

# Freeing the Spring-Loaded Tip Mechanism of Olympus LB Series Objectives

REVISION 1



Copyright © 2017 Carl Hunsinger

All rights reserved. This document may not be reproduced or distributed, in whole or in part, for any commercial purpose without the express written consent of the author (carlh6902@gmail.com). Permission is hereby granted to distribute this PDF document in its entirety for personal, non-commercial purposes only, provided that the contents are not modified in any way, including the copyright notices contained herein. This document may be freely distributed on WWW, FTP, or BBS sites in accordance with these restrictions.

## Document Revision History

Revision	Description of Changes	Date
1	--- INITIAL RELEASE ---	10-4-2017

## Table of Contents

Introduction .....	4
Scope of this Document .....	4
Safety Warnings and Disclaimers .....	4
Tools Needed .....	4
Supplies Needed .....	4
Recommended Solvents .....	4
Safety Considerations with Solvents .....	4
Solvent Compatibility with Parts and Finishes .....	4
Test the Spring-Loaded Tip .....	5
Repairing the Spring-Loaded Tip .....	5
Remove the Knurled-Rubber Grip Collar .....	5
Remove the Retaining Screw .....	5
Remove the Threaded Rear Cover .....	6
Remove the Extension Spring .....	6
Remove the Inner-Optics Barrel .....	6
Clean the Bore of the Outer Objective Barrel .....	7
Clean the Outer Surface of the Inner-Optics Barrel .....	7
Reinstall Inner-Optics Barrel into Objective Barrel .....	7
Reinstall the Retaining Screw .....	7
Test the Tip without the Extension Spring .....	8
Reinstall the Extension Spring .....	8
Reinstall the Threaded Rear Cover .....	8
Test the Spring-Loaded Tip After Reassembly .....	8
Reinstall the Knurled-Rubber Grip Collar .....	8
Clean the Exposed Objective Lens .....	9
Ready for Service .....	9
How to Contact the Author .....	9
Appendix 1 .....	10
Sources for Replacement Tools and Supplies Referenced in this Document .....	10

## Table of Figures

Figure 1 – Recommended #00 Phillips screwdriver .....	4
Figure 2 – Test the spring-loaded tip .....	5
Figure 3 – Olympus DPlan 100X oil-immersion objective .....	5
Figure 4 – Remove the knurled-rubber grip collar .....	5
Figure 5 – A view of the small retaining screw .....	5
Figure 6 – Remove the small retaining screw .....	5
Figure 7 – The threaded rear objective cover .....	6
Figure 8 – Loosen the threaded rear cover on rubber sheet .....	6
Figure 9 – Remove threaded rear cover from objective barrel .....	6
Figure 10 – Remove the extension spring .....	6
Figure 11 – Push objective tip up into the objective barrel .....	6
Figure 12 – Remove the inner-optics barrel .....	6
Figure 13 – Inner-optics barrel removed from outer barrel .....	7
Figure 14 – Clean inner bore of the outer objective barrel .....	7
Figure 15 – Clean outer surface of the inner-optics barrel .....	7
Figure 16 – Place outer barrel over the inner-optics barrel .....	7
Figure 17 – Align the inner slot with the outer screw hole .....	7

Figure 18 – Carefully reinstall the small retaining screw .....	7
Figure 19 – Depress the tip and allow it to drop .....	8
Figure 20 – Reinstall the extension spring .....	8
Figure 21 – Reinstall the threaded rear cover .....	8
Figure 22 – Tighten threaded rear cover on rubber sheet .....	8
Figure 23 – Test the tip of the reassembled objective .....	8
Figure 24 – Reinstall the knurled rubber grip collar .....	8
Figure 25 – DPlan 100X objective is now ready for service .....	9

## Introduction

The higher-power objectives on most microscopes incorporate a spring-loaded design, such that the objective tip is free to move up into the outer barrel of the objective if the tip ever crashes into the cover slip of the slide under observation. This feature exists to prevent damage to the exposed lower optics of the objective and to the cover slip. Once the focus has been raised to the point where the objective is no longer in contact with the cover slip, the spring in the objective pushes the tip back out to its normal position, and the objective, none the worse for wear, is ready for use again.

