GOLD STANDARD℠
DIAGNOSTICS

Coconut Service Manual

Contents

1. Introduction

The purpose of this manual is to provide instructions on services which may be performed on the Gold Standard Diagnostics (GSD) Coconut instrument. This manual provides information about and instructions for accessing different parts of the instrument, replacing motors, printed circuit boards (PCBs) and other components, and use of service software applications.

This manual is intended as a supplement to the instrument User's Manual. The instructions given in this manual require understanding of instrument components and use. This service manual assumes prior familiarity with the instrument, including its intended use, certifications, safety information, the system and its components, instrument software, use, maintenance, and troubleshooting. Please refer to the instrument's User's Manual for details about the aforementioned items. It is strongly recommended that all first time personnel read this manual prior to working with the instrument and also receive service training from Gold Standard Diagnostics (GSD) or a GSD distributor.

The steps described herein should only be performed by or with the assistance of a trained service technician, in order to minimize exposure of the operator to mechanical risks.
Improper handling of the instrument may cause serious damage to the instrument and could result in injury to the operator or service technician.

Note: Not all Coconut instruments include all components referred to in this manual, and slight differences may exist between different models/hardware combinations. Contact GSD with any questions about instrument models or hardware combinations.

2. Service Introduction

Users of this manual should take note of the following items before proceeding.

2.1. General Service Notes

1. In addition to this service manual, GSD has additional training materials and support available to trained service technicians, as applicable. These may include supplementary documents, videos, or presentations. Contact GSD for additional information about these resources.
2. Since GSD manufactures and distributes various instruments, many service instructions are common among these instruments. Service technicians should follow the service instructions from GSD, even if the particular instrument described/shown may be different than the one being serviced. All instrument and model-specific instructions are noted appropriately.
3. It is recommended that service technicians have the appropriate tools and materials readily available before performing service. These include: utility knife, extra fuses, alcohol wipes, needle-nose pliers, zip ties, Allen keys (metric), screwdriver set, and manufacturer-approved lubricant.
4. Before servicing an instrument, if applicable, be sure that there is no power to the instrument.
5. When instrument is powered off, parts can be moved/removed as needed to make access to different locations easier.
6. Whenever possible, wear gloves during servicing to protect against biological hazards and to prevent damage to instrument PCBs and other components.

2.2. Important Instrument Considerations

1. Instrument screws should generally be moderately tight.
2. The Instrument harness has tabs that can be pushed.
3. An Instrument switch (lever type) is present on the back-left side of the instrument to indicate the home position along the X-axis.

2.3. Instrument Power/Fuses

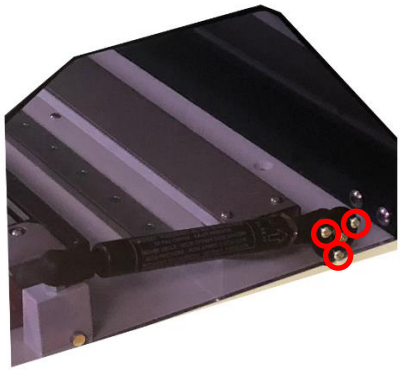
1. The instrument uses one AC fuse with the following specifications:
   AC Fuse: 5mm x 20mm, Time Delay, Glass Tube (T2AL250V)
   Voltage Rating: 250VAC
   Amperage Rating: 2A
2. Fuses that are non-functioning must be replaced using fuses which match the values and ratings (nominal voltage, nominal current, and type) specified for the instrument.
3. Power comes from the wall into the instrument's filter at 110V, then to the PSU board (where the voltage is converted) and then to the blot tray loader driver board.
4. AC fuse:
   a. This fuse is accessible from inside the instrument. To replace the fuse:
      i. Follow instructions from a later section of this document for removal of the top cover and base plate.
      ii. The fuse is located on the top, left of the PSU board, directly behind the filter (see image below). Remove the fuse from the fuse holder and replace with a new one.

3. Instrument Access

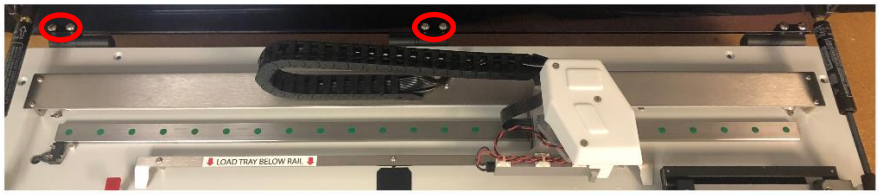
In order to properly service the instrument, it is sometimes necessary to access interior spaces and parts. Instrument covers and components may be removed to assist in this process, as described below.

