

PHANTOM™

I N T E L L I G E N C E

SUBJECT:

**BALL LAYOUT DEFINITIONS,
IMPORTANT DIMENSIONS**

BULLETIN #1

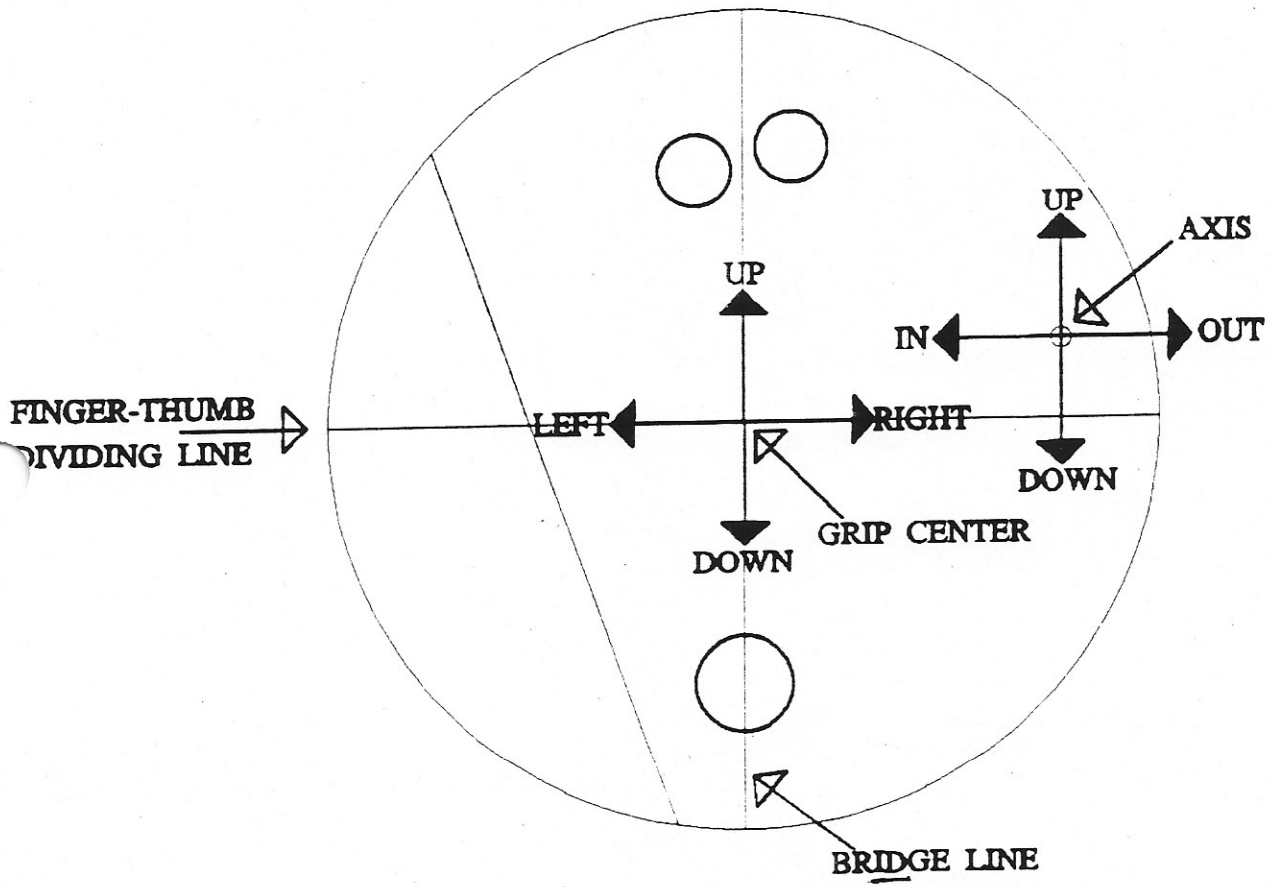
JAN. 1, 1992

**MARKETING DEPT.
MUSKEGON, MI**

In order to describe how to lay out and drill the Phantom, it is important that the directions and the terms used are commonly understood. Because there are many different conventions for navigating across the surface of the ball, this report defines the terminology that has been used in the Phantom development and literature.

