Repairing the 20W Lamp House for the Olympus BH-2 and SZH Microscopes

Revision 3

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

Introduction

The LS20H lamp house used on the Olympus BHT and BHTU microscope stands in the BH-2 line, as well as on 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 lamp houses are generally available when needed, but their prices can be high. Fortunately, replacement of the entire lamp house is seldom necessary, since defective LS20H lamp houses 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.

Lamp House Versions

There were two versions of the LS20H lamp house made by Olympus, as shown in **Figure 1**. The original 5-LB402 version, without the lamp reflector, is shown on the left, and the newer 5-S119 version, with the 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 reflector provides more usable illumination from the halogen lamp. The 5-S119 version should therefore be used whenever possible. Both versions can be repaired using the procedure outlined in this document[1].

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 lamp house:

- Adhesive, heat-resistant (item 5 or 10 of Appendix 1)
- Diagonal cutters
- Glove, heat-resistant (item 6 of Appendix 1)
- Heat gun, 1500W (item 7 of Appendix 1)
- Lamp socket, ceramic (item 2 of Appendix 1)
- PanaVise® work vise (item 13 of Appendix 1)
- Pliers, needle-nose
- Screwdrivers, JIS (item 8 or 9 of Appendix 1)[2]
- Screwdriver, slotted, small
- Soldering equipment and solder
- Solder sucker vacuum tool (item 11 of Appendix 1)
- De-soldering braid (item 12 of Appendix 1)
- Tape, adhesive
- Wire cutter / stripper
- X-Acto® knife with sharp blade (item 14 of Appendix 1)

Remove the 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 (to prevent oil and contaminants from getting on the glass) and pulling straight up, as shown in **Figure 2**. Place the lamp in a safe place for later re-assembly.

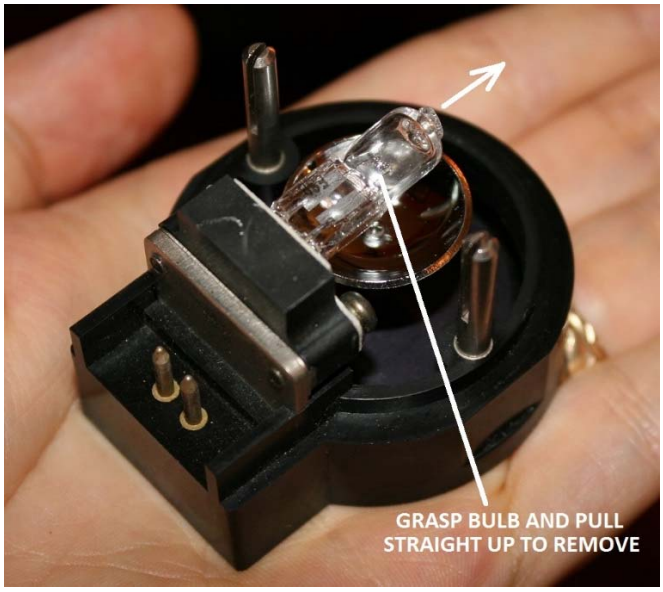

Figure 2 – Remove the lamp from the lamp socket

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

[1] All photos in this document show the 5-S119 (LS20H-M/M2) version.

[2] If JIS screwdrivers are not available, Phillips screwdrivers may be used instead, but be careful as the screw heads of tight JIS fasteners can be damaged if Phillips drivers are used.

