DYNEX
TECHNOLOGIES

Agility™ Automated ELISA System

Service Manual
Rev A
Part Number 91001050

IMPORTANT: Please read this manual carefully before servicing or adjusting the system.

Revision History

Revision Date:

January 2012

Notice: The *Agility™ Automated ELISA System* is covered by a warranty (a copy of which is enclosed in this manual). The customer is required to perform routine maintenance as described in the user's manual on a periodic basis to keep the warranty in effect.

DYNEX Technologies reserves the right to make technical improvements to this equipment and documentation without notice as part of a continuous program of product development. This manual supersedes all previous editions.

Due to continuing software development, dialog boxes displayed in this manual may differ from those actually seen in the software screens. Every effort has been made to ensure the information in this manual is accurate, updated and consistent with the product it describes. DYNEX reserves the right to make technical improvements to the system and documentation without prior notice as part of a continuous program of product development.

The material included in this manual is provided to assist service engineers in the maintenance and repair of the *Agility™ Automated ELISA System*. It is assumed that the individual using this manual has sufficient training in the service of analytical instrumentation and is aware of the potential hazards including (but not limited to) electrical hazards, chemical hazards and mechanical hazards.

If this manual is provided to an end user, it is with the understanding that the material included herein is proprietary to DYNEX Technologies, Inc. The user may not provide this material to a third party without the written permission of DYNEX Technologies.

Questions or comments regarding the content of this manual can be directed to:

DYNEX Technologies, Inc.
14340 Sullyfield Circle
Chantilly VA 20151-1683 USA
Phone: (800) 288-2354 (USA only)
(703) 631-7800
Fax: (703) 803-1441

Agility™ Automated ELISA System is a trademark of DYNEX Technologies, Inc.

This manual is published by DYNEX Technologies, Inc.

© 2012. This document is the copyright of DYNEX Technologies, Inc. and must not be copied or reproduced in any form without prior consent. This manual supersedes all previous editions.

Table of Contents

Preface

The purpose of this manual is to enable a qualified field service engineer to carry out routine maintenance and minor repairs on the DYNEX Technologies *Agility™ Automated ELISA System*.

This manual is divided into two parts:

- Section A includes general information describing the system, safety considerations, installation, maintenance, troubleshooting, use of the diagnostic software, decontamination, decommissioning and related information.
- Section B describes how various components are replaced and repaired. In general, the field service engineer is expected to make repairs, replace modules and replace electromechanical subassemblies. Printed circuit boards and a few other components are typically replaced as major subassemblies.

This manual is provided to complement the *Agility™ Automated ELISA System Operator's Manual*. In some instances, references will be made to the *Operator's Manual*.

In some instances, the supplier of the reagent kit will install the unit. Detailed installation information is provided in Chapter 2 of the *Operator's Manual* as well as Chapter 2 of this manual.

Defective subassemblies may be returned to DYNEX Technologies or your DYNEX Technologies distributor, where comprehensive repair facilities are available.

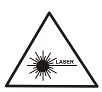
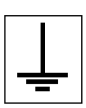
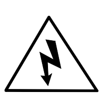
The service engineer should contact the local DYNEX Technologies service office for additional information.

This page intentionally left blank.

Safety

Warning Labels

The Agility™ system and its components contain labels that warn the user of a hazard or an electrical connection. The description of the labels is described below. Potential personal injury to the operator or damage the system can result if the labels are not followed.

Label	Description
	Alternating current is present
	Caution symbol. Refer to the *Routine Maintenance* chapter
	Caution, motion hazard
	Caution, pinching or mechanical hazard
	Caution, hot surface
	Laser radiation – Do not stare into beam
	Protective conductor terminal
	Earth (ground) terminal
	Caution, risk of electric shock
	Caution, biohazard

Safety Precautions

While the *Agility*^{TM} system is designed to meet international safety regulations, it must be recognized that servicing the instrument may expose the service engineer to potential hazards that are inherent in the operation and servicing of the instrument. This section describes a number of situations that the engineer should be cognizant of to optimize personal safety and eliminate the potential of damage to the system

> ***Note:*** *If the instructions in this manual and the operator's manual are not followed, the protection provided by the equipment may be impaired.*

Chemical and Biological Hazards

Appropriate precautions must be taken when working with biohazards. Universal precautions, appropriate hygiene, and decontamination of surfaces are recommended. Consult the reagent kit manufacturer for precautions on handling potentially hazardous substances.

The reagents, wash solution, etc., may contain compounds that may be hazardous. Always wear safety glasses and protective clothing when working with the washing solution or when the washer is operating (when testing the system, it is recommended that deionized water be used).

The microplates and the waste solution may contain materials that present a toxicological, radioactive or biological hazard. If the system is returned to a DYNEX Technologies service facility, make certain that a "*Certification of Decontamination*" is submitted before working on the unit.

Do not use decontamination or cleaning agents that could cause a HAZARD as a result of reaction with parts of the equipment or material contained in it. 70 % isopropyl alcohol and laboratory disinfectants containing quaternary ammonium sulphates are approved for use to clean and disinfect the system. Please contact your instrument provider and/or kit supplier if there is any doubt about the compatibility of decontamination or cleaning agents with the system.

If any liquid is deposited on the base of the system, clean it up immediately.

Mechanical Hazards

1. Appropriate personal safety precautions must be made when opening and closing the system doors while the system is operating. When the system is operating, take special care in accessing the work area.

2. Ensure that all sample tubes are firmly inserted in the sample racks so that the pipette module from being obstructed.

3. Ensure that all replacement parts and accessories for the system are supplied by the manufacturer of the system or the supplier of the kits.

Electrical Hazards

1. The system should be plugged into a power line that is connected to a true ground. Make certain that all internal grounding cables are connected.
2. Do not use this system in close proximity to sources of strong electromagnetic radiation (e.g. unshielded intentional RF sources) as these may interfere with the proper operation.
3. Use of the system in a dry environment, especially if synthetic materials are present (e.g. synthetic clothing, carpets, etc.) may cause damaging static discharges that may cause erroneous results.
4. Do not position the system so that it is difficult to disconnect it from the power supply and ensure that the power switch is not blocked.
5. Line voltage is present in various parts of the system and lower voltages are present in other components. If the power must be on during testing, take care to avoid contacting exposed components.

Compliance Issues

6. The system is tested and compliant with IEC 61326-1:2006 standard for electrical equipment for measurement, control and laboratory use with particular requirements for in-vitro diagnostic devices
7. This equipment has been designed and tested to FCC 15: Part B, ICES-003 for Class A device. In a domestic environment it may cause radio interference, in which case you may need to take measures to mitigate the interference.
8. Ensure that a compatible electromagnetic environment for the equipment can be maintained so that the system will perform as intended. The electromagnetic environment should be evaluated prior to the operation of the system.
9. The system is designed to meet Electromagnetic Perturbation – EMC Directive 2004/108/EC:EN 61326-2-6:2006, EN 61326-2-6:2006 and Electrical Safety – BS EN 61010-1:2001, IEC61010-1:2001, IEC 61010-02-101, also meets UL and CSA requirements.
10. The system is RoHS Compliant and is lead free.
11. IVDD- CE marked per IVD 98/79/EC Directive.

This page intentionally left blank.

Chapter 1 Introduction to the Agility™ Automated ELISA System

1.1 Overview

The *Agility Automated ELISA Processing System* (Figure 1-1) is an automated system which includes state of the art robotic processing to provide high analytical throughput with superb precision. A broad range of automated procedures are included to eliminate almost all manual steps that are required for an assay, thus increasing lab productivity and reducing the cost per test.

Figure 1-1: Agility™ Automated ELISA Processing System

This chapter is designed to provide a broad overview to the system and includes:

- A functional description of the system (Section 1.2)
- A description of the steps in a typical assay performed by the system (Section 1.3)
- Information about major components of the system (Section 1.4)
- Contents of this manual (Section 1.5)

1.2 Functional Description and Features

The *Agility™ Automated ELISA Processing System* automates each of the steps in an ELISA assay, including sampling, distribution, dilution, addition of reagents, incubation, washing, detection and data processing. All operations are performed through an assay protocol that is provided by the supplier of the reagents using a 2-dimensional barcode label that includes the details of the assay, data reduction and reporting. In addition, the barcode label contains lot information, usage volumes and pack layout. The system can be used to perform a single assay on all samples or it can perform a number of different assays on the selected samples.

To perform the desired assays, the operator inserts the following into the system:

- pre-packaged SmartKits™ which contain the reagents, standards and related fluids and the appropriate assay information
- consumables (e.g. pipette tips, mixing wells)
- samples

The operator generates a worklist, which indicates the assays to be performed on the various samples and the *Agility* system will automatically generate a schedule to perform the required processes such as adding reagents, mixing, incubation, reading of the absorbance and processing data.

The *Agility™ Automated ELISA Processing System* has a number of performance and convenience features, including:

- ESP™ (Electronic Signature Pipetting) for liquid level and clot detection
- Endpoint data analysis to perform qualitative and quantitative data reduction
- Less than 30 second reading time (using single wavelength mode)
- Less than 10 second reading time (using single wavelength mode)
- On-board self-diagnostics
- Automated selection of up to six filters
- Single, dual and multiple wavelength reading modes
- A variety of wash protocols can be programmed
- A variety of plate types can be programmed
- Liquid level sensing on waste container and wash buffer containers
- Quick dispense of reagents
- Aspirating/pipetting speed can be changed for viscous liquids

1.3 Steps in an Analysis

In a typical assay, the operations shown in Figure 1-2 are performed under computer control. In some cases, two (or more) additional, incubation or wash cycles may be required for an analytical procedure.

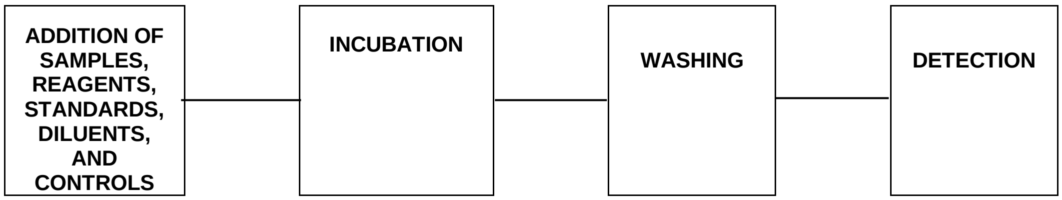


Figure 1-2: Operation Steps of the Agility™ Automated ELISA System

1. Addition of Samples, Reagents, Standards, Diluents and Controls to the Plates

An automated pipette is used to withdraw the appropriate amount of sample, reagent, standard, diluent or control from tubes (bottles) that are located in the SmartKit and add the liquid to the appropriate samples. Pipetting is performed by custom designed disposable pipette tips to assure pipetting precision and eliminate the possibility of cross contamination.

All movement of the pipette tip, as well as replacement of pipette tips is performed under computer control.

2. Incubation

Once the sample, reagents, diluents and standards have been added to each sample, the microplate is placed in an incubator module that is set to a specific temperature (from 4°C above ambient to 50°C) for the appropriate period of time. If desired, the microplate can be shaken during the incubation.

3. Washing

After the incubation is complete, the microplate is moved to the wash module and is washed. Eight wells of a microplate can be washed simultaneously, and different wash cycles can be used on different columns on a microplate.

4. Detection and Calculation

The absorbance module measures the optical density of each sample, which is used to calculate the concentration of the compound of interest in each sample on the microplate. In addition, QC operations on raw data as well as curve fitting can be performed to provide the desired results.

1.4 Major Components of the System

1.4.1 Overview

The system consists of a number of discrete modules whose operation is governed by the assay protocol and the worklist provided by the user. This chapter provides an overview of the major components of the system and the components are described in the following sections:

- Externally Accessible Components (Section 1.4.2)
- Workspaces (Section 1.4.3)
- Internal Components (Section 1.4.4)
- Consumables (Section 1.4.5)
- Electronics and Control Software (Section 1.4.6)

A detailed discussion about the replacement and service of these components is presented in Chapters A-AA.

1.4.2 Externally Accessible Components

1.4.2.1 Sample Racks

The *Sample Racks* (Figure 1-3) contain 10 sample tube racks which slide into the system. Each rack can hold 20 tubes (external diameter: 10-17 mm, internal diameter: 8-14 mm, height: 40-100 mm). The user manually fills the rack and the bar code is read by the sample reader (Section 1.4.2.2).

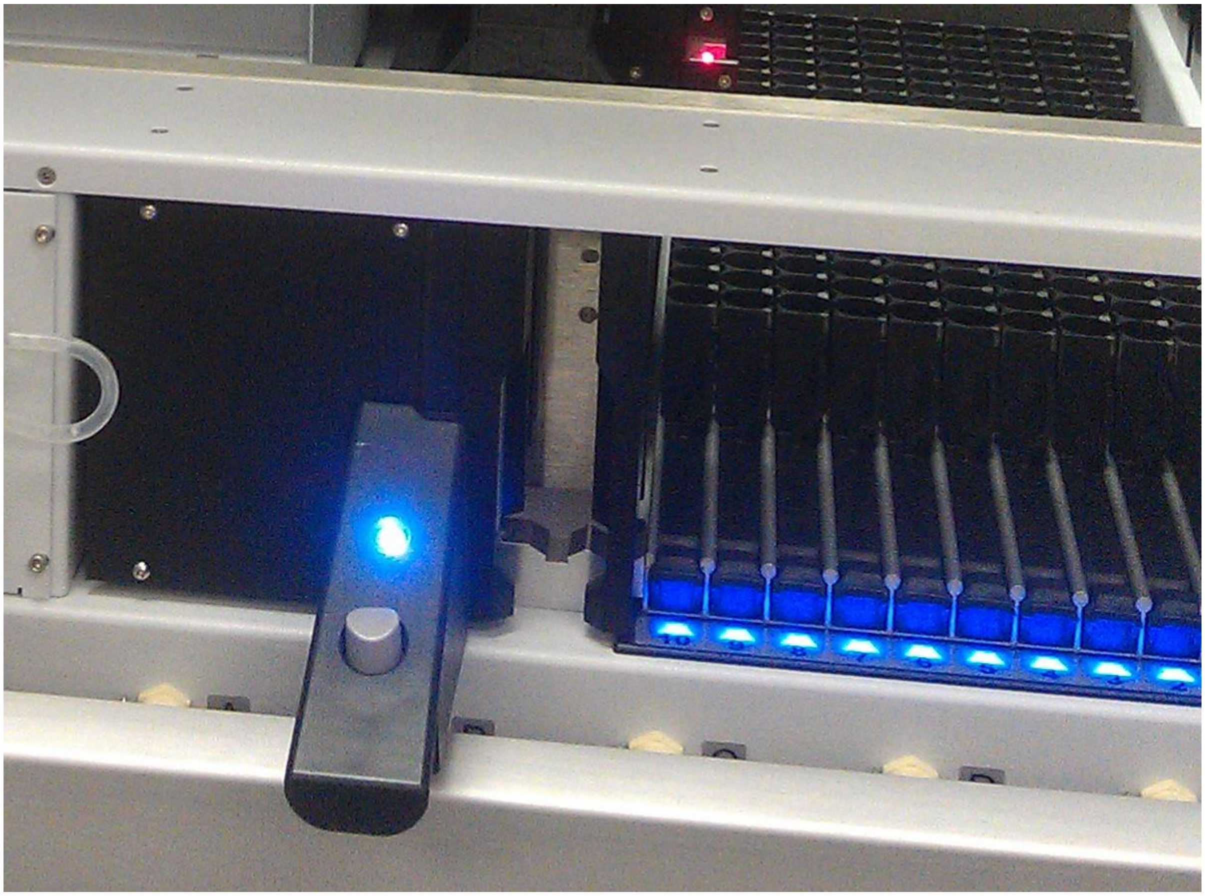


Figure 1-3: Sample Racks and Reader

The LED on the end of each rack indicates the status of the rack:

- White - no rack in slot
- Blue - rack inserted, barcodes read, no assigned assay job for samples
- Blue pulsing - rack in slot is completed jobs, rack could be removed
- Orange - rack inserted, barcode read, jobs pending, *Do Not Remove*
- Red pulsing - error, sample ID barcode read error, or rack has been reloaded but has not gone through the loader

1.4.2.2 Sample Rack Loader and Sample Reader

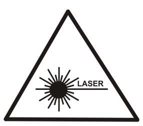
The sample racks are designed to go through a sample rack loader which houses a barcode reader and sensors for tube detection and tube size detection. The rack loader is manually moved by the operator to a position for each rack slot for loading racks. The loader may also be moved completely out of the way for user removal of all racks instead of one rack at a time.

The LED on the sample rack loading handle indicates the status of the loading sample tubes operation:

- White - normal state
- Red pulsing - Barcode read or tube error

The system detects the presence of a sample tube in a sample rack tube position, measures the height of each loaded sample tube and detects the diameter of each tube. This information is used to determine the size of sample tube and adjust the height of initial level detection to speed up and accurately schedule sampling time. It also adjusts centering and tracking of fluid based on the tube diameter.

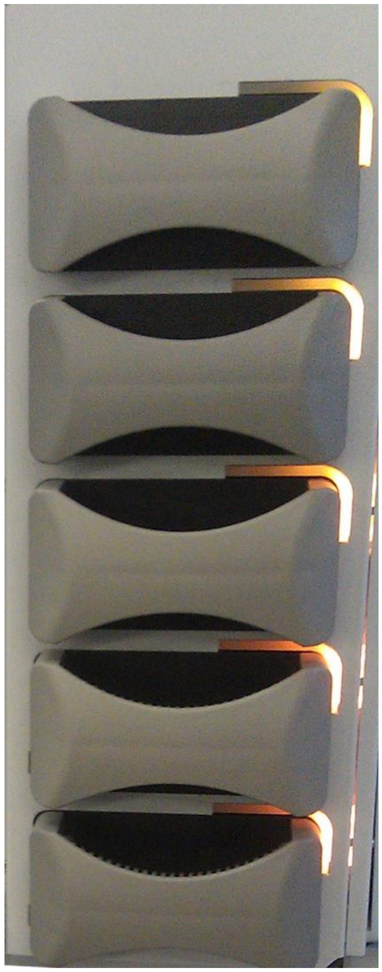
The barcode scanner reads barcode labels on the sample tubes and the position barcodes in-between. It includes a CDRH Class II laser barcode scanner.

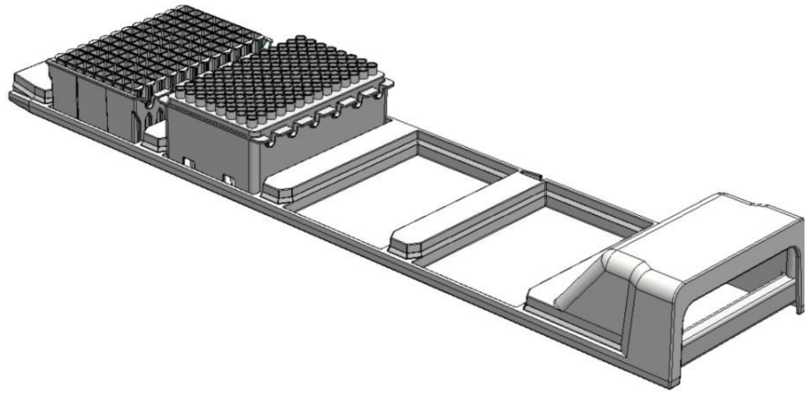


Caution: *The vertical barcode scanner has a maximum radiated power output of 1.0 milliwatt. Do not stare into the beam of the barcode scanner without appropriate protective equipment (e.g. protective glasses). Obey the warning label (shown below) that is attached to the on the front of the barcode scanner.*

1.4.2.3 Consumable Drawers

There are five user removable drawers (Figure 1-4) located on the right side of the system to load consumable items such as Sample Tip Holders, Deep Well Strip Holders and Reagent Mixing Vessel Holders. The contents of each drawer position are determined by a 2-dimensional barcode on the holder in each position.





(a) (b)

Figure 1-4: Consumable Drawers a) Location, b) Typical Rack

When a drawer is loaded, it will be detected as being inserted (sensor at rear) and the system schedules a read of the drawer consumable packs to determine what the drawer contains. The read is performed by the camera on the telescopic arm. Prior to performing the read will have activated the locking mechanism to secure the drawer. Locking the drawer in place maintains secure custody of the contents of the drawer for usage tracking of consumables and instrument status.

Once all consumable items on a drawer have been used, the drawer is unlocked and the status light changed to a pulsing blue so that the user may reload further drawer items. To aid the user what to load when additional consumables are required the system will schedule a load wizard window for the operator to perform, rearranging drawer items to make a used drawer available if necessary.

Each consumable drawer has an indicator light for the user to determine the status of the individual drawer. The status light indicates that the drawer is locked and is in use or that the contents of the drawer have been exhausted and the user is free to remove a drawer to reload more consumables.

The system tracks the status of the loaded unused consumables to determine if there are sufficient available consumables to run pending worklists. A status screen is available to see the number of each loaded consumables type and also show if there is sufficient to perform any pending or potential worklist jobs. The system will schedule load wizard windows to notify the user which additional consumables are required and when additional consumable items should be loaded.

1.4.2.4 SmartKit™ Ports

SmartKit™ reagent packs which includes bottles that contain the fluids that are required to perform the assay is inserted in ports on the doors of the system (Figure 1-5) A SmartKit™ includes a 2-dimensional barcode label that includes the details of the assay, data reduction and reporting as well as lot information, usage volumes and pack layout.

Figure 1-5: Ports for SmartKits and Microplates

1.4.2.5 Microplate Ports

The Microplate ports are directly below the SmartKit ports. A microplate is inserted into a microplate holder (Figure 1-6) that is used to hold and aid transportation of the microplate around the system. The microplate holder has a 2-dimensional barcode for its identification by the system.

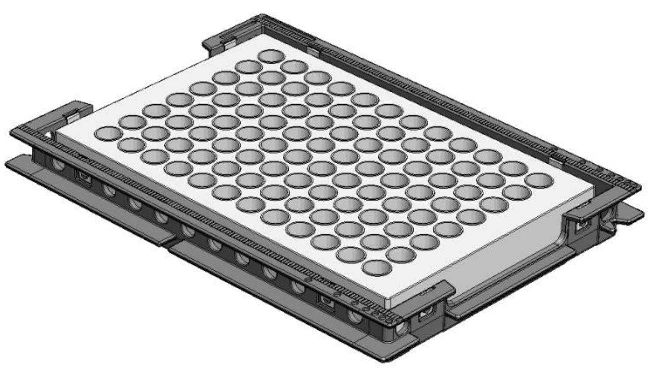


Figure 1-6: Microplate and Holder

1.4.2.6 Fluid Bottles and Waste Bottle

Five wash fluid bottles and a waste bottle are located on the lower part of the system behind the lower door (Figure 1-7).

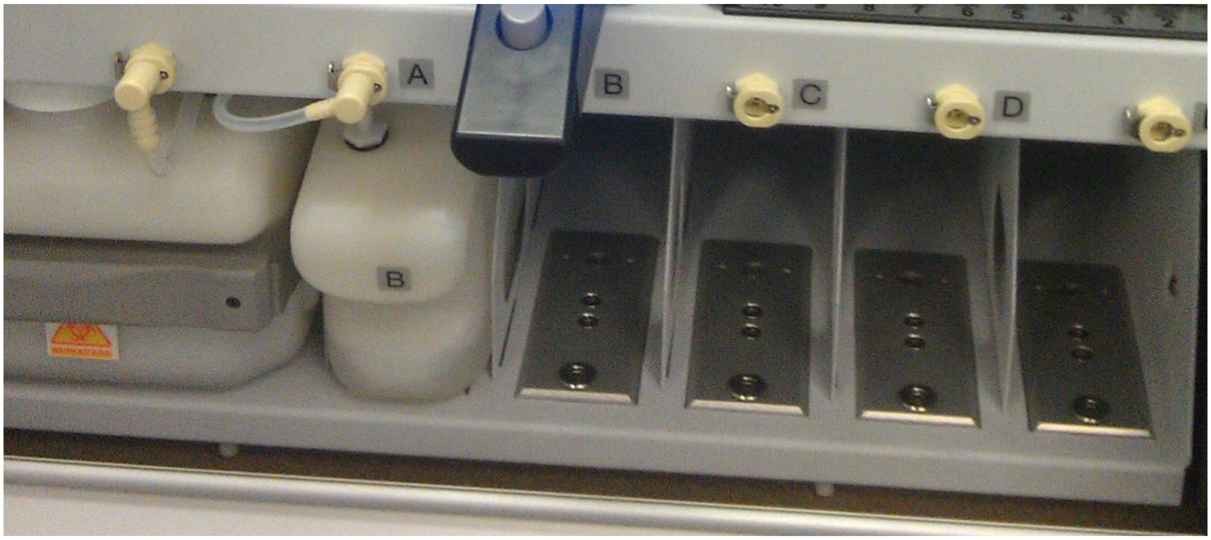


Figure 1-7: Wash Fluid Bottles and Waste Bottles

Up to three different washing and/or dispensing reagents may be placed in the two wash buffer containers (A and B) and the wash buffer bottle. The capacity of each wash buffer container is 2 L of liquid. Dispensing of wash buffer from a container is controlled by a bottle valve above the wash pump and a dispense valve located near the wash pump. The minimum volume for dispensing required for each wash buffer container is 500 mL. A quick disconnect fitting and a float switch connector allow easy removal of a wash buffer container from the system.

Fluid that is removed during purging and washing is collected in the liquid waste container. Discarded sample and reagent pipette tips are ejected into the Tip Waste container by the pipetting arm. The liquid waste container holds up to1.5 L of waste. A waste fluid level sensor alerts the operator when the liquid waste container is full and should be emptied.

1.4.2.7 Waste Tip Container

Used sample tips are ejected to a tip waste reservoir (Figure 1-8), which is capable of holding a minimum of 1334 sample tips (12 sample tip racks). The number of ejected tips is recorded in the tip status and the user is notified if it requires emptying. If the user removes the box, a prompt is provided to confirm that the tip waste reservoir was emptied and counter should be reset.

Figure 1-8: Waste Tip Container

1.4.2.8 User Interaction Monitor

A touchscreen video display unit (VDU) is provided on the lower right side of the system which incorporates touch screen technology. The position of the VDU can be selected by the operator for ease of reading. The VDU presents the present status of the system and allows the operator to view broad range of parameters. A standard keyboard can be displayed on the touchscreen for entering alphanumeric information as required.

1.4.3 Workspaces

Note: *The workspaces can be accessed via the front doors. These doors are locked electronically when the instrument is powered up and in use. In the event of a power failure the doors are also locked and can be opened using a manual key. The doors are software controlled and each door can be opened individually through the software user interface so that control is maintained. This is available when a worklist is not currently running or in certain error states.*

1.4.3.1 Lower Workspace

The lower workspace (Figure 1-9) provides the locations for SmartKits™, microplates, sample tips, deep well strips, reagent packs and samples. It can contain three SmartKits™, ten sample racks (200 individual sample tubes) and includes eight universal positions that are capable of holding the microplate holders, deep well strip holders and sample tip racks. As described below, the *Transport Arm* moves SmartKits, sample trays and trays of consumable items from their respective storage areas into the workspace area

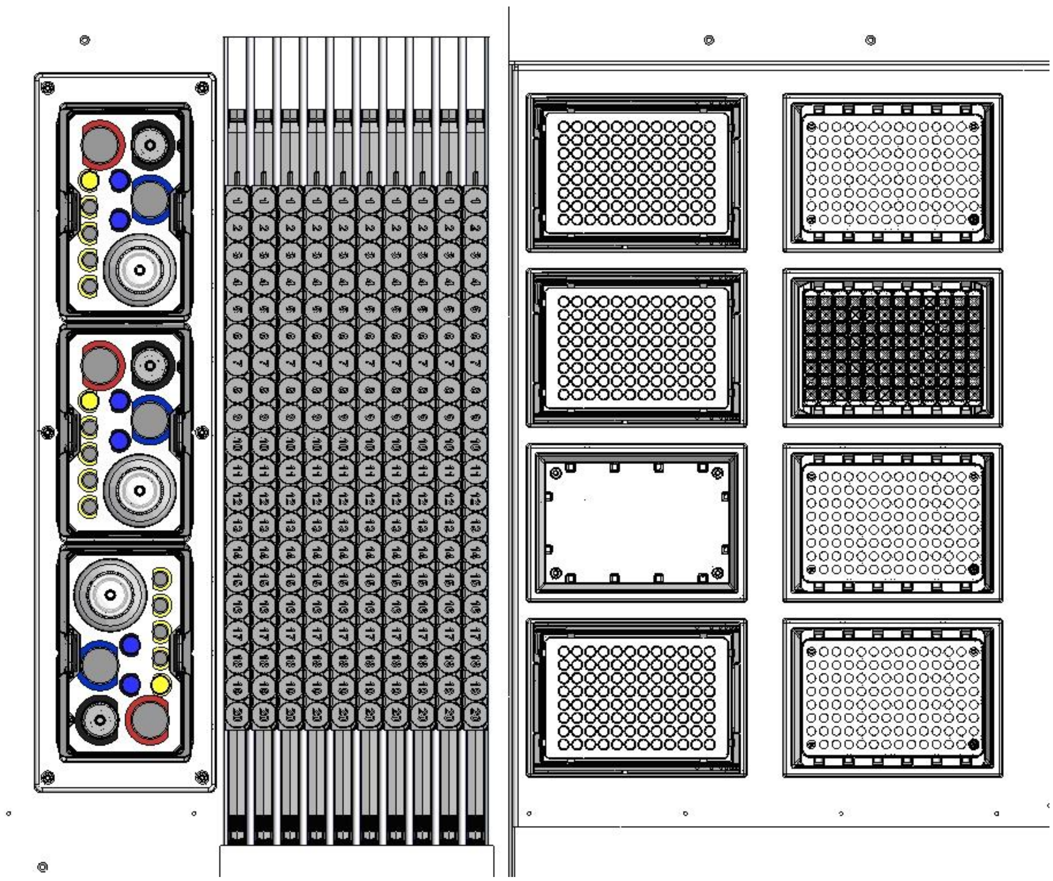


Figure 1-9: Lower Workspace Area

The system tracks the status of the loaded unused consumables to determine if there are sufficient available consumables to run pending worklists. A status screen is available to see the number of each loaded consumables type and also show if there is sufficient to perform any pending or potential worklist jobs. The system will schedule load wizard windows to notify the user which additional consumables are required and when additional consumable items should be loaded.

1.4.3.2 Upper (Reagent) Workspace

The Upper (reagent) workspace (Figure 1-10) has four locations capable of holding reagent packs or reagent tips and two locations capable of holding microplate holders, deep well strip holders or mixing well holders.

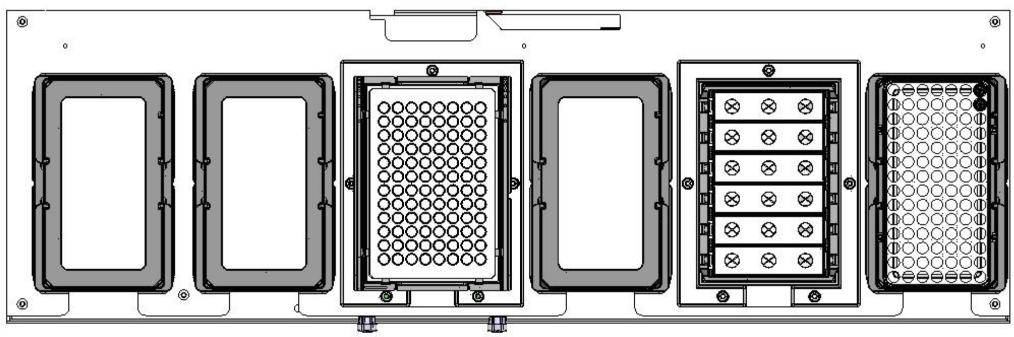


Figure 1-10: Upper (Reagent Workspace)

1.4.4 Internal Components

▶ ***Note:*** *The internal components described below can be accessed via the front doors. These doors are locked electronically when the instrument is powered up and in use. In the event of a power failure the doors are also locked and can be opened using a manual key. The doors are software controlled and each door can be opened individually through the software user interface so that control is maintained. This is available when a worklist is not currently running or in certain error states.*

1.4.4.1 Transport Arm

The *Robotic Transport Arm* (Figure 1-11) transports the various consumables around the instrument locations at times required to perform the operations defined by the controlling software and the worklist. The transport arm has gripper arms for positive locking and moving the consumable holders around the system. In addition, the gripper arms are also used to operate sliding doors and lock mechanisms within the system.

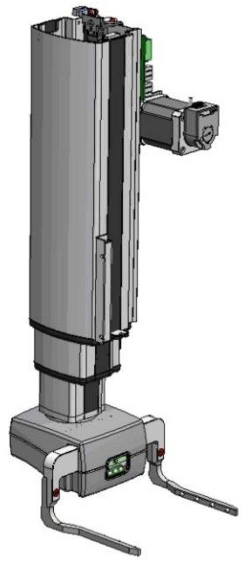


Figure 1-11: Transport Arm

There are two cameras associated with the transport arm:

- The vertical transport arm camera can image the side of an object and is used for reading 2-dimensional barcodes on objects.
- The horizontal transport arm camera images an object from above and is used to check for the correct number of strips loaded in a microplate or deep well holder. It may be used to determine the number of mixing vessels loaded in a mixing vessel holder. The camera can also record an image of the microplate (and save to an event log) after fluid has been added to the plate.

> ***Note:*** *Two additional cameras are included in the system, a sample workspace camera (Section 1.4.4.4) and a washer module camera (Section 1.4.4.5).*

1.4.4.2 Sample Pipettor Arm

The sample pipettor arm (Figure 1-12) is used to:

- Get a new sample tip from the sample tip rack
- Eject a used sample tip into the tip waste container
- Transfer sample fluid from sample tube to microplate wells / Dilution Strips
- Transfer dilution fluid from dilution strip to microplate well
- Transfer controls / Standard fluids from reagent packs to microplate wells / Dilution strips
- Mix fluid within Dilution Strip

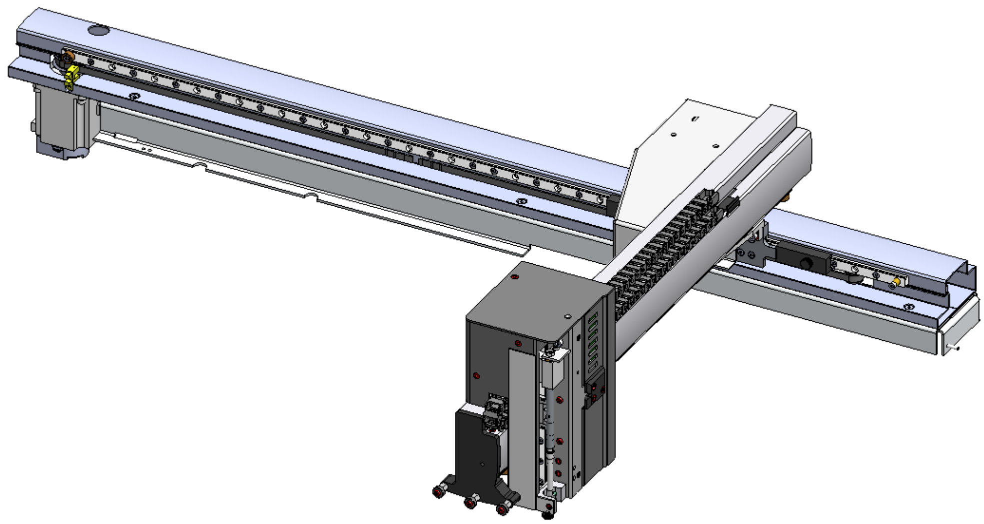


Figure 1-12: Sample Pipettor Arm

The sample pipettor is capable of determining a liquid level detect and can distinguish between the actual fluid body and bubbles / foam that may be encountered at the fluid surface, to ensure the fluid height is detected at the correct place.

The sample pipettor incorporates a method of determining if a fluid transfer can or has been achieved successfully. The method of determining this is based on what the pipettor is capable of pipetting. The following reasons for incorrect fluid transfer are:

- Foam
- Bubbles
- Clots
- Any pipetting anomaly

The pipettors determination of what can be pipetted will be based on real time pressure data collected at the time of aspiration.

1.4.4.3 Reagent Arm

The *Reagent Pipettor Arm* (Figure 1-13) is used to:

- Get a new Reagent Tip from the Reagent Tip Rack
- Eject a used Reagent Tip back to the Reagent Tip Rack
- Transfer reagent fluid from a reagent bottle in a reagent pack to a microplate well
- Transfer reagent fluid from a reagent bottle in a reagent pack to a deep well dilution strip well.
- Transfer reagent fluid from a reagent bottle in a reagent pack to a mixing well

- Mix reagent fluids (aspirating / dispensing) in a mixing well.
- Transfer fluid from a Mixing well to a Microplate Well/Dilution Strip well

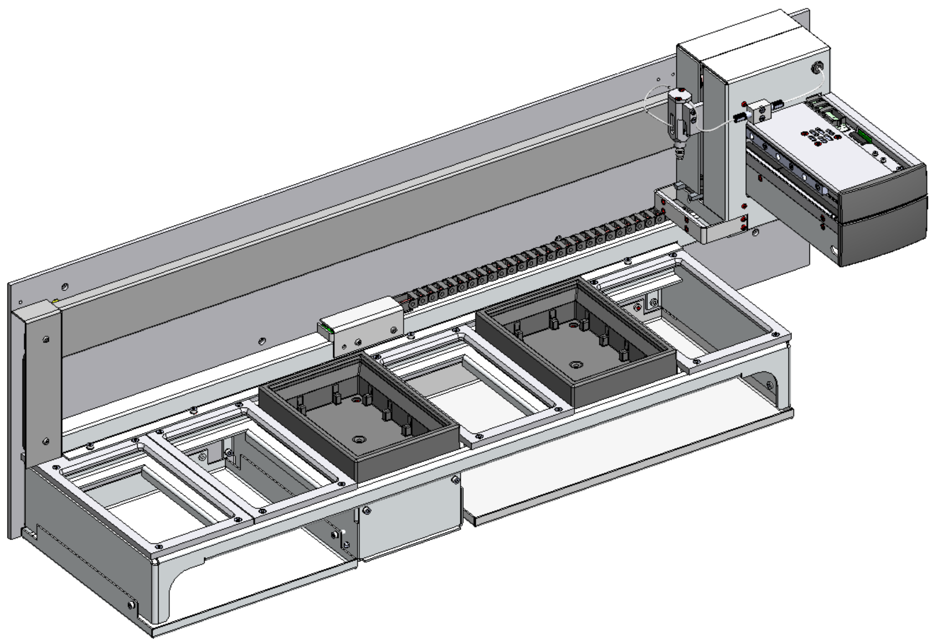


Figure 1-13: Reagent Arm

The used tips are ejected back into the same location that the tip was picked up from once the tip has been used. The reagent pipettor will incorporate a method of detecting the tip is present.

1.4.4.4 Sample Workspace Camera

This camera is mounted at an elevated position so that it can see the entire sample workspace consisting of the 8 holder positions, the sample racks and the Reagent Packs on the workspace.

The software enables the video to be played in real time on the touch screen monitor either in full screen mode or in a reduced window.

1.4.4.5 Washer Module Camera

This camera is mounted so that it looks at the front of the washer module and monitor all wash functions involving dispense and aspirate, so that the user can determine if during a dispense the fluid is flowing out of each Wash Head dispense tube correctly.

1.4.4.6 Telescopic Arm Camera

The telescopic arm camera can be used as additional feed for viewing on the instrument touch screen monitor. The telescopic arm camera can also capture an image of the microplate from above after fluid addition operations to the plate (normally prior to moving plate).

1.4.4.7 Ambient Incubators

There are 6 ambient incubators, positioned on the lower part of each door. The system will load plates when determined by the worklist timeline and when the incubation period is over, it will be returned to the unloading position.

The ambient incubators will be capable of shaking at 3 speeds low / medium/ high consistent with Agility shake frequencies. The incubators will be able to shake for the duration of the Incubation period or a set initial period.

1.4.4.8 Elevated Temperature Incubators

The system houses 6 elevated temperature incubators housed at the upper level of each front door. Each door will house 3 elevated temperature incubator compartments that are only accessible from the inside of the instrument.

1.4.4.9 Microplate Washer

The system washer has an 8 way wash head capable of dispensing to a standard microplate strip format of 3mm (Figure 1-14). The washer can sense the flow of wash fluid from each dispense pin prior to performing a wash operation to determine that none of the dispense tubes are blocked and can sense that none of the aspirate tubes are blocked.

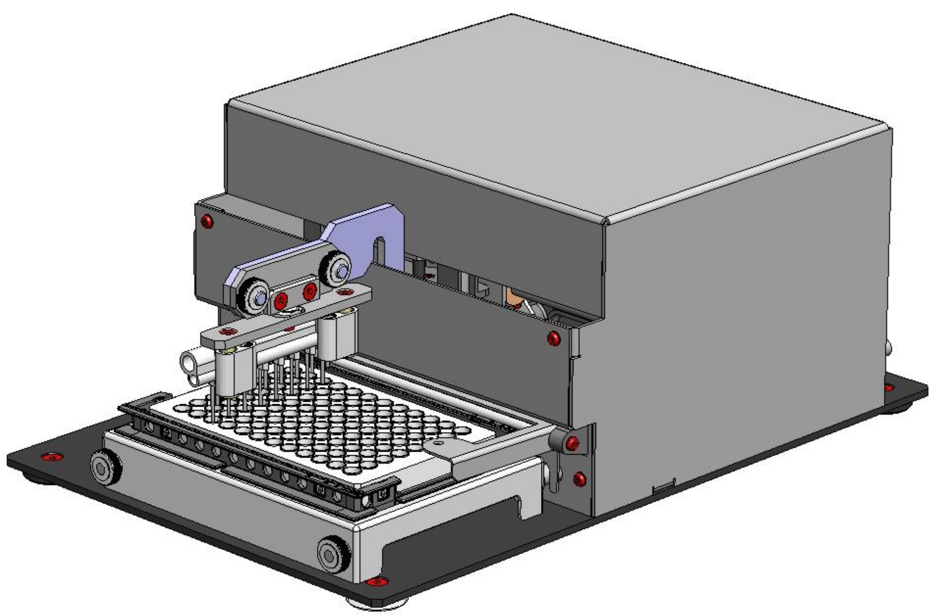


Figure 1-14: Microplate Washer

The wash head pin heights should be configurable to allow specific wash head heights to be used and adjusted when a specific plate type definition is selected for an assay. Wash head heights are configurable for:

- Dispense Height
- Top of Well Height
- Aspirate Height
- Sweep Height (+ sweep width)
- Bottom Wash Height

  The product wash module should have the ability to wash the entire plate or on specific strips and four different wash operations can be programmed:

- Standard Wash

  If a standard wash operation is programmed the wash head will initially aspirate the well prior to dispensing the programmed dispense volume to the well from the dispense height set in the plate definition.

1.4.4.10 Bottom Wash

If a bottom wash operation is programmed the wash head will initially aspirate the well prior to dispensing the programmed dispense volume to the well from the bottom wash height set in the plate definition (usually within the well). As the dispensed fluid is usually dispensed close to the bottom of the well it will aspirate the fluid at the same time causing a more vigorous wash.

1.4.4.11 Wash Fill

If a wash fill operation is programmed, the wash head will dispense the programmed fill volume to the well without performing an initial aspiration of the well.

1.4.4.12 Wash Aspirate

If a wash aspirate operation is programmed the wash head will aspirate the well only with no additional dispense to the well.

The product wash module should have the ability to aspirate the plate with different sweep modes.

1.4.4.13 No Sweep

No side sweep, the well is aspirate from the centre only.

1.4.4.14 Sweep

On each cycle of the plate, the well is aspirated while the wash head moves left to right.

1.4.4.15 Sweep on Last Cycle

On the last dispense cycle of the plate only the well is aspirated while the wash head moves left to right. For previous cycles no sweep setting would be used.

1.4.4.16 Super Sweep

On each cycle of the plate, the well is aspirated by moving the head using a 5 point sweep of the well (central and 4 points around the edge of the well).

1.4.4.17 Super Sweep on Last Cycle

On the last dispense cycle of the plate; the well is aspirated by moving the head using a 5 point sweep of the well (central and 4 points around the edge of the well).

1.4.5 Absorbance Module

The *Absorbance module* (Figure 1-15) measures the optical density (OD) of the reaction mixture in the microplate wells. The wavelength blank and the wavelength(s) at which the optical density is measured are specified during assay programming.

Figure 1-15: Absorbance Module

During operation, each microplate is automatically transported into the Absorbance Module at the rear of the instrument. The optical densities of the wells specified during assay definition are read, the specified calculations (for example, blanking, QC raw data, threshold or curve fitting) are applied, and the calculated results for the microplate wells are reported.

The Reader in the Agility system is able to take readings in two different modes:

- Single - using one test wavelength. This is sufficient for most applications.
- Dual - using a reference wavelength and a test wavelength. A discussion of this mode is presented in the Operator's Manual (page 25).

The Reader allows subtraction of a reference value from well ODs. Air is normally used as the reference, but the absorbance of a reagent solution can also be subtracted from the test result. Blanks may be single wells or an average of multiple wells.

1.4.6 Consumables

1.4.6.1 SmartKit™

The heart of the Agility Automated ELISA Processing System is the SmartKit™, which is a reagent pack that is designed to hold bottles that contain the fluids that are required to perform the assay. The SmartKit™ includes a 2-dimensional barcode label that includes the details of the assay, data reduction and reporting as well as lot information, usage volumes and pack layout.

Typically, a complete SmartKit™ is provided by a supplier of ELISA assay kits and placed into the front door of the Agility Automated ELISA Processing System. As an alternative, a generic pack design can be used to hold standard fluid containers that the laboratory user fills from the bottles of a manufacturers test kit. The pack is fitted into a reagent pack holder to be loaded on the system through the reagent pack load position. A typical SmartKit™ and reagent pack holder is shown in Figure 1-16.

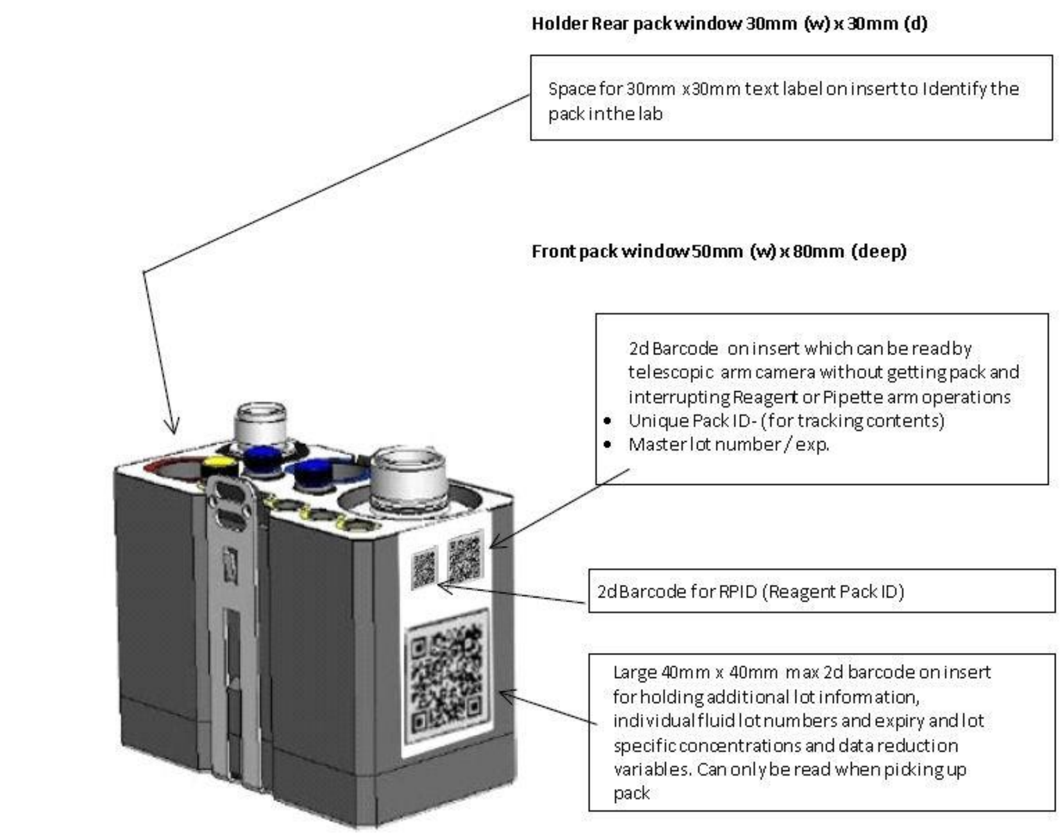


Figure 1-16: A SmartKit and Reagent Pack Holder

The SmartKit™ and holder are loaded on the system and the label is read with a transport arm camera, the transport arm also grips and moves the SmartKit™ around the system workspace locations with the transport arm where required.

1.4.6.2 Pipette Tips

Sample tips are used to dispense samples, standards, and control fluids. These tips are supplied in a rack of 112 tips and are placed in the consumable drawers.

Reagent tips are used to dispense reagent fluids. These tips are supplied in a rack of 98 tips and are placed in the consumable drawers.

1.4.6.3 Mixing Vessels

Some test kits will require that two or more components be mixed before being added to the sample on a microplate or a dilution strip. If the assay requires mixing, a holder containing 18 mixing vessels (6 strips containing 3 mixing vessels) is placed in the consumables compartment. The holder has a bar code and is selected as required by the transport arm and placed in the lower workspace.

1.4.6.4 Deep Well Strips

Some test kits will require that the sample, standards, reagents or controls be diluted before use. If a liquid requires dilution, a holder containing 12 deep well strips is placed in the consumables compartment. The holder has a bar code and is selected as required by the transport arm and placed in the lower workspace.

1.4.7 Application Software

The Agility system is controlled by an internal computer and application software which automates the sample distribution, incubation, reagent addition, washing and detection phases of microplate assays. It also provides the user interface for configuration of the instrument and management of consumables

The software includes an extensive menu of assay definition options that allow you to customize the readings, calculations, QC checks and results format for an assay.

Additional information about the software can be found in the Agility Operator’s Manual and additional help can be accessed by selecting the **Help** menu.

1.5 Contents of this Manual

This manual contains the following information:

Section A: General Service Information

- **Chapter 2: Installation** - describes how the *Agility ELISA System* is installed in the customer's facility.
- **Chapter 3: Maintenance and Introduction to Service** - Outlines a series of activities that should be performed on a routine basis and describes the general approach to servicing the system.
- **Chapter 4: Troubleshooting, Self-Test Information and Error Codes** - describes how the service engineer can determine the cause of the immediate problem. In addition, this chapter describes general calibration of the system.
- **Chapter 5: Using Diagnostic Software** - describes a series of operations that can be performed by the service engineer to manually control various components of the system and describes the diagnostic software. These functions can be used to independently test the modules in the system.
- **Chapter 6: Schematics -** provides a series of schematic diagrams

Section B: Replacing and Repairing System Components

This section includes a chapter for the replacement and repair of each major high level component. In most instances, the service engineer will replace the defective component with a new component and the defective component will be returned to a service depot for repair unless the repair is trivial (e.g. if a pipettor is not working properly, the entire pipettor assembly will be replaced, Each chapter will describe the test procedure(s) necessary to ensure that the replaced component and the overall system is functioning properly.

- **Chapter A: Replacing Components**
- **Chapter B: Backplane Assembly**
- **Chapter C: Consumable Drawers Assembly**
- **Chapter D: Doors**
- **Chapter E: Electronics Box**
- **Chapter F: Fans (Extraction Assembly)**
- **Chapter G: Fluidics Panel Assembly**
- **Chapter H: Gripper Assembly**
- **Chapter I: Incubator (Ambient)**
- **Chapter J: Incubator (Heated)**
- **Chapter K: Lower Fluidics Assembly**
- **Chapter L: Magnetic Encoder**

- **Chapter M: Power Switches**
- **Chapter N: Reader Assembly Reagent**
- **Chapter O: Reagent Pipettor**
- **Chapter P: Reagent Pipettor (Y Drive)**
- **Chapter Q: Reagent Pipettor (X Drive)**
- **Chapter R: Rotator Drive**
- **Chapter S: Sample Pipettor (X Drive),**
- **Chapter T: Sample Pipettor (Y Drive),**
- **Chapter U: Sample Pipettor (Z Drive),**
- **Chapter V: Sample Rack Scanner,**
- **Chapter W: Touchscreen**
- **Chapter X: Transport Arm (X Drive)**
- **Chapter Y: Transport Arm (Y Drive)**
- **Chapter Z: Transport Arm (Z Drive)**
- **Chapter AA: Washer**

Chapter 2 Installation

2.1 Overview

The *Agility™ Automated ELISA System* should be installed and set up by a factory trained DYNEX Technologies representative or a factory trained representative of the organization that is supplying the reagent kits. A reagent kit provides the various reagents for an assay and includes the assay protocol as described in Chapter 1.

2.2 Receipt of the System

The *Agility™ Automated ELISA System* is normally shipped in a single crate. Upon arrival of the system, the customer should inspect the shipment and ensure that all components have arrived in good shape. If damage is observed, either upon arrival of the system or upon unpacking, the customer should immediately make a written claim to the transport company and Dynex Technologies (or the organization from which the unit was purchased).

Table 2-1 provides a list of all components shipped with the system. If any items are missing or defective upon unpacking, the customer should immediately make a written claim to the transport and Dynex Technologies (or the organization from which the unit was purchased).

Table 2-1: Agility Packing List

Part No.	Description	Quantity
352101800	Cleaning Wire (.018”)	2
352104000	Cleaning Wire (.040”)	2
91001040	Operating Manual	1
47000030	O-Ring Lubricant Silicone (1/2 Oz Tube)	1
42000810	Hex Key (2mm Short)	1
42000830	Hex Key (4mm Long)	1
P24FIX066	Wash Head Alignment Fixture	1
62910	Deep Well Strips	12
67951	Mixing Well Strips (Blue)	6
67910	Sample Tips	1 Box of 896 (8 Racks of 112)
67920	Reagent Tips	196
67930	Dilution Tray Holder With Barcode Label	1
67940	Mixing Tray Holder With Barcode Label	1
24901041	Reagent Rack Holder	2
13501500	Assembly, Plate Carrier	2
65940	Vials, Control (With Caps)	1 Pack of 33
62920	Tubes, Reagent, 25ml	2 Packs of 10
24902350	Bronze Kit Insert	1
24902360	Bronze Kit Trough	1
22504750	Override Key [a]	1
	Power Cord [a] [b]	1

(a) The Override Key, Sample Kit and Power Cord are stored in the Tip Waste Container. All other items will be in a box in the cavity of the instrument. This box also contains the Wash Head Assembly and the Power Cord and may contain a USB Memory Stick for the software.

(b) The power cord will correspond to the plug configuration of the user location.

An external box contains:

Table 2-2: External Box Contents

Part Number	Description	Quantity
67930	Dilution Tray Holder With Barcode Label	11
24901041	Reagent Rack Holder	14
13501500	Assembly, Plate Carrier	10
24902350	Bronze Kit Insert	5
24902360	Bronze Kit Trough	5

2.3 Power Requirements

The system requires 120 V/240 V (automatic switching), 50/60 Hz and has a power consumption of < 1000 VA. The system should be installed on a dedicated power line that is connected to a true ground. An on-line uninterruptible power supply (UPS) with an output power capacity of 1000VA/800W and 120V nominal output voltage with 10-30 minutes backup time should be used.

Note: *Do not use this system in close proximity to sources of strong electromagnetic radiation (e.g. unshielded intentional RF sources) as these may interfere with the proper operation.*

2.4 Locating the System in the Laboratory

The system weighs 204 kg (450 lb) and should be installed on a laboratory bench that is capable of supporting this weight along with any ancillary equipment. As a minimum, it is suggested that the bench be able to support 300 kg (660lb.).

When the system is shipped, it is bolted to the shipping crate. A separate document (part number 99002680) describes the removal of the system form the shipping crate.

__Note:__ At least four people are needed to position the system on the bench.

__Note:__ It is recommended that all shipping materials are saved until the training session has been completed and the overall performance of the system and assay results is deemed to be satisfactory.

The system is: 1200 mm (48”) wide, 900 mm (36”) deep and 1200 mm (48”) high and has a footprint 1200 x 650 mm (48” x 26”).

There must be at least 10 cm (3.9”) of space at the rear of the instrument to allow for sufficient ventilation.

Make sure that the system is away from air conditioning vents, heat vents, windows and any other device that can lead to significant temperature change. If organic solvents are used in the laboratory, make sure that there are no open flames or devices that can create sparks in the laboratory.

The system should be positioned on a level surface that does not support other devices that produce vibration (e.g. shakers, centrifuges, etc.).

The system should be positioned in a manner that the power cord and the on/off switch on the rear panel are accessible.

2.5 Connecting the System Power Cord

The power cord connection to the system is located in the back panel of the system.

Caution: *The* system *must be connected to a properly grounded electrical outlet. Verify that the electrical outlet is properly grounded.*

Before connecting the power cable, be sure that the system and any auxiliary components have been connected to each other.

To Connect the Power Cord:

1. Plug the power cord into the connector at the back of the instrument.
2. Connect the other end of the power cord to the laboratory electrical supply outlet.

2.6 Powering Up the System

The power switch is located on the rear panel adjacent to the power input. When the system is powered up, the display will present the *Welcome* screen (Figure 2-1).

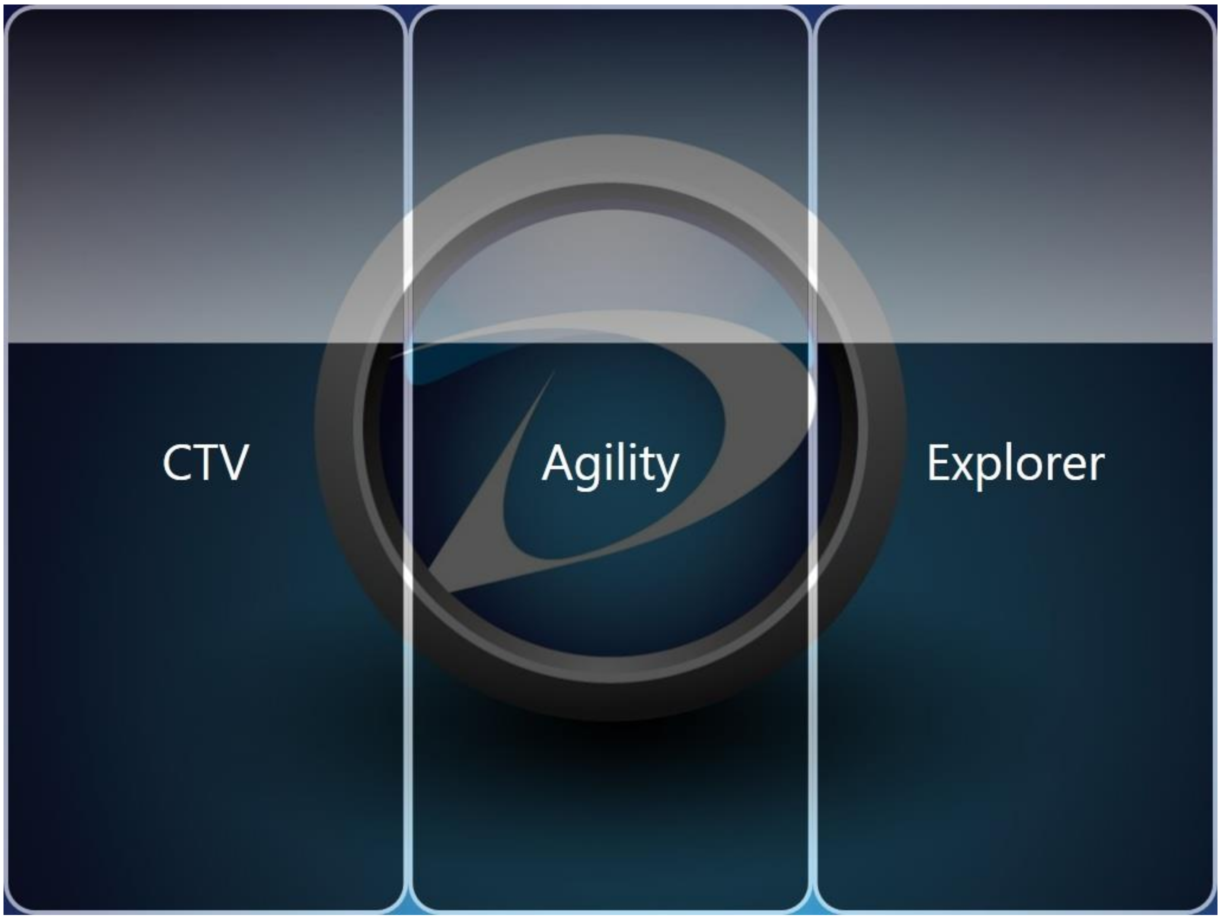


Figure 2-1: The Welcome Screen

There are three large buttons.

- Agility - enters the standard mode of operation and presents the Home screen (Figure 2-2).
- CTV - activates routines for control, test and verification. It is used for service and maintenance. It should only be used by trained service technicians.
- Explorer - lets the user work at the operating system level.

Figure 2-2: Welcome Screen

> ***Note:*** *An individual at the user site will be designated as the the local administrator for the system and will be given login information as a local administrator. Login will be handled through the Windows login at the local group level. Once logged in and if it is hooked up to the account's LAN, the administrator can tap into the network domain and add anyone they choose to the local group. If the system is not on a network, the user names/passwords can be added on a local basis.*

2. Enter the *Password* and press the *Right Arrow* to present the *Startup* screen (Figure 2-3).

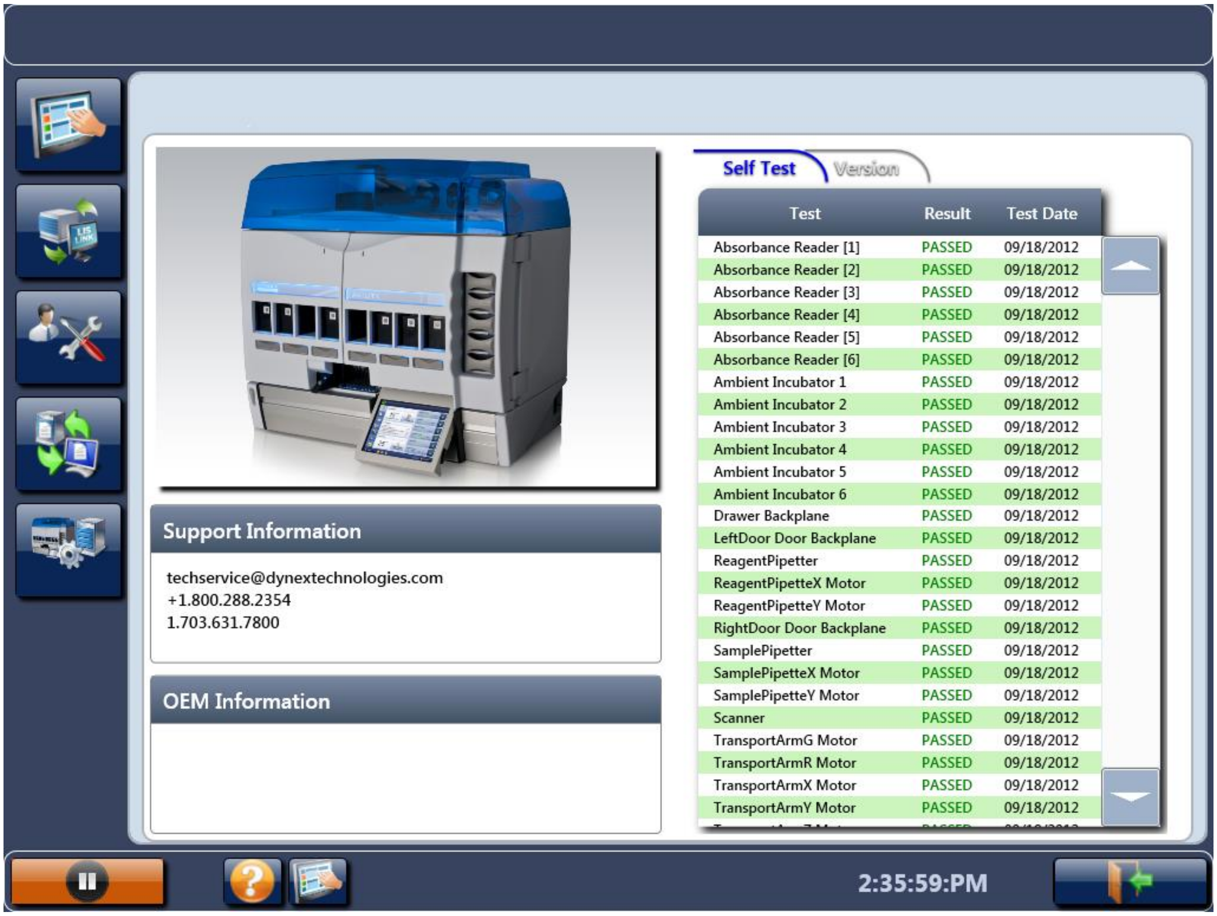


Figure 2-3: The Startup Screen

A number of instrument self-tests will be performed.

If all module tests are positive, the *Dashboard* will be presented (Figure 2-4).

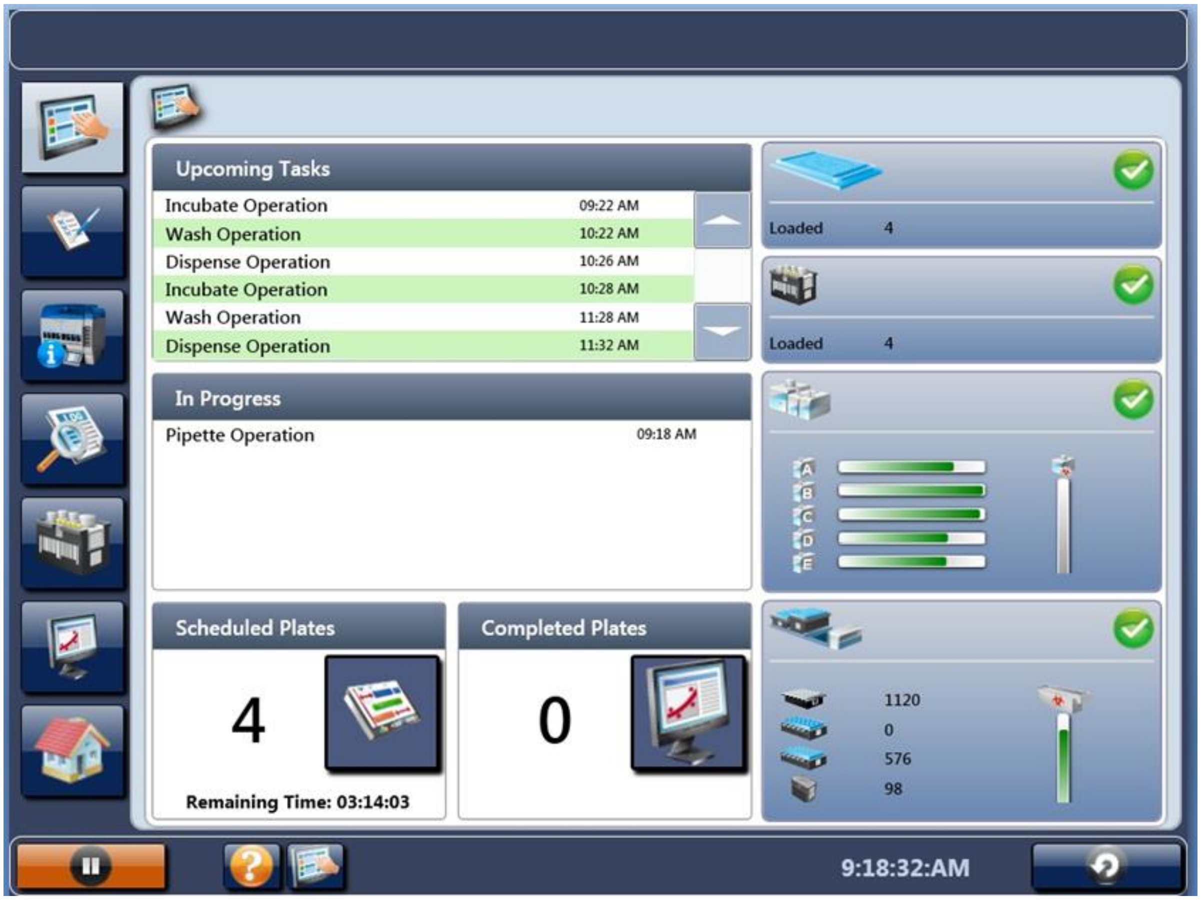


Figure 2-4: The Dashboard

2.7 Establishing LIS-Link

LIS-Link is a separate application that may be installed to enable bidirectional communication with the laboratory's LIS system. Worklists may be set up automatically according to downloaded information from the LIS system and results of processing and analysis can be sent automatically or through operator efforts to the LIS system after completion. Consult the LIS-Link manual for operation instructions.

Agility has been configured for serial communication to the LIS and a cable (Figure 2-5) is included with the accessory kit. It must be set up on site.

To establish the link for the communication:

1. Insert the Serial Converter Cable (Figure 2-5) into a USB port. Three ports are available on the right side of the instrument at the power receptacle area in the bottom rear as shown in Figure 2-6 and an additional three ports the power switch area in the front of the system on the lower left corner (Figure 2-7).

Figure 2-5: Serial converter cable

Figure 2-6: Power receptacle area

Three more ports are located in the power switch area in the front on the lower left.

Figure 2-7: Power switch area

To establish the Communications port:

> ***Note:*** *Each port is automatically assigned a name by Windows. However, LIS-Link software only recognizes port names COM1 to COM9.*

1. From the Windows Start screen (Figure 2-8), press the Start button, then right click on *Computer t*o present the *Device Manager* screen (Figure 2-9).

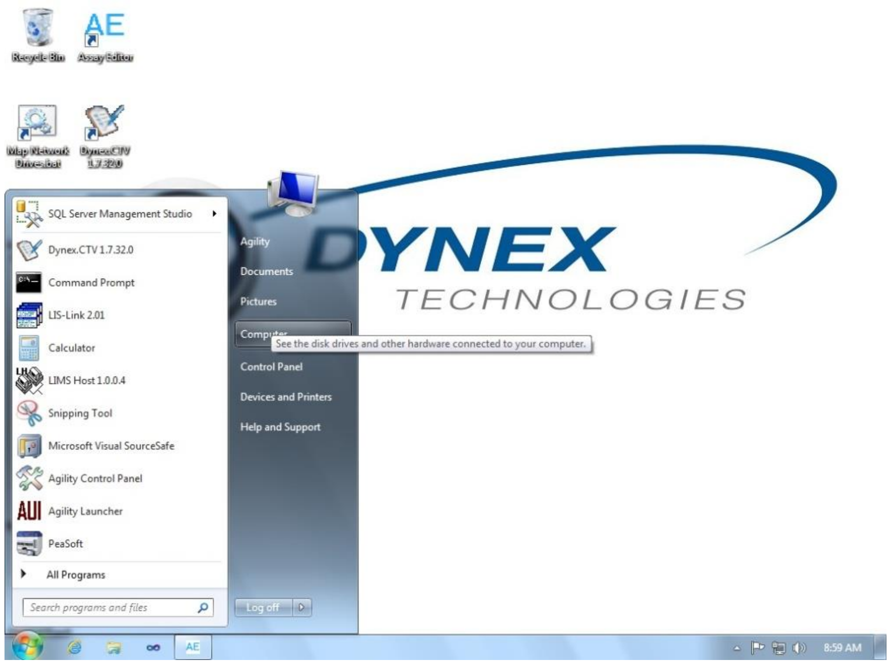


Figure 2-8: Computer Configuration

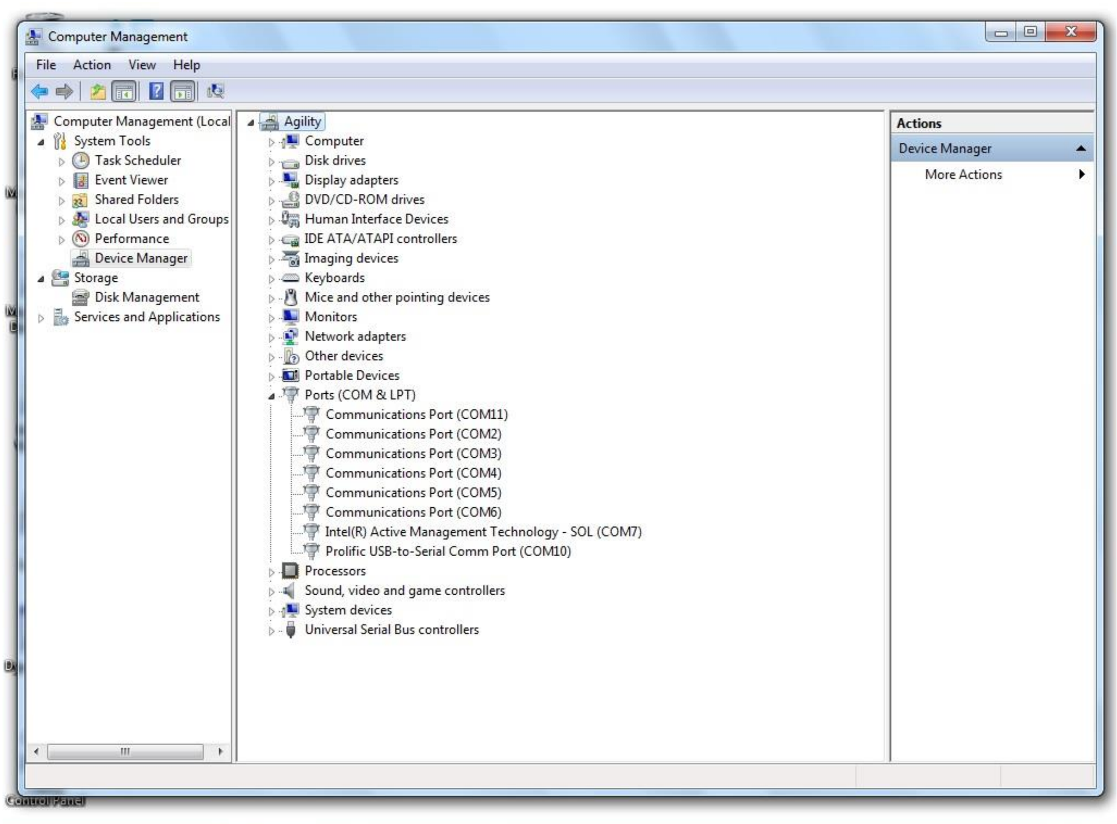


Figure 2-9: Device Manager

2. Select the *Prolific USB-to-Serial Comm Port*. If is not named COM1 to COM9, it must be renamed.

COM8 and COM9 are available for LIS-Link and LIMS HOST.

To rename a COM port

1. Right click on Properties to present the properties listing (Figure 2-10).

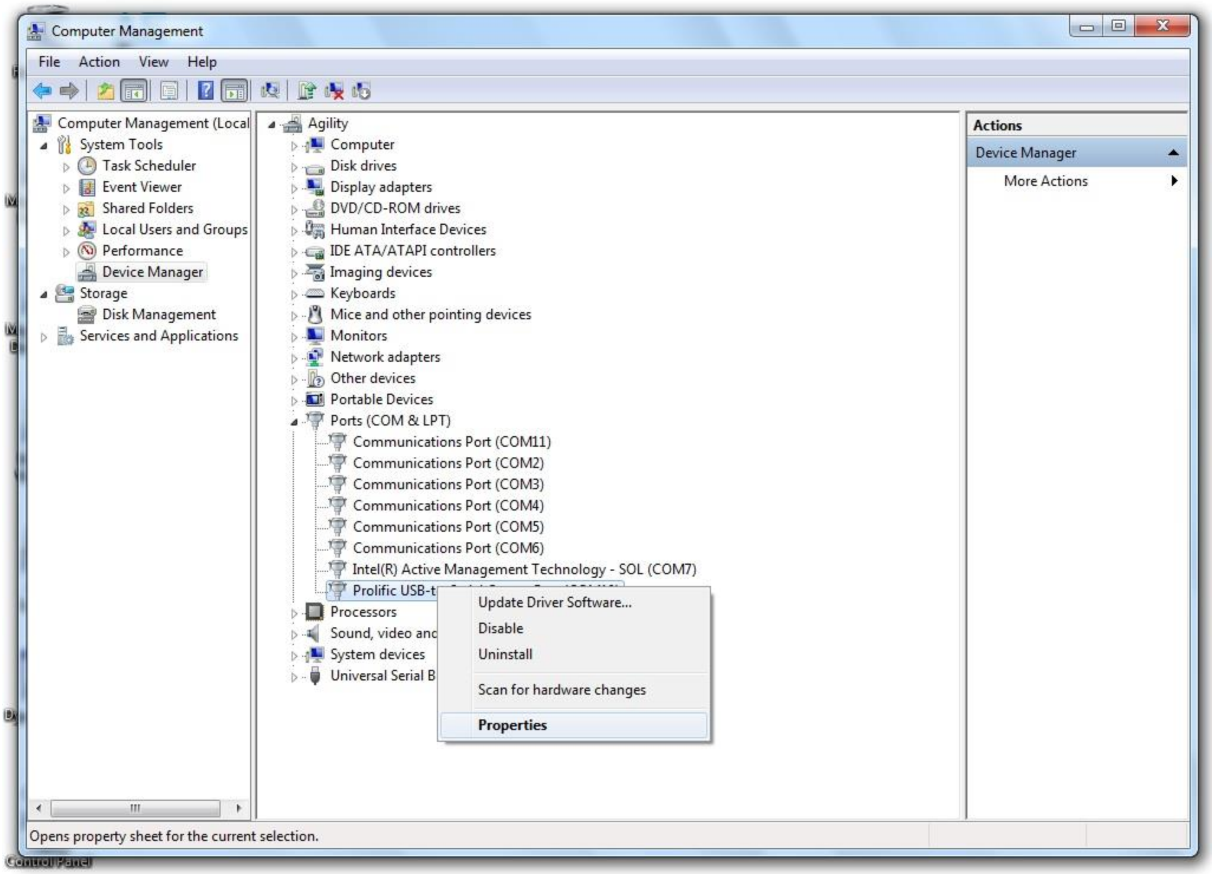


Figure 2-10: COM Port Selection

2. Select USB-to-Serial Comm Port (Figure 2-11).

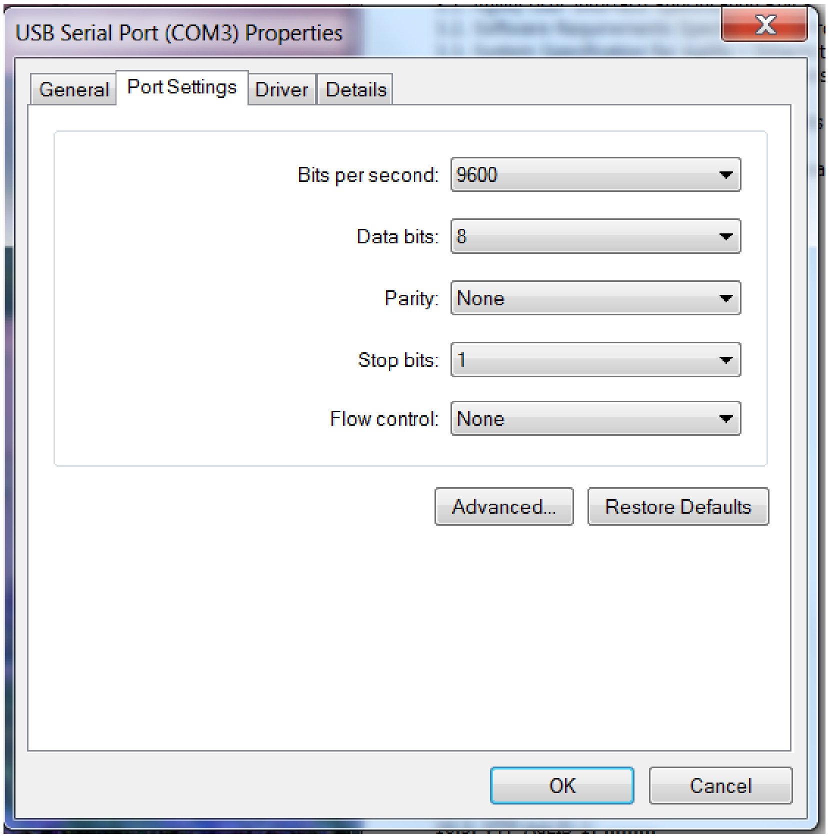


Figure 2-11: COM Port Properties

3. Click on Advanced (Figure 2-12).

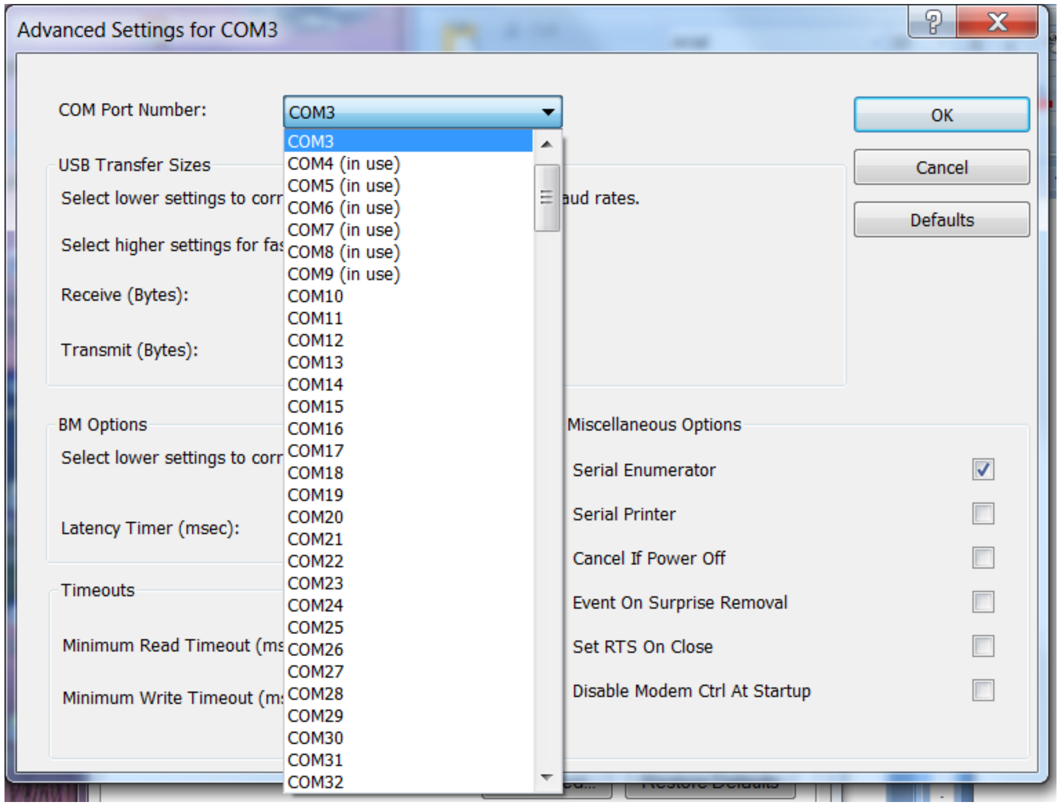


Figure 2-12: Advanced Properties

4. If the COM port name is not assigned COM 1 to COM9, select a proper COM name from "COM Port Number" list.

Chapter 3 Maintenance and Introduction to Service

3.1 Overview

This chapter describes:

- Routine maintenance activities. While these activities are typically performed by the user, they (and are included in the user's manual), this material is included here as the service engineer may be required to perform these activities from time to time (Section 3.2).
- Servicing the System (Section 3.3)
- Returning Components (Section 3.4)
- Cleaning and Decontamination (Section 3.5)
- Updating the System (Section 3.6)
- A list of jigs, software and tools that are required to support the servicing of the system (Section 3.7)

3.2 Routine Maintenance Activities

3.2.1 Maintenance Schedule

The following periodic maintenance procedures should be performed on a routine basis. The actual frequency can vary, dependent on the use of the system.

Daily Maintenance

1. Empty and clean the tip waste container.

Warning: *While the system does not present a biohazard, the samples that are used and all parts and consumables that are in contact with the samples must be considered biohazards. Always wear protective gloves when handling potential biohazards.*

2. Empty and clean the liquid waste container on an as needed basis.

Note: *If desired, the waste tip container and the liquid waste container can be disinfected with a 10% (v/v) solution of household bleach in water or 70% ethanol. If bleach is used, the containers must be thoroughly rinsed with deionized water before replacing, as residual bleach fumes may affect the results of ELISA assays.*

3. Clean all plate drawers and external surfaces using a towel moistened with a 70% ethanol solution.

4. Clean the pipette spigot using a towel moistened with 70% ethanol.
5. Purge the washer with 50 mL of deionized water.
6. The pipette spigot tip should be cleaned with ethanol.

Weekly Maintenance

1. Empty the wash buffer containers and clean them with several rinses of deionized water.

Periodic Maintenance

1. When the dispense tubing or the aspirate tubing becomes cracked, deformed or discolored, it should be replaced.
2. The lamp in the absorbance reader has a approximate average lifetime of 2000 hours and should be replaced as described in Section N.2

3.3 Servicing the System

3.3.1 General Approach to Service

The system is designed to perform a series of ELISA assays using kits that are supplied by third parties. The service engineer is expected to install the system as described in Chapter 2 and ensure that all modules are operating properly, as indicated by the PASS remark in the *Test* fields in Figure 2-3. When a service call is made, the service engineer is likewise expected to demonstrate that all modules are functioning in the pass mode.

The validity of analytical results obtained by the system is dependent on the performance of the Agility system and the nature of the SmartKits that are used for the assay. If problems with an assay are observed and if all modules in the system pass the start up tests, the general approach in problem solving should be to focus on the nature of the SmartKit and the user should be encouraged to contact the manufacturer of the SmartKit.

3.3.2 Modular Nature of the System

The *Agility* system is composed of a number of discrete components. If a problem is observed with the system, the first job is to determine whether one particular module may be faulty. Power the system down and then start it up again; the results of the various tests performed during the initialization protocol is indicated on the *Startup* screen (Figure 2-4).

Most of the modules are readily removed from the system. Unless the repair can be easily done on location, the entire module is replaced and the defective module is returned to a service center. Typically the replacement module will be sent via express and the user can install the replacement module. Please refer to Section 3.4 for information about returning modules.

Some components of the system, such as the X, Y and Z drive mechanisms are not readily removed from the system as modules. For these items, the service engineer may be required to determine the problem and perform the necessary service on-site.

3.3.3 Role of the Post Service Checkout Protocol

After any service activity, the component(s) that have been replaced should be checked and the six month testing protocol should be performed to ensure that all components of the system are functioning properly.

3.4 Returning Components

When a component (e.g. the Reader module) is to be returned to DYNEX Technologies, the user or service engineer is expected to obtain a return authorization number before shipping the unit and must include an *Equipment in Transit* form. For international locations, please contact your local DYNEX Technologies facility or local service depot.

Warning*: The system or component must be decontaminated before shipment. The decontamination process in presented in Section 3.5.*

DYNEX TECHNOLOGIES

EQUIPMENT IN TRANSIT

IMPORTANT: Please include a copy of this form with each instrument. If your instrument contains a hard drive please retain back-up copies of any stored files. Failure to do so may result in loss of those files.

Return Authorization Number: ____________
Contact Technical Service, DYNEX Technologies
Phone: (800) 228-2354
Fax: (703) 631-7816
Equipment: ____________
Serial Number: _________

EQUIPMENT DECLARATION

Clearly indicate fault condition or reason for return.

CERTIFICATE OF DECONTAMINATION

I certify that the equipment described above has been disinfected/decontaminated* and is clean, dry and fit for transport.

Signed: ____

Title: ____

Date: __________________

(DYNEX Technologies reserves the right to refuse improperly cleaned equipment)

Shipping address: DYNEX Technologies
Attn: (Above return number)
14340 Sullyfield Circle
Chantilly VA 20151-1683

*** Suggested decontamination methods:**

Readers - Wipe all surfaces with a cloth moistened with 10% bleach or 70% alcohol. If using the bleach solution, follow with a mild detergent solution. Subjecting surfaces to prolonged exposure to 10% bleach is not recommended.

Washers - Please follow the “Decontamination Procedure” found in the manual.

Figure 3-1: Equipment in Transit Form

When a component is being returned to the factory or a service depot, obtain a Return Authorization Number (RA#) and package it is a manner that will preclude any damage due to shipping.

3.5 Cleaning and Decontamination

Warning: *The samples, reagents, wash solution and/or the aspirated wash solution may contain toxic materials or biohazards. The service engineer must assume that these liquids and any components that come in contact with them are hazardous.*

Ensure that the system has been decontaminated or take suitable precautions (e.g., wear rubber gloves and suitable eye protection).

If the system is sent back to a Dynex technologies facility, the user must certify that the unit has been decontaminated.

3.5.1 Cleaning the System

The system is constructed from materials that are resistant to chemical attack.

Spills should be cleaned up as soon as possible. The service engineer should clean and contaminate the system before servicing it.

Warning: *Make certain that the power cable is disconnected before cleaning the instrument.*

Clean all external surfaces with a cloth moistened with a mild laboratory detergent. If necessary dilute the detergent according to the manufacturer's instructions before using.

Note: *If particulate matter is observed in the Wash Bottle, the wash solution should be discarded at once.*

3.5.2 Decontaminating the System:

Wipe all surfaces with a cloth moistened with a cleaner such as iDecon Detergent disinfectant or a 70 % (by volume) solution of ethanol.

▶ ***Note:*** *Bleach is not recommended as it attacks materials chemically and will shorten the useful life of many components. If bleach is used, remove residual bleach from surfaces with a cloth moistened with deionized water.*

If the system will not be used for a period of time, the system should be flushed with de-ionized water so that buffers and/or reagents are not deposited on the wash head or other components of the system. The dispense tubing should be removed from the pinch valves to prevent permanent compression of the tubing.

If dispense or aspiration tips become clogged, use the wires supplied with the system to remove any particulate matter from them.

If a system is returned to a DYNEX Technologies facility, the customer must decontaminate the system before shipment and a decontamination certificate must be submitted with the unit.

3.6 Updating of the Operating Program

On a periodic basis, it is possible that Dynex Technologies may update or add features to the operating program. Updates will be provided and the service engineer may be required to install the software. Information about updating will be provided when the update is distributed.

3.7 Jigs, Tools and Software Needed by the Service Engineer

3.7.1 Jigs

The service engineer and the service depots will be provided with the following jigs to assist in the service of systems and to refurbish modules that are returned from customer sites.

Table 3-1: Jigs to Maintain and Repair the Agility System

Name	Part Number	Service Engineer	Service Depot
Vacuum Switch Calibrator Fixture	DS2FIX025		
Incubator Pulley Height Fixture	P24FIX003		
Pulley Fixture	P24FIX004		
Pulley Spacer 09 X 2mm Fixture	P24FIX006		
Encoder Centre Fixture	P24FIX007		
TAYD Belt Tensioning Fixture	P24FIX008		
TAXD Corner Fixture	P24FIX009		
TAXD Belt Tightening Fixture	P24FIX010		
SPYD Tensioning Fixture	P24FIX013		
TAXD Timing Back Fixture	P24FIX014B		
TAXD Timing Front Fixture	P24FIX014F		
Encoder Centre Mounting Fixture	P24FIX015		
Gripper Timing Fixture	P24FIX016		
Door Height Fixture	P24FIX018		
Door Alignment Fixture	P24FIX019		
Dispense Syringe Piston Assembly Fixture	P24FIX020		
TAZD Centre Belt Tensioning Fixture	P24FIX026		
TAZD Belt Clamp Locator Fixture	P24FIX029		
Reagent Guide Fixture	P24FIX032		
Upper Reagent Guide Spacer Fixture	P24FIX033		
Lower Reagent Guide Spacer Fixture	P24FIX035		
Touchscreen Plunger Fixture	P24FIX036		
Door Squaring Fixture	P24FIX037		
Rotator Gearing Fixture	P24FIX048		
Incubator Belt Tensioning Fixture	P24FIX067		
Gripper Arm Setting Fixture	P24FIX073		
Gripper Arm Spacing Fixture	P24FIX074		
Temperature Location Fixture	P24FIX075		
Rack Switch Position Fixture	P24FIX077		

3.7.2 Tools

Table 3-2 lists the items that should be carried in the service engineer’s kit.

Table 3-2: Required Tools

Name	**Dimension**	**Part No [a]**
Set of Hex Wrenches	1-10 mm	
Flash Drive	Minimum 8 Mb capacity	

(a) If no part number is provided, a generic item can be employed

3.7.3 Service Software

The CVT program, which is used by service engineers is installed on the Agility system and can be accessed via the service password (XXXXXXX). This program is described in detail in Chapter 5.

Chapter 4 Troubleshooting, Self-Test Information and Error Codes

4.1 Overview

The Agility system is designed to provide a significant amount of detail to assist the user and service engineer in the determination of the cause of problems. This chapter describes the format of information that might be presented during the opening self-test protocol and during operation of the system. In addition, there is a detailed series of test protocols that can be used for the diagnosis of issues; the CTV test protocols are described in Chapter 5.

It should be noted that in almost all situations, a problem in the system is due to a fault in a single component, and the identification of the defective component is the first step in remedying the problem.

4.2 Self-Test Information

The system performs a detailed verification of all components during the start up protocol and the self test can be initiated as desired from the main screen. In addition, if the system detects a failure, an error screen will be presented indicating the defective component, the recovery options and a series of instructions to remedy the situation. A typical error screen is presented in Figure 4-1.

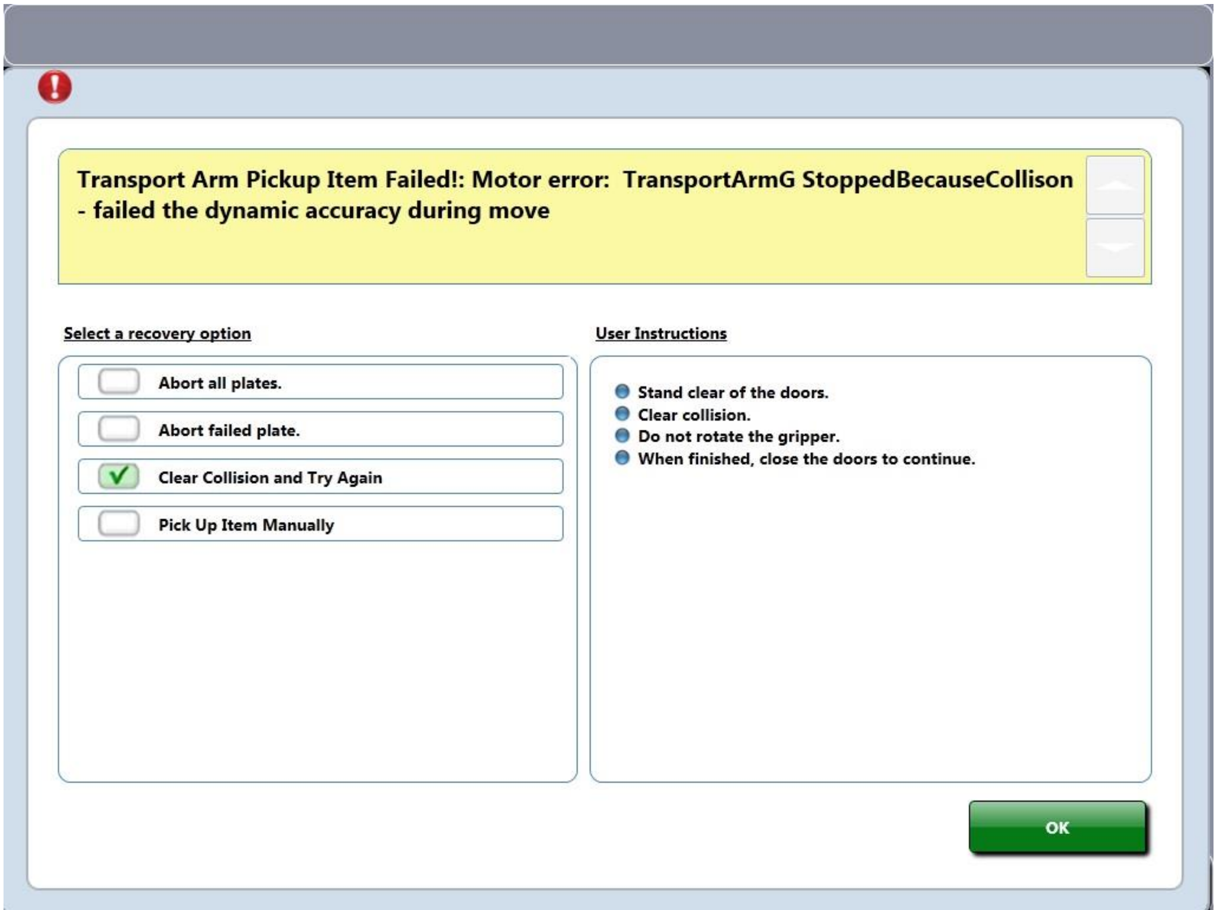


Figure 4-1: Typical Error Screen

Chapter 5 Agility Test Procedures

5.1 Overview

This chapter describes:

- The CTV test procedures which are used to demonstrate that the system is working in an appropriate manner and may assist in the detection of defective modules (Section 5.2).
- The final assay test (Section 5.3).

5.2 Overview of the CTV Tests

The CTV test procedures are fully described in a series of Manufacturing Test Procedure documents. Each document includes:

- A list of the materials and fixtures that are required for the specific test.
- A discussion of preliminary steps that are required to perform the test (e.g. interfacing the device with the text fixture).
- A step by step procedure that leads the service engineer through the testing of the device. The steps are presented on the touch screen.
- Instructions to save the test data.

A typical CTV test (for the Absorbance Reader) is described in Section 5.2.3 to provide the engineer with a general understanding of the methodology and approach used.

A list of the Manufacturing Test Procedure documents is provided in Table 5-1.

Table 5-1: CTV Test Procedures

Test Procedure	Document Number
Elevated Incubator	T13501151
Ambient Incubator	T13501160
Gripper	T13501290
Rotator Drive	T13501302
Sample Pipettor Z Drive	T13501322
Washer	T13501450
RH Door	T13501481
Reader Assembly	T13501560
LH Door	T13501720
E-Box	T13502020
Extraction Assembly	T13502030
KNF Pump	T43000630

5.2.1 Initial Operations

> ***Note:*** *All Assemblies, Harnesses, Sub-assemblies and related items must be connected to the Agility before it is powered up. Power the Agility system down before disconnecting any Assemblies, Harnesses, Sub-assemblies and related items.*

If the CTV software is shut down and powered up again, it will be necessary to reconnect the module to the CTV software

To prepare for testing:

1. Review the Manufacturing Test Procedure and ensure that all preliminary steps are performed.
2. Ensure that the system is connected to an AC power source and is connected to a network via an Ethernet connection.
3. Power up the system via the switch on the rear panel immediately above the AC line cord.
4. Turn the Agility system on using the soft power switch on the left front on the unit. The ring around the button will appear green.
5. The onboard computer will load Windows and a Windows welcome screen will be presented.
6. Select the Agility icon on the desktop, to present a screen to enter the password (Figure 5-1).

Figure 5-1: Password Screen

7. Enter the Service password to present the Home screen (Figure 5-2). The self tests will be performed.

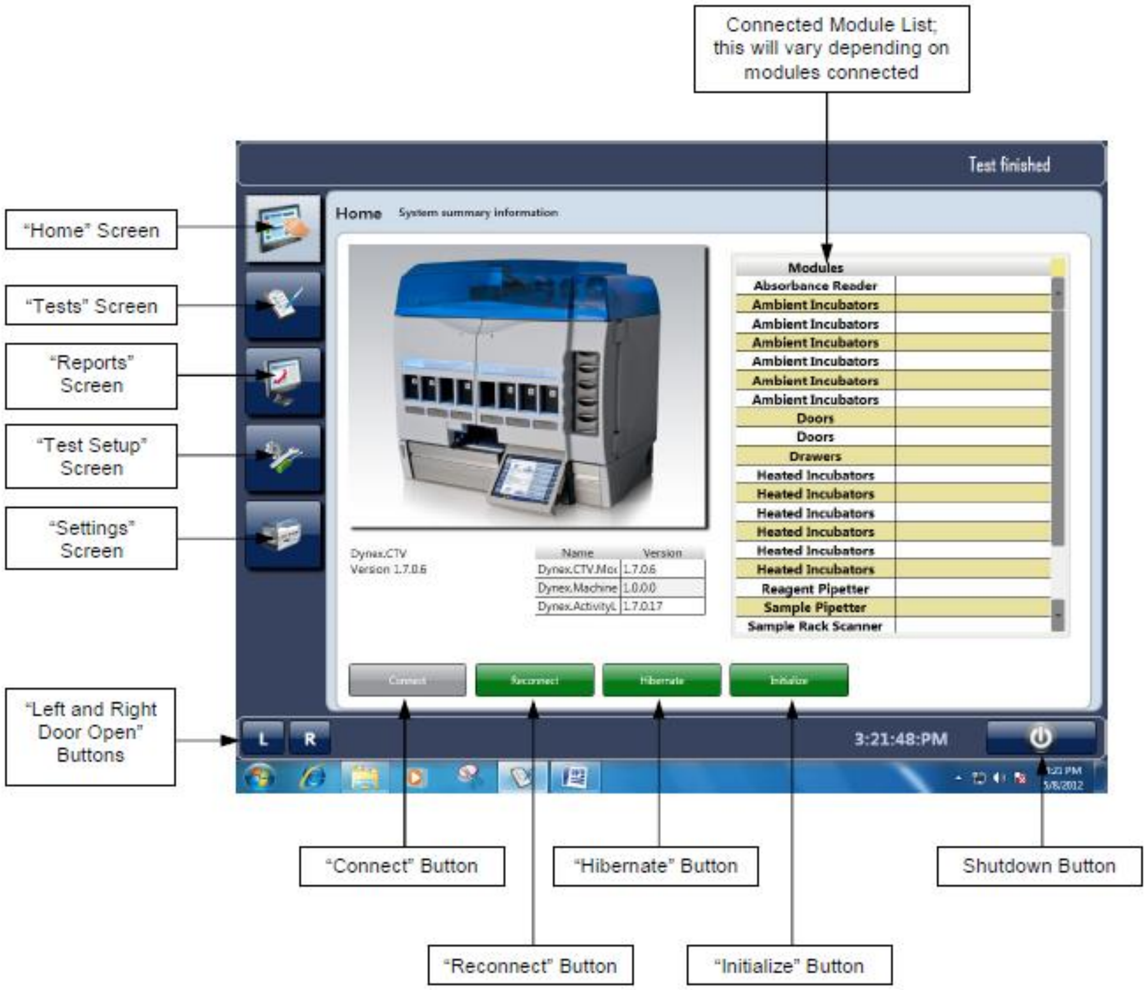


Figure 5-2: CTV Home Screen

8. The buttons on the left side of the Home Screen serve to access a variety of functions of the CTV software. The button for the screen that is presented is indicated with a pale background while other buttons have a dark background.

- Home - summary information (Figure 5-3)
- Tests - presents a listing of the tests that can be performed (Section 5.2.3)
- Reports - presents a screen to access various reports
- Test Setup -
- Settings -
- L, R - Opens the Left or Right Door
- Connect - Connects the system
- Reconnect - reconnects the system after hibernation
- Hibernate - stops the testing
- Initialize - will initialize the system and perform all self-tests
- Shutdown button - initiates the shutdown of the system

9. Press the *Connect* button. The list of connected modules will be presented on the right side of the screen as shown in Figure 5-3.
10. Press the *Initialize* button to re-initialize the system. The system will go through the entire self test procedure;
11. Press the *Settings* button and ensure that the test report files will be saved to the correct network location.
12. Press the *Tests* button to present the *Tests* screen (Figure 5-4) which presents a listing of each connected module for which tests can be performed.

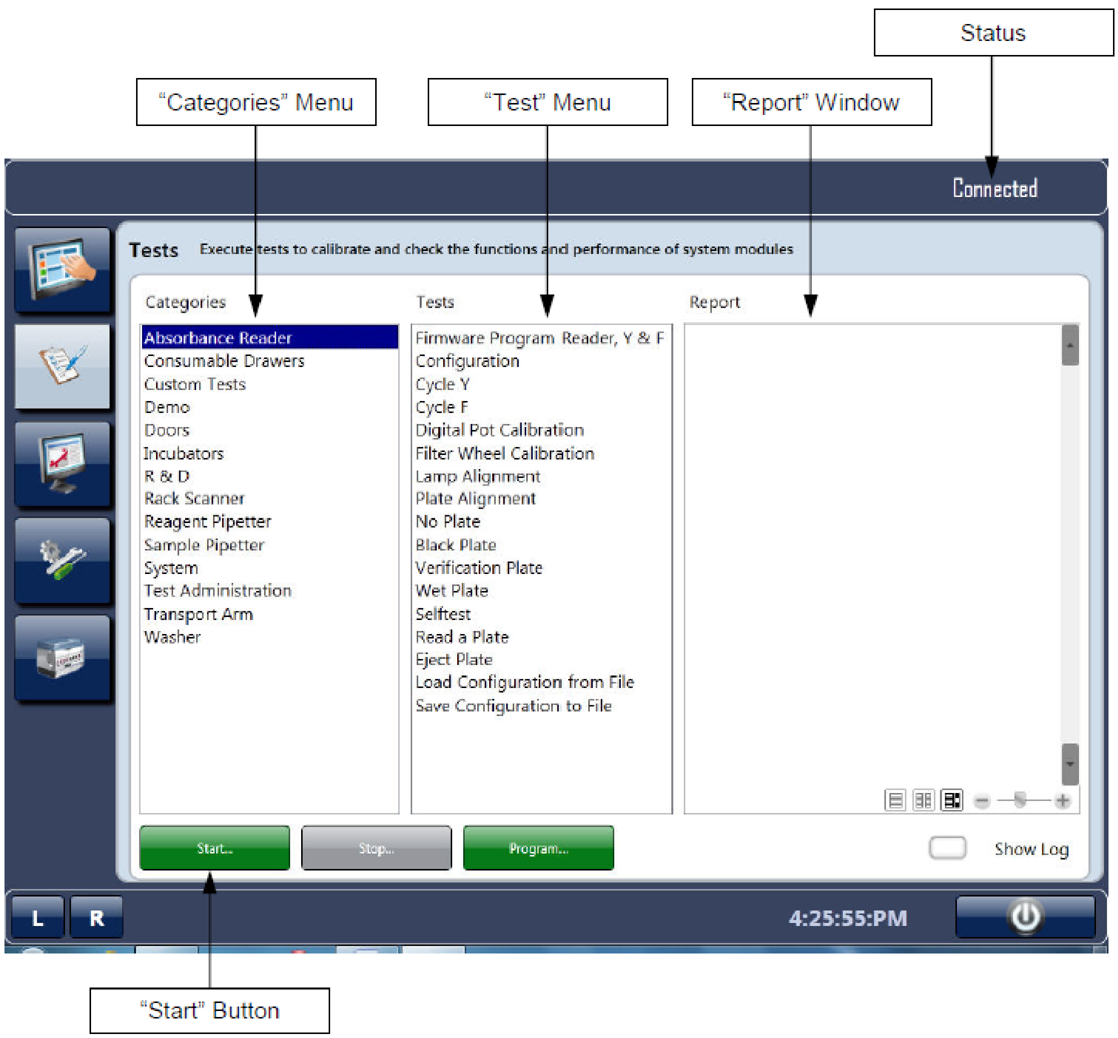


Figure 5-3: The Test Screen

13. Select the desired module in the *Categories* menu. The *Test* column will present a list of the tests that can be performed on the module.
14. Select *Module Inventory* and press *Start*. This will generate a report detailing the firmware versions located on the Y and F drives. If the versions are correct, proceed to Section 5.5.

5.3 A Typical CTV Test Procedure - Checking the Reader Assembly

Each test procedure is designed to fully test a specific component of the system. A list of available procedure is presented in Section 5.1. This section provides an overview of a typical procedure.

The entire test procedure to check the Reader Assembly is described in detail in Document T13501560. This section is provided to give the reader an understanding of the steps involved in performing a test procedure and does not include the detailed steps included to perform the test.

5.3.1 Material Required

- Test E Box (P24FIX041)
- Reader Assembly (13501560)
- Reader Support Fixture (P24FIX052)
- Reader Harness (15500340)
- Optical Filters:
    - 450 Filter (41500450)
    - 630 Filter (41500630)
    - 690 Filter (41500690)
- Verification Plates X1 and X2, PT1 and PT2, or PT1B and PT2B
- “Wet Plate” Verification Plate as per document “reddyeb.doc”

5.3.2 Preliminary Activities

The following activities for the Reader Test should be performed:

1. Remove the reader from the system and place it on the Reader Support Fixture (P24FIX052).
2. Open the Primary Optics access Panel on the side rear of the Reader and remove the Primary Optics Assembly by pulling on the handle (Figure 5-4).

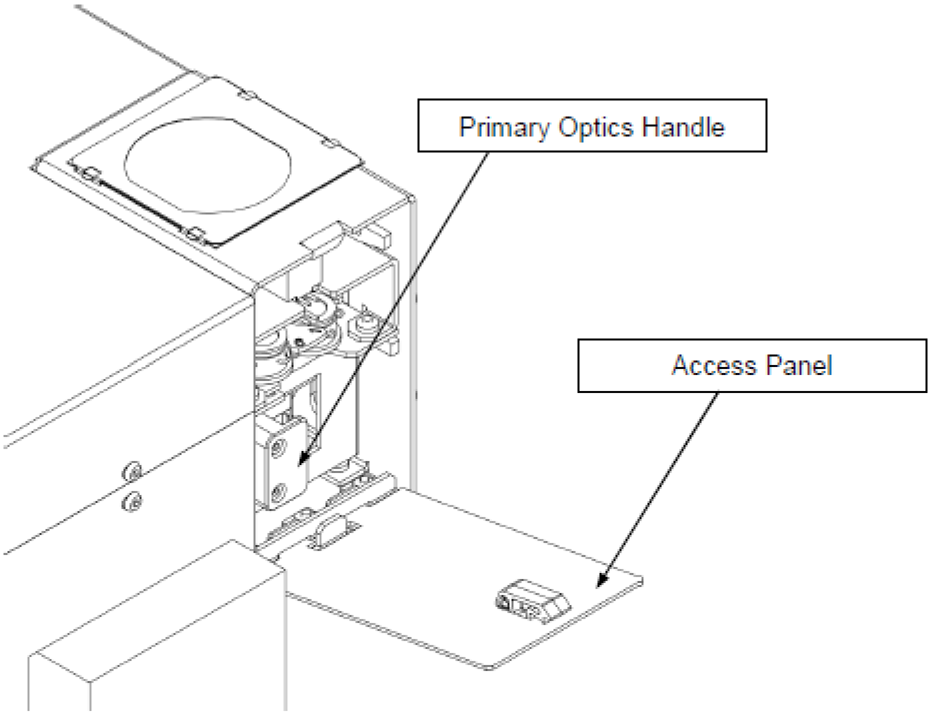


Figure 5-4: Open the Access Panel and Remove the Filter Wheel

3. Place three Optic Filters; the 450 Filter in position 2, the 630 Filter in position 3, and the 690 Filter (in position 4 of the Primary Optics Filter Wheel. Push the filters past the spring tines such that the annular grooves align with the filter wheel slots (Figure 5-5). A 405 Filter should already be installed in position 1 of the Filter Wheel.

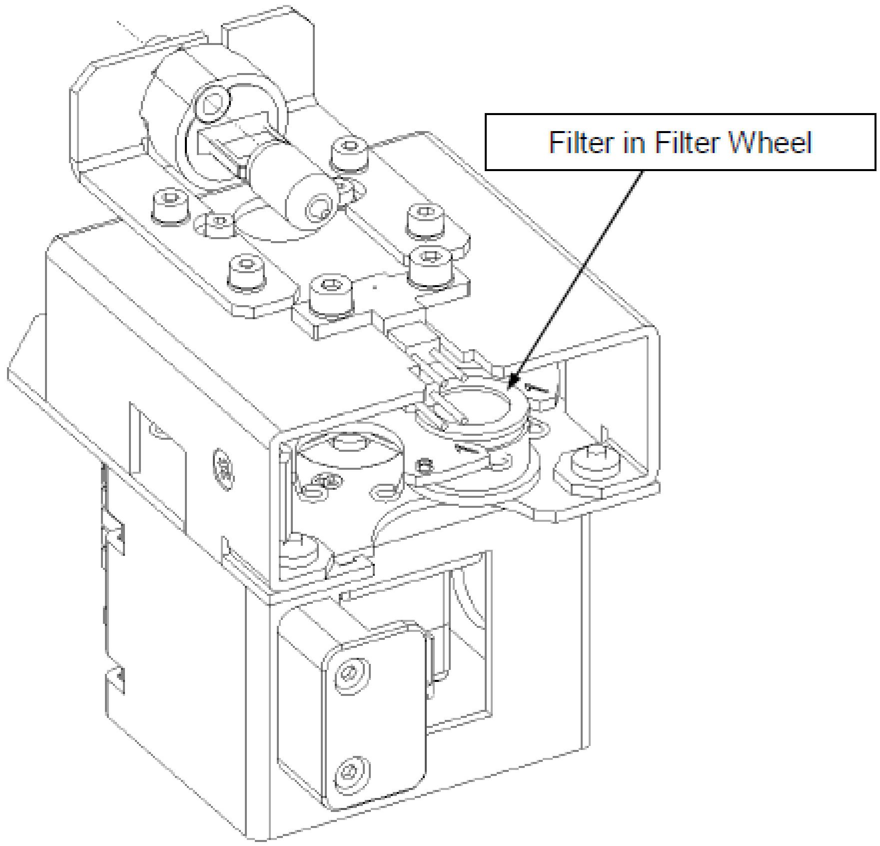


Figure 5-5: Filter in Filter Wheel

4. Replace the Primary Optics Assembly and close the access panel.

5. Connect the Reader assembly to the Test E-Box Backplane using a Reader Harness (15500340). The harness drawer connector plugs into the rear of the Reader Assembly as shown. The two backplane connectors' plug into the sockets marked “Reader” and “Reader Pwr 3 (Figure 5-6).

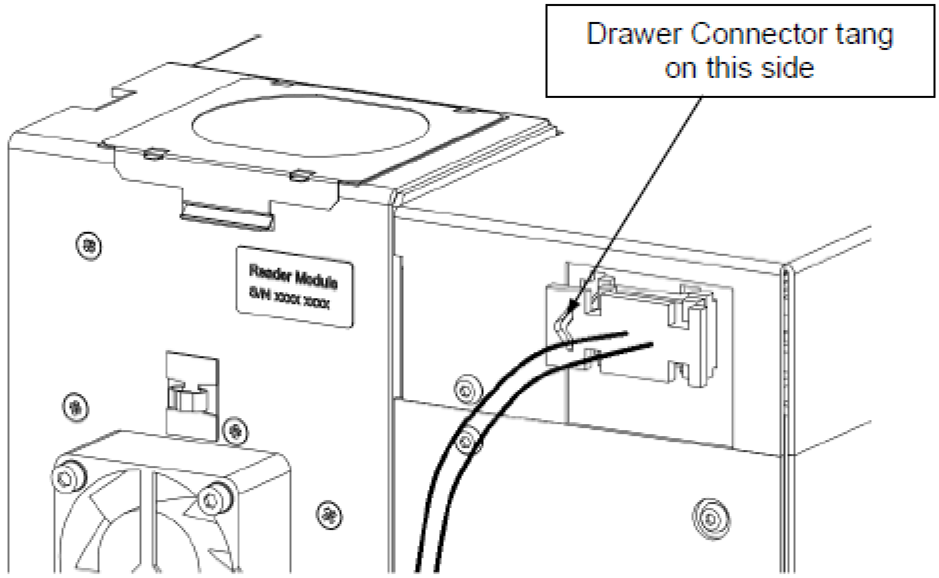


Figure 5-6: Connecting the Test E-Box

6. Ensure the DC Toggle Switch on top of the Test E-Box is switched OFF.

> ***Note:*** *Assemblies, Harnesses, or Sub-Assemblies must never be connected of disconnected from the Test E-Box without first shutting the E-Box down, or turning the DC Toggle Switch to OFF. If the DC Toggle Switch is turned OFF or the CTV software shut down, any connected module will need to be reconnected and initialized in the CTV Software, before further testing can be performed.*

7. Connect the Test E-Box is connected to a network connection via an Ethernet Cable.

8. Turn the Test E-Box ON.

9. Ensure that the two indicators on the Grounding Test Box, connected to the E-Box Backplane, are GREEN. If the two indicators are GREEN, turn the DC Toggle Switch to ON and proceed to the next step.

- If a Blinking RED indicator appears, a short circuit has occurred and the Reader should be disconnected from the Test E-Box.
- If a solid RED indicator appears, power down the Test E-Box, check the Grounding Test Box Connections to the E-Box Backplane are correct, and return to step f.

10. Run the Agility CTV Software as described in Section.5.2.2.

11. Select *Absorbance Reader* from the Test screen (Figure 5-3), select *Configuration f*rom the *Test* menu, then press *Start*.

12. The touch screen will present a dialog box to enter the serial number of the reader (which can be found on the rear of the module above the fan.

5.3.3 Performing Tests

A variety of tests can be performed on the Reader Assembly. The touch screen leads the user through a test and presents a series of dialog boxes instructing the user to perform a specific action. At the conclusion of a test, the user must acknowledge that the test was successfully completed (e.g. the desired operation happened, or the test result met specifications) and the report will be stored in the log:

1. *Cycle Drive* - This test rotates the Reader Filter Wheel Drive so that each filter is located in turn below the primary optics lamp. At the conclusion of the test
2. *Digital Pot Calibration* - used to calibrate the Digital Potentiometer in the reader.

> ***Note:*** *The Digital Pot Calibration test should ideally only be run once as the Reader is only capable of a limited number of these tests.*

3. *Filter Wheel Calibration* – used to set the zero position based on maximum energy throughput at the 405 nm filter position.
4. *Lamp Alignment* – used to determine if the lamp output is sufficient for each channel. This test is only required if the Reader has not been initialized since being connected to the CTV software, or if the reader has not been initialized in the last hour (approximately)
5. *Plate Alignment* - A Load Calibration plate (X1, X2, PT1, PT2, PT1B or PT2B) is inserted into the reader and the test generated new alignment parameters. The user is asked if the parameters should be updated in the module.
6. *No Plate* -This test is used to see if the system can detect that no plate is present in the reader
7. *Black Plate* - This test is used to see if the system can detect that a black plate no plate is present in the reader.
8. *Verification Plate* - 2 Verification plates are used in various positions to check the observed intensities detected by the reader.
9. *Wet Plate* – A standard microplate is filled with the Dynex red dye and tested five times in one direction, turned 180° and then in the other.

Once the desired tests have been run, press *Save Configuration to File* from the Tests menu and press Start.

5.4 The Final Assay Test

The Final Assay test checks all of the modules of the system and indicates if they have passed the self test, then performs a work list with samples and the Final Assembly SmartKit. It is fully described in Section 3.4 of Section M of T13502150, the Manufacturing Test Procedure.

To Perform the Final Assay Test:

1. Power up The Agility System, log on as *Administrator* and select Agility on the Options window (Figure 5-1).
2. Press the *Initialize* button. The system will check all modules and present a report as shown in Figure 5-7.

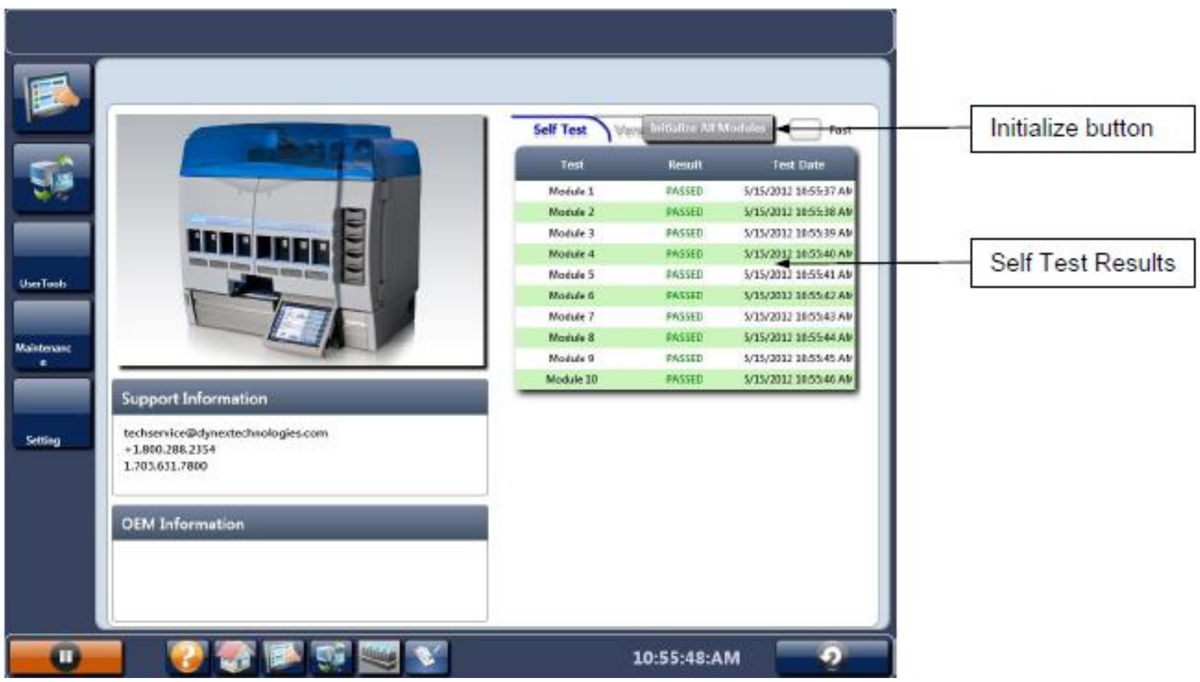


Figure 5-7: Self Test Results

3. After the system has been initialized, the Sample Scanner handle light will illuminate. If any module does not pass, perform the test again.
4. Load two Sample Tip Racks and one Deep Well Strip Holder into a consumables tray and replace the tray into the system.
5. Load 22 sample tubes containing a minimum of 1 mL of red dye (see reddye.cpm) into the system

> ***Note:*** *It is not necessary to have bar coded on the tubes. When prompted, auto assign Sample ID's to the tubes.*

6. Load a reagent tip pack into a Reagent Pack Holder and insert into any of the loading bays on the doors.
7. Fill a Bronze Kit Trough (Figure 5-8) with a minimum of 30mL DI Water and place into the Final Assay SmartKit. Also, fill eight Control Vials with a minimum of 1mL Red Dye each (as per reddye.doc) and place in the SmartKit as shown. Load the Kit into a Reagent Pack Holder and load into any of the loading bays on the doors.

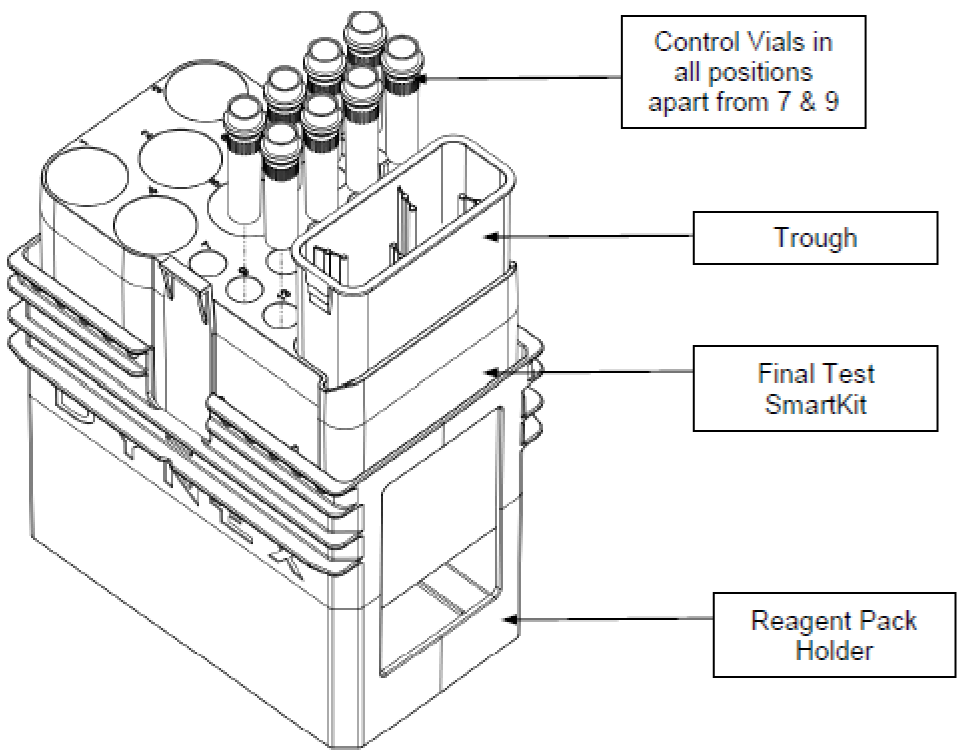


Figure 5-8: Final Assay Smart Kit

8. Select the *Dashboard* icon from the left hand menu bar, the select the *Create Worklist* icon from the dashboard. The Final test Assay should be shown on the worklist filter and indicated to run automatically (Figure 5-9).

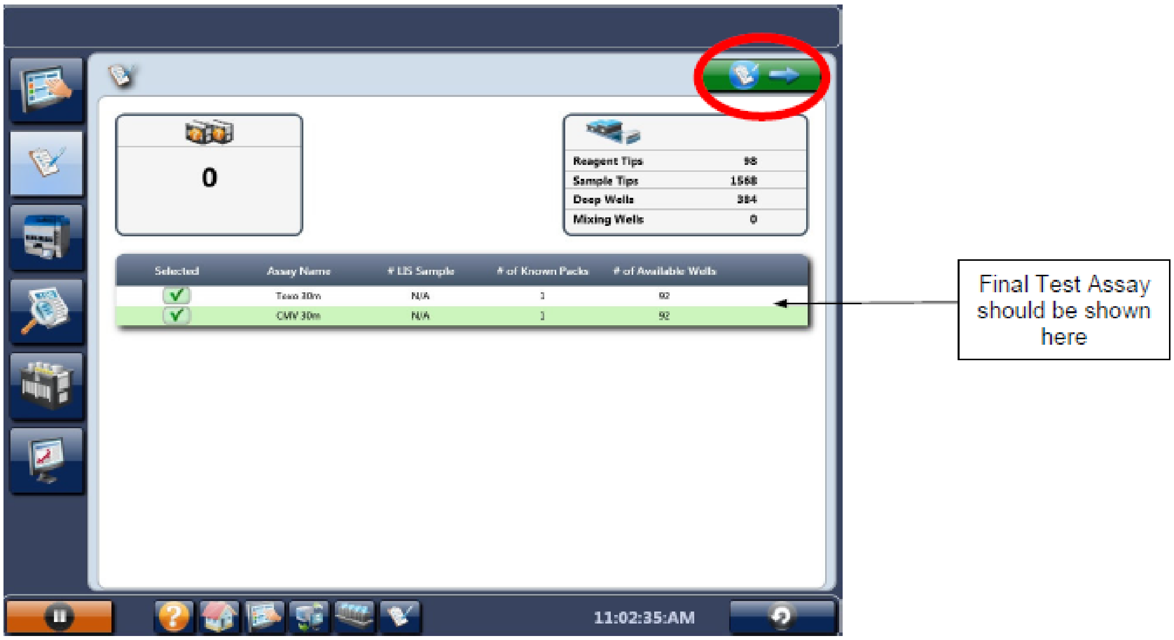


Figure 5-9: Worklist Filter Screen

9. Press the *Filter Edit* button to present the *Worklist Edit* screen which includes the 22 samples. (Figure 5-10).

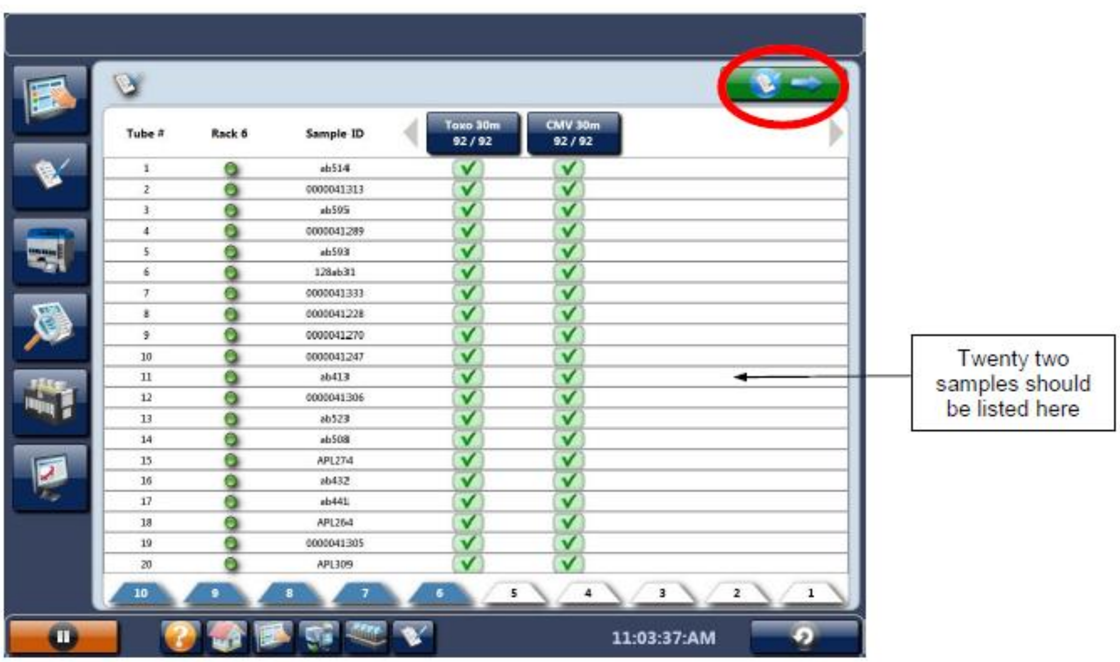


Figure 5-10: Worklist Edit Screen

10. Start the Worklist by pressing the *Worklist Start* button. This will present the schedule (Figure 5-11).

Figure 5-11: The Schedule Screen

Two alert icons will be presented in the upper right corner; one for a plate load and one for a wash load.

11. Press the *Plate Load* icon to present the Plate Load screen. One of the plate positions will be displaying a while light. Load a flat bottom plate into a plate carrier and insert the plate carrier into the lit position. When the plate is loaded the screen will disappear and the schedule screen will reappear.

12. Press the *Wash Load alert* icon to present the *Fluid Load* screen (Figure 5-12) and assign the listed fluids to the bottle locations of the loaded fluids. Remove one of the Wash bottles from the system, fill with enough fluid listed in the *Wash Buffer List* to run the assay, and re-load into the system.

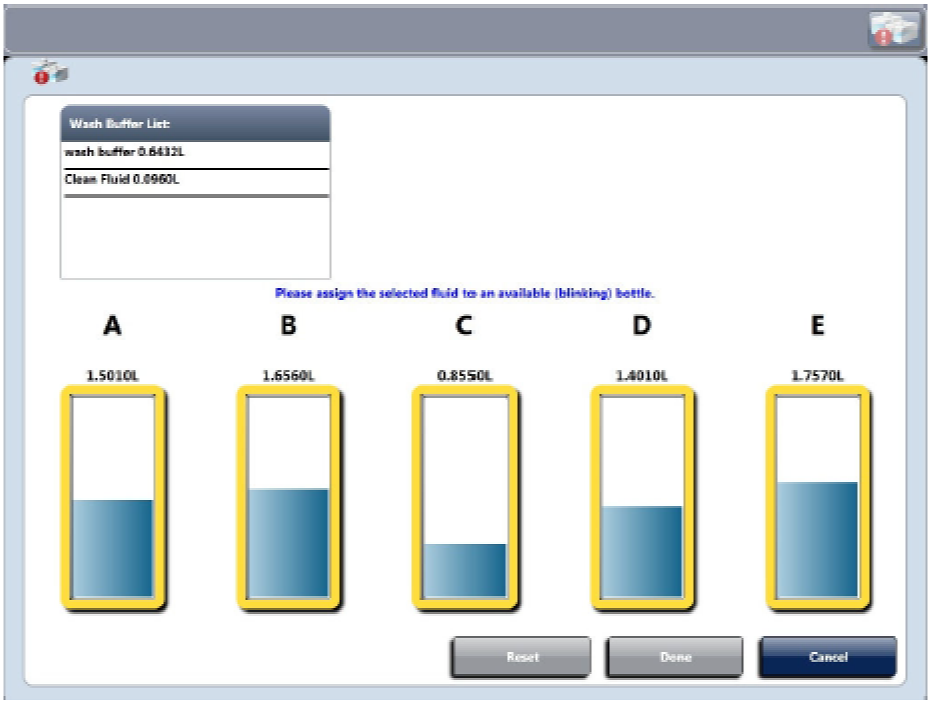


Figure 5-12: Fluid Load Screen

13. Select the fluid name in the list and then select the bottle position to assign. Once all fluids are assigned, select the *Done* button.

14. The assay will then run, on completion of the Final Test Assay, a Pass/Fail result will be displayed.

This page intentionally left blank.

Chapter 6 Wiring Diagrams and Cabling Information

Sections 6.1 to 6.9 present wiring diagrams for various circuit boards in the system.

6.1   Backplane

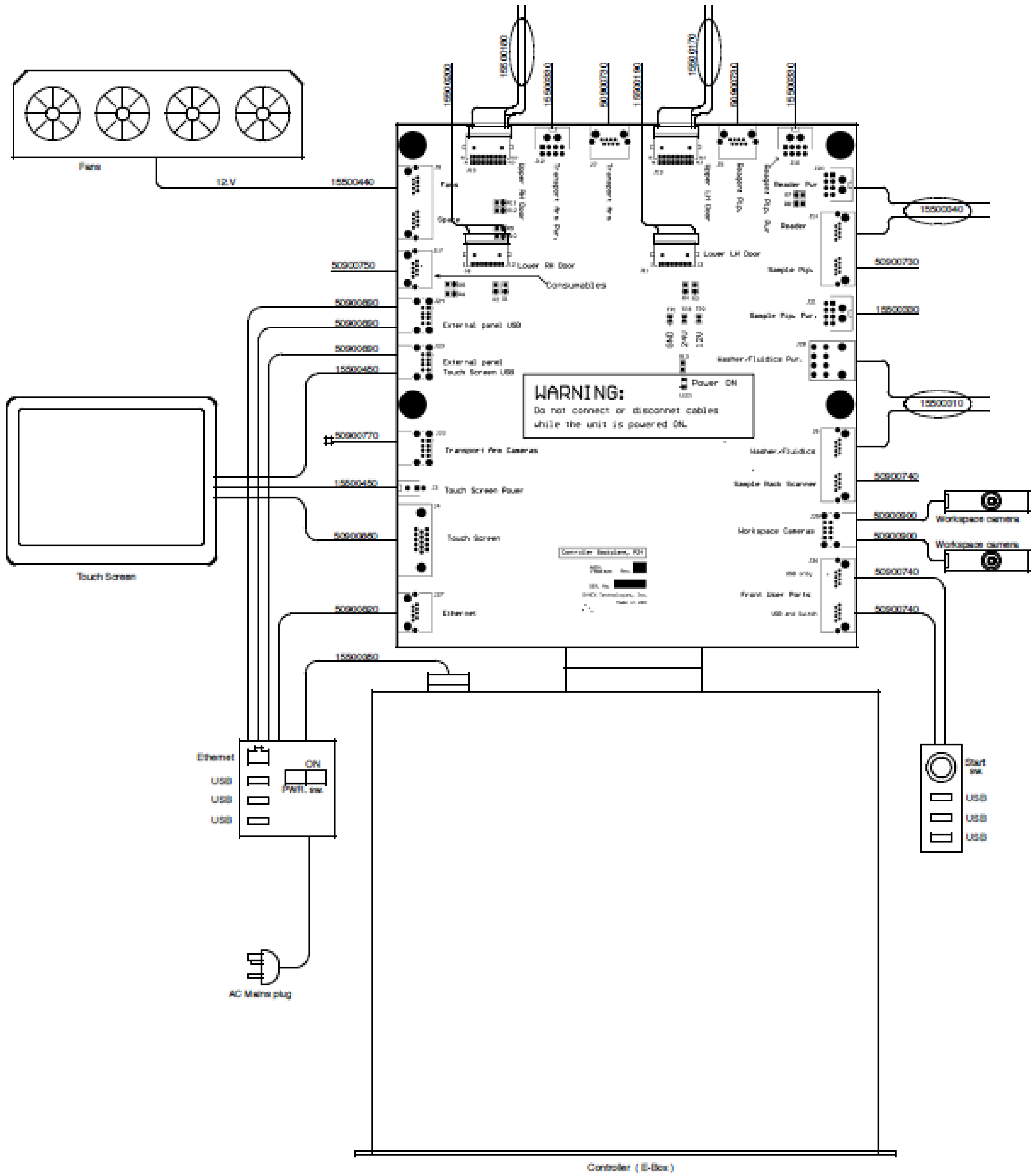


Figure 6-1: Backplane Connections

6.2 Left Door Connections

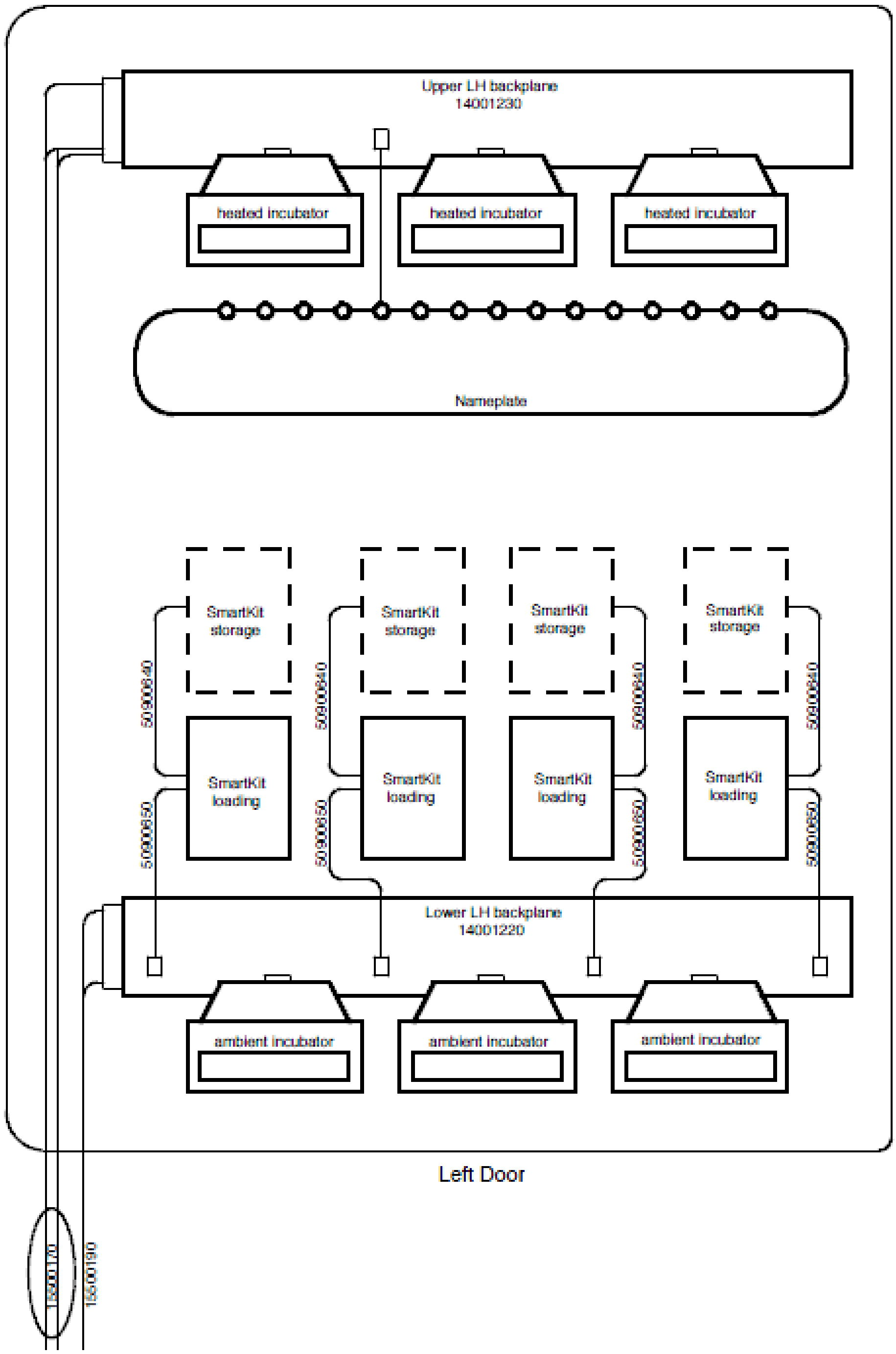


Figure 6-2: Left Door Connections

6.3 Right Door Connections

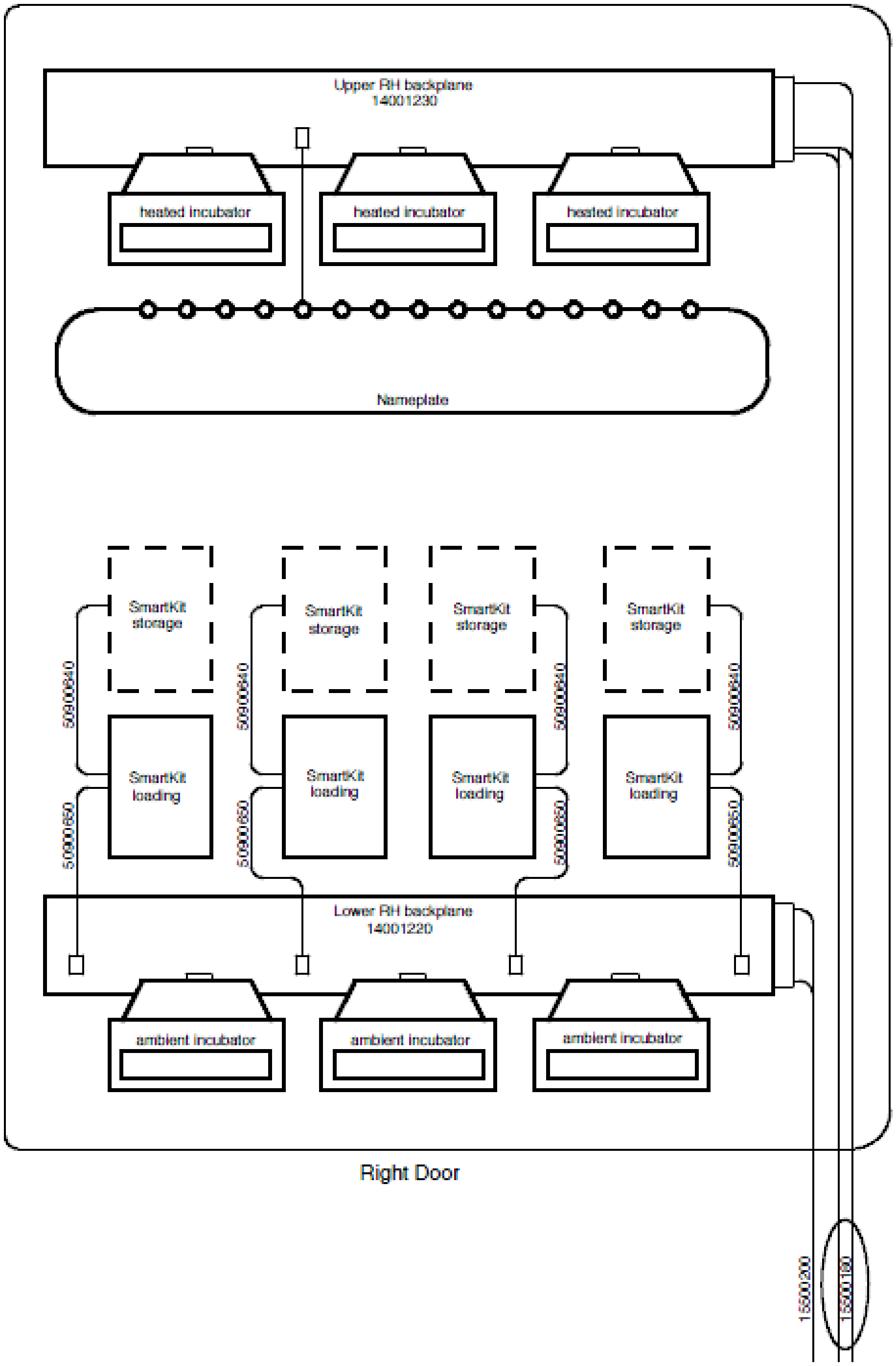


Figure 6-3: Right Door Connections

6.4 Sample Pipette

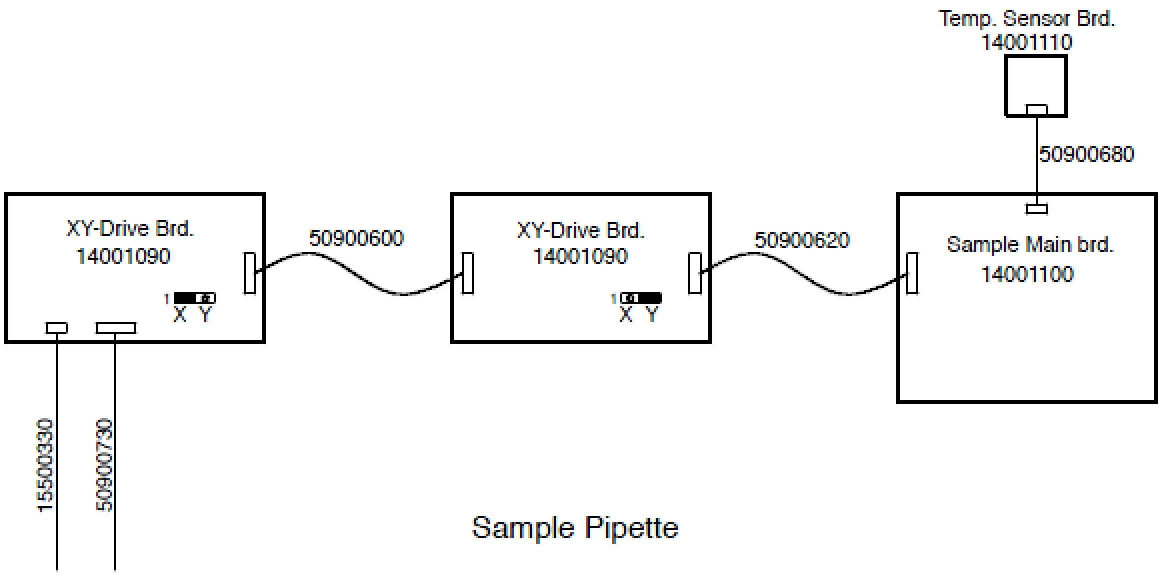


Figure 6-4: Sample Pipette Connections

6.5 Reagent Pipette

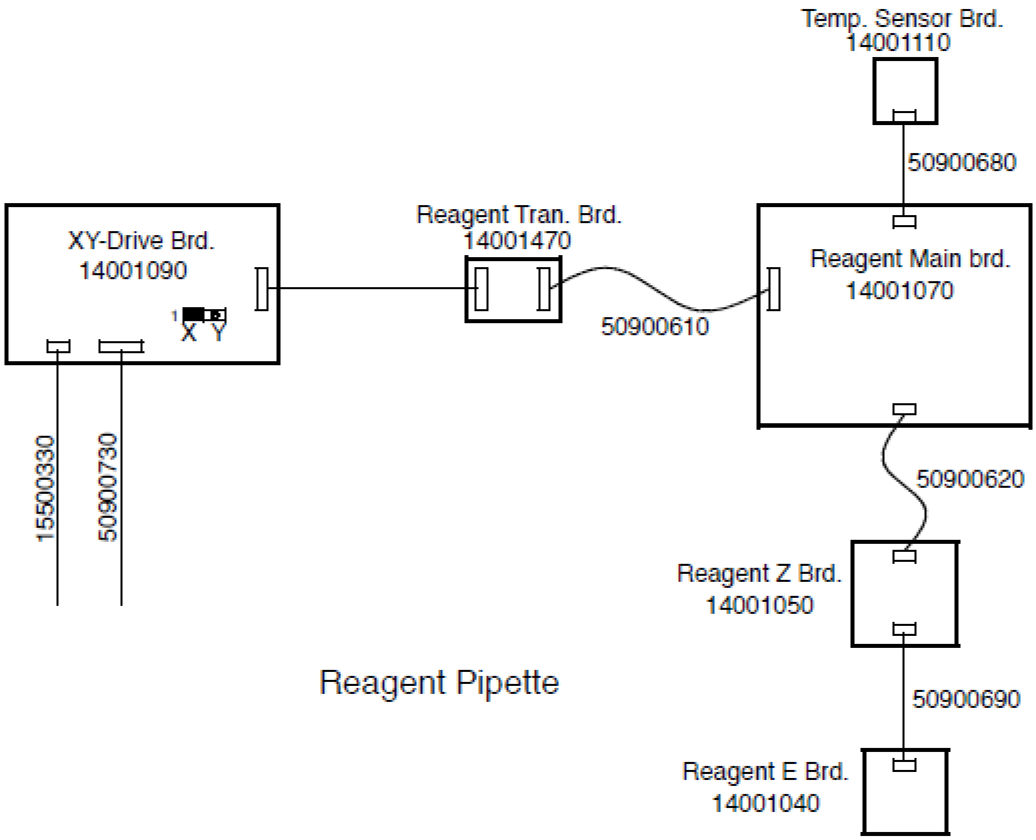


Figure 6-5: Reagent Pipette Connections

6.6 Rack Scanner

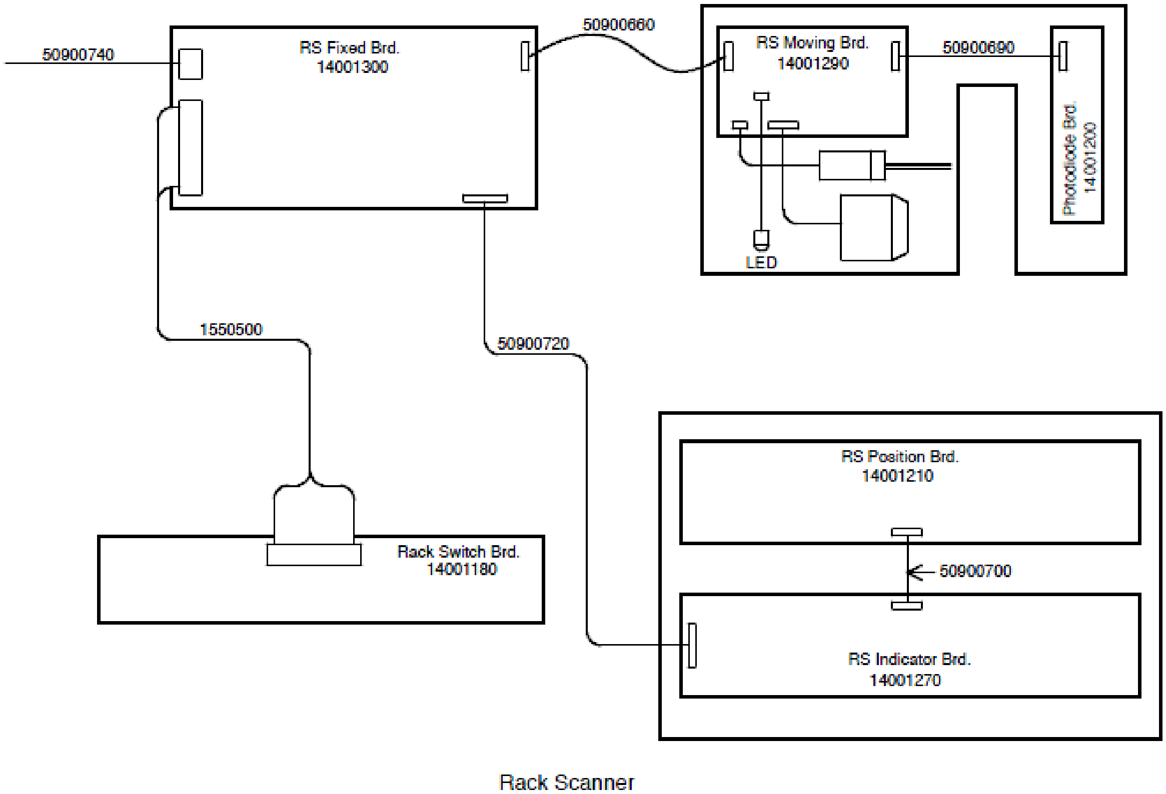


Figure 6-6: Rack Scanner Connections

6.7 Reader, Washer, Fluidics and Pump Connections

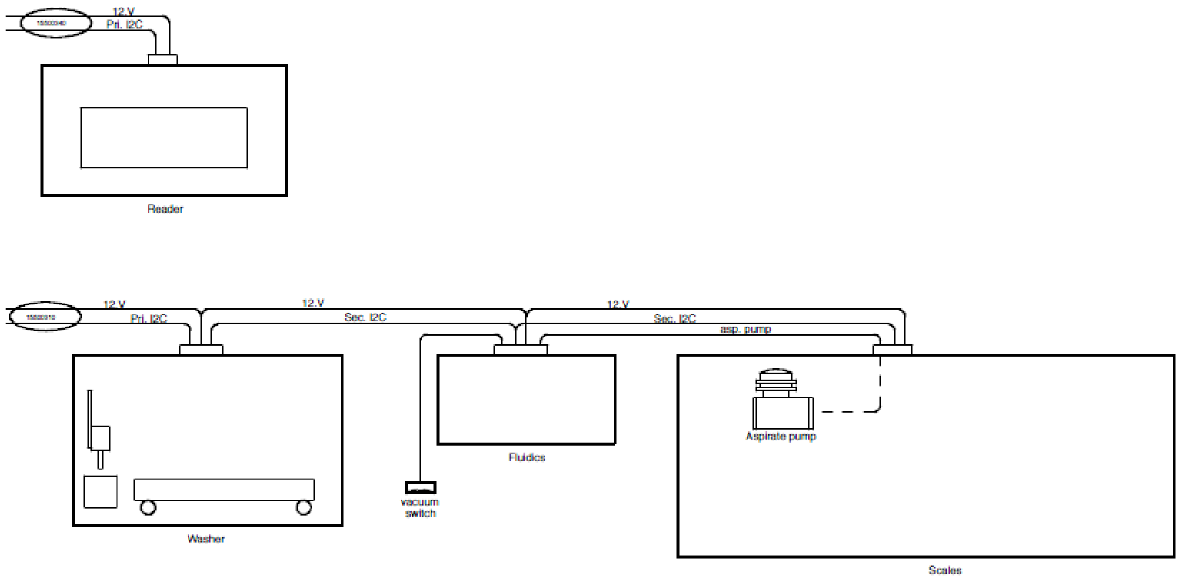


Figure 6-7: Reader, Washer, Fluidics and Pump Connections

6.8 X, Y and Z Drives, Rotator and Gripper Connections

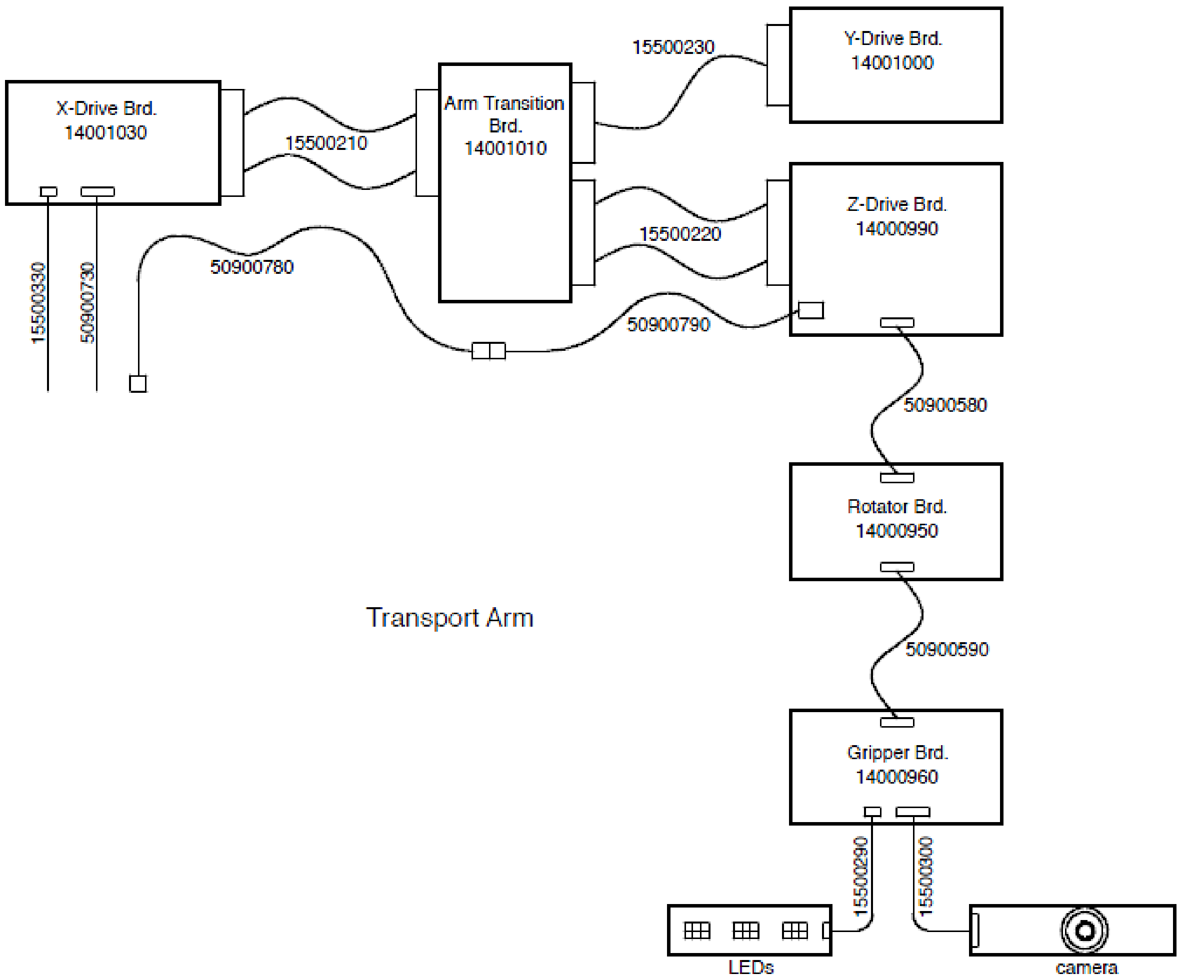


Figure 6-8: X, Y and Z Drives, Rotator and Gripper Connections

6.9 Consumables Wiring

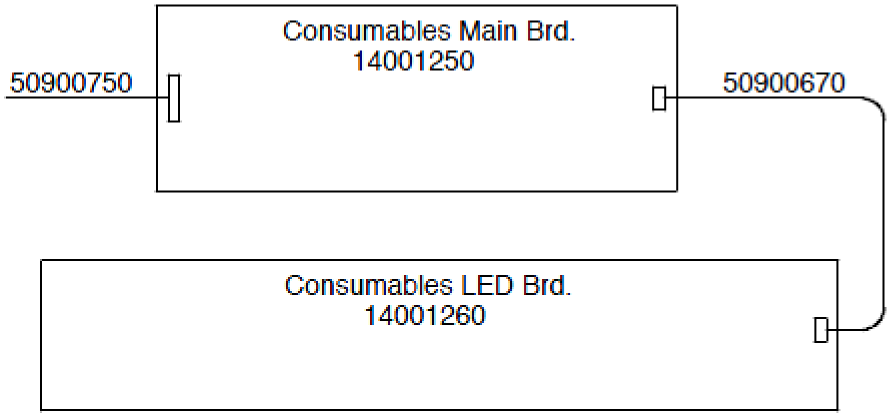


Figure 6-9: Consumables Wiring

6.10 Cable Connection Tables

6.10.1 E-box PCIe Board USB Connections

PCIe board Input connector	HUB chip or Direct connect	Port numbers	PCIe board LED	Backplane Connector	USB Connectors
J11-7,8 (USB C)	Direct	3	n.a.	J26A top	Top front user port
J11-2,3 (USB C)	HUB Ch.0	2	LED3_1	J26A top	Middle front user port
J11-2,3 (USB C)	HUB Ch.0	3	LED2_1	J26B bottom	Bottom front user port and switch
J12B (USB A)	HUB Ch.1	4 5	LED4_2 LED5_2	J23	Touch screen and one side user port
J12B (USB A)	HUB Ch.1	6 7	LED3_2 LED2_2	J24	Two side user ports
J9A (USB B) J9B (USB B)	Direct	0 1	n.a.	J22	Two arm camera ports
J10-2,3 (USB D) J10-7,8 (USB D)	Direct	4 5	n.a.	J25	Two workspace camera ports

Note: J11-2, 3 are the pins furthest from board. J9A is the connection furthest from board.

6.10.2 E-box Backplane Bus Power Connections

I2C Bus Item	I2C Connector	Power Connector	DC Voltage
Reader	RO-45	2x4 MicroFit	12V
Washer & Fluidics	RO-45	2x4 MiniFit Jr.	12V
Transport Arm	RO-45	2x4 MicroFit	24V
Reagent pipette	RO-45	2x4 MicroFit	24V
Sample pipette	RO-45	2x4 MicroFit	24V
Door bp, upper left	Dual 13 FFC	←	12V
Door bp, lower left	Single 12 FFC	←	12V, 24V
Door bp, upper right	Dual 13 FFC	←	12V
Door bp, lower right	Single 12 FFC	←	12V, 24V
Consumables Main/Indicators	RO-45	←	12V
Sample Rack Scanner	RO-45	←	12V
Door latch	RO-45	←	12V

6.10.3 Round Grey Cable

This cable carries power and communications connected through a 2 x 4 row Molex Micro-Fit 3.0 connector as follows:

- **POWER** application: 2x4 connector

Pin #	Shielded Cable	Color
1	CGND	Shield
2	GND	BLK
3	GND	BRN
4	GND	GRN
5	+12.V	RED
6	V_{motor}	ORN
7	V_{motor}	BLU
8	V_{motor}	WHT

- **COMMs** application: (Note: **Scale board** is different)

Pin #	Shielded Cable	Color
1	CGND (shield)	n.a.
2	GND	BLK
3	Start	BRN
4	SCL	GRN
5	SDA	RED
6	+V	ORN
7	Stop	BLU
8	+V	WHT

6.10.4 RO-45 Round CAT-6 Cable

Pin #	CAT6 Cable	Wire Color
1	+V	WHT/ORN
2	Start/Done	ORN
3	SDA	WHT/GRN
4	GND.	BLU
5	SCL	WHT/BLU
6	GND.	GRN
7	+V or Blink clk.	WHT/BRN
8	Stop/Reset	BRN

6.10.5 Transport Arm X Board

This cable has dual 1.27mm pitch flex cable connections:
(p/n15500210)

Pin #	Cable A	Cable B
1	CGND (shield)	CGND (shield)
2	SDA	GND
3	GND	+12.V
4	SCL	GND
5	GND	+12.V
6	Start-Done	GND
7	GND	V_{motor}
8	Stop-Reset	GND
9	GND	V_{motor}
10	V_{motor}	V_{motor}
11	V_{motor}	V_{motor}
12	V_{motor}	V_{motor}
13	GND	GND

6.10.6 Transport Arm Transition Board

This cable has dual flex cable connections:
(NOTE: The A and B rows swap connections at the cable ends.)
(p/n 15500210 and 15500220)

Pin #	Row B	Row A
1	CGND (shield)	CGND (shield)
2	SDA	GND
3	GND	+12.V
4	SCL	GND
5	GND	+12.V
6	Start-Done	GND
7	GND	V_{motor}
8	Stop-Reset	GND
9	GND	V_{motor}
10	V_{motor}	V_{motor}
11	V_{motor}	V_{motor}
12	V_{motor}	V_{motor}
13	GND	GND

6.10.7 Transport Arm Transition Board to Z Board

This cable has dual 1.27mm pitch flex cable connections:
(p/n 15500220)

Pin #	Cable A	Cable B
1	CGND (shield)	CGND (shield)
2	SDA	GND
3	GND	+12.V
4	SCL	GND
5	GND	+12.V
6	Start-Done	GND
7	GND	V_{motor}
8	Stop-Reset	GND
9	GND	V_{motor}
10	V_{motor}	V_{motor}
11	V_{motor}	V_{motor}
12	V_{motor}	V_{motor}
13	GND	GND

6.10.8 Transport Arm Transition Board to Y Board

This cable has single 1.27mm pitch flex cable connections:
(p/n 15500230)

Pin #	12 way Cable
1	CGND (shield)
2	SDA
3	GND
4	SCL
5	GND
6	Start-Done
7	GND
8	Stop-Reset
9	+12.V
10	V_{motor}
11	V_{motor}
12	V_{motor}

6.10.9 Transport Arm Column Upper Section

This cable has single 0.5mm pitch flex cable connections:

- Contacts opposite sides, non-shielded

(p/n 50900580)

Pin #	Cable
1	CGND (shield)
2	SDA
3	GND
4	SCL
5	GND
6	Start-Done
7	+5.V
8	Stop-Reset
9	GND
10	V_{motor}
11	USB1-H
12	USB1-L
13	V_{motor}
14	USB2-H
15	USB2-L
16	GND
17	+5.V
18	+5.V

6.10.10 Transport Arm Column Lower Section

This cable has single 0.5mm pitch flex cable connections:

- Contacts opposite sides, non-shielded

(p/n 50900590)

Pin #	Cable
1	CGND (shield)
2	SDA
3	GND
4	SCL
5	GND
6	Start-Done
7	+5.V
8	Stop-Reset
9	GND
10	V_{motor}
11	USB1-H
12	USB1-L
13	V_{motor}
14	USB2-H
15	USB2-L

6.10.11 Incubator Board drawer Connector

Pin #	Function
1	+12.V
2	+12.V
3	GND. (BLU)
4	SCL (WHT/BLU)
5	Start/Done (ORN)
6	Secondary SCL
7	Vmotor
8	+12.V
9	GND. (GRN)
10	SDA (WHT/GRN)
11	Stop/Reset (BRN)
12	Secondary SDA

6.10.12 Washer Drawer Connector

This cable has two connections, a 2x8 Microfit 3.0 connector with round and RO-45 cable from Washer to E-box. (p/n 15500310)

Pin #	Function	Fluidics round	E-box round	E-box RO-45
1	Secondary Start	18(**BRN1**)	----	----
2	Secondary SCL	17(**GRN1**)	----	----
3	GND.	7(**BLK1**)	----	----
4	+12.V	6(**RED1**)	----	----
5	+12.V	----	7 (**RED2**)	----
6	GND.	----	3 (**BLK2**)	----
7	SCL	----	----	5 (WHT/BLU)
8	Start	----	----	2 (ORN)
9	Secondary Stop	9(**BLU1**)	----	----
10	Secondary SDA	8(**WHT1**)	----	----
11	Round shield	16(**Silver1**)	----	----
12	+12.V	15(**ORN1**)	----	----
13	+12.V	----	8 (**ORN2**)	----
14	GND.	----	4 (**BRN2**)	----
15	SDA	----	----	3 (WHT/GRN)
16	Stop	----	----	8 (BRN)

6.10.13 Washer Main to Washer Transition Board

This cable has internal flex cable connections:

Pin #	Cable
1	CGND (shield)
2	Home
3	GND
4	Vcc
5	GND
6	Phase 1A
7	Phase 1A
8	Phase 1A
9	Phase 1B
10	Phase 1B
11	Phase 1B
12	Phase 2A
13	Phase 2A
14	Phase 2A
15	Phase 2B
16	Phase 2B
17	Phase 2B
18	GND

6.10.14 Fluidics Board

This cable connection is a 2x9 Microfit 3.0 connector with 2 round cables to Washer and Scale/Pump. (p/n 15500310)

Pin #	Rev.1 brd.	color	Washer	Scale
1	Vac. Switch_2	**24 GA. BLK wire**	----	----
2	Pump return	**RED3**	----	5
3	GND.	**BLK3**	----	3
4	SDA	**WHT3**	----	7
5	Stop	**BLU3**	----	6
6	+12.V	**RED1**	4	----
7	GND.	**BLK1**	3	----
8	SDA	**WHT1**	10	----
9	Stop	**BLU1**	9	----
10	Vac. Switch_1	**24 GA. BLK wire**	----	----
11	Pump return	**ORN3**	----	10
12	shield	**Silver3**	----	----
13	SCL	**GRN3**	----	2
14	Start	**BRN3**	----	1
15	+12.V	**ORN1**	12	----
16	shield	**Silver1**	11	----
17	SCL	**GRN1**	2	----
18	Start	**BRN1**	1	----

6.10.15 Scale and Aspirate Pump Drawer

The connector cable connections are 2x5 Mini-Fit Jr. connector with round cable from Scale/Pump to Fluidics
(p/n 15500310)

Pin #	Function	Round cable	18 GA. wire
1	Start	**BRN3**	----
2	SCL	**GRN3**	----
3	GND.+ shield	**BLK3**	----
4	+12.V (from Host)	----	**RED**
5	Pump return	**RED3**	----
6	Stop	**BLU3**	----
7	SDA	**WHT3**	----
8	GND. (from Host)	----	**BLK**
9	+12.V (from Host)	----	**RED**
10	Pump return	**ORN3**	----

6.10.16 Sample Rack Scanner Fixed (main) to Moving Board

The cable has single 0.5mm pitch flex cable connections.
(p/n 50900660)

Pin #	Photodiode Brd.
1	GND./ Shield
2	Reflect out
3	Reflect LED
4	GND.
5	Photodiode out
6	GND.
7	Mux A0
8	Mux A1
9	Mux A2
10	+5.V
11	Barcode TX
12	+5.V
13	Barcode RX
14	+5.V
15	RED Led anode
16	GRN Led anode
17	BLU Led anode
18	Laser cathode

6.10.17 Sample Rack Scanner Moving Board to Photodiode Board

The cable has single 0.5mm pitch flex cable connections.
(p/n 50900690)

Pin #	Photodiode Brd.	Moving Brd.
1	GND.	GND.
2	Reflect out	Mux A2
3	Reflect LED	Mux A1
4	+5V	Mux A0
5	Photodiode out	GND
6	GND	Photodiode out
7	Mux A0	+5V
8	Mux A1	Reflect LED
9	Mux A2	Reflect out
10	GND.	GND.

