Application Note 2

Hinge Line Alignment

System Recommendations

L-705 Bore Hinge Line Alignment System

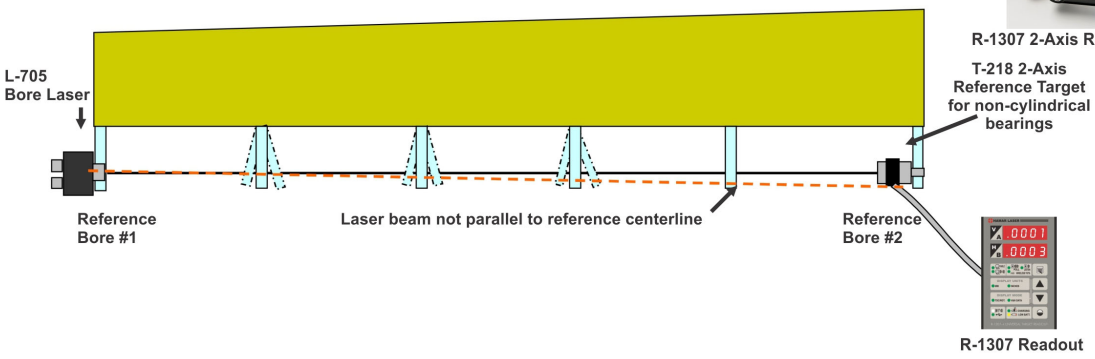
How Hinge Line Alignment Works

Hinge Line Bearing Alignment Procedure
Top View
Basic Setup

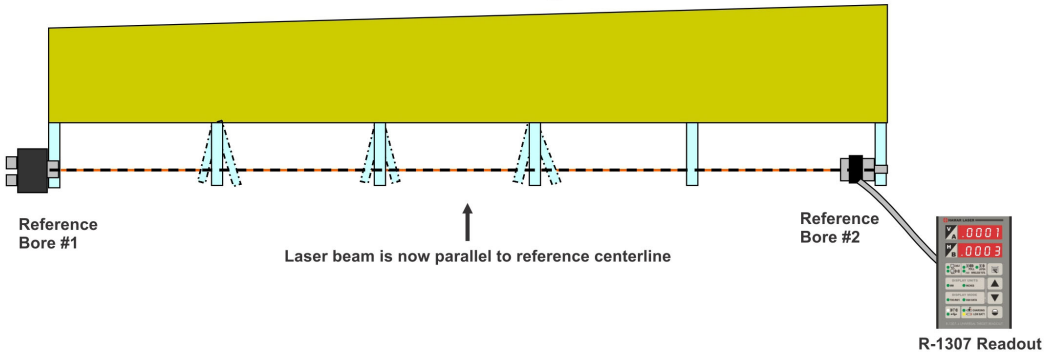
L-705 Bore Alignment Laser

T-218 2-Axis Reference Target

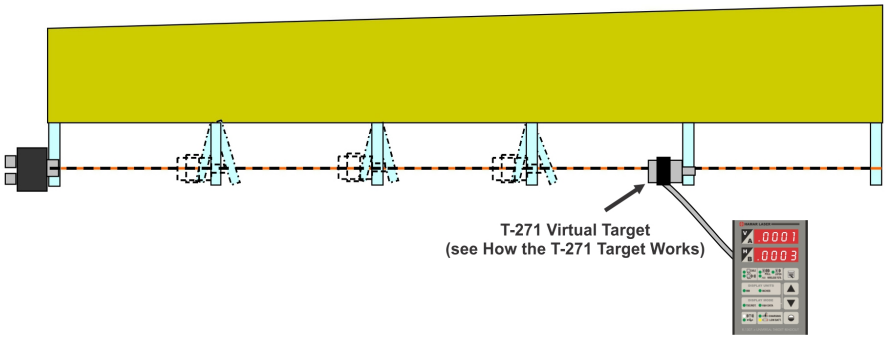
R-1307 2-Axis Readout



Steer beam until reference target reads ZERO

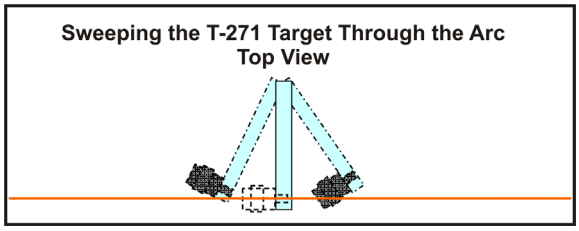


Move target to other bores



Hinge Line Bearing Alignment Procedure

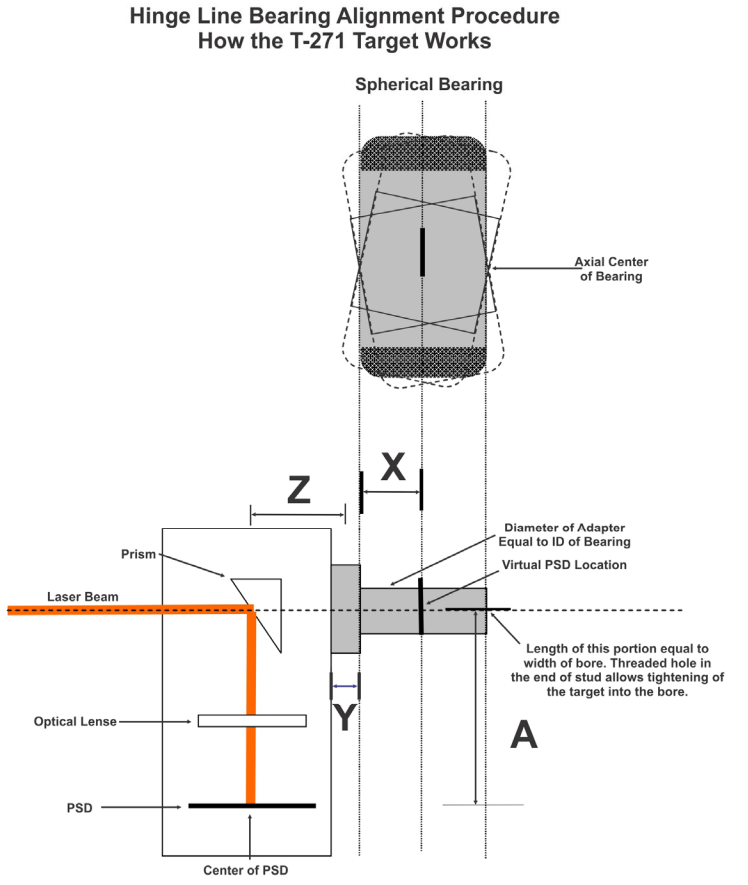
1. Insert the L-705 nosepiece into the L-705 laser mounting stud to step the outside diameter (OD) down to the desired bore diameter. Insert the laser and nosepiece into Reference Bore #1. The laser beam is concentric to the OD to within 0.01 mm.
2. Attach the target adapter to the T-218 or T-271 target and place into Reference Bore #2. The T-218 target can be used as a reference target and left in Reference Bore #2 for the duration of the alignment to check for laser drift. If the T-218 is not used, the T-271 can be used as a reference target and then moved to the other bore locations for measurement of the other bores for alignment.
3. Connect the R-1307 Readout and power on.
4. Adjust the laser using the pitch and yaw micrometers until the R-1307 shows 0.00 mm in both the Vertical and Horizontal axes.
5. Attach the appropriate adapter to the T-271 Universal Virtual Target. Place the T-271 in the cylindrical bore and take a measurement. Any deviation from 0.00 is a measure of the misalignment.
   - A + (plus) vertical measurement indicates the target is higher than the laser beam.
   - A – (minus) vertical measurement indicates the target is lower than the laser beam.
   - A + (plus) horizontal measurement indicates the target is to the right of the laser beam as viewed looking into the target.
