

Application Notes

Roll Alignment

System Recommendations

Printing Presses/Paper Machines

L-742 Ultra-Precision Roll Alignment System

Rubber Mills/Textiles

L-732 Precision Roll Alignment System



L-742 Ultra-Precision Roll Alignment System

Whether you have a paper mill, printing press or textile mill, your business can benefit from laser alignment. Most roll-type machines that are poorly aligned will produce a product that has wrinkles and other quality problems. The material will also wander or "walk" to one side of the roll or the other. This means a lot of down time and scrapped product.

Our patented, state-of-the-art laser alignment systems are up to six times more accurate than and twice as fast as a theodolite. The system can align one roll of a mill to another that is 200 feet away to within .004". And that's an honest .004", not what some technician thinks he sees in his theodolite. Furthermore, unlike theodolites, only one technician is needed to run the laser system, freeing up critical maintenance staff during shutdowns.

L-742 Ultra-Precision Roll Alignment System for Printing Presses/Paper Machines

The L-742 Ultra-Precision Roll Alignment system has been designed specifically for roll alignment applications. It is a very affordable yet powerful tool to not only measure but also *fix* roll misalignment on almost any kind of paper mill or process mill, all in a fraction of the time needed with conventional methods. The system is so accurate and easy to use that you can get the alignment right the first time, saving enormous costs in reduced downtime, scrapped product and quality problems. In fact, most machines that can handle it can run at faster speeds after laser alignment. This increased productivity can pay for the laser in a matter months.

Laser Planes Have 200-Foot Range Vertically and Horizontally

The L-742 Ultra-Precision Dual Scan[®] Laser offers two automatically rotating laser planes with 100-foot (30.5 meters) range in radius. That means rolls, at almost any elevation, can be measured simultaneously without having to move the laser vertically. This also allows the laser to be moved to more sections without having to change the location of the reference targets. In addition, the laser can be configured at the factory to have either two vertical planes, or one horizontal and one vertical plane.

Wireless Targets and Readout Speeds Setup

With Hamar's new line of wireless targets there is no need to string long extension cords to reference targets. The targets have up to a 3" (76 mm) measuring range and can be used up to 100 feet (30.5 meters) from the laser.

The A-1531/1532/1533 targets have built-in readouts and .001" (0.013 mm) resolution. The A-1519/A-1519HR/A-1520 targets use the R-1309 Cassiopeia PDA Readout, provide up to 0.00002" (0.0005 mm) resolution, color software and a wireless receiver to display up to four targets simultaneously. Other features like electronic zeroing and target averaging help to speed setup.



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Less Manpower Needed for Alignments

The L-742 Roll Alignment System reduces the alignment-team manpower. Wireless targets and automatically rotating laser planes make setting up the laser at each machine section easier and reduce the alignment team manpower. Our laser systems usually require only one operator. The wireless readout displays both targets simultaneously, allowing the user to quickly reference the benchmarks. Traditional optics usually requires at least one man holding a reference target in both reference locations.

No Need for Optic's Time-Consuming Recalibration after Plumb Measurements

Unlike optics that usually require recalibration of the levels each time plumb is checked, the L-742 can simultaneously check level and plumb from a single setup. The levels usually only require calibration once a month or so and can easily be checked in the field with a simple 10-minute procedure.

L-742 Significantly Simplifies Roll Parallelism Checks

The setup process is easy and fast because we use timesaving and simplifying features like is our ALIGN mode in the R-1309 readout. The feature compares one targets reading versus another, calculating the difference between the two. This allows the user to adjust the roll until the "difference" reading is zero instead of having to calculate the difference in his head. It also is a great time saver for making the laser parallel to the reference targets.

High Accuracy Reduces Optics' Guesswork

Hamar Laser's L-742 Roll Alignment System is accurate to +/- .002" (.06 mm) in 200' (61 meters) under good atmospheric conditions. This accuracy turns the alignment process from an art using optics to a science using lasers. The use of optics is considered an art because each operator "sees" the readings differently and essentially has to make an educated guess as to the correct number. In fact, it is rare that any two optics operators will get the same numbers. With the L-742, this guesswork is essentially eliminated because the target electronics determine the alignment reading, which is very repeatable from one operator to the next.