6.10.18 Sample Rack Scanner Fixed Board to Indicator Board

The cable has single 0.5mm pitch flex cable connections.

- +12.V regulated down to +5.V for the Position board.

(p/n 50900720)

Pin #	Indicator Brd.
1	AA0
2	AA1
3	AA2
4	AA3
5	+12.V
6	Quad A
7	Quad B
8	+3.3V
9	Field Strength
10	GND.
11	Secondary SDA
12	Secondary SCL
13	GND.
14	Blink Clock
15	Reset

6.10.19 Sample Rack Scanner Indicator Board to Position Board

The cable has single 0.5mm pitch flex cable connections.
(p/n 50900700)

Pin #	Position Brd. end	Indicator Brd. end
1	AA0	GND.
2	AA1	Field Strength
3	AA2	+3.3V
4	AA3	Quad B
5	+5.V	Quad A
6	Quad A	+5.V
7	Quad B	AA3
8	+3.3V	AA2
9	Field Strength	AA1
10	GND.	AA0

6.10.20 Barcode Reader

pin-out: (Opticon NLB1000)

- Connector pin 1 at top and pin 10 at bottom of list. (standard wire color code not applied, even and odd pin rows)

Wire Color	Signal	Remarks
Green	TxD	
White	RxD	
Gray	RTS	
Blue	CTS	
Red	VCC	5 V input
Black	S.GND	GND
Brown	Trigger	H-level: Open; L-level: Trigger
Yellow	OK	NPN open connector (DC 24 V, 30 mA)
Orange	NG	NPN open connector (DC 24 V, 30 mA)
Shield	F.GND	shrinkable tube

6.10.21 Pipettes X to Y

The cable has single 0.5mm pitch flex cable connections:

Pin #	Cable
1	CGND (shield)
2	SDA
3	GND
4	SCL
5	GND
6	Start-Done
7	GND
8	Stop-Reset
9	GND
10	V_{motor}
11	V_{motor}
12	V_{motor}
13	V_{motor}
14	V_{motor}
15	V_{motor}
16	GND
17	+12.V
18	+12.V

6.10.22   Reagent Pipette E to Z

The cable has flex cable connections:
(p/n 50900690)

Pin #	E connections	Z connections
1	GND	E motor, ph.2B
2	Diode anode	E motor, ph.2A
3	Diode cathode	E motor, ph.1B
4	GND	E motor, ph.1A
5	+5.V	E Home
6	E Home	+5.V
7	E motor, ph.1A	GND
8	E motor, ph.1B	Diode cathode
9	E motor, ph.2A	Diode anode
10	E motor, ph.2B	GND

6.10.23   Reagent Pipette Z to Main

The cable has flex cable connections:
(p/n 50900620)

Pin #	Z and Y connections
1	CGND (shield)
2	Diode anode
3	Diode cathode
4	GND
5	E Home
6	Z Home
7	+5.V
8	Z Encoder ch.A
9	Z Encoder ch.B
10	+5.V
11	E motor, ph.1A
12	E motor, ph.1B
13	E motor, ph.2A
14	E motor, ph.2B
15	Z motor, ph.1A
16	Z motor, ph.1B
17	Z motor, ph.2A
18	Z motor, ph.2B

6.10.24 Pipettes Syringe Temperature Sensor,

The cable has 6 way flex cable connections.
(p/n 50900680)

Pin #	connections
1	GND.
2	2nd SDA
3	+5.V
4	+5.V
5	2nd SCL
6	GND.

6.10.25 Reader to E-box

This is a split cable (Round plus Cat-6) connector:
(p/n 15500340)

Reader Connector Micro-fit 2x5	Function	Controller (round) Micro-fit 2x4	Controller (Cat-6) RO-45
1	Start/Done	---------	2 (ORN)
2	SCL	---------	5 (WHT/BLU)
3	GND.	---------	4 (BLU)
4	+12.V (Lamp)	5 (RED)	---------
5	+12.V (Lamp)	6 (ORN)	---------
6	Stop/Reset	---------	8 (BRN)
7	SDA	---------	3 (WHT/GRN)
8	GND.	3 (BRN)	---------
9	+12.V	7 (BLU)	---------
10	Vmotor	8 (WHT)	---------

6.10.26 Reader Main Internal Power/Comms

Cable connections:

Pin #	Function
1	Start/Done
2	SCL
3	GND.
4	+12.V (Lamp)
5	+12.V (Lamp)
6	Stop/Reset
7	SDA
8	GND.
9	+12.V
10	Vmotor

6.10.27 Reader PCB to Light Cube

Cable connections:

Pin #	Function
1	LED anode (filter home)
2	LED cathode (filter home)
3	+12.V to FAN
4	Output (filter home collector)
5	GND. (filter home emitter)
6	Lamp_A
7	Flt. Motor, Phase 1A, BLK
8	Flt. Motor, Phase 1B, GRN
9	Flt. Motor, Phase 2A, RED
10	Flt. Motor, Phase 2B, BLU
11	GND. To FAN
12	Lamp_B

6.10.28 Consumables Main to E-box

Cable connections:
(p/n 50900750)

Pin #	CAT6 Cable	Wire Color
1	+24V	WHT/ORN
2	Start/Done	ORN
3	SDA	WHT/GRN
4	GND.	BLU
5	SCL	WHT/BLU
6	GND.	GRN
7	Blink clk.	WHT/BRN
8	Stop/Reset	BRN

6.10.29 Consumables Main to Indicator

The cable has board flex cable connections:
(p/n 50900670)

Pin #	Cable
1	GND
2	Reset
3	+5.V
4	SDA
5	SCL
6	+24.V
7	Blink Clk.
8	+24.V
9	+3.3V
10	GND

6.10.30   Doors Upper Backplane

Dual 1.27mm pitch flex cable connections:
15500170 and 155500180

Pin #	Cable B	Cable A
1	CGND (shield)	CGND (shield)
2	SDA	GND
3	GND	+12.V
4	SCL	+12.V
5	GND	+12.V
6	Start-Done	+12.V
7	GND	+12.V
8	Stop-Reset	+12.V
9	GND	+12.V
10	Blink Clk.	+12.V
11	+12.V	+12.V
12	+24.V for LEDS	GND
13	GND	GND

6.10.31   Doors Lower Backplane

The cable has single 1.27mm pitch flex cable connections:
(p/n 15500190 and 15500200)

Pin #	Cable
1	CGND (shield)
2	SDA
3	GND
4	SCL
5	GND
6	Start-Done
7	GND
8	Stop-Reset
9	GND
10	Blink Clk.
11	+12.V
12	+24.V for LEDS

6.10.32 Weighing Scale and Aspirate Pump

Internal cable connections:

Connector A Pin#	Connector B Pin#	Connector C Pin#	Function
1	-----	7	Start
2	-----	8	SCL
3	-----	2	GND.(shield)
4	1	-----	+12.V
5	2	-----	Pump return
6	-----	5	Stop
7	-----	6	SDA
8	-----	4	GND.
9	-----	1, 3	+12.V
10	2	-----	Pump return

Chapter A Replacing Components

This section of the manual describes the replacement of various components in the Agility system. It assumes that the service engineer has determined the component that requires replacement (e.g. the washer or an incubator). In some instances, the determination of the defective component is made on a visual basis (e.g. the gripper is not working). In addition, a number of tools can be used to determine the defective component including the self check protocol when the system is powered up and using the CVT software.

Note: *It is assumed that all service activities be performed by a factory trained engineer. Service by an unauthorized individual or by an individual who is not factory trained may jeopardize the Dynex Technologies, Inc. warranty.*

The general approach is for the service engineer is to replace the defective item and replace it with one obtained from the nearest depot. If the defective component can be readily repaired, the service engineer will then send it the depot for rework and retesting. It is recognized that in a few cases, this approach will not be reasonable (e.g. if a door becomes misaligned) and the service engineer will be required to repair the problem on-site.

Each chapter in this section provides service information about a major component of the system. The replacement of items that are essentially static in nature and are considered extremely unlikely to fail (e.g. brackets, mechanical stops and plates on which other items are mounted) is not described.

There are two major sections in each chapter:

a) Instructions for replacing the defective part on site. This will include any tests that may need to be done to ensure that the component is working in the proper manner. In addition, this part will include detailed service information when the component must be repaired on-site.

b) Instructions for repairing the defective component by the depot. These instructions will include information and describe testing that should be performed to place the item in replacement inventory.

For the sake of brevity, we have deleted routine and obvious steps such as removing cables from printed circuit boards, removing sheet metal enclosures, etc. from these instructions.

Warning: *The service engineer should ensure that all potentially hazardous materials are removed from the system before servicing the unit. In addition, if the component must be decontaminated as described in Section 2.11 before it is shipped to a depot.*

This page intentionally left blank.

Chapter B Backplane Assembly

The *Backplane Assembly* is a printed circuit board that is attached to the rear of the instrument. If the board is defective, it is replaced at the customer site and returned to the depot for repair.

To remove the backplane assembly

1. Remove the Rear Chassis Panel (Figure B-1)

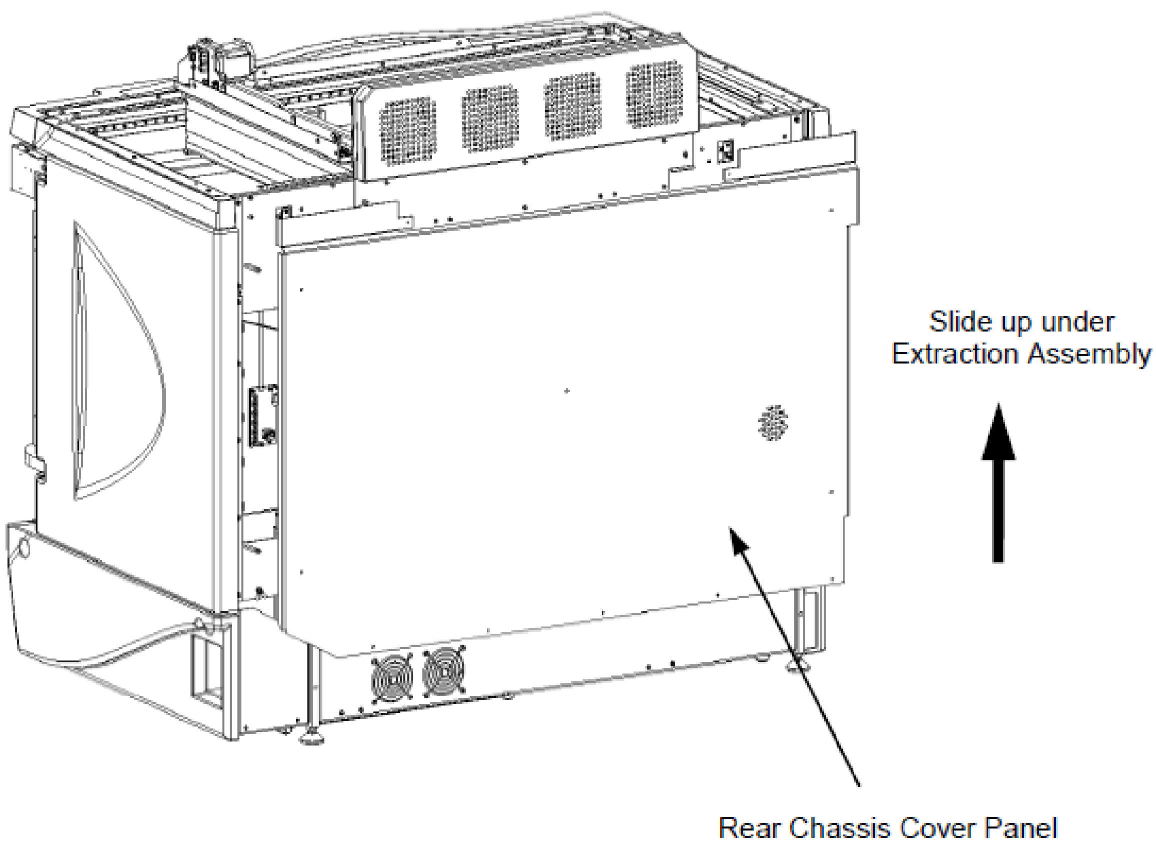


Figure B-1: Rear Chassis Panel

2. Remove the Backplane Assembly by unscrewing the four nylon nuts that attach the assembly to the back panel (Figure B-2) and disconnecting all cables.

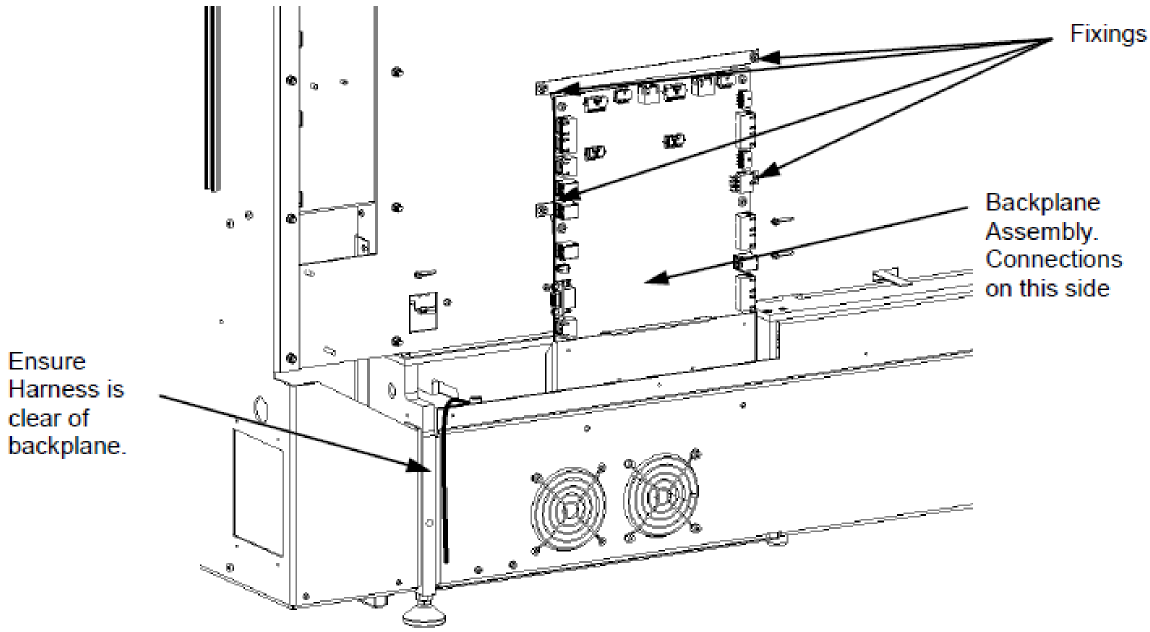


Figure B-2: Backplane Assembly Fixings

3. Remove the brackets from the backplane PCB.

When placing the new assembly into the system:

1. Loosely fit the Backplane Assembly to the rear of the Chassis using four M3 Nyloc Nuts and four M3 Fender Washers. Ensure the cabling that is connected to the drawer connector in the Baseplate is clear of the Backplane by routing it outside of the unit.

2. Remove the Fitting screws for the Electronics Box assembly (Figure B-3).

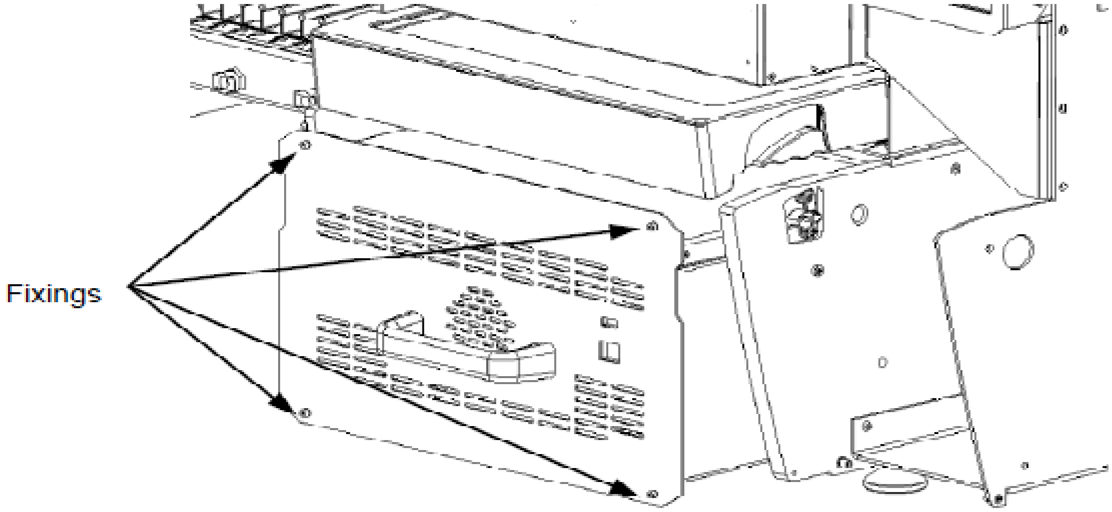


Figure B-3: The Electronics Box

3. Carefully slide the Electronics Box Assembly into the Baseplate until resistance against the Backplane assembly is felt.

4. Tighten the eight fixings securing the Backplane PCB to its Mounting Brackets and the mounting brackets to the chassis.

5. Secure the Backplane Assembly to the rear Baseplate using two M4x8 Socket Head Cap Screws, two M4 Washers and Loctite 222. Ensure all loose cabling is clear of both the Electronics Box and Backplane Assemblies.

This page intentionally left blank.

Chapter C Consumables Drawers Assembly

C.1 Overview

The *Consumables Drawers* on the right side of the system are used to house a broad variety of materials such as pipette tips, mixing wells, deep wells that are used by the assays to be performed. On a periodic basis, the operator may be required to replace various items to maintain system operation. The presence of items on the drawers is detected by the camera. These drawers slide out and can be completely removed from the system by moving the lock handle.

C.2 Replacing the Optosensor

Each consumable drawer includes an optosensor which can be replaced. The optosensor is located on the lock housing on the rear of the drawer adjacent to the accepted sticker (Figure C-1).

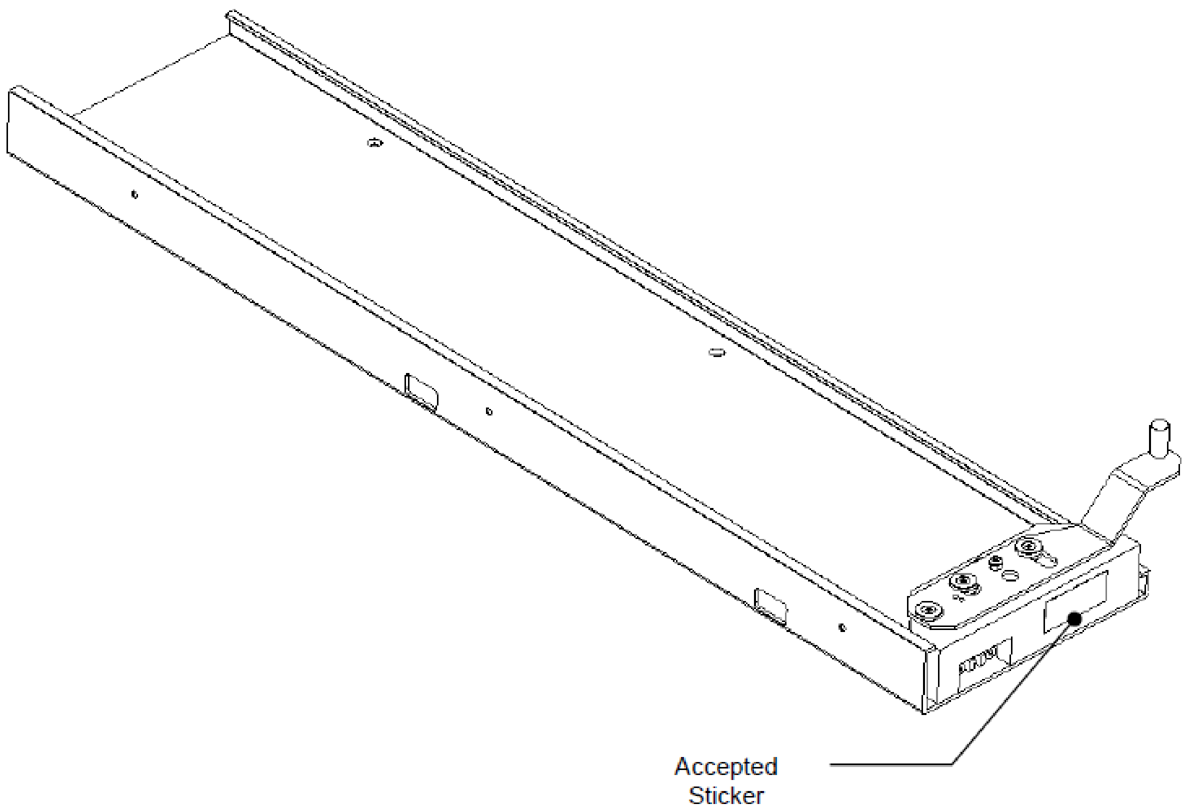


Figure C-1: Consumables Drawer

These optosensors must be accessed from behind the Agility as they are plugged into a printed circuit board mounted on the back wall. To remove the Optosensor, remove the two M3x6 Socket Head Cap Screws (and two M3 Internal Tooth Washers as shown in Figure C-2.

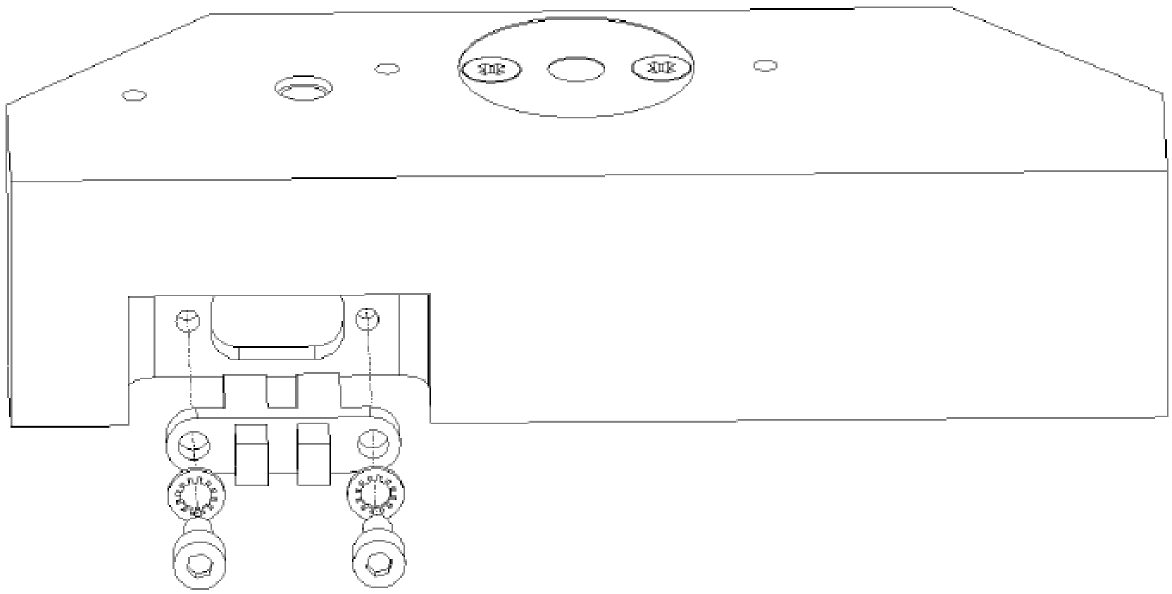


Figure C-2: Removing the Optosensor

When replacing the optosensor, tighten the socket head cap screws using a 4-6 in-lb torque driver.

Chapter D Doors

D.1 Overview

The doors are in the correct position when an override key will pass through the door slots and then through the Main Cover slots as shown in Figure D-1. In addition, the molded door covers should not be touching each other when the doors are closed. The proper position is shown in Figure D-2.

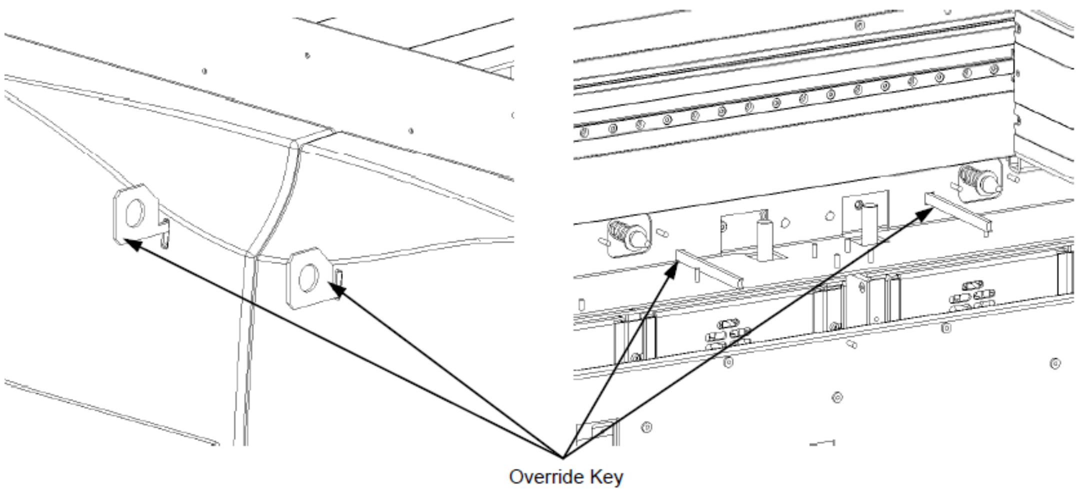


Figure D-1: Override Key Passing through the Door Slots

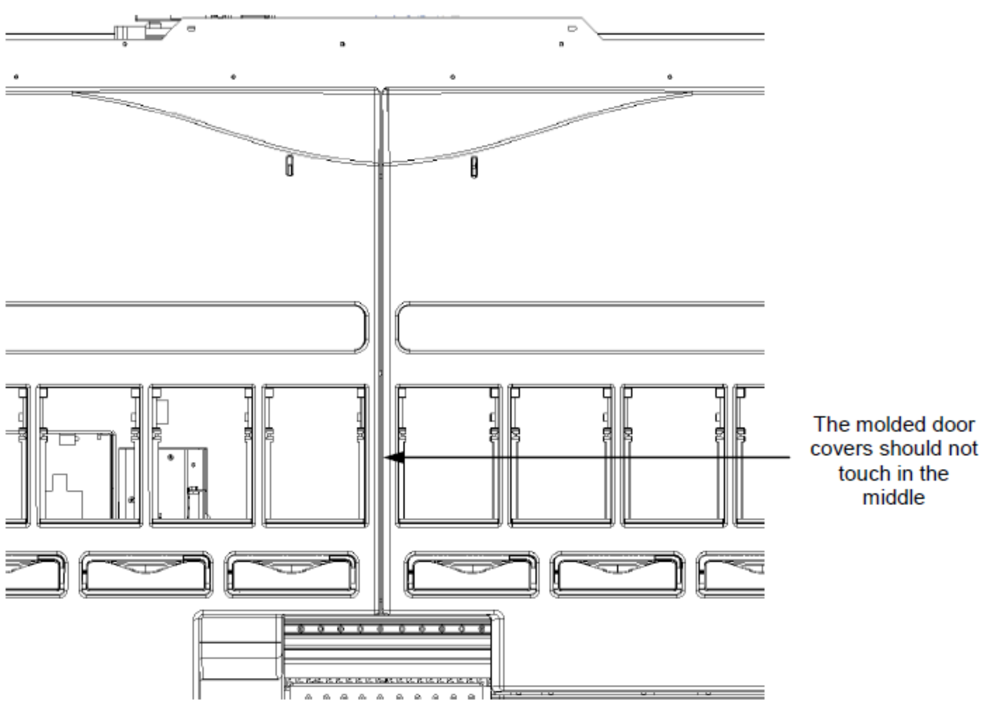


Figure D-2: Correct Position for Doors

D.2 Adjusting the Doors

D.2.1 Adjusting the Doors Left/ Right

If it is necessary to adjust the doors, it will be necessary remove the side panels to gain access to the hinge mechanism to adjust them.

To adjust the hinges:

1. Remove the left hand Hinge Body Cover from the lower left hand hinge by unscrewing the two M2x6 screws (Figure D-3). When replacing the cover, secure the screws with Loctite 222.

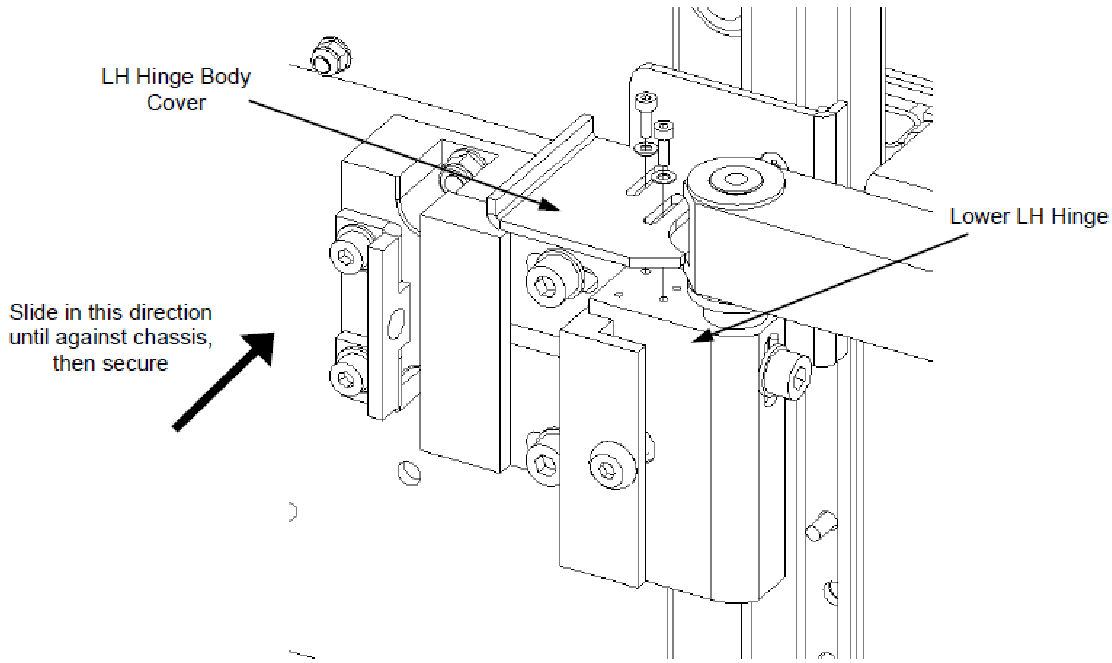


Figure D-3: Left Hand Hinge Body Cover

2. Remove the right hand hinge Body Cover from the lower right hand hinge by unscrewing the two M2x6 screws (Figure D-4). When replacing the cover, secure the screws with Loctite 222.

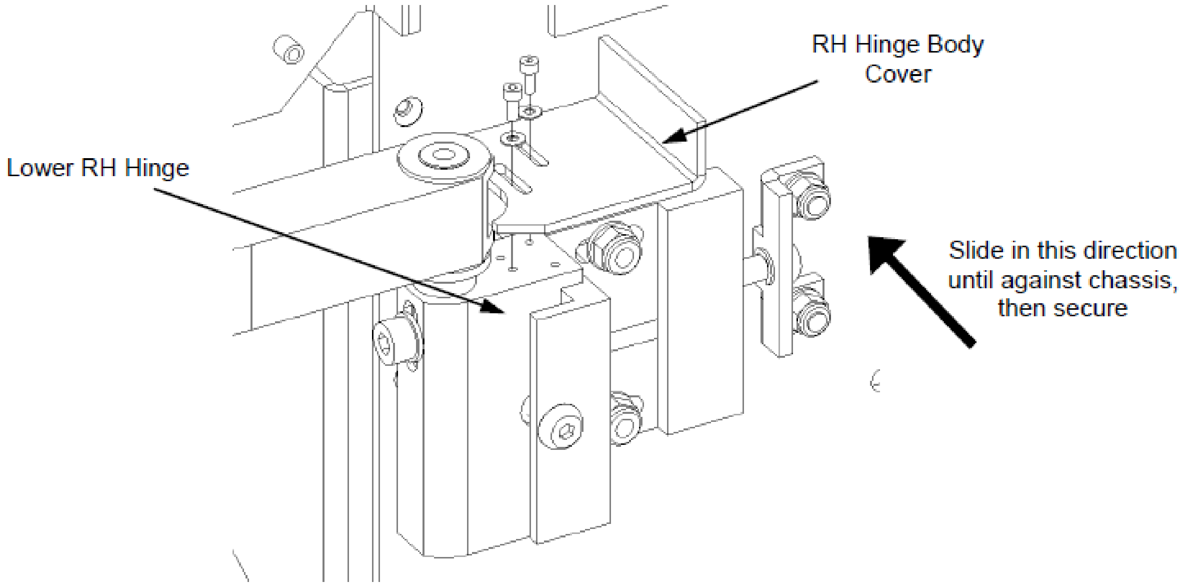


Figure D-4: Right Hand Hinge Body Cover

3. Loosen the screws as shown in Figure D-5.

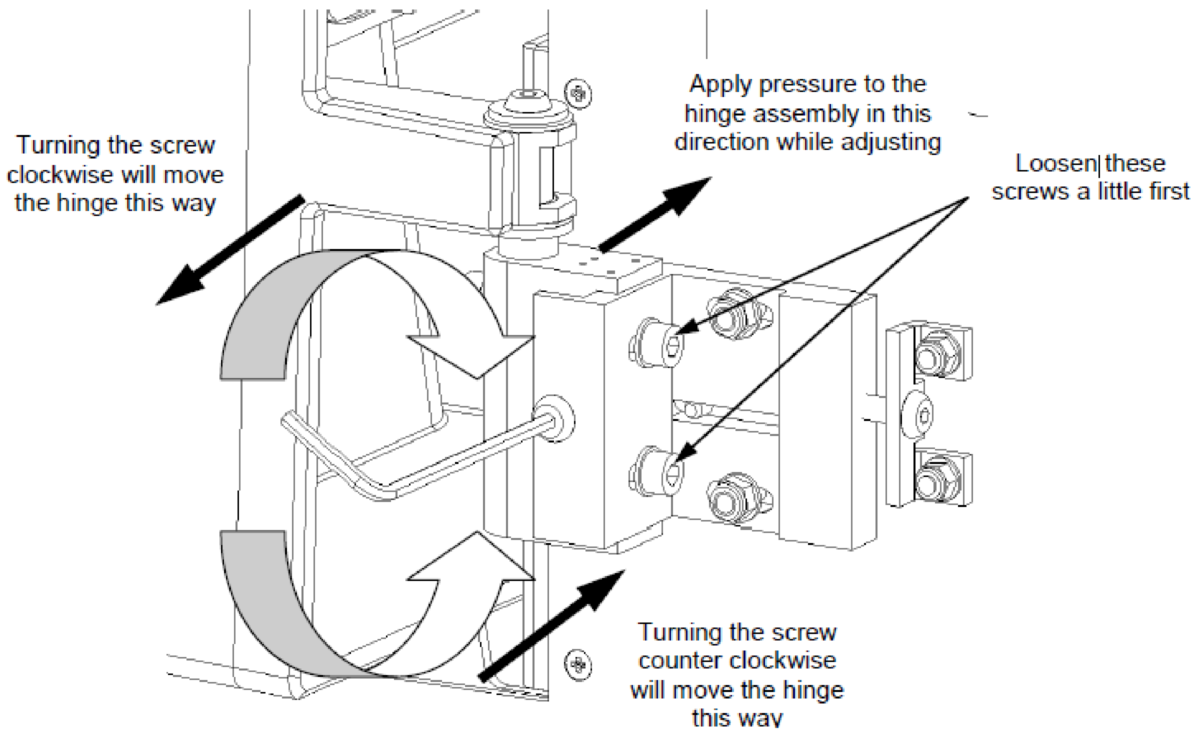


Figure D-5: Adjusting the Door Hinge

4. Turn the adjustment screw as shown. Record the number of turns on the adjustment screw. Re-tighten the fixing screws and repeat for the second hinge assembly.

> ***Note:*** *At the lower hinges, pressure should be applied to the door hinge as adjustment is made as excess force acting on the Adjustment Screw E-Clip may cause it to pop off.*

5. After making an adjustment to any hinge assembly, retighten the loose screws before adjusting another hinge assembly.

D.2.2 Adjusting the Doors Up/ Down

The Doors may need some adjustment so ensure that they are at the correct height relative to the Main X Cover. To check if they are at the correct height, measure from the top of the Main X Cover to the top of each end of each door. The doors should be closed when measuring.

The raised section of the Main X Cover is 20mm above the lower section, and so, the difference in measurement between the ends of each door should be 142.5mm and 162.5mm as shown in Figure D-6.

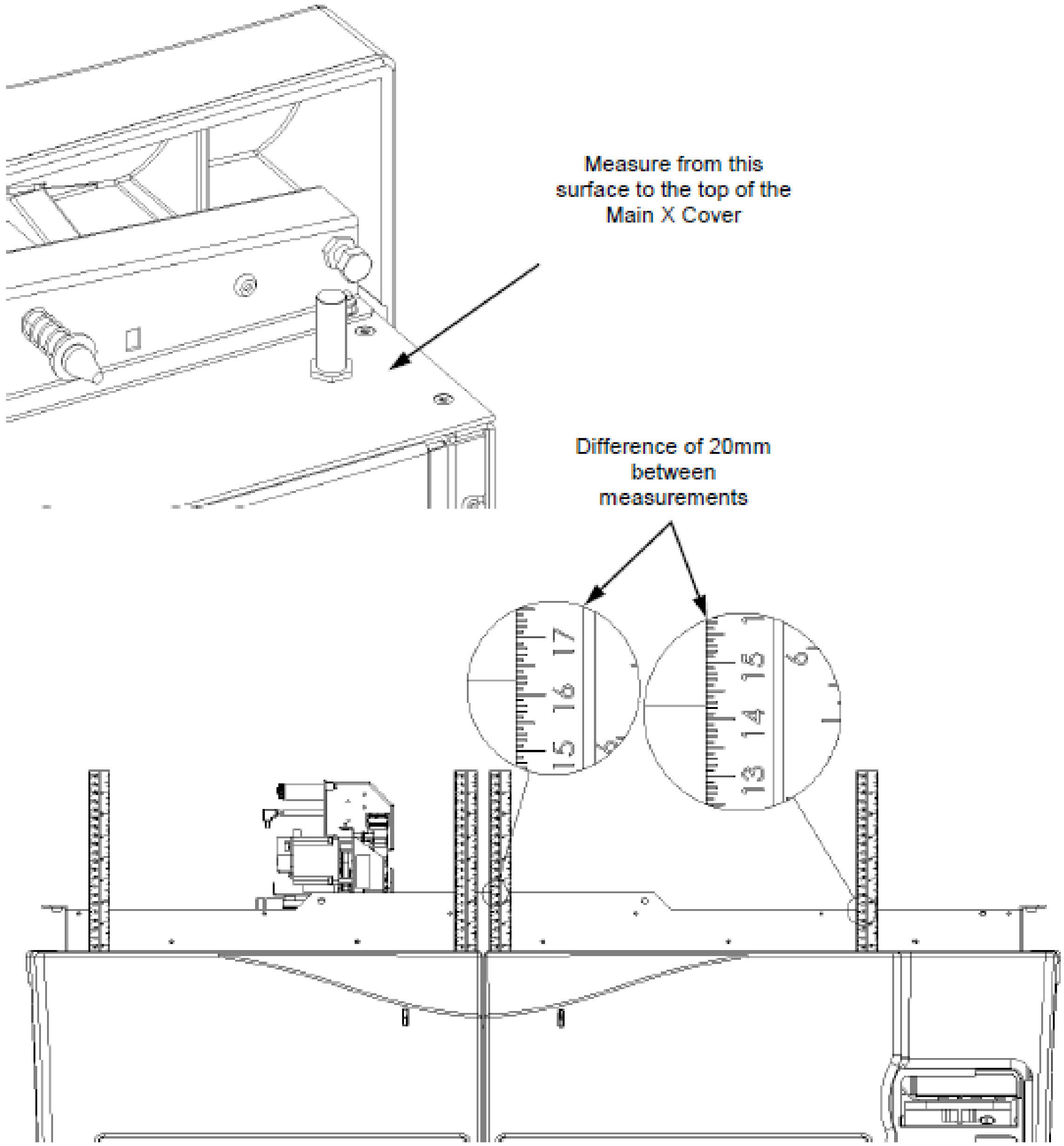


Figure D-6: Measuring the Door Height

If either door is not at the correct height, proceed to the next step. If the doors are at the correct height, proceed as described below

1. Remove the hinge body covers as described in Section D.2.1, steps (1) and (2).

2. Loosen the screw shown in Figure D-7 on both hinge assemblies.

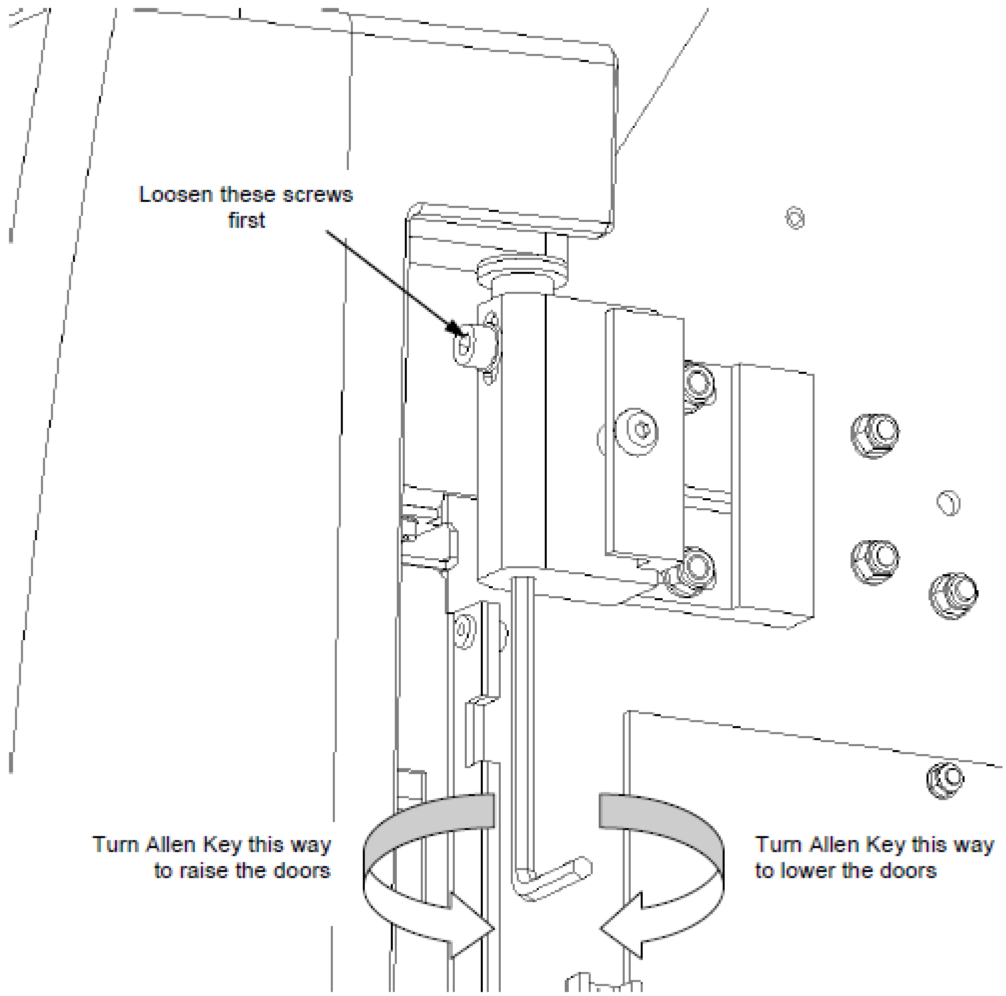


Figure D-7: Raising or Lowering Doors

3. Insert a 4mm Allen Key into the hole at the base of the upper hinge pivot shaft housing. Turn as shown in figure D-6 to either raise or lower the hinge.

4. Make the same adjustment to the lower hinge. Retighten the fixing screws and re-measure the door height.

5. Repeat this process as necessary. As a guide, one full turn of the screws should raise or lower the door by approximately 0.8mm.

D.2.3 Adjusting the Doors In/ Out

If the Right Hand Door molded cover comes into contact with the front of the Consumables Front Panel or if it is too far away, the hinge positions will need to be adjusted. The same amount of adjustment needs to be made at both the top and bottom hinge so the door stays in a vertical orientation.

To adjust the cover:

1. Remove the hinge body covers as described in Section D.2.1, steps (1) and (2).
2. To adjust the door forward, loosen the Nyloc Nuts securing the lower hinge to the Chassis (Figure D-8).

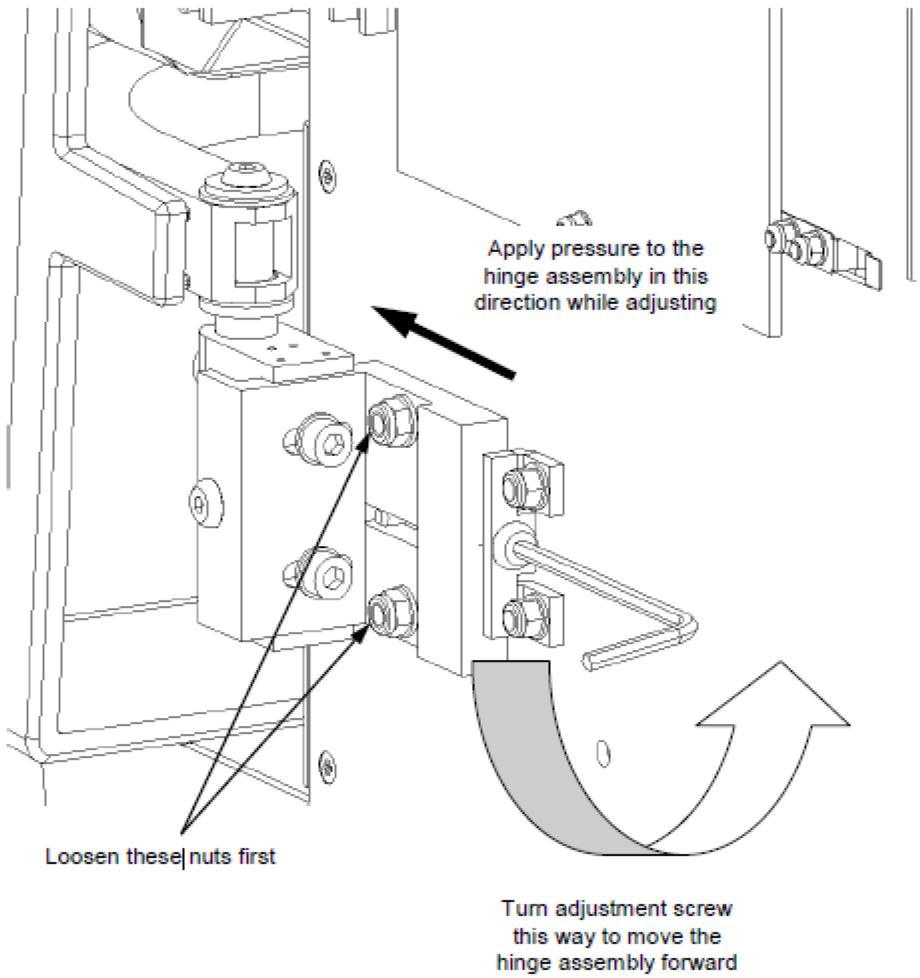


Figure D-8: Adjusting Right Hand Door

3. Turn the adjustment screw shown counterclockwise until the molded cover is approximately 0.5 - 1.0 mm away from the front of the Consumables Front Panel.

4. Re-secure the hinge assembly to the Chassis.

> ***Note:*** *Pressure should be applied to the door hinge as adjustment is made as excess force acting on the Adjustment Screw E-Clip may cause it to pop off.*

5. Repeat the adjustment on the top hinge assembly, turning the adjustment screw the same number of times as on the lower hinge adjustment. Record the number of turns made of the adjustment screw.

6. Repeat this process for the upper and lower LH door hinges, adjusting with the same number of adjustment screw turns.

7. Take the number of turns of each adjustment screw from the previous step and multiply it 0.8. The resulting figure will be the distance each hinge was adjusted in mm. For example, if 3 turns were required per hinge, each hinge assembly was adjusted by a distance of: 3 x 0.8 = **2.4mm**

8. The upper stop of each door needs to be adjusted by the same distance. To do this, start by measuring how far the Hex Bolt is away from the upper door bracket and then add the adjustment distance made at the door hinge.

9. Hold the upper stop Hex Bolt in place and loosen the Hex Nut that locks it in place (Figure D-9).

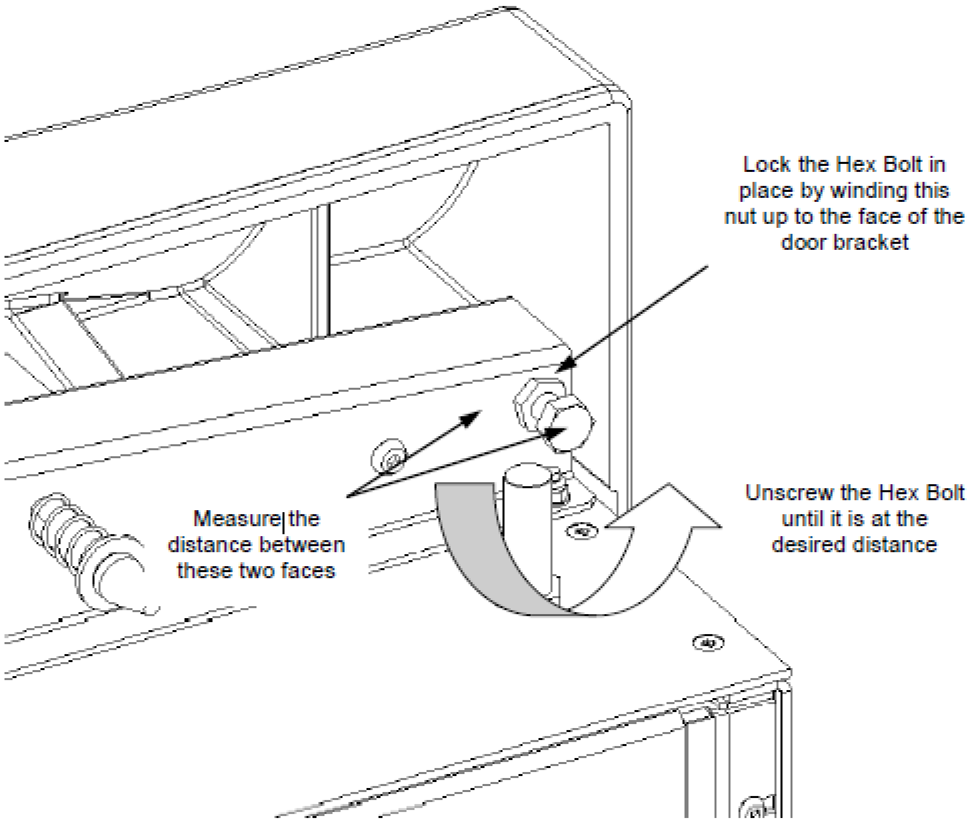


Figure D-9: Adjusting the Upper Stop

10. Unscrew the Hex Bolt until at the resulting distance. For example, if the Hex Bolt Head starts at 12.9mm from the face of the door bracket, and the hinges were adjusted by 2.4mm, the Hex Bolt should be unscrewed until its head is: 12.9 + 2.4 = **15.3mm** from the face of the door bracket. As a guide, one complete turn of the Hex Bolt will move it 1.0 mm away from the door bracket.

11. Once the Hex Bolt is at the correct distance, hold it in place and re-tighten the Hex Nut up to the face of the Door Bracket.

D.2.4 Removing the Door Covers

If it is necessary to remove the door covers:

To remove the Right Hand Door Cover from the Door, disconnect the Nameplate LED and unscrew the five M4x8 BHCS screws. When replacing the door, apply Loctite 425 and take not to damage the RH Door Cover Light Guides when slotting them through the front of the Door (Figure D-10).

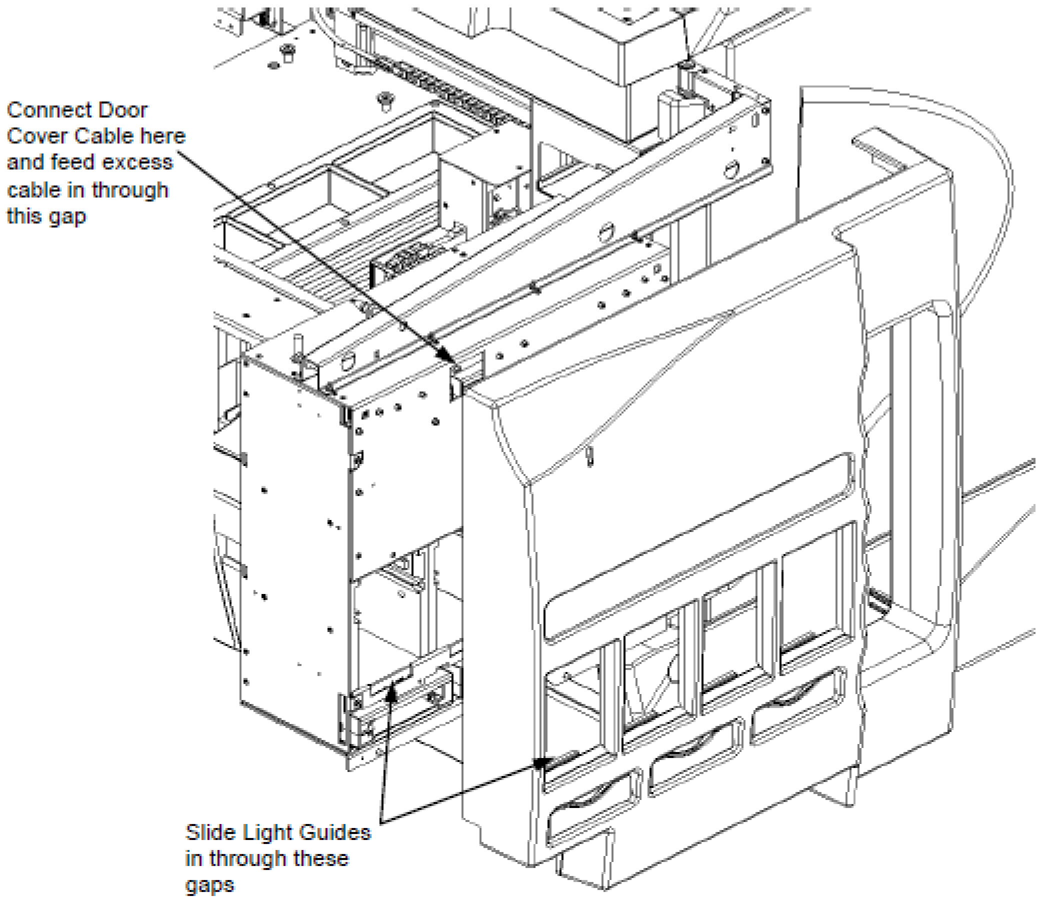


Figure D-10: Replacing the Right Hand Door Cover

Remove and replace the Left Hand Door Cover and nameplate LED in the same manner (there are only four M4x8 BHCS screws).

Chapter E Electronics Box

E.1 On-Site Service Activities

The *Electronics Box* assembly is attached to the baseplate by four M3x8 Socket Head Cap Screws and four M3 Internal Tooth Washers (Figure E-1).

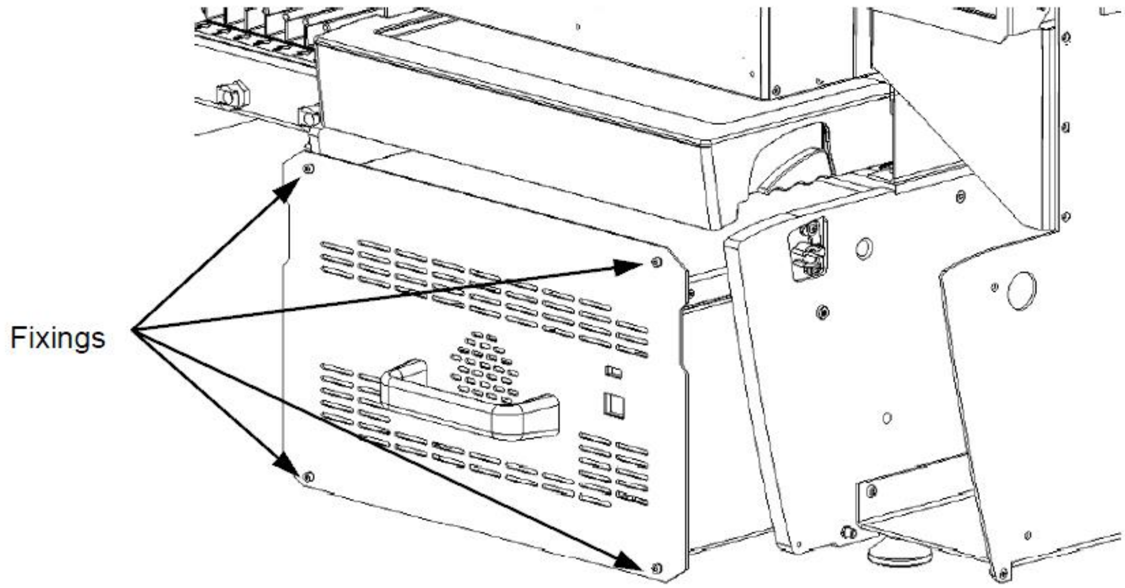


Figure E-1: Removing the Electronics Box Assembly

It is recommended that defective electronics box assemblies are replaced in the field and the defective unit should be sent to the local depot for refurbishing.

To remove the Electronics Box Assembly:

1. Remove the right hand panel and the two bottle cover stops shown in Figure E-2.

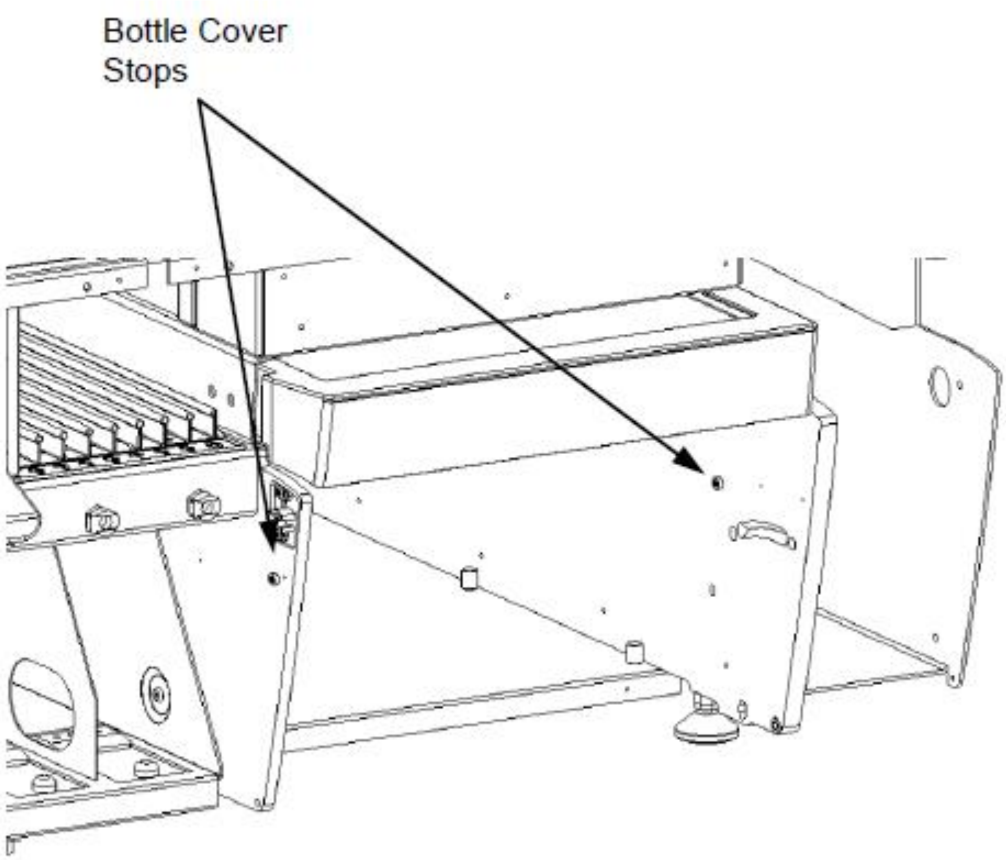


Figure E-2: Removing the Panel Door and Stopper

2. Slide the display all the up so that the electronics box is visible.
3. Unscrew the four fittings that attach the electronics box to the system.
4. Gently pull on the handle to remove the electronics box.

E.2 Service Depot Activities

E.2.1 Removing the Cover

The cover of the electronics box can be removed by removing the screws indicated in Figure E-3.

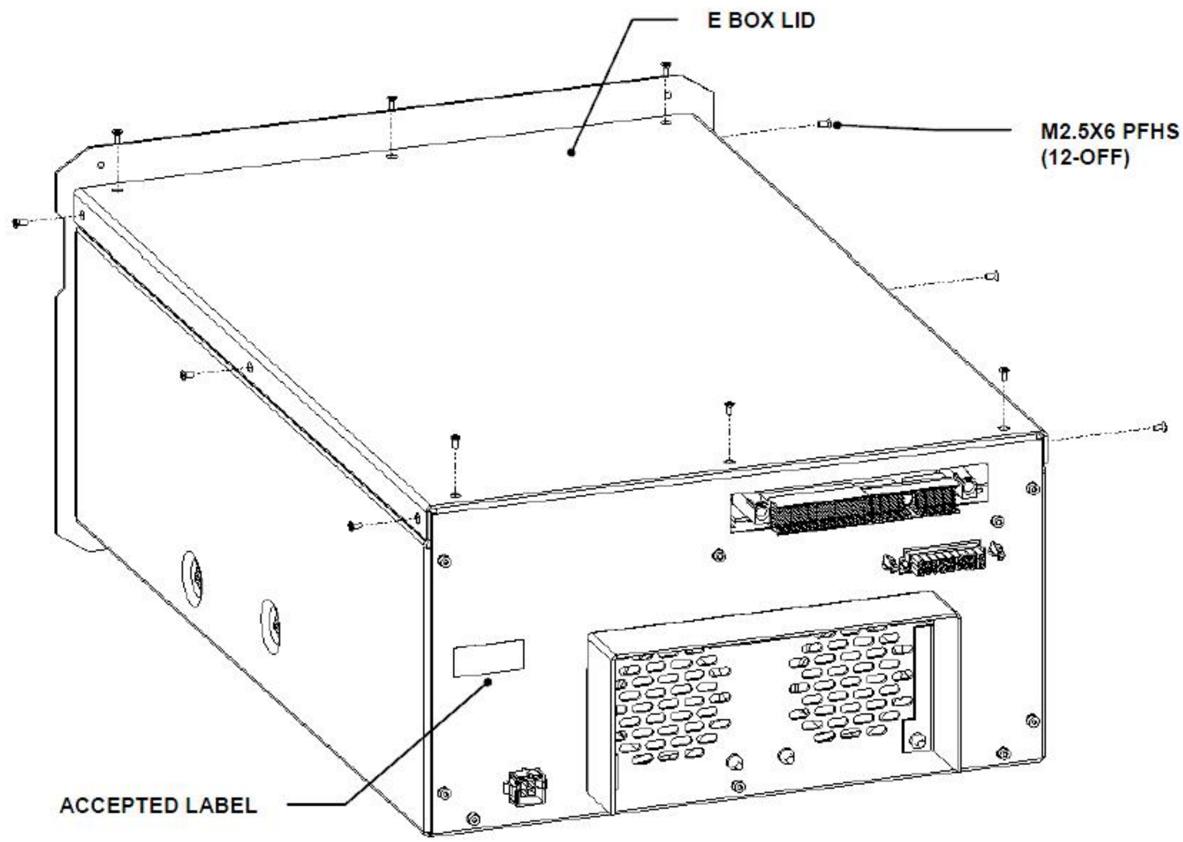


Figure E-3: Opening the Electronics Box

E.2.2 Removing the PCI Card

The PCI card is located as shown in Figure E-4.

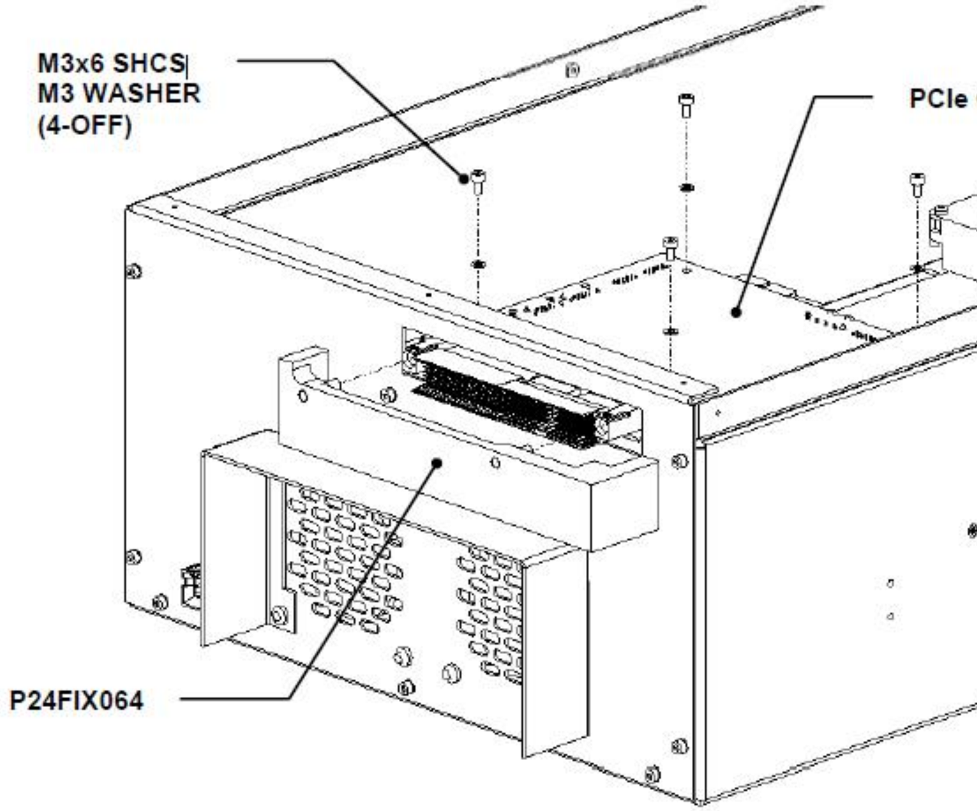


Figure E-4: Location of the PCI Card Printed Circuit Board

To remove the PCI Card Printed Circuit Board, unlock the screws and pull the card back.

To replace the card:

1. Fit a PCIe Card Printed Circuit Board into the electronics box by loosely screwing the four M3x6 Socket Head Cap Screws and four M3 Washers onto the standoffs on the Mother Board Shelf and PCI Card Bracket. Use a small amount of Loctite 222.
2. Place the fixture in contact with the rear left hand side of the electronics box as shown in Figure E-5. Push the PCI card back towards the fixture as far as it will go and lock the screws down in place.

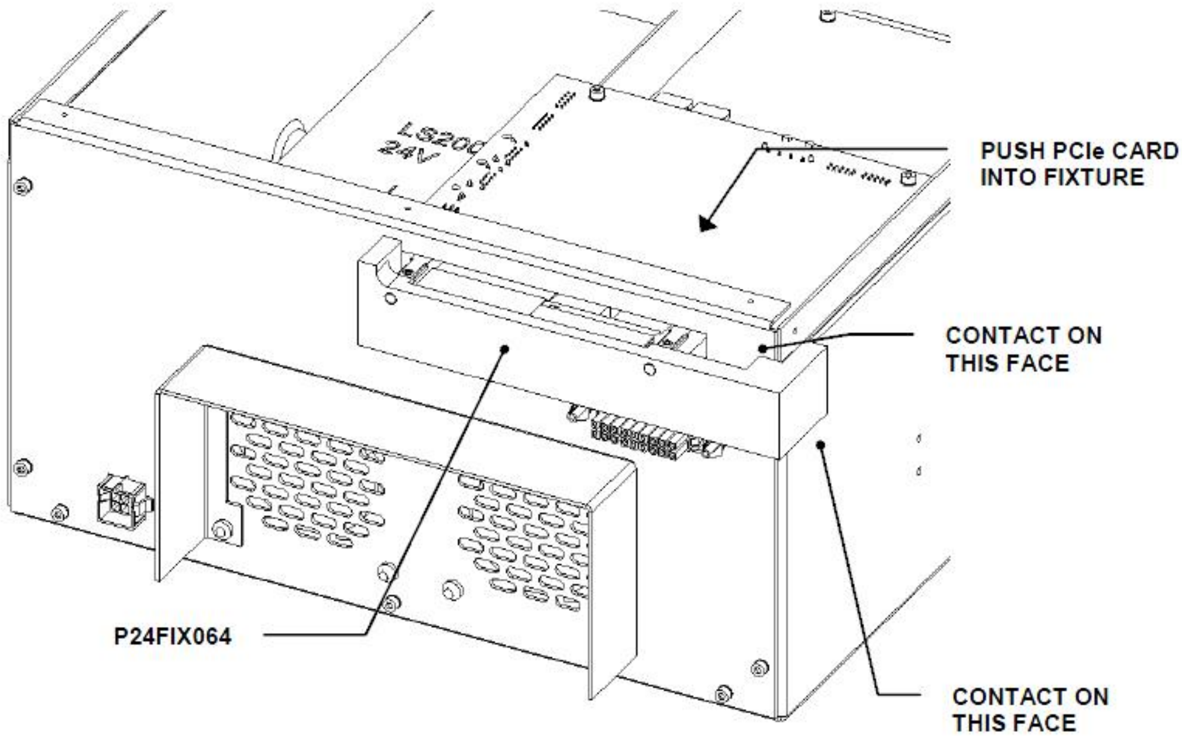


Figure E-5: Positioning the PCI Board

E.2.3 Replacing the Motherboard

The motherboard is attached to the Electronics box as shown in Figure E-6.

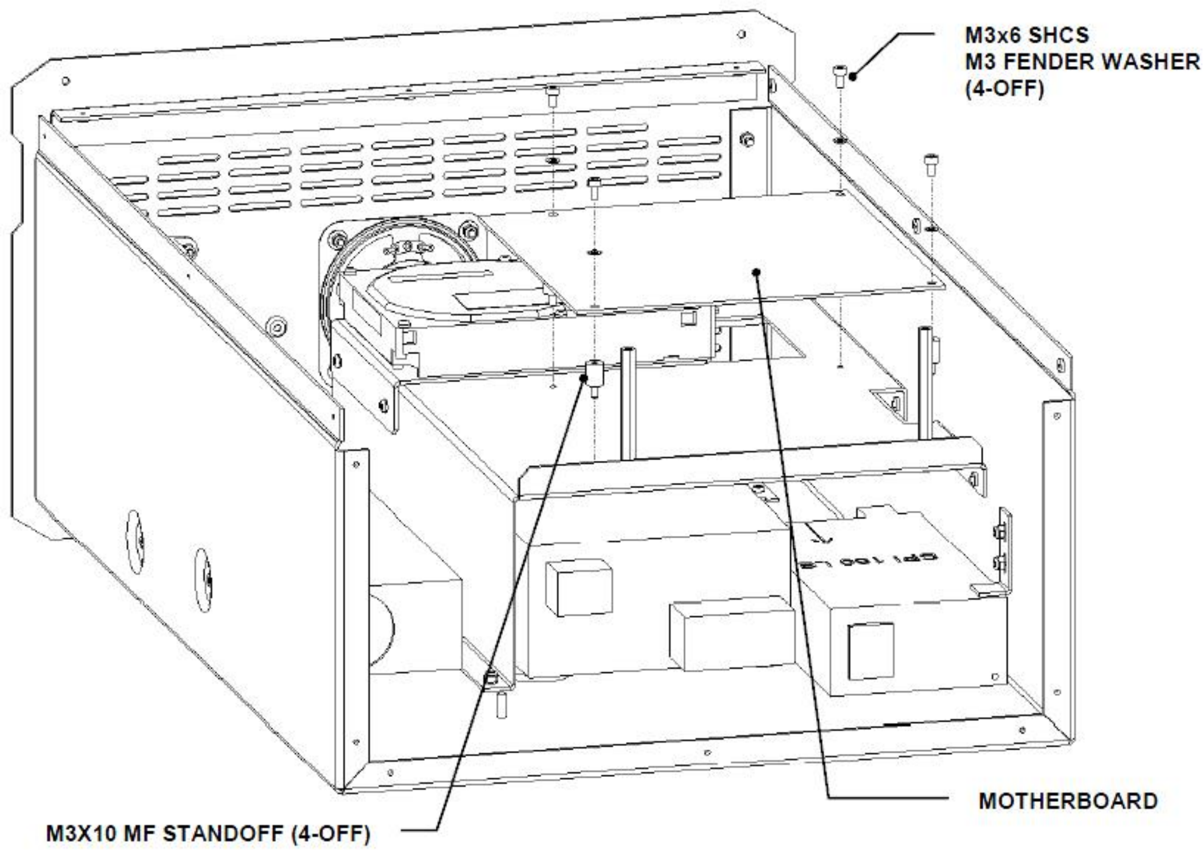


Figure E-6: Location of the Motherboard

When replacing the motherboard and standoffs, use a small amount of Loctite 425.

E.2.4 Replacing the Fans

The fans are located on the rear panel of the Electronics box (Figure E-7).

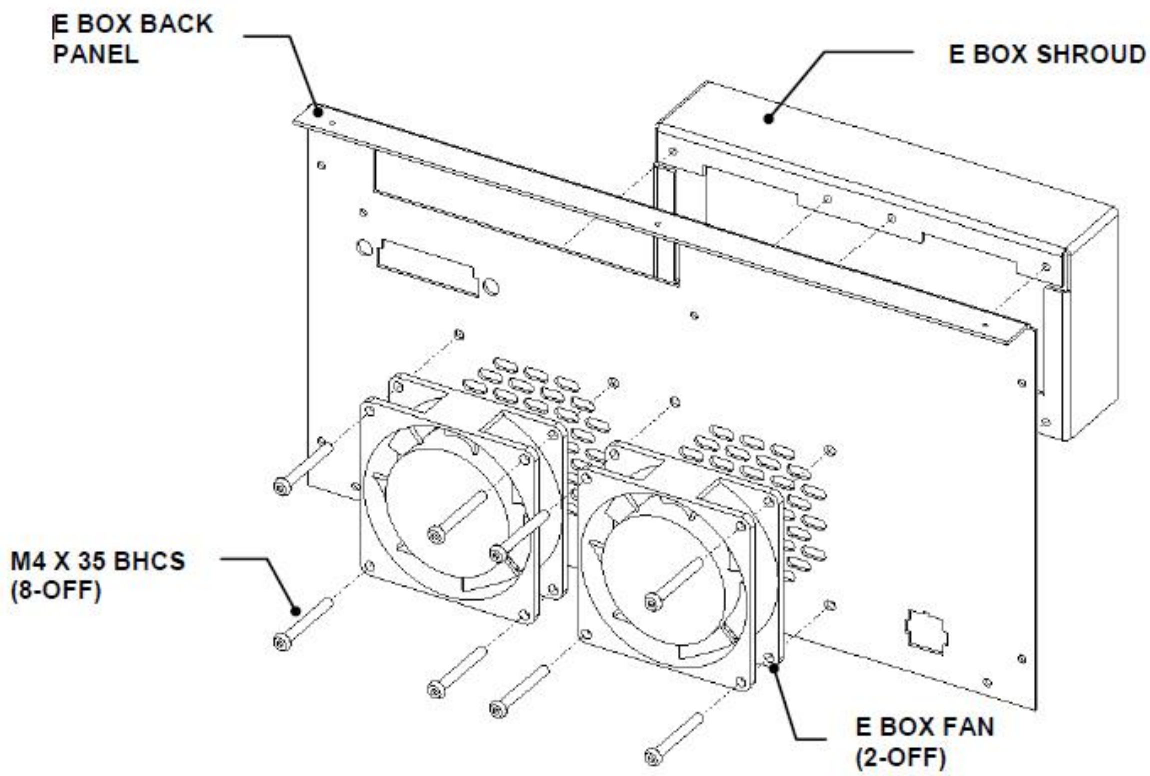


Figure E-7: Location of the Fans

When replacing a fan, ensure that the air direction and the cable exiting is as shown in Figure E-8.

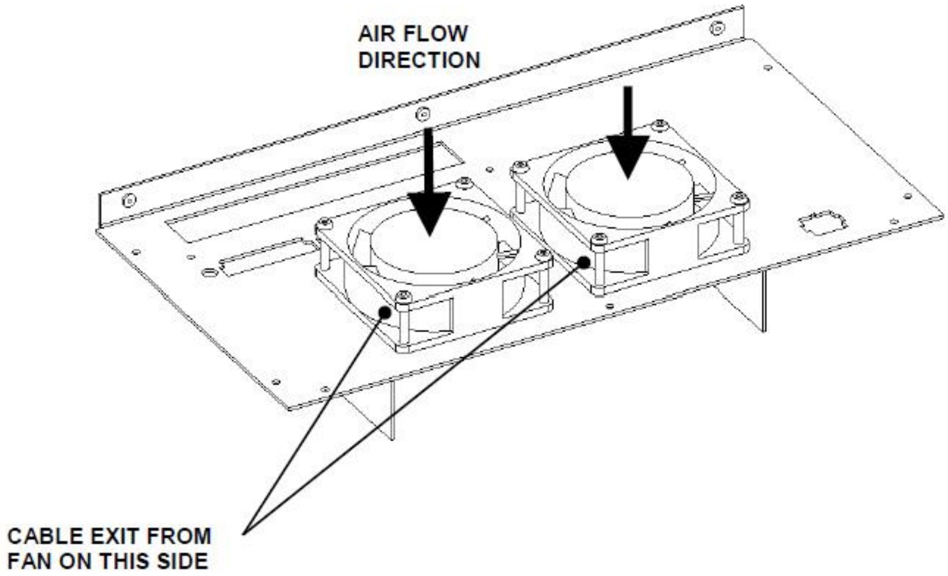


Figure E-8: Positioning the Fans

E.2.5 Hard Disk

The hard disk is located on the motherboard shelf as shown in Figure E-9. To remove the hard disk assembly, remove the three screws that attach it to the motherboard shelf and then remove the three screws that attach the drive to the tray to which it is affixed.

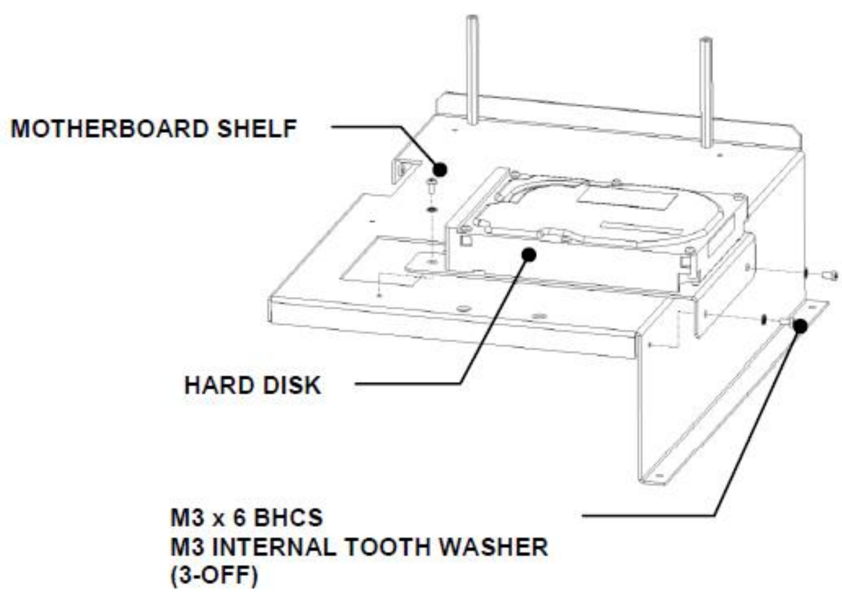


Figure E-9: Location of Hard Drive

Replace the hard drive by affixing it to the tray and then attaching the tray to the motherboard shelf.

E.2.6 Audio Amp Printed Circuit Board

The Audio Amp Printed Circuit Board is located in the front left of the electronics box (Figure E-10). It can be removed by unscrewing the four screws.

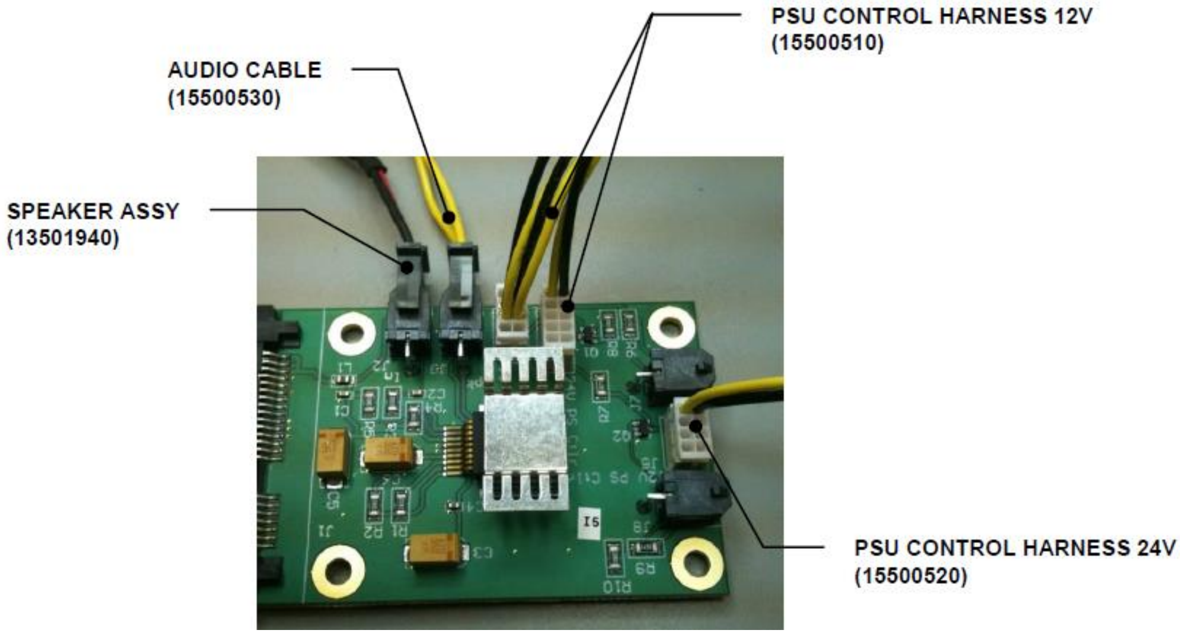


Figure E-10: Audio Amp Board

E.2.7 12 and 24 V Power Supply Units

The 12 and 24 V Power Supply Units are mounted to the base of the Electronics box as shown in Figure E-11.

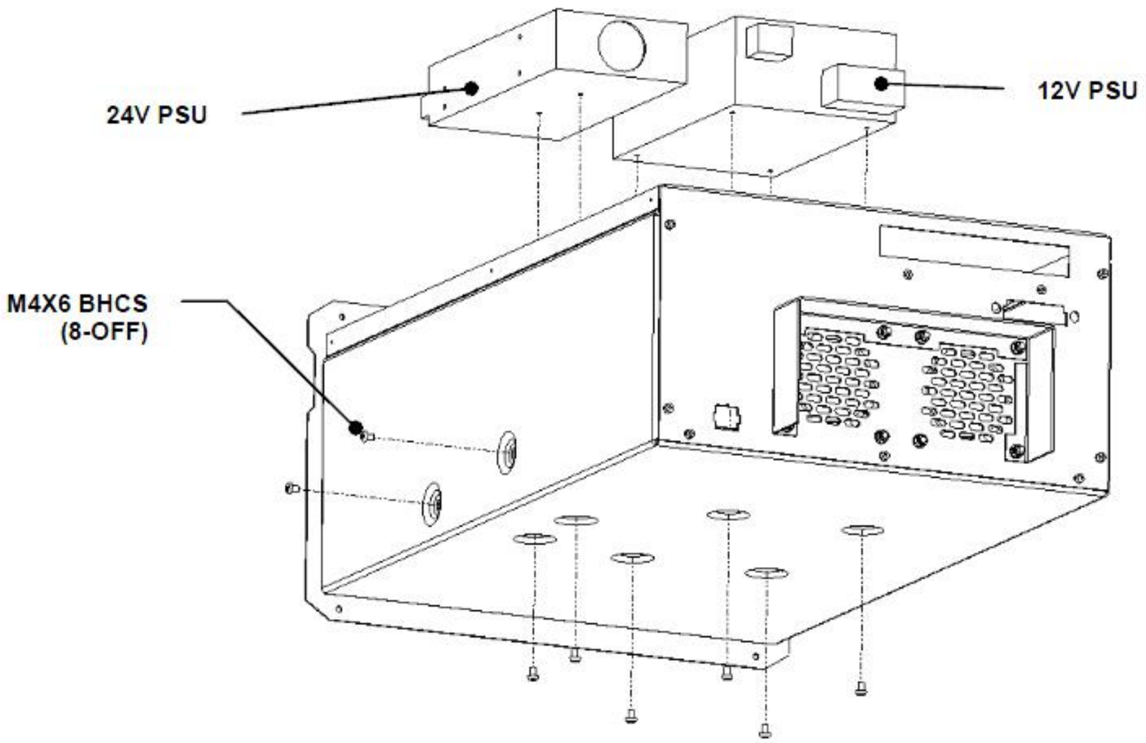


Figure E-11: Removing the 12 V Power Supply and 24 V Power Supply

To remove the 12 V power supply, remove the four screws from the bottom of the box. To remove the 24 V power supply, remove the two screws from the bottom of the box and the two screws from the side of the box.

E.2.8 ATX Power Supply

The ATX power supply is mounted in the center of the left side of the Electronics box as shown in Figure E-12.

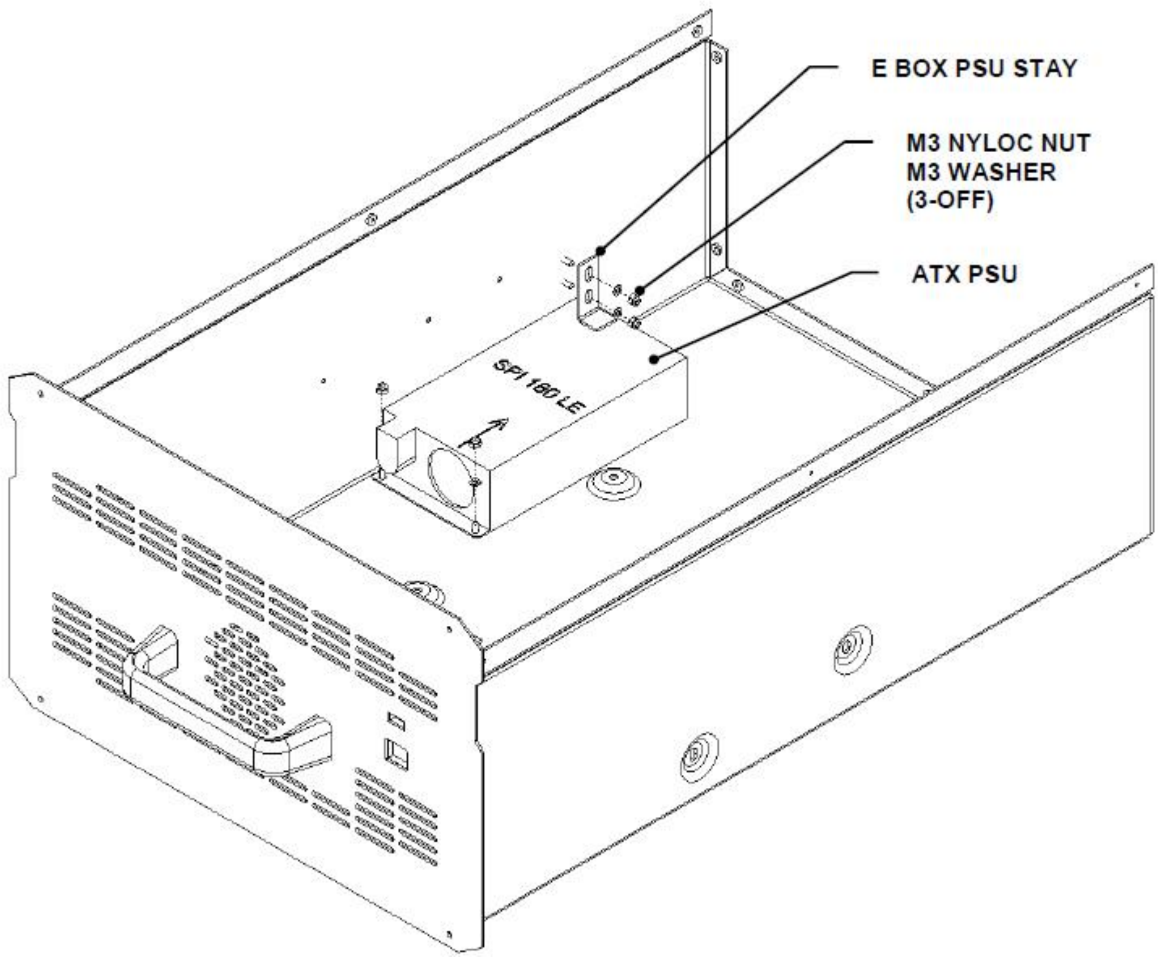


Figure E-12: The ATX Power Supply

E.2.9 Speaker Assembly

The speaker assembly is mounted on the front panel of the Electronics box. It is removed by unscrewing the four nuts. When replacing the speaker, make sure that the speaker cable faces downward as shown in Figure E-13.

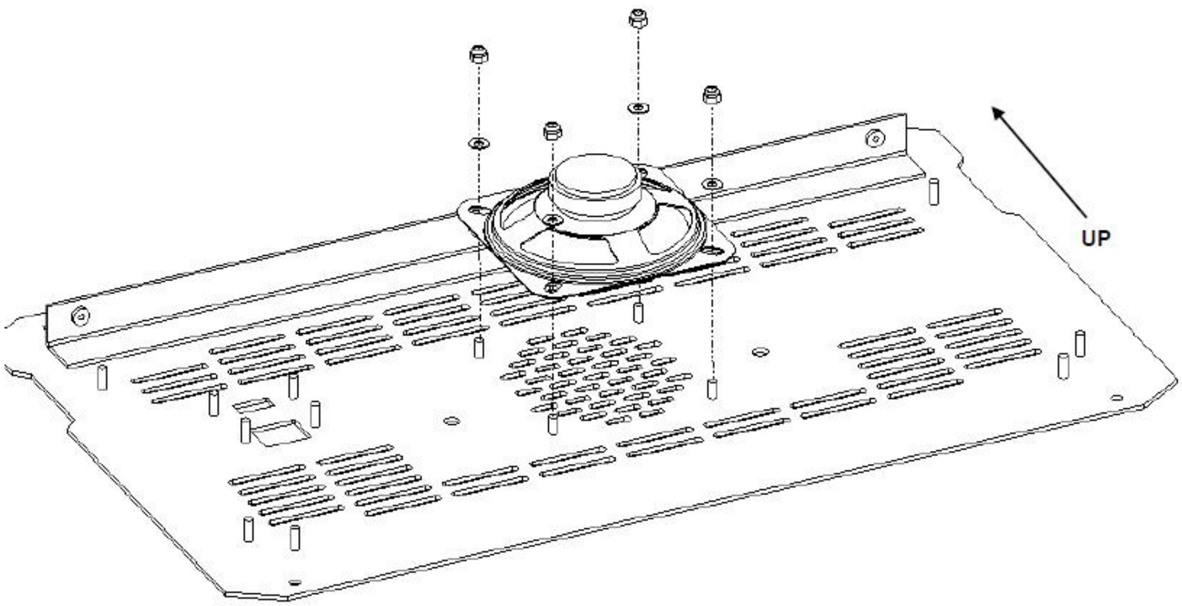


Figure E-13: The Speaker Assembly

Chapter F Fans (Extraction Assembly)

F.1 Location of Fans

There are several fans in the Agility system:

- The Extraction Assembly includes four fans, described in Section F.2.
- Various components of the system (e.g. incubators, reader and electronics box) include a fan. Servicing of a fan that is embedded in a component is described in the section describing the specified component.

F.2 Extraction Assembly

The *Extraction Assembly* includes four fans and is mounted on the top of the rear of the instrument as shown in Figure F-1.

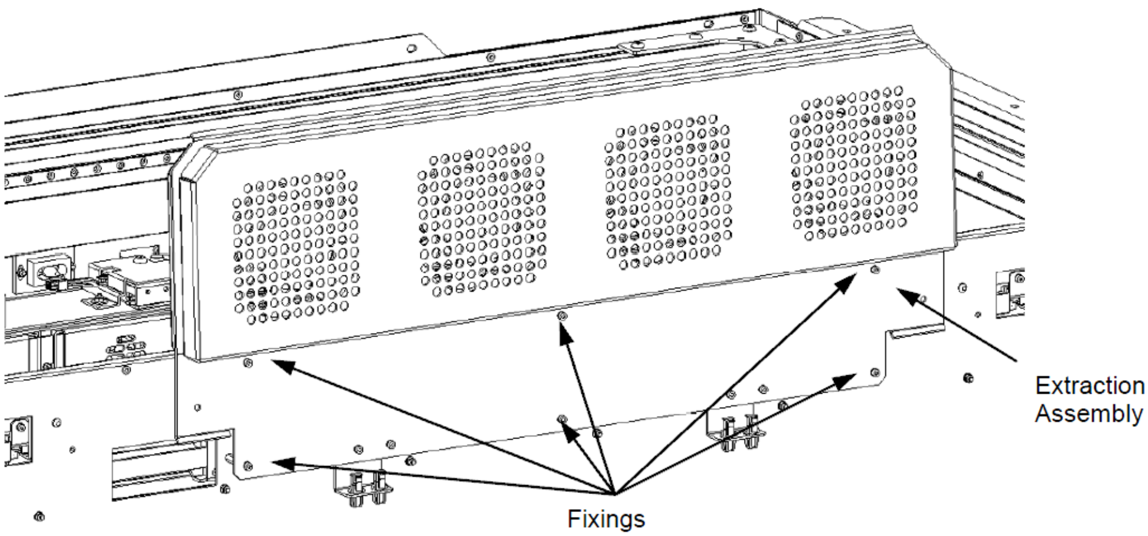


Figure F-1: The Extraction Assembly

To replace a fan on the extraction assembly:

1. Remove the thumbscrews that attach the extraction assembly to the top cover (Figure F-2).

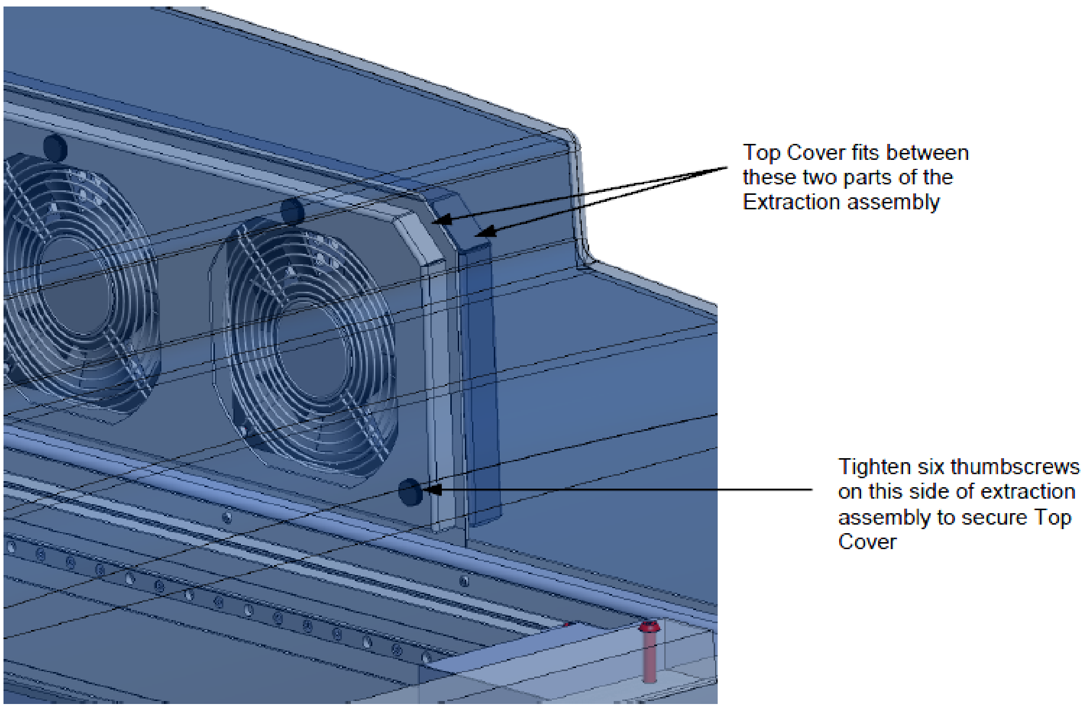


Figure F-2: Extraction Assembly Thumbscrews

2. Remove the top cover of the system (Figure F-3).

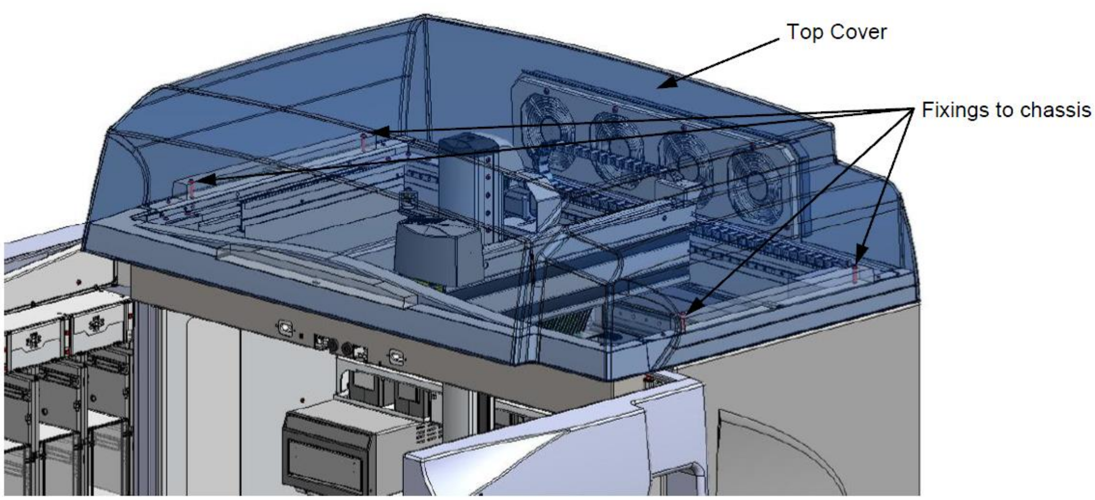


Figure F-3: Removing the Top Cover

3. Unscrew the six fittings that attach the extraction assembly to the rear panel.
4. Remove the Fan Cover from the assembly (Figure F-4).

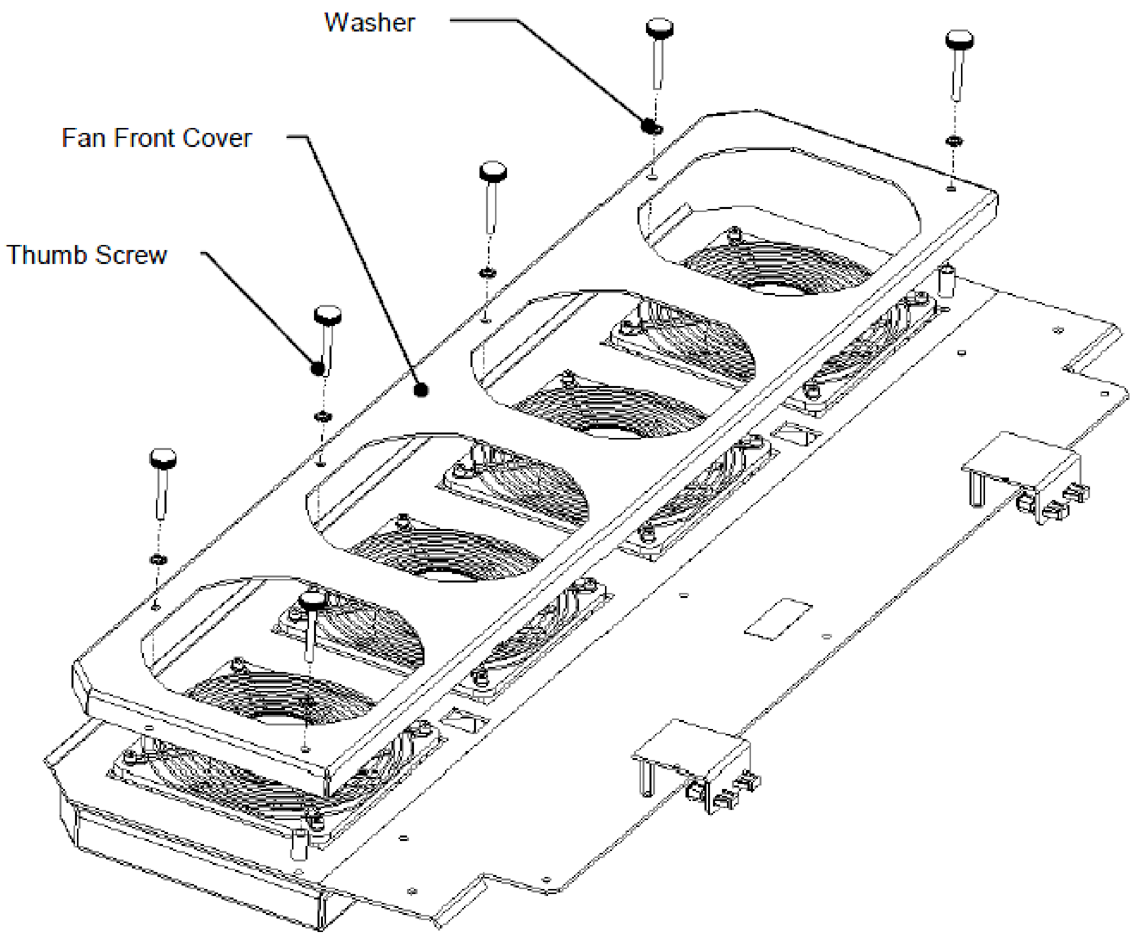


Figure F-4: Removing the Fan Cover

5. Remove the fan and fan plate by unscrewing the four screws that attach it to the plate.

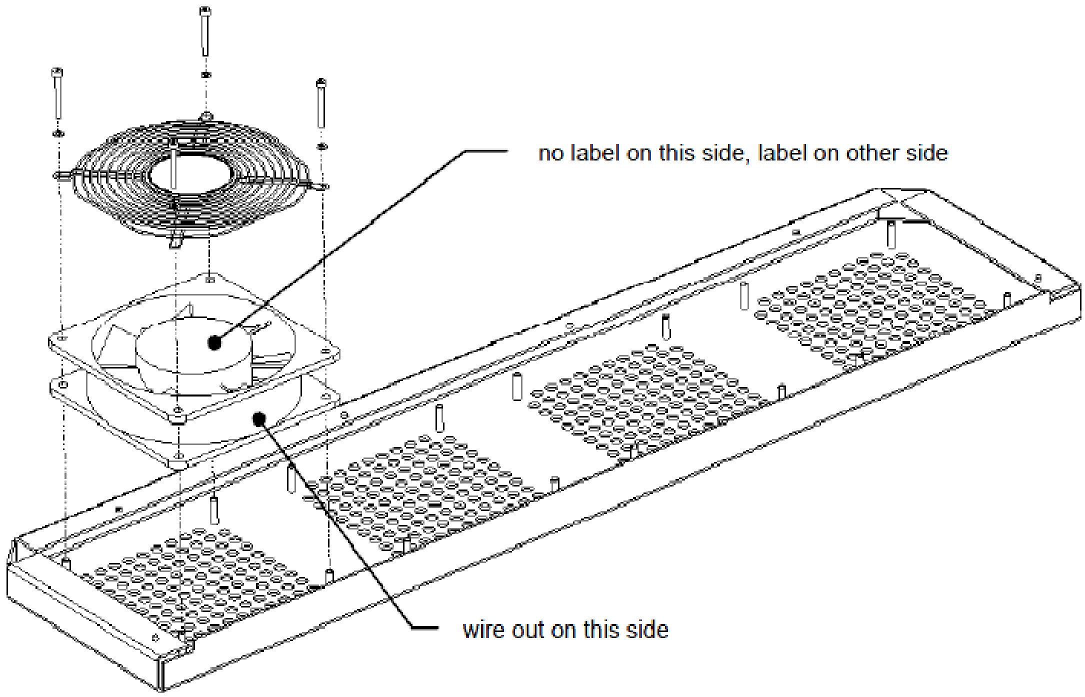


Figure F-5: Fan Orientation

When replacing a fan, apply a drop of Loctite 425 in the standoff and note that the orientation of the label on the fan should face the plate. Lead the wires through the two holes on the plate as shown in Figure F-6.

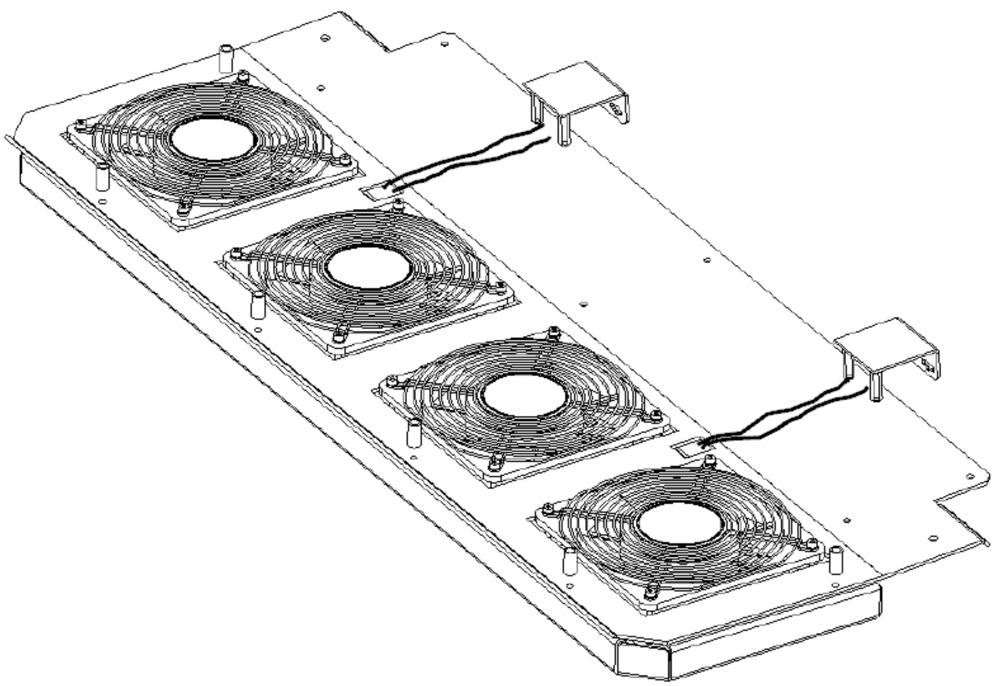


Figure F-6: Fan Wires

Chapter G Fluidics Panel Assembly

G.1 Overview

The *Fluidics Panel Assembly* is located on the lower left of the system (Figure G-1).

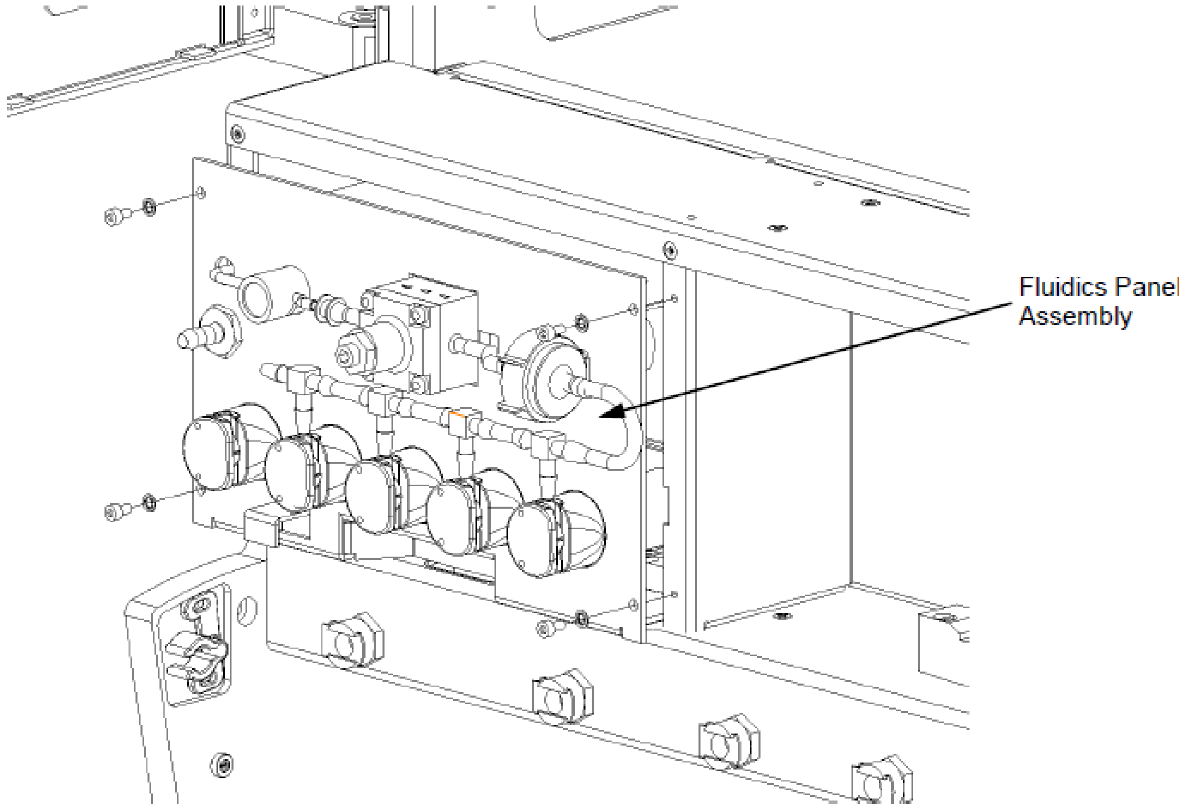


Figure G-1: Location of the Fluidics Panel Assembly

G.2 Removal of the Fluidics Panel Assembly

To remove the Fluidics Panel Assembly:

1. Remove the four screws attaching it to the system (Figure G-1).
2. Disconnect the Vacuum Tube from the bulkhead as shown in Figure G-2.

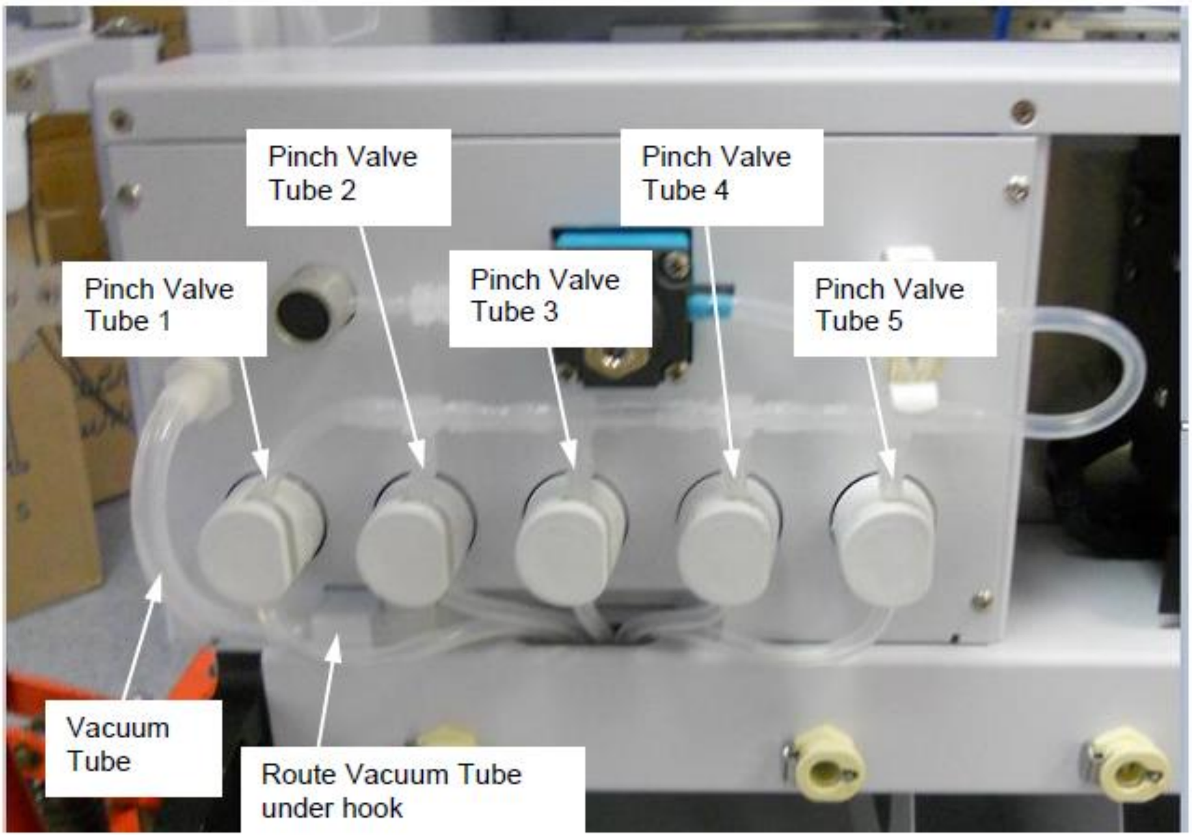


Figure G-2: Fluidics Panel Assembly Connections

3. Disconnect the Pinch Valve tubing from the T connectors.

G.3 Replacing Tubing on the Fluidics Panel

The tubing on the Fluidics Panel should be replaced as necessary. It is recommended that the tubing be replaced when cloudiness or cracking is observed.

The dispense valve tubing is depicted in Figure G-3. The 45 mm tube end should be connected to the KNF pump outlet.

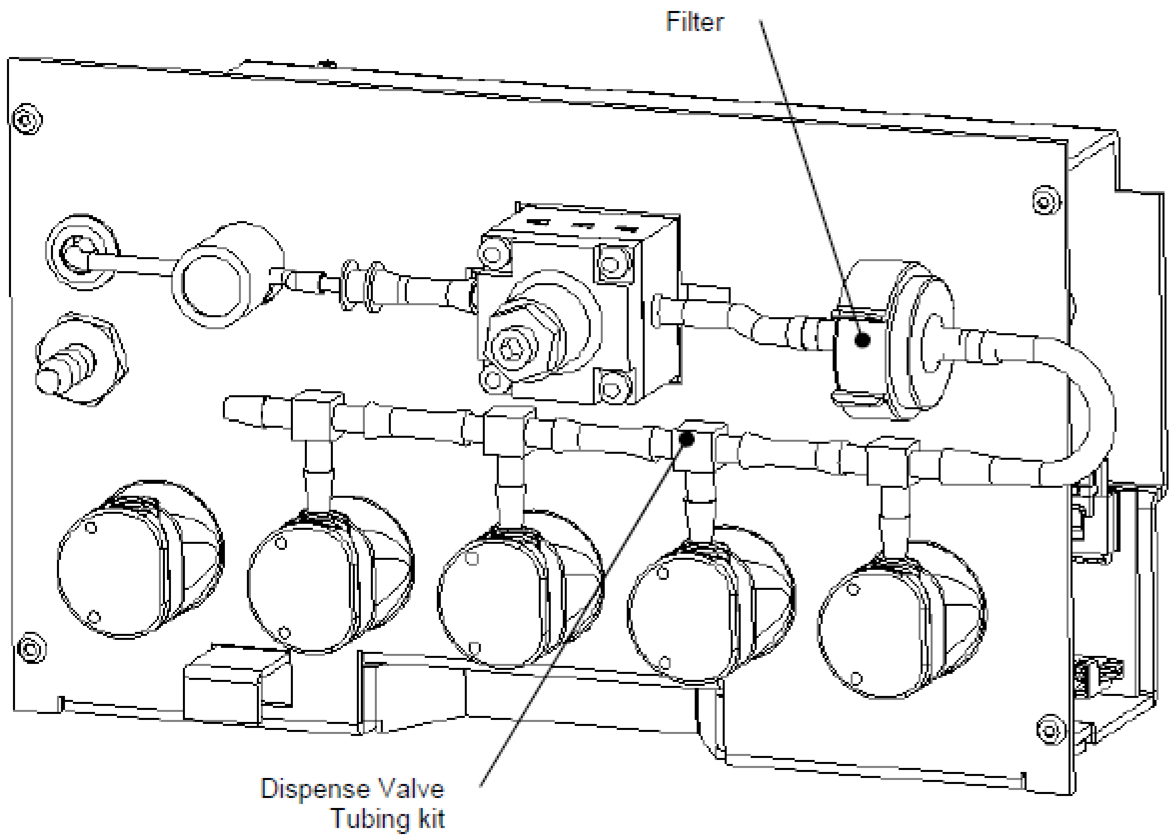


Figure G-3: Dispense Valve Tubing

The tubing from the KNF pump should be connected to the wash head manifold as shown in Figure G-4.

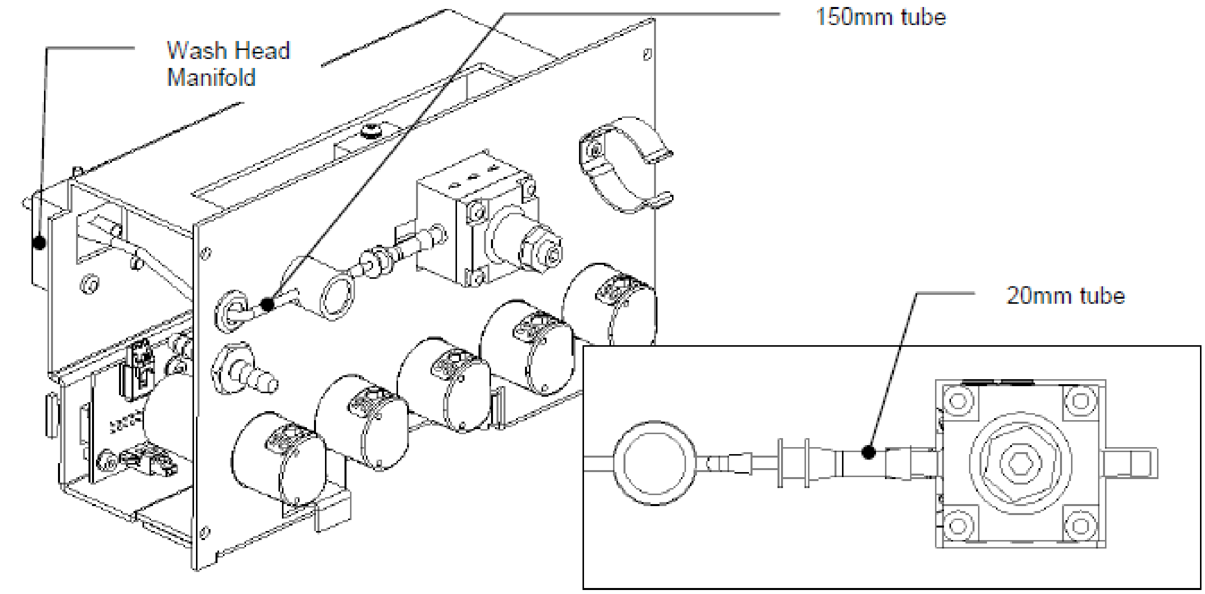


Figure G-4: Connecting the KNF Pump to the Wash Head Manifold

The vacuum tubing connects the large tube on the front panel to the panel mount hose barb as shown in Figure G-5.

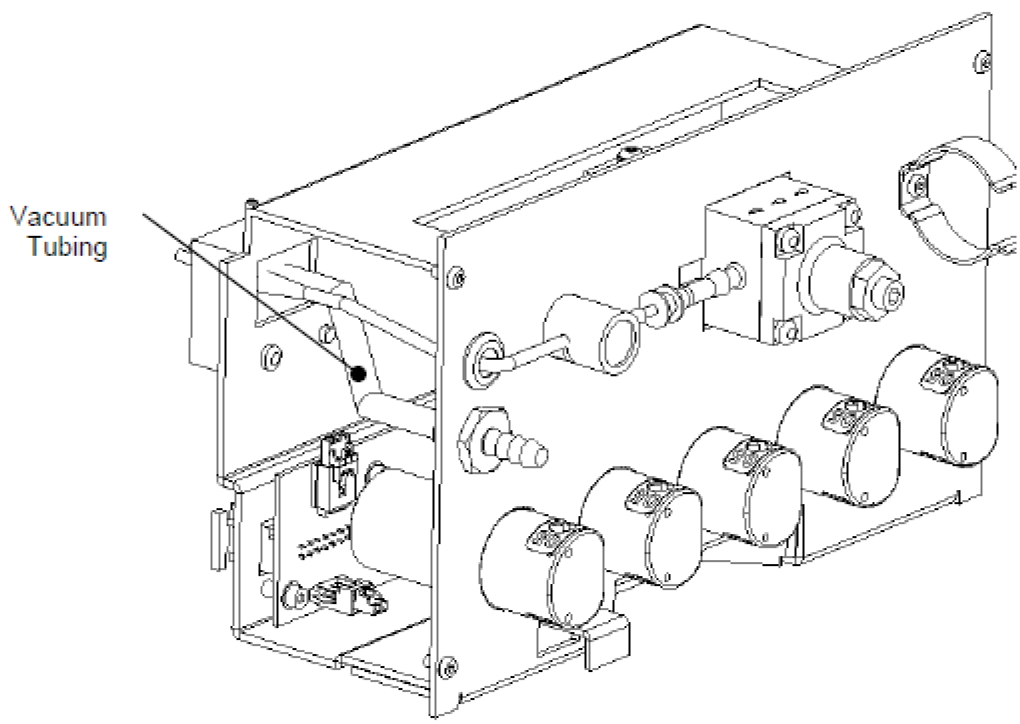


Figure G-5: Connecting the Vacuum Tubing

G.4 Replacing Components on the Fluidics Panel

To access various components on the Fluidics panel, remove the Fluidics Panel Insert Assembly and Fluidics Panel Assembly by removing the two M3 x 6 Pozi Head Flat Head Screws on the bottom and the two M3 Nyloc Nuts on the studs on the top as shown in Figure G-6.

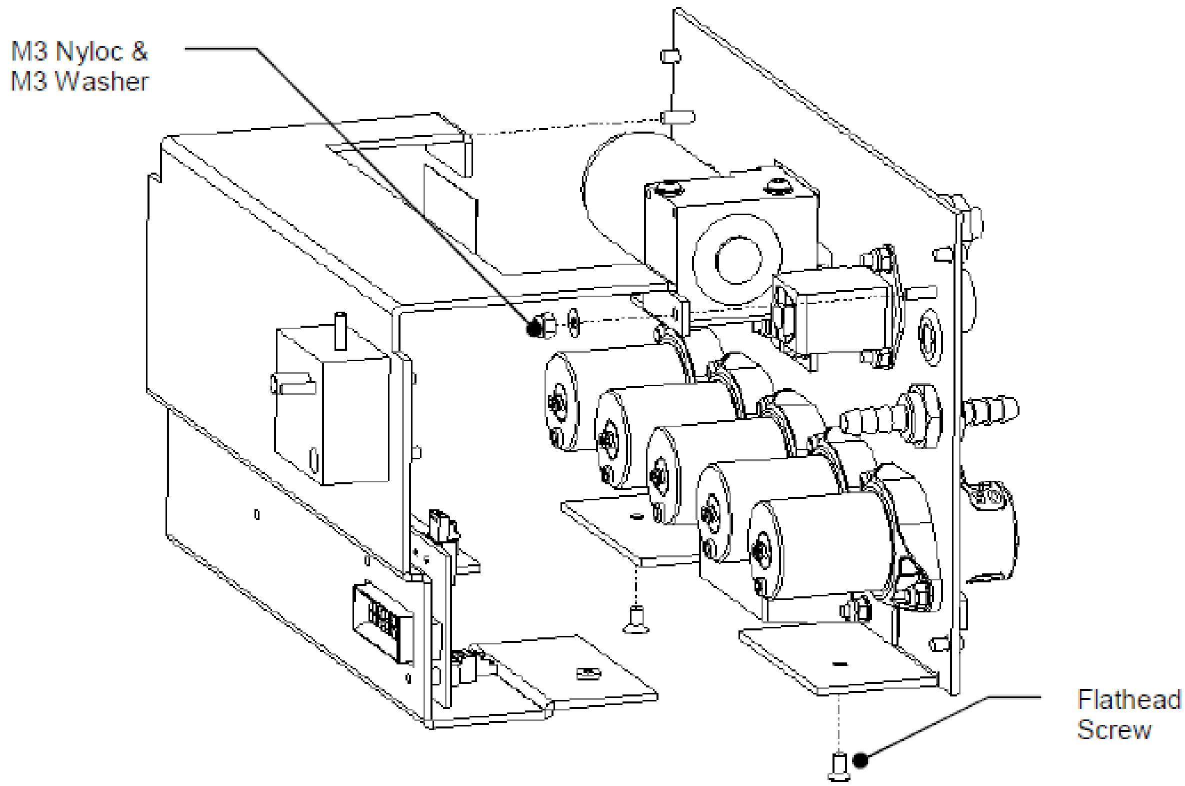


Figure G-6: Separating the Fluidics Sub-assemblies

When reassembling the Fluidics Assembly, position the two sub-assemblies close to one another and connect the small pinch valve, the five dispense valves and the KNF pump as shown in Figure G-7 and G-8.

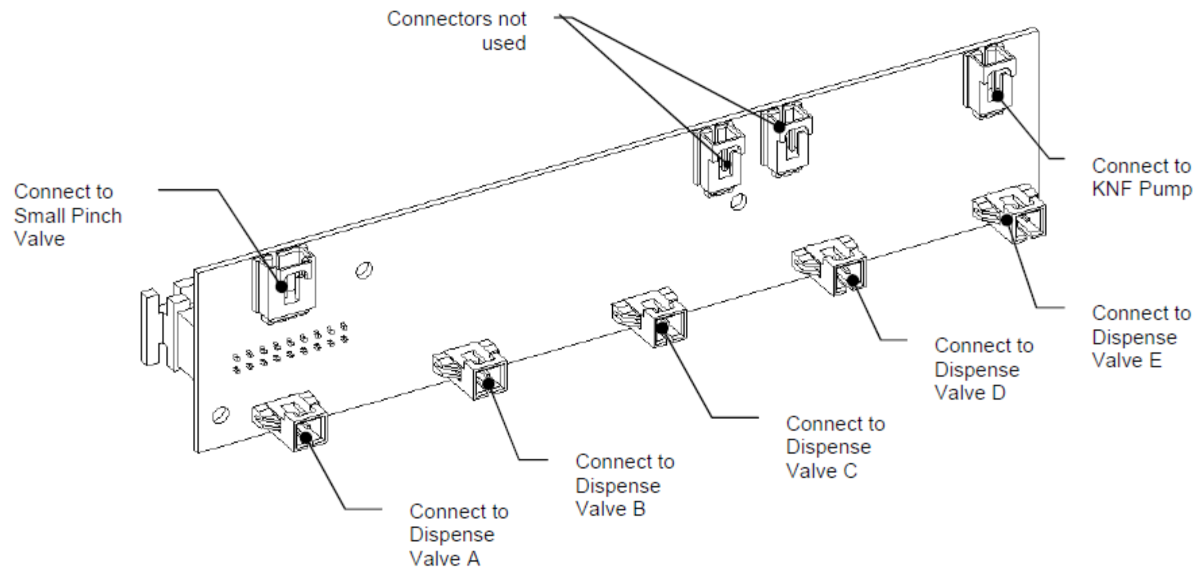


Figure G-7: Fluidics Panel Insert

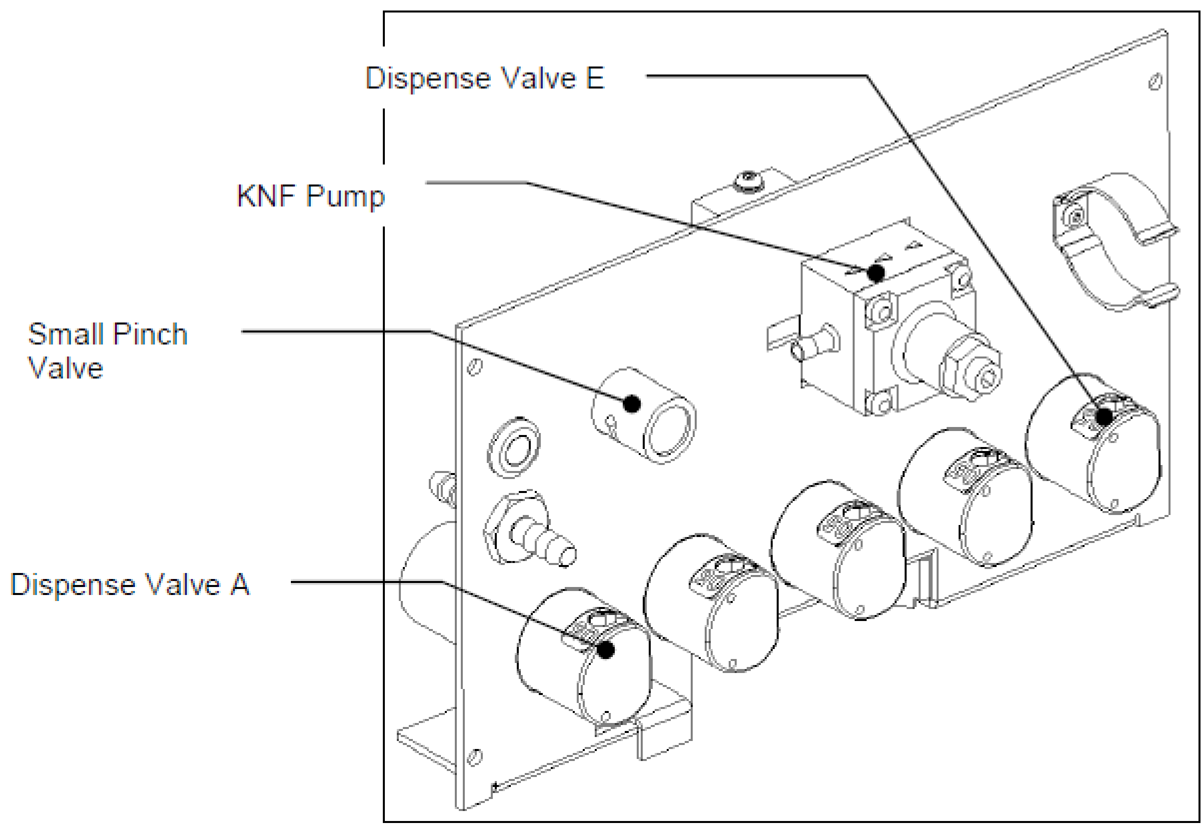


Figure G-8: Fluidics Panel

When reassembling the two sub-assemblies, secure the screws with Loctite 222.

G.4.1 Replacing a Dispense Valve

To Replace a Dispense Valve:

1. Remove the M3 Nyloc Nuts connecting the valve as shown in Figure G-9.

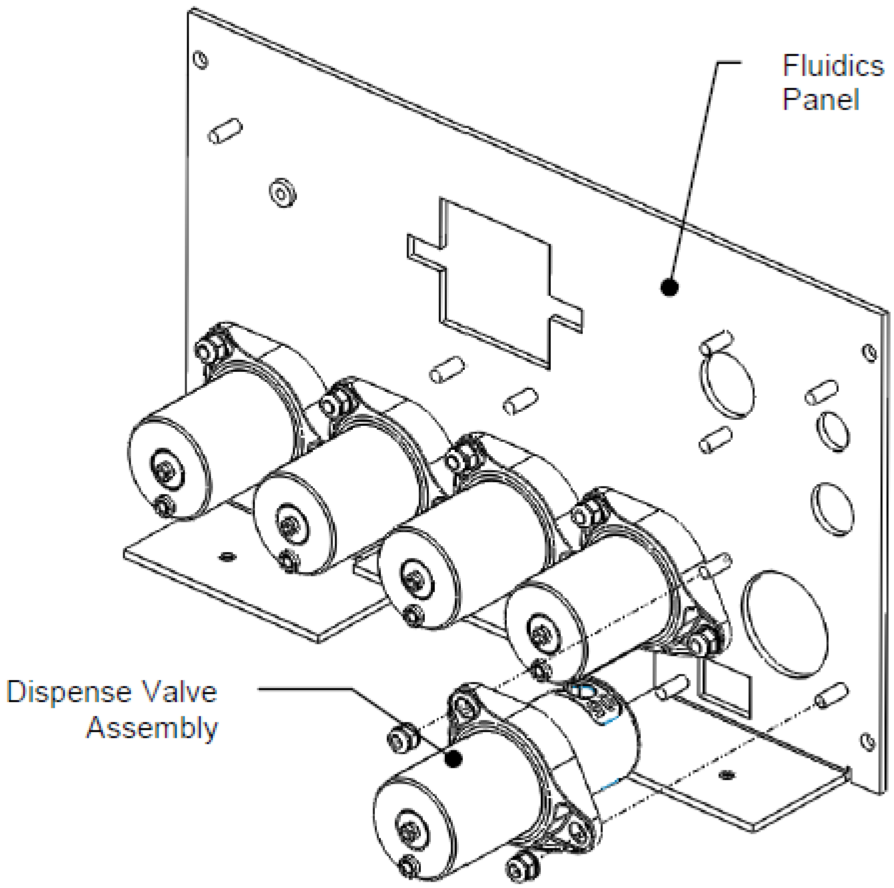


Figure G-9: Replacing a Dispense Valve Assembly

2. Replace the Valve as shown in Figure G-10.

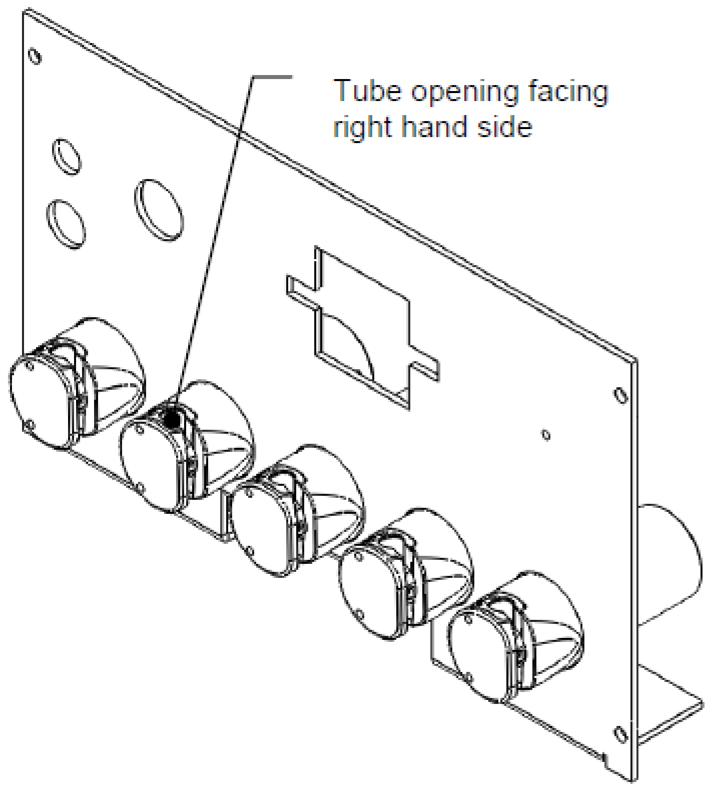


Figure G-10: Insertion Position for a Dispense Valve

3. After you have inserted the valve, place a numerical label (from the Fluidics Label set) on the valve. It is suggested that you clean the valve front with alcohol before affixing the label.

G.4.2 Replacing the KNF Pump

To replace the KNF pump:

1. Remove the pump and plate assembly from the Fluidics Panel as shown in Figure G-11 by removing the two M3 Nyloc Nuts.

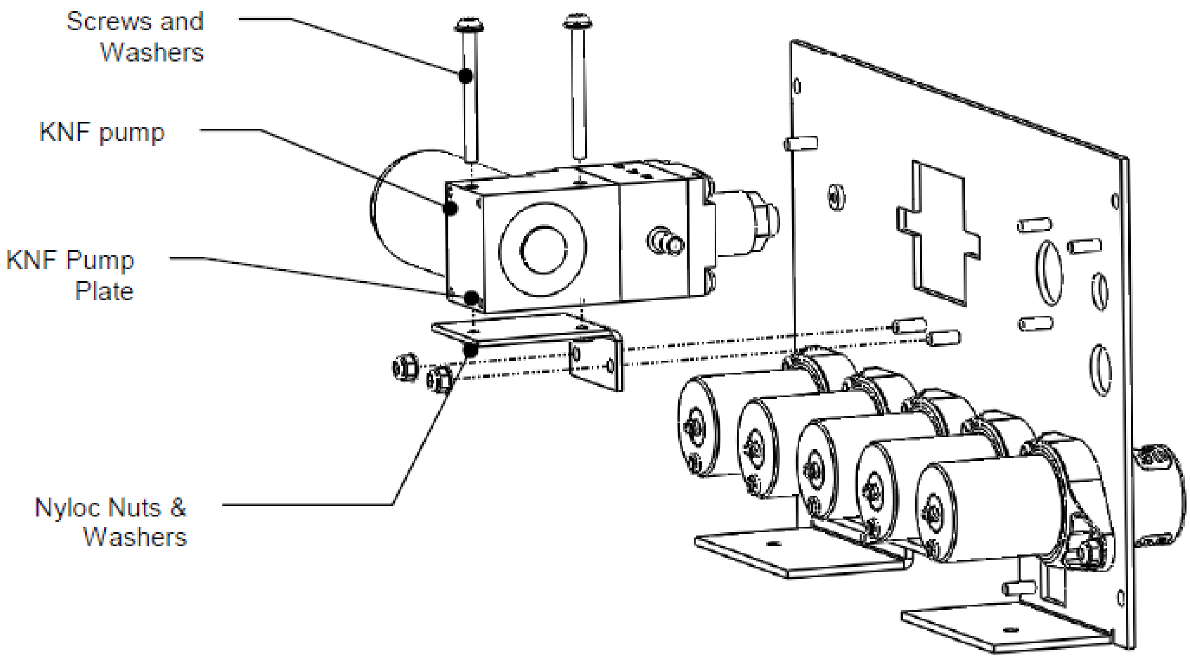


Figure G-11: Replacing the KNF Pump Assembly

2. Remove the Pump Assembly form the pump plate by removing the two M3 x35 Pan Head screws and M3 washers.

G.4.3 Replacing the Small Pinch Valve

The small pinch valve is attached to the Fluidics Panel using two M3 Nyloc Nuts. When replacing the valve, verify that the connector lugs should be facing left and the tube opening faces downward as shown in Figure G-12.

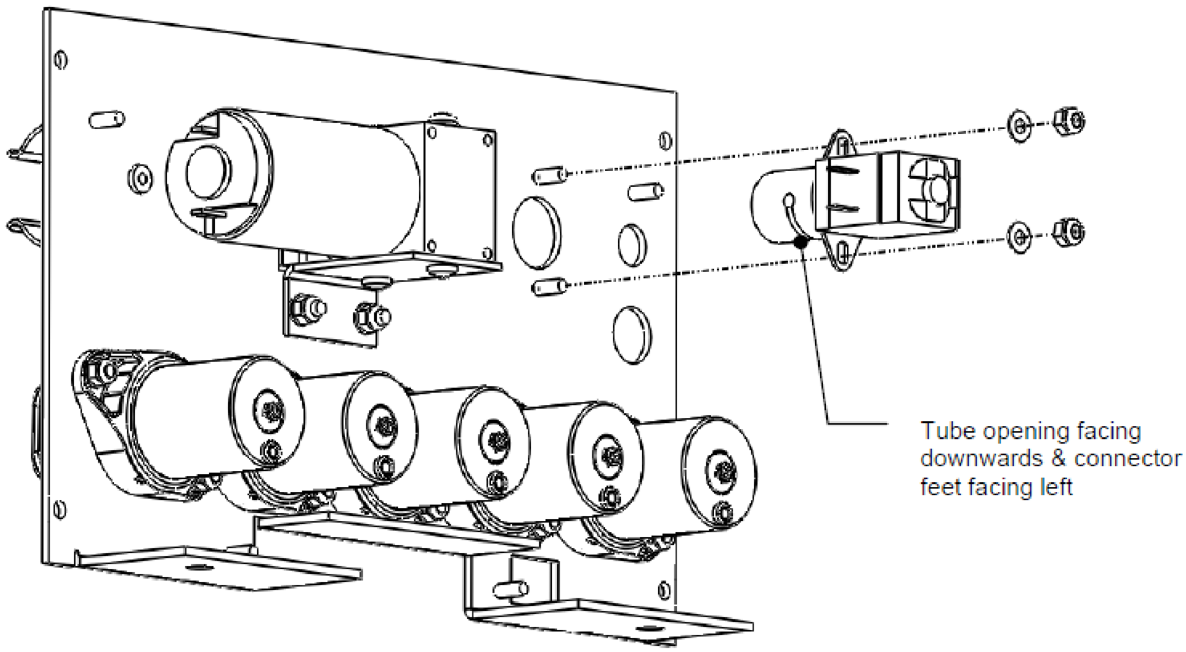


Figure G-12: Installing the Pinch Valve

G.4.4 Replacing the Wash Head Manifold

The Wash Head Manifold is attached to the Fluidics Panel Insert as shown in Figure G-13.

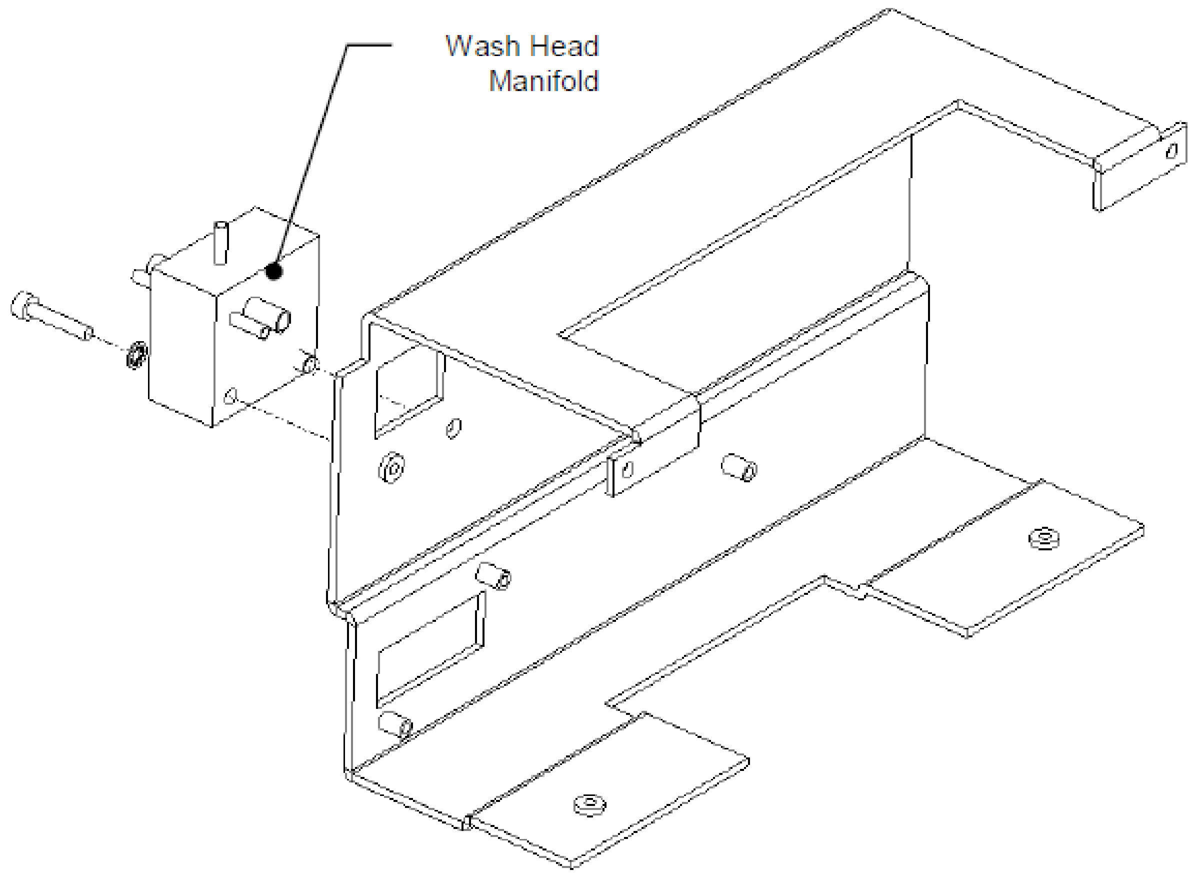


Figure G-13: The Wash Head Manifold

G.4.5 Fluidics Printed Circuit Board

The Fluidics Printed Circuit Board is attached to the Fluidics Panel insert using three M3x6 Socket Cap Head screws as shown in Figure G-14.

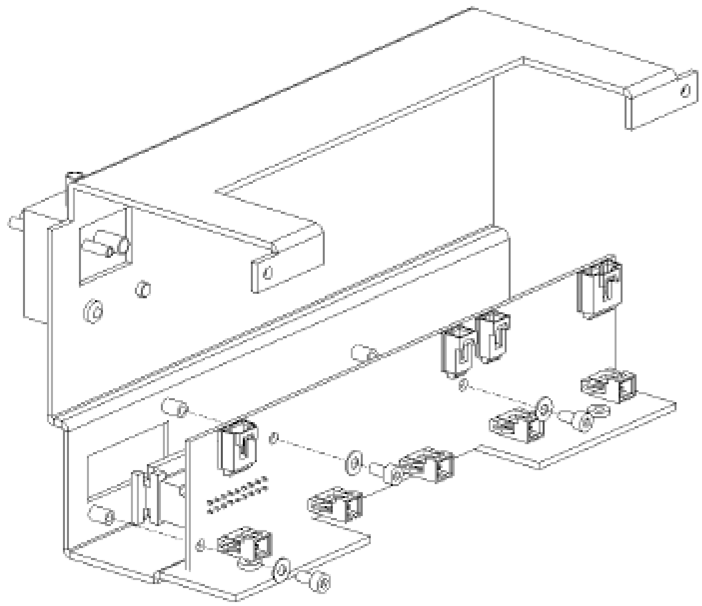


Figure G-14: The Fluidics Printed Circuit Board

Chapter H Gripper Assembly

H.1 On-Site Service Activities

The *Gripper Assembly* is located on the bottom of the Z-drive (Figure H-1).

To remove the gripper assembly:

1. Remove the Gripper Body Bottom assembly from the bottom of the Gripper by removing the three M3x6 BHCS and remove the screen (Figure H-1).

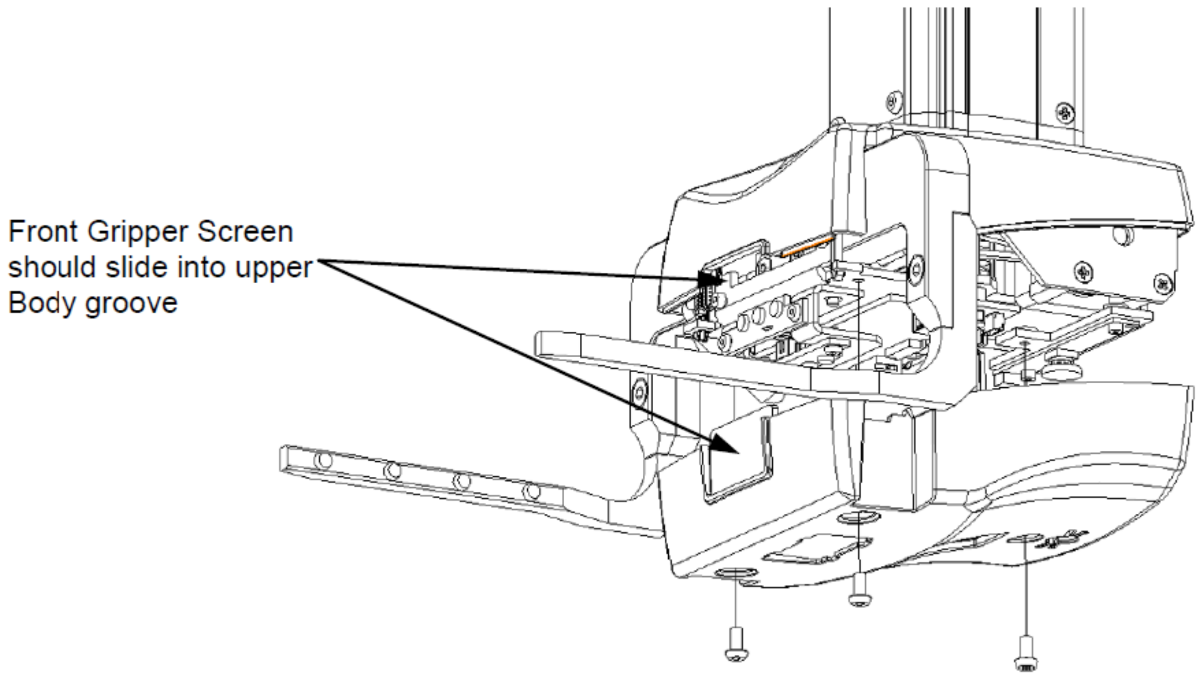


Figure H-1: Removal of Gripper Body Bottom Assembly

Refer to Section L of T13502150 Agility Online CTV document before continuing

2. Disconnect the Rotator Drive Flex Cable to the Gripper PCB as shown in Figure H-2.

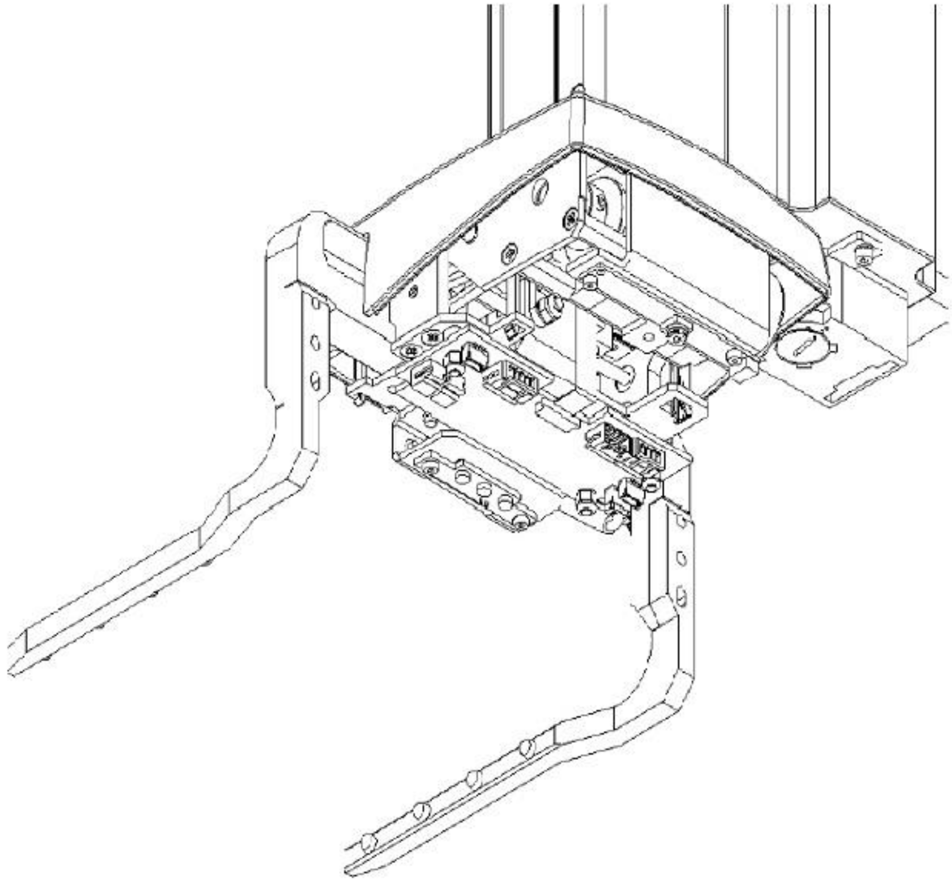


Figure H-2: Disconnect the Rotator Drive Flex Cable

3. Remove the M5x10 SCHS holding the gripper to the arm (Figure H-3).

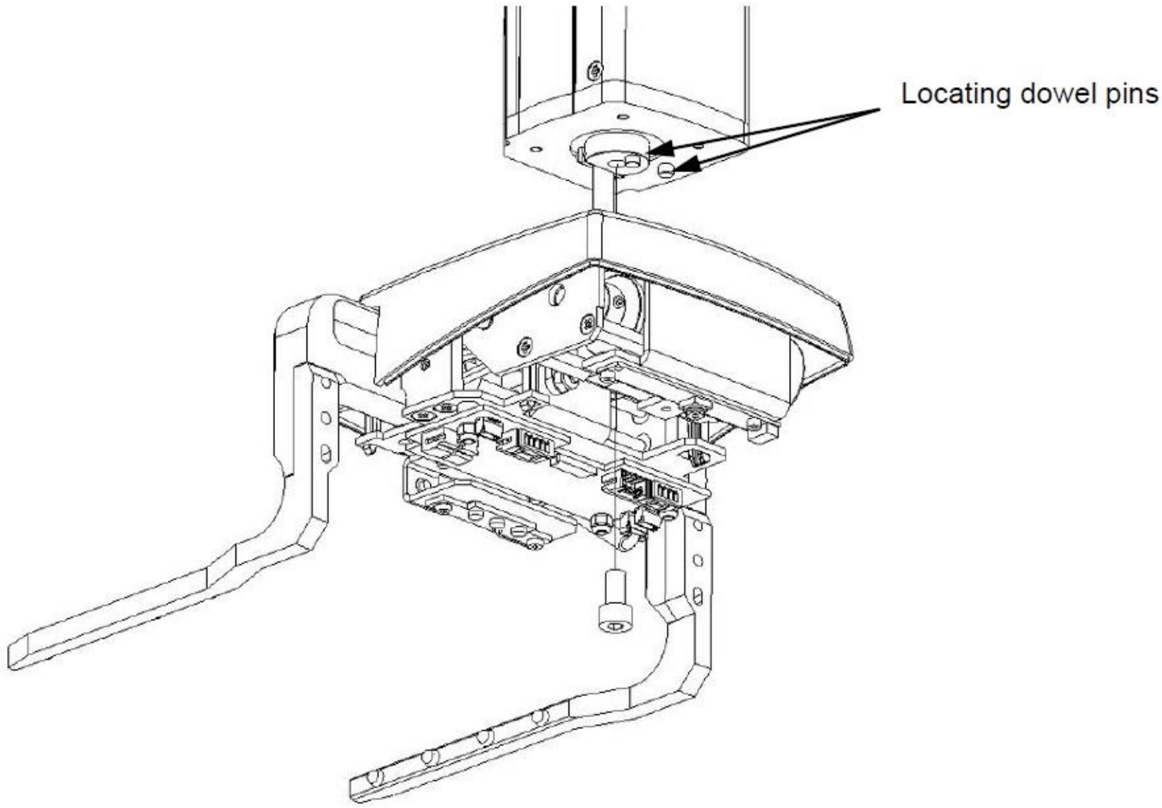


Figure H-3: Removing the Gripper from the Arm

To place a new gripper on the arm:

1. Place a Gripper Assembly onto the bottom of the Z Drive. The Flex Cable coming from the bottom of the Rotator should be oriented as shown in Figure H-4, In addition, ensure that the two dowel pins at the base of the Rotator are located into the slots in the top of the Gripper Assembly and secure using one M5x10 SCHS and Loctite 222 (Figure H-4 and H-5).

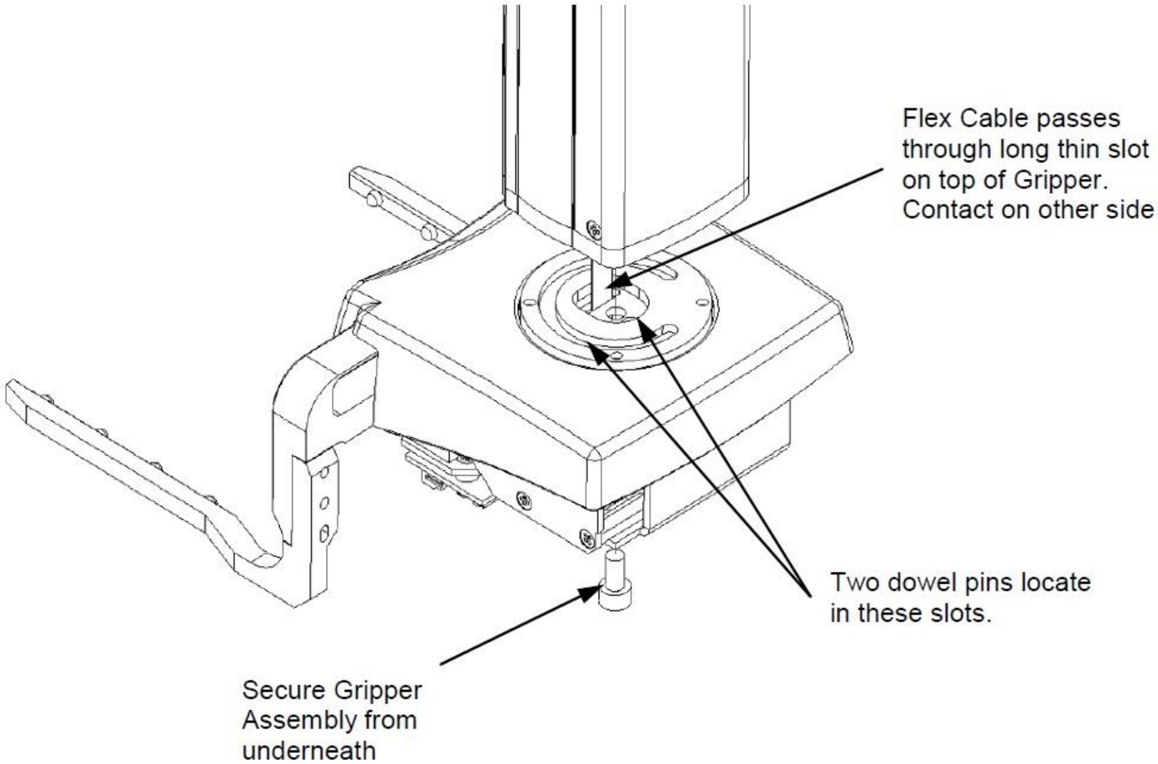


Figure H-4: Securing the Gripper- Position of Lower Dowel Pins

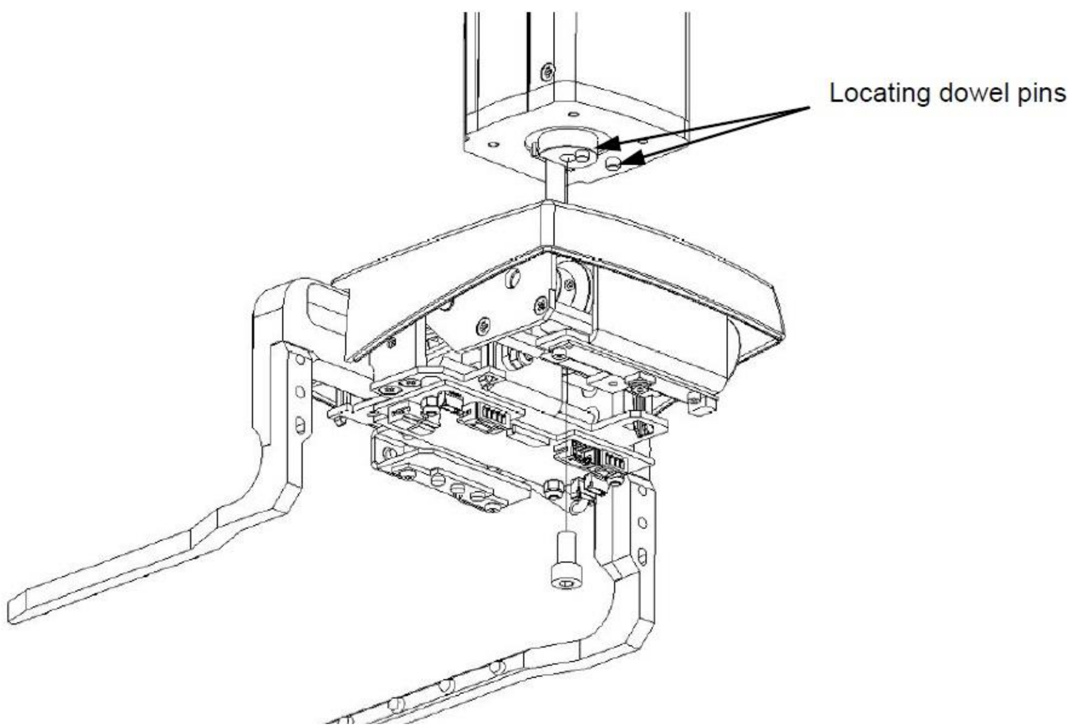


Figure H-5: Securing the Gripper- Position of Upper Dowel Pins

2. Connect the Rotator Drive Flex Cable to the Gripper PCB as shown in Figure H-6.

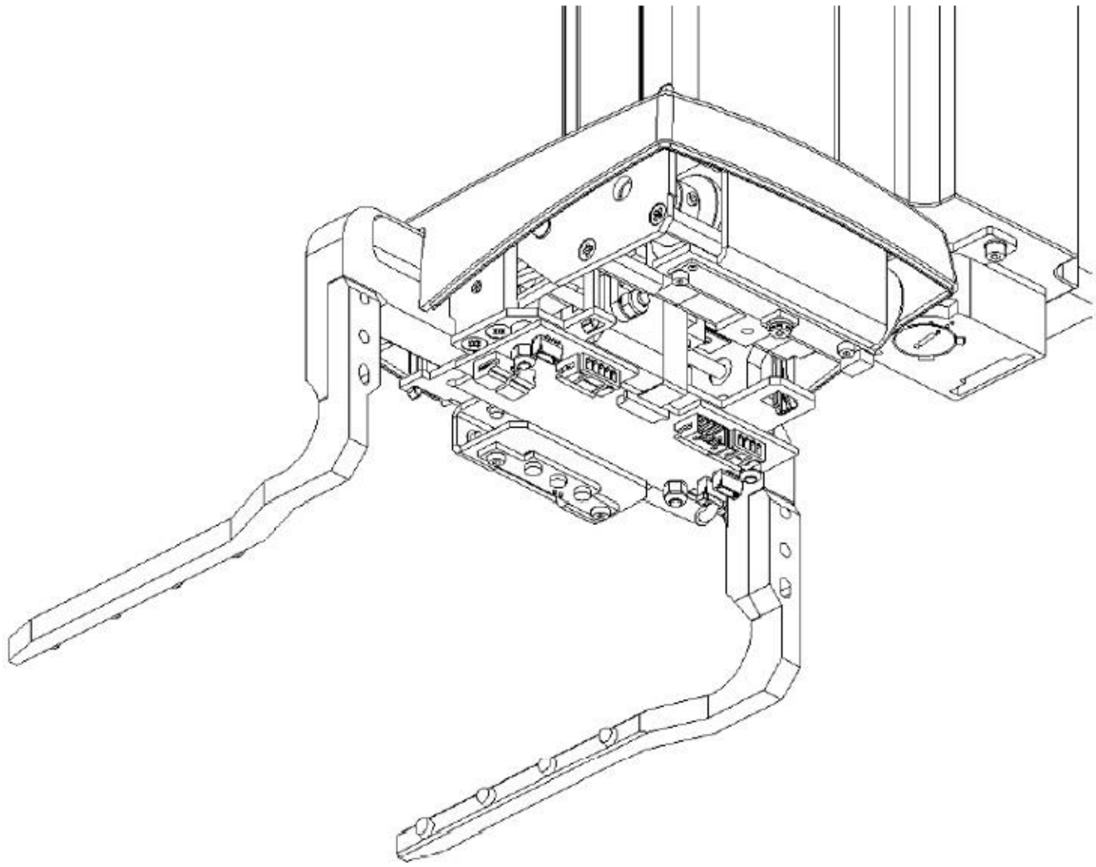


Figure H-6: Connecting the Rotator Flex Cable

3. Refer to Section L of T13502150 Agility Online CTV document before continuing.

4. Slide a Gripper Screen into the groove at the front of the Gripper Body Bottom (Figure H-7). Remove any protective covers from the screen before installing and ensure the screen is clean.