It is relatively common with Olympus BH-2, CH-2, and CH30/40 microscopes for the retractable spring tips in the higher-power objectives to become sluggish and sticky, due to the presence of immersion oil and other contaminants within the retractable mechanism. This condition can get bad enough that the spring-loaded tip remains partially or fully depressed after the cover slip has moved away from the objective, which will cause a loss of parfocality of the affected objective. Even if the tip re-extends to its normal position following a collision with the cover slip, the presence of oil and contaminants within the spring mechanism can cause the force required to depress the tip to be high enough that the retractable tip can no longer safely protect the optics or the cover slip.

## Scope of this Document

This document provides a detailed description of the proper procedure to disassemble, clean, and reassemble the spring-loaded tip mechanism in many of the LB (long barrel) objectives used in the Olympus BH-2, CH-2, and CH30/40 microscopes. Specifically, this document shows the disassembly, cleaning, and reassembly of an Olympus DPlan 100X oil-immersion objective. The same basic technique applies to other objective types in the LB series as well, including those marked A and EA.

## Safety Warnings and Disclaimers

The content of this document is provided for informational purposes only, with no expressed or implied warranties whatsoever, including, but not limited to, function, suitability, safety, accuracy, and completeness of information.

## Tools Needed

The only tools needed to complete the disassembly, cleaning, and reassembly of the spring-loaded tip mechanism in an Olympus A, EA, or DPlan objective are a Phillips #00 screwdriver (item 1 of [Appendix 1](#), shown

in [Figure 1](#)), and a small sheet of silicon rubber (item 2 of [Appendix 1](#)).



Figure 1 – Recommended #00 Phillips screwdriver

## Supplies Needed

The following supplies are needed to complete the disassembly, cleaning, and reassembly of the spring-loaded tip mechanism in the A, EA, or DPlan objectives in the Olympus LB objective line:

- Cleaning solvent (see [Recommended Solvents](#) section below)
- Cotton swabs
- Len-cleaning wipes, pre-moistened (item 3 of [Appendix 1](#)).

## Recommended Solvents

Some type of cleaning solvent will be needed to remove any oil or other contaminants found within the retractable-tip mechanism. Solvents that can be used are acetone (commonly sold as fingernail polish remover), diethyl ether, heptane, hexane, mineral spirits, turpentine, and xylene. Of the solvents listed, acetone fingernail polish remover is available in most grocery or department stores. Look for a fingernail polish remover that is labeled as 100% acetone.

## Safety Considerations with Solvents

Regardless of whichever 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

Be extremely careful with whatever solvent you choose to use. Since many solvents will remove the painted text from the outer barrel of the objectives, be sure to

not allow the solvent to contact the outer painted surface of the objective.

### Test the Spring-Loaded Tip

Test the spring-loaded tip mechanism by fully depressing the spring-loaded tip with your finger (be careful to not touch the exposed lower lens while doing this) and release the tip, observing how freely the tip re-extends after it is released. The tip should quickly re-extend without hesitation to its normal, fully extended position. If it does not, perform the disassembly, cleaning, and reassembly procedure described below to correct this condition.



Figure 2 – Test the spring-loaded tip

### Repairing the Spring-Loaded Tip

The following sections describe the procedure for disassembling, cleaning, and reassembling the spring-loaded tip mechanism in an Olympus DPlan 100X oil-immersion objective (see Figure 3).

