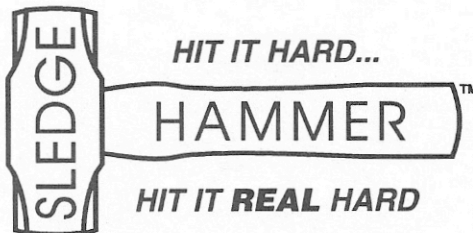
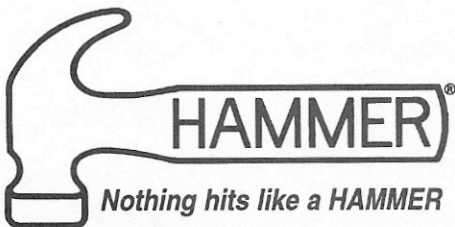


HAMMER[®]

OFFSET

TECHNOLOGY

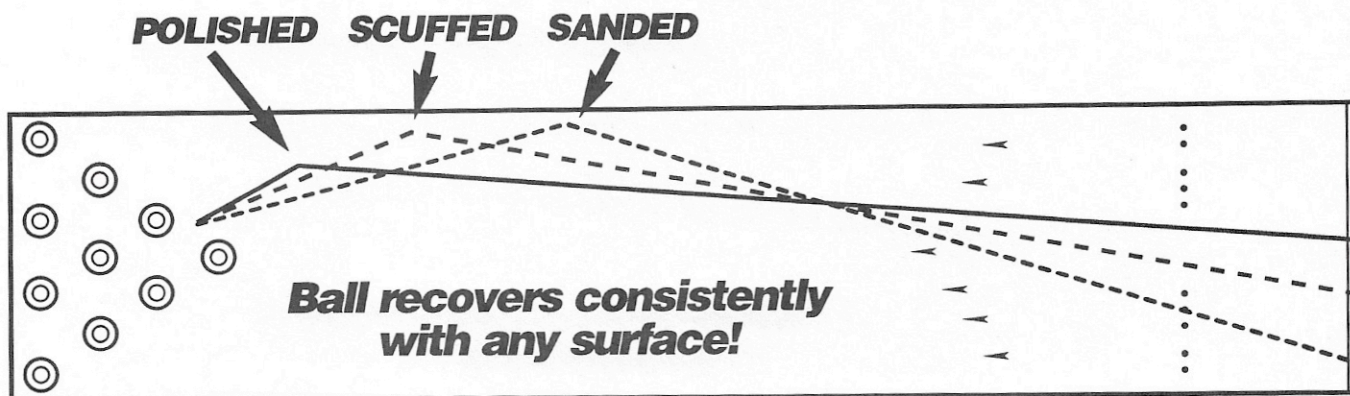


MATCHING UP WITH HAMMER

THE MOST VERSATILE HAMMER® EVER... THE NEW SLEDGE HAMMER™

WHAT ARE THE RESULTS?

As the bowler imparts the ball's forward motion during delivery, the speed rate is communicated to the interior core and cover material. The interior core will move the ball in its forward and side-ward motion, flare and rev, while the cover creates ball hook and steers the ball's direction path, hook, towards a consistent break point.

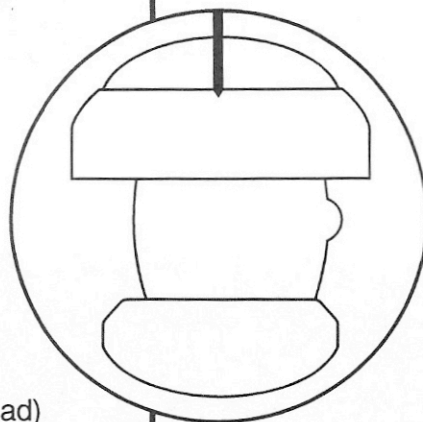


NEVER QUILTS
the ball has a great cover stock
STRONGEST COVER

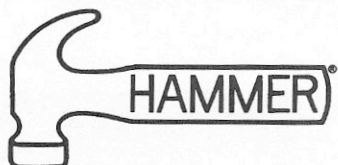
TURNS THE CORNER
the core has huge flip blocks
BIGGEST FLIP BLOCKS

REVS UP
the core has an extremely dense body
DENSEST BODY

SLEDGE HAMMER CRIMSON RED	
TECHNICAL SPECIFICATIONS	Hook Potential-Overall: <i>(Scale 1-20)</i> : 20+ Dull/14 Shiny
	Typical Length: <i>(Scale 1-20)</i> : 8 Dull/12 Shiny
	Typical Back End: <i>(Scale 1-20)</i> : 12 Dull/15 Shiny
	Radius of Gyration: : Low
	Coefficient of Friction: : High
	Hardness: <i>(D-Scale Durometer)</i> : 75-78
	Flare Potential: <i>(range/inches)</i> : 6" - 9"
	Lane Conditions: <i>(oil)</i> : Medium to Heavy
	Pin Location-Above HOT Spot: : 6 3/4"
	Pin Distance-From C.G.: <i>(average)</i> : 1" to 4.5"
	Average Top Weight Range: <i>(average)</i> : 2.0 to 4.5 ounces
	Surface Finish: : Dull (500 Grit/7447 Pad)
	Ball Color: <i>(includes Mica)</i> : Crimson Red with Silver
Sledge Hammer Logo Color: <i>(left side)</i> : Fluorescent Yellow	
Core Outline Color: <i>(right side)</i> : Fluorescent Yellow	
Pin Color: : Brite Yellow	
HOT Spot & C.G. Colors: : Fluorescent Yellow	
Available Weights/Core: : 13 - 16 lb. Quad-Density Offset	



The Quad-Density Interior Core, features one of Hammer's latest advances in Offset Technology.



Visit our web site at
www.faball.com



OFFSET HAMMER®

• BLAZING VIOLET • DEEP INDIGO • TOUR OFFSET

FEATURING **HAMMER OFFSET TECHNOLOGY**

T E C H N I C A L I N F O R M A T I O N

CORE GENERAL

Triple Density/Offset body (13-16#). Two specifically balanced flip blocks, upper and lower, attached to a dense, barrel shape core. The core is Offset in relation to the ball center and flip blocks and becomes a Third Flip Block for more ball action. Flip blocks, upper and lower, are different densities.

The core body contains a center locator pin, know as the Hot Spot or HOT, which designates the core center (widest part of the core body). In 14, 15 and 16 pound (Tour Offset 15 & 16 pound) the core shift or Offset is in the direction of the Hot Spot; reverse for 13 pound. 10, 11, and 12 pound balls use the Hammer Elliptical Lite Core. As with all Offset Hammer Balls 14, 15, and 16 pounds, the Core Body and Pin are always a constant 6 3/4 inches from each other.

COVERSTOCK

BLAZING VIOLET: Reactive NEOFLEX with mica. Factory Textured 1000 Gloss Finish.

DEEP INDIGO: Reactive NEOFLEX II with mica and Titanium Dioxide Crystals for increased traction. Factory Textured 800 Finish.

TOUR OFFSET: MICROACTIVE infused with 4X mica. Factory Polished Black Sable Finish.

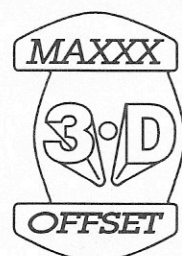
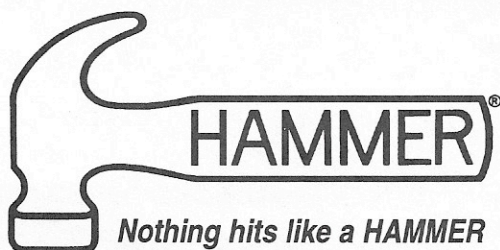
PERFORMANCE EVALUATION

BLAZING VIOLET: Creates highest rate of revolution. Rolls up heavy in front part of lane. Smooth transition from skid to hook.

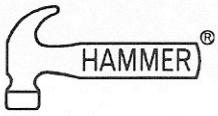
DEEP INDIGO: Designed for medium to heavy oil conditions. Early revs and extended hook. Consistency and stability in each shot.

TOUR OFFSET: Condition specific for dry heads. Generates less track flare and more forward motion. Delayed movement to pocket for optimum entry angle.

SPECIFICATIONS	BLAZING VIOLET	DEEP INDIGO	TOUR OFFSET
Hook Potential-Overall: (Scale 1-20)	19	19.5 dull / 12 shiny	17 dull / 10 shiny
Hook Potential-Back End: (Scale 1-15)	11	14.0 dull / 10 shiny	13 dull / 9 shiny
Radius of Gyration:	Low	Low	Medium
Coefficient of Friction:	High	High	High
Hardness: (D-Scale Durometer)	75-78	75-78	75-78
Flare Potential: (inches)	7" - 8"	6" - 9"	4" - 6"
Lane Conditions: (oil)	Medium to Heavy	Medium to Heavy	Medium
Pin Location-Above HOT Spot:	6 3/4"	6 3/4"	6 3/4"
Pin Distance-From C.G.:	1 to 4.5"	1 to 4.5"	1 to 4.5"
Average Top Weight Range:	2.0 to 3.25 oz	2.0 to 3.25 oz	2.0 to 4.5 oz
Surface Finish:	Factory Textured 1000 grit	Factory Textured 800 grit	Factory Polished
Ball Color: (includes Mica)	Blazing Violet	Deep Indigo Blue	Black Sable
Pin & Dual Hammer Logo Color:	Brite Yellow	Brite Yellow	Emerald & Ruby Red
Core Outline Color	Fluorescent Orange	Fluorescent Green	Fluorescent Green
HOT Spot & C.G. Colors:	Fluorescent Yellow	Fluorescent Yellow	Fluorescent Green
Available Weights/Core Type:	13 - 16 lb. 3-D Offset 10 - 12 lb. Elliptical	13 - 16 lb. 3-D Offset 10 - 12 lb. Elliptical	14, 15, 16 lb. Hammer Offset

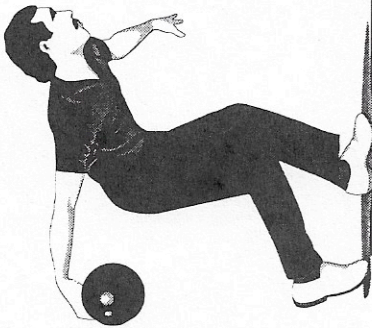


DRILLING SUGGESTIONS: Quick Reference, Precision and Full Roller Drilling. Suggestions are included with each ball. ALWAYS consult your Professional Ball Driller for the most effective fit, drilling and performance of your Offset Hammer.



Matching Up

Bowler



Foul
Line

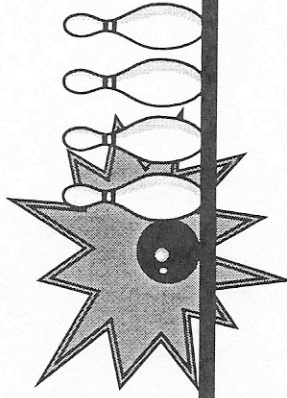
Bowling Environment

Lane Surface
Lane Condition
Bowling Ball



60 ft. ± 1/2"

Pins



Initial Ball Speed

Initial Rev Rate

Initial Axis Rotation

Rate ball loses ball speed

Rate ball revs up

Rate ball loses axis rotation

Higher Scores!

More often!

Benefits of Matching Up

HOOK

Insures proper entry angle, and rev rate.

PIN CARRY

Maximizes strike percentage.

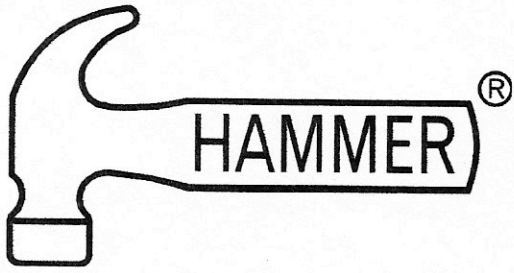
VERSATILITY

Allows surface, and static adjustments,
to adjust the break point.

MARGIN for ERROR

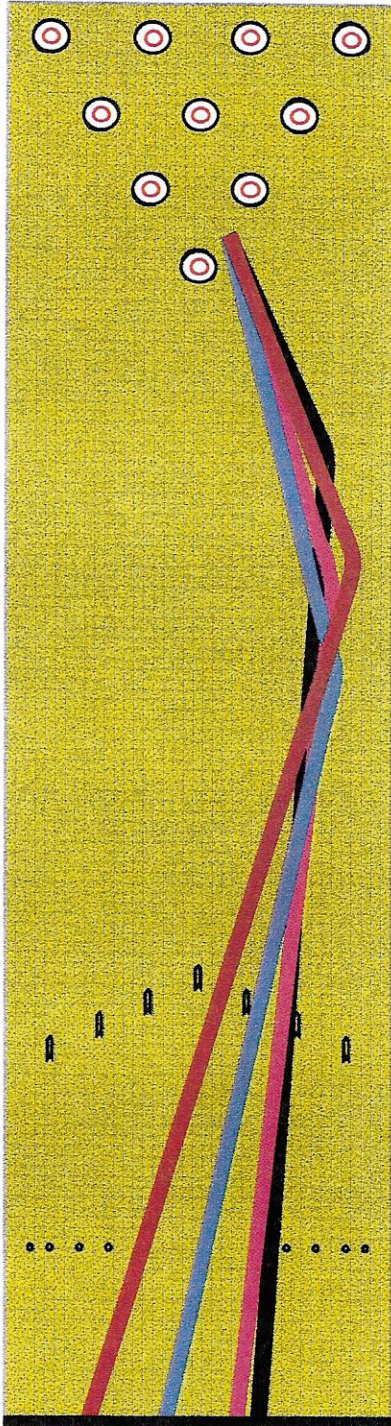
Increases area at the
break point.





H.O.T. VERSATILITY

Sledge Hammer

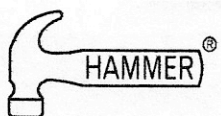


3D Maxxx

Violet HiRev

Tour Offset

Using similar layouts and surface textures.



Proper Ball Motion

Roll

- Least ball speed
- Maximum rev rate
- Least axis rotation
- Most hitting power
- Axis rotation =axis tilt

Hook

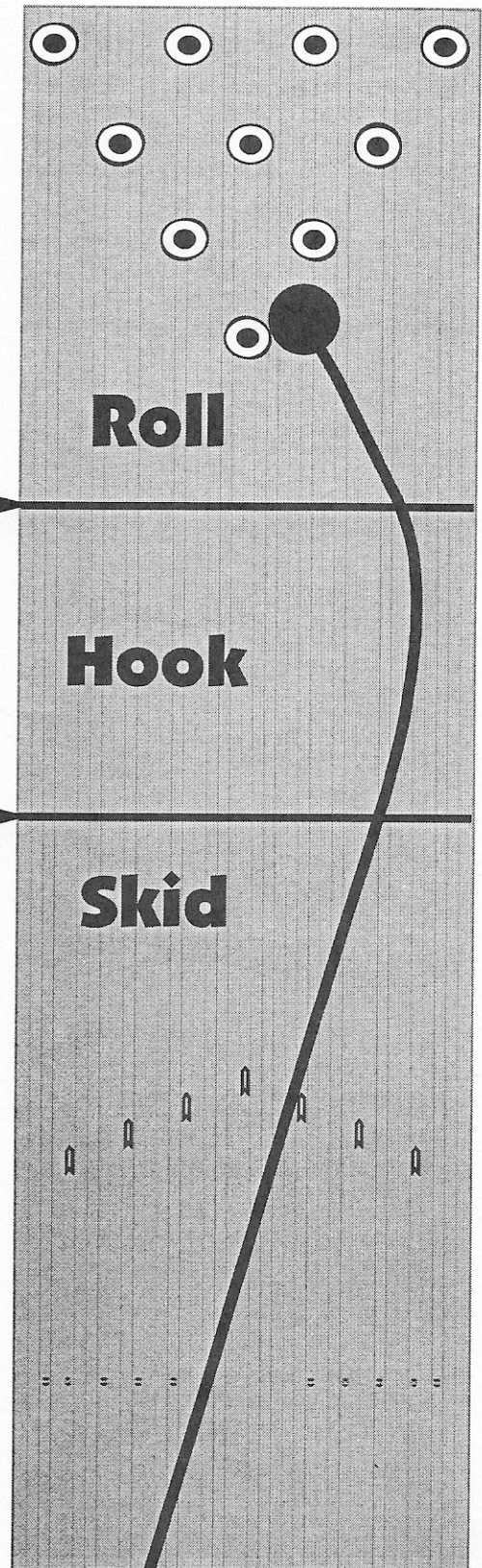
- Less ball speed
- More rev rate
- Less axis rotation
- Force created by rev rate exceeds force created by ball speed

Skid

- Highest Ball Speed
- Lowest Rev Rate
- Maximum Axis Rotation
- Force created by ball speed exceeds force created by rev rate

Max rev rate

Force from speed = force from revs



Controlling Ball Motion

The **dominant factor** in ball motion is **when**, and **where** the ball loses **ball speed** during its path down the lane.

- ◆ The **earlier** the ball loses ball speed the **sooner** it will react to the lane.
- ◆ The **later** the ball loses ball speed the **later** it will react to the lane.

Controls for Ball Motion

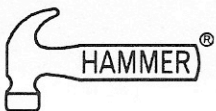
1. Initial ball speed and rate ball loses ball speed
2. Initial rev rate and rate ball revs up
3. Initial axis rotation and rate ball loses axis rotation

The Bowler Controls:

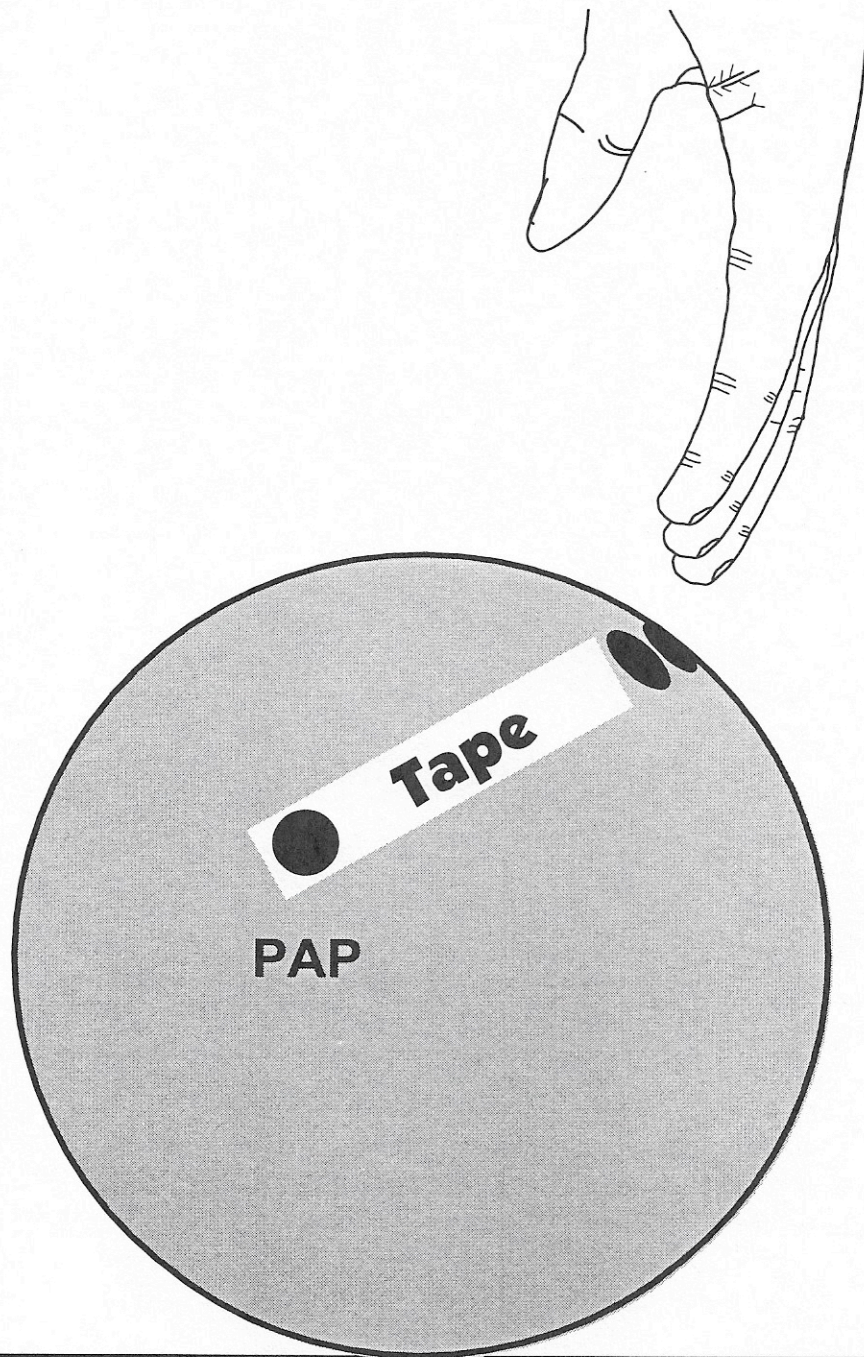
INITIAL BALL SPEED

INITIAL REV RATE

INITIAL AXIS ROTATION
and TILT



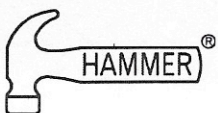
How to Measure Rev Rate



View is from behind bowler,
looking towards the pins.