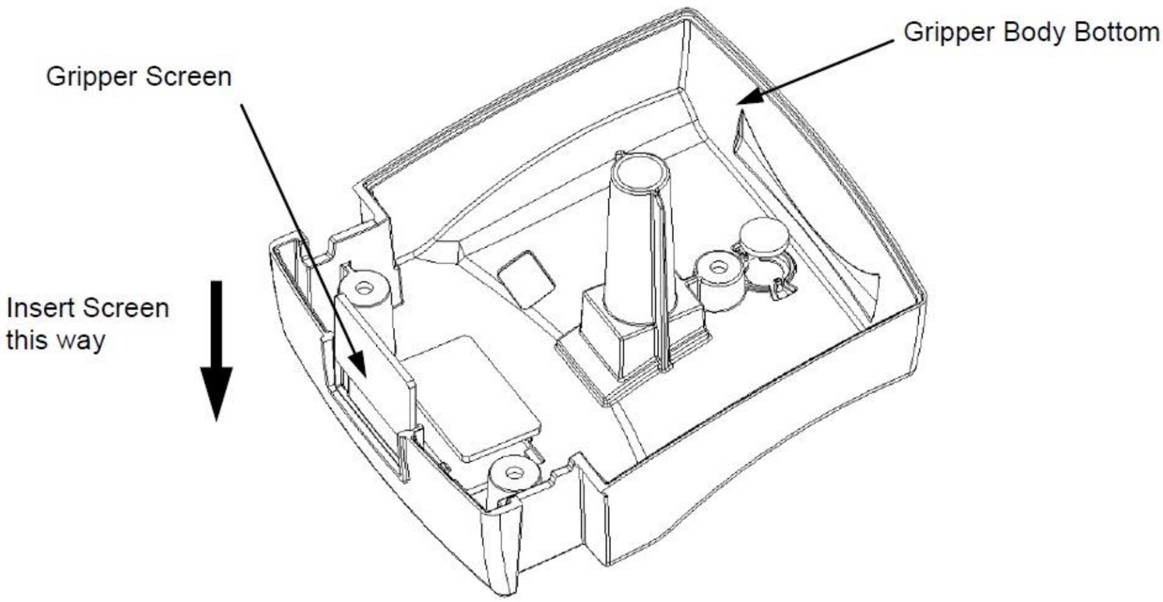


Figure H-7: Inserting the Gripper Screen

5. Secure the Gripper Body Bottom assembly to the bottom of the Gripper using three M3x6 BHCS and Loctite 425. Locate the Bottom Body so the Screen slides into the groove of the Upper Body (Figure H-8).

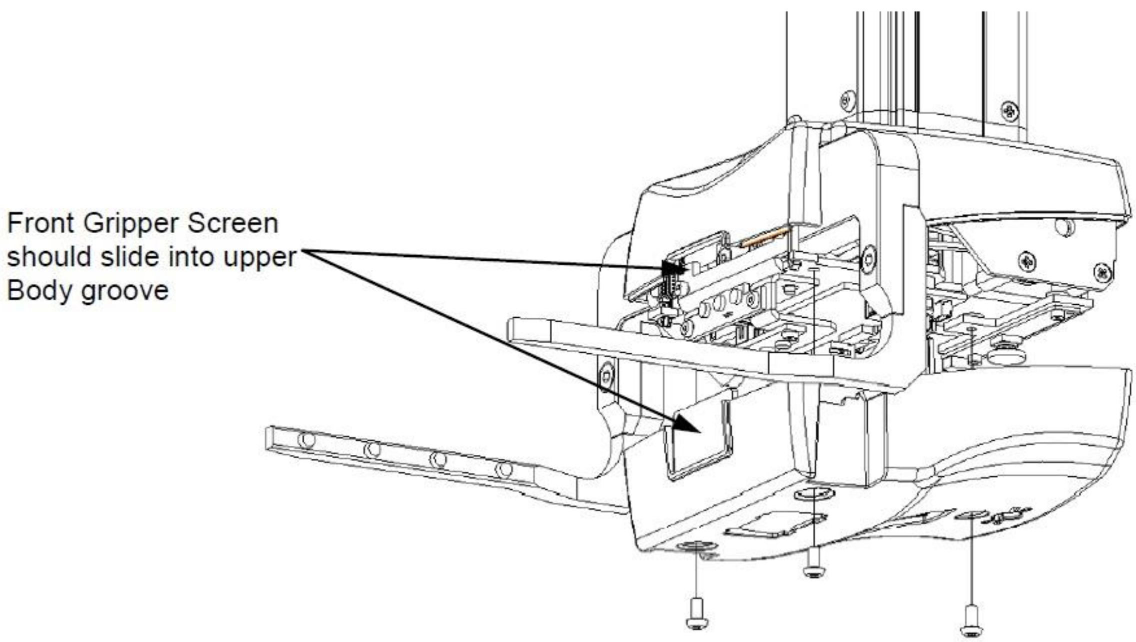


Figure H-8: Securing the Gripper Bottom Assembly

H.2 Service Depot Activities

H.2.1 Removing the Gripper Body Top

The Gripper Body Top snaps onto the Gripper Assembly. When removing the top, release the three hooks as shown in Figure H-9.

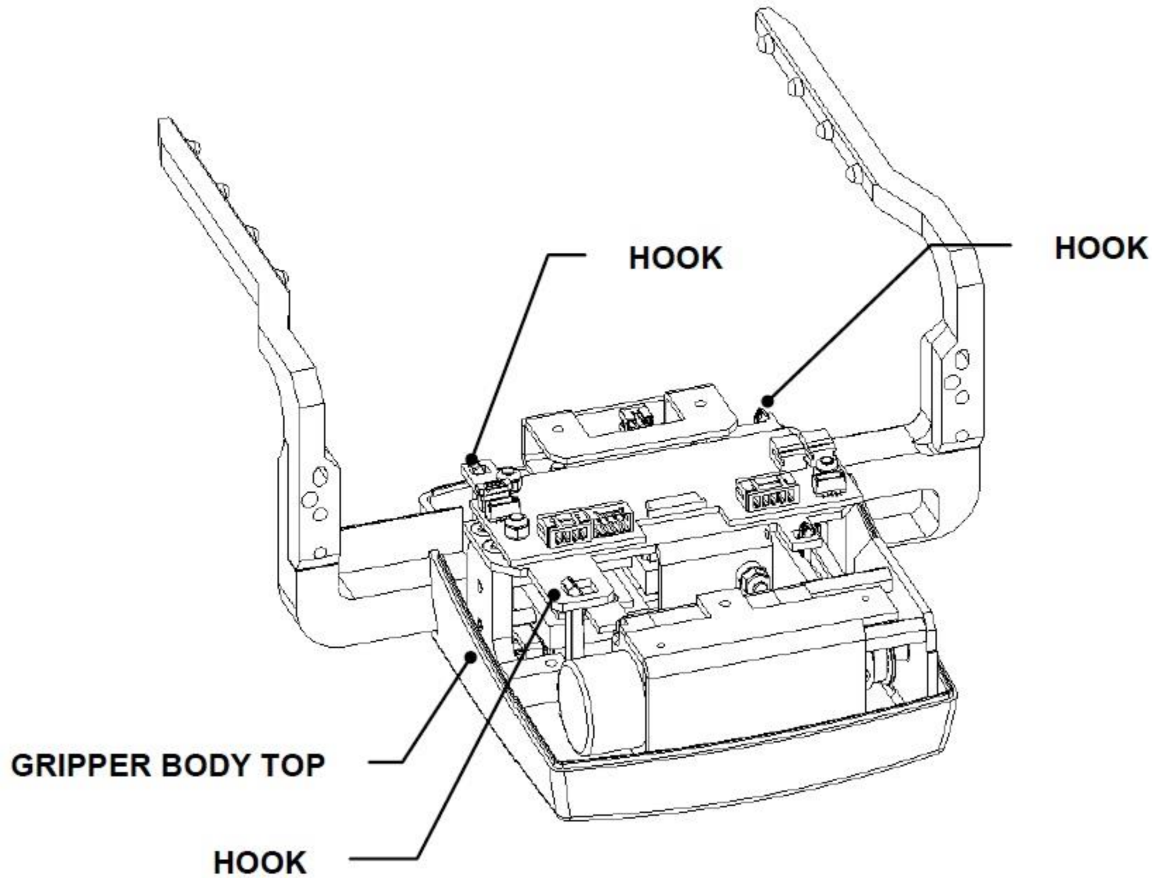


Figure H-9: Removing the Gripper Body Top

H.2.2 Replacing the Gripper Arms

The Gripper arms are attached to the assembly using M4 x 10 SHCS as shown in Figure H-10.

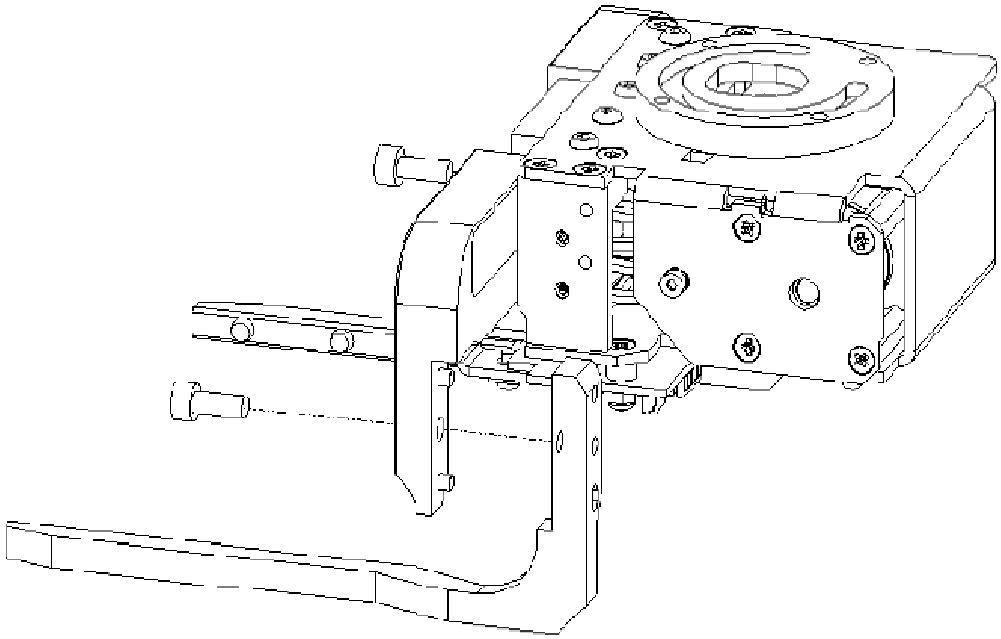


Figure H-10: Removing the Gripper Arms

When replacing the arms:

1. Fit the arms to the assembly with two screws but do not use Loctite. When replacing the arms, care should be taken not to put any bending forces on the arms.
2. Fit the Gripper Arm Setting Fixture to the LH and RH arms as shown in Figure H-11. Ensure the inside face of each arm is securely against the holed face of the fixture and the cones of the Gripper Arms are engaged in the holes. Secure the arms to the fixture with the thumbscrews.

Note: *The fixture faces are angled in order to bias the gripper arms closer together at the front.*

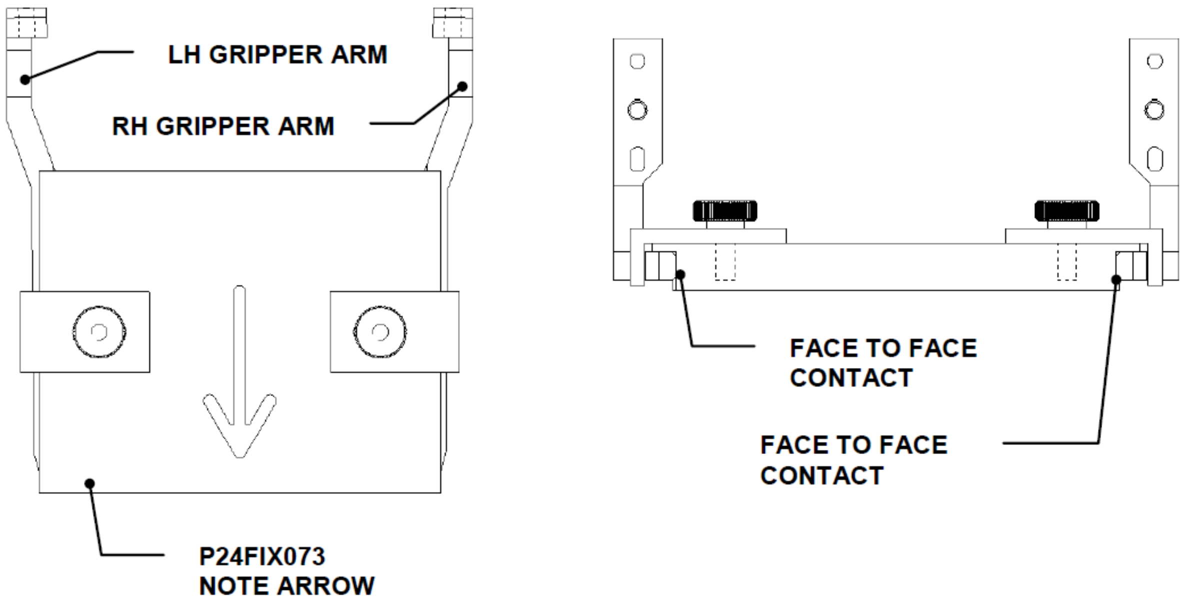
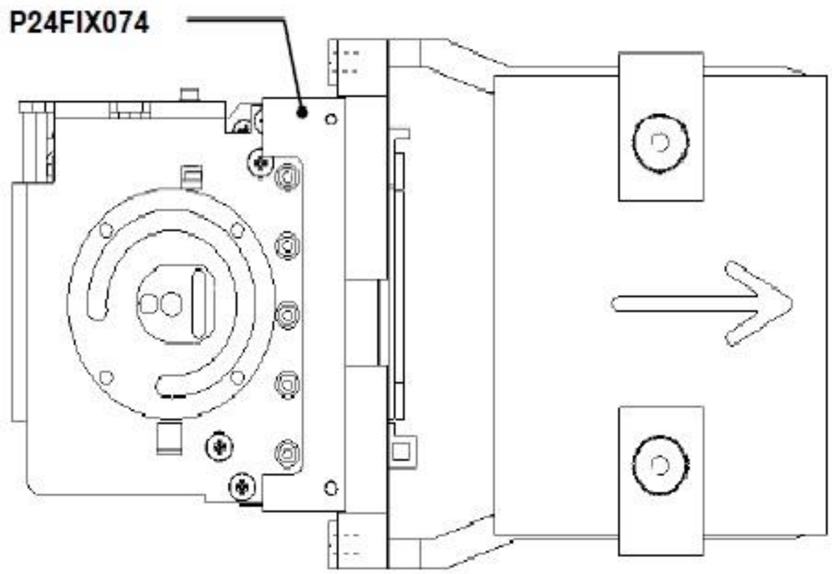


Figure H-11: Gripper Arm Setting Fixture

3. With the arms secured to the fixture, insert the Gripper Arm Spacing Fixture (Figure H-12). The dowel pins should be between the Leadscrew Bearing Housings and the Gripper Arm Mounting Blocks.



P24FIX074 LOCATION DETAIL (SAME BOTH SIDES)

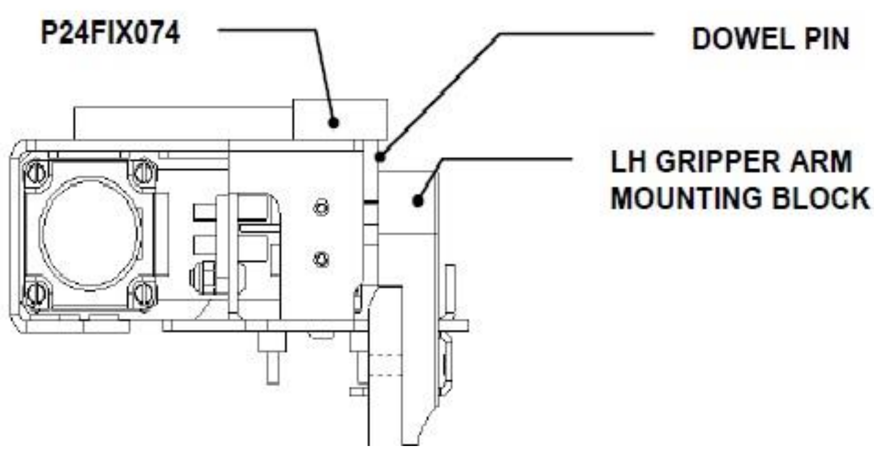


Figure H-12: The Gripper Arm Spacing Fixture

4. Ensure that the LH Gripper Arm Mounting Block is pushed back into contact with the dowel pin of the fixture (Figure H-13). While holding this position, tighten the five M3 x 6 BHCS in the top of the Gripper Upper Enclosure. Repeat this for the RH Gripper Arm Mounting Block and the five M3 x 6 BHCS in the Gripper Lower Plate. All screws should be tightened to 1.0Nm (8.8 in.lb.).

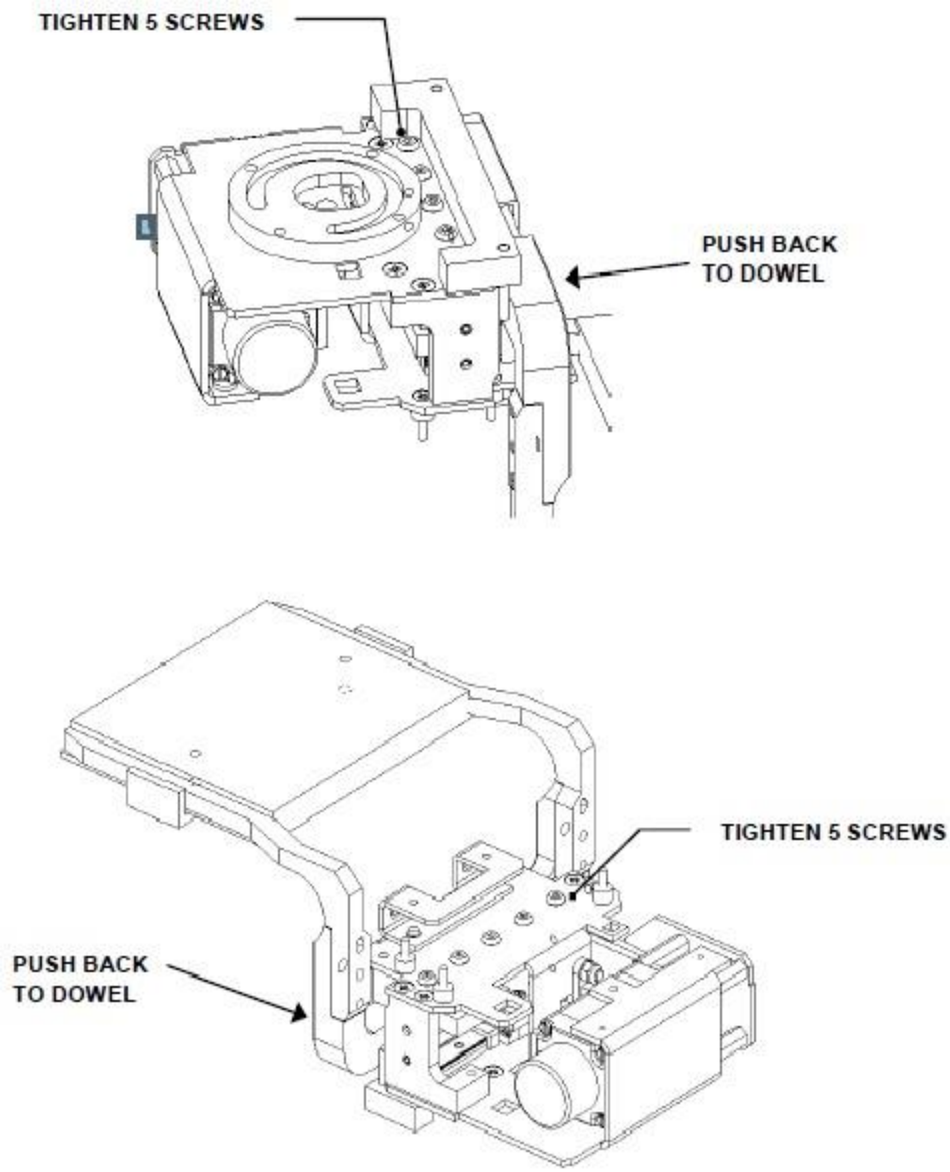


Figure H-13: Using the LH Gripper Arm Mounting Block

5. Remove both fixtures.

6. Remove both LH and RH Gripper Arms, taking care not to bend them.

H.2.3 Replacing the Camera

The camera is mounted to the assembly as shown in Figure H-14.

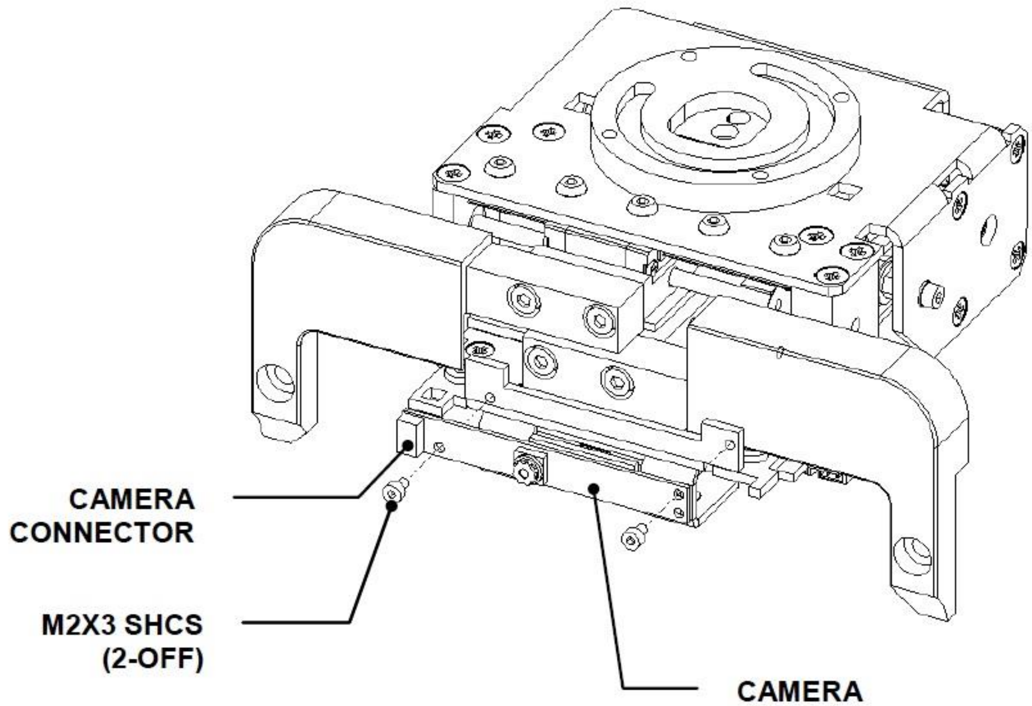


Figure H-14: Mounting of the Camera

When replacing the camera, make certain that the camera opening circled in Figure H-15 is not blocked by the cabling. A small amount of Loctite 222 should be used to secure the screws.

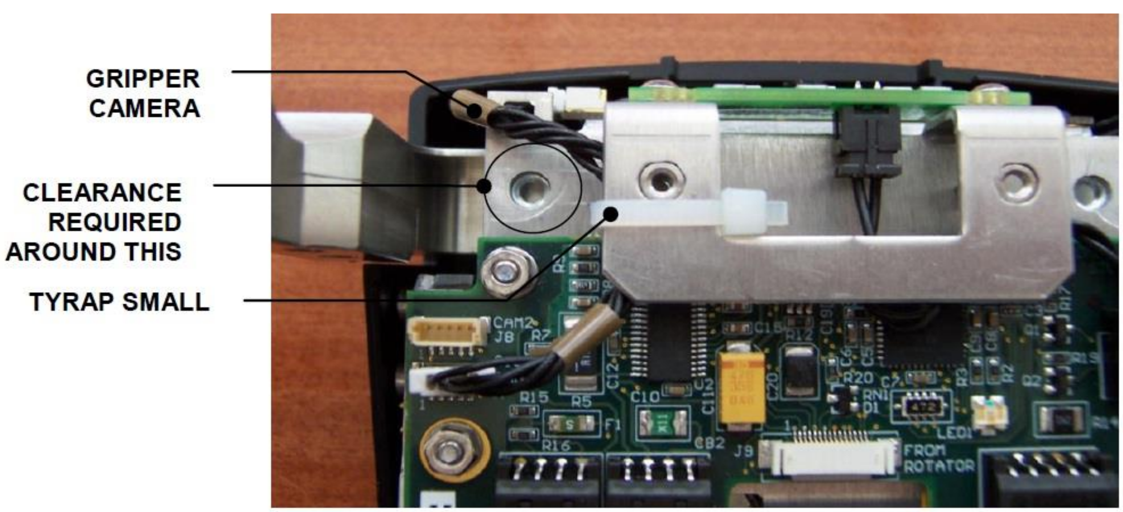


Figure H-15: Location of Camera Opening

H.2.4 Replacing the Gripper PCB Assembly:

The Gripper PCB assembly is mounted on the gripper base as shown in Figure H-16. It is removed by removing the three nuts. Do not use Loctite when replacing the board.

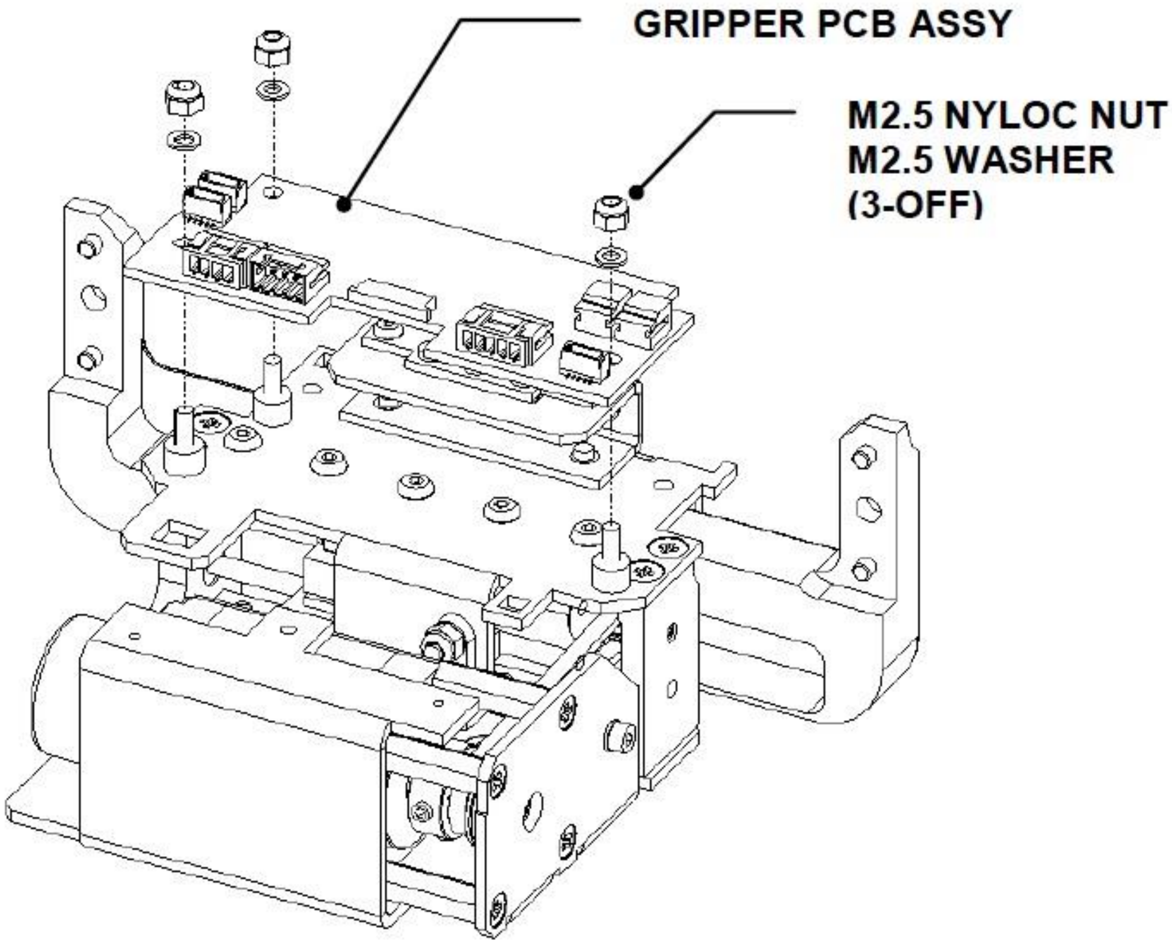


Figure H-16: The Gripper PCB Assembly

H.2.5 Replacing the Gripper LED PCB

The Gripper PCB is shown in Figure H-17. It is removed by unscrewing the two screws that attach it to the assembly.

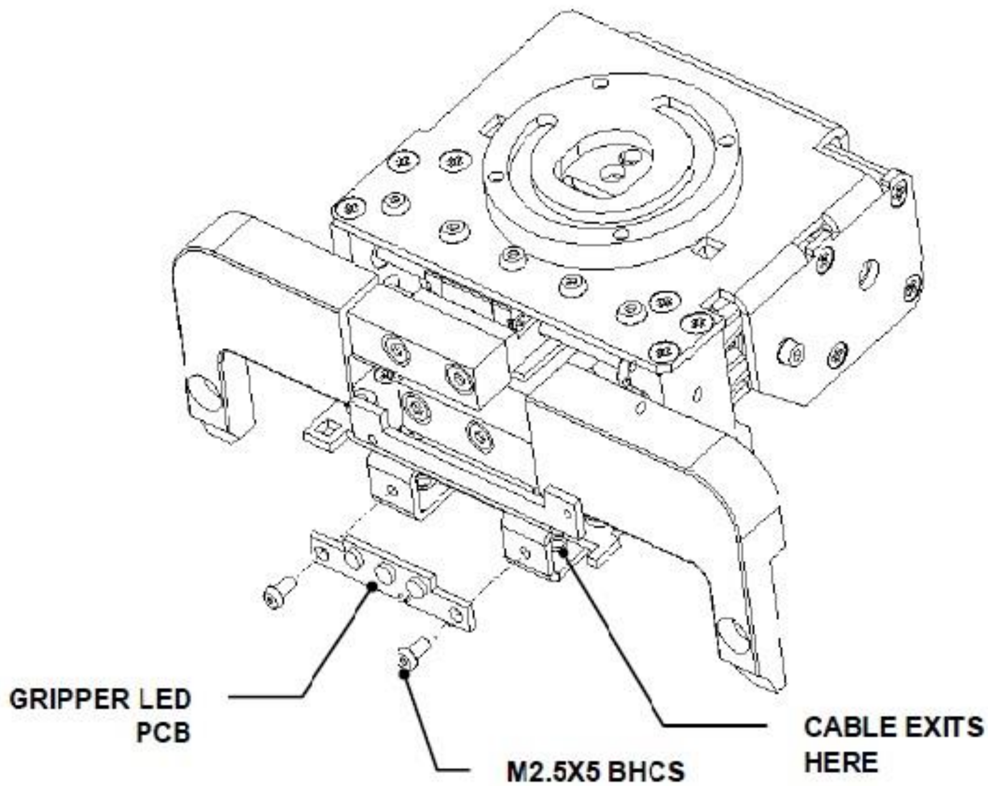


Figure H-17: Gripper LED

H.2.6 Replacing the Gripper Belt

The gripper belt connects the motor pulley to the leadscrew pulleys as shown in Figure H-17 and H-18.

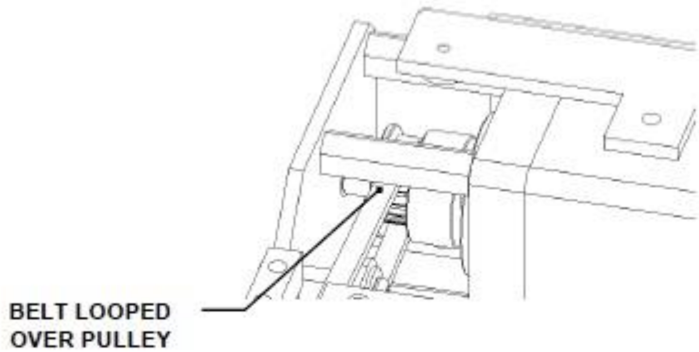


Figure H-17: Belt over Motor Pulley

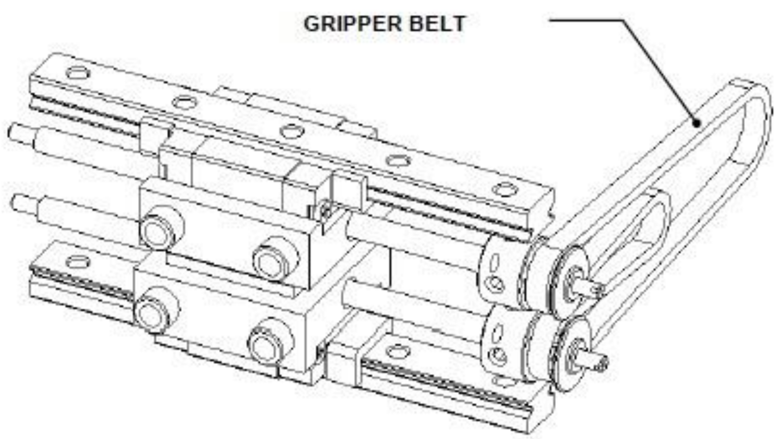


Figure H-18: Belt Format around Leadscrew Pulleys

To remove the belt

1. Remove the right side of the leadscrew bearing housing (Figure H-19).

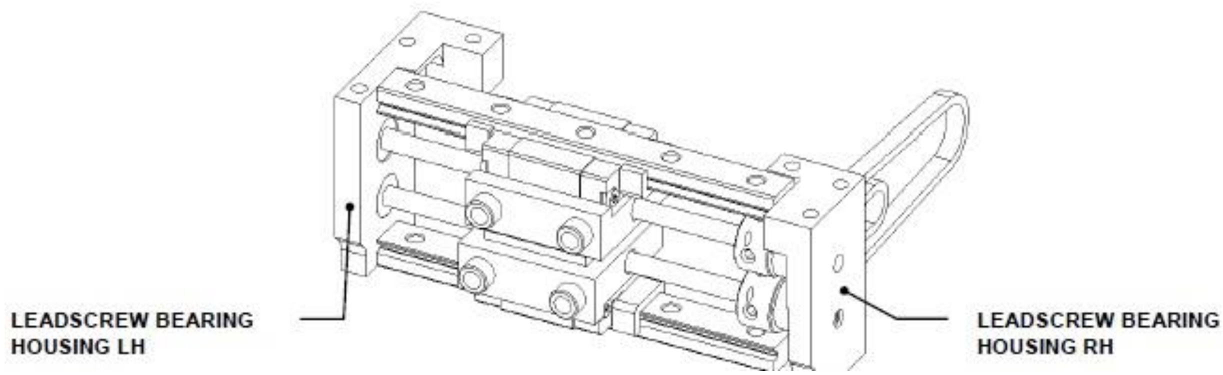


Figure H-19: Leadscrew Bearing Housing

2. Loosen the motor.

To replace the Belt:

1. Thread the belt over the pulleys on the Leadscrew as shown in Figure H-18 and the motor as shown in Figure H-17.
2. Position the Gates Sonic Tension Meter 507C at the position indicated in Figure H-20, approximately in line with the Eccentric Idler. The Tension Meter must be 3-6mm away from the belt to obtain a reading.

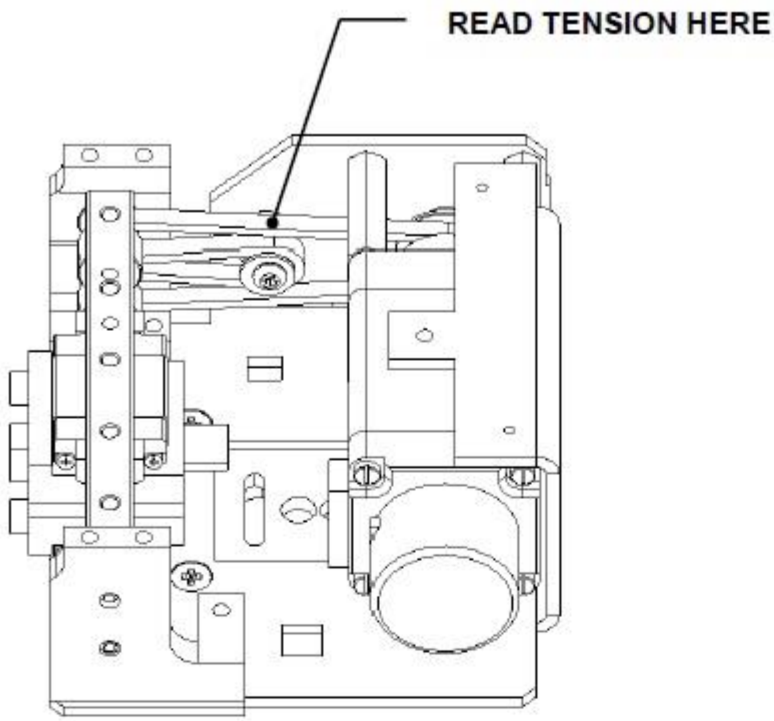


Figure H-20: Location of Tension Meter

3. Ensure that the M2.5 x 6 SHCS locking screw into the Gripper Eccentric Idler is tight. Use a 5mm A/F wrench (Figure H-21).

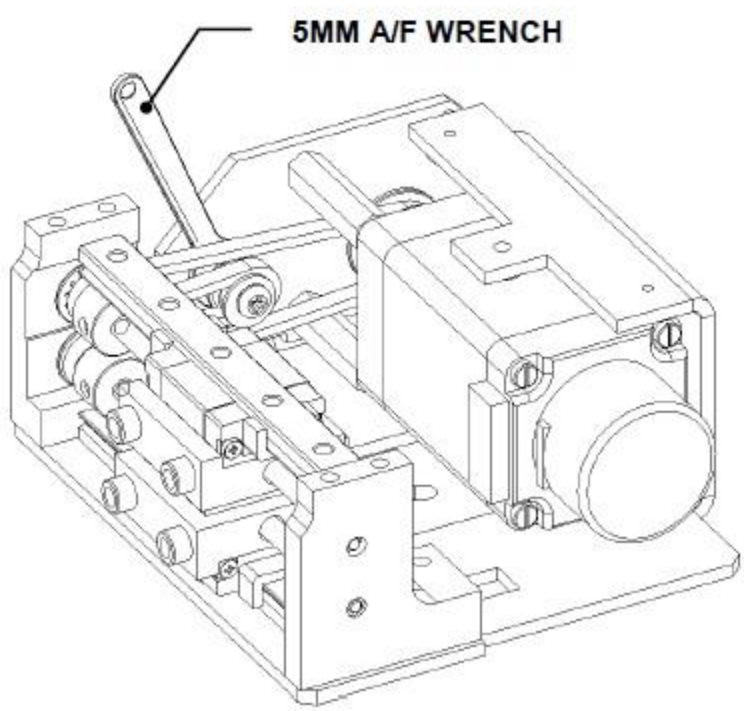


Figure H-21: Position of Wrench to Tighten Locking Screw

4. Tap the belt to cause it to oscillate. While the belt is oscillating and the sensor is in position, press and hold the red button on the meter. The required frequency is 386-405 Hz.

5. If the reading is above or below this range loosen the locking screw, adjust the Gripper Eccentric Idler and re-lock the screw.

6. Repeat the above steps until three consecutive readings in the range 386-405 Hz are obtained.

7. Fully tighten the M2.5x6 SHCS (Figure H-22).

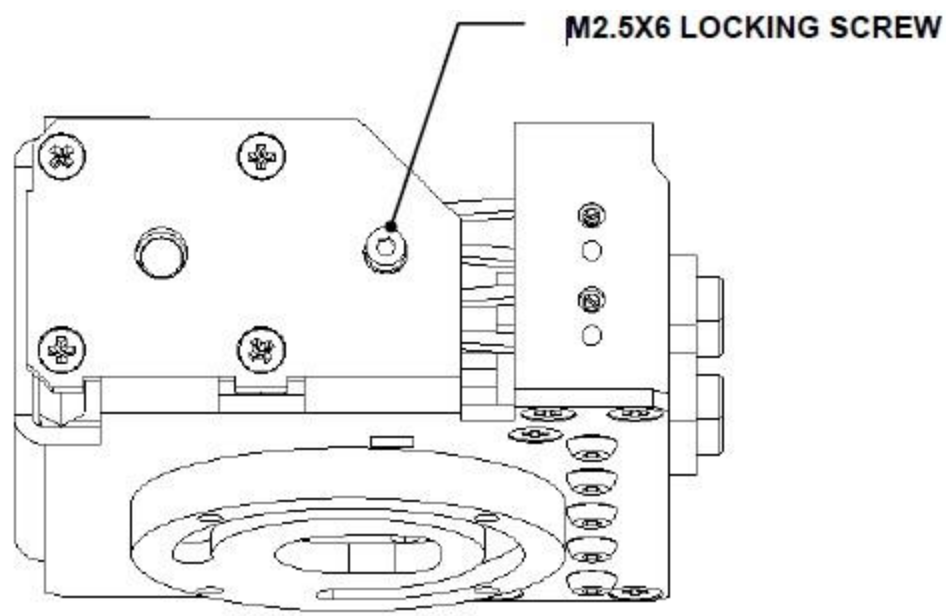


Figure H-22: Locking Screw

8. Re-check the frequency using the meter.

H.2.7 Replacing the Gripper Motor

The Gripper Motor is attached to the upper enclosure as shown in Figure H-23.

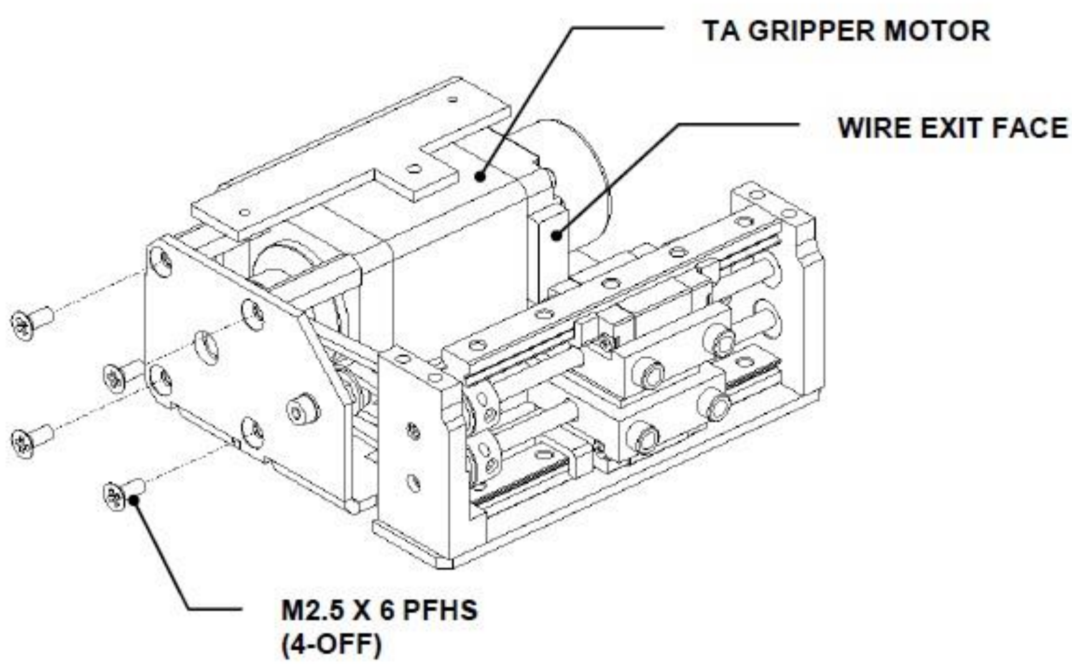


Figure H-23: Gripper Motor

To remove the motor:

1. Unscrew the four screws that attach the motor to the upper enclosure via the standoffs.
2. Remove the belt off the pulley.
3. Remove the Gripper Motor Pulley (Figure H-24).

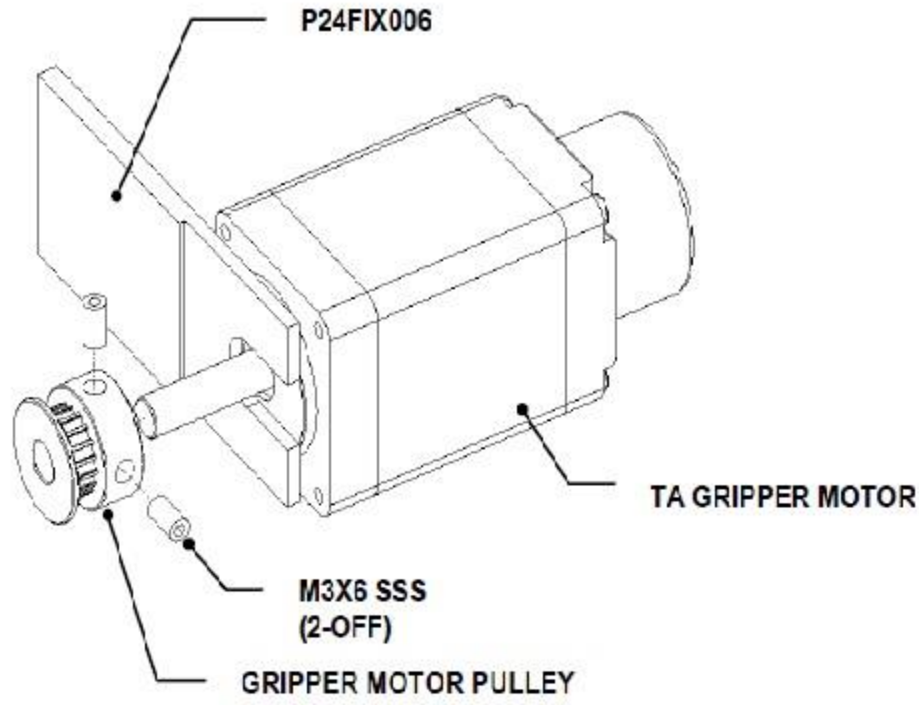


Figure H-24: Gripper Motor Pulley

To replace the pulley, use the Pulley spacer as shown in Figure H-25.

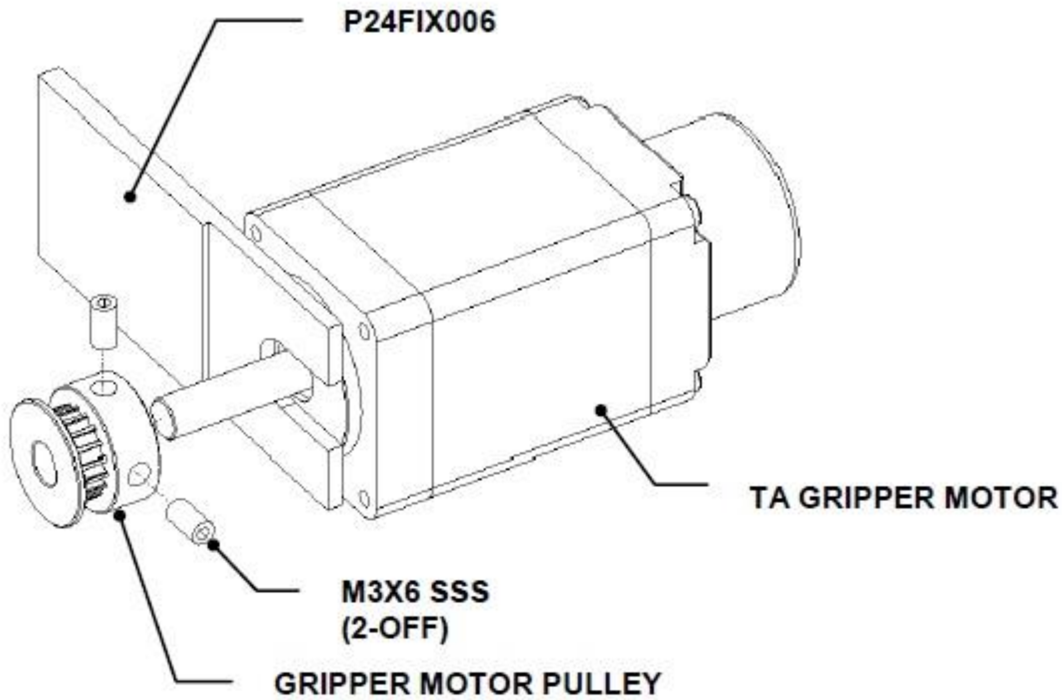


Figure H-25: Motor Pulley

Note: *After the motor is replaced, adjust the belt tension as described in H.2.6.*

H.2.8 Replacing the Optosensor

The optosensor is located on the lower plate of the gripper assembly as shown in Figure H-26.

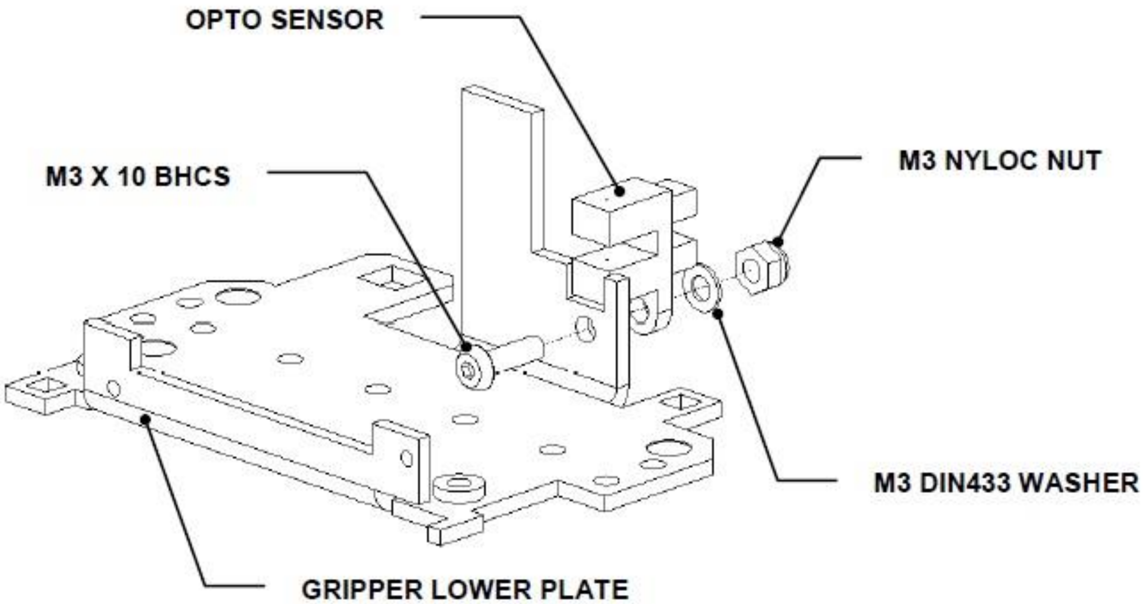


Figure H-26: The Optosensor

To replace the optosensor, remove the existing sensor and attach a new one. Tighten the screw using a 4-6 in.-lb torque driver.

Chapter I Incubator (Ambient)

I.1 On-Site Service Activities

There are six ambient incubators which are fitted in the bottom of the two doors as shown in Figure I-1.

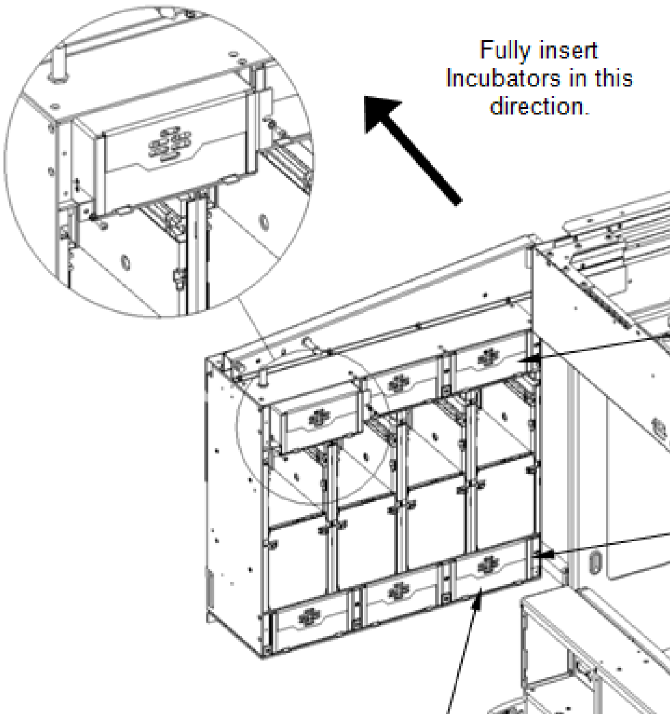


Figure I-1: Location of Ambient Incubators

To remove an ambient incubator, unscrew the four screws that attach the incubator to the door and pull the incubator out.

It is recommended that defective ambient incubators be simply replaced in the field and the defective units should be sent to the local depot for refurbishing.

I.2 Service Depot Activities

I.2.1 Removing the Cover

The cover of the ambient incubator can be removed by removing the four self tapping flat head screws (Figure I-2).

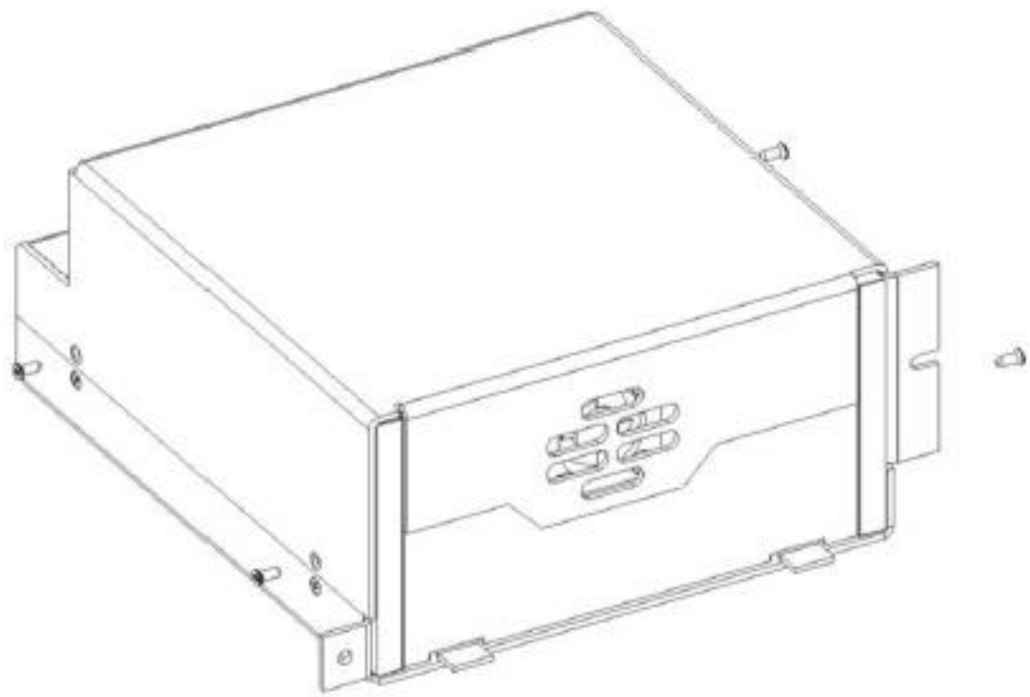


Figure I-2: Opening the Incubator

> ***Note:*** *When replacing the cover, tilt the top enclosure initially as shown in Figure I-3 in order to clear the PCB backplane.*

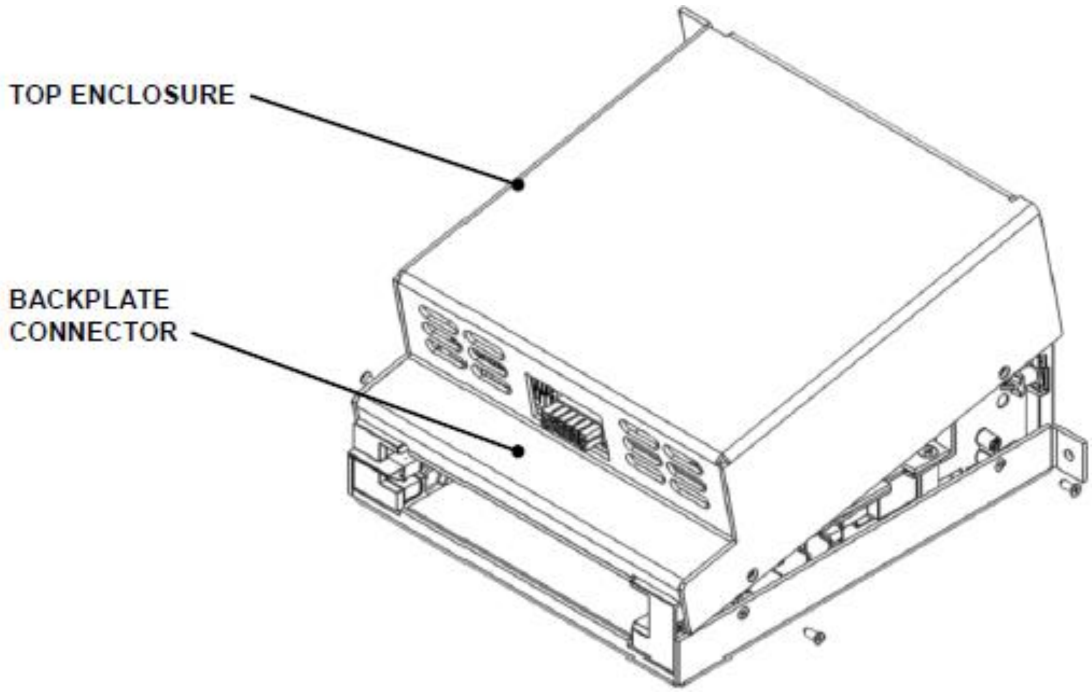


Figure I-3: Replacing the Top Cover.

I.2.2 Replacing the Printed Circuit Board

The printed circuit board is located on the right hand guide as shown in Figure I-4.

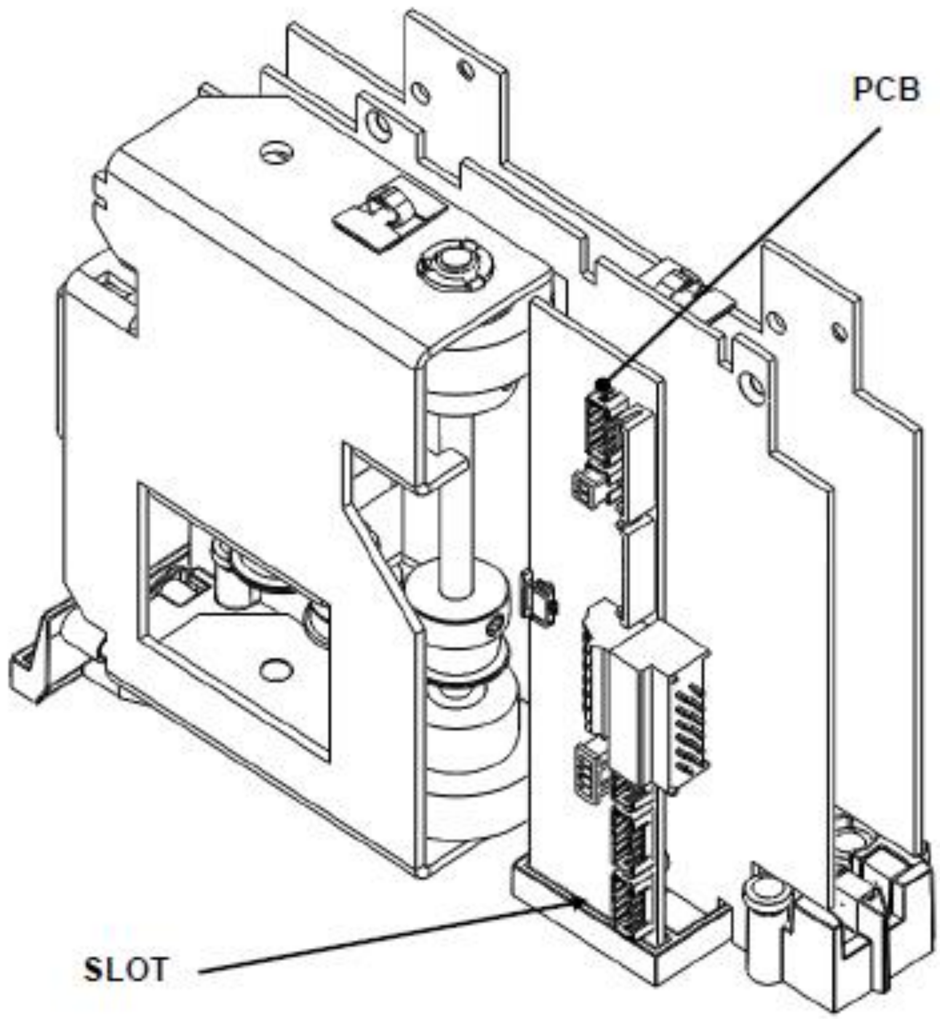


Figure I-4: Location of the Printed Circuit Board

To replace the printed circuit board:

1. Disconnect the cables on the printed circuit board.
2. Remove the right hand guide assembly from the top and bottom plates by removing the four self tapping screws.
3. Remove the printed circuit board
4. Place the new board in the slot as shown in Figure I-4 and reconnect the cables.
5. Ensure that the circular boss on the right hand guide mates with the hole in the driver chassis.
6. Secure the guide to the top and bottom plates using the four self tapping screws.

I.2.3 Replacing the Fan

The fan is located on the driver chassis (Figure I-5) using three M2.5x 16 Posi Flathead screws, three M2.5 Washers and three Nyloc Hex Nuts.

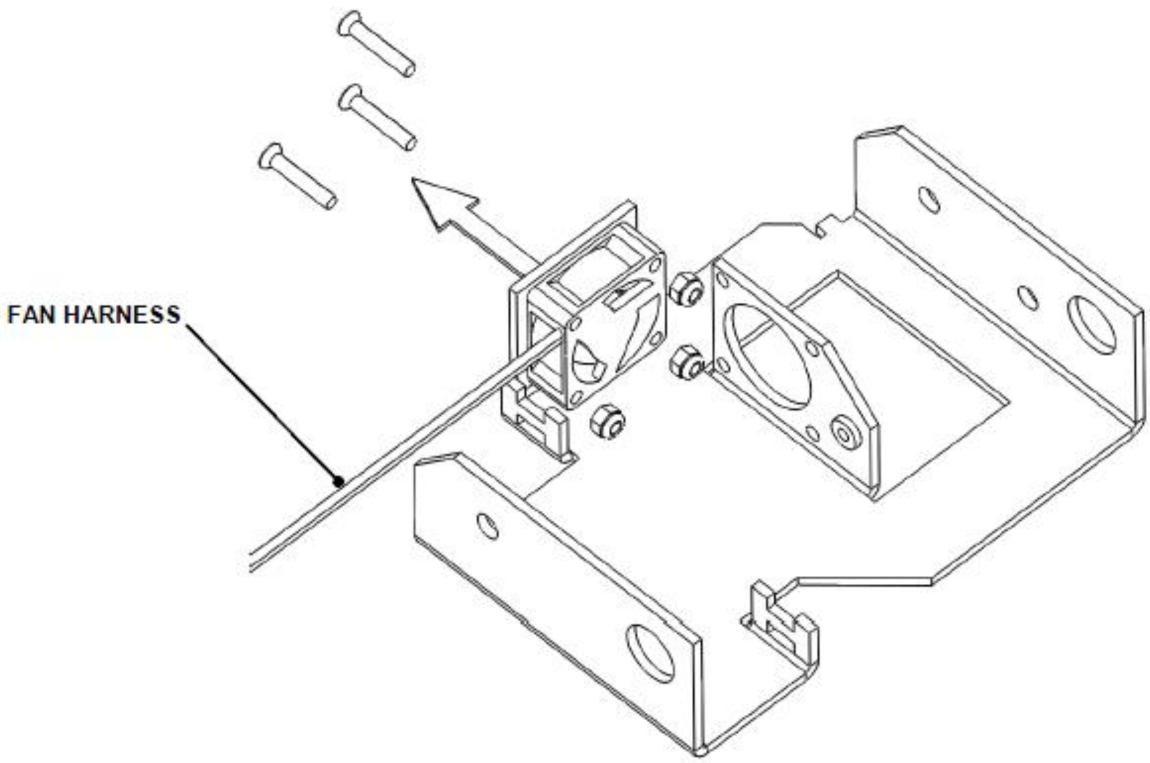


Figure I-5: Fan

To replace the fan

1. Disconnect the fan harness from the printed circuit board.
2. Remove the fan by removing the three screws that attach it to the chassis.
3. Secure a the new fan to the Driver Chassis (using three M2.5x16 Posi Head Flathead Screws (30100180), three M2.5 Washers and three M2.5 Nyloc Hex Nuts (Leave the hole nearest the harness empty, as shown in Figure I-5). Ensure the fan is oriented as shown and the air flow is in the same direction as that of the arrow.
4. Reconnect the fan harness to the printed circuit board.

I.2.4 Replacing the Optosensors

There are two optosensors on the left hand guide (Figure I-6) and one on the right hand guide (Figure I-7).

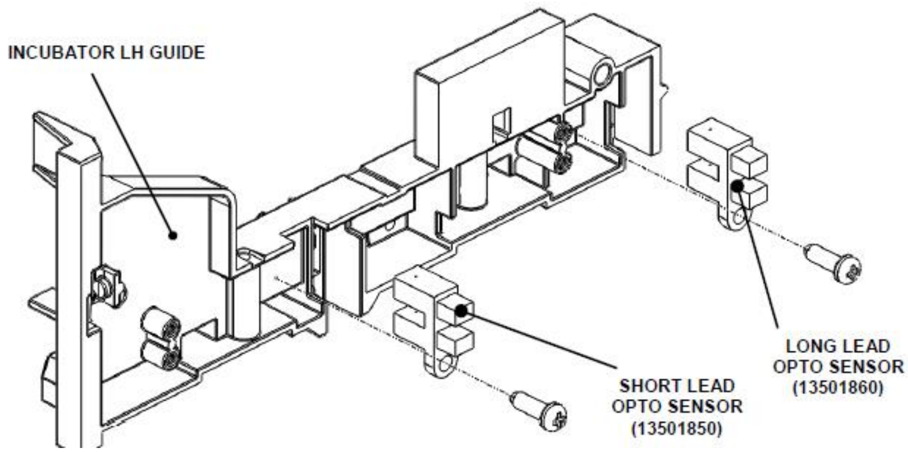


Figure I-6: Left Hand Guide

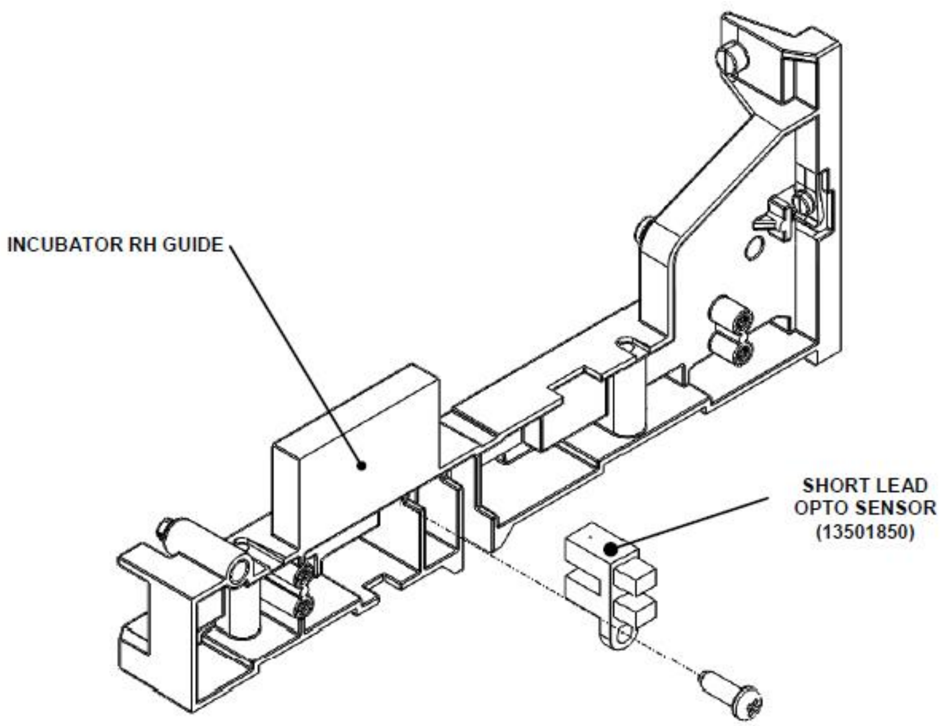


Figure I-7: Right Hand Guide

To replace an optosensor:

1. Disconnect the lead from the printed circuit board and remove the screw that attaches the optosensor to the guide.
2. Replace the optosensor and screw, and then reconnect the lead.

I.2.5 Replacing the Ambient Temperature Sensor

The ambient temperature sensor is located on the bottom plate (Figure I-8).

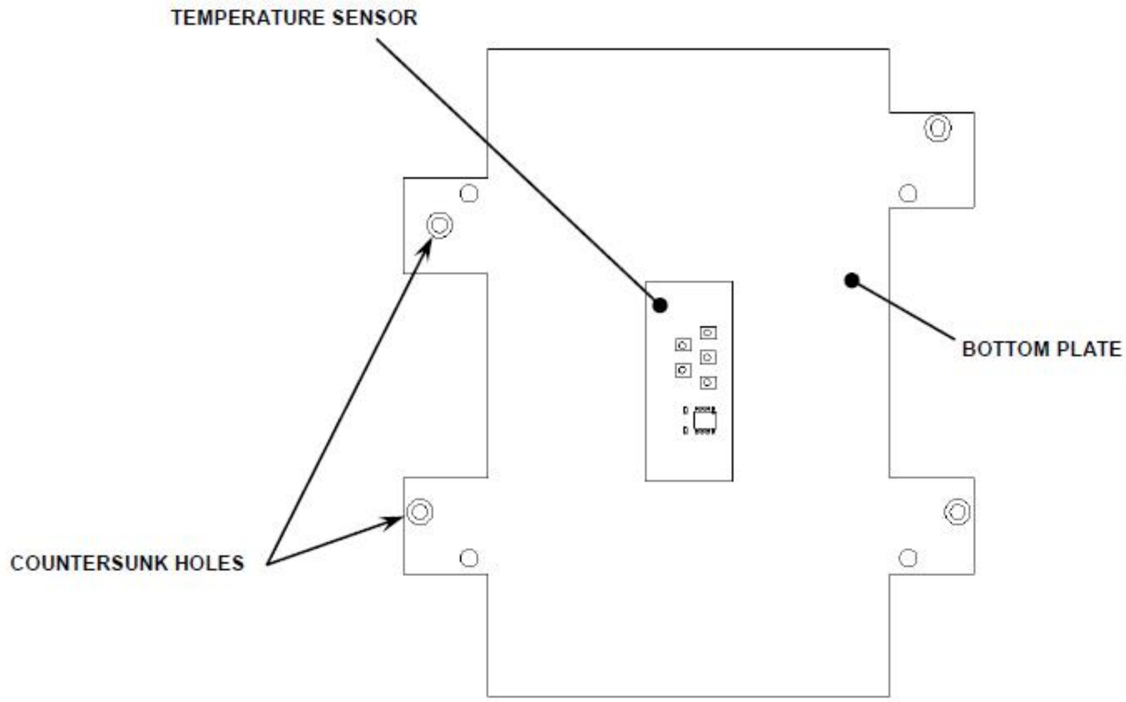


Figure I-8: Ambient Temperature sensor

To replace the sensor

1. Disconnect the cable for the sensor from the printed circuit board.
2. Remove the sensor from the bottom plate.
3. Remove the protective backing from the new sensor and stick it to the face of the bottom plate with countersunk holes facing up as shown in Figure I-8. Center the sensor by eye in the orientation shown in the figure.

I.2.6 Replacing the Drive Mechanism and Components

The plate drive mechanism consists of a motor assembly, bearings and drive shaft, belt, roller, and pulley which are mounted on the baseplate. Typically, the bearings, drive shaft, roller and pulley will not need to replaced, while the motor and/ or belt may have to be replaced.

To access the various components of the drive mechanism:

1. Remove the left hand and right hand guides from the top and bottom plates by removing the self tapping screws.
2. Loosen the drive pulley and remove the belt (Figure I-9).

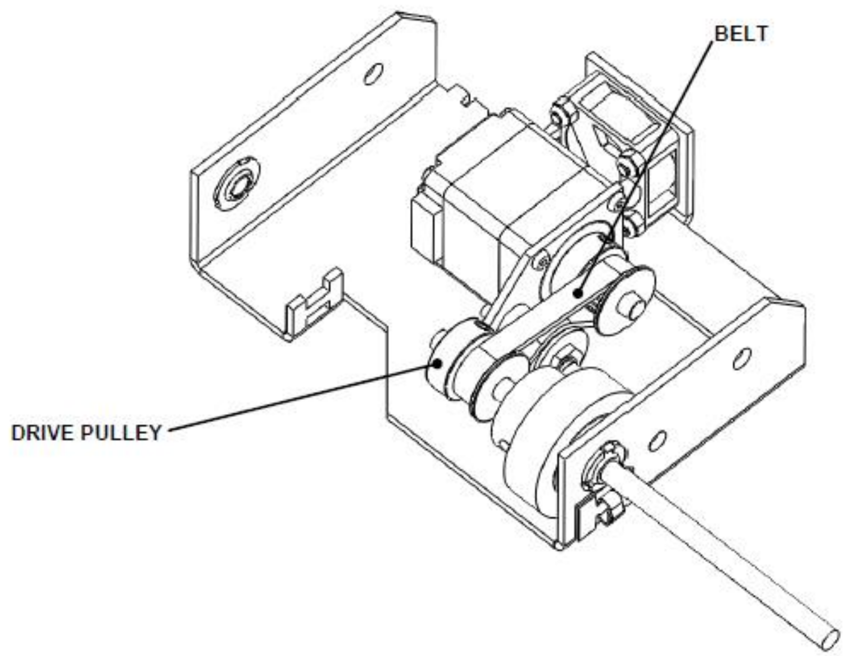


Figure I-9: Belt and Drive Pulley

To replace the motor:

1. Remove the motor cable from the PCB.
2. Remove the four screws that attach the motor assembly to the driver chassis.

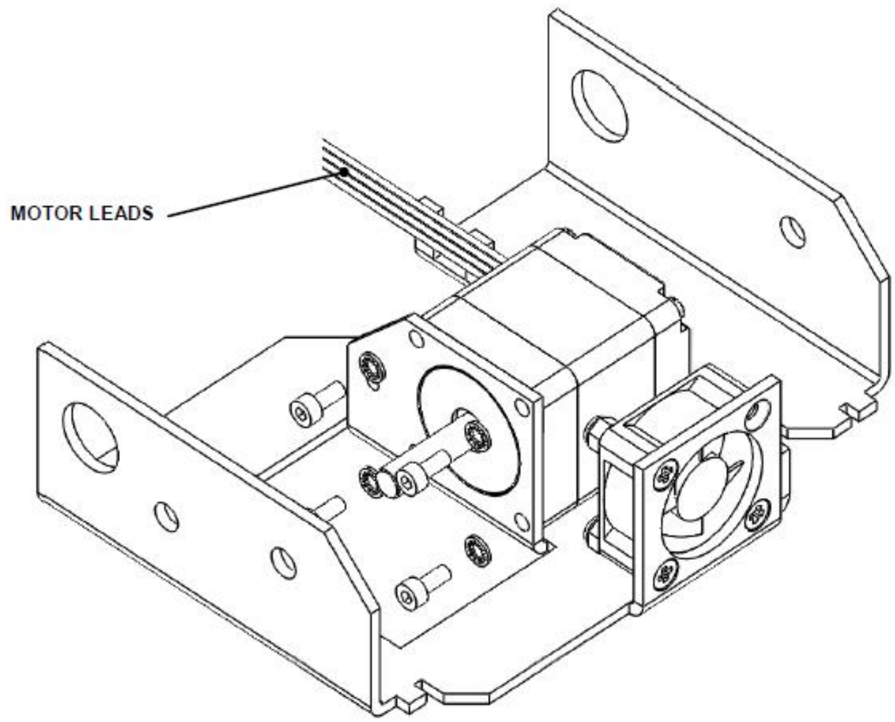


Figure I-10: Removing the Motor

To replace the motor:

1. Attach a 20 Tooth Drive Pulley to a new Incubator Motor using the Incubator Pulley Height Setting Fixture (Figure I-11) and two M4x6 Set Screws and Loctite 222. After you have set the pulley with Loctite, remove the height setting fixture.

> ***Note:*** *If a new pulley is used, remove and discard any set screws that come with the new pulley and use the set screws from the old pulley.*

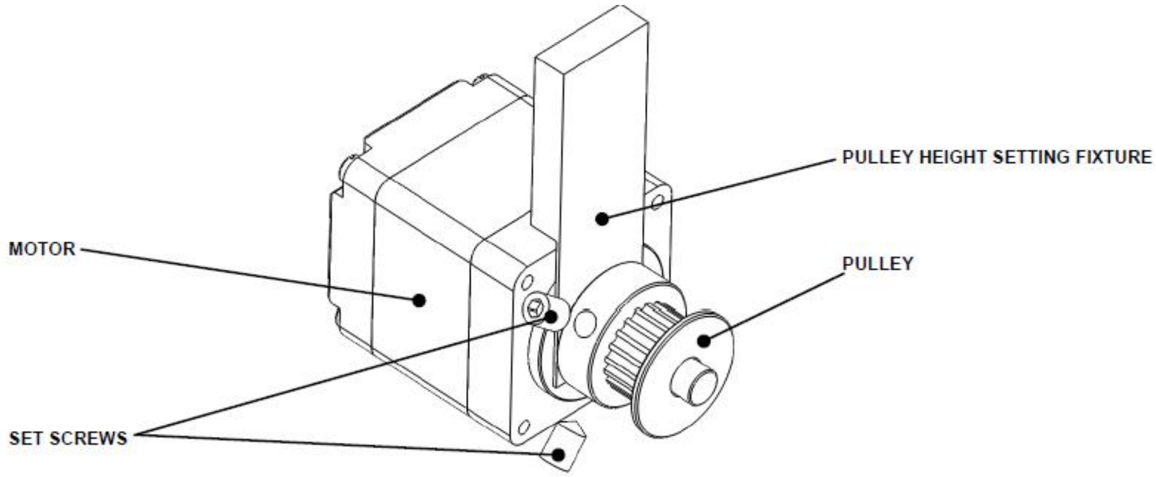


Figure I-11: Attaching the Pulley to the Motor

2. Mount the motor as shown in Figure I-10.

3. Loop a belt around the drive pulley attached to the motor and over the eccentric idler assembly (Figure I-12).

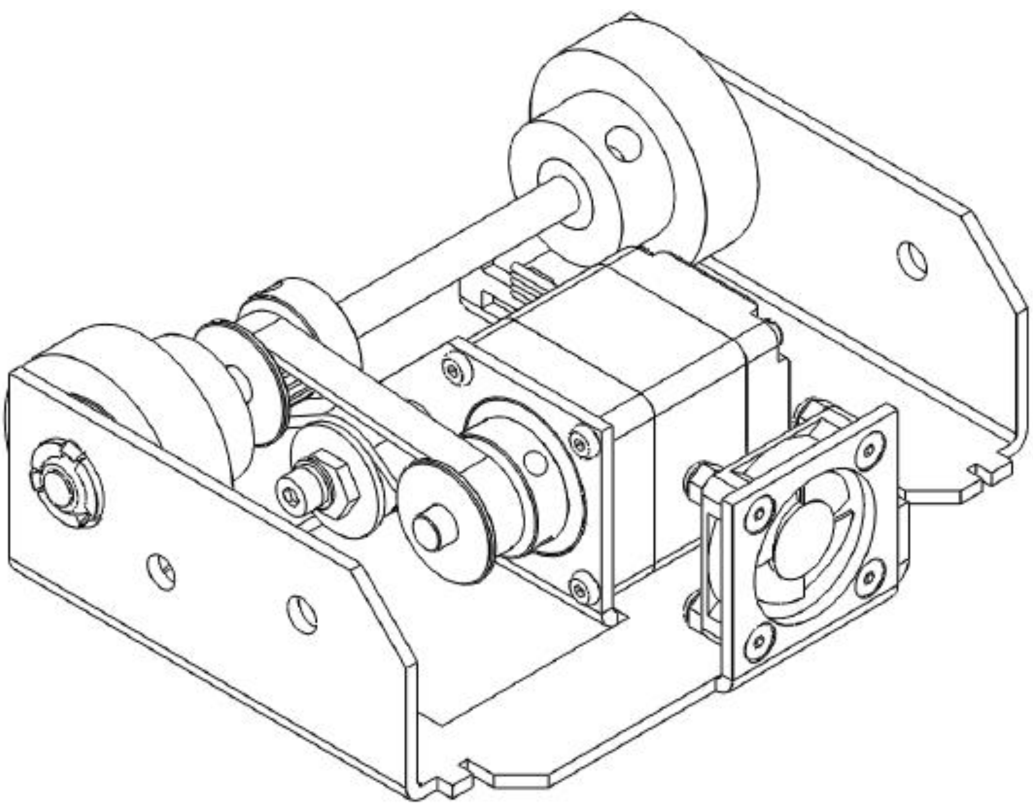


Figure I-12: Belt on Pulley and Eccentric

4. Position the drive pulley on the shaft using the Pulley Fixture so that it lines up with the pulley attached to the motor (Figure I-13). Fix the pulley in place using two M4x6 Set Screws and Loctite 222.

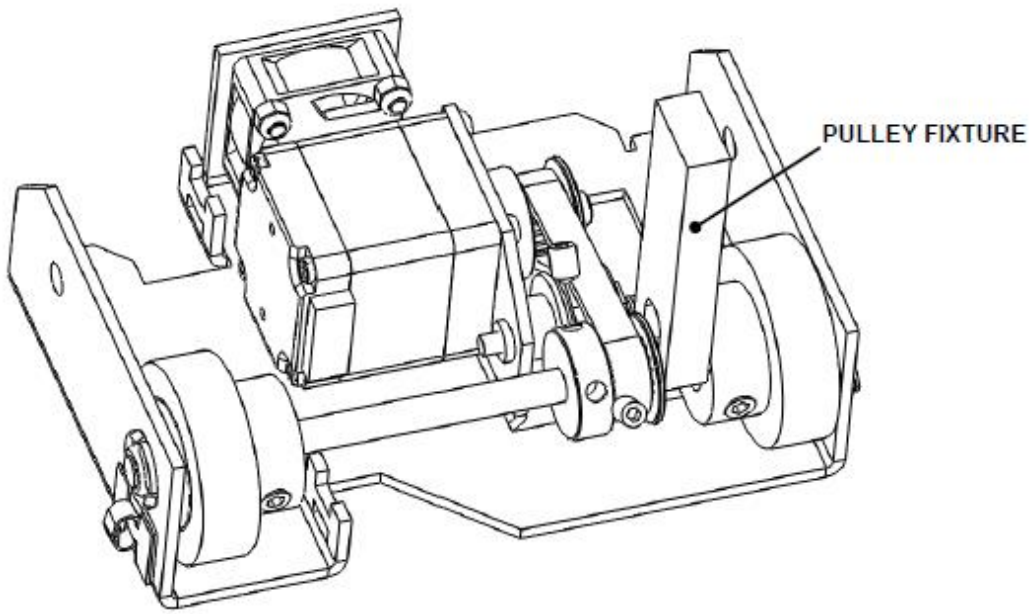


Figure I-13: Using the Pulley Fixture

5. Position the Incubator Belt Tensioning Fixture so the two timing pulleys are between the flanges of the fixture and touching the flat face of the fixture. One end of the fixture should also be held against the motor mounting screw as shown. Next, turn the eccentric tensioning idler using an 8mm spanner as shown. The fixture plunger will move out from the fixture. When the groove of the plunger becomes visible, tighten the screw securing the tensioning idler in place (Figure I-14).

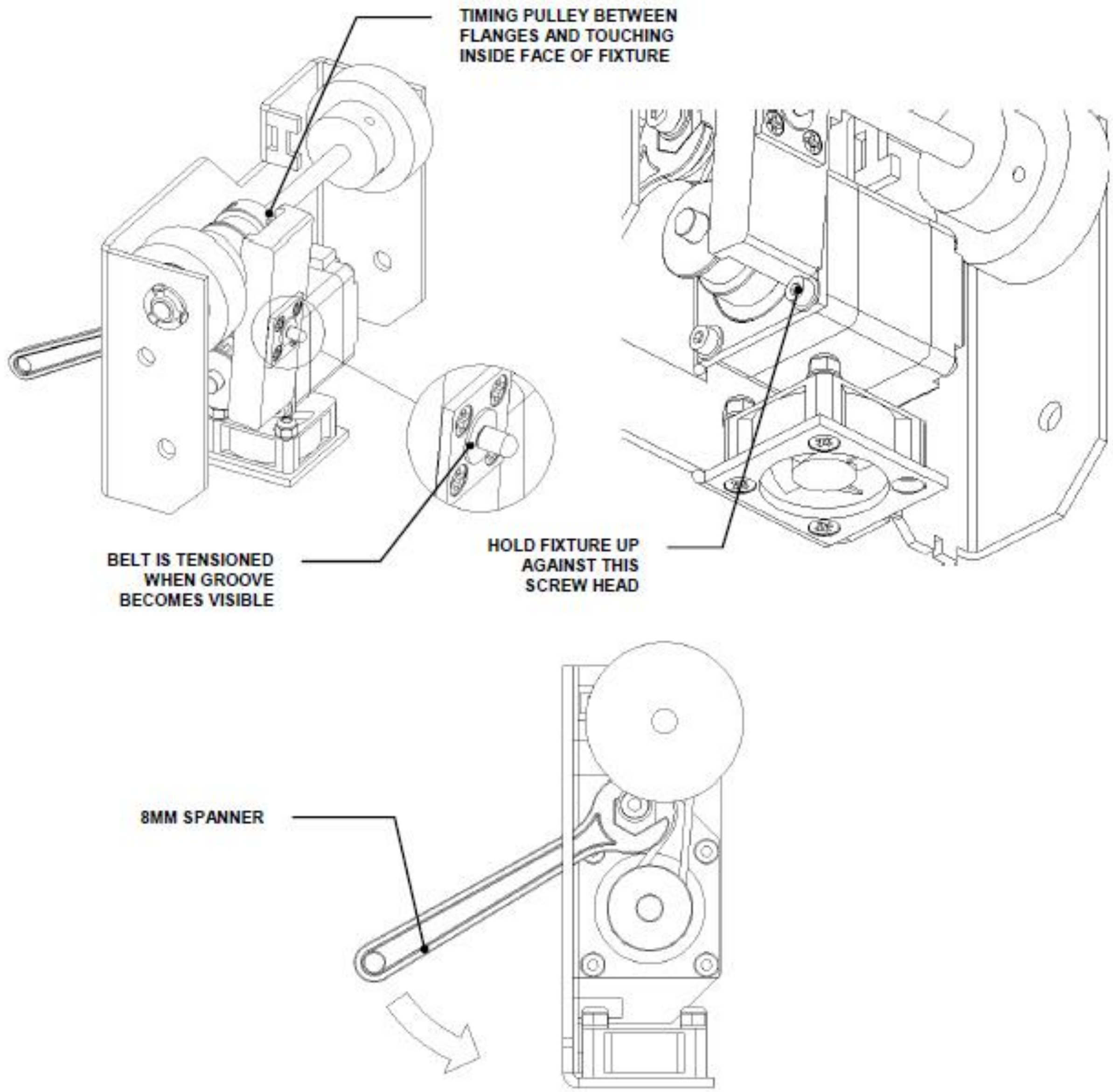


Figure I-14: Securing the Tensioning Idler

Chapter J Incubator (Heated)

J.1 On-Site Service Activities

There are six heated incubators which are fitted in the upper of the two doors as shown in Figure J-1.

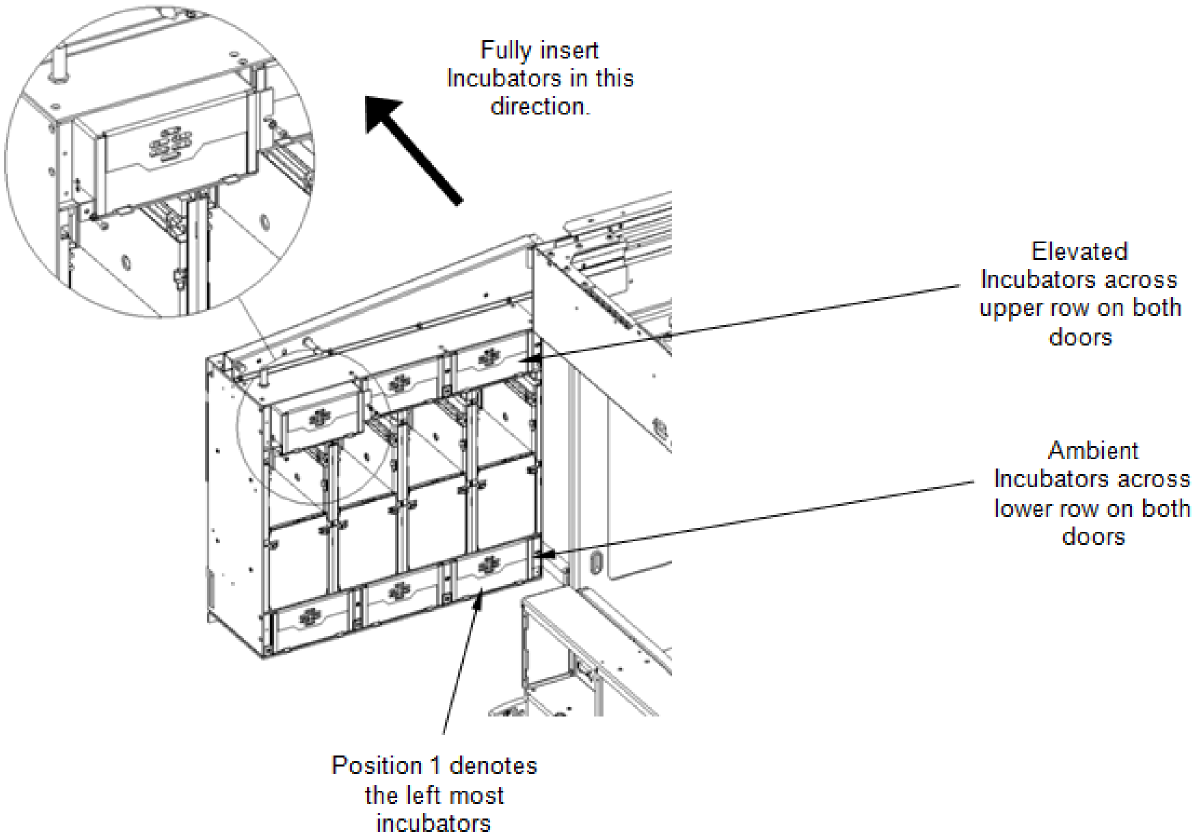


Figure J-1: Location of Ambient Incubators

To remove a heated incubator, unscrew the four screws that attach the incubator to the door and pull the incubator out.

It is recommended that defective incubators be simply replaced in the field and the defective units sent to the local depot for refurbishing.

J.2 Service Depot Activities

J.2.1 Removing the Cover

The cover of the incubator can be removed by removing the four self tapping flat head screws (Figure J-2).

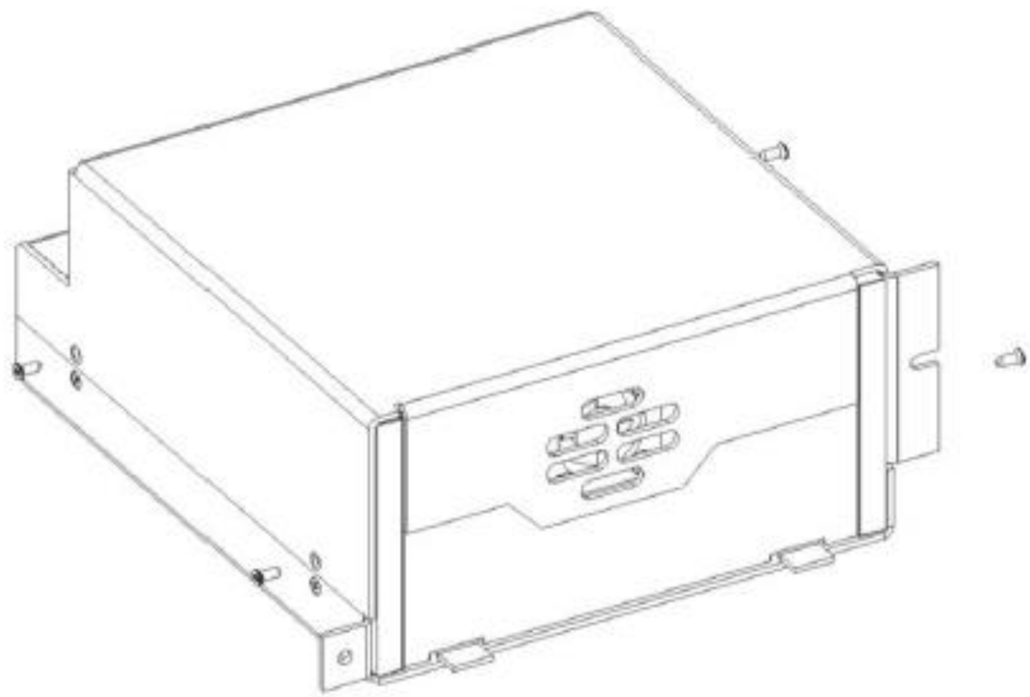


Figure J-2: Opening the Incubator

> **Note:** *When replacing the cover, tilt the top enclosure initially as shown in Figure J-3 in order to clear the PCB backplane.*

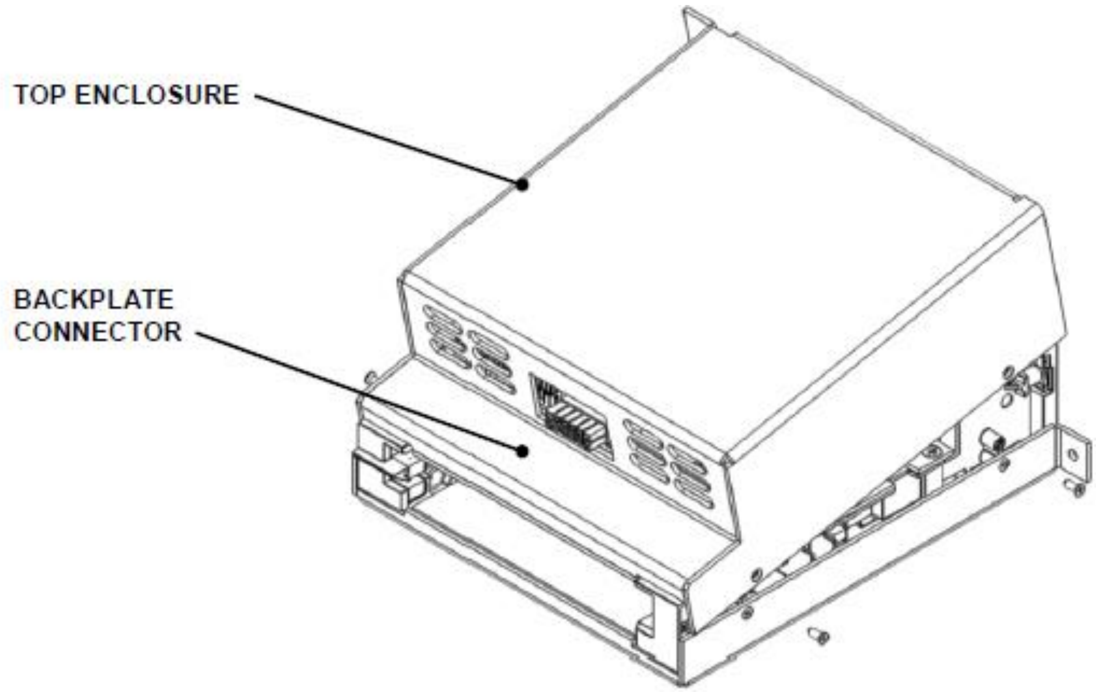


Figure J-3: Replacing the Top Cover.

J.2.2 Replacing the Printed Circuit Board

The printed circuit board is located on the right hand guide as shown in Figure J-4.

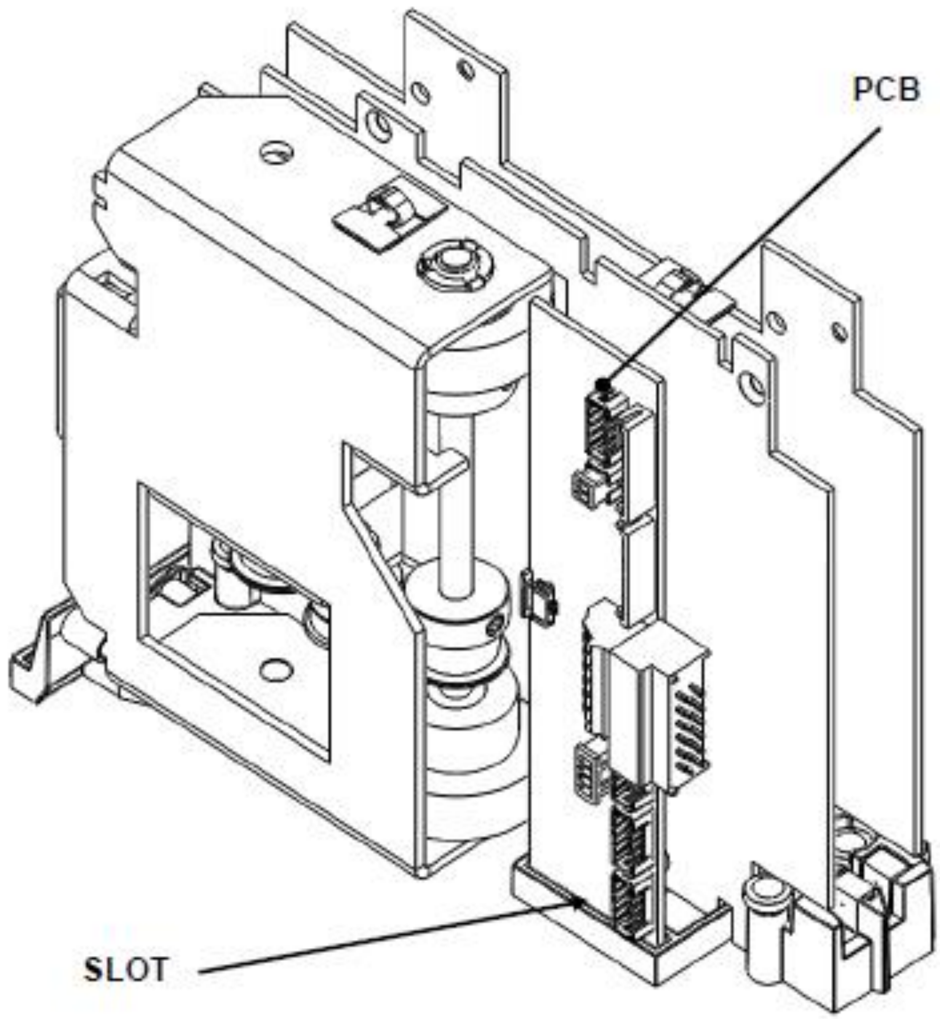


Figure J-4: Location of the Printed Circuit Board

To replace the printed circuit board:

1. Disconnect the cables on the printed circuit board.
2. Remove the right hand guide assembly from the top and bottom plates by removing the four self tapping screws.
3. Remove the printed circuit board.
4. Place the new board in the slot as shown in Figure H-4 and reconnect the cables.
5. Ensure that the circular boss on the right hand guide mates with the hole in the driver chassis.
6. Secure the guide to the top and bottom plates using the four self tapping screws.

J.2.3 Replacing the Fan

The fan is located on the driver chassis (Figure J-5) using three M2.5x 16 Posi Flathead screws, three M2.5 Washers and three Nyloc Hex Nuts.

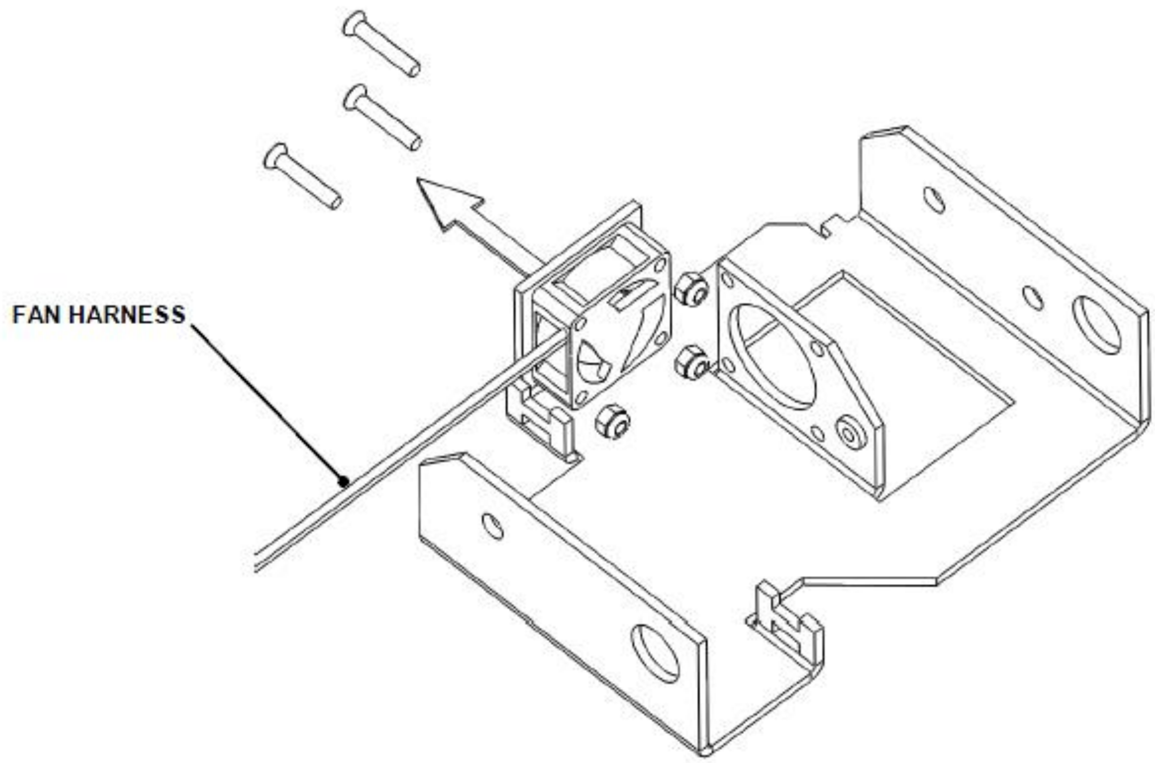


Figure J-5: Fan

To replace the fan

1. Disconnect the fan harness from the printed circuit board.
2. Remove the fan by removing the three screws that attach it to the chassis.
3. Secure a the new fan to the Driver Chassis (using three M2.5x16 Posi Head Flathead Screws (30100180), three M2.5 Washers and three M2.5 Nyloc Hex Nuts (Leave the hole nearest the harness empty, as shown in Figure J-5). Ensure the fan is oriented as shown and the air flow is in the same direction as that of the arrow.
4. Reconnect the fan harness to the printed circuit board.

J.2.4 Replacing the Optosensors

There are two optosensors on the left hand guide (Figure J-6) and one on the right hand guide (Figure J-7).

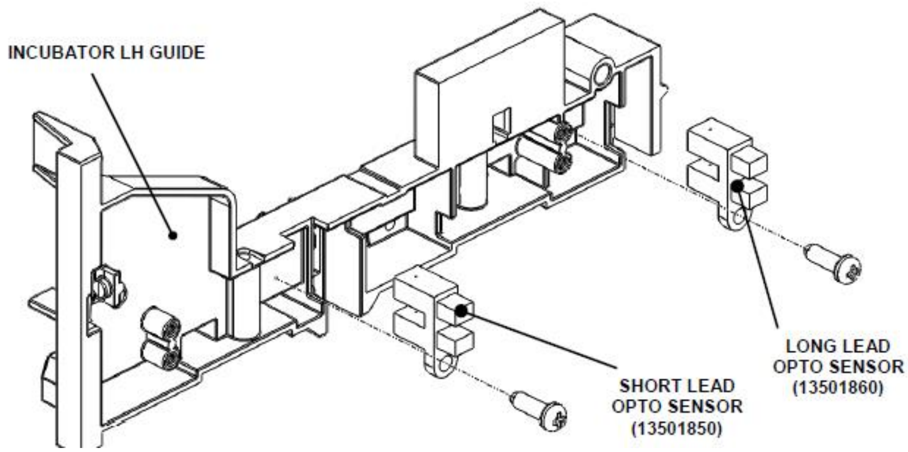


Figure J-6: Left Hand Guide

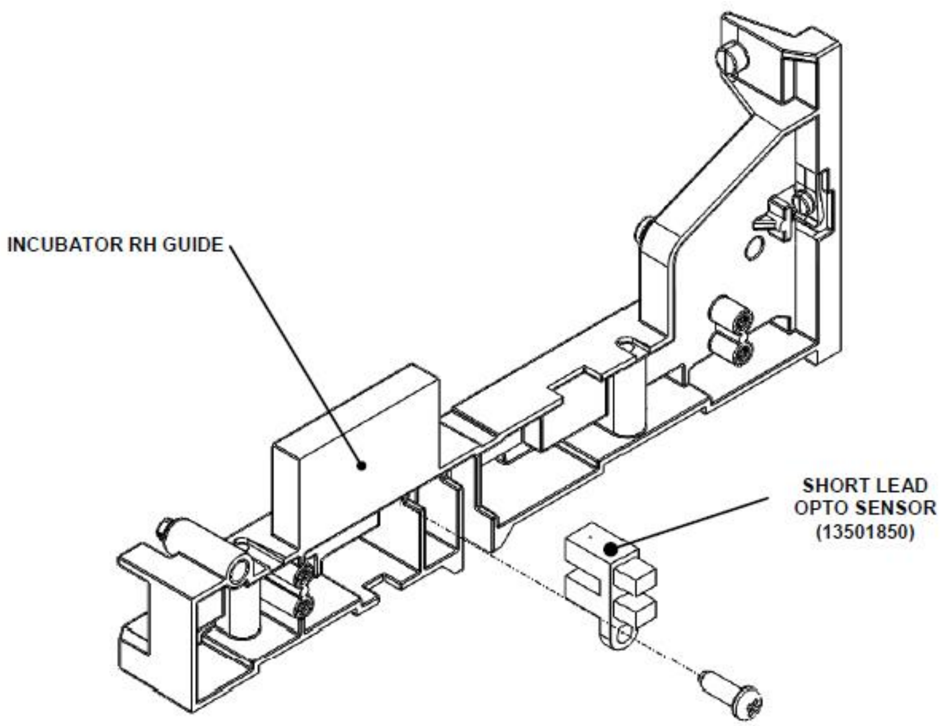


Figure J-7: Right Hand Guide

To replace an Optosensor:

1. Disconnect the lead from the printed circuit board and remove the screw that attaches the optosensor to the guide.
2. Replace the optosensor and screw, and then reconnect the lead.

J.2.5 Replacing the Heater Foils

The heater foils are located on the bottom and bottom plates (Figure J-8 and J-9).

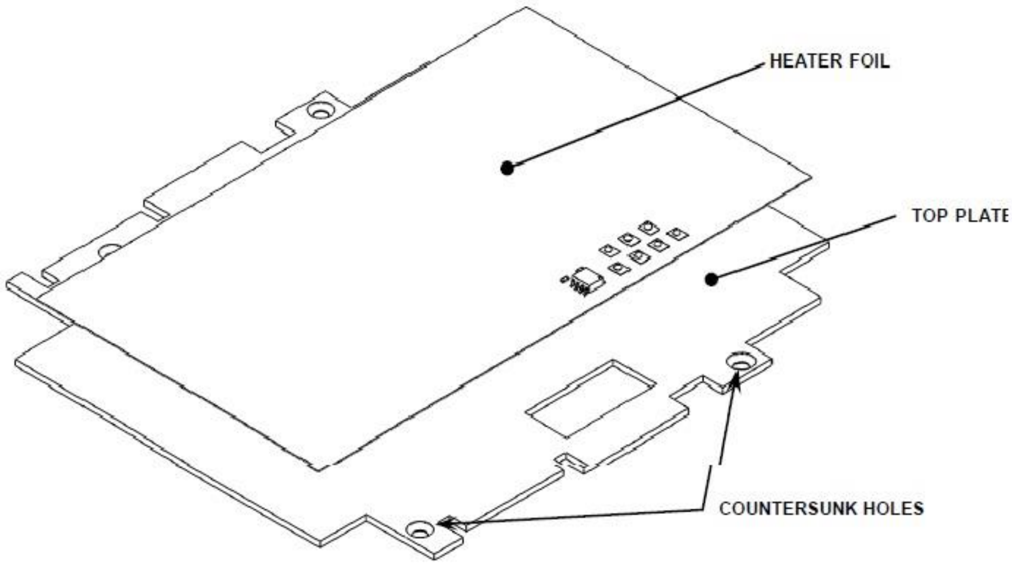


Figure J-8: Heater Foil – Top Plate

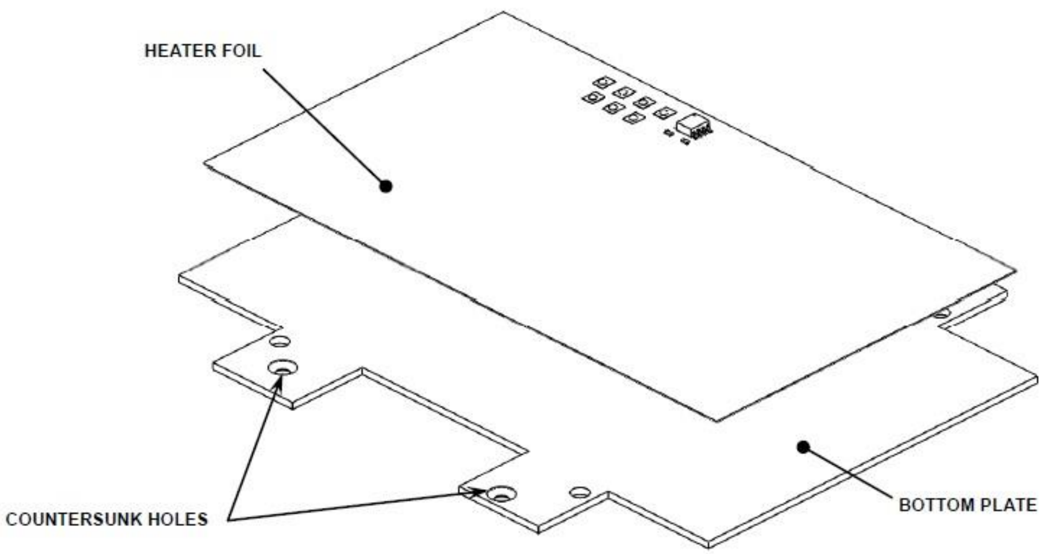


Figure J-9: Heater Foil – Bottom Plate

To replace a Heater Foil:

1. Disconnect the cable for the plate from the printed circuit board.

2. Remove the plate and the foil.

3. Remove the protective backing from a Heater Foil and stick to the face of the plate with the countersunk holes facing up.

J.2.6 Replacing the Drive Mechanism and Components

The plate drive mechanism consists of a motor assembly, bearings and drive shaft, belt, roller, and pulley which are mounted on the baseplate. Typically, the bearings, drive shaft, roller and pulley will not need to replaced, while the motor and/ or belt may have to be replaced

To access the various components of the drive mechanism:

1. Remove the left hand and right hand guides from the top and bottom plates by removing the self tapping screws.
2. Loosen the drive pulley and remove the belt (Figure J-10).

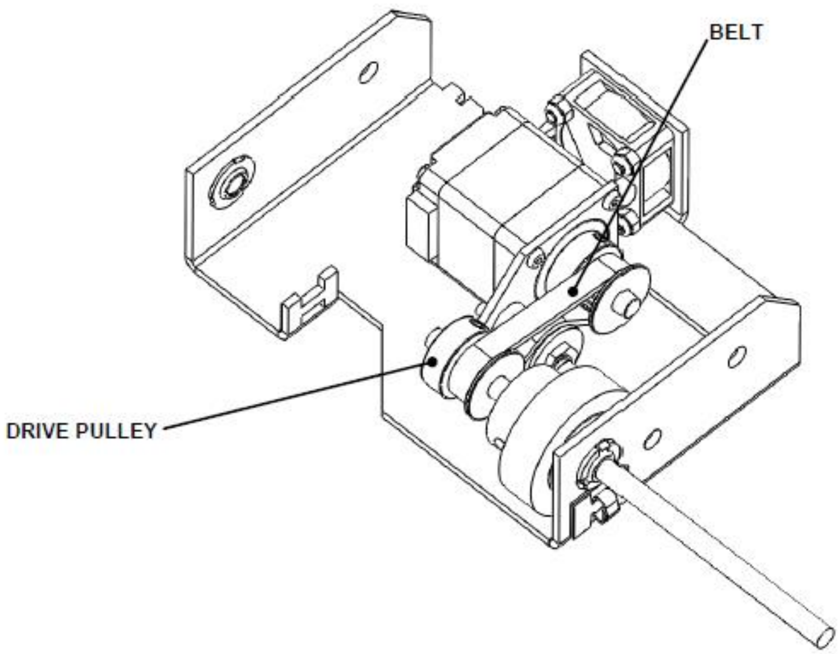


Figure J-10: Belt and Drive Pulley

To replace the motor:

1. Remove the motor cable from the PCB
2. Remove the four screws that attach the motor assembly to the driver chassis (Figure J-11).

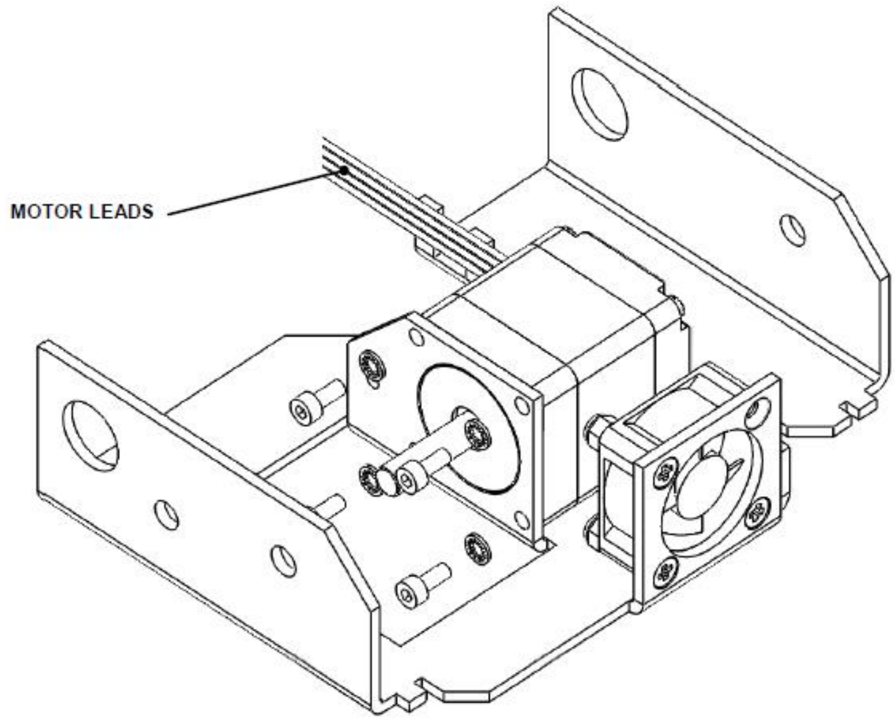


Figure J-11: Removing the Motor

To replace the motor:

1. Attach a 20 Tooth Drive Pulley to a new Incubator Motor using the Incubator Pulley Height Setting Fixture (Figure J-12) and two M4x6 Set Screws and Loctite 222. After you have set the pulley with Loctite, remove the height setting fixture.

> ***Note:*** *If a new pulley is used, remove and discard any set screws that come with the new pulley and use the set screws from the old pulley.*

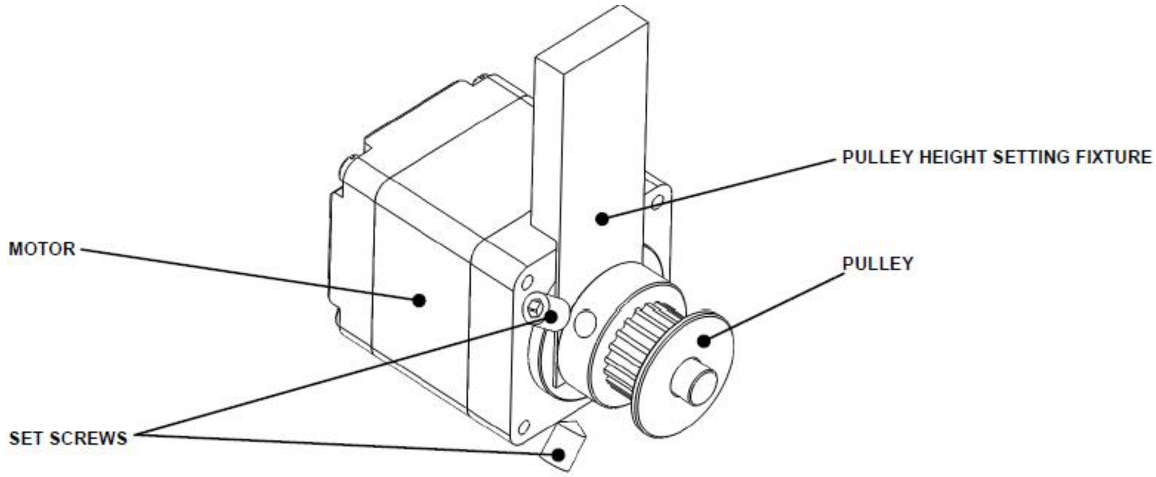


Figure J-12: Attaching the Pulley to the Motor

2. Mount the motor as shown in Figure J-11.
3. Loop a belt around the drive pulley attached to the motor and over the eccentric idler assembly (Figure J-13).

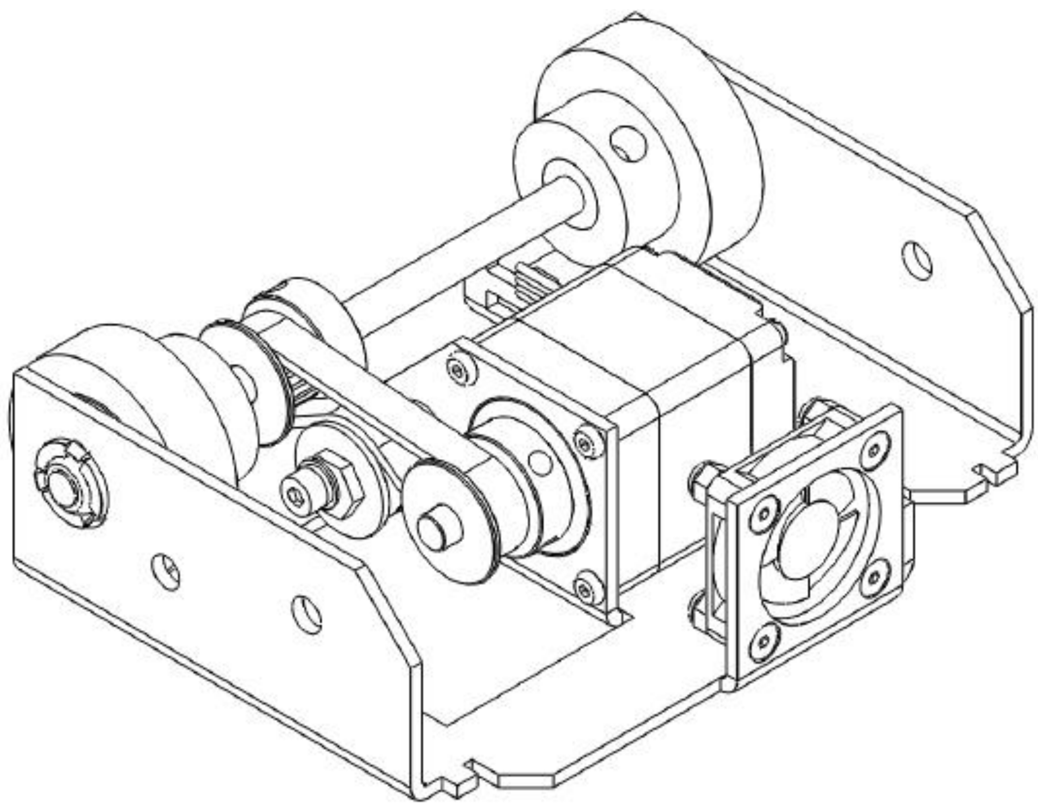


Figure J-13: Belt on Pulley and Eccentric

4. Position the drive pulley on the shaft using the Pulley Fixture so that it lines up with the pulley attached to the motor (Figure J-14). Fix the pulley in place using two M4x6 Set Screws and Loctite 222.

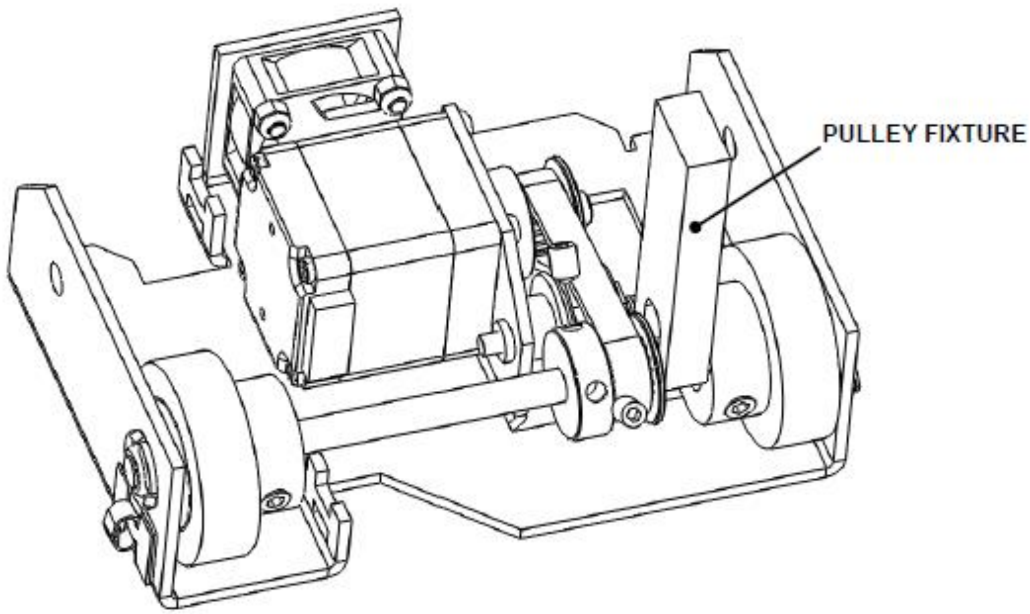


Figure J-14: Using the Pulley Fixture

5. Position the Incubator Belt Tensioning Fixture so the two timing pulleys are between the flanges of the fixture and touching the flat face of the fixture. One end of the fixture should also be held against the motor mounting screw as shown. Next, turn the eccentric tensioning idler using an 8mm spanner as shown. The fixture plunger will move out from the fixture. When the groove of the plunger becomes visible, tighten the screw securing the tensioning idler in place (Figure J-15).

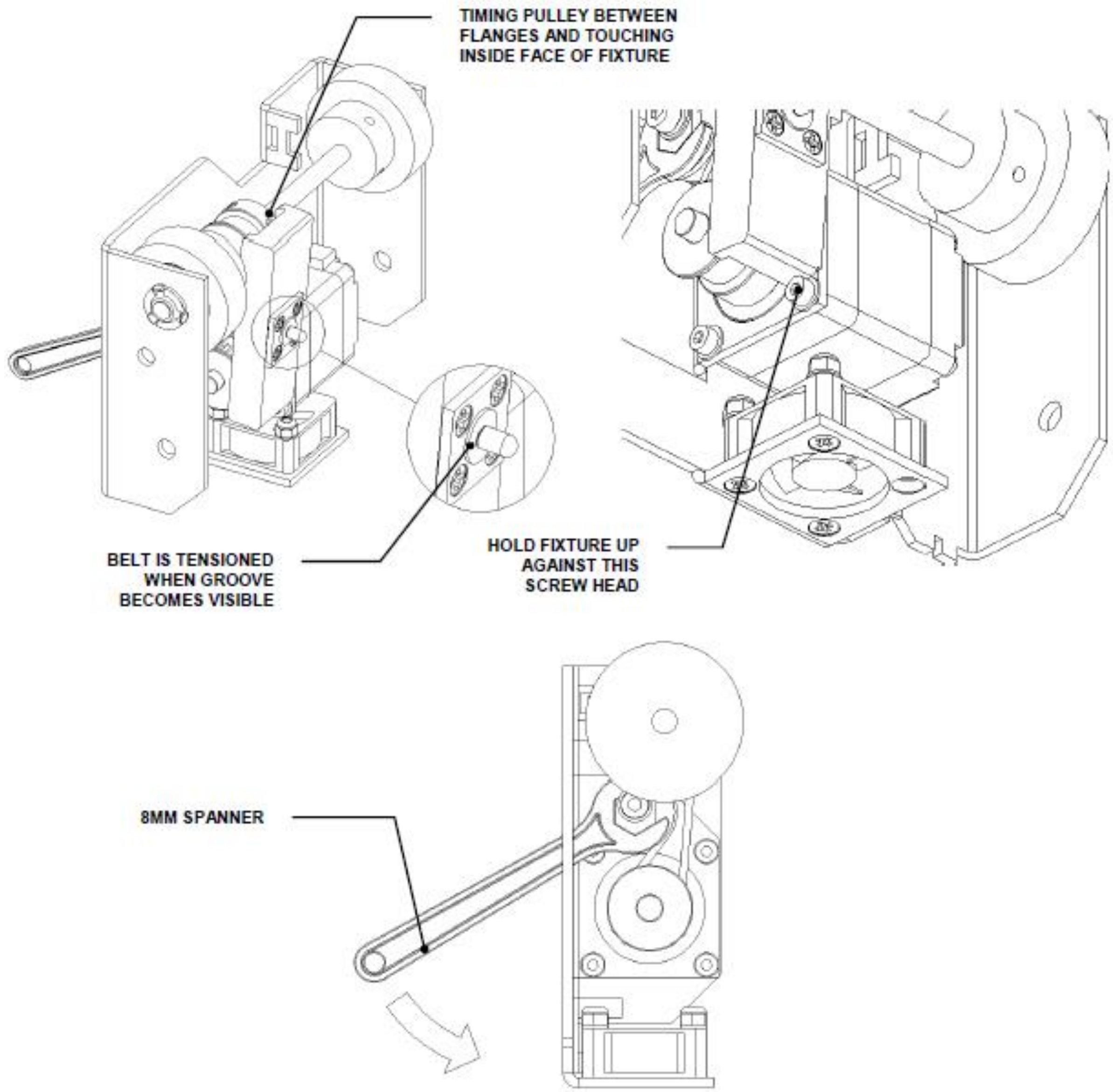


Figure J-15: Securing the Tensioning Idler

Chapter K Lower Fluidics Assembly

K.1 Removing the Lower Fluidics Assembly

The *Lower Fluidics Assembly* is used to house the buffer containers and waste bottle.

To remove the assembly:

1. Remove the two M5x8 BHCS that secure the sides of the Fluidics assembly as shown in Figure K-1.

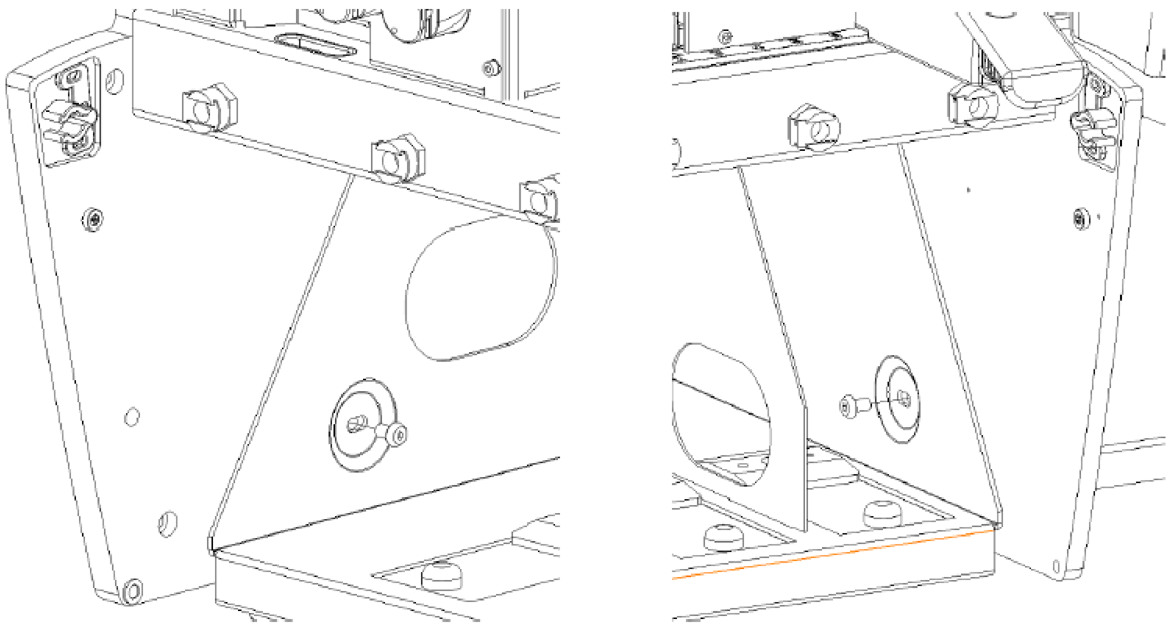


Figure K-1: Removing the Screws that Secure the Sides

2. Remove the two M5x50 BCHS and the M5x40 BCHS that attach the assembly to the base as shown in Figure K-2.

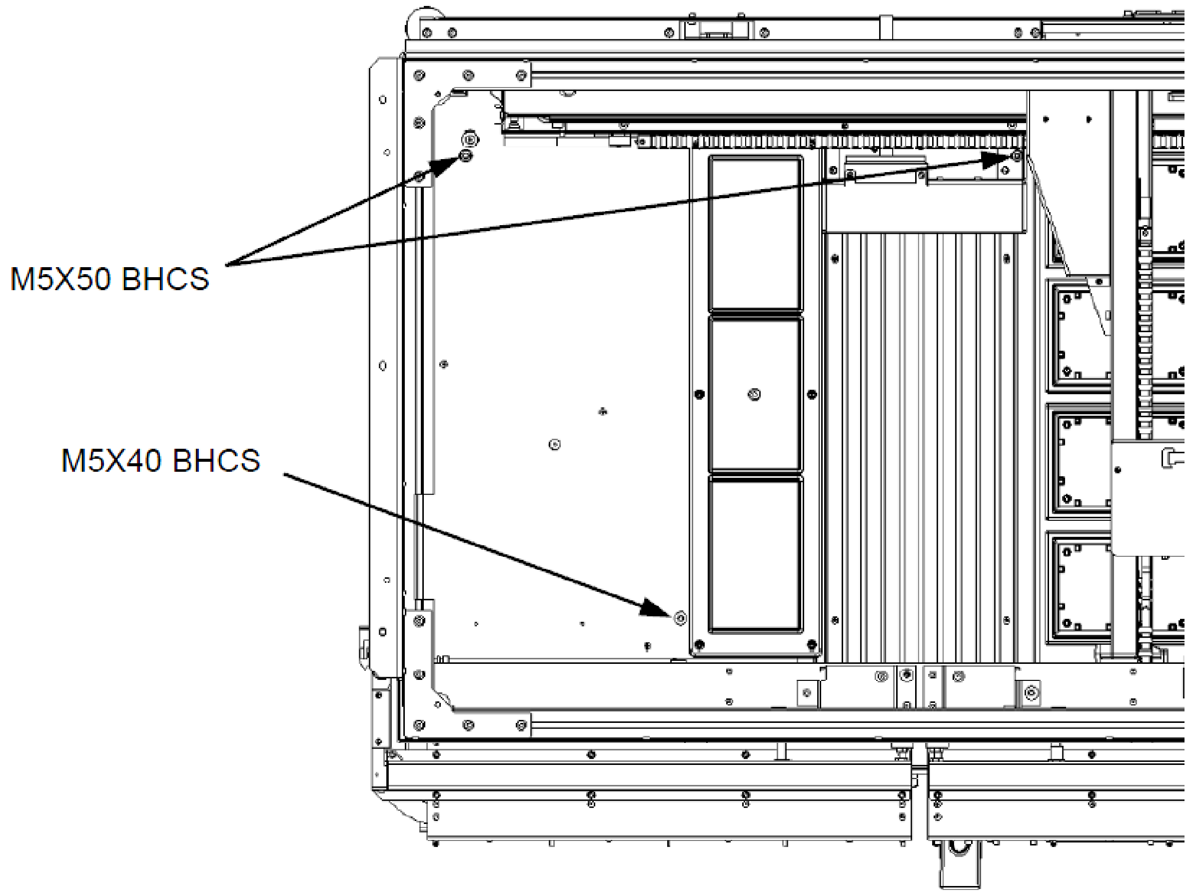


Figure K-2: Removing Screws that Attach the Lower Fluidics Assembly to the Base

3. Slide the Assembly from the Housing (Figure K-3).

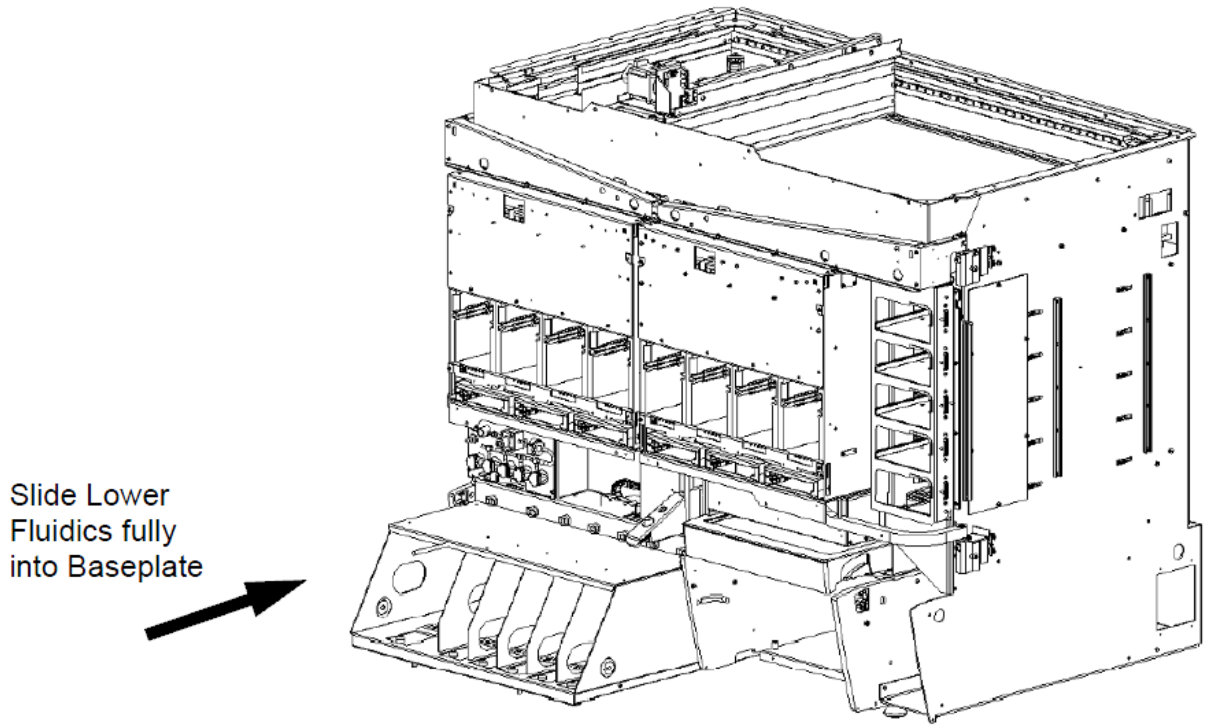


Figure K-3: Sliding the Assembly from the System

When replacing the assembly, apply Loctite 222 to all screws.

K.2 Replacing Components on the Lower Fluidics Assembly

K.2.1 Tubing Connections

The various components of the Lower Fluidics Assembly are connected as shown in Figure K-4. When replacing items in this assembly, ensure that the appropriate connections are made.

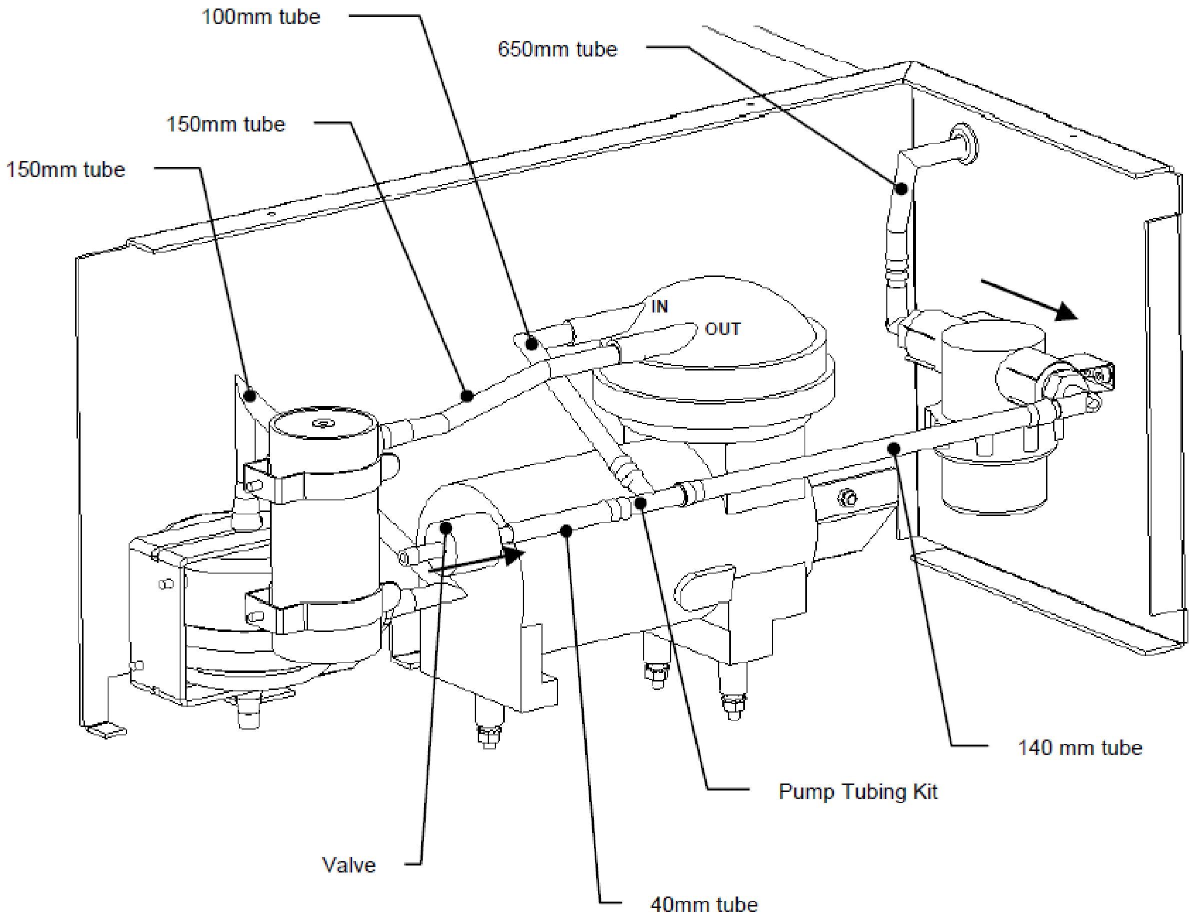


Figure K-4: Tubing Connections in the Lower Fluidics Assembly

K.2.2 Replacing the Thomas Pump

The Thomas Pump is secured to the base of the Lower Fluidics Assembly by three 8-32 KEP nuts (Figure K-5).

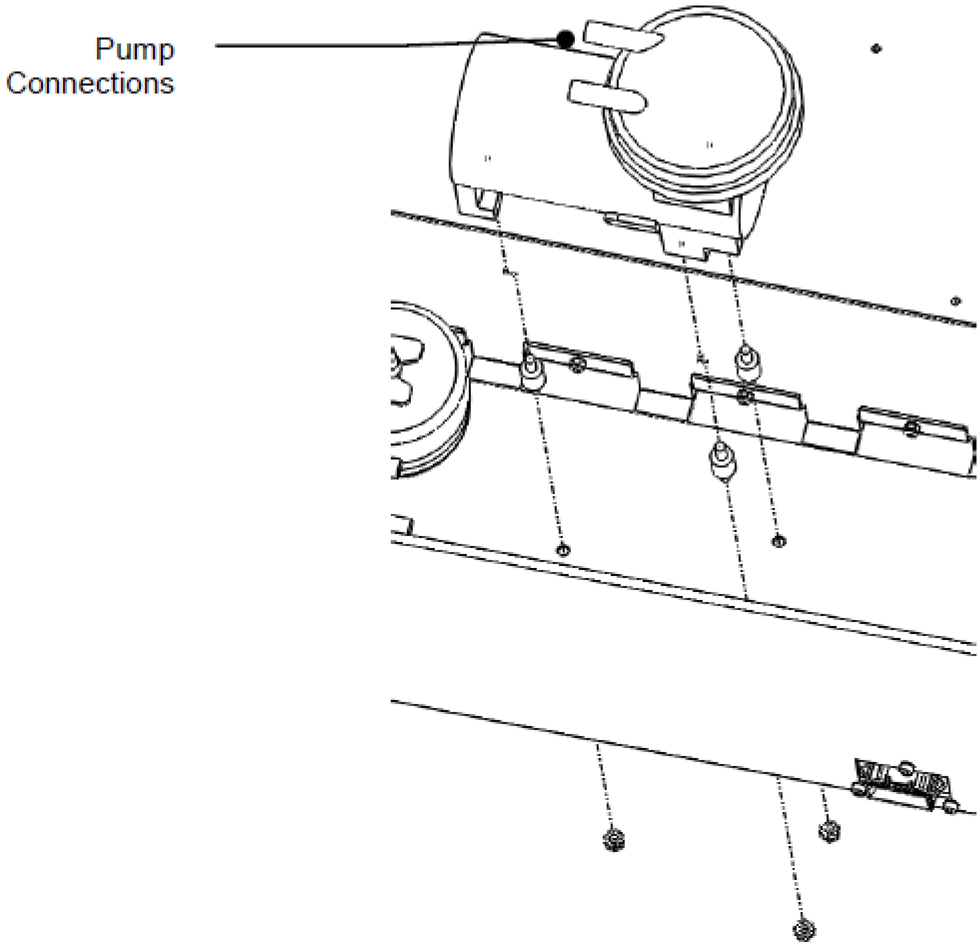


Figure K-5: Thomas Pump Assembly

When replacing the pump, make certain that the shock mounts are installed and note the orientation of the pump connections.

K.2.3 Silencer and HEPA Filter

The Silencer and HEPA Filter are mounted as shown in Figure K-6.

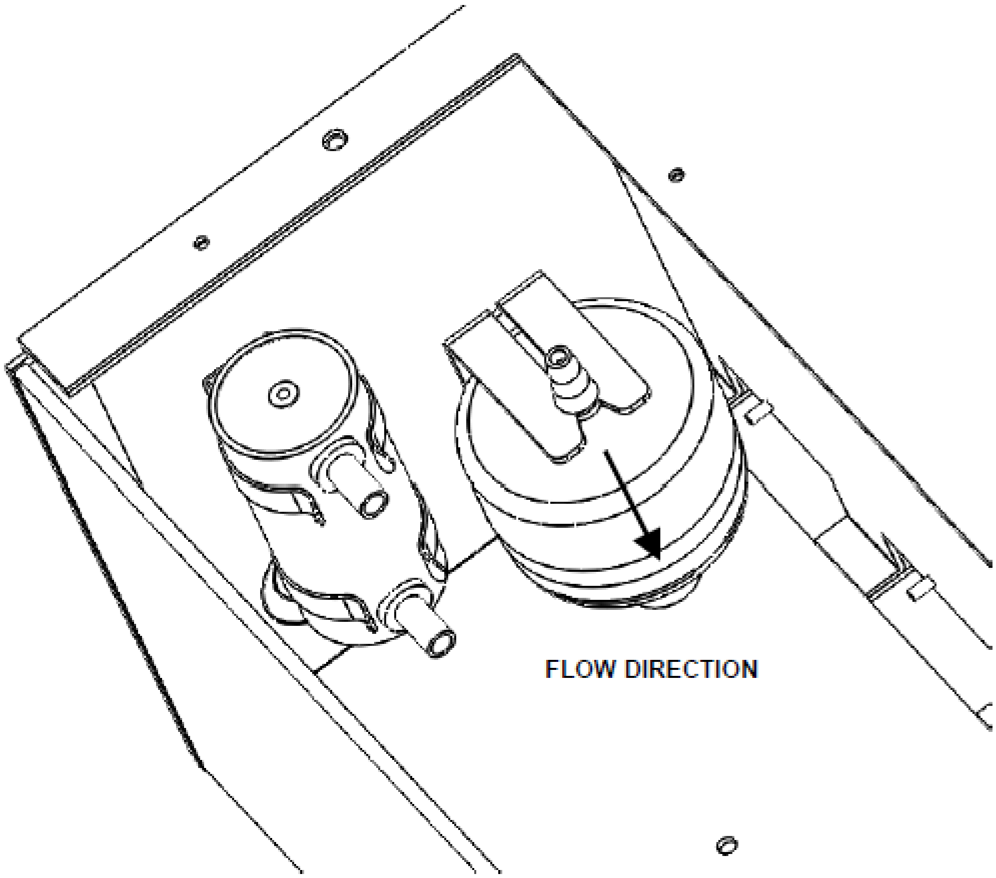


Figure K-6: The Silencer and HEPA Filter

K.2.4 Water Trap

The Water Trap is mounted on the baseplate using a Seatrom clip on the base as shown in Figure K-7.

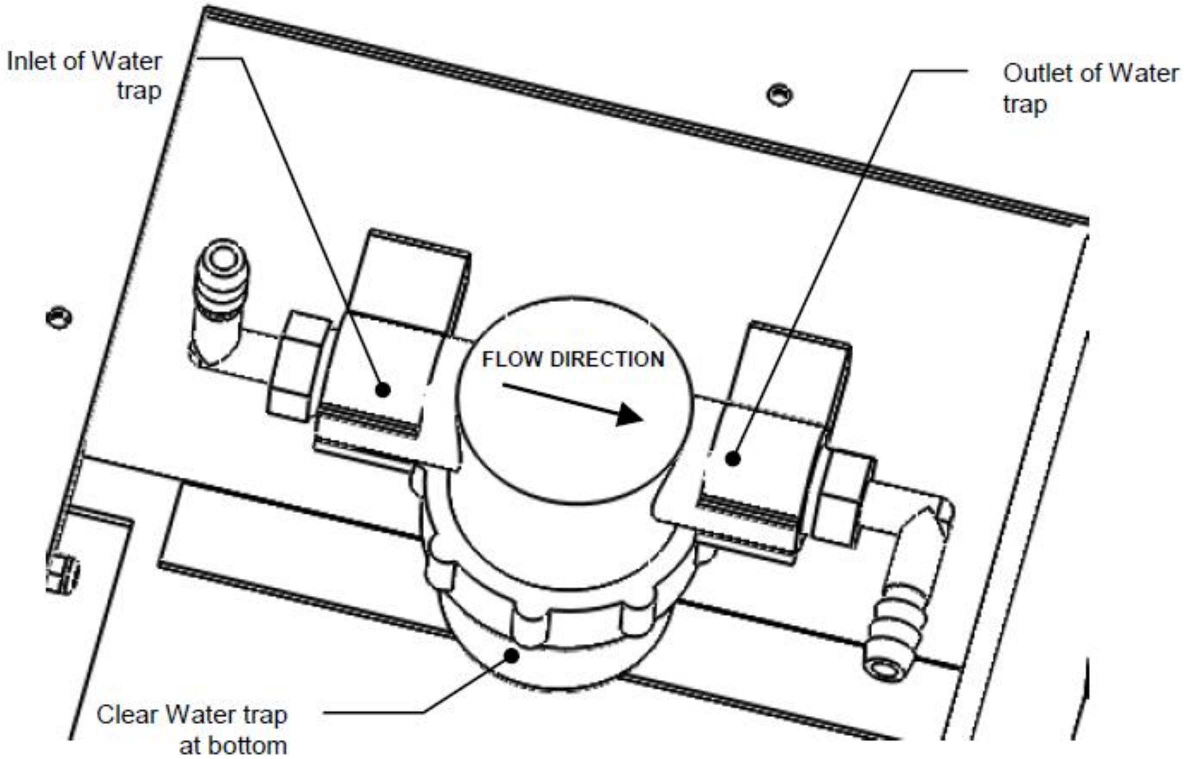


Figure K-7: Mounting the Water Trap

K.2.5 Weighing Scale PCB

The Weighing Scale PCB is attached to the Fluidics Drawer Assembly a shown in Figure K-8.

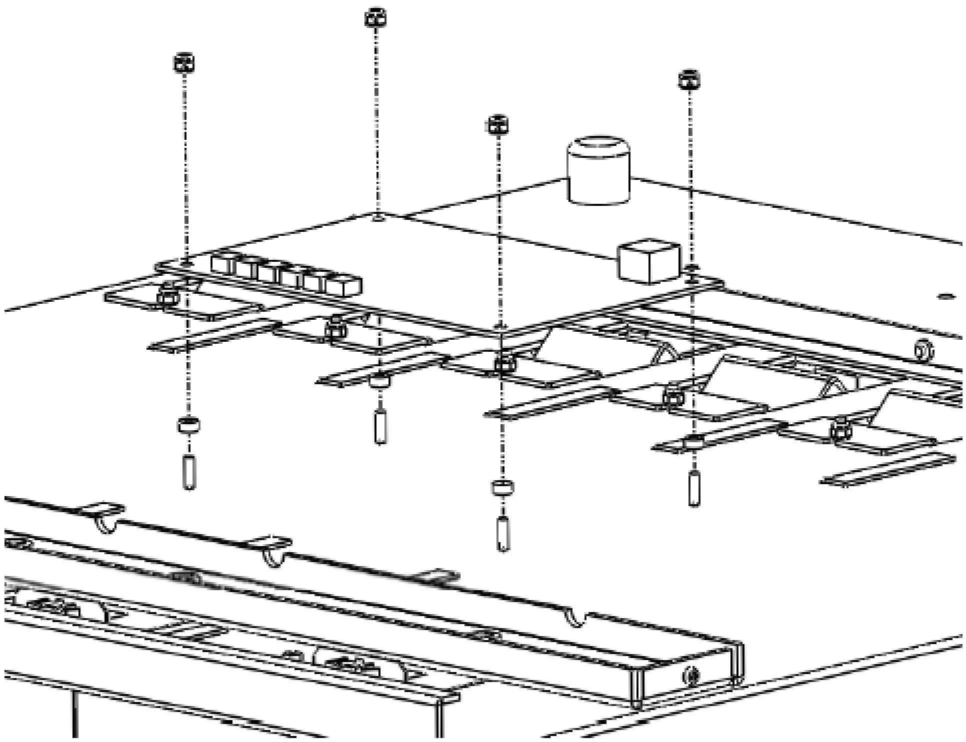


Figure K-8: Mounting the Weighing Scale PCB

To remove the board, remove the four Nyloc nuts and spacers.

K.2.6 Replacing the Weighing Scale Assemblies

The Weighing Scale Assemblies are attached to the assembly as shown in Figure K-9.

Figure K-9: Weighing Scale Assemblies

To remove an assembly, remove the M6x10 Button Head Cap Screw and clamp.

When replacing an assembly, ensure that the scale is positioned as shown in the figure and affix Loctite 222.

This page intentionally left blank.

Chapter L Magnetic Encoder

L.1 Overview

The *Magnetic Encoder* assembly is located on the workspace. There are two printed circuit boards which can be replaced.

To remove the Magnetic Encoder Assembly:

1. Unscrew the four M3x6 Posi Head fixing screws as shown in Figure L-1.

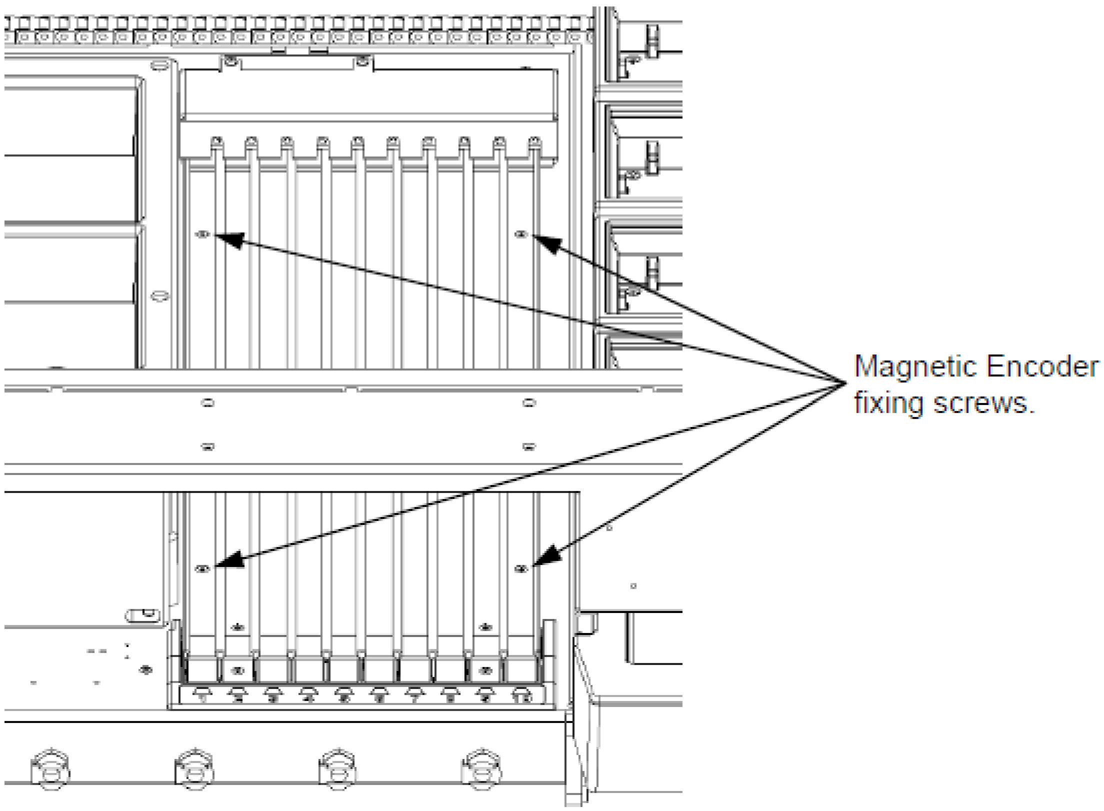


Figure L-1: Magnetic Encoder Attachment Screws

2. Move the Sample Rack Scanner to the leftmost (Parked position), then slide the assembly out of the workspace.

3. Remove the cover and then remove the Flex Cable from the SRS board.

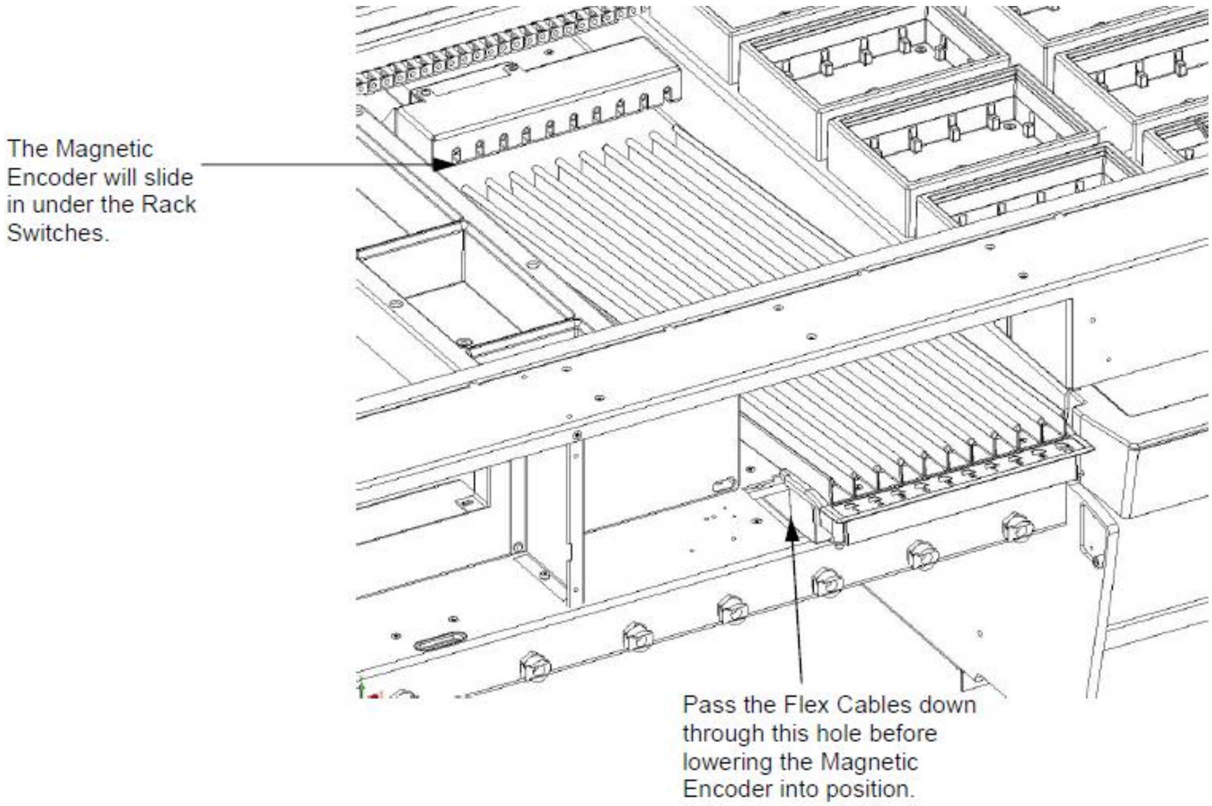


Figure L-2: Removing the Magnetic Encoder

To replace the Magnetic Encoder Assembly, slide it into the Workspace as shown and lower the molded part into the opening in the Workspace. When replacing the Flex Cable attached to the Magnetic Encoder, feed it through the opening in the Workspace and Baseplate before the molded part of the assembly is lowered into the gap.

Typically, a defective magnetic encoder is replaced and sent to the depot for refurbishing.

L.2 Refurbishing the Magnetic Encoder

L.2.1 Accessing the Interior Components of the Magnetic Encoder

The Magnetic Encoder contains two printed circuit boards which can be replaced, the Rack Scanner printed circuit board (Section L.2.2) and the Rack Scanner Indicator printed circuit board.

To access these components, it is necessary to remove the Sample Rack, Magnetic Enclosure cover and the floating plate as described below.

1. Remove the Sample Rack Guide (Figure L-3) by unscrewing the four M3x6 Posi Flat Head Screws.

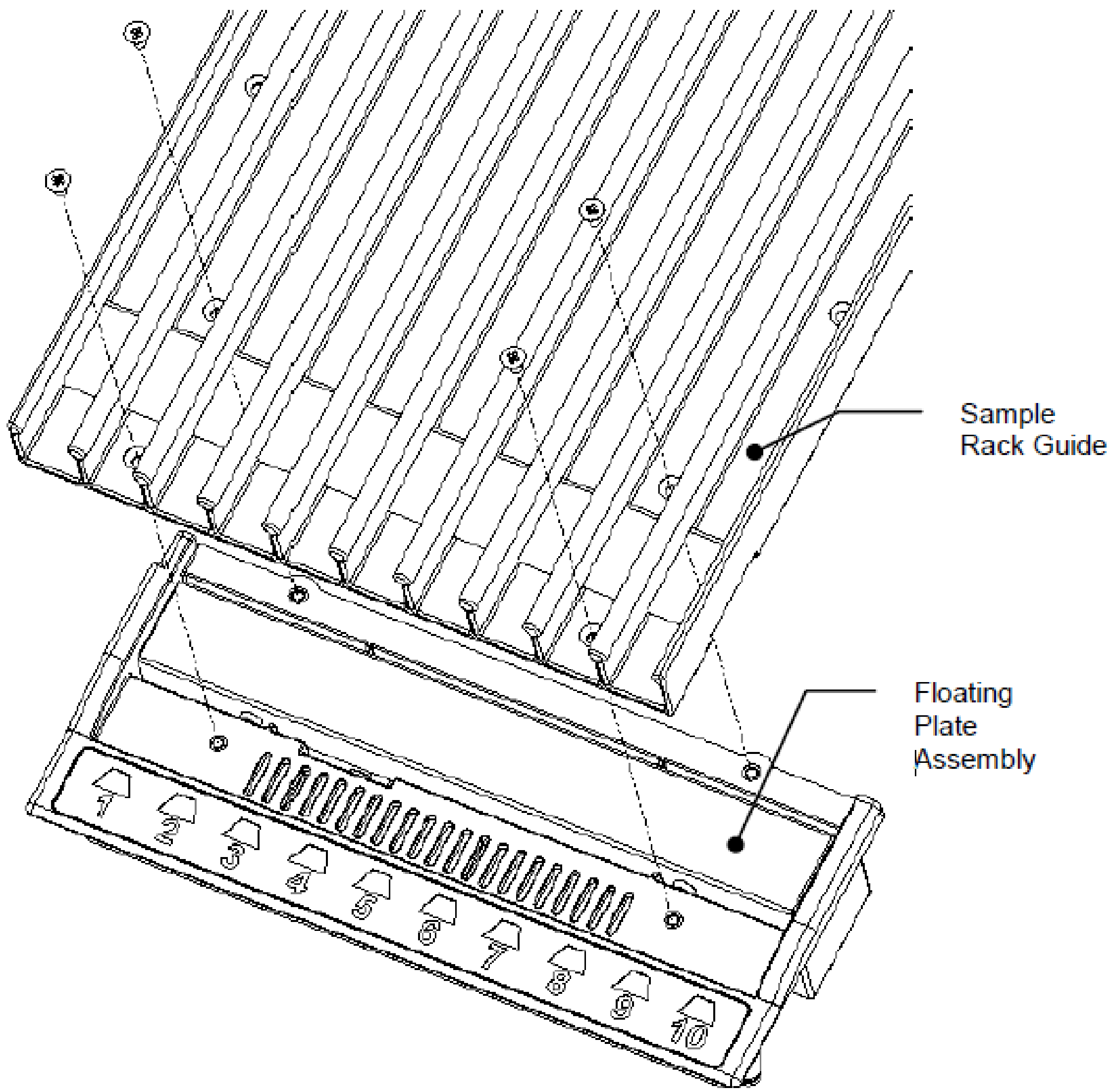


Figure L-3: Removing the Sample Rack Tray

2. The Magnetic Enclosure cover can be removed from the encoder housing by removing the 2 M3x6 Socket Head Cap Screws and washers (Figure L-4).

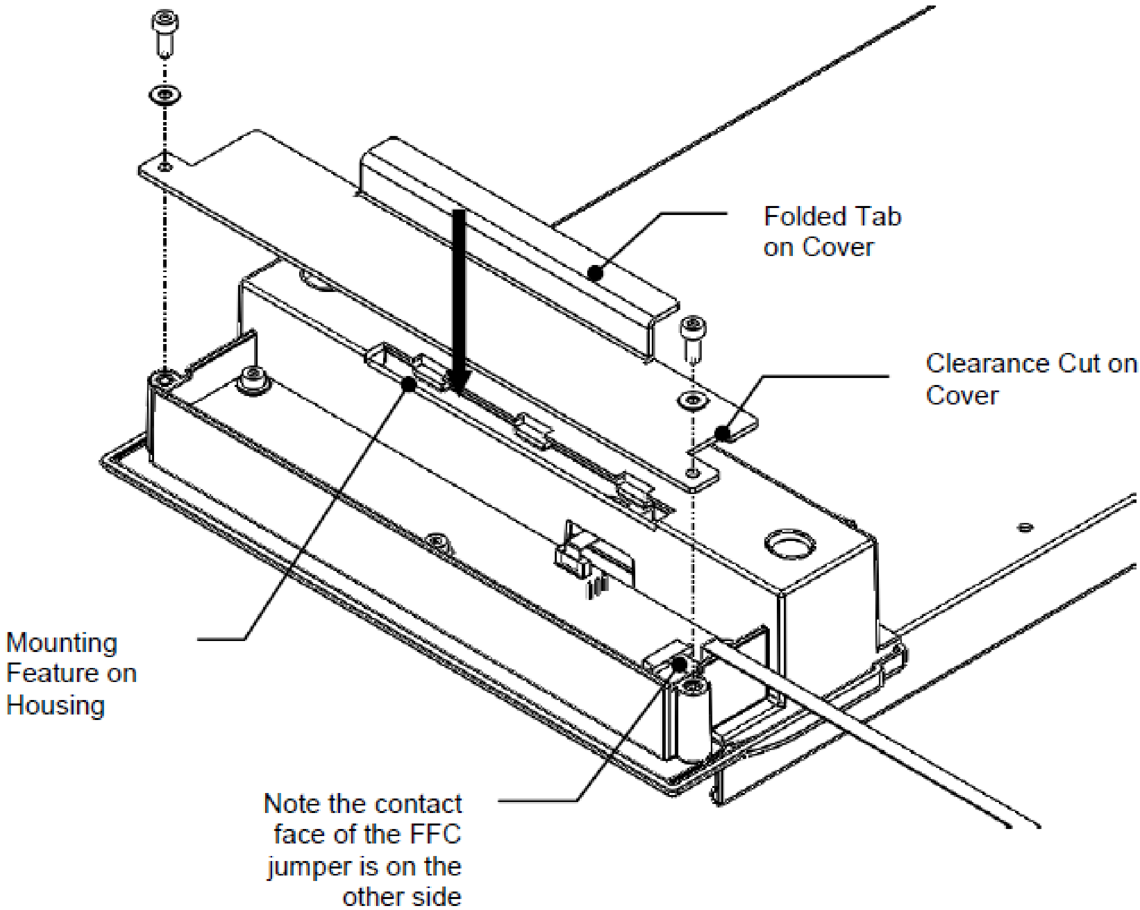


Figure L-4: Removing the Cover

3. Disconnect the FFC going to the indicator board.
4. The Floating Plate assembly is removed by lifting it off the dowels (Figure L-5).