Factory-Built Benchmark Fixturing

The L-742 Roll Alignment System comes with fixtures to pick up floor benchmarks for aligning the laser to the machine's centerline. The L-742 also has the flexibility to easily use the reference roll to set up temporary offset centerlines. In fact, this is our preferred method of referencing the machine's centerline, as benchmarks are frequently in not much better shape than the floor they sit in. Cracks in the floor can seriously affect the position of the benchmarks and often result in poor alignments.

L-742 System Features

- 2 continuously rotating laser planes with operational range of 100' (30.5 meters) in radius.
- Completely self-contained
- Backlit levels accurate to 1 arc second (0.00006"/ft or 0.005mm/M)
- Laser planes flat to 1/2 arc second (0.00003"/ft or 0.0025 mm/M) in 180° sweep and 1/4 arc second (0.000015"/ft or 0.001 mm/M) in 90° sweep.
- Laser planes flat to 1/2 arc second (0.00003"/ft or 0.0025 mm/M) in 180° sweep and 1/4 arc second (0.000015"/ft or 0.001 mm/M) in 90° sweep.
- Planes are mutually square to 1 arc second (0.00006"/ft or 0.005 mm/M)
- Standard targets: A-1519 Single-Axis Wireless Target with 1" (24.5 mm) measuring range and .0005" (.01 mm) resolution
- A-1519HR Single-Axis Wireless Targets w/1" (24.5mm) range and .0001" (0.0025mm) resolution for higher accuracy applications
- Factory-built benchmark fixtures and laser translation slide are included in system
- Includes Pitch/Roll/Yaw base with coarse and fine adjustments
- Instant on with virtually no warm-up
- Battery or AC powered
- Typical setup time 15 minutes or less
- Diode lasers 2 times more stable than HeNe-based laser systems

Recommended System Configuration

L-742 Ultra-Precision Dual Scan Laser
Floor Fixture for reference targets
A-1519 Single-Axis Wireless Target w/1" range and .0005" resolution
R-1309 Cassiopeia PDA Readout w/Read9 Software and IR Receiver
EL-905 Electronic Level
L-106 Instrument Stand
A-909 Shipping Case

Optional Accessories

A-1519HR Single-Axis Wireless Target w/1" range and .0001" resolution
A-1520 Single-Axis Wireless Target w/.250" range and .0002" resolution for higher accuracy applications
A-1531 Universal Scan Target w/1.5" range and .001" resolution
A-1532 Universal Scan Target w/3" range and .001" resolution
A-1533 Universal Scan Target w/3" range, swivel head and .001" resolution
A-1530 Digital Height Gage Target w/pole

L-732 Precision Roll Alignment System for Lower Accuracy Roll Alignment Applications



L-732 Precision Roll Alignment System

Primarily designed for roll alignment and other similar alignment applications that do not require the exacting tolerances of the L-742 Ultra-Precision Laser, the L-732 Precision Dual Scan Laser also offers two automatically rotating laser planes that can be configured at the factory to have either two vertical planes, or one horizontal and one vertical laser plane. The L-732 laser planes are flat and square to two arc seconds (0.00012"/ft or 0.01 mm/M). It comes with a pitch, roll and yaw adjustment base for setting the laser planes parallel to reference points, 2-arc-second level vials and a powerful magnet for maximum stability.

