Aligning Bores is Now Faster and Easier Than Ever
L-707 Laser Bore Alignment System

The Leader in Laser Bore Alignment Technology
Hamar Laser manufactures the most accurate, versatile and portable bore alignment laser system available: The L-707.

Data taking targets include: self-centering, see-through, 2-axis and 4-axis targets, hand-held readouts, and Windows-based software to display and analyze alignment data in real time.

L-707 Bore Alignment Lasers can be used for a variety of bore alignment and measurement applications: engine block bearings, compressor bores, shaft bearing bores, stern tubes, and many more.

Results 3x Faster Than Optical Bore Scopes or Tight Wire
With the L-707, alignment of bores is fast and easy: Setup takes 15 to 20 minutes, and overall alignments are done up to 3x faster than with optical bore scopes or tight wire. Because alignment data is real time, misaligned bores can be brought into tolerance very quickly. After setup, a 10’ (3 M) long bore can be measured for straightness every foot (300 mm) in under 5 minutes!

Self-Centering Target Adapters Reduces Setup time by 50%
With conventional bore alignment methods, the measuring device is typically mounted outside the bores, and targets are used in reference bores to align the measurement system — a very cumbersome process that can easily take an hour, or more. With Hamar Laser’s patented, self-centering target adapter technology, the setup process is simple: Use the A-514G Leg Setting Gage to set the legs to the desired diameter. Then the laser and target are mounted directly into the reference bores, reducing setup time to just minutes rather than hours.

More Accurate and Repeatable Measurements Than Optics
With optics, the measurement process can be more of an “art” than a science, since one operator will “see” a different set of values than another. The L-707 uses sophisticated electronic sensors to detect the laser and thus offers greater accuracy and repeatability. Bores can be aligned to 0005” (0.013 mm) and the results are repeatable to .0002” (.005 mm).

Extend Component Life, Reduce Downtime
Misaligned bearing bores will cause premature failures, requiring frequent replacement, more downtime, and higher maintenance costs. Proper and more accurate alignment helps components to last longer and prevent big problems — before they occur.

Key Features:
- Adaptable to most bore applications
- Fast, easy setup using simple self-centering adapters
- Setup and start capturing alignment data in under 20 minutes
- Measure diameters from 3.5” (86 mm) to 40”+ (1 M)
- Adjustable legs will fit any bore diameter
- Leg Setting Gage centers adapters to .0003” (.0075 mm)
- Live “real-time” data display with large color graphics
- Choice of standard LED readout, or add a second readout to transmit readings wirelessly up to 100’ (30.5 M)
- Operational range up to 50’ (15.2 M)
- Durable and rugged design

Hamar’s patented, self-centering A-514 Target Adapters speed the alignment process, and use adjustable legs for different sized bores.
Features Designed With Versatility in Mind

Self-Centering Laser and Target Bore Adapters
Our patented A-514 self-centering laser and target bore adapters accurately and quickly position the laser and target on the bore centerline. The adapters can be centered to the bore to within .0003" (.008 mm).

Adjustable Target Adapter Legs
Self-centering laser and target adapters have adjustable legs that allow adapters to be used for diameters ranging from 3.5" (86 mm) to 40" (1 M). Choose from three bore adapters: A-514A for bores from 3.5" (90 mm) to 6.5" (165.1 mm), A-514B for bores from 6" (152.4 mm) to 18" (457.2 mm) and the A-514C for bores from 17" (435 mm) to 40" (1 M).

Precise Angular Laser Adjustment
Precision angular adjustments provide angular pointing control of the laser beam so it can be aligned to the reference bore center line to within .0001" in 10' or .0025 mm in 3 M.

Visible-Light Beam, Rugged Design
The L-707 Laser has a low power, visible-light beam making coarse alignment easy. No viewing devices are required for operation. It is made of hardened 303 stainless steel for high durability and is lightweight (1.7 lbs.)