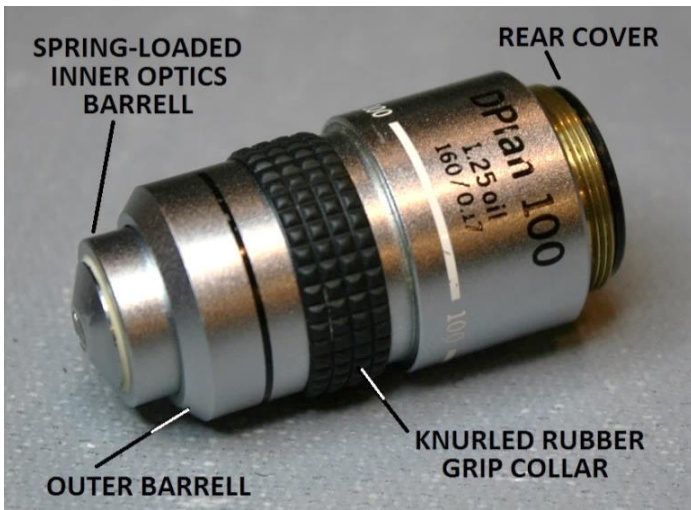


Figure 3 – Olympus DPlan 100X oil-immersion objective

### Remove the Knurled-Rubber Grip Collar

The black, knurled-rubber grip collar (which is present on the A and DPlan objective types) must be removed to gain access to the small retaining screw that holds

the spring-loaded inner-optics barrel in the outer objective barrel. Use a dental pick or similar tool (if necessary) to carefully lift the edge of the grip collar and slide the collar up and out of the groove in which it sits. Remove the collar by sliding it off the lower end of the objective (see Figure 4), being careful to not stretch the rubber collar in the process.



Figure 4 – Remove the knurled-rubber grip collar

### Remove the Retaining Screw

Use a #00 Phillips screwdriver (item 1 of Appendix 1) to loosen and remove the small retaining screw in the groove in the outer objective barrel. This screw retains the retractable inner-optics barrel within the outer objective barrel (see Figure 5 and Figure 6).

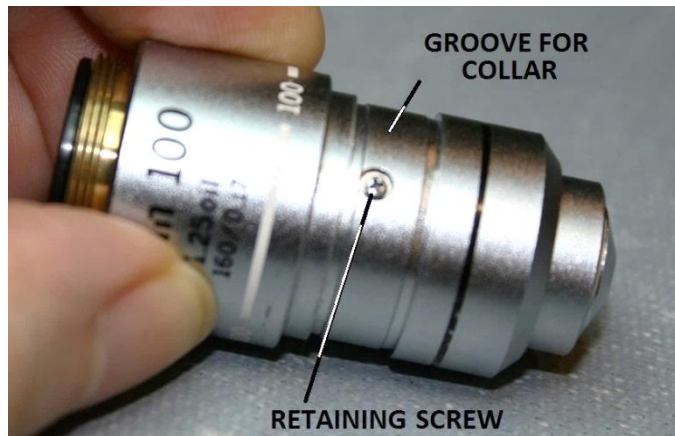


Figure 5 – A view of the small retaining screw



Figure 6 – Remove the small retaining screw

### Remove the Threaded Rear Cover

Loosen the threaded rear cover (see [Figure 7](#)) from the objective by placing a small sheet of silicone rubber (item 2 of [Appendix 1](#)) onto the work surface and firmly pressing the threaded rear cover down onto the rubber sheet, while turning the objective counter-clockwise (see [Figure 8](#)).

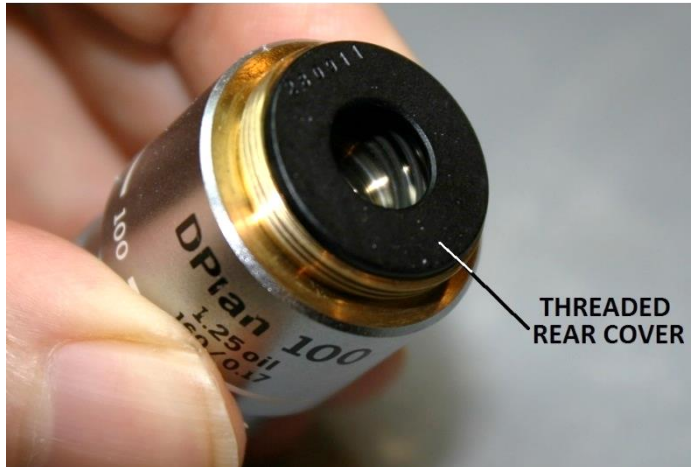


Figure 7 – The threaded rear objective cover



Figure 8 – Loosen the threaded rear cover on rubber sheet

Unscrew and remove the threaded rear cover from the outer objective barrel (see [Figure 9](#)), being careful that the extension spring beneath the cover does not shoot out.