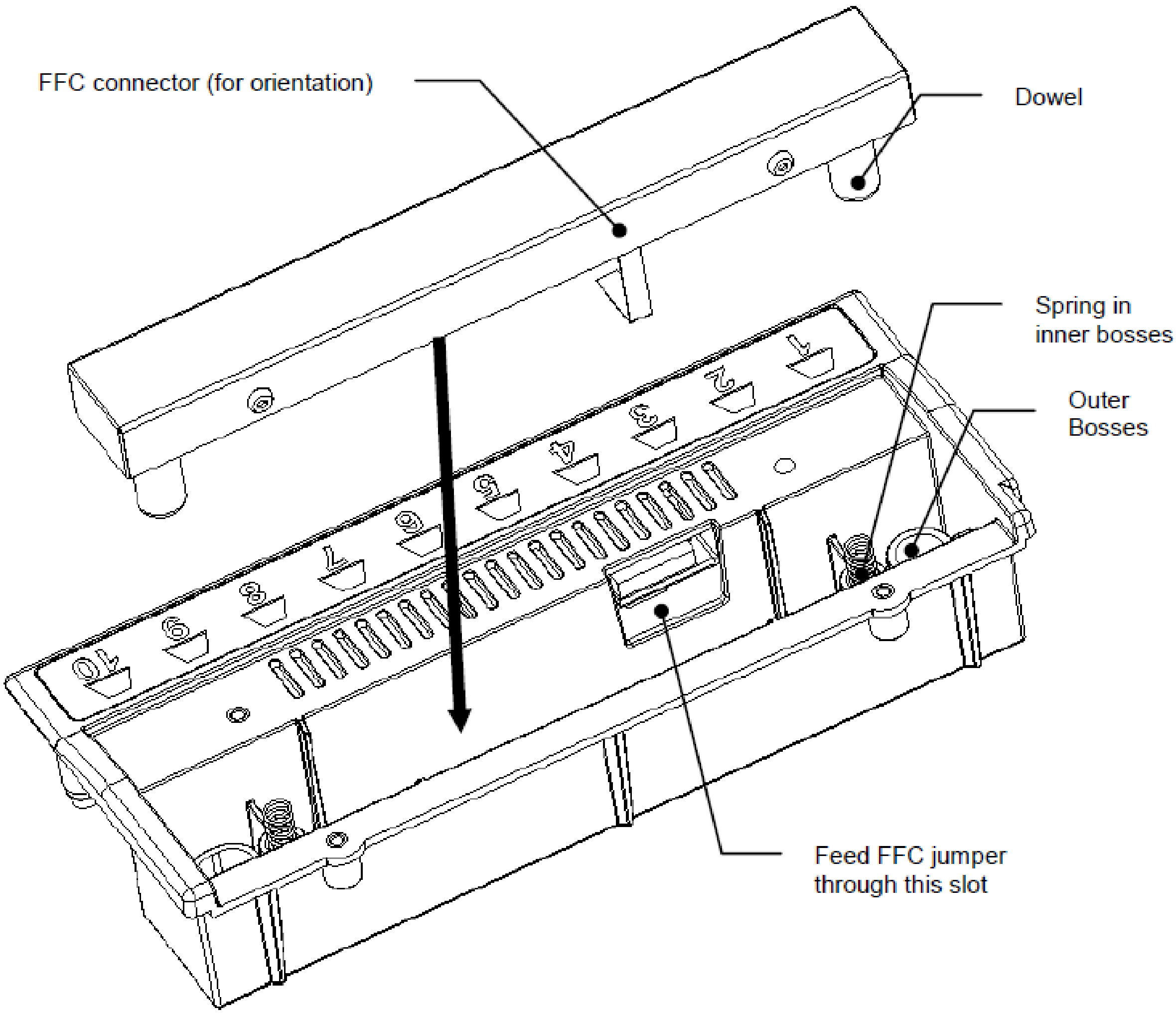


Figure L-5: Removing the Floating Plate Assembly

5. Remove the Magnetic Encoder Enclosure from the Floating Plate by removing the four M3x6 Socket Button Head Screws (Figure L-6).

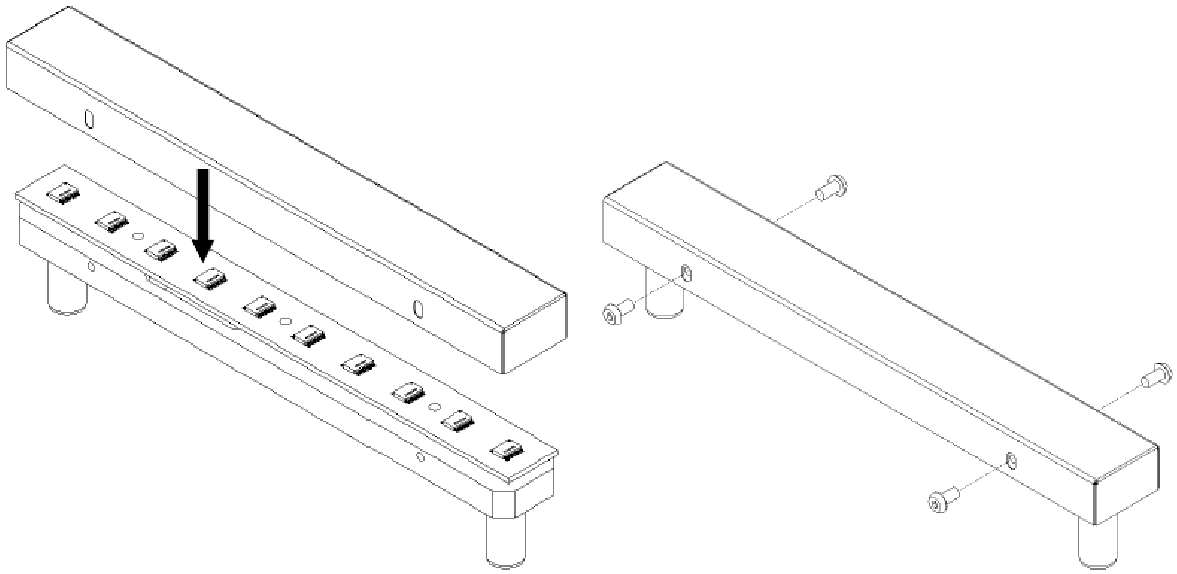


Figure L-6: Removing the Magnetic Encoder Enclosure

When rebuilding the encoder, the reverse of the above procedure should be employed. The following should be noted:

1. The FFC jumper should be placed on the PCB as shown in Figure L-8. The contact face of the FFC jumper should match the contact face of the connector.

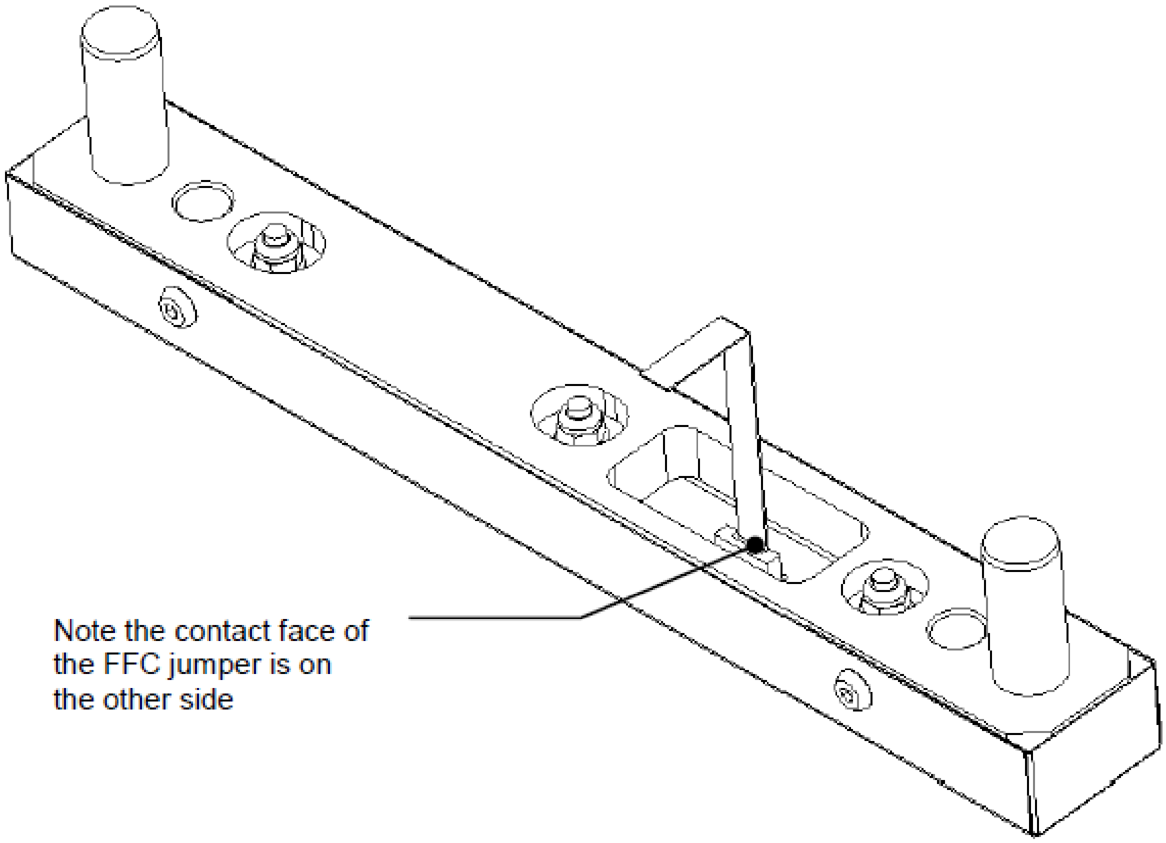


Figure L-8: Positioning of FFC Jumper

2. The compression springs (Figure L-6) should be placed on the outer bosses of the Encoder Housing and the FFC jumper should be fed through the slot on the Encoder Housing.

3. Plug the loose end of the FC jumper (coming thru the slot) into the connector on the bottom of the PCB (Figure L-9).

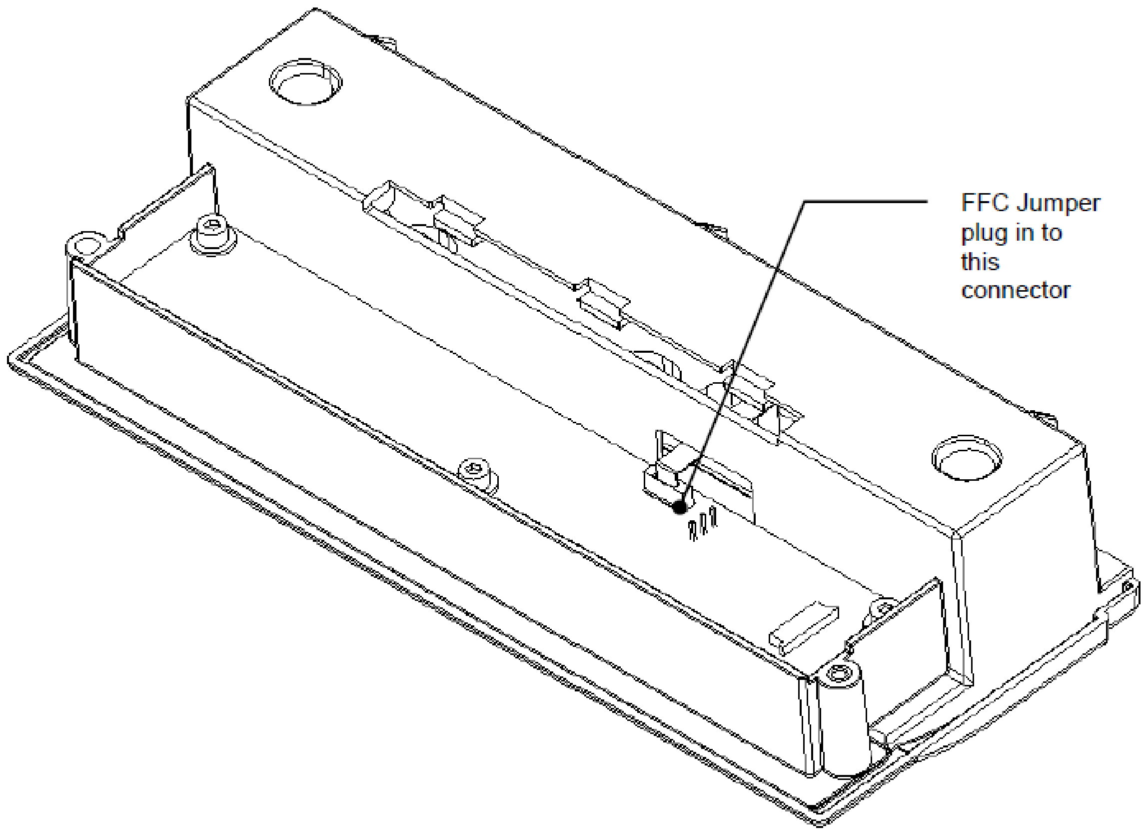


Figure L-9: Plugging the FFC Jumper into the PCB

4. After re-installing the floating plate, check that it is free to move downwards by pressing on the floating plate (Figure L-10). The plate should return to the original position upon release. This step should be done at two different positions of the plate.

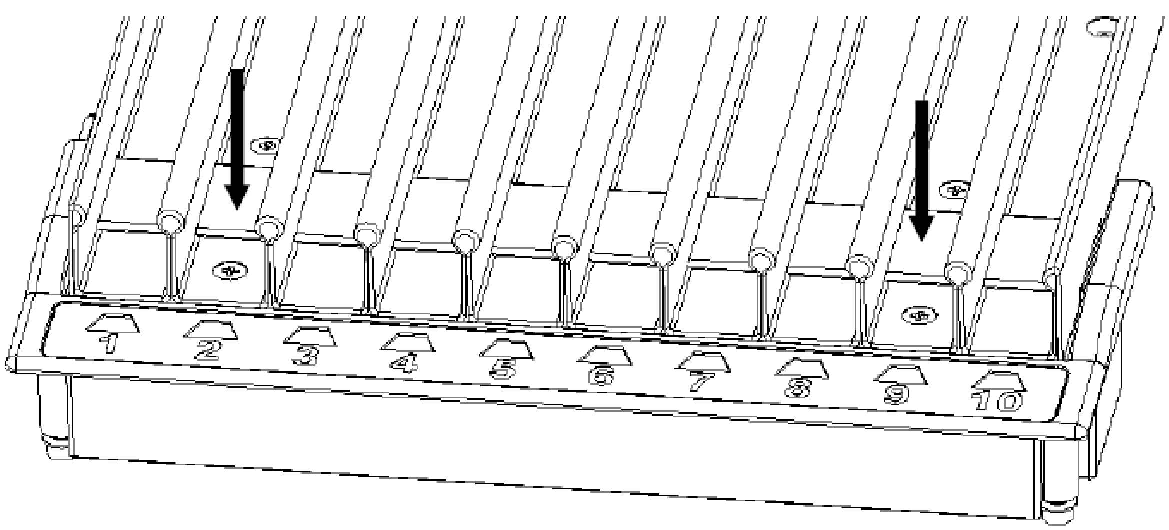


Figure L-10: Check that the Plate is Free to Move Downwards

L.2.2 Replacing the Rack Scanner Position Printed Circuit Board

The Rack Scanner Position Printed Circuit Board is located on the Floating Plate (Figure L-11) and is removed by removing the three M3 Nyloc Nuts and washers. When replacing the PCB, note the orientation as the connector should sit inside the slot on the Magnetic Encoder Floating Plate.

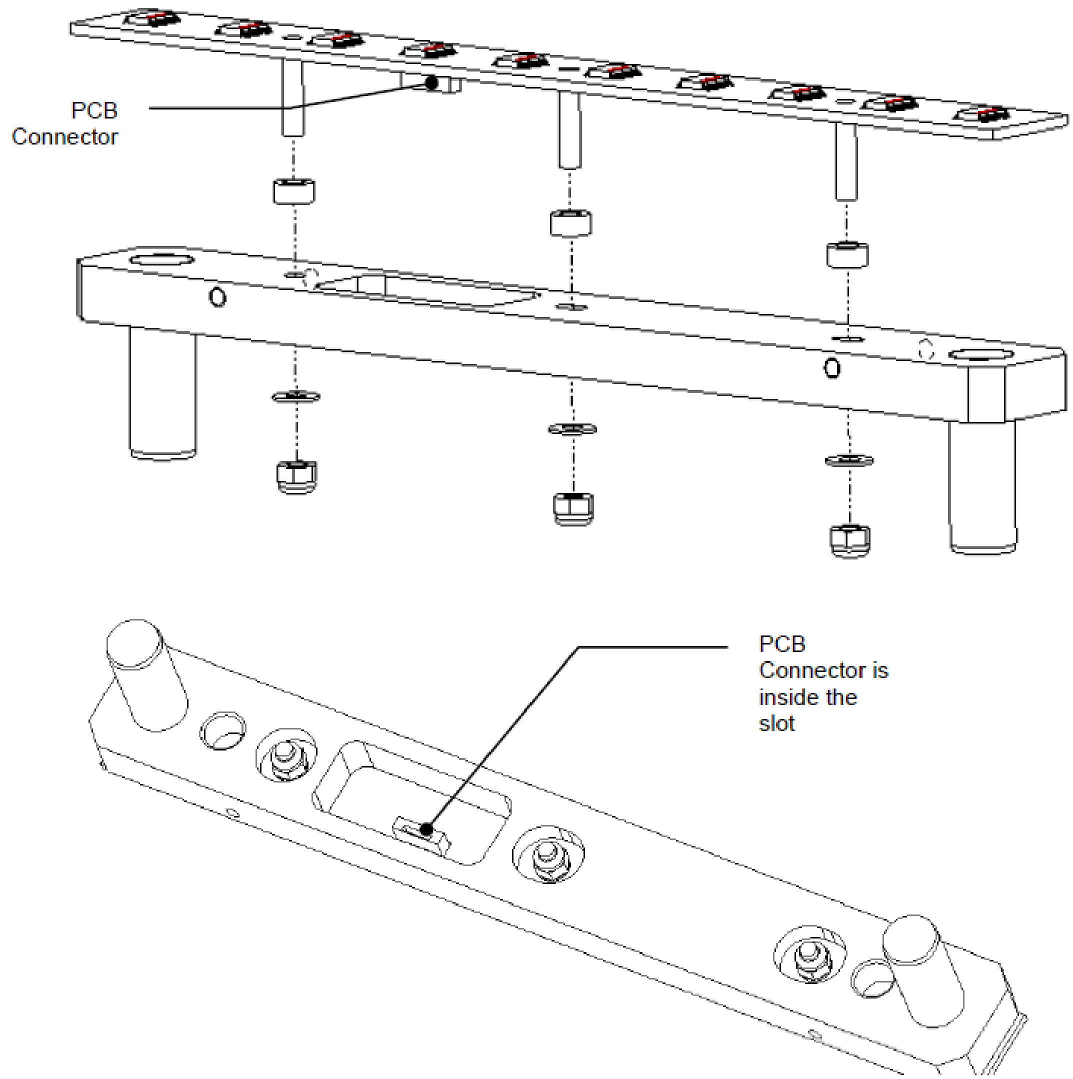


Figure L-11: The Rack Scanner Position Printed Circuit Board

L.2.3 Replacing the Rack Scanner Indicators Printed Circuit Board

The Rack Scanner Indicators Printed Circuit Board is attached to the Magnetic Encoder Housing as shown in Figure L-12 and can be removed by disconnecting the FFC from the Position PCB and then unscrewing the three M3x8 Socket Head Cap Screws and washers.

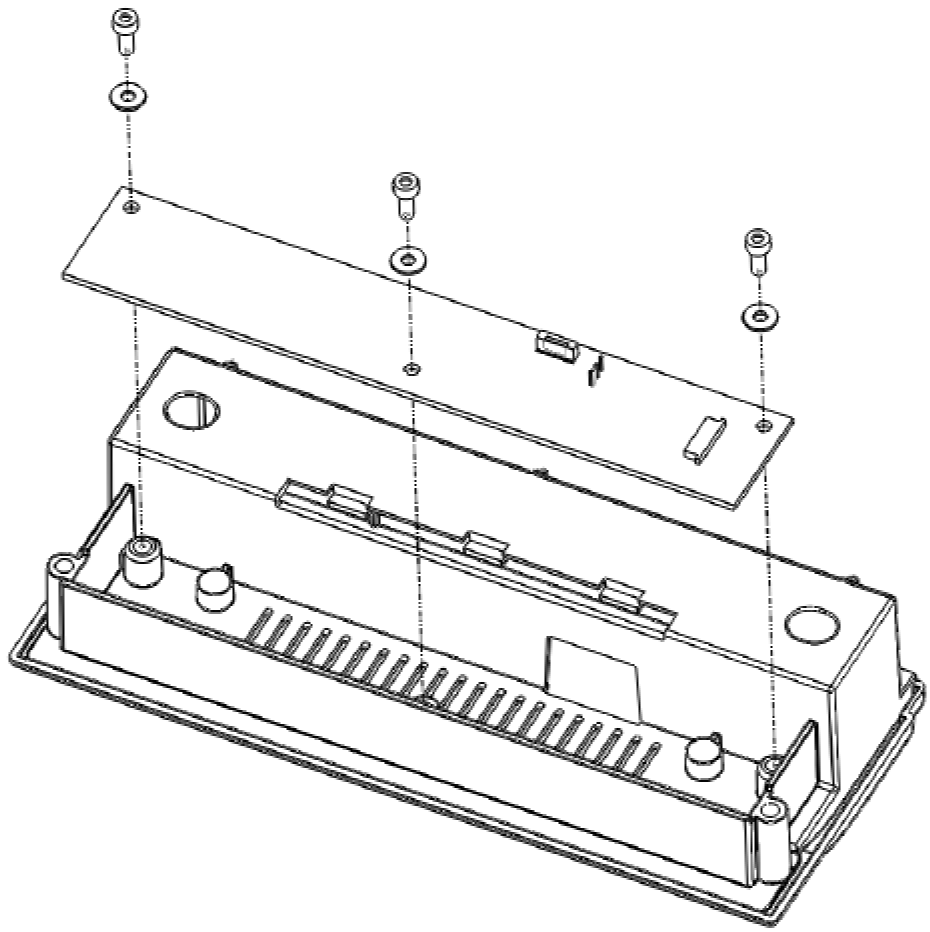


Figure L-11: The Rack Scanner Position Printed Circuit Board

Chapter M Power Switches

M.1 Power Controls

The main power switch for the system is located on the right rear panel and a second switch is located on the lower left panel immediately above the three USB ports. Both switches must be on for the operation of the system. The rear panel switch overrides the front panel switch.

M.2 Main Power Switch

The main power switch is mounted on the lower right corner of the rear panel as shown in Figure M-1.

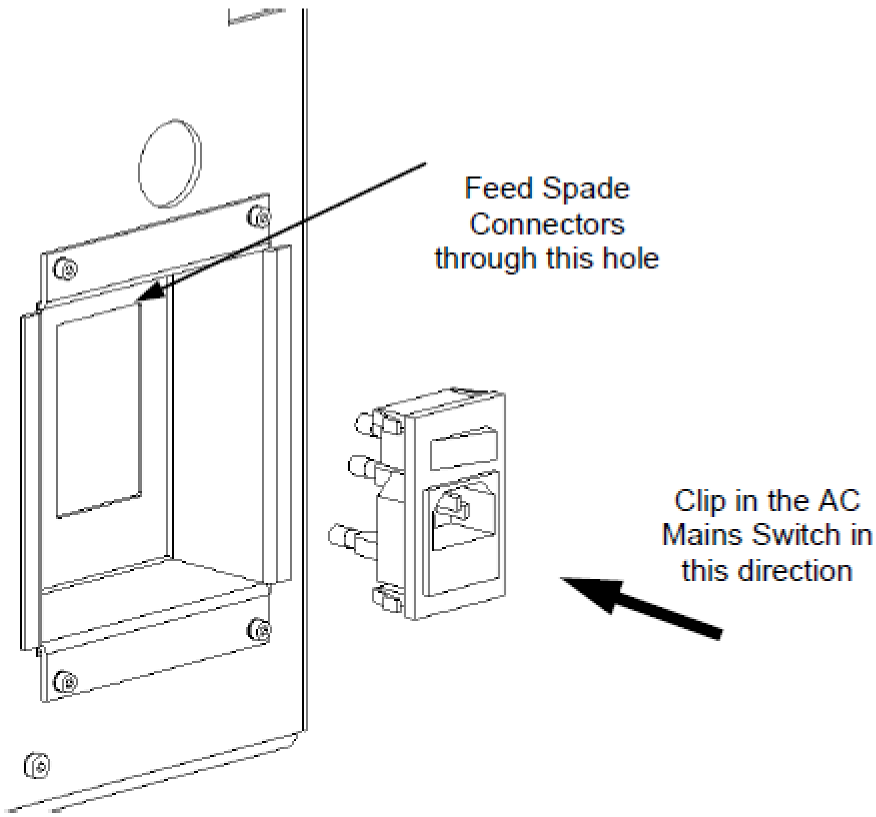


Figure M-1: Location of Main Power Switch

A fuse is located on the switch as shown in Figure M-2.

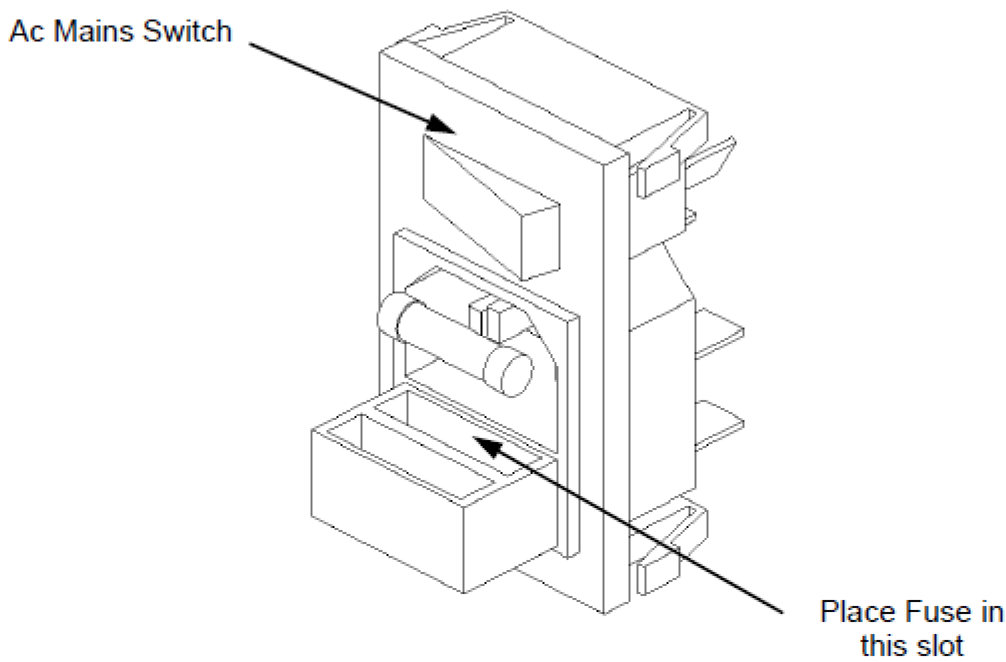


Figure M-2: Location of Fuse

When replacing the main power switch connecting, note the connections for the cables as shown in Figure M-3 through M-5.

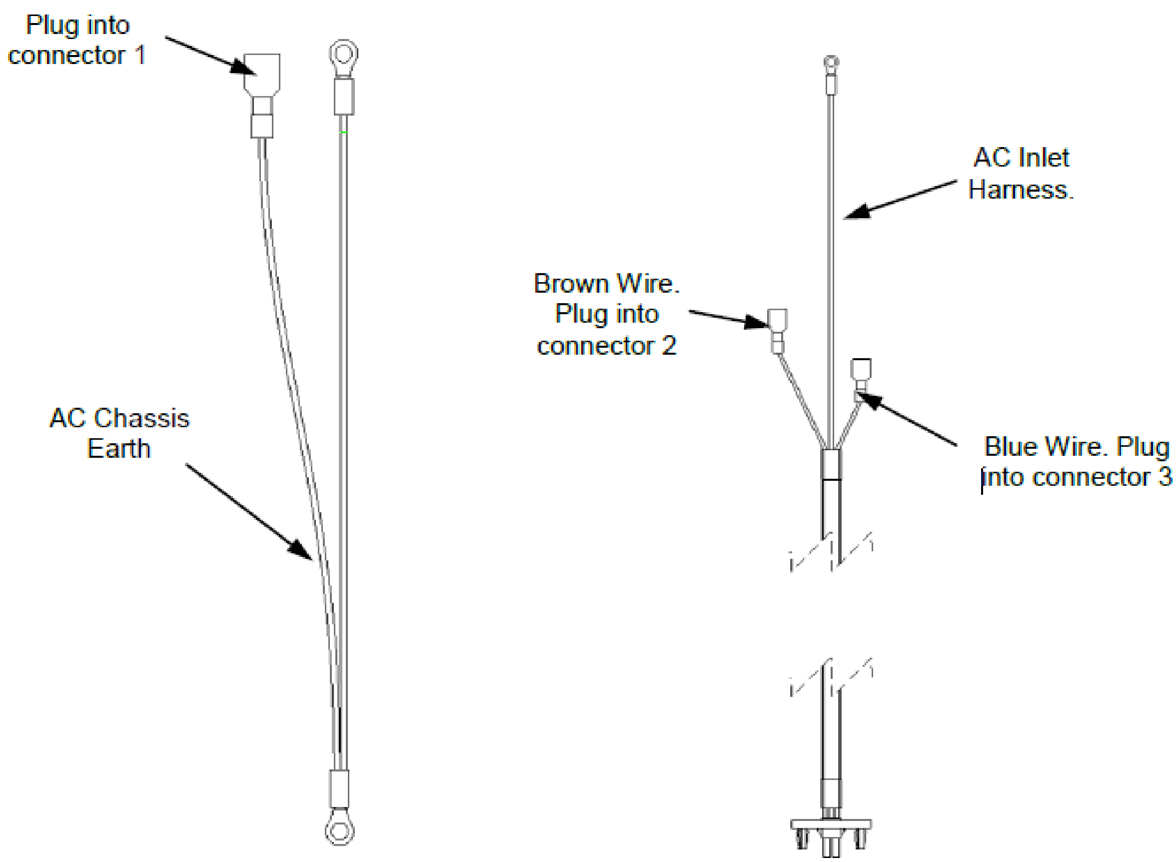


Figure M-3: Cables for Power Switch

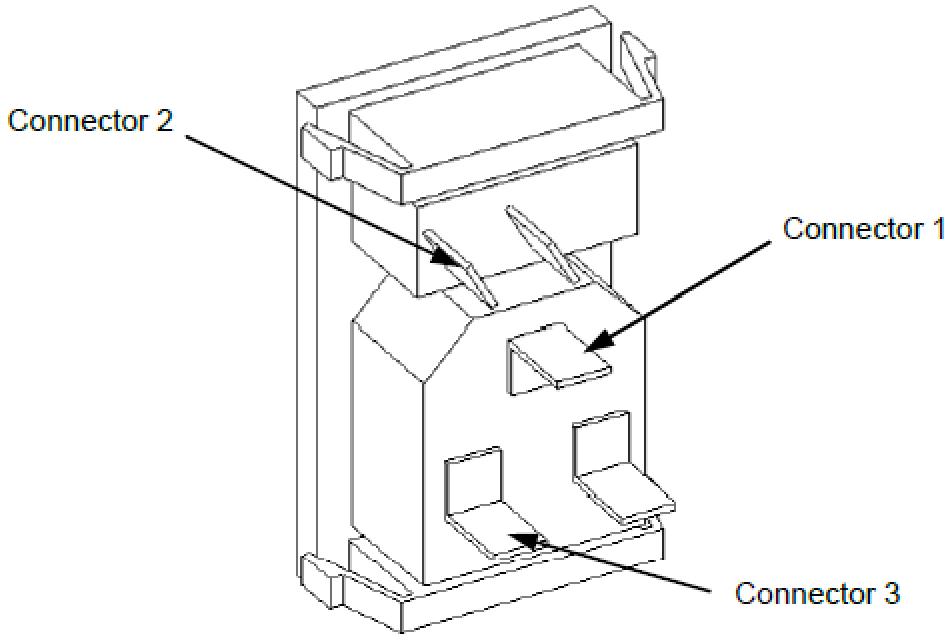


Figure M-4: Power Connections

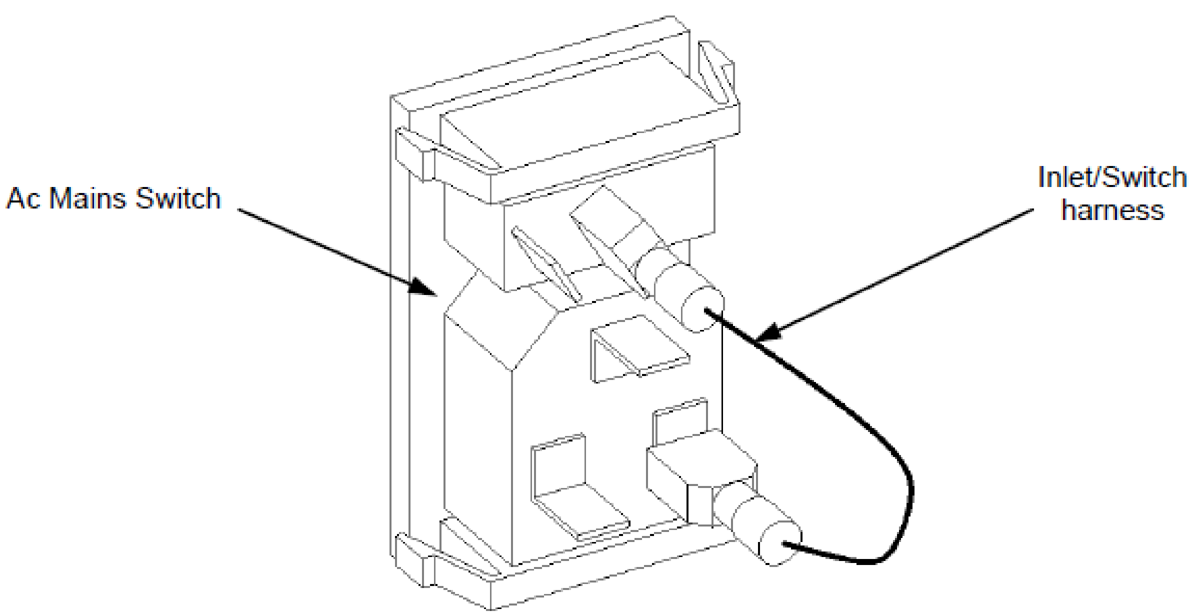


Figure M-5: Inlet Switch Harness

M.3 Front Panel Power Switch

The Front Panel Power Switch is mounted on the left hand base panel as shown in Figure M-6.

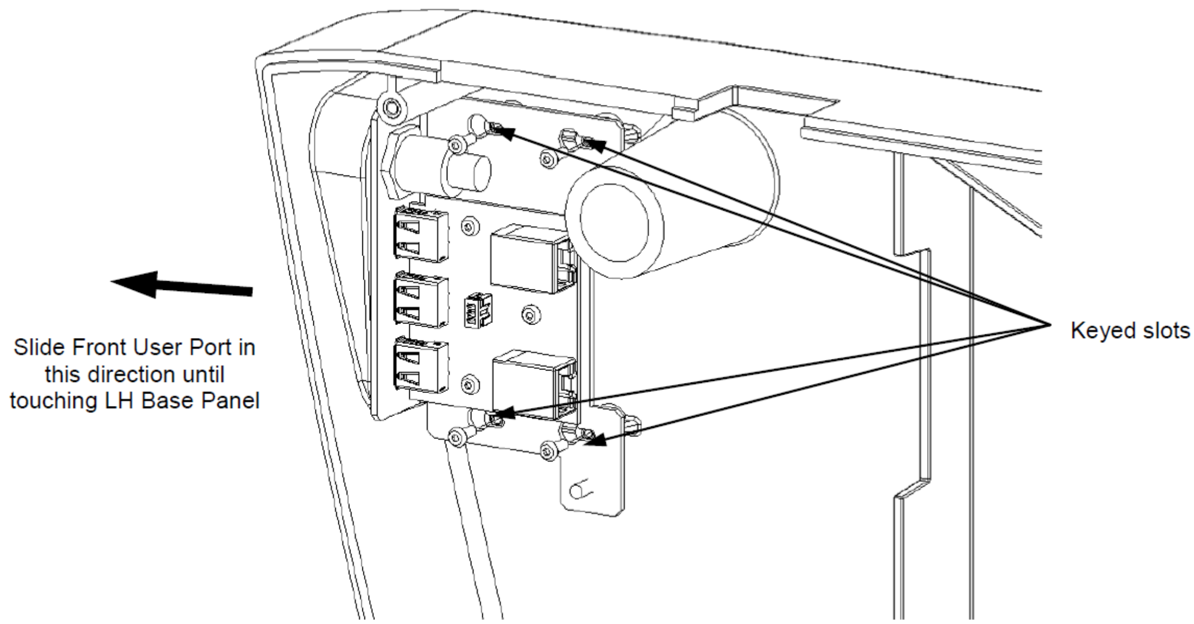


Figure M-6: Location of Front Panel Power Switch

The power switch can be removed from the assembly by unscrewing the nut and disconnecting the cable as shown in Figure M-7.

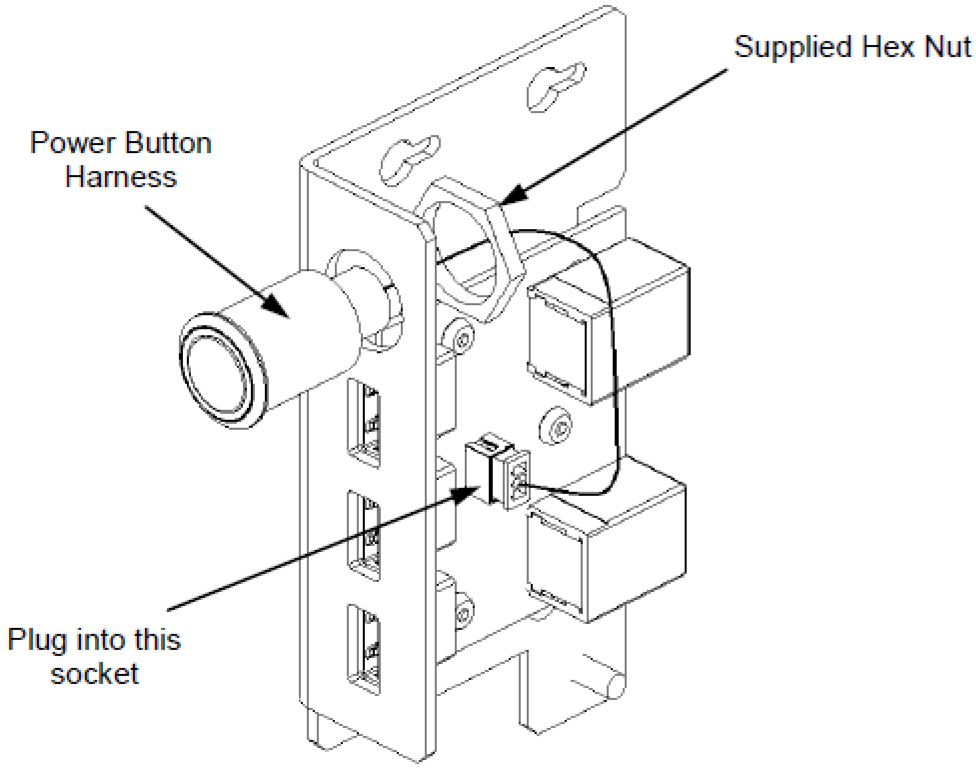


Figure M-7: Replacing the Power Button

> ***Note:*** *When replacing the Front Panel Power Switch, make certain that the grounding strap is connected as shown in Figure M-8.*

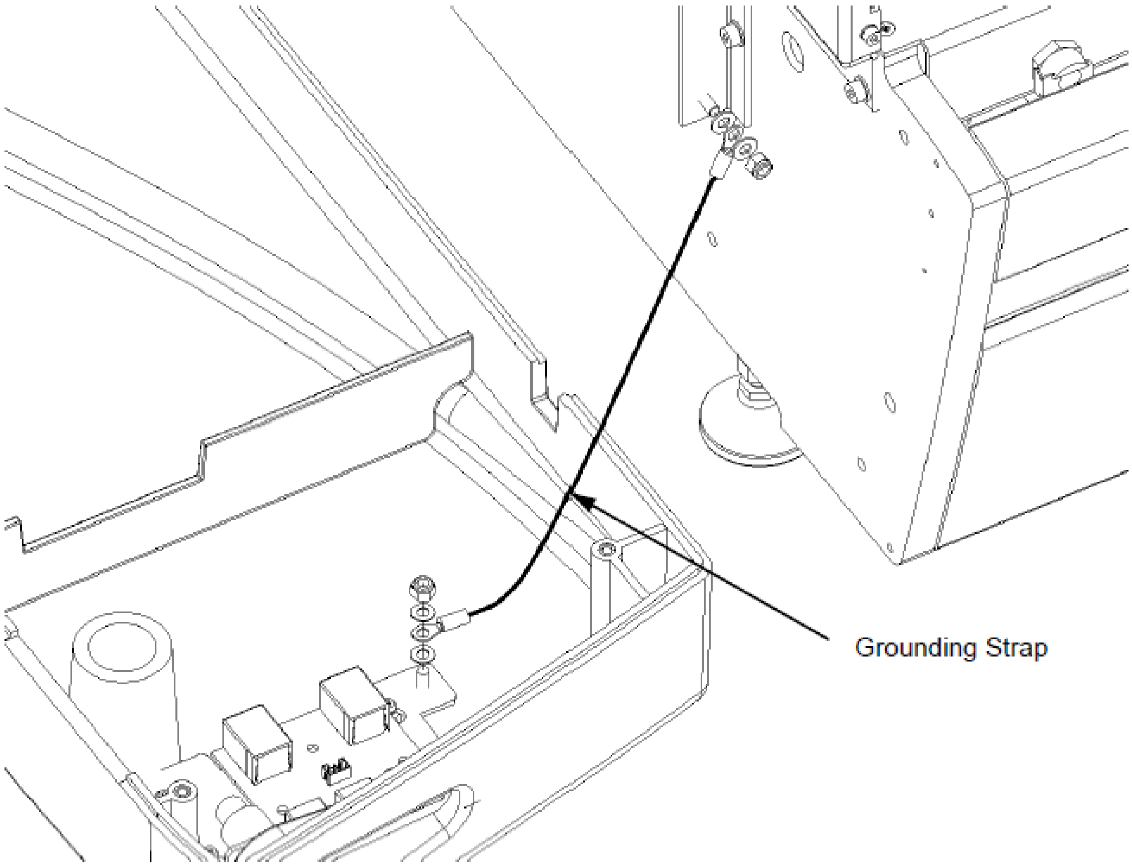


Figure M-8: Grounding Strap

This page intentionally left blank.

Chapter N Reader Assembly

N.1 Removing the Reader Assembly from the System

The *Reader Assembly* is located in the Reader Enclosure and can be removed from the system by removing the two fittings as shown in Figure N-1.

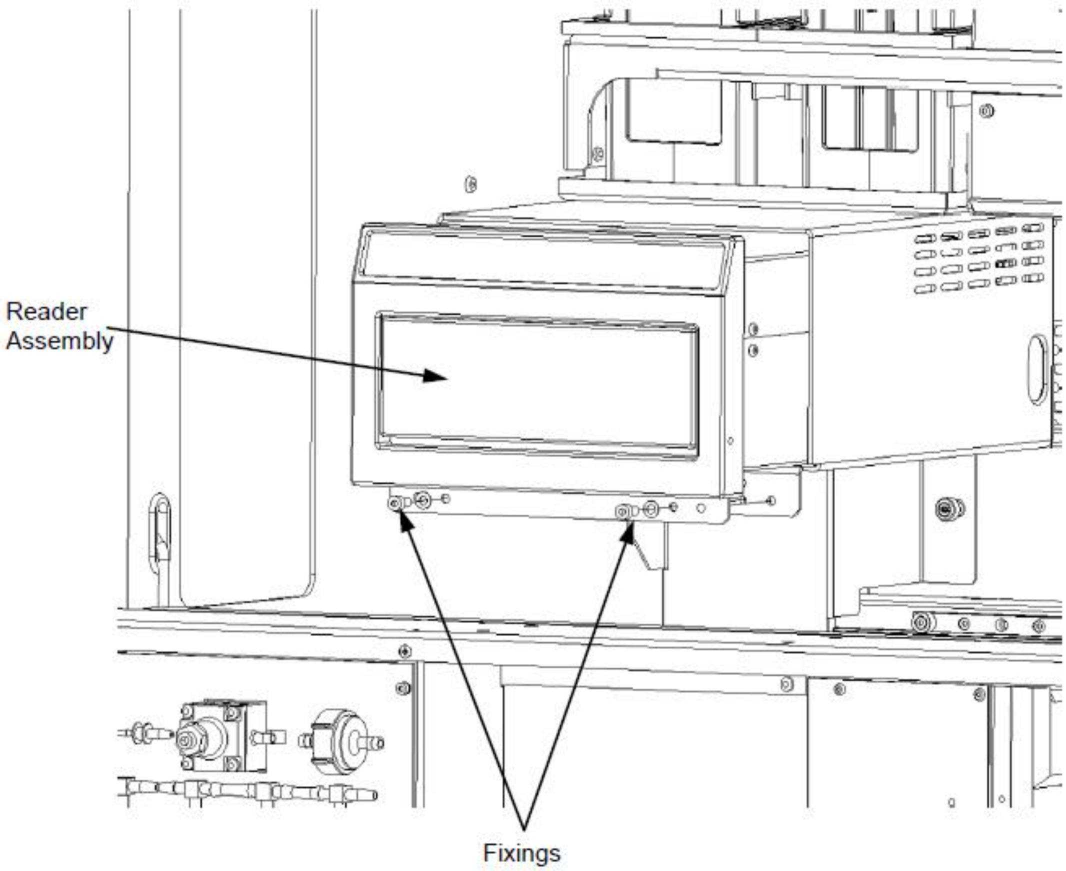


Figure N-1: Reader Assembly

N.2 On-Site Service Activities

N.2.1 Replacing the Lamp Assembly

The most common service issue regarding the reader is replacing the Lamp Assembly. While this can be performed by the end user, it is likely that the service engineer will perform this operation for some users. It should be noted that lamp has a typical lifetime of 2000 hours.

The Lamp assembly is accessed by the door on the right rear corner of the reader assembly (Figure N-2)

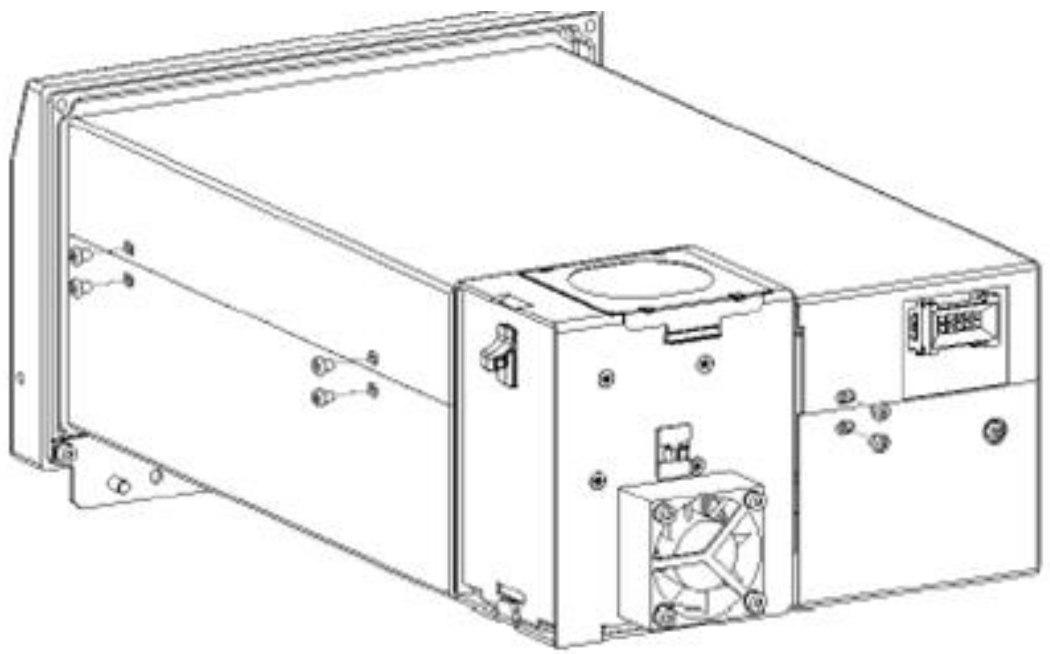


Figure N-2: Access to Lamp Assembly

To replace the lamp:

1. Slide out the Primary Optics Assembly (Figure N-3).

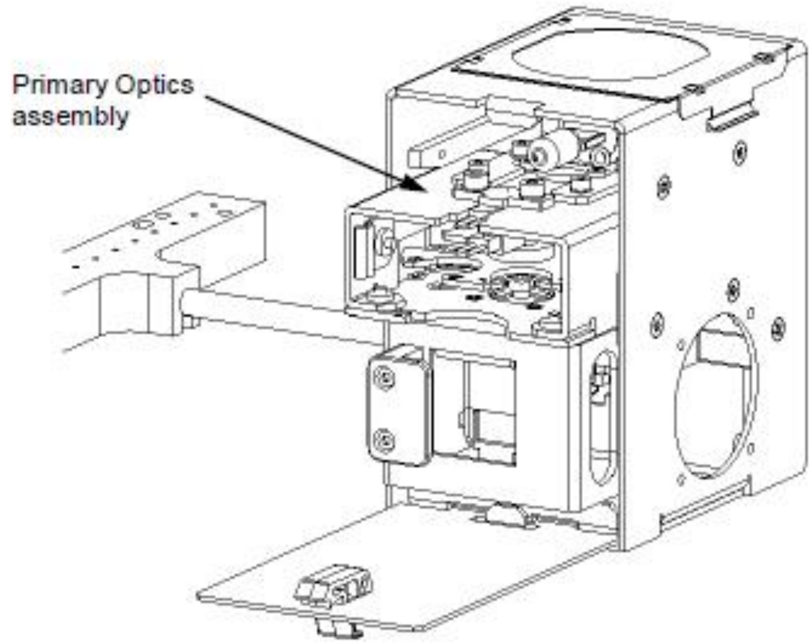


Figure N-3: Primary Optics Assembly

2. Remove the Reader Lamp Assembly from Lamp Bracket by unscrewing the two M3x8 Socket Cap Head Screws and two M3 Washers (Figure N-4).

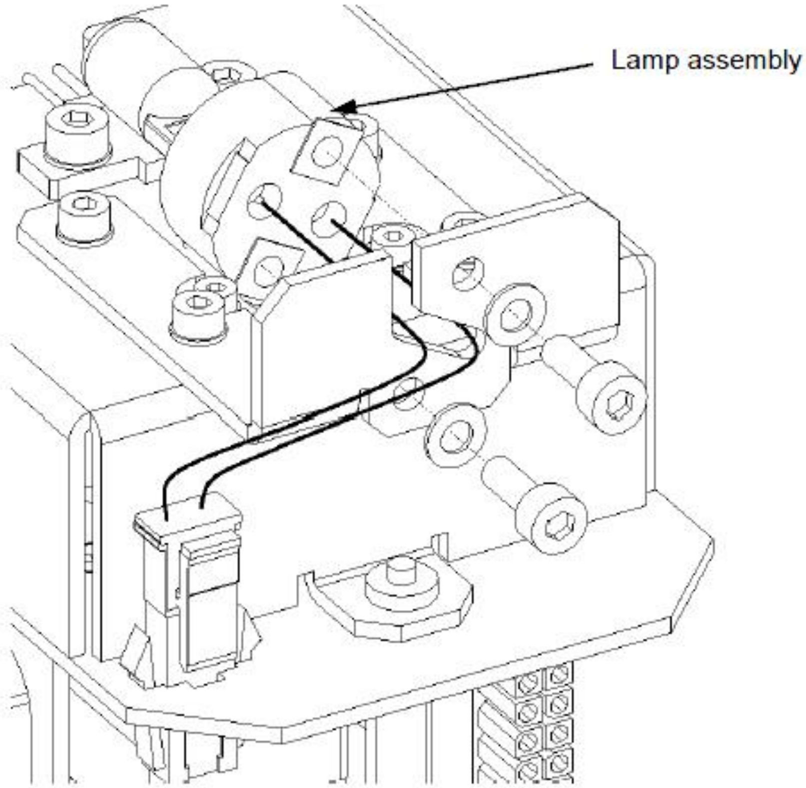


Figure N-4: Removing the Lamp Assembly

3. Disconnect the lamp harness to the connector on the Motor Plate.

> **Note:** *When replacing the lamp, take care not to get fingerprints or other foreign material on it. It is recommended that gloves are worn during this procedure. If fingerprints or other foreign material gets deposited on the lamp, remove it with a soft tissue saturated with methanol.*

4. After the cap head screws are tightened, place Loctite 425 on them to secure them.

N.2.2 Replacing the Filter

A 405 nm filter is placed in position 1 of the filter wheel (Figure N-5) which is mounted on the lamp assembly. To replace the filter, remove the existing filter and install a new filter (41500405) into position 1 of the Filter Wheel. Push the filter past spring tines such that the annular grove aligns with the filter wheel slot.

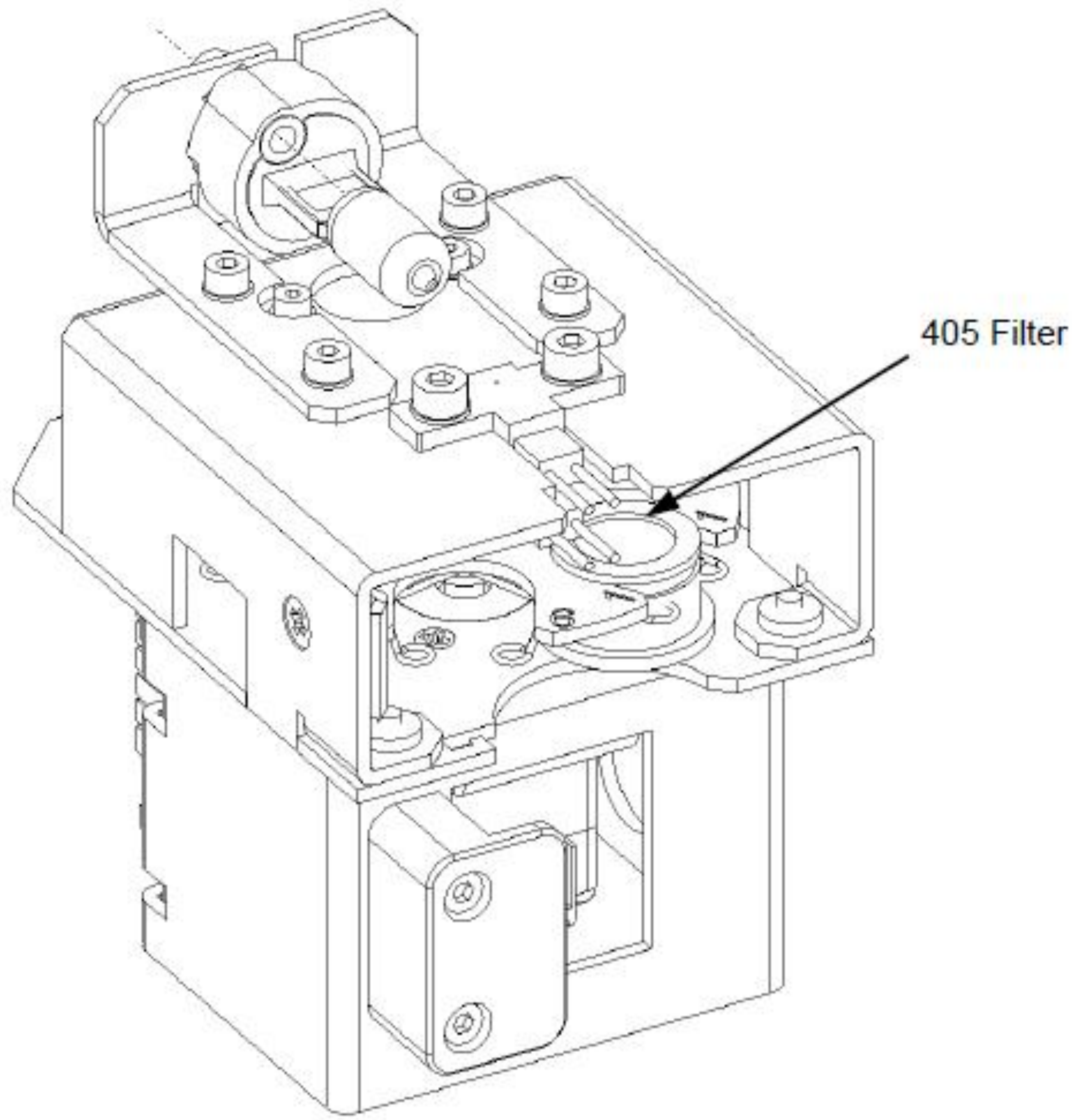


Figure N-5: 405 Filter

N.3 Depot Servicing of the Reader

Note: If there is a problem with the reader in a field unit, it is suggested that the entire unit be sent to a depot and a replacement reader installed.

N.3.1 Removing the Cover

Eight screws are used to secure the covers (Figure N-6).

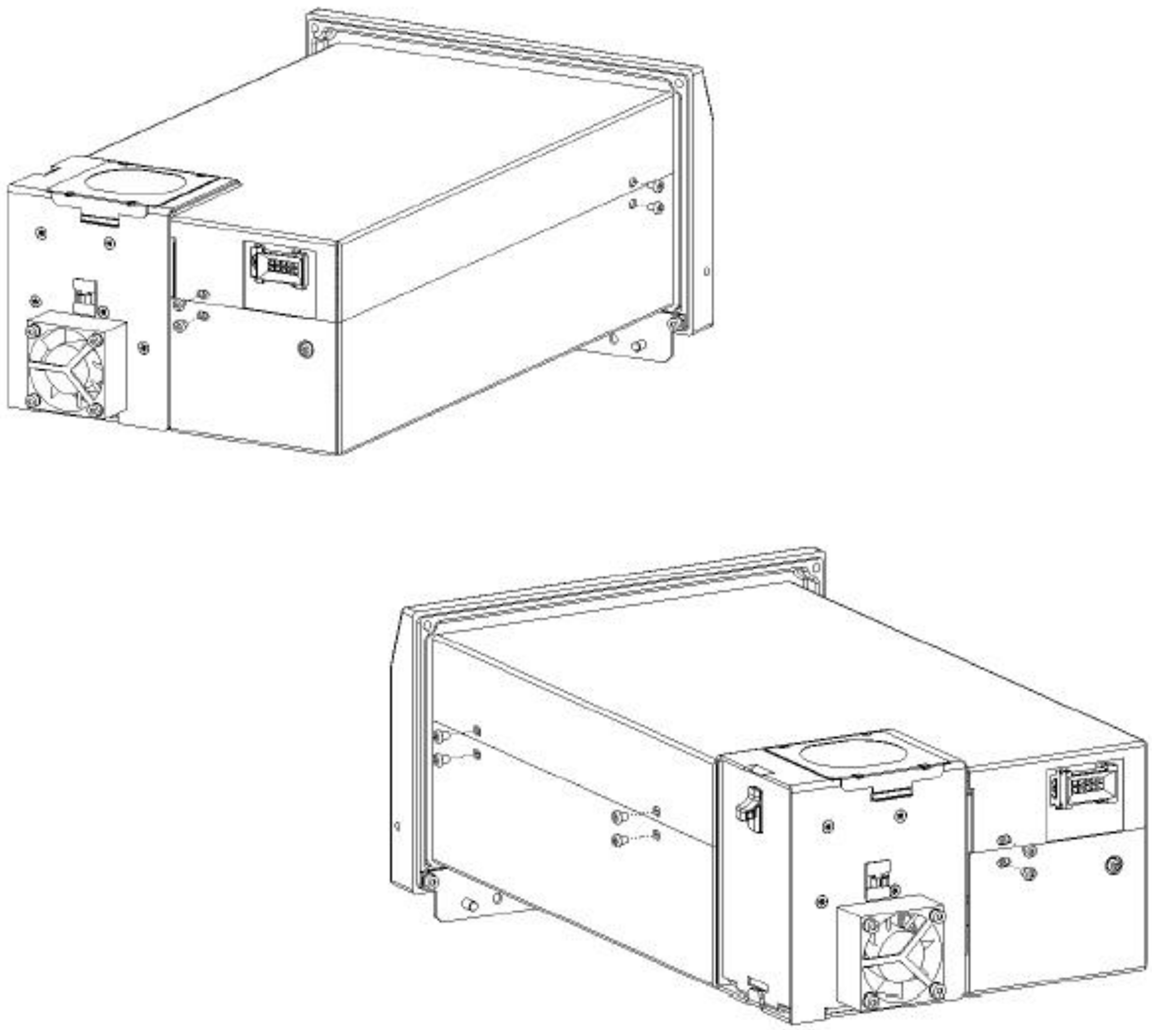


Figure N-6: Screws Securing the Reader Covers

N.3.2 Replacing the Fan

The fan is mounted to the rear of the Baseplate (Figure N-7). It is removed by using unscrewing the four M3x25 Socket Cap Head Screws and four M3 Washers and disconnecting the fan cable from the loose connector of the Primary Optics Harness.

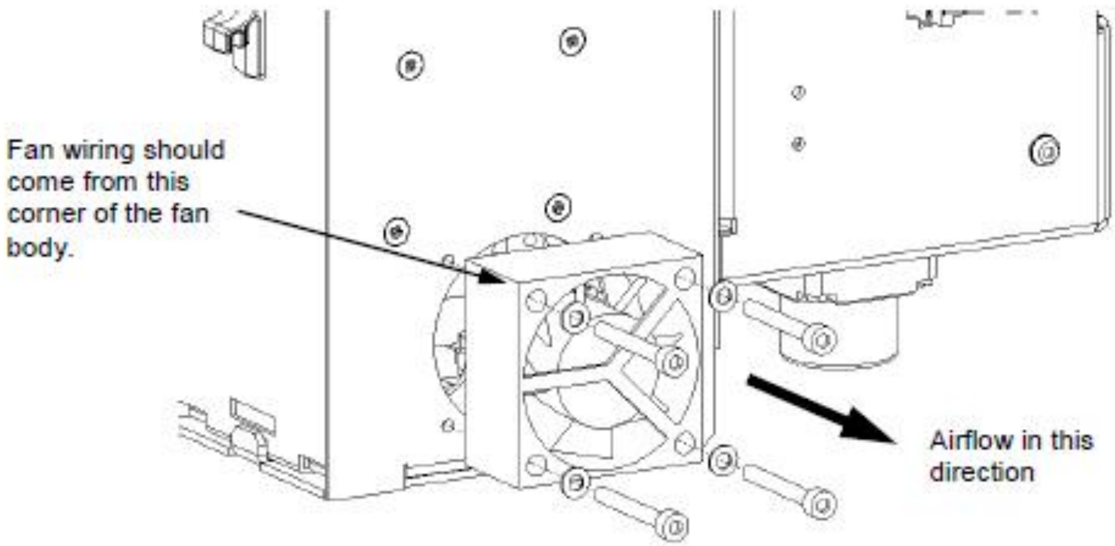


Figure N-7: Replacing the Fan

> ***Note:*** *When replacing the fan, mount it with the airflow blowing away from the assembly, as denoted in Figure N-6 and the wiring come from the upper left corner.*

N.3.3 Removing the Reader PCB

The Reader PCB covers the Optics Block as well as the tray that transports the microplate. It must be removed to access these items.

To remove the Reader PCB:

1. Disconnect all cables from the Reader PCB (Figure N-8) and disconnect the fan cable from the loose connector of the Primary Optics Harness.

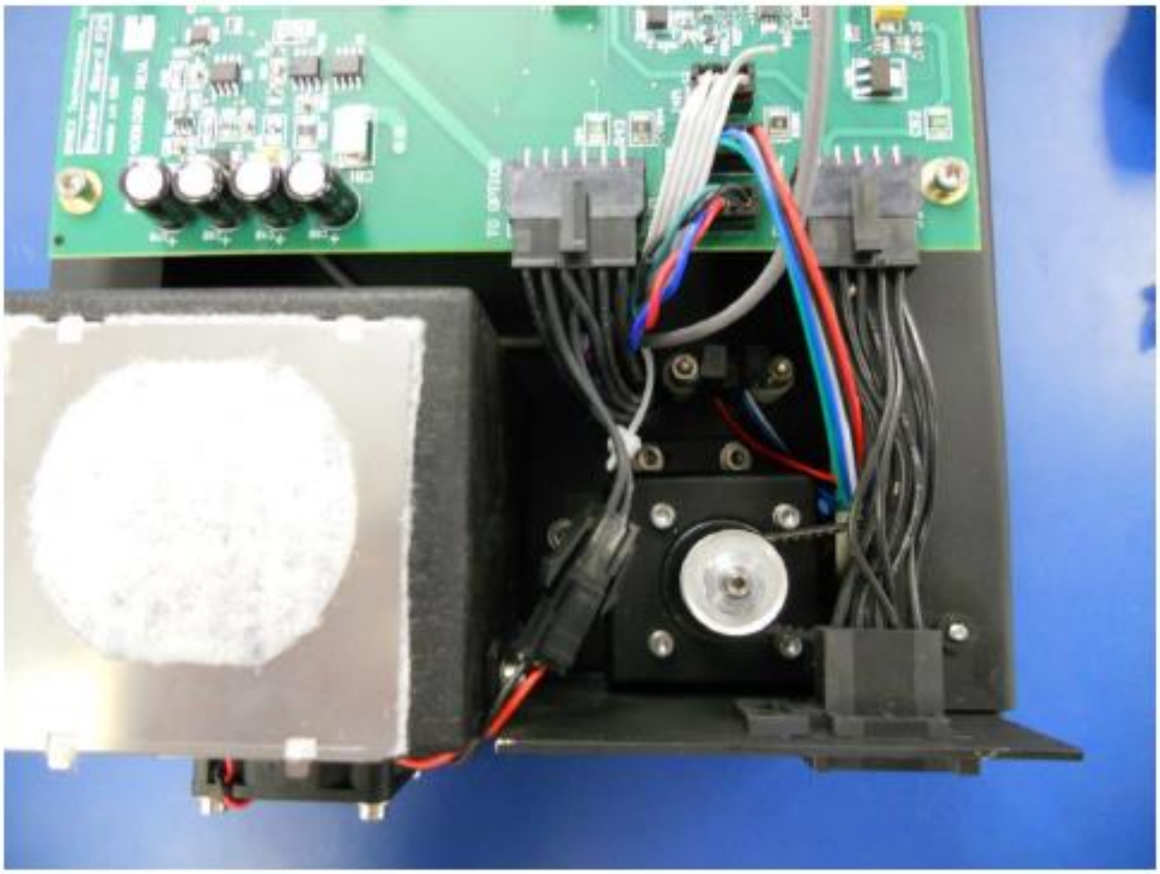


Figure N-8: Cables on the Reader PCB

2. Remove the Reader PCB by removing the six cap head screws (Figure N-9).

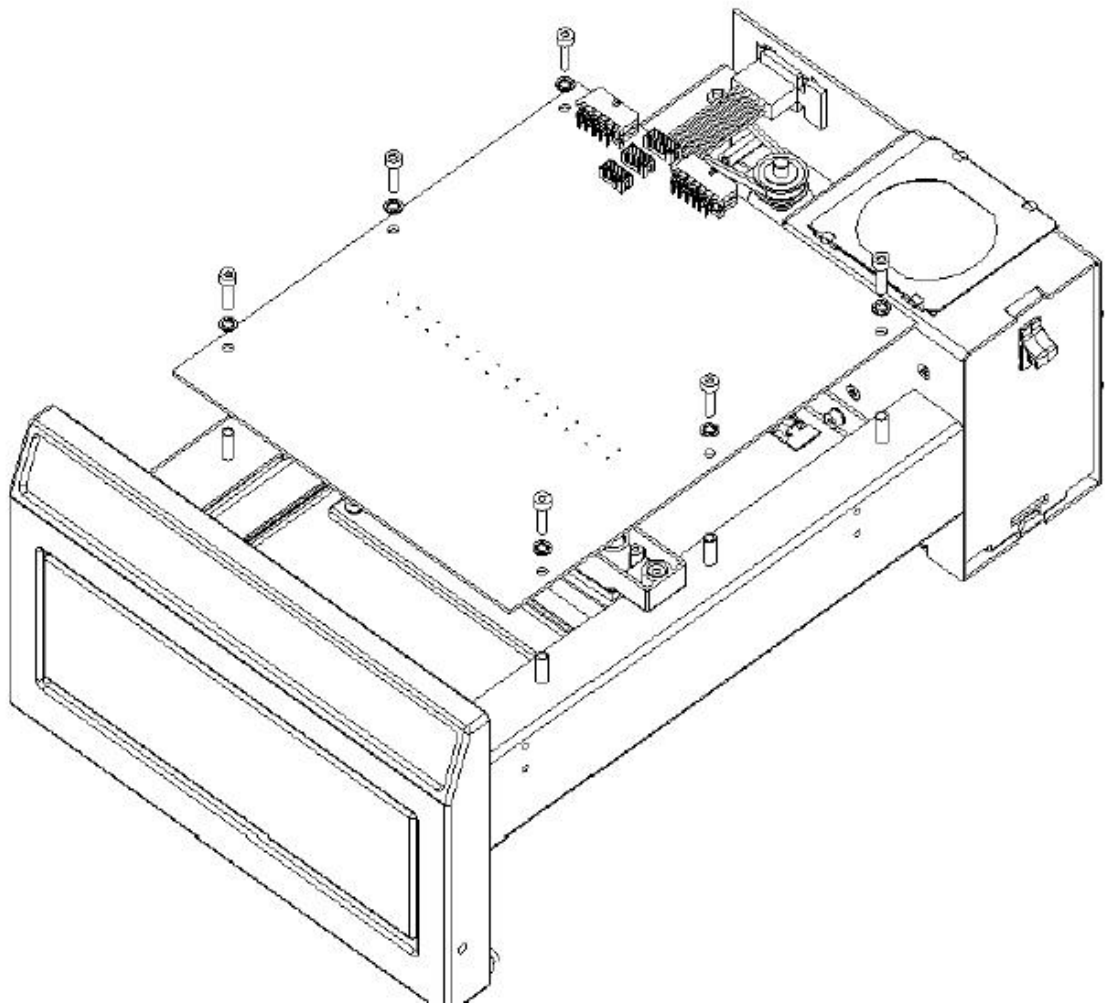


Figure N-9: Removing the Reader PCB

> ***Note:*** *When replacing the PCB, Ensure that the diodes on the Reader PCB sit in the holes of the Upper Optics Block.*

N.3.4 Replacing the Optics

The optics for the reader consists of two specific components, an Upper Optics assembly and a Lower Optics assembly.

To remove the Optics assemblies:

1. Remove the PCB (Section N.3.3).
2. Remove the Upper Optics assembly by unscrewing the two M3x10 Socket Cap Head Screws and disconnecting the Reference Diode wire (Figure N-10).

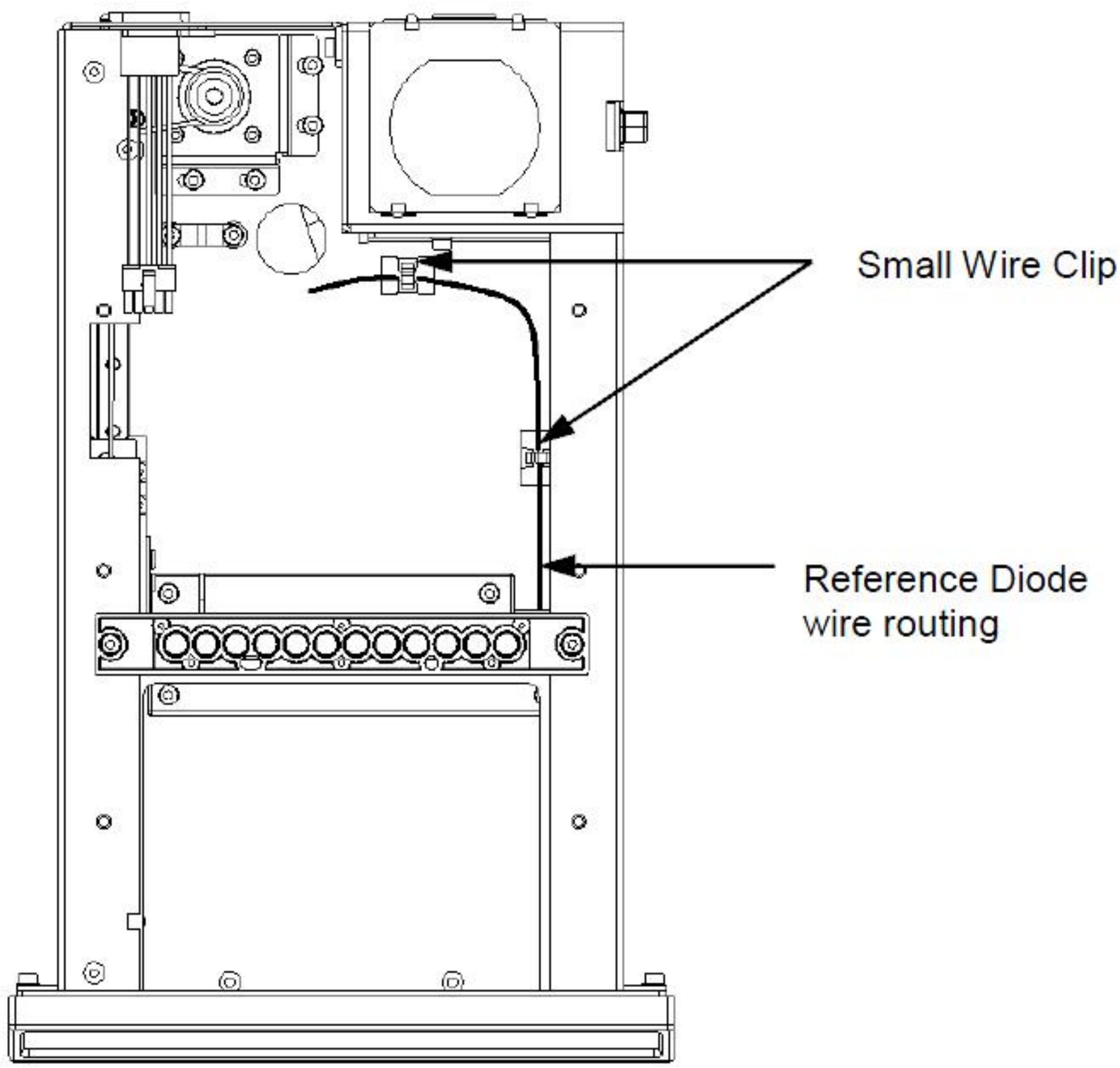


Figure N-10: Removing the Upper Optics Block

3. Remove the Lower Optics assembly by removing the four screws that attach it to the baseplate. These screws are located on the bottom of the baseplate.

To replace the Optics Assemblies

1. Place an O Ring over the reference Diode in the Lower Optics assembly. Slide two Alignment Pins through the Lower Optics and then through the Fiber Optics Block. Secure the Fiber Optics Block to the Lower Optics, ensuring the O Ring is in place, using four M3x20 Socket Cap Head Screws and four M3 Internal Tooth Washers. Care should be taken not to over tighten the screws (Figure N-11).

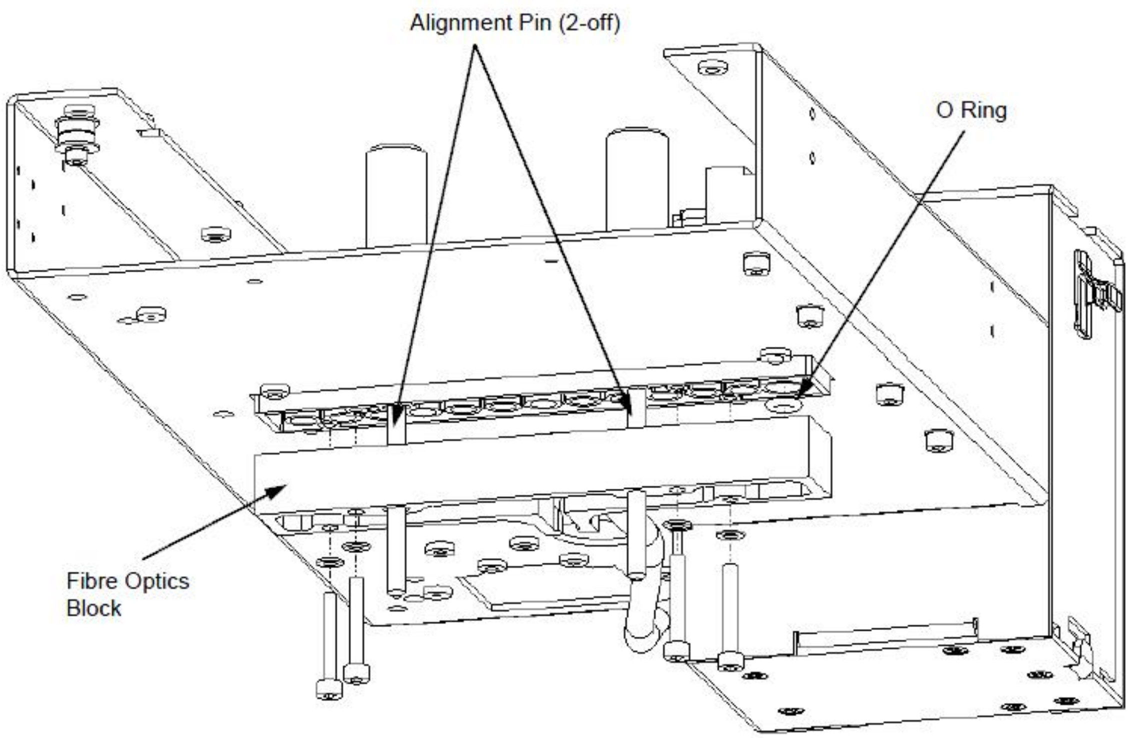


Figure N-11: Installing the Lower Optics Block

2. Loosely fit a Lens Strip and an Upper Stop to an Upper Optics Block using six M2x8 Socket Button Head Screws. Slide two Alignment Pins through the assembly and tighten the screws. Remove the Alignment Pin Handles (Figure N-12).

> ***Note:*** *Always handle optical components either with gloves or tweezers. Care should be taken not to over tighten the screws.*

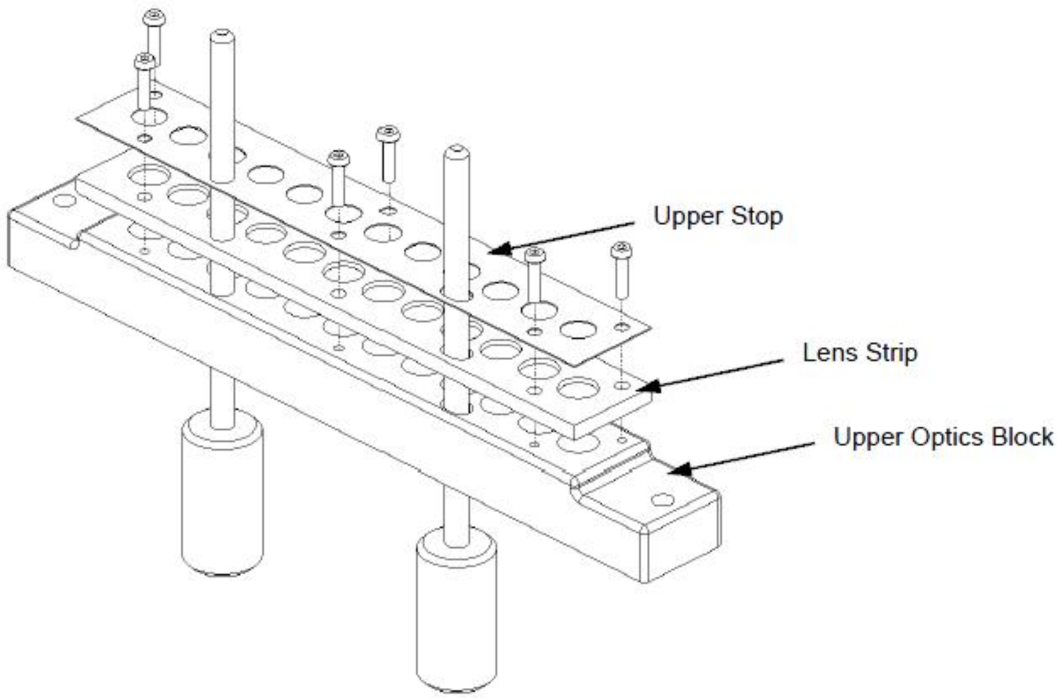


Figure N-12: Constructing the Upper Optics Block

3. Place a Reader Alignment Plate into a Plate Carrier. Place the two parts into the Reader Plate Holder. Push the Plate Carrier to the right of the Holder so the “v” profiles are nested (Figure N-13).

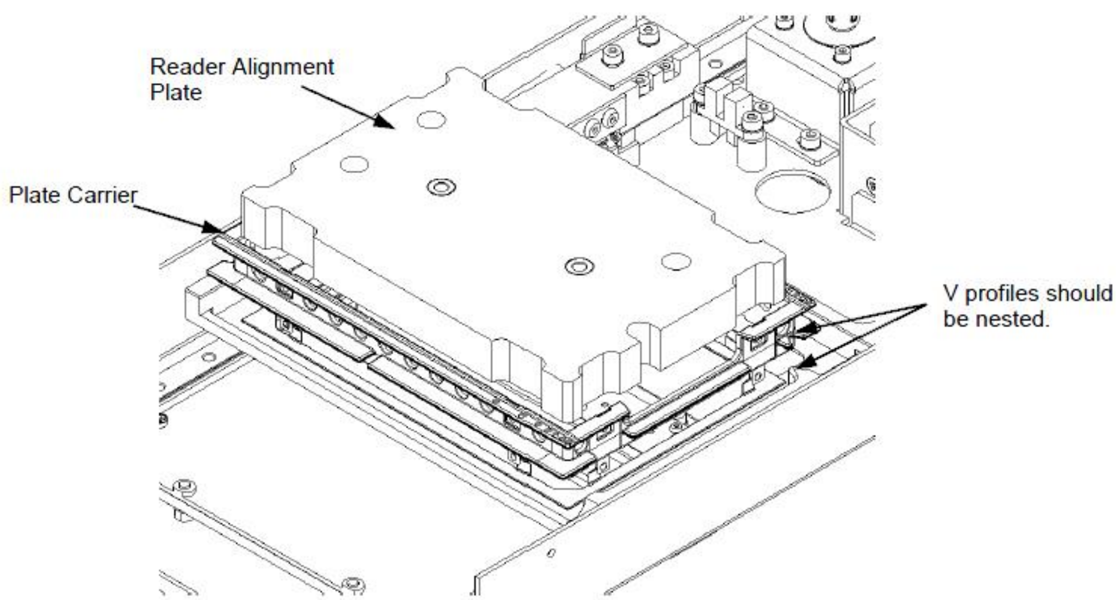


Figure N-13: Using the Reader Alignment Plate

4. Loosely fit the Upper Optics assembly to the Baseplate using two M3x10 Socket Cap Head Screws and two M3 internal Tooth Washers. Slide two Alignment Pins through the Upper Optics assembly, the Reader Alignment Plate, and the Lower Optics Assembly. Secure the Upper Optics assembly to the Baseplate as well as the three accessible screws of the Lower Optics assembly. Finally, remove the fixtures and tighten the final screw fixing the Lower Optics assembly to the Baseplate (Figure N-14).

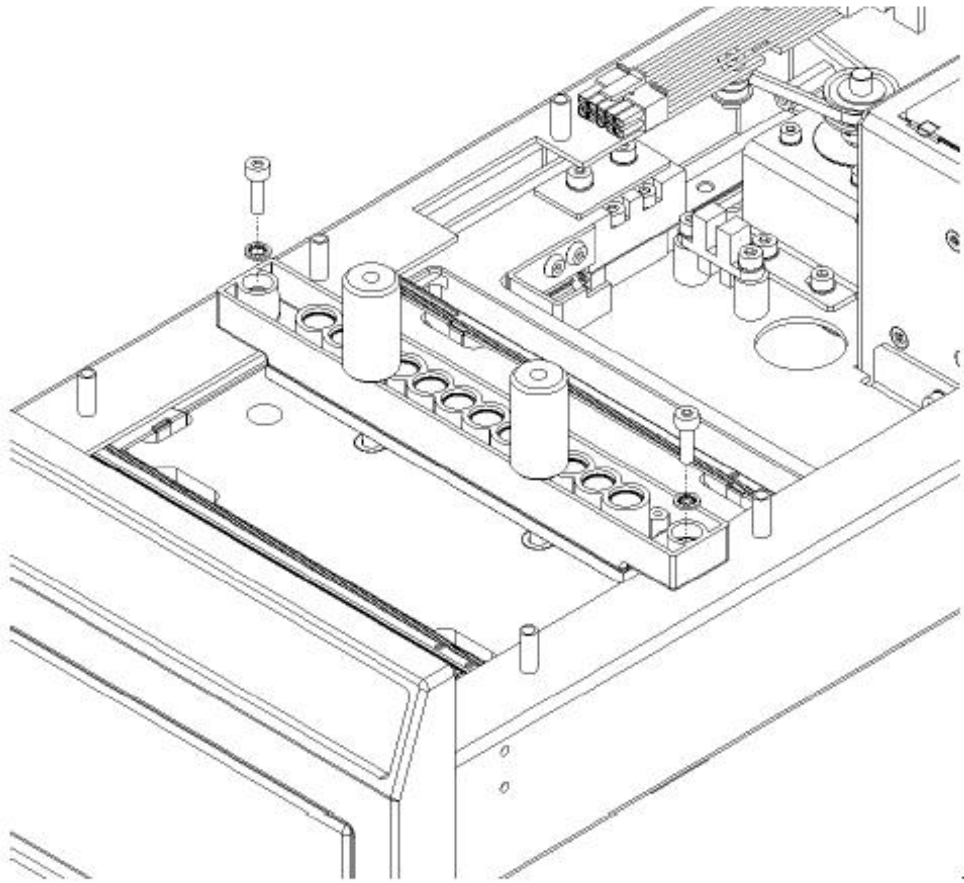


Figure N-14: Installing the Upper Optics Assembly

5. Reconnect the Reference Diode wire.

N.3.5 Replacing the Drive Motor

To remove the motor assembly from the baseplate:

1. Remove the pulley and belt on top of the motor (Figure N-15).

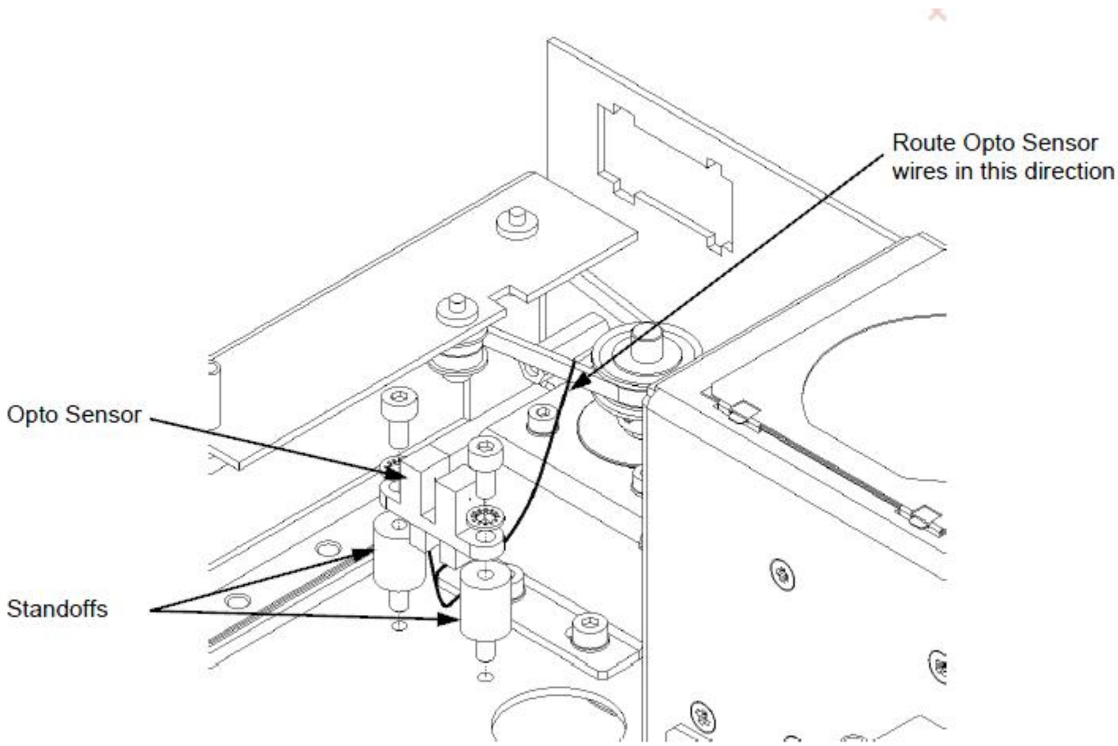


Figure N-15: Motor Pulley and Belt

2. Remove the 4 screws that attach the motor to the baseplate (Figure N-16).

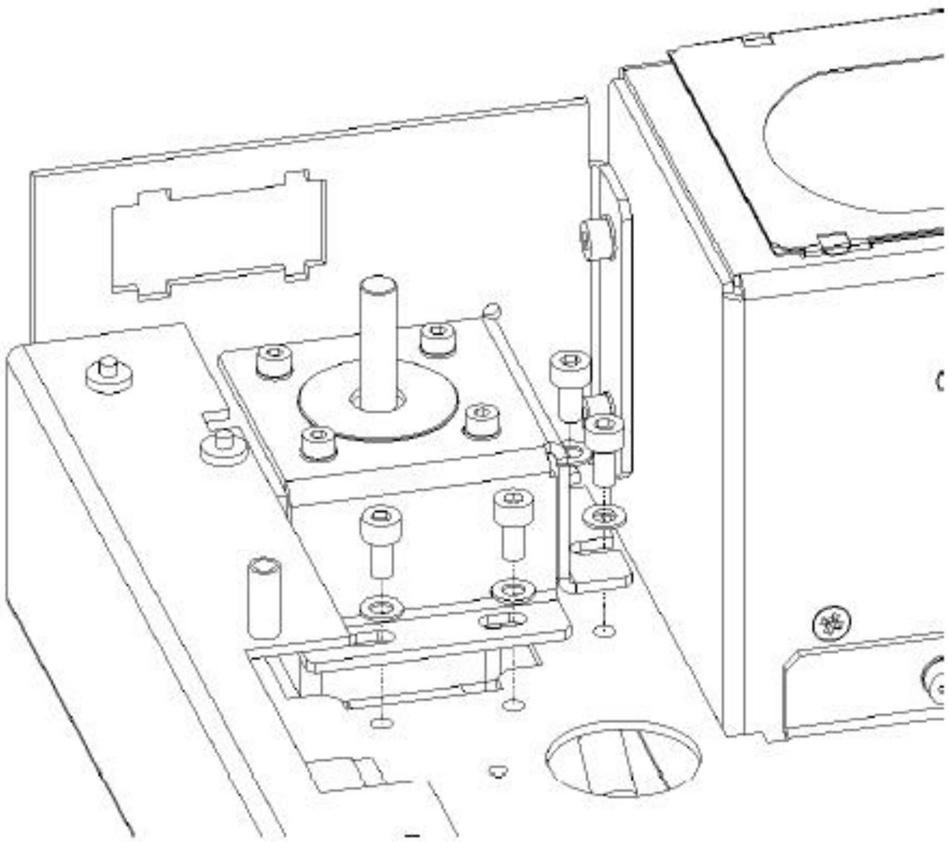


Figure N-16: Motor Assembly

To replace the motor:

1. Locate the Reader Drive Motor into the Reader Y Motor Bracket as shown in Figure N-17 and secure using four M2.5x6 Socket Cap Head Screws, four M2.5 Washers, and Loctite 222.

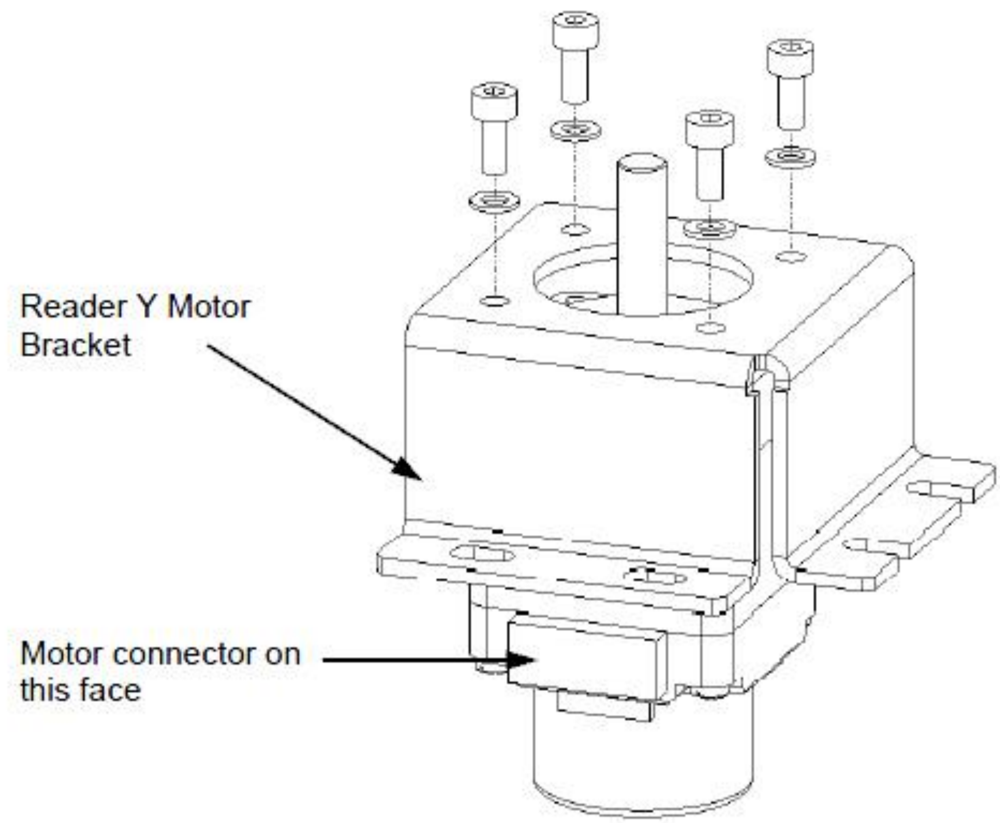


Figure N-17: Motor Bracket

2. Loosely fit the Motor assembly to the Baseplate using four M3x6 Socket Cap Head Screws, four M3 Washers and Loctite 222 (Figure N-18).

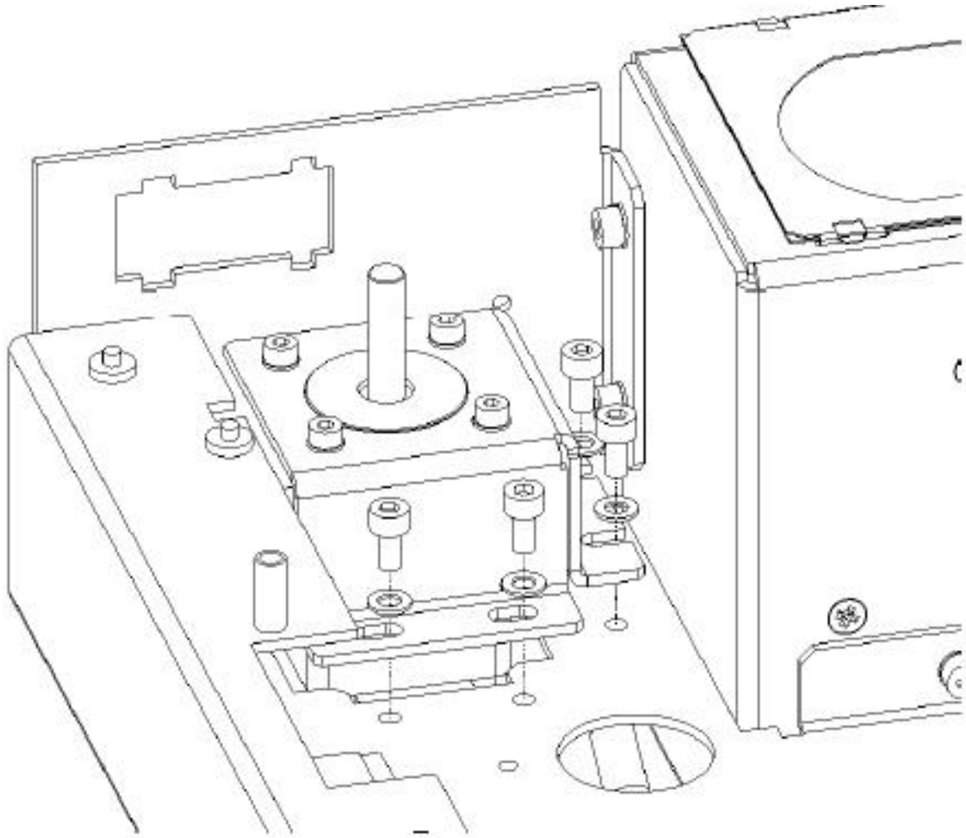


Figure N-18: Mounting the Motor

3. Discard the Set Screws that come with the Reader Pulley. Route the belt as shown in Figure N-19 and slide the Motor Pulley over the Motor shaft. Set the height of the pulley from the motor using the Reader Pulley Spacer (Figure N-20) and secure the pulley using two M3x4 Cone Point Set Screws and Loctite 222.

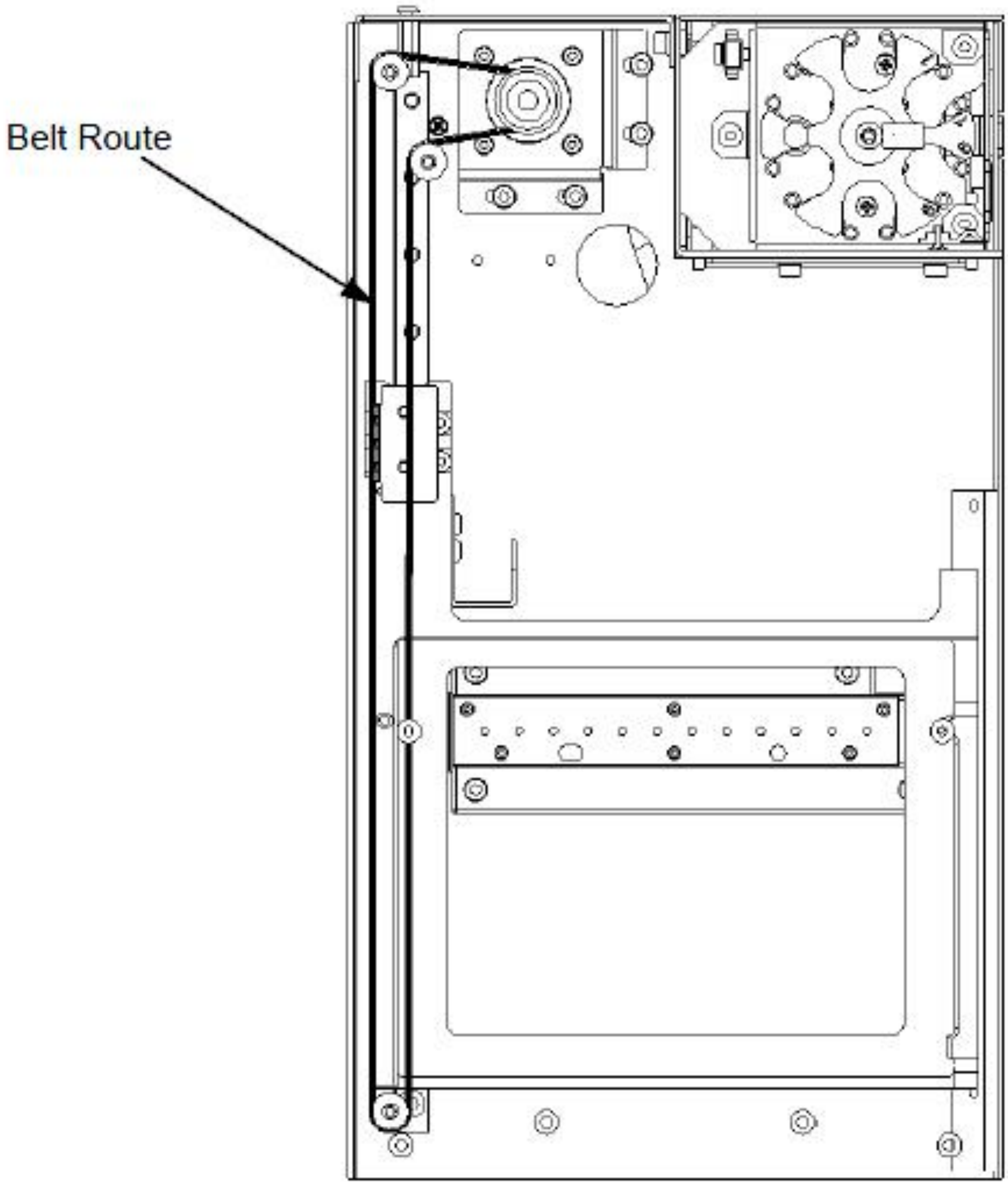


Figure N-19: Routing the Belt

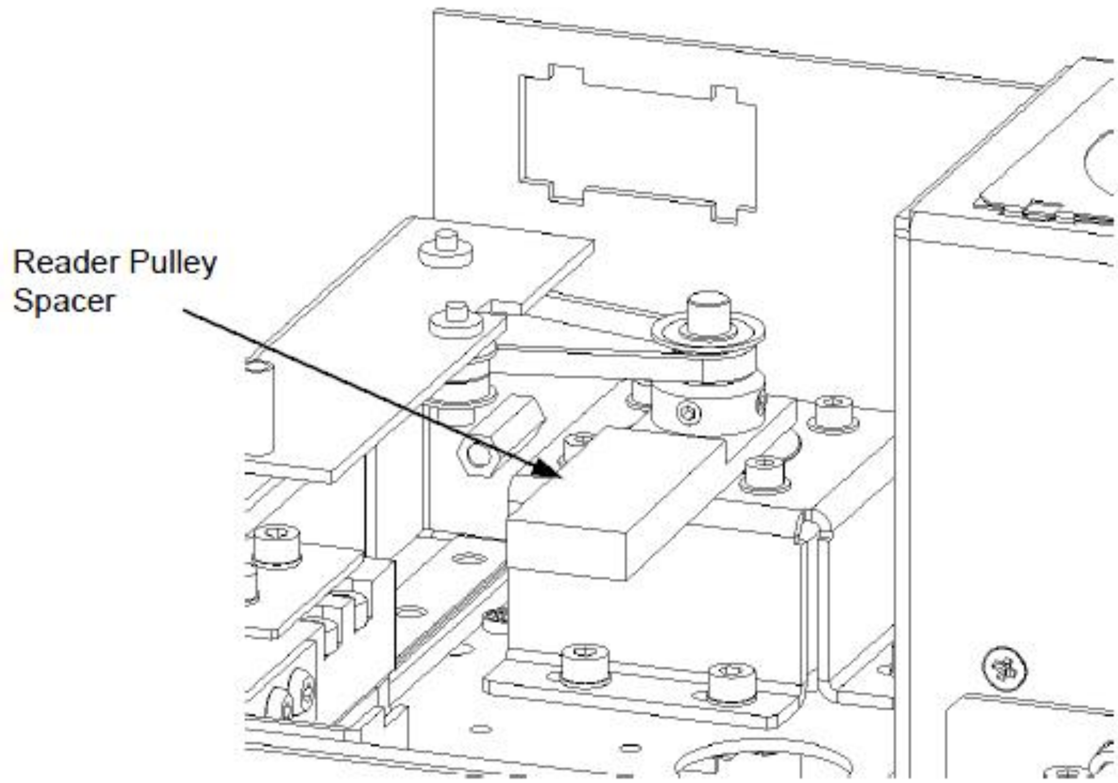


Figure N-20: Reader Spacer Pulley

4. Position a Gates Sonic Tension Meter 507C at the positions indicated in Figure N-21. The Tension Meter must be 3-6mm away from the belt to obtain a reading.

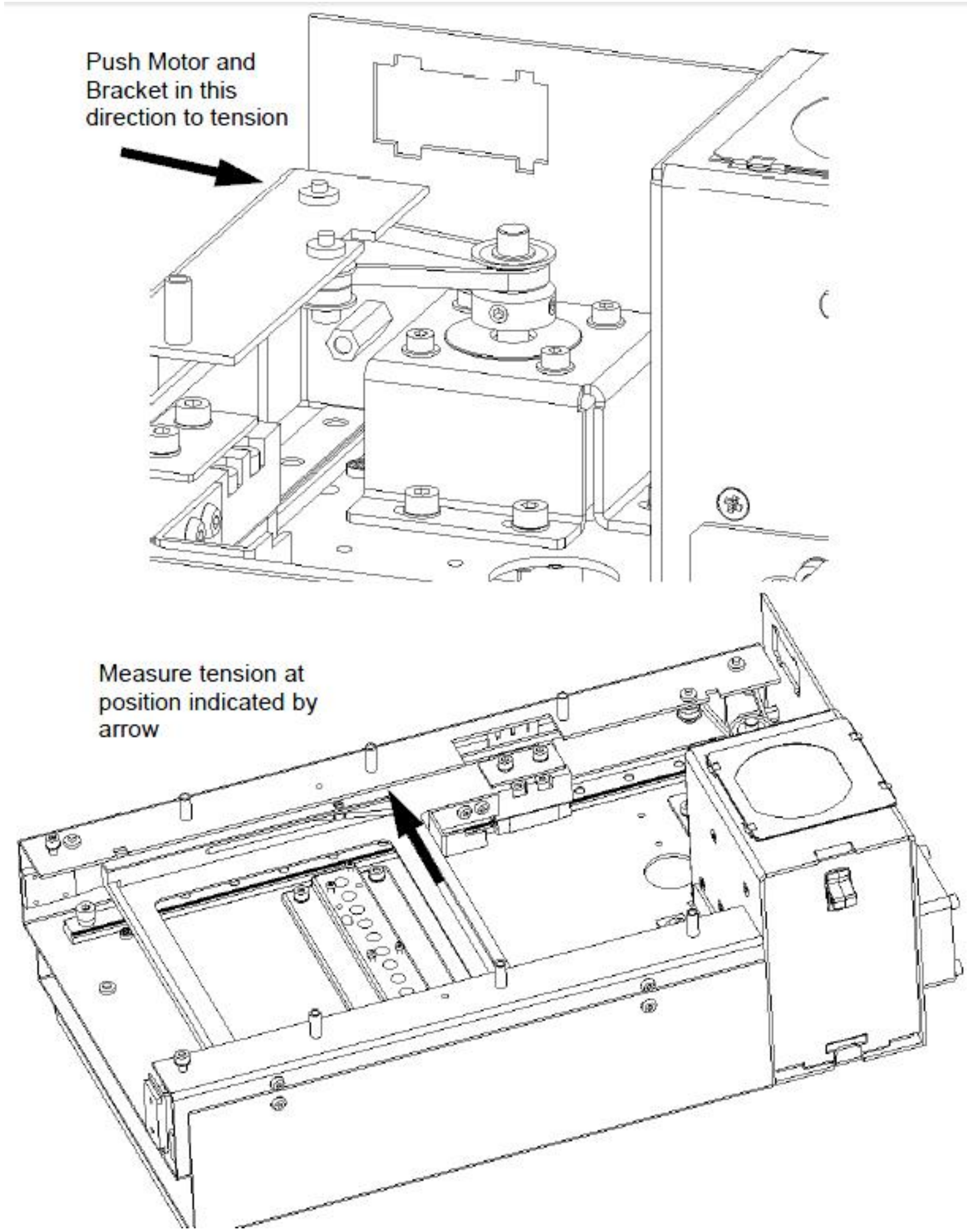


Figure N-21: Tightening the Belt

5. Tap the belt to cause it to oscillate.

- While the belt is oscillating and sensor is in position, press and hold the red button on the meter.
- The required frequency is 83-87 Hz. If the reading is above or below this value adjust then push the motor as indicated.
- Repeat the above steps until three consecutive readings at 83-87 Hz are obtained.
- Tighten the four M3x6 SHCS in the Baseplate.
- Re-check the frequency using the meter.

N.3.6 Replacing the Optosensor

The Optosensor is located on the Baseplate as shown in Figure N-22.

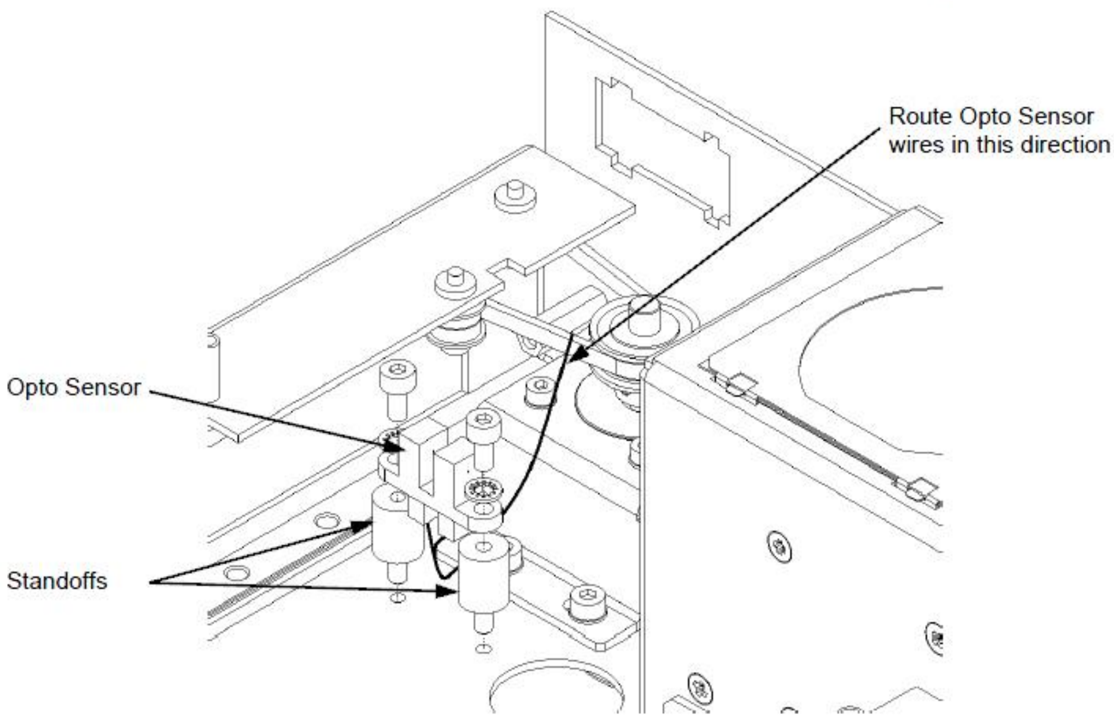


Figure N-22: Optosensor

To replace the optosensor:

1. Remove the two screws and the wires from the system.
2. Screw two Standoffs into the Baseplate using Loctite 425.
3. Fix an Optosensor to the two standoffs using two M3x6 Socket Cap head Screws and two M3 Internal Tooth Washers) using a 4-6 lb-in Torque Driver. When fitting the Optosensor, ensure wiring is routed away from the Plate Holder.
4. Ensure the Flag on the Plate Holder Passes through the Optosensor when the Plate Holder is pushed back.

N.3.7 Replacing the Belt

The Belt route is shown in Figure N-23. To take the existing belt from the reader belt, remove the pulley from the motor and remove the belt.

To replace the belt:

1. Cut a 636mm length of belt material. Rout the belt around the system as shown in Figure N-19.
2. Install the cut belt into a Belt Bracket (Figure N-23). Install the belt such that there are two front teeth exposed and four back teeth between slots.

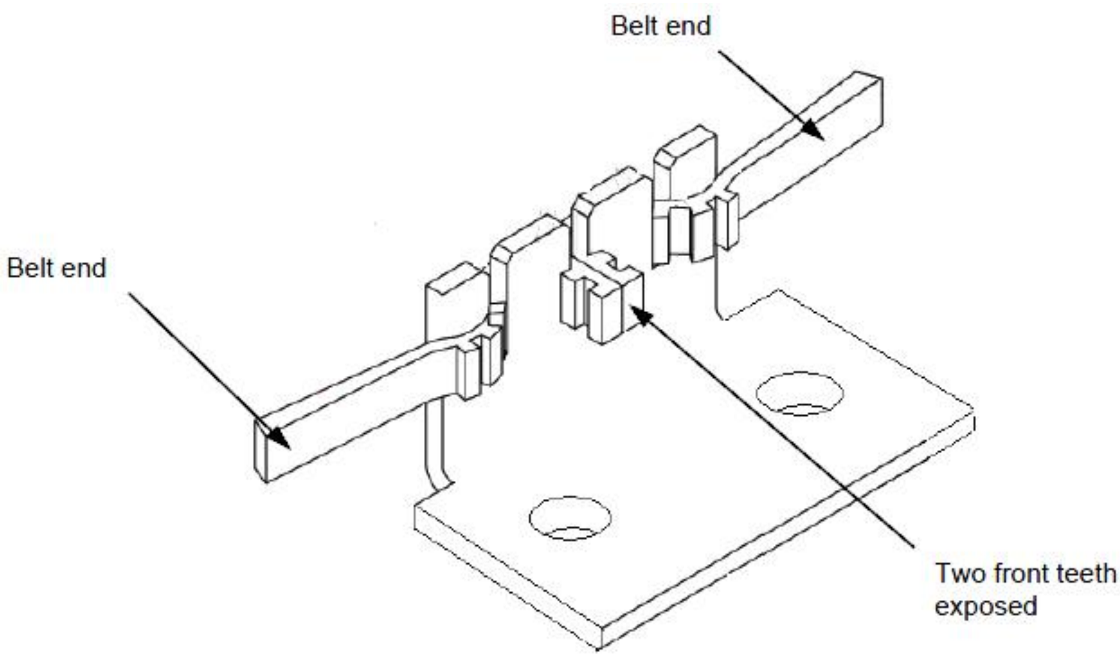


Figure N-23: Installing Belt in Belt Bracket

3. Fit the Reader Belt Bracket to the Plate Holder using two M3x8 Socket Cap Head Screws, two M3 Washers and Loctite 222 (Figure N-24).

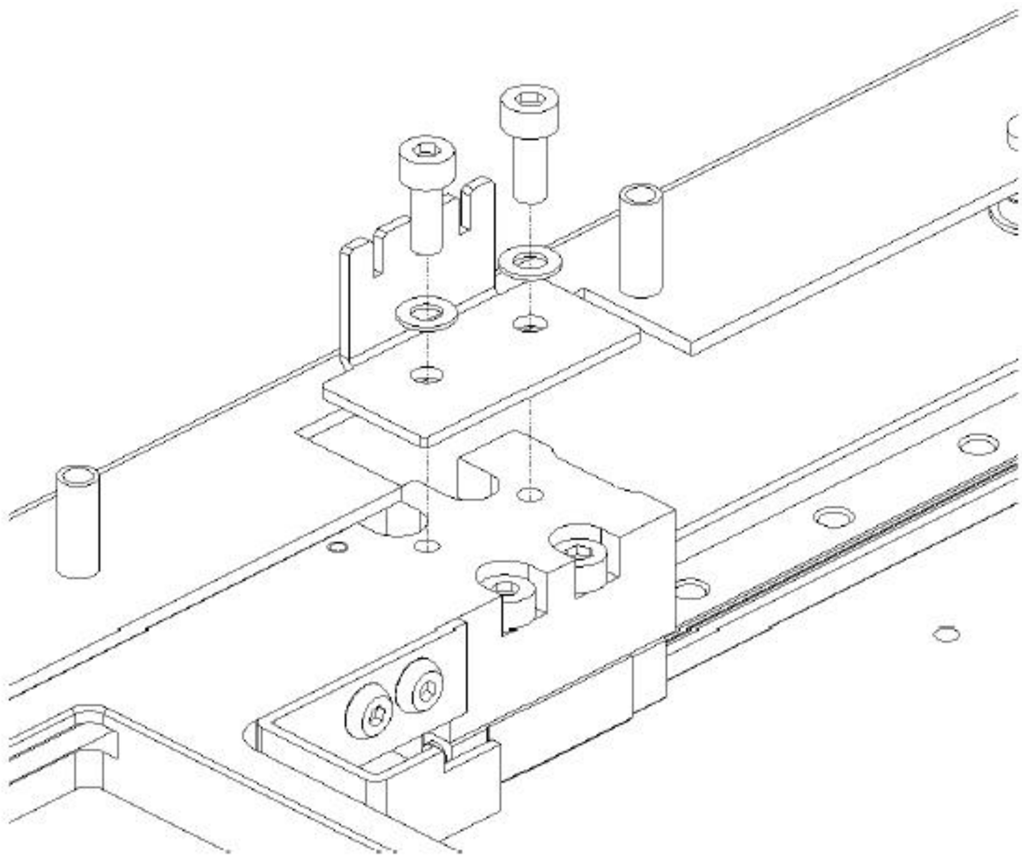


Figure N-24: Fitting the Belt Bracket

4. Check the tension in the same manner as was done in the motor replacement section (Section N.3.5).

N.3.8 Replacing the Filter

The filter in fan filter assembly on top of the primary optics enclosure (Figure N-25) may need to be replaced from time to time.

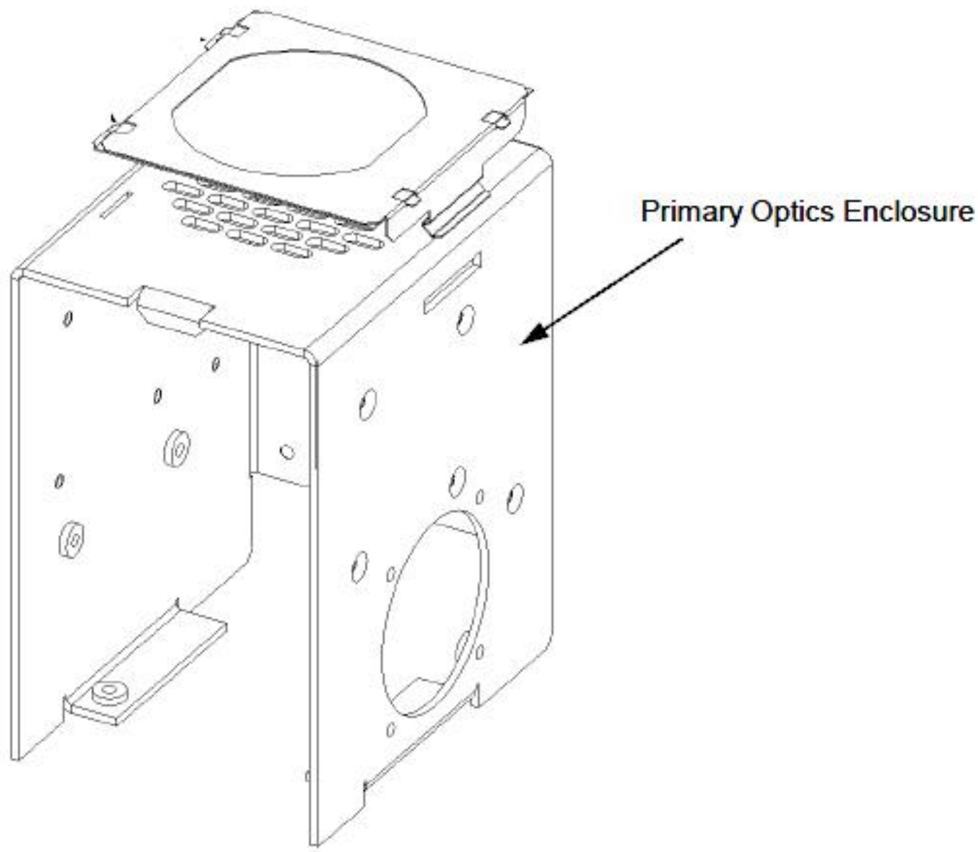


Figure N-25: Filter Assembly on Primary Optics Enclosure

Remove the assembly and replace the filter (Figure N-26). The clips on the right side should be inserted first.

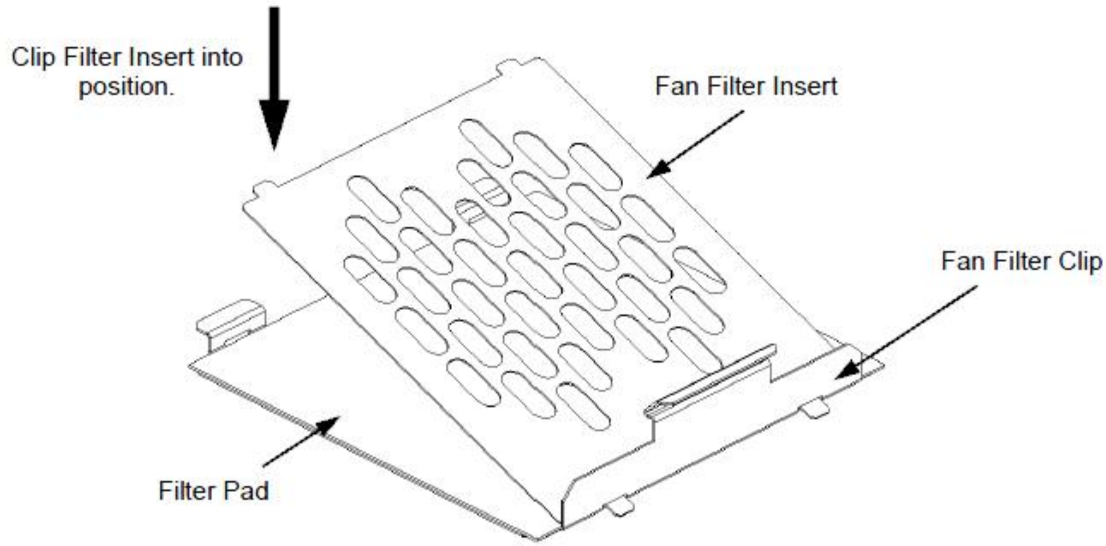


Figure N-26: Placing the Filter Pad in the Assembly

Replace the assembly on the optics enclosure.

This page intentionally left blank.

Chapter O Reagent Pipettor

O.1 Overview

The *Reagent Pipettor* is mounted on an assembly that transports the pipettor in the X, Y and Z direction. The Y Drive (containing the pipettor) and the Z drive are removed as a unit and the servicing of these two components are discussed in this chapter. Servicing of the X drive is discussed in a separate chapter (Chapter P). Typically, the entire assembly is removed and a new one is installed, with the defective unit sent to the depot for refurbishing.

O.2 Removing the Reagent Pipettor from the Agility System

The Reagent Pipettor is mounted on the rear chassis as shown in Figure O-1.

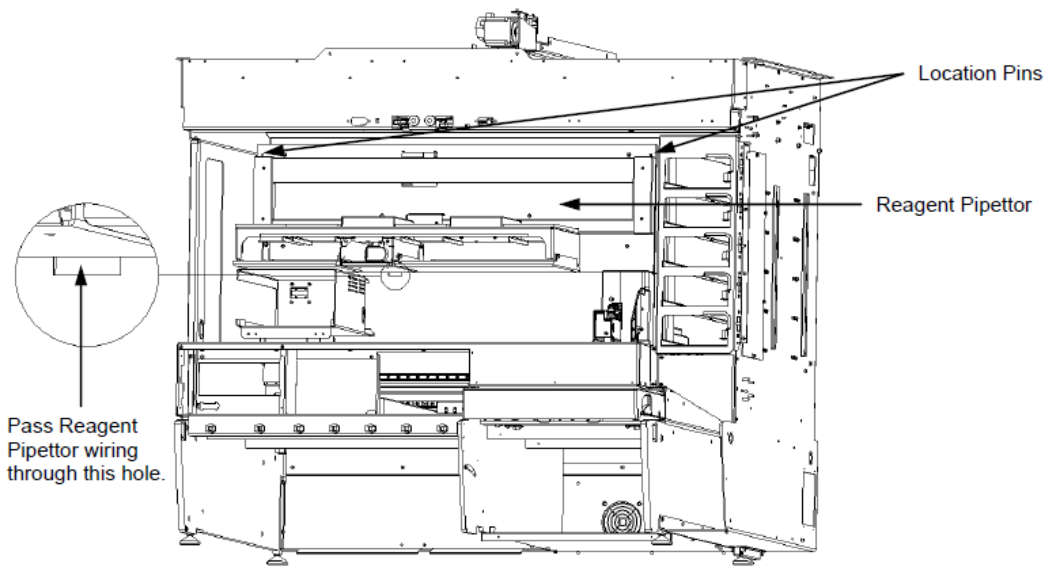


Figure O-1: Mounting of the Reagent Pipettor and Drive

To remove the assembly:

1. Remove the electrical connections will need to be unmade.
2. Take off the door in front of the X Drive PCB.
3. Disconnect the Flex Cable, pull the PCB forward and disconnect the connectors. If there is access to the back of the system the cables can be unplugged from the system backplane instead.
4. Unscrew the six M3x6 Socket Cap Head Screws that attach the assembly to the rear Chassis Panel.

When reinstalling the assembly, use Loctite 222 to secure the screws. The cables should be routed through the hole indicated in Figure O-1 if there is access to the rear of the system. Care should be taken not to trap the cables when mounting the assembly.

O.3 Z Axis

O.3.1 Removing the Z Axis Drive and Pipettor

To remove the Z Axis Drive and Pipettor:

1. Unthread the Fitting Nuts on the PTFE Tubes from the Reagent Pipettor Z Drive and the Reagent Pipettor Y Drive Assembly into Reagent Pipettor Z Drive Manifold (Figure O-2).

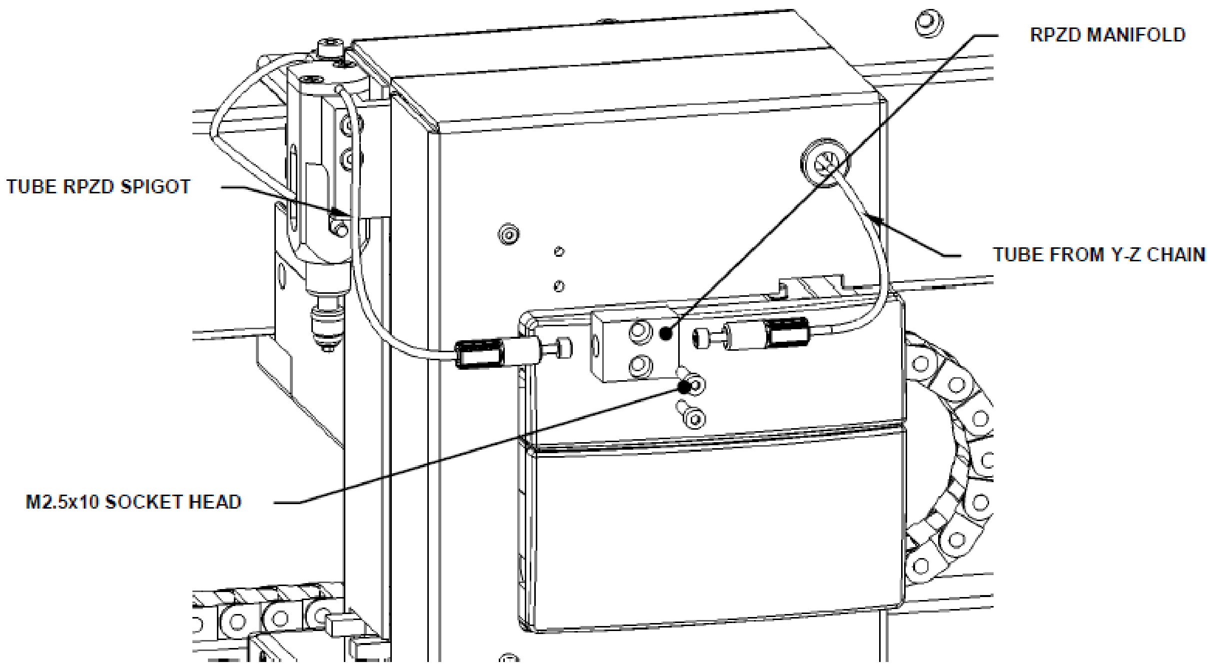


Figure O-2: Removing the Z- Drive

2. Remove the two M2.5x10 Socket Head Screws and remove the cover. When replacing the cover use Loctite 425.

3. Remove the PTFE tube from the Grommet on the Reagent Pipettor Z Drive Front Enclosure.

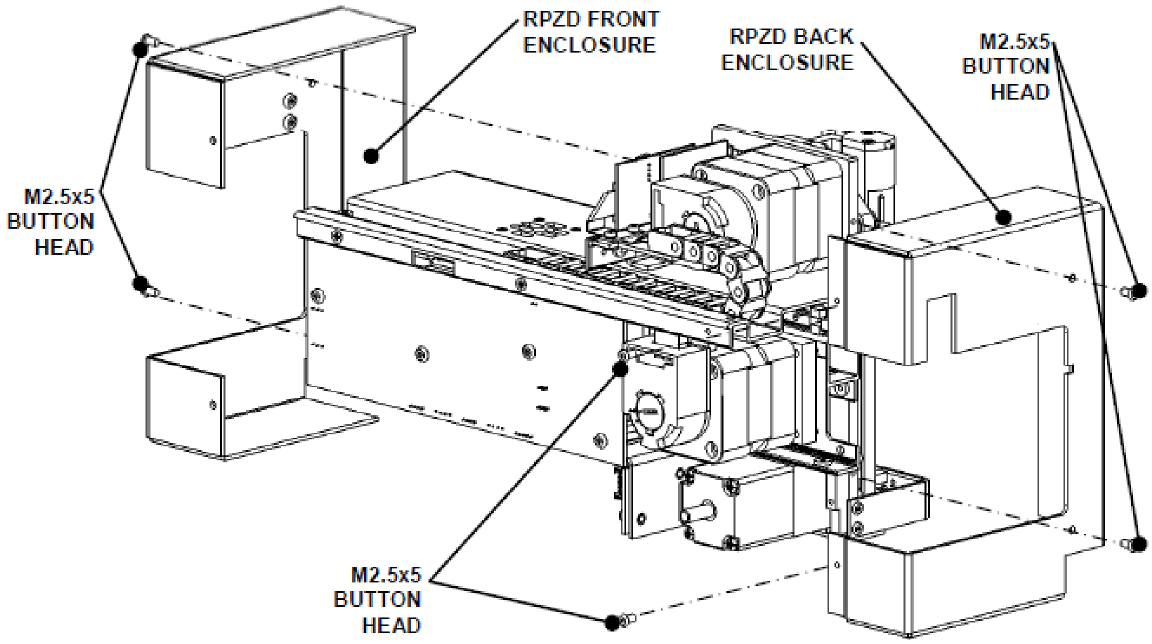


Figure O-3: The Reagent Pipettor Z Drive Front Enclosure and the Reagent Pipettor Z Drive Back Enclosure

4. Remove the Reagent Pipettor Z Drive front enclosure and the Reagent Pipettor Z Drive back enclosure by unscrewing the six M2.5x5 Button Head Screws.

5. Disconnect the Flex Cable from the Z-Drive PCB.

6. Remove the Reagent Pipettor Z Drive Chain Bracket on the Reagent Pipettor Z Drive PCB Bracket by unscrewing the M2.5x6 Flat Head Screw (Figure O-4).

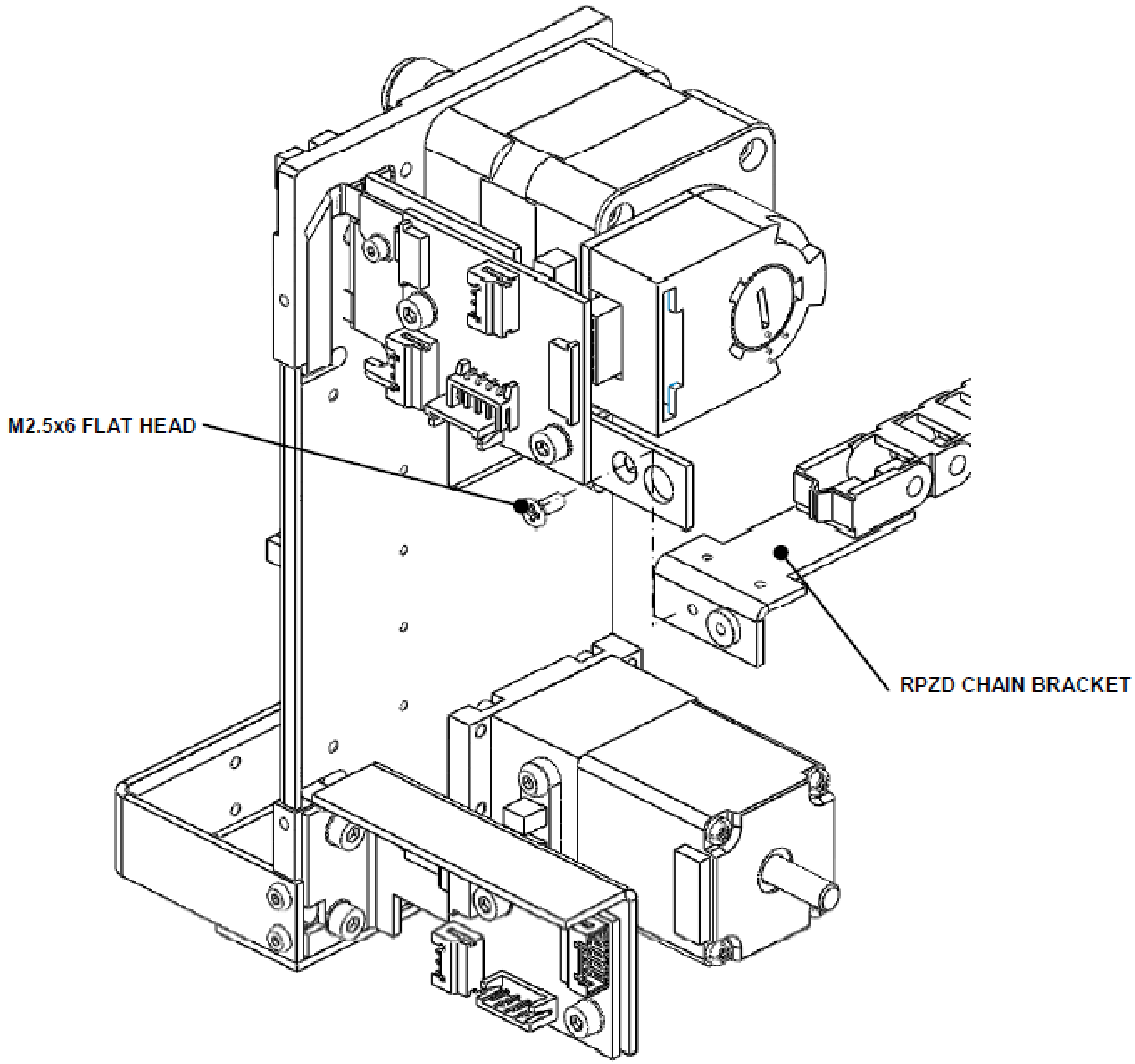


Figure O-4: The Z Chain Bracket

7. Remove the Reagent Pipettor Z Drive Assembly from the Reagent Pipettor Y Drive Bearing Plate by unscrewing the two M3x8 Cap Head Screws and washers (Figure O-5). When replacing the assembly, use Loctite 222 on the screws and ensure that the Reagent Pipettor Z Drive Assembly sits horizontally on the Reagent Pipettor Y Drive Bearing Plate.

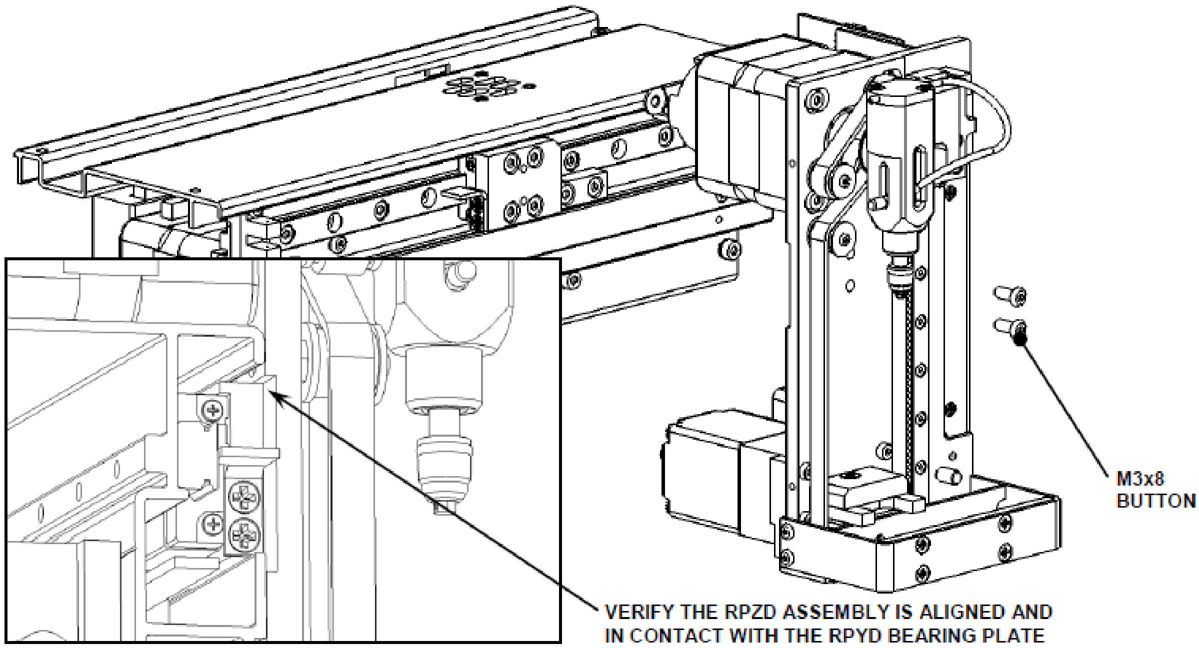


Figure O-5: Removing the Reagent Pipettor Z Drive Assembly

O.3.2 Repairing the Z Drive and Pipettor

O.3.2.1 Replacing the PTFE Tube on the Pipettor

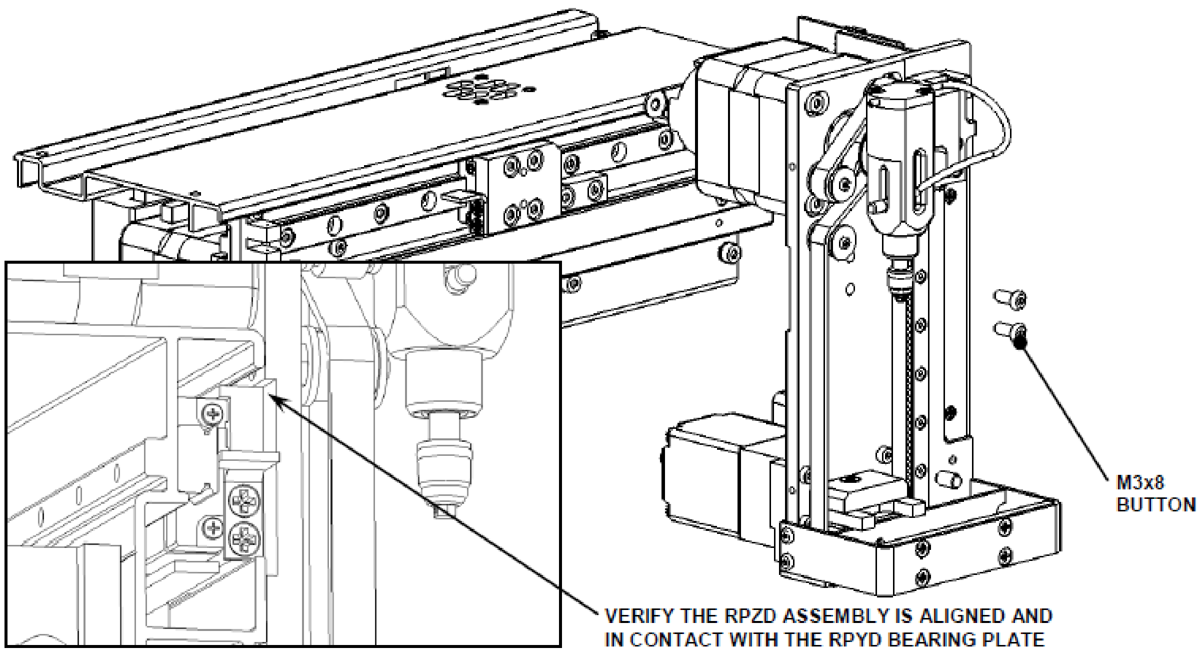


Figure O-6: Replacing the PTFE Tube on the Pipettor

The PTFE tube on the pipettor is attached to the spigot assembly (Figure O-7) and is removed by unscrewing the spigot. In addition, it will be necessary to remove the fitting from the other end of the table.

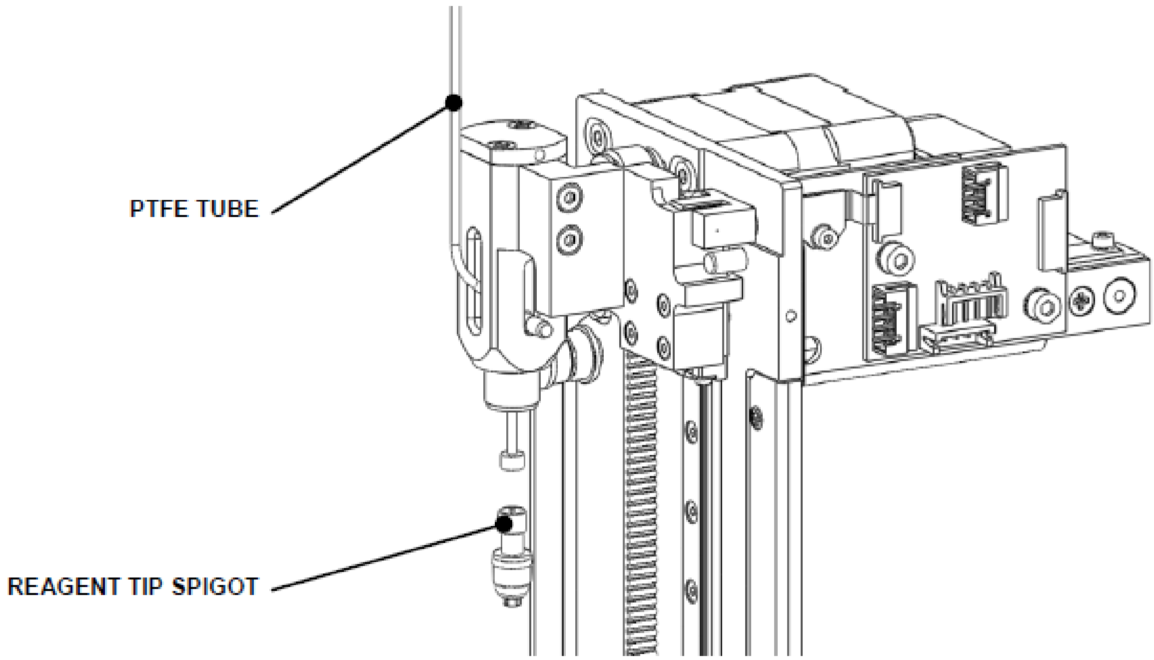


Figure O-7: The Reagent Tip Spigot

To replace the Tubing:

1. Cut a 300mm length of PTFE Tubing. With a scalpel, cut the tubing to form a point approximately 10 to 15mm long (Figure O-8). Thread the cut (pointed) end of the tube through a Type P Ferrule (ensuring that the Ferrule is orientated as shown with the PTFE face pointing up the tube. With a pair of pliers, grip the pointed end of the tube, and pull the tube through the Ferrule until it has reached an uncut section of the tube (approximately 30 to 40mm from the start of the angled cut).

► ***Note:*** *Keep the Ferrule as perpendicular to the tube as possible.*

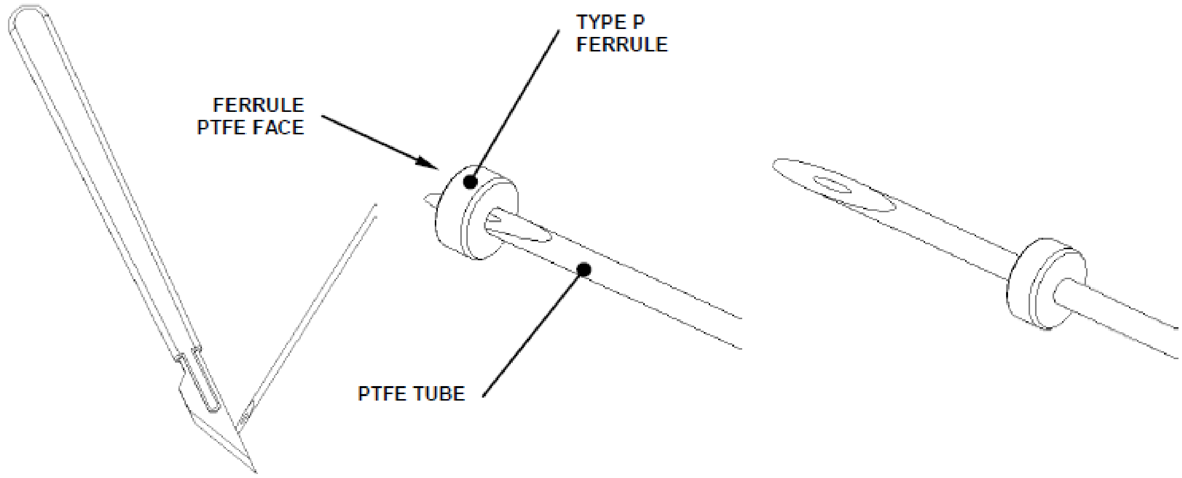


Figure O-8: Preparing the Tubing

2. Rotate the Ferrule around the tube 3 or 4 times to seat the gripper onto the tube correctly. Then, thread the cut (pointed) end of the tube through the Pipettor Tube Length Block (DS2FIX012) until the Ferrule is seated in the block's counter-bore as shown in Figure O-9. With the scalpel, cut the excess tube off the cut (pointed) end of the tube flush with the cutting face of the block.

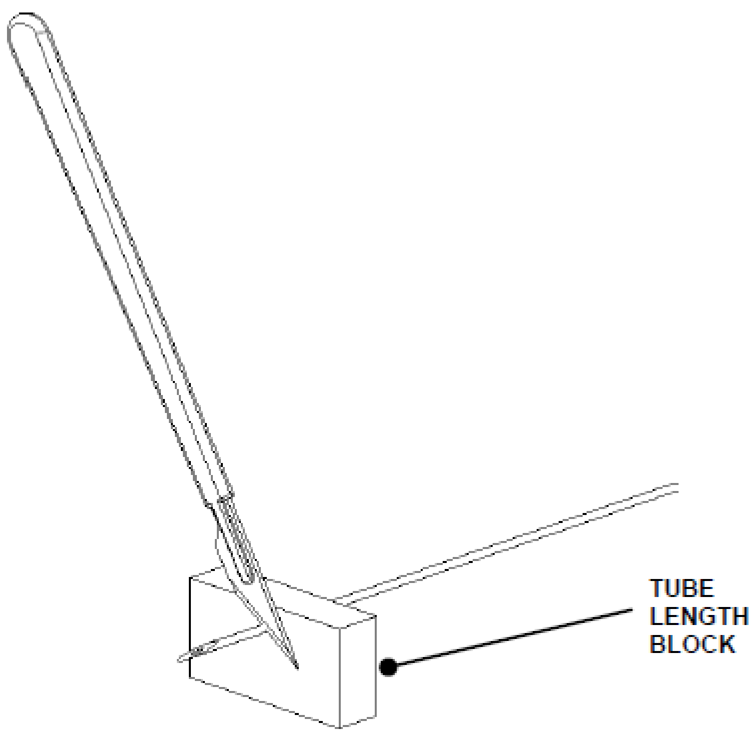


Figure O-9: Threading and Cutting the Tube

3. Thread the PTFE Tube into the Reagent Pipettor Spigot Slider Assembly from underneath and let it come out from the front slot. Pull the tube till the Type P Ferrule sits in the cavity provided in the Reagent Pipettor Spigot Slider Assembly and secure it by screwing the Reagent Tip Spigot using Loctite 242 (Figure O-10).

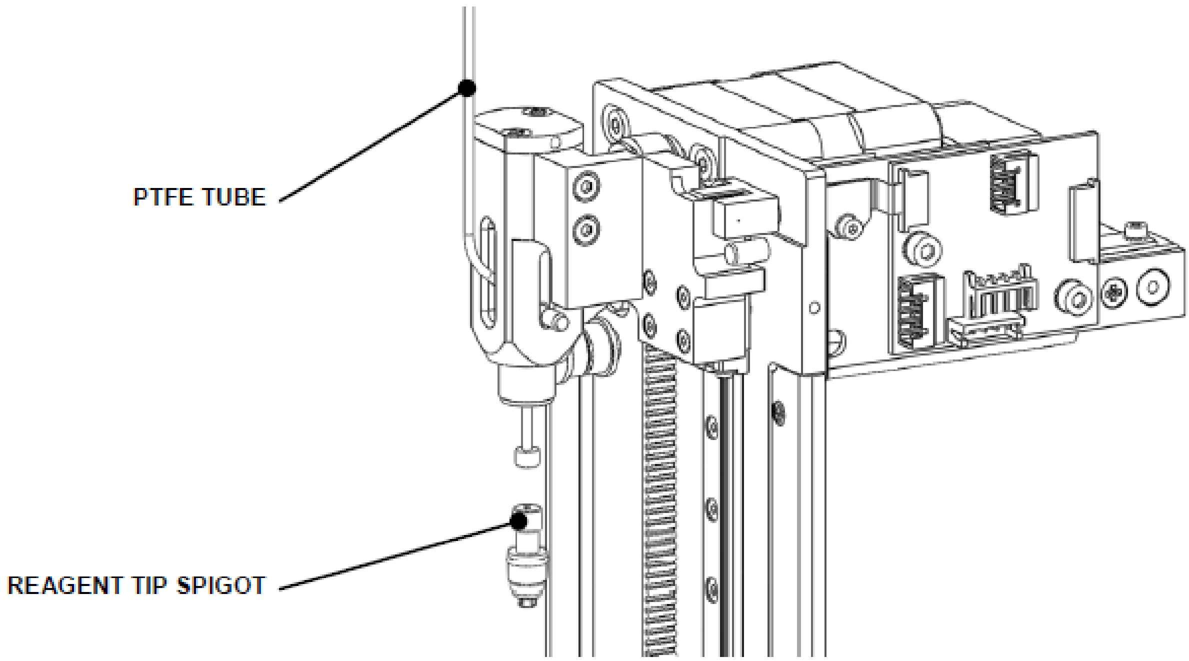


Figure O-10: Threading the Teflon Tube

4. Thread the PTFE tube through the hole in the Reagent Pipettor Spigot Slider Top Cover. With a permanent marker, draw a line on the PTFE Tube 120mm from the top face of the Reagent Pipettor Spigot Slider Assembly (Figure O-11).

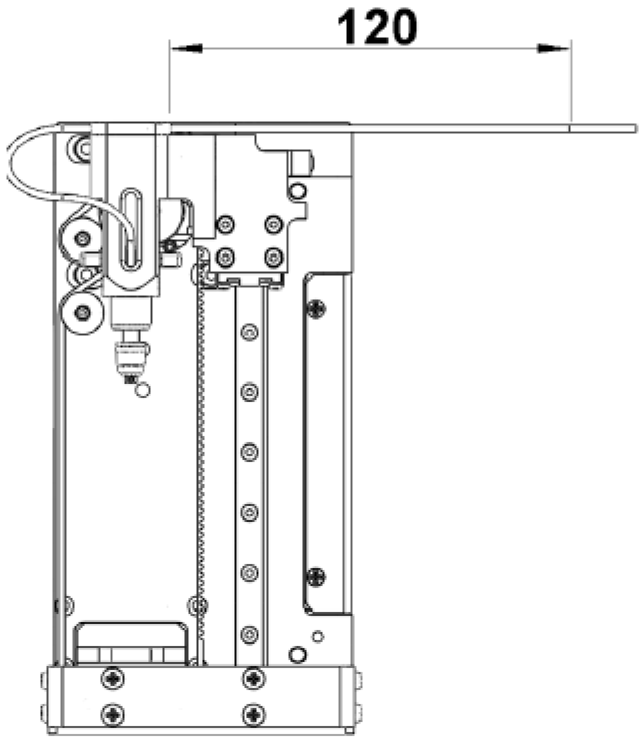


Figure O-11: Threading the Teflon Tube

5. Using a scalpel, cut the free end of the tube to form a point approximately 10 to 15mm long. Thread the cut (pointed) end of the tube through a PP Fitting Nut. Then, thread the cut (pointed) end of the tube through a Type P Ferrule ensuring that the Ferrule is orientated as shown with the PTFE face pointing up the tube. With a pair of pliers, grip the pointed end of the tube and pull it through the Ferrule until it has reached the line on the Tub (Figure O-12).

> ***Note:*** *Keep the Ferrule as perpendicular to the tube as possible.*

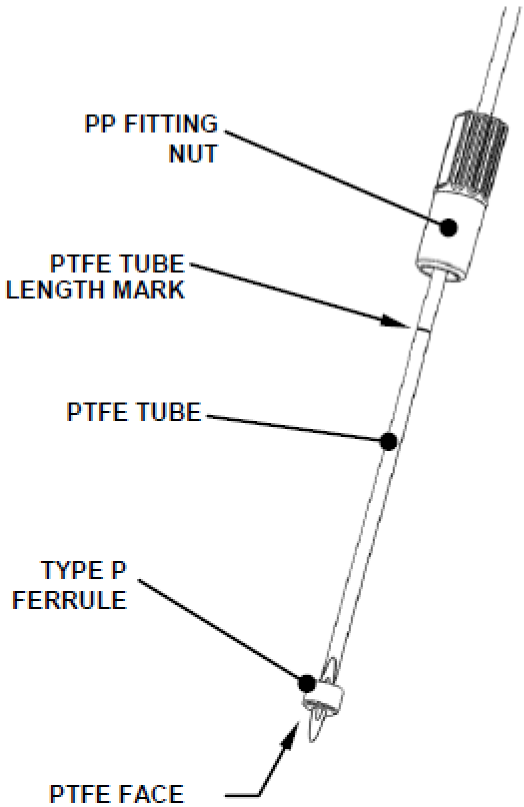


Figure O-12: Preparing the Tube

6. Rotate the Ferrule around the tube 3 or 4 times to seat the Ferrule onto the tube correctly. With the scalpel, cut the excess tube off the cut (pointed) end of the tube flush with the PTFE face as possible ensuring that the PTFE face is not damaged (Figure O-13).

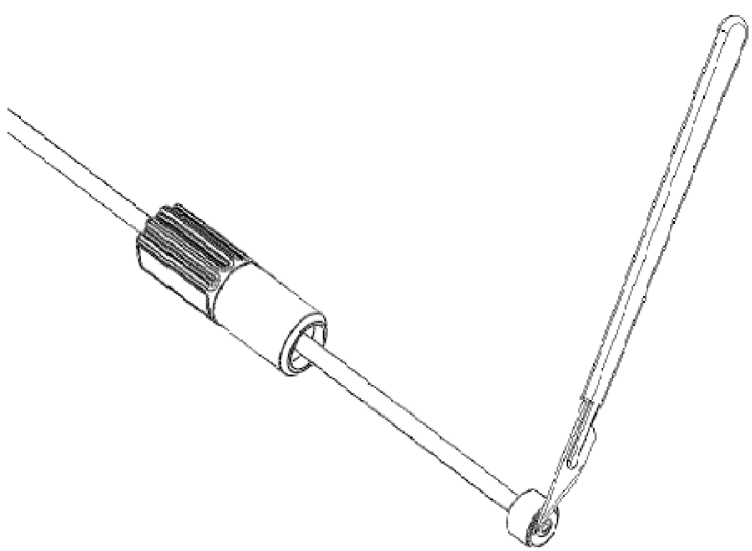


Figure O-13: Seating the Ferrule

O.3.3.2 Replacing the Polarizing Filter and Photodiode

The polarizing filter and photodiode are located behind the Reagent Pipettor Z Drive Tip Detector Support (Figure O-14).

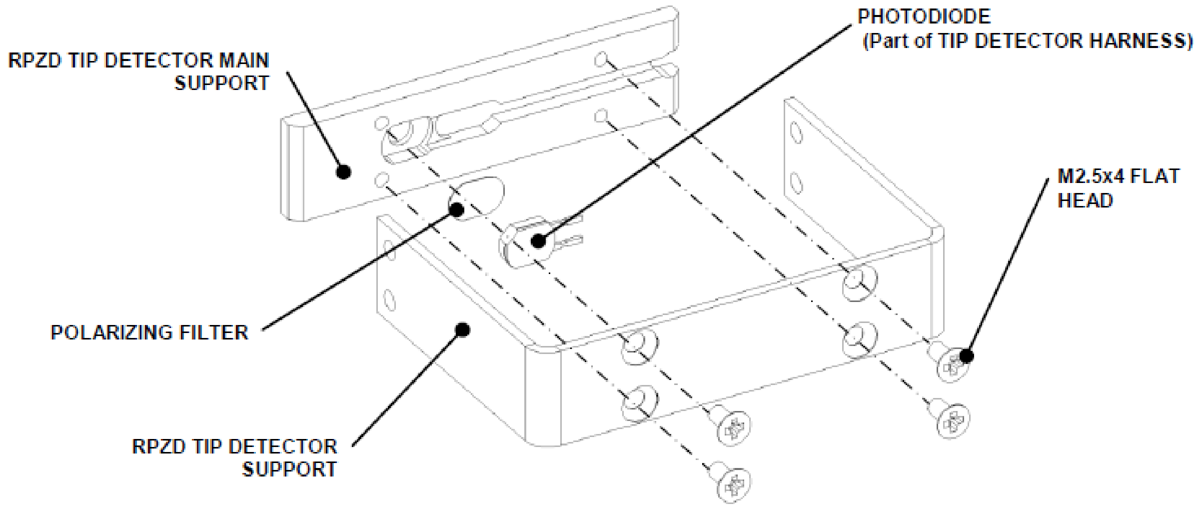


Figure O-14: The Polarizing Filter and Photodiode

To replace these two items, remove the support by unscrewing the four screws and remove he appropriate item. The wiring goes thru the tip eject mechanism. Use Loctite 222 when replacing the screws

O.3.2.3 Replacing the Eject PCB

The Eject PCB is located on the assembly as shown in Figure O-15 and is removed by disconnecting the wiring and removing the two screws.

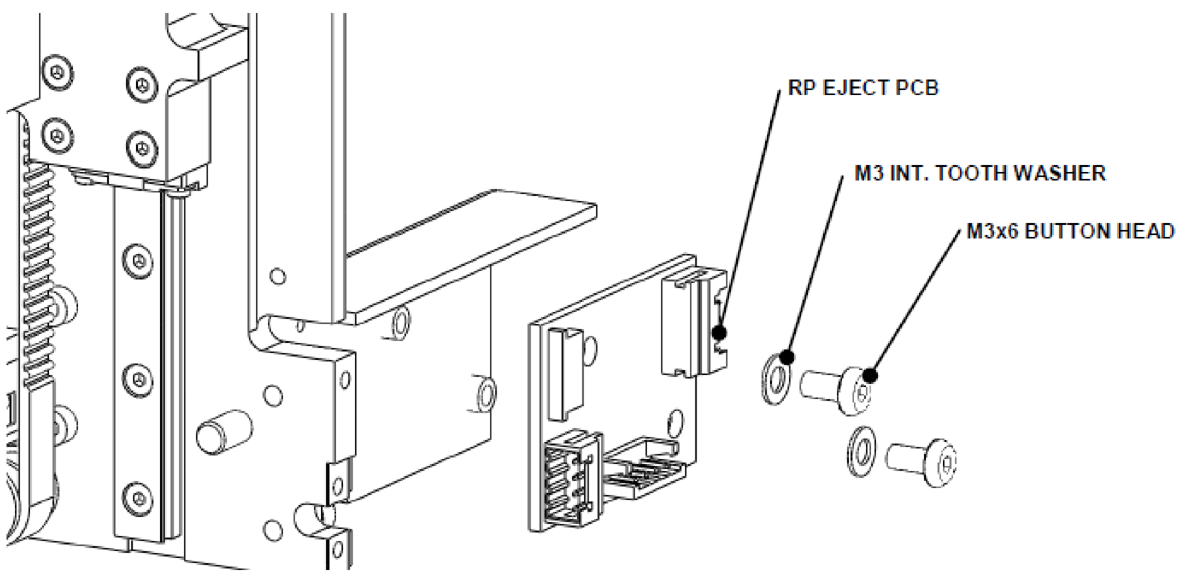


Figure O-15: Eject PCB

O.3.2.4 Z Drive PCB

The Z Drive PCB is mounted on a bracket as shown in Figure O-16 and then mounted on the assembly as shown in Figure O-17.

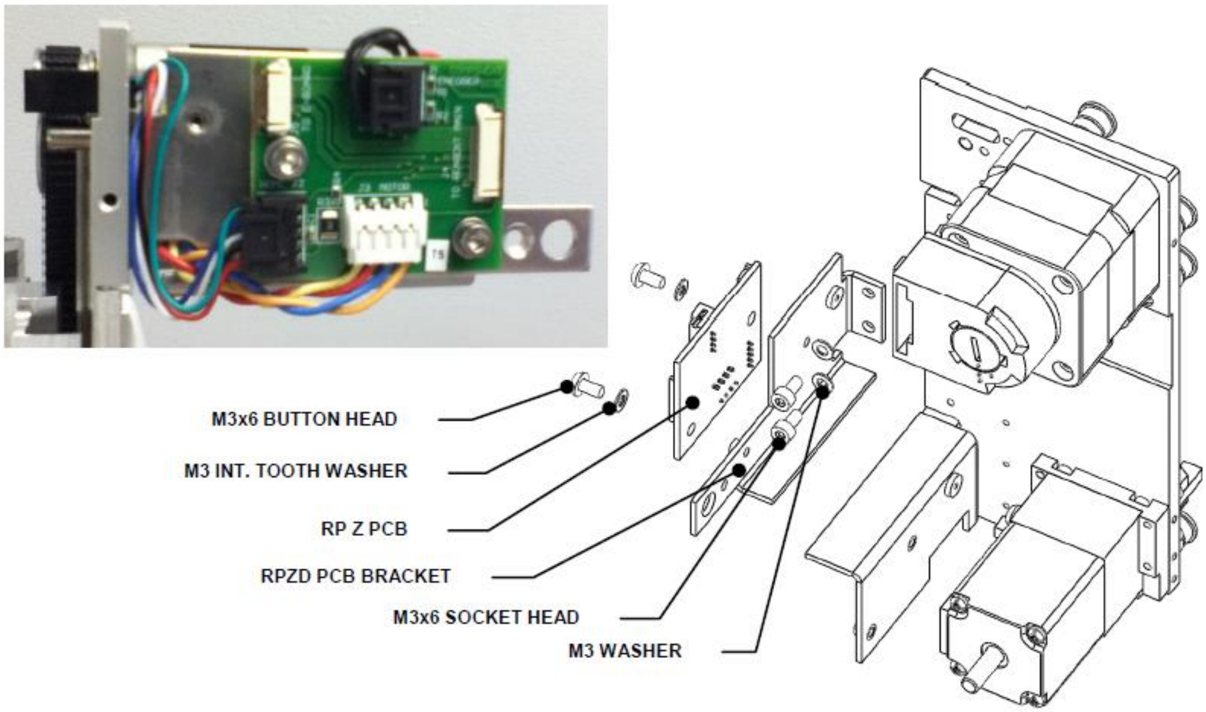


Figure O16: The Z Drive PCB

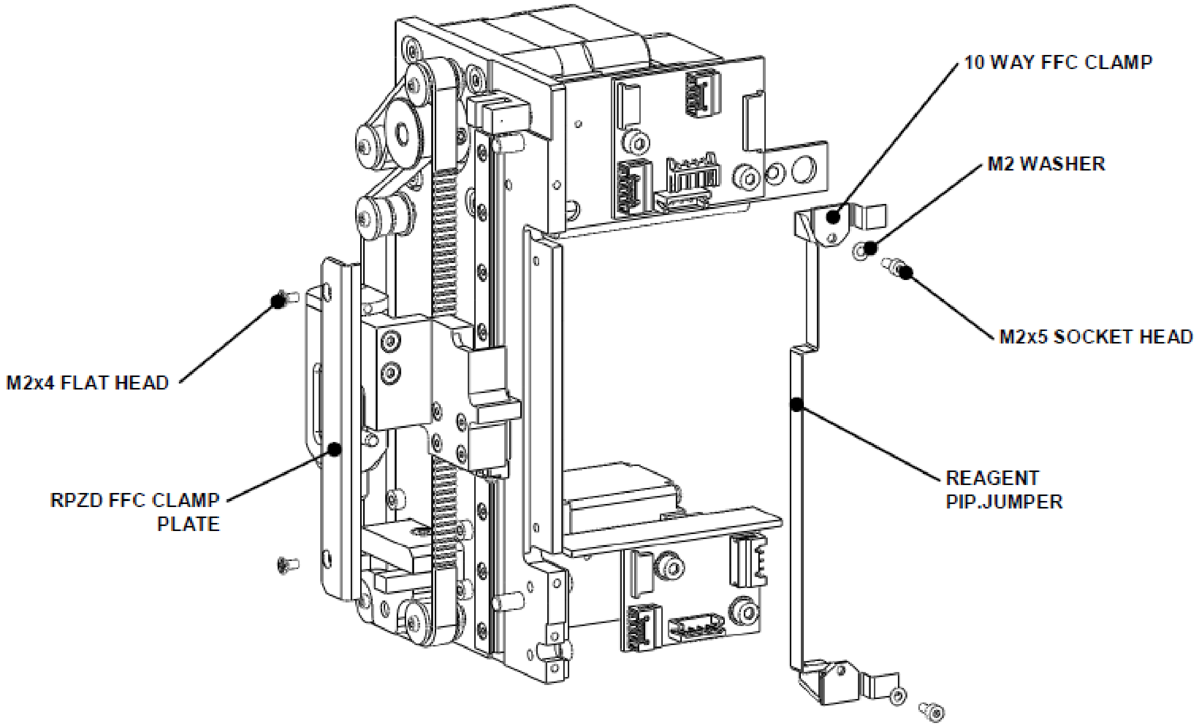


Figure O-17: Mounting the PCB (the Z drive PCB is the upper board)

O.2.3 Optosensors

The Z Drive Optosensor is mounted on the main plate as shown in Figure O-18. When replacing the sensor, tighten the screw using a 4-6 in.lb torque driver.

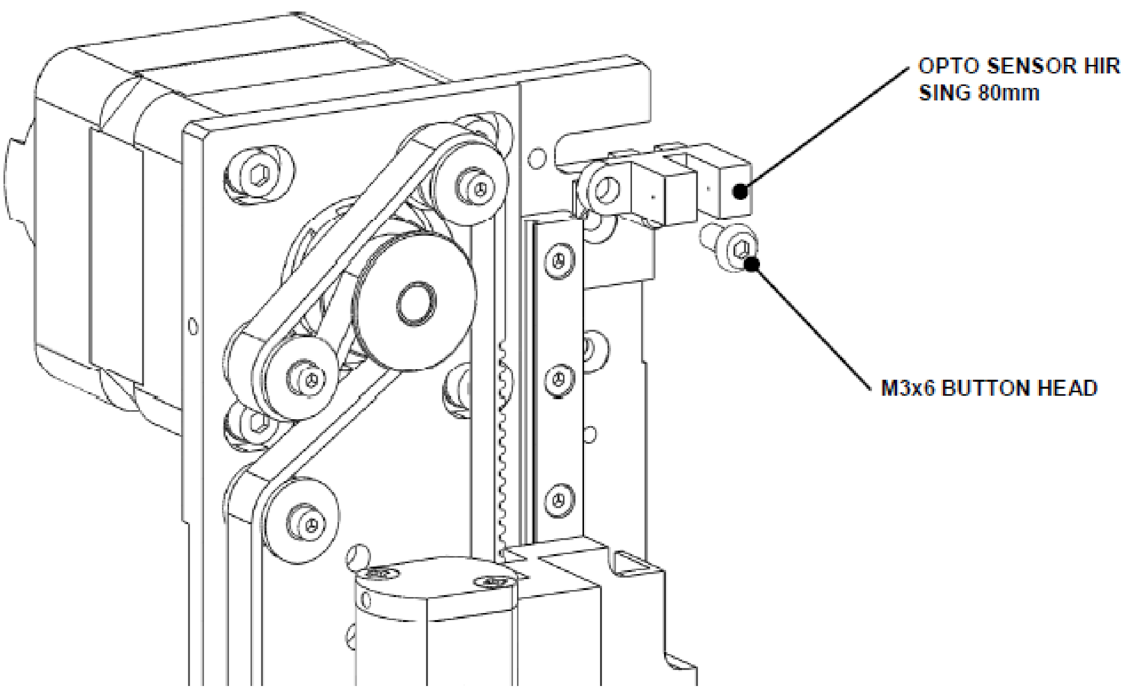


Figure O-18: The Z Drive Optosensor

O.2.4 Spigot Slider Assembly

The Spigot Slider Assembly is mounted on the spigot block as shown in Figure O-19 and is removed by unscrewing the two screws. When replacing the assembly, use Loctite 222 on the screws.