3.1. Top Cover

1. To remove the top cover:
    a. Remove the three M3x8 screws that secure the top cover to the gas spring on both the left and right side.



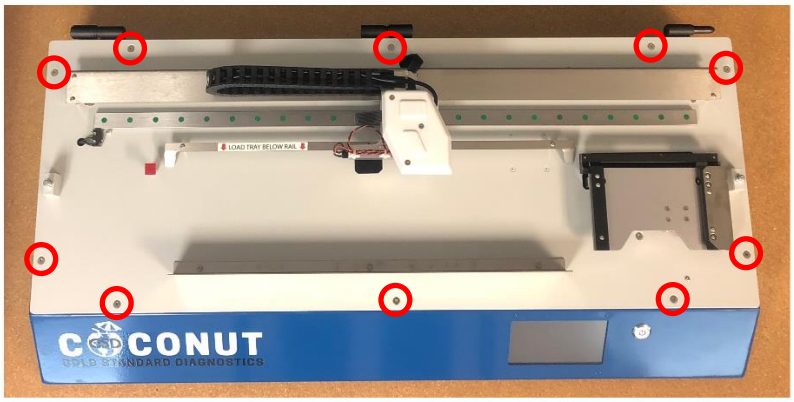
    b. Push the gas spring through the hole in the top cover on both the left and right side and rotate the gas springs out of the way.
    c. Remove the four M4x12 screws that secure the top cover to the left and middle hinges on the back of the instrument. The two screws that secure the top cover to the right hinge can remain in place. The cover will now be loose, so be careful to keep the cover on the base plate so that excess stress is not placed on the screws and top cover at the right hinge.



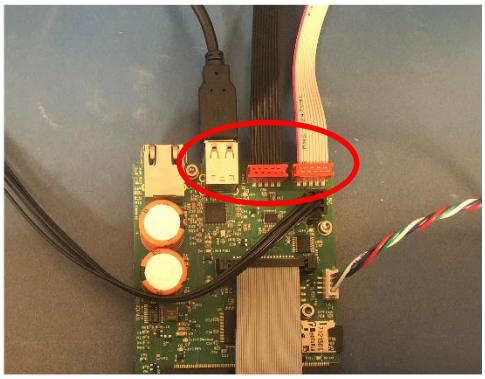
    d. Slide the top cover to the right to remove the right hinge counterpart from the right hinge and set the top cover aside.

3.2. Base Plate

1. To remove the base plate:
    a. Remove the 10 M4x10 screws that secure the base plate to the frame.



    b. Lift the base plate from the front and rotate towards the back of the instrument. There are cables connected from the base plate to the frame of the instrument so do not completely separate the base plate from the frame.
    c. Disconnect the USB camera cable and the two flat cables that are attached to the blot tray loader driver board. You can now remove the entire base plate.

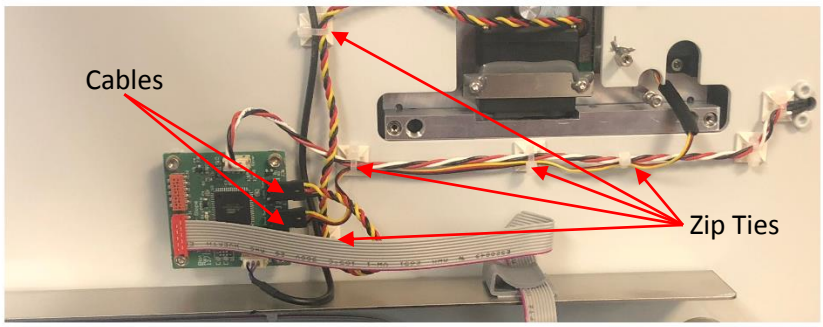


4. Removal/Replacement of Instrument Components

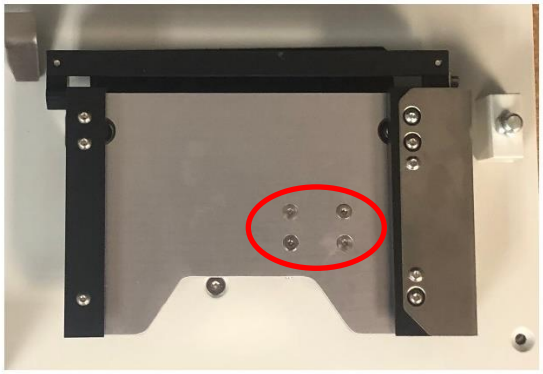
In certain situations, some components of the instrument may need to be removed/replaced for servicing purposes, as explained in detail below.

4.1. Strips Booklet Holder

1. To remove the strips booklet holder
    a. Disconnect the bend servo motor cable and the lock servo motor cable from the blot tray loader slope PCB. The blot tray loader slope PCB is located on the underside of the base plate.
    b. Cut and remove the zip ties that are securing the cables to the zip tie holders and cables.



