

# Repairing the 20W Lamphouse for the Olympus BH-2, CK2, and SZH Microscopes

Revision 5



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Document Revision History		
Revision	Description of Changes	Date
1	Initial Release	October 18, 2016
2	Clarified requirement for JIS drivers	October 20, 2016
3	Re-formatted and added references to SZH-ILLB and SZH-ILLK stereo bases. Changed RTV callout.	January 26, 2017
4	Added six split-lock washers, revised heating procedure, added metal spacer, added reference to CK2.	May 23, 2018
5	Common formatting. Added lamp centering diagram. Added shorter screws.	June 1, 2021

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## Introduction

The LS20H lamphouse used on the Olympus BHT and BHTU microscope stands in the BH-2 line, as well as on the CK2 inverted stands and the SZH-ILLB and SZH-ILLK illumination bases for the SZH stereo zoom microscopes, is subject to failure due to the extreme operating temperatures of the 20W halogen lamp used for illumination. These high temperatures subject the metallic contacts in the lamp socket to accelerated rates of corrosion, which leads to eventual failure of the socket. Replacement lamphouses are generally available when needed, but their prices can be high. Fortunately, replacement of the entire lamphouse is seldom necessary, since defective LS20H lamphouses can usually be repaired by replacing the oxidized lamp socket, as described in this document, for a total cost of around \$20. Note that soldering skills are required to perform this repair.

## Lamphouse Versions

There were two versions of the LS20H lamphouse made by Olympus, as shown in [Figure 1](#). The original 5-LB402 version, without a lamp reflector, is shown on the left, and the newer 5-S119 version, with a lamp reflector, is shown on the right. The 5-S119 version (sold as LS20H-M and LS20H-M2) is superior to the 5-LB402 version (sold as LS20H), since the integral reflector provides more usable illumination from the halogen lamp, and this version should therefore be used whenever possible. Both versions can be repaired using the procedure outlined in this document<sup>1</sup>.



**Figure 1 – Original (left) and newer version (right)**

## Parts, Tools, and Supplies Needed

The following parts, tools, and supplies will be needed to replace the lamp socket in a LS20H or LS20H-M/M2 lamphouse.

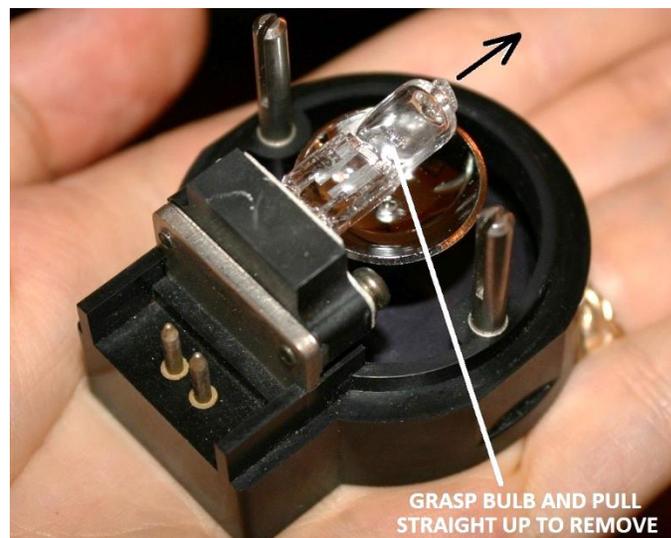
- Adhesive, heat-resistant (item S1 of [Appendix 1](#))
- Diagonal cutters

- Glove, heat-resistant (item T1 of [Appendix 1](#))
- Heat gun, 1500W (item T2 of [Appendix 1](#))
- Lamp socket, ceramic (item P2 of [Appendix 1](#))
- PanaVise® work vise (item T5 of [Appendix 1](#))
- Pliers, needle-nose
- Screwdrivers, JIS (item T3 of [Appendix 1](#))<sup>2</sup>
- Screwdriver, slotted, small
- Soldering equipment and solder
- Solder sucker vacuum tool (item T4 of [Appendix 1](#))
- De-soldering braid (item S3 of [Appendix 1](#))
- Tape, adhesive
- Wire cutter / stripper
- X-Acto® knife with sharp blade (item T6 of [Appendix 1](#))
- M3X9 screws (2X), Phillips head (item P4 of [Appendix 1](#))

## Replace the Lamp Socket

### Remove the Halogen Lamp

The first step in the repair process is to remove the halogen lamp, by grasping the lamp with an oil-free tissue or cloth and pulling straight up, as shown in [Figure 2](#). Do not touch the halogen lamp with your fingers, as oils from your skin may cause premature failure of the bulb. If the bulb is accidentally touched, clean it with isopropyl alcohol before proceeding. Place the lamp in a safe place for later re-assembly.