Large Bore, Half Bore and See-Through Applications
For bores over 1 meter, half-bores, or where bore surfaces are worn or rough, the T-218 Two-Axis Universal Target and T-225L Large Bore Flange are used. The T-218 has a prism that flips out of the way, allowing the laser beam to pass unobstructed through the target without removing it — a useful feature when aligning multiple bores over long distances. For half-bores, the T-218 is used with our A-502A Half-Bore and A-501A Bore Sweep Fixtures to center it in the bore.

Long Range, High Accuracy
The L-707 has built-in angular adjustments which are used to adjust the laser beam to .001" in 50 feet (0.025 mm in 15 M). The beam is straight to .00001"/ft or 0.0008 mm/M.

Laser Beam Concentric to Mounting OD
The L-707 laser beam is concentric to its 1.1870" (30.2 mm) OD mounting surface to 0.0003" (0.008 mm). The end of the mounting surface is threaded to hold the laser in place.

Optional Computer Upgrade
Data can be collected and displayed in real time with optional laptop upgrade and Bore8 Software that plots bore misalignment in three ways: 1) relative to end bores, 2) relative to two user-defined bores or 3) relative to Best Fit line.

Bore8 Software showing plot of bore straightness.
Simple to Set Up, Simple to Use
First, the A-514 Bore Adapters are put on a leg-setting gage to adjust the legs to the desired bore radius. Next the L-707 and A-512 Targets are inserted into their Bore Adapters. The entire laser and target assemblies are inserted into the two reference bores where they self center. Once inserted, the laser’s angular adjustment knobs are used to set/tilt the laser to zero on the target, establishing the reference bore centerline.

With the laser now parallel to the end bores, the target can be moved — or a second target added — to inner bores for alignment checks. Since alignment data in the target updates in the readout automatically, any errors can be adjusted using the target as a live indicator.

Measuring Bore Alignment
After initial setup, the A-512 Target is then placed in the desired bore for measurement, which takes about 10 seconds. The R-1307 2-Axis Readout displays the bore misalignment. To truly align a bore to a centerline, two sets of readings are needed: one set in the section of the bore closest to the laser and one set in the section farthest away from the laser. This aligns both the angle of the bore as well as its center to the reference bore centerline.

Checking Straightness on Bores up to 25’ Long
Checking the straightness of a bore is a simple procedure. After setting up the laser, the target is inserted into the bore in predetermined increments and the readings are recorded. Bore8 records the data and, if needed, also removes any remaining laser slope error. For long bores, the A-512 Target uses a pole to push and position the target into each measuring point, and allows measurements to be taken inside bores up to 25’ (7.6 m) long.

Self-Centering Adapter Hubs — The Key to Speed
The A-512 Target and A-514 Adapter Hubs are designed so that the PSD (position sensing detector) is centered axially between the four feet of the adapter, two of which are offset axially from the other two. This, in effect, puts the PSD on the pivot point of the adapter and allows the angle of incidence to the laser beam to vary by up to 45°. The A-512 takes advantage of this property by making the adapter slightly larger than the bore. A spring-loaded pole or weighted handle is attached to the target and bore adapter and together they are tipped forward and inserted into the bore. The weight of the pole or a counter weight forces the target to tip backward, which “jams” the target into the bore where it centers itself, measuring the alignment.

High-Tolerance Bore Alignment
For high-tolerance bore alignment applications, the Target Sensor Concentricity Error (TSCE) must be calculated using a simple procedure called the NORMIN method. Our Read8 software makes the process very simple. The TSCE is calculated by taking two readings, one with the target at the normal (12:00) position and a second with the target inverted (6:00). Horizontal and vertical calculations are done separately. The second reading is added to the first and the result is divided by two. This is the TSCE, which is the centering error of the target/adapter assembly.