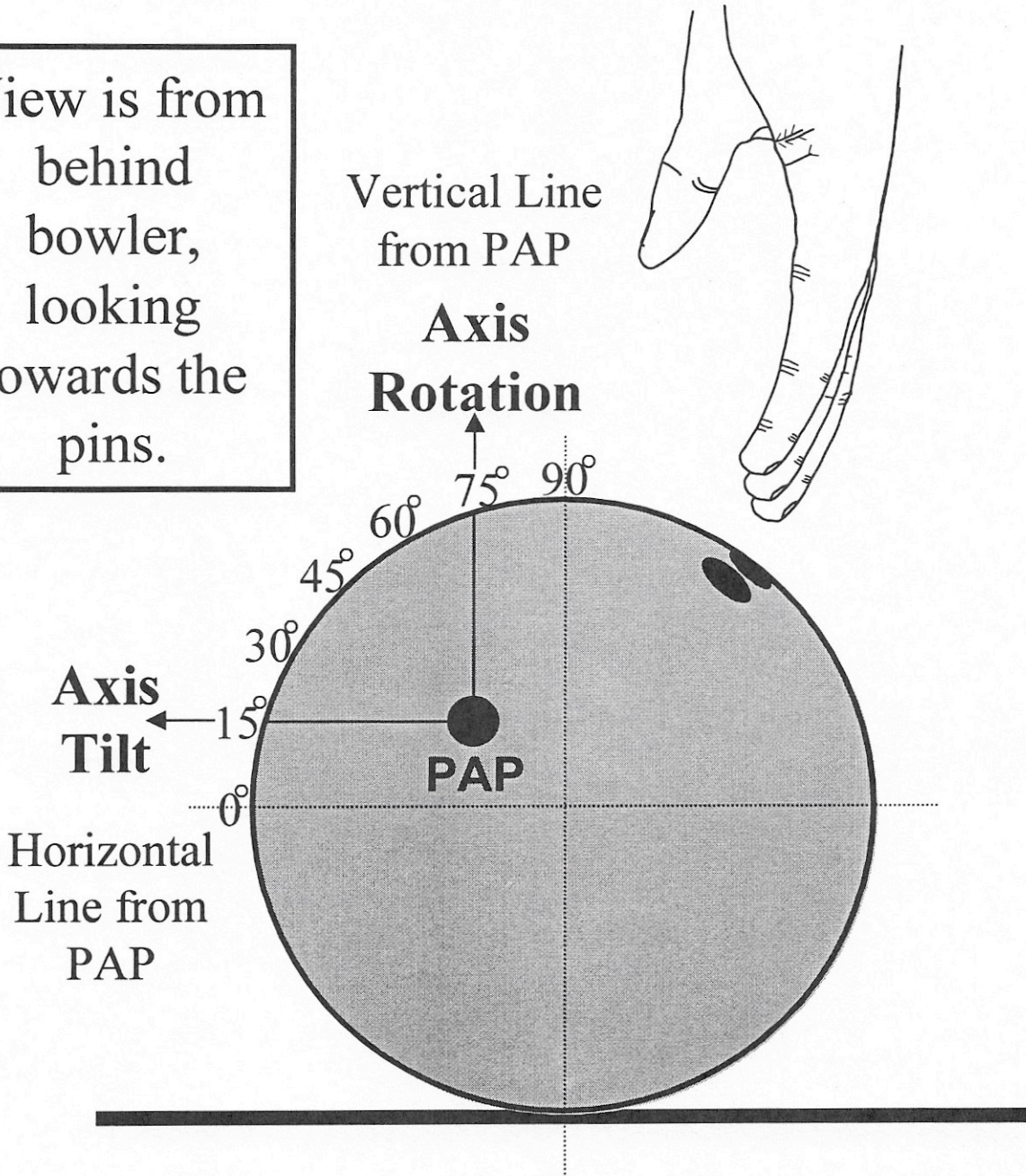
How to Measure Rev Rate

1. Video tape bowler's release from the back of the approach on the trajectory line of the ball.
2. Replay bowler's delivery on a VHS VCR with stop action and frame advance.
3. Stop the video tape at first frame after bowler's fingers leave the ball.
4. Count the number of revolutions (in clock hours) made by the tape in the next 10 video frames, e.g. 1 revolution (12 hrs.), 1 1/2 revolutions (18 hrs.), 2 revolutions (24 hrs.).
5. Multiply the number of revolutions measured in clock hours by 15 to measure the bowler's rev rate at release, e.g. 15 hrs. X 15 = 225 RPMs, 20 hrs. X 15 = 300 RPMs.



How to Measure Axis Rotation and Tilt at Release

View is from behind bowler, looking towards the pins.



Stop video tape at the first frame after the bowler's fingers leave the ball.

Bowler's Styles

STRAIGHTER PLAYER

Low rev rate
Less axis rotation and tilt

STROKER

Medium rev rate
Medium axis rotation and tilt

SPINNER

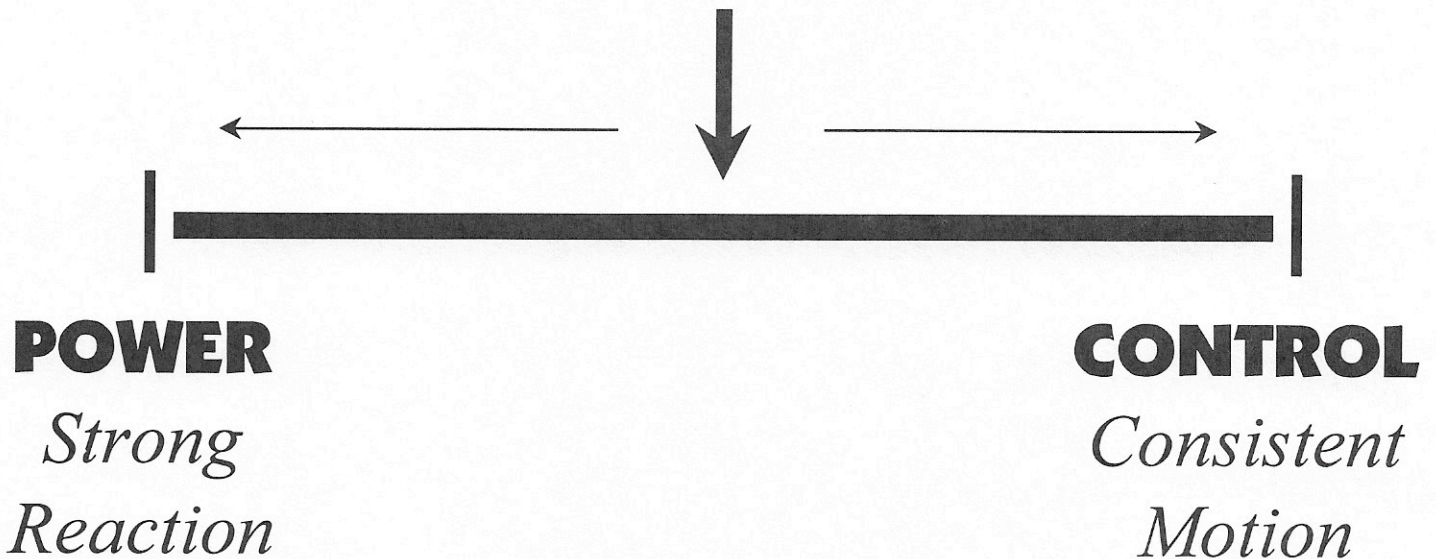
Low to medium rev rate
Large axis rotation and tilt

CRANKER

High rev rate



Power - Control Spectrum



GOAL

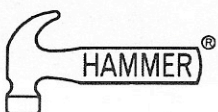
To match the **BOWLING BALL** with the proper **LAYOUT** to the **BOWLER'S STYLE** and adjust the **SURFACE** of the ball to achieve the proper **BALANCE** between **POWER** and **CONTROL** to **MAXIMIZE SCORING** on every **LANE CONDITION**.

The Bowling Ball Rolling on the Lane Controls the Rate:

The ball loses BALL SPEED

The ball REVS UP

**The ball loses
AXIS ROTATION**



Motion Potential of Bowling Balls

1. **Flare potential** (flare consistency):

<i>Small</i> (less than 3")	<i>Medium</i> (3" to 5")	<i>Large</i> (5" or more)
--------------------------------	-----------------------------	------------------------------

2. **Length potential:**

a. **Coverstock**

- i. *Very aggressive*
- ii. *Aggressive*
- iii. *Medium*
- iv. *Mild*

b. **Radius of Gyration (RG)** [Moment of inertia]

<i>Low</i> (less than 2.53")	<i>Medium</i> (2.53" to 2.60")	<i>High</i> (more than 2.60")
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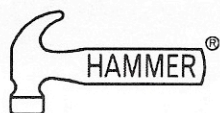
3. **Flip potential** (CORE TORQUE):

<i>Small</i>	<i>Medium</i>	<i>Large</i>
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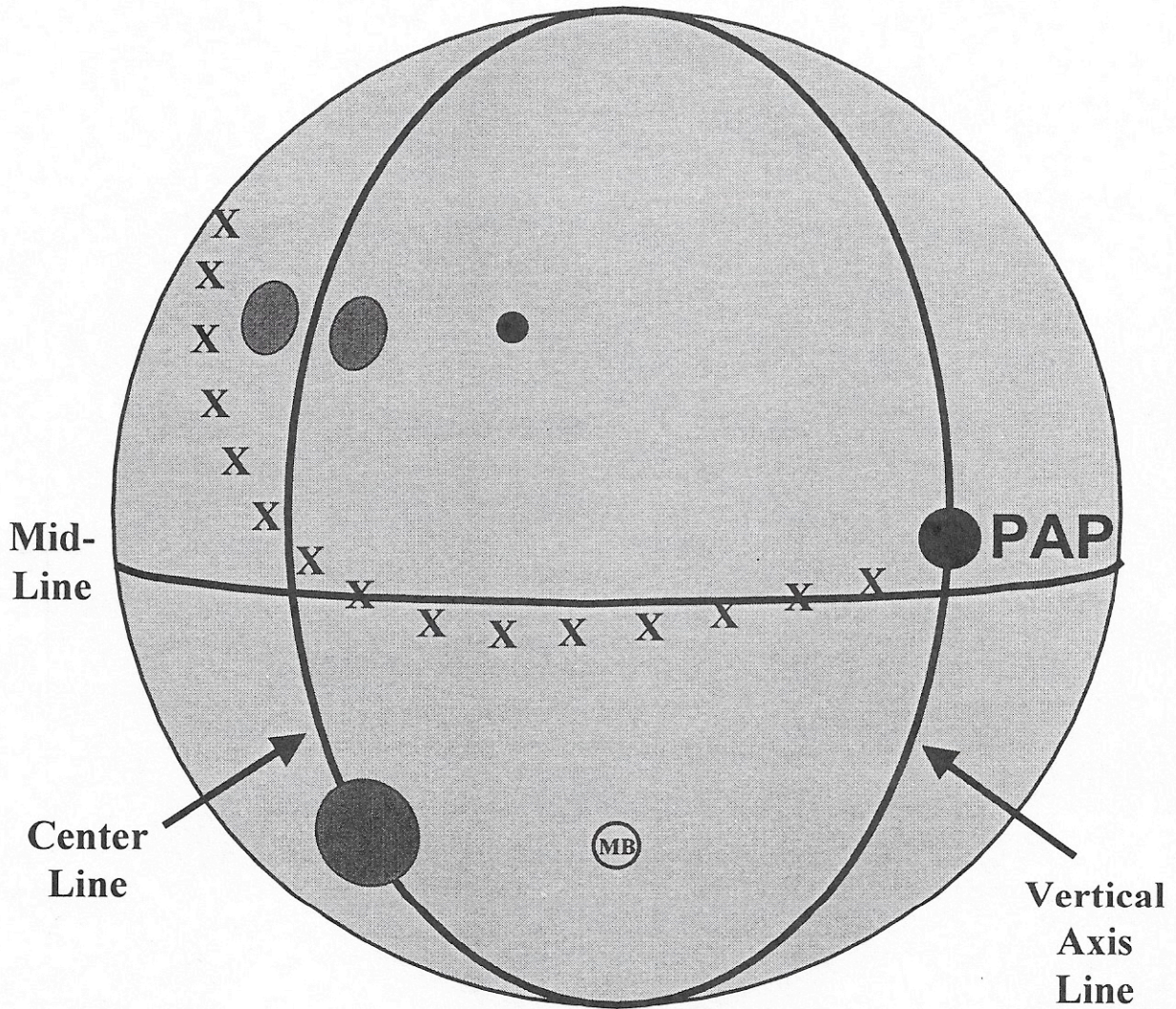
Possible Combinations

3	x	4	x	3	x	3	=	108
---	---	---	---	---	---	---	---	------------

flare	cover stock	RG	core torque
-------	-------------	----	-------------



Axis Migration (flare)



X shows the **path** of the **positive axis point** of a flaring ball as it travels down the lane.

The Effects of Bowling Balls on Ball Motion

1. **MOTION POTENTIAL:**

- a. **Flare potential:** The more the flare, the sooner the ball loses ball speed.
- b. **Cover stock:** The more aggressive the cover stock, the sooner the ball loses ball speed.
- c. **RG's:** The higher the RG's of the ball, the later the ball revs up.
- d. **Core torque:** The higher the core torque, the longer the ball retains axis rotation.



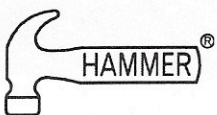
Bowling Ball Layout Techniques

1. **Pin placement:** Controls flare of bowling ball up to 100% of ball's flare potential.

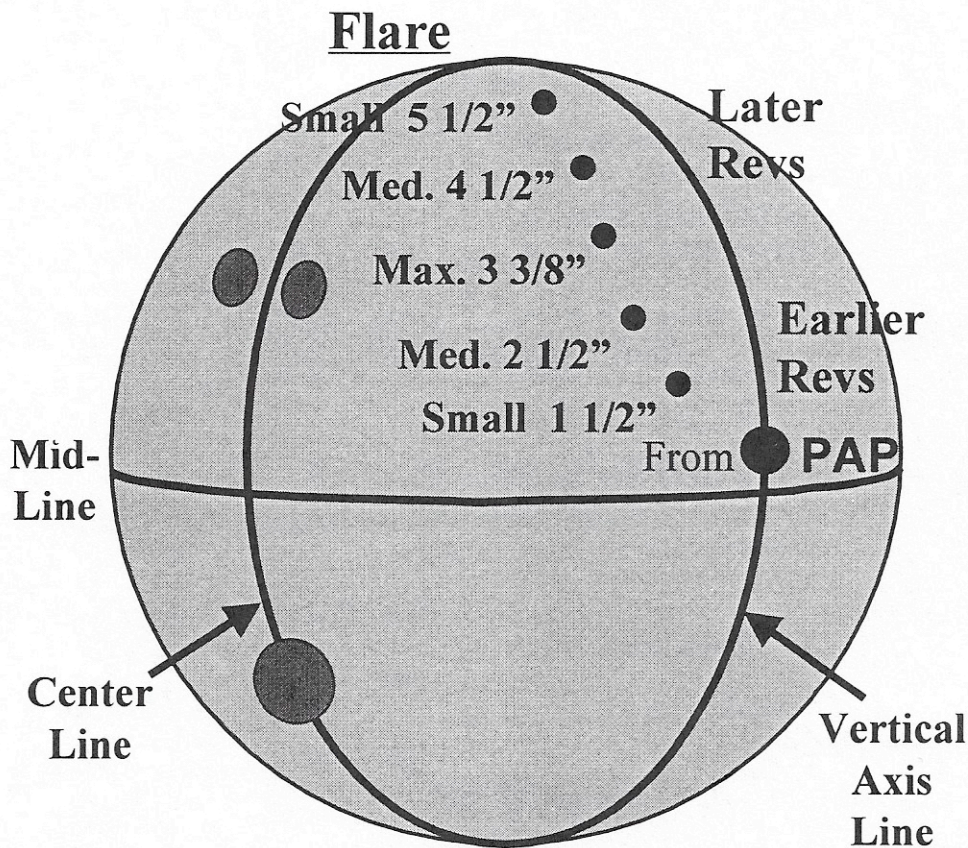
2. **Mass Bias placement:** Controls ball motion.
 - a. *Three types of ball motion:*
 - i. *Strong ball reaction*
 - ii. *Arc*
 - iii. *Hook and set* { *Controlled back end*
Instant roll

3. **Balance hole placement:** Returns ball to legal static balance and fine tunes ball motion.

4. **Static weights** (*top, side, and finger*): Fine tunes ball motion.



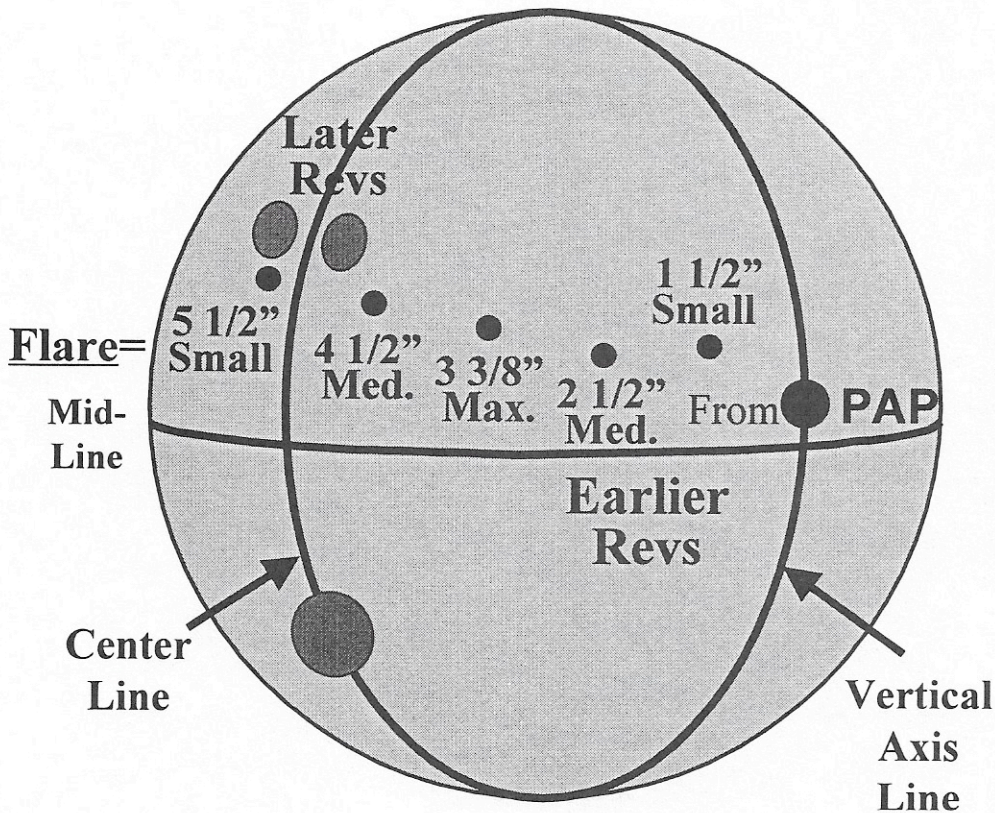
Pin Placements



Pin Dist. from PAP	Pin Dist. From VAL
5 1/2"	1 1/2"
4 1/2"	1 1/2"
3 3/8"	1 1/4"
2 1/2"	1 1/4"
1 1/2"	1"

These **pin placements** will produce ball motion with a **sharper break point** (more **reaction**, less control).

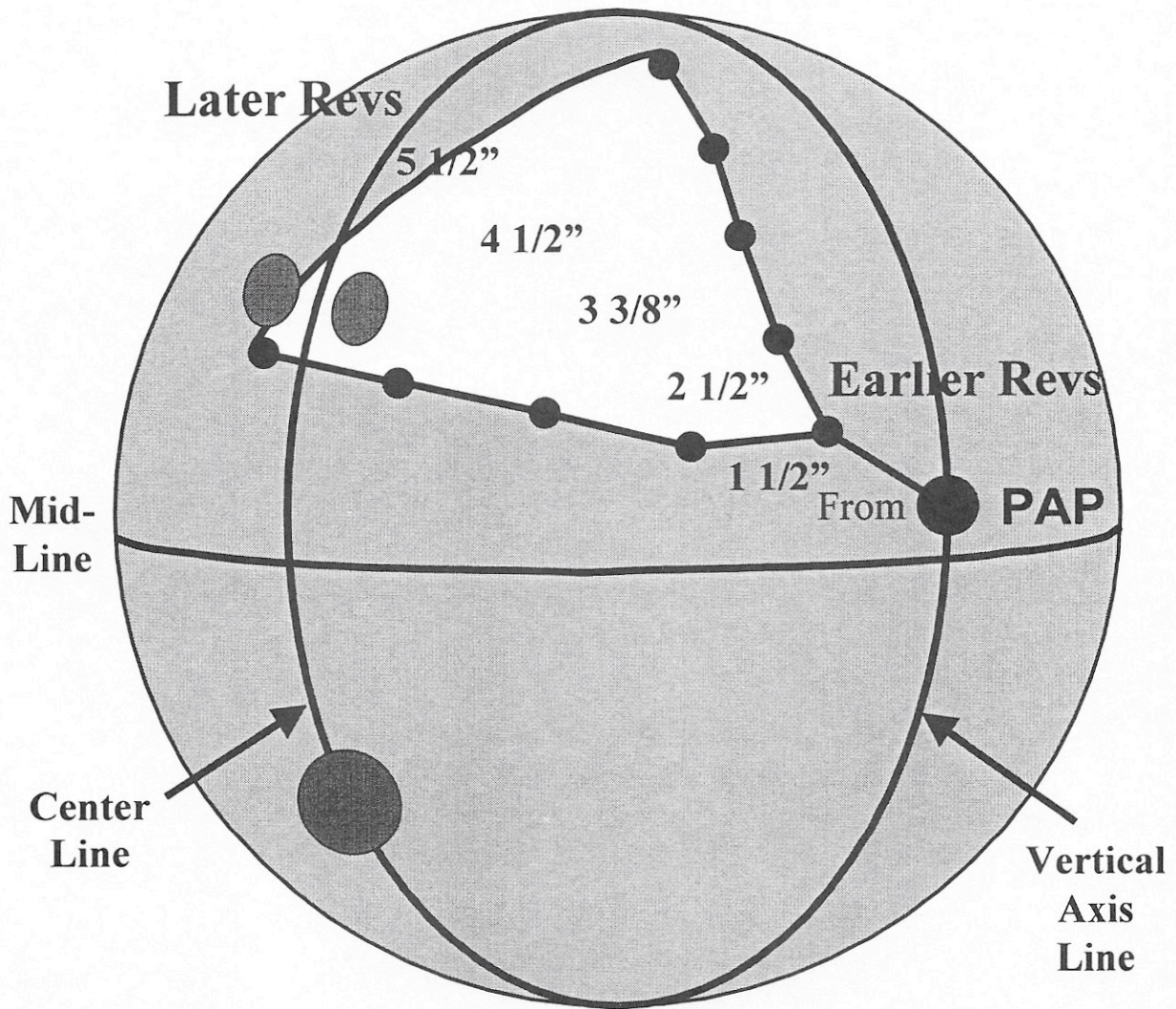
Pin Placements (cont.)