In order to lay out a Phantom, it is important to know what point on the surface of the ball is to be the bowlers' axis after drilling, and where the center of the grip is to be placed. The placement of the axis will control the ball reaction, while the placement of the grip center will control both the static (do-do scale) balance of the ball and the relationship of the track flare to the grip holes. To tie the grip center together with the axis, a mapping system for the ball surface is needed. Figure 1 shows the system that has been used in all of the Phantom literature. The **Grip Center** is defined by the intersection of the **Bridge Line** (which divides the ball into the positive and negative sides) and the **Finger-Thumb Dividing Line** (which divides the ball into the finger and thumb halves). Movement toward the fingers from the grip center is defined as **Up**, movement toward the thumb is **Down**. Movement along the **Finger-Thumb Dividing Line** from the **Grip Center** is defined as **Left** or **Right**. From the bowlers' axis, movement at a right angle to the **Finger-Thumb Dividing Line** is either **Up** or **Down**. The grip center and the axis are tied together by the distance either right or left of the grip center and the distance above or below the finger thumb dividing line. Once these dimensions are determined for a given bowler, the Phantom Commander layout tool makes locating the grip center off the axis point very easy. For more information on use of the Commander, see the "How to Arm a Phantom" drilling manual and videotape.

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I N T E L L I G E N C E

SUBJECT:

PIN IN, PIN OUT

BULLETIN #2

JAN. 1, 1992

**MARKETING DEPT.
MUSKEGON, MI**

One of the most misunderstood aspects of bowling ball manufacture and drilling is the marking of the zero balance punch, or what many people consider the "heavy spot" on the ball. All balls have this punch marked on their surface. Most balls use this punch mark to center the label. In the Phantom, the label is centered around the riser pin, *not* around the zero balance punch. The purpose of this update is to explain what the zero balance punch indicates, why it can vary off the riser pin, and how to use the "Pin Out" Phantoms to their best advantage.

In the manufacture of bowling balls, materials of different densities are used for the core(s), the weight block(s) and the shell of the ball. The balance of the ball before drilling will depend on these densities as well as the size, shape, and placement of the different pieces within the ball. If the bowling ball was a solid sphere of a single material, the center of balance, or center of gravity, would be at the actual (geometric) center of the sphere. If this ball was placed in the do-do scale, no matter how it was turned the total weight would appear to remain the same, the balance beam would always remain level and the ball would be said to have no top weight. However, when materials of different densities and shapes are placed within the ball, the center of balance of the total sphere is moved away from the geometric center of the ball, causing the ball to become statically unbalanced. The farther the center of gravity is moved away from the center of the ball, the more statically out of balance the ball becomes. The do-do scale *indicates* this imbalance as an *apparent* difference in weight between any two arbitrarily chosen halves of the ball. What the scale is *actually* measuring is the distance of the center of gravity from the center of the ball. The distance that the center of gravity can be offset from the center of the ball *and* remain within ABC/WIBC specifications can be precisely calculated and is much smaller than is generally assumed. In a 16-pound ball, each ounce of imbalance that appears on the scale is created by a 13/1000" shift in the center of gravity. Thus, moving the center of gravity slightly less than 1/64" away from the center of the ball will cause a one ounce change on the scale. The center of gravity of a 16-pound ball that has 3.5 ounces of top weight before drilling is only 3/64" away from the center of the ball. For more information on center of gravity and the workings of the do-do scale, please refer to the "How To Arm A Phantom" videotape.

CREATING THE BALANCE PUNCH

A great deal of confusion arises because many people have been taught that the static balance punch on the surface of the ball IS the center gravity. This is absolutely *false*. If a line was drawn from the center of the ball *through* the center of gravity (which is very close to the center of the ball) to the surface of the ball, this line would hit the surface at the punch mark. In order to create the punch mark, once that ball has been finished it is floated on a cushion of air. Because the ball is not

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statically balanced it will rotate to place the center of gravity straight down below the center of the ball. Once the ball has stopped moving, the bottom dead center point is punched, creating the zero balance punch on the surface of the ball. This punch simply indicates that the center of gravity of the ball is on the line that connects the punch to the actual center of the ball. It does not provide *any* information as to the number of pieces in the ball or their locations.

