 User Interface

System Icons

Symbol	Description
	Select to open door to enter panels.
	Select to open door to remove panels.
Application Header	
	Indicates a system alert.
	Indicates instrument number.
	Indicates that EpiCenter is connected and configured.
	Indicates that EpiCenter is disconnected.
	Indicates that LIS is configured and connected.
	Indicates that LIS is configured and disconnected.

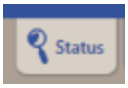
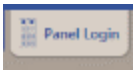
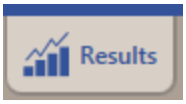
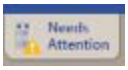
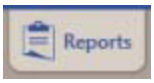
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Symbol	Description
	Indicates inoculum levels configured in the instrument.
	Indicates that a panel has been marked critical.
Summary Group	
	Indicates the number of panels that can be removed. Indicates the number of empty stations in the instrument. AB / CD indicates the tiers on instrument. For one instrument, the tiers are AB. For two instruments, the tiers are AB / CD.  Indicates that the door is locked.  Do not attempt to force the door if this icon is not present. The status icon changes depending on the instrument operation.  Indicates instrument reading panels. Panels can be accessioned, but it is best not to open the door as the reading cycle will be aborted.  Indicates that the instrument is making a panel inventory.  Indicates that the instrument is processing data after a reading.
	Indicates Date/Time.
	Indicates currently logged on user.

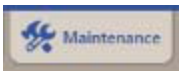
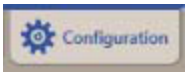
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Symbol	Description
	Select to access to the on-line User's Manual.
	Indicates instrument software versions. • The first number indicates the currently installed instrument software version. • The second number indicates the currently installed Phoenix Update Data (**PUD**).
Status Display	
	Indicates how many panels in the instrument are complete (removable).
	Indicates how many ongoing panels are present in instrument.
	Indicates how many empty stations are in the instrument. • The available station counter decreases by one for each temperature panel.
	Indicates the number of blocked stations in the instrument. Each instrument has one blocked station. The blocked station counter increases by one for each temperature panel.
	Indicates that the instrument is in the idle mode. • The door can be opened to add panels. • The corresponding # indicates minutes left before testing begins.
	Temperature
	Indicates that the AIO is connected.
	Indicates that the AIO is disconnected.
	Indicates that the system is adjusting the UV Light Source.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Symbol	Description
	Indicates that the systems is adjusting the Red-Green-Blue Light Sources.
	Indicates that the instrument is in warm-up.
Application Footer	
	Select to Login/Log out.
	Select to silence any alarms.
	Select to see all icons found in Application Header and Status and all tabs found in Application Footer.
	Select to login in both clinical and QC panels.
	Select to view results. You must enter either an accession number or sequence number to view results.
 *Does not appear if instrument is connected to EpiCenter*	Select to finalize panel results. Panels can be finalized individually or in a batch.
 *Visible when one panel is in Needs Attention*	Select to view all panels in Needs Attention.
	Select to view all the panels currently residing in the instrument.
	Select to print reports. The number of reports that are available differ depending upon if the instrument is connected or not connected to EpiCenter.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Symbol	Description
	Select to perform User and Non-user maintenance tasks.
	Select to configure the system. Items to configure include: • Facility Name and address • Inoculum Density
	Indicates no Needs Attention conditions exist for any panels.
	Indicates that a panel cannot be finalized.
	Indicates that the message text is collapsed.
	Indicates that the message text can be expanded.
	Indicates that the organism identification determined by the testing of the panel has been changed by the user.
	Indicates that the result was due to rapid completion of the panel.
	Indicates that a Resistance Marker has been detected for that isolate.
	Indicates that data is uploading after Isolation Mode has been resolved.

Note: Refer to Phoenix M50 User's Manual document numbers US 500008930, exUS 500008940 for additional detail regarding system software.

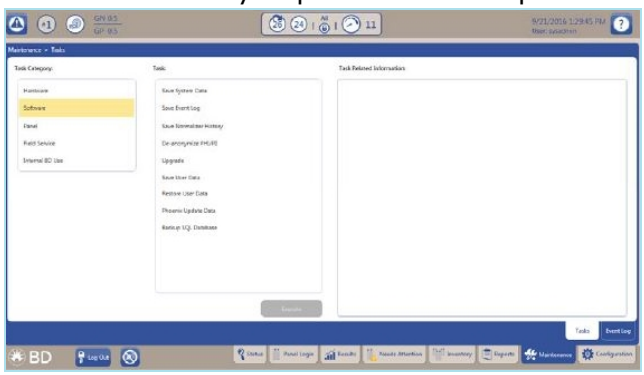
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

3.3 Maintenance Interface

3.3.1 BD User Maintenance

Software

BD associates may request the user to perform some tasks in this section.



Task	Purpose	General User	Lab Admin	Sys Admin	BDFS
Save System Data	Saves the system data to a USB memory device. Included in this backup are: database.dat, eventlog.dat, support.dat, sysparms.dat and *.csv files. System data can only be restored to the same version of system software in which it was backed up. **Note:** If the **database.dat** is restored, the accession information will be anonymized. The user must enter **BD-NNN** into the **Deanonymize** option to view the original accession information.	√	√	√	√
Save Event Log	Saves the Event Log in zip format to an external USB drive.	√	√	√	√
Save Normalizer History	Saves Normalizer History to an external USB drive.	√	√	√	√

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Task	Purpose	General User	Lab Admin	Sys Admin	BDFS
De anonymize PHI / PII	Allows user to identify accession numbers that have been anonymized.	√	√	√	√
Upgrade	A software compatibility matrix is available online on the BD Service Intranet site. It contains important information on software compatibility, PUD and support data files.		√	√	√
Save User Data	Select to back up configuration parameters to an external drive. • This includes: Custom Interpretation Rule Set Configuration, and BDXpert Rules Configuration. • The information is saved is for current instrument only. Information saved on one instrument can be restored at another instrument. • It is recommended that Configuration parameters be stored on a USB key in the event of a system failure.		√	√	√
Restore User Data	Select to restore the Configuration parameters that were copied back to the instrument. • The instrument door must be closed to execute this function. • User data can only be restored to the same version of system software in which it was backed up.		√	√	√
Phoenix Update Data	The Phoenix Update Data (PUD) contains important data such as CLSI rules that are upgraded on a regular basis more frequently than Phoenix System software. The PUD facilitates these updates. It		√	√	√

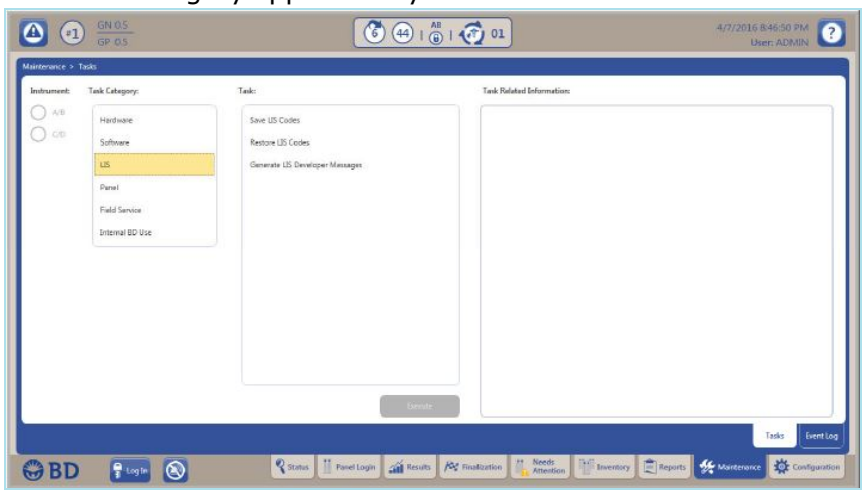
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Task	Purpose	General User	Lab Admin	Sys Admin	BDFS
	requires less time to validate and release a PUD as opposed to a full version of Phoenix System Software. This option allows the user to update the PUD. When highlighted, the current PUD version is displayed (as it is in the main display to the right of the Phoenix System Software Version). A software compatibility matrix is available online on the BD Service Intranet site. It contains important information on software compatibility, PUD and support data files. If connected to an EpiCenter the PUD must be updated on both systems.				
Backup SQL Database	Create a backup file of the SQL database to an external drive		√	√	√
Save Binary Files	Saves all binary files	√	√	√	√
Save Specific Binary Files	Save up to 10 specific binary files based on sequence number. Files for the 7 days following the selected **Start Date** will be retrieved. **Note:** This is the recommended method for retrieving binary files for internal investigation.	√	√	√	√

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

LIS

This task category appears only if LIS communications is enabled.

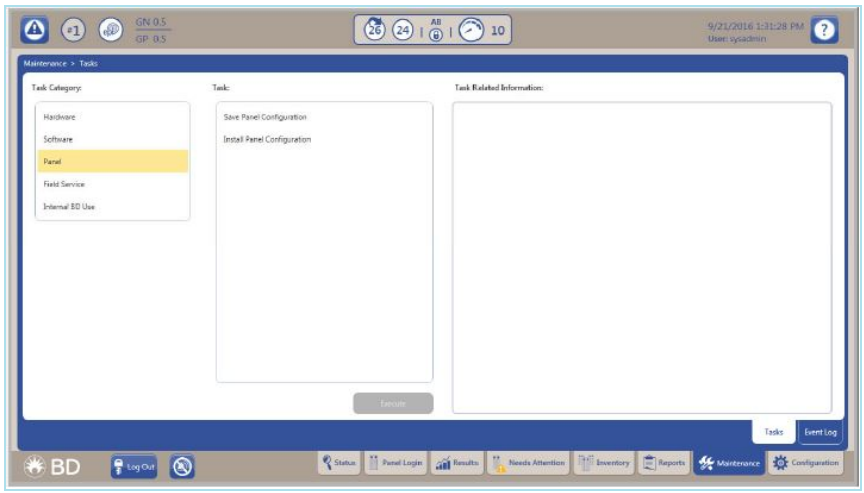


Function	Purpose
Save LIS Codes	Enables the user to save all defined Organism and Antimicrobial LIS codes. • This produces a text file editable on a PC. The edited codes can be restored back to the Phoenix instrument. • It enables the user to copy codes from one instrument to another.
Restore LIS Codes	Enables the user to restore the organism and antimicrobial LIS codes previously copied to the instrument. The restore operation completely overwrites the existing organism/antimicrobial LIS code database. Codes are not restored if a field other than LIS code was modified or if LIS code is in an incorrect format. If this happens, an error log is written. Review this file to see the cause of error.

3.3.1.1 Panel

The **Panel** appears only if QC Lot support is enabled.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



Function	Purpose	General User	Lab Admin	Sys Admin	BDFS
Save Panel Lot Definitions	Allows the user to save the panel present in the instrument to transfer these lot definitions (and QC panel results) to other instruments so that the records can be viewed/used there. It saves the defined panel and related data for any strains tested.		√	√	√
Restore Panel Lot Definitions	Allows the user to restore Panel Lot Definitions saved at one instrument to another. This makes Panel Lot definitions and QC panel results transferable in labs that use multiple instruments, so that you only have to define a lot once using the box (carton) label.		√	√	√
Save Panel Configuration	Allows the user to save the PANELS.CSV file for the current instrument only. However, information saved at one instrument can be installed at another instrument. This enables you to have consistent panel configurations among all the instruments.		√	√	√

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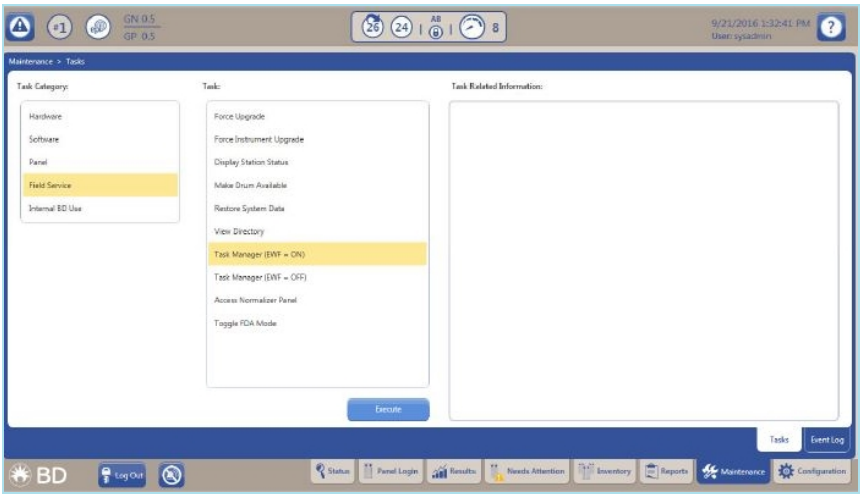
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Function	Purpose	General User	Lab Admin	Sys Admin	BDFS
Install Panel Configuration	Allows the user to restore the PANELS.CSV file. The PANELS.CSV file contains information for the system to utilize panels. It identifies a panel type to the system and how algorithms should be applied. When a new panel type is created and available for use, a new PANELS.CSV file is generated and must be uploaded to the instrument to identify the panel. When highlighted this option displays the current version of the file in the maintenance menu. If connected to an EpiCenter the panel configuration or PANELS.CSV file must be updated on both systems.		√	√	√

Field service

This task category is only for BD field service login.



Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
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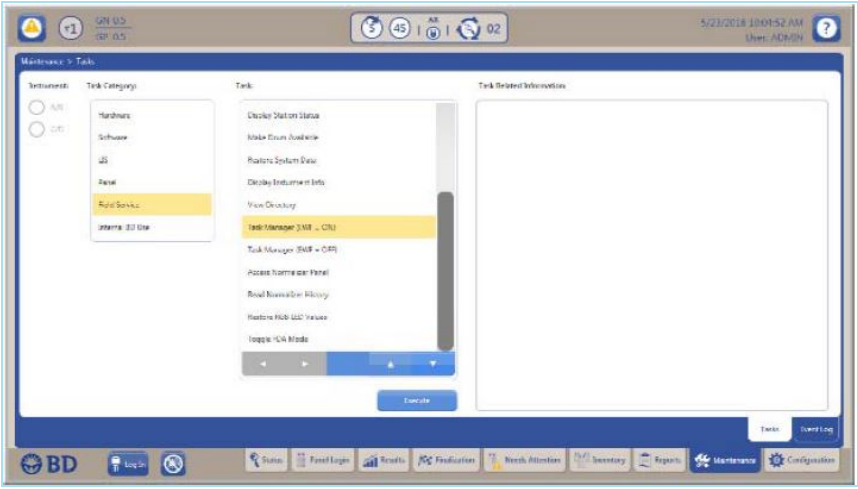


Task	Purpose	General User	Lab Admin	Sys Admin	BDFS
Force Upgrade	Forces user software upgrade regardless of the current software version on instrument.			√	√
Force Instrument Upgrade	Forces firmware software to be upgraded regardless of version of software currently on instrument.			√	√
Display Station Status				√	√
Make Drum Available				√	√
Restore System Data	It restores data save from the maintenance option **SAVE SYSTEM DATA TO DISK** from one or more USBs. System data can only be restored to the same version of system software in which it was backed up.			√	√
View Directory	Opens **Windows Explorer**.			√	√

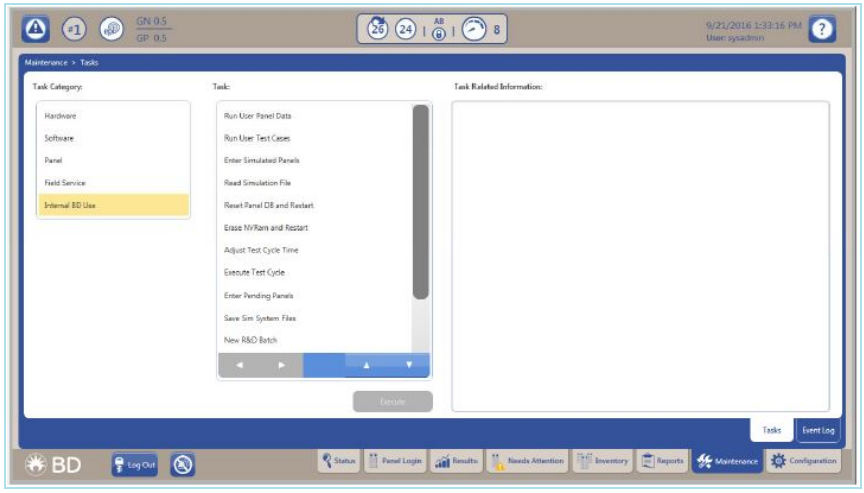
Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential

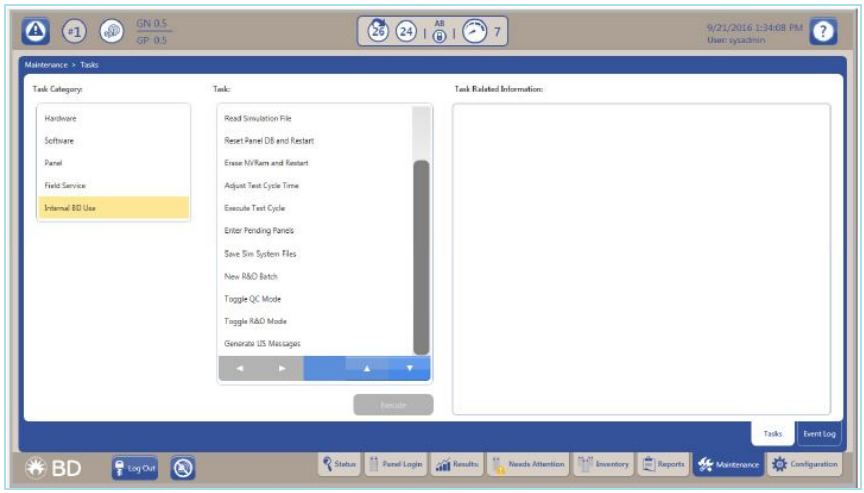
Task	Purpose	General User	Lab Admin	Sys Admin	BDFS
	Note: Do not use this function to navigate to the Falcon Toolkit as this will cause a conflict with the User Software.				
Task Manager (EWF = ON) (Windows 7 only)	Windows security function that write protects the C: drive. When **EWF is on**, any changes made are saved to a temporary location that goes away when power is cycled.			√	√
Board Task Manager (EWF = OFF) (Windows 7 only)	Turning **EWF** off reboots the instrument and turns off the user software. Changes can now be saved to the C: drive. **Note:** This Function should only be used for BD Maintenance			√	√
Access Normalizer Panel	Its function is to position the Normalizer panels in front of the door for access. Normalizer sequence numbers and expiration dates are listed when this option is highlighted.			√	√
Toggle FDA Mode	Changes mode from FDA to NFDA or vice versa.			√	√
Exit Application (Windows 10 only)	Exits from the GUI into the Windows 10 desktop			√	√
Toggle RSS (Windows 10 only)	Enables RSS connection. Requires installation of RSS server components.			√	√

Internal BD use

This task category appears only for internal BD use login.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential





Event log

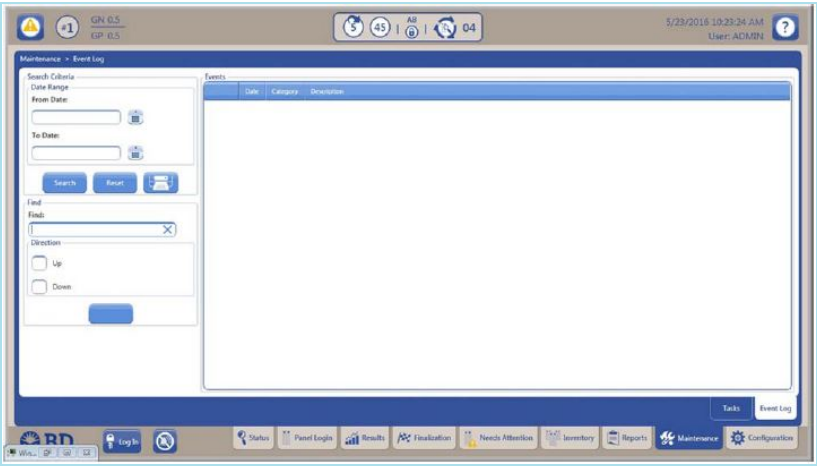
This log is downloadable and displays a filterable and searchable LIS Eventlog.

> **Note:** This is not the full system Eventlog. To extract the system Eventlog, navigate to **Maintenance** > **Software** > **Save Eventlog**.

1. Enter a **Date Range** and click **Search**.
2. Enter a phrase in the **Find** field to search for a specific event.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

3. Check the **Up** or **Down** box to refine search.

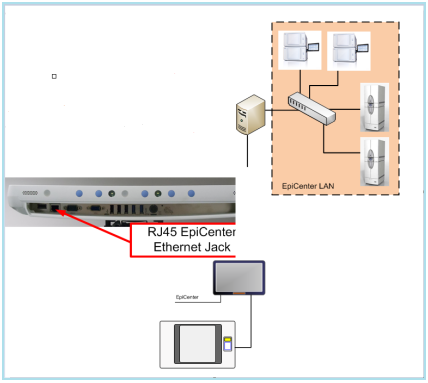


3.3.2 Connections

Phoenix M50 can connect to EpiCenter (BD's single-point data management solution).

> **Note:** Phoenix M50 is limited to 30 days of data. EpiCenter can retain data much longer.

The Phoenix M50 currently connects to the EpiCenter via the RJ45 ethernet jack at the bottom of the AIO computer using standard CAT 5 cabling. It resides on the private EpiCenter LAN with IP address in the **192.168.2.X** range. The EpiCenter may be connected to other EpiCenter computers through a second private LAN or though the lab/hospital network.



User software setup

Navigate to **Configuration > Communications Configuration > EpiCenter > Save** to control the EpiCenter connectivity. The user software looks for EpiCenter LAN to display the NIC and the IP addresses. The Phoenix M50 automatically detects the EpiCenter IP address through a general broadcast.

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
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Usage: Production Usage
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Revision: 03
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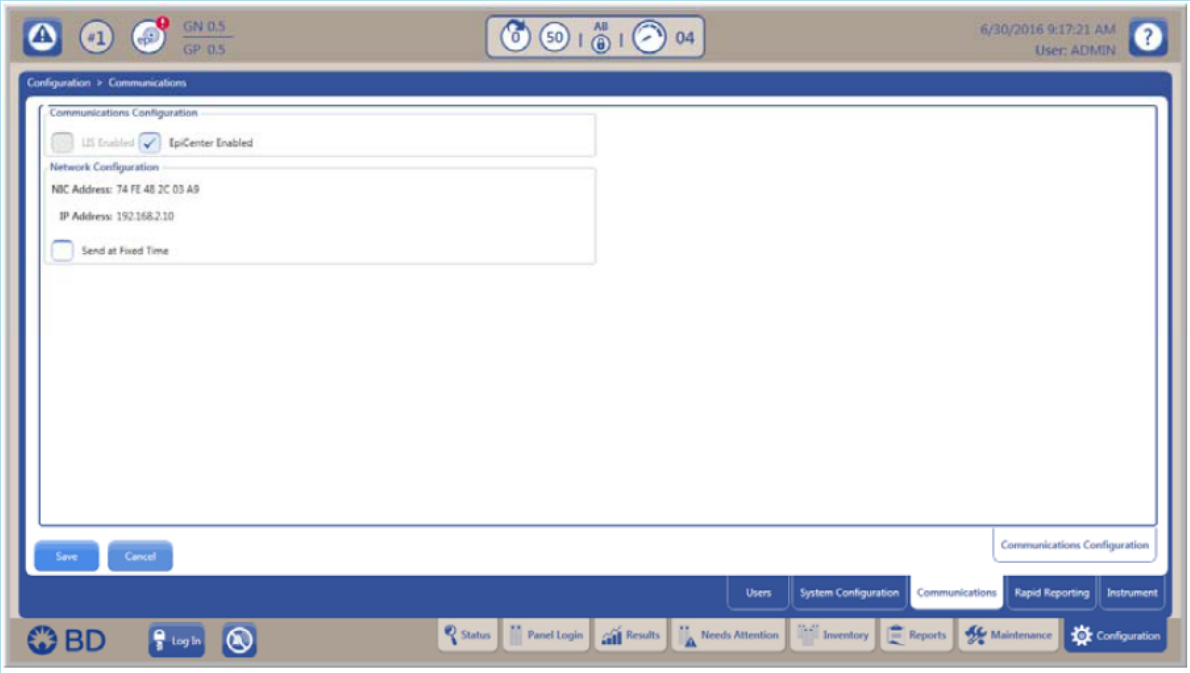
Change #: 500000269376
Classification: Confidential



Warning: There can only be one EpiCenter on the EpiCenter LAN containing the Phoenix M50. This is the standard configuration and should be checked if connection issues arise.

Note: If the NIC address is 00 00 00 00 00 00 and the IP address remains 127.0.0.1, it means that the user software could not find an appropriately named network interface. It may then be necessary to go through Windows and rename the Network Adapter to EpiCenter LAN. This name is internal to the instrument and not visible to the EpiCenter.

EpiCenter setup

The following materials are required for successful configuration of instruments to the EpiCenter system. Software can be ordered through SAP or downloaded via the IDS Software Repository as per BDLS6265 BD LS File Repository Guidelines.

1. EpiCenter Windows image passwords and monthly backdoor password.
2. Network cables and switches as determined in the instrument pre-install.
3. Compatibility matrix.
4. Latest version of EpiCenter software (440981).
5. Related instrument procedures, service bulletins, and manuals.
6. Dillobits SNTP software 4.1.3.
7. BALTFS0170 – EpiCenter accessories and options.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

8. Phoenix M50
    a. Phoenix M50 OS Image (443570)
    b. Phoenix M50 system software (443866)
    c. Phoenix PUD (exUS: 441107 / FDA: 443697)

Note:

- Prior to shutting down the EpiCenter toolbar, ensure that the customer is aware as to not interrupt any critical workflow.
- All physical connections between EpiCenter and an instrument should be through a BD provided network switch. Direct connections between EpiCenter and an instrument can result in GLUE crashing issues.
- Review the Compatibility Matrix and ensure all instrumentation software is compatible with EpiCenter version installed. It is recommended to update all connected instruments to the latest available software versions. Discuss the software changes with the customer and update with the customers approval before performing any software updates.
- It is recommended to configure and connect one instrument to EpiCenter at a time.
- This procedure uses a process to access Windows settings through the [(Windows Key)] + [R] keyboard shortcut to enter commands in run box. This provides a universal method of accessing applications across Windows OS.
  If a keyboard does not have a Windows key, the same can be accomplished by clicking the Start menu button and typing the shortcut command. Click the correct shortcut.

Recommendations for setting up an EpiCenter network

Instrument	Recommended Starting IP Range	Recommended Ending IP Range
Phoenix M50	192.168.2.50	192.168.2.79

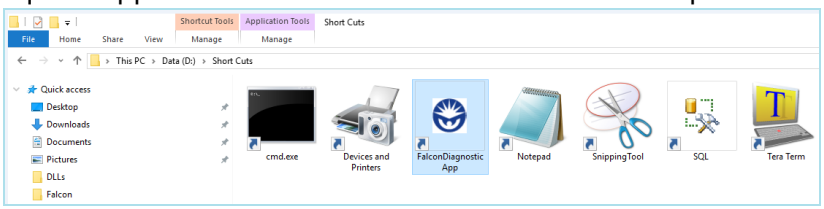
3.4 Falcon Toolkit

The Falcon Toolkit, a back-end maintenance program, cannot be run with the M50 application running. To run the kit, exit the M50 application system. The Toolkit allows service associates to test and troubleshoot system performance with tests that are not available through the user software. The kit is not available through the normal user interface. Its use is restricted to the trained BD service associates.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Accessing Toolkit

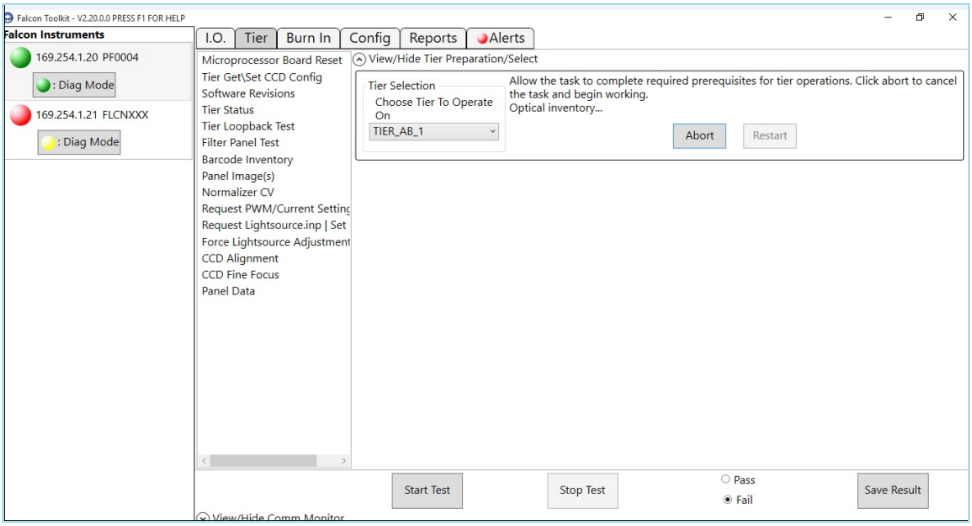
1. Navigate to **Maintenance** > **Tasks** > **Field Service** > **Exit Application** > **Execute**.
2. In the **Create New Task** screen, type **explorer**.
3. Navigate to **D:\Short Cuts**. Long press the **FalconDiagnosticApp.exe** icon until the gray square appears. Select **Run as Administrator** to open the Falcon Toolkit.



Note: On the first run, the Toolkit may take several minutes to start up.

Interface

The Phoenix M50 Toolkit is a separate program with its own interface. It runs independent of the user software. The interface has sections for testing and monitoring.



Instruments status pane

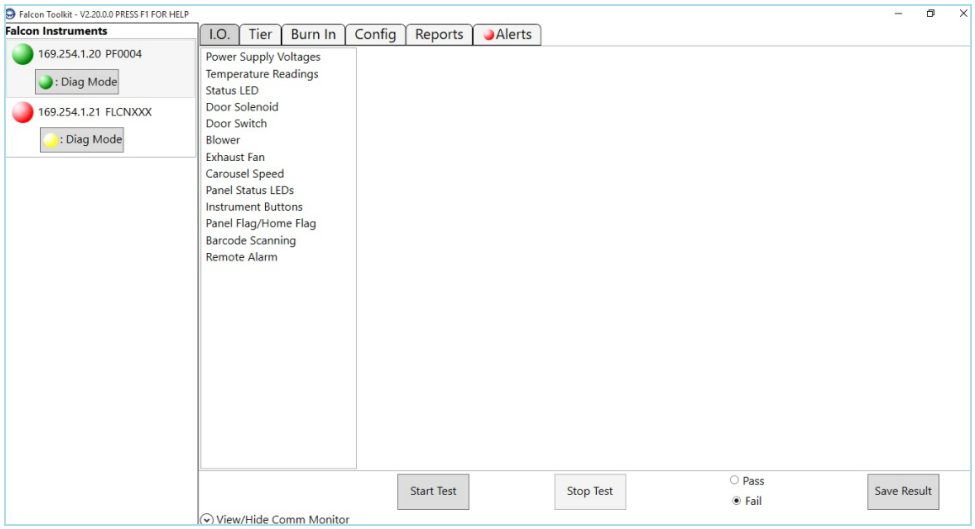
This pane displays available instruments, their connections to the toolkit. The end user can toggle an instrument between **Diag Mode** and **Isolation Mode**. Instruments are identified by their **IP addresses** and **Serial Numbers**.

Tabs pane

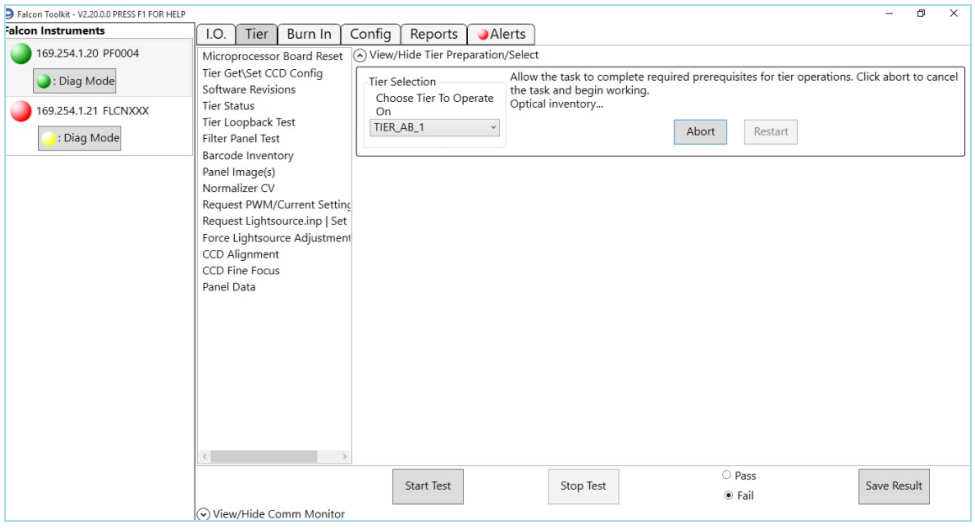
This pane has multiple options to switch between testing and reporting modes of the toolkit. The **IO**, **Tier**, and **Alerts** tabs are used for field service.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

The **IO** tab provides the functionality to test static instrument systems and parameters. Each test result is displayed on the screen. **Power Supply Voltages** test and **Temperature Readings** test only display results on the screen. **Status LED** or **Door Switch** tests require multiple steps to complete the test.

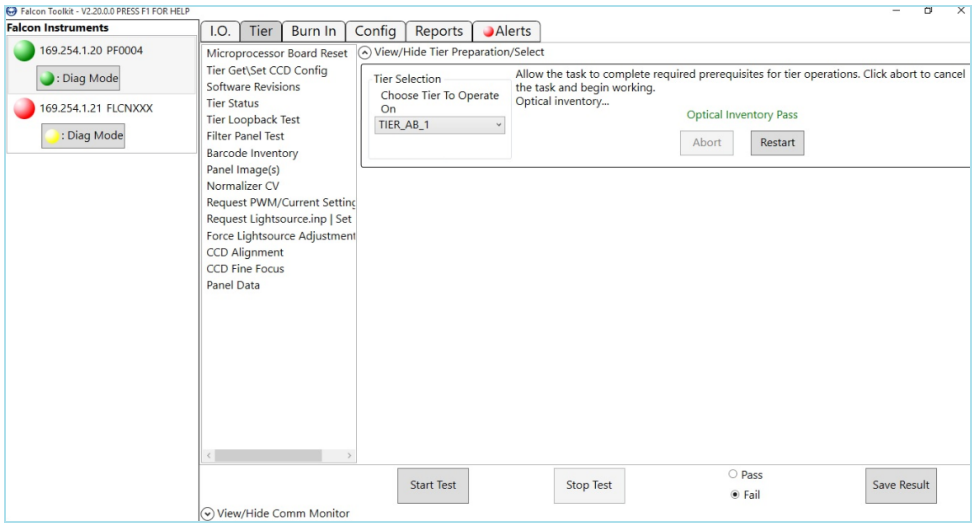


The **Tier** tab contains a list of operational tests and information about alignments . This tab facilitates all adjustments and validations of the optical system and contains tools to aid in problem diagnostics.



The first time the **Tier** tab is selected, the program tries to run an optical inventory after several seconds. This behavior can be halted by pressing the **Abort** icon in the tier selection drop-down window. Press the **Restart** icon in the tier selection drop-down window for manual optical inventory.

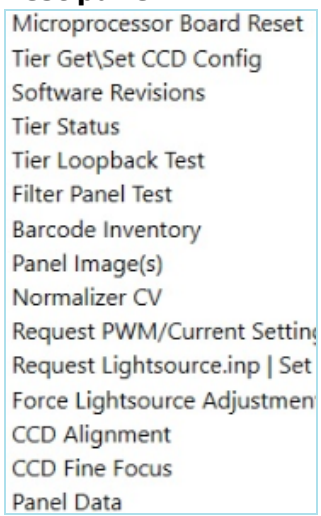
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



Note:

- The following tests in the Tier tab cannot be run until an optical inventory is complete.
  - Filter Panel Test
  - Normalizer CV
  - Force Lightsource Adjustment
  - Barcode Inventory
  - Panel Image(s)

Test pane

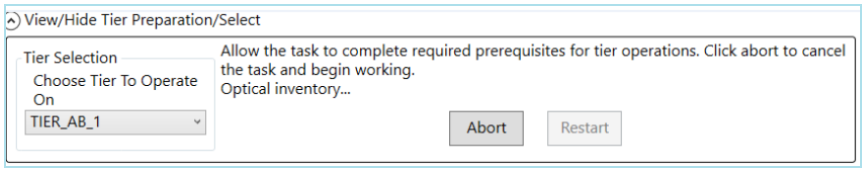


Depending on the tab selected, the **Test** pane provides access to tests available under the tab.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

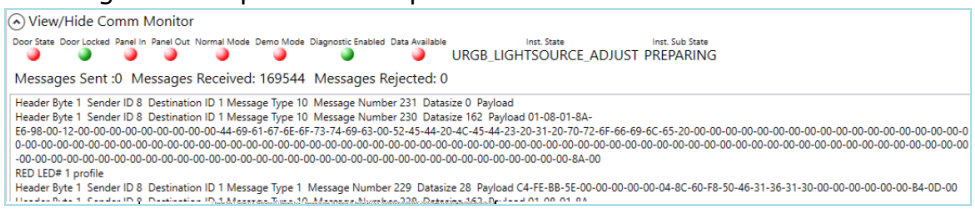
View/Hide Tier Preparation/Select

This is a collapsible panel and sets the active tier. It can abort the tier optical inventory start-up routine.



View/Hide Comm Monitor

A series of status indicators display the state of sub systems. Message packets are displayed in a scrolling list. This panel is collapsible and can be hidden.



Start/Stop Test

When a test starts, do not change tabs or run another test without terminating the first test. The **Start Test** icon is grayed out and the **Stop Test** icon becomes available. When a test ends automatically, the **Start Test** icon becomes active. For tests that do not end automatically, press **the Stop Test** icon. For a list of individual Toolkit tests, refer to "Qualification Tests" on page 209.

3.5 Network Configuration

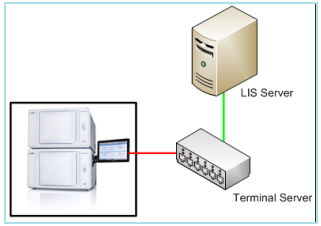
LIS

> **Note:** LIS is a general acronym. A system can also be referred to as a Hospital Information System (HIS).

The Phoenix M50 can be connected directly to a LIS. In a normal LIS setup, a LIS server in the facility is connected to a terminal server. BD instruments connect to the terminal server via a serial line. The facility may use RJ45 and CAT 5 cabling. The communications protocol should be serial for the BD LIS interface to work.

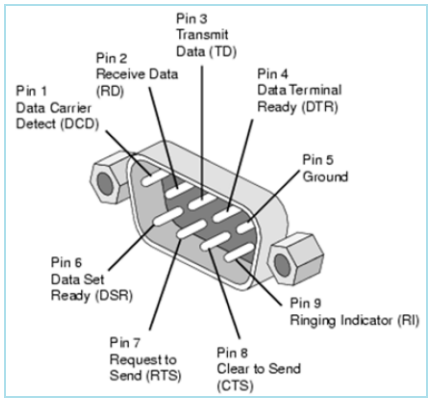
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

For a RJ45 connector, a RJ45 to DB9 serial adapter is required. If the facility uses a standard RS232 DB9 connector, it can be plugged in directly.



Connections

The LIS connects to the DB9 serial port on the bottom of the AIO computer. This is a standard RS-232 DB-9 connector with standard pinouts. The Phoenix M50 uses pins 2, 3, and 5. If the facility uses CAT 5 cabling for this connection, an adaptor may be required.



User software setup

1. Navigate to **Configuration > Communications**.
2. Check **LIS Enabled** and click **Save**.

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
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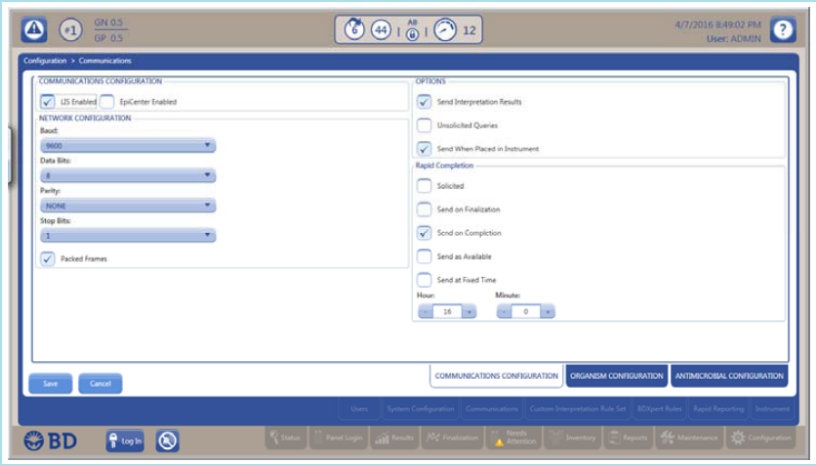

The low level LIS options include baud rate, data bits, parity, stop bits, and packed/unpacked frames. Refer to **LIS vendor specification** for BD LIS interface description.

3.6 Remote Support Solutions

Phoenix M50 instruments running system software ≥2.20.0.0 can be connected via RSS. Refer to **BALTFS0172 Remote Support Services (RSS) Installation** for installation instructions.

3.7 Service Mode Access EWF OFF

Note: EWF is a Windows 7 only feature. Windows 10 does not support EWF.

Phoenix M50 uses Enhanced Write Filtering (EWF) as a protection for Windows 7 OS. EWF restricts **writes** to the C drive. Changes get written to a temporary memory location which when the computer reboots, is cleared and all changes are lost. The field service engineer can enable or disable EWF as needed.

To access additional software and program options, log in with the user name **BDFS (BD Field Service)**.

1. Navigate to **Maintenance > Tasks > Field Service > Task Manager** (EWF=Off) **> Execute**. This shuts down the user application software and puts the instrument(s) in

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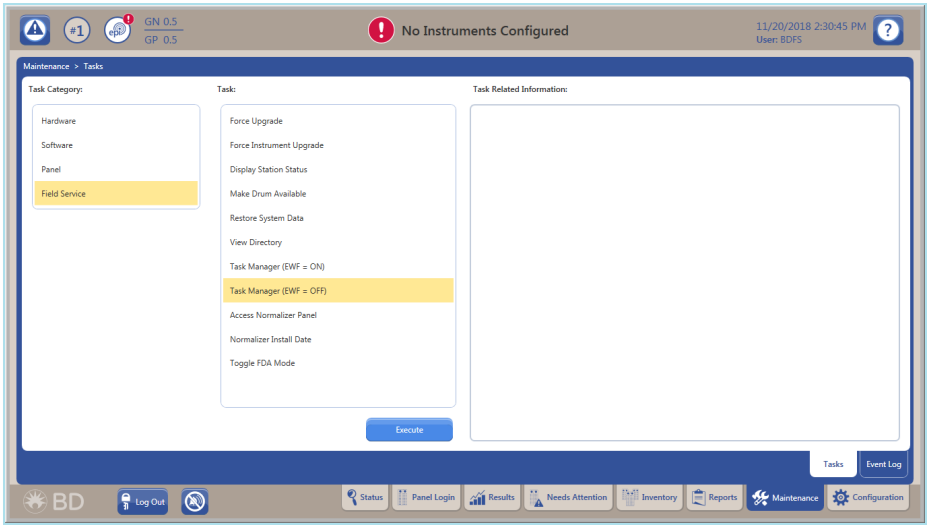
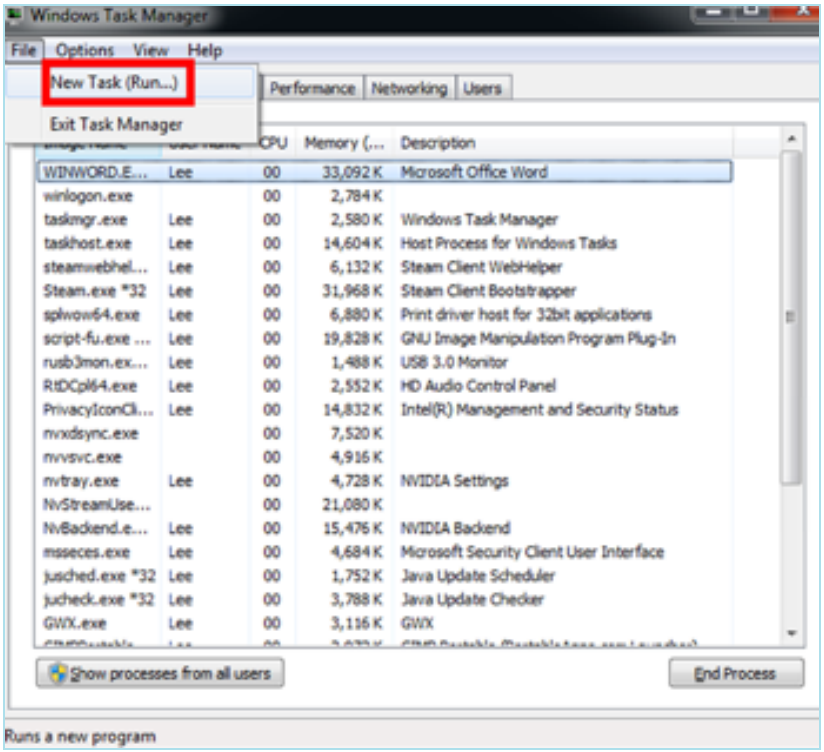
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Isolation mode.



Note: The instrument reboots to a black screen with the Windows **Task Manager** running.

2. From the menu bar, select **File > New Task** (**Run**...).



3. In the **Create New Task** screen, type the name of the program to run.

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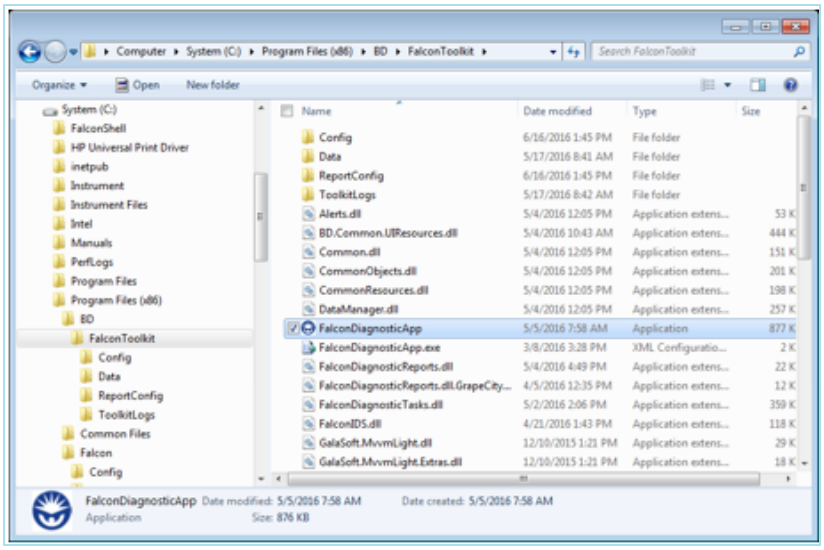
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

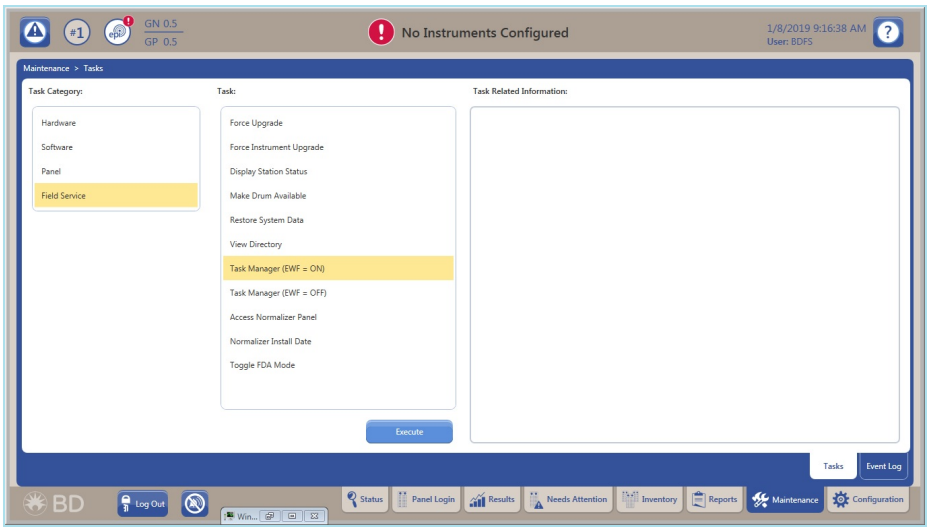


Note: Closing the **Task Manager** causes the system to reboot to **EWF=On**.

Warning: When **EWF** is off, any change made is permanent.

Service Mode access EWF on

1. Navigate to **Maintenance** > **Tasks** > **Field Service** > **Task Manager** (**EWF=On**) > **Execute**.



Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

2. The **Task Manager** is now available.

> **Note:** In this case, changes are not permanent and disappear after reboot or reset.