**Figure 2 – Remove the lamp from the lamp socket**

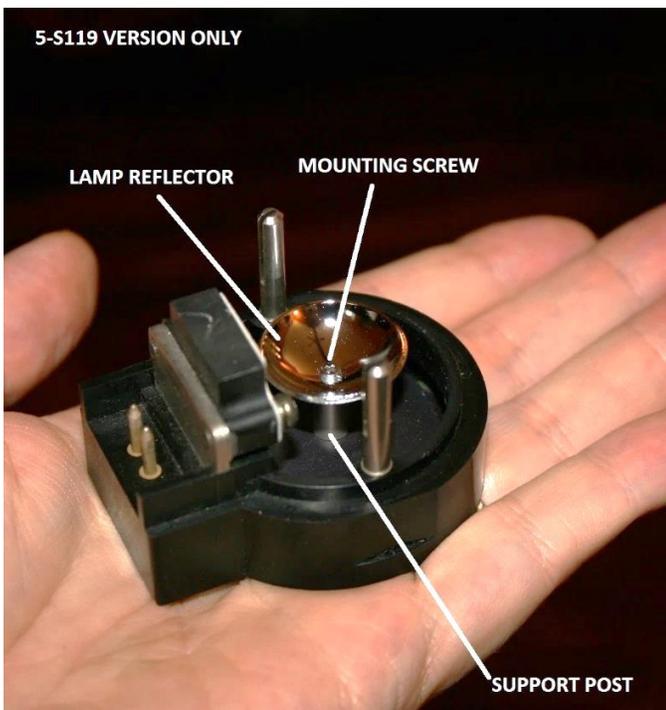
### Remove the Lamp Reflector (5-S119 only)

Next, remove the lamp reflector by removing the small cross-point mounting screw that secures the reflector to

<sup>2</sup> If JIS screwdrivers are not available, Phillips screwdrivers may be used instead, but be very careful as the screw heads of tight JIS fasteners can be damaged if Phillips drivers are used.

<sup>1</sup> All photos in this document show the 5-S119 (LS20H-M/M2) version.

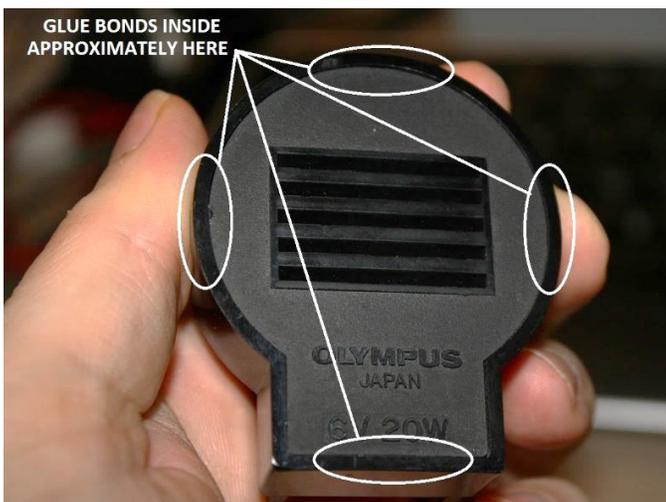
the support post (see [Figure 3](#)). Place the lamp reflector and the mounting screw in a safe place for later re-assembly.



**Figure 3 – The lamp reflector on the 5-S119 version**

### Remove the Back Cover

The back cover of the lamphouse needs to be removed next, in order to gain access to the wiring for the socket. This plastic cover is typically secured in place with two spots of adhesive inside the plastic housing, in the approximate locations shown by the top and bottom circles of [Figure 4](#). There may also be adhesive on the sides, as shown in the left and right circles, but adhesive in these locations is less frequently encountered.



**Figure 4 – Locations of adhesive inside the housing**

The best way to remove the back cover is to apply heat, using a heat gun as shown in [Figure 5](#), to the flat of the housing/cover where the lower glue spot is located and to the two sides where glue spots may be located<sup>3</sup> (i.e., the circled area at the bottom and sides of [Figure 4](#)). While applying heat to these areas, concentrate the heat on the housing, rather than the more-fragile back cover. Pry the flat end of the back cover loose with a small screwdriver inserted into the housing as shown in [Figure 6](#). When doing this, be very careful so as to not damage the baffle plate inside the housing (see [Figure 8](#)) with the screwdriver blade and wear a suitable heat-resistant glove to protect your hand from the heat.