STATIC PUNCH AND CORE POSITION

In the Phantoms, and in many other two-piece balls, the position of the riser pin gives the driller information regarding the placement of the core inside the ball. If the line connecting the center of the ball through the center of gravity is in line with the riser pin, the static punch and the riser pin will be very close to each other. If the core is *slightly* offset from the center of the ball, the static punch and the pin will no longer be close to each other on the surface. This situation can occur with very slight movements of the core within the ball. Figures 1 through 3 illustrate how "Pin In" and "Pin Out" balls can arise. If the core is precisely centered in the ball as in Figure 1, the static balance punch and the riser pin will be very close and the "Pin In" situation will occur. If the hole drilled in the core in order to support the core in the mold is not exactly on the core center line, as in Figure 2, the core will be offset in the mold and the static balance punch and the riser pin will be at different places on the surface of the ball creating a "Pin Out" situation. A core shift as small as 20/1000" (approximately 1/64") can cause the punch mark to move more than an inch across the surface of the ball from the riser pin. Remember, the punch mark is the surface point of the line from the center of the ball, *through* the center of gravity to the surface of the ball. Since the center of gravity is *always* very near the center of the ball, very small core moves cause large moves on the surface. Figure 3 shows how a riser pin bend as small as 1° can offset the core in the ball, again causing a "Pin Out" situation.

USING THE STATIC PUNCH IN LAYING OUT PHANTOMS

Brunswick has chosen to label the Phantoms around the riser pins because the position of the core with respect to the individual bowler's track and axis will control the dynamics of the ball's reaction. The static balance punch simply indicates the balance of the ball while it is sitting still and has very little to do with the ball's reaction when it is rolling. In drilling the Phantom for a customer, it is important to be aware of the position of the static balance punch mark when laying out the ball, as it will control whether or not an extra hole will be required to make the ball legal under ABC/WIBC regulations for balance.

Phantoms that have the static balance punch away from the riser pin ("Pin Out") allow the driller the flexibility of moving the riser pin away from the center of the bowler's grip while keeping the static balance punch toward the center of the grip. This minimizes the need for and/or the size of the extra hole necessary for balance purposes. *Any* JET or NAVY PHANTOM with the "Pin Out" can be used for Layout #2 for either right or left-handed bowlers. Simply place the Green Riser Pin on the bowler's axis and position the static balance punch so that it is between the bowler's grip center and axis point. Depending on the position of the static balance punch, "Pin Out" balls can be used for all of the Layouts for the Phantom. The enclosed diagram details the best uses depending on the static punch locations.

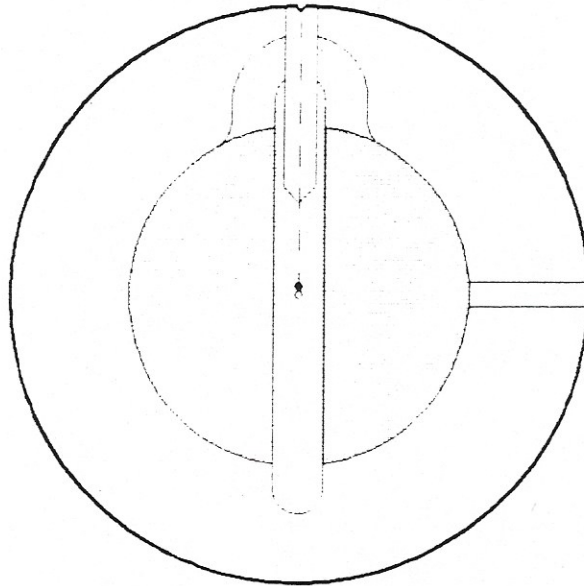


FIGURE 1
CORE CENTERED IN BALL
C.G. IN LINE WITH RISER PIN
PUNCH CLOSE TO RISER PIN ("PIN IN")