Pin Dist. from PAP	Pin Dist. From VAL
5 1/2"	5 1/8"
4 1/2"	4 1/8"
3 3/8"	3"
2 1/2"	2"
1 1/2"	1 1/4"

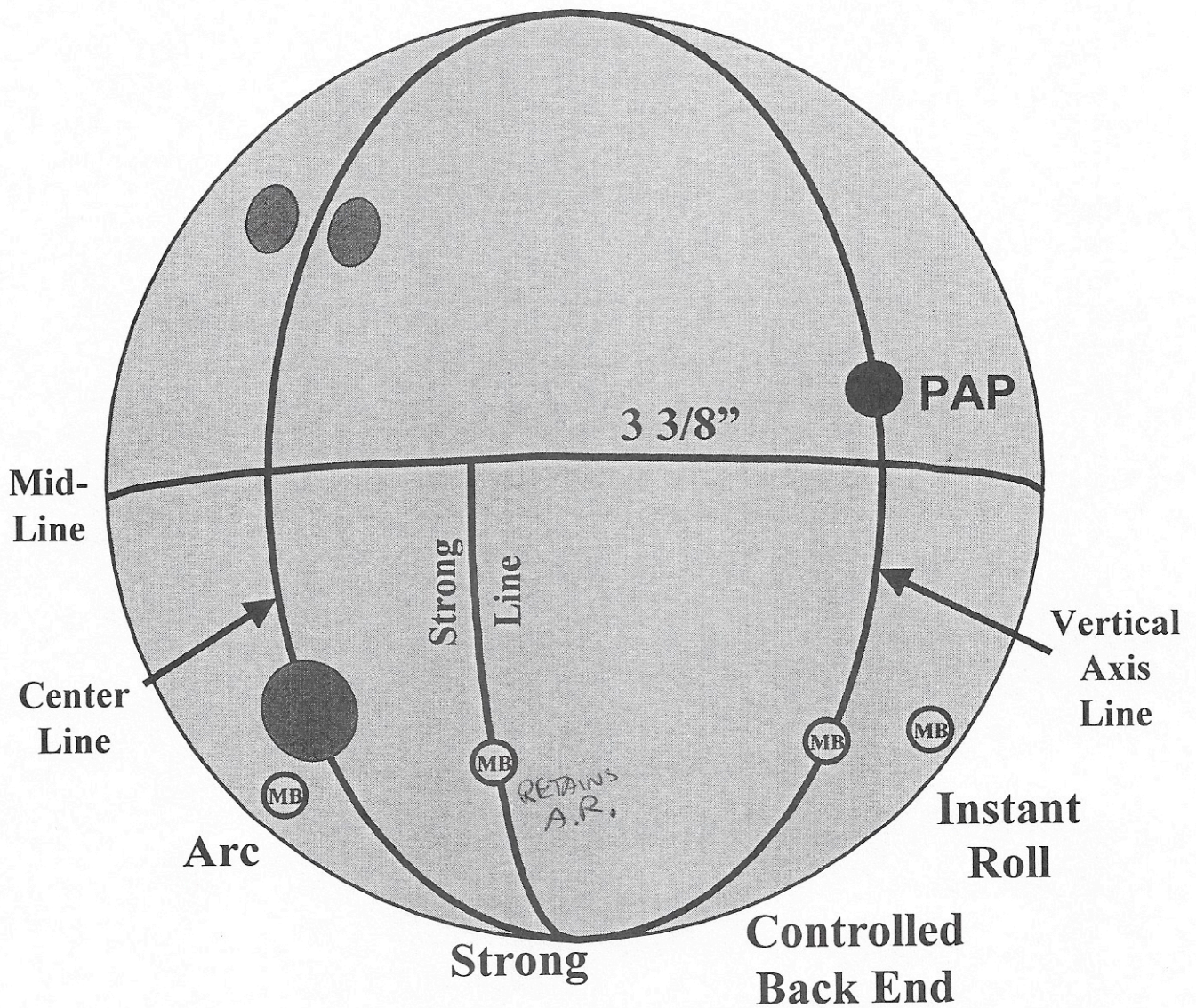
These **pin placements** will produce ball motion with an **even break point** (more **control**, less reaction).

Pin Placements (cont.)



Suggested location for pin placements

Mass Bias Placements



Ball motions created by different mass bias placements

Mass Bias Placements (cont.)

Strong ball motion: *Ball reacts violently to changes in friction (amount of oil). Ball retains axis rotation as long as possible.*

Arc motion: *Ball rolls up but does not rev up. Ball loses axis rotation sooner but revs up later.*

Hook and set motion: *Ball rolls up and revs up.*

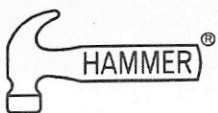
1. **Controlled back end:** *ball loses axis rotation earlier and revs up sooner*
2. **Instant roll:** *Ball loses axis rotation as soon as possible and revs up as early as possible.*



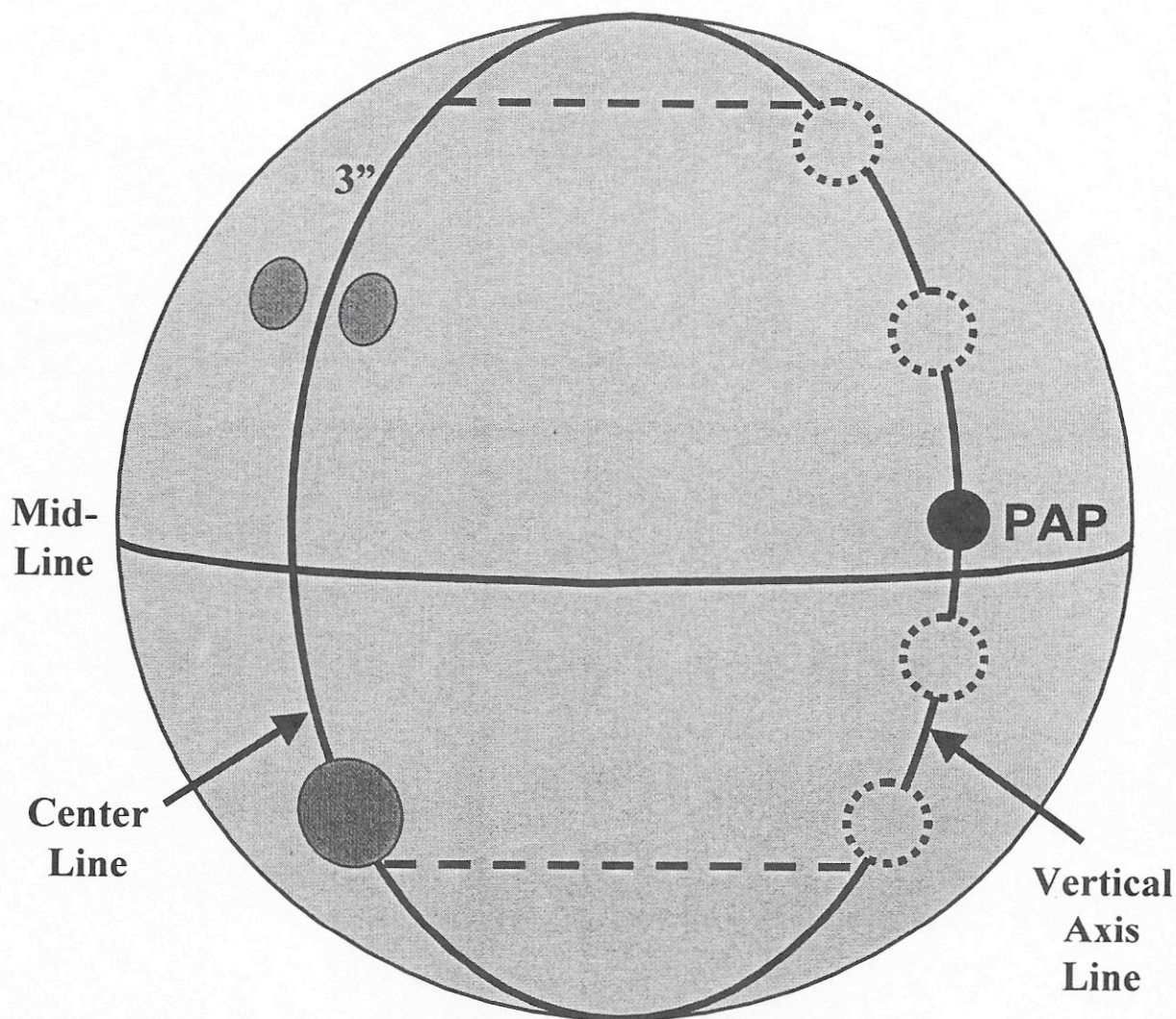
The Effects of Bowling Balls on Ball Motion (cont.)

2. **LAYOUT TECHNIQUES:**

- a. **Pin placement:** The more the flare, the sooner the ball loses ball speed.
- b. **Mass bias:** Controls the rate at which the ball revs up and loses axis rotation.
- c. **Static Weights:** Fine tunes the rate at which the ball revs up and loses axis rotation.



Balance Hole Placement



Preferred balance hole placements on the positive side of the ball are on the **vertical axis line** from 3" above the finger holes to the bottom edge of the thumb hole to avoid interfering with the ball's flare pattern.

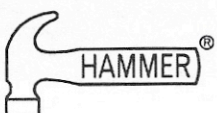
Balance Hole Placement (cont.)

Placing **balance holes** beyond the **vertical axis line** can result in the ball flaring over the balance hole. For this reason **avoid** placing **balance holes beyond** the **vertical axis line**.

Balance holes placed on the **vertical axis line** and **pitched** away from the center of the grip will **increase** the **flare potential** of the ball. Use 1" to 1 1/4" of pitch for the pitched balance hole.

Maximum size of a pitched balance hole is 1 3/16", to be ABC/WIBC legal.

Balance holes placed on the **negative side** of the ball should be placed **on** or **below** the **vertical axis line** to avoid interfering the flare pattern of the ball.



Adjusting the surface

TEXTURE

of a drilled **BALL**

matches the **BOWLER**

to the **LANE CONDITION.**



Surface Texture of Bowling Balls

Dull Surface (220 grit to 400 grit sanded):

Ball loses ball speed earliest.

Ball revs up soonest.

Ball loses axis rotation earliest.

Smooth Surface (600 grit to 1500 grit sanded):

Ball loses ball speed gradually.

Ball revs up soon.

Ball loses axis rotation slowly.

Polished Surface (ball finished with polish):

Ball retains ball speed longest.

Ball revs up later.

Ball retains axis rotation longest.

Scuffing a polished ball can be used to gain control of the break point.



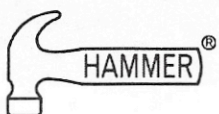
HOW TO LAYOUT

HAMMER

OFFSET

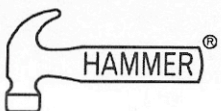
TECHNOLOGY

BOWLING BALLS



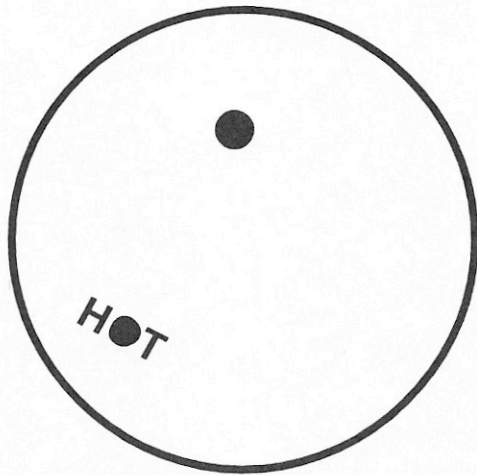
How to Layout H.O.T. Balls

1. Place the ball with the pin and the mass bias (the H.O.T. Spot) in the desired alignment.
2. Measure desired distance from pin to the vertical axis line.
3. Measure the desired distance from the mass bias (the H.O.T. spot) to the vertical axis line and draw the vertical axis line (VAL).
4. Mark the desired distance from the pin to the P.A.P. on the vertical axis line.
5. Measure back from the P.A.P. to the center of the bowler's grip using the bowler's axis coordinates.
6. Draw a line from the center of the bowler's grip through the C.G. of the ball past the vertical axis line. Place the balance hole at the intersection of this line with the vertical axis line, if necessary.

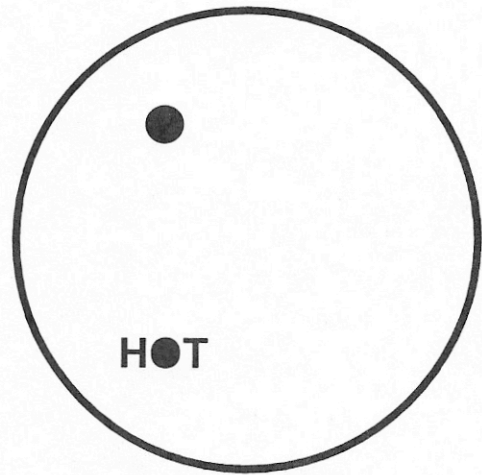


How to Layout H.O.T. Balls

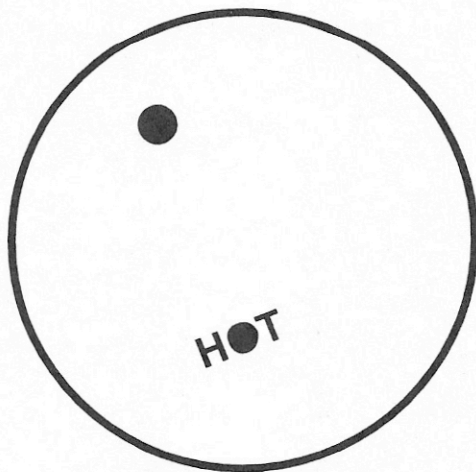
1. Place the ball with the pin and the mass bias (the H.O.T. Spot) in the desired alignment.



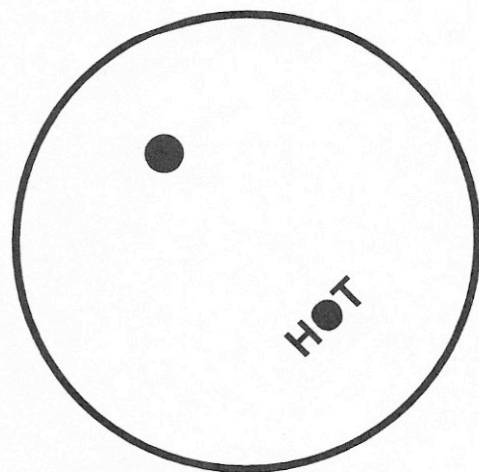
Most arc drillings



Most strong drillings



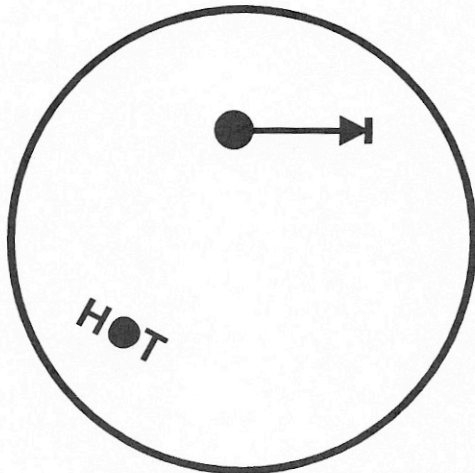
All controlled back
end drillings



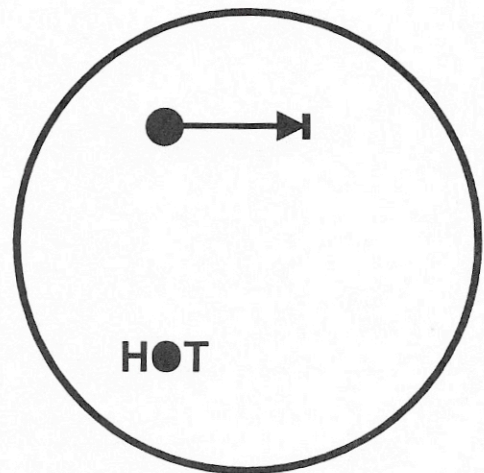
All instant roll
drillings

How to Layout H.O.T. Balls

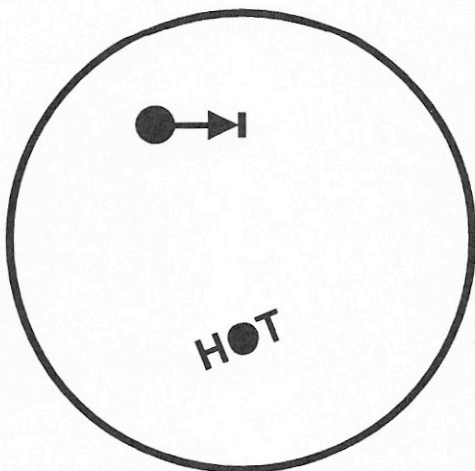
2. Measure desired distance from pin to the vertical axis line.



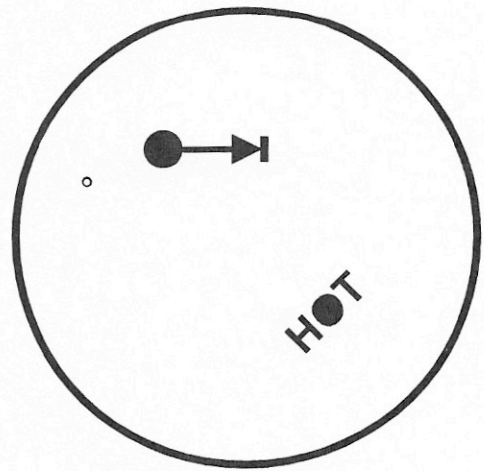
Most arc drillings



Most strong drillings



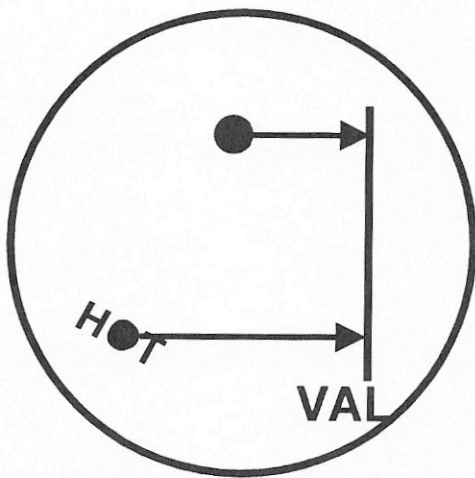
All controlled back end drillings



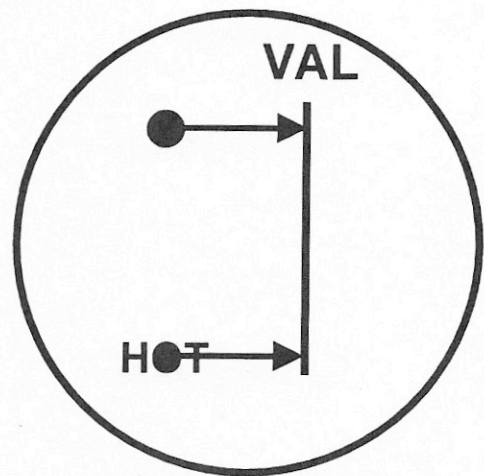
All instant roll drillings

How to Layout H.O.T. Balls

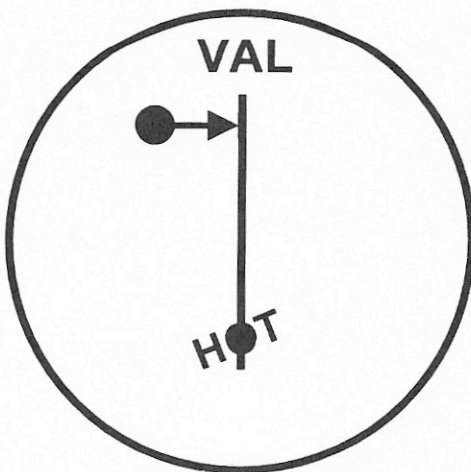
3. Measure the desired distance from the mass bias (the H.O.T. spot) to the vertical axis line and draw the vertical axis line (VAL).