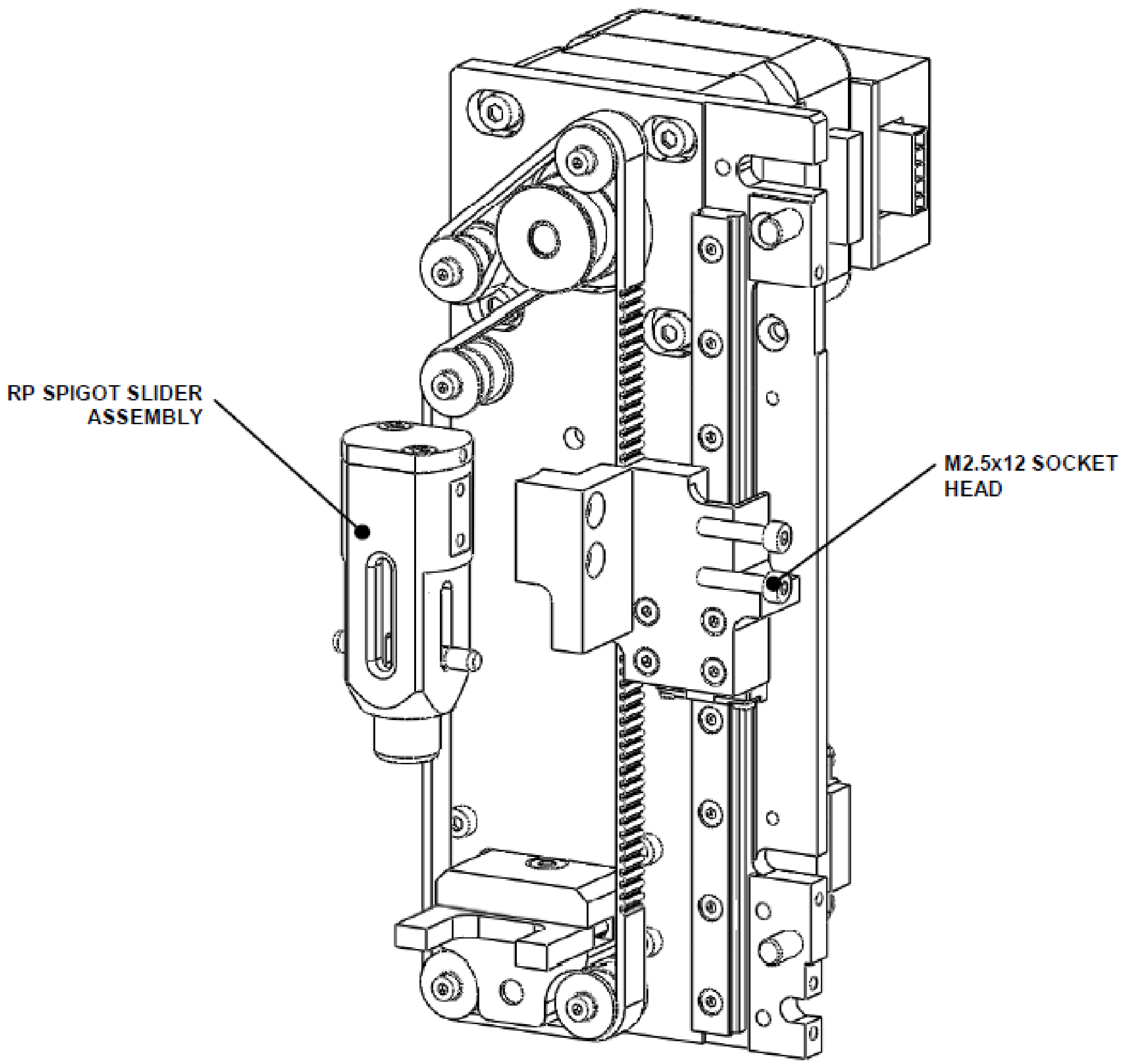


Figure O 19: Mounting the Spigot Slider Assembly

The Spigot Slide Assembly is disassembled as shown by removing the two M3x6 Flat Head screws (Figure O-20). When replacing the assembly, use Loctite 222.

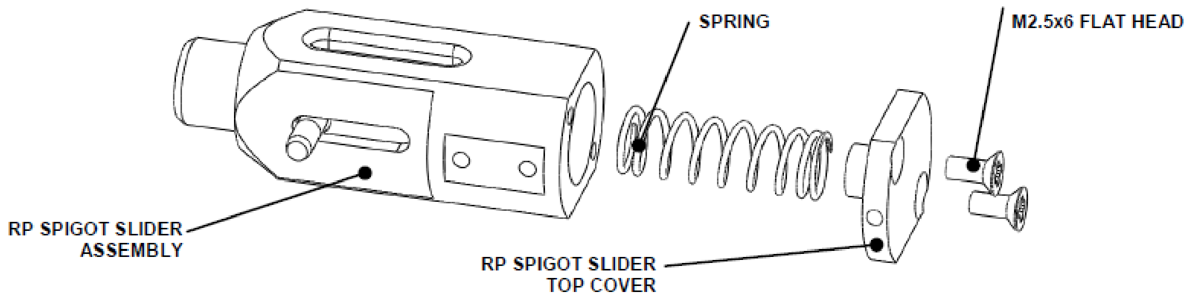


Figure O-20: Components of the Spigot Slider Assembly

O.2.5 Reagent Pipettor Z Drive Belt

The Reagent Pipettor Z Drive Belt can be removed by:

1. Removing the Spigot Block
2. Loosening the motor screws to move the motor.
3. Removing the belt (Figure O-21).

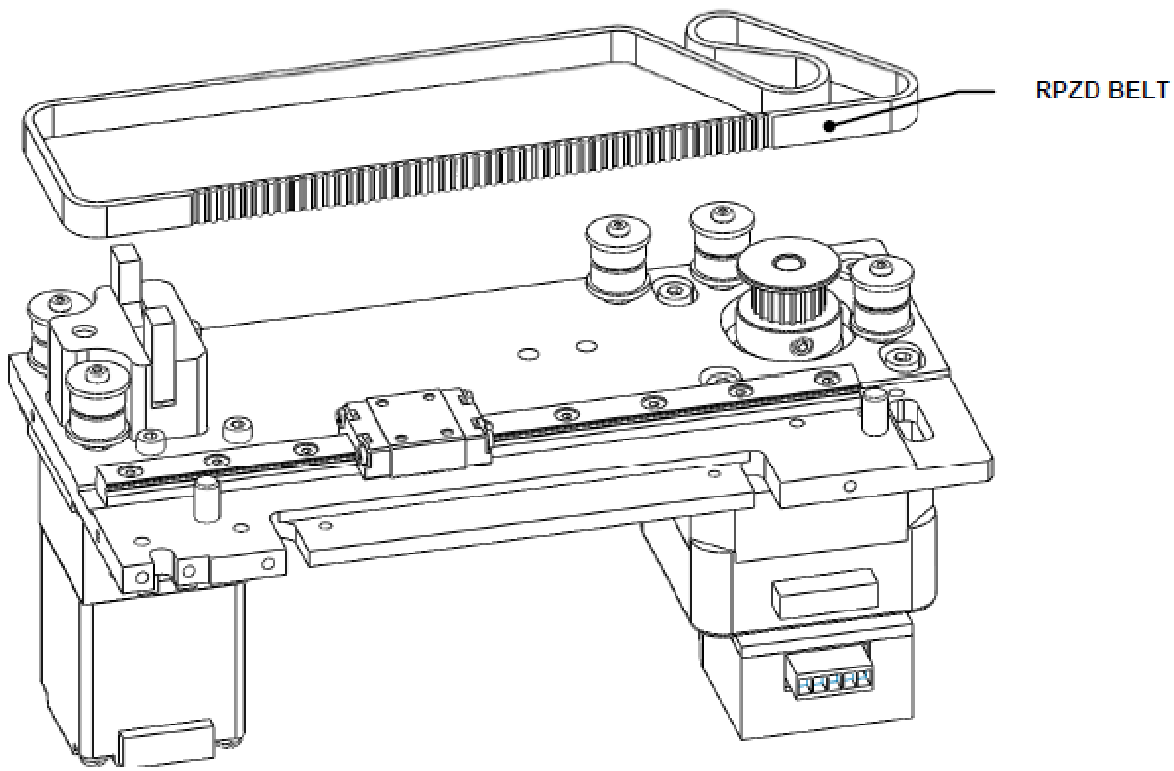


Figure O-21: Removing the Belt

To replace the belt:

1. Place the new belt in position
2. Position the Tension Meter (Gates Sonic Tension Meter 507C, Brecoflex SM4, or equivalent) at the position indicated in Figure O-22. The Tension Meter must be 3-6mm away from the belt to obtain a reading.

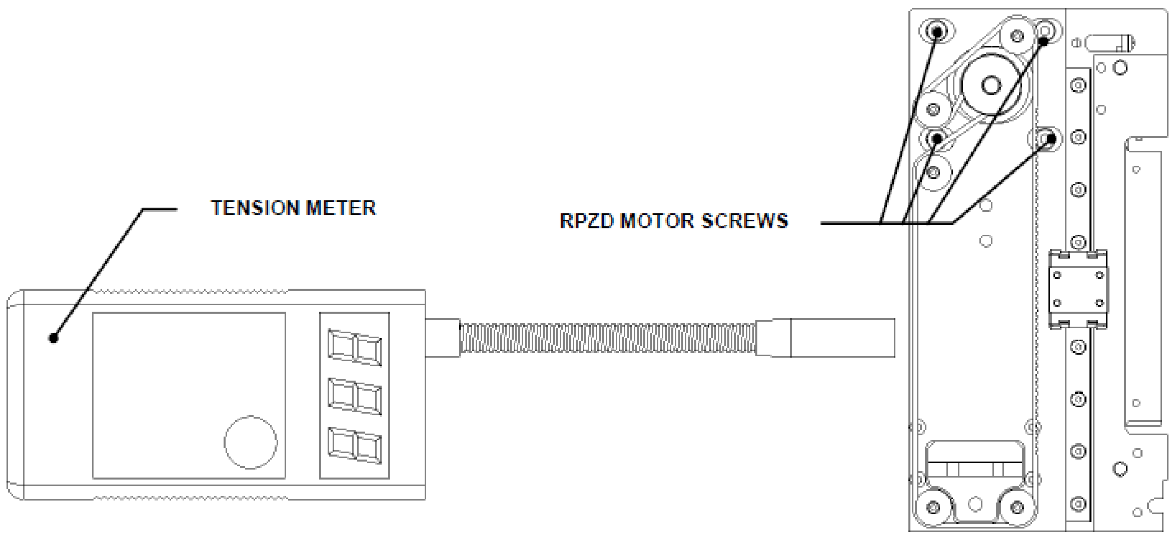


Figure O-22: Using the Tension Meter

3. Tap the belt to cause it to oscillate. While the belt is oscillating and sensor is in position, press and hold the red button on the meter. Required frequency is 199-209 Hz. If the reading is above or below this range move the motor as appropriate.
4. Repeat the above steps until three consecutive readings within 199-209 Hz are obtained.
5. Tighten the Reagent Pipettor Z Drive Motor screws and re-check the frequency using the meter.

O.2.6 Eject Assembly

The Eject assembly is mounted on the main plate of the Reagent Pipettor Z Drive as shown in Figure O-23. To remove the assembly, remove the four M2.5x10 Socket Head Screws. When reinstalling, use Loctite 425.

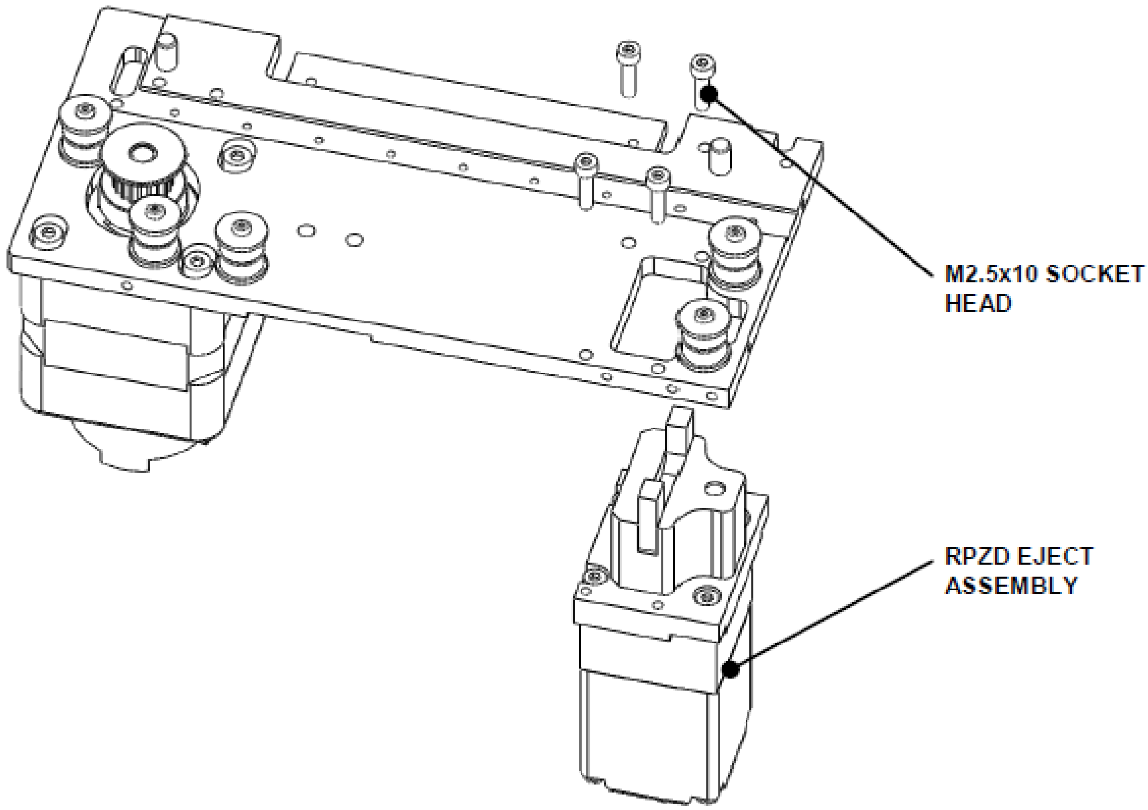


Figure O-23: Mounting the Eject Assembly

The eject assembly includes an Optosensor (Her Sing 140mm) which is removed by unscrewing the M3x6 Button Head Screw. When replacing the optosensor, use a 4-6 in.lb torque driver.

The LED part of the Tip Detector Harness fits through the Reagent Pipettor Z Drive Eject Motor Spacer as shown in Figure O-22. To replace the LED, slide it onto the Reagent Pipettor Z Drive Tip Detector LED Block and insert them into the Reagent Pipettor Z Drive Eject Fork Housing together with the Reagent Pipettor Z Drive Tip Detector LED Spacer (23504280). Check the assembly remains flush with the Reagent Pipettor Z Drive Eject Fork Housing.

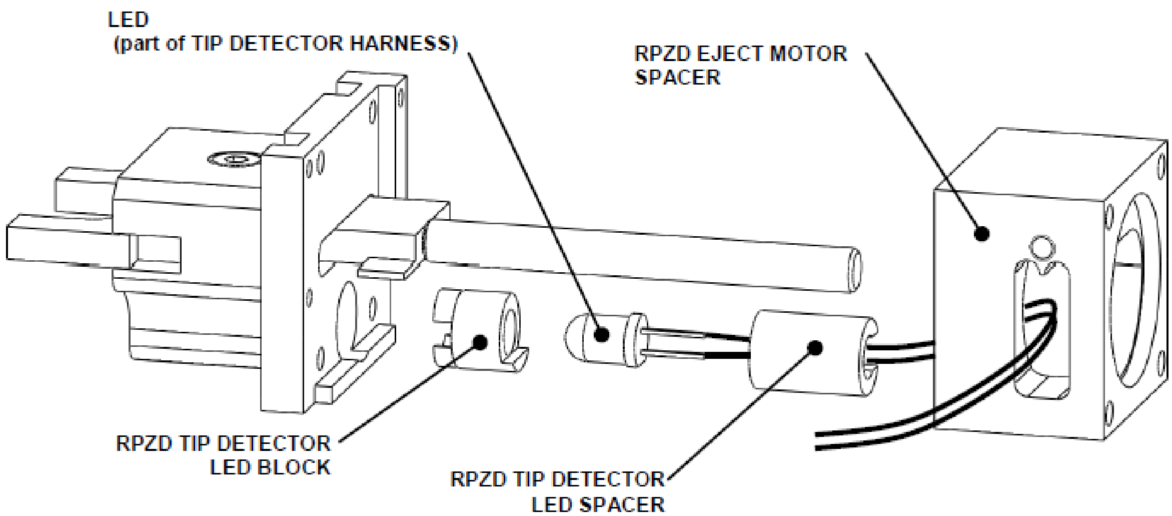


Figure O-24: The Reagent Pipettor Z Drive Eject Motor LED

A polarizing filter is located in the Eject Fork Housing as shown in Figure O-25. When replacing, make certain that it fits into the special cavity.

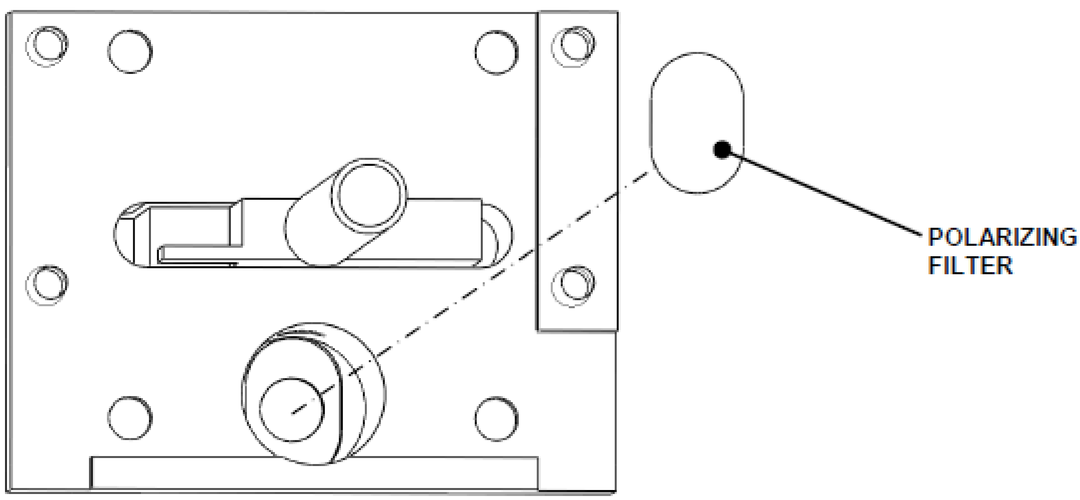


Figure O-25: Polarizing Filter

To replace the lead screw remove it from the motor (Figure O-26). When replacing it, degrease the end of it using alcohol and thread it into the Eject Fork using Loctite 262.

▶ ***Note:*** *This sub-assembly must dry for ten minutes.*

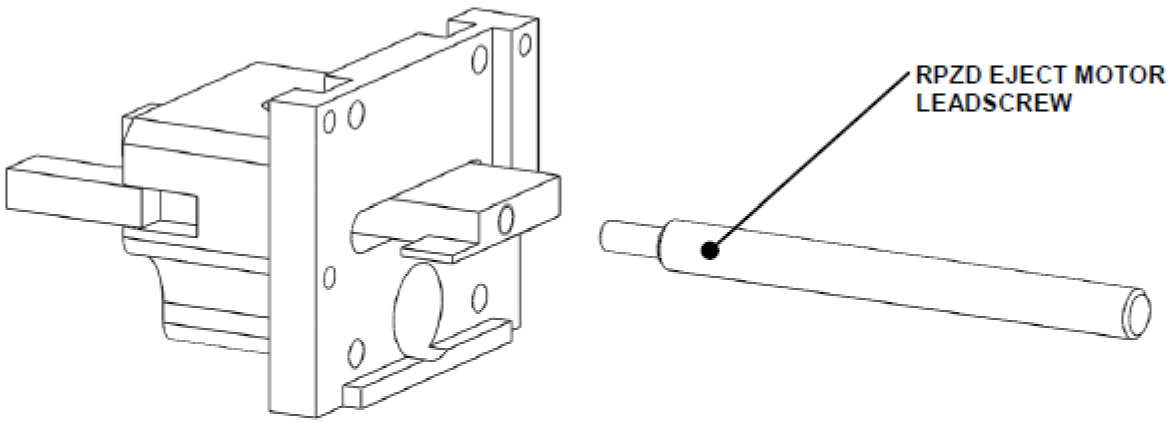


Figure O-26: Eject Motor Leadscrew

O.2.7 Eject Motor

The eject motor is mounted as shown in Figure O-27.

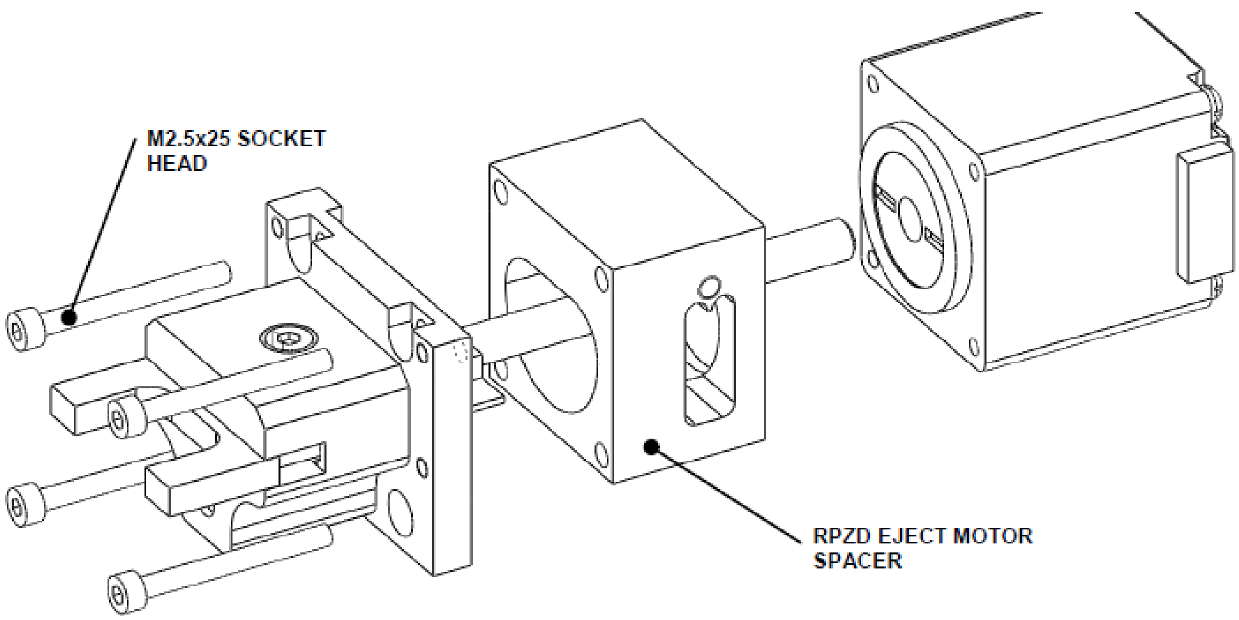


Figure O-27: Eject Motor

To remove it, unscrew the four M3x6 screws. When replacing the motor, do not fully tighten the screws as it they will be adjusted when the belt is adjusted.

To replace the motor:

1. Take a 20-Tooth Drive Pulley, remove and discard any set screws that come with it. Attach the pulley to the front shaft of the RP Z Motor with the DS2FIX004 using two M4x6 Set Screws) and Loctite 222 (Figure O-28).

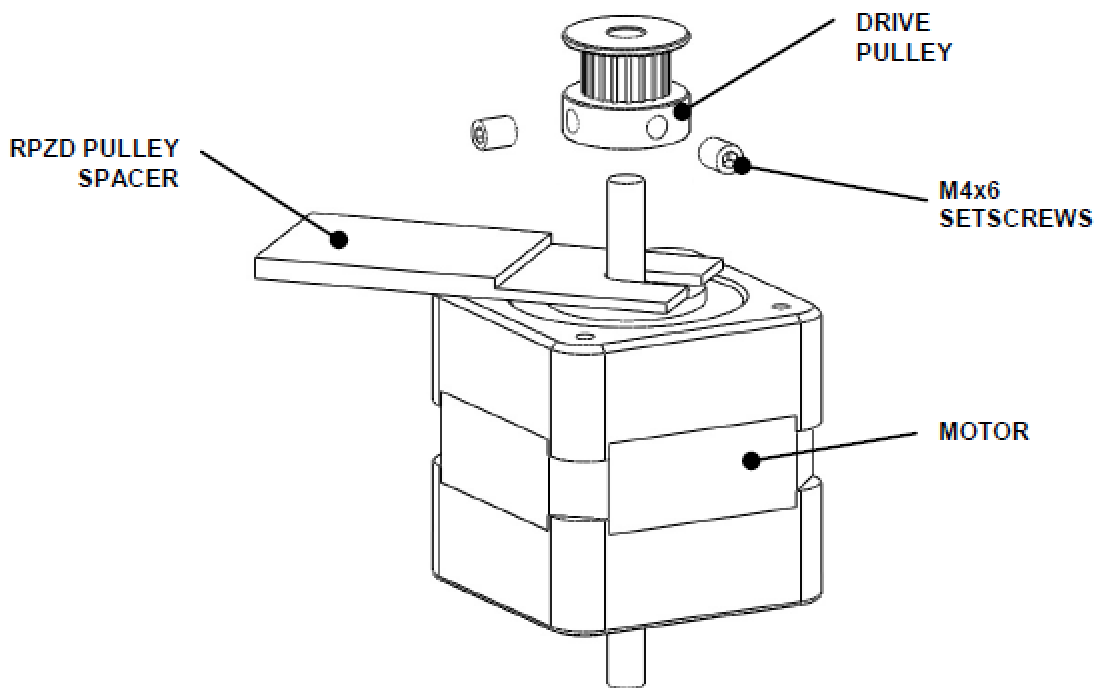


Figure O-28: Fitting the Pulley

> **Note:** *Install the set screws firmly. The pointed cone of each set screw must pierce the motor shaft for a strong fit.*

2. Attach the Mounting Plate, part of the Encoder (to the motor with the Encoder Mounting Fixture (DSXFIX015) using three M1.6X6 Pan Head Screws. Ensure that the mounting plate is centralized around the pulley idler shaft and the motor cable (part of motor assembly) is plugged into the motor. (Figure O-29)

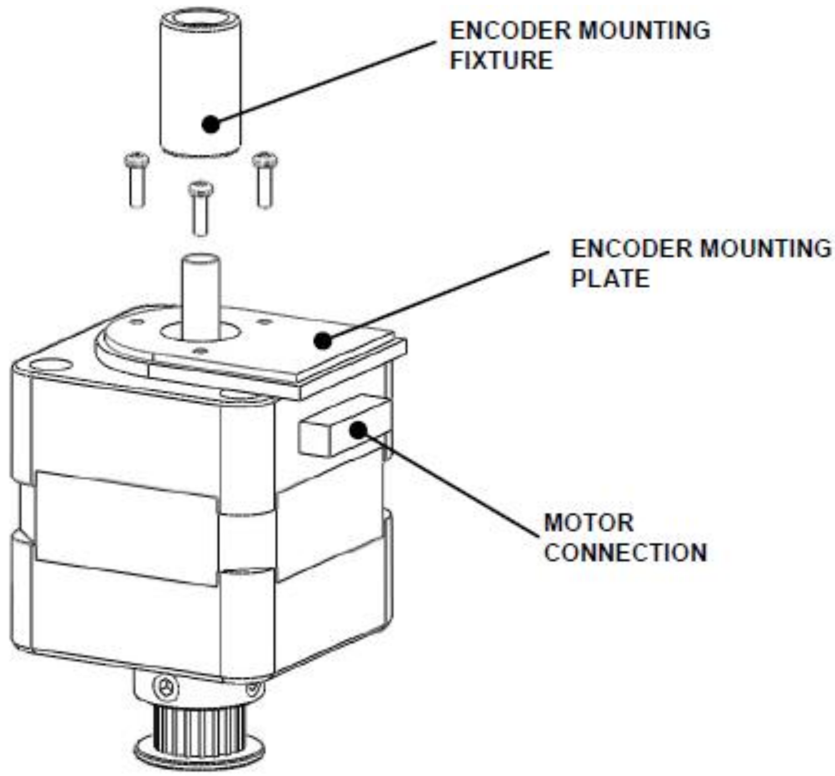


Figure O-29: Mounting the Encoder Mounting Plate

3. Install the main part of the Encoder onto the Mounting Plate by snapping it in place (Figure O-30).

> ***Note:*** *Do not remove the Allen key in the encoder.*

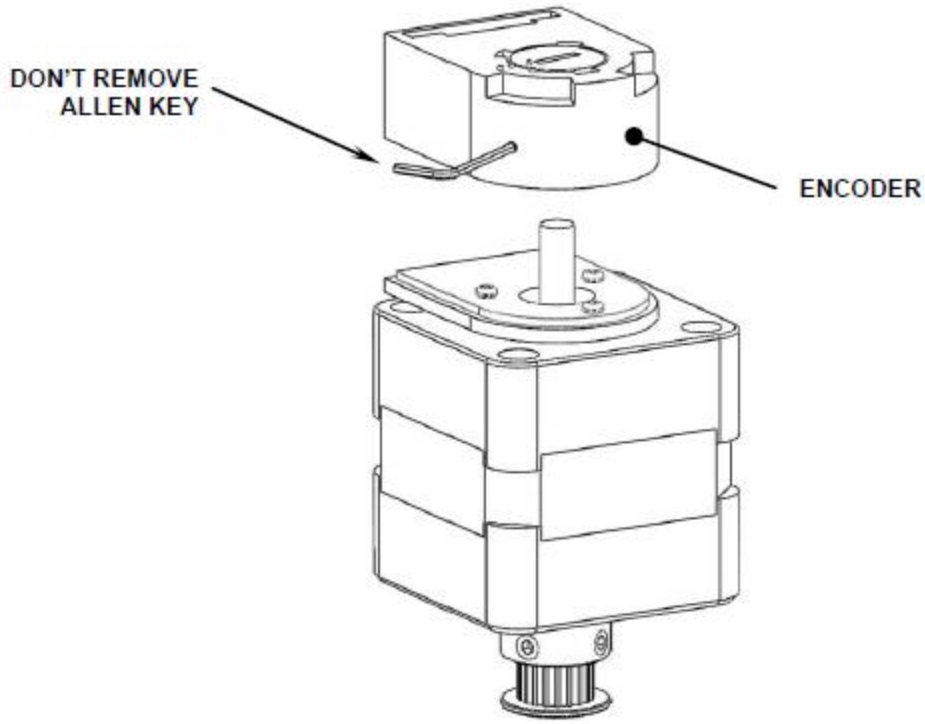


Figure O-30: Mounting the Encoder

4. Push the Allen Key into the body of the encoder to ensure that it is properly seated into the code wheel hub set screw. Then, apply a downward force on the end of the Allen Key. (This sets the code wheel gap by levering the code wheel hub to its upper position.) While continuing to apply a downward force, rotate the Allen Key to the clockwise direction until the hub set screw is tight against the idler shaft. Remove the Allen Key by pulling it straight out of the encoder body (Figure O-31).

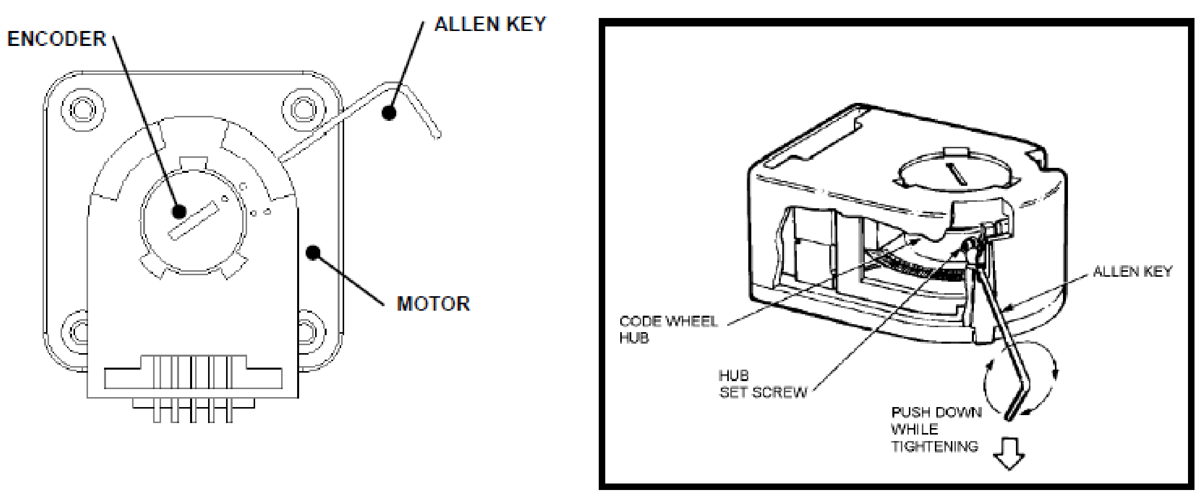


Figure O-31: Setting the Encoder

Chapter P Reagent Pipette Y Drive

P.1 Accessing the Internal Components of the Y Drive

The *Reagent Pipette Y Drive* is mounted on the Reagent Pipette X Drive

To remove the covers:

1. Remove the Reagent Pipette Y Drive Back Cover by unscrewing the seven M2.5x6 Flat Head Screws (Figure P-1). When replacing the cover, use Loctite 222.

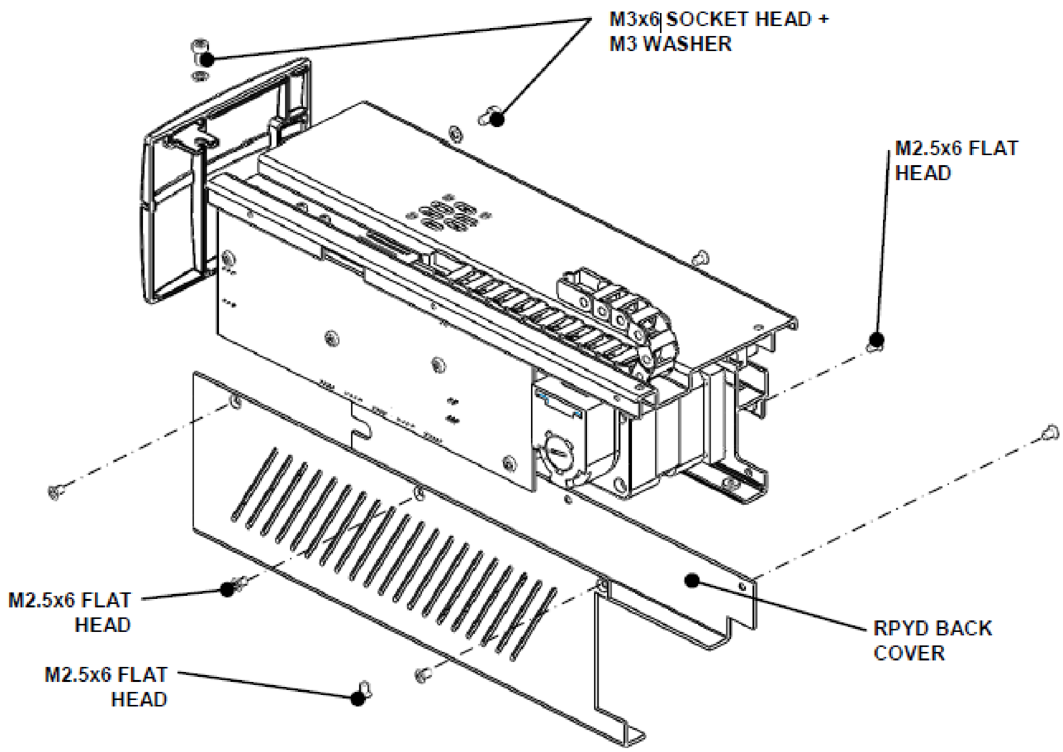


Figure P-1: Removing the Covers of the Y Drive

2. Remove the Reagent Pipette Y Drive Front Cover by unscrewing the two M3x6 Socket Head Screws. When replacing the cover affix Loctite 425 to the screws.

P.2 Y Drive Printed Circuit Board

To remove the Y drive printed circuit board, disconnect all electrical components, including the flex cable, then remove the four M3x6 Socket Button Head Screws as shown in Figure P-1.

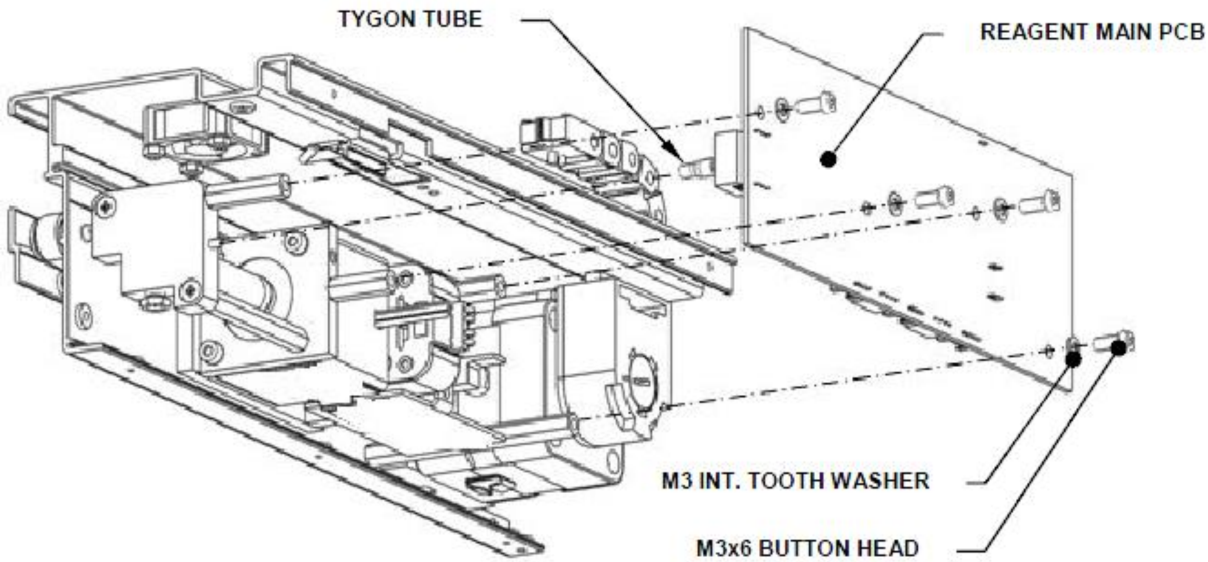


Figure P-2: Removing the Printed Circuit Board

When installing the board, aligning the Tygon Tube with the tip on the Syringe Manifold and secure it to the standoffs with four M3x6 Socket Button Head Screws and four M3 Internal Tooth Washers

> ***Note:*** *Verify the PCB is correctly aligned and that the Syringe Flag (on the Syringe Anti-Rotation Block) doesn't clash with the onboard optosensor. When fitting the board, ensure that the Flex Cable remains square to its connector and is not under strain.*

P.3 Replacing the Cable Chain

The Y drive cable chain is connected to the Z Drive as shown in Figure P-3.

To remove the cable:

1. Remove the 18 Way Flex Cable from the Y Drive Cable Chain and pass the PTFE Tube on top of the Flexcable (Figure P-3).

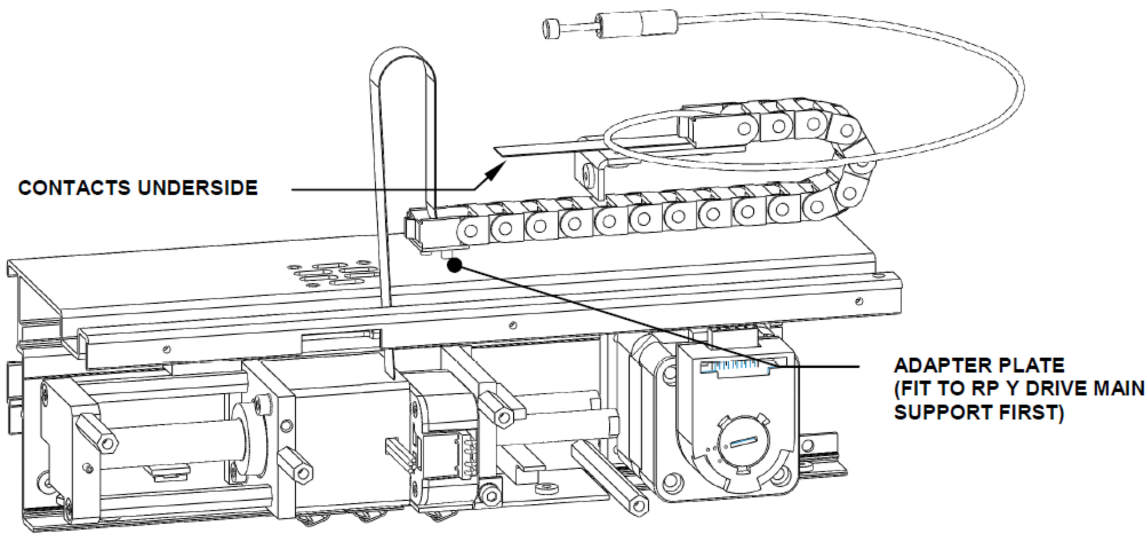


Figure P-3: Removing the Cable and Tube from the Y Drive Chain

When reinstalling the chain, note the orientation of the Flex Cable by the position of the contacts on one end. Fit an Adapter Plate to the location shown on the RP Y Drive Main Support and clip the RPYD Cable Chain to the Adapter Plate and thread the PTFE Tube and the 18 Way Flex Cable through the slot.

P.4 Replacing the Belt

The belt is removed by loosening the clamp (Figure P-4).

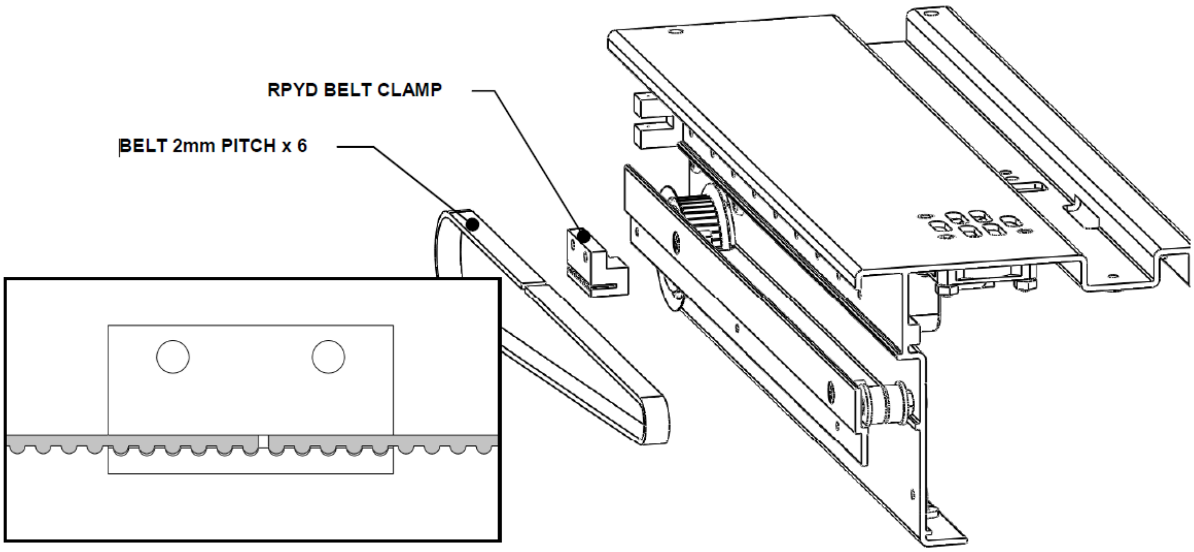


Figure P-4: Removing the Belt Clamp

When replacing the belt:

1. Use a piece of Belt 2mm pitch x 6) cut to 420mm long. Pass it around the Motor Pulley and the Idler and close the belt with the RPYD Belt Clamp leaving no empty slots.
2. Position the Tension Meter (Gates Sonic Tension Meter 507C, Brecoflex SM4, or equivalent) at the position indicated in Figure P-5. The Tension Meter must be 3-6mm away from the belt to obtain a reading.

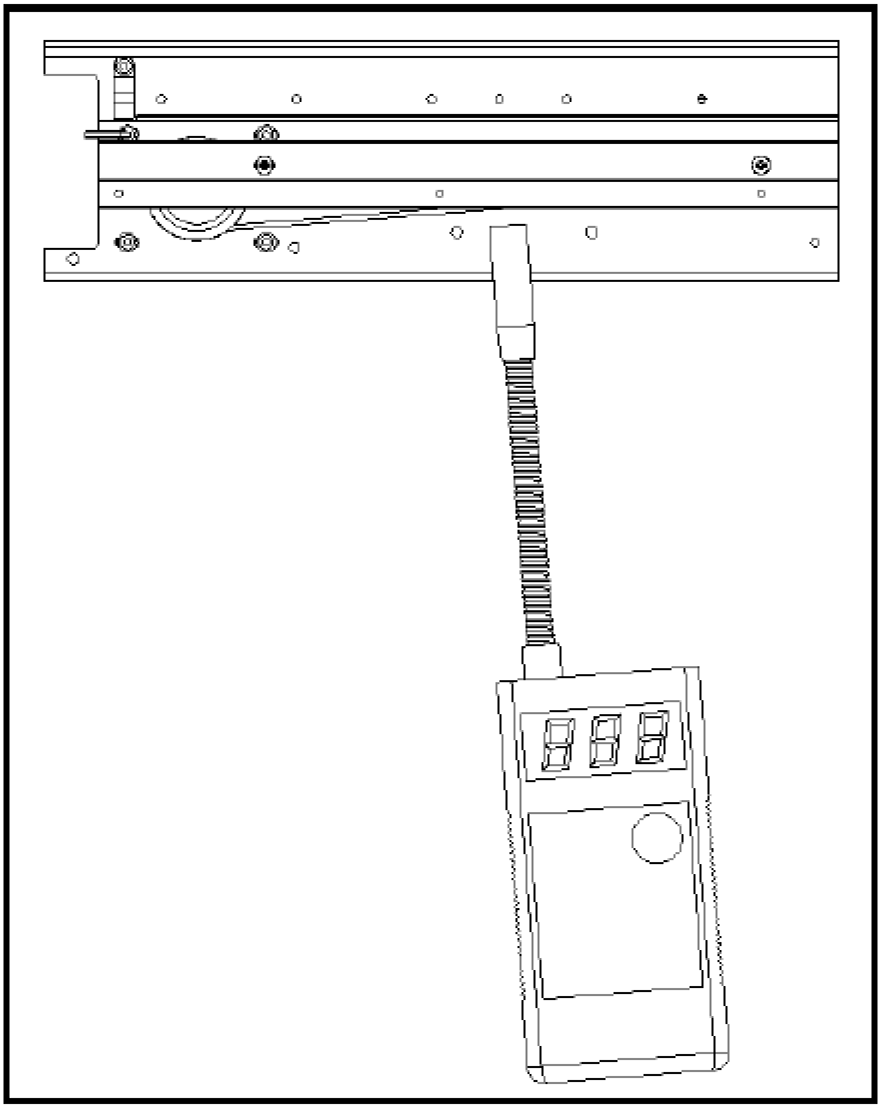


Figure P-5: Position of the Tension Meter

3. Tap the belt to cause it to oscillate. While the belt is oscillating and the sensor is in position, press and hold the red button on the meter.

4. The required frequency is in the range 113-119 Hz. If the reading is above or below this range loosen the four M3x8 Socket Button Head Screws and move the motor in order to obtain the desired tension (Figure P-6).

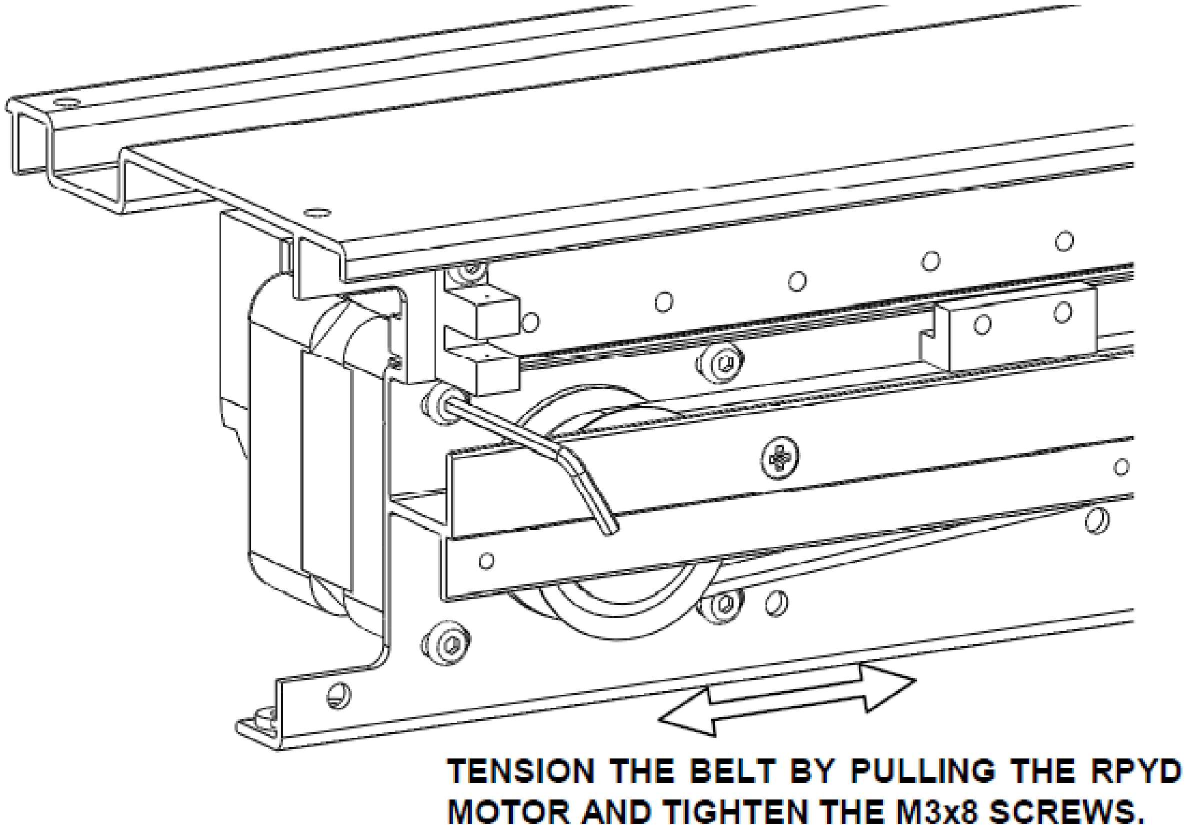


Figure P-6: Tightening the Belt

5. Repeat the above steps until three consecutive readings within 113-119 Hz are obtained.

6. Tighten the four M3x8 Socket Button Head Screws.

7. Re-check the frequency using the meter.

P.5 Replacing the Fan

The fan is located on the Y Drive Main Support (Figure P-7). To replace the fan, remove the three self-tapping screws.

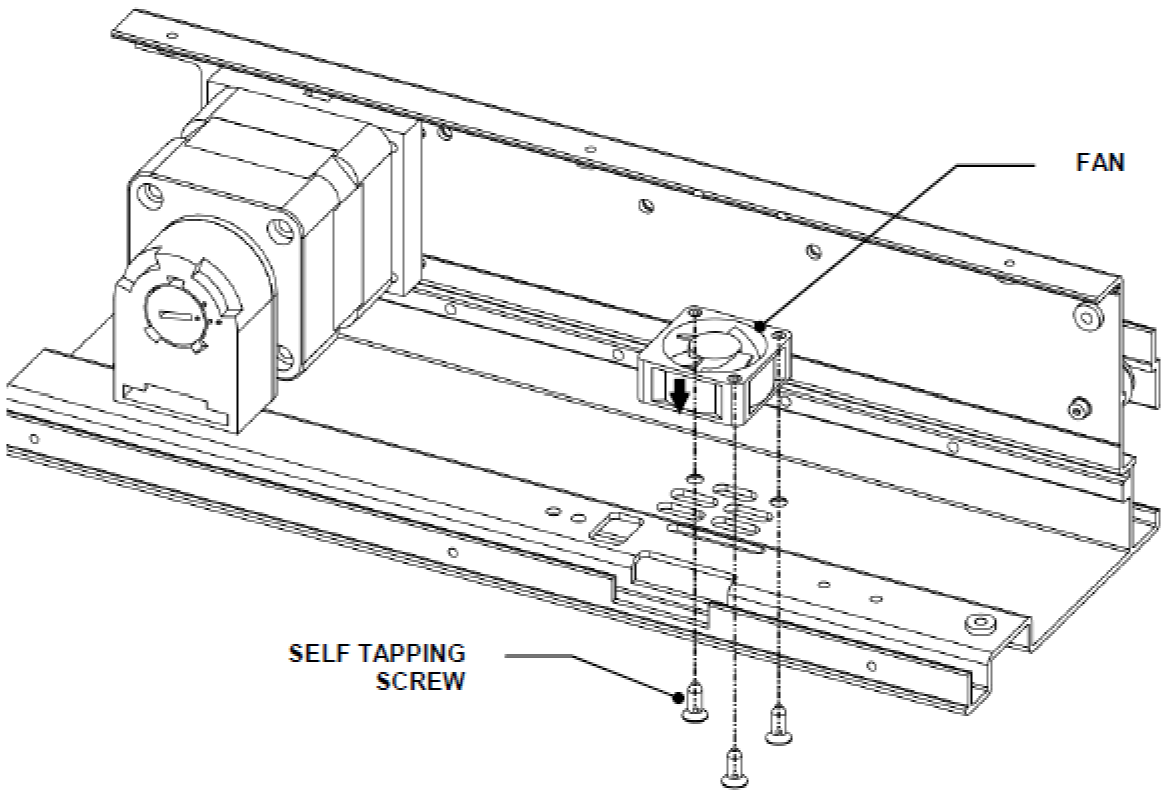


Figure P-7: Fan

P.6 Replacing the Optosensor

The optosensor is located on the Y Drive Main Support (Figure P-8). To replace the optosensor, remove the M3x10 Socket Button Head Screw, M3 Nyloc Nut and an M3 Washer.

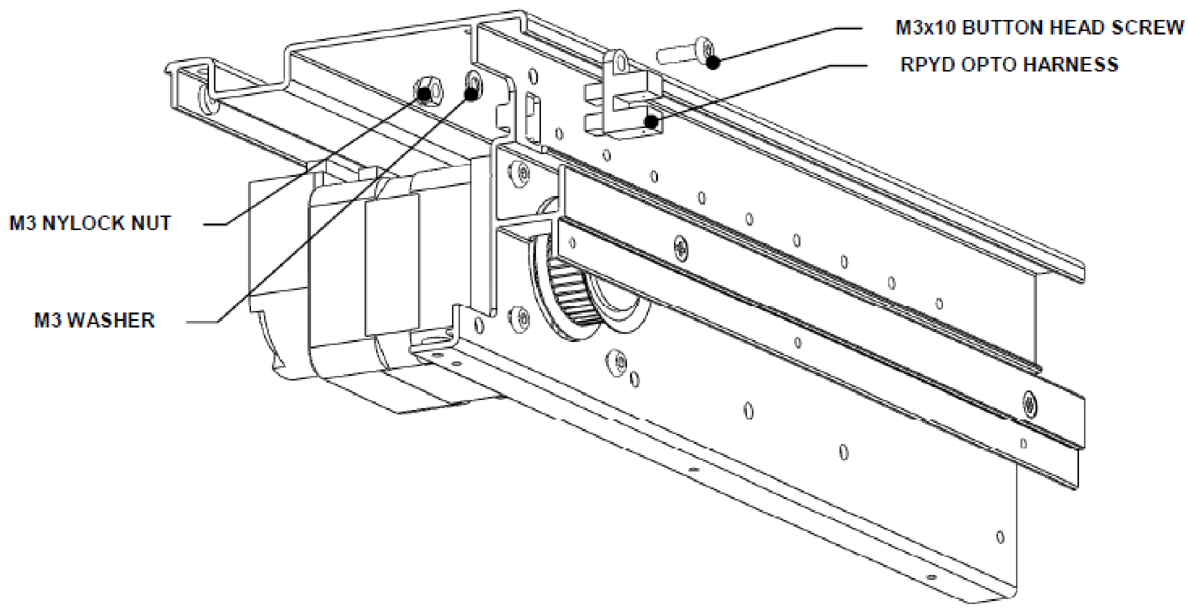


Figure P-8: Location of the Optosensor

P.7 Y Drive Motor Assembly

The Y Drive Motor Assembly is mounted on the Y Drive Main Support as shown in Figure P-9.

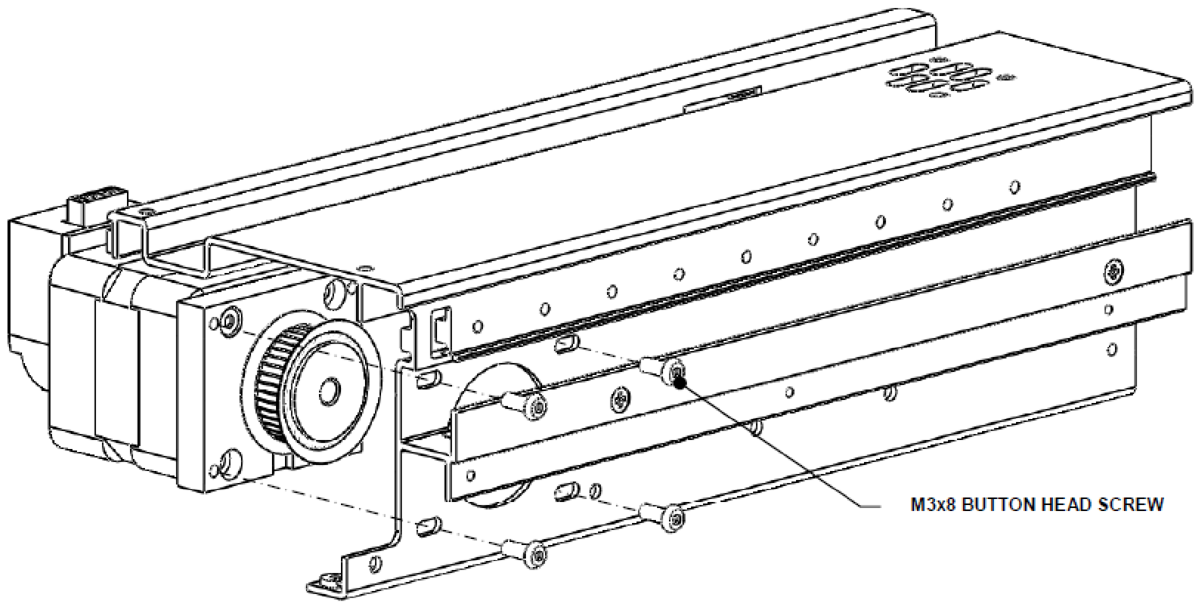


Figure P-9: Mounting the Y Drive Motor Assembly

To remove the motor assembly, unscrew the four screws that attach it to the support.

To replace the RP Y Motor Assembly on the RPY Drive Main Support use four M3x8 Socket Button Head Screws using Loctite 222 (the screws will need to be loosened and re-tightened later on). Note the orientation of the Motor Assembly by the position of the encoder.

To assemble a new motor assembly:

1. Attach the Mounting Plate to the RP Y Motor (50800250) with the Encoder Mounting Fixture (DSXFIX015) using three M1.6x6 Pan Head Screws and Loctite 425. Ensure that the mounting plate is centralized around the pulley idler shaft (Figure P-10).

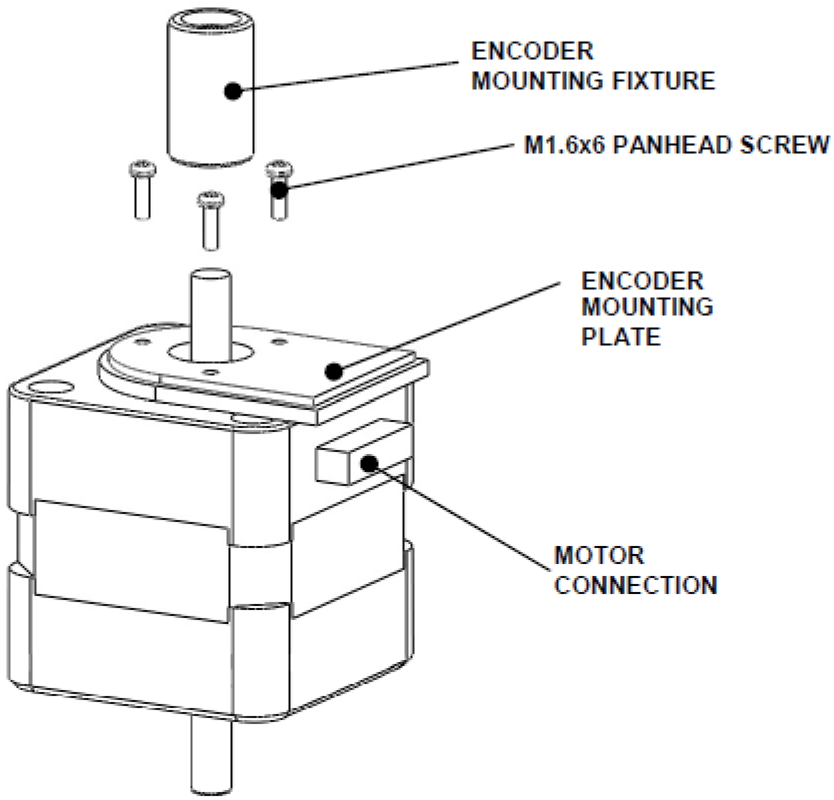


Figure P-10: The Encoder Mounting Plate and Fixture

2. Install the main part of the Encoder onto the Mounting Plate by snapping it in place (Figure P-11).

Note: *Do not remove the Allen key in the encoder.*

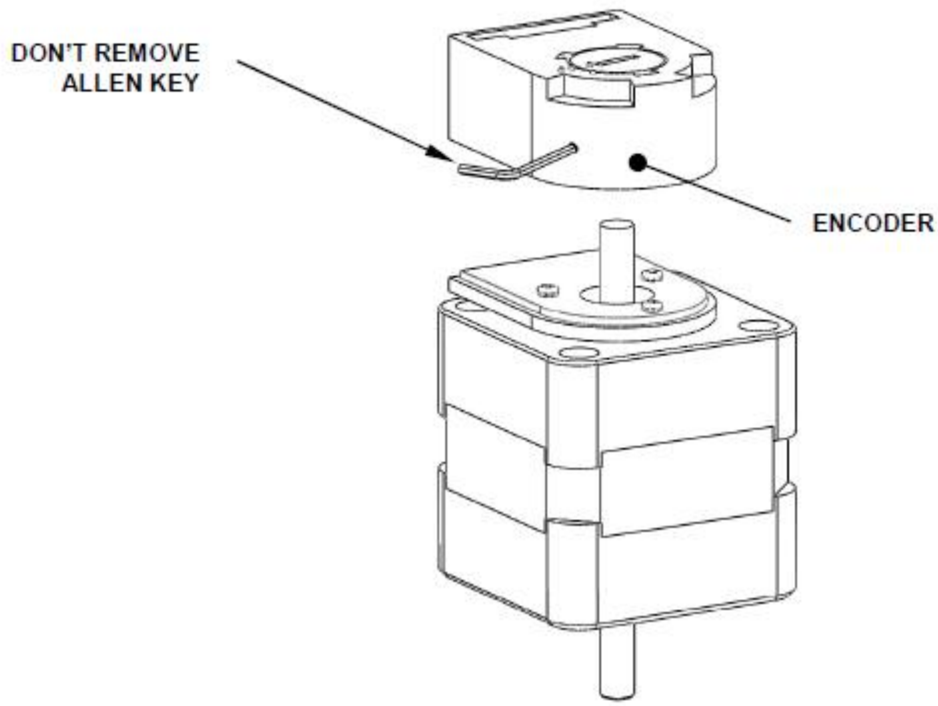


Figure P-11: Mounting the Encoder

3. Push the Allen Key into the body of the encoder to ensure that it is properly seated into the code wheel hub set screw (Figure P-12).

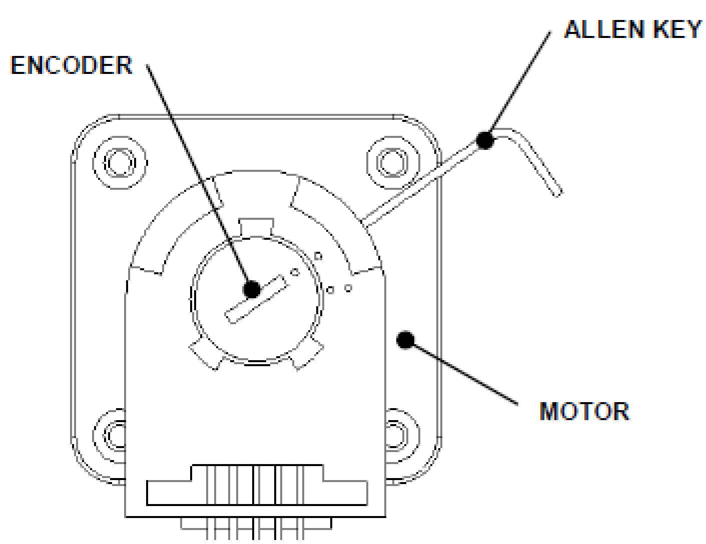


Figure P-13: Inserting the Allen Key in the Code Wheel

4. Apply a downward force on the end of the Allen Key. (This sets the code wheel gap by levering the code wheel hub to its upper position. (Figure P-13).

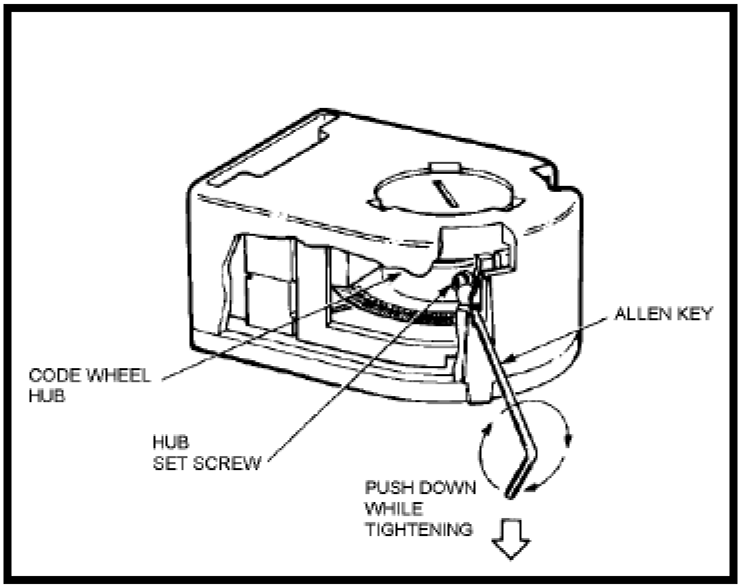


Figure P-13: Setting the Code Wheel Gap

5. While continuing to apply a downward force, rotate the Allen Key to the clockwise direction until the hub set screw is tight against the idler shaft.

6. Remove the Allen Key by pulling it straight out of the encoder body.

7. Rotate the encoder cover from the open to the closed position by inserting a small flat blade screwdriver into the notch and rotating (Figure P-14).

> ***Note:*** *The encoder cover is shown below in the closed position.*

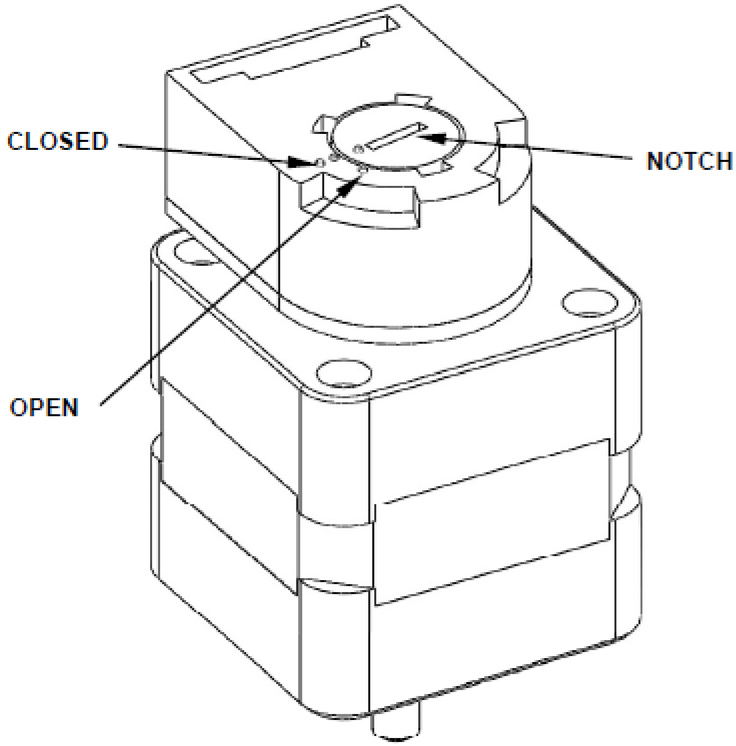


Figure P-14: Setting the Encoder Position

8. Fit a Y Drive Motor Support to the Y Motor with four M3x8 Socket Cap Head Screws and Loctite 222 (Figure P-15). Note the orientation of the RPYD Motor Support by the position of the notch.

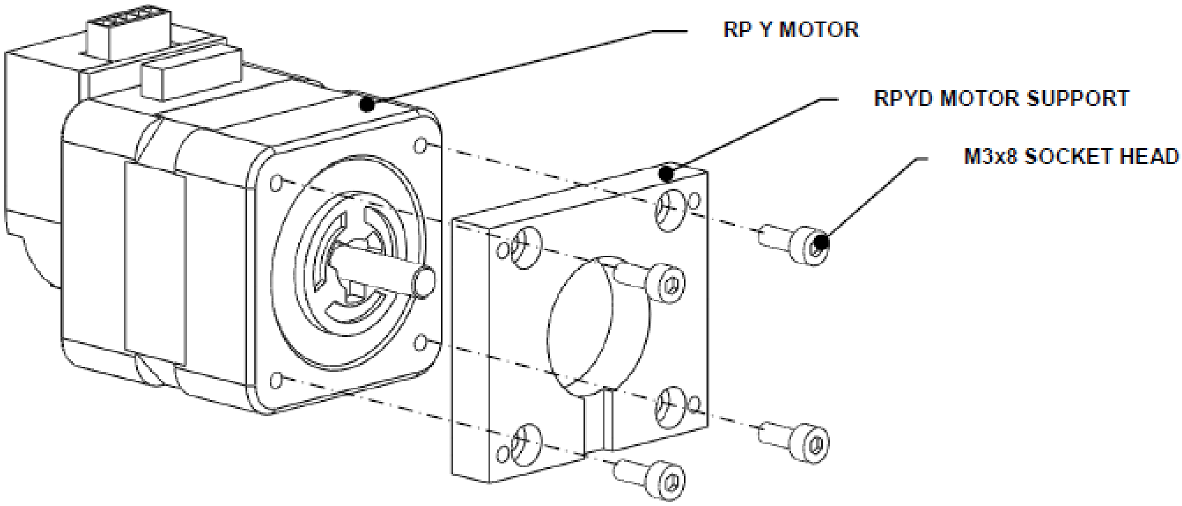


Figure P-15: Fitting the Y Drive Motor Support

9. Attach a pulley to the shaft of the motor using two M4x6 Set Screws and Loctite 222 using the pacer Ø20.0x2.5 (P24FIX030) (Figure P-16). Install the set screws firmly. The pointed cone of each set screw must pierce the motor shaft for a strong fit.

> ***Note:*** *Discard any set screws that come with the pulley.*

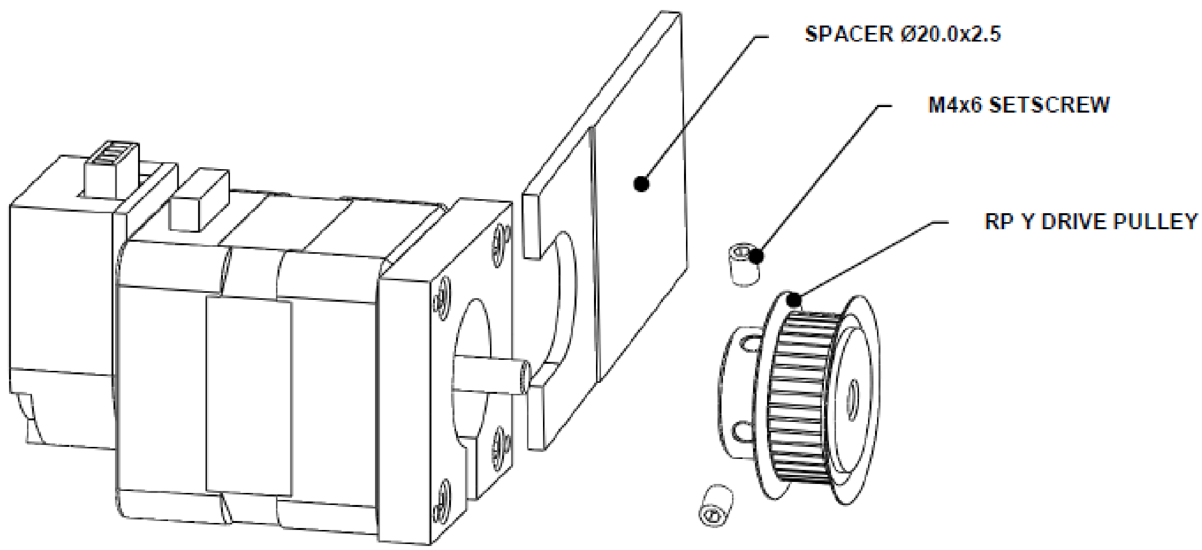


Figure P-16: Attaching the Pulley

Chapter Q Reagent Pipettor X Drive

Q.1 Overview

The *Reagent Pipettor X Drive* is mounted on the Workspace. To access the X drive, remove the Reagent Pipettor Y & Z Drive Assembly from the Reagent X Drive carriage by removing the three M3x8 Socket Cap Head Screws (Figure Q-1).

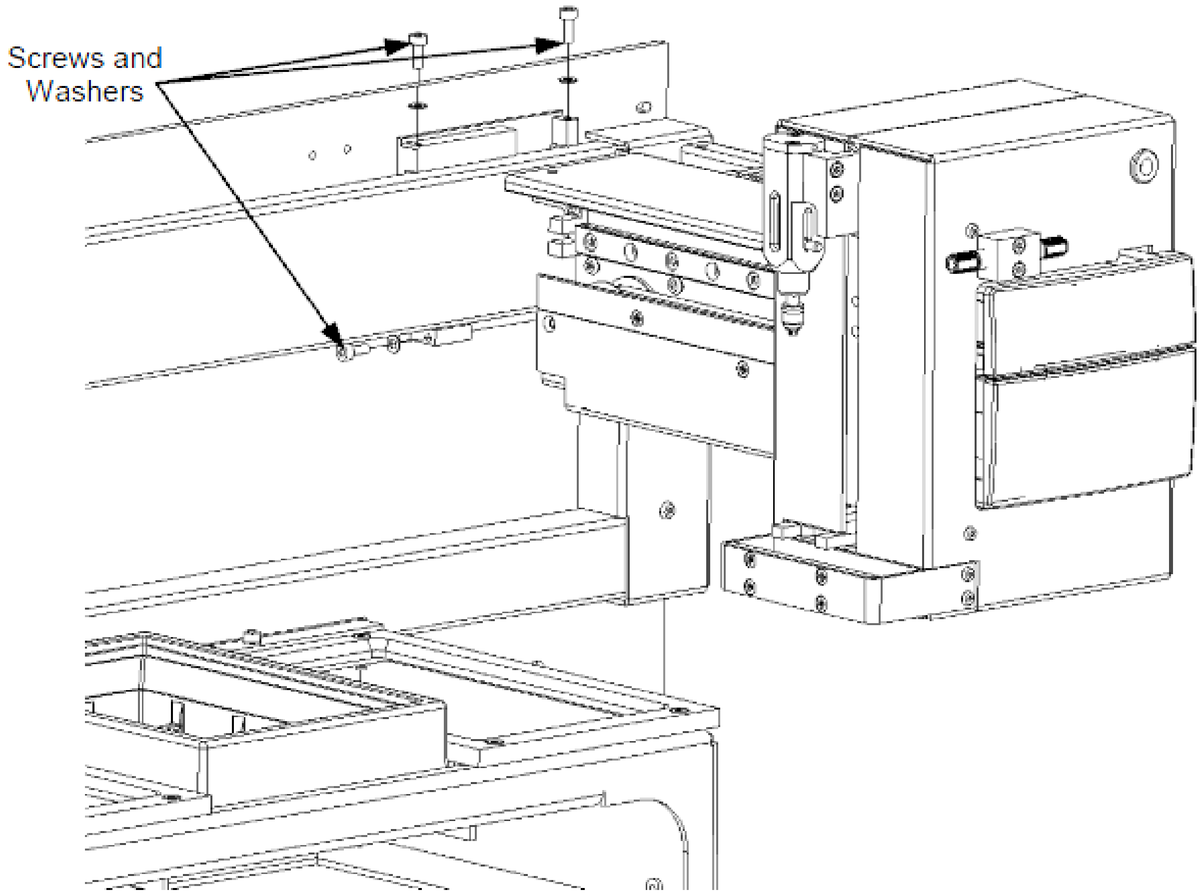


Figure Q-1: Removing the Reagent Pipettor Y & Z Drive Assembly

Q.2 Replacing the Reagent Pipettor X Drive Printed Circuit Board

To replace the reagent Pipettor X Drive PCB:

1. Remove the Reagent Pipettor X Drive PCB Cover Panel by removing the two M3x6 Socket Cap Head Screws (Figure Q-2).

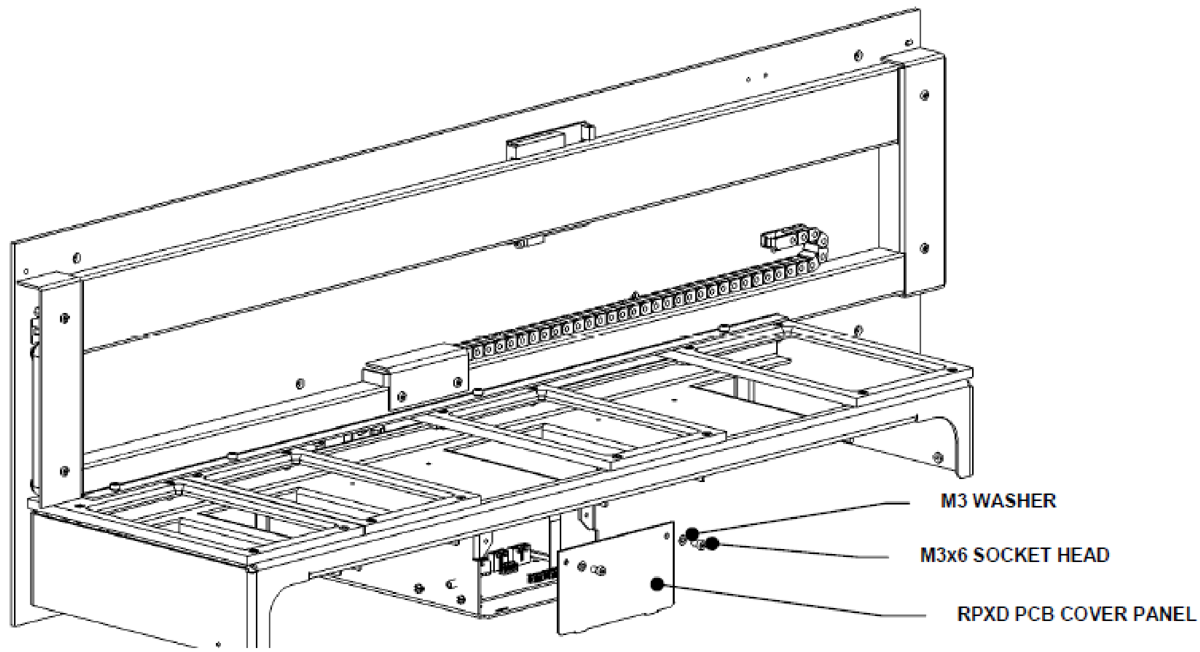


Figure Q-2: Removing the Reagent Pipettor X Drive PCB Cover Panel

2. Disconnect all electrical connections from the PCB and remove it from the slots in the card guide. When replacing the board, ensure that the jumper (indicated in Figure Q-3) is in the ‘X’ position. The jumper is removed by lifting it off the pins and placing back on the lower two pins (marked ‘X’ and ‘Function’).

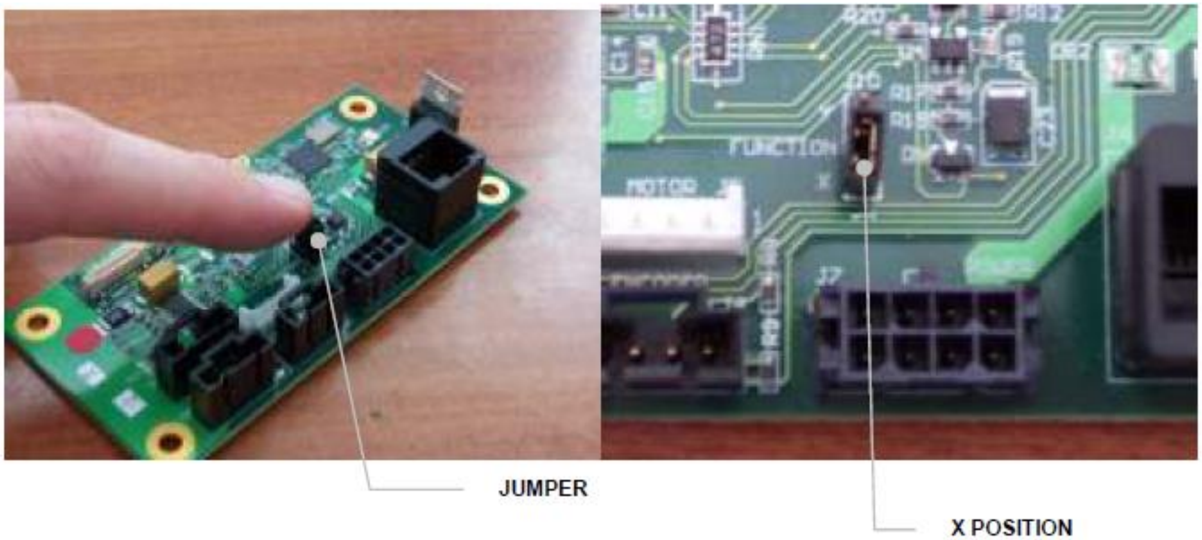


Figure Q-3: Setting the Jumper on the Reagent Pipettor X Drive Board

3. When replacing the cover, engage the tabs into the slots of the Reagent pipette X Drive PCB Cover and secure with two M3x6 Socket Cap Head Screws), two M3 Washers (6514130011) and Loctite 222.

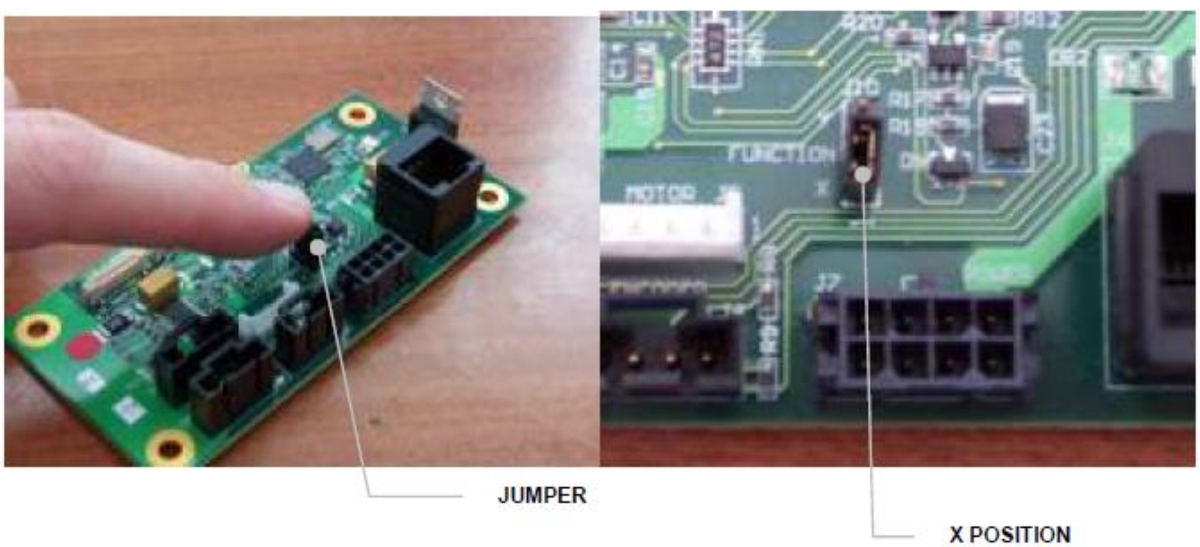


Figure Q-4: Position of the Jumper on the PCB

Q.3 Replacing the Chain

To replace the chain:

1. Remove the Reagent Pipettor X Drive Cable Chain Cover (Figure Q-5) from the Reagent Pipettor X Drive Reagent Pipettor X Drive Belt Cover Lower by removing the two M3x6 Socket Button Head Screws. When replacing the cover, use Loctite 222.

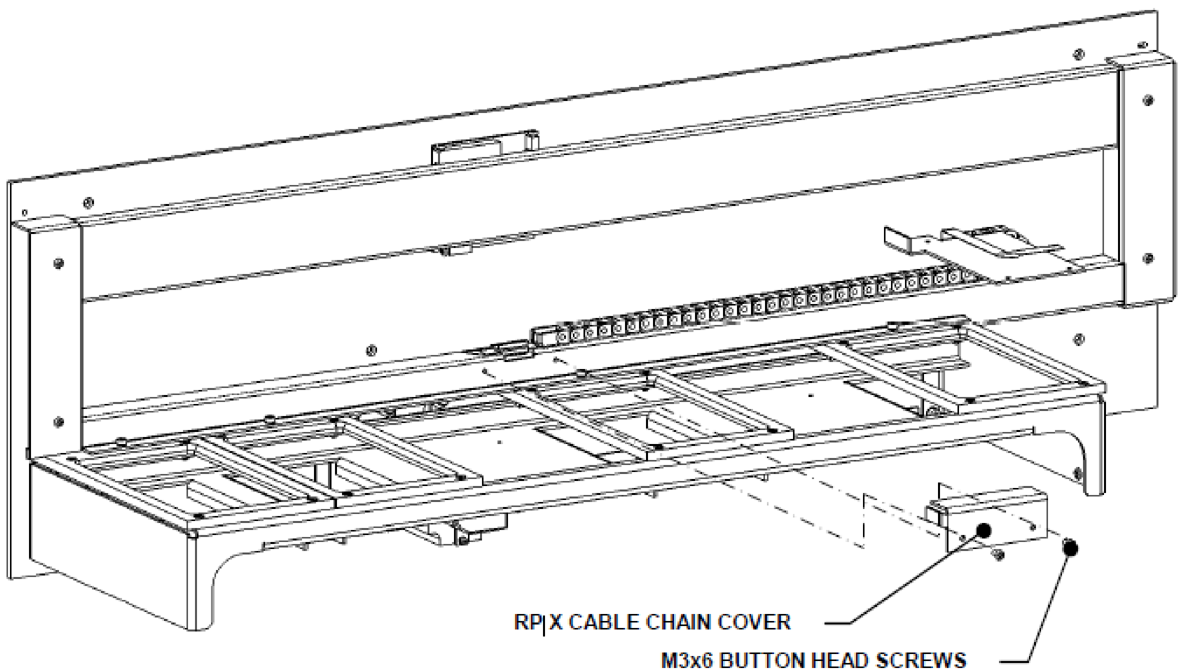


Figure Q-5: Removing the Reagent Pipettor X Drive Cable Chain Cover

2. Remove the screw that attaches the chain to the adapter (Figure Q-6).

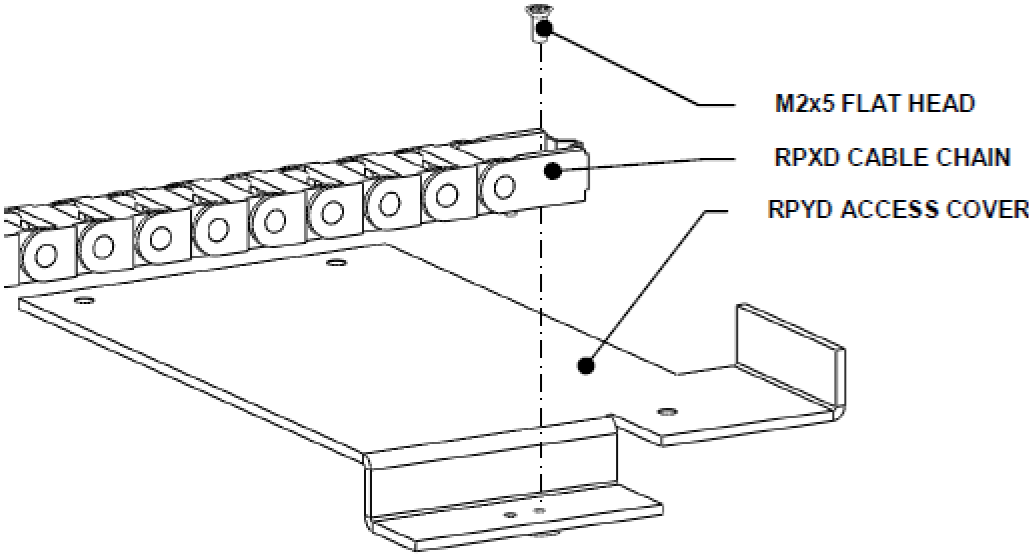


Figure Q-6: Removing the Chain Attachment Screw

When replacing the chain, feed the flex cable thru the chain as shown in Figure Q-7.

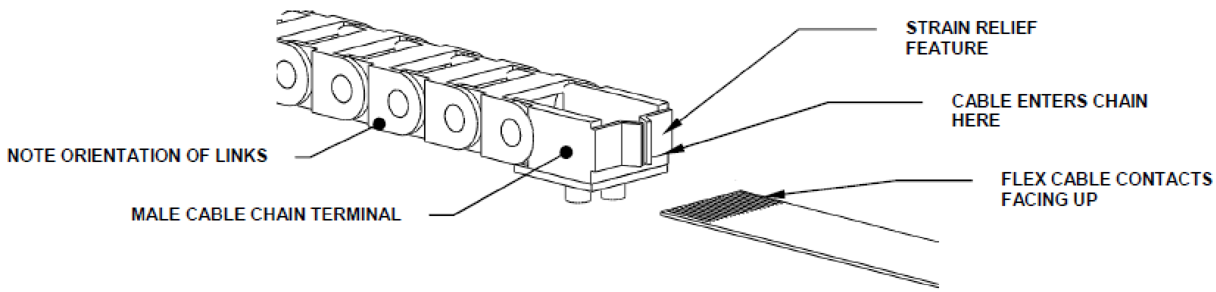


Figure Q-7: Feeding the Cable through the Chain

Q.4 Replacing the Belt

To replace the belt:

1. Remove the left and right covers, and then remove the Reagent Pipette X Drive Lower Belt Cover by removing the four M3x6 Socket Cap Head Screws and four M3 Washers (Figure Q-8). When replacing the cover, apply Loctite 222 to the screws.

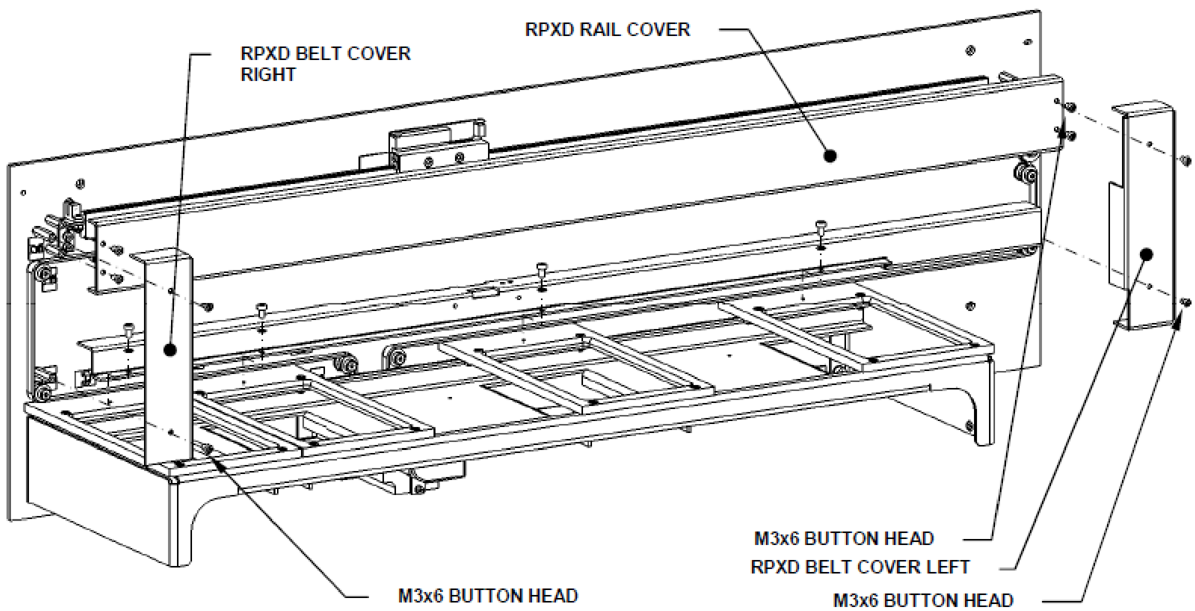


Figure Q-8: Removing the Rail Cover

2. Remove the clamp from the belt (Figure Q-9) by unscrewing the two M2.5x6 Socket Cap Head Screws.

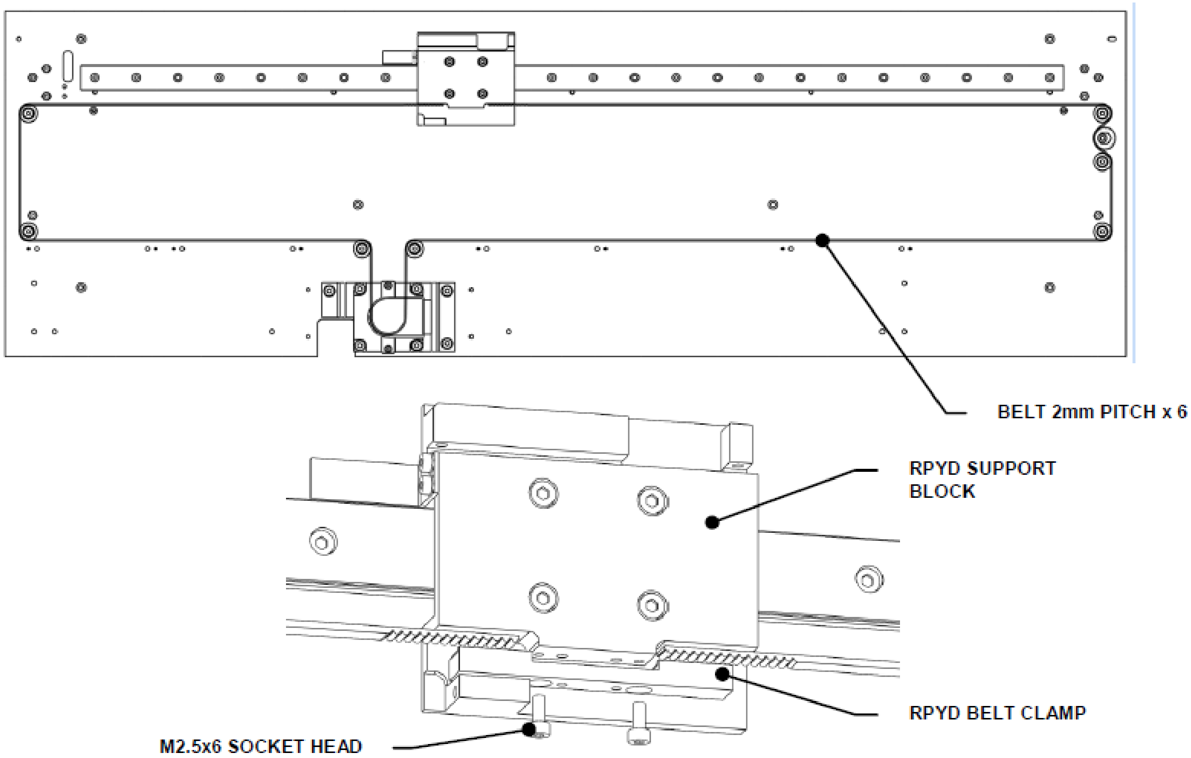


Figure Q-9: Removing the Belt

When replacing the belt:

1. Take a piece of Belt 2mm pitch x 6 cut to 1862mm long and pass the belt around the motor pulley and the idlers as shown in Figure Q-9.
2. Place the ends under the Reagent Pipette Y Drive Support Block and secure them using a Reagent Pipette X Drive Belt Clamp, two M2.5x6 Socket Cap Head Screws and Loctite 222 (Figure Q-10).

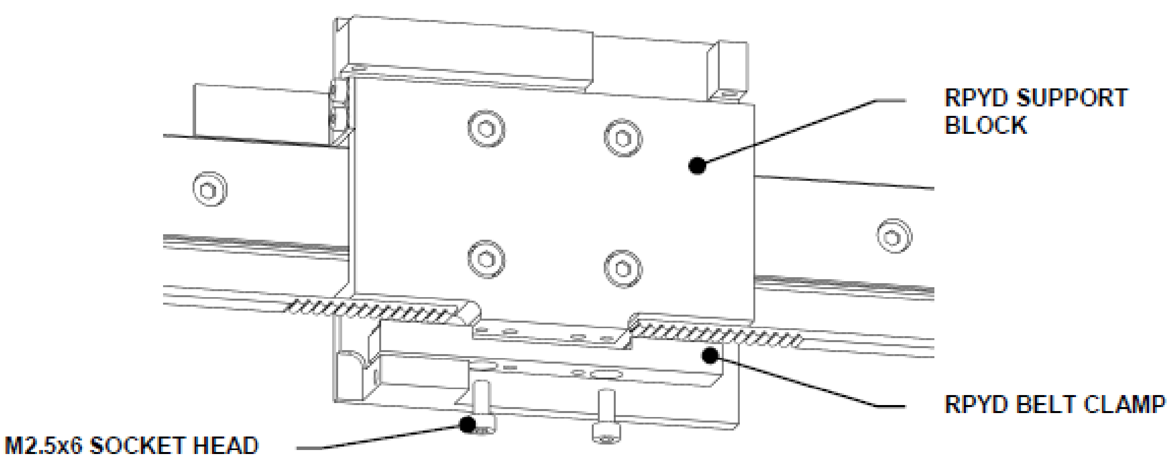


Figure Q-10: Clamping the Belt

3. Position the Tension Meter (Gates Sonic Tension Meter 507C, Brecoflex SM4, or equivalent) at the position indicated in Figure Q-11. The Tension Meter must be 3-6mm away from the belt to obtain a reading.

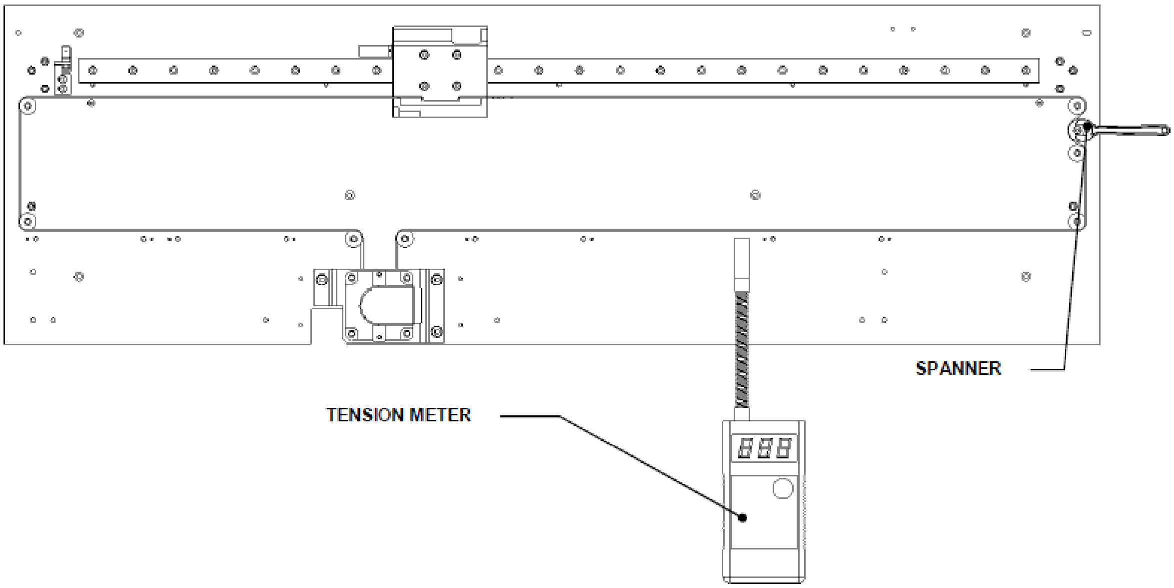


Figure Q-11: Positioning the Tension Meter

4. Tap the belt to cause it to oscillate. While the belt is oscillating and the sensor is in position, press and holds the red button on the meter. The required frequency is 38 ±1 Hz. If the reading is above or below this value, loosen the Eccentric Idler's screw and rotate the shaft with an 8mm spanner in order to tension the belt (Figure Q-12).

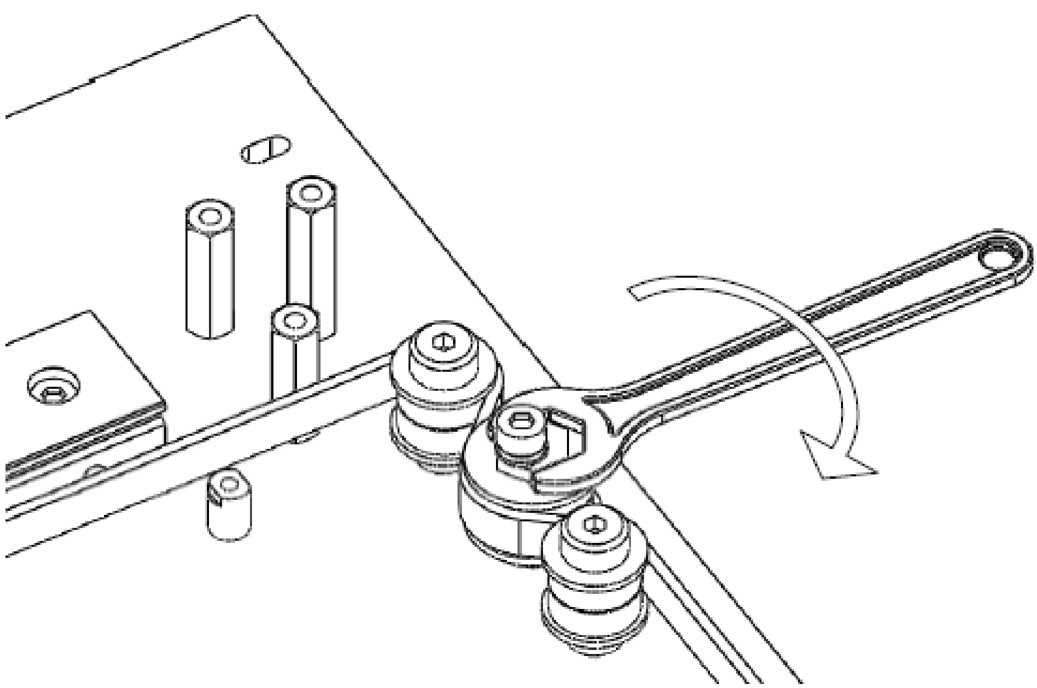


Figure Q-12: Rotating the Idler

5. Repeat the above steps until three consecutive readings at 38 ± 1 Hz are obtained.

6. Tighten the screw again once the desired tension is achieved.

7. Re-check the frequency using the meter.

Q.5 Replacing the Motor

To remove the motor assembly, remove the two M4x6 socket head screws (Figure Q-13).

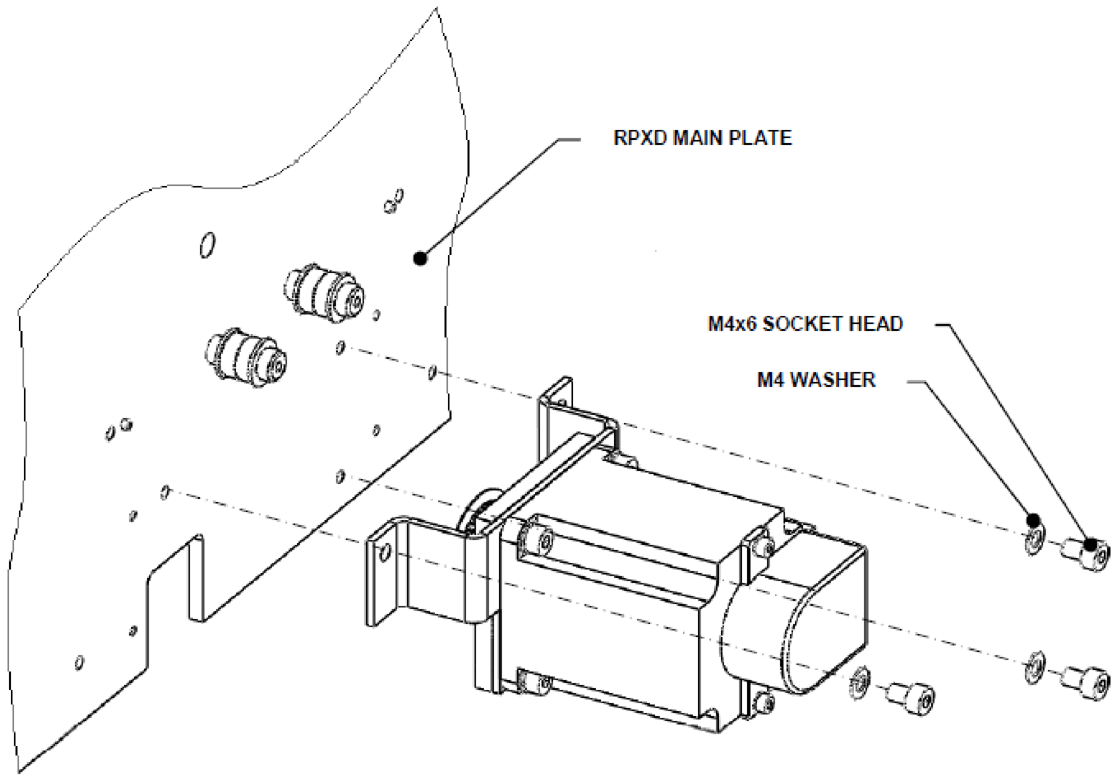


Figure Q-13: Removing the Motor Assembly

To build a motor assembly

1. Take an SRP XY Pulley remove and discard any set screws that come with it and fit two M4x6 Set Screws with Loctite 222. Slide the pulley on the Reagent Pipettor X Drive Motor (50800240) (Figure Q-14).

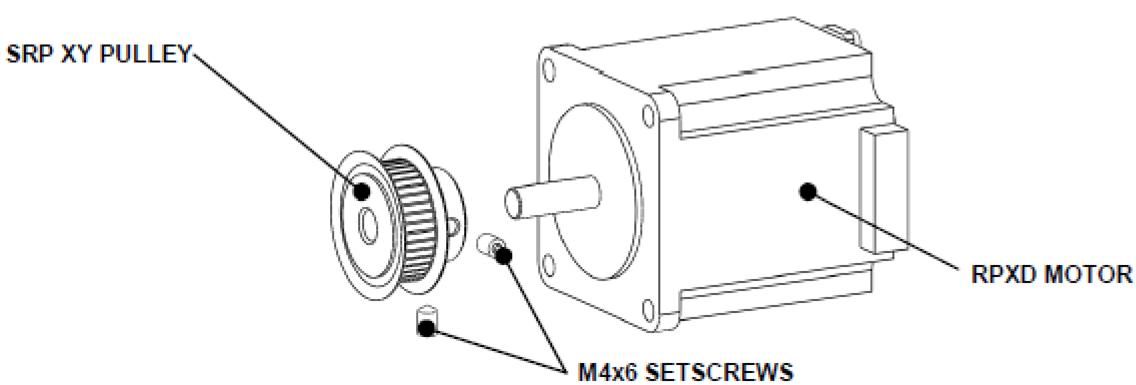


Figure Q-14: Mounting the Pulley

2. Locate the Pulley in the right position on Reagent Pipettor X Drive using the Spacer Ø7.0x0.5 (P24FIX003) and tighten the Set Screws. NOTE: Install the Set Screws firmly. The cone of each Set Screw must pierce the motor shaft for a strong fit (Figure Q-15).

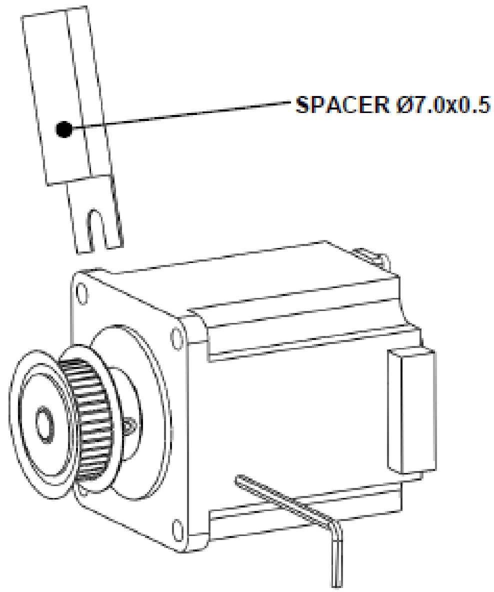


Figure Q-15: Locate the Pulley on the Reagent Pipettor X Drive

3. Attach the Mounting Plate, part of the Encoder, to the Reagent Pipettor X Drive Motor using the Encoder Centre Fixture 6.35mm (P24FIX007) and two M2.5x6 Socket Cap Head Screws with Loctite 425. Ensure that the mounting plate is centralized around the pulley idler shaft (Figure Q-16).

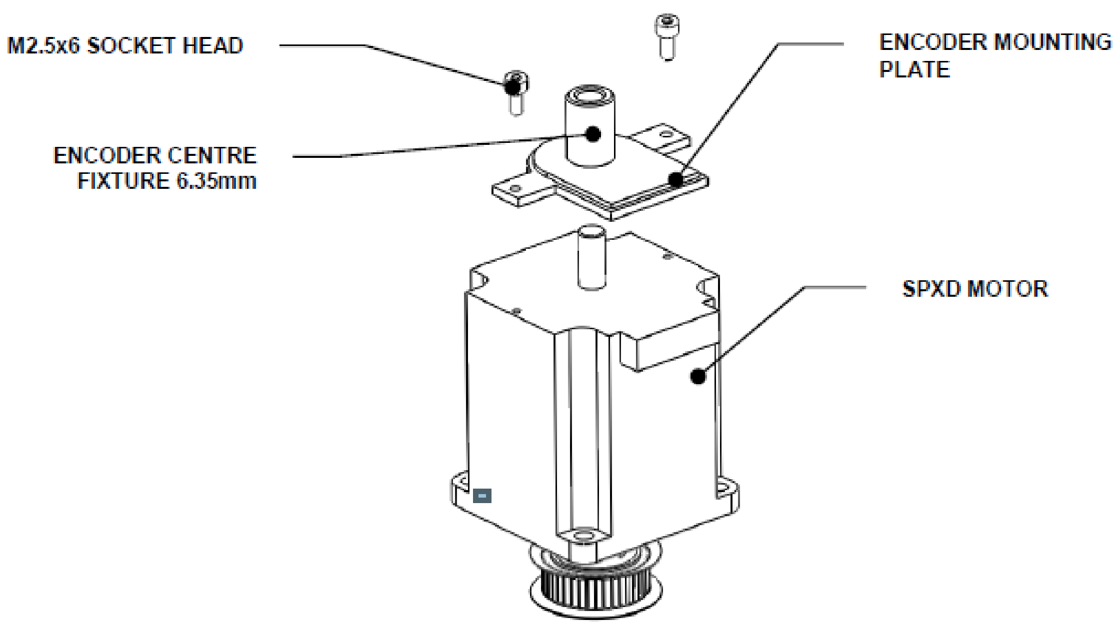


Figure Q-16: Mounting the Encoder Mounting Plate

4. Install the main part of the Encoder onto the Mounting Plate by snapping it in place.

> **Note:** *Do not remove the Allen key in the encoder (Figure Q-17).*

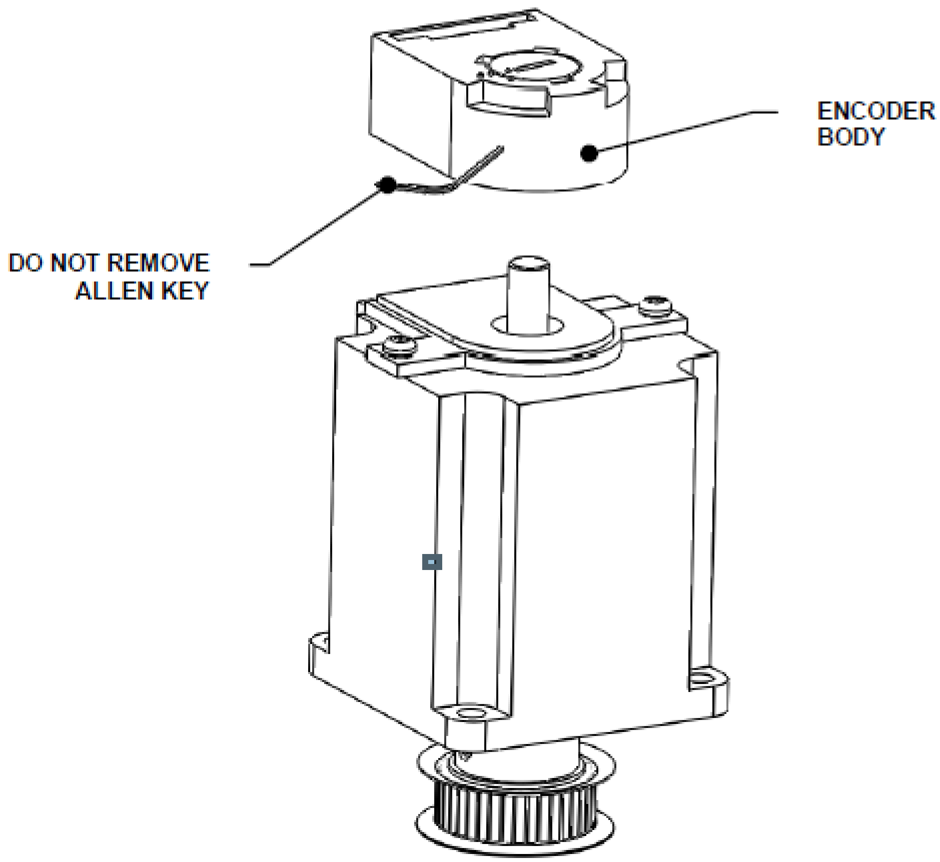


Figure Q-17: Snapping the Encoder in Place

5. Push the Allen Key into the body of the encoder to ensure that it is properly seated into the code wheel hub set screw. Then, apply a downward force on the end of the Allen Key as shown in Figure Q-18. This sets the code wheel gap by levering the code wheel hub to its upper position.

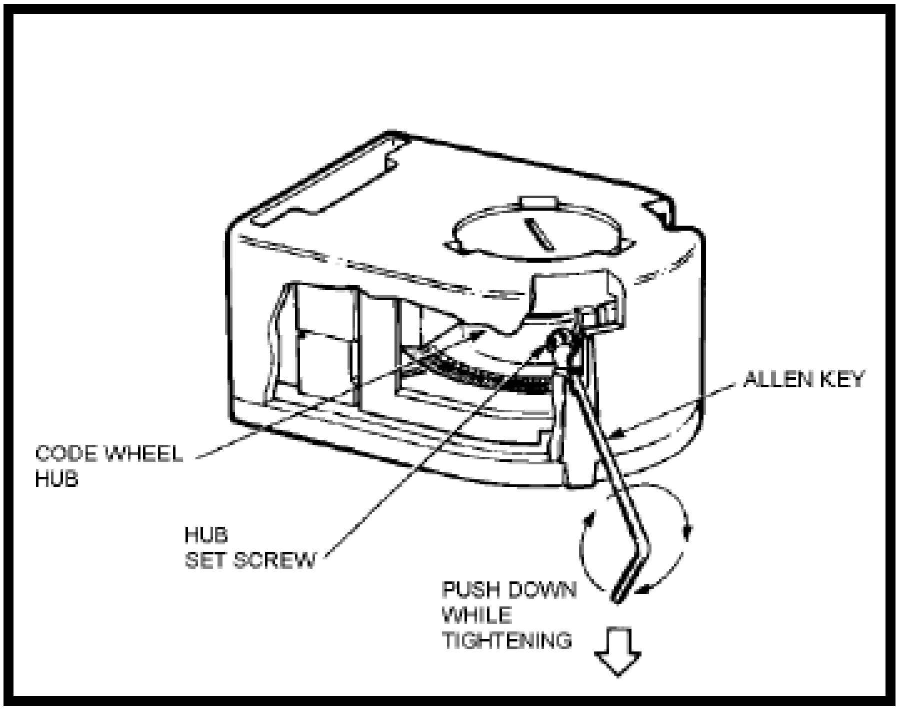


Figure Q-18: Setting the Encoder

6. While continuing to apply a downward force, rotate the Allen Key to the clockwise direction until the hub set screw is tight against the idler shaft.

7. Remove the Allen Key by pulling it straight out of the encoder body.

8. Rotate the encoder cover from the open to the closed position by inserting a small flat blade screwdriver into the notch and rotating clockwise (Figure Q-17).

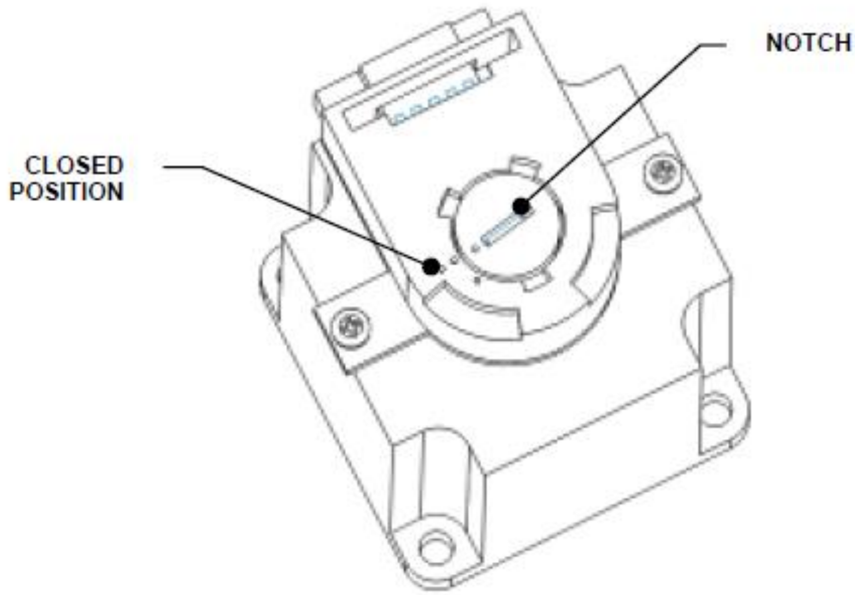


Figure Q-19: Rotating the Encoder Cover

9. Mount the Motor on the Reagent Pipettor X Drive Motor Support Central (and fix it with four M4x12 Socket Cap Head Screws, four M4 SplitLock Washers and four M4 Washers (309300400) (Figure Q-20). Note the encoder's orientation

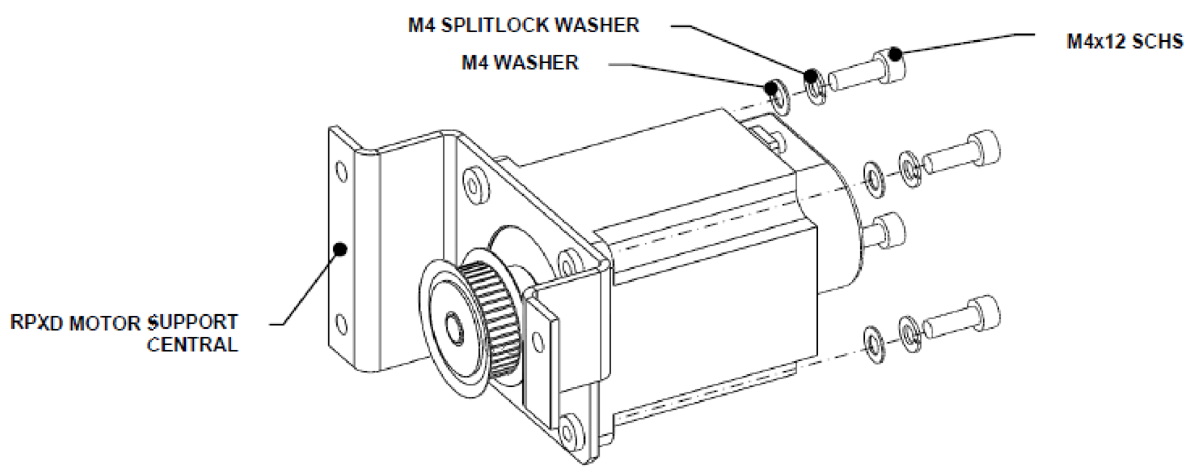


Figure Q-20: Mounting the Motor on the Support

Q.6 Replacing the Optosensor

The Optosensor is mounted on the main plate as shown in Figure Q-21.

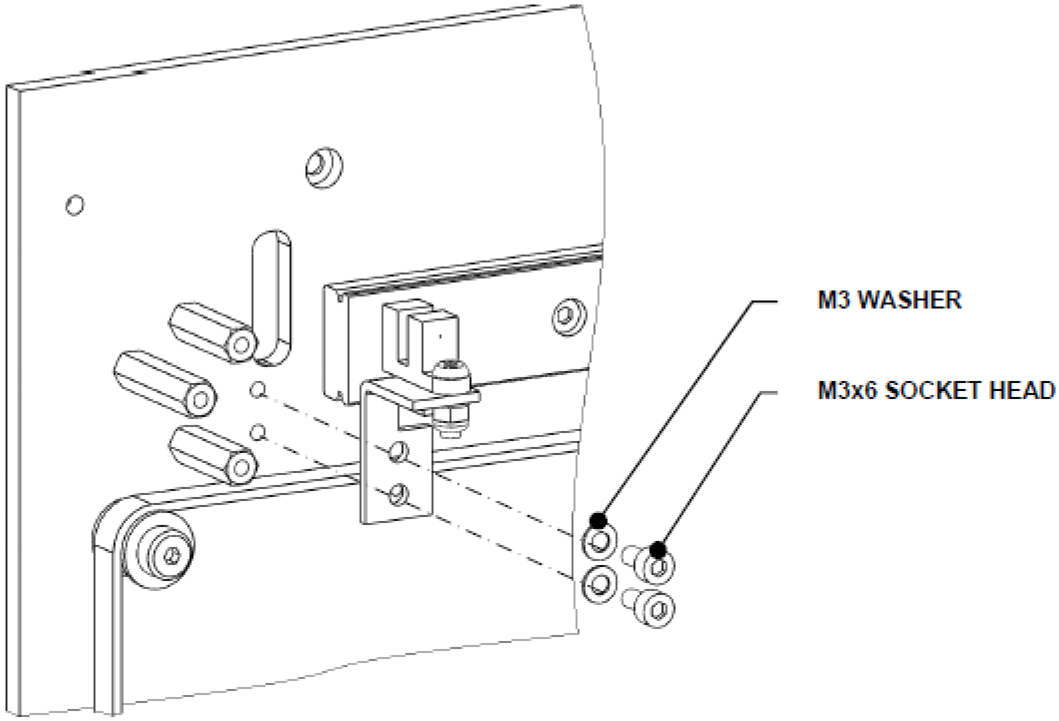


Figure Q-21: Mounting the Optosensor

To remove the optosensor, remove the M3x10 Button Head (Figure Q-22).

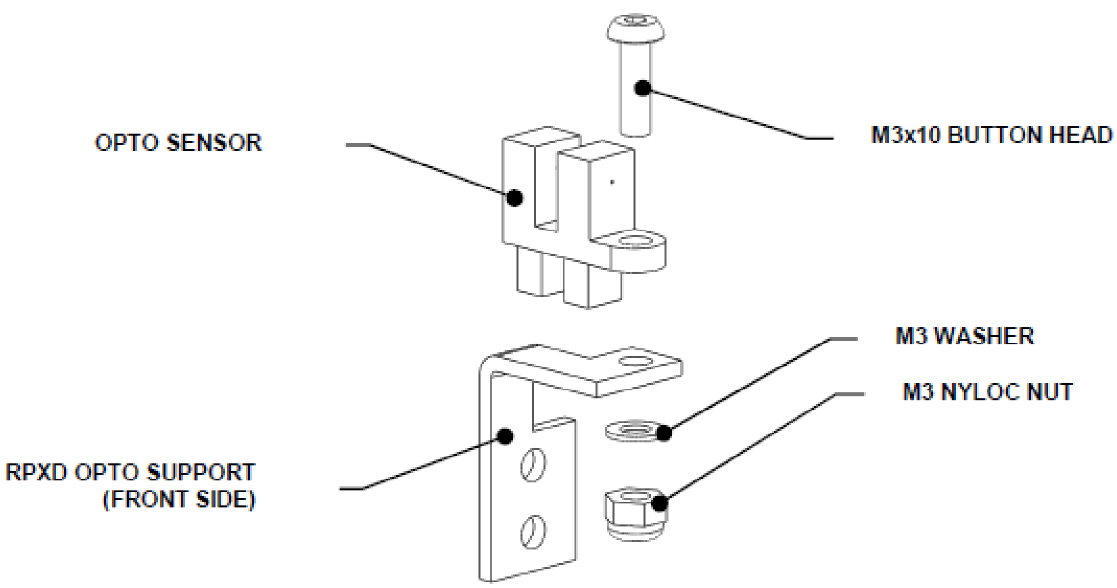


Figure Q-22: Location of Optosensor

This page intentionally left blank.

Chapter R Rotator Drive

R.1 Overview

The *Rotator Drive* is located on the bottom of the Transport Arm and is used to rotate the Gripper so that the Gripper is able to pick up the various items required for the analysis such as plates, reagent kits, etc. The assembly can be readily removed as described below and a defective unit should be sent to the depot for refurbishment.

R.2 Replacing the Rotator Drive

To remove the rotator drive:

1. Remove the Gripper assembly as described in Chapter H.
2. Remove the Transport arm base cap from the Center Z extrusion by removing the M2.5 Nut shown in Figure R-1.

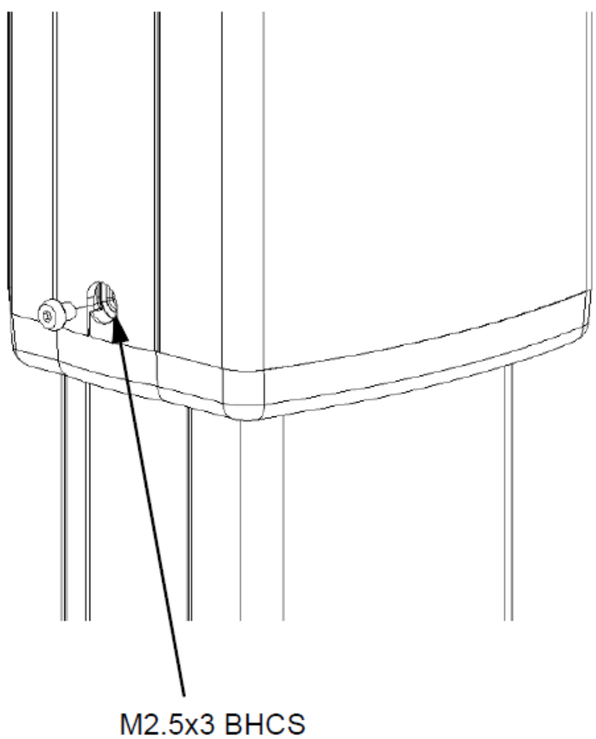


Figure R-1: Removing the Transport Arm Base Cap

3. Remove the two Transport Arm Z Cover Strips (23506630) from the Center Z Extrusion (Figure R-2).

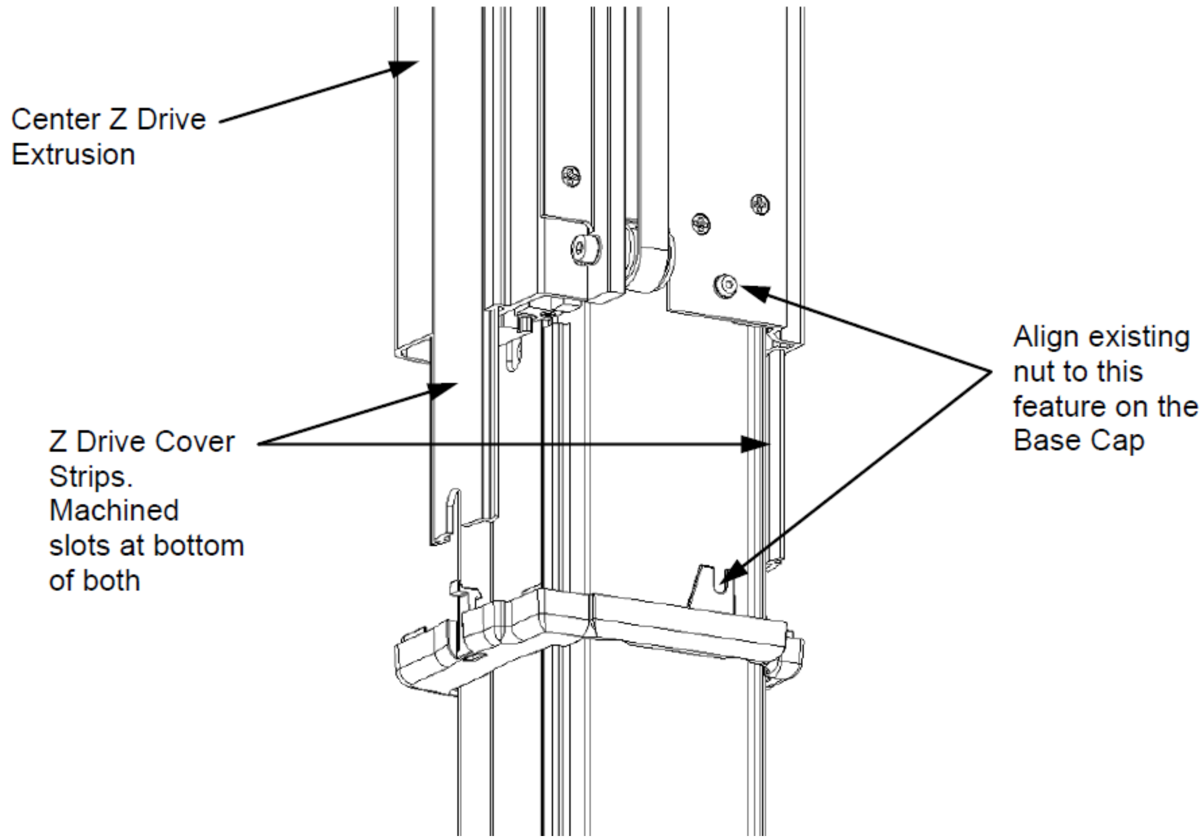


Figure R-2: Removing the Z Drive Cover Strips

4. Unscrew the two M3x5 BHCs that attach the rotator drive to the bottom of the Z drive assembly (Figure R-3).

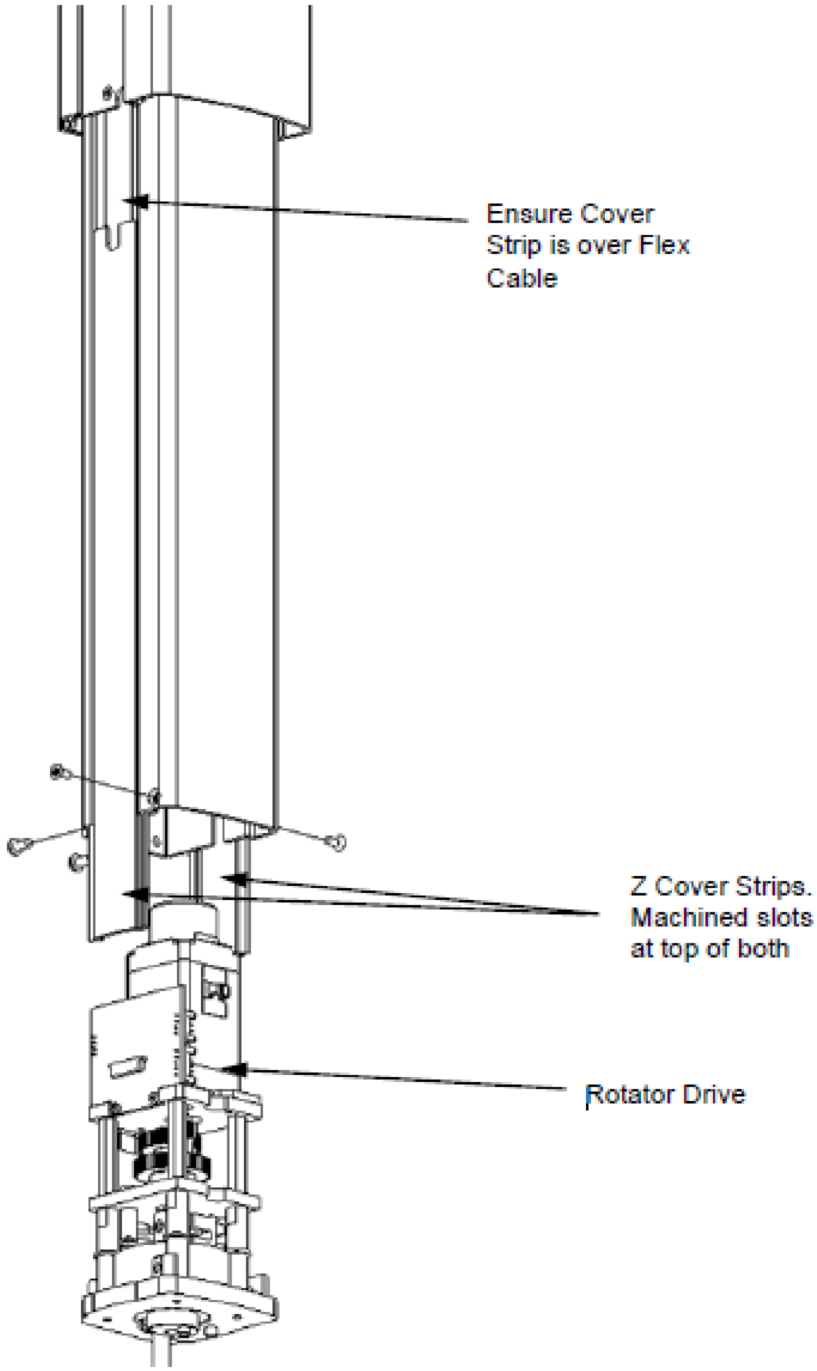


Figure R-3: Removing the Rotator Drive

When replacing the rotator drive, ensure that the cover strip is properly covers the flex cable (Figure R-2), the drive is secured two M3x5 BHCs, two M2.5x6 PFHS, and Loctite 222. The base cap includes a hook which must be clipped into the slot shown in Figure R-4. Use Loctite 425 on the M2.5x3 BHCS.

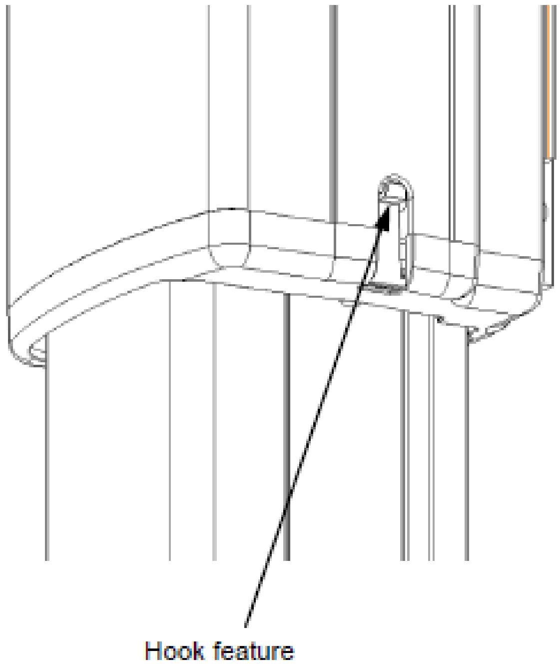


Figure R-4: Replacing the Base Cap

R.3 Disassembling the Rotator Drive

R.3.1 Replacing the Motor Assembly

The position of the motor assembly is shown in Figure R-5.

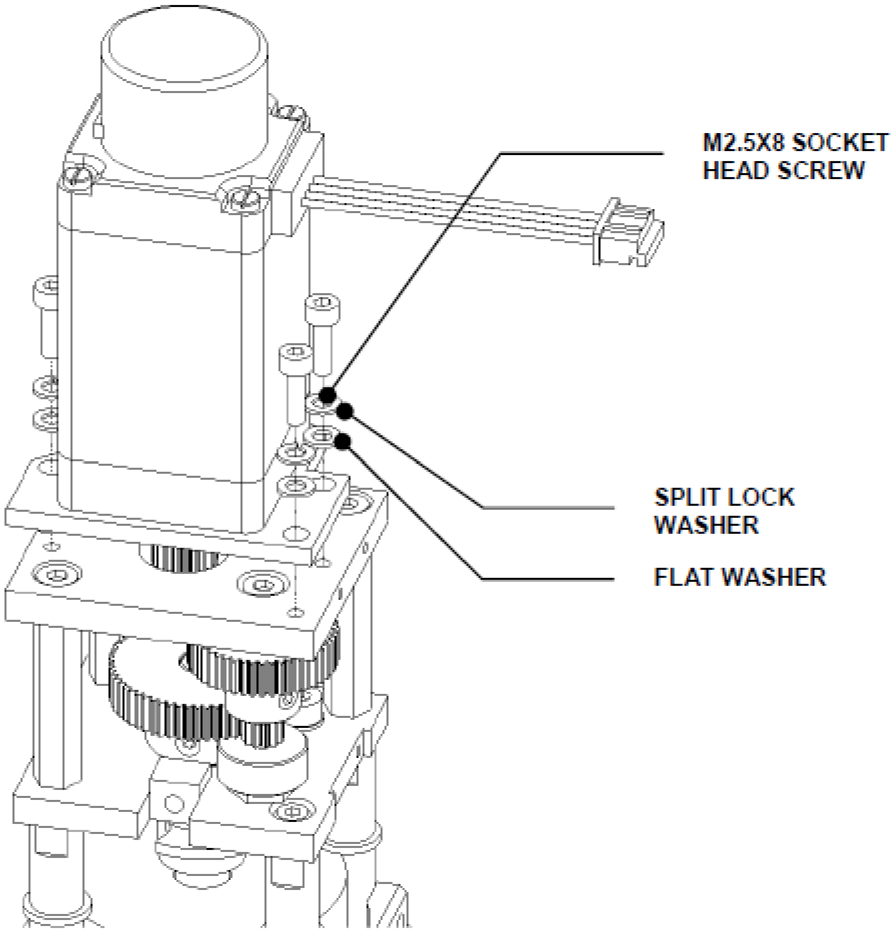


Figure R-5: The Motor Assembly

To replace the motor assembly:

1. Remove the three M2.5 x 8 Socket Cap Screws (Figure R-5).
2. Remove the Motor plate by removing the three M2.5 x 6 Posi Flat Head screws (Figure R-6).

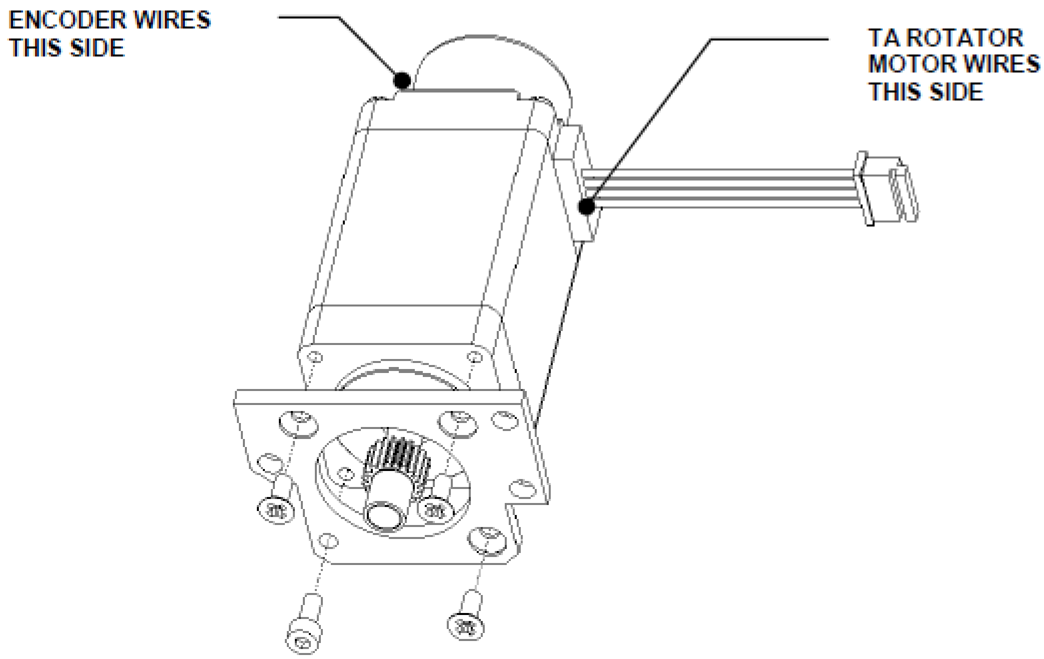


Figure R-6: Removing the Motor Plate

When replacing the motor assembly:

1. Push the Motor Plate in the direction shown to mesh the gear on the end of the Motor Shaft with the large gear of the Transmission Gear assembly (Figure R-7). Hold the Motor Plate in this position and secure it in place.

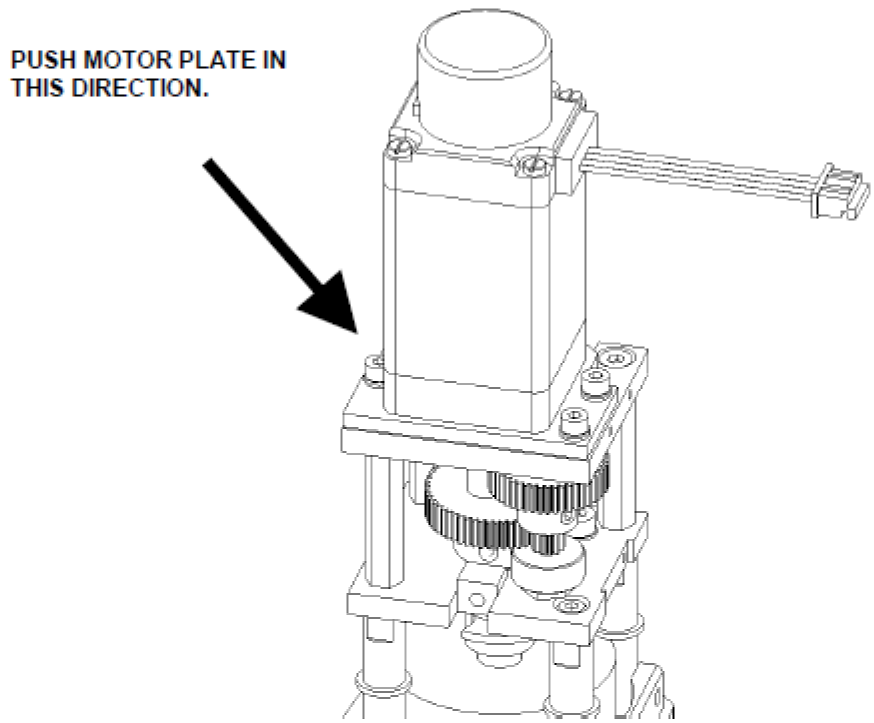


Figure R-7: Connecting Motor to Transmission Gear Assembly

2. Check for smooth rotation between the two stops by rotating the bottom of the Rotator Bearing Shaft between your thumb and fore-finger. If binding occurs, then slacken the three M2.5 x 6 Socket Cap Head Screws, rotate the gears slightly and repeat the previous step.

3. Apply a thin layer of Super Lube Synthetic Grease Item No. 21030 to each of the gears using the end of a Tyrap or similar and evenly distribute it by rotating the gears between the stops. Any excess grease which is squeezed out should be removed as much as possible.

R.3.2 Replacing the Rotator PCB Assembly

The Rotator PC B assembly is mounted on the motor assembly as shown in Figure R-8.

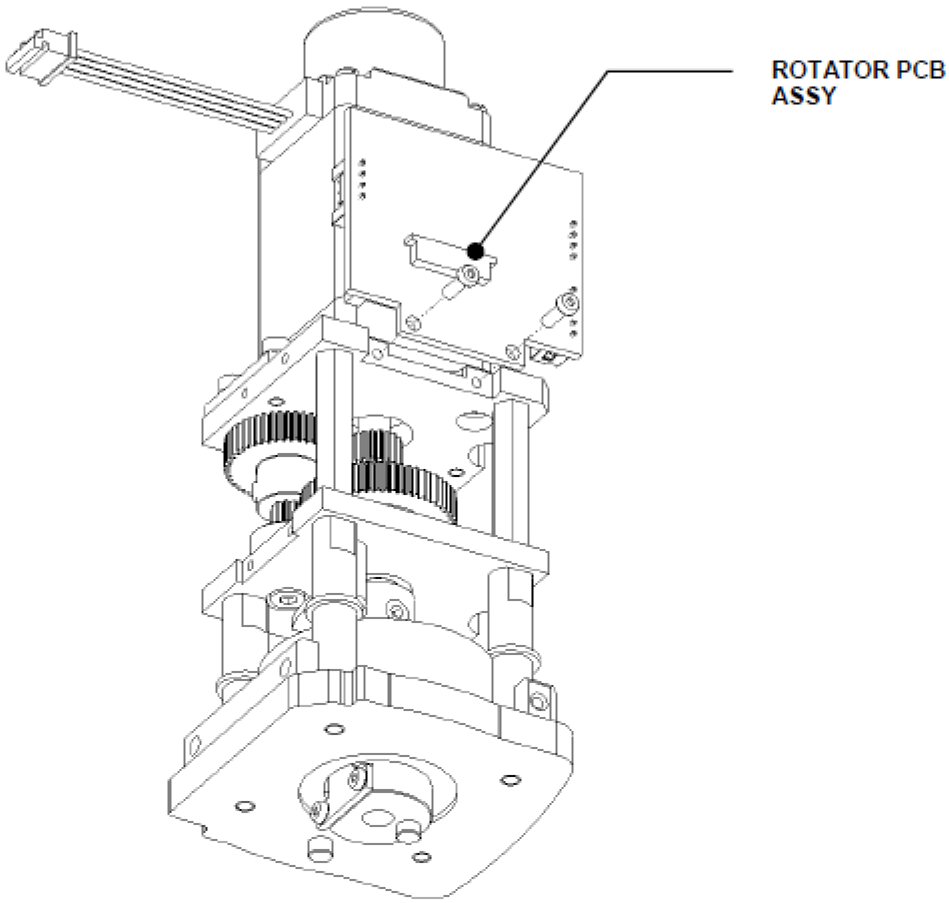


Figure R-8: The Rotator PCB

R.3.3 Transmission Gear Assembly

The Transmission Gear Assembly sits directly below the motor assembly and is depicted in Figure R-9.

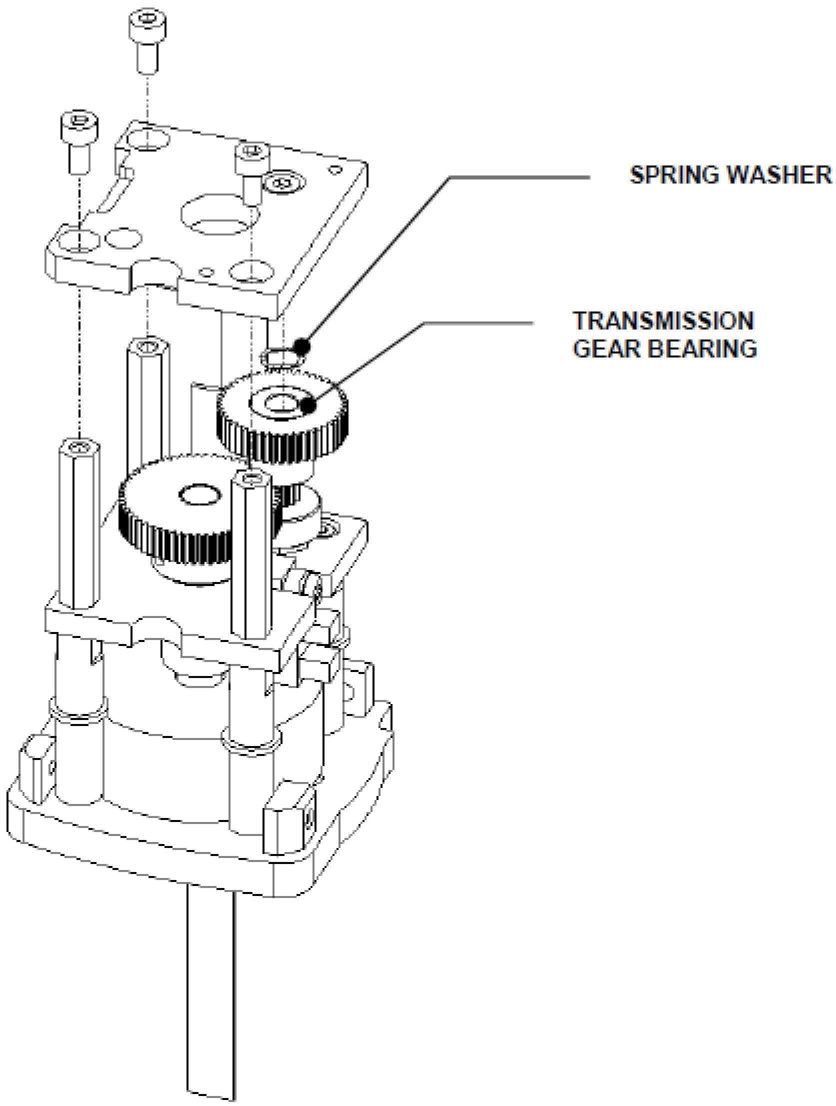


Figure R-9: Transmission Gear Assembly

To disassemble the assembly:

1. Remove the three M3 x 8 Socket Head Cap Screws.
2. Remove the output gear (Figure R-10).

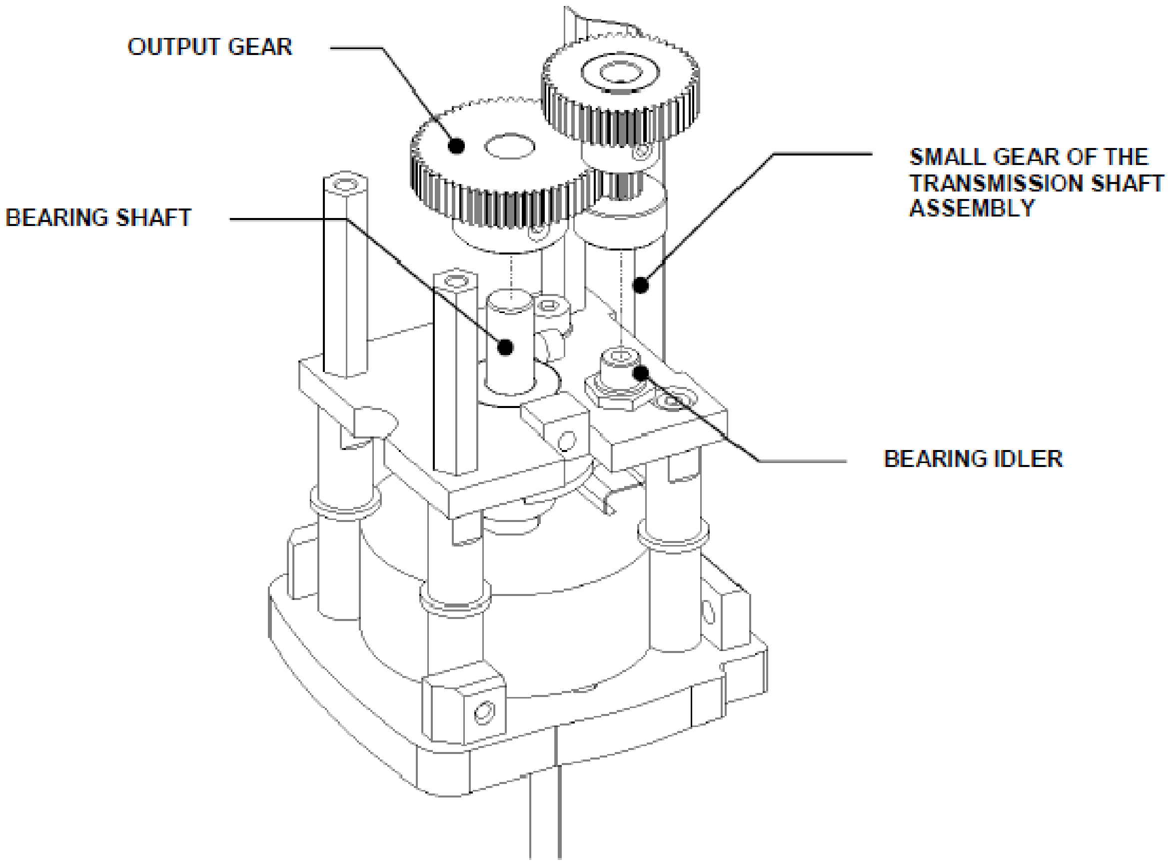


Figure R-10: Output Gear

3. Remove the spacers on the Rotator Bearing Shaft (Figure R-11).

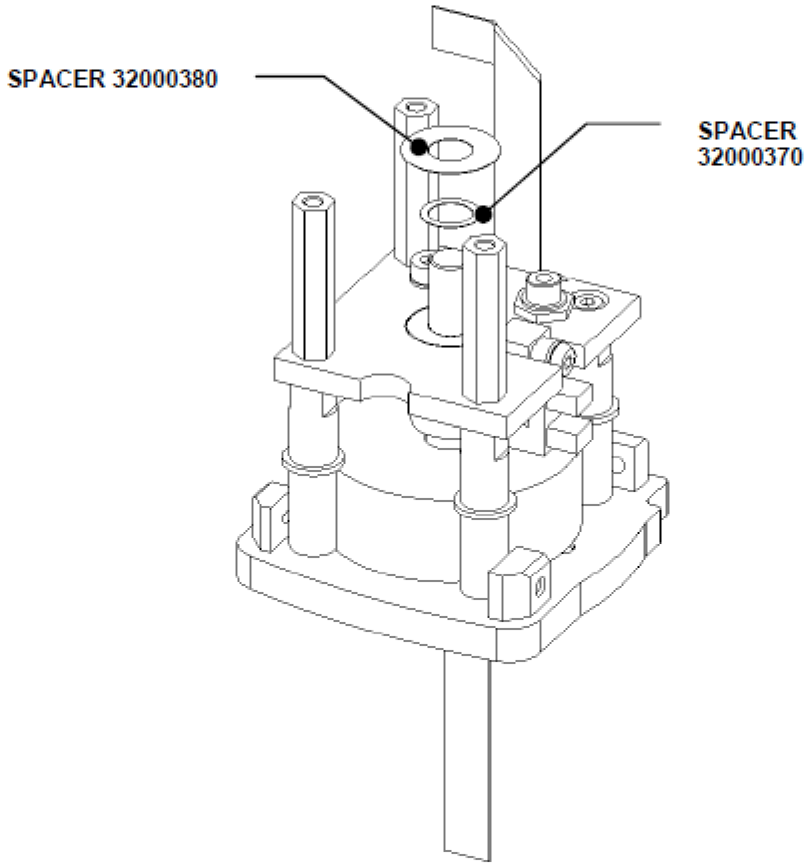


Figure R-11: Bearing Shaft Spacers

To install a new Output Gear and Reassemble the Transmission Gear Assembly

1. Obtain a new Output gear and loosely fit two M4 x 4 Cone Point Set Screws (Figure R-12).

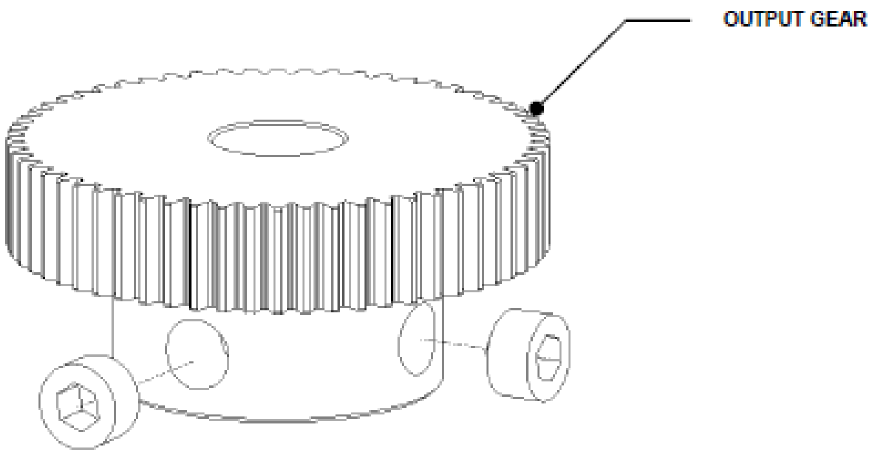


Figure R-12: Output Gear and Set Screws

2. Place two spacers on the Rotator Bearing shaft (Figure R-11).
3. With the Output Gear meshed with the small Gear on the Transmission Gear Assembly, slide the Output Gear onto the Bearing Shaft and the Transmission Gear onto the Bearing Idler (See Figure R-10).
4. Place a Spring Washer over the top bearing of the Transmission Gear Assembly. Slide the Bearing Idler through the Spring Washer and into the Transmission Gear bearing and secure the Gearbox Flange to the three Standoffs using three M3x6 Socket Cap Head Screws and Loctite 222 (See Figure R-9).

> ***Note:*** *There is a bearing idler on the Gearbox Flange. If it was necessary to remove the idler during disassembly, loosely fit a new idler onto to the Gearbox Flange using an M3x6 Socket Cap Head Screw and Loctite 222. Ensure no residual Loctite remains on the Idler surfaces.*

5. Adjust the Output Gear so that it is centrally positioned in between the transmission gear flanges. Ensure that there equal spacing between the output gear and both flanges. Secure the Output Gear to the Rotator Bearing Shaft by tightening the set screw (Figure R-13).

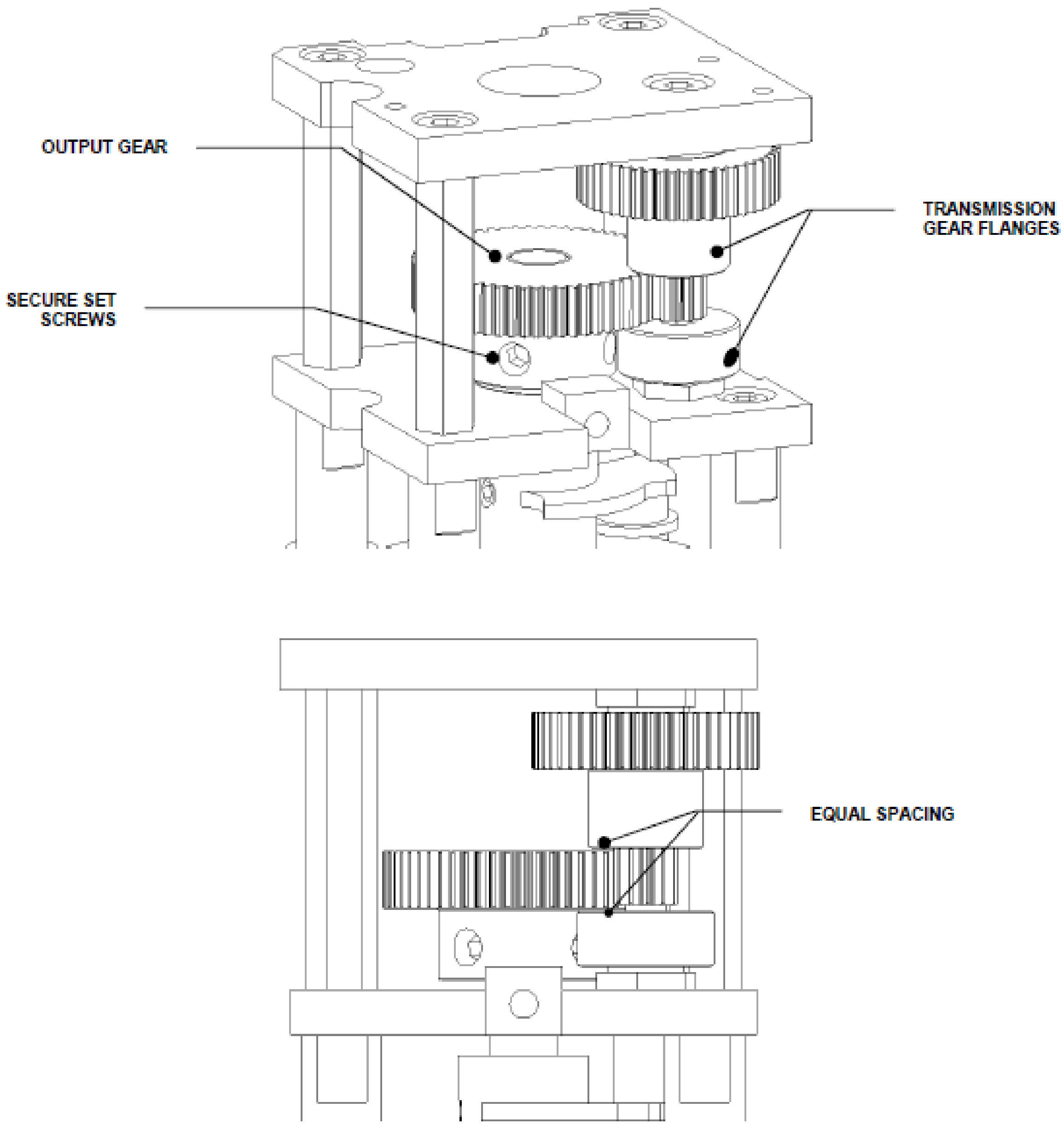


Figure R-13: Adjusting the Output Gear

6. Insert the Rotator Gearing Fixture (P24FIX048) into the Rotator assembly so the Bearing Idlers at the top and bottom of the Transmission Gear are held between the flat sections of the fixture as shown (Figure R-14).

> ***Note:*** *Ensure the Flex Cable is not pinched between the fixture and Rotator assembly.*

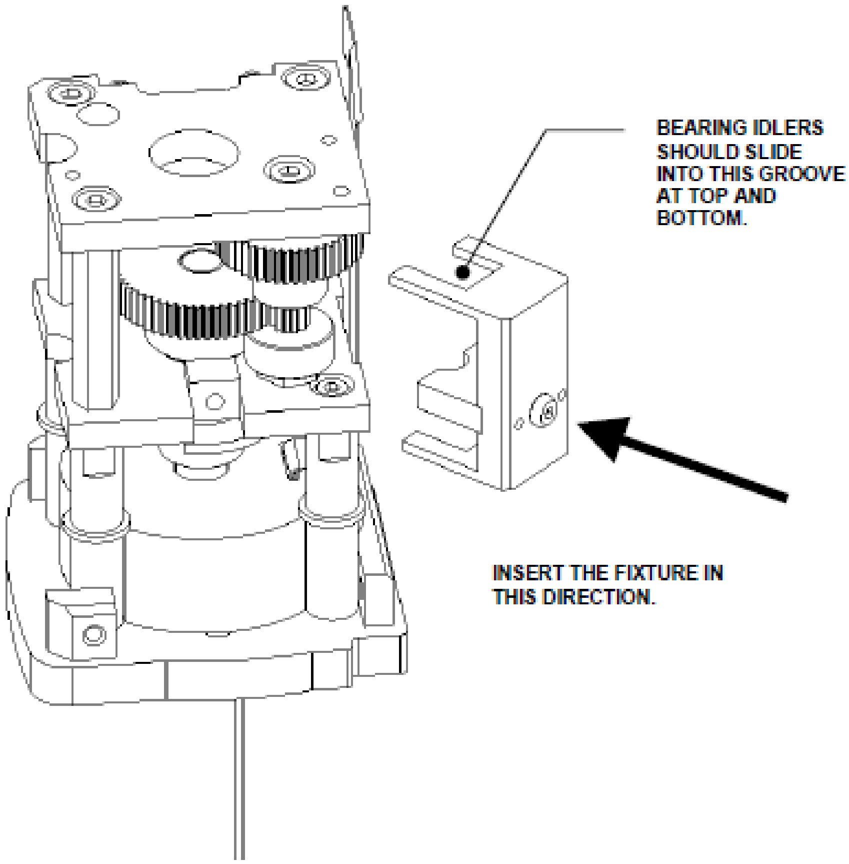


Figure R-14: Inserting the Rotator Gearing Fixture

R.3.4 Replacing the Rotator Optosensor

The Rotator Optosensor is located on the lower plate as shown in Figure R-15.

