



LS 3000 Optical Inspection System

Operation Manual

P/N 5050-0517
Rev A-CB



CAUTION: RIGID PROBE IS EXTREMELY FRAGILE. PLEASE USE EXTREME CARE WHILE HANDLING AND USING

1. Packing Contents, Standard Items

a. Packing contents (Standard Items)

<u>Description</u>	<u>Part Number</u>
Rigid Probe	1106-0046-P1
Fiber Probe End piece	1106-0049-P1
Large PCB Holder (2)	1400-0001-01-P1
Med PCB Holder (2)	1400-0001-02-P1
Small PCB Holder (4)	1400-0001-03-P1
Small PCB Tray	1400-0050-P1
Single Gooseneck	6007-0020-P1

2. Specifications:

120 VAC Unit	8007-0401
230 VAC Unit	8007-0402
Dimensions	H: 510mm (20") W: 635mm (25") D: 660mm (26")
Weight	32kg (70lbs)
Magnification	100x – 375x with object 3.3mm (13") away from probe using a 381mm (15") diagonal monitor
Field of View	1.5mm (.06") – 6.35mm (.25") with object at 6.35mm (.25mm) away from probe using 381mm (15") diagonal monitor
Focus Distance	0 – 228mm (9") with 381mm (15") diagonal monitor
Minimum Standoff Height (distance between top of PCB and underside of component)	.05mm (.002")
Minimum Distance Between Components	2.54mm (.1")
Optics Probe	Fiber Optic rigid probe with stainless steel protective cap
Lighting Type	Adjustable Metal Halide Light Source
Maximum PCB Size	510mm (20") x 610mm (24")
Camera	Hi-Resolution CCD Camera
Agency Approvals	CE

Optional Accessories	<ul style="list-style-type: none">- Flexible Optics Probe 0.38mm (.015") diameter. P/N 1106-0047-P1- Dual Fiber Light Gooseneck. P/N 6007-0021-P1- 15" LCD Flat Panel Monitor P/N 7015-0010 <p>Right Angle Light Bar:</p> <ul style="list-style-type: none">- 12.7mm (.5") Wide: P/N 1106-0048-03-P1- 25.4mm (1") Wide: P/N 1106-0048-02-P1- 38.1mm (1.5") Wide: P/N 1106-0048-01-P1
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Figure 1: LS 3000

3. Safety Information

- a. Follow all manufacturer safety precautions listed in this manual.
- b. Ensure system is used only in accordance with the following procedures.
- c. Immediately replace any worn or damaged items
- d. Do not open the back panel while system is in use.

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4. Features

- a. The LS 3000 is the newest, cost effective, optical inspection system specifically designed for today's electronics. It's primary use is for inspection of area array devices including PBGA's, CSP's, Flip Chips, LBGA's, CBGA's etc. However, the LS 3000 has a wide range of other inspection used on any SMT or through-hole base PCB. The LS 3000 is ideal for periodically monitoring the performance of production or rework reflow equipment. It is also a critical inspection/monitoring instrument for R&D labs and process development departments when developing new processes of troubleshooting problems.
- b. The LS 3000 features a high resolution CCD chip camera and incorporates industrial quality endoscopic components to acquire images. The video signal can be sent to a stand-alone monitor or can be routed to a PC via a video acquisition card. The system comes standard with front lighting through the endoscope and with back lighting from one fiber light gooseneck and one end piece. Both back and front lighting can be adjusted independently. An optional dual gooseneck for back lighting is also available. The camera head on the LS 3000 can be moved in the Y direction using a fine adjustment knob on the side of the system, which allows the user to scan an entire side of a device with ease.
- c. The LS 3000 verifies your process integrity so you can have absolute confidence in your production or rework process.

5. Un-packing

Your LS 3000 system comes completely contained in one cardboard box, which has been secured to a shipping palette. If you have purchased the optional monitor, it will come packaged in it's own box and will be attached to the top of the system box.