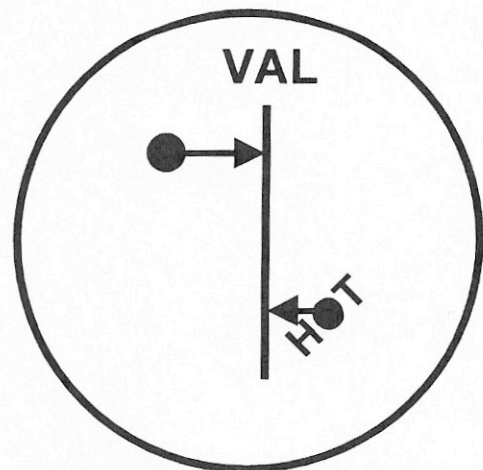
Most arc drillings



Most strong drillings



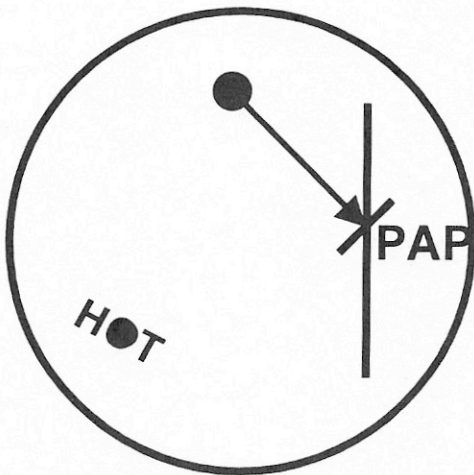
All controlled back end drillings



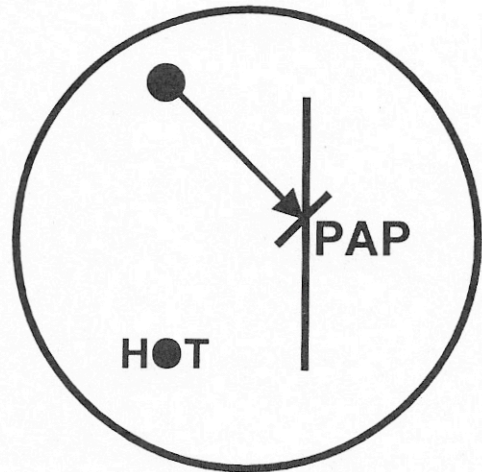
All instant roll drillings

How to Layout H.O.T. Balls

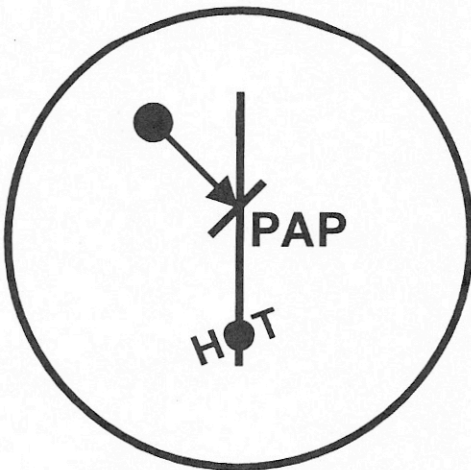
4. Mark the desired distance from the pin to the positive axis point (PAP) on the vertical axis line.



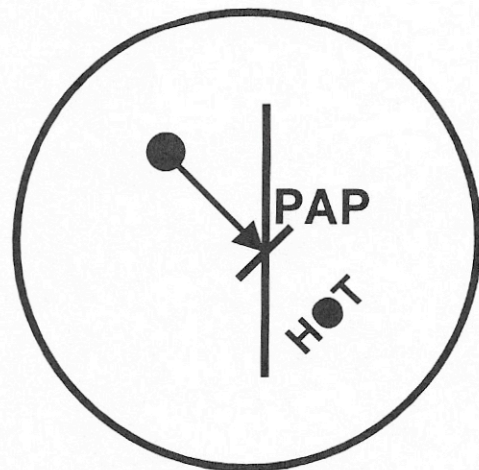
Most arc drillings



Most strong drillings



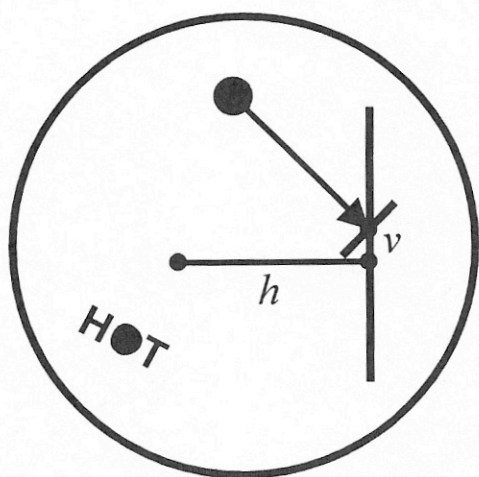
All controlled back end drillings



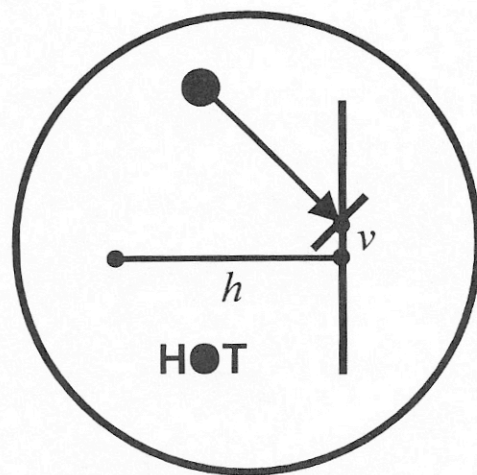
All instant roll drillings

How to Layout H.O.T. Balls

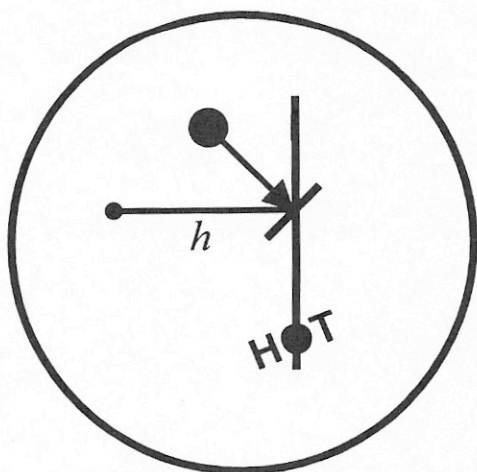
5. Measure back from the PAP to the center of the bowler's grip using the bowler's axis coordinates.



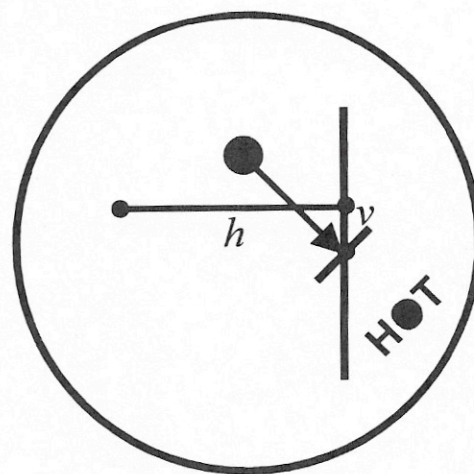
Most arc drillings



Most strong drillings



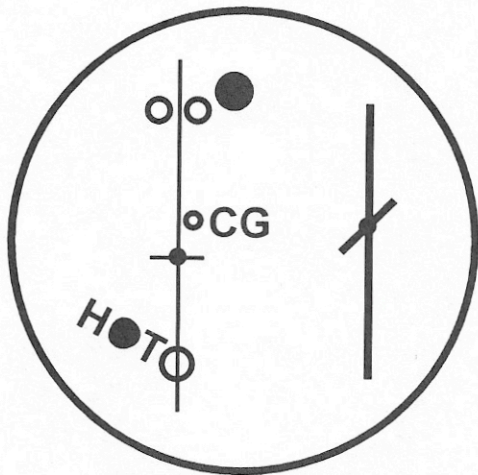
All controlled back end drillings



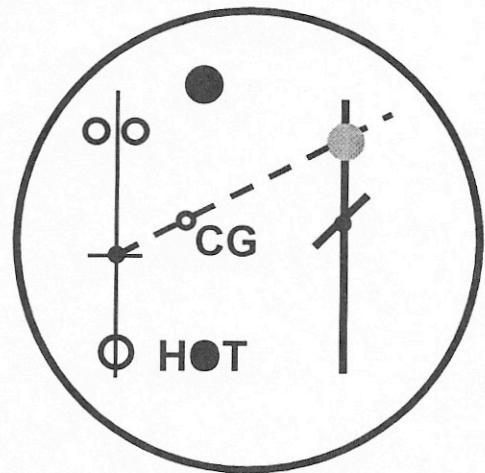
All instant roll drillings

How to Layout H.O.T. Balls

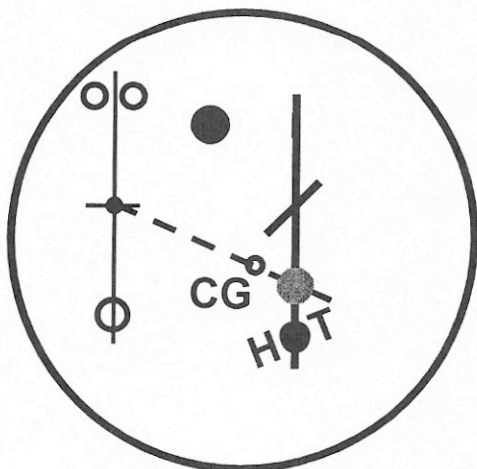
6. Draw a line from the center of the bowler's grip through the CG of the ball past the vertical axis line. Place the balance hole at the intersection of this line with the vertical axis line, if necessary. (CG distance from pin will effect balance hole position)



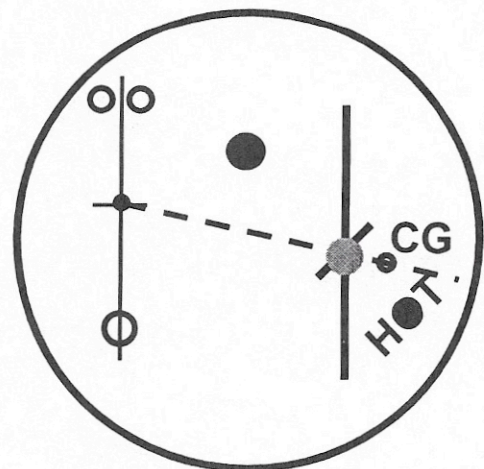
Most arc drillings
(no hole required)



Most strong drillings



All controlled back
end drillings



All instant roll
drillings

HOW TO

PLAY

THE MODERN

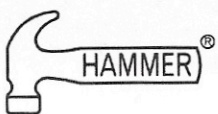
BOWLING GAME

EFFECTIVELY



The Rules for Reading Ball Reaction

- 1. A player cannot out execute bad ball reaction.*
- 2. It's more important where a ball hooks than how much it hooks.*
- 3. On most lane conditions, it is more important that a player's feet are in the right place than to hit the exact target.*

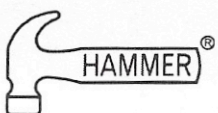


The Correct Outlook for the Contemporary Game

1. **What shot am I going to play?**

2. **What ball am I going to use?**
(for the shot I am going to play)

3. **Good execution**
(basic fundamentals using biomechanical tools)



What Shot am I Going to Play?

1. **Feet and target in line:**

- a. *Ball trajectory more parallel to boards.*
- b. *Lay down area more in line with target.*

2. **Feet and target separated:**

- a. *Ball trajectory away from the headpin.*
- b. *Lay down area inside of target.*

3. **Break point:**

- a. *Ball hooking at break point.*
- b. *Ball rolling up at break point.*
- c. *Combination of hook/roll at break point.*
- d. *Gradual hook at break point.*



What Ball am I Going to Use?

1. **Feet and target in line:**

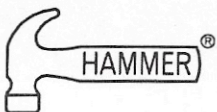
- a. *Less track flare*
- b. *Arc drilling or roll drilling*
- c. *Less static weights*
- d. *Less surface texture*

2. **Feet and target separated:**

- a. *More track flare*
- b. *Stronger drillings*
- c. *More static imbalance (positive weights)*
- d. *More surface texture*

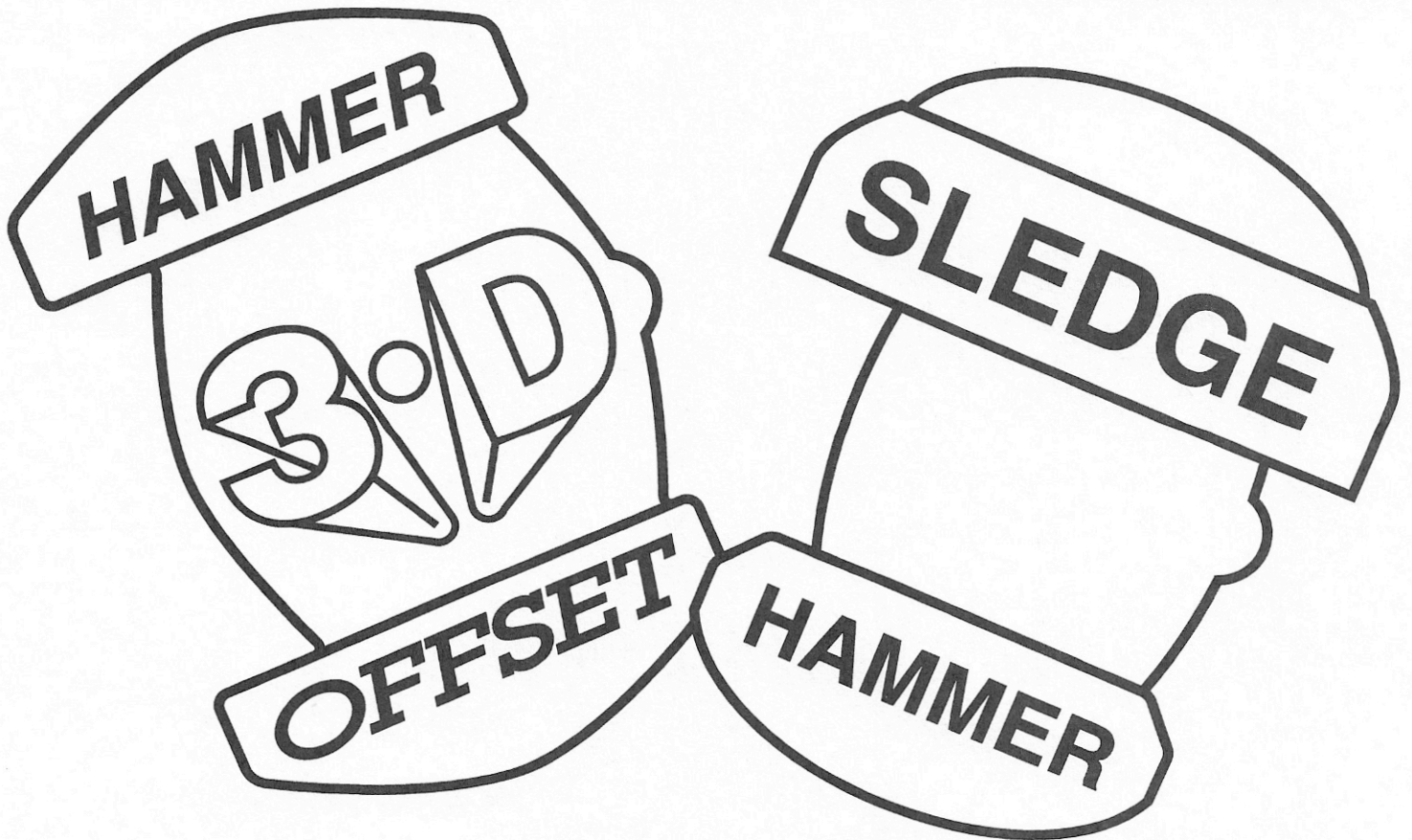
3. **Break point:**

- a. **Hook:** Strong drillings to retain axis rotation and axis tilt
- b. **Roll up:** Roll drillings to lose axis rotation and tilt early
- c. **Combination hook/roll:** Hook and set drillings (Distinct break point)
- d. **Gradual hook:** Arc drillings to smooth out transition from skid to hook to roll

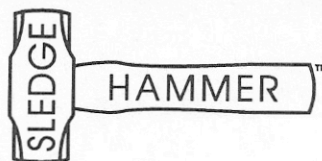
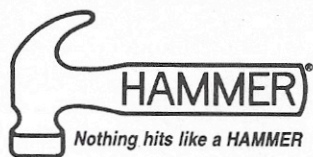


HAMMER[®] DRILLING SUGGESTIONS

PRECISION, QUICK REFERENCE, FULL ROLLER
FOR SLEDGE HAMMER™ & 3-D OFFSET HAMMER BALLS

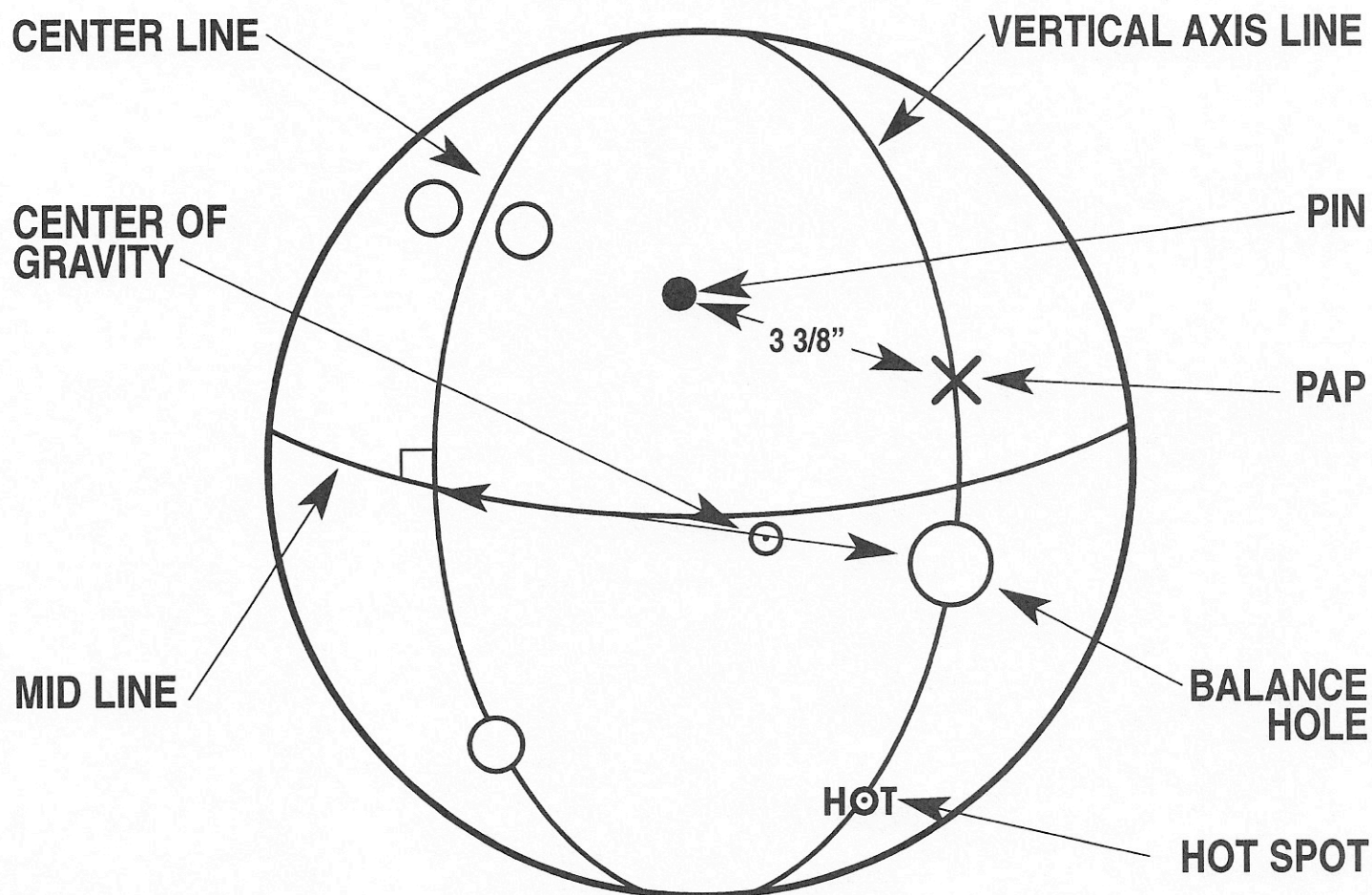


MATCHING UP WITH HAMMER



MATCHING UP WITH HAMMER®

FEATURING **HAMMER OFFSET TECHNOLOGY**



DESIRED REACTION: Large flare, large hook, controlled back end.

LANE CONDITION: Medium to heavy oil with carry down.

