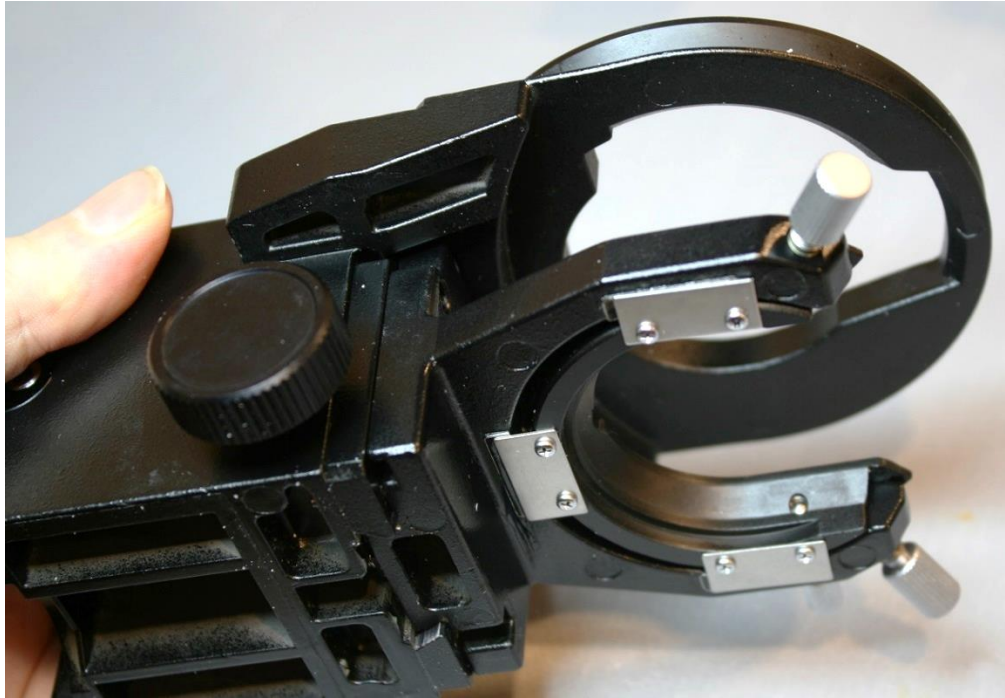


Complete Teardown, Cleaning/Lubrication, and Reassembly of the Olympus BH2-CH Substage Assembly

Revision 1



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Introduction

The microscopes in the Olympus BH-2 line (BHS, BHSU, BHT, and BHTU) have largely been replaced in the professional and clinical world, due to their advancing age and the lack of repair parts from Olympus. A great many of these microscopes were produced in their day, and because of this are they readily available on the used market for very reasonable prices. Thanks to their excellent build quality and solid optical performance, these scopes are now very popular with hobbyists, providing an affordable, high-quality alternative to the Chinese-made scopes prevalent today.

The BH2-CH substage assembly (sometimes referred to as the *Condenser Holder*) on the BH-2 equipment mounts onto the sliding focus block of the stand, and provides a ring for the mechanical stage to mount onto, as well as a centering mount for the substage condenser. The height of the substage condenser can be adjusted, relative to the stage, by a rack-and-pinion mechanism, and the maximum condenser height can be precisely set by the adjustable condenser-height stop. Due to the age of BH-2 equipment, the BH2-CH substage assembly frequently needs disassembled and regreased to function well again.

Scope of this Document

This document describes the complete teardown, cleaning/lubrication, and reassembly of the BH2-CH substage assembly used on the Olympus BH-2 series of microscopes.

Tools Needed

The following tools are needed to service the BH2-CH substage assembly:

- Allen wrench or driver, 1.5mm (item 4 of [Appendix 1](#))
- Allen wrench or driver, 2.5mm (item 5 of [Appendix 1](#))
- Allen wrench or driver, 3.0mm (item 6 of [Appendix 1](#))
- Center punch (or nailset)
- Pliers, needle-nose (fine-point)
- Screwdriver set, JIS (item 7 of [Appendix 1](#))
- Screwdriver set, slotted

A Few Words about JIS Screws

Screws with JIS heads are found in much of the equipment designed and manufactured in Japan. JIS screws look very much like standard Phillips screws, but they differ in that JIS screws were designed to not cam-out under torque, whereas Phillips screws were designed to intentionally cam-out, as a means to limit the torque applied to the fasteners. Because of this crucial difference in the geometry of the two screw types, JIS screws will be damaged by standard Phillips drivers if too much torque is applied. JIS screws can

usually be identified by the presence of a single dot, or by an “X”, stamped into one of the four quadrants of the cross-point depression (see [Figure 1](#)).

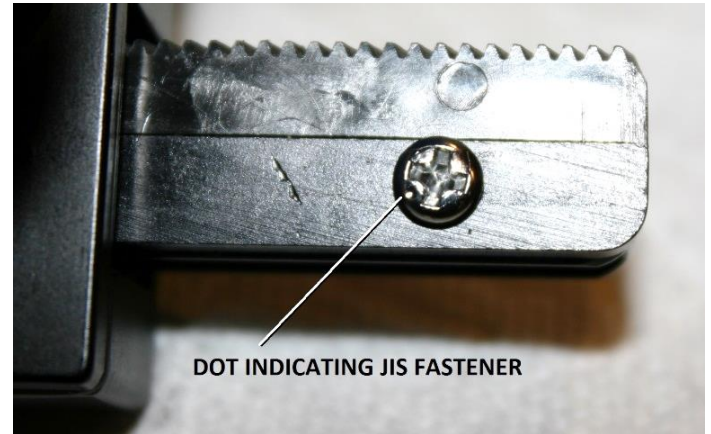


Figure 1 – Head of a typical JIS screw

Supplies Needed

The following supplies are needed to service the BH2-CH substage assembly:

- Cleaning solvent (see [Recommended Solvents](#) section below)
- Cotton swabs
- Grease (see [Recommended Lubricants](#) section below)
- Tissues, oil-free

Recommended Lubricants

Dow Molykote® 44 (item 2 of [Appendix 1](#)) or Nye 704C (item 3 of [Appendix 1](#)) is recommended for the BH2-CH substage assembly. Both of these greases are sufficiently light for the greased dovetail slides, and both types will remain stable and serviceable for many years to come.

Recommended Solvents

Some type of cleaning solvent will be needed to remove the old grease from the various components of the BH2-CH substage assembly. Solvents that can be used are acetone, diethyl ether, heptane, hexane, mineral spirits, turpentine, and xylene.

Safety Considerations with Solvents

Regardless of which solvent is chosen, make sure that adequate ventilation is present during the cleaning process, and that any necessary personal protective equipment is utilized to minimize exposure. Consult the MSDS sheet before using any unfamiliar solvents. Many of the solvents listed above are flammable, and their vapors may represent an explosion hazard if mishandled. Whichever solvents are chosen, be sure to follow all manufacturer’s instructions and safety precautions.

Solvent Compatibility with Parts and Finishes

Many solvents will damage the finish of painted surfaces (isopropyl alcohol or 409 Cleaner may be safely

used to clean most painted surfaces). Additionally, many solvents will dissolve or damage plastic parts. Do not allow untested solvents to contact the plastic condenser-height knob or the plastic gear rack, as these parts may be damaged by exposure to solvents. Before using any solvent to clean plastic parts, test a small amount of the solvent in an inconspicuous area of the part (such as inside the knob) to ensure compatibility with the plastic. Never use xylene to clean nylon parts, as xylene dissolves nylon. Isopropyl alcohol and trichloroethylene will cause swelling of nylon due to solvent absorption. The list of solvents generally considered safe for nylon includes acetone, diethyl ether, heptane, mineral spirits, naphthalene, and turpentine.

Common Problems with the BH2-CH Substage

A few of the more common problems which can affect the BH2-CH substage assembly are discussed below.

Inability to Center the Condenser

Stiffness in the centering plunger or in the centering yoke in the condenser-centering mechanism can cause impaired condenser centering of the BH2-CH. This is usually caused by dried, stiff grease in the centering mechanism, and can be corrected by performing the teardown, cleaning/lubrication, and reassembly procedure described in the relevant sections below.

Stiffness in the Condenser-Slide Mechanism

Stiffness in the condenser-slide mechanism can cause damage to the plastic condenser-height rack if the problem gets bad enough. This is usually caused by dried, stiff grease in the condenser-slide mechanism, and can be corrected by performing the teardown, cleaning/lubrication, and reassembly procedure described in the relevant sections below.

Erratic Condenser-Height Adjustment

Erratic operation, no operation, or binding of the condenser-height mechanism can be caused by dirt or debris in the teeth of the pinion gear or in the teeth of the plastic condenser-height rack, or by damage to the teeth of the condenser-height rack. If the problem is caused by dirt or debris in the teeth of the rack or pinion gear, this can be corrected by performing the teardown, cleaning/lubrication, and reassembly procedure described in the relevant sections below. If the problem is caused by damage to the condenser-height rack, this can be corrected by replacing the rack¹, but the rack should only be replaced as part of the full teardown, cleaning/lubrication, and reassembly

¹ Parts for the BH2-CH, including the condenser-height rack, are no longer available from Olympus.

procedure described below, since damage to the new rack can be caused by dry, thickened grease in the condenser-slide mechanism.

Teardown/Reassembly of BH2-CH Substage

The procedure for disassembling, cleaning/lubricating, and reassembling the BH2-CH substage assembly is described in the sections below. During the teardown of the BH2-CH substage assembly, be sure to bag and tag the various components, to prevent their loss and to facilitate their proper identification during later reassembly.

Remove the Condenser-Slide Assembly

The first step in the disassembly procedure is to remove the condenser-slide assembly from the main housing of the substage. To do this, use the condenser-height knob to adjust the position of the condenser slide until the hole in the condenser slide aligns with the slotted stop screw (see [Figure 2](#)).



Figure 2 – Adjust condenser height until screw is visible

Next, use a suitable slotted screwdriver to remove the M2.6x4 slotted stop screw (see [Figure 3](#)).

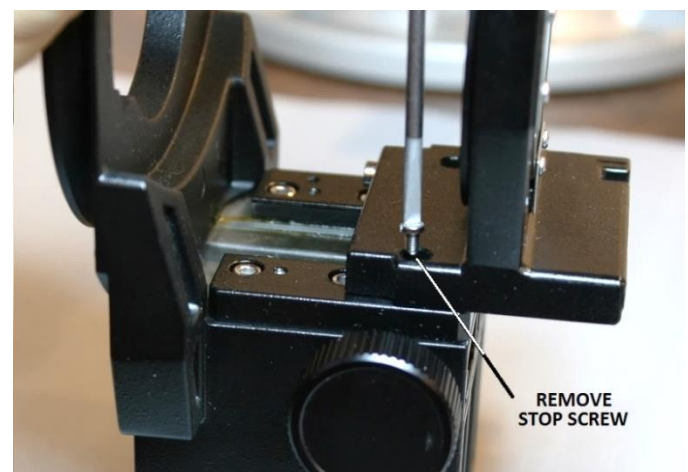


Figure 3 – Unscrew and remove the slotted stop screw

Rotate the condenser-height knob clockwise until the condenser-slide assembly disengages from the bottom of the main housing (see [Figure 4](#)).

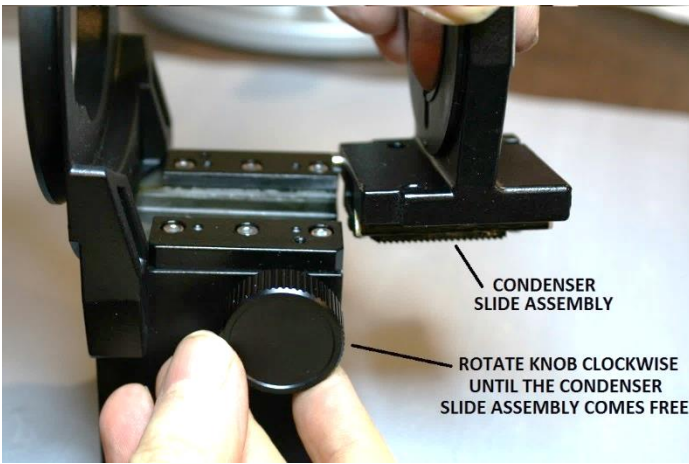


Figure 4 – Remove the condenser slide assembly

Remove the Locking and Centering Thumbscrews

Loosen and remove the condenser-lock thumbscrew from the centering yoke (see **Figure 5**).

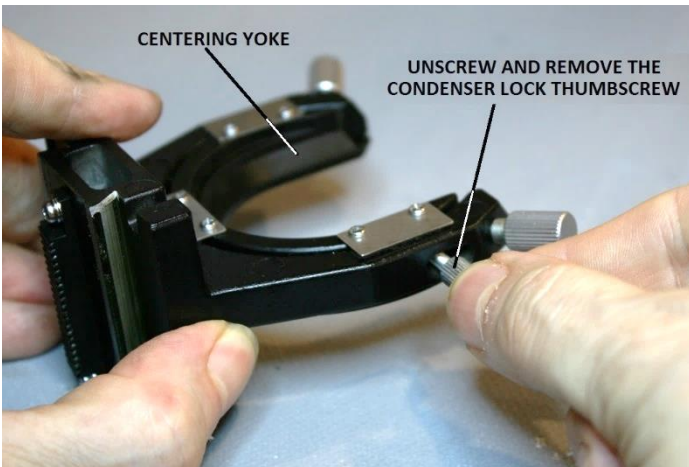


Figure 5 – Remove the condenser-lock thumbscrew

Loosen and remove the two centering thumbscrews from the support yoke (see **Figure 6**).

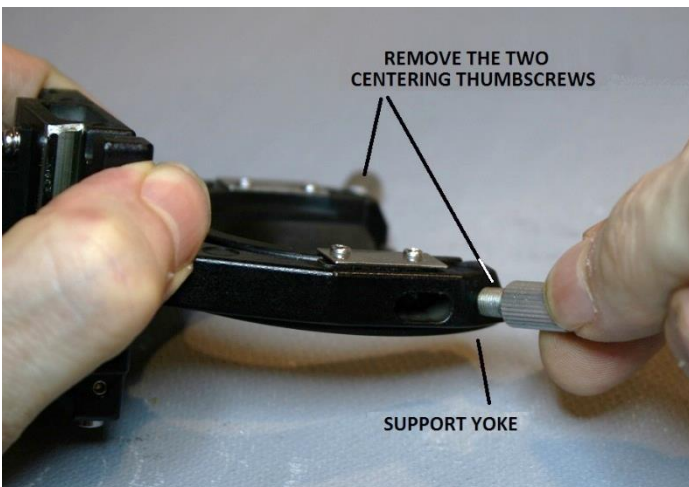


Figure 6 – Remove the centering thumbscrews

Remove the Slip Plates

The condenser-slide assembly is shown in **Figure 7**.

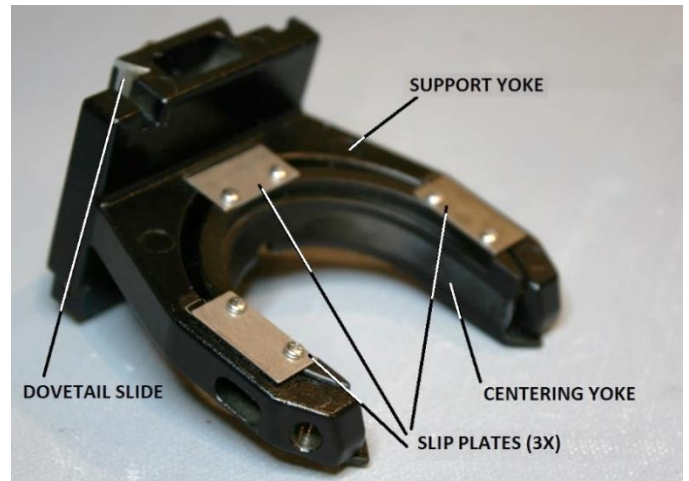


Figure 7 – The condenser-slide assembly (bottom view)

Use a suitable JIS screwdriver to remove the six M2x4 JIS screws securing the three slip plates to the centering yoke (see **Figure 8**).