3.8 Password Generator Utility

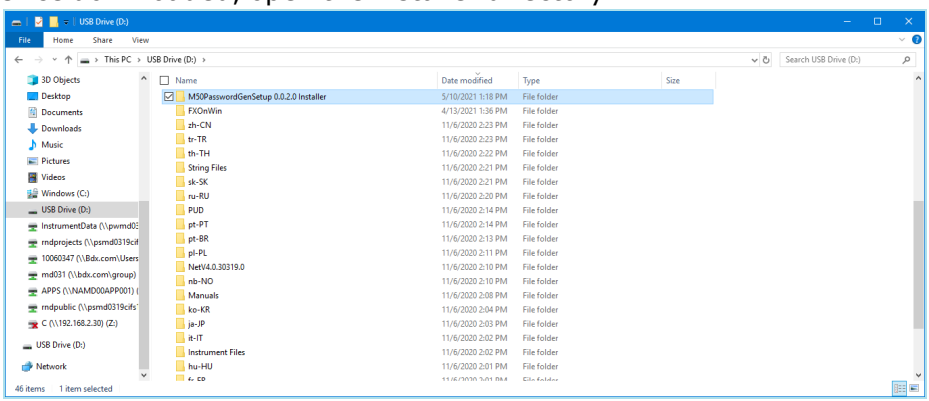
The Phoenix M50 Password Generator is used to produce the password for:

1. BD Field Service engineers to log in to a specific AIO based on the AIO serial number. The password is valid for one week from the Monday of the week to the Sunday at the end of the week.
2. A Lab Administrator account in which the Lab administrator has forgotten the password or has completely forgotten the account name and password. The password is based on the AIO serial number. The password is valid for one day.
3. An internal BD user. A password can be created to log in to a specific AIO based on the AIO serial number. The password is valid for one week from the Monday of the week to the Sunday at the end of the week.

Once the Phoenix M50 Password Generator is installed, it will expire 1 year and 1 day after installation. In that case, it should be uninstalled from Add/Remove Programs. Run the installer again to reinstall it.

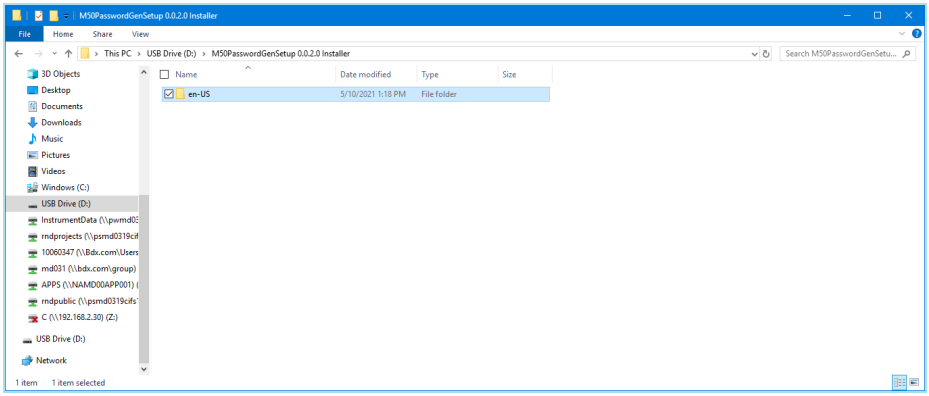
3.8.1 Installation of the Password Generator Utility

1. The M50 Password Generator installer will be located on the Software Repository for download per BDLS6265 BD LS File Repository Guidelines.
2. Once downloaded, open the installer directory.

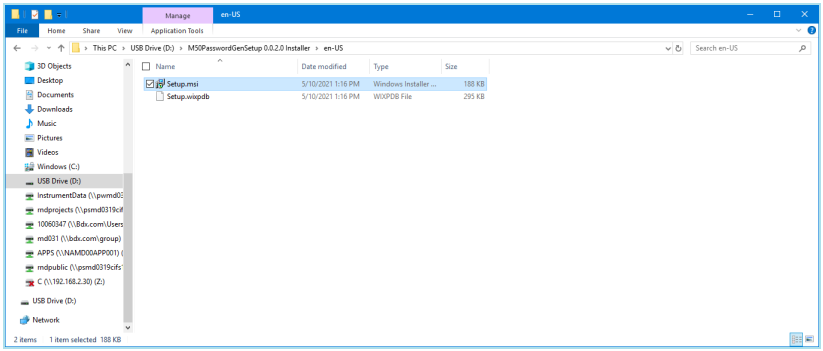


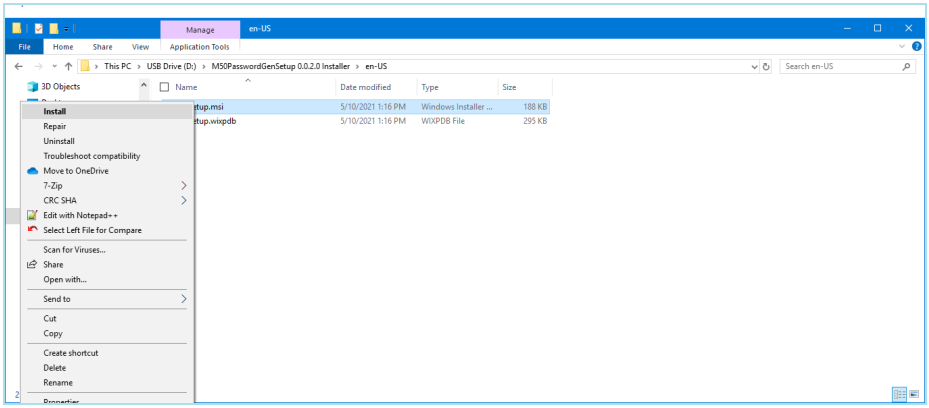
3. Open the en-US directory.

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential



4. Right click **Setup.msi** and select **Install**.





5. The installer will open and begin to run.

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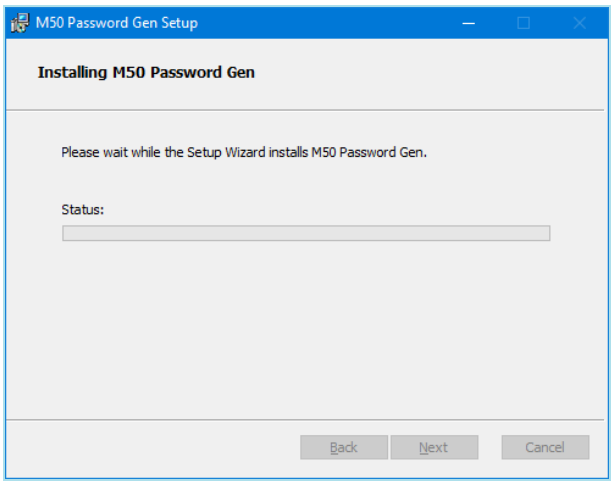
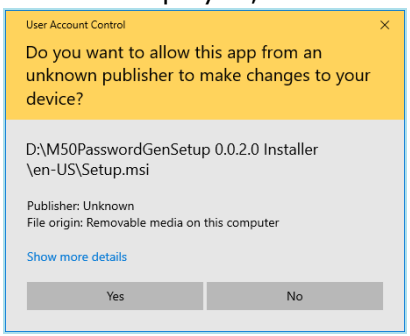
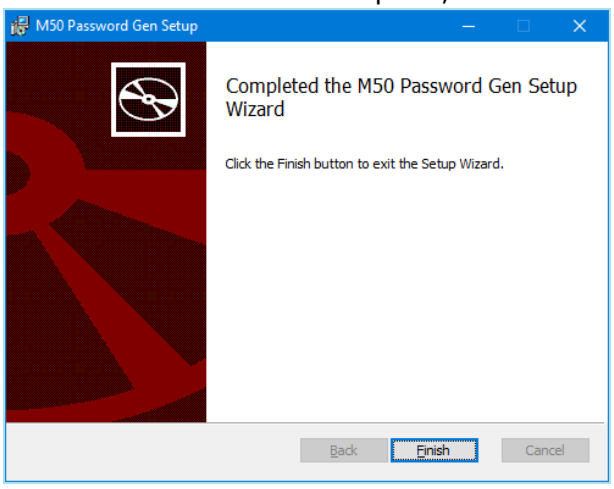
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



6. When prompted to allow this application from an unknown publisher to make changes to your device is displayed, select **Yes**.



7. When the installation is complete, select **Finish**.

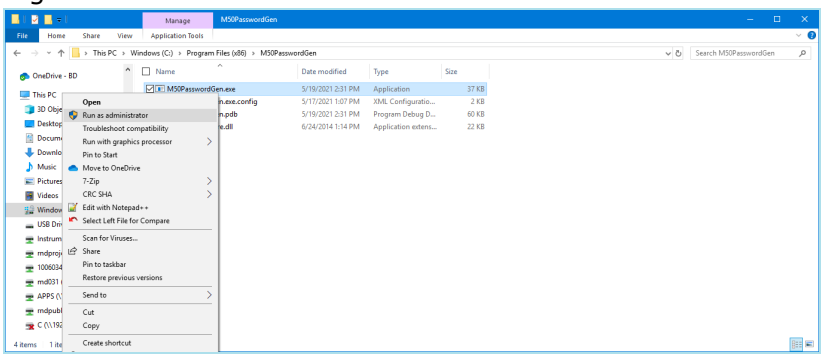


8. The Phoenix M50 Password Generator utility is successfully installed and is located at: **C:\Program Files (x86)\M50PasswordGen**.

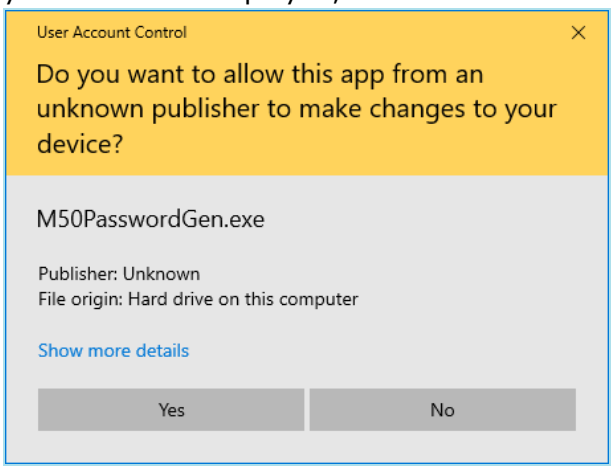
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

3.8.2 Running the Password Generator Utility

1. Open the directory located at **C:\Program Files (x86)\M50PasswordGen**.
2. Right click and select **Run as administrator** on the M50PasswordGen.exe.

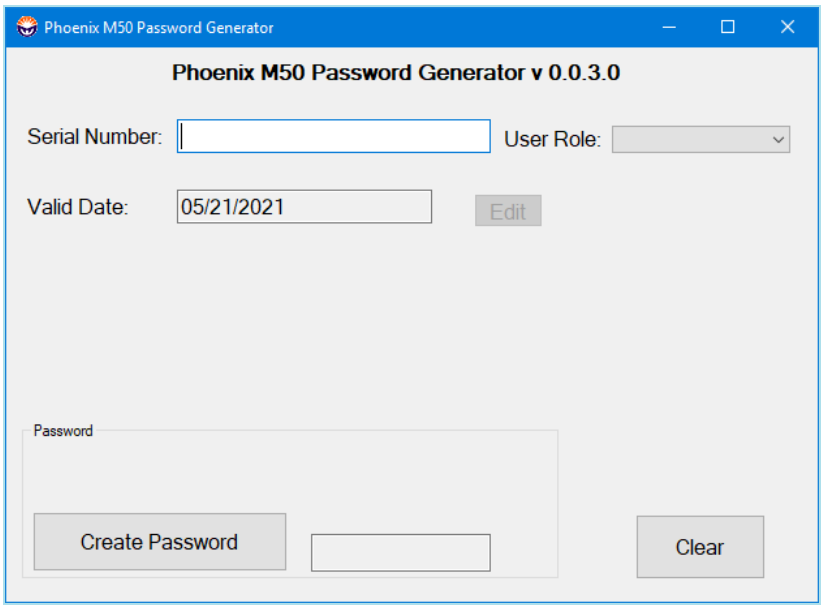


3. The message Do you want to allow this app from an unknown publisher to make changes to your device? is displayed, select **Yes**.



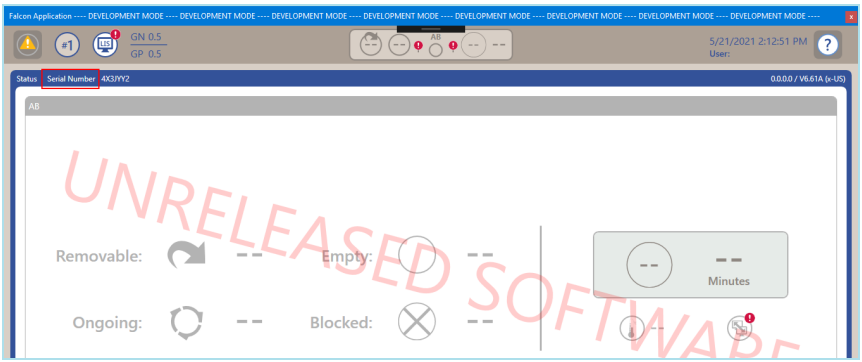
4. The following application is displayed.

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential



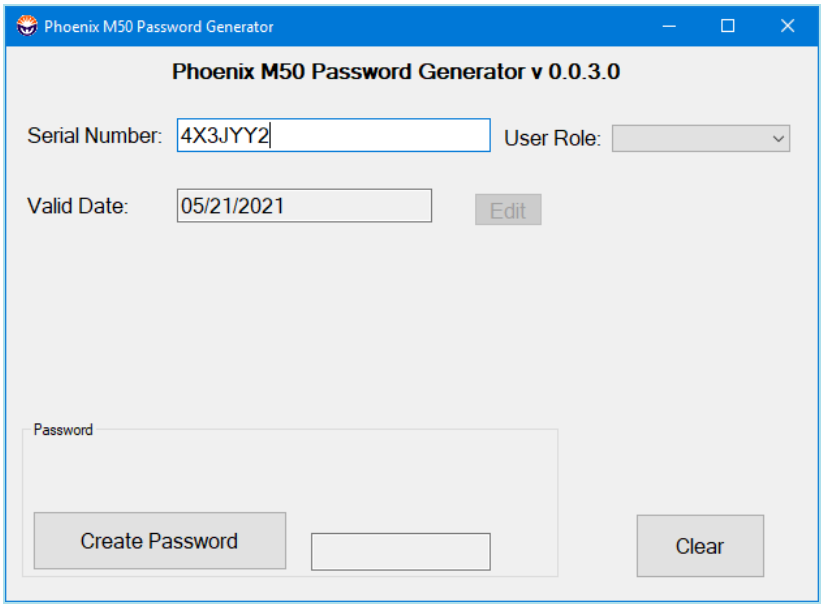
3.8.3 Creating FSE Password

Determine the serial number associated with the AIO for which the password is being created. This will be displayed in the upper left-hand side of the screen next to Status as shown in the red box in the figure below. In this case, 4X3JYY2 is the AIO serial number.

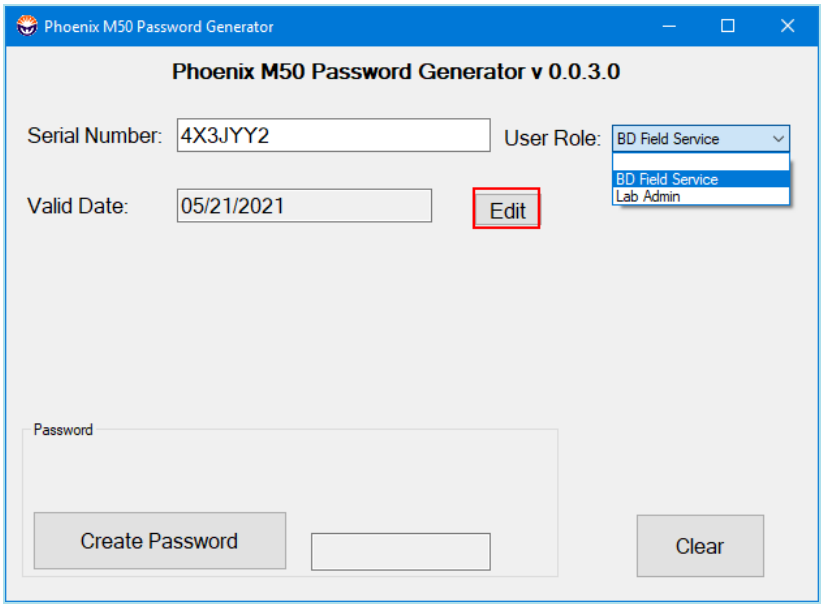


Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential

1. Enter the serial number into the Serial Number field.

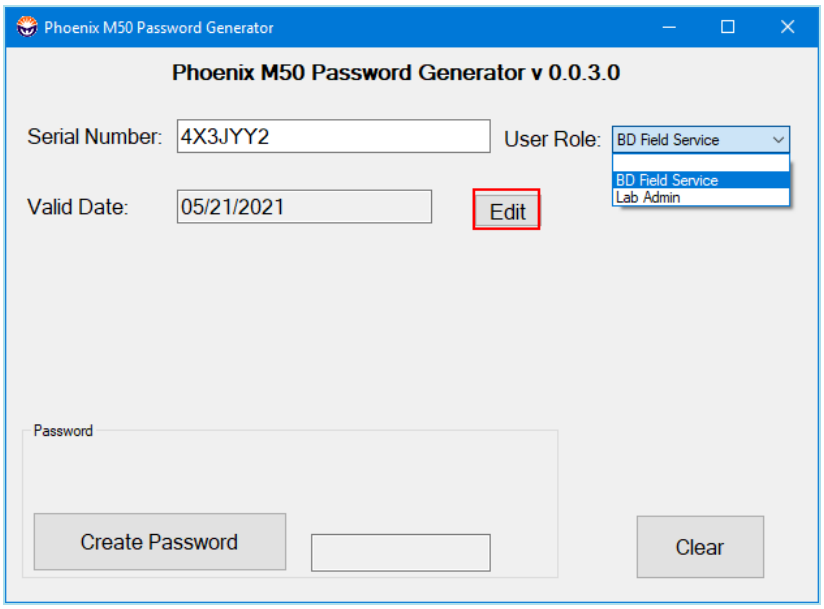


2. From the User Role drop-down select **BD Field Service**.



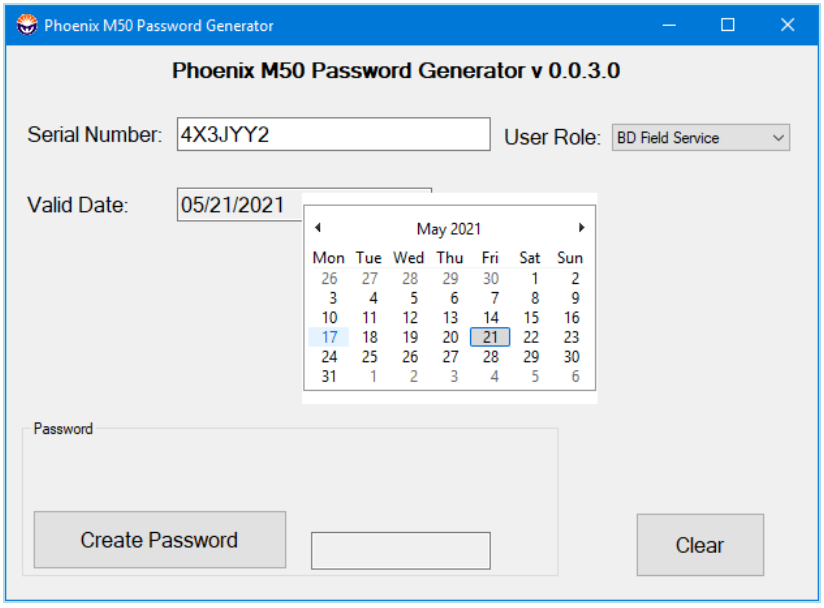
3. Select the Edit button.

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential



Note: The password that is generated will be good for one week - from the Monday of the week until the Sunday at the end of the week.

4. Select any day during the week for which the password is needed for access to the specific AIO.



5. Click on the date. Note the value displayed in the **Valid Date** field.

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
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Usage: Production Usage
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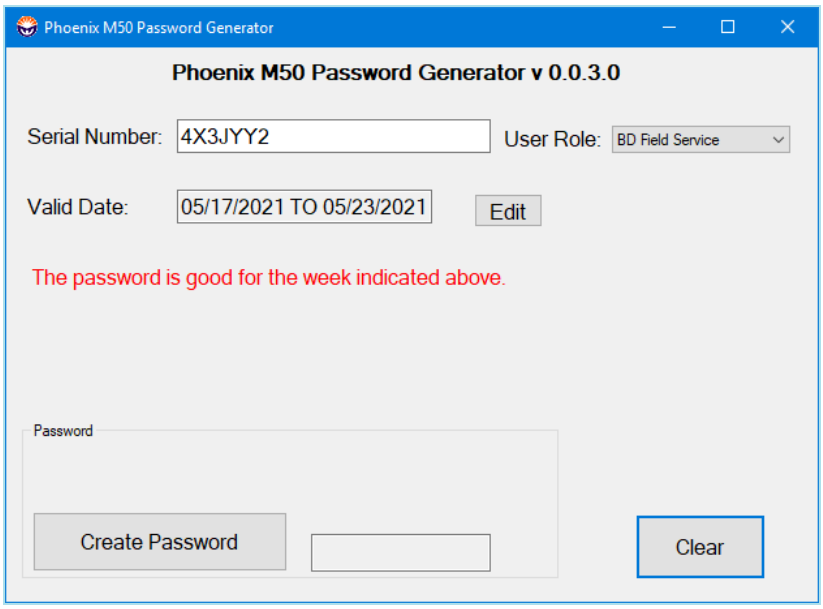
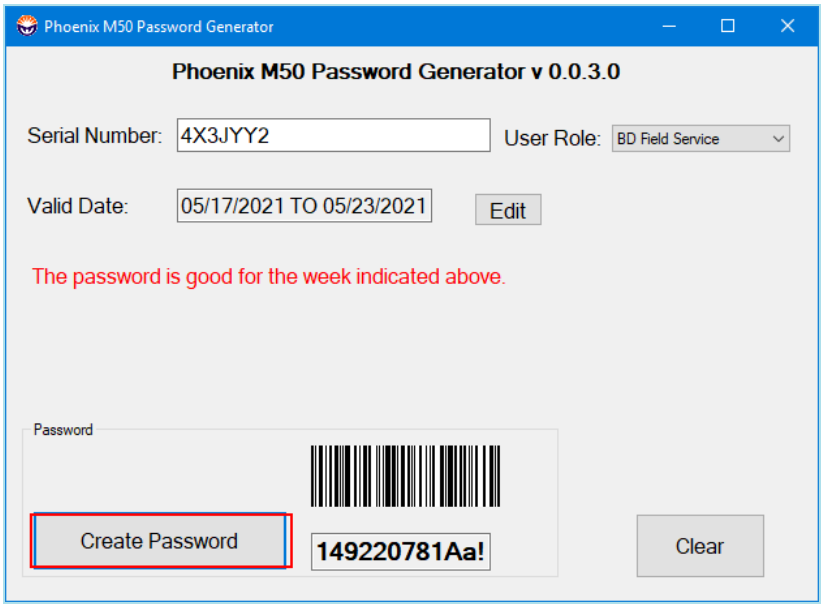


6. Click the **Create Password** button.



The password for the BD Field Service login for the specific AIO Serial number for the week of 05/17/2021 TO 05/23/2021 is 149220781Aa!

The password can be recorded for later use or the barcode can be scanned at the specific AIO when the Login screen is displayed and no user is currently logged in.

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential

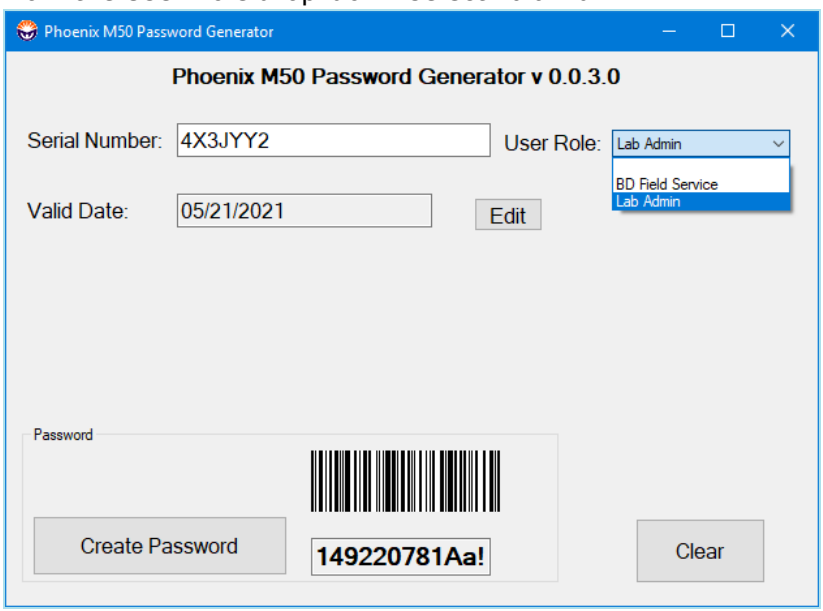
3.8.4 Creating Lab Administrator Break Glass Password

In the case of a Laboratory Administrator forgetting their password or their User Name, a password can be created that is good for one day.

The password can be used to log into any account with the permission level of LabAdmin. This may be the LabAdmin account that has been created with a specific User Name or this can be the initial LabAdmin account (with the User Name LabAdmin) that is being used by the laboratory or that has been disabled by the laboratory.

To create the LabAdmin **Break Glass** Password, determine serial number associated with the AIO for which the password is being created. This will be displayed in the upper left-hand side of the screen next to Status as shown in the red box. In this case, 4X3JYY2 is the AIO serial number.

1. Enter the serial number into the **Serial Number** field.
2. From the User Role drop-down select **Lab Admin**.

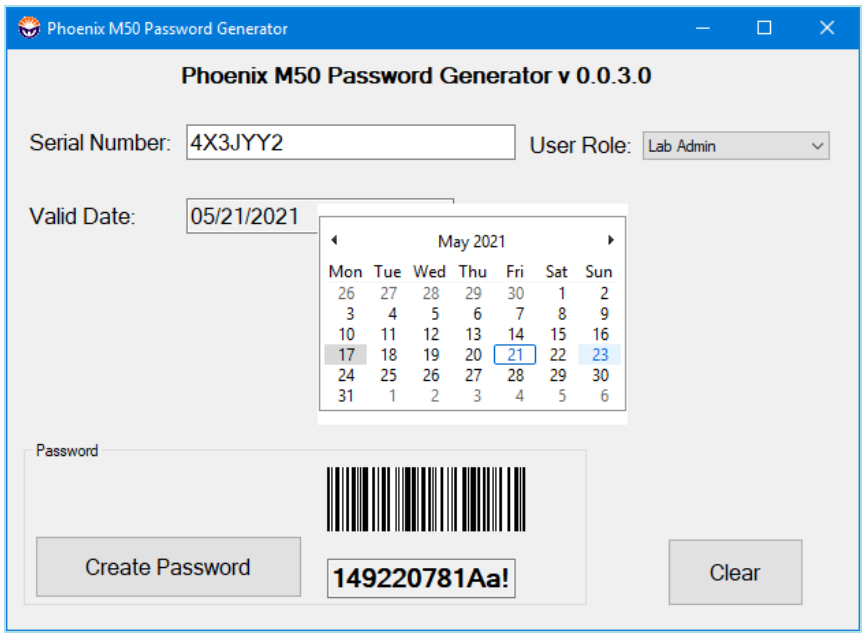


Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential

3. Select the Edit button next to the Valid Date. The Valid Date will default to the current date. If the Valid Date (the date of the day for which the password is being generated) is not the current date, the Edit button next to the Valid Date: text box should be pressed.

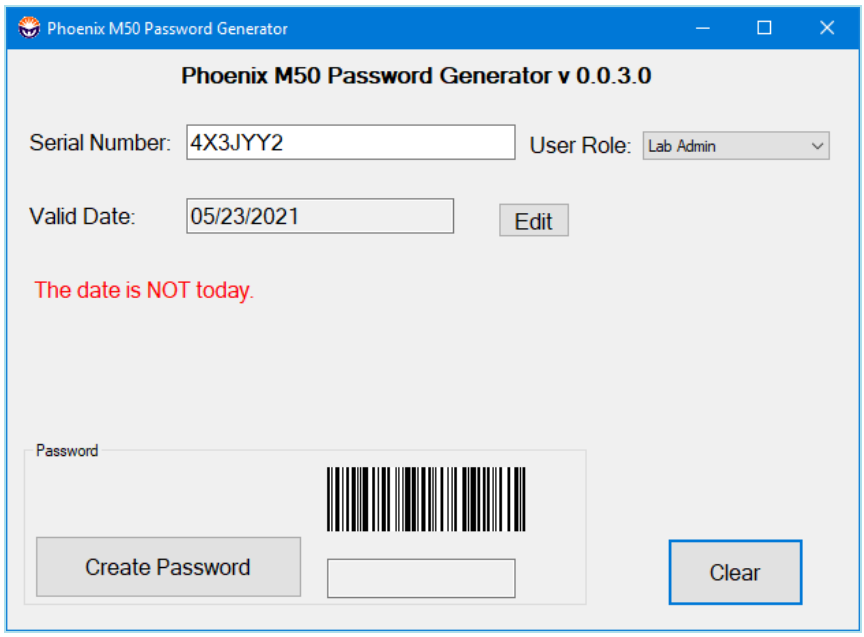
Note: The password that is generated will be good for the day that is indicated in the Valid Date field.

4. Select any day during the week for which the password is needed for access to the specific AIO.

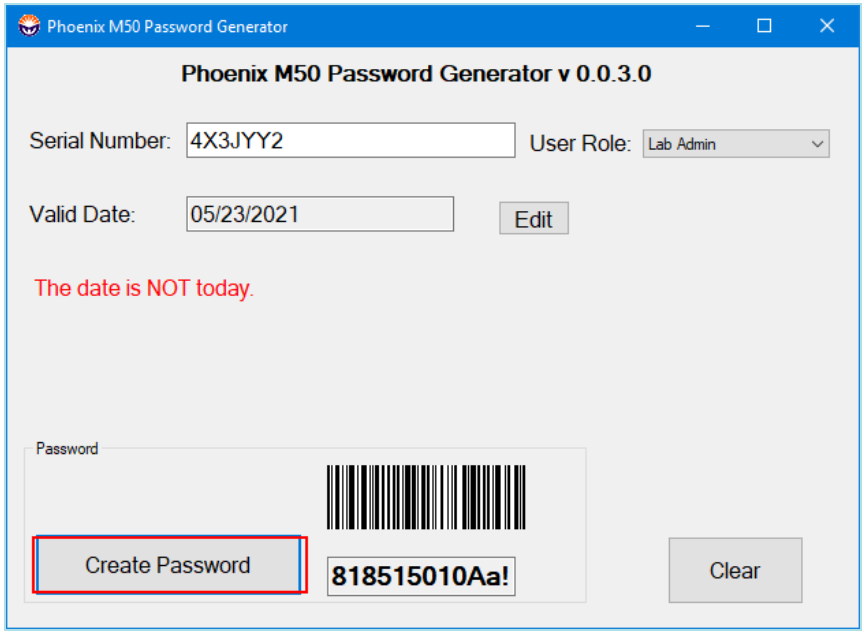


5. Click on the date. Note the value displayed in the **Valid Date** field.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



6. Click **Create Password**.



The password for the LabAdmin login for the specific AIO Serial number for 05/23/2021 is 818515010Aa!

The field user can be given this password. Enter the password at the specific AIO for the day created.

The user will be prompted to change their password when they log in.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

4 Diagnostics and Troubleshooting

4.1 Virtual Debug Console

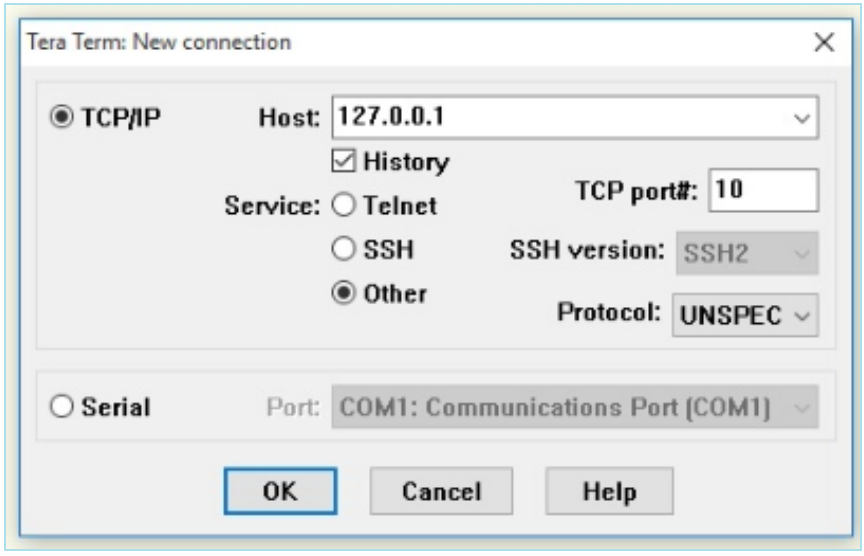
A terminal emulator can stream instrument command packets in real time instead of downloading log files for later review.

Connecting

The **Falcon Toolkit** must be running to connect the terminal emulator to the instrument. The emulator functions over the USB connection. No additional cabling is required.

1. A shortcut icon is at **D:\Short Cuts**. Double-click **Tera** Term shortcut.

2. The **Tera Term: New connection** screen is displayed.



Setting up a connection

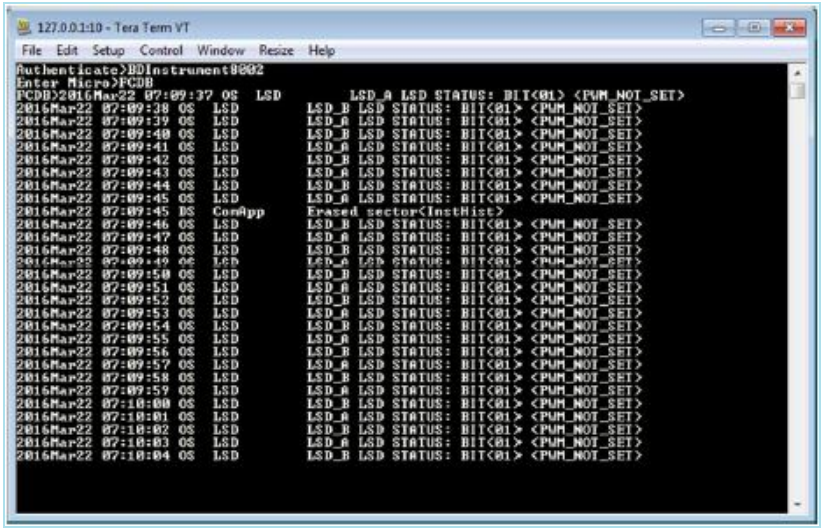
1. Select **TCP/IP** and set the Host to **127.0.0.1**.
2. Check the **History** box and set **Service** to **Other**.
3. Set the **TCP Port#** to **10** (if two instruments are connected, the second instrument will be set to 11).

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

4. Set **SSH version** to **SSH2** and **Protocol** to **UNSPEC**.
5. Select **OK** to connect to the instrument.

Login to the instrument

1. The first line of the Window displays the word **Authenticate**. Type **BDInstrument8002** and press **Enter**.
2. **Enter Micro >** is displayed. Type **FCDB**.
3. Type **TIERA** or **TIERB** for the corresponding **Tier Board**.
4. Type **LSDA** or **LSDB** for the corresponding **Light Source Driver Board**.



Information begins streaming. Multiple connections can be opened to different Micros.

Warning: Do not open multiple connections to the same Micro. Opening multiple connections to the same Micro may cause a firmware crash.

4.2 Fault Isolation

Fault isolation identifies the Field Replaceable Unit (**FRU**) based on hardware failures. The instrument performs fault isolation tests at startup on a continuous and periodic basis. The instrument software provides input in the form of system alerts to the fault isolation software on the user interface PC.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

4.2.1 Fault Isolation Indicators

Fault isolation startup tests are performed each time the software starts up. Continuous monitoring and periodic fault isolation testing begin after startup tests are performed. The fault isolation task on the FCDB performs periodic fault isolation testing. This task is determined every second.

Periodic fault isolation testing is performed when all conditions stated below are true.

1. The time is 10, 30 or 50 minutes after the hour, which is about 3 minutes after each test cycle completes.

   Note: Test cycles are performed at 0, 20 and 40 minutes after the hour. Each test cycle takes about 7 minutes to complete.

2. The **Test Sequencer's** state is idle.
3. The door is closed and successfully locked.
4. Drum speed is at 1 rpm.
5. Not in Diagnostics Mode.
   - If a test cycle has not been performed in the last hour and the door is closed, fault isolation testing is initiated.
   - If condition 1 is true and conditions 2, 3, 4 and 5 are not all true, fault isolation periodic testing is performed as soon as conditions 2, 3, 4 and 5 are all true.
   - System testing occurs at fixed intervals.
   - If a user workflow operation or a test cycle starts while periodic fault isolation testing is in execution, fault isolation periodic testing is aborted, marked **pending** and restarted the next time conditions 2, 3, 4, and 5 above are all true again.
   - A fault isolation alert is set if a reading is out of range during fault isolation testing. The FCDB application obtains test and data point limits from the legacy Phoenix LEDLTSRC.INP (UV LED version) and the Phoenix M50 file DF85settings.XML.

4.2.2 Common Error Codes and Resolutions

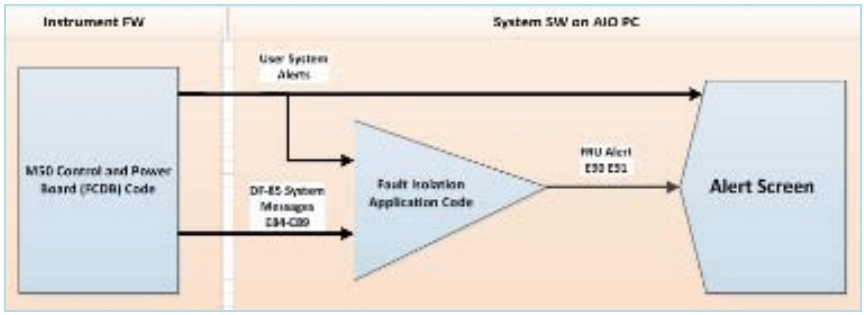
Alert	Description
User System Alert	This system alert causes the Yellow System Indicator LED on the instrument to be solid. The system alert appears on the **Alerts** screen on the user interface PC. E1 to E50 and E98 are user system alerts.
Fault Isolation	This type of system message is set by the instrument and notifies the Fault

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Alert	Description
(DF-85) System Message	Isolation software on the User Interface PC that a possible hardware failure may have occurred. These messages: • Do not appear on the **Alerts** screen • Do not cause the instrument Yellow System Indicator to turn on • Are annotated in the Log File • Are not visible to the customer • E84, E85, E86, E87, E88 and E89 are Fault Isolation system messages
FRU system alert	This type of system alert is set by the Fault Isolation software on the User Interface PC. This alert notifies the user that a FRU needs to be replaced. This alert appears on the Alerts screen. E90 and E91 are FRU system alerts.

Alert message flow

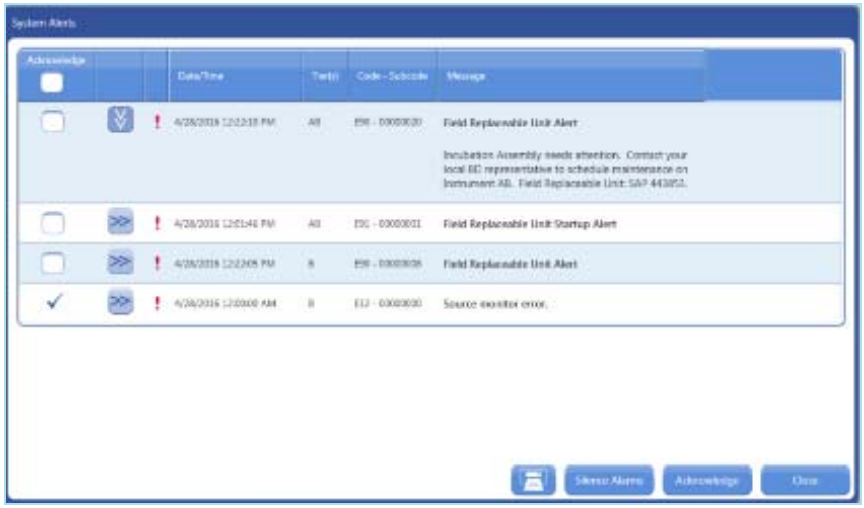
This image displays the user and fault isolation system alerts information processing flow. The FCDB monitors the instrument and periodically runs DF85 tests. User system alerts are forwarded from the FCDB directly to the user software on the **AIO**. System alerts are then displayed in real time on the **Alert Status** screen.



Note: The user system alerts are inputs to the fault isolation subroutine running on the AIO.

Fault isolation system messages are passed from the FCDB directly to the fault isolation subroutine running on the AIO and stored in the system database and log file. The fault isolation subroutine collects data from the FCDB. Then, periodically parses the data, and based on the results may generate a **Field Replaceable Unit System** alert. The alert is passed to the **Alert** window. The message provides the user with a service spare part number.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



Note: DF85 Alerts are run on a schedule and do not occur in real time. It may take up to 20 minutes for a DF85 alert to appear.

4.2.2.1 E01 Incubator Temperature Alert

The system sets an incubation temperature alert when the system's temperature is out of specification. This type of alert can be cleared.

Alert	Action	Description
Average Temperature Too High E01 0x00000001	Cause	The system shall set Average Temperature Too High for single average temperature reading.
	Cleared	The system shall clear the Average Temperature Too High when the single average temperature reading is no longer too high.
Average Temperature Too Low E01 0x00000002	Cause	The system shall set 'Average Temperature Too Low' for a single average temperature reading.
	Cleared	An Avg.Temp. Too Low subcode shall be cleared when the single average temperature reading is no longer too low.
Bad Main Temperature Sensor E01 0x00000004	Cause	The system shall set a 'Bad Main Temperature Sensor' when there is bad communication with the temperature sensor.
	Clearing	A Bad Main Temperature Sensor subcode shall be cleared when the main temperature sensor communicates

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Alert	Action	Description
		successfully.
Average Temperature Too High for > 1 Hour E01 0x00000010	Cause	The system shall set an Average Temperature Too High over time. (>1 HR)
	Cleared	An Average Temperature Too High subcode shall be cleared when an average temperature is no longer too high.
Average Temperature Too Low for > 1 Hour E01 0x00000020	Cause	The system shall set an Average Temperature Too Low over time. (> 1 hr).
	Cleared	An Average Temperature Too Low subcode shall be cleared when an average temperature is no longer too low.
Absolute High Temperature E01 0x00000040	Cause	The system shall set an absolute high temperature when the most recent temperature average is greater than the absolute high temperature.
	Cleared	An Absolute High Temperature subcode shall be cleared when the average temperature is less than the absolute high temperature.
QC Temperature Sensors reading out of range E01 0x00000100	Cause	The system shall set a Control and QC Sensors disagree when the temperatures detected by each of the sensors are not within 1.5ºC of each other.
	Cleared	The system shall clear a Control and QC Temperature Sensors disagree when the temperatures detected by each of the sensors differ by 1.5C or less degrees.
QC Temperature Sensors reading out of range E01 0x00000100	Cause	The system shall set this error when the QC Sensor reading is out of range.
	Cleared	The system shall clear this error when the QC Sensor reading is within range.

4.2.2.2 E18 Normalizer Row Averages Alert

After each test cycle, row averages are computed for each normalizer's four light sources. Each row average is then compared to three range limits. If three consecutive test cycles have an error status for a light source, then an E18 error system alert is generated for the light source. If the lowest row normalizer status from the last three test cycles is a warning status, then the E18

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

warning alert is generated for the light source. The warning or error sub-code identifies the flagged light source.

Refer to "E18 Troubleshooting" on page 157 and "E05 sc4000 Troubleshooting" on page 157.

Range	Low Range Limits (UV, RED, GREEN, BLUE)	High Range Limits (UV, RED, GREEN, BLUE)	Action
Ideal			No action.
Notice	0275,1020,1020,0890	0688,1380,1380,1210	Log entry written into the event log.
Warning	0229,0900,0900,0800	0733,1450,1450,1250	Log entry written into the event log. Data is used by algorithms. System alert is generated if lowest status after three tests is a warning.
Error	0183,0550,0550,0500	0779,1600,1600,1400	Log entry written into the event log. Data is not used by algorithms. System alert is generated if the lowest status after three tests is an error.

Alert	Description
Normalizer Row Averages E18 Cause	The system shall set a Normalizer Row Averages E18 when a normalizer row average error condition is detected.
Normalizer Row Averages E18 Cleared	The system shall clear a Normalizer Row Averages Alert E18 when the normalizer row averages are no longer in error.
Normalizer Row Averages E18 Alert	The Normalizer Row Averages E18 Alert shall be clearable.
UV Normalizer Warning E18 0x00000001 Cause	The system shall set a UV Normalizer Warning E18 0x00000001 when a UV row average warning level error exists.
UV Normalizer Warning E18 0x00000001 Cleared	The system shall clear the Normalizer Warning E18 0x00000001 when UV row average warning level error no longer exists.
Red Normalizer Warning E18 0x00000002 Cause	The system shall set a Red Normalizer Warning E18 0x00000002 when a Red row average warning level error exists.
Red Normalizer Warning	The system shall clear the Normalizer Warning E18 0x00000002

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Alert	Description
E18 0x00000002 Cleared	when a Red row average warning level error no longer exists.
Green Normalizer Warning	The system shall set a Green Normalizer Warning E18
E18 0x00000004 Cause	0x00000004 when a Green row average warning level error exists.
Green Normalizer Warning E18 0x00000004 Cleared	The system shall clear the Normalizer Warning E18 0x00000004 when a Green row average warning level error no longer exists.
Blue Normalizer Warning E18 0x00000008 Cause	The system shall set a Blue Normalizer Warning E18 0x00000008 when a Blue row average warning level error exists.
Blue Normalizer Warning E18 0x0000008 Cleared	The system shall clear the Normalizer Warning E18 0x00000008 when a Blue row average warning level error no longer exists.
UV Normalizer Error E18 0x00000010 Cause	The system shall set a UV Normalizer Error E18 0x00000010 when a UV row average error level error exists.
UV Normalizer Error E18 0x00000010 Cleared	The system shall clear the Normalizer Error E18 0x000000010 when a UV row average error level error no longer exists.
Red Normalizer Error E18 0x00000020 Cause	The system shall set a Red Normalizer Error E18 0x00000020 when a Red row average error level exists.
Red Normalizer Error E18 0x00000020 Cleared	The system shall clear the Normalizer Error E18 0x000000020 when the Red row average error level no longer exists.
Green Normalizer Error E18 0x00000040 Cause	The system shall set a Green Normalizer Error E18 0x00000020 when a Green row average error level exists.
Green Normalizer Error E18 0x00000040 Cleared	The system shall clear the Normalizer Error E18 0x000000040 when the Green row average error level no longer exists.
Blue Normalizer Error E18 0x00000080 Cause	The system shall set a Blue Normalizer Error E18 0x00000080 when a Blue row average error level error exists.
Blue Normalizer Error E18 0x00000080 Cleared	The system shall clear the Normalizer Error E18 0x000000080 when a Blue row average error level error no longer exists.

4.2.2.3 E19 Passed Read Position

Alert	Description
Passed Read Position E19 Cause	The system shall set a Passed Read Position E19 when a tier detects the Carousel has passed the read position.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Alert	Description
Passed Read Position E19 Cleared	The system shall clear the Passed Read Position E19 when the location no longer detects a passed read position during a test scan.
Clearing Alert E19	The system shall be able to clear Passed Read Position alert E19.

4.2.2.4 E20 Internal Barcode Scanner Not Communicating

Alert	Description
Barcode Scanner Not Communicating E20 0x00000001, 0x00000002, 0x00000004, 0x00000008 Causes	The system shall set a Barcode Scanner Not Communicating E20 and its associated subcode when the internal scanner for a tier does not respond during startup.
Barcode Scanner Not Communicating E20 0x00000001, 0x00000002, 0x00000004, 0x00000008 Cleared	The system shall clear the Barcode Scanner Not Communicating E20 and its associated subcode when the internal scanner for a tier does respond during startup.

4.2.2.5 E21 Rotor Step Warning

Rotor step data is collected for each optical panel inventory and test cycle per station, whether a panel is present or not. The rotor steps for each test cycle scan are compared to the rotor steps from the last optical inventory from the same station. The most severe rotor step status is saved from the four test cycle scans. The lowest rotor step status is then determined from the current and previous two test cycles. If the current station's status is an error and a panel is located in the station, the panel's data is considered invalid and not passed to the algorithms. The E21 rotor step warning and E22 rotor step error system alerts sub-code bits represents the station number in a warning or error state. If in error the station is blocked. The E21 system alert subcode bit is cleared when during the next test cycle no scans have a warning or error status for the station. The E22 system alert subcode bit is cleared when during the next test cycle no scans have an error status for the station.

Range	Range Limits	Action
Idea		No action.
Notice	15	Log entry written into the event log.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Range	Range Limits	Action
Warning	20	Log entry written into the event log. Data is used by algorithms. System alert is generated if lowest status after three tests is a warning
Error	30	Log entry written into the event log. Data is NOT used by algorithms. System alert is generated if the lowest status after three tests is an error.