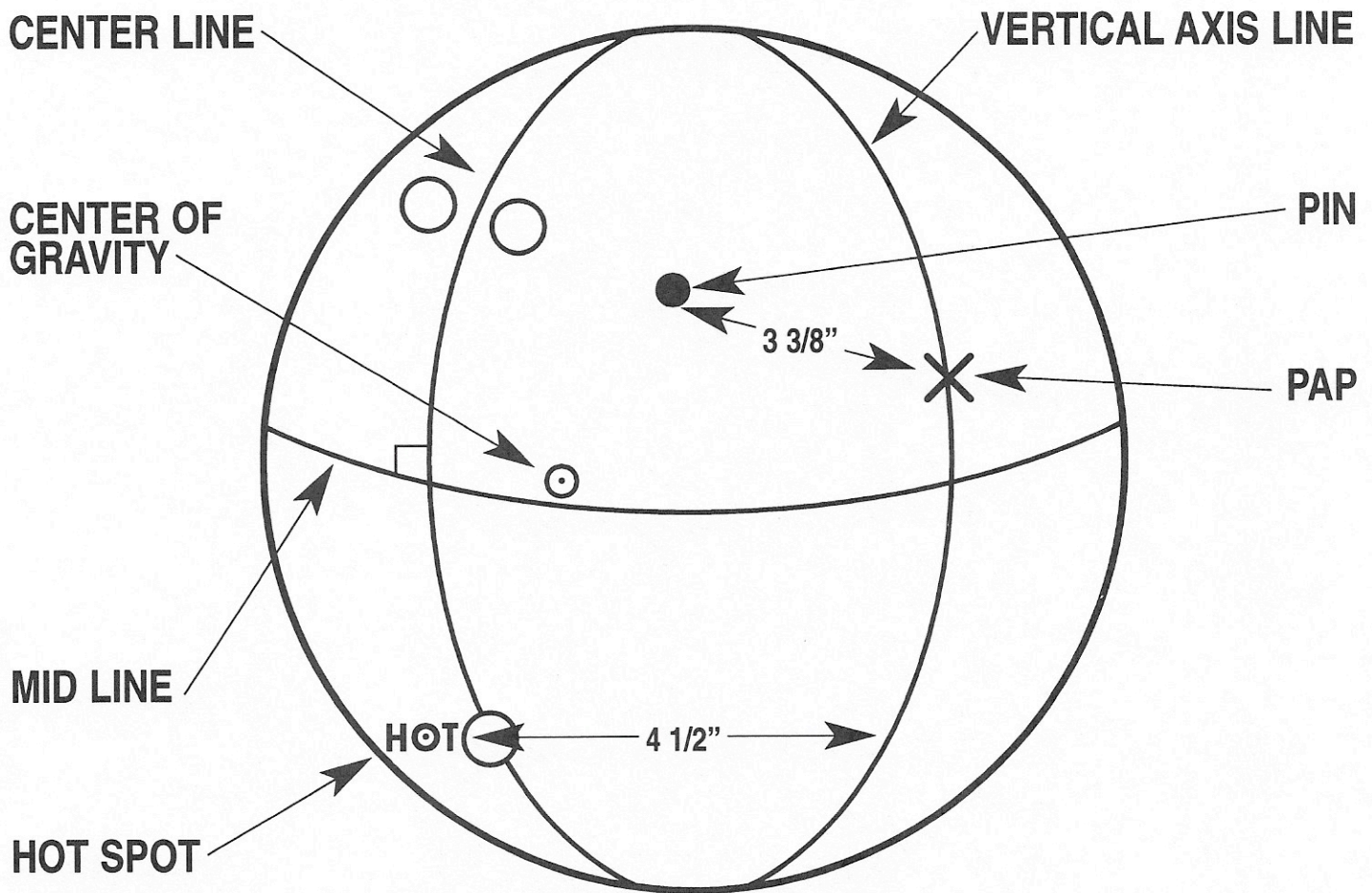
PIN PLACEMENT: 3 3/8" from P.A.P. (use ball with pin 1" - 4" out and less than 3 ounces top weight).

HOT SPOT PLACEMENT: Position Hot Spot on the vertical axis line.

This drilling will result in a more controlled back end by generating heavy forward roll from the break point to the pins. Great for low track players.

MATCHING UP WITH HAMMER®

FEATURING **HAMMER OFFSET TECHNOLOGY**



DESIRED REACTION: Large flare, large hook, smooth arc.

LANE CONDITION: Medium to heavy oil with a hooking ball track.

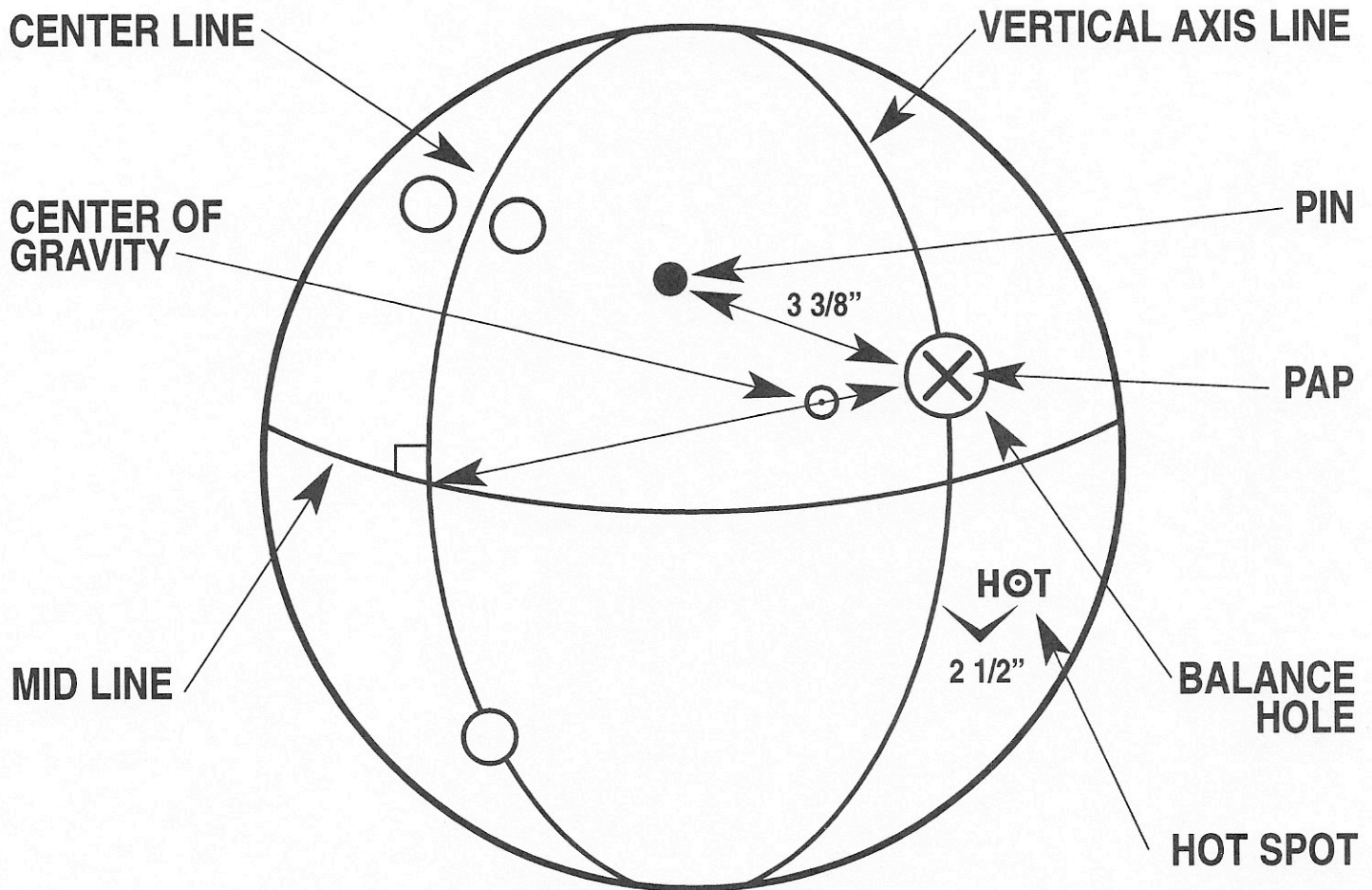
PIN PLACEMENT: 3 3/8" from P.A.P. (use ball with pin 1" - 4" out).

HOT SPOT PLACEMENT: 4 1/2" left of vertical axis line. Hot Spot will be left of the center line.

This drilling produces a smooth arc with a large flare pattern.
Not recommended for an inside line.

MATCHING UP WITH HAMMER®

FEATURING **HAMMER OFFSET TECHNOLOGY**



DESIRED REACTION: Large flare, large hook, early revs, most controllable break point.

LANE CONDITION: Heavier oil with wet/dry lane conditions or heavy carry down.

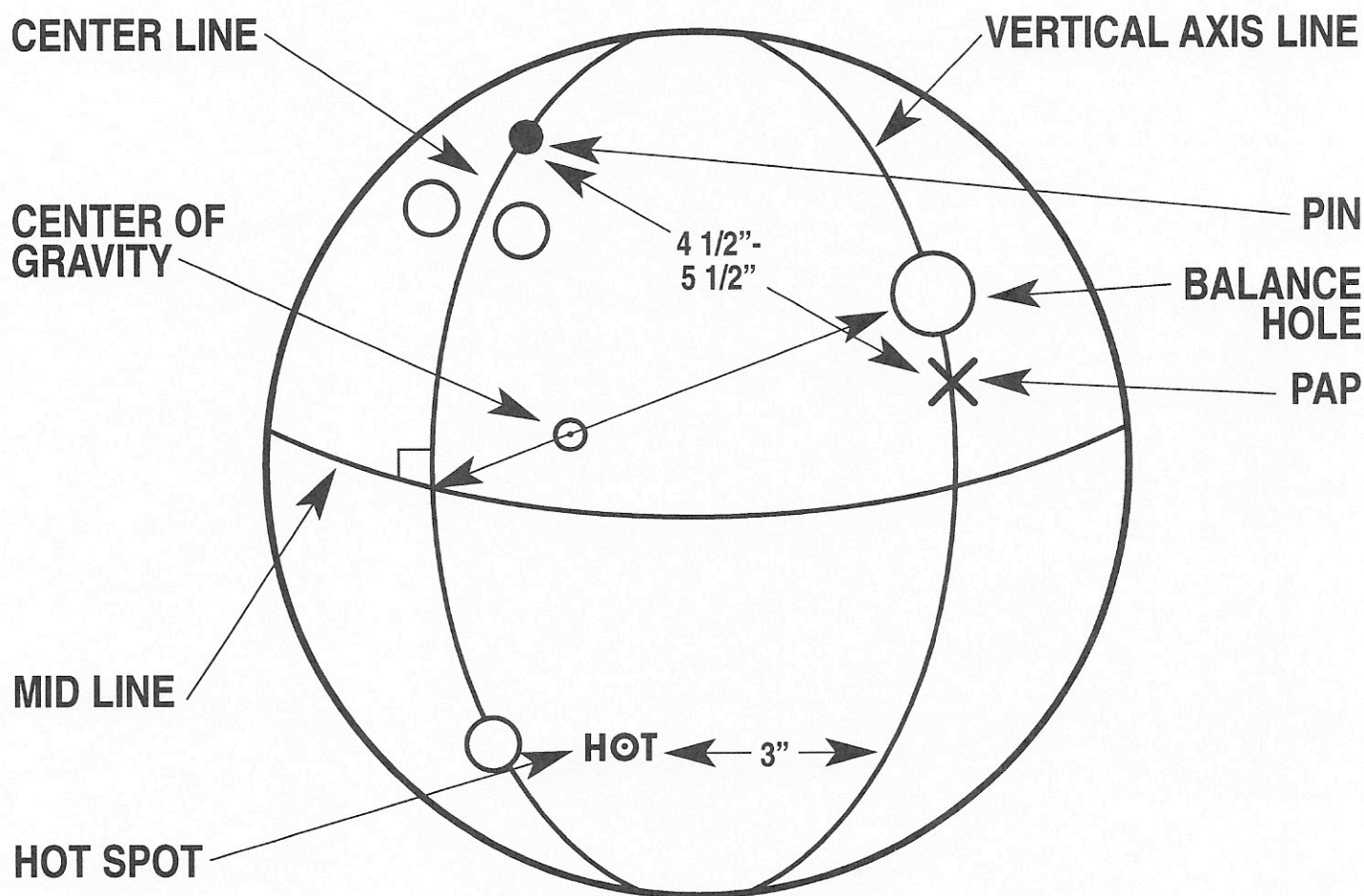
PIN PLACEMENT: 3 3/8" from P.A.P. (use ball with pin 1" - 4" out)

HOT SPOT PLACEMENT: 2 1/2" right of vertical axis line.

This drilling will produce large hook with earliest revs and most controllable break point.

MATCHING UP WITH HAMMER®

FEATURING **HAMMER OFFSET TECHNOLOGY**



DESIRED REACTION: Medium flare, medium hook, strong back end.

LANE CONDITION: Medium oil with dry back end.

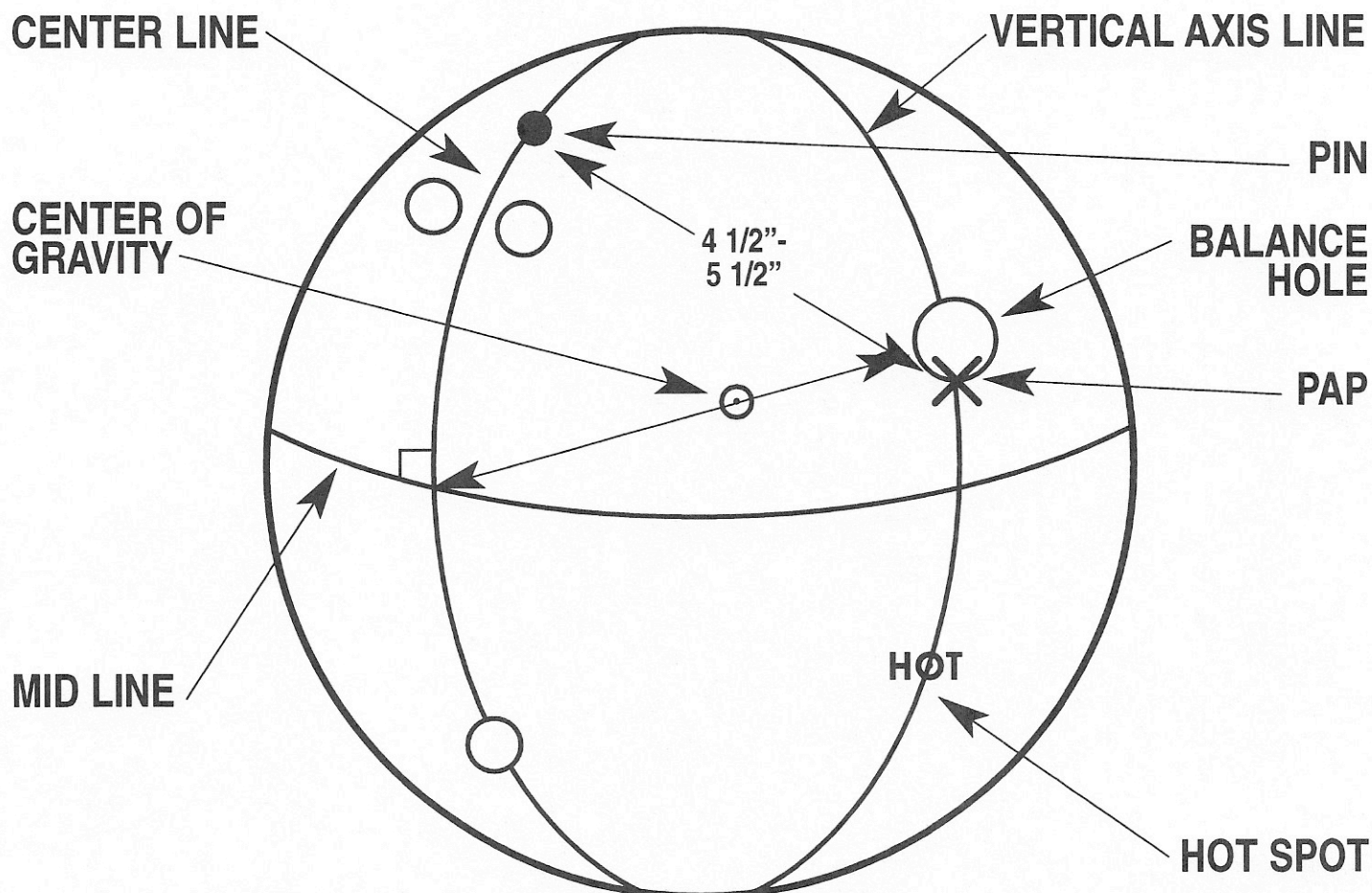
PIN PLACEMENT: 4 1/2" - 5 1/2" from P.A.P. (use ball with pin 2" - 4 1/2" out).

HOT SPOT PLACEMENT: 3" left of vertical axis line.

This drilling will produce Medium hook with a late break point. Good for playing inside the ball track. This drilling revs up later.

MATCHING UP WITH HAMMER®

FEATURING **HAMMER OFFSET TECHNOLOGY**



DESIRED REACTION: Medium flare, medium hook, controlled back end.

LANE CONDITION: Medium oil with carry down.

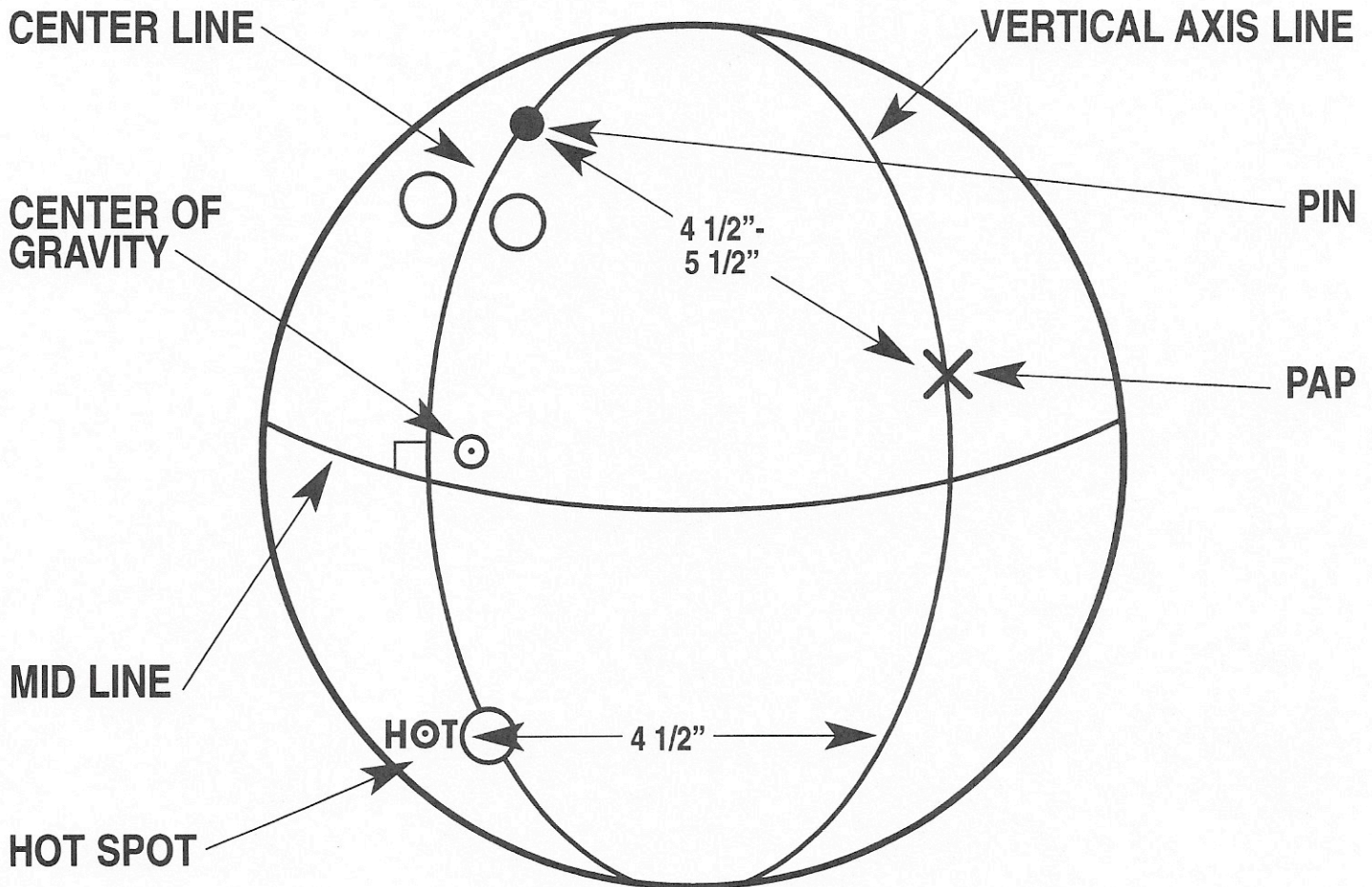
PIN PLACEMENT: 4 1/2" - 5 1/2" from P.A.P. (use ball with pin 2" - 4 1/2" out and less than 3 ounces top weight).

HOT SPOT PLACEMENT: Position Hot Spot on the vertical axis line.

This drilling will produce medium hook, with controlled back end, by generating heavy forward roll from the break point to the pins. Good for wet/dry conditions. This drilling revs up later.

MATCHING UP WITH HAMMER®

FEATURING **HAMMER OFFSET TECHNOLOGY**



DESIRED REACTION: Medium flare, less hook, smooth arc.

LANE CONDITION: Medium to light oil with a hooking ball track.