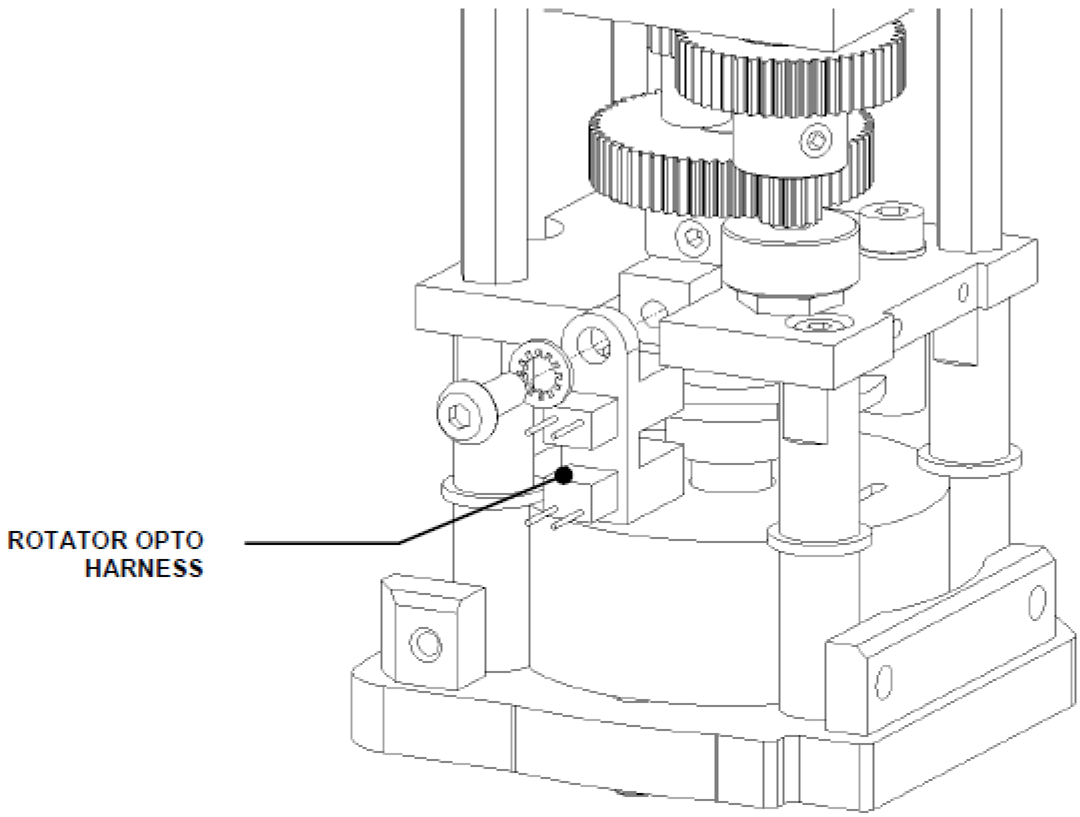


Figure R-15: Rotator Optosensor

The Rotator Opto Harness is attached to the Lower Plate and can be removed by unscrewing the BCHS screw. When replacing the Harness, use one M3x8 BHCS, one M3 Internal Tooth Washer, and Loctite 425. Take care not to over-tighten the screw. Once the harness is secured, ensure the Rotator Flag passes freely through the slot of the Optosensor.

This page intentionally left blank.

Chapter S Sample Pipettor, X Drive

S.1 Overview

The *Sample Pipettor X Drive* is mounted on the extrusion support as shown in Figure S-1 and can be removed by unscrewing the six screws.

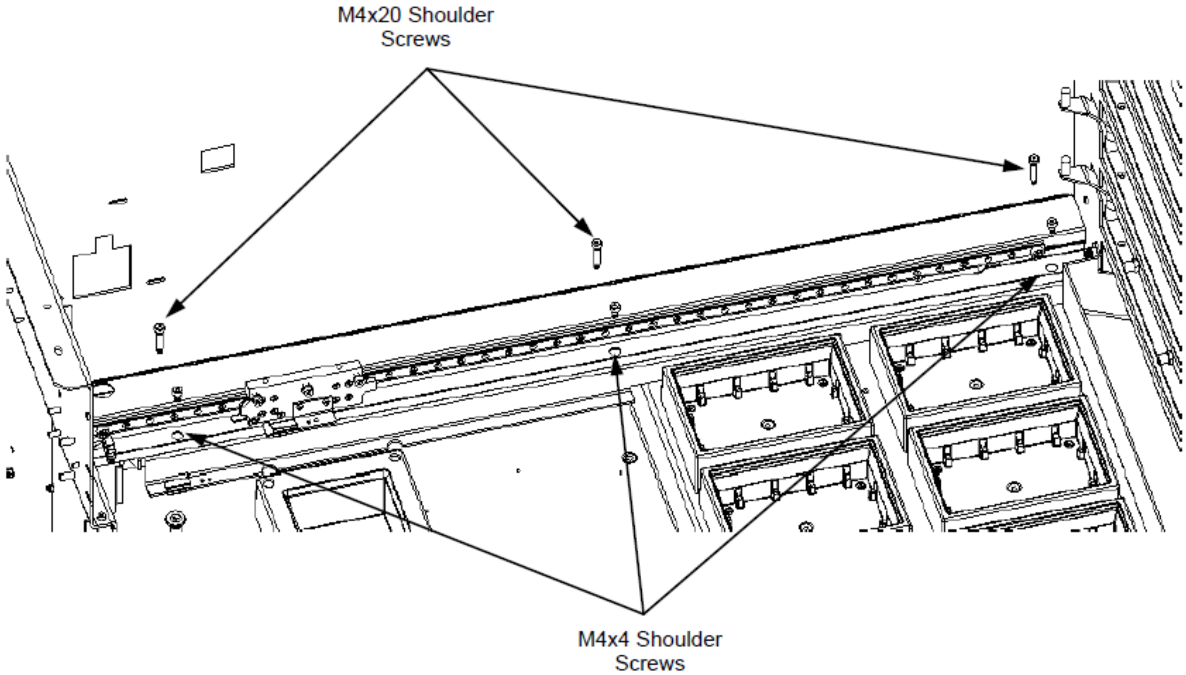


Figure S-1: Mounting the Sample Pipettor, X Drive

S.2 Sample Pipettor, X Drive PCB

The PCB Board for the X Drive is shown in Figure S-2.

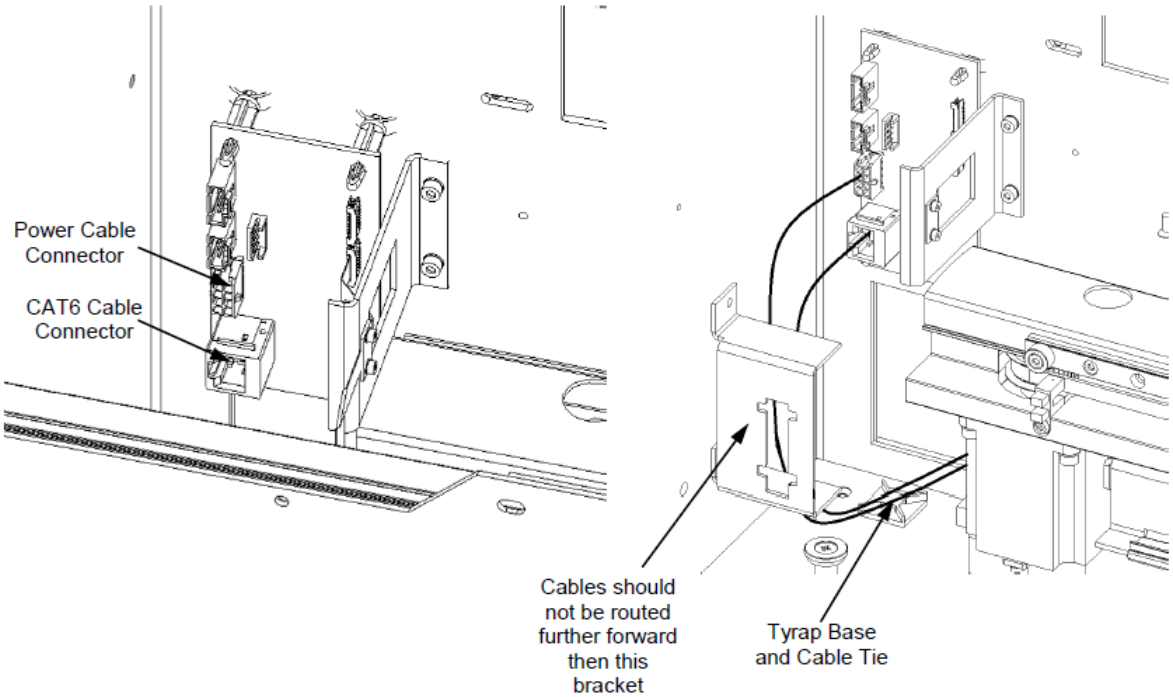


Figure S-2: Pipette Drive, X Drive Printed Circuit Board

> ***Note:*** *Ensure that the cabling inside of the chassis is routed behind the Washer Connector Bracket.*

S.3 Motor Assembly

The motor assembly is mounted on the Sample Pipettor X drive extrusion as shown in Figure S-3 and can be removed by removing the four screws that affix it to the extrusion.

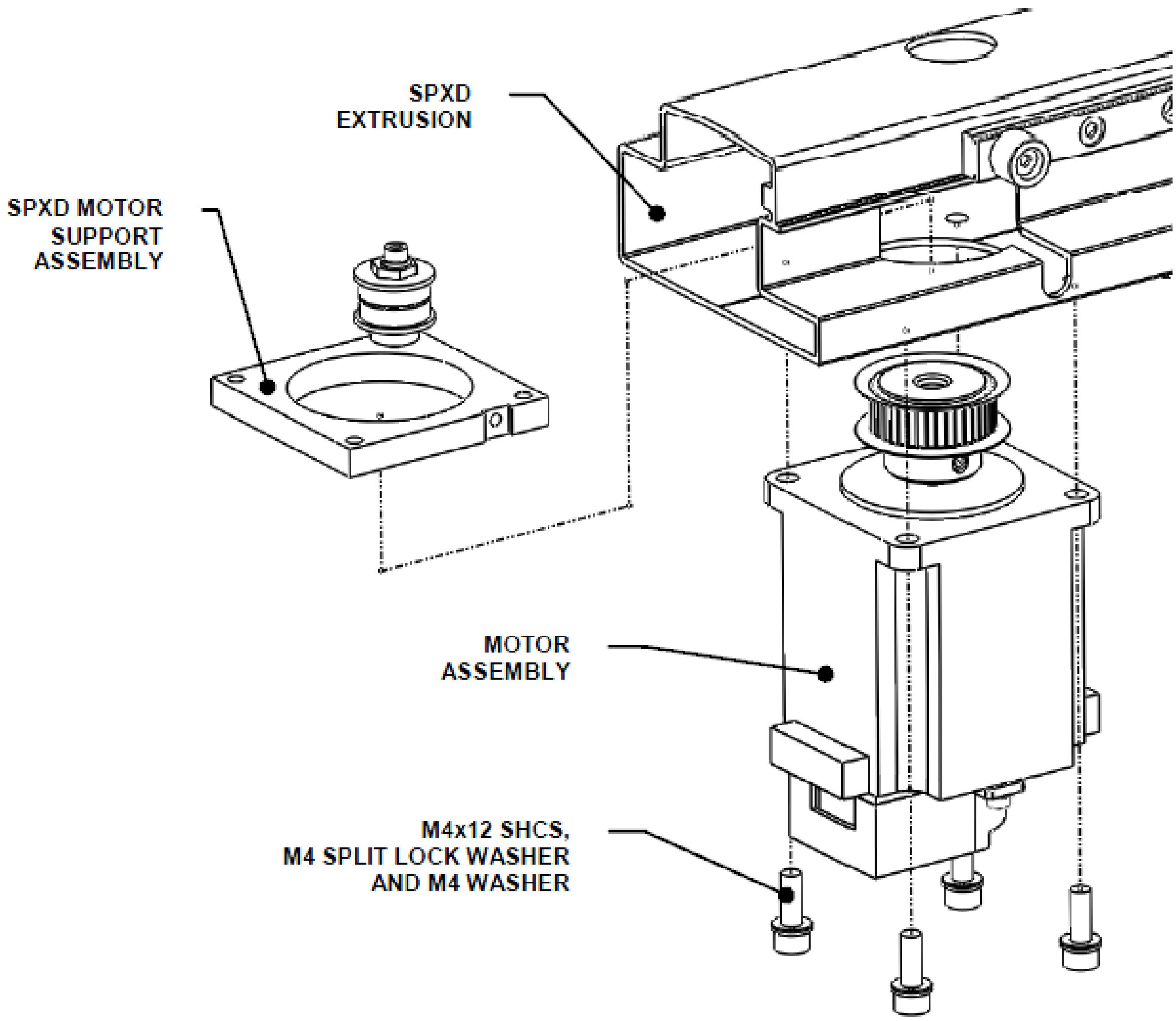


Figure S-3: Mounting the Motor

To replace the motor:

1. Mount the pulley on the shaft of the motor (discard any set screws that come with the pulley) with the screws that were used on the old motor as shown in Figure S-4. Use the Upper Pulley Spacer Ø7.0x2.5 (DS2FIX006) to set the appropriate distance and affix the set screws with Loctite 222.

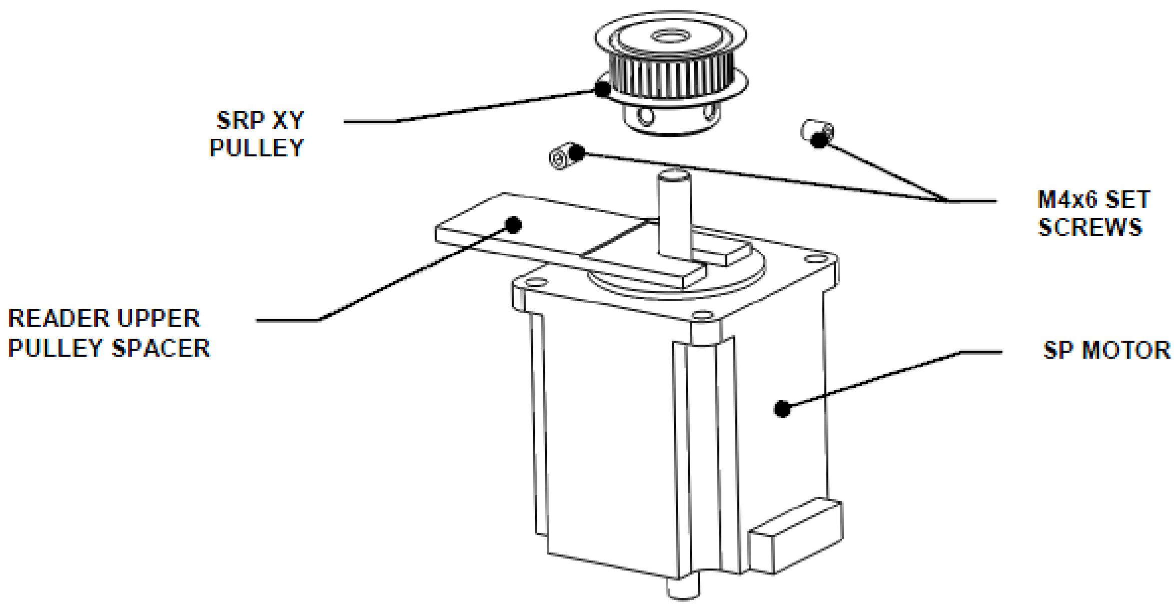


Figure S-4: Affixing the Pulley

> ***Note:*** *Install the set screws firmly. The pointed cone of each set screw must pierce the motor shaft for a strong fit.*

2. Attach the Mounting Plate for the Encoder, to the motor with the Encoder Centre Fixture 6.35mm (P24FIX007) using two M2.5x6 SHCS Screws and two M2.5 Washers and Loctite 425. Ensure that the mounting plate is centralized around the motor back shaft as shown in Figure S-5.

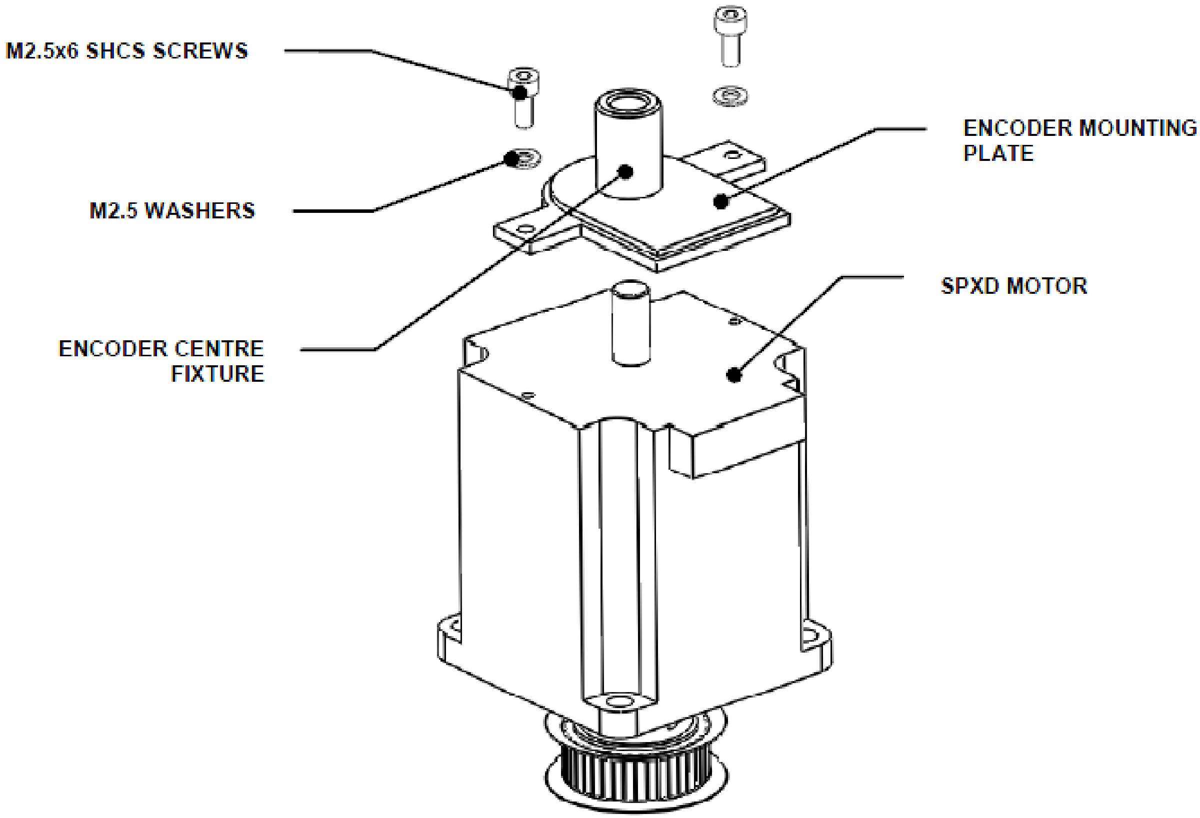


Figure S-5: Attaching the Encoder Mounting Plate

3. Install the main part of the Encoder onto the Mounting Plate by snapping it in place as shown in Figure S-6. Do not remove the Allen key in the encoder.

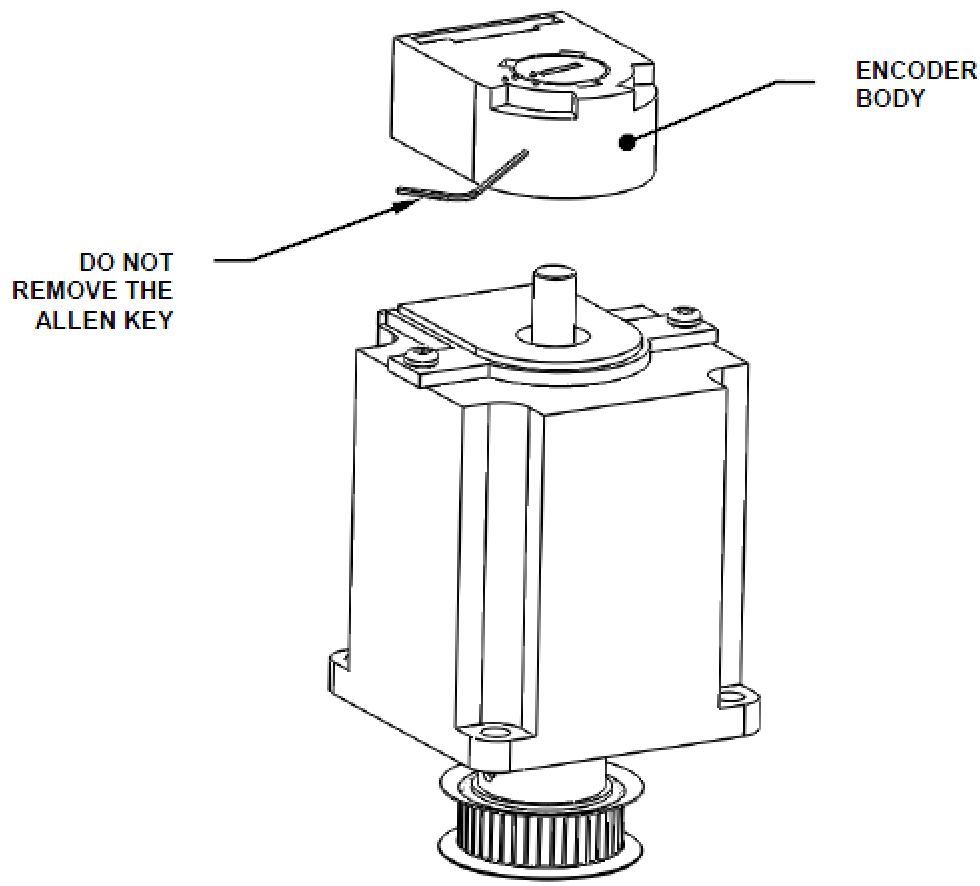


Figure S-6: Installing the Encoder

4. Push the Allen Key into the body of the encoder to ensure that it is properly seated into the code wheel hub set screw (Figure S-7). Apply a downward force on the end of the Allen Key. This sets the code wheel gap by levering the code wheel hub to its upper position. While continuing to apply a downward force, rotate the Allen Key to the clockwise direction until the hub set screw is tight against the idler shaft. Remove the Allen Key by pulling it straight out of the encoder body.

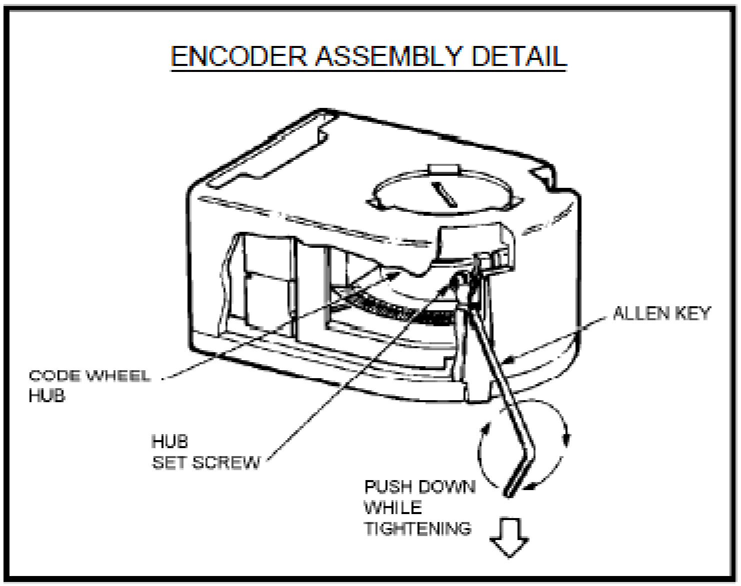


Figure S-7: Setting the Encoder

5. Rotate the encoder cover from the open to the closed position by inserting a small flat blade screwdriver into the notch and rotating as shown in Figure S-8. The encoder cover is shown in the closed position in the figure.

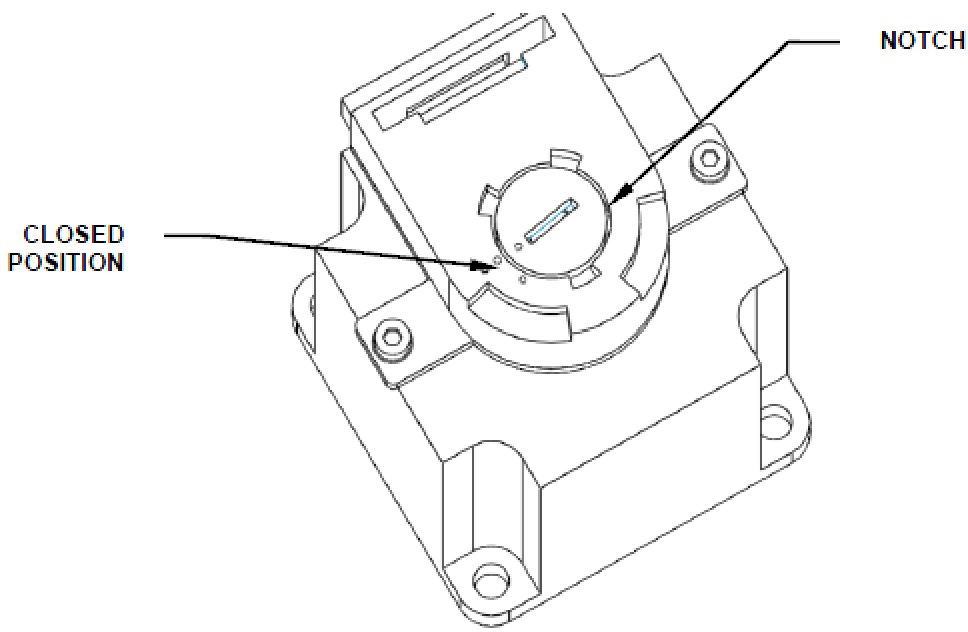


Figure S-8: Rotating the Encoder Position

S.4 Replacing the Belt

To replace the belt:

1. Remove the Optosensor and Chain Cable Bracket as shown in Figure S-9.

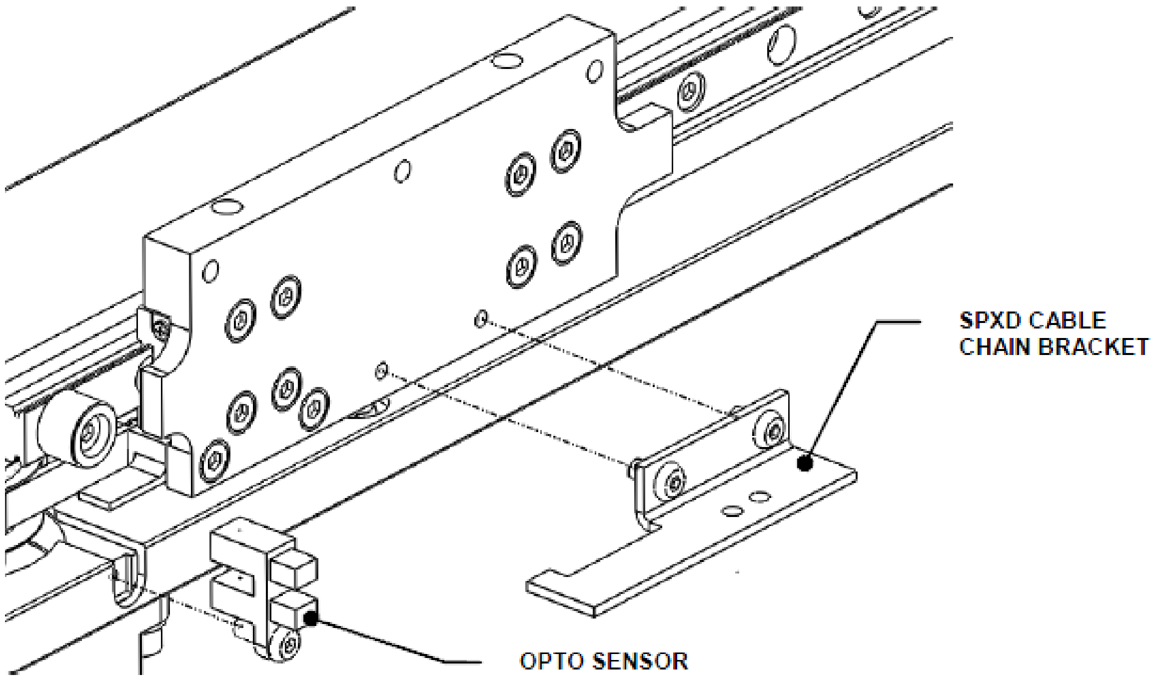


Figure S-9: Removing the Optosensor and Chain Cable Bracket

2. Remove the Sample Pipette X Drive Carriage (Figure S-10).

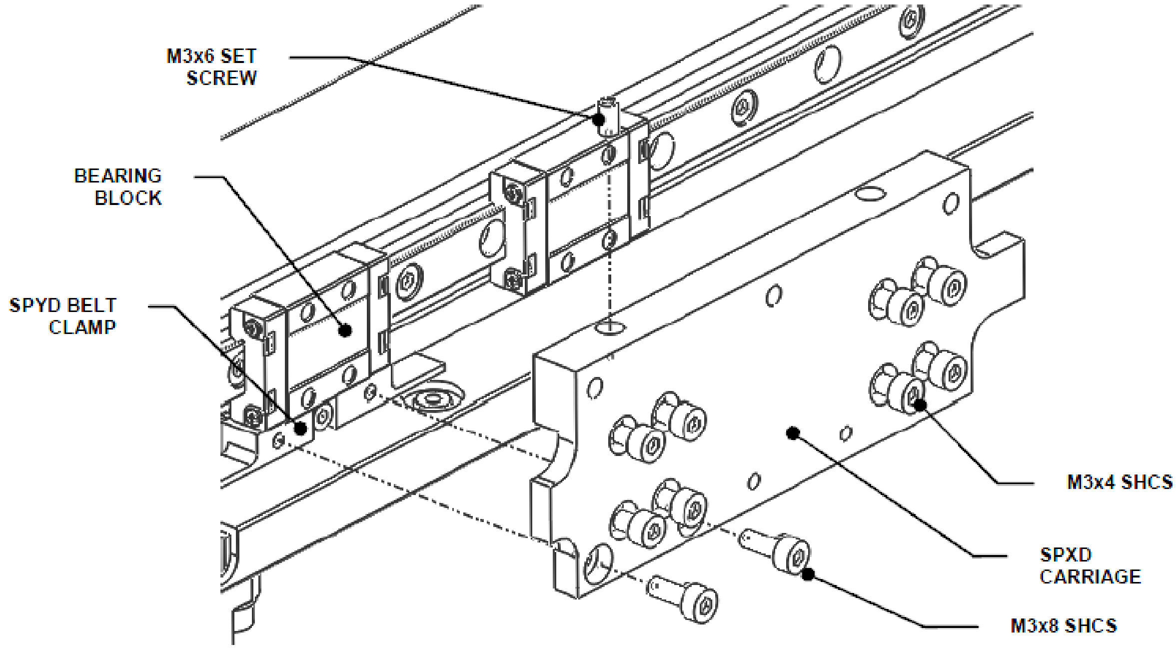


Figure S-10: Removing the Sample Pipette X Drive Carriage

3. Remove the belt from around the Pulley, Eccentric Idler and Idler Assembly (Figure S-11).

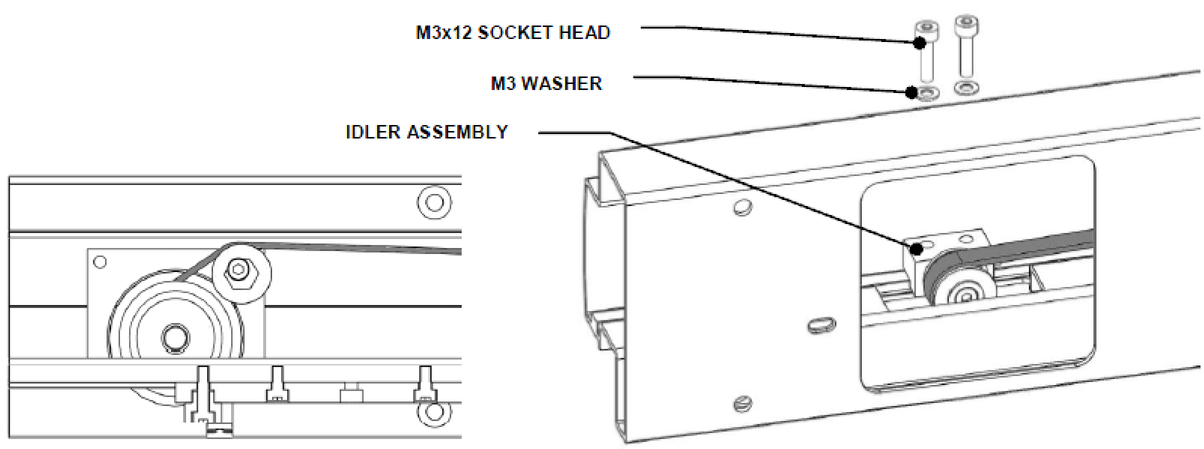


Figure S-11: Removing the Belt

To replace the belt:

1. Pass the belt around the Motor Pulley, the Eccentric Idler and the Idler assembly as shown in Figure S-11. Secure the idler assembly to the X drive Main extrusion using two M3x12 Socket Head Cap Screw, two M3 Washers and Loctite 222.
2. Loosely mount the X drive Carriage to the two bearing blocks using eight M3x4 Socket Head Cap Screws (with Loctite 222 (Figure S-10). Screw down two M3x6 Set Screw with a 3in-lb driver in order to push the linear bearings against the provided step on the SPXD Carriage. Then fully tighten the M3x4 screws using a 10in-lb driver. Fix the Y Drive Belt Clamp using two M3x8 Socket Head Cap Screws and Loctite 222.
3. Replace the X Drive Chain Bracket and optosensor (Figure S-9). When replacing the optosensor use Loctite 425 and when replacing the bracket, use Loctite 222.
4. Measure the tension using the Gates Sonic Tension 507C at the position indicated in Figure S-12. The tension should read 29-30 Hz. Adjust the tension using the spanner (Figure S-13); when the tension is correct, secure the pulley with the Allen key.

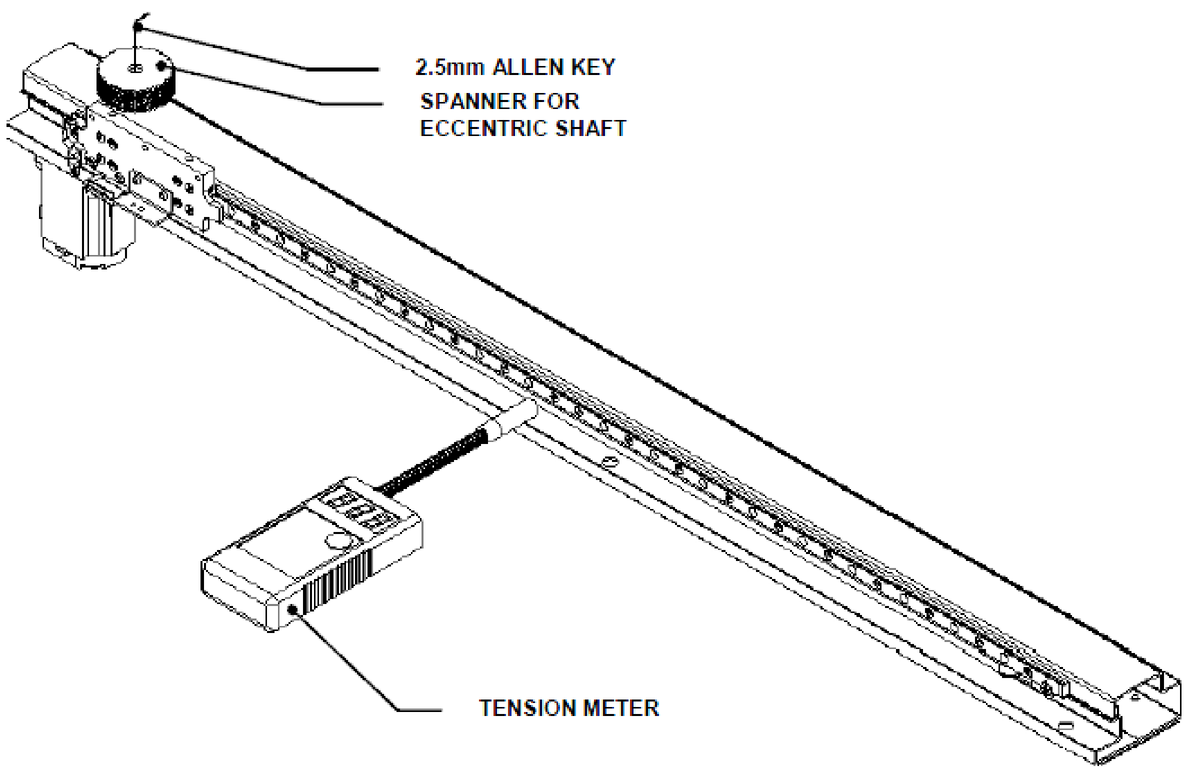


Figure S-12: Location of Tension Meter

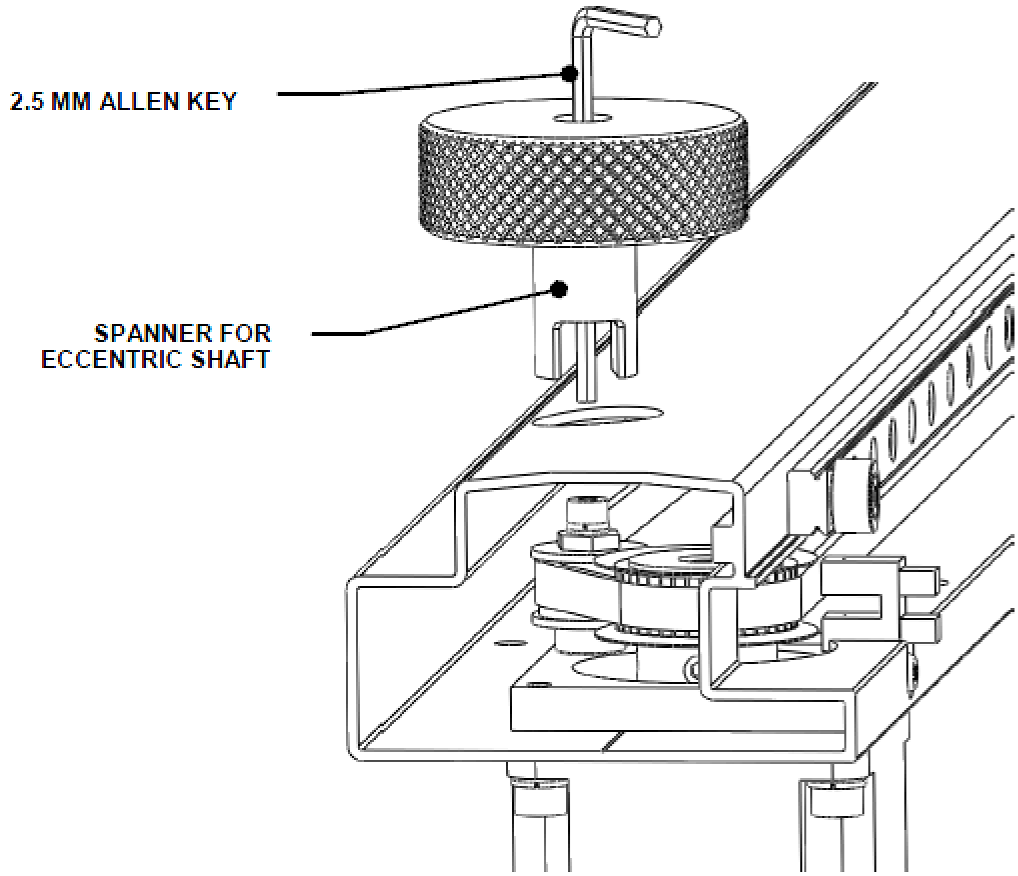


Figure S-13: Location of Allen Key and Spanner

This page intentionally left blank.

Chapter T Sample Pipettor, Y Drive

T.1 Overview

The *Sample Pipettor Y Drive* is incorporated into the system by sliding the bearings at the end of the Sample Pipettor Y Drive into the Front Cover Channel and mounting to the X Drive using three M4x16 Socket Head Cap Screws as shown in Figure T-1.

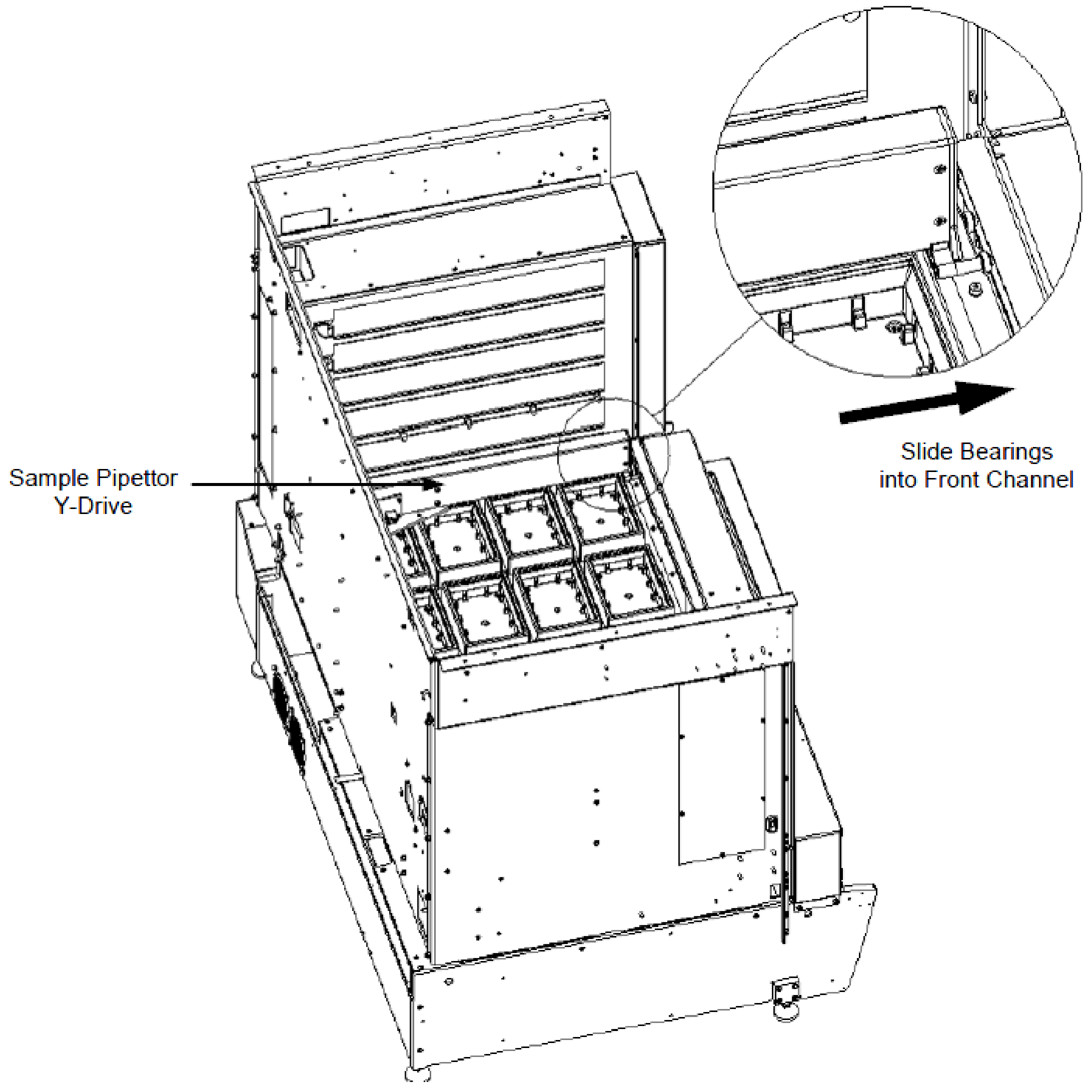


Figure T-1: Location of the Sample Pipettor Y Drive

T.2 Sample Pipettor, X Drive PCB

The PCB Board for the X Drive is shown in Figure T-2 and is attached to the drive assembly by the four LCBS-6m-01 supports.

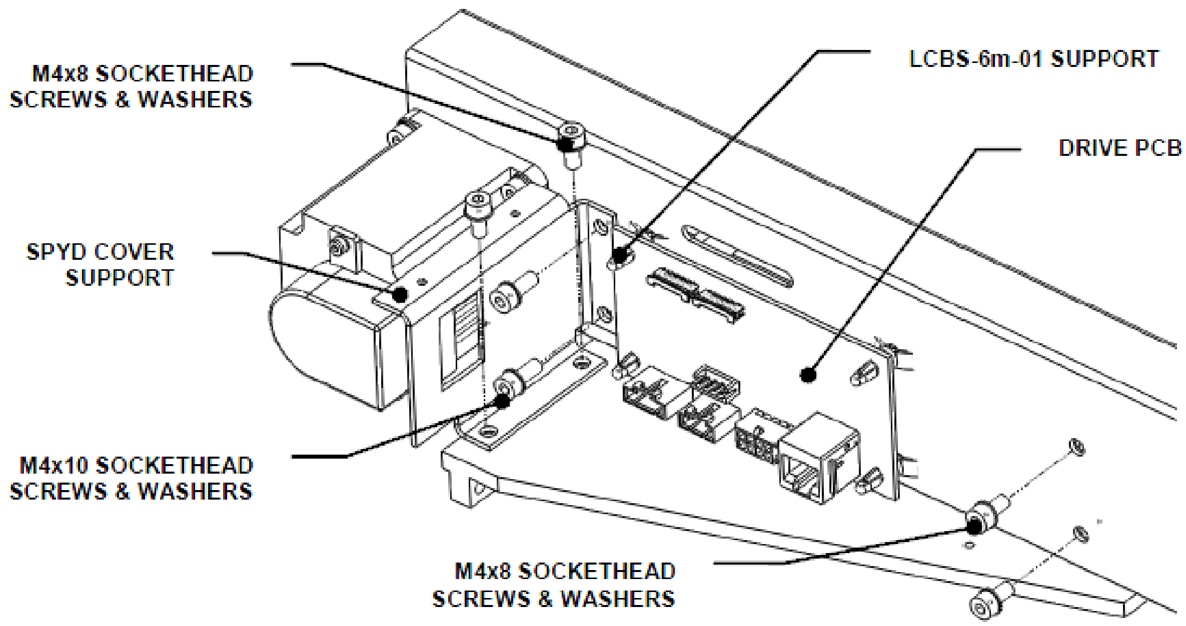


Figure T-2: Drive PCB

T.3 Motor Assembly

The Motor Assembly is mounted on the Sample Pipettor X drive extrusion as shown in Figure T-3 and can be removed by removing the four screws that affix it to the extrusion.

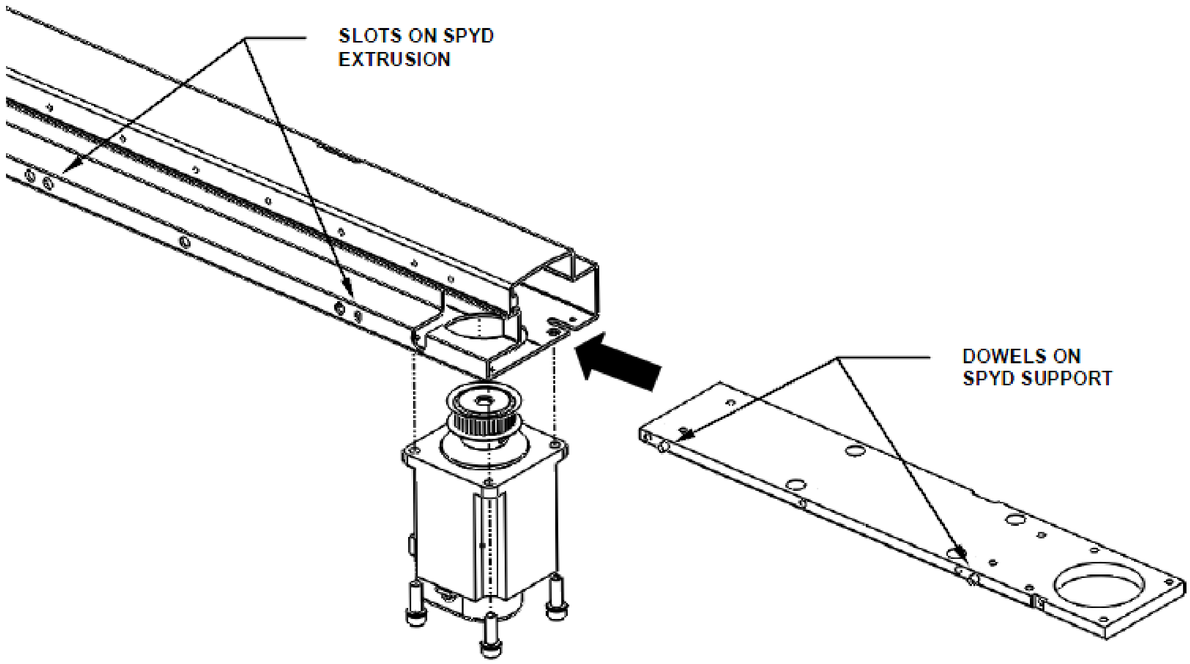


Figure T-3: Mounting the Motor

To replace the motor:

1. Mount the pulley on the shaft of the motor (discard any set screws that come with the pulley) with the screws that were used on the old motor as shown in Figure T-4. Use the Upper Pulley Spacer Ø7.0x2.5 (DS2FIX006) to set the appropriate distance and affix the set screws with Loctite 222.

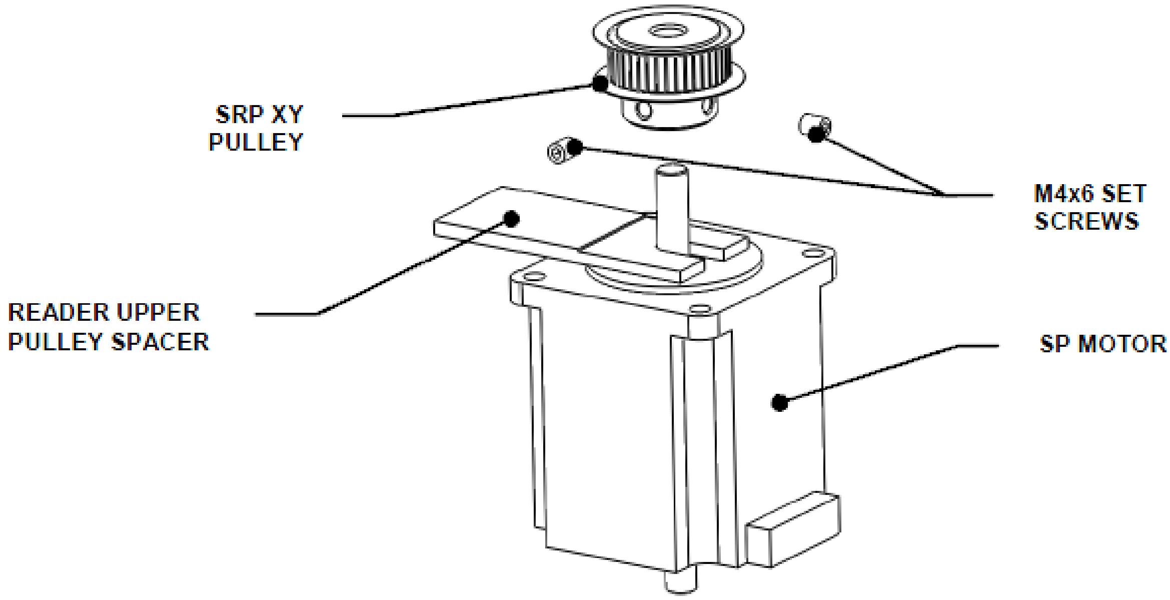


Figure T-4: Affixing the Pulley

> ***Note:*** *Install the set screws firmly. The pointed cone of each set screw must pierce the motor shaft for a strong fit.*

2. Attach the Mounting Plate for the Encoder (55000030), to the motor with the Encoder Centre Fixture 6.35mm (P24FIX007) using two M2.5x6 SHCS Screws and two M2.5 Washers and Loctite 425. Ensure that the mounting plate is centralized around the motor back shaft as shown in Figure T-5.

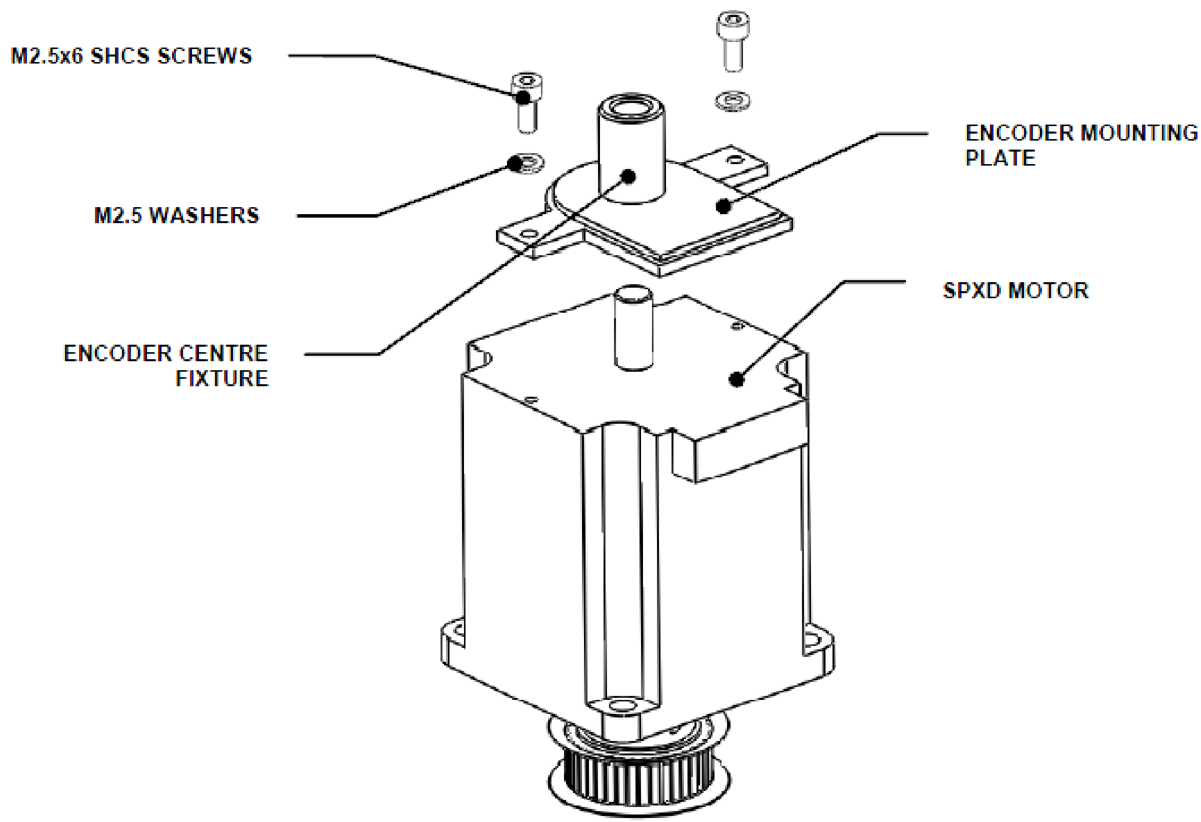


Figure T-5: Attaching the Encoder Mounting Plate

3. Install the main part of the Encoder onto the Mounting Plate by snapping it in place as shown in Figure T-6. Do not remove the Allen key in the encoder.

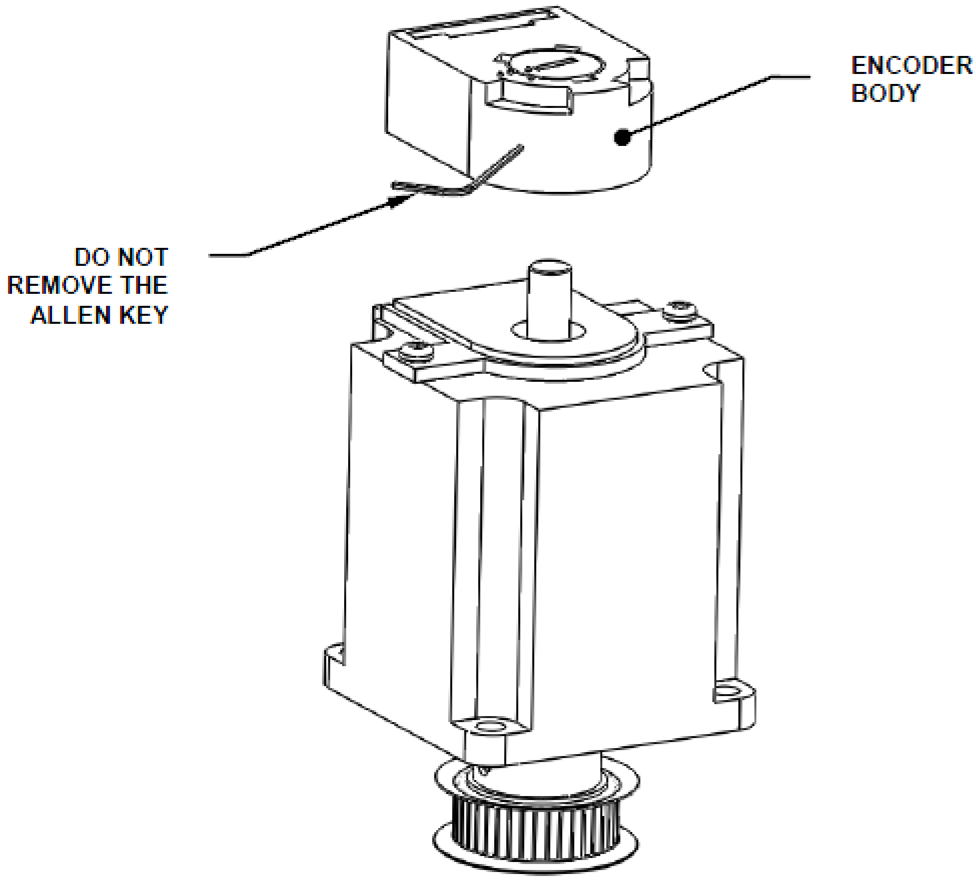


Figure T-6: Installing the Encoder

4. Push the Allen Key into the body of the encoder to ensure that it is properly seated into the code wheel hub set screw (Figure T-7). Apply a downward force on the end of the Allen key. This sets the code wheel gap by levering the code wheel hub to its upper position. While continuing to apply a downward force, rotate the Allen Key to the clockwise direction until the hub set screw is tight against the idler shaft. Remove the Allen Key by pulling it straight out of the encoder body.

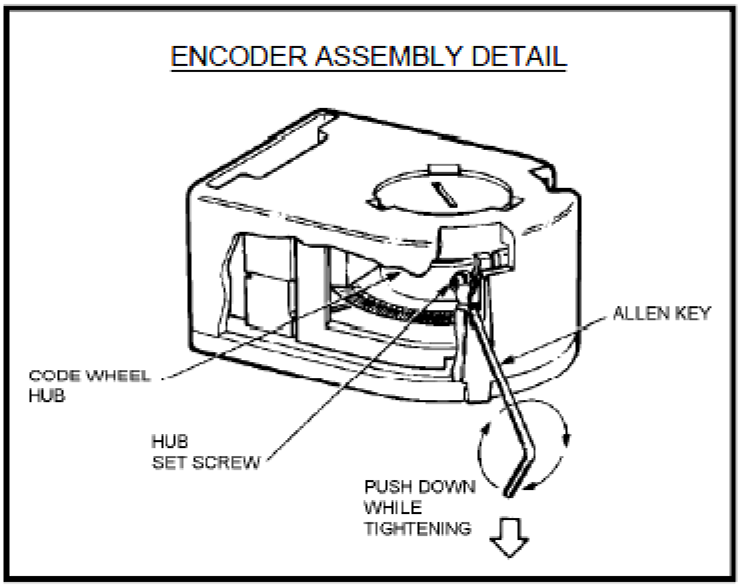


Figure T-7: Setting the Encoder

5. Rotate the encoder cover from the open to the closed position by inserting a small flat blade screwdriver into the notch and rotating as shown in Figure T-8. The encoder cover is shown in the closed position in the figure.

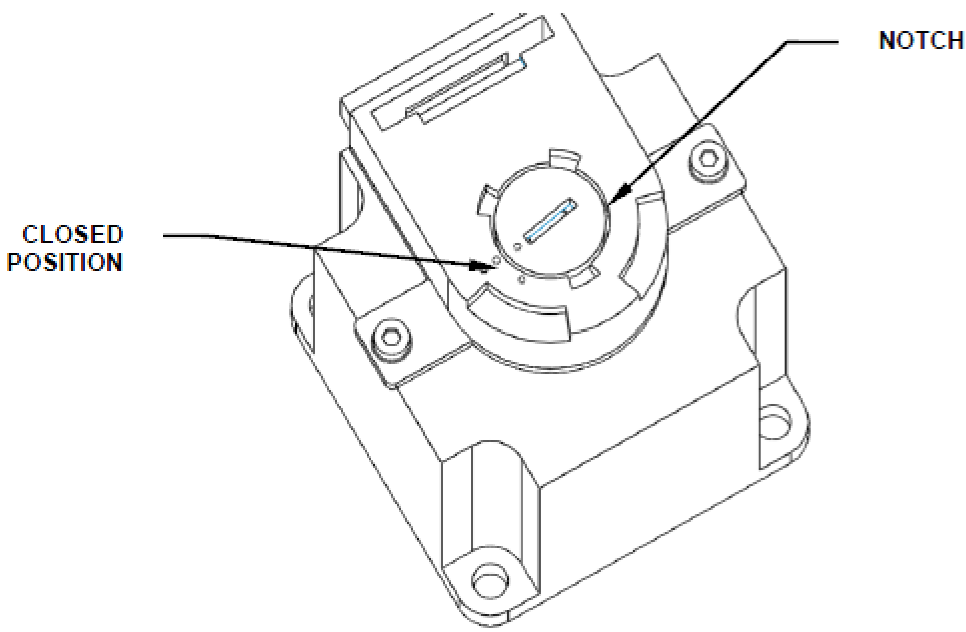


Figure T-8: Rotating the Encoder Position

T.4 Replacing the Belt

To replace the belt:

1. Remove the Sample Pipettor Y Drive Front Cap from the extrusion by removing the three flat head screws and the socket head screw that attach it to the extrusion (Figure T-9).

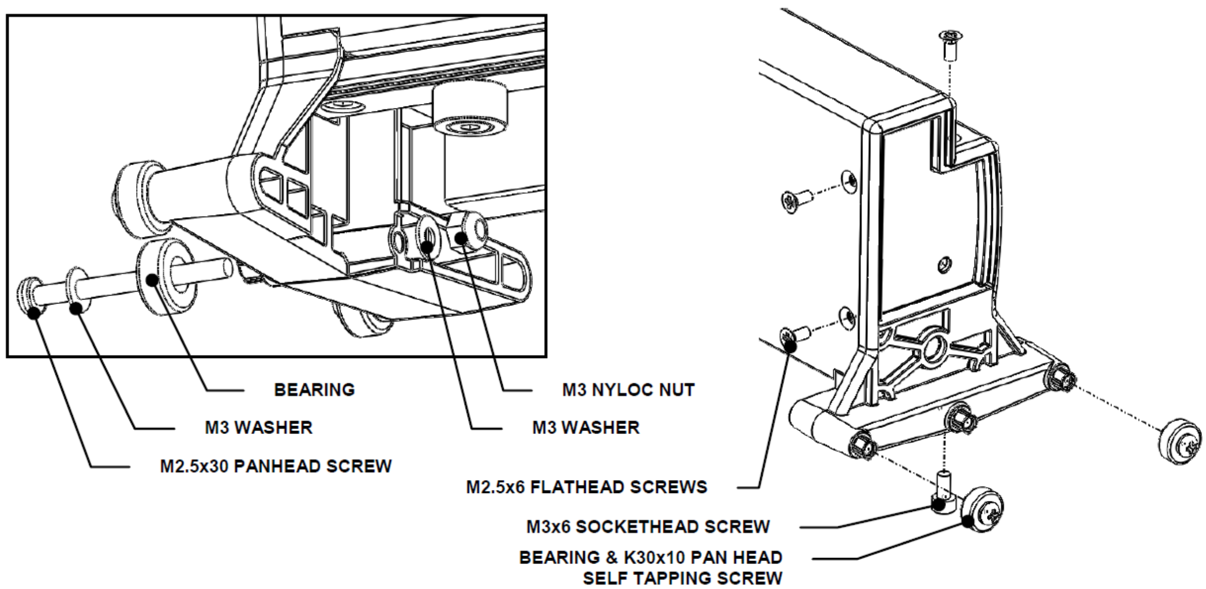


Figure T-9: Removing the Sample Pipettor Y Drive Front Cap

2. Remove the Central Boss from the end cap.

3. Remove the Sample Pipettor Y Drive Carriage by unscrewing the four socket head screws and the set screw (Figure T-10)

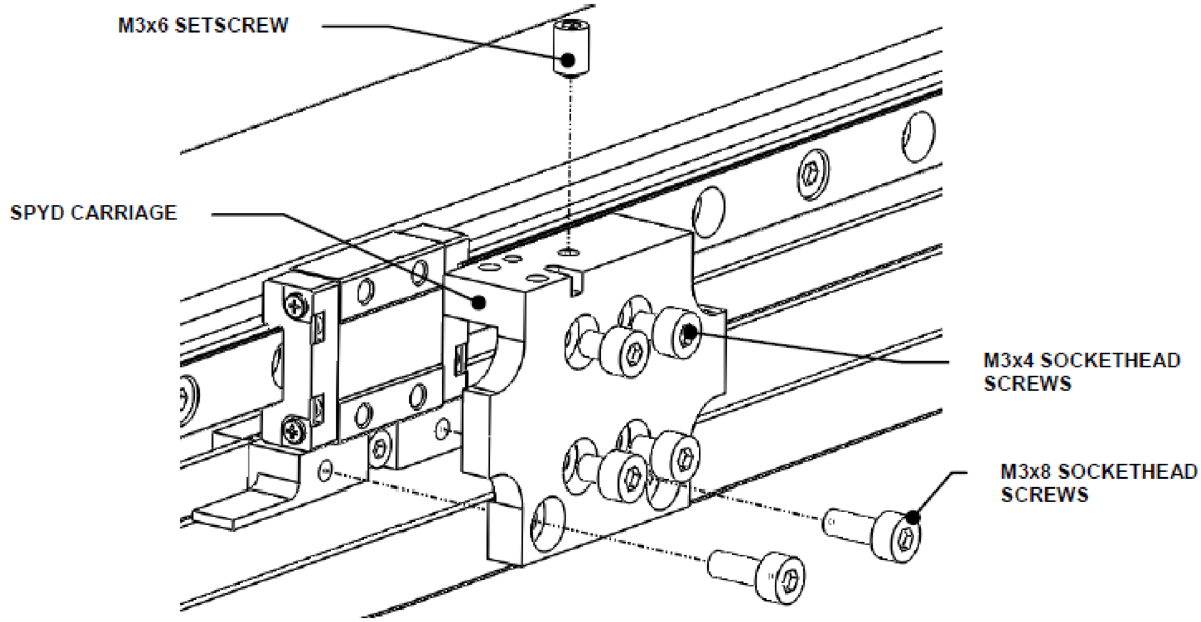


Figure T-10: Removing the Sample Pipettor Y Drive Carriage

4. Unclamp the Remove the Sample Pipettor Y Drive Belt Clamp and un-loop the belt from the pulleys (Figure T-11).

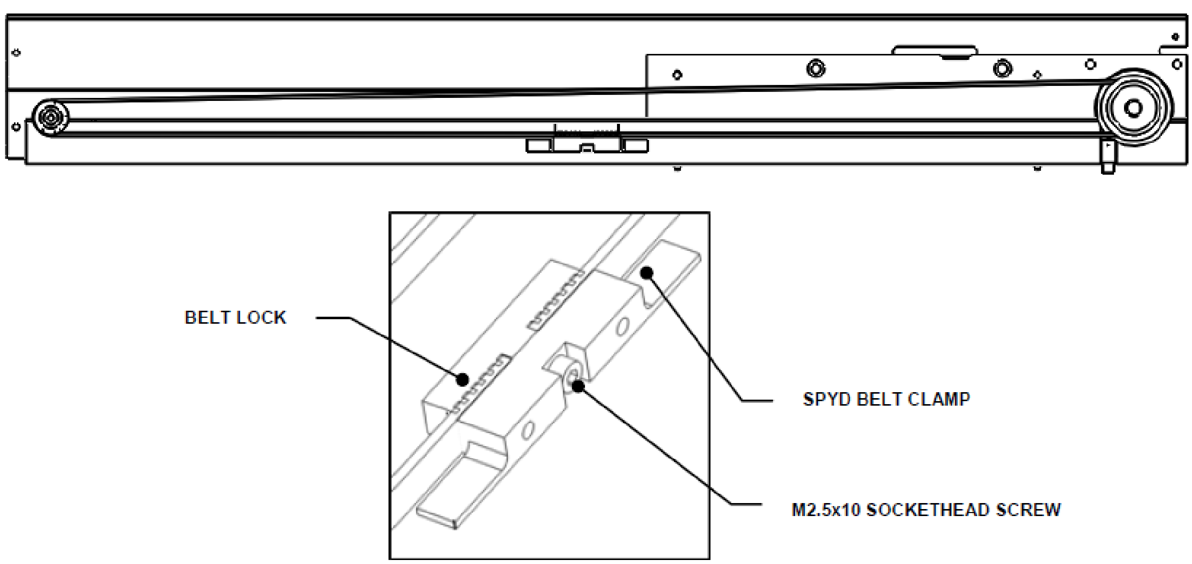


Figure T-11: Unclamping the Belt and Un-looping the Belt

To Replace the Belt:

1. Cut a length 1074mm of Timing Belt GT2 and form a loop around the two pulleys. Clamp ends of the belt with a Sample Pipettor Y Drive Belt Clamp, a Belt Lock and an M2.5x10 Socket Head Cap Screw) using Loctite 222 (Figure T-11). Make sure 6 teeth on each end of the belts are trapped by the Belt Lock and that the Belt Clamp and the Belt Lock are parallel and the Belt is flush with them.
2. Check that the flag passes through the Optosensor.
3. Loosely mount a Sample Pipettor Y Drive Belt Carriage on the bearing block using four M3x4 Socket Head Cap Screws and Loctite 222 (Figure T-10).
4. Screw down the M3x6 Set Screw with a 3in-lb driver in order to push the linear bearing against the provided step on the Sample Pipettor Y Drive Belt Carriage, then tighten the M4 Screws with a 10in-lb driver and fix the Sample Pipettor Y Drive Belt Clamp using two M3x8 Socket Head Cap Screws and Loctite 222.
5. Fit and secure the Sample Pipette Y Drive Front Cap to extrusion using three M2.5x6 Pozi Flat Head Screws, an M3x6 Socket Head Cap Screw and Loctite 222 (Figure T-9).
6. Secure two Bearings 5x4x10 to the bosses on the sides of the SPYD Front Cap with two K30x10 Pan Head Self Tapping Screws using a 10lb/in driver.
7. Place a third bearing in the central boss and secure it with an M2.5x30 Pozi Pan Head Screw, two M2.5 Washers and an M3 Nyloc Nut.
8. Move the Sample Pipette Y Drive Carriage to the end of its travel nearest the motor as shown in Figure T-12.

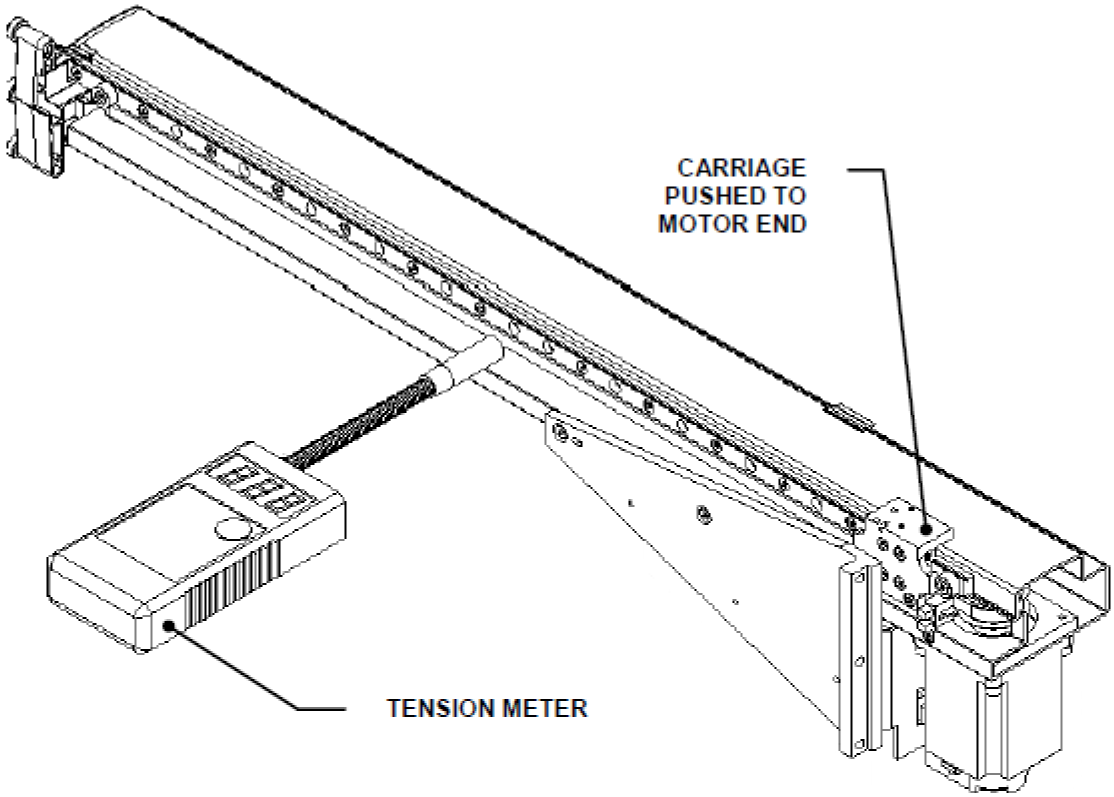


Figure T-12: Location of Carriage for Tension Adjustment

9. Fit the Sample Pipette Y Drive Tensioning Fixture (P24FIX013) to the position shown in Figure T-13 and engage the captive screw in the tensioning slide.

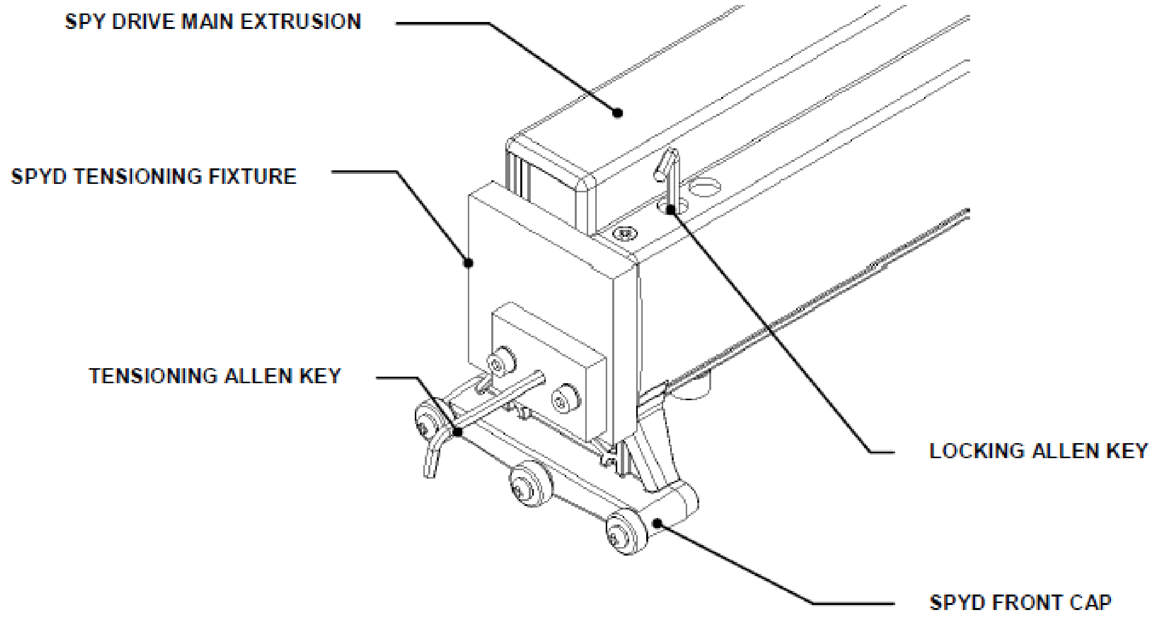


Figure T-13: Tensioning Fixture

10. Measure the belt tension in the position indicated using a Gates Sonic Tension Meter 507C.

11. Adjust the belt tension by loosening the two M3x12 Socket Head Cap Screws on the Tensioning Slide (through the clearance holes on the extrusion) to unlock the pulley and then rotating the M3x25 Socket Head Cap Screw, which is retained in place by the SPYD Tensioning Fixture (P24FIX013), until the tension meter reads between 46-48 Hz. Tighten the screws holding the tensioning slide after adjustment.

12. Remove the fixture.

T.5 Replacing the Optosensor

The optosensor is located on the extrusion near the motor as shown in Figure T-14 and is removed by unscrewing the M3x8 Buttonhead screw.

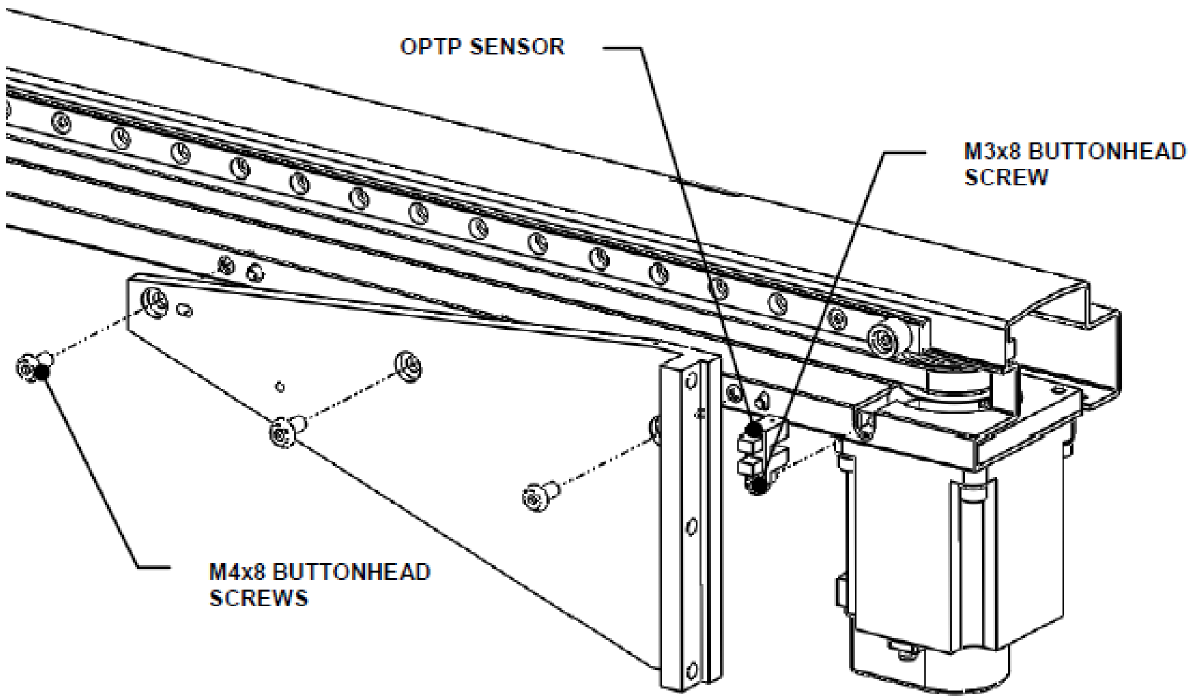


Figure T-14: Location of Optosensor

This page intentionally left blank.

Chapter U Sample Pipettor, Z Drive

U.1 Overview

The *Sample Pipettor Z Driv*e includes the pipettor and is attached to the Y Drive Assembly as shown in Figure U-1. It is removed as described below and should be sent to the depot for refurbishment. Installation of a replacement drive is described in Section U.2.

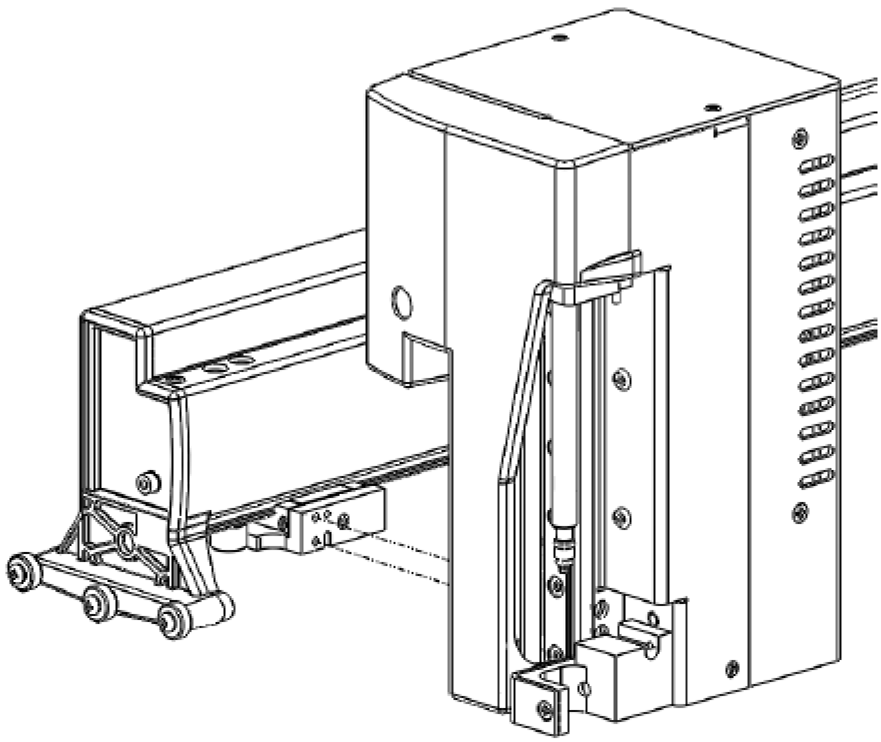


Figure U-1: Sample Pipettor Z Drive Attachment to Y Drive

U.2 Removal of the Sample Pipettor Z Drive

To remove the Sample Pipettor Z Drive:

1. Remove the Y Drive Motor Cover (Figure U-2).

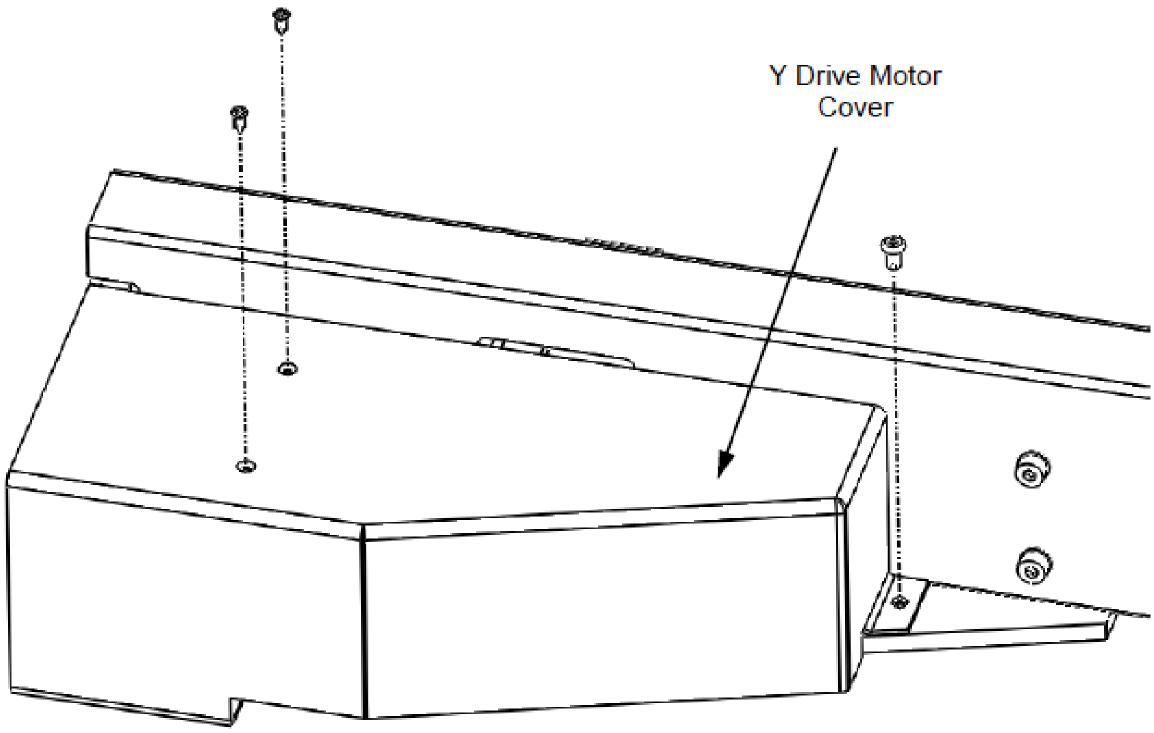


Figure U-2: Removal of Y Drive Motor Cover

2. Remove the Z Drive Cable Chain from the Y Drive by removing the 18 way FFC Clamp (Figure U-3).

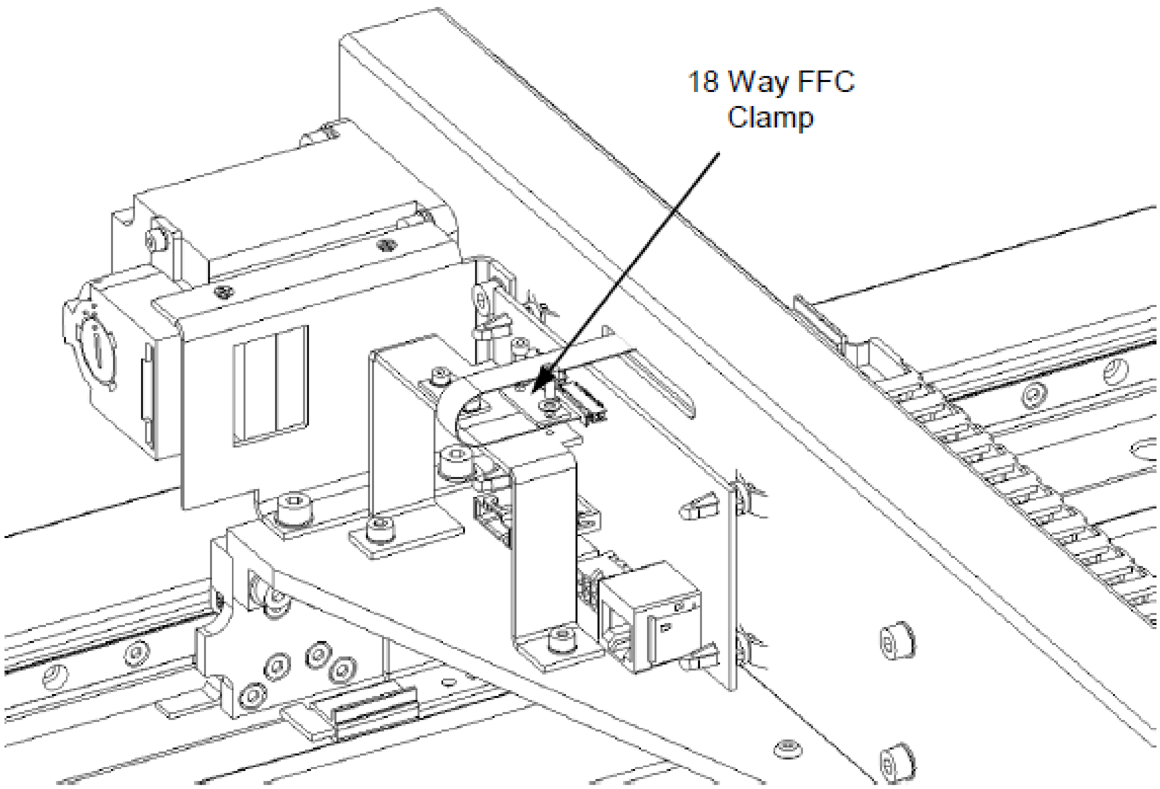


Figure U-3: 18 Way FFC Clamp

3. Remove the Flex C Clip (Figure U-4).

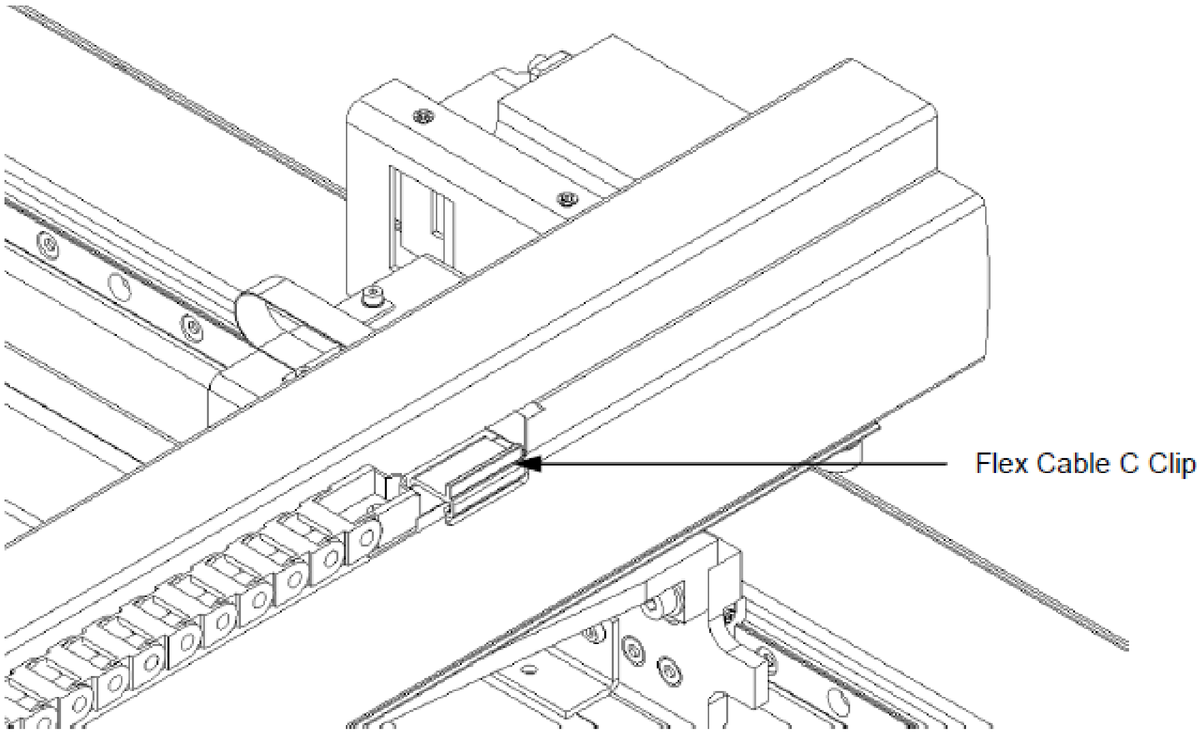


Figure U-4: Flex Cable C Clamp

4. Remove the Cable Chain Adapter Plate (Figure U-5).

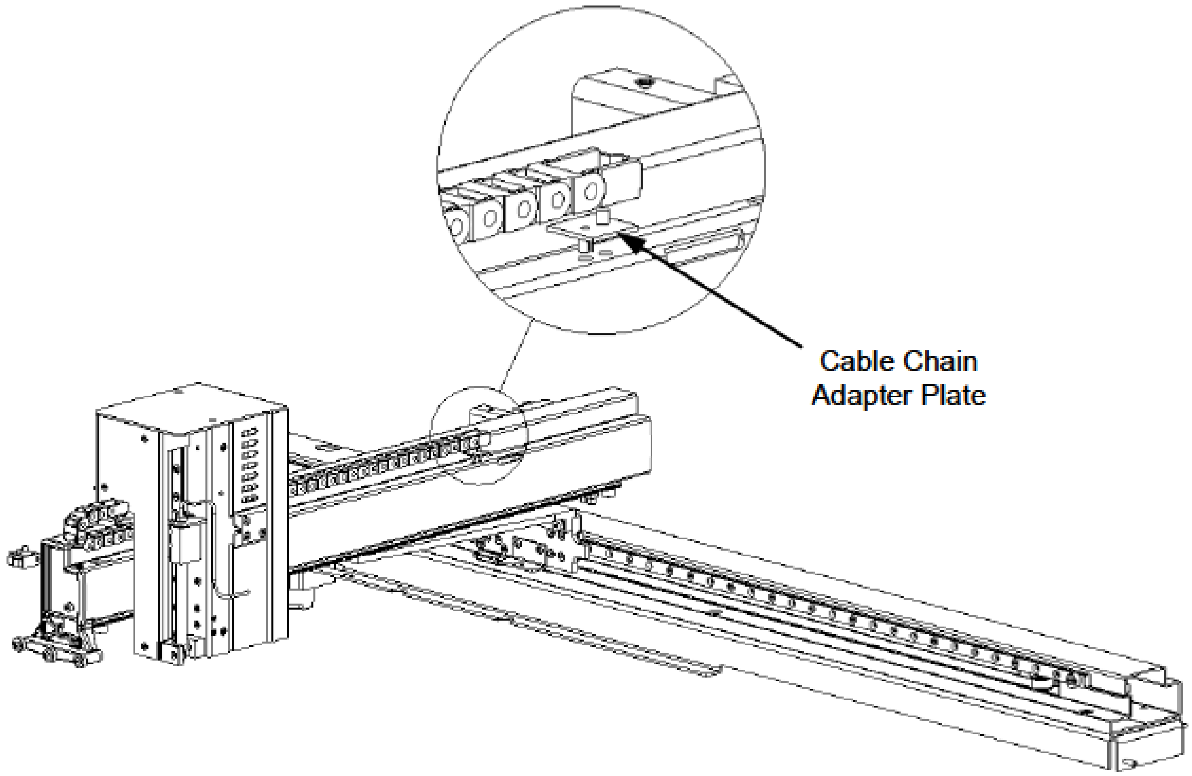


Figure U-5: The Cable Chain Adapter Plate

U.3 Repairing the Sample Pipettor, Z Drive

U.3.1 Removing the front and back cover of the Sample Pipettor, Z Drive

To remove the Sample Pipettor, Z Drive front unscrew the three screws as shown in Figure U-6.

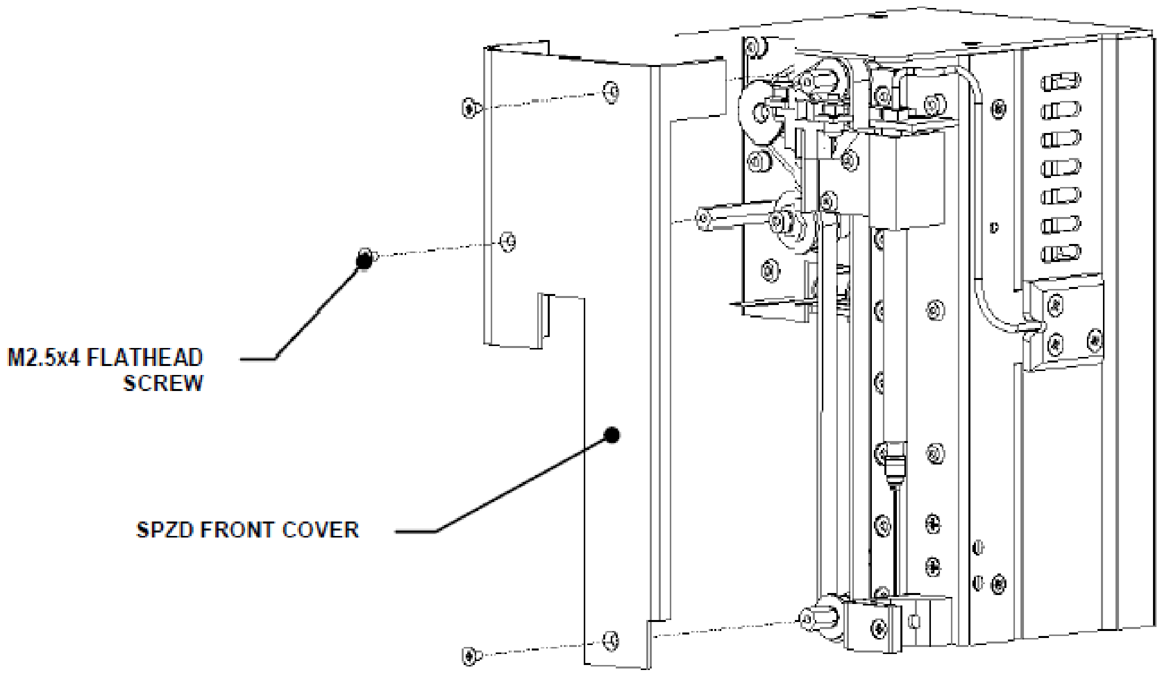


Figure U-6: Removing the Front Cover

To remove the back cover, unscrew the three screws as shown in Figure U-7.

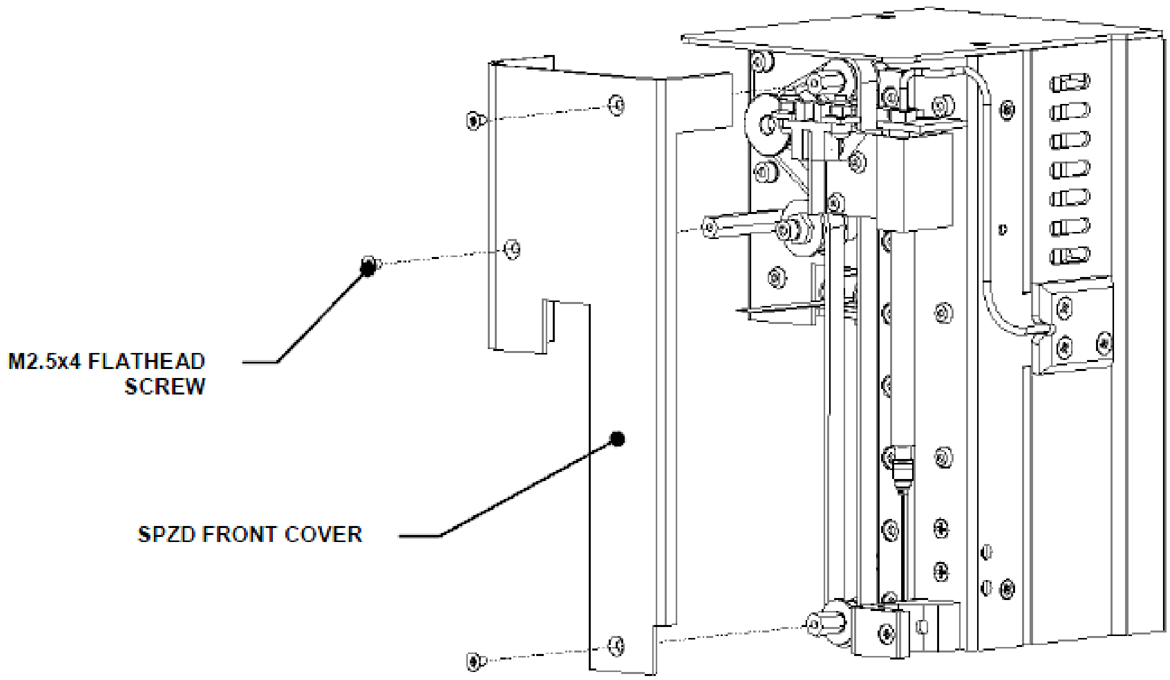


Figure U-7: Removing the Back Cover

U.3.2 Replacing the Motor Assembly on the Main Chassis

The motor assembly is attached to the main chassis as shown in Figure U-8.

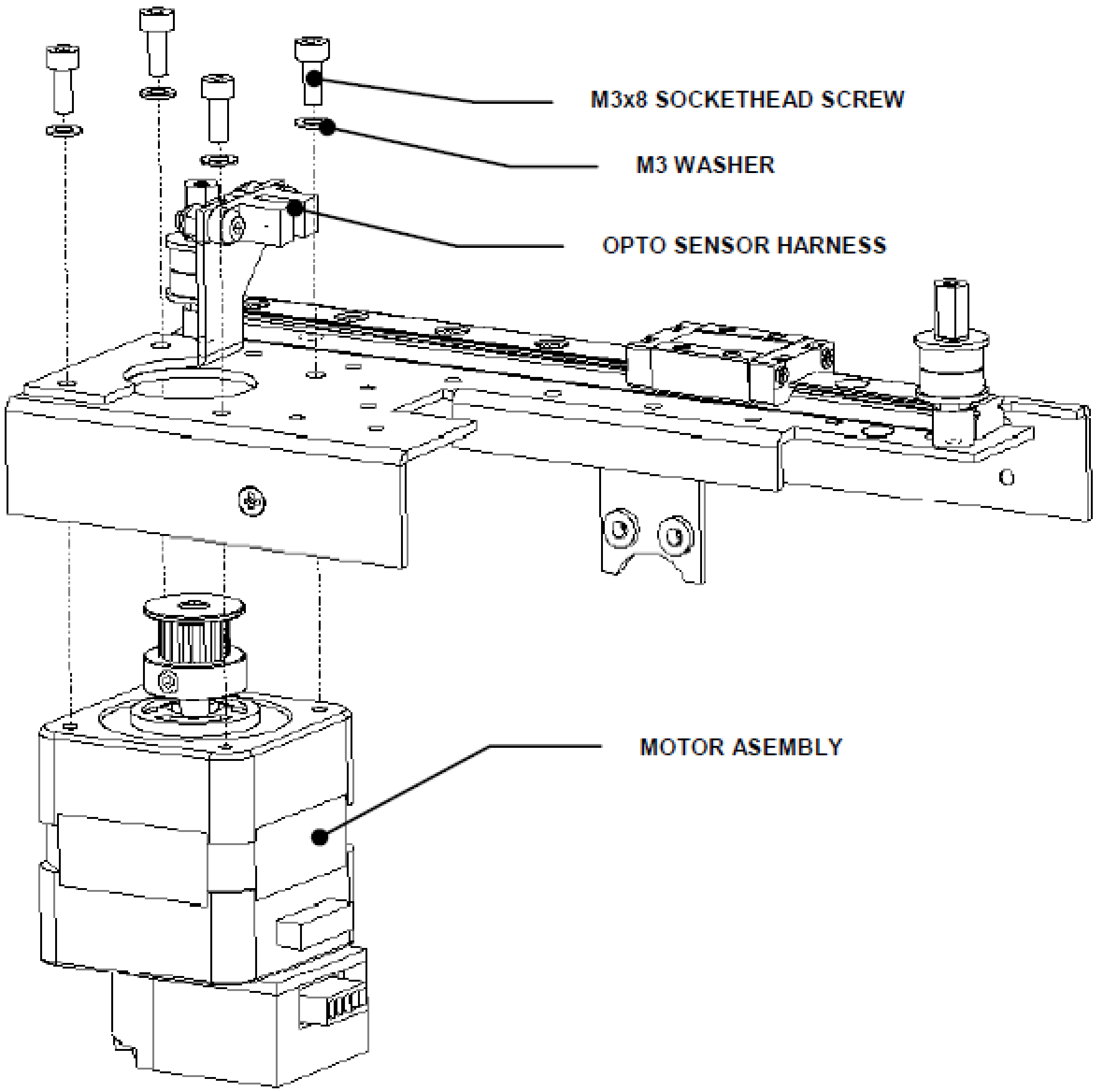


Figure U-8: Removing the Motor Assembly

To rebuild the motor assembly:

1. Mount a 20-Tooth Drive Pulley (remove and discard any set screws that come with it) to the front shaft of the Motor with the SPZD Pulley Spacer (P24FIX012) using two M4x6 Set Screws and Loctite 222 (Figure U-9).

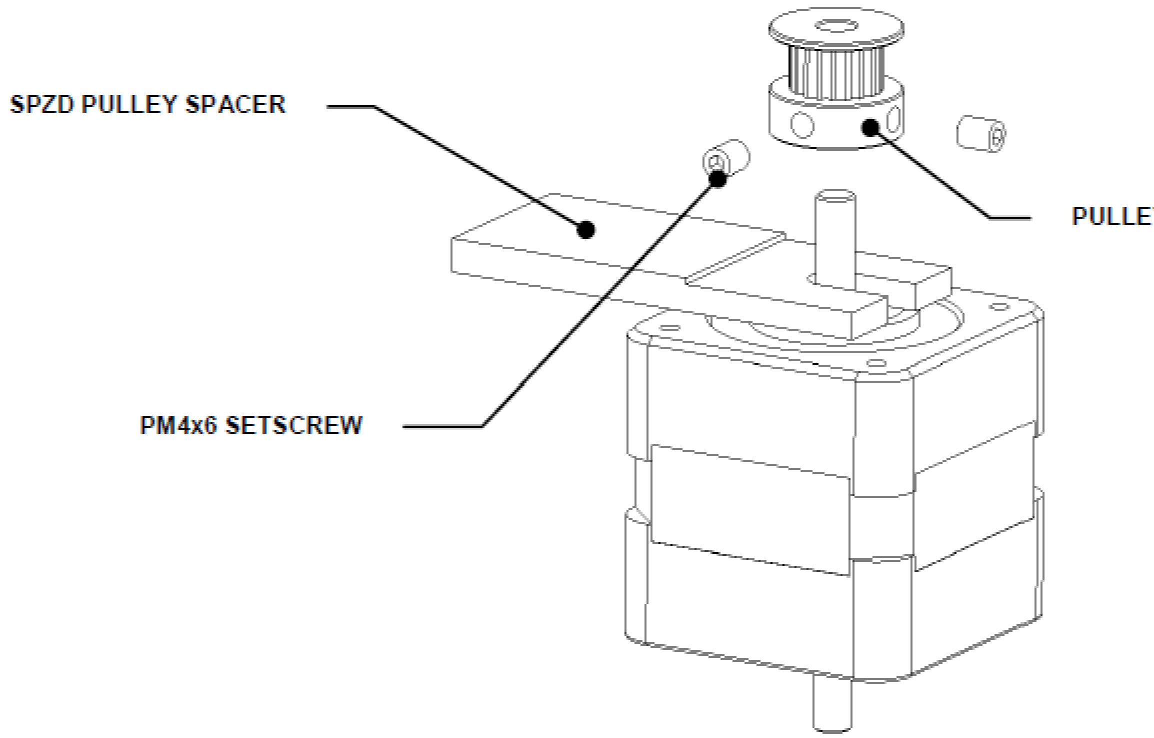


Figure U-8: Mounting the Pulley

> ***Note:*** *Install the set screws firmly. The pointed cone of each set screw must pierce the motor shaft for a strong fit.*

2. Attach the Mounting Plate, for the Encoder, to the motor with an Encoder Centre (DSXFIX015) using three M1.6X6 Pan Head Screws). Ensure that the mounting plate is centralized around the shaft (Figure U-10).

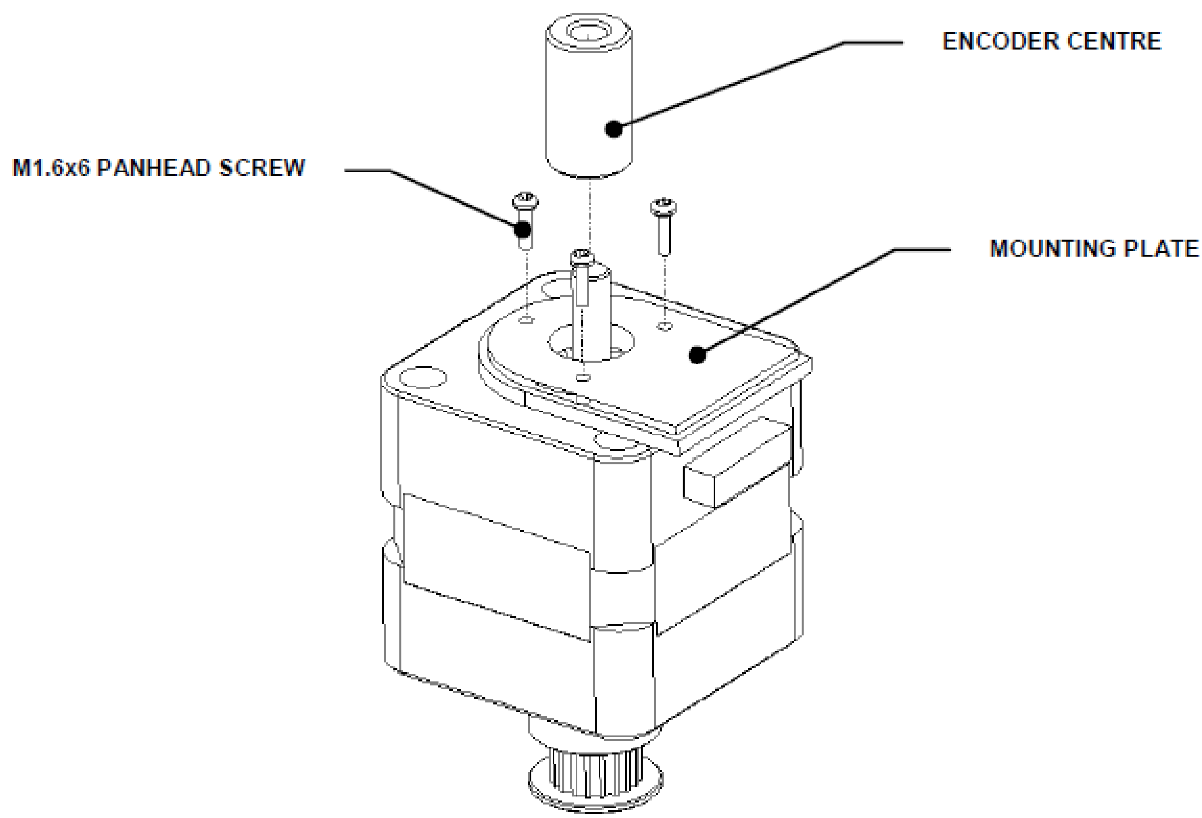


Figure U-10: Attaching the Encoder Mounting Plate

3. Install the Encoder body onto the mounting plate by snapping it in place (Figure U-11).

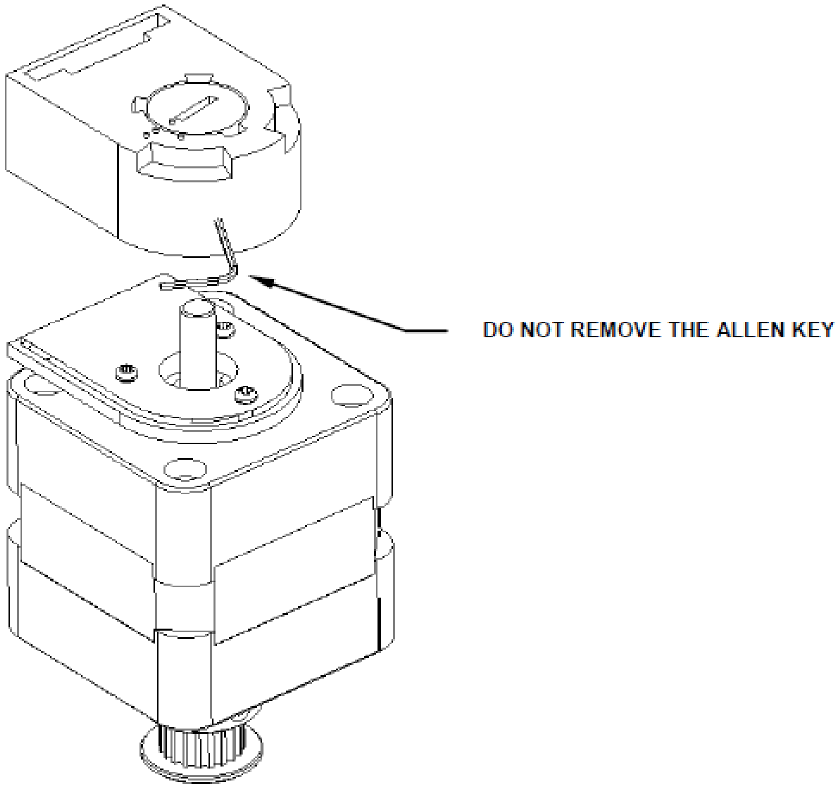


Figure U-11: Mounting the Encoder Body

4. Push the Allen Key into the body of the encoder to ensure that it is properly seated into the code wheel hub set screw. Then apply a downward force on the end of the Allen Key. (This sets the code wheel gap by levering the code wheel hub to its upper position.) While continuing to apply a downward force, rotate the Allen Key to the clockwise direction until the hub set screw is tight against the idler shaft. Remove the Allen Key by pulling it straight out of the encoder body (Figure U-12).

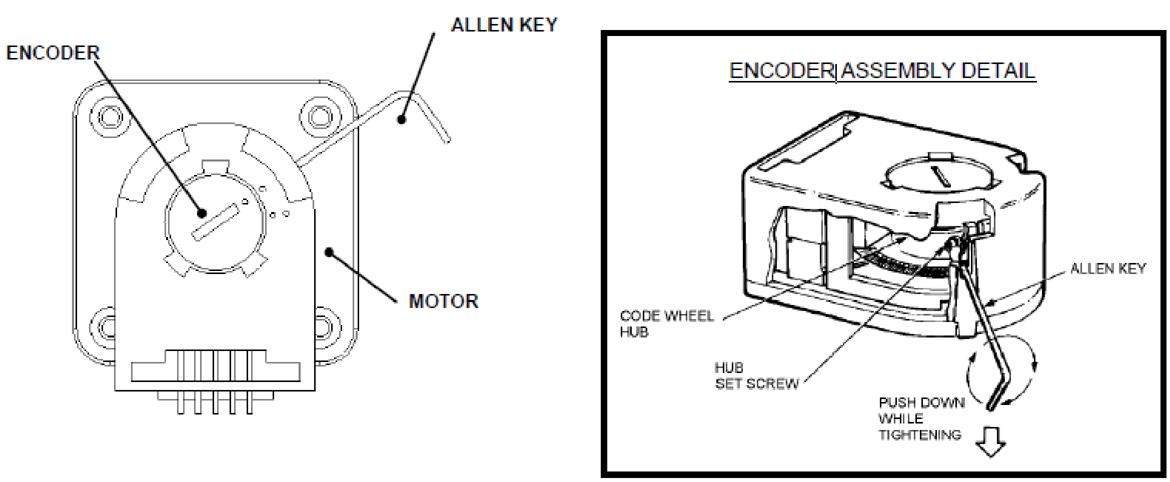


Figure U-12: Setting the Code Wheel

U.3.3 Replacing the Optosensor

The Optosensor is located on the Sample Pipettor Z Drive Home Sensor Bracket as shown in Figure U-13. It can be replaced by removing the2 M3x10 Buttonhead screws. The bracket is mounted on the left side of the main chassis as shown in Figure U-8.

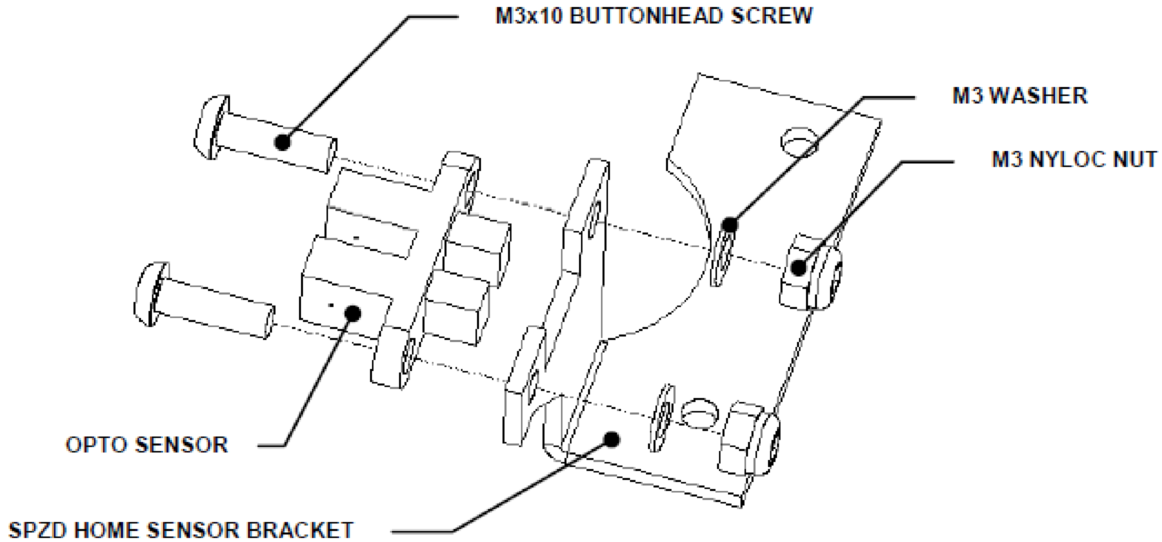


Figure U-13: Mounting the Optosensor

U.3.4 Replacing the Printed Circuit Board

The Printed Circuit Board is mounted on the Pipette Syringe Assembly as shown in Figure U-14 and is removed by unscrewing the three screws.

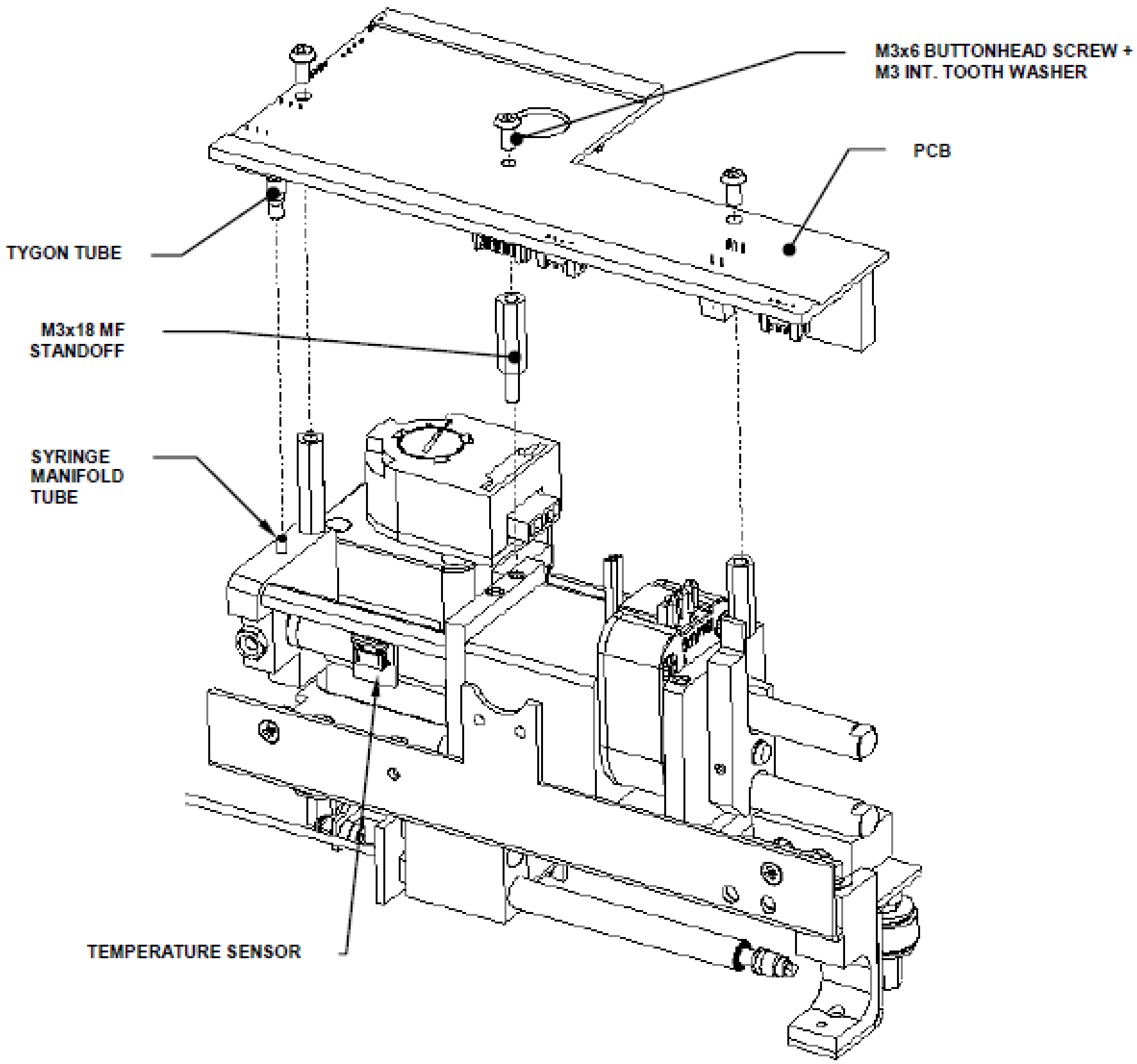


Figure U-14: The Printed Circuit Board

To replace the board:

1. Fit an M3x18 MF Standoff and Loctite 222 onto the Pipettor Syringe Assembly and secure the Z Drive Printed Circuit Board onto the standoffs using three M3x6 Button Head Cap Screws with three M3 Internal Tooth Washers
2. Ensure that the Tygon Tubing fits on the Syringe Manifold Tube.
3. Connect the Temperature Sensor FFC to the Temperature Sensor and the Printed Circuit Board.

U.3.5 Pipette Syringe Assembly

The Pipette Syringe Assembly is mounted on the Chassis Assembly as shown in Figure U-15.

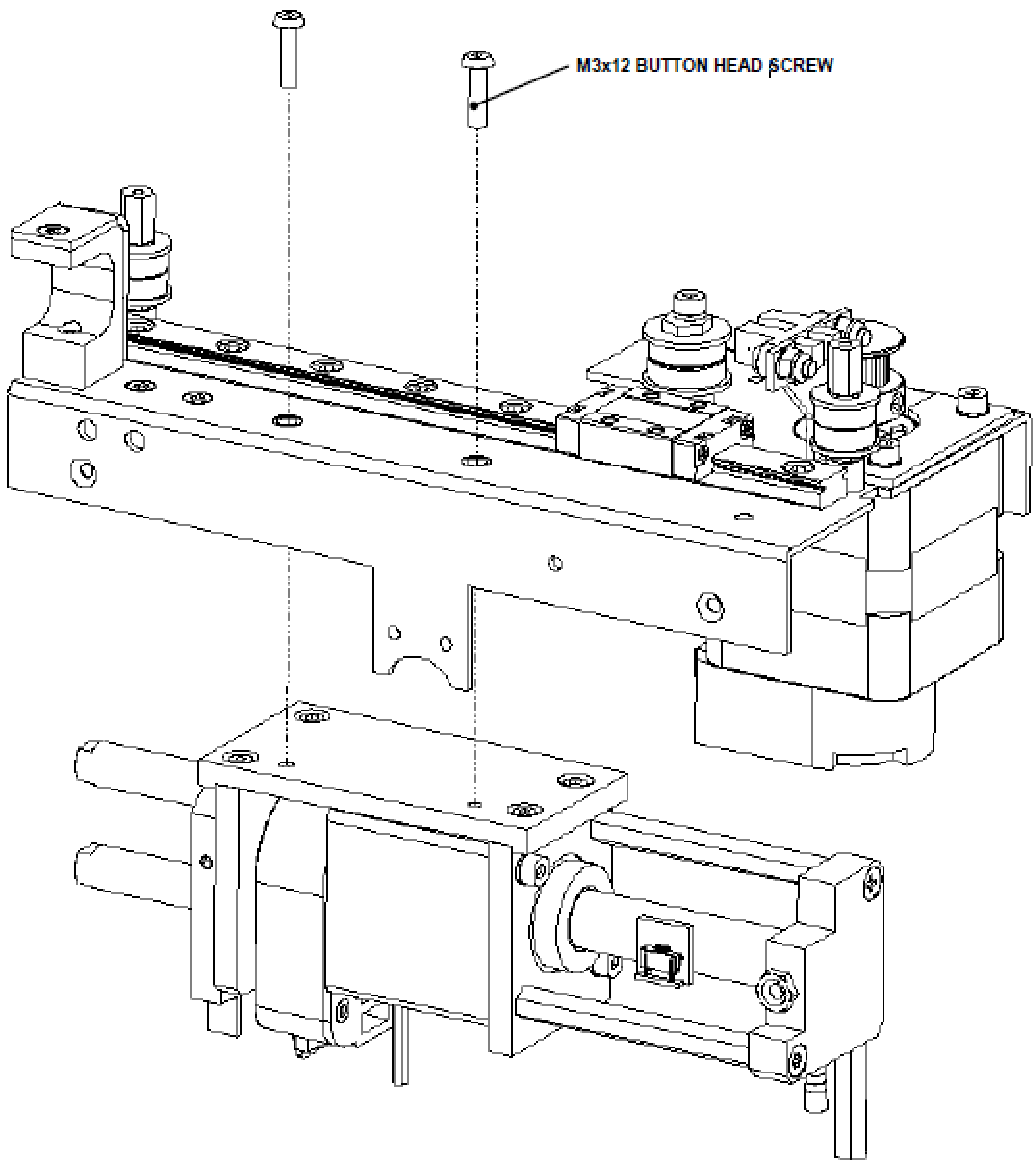


Figure U-15: Mounting the Pipette Syringe Assembly

U.3.5.1 Disassembly of the Pipette Syringe Assembly

To disassemble the Pipette Syringe Assembly:

1. Remove the Syringe Anti-Rotation Block (Figure U-16).

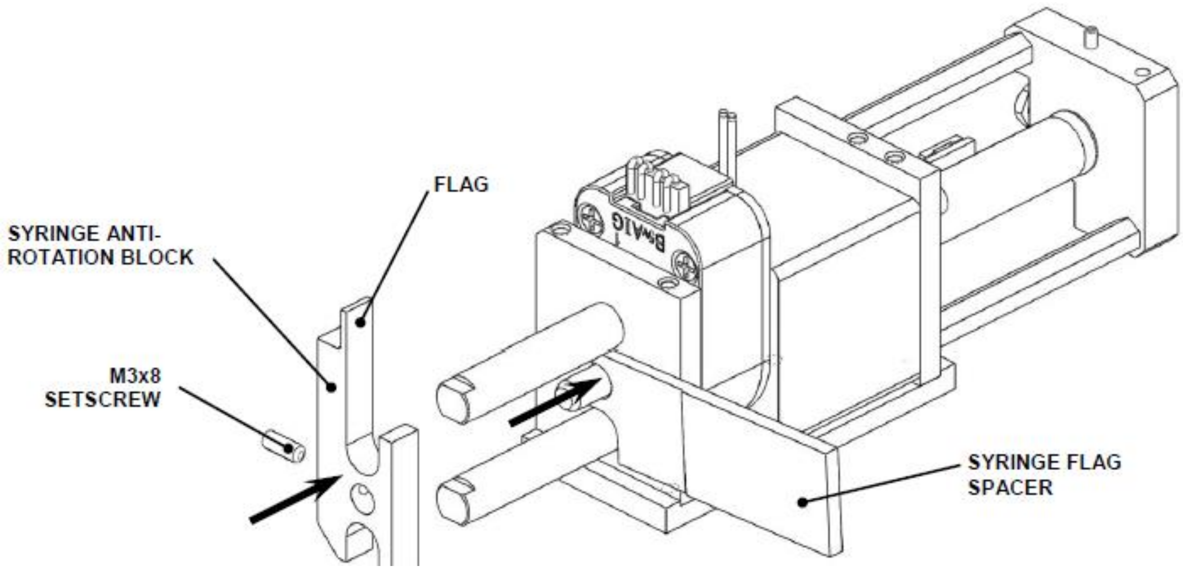


Figure U-16; The Syringe Anti-Rotation Block

2. Remove the Motor Lead Screw

3. Remove the Syringe Manifold from the Dispense Tube (Figure U-17)

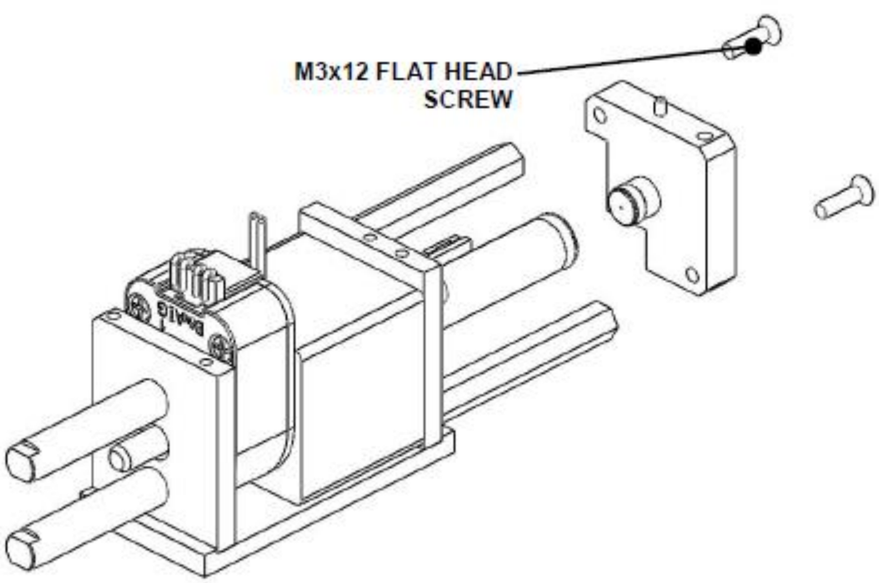


Figure U-17: Removing the Syringe Manifold from the Dispense Tube

4. Remove the Dispense Tube that is on the Dispense Piston from the Barrel Center (Figure U-18).

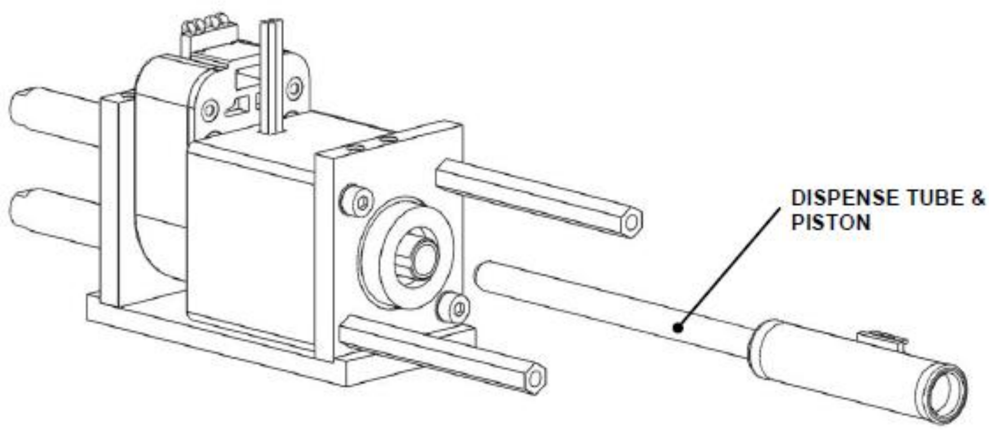


Figure U-18: Removing the Dispense Tube on the Dispense Piston from the Barrel Center

5. Remove the Barrel Center, related components and the standoffs (Figure U-19).

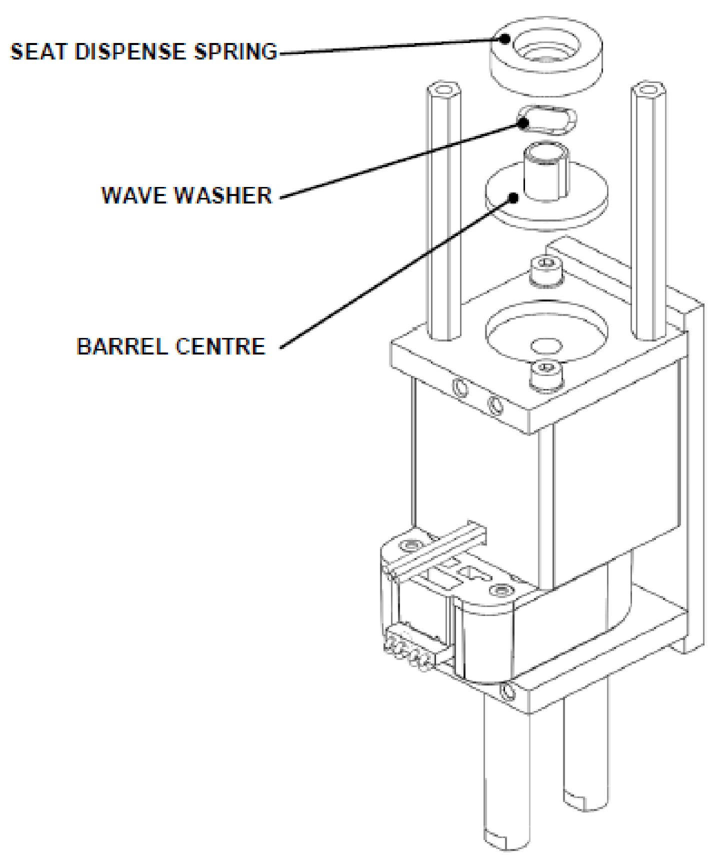


Figure U-19: Removing the Barrel Center

6. Remove Back Guide Bar Assembly (item with two rods) and the Syringe Main Plate (Figure U-20) from the Syringe Main Plate.

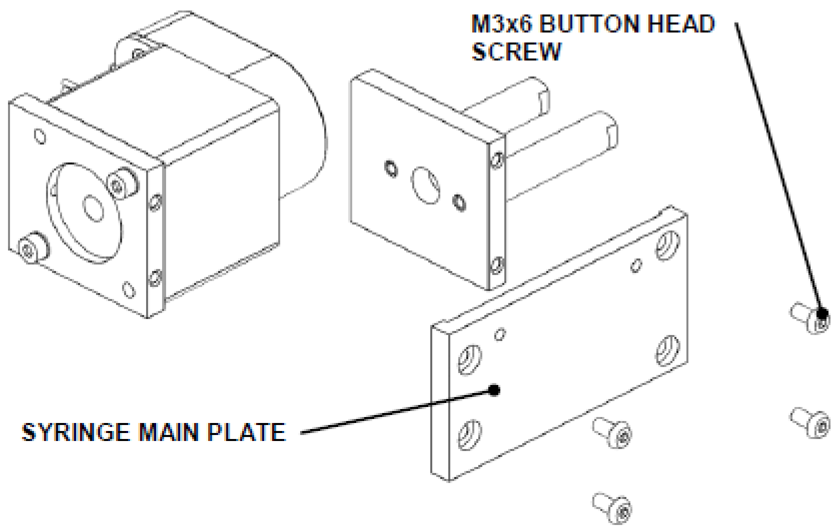


Figure U-20: Removal of Back Guide Bar Assembly (item with two rods) and the Syringe Main Plate

7. Remove Syringe Motor Support from Motor.

U.3.5.2 Rebuilding the Syringe Assembly

To rebuild the syringe assembly:

1. Press a SP Syringe Piston into the Dispense Seal to form the Dispense Piston Assembly using the fixture PMFIX020 and the PanaVise RJ14 manual mini presser (Figure U-21). NOTE: Listen for two clicks to ensure proper fit.

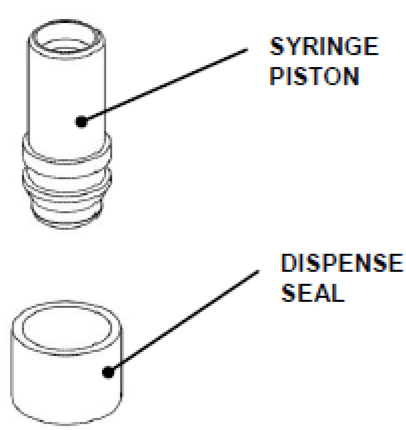


Figure U-21: Inserting a Syringe Piston into the Dispense Seal

2. Using alcohol, degrease the end of the lead screw from the Syringe Motor (Figure U-22). Thread the Dispense Piston Assembly onto the lead screw using Loctite 262.

Note: *This sub-assembly must dry for ten minutes.*

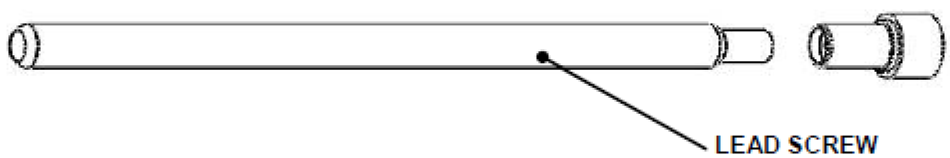


Figure U-22: Lead Screw from Syringe Motor

3. Apply a small amount of Silicone Grease (Dow Corning 44) to the dispense piston assembly (Figure U-23). Lubricate the internal walls of the Syringe Tube PCB (13501770) with grease by pushing the dispense piston assembly in one direction through the dispense tube (5 times).

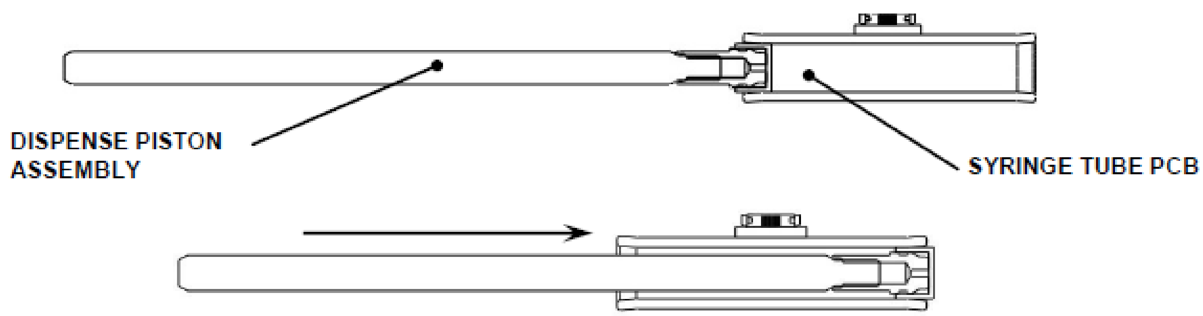


Figure U-23: Lubricating the Dispense Piston Assembly

4. Place the body of the Syringe Motor on the Syringe Motor Support and fix it with two M3x8 Socket Head Cap Screws and two M3 Washers as shown in Figure U-24 using Loctite 222. Note encoder position and top holes on the Syringe Motor Support. Connect Encoder Cable.

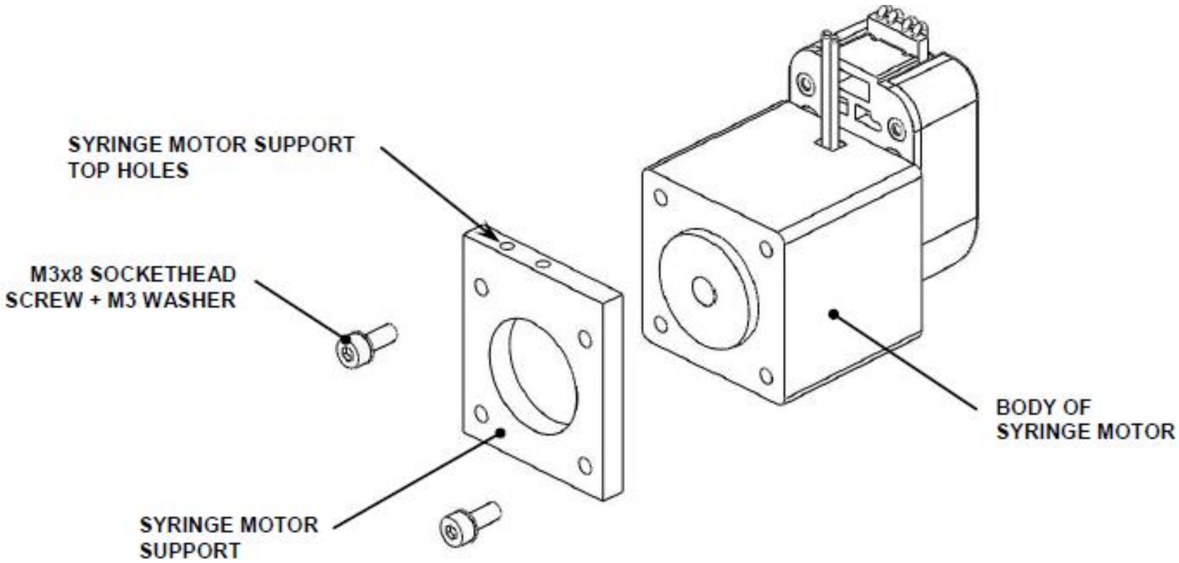


Figure U-24: Syringe Motor Support

5. Screw two Syringe Back Guide Bar on the Syringe Back Guide using Loctite 222 as shown in Figure U-25 (note chamfer position on the Syringe Back Guide).

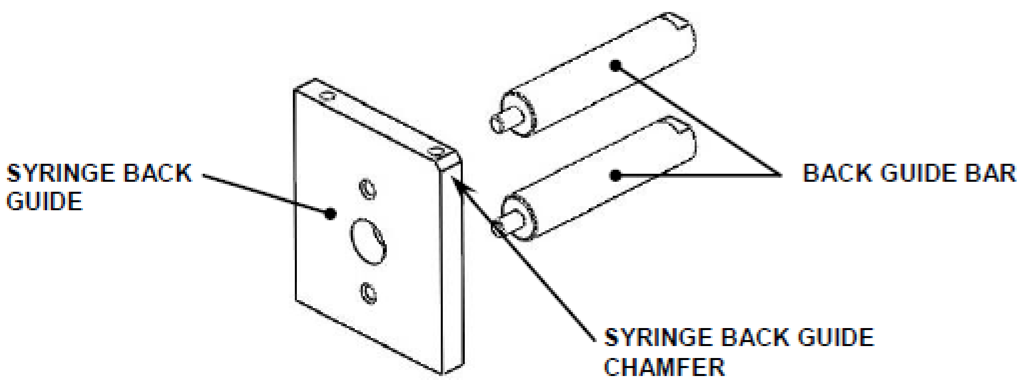


Figure U-25: Screwing two Syringe Back Guide Bar on the Syringe Back Guide

6. Fix the previous sub-assemblies on the SP Syringe Main Plate with four M3x6 Button Head Screws using Loctite 222 (Figure U-20).

7. Screw two standoffs (M3x50) into the .Syringe Motor Support (Figure U-24), holes that are not filled with screws

8. Locate the Barrel Center, Wave Washer and Seat Dispenser Spring on the motor front face (Figure U-19).

9. Slide the Dispense Tube assembled on the Dispense Piston through the Barrel Centre and the body of the Linear Actuator till the Tube sits on the Seat Dispense Spring. (Figure U-26).

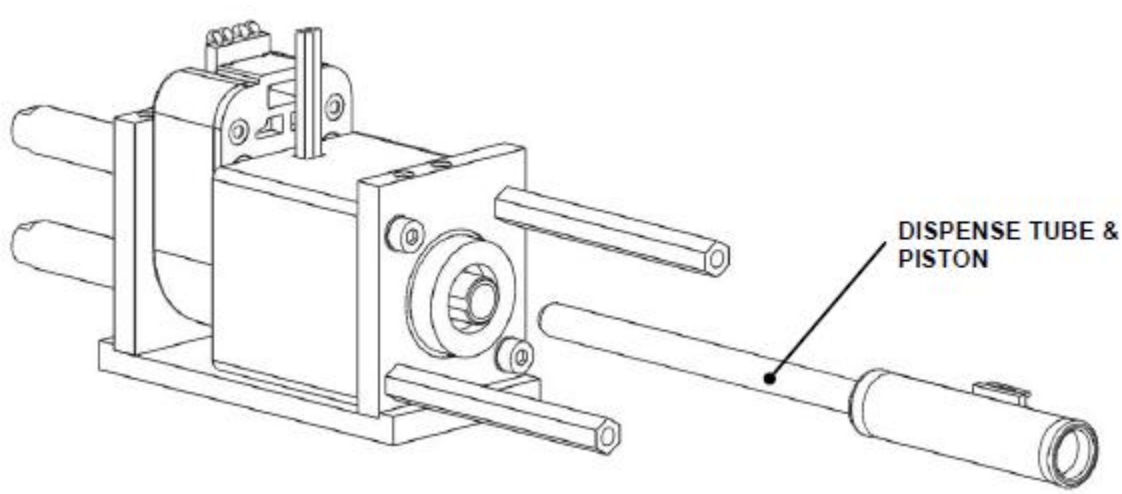


Figure U-26: Sliding the Dispense Tube assembled on the Dispense Piston through the Barrel Centre

10. Apply Silicone Grease (Dow Corning 44) to the Syringe Manifold before fitting an O-Ring. Ensure that the grease does not block the manifold hole (Figure U-27). Check manifold passage is unobstructed with compressed air can; attached 10mm PTFE tube out the end hole of Syringe Manifold to blow air to other end manifold hole.

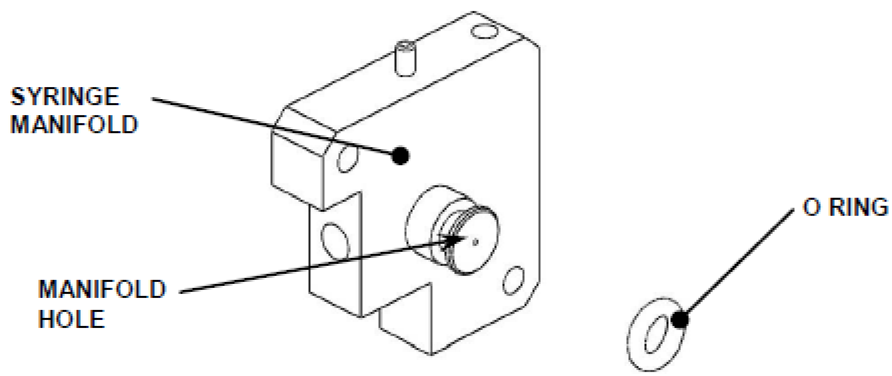


Figure U-27: Fitting the O-Ring

11. Slide the Syringe Manifold into the Dispense Tube and screw two M3x12 Flat Head Screws (using Loctite 425 as shown in Figure U-28 (note the Manifold orientation)).

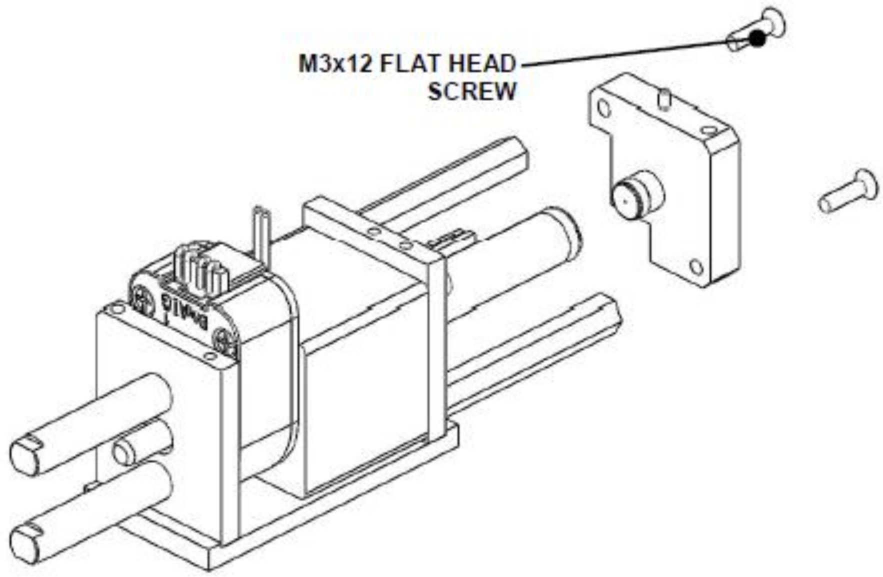


Figure U-28: Sliding the Syringe Manifold into the Dispense Tube

12. Push the Motor Lead Screw up through the Motor until the top face of the Dispense Seal touches the bottom face of the Manifold (Figure U-29). Position the Syringe Flag Spacer over the Lead Screw. Then, slide the Syringe Anti-Rotation Block (23503490) until it touches the spacer. In this configuration, fix the Syringe Anti-Rotation Block to the Motor Lead Screw with one M3x8 Flat Point Set Screw using a 3 in-lb torque driver. Note that the flag goes on the same face as the Motor and Encoder Cables.

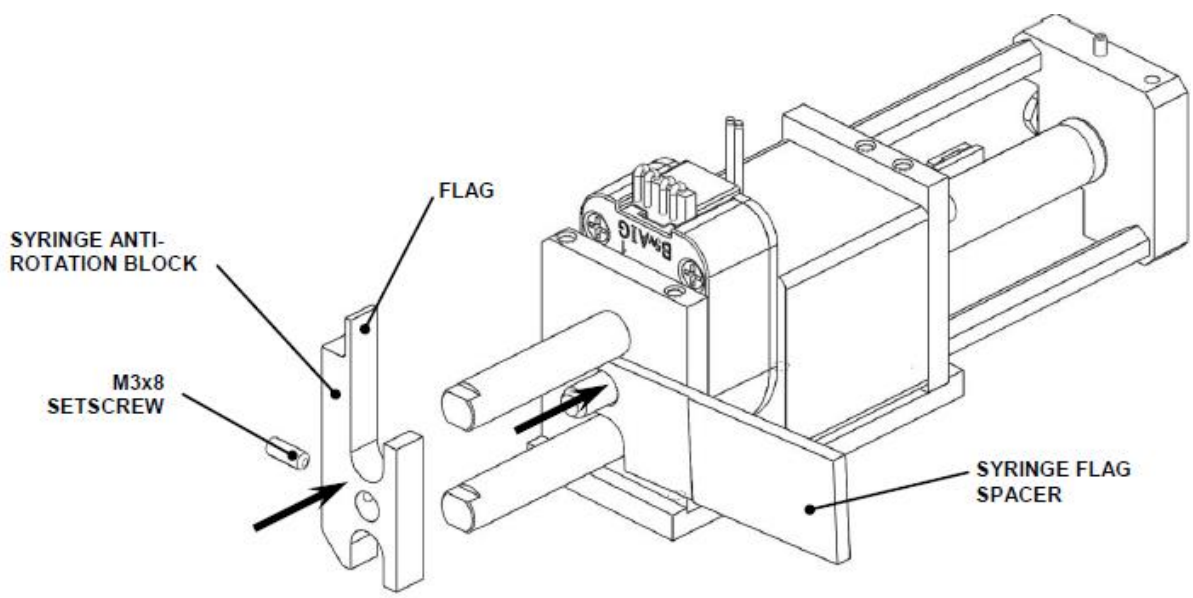


Figure U-29: Assembling the Syringe Assembly

U.3.6 Replacing the Timing Belt Assembly

The Timing Belt Assembly is shown in Figure U-30.

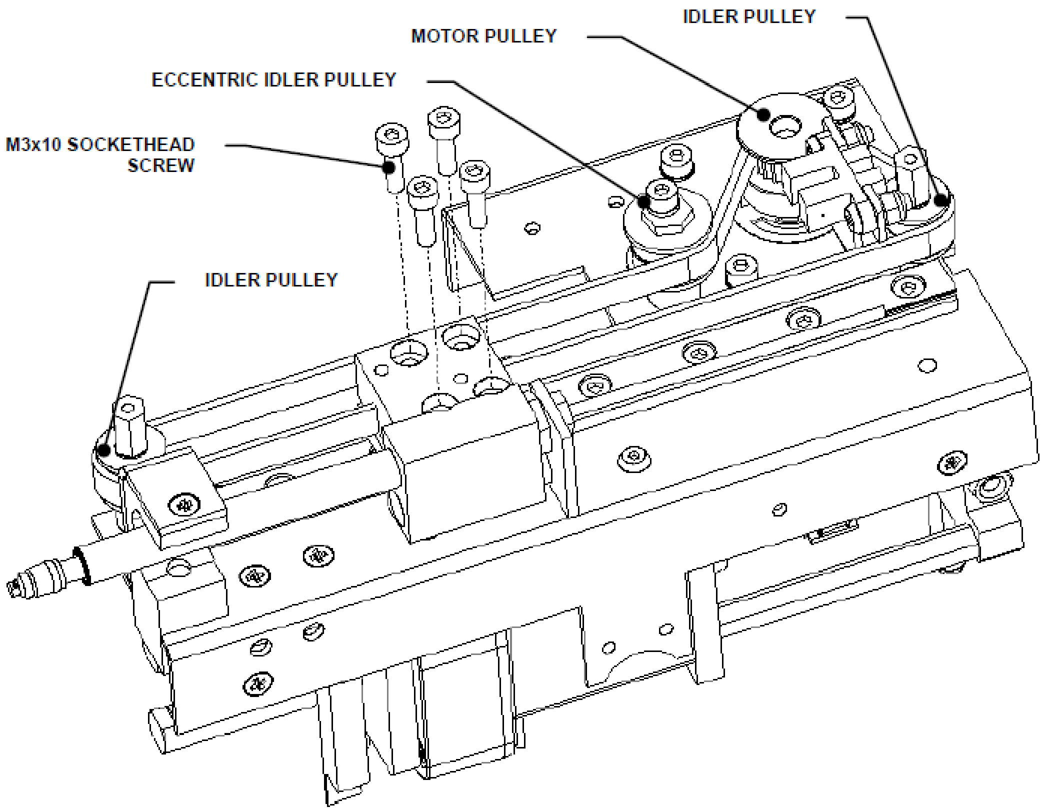


Figure U-30: Belt Assembly

To remove the belt, loosen the Spigot Support Vanes (Figure U-31).

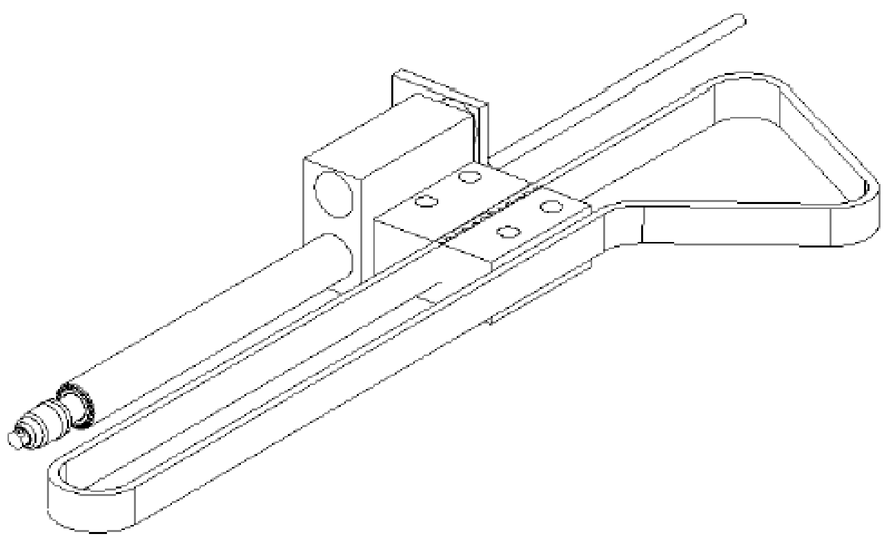


Figure U-31: Spigot Support Vanes

To replace the belt:

1. Cut a piece of Timing Belt GT2 (366mm long = 183 teeth) and slide it into the Spigot Support in a way that 5 teeth on each end of the belt are trapped into the Spigot Support vanes (6th tooth remains empty)as shown in Figure U-32.

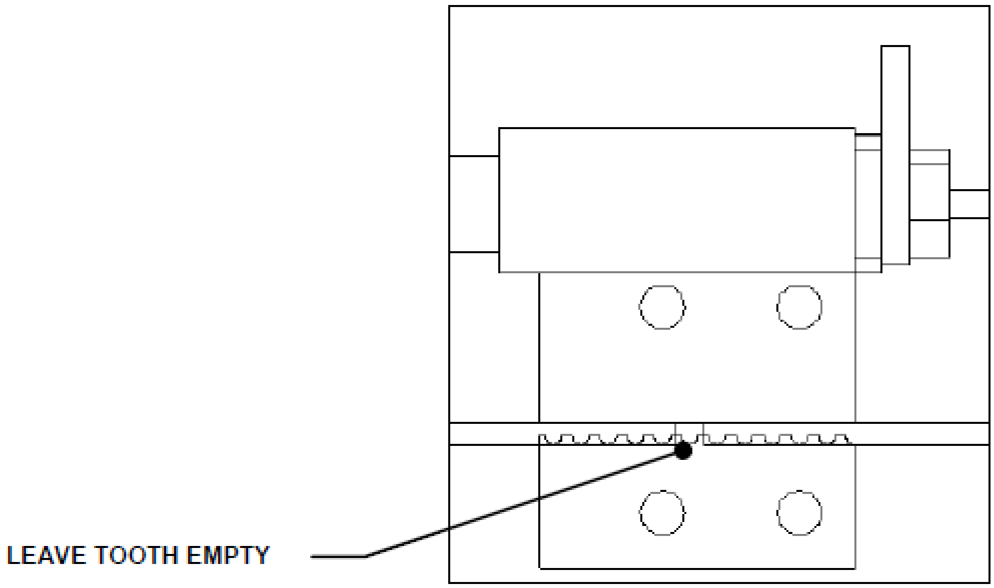


Figure U-32: Inserting Timing Belt

2. Loop the Belt around the Motor Pulley, Idler Pulleys and the Eccentric Idler Pulley. Loosen the Eccentric Idler Pulley Assembly if required to fit the Belt (Figure U-30). Secure the Spigot Support onto the Linear Rail Bearing Block using four M3x10 Socket Head Cap Screws and Loctite 222.

> ***Note:*** *Make sure that the Optocable does not rub against the belt.*

3. Push the Spigot Block to the lower end of the Sample Pipettor Z Drive as shown in Figure U-33.

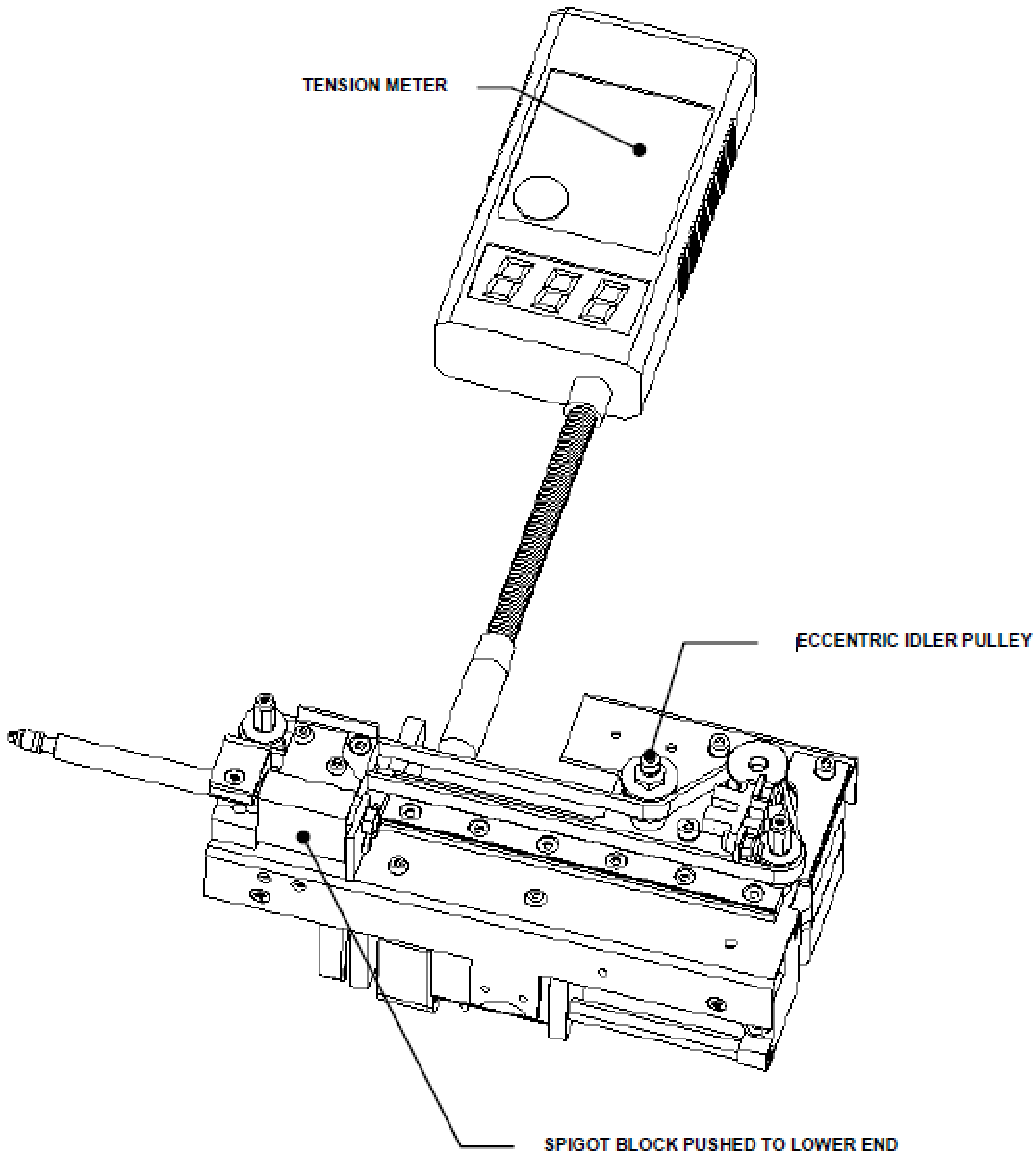


Figure U-33: Tensioning the Timing Belt

4. Measure the belt tension in the position indicated below using a Gates Sonic Tension Meter 507C.
5. Adjust the belt tension by rotating the Eccentric Pulley Shaft until the tension meter reads between 200-210 Hz.
6. Secure the Eccentric Pulley Shaft by tightening the screw after adjustment.
7. Mount a SPZD Home Sensor Flag onto the Spigot Support (Figure U-34) using two M3x6 Button Head Cap Screws and Loctite 222. Fit an M4x6 Socket Head Screw) using Loctite 262.

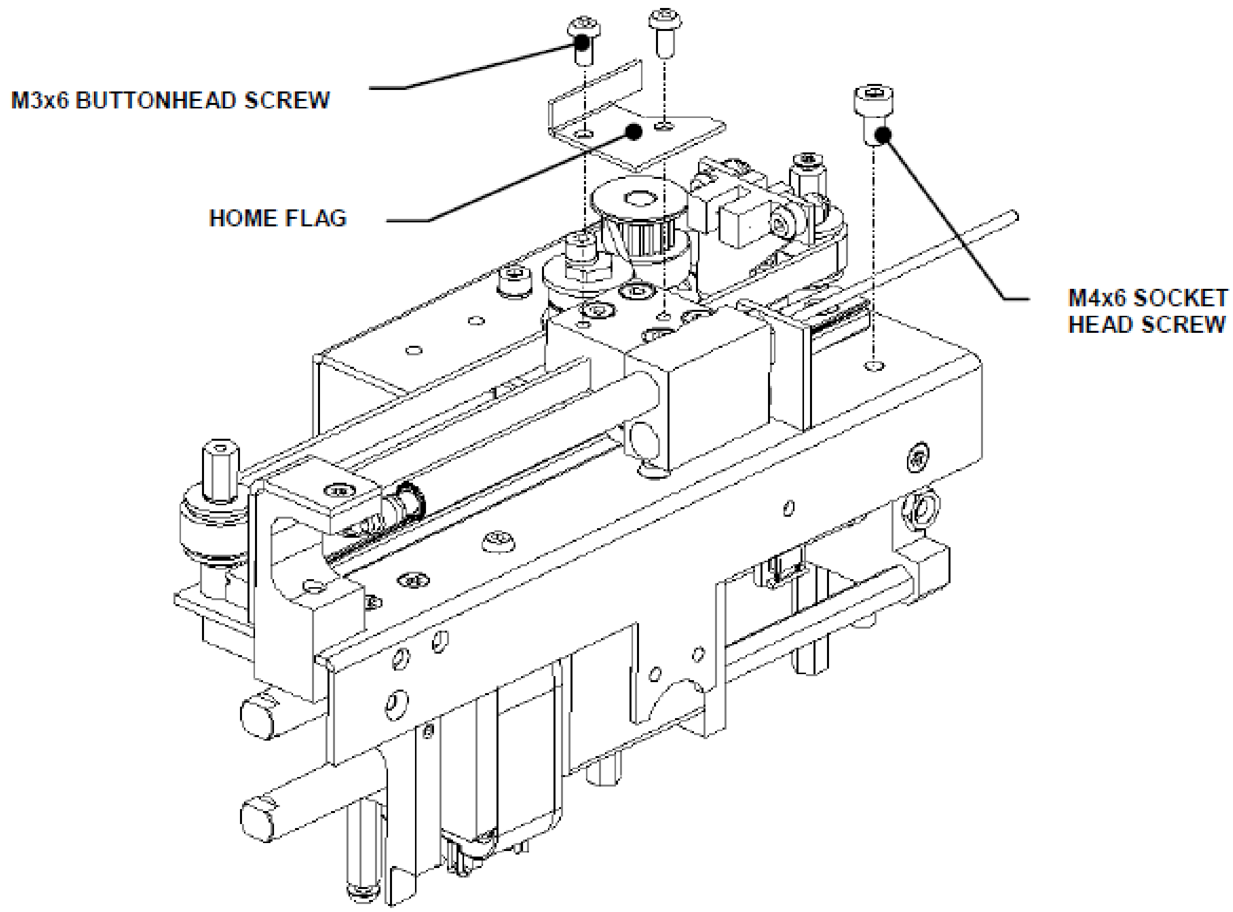


Figure U-34: Mounting the Home Flag

U.3.7 Replacing the Teflon Tube to the Spigot

A Teflon tube is attached to the syringe via a fixing nut assembly as shown in Figure U-35.

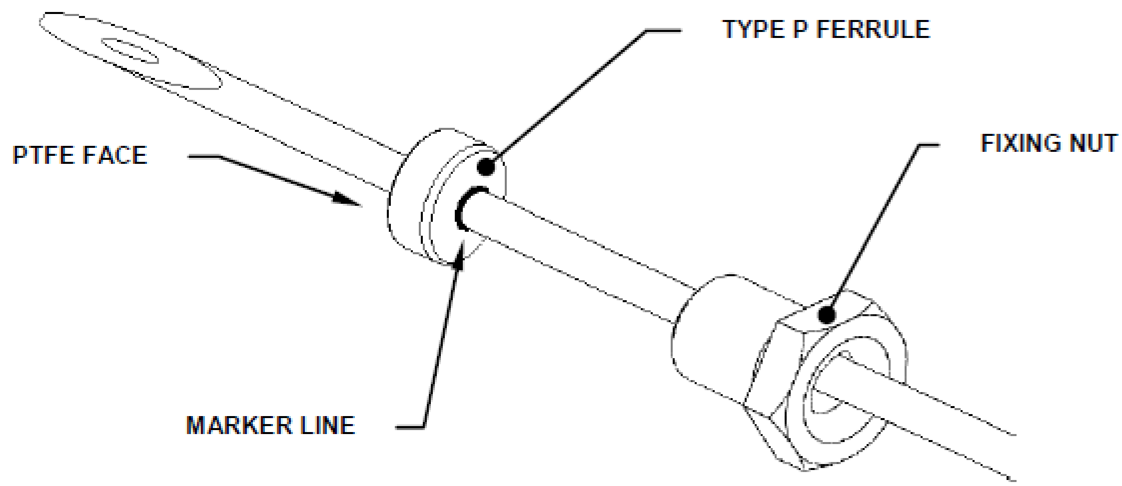


Figure U-35: Teflon Tube Assembly

Completely disassemble the spigot support and reconstruct as described below using a new Teflon tube.

1. Place a Top Nut on the Spigot Support as shown in Figure U-36.

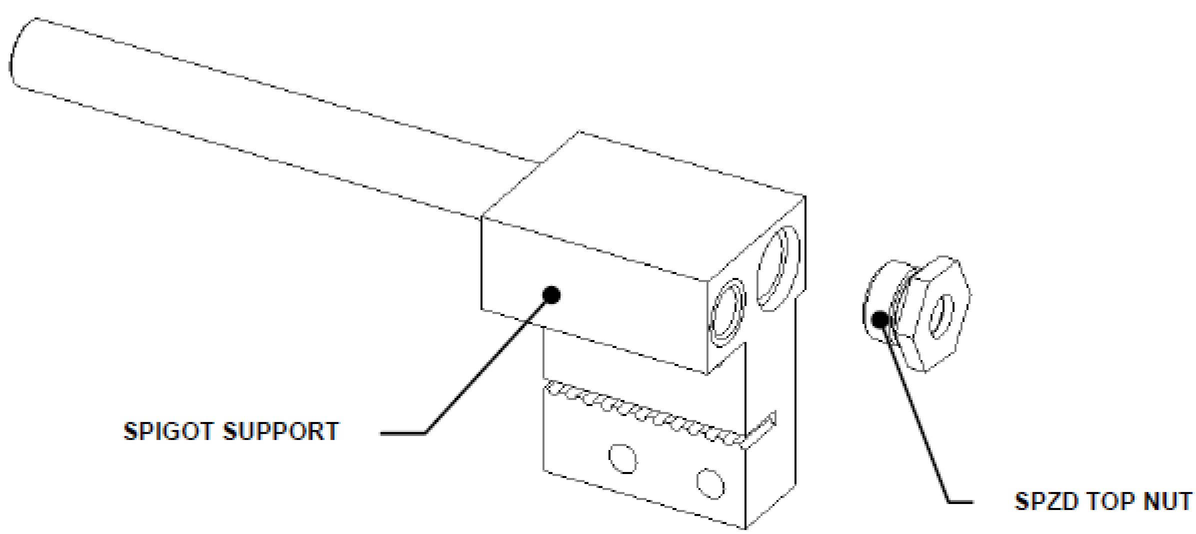


Figure U-36: Placing a Nut on the Spigot Support

2. Take a Split Bearing and clip it onto a Spigot Slider. Slide an SP Spigot Spring (42001270) on the Spigot Slider (Figure U-37).