Recommended System Configuration

L-732 Precision Dual Scan Laser
Benchmark Floor Target Fixtures
A-1533 Universal Scan Target w/3" range, swivel head and .001" resolution
L-106 Instrument Stand
A-909 Shipping Case

Optional Accessories

A-1531 Universal Scan Target w/1.5" range and .001" resolution
A-1532 Universal Scan Target w/3" range and .001" resolution
A-1519 Single-Axis Wireless Target w/1" range and .0005" resolution for higher accuracy applications
R-1309 Cassiopeia PDA Readout w/Read9 Software and IR Receiver
S-1388 Plane5 Software

L-732 System Features

- 2 automatically rotating laser planes, flat to 2 arc seconds (0.00012"/ft. or .01 mm/M in 180° sweep and 1 arc second in 90° sweep
- Completely self-contained
- Planes are mutually square to 2 arc seconds (0.00012"/ft. or .01 mm/M
- Includes Pitch/Roll/Yaw base with medium adjustments
- Backlit levels accurate to 2 arc seconds (0.00012"/ft. or .01 mm/M
- Factory-built benchmarking feature
- Standard Targets: A-1533 Single-Axis Target with 3" (75mm) Measuring Range and .001" (.025mm) Resolution and Swiveling Readout.
- Uses A-1519 Single-Axis, Wireless Target with 1" (25.4 mm) Measuring Range and .0005" (.013 mm) Resolution for higher-accuracy applications.
- Instant on with virtually no warm-up
- Battery or AC powered
- Typical setup time 20 minutes or less
- Multiple mounting orientations

How the Alignment Systems Work

Horizontal Roll Parallelism

When aligning rolls for paper mills, printing presses or film lines, the most difficult alignment is the horizontal parallelism (vertical parallelism or levelness can easily be checked using a machinist level or Hamar Laser's new EL-905 Electronic Bubble Level). The following section provides suggestions for choosing a reference and step-by-step procedures for equipment setup and performing an alignment.

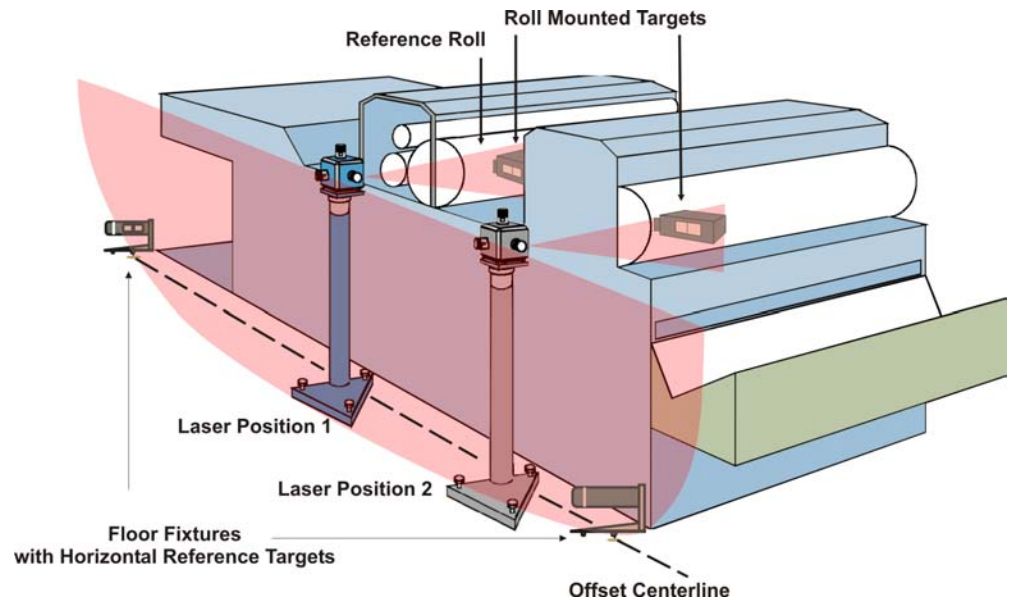


Figure 1 – Dimensional View of Roll Alignment

Choosing a Reference on Process Mills

Conventional methods of roll alignment usually use floor benchmarks (monuments) at the side of the machine as references. The L-742 or L-732 offers the versatility of using these benchmarks or of picking up a reference roll, such as a cooch roll on paper mills. We strongly believe that using a reference roll provides the most accurate reference and results in better alignments.