Starting with the LS 3000 container, please use the following steps to safely unpack;

- a. If your system came with the monitor, cut or loosen any straps, which hold the monitor box to the main assembly box. Set monitor box aside.
- b. The cardboard box holding your LS 3000 will come strapped to a pallet. This can be left intact or the straps holding it to the pallet can be removed and the box removed from the pallet.
- c. Carefully cut any tape holding the main assembly box top together and open the box top.
- d. The interior of the box contains several, custom cut, foam packing trays. The top packing tray will have a set of Velcro straps running through it.
- e. Un-do the Velcro straps as shown in figure 2 and carefully remove the top foam-packing tray. This will reveal the camera head assembly, which has been removed from the main system for shipping.



Figure 2 Undoing the Velcro Straps

- f. The camera head assembly is still connected to the main unit via it's wiring which will be clearly seen. Carefully lift the camera head assembly without placing any strain on the wiring and remove the second foam-packing tray as shown in figure 3. This is the packing tray that previously cradled the camera head assembly.

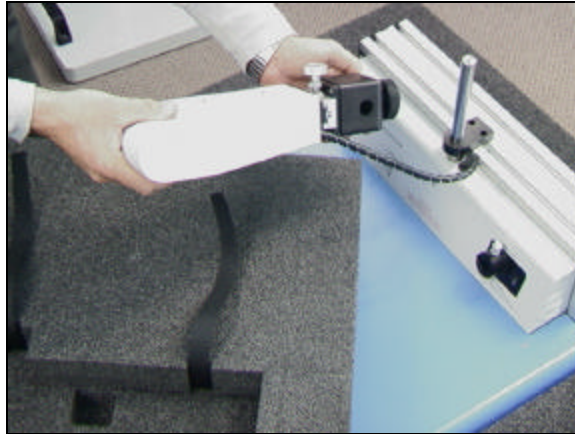


Figure 3. Removing the Camera Head Assembly from Packaging

- g. Prior to proceeding with the unpacking process it is advisable to first attach the camera head assembly to the main unit. This can be done as follows;
 - i. Loosen the coarse height adjustment knob as show in figure 4. Do not remove the knob.



Figure 4. Loosening the Coarse Adjustment Knob

- ii. Carefully slide the camera head assembly onto the camera head assembly post on the main frame of the system as show in figure 5. It does not need to be at any specific height at this point.

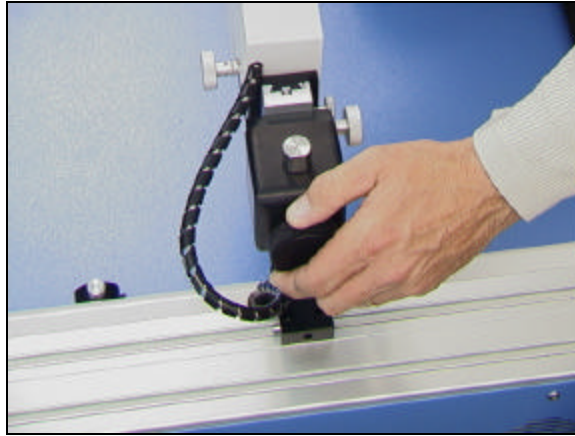


Figure 5. Placing the Camera Head Assembly onto the Camera Post

- iii. Tighten the coarse height adjustment knob so the camera head assembly is now fixed on the camera head assembly post.
- iv. Proceed with the un-packing procedure.

- h. Carefully lift the main system out of the box and place on a firm, sturdy surface.
- i. In the bottom of the packing box, the accessories bag will be found. Remove this bag from the main box and set aside.
- j. Check the main shipping box for any other items and remove as necessary.
- k. Proceed to set-up

6. Set-up

Prior to use, it is necessary to use the following procedure to safely set-up your LS 3000 system.