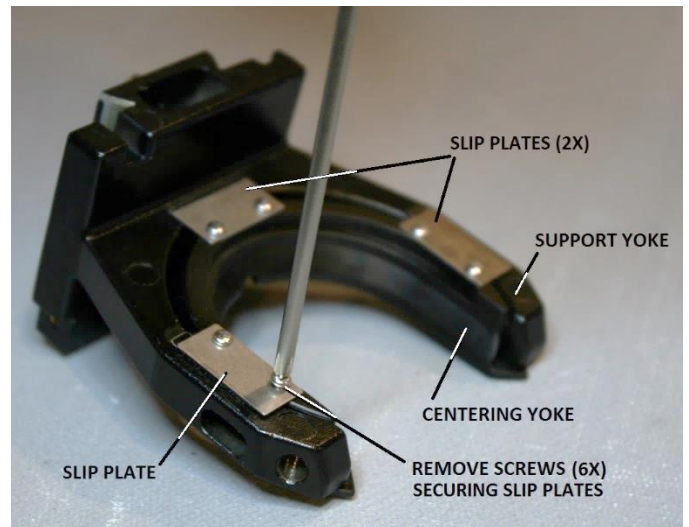


Figure 8 – Remove screws securing the slip plates

Remove the three loose slip plates (see **Figure 9**), being careful to not lose any small brass shim washers that may be beneath the slip plates.

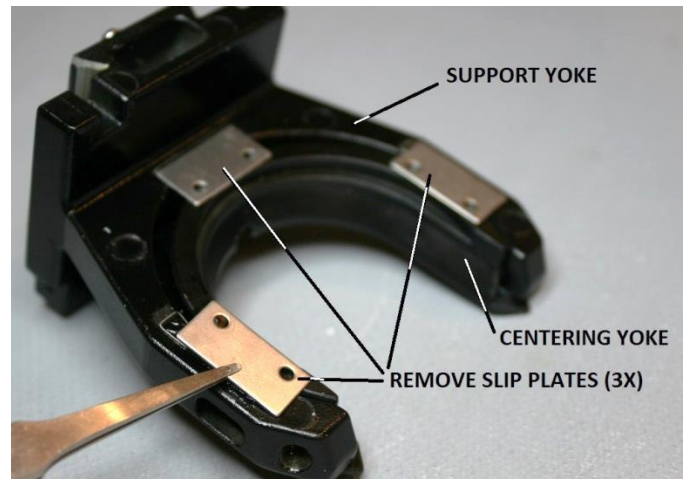


Figure 9 – Remove the three slip plates

Note the location of any small, brass shim washers that may be present beneath any of the slip plates so that they can be returned to their proper place during reassembly (see [Figure 10](#)).

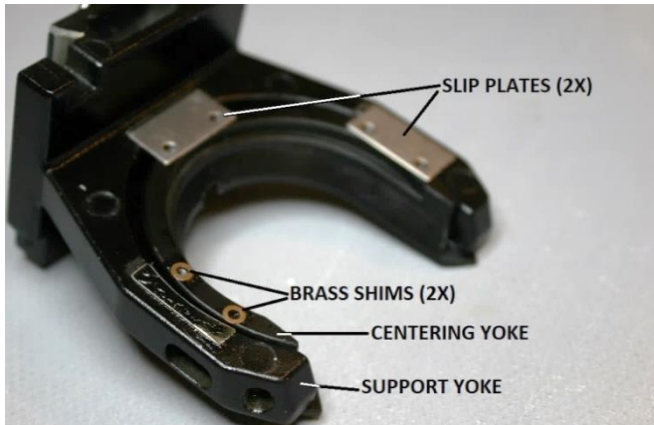


Figure 10 – Look for shim washers under the slip plates

Carefully remove any brass shim washers that are present beneath the slip plates (see [Figure 11](#)).

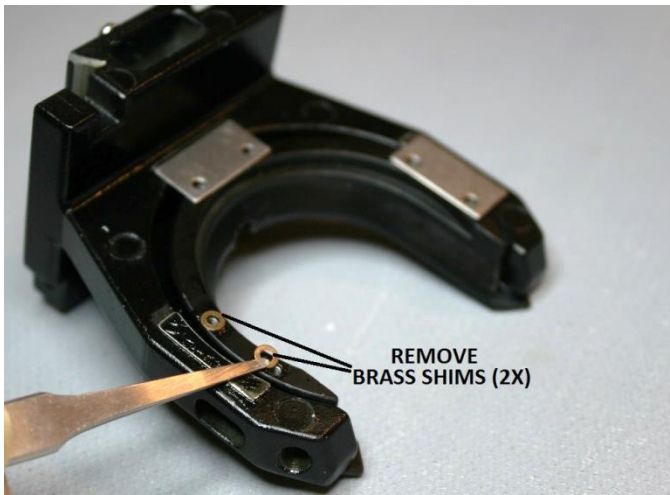


Figure 11 – Remove any brass shim washers

Remove the Centering Yoke from the Support Yoke

Place your thumb in position on the centering yoke as shown in [Figure 12](#), and press in on the centering yoke to depress the centering plunger.



Figure 12 – Depress the centering plunger

While holding the centering yoke such that the centering plunger is depressed, separate the centering yoke from the support yoke (see [Figure 13](#)).

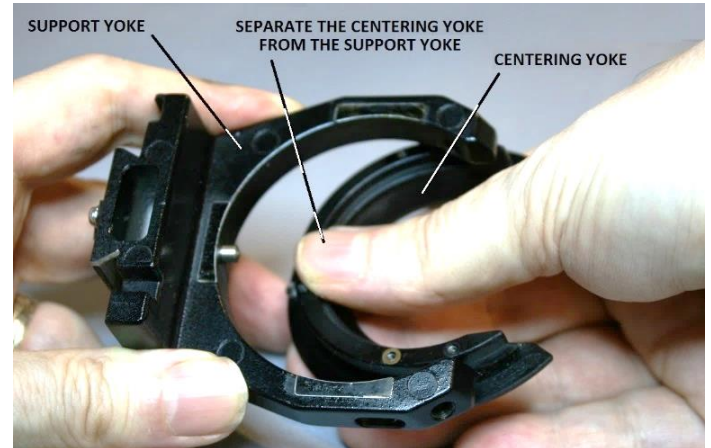


Figure 13 – Separate centering yoke from support yoke

The various components of the support yoke (which is part of the condenser slide) are shown in [Figure 14](#).

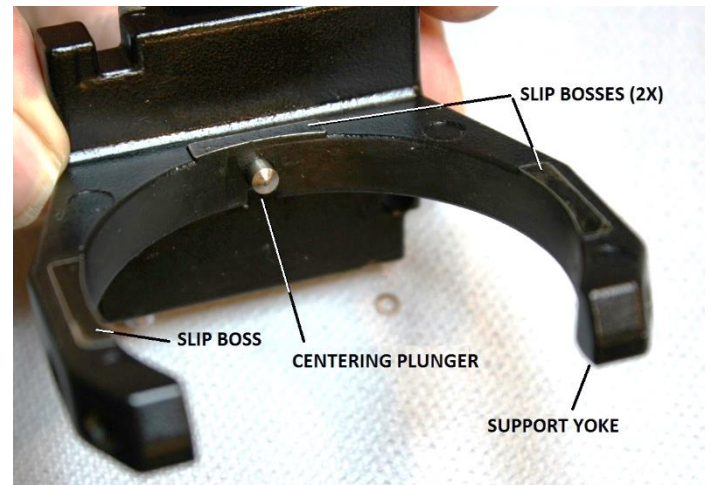


Figure 14 – The support yoke on the condenser slide

The centering yoke is shown in [Figure 15](#).

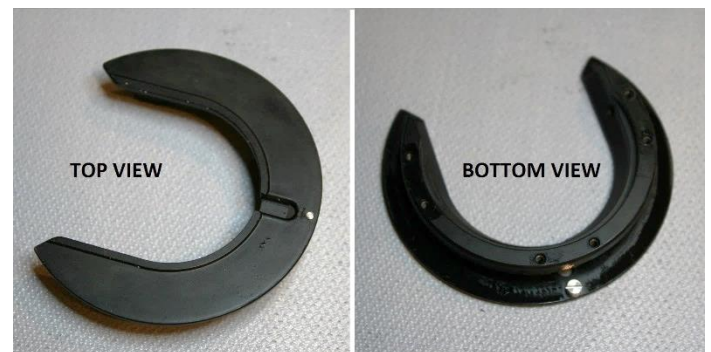


Figure 15 – The centering yoke

Remove the Condenser-Height Rack

Use a suitable JIS screwdriver to remove the two M2.6x6 JIS screws and washers securing the condenser-height rack to the dovetail slide (see [Figure 16](#)).

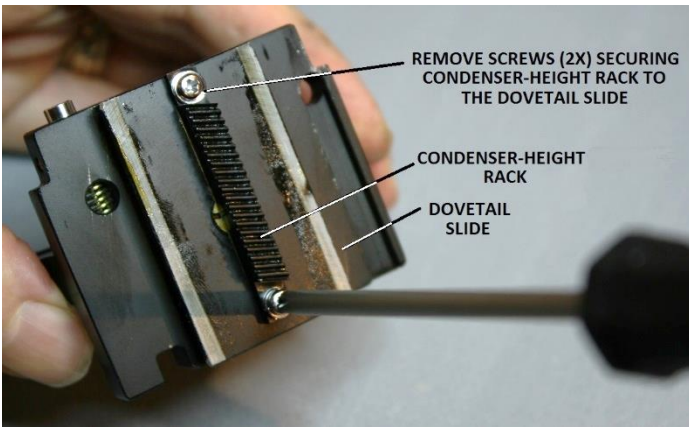


Figure 16 – Remove screws and washers securing rack

Remove the loose condenser-height rack from the face of the dovetail slide (see [Figure 17](#)).

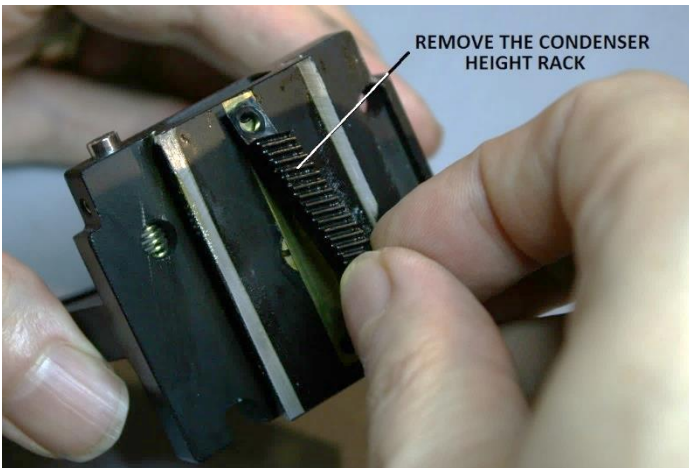


Figure 17 – Remove the condenser-height rack

Look for a brass shim either on the back of the condenser-height rack or on the face of the dovetail slide (see [Figure 18](#)).

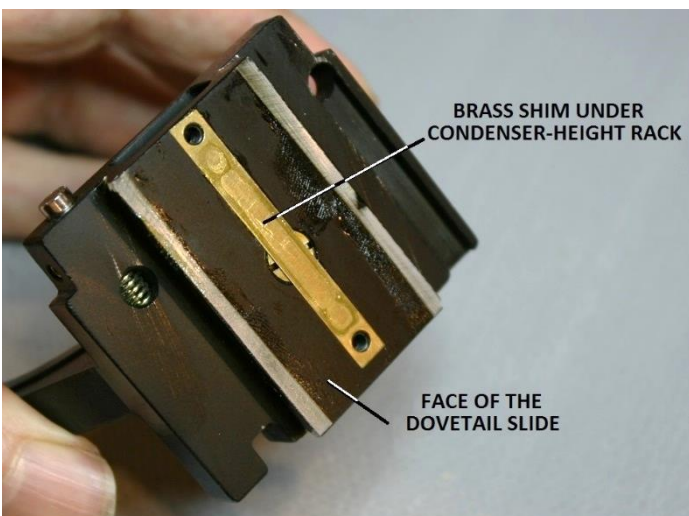


Figure 18 – Brass shim for the condenser-height rack

Remove the brass shim from the back of the condenser-height rack or from the face of the dovetail slide, whichever is applicable (see [Figure 19](#)).

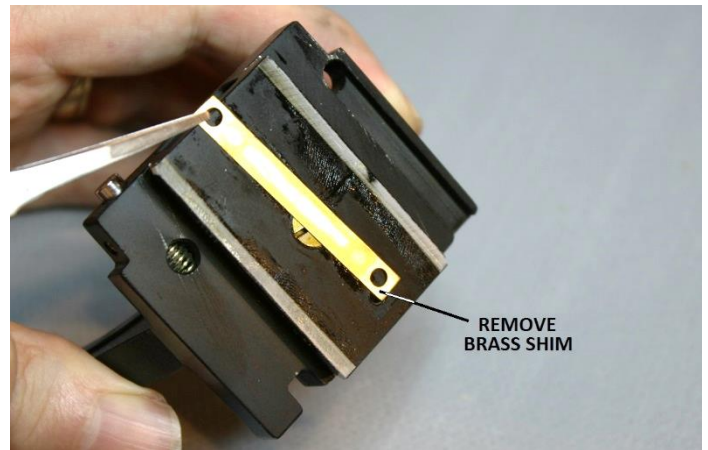


Figure 19 – Remove brass shim for condenser-height rack

Disassemble the Condenser-Height Stop

Hold the M5x12 condenser-height stop pin down with your finger, and use a 1.5mm Allen wrench or driver to loosen the M3x4 set screw holding the stop pin in place. While holding your finger on top of the stop pin, allow the stop pin to rise in order to alleviate the compression on the internal stop spring (see [Figure 20](#)).

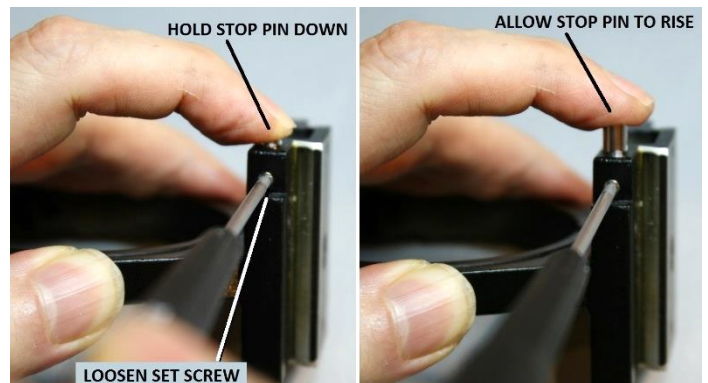


Figure 20 – Loosen set screw while holding the stop pin

Remove the M5x12 stop pin from the bore in the condenser slide (see [Figure 21](#)).

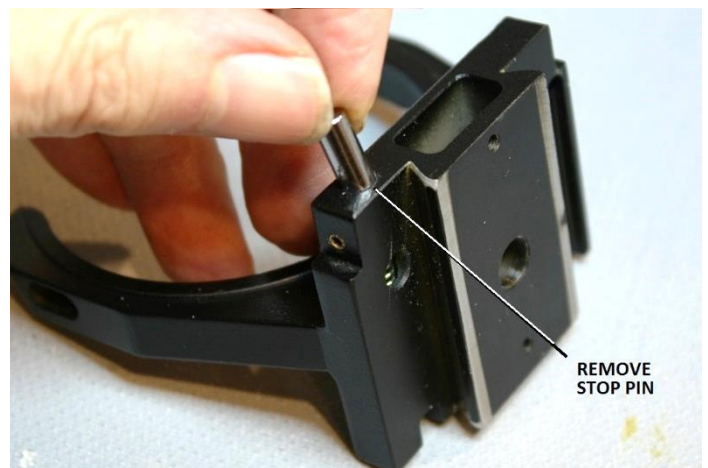


Figure 21 – Remove the loose stop pin from the bore

Remove the stop-pin spring from the bore in the condenser slide (see [Figure 22](#)).



Figure 22 – Remove the stop-pin spring from the slide

Reassemble the Condenser-Height Stop

Use a 1.5mm Allen wrench or driver to back out the M3x4 stop-pin set screw so that the threads do not protrude into the bore in the condenser slide (see **Figure 23**).

