Stanford University
W.W. Hansen Experimental Physics Laboratory
Gravity Probe B Relativity Mission
Stanford, California 94305-4085

GP-B Telescope Image Divider Assembly (IDA) "Position Left and Right Relay Lenses on IDA Channel B" P0294 Rev -

June 30, 1997

Prepared: _____ Date _____
Ken Bower, Telescope Assembly

Prepared: _____ Date _____
Don Davidson, Telescope Assembly

Prepared: _____ Date _____
Jason Gwo, Telescope Assembly

Approved: _____ Date _____
Lynn Huff, Telescope Responsible Engineer

Approved: _____ Date _____
John Lipa, Telescope Manager

Approved: _____ Date _____
John Turneaure, Hardware Manager

Approved: _____ Date _____

Ben Taller, Quality Assurance

POSITION LEFT AND RIGHT RELAY LENSES ON IDA CHANNEL B

- for SUGP-B dwg# 25089
- follows *Position Image Divider Housing/Channel B Assembly on Channel A Plate* (SUGP-B P0293)
- also use *GP-B Telescope Image Divider Assembly (IDA) General Alignment and Bonding Procedures* (SUGP-B P0282).

1) Verify cleanliness of all fixturing.
2) Protect inside of IDA from airborne contamination by wrapping a piece of clean polyethylene (~1"x~10") around the IDA housing such that the five holes are covered. Use care to prevent particle creation by abrasion between the cover and edges of the IDA.
3) Carefully rotate the Basic IDA Fixtures so that the 'top' plane is vertical with the open end of the 'horseshoe' (OID dwg# 620-0059D) on the right. This fixture is heavy, unbalanced, and supports fragile flight hardware -- use extreme caution!
4) Remove the four legs (632-0007A) from the fixtures and replace them with the two large angle brackets. The brackets are heavy enough to stabilize the fixturing while still, but that stability can easily be overcome by only a few pounds of force.
5) Adjust the leveling screws on the brackets to maximize stability.
6) Position the fixturing so that the top of the IDA faces out from the work area secure the brackets with tape to the table top.
7) Attach the mounting brackets (515-0032A, 515-0033A) and two x-y stages (Newport 460A X-Y with SM-13 drives) onto the fixturing as shown in 800-0057F.
8) Adjust the x-y stages such that their translatable surfaces are as far out from the center and away from the surface of the fixturing.
9) Carefully attach the locating bars (506-0030A, 506-0031A) to the x-y stages as shown in 800-0057F.
10) Prepare an Optical Detector Package Assembly (DPA) (SUGP-B dwg# 25076). Install two targeting reticles ('o+o' pattern) in the DPA. Align and fix the targeting reticles such that the horizontal element of the 'o+o' is parallel to the sides of the DPA (<1°).
11) Attach the detector housing holder (572-0061A) onto the fixturing as shown in 800-0057F.
12) Install the Optical DPA onto the holder as shown in 572-0061A. Use special care to ensure that all contacting surfaces are in solid contact.
13) Assemble two microscope holders (572-0065B) with 2" focal length microscopes and mount them to the fixturing as shown in 800-0057F.
14) Attach CCD cameras and monitors to the microscopes. Adjust the depth and angles of the microscopes until the targeting reticle pattern ('o+o') is at best focus and lock in place.
15) Verify cleanliness of all fixturing.

16) Remove the polyethylene cover installed in step 2.
17) Apply power to the laser and adjust to comfortable viewing levels through the monitors attached to the CCD cameras (mid range -- some diffraction pattern should be visible).
18) Place a small piece (~1cmsq.) of 2 mil ‘orange’ shim stock near the top and bottom of the hole on the right of the Channel B face of the IDA housing to protect surfaces during initial alignment. Use care to prevent the introduction of any particles into the IDA housing.

19) Carefully place the 'left' relay lens (SUGP-B dwg# 25064; will be on the right in this configuration) over the hole as shown in 800-0057F. This part is very difficult to maneuver safely into position. Carefully hold the lens using soft jawed tweezers. A very delicate and cautious touch is required for this operation.
20) Adjust the micrometer drives on the x-y stage on the right to bring the locating bar to its approximate position as shown in 800-0057F. Verify that the locating bar safely clears the surface of the IDA.
21) Carefully slide the lens so that it is in full contact with the locating bar. Avoid touching any coated surfaces in this operation.
22) One of the spots on the monitor should now be much more tightly focused. If not, recheck the camera focus and verify that the lens is lying flat against the IDA face.
23) While keeping the lens in full contact with the locating bar, adjust the micrometer drives on the x-y stage such that the related spot on the monitor is centered with respect to the related 'o' in the targeting reticle pattern (<5% of the 'o' ID).
24) Reverify full contacts between the relay lens, locating bar, and IDA face.
25) Carefully remove the lens. Handle as described in step 19.
26) Carefully remove the shim stock.
27) Verify cleanliness of all fixturing.
28) Bond relay lens to IDA housing using *Bonding Procedures for Fused-Quartz Components* (SUGP-B P0218). Use special care when placing the lens to prevent early contacting.
29) Monitor the relevant laser spot and make adjustments as required within a few minutes. Use care to keep the lens in contact with the locating bar, protect the coated surface, and avoid using any downward force on the lens.
30) Allow to cure at least 24 hours.
31) Repeat steps 18-29 for the right relay lens (SUGP-B dwg# 25064).
32) Allow to cure at least 48 hours.
33) Verify cleanliness of all fixturing.
34) Adjust the micrometer drives so that the locating bars are moved away from the lenses to their most distant positions. Use great care to adjust drives in the correct direction -- *adjusting in the wrong direction can apply great forces to the lenses and can destroy flight parts.*
35) Remove fixtures 506-0030A and 506-0031A. Replace the polyethylene cover as in step 2.
36) Remove both x-y stages and fixtures 515-0032A and 515-0033A. Remove the two microscope assemblies. Demount the optical DPA from its holder. Remove fixture 572-0061A.
37) Verify cleanliness of all fixturing.

Attachments: SUGP-B dwg#'s 25089, 25064; OID dwg#'s 620-0059D, 800-0057F, 515-0032A, 515-0033A, 572-0061A, 572-0065B, 506-0030A, 506-0031A.