Once the flat end of the back cover comes free, push the newly freed end out a bit with the tip of the screwdriver that is inside the housing and place the tip of a second slotted screwdriver between the cover and housing, from the outside. While holding this second screwdriver in place, remove the screwdriver that's inside the housing and proceed to apply heat to the sides and to the rounded end of the housing/cover directly opposite the flat end (i.e., the circled areas at the top and sides of [Figure 4](#)) to soften the remaining glue bond(s). Gently pry the flat end of the cover with the slotted screwdriver, while applying heat to the sides and to the rounded end, until the remaining glue bond(s) lets go and the back cover comes loose.



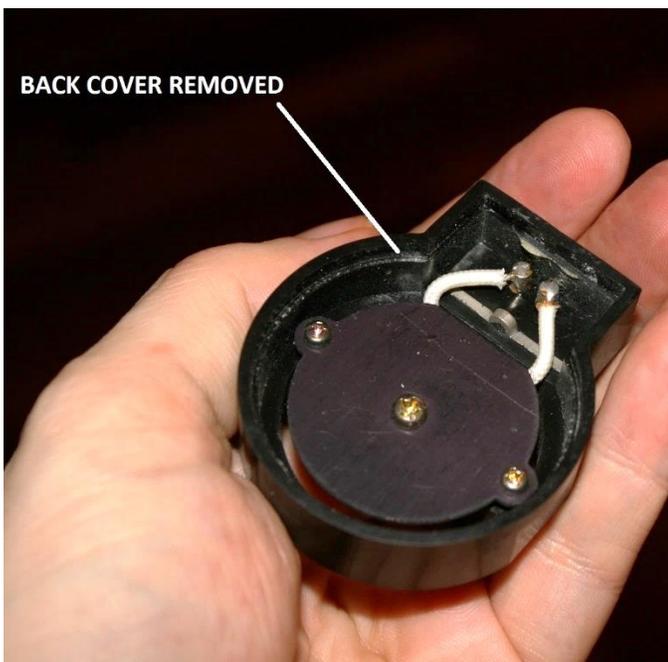
**Figure 5 – Apply heat to the flat end to soften the adhesive**

<sup>3</sup> The housing and back cover are both made from heat-resistant plastic, so it takes a fair amount of heat to cause damage to these pieces. Nevertheless, be careful with the heat gun. Of the two pieces, the back cover is most susceptible to heat damage due to the presence of the vent slots and because of the type of plastic from which it is made.



**Figure 6 – Use screwdriver to pry the flat end of cover**

Once the back cover has been removed (see [Figure 7](#)), carefully trim any glue residue from the back cover and from the housing with an X-Acto® knife with a sharp blade.

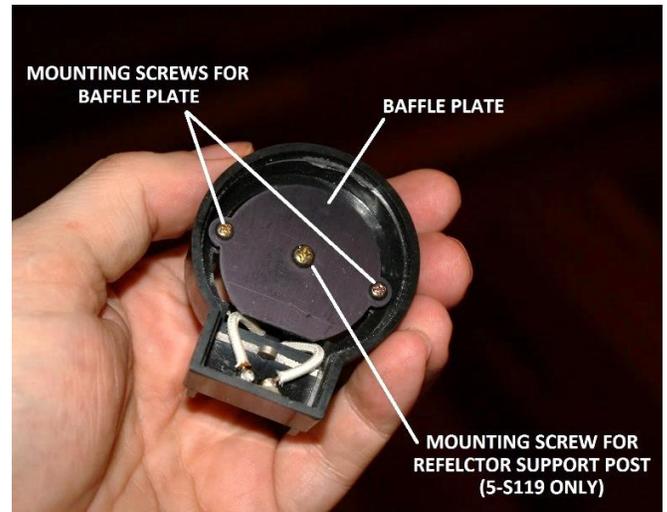


**Figure 7 – The lamphouse with back cover removed**

### Remove the Baffle Plate

Remove the baffle plate (with attached reflector support post on 5-S119 version) by removing the two JIS mounting screws securing the baffle plate to the two