Alert		Description
Rotor Step 21	Cause	The system shall set a Rotor Step Warning E21 when this level of rotor step error is detected.
	Cleared	The system shall clear a Rotor Step Error E21 when this level of rotor step error is no longer detected.
	Clearing	The system shall be able to clear the Rotor Step Warning 21.
Rotor Step Error 22	Cause	The system shall set a Rotor Step Error E22 when this level of rotor step error is detected.
	Cleared	The Rotor Step Error E22 shall be cleared when the level of rotor step error is no longer detected.
	Clearing	The system shall be able to clear the Rotor Step Error E22.
Normalizer Alert Highest / Lowest Well Reading E23	Cause	The system shall set a Normalizer Alert Highest/Lowest Well Reading E23 when the Normalizer highest and lowest well reading vary by more than an allowable percentage.
	Cleared	The system shall clear a Normalizer Alert Highest/Lowest Well Reading E23 when the Normalizer highest and lowest well reading no longer vary by more than an allowable percentage.
		The Normalizer Alert Highest/Lowest Well Reading E23 shall be clearable.
Rotor Step Error 22	Cause	The system shall set a Rotor Step Error E22 when this level of rotor step error is detected.
	Cleared	The Rotor Step Error E22 shall be cleared when the level of rotor step error is no longer detected.
	Clearing	The system shall be able to clear the Rotor Step Error E22.
Well Limit Warning E23 0x00000001	Cause	The system shall set a Well Limit Warning E23 0x00000001

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Alert		Description
		when the least severe well status is a warning from the last three test cycles.
	Cleared	The system shall clear a Well Limit Warning E23 0x00000001 when the least severe well status is not a warning from the last three test cycles.
SS2919	Cause	The system shall set a Well Limit Error E23 0x00000002 when the least severe well status is an error from the last three test cycles.
SS4210	Cleared	The system shall clear the E23 0x00000001 alert when the least severe well status is not an error from the last three test cycles.

4.2.2.6 E30 Normalizer Expiration Warning

The Normalizer Expiration Warning E30 and its associated subcodes is a self-clearing alert type. This alert is detected when:

- A Normalizer panel’s days remaining is >= 30 days and < 60 days during which the Normalizer Expiration Warning Alert is reported weekly
- A Normalizer panel’s days remaining is < 30 days during which the Normalizer Expiration Warning Alert is reported daily until the expiration date is reached.

The following events cause a normalizer expiration warning alert to be detected:

- The normal passing of time
- Modifying the instrument date
- Modifying the Normalizer Install Date
- Replacing Normalizer Panels already in the instrument and have less than 60 days to expiration

Restoring a **Normhist.csv** file that modifies the instrument's current Normalizer panels’ install dates which results in the panels having less than 60 days to expiration.

Alert	Attribute/Parameter	Description
SS4214	Normalizer Expiration Warning E30 0x00000001 Weekly Warning Cause	The system shall set a Normalizer Expiration Warning E30 0x000000001 Weekly warning when the time to expiration is within the weekly warning range.
SS4215	Normalizer Expiration	The system shall set a Normalizer Expiration Warning E30

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Alert	Attribute/Parameter	Description
	Warning E30 0x00000002 Daily Warning Cause	0x00000002 Daily Warning when the time to expiration is within the daily warning range.
SS2924	Normalizer Expired E31 0x00000001 Cause	The system shall set a Normalizer Expired Alert on a tier basis when an expired normalizer condition exists.
SS4216	Normalizer Expired E31 0x00000001 Cleared	The Normalizer Expired E31 0x00000001 shall be cleared when the expired normalizer condition for the affected tier no longer exists.
SS2925	Upgrade Status E34 Cause	The system shall report an Upgrade Status when an error occurs during an Upgrade, Install, or Restore operation. An Upgrade Status E34 will also be reported on the successful and unsuccessful completion of an instrument upgrade.
SS2926	Restore User Data E34 0x00000001 Cause	The system shall set Upgrade Error E34 0x00000001 Restore User Data, at power up, when the Restore Operation did not complete successfully.
SS2927	Install Panel Configuration E34 0x00000002 Cause	
SS2928	Custom Breakpoints Merge E34 0x00000004 Cause	The system shall set Custom Breakpoint Merge E34 0x00000004 when the merge operation does not complete successfully at power up.
SS2929	Phoenix Update Disk Staging Error E34 0x00000008	The system shall report the Phoenix Update Disk Staging Error (E34 0x00000008), at power up, when the update for the Phoenix Update Disk did not complete successfully.
SS2930	Restore Panel Lot Definitions Error E34 0x00000010	The system shall set Restore Panel Lot Definitions E34 0x00000010 when the restore operation does not complete successfully at startup.
SS4299	DiskRev.ID bad E34 0x00000020	The system shall set Upgrade Error DiskRev.ID E34 0x0000020 upgrade status error when the DiskRev.ID file's CRC does not match the CRC calculated by the FCDB software.
SS4300	FCDB.BIN bad E34 0x00000040	The system shall set Upgrade Error FCDB.BIN E34 0x0000040 upgrade status error when the FCDB.BIN's CRC

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Alert	Attribute/Parameter	Description
		in the DiskRev.ID file does not match the calculated CRC.
SS4301	TIER.BIN bad E34 0x00000080	The system shall set Upgrade Error TIER.BIN E34 0x0000080 upgrade status error when the TIER.BIN's CRC in the DiskRev.ID file does not match the calculated CRC.
SS4302	LSD.BIN bad E34 0x00000100	The system shall set Upgrade Error LSD.BIN E34 0x0000100 upgrade status subcode when the LSD.BIN's CRC in the DiskRev.ID file does not match the calculated CRC.
SS4303	LightSrc.INP bad E34 0x00000200	The system shall set Upgrade Error LightScr.INP E34 0x0000200 upgrade status error when the LightScr.INP's CRC does not match the calculated CRC.
SS4304	DF85Settings.XML bad E34 0x00000400	The system shall set Upgrade Error DF85Settings.XML E34 0x0000400 upgrade status error when the DF85Settings.XML's CRC does not match the calculated CRC.
SS4319	LSDB A Upgrade failed E34 0x000000800	The system shall set Upgrade failed E34 0x00000800 when the LSDB A upgrade has failed.
SS4320	LSDB B Upgrade failed E34 0x00001000	The system shall set Upgrade failed E34 0x00001000 when the LSDB B upgrade has failed.
SS4321	Tier A Upgrade failed E34 0x00002000	The system shall set Upgrade failed E34 0x00002000 when the Tier A upgrade has failed.
SS4322	Tier B Upgrade failed E34 0x00004000	The system shall set Upgrade failed E34 0x00004000 when the Tier B upgrade has failed.
SS4323	FCDB Upgrade Failed E34 0x00008000	The system shall set Upgrade failed E34 0x00008000 when the FCDB upgrade has failed.
SS4452	LSDB A Upgrade Succeeded E34 0x00010000	The system shall set Upgrade failed E34 0x00010000 when the LSDB A upgrade has failed.
SS4324	LSDB B Upgrade Succeeded E34 0x00020000	The system shall set Upgrade failed E34 0x00020000 when the LSDB B upgrade has failed.
SS4325	Tier A Upgrade Succeeded E34	The system shall set Upgrade failed E34 0x00020000 when the LSDB B upgrade has failed.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Alert	Attribute/Parameter	Description
	0x00040000	
SS4326	Tier B Upgrade Succeeded E34 0x00080000	The system shall set Upgrade failed E34 0x00040000 when the Tier B upgrade has succeeded.
SS4327	FCDB Upgrade Succeeded E34 0x00100000	The system shall set Upgrade failed E34 0x00100000 when the FCDB upgrade has succeeded.
SS2933	LIS Communications Error E44 Cause	An LIS Communications Error System Alert shall be displayed when data is uploaded from the system to LIS and the data is not completely uploaded.
SS4218	LIS Communications Error 44 Cleared	The system shall be able to clear the LIS Communication Error E44 when the communication issue no longer exists.
DD4219	The LIS Communication Error 44	The LIS Communication Error 44 shall be clearable.
SS4220	LIS Not Responding E44 0x00000001 Cause	The LIS Not Responding E44 0x00000001 alert shall be set when the instrument is not able to send data to the LIS.
SS4222	LIS Fatal Operating System Error E44 0x00000008	The LIS Fatal Operating System Error E44 0x00000008 shall be set when the instrument is not able to send data to the LIS.
SS2934	Internal Software Error E50 Cause	The system shall set an Internal Software Error alert E50 when an internal software error occurs.
SS4223	General Protection Fault E50 0x00000001 Cause	The system shall set the General Protection Fault E50 0x00000001 when the instrument software reboots due a fault condition.
SS4224	Assert E50 0x00000002 Cause	The system shall set Assert E50 0x00000002 when the software executes an assert command.
SS4226	PC Alerts E98 Cause	When an error condition occurs at the PC, the system shall set the PC Alert E98.
SS4227	PC Alerts E98 Cleared	When the error condition no longer exists at the PC, the system shall clear the PC Alert E98.
	PC Alert E98	

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Alert	Attribute/Parameter	Description
	0x00000001	
	PC Alert E98 0x00000002	
	PC Alert E98 0x00000004	
	PC Alert E98 0x00000010	
SS4530	PC Alert E98 0x00000010 Causes	The system shall set a PC Alert E98 with a subcode of 0x00000010 when the error occurs during configuration of the HID barcode scanner.
SS4531	PC Alert E98 0x00000010 Cleared	The system shall clear a PC Alert E98 with a subcode of 0x00000010 when the software successfully loads the configuration information from configuration file.
SS4532	PC Alert E98 0x00000020 Causes	The system shall set a PC Alert E98 with a subcode of 0x00000020 when a connected instrument's serial number is not in the list of commissioned instruments.
SS4533	PC Alert E98 0x00000020 Cleared	The system shall clear a PC Alert E98 with a subcode of 0x00000010 when the software has determined that all connected instruments' serial numbers are in the list of commissioned instruments.

4.2.2.7 DF85 Hidden System Alerts

These alerts are not visible to the customer.

4.2.2.8 E84 Missed Panel Flag

The Tier associated with this alert is written in the log message. The corrective action for this system alert is to check the subcode's corresponding station’s panel carrier to make sure it is seated completely. The adjacent stations’ panel carriers should also be checked to make sure they are seated completely.

Subcode / Subcode Name	Detail
00000001 station<00>	Panel Flag in this station has not been read

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Subcode / Subcode Name	Detail
00000002 station<01>	Panel Flag in this station has not been read
00000004 station<02>	Panel Flag in this station has not been read
00000008 station<03>	Panel Flag in this station has not been read
00000010 station<04>	Panel Flag in this station has not been read
00000020 station<05>	Panel Flag in this station has not been read
00000040 station<06>	Panel Flag in this station has not been read
00000080 station<07>	Panel Flag in this station has not been read
00000100 station<08>	Panel Flag in this station has not been read
00000200 station<09>	Panel Flag in this station has not been read
00000400 station<10>	Panel Flag in this station has not been read
00000800 station<11>	Panel Flag in this station has not been read
00001000 station<12>	Panel Flag in this station has not been read
00002000 station<13>	Panel Flag in this station has not been read
00004000 station<14>	Panel Flag in this station has not been read
00008000 station<15>	Panel Flag in this station has not been read
00010000 station<16>	Panel Flag in this station has not been read
00020000 station<17>	Panel Flag in this station has not been read
00040000 station<18>	Panel Flag in this station has not been read
00080000 station<19>	Panel Flag in this station has not been read
00100000 station<20>	Panel Flag in this station has not been read
00200000 station<21>	Panel Flag in this station has not been read
00400000 station<22>	Panel Flag in this station has not been read
00800000 station<23>	Panel Flag in this station has not been read
01000000 station<24>	Panel Flag in this station has not been read
02000000 station<25>	Panel Flag in this station has not been read

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

4.2.2.9 E85 Falcon Control and Power Board

Subcode Name	Detail
00000001 blower tach low blower on	Incubation Module Blower Speed is low
00000002 blower tach high blower on	Incubation Module Blower Speed is high
00000010 exhaust tach Low	Exhaust Fan Speed is low
00000020 exhaust tach high	Exhaust Fan Speed is low
00000040 Tier B too few PFs	Tier B board Panel Flag count lower than expected Similar to E06 Subcode 0000002, but Alert is for Tier A
00000080 Tier B too many PFs	Tier B board Panel Flag count higher than expected Similar to E06 Subcode 0000002, but Alert is for Tier A
00000100 1 RPM motor encoder cnts low	Servo Motor Encoder Counts Low at 1 RPM
00000200 1 RPM motor encoder cnts high	Servo Motor Encoder Counts High at 1 RPM
00000400 2 RPM motor encoder cnts low	Servo Motor Encoder Counts Low at 2 RPM
00000800 2 RPM motor encoder cnts high	Servo Motor Encoder Counts High at 2 RPM
00001000 ION drive comm error	ION Drive is reporting a Communications Error
00002000 ION drive motion error	ION Drive is reporting a Motion Error. The Error Value between the Servo Encoder Counts and the Commanded Position are too high.
00004000 ION drive temperature error	ION Drive is reporting a Temperature Error where the ION is over safe operating temperatures
00008000 ION drive	ION Drive is reporting an out of range Voltage to the ION

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Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Subcode Name	Detail
voltage error	
00010000 ION drive commutation error	ION Drive is reporting a Motor Commutation Error
00020000 ION drive initialization failed	ION Drive is reporting that the Motor cannot be Phase Initialized. Motion will not start
00040000 Bad Ambient RTD	Ambient RTD is reading extreme values and may be opened or shorted
00080000 Ambient temperature low	Ambient RTD is reading a Low Ambient Temperature of the air outside of the instrument
00100000 Ambient temperature high	Ambient RTD is reading a High Ambient Temperature of the air outside of the instrument
00200000 Tier cables swapped	Not Part of SW currently
00400000 LSDB cables swapped	Cables may be swapped
00800000 Monitor Temp high	Board Temp High
01000000 BC Cables swapped	Not Part of SW currently

4.2.2.10 E86 Tier Board

Subcode / Subcode Name	Detail
00000001 temp high	Board Temperature Sensor reading High
00000002 temp low	Board Temperature Sensor reading Low
00000004 +5V high	Board Voltage High
00000008 +5V low	Board Voltage Low
00000010 +3.072V high	Board Voltage High
00000020 +3.072V low	Board Voltage Low
00000040 white LED on test failed	CCD Counts measured low with On-Board White LED On

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Subcode / Subcode Name	Detail
00000080 white LED off test failed	CCD Counts measured high with On-Board White LED Off
00000100 Tier comm port connected to LSDB A	Tier Board is connected to Tier A Light Source DriverBoard Port on FCDB
00000200 Tier comm port connected to LSDB B	Tier Board is connected to Tier A Light Source Driver Board Port on FCDB
00000400 white LED current low	On-Board White LED current reading low when on
00000800 white LED current high	On-Board White LED current reading high when on
00001000 Tier comm cables swapped	No Test For this currently
00002000 CCD Alignment out of tolerance	CCD out of Alignment; Normalizer well coordinates off from initial optical inventory position.
00004000 CCD Alignment reset to defaults	Bad checksum for CCD Alignment Data

4.2.2.11 E87 LSD Board

The Tier associated with the alert is written in the log message.

Subcode Name	Detail
00000001 temp high	Board Temperature Sensor reading High
00000002 temp low	Board Temperature Sensor reading Low
00000004 +15V high	Board Voltage High
00000008 +15V low	Board Voltage Low
00000010 +5V high	Board Voltage Low
00000020 +5V low	Board Voltage Low
00000040 -5V high	Board Voltage High
00000080 -5V low	Board Voltage Low
00000100 +3.3V high	Board Voltage High
00000200 +3.3V low	Board Voltage Low
00000400 +2.5V high	Board Voltage High

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Subcode Name	Detail
00000800 +2.5V low	Board Voltage Low
00001000 +1.2V high	Board Voltage High
00002000 +1.2V low	Board Voltage Low
00004000 DACREF0 +2.5V high	Board Voltage High
00008000 DACREF0 +2.5V low	Board Voltage Low
00010000 DACREF1 +2.5V high	Board Voltage High
00020000 DACREF1 +2.5V low	Board Voltage Low
00040000 LED Fault	Light Source LED Fault occurred for one of source color (RGB/UV)
00080000 LSD Component Failure	LSD Component Failure occurred for one of source colors (RGB/UV)
00100000 Source Monitor Check	Source Monitor Failed for one of source colors (RGB/UV)
00200000 Bank Fault Low Current	LED Bank Current read low for one of source colors (RGB/UV)
00400000 Bank Fault Hi Leakage	High Leakage Current read for one of the source colors (RGB/UV)
00800000 GND High	Board Voltage High
10000000 Comm cable connected to Tier PCB	Communications test to verify that the board connected is an LSDB and not a Tier
20000000 Comm cable connected to wrong LSDB PCB	Check to make sure cable is plugged into correct LSDB. Uses board-to-board jumper to identify which tier each board is in

4.2.2.12 E05 Carousel Alert

When an alert occurs during carousel advancement that aborts a barcode inventory, the carousel advancement is terminated and a full barcode inventory scan is performed.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

The system sets a carousel alert E05 when a carousel error condition is detected. The system clears the carousel alert E05 when a Carousel error condition no longer exists. This type of alert can be cleared.

The table below illustrates the carousel speed tolerances. Carousel alerts traveling too slow or too fast alerts are generated when the revolution is 5% above or below the expected time. A missed home flag system alert is generated when a home flag is not seen within the +7% time out period listed in the table.

Drum RPMS	+%5 Above expected RPM alert		-5% Below expected RPM alert		+7% Drum failure	
1	1.05 rpms	57.0 secs	0.95 rpms	63.0 secs	0.93 rpms	64.2 secs
2	2.10 rpms	28.5 secs	1.94 rpms	31.5 secs	1.86 rpms	32.1 secs
4	4.20 rpms	14.25 secs	3.88 rpms	15.75 secs	3.72 rpms	16.05 secs

Alert	Description	Note
Carousel RPM is Below Spec. E05 0x00000001 Cause	The system shall set a Carousel RPM is Below Spec E05 0x00000001 when the drum rotation takes longer than the expected time.	
Carousel RPM is below spec E05 0x0000001 Cleared	The system shall clear a Carousel RPM error E05 0x00000001 when a drum rotation takes less than or equal to the expected time.	
Carousel RPM is above specification E05 0x00000002 Cause	The system shall set a Carousel RPM is Above Spec E05 0x00000002 when the drum rotation takes less time to complete than the expected time	Refer to the description on the **Carousel RPM is below specification E05 0x00000001** alert.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Alert	Description	Note
Carousel RPM is above specification E05 0x00000002 Cleared	The system shall clear a Carousel RPM is Above Spec E05 0x00000002 when the drum rotation takes the expected amount of time to complete	
Home Flag Missed E05 0x00000004 Cause	The system shall set a Home Flag Missed E05 0x00000004 when the home flag sensor was not detected within the expected time.	Generated when a home flag is not seen within the +7% time out period listed in the table below. Refer to the description on the **Carousel RPM is below specification E05 0x00000001** alert.
Home Flag Missed E05 0x00000004 Cleared	The system shall clear a Home Flag Missed E05 0x000000004 when the home flag sensor is detected within the expected time.	
Too Few Panel Flags FCDB E05 0x00000008 cause	The system shall set Too Few Panel Flags E05 0x00000008 when less than 26 panel flags are seen between home flag detection.	Set when a home flag interrupt occurs and less than 26 panel flags were detected by the panel flag interrupt service routine.
Too Few Panel Flags FCDB E05 0x00000008 cleared	The system shall clear Too Few Panel Flags E05 0x00000008 when 26 panel flags are seen between home flag detection.	Since the previous home flag. If the current panel position is not known this error is not set. The current panel position is not known under the following conditions: 1. When the FCDB application first starts up. 2. The Carousel is moved by the user when the door is open. 3. Missed home flag error. 4. After a too few panel flag error. 5. After a too many panel flag error.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Alert	Description	Note
		6. Missed panel flag error.
Too Many Panel Flags FCDB detected E05 0x00000010 Cause	The system shall set Too Many Panel Flags E05 0x00000010 when is set when more than 26 panel flags are seen before a home flag.	Set when more than 26 panel flags are seen before a home flag.
Too Many Panel Flags FCDB Detected E05 0x00000010 Cleared	The system shall clear Too Many Panel Flags FCDB E05 0x00000010 when 26 panel flags are seen between home flag detection.	
Missed Panel Flag FCDB E05 0x00000020 Cause	The system shall set a Missed Panel Flag E05 0x00000020 when three consecutive Carousel commands failed due to a panel flag not being detected.	Generated when three consecutive Carousel commands failed due to a panel flag not being detected. The drum is stopped.
Missed Panel Flag FCDB E05 0x00000020 Cleared	The system shall clear a Missed Panel Flag E05 0x00000020 when a panel flag is detected within the expected time.	
Carousel Jammed FCDB E05 0x00000080 cause	The system shall report Carousel Jammed E05 0x00000080 when three consecutive attempts to start drum fail due to a missed panel flag.	Generated when three consecutive attempts to start the drum fail due to a missed panel flag. When a drum
Carousel Jammed FCDB E05	The system shall clear the Carousel Jammed E05 0x00000080 alert	Jammed system alert occurs testing is terminated. The system must be shut down. When the instrument is powered up, the system attempts to

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Alert	Description	Note
0x00000080 Cleared	when the instrument is restarted and a panel flag is seen.	recover. If a panel flag is detected, the drum jammed system alert is cleared.
Door Lock Error Recovery E05 0x00004000 cause	The system shall report Door Lock Error Recovery E05 0x00004000 when five consecutive reading of the door's status indicates a violent separation has occurred.	When a violent separation event occurs the instrument software continually checks for the violent separation event to be cleared. When a violent separation event occurs, the instrument software does the following until the door status indicates the door is locked which indicates the door is no longer in a violent separation state. 1. unlocks the door 2. delays 1 second 3. locks the door 4. reads the door status According to the solenoid interlock documentation from Schmersal, a violent separation occurs when the actuator and the interlock are separated in an unauthorized and violent way. Schmersal is the company that manufactures the solenoid interlock. Misalignment of the door may generate this error.
Door Lock Error Recovery E05 0x00004000 Cleared	The system shall clear the Door Lock Error Recovery E05 0x00004000 alert when the door status indicates a violent separation has not occurred.	

4.2.2.13 E88 and E89 Falcon Control and Power Board

Fault Isolo (DF-85) Data Points	Ecode Low Limit	EcodeHigh Limit	Subcode Low Limit	Subcode High Limit	Alert Detail
Tier A amperage	E88	E89	0x00000001	0x00000001	Board current read out of range

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Fault Isolo (DF-85) Data Points	Ecode Low Limit	EcodeHigh Limit	Subcode Low Limit	Subcode High Limit	Alert Detail
Tier B amperage	E88	E89	0x00000002	0x00000002	Board current read out of range
LSDB A amperage	E88	E89	0x00000004	0x00000004	Board current read out of range
LSDB B amperage	E88	E89	0x00000008	0x00000008	Board current read out of range
Panel Status Indicator PCBs amperage – LEDs off	E88	E89	0x00000010	0x00000010	Board currents read out of range with all the LEDs off
System Indicator amperage – LEDs unknown state	E88	E89	0x00000020	0x00000020	Board currents read out of range at the current and unknown state
Barcode A amperage	E88	E89	0x00000040	0x00000040	Barcode Reader current read out of range
Barcode B amperage	E88	E89	0x00000080	0x00000080	Barcode Reader current read out of range
Blower amperage – blower on	E88	E89	0x00000100	0x00000100	Blower current read out of range with the blower on 100% PWM
Heater amperage - Heater power off	E88	E89	0x00000200	0x00000200	Blower current read out of range with the blower off
Motor AUXV amperage	E88	E89	0x00000400	0x00000400	ION Drive current reading out of range
Motor HV amperage	E88	E89	0x00000800	0x00000800	Servo Motor current reading out

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Fault Isolo (DF-85) Data Points	Ecode Low Limit	EcodeHigh Limit	Subcode Low Limit	Subcode High Limit	Alert Detail
					of range
Door lock amperage	E88	E89	0x00001000	0x00001000	Door Lock current reading out of range
Exhaust Fan amperage	E88	E89	0x00002000	0x00002000	Fan current reading out of range
FCDB zero scale channel	E88	E89	0x01000000	0x01000000	External ADC for RTD readings out of calibration
FCDB full scale channel	E88	E89	0x02000000	0x02000000	External ADC for RTD readings out of calibration
+24V with heater on full power	E88	E89	0x08000000	0x08000000	FCDB supply voltage with the Incubation Heater Bar on 100% PWM

4.2.2.14 E06 Tier Alert

Tier Alert E06 errors are due to a failure on one of the Tier or LSD PCBs. The LSDB offline E06 0x00100000 is the only LSDB based E06 error.

The system sets a Tier Alert E06 when a tier level error is detected. The system clears a Tier Error E06 when the error condition no longer exists. This type of alert is clearable.

Alert	Description	Note
Missed Panel Flag Tier E06 0x00000001 Cause	The system shall set a Missed Panel Flag E06 0x000000001 when a panel flag is not detected within the expected time by a Tier.	
Missed Panel Flag Tier E06 0x00000001 Cleared	The system shall clear a Missed Panel flag E06 0x00000001 when a panel flag is detected within the expected time by a Tier.	

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Alert	Description	Note
Too Few Panel Flags E06 0x00000002 Cause	The system shall detect a Too Few Panel Flags Tier Alert E06 0x000000002 when less than 26 panel flags are detected between home flag detection by a Tier.	
Too Few Panel Flags E06 0x00000002 cleared	The system shall clear a Too Few Panel Flags Tier Alert E06 0x00000002 when the expected number panel flags are detected between home flag detection by a Tier.	Verify that all panel holders in the alert's tier are seated completely.
Too Many Panel Flags Tier E06 0x00000004 Cause	The system shall set a Too Many Panel Flags Tier Alert E06 0x00000004 when more than the expected number of panel flags are detected between each home sensor by the Tier, regardless of the instrument RPM.	
Too Many Panel Flags Tier E06 0x00000004 Cleared	The system shall clear a Too Many Panel Flags Tier Alert E06 0x00000004 when the expected number of panel flags are detected between each home sensor by the tier, regardless of the instrument RPM.	
No Normalizer Panel Data E06 0x00000008 Cause	The system shall set a No Normalizer Panel Data E06 0x000000008 when panel data for the Tier's normalizer panel is not sent to the FCDB.	
No Normalizer Panel Data E06 0x00000008 Cleared	The system shall clear a No Normalizer Panel Data E06 0x000000008 during a test cycle when the normalizer panel data is processed by the FCDB.	
Tier Offline E06 0x00000010 Cause	The system shall set the Tier Offline E06 0x00000010 when the tier does not have the expected software or communication between the FCDB and Tier PCBs failed	
Tier Offline E06 0x00000010 Cleared	The system shall clear the Tier Offline E06 0x00000010 when the tier has the expected software and is communication with the FCDB PCB.	

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Alert	Description	Note
Normalizer Panel Not Seen E06 0x00000040 Cause	The system shall set a Normalizer Panel Not Seen Tier Alert E06 0x00000040 when the normalizer panel is not detected during an optical panel inventory by Tier.	
Normalizer Panel Not Seen E06 0x00000040 Cleared	The system shall clear the Normalizer Panel Not Seen Tier Alert E06 0x00000040 when the normalizer panel is detected by Tier.	
No Normalizer Panel Barcode Present E06 0x00000080 Cause	The system shall set a No Normalizer Panel Barcode Present System Alert when the normalizer panel barcode is not detected when expected.	
No Normalizer Panel Barcode Present E06 0x00000080 Cleared	The system shall clear the No Normalizer Panel Barcode Present System Alert when the normalizer panel barcode is detected when expected.	
Unexpected Home Flag E06 0x00000100 Cause	The system shall set an Unexpected Home Flag System Alert E06 0x00000100 when a home flag is detected when it is not expected.	Generated when an unexpected home flag occurs during a panel inventory or test cycle. This error causes the test cycle or panel
Unexpected Home Flag E06 0x00000100 Cleared	The system shall clear the Unexpected Home Flag System Alert E06 0x00000100 when a home flag is detected when it is expected.	Inventory to terminate prematurely. The event is cleared following a successful panel inventory or test cycle.
High Dark Pixel Count E06 0x00000400 Cause	The system shall set a High Dark Pixel Count Tier Alert E06 0x00000400 when a dark pixel is greater than 200 counts.	
High Dark Pixel Count E06 0x00000400	The system shall clear a High Dark Pixel Count Tier Alert E06 0x00000400 when all dark pixels are below 200 counts.	

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Alert	Description	Note
Cleared		
Panel in Station 0 Not a Normalizer E06 0x00004000 Cause	The system shall set a Panel in Station 0 Not a Normalizer Tier Alert E06 0x00004000 when a panel other than a normalizer is detected in the normalizer station.	
Panel in Station 0 Not a Normalizer E06 0x00004000 Cleared	The system shall clear the Panel in Station 0 Not a Normalizer Tier Alert E06 0x00004000 when a normalizer panel is detected in the normalizer station.	
Wrong Normalizer Barcode E06 0x00020000 Cause	The system shall set a Wrong Normalizer Barcode System Alert E06 0x00020000 when the internal scanner reads the normalizer barcode and it does not match the normalizer barcode specified for this tier.	
Wrong Normalizer Barcode E06 0x00020000 Cleared	The system shall clear the Wrong Normalizer Barcode System Alert E06 0x00020000 when the internal scanner reads the normalizer barcode and it does match the normalizer barcode specified for this tier.	
Zero Black Pixel Error E06 0x00040000 cause	The system shall set a Zero Black Pixel Error E06 0x00040000 alert if either of the Tier's 4ms or 8ms black pixel are zero.	After each test cycle each Tier's 4ms and 8ms black pixels are validated. If either is 0 then the Zero Black Pixel E06 0x00040000 alert is set.
Zero Black Pixel Error E06 0x00040000 cleared	The system shall clear a Zero Black Pixel Error E06 0x00040000 alert when the Tier's 4ms and 8ms black pixels are both greater than zero.	
Black Pixel above 200 Error E06 0x00080000	The system shall set a Black Pixel Error E06 0x00080000 when the 4ms or 8ms black pixel is above 200.	After each test cycle each Tier's 4ms and 8ms black pixels are validated. If either is greater than 200 then the Black Pixel

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Alert	Description	Note
Cause		above 200 E06 0x00080000 alert is set.
Black Pixel above 200 Error E06 0x00080000 Cleared	The system shall clear the Black Pixel above 200 Error E06 0x000800000 when a test cycle completes and the tier's black pixels are both less than or equal to 200.	
LSD Offline E06 0x001000000 Cause	The system shall set a Tier LSD offline when the LSD is not communicating or has an unexpected version.	
Tier LSD Offline E06 0x001000000 cleared	The system shall clear a Tier LSD offline when the LSD is communicating and it reports the expected version.	
Tier Missed Home Flag E06 0x00200000 Cause	The system shall set a Tier missed home flag error when the home flag is not seen when it is expected during an optical panel inventory or a test cycle.	
Tier Missed Home Flag E06 0x00200000 Cleared	The system shall clear a Tier missed home flag error when the home flag is seen when it is expected during an optical panel inventory or a test cycle.	
Tier No Panel Flags E06 0x00400000 Cause	The system shall set a Tier No Panel Flags error when the home flag is seen and no panel flags were seen.	
Tier No Panel Flags E06 0x00400000 Cleared	The system shall clear a Tier No Panel Flags error when the home flag is seen and panel flags were seen.	

4.2.2.15 E07 Power Supply Alert

The system sets a power supply alert E07 when out of specification voltages are detected. The system clears a power supply alert E07 when voltage is no longer out of specification.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Alert	Description
+24V Too High E07 0x00000040 Cause	The system shall set a +24V Too High E07 0x00000040 when this power supply reports a single voltage reading above the permitted value.
+24V Too High E07 0x00000040 Cleared	The system shall clear a +24V Too High E07 0x00000040 when this power supply reports a single voltage reading below the maximum permitted value.
+24V Too Low E07 0x00000080 Cause	The system shall set a +24V Too Low E07 0x00000080 when this Power Supply reports a single reading below the lowest permitted voltage value.
+24V Too Low E07 0x00000080 Cleared	The system shall clear a +24V Too Low E07 0x00000080 when this Power Supply reports a single reading above the lowest permitted voltage value.

4.2.2.16 E08 Tier Power Supply Alert

The system reports a tier power supply alert E08 when out of specification voltages are detected. The system clears a power supply alert E08 when voltage is no longer out of specification.

Alert	Description
Tier Power Supply +24V Too High E08 0x00000001 Cause	The instrument shall set a +24V Too High E08 0x00000001 when this Power Supply reports a single reading greater than the highest voltage permitted value.
Tier Power Supply +24V Too High E08 0x00000001 Cleared	The instrument shall clear a +24V Too High E08 0x00000001 when this Power Supply reports a single reading of less than the highest voltage permitted value.
Tier Power Supply +24V Too Low E08 0x00000002 Cause	The system shall set a +24V Too Low E08 0x00000002 when a single voltage reading is less than the lowest voltage permitted value.
Tier Power supply +5V Too Low E08 0x00000002 Cleared	The system shall clear a +24V Too Low E08 0x00000002 when a single voltage reading is not less than the lowest voltage permitted value.
LSD PCB Power Supply +24V Too High E08 0x00000004 Cause	The system shall set a +24V Too High E08 0x00000004 when the LSD PCB Power Supply reports a single reading of more than the permitted highest voltage value.
LSD PCB Power Supply	The system shall clear a +24V Too High E08 0x00000004 when the

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Alert	Description
+24V Too High E08 0x00000004 Cleared	LSD PCB Power Supply reports a single reading less than the permitted highest voltage reading.
LSD PCB Power supply +24V Too Low E08 0x00000008 Cause	The system shall set a +24V Too Low E08 0x00000008 when the LSD PCB Power Supply reports a single reading of less than the permitted lower voltage value.
Tier Power supply +15V Too Low E08 0x00000008 Cleared	The system shall set a +24V Too Low E08 0x00000008 when the LSD PCB Power Supply reports a single reading of greater than the permitted lower voltage value.

4.2.2.17 Test Aborted

Alert	Description
Test Aborted E09 0x20000000	The system shall set a No Test in 1 hour if a test cycle has not been performed in the last hour.

4.2.2.18 E10 Database Corruption

Alert	Description
Database Corruption E10 Cause	The system shall report a Database Corruption E10 when any of the system's c-code databases are invalid.
Panel Database Corrupted E10 0x00000001 Cause	The system shall set Panel Database Corrupted E10 0x00000001 when the panel database is invalid.
System Parameters Database Corrupted E10 0x00000002	The system shall set a System Parameters Database Corrupted E10 0x00000002 when the System Parameters database is invalid.
BDXpert Rules Database Corrupted E10 0x00000008	The system shall set a BDXpert Rules Database Corrupted E10 0x00000008 when the BDXpert rules database is invalid.
Panel Lot Database	The system shall set Panel Database Corrupted E10 0x00000010 when

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Alert	Description
Corrupted E10 0x00000010	the panel lot database is corrupt.
Custom Breakpoint Database Corrupted E10 0x00000020	The system shall set Custom Breakpoint Database Corrupted E10 0x00000020 when the custom breakpoint database is invalid.
User Codes Database Corrupted E10 0x0000040	The system shall set User Codes Database Corrupted E10 0x00000040 when the User Codes database is invalid.
Alert / Eventlog Database Corrupted Subcode 00000080	The system shall set Alert Database Corrupted E10 0x00000080 when the Alert database is corrupt.
Instrument History Corrupted E10 0x00001000 Cause	The system shall set Instrument History Corrupted E10 0x00001000 when the instrument history log is corrupt.
Instrument SysParms Corrupted E10 0x00002000	The system shall set Instrument SysParms Corrupted E10 0x00002000 when the instrument sys parms is corrupt or missing.
Instrument Light Source Corrupt E10 0x00004000	The system shall set Instrument Light Source Corrupted E10 0x00004000 when the instrument light source is missing or corrupt.
Instrument Light Source History Corrupt E10 0x00008000	The system shall set Instrument Light Source History Database Corrupted E10 0x00008000 when the instrument light source history is missing or corrupt.
Instrument Alert Database Corrupt E10 0x00010000	The system shall set Alert Database Corrupted E10 0x00010000 when the alert database is corrupt.
Instrument LEDLTSRC.INP crc bad E10	The system shall set Instrument LEDLTSRC.INP Corrupted E10 0x00020000 when the LEDLTSRC.INP has a bad checksum value.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Alert	Description
0x00020000	
Instrument LEDLTSRC.INP missing E10 0x00040000	The system shall set Instrument LEDLTSRC.INP Corrupted E10 0x00040000 when the LEDLTSRC.INP is missing.
Instrument DF85Settngs.xml crc bad E10 0x00080000	The system shall set Instrument DF85Settings.xml crc bad E10 0x00080000 when the DF85Settings.XML has a bad checksum value.
Instrument DF85Settings.XML missing E10 0x00100000	The system shall set Instrument DF85Settings.xml missing E10 0x00080000 when the DF85Settings.XML is missing.
Instrument Configuration Initialized E10 0x00200000	The Instrument Configuration Parameters Initialized alert is set when the computed checksum and stored checksum in the Instrument Configuration record located in the I2C EEprom do not match and has been initialized with default settings.
Instrument Configuration Corrupt E10 0x00400000	The Instrument Configuration Parameters Corrupt E10 0x00400000 alert is set when the Instrument Configuration record located in the I2C EEprom is corrupt and the re-initialization failed.

4.2.2.19 E11 Printer Error

Alert	Description
Printer Error E11 0x20000000	The system shall set Printer Error E11 when a printer error is detected. TBD

4.2.2.20 E12 Source Monitor Error

A test cycle's source monitor readings are compared to the range limits in the table. If a source monitor reading is outside of the ranges listed below, then the corresponding action is taken.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Range	Low Range Limits	High Range Limits	Action
Idea			No action.
Notice	790	950	Log entry written into the event log. Data is used by algorithms.
Error	400	1022	Log entry written into the event log. Data is NOT used by algorithms. System alert is generated if the lowest status after three tests is an error.

Alert	Action	Description
Source Monitor Error E12	Cause	The system shall set Source Monitor Error E12 when a source monitor error has been detected.
	Cleared	The system shall clear Source Monitor Error E12 when a source monitor error no longer exists.
	Alert	The Source Monitor Error E12 shall be clearable.
Instrument Power Failure Alert E13		The system shall report the Instrument Power Failure Alert E13 when the instrument has lost power after power has been restored. The power lost and power restored times shall be displayed.
CCD Under Run 14	Cause	The system shall set a CCD Under Run E14 when scanning of a panel stops prematurely.
	Cleared	The system shall clear CCD Under Run Error E14 when a CCD Under Run error no longer exists.
	Alert	The CCD Under Run E14 alert shall be clearable.

4.2.2.21 Field Replaceable Unit System Alerts

E90 and E91 alerts are FRU system alerts and are visible to the customer. They are accessible via the log file.

FRU Alert Number	FRU/Failure	Service Action	Additional Troubleshooting
E90 Alert subcode 0x00000001	Servo Motor Assembly	1. FRU Alert will be paired with E90 0x00000040 Drive Belt SAP 443855	

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

FRU Alert Number	FRU/Failure	Service Action	Additional Troubleshooting
	SAP 443831	Re-tension belt. 2. Inspect Sprocket in Motor Assembly. 3. Replace Motor Assemble if Sprocket Loose. 4. Replace belt.	
E90 Alert subcode 0x00000002	Power Entry Panel Assembly SAP 443843	Replace Power Entry Panel and cabling. If Alerts comes up with E90 Alert subcode 0x00000020 Incubation Assembly SAP 443853: Replace Power Entry Panel and cabling and Incubation Module and Cabling.	Possible Control & Power Distribution Board (FCDB) Failure; Replace Board and Cabling.
E90 Alert subcode 0x00000004	Control & Power Distribution Board (FCDB) SAP 443846	Replace Board and Cabling.	
E90 Alert subcode 0x00000008	Light Source Board SAP 443848	1. Check connections to FCDB. 2. Check Connections to board. 3. Replace Boards and Cabling.	
E90 Alert subcode 0x00000010	Tier Micro Board	1. Check connections to FCDB. 2. Check Connections to board. 3. Check that Power/Comms and Flags connections are not interchanged 4. Replace Boards and Cabling.	
E90 Alert subcode 0x00000020	Incubation Assembly SAP 443853	1. Replace Incubation Module and cabling. If Alerts comes up with E90 Alert subcode 0x00000002 Power Entry Panel Assembly SAP 443843: Replace Power Entry Panel and cabling and Incubation Module and Cabling.	Possible Control & Power Distribution Board (FCDB) Failure Replace Board and Cabling.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

FRU Alert Number	FRU/Failure	Service Action	Additional Troubleshooting
E90 Alert subcode 0x00000040	Drive Belt SAP 443855	FRU Alert will be paired with E90 Alert 0x00000001 Servo Motor Assembly SAP 443831. 1. Re-tension belt. 2. Inspect Sprocket in Motor Assembly. 3. Replace Motor Assembly if Sprocket Loose Replace belt.	
E90 Alert subcode 0x00000080	Ion Drive SAP 443856	1. Replace Ion Drive and cabling.	
E90 Alert subcode 0x00000100	Magnetic Locking Guard SAP 443870	1. Close door. 2. Check all door lock cabling. 3. Check door and magnet alignment. 4. Replace FRU.	Replace Fascia.
E90 Alert subcode 0x00000200	Carousel is jammed	1. Clear Jam. 2. Check for damage to instrument. 3. Check for other Carousel issues like Bearing Failure.	
E91 Alert subcode 0x00000001	System Status Indicator Assembly SAP 443844	1. Check all board connections 2. Replace board and cabling.	
E91 Alert subcode 0x00000002	Internal Barcode Reader SAP 443845	1. Check Reader connections at Reader and FCDB. 2. Replace Reader and Cabling.	

4.3 Troubleshooting

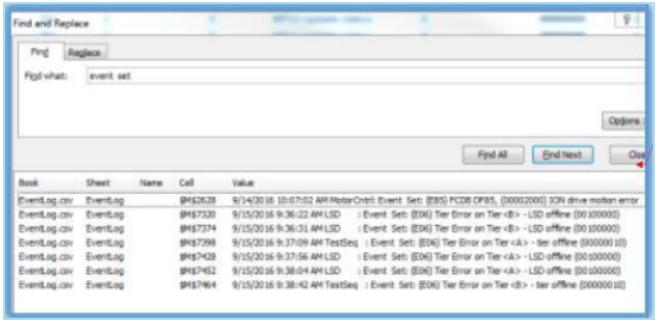
Troubleshooting is the technique of identifying a problem or issue that is preventing an instrument from performing its task correctly and effectively. Instrumentation can be thought of

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

as a set of systems that interact to perform a function. To effectively troubleshoot an instrument, it is necessary to understand how the various systems work together, what to observe, and what to test. The table below contains a six step troubleshooting technique that is effective across a wide range of systems. These steps allow the engineer to effectively and quickly identify and repair instrument issues.

Task	Description
Preparation	Effective troubleshooting starts before an engineer ever arrives on site. The engineer should collect and have all relevant data and materials available. This includes the history of the instrument, technical documentation and updates, relevant software, special tools that may be required, and the reported symptoms.
Observation	On site, the first thing an engineer should do is perform a visual inspection. This includes checking connectors, switch settings, any moving parts, and overall instrument condition and environment. After it has been determined that the instrument is setup correctly, power it up and observe how the startup sequence progresses. Observations should not be restricted to just the visual. Listen to the noises the instrument makes. Note any unusual odors. Check for odd vibrations. Try to reproduce the problem.
Identify Probable Problem Areas or Processes	Review observational data and try to logically determine what systems or sub systems of the instrument are not functioning correctly. The steps below should be followed to identify and correct the problem(s): 1. View the active alerts on the alert screen by pressing the alert screen button that is on the upper right of the status screen. 2. If any FRU (E90 or E91) system alerts are active, refer to "Field Replaceable Unit System Alerts" on page 141. The corrective actions noted for each active FRU system alert should then be performed. 3. If there are any active user system alerts, refer to "Common Error Codes and Resolutions" on page 109 and find each active alert's matching error code and subcode. Follow the instructions to resolve each active alert. 4. If the problem(s) has not been corrected or there are still active system alerts, then save the even log files. Refer to "Log Files" on page 152. 5. Open the **EventLog.csv** file that is in the zip file **eventLog.zip** with Microsoft Excel. Extract the **EvenltLog.csv** file from the **EventLog.zip** and then perform the following: • Press **Ctrl A** to select all rows in the spreadsheet.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Task	Description
	• Press **Ctrl F** to have the **Find and Replace** window appear. • Enter **(E*)** in the **Find what:** text box. • Press the **Find All** button on the **Find and Replace** window. • All rows with the string **(E*)** will appear in the **Find Results** pane which is the bottom pane of the **Find and Replace** window.  • Search the **Find Results** pane for the DF85 Hidden System Alerts. • If a number of active DF85 Hidden and/or Use System Alerts are associated with the same FRU, the FRU may need to be replaced. Start with the system as a whole, and for each observation that deviates from normal functionality determine what systems and sub systems could cause the observed deviation. Make notes about why a particular system would not cause the deviation and why another system would cause the deviation.
Determine Possible Causes	From the faulty system try to identify which assemblies or components might cause the problem and what sort of tests might need to be performed to confirm the hypotheses. At this stage it will be necessary to open up the instrument and visually inspect assemblies and components.
Test and Repair	Perform any tests that will identify the defective assembly or component. Try to avoid **test by replacement** until there is a high level of confidence that the suspect part is faulty. If a part was replaced as part of an FAI or ELF event, or is marked **Yes** in the **Effective Return** column of the WW Spare Parts list, return the part per the RMA process. Include a detailed description of the issue in the service report, noting if the part replacement addressed the root cause of the problem.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Task	Description
Follow-up	There are two parts to follow up. The first part of follow up is to ask the customer if the instrument is functioning correctly. Follow up calls to the customer should occur after they have had a chance to use the instrument. The second follow up is related to the repair itself. For example: what was noted and observed, has this part failed before, does it have a history of failure, or were there signs of excessive wear or misuse, etc.

4.3.1 Hardware Troubleshooting

This section contains errors, reasons, and resolutions related to FCDB, Tier Micros, and LSDB.

