the
Effective
Use of the
DeTerminat

Uses of the **DeTerminator**

1. Verify the location of the **PSA** of an undrilled asymmetrical ball.

Once the **PSA** (the **high RG axis**) of an undrilled asymmetrical ball is located, the location of the **low RG axis** can, also, be determined. This allows for a more accurate layout.

Uses of the **DeTerminato**

1. Verify the location of the **PSA** of an undrilled asymmetrical ball.
2. Locate the real **PSA** of a drilled ball.

Once the **PSA** (the **high RG axis**) of a drilled ball is located, the location of the **low RG axis** can, also, be determined. As a balance hole is added, the change in the real **PSA** location can be determined. This is extremely important for **drilled symmetrical balls** because of the movement of the real **PSA** by adding the balance hole or changing the size of it.

Uses of the DeTerminato

1. Verify the location of the **PSA** of an undrilled asymmetrical ball.
2. Locate the real **PSA** of a drilled ball.
3. Measure the **spin time** of the ball to determine the dynamics of the ball.

Spin Time of a **Bowling Ball**

The **spin time** of a bowling ball is the best method of measuring the strength of the **PSA** of a bowling ball.

The strength of the **PSA** measures the gyroscopic inertia of the bowling ball.

The strength of the **PSA** is affected by many factors including **RG**, total differential, intermediate differential, height of the core and all densities of the ball. Since there are so many contributing factors to the strength of the **PSA** of a bowling ball, **spin time** is one method of measuring it. It is my

Accuracy of the **Spin Time**

The accuracy of the measurement of the **spin time** of a bowling ball is affected by certain factors. They are:

1. The quality of the electrical power to the **deTerminator**.
2. The size of the bowling ball being measured.
3. The roundness of the ball being measured.

Variations in size and roundness of the ball being measured can have an effect on the spin time of the ball.

Measuring Spin Time

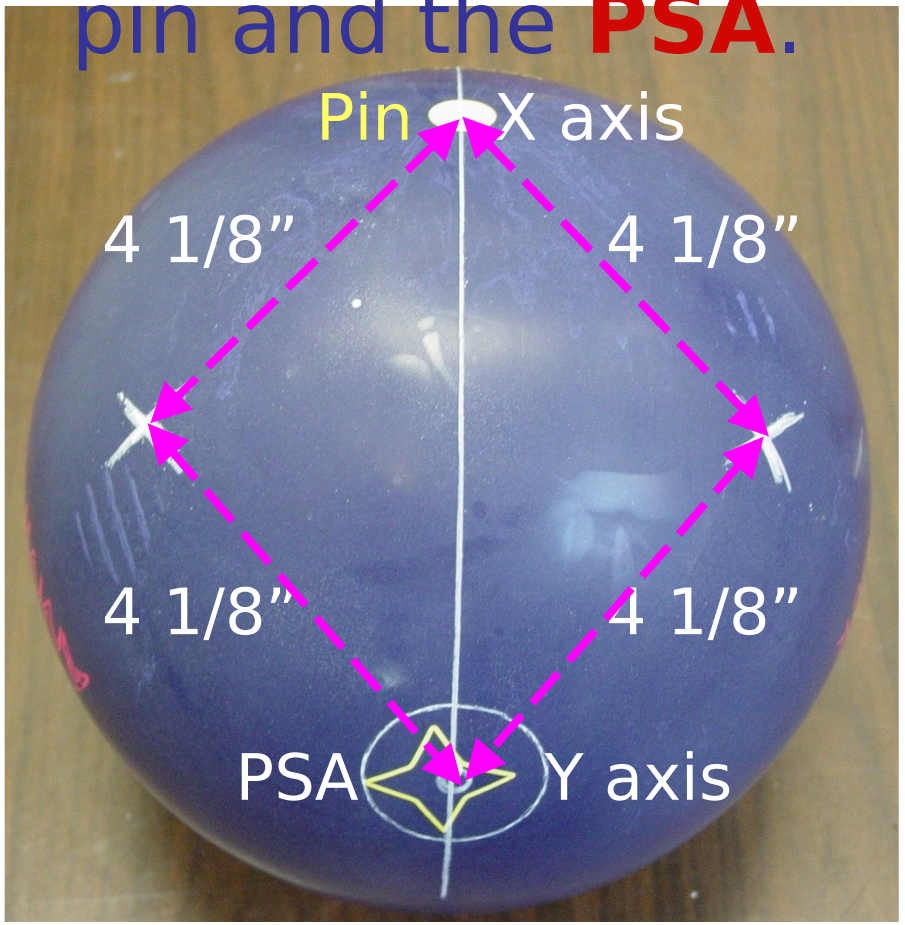
The **spin time** of a bowling ball is the time it takes for a bowling ball to reach its **PSA** when the ball is placed in a neutral position.
The neutral position is a point on the surface of the ball that is equidistant from the **x**, **y**, and **z axes** of the ball.

This is referred to as the **60 degree spin time** of a bowling ball in the ball specs.
The **60 degree spin time** of a ball measures the strength of its **PSA**.