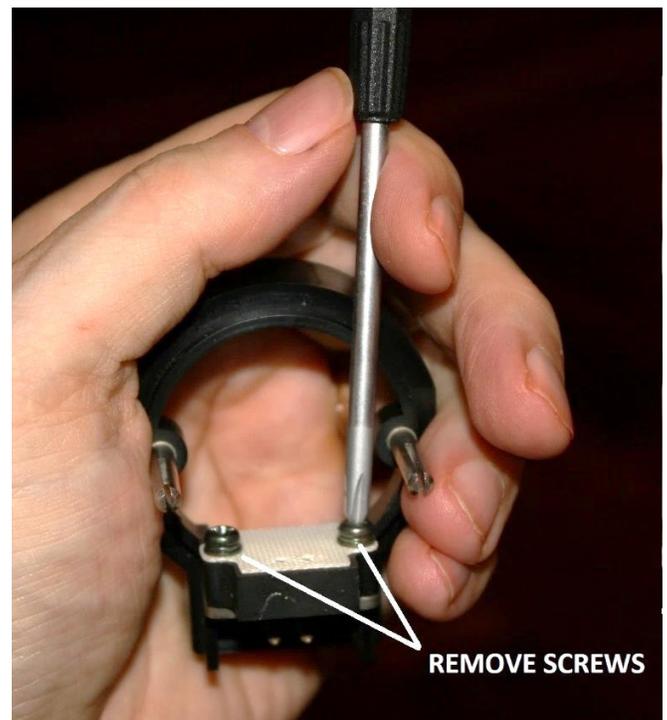
alignment/support pins molded into the plastic housing (see [Figure 8](#)). Place the screws and baffle plate in a safe place for later re-assembly.



**Figure 8 – The baffle plate and mounting hardware**

### Remove the Lamp Socket

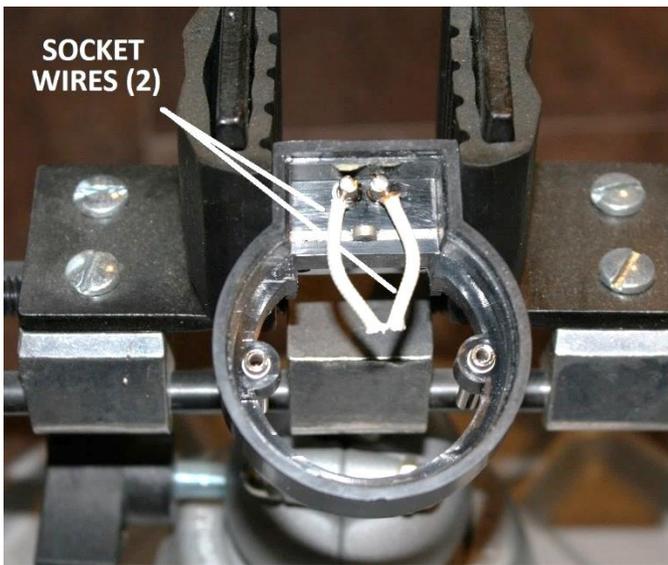
Remove the two M3X12 JIS screws, the two M3 split lock washers, and the two M3 flat washers securing the lamp socket to the plastic housing (see [Figure 9](#)).



**Figure 9 – Remove two screws holding the lamp socket**

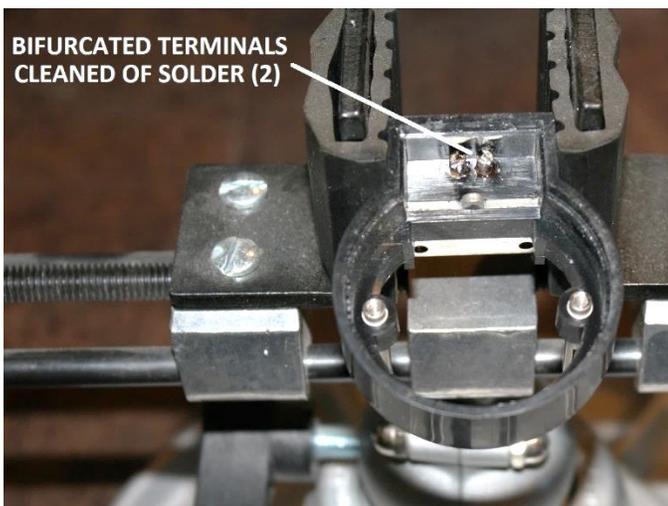
Discard the white, fibrous top cover from the socket, as this will not be needed. Do not discard the metal spacer from the bottom of the lamp socket, as this may be needed later. Cut the two socket wires close to the

body of the socket and place the socket body aside for later reference. Place the plastic housing in a PanaVise® work vise (or similar) to facilitate de-soldering of the wires (see [Figure 10](#)).



