

# *Operations Manual*

## **L-705 Hinge Line Alignment System**

*February 2019*



**HAMAR  
LASER**®  
**ALIGN WITH THE BEST**

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## Critical Note on Calibration

When configuring the R-1307 Readout, it is critical to match the target ID with the target ID identified on the serial number of the target. For example, if the target ID on the target serial number label is 2, then the R-1307 must also be set to the number 2. If the target and readout are not matched, a centering error of up to .004 in. (0.10 mm) can occur. In addition, the laser switch setting (CONT. or Fixed vs. PULSE) must also agree with the R-1307 Readout setting (F10.10 vs. P10.10).

For example:  $\pm 6 \pm .02$  F. 10. 10 or  $\pm 6 \pm .02$  P. 10. 10 for R-1307 #2



For more information on the Pulse/CONTinuous modes on the laser, see *Pulse/Continuous Modes (L-705 and L-706 Lasers)* on Page 5. For complete information on matching the target to the readout, see *Configuring the R-1307 Readouts* on Page 9.

# The L-705 Hinge Line Alignment System

Hamar Laser's Hinge Line Alignment System has been a proven performer in the aerospace industry for many years. In fact, the first hinge line system Hamar Laser delivered revolutionized the industry by reducing an 8-hour job, requiring eight workers and four theodolites, to one that took only two workers less than an hour to complete. In addition, accuracy was significantly higher and the results were consistently repeatable. Currently, several aircraft builders are using this alignment system to accurately align hinge-pin bushings in tooling fixtures and vertical and horizontal stabilizers.

## Model L-705 Laser

The L-705 Bore Laser is a battery-operated, visible light laser that mounts magnetically in a bore fixture or mounting. It is suitable for almost all bore applications. The laser has two mounting surfaces: 0.7498 in. (19.04 mm) and 2.2498 in. (57.14 mm). The laser beam is centered to both mounting ODs to within .0003 in. (0.08 mm). The L-705 laser beam is designed to shoot up to 110 ft. (33 m) but has an angular adjustment resolution of .001 in. (0.025 mm) in 50 ft. (15 m) and is best used under 50 ft.

The L-705 Laser has been designed with a standard aerospace tooling diameter of 2.25 in. (57.15 mm). The centering of the laser beam to the housing is controlled to extremely tight tolerances, usually less than .0005 in. (.013 mm). Built-in micrometers on the back of the laser control the angle adjustment of the laser beam. These two features eliminate the steering fixture and a reference target, making the task of aligning large floor assembly jigs fast and accurate.

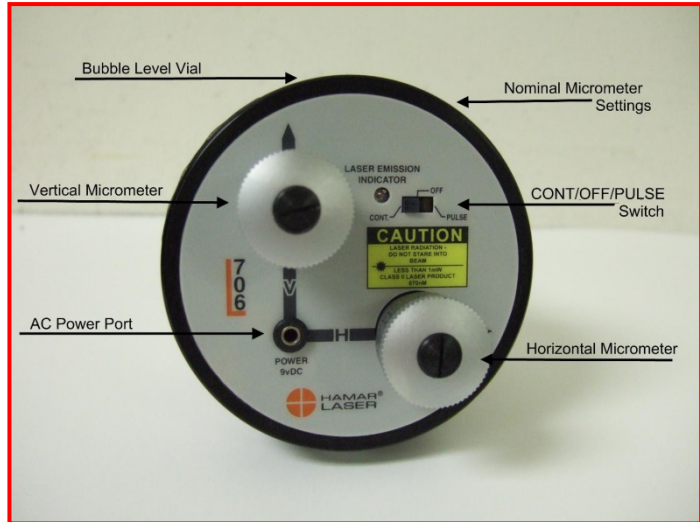
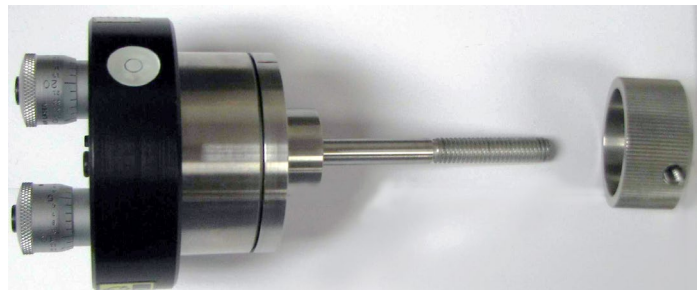


Figure 1 – The L-706 Laser





## Model L-706 Long Distance Laser

For long-distance applications that exceed the range of the L-705, the L-706 Laser is equipped with the finer angular adjustments necessary to set the laser beam to the center of the far reference target. It is used for applications up to 110 ft. (33 m). The finer angular adjustments mean there is less adjustment range, which make the L-706 difficult to use in shorter distances.

The following describes the operational features of the laser. These features include bubble level vial orientation, micrometer values and settings, ON/OFF switches and the external battery pack.

- **The ON/OFF slide switch** has a lighted LED to indicate that power is ON.
- **The Pulse/Continuous switch** selects the laser mode compatible with the readout/interface being used (see Page 4 for more information about Pulse/Continuous modes and the readouts used for each mode).
- **Battery Pack connector** accepts a slip-fit probe with a flexible cord.
- **Bubble level vials** on the laser mounting flange are used for rotational accuracy. When the bubbles in the level vial are centered horizontally, all micrometer adjustments (controlling laser beam angle) will shift the laser beam vertically or horizontally with reference to the bore/target axis. If the bubbles are not centered, any micrometer adjustment to one laser axis will change the laser beam position in both axes. The levels also provide fixture mounting repeatability (assuming the laser is hard-mounted to fixture).
- **Micrometer controls** are provided for the adjustment of the angle at which the laser beam emerges from the precision ground, mutually concentric steel laser housing. Each laser has a **NOMINAL** setting for both the V-Vertical and the H-Horizontal micrometer controls. The nominal settings are determined at the factory and correlate to values for the laser beam when it is perpendicular to both the 2 in. and 4 in. mounting faces. When the bubble in one of the level vials is centered, a nominal setting of each micrometer squares the laser beam to that specific axis. For example, if the nominal vertical setting is .120, then setting the micrometer to .120 sets the laser beam square to the vertical axis. When a laser is mounted in the gearbox or bore adapter, vertical and horizontal micrometers should be *set in the nominal positions* to facilitate the alignment and measurement process.