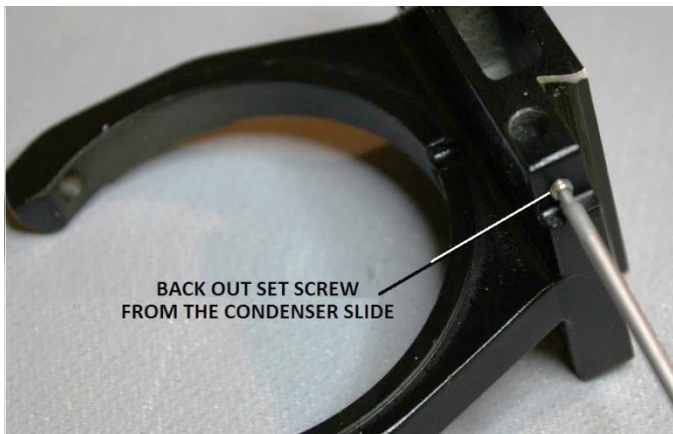


Figure 23 – Back out the stop-pin set screw from the slide

Use a cotton swab and a suitable solvent (e.g., acetone) to thoroughly clean the stop pin and the bore of the condenser slide. Test the fit of the stop pin in the bore. The pin should slide freely in the bore without any noticeable friction or binding (see **Figure 24**).

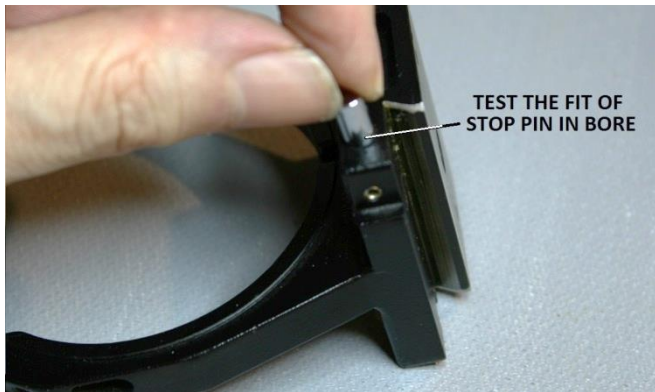


Figure 24 – Test the fit of the stop pin in the bore

It is critical to the operation of the condenser-height stop that this pin move freely in the bore in the condenser slide. If there is noticeable friction or any binding present, use a .1990" (i.e., 5.05mm) twist drill

bit to clean the bore of any debris or internal burring (see **Figure 25**).



Figure 25 – Clean any debris or burring from the bore

Place the stop-pin spring into the bore in the condenser slide (see **Figure 26**).

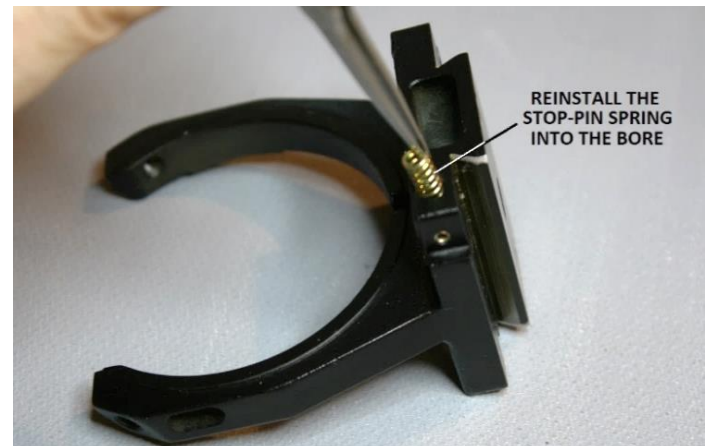


Figure 26 – Reinstall the stop-pin spring into the bore

Place the M5x12 stop pin into the bore in the condenser slide (see **Figure 27**).

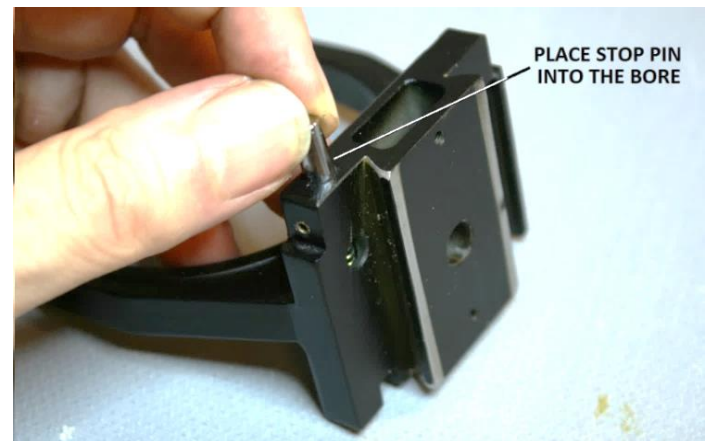


Figure 27 – Reinstall the stop pin into the bore

Use a 1.5mm Allen wrench or driver to tighten the M3x4 set screw to secure the stop pin in position (see **Figure 28**).



Figure 28 – Tighten set screw to lock the stop pin

Disassemble the Centering Plunger

Test the operation of the spring-loaded centering plunger by pressing the plunger in, and then observing how freely the plunger extends when the pressure is released (see **Figure 29**). If the plunger quickly returns to the fully extended position when the pressure is released, skip ahead to the **Reinstall the Condenser-Height Rack** section of this document. Otherwise, proceed with the teardown of the centering plunger as described below.

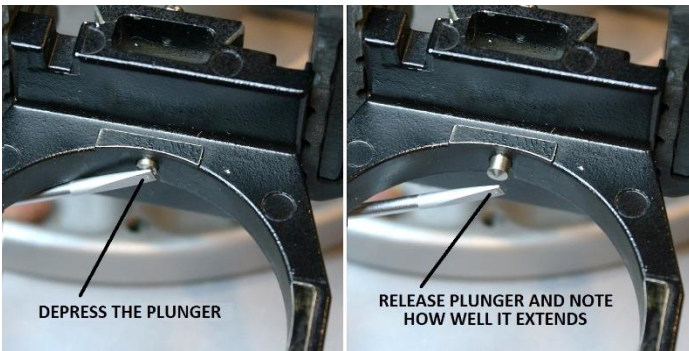


Figure 29 – Test centering plunger for freedom of motion

Use a suitable slotted screwdriver to loosen (but do not remove) the plunger-retaining screw (see **Figure 30**).

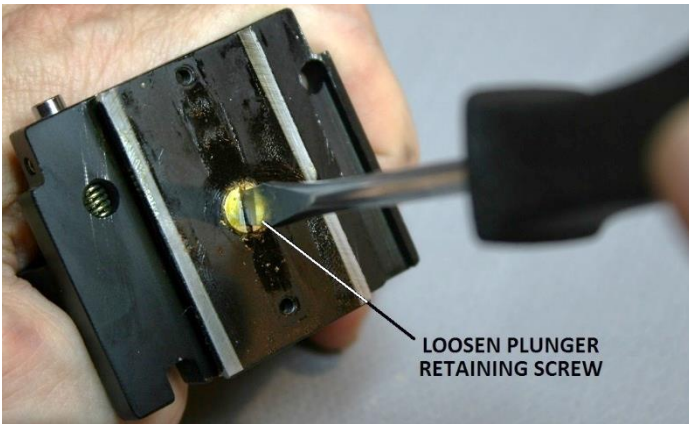


Figure 30 – Loosen the plunger-retaining screw

Unscrew and remove the plunger-retaining screw, being careful that the compressed spring behind the screw does not fly out and become lost (see **Figure 31**).

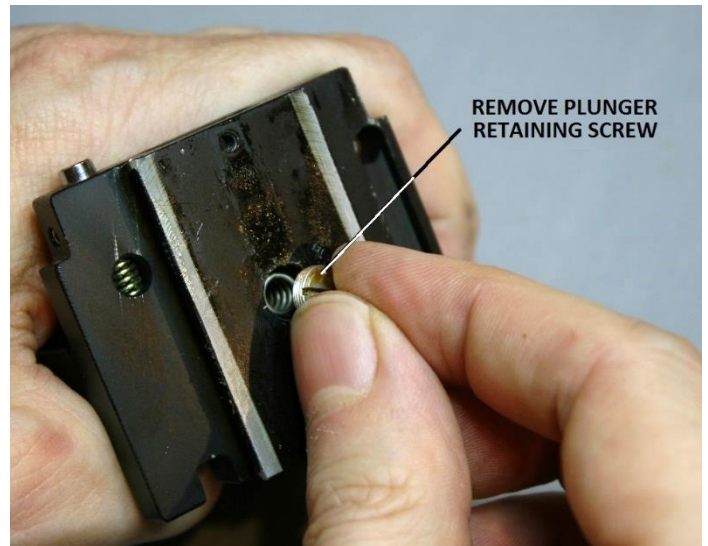


Figure 31 – Remove the plunger-retaining screw

Remove the plunger-extension spring, which is located in the bore behind the plunger-retaining screw (see **Figure 32**).

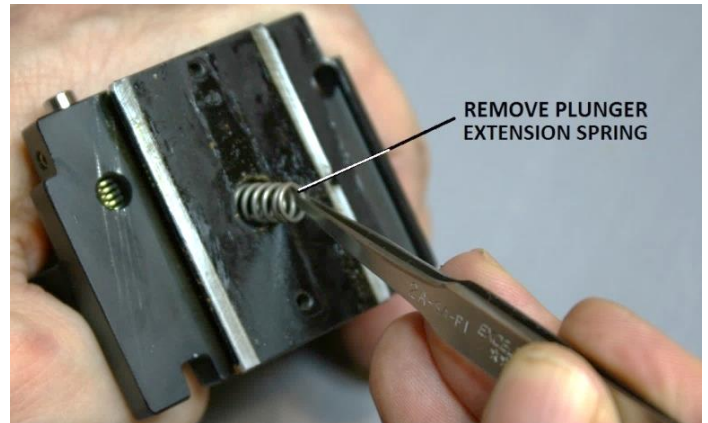


Figure 32 – Remove the plunger-extension spring

Use a suitable blunt tool to press the centering plunger into the bore in the front of the condenser slide and out the opposite side (i.e., out the bore on the face of the dovetail slide). Grasp the plunger and attached c-clip protruding from the face of the dovetail slide and withdraw the plunger and c-clip from the bore (see **Figure 33** and **Figure 34**).



Figure 33 – Press centering plunger out the back of bore

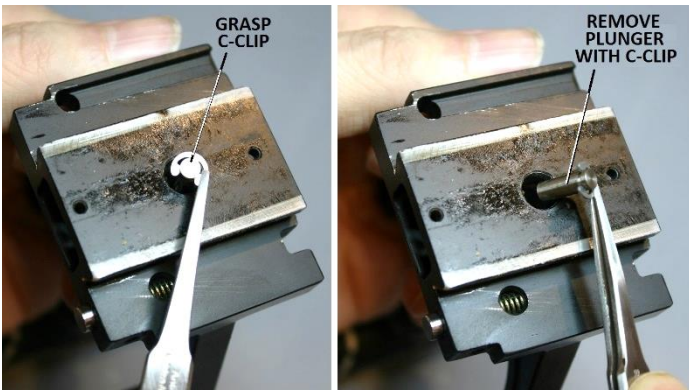


Figure 34 – Remove centering plunger from the bore

Reassemble the Centering Plunger

Use a cotton swab wetted with a suitable solvent (e.g., acetone) to clean any old grease from the plunger and spring. Also clean the bore in the condenser slide, the face of the dovetail slide, and the bearing surfaces on the face and bevels of the dovetail slide (see **Figure 35**).

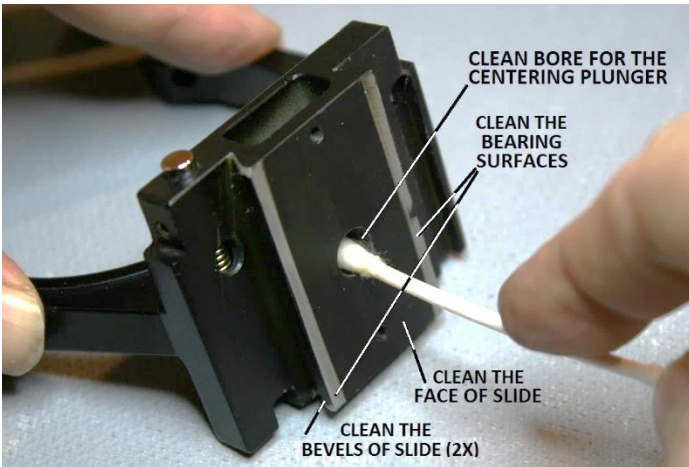


Figure 35 – Clean grease from bore and dovetail slide

Apply fresh grease to the centering-plunger bore in the condenser slide (see **Figure 36**).

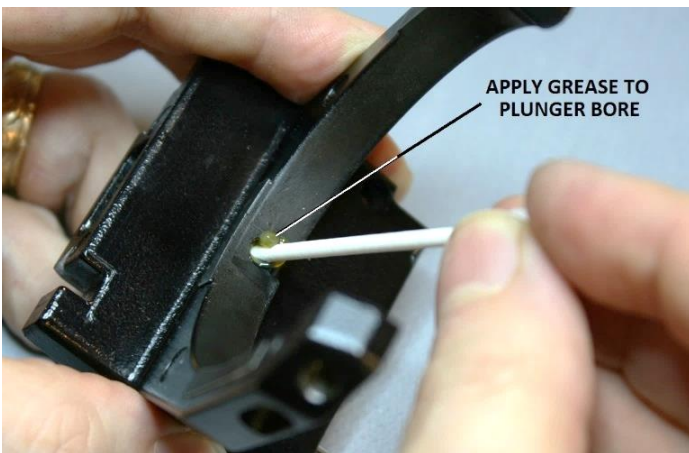


Figure 36 – Apply grease to the centering-plunger bore

Insert the centering plunger, with attached c-clip, into the centering-plunger bore in the face of the dovetail slide (see **Figure 37**).

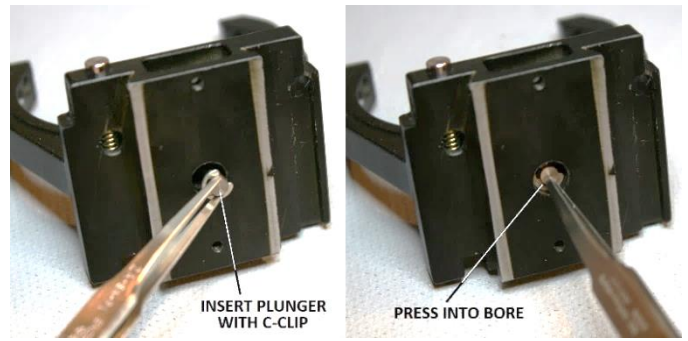


Figure 37 – Reinstall plunger and c-clip into bore

Insert the plunger-extension spring into the centering-plunger bore in the face of the dovetail slide (see **Figure 38**).

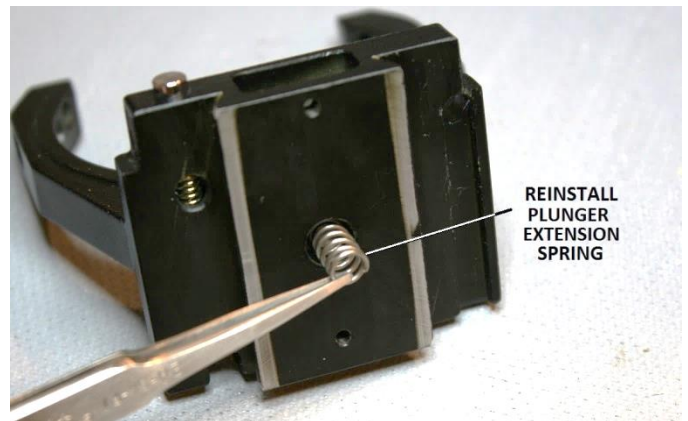


Figure 38 – Reinstall plunger-extension spring into bore

Compress the extension spring and reinstall the plunger-retaining screw into the bore of the dovetail slide, to retain the extension spring and centering plunger (see **Figure 39**).