**Figure 10 – The housing in a PanaVise® for de-soldering**

One at a time, heat the two bifurcated terminals with a soldering iron while gently pulling the attached wires with needle-nose pliers to remove them. Clean the excess solder from the bifurcated terminals using a vacuum de-soldering device or solder wick (see [Figure 11](#)). Exercise caution to avoid overheating the terminals to prevent melting the plastic housing during the de-soldering process.

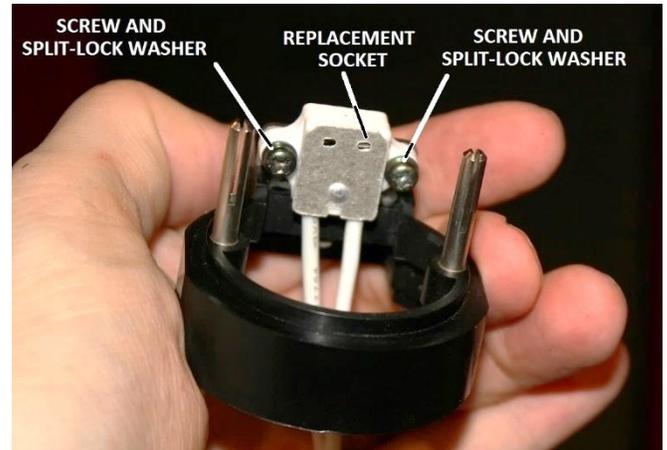


**Figure 11 – With wires removed and terminals cleaned**

#### **Mount the New Lamp Socket**

Remove the plastic housing from the PanaVise® and mount the replacement socket (item P2 of [Appendix 1](#)) onto the plastic housing, using two M3X9 screws (item

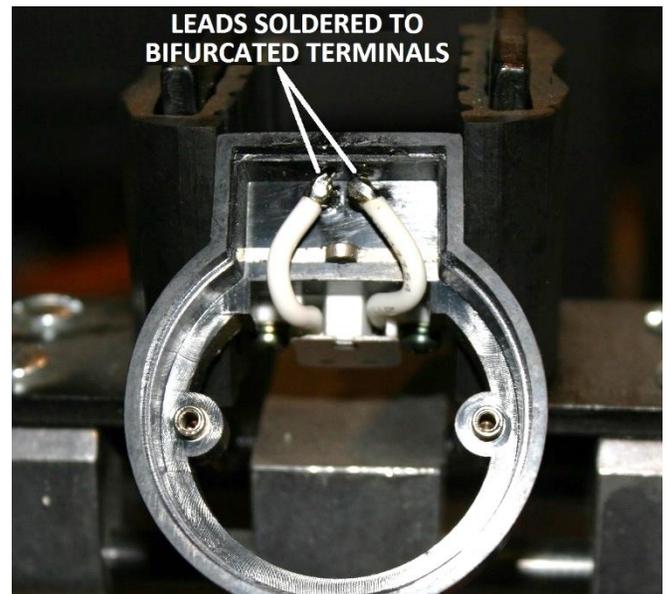
P4 of [Appendix 1](#)), two M3 split lock washers (item P3 of [Appendix 1](#)), and two M3 flat washers<sup>4</sup>. Before mounting the socket to the housing, compare the height of the new socket to that of the original socket, to determine if the metal spacer is necessary between the housing and socket. Include the metal spacer, if necessary, to position the new socket at the same height as the original socket.



**Figure 12 – New socket mounted onto the housing**

#### **Solder the New Lamp Socket**

Once again, place the plastic housing in the PanaVise®. Trim and strip both leads of the socket to the proper length and solder the leads to the bifurcated terminals (see [Figure 13](#)). Exercise caution to avoid overheating the terminals to prevent melting the plastic housing during the soldering process.



**Figure 13 – Leads of new socket soldered to terminals**

<sup>4</sup> Alternatively, use the original M3X12 screws and flat washers, and add three additional M3 split lock washers to each of the screws.

### Reinstall the Baffle Plate

Remove the plastic housing from the PanaVise® and reinstall the baffle plate using the correct two JIS screws. Re-position the socket wires as necessary to prevent them from contacting the baffle plate (see [Figure 14](#)).