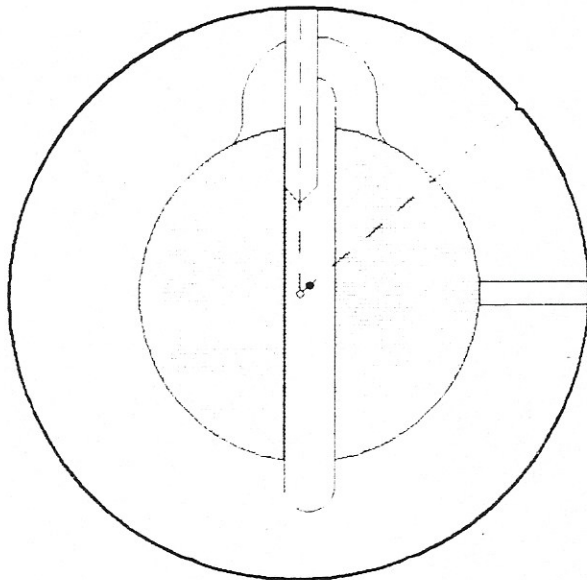


FIGURE 2
CORE OFFSET FROM CENTER
C.G. OUT OF LINE WITH RISER PIN
PUNCH AWAY FROM RISER PIN ("PIN OUT")

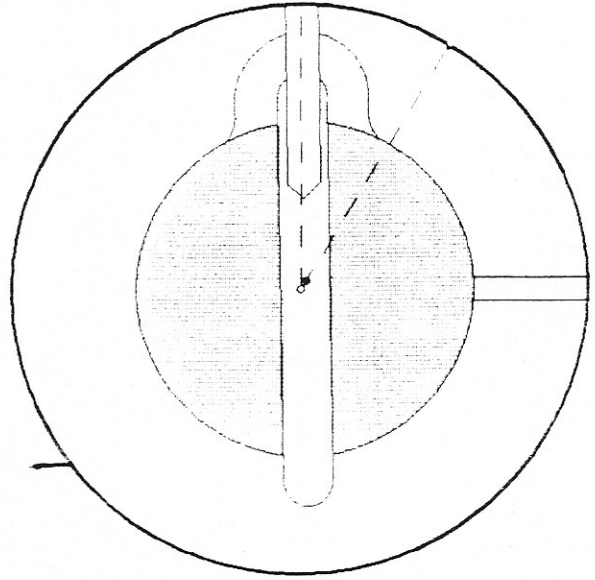


FIGURE 3
RISER PIN BENT
C.G. IN LINE WITH RISER PIN
PUNCH AWAY FROM RISER PIN ("PIN OUT")

FIGURES 1 - 3
● = CENTER OF GRAVITY (C.G.)
○ = CENTER OF BALL
∨ = ZERO BALANCE PUNCH
(DISTANCE OF C.G. FROM CENTER IS NOT TO SCALE.)



STATIC BALANCE PUNCH RIGHT

STATIC BALANCE PUNCH LEFT

DRILLED WITH LABEL NORMAL

DRILLED WITH LABEL NORMAL

RH.: LAYOUT #1 OR #3

RH.: LAYOUT #4

LH.: LAYOUT #4

LH.: LAYOUT #1 OR #3

WITH LABEL UPSIDE DOWN (180° TWIST)

WITH LABEL UPSIDE DOWN (180° TWIST)

RH.: LAYOUT #4

RH.: LAYOUT #1 OR #3

LH.: LAYOUT #1 OR #3

LH.: LAYOUT #4



STATIC BALANCE PUNCH UP

STATIC BALANCE PUNCH DOWN

WITH LABEL UPSIDE DOWN (180° TWIST)

DRILLED WITH LABEL NORMAL

RH. & LH.: LAYOUT #4

RH. & LH.: LAYOUT #4

WITH LABEL SIDeways, "B" RIGHT

WITH LABEL SIDeways, "B" RIGHT

LH.: 90° TWIST

RH.: 90° TWIST

WITH LABEL SIDeways, "B" LEFT

WITH LABEL SIDeways, "B" LEFT

RH.: 90° TWIST

LH.: 90° TWIST

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I N T E L L I G E N C E

SUBJECT:

**DRILLING TECHNIQUES
FOR FULL ROLLERS**

BULLETIN #3

JAN. 1, 1992

**MARKETING DEPT.
MUSKEGON, MI**

One of the most frequently asked questions at the Phantom seminars dealt with how best to drill a Phantom for bowlers with full roller tracks. The answer in part depends on the reaction you are trying to create.

