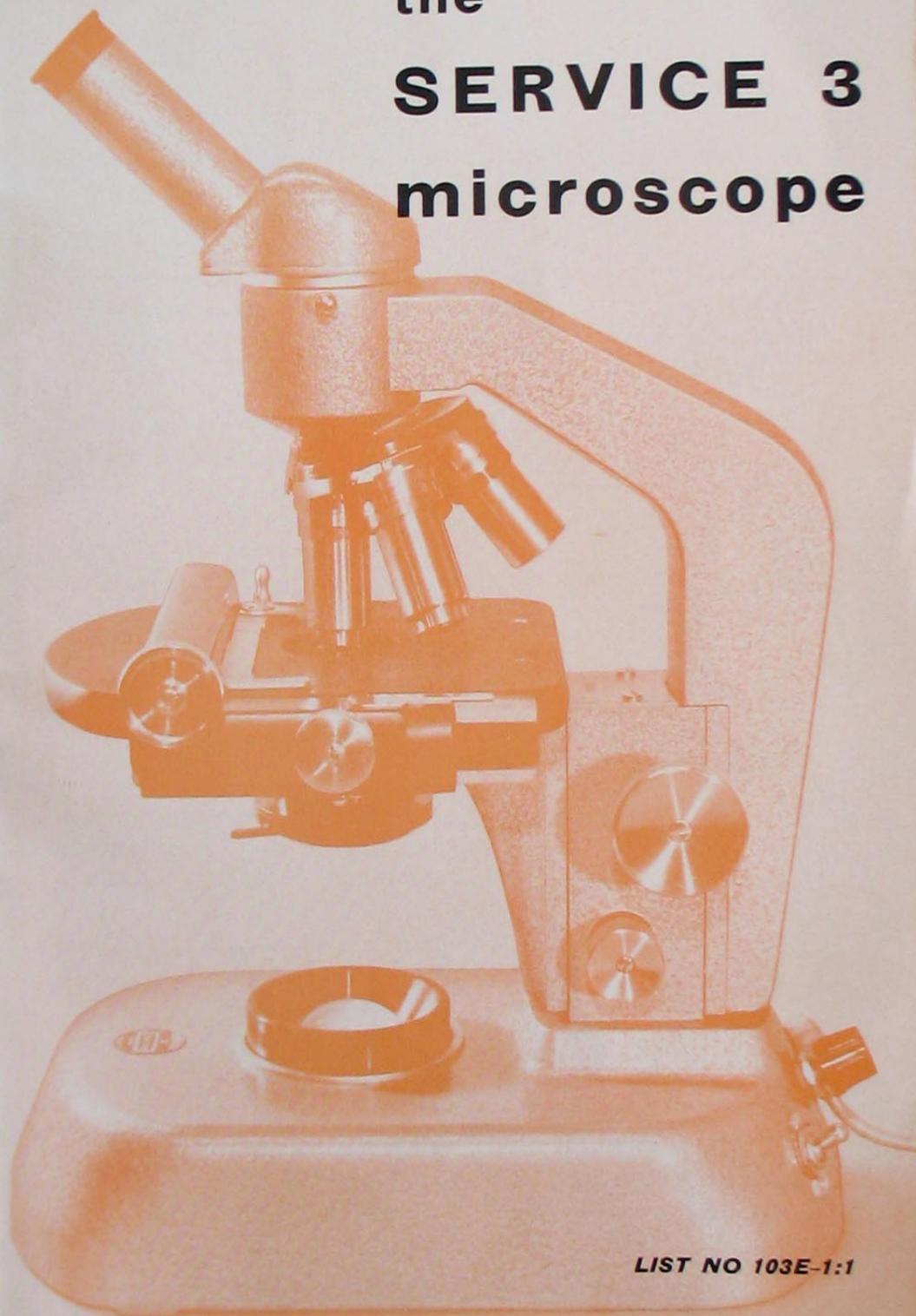


**WATSON**

a handbook for  
the  
**SERVICE 3**  
microscope



*LIST NO 103E-1:1*

## THE PARTS OF YOUR SERVICE 3 MICROSCOPE

**The Microscope Head** (*inclined monocular, inclined monocular with drawtube, vertical monocular or inclined binocular*) is located into the circular dovetail at the top of the microscope limb and then secured by the locking screw. Rotation of the head in use should not be attempted without first releasing the locking screw, otherwise damage to the circular dovetail will result.

