Calibration

W. Pierre Peltier
Technical Sales
And
Business Development
Terry Asphalt Materials Inc.

What will we cover?

- **Basics of calibration**

History of Calibration Process

- In early days of industry, calibration performed by operator judgment.
- Worked fine for unmodified, slow set slurry.
- Introduction of polymer modified emulsions required conforming to tighter specifications.
- Results in better quality control of the product.

What is calibration?

- Process of measuring by weight
  - Actual output of:
    - Aggregate
    - Emulsion
    - Fines (dependent on machine make)
- Correlated to revolutions of the aggregate belt
- Recorded by a counter

Why do we calibrate?

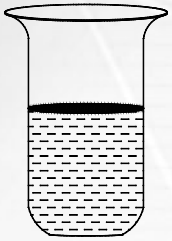
- Allow the machine to be set such that the ratios of aggregate, emulsion and fines stay fixed at a predetermined level.
- Ensure quality control of the system for the contractor and buying agency

How do we calibrate?

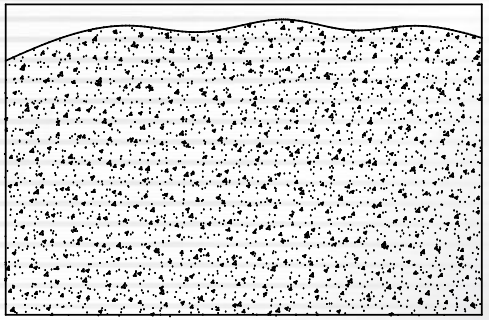
- The mix design specifies the amount of emulsion as a percentage of the amount of aggregate, by weight.
- For example, a 10% mix design means the weight of the emulsion shall be 10% of the weight of the aggregate. To then switch to a 12% mix design requires changing the quantity of emulsion or aggregate.
- If we mixed in a batch...

How do we calibrate?

10%

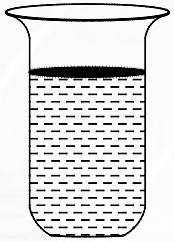


Emulsion – 10 lbs

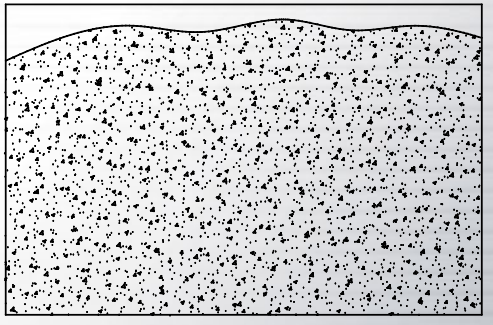


Rock – 100 lbs

12%

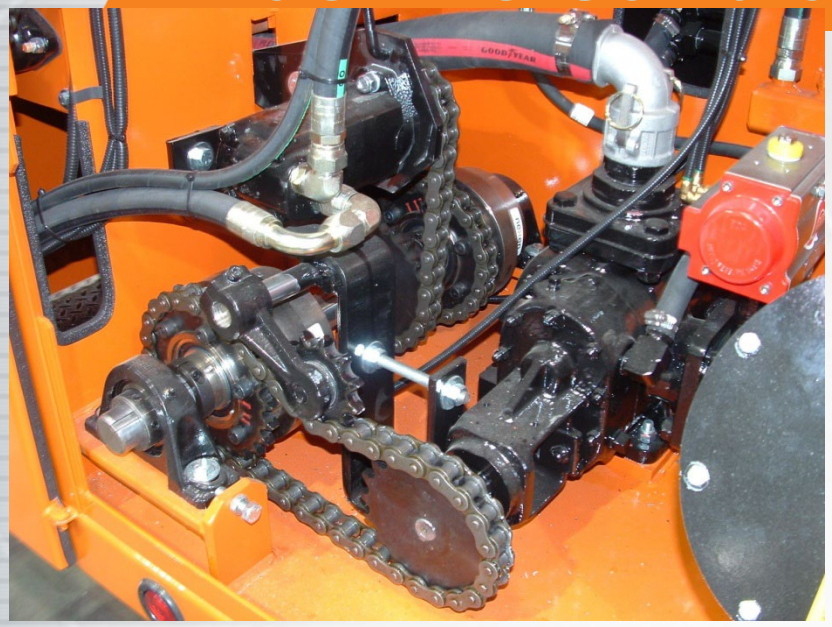


Emulsion – 12 lbs



Rock – 100 lbs

Machine Calibration



Since we have a continuous feed operation, we must match the aggregate delivery to the emulsion pump delivery.