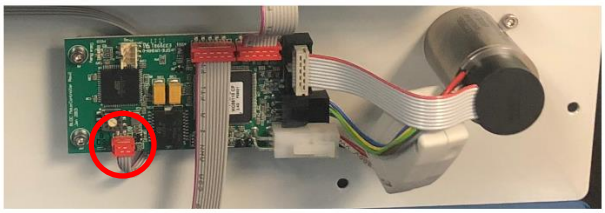
    c. Remove the spring attached to the screws on the bottom side of the strips booklet holder and the frame.
    d. Lower the base plate and remove the four M screws holding the strips booklet holder to the slide unit.



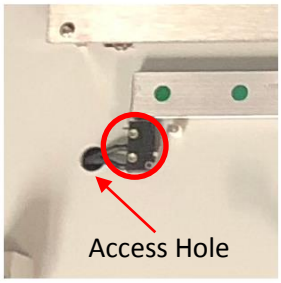
    e. Lift the strips booklet holder up to remove. Note that the cable for the lock servo motor lies against the slide unit and may cause some resistance when lifting out the booklet holder. You may need to pull the slide unit towards the front of the machine to provide enough clearance to lift out the booklet holder. Be careful not to pull the slide unit completely off the slide rail. There are small ball bearings in the slide unit that can easily come out if the slide unit is not completely on the slide rail.

4.2. Home Position Switch

1. To remove the home position switch
    a. Remove the home position switch cable from the BLDC motorcontroller located on the underside of the base plate.



    b. Cut the zip ties securing the cable to the zip tie holders.
    c. Remove the two M2x12 screws securing the switch to the base plate.

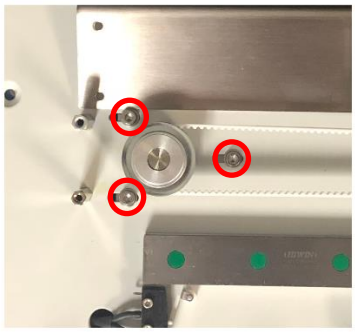


    d. Remove the home position switch by pulling the cable through the access hole.

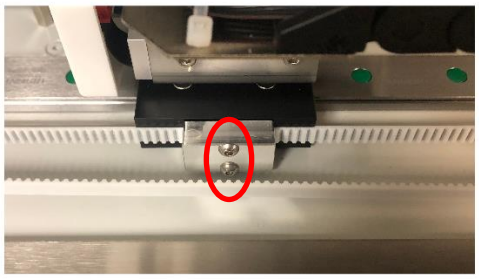
4.3. Timing Belt

1. To remove the timing belt
    a. Remove the five M3x8 screws securing the belt cover. Push the belt cover towards the back of the instrument so you can access the belt pulley on the left side of the instrument.

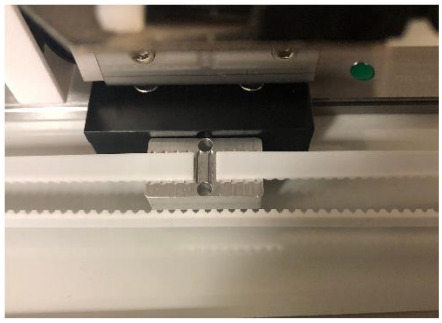
    b. Loosen (do not remove) the three M3x12 screws securing the left side pulley on the base plate. This will allow you to slide the pulley left and right to decrease the tension on the timing belt.



c. Remove the two M3x12 screws securing the belt to the wagon block.



d. Remove the timing belt.
e. When replacing with a new belt, make sure to place the cut ends of the belt in the orientation shown below.



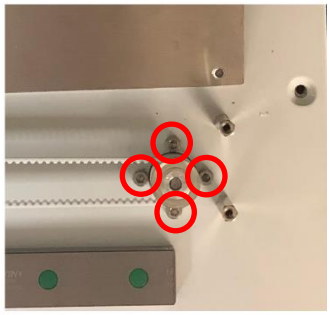
5. Motor Servicing

The instrument contains various motor types, including a brushless (BLDC) motor, stepper motor, and servo motors.
Both BLDC and stepper motors are addressed with the rotary dial on the motor controller PCB. A small flathead screwdriver can be used to change motor addresses. When replacing a motor assembly, make sure that the motor controller PCB is addressed according to the table below:

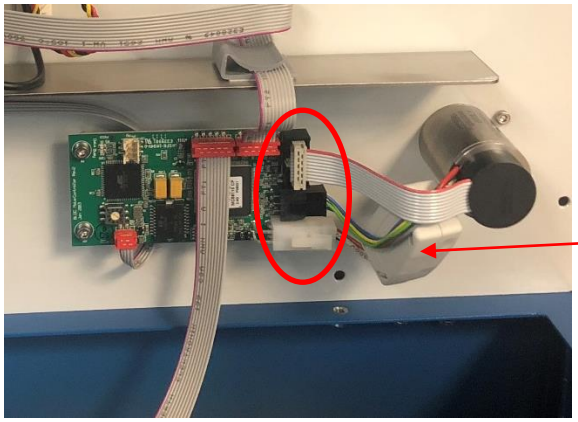
Address #	Motor	Motor Type
1	X-axis Motor	BLDC
1	Z-axis Motor	Stepper

5.1. X-axis BLDC Motor Replacement

1. To remove the X-axis BLDC Motor:
    a. Remove the belt cover (see section 4.3).
    b. Remove the 10 M4x10 screws the secure the base plate to the frame (see section 0).
    c. Loosen the three M3x12 screws securing the left side pulley on the base plate (see section 4.3). Slide the left side pulley as far to the right as possible to decrease the tension on the timing belt.
    d. Remove the four M3x12 screws securing the motor to the frame. While removing the final screw, hold the pulley so the motor does not fall through the access hole once the final screw is removed. Keep holding the pulley until you can lift up the base plate to get to the motor from the underside of the base plate.

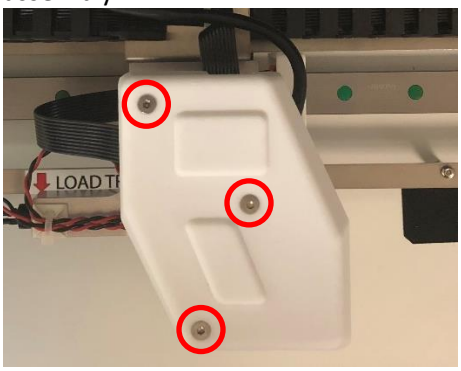


    e. Remove the timing belt from the X-axis motor pulley.
    f. Lift up the base plate from the front and rotate towards the back of the instrument so you can pull the motor through the access hole in the base plate.
    g. Remove the three cables from the motor that are attached to the BLDC motor controller.

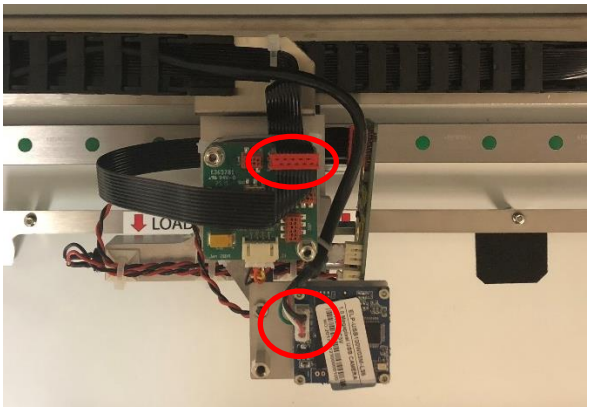


5.2. Z-axis Stepper Motor Replacement

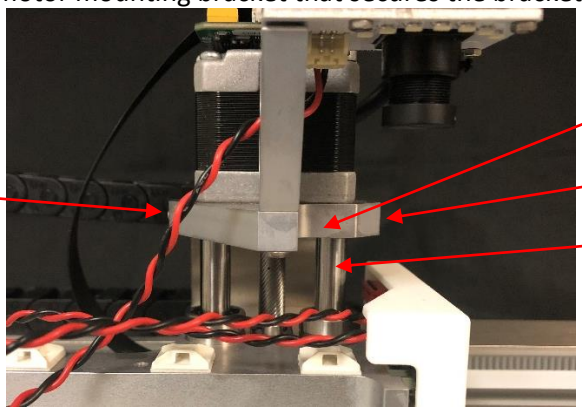
1. To remove the Z-axis stepper motor:
    a. Remove the Z-axis motor cover by removing the three M3x8 screws securing it to the assembly.



    b. Remove the flat cable attached to the Z-axis stepper motor controller and the cable attached to the camera module.



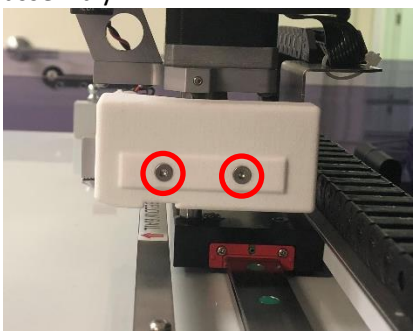
    c. Loosen (do not remove) the two M3x8 set screws on the left and right side of the Z-axis motor mounting bracket that secures the bracket to the ground shafts.