- a. Place your LS 3000 system on a sturdy, firm surface. Ensure the surface has enough space to support the four legs under the system.
- b. Ensure the system sits level on its bench. If it does not, the four individual legs can be adjusted as show using a medium sized adjustable wrench.
- c. Locate the main power cord in the accessories kit.
- d. Attach the main power cord to the rear of the unit as shown in figure 6. Do not turn on main power at this time.



Figure 6. Attaching the Main Power Cord

- e. Connect the system to a monitor. This can be done using your own existing monitor or with the optional monitor. Ensure all power and video cables are connected correctly if using an existing monitor. Do not turn on the main power at this time.
- f. If using the optional monitor, use the following procedure to properly connect;
 - i. Carefully remove the monitor from its box.
 - ii. Locate the accessories bag and remove
 - iii. Set-up the monitor base using the enclosed instructions.
 - iv. Attach the main power cord and the video cables to the back of the monitor as shown in figure 7. Do not turn on the main power at this time.



Figure 7. Power and Video Cables Attached to Back of Monitor

- v. Attach the video cable to the back of the LS 3000 as shown in figure 8.



Figure 8. Attaching the Video cable to the LS 3000

- g. Proceed with accessories set-up

7. Accessories Set-Up

- a. Locate the accessories drawer keys in the accessories package.
- b. The accessories drawer can be found on the front of your LS 3000 system shown in figure 9 and can be used to safely store your system accessories when they are not in use.



Figure 9. Accessories Drawer Location w/keys)

- c. Using the keys, open the accessories drawer.
- d. Place all system accessories in the accessories drawer.
- e. Locate the Rigid Probe and attach using the following steps;

- i. Attach the rigid probe to the camera head assembly by carefully inserting it into the underside of the camera head as shown in figure 10.



Figure 10. Installing the Rigid Probe

- ii. Rotate the Rigid probe until it clicks into place on the factory set detent. Probe should be facing to the right as shown.
- iii. Using the coarse height adjustment knob, raise the camera head assembly on the camera head assembly post to the highest position to avoid damaging the Rigid Probe

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- f. Locate the Gooseneck light and attach using the following steps;
 - i. Attach the Gooseneck light by carefully inserting it into the Back Light Adapter as show in figure 11. Tighten the setscrew knob.



Figure 11. Attaching the Gooseneck Light

- g. Locate the PCB manipulator and the PCB holders and set up using the following steps;
 - i. Place the PCB manipulator of the LS 3000 table as shown in figure 12.

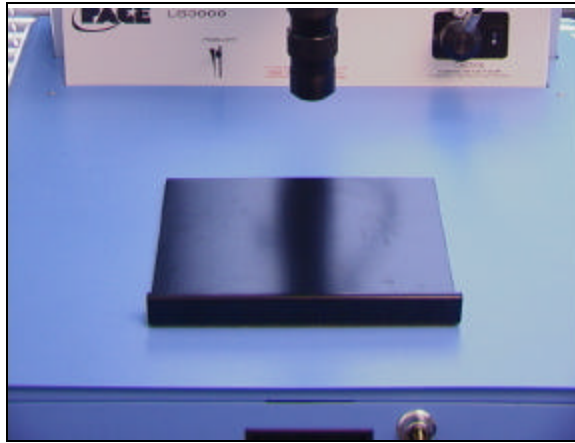


Figure 12. Placing the PCB Manipulator

- ii. Place the PCB holders on the PCB manipulator as shown in figure 13 being careful not to contact the Rigid Probe. The PCB holding blocks are equipped with both V-shaped and L-shaped notches.