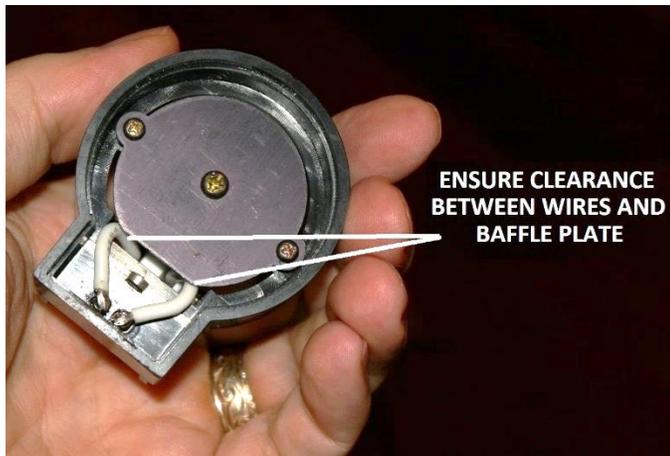


Figure 14 – Socket wires routed away from baffle plate

### Reinstall the Lamp Reflector (5-S119 only)

Reinstall the lamp reflector onto the support post using the small cross-point screw. Remove any visible fingerprints or contaminants from the reflector using a clean, oil-free tissue or cloth (see [Figure 15](#)).

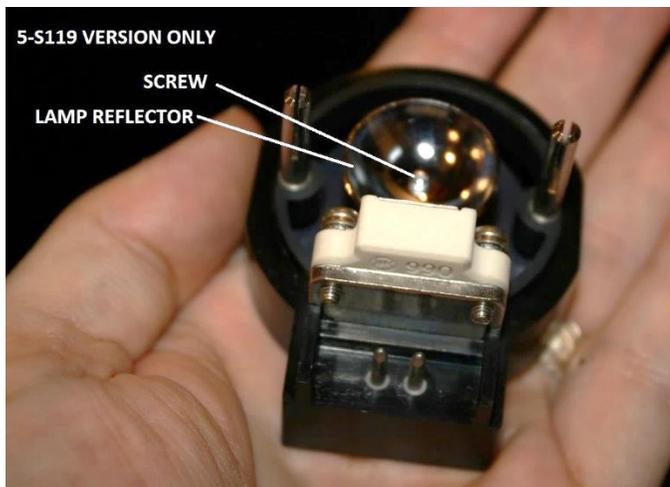


Figure 15 – Reflector reinstalled onto the support post

### Reinstall the Back Cover

Apply a suitable adhesive to the spots on the plastic housing where the back cover was originally glued (see [Figure 16](#)). Black silicone RTV adhesive, such as used for replacing engine gaskets, is a good choice here, since it is very heat resistant and can be easily removed for future repairs (item S2 of [Appendix 1](#)). J-B Weld® two-part epoxy (item S1 of [Appendix 1](#)) is also well suited

for this application, but this would be more difficult to remove should future repairs ever become necessary. In practice, most two-part epoxies will work, even though the lamphouse operates at temperatures above the service ratings of many of these epoxies. Reinstall the back cover and secure it in position with adhesive tape at the adhesive points until the adhesive cures. Remove the tape once the adhesive has fully cured.

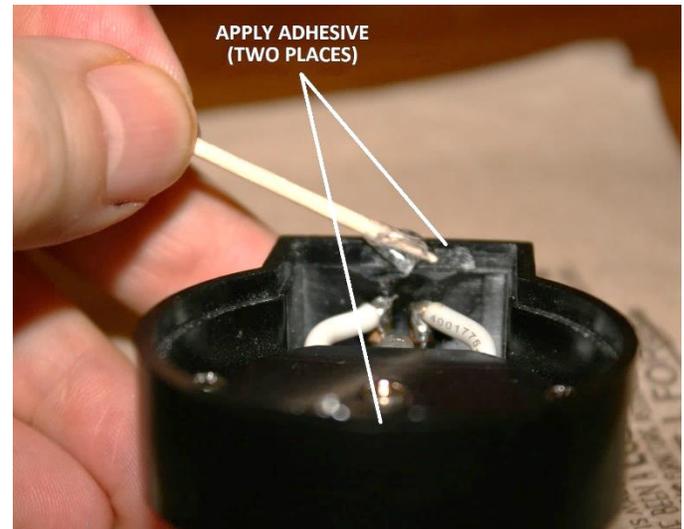


Figure 16 – Apply adhesive to re-attach the back cover

### Reinstall the Halogen Lamp

Using a clean, oil-free tissue or cloth, reinstall the halogen lamp. Better still, install a new Philips 7388 (item P1 of [Appendix 1](#)) or equivalent 6V/20W ESB halogen lamp (see [Table 1](#)). The lamp should be inserted into the socket such that the filament will be properly centered in the optical path of the microscope.

