
# LASER INSTRUMENTS PRESENTATION

## NATIONAL CONVENTION

### ANAHEIM, CALIFORNIA

### 2014

# LASER MEASUREMENT PRESENTATION

## **USATF NATIONAL CONVENTION**, Anaheim, California

Southern California Association Implementation

December 3, 2014

**INTRODUCTIONS:**

Douglas J. Parsons – Member of the Southern California and San Diego Associations. Ex-thrower, so specializes in those events. First to use each the Leica Disto D5 and then Leica 705 in competition, in Orange County, in 2012. Trains, mentors and is the EMJ on total station laser measurement crews for major meets and championships, throughout California. Trains regularly at Leica and TopCon classes, as well as with professional surveyors to maintain proficiency in using data collectors. Has set up all stations for Field Lynx compatibility/integration. Instrumental in surveying local venues to IAAF standards, and setting and certifying the monuments (known survey points) at many of the sites we implement the use of these systems. Owns and operates 4 Leica TS 02 and 2 South 352 total stations. Owns and utilizes 2 digital performance displays.

Jeffrey T. Haspell – Commissioner/Officials' Coordinator for Orange County Area from 1996 to 2014. Master Level Official for over 20 years. Grade 3 Referee for Track, Field and Technical Manager. Member of Southern California and San Diego Associations. Land development civil engineer by profession. Began use, laser survey/measurement instruments, in early 1990's. Began using laser measurement for officiating in 2007. Worked on EMJ crews at the WMA World Championships, Sacramento 2011, and has since implemented their use at several major conference and state championships. Trains, mentors and implements use of linear lasers for field event crews for all venues, for all collegiate meets and championships, throughout Orange County, since 2012. Orange County was the first Area in North America, to exclusively use lasers and survey rods for a complete track & field meet. Owns and operates five (5) sets of Leica lasers.

Objective Purposes –

Use technology to increase confidence, of all parties, in the officiating process:

Increase accuracy

Fiberglass tape is both temperature and tension sensitive. Therefore, it stretches irregularly. It is also inaccurately marked graphically. Steel tape is also vulnerable to the same effects, except to a lesser extent. Certified steel tape is still vulnerable, but at a far less extent than common steel tape. Add the factors of uneven terrain and improbability of laying the tape in a true straight line, the length of measurement is irregular with every measurement. Add to that, overall value comparison of equipment used. Laser devises are now cheaper than certified steel tape, if bought in quantity.

Increase efficiency

The time to humanly triangulate or directly mark a point of first touch/landing is consistent between tape and laser systems. The efficiency is realized with the time it takes to shoot a target through a laser viewer, versus the multi-mechanical process of manually aligning, adjusting, reading and then returning the tape to out of sector.

Increase transparency

Digital readout of a measurement is instantly (real time) verifiable visually, stored AND instantaneously transmitted to one or more digital screens or satellite feeds - versus the chance of mis-reading a tape and then transposing the reading verbally to multiple manual recorders, who then must verbally relay the net reading to a remote location.

Increased Credibility

The combination of increased accuracy, efficiency, transparency, plus the expanding use at International competitions, provides a level of exposure that has propelled the use of laser measurement as the preferred reliable tools of competition measurement.
This credibility is valuable to athletes – who will prefer to compete with these tools.
This credibility is valuable to organizers – who wish to attract the marquee athletes.
This credibility is valuable to sponsors – who prefer association with premium events.
This credibility is valuable to spectators – who prefer to attend premium competitions.
This credibility translates to more events being televised – bringing more awareness.

Reduce clutter

Officials can be consolidated into two areas, away from the popular points of focus for each venue. This opens the view sheds for coaches, camera crews and spectators.
Only one or two official(s) are stationed at the "foul" line/arc or cage/ring – opposite of the coaches, media and/or spectators' viewing areas.
Only one or two official(s) are stationed along the sector lines for throwing events.
Measurement judges, recorders and clerks are stationed **8m or 20m** away from those areas, back near the competitors, where visual and verbal communications are most critical. This increases accuracy/efficiency between officials, since they're adjacent.

Future Growth

Hand held Leica Disto linear systems have been continually improving software for accuracy and sensitivity over the last 3 years. The improvements have brought them to par with more expensive transit systems – especially in functions needed for track & field adjudication. Most components are the same as incorporated in transit units.
The accuracy for the Disto is now at **3mm** per **300m** measurement…same as transits.

Technology is currently in use that allows for these functions to be done from satellites, using cameras and lasers, with all four Global Navigation Satellite Systems (GNSS) – GPS (North America); Galileo (Europe); GLONASS (Russia); Compass/BeiDou (China).
We are testing the use of Unmanned Aerial Vehicles (UAV's) mounted with cameras and lasers to make the same measurements as the linked GPS satellite systems. This approach will be less costly, less cumbersome and equally accurate, as it can be more localized. Currently the cost of using any of these tools at our track & field meets is prohibitive. However, their use at our major meets is less than six (6) years away.

Southern California Implements Laser Systems Differently Than Other Associations -

SCA primarily uses linear systems on each of the jumps. It is also the primary option on Shot Put and weight throws. It is the secondary option on the three (3) long throws. The total station transit systems are the primary systems for the long throws. With the number of meets each weekend in Southern California, proficiency with the Disto in all events is necessary - due to the economics of supply and demand. On any given weekend, at least 35 laser systems are needed. We have only 6 transit systems and operators. As the price of the Disto lasers drops, more officials are buying them for personal use at meets. The Association has purchased ten (10) Disto linear systems for use by officials. Many of the colleges have also purchased Distos for use, at their sites. We can then supplement SCA crews with their trained staff, who have now also become certified USATF officials. The colleges are also marking their venues with setback lines and survey point markers, for fast certification and use of laser systems.