## Adjusting the Laser

The laser beam is factory-adjusted to be concentric to the mounting diameters (2.25 in. or 57.15 mm and .75 in. or 19.05 mm) within  $\pm 0.0005$  in. (0.0127 mm). With the adjusting micrometers set at the nominal position, (see the **Nominal Settings** label on the outer flange), the laser beam is perpendicular to the front mounting surface and parallel to the mounting diameters within  $\pm 0.0003$  in/ft.

In a typical bore measuring application, the laser is mounted concentric to one end of the bore by means of a fixture ring or plate. Because fixtures are seldom perfect, the laser beam requires angular adjustment to make it concentric to the bore. This is accomplished by placing the Self-Centering measuring target at the other end of the bore and adjusting the micrometers on the laser until the laser beam is centered on the target.

The circular level vial on the laser mounting flange is used to reference the orientation of the vertical and horizontal axes of the laser. When the bubble in the level vial is centered, all



Figure 2 – Laser Micrometer Adjustments

micrometer adjustments (controlling laser beam angle) will shift the laser beam vertically or horizontally with reference to the bore/target axis. If the circular level bubble is *not* centered, any micrometer adjustment to one laser axis *will make the laser beam position appear to change in both axes*. The level vial also provides fixture mounting repeatability (assuming the laser is hard mounted to the fixture). Only minor readjustments of the laser to the bore and fixture surfaces are required in situations where frequent alignment is expected.

### Attaching the Battery Pack

The L-705 Laser battery pack is a stand-alone unit that attaches magnetically to an extruder gearbox. The battery pack has a detachable cord with a probe at each end. One probe attaches directly to a jack on the battery pack and the other probe is inserted in the control panel of the L-705 Laser.

- 1. Turn off the main power switch.**  
The main power switch *must* be off before attaching the battery pack.
- 2. Insert the probe into the battery power input jack.**  
The jack is located on the end panel of the battery pack. Insert the plug gently until it snaps into place.
- 3. Insert the probe into the laser power input jack.**  
The jack is located on the micrometer control, at the apex of the V and H axis arrows. Insert the plug gently until it snaps into place.



Figure 3 – Attaching the Battery Pack

### Replacing the Batteries

The battery pack uses two 9-volt batteries. The batteries are housed in a two-part case which is held together by flathead screws. Hamar Laser recommends using alkaline or nickel-cadmium (NiCad) cells for best performance.

- 1. Unplug the battery pack from the laser.**  
Pull the probe out of the laser jack and gently set aside.
- 2. Unscrew the cover of the battery pack.**  
Locate and loosen the two captive flathead screws and remove the cover.
- 3. Replace the two batteries.**  
Remove the old batteries and replace them with new 9-volt cells, being careful to orient them with the *negative terminal out (or up)*.
- 4. Re-attach the cover.**  
Put the cover back on and secure it to the battery pack with the screws.

### **Pulse/Continuous Modes (L-705 and L-706 Lasers)**

The L-705 and L-706 Lasers are now equipped with a PULSE/CONTInuous switch, which manually switches the laser beam between *Pulsed* and *Fixed Beam Modes*. *Pulse Mode* automatically removes the effects of excess (ambient) background light for the R-1307 readouts, providing a more accurate reading. The R-1307 Readout supports both Pulse Mode and Continuous Mode as well as storing up to nine different target calibration factors for multiple target users. These capabilities must be specified when ordering a system.

The chart below indicates the operational modes for Readouts/Computer Interfaces that operate with the L-705/L-706 Lasers:

<b>Mode</b>	<b>Readouts</b>	<b>Computer Interfaces</b>
Pulse	R-1307B-2.4ZB, R-1307BC, R-1307C, R-1307-900/2.4, R-1307-2.4ZB, R-1307+R	A-910-900/2.4 (when used with R-1307-900 or R-1307-2.4) A-910-2.4ZB
CONTInuous	R-307, R-307V	R-358

#### **Notes:**

1. The T-261A and T-266 Targets do not support the Pulsed-Beam Mode and the system purchased is factory-configured to operate in CONTInuous mode when using these targets.
2. When using the L-700 Laser with the R-1307 and a 2-Axis Target, the system is factory-configured to operate in CONTInuous mode.



## R-1307 Target Readouts

The Model R-1307 Readouts support both wireless, such as the A-1519, or cabled (local) targets. The wide choice of configurations (R-1307C, R-1307-900/2.4, R-1307-2.4ZB, R-1307W-900/2.4 and R-1307W-2.4ZB) is designed to suit a user's specific needs, with the R-1307-2.4ZB and the R-1307W-2.4 ZB models featuring ZigBee® radio technology.

The readout is available with a radio frequency of either 900 MHz or 2.4 GHz and can be used as the *primary* readout or as an additional readout to copy position data captured by another R-1307.

### Model R-1307C

- Supports cabled (local) targets only
- Supports both pulsed-beam and continuous laser modes
- Functional replacement for the R-307 Analog Readout

### Models R-1307-900/2.4 and R-1307W-2.4ZB

- Supports wireless targets (A-1519-900, A-1519-2.4, etc.) only
- Radio frequency available in either 900 MHz or 2.4 GHz ISM band

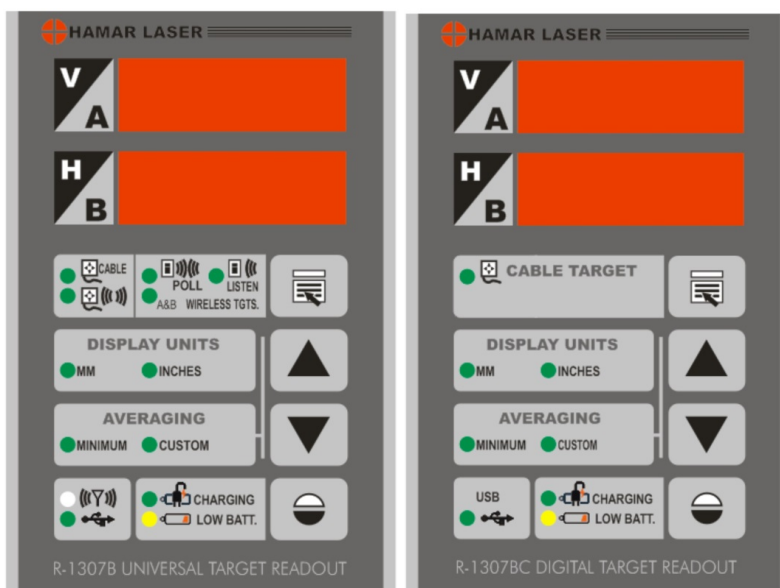
### Model R-1307-900/2.4 and R-1307-2.4ZB

- Supports both wireless targets (A-1519-900, A-1519-2.4, etc.) or cabled (local) targets
- Supports both pulsed-beam and continuous laser modes
- Radio frequency available in either 900 MHz or 2.4 GHz ISM band
- Can also be used as an additional readout to receive data alignment data transmitted from another R-1307 unit in master (poll) mode

Please refer to the R-1307 manual that comes with your readout for complete information and instructions.