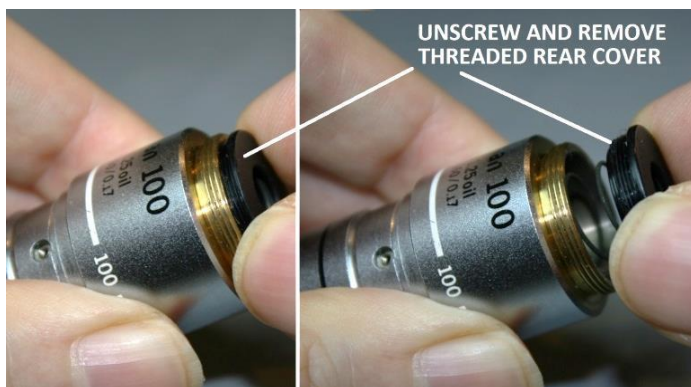


Figure 9 – Remove threaded rear cover from objective barrel

### Remove the Extension Spring

Grasp the extension spring and remove it from the rear opening of the outer objective barrel (see [Figure 10](#)).

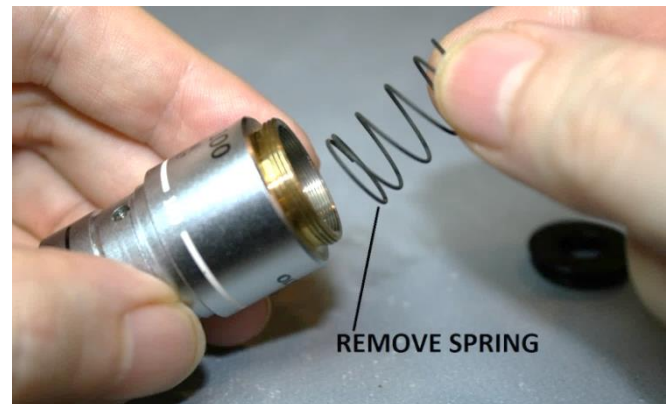


Figure 10 – Remove the extension spring

### Remove the Inner-Optics Barrel

Push the tip of the inner-optics barrel up into the bore of the outer objective barrel, such that the top end of the inner-optics barrel protrudes from the rear of the outer objective barrel (see [Figure 11](#)).



Figure 11 – Push objective tip up into the objective barrel

Grasp the protruding end of the inner-optics barrel and withdraw the inner-optics barrel from the bore of the outer objective barrel (see [Figure 12](#) and [Figure 13](#)).

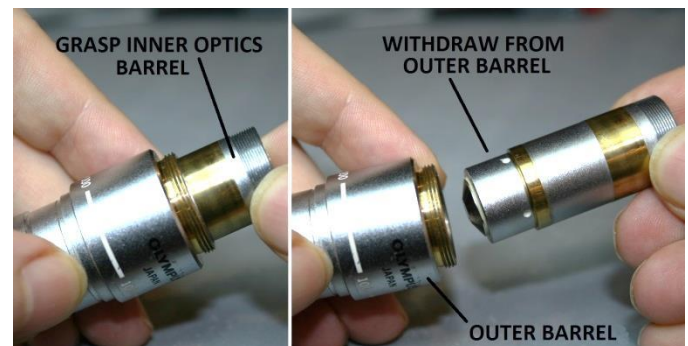


Figure 12 – Remove the inner-optics barrel



Figure 13 – Inner-optics barrel removed from outer barrel

### Clean the Bore of the Outer Objective Barrel

Use a cotton swab and a suitable solvent (e.g., acetone) to thoroughly clean the inner bore of the outer objective barrel (see Figure 14). It is critical that all traces of oil or other contaminants be removed, leaving the bore scrupulously clean.