   - A – (minus) horizontal measurement indicates the target is to the left of the laser beam.
6. If the bearing support structure has axial movement and there is no locating device, the best way to perform the alignment is to sweep the target towards and away from the laser and the highest point (both H and V) indicate a measure of the alignment at the top of the arc or Top Dead Center (see sketch).



How the T-271 Target Works

The T-271 measures angle. This angle is multiplied by a predetermined length to provide a *center reading*. If the angle of the target is known, the center reading at any point along the axis of the target can be calculated. For example, if X is 100 mm and the target determines the angle to be 0.01 mm/100 mm relative to the laser beam, the center reading of the bearing will be .01 mm *higher* or *lower* (depending on whether it is a + or – angle) in the middle of the bearing than at the front of the bearing. Accordingly, we customize the target to a known dimension **A**, which equals **Z+Y+X**.

As long as **X+Y+Z=A**, the readings produced by the target will not be dependent upon the angle of the target because the effective cell plane will be in the center of the spherical bearing and thus will be on its pivot point. The center of the bore at the pivot point in a spherical bearing does not change unless the bearing itself is moved up or down. Therefore, if the center reading produced by the T-271 does not change when the bearing angle changes, it becomes very easy to align the bearing to the laser beam.



For bores with different widths and diameters, only the length (Y) and the diameter of the adapter need to change. Therefore, we customize the Y dimension of the adapter to make X+Y+Z equal to A. It is important to note that the L-705 Laser emitter must be in reference point that is locked on the centerline and does not pivot. Obviously, it is important to ensure that the laser beam stays on the reference centerline of the hinge line.