### Model R-1307B-2.4ZB and Model R-1307BC

The R-1307B-2.4ZB and the R-1307BC Basic Series target readouts are available in two configurations. The R-1307BC supports 2-axis cabled targets and the R-1307B-2.4ZB is a combination readout for cabled targets with the capability to wirelessly transmit target data to a second R-1307 or to the A-910-2.4ZB computer data receiver. Both models support blinking and continuous laser modes. Power is provided by a 2500 mAh Lithium-Polymer rechargeable battery for 7-22 hours of continuous use, depending on the model, radio type and display brightness settings.



The following chart lists the menu items available for each unit:

<b>R-1307B-2.4ZB</b>	<b>R-1307BC</b>
<b>Display Units</b> allows the selection of either inches or millimeters to display readings.	<b>Display Units</b> allows the selection of either inches or millimeters to display readings.
<b>Resolution (selected from the MENU button)</b> allows the selection of display digits up to a maximum of .0001 in. or 0.001 mm.	<b>Resolution (selected from the MENU button)</b> allows the selection of display digits up to a maximum of .0001 in. or 0.001 mm.
<b>Averaging</b> allows the selection of 2 to 64 samples for difficult atmospheric conditions.	<b>Averaging</b> allows the selection of 2 to 64 samples for difficult atmospheric conditions.
<b>Up</b> and <b>Down</b> arrow keys switch between the minimum number of sample (8 samples) and the menu-selectable number of sample (custom).	<b>Up</b> and <b>Down</b> arrow keys switch between the minimum number of sample (8 samples) and the menu-selectable number of sample (custom).
<b>Channel Selection (selected from the MENU button)</b> sets the System ID (radio channel).	

## Using the MENU Key

The **Menu Key** provides access to the operational functions of the R-1307, such as display mode, measurement units, dampening, display resolution and display brightness. In addition, communication parameters between the target and readout are set through the **Menu Key**.

To use the **Menu Key**, press and hold the key for two seconds to enter *Configuration Mode*, and then press the **Menu Key** to cycle through the menu selections. Press the UP arrow key (↑) or the DOWN arrow key (↓) to change the settings for a selection.



Menu Selection	Selectable Options	Meaning
dISP	rEL AbS	Relative (datum) position Absolute (default) position
UnitS	inch mm	Inches Millimeters
AUG_	2, 4, 8, 16, 32	Dampening Number of Samples to Average
rES		Display Resolution
id_	Upper Display id_01 Lower Display id_02	ID of first wireless scanning target ID of second wireless scanning target <b>Note:</b> For fixed beam wireless target or local target, set both upper and lower ID to the same number
ch_	0-9	System ID of Wireless Target(s) or local target
brtE	1 (dim) to 5 (bright)	Display brightness
Funct_	LOCAL POLL LStn	Display position of target connected to local port Request and display position of wireless target(s) Display position of wireless targets controlled by another R-1307 or radio transceiver in Poll (Master) mode
	Following is an example of the information displayed for the selected target:	
	PSD_1 FID_10	Displays the PSD type (SC-100D or DL-10) target number, the laser mode (Pulsed or Fixed) and the PSD size (4x4 mm, 10x10 mm and 20x20 mm)

Hidden menu items for any R-1307 model can be temporarily enabled by pressing and holding the UP arrow key while pressing the **MENU** key.

To exit configuration mode, press and hold the MENU button for approximately three seconds until the display returns to normal mode. The R-1307 will also return to normal mode automatically after approximately four seconds of inactivity.

## Configuring the R-1307 Readouts

### Configuring the R-1307B-2.4ZB, R-1307C, R-1307-900/2.4 or R-1307-2.4ZB for a Cabled (Local) Target

**Note:** *Shut off power to the readout before connecting or disconnecting a target from the local port.*

- 1. Connect the cabled target to the local port of the readout**
- 2. Press and hold the MENU button for approximately 2 seconds to enter configuration mode.**
- 3. Set the Measurement Units**  
Press the MENU button until the upper display shows  $UNITS$ . Use the UP and DOWN arrow keys to select either  $inch$  for inches or  $mm$  for millimeters.
- 4. Set the Dampening Level**  
Press the MENU button until the upper display shows  $AVER$ . Use the UP and DOWN arrow keys to set the number of averages. Adjust this value as required to suit the application. The default for this application should be changed to at least 8. For long distance shots, use 16 or 32.
- 5. Set the Readout Function to Cabled (Local) Target**  
Press the MENU button until the upper display shows  $FUNCTION$ . Use the UP and DOWN arrow keys to select  $FUNCTION LOCAL$ .
- 6. Select the PSD descriptor applicable to your target**  
Press the MENU button until the upper display shows  $TGT=nn$ , where  $nn$  designates the target number. Each R-1307 has three target descriptors:
  - TGT=0 (for HLI use only. Do not use )
  - TGT = nn, P.10.10 (pulsed beam mode)
  - TGT = nn, F.10.10 (fixed beam mode)