Figure 39 – Reinstall the plunger-retaining screw

Use a suitable slotted screwdriver to tighten the plunger-retaining screw such that the head of the screw is slightly recessed relative to the face of the dovetail slide (see **Figure 40** and **Figure 41**). This will prevent the screw from interfering with the mounting of the plastic condenser-height rack. Wipe off any grease pushed out by the plunger.

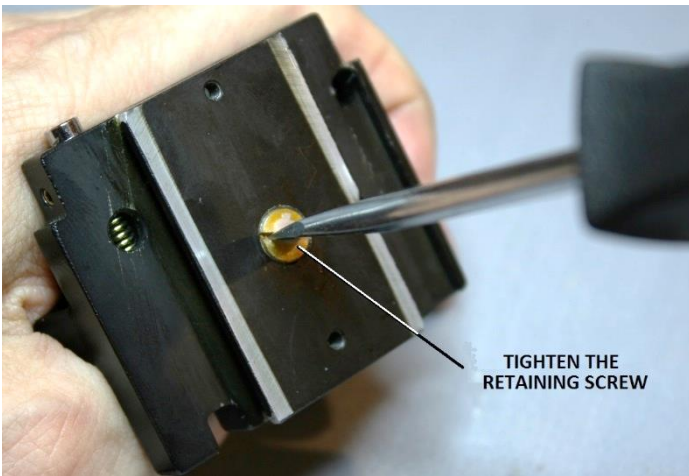


Figure 40 – Tighten the plunger-retaining screw

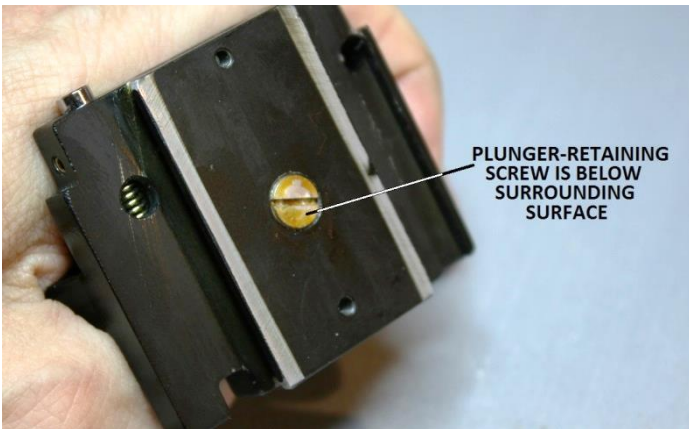


Figure 41 – Head of retaining screw must be recessed

Reinstall the Condenser-Height Rack

Clean any grease from the bevels and from the face of the dovetail slide, and reinstall the brass shim for the condenser-height rack onto the face of the dovetail slide (see **Figure 42**). Use a few spots of heavy grease behind the brass shim to hold the shim in position for the subsequent reassembly steps, if necessary.

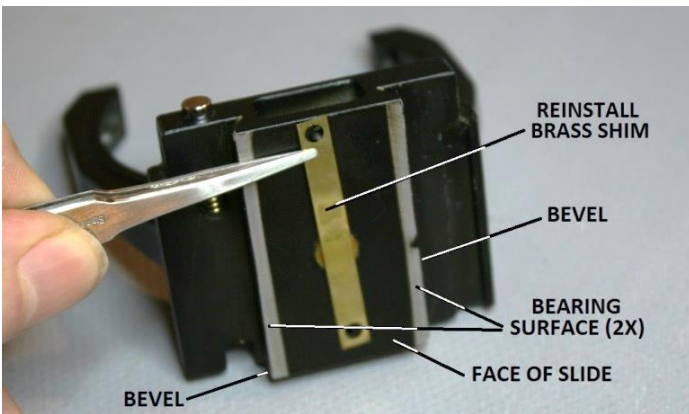


Figure 42 – Reinstall brass shim for condenser-height rack

Clean any grease or debris from the condenser-height rack. Use a suitable JIS screwdriver to loosely reinstall the two M2.6x6 JIS screws and two washers to hold the rack in position on the dovetail slide (see **Figure 43**).

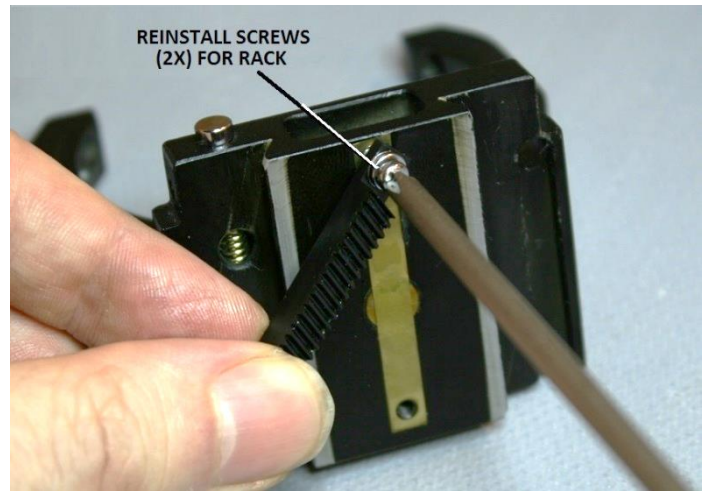


Figure 43 – Reinstall screws for the condenser-height rack

Tighten the two M2.6x6 JIS screws to secure the condenser-height rack to the dovetail slide (see **Figure 44**). Do not over-tighten these screws or the plastic rack may be damaged.

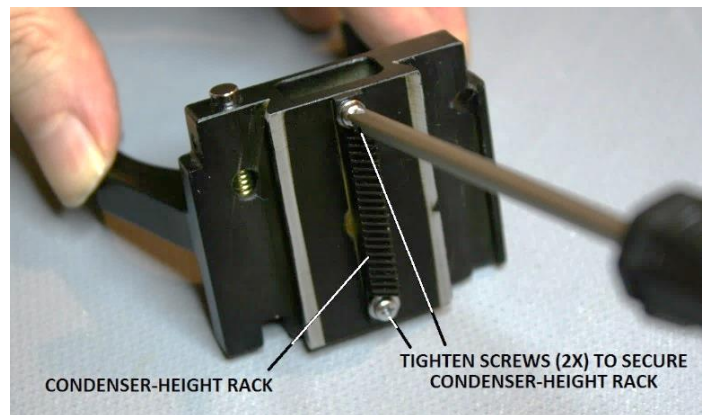


Figure 44 – Tighten screws for the condenser-height rack

Reinstall the Centering Yoke into the Support Yoke

Clean any old grease from the slip plates, centering yoke, and support yoke (see **Figure 45**).

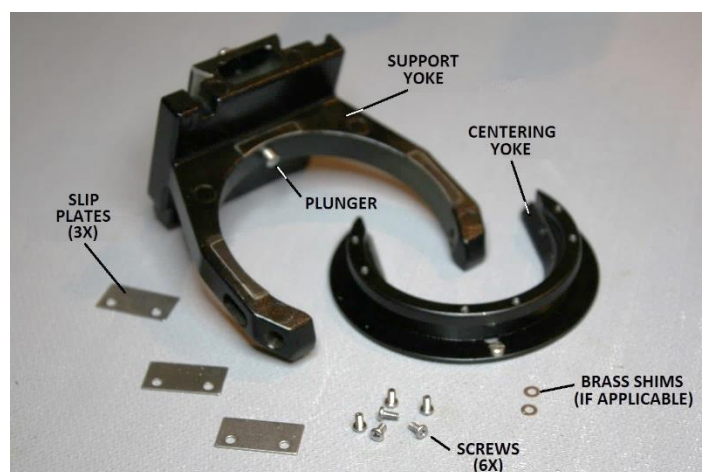


Figure 45 – Parts for the condenser-centering mechanism

Lightly grease the lower bearing surface of the centering yoke (see **Figure 46**).



Figure 46 – Lightly grease the underside of centering yoke

Place the back of the centering yoke against the centering plunger, and while pressing on the centering yoke to depress the centering plunger, seat the centering yoke into the support yoke (see **Figure 47**).

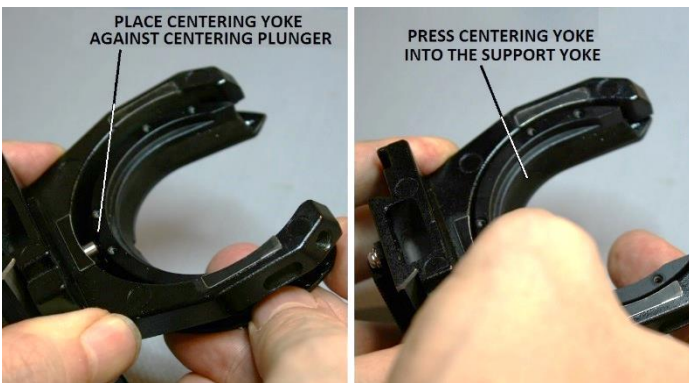


Figure 47 – Reinstall centering yoke into support yoke

Reinstall the Slip Plates

Carefully reposition any small, brass shim washers back into the original locations where they were found during disassembly (see **Figure 48**).

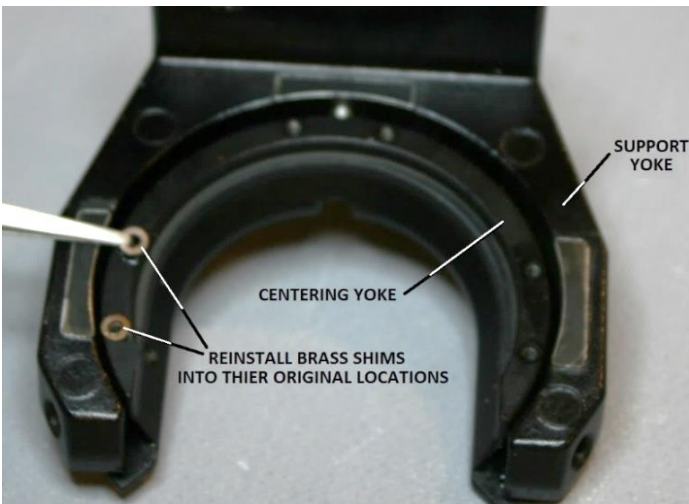


Figure 48 – Reinstall any brass shim washers

Apply a thin layer of grease to the three slip bosses machined into the support yoke (see **Figure 49**).

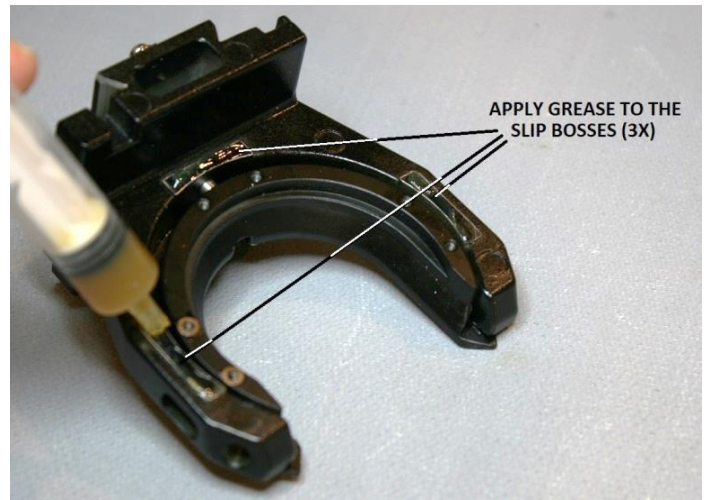


Figure 49 – Apply grease to the three slip bosses

Carefully place the three slip plates onto the greased slip bosses, aligning the holes in the slip plates with the tapped holes in the centering yoke, without disturbing any of the brass shim washers (see **Figure 50**).

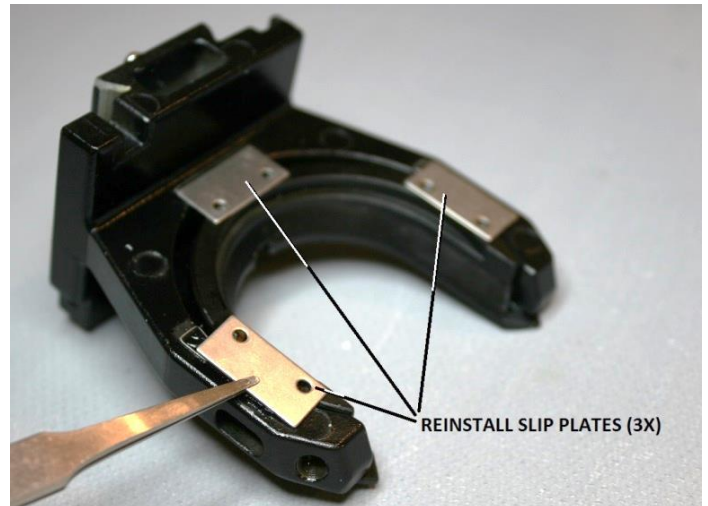


Figure 50 – Reinstall slip plates onto the slip bosses

Use a suitable JIS screwdriver to reinstall six M2x4 JIS screws to secure the slip plates onto the centering yoke (see **Figure 51**).

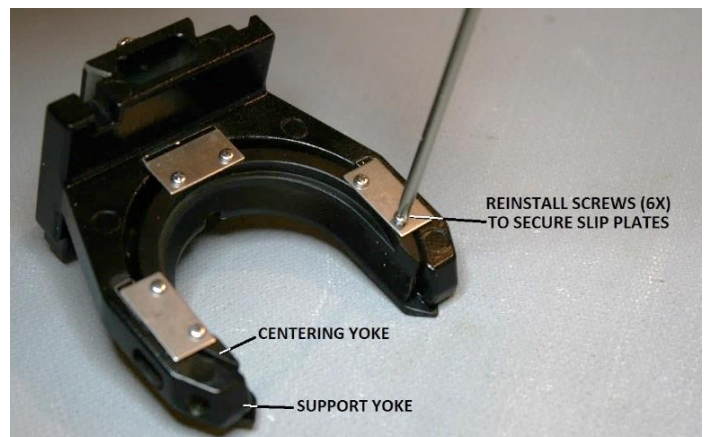


Figure 51 – Reinstall screws to secure the slip plates

Reinstall the Locking and Centering Thumbscrews

Lightly grease the threads of the condenser-locking thumbscrew (see [Figure 52](#)) and reinstall the thumbscrew into the centering yoke (see [Figure 53](#)).

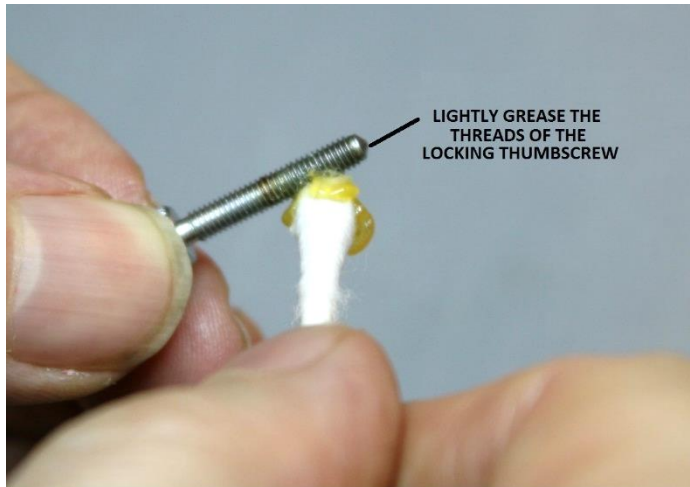


Figure 52 – Lightly grease the locking thumbscrew



Figure 53 – Reinstall the locking thumbscrew

Lightly grease the threads of the two condenser-centering thumbscrews (see [Figure 54](#)) and reinstall the thumbscrews into the support yoke (see [Figure 55](#)).