Figure 14 – Clean inner bore of the outer objective barrel

### Clean the Outer Surface of the Inner-Optics Barrel

Use a cotton swab and a suitable solvent (e.g., acetone) to thoroughly clean the outer surface of the inner-optics barrel (see Figure 15). It is critical that all traces of oil or other contaminants be removed, leaving the outer surface scrupulously clean.

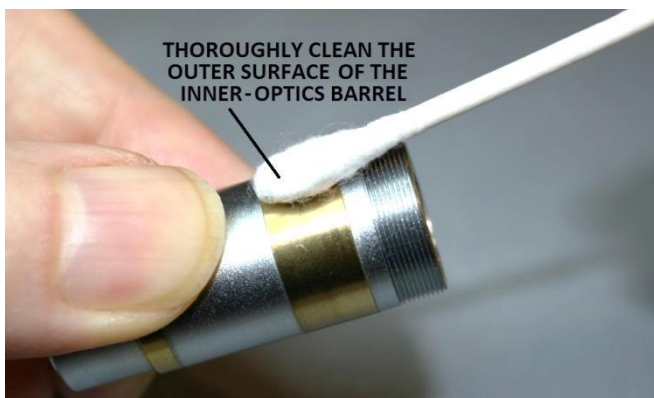


Figure 15 – Clean outer surface of the inner-optics barrel

### Reinstall Inner-Optics Barrel into Objective Barrel

Place the inner-optics barrel on the work surface, with the objective tip facing upwards. Carefully lower the outer objective barrel over the inner-optics barrel (see Figure 16).



Figure 16 – Place outer barrel over the inner-optics barrel

### Reinstall the Retaining Screw

Look into the hole in the groove of the outer objective barrel (i.e., the hole for the small retaining screw) and carefully rotate the inner-optics barrel within the outer objective barrel until the slot in the inner-optics barrel (see Figure 16) aligns with the hole in the groove of the outer objective barrel (see Figure 17).

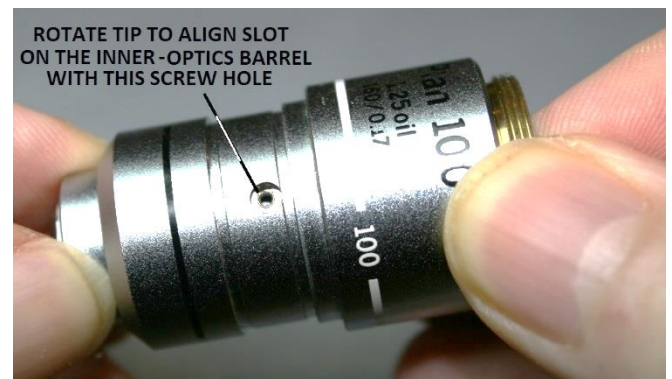


Figure 17 – Align the inner slot with the outer screw hole

Use a #00 Phillips screwdriver (item 1 of Appendix 1) to carefully reinstall the small retaining screw to secure the inner-optics barrel into the outer objective barrel (see Figure 18).

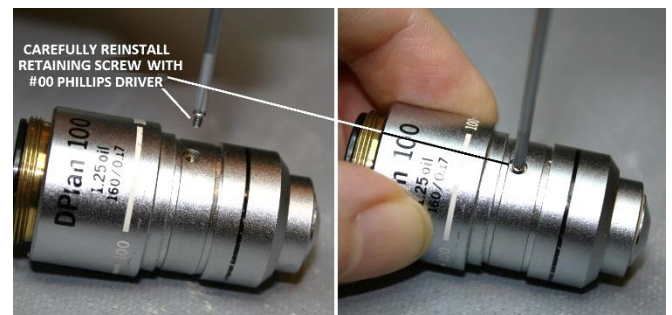


Figure 18 – Carefully reinstall the small retaining screw

### Test the Tip without the Extension Spring

Test the freedom of motion of the inner-optics barrel by holding the objective with the tip pointing downwards, and then press the tip up into the outer objective barrel (be careful to not touch the exposed lower lens while doing this) and release it. The tip should drop freely and without hesitation (see [Figure 19](#)). If the tip sticks or drops slowly, repeat the disassembly, cleaning, and reassembly procedure described above until the tip drops properly when tested in this manner.