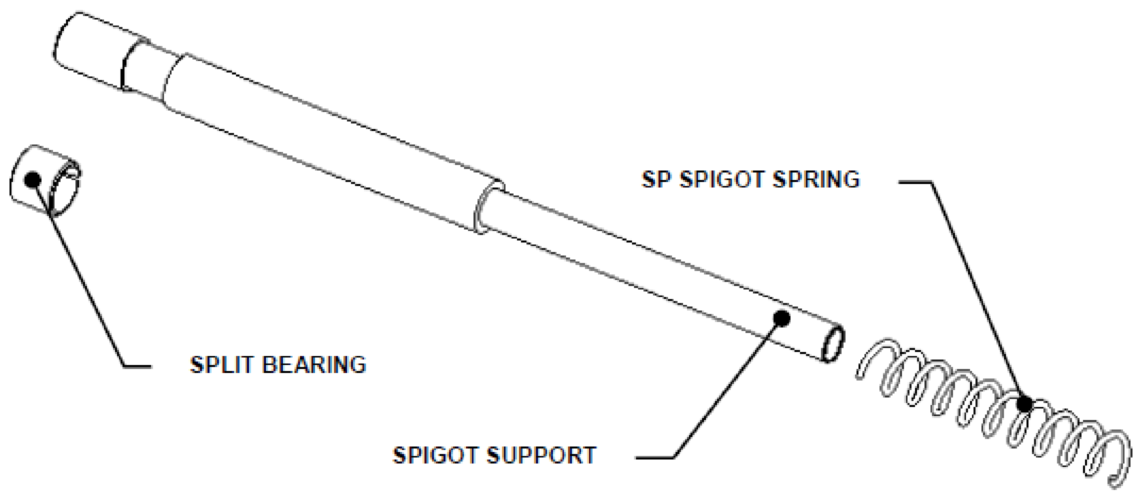


Figure U-37: The Spigot Slider

3. Slide the assembly from step b through the Spigot Support and secure it with a SPZD Spigot Block. Block it with a SPZD Spigot End Nut (Figure U-38).

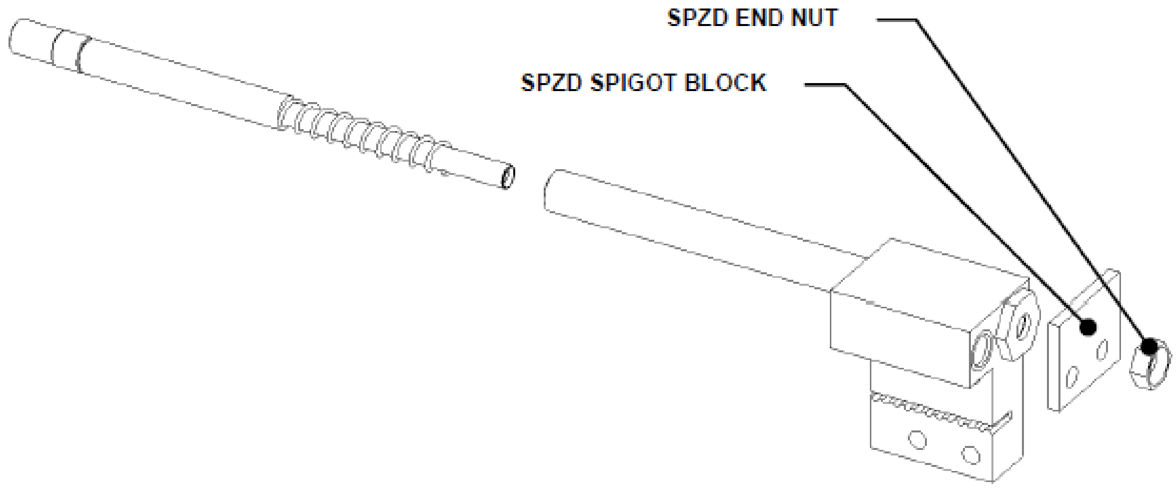


Figure U-38: Using the Spigot Support

4. Put a Spigot Guide into the Spigot Support (Figure H-39) and secure it with an M3x6 Button Head Screw using Loctite 222. Verify the mobile assembly can slide properly.

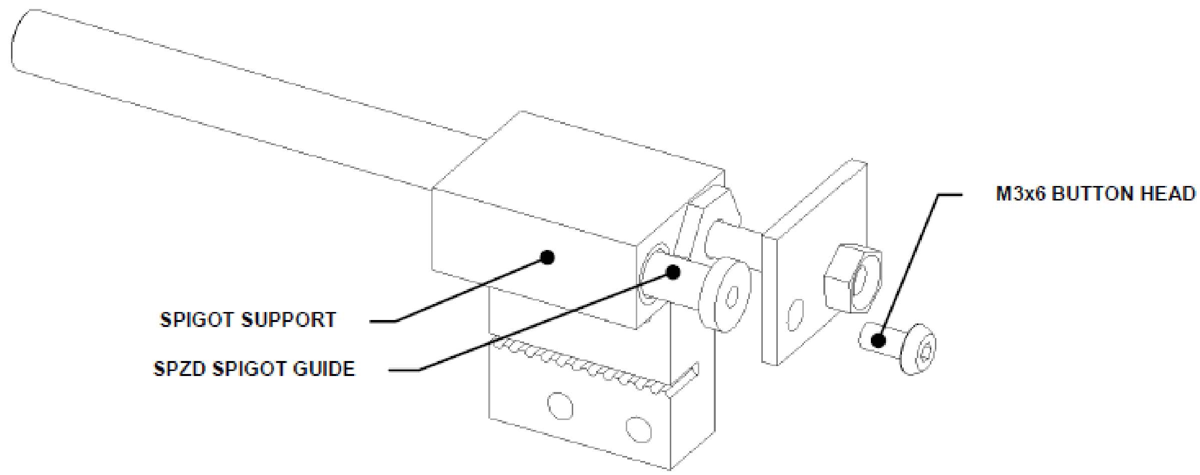
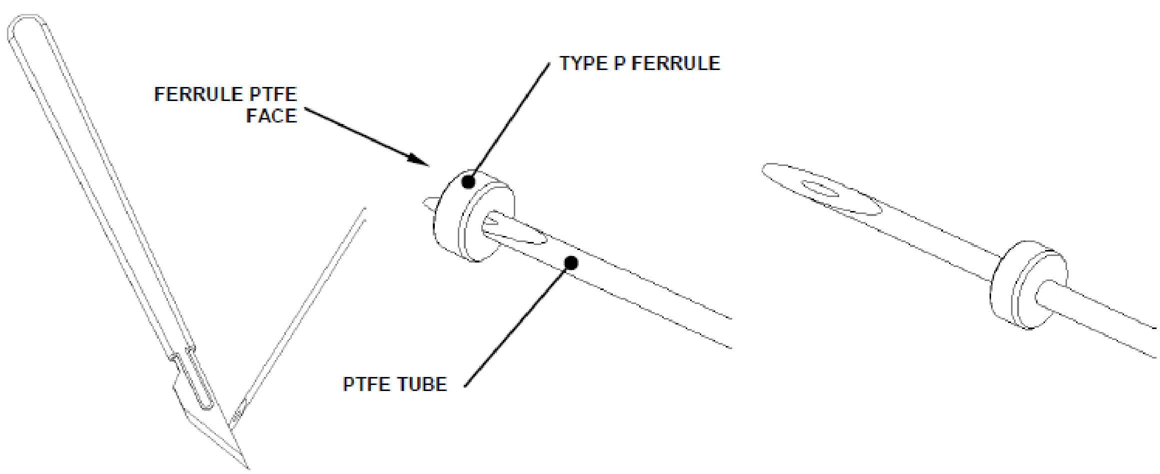


Figure U-39: Inserting the Spigot Guide

5. Cut a 350mm length of PTFE Tubing. With a scalpel, cut the tubing to form a point (approximately 10 to 15mm long). Thread the cut (pointed) end of the tube through a Type P Ferrule ensuring that the Ferrule is orientated as shown with the PTFE face pointing out (Figure U-40).



.

Figure U-40: Cutting the Teflon Tubing

6. With a pair of pliers, grip the pointed end of the tube, and pull the tube through the Ferrule until it has reached an uncut section of the tube (approximately 30 to 40mm from the start of the angled cut).

> **Note:** *Keep the Ferrule as perpendicular to the tube as possible.*

7. Rotate the Ferrule around the tube 3 or 4 times to seat the gripper onto the tube correctly. Then, thread the cut (pointed) end of the tube through the Pipette Tube Length Block (DS2FIX012) until the Ferrule is seated in the block's counter-bore

8. With a scalpel, cut the excess tube off the cut (pointed) end of the tube flush with the cutting face of the block (Figure U-41).

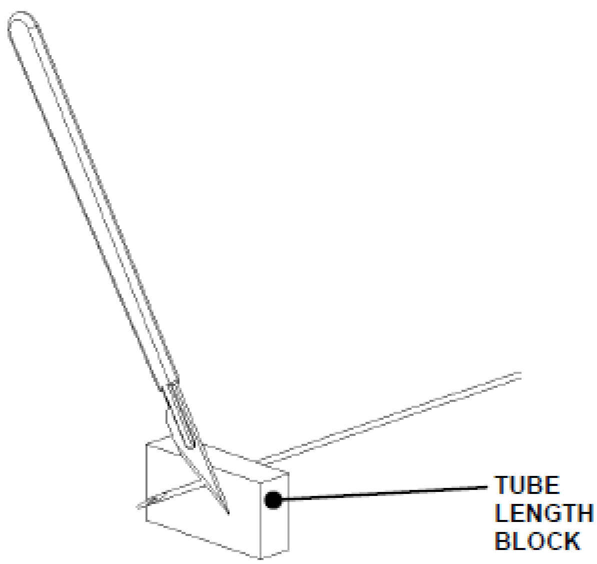


Figure U-41: Cutting the Tubing

9. Use a permanent marker to draw a line on the Teflon tube (300 mm diameter) on the outer tip of the ferrule.

10. Feed the PTFE Tube through the Spigot Support until the Omni-Lok sits on the inner step inside the Spigot Support and secure it with a Sample Tip Spigot using Loctite 242 (Figure U-42). Verify that this connection is air tight. Fit a 10mm long Tygon Tubing piece on the PTFE Tube.

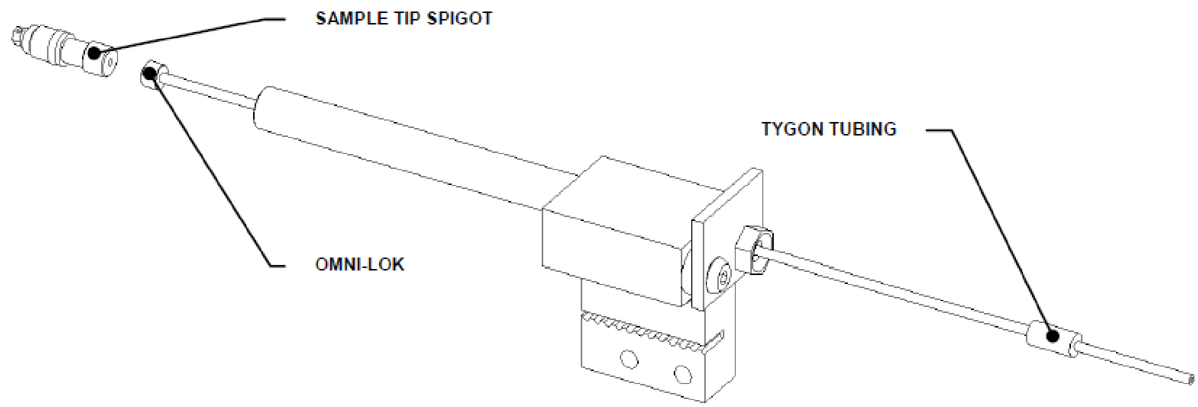


Figure U-42: Securing the Spigot

11. Thread the PTFE Tube through a Fixing Nut. With a scalpel, cut the tubing to form a point (approximately 10 to 15mm long). Thread the cut (pointed) end of the tube through a Type P Ferrule (43000640) ensuring that the Ferrule is orientated as shown with the PTFE face pointing out (Figure U-43).

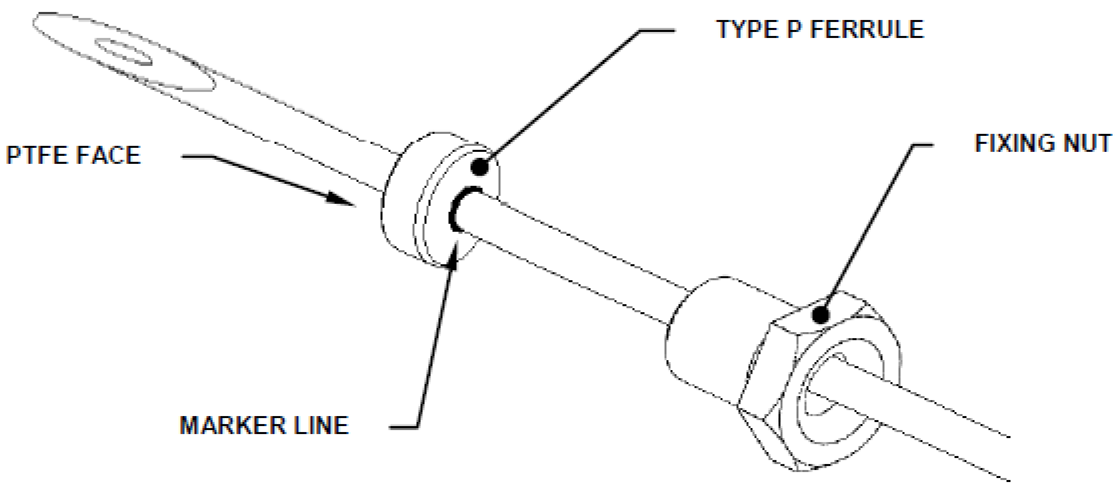


Figure U-43: Threading the Tube Through the Fixing Nut

12. With a pair of pliers, grip the pointed end of the tube, and pull the tube through the Ferrule until it has reached the marker line, keeping the Ferrule as perpendicular to the tube as possible. Cut the PTFE Tube flush to the PTFE face of the Ferrule. Connect the PTFE Tube to the Syringe by inserting the Fixing Nut half length and turn by hand ¼ turn.

Chapter V Sample Rack Scanner

V.1 Overview

The *Sample Rack Scanner* is located in the front of the system and is readily removed, as described in Section V.2. In general, the assembly should be completely replaced and the defective unit returned to the depot for refurbishing.

V.2 Removing the Sample Rack Scanner from the System

To remove the Sample Rack Scanner from the System:

1. Remove the handle and cover assembly from the sample rack scanner, then remove the Sample Rack Scanner Cove (Figure V-1).

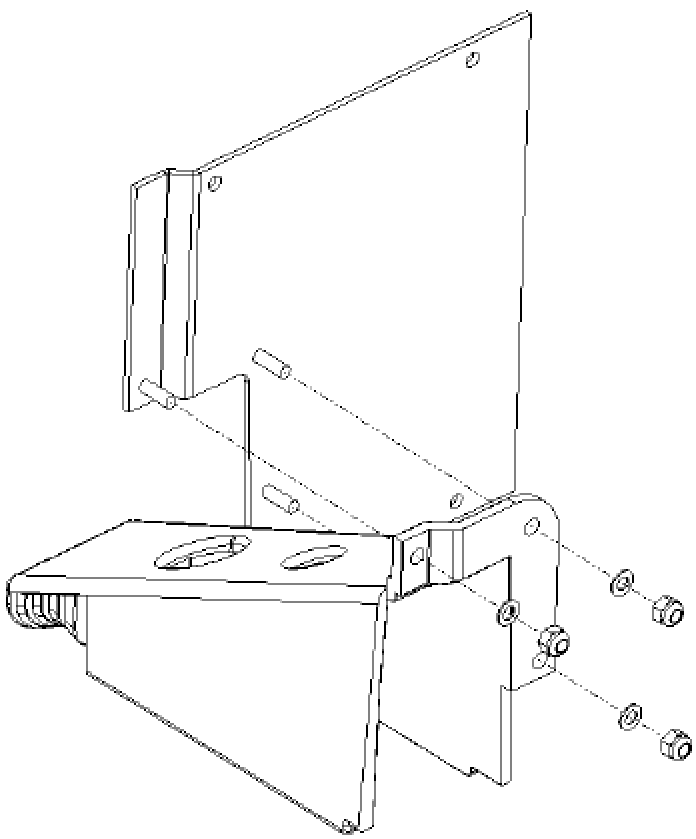


Figure V-1: Removing the Sample Rack Scanner Cover

2. Disconnect the cable from the Fixed PCB, then depress the Button on the Sample Rack Scanner and move it to its right-most position. Unclip the free end of the Cable Chain to the Workspace and remove Cable Chain Adapter Plate (Figure V-2).

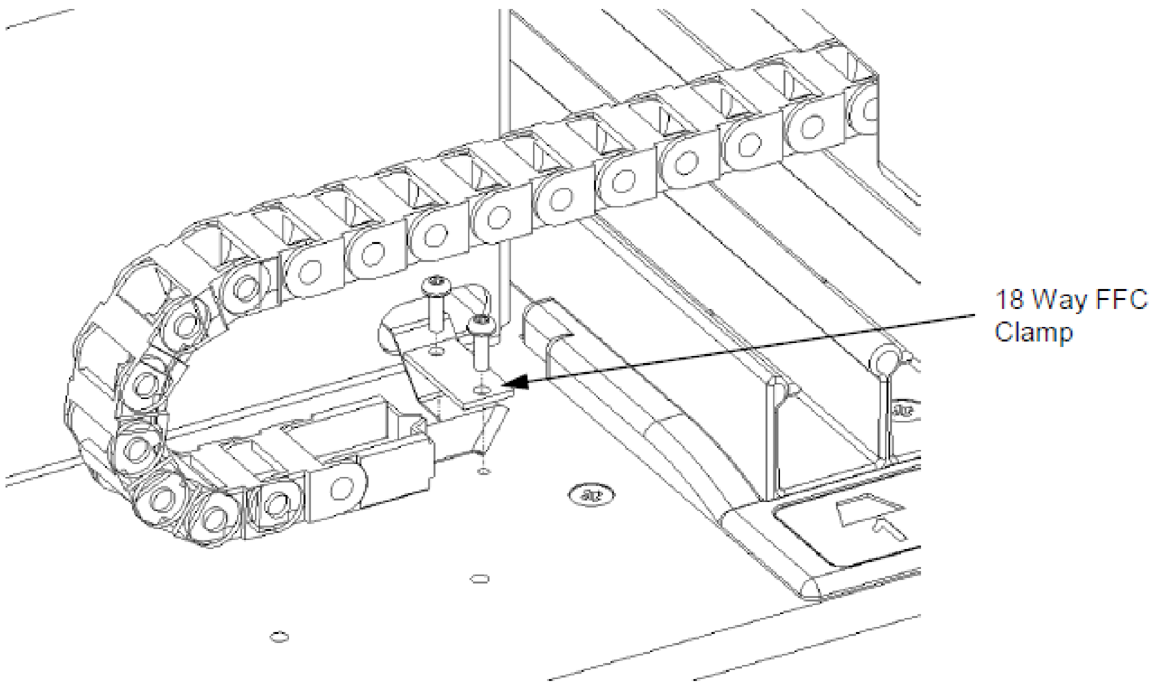


Figure V-2: Removing the 18 Way FFC Clamp

3. Remove the Flex Cable. (Figure V-3).

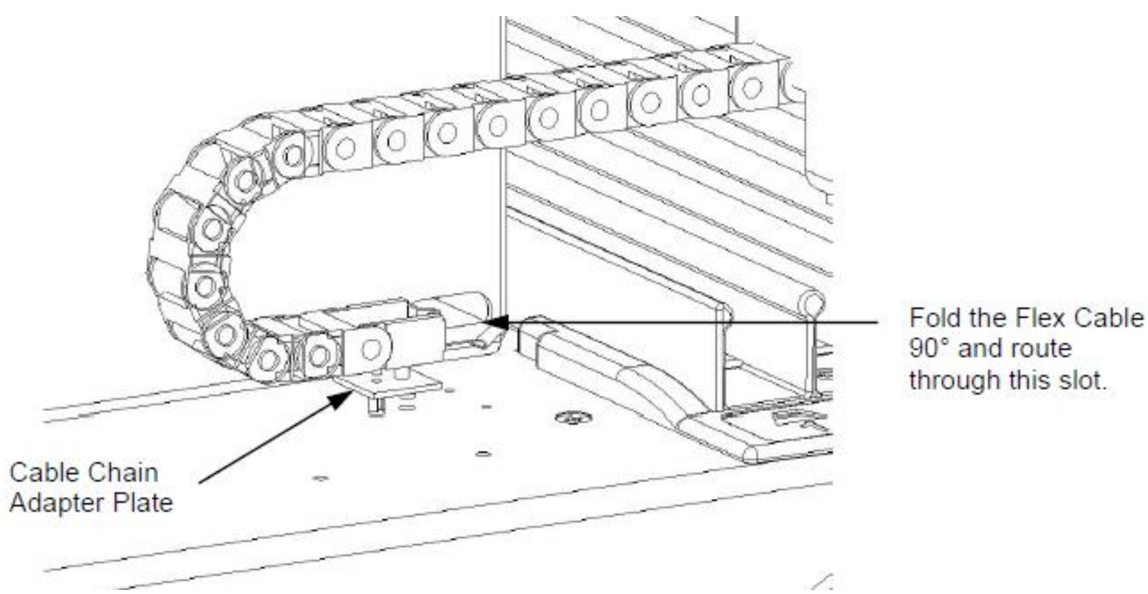


Figure V-3: Removing the Flex Cable

4. Remove the Sample Rack Scanner Assembly from the front workspace cover by unscrewing the six M3x6 Posi Flat Head Screws (Figure V-4). The Sample Rack Scanner body will need to be in the leftmost position for removal. When replacing the assembly, use Loctite 222 on the screws.

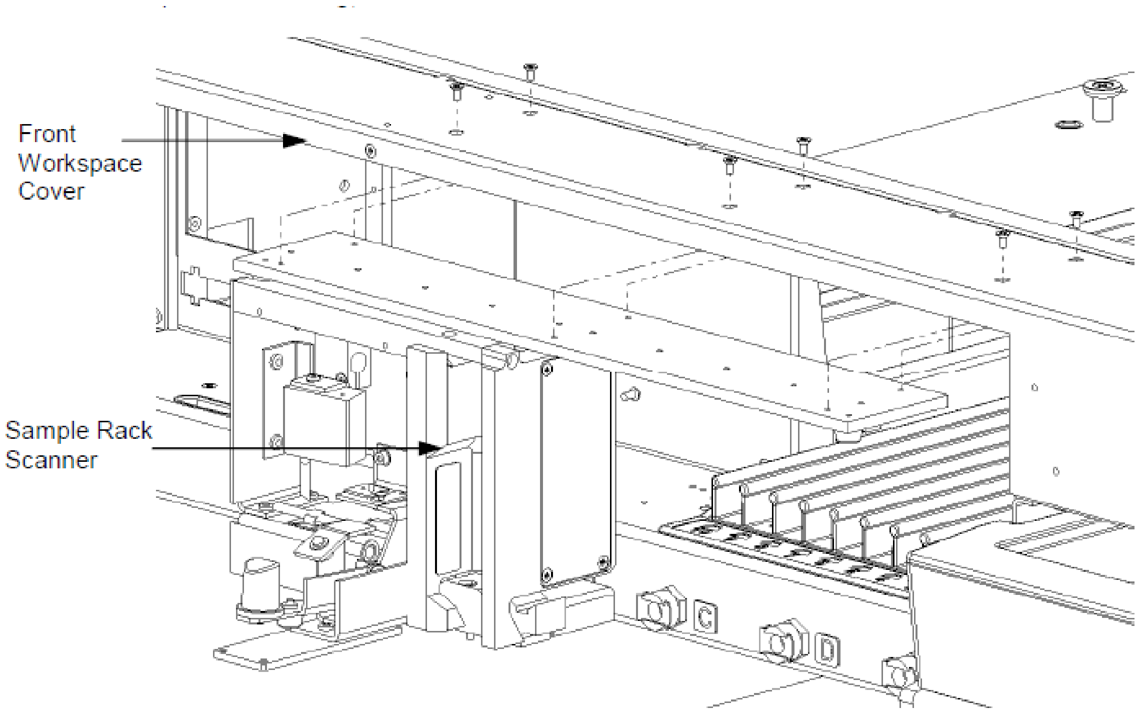


Figure V-4: Removing the Sample Rack Scanner Assembly

When replacing the assembly, move it to its left-most position.

V.3 Replacing Items on the Sample Rack Scanner

V.3.1 Replacing the LED

The LED bracket assembly is mounted on the Carriage Assembly with an M3x6 Pozi Flat Head Screw (Figure V-5). When replacing the LED bracket, use Loctite 222.

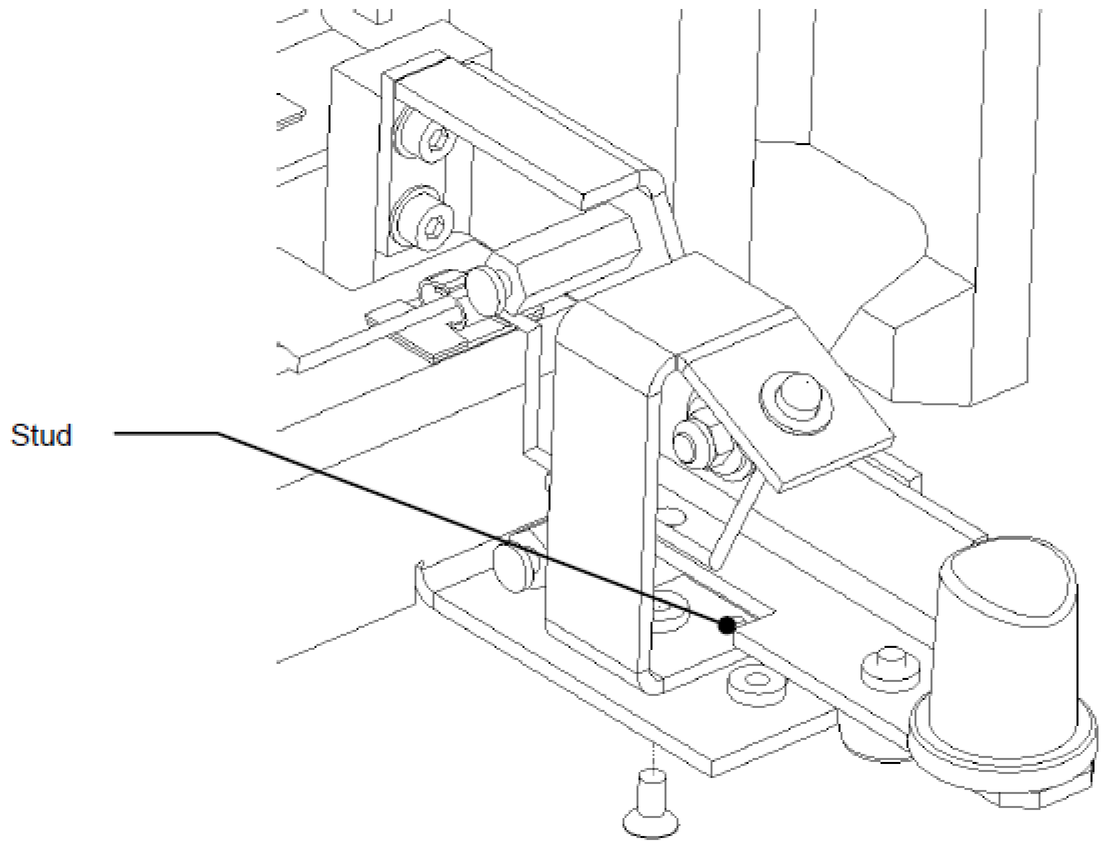


Figure V-5: The LED Bracket Assembly

The LED assembly is shown in Figure V-6. When removing the LED, unclip the retaining ring. Use fixture P24FIX017 to clamp the clip to the retaining ring when rebuilding the assembly.

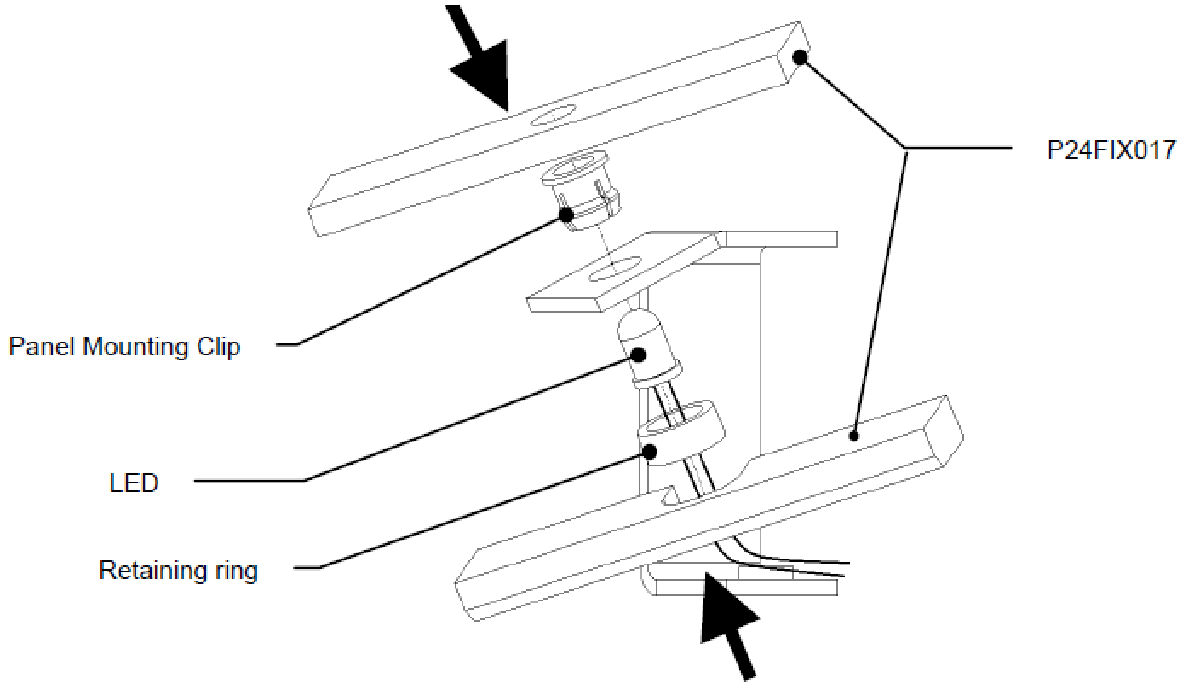


Figure V-5: The LED Assembly

V.3.2 Replacing the Photodiode

To replace the Photodiode:

1. Remove the Photodiode Cover from the Photodiode Assembly by removing the four M3x6 Pozi Flat Head Screws (Figure V-6).

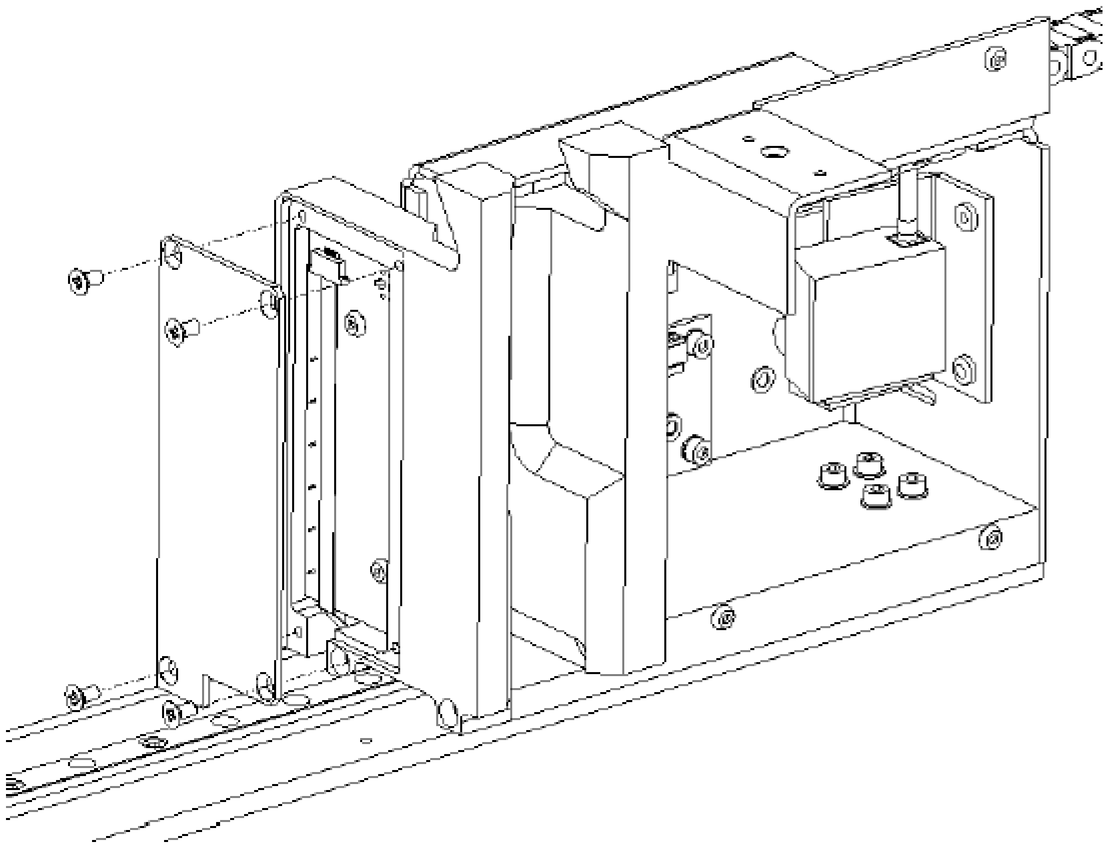


Figure V-6: Removing the Photodiode Cover

2. Remove the Photodiode Housing Assembly from the Carriage Assembly by removing the two M3x16 Pozi Head Flat Screws (Figure V-7).

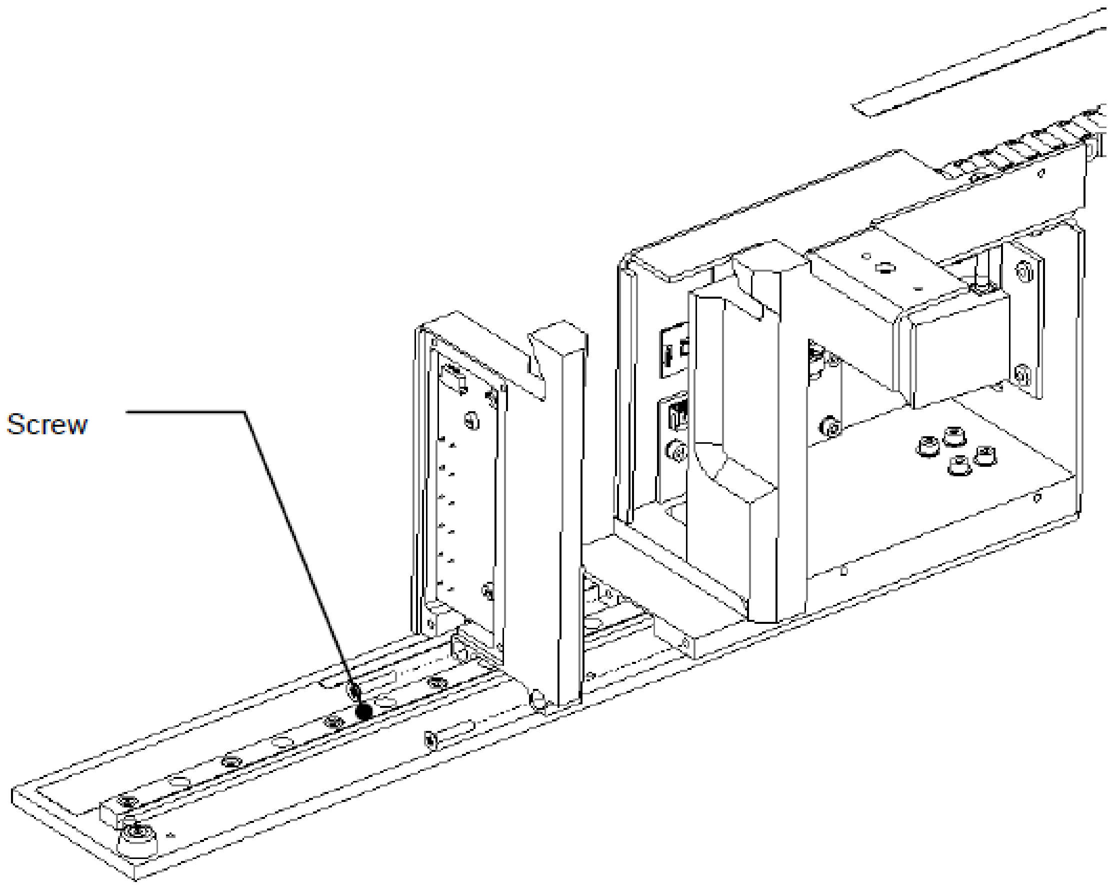


Figure V-7: Removing the Photodiode Housing Assembly

3. Disconnect the flex cable; then remove the Photodiode PCB from to the housing by unscrewing the two M3x6 Socket Button Head screws (Figure V-8).

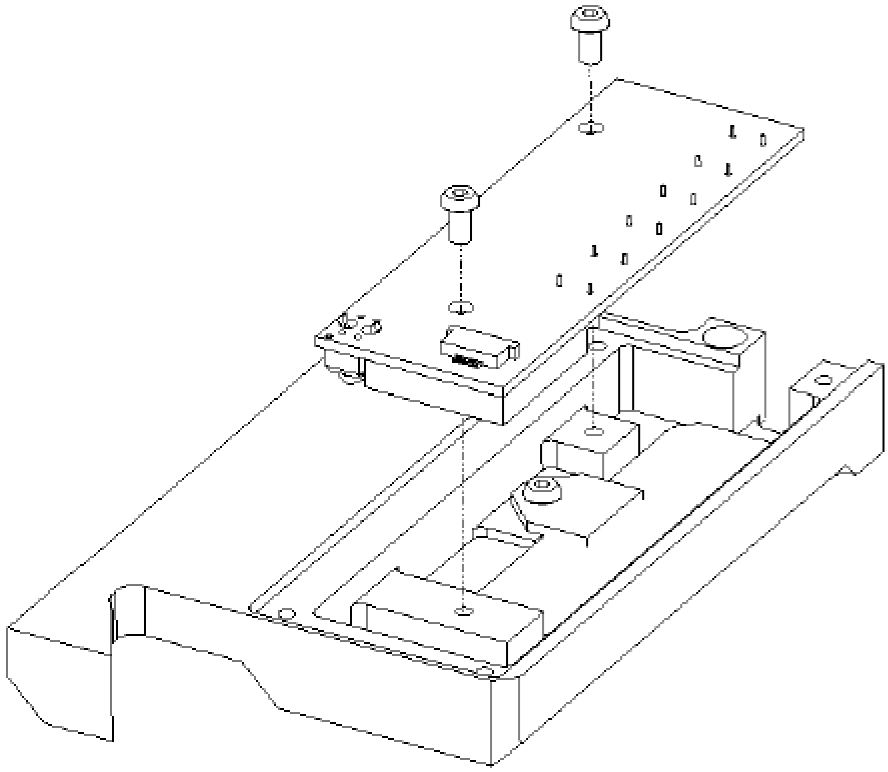


Figure V-8: Photodiode PCB

V.3.3 SRS Moveable PCB

Disconnect all hardware that is connected to the PCB. The SRS Moveable PCB is mounted on the Carriage support and can be removed by unscrewing the three M3x6 Socket Head Cap Screws (Figure V-8). When replacing the board, use Loctite 222.

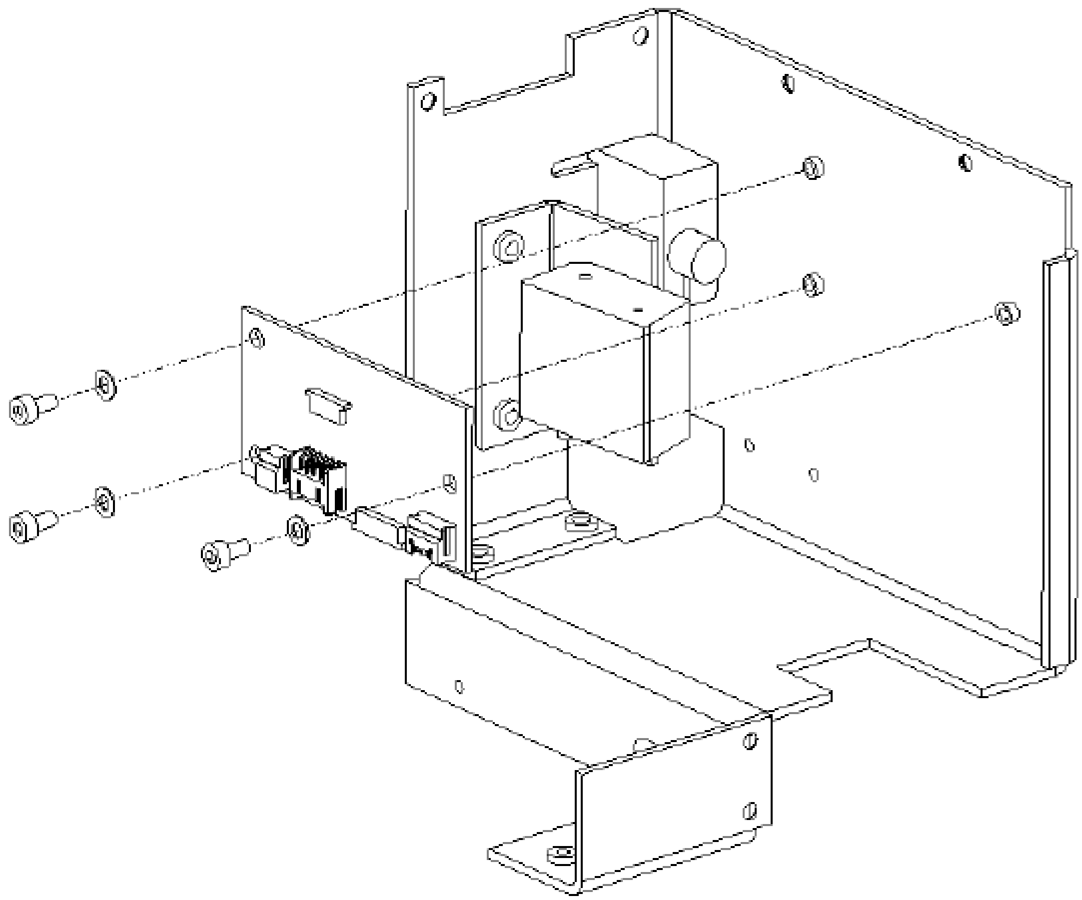


Figure V-9: The Scanner Printed Circuit Board

V.3.4 Replacing the Laser

The Laser is housed on the Bar Code Scanner, which is secured to the SRS Scanner support.

To replace the Laser:

1. Disconnect the assembly from the PCB, and then remove the Barcode Scanner Assembly from the Carriage Support by removing the two M3x6 Socket Button Head Screws (Figure V-11). When replacing the assembly, ensure that the Barcode Scanner Assembly is mounted to the left end of the slot as shown in the right part of Figure V-11.

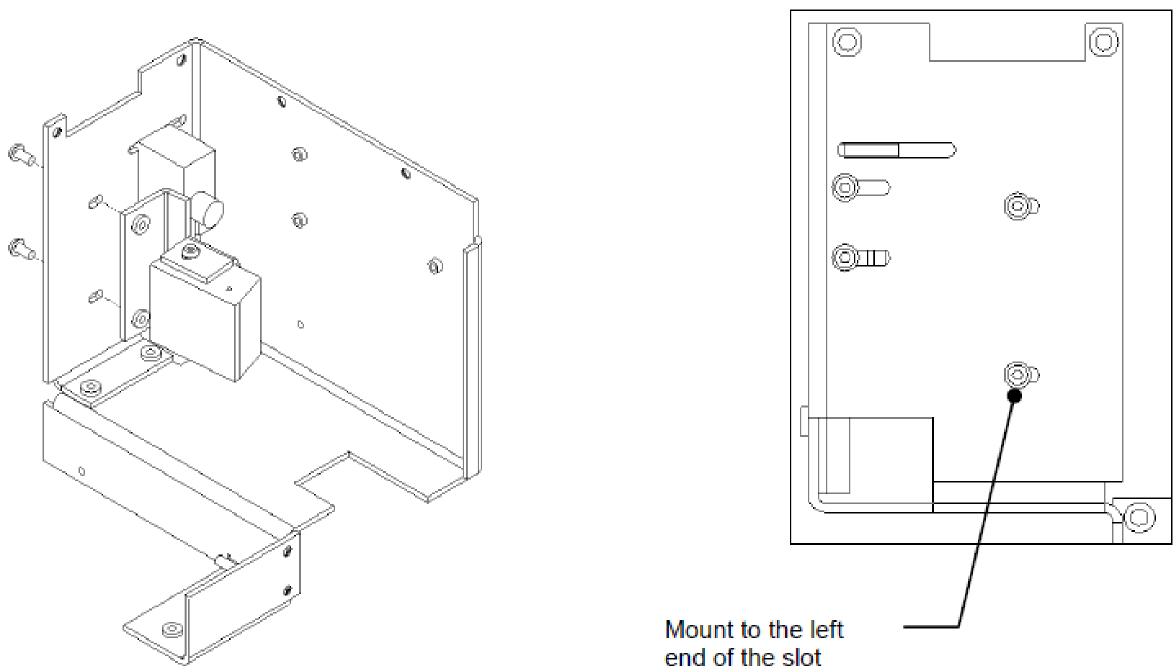


Figure V-10: Connecting the Barcode Scanner to the Support

2. Remove the Barcode Scanner Assembly from the Sample Rack Scanner Support by removing the two M3x5 Button Head Cap Screws (Figure V-11).

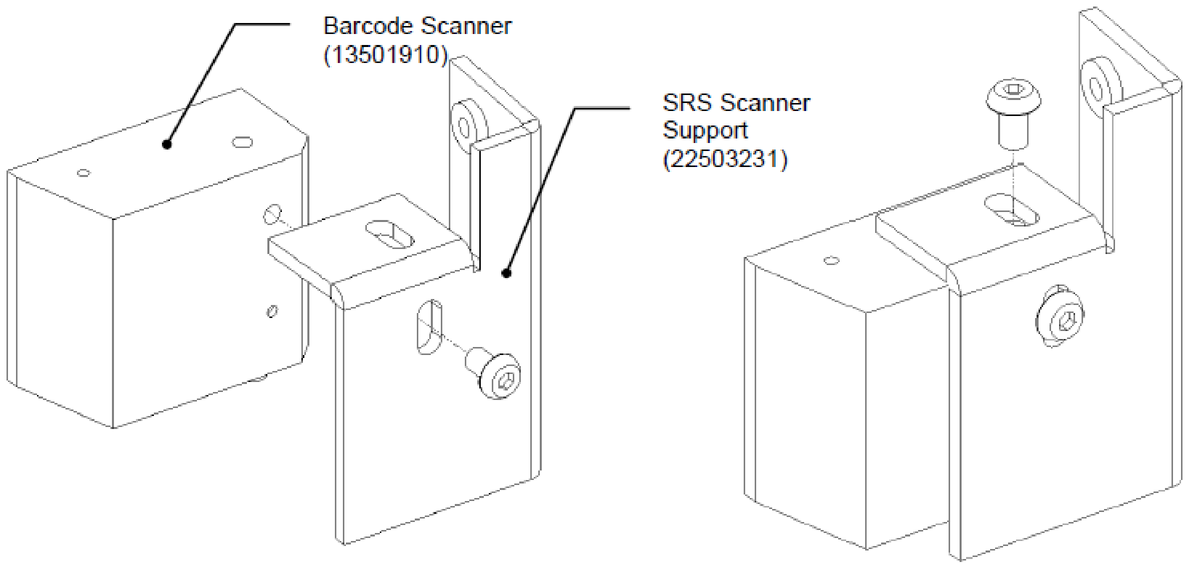


Figure V-11: The Barcode Scanner Assembly and the Sample Rack Scanner Support

3. Disconnect the assembly from the PCB, and then remove the Laser Mounting Assembly from the Sample Rack Scanner Carriage Support by removing the two M3x6 Socket Head Button Screws (Figure V-12).

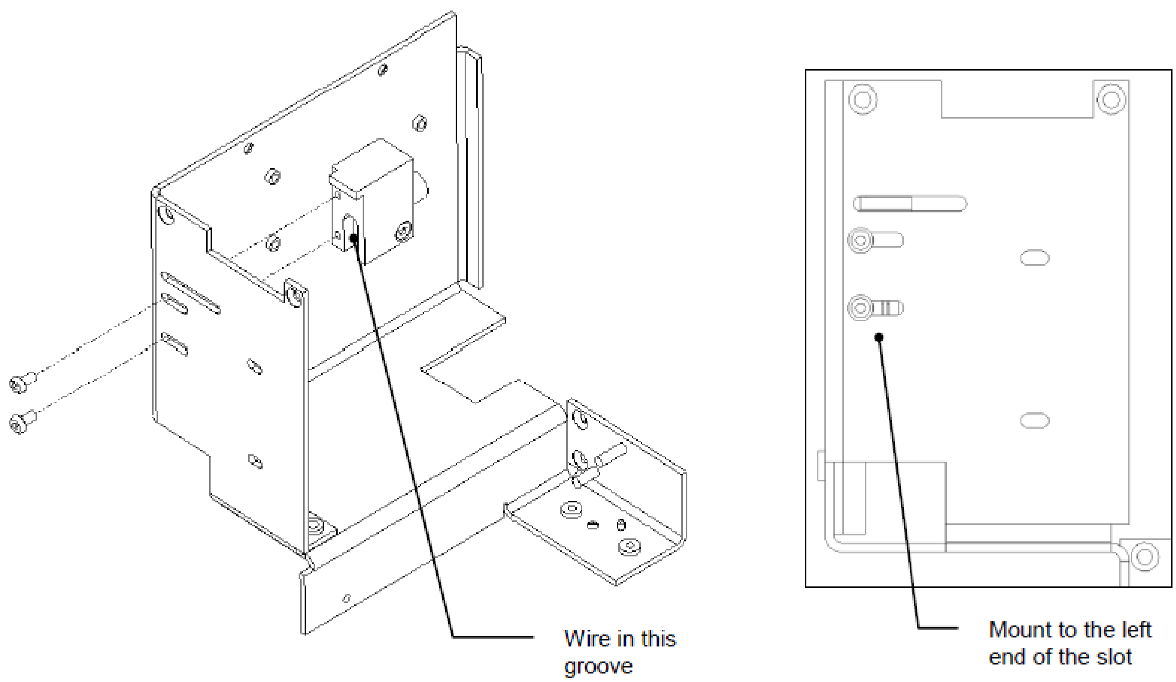


Figure V-12: Removing and Replacing the Laser Mounting Assembly

When replacing the assembly, position it to the left end in the slot, see the right side of Figure V-12. Ensure that the wires are routed downwards in the groove. Note: do not trap the wires between the support and Laser Mounting.

4. Remove the laser module from the laser mount by loosening the M3x10 Socket Cap Head Screw.

When replacing the Laser Module, loosely fit it into the Laser Mount (Figure V-13) using an M3x10 Socket Cap Head Screw. The lines on the laser lens should be vertical. Place the Laser Mount into the Laser Module Alignment Fixture (P24FIX040) as shown. Check that the laser light is in line and inside the machine slot; tighten the M3x10 Socket Head Cap Screw, fixing the laser in place. If the laser line deviates to the left, rotate the laser by 180 deg, so that the line deviates to the right. Note that the Machine slot is not symmetrical in spacing in relative to the laser line.

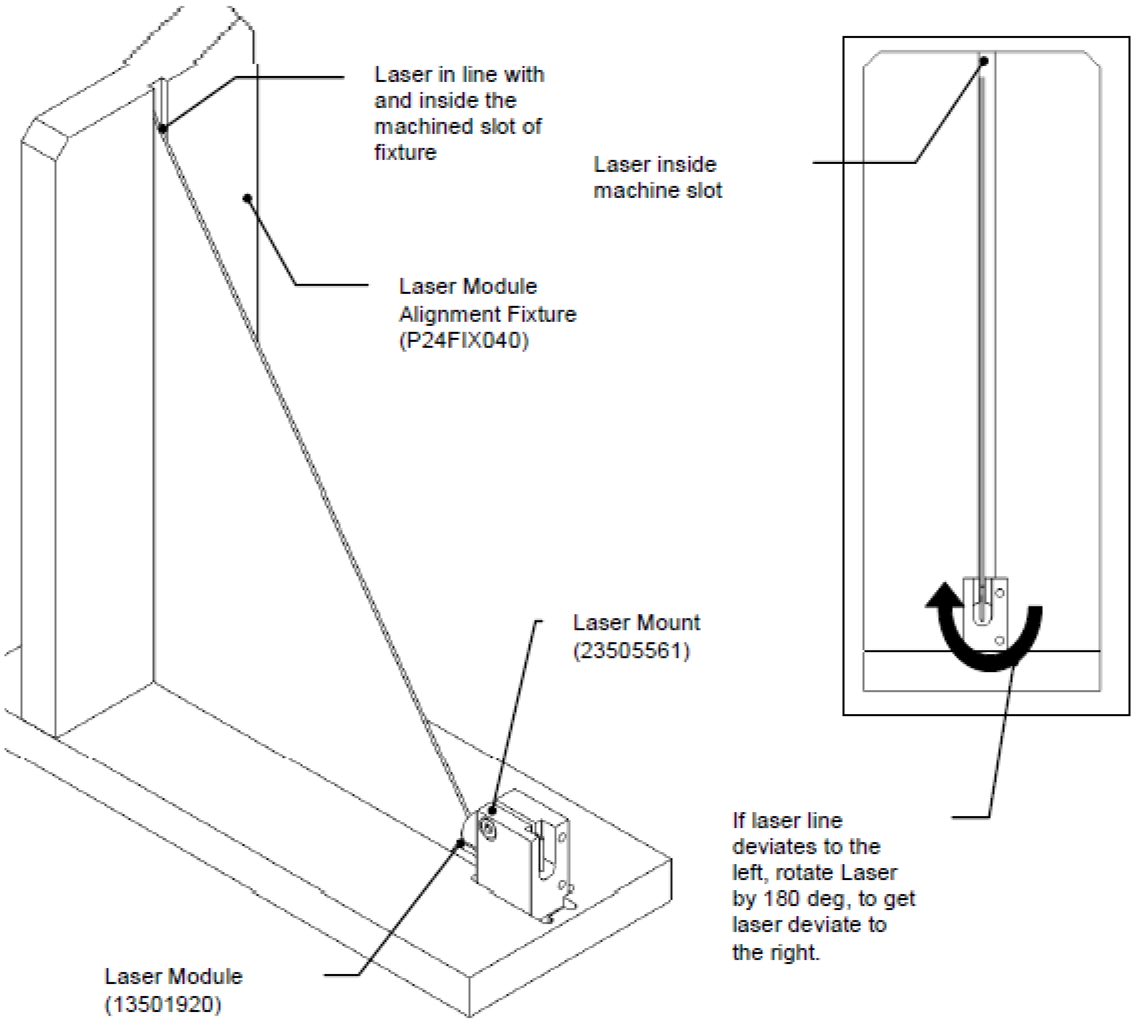


Figure V-13: Aligning the Laser

Chapter W Touchscreen

W.1 Removing the Touchscreen

A defective Touchscreen assembly should be replaced on site.

To Remove the Touchscreen:

1. Remove the top cover of the Touchscreen assembly
2. Undo the screws on the underside of the Touchscreen (Figure W-1).
3. Cut the cable ties and disconnect all cables and plugs
4. Slide the Touchscreen assembly back.

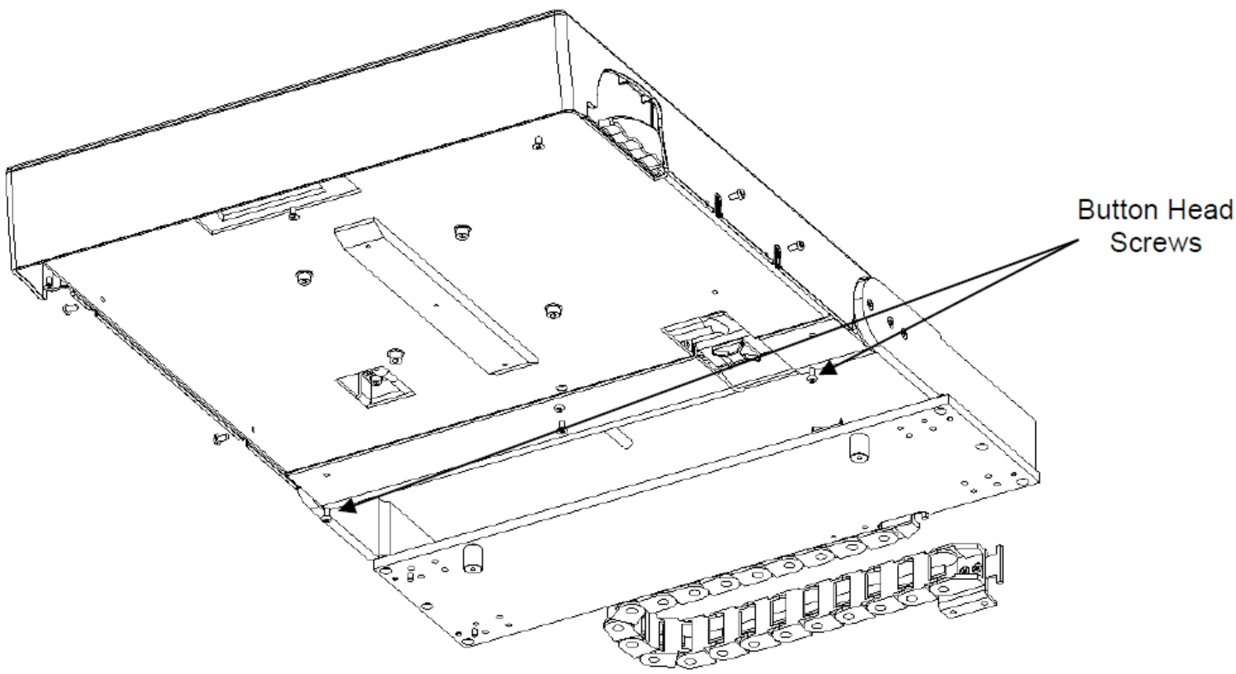


Figure W-1: Location of Touchscreen Assembly Screws

Replacement of the new touchscreen is the reverse of the above procedure.

W.2 Adjusting the Viewer Preferences

The Touchscreen is aligned at the factory and it is probable that the service engineer need not align or adjust it. If the screen performance is not optimal, it can be adjusted as described in this section using the *ELO Touchscreen Properties* dialog box (Figure W-2).

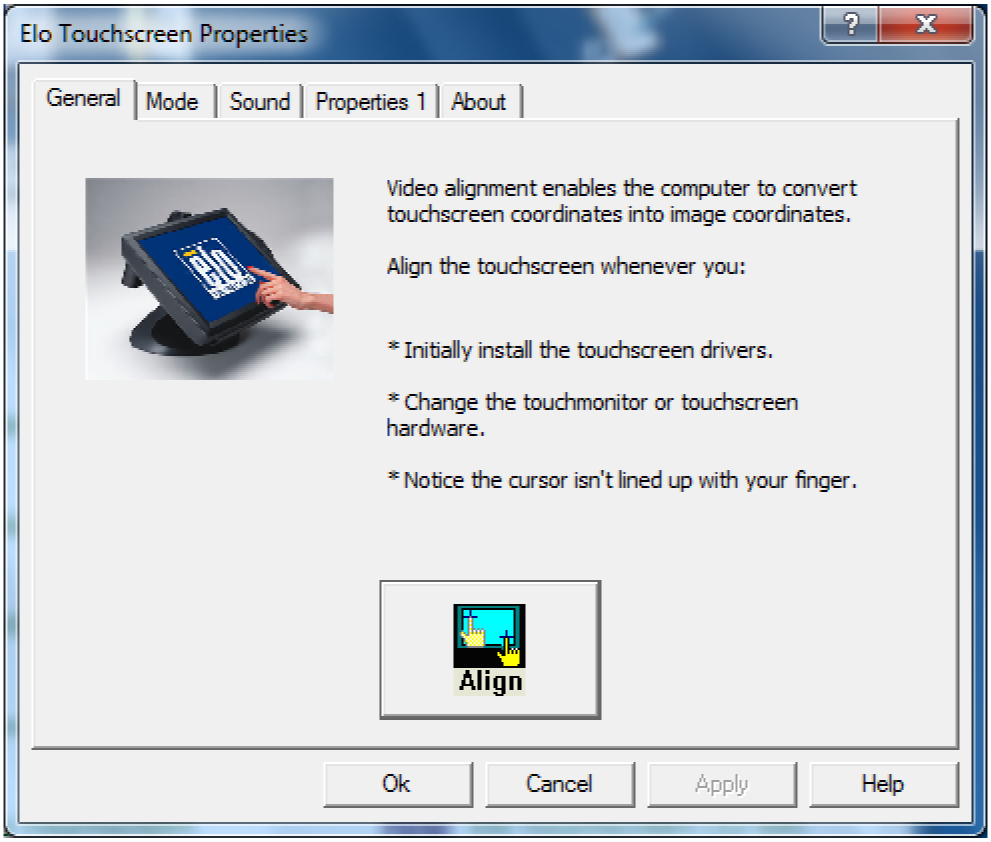


Figure W-2: Touchscreen Properties Dialog Box

To access the ELO Touchscreen Properties dialog box:

1. Select *Windows Control* from the *Start* menu, and select *Devices and Printers*. The touchscreen will present an icon for each device connected to the system (Figure W-3).

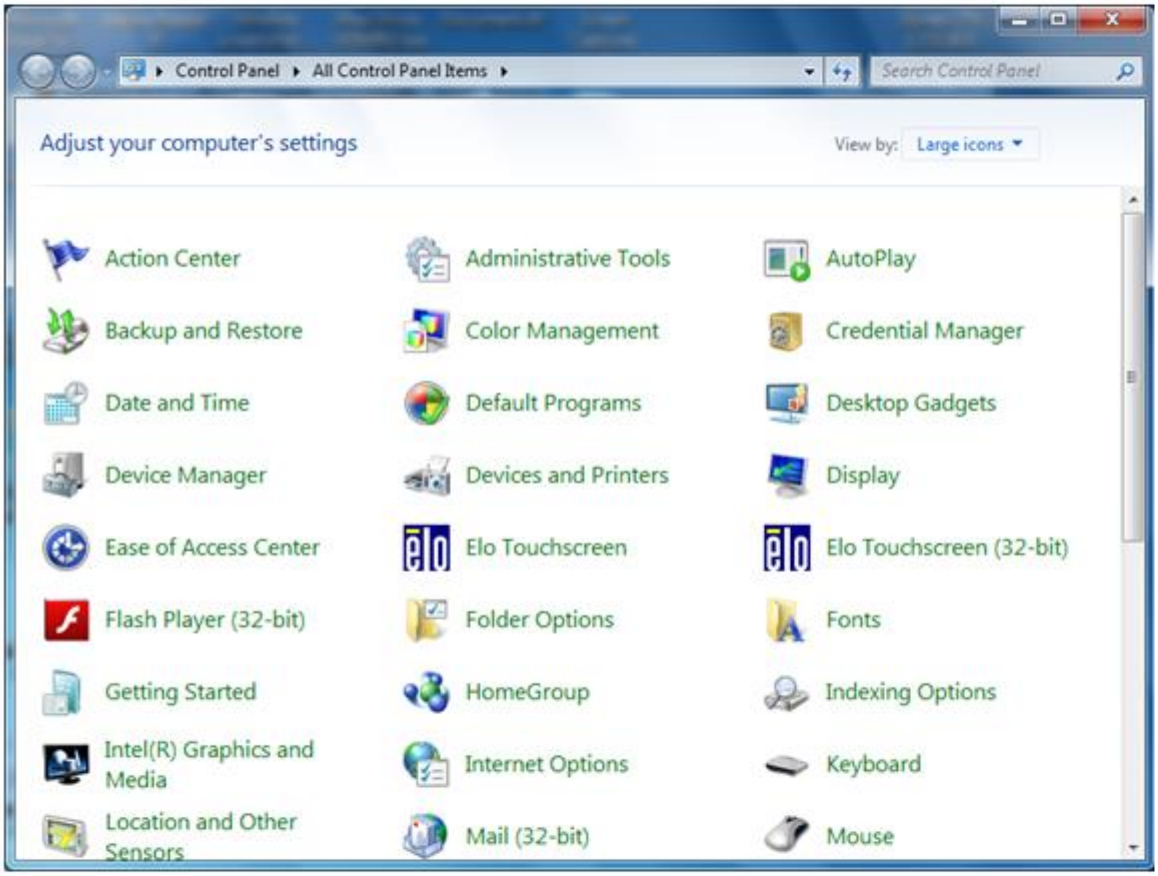


Figure W-3: Control Panel

2. Select Elo Touchscreen (32-bit).

The *Align* button should be employed as indicated on the *Properties* screen. Follow the directions as displayed on the monitor.

The tabs on the Properties screen are used as follows:

- **Mode** - to set a variety of user preferences the regarding the mouse emulation mode (Section W.2.1)
- **Sound** - to set sound preferences (Section W.2.2)
- **Properties 1** - provides the characteristics of the monitor and serial number information (Section W.2.3)
- **About** - obtain additional information about the Touchscreen (Section W.2.4)

W.2.1 Mode Tab

The Mode tab (Figure W-4) is used to set a variety of mouse related preferences.

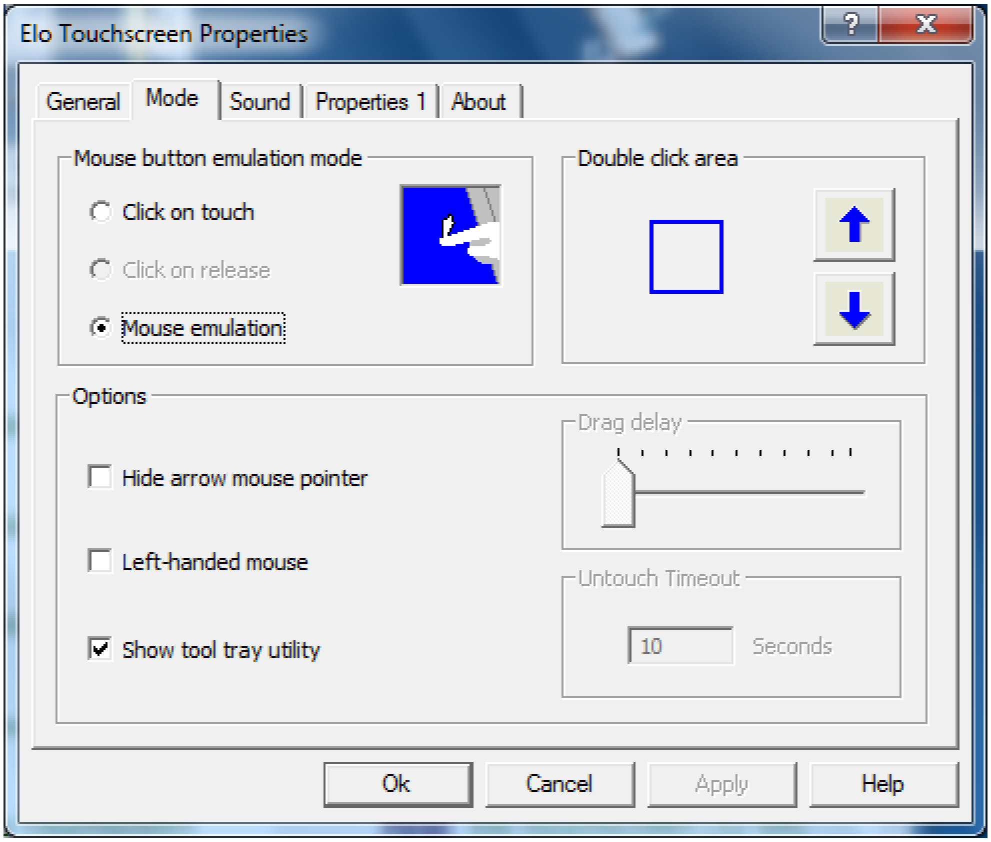


Figure W-4: Mode Tab

W.2.2 Sound Tab

The Mode tab (Figure W-5) is used to set a variety of sound related preferences.

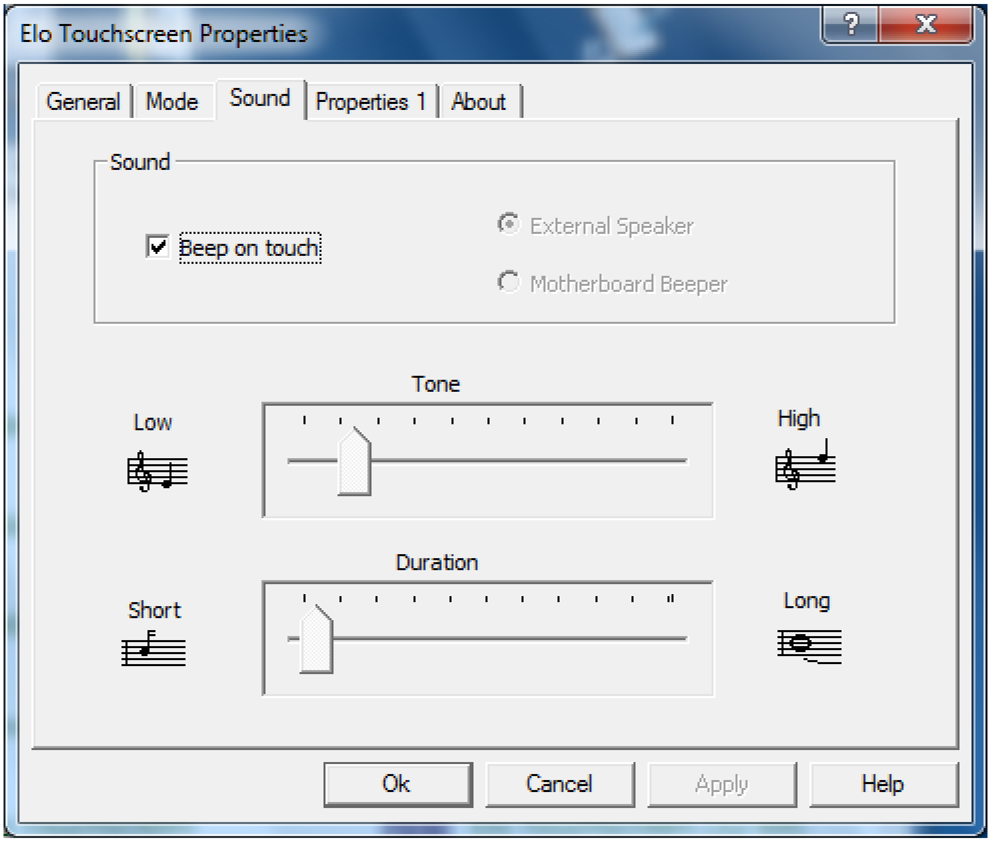


Figure W-5: Sound Tab

W.2.3 Properties 1

The information on the *Properties* tab (Figure W-6) is provided for reference purposes and cannot be edited. It may be useful to transmit the information on this tab to the factory when troubleshooting the Touchscreen.

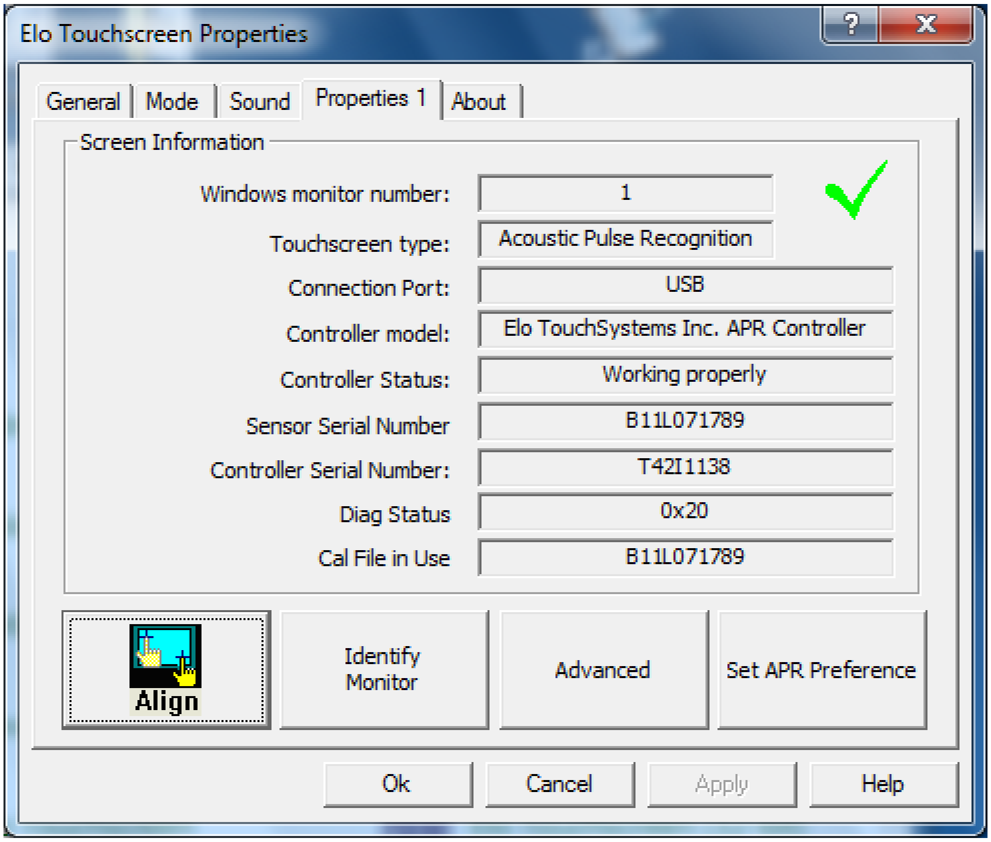


Figure W-6: The Properties 1 Tab

W.2.4 About Tab

The About tab (Figure W-7) is provided to obtain additional information about the Touchscreen.

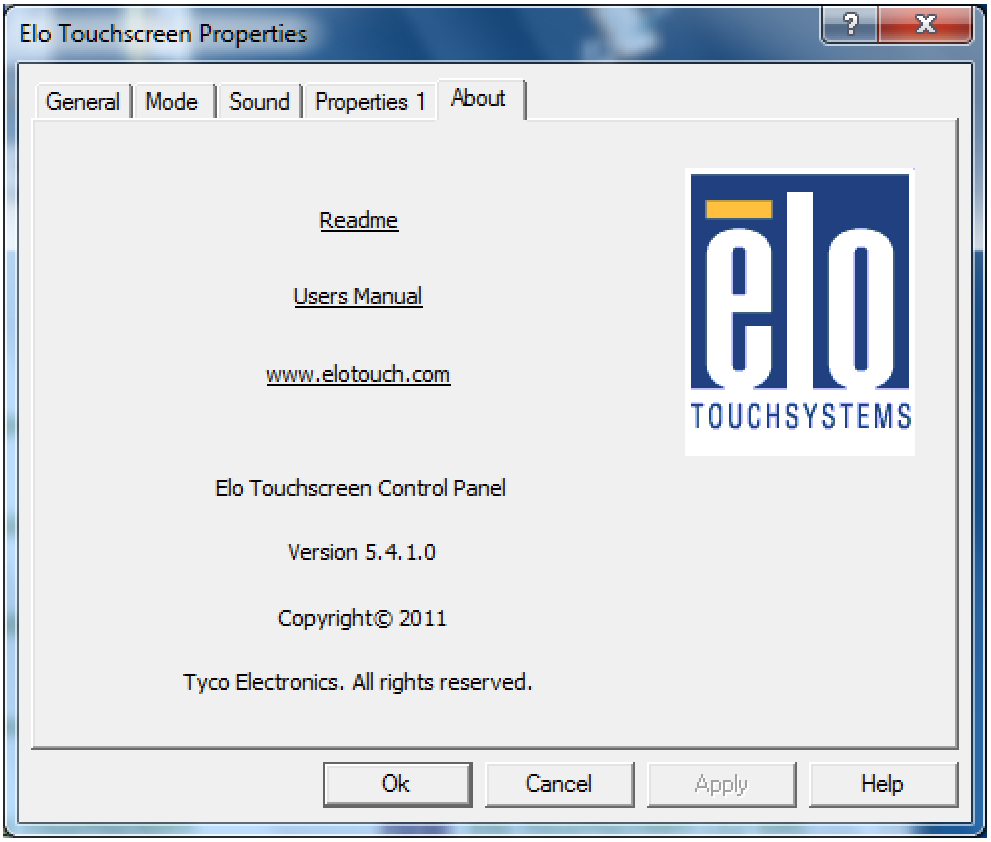


Figure W-7: About Tab

This page intentionally left blank.

Chapter X Transport Arm, X Drive

X.1 Overview and Access to the Transport Arm X Drive

The *Transport Arm X Drive* mechanism is an integral component of the system and is typically repaired at the user site. While certain items such as the motor can be replaced and returned to the depot for refurbishment, most service activities such as replacement of the drive belt must be done on a local basis.

To access the Transport Arm X Drive:

1. Remove the top cover of the system (Figure X-1).

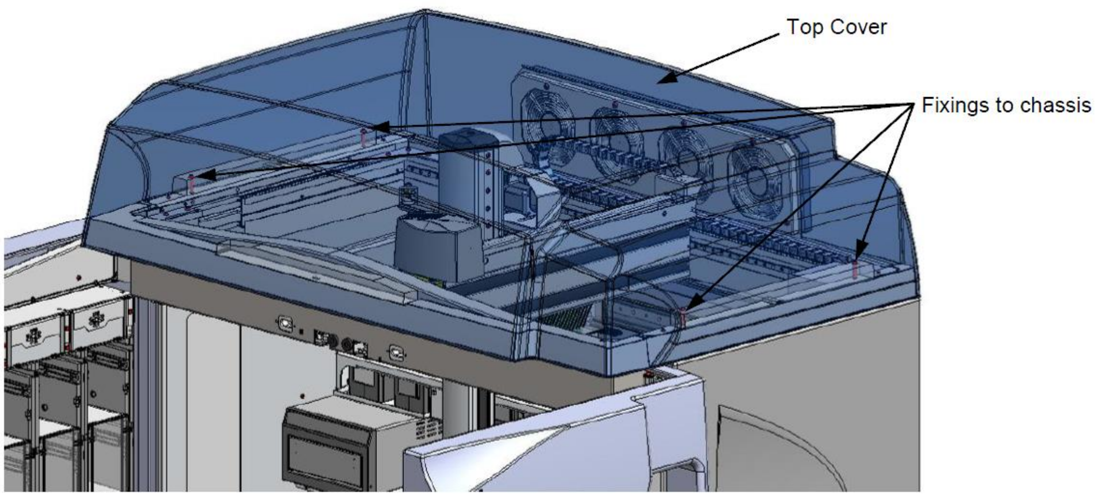


Figure X-1: Removing the Top Cover

2. Remove the Rear Chassis Cover Panel as shown in Figure X-2 (when replacing the panel, secure the screws and washers with Loctite 222).

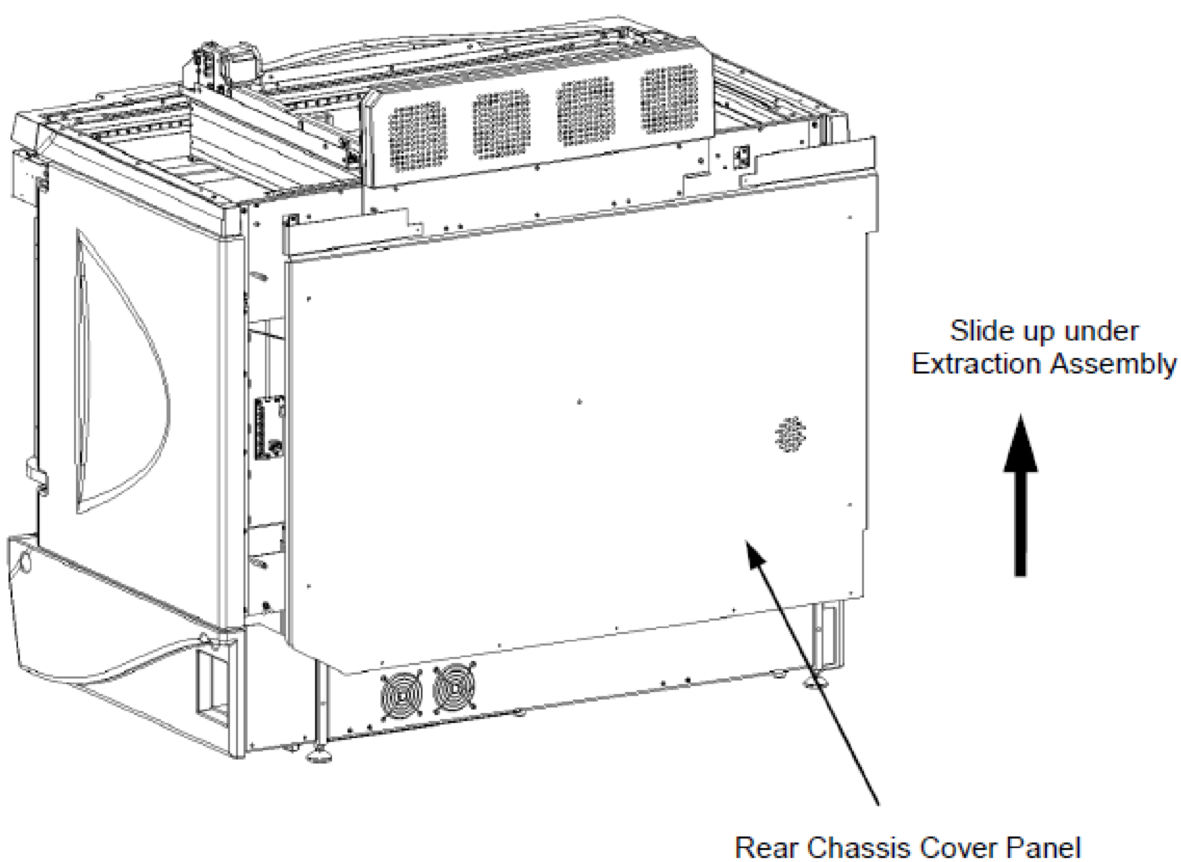


Figure X-2: Rear Chassis Cover Panel

3. Remove the two Home Sensor assemblies to the Rear of the X Drive shown in Figure X-3.

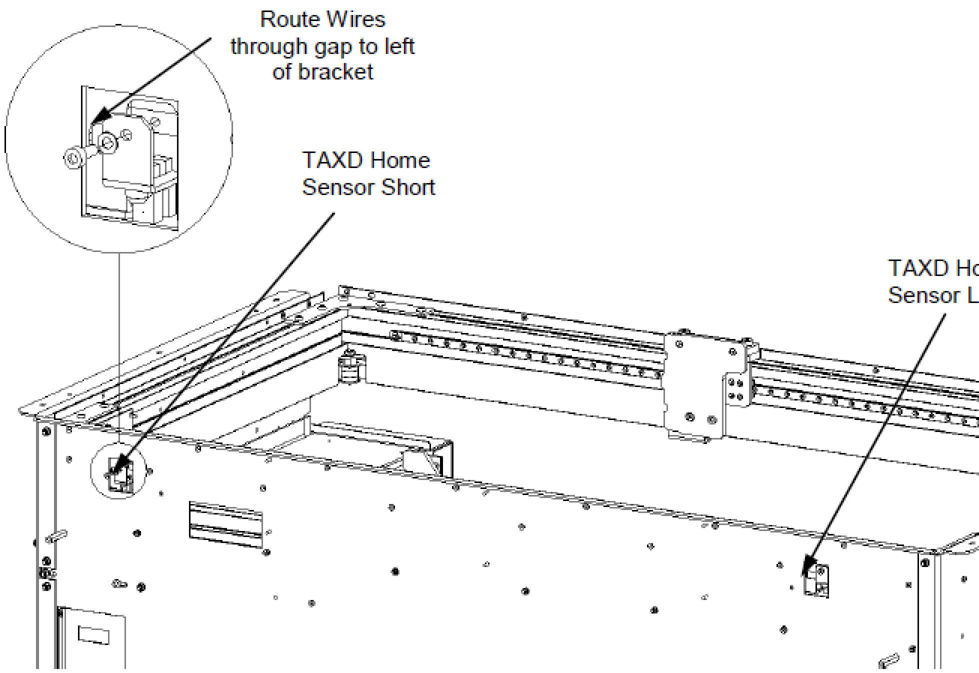


Figure X-3: The Transport Arm X Drive Sensors (Drive removed for clarity)

4. Remove the main Y drive (Figure X-4) by removing the screws which attach it to the X drive.

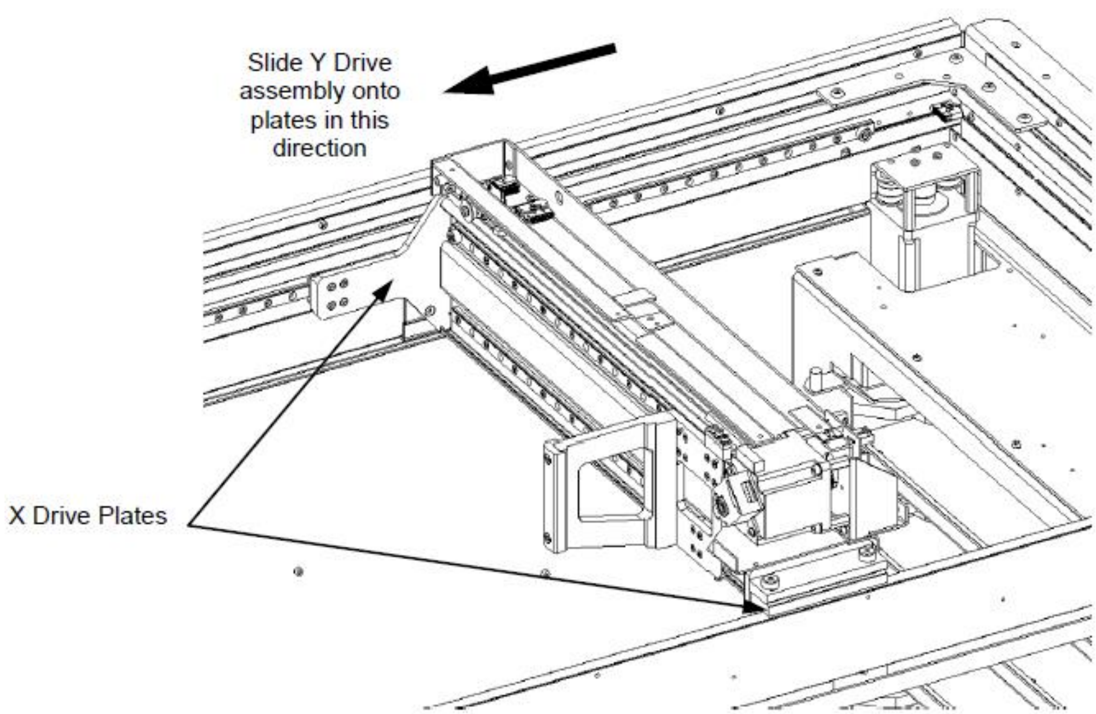


Figure X-4: Removing the Y Drive

5. Remove the screws that attach the X drive to the chassis (Figure X-5).

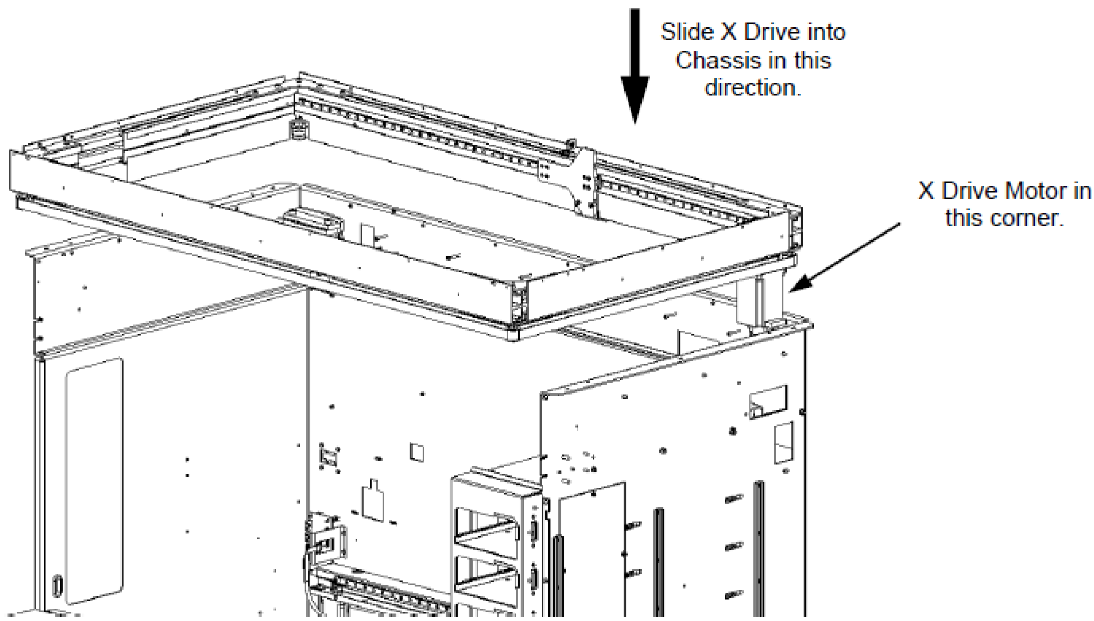


Figure X-5: Removing the X Drive

X.2 Removing X Drive Components

X.2.1 Motor Assembly

The Transport Arm X Motor Assembly, which includes the decoder, is attached to the Motor Corner Plate using pillars as shown in Figure X-6.

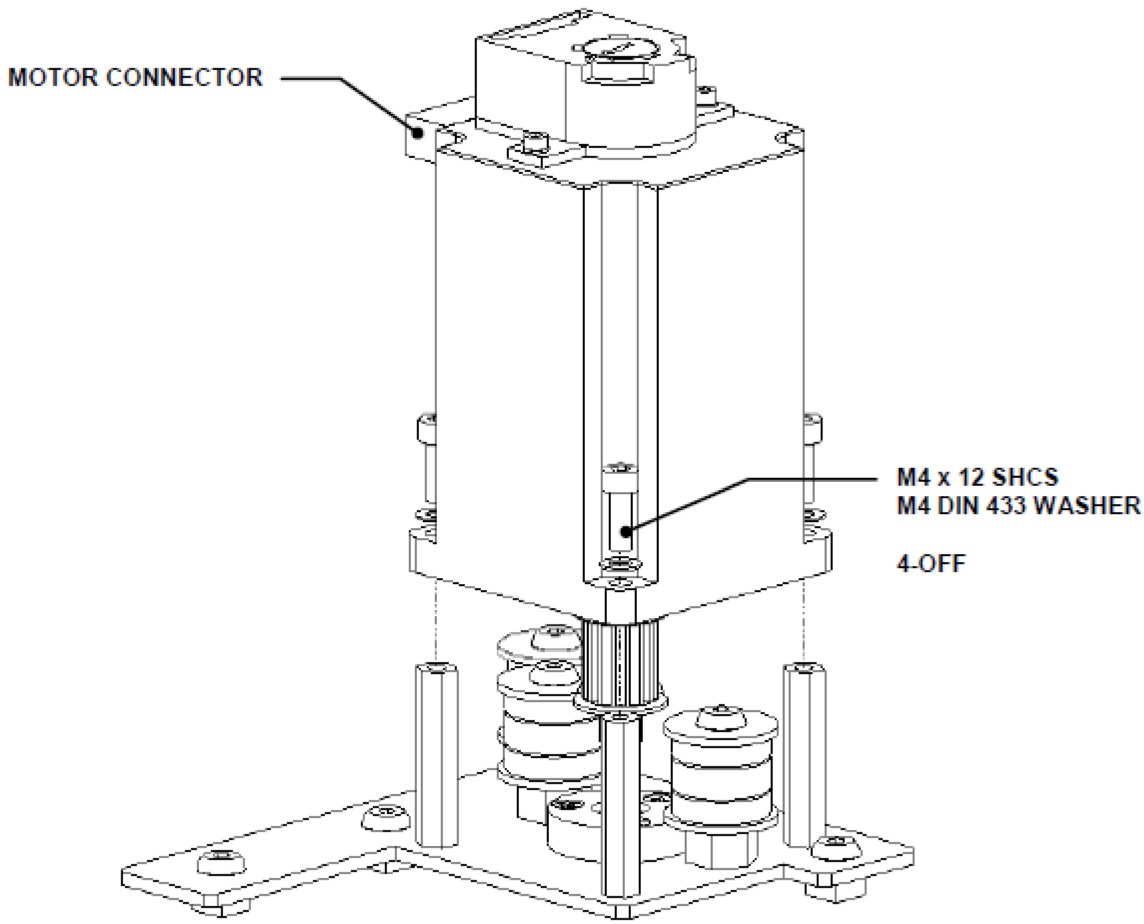


Figure X-6: The Motor Assembly

The motor assembly is removed from the system by unscrewing the screws that attach it to the drive plate. Once the motor assembly is removed from the system, the encoder can be manually removed by pulling it off the mounting plate and the pulley can be removed by removing the two set screws that affix it to the drive shaft.

To install the new motor assembly:

1. Attach the Pulley to the Motor Assembly with the Pulley Spacer Ø9 x 2mm (P24FIX006) fixture as shown in Figure X-7 using the two M4x6 Cone Point Set Screws and Loctite 222. Remove the fixture after the pulley has been affixed.

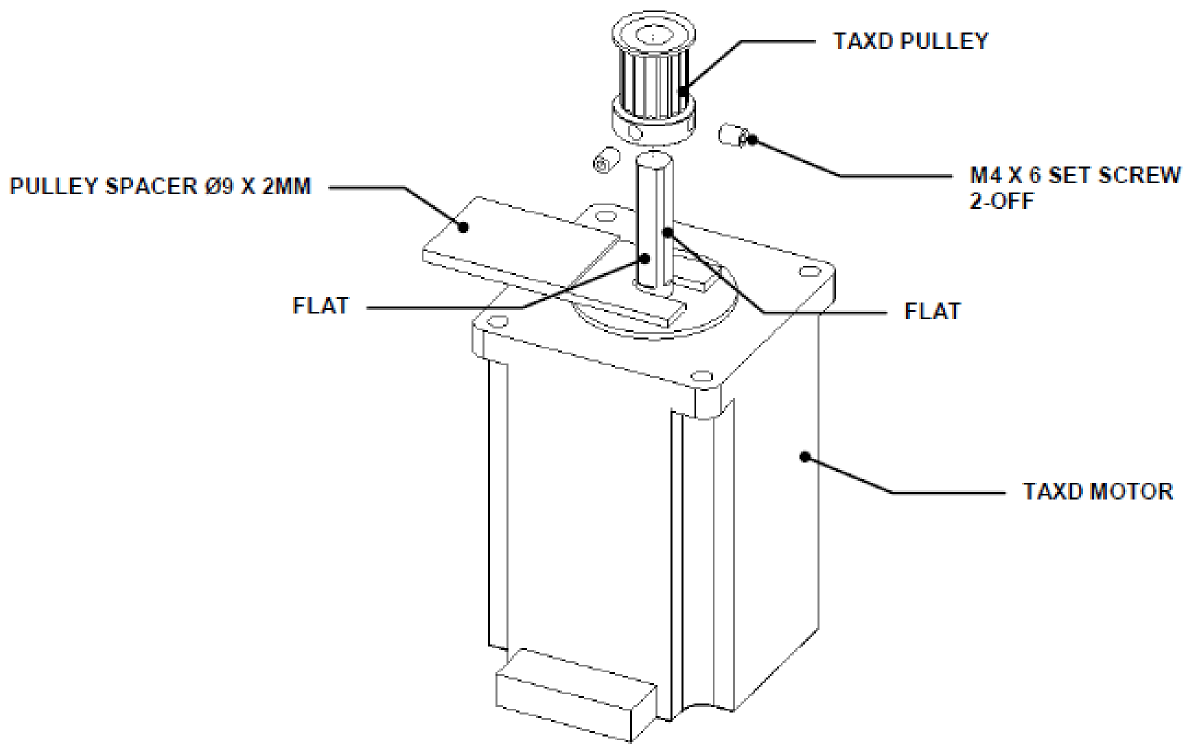


Figure X-7: Pulley Assembly

2. Attach the Encoder Mounting Plate using the Encoder Center Fixture 6.35mm (P24FIX007) to ensure that Mounting Plate of Encoder is located concentrically with Motor Shaft as shown in Figure X-8. Fasten the screws and affix with Loctite 425. Remove the fixture when the pulley is affixed.

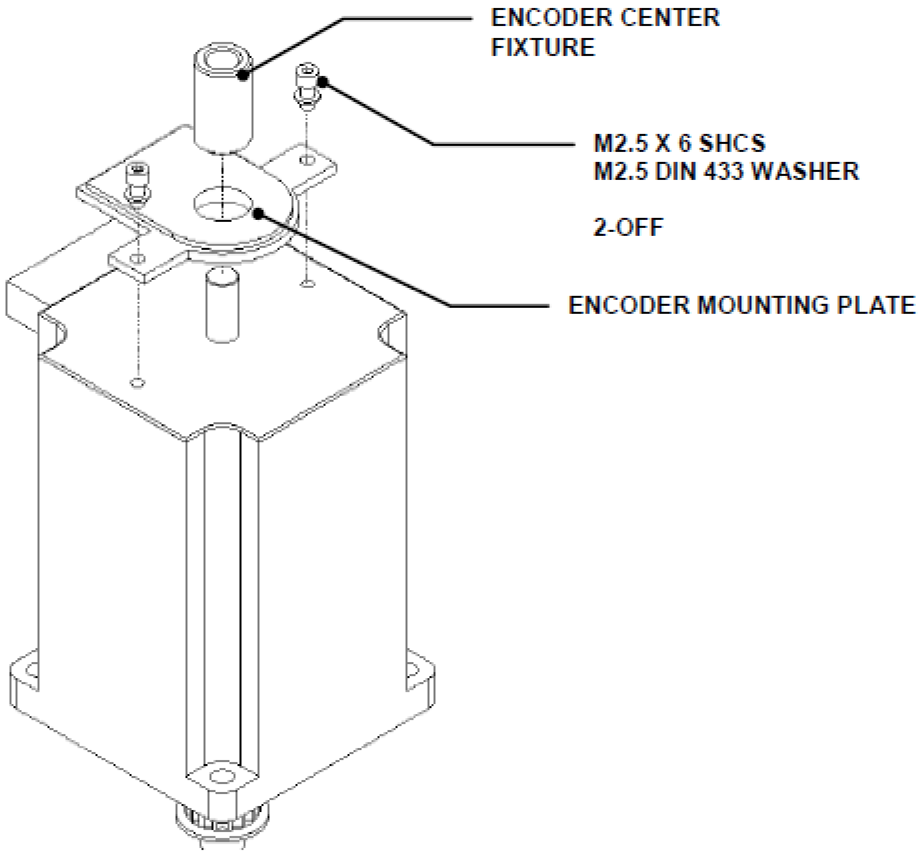


Figure X-8: Positioning the Encoder Plate and Fixture

3. Install the encoder onto the Mounting Plate by snapping it in place. Do not remove the Allen key in the encoder (Figure X-9).

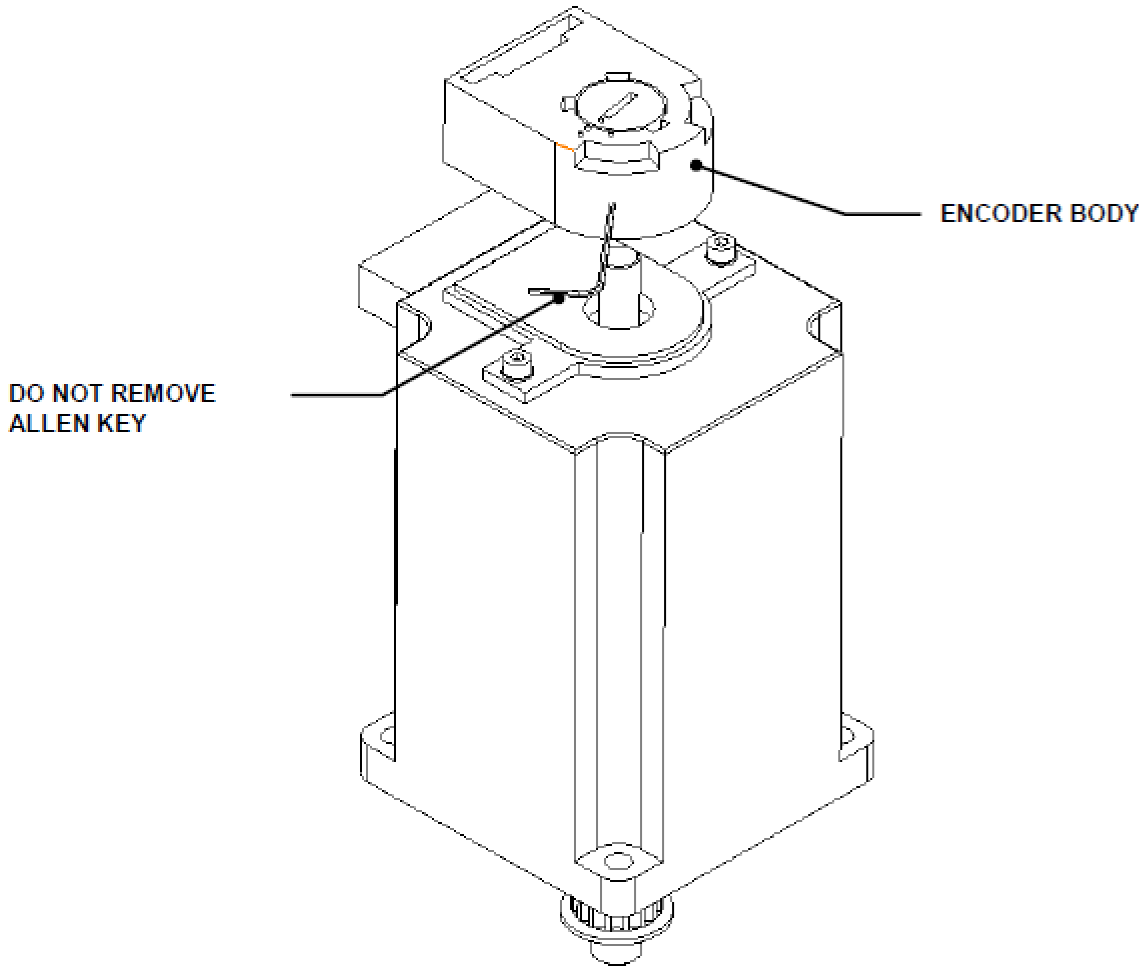


Figure X-9: Installing the Encoder

4. Push the Allen Key into the body of the encoder to ensure that it is properly seated into the code wheel hub set screw (Figure X-10).

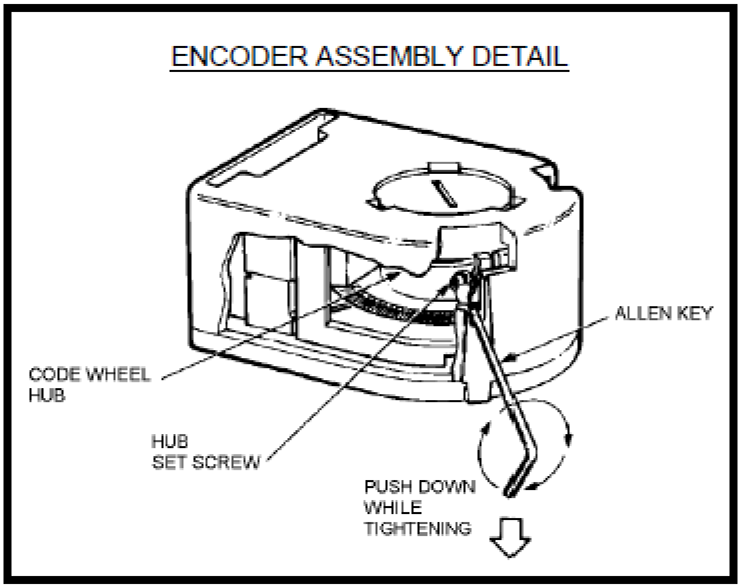


Figure X-10: Seating the Encoder

5. Apply a downward force on the end of the Allen Key which the code wheel gap by levering the code wheel hub to its upper position.

6. While continuing to apply a downward force, rotate the Allen Key to the closed position as shown in Figure X-11.

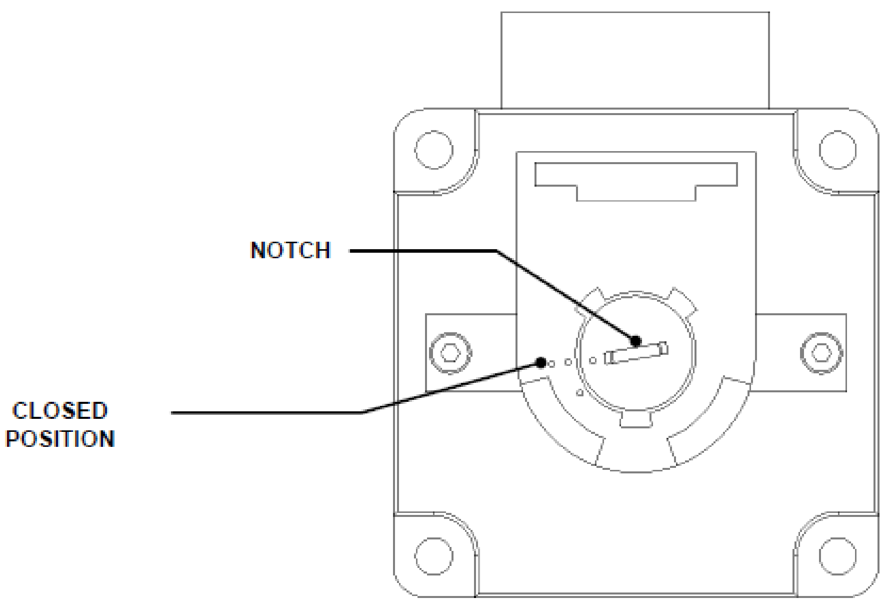


Figure X-11: Setting the Encoder Position

7. Fit the motor assembly to pillars on the Motor Corner Plate using four screws and washers. Affix Loctite 222 to the screws. When fitting the motor assembly, note the orientation as shown in Figure X-4.

X.2.2 Replacing the Belt

The routing for the belt for the X drive for the transport arm is shown in Figure X-12.

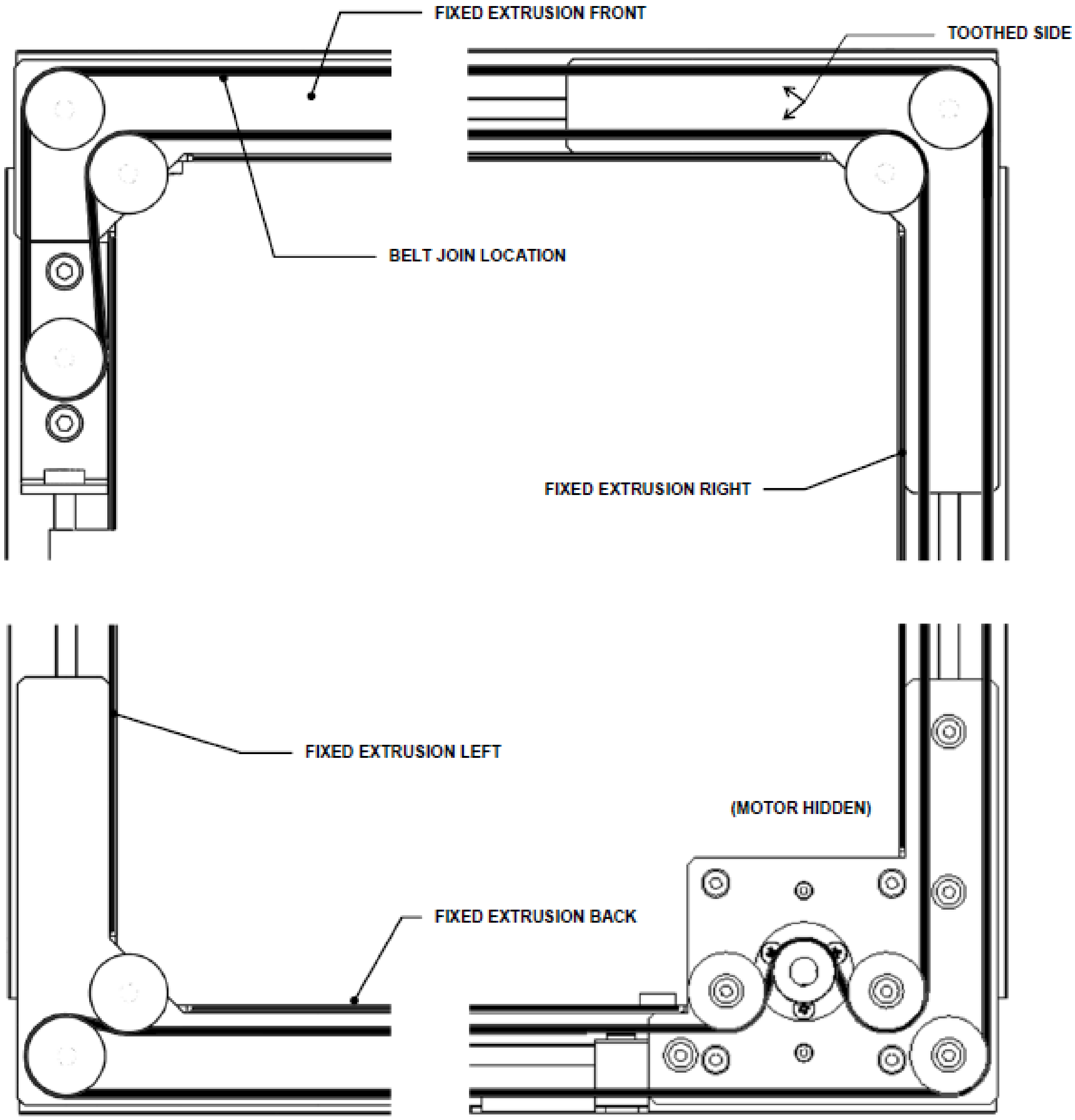


Figure X-12: Y Drive Transport Arm Belt Routing

To replace the belt:

1. Remove the Belt Bracket Front from the Y Drive Plate Front (Figure X-13).

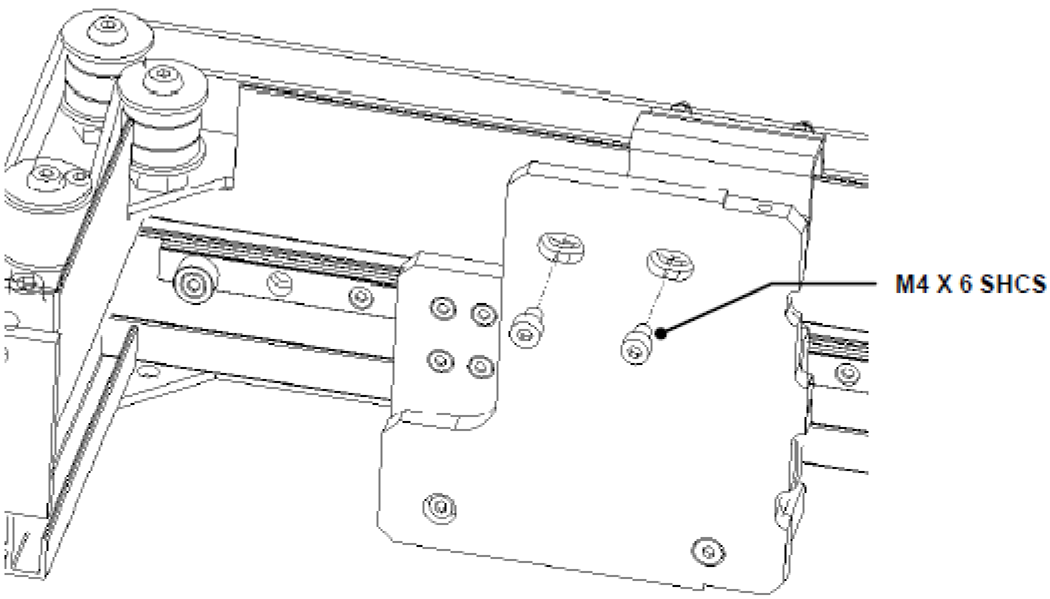


Figure X-13: Belt Bracket Front

2. Remove the front part of the belt clamp by unscrewing the three nuts as shown in Figure X-14 and remove the belt.

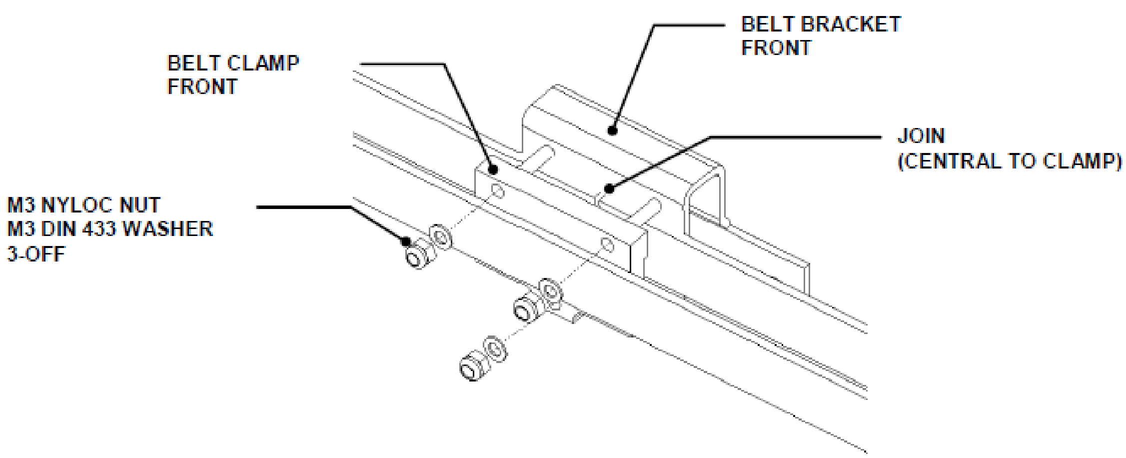


Figure X-14: The Transport Arm X Drive Belt Clamp

3. Place the new belt in position around the idler assemblies as shown in Figure X-12. Ensure that the join in the belt and the X drive Plate Front are in the approximate position shown in Figure X-15.

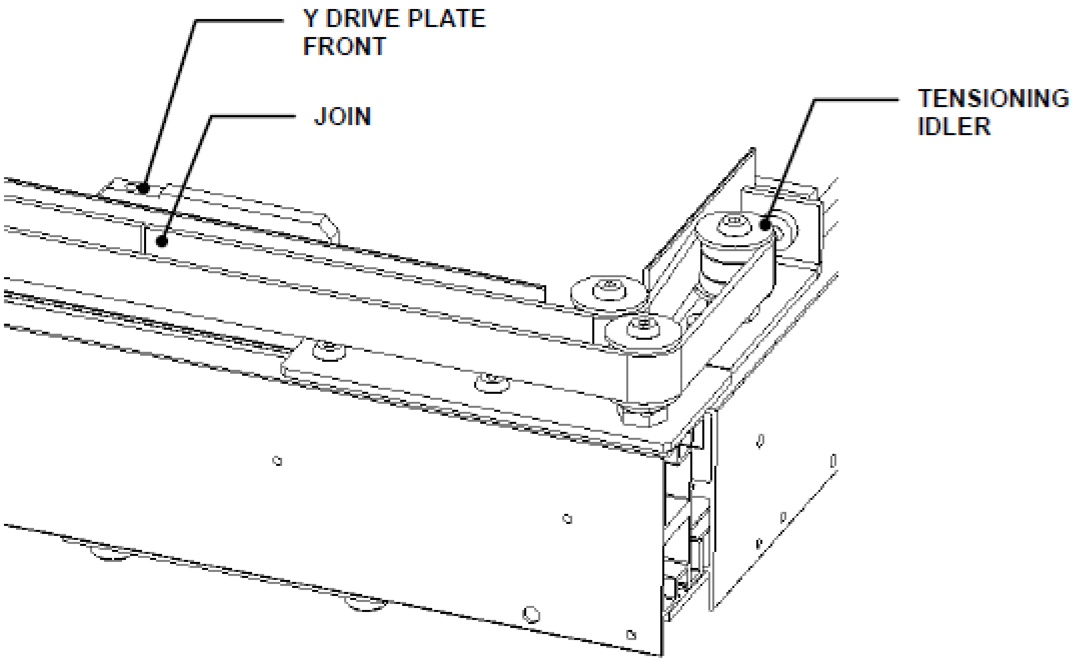


Figure X-15: Location of Belt Join

4. Replace the Belt Bracket Front to the Y Drive Plate Front. Ensure that the screws are located approximately central to the drive plate and affix with Loctite 222.

5. Ensure that the belt is properly positioned between the flanges of all idler bearing assemblies.

6. Attach the Transport arm X Drive Belt Tensioning Fixture (P24FIX010) to Fixed Extrusion Left using the screws and washers supplied with the fixture. Fit the supplied through the fixture into the X Tensioner Plate and turn the screw clockwise to take up any initial slack in the belt (Figure X-16).

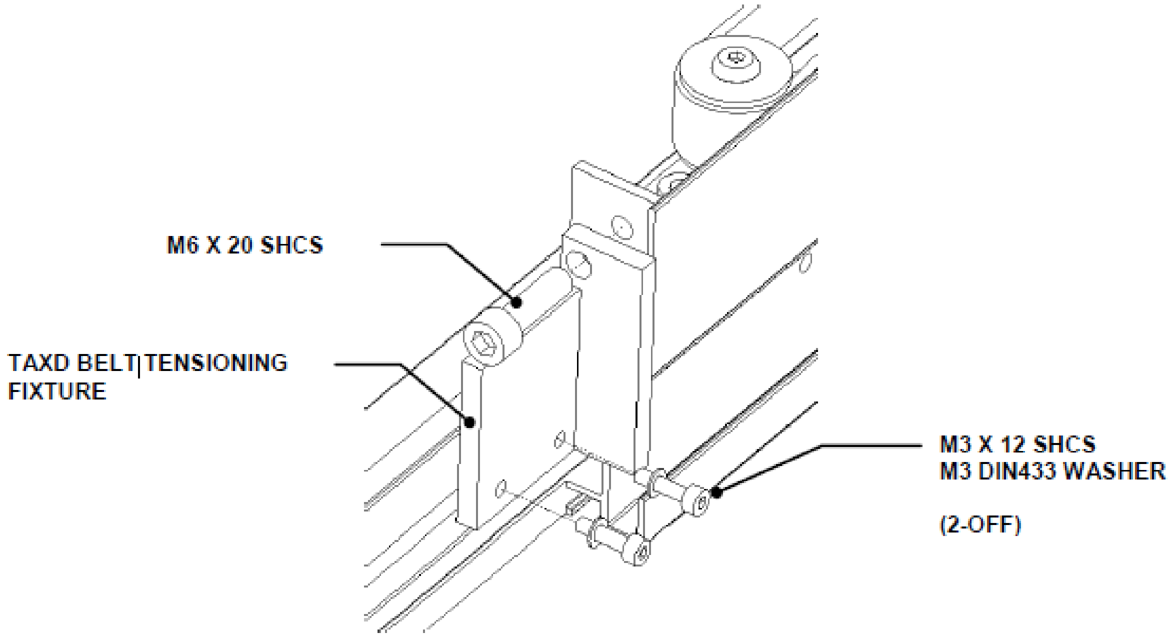


Figure X-16: Placing Belt Tensioning Fixture

7. Push Y Drive Plate Front to the stop shown in Figure X-17.

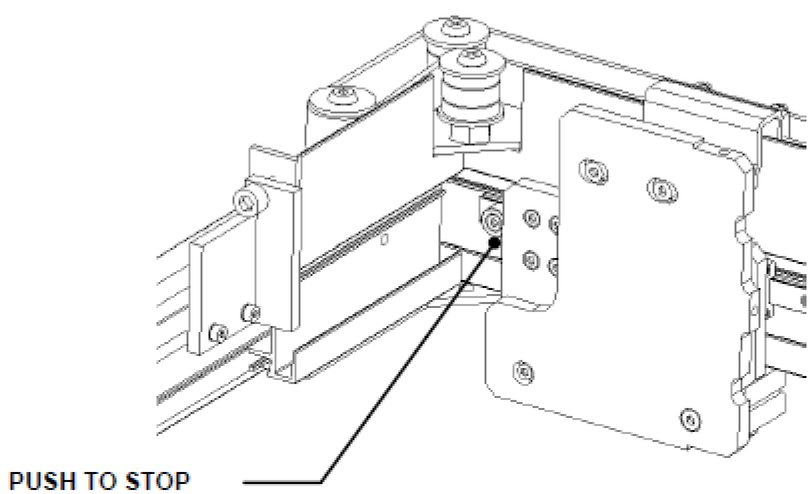


Figure X-17: Positioning Y Drive Plate Front

8. Position the Tension Meter (Gates Sonic Tension Meter 507C) at the position shown in Figure X-18. The Tension Meter must be 3-6mm away from the belt to obtain a reading.

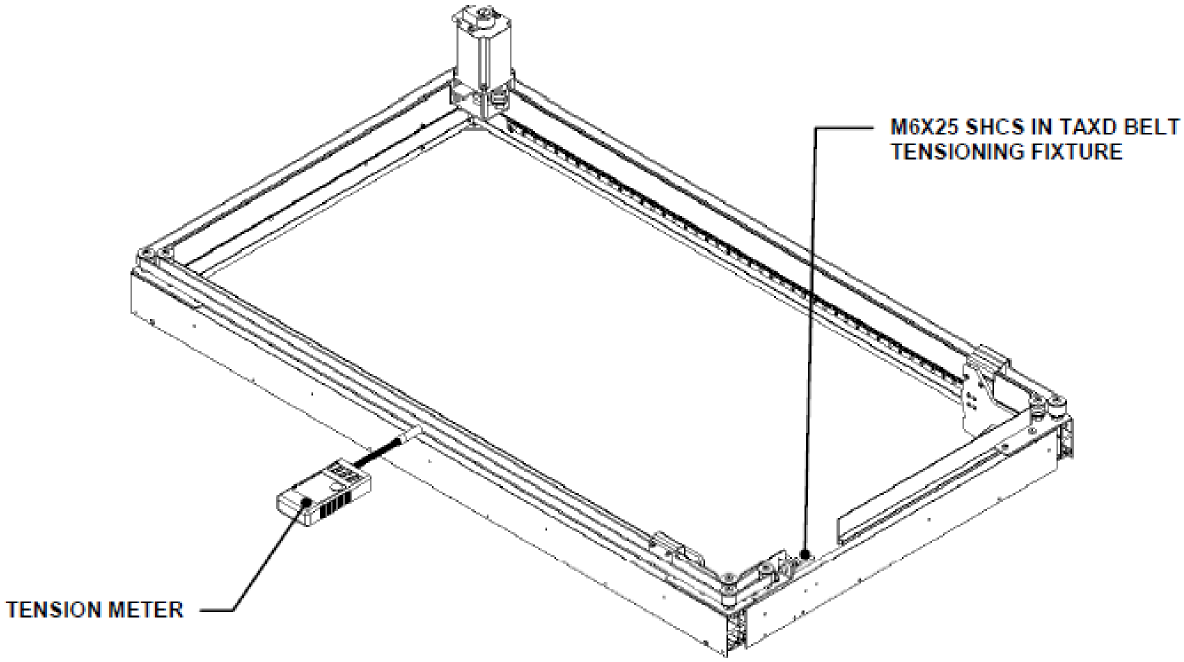


Figure X-18: Position of Tension Meter

9. Tap the belt to cause it to oscillate. While the belt is oscillating and sensor is in position, press and hold the red button on the meter. The required frequency is 25 Hz. If the reading is above or below this value adjust the M6 screw in the Belt Tensioning Fixture.

10. Repeat the above steps until three consecutive readings at 25 ± 1 Hz are obtained.

11. Tighten the two M5 x 10 SHCS in the X Tensioner Plate.

12. Re-check the frequency using the meter.

13. Remove the TAXD Belt Tensioning Fixture and screws.

X.3 Replacing the Transport Arm

To replace the Transport Arm:

1. Slide the Main X Drive assembly into the chassis from above as shown in Figure X-19. The X Drive extrusion should sit on standoffs on the inside of the chassis.

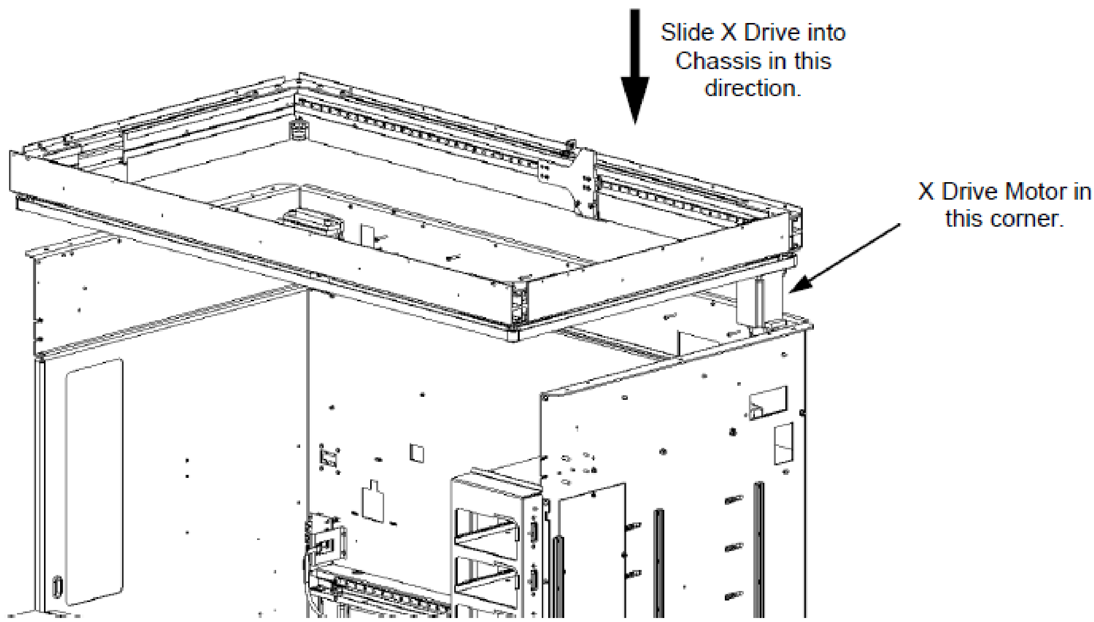


Figure X-19: Replacing the Transport Arm X Drive Assembly

2. Loosely fit the X Drive to the left and right hand chassis using six M3x30 screws, six M3x6 screws and twelve M3 Washers.

3. Secure the X Drive to the Rear Chassis using seven M3x6 screws along the top flange, seven M3x30 screws through the Linear Rail and one M3x30 screw and one M3 Washer at the right hand end of the extrusion (Figure 19-21). Use Loctite 222 on all fixings; however, ensure no residual Loctite remains on the linear rail surface. Tighten fixings to the left hand and right chassis.

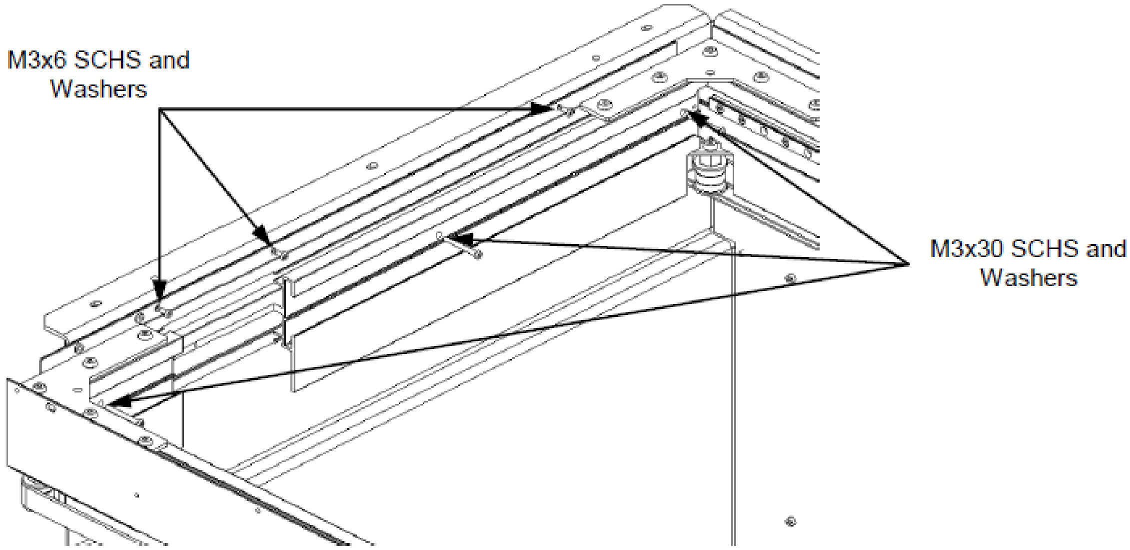


Figure X-20: Securing the X Drive, Part 1

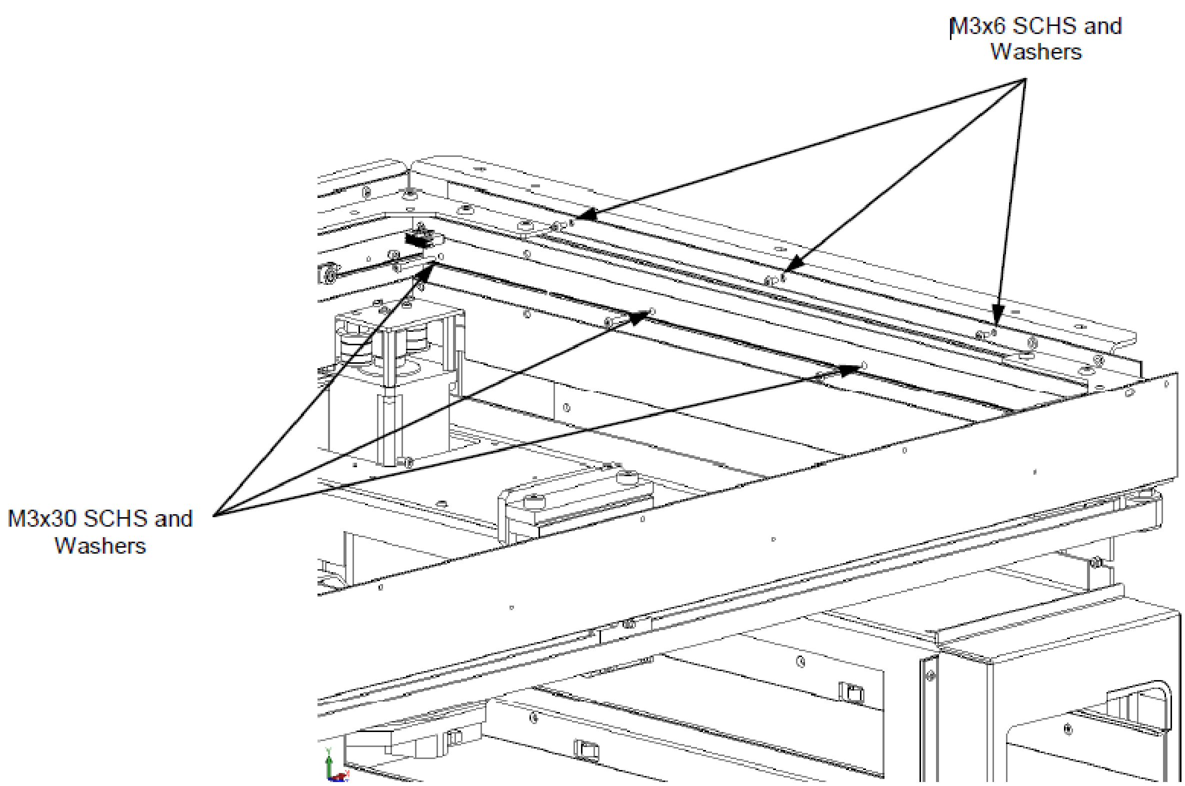


Figure X-21: Securing the X Drive, Part 2

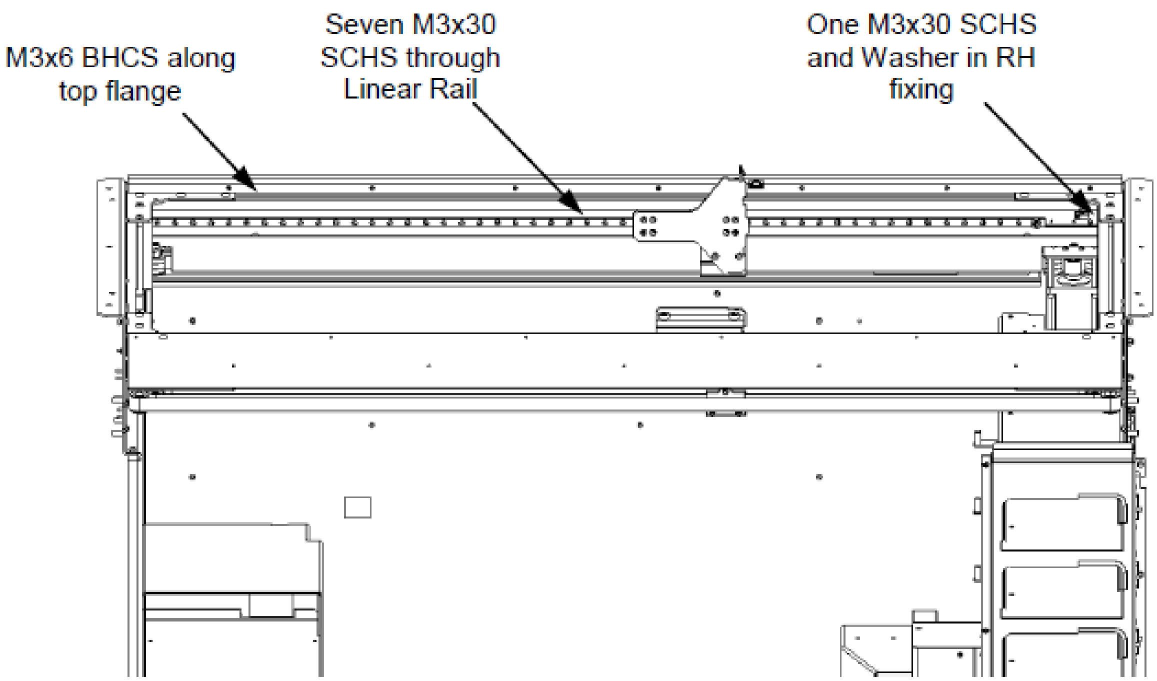


Figure X-22: Securing the X Drive, Part 3

4. Tighten the three remaining loose nuts on the rear of the chassis (Figure X-23).

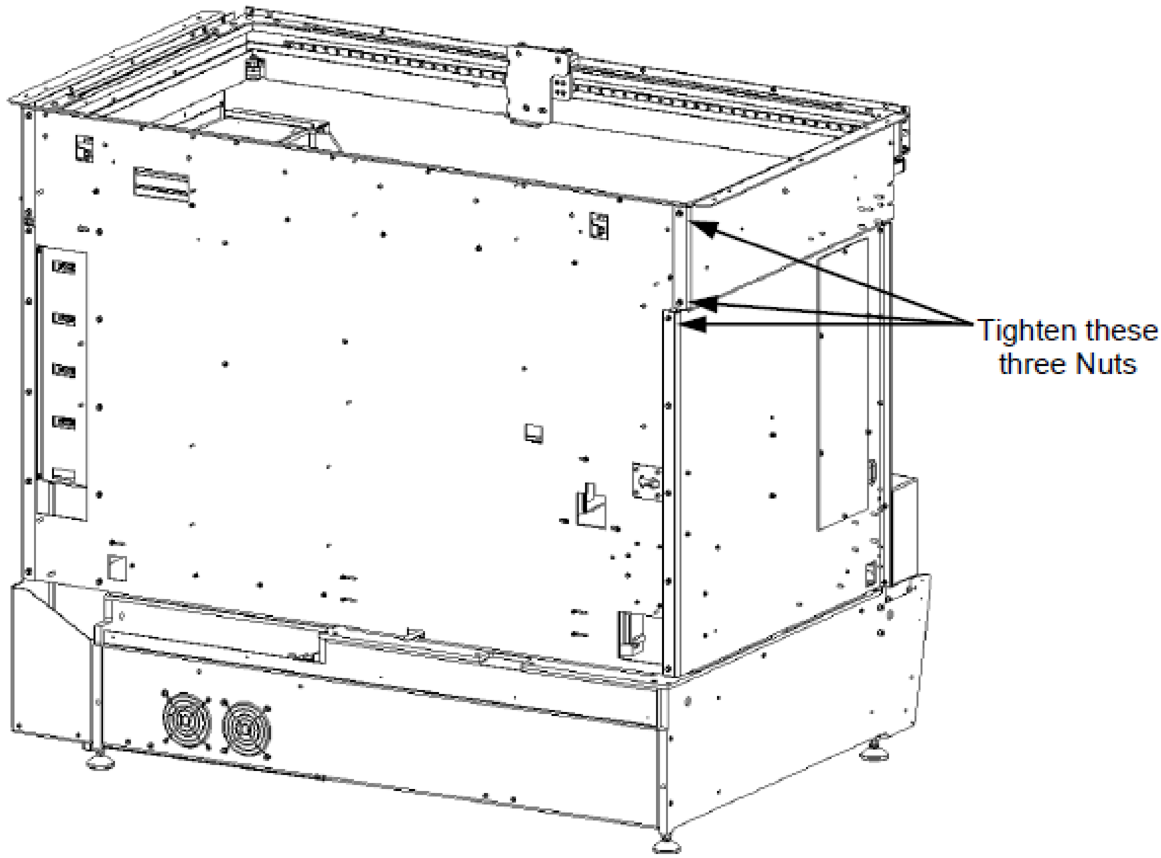


Figure X-24; Tightening the Nuts

5. Slide the Main Y Drive over the drive plates on the Main X Drive in the direction shown in Figure X-25. For clarity, only the Y Drive is shown in Figure X-25.

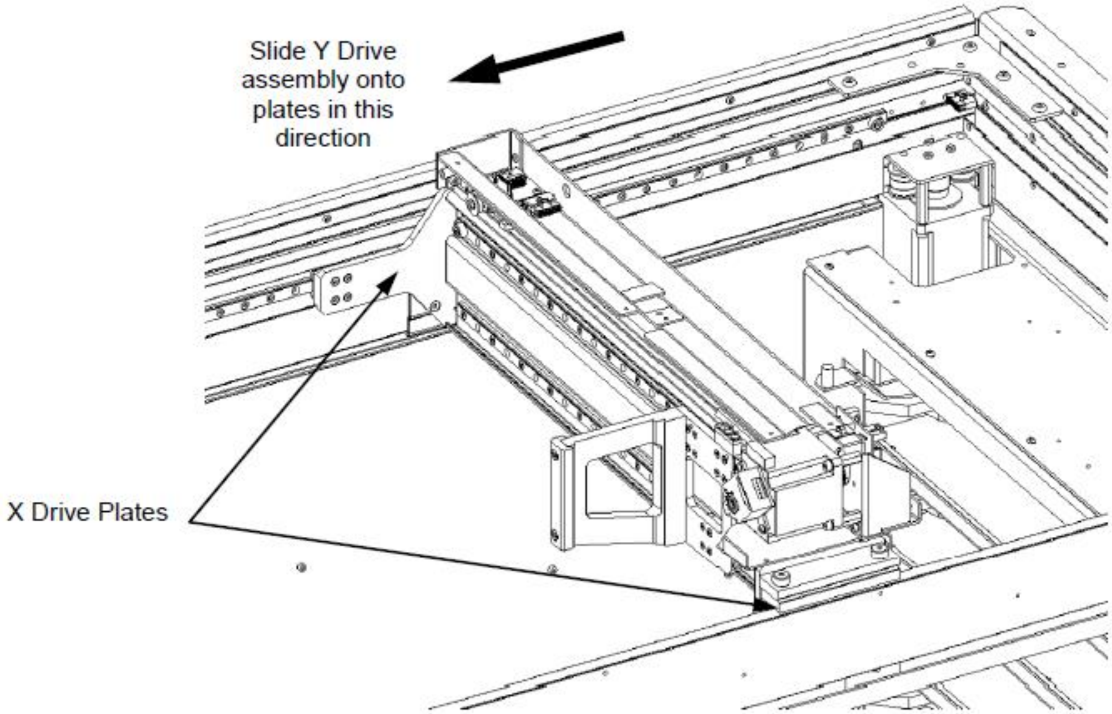


Figure X-25: Sliding the Y Drive over the Drive Plates on the X Drive

6. Loosely fit the Y drive to the X Drive using five M4x10 screws and M4 Washers, one M3x8 SCHS (and one M3 Washer. Use Loctite 222 (Figure X-26).

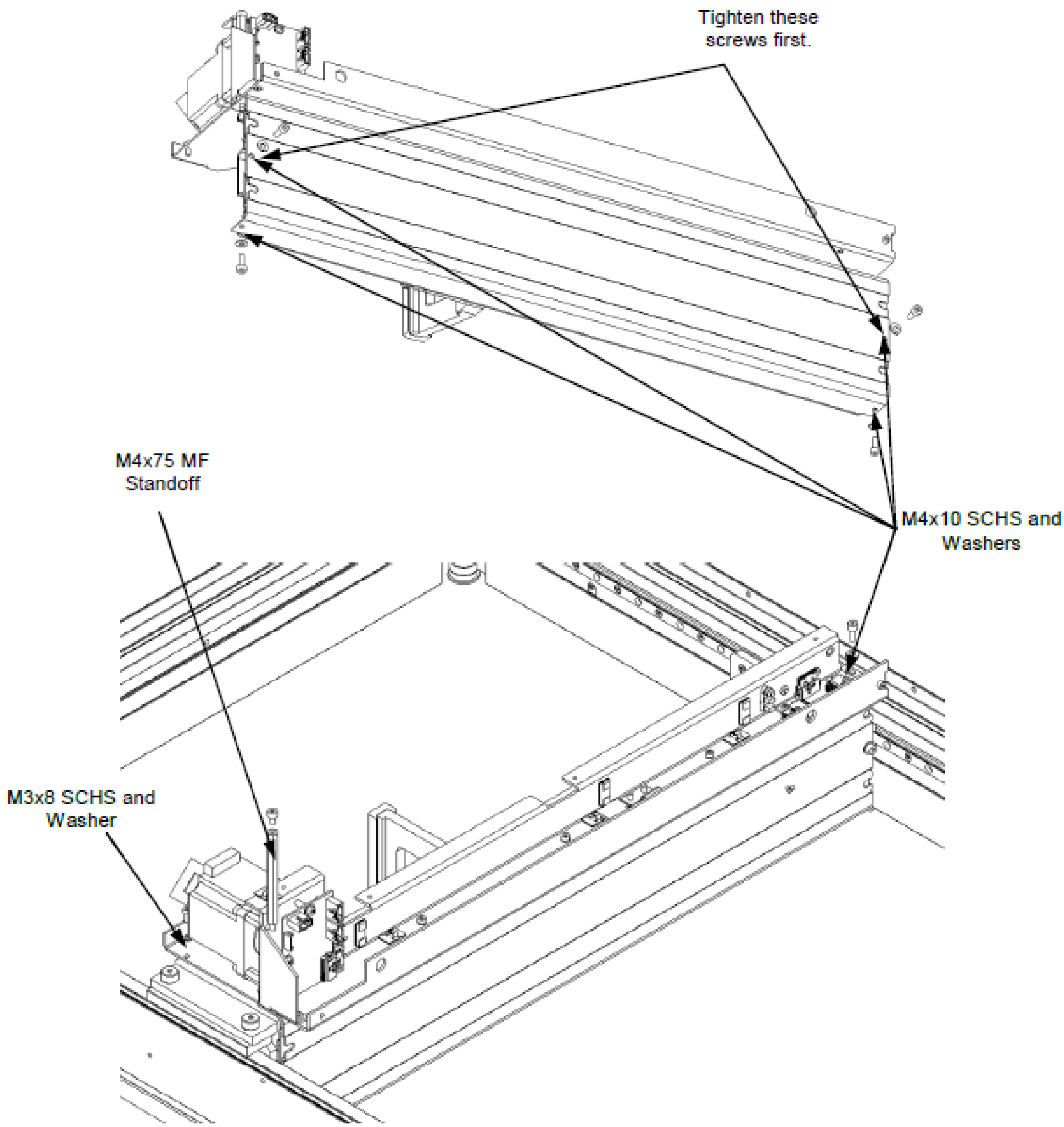


Figure X-26: Fitting the Y Drive to the X Drive

7. Insert an M4x6 screw into an M4x75 MF Standoff using Loctite 262 and then loosely screw the standoff into the X Drive. Care should be taken not to over tighten the standoff.

8. Tighten the front two screws securing the Y to X Drive and then tighten the remaining fixings.

9. Loosen the two fine adjustment screws on the X Drive Plate as shown in Figure X-27. Hold the Transport Arm X Drive Timing Fixture Front (P24FIX014F) and Transport Arm X Drive Timing Fixture Back (P24FIX014B) into the inside corners of the X Drive so the machined lip of each fixture part is up against the relevant lips on the X Drive extrusions.

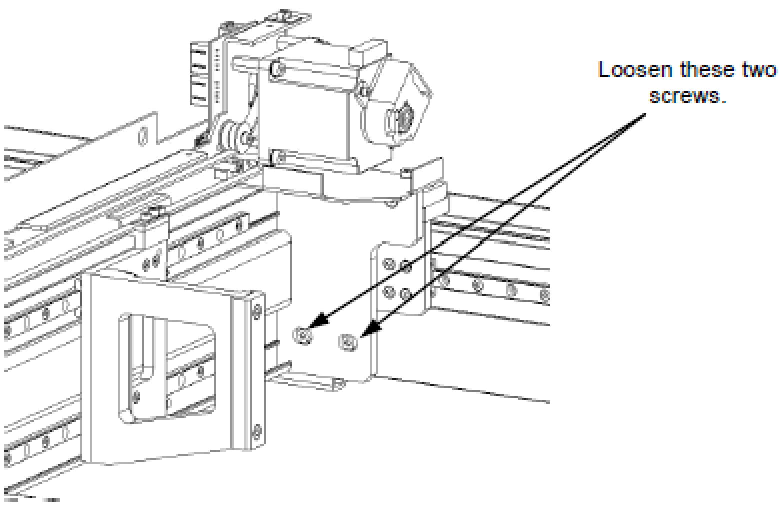


Figure X-27: Adjustment Screws - X Drive Plate

10. Move the Y Drive until it is in contact with both fixture parts (Figure X-28). While holding in place, retighten the fine adjustment screws. Move the Y Drive away from the fixtures to remove.

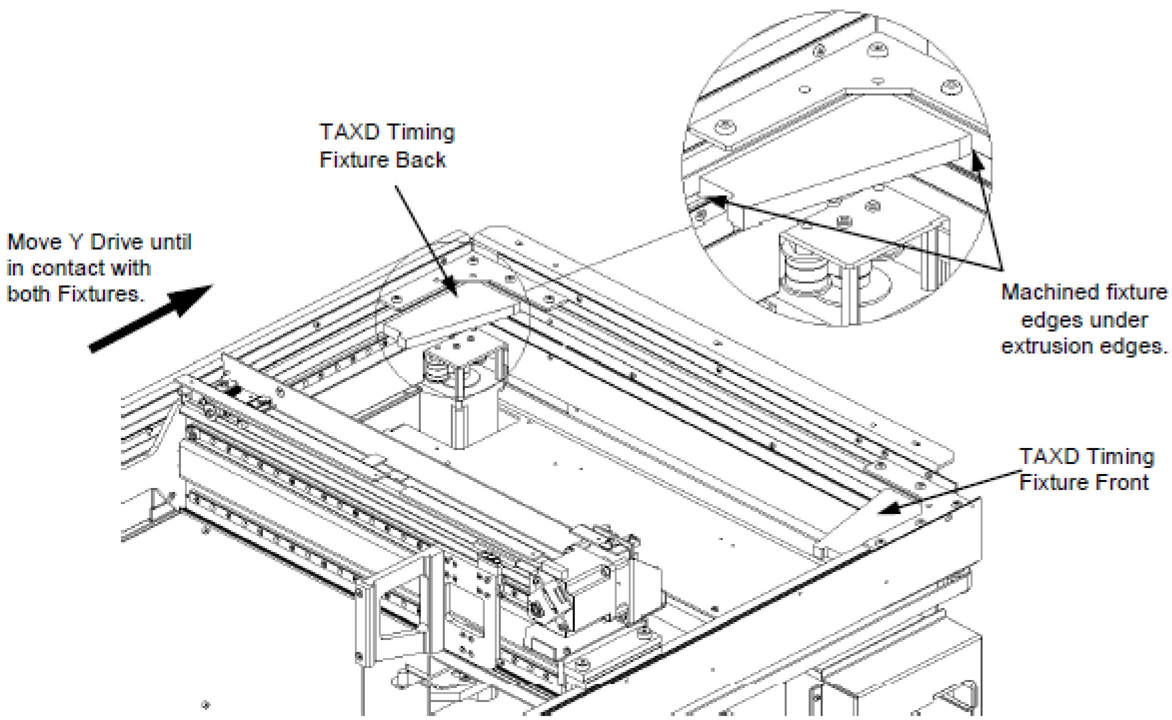


Figure X-28; Moving Y Drive

11. Press four Richco LCBS-6M-01 Standoffs into the X Drive extrusion in the orientation shown in Figure X-29 and then press the X Drive PCB (14001030) onto the Standoffs as shown.

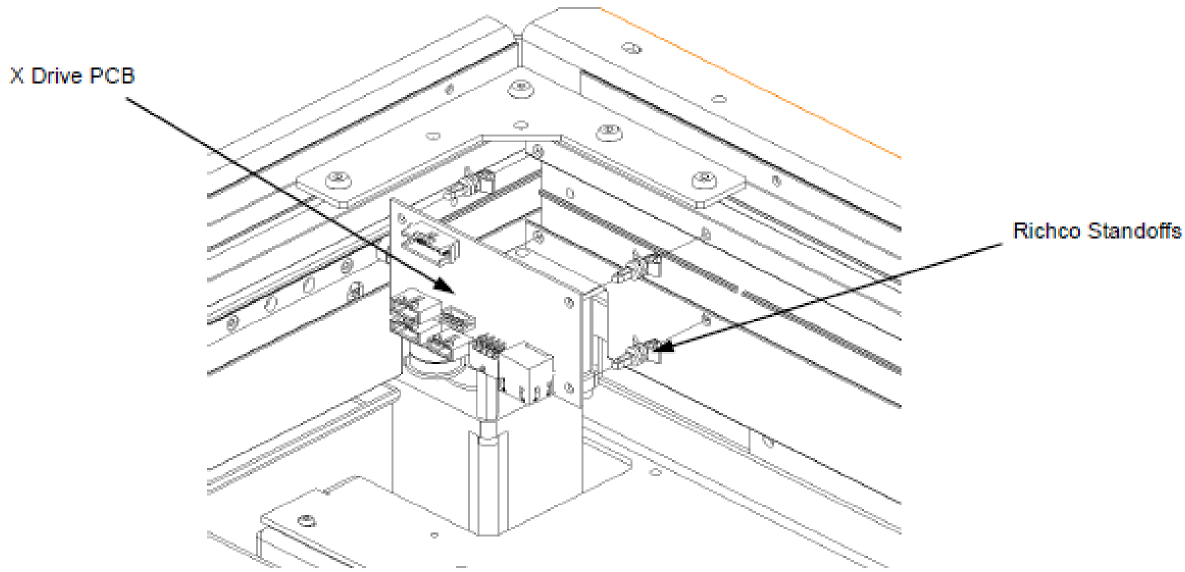


Figure X-29: Inserting Richco LCBS-6M-01 Standoffs

12. Secure the Rear Chassis Catch Tray (to the Rear Chassis as shown using seven M3 Nyloc Hex Nuts) and seven M3 Washers (Figure X-30).

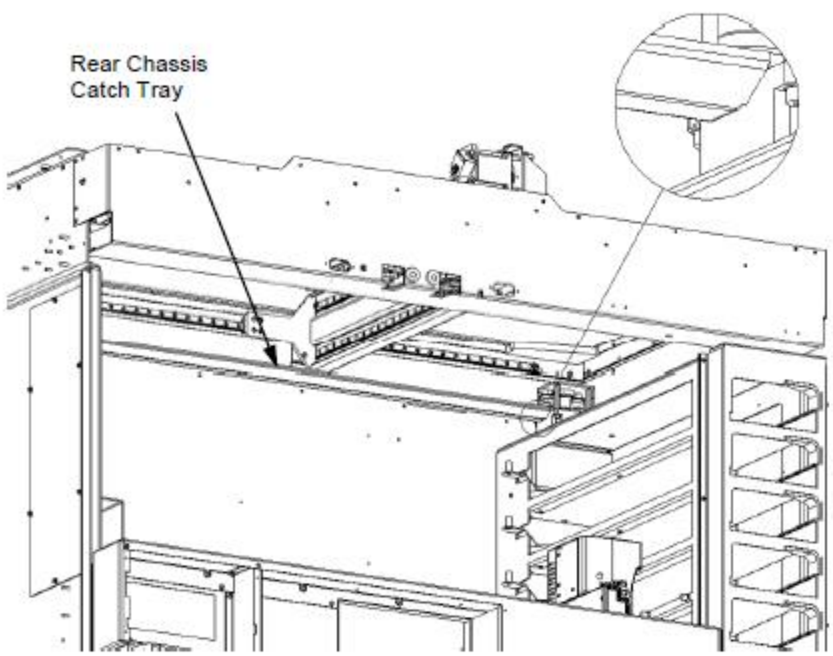


Figure X-30: Securing the Rear Chassis Catch Tray

Chapter Y Transport Arm, Y Drive

Y.1 Overview

The *Transport Arm Y Drive* mechanism is an integral component of the system and is typically repaired at the user site. While certain items such as the motor can be replaced and returned to the depot for refurbishment, most service activities such as replacement of the drive belt must be done on a local basis.

Y.2 The Motor Assembly

The Transport Arm Y Motor Assembly, which includes the decoder, is attached to the Y drive plate as shown in Figure Y-1.

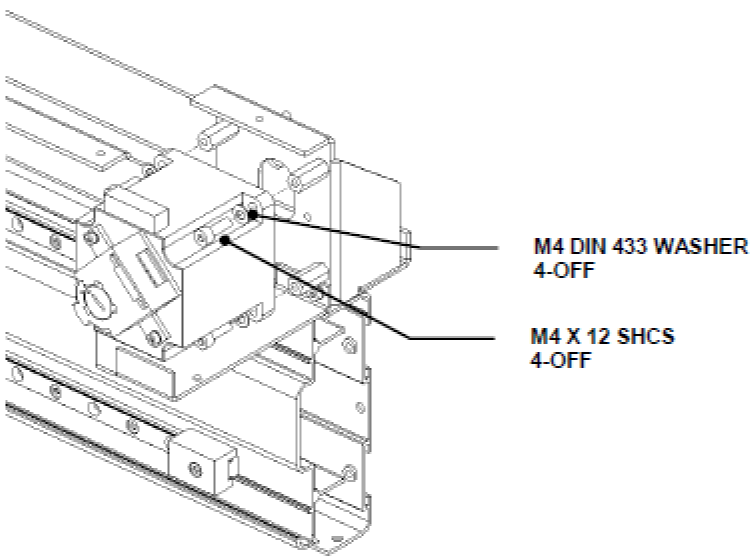


Figure Y-1: The Motor Assembly

The motor assembly is removed from the system by unscrewing the screws that attach it to the drive plate. Once the motor assembly is removed from the system, the encoder can be manually removed by pulling it off the mounting plate and the pulley can be removed by removing the two set screws that affix it to the drive shaft.

To install the new motor assembly:

1. Attach the Pulley to the Motor Assembly with the Pulley Spacer Ø9 x 2mm (P24FIX006) fixture as shown in Figure Y-2 using the two M4x6 Cone Point Set Screws and Loctite 222. Remove the fixture after the pulley has been affixed.

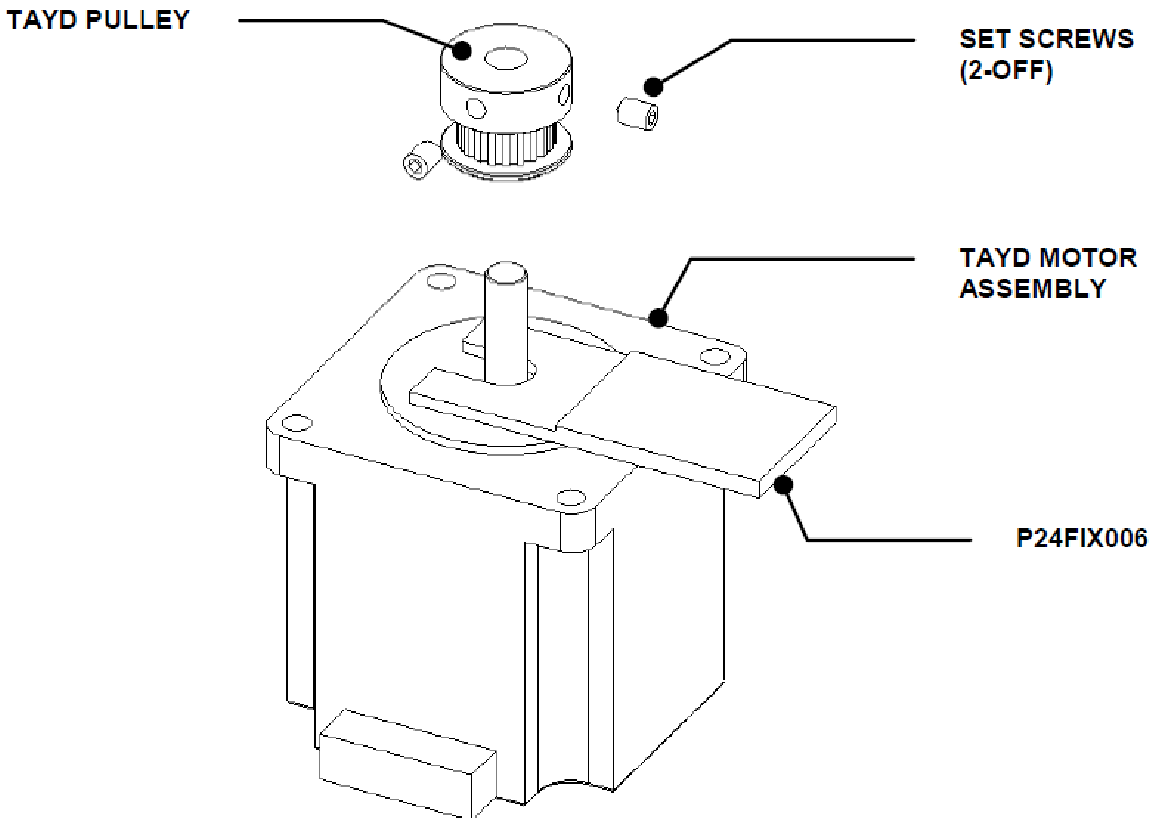


Figure Y-2: Pulley Assembly

2. Attach the Encoder Mounting Plate using the Encoder Center Fixture 6.35mm (P24FIX007) to ensure that Mounting Plate of Encoder is located concentrically with Motor Shaft, fasten the screws and affix with Loctite 425. Remove the fixture when the pulley is affixed.

3. Install the encoder onto the Mounting Plate by snapping it in place. Do not remove the Allen key in the encoder (Figure Y-3).

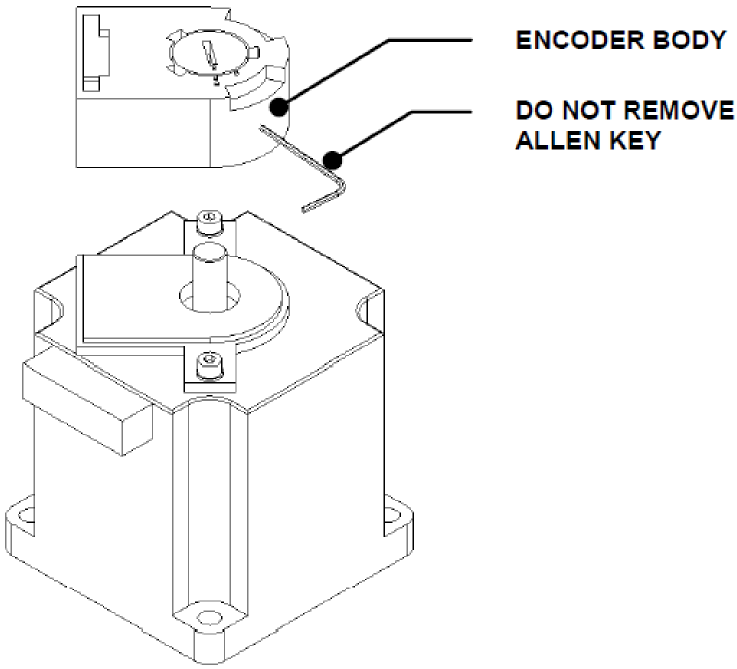


Figure Y-3: Installing the Encoder

4. Push the Allen Key into the body of the encoder to ensure that it is properly seated into the code wheel hub set screw (Figure Y-4).

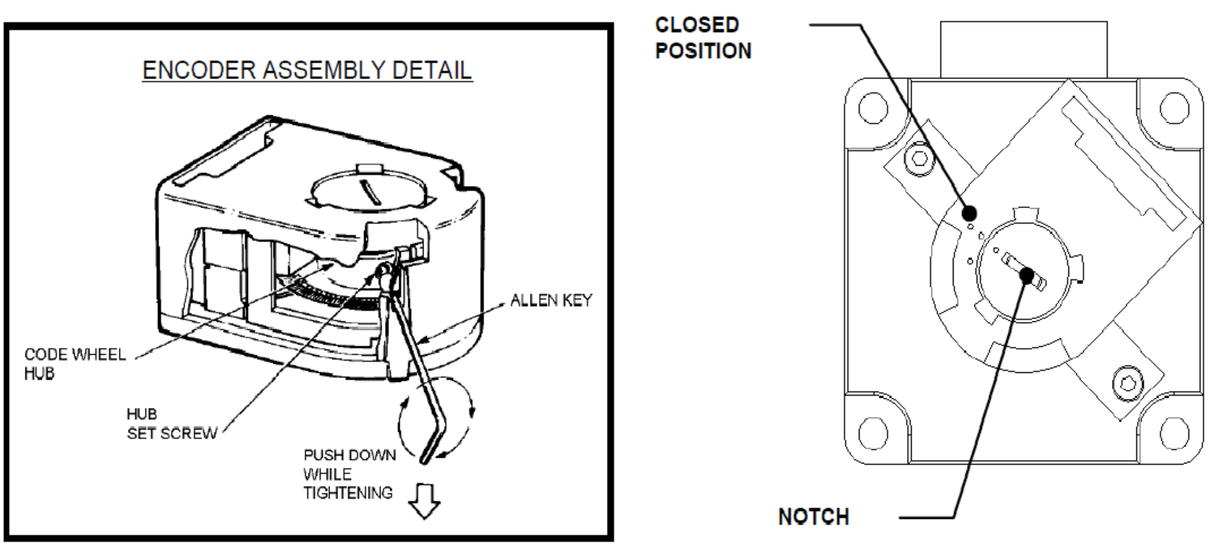


Figure Y-4: Setting the Encoder Position

5. Apply a downward force on the end of the Allen Key which the code wheel gap by levering the code wheel hub to its upper position.

6. While continuing to apply a downward force, rotate the Allen Key to the clockwise direction until the hub set screw is tight against the idler shaft. Remove the Allen Key by pulling it straight out of the encoder body.

Y.3 Replacing the Sensors

There are two sensors mounted on the Y extrusion (Figure Y-5). The Optosensor is located on the right side of the extrusion while the home sensor is located near the motor.

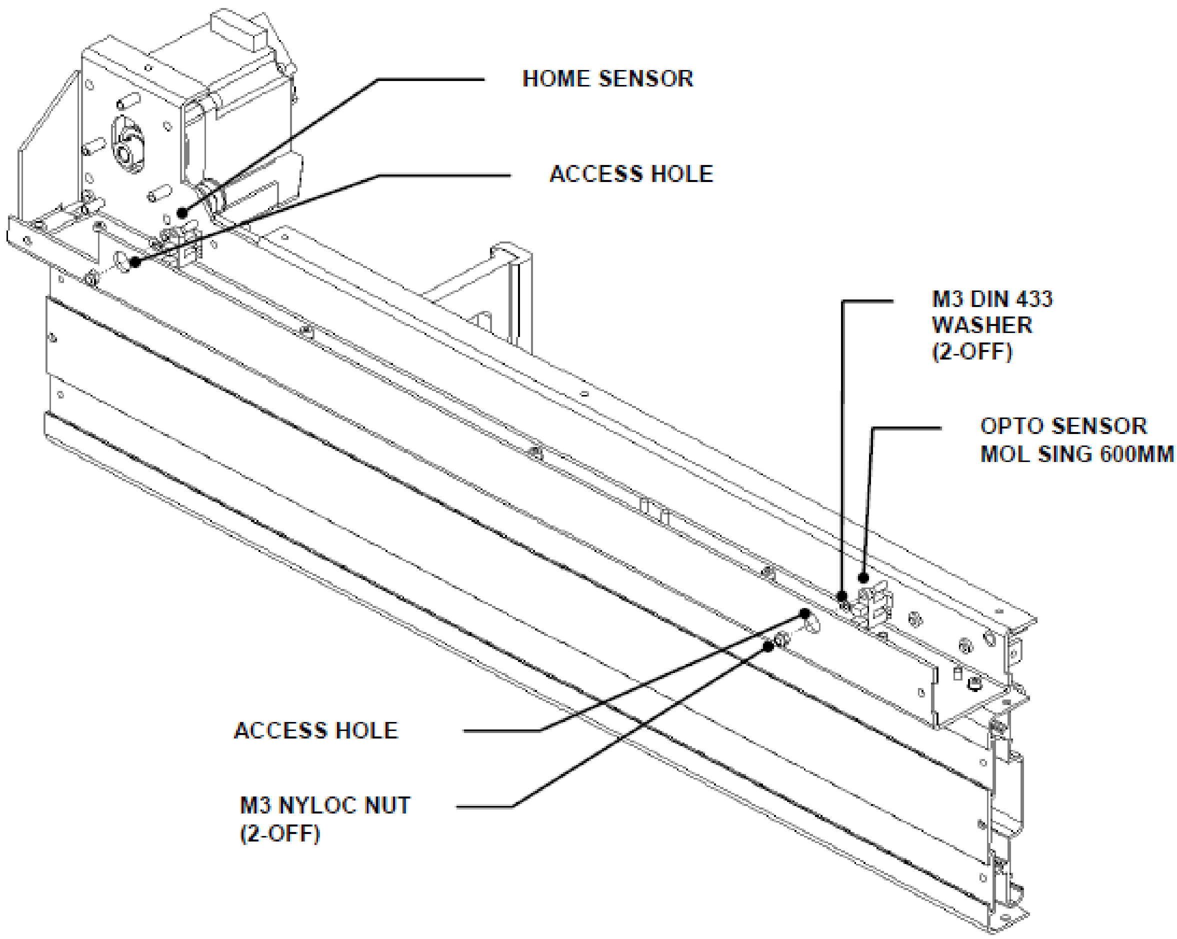


Figure Y-5: Location of Sensors

Y.4 PCB Assembly

The PCB assembly is connected to the standoffs on the drive plate as shown in Figure Y-6.

