

FILLING ENGRAVED SCALES

GENERAL

1. Scales are used on instruments to measure angular values, interocular and dioptré settings or to set axes, eg, zero indices for horizontal axis on Telescopes Panoramic. Nomenclature information, serial numbers and often brief operating information is engraved on instruments. Engraved lines, figures and letters must be filled with a material that contrasts with the background of the scale so that they are legible and easily read by the user.

2. Depending upon the background, the colours most used are white and black. Red is sometimes used to indicate angular movement in depression (Aiming Circle) deflection angles (Telescope Panoramic) or when using two separate scales with one micrometer (Quadrant Gunners MI).

3. Weathering, handling and drying out will render engraved scales difficult to read and detracts from the appearance of the instrument. Heat will cause engravings filled with a wax base filler to "run". When completely finishing an instrument, it is often not possible to mask scales and they must be painted over and refilled.

TYPES OF SCALES

4. Scales can be divided into two main types considering the finish or material used.

5. In the first classification are painted micrometer drums, scale rings, and scale plates. Lines and figures engraved on them are filled with contrasting coloured wax filler or paint. Examples of these scales are found on panoramic telescopes, binocular dioptré collars, instrument mounts and compass bodies.

6. In the second classification the scale is either plated (often with cadmium or silver) or is finished by polishing, blueing or bronzing. Plated and polished scales are the more common. Examples of these types are found on Aiming Circles, Instrument Testing Scales and Sub Standard Compasses.

PREPARATION FOR FILLING

7. All of the old filler in engraved scales must be removed before refilling. This is done either by picking out the material in each engraved line or figure with a pointed tool or by using a suitable thinner and a stiff brush.

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8. If, for example, a painted micrometer drum scale is to be re-finished, the old filler can be left in the lines and figures until the drum has been painted with the background colour. After the paint has thoroughly hardened, the filler material in engraved lines can be picked out. Care must be used to avoid chipping the paint at the edges of the engravings. Removing the filler before the background paint is applied would result in paint being deposited in the engravings and would require additional cleaning out unless the paint had been applied very thinly and the engravings were fairly large. If this is the case, engraved lines can be cleaned out before painting, although with fine engravings this is not recommended.

9. When preparing a plated or polished type scale for refilling a suitable thinner should be used to remove any lacquer protecting the scale surface. The filler is removed with thinner or by picking the material out of large engravings. Do not use abrasives to improve the appearance of plated scales as this might result in wearing the plating through to the base metal.

APPLICATION OF FILLER TO ENGRAVINGS

Wax Base Fillers

10. Wax base fillers flow more readily into engravings if the scale or micrometer drum is heated beforehand. After the part has been heated with an alcohol lamp the filler is applied to the engravings so that it completely fills them. Excess filler can be removed by wiping the scale with a soft cloth or piece of tissue moistened with instrument oil.

Oil Base Paint Filler

11. If it has been decided to fill engravings with paint, it is thinned to a consistency thinner than for normal painting. Large engravings are filled individually by applying a drop of paint to each engraving with a pin or a sharpened piece of pegwood. The paint should be thin enough to flow and completely fill the engraving.

12. Fine engravings are filled by "wiping" with thin paint. After applying a small quantity of paint to a soft, clean cloth or tissue, it is wiped across the scale to deposit paint in engravings. The engravings should be inspected to ensure that each has been filled then the paint is allowed to dry for 5-10 minutes. Traces of paint on the surface of the scale are removed by wiping with a cloth or tissue moistened with thinner.

(CAUTION: Excessive rubbing with thinner should be avoided as it may cause filler to be removed from engravings.)

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13. Other materials such as lamp black, graphite and numerous types of commercial filler are satisfactory for use. The selection of the filler to be used depends upon the finish of the scale and the size of the engravings.

LAQUERING SCALES

14. Plated or polished scales should be protected with clear lacquer after engravings have been filled. If there is a difference in temperature between the scale and the lacquer, bubbles may result when the lacquer is applied. This can be avoided by heating the scale and lacquer until they are both warm. Apply a thin coat of lacquer to the scale with a fine brush without stopping or changing the direction of movement of the brush until the scale has been covered. If possible, the brush should be wide enough to lacquer the entire scale in one pass to avoid producing lines on the finish where several lacquered areas meet.

15. If filler does not completely fill the engravings and lacquer is applied to the scale, the lacquer will probably wear through first at the edges of the engraved lines due to the corners which are produced because of the uneven surface. If a scale or micrometer drum is to be lacquered, it is desirable that the engravings be filled flush with the surface of the scale.