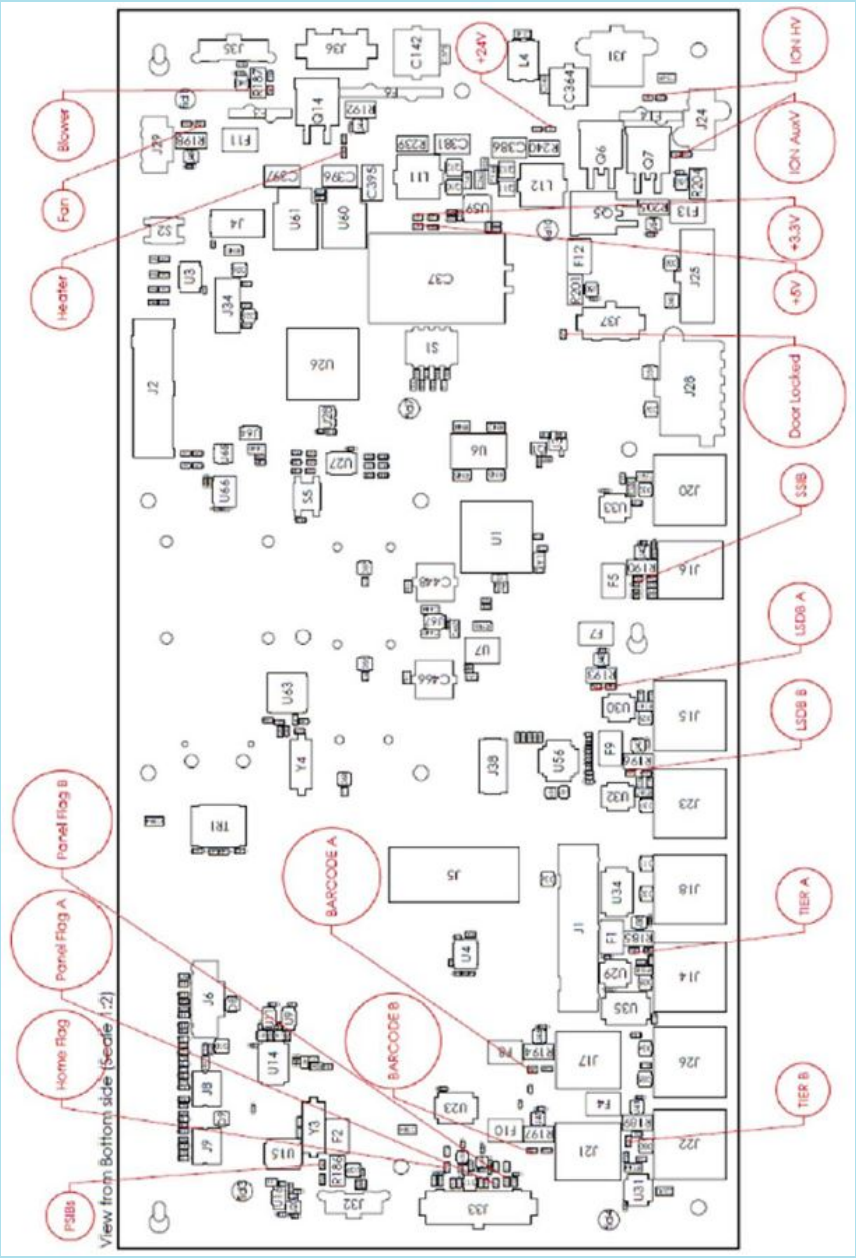
FCDB			
Error	**Description**	**Reason**	**Resolution**
D18	Home Flag Sensor	Missing Home Flag	1. Check Sensor connections 2. Replace Sensor
D16	Tier A Panel Flag Sensor	Missing Tier A Flag	1. Check Sensor connections 2. Replace Sensor
D19	Tier B Panel Flag Sensor	Missing Tier B Flag	1. Check Sensor connections 2. Replace Sensor
D3 D4 D5 D6	All Off - Programed and Running (Normal)	Reset	• Power cycle the instrument
	All On – Reset or Not programed	Not Programed	• Reload firmware
	Alternating Pairs - Stuck in Boot Loader	Bootloader	• Replace Board

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

FCDB			
Error	**Description**	**Reason**	**Resolution**
D41	Blower	If LED turns on, then module is drawing too much current.	1. Power down 2. Disconnect 3. Power up Module 4. Replace FCDB
D56	Tier Micro A		
D57	Tier Micro B		
D58	LSDB A		
D59	LSDB B		
D60	Fan		
D61	PSIBs		
D62	SSIB		
D63	Barcode A		
D64	Barcode B		
D42	Heater (Duty Cycle Dependent)		
D71	Schmersal Lock - Only on when the door is locked.		
D55	Ion Motor Power (HV) – Only on when the door is locked.		
D65	Ion Auxiliary Power (AUXV)		
D51	24V Power Supply		
D53	FCDB 5V		
D52	FCDB 3.3V		

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

FCDB Indicator LEDs



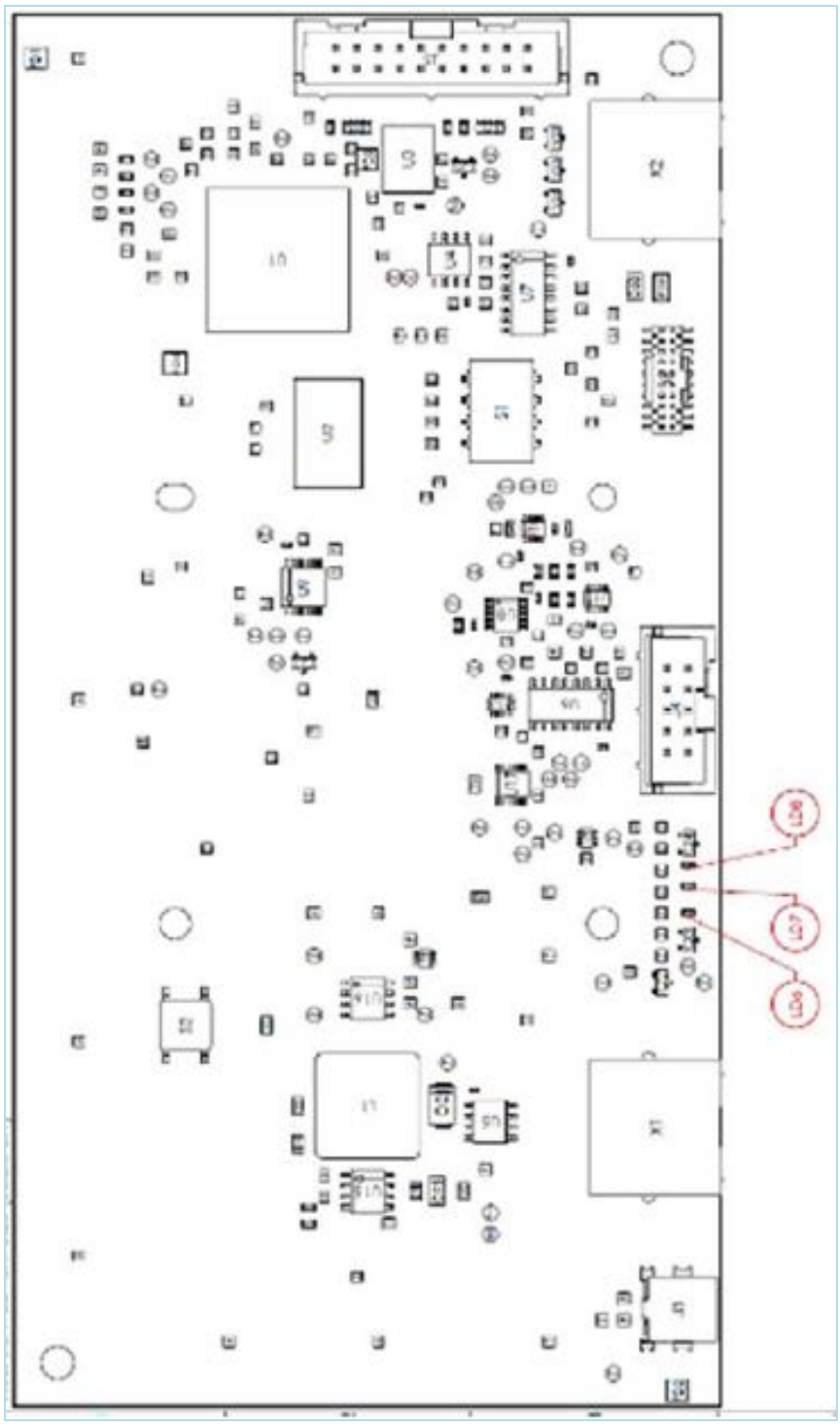
Tier Macros			
Error	**Description**	**Reason**	**Resolution**
LD6 LD7	All Off - Programed and Running (Normal)	Reset	1. Power Cycle 2. Wait 20 seconds after power up for LEDs to turn off

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential

Tier Macros			
Error	**Description**	**Reason**	**Resolution**
	All On – Reset or Not programed	Not Programed	1. Load Firmware 2. Wait 20 seconds after power up for LEDs to turn off
LD8	Boot Loader, turns on briefly before LD6 and LD7 turn off. Off is normal condition.	LED remains on	• Replace Tier Micro PCB

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Tier Micro Indicator LEDs

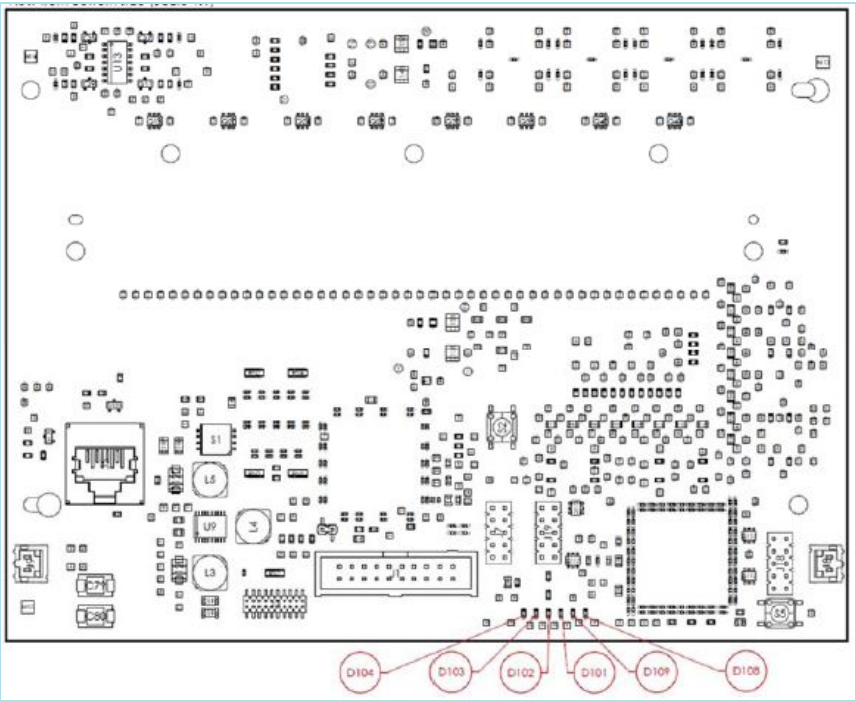


Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

LSDB			
Error	**Description**	**Reason**	**Resolution**
D104 D103 D102 D101	Flashing in Pairs -1 Hz	Boot loader cannot find application	Replace LSDB
	Flashing together - 1 Hz	LSDB Startup component check failure	Replace LSDB
	All on	Board in reset	1. Cycle Power 2. Replace LSDB
	All Off, Test Cycle	Test cycle, normal operation	
D101 D102 D103	Bank On Indicator 001 = UV 010 = Red 011 = Green 100 = Blue	LEDs disabled while gathering source monitor data - Normal Operation	
D104	Flashing 1Hz	Normal Operation	

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

LSDB Indicator LEDs



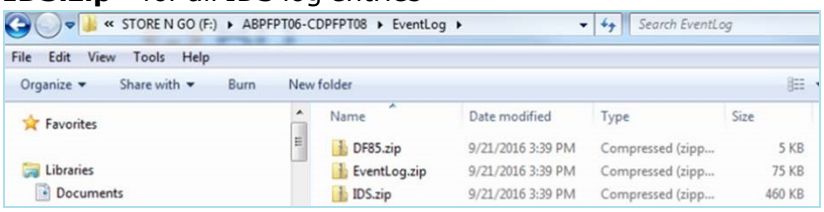
4.3.1.1 Log Files

To obtain the instrument log file

1. Insert **USB key** into a port on the underside of the AIO.
2. Allow time for the AIO to recognize the inserted USB key.
3. From the **Maintenance** tab in the software, select **Save Event Log**.

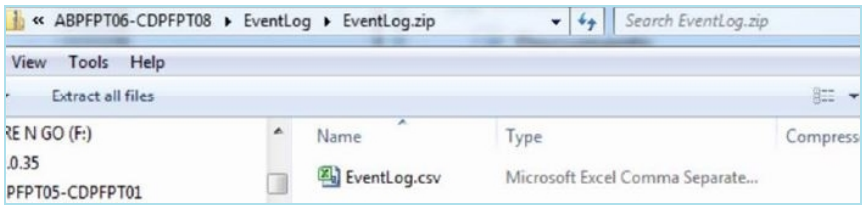
Event log entries are saved to:

1. **DF85.zip -** for all DF85 entries
2. **eventLog.zip -** for all log entries that are not DF85 or IDS log entries
3. **IDS.zip -** for all IDS log entries



Each zip file contains a CSV file with the same file name.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



Event Log CSV file

This is the only log file a FSE reviews during troubleshooting. It contains:

- All active user and DF85 hidden (E84, E85, E86, E87, E88 and E89) system alerts. A DF85 system alert set by the instrument is a DF85 data point that is out of range.
- FCDB voltages and temperatures
- LSDB voltages and temperatures
- Tier Micro voltages and temperatures

DF85 CSV File

This file contains all DF85 values and is reviewed for changes over time. For example, motor rpm falling off over time is an indication of a motor going bad.

1. Select the message text column.
2. Paste it into another spreadsheet that contains the DF85 headers.
3. The data is broken into columns using the **text to column** option with comma delimited fields.

IDS CSV File

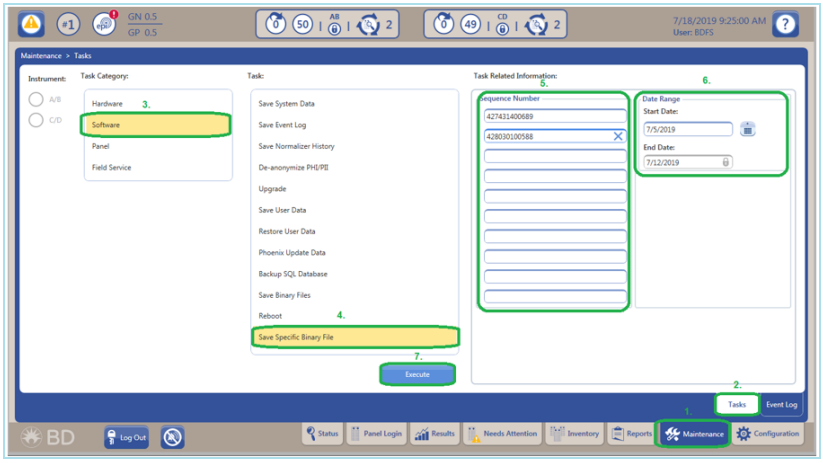
The IDS CSV file contains IDS log entries. These log entries are reviewed by software developers in R&D.

Save Specific Binary File

1. Insert a USB key into a port at the base of the M50 AIO PC.
2. Log in to the M50 AIO PC by selecting the **Log On** icon at the bottom left of the screen. Use **M50User** credential, or **M50Admin** credential, or **BDFS** credential to login (**Never share BDFS login with customer**).
3. Select the **Maintenance** tab on the bottom right of the screen.
4. Select **Software** on the upper left corner of the screen.
5. Select **Save Specific Binary File**.
6. Within the **Sequence Number** box, enter the sequence barcode numbers of the panels in question (up to 10).

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

7. Within the **Date Range** box, set the **Start Date** to one day before the event occured (the end date is automatically set to 7 days after the start date and cannot be changed).
8. Select **Execute**. Binary files are transferred to the USB key (files end with the .DAT extension).



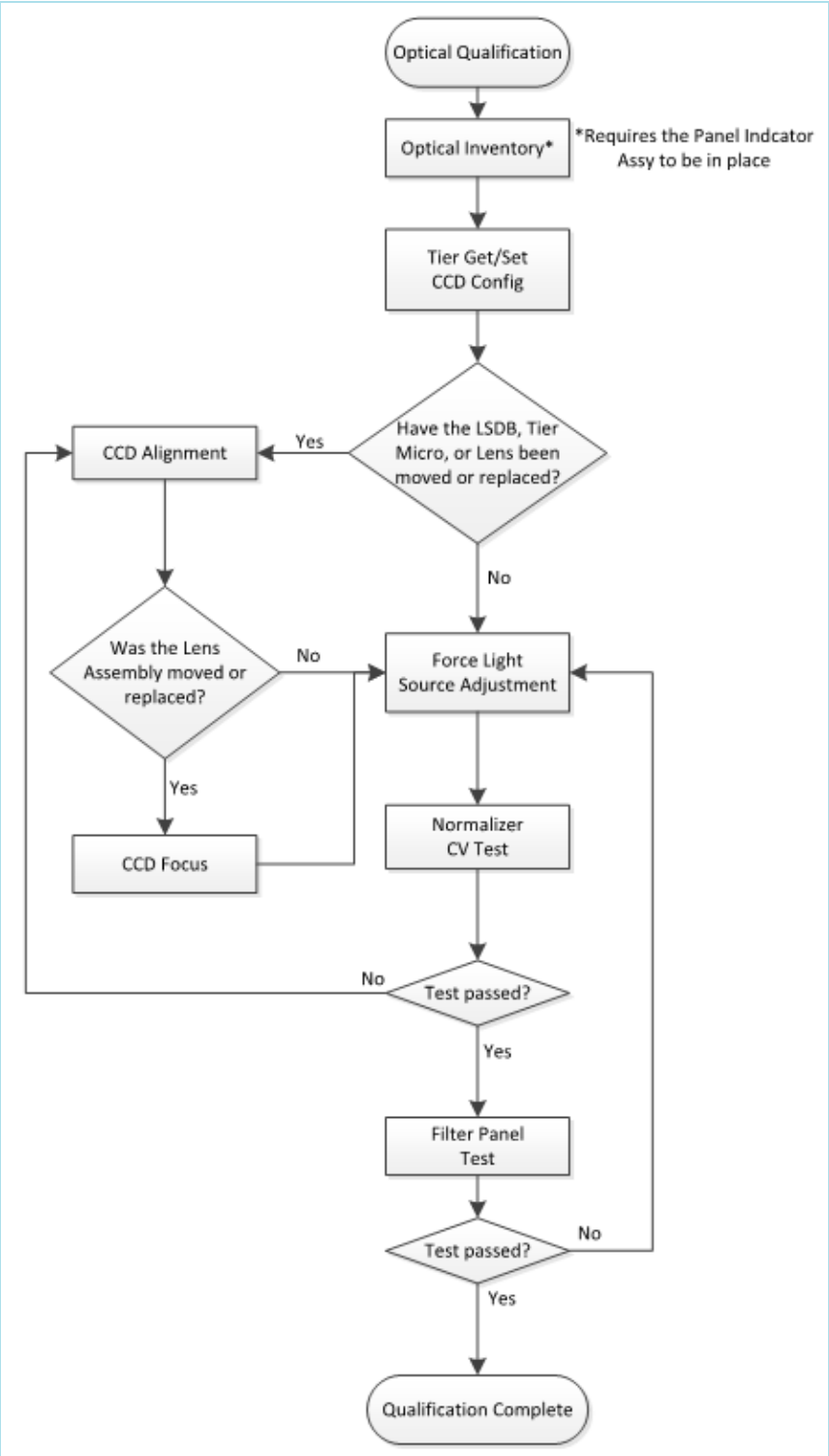
Saving Binary DAT Files (Win 7)

1. Start **Windows Explorer** (either with EWF= On or EWF = Off).
2. Navigate to the **binary** folder on the **D drive**.

AB is a subfolder for a single instrument. For a stack, a CD directory exists for the second instrument. Download all the files ending in a **.DAT** extension to a USB key.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

4.3.2 Optical Qualification



Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Optical System Parts

		Normalizers	LSDB	Tier Board	Lens	Remarks
Alignment Task Required	Optical Inventory	N/A*	N/A*	N/A*	N/A*	Automatic test performed when entering the Tier tab, unless aborted. **Note:** This test is required for some of the other Tier Tests.
	Tier Get/Set CCD Config	No	No	Yes	No	Sets the CCD Gain from a white LED mounted to the Tier micro PCB. This adjustment only involves the Tier micro PCB.
	CCD Alignment	No	Yes	Yes	Yes	This adjustment sets the horizontal alignment of the Tier board for maximum signal amplitude on the CCD from the LSDB.
	CCD Focus	No	No	No	Yes	This adjustment is used to focus the lens.
	Force Light Source Adjust	Yes	Yes	Yes	Yes	This adjustment sets the intensity of the LEDs on the LSDB.
	Filter Panel Test	Yes	Yes	Yes	Yes	This test verifies the colorimetric ratios of the LSDB as seen by the CCD on the Tier board.
	Normalizer CV Test	Yes	Yes	Yes	Yes	This test verifies alignment and focus of the optics system.

Note: Optical alignment requires use of the Falcon Toolkit which can only be accessed outside of the system application. Refer to "Falcon Toolkit" on page 87 for details.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

4.3.3 E18 Troubleshooting

Corrective actions

1. Perform a source adjustment using the Falcon Toolkit or via the system software by allowing any ongoing panels to complete. Once no panels are in the **Ongoing** state, the system will perform an automatic adjustment. This will take ~1 hour.
2. If source adjustment does not correct the issue, replace LSDB. Refer to "Light Source Driver Board (LSDB)" on page 180.

4.3.4 E05 sc4000 Troubleshooting

Review the following EventLog excerpt.

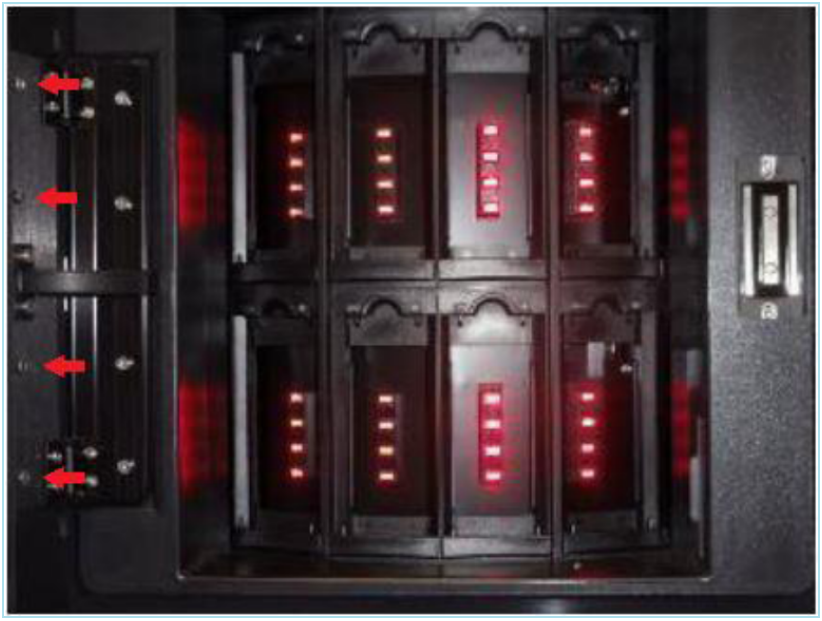
```
03/03/2020 11:50:40 Door      : Door state - open unlocked
03/03/2020 11:50:40 Door      : Instrument Door OPEN at right most station position<1> door state changes<0>
03/03/2020 11:50:40 Carousel  : Carousel Task : State<DRUM_STOPPED> Cmd<DRUM_IDLE> Status<DOOR_OPEN> EFGValue
03/03/2020 11:50:40 UICarousel: UIC_HandleCarouselDoorClose TierA_PF<0> Target_PF<1>
03/03/2020 11:50:43 Door      : Door state - closed unlocked
03/03/2020 11:50:43 Door      : Instrument Door CLOSE at right most station position<1> door state changes<0>
03/03/2020 11:50:43 UICarousel: UIC_HandleCarouselDoorClose TierA_PF<0> Target_PF<1>
03/03/2020 11:50:43 Carousel  : Cmd<LockDoor>
03/03/2020 11:50:43 Carousel  : Action<LOCK_DOOR>
03/03/2020 11:50:44 Door      : Door state - door obstructed
03/03/2020 11:50:46 Door      : Instr Door Obstructed! unlocking and locking the door
03/03/2020 11:50:46 Carousel  : Action<CMD_DONE>
Setting alert to Alerting(). Alert is already active. AB_TIERS EM_DRUM #00004000
03/03/2020 11:50:46 Door      : Event  Set: (E05) for drum events, (00004000) Door lock error - Violent Sep Mode Recovery
03/03/2020 11:50:48 Door      : Instr Door Obstructed! unlocking and locking the door
03/03/2020 11:50:48 Carousel  : Cmd<ReadLastBarcodes>
03/03/2020 11:50:48 Carousel  : Action<BC_READERS_ON>
03/03/2020 11:50:48 Carousel  : Action<LOCK_DOOR>
03/03/2020 11:50:50 Door      : Event  Clear: (E05) for drum events, (00004000) Door lock error - Violent Sep Mode Recovery
03/03/2020 11:50:50 Door      : Door state - closed locked
03/03/2020 11:50:50 Carousel  : Action<SPEED_COMMAND_NO_WAIT> TargetSpeed <2.00>
```

Corrective actions

If the E05 sc4000 alert is present, the alignment of the door with the magnetic locking guard (443870) must be verified by following these steps:

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

1. Loosen the 4 door hinge screws.



2. Manually move the door to align it with the front fascia.

Note: Raising the door as little as 1 mm may be sufficient to resolve the issue as the magnet is very sensitive.

3. Tighten the 4 door hinge screws.

Note: Do not over tighten as this may cause the rear fascia to interfere with the carousel.

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential

5 Maintenance

This chapter contains procedures for maintaining the Phoenix M50.

5.1 Preventive Maintenance

Materials

- Digital multimeter, 5 mm hex key, 3 mm hex key

Warning: Do not connect or disconnect any internal cables without turning the instrument power off.

Note: Preventive maintenance requirements and intervals are specified in the **Phoenix M50 User's Manual**.

Regulatory setting

Verify that the FDA/Non FDA Mode is set correctly per regional requirement.

Environment

- Verify that the instrument is on a level load bearing surface with sufficient clearance for the instrument door to fully open.
- Verify that the temperature and the humidity are within the operational limits and the environment is free of contaminants.

External condition

Maintain the exterior surfaces of the instrument, cables, and peripherals free from wear or damage.

Software and logs

Download and review the instrument event log for unusual or abnormal activity.

Note: Be aware of existing instrument alerts.

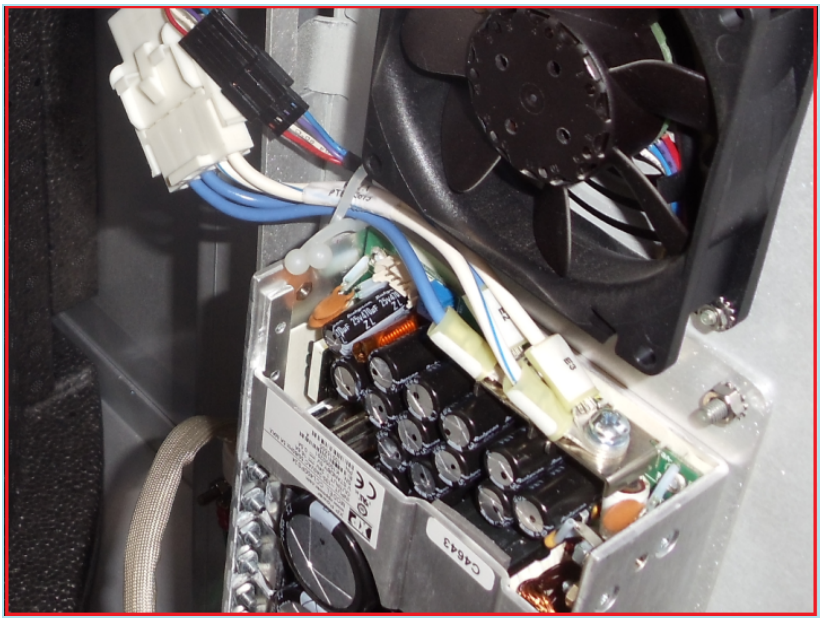
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Power supply check

1. Open the power supply panel.

2. Using a digital multimeter, measure the 24V power supply voltage between lugs E2 and E3. The expected range is 22.80V DC – 25.20V DC.

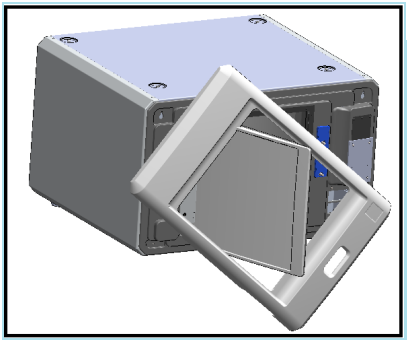
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

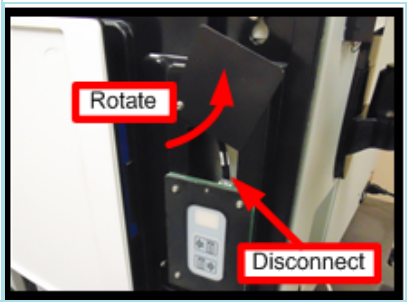


3. Close the panel.
4. Power down the instrument and the tablet computer.

Internal inspection

1. Open the door and rotate the carousel.
2. Remove the front and the rear fascia.





Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
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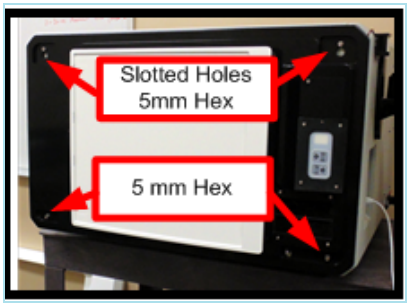
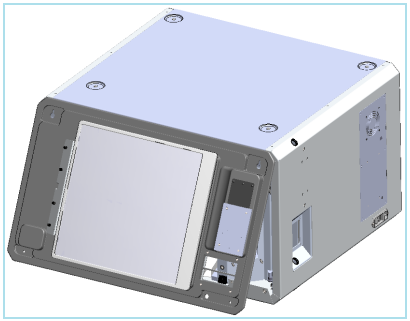
Change #: 500000269376
Classification: Confidential





3. Inspect the internal mechanical components for signs of wear and damage.
4. Check for and remove any debris or foreign materials within the instrument.
5. Reinstall the front and the rear fascia.

Note: Do not over tighten the screws.

6. Power up the instrument and the tablet computer.

Instrument qualification

Qualify Phoenix M50. Refer to "Instrument Qualification and Software Upgrade Procedure" on page 204.

5.1.1 Normalizer Panel

Note: In software versions ≥2.20.0.0, the normalizer panels must be replaced every five years. In software versions ≤1.1.110.0, the normalizer panels must be replaced every two years. It is highly recommended that a software upgrade be performed on any instrument with ≤1.1.110.0 software in lieu of normalizer replacement.

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential

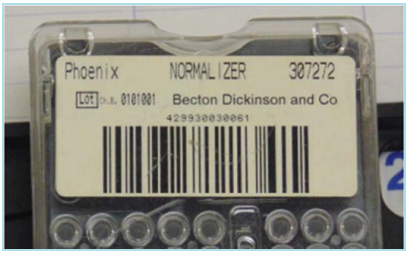
Parts and tools

- Standard Phillips head screw driver
- 6% gold normalizer panels (447157)

Procedure

1. Power down the instrument and open the door.
2. Rotate the carousel by hand to expose the normalizer panels. They should be in location 00.
3. Open the normalizer carriers by removing the two Philips head screws. Remove the old normalizer panels.

4. Verify that the barcode sequence for the new normalizer panels is correct.
5. The barcode sequence number is decoded as follows:
   - 4299MMYYNNN – 42**:** indicates a Phoenix panel
   - 4299MMYYNNN – 99**:** indicates a 6% gold normalizer
   - 4299MMYYNNN – MM**:** is a month code from the below table
   - 4299MMYYNNNN – YY**:** is a 2 digit year of manufacture code
   - 4299MMYYNNNN**:** is a 4 digit consecutive numbering code



Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Month of Manufacture Code												
Lot #	MM JAN	MM FEB	MM MAR	MM APR	MM APR	MM JUN	MM JUL	MM AUG	MM SEP	MM OCT	MM NOV	MM DEC
0	1	2	3	4	5	6	7	8	9	10	11	12
1	21	22	23	24	25	26	27	28	29	30	31	32
2	41	42	43	44	45	46	47	48	49	50	51	52
3	61	62	63	64	65	66	67	68	69	70	71	72
4	81	82	83	84	85	86	87	88	89	90	91	92

6. Insert new normalizer panels and reassemble the normalizer panel carrier.
7. Close the instrument door and turn power **ON.**
8. Update **Normalizer Panel Information** in **System Software**.
9. Perform "Force Lightsource Adjustment Test" on page 219, "Filter Panel Test" on page 221, "Normalizer CV Test" on page 220.

5.2 Corrective Maintenance

5.2.1 Front Fascia and Rear Fascia

Removing front fascia and rear fascia covers

Note: The fascia is a service spare and it takes about 5 minutes to remove the front fascia. There are handholds on the bottom of the fascia and a ridged lip running around the outside.

Front Fascia

Parts and tools

- Fascia
- Service spare 443840

Removal procedure

1. Power down the instrument and open the door.
2. Pull out on the bottom handholds. Lift slightly to free the top.
3. Once the fascia is free of the front of the instrument, rotate it approximately 45 ° and slide it

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

over the door.

Installation procedure

1. Rotate the fascia 45º so the door fits through the center opening. Slide the fascia over the door.
2. Rotate the fascia level with the instrument and push the top in place.
3. Apply gentle pressure until the bottom snaps in place.

Rear Fascia

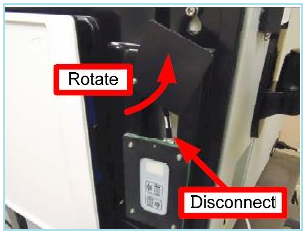
Note: The front fascia must be removed before the front cover can be removed. It takes about 5 minutes to remove the front cover. The door is part of the front cover. Be careful when handling the front cover. There are several gaskets that prevent light intrusion.

Parts and tools

- 5 mm hex key
- Rear fascia
- Door assembly
- Service spare 443871

Removal procedure

1. Rotate the small plate on the right side of the front cover and disconnect the cable from the system status indicator panel (443844).



Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
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Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential

2. The rear fascia is held by four 5 mm hex head screws. Loosen, but do not remove the two top screws.
3. Remove the two bottom screws. The two top screws hold the rear fascia in place.
4. To remove the rear fascia, pull the bottom slightly away from the instrument to clear the ambient RTD (443851) at the bottom right. Lift up and pull back.

Installation procedure

1. Holding the rear fascia, maneuver it until the slotted holes go over the top screws. Let the cover hang on the two top screws.
2. Install the two bottom screws.
3. Slide the plate on the right aside and connect the system status indicator.

5.2.2 Electronics Bay Cover

Note: Remove the front fascia and the front cover to access the electronics bay cover. It takes about 5 minutes to remove the electronics bay cover.

Removal procedure

1. Remove the connector from the door magnet/switch unit.
2. Loosen the two captive screws.
3. Lift the plate upwards and pull back to remove it from the instrument.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Installation procedure

1. Align the two pins with the slots in the cover. Slowly drop the cover onto the two pins.
2. Tighten the two knurled screws.
3. Connect the door magnet/switch assembly connector.

5.2.3 Top Cover

Note: Remove the front fascia to remove the top cover. Remove the two top screws holding the front cover. For non-stacked instruments, the top instrument must be removed before the bottom instrument top can be taken off. It takes about 5 minutes to remove the electronics bay cover.

Parts and tools

- 5 mm hex key
- Medium Phillips screwdriver
- Top and rear cover, service spare 443869

Removal procedure

1. Remove thefour Phillips screws from the top of the instrument.
2. Lift up the top and remove it from the instrument.

Installation procedure

1. Make sure the front of the top cover is behind the front cover.
2. Install the four Phillips head screws on top of the instrument.

5.2.4 Rear Cover

Note: There is currently no maintenance based reason to remove the rear cover. This is for future automation updates.

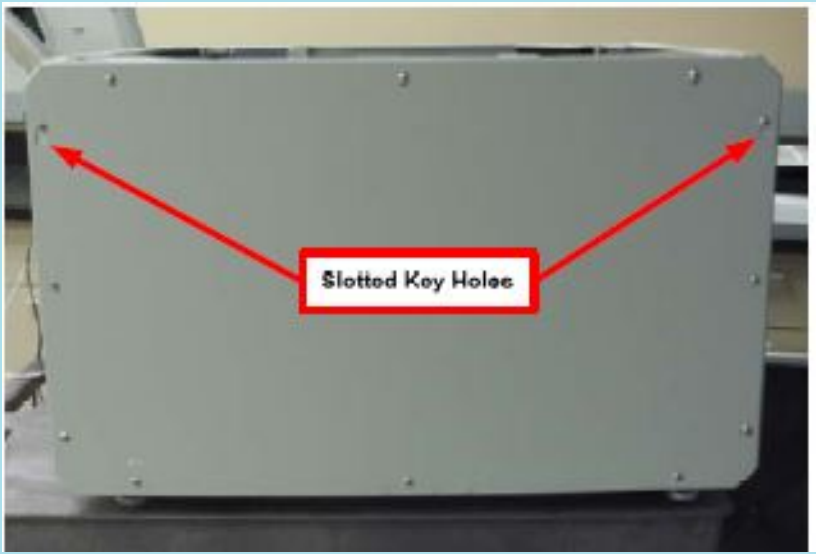
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Parts and tools

- Medium Phillips screwdriver
- Top and rear cover, service spare 443869

Removal procedure

1. Remove the ten Philips screws from the non-slotted holes on the back of the instrument.
2. Loosen the two Philips screws in the slotted holes on each side.
3. Lift the rear cover.



Installation procedure

1. Insert two Phillips head screws into the back of the instrument at the top of the left and the right sides. Do not tighten.
2. Hang the back off of these two screws through the slotted holes.
3. Install the rest of the screws. Tighten all screws.

5.2.5 Inlet Air Filter

Note: The air filter protects the electronics bay and power supply from dust intrusion. It can be cleaned or replaced. If cleaned, use water and let dry thoroughly before inserting back in the instrument.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Parts and tools

- Inlet air filter, service spare 443842

Removal procedure

1. Open the door and remove the filter. It is located on the lower right facing the instrument.

Installation procedure

1. Open the door.
2. If the filter was cleaned, make sure it is dry before inserting.
3. Push the filter into the filter slot.

5.2.6 Panel Carriers

Note: It may be necessary to remove some panel carriers to access the inside of the carousel. Remove Phoenix panel before removing the panel carrier.

If panels are damaged, request a panel carrier kit.

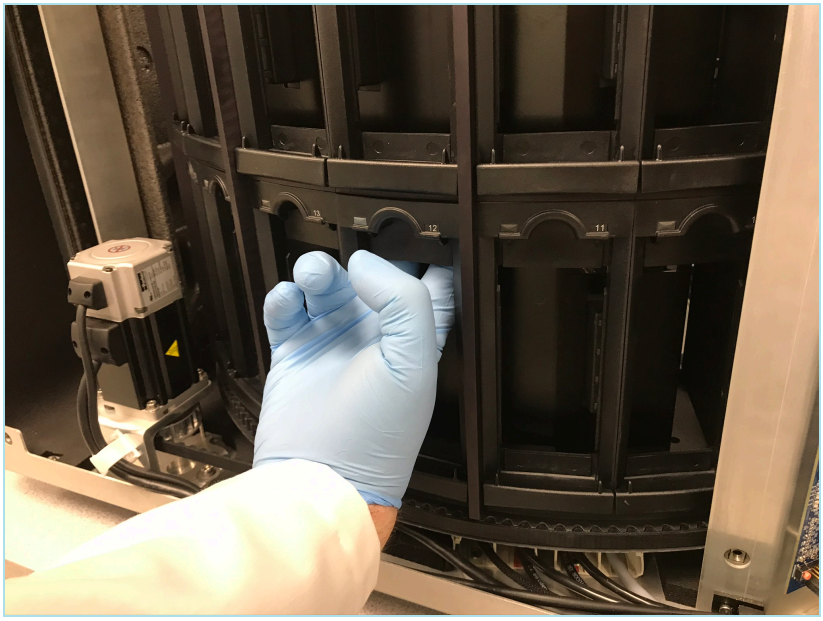
Parts and tools

- Panel carrier kit (for replacing broken panels) 443568

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Removal procedure

1. Gently push down on the top two tabs on the rear of the panel carrier.



2. Pull outwards on the top of the panel carrier until the clips are partially disengaged.
3. Gently push up on the bottom two tabs securing the panel carrier to the carousel assembly.

4. Remove panel carrier.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Installation procedure

1. Partially seat the bottom two tabs of the panel carrier against the carousel assembly, do not fully engage.
2. Partially seat the top two tabs of the panel carrier against the carousel assembly.
3. Gently press the panel carrier into place until the panel carrier is completely secured.

5.2.7 Panel Indicator Assembly

Note: Move the panel indicator assembly aside to access the center of the carousel. This will require removing panel carriers and possibly the front and the rear fascia.

Move to Service position

1. Remove the front and rear fascia. Refer to "Front Fascia and Rear Fascia" on page 165.
2. Remove two adjacent panel carriers from the lower tier of the carousel to allow access to the interior of the instrument.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

3. Reach through and unscrew the knurled thumb screw to the right of the panel indicator assembly (as viewed from the front of the instrument). Older instruments may have a captive screw, while newer instruments make have a black thumbscrew that may be fully removed.
4. Apply a small amount of pressure to free the panel indicator assembly from the positioning magnet. Rotate the panel indicator assembly to the left, allowing access to the interior of the instrument.

Move to Operation position

1. Rotate the panel indicator assembly to the right until secured by the positioning magnet.
2. Secure the knurled thumb screw.

> **Note:** The positioning magnet alone will not fully secure the panel indicator assembly. Ensure the knurled thumbscrew is engaged before proceeding.

3. Replace panel carriers. Refer to "Panel Carriers" on page 170.
4. Replace front and rear fascia. Refer to "Front Fascia and Rear Fascia" on page 165.

5.2.8 Incubation Assembly

> **Note:** It takes about 10 minutes to remove the incubation assembly. The assembly contains blower, heater bar, and RTDs. It is replaced as one unit. Remove the front fascia and the rear fascia first.

Parts and tools

- 3 mm hex key
- Incubation assembly, service spare 443853

Removal Procedure

1. Disconnect the three cables (motor, RTCs, and heater bar) located at the upper end of the incubation assembly.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

2. Remove the lower hex screw and the upper hex screw.

3. Pull the entire assembly straight back to remove it.

Installation procedure

1. Insert the incubation assembly into the slot on the left side of the instrument.
2. Insert the upper hex screw first and partially tighten it.
3. Insert the bottom hex screw and tighten both the top and the bottom screws securely.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

4. Connect the three cables. All the three connectors are different and keyed.
5. Validate that the instrument comes up to incubation temperature and maintains it.

5.2.9 Drive Belt Assembly

Note: It takes about 10 minutes to remove the drive belt. It can be removed without unstacking or removing the instrument top. Remove the front fascia and the rear fascia first. Take care not to damage the normalizer panels while removing and installing the drive belt.

Parts and tools

- 5 mm hex key
- Long nose pliers, standard screwdriver, and 5/16 wrench
- Drive belt, service spare 443855

Removal procedure

1. Loosen (do not remove) the 5 mm mounting bolts to the right of the drive motor.
2. Remove the tension spring using long nose pliers.
3. Loosen the 5/16 jam nut with wrench.
4. Remove the alignment screw using a Standard screwdriver.
5. Applying inward pressure to the drive motor. Slide belt off of the underside of the drive pulley. Rotation of the carousel may be required to free the belt.
6. Applying constant upward pressure on the belt, rotate the carousel until the belt comes free.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Installation procedure

1. Slip the drive belt over the top of the carousel.
2. Keep turning the carousel as you walk the drive belt down to the gear adapter ring.
3. Once the drive belt is situated on the gear adapter ring, push the drive motor assembly inwards and thread the drive belt onto the drive pulley while rotating the carousel.
4. Use long nose pliers to attach the tension spring.
5. Pull the drive motor outward to apply tension to the belt.
6. Secure the 5 mm hex screws on the drive motor base.
7. Reinstall the drive motor alignment screw and jam nut. Adjust the alignment screw so the belt does not ride up or down on the drive gear when the carousel is turned. Tighten the jam nut using 5/16 wrench.
8. Rotate the carousel by hand to ensure smooth motion.
9. Perform carousel speed test to re-qualify. Refer to "Carousel Speed" on page 227. If a creaking or clicking noise occurs, readjust the belt position.

5.2.10 Drive Motor Assembly

Note: It takes 15 minutes to remove the motor drive assembly and 15 minutes to install the motor drive assembly.

Remove front fascia, rear fascia, and electronics bay cover first. Refer to "Front Fascia and Rear Fascia" on page 165 and "Electronics Bay Cover" on page 167.

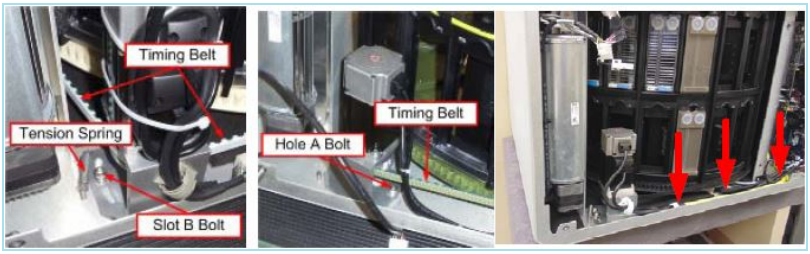
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Parts and tools

- 5 mm hex key
- Long nose pliers
- Standard screw driver
- Socket drive with extension or open ended wrench
- Motor assembly kit SAP 443831

Removal procedure

1. Secure power to the instrument.
2. Loosen the two 5 mm hex head bolts but do not remove them.
3. Use a pair of long nose pliers to remove the tension spring. Push the motor base inwards and remove the belt from the motor pulley.



4. Unclamp the two cables running along the front of the instrument below the carousel from the motor assembly to the FDCB and the ion motor controller. Disconnect both the cables.
5. Remove the two 5 mm bolts. Then, loosen the jam nut and remove the adjustment screw.
6. Remove the motor assembly from the instrument.

Installation procedure

1. Loosen the jam nut and remove the adjustment screw.
2. Place the motor drive assembly inside the instrument and screw in two 5 mm bolts to hole A and slot B. Do not tighten.
3. Route the two cables along the lower front of the instrument back to the ion drive and the FDCB. Connect both the cables and clamp them in place.
4. Attach the tensioning spring.
5. Push the motor drive assembly inwards and slide the belt under and onto the toothed drive pulley. Make sure the timing belt teeth are engaged with the carousel teeth.
6. Release the drive motor and allow the tension spring to automatically adjust the belt tension. Tighten the two 5 mm bolts in hole A and slot B. Install the alignment screw and jam nut.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

7. Run the instrument. If there are unusual noises check that the belt is not riding up or down on the carousel or the drive gear. If it is,
   a. Loosen the jam nut and adjust the alignment screw on the inside of the drive assembly.
   b. Rotate the carousel and observe the belt movement.
   c. Adjust the screw so the belt rides in the center of the drive gear. Tighten the locking nut.
8. Validate that the carousel turns at the correct RPM and there are no unusual noises.

5.2.11 Ion Drive

Note: The ion drive is located at the upper left of the electronics bay. Removal takes about 15 minutes.

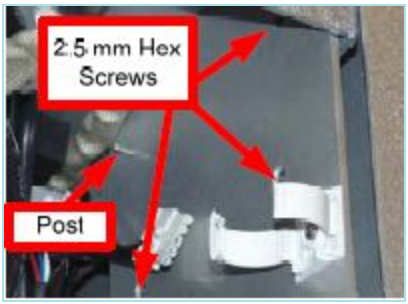
Parts and tools

- 2.5 mm hex key
- Motor driver and Cables SAP 443856

Removal procedure

1. Remove front fascia, rear fascia, and electronics bay cover. (Optional) Remove top tier LSDB for additional workspace. Refer to "Front Fascia and Rear Fascia" on page 165, "Electronics Bay Cover" on page 167.
2. The motor drive (ion drive) is secured by three 2.5 mm hex screws in the lower left and right and upper right corner when looking at the model from the top. The fourth upper left corner sits on the electronics bay wall. Remove the three 2.5 mm hex screws.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



3. Lift the ion drive off the post for better access to the connectors.

4. Disconnect power, comms, and encoder cables going to the FCDB. Disconnect the drive cable going to the drive motor. Do not remove the jumper.
5. Remove the unit from the instrument.
6. If this is a new ion drive, transfer the jumper cable from the old drive.
7. Connect power, comms, and encoder cables from the FCDB to the ion drive.
8. Connect the encoder cable from the drive motor.
9. Place the upper left corner hole over the post. Screw in the three 2.5 mm hex screws.
10. Validate that the carousel rotates at the correct RPM.

5.2.12 Light Source Driver Board (LSDB)

Note: There are two light source driver boards, one on each tier. They are located in the front right electronics bay. It takes 10 minutes to remove the light source driver board.

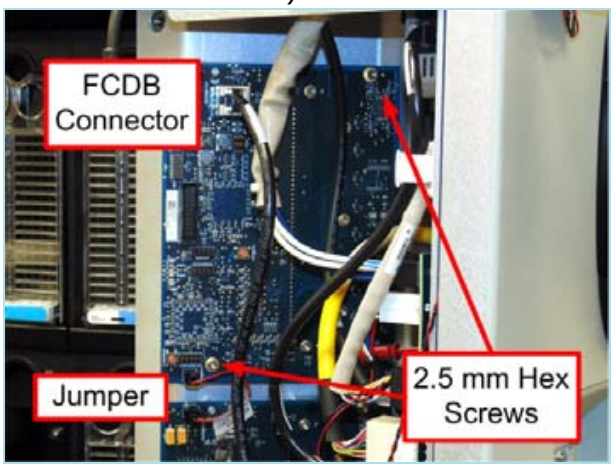
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Parts and tools

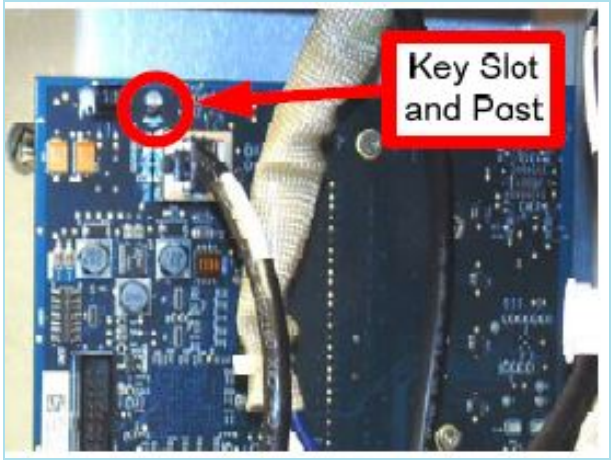
- 2.5 mm hex key
- Light source board kit SAP 443848

Removal procedure

1. Remove front fascia, rear fascia, and electronics bay cover. Refer to "Front Fascia and Rear Fascia" on page 165 and "Electronics Bay Cover" on page 167.
2. Secure power to instrument.
3. Disconnect the RJ45 connector that comes from the FCDB.
4. Disconnect the jumper that connects the light source driver boards together across the tiers.
5. Remove the two 2.5 mm hex screws from the upper right and lower left corners (as you face the front of the board). Do not remove the 5 inner hex screws.



6. Lift the board up until the posts are in the middle of the key slots on the upper left and lower right corners of the board. Then pull the board towards you to remove it. Ensure that the posts do not drag across the circuit card and damage it.



Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Installation procedure

1. Align the keyways over the posts and carefully insert the card. Let it slide down so the posts are in the narrow part of the keyway.
2. Install the two 2.5 mm hex screws.
3. Attach the RJ45 connector from the FCDB and the jumper from the other light source driver board.
4. Perform qualification per section "Optical Qualification" on page 155.

5.2.13 Falcon Control Distribution Board (FCDB)

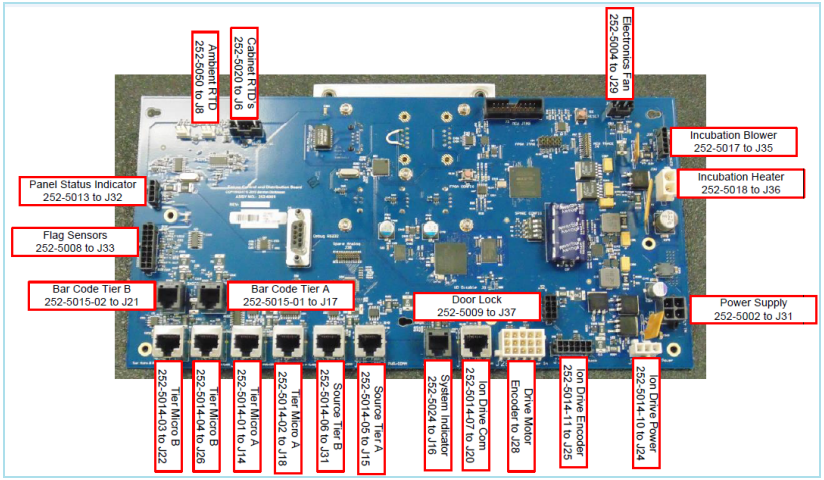
Note: The FCDB is the large circuit board located on the right side of the electronics bay. There are several connectors on the back of the board that extend through the side of the instrument. As it has a large number of connections, it is best to work from the lower outer edge to the upper inner edge when removing them, and reverse this when connecting them.