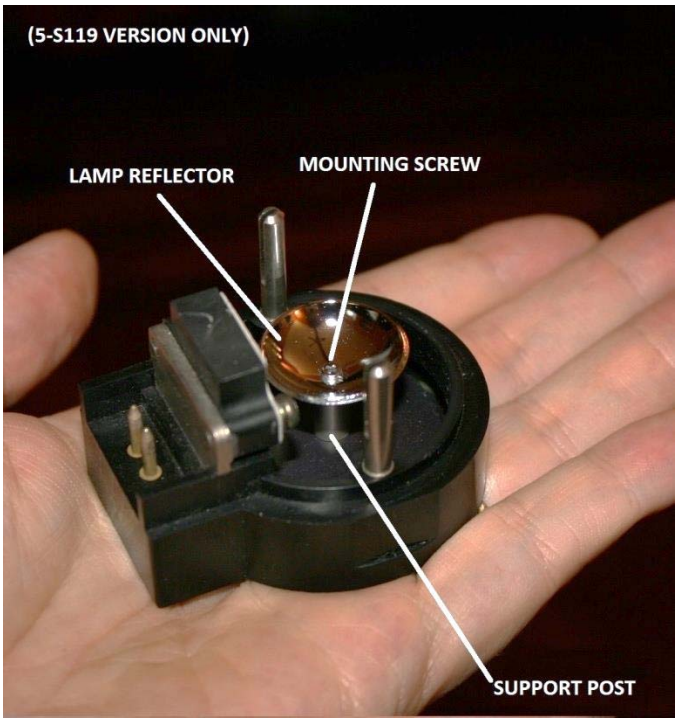

Figure 3 – The lamp reflector on the 5-S119 version

Remove the Back Cover

The back cover of the lamp house 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 in **Figure 4**.

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[3] (i.e., the circled area at the bottom of **Figure 4**). While applying heat to this area, pry the flat end of the back cover loose with a small screwdriver inserted into the housing as shown in **Figure 6**. Be careful so as to not damage the baffle plate (see **Figure 8**) with the screwdriver blade while doing this, 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 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 apply heat to the rounded end of the housing/cover directly opposite the flat end (i.e., the circled area at the top of **Figure 4**) to soften the remaining glue bond. Gently pry the flat end of the cover with the slotted screwdriver, while applying heat to the rounded end, until the remaining glue bond lets go and the back cover comes loose.

Figure 4 – Locations of adhesive inside the housing

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

[3] 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. The slotted fins on the back cover are fragile and are therefore susceptible to heat damage.

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

Once the back cover has been removed (see Figure 7), clean any glue residue from the back cover and from the housing with a sharp X-Acto® knife.

Figure 7 – The lamp house 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.

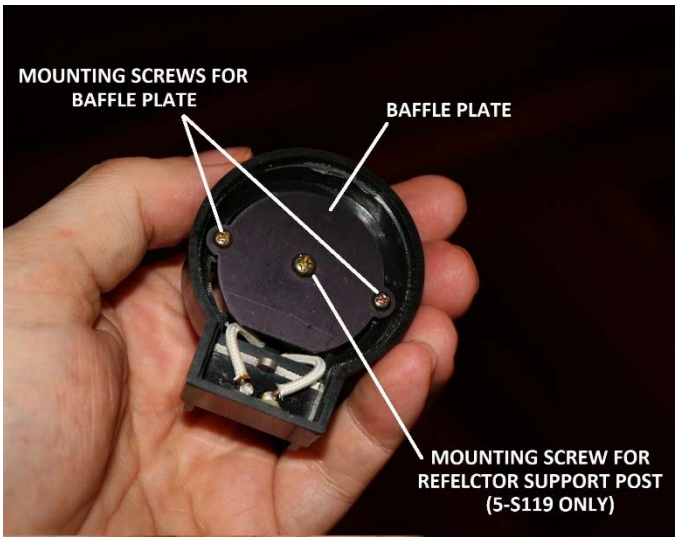

Figure 8 – The baffle plate and mounting hardware

Remove the Lamp Socket

Remove the two JIS screws securing the lamp socket to the plastic housing (see Figure 9).

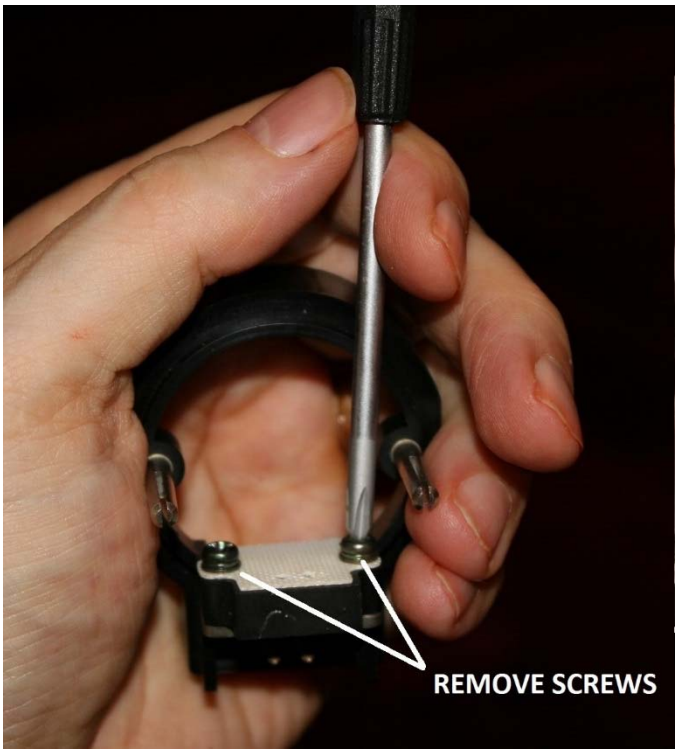

Figure 9 – Remove two screws holding the lamp socket

Discard the fiber insulator and metal cover from the top of the lamp socket, as these will not be needed. Cut the two socket wires close to the body of the socket, and discard the socket. Place the plastic housing in a