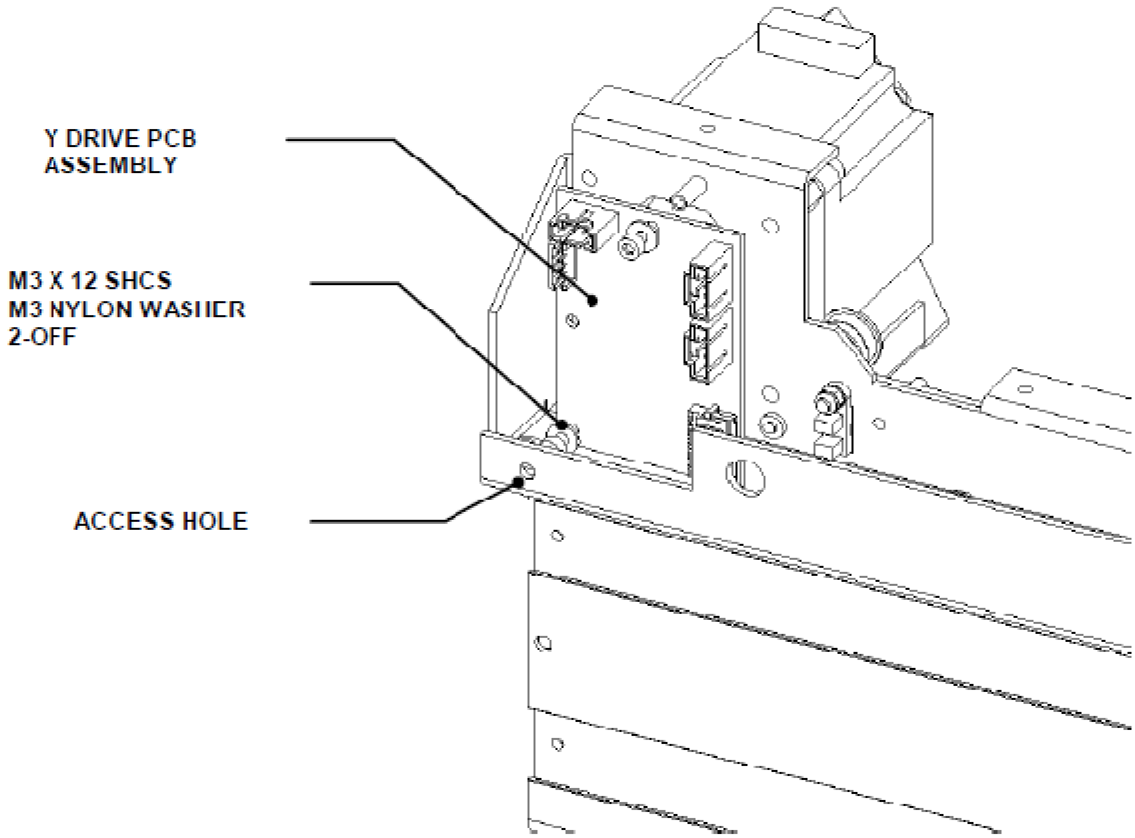


Figure Y-6: The PCB Assembly

To remove the board, unscrew the screws that attach it to the drive assembly. When replacing the board, do not use Loctite.

Y.5 Transition Board

The transition board is mounted on the Y Drive Plate as shown in Figure Y-7.

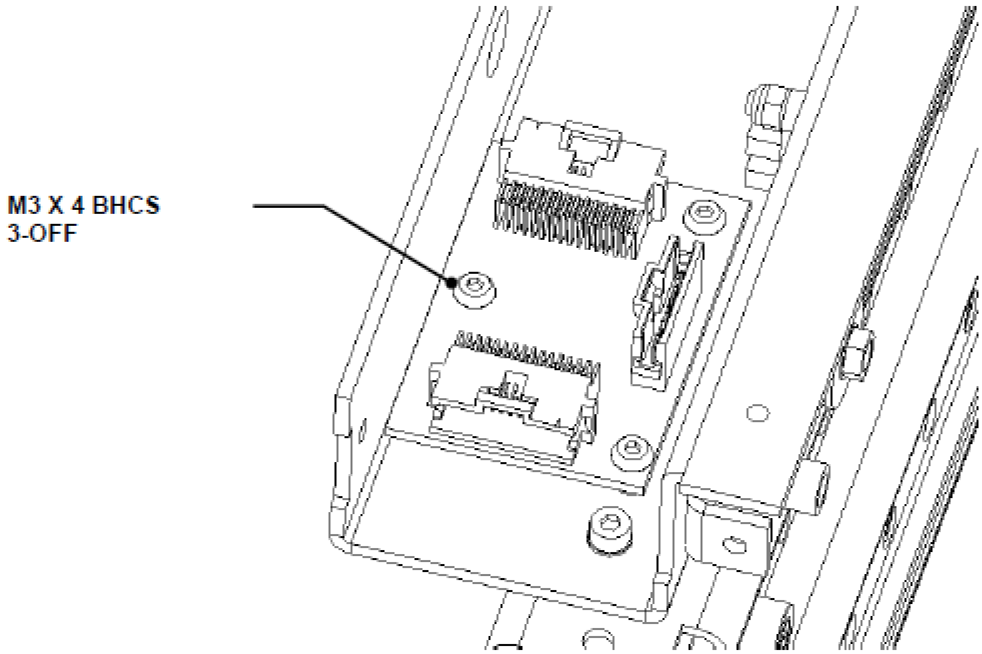


Figure Y-7: Transition Board

To remove the board, unscrew the screws that attach it to the drive assembly. When replacing the board, use Loctite 222 on the screws.

Y.6 Drive Belt

The Y Transport Drive Belt is shown in Figure Y-8.

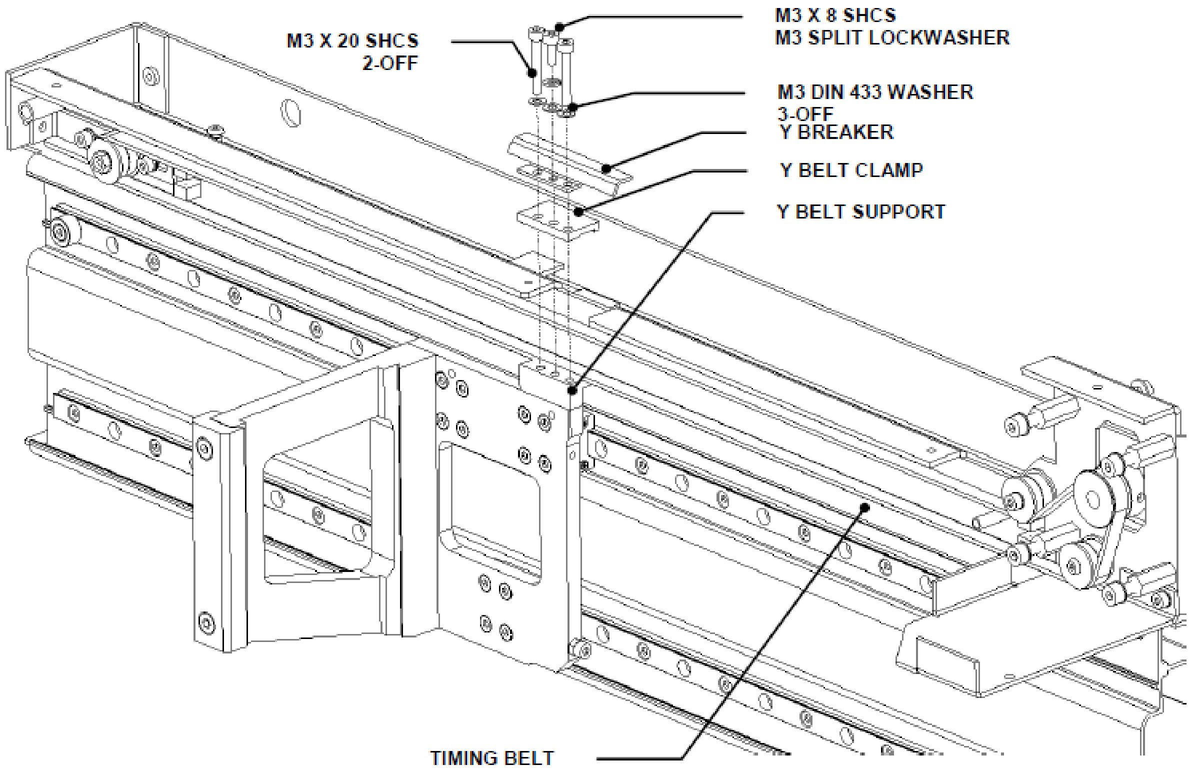


Figure Y-8: Y Transport Drive Belt

To remove the drive belt:

1. Remove the three screws that attach the belt clamp to the belt support.
2. Remove the timing belt from the left and right bearings and pulleys.

To replace the belt:

1. Route a length of 1054mm of GT2 2mm x 6mm Timing Belt around the motor and the pulleys on the right side of the extrusion (Figure Y-9). Route the remainder of the belt as shown in Figure Y-8 (the motor is not shown in the figure for the sake of clarity),

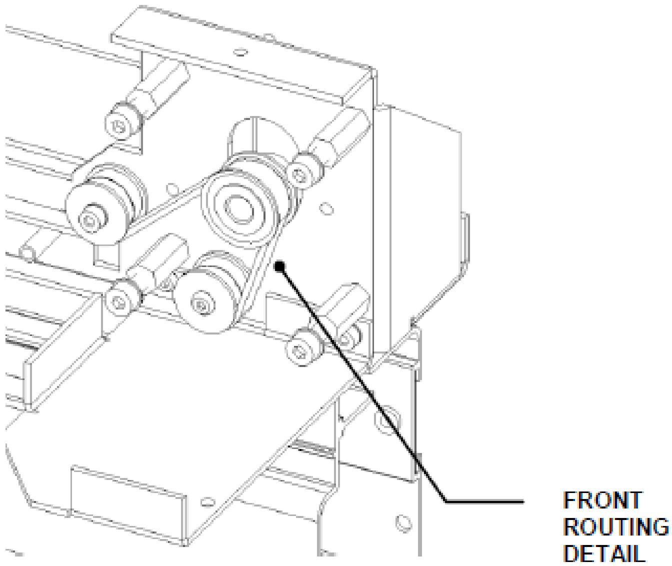


Figure Y-9: Routing Detail around Right Side of Extrusion

2. Trap the belt equidistant between Y Belt Clamp (23502311) and Y Belt Support (23503700). The Y Breaker is fitted on top of Y Belt Clamp.

3. Fit one screw and split washer and washer loosely to the clamp assembly as shown in Figure Y-8.,

4. Fit the clamp assembly to the Z Drive Plate using two M3 x 20 SHCS (30200330) and two M3 DIN 433 Washers (6514130011). Use Loctite 222. Tighten central screw.

5. Reaffix the clamp assembly. The completed clamp assembly is shown in Figure Y-10.

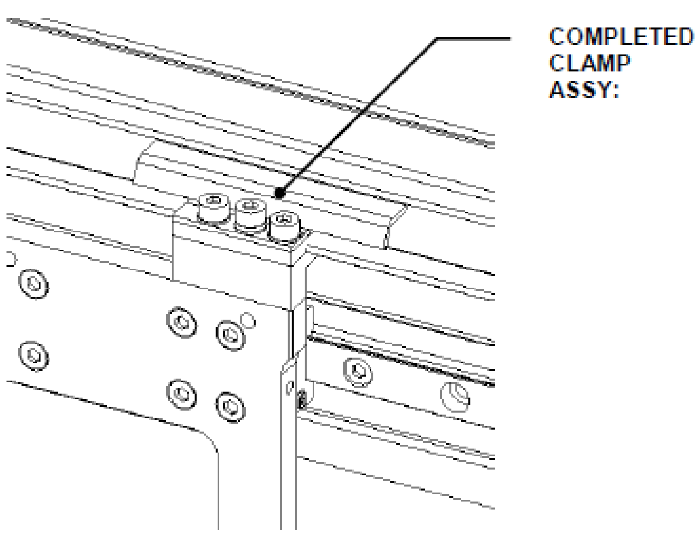


Figure Y-10: Completed Clamp Assembly

6. Ensure that there is a positioning nut on the Z Drive Plate as shown in Figure Y-11. If not, insert one.

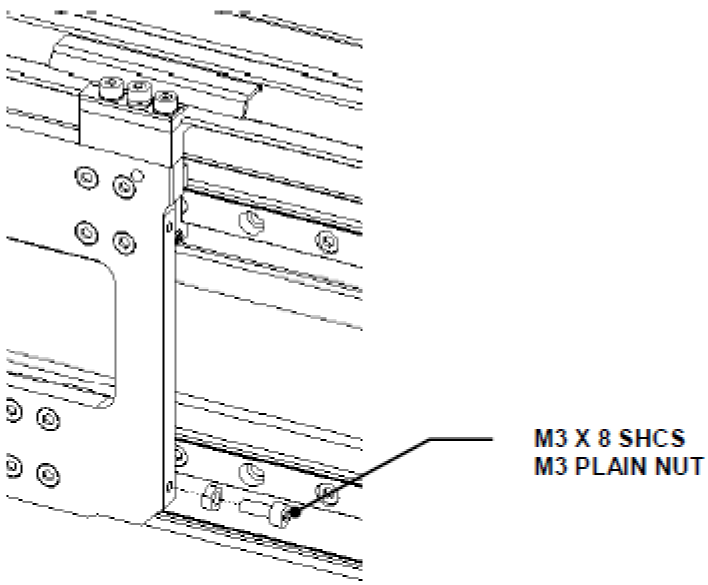


Figure Y-11: Positioning Nut on Z Plate

7. Fit the Transport Arm Y Drive Belt Tensioning Fixture (P24FIX008) to the Y Drive Plate using the screw supplied with the fixture (Figure Y-12). Do not use Loctite.

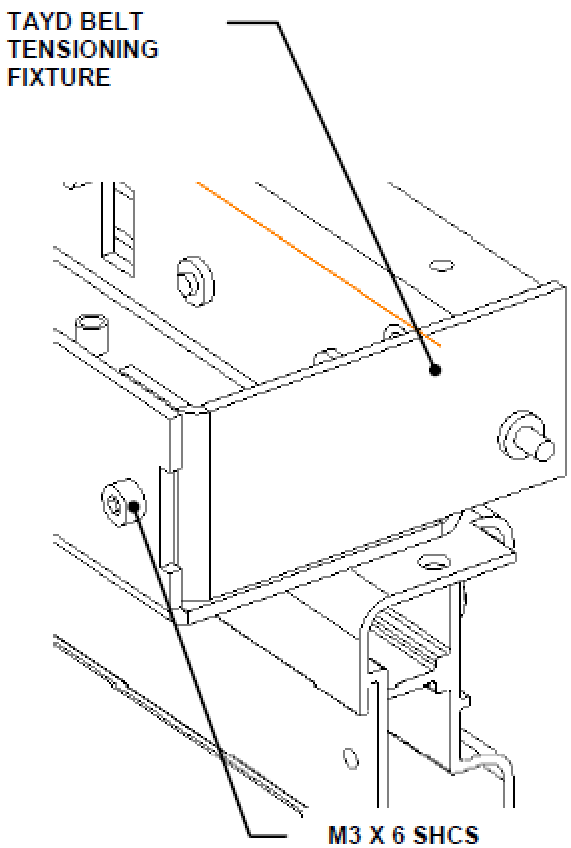


Figure Y-12: Transport Arm Y Drive Belt Tensioning Fixture

8. Fit the screw supplied with the fixture, through the Y Idler Adjusting Plate into the Belt Tensioning Fixture (Figure Y-13).

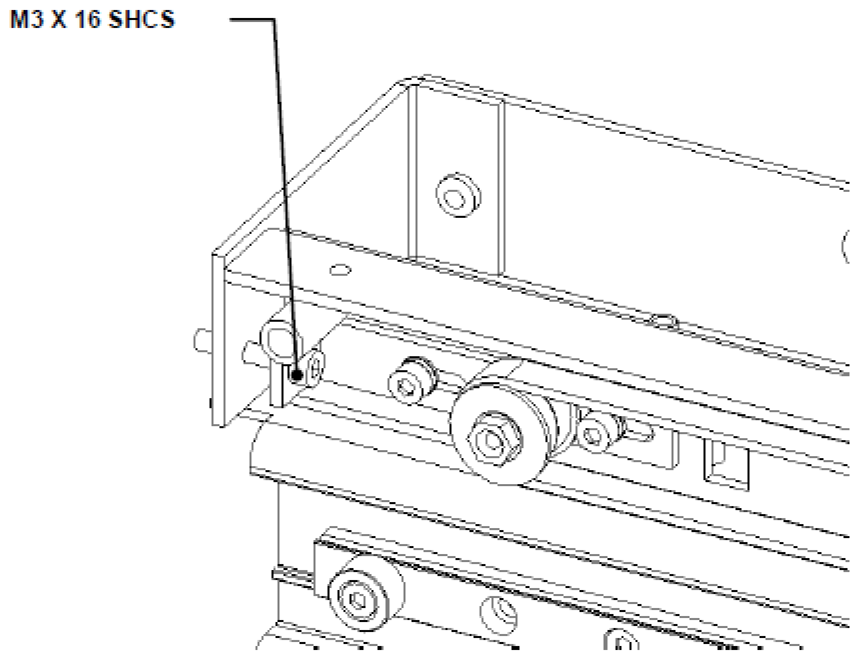


Figure Y-13: Screw between Y Idler Adjusting Plate and the Belt Tensioning Fixture

9. Ensure the two screws through the Y Idler Adjusting Plate are loose and that the Z Drive Plate (and nut) is pushed to the Y Drive Stop.

10. Position the Tension Meter (Gates Sonic Tension Meter 507C) at the approximate position indicated below **near the lower half of the belt**. The Tension Meter must be 3-6mm away from the belt to obtain a reading (Figure Y-14).

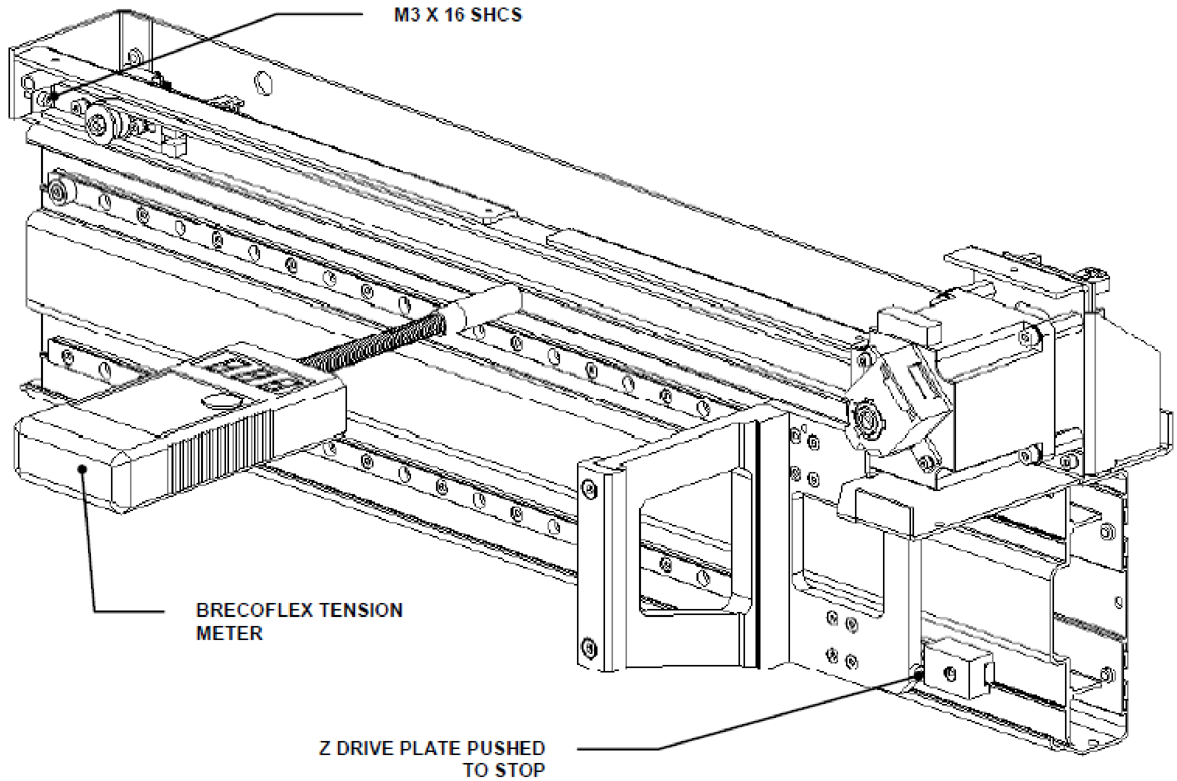


Figure Y-14: Using the Tension Meter

11. Tap the belt to cause it to oscillate. While the belt is oscillating, and the sensor is in position, press and hold the red button on the meter. The required frequency is 48 Hz..

12. If the reading is above or below this frequency, adjust the M3x16 screw in the Belt Tensioning fixture.

13. Repeat the above steps until three consecutive readings at 48 +/- 1 Hz are obtained.

14. Tighten the two M3x8 screws in the Z adjustable Idler Block.

15. Recheck the frequency using the meter. If it is still 48 Hz, remove the Belt Tensioning fixture. If not, loosen the screws (item I) and repeat steps 12 through 13).

Chapter Z Transport Arm, Z Drive

Z.1 Overview

The *Transport Arm* is used to move the items such as the microplates, smart kits and consumables of the system into the appropriate position for the various operations required to perform the assay. The arm can travel in the X, Y and Z directions, and includes a gripper mechanism to remove an item from its present location and move it to the desired location. Service of the gripper is described in Section H.

The Z-Drive is replaced on site and repaired at a service depot.

Z.2 Removing the Covers

To remove the covers:

1. Remove the Transport Arm Z Drive Motor Cover from the back of the Z Drive (Figure Z-1).

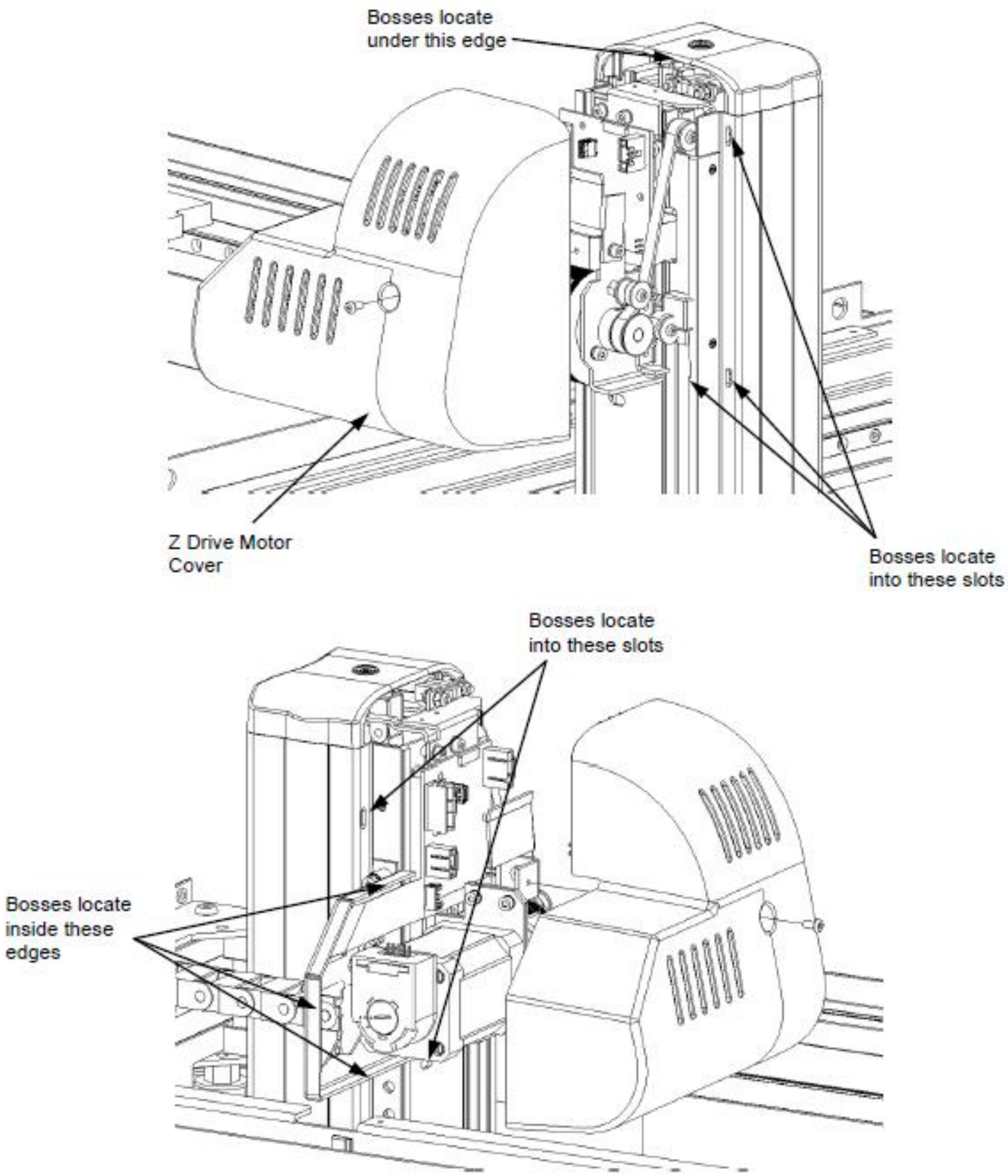


Figure Z-1: Removing the Z Drive Motor Cover

> ***Note:*** *When replacing the cover, ensure that the four sets of bosses which locate into slots in the rear of the drive, three bosses which locate inside the Upper Cap, and three bosses which locate inside the Y Drive Flex Cable Bracket are properly fitted and secure the screw with Loctite 425.*

2. Remove the two Transport Arm Z Cover Upper Strips from the Upper Z Extrusion and remove the Transport Arm Upper Cap from the top of the assembly (Figure Z-2). When replacing, secure the screw with Loctite 425

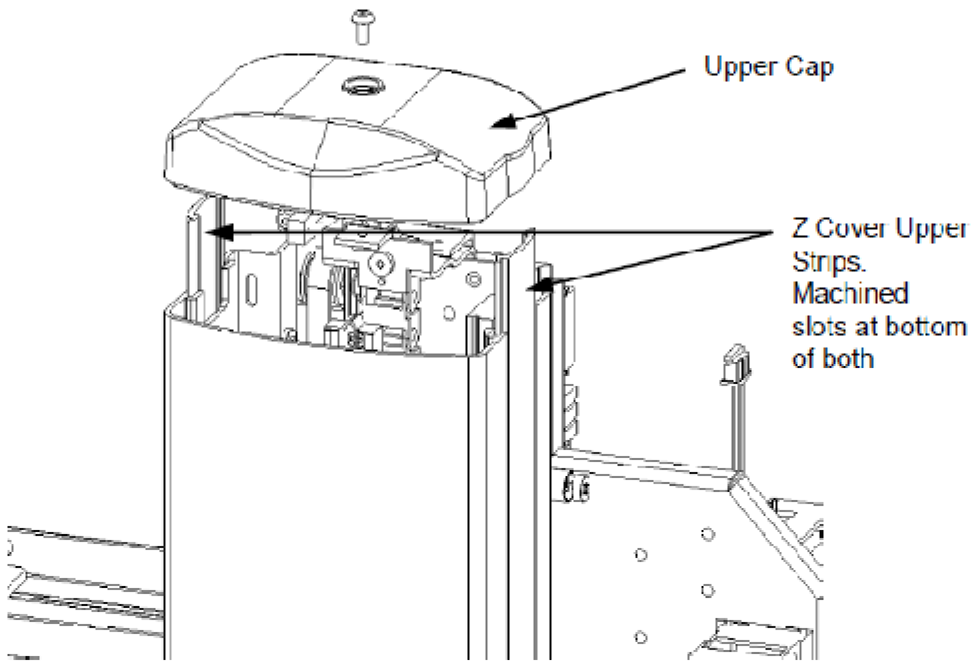


Figure Z-2: Removing Cap and Cover Screws

3. Remove the two screws holding the Z Drive Spring Housing to the Z Drive Motor Bracket (Figure Z-3).

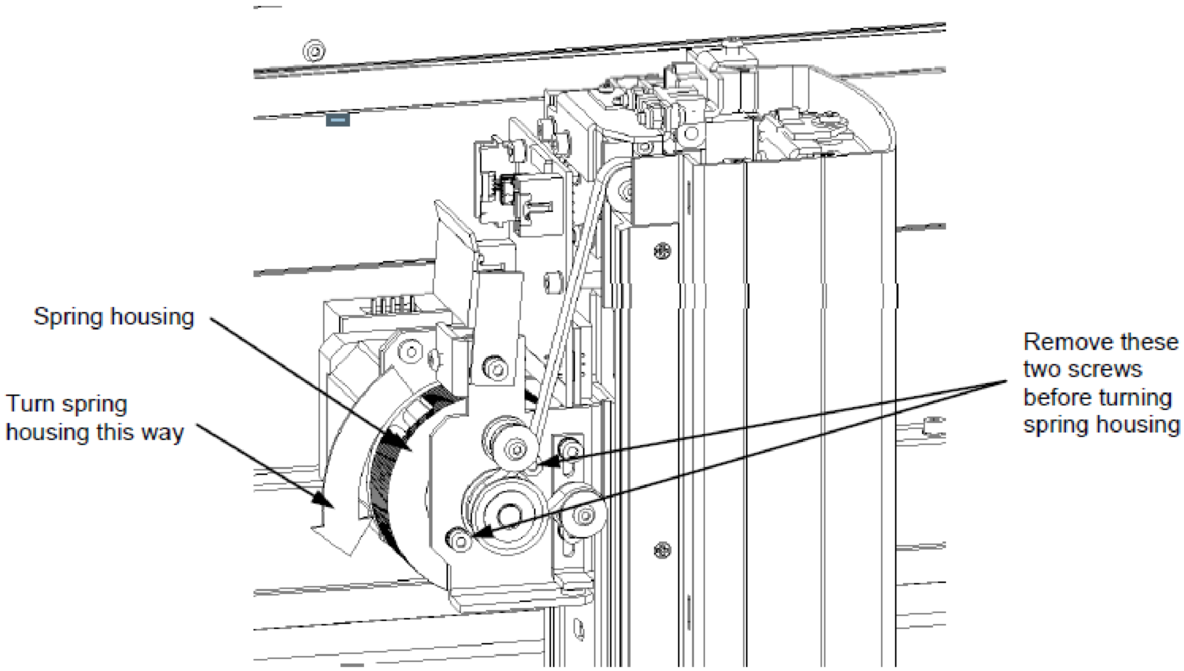


Figure Z-3: Spring Drive Housing

When replacing, turn the Spring Housing in the direction shown three complete revolutions and then re-secure to the Motor Bracket. Ensure the Bearing in the Motor Housing locates in the Hole of the Motor Bracket.

4. Remove the Gripper Assembly as Described in Section H.

5. Remove the two Transport Arm Z Cover Strips from the Center Z Extrusion (Figure Z-4).

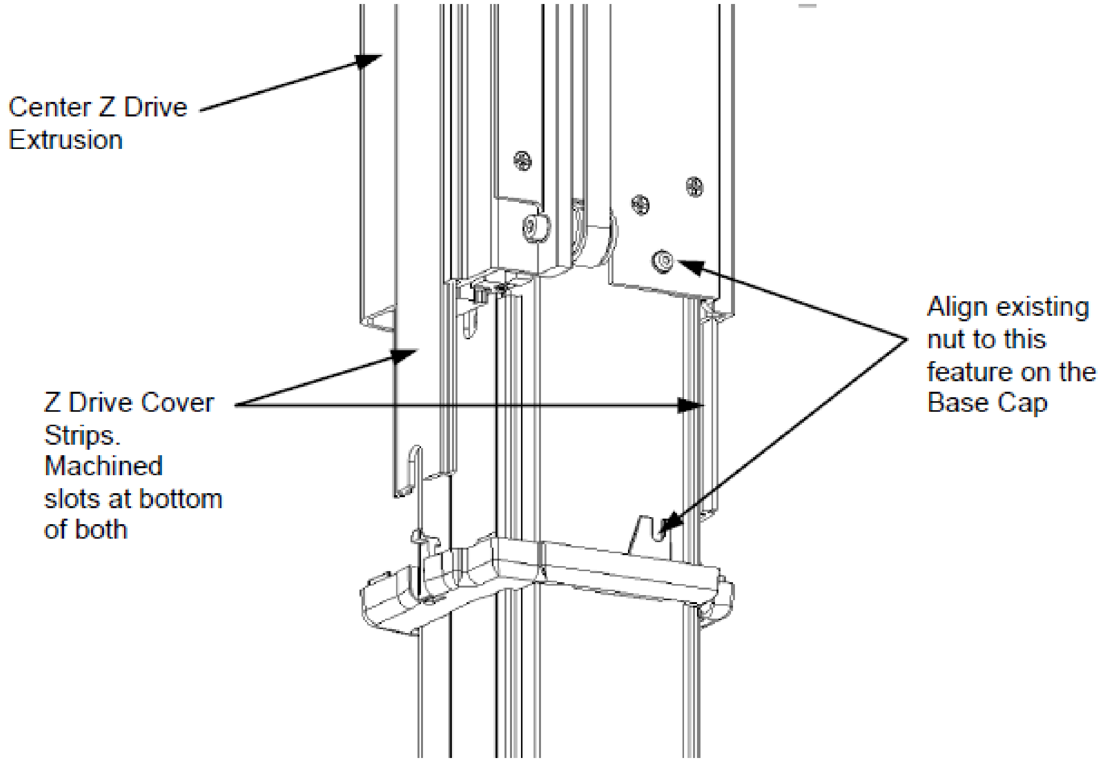


Figure Z-4: Center Z Extrusion

6. Remove the Transport Arm Center Base Cap to the Center Z Extrusion.

When replacing the cap, make sure that the hook is clipped into the slot shown in Figure Z-5 and secure the screw with Loctite 425.

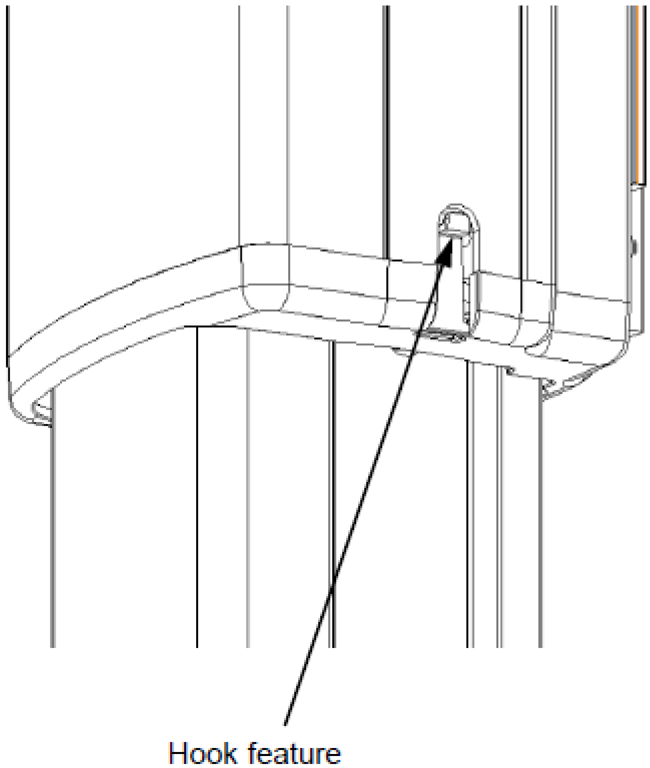


Figure Z-5: Inserting the Cap

7. Lift the left hand Cover Strip to expose the Flex Cable and Rotator PCB. Disconnect the Flex Cable to the PCB and raise the Cover Strip. Then, remove the screw that secures it to the lower Z drive extrusion (Figure Z-6). When rebuilding, secure the screw with Loctite 222.

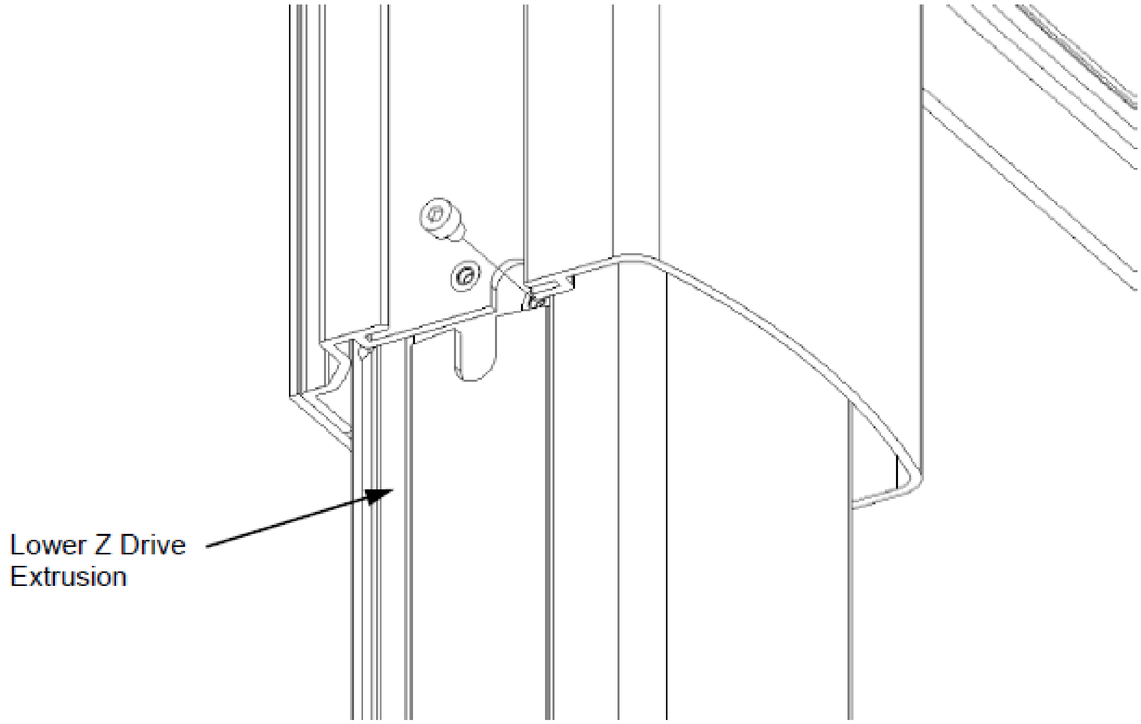


Figure Z-6: Securing the Lower Z Drive Extrusion

8. Remove the two Transport Arm Z Cover Strips up from the lower section of the Z Drive and remove the Rotator Drive from the bottom of the Z Drive.

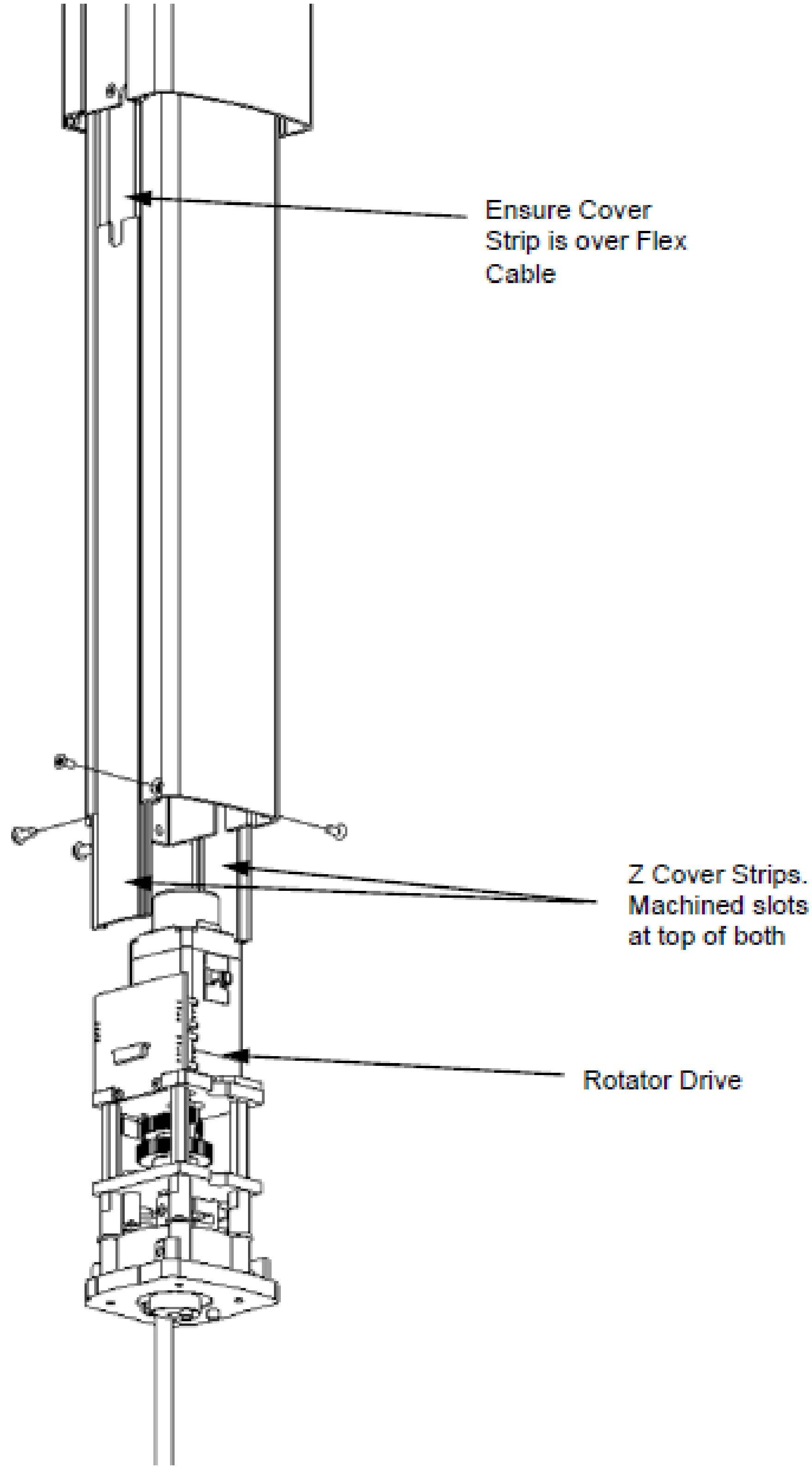


Figure Z-7: Removing the Rotator Drive

When rebuilding, ensure that ensure the left hand Cover Strip slides in over the exposed Flex Cable and secure the screws using Loctite 222.

9. Remove the USB connector by loosening its mounting screw (Figure Z-8).

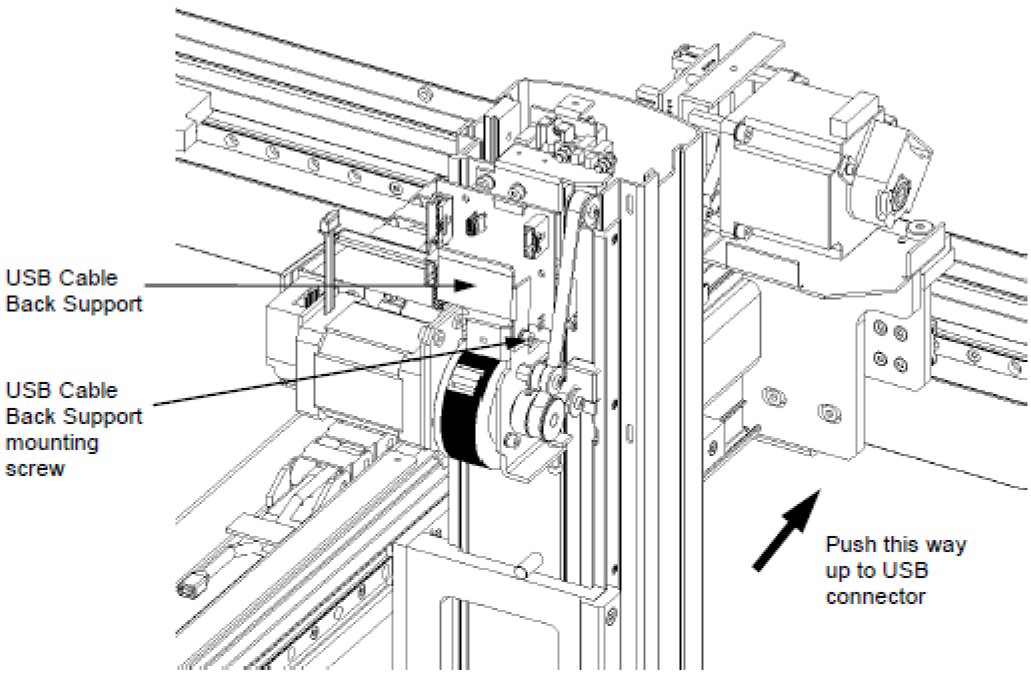


Figure Z-8: USB Mounting Screw

10. Remove the Flex Cable and USB from the Y Drive Cable Chain into the PCB on the rear of the Z Drive (Figure Z-9).

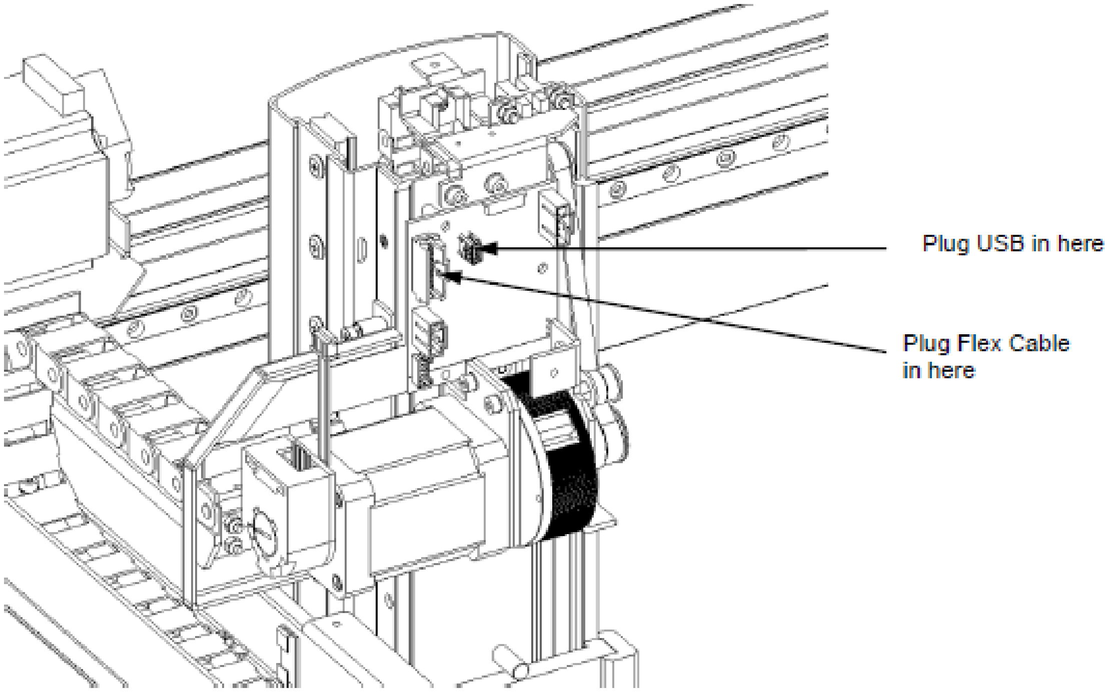


Figure Z-9: Removing Flex Cable and USB

11. Remove the Y Drive Cable Chain Plate to the side of the Z Drive as shown in Figure Z-10.

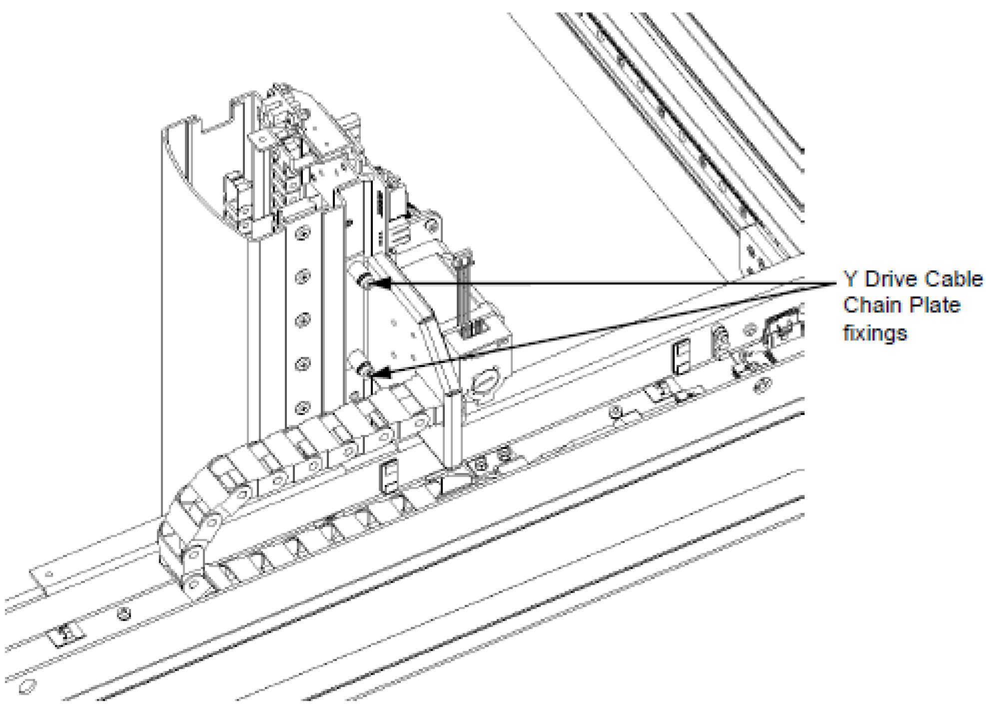


Figure Z-10: Removing the Y Drive Chain Plate

12. Remove the front of the Z drive.

> **_Note:_** *For clarity, the Transport Arm has been isolated in the following views.*

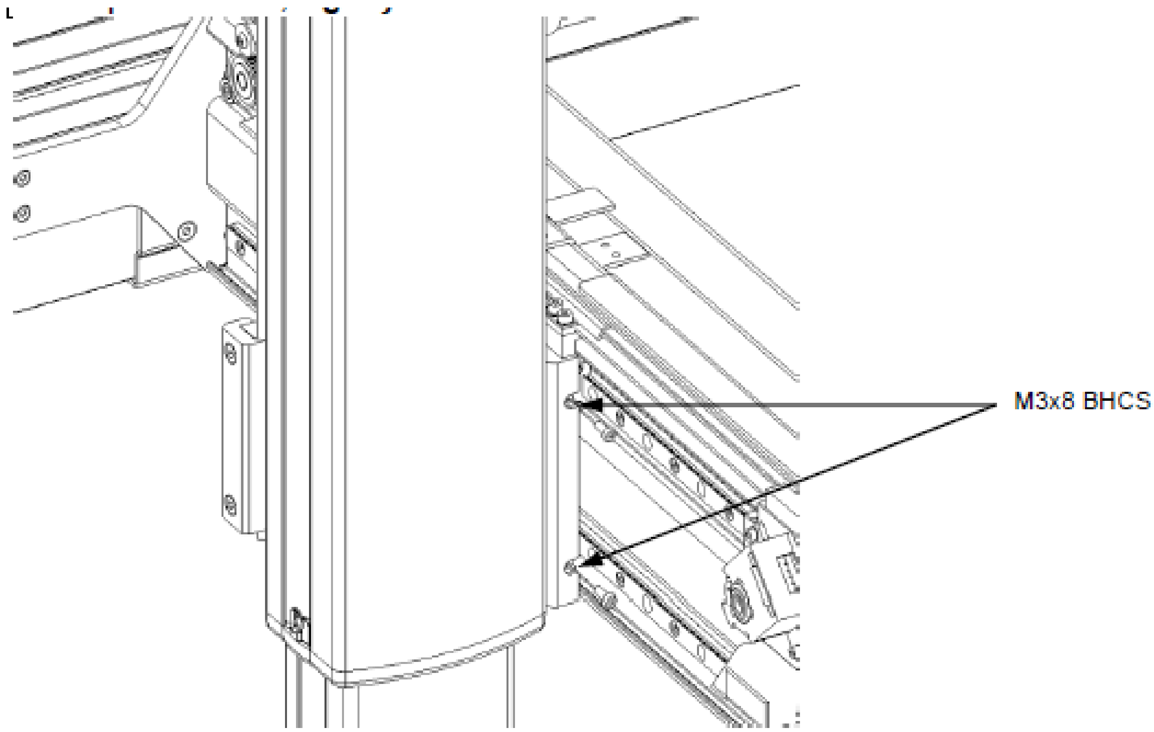


Figure Z-10: Removing the Front of the Z Drive

13. Loosen the Z drive Clamping screws.

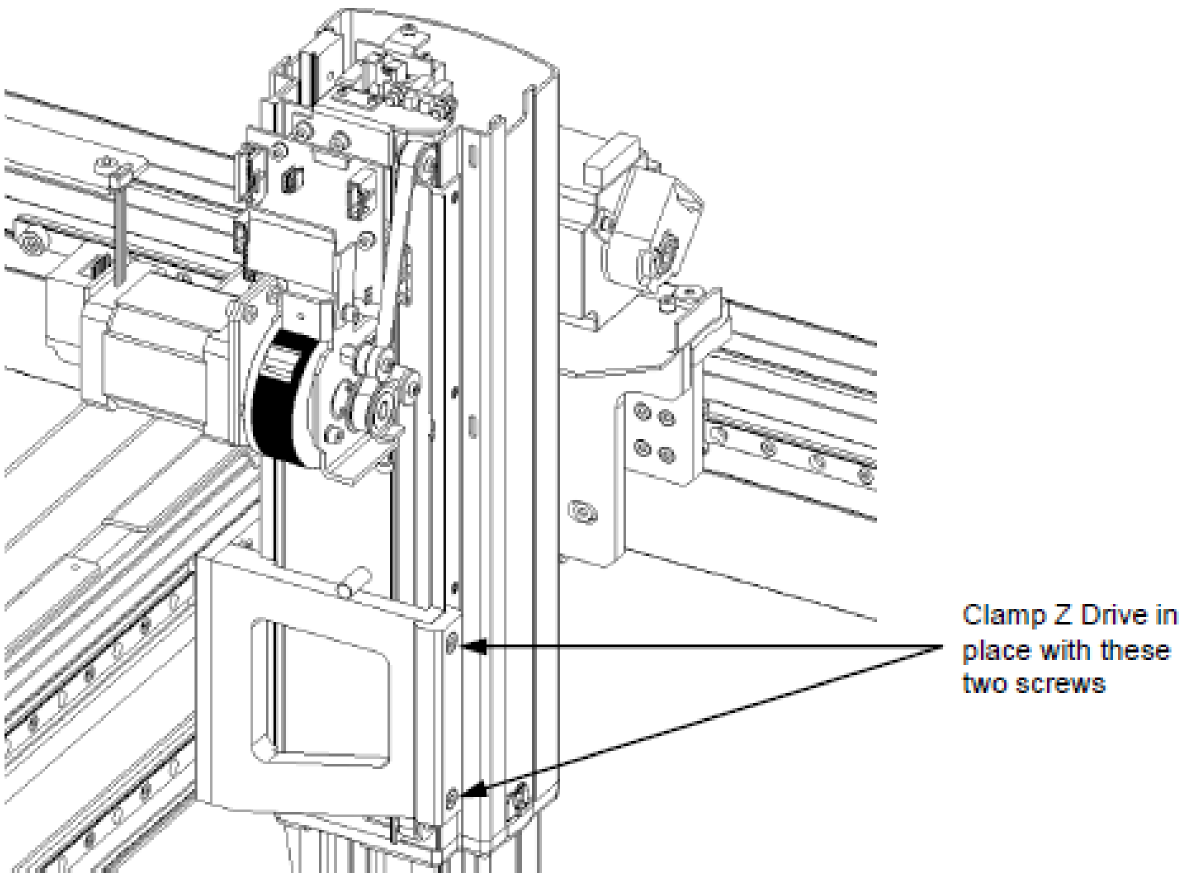


Figure Z-11: Clamping Screws

14. Remove the Z drive.

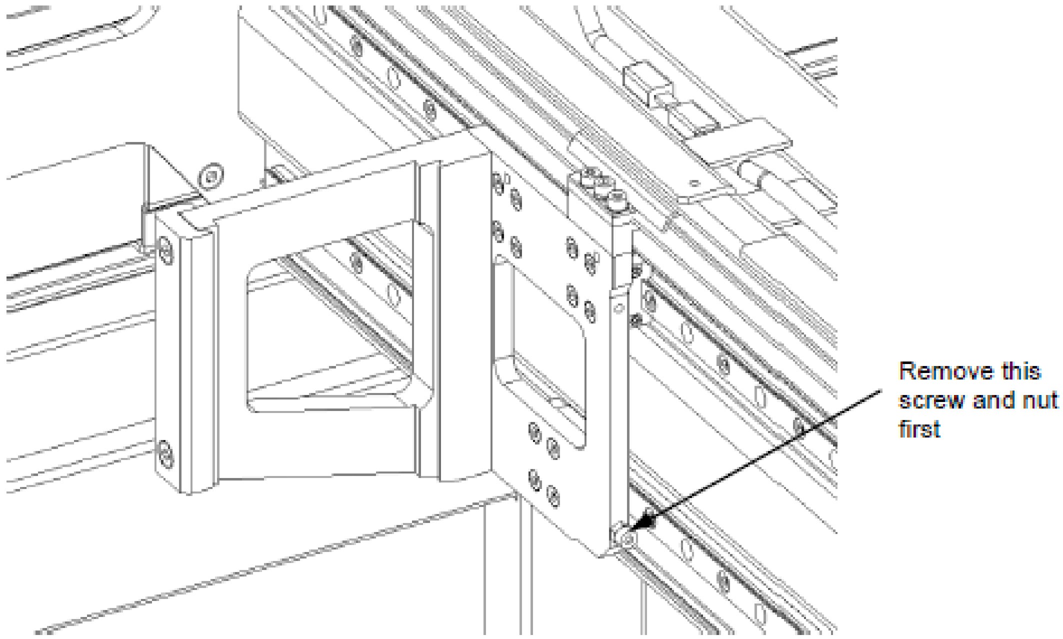


Figure Z-12: Removing the Z Drive

When rebuilding the system, remove the screw and hex nut fitted to the front of the Main Y Drive travelling Plate. Then, ensuring the two Z Drive clamping screws are loose, place the Main Z Drive (13501141) onto the Y Drive so that its rear stop is touching the Y Drive travelling plate and that the angled sections at the rear of the Z Drive are in the grooves of the Y Drive travelling plate.

Z.2 Replacing Components

Z.2.1 Motor and Encoder

The motor, spring housing and encoder module are attached to the Transport Arm Upper Z Backplate as shown in Figure Z-13.

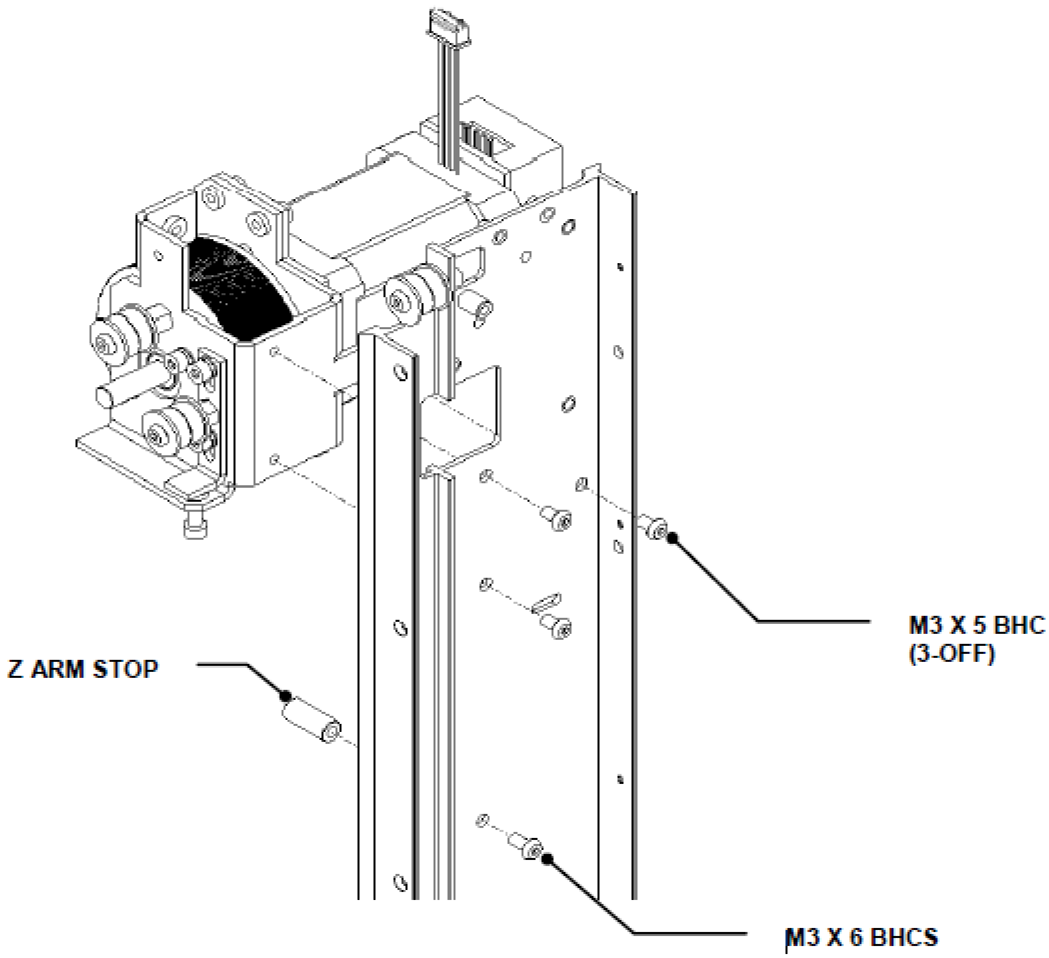


Figure Z-13: Attachment of Motor to Transport Arm

Z.2.1.1 Replacing the Module

To replace the module:

1. When replacing the module, use Loctite 222 to affix the screws, then fit the TAZD Pulley to Z Motor Coupling using the P24FIX086 fixture to set the gap between the pulley and the Z Motor Bracket as shown in Figure Z-14. Fit with two M4x6 Cone Point Set Screws. Use Loctite 222. Do not fully tighten the screws yet, allowing rotation of the pulley on the shaft.

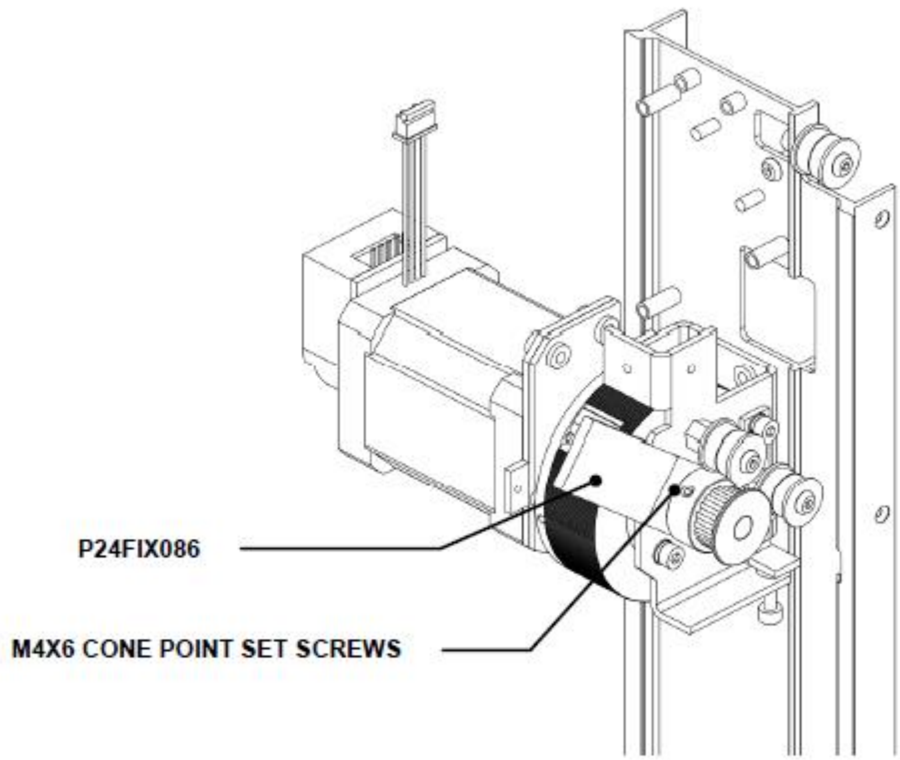


Figure Z-14: Fitting Pulley to Motor Coupling

2. Route the TAZD Upper Belt as shown in Figure Z-15. Position the Tension Meter (Gates Sonic Tension Meter 507C) at the approximate position indicated in the figure (the Tension Meter must be 3-6mm away from the belt to obtain a reading).

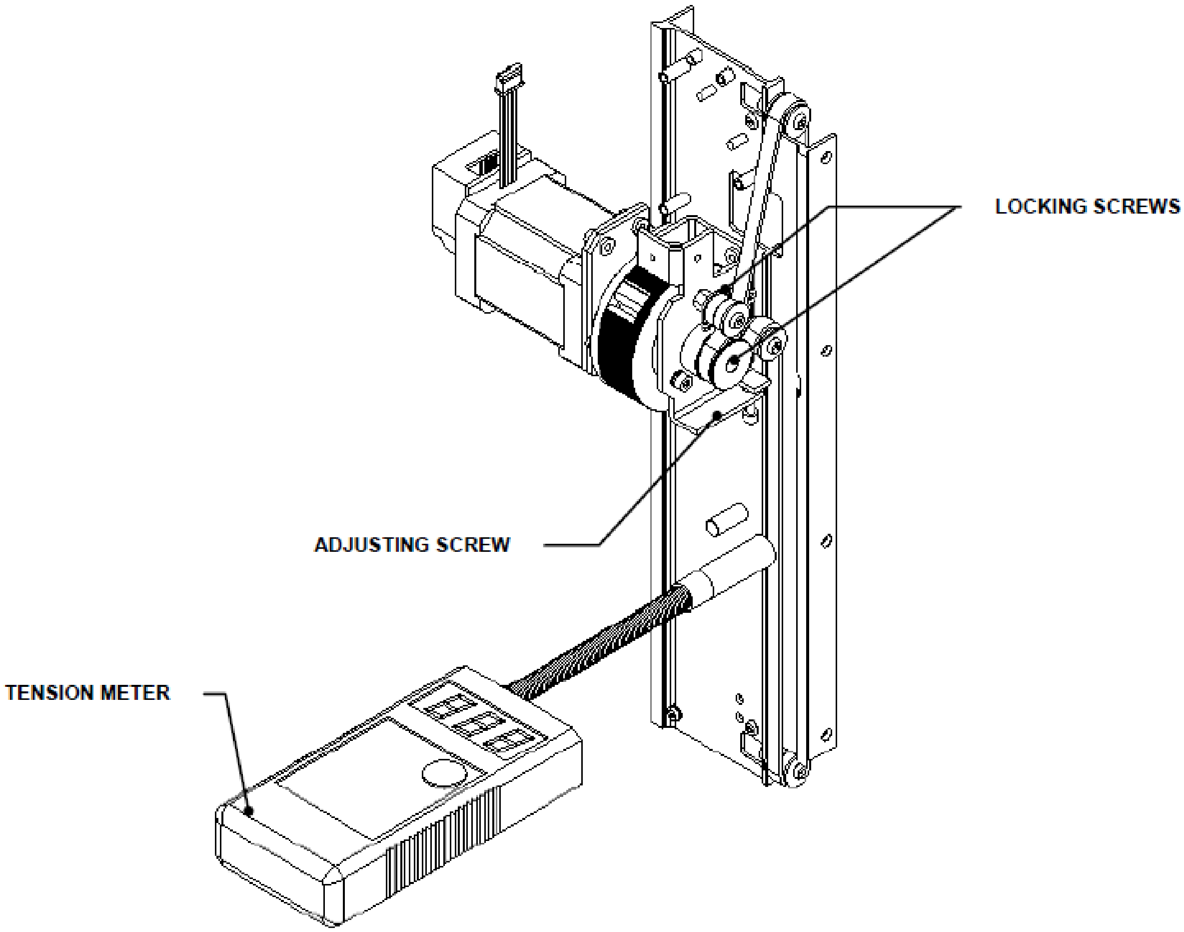


Figure Z-15: Adjusting the Belt Tension

3. Tap the belt to cause it to oscillate. While the belt is oscillating and sensor is in position, press and hold the red button on the meter.

4. Monitor the meter, the required frequency is 155 ±5 Hz. If the reading is above or below this frequency, adjust the M3x12 SHCS screw in the Belt Tensioning Fixture.

5. Repeat the above steps until three consecutive readings at 155 ±5 Hz are obtained.

6. Tighten the two M3x8 SHCS in the Z Motor Idler Adjusting Plate to lock the tensioning idler.

7. Re-check the frequency using the meter.

8. The Counterbalance Spring now needs to be preloaded. Ensure that the TAZD is in the fully retracted position and remove the two M3 x 8 Screws and Washers securing the Spring Housing to the Z Motor Bracket

9. Wind the spring housing in the direction shown a total of 5 complete revolutions (Figure Z-16). Note that it will get progressively more difficult to wind as the tension increases.

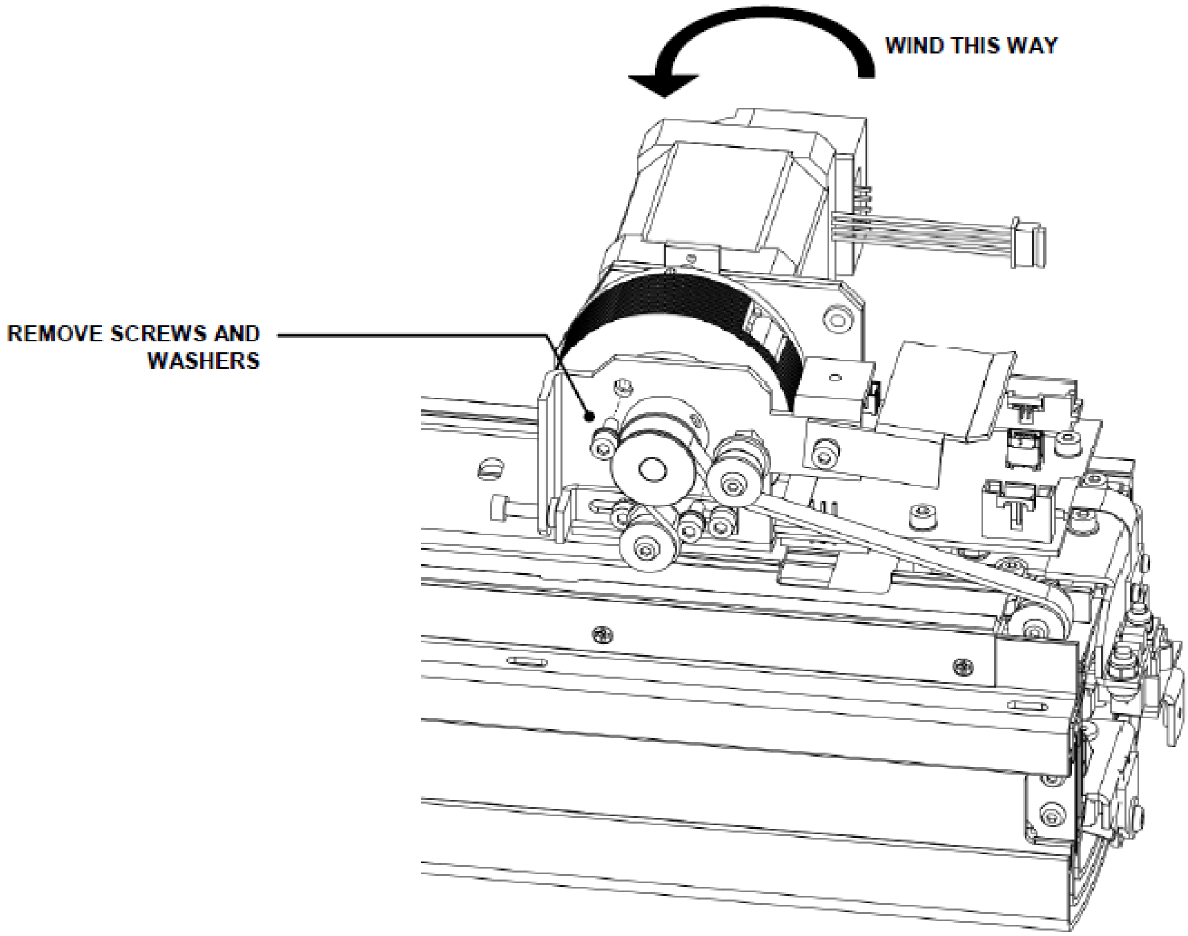


Figure Z-16: Rewinding the Spring

Z.2.2 Disassembling and Reassembling the Motor Module

To disassemble and reassemble the motor module:

1. Remove the mounting bracket (Figure Z-17).

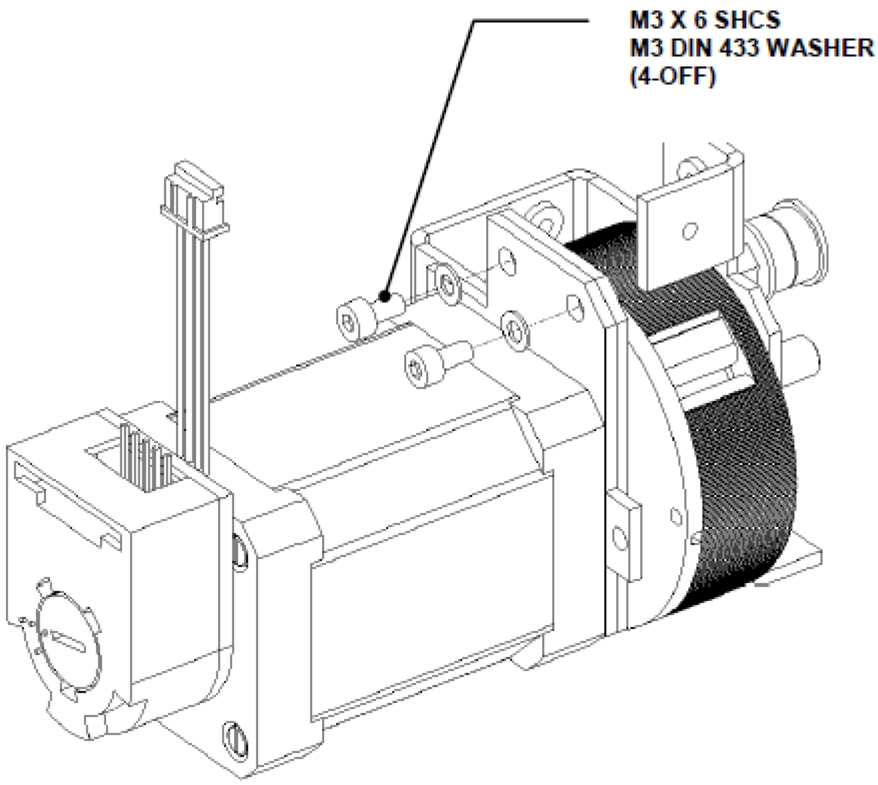


Figure Z-17: Mounting Bracket

2. Remove the Spring Assembly (Figure Z-18).

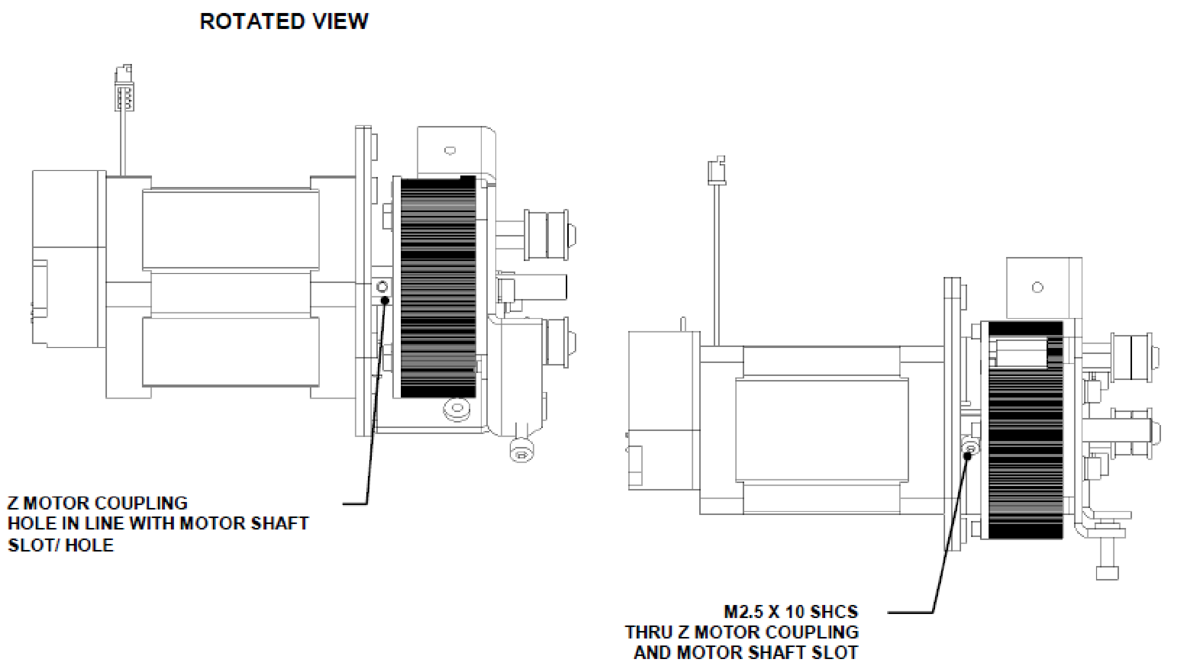


Figure Z-18: Attaching the Motor to the Spring Housing

When reassembling, engage the shaft of the motor with the hole in the end of the Z motor coupling and set the rotation of the motor shaft so that its slot aligns with the hole in the Coupling. Loosely insert a M2.5 x 10 DIN 912 SHCS through the coupling using Loctite 222.

3. Remove the Z Motor Coupling which (Figure Z-19).

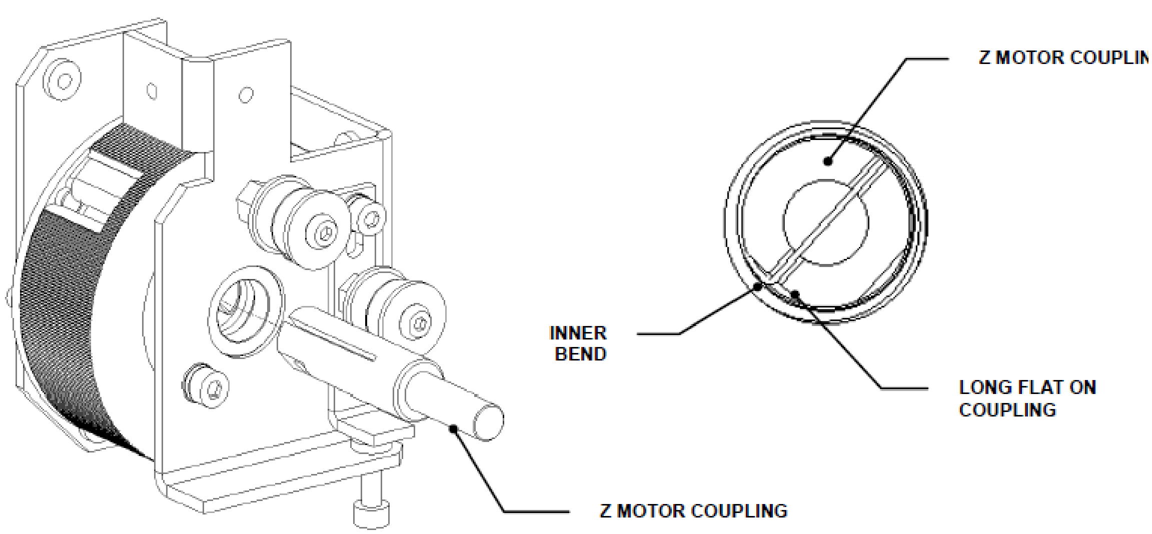


Figure Z-19: Removing the Z Motor Coupling

When replacing the Z motor coupling, push Z Motor Coupling (23505790) though bearing in Spring Housing and rotate it so that it engages with Counterbalance Spring. Fit so that the long flat on the end of the Z Motor Coupling is located at the inner bend of the spring as shown. Push coupling fully home. The inner end of the spring will limit the travel.

Note: *The disassembly of the spring assembly is presented in Section Z.2.4.*

4. Remove the TAZD Doubler Plate (Figure Z-20).

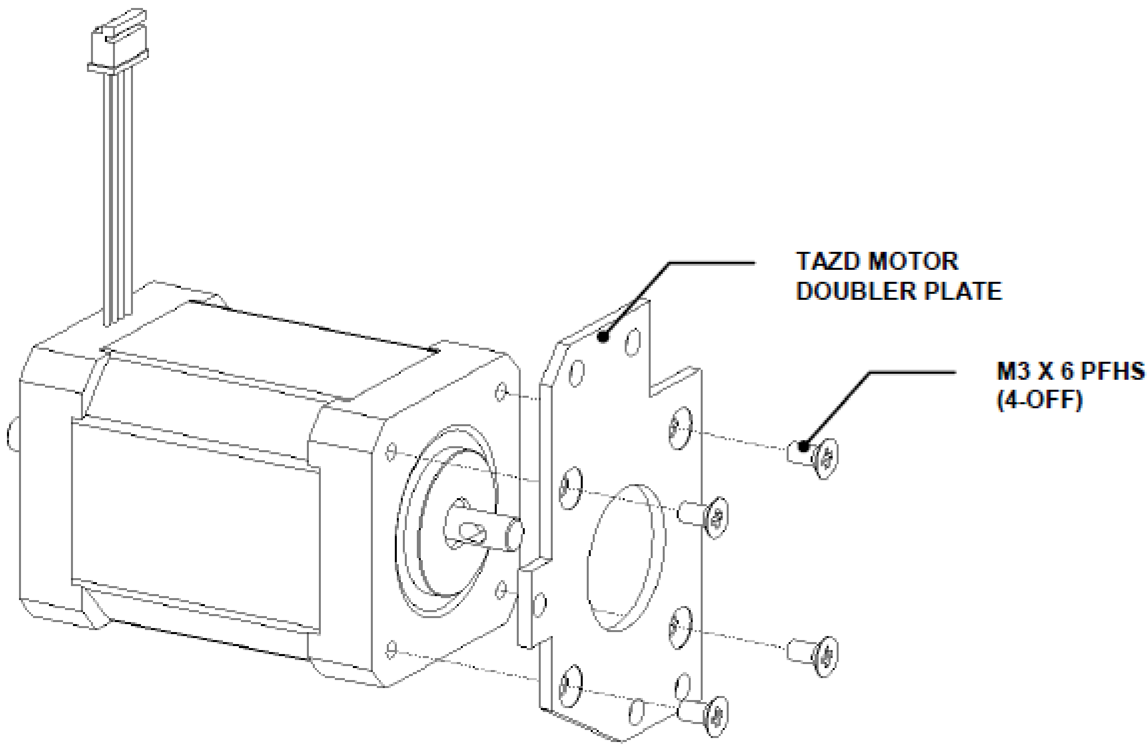


Figure Z-20: Removing the Motor Doubler Plate

5. Remove the Encoder from the Motor, by placing an Allen key in the body and apply an upward force on the key to free the encoder. Reinstallation of the Encoder is described in Section Z.2.3.

6. Remove the encoder mounting plate. When reinstalling, use the Encoder Center Fixture (DSXFIX015) to ensure that the Mounting Plate is located concentrically with Motor Shaft. Fix the mounting plate using two M2.5 x 5 BHCS and a small amount of Loctite 425 (Figure Z-21).

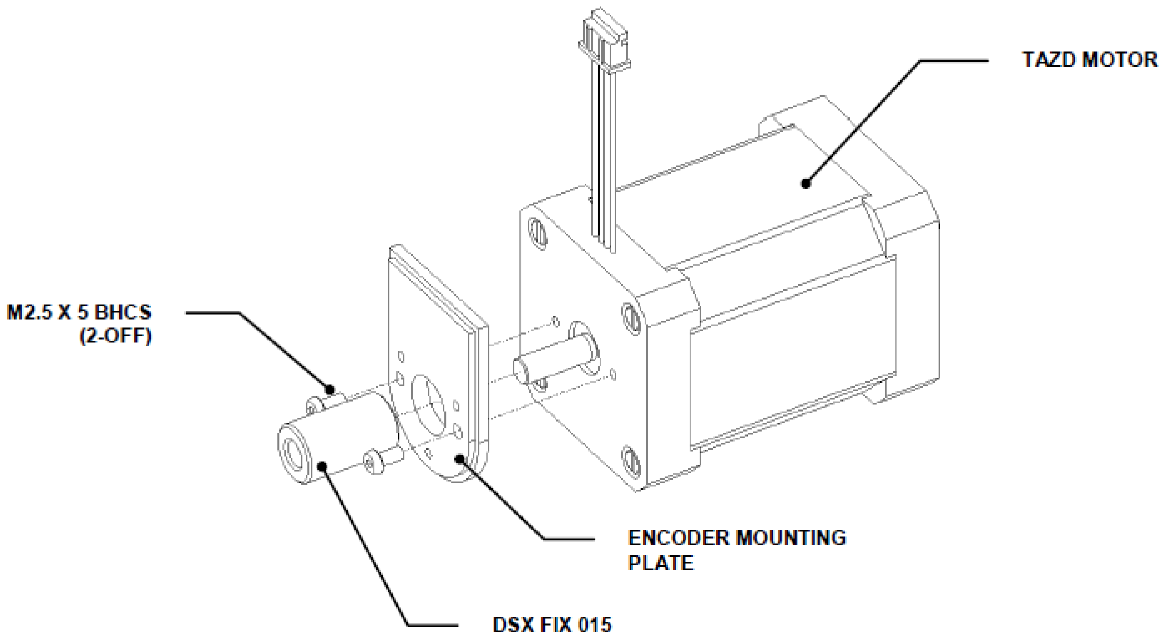


Figure Z-21: Encoder Mounting Plate

Z.2.3 Reinstallation of the Encoder

To replace the encoder:

1. Install the main part of the Encoder onto the Mounting Plate by snapping it in place (Figure Z-22).

> *Note:* *Do not remove the Allen key in the encoder.*

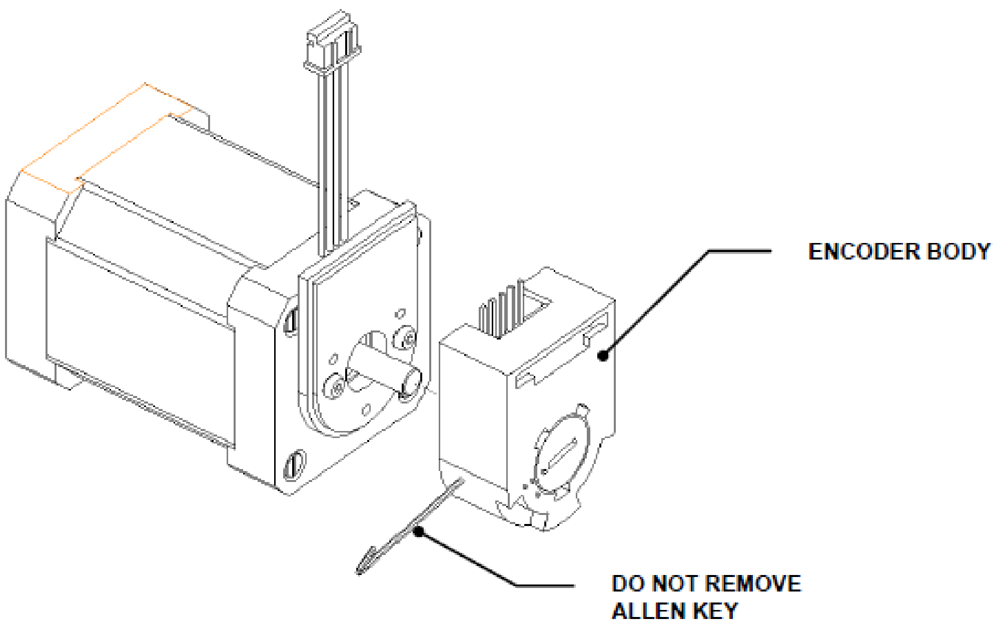


Figure Z-22: Installing the Encoder

2. Push the Allen Key into the body of the encoder to ensure that it is properly seated into the code wheel hub set screw. Then, apply a downward force on the end of the Allen Key. (This sets the code wheel gap by levering the code wheel hub to its upper position.) While continuing to apply a downward force, rotate the Allen Key to the clockwise direction until the hub set screw is tight against the idler shaft. Remove the Allen Key by pulling it straight out of the encoder body (Figure Z-23).

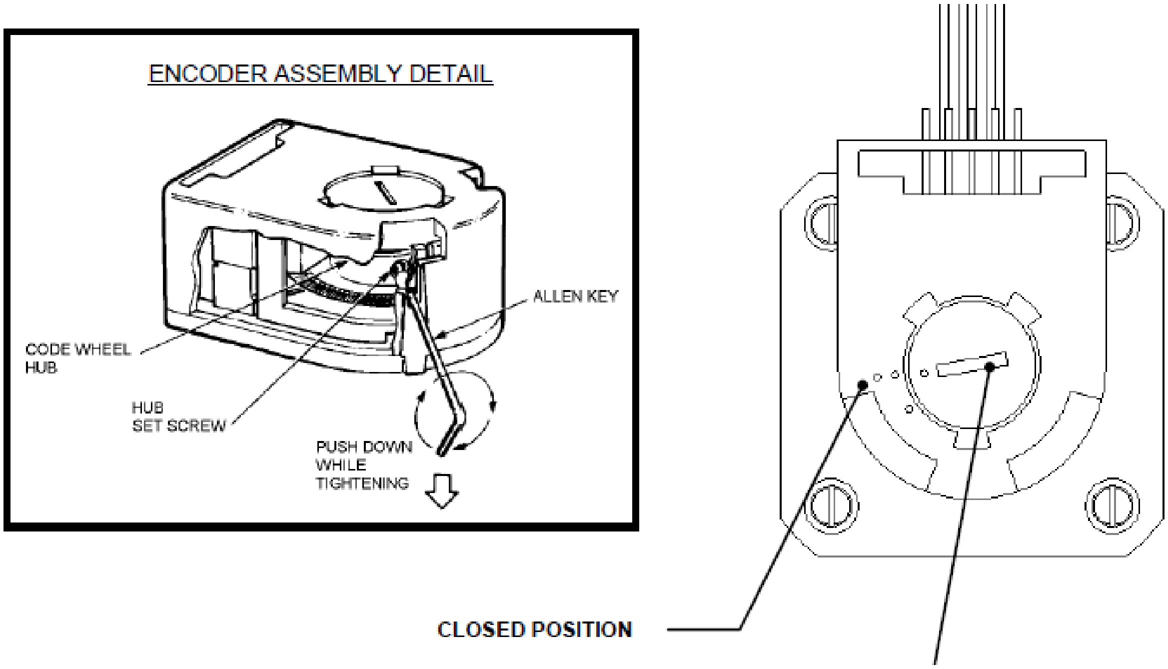


Figure Z-23: Encoder Assembly Detail

3. Rotate the encoder cover from the open to the closed position by inserting a flat blade screwdriver into the notch and rotating.

Note: *The encoder cover is shown below in the closed position.*

Z.2.4 Spring Housing

The spring housing assembly is shown in Figure Z-24.

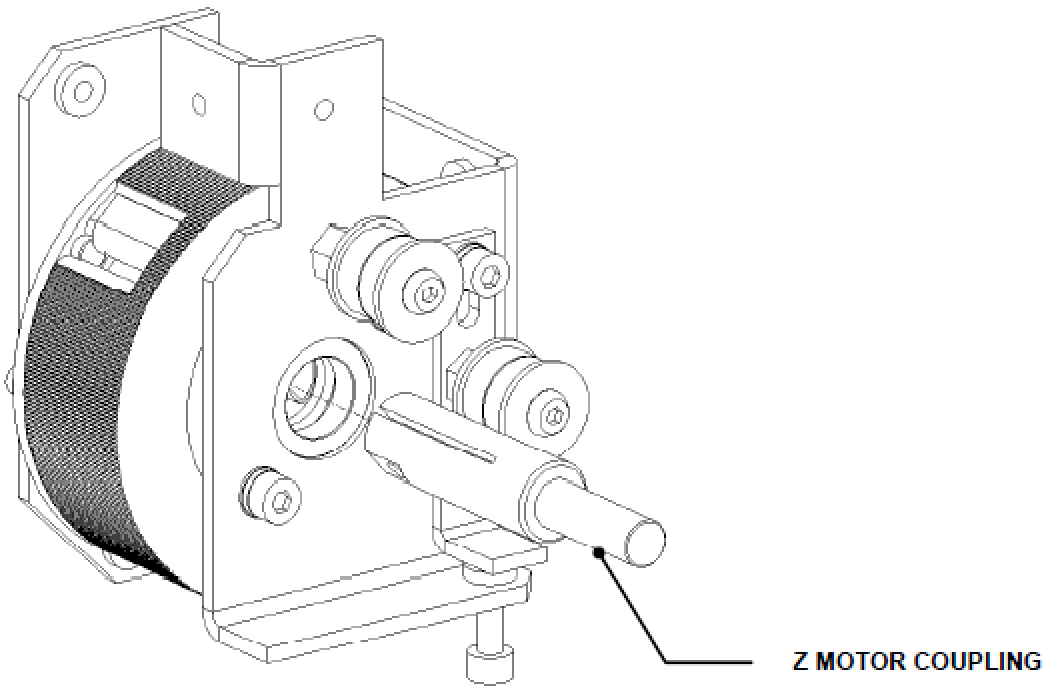


Figure Z-24: Spring Housing Assembly

To disassemble the Spring Housing Assembly:

1. Remove the coupling (Figure Z-24).
2. Remove the bearing that is pressed into the spring housing (Figure Z-25).

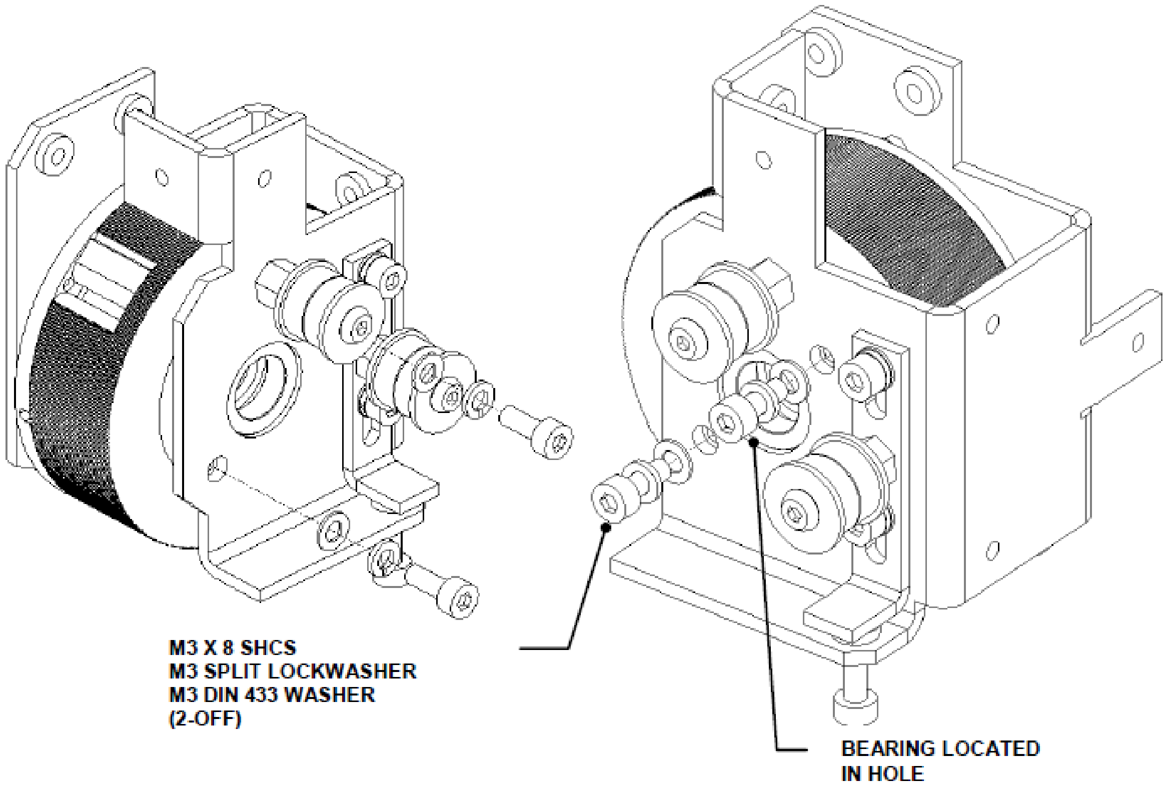


Figure Z-25: Removing the Bearing

3. Remove the three screws which attach the spring housing lid to the housing.

To rebuild the spring housing:

1. Take a P24 Counterbalance Spring and cut the heat-shrink around it using a pair of side cutters. Do not use a blade across the edges of the spring as they may become scored.

Figure Z-26: Removing Heat Shrink

2. Place Counterbalance Shim into Spring Housing removing the spring retainer as required (Figure Z-27). Ensure that the spring is inserted so that the edge of the outer coil is flush with the face of the Spring Housing around the whole of its circumference. This can be achieved by pressing the housing and part inserted spring down onto a flat surface.

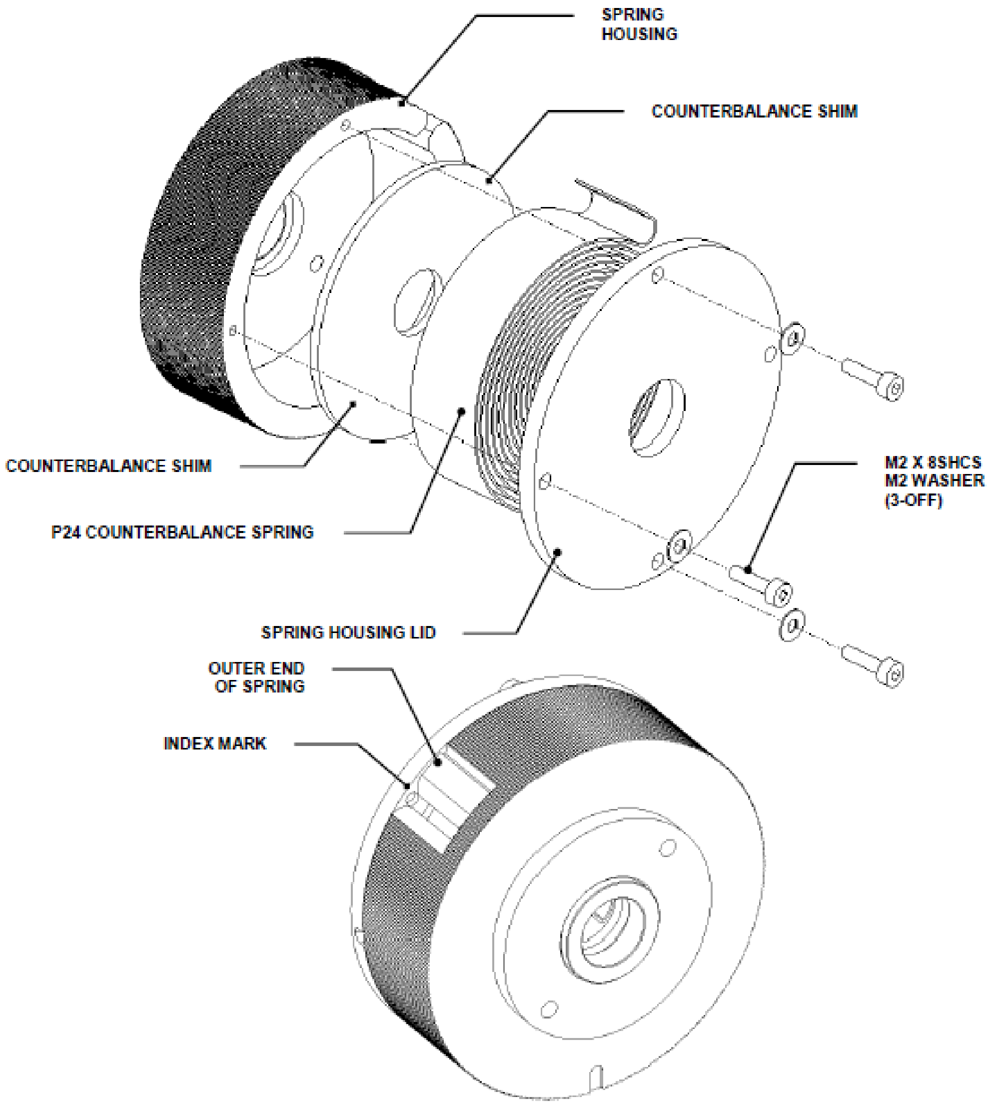


Figure Z-27: Spring Assembly

3. Place the Spring Housing Lid onto the spring housing and align the index mark on it with the outer end of the spring.

4. Secure the spring housing lid to the Spring Housing using three M2 x 8 SHCS and M2 washers in the locations shown and use Loctite 425.

Z.2.5 Replacing the Center Belt

The center belt is located in the center backplate assembly (Figure Z-28), which is mounted on the Center extrusion.

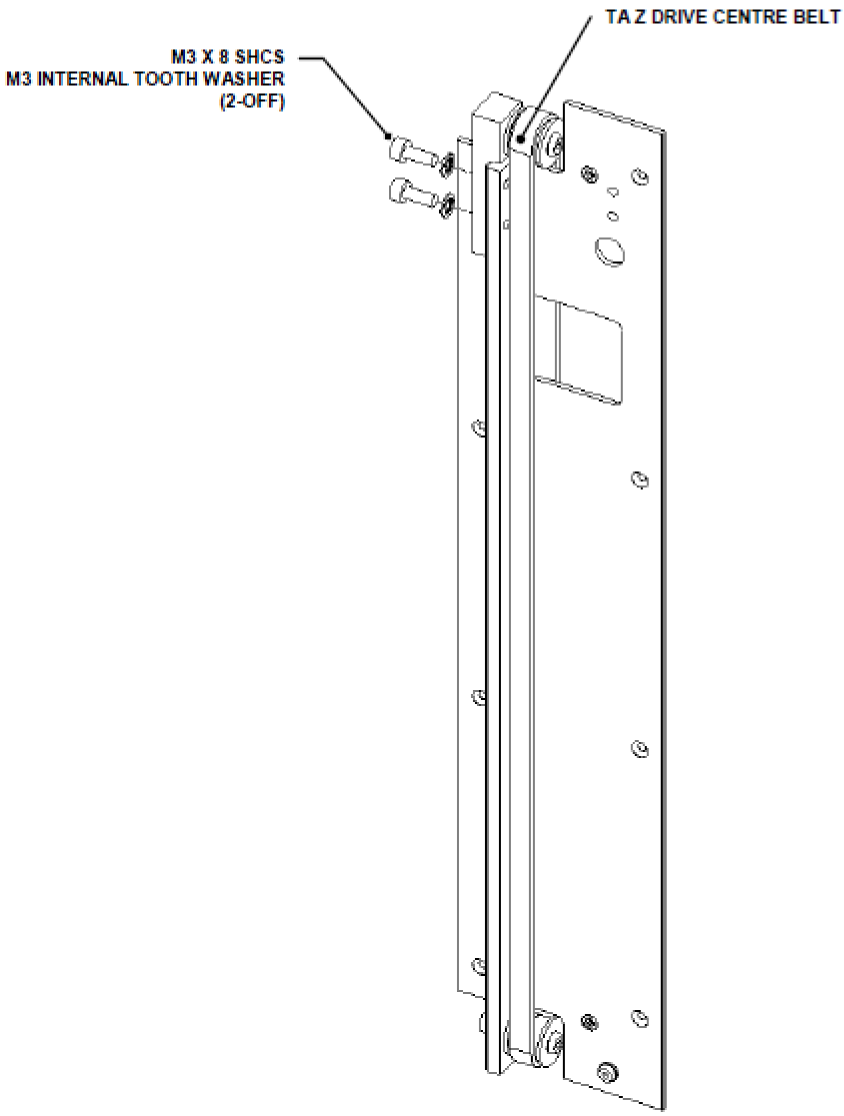


Figure Z-28: Center Belt Assembly

The belt can be removed by loosening the lower bearing the assembly from the center extrusion.

To replace the belt:

1. Fit the Center Belt over the lower idler assembly so that the teeth are in contact with the bearings.
2. b). Fit Z Adjustable Idler block and bearing assembly into belt. Loosely fit two M3 x 8 SHCS and M3 Internal Tooth Lockwashers and secure with Loctite 222.
3. Insert the Transport Arm Centre Z Backplate assembly into TAZD Center Belt Tensioning Fixture (P24FIX026) and position the Gates Sonic Tension Meter 570C at the position indicated in Figure Z-29 approximately in line with the notch in the fixture. The Tension Meter must be 3-6mm away from the belt to obtain a reading.

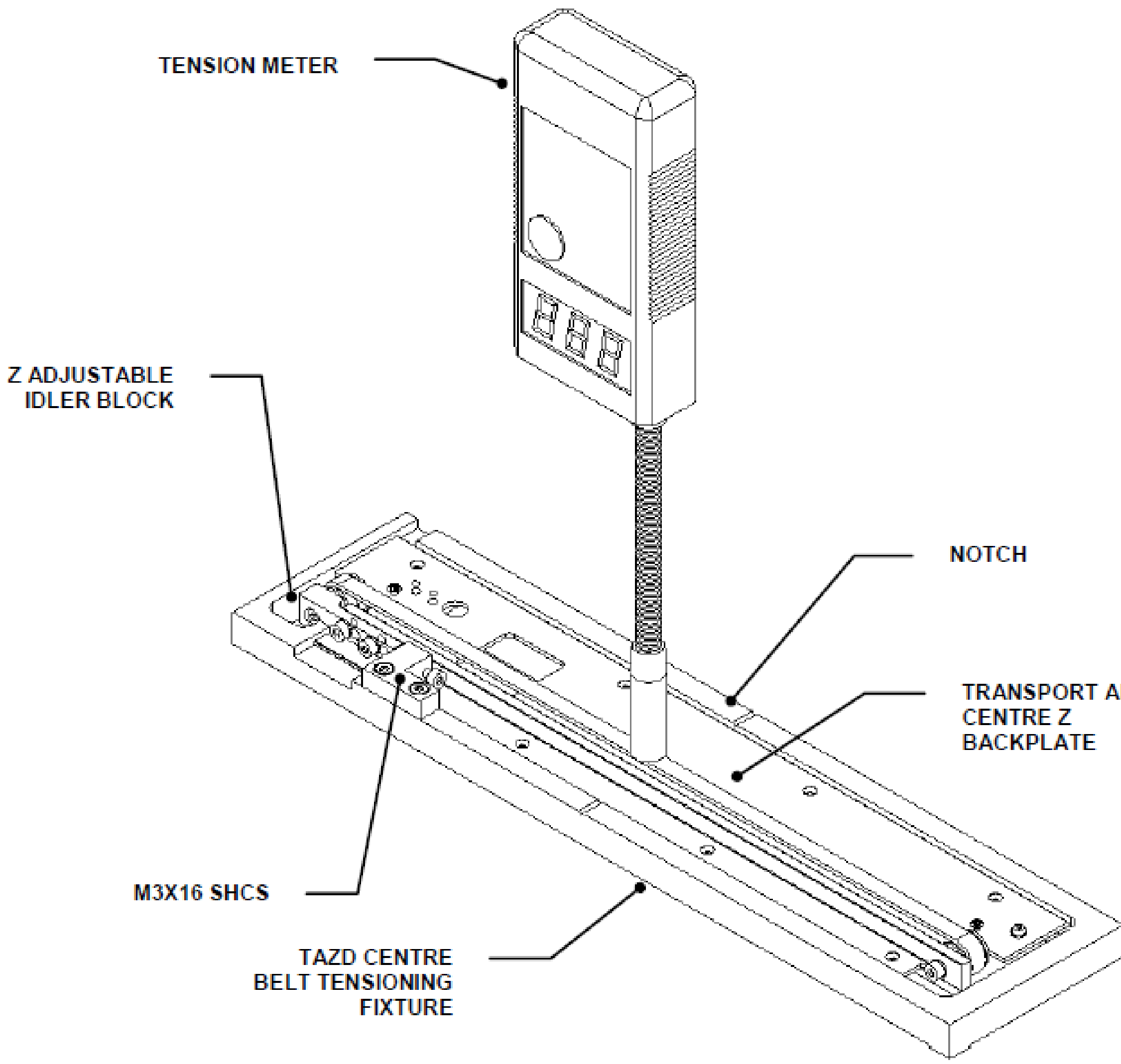


Figure Z-29: Inserting the Assembly in the Tensioning Fixture

4. Tap the belt to cause it to oscillate.
5. While the belt is oscillating and the sensor is in position, press and hold the red button on the meter. The required frequency is 76-80 Hz. If the reading is above or below this range adjust the screw in the Belt Tensioning Fixture.
6. Repeat the above steps until three consecutive readings in 76-80 Hz are obtained.
7. Tighten the two M3x8 SHCS in the Z Adjustable Idler Block.
8. Re-check the frequency using the meter.
9. Remove the Transport Arm Center Z Backplate from the TAZD Center Belt Tensioning Fixture.
10. Replace the backplate on the Center Z extrusion.
11. Pull the Centre Z Extrusion out to the approximate position shown (Figure Z-30) and place the Belt Clamp Locator (P24FIX029) on to the TA Centre Z Backplate.

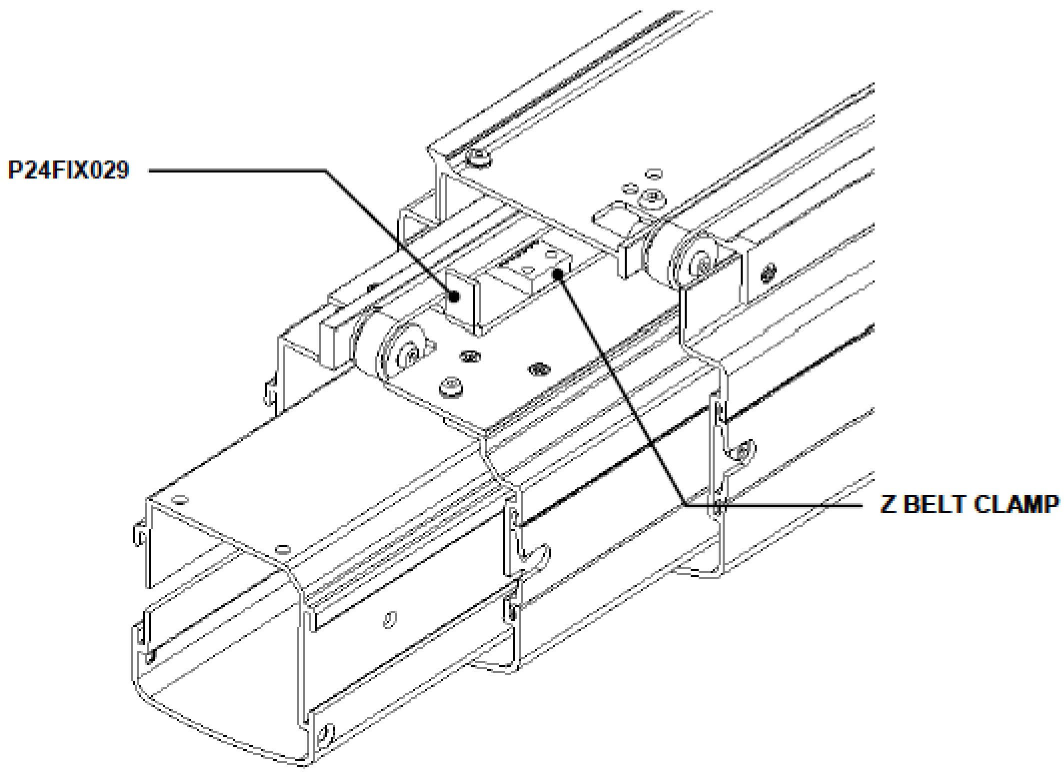


Figure Z-30: Belt on Center Extrusion

12. Place Z Belt Clamp onto the pegs of the fixture.

13. Push the P24FIX029 fixture towards the Z Backplate until the tab comes into contact. This will align the holes for the Z Belt Clamp.

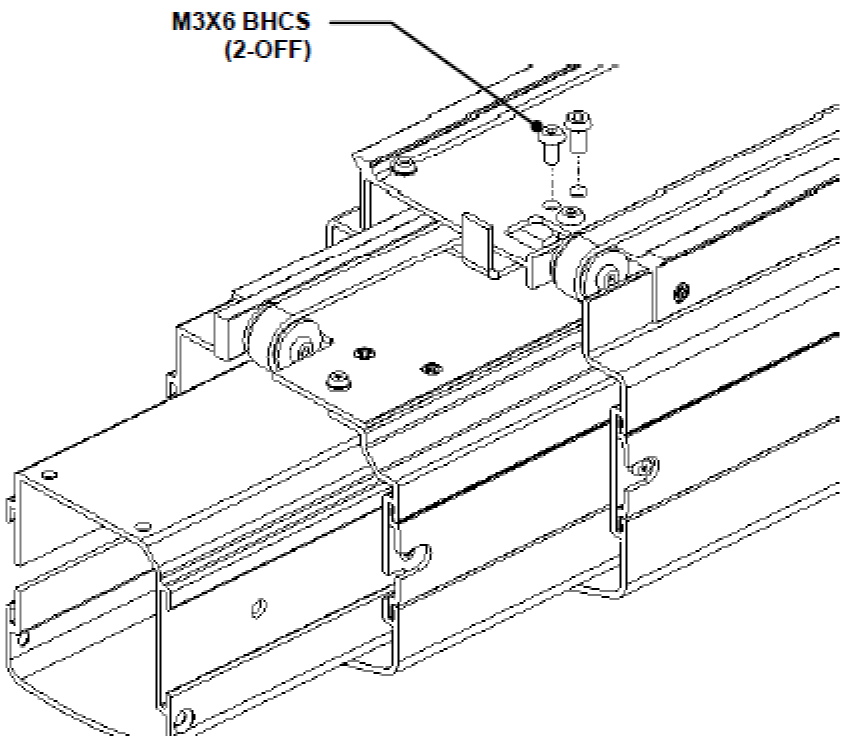


Figure Z-31: Aligning the Belt Clamp

14. Fit two screws in the holes shown in Figure S-29, approximately two turns into the Z Belt Clamp. Ensure that the TA Z Drive Centre Belt can slip through the teeth of the Clamp. If not loosen the screws further. When the screws are properly set, use Loctite 222.

Z.2.6 Replacing the Optosensor

The Optosensor is mounted on a bracket that is attached the Z backplate as shown in Figure Z-32.

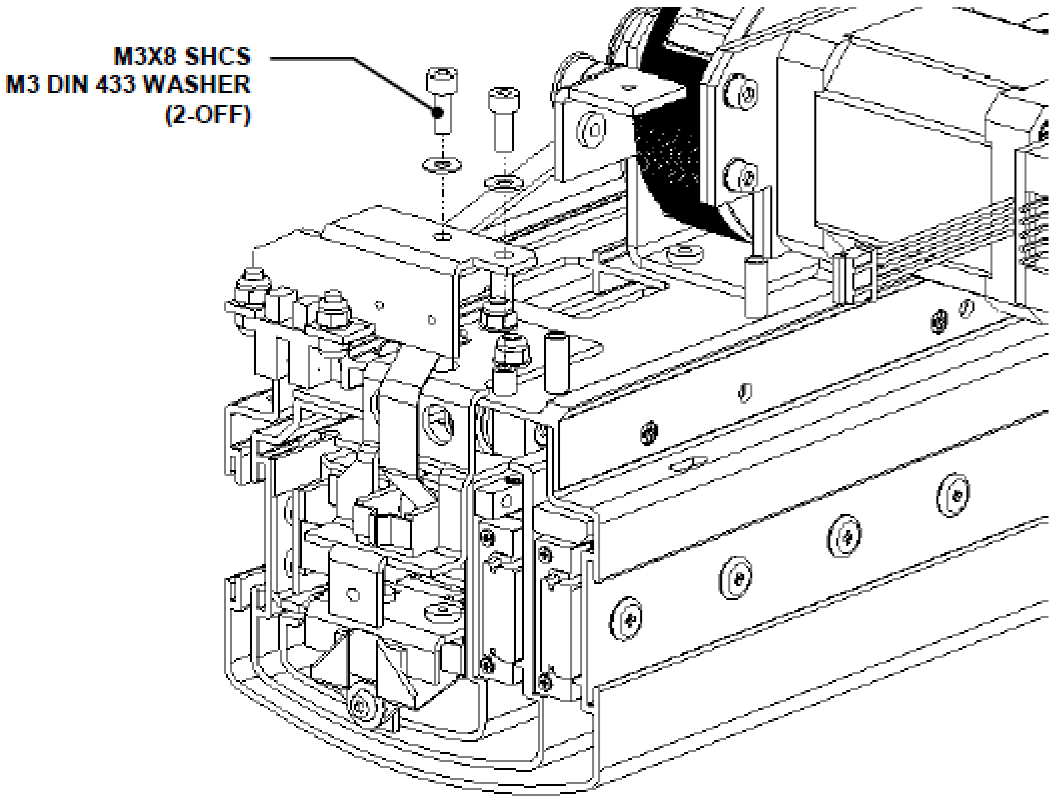


Figure Z-32: Optosensor Bracket

Z.2.7 Z Drive PCB Assembly

The Z Drive PCB Assembly is attached to the Upper Z backplate as shown in Figure Z-33. To remove it, disconnect the locking bar and remove the cable, then remove the two screws.

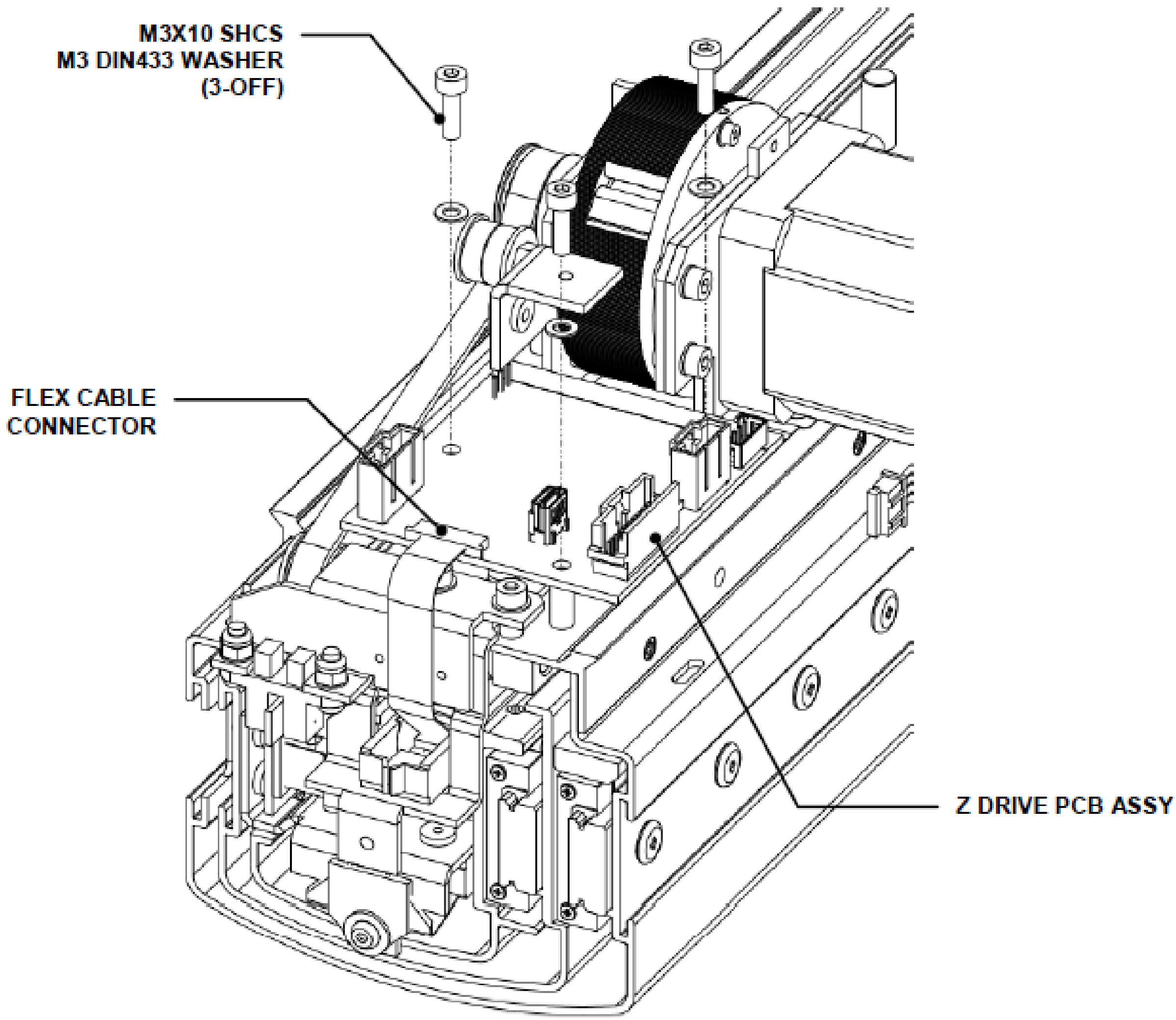


Figure Z-33: Z Drive PCB Assembly

Chapter AA Washer Assembly

AA.1   On-Site Service Activities

The *Washer Assembly* is located above the trough (Figure AA-1).

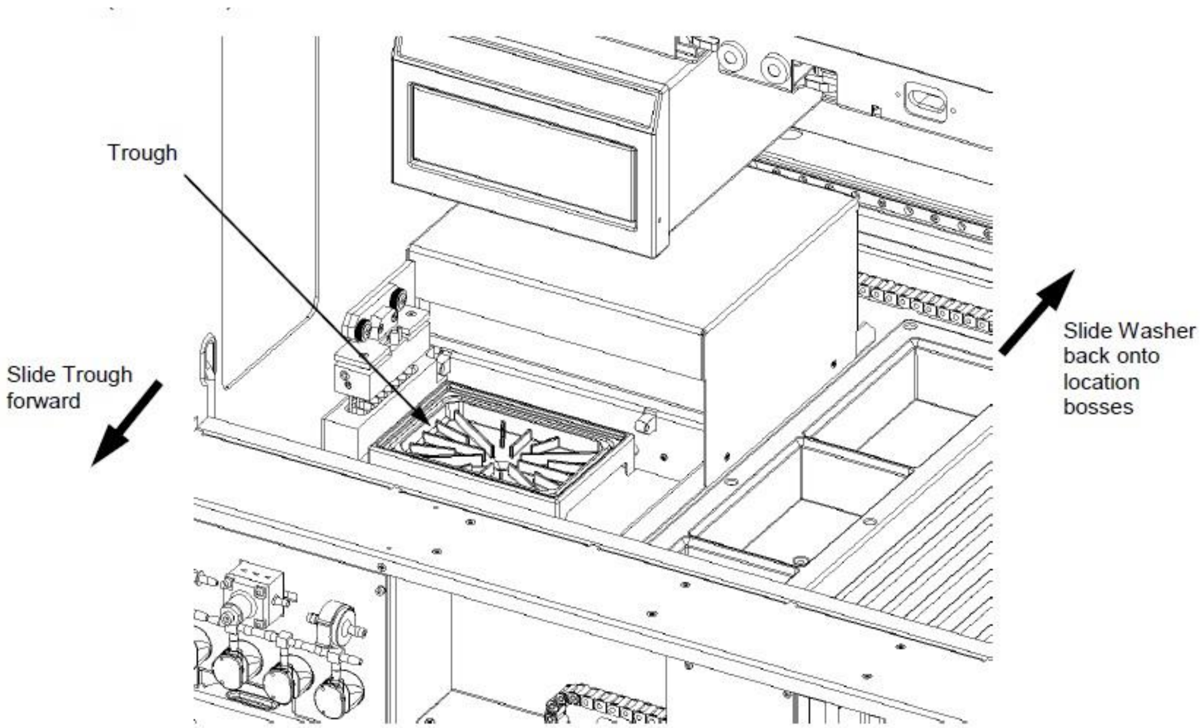


Figure AA-1: The Washer Assembly

To Remove the Washer:

1. Remove the Trough by unscrewing the Fixing screw (Figure AA-2).

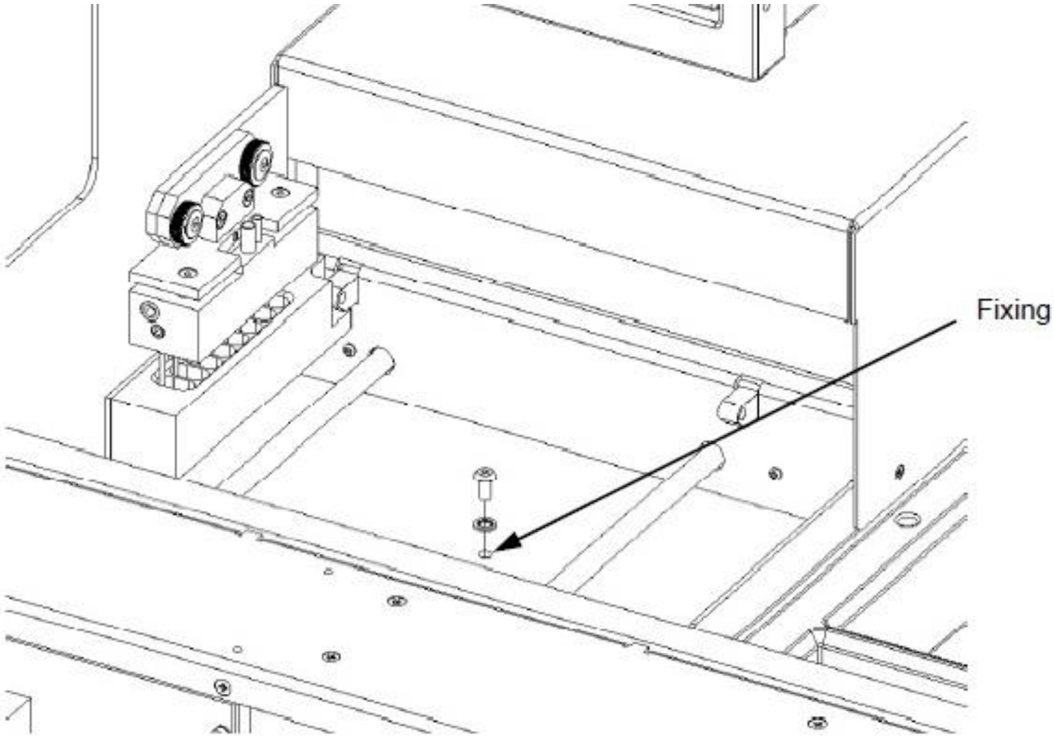


Figure AA-2: Fixing Screw for Trough

2. Slide the Washer Assembly away from the Workspace (it is located on the two bosses as the rear of the Workspace).

To remove the washer assembly:

AA.2.1 Removing the Washer Enclosure

1. Remove the four screws at the rear of the enclosure to unsecure the folds (Figure AA-3).

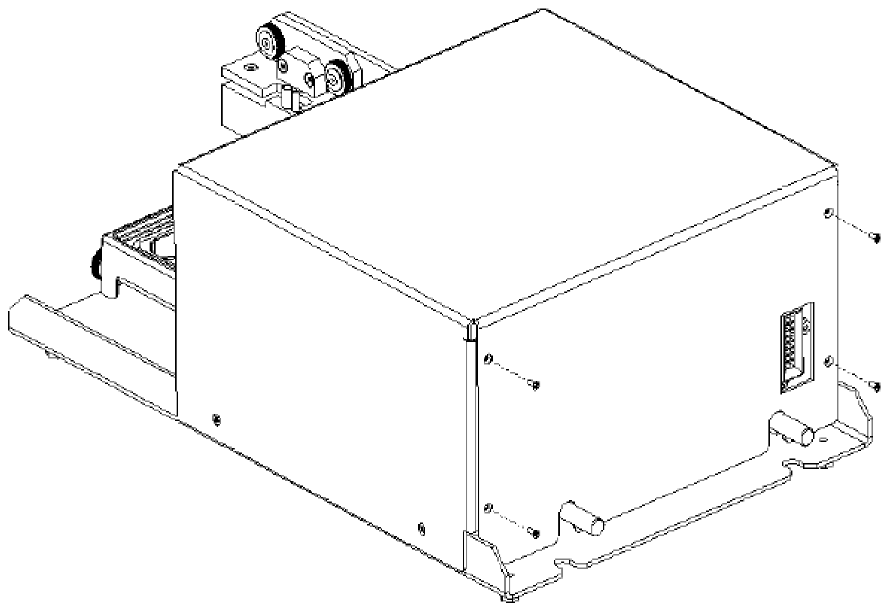


Figure AA-3: Removal of Rear Screws

2. Remove the four screws that attach the enclosure to the baseplate (Figure AA-4).

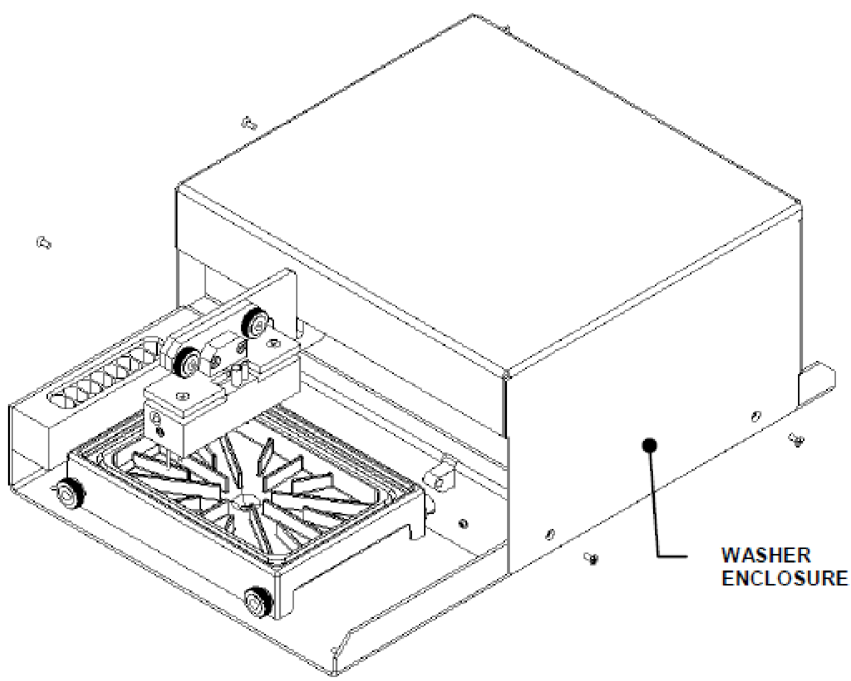


Figure AA-4: Removal of Washer Enclosure

AA.2.2 Replacing the Printed Circuit Board

The PCB assembly is attached to the side plates as shown in Figure AA-5. To remove the PCB, unscrew the three screws.

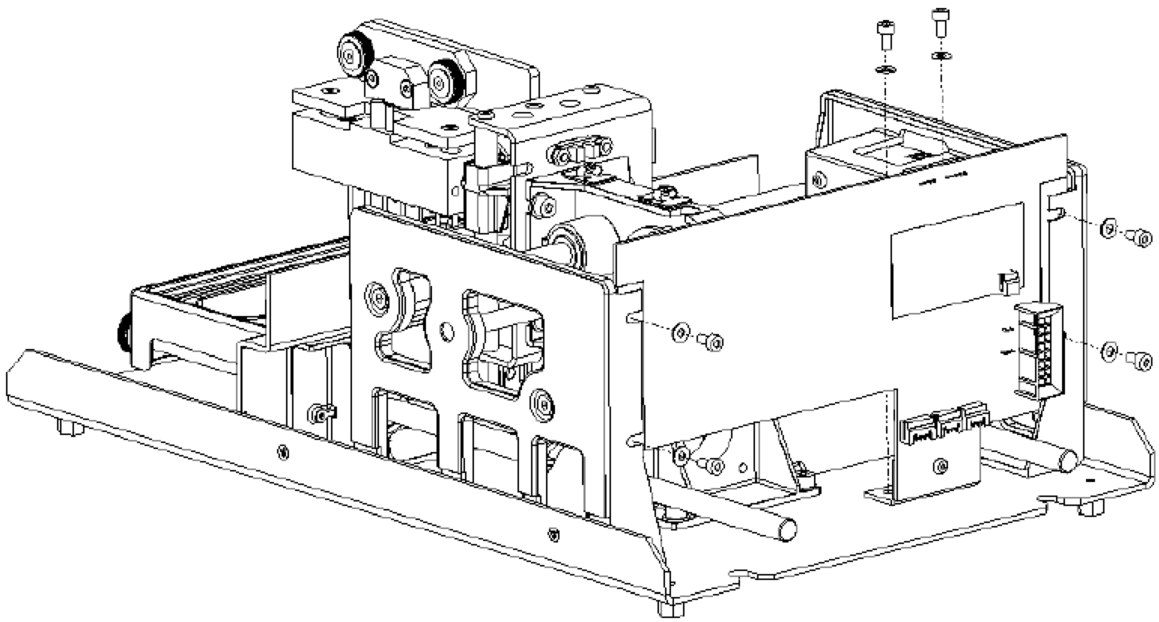


Figure AA-5: Removing the PCB

When replacing the PCB, remove the old board from the bracket and attach the new board to it.

AA.2.3 Removing and Rebuilding the Wash Head

The wash head is attached to the wash head arm using the two fixing knobs (Figure AA-6)

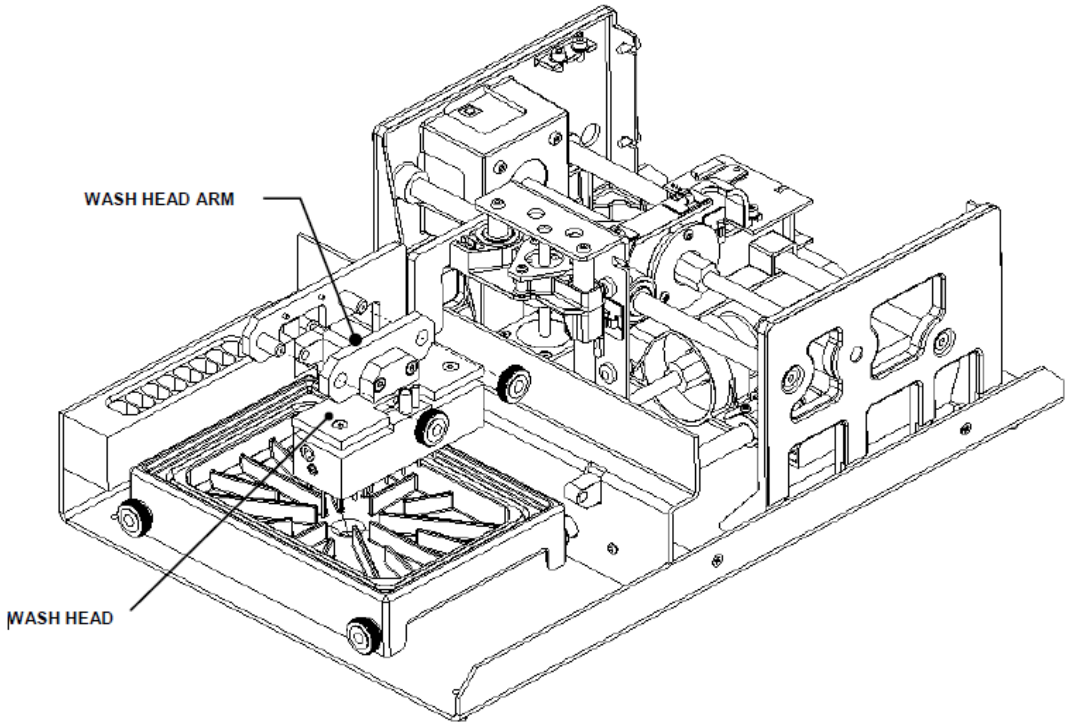


Figure AA-6: Removing the Wash Head Arm

To disassemble the wash head, remove the two screws that attach the lock and attachment as shown in Figure AA-7.

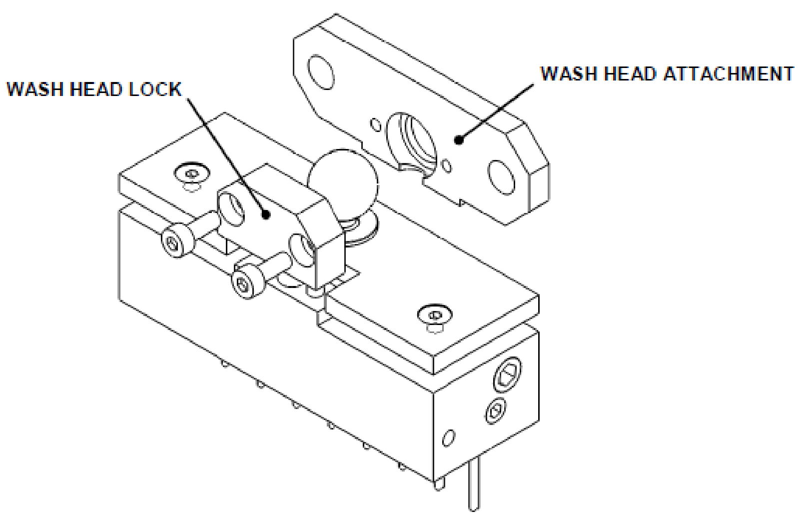


Figure AA-7: Disassembling the Wash Head

> ***Note:*** *Only lightly tighten the clamp screws as assembly will require adjustment at a later stage.*

AA.2.4 Disassembling the Wash Head Assembly

To disassemble the Wash Head Assembly, remove the two screws that secure the plate to the Floating Wash Head as shown in Figure AA-8.

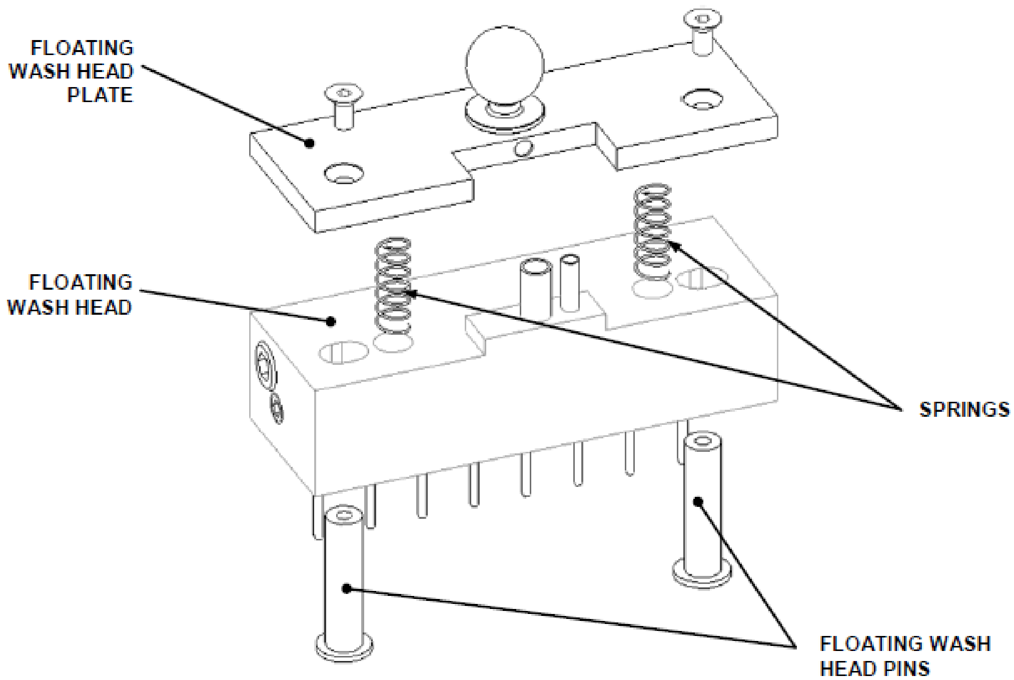


Figure AA-8: Disassembly of Wash Head

To reassemble the wash head

> ***Note:*** *Refer to Section A of the T13501450 Washer Offline CTV Test document to test the Wash Head prior to continuing with assembly.*

1. Fit two Springs into the recesses in the Floating Wash Head.
2. Slide the two Floating Wash Head Pins up through the Floating Wash Head and secure to the Floating Wash Head Plate using two M3x6 Socket Flathead Screws and Loctite 222.

> ***Note:*** *Ensure the tops of the pins locate into the recesses in the underside of the Plate.*

> ***Note:*** *Check That the Wash Head moves up and down freely and released sits down on the ends of the Floating Wash Head Pins.*

AA.2.5 Travelling Plate

The travelling plate is used to drive the wash head to the desired position.

To remove the travelling plate:

1. Remove the screws on the left and right side plate. Figure AA-9 shows the left hand plate, the position of the screws on the right hand plate is similar.

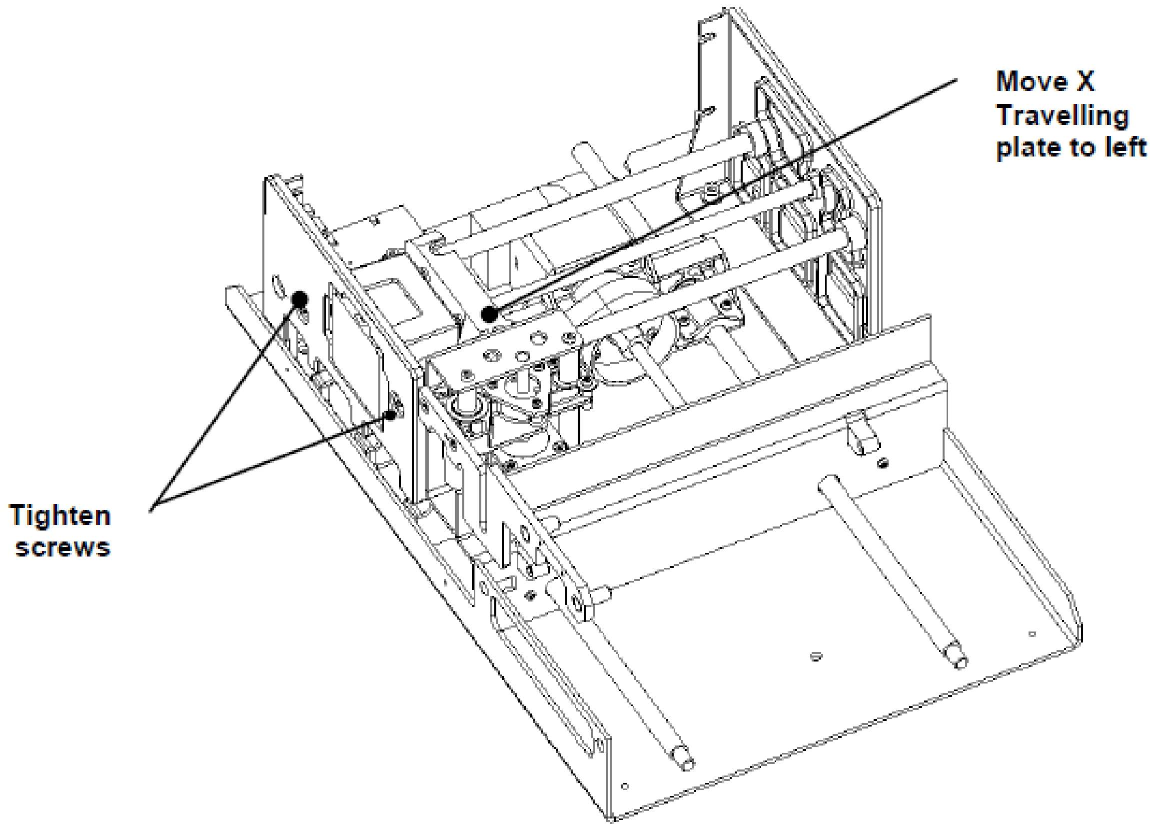


Figure AA-9: Screws for Travelling Plate

2. Remove the Washer X Actuator and lead screw by removing the four screws that attach it to the left hand side plate as shown in figure AA-10.

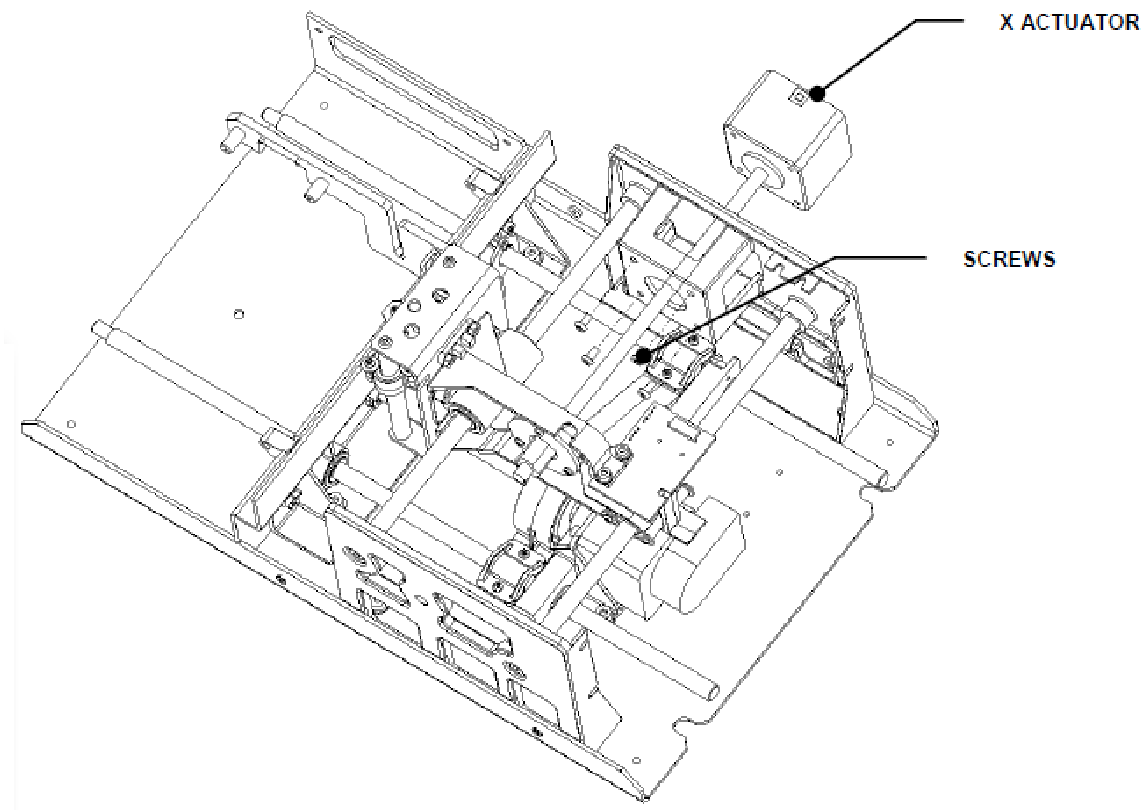


Figure AA-10: Removing the X Actuator

3. Remove the X drive assembly from the baseplate by removing the four screws as shown in Figure AA-11.

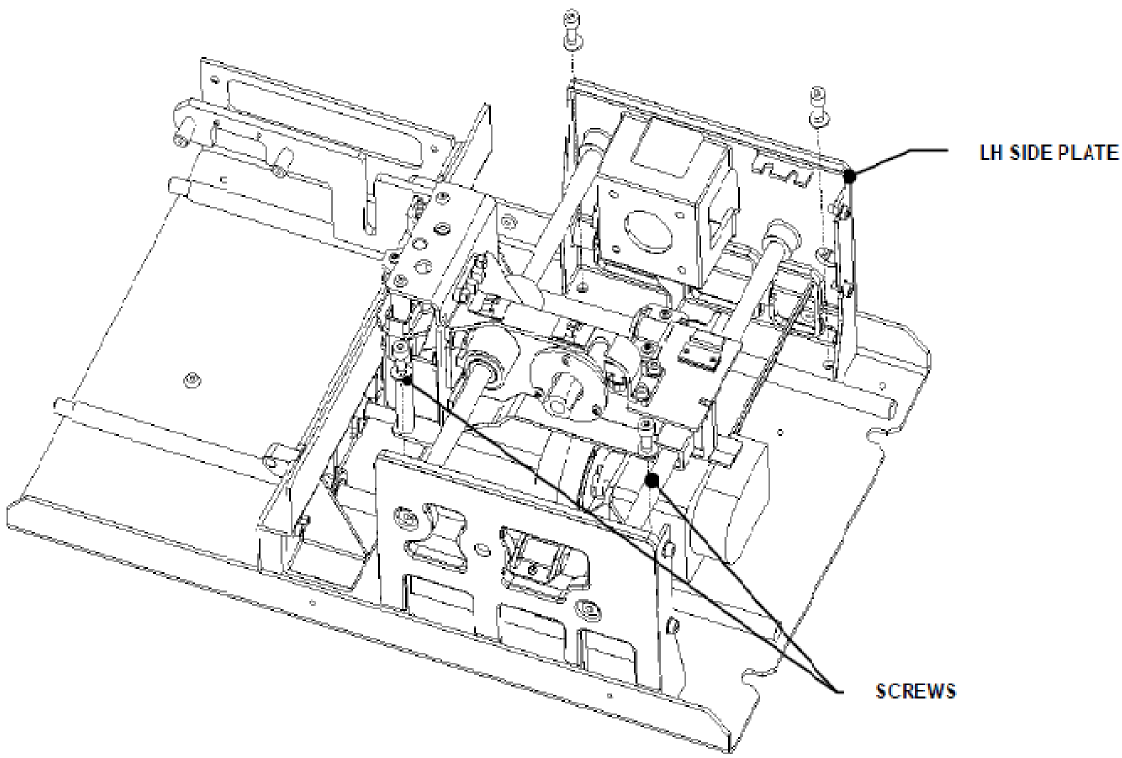


Figure AA-11: Removing the X Drive Assembly

4. Removing the X Drive Shafts

The X drive shafts can be removed by unscrewing the four screws that attach it to the side plates as shown in Figure AA-12

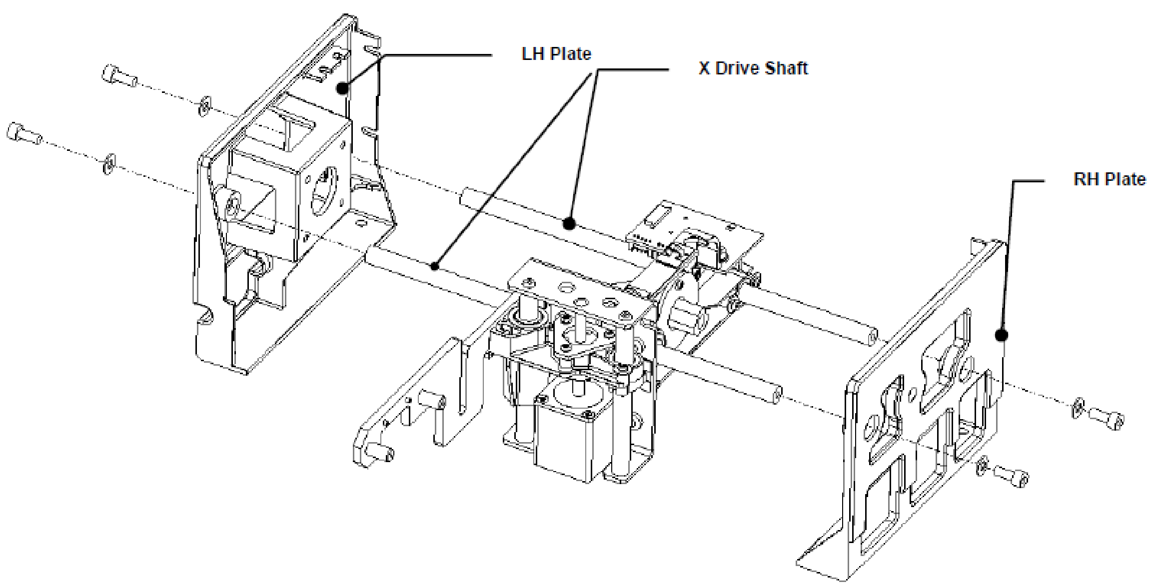


Figure AA-12: X Drive Shafts

5. The Washer Transition PCB

The Washer Transition PCB is attached to the X Drive travelling plate as shown in Figure AA-13.

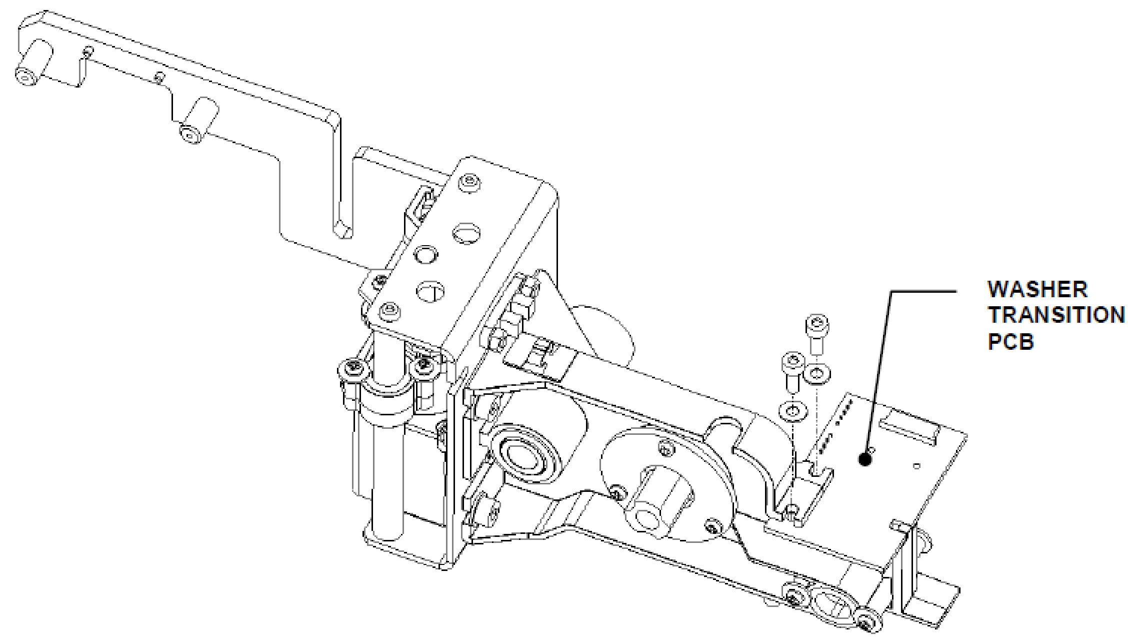


Figure AA-13: Location of the Washer Transition PCB on X Drive Travelling Plate

6. The Z Drive Assembly

The Z Drive assembly is mounted on the X drive drive shafts as shown in Figure AA-14.

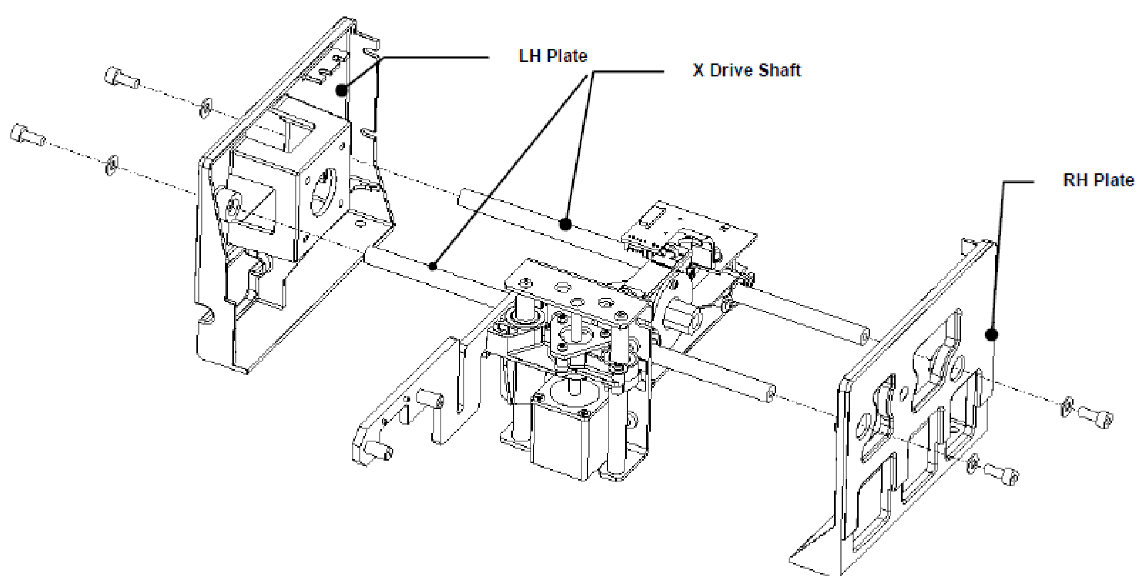


Figure AA-14: Location of the Z Drive Assembly

To remove the Z drive assembly

1. Remove the left and right hand plates.
2. Slide the assembly off the drive shafts
3. Remove the motor from the Z drive assembly
4. Remove the Motor from the main support by removing the two screws as shown in Figure AA-15.

When reinstalling the motor, pass the lead screw through the linear actuator nut in the travelling plate and secure the main support using the two screws and Loctite 222,

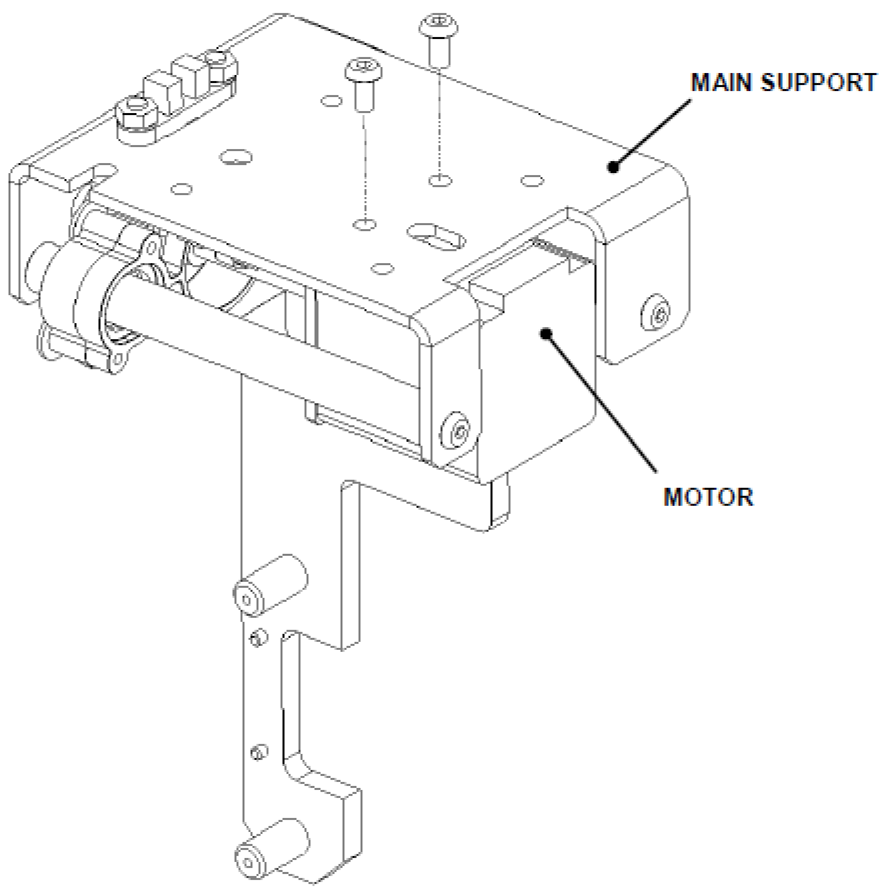


Figure AA-15: Mounting the Motor on the Main Support

5. Remove the washer Z actuator from the WZD Motor bracket by removing the four screws (Figure AA-16).

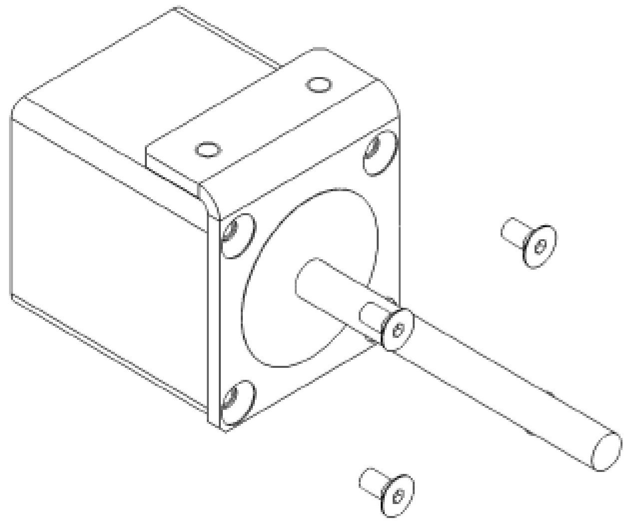


Figure AA-16: WZD Motor and Bracket

AA.2.6 Optosensors

An optosensor is located on the WYD back plate as shown in Figure AA-17.

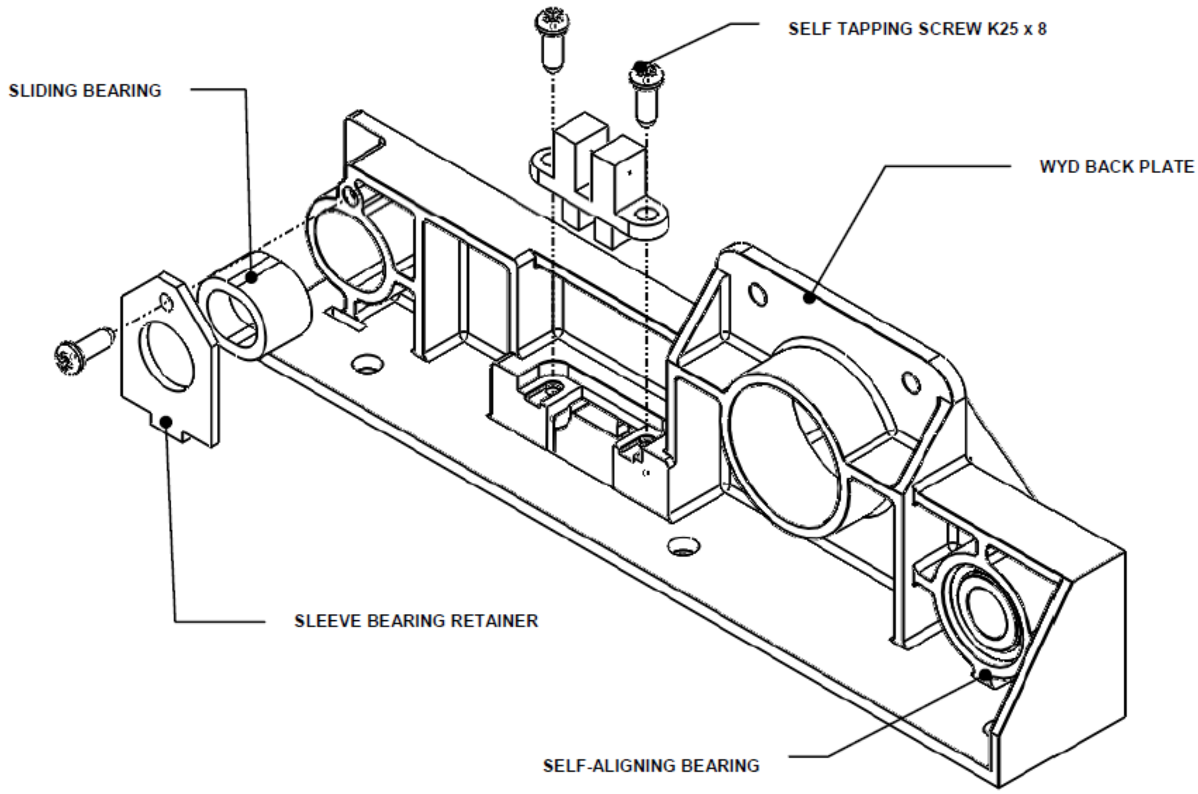


Figure AA-17: WYD Optosensor

A second optosensor is located on the WXD Main support as shown in Figure AA-18.

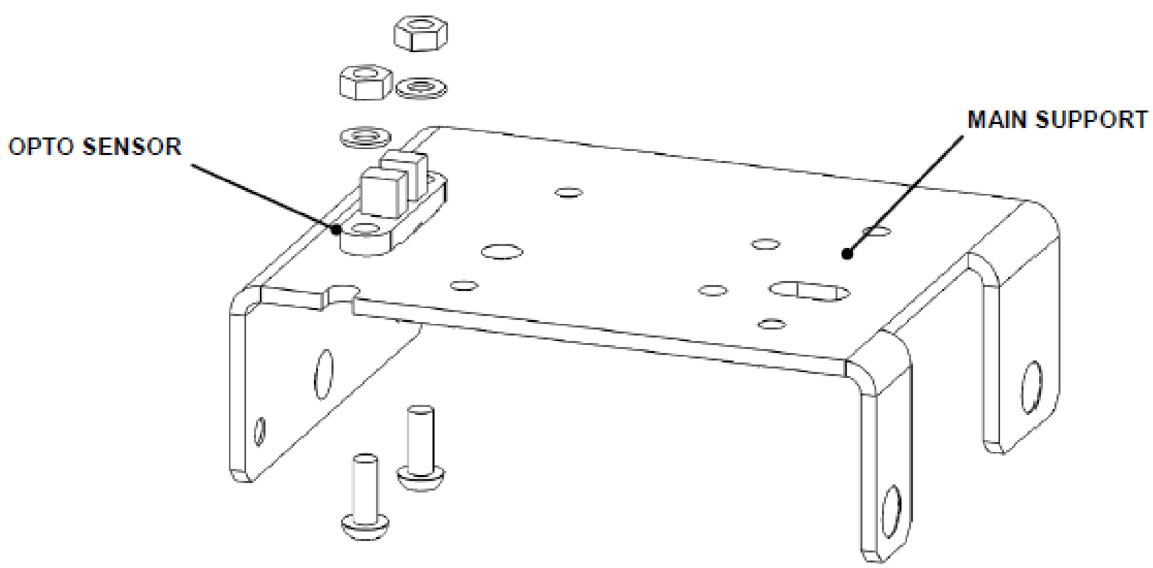


Figure AA-18: WXD Optosensor

This page intentionally left blank.

Index