### Centering the Halogen Lamp

For the older 5-LB402 lamphouses, centering of the lamp filament is difficult to visually judge. In these cases, the best you can do is to make sure that the lamp is pressed completely into the socket and is not noticeably off to either side of the visual center of the baffle plate.

In the newer 5-S119 lamphouses, position the lamp such that the filament covers the lower half of the screw securing the lamp reflector to the support post, when viewed from dead-on in the front of the reflector (see [Figure 17](#)). In either case, do not touch the lamp glass with your bare fingers, since any oil or contaminants left on the glass could lead to premature failure of the lamp. Clean the glass with alcohol and an oil-free tissue or cloth, if necessary, to remove any existing oil, contaminants, or fingerprints.

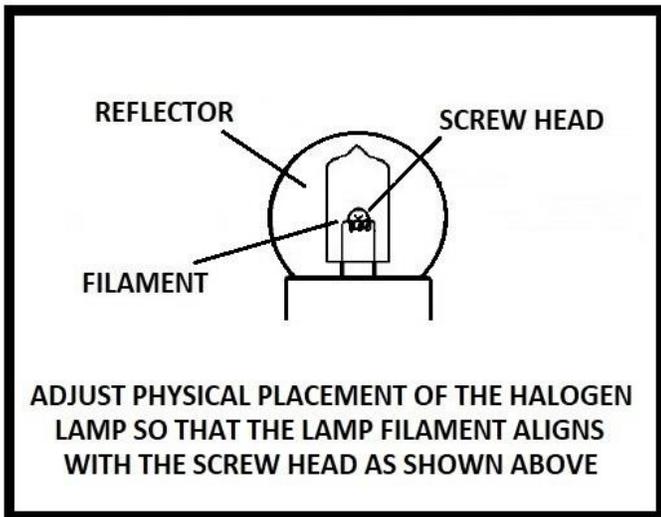


Figure 17 – Proper lamp centering

### Ready for Service

The newly refurbished LS20-H lamphouse is now ready to be put back into service (see [Figure 18](#)).



Figure 18 – Refurbished lamphouse ready for service

### Replacement Lamps

**Table 1** lists various replacements for the quartz halogen 6V/20W ESB lamp used in the BHT/BHTU microscopes.

Manufacturer	Part Number
General Electric	778 (49718) or 788 (943117)
Nikon®	79099
Guerra	6518/2
Olympus	8-C405
Osram	64250 HLX
Philips	7388 (256784)
Reichert®	11143
Swift	MA-780
Ushio	1000532
Vivitar	058103

Table 1 – List of compatible halogen lamp numbers

### Dissecting the Old Socket to See the Damage

The typical failure mode for the 20W lamphouse is severe oxidation of the electrical contacts within the lamp connector, which causes poor or erratic electrical contact with the pins of the 6V/20W halogen lamp. These oxidized contacts can be easily seen once the fibrous cover has been removed from the top of the connector housing (see [Figure 19](#), contact on left is badly oxidized).

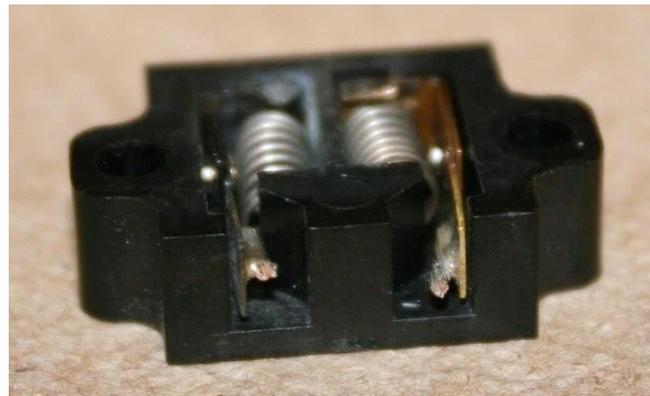


Figure 19 – Cover removed to show oxidized contacts

**Figure 20** shows the electrical contacts after they have been removed from the connector housing, so that the effects of oxidation can be more readily seen. Note that one of the contacts in [Figure 20](#) is much more oxidized than the other, which is typical. This non-symmetrical oxidation of the contacts occurs because the halogen lamp is driven by direct current, rather than by alternating current, in the Olympus BH-2 microscopes.