PanaVise® work vise (or similar) to facilitate de-soldering (see Figure 10).

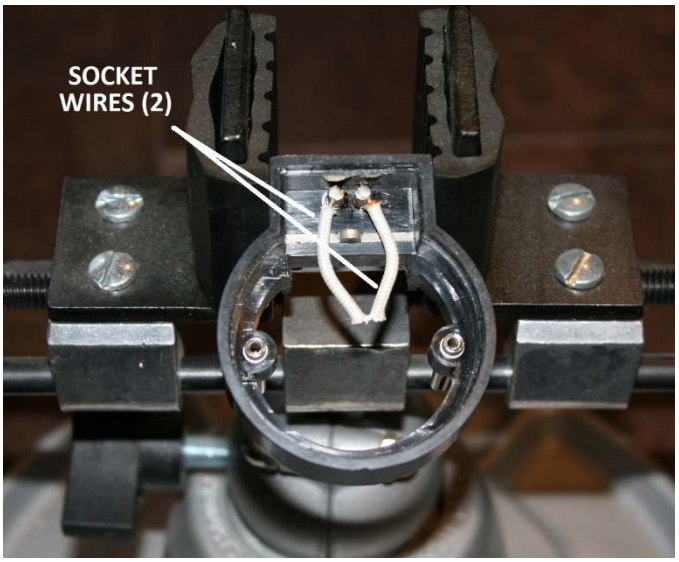

Figure 10 – The housing in a PanaVise® for de-soldering

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.

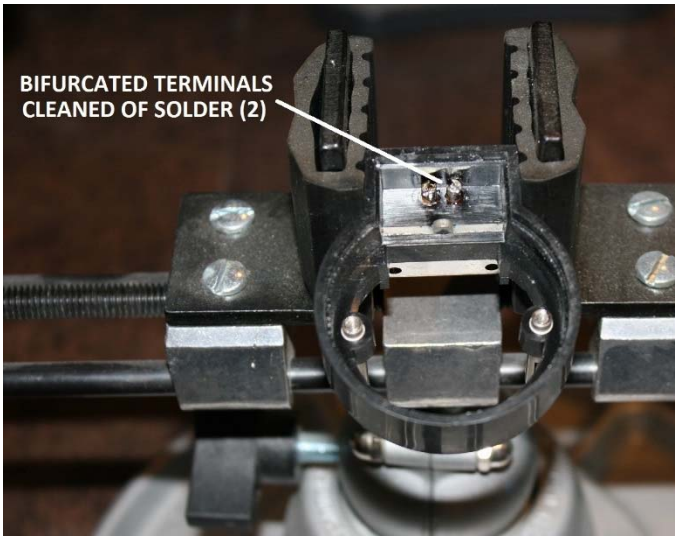

Figure 11 – Wires removed and the terminals cleaned

Mount the New Lamp Socket

Remove the plastic housing from the PanaVise® and mount the replacement socket (item 2 of Appendix 1) onto the plastic housing using the two JIS screws that secured the original socket (see Figure 12).

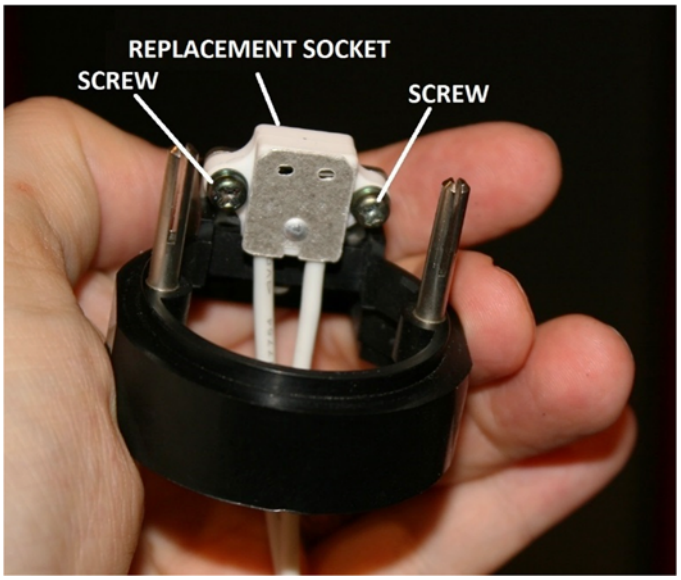

Figure 12 – New socket mounted onto the housing

Soldering 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.