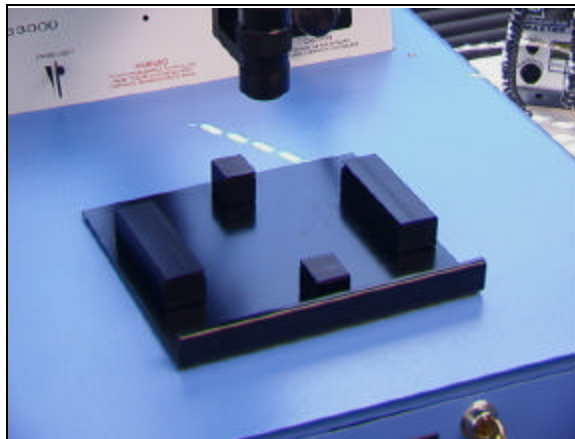


Figure 13. Placing the PCB Holders

You are now ready to use your LS 3000 Optical Inspection System.

8. Operation

Use the following steps to safely use your LS 3000 Optical Inspection System;

- a. Turn on the main power switch on the LS 3000 as shown in figure 14. You should now have light showing through the camera head assembly. At this time you should also turn on the power to the gooseneck light.



Figure 14. Main Power Switch in the On Position

- b. Turn on the main power to the monitor.
- c. Adjust your PCB holders on the PCB Manipulator so your PCB is held securely in place.
- d. Place the entire assembly under the camera head assembly.
- e. Using the coarse height adjustment knob, carefully lower the camera head assembly and Rigid Probe so the bottom of the rigid probe is slightly higher than the PCB.
- f. Carefully position the PCB Manipulator so the component to be inspected is directly under the Rigid Probe.

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- g. Using the Fine Height adjustment as shown in figure 15 and while adjusting the position of the PCB Manipulator, position the Rigid Probe so that it is along the side of the component to be inspected. Do not contact the PCB with the Rigid Probe. The ideal position of the Rigid Probe will be just slightly above the board surface to allow freedom of movement.

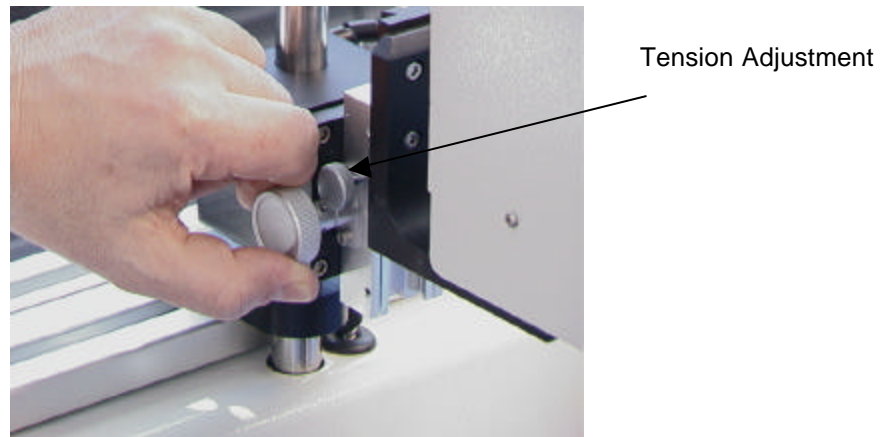


Figure 15. Fine Height Adjustment

- h. Using both the focus adjustment and the zoom adjustment as shown in figure 16, adjust the image on the monitor screen for a clear picture. If a clear picture is not seen on the monitor screen, refer to the troubleshooting section of this manual.



Figure 16. Focus and Zoom Adjustments

- i. Position the Gooseneck light on the side of the component opposite the Rigid Probe as shown in figure 17. This will provide backlighting to further enhance the image on the monitor.

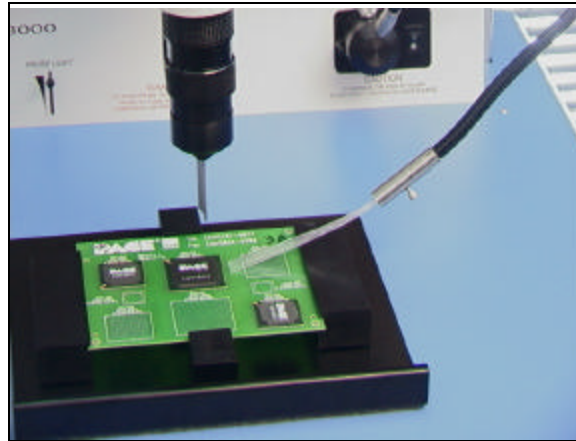


Figure 17. Positioning the Gooseneck w/ the Plastic Fiber Probe

- j. Once a clear picture is displayed on the monitor screen, use the camera head position adjustment as shown in figure 18 to move the Rigid Probe along the length of the component to be inspected.