Parts and tools

- 2.5 mm hex key
- 3 mm hex key
- FCDB kit SAP 443846

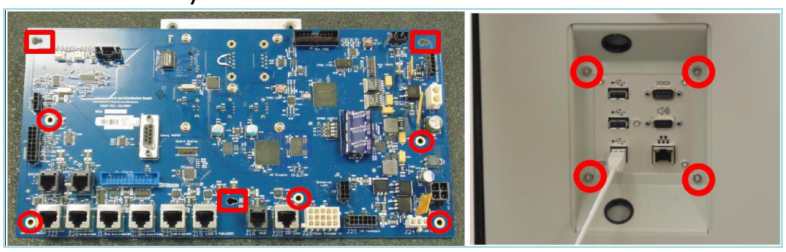
Removal procedure

1. Remove front fascia, rear fascia, and electronics bay cover. Refer to "Front Fascia and Rear Fascia" on page 165, and "Electronics Bay Cover" on page 167.
2. Secure power to the instrument and disconnect external USB cables.
3. Disconnect the following cables.



Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

a. Two tier B micro connectors at J22 and J26
b. Two tier A micro connectors at J14 and J18
c. Tier A barcode reader at J17
d. Tier B barcode reader at J21
e. Source tier A at J15
f. Source tier B at J31
g. Flag sensors at J33
h. Panel indicators at J32
i. Ambient RTD at J8
j. Cabinet RTDs at J6
k. System indicator at J16
l. Ion drive comms at J20
m. Ion drive encoder at J25
n. Ion drive power at J24
o. Motor drive encoder at J28
p. Door lock at J37
q. Power supply at J21
r. Incubation blower at J36
s. Incubation heater at J35
t. Electronics bay fan at J29



4. Remove the five 2.5 mm hex internal screws.
5. Remove the four external 3 mm hex panel screws.

Installation procedure

1. Align the keyways over the three posts and carefully insert the card. Do not damage any surface mounted component. Let it slide down so the posts are in the slots.
2. Install the five 2.5 mm hex internal screws. Do not tighten.
3. Install the four external 3 mm hex panel screws. Tighten all inside and outside screws.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

4. Connect the internal cables in the reverse order of their removal. Ensure proper cable management.
5. Connect external USB cables, if any.
6. If designated as bottom instrument C/D, configure IP address per "Configure the Instruments" on page 56.
7. Perform a full system qualification. Refer to "Optical Qualification" on page 155.

5.2.14 Power Supply Module

Parts and tools

- 3 mm hex key
- Small flat head screw driver
- Power module kit SAP 443843

Removal procedure

1. The instrument must be physically unplugged from the main power cable before access is allowed to the power supply.
2. Remove the six 3 mm hex head screws that secure the power supply module to the side of the Phoenix M50.

3. Use a small flathead screw driver to remove line, neutral, and ground wires. The red wire connects to L, blue wire connects to N, and green wire connects to E.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Installation procedure

1. Use the hinge mounts to hold the power supply module up in place while connecting the two connectors and the three wires.
2. Swing the power supply module into place and secure with six Philips head screws.
3. Validate the voltages using the Falcon Toolkit.

> **Note:** Once the door has been fastened in the closed position, re-insert the power cable and turn the instrument on. If a problem exists with the internal wiring to the power supply or the power switch itself, the circuit breaker built into the power switch may trip, which will prevent the switch from staying in the on position. If this occurs, power down immediately, remove the power cable, and inspect the wiring between the switch and the power supply.

5.2.15 Lens Assembly

> **Note:** The lens assembly is located in the center of the carousel. To work on the lens assembly, remove the front and rear fascia, some panel carriers from the carousel, and move the panel indicators out of the way.

> **Warning:** Do not over tighten the lens holder locking ring. It has a torque rating of 20 inch pounds.

Parts and tools

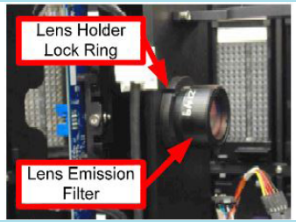
- 1/4" ratchet
- Lens with emission filter (443919)
- PHX M50 Toolkit (443859)

Removal procedure

1. Remove front and rear fascia. Refer to "Front Fascia and Rear Fascia" on page 165. Move the panel indicator assembly to service position.
2. Remove two panel carriers from the tier the repair is being performed on.
3. Applying minimal force, use the lens locking ring spanner attached to 1/4" ratchet to loosen the locking ring.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

4. Unscrew the lens.



Installation procedure

1. Screw the lens holder lock ring onto the lens barrel.
2. Once you have access to the center of the carousel, thread the lens assembly into the light tower.
3. Once installed, a coarse and fine adjustment must be made.
4. Once adjusted, screw the locking ring down finger tight.
5. Verify the coarse and fine adjustment as well as filter panel and CV normalizer test.

5.2.16 Tier Micro Board

Note:

- The tier micro board contains the CCD. To access the tier micro board, remove front and rear fascia, remove multiple panel carriers, and move the panel indicator assembly all the way clockwise.
- Optical calibration is required if a tier micro is removed.

Parts and tools

- Tier micro board (443850)

Removal procedure

1. Secure power.
2. Access the center of the carousel and disconnect the two cables from the tier micro board.
3. Turn the tier micro adjustment knob counter clockwise.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

4. Once the adjustment screw is free, slide the tier micro board out and remove it from the instrument.

Installation procedure

1. Insert the tier micro assembly carrier into the slide and push it in until it stops.
2. Turn the adjustment knob eight turns clockwise.
3. The corner of the tier micro assembly being installed must align with the corner of the tier micro assembly still in the instrument.
4. Reconnect the two cables to the RJ45 jacks on the end of the tier micro assembly.
5. Power up the instrument and perform optical alignment.

5.2.17 Panel Status Indicator PCB

Note: There are eight panel status indicators connected via a daisy chain. To change a panel status indicator, remove the front and rear fascia, remove multiple panels from the carousel, and rotate the panel indicator assembly for access.

Parts and tools

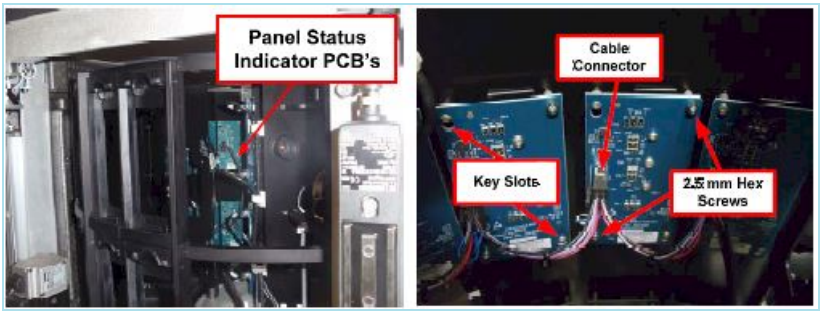
- 2.5 mm hex key
- Panel status indicator kit (443841)

Removal procedure

1. Secure power.
2. Disconnect the cable from the status panel indicator.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

3. Remove the two 2.5 mm hex screws.
4. Lift the panel indicator up so the posts can fit through the two key slots. Remove the card.



Installation procedure

1. Insert the PCB and guide the key slots over the posts.
2. Install two 2.5 mm hex screws.
3. Connect the cable.
4. Run **Status LED Test**.

5.2.18 Internal Barcode Scanner

Note:

- Each tier has its own internal barcode scanner located on the panel indicator assembly. Changing an internal barcode scanner will require moving the panel indicator assembly.
- The barcode scanner is in a frame mounted to the panel indicator assembly. The mounting holes are slotted to allow scanner adjustment.

Remove the top for easy access.

Parts and tools

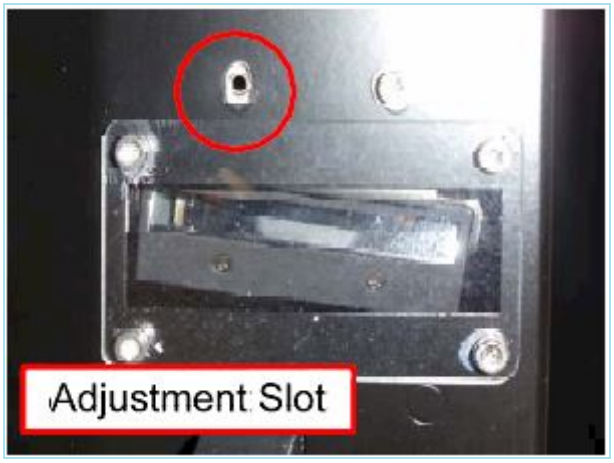
- 2.5 mm hex key
- Internal barcode scanner (443845)

Removal procedure

1. Secure power.
2. Disconnect the cable from the barcode scanner.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

3. Remove the two 2.5 mm hex screws to remove the barcode scanner.



Installation procedure

1. Position the scanner such that the top left of the scanner window (as seen from the front) is at the top left position of the Plexiglas window. The scanner should angle down about 15°.
2. Install two 2.5 mm hex screws. Reconnect the cable.
3. Close up the instrument. Install filter panels and temperature QC panels.
4. Run a panel inventory with the Falcon Toolkit.
5. If the instrument does not read all barcodes, power down the instrument and loosen the two 2.5 mm hex screws and adjust the scanner position. Run another panel inventory.

5.2.19 Ambient RTD

Note: The ambient Resistive Temperature Device (**RTD**) is located in the lower right front of the instrument and will require removal of front and rear fascia and electronics bay cover.

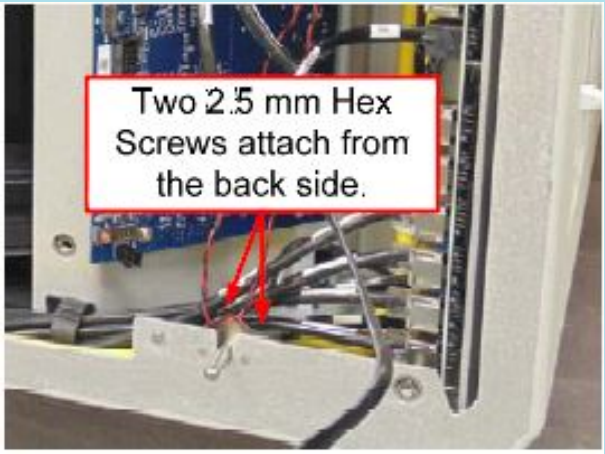
Parts and tools

- 2.5 mm hex key
- Ambient RTD Assembly (443851)

Removal procedure

1. Remove the two 2.5 mm hex screws securing the RTD in place.
2. Disconnect the ambient RTD from the FCDB and remove.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



Installation procedure

1. Secure the ambient RTD in place with two 2.5 mm hex screws.
2. Connect the RTD connector to the FCDB.
3. Run the instrument. Pull a log file and validate the ambient temperature.

> **Note:** The sensor is not calibrated. The readings are only gross estimations.

5.2.20 System Status Indicator

> **Note:** Remove the front fascia to change the system status indicator.

Parts and tools

- 2.5 mm hex key
- System status indicator assembly (443844)

Removal procedure

1. Secure power to the instrument and open the connector cover.
2. Disconnect the status indicator assembly.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

3. Remove the four 2.5 mm hex screws and remove the indicator.

Installation procedure

1. Secure the new system status indicator assembly with four 2.5 mm hex screws.
2. Rotate the cable cover aside and connect the cable.
3. Restart the instrument.
4. In either the user software or the Falcon Toolkit, test the lights and open the door to make sure the assembly is functioning correctly.

5.2.21 Magnetic Locking Guard

Note: The magnetic locking guard is attached to the electronics bay cover.

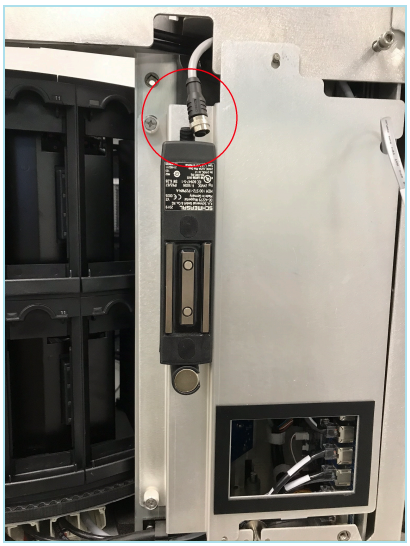
Parts and tools

- 5 mm hex key
- Magnetic locking guard kit (443870)

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Removal procedure

1. Remove front and rear fascia. Refer to "Front Fascia and Rear Fascia" on page 165.
2. Disconnect the cable from the top of the assembly.



3. Remove the two circular black screw covers by pressing on the bottom edge of the cover.

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential

4. Remove the two 5 mm hex screws that mount the assembly to the electronics bay cover.

Installation procedure

1. Secure the assembly to the electronics bay cover with the two 5 mm hex screws.
2. Fit the two circular black screw covers over screw openings.
3. Reconnect the cable.
4. Reinstall front and rear fascia.
5. Perform **Door Switch IO** test to verify proper operation. Refer to "Door Switch" on page 225.

5.2.22 Carousel Ring

Parts and tools

- 2 mm hex key
- 2.5 mm hex key
- 5 mm hex key

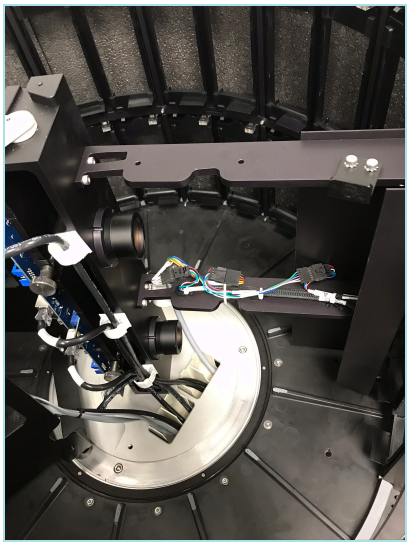
Removal procedure

> **Note:** Do not lift while grasping panel carriers. Take care to not damage the normalizer panels and the LSDB.

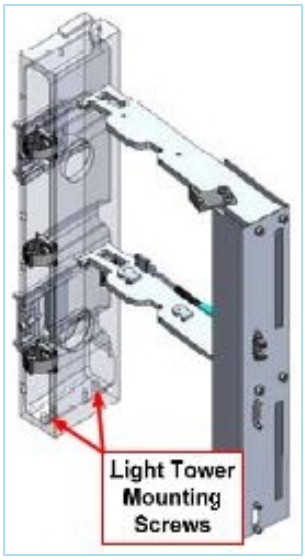
1. Remove the top cover, front and rear fascia from the instrument to remove the carousel. Refer to "Top Cover" on page 168, "Front Fascia and Rear Fascia" on page 165.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

2. Disconnect optical sensor connections A, B, and home from the central optics tower removing any securing zip ties.

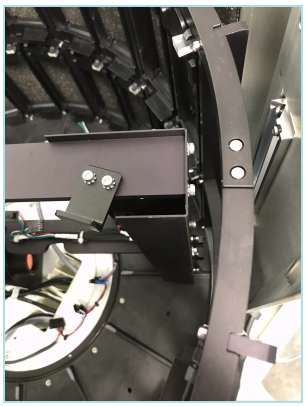


3. Disconnect the four tier micro board connections and open the attached cable clamps.
4. Disconnect the eight panel status board connections.
5. Disconnect the 2 barcode scanner cables.
6. Remove the 2.5 mm shoulder bolt securing the panel status indicator assembly to the light tower.
7. Remove the two 5 mm light tower mounting screws.

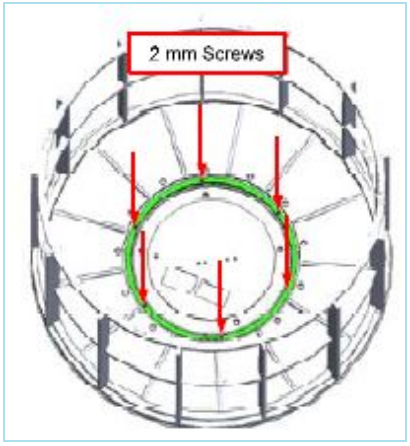


8. Remove 4 panel carriers between stanchions to allow light tower to be removed without interference.

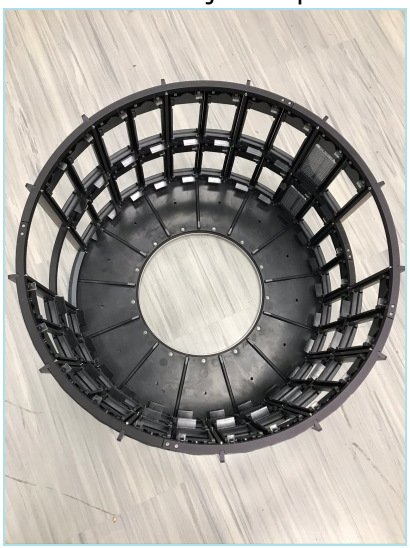
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



9. Remove the light tower.
10. Remove the drive belt. Refer to "Drive Belt Assembly" on page 175.
11. Remove six 2 mm hex screws on bearing ring cover.



12. Remove two adjacent panel carriers or opposite sides of the carousel.



Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

13. (Optional) Remove normalizer panels and panel carriers if replacing the carousel assembly. Lift out the carousel assembly using open panel carrier locations.

Installation procedure

1. Place the carousel in the instrument. Install the bearing cover plate with six 2 mm hex screws.
2. (optional) Transfer the normalizers and the panel carriers to the new carousel assembly.
3. Install the light tower with two 5 mm hex screws.
4. Connect the tier micros (two connectors per board).
5. Connect the A, B, and Home optical sensor connections.
6. Secure optical sensor cabling with zip ties.
7. Reinstall the drive belt, top cover, front and rear fascia. Perform complete alignment and optical qualification. Refer to "Drive Belt Assembly" on page 175, "Top Cover" on page 168, "Front Fascia and Rear Fascia" on page 165. Refer to "Optical Qualification" on page 155.

5.2.23 All-In-One (AIO) PC

Touch screen computer

> **Note:** It may be necessary to adjust the tension on the mounting arm when attaching the AIO monitor. The touch screen computer is assumed to be non functional.

Parts and tools

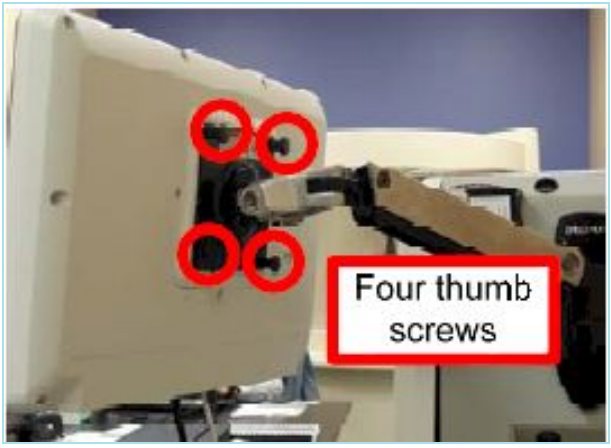
- 4 mm hex key
- Touch screen computer (443868)

Removal procedure

1. Secure power to the instrument.
2. Disconnect all the peripheral devices form the computer. Disconnect the power plug.

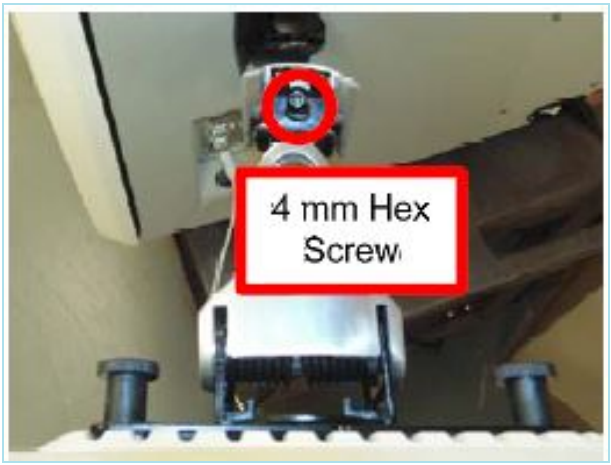
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

3. Hold the computer and remove the four thumb screws from the mounting plate.



Removal procedure

1. Hold the computer against the mounting plate and install the four thumb screws.
2. Use a 4 mm hex key to adjust the tension on the arm so that the monitor is easy to move and stays in place once moved.



3. Recommission the instrument(s) with the new tablet. If there is a recent backup, it may be possible to restore some of the data.

5.2.24 Mounting Arm

Note: The mounting arm mounts on the right side of the instrument (facing the front of the instrument). For a stack of two instruments it goes on the bottom instrument.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Parts and tools

- 4 mm hex key
- Mounting arm kit SAP 443867

Removal procedure

1. Secure power to the instrument.
2. For safety and to reduce the weight, remove the AIO before removing the mounting arm.
3. Use a flat bladed screw driver to help remove the mounting cover plates on the top and the bottom of the mounting arm base that attaches to the instrument.
4. Remove the four 4 mm hex screws that hold the arm in place.

Installation procedure

1. Use four 4 mm screws to secure the mounting arm to the side of the instrument.
2. Snap the two plastic covers in place.

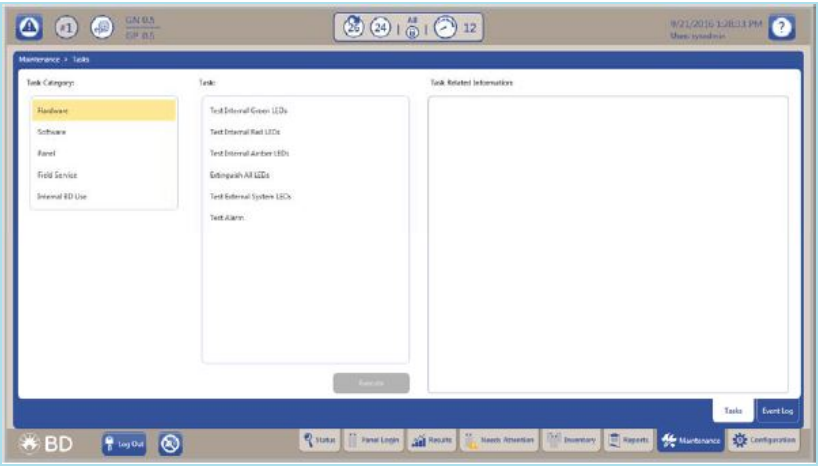
5.3 Lab User Maintenance

User maintenance tasks are performed at certain time intervals. Several tasks are accessed through the **Maintenance** tab on the **Status** display.

1. Press the **Maintenance** tab > **Tasks**.
2. Select the appropriate instrument radio button.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

3. Select **Hardware** > **Task** > **Execute.**



Tasks

Time Frame	Procedure
Daily Record results on Daily Instrument Report	1. Check paper supply. 2. Record temperature on the LCD display. The temperature should be 35°C ± 1.5°C. 3. Record temperature standard panel. Bring the temperature panel into view by selecting one of the instrument LED check functions on the **Maintenance** menu. 4. The temperature should be 35°C ± 1.5°C. 5. Perform daily verification on PhoenixSpec™. 6. Refer to **Nephelometer Calibration** in PhoenixSpec™ package insert.
Weekly Record results on Daily Instrument Report	Perform the tasks listed under the **Hardware** radio button.

Function	Purpose
Test Internal Green LEDs	Turns on all internal green panel status LED. 
Test Internal Red LEDs	Turns on all internal red panel status LED.

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential

<table>
<tr><th>Time Frame</th><th>Procedure</th></tr>
<tr><td></td><td>
<table>
<tr><th>Function</th><th>Purpose</th></tr>
<tr><td></td><td>  </td></tr>
<tr><td>Test Internal Amber LEDs</td><td>Turns on all internal amber panel status LED.
  </td></tr>
<tr><td>Extinguish all LEDs</td><td>Turns off all panel Status LEDs.</td></tr>
<tr><td>Test External System LED</td><td>Tests the blue and yellow LEDs on the system status indicator.</td></tr>
<tr><td>Test Alarm</td><td>Tests the audio alarm.</td></tr>
</table>
</td></tr>
<tr><td>Monthly</td><td>Check filter in instrument. If the instrument's environment is especially dusty, the air intake filter should be checked more frequently and cleaned or replaced 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.
1. Press Panels in or Panels out button to access panel entry area.
2. Filter is located on the lower right side of the opening.
 
3. To remove the filter, grasp the black tab and slide towards the left side of the panel access area.
4. Remove the old filter and clean and dry it before replacing in the instrument,</td></tr>
</table>

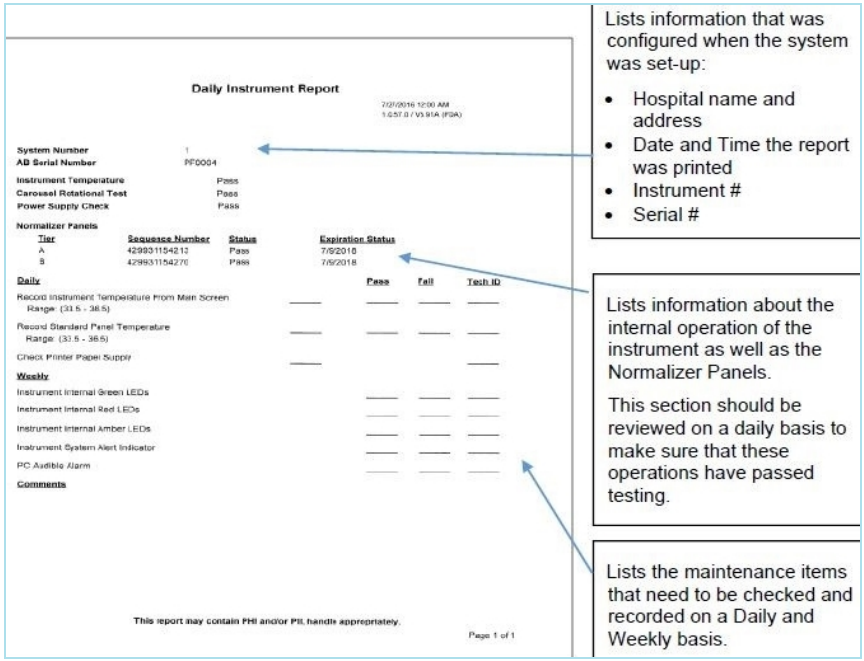
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Time Frame	Procedure
	or, place a new filter in the housing while the old one is cleaned and dried. 5. 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. 6. Close the instrument door.  Cleaning Air Filter 1. Wash dirty filters in a bactericidal disinfectant. 2. Place them on paper towels and dry them thoroughly (if you are going to reuse them immediately). 3. To save time, replace dirty filters with a spare clean set. Wash, dry, and set aside the removed dirty filters for the next filter replacement.
Every 3 months	Perform calibration of PhoenixSpec™. • Refer to **Nephelometer Calibration** in PhoenixSpec™ package insert.
As Needed	Clean panel locations if they become contaminated by a leaking panel. 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. • The contamination procedure applies only to accessible areas. ◦ If the spill extends into regions of the carousel that are not accessible, contact your local BD Service representative. • The solution recommended to clean the affected surfaces should be at least a 10 percent household bleach solution. ◦ All surfaces must be thoroughly washed with the freshly prepared bleach solution, so that the surfaces are glistening wet. If unsure of the extent of the contamination, 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

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Time Frame	Procedure
	• Gauze pads or paper towels • Tap water Procedure All portions of the body that could come into contact with the affected instrument surfaces must be completely covered before beginning the decontamination process. 1. Wear gloves and a gown, completely covering all the body surfaces that could 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 cloth with water. Wipe down the decontaminated surfaces. 7. Thoroughly dry all wet surfaces. 8. Discard all cleanup materials as bio-hazardous waste.

The **Daily Instrument Report** prints at a user defined time or print upon request.



Note: The values for the Instrument Temperature, the Carousel Rational Test, and the Power Supply Check may appear as **???** if the instrument uses memory for testing. This event is expected in the course of normal operation and does not constitute an error state.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

6 Qualification and Software Upgrades

6.1 Instrument Qualification and Software Upgrade Procedure

Materials required

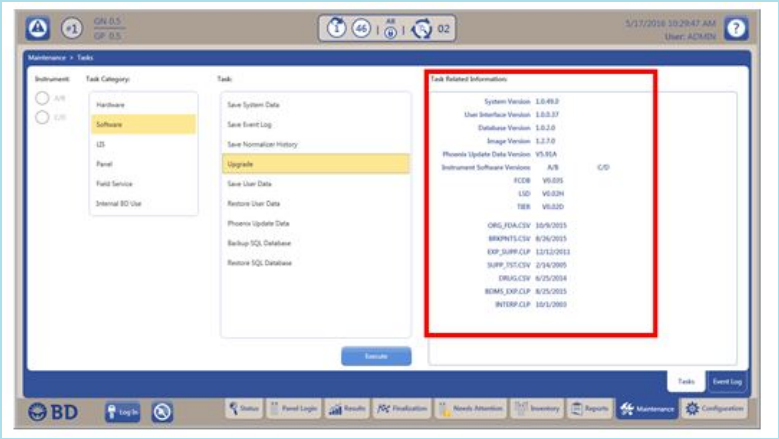
1. Latest M50 system software update USB key (SAP 443866)
2. Latest Phoenix PUD (SAP 448047 - US / 441107 - Ex US)
3. Blank USB drive
4. Field Tool Kit (SAP 443859)
5. Light Source Driver Board (SAP 443848) (Optional)
6. 5 mm hex key

Note: Phoenix M50 field service passwords are available on the IDS Software Repository as per BDLS6265 BD LS File Repository Guidelines.

Procedure

1. Log in as BDFS.
2. Verify system, image, and Phoenix Update Data versions are the latest available versions.
   a. Navigate to **Maintenance > Tasks**.
   b. Select **Software > Upgrade**. Review information on the right side of the screen.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



c. If required, update user software and or PUD to the latest version.
   i. If this is a stack (two instruments), disconnect one of the instruments.
   ii. Insert the latest **Phoenix M50 software upgrade USB key**.
   iii. Select **Upgrade** button.
   iv. Firmware is installed at the same time as the user software. Wait for the firmware installation to complete.
   v. If this is a stack, reconnect the instrument disconnected. Wait for any firmware updates to complete.

Note: Do not power down AIO or instrument during firmware upgrade.

3. Check Normalizer expiration dates.
   a. Navigate to **Maintenance > Tasks > Field Service > Access Normalizer Panels**

   Note: It can take one test cycle to populate normalizer data.

4. Check FDA mode.
   a. Navigate to **Field Service > FDA Mode** and check if the instrument is set correctly for the customer site.

   Warning: Opening the Falcon Toolkit will abort any ongoing panels in the connected instruments.

5. Check power supply voltage.
   a. Navigate to the **Maintenance** tab > **Field Service**, then select **Exit Application**. Use File Explorer to navigate to **D:/Short Cuts**. Long press the **FalconDiagnosticApp.exe** icon until the gray square appears. Select **Run as Administrator** to open the Falcon Toolkit.

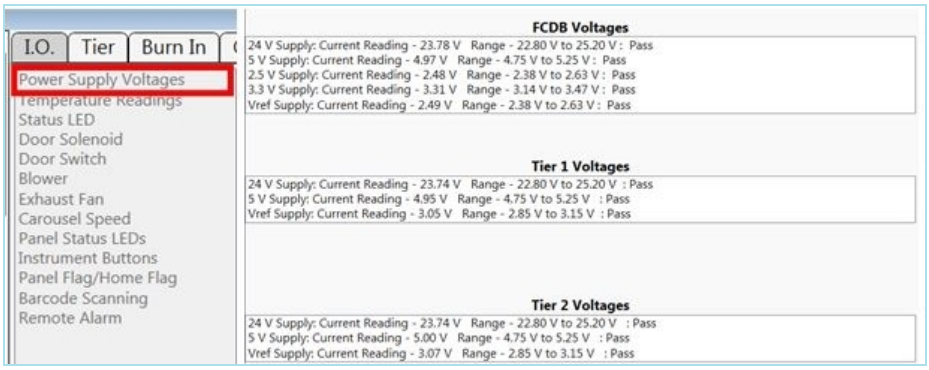
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

b. Go to **IO > Power Supply Voltages**.

c. Select **Start Test**.

d. Check that all voltages are within specified tolerances and listed as **Pass**.

e. Select **Stop Test**. Refer to "Power Supply Voltages" on page 222 for more information.



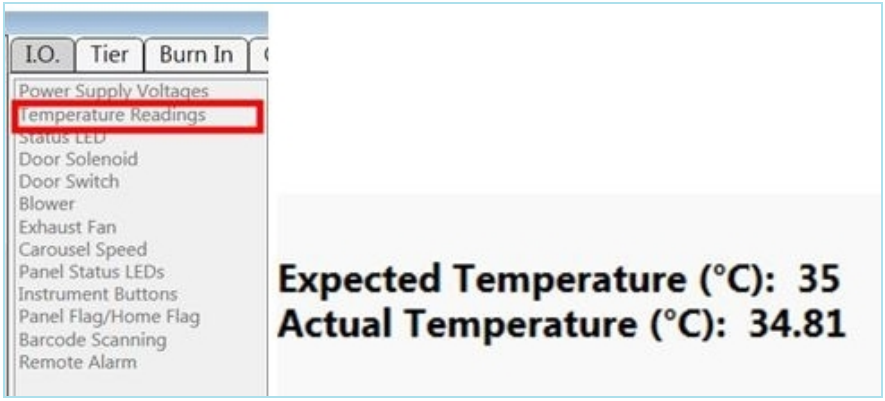
6. Incubation temperature.

a. Navigate to **IO > Temperature Readings**.

b. Select **Start Test** and monitor temperature readings for several minutes.

c. Temperature should be **± 0.5°** of the expected temperature.

d. Select **Stop Test**. Refer to "Temperature Readings" on page 223 for more information.



7. Check status indicator LEDs.

a. From the **IO** tab, select **Status LED**.

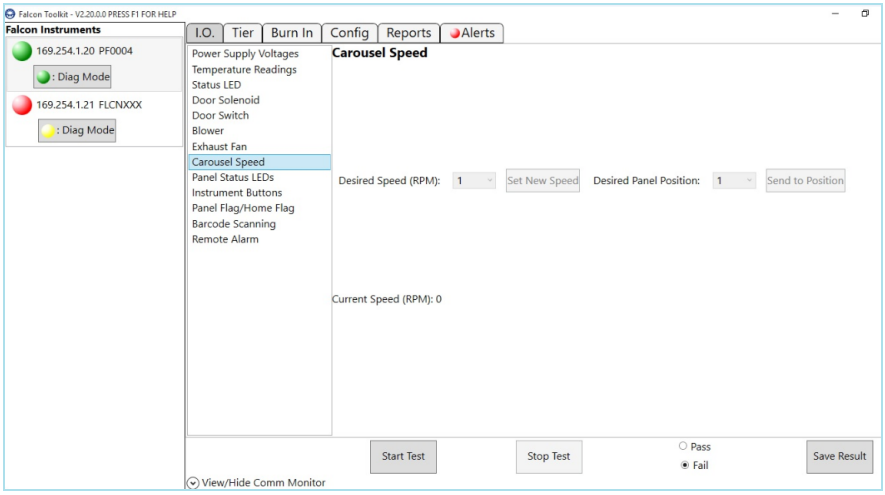
b. Select **Start Test**.

c. Follow the onscreen instructions and observe the status lights.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

d. Refer to "Status LED" on page 224 for more information.

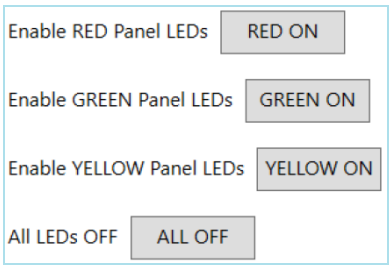
8. Check door switch.
   a. Select the **Door Switch Test** and **Start Test**.
   b. Follow the onscreen instructions.
   c. Refer to "Door Switch" on page 225 for more information.
9. Carousel rotation speed.
   a. Navigate to **IO > Carousel Speed.**
   b. Select **Start Test**.
   c. Select **1 rpm** as the desired speed. Press the **Set New Speed** icon.
   d. Verify that the current speed is reported as **1 rpm** ± 5% (.95 -1.05 rpm).
   e. Select **4 rpm** as the desired speed. Press the **Set Speed** icon.
   f. Verify that the current speed is **4 rpm** ± ~5% (3.88 - 4.20 rpm).
   g. Reset the speed to **1 rpm**.



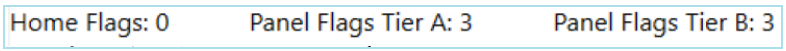
   h. Select **Stop Test.** Refer to "Carousel Speed" on page 227 for more information.
10. Panel status LEDs.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

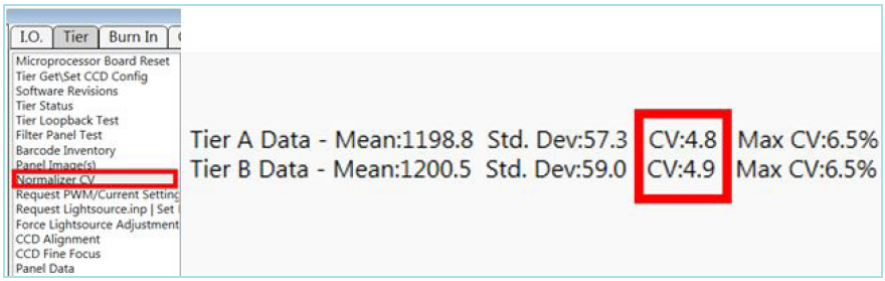
a. Navigate to **IO > Panel Status LEDs** test.
b. Select **Start Test**.
   i. Test **Internal Red** LEDs.
   ii. Test **Internal Green** LEDs.
   iii. Test **Panel Indicators**.
   iv. Select **Stop Test**. Refer to "Panel Status LEDs" on page 228 for more information.



11. Home and panel flags.
    a. Navigate to **IO > Panel Flag** or **Homer Flag**.
    b. Select **Start Test**. Wait a moment (up to one minute) for the instrument to find the **Home Flag**.
    c. Monitor **Home Flag** and **Panel Flag** counts. There should be 26 panel flag counts on each tier for one **Home Flag** count.
    d. Select **Stop Test**. Refer to "Panel and Home Flag" on page 229 for more information.



12. Normalizer CV test.
    a. From the Toolkit, select the **Tier** tab and allow the optical inventory to complete.
    b. Select **Normalizer CV** and **Start Test**.
    c. The test should take less than five minutes to complete.
    d. Check that the CV values are less than 6.5. Refer to "Normalizer CV Test" on page 220 for more information.



13. Select **Request PWM/Current Settings** and **Start Test**.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

a. If any PWM Settings exceed 225, the Light Source Driver Board (SAP 443848) should be replaced as per "Light Source Driver Board (LSDB)" on page 180.

b. Repeat the Instrument Qualification as per "Instrument Qualification and Software Upgrade Procedure" on page 204.

14. Restart the instrument and the AIO computer.

6.2 Qualification Tests

Optical system maintenance

Gently clean lens, normalizers, and CCDs with lint-free wipes and lens cleaner (do not use any substance that leaves behind a residue). Blow off any loose particles with canned air meant for optics cleaning.

Filter cleaning and replacement

> **Note:** The inlet air filter is a user serviceable part. Clean the filter. Refer to the **User Manual** for information. Replace, if damaged.

Parts and tools

Phoenix M50 inlet air filter (443842)

Procedure

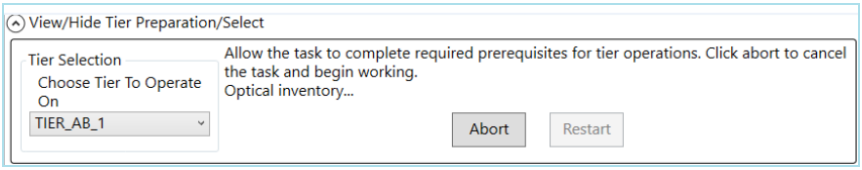
- Open the door and replace the filter.

6.2.1 Optical Inventory

> **Note:** Unless the **Abort** button is selected, an optical inventory is performed 10 seconds after entering the **Tier** tab of the FalconToolkit. The inventory takes approximately three minutes to complete. Inventory will be gathered from both tiers simultaneously, regardless of which tier is selected.

Start and complete the optical inventory, if using the **Tier** tab for the first time. Pressing **Restart** forces an optical inventory to be done. The **Tier** panel is displayed if an optical inventory is successfully completed.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

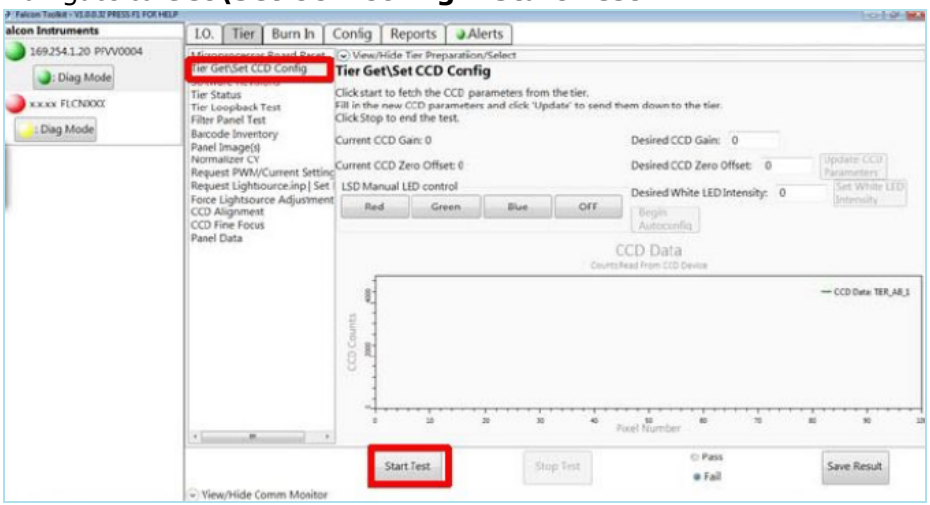


6.2.2 Tier Get and Set CCD Config

Note: This test sets the gain and offset levels for CCD on the tier micro board. A white LED mounted on the tier micro board adjusts the CCD gain and offset. No other parts of Phoenix M50 optical system are used in setting the CCD gain and offset. The test is completely automatic.

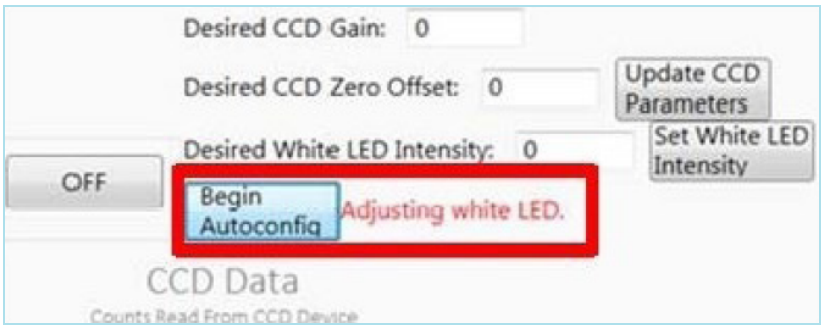
Procedure

1. Launch the **Falcon Toolkit** and wait for it to connect to the instrument.
2. Select the **Tier** tab. The optical inventory does not need to complete this test and can be aborted.
3. From the **Tier Preparation Select** drop-down window, select the **Tier** to run the test on. Close the window.
4. Navigate to **Get\Set CCD Config** > **Start Test**.

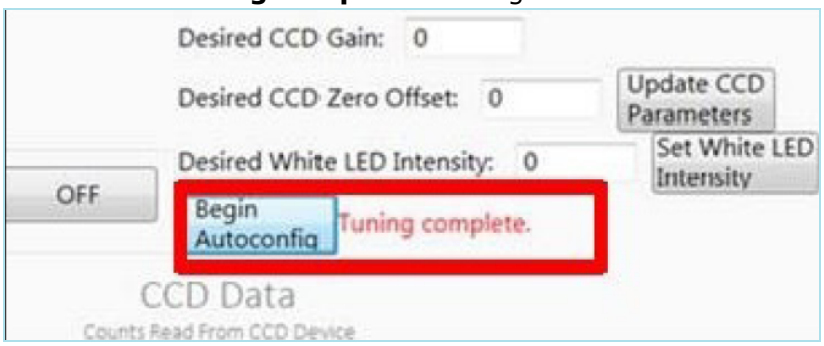


5. The **Begin Autoconfig** button becomes available. Press the button.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

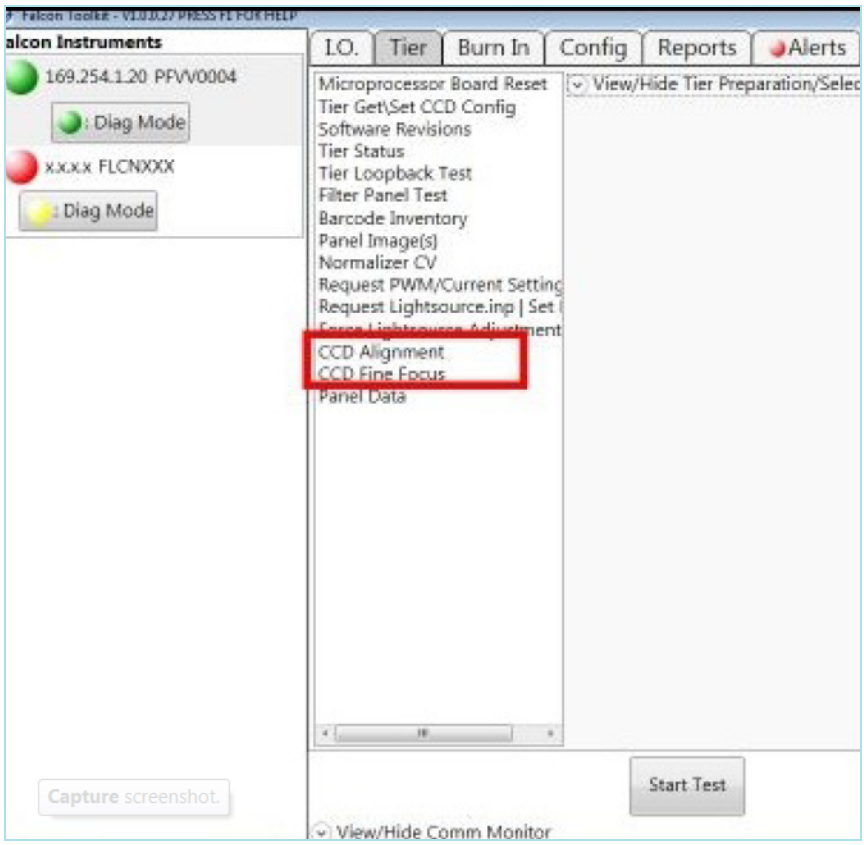


6. Wait for the **Tuning complete** message.



Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

6.2.3 CCD Alignment



Perform this procedure to replace or adjust parts of the optics system.

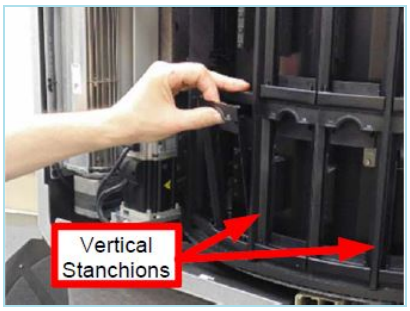
Parts and tools

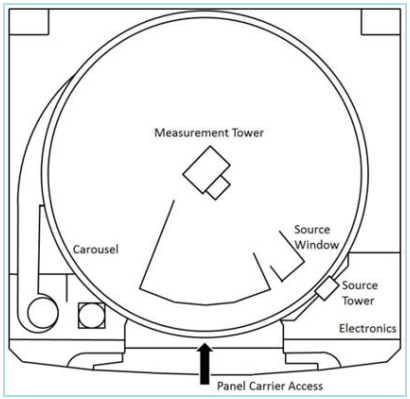
- Phoenix M50 field Toolkit (443859)
- 5 mm hex key

Procedure

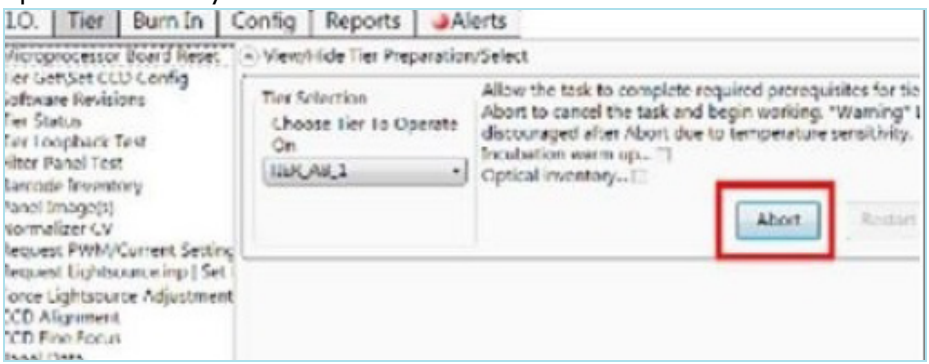
1. Power down the instrument.
2. Open the door and remove two panel carriers between the vertical stanchions of the carousel to reach inside the carousel. Refer to "Panel Carriers" on page 170.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential





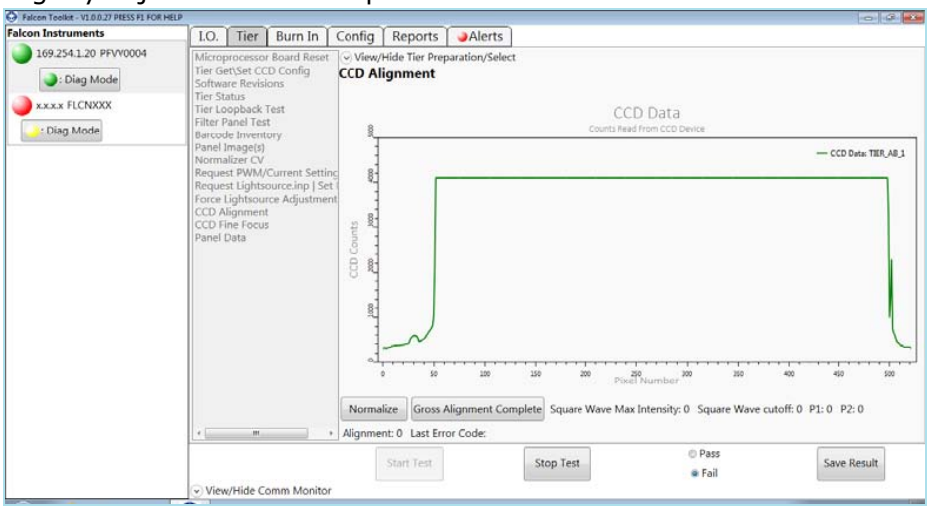
3. Rotate the panel indicator assembly to the left, or clockwise. Refer to " Panel Indicator Assembly" on page 172. If necessary, remove the front and the rear fascia. Refer to "Front Fascia and Rear Fascia" on page 165. Reinstall fascia before continuing.
4. Ensure all covers are in place and power on the instrument. Start the Falcon Toolkit on the computer.
5. Select the **Tier** tab and immediately hit **Abort**. If you do not hit **Abort**, the toolkit starts an optical inventory after 10 seconds.