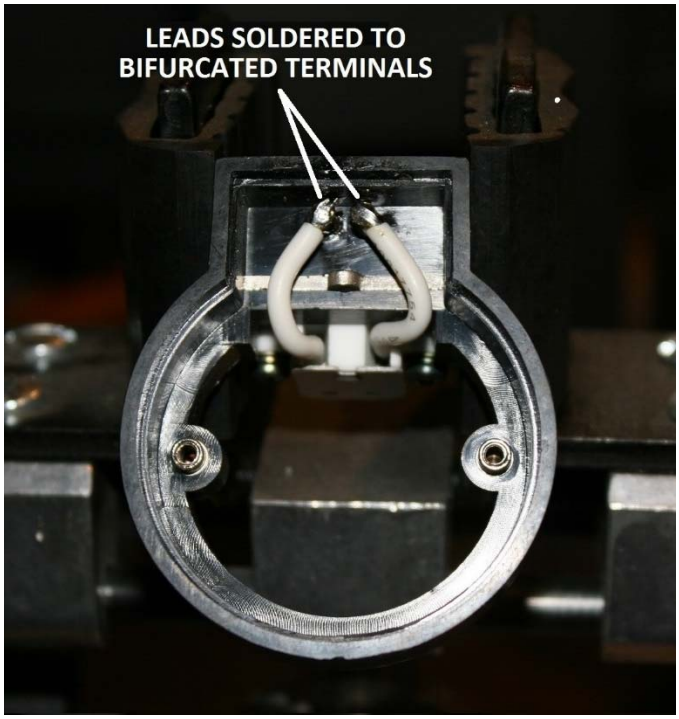

Figure 13 – Leads of new socket soldered to terminals

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 wires, if necessary, to prevent them from contacting the baffle plate (see **Figure 14**).

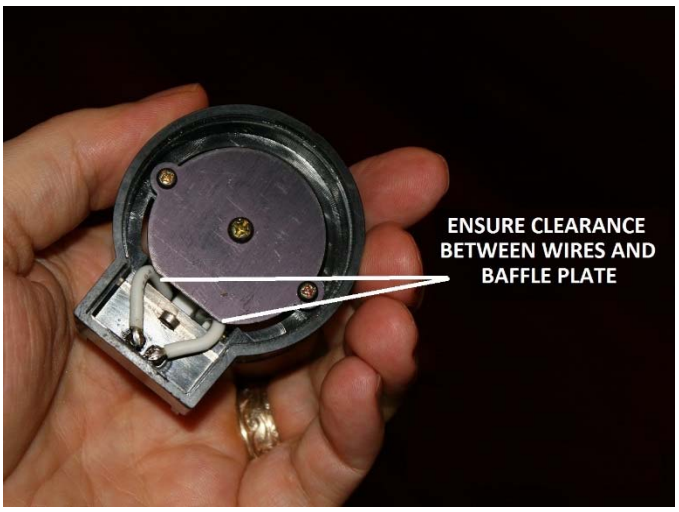

Figure 14 – Socket wires routed away from baffle plate

Reinstall the Lamp Reflector (5-S119 only)