If you want to help delay the roll or keep the ball from overreacting once it starts to roll, either drilling pattern #1 or #2 exactly as described can be used with *any* Phantom.

If, however, you want to create a reaction that has the chance to be stronger than the bowler is used to, it is recommended to use a **modified #3** layout for the **JET PHANTOM**, due to the position of the full roller track with respect to the grip holes. The **NAVY PHANTOM** is not recommended for this layout because of the amount of track flare.

DRILLING LAYOUT PATTERN #3-FR (FULL ROLLER).

The clockwise core twist used for right-handed players that track outside of both the finger and thumb holes creates a flare pattern that moves toward the fingers (right) above the narrow point in the flare and away from the thumb (left) below the narrow point. If used for a full roller, this flare direction would move the track toward both the finger and thumb holes.

In order to reverse the flare pattern, causing the track to move to the left above the narrow point and to the right below the narrow point (away from both the finger and thumb holes), simply twist the core counter-clockwise* instead of clockwise as previously described. This will place the small locating pin above the bowler's axis (toward the fingers) with the label and serial number appearing to go uphill to the right. As with the clockwise twist, the strongest reaction will be obtained when the small locating pin is 3-3/8" above the bowler's axis (45°). Twists between 0° and 45° will give reactions between Layouts #1 and #3-FR.

*Note: Layout #3 for a left-handed player is a counter-clockwise twist. Layout #3-FR for a left-handed player is a clockwise twist.

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I N T E R I M E N C E

SUBJECT:

**90° TWIST LAYOUT
PATTERN**

BULLETIN #4

JAN. 1, 1992

**MARKETING DEPT.
MUSKEGON, MI**

There have been a number of inquiries as to how the **JET PHANTOM** that Amleto Monacelli used to win in Peoria was drilled, as it didn't appear to match any of the drilling layout patterns listed in the manual or the videotape. The ball that Amleto used was a modification to Layout Pattern #2 in order to obtain a ball that gave a very even reaction like the basic #2 Layout, but slightly more back-end reaction than the basic layout. To explain this in-between pattern, refer to Figures 1 through 4.

If you take a Phantom out of the box and set it in a ball cup with the riser pin straight up and the locating pin directly to the right, looking down on the top of the ball, the ring of the core would appear as in Figure 1. If the locating pin was on the axis of revolution, this would correspond to Layout #1.

If the ball is tipped 90° to the right so that the riser pin is directly to the right and the locating pin is on the bottom of the ball, the ring would be parallel to the table and would appear to be a circle when viewed from above as in Figure 2. If the riser pin was on the axis of revolution, this would be Layout #2.

Layout #2 can also be achieved by starting with the ball in the position of Figure 1, then first twisting the ball 90° clockwise so that the riser pin is still up but the locating pin is directly forward as in Figure 3.

With the ball in this position, tip it 90° to the right so that the riser pin is to the right and the locating pin is forward as in Figure 4. This is also a position for Layout #2.

The difference between Figures 2 and 4 is simply a quarter revolution about the riser pin, which in this layout is the axis of revolution. Therefore, from a reaction standpoint, Figures 2 and 4 would be identical.

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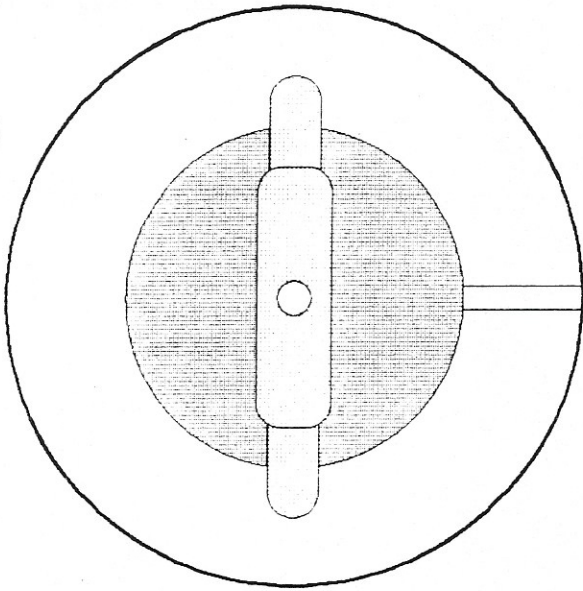
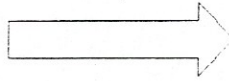