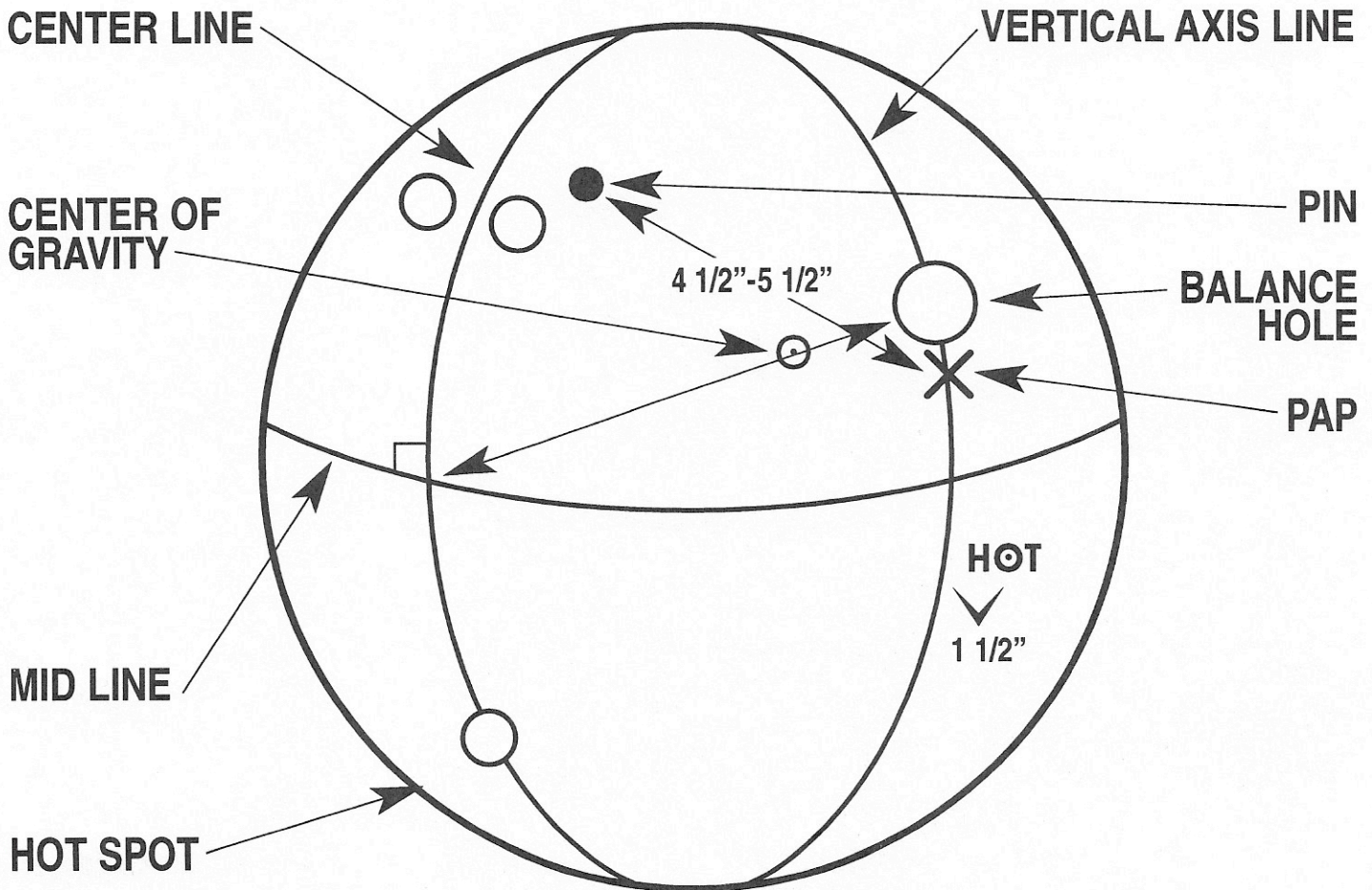
PIN PLACEMENT: 4 1/2" - 5 1/2" from P.A.P. (use ball with pin 2" - 4 1/2" out).

HOT SPOT PLACEMENT: 4 1/2" left of vertical axis line. Hot Spot will be left of the center line.

This drilling will produce an even arc reaction. Not recommended when playing a deep inside line. This drilling revs up later.

MATCHING UP WITH HAMMER®

FEATURING **HAMMER OFFSET TECHNOLOGY**



DESIRED REACTION: Medium flare, less hook, early revs, most controllable break point.

LANE CONDITION: Less oil with wet/dry lane conditions or medium carry down.

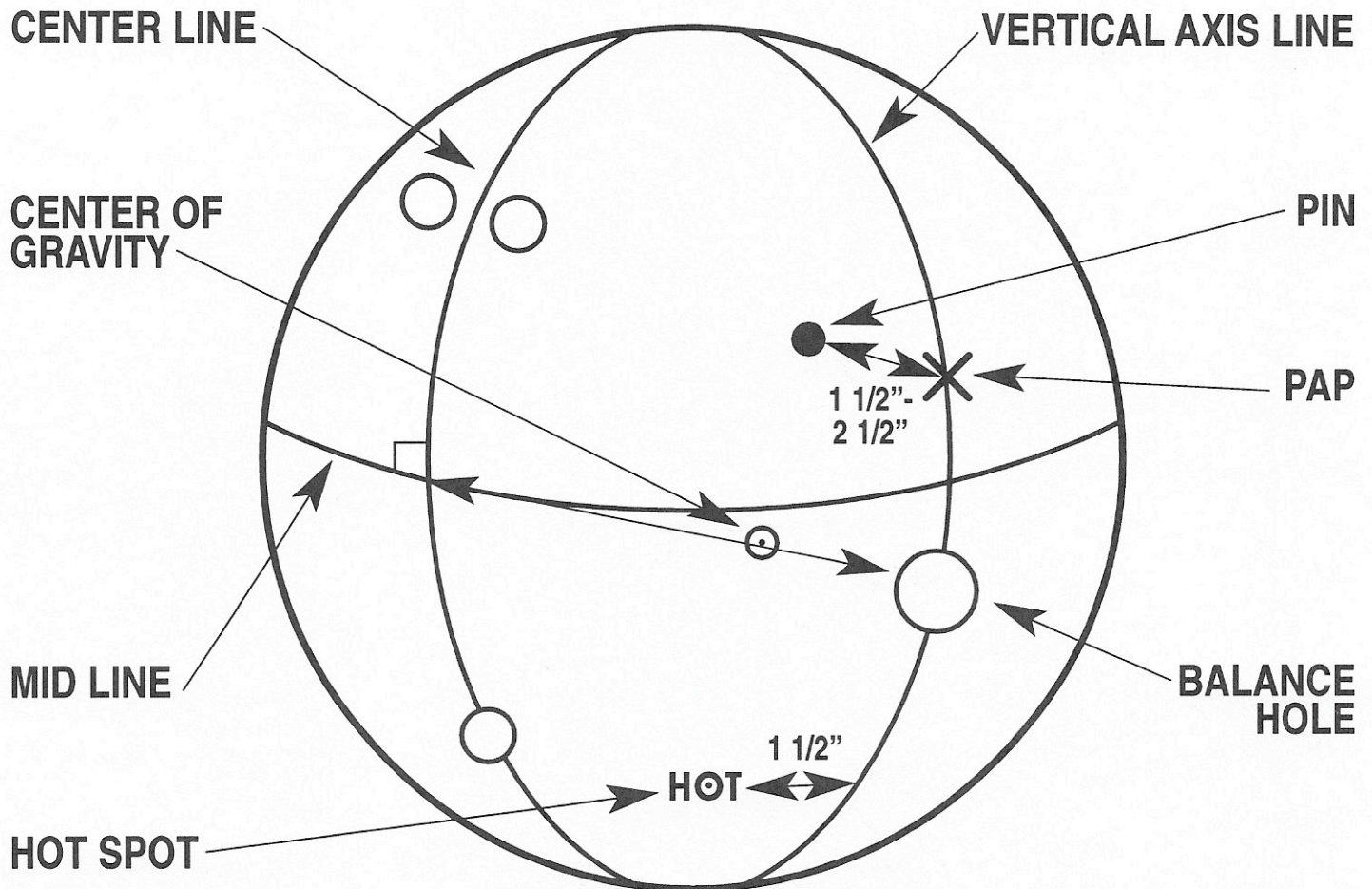
PIN PLACEMENT: 4 1/2" - 5 1/2" from P.A.P. (use ball with pin 2" - 4 1/2" out)

HOT SPOT PLACEMENT: 1 1/2" right of vertical axis line.

This drilling will produce less hook with earliest revs and most controllable break point.

MATCHING UP WITH HAMMER[®]

FEATURING **HAMMER OFFSET TECHNOLOGY**



DESIRED REACTION: Early revolutions, medium hook, strong back end reaction.

LANE CONDITION: Medium to light oil.

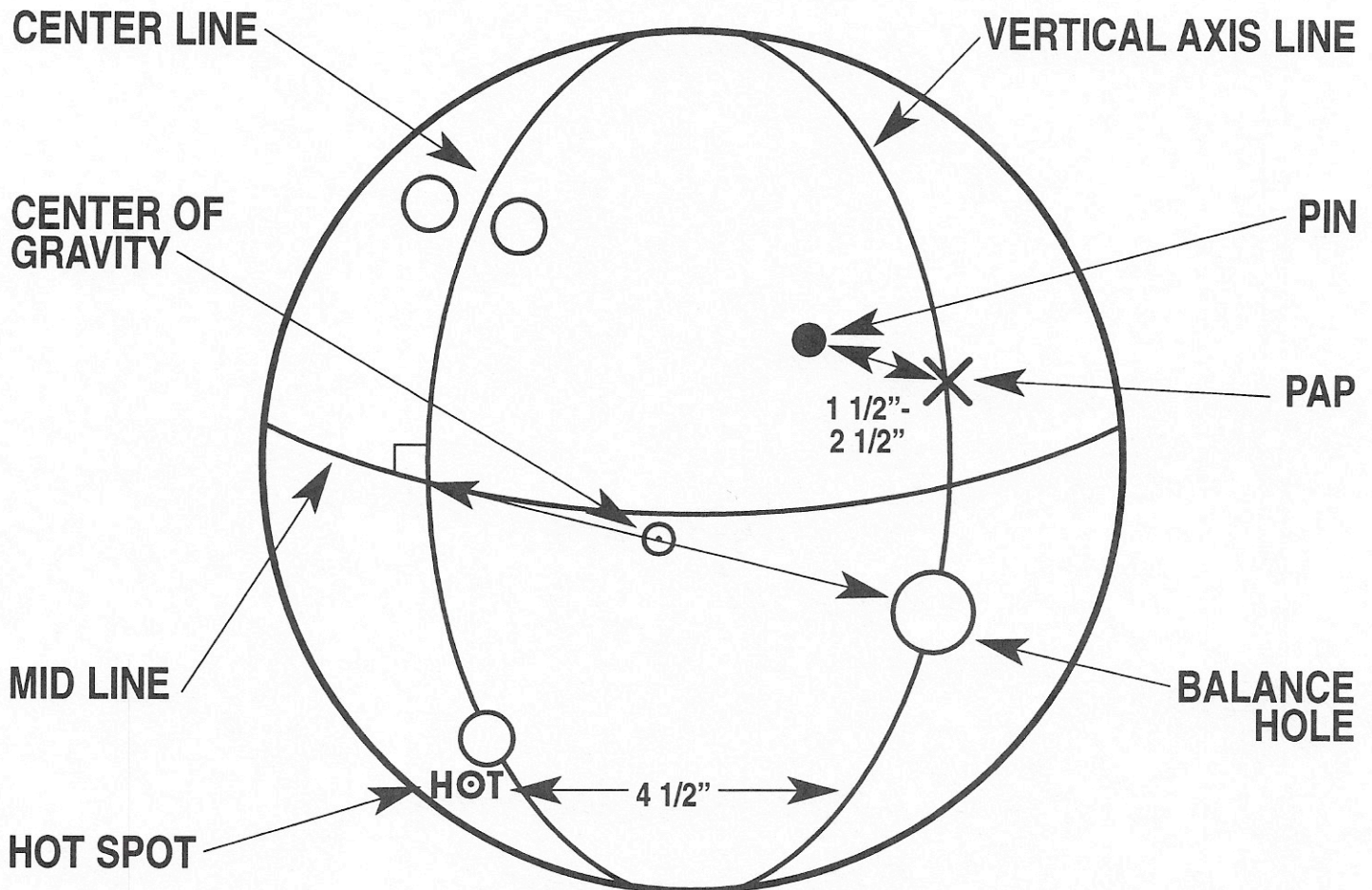
PIN PLACEMENT: 1 1/2" - 2 1/2" from P.A.P. (use ball with pin 1" - 3" out and less than 3 ounces top weight)

HOT SPOT PLACEMENT: 1 1/2" left of vertical axis line.

This drilling will produce early revs in the front part of the lane with medium flare and a strong reaction at the breakpoint.

MATCHING UP WITH HAMMER®

FEATURING **HAMMER OFFSET TECHNOLOGY**



DESIRED REACTION: Early revolutions, medium hook, smooth arc.

LANE CONDITION: Medium to light oil with a hooking ball track.

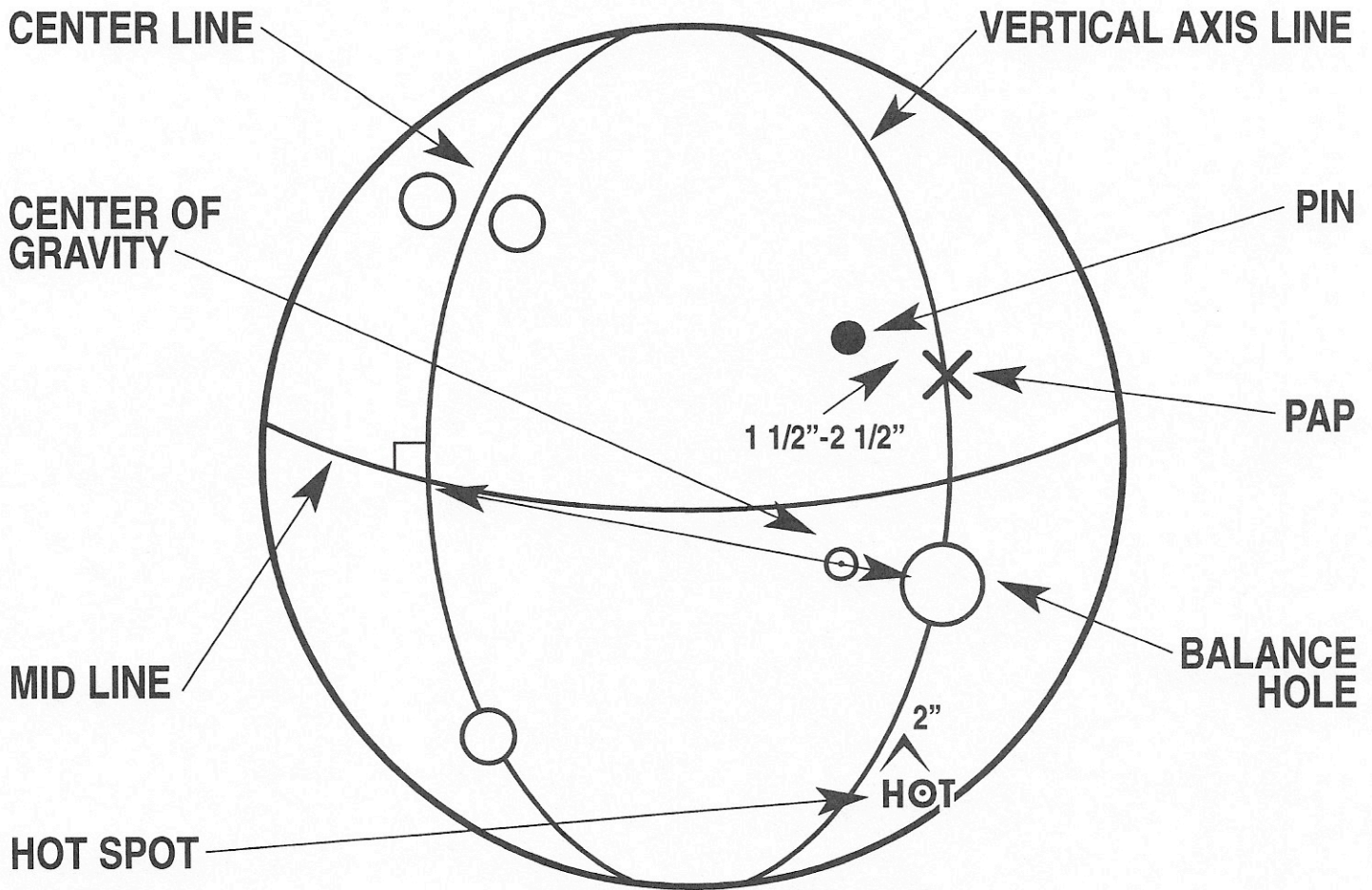
PIN PLACEMENT: 1 1/2" - 2 1/2" from P.A.P. (use ball with pin 1" - 3" out)

HOT SPOT PLACEMENT: 4 1/2" left of vertical axis line. Hot Spot will be left of Center Line..

This drilling will produce early revs in the front part of the lane with smooth arc. Good for playing a direct trajectory when the ball track is hooking.

MATCHING UP WITH HAMMER®

FEATURING **HAMMER OFFSET TECHNOLOGY**



DESIRED REACTION: Medium flare, medium hook, early revs, most controllable break point.

LANE CONDITION: Medium oil with wet/dry lane conditions or carry down.

PIN PLACEMENT: 1 1/2" - 2 1/2" from P.A.P. (use ball with pin 1" - 3" out)

HOT SPOT PLACEMENT: 2" right of vertical axis line.

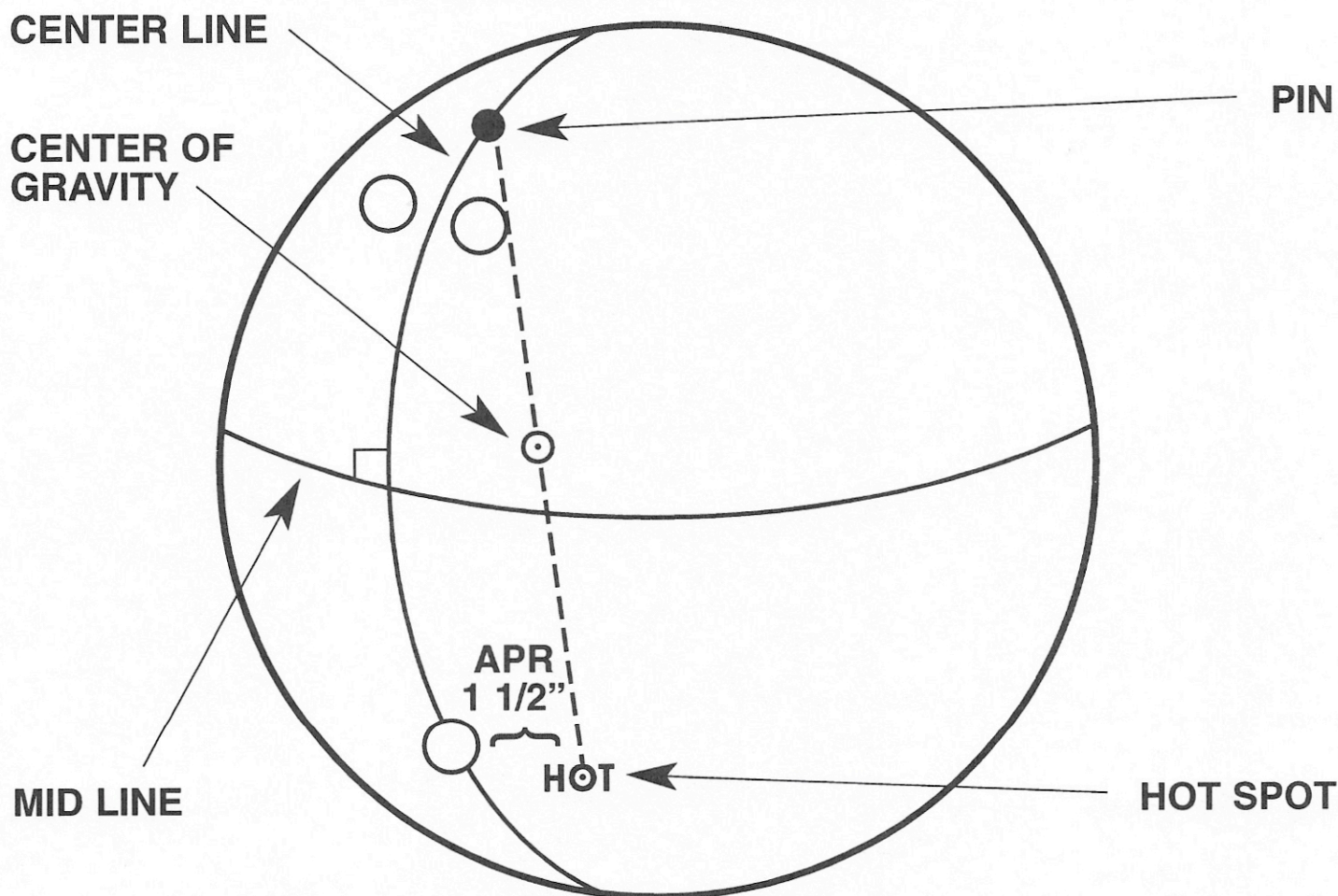
This drilling will produce medium hook with earliest revs and most controllable break point.