Measuring Spin Time (cont

To measure the **60 degree spin time** of a bowling ball, mark two spots on the ball that are both 4 1/8” from both the pin and the **PSA**.

Use this mark for left handed bowlers



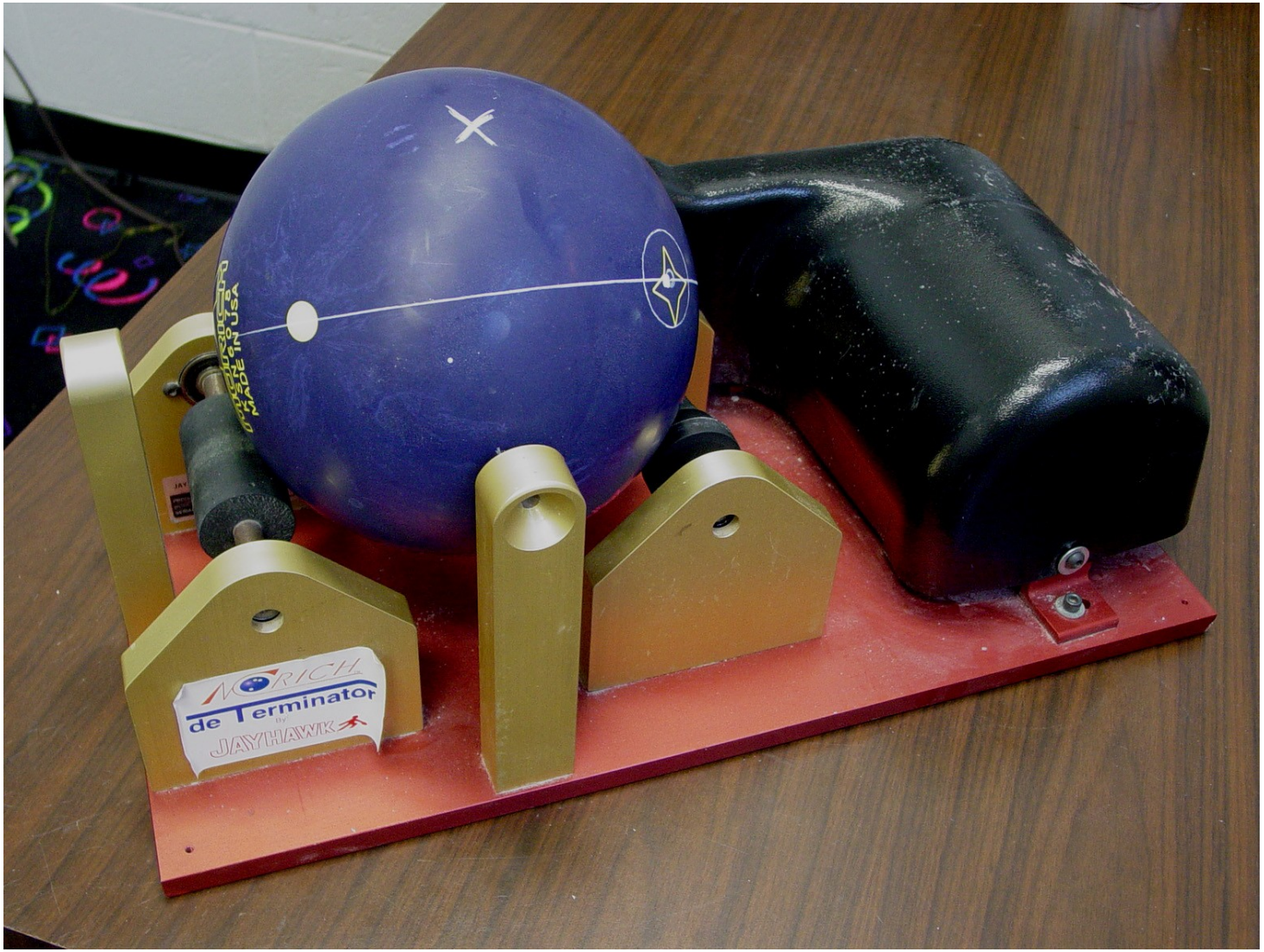
Use this mark for right handed bowlers

Measuring Spin Time (cont

To get the most realistic and accurate time, we must use the correct direction of spin, and align it properly with the force of gravity.
To accomplish this, we place the right hand spot under the alignment hole on the left column of the **deTerminator** for right handed bowlers.
To accomplish this for left handed bowlers, we place the left hand spot under the alignment hole on the right column of the **deTerminator.**

Measuring Spin Time (cont
for right handed bowlers

Measuring Spin Time (cont
for left handed bowlers

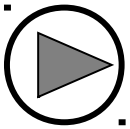


Measuring Spin Time (cont

To accurately measure the **60 degree spin time** of a bowling ball, place the ball on the **deTerminator** in the proper position for either a right or left handed bowler.
Turn on the **deTerminator** and measure the amount of time it takes to reach its **PSA**.
To obtain the most accurate result, use the average of three spins.