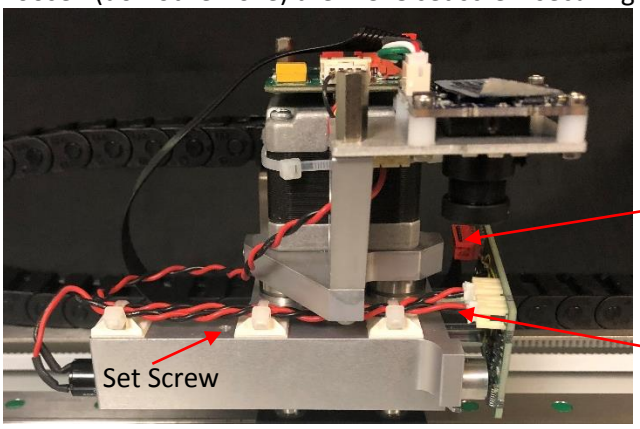
    d. Lift the motor and mounting bracket up the remove the assembly from the ground shafts. There may be some resistance from the ground shafts and/or the Z-axis nut, so considerable force may be needed to remove the assembly.
    e. Remove the four M3x12 screws that secure the Z-axis motor to the mounting bracket.

5.3. Gripper Motor Replacement

1. To remove the gripper motor:
    a. Remove the clamp PCB cover by removing the two M screws securing the cover to the assembly.



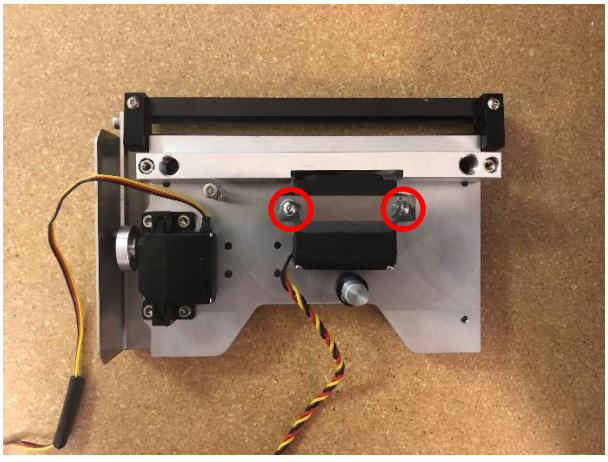
    b. Remove the zip ties holding the camera module cable and the gripper motor cable to the zip tie holders.
    c. Remove the flat cable and the gripper motor cable that are attached to the clamp PCB.
    d. Loosen (do not remove) the M3x8 set screw securing the gripper motor.



    e. Remove the gripper motor by pulling it to the right through the gripper base plate.

5.4. Lock Servo Motor Replacement

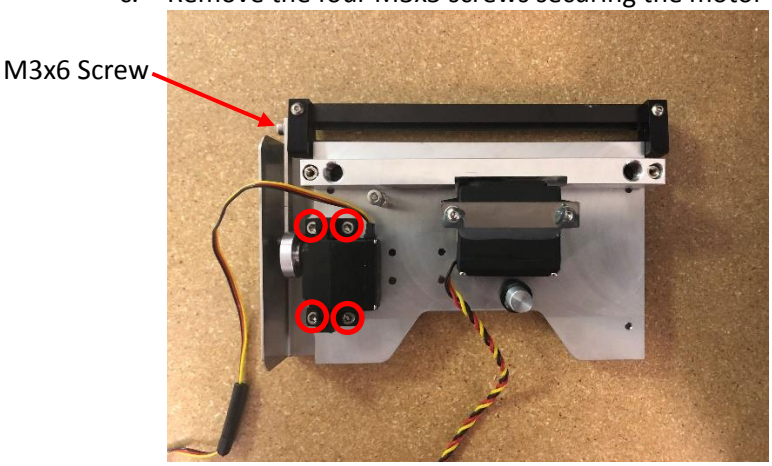
1. To remove the lock servo motor:
    a. Remove the strips booklet holder (see section 4.1).
    b. Remove the two M3x25 screws from the mounting bracket securing the lock servo motor in place and remove the mounting bracket.



c. Lift the motor out from the strips booklet holder.

5.5. Bend Servo Motor Replacement

1. To remove the bend servo motor:
    a. Remove the strips booklet holder (see section 4.1).
    b. Remove the M3x6 screw securing the metal plate to the bending bar assembly.
    c. Remove the four M3x5 screws securing the motor to the strips booklet holder.