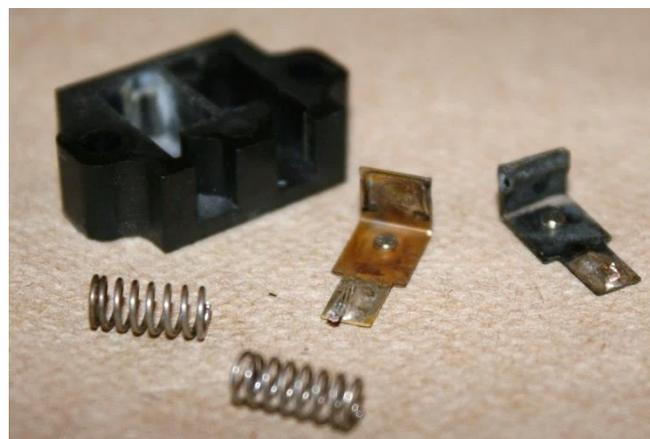


Figure 20 – Oxidized contacts removed from socket

### How to Contact the Author

Please feel free to direct any questions or comments regarding this document (or BH-2 equipment in general) to the author, at the email address included on the cover of this document.

## Appendix 1

### Tools, Parts, and Supplies Referenced in this Document

**Table 2, Table 3, and Table 4** list the specific information for many of the tools, parts, and supplies discussed in this document. Standard items commonly available at local hardware stores are not included below. The pricing listed below is accurate as-of June 2021 but is subject to change without notice.

Item	Description	Manufacturer	Model	Vendor	Vendor #	Price
T1	Glove, heat-resistant	Kiloline	---	Amazon	---	\$4.76
T2	Heat gun, 1500W, dual temperature	Black & Decker	HG1300	Amazon	---	\$30.99
		Harbor Freight	Warrior	Harbor Freight	56434	\$16.99
T3	Screwdriver set, JIS, 4-piece	Hozan	---	Amazon	---	\$20.23
	Screwdriver set, JIS, 4-piece (small)	Moody Tools	58-0219	Amazon	---	\$26.05
T4	Solder sucker, vacuum tool	Vastar	---	Amazon	AD444	\$6.99
T5	Vise, multi-purpose	Panavise®	350	Amazon	---	\$89.99
		Harbor Freight	Central Forge® 3311	Harbor Freight	3311	\$17.99
T6	X-Acto® #2 knife with safety cap	X-Acto®	---	Amazon	X3311	\$8.11

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

Item	Description	Manufacturer	Model	Vendor	Vendor #	Price
P1	Halogen lamp, ESB	Philips	7388	Bulbtronics®	0000986	\$3.95
				Bulbworks	BW.ESB	\$7.35
P2	Lamp socket, G4, ceramic	Bender & Wirth	990	Bulbworks	BW.990	\$19.43
P3	M3 split lock washers, pack of 100	various	---	Amazon	---	\$8.00
P4	M3X9 Phillips screws, pack of 100	various	---	Amazon	---	\$9.99

**Table 3 – Parts referenced in this document**

Item	Description	Manufacturer	Model	Vendor	Vendor #	Price
S1	Epoxy, cold-weld formula, 2 oz.	J-B Weld	8265S	Amazon	---	\$3.29
S2	Silicone Gasket RTV, Black	J-B Weld	32329	Amazon	---	\$6.50
S3	Solder wick, 2.5mm x 5'	Aven	17542	Amazon	---	\$1.81

**Table 4 – Supplies referenced in this document**

**Table 5** lists the contact information for the vendors of the tools, parts, and supplies listed in **Table 2, Table 3, and Table 4**.

Company Name	URL	Telephone #	Toll-Free #	Fax #	Email
Amazon	<a href="http://www.amazon.com">www.amazon.com</a>	---	1-800-280-4331	---	---
Bulbtronics®	<a href="http://www.bulbtronics.com">www.bulbtronics.com</a>	---	1-631-249-6000	1-800-588-2852	<a href="mailto:custservdept@bulbtronics.com">custservdept@bulbtronics.com</a>
Bulbworks Specialty Lightbulbs and Sockets	<a href="http://www.bulbworks.com">www.bulbworks.com</a>	1-973-584-7171	1-800-334-2852	---	<a href="mailto:bulbwork@bulbworks.com">bulbwork@bulbworks.com</a>
Harbor Freight Tools	<a href="http://www.harborfreight.com">www.harborfreight.com</a>	1-858-436-8388	1-800-423-2567 1-800-444-3353	1-800-423-2567 1-800-444-3353	---

**Table 5 – Vendors for tools, parts, and supplies**