Benchmarks are usually set in a thin concrete floor, are rarely covered, and are routinely run over and nicked. More importantly, they move with the slab of concrete and rarely hold their position relative to the mill itself. Most floors in a typical plant have multiple slabs and are usually cracked throughout, creating instability of the monuments. Unless checked every time they are used, the use of the benchmark probably will result in significant alignment errors.

The Procedure

Here's how the process works for picking up a reference roll: (keep in mind that the L-742 or L-732 is like having 2 walls, both perpendicular to each other, 100 feet (30.5 M) in radius and very flat).

1. Place the laser on an instrument stand near the reference roll at the side of the machine and level using the laser's level vials. Make the vertical laser plane approximately parallel to the reference roll using visual aids (see Figure 1 for a dimensional view and Figure 3 for a top view of the setup).
2. Place one target horizontally on the reference roll at the closest point to laser. Mark the location on the roll. Adjust until the target detects the laser and zero the target. Move the target to the far end of the roll. Place a second target on the same point on the rolls that is closest to the laser and zero. Since both targets were zeroed at the same point on the roll, they become the reference points for the roll.
3. "Buck-in"¹ or adjust the vertical laser until the same reading appears on the two reference targets. The laser plane is now parallel to the reference roll (see Figure 3, Step 1).
4. Since the laser is placed outside the machine and the second vertical laser plane is perpendicular to the first, the second laser plane, in effect, becomes the offset centerline of the mill. This

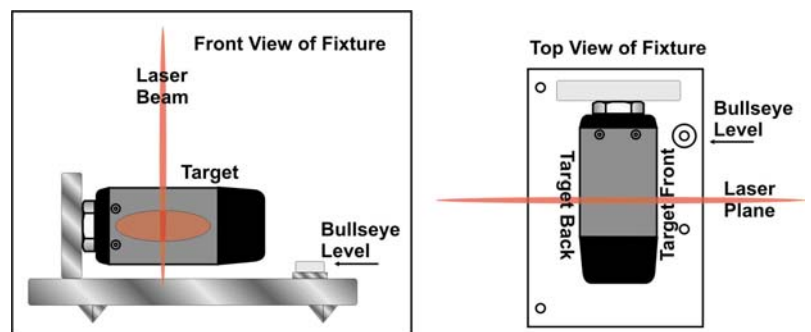


Figure 2 – Reference Targets Mounted on Floor Fixtures

¹ **BUCK-IN**—Adjusting a laser plane or line to be parallel to the surface being measured (a table top, a surface plate, or a way surface). Three points are required to buck-in a laser plane to a reference surface. Two points are needed to buck-in a straight-line laser to a reference line (i.e., centerline).

offset centerline has a range of 100 feet (30.5 meters) on either side of the laser. To measure other rolls for parallelism, the offset centerline must be temporarily established by placing two reference targets, horizontally, either on floor fixtures (see Figure 2) or on the side frame of the mill (see Figure 1). The reference targets are zeroed, thus becoming the offset reference line and are not touched during the remainder of the alignment.

5. To check the parallelism of an individual roll, move the laser and stand along the offset centerline until the desired roll or section of rolls is reached. Position the laser to allow about 4-5" of horizontal space between the laser plane and the roll to be measured. The instrument is then leveled (see Figure 3, Step 2).
6. Use the yaw adjustment on the laser base to make the second vertical laser plane parallel to the offset centerline, using the temporary reference targets as guides. When the same reading appears on both reference targets, the laser is parallel to the centerline. This task has been greatly simplified by the "A-B" Feature of the R-1309 Cassiopeia Readout (see Figure 5) and the A-1519 Single-Axis Wireless Targets. The feature subtracts one reference target reading from the other and displays the difference in a graphical format. Adjust the laser until the difference is zero and the laser is bucked in.
7. Place a target horizontally on the roll closest to the laser and zero. Move the target to the far end of the roll and measure the deviation from parallel (Figure 3, Step 3). Since the readings are live, the roll can then be adjusted until both near and far target positions read zero, which would mean the roll is aligned and parallel to the reference roll. Since the laser generates a plane, rolls at any elevation in that section that are within 2 feet (610 mm) horizontally of the laser plane can be measured for parallelism without changing the setup of the laser.