# LASER MEASUREMENT PRESENTATION

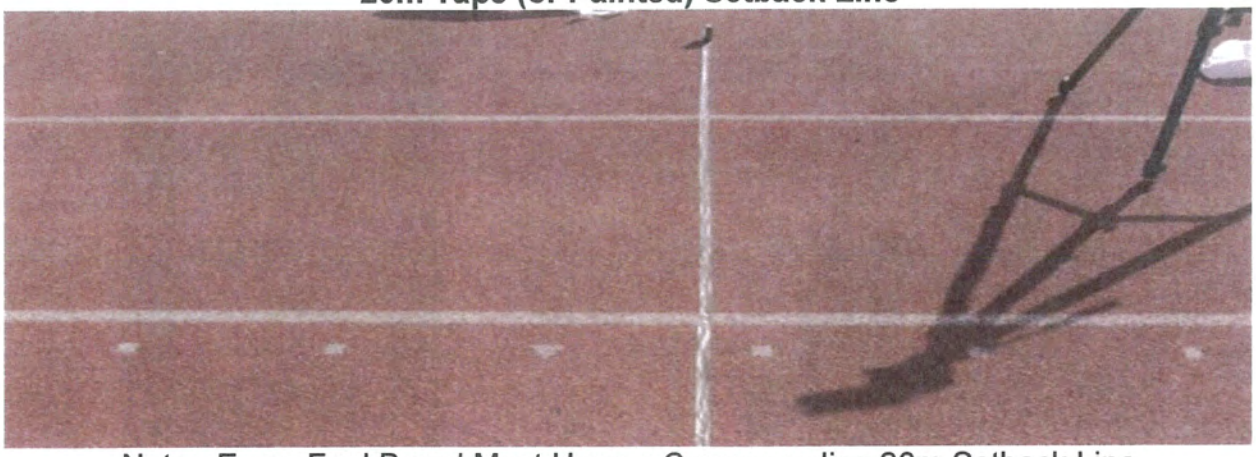
**Leica TS 02**

**Leica E7500i ("Hornet")**


**Leica TS 09**

**Leica D-5 ("Bumble Bee")**

**20m Tape (or Painted) Setback Line**

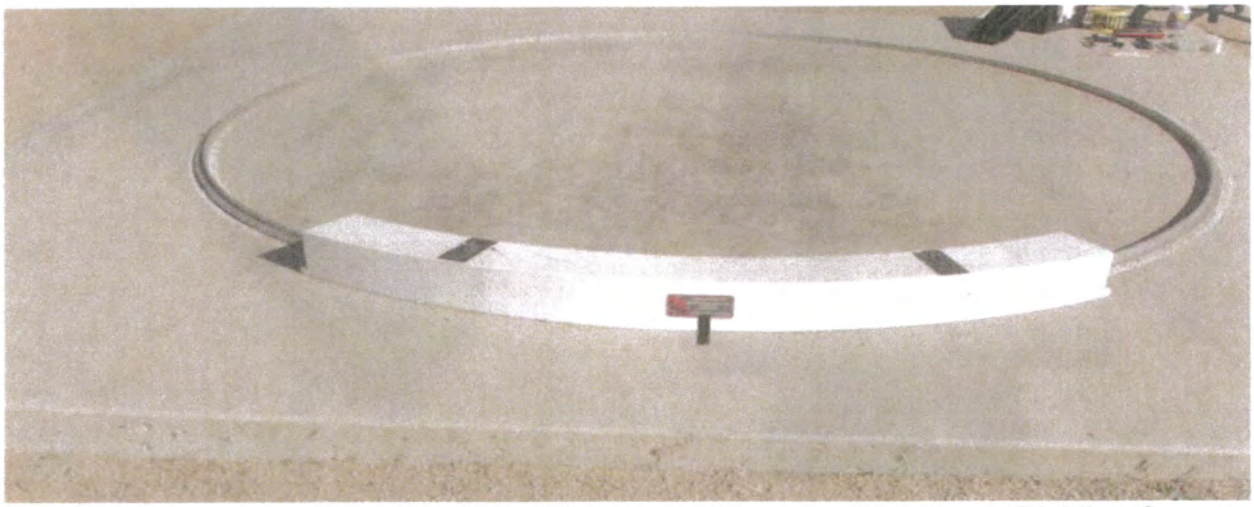


Note: Every Foul Board Must Have a Corresponding 20m Setback Line

**Tacks - Anchoring Tape Setback Line**

Note: No Tacks Placed Within Runway – Let Tape "Melt" to Surface Before Warm-ups

**Shot Put Stop Board Front Marking**



Note: Marks at Front Center of Stop Board and Along Sector Lines – Dividing Sector

## SITE PREPARATION:

Monuments –

All tracks, on synthetic surfaces, come with a 100m start and finish line combination. There should be survey documentation/marks verifying their accuracy. Use these two lines to verify any calibration by measuring down a lane line, with your laser and target.

Properly installed throwing sectors are constructed/marked with certified surveyor monuments (survey points). Use these features to verify calibration by measuring from the vertex of the sector to the radial survey monument, minus the "offset" to the foul line/arc. You will also be able to determine if the radius of a throwing circle/wedge is accurate, if using the transit system. You will then be able to adjust the "offset" constant of each triangulated or linear measurement – depending upon the devise.

Competition Venue Markings -

Long Jump & Triple Jump (see photo left)

Construct a ¾ **inch** wide black line, parallel to each permanent take-off board foul line, across the entire width of the runway and apron – and if possible, at least **1.0m** wider than landing pit – with paint, at **20.0m**. If the facility resists, you can construct this line with industrial tape. When temporary "take-off" board(s) are necessary, you will be compelled to use industrial tape to construct not only the boards, but also the parallel ¾ **inch** black line(s), at those additional **20.0m** setbacks. When using industrial tape, reinforce the ends with thumb tacks placed outside the runway. *Construct these lines early enough in the day so that the glue has time to "melt" into the runway*. Where the running surface does not extend past the runway limits, to landing pit width, you will need to provide a temporary hard line extension – similar to what crews have been doing with traditional 'tape' measuring systems in the past, but at **20.0m** instead 0.0m.

Javelin

Highlight the sector radial pin, located **8.0m** from the foul arc line. Many runways are painted with an arrow or diamond, at an "approximate" **8m** point. If a pin is not found, construct an accurate location for a ¾"-1" thumb tack. Mark its circumference in paint.

Shot Put (see photo left)

Mark a ¾ **inch** wide, **6 inch** long, black line, radial from the center of the circle, in front of toe board, on the concrete apron, with industrial tape or black paint – at center of toe board (and if necessary along the sector lines extended). As "Reference Points"

## SYSTEM / INSTRUMENT SET-UP:

Certification –

- Locate documentation from the Facilities Administrator Office that identifies all of the Certified Survey Monuments used to construct the stadium and field event venues.
- Take readings from two known survey monuments - the track and each sector used.
- If you cannot locate the known survey points, use a **Certified** Steel Tape during cool weather, to set temporary survey points, along each sector line – at each venue.
- Set the temporary survey points with survey nails, spikes or whiskers.
- Set the temporary survey points for field event runways with tacks and tape, or paint.
- Make any appropriate adjustments (mm to 1cm) to the laser to "zero out" the laser.
- These readings shall be repeated after each event to insure constant venue conditions.
- These readings will also verify the particular "off-sets" that may have been necessary.
- The use of a **Certified** Steel Tape to be used to establish starting points, if necessary.

**REMOTE TRANSMISSION and RELAY SET-UP:**

Field Lynx (Used with Total Station) –

Check for adequate **WiFi** service throughout stadium and field events venues.
Set connections with timing center/tent and performance boards. Test all connections.
Load event titles, numbers and athlete data, from the Field Lynx control center, into the laptop connected to the laser instrument, so that they may all 'talk' to each other. Be sure to enter the number of preliminary rounds, how many athletes (and their names) in each of the preliminary rounds, and how many athletes may advance to Finals.