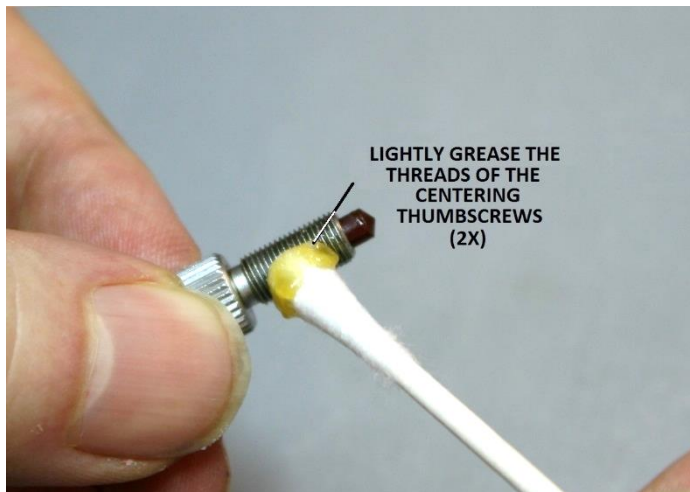


Figure 54 – Lightly grease the centering thumbscrews



Figure 55 – Reinstall the centering thumbscrews

Disassemble the Friction Lock

Note: Disassembly of the friction lock is not necessary, but is shown here for the sake of completeness.

Use a 3.0mm Allen wrench or driver to remove the M4x12 hex socket-head cap screw for the plastic friction lock (see [Figure 56](#)).

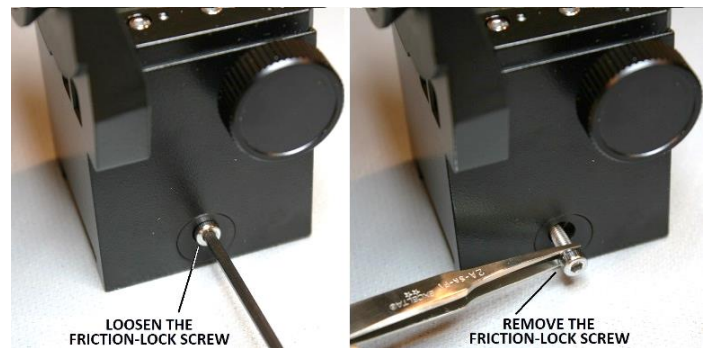


Figure 56 – Loosen and remove the friction-lock screw

Remove the plastic friction lock from the bore in the left-hand side of the main housing (see [Figure 57](#)).

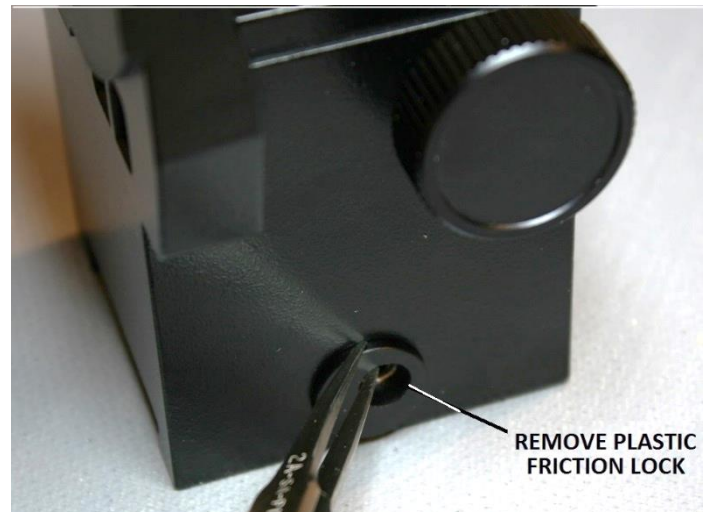


Figure 57 – Remove the plastic friction lock from housing

Reassemble the Friction Lock

Insert the plastic friction lock into the bore in the left-hand side of the main housing, with the recessed hole facing outwards (see [Figure 58](#)).

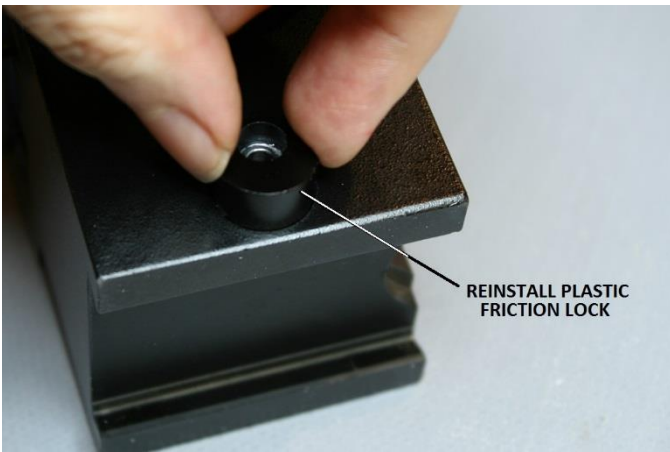


Figure 58 – Reinstall the plastic friction lock in bore

Use a 3.0mm Allen wrench or driver to loosely reinstall the M4x12 hex socket-head cap screw to secure the plastic friction lock into the main housing (see [Figure 59](#)).

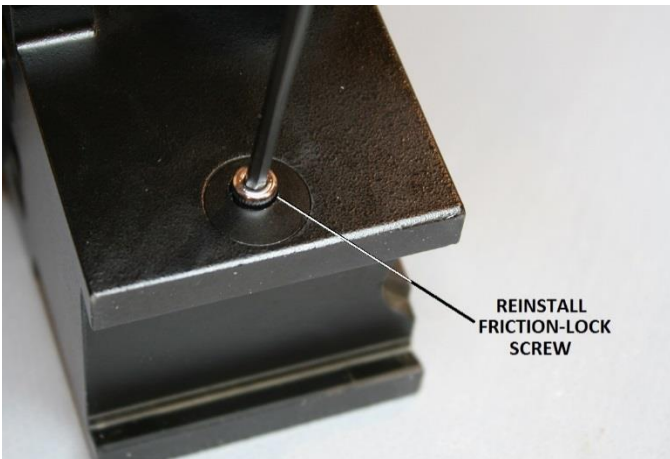


Figure 59 – Reinstall the friction-lock screw

Remove the Dovetail Blocks

Use a 2.5mm Allen wrench or driver to remove the three M3x6 hex socket-head cap screws securing the right-hand dovetail block to the main housing (see [Figure 60](#)).

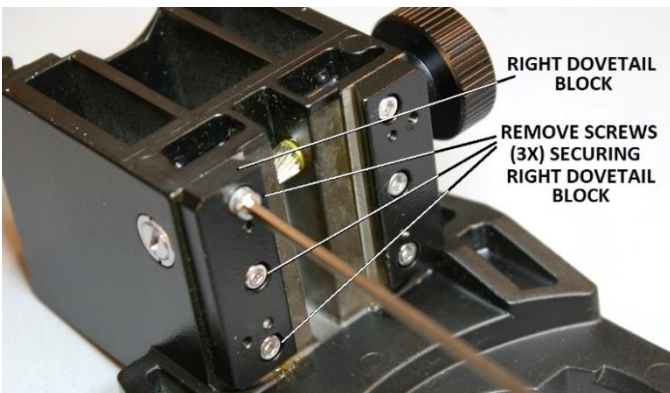


Figure 60 – Remove screws from right dovetail block

With the three screws removed, the only thing now holding the right-hand dovetail block onto the main

housing are two M2x8 alignment pins. Remove the right-hand dovetail block (with the two alignment pins) by pulling it straight out, away from the main housing (see [Figure 61](#) and [Figure 62](#)). Reinsert the alignment pins back into the dovetail block if necessary.

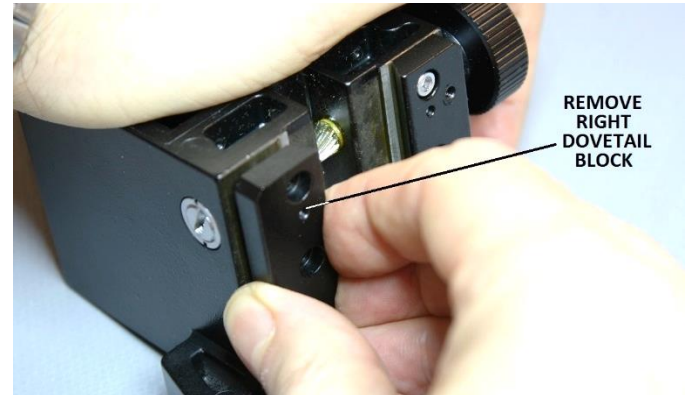


Figure 61 – Remove right dovetail block from the housing

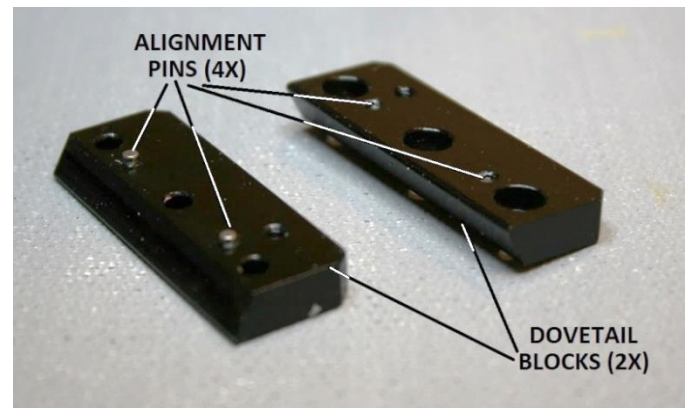


Figure 62 – Dovetail blocks with alignment pins

Use a 2.5mm Allen wrench or driver to remove the three M3x6 hex socket-head cap screws securing the left-hand dovetail block to the main housing (see [Figure 63](#)).

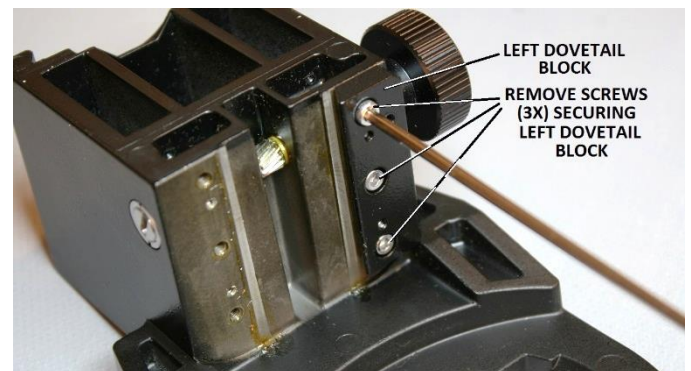


Figure 63 – Remove screws from left dovetail block

With the three screws removed, the only thing now holding the left-hand dovetail block onto the main housing are two M2x8 alignment pins. Remove the left-hand dovetail block (with the two alignment pins) by

pulling it straight out, away from the main housing (see [Figure 64](#) and [Figure 62](#)). Reinsert the alignment pins back into the dovetail block if necessary.

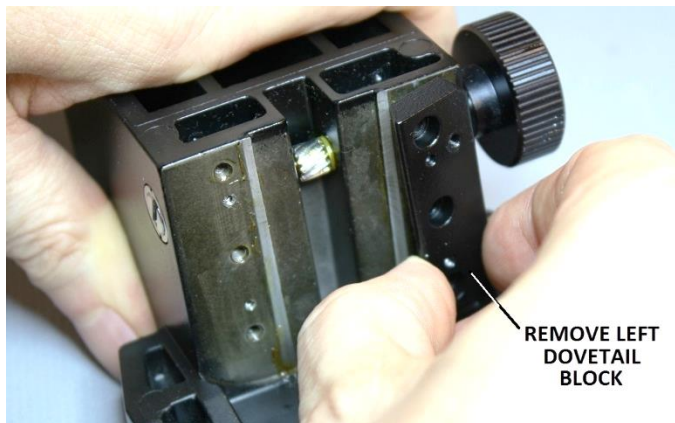


Figure 64 – Remove left dovetail block from the housing

Use a cotton swab and a suitable solvent (e.g., acetone) to clean the grease from the two dovetail blocks (see [Figure 65](#)).

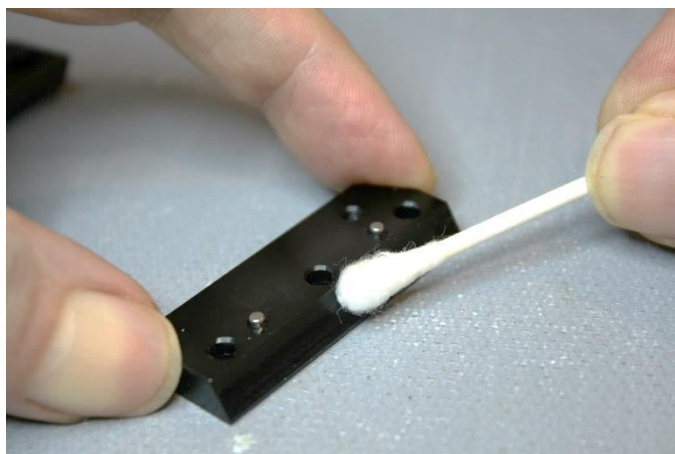


Figure 65 – Clean grease from the dovetail blocks

Remove the Condenser-Height Knob

Use a 1.5mm Allen wrench or driver to loosen the two M3x4 set screws securing the condenser-height knob to the condenser-height shaft (see [Figure 66](#)).

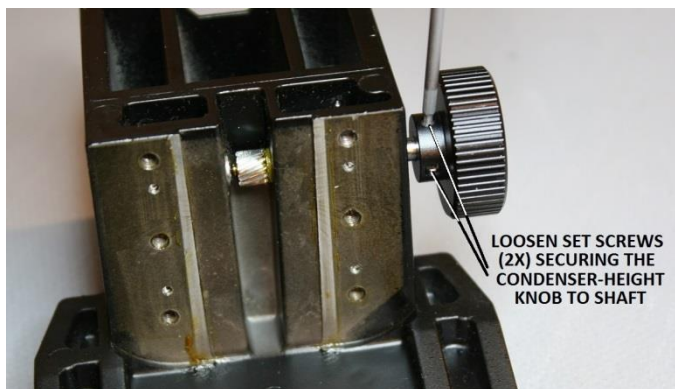


Figure 66 – Loosen set screws in condenser-height knob

Remove the condenser-height knob from the condenser-height shaft (see [Figure 67](#)).

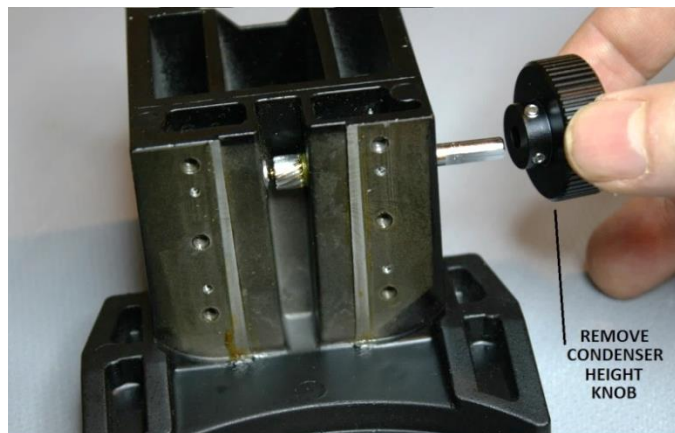


Figure 67 – Remove the condenser-height knob

Remove the Condenser-Height Shaft

Use a suitable tool (e.g., sharp needle-nose pliers) to loosen the lock nut for the tension screw for the condenser-height shaft (see [Figure 68](#)).

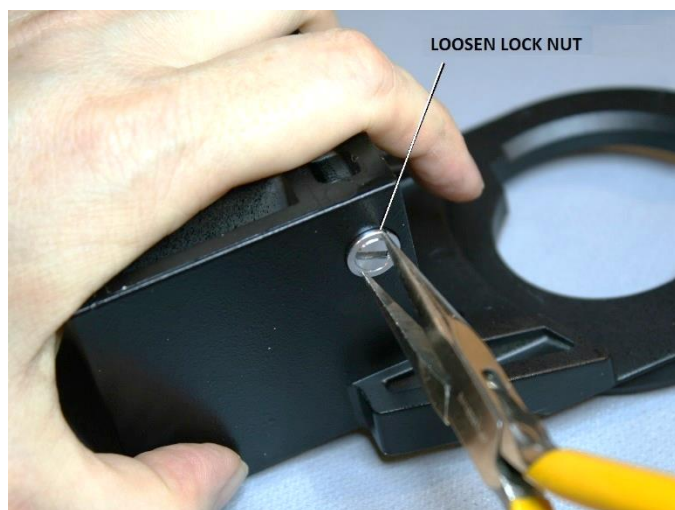


Figure 68 – Loosen the tension-screw lock nut

Unscrew and remove the lock nut from the tension screw (see [Figure 69](#)).