nn= R-1037 Readout number and matching target number

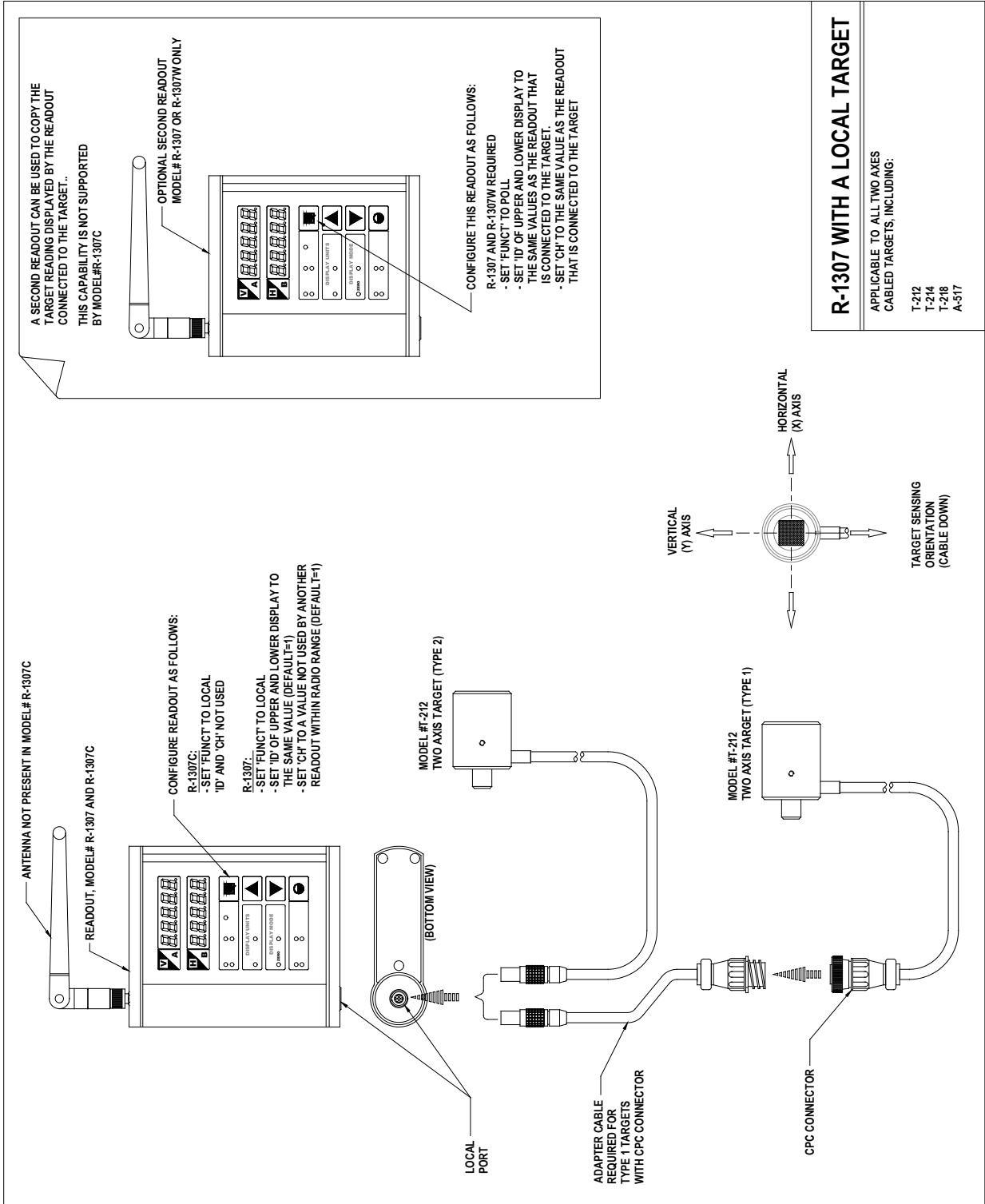
Press the UP or DOWN arrow to select the correct target number and to change the second window. For example,  $TGT=02 F. 10. 10$  or  $TGT=02 P. 10. 10$  for R-1307 #2

**WARNING:** *Targets are matched to specific R-1307 Readouts. For example, Target #1 must be connected to Readout #1 or the calibration is void.*

- 7. To exit configuration mode, press and hold the MENU button for approximately three seconds until the display returns to normal mode.**  
The R-1307 also returns to normal mode automatically after approximately four seconds of inactivity.

## Miscellaneous Display Messages

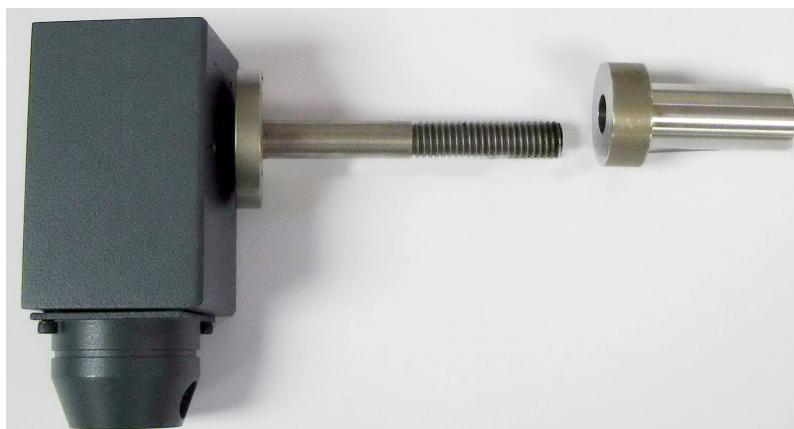
-HLI-	
r 1_00	Startup Message. Lower Display shows firmware Revision Number.
. . .	3 moving dots. Wireless target is not responding to a polling request from Readout. Check ID and Channel settings. Check Target(s).
- - -	3 dashes. Target detected but the laser is not on target. Check laser.
ch_ _no	
rAd io	Radio channel cannot be selected because no Radio is present or detected. This is a standard message for the R-1307C. For Models R-1307 or R-1307W, this message indicates a fault in the radio module.
Fault	
PSd	Indicates a problem with the connection to the Cabled (Local) Target's Position Sensing Device (PSD). Check plugs and cable(s).
t6t_n	
UnCAL	Target 'n' descriptor does not contain target calibration data.