The laptops and control/results center can constantly update competition placings, and throwing orders instantaneously with each attempt. These two statuses are shown, on a split screens, on the laptops. The option to broadcast these results live rests with the Meet Director. Athletes will know at the conclusion of the last preliminary round attempt, who will go to Finals, and in what order. This is beneficial to athletes of the earlier preliminary rounds so they may plan for 'warm ups' needed prior to Finals beginning.

Bluetooth (Used with Disto E7500i) –

Check to see if **Hot Spots** are needed at each of the stadium and field event venues.
Synchronize connections of the devise(s) with the control/results center, press box and smartphones. Test all connections and subsequent relay/syncs to performance boards.
As with the Field Lynx discussion, real time performances and standings are available to coaches, media and spectators through smartphone apps and performance boards.

Radio/Walkie-Talkie (Used with both systems) -

Equip each member of the EMJ crew with a headset – for intra-crew communication.
It is important to have real time access between the field prism, laser, clerk and chief.
The event Chiefs maintain contact with the Field Referee with a separate radio set-up.
Complete a system check and then a battery check before each round of competition.

**TRANSIT (Triangulation) TOTAL STATION LASER SYSTEMS:**

*Prevalent Instrument Systems – Leica TS 02 and South 352*

Layouts –

Hammer, Discus & Javelin (and Shot Put if requested)

Set up an isolated area for the equipment, set back from the competition sector, so that there are no, and will be no, obstructions or spectators between any measurement points and to the throwing ring cages. Provide a clear (preferably flagged) area around the location of the laser equipment where athletes, coaches, media and spectators cannot encroach. It is recommended that a canopy be setup over the laser equipment, to protect it, the laptop and the operator - from direct sunlight and precipitation.

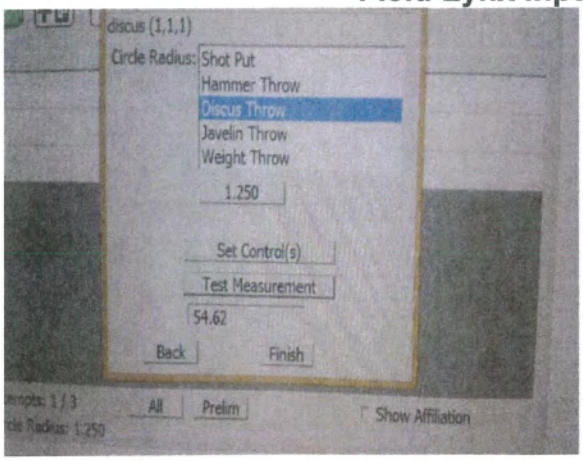
***Note:*** SCA does not currently use transit system laser measurement for any Jumps.

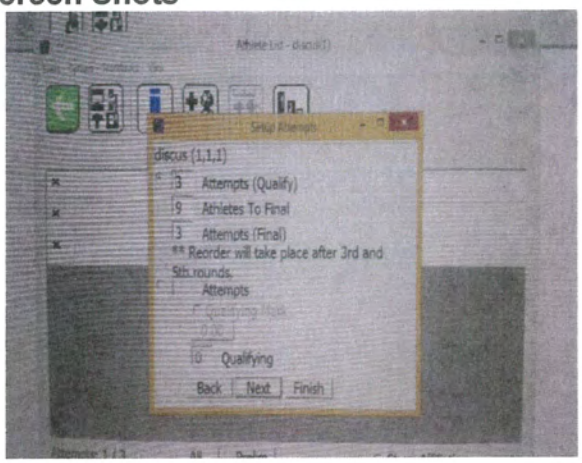
Instrument Setup –

General

Locate the center of each of the throwing rings to be used during the competitions. Measure the distance from the found center point (vertex of sector) of the ring to the front lip of the ring. Compare to the **1.065m**, or **1.250m** radius required for respective legal rings. Verify the diameter(s) of the rings by measuring through the found center point of the ring, at three different orientations. Verify the diameter(s) to determine whether the center point is the true vertex of the sector.

## Field Lynx Inputs / Screen Shots




Note: Functions are Click and Proceed – User-Friendly Commands

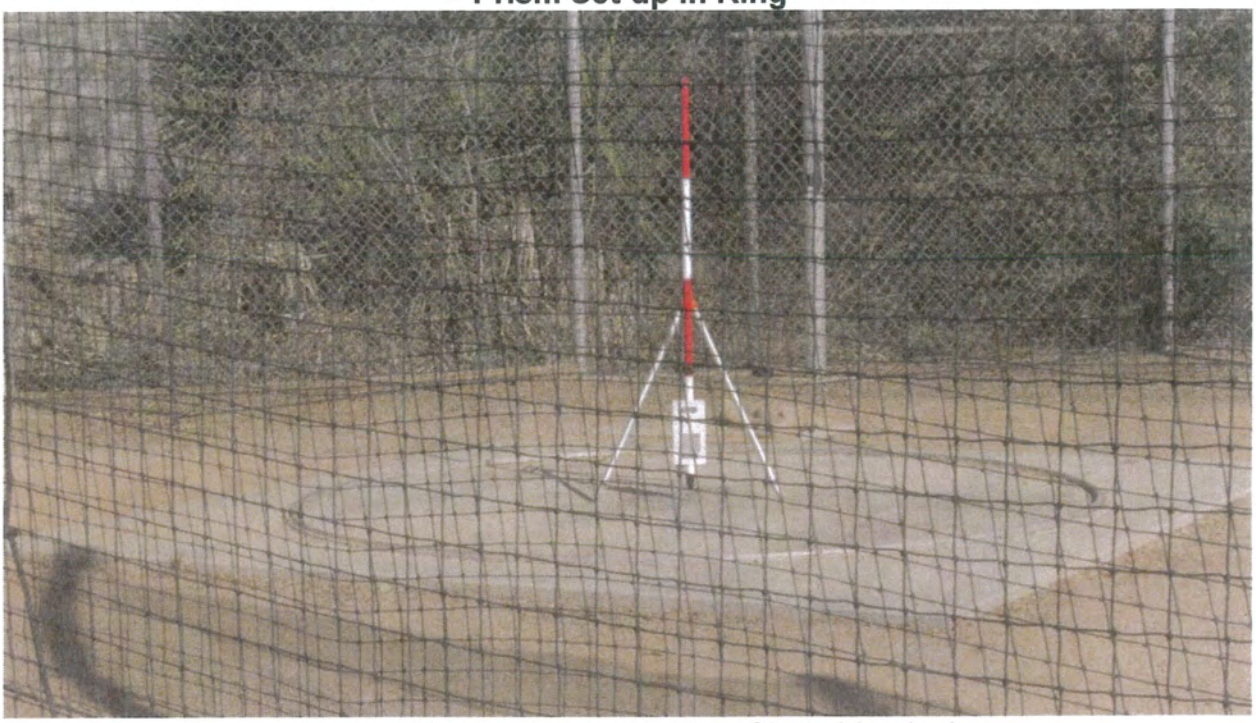
## Transit Staging Set-up Looking to Cage