The inclined binocular head is fitted with an interpupillary distance adjustment (by movement of the central wheel) and independent focusing of the right eyepiece tube compensates for any difference of vision between the eyes of the observer.

**The Nosepiece** is provided with four apertures for objectives. Those not in use are fitted with a removable dust cap.

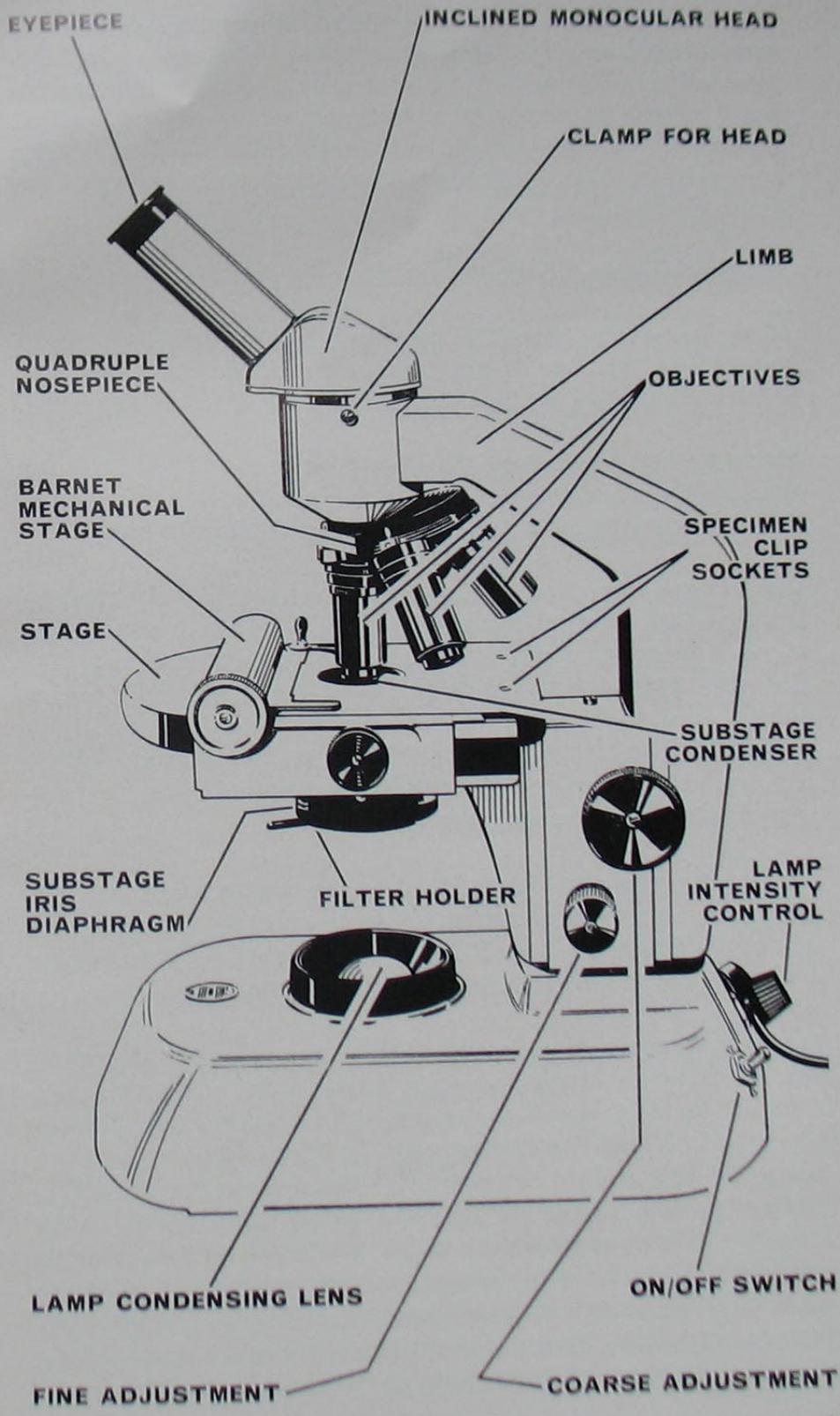
**The Objectives** have been subjected to rigid inspection tests and as supplied conform to the highest standards of manufacture and performance. Each objective is fitted with a colour band for quick identification (a complete list of colour codes will be found on the inside of the back cover) and all high power dry and oil immersion objectives are spring loaded for specimen protection. All powers are accurately parfocussed, centred and completely interchangeable.