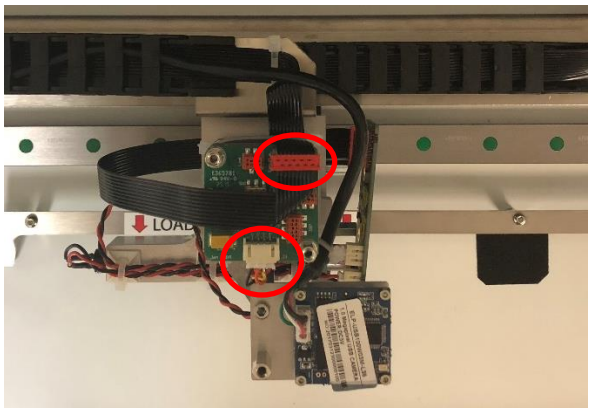
    d. Lift the motor out from the strips booklet holder.

6. PCB Replacement

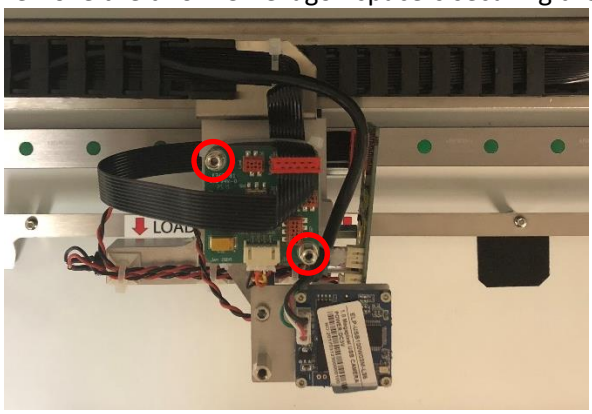
The instrument contains various PCBs (printed circuit boards) that may require replacement if damage or malfunction occurs. The replacement of PCB boards is outlined below.
Note: New PCBs sometimes have orange tape; be sure to remove this tape before installing the PCB.

6.1. Z-Axis Stepper Motor Controller PCB

1. To remove the Z-axis stepper motor controller PCB:
    a. Remove the Z-axis motor cover (see section 0).
    b. Disconnect the flat cable and the motor cable attached to the Z-axis stepper motor controller.



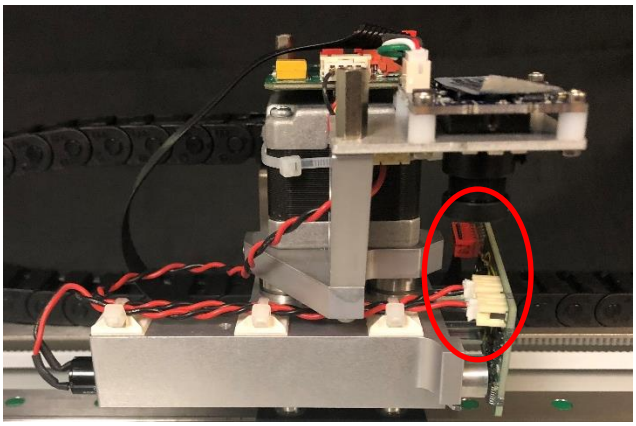
c. Remove the two M3 hexagon spacers securing the motor controller PCB to the motor.



d. Lift the motor controller out of place.

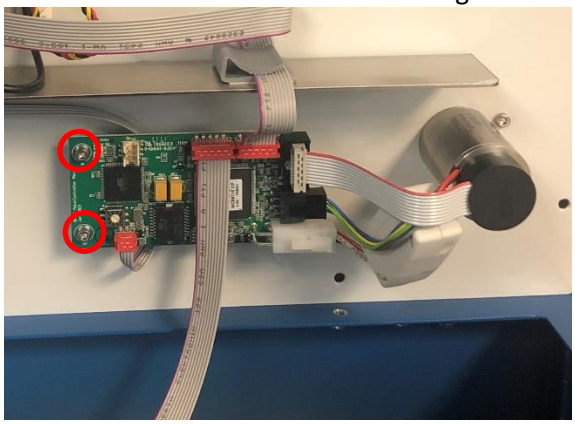
6.2. Clamp PCB

1. To remove the clamp PCB:
    a. Remove the clamp PCB cover (see section 0).
    b. Disconnect the flat cable, camera module cable and gripper motor cable from the clamp PCB.