Note: Good View Window/Clearance Between Support Poles

## Transit Staging Set-up Looking to Throwing Sector

Note: No Obstructions/People Within Viewshed of Laser to Sector

**Prism Set-up in Ring**

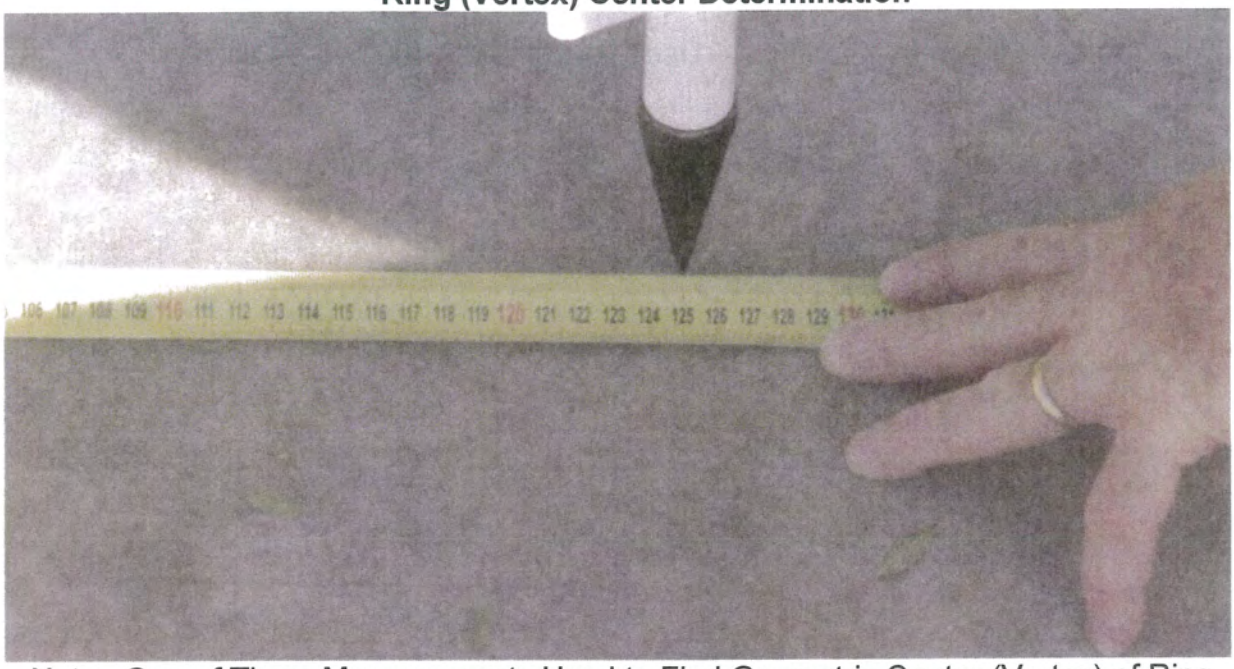


Note: Tripod Used So Multiple Shots Identical

**Prism Set-up on Survey Monuments for Throwing Sector**

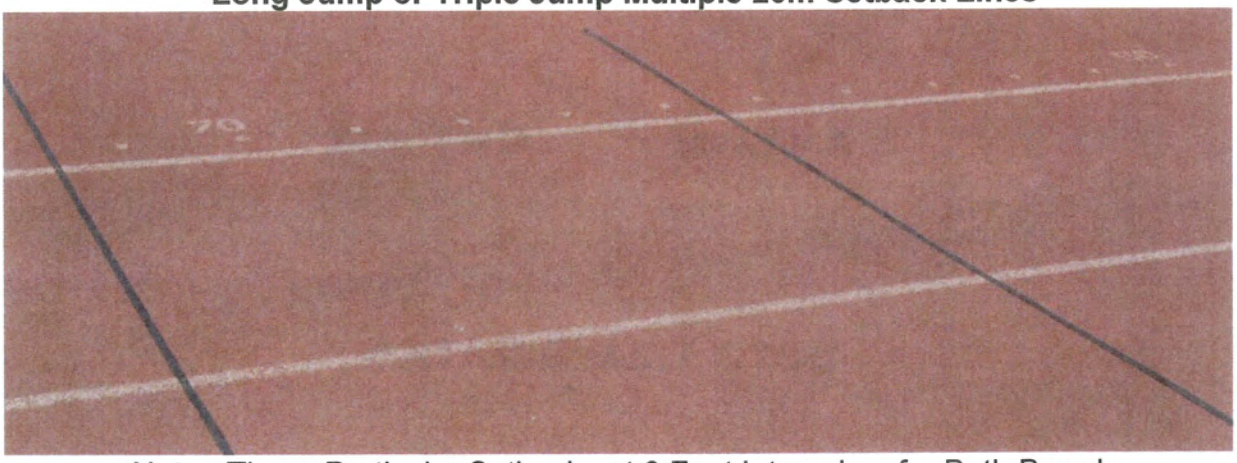
Note: Tripod Used to Establish Consistent Distance for Multiple Shootings/Verifications