FIGURE 1
RISER PIN UP
LOCATING PIN RIGHT



90° TIP
TO RIGHT

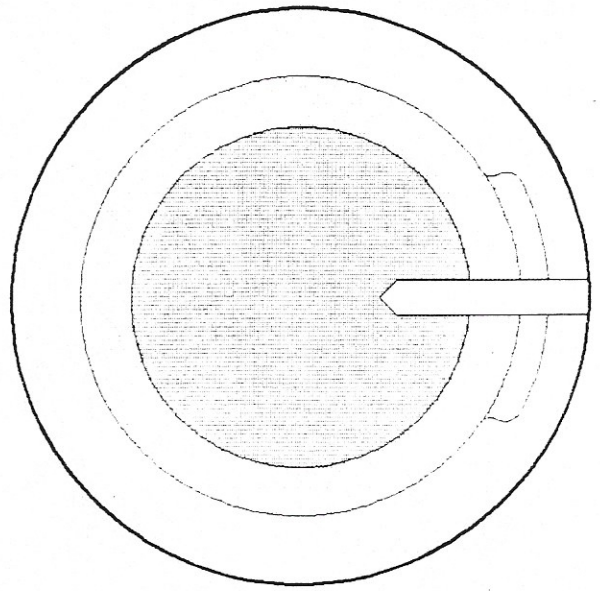
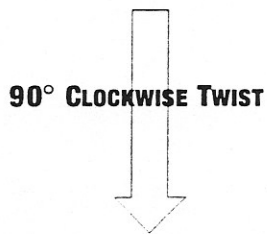


FIGURE 2
RISER PIN RIGHT
LOCATING PIN DOWN



90° CLOCKWISE TWIST

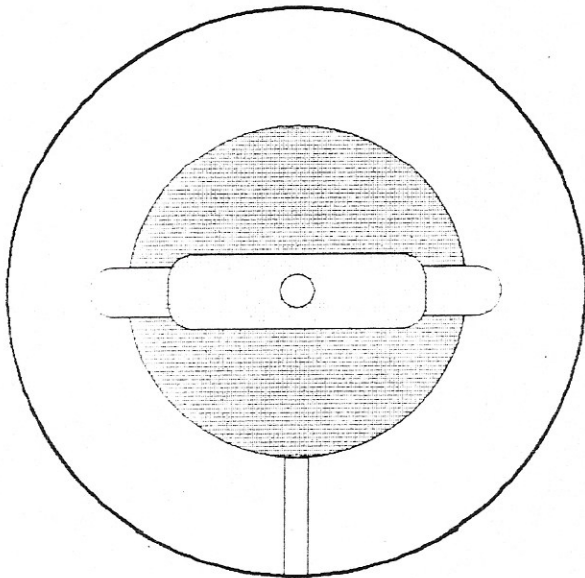
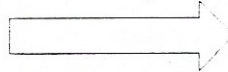


FIGURE 3
RISER PIN UP
LOCATING PIN FORWARD



90° TIP
TO RIGHT

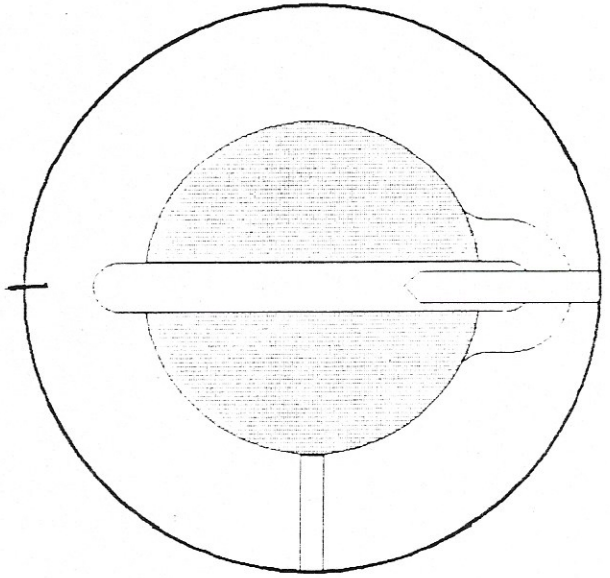


FIGURE 4
RISER PIN RIGHT
LOCATING PIN FORWARD



90° ROTATION
ABOUT RISER

REACTION CONTROL WITH A MODIFIED #2 LAYOUT.