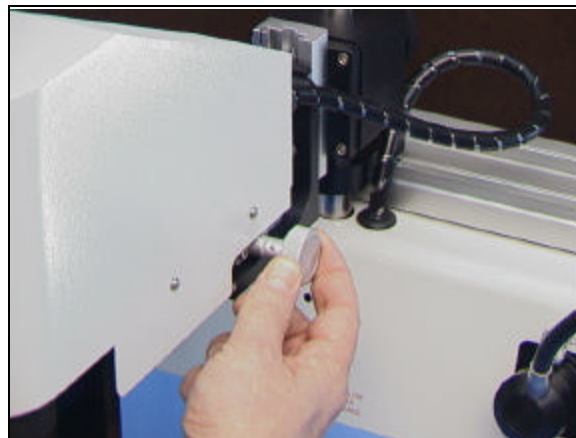


Figure 18. Camera Head Assembly Position Adjustment

- k. Use the focus adjustment to extend the picture further under the component as necessary.

Your system can also be equipped with an optional Flexible Probe, which can be used with the following procedure;

Locate the Flexible Probe and attach using the following steps;

- i. Attach the Flexible Probe to the camera head assembly by carefully inserting it into the underside of the camera head as shown in figure 19.

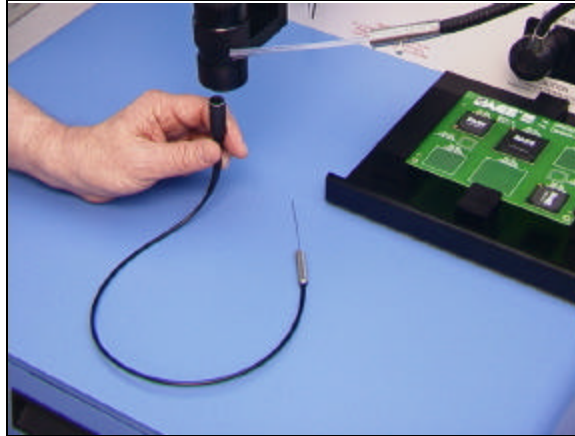


Figure 19. Attaching the Flexible Probe

- ii. Carefully remove the protective sleeve from the Flexible Probe
- iii. Place the Flexible Probe along the side of the component to be inspected as shown in figure 20.

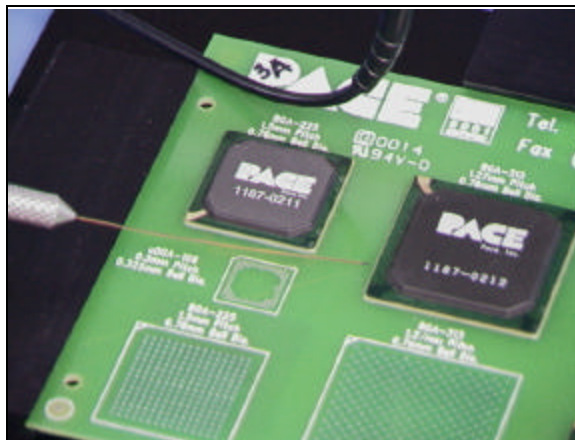


Figure 20. Positioning the Flexible Probe

- iv. Using the focus and zoom adjustments, adjust so a clear picture is seen on the monitor.
- v. Move and position the Flexible Probe as necessary to inspect the underside of the component.