**Ring (Vertex) Center Determination**



Note: One of Three Measurements Used to Find Geometric Center (Vertex) of Ring

**Long Jump or Triple Jump Multiple 20m Setback Lines**



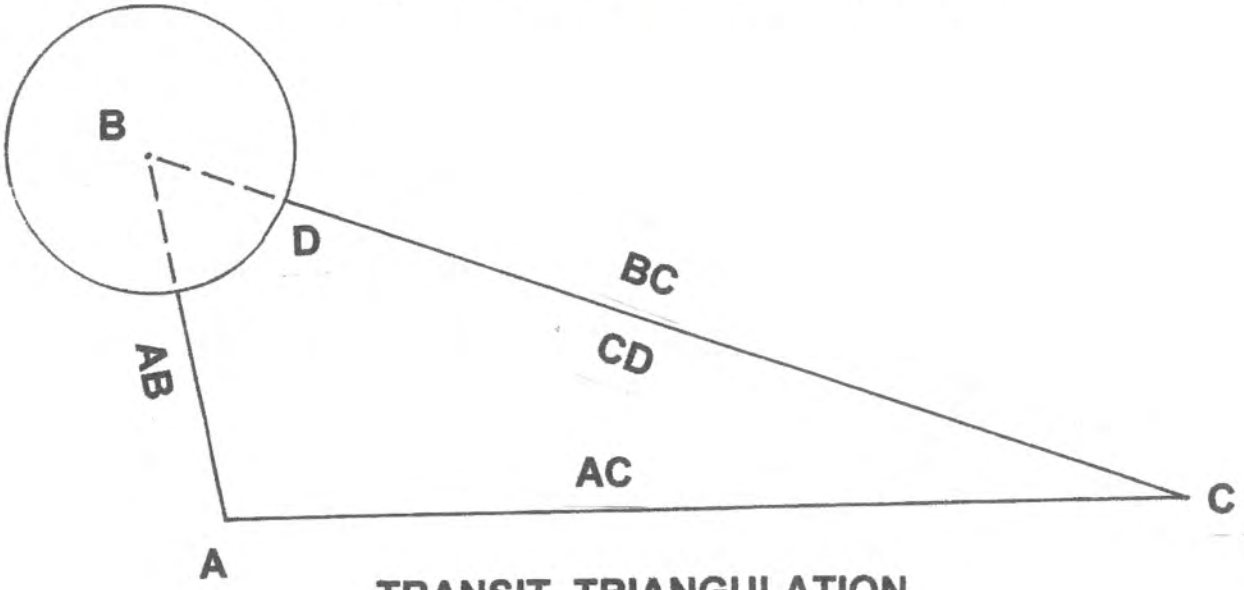
Note: These Particular Setbacks at 6 Foot Intervals – for Both Boards

**Javelin 8m Setback Pin**

Note: On Many Runways the Pin is Covered and Marked by Paint Only

**Transit & Disto Triangulations & Algorithms**

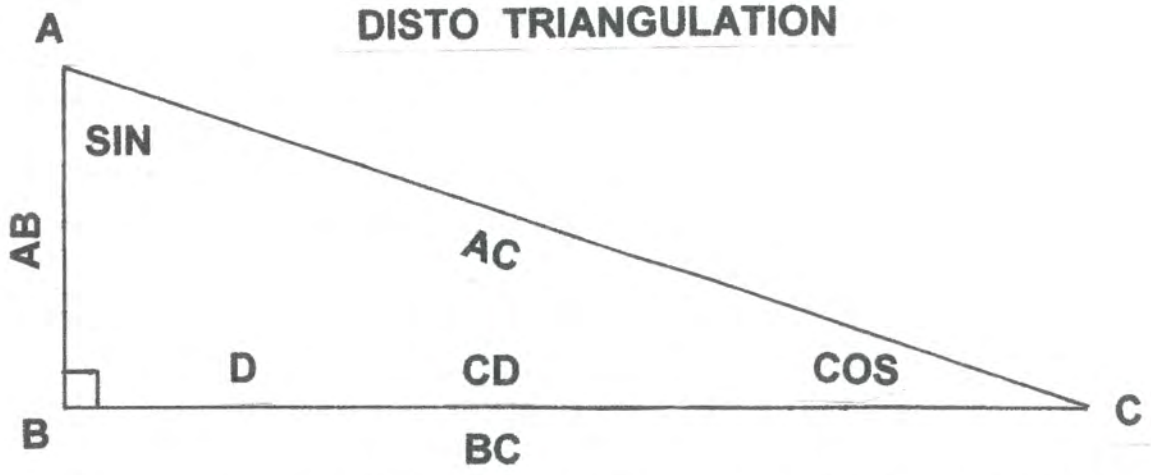
Horizontal Algorithms – Used for Transit Measuring Devices




**TRANSIT TRIANGULATION**

**A = Laser** **C = Throw**

**DISTO TRIANGULATION**




Vertical Algorithms – Used for Both Transit and Linear Measuring Devices

If the found point is the true center of the ring, it must be used. If it is not the correct distance, enter it anyhow and note it on any Record Forms. This discrepancy will not effect the actual measurement of a throw, as it is the 'constant offset' calculated into every throw. You will find that most rings are not constructed to proper specifications. If the found point is not the true center, construct a true center and permanently mark it for current (and future) use. Subtract the corrected radiuses of the respective rings, for net throw distance readings. *This net radius is the constant entered into computer.*

The laser is Point **A** of all triangles used during competition. It is the fixed vertex of all obtuse angles **BAC** calculated to determine the base line side **BC** of each triangle.

Set the prism on the center point of the throwing ring, facing the laser at Point **A**. Shoot the distance to that point and lock it in by entering it as Point **B** via the key pad. It is the fixed vertex of the primary acute angle **ABC**, used to calculate the opposite acute angle, of each new triangle. Enter distance as side **AB**. It is a fixed distance.

Set prism at a survey point along the closest sector line, facing the laser at Point **A**. Shoot the distance to that point and lock it in by entering it as Point **C** via the key pad. It is a "sample/test" vertex of the 'opposite' acute angle **ACB**. *This is the point that the field official(s) mark with the prism for each measurement **AC** during the competition.* This angle can now be calculated as the result of the previous two angles (**BAC** and **ABC**). Sides **BC** and **AC** can now also be calculated. Side **BC** is the *gross* distance of the throw. Point **C** changes - and is re-shot, and is re-calculated - with every throw.

Enter distance of the radius of the ring "Offset" as Segment **BD**, a constant subtraction from every missing base line **BC** calculation. This is either manually subtracted from each throw, or can be entered as a constant 'offset' via key pad, to amend each throw.

The internal computer will calculate the algorithms of all three (3) angles and (3) sides between Points **A, B & C**, as well as measurement **BD**, to determine the ***net* throw** - line **CD**. Computers broadcast results (**CD**) in metric, imperial, or by alternating each.

Operation -

Hammer

Shoot only the prism mark, within the sector, as determined by the field officials. Enter the reading as competition distance Point **C** on key pad. "Offset" is **-1.065m+/-mm**.

Discus

Set-up and operation are the same as at Hammer. However "Offset" is **-1.250m+/-mm**.

Javelin

Set-up and operation are the same as at Discus. However, "Offset" is **-8.0m+/-mm**.

Shot Put

Set-up and operation would be identical to that of the Hammer, if requested.

Comparison to traditional tape measurement

Controlling the angles of a stadia rod is no different than controlling a (tape) poker stick. The angles set to the vertex of the sector does not have to be as accurate with a prism. The laser reflection compensates for over ten (10) degrees of angle, in any direction, without any loss in measurement accuracy. An untrained field prism official can align it within five (5) degrees of the laser. Temperature and humidity have less effect on laser software/technology, than they physically do on fiberglass or steel measuring tapes.