When recording data for publication, **MoRich** spins 6 balls three times on each side and takes the average for the spec sheet

60 Degree Spin Time

Click  to replay video

the USBC Ball Analysis Form

United States Bowling Congress

Equipment Specifications & Certifications

Ball Motion Analysis Form

"Real World Measurable Variables in the Pro Shop"

Prologue

In the fall of 2005, the USBC's Equipment Specifications and Certifications team joined up with the bowling ball manufacturers to form the Ball Task Force. In an effort to better understand ball motion and the most influential variables, this task force worked together for two and a half years to complete the Ball Motion Study phases I and II.

During this time, the USBC utilized Harry, USBC's robotic ball thrower, and Super CATS, the 23 sensor system that measures position, velocity, and vertical angles, to evaluate balls in a comprehensive manner including multiple regression analysis in order to better understand ball motion. Upon completion of the testing, several debates were settled and the results were published in early 2008.

But not every bowling center, pro shop and coach has access to all the high tech equipment used to evaluate ball motion. So, in an effort to bring the ball motion study to the bowlers, coaches, and pro shops around the world, the USBC has developed in conjunction with Mo Pinel, IBPSIA Advanced HOTS instructor and CEO of Morich, this new Ball Motion Analysis Form. Equipment was supplied by Storm Products, Inc. and Morich Enterprises during the testing used to validate this methodology.

This form affords everyone the ability to better understand a ball's dynamic properties based on a variety of factors including the flare pattern of that particular ball. The USBC graphical analysis and measured coverstock and core dynamic variables of the balls used in this testing **validated** this form, so use it with confidence!

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Ball Motion Analysis Form

Name		Ball Brand		Date	
Serial #		Ball Model		Location	
Bowler's PAP		Ball Surface		Spin Time Drilled	
Ball Layout		PAP at Release		Axis Tilt	
Actual Layout		Wt Hole		Wt Hl Loc	
Notes:					
Ball Location at Foul Line		Ball at Arrows		Ball at BreakPoint	
PAP at BP		PAP at Pins			
Axis Migration in Oil		Axis Migration in Dry		Total Axis Migration	

Pin to PAP distance at:

Release		Breakpoint		Pins	

Axis Migration Picture:

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Equipment Specifications & Certifications

Instructions for Ball Motion Analysis Form

Note: There should be **ONE** sheet per ball; each ball needs a separate testing sheet.

Information Groupings and Definitions

Bowler's Information

- Name: Write the name of the bowler.
- Bowler's PAP: The Positive Axis Point (PAP) that the bowler states is their PAP, leave blank if the bowler does not know their PAP.

Test Information

- Location: The location at which the testing takes place.
- Date: The date testing occurred

Ball Information (Information Taken from Ball to be Tested)

- Serial #: The serial # of the ball
- Ball Brand: Write the company that manufactured the ball that you are testing.
- Ball Model: The model of bowling ball being tested
- Ball Surface: The surface at which the ball currently exists while testing, if you sand or polish the ball previous to testing, please write down the new surface.
- Ball Layout: If known, write down the pre drilling technique in the boxes provided using either the Morich Dual Angle Drilling Technique or the three measurement system consisting of Pin to PAP distance, MB to PAP Distance, and Pin to VAL distance.
- Wt Hole: Diameter and depth of the weight hole, if the ball has one.
- Wt Hl Loc: The Location of the weight hole, either in coordinates from center of grip, or Morich's Gradient Line Technique.

Ball Test Data (Watch Ball Being Thrown with Bowler Lined Up to Hit the Pocket)

- Ball Location at Foul Line: Where the ball crosses the foul line
- Ball Location at Arrows: Where the ball crosses the arrows
- Ball Location at Break Point: Board at which the ball has its break point

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Instructions for Ball Motion Analysis Form Continued

Ball Test Measurements (After the Ball is Thrown)

- PAP at Release: As measured by you during this test
- Axis Tilt: Axis Tilt as measured by you
- Actual Layout: Measure the post drilling technique using the Preferred Spin Axis (PSA) as found by the deTerminator, if available.
- Spin Time Drilled: Initial spin time of the bowling ball as measured by a deTerminator using the standard 60 degree procedure
- PAP at Breakpoint: PAP measured from the last oil ring
- PAP at Pins: PAP measured from the last whole "dry oil" ring
- Axis Migration in Oil: The length from initial PAP to PAP at Break Point
- Axis Migration in Dry: The length from PAP at Break Point to PAP at Pins
- Total Axis Migration: The total length of the axis migration from PAP at Release to PAP at Pins (Axis migration in oil plus axis migration in dry)
- Distance from Pin to PAP at Release: Distance from the middle of the true pin to PAP at Release
- Distance from Pin to PAP at Breakpoint: Distance from the middle of the true pin to PAP at Break Point
- Distance from Pin to PAP at Pins: Distance from the middle of the true pin to PAP at Pins.

Axis Migration Diagram:

- Draw a picture of the axis migration path including the pin to all the PAP distances and the axis migration distances in the oil and in the dry.
- In lieu of a drawing, place a digital picture of the axis migration in the space provided. Make sure dimensions are labeled on the photo.

Thanks for your interest,

MO