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

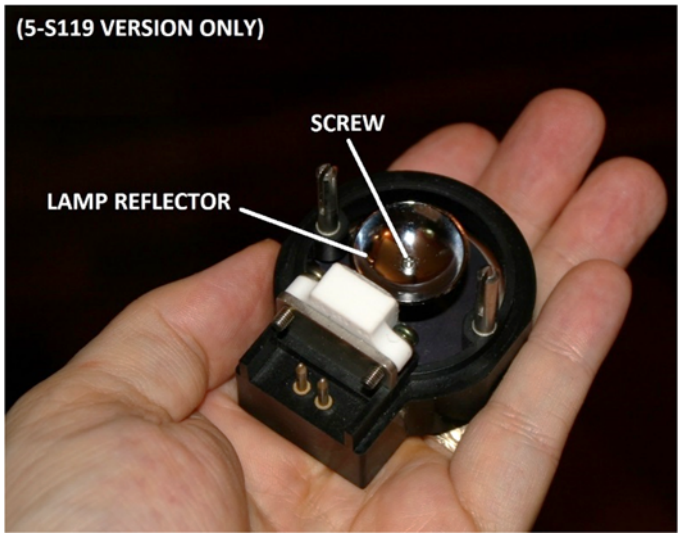

Figure 15 – Reflector reinstalled onto the support post

Re-Attach the Back Cover

Apply a suitable adhesive to the two spots on the plastic housing where the back cover was originally glued (see **Figure 16**). 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 10 of Appendix 1). J-B Weld® two-part epoxy is also well suited for this application, but would be more difficult to remove should future repairs ever be necessary (item 5 of Appendix 1). In practice, most two-part epoxies will work, even though the lamp house 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 two glue points until the adhesive cures. Remove the tape once the adhesive has cured.

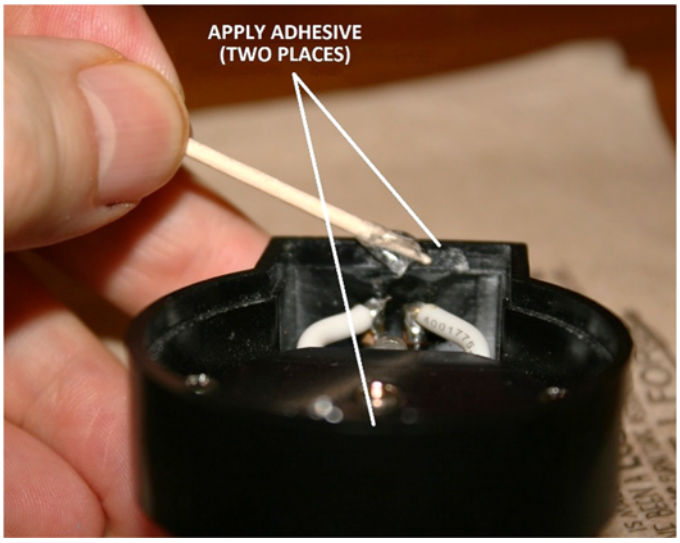

Figure 16 – Apply adhesive to re-attach the back cover

Reinstall the Halogen Lamp

Using a clean, oil-free tissue or cloth, reinstall the halogen lamp. Better still, install a new Philips 7388 (item 1 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 is properly centered in the optical path of the microscope. Do not touch the lamp glass with your 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.

For the older 5-LB402 lamp houses, 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 lamp houses, 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. The newly refurbished lamp house is now ready to be put back into service (see Figure 17).

Figure 17 – Refurbished lamp house ready for service

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 suitable lamp numbers

Dissecting the Old Socket

The typical failure mode for the 20W lamp house is oxidation of the electrical contacts within the lamp connector, which causes poor or erratic electrical contact with the pins on the halogen lamp. These oxidized contacts can be seen in the connector shown in Figure 18.

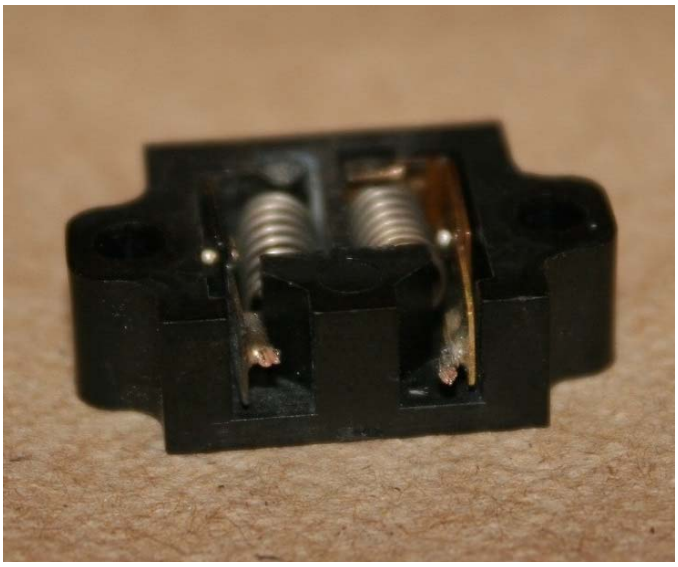

Figure 18 – Cover removed to show oxidized contacts

Figure 19 shows the contacts removed from the housing, so that the oxidation can be more easily seen. Note that one of the contacts is much more oxidized than the other. This happens because the halogen lamp is driven by direct current, rather than by alternating current.