# LASER MEASUREMENT PRESENTATION

**LINEAR LASER SYSTEMS:**

*Prevalent Instrument – Leica Disto E7500i (Leica Disto D5 used for training & back-up)*

Layouts -

Long Jump & Triple Jump (see photo lower right)

Stage laser tripod opposite of the wind gauge, 2m off of the runway. Recorders, clerks and event coordinator will sit in a neatly ordered row, behind the alignment of the wind gauge, so as not to interfere with the wind pattern(s). This allows easy movement to a required **20m** lines. Flight Coordinator verifies the Take-off Board and the **20m** line.

Javelin

Stage tripod on the same side of the runway as the Foul Line Judge, **8m** up the runway from the Foul Arc Line, 2m off of runway. This allows easy monitoring of flight of throw.

Shot Put

It is not necessary to use a tripod to support or station this type of laser devise. Flag off an area behind the Shot ring, of sufficient radius, for the operator to view put and then move forward, around ring, to (and from) the Stop Board, for each measurement. This allows easy monitoring of the back lip of the ring, release angle and flight of put. It may be necessary to apply layered patches of tape to the bottom of the Disto, to compensate for an unleveled angle of the top of the Stop Board, so the laser beam does not hit the ground, or aim above the target. Experiment during the venue setup.

Hammer & Discus

Front Access Cage – Stage tripod on opposite side of cage from athlete entrance/exit. Provide a carpeted (towels) path across grass, dirt or mud – so debris will not collect.
Rear Access Cage – Stage tripod on outside of cage, but adjacent the entry/exit chute. Provide a carpeted (towels) path across grass, dirt or mud – so debris will not collect.

Pole Vault

Mount the Disto vertically onto a 1.5m steel slotted and flanged box rod (Gill), designed for it. Stage on same side of the runway as the Recorder, 3-5m up the runway from the Plant Box, 2m off of the runway. This allows for easy monitoring of pole plants.

***Notes:*** SCA does not use any laser measurement for High Jump. It is not any faster. (SCA uses calibrated surveyor rods that lock into specific heights, up to 3 meters)

Instrument Setup -

General

Every application of the Disto is executed with measurements set to "base of the unit." Setting the tripod base height for the Disto must then be consistent. Extend only the 2nd section to its fullest extent. (It is the sturdiest of the sections – for stability) Tighten the rubber tip screw guards to expose the metal points to full exposure. Then use the vertical neck screw control to raise or lower the Disto shelf to a comfortable height. *DO NOT ADJUST THE TRIPOD LEGS AFTER YOU HAVE STARTED AN EVENT.*

***Notes:*** The height of the shelf does not effect the measurement accuracy of shots. (Adjusting the length of the tripod legs **will effect** the measurement accuracy)

For Jumps and Shot Put, set the viewing screen to **200%**. Weight Throw can be **100%**. For Throws, set the viewing screen to **400%**. Press Camera Icon Key and arrow "up." Verify measurements are being calculated from base of unit. See Disto icon on left. Verify measurements are being calculated in metric or imperial. See opening screen. Verify batteries are full (4 bars). See upper left corner of opening screen. Find spares.

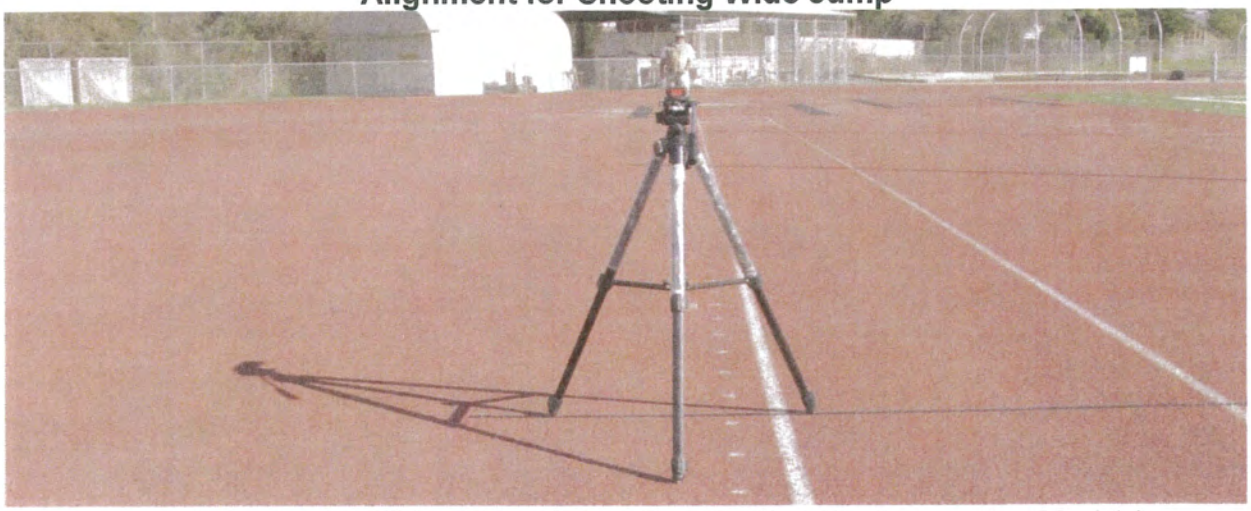
**Field Positioning for Disto to Target Measurement**

Note: Target Aligned Perpendicular to Radial Angle of Throw

**Runway Staging Set-up for Long/Triple Jump**

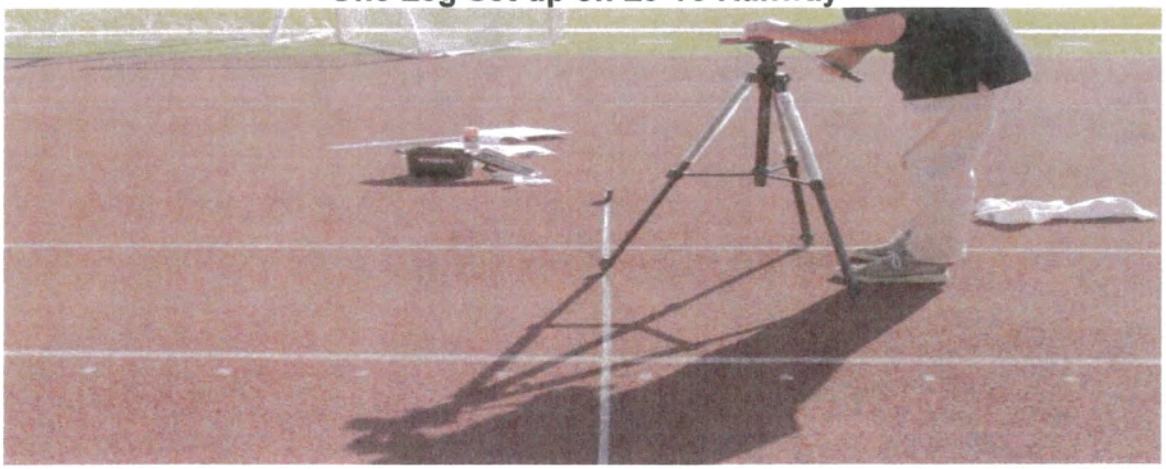
Note: Staged Opposite of Wind Gauge, Clerks and Officials – and Athletes

