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1.0 SCOPE

This test procedure is to be used to insure that the performance of the primary reticle satisfies Itek product design engineering specifications.

2.0 APPLICABLE DOCUMENTS

- 2.1 Drawing #149126, Project Test Plan and Procedures.
- 2.2 Itek File #X15, Specification Document.
- 2.3 344-68-278, Acceptance Test Plan.
- 2.4 Drawing #141594, Primary Reticle Assembly.
- 2.5 Drawing #141559, Reticle Assembly.

3.0 TEST DESCRIPTION

3.1 Purpose and Objective

The primary reticle will be assembled and testing conducted to insure that specifications have been satisfied.

3.2 Test Specimen

Testing will be conducted on the complete primary reticle assembly, #141594, including all mechanical parts.

3.3 Test Requirements

The assembly shall meet the following performance requirements:

- 3.3.1 Lateral positioning of 10 microns (0.0004") shall be demonstrated.
- 3.3.2 Angular positioning repeatability of 30.0 arc-seconds shall be demonstrated.
- 3.3.3 Image quality of 80 lines/mm must be shown.
- 3.3.4 Focus shall be repeatable to $\pm 0.001"$.
- 3.3.5 The reticle shall be shown free of double images.
- 3.3.6 The total time needed to remove and reinstall the reticle shall be less than 10 minutes.

3.4 Test Conditions

- 3.4.1 Laboratory environment shall be $75^{\circ}\text{F} \pm 10^{\circ}\text{F}$ at ambient humidity.

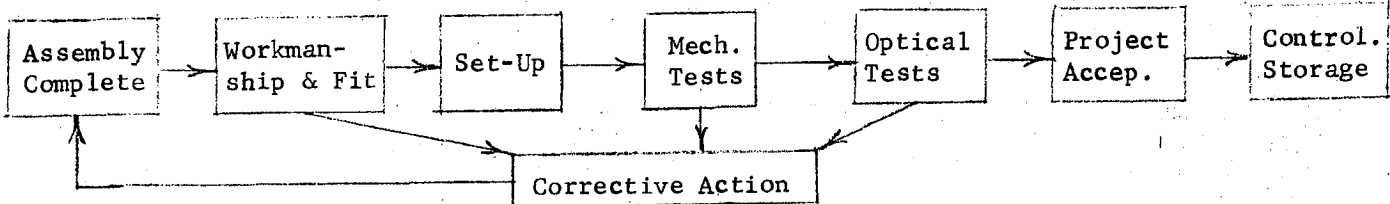
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3.5 Test Flow



3.6 Anticipated Results

The primary reticle assembly will correctly demonstrate its design capabilities and specification requirements.

3.7 Safety Precautions

None.

3.8 Instrumentation

- 3.8.1 A bench microscope, assembly #149740, with 20X and 32 mm objective lenses.
- 3.8.2 A Bausch & Lomb filar micrometer eyepiece.
- 3.8.3 A calibrated stage micrometer.

3.9 Facilities and Equipment

- 3.9.1 An optical bench.
- 3.9.2 A mounted optical tri-bar target, per USAF51 high contrast negative.
- 3.9.3 An American Optical microscope light source.
- 3.9.4 A room where the lighting may be shut off, or at least reduced.

4.0 TEST PROCEDURE

The reticle is a precise optical piece which should never be touched or allowed to get dirty. If either should happen, immediately contact the optical engineer for assistance. Do not attempt to clean the reticle.

4.1 Test Set-Up

- 4.1.1 Calibrate the filar eyepiece and the 20X objective using the stage micrometer. Position the eyepiece so that the micrometer moves exactly vertical.

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- 4.1.2 Connect the reticle assembly and the microscope to the top of the optical bench as shown in the attached sketch.
- 4.1.3 Install the light source on the opposite side of the reticle from the microscope and about 4" from it.
- 4.1.4 Adjust the primary reticle assembly so that the pattern is centered and the horizontal leg of the cross is parallel to the microscope traverse within $\pm 0.00020''$ in $0.3750''$ lateral shift.
- 4.1.5 Check that the filar micrometer moves along the vertical leg.

4.2 Alignment of Test Instrumentation

- 4.2.1 Focus the microscope, using the 32 mm objective lens, on the resolution target such that it is clear and sharp. Make sure that it can also be focused on the reticle.
- 4.2.2 Change the lens to the 20X objective. Make sure that the microscope can be focused on the reticle pattern such that it is clear and sharp.

4.3 Measurement of Mechanical Parameters

- 4.3.1 Record the laboratory temperature.
- 4.3.2 With the microscope (20X objective) focused on the reticle pattern, remove the reticle assembly by pulling up the spring release and pulling it out by the handle. Note the time.
- 4.3.3 Reinstall the reticle assembly and note the time. The time difference between steps 4.3.2 and 4.3.3 should be less than 10 minutes.
- 4.3.4 Measure and record, using the microscope, any changes in focus or lateral pattern location. The open space between the pattern lines should still be clearly discernable on all legs within $\pm 0.001''$ refocusing. The pattern center should not have shifted laterally more than 10 microns ($0.0004''$) in any direction.
- 4.3.5 Position the microscope center $0.3750''$ to the left of the reticle center and align the filar micrometer vertically with the reticle line. Record the micrometer setting. Move the microscope laterally 0.7500 inches to the right and measure the vertical distance to the crossline with the filar micrometer. Record the setting. Since the angular displacement should not exceed 30.0 arc seconds, the vertical displacement corresponding to this distance should not exceed $0.000110''$.