This calculation creates an offset that can then be subtracted from all subsequent bore measurements to get the true misalignment number. Our Bore8 software can easily calculate TSCE and even automatically remove it from the displayed reading.
Alignment Solutions for Even the Most Difficult Bore Applications

Applications Overview
Hamar Laser bore systems can handle a wide range of bore alignment, straightness determination and measurement tasks. Even extremely difficult bore alignment challenges, like spherical bearings, can be done easily. If you do not see your application listed, please contact us to discuss your requirements. We will be more than happy to provide a solution that’s right for your unique alignment problem.

Automotive, Marine & Locomotive Engine Blocks
• Crankshaft and camshaft line bores
• Cylinder straightness

Manufacturing & Metalworking
• Boring bar bearing alignment
• Deep bore straightness checks on parts
• Workpiece bore to spindle alignment

Marine
• Propeller shaft bearing bores
• Stern tube alignment

Power Generation
• Steam turbines
• Gas turbines

Plastics
• Extruder barrel alignment
• Extruder bore straightness and wear

Aerospace
• Hinge line spherical bearing bores

Stern Tube & Propeller Shaft Bearings
The L-707 can quickly and easily check stern tube and propeller shaft bearing alignment. It can even check the gearbox shaft’s axis of rotation alignment to its bearings, saving loads of time versus a tight wire. It can also be used to set up boring bar bearings for line boring equipment.

Engine Block Bore Alignment
The L-707 gives automotive and diesel-engine manufacturers a fast, reliable way to measure crankshaft bores for straightness and alignment. Our system decreases inspection times significantly and eliminates the need for expensive gauging. The L-707 is also used for measuring the straightness of engine block cylinder bores.

Turbine Alignment
Since 1975, our Steam Turbine Alignment System has cut alignment times by 50% and increased accuracy vs. tight wires. With the introduction of the L-705/L-706/L-707, alignment times have been further reduced. We also offer lasers to check split joint flatness and motor couplings.

Extruder Barrel Alignment
With a 10 minute setup time and simple procedure, extruder barrels can be aligned in less than 1 hour using our L-705 Bore Laser. The adapters can also be used to measure barrel wear.

Hinge-Line Bearing Alignment
Smaller spherical bearings in commercial aircraft hinge-lines are aligned using the L-705 and T-271 2-Axis Virtual Center Target. For larger spherical bearings (2.25" and above) the T-218 Target and T-225X Flange are used. Now extremely difficult alignment tasks can be done in one-tenth the time!
Specifications

Target and Bore Adapters

A-512 Target
Mounting Surface OD: 1.1870" (30.15 mm). Target sensor concentric to OD to within .0003" (0.008 mm). Mounting surface 303 SS.

A-514A Small Bore Target Adapter
For bore diameters from 3.5" (88.9 mm) to 6.5" (165.1 mm).

A-514B Medium Bore Target Adapter
For bore diameters from 6" (152.4 mm) to 18.5" (475.2 mm).

A-514C Large Bore Target Adapter
For bore diameters from 17" (431.8 mm) to 40" (1 M)

A-514G Bore Gage

L-707 Laser

Size
(See line drawings)

Weight
1.7 lbs. (0.5 kilograms)

Power
9V external battery pack/AC adapter

Center
Laser aperture ground concentric within .0003" (0.008 mm)
No adjustment

Angle
Controlled by two high-pitch adjustment knobs. Can be set to .001" (.025 mm) in 40' (12.2 M)

Angular Adj.
Range
±0.18” (± .375 in./ft. or ± 3.13 mm/M)

Operating Distance
Up to 50' (14.2 M) recommended

Laser Beam Diameter
Laser < 0.25 in./6.4 mm dia. [Up to 30'/9 M]

Beam Straightness
.00001”/ft. (.0008 mm/M)

Beam
.0001”/hr./°F (0.004 mm/hr./°C)

Stability
.0001”/hr./°F (0.01 mm/M/hr./°C)

Laser Type
Laser < 1 mW Cw, BRH Class II

Laser Wavelength
670 nanometers

Materials
Aluminum Flange. All mounting surfaces: 303 SS.