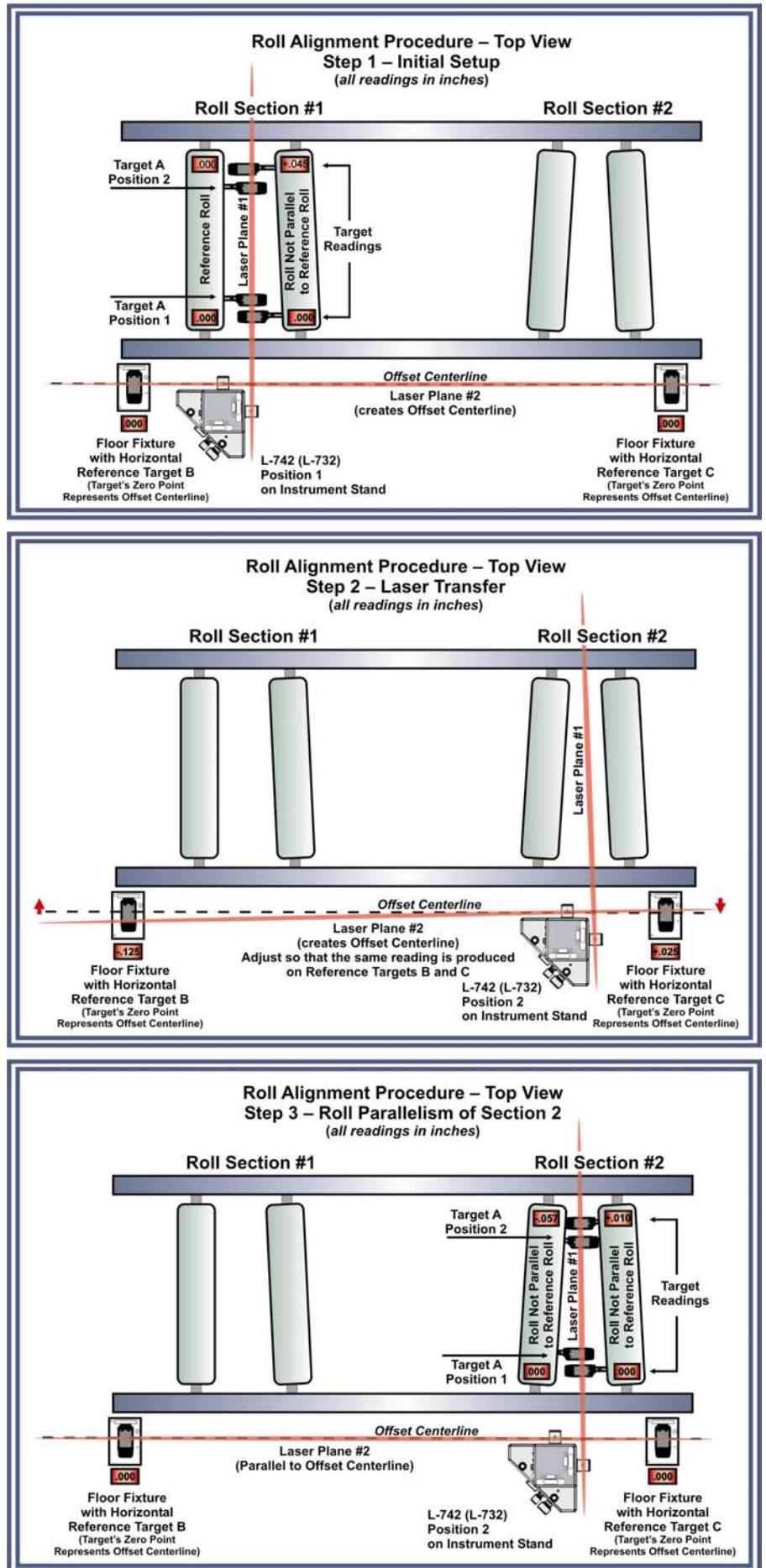


Figure 3 – Top View of Roll Alignment Procedure

Leveling Rolls

For checking level on applications with multiple rolls in the same horizontal plane, the L-743 or L-733 must be used since they have a horizontal laser plane in addition to the 2 vertical planes of the L-742 or L-732. The laser is leveled and a target is placed on one end of the roll and zeroed. The target is then moved to the other end of the roll and the deviation from level is measured. If both readings are zero, then the roll is level. If not, it can be adjusted using the target as an electronic indicator.