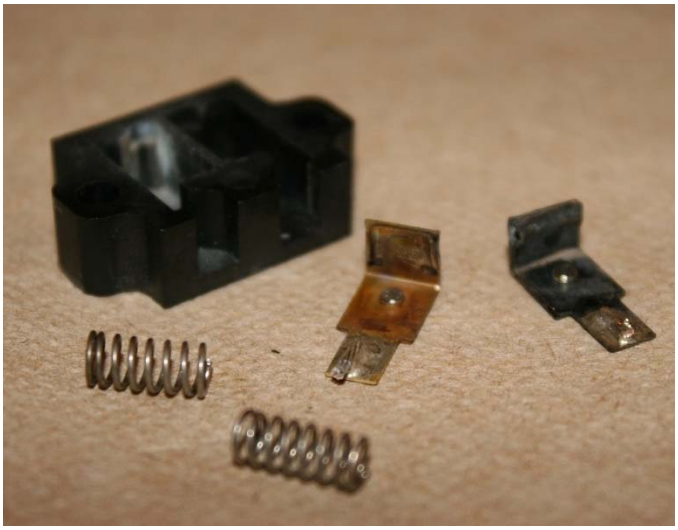

Figure 19 – Oxidized contacts removed from socket

Appendix 1

Sources for Replacement Parts, Tools, and Supplies Referenced in this Document

Table 2 lists the sources and specific information for many of the parts, tools, and supplies discussed in this document. The pricing listed below is accurate as-of January 2017, but pricing and availability is subject to change without notice. Standard tools commonly available at local hardware stores are not included below.

Item	Description	Manufacturer	Model	Vendor	Vendor #	Price
1	Halogen lamp, ESB	Philips	7388	Bulbtronics®	0000986	$3.84
				Bulbworks	BW.ESB	$6.62
2	Lamp socket, G4, ceramic	Bender & Wirth	990	Bulbtronics®	0006593	$5.22 for 100
				Bulbworks	BW.990	$16.98
3	Repair kit for LS20H lamp house	---	JC120-1	JC Ritchey	JC120-1	$30
4	In-house repair/exchange of lamp house	---	JC120	JC Ritchey	JC120	$60
5	Epoxy, cold-weld formula, 2 oz.	J-B Weld	8265S	Amazon	---	$4.31
6	Glove, heat-resistant	Kiloline	---	Amazon	---	$4.93
7	Heat gun, 1500W, dual temperature	Black & Decker	HG1300	Amazon	---	$27.24
		Harbor Freight	Drill Master® 96289	Harbor Freight	96289	$11.99
8	Screwdriver set, JIS, 4-piece	Hozan	---	Amazon	---	$21.58
9	Screwdriver set, JIS, 4-piece	Moody Tools	58-0219	Amazon	---	$17.95
10	Silicone Gasket RTV, Black	J-B Weld	32329	Amazon	---	$6.77
11	Solder sucker vacuum tool	Vastar	---	Amazon	---	$6.99
12	Solder wick, 2.5mm x 5’	Aven	17542	Amazon	---	$3.45
13	Vise, multi-purpose	Panavise®	350	Amazon	---	$89.99
		Harbor Freight	Central Forge® 3311	Harbor Freight	3311	$15.99
14	X-Acto® #2 knife with safety cap	X-Acto®	---	Amazon	---	$5.90

Table 2 – Replacement Parts, Tools, and Supplies

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

Company Name	URL	Telephone #	Toll-Free #	Fax #	Email
Amazon	www.amazon.com	---	1-800-280-4331	---	---
Bulbtronics®	www.bulbtronics.com	---	1-631-249-6000	1-800-588-2852	custservdept@bulbtronics.com
Bulbworks Specialty Lightbulbs and Sockets	www.bulbworks.com	1-973-584-7171	1-800-334-2852	---	bulbwork@bulbworks.com
Harbor Freight Tools	www.harborfreight.com	1-858-436-8388	1-800-423-2567 1-800-444-3353	1-800-423-2567 1-800-444-3353	---
J.C. Ritchey Company, LLC	www.ritcheymicroscopeservice.com	1-740-862-9252	---	---	ritcheymicroscopeservice@hotmail.com

Table 3 – Vendors for Parts, Tools, and Supplies