6. From the drop-down select the tier to work with. Tier_AB_1 is the top tier and Tier_AB_2 is the bottom tier. Use the small up arrow to hide the **Tier Selection** panel. Hide the bottom **Comm Panel**.

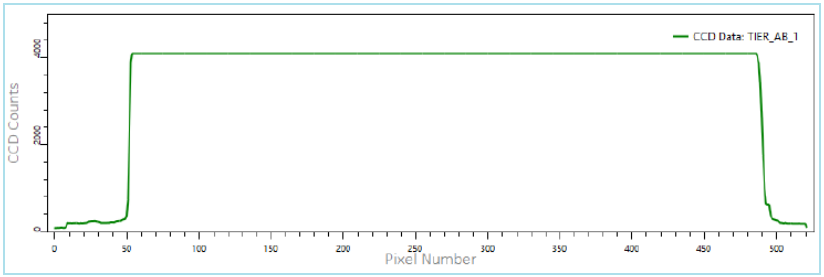
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

7. Rotate the carousel until an empty panel carrier is in front of the source board. Select **CCD Alignment** test > **Start Test**. A display similar to the picture square pulse is seen. If not, slightly adjust the carousel position.

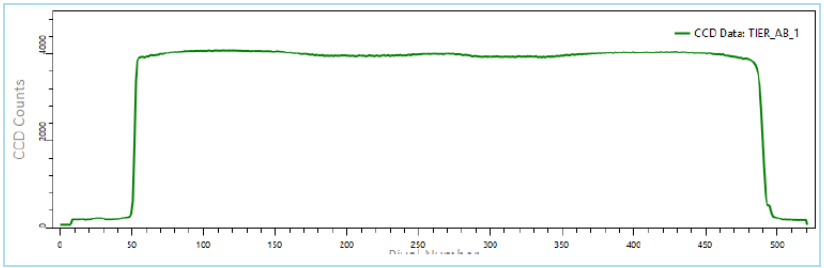


8. Examine the display. The amplitude (CCD Counts) of the display should be slightly less than 4095. The top of the curve should not be flat, but slightly rounded. If the top is flat, then the CCD is being saturated. Left clicking within the CCD Data box will display the CCD counts for each pixel. Examine the following examples.

High Amplitude (Saturated)

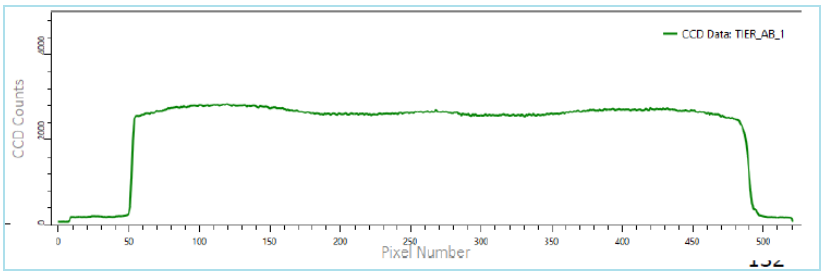


Good Amplitude

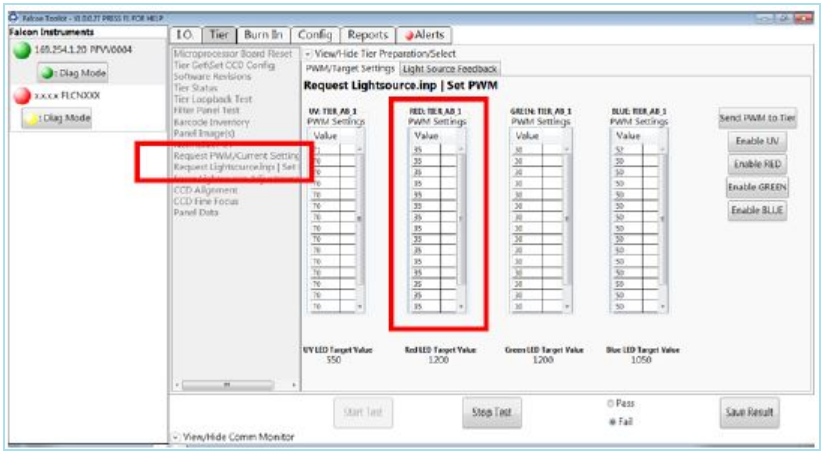


Amplitude Low

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

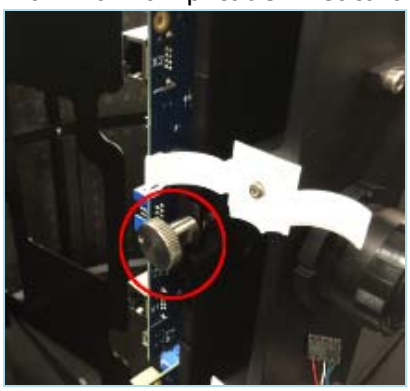


9. If the amplitude is not correct, select **Stop Test**. Otherwise go to **step 11**.



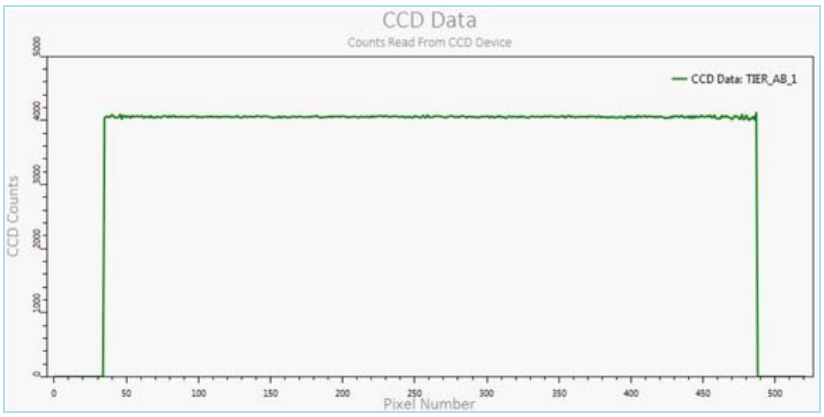
   a. Select **Request Lightsource.inp|SetPWM**. Select **Start Test**.
   b. Increase/decrease the red LED PWM settings for the tier you are working on, up or down as required.
   c. Select **Send PWM to Tier**. Select **Stop Test**. Return to **step 8**.

10. Use the knurled knob on the tier board mount to adjust the CCD adjustment screw for maximum amplitude. If saturation is reached, go to **step 9b**.

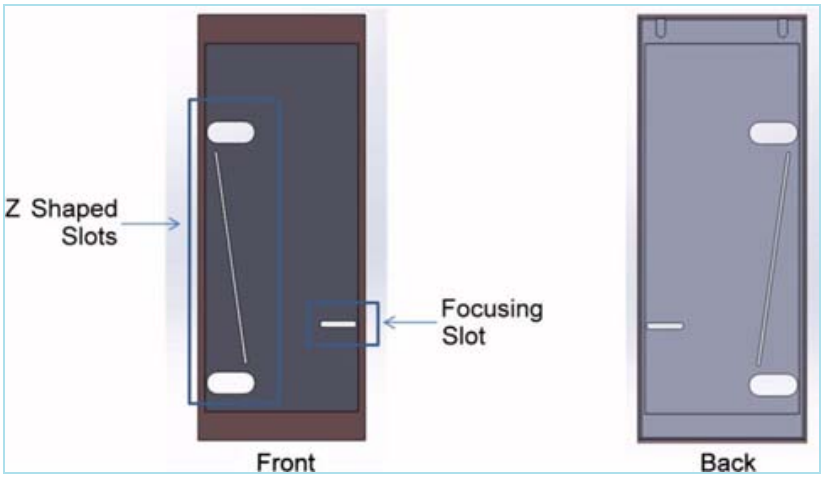


11. Close the instrument door and select **Normalize**. The normalized plot appears as a square pulse.

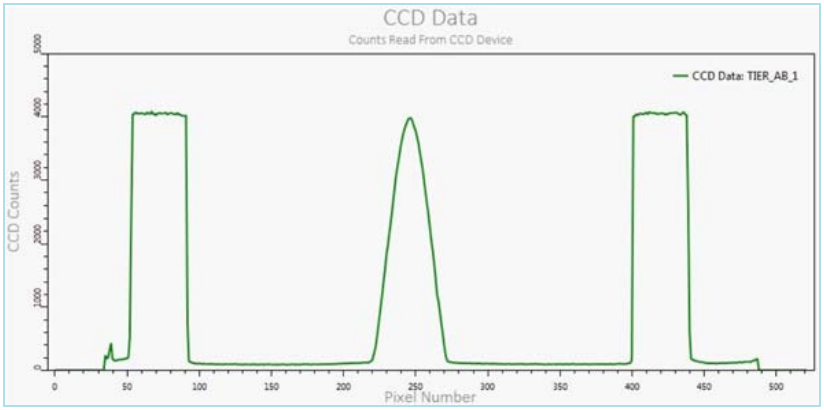
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



12. Open the door and install an alignment panel. Rotate the carousel until the alignment panel is in front of the source board.

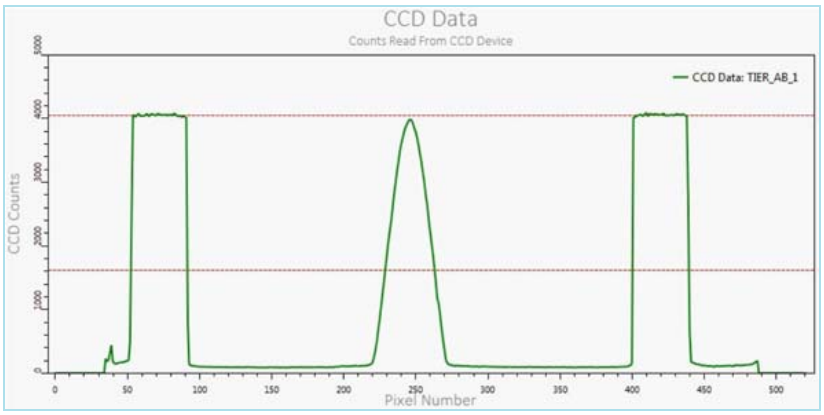


13. Adjust the carousel until the message **Do Not Move the Carousel After This is Achieved** is displayed. If necessary, install locking clamps (Phoenix M50 Toolkit) to keep the carousel stationary. Shield the open door to prevent external light contamination, if required.

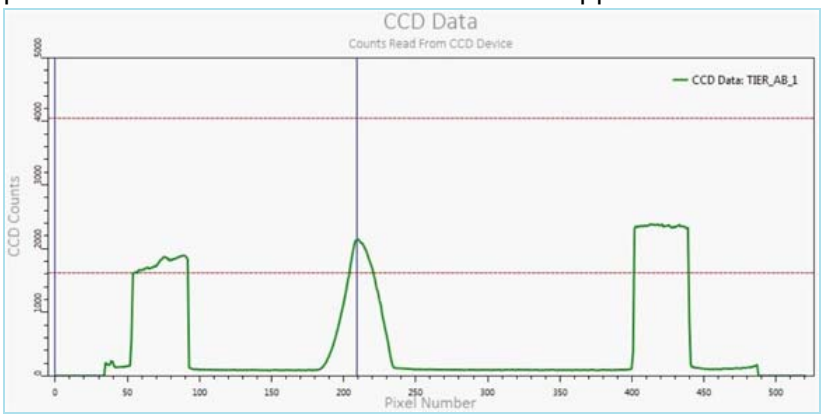


14. Select **Gross Alignment Complete**. The display looks like this image.

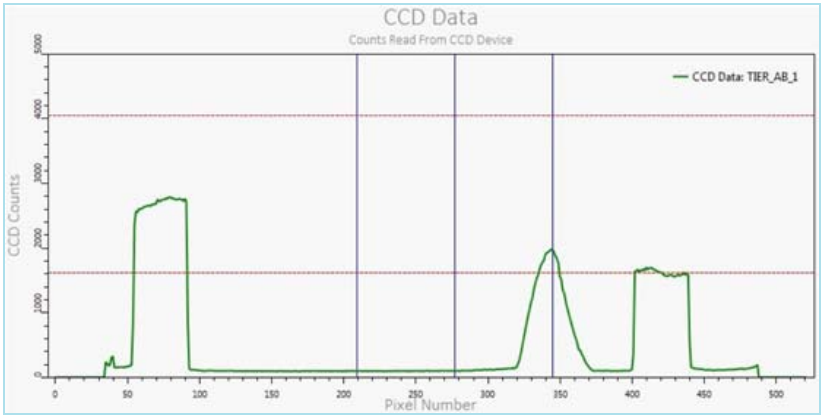
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



15. Slowly rotate the CCD screw counter clockwise until the top of the left square wave lowers past the lower red line. A vertical blue line appears.

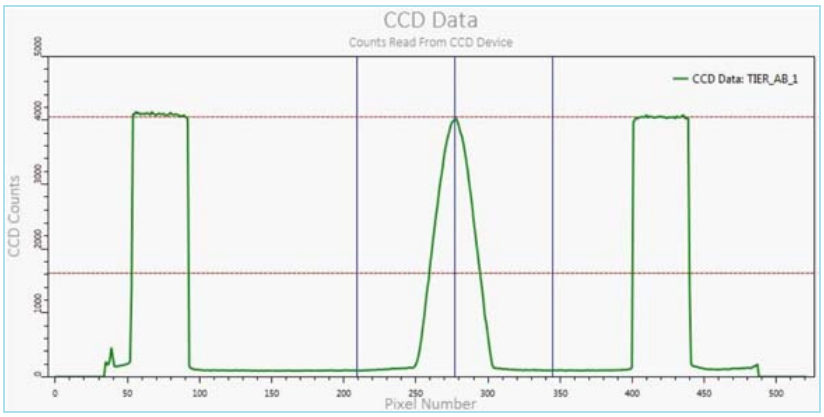


16. Rotate the CCD screw clockwise until the right square wave lowers past the lower red line. Two additional vertical blue lines appear.



17. Turn the CCD screw counter clockwise until the peak of the center spike is aligned with the middle blue line. Select **Stop Test**.

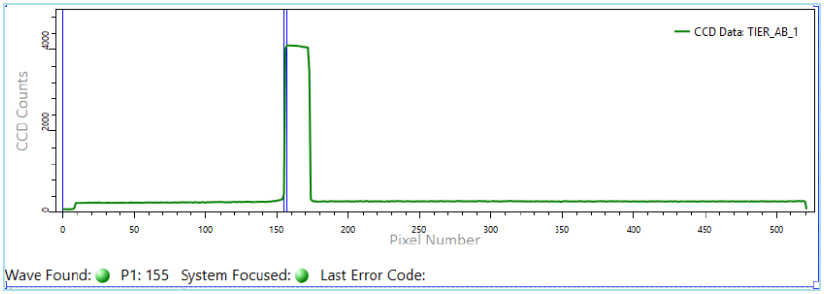
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



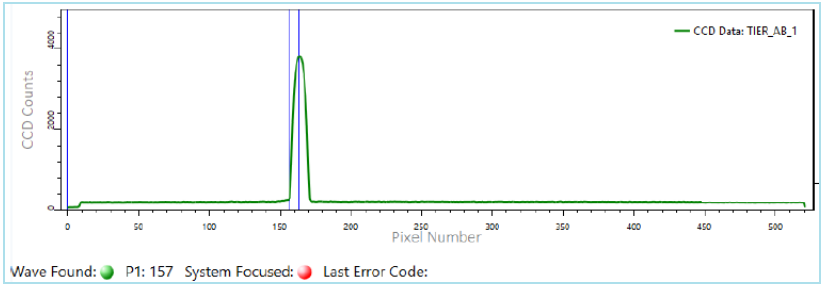
18. If used, remove the carousel clamps.

6.2.4 CCD Fine Focus

1. Select **CCD Fine Focus**.
2. Rotate the carousel clockwise until a single spike appears with two vertical blue lines. Adjust the carousel for maximum amplitude of the spike. If necessary, use locking clamps to keep carousel in this position.

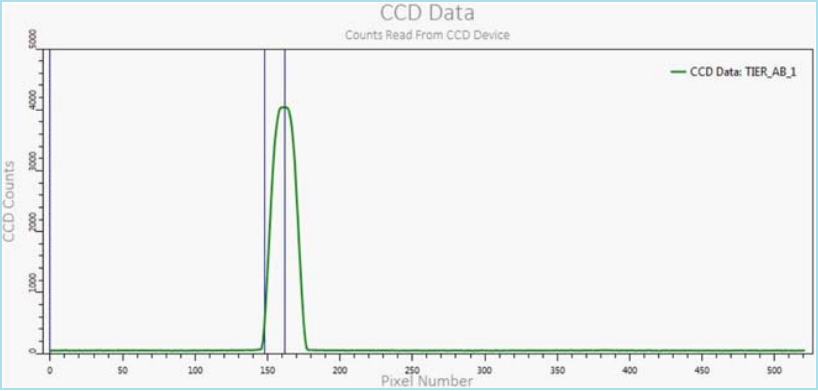


3. If the **Wave Found** and **System Focused** indicators are green, select **Stop Test.** Remove all tools and test fixtures and reassemble the instrument and continue with the qualification process. If the **System Focused** indicator remains red, loosen the lens locking ring. Refer to "Lens Assembly" on page 185.



Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential

4. Adjust the lens until the spike looks like a square pulse and the two blue lines are as close as possible to each other.
5. Tighten the **Lens Locking** to the extent of a ring finger tight only. Over tightening will cause the **Lens** to crack.
6. Check that the **Wave Found** and **System Focused** indicators are green. Select **Stop Test**. Remove all tools and test fixtures and reassemble the instrument.



7. Move the panel indicator assembly into operational position. Refer to " Panel Indicator Assembly" on page 172.
8. Reinstall panel carriers. Refer to "Panel Carriers" on page 170.

6.2.5 Force Lightsource Adjustment Test

Note: The source adjustment is an automated process for adjusting the source board. Making adjustments to the optical system may require that a source adjustment be initiated outside of normal operations.

A source adjustment takes approximately 30 minutes to complete. Non-expired normalizers are installed in position 00 of each tier.

Parts and tools

- Set of gold normalizer panels (447157)

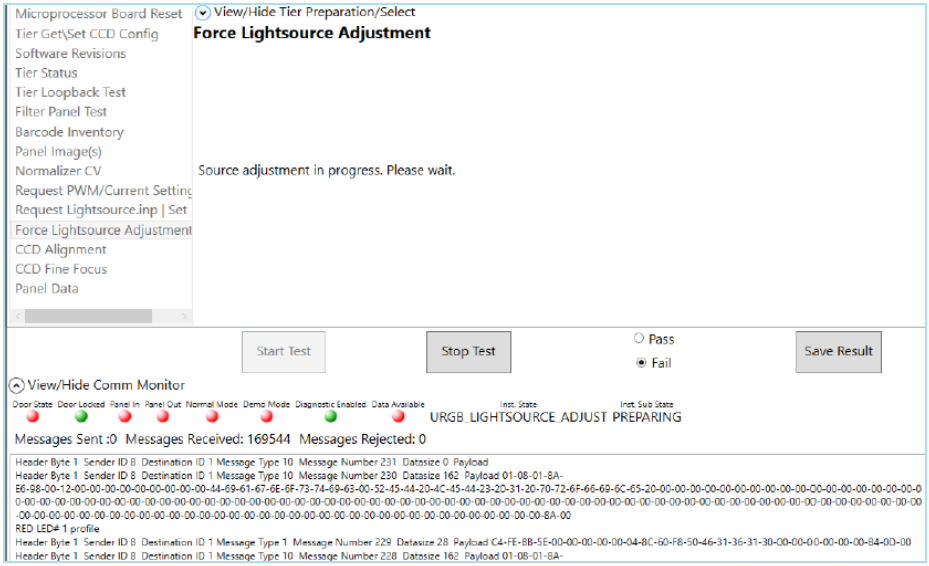
Procedure

1. Enter the **Tier** tab. Complete optical inventory, if still incomplete. If it has been aborted, select **Restart** on the **Tier Preparation/Select** drop-down panel.

   An optical inventory may take up to five minutes to complete. Collapse the drop-down panel if the optical inventory passed.
2. Select **Force Lightsource Adjustment** test. Press **Start Test**.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

3. The toolkit displays **Source Adjustment in Progress, Please Wait**. To monitor the process, select the **View/Hide Comm Monitor** tab at the bottom of the screen.



4. Upon completion of the Source Adjustment verify UV, Red, Green, and Blue values are **True**. If any value is **False**, verify the PWM values and perform corrective actions as necessary.

6.2.6 Normalizer CV Test

Note: The Normalizer Coefficient of Variance (**CV**) tests the overall state of the optical system. If the CV for a tier is less than 6.5%, the optics system for that tier can be considered to be functioning properly and within specifications.

Parts and tools

Set of gold normalizer panels (447157)

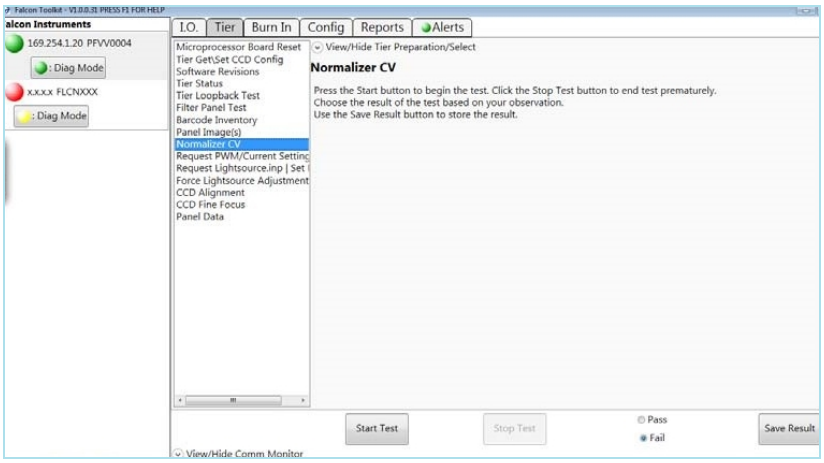
Procedure

It is assumed that non-expired normalizers are installed in position 00 of each tier.

1. Click the **Tier** tab. Complete optical inventory, if still incomplete. If it has been aborted, select **Restart** on the **Tier Preparation/Select** drop-down panel.

   An optical inventory may take up to five minutes to complete. Collapse the drop-down panel if the optical inventory passed.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



2. Select **Normalizer CV Test**. Press **Start Test**. This test takes about ten minutes to run.
3. Mean, standard deviation, and CV values of each tier are displayed after the test completes.

   Tier A Data - Mean:1198.8 Std. Dev:57.3 CV:4.8 Max CV:6.5%
   Tier B Data - Mean:1200.5 Std. Dev:59.0 CV:4.9 Max CV:6.5%

   If CV values are less than 6.5%, the optics system for that tier is operating correctly. If CV values are greater than 6.5%, perform CCD alignment.

6.2.7 Filter Panel Test

Note:

- Perform filter panel test when a part of the optics system is replaced or adjusted. The test validates the colorimetric ratio response between the three colors of LEDs used by the instrument.
- The filter panel used in the test has three pieces of colored glass filters. The panel is designed to be loaded into a standard panel carrier. For proper functioning, the filter panels need to be loaded into position **01** of both tiers. A filter panel test takes approximately 10 minutes to perform.

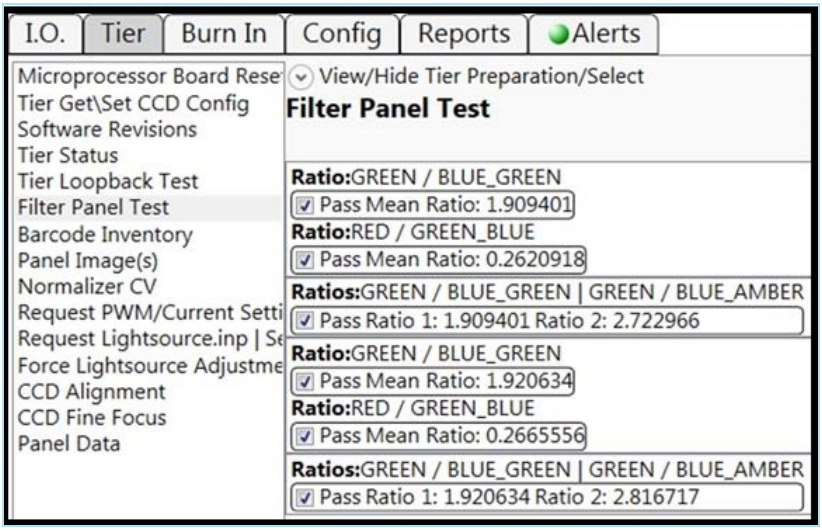
Parts and tools

Gen 4 filter panels (441051 or 443569)

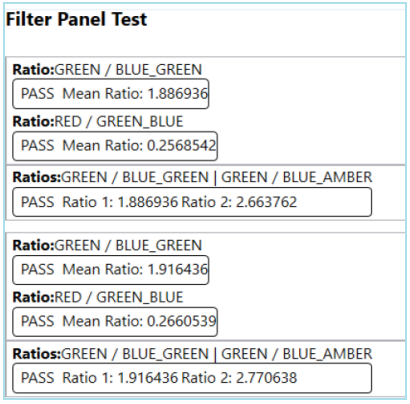
Procedure

1. Use the **Door Solenoid** test to release the magnetic door latch, and open the door.
2. Install the filter panels into slot 01 on both the tiers. Rotate the carousel by hand to expose position 01, if required.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



3. Close the door and start the Toolkit. Go to the **Tier** screen and wait for the optical inventory to complete.
4. Select **Filter Panel Test** and **Start Test**.



5. Upon completion, several ratios are displayed on the screen. Confirm that each ratio passes. If any ratio fails, perform a source adjustment. Refer to "Force Lightsource Adjustment Test" on page 219.

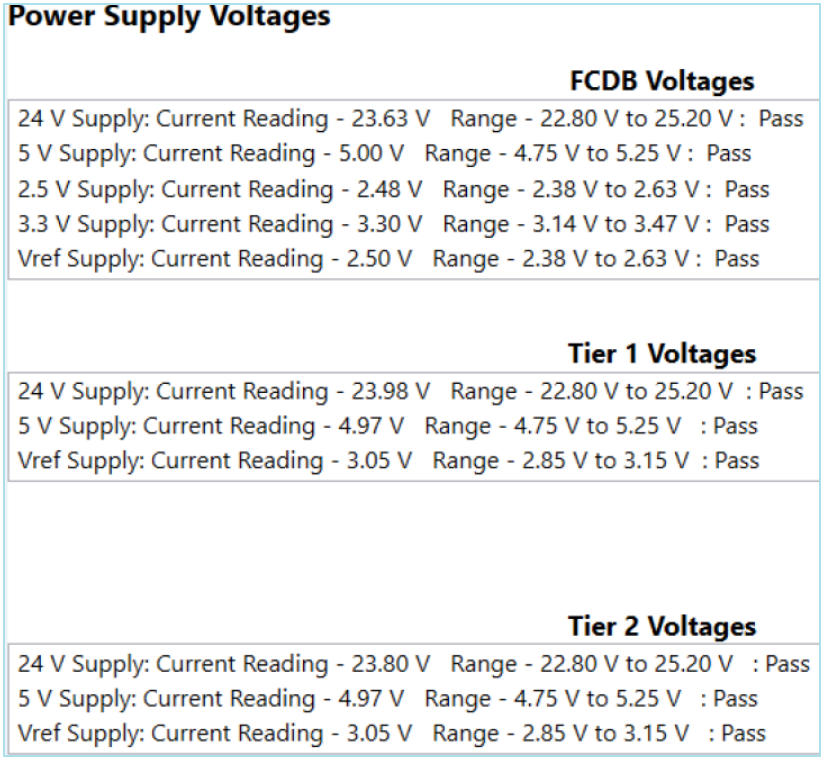
6.2.8 Power Supply Voltages

Note: DF85 on the Phoenix M50 monitors power supply voltages. These voltages can be observed on the Falcon Toolkit **IO** tab.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Procedure

1. Start the **Falcon Toolkit** and allow it to connect to the instrument. Select the **IO** tab.
2. Select **Power Supply Voltages** and press **Start Test**.



3. Voltages and acceptable ranges are displayed for **FCDB**, **Tier 1**, and **Tier 2**.
4. Press **Stop Test** when finished.

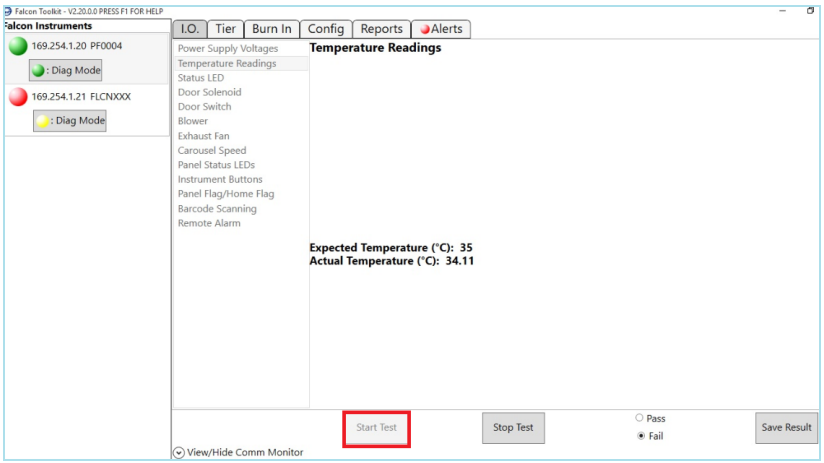
6.2.9 Temperature Readings

Note: DF85 on the Phoenix M50 monitors the incubation temperature. This can be observed in the Falcon Toolkit IO tab.

Procedure

1. Start the **Falcon Toolkit** and allow it to connect to the instrument. Select the **IO** tab.
2. Go to **Temperature Readings** > **Start Test.**

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential



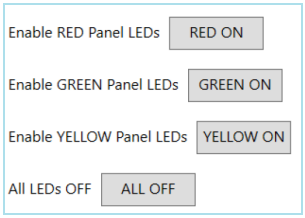
3. The **Expected Temperature** and **Actual Temperature** are displayed.
4. Press **Stop Test** when finished.

6.2.10 Status LED

Note: This test turns the status panel indicator lights on and off. The status LED panel is located to the right of the door (facing the instrument).

Procedure

1. Start the Falcon Toolkit and allow it to connect to the instrument. Select the **IO** tab.
2. Select **Status LED**.



3. The Status LED (yellow) and the Carousel (blue) indicators then turn off for 10 seconds. The test ends.

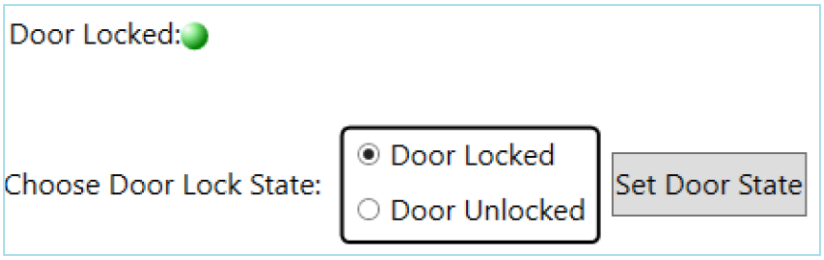
6.2.11 Door Solenoid

Note: This test is used to turn the door latch magnet off and on and can be used in conjunction with tests that require the door to be opened or closed.

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential

Procedure

1. Start the **Falcon Toolkit** and allow it to connect to the instrument. Select the **IO** tab.
2. Select **Door Solenoid** > **Start Test**. This enables **Choose Door Lock State**.



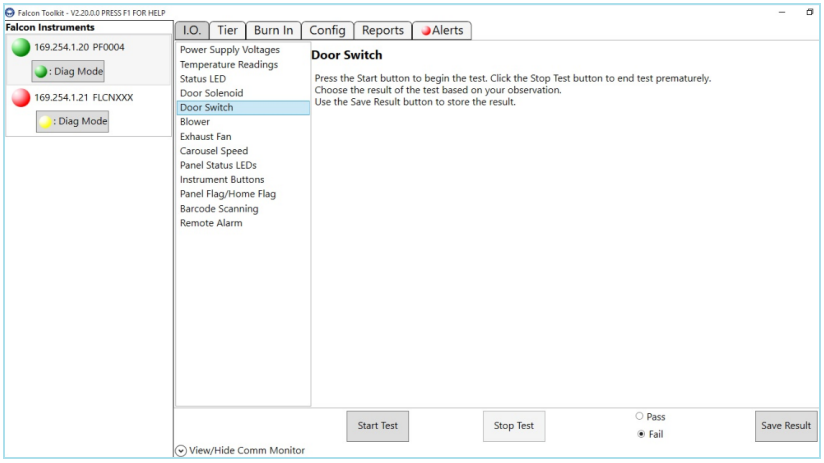
3. Select **Door Unlocked** radio button, then select **Set Door State**. The door can be opened when the door locked indicator is red.
4. Select **Door Locked** radio button, then select **Set Door State**. The door should be locked when the door locked indicator turns green.
5. Select **Stop Test** to finish.

6.2.12 Door Switch

Note: This test detects the open or close status of the door.

Procedure

1. Start the Falcon Toolkit and allow it to connect to the instrument. Select the IO tab.
2. Go to **Door Switch** > **Start Test**.



3. On prompt, open and then close the door.
4. If the door switch passes, it is indicated.

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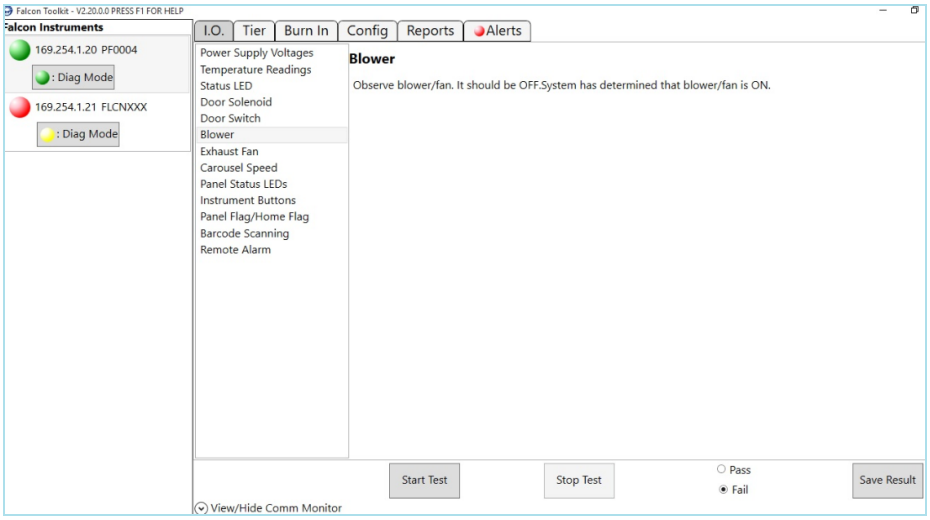
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

6.2.13 Blower

Note: DF85 on the Phoenix M50 monitors the blower RPM and its operations.

Procedure

1. Start the **Falcon Toolkit** and allow it to connect to the instrument. Select the **IO** tab.
2. Go to **Blower** > **Start Test**.



3. Read the on-screen instructions. The test cycles the blower on and off. The blower state must be verified. This is a timed test and exits when complete.

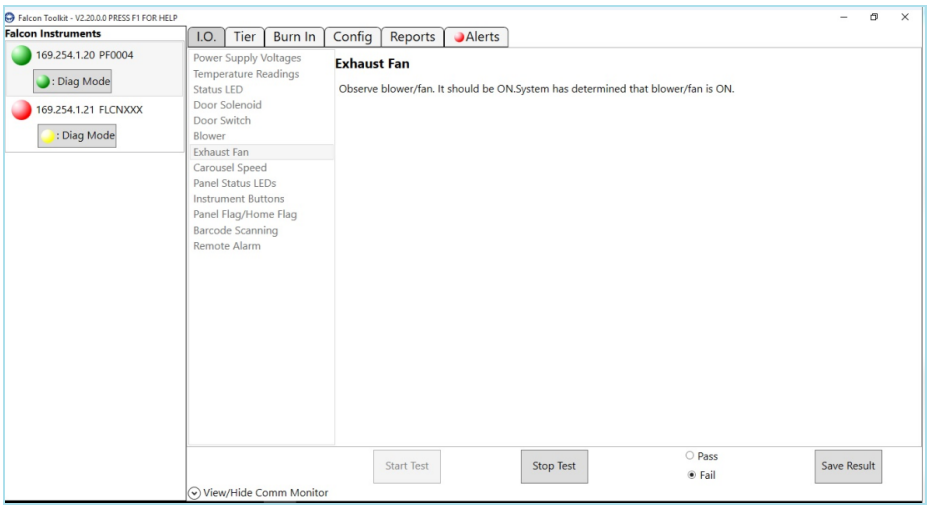
6.2.14 Exhaust Fan

Note: DF85 on the Phoenix M50 monitors the RPM of the exhaust fan and its operations.

Procedure

1. Start the **Falcon Toolkit** and allow it to connect to the instrument. Select the **IO** tab.
2. Go to **Exhaust Fan** > **Start Test.**

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential



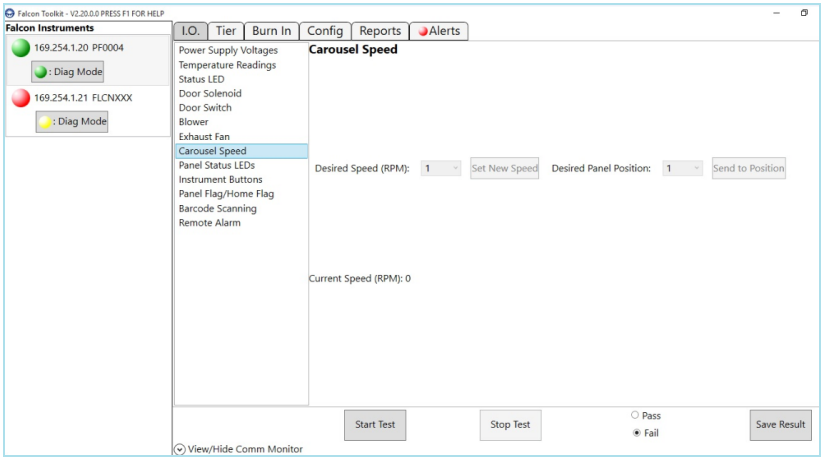
3. Read the on-screen instructions. The test cycles the exhaust fan on and off. The exhaust fan state must be verified. This is a timed test and exits when complete.

6.2.15 Carousel Speed

Note: The carousel speed can be varied and confirmed in this test.

Procedure

1. Start the **Falcon Toolkit** and allow it to connect to the instrument. Select the **IO** tab.
2. Select **Carousel Speed**. Enter the **Desired Speed**. ±5% of the target RPM is considered passing. Press **Set New Speed** > **Start Test**. The door remains locked during the test.



.

3. The carousel rotates and the current speed is indicated. Press **Stop Test** to halt the carousel.

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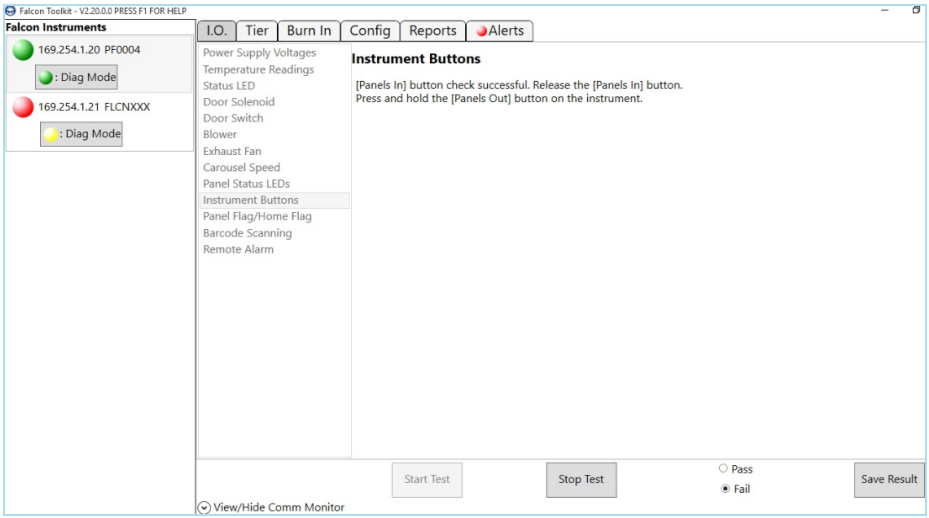
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

6.2.16 Instrument Buttons

Note: This test validates the function of **In/Out** buttons on the instrument status indicator.

Procedure

1. Start the **Falcon Toolkit** and allow it to connect to the instrument. Navigate to **IO** > **Instrument Buttons**.
2. Select **Start Test** and follow the on-screen instructions.
3. Press **Panel In**, **Panel Out** as directed on the screen. If both the conditions function correctly, the test result is a **Pass**.

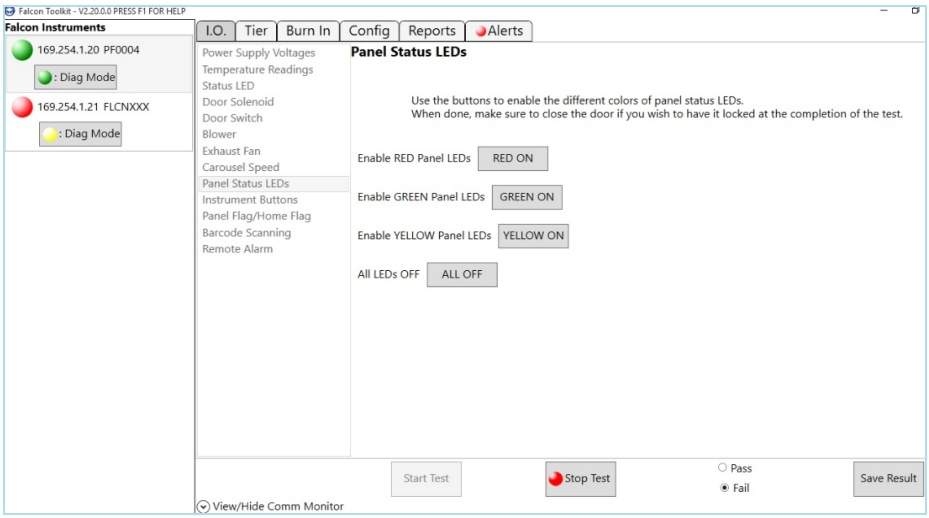


6.2.17 Panel Status LEDs

Procedure

1. Start the **Falcon Toolkit** and allow it to connect to the instrument. Select the **IO** tab.
2. Navigate to **Panel Status LEDs** > **Start Test**.

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential

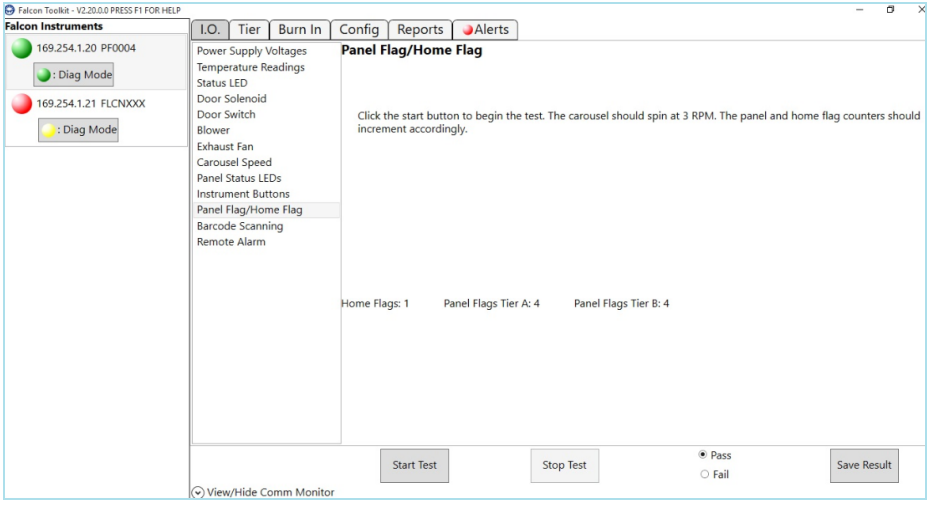


3. The door unlocks. Select the desired LED color test and examine the results. Press **Stop Test** to halt the test and lock the door.

6.2.18 Panel and Home Flag

Procedure

1. Start the **Falcon Toolkit** and allow it to connect to the instrument. Select the **IO** tab.
2. Go to **Panel Flag/Home Flag** > **Start Test**.



3. The carousel rotates and the **Panel Flag/Home Flag** counts increase. Press **Stop Test** to halt the carousel.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

6.2.19 SQL Server

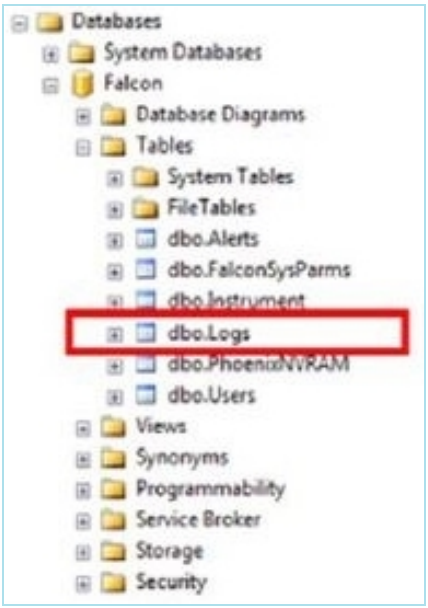
The Microsoft SQL Server management studio can be used to view the Phoenix M50 database. This program allows historical querying of the DF85 fault isolation data stored in the SQL database.

Task	Instructions
From the system software	1. Navigate to **Maintenance** > **FieldService** > **View Directory**. 2. Navigate to **D** drive > **Short Cuts** folder. Select **SQL-Shortcut** icon.
From the EWF Off screen	1. From the **Task Manager** menu, select **File > NewTask**. Type **Explorer** in the text box. 2. Navigate to **D** drive and select **SQL-Shortcut** icon.

Accessing system logs

Note: System logs can also be accessed by navigating to **D:/Logs** in Windows Explorer.

The left side of the SQL Server program contains a tree view. Go to **Databases > Falcon > Tables > dbo.logs**. Run standard SQL queries on the database table from here.



Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

MS SQL query

The basic SQL query is a table grid made up of columns (data elements to be tracked) and rows (data sets containing the data elements).

Statement	Description
SELECT	All queries will begin with the **SELECT** statement. This is followed by either a **comma separated list of columns** (within the table) to display, or a ***** indicating all columns.
FROM	Next comes the FROM statement followed by the name of the table being searched.
WHERE	This is an optional statement which is used to add search criteria. The WHERE statements are made up of a column names, an operator, and a value to search for. • **Standard Operators** - =, <' >' <>' <=, >=, BETWEEN, LIKE • **Wild Card –** Standard SQL Wild Card is the **%** sign • **AND/OR –** Logical operators used with the WHERE statement when searching multiple columns.
ORDER BY	Set sort criteria for specific columns. • **ASC/DESC** – Used with ORDER BY to set Ascending or Descending sort order.

Examples of MSL SQL Queries

Query	Description
List All DF85 Data Points	SELECT * FROM Logs WHERE Category Code LIKE '%DF85Datapoint%' ORDER BY Id DESC This query will retrieve all of the individually measured data points collected at each DF85 cycle. Each row is an individual data point. The text in the MessageID column will indicate which data point it is and which machine it came from.
List All DF85 Data Points for a Specific Instrument	SELECT * FROM Logs WHERE Category Code LIKE '%DF85%' and MessageID LIKE '%169.254.1.20%' ORDER BY Id DESC Same as above query, except the IP address is checked form the MessageID Column. Generally 169.254.1.20 for AB and 169.254.1.21 for CD.
Selecting Specific Data Points	SELECT * FROM Logs WHERE MessageID LIKE '%Tier 5V_MON (MCU ADC0_2)%' and MessageID like '%169.254.1.21%' ORDER BY Id DESC

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Query	Description
	This query finds results based on a specific instrument (MessageID) and a specific MessageID; in this case Tier 5V_MON(MCU ADO_2).