## T-271 2-Axis Virtual Target for Spherical Bearings

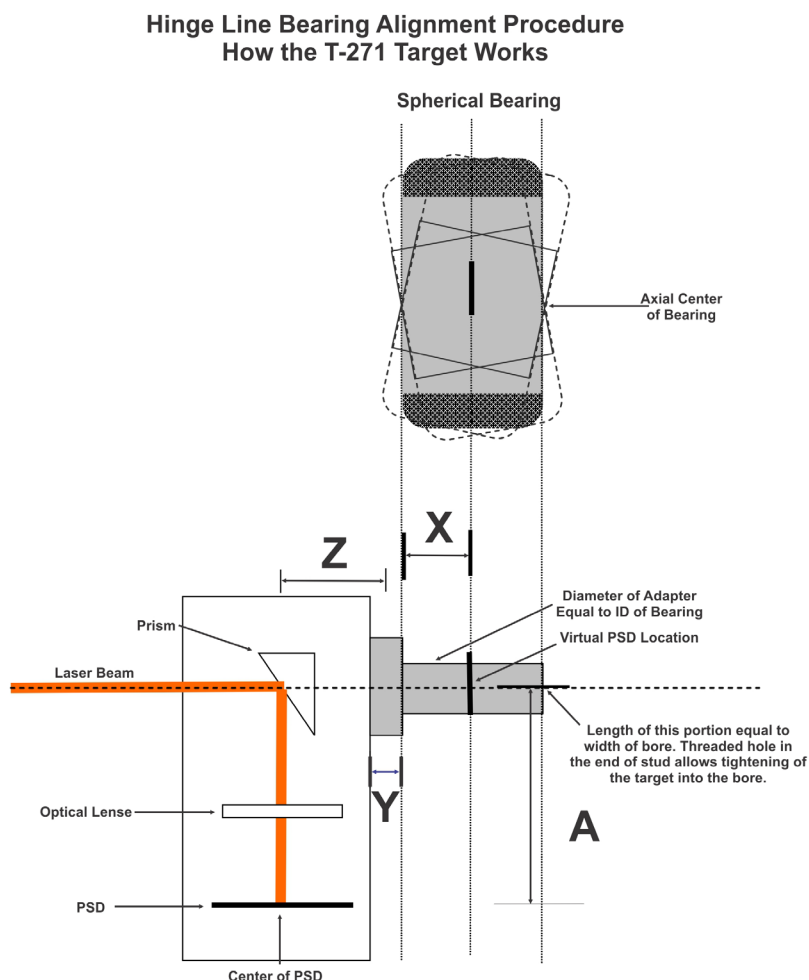
The T-271 Virtual Target is designed specifically for spherical bearings to align them down to accuracies of .0005 in. (0.013 mm). It comes with a bore adapter that is customized for the specific bore ID. The target works by using an optical trick to center the PSD (laser sensor) axially in the bearing so the squareness of the bearing to the centerline will not affect the target's measurement of the radial centering (alignment). This eliminates the need for fixtures to hold the bearing square to the centerline.



The target sets up in a few minutes and provides live alignment data via our R-1307 readouts. With the use of customized bushing adapters, the bore adapter can be customized to most IDs above .25 in. (6.4 mm).

### 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  $Z+Y+X$ .

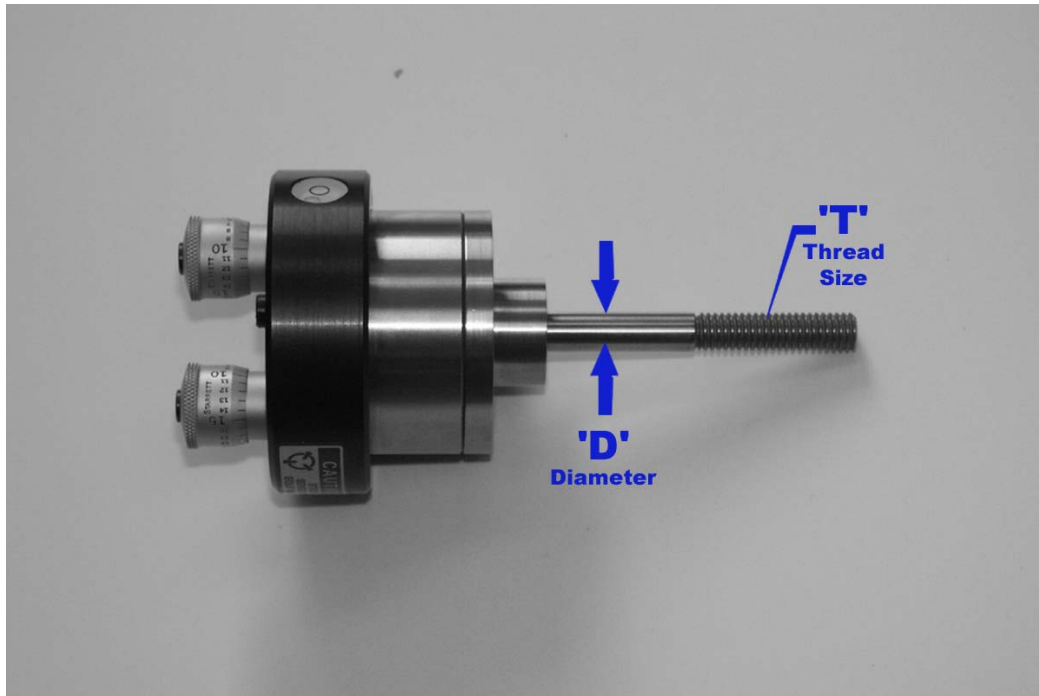


As long as  $X+Y+Z=A$ , the readings produced by the target will not be dependent upon the angle of the target because the effective cell plane will be in the center of the spherical bearing and thus will be on its pivot point. The center of the bore at the pivot point in a spherical bearing does not 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.

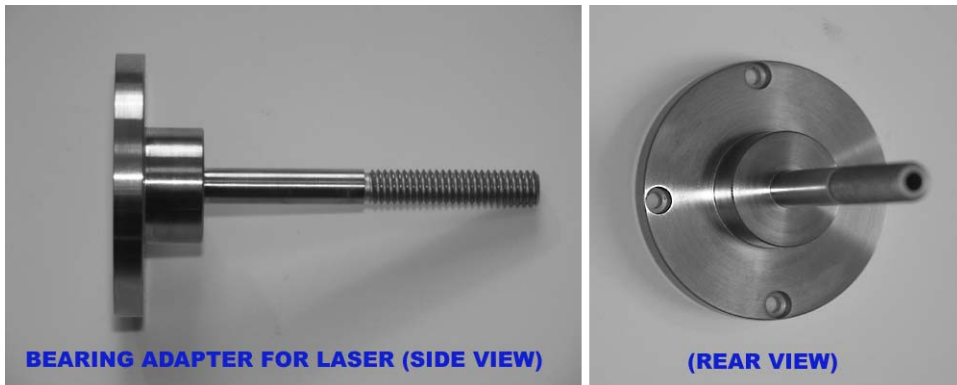
For bores with different widths and diameters, only the length (Y) and the diameter of the adapter need to change. Therefore, we customize the Y dimension of the adapter to make  $X+Y+Z$  equal to A. It is important to note that the L-705 Laser emitter must be in reference point that is locked on the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