BULLETIN #4

PAGE 3 OF 3

The modified Layout #2 that Amleto used first was twisted 90° as in Figure 3, but then the riser pin was only partially tipped toward the axis. This caused the overall ring to be in the same position as for Layout #2 except that the thick part of the ring wasn't as close to the axis as possible, creating slightly more instability than is present in a pure Layout #2. This translates into slightly more reaction than a pure #2 will provide. With the 90° twist layouts, the more the riser pin is tipped toward the axis, the less reactive the ball will be, even though tipping the riser pin toward the axis adds more side weight. The dynamic stability that is gained by placing the thick part of the ring closer to the axis of revolution, approaching the ball's minimum moment of inertia, overcomes the static influence of increasing side weight.

LAYOUT FOR MODIFIED #2 DRILLING.

To lay out a ball with a 90° twist, it is helpful to make a second locating pin. First, from the riser pin measure 6-3/4" toward the "B" logo, which would normally be above the fingers. Make a short arc to mark this distance. Next, from the locating pin, measure 6-3/4" toward the "B" logo and make a short arc to mark this distance. Where the two arcs come together, make a punch mark with the tip of a bevel knife or a scribe. This mark becomes the "90° locating pin" and can be used to lay out various degrees of tip along with the 90° twist. For example, to achieve a 90° twist with a 45° tip, find the halfway point between the riser pin and the 90° locating pin and use that point as the bowler's axis. For more tip, move the axis toward the riser pin. For less tip, move the axis toward the 90° pin.

For players with a very strong release and over 15 revolutions, the 90° twist with little or no tip may prove to be very unstable and give much more reaction than is desired, even though the same layout for a player with a less strong game may be stable enough to provide the desired reaction.

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I N T E L L I G E N C E

SUBJECT:

**NAVY PHANTOM
DRILLING
CONSIDERATIONS**

BULLETIN #5

JAN. 1, 1992

**MARKETING DEPT.
MUSKEGON, MI**

The construction of the **NAVY PHANTOM** is different than any other bowling ball currently available. As is explained in the "How To Arm A Phantom" drilling manual and videotape, the **NAVY PHANTOM** is actually a three-piece ball. Unlike standard three-piece balls that have a core, weight block and shell as their three pieces, the **NAVY PHANTOM** has an inner core, an outer core and shell which creates a three-piece ball with the reaction characteristics of a two-piece ball. The inner core of the **NAVY PHANTOM** is exactly the same size and shape as the core of the **JET PHANTOM**, but is made from a material that is 40% more dense, which allows more of the weight of the ball to be located close to the center of the ball. This effectively lowers the overall moment of inertia of the ball, causing the **NAVY PHANTOM** to roll earlier and change its axis more quickly than a **JET PHANTOM** drilled in the same configuration. The dense core also allows the **NAVY PHANTOM** to be manufactured in gross weights down to 12 pounds while still maintaining its dynamic integrity. To compensate for the additional weight of the inner core in the **NAVY PHANTOM**, it is necessary to surround it with a lightweight outer core, creating a spherical total core. This total core is then surrounded by a constant thickness urethane shell to complete the ball.

Due to the construction of the **NAVY PHANTOM**, there are some precautions that must be taken in drilling and working out the balls.

1. DRILL THE HOLES WITH A MEDIUM TO SLOW RATE OF DRILL BIT FEED.

Because the shell, outer and inner cores are of different densities and hardness, drilling the holes too quickly can cause the drill bit to wander as it hits the different materials, creating holes that are not round. Drilling the holes at a medium to slow feed rate will solve this problem. If you have trouble creating round holes when you drill partially into plug and partially into the ball, you will probably have trouble drilling a **NAVY PHANTOM** due to the play in your drill press.