Saving query data to CSV file

Select **save results** to save results to a CSV file. The location of the saved file can be set from the **save** dialog.

DF85 data from the Falcon Toolkit

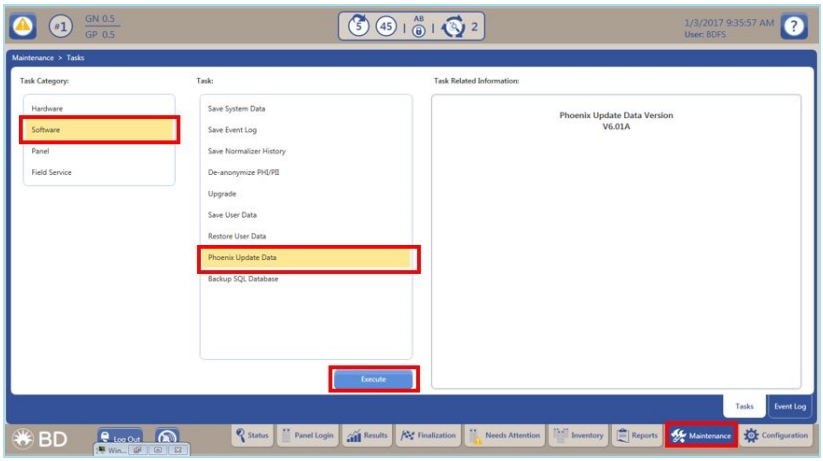
The most recent set of DF85 data is at the bottom of the **Alert** tab.

6.3 Phoenix Update Data Upgrade

Note:

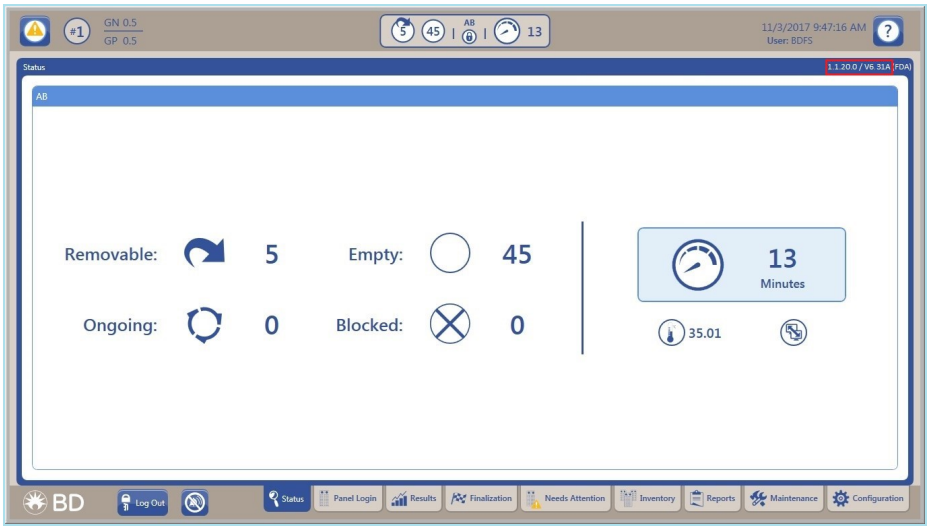
- For PUD media creation:
  - Download the latest available Phoenix PUD software release from the EFT site.
  - Extract folders from the PUD V6.71A.zip (or greater) to your BD issued laptop.
  - Copy the file folders to the root of a blank FAT32 formatted USB key.

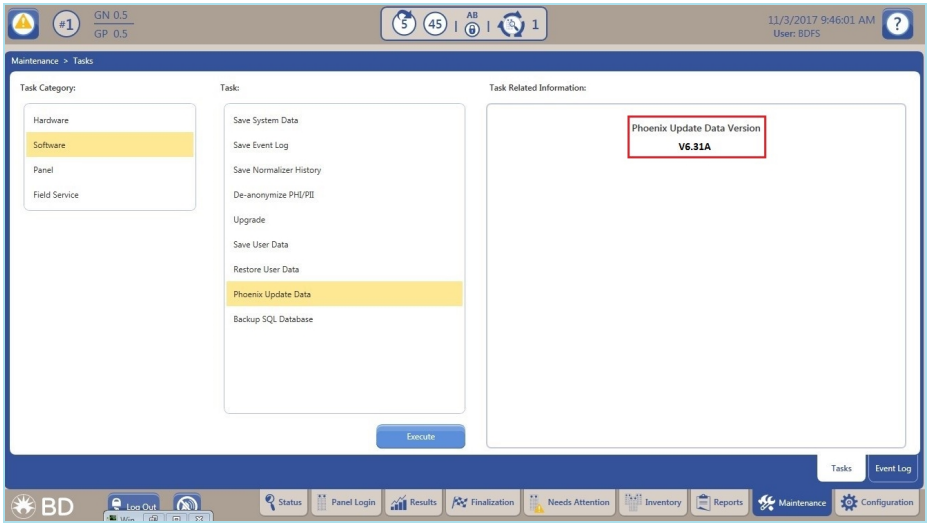
1. Log in with the user name **BDFS** (BD Field Service).
2. Place the USB key containing the Phoenix PUD software (Part # 448047-US/441107-EXUS) into the USB drive of the instrument or the AIO tablet.
3. From the **Maintenance** tab, navigate to **Software > Phoenix Update Data** and click **Execute**.



Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

4. When selected, the system displays **Are you sure? The Instrument will Reboot after this action is completed**. Select **OK**.
5. The instrument reboots. Install the files.
6. After the upgrade is complete, verify that the new PUD version is properly displayed on the **Status** screen. Check the PUD version by navigating to **Maintenance** > **Software > Phoenix Update Data**.





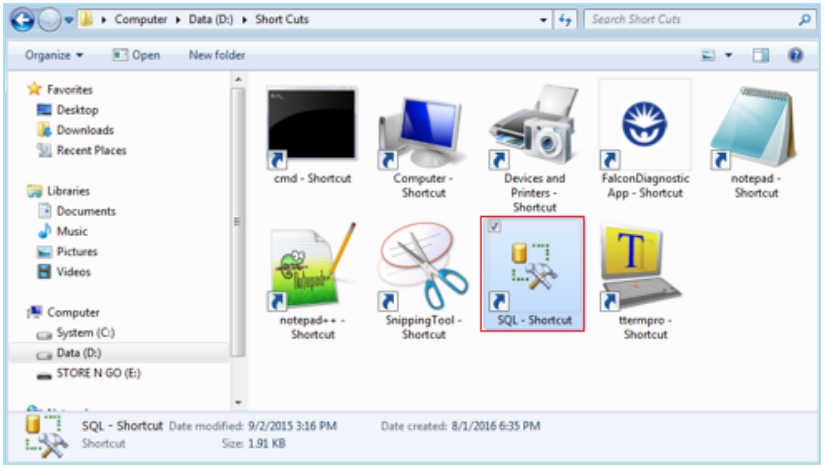
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

6.4 Backup and Restore SQL Database

Backup database

Note: Database backup is required only if the system has been used clinically. If the system is a new install and the OS image is being updated as part of the install, database backup is not required. Prior to the upgrade, save a backup copy of SQL system databases, **Falcon** and **SecurityFramework** to a USB key. The backup process is the same for both the databases.

1. Disconnect the instrument from the AIO.
2. If the system is connected to Epicenter, disconnect the EpiCenter cable.
3. Place the blank USB key in an available USB port.
4. Log in with the user name **BDFS** (BD Field Service).
5. Navigate to **Maintenance** > **Tasks** > **Field Service Tasks** > **View Directory** > **Execute**.
6. Open Windows **File Explorer**, navigate to the USB drive and note the drive letter. Create the **DBBackups** folder on the USB drive.
7. Navigate to **D:\Short Cuts**. Double-click the **SQL - Shortcut** icon.



8. The Microsoft SQL Management Studio opens after several minutes. Click **Connect**.

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
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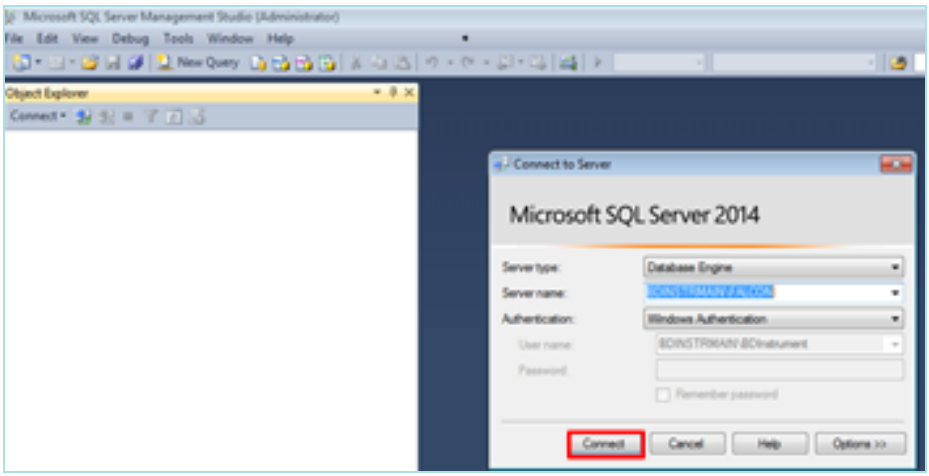
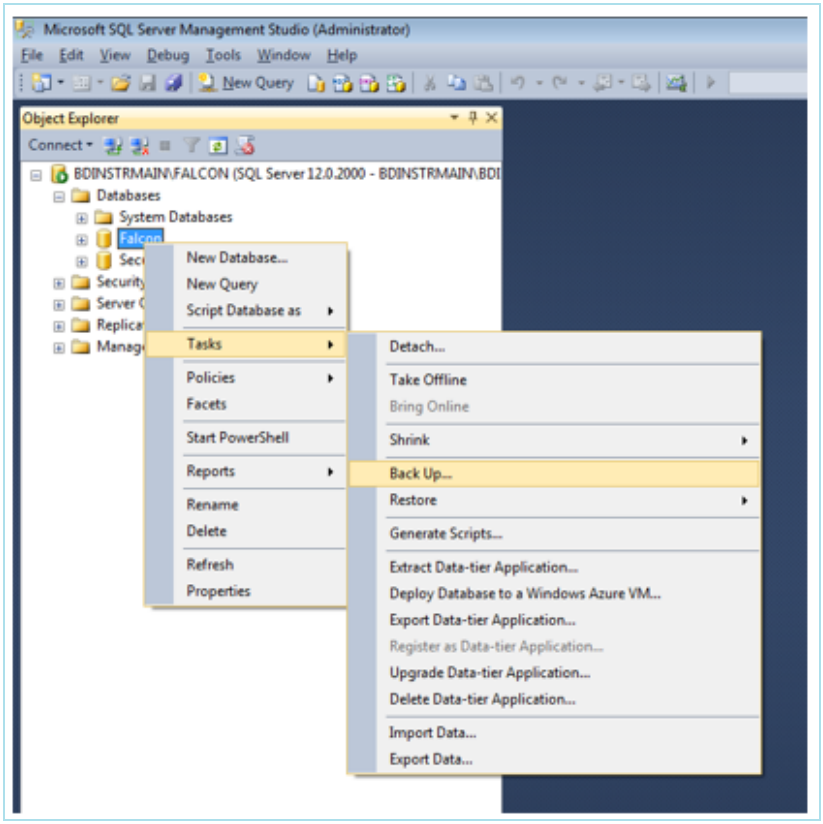
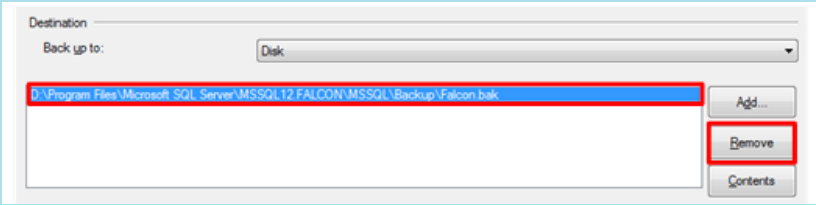


9. In the **Object Explorer** pane on the left, click on the **+** sign to expand the Databases entry.
10. Right-click **Falcon** > **Tasks** > **Back Up**... to open the **Backup Databases** window.

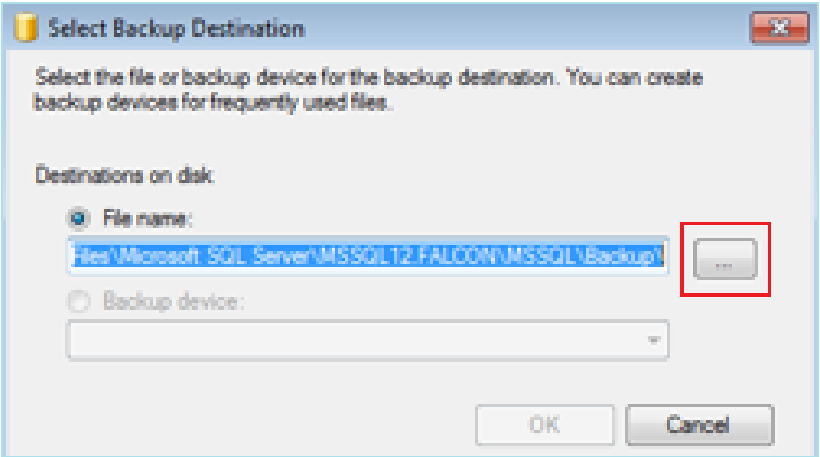


11. If there are entries in the **Destination** box, and the **Remove** button is not grayed out, click **Remove** to remove all entries until the box is blank and the **Remove** button is grayed out.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



12. Click **Add**. The **Select Backup Destination** window is displayed.



13. Click the browse button (…). The **Locate Database Files** window is displayed. Navigate to the **DBBackup** folder on the USB key. In the **File name** field enter **Falcon**.**BAK**, then select **OK**.

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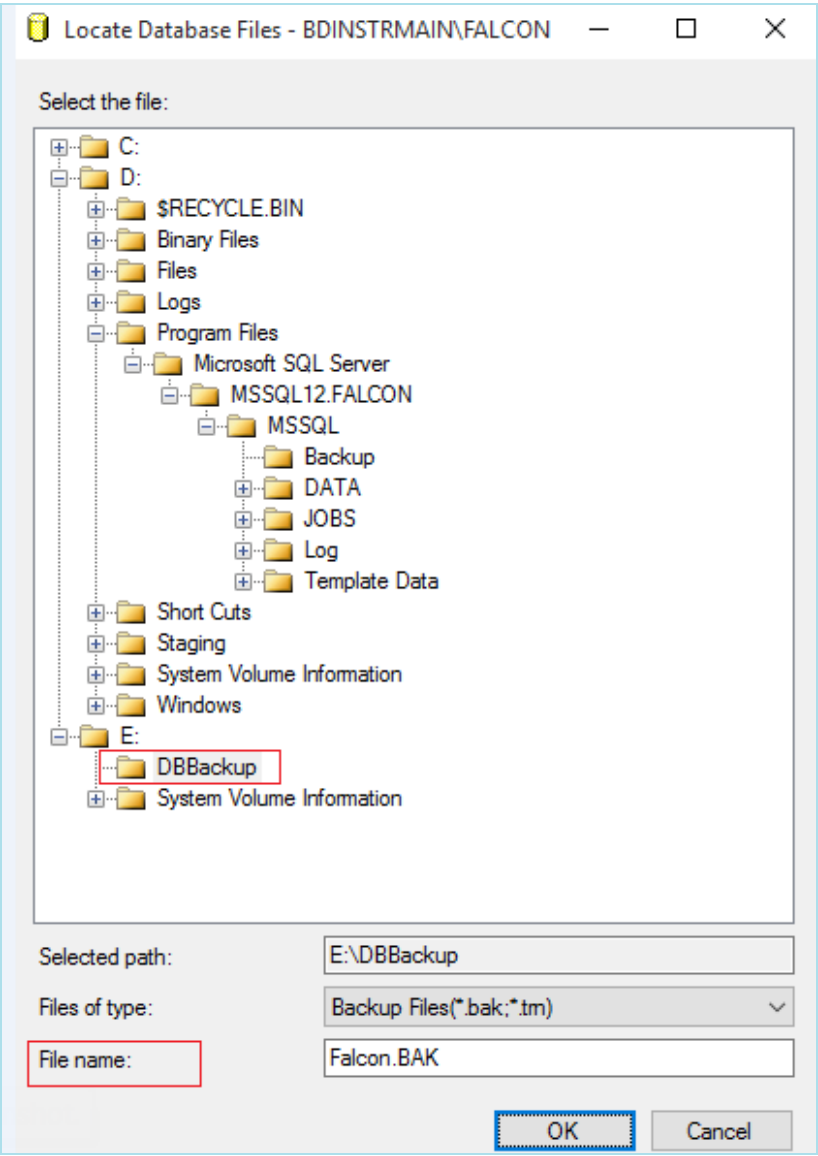
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



14. The **Select Backup Destination** window is displayed. In the **File name** field, confirm the destination path and name. Click **OK**.

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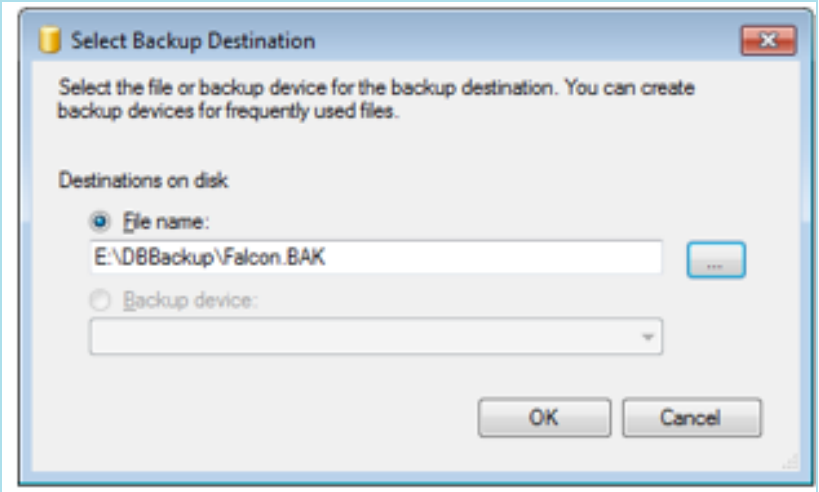
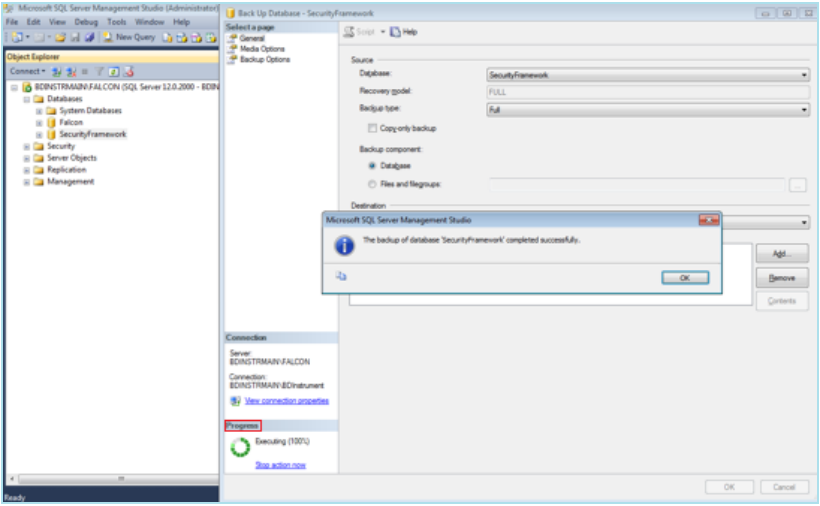
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



15. The **Backup Database - Falcon** screen is displayed. Click **OK**. When the Microsoft SQL Server Management Studio message appears, the backup is complete. Click **OK**.



16. Repeat **steps 9 - 15**, substituting **SecurityFramework** in place of Falcon to create the file **SecurityFramework.BAK**.

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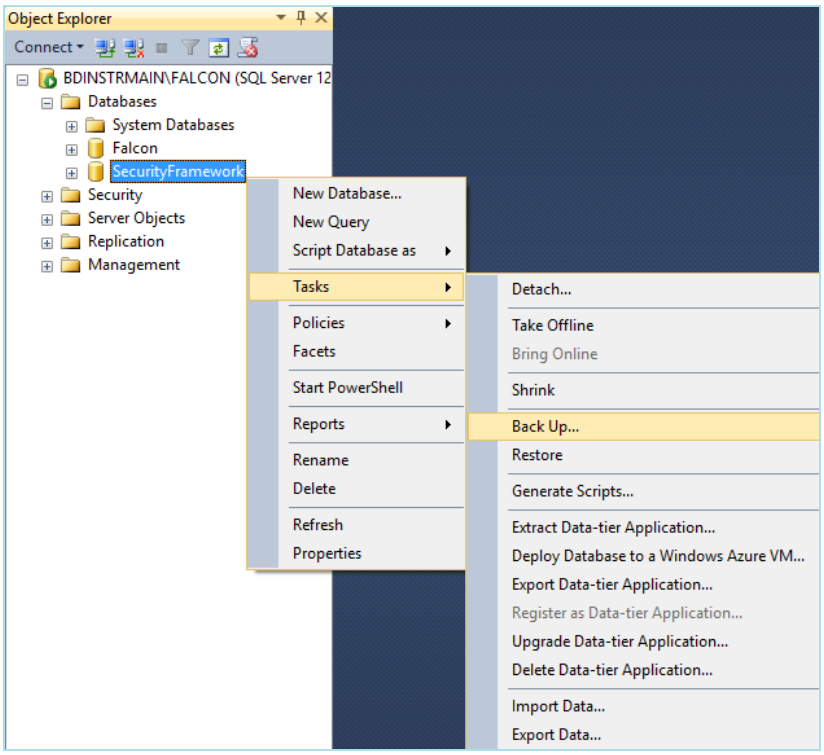
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



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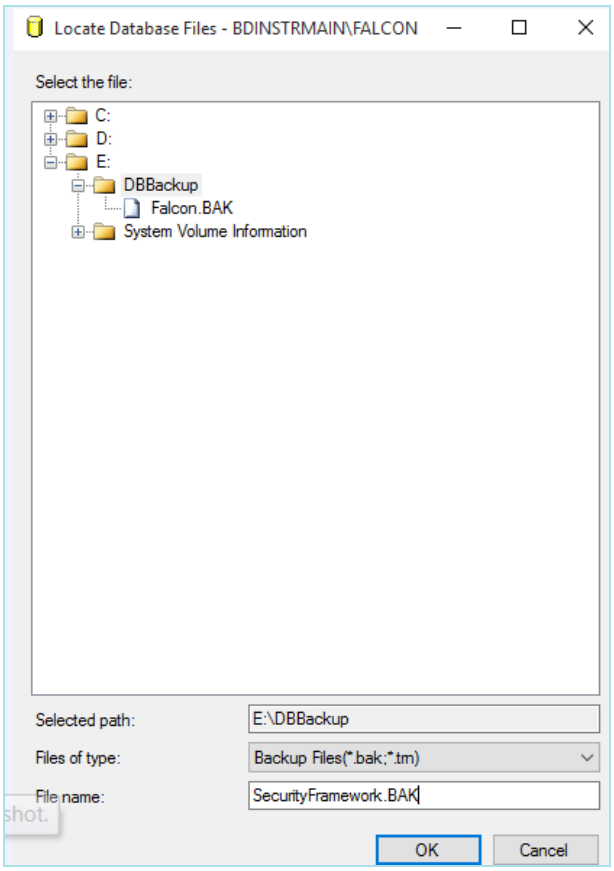
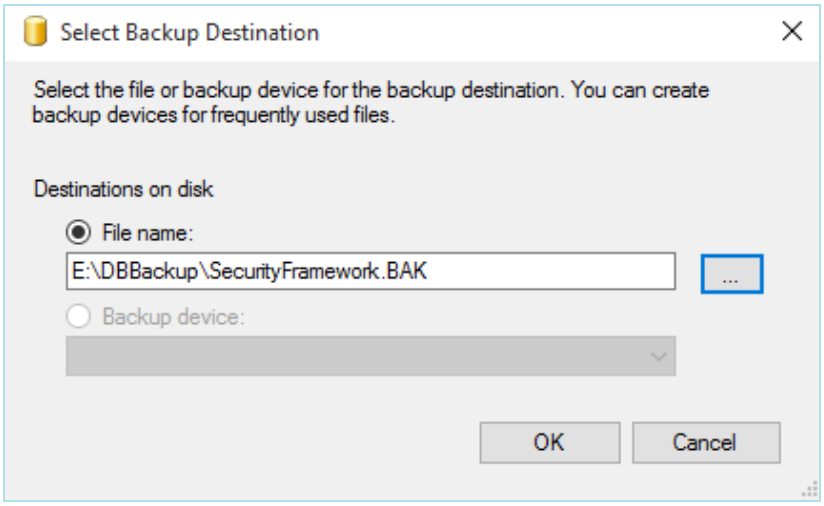




17. Close Microsoft SQL Management Studio.
18. If the system has been used clinically, proceed to the **Clinical File Backup** section. If not, close **File Explorer** to return to the system software.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

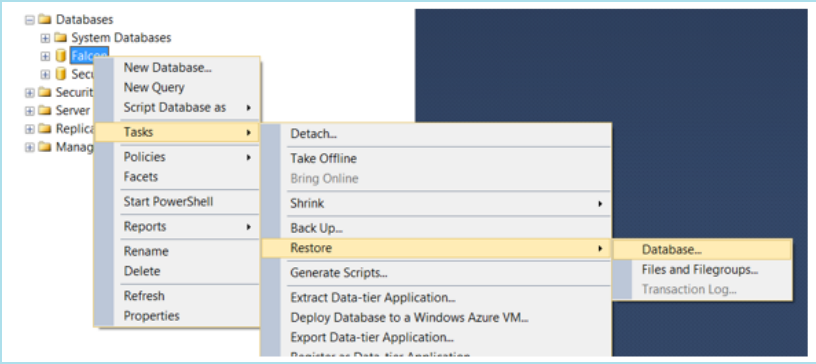
Clinical File Backup

Note: The Normalizer History and Binary File backup are only required if the system has been used clinically.

1. In File Explorer navigate to **D:\Files**.
2. Copy the **NormHist.csv** file to the USB drive.
3. Navigate to **D:\Binary Files.**
4. Copy the **AB** and **CD** folders to the USB drive.
5. Close **File Explorer** to return to the system software.

Restore Database

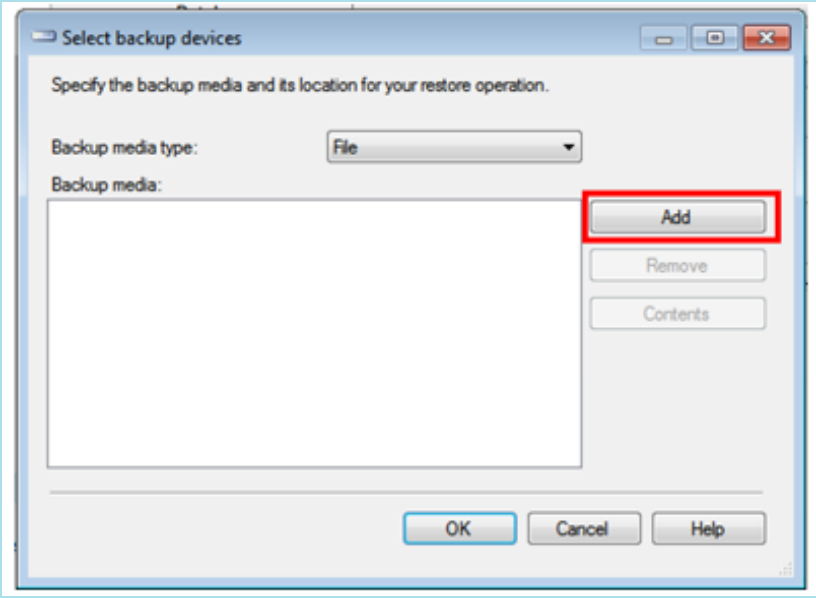
1. Log in with the user name **BDFS** (BD Field Service).
2. Navigate to **Maintenance** > **Tasks** > **Field Service** > **Exit Application** > **Execute**.
3. Use **File Explorer** to navigate to **D:\Short Cuts** and double click **SQL shortcut.**
4. In the **Microsoft SQL Management Studio** connect to Server window and select **Connect**.
5. Expand **Database** in **Object Explorer**.
6. Navigate to **Falcon** > **Tasks** > **Restore** > **Database...**



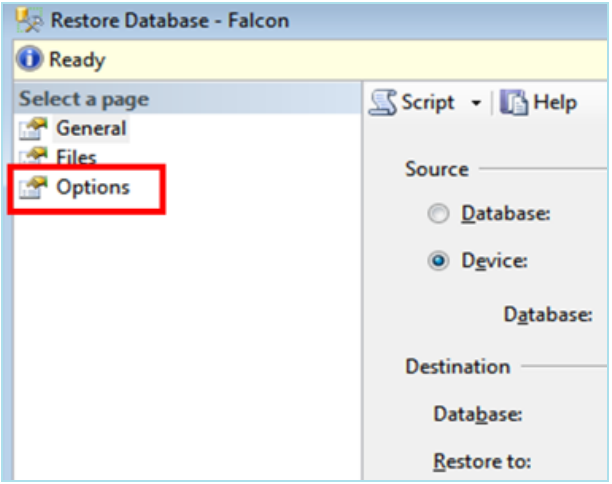
7. The **Restore Database** screen is displayed. In the **Source** group box, select **Device** and click **...** (browse button).

8. From the **Select backup devices** window click **Add**.

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential



9. From the **Locate Backup File** window navigate to the USB drive and the **Falcon.Bak** file in the **DBBackup** folder. Select this file and press **OK**.
10. In the **Select backup devices** window confirm selection and press **OK**.
11. In the **Restore Database** window select **Options**.



12. On the **Restore Options** screen, select **Overwrite the existing database (WITH REPLACE)**.

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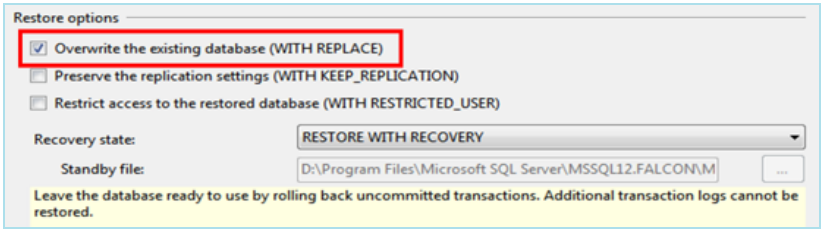
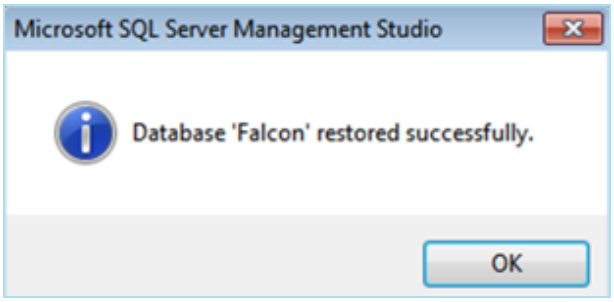
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



13. Click **OK** and wait for the operation to complete. A window displays the Database Falcon restore success message.



14. To restore the SecurityFramework database, repeat **steps 4 - 11** replacing references to **Falcon** with **SecurityFramework**.
15. Exit Microsoft SQL Management Studio.
16. If restoring backup clinical files, proceed to **Restore Clinical Files**. If clinical file are not being restored, restart the AIO by selecting the **Windows Start Menu** > **Power Icon** > **Restart**.

Restore Clinical Files

> **Note:** Normalizer History and Binary File restoration are only required if backup files were captured.

1. In **File Explorer** navigate to the USB drive containing the backup files.
2. Copy the **NormHist.csv** file to **D:\Files**.
3. Copy the contents of the AB and CD folders to **D:\Binary Files\AB** and **D:\Binary Files\CD**, respectively.
4. Restart the AIO by selecting the **Windows Start Menu** > **Power Icon** > **Restart.**

6.5 Imaging Procedures

This section provides instructions to deploy a Phoenix M50 image onto the AIO tablet. Refer to the M50 customer release notes for the latest updates.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

6.5.1 Applying ≥3.25.0.0 Windows 10 Operating System Image

The installation procedure uses the boot menu to boot to the system from the USB key and deploy the image. The startup menu is later used to restore booting to the M50 application.

Warning:

- Installation of M50 application software version ≥2.20.0.0 requires upgrade of the operating system to Windows 10 version ≥3.20.0.0. Downgrading of the application software is not supported. It is not recommended that users continue to use prior versions of the application. This version incorporates multiple improvements to the Phoenix M50 application that address many of the problems reported to BD.
- If there are ongoing panels in the instrument(s) the instrument cable(s) should be disconnected before the process is started and must remain disconnected until the entire process has been completed.
- Prior instrument data will be stored on the root of the Image Key USB in a folder titled TPO####### (where # equals the previously upgraded AIO serial number). Ensure sufficient space availability on USB.

Materials required

Name	SAP	Remarks
M50 Image Key	443570	V 3.25.0.0 / V 1.2.0.0 or the latest available version
USB Keyboard and Mouse	N/A	N/A
M50 User Software*	N/A	Version 1.1.110.0
Phoenix Update Data*	441107	Version ≥7.01 A

*required if upgrade is required

Minimum Phoenix M50 and EpiCenter software versions required to be installed on the instrument and EpiCenter

Minimum version	
User Interface Version	1.1.110.0
Image Version	2.0.9.1 / 2.0.11.0
EpiCenter	7.22A
PUD	≥ 7.01 A

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

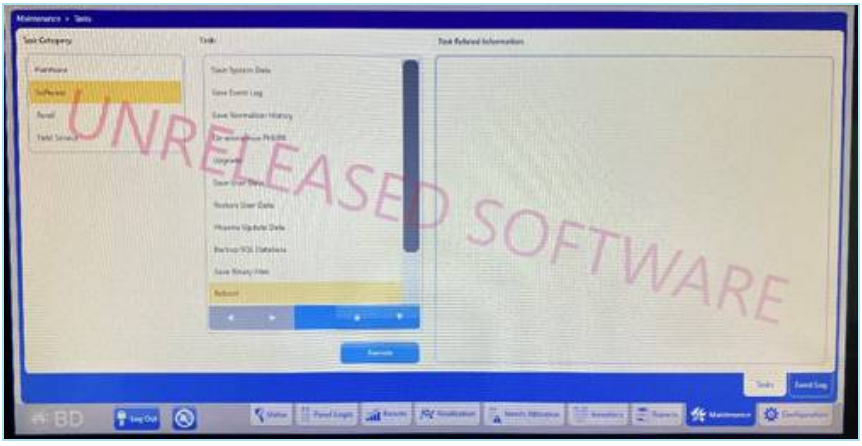
Note: User software V3.25.0.0 includes PUD V7.01A. If you are using the M50 Image Key on an instrument connected to EpiCenter, disconnect all the instruments from EpiCenter until both the EpiCenter PUD and all the instrument PUDs have been updated to PUD V7.01A.

Procedure:

This procedure provides instructions on how to apply the V3.25.0.0 Windows 10 Operating System Image using the WinPE environment.

Note: This process should take approximately 30 minutes to 1 hour to complete.

1. Disconnect the USB A/B instrument cables from the AIO.
2. Insert the M50 Image Version ≥3.25.0.0 USB key into the AIO. This can be obtained from the software repository.
3. Connect a USB keyboard to the AIO.
4. Select **Log In**.
5. Log in as BDFS. Refer to "Password Generator Utility" on page 96 if necessary.
6. Navigate to the **Maintenance** tab > **Software** > **Reboot**.
7. Select **Execute**.



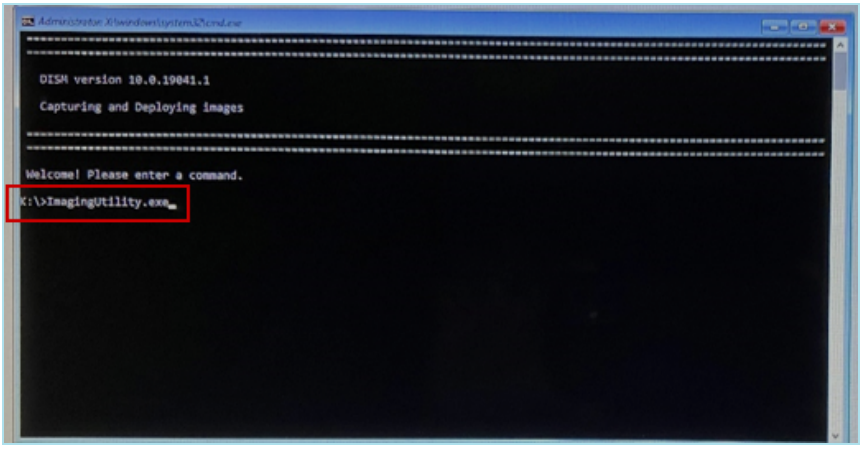
8. When the Maintenance – Informational (M117) prompt appears, select **OK** to exit application.
9. Ensure the USB keyboard is connected to the AIO.
10. When the AIO starts up, press **F12** on the keyboard when the black screen with the header American Megatrends and white letters appears.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

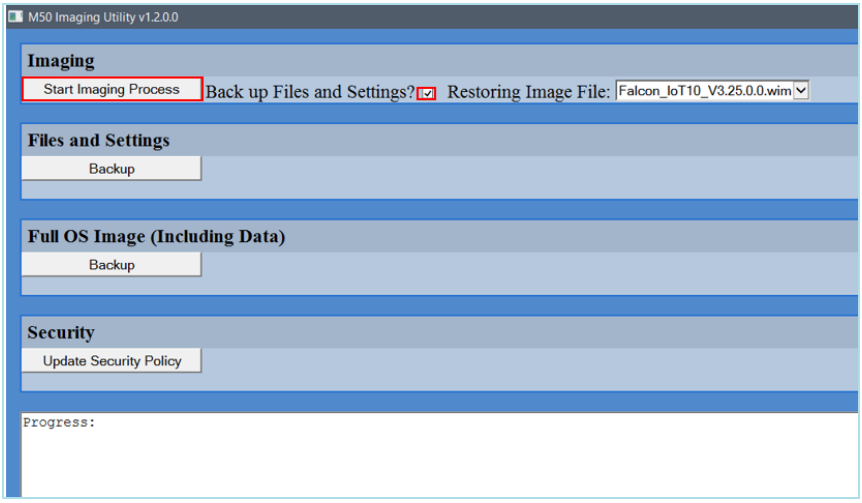
11. A box displays the title Please select boot device:

12. Use the down arrow key on the keyboard to highlight the UEFI boot device for the imaging key. **E.g., UEFI KingstonDataTraveler the name of the SW key manufacturer may vary**.
13. Press Enter on the keyboard to boot from this device. This may take 1 – 2 minutes.
14. At the command line type **ImagingUtility.exe**.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



15. Press **Enter**.
16. The OS loads from the USB Device and allows the AIO to boot into the WinPE environment. This takes 1 – 2 minutes.
17. Ensure the **Back up Files and Settings?** checkbox is selected, then select **Start Imaging Process** to start the imaging process.

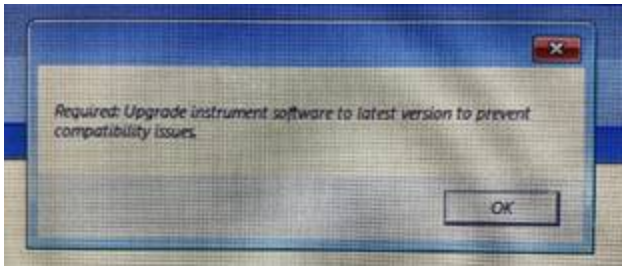


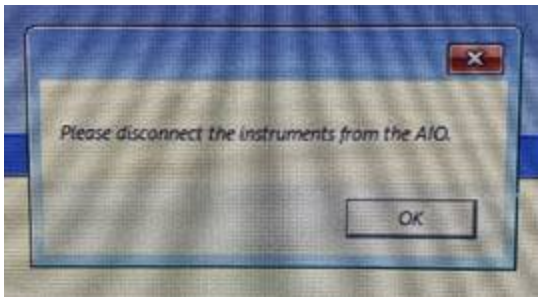
18. Follow the instructions on the prompts then select **OK** and/or **YES** to continue imaging procedure.

Note:

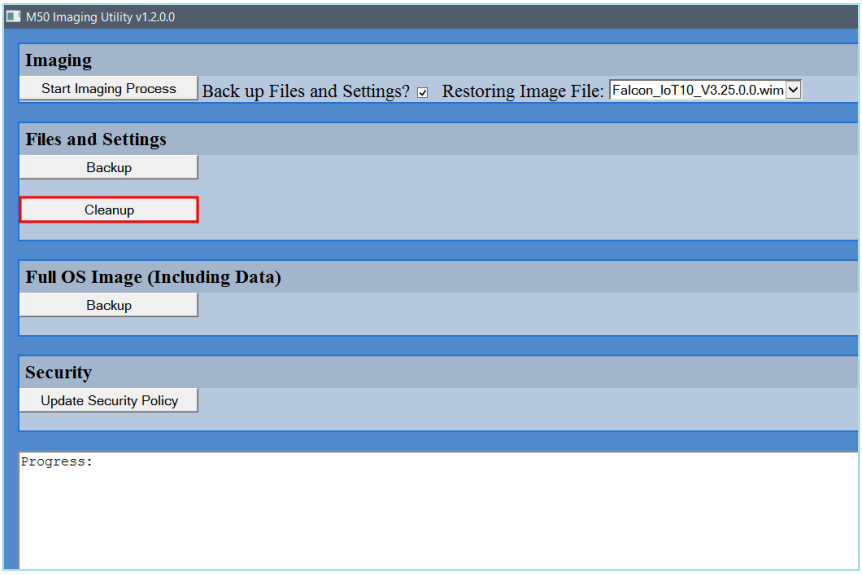
- Refer to "Imaging Procedure Troubleshooting" on page 251 to address any on screen prompts.
- Some prompts may not appear depending on if the AIO is a clean install or if the AIO is being upgraded. Examples of some prompts are shown below.

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential





Warning: If the prompt **Please run the cleanup process before continues with the re-imaging process** appears, select **Cleanup**. When complete ensure the **Back up Files and Settings** checkbox is selected. Then select **Start Imaging Process** to continue the imaging process.



19. A series of backups occur before image is applied. This takes 30 minutes to 1 hour.

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
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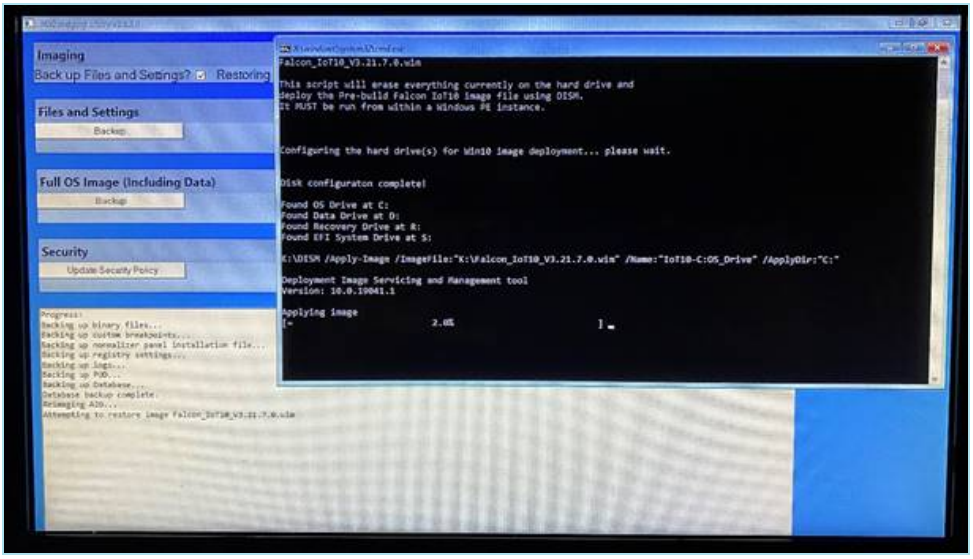
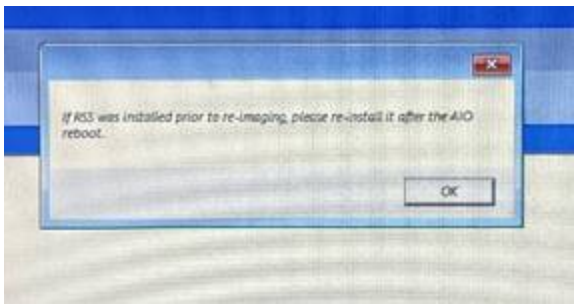
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential

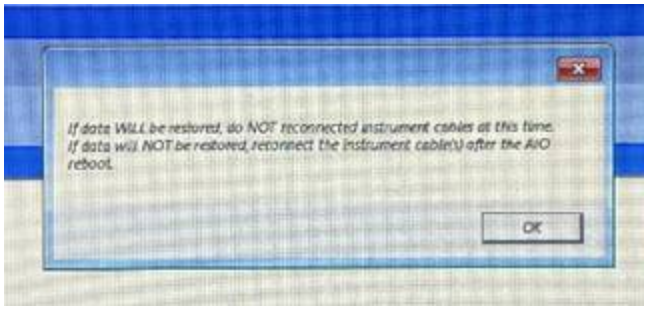


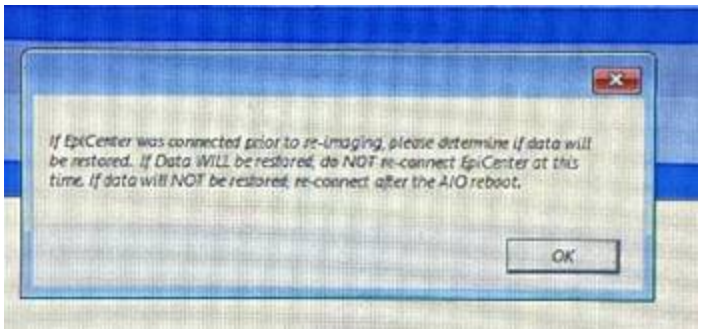
20. The AIO will restart back to the WINPE environment, then follow the instructions on the prompts. Then select **OK** and/or **YES** to continue.

Note:

- Refer to "Imaging Procedure Troubleshooting" on page 251 to address any on screen prompts.
- Some prompts may not appear depending on if the AIO is a clean install or if the AIO is being upgraded. Examples of some prompts are shown below.

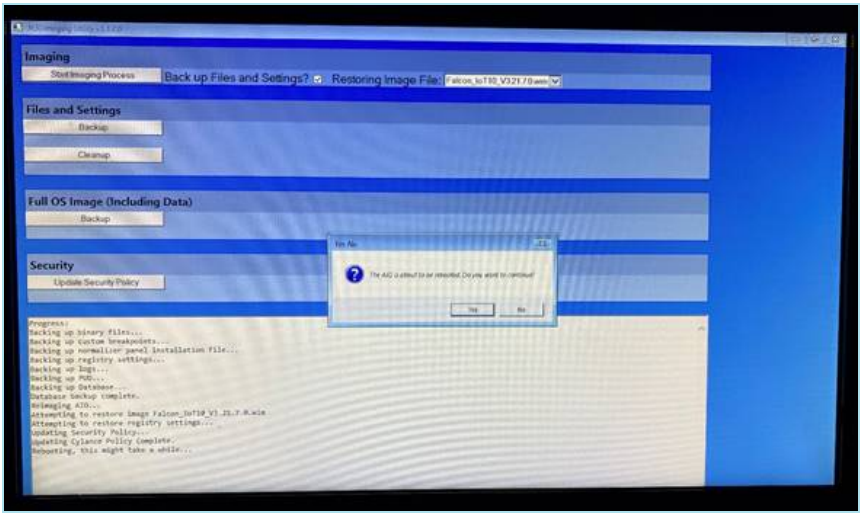






Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

21. Press **YES** at the prompt to reboot the AIO into the M50 Application.



22. At the command line type **press any key to continue** or wait for the AIO to reboot to complete imaging procedure.

23. Perform final upgrade tasks:
    a. Confirm date and time are correct.
    b. Set up barcode scanner and the printer. Refer to "Installation Procedure" on page 51.
    c. Remove Imaging Utility USB.
    d. Remove USB Keyboard.
    e. Reconnect A/B instrument connection cables.
    f. Confirm the connection is successful and system is restored as expected.
    g. Restore the connection to Epicenter and confirm communication is successful.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

h. Document Upgrade by updating the M50 system software attributes in ServiceMax:
   i. M50 system software
   ii. M50 user software
   iii. Phoenix PUD version

6.5.1.1 Imaging Procedure Troubleshooting

This section details potential on-screen prompt errors messages that may occur during the imaging procedure. Based on the error message and the cause, potential fixes can be performed to resolve the issue.

Message: Please run the cleanup process before continuing with the re-imaging process.

Cause: Clean-up has not been performed since last imaging backup.

Fix: Run Imaging clean-up.

Message: Unknown hardware failure.

Cause: Unknown script failure.

Fix: Run utility again.

Message: The PUD version needs to be upgraded to at least V7.01A in order to continue. Please upgrade the PUD before continuing.

Cause: Application PUD is too old on this Windows 7 based OS.

Fix: Upgrade PUD on the system before imaging or disable backup procedure during imaging.