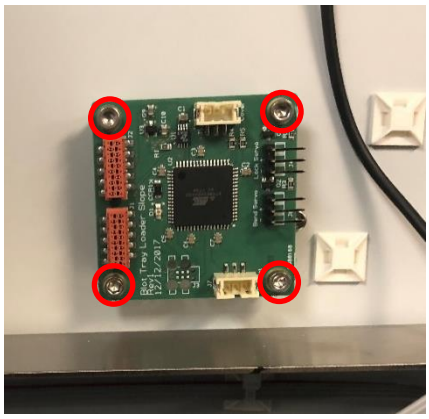
6.3. BLDC Motor Controller

1. To remove the BLDC motor controller:
    a. Remove the base plate (see section 0).
    b. Lift the base plate from the front and rotate up, towards the back of the instrument.
    c. Disconnect the three flat cables and the three X-axis motor cables from the PCB.
    d. Remove the two M3x6 screws securing the BLDC motor controller to the frame.



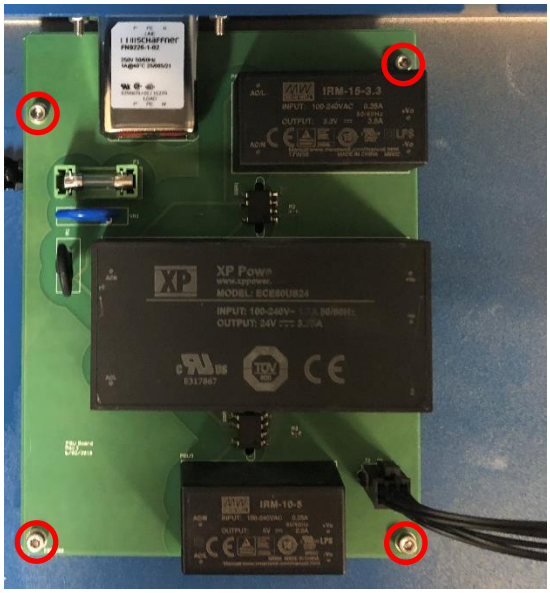
6.4. Blot Tray Loader Slope PCB

1. To remove the blot tray loader slope PCB:
    a. Remove the base plate (see section 0).
    b. Lift the base plate from the front and rotate up, towards the back of the instrument.
    c. Disconnect the flat cable, cable for the proximity sensor, cable for the top cover HAL sensor and the cables for the bend and lock servo motors from the PCB.
    d. Remove the two M3x6 screws securing the PCB to the frame.



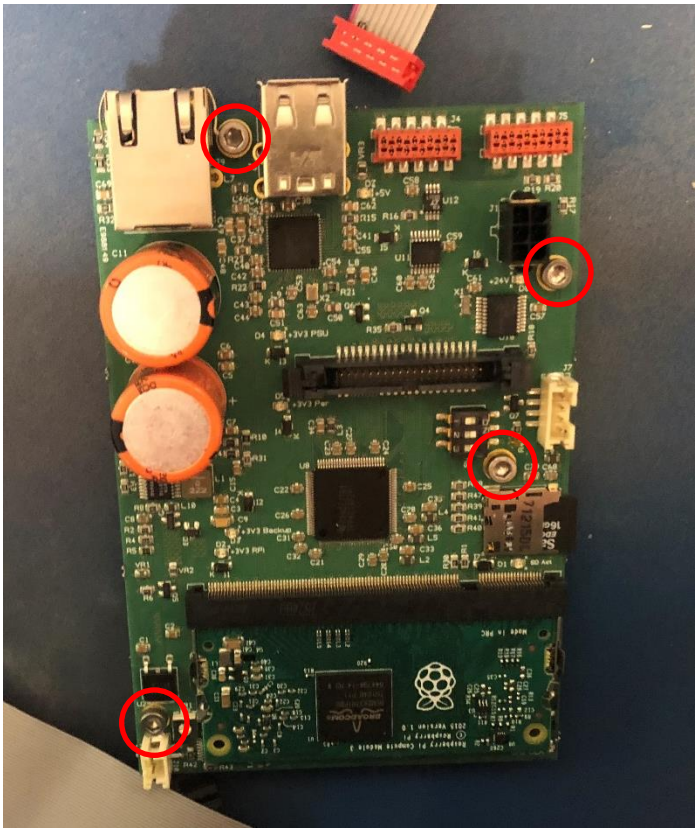
6.5. PSU Board

1. To remove the PSU board:
    a. Remove the base plate (see section 0).
    b. Lift the base plate from the front and rotate up, towards the back of the instrument.
    c. Remove the two screws from the outside, rear of the instrument that secure the filter (on/off switch). There are two M3 nuts inside of the instrument that are also used to secure the filter.
    d. Disconnect the cable from the PSU board to the blot tray loader driver board.
    e. Remove the four M3x5 screws that secure the PSU board to the frame.