## Assembling the System

### The L-705/L-706 Bearing Adaptor Assembly



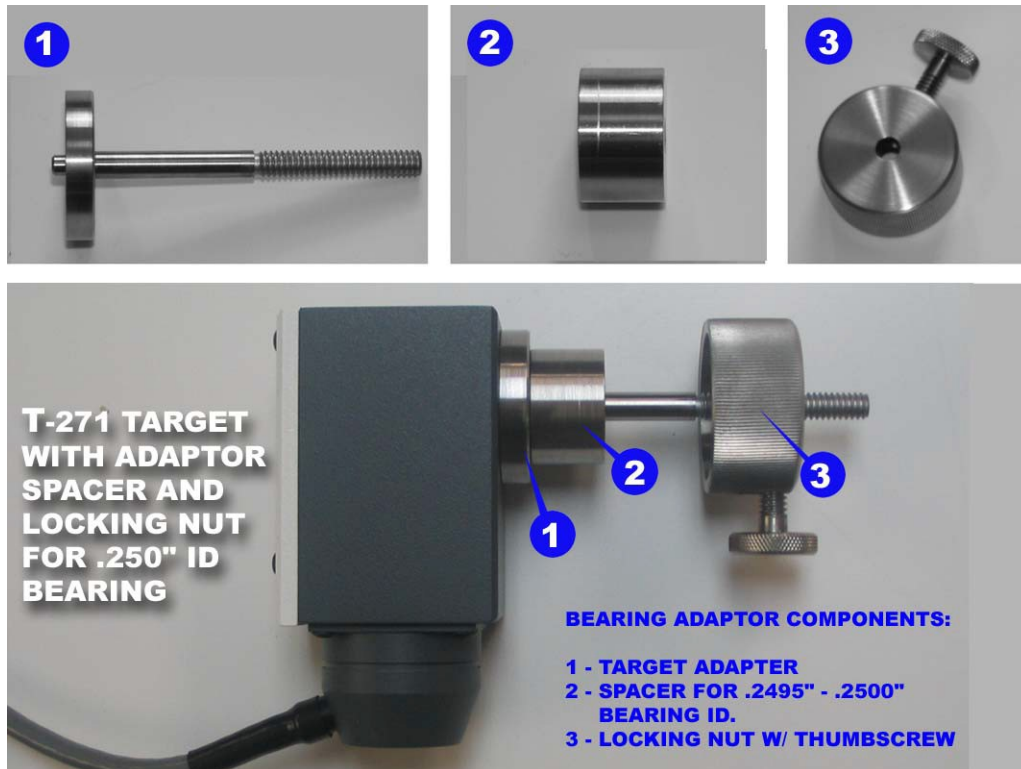
You will need the following components:



- (1X) Bearing Adaptor for Laser, of the appropriate bearing inside diameter 'D'
- (4X) Socket Head Cap Screws (SHCS), #4-40 x 3/8

Align the rotation index mark on the laser body with the index mark on the bearing adaptor. Secure the bearing adaptor with the four socket head cap screws.

## T-271 Target .2500 in. and .3125 in. Bearing Adaptor Assemblies



### Mounting the Laser on a Bearing

The image at the right shows the laser mounted on a bearing.

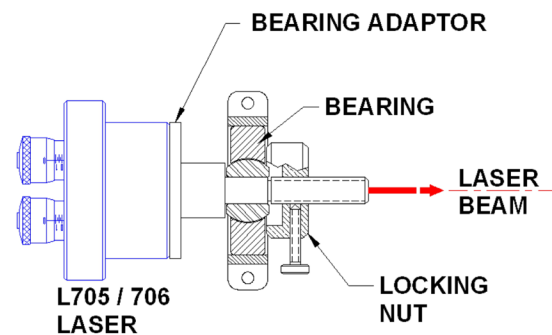
#### Parts requirements

- **L-705 or L-706 with the appropriate bearing adaptor (nose piece) pre-installed.**

*Note: The shaft diameter of the bearing adaptor must precisely match the inside diameter of the bearing.*

- **Locking Nut**

The inside diameter of the locking nut must fit the thread diameter of the nose piece. For example, use the locking nut with an inside diameter of .313 in. with the .3120-.3125 nose piece.



#### Mounting procedure

1. Mount the laser with the laser beam oriented towards the other bearings to be aligned.
2. Slide the locking nut over the threaded end. Turn the thumbscrew until it engages the bearing adaptor thread.
3. Rotate the locking nut until the laser can no longer pivot with the bearing and tighten the thumbscrew.

## Mounting the T-271 Target on a Bearing

The image at the right shows the T-271 Target mounted on a bearing.

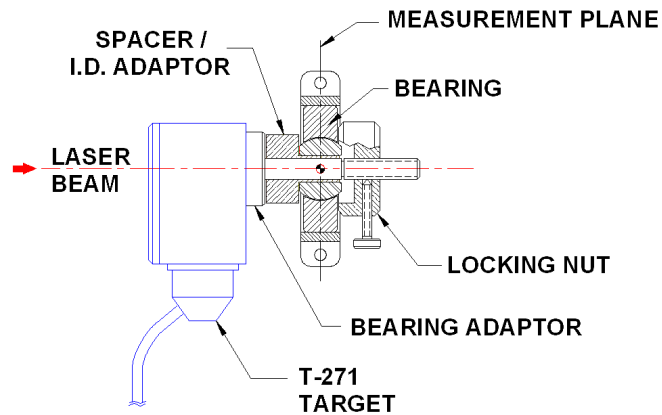
### Parts requirements

- **T-271 Target with the appropriate bearing adaptor (target adaptor) pre-installed.**

*Note: The shaft diameter of the .250 Bearing Adaptor precisely matches the inside diameter of the Bearing. Larger diameters are accommodated by the Spacer / ID Adaptor.*