**The Stage** of the Service 3 Microscope provides a plain (with specimen clips) acid resisting surface of robust construction. It will accept any of three mechanical stages: *The Barnet* (Code 63); *The Service* (Code 600) or *The College* (Code 198).

*The Barnet Mechanical Stage* may be attached to either side of the plain stage by means of the knurled bolts which screw into the appropriate bosses on the underside of the plain stage casting.

Both *Service* and *College Mechanical Stages* are fitted by passing the threaded pins through the specimen clip apertures and then securing with the knurled nuts provided.

Great care should be exercised when fitting mechanical stages to see that the objectives are not damaged in any way.



**The Substage** is accurately centred to the optical axis of the microscope and focusing is achieved by means of the knurled ring which circumscribes the assembly. The multi-start thread is precisely manufactured to ensure optical alignment throughout the range of condenser travel. The condenser mount is fitted with an aperture iris diaphragm and a filter holder.

**Microscope Base** *Three alternative bases are available*

**Mirror Assembly Base** The assembly is located by spring-loaded ball bearings. It fits into the top of the base, ensuring accurate centration with the optical axis of the microscope.

**Mains Voltage Lamp Base** This has a built-in 25 watt bulb for mains voltage operation. A 6-foot length of 3-core cable is fitted. Above the lamp is a self-centring condensing lens.

**Low-voltage Lamp Base** This model has a completely built-in illuminating system. Housed within the base are a 6 volt 18 watt prefocus bulb, a tapped transformer and variable rheostat. Fitted to the outside are an on/off switch, a mains socket and a rheostat control knob for adjusting light intensity. The transformer tappings can be altered to allow the bulb to be overrun for special applications. A self-centring condensing lens is provided.

The lamp condensing lens fitted to the mains and low voltage models is designed correctly to illuminate the aperture of any objective in use. It may be replaced by the mirror assembly for use with a separate microscope lamp.

**Focusing Controls** The Service 3 Microscope is provided with two focusing motions, a coarse adjustment operating the limb of the microscope and a fine adjustment which moves the stage. When the instrument is fitted with a built-in lamp the limb should be positioned away from the observer. The focusing controls will then be found to be comfortably situated at a convenient distance to allow the forearms to rest on the bench. The action of the coarse adjustment is such that when the control heads are moved in the most natural direction, that is the top away from the user, the objective is lowered into focus on the specimen. When the

fine adjustment control heads are moved in the same direction the stage is raised, this bringing objective and specimen closer together as with the coarse adjustment.

### **SETTING UP** *mirror model only*

Unless the microscope is supplied with mains operated or low voltage illumination a suitable source of light will be required. Daylight is not very satisfactory by reason of its variability and low intensity. A 60 watt pearl bulb, enclosed in a suitable housing to shield the observer's eyes from direct light, will be found satisfactory for general and class work.

Place the lamp directly in front of the microscope and about eight inches away from it.

Rotate the nosepiece until the lowest power objective is in line with the body tube, then, looking into the instrument, move the mirror until the field appears brightly illuminated. A little patience may be required when doing this at first, but the adjustment soon becomes easy, particularly when an objective and eyepiece of low power are used. Having illuminated the field, place a slide on the stage, and bring the condenser to the top of its travel by operating the substage focusing control.

Still using the low power, put the object out of focus by racking the body first a little above and then slightly below the position at which the object is clearly seen. When this is done the object should not appear to move across the field; if such movement is present the indication is that the illumination is not correctly set. Move the mirror slightly with one hand whilst focusing with the other until the object goes in and out of focus without appreciable shift.