9. Inspection Examples

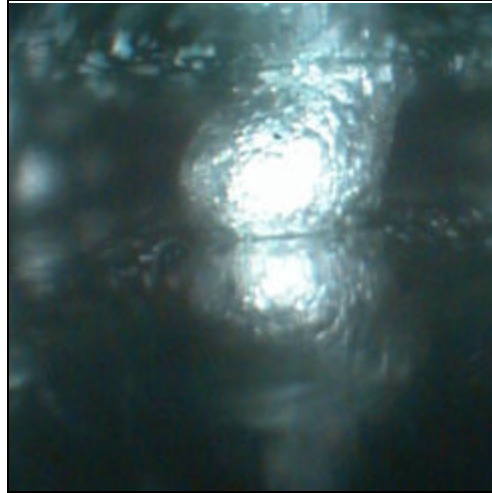
- a. The following images depict various good and bad soldered connections for you to use as a general reference as you use your LS 3000.



A good solder joint. Note the smooth shiny surface of the ball and good fillets on the top and bottom.



A solder bridge in which two solder balls have flown together



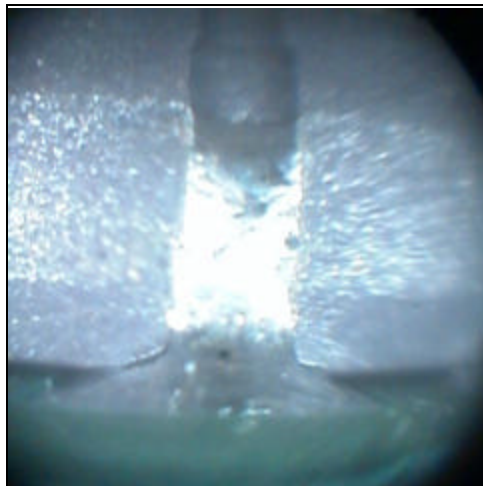
An irregular shaped joint most likely caused by either poor initial alignment of the part moved before the solder re-solidified. Note the rough surface of the solder indicating incomplete reflow.



Excessive Flux left at the bottom of the solder ball after reflow



An open connection between the part and the PCB.



An example of a fillet on a LCCC type component

10. Maintenance

- a. The following procedures should be followed in order to periodically check and inspect your LS 3000 system. Anything beyond normal cleaning and checkup should be referred to a qualified PACE service technician.
 - i. Periodically inspect the main power cord for signs of wear or damage. If wear or damage is found, replace the cord immediately.
 - ii. You may clean the rigid probe assembly with a soft cloth. Do not use any type of cleaner for this process as damage to the probe may occur. If the image seen with the rigid probe is not clear and crisp, contact your local PACE Representative
 - iii. The plastic fiber probe can be trimmed should the ends become frayed or damaged. Trimming can be accomplished by carefully using a razor knife and cutting all fibers to the same length. Eventually the plastic fiber probe will need to be replaced.
 - iv. The main tray and work surface can be periodically wiped clean with a soft damp cloth. Avoid cleaning chemicals.

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11. Major Replacement Parts

Part Name	Part Number	Comments
Replacement Bulb	1165-0031	Replacement Light Bulbs

12. Optional Items and Accessories

Flex Probe	1106-0047-P 1
Light Bar 1.5"	1106-0048-01-P1
Light Bar 1.0"	1106-0048-02-P1
Light Bar .5"	1106-0048-03-P1
Analytical Software	1199-0009-P 1
Large PCB Tray	1400-0002-P 1
Dual Gooseneck	6007-0021-P 1
13" Monitor Full Screen	1107-0029-P 1

13. Regulation

- a. This product is CE approved
- b. PACE products meet or exceed all applicable military and civilian EOS/ESD, temperature stability and other specifications, including MIL-STD-2000, ANSI-J-STD-001, IPC 7711, IPC 7721 and IPC-A-610.

14. Service

Please contact PACE or your local distributor for service and repair.



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