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4.3.6 Repeat steps 4.3.2 through 4.3.5 ten times to assure proper positioning.

4.4 Measurement of Optical Parameter

- 4.4.1 Move the light source as closely as possible to the back of the reticle and check the transmitted light for double or multiple images at the reticle front. Install the 32 mm objective and recheck.
- 4.4.2 Move the light source to its former location and install the mounted optical test target between it and the reticle. Move the three pieces close to one another, as in the sketch.
- 4.4.3 Using the microscope with the 32 mm objective, determine the quality of the pattern image as transmitted through the reticle. At least 80 lines/mm (group 6/3) must be seen. Record the actual resolution. Remove the reticle assembly and determine if the pattern quality has increased and, if so, to what.
- 4.4.4 Record the laboratory temperature.

4.5 Measurement of Electrical Parameters

None.

5.0 TEST DATA

Test data will be recorded on data sheets as required under Section 4.0

6.0 QUALITY ASSURANCE PROVISIONS

Each unit shall be subjected to inspection and test surveillance by the project quality assurance department to the extent necessary to assure that drawing and specification requirements are met.

7.0 CHANGES

Any changes to this procedure must be approved by the test engineer using standard document control procedures. Testing that cannot be accomplished at this unit level will be accomplished at the next higher assembly level.

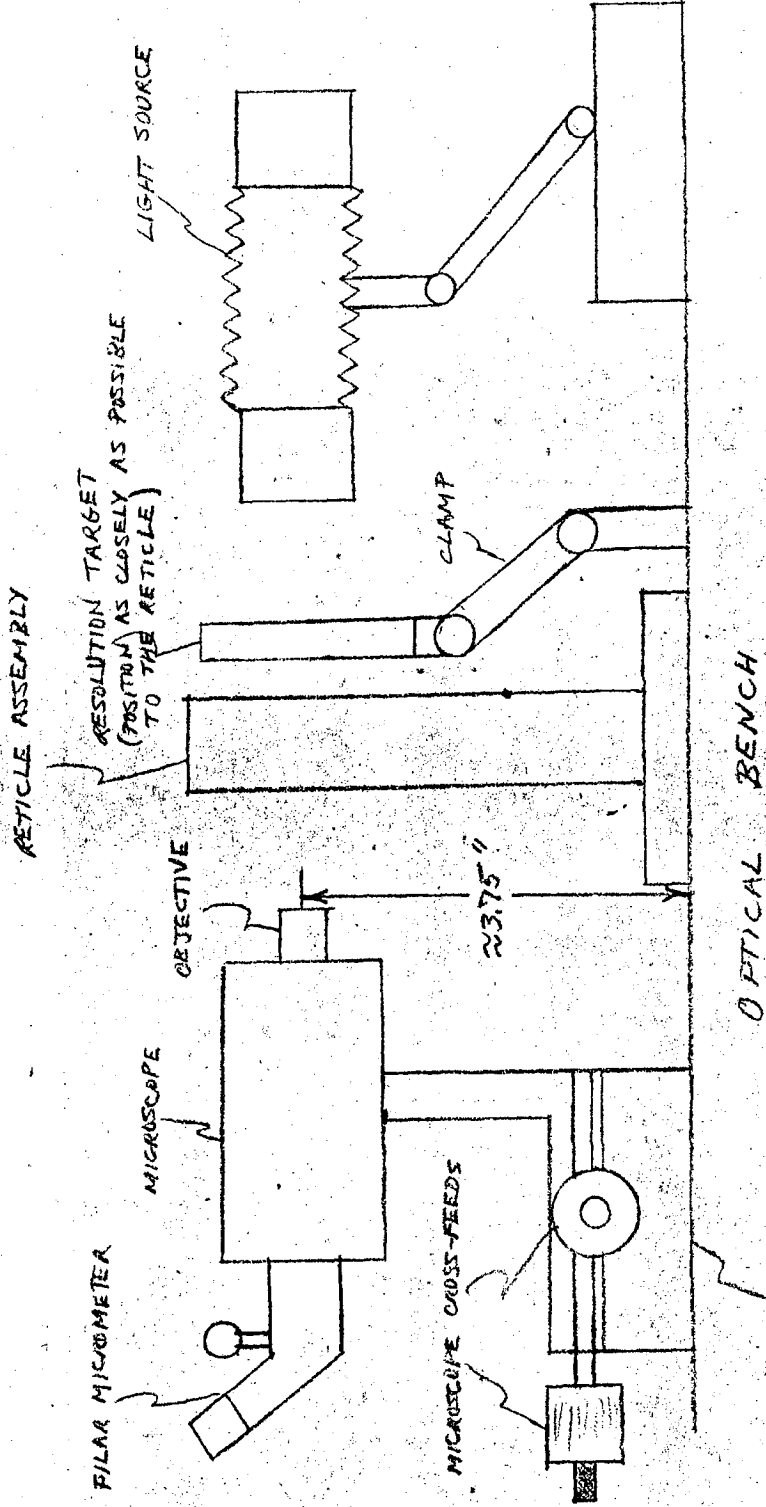
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BENCH MICROSCOPE
ASSEMBLY #149740

PRIMARY RETICLE TEST SET-UP

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