Figure 69 – Unscrew and remove tension-screw lock nut

Use a suitable slotted screwdriver to loosen the condenser-height tension screw (see [Figure 70](#)).

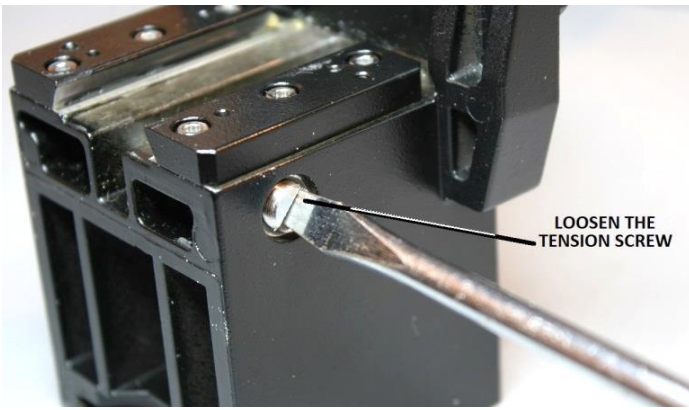


Figure 70 – Loosen the tension screw in housing

Unscrew and remove the condenser-height tension screw from the main housing (see **Figure 71**).

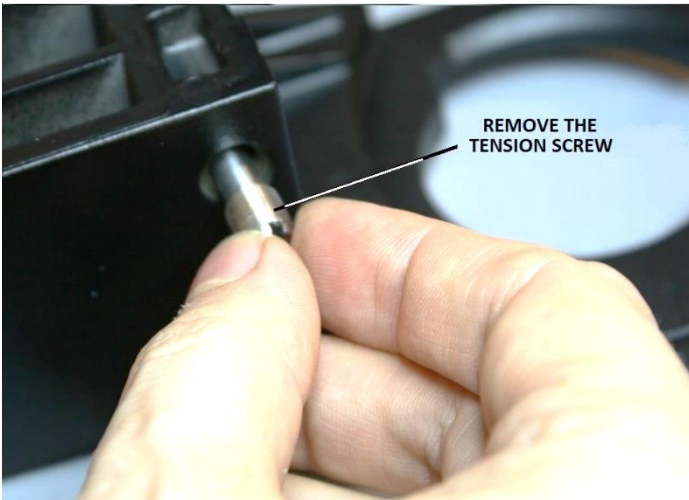


Figure 71 – Unscrew and remove the tension screw

Inspect the end of the tension screw for a 3/32" bearing ball, and remove this bearing ball if found (see **Figure 72**). If the bearing ball is not found there, look inside the housing at the end of the pinion gear (on the pinion shaft), and it should be there (see **Figure 73**). The bearing ball will be removed from the pinion shaft in a later step.

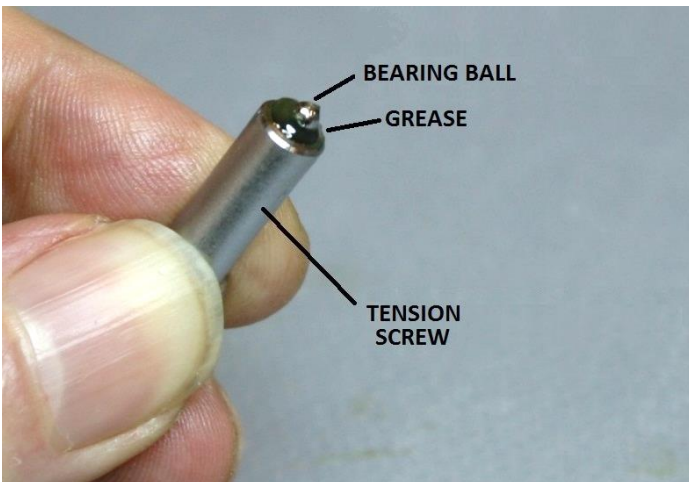


Figure 72 – Bearing ball on the end of the tension screw

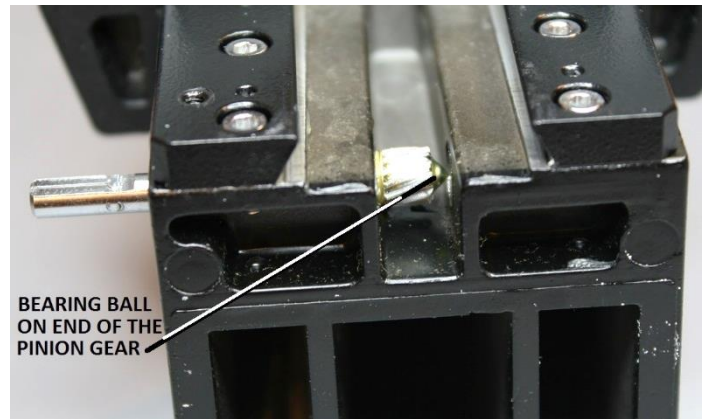


Figure 73 – Bearing ball on the end of the pinion gear

Place the tip of a suitable punch or nailset tool into the depression in the end of the pinion shaft, and lightly tap the punch or nailset tool with a hammer or mallet to push the protruding pinion shaft into the bore of the housing until it is approximately flush (see **Figure 74**).

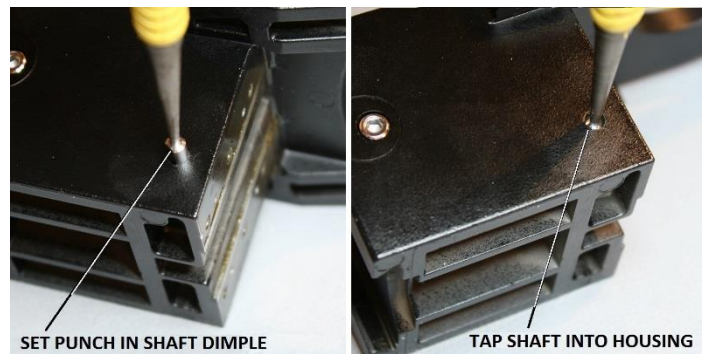


Figure 74 – Press or tap pinion shaft into main housing

Stand the main housing upright and press or tap the pinion shaft deeper into the bore with the punch or nailset, until the pinion gear protrudes from the opposite side of the housing (see **Figure 75**). Be very careful when doing this, so as to not damage the walls of the bore with the punch or nailset.

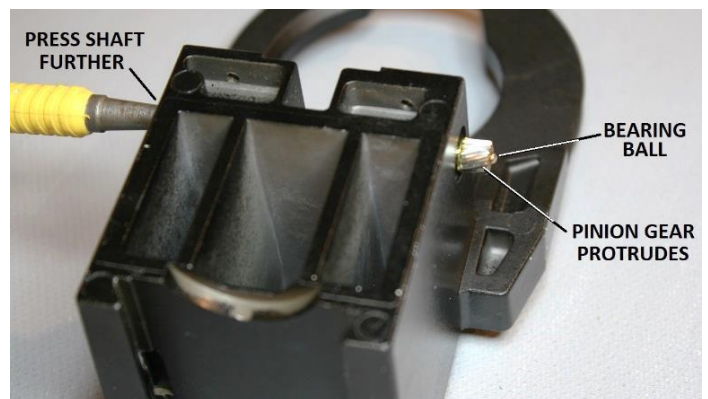


Figure 75 – Press shaft until pinion gear protrudes

If present, carefully remove the 3/32" bearing ball from the grease in the depression of the pinion gear (see **Figure 76**).

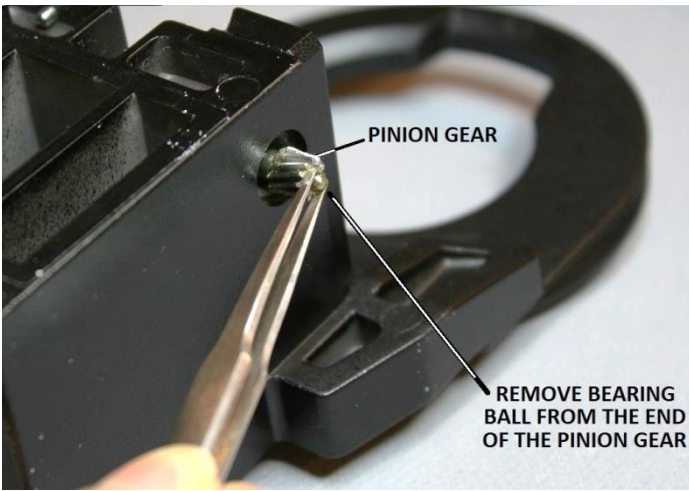


Figure 76 – Remove the bearing ball from the pinion gear

Grasp the pinion gear protruding from the right-hand side of the main housing and withdraw the pinion shaft (see [Figure 77](#)).

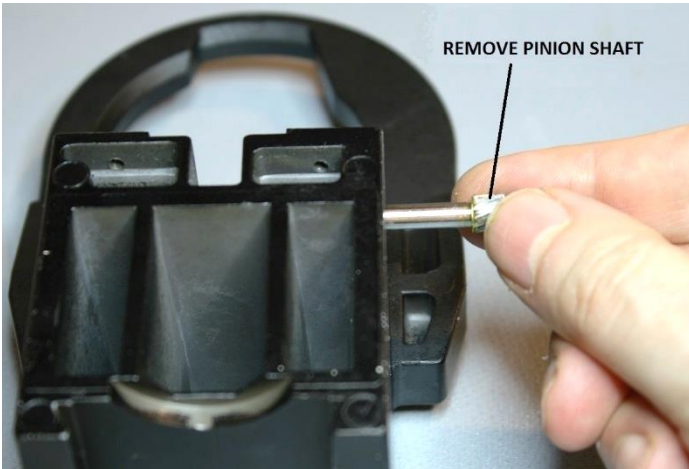


Figure 77 – Withdraw the pinion shaft from main housing

Remove the metal flat washer from the pinion shaft (see [Figure 78](#)).

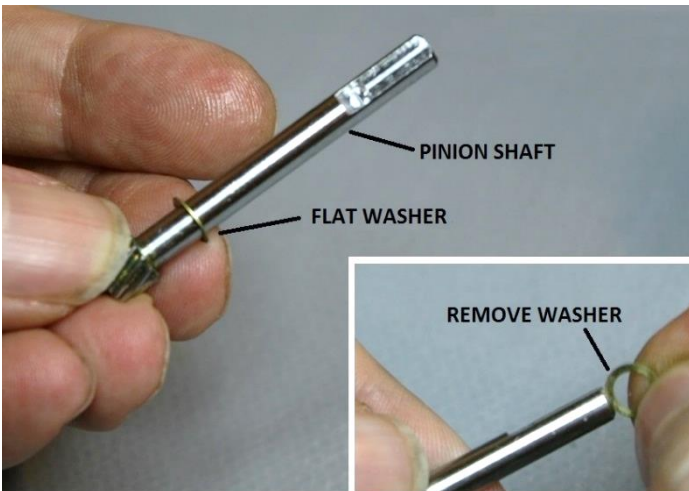


Figure 78 – Remove metal washer from the pinion shaft

Remove the small nylon washer from the recess in the inner ledge of the main housing (see [Figure 79](#)).

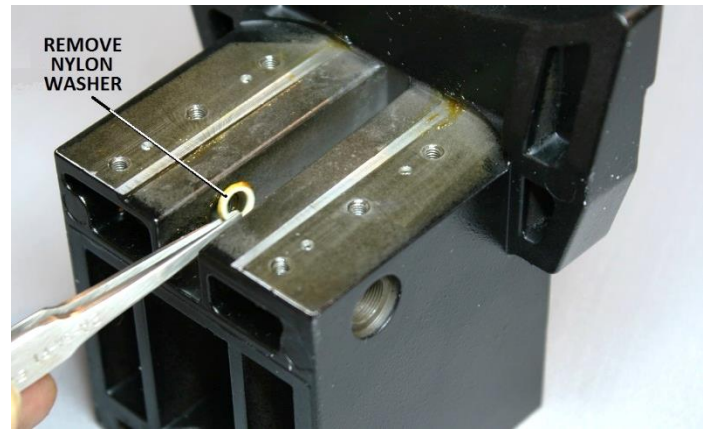


Figure 79 – Remove nylon washer from the main housing

Reinstall the Condenser-Height Shaft

Using a suitable solvent (e.g., acetone), clean any old grease from the pinion shaft, the tension screw, the bearing ball, the metal flat washer, and from the nylon washer. The various components of the condenser-height shaft are shown in [Figure 80](#).

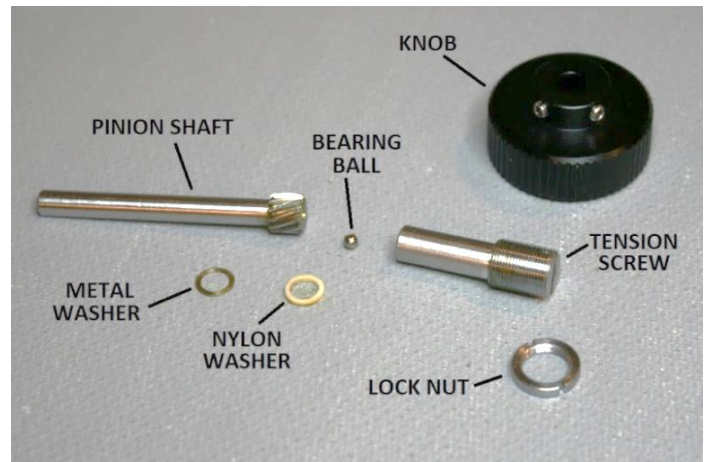


Figure 80 – Components of the condenser-height shaft

Use a cotton swab and a suitable solvent (e.g., acetone) to clean the grease from the bore in the left-hand side of the main housing (see [Figure 81](#)) and from the recess in the inner ledge of the main housing where the nylon washer seats.

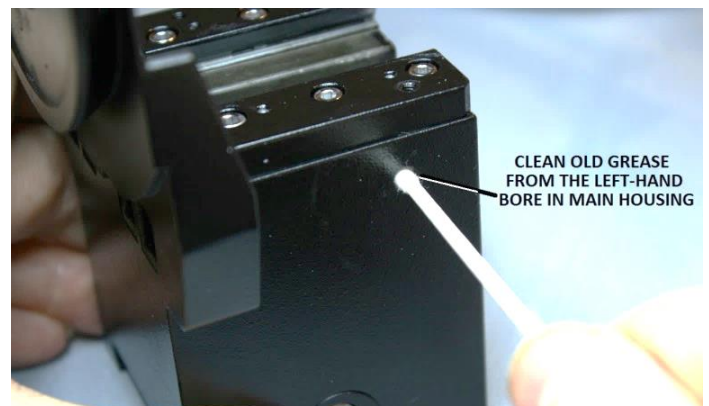


Figure 81 – Clean grease from bore in the main housing

Apply fresh grease to both sides of the small nylon washer. Place the nylon washer into the recess in the inner ledge of the main housing (see [Figure 82](#)). The grease will hold the nylon washer in place during the subsequent reassembly steps.

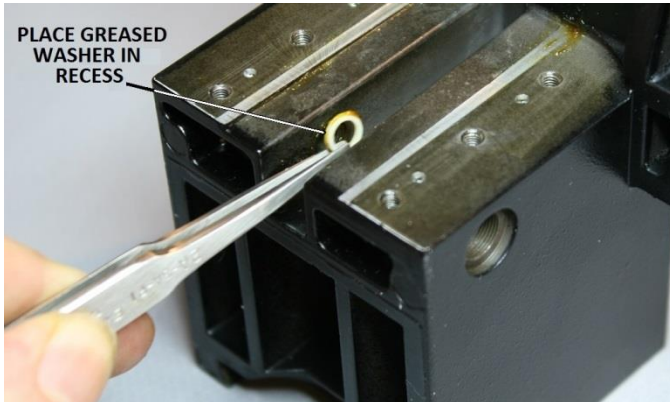


Figure 82 – Place washer in recess in the main housing

Apply fresh grease to the bore in the left-hand side of the main housing (see [Figure 83](#)).