**Alignment for Shooting Wide Jump**



Note: Plumb of Tripod Parallel to Runway Relative to Landing Mark(s)

**One Leg Set-up on LJ-TJ Runway**



Note: Metal Tip of Tripod Leg at the extreme Front Edge of the 20m Setback Line

**Two Leg Set-up on LJ-TJ Runway**

Note: Metal Tips of Tripod Legs at the extreme Front Edge of the 20m Setback Line

**One Leg Set-up on Javelin Runway**

Note: Metal Tip of Tripod Leg Centered Atop the 8m (from Foul Line) Pin

Long Jump & Triple Jump

*One Leg Method* – (see photo left)

Place metal tip of forward leg, along the front of the **20m** setback line. Set target flush with the hairline foul line, perpendicular to the Disto. Subtract 20.0m plus the tripod plumb distance – approximately **-20.40m** – and enter that distance as an "offset" in the Disto. Shoot a measurement. The objective reading is **0.00m**. Repeat the test process twice along foul line, to determine correct final "offset" to get **0.00m**.

*Two Leg Method – Primarily Used at Grass Lined Runways* - (see photo left)

Place metal tip of each forward leg, along the front of the **20m** setback line. Set target flush with hairline foul line, perpendicular to the Disto. Subtract 20.0m plus the tripod plumb distance – approximately **-20.20m** – and enter that distance as an "offset" in the Disto. Shoot a measurement. The objective reading is **0.00m**. Repeat the test process twice along foul line, to determine correct final "offset" to get **0.00m**.

Javelin (see photo left)

Place the metal tip of forward leg, at the center of the **8m** pin. Set target flush with the hairline arc foul line, perpendicular to the Disto. Subtract 8.0m plus the tripod plumb distance – approximately **-8.40m** – and enter that distance as an "offset" in the Disto. Shoot a measurement. The objective reading is **0.00m**. Repeat the test process twice along the foul line arc, to determine correct final "offset" to get **0.00m**.

Shot Put

No preliminary measurements are necessary. The back of the Stop Board is the back of the Disto. Measurements are thus true net distances. The reading angle is minimal.

Hammer & Discus

Measure the distance from center point (vertex) of the ring to the front lip of the ring. Set target flush with a known survey point, perpendicular to the Disto. Subtract either **1.065m** or **1.25m**, plus the tripod plumb distance – approximately **-1.88m or -2.26m** – and enter that distance as an "offset" in the Disto. Place the back two legs of the tripod snug against back lip of ring. Shoot a measurement. The objective reading is the certified distance to the survey point. Repeat procedure to another known survey point. (or use certified steel tape lengths) Compare to determine correct final "offset."

Pole Vault

Measure the distance from the bottom of the Disto slot to the bottom of the flange, on the base of metal box pole. Set that distance, plus the **0.03m** thickness of the cross bar, as the "offset" in the Disto. The metal box pole length should be trimmed so that the mounted Disto camera will be at eye level, when the pole is placed in true plumb.

Typical "Off-Sets" for Disto on a TRI-100 Tripod (set at leg lengths described above)

One Leg Forward at Setback Line – **-0.40m** (long & triple jumps & javelin)

Two Legs Forward at Setback Line – **-0.20m** (long & triple jumps)

Two Legs Back to Ring Lip – **-1.88m** (hammer) **-2.26m** (discus)

- The flatter arc of the Discus ring will generate **-1cm** inconsistency in the algebra.
- Depending upon the accuracy of ring construction, some setbacks may be way off.
- These are the distances internally subtracted from the gross laser measurements.
- Laser 'shoots' Hypotenuse **AC** of (vertical) Right Triangle. Plumb of tripod is short leg **AB** of the right triangle. Internal calculator and gyroscope measure laser angle, applies Sin of angle to the ground, determines (missing) long leg distance **BC**, and then subtracts any previously entered "offset" **BD**. **Net throw** is **CD**. *See Page **10.***

- Tips – Cover the camera screen with a small, light colored towel between readings. This helps to reduce the amount of time for direct sunlight onto the camera display screen, thereby minimizing the time the screen needs to readjust from sun light. If possible, store the Disto under a canopy between flights. Heat effects battery life. Turn off camera between flights. The camera function is the greatest energy user.

Operation –

Set the clamping bracket of the Disto so that the rounded edge of the bracket faces the operator. Secure the Disto into the tripod receiver and level it to a slight negative angle. Tighten all three (3) axis knobs and shelf lever to a **snug** tension – *not* tight. ***NEVER STEP INTO A THROWING RING***. Enunciate read out as you return to start.

Long Jump & Triple Jump

Depending upon your skill level, you may use one, or two leg tips of the tripod for alignment. Make sure that alignment method is the same as when your calibrated it. As the runner passes by, enter the runway and set the tripod laterally along the **20m** line, to align parallel with their landing point in the pit. A leg may be outside of runway, on a different surface. The lateral angle of the Disto does **not** effect measurement.

Javelin

As the thrower passes by, enter the runway and make a preliminary alignment while the Javelin is still in flight. Set the forward leg tip of the tripod radially onto the **8m** pin.

Shot Put (see photo right)

After the release, observe where – laterally within the sector – the Shot lands. When you get up to the Stop Board, reference the three (3) tape marks to preliminarily orient the Disto atop of it. Hook the "tail fin" of the Disto snug against the inside radius of the Stop Board, and slide the Disto radially until the camera sights align with the target.

Hammer & Discus (& optional Shot Put) (see photo right)

Approach the back of the ring, from the outside. Drop the back two legs of the tripod into the ring. Aim the raised lead leg of the tripod, like the tip of an arrowhead pointed at the target, and slide the two dropped legs back until snug against the lip of the ring, ***MAKING SURE THE VIEW IS THROUGH THE CENTER POINT OF THE RING***. This technique reduces glare, off of the apron, into the camera lens, so it will focus faster.

Pole Vault

Approach the plant box from the runway and slide 'lip' of the Disto rod under the lip of the pit safety collar/pad, flush with the top and center of the plant box. Use the camera to find the bar, aim and shoot the crossbar. Return Standards to requested setback.

Up to 30 of the most recent readings can be recalled, in order, any time, until deleted. This feature helps confirm or correct questionable recording of a recent throw or jump.