MATCHING UP WITH HAMMER[®]

FEATURING **HAMMER OFFSET TECHNOLOGY**

Higher Track Players (ball track within 1 1/2' of thumb hole) and also strokers

MEDIUM HOOK



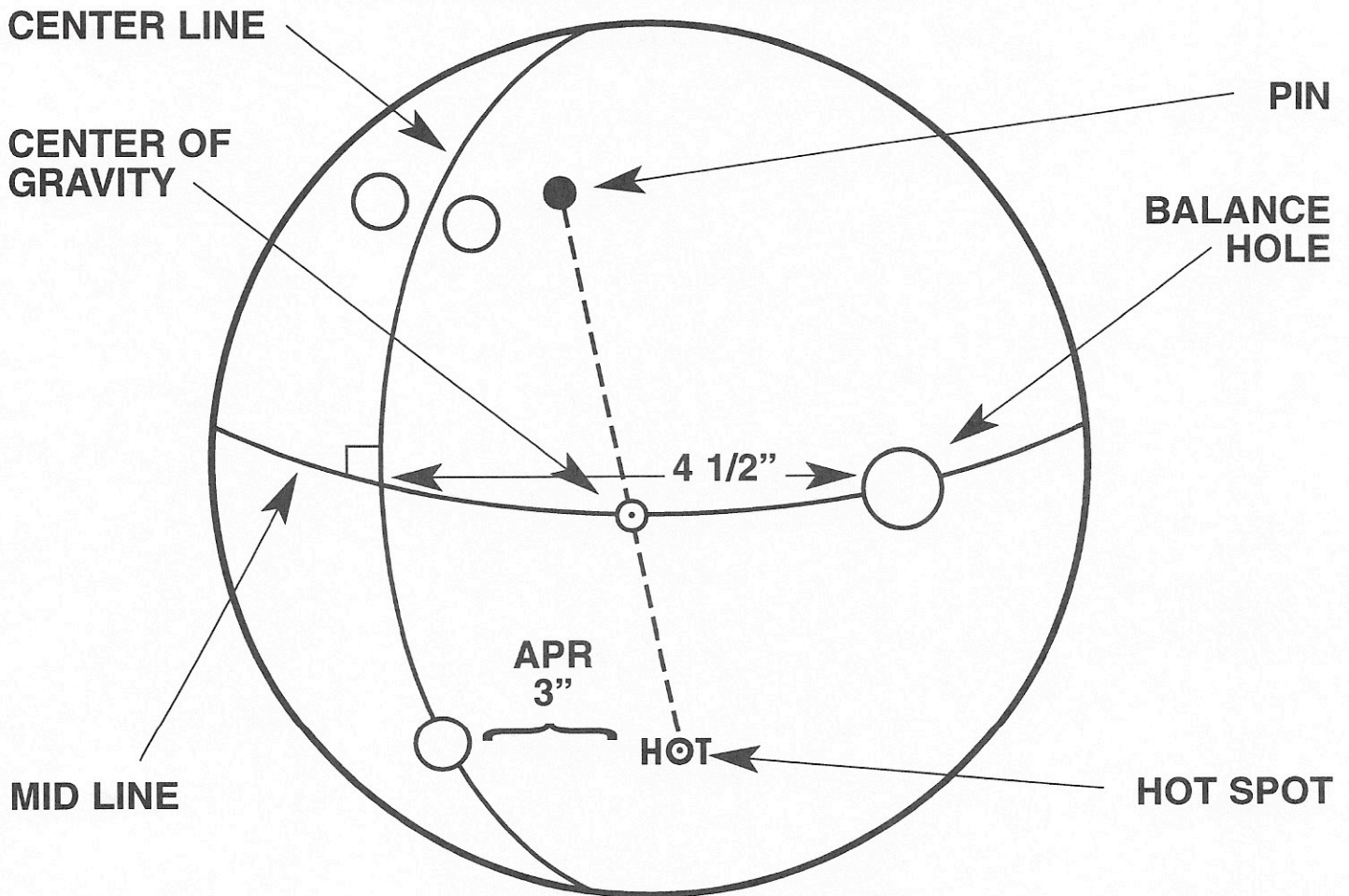
- Select ball with pin 2 - 4" out.
- Position pin above finger holes on center line, as shown.
- Position HOT SPOT approximately 1 1/2" right of center line, as shown.
- If balance hole is required, mark line from center of grip through C.G. and drill balance hole 5 1/2" from center of grip on that line. Balance hole may be drilled above or below midline.

MATCHING UP WITH HAMMER®

FEATURING **HAMMER OFFSET TECHNOLOGY**

Lower Track Players (ball track more than 1 1/2' from thumb hole) and also crankers

MAXIMUM HOOK



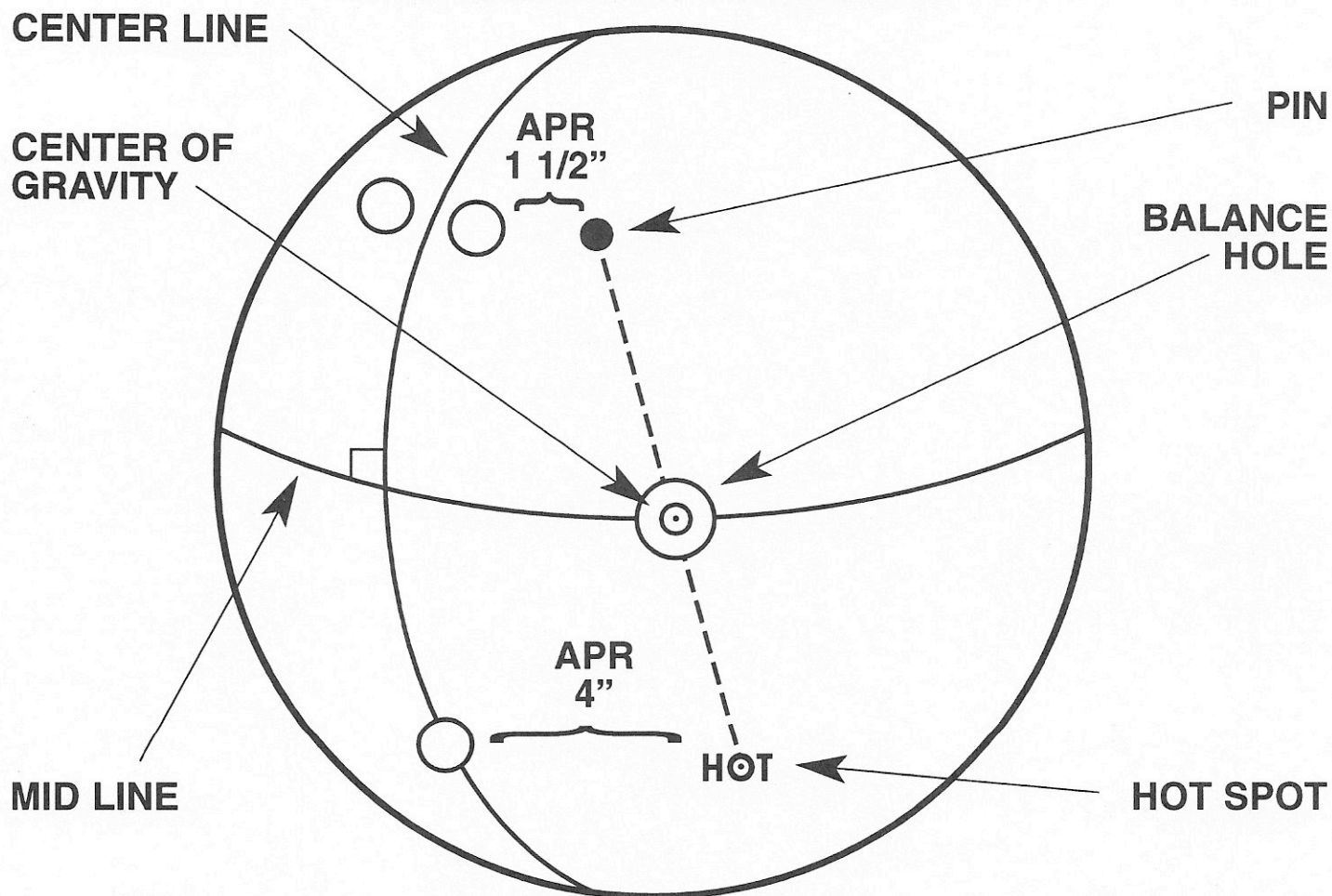
- Select ball with pin 2 - 4" out and less than 3.0 oz top weight.
- Position pin 45°, just above ring finger, as shown.
- Position HOT SPOT approximately 3" right of center line, as shown.
- If balance hole is required, mark line from center of grip through C.G. and drill balance hole 4 1/2" from center of grip on that line. Balance hole may be drilled above or below midline.

MATCHING UP WITH HAMMER®

FEATURING **HAMMER OFFSET TECHNOLOGY**

Lower Track Players (ball track more than 1 1/2" from thumb hole) and also crankers

MEDIUM HOOK

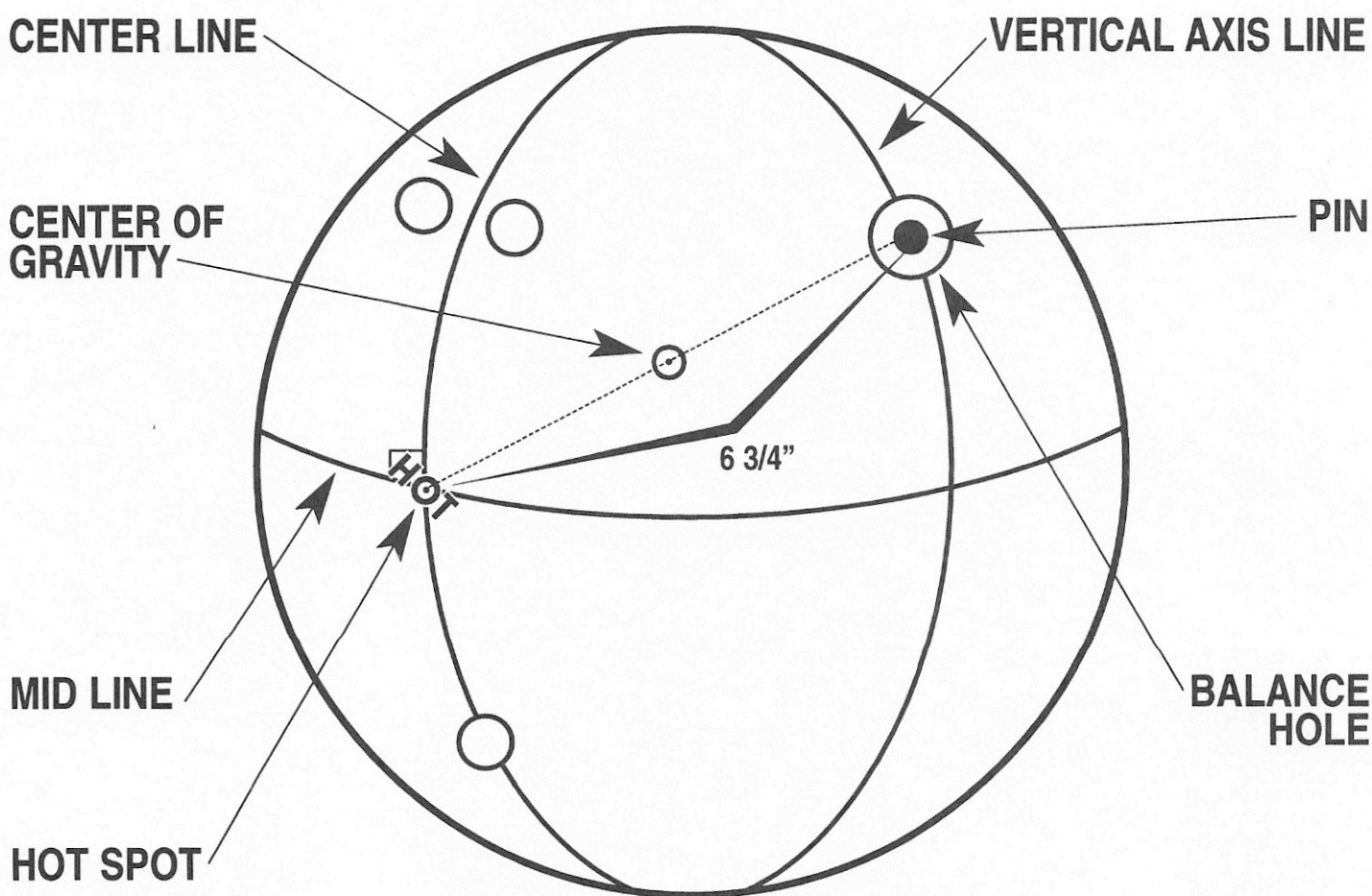


- Select ball with pin 2 - 4" out and less than 3.0 oz top weight.
- Position pin 1 1/2", right of ring finger, as shown.
- Position HOT SPOT approximately 4" right of center line, as shown.
- Drill balance hole at C.G. Balance hole may be drilled above or below midline.

MATCHING UP WITH HAMMER®

FEATURING **HAMMER OFFSET TECHNOLOGY**

**NO FLARE DRILLING
THAT PRODUCES END OVER END ROLL.**
for use on dry lane conditions



- Select a ball with less than 3 ounces of top weight and pin 3-4" out.
- Position pin 6 3/4" from center of grip in a 1:30 position, as shown.
- Position HOT Spot in center of grip, as shown.
- Drill the balance hole through pin.

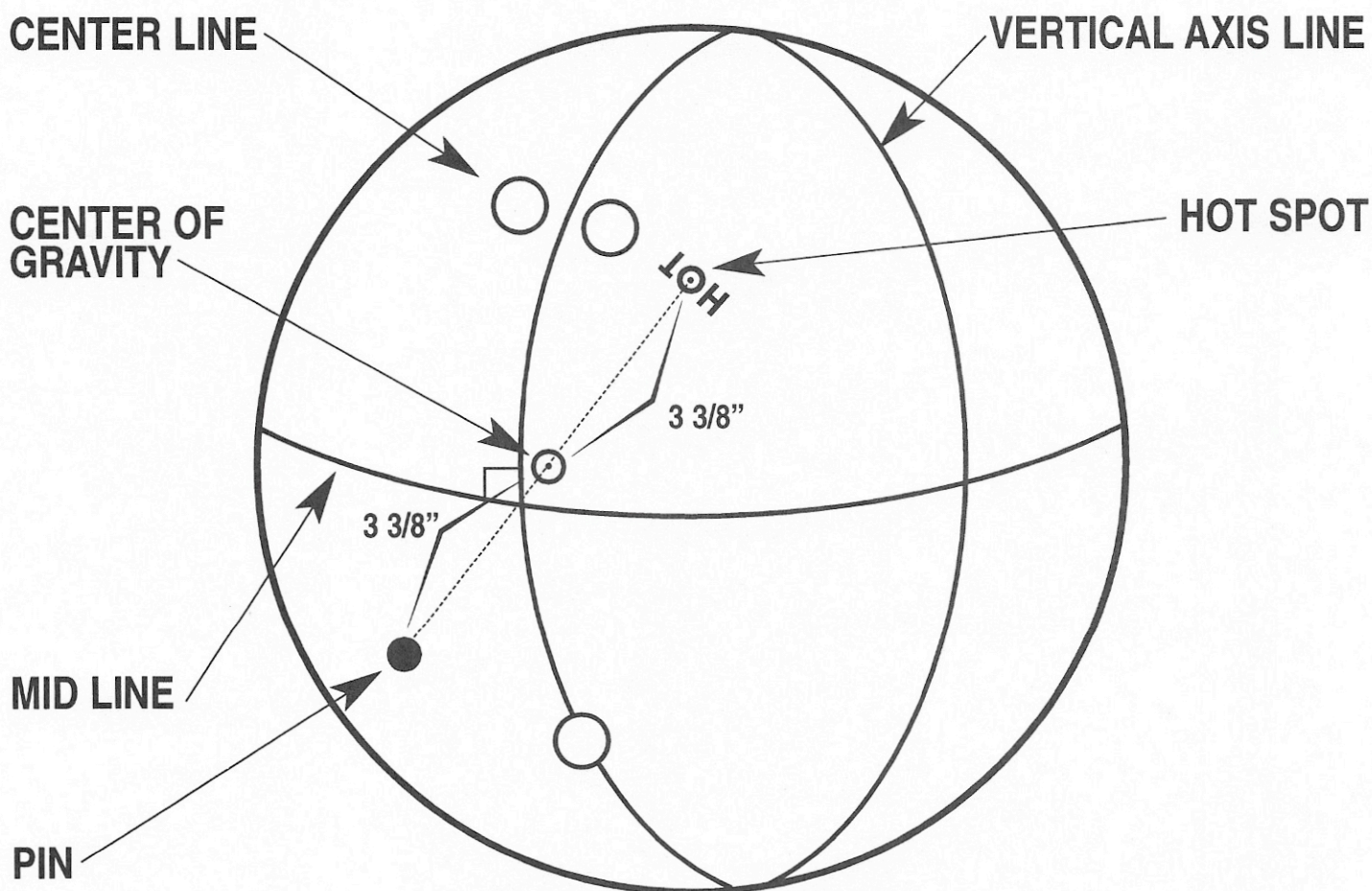
MATCHING UP WITH HAMMER[®]

FEATURING **HAMMER OFFSET TECHNOLOGY**

MEDIUM REACTION DRILLING THAT WILL KEEP THE TRACK BETWEEN THE FINGERS AND THUMB.

Most common layout for full rollers.

for use on medium to heavy oil conditions.



- Select a ball with less than 3 ounces of top weight and pin 3-4" out.
- Position pin 3 3/8" from center of grip in a 7:00 position, as shown.
- Position HOT Spot 3 3/8" from center of grip in a 1:30 position as shown.

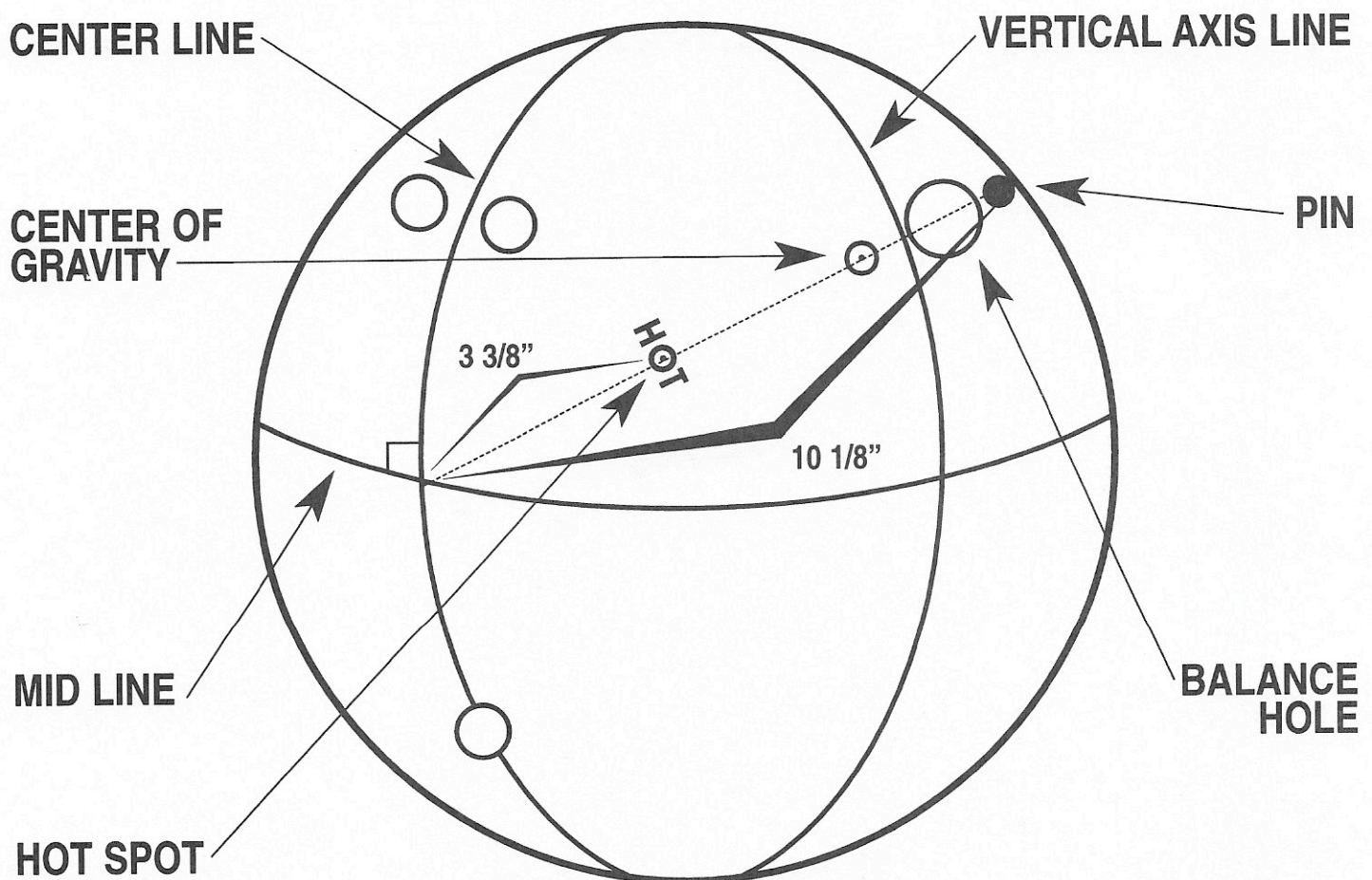
MATCHING UP WITH HAMMER®

FEATURING **HAMMER OFFSET TECHNOLOGY**

MAXIMUM REACTION DRILLING FOR FULL ROLLER.