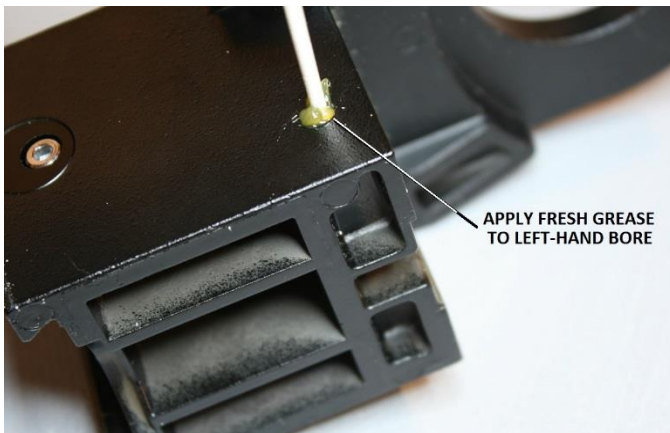


Figure 83 – Grease the left-hand bore in main housing

Place the metal flat washer over the pinion shaft. Lightly grease the pinion shaft (see [Figure 84](#)).

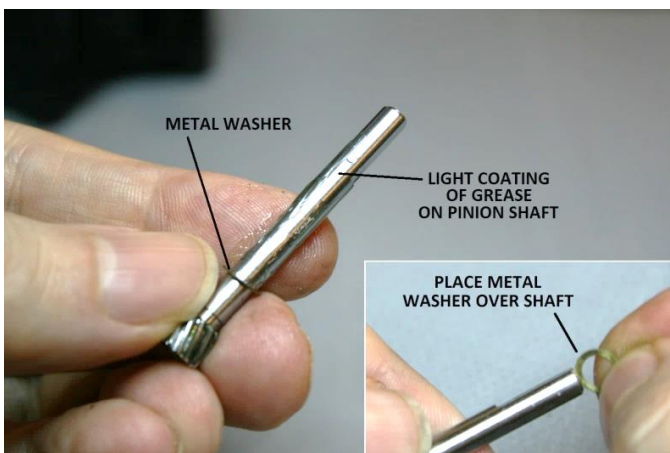


Figure 84 – Place metal washer over greased pinion shaft

Insert the greased pinion shaft into the bore on the right-hand side of the main housing (see [Figure 85](#)).

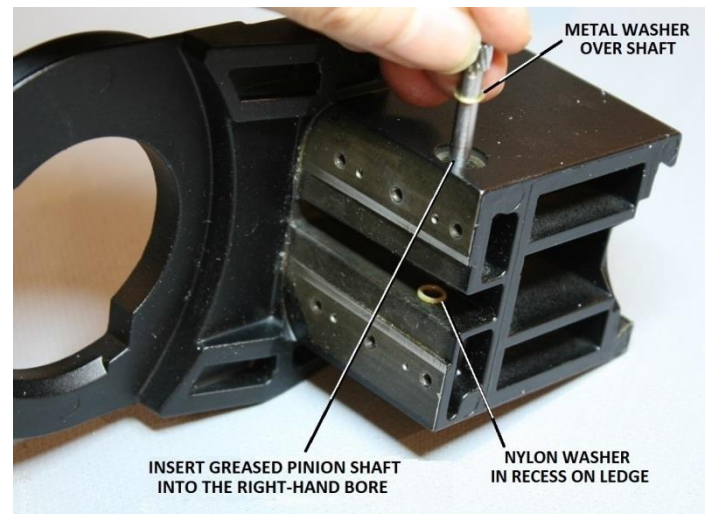


Figure 85 – Insert pinion shaft into the right-hand bore

Use a suitable blunt tool (i.e., one with a tip wide enough such that it does not damage the dimple for the bearing ball in the end of the pinion gear) to press the pinion shaft fully into the right-hand bore in the main housing, until the pinion gear comes to rest on the nylon washer on the internal ledge of the main housing (see [Figure 86](#)).

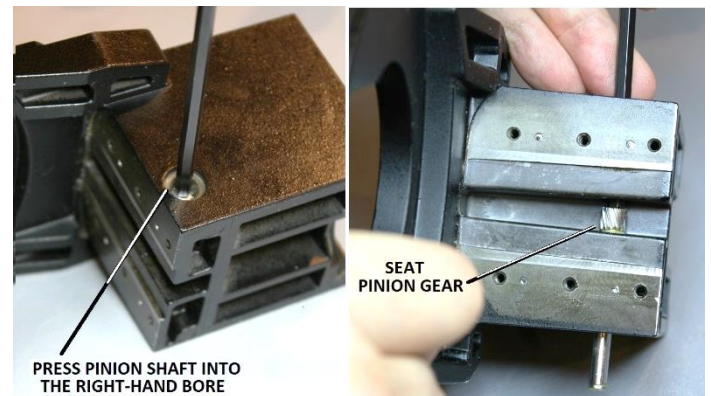


Figure 86 – Seat pinion gear onto main housing ledge

Apply a bit of fresh grease to the depression in the end of the tension screw (see [Figure 87](#)).



Figure 87 – Apply grease to the end of the tension screw

Carefully place the 3/32" bearing ball (item 1 of [Appendix 1](#)) into the greased depression in the end of the tension screw. Apply a bit of grease to the top of the ball (see [Figure 88](#)).

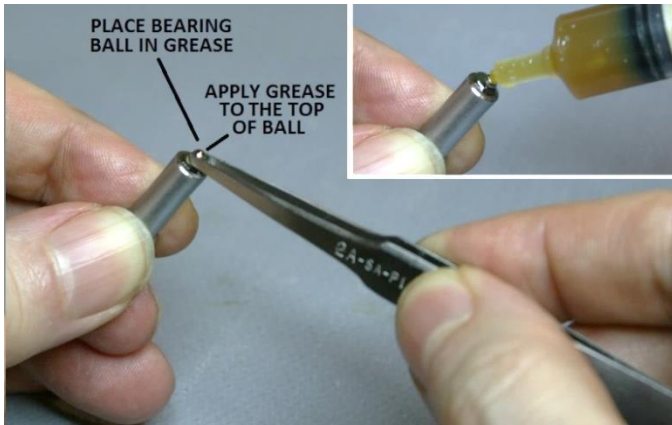


Figure 88 – Place ball into greased end of tension screw

Use an object of some type to support the main housing such that the protruding pinion shaft does not get pushed up into the main housing. Insert the tension screw into the right-hand bore of the housing, with the bearing ball pointing downwards (see [Figure 89](#)).

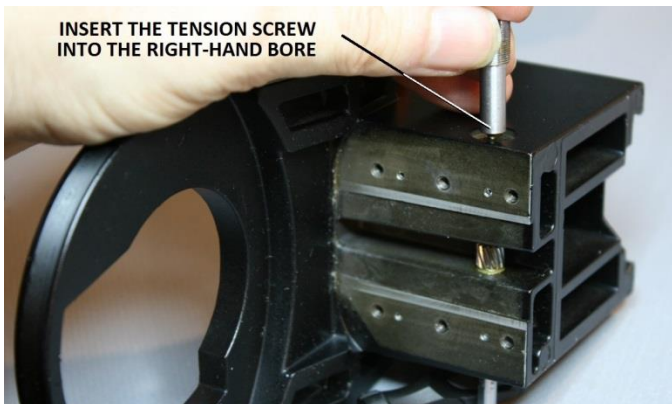


Figure 89 – Insert tension screw into right-hand bore

Engage the threads of the tension screw with the threads in the main housing (see [Figure 90](#)).



Figure 90 – Engage threads of tension screw with housing

Use a suitable slotted screwdriver to snug the tension screw just a bit, to hold the 3/32" bearing ball in

position between the pinion gear and the tension screw (see [Figure 91](#)).

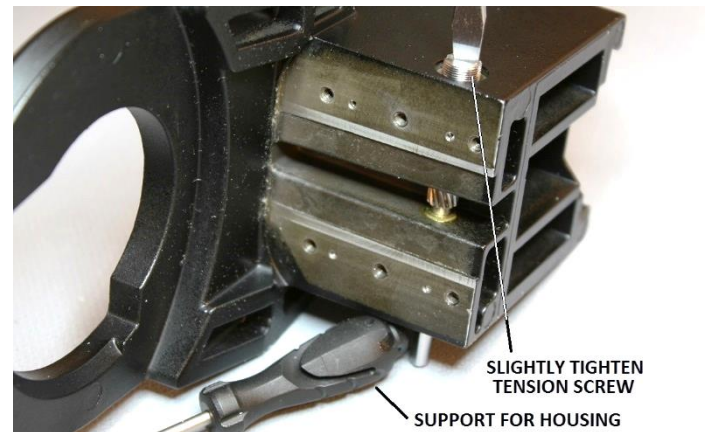


Figure 91 – Slightly tighten the tension screw to hold ball

Reinstall the lock nut onto the threads of the tension screw (see [Figure 92](#)), but do not tighten it yet. The tension screw will be adjusted and the lock nut will be tightened after the condenser-height knob has been reinstalled.

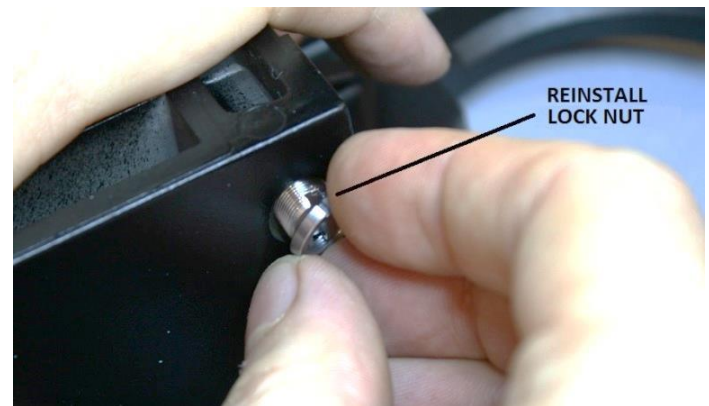


Figure 92 – Reinstall the tension-screw lock nut

Reinstall the Condenser-Height Knob

Reinstall the condenser-height knob onto the condenser-height shaft, making sure to align one of the two set screws with the flat on the shaft (see [Figure 93](#)).



Figure 93 – Reinstall knob onto condenser-height shaft

Use a 1.5mm Allen wrench or driver to tighten the two M3x4 set screws to secure the condenser-height knob to the condenser-height shaft (see [Figure 94](#)).

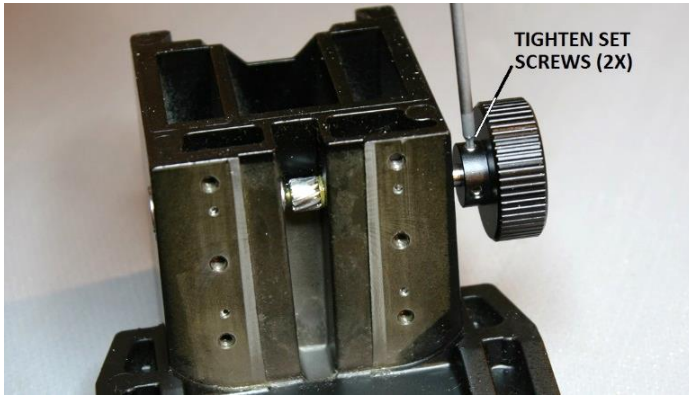


Figure 94 – Tighten set screws to secure the height knob

Adjust the Tension of the Condenser-Height Shaft

Use a suitable slotted screwdriver to tighten the tension screw until the condenser-height knob has the desired feel, with no thrust play in the condenser-height shaft (see [Figure 95](#)).

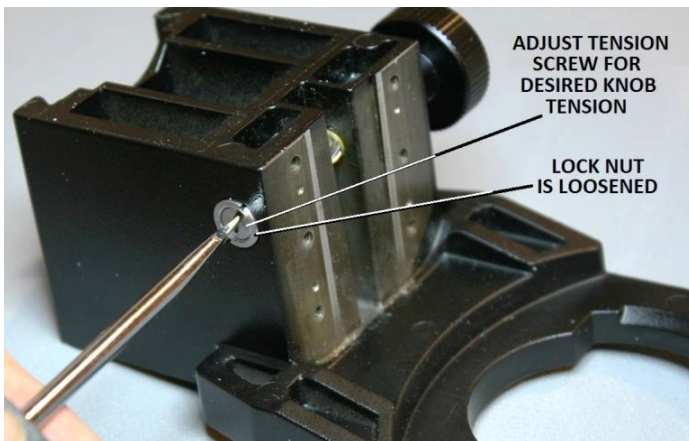


Figure 95 – Adjust tension screw for no thrust play

Use a suitable tool (e.g., sharp needle-nose pliers) to snug the lock nut for the tension screw, to lock the tension screw in position (see [Figure 96](#)).

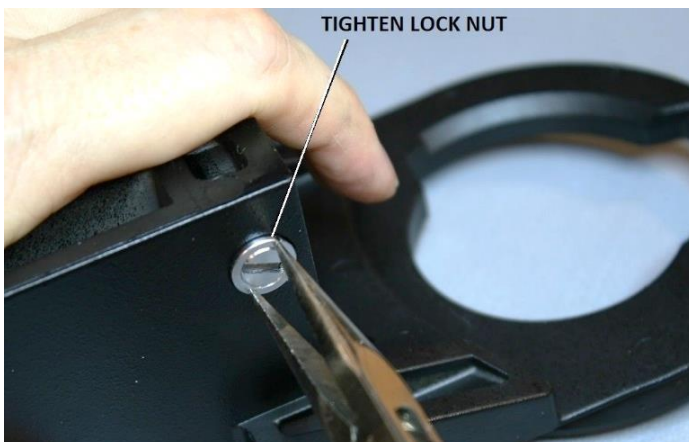


Figure 96 – Tighten lock nut to secure tension screw

Reinstall the Dovetail Blocks

Place the right-hand dovetail block into position on the main housing (see [Figure 97](#)). Make sure that the two M2x8 alignment pins in the dovetail block seat into the alignment holes in the main housing.

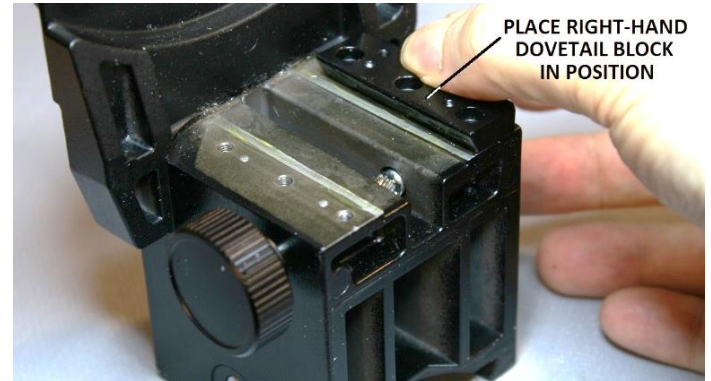


Figure 97 – Place right-hand dovetail block onto housing

Use a 2.5mm Allen wrench or driver to reinstall three M3x6 hex socket-head cap screws to secure the right-hand dovetail block onto the main housing (see [Figure 98](#)).

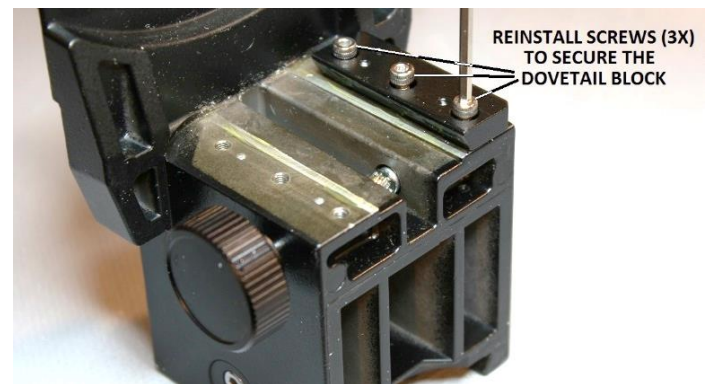


Figure 98 – Reinstall screws to secure right dovetail block

Place the left-hand dovetail block into position on the main housing (see [Figure 99](#)). Make sure that the two M2x8 alignment pins in the dovetail block seat into the alignment holes in the main housing.