For checking level of rolls at many different elevations, our EL-905 Electronic Level can be used. It has a swiveling readout, v-block base, 1 arc-second accuracy and a strapping system to prevent it from falling off the roll.

Checking Drive Shaft Alignment

To check the drive shaft alignment, the L-742 or L-732 is placed either at the end of the drive shaft or in the middle, depending on the how long it is. The horizontal plane is made parallel to the top of the closest drive shaft using vertically mounted targets and the vertical scan plane is made parallel to the side of the same shaft.

Each shaft is checked for parallelism to the reference shaft and aligned accordingly. To check a shaft for parallelism/colinearity, a target is moved from the reference shaft without re-zeroing, and two measurements are made, one at either end of the shaft. The difference between the two readings is the angle of the shaft relative to the reference shaft and the average is how far off center it is from the reference shaft. Up to 200 feet of drive shafts can be checked with one setup.

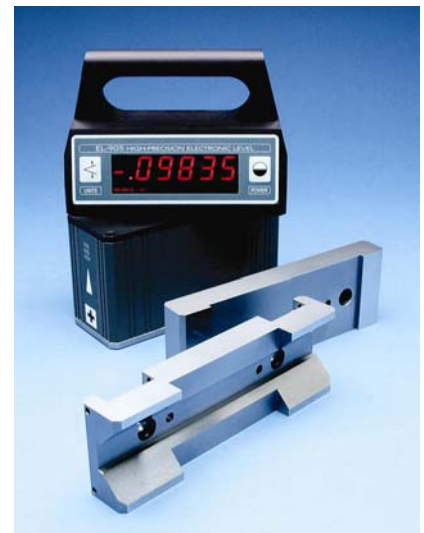


Figure 4 – EL-905 Electronic Level

The R-1309 Cassiopeia Readout

The R-1309 is an innovative readout that uses Hamar Laser's Read9 alignment software on a Cassiopeia handheld computer or personal digital assistant (PDA). The R-1309 can display up to 4 A-1519/20 Single-Axis Wireless Targets using a wireless infrared receiver, eliminating messy cabling and multiple readouts. It allows a user to perform many alignment functions with the convenience and portability of a handheld computer. The display screen shows a measurement value for each of the connected targets (letters A through D refer to the corresponding labels on the targets). Each numeric value represents the position of the laser plane relative to the target centerline. A positive reading indicates that target is above the laser plane, while a negative reading indicates that the target is below the laser plane.

The R-1309 can toggle between **Absolute** (indicating exactly where the laser plane hits the target cell) and **Relative** modes. In Relative mode, the readout shows the measurement relative to the user-determined zero point. It also shows a display of the difference between two target measurements, a very useful feature for buck-in, roll alignment and angular measurements, and a graphical display of each target's position relative to the laser plane.

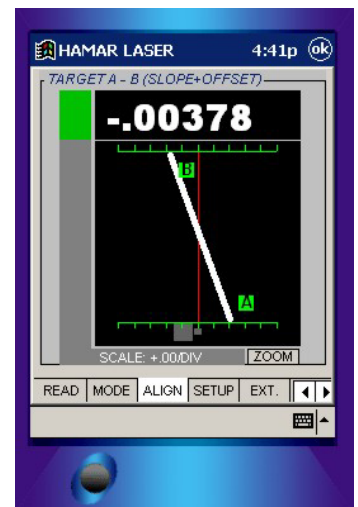


Figure 5 – Read9 ALIGN Screen showing the difference between Targets A and B relative to the laser plane.