This pattern will cause the track to reverse and flare towards the mid-line instead of the grip holes.

for use on heavy oil conditions



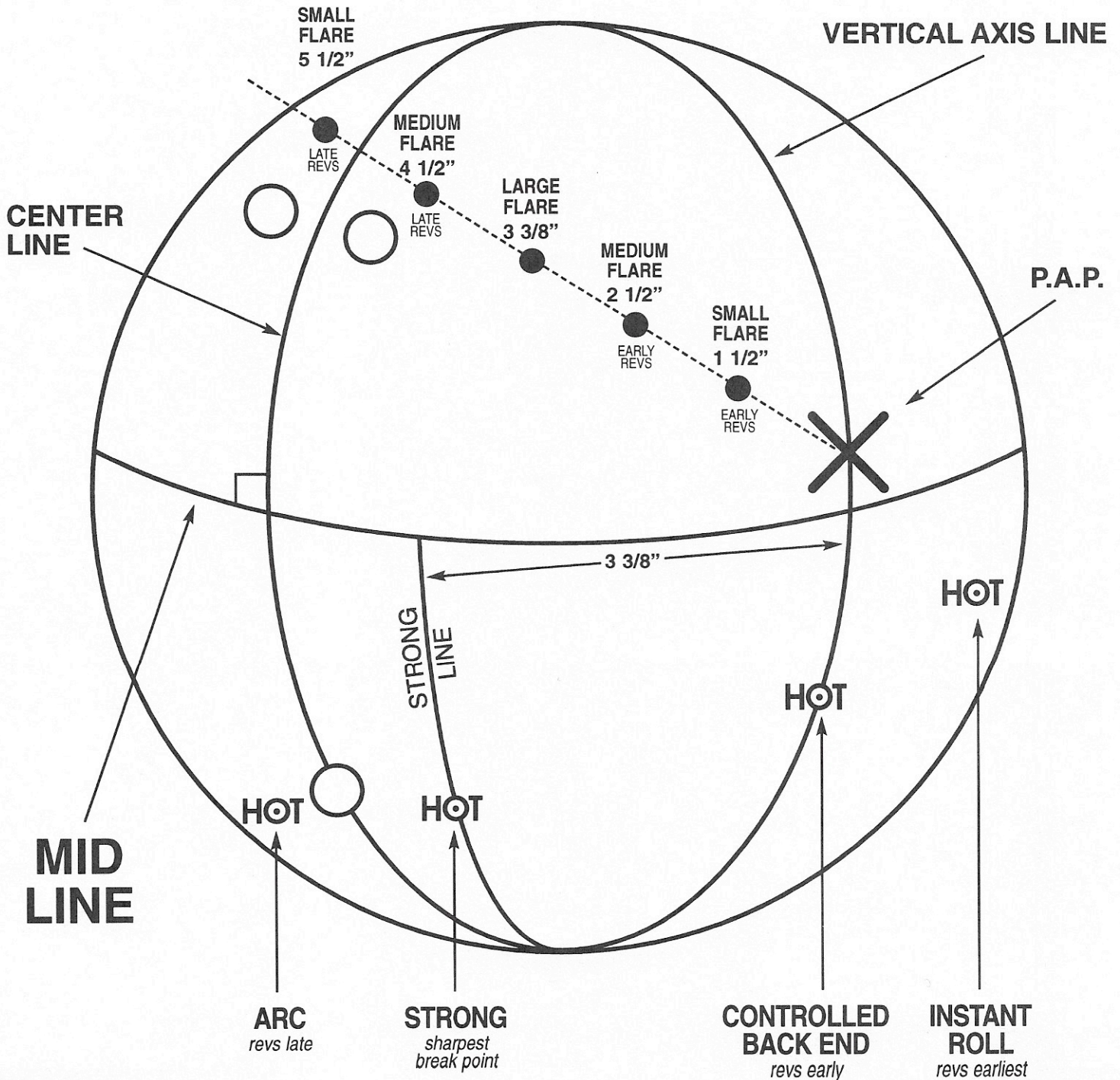
- Select a ball with less than 2.7 ounces of top weight and pin 3-4" out.
- Position pin $10 \frac{1}{8}$ " from center of grip in a 1:30 position, as shown.
NOTE: this will put the pin on the botton of the ball in relation to the center of the grip.
- Position HOT Spot $3 \frac{3}{8}$ " from center of grip in a 1:30 position, as shown.
- Drill balance hole half way between C.G. and pin.

FULL ROLLER DRILLING DIAGRAM 3

MATCHING UP WITH HAMMER®

FEATURING **HAMMER OFFSET TECHNOLOGY**

DRILLING INSTRUCTIONS



MATCHING UP WITH HAMMER®

FEATURING **HAMMER OFFSET TECHNOLOGY**

To produce ball reaction described, position HOT Spot at the designated distance from the Vertical Axis Line (V.A.L.)

PIN DISTANCE FROM P.A.P.	PIN DISTANCE FROM V.A.L.	FLARE	ARC	STRONG	CONTROLLED BACK END	INSTANT ROLL	
	5 1/2"	3 3/4"	1/3 of ball's flare potential	4 1/2" left	2 1/2" left	On VAL	1" right
	4 1/2"	3"	2/3 of ball's flare potential	4 1/2" left	2 1/4" left	On VAL	2" right
	3 3/8"	2 1/4"	Ball's maximum flare potential	4 1/2" left	2" left	On VAL	2 1/2" right
	2 1/2"	1 3/4"	2/3 of ball's flare potential	4 1/2" left	1 1/2" left	On VAL	2 1/4" right
	1 1/2"	1"	1/3 of ball's flare potential	4 1/2" left	1" left	On VAL	1 3/4" right

*For left handed bowlers reverse the direction of HOT Spot placement from Vertical Axis Line (V.A.L.)

MATCHING UP WITH HAMMER®

FEATURING **HAMMER OFFSET TECHNOLOGY**

Suggestions for matching different bowlers styles
to different lane conditions

H.O.T. DRILLINGS				
BOWLERS STYLE	LANE CONDITIONS ➔	BLENDED LANE CONDITION	WET / DRY LANE CONDITION	DRY BALL TRACK <i>Right Handers Only</i>
	STRAIGHTER PLAYER <i>small axis rotation, low rev rate</i>	SLEDGE HAMMER STRONG 3-D VIOLET STRONG	SLEDGE HAMMER ARC MAXXX STRONG	<i>use less flare</i> SLEDGE HAMMER STRONG 3-D VIOLET STRONG TOUR OFFSET STRONG
	STROKER <i>smooth delivery, medium axis rotation, Medium revs</i>	SLEDGE HAMMER STRONG MAXXX STRONG TOUR OFFSET STRONG	SLEDGE HAMMER CONTROLLED BACK END MAXXX ARC	<i>use less flare</i> SLEDGE HAMMER STRONG TOUR OFFSET STRONG
	SPINNER <i>low track large axis rotation, large axis tilt</i>	SLEDGE HAMMER CONTROLLED BACK END MAXXX CONTROLLED BACK END	SLEDGE HAMMER INSTANT ROLL MAXXX CONTROLLED BACK END	<i>use less flare</i> SLEDGE HAMMER INSTANT ROLL MAXXX CONTROLLED BACK END
	CRANKER <i>high rev rate</i>	SLEDGE HAMMER CONTROLLED BACK END 3-D VIOLET CONTROLLED BACK END TOUR OFFSET STRONG	<i>use less flare</i> SLEDGE HAMMER ARC MAXXX ARC TOUR OFFSET CONTROLLED BACK END	<i>use less flare</i> SLEDGE HAMMER ARC TOUR OFFSET CONTROLLED BACK END

Vary Pin Distance from P.A.P. to get appropriate flare and break point depending on amount of oil on the lane

MATCHING UP WITH HAMMER[®]

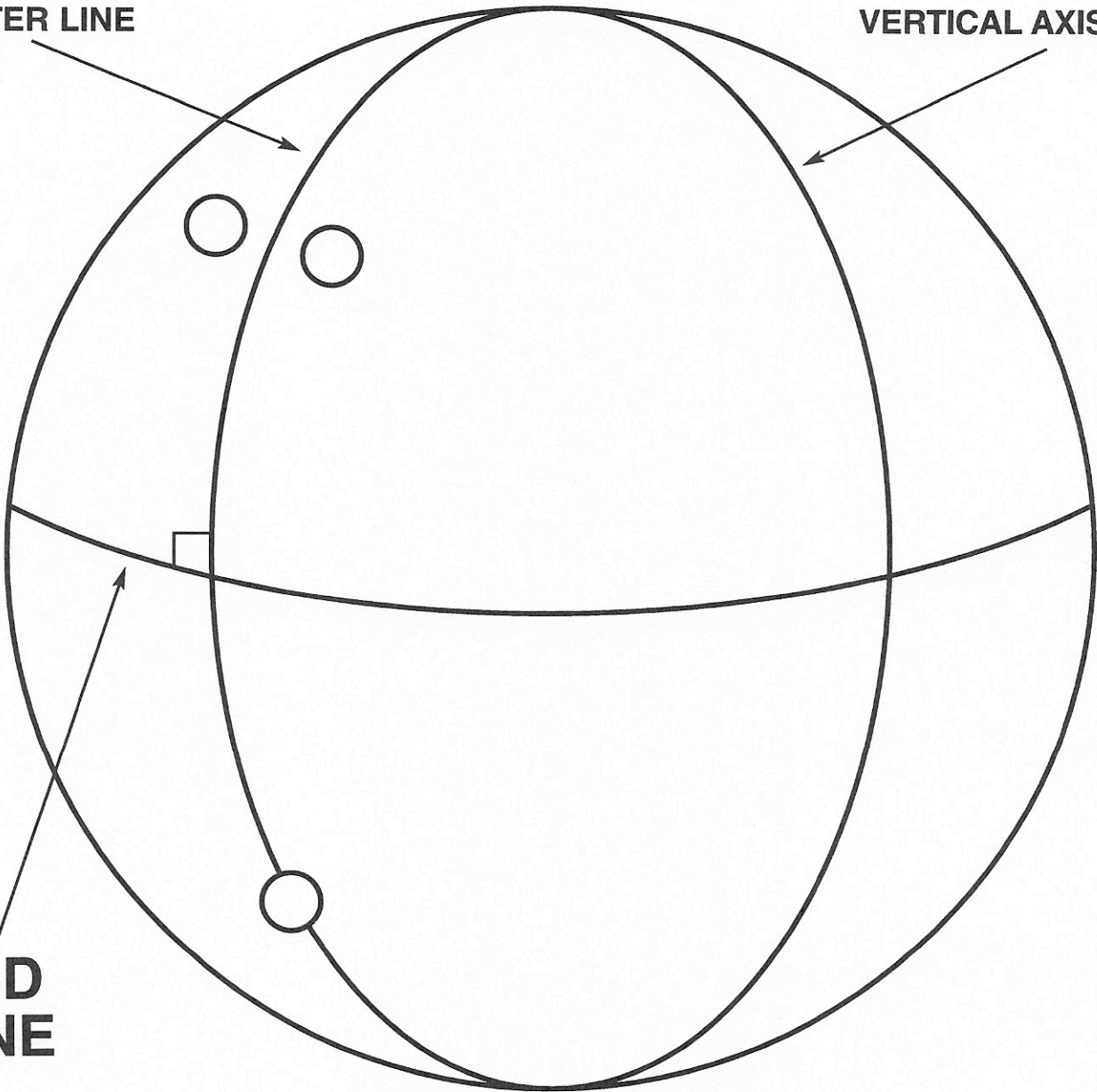
FEATURING **HAMMER OFFSET TECHNOLOGY**

D R I L L I N G I N S T R U C T I O N S

CENTER LINE

VERTICAL AXIS LINE

MID
LINE



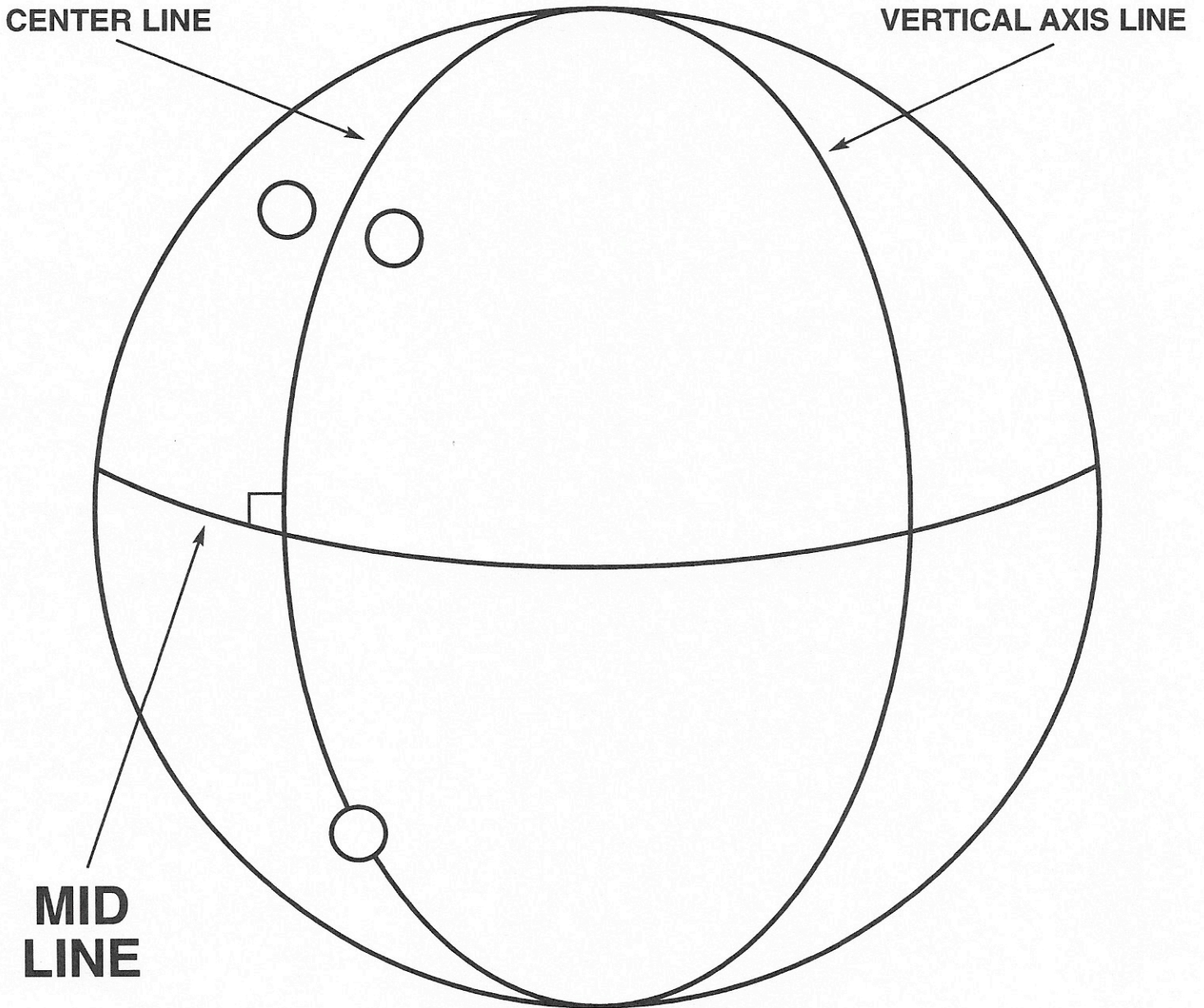
MATCHING UP WITH HAMMER®

FEATURING **HAMMER OFFSET TECHNOLOGY**

D R I L L I N G I N S T R U C T I O N S

CENTER LINE

VERTICAL AXIS LINE

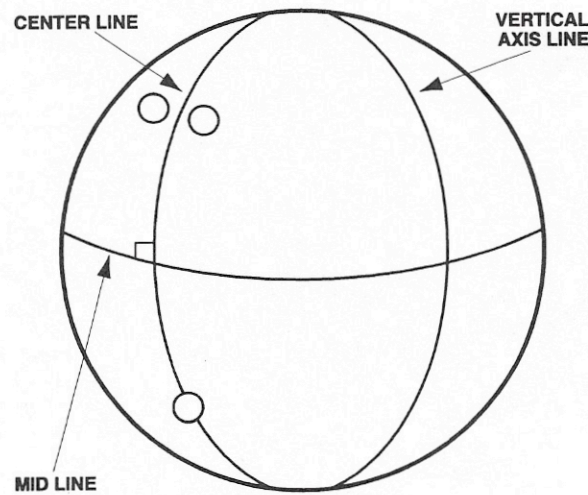
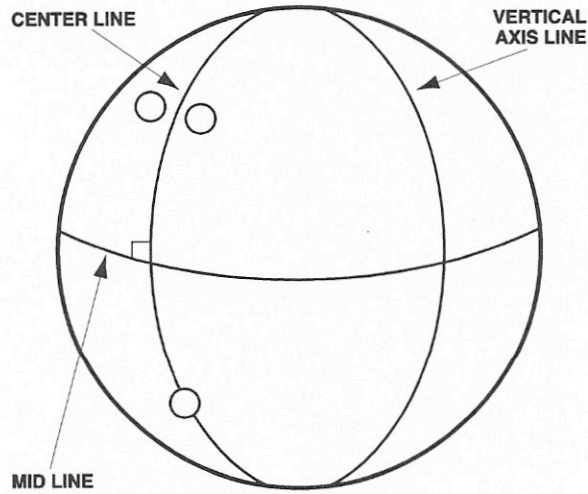
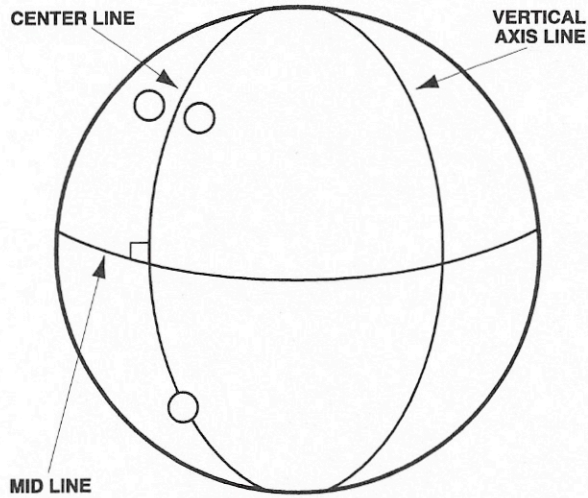


MID
LINE

MATCHING UP WITH HAMMER®

FEATURING **HAMMER OFFSET TECHNOLOGY**

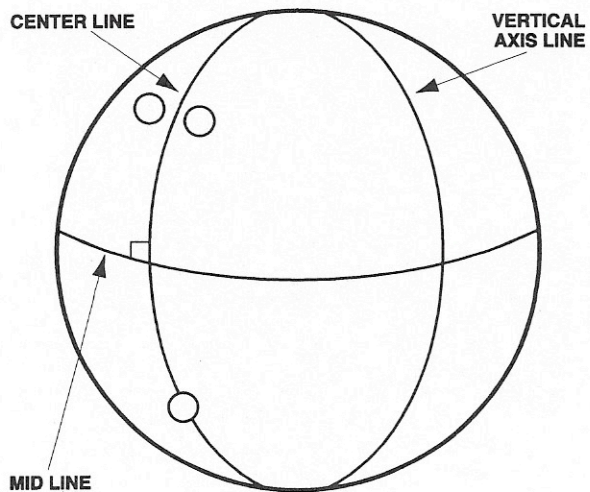
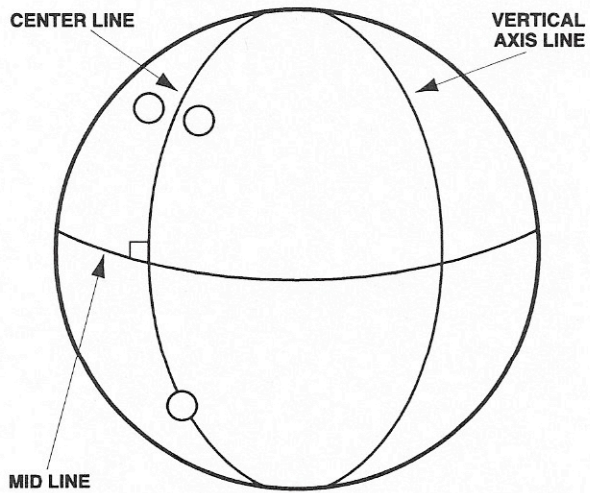
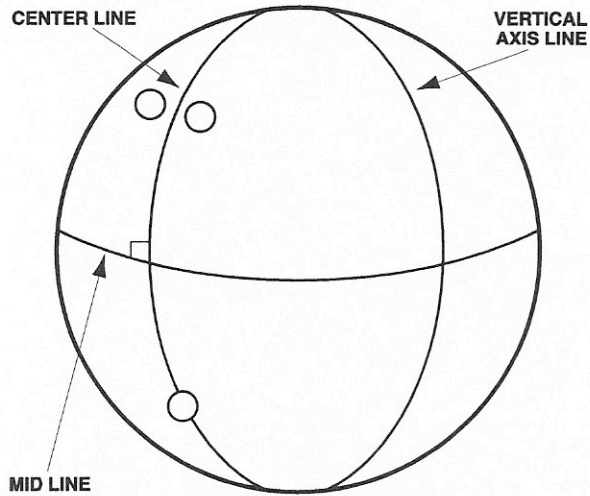
D R I L L I N G I N S T R U C T I O N S



MATCHING UP WITH HAMMER[®]

FEATURING **HAMMER OFFSET TECHNOLOGY**

D R I L L I N G I N S T R U C T I O N S



ACKNOWLEDGEMENTS

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and Jeff Sewell.

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January 1, 1999