Message: The Falcon Application and/or the image version does not meet the requirements. You need to upgrade to Falcon Application 1.1.110.0 and image 2.0.9.1.

Cause: Application version is too old on this Windows 7 based OS.

Fix: Upgrade M50 application to the most recent version on Windows 7 or disable the backup during the imaging.

Message: Please use a writeable storage device with at least 23GB of free space.

Cause: The USB drive may be read only or have less than 23GB of space. Imaging Utility may not be able to identify the correct drive.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Fix: Make sure USB drive is writeable and has enough space for backup procedures. Disable backup procedures during imaging procedure.

Message: The binary files could not be backed up. Please back them up using the command (XCOPY ""D:\Binary Files*.*"" ""K:\%computername%\Binary Files\"" /E /I /K /Q /S /V /Y) before continuing. Would you like to continue imaging process?

Cause: Files may not exist or are not accessible.

Fix: Manually perform action before moving forward with imaging procedure or click continue imaging process to continue.

Message: The custom breakpoints file could not be backed up. Please back it up using the command (XCOPY D:\files\MergeRpt.xml K:\%computername%\files\ /I /K /Q /V /Y) before continuing. Would you like to continue imaging process?

Cause: Breakpoint files may have not been created at any time.

Fix: Manually backup break point report file before continuing on or click continue imaging process to continue.

Message: The Normalizer Panel Installation file could not be backed up. Please back it up using the command (XCOPY D:\files\NormHist.csv K:\%computername%\files\ /I /K /Q /V /Y) before continuing. Would you like to continue imaging process?

Cause: Instrument normalizers have not been run.

Fix: Run normalization on instrument and then continue, or click through the notice and continue on, or Run normalizer after installation.

Message: The FDA Mode value could not be backed up. Please ensure that the AIO is in the proper operating mode after the upgrade process is complete.

Cause: The FDA Registry key is missing from the registry and could not be backed up.

Fix: Click through the notice and assume the instrument was set to NFDA mode during restoring options.

Message: The registry settings could not be backed up. Please ensure that the operating mode and language settings are correct after the upgrade process is complete.

Cause: The Imaging utility failed to identify the regional language and did not backup the FDA mode.

Fix: Restore the device to the correct language and FDA mode during restoration of the device.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Message: The log files could not be backed up. Please back them up using the command (XCOPY D:\Logs*.* K:\%computername%\Logs\ /E /I /K /Q /S /V /Y) before continuing. Would you like to continue imaging process?

Cause: Log files do not exist.

Fix: Click through the message.

Message: The PUD could not be backed up properly. Please contact BD. Would you like to continue imaging process?

Cause: Missing PUD files.

Fix: Record current PUD files version of the device and run PUD installation if needed to recover files or click through the notice.

Message: Failed to back up Database. Would you like to continue imaging process?

Cause: Database files are missing or inaccessible.

Fix: Attempt to copy files manually before restoring image. Attempt to re-run backup procedure.

Message: Operating System re-imaging failed. The initial image will now be restored, if backup was taken.

Cause: Imaging failed.

Fix: Preserve and successful backups created using cleanup operation. Disable backup procedure and attempt to re-apply image. Rename serial numbered folder to MINWINPC and create a file named BComplete.txt. Continue to data restore activities.

Message: The registry settings could not be restored. Restore this setting manually.

Cause: Registry failed backup procedure during imaging.

Fix: Manually reset the FDA mode on the device.

Message: The binary files could not be restored. Please manually restore these files to the AIO after reboot.

Cause: Utility failed to backup files during imaging.

Fix: Follow instructions and click through notification.

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Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Message: The Normalizer Panel Installation file could not be restored. Please re-run the Normalizer Panel operation after the final reboot.

Cause: Normalizer data was not backed up.

Fix: Follow instructions and click through notification.

Message: The custom breakpoint file could not be restored. Please manually copy the custom breakpoint file to the AIO (D:\files\MergeRpt.xml) after the final reboot.

Cause: Custom Break Point file report was not created during back up.

Fix: Follow instructions and click through notification.

Message: The log files could not be restored. Please manually restore these files to the AIO after reboot.

Cause: Log Files were not created during backup.

Fix: Follow instructions and click through notification.

Message: The PUD could not be restored properly. Please contact BD.

Cause: PUD files missing.

Fix: Follow instructions and click through notification.

Message: Date or Time could not be set properly. Please contact BD.

Cause: Possible script failure.

Fix: Reset date and time during restore.

Message: The Operating System Image could not be backed up. Please contact BD.

Cause: Image backup failure

Fix: Re-run backup procedure.

Message: File permissions update failed. Please contact BD.

Cause: Security update failure.

Fix: Re-run process.

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Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

6.5.2 Imaging Utility Functions

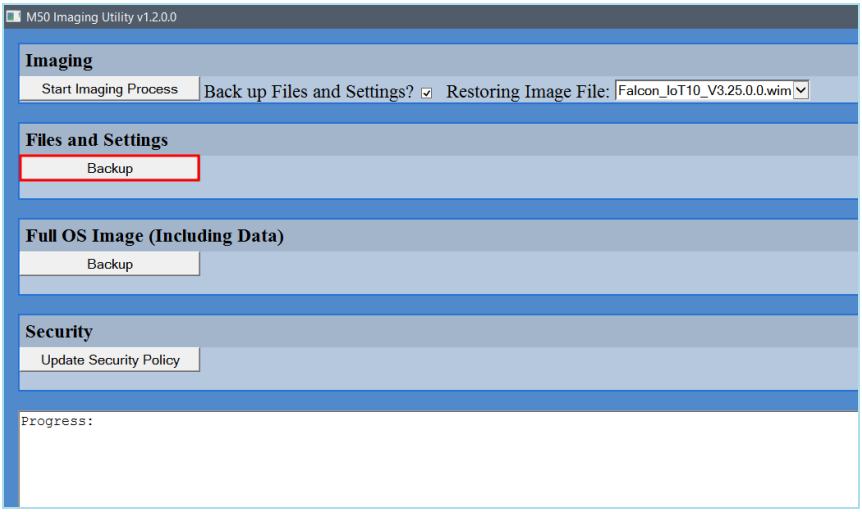
This section provides information about the Imaging Utility functions in v3.25.0.0 Windows 10 Operating System Image.

6.5.2.1 Imaging Utility WinPE – M50 Application Data Backup Files and Settings

This allows the collection of data from the client PC to analyze at a later time or to restore data at a later time.

How to Backup Files and Settings:

1. Click the **Backup** button found in the **Files and Setting**s area. This can take at least 10 minutes to complete depending on the size of data found on the client machine.
2. Once this has completed the Restore option will appear ONLY in the Windows 10 environment.
3. After completing the task, clean these files to apply new images.



6.5.2.2 Imaging Utility WinPE – M50 Application Data Cleanup Files

This allows the Imaging Utility reset internal status in order to perform additional imaging procedures. This is done before applying a new image with or without data backup. This will also preserve the existing data collected for later use.

How to Backup Cleanup Files:

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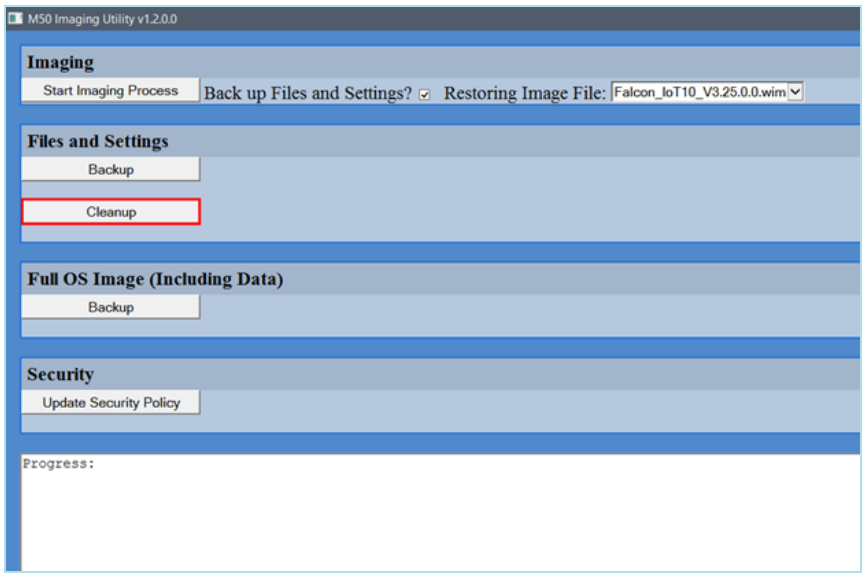
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

1. Click the **Cleanup** button found in the Files and Settings area.
2. Once this has completed, the **Cleanup** button will disappear and a folder with the AIO Serial Number will be created on the USB device.

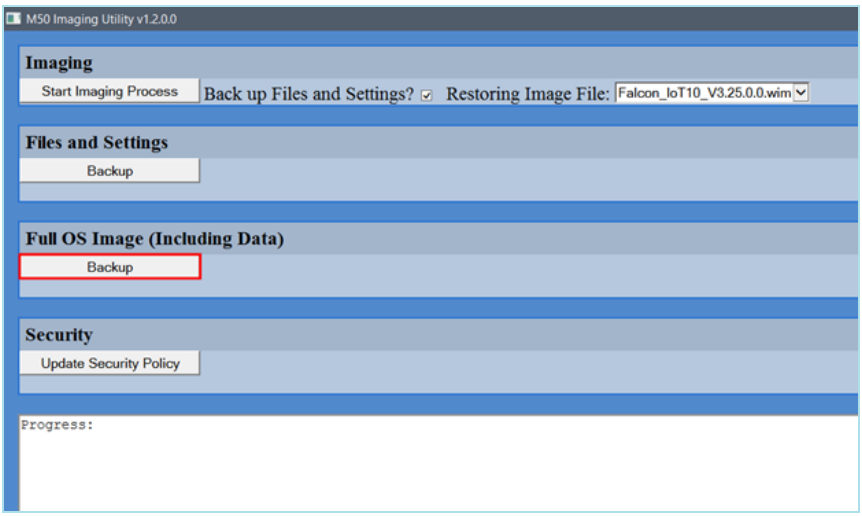


6.5.2.3 Imaging Utility WinPE - Backup OS and Data Image

How to Backup OS and Data Image:

1. Click the **Backup** button found in the **Full OS Image (Including Data)** area. This can take one to three hours.
2. Once this has completed, the restore option will appear. After completing this task, the image will be available in the case of imaging failure. In this scenario, the utility will attempt to restore this image upon imaging failure.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



6.5.2.4 Imaging Utility WinPE- OS Restore Procedure

How to Restore the OS:

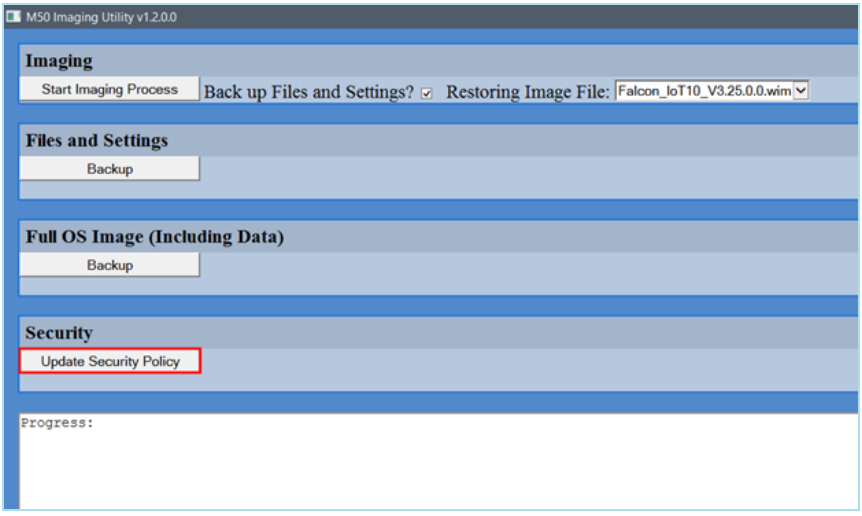
If the **Restore** button is present in the **Full OS Image (Including Data)** area, click the button to activate image restoration. This could take 30 or more minutes.

6.5.2.5 Imaging Utility WinPE– Update Security Policy

This updates security policy in the case only the ImagingUtility application has been updated.

How to Update Security the Security Policy:

If the **Update Security Policy** button is present, click it.



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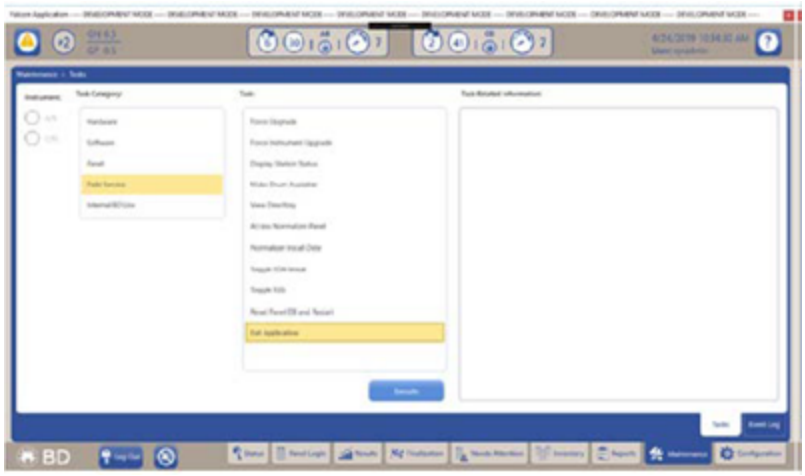
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

6.5.2.6 Imaging Utility - Restore M50 application Data

1. Disconnect the USB A/B instrument cables from the AIO. Do not reconnect until directed to do so.
2. Disconnect the EpiCenter cable if the system is connected to Epicenter.
3. Place the Image utility USB key in an available USB port.
4. Connect a USB keyboard and mouse to the AIO.
5. Log into BDFS. Refer to "Password Generator Utility" on page 96 if necessary.
6. Go to the **Maintenance** > **Tasks** tab. Select **Field Service Tasks** > **View Directory** Sub Task. Click **Execute**.



7. Navigate to **D:\Logs**. Permanently delete all but the most recent **.zip log** file folders by highlighting the files and simultaneously pressing the **Shift** and **Delete** keys.
8. Once Windows File Explorer opens, navigate to the USB drive, right click on **ImagingUtility.exe**, and select **Run as administrator**. Close this application and re-run as an administrator.
9. If the **Restore** button is present, click it. Restoration process can take at least 10 minutes to complete.
10. Power off tablet.
11. Reconnect cables.
12. Power on tablet.

6.5.2.7 Imaging Utility –Troubleshooting

1. Unable to Apply image until cleanup has been performed.
   The imaging utility is designed to prevent accidental data transfer to other devices. This is

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Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

done by ensure that the Imaging device is clean before any additional information is captured

2. Files and Settings Restore button is missing in Windows 10.
   If the application has not performed a data backup, the restore option will not be present. The data restore option will also not be present if only the Full Image backup has been performed. The M50 application data is preserved through a different process than the Full Image Backup. Both the processes will create the **MINWINPC** folder, so this alone is not an indication that the M50 application data has been produced.

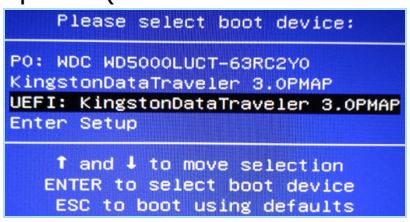
Warning: If the imaging utility fails to automatically back up files and data, please restore M50 application data manually. Refer to "Legacy Imaging Procedures" on page 259.

6.5.3 Legacy Imaging Procedures

Applying the ≥3.20.0.0 Windows 10 Operating System Image with No Ongoing Panels

The installation procedure uses the boot menu to boot the system from the USB key and deploy the image. The startup menu is used later to restore booting to the M50 application.

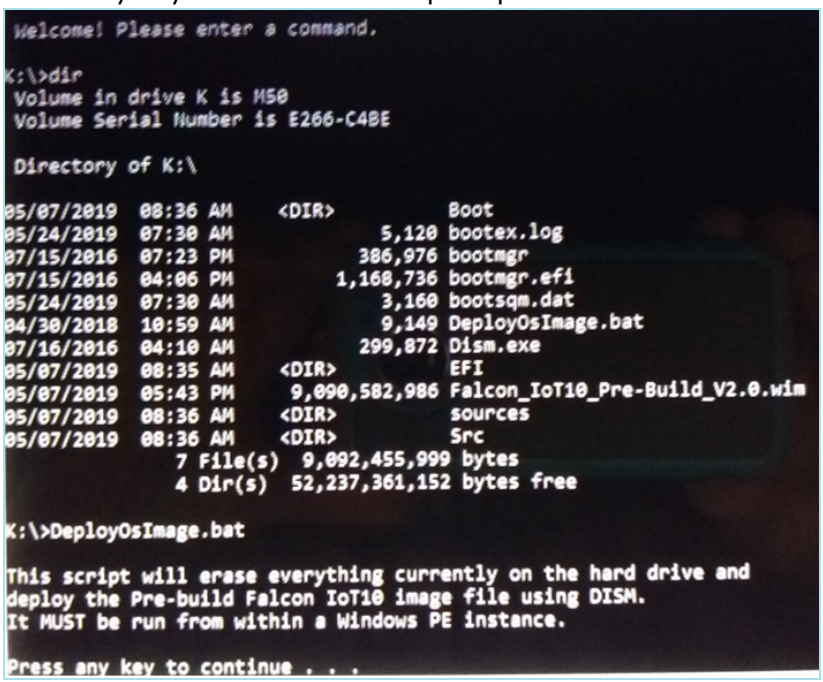
1. Ensure SQL Database backup is complete per "Backup and Restore SQL Database" on page 234.
2. Confirm that the AIO is disconnected from the instrument and the EpiCenter.
3. Insert the M50 Image Version **≥3.20.0.0** USB key into the AIO.
4. Connect the USB keyboard to the AIO.
5. Use the **Power** button to power down and restart the AIO.
6. When the AIO starts up, press **F12** on the keyboard when the black screen (with the header **American Megatrends** and white letters) appears.
7. The **Please select boot device** message is displayed.
8. Use the down arrow key on the keyboard to highlight the **UEFI KingstonDataTraveler** option. (The name of the SW key manufacturer may be different.)



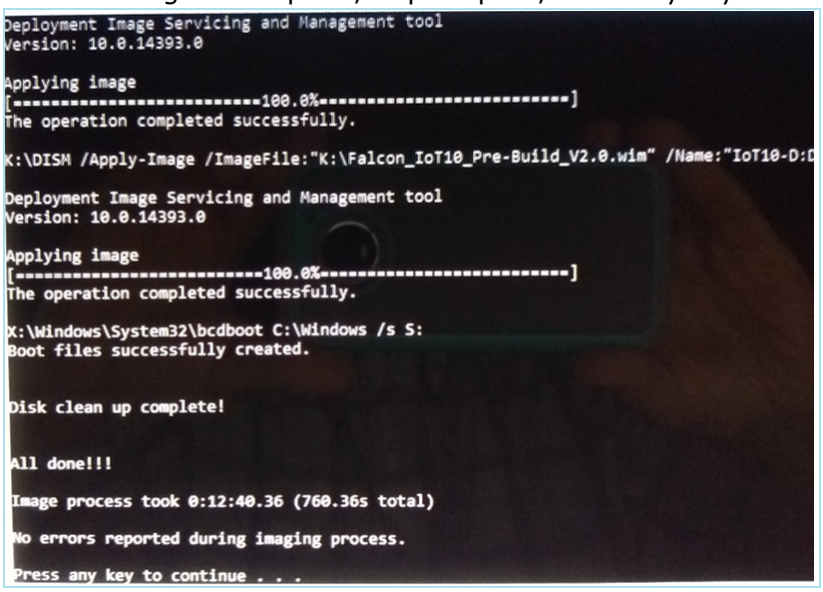
9. Press **Enter** on the keyboard to boot from this device.
10. Allow the AIO to boot into the WinPE environment.
11. Close the Imaging Utility using the red X in the upper right corner.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

12. Type **dir** at the command prompt and **Enter**.
13. A list of all items on the image USB key is displayed including **DeployOSImage.bat**.
14. At the command prompt type **DeployOsImage.bat**
15. Press any key to continue when prompted.



16. When reimage is complete, as prompted, enter any key to continue.



17. The command prompt is displayed.

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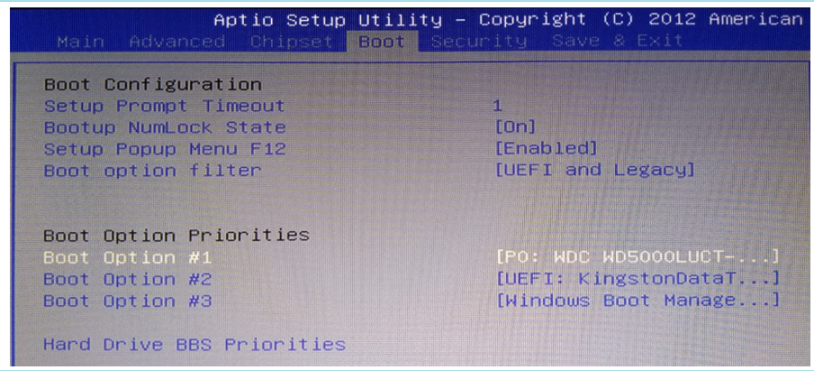
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

18. Type **exit** at the command prompt and **Enter**.
19. The AIO restarts.
20. When the AIO starts up, press the **Delete** key on the keyboard when the black screen (with the header **American Megatrends** and white letters) appears.
21. The setup screen with its associated menu items is displayed.
22. The menu displayed across the top of the window contains the tabs **Main**, **Advanced**, **Chipset**, **Boot**, **Security**.
23. Use the right arrow key to tab over to the **Boot** tab.
24. Use the down arrow key to select the **Boot Option #1** item. Select the **Enter** key on the keyboard.
25. Use the down arrow key to select the **Windows Boot Manager**. Select the **Enter** key on the keyboard.



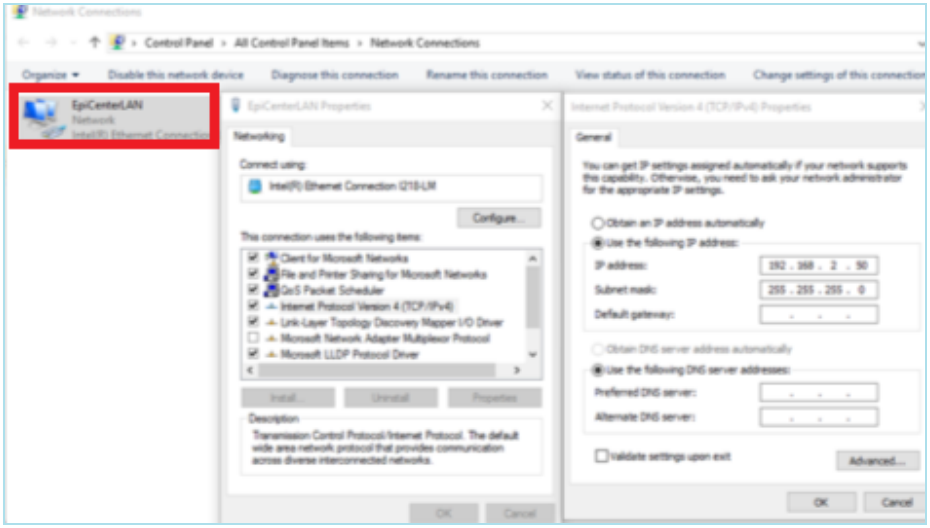
26. **Boot Option #1** now contains the [**Windows Boot Manager ...**] item.
27. Select **F4** to **Save and Exit**.
28. The **Save and Exit** setup message is displayed with a **Yes** or **No** option.
29. Select the **Yes** option and press **Enter** on the keyboard.
30. Allow the application to startup.
31. Complete SQL Database restore per "Backup and Restore SQL Database" on page 234.

6.5.4 Configure EpiCenter Network Interface

1. The network interface IP address will have to be set if the instrument was connected to EpiCenter before the update of the OS to Win 10.
2. Navigate to **D:\Short Cuts.**
3. Double-click the **cmd.exe** shortcut.
4. Type **ncpa.cpl** and press **Enter.**

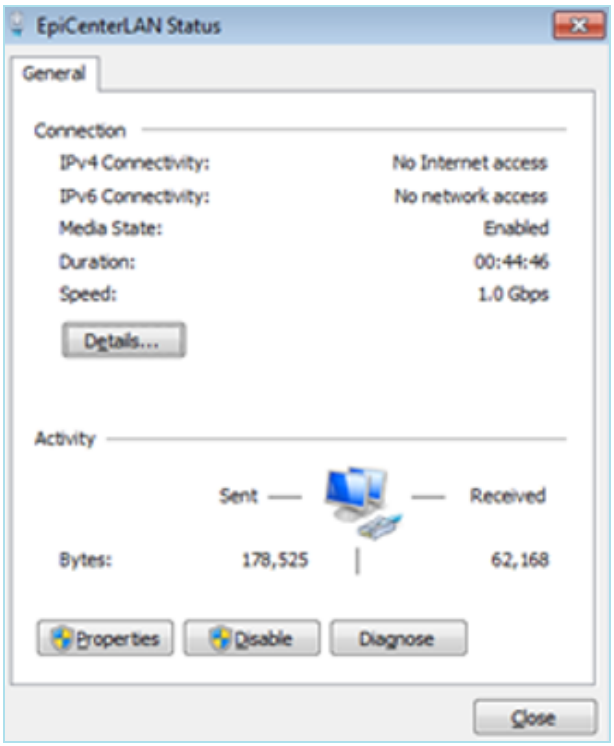
Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

5. Right-click the network icon called **EpiCenterLAN** and select **Properties**.



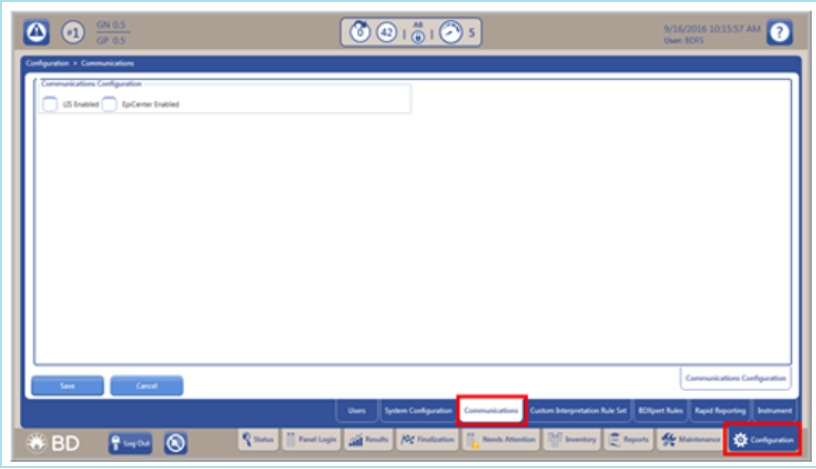
6. Highlight **Internet Protocol Version 4 (TCP/IPv4)** and click **Properties**.
7. Change the setting from **Obtain an IP address automatically** to **Use the following IP address**.
8. Set the IP Address to the value saved previously. For new installations, use the prefix **192.168.2.XX** with the last digits being set unique to another device on the EpiCenterLAN network.
9. Click **OK** to close the **TCP/IPv4 Properties** window.
10. Click **OK** to close the **EpiCenterLAN Properties** window.
11. Physically connect the instrument to the network switch attached to the controlling EpiCenter PC.
12. Double-click or double-tap the EpiCenterLAN icon to bring up the **EpiCenterLAN Status** window and click **Details**.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

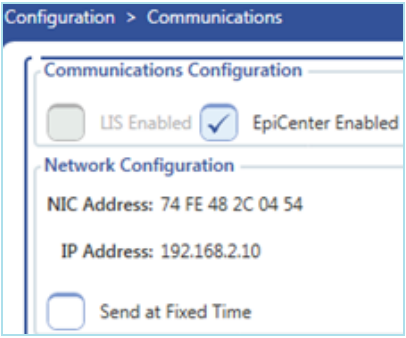


13. Record the **Physical Address** value displayed in the **Network Connection Details** window.
14. Click **Close. Close** again to close all network windows.
15. Restart the AIO by selecting the Windows **Start Menu** > **Power** Icon > **Restart**.
    a. When the AIO starts up, press **ESC** on the keyboard when the black screen with the header American Megatrends and white letters appears.
    b. Navigate to the **Boot** tab with the arrow keys.
    c. Under **Boot Option Priorities** set **Boot Option #1** to Windows Boot Manager.
    d. Press **F4** and select **Yes** to save and exit.
16. Once the AIO boots to the user software, log into the tablet as BDFS with the appropriate password.
17. Navigate to the **Configuration** tab and the sub-tab **System Configuration.**
18. Change the **System Number** as appropriate and select **Save**.
19. Configure EpiCenter per **BALTFS0196 Appendix A** (if necessary). If AIO is to be configured as standalone, continue to **step 24**.
20. Navigate to **Configuration** > **Communications**.

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential



21. Check **EpiCenter Enabled** and click **Save**. The **IP Address** displayed is updated.



22. Document the instrument number with the **NIC** and the **IP** addresses.
23. Verify that the instrument syncs with EpiCenter.
24. Click **Log Out** to exit the BDFS account.

6.6 Phoenix M50 License File Installation

This section provides instructions in the event that the Phoenix M50 License File needs to be applied to the Phoenix M50 software. The license file is specific to the AIO serial number and the version of the software installed, and must be obtained from Quality.

An **UNRELEASED SOFTWARE** watermark is displayed across the screen of the AIO in the event that there is no license associated with the Phoenix M50 software as shown in the figure. The alert message **E98 – 00000020 Falcon PC alert** will be displayed.

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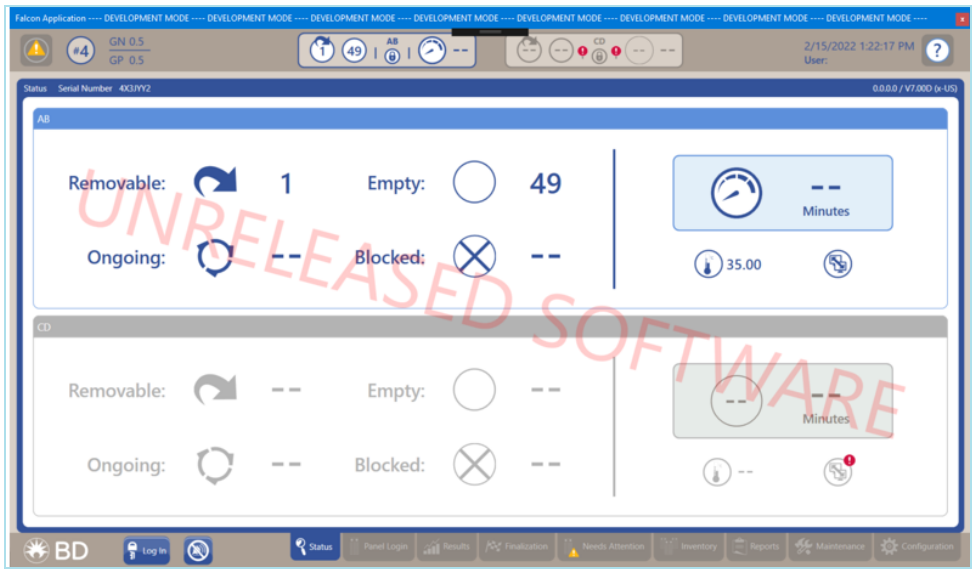
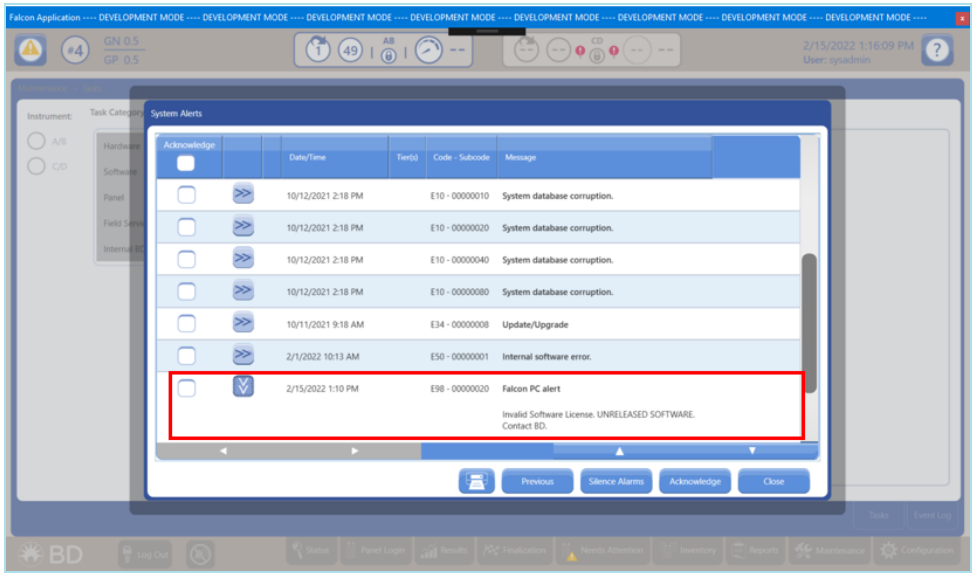
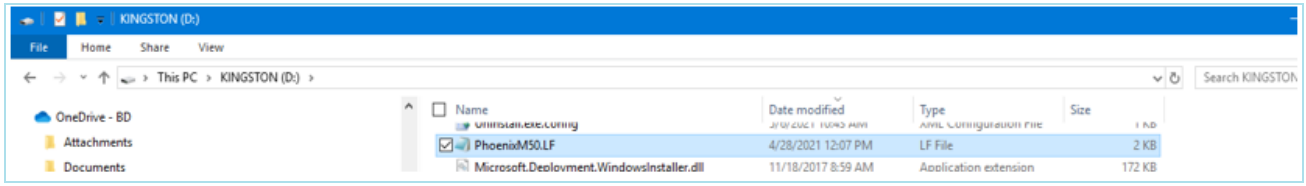
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential





Procedure:

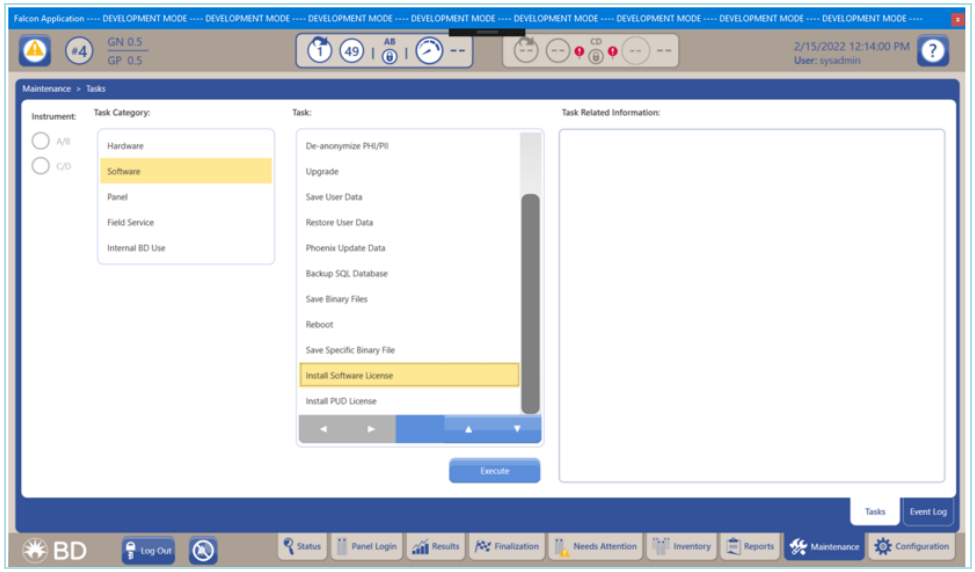
1. Insert the USB key into the AIO containing the M50 License file.



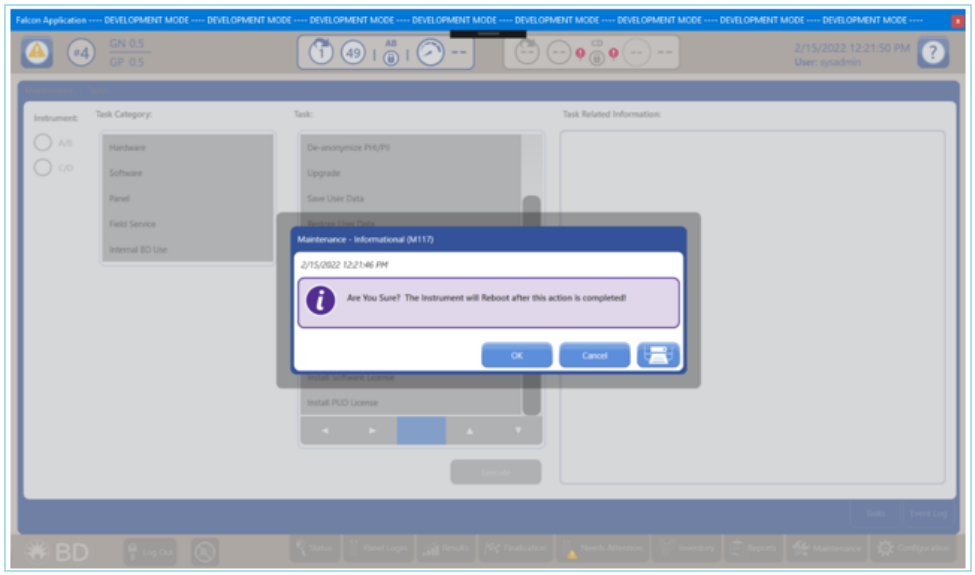
2. Select **Log In**.
3. Log in as BDFS. Refer to "Password Generator Utility" on page 96 if necessary.

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential

4. Navigate to the **Maintenance** tab > **Software** > **Install Software License**.



5. Select Execute.
6. Select OK.



The **UNRELEASED SOFTWARE** watermark will be removed if the installation of the license file was successful.

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Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

7 Service Parts

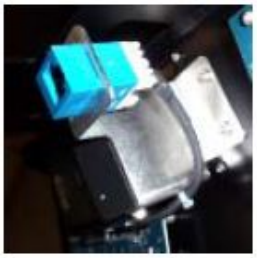
7.1 Parts Overview

This chapter lists the BD Phoenix™ M50 parts.

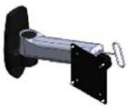
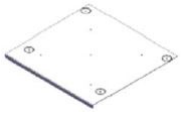
7.2 Parts List

Number/Name	Description	Image
441624 M50 Stand		
443809 Barcode reader, External	Drawings: 246-1352 Universal External Barcode Scanner	
443831 Servo Motor Assembly	Drawings: 252-3014, PR00058 Carousel Drive Motor	
443832 Carousel Assembly	Drawings: 252-3008 Complete Carousel Assembly	
443833 Carousel Bearing Assembly	Drawings: 252-3012 Carousel Bearing Assembly	
443840 Fascia Front	Drawings: 252-2044, 252-2094 Phoenix M50 Front Fascia	
443841 Panel Status Indicator Kit	Drawings: 252-7005 Phoenix M50 Tri Color Panel Status Indicators	
443842 Inlet Air Filter	Drawings: 252-2066 Phoenix M50 Inlet Air Filter	

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Number/Name	Description	Image
443843 Power Entry Panel Assembly	Drawings: 252-7000, 252-5002, 252- 5004 Phoenix M50 Power Supply and Cooling Fan Assembly	
443844 System Status Indicator	Drawings: 252-7001, 252-5024 Phoenix M50 System Status Indicator Assembly	
443845 Internal Bar Code reader	Drawings: 252-7126, 252-5015 Phoenix M50 Internal Bar Code Scanner	
443846 Control and Power Distribution board	Drawings: 252-6001 FALCON Control and Power Distribution board	
443848 Light Source Driver Board Kit	Drawings: 252-7113, 252-5023, 252- 5014 Light Source Driver Board Kit	
443850 Tier Micro Board Kit	Drawings: 252-7119, 252-5014 Tier Micro CCD Assembly Kit	
443854 Flag Sensor Kit with Harness	Drawings: 252-5016, 252-5008, 8087252, 11900082 Carrousel Flag Sensors	
443855 Drive Belt	Drawings: PR00008, PR00058 Carrousel Drive Belt	
443856 Motor Drive With Cables	Drawings: PR00012, 252-5011, 252- 5010, 252-5014, 252-5019 Ion Drive for Carrousel Motor	

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
Doc Part: EN
Usage: Production Usage
Status: Released EFFECTIVE
Revision: 03
Version: C
Change #: 500000269376
Classification: Confidential

Number/Name	Description	Image
443859 M50 Toolkit	Drawings 252-7117, TD100-00000- 01, 252-0103 Phoenix M50 Toolkit	
443867 Mounting Arm Ergotron	Drawings 252-0008 Phoenix M50 Computer Mounting Arm	
443868 15.6” AIO Touch Screen Computer	Drawings 500012101 Phoenix M50 Computer	
443869 Top and rear Covers	Drawings 252-2090, 252-2009 Phoenix M50 Top and Rear Cover	
443870 Magnetic Locking Guard Kit	Drawings: PRD00028, 252-5009 Phoenix M50 Door Lock Assembly	
443871 Rear Fascia and Door Assembly	Drawings: 252-0007, 252-2095 Phoenix M50 Inner Rear Fascia and Door Assembly	
443873 M50 FX40 Adapter Plate		
443919 RoHS Lens With Emission Filter	Drawings: 252-7124 Phoenix Lens Assembly	
447157 Normalizer Panel	Drawings: 100-9008-01JAA Phoenix Gold 6% Normalizer Panel	
448984 Temperature Reference Panel	Drawings: Temperature Reference Panel	

Document: BDDSSGFS7410
Valid From: 17-Mar-2022 To: 31-Dec-9999
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time
Doc Type: ZIP
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Appendix A Pre Installation Checklist

Account	
Location	
Country	
Contact Title	
Contact Name	
Telephone	
Contact Email	

The checklist is an optional tool available for use to ensure adherence to the procedure and should not be used exclusively to drive full compliance with procedural directives.

General Requirements

Description	Y	N	N/A
Installation surface is ± 0.5° of level?			
Installation area is free from undue vibration?			
Installation area is free from direct sunlight?			
Installation area is free from high humidity?			
Installation area is free from dust?			
Installation area is free from extreme temperatures?			
Installation area is free from corrosive or explosive vapors or gases?			
Installation area meets the clearance requirements?			
All instruments and associated items can be safely transported from shipping/receiving to the installation location?			

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Environmental Requirements

Description	Y	N	N/A
Non operational storage area temperature is acceptable?			
Non operational storage area humidity is acceptable?			
Installation area temperature is acceptable?			
Installation area humidity is acceptable?			
Installation location altitude is ≤ 2000 meters?			

Electrical Requirements

Description	Y	N	N/A
110/220V AC at 50/60 Hz is available at installation location?			

Printers

Description	Y	N	N/A
110/220V AC at 50/60 Hz for printer power is available at installation location?			

Installation Configuration

Description	Y	N	N/A
Instrument mode is determined (FDA vs Non FDA)?			

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Required Parts and Install Kits

In the first row, record the number of each type of configuration that will be installed on site. Multiply this number by the values shown for the Service Spares in the last six rows, and enter the total number of Service Spares for that row in the final right hand column.

Enter the required parts and install kits in the table.

Part ID	Single M50 on Table or Bench	M50 Stack on Table or Bench	M50 Stack on Shallow Bench	Single M50 Anchored	M50 Stack Seismic Anchored	Total Required Number of Installs multiplied by kits
Number of Separate Installs (mark 0 for none)						
443624 M50 Instrument	1	2	2	1	2	
443625 M50 Starter Kit	1	1	1	1	1	
443991 BD Seismic Table	1[1]	1[1]		1	1	
443910 Stacking Kit		1	1		0[2]	
443918 Seismic Kit				1	1	

Connectivity

Description	Y	N	N/A
Direct connect LIS will be used for this installation?			
Onsite local LIS Support is available?			
Remote LIS Support is available?			
LIS network drop is configured?			

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Description	Y	N	N/A
LIS Interface (L 005933) provided to the customer?			
Customer is aware of RS 232 Interface?			
Customer is aware of ASTM format?			
Does the LIS query for data?			
EpiCenter will be used with this installation?			
EpiCenter pre install performed?			

Complete the information below for LIS installations

LIS Vendor Information	
Vendor Name	
Version	
Contact Name	
Support Capabilities	
Customer LIS Support Staff	
Contact Name	
Title/Position	
Contact Number	
Support Capabilities	

Outstanding Issues

Document any outstanding issues that must be resolved before installation.

BD Responsibilities
Customer Responsibilities

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Signature and Date

BD FSE Signature and Date	
Customer Signature and Date	

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Appendix B Installation Checklist

Account	
Location	
Country	
Contact Title	
Contact Name	
Telephone	
Contact Email	

The checklist is an optional tool available for use to ensure adherence to the procedure and should not be used exclusively to drive full compliance with procedural directives.

Shipment and Materials Inspection

Description	Y	N	N/A
All materials are present?			
All materials are undamaged?			
All packing materials are properly disposed?			
Instrument and associated parts are in final location in the lab?			

Instrument Installation

Description	Y	N	N/A
Location of instrument is away from direct sunlight, other heat sources, and not close to any vents?			
Instrument(s) are within ± 0.5° of level?			
Rear fascia is installed?			
Front fascia is installed?			
Normalizers are installed?			
Swing arm is installed?			
All In One is installed and properly adjusted?			

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Instrument Configuration

Description	Y	N	N/A
AIO boots up to M50 user software?			
Instrument(s) are commissioned?			
The correct format, location, keyboard, and language is set for the region?			
Time zone, daylight saving time, date, and time, is set for location?			
Instrument mode is set (FDA vs Non FDA)?			
Printer is set up and tested?			
Instrument number is set?			
Normalizer install date is set?			
System decals are installed?			
Scanner is set up and tested?			
Cable dress is complete?			
Phoenix™ M50 Serial Number(s)			
A/B			
C/D			

Instrument Qualification

Description	Y	N	N/A
Phoenix M50 Instrument Qualification performed?			

Comments

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Signature and Date

BD FSE Signature and Date	
Customer Signature and Date	

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Appendix C PM Inspection Checklist

Account	
Location	
Country	
Contact Title	
Contact Name	
Telephone	
Contact Email	
Phoenix™ Serial Number(s)	A/B
	C/D

The checklist is an optional tool available for use to ensure adherence to the procedure and should not be used exclusively to drive full compliance with procedural directives.

Instrument Mode

Description	Y	N	N/A
Instrument mode is set correctly? (FDA vs Non FDA)			

Instrument Environment

Description	Y	N	N/A
Instrument installed on a level load bearing surface?			
Instrument has sufficient clearance?			
The temperature and humidity are within operational limits?			
The environment is free of contaminants?			

External Instrument Condition

Description	Y	N	N/A
Exterior surfaces of instrument are free from wear or damage?			

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Description	Y	N	N/A
Peripherals are free from wear or damage?			
Cables are free from wear, damage, and undue stress?			

Instrument Software and Logs

Description	Y	N	N/A
Instrument is free of alerts that require investigation and/or resolution?			
Instrument event log is free of unusual or abnormal activity?			

Power Supply Check

Description	Y	N	N/A
Power supply voltage is 22.80 - 25.20V DC?			

Internal Inspection

Description	Y	N	N/A
Mechanical components are free of wear and damage?			
Instrument is free of debris and foreign materials?			

Instrument Qualification

Description	Y	N	N/A
Phoenix M50 Instrument Qualification performed?			

Comments

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Signature and Date

BD FSE Signature and Date	
Customer Signature and Date	

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Appendix D Qualification Checklist

Account	
Location	
Country	
Contact Title	
Contact Name	
Telephone	
Contact Email	
Serial Number of the Instrument	A/B
	C/D

The checklist is an optional tool available for use to ensure adherence to the procedure and should not be used exclusively to drive full compliance with procedural directives.

System Information

Description	Initial	Final
System Version		
Image Version		
Phoenix Update Data Version		
Normalizer Expiration Dates		
Instrument Mode is set correctly? (FDA vs Non FDA)		
Falcon Toolkit Version		

Power Supply Voltage Check

Description	Y	N	N/A
FCDB voltages are within tolerance?			
Tier 1 voltages are within tolerance?			
Tier 2 voltages are within tolerance?			

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Instrument Tests

Description	Y	N	N/A
Temperature is ± 0.5 degrees of the expected temperature			
Status indicator LEDs are operational?			
Door switch test is passed?			
Carousel speed is ± 5% at 1 RPM?			
Carousel speed is ± 5% at 4 RPM?			
All internal red panel status LEDs on during test?			
All internal green panel status LEDs on during test?			
All internal yellow panel status LEDs on during test?			
All internal panel status LEDs extinguished during test?			
Home and panel flag count is correct?			
Normalizer CV values < 6.5%?			
PWM Settings verified?			
AIO boots up to M50 user software?			

Comments

Signature and Date

BD FSE Signature and Date	
Customer Signature and Date	

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential

Revision History

Version	Changes	Release
1	Initial release in 7 chapter format per BDLS0261.	09/2020
2	Corrected typographical errors and carousel speed specifications.	02/2021
3	i. Changed EFT references to IDS Repository ii. LSDB - Inspect and replace iii. Included the System Architecture diagram iv. Added the password generator utility section v. Updated imaging procedures vi. Added the Phoenix M50 License File Installation section	04/2022

Document: BDDSSGFS7410 Doc Type: ZIP Status: Released EFFECTIVE
Valid From: 17-Mar-2022 To: 31-Dec-9999 Doc Part: EN Revision: 03 Change #: 500000269376
Print Date: 17-Mar-2022 19:25:59 GMT Standard Time Usage: Production Usage Version: C Classification: Confidential