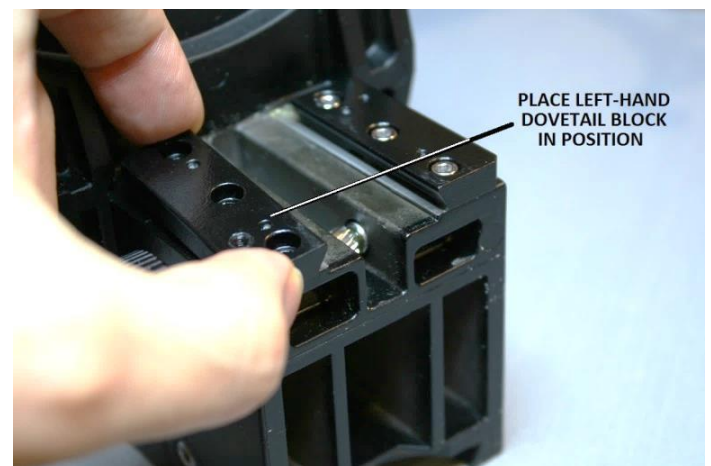


Figure 99 – Place left-hand dovetail block onto housing

Use a 2.5mm Allen wrench or driver to reinstall three M3x6 hex socket-head cap screws to secure the left-hand dovetail block onto the main housing (see [Figure 100](#)).

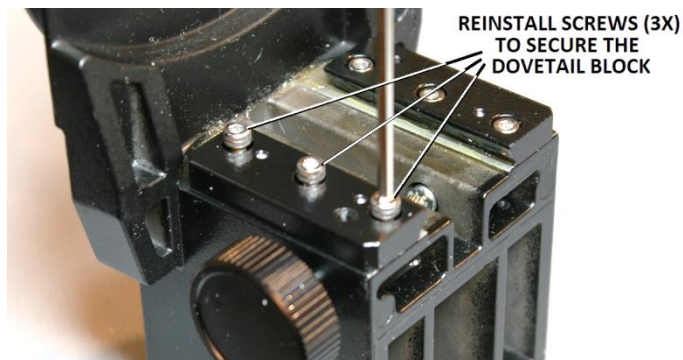


Figure 100 – Reinstall screws to secure left dovetail block

Apply a light coating of grease onto the inside beveled bearing surfaces of the two dovetail blocks and onto the two flat bearing surfaces of the main housing (see [Figure 101](#)).

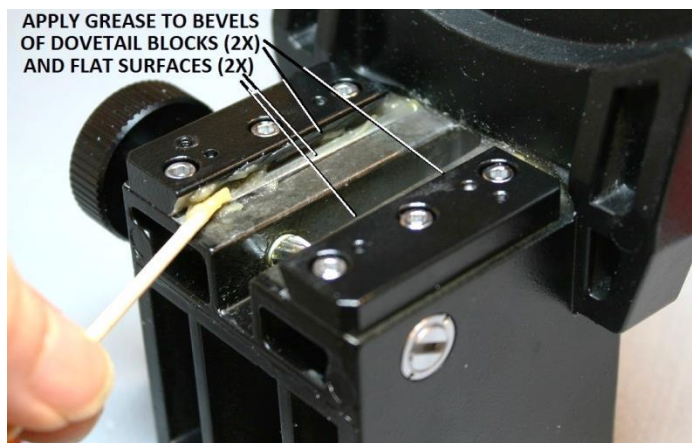


Figure 101 – Grease the bearing surfaces for the slide

Reinstall the Condenser-Slide Assembly

Apply a light coating of grease onto the flat bearing surfaces of the dovetail slide (see [Figure 102](#)).

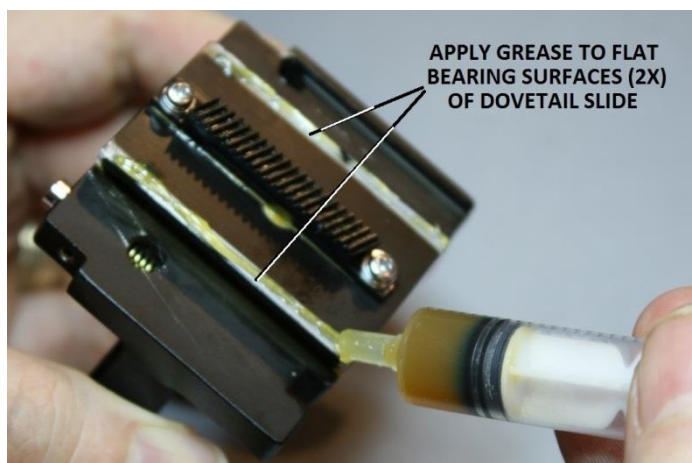


Figure 102 – Grease flat bearing surfaces of dovetail slide

Apply a light coating of grease onto the two beveled bearing surfaces of the dovetail slide (see [Figure 103](#)).

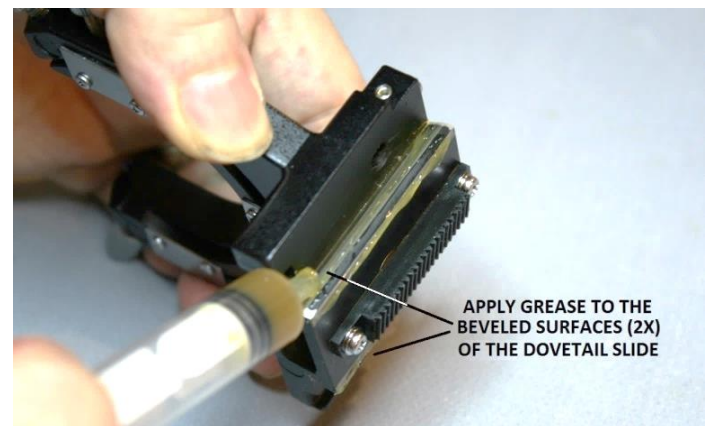


Figure 103 – Grease beveled surfaces of dovetail slide

Carefully engage the greased condenser slide with the dovetail blocks on the main housing (see [Figure 104](#)).

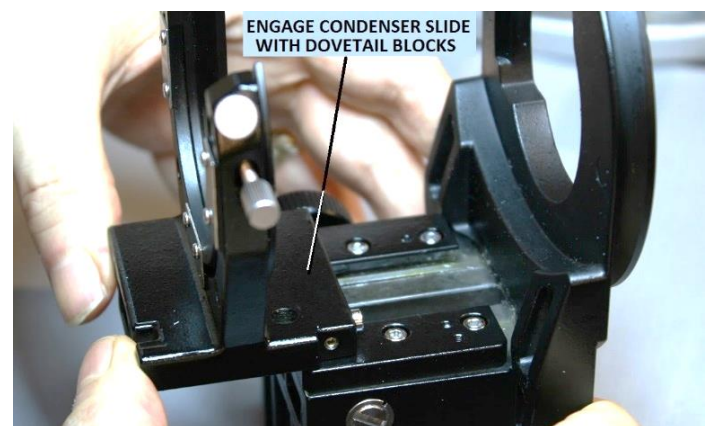


Figure 104 – Engage condenser slide with dovetail blocks

Rotate the condenser-height knob counter-clockwise until the hole in the condenser slide aligns with the tapped hole in the main housing (see [Figure 105](#)).

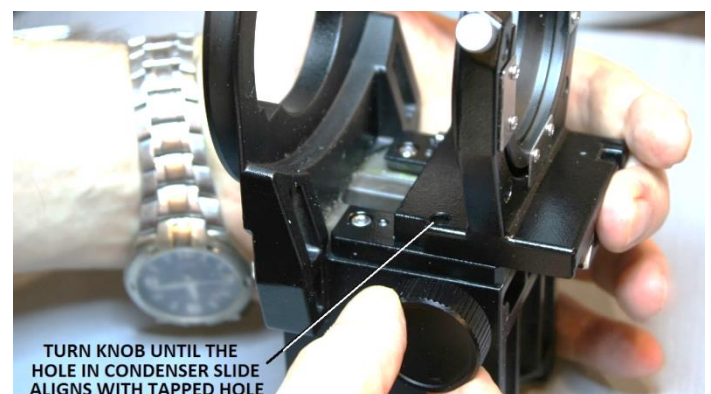


Figure 105 – Align the hole in slide with the tapped hole

Use a suitable slotted screwdriver to reinstall the M2.6x4 condenser-slide stop screw through the hole in the condenser slide and into the tapped hole in the main housing (see [Figure 106](#)).

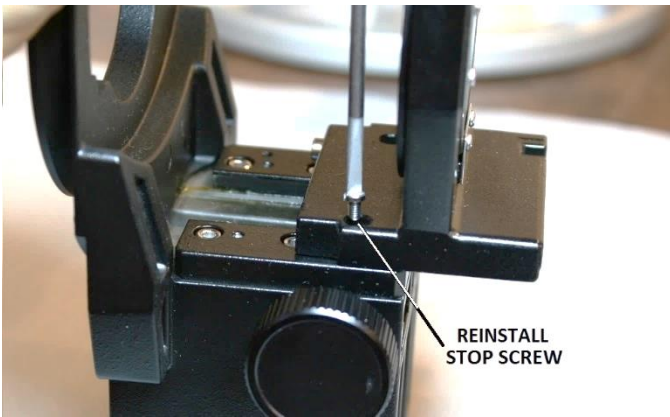


Figure 106 – Reinstall the condenser-slide stop screw

Adjust the Condenser-Height Stop

The purpose of the condenser-height stop on the BH2-CH substage assembly is to allow the condenser to be raised to the height required to achieve the proper setup for Köhler illumination, yet prevent the upper lens element from contacting the bottom of the glass specimen slide. The height stop can be adjusted by first mounting the condenser into the BH2-CH substage assembly, and then adjusting the condenser-height knob until the stop pin in the condenser slide either hits the stop (see **Figure 107**, shown with the condenser removed for clarity), or reaches the desired maximum height (i.e., just short of the point where the upper lens element of the condenser contacts the bottom of a glass slide sitting on the stage surface).

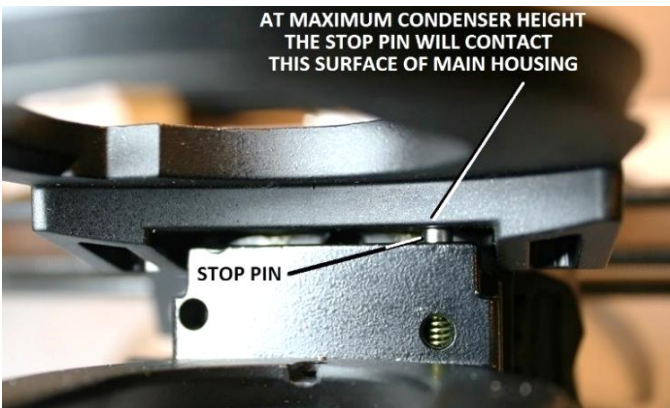


Figure 107 – The condenser set to maximum height

If the mechanism reaches the stop at the proper condenser height, no further adjustment is needed. If it does not, use a 1.5mm Allen wrench or driver to loosen the M3x4 set screw securing the stop pin in position (see **Figure 108**) and turn the condenser-height knob to set the condenser to the desired maximum height, then retighten the set screw to lock the stop pin to this new position. The condenser-height stop should be checked anytime a different condenser is mounted into the BH2-CH substage assembly, and should be readjusted if necessary to prevent the condenser from contacting the

bottom of the glass slide. **Caution:** Never loosen the M3x4 set screw securing the condenser-height stop pin (see **Figure 108**) unless the condenser is at or near its maximum height setting, otherwise the spring in the stop mechanism might eject the stop pin.

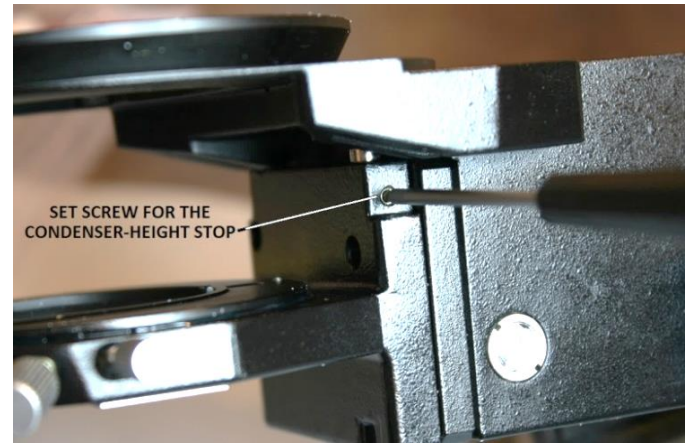


Figure 108 – The set screw for the condenser-height stop

Ready for Service

The BH2-CH substage assembly is now ready for service and can be reinstalled onto the microscope stand.

Original Olympus Documentation

A scanned PDF of the *Olympus Research Microscope Series BH2 (BHS) Repair Manual* is available for download at various microscope-related hobbyist sites on the internet, and can be found by searching for the title in an internet search engine, such as Google.

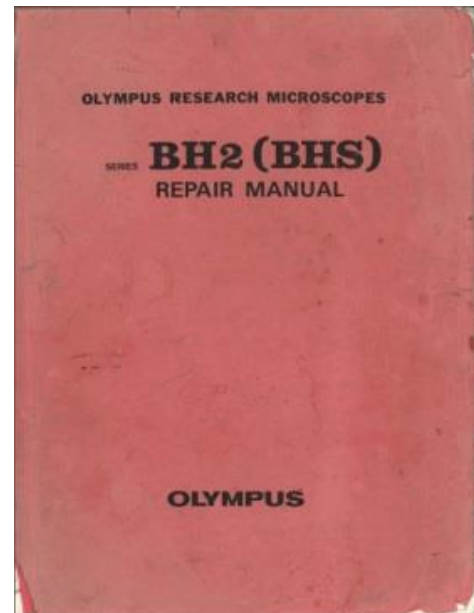


Figure 109 – Olympus BH2 (BHS) repair manual

How to Contact the Author

Please feel free to direct any questions or comments regarding this document (or BH-2 microscopes in general) to the author, at the following email address: carlh6902@gmail.com

Appendix 1

Parts, Supplies, and Tools Referenced in this Document

Parts, Supplies, and Tools

Table 1, **Table 2**, and **Table 3** list specific information for the various parts, supplies, and tools discussed in this document. These tables list only the items that may be difficult to source locally. The pricing and availability listed below is accurate as-of August 2017, but is subject to change without notice.

Item	Description	Manufacturer	Mfg. Part #	Vendor	Vendor #	Price
1	Bearing balls, stainless steel, 3/32", G25	various	---	Amazon	---	\$4.47

Table 1 – Parts for servicing the BH2-CH substage assembly

Item	Description	Manufacturer	Mfg. Part #	Vendor	Vendor #	Price
2	Grease, Molykote® 44 (medium), 28g	Dow Corning	Molykote 44	Amazon	---	\$6.95
3	Nye 704C, 50g	Nye Lubricants	Nye 704C	TAI Lubricants, Inc.	---	\$49.95

Table 2 –Supplies for servicing the BH2-CH substage assembly

Item	Description	Manufacturer	Mfg. Part #	Vendor	Vendor #	Price
4	Allen driver, 1.5mm, 50mm	Wiha	96315	Amazon	---	\$8.61
5	Allen driver, 2.5mm, 200mm T-Handle	Wiha	33437	Amazon	---	\$8.59
6	Allen driver, 3.0mm, 200mm T-Handle	Wiha	33405	Amazon	---	\$7.99
7	Screwdriver set, JIS, 4 pieces	Hozan	JIS-4	Amazon	---	\$19.66

Table 3 – Tools for servicing the BH2-CH substage assembly

Sources for Parts, Supplies, and Tools

Table 4 lists the contact information for the vendors referenced in **Table 1**, **Table 2**, and **Table 3**.

Vendor	URL	Telephone	Toll Free	email
Amazon	www.amazon.com	---	---	---
TAI Lubricants, Inc.	www.lubekits.com www.TAI-Lubricants.com	1-302-326-0200	---	---

Table 4 – Vendor Listing