6.6. Blot Tray Loader Driver Board

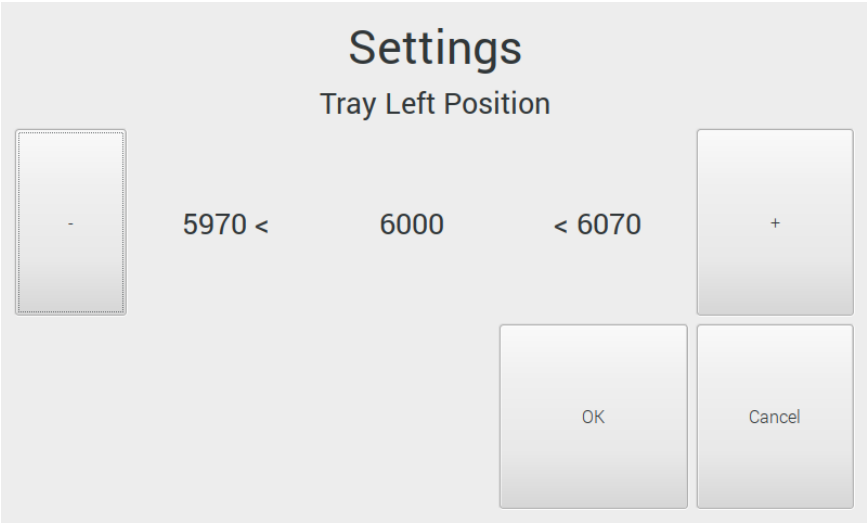
1. To remove the blot tray loader driver board:
    a. Remove the base plate (see section 0).
    b. Lift the base plate from the front and rotate up, towards the back of the instrument.
    c. Remove the USB cable, two flat cables, flat cable from the display and cable from the power button from the PCB.
    d. Remove the four M3X5 screws that secure the PCB to the frame.



7. Instrument Alignment Settings Screen

There are four different alignments that can be performed by accessing the instrument alignment setting screen from the display screen. To access the alignment settings:

1. Turn on the instrument and allow it to initialize and home itself.
2. There are five different settings to navigate through. Each screen looks similar to the following. The number in the middle is the current value and the numbers on the left and right are the limits of whatever position is being set. Tapping the plus and minus buttons will move the assembly left and right, or up and down depending on the position being set. Tapping the OK button will save the position and proceed to the next setting and tapping the Cancel button will discard any adjusted settings and return to the home screen.



3. To access the settings screen and adjust the five different settings, tap on the progress bar five times within one second. The software will then go to the alignment settings.
    a. Tray Left Position – This setting allows the user to align the gripper above the left most position of the tray. Place a tray in the tray holder and align the gripper to the center of the first trough. Tapping the minus button will move the gripper to the right and tapping the plus button will move the gripper to the left. Tap on the OK button to proceed to the next step.
    b. Bend Servo Up Position – This setting allows the user to set the upper position of the servo motor that will bend the booklet. Place a booklet into the strips booklet holder. The front edge of the booklet should be able to slide below the bending bar. Tapping the minus button will lower the bending bar and tapping the plus button will raise it. Tap on the OK button to proceed to the next step.
    c. Bend Servo Down Position – This setting allows the user to set the down position of the servo motor that will bend the booklet. This setting generally will not need to be adjusted since the amount of bend in the booklet won't affect its performance. However, this position must not be set too high. If the bending bar is too high, the gripper can hit the bending bar when moving to grab the strips in the booklet. Tapping the minus button will lower the bending bar and tapping the plus button will raise it. Tap on the OK button to proceed to the next step.
    d. Lock Servo Unlocked Position – This setting allows the user to set the unlocked position of the servo motor that locks the booklet in place. The unlocked position should provide enough clearance for the booklet to slide easily through the booklet holder all the way to the bending bar. If the unlocked position is too high, you won't be able to push the booklet passed the large ball bearings on the left and right side of the booklet holder. Tapping the minus button will raise the bar containing the ball bearings and tapping the plus button will lower it. Tap on the OK button to proceed to the next step.
    e. Lock Servo Locked Position – This setting allows the user to set the locked position of the servo motor that locks the booklet in place. When the lock servo motor is in the locked position, you should not be able to remove the booklet from the booklet holder. Tapping the minus button will raise the bar containing the ball bearings and tapping the plus button will lower it. Tap on the OK button to finish. Note that the instrument will go through the startup initialization procedure.

8. Contact Information

Company Name	Orendes
Company Address	Grauwmeer 17 Heverlee 3001
Country	Belgium
Email	TBHELP@GSDX.us
Phone	+1 (530) 759-8000
Coconut®	Catalog #: BTL-50

8.1. Device Manufacturer

8.1. Service Contact

Company Name	Gold Standard Diagnostics
Company Address	2851 Spafford Street Davis, CA 95618
Country	United States
Phone	530-759-8000
Fax	530-759-8012
Website	www.gsdx.us