- **Locking Nut**

The inside diameter of the locking nut must fit the .250-20 UNC adaptor thread



### Mounting procedure

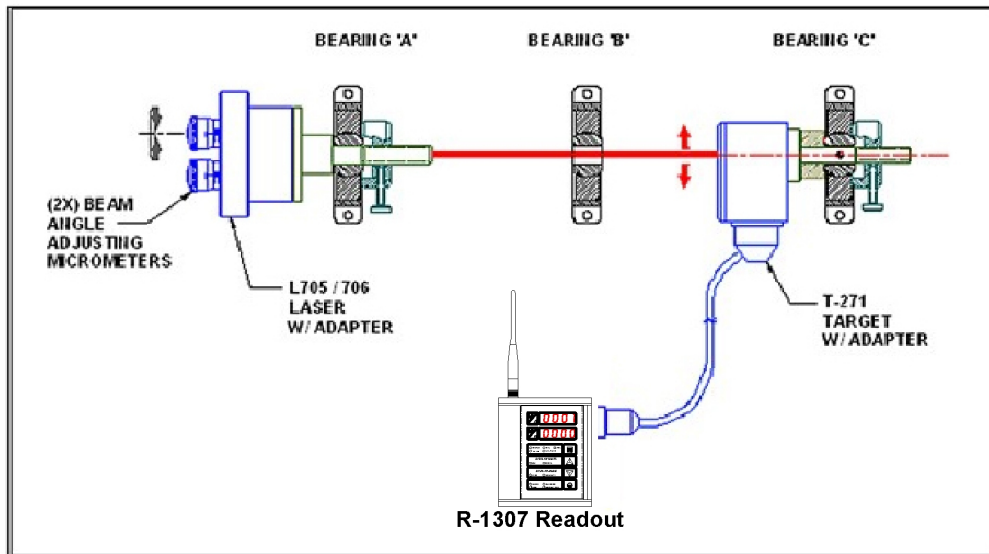
1. Mount the target with the aperture window oriented towards the laser.
2. Slide the locking nut over the threaded end. Turn the thumb screw until it engages the bearing adaptor thread.
3. Rotate the locking nut until the target can no longer pivot with the bearing and tighten the thumbscrew.

# Hinge Line Alignment Procedure

In the following example, bearings A, B and C will be aligned concentric to each other. Bearings A and C establish the *datum line* to which bearing B will be aligned.

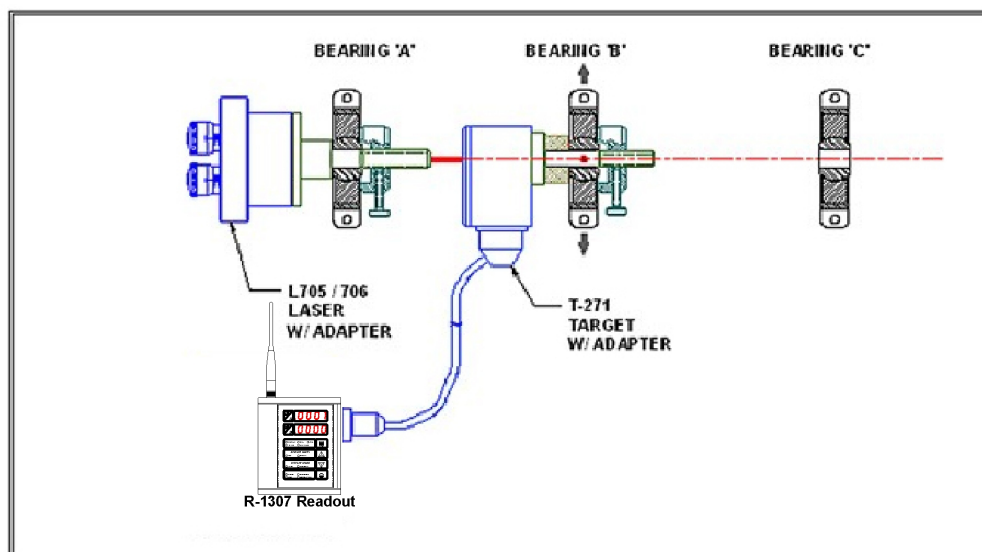
## Step 1

1. Mount the laser on bearing A and the target on bearing C.
2. Turn the laser angle adjustment micrometers to steer the laser beam until the readout displays zero on both axes.



## Step 2

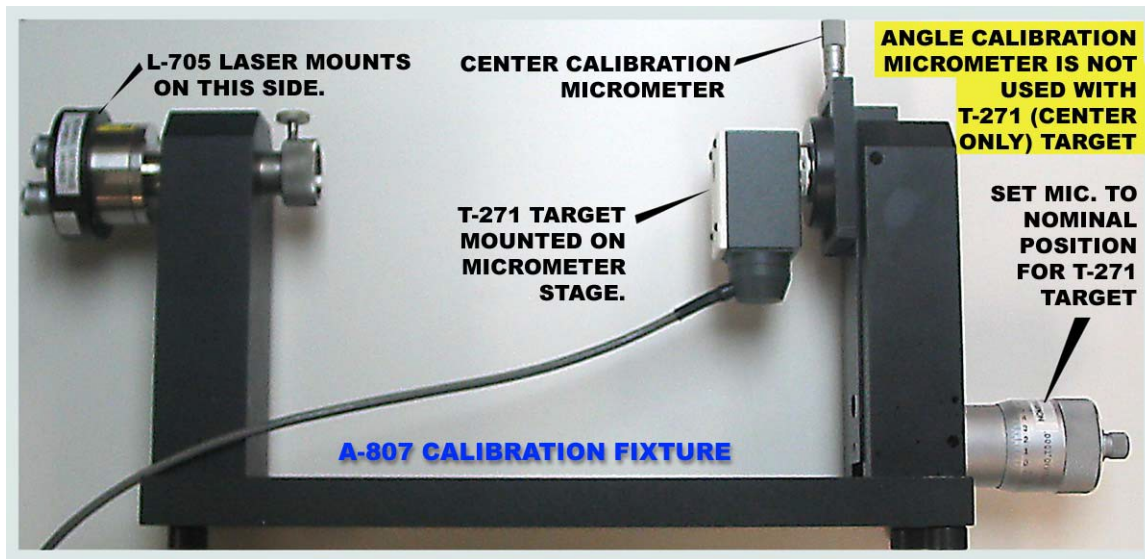
1. Move the target to bearing B.
2. Translate and/or shim bearing B until the readout displays zero on both axes.





## Appendix A – Checking the Target Calibration Using the A-807 Calibration Fixture

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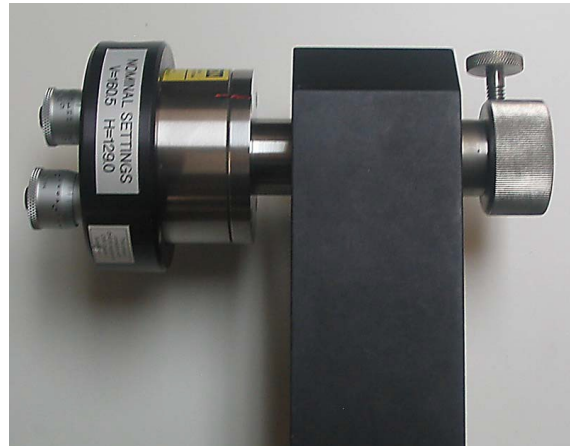
1. Remove the target bearing adaptor and replace it with the calibration mount adaptor. The calibration adaptor has a .500 in. diameter stud, suitable for mounting the target to the micrometer stage of the A-807 Calibration Fixture.