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2. BE CAREFUL USING THE HIGH SPEED BEVEL SANDER TO FINISH HOLES. USE ONLY ONE SANDING DISC ON THE BEVEL SANDER.

The outer core material of the **NAVY PHANTOM** is a lightweight material and sands away rapidly with the bevel sander. Too much time or pressure with the bevel sander will cause a lip between the shell of the ball and the outer core. Approach the finishing off of the holes the same way you would a lightweight ball and there should be no problem with the holes.

3. RESPECT THE DYNAMICS OF THE NAVY PHANTOM.

Due to its construction, the **NAVY PHANTOM** is going to roll sooner and change its axis more quickly than any other bowling ball currently being manufactured. (*Note: This does not mean that it will hook more for every bowler on every lane condition*). For some bowlers this ball will be an advantage, but for some it will be a disadvantage.

The **NAVY PHANTOM** is recommended for players who are having difficulty creating ball reaction on medium to heavily oiled lanes *because* their current ball gets into a roll too late or doesn't roll strong enough once it starts to roll.

Players whose physical game allows them to generate early enough roll on medium to heavily oiled lanes with current high hook potential balls such as the **JET PHANTOM**, Blue Hammer or Nitro may find that the **NAVY PHANTOM** will roll too soon or roll out for them on all but the most flooded lanes.

The **NAVY PHANTOM** is not recommended if the player wants to only use a single ball. In this case a less reactive ball would be recommended.

Because of the strength of the dynamics of the **NAVY PHANTOM**, it is *not* generally recommended for full rollers because it is difficult to keep the track off of either the thumb or the finger holes. If drilling a **NAVY PHANTOM** for a player who throws a full roller is required, the best chance for success is to drill either Layout #1 or #2, as these are stable positions and *may* not hit the holes. For more information on drilling for full rollers see Phantom Intelligence Bulletin #3.

When drilling a **NAVY PHANTOM** in dynamically instable positions, it is *strongly recommended* to keep the narrow point of the flare near the middle finger hole. As is explained in the drilling manual and videotape, this is done by drawing a line from the small locating pin *through*, and past, the riser pin. Where this line meets the track is where the narrow point of the flare will occur. Using the layouts described, or any layout in-between, will then cause the flare to move to the right (toward the finger holes) above the narrow point and to the left (away from the thumb) below the narrow point for a right handed bowler with a track outside of the finger and thumb holes. Pure #3 and #4 Layouts with the **NAVY PHANTOM** *will* create a wide flare pattern. If the narrow point of the flare is on the grip center line or near the thumb, it is very possible that the track will flare over the holes. If the narrow point of the flare is near the middle finger, the same amount of flare will rotate the track *around and above* the holes.

Due to the strength of the dynamics of the **NAVY PHANTOM**, it is very possible that small moves off of the #1 and #2 Layouts toward the #3 or #4 Layouts will produce enough reaction for all but the most flooded lanes. This will also minimize the total width of the flare pattern. The closer the ball is drilled to a #1 or #2 Layout, the less it will flare. The closer the ball is drilled to a #3 or a #4 Layout, the more it will flare.

The modified #2 Layout with a 90° twist and a 45° tip, as described in Phantom Intelligence Bulletin #4, will create a ball that rolls slightly later than a pure #2 but provides almost as much reaction as a pure #4 with a more moderate amount of flare. Due to the dynamics of the **NAVY PHANTOM**, this layout gives a much stronger reaction than the same layout in the **JET PHANTOM**. To obtain a reaction closer to a pure #2 Layout, it is recommended you keep the riser pin within 1-1/2" of the bowler's axis.

Remember, the **NAVY PHANTOM** has been *designed* for use on medium to heavily oiled lanes for most players. Those players with weaker physical games may find that the **NAVY PHANTOM** gives them slightly more reaction than they are used to getting. Those players with good to strong physical games may find that the **NAVY PHANTOM** can only be used when there is a lot of oil on the lanes and all of their other equipment is skidding too long or reacting too weakly. Those players with the strongest games may find very few opportunities to use the **NAVY PHANTOM** effectively.