Figure 19 – Depress the tip and allow it to drop

### Reinstall the Extension Spring

Carefully place the extension spring into the rear opening of the outer objective barrel (see [Figure 20](#)).

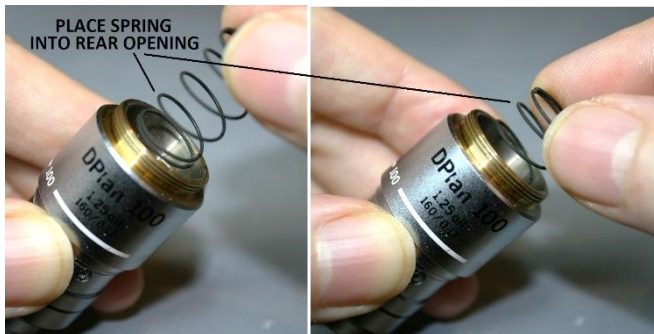


Figure 20 – Reinstall the extension spring

### Reinstall the Threaded Rear Cover

Compress the extension spring and screw the threaded rear cover into the inner threads in the rear of the outer objective barrel (see [Figure 21](#)).



Figure 21 – Reinstall the threaded rear cover

Tighten the threaded rear cover by placing a small sheet of silicone rubber (item 2 of [Appendix 1](#)) onto the work surface and firmly pressing the threaded rear cover down onto the rubber sheet, while turning the objective clockwise (see [Figure 22](#)).



Figure 22 – Tighten threaded rear cover on rubber sheet

### Test the Spring-Loaded Tip After Reassembly

Test the freedom of motion of the spring-loaded tip of the reassembled objective by pressing the tip up into the bore of the outer objective barrel (be careful to not touch the lower lens while doing this) and release it. When the tip is released, it should quickly re-extend to its original position.



Figure 23 – Test the tip of the reassembled objective

### Reinstall the Knurled-Rubber Grip Collar

Carefully reinstall the knurled-rubber grip collar into the groove on the outer objective barrel (see [Figure 24](#)).



Figure 24 – Reinstall the knurled rubber grip collar



### **Clean the Exposed Objective Lens**

Use a suitable pre-moistened lens wipe (item 3 of [Appendix 1](#)) to carefully clean the exposed lower lens in the retractable tip of the objective.

### **Ready for Service**

The DPlan 100X oil-immersion objective is now ready to be put back into service (see [Figure 25](#)).



**Figure 25 – DPlan 100X objective is now ready for service**

### **How to Contact the Author**

Please direct any questions or comments regarding this document (or BH-2 microscopes in general) to [carlh6902@gmail.com](mailto:carlh6902@gmail.com).

## Appendix 1

### Sources for Replacement Tools and Supplies Referenced in this Document

**Table 1** and **Table 2** list specific information for the various tools and supplies 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 October 2017, but is subject to change without notice.

Item	Description	Manufacturer	Manufacturer Model / #	Vendor	Vendor #	Price
1	Wiha screwdriver, 261 / PH00 x 40	Wiha	96100	Amazon	---	\$7.97
2	Rubber, silicon, 12" X 12" X 1/16"	various	various	Amazon	---	\$12.65

**Table 1 – Tools referenced in this document**

Item	Description	Manufacturer	Manufacturer Model / #	Vendor	Vendor #	Price
3	Lens wipes, pre-moistened, 100 count	Zeiss	---	Amazon	---	\$8.79

**Table 2 – Supplies referenced in this document**

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

Vendor	URL	Local Phone	Toll Free	Fax	email
Amazon	<a href="http://www.amazon.com">www.amazon.com</a>	---	---	---	---

**Table 3 – Vendor Listing**