2. Mount the target to the micrometer stage. Tighten the calibration mount set screw using a 3/32 Allen wrench. The photograph at the right shows the target with the vertical axis aligned with the micrometer stage line of travel. This orientation is used to check the calibration of the vertical (Y) axis. Rotate the target 90 degrees to check the calibration of the horizontal (X) axis.



3. Mount the L-705 Laser as shown in the adjacent image. Connect the laser power supply or external battery pack and switch the power to the **ON** position.
4. Turn the angle adjusting micrometer knobs on the laser to the setting specified on the **Nominal Settings** label. This ensures that the laser beam is set perpendicular to the laser mount.




### Checking the Vertical (Y) Axis Calibration

1. Mount the target in the vertical axis orientation, as described above. In this position, the target cable is located at 6 o'clock.
2. Rotate the center calibration micrometer to the midpoint of the travel range (.250 in.).
3. The R-1307 Readout should display readings that are close to zero on both axes. Adjust the laser beam using the angle adjustment micrometers of the L-705 Laser until the R-1307 Readout displays zero in both axes.
4. Turn the calibration micrometer one full turn clockwise (.0250 in.). The R-1307 Readout should read .0250 in.,  $\pm 5\%$  on the vertical axis.
5. Return the calibration micrometer to the midpoint. The R-1307 Readout should read zero.
6. Turn the calibration micrometer one full turn counter-clockwise (-.0250 in.). The R-1307 Readout should read -.0250 in.,  $\pm 5\%$  on the vertical axis.

### Checking the Horizontal (X) Axis Calibration

1. Mount the target in the horizontal axis orientation, as described above. In this position, the target cable is located at 3 o'clock.
2. Rotate the center calibration micrometer to the midpoint of the travel range (.250 in.).
3. The R-1307 Readout should display readings that are close to zero on both axes. Adjust the laser beam using the angle adjustment micrometers of the L-705 Laser until the R-1307 Readout displays zero in both axes.
4. Turn the calibration micrometer one full turn clockwise (.0250 in.). The R-1307 Readout should read .0250 in.,  $\pm 5\%$  on the horizontal axis.
5. Return the calibration micrometer to the midpoint. The R-1307 Readout should read zero.
6. Turn the calibration micrometer one full turn counter-clockwise (-.0250 in.). The R-1307 Readout should read -.0250 in.,  $\pm 5\%$  on the horizontal axis.

## Appendix B – Troubleshooting Guide for the L-705

	Problem	Possible Solutions
1.	No Laser Beam	<ul style="list-style-type: none"> <li>Ensure the laser is turned on. When the laser beam is switched <b>ON</b>, the red LED on the faceplate lights. If the LED on front of laser is <b>ON</b> but dim, the battery may be low. If the LED is bright, the laser diode has probably failed and unit should be sent in for repair.</li> <li>Replace battery and ensure it is inserted correctly (see <i>Replacing the Batteries</i> on Page 4).</li> <li>Check for switch damage.</li> </ul>  <p style="text-align: center;"><b>ON/OFF Switch</b></p>
2.	Beam Is Not Round (use white paper to see beam)	<ul style="list-style-type: none"> <li>Clean laser optics with alcohol</li> <li>Make sure optics are not scratched or cracked</li> </ul>
3.	Beam has satellites (use white paper to see beam)	<ul style="list-style-type: none"> <li>Clean laser optics with alcohol</li> <li>Make sure optics are not scratched to cracked</li> </ul>
4.	- - - shown in R-1307 Display	<ul style="list-style-type: none"> <li>Three dashes. Target detected but the laser is not on target. Check laser.</li> </ul>
5.	FAULT PSD	<ul style="list-style-type: none"> <li>Indicates a problem with the connection to the Cabled (Local) Target's Position Sensing Device (PSD). Check plugs and cable(s).</li> </ul>
6.	UNKNOWN UNCAL	<ul style="list-style-type: none"> <li>Target 'n' descriptor does not contain target calibration data.</li> </ul>
7.	R-1307 shows no readings	<ul style="list-style-type: none"> <li>Make sure cables are securely connected.</li> <li>Check Menu selections.</li> <li>For cabled targets, see <i>Configuring the R-1307B-2.4ZB, R-1307C, R-1307-900/2.4 or R-1307-2.4ZB for a Cabled (Local) Target</i> on Page 9.</li> </ul>

8.	Numbers in Target Display are noisy (jump up/down by more than 0.002 mm in 2 m)	<ul style="list-style-type: none"> <li>• Check for vibrations (try turning off machine)</li> <li>• Check for warm or cold air (relative to ambient temperature) blowing between laser and targets.</li> <li>• Check laser and target mounting setups to ensure tight clamp.</li> <li>• Increase data averaging in R-1307.</li> <li>• Check that the paired Target (calibrated target) was selected in the Menu. (example <code>z t 9 t _ 1 P 10_ 10 or F 10_ 10</code> )</li> </ul>
9.	No Negative or Positive readings are displayed	<ul style="list-style-type: none"> <li>• Check for broken wires or pins pushed out of target connectors. Target will probably need repairing</li> <li>• Make sure the screws on target connector are tightened in the R-358</li> </ul>
10.	R-1307 Readout not visible to Radio Devices	<p><b>The following is applicable to the R-1307 only:</b> To make the unit visible to all other radio-enabled devices, you must set the Target Network ID and the System ID for the readout.</p> <ul style="list-style-type: none"> <li>• <b>Set the Local Target Network ID</b> Press the MENU button until the <i>upper</i> display shows <code>d _ z n n</code> with the current Target ID (<i>nn</i>) blinking. Use the UP and DOWN arrow keys to set the Target ID (the default is 01).  Press the MENU button again until the lower display shows <code>u d _ z n n</code> with the current Target ID (<i>nn</i>) blinking. Use the UP and DOWN arrow keys to set the Target ID to the same value as that of the upper display's Target ID (the default is 01).  The upper display will show the vertical (Y) axis position of the local target. The lower display will show the Horizontal (X) axis position of the local target.</li> <li>• <b>Set the System ID (Radio Channel)</b> Press the MENU button until the upper display shows <code>c h _ z n n</code>, with the current System ID (<i>nn</i>) blinking. Use the UP and DOWN arrow keys to set the System ID (the default is 01).</li> </ul>