If at this stage it is found that the field is no longer fully illuminated, the lamp should be moved in relation to the microscope to obtain the desired results.

### **USE OF THE CONDENSER**

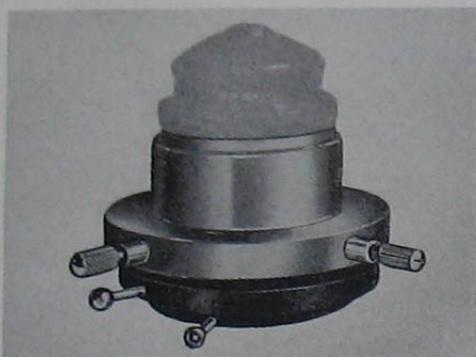
With the microscope focused on a slide using the 16mm (x10) objective and with the condenser at the top of its travel, look into the instrument and hold a pencil or a mounted needle against the surface of the lamp or the built-in lamp condensing lens; move the needle or pencil until its shadow is seen in the field of view. Next, slowly lower the substage

condenser until the tip of the pencil is clearly seen, superimposed on the object. The substage condenser is now focused, i.e. it is forming an image of the light source in the plane of the specimen.

The frosted surface of the lamp or the built-in lamp condensing lens may become visible, so that those portions of the field not occupied by the object have the appearance of ground glass. A further slight movement of the substage condenser serves to lose this grinding, but the movement should be no more than is necessary to do so.



*Plain mount supplied for use with Abbe condenser*



*Centring mount recommended for all condensers other than Abbe*

## **USE OF SUBSTAGE IRIS DIAPHRAGM**

Take out the eyepiece and look at the back lens of the objective, the eye being six inches or so from the top of the microscope tube. Close and open the substage iris, noting that this regulates the proportion of the back lens which is filled with light. Adjust the iris until about three quarters of the back lens is illuminated. Now replace the eyepiece and note the appearance of the object. Again open and close the diaphragm, watching the change which this produces in the image. When too far open, the image will be flooded with light; when too far closed the outlines and fine details of the object become thickened or doubled; this is an artificial appearance and should be recognised as such.

For a given objective the precise setting of the substage iris depends upon the nature of the object. A setting which fills three quarters of the back lens will be found suitable for many objects but the user will quickly learn to adjust the iris by the appearance of the image.

From what has been said, it will be appreciated that the iris must not be used to regulate the intensity of the light. It

may sometimes be found that the field is uncomfortably bright, in which case a neutral or coloured filter may be placed in the filter carrier immediately below the substage condenser iris. Normally the filter carrier takes the disc of blue glass which is supplied with the instrument. Its purpose is simply to whiten the rather yellowish nature of the tungsten source.

### ***CENTRING THE SUBSTAGE CONDENSER***

In the case of a substage condenser provided with a centring mount, the centration should be checked and if necessary, adjusted. This is normally done at the beginning of the setting-up procedure.

With the condenser at the top of its travel focus the microscope on a slide using the 16mm objective. Close the substage iris to a pinhole and rack the condenser down until the small aperture of the iris diaphragm is seen. It should appear at the centre of the field of view and if necessary it is brought there by means of the substage centring screws.

The Abbe condenser in plain mount is accurately centred during manufacture. With the more highly corrected types of condenser the greater accuracy of centration afforded by a centring mount is a necessity. The thin colour fringe visible at the edge of the iris image should be symmetrical and uniform.

### ***USE OF THE HIGHER POWERS***

To observe with a higher power than the 16mm the object is first set up under the low power and the nosepiece is then rotated to bring the new objective into use. A slight movement of the fine adjustment is all that is necessary to bring the object into sharp focus. In rotating the nosepiece, care should be taken that the front of the high power objective does not foul the stage clips.

If the substage condenser has been previously focused for the low power, it should not now require re-focusing, but the setting of the substage iris may require adjustment to obtain optimum results.

To use an oil immersion objective, rotate the nosepiece just sufficiently to gain access to the slide with the immersion oil. Place a small drop of oil over the part of the specimen

which it is desired to examine; the small spot of light from the substage condenser will indicate the place. Continue rotation of the nosepiece to bring the objective into contact with the oil. A slight turn of the fine adjustment may be necessary to focus the specimen.