Comparison to traditional tape measurement

Controlling the angles of an 18" x 12" target is no different than controlling a (tape) poker stick. The target offers a better frame of reference/angle/scale for determining whether two landing marks (in horizontal jumps) are equidistant from the foul board. The laser reflections compensate for over ten (10) degrees of angle, in any direction, without any loss in measurement accuracy. An untrained target official can align it within five (5) degrees. Distos have a constant readout (upper right corner) that indicates when a reading is being taken at too great of a horizontal axis angle to accurately calculate.

# LASER MEASUREMENT PRESENTATION

## Shot Put – Disto Tail Hook Positioning Against Stop Boards

**Side Angle View**

**Straight View**

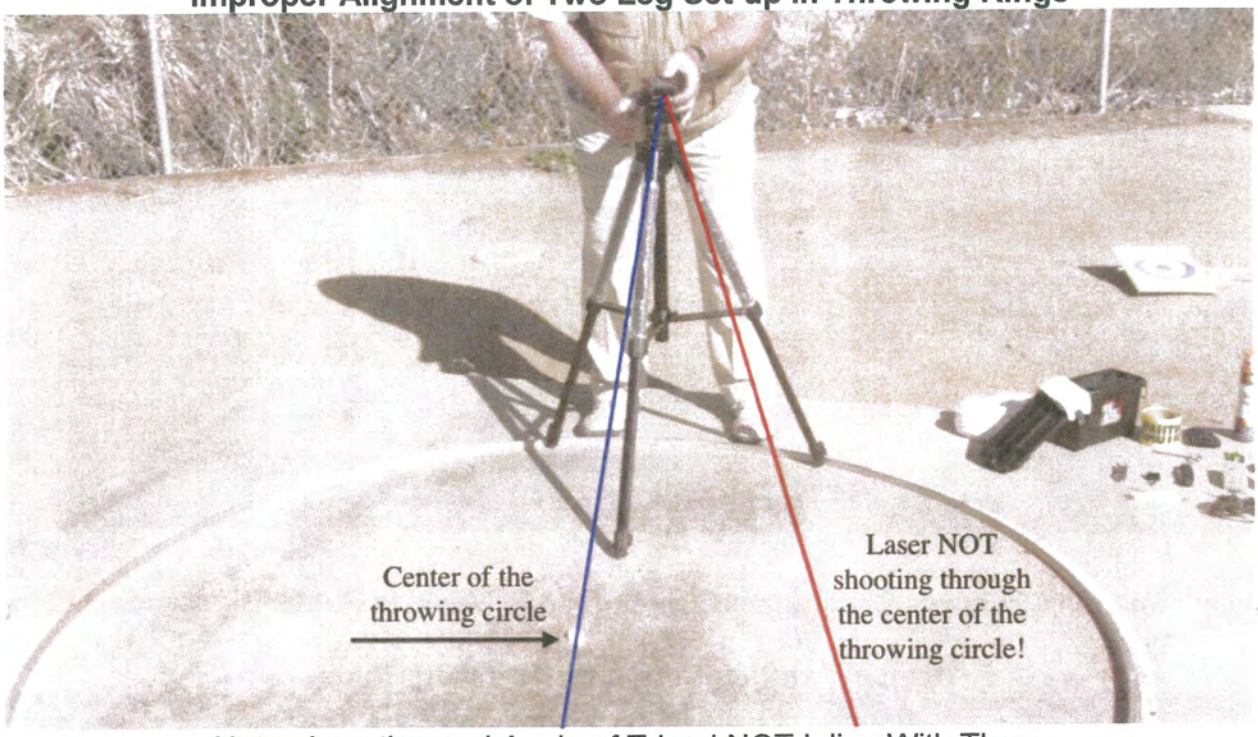
**Camera Image**

Note: Tail Hook Remains Snug Against Stop Board to Maintain Radial Directional Integrity

## Proper Two Leg Set-up in Throwing Rings


Note: Lead Tripod Leg Points Radially Through the Center of the Ring

**Improper Alignment of Two Leg Set-up in Throwing Rings**




Note: Location and Angle of Tripod NOT Inline With Throw
Do NOT Swivel Disto to Find Target – Only Swivel to "Fine Tune" View **After** Target Sited

**Disto Accessories**

Note: All Items Smaller Than the Case Should Fit Within Case – So Minimal Carry-Ins

# LASER MEASUREMENT PRESENTATION

**CARE, MAINTENANCE and ACCESSORIES:**

These are the most expensive officiating tools you will use and/or own. Make sure you add them to your insurance policy. Never leave units unattended. Take batteries out of unit if not using for 30 minutes. You should also purchase the following accessories:

- Aluminum Target 18" x 12", w/1m handle
- Ammunition Case(s) w/rubber seals
- Chemical Dry Packets (for ammo cases)
- 6 Rechargeable Batteries and Charger
- ½" - ¾" Thumb Tacks and Binder Clips
- 6-pak of ¾" heavy industrial utility Tape
- Leica L-100 Tripod and Case
- Walkie-Talkie set for 4 officials
- Mini Speaker w/wireless microphone
- 36" – 48" aluminum straight edge/ruler
- White Wash Cloths and Hand Towel
- Utility Knife w/Screw Driver & Pliers

Store lasers and accessories in a climate controlled environment. Test/use monthly!

**TRAINING and CERTIFICATION:**

Currently, there is no certification process for linear laser systems. There is for transits. Jeff has personally taught and mentored 25+ officials, from the SCA, on the uses of the Disto 5 and Disto E7500i – for his meets across Orange County. Some of those officials have, in turn, used and passed along their knowledge to other areas within SCA - as well as bought Disto units for their personal use. Doug focuses on training officials on transit systems and looks to integrate his classes into the National certification process. Both gentlemen proactively continue to train officials on vanguard uses of both systems.

**CLOSING REMARKS:**

EMJ owner/operators from the Southern California Association are exclusive providers of laser measurement for the San Diego Association, and the Olympic Training Center, Chula Vista – as well as contracted to other areas of California, Nevada and Arizona as needed. We work in conjunction with Field Lynx operators to provide real time results during any major track & field meet equipped to do so. Results can be instantaneously displayed on performance boards and internet services. The proliferation of Disto linear systems, with built-in Blue Tooth technology, allows us to relay results in similar manner.

This presentation is proprietary. These booklets have been provided as a courtesy to those certified USATF officials attending this presentation for educational purposes. A digital broadcast of this presentation will be uploaded to the following internet link:

---

Special acknowledgements: *Matt Morris,* **M²** Productions (photos); *J.R. Cusick,* facilities; *Duke Fuller and Craig Cooper,* equipment; *Robert Palmer and Jim Leahy*, hands-on sessions - for their assistance in preparing for, and assisting with this presentation.

**QUESTIONS & ANSWERS SESSION:**

- .
  - .
- .
  - .

**"HANDS ON" SESSIONS:**

**NOTES:**

(continue on back of this page)