Immersion objectives focus very close to the preparation and great care is called for in their use. As the substage iris required adjustment in passing from the 16mm objective to the 4mm, so it will normally need to be re-set on transferring to the oil immersion 2mm.

After use, the immersion oil should be cleaned from the objective, and from the preparation with a piece of lens tissue or soft linen. Under no circumstances must xylol, alcohol or solutions of alcohol be used to clean an objective. Oil immersion objectives should never be used "dry", i.e., without immersion contact. In the same way, other objectives must not be used immersed. If, after an immersion objective has been used, it is desired to revert to a dry objective the slide must be cleaned. The layer of oil will suffice to upset the performance.

The total magnification of the microscope, provided that the tube length is kept at 160mm, is the product of the magnifications engraved on the objective and the eyepiece.

## **CARE OF THE MICROSCOPE**

Microscopes do not require frequent lubrication. The greases which are used during manufacture last for many years. The user is particularly warned against applying oil to the bearings of the shafts which carry the milled heads.

When not in use the instrument should be kept in its case as a protection against dust. It should not be stored in a chemical laboratory or in any place where it is liable to come into contact with corrosive fumes.

Optical surfaces may be cleaned with lens tissue or with a soft linen cloth but cleaning should normally be confined to the exposed and readily accessible surfaces, and should not be carried out unnecessarily. Under no circumstances should an objective be taken to pieces.

Objectives may be left on the nosepiece when not in use, but when this is done an eyepiece should always be left in the tube to prevent dust collecting on the back lenses of the

objectives. If for any reason it becomes necessary to clean the back lens of an objective use a dry camel hair brush.

The performance of the instrument will not be affected by small traces of dust on the objectives and condenser. If specks are seen in the field it is probable that they are on the eyepiece, and this can be confirmed by rotating the eyepiece. The eyepieces are easily cleaned and careful dusting of the exposed surfaces should remove the offending particles.

### **Lamp Replacement** (*Low-voltage model*)

The normal life of the 6v. 18w. bulb is 100 hours at its full voltage, but in practice it is usually run below this level and the life is considerably extended. The life will be very much reduced if the supply is switched on with the rheostat intensity control more than half way up.

### **Spare Bulbs**

240v. 25w. S.B.C. bulb (Mains voltage model) ... .. Code No 2121  
6v. 18w. pre-focus bulb (Low-voltage model) ... .. Code No 2087

*A full list of accessories for the Service 3 Microscope will be sent on request*

## **OBJECTIVE COLOUR CODING**

<b>OBJECTIVE</b>	<b>FOCAL LENGTH</b>	<b>COLOUR BAND</b>
40mm	1½"	Violet
25mm	1"	Violet
16mm	2/3"	Dark Blue
8mm	1/3"	Light Blue
4mm	1/6"	Green
3.6mm	1/7"	Yellow
3mm	1/8"	Yellow
2mm	1/12"	Red

*Our policy is one of continuous development. Current production models of the SERVICE 3 may, therefore, differ in minor details from those described in this handbook.*

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# THE USE AND CARE OF YOUR SERVICE 3 MICROSCOPE

## UNPACKING THE MICROSCOPE

For safety in transit the microscope is secured to the floor of its case by two screws which may be removed with the aid of a coin.

The rubber band which protects the fine adjustment against shock should be removed. The various items comprising the outfit should be checked to ensure that no damage has occurred in transit.

The objectives will be found screwed into the nosepiece, and a check should be made to ensure that these have not become loose in transit. Care should be taken to avoid touching the glass surfaces, since grease from the fingers will affect definition. Remove the dust cap from the eyepiece tube of the microscope and insert a suitable eyepiece from those clipped to the inside of the case door.

The condenser in its mount (*see page 6*) is pushed up into the substage from below, the keyway acting as a guide for the small screw on the mount. The assembly is then secured by the locking screw.

A plastic dust cover and a blue glass filter are supplied with each outfit. When the outfit includes an oil immersion objective a small amount of oil and lens cleaning tissue are provided.



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