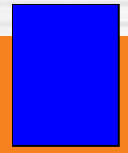
This is done with “counters” which are also known as totalizers.

Counters

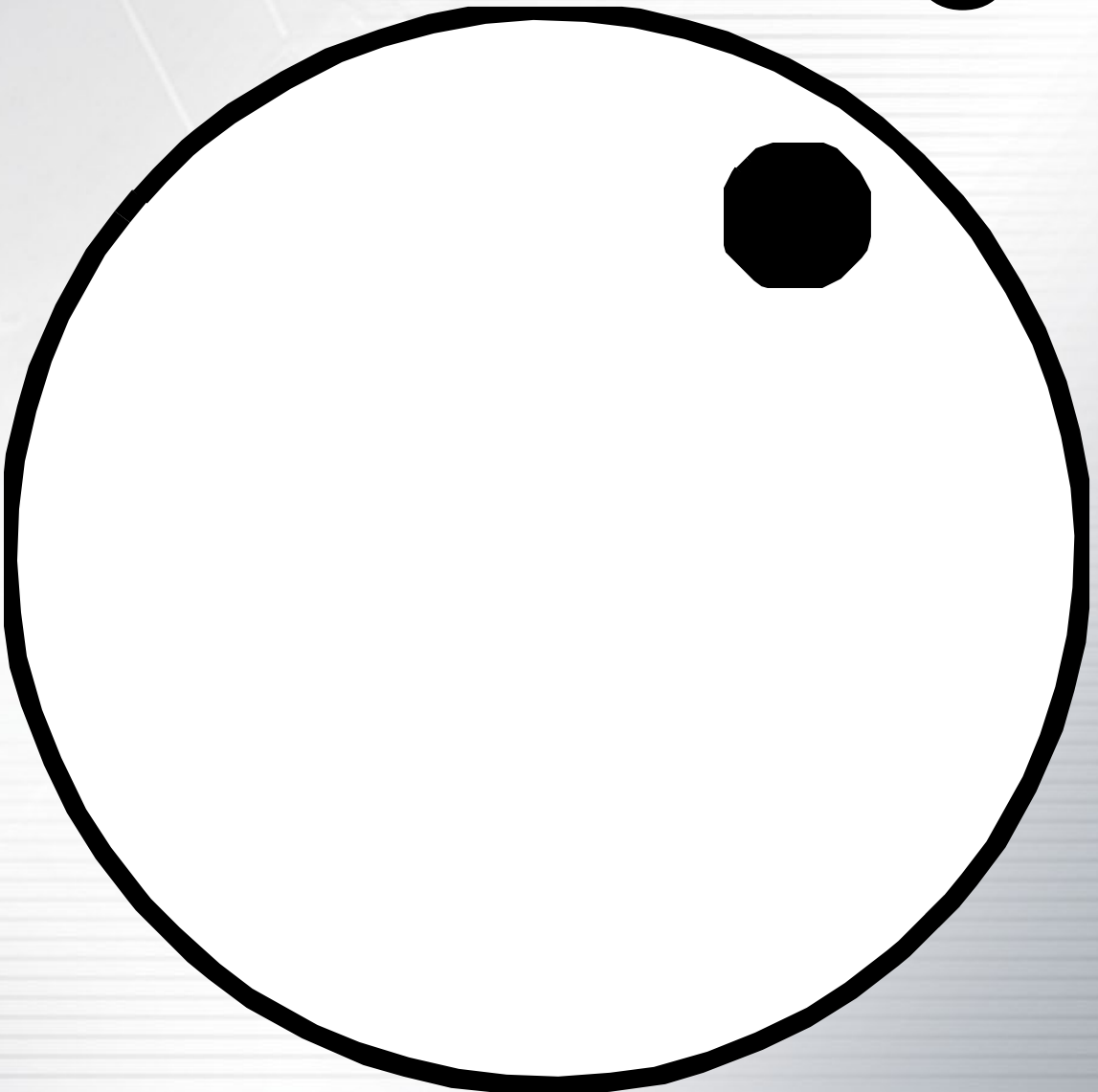
- Count, or totalize the revolutions of a shaft, pulley or sprocket.
- In some applications, counts fractions of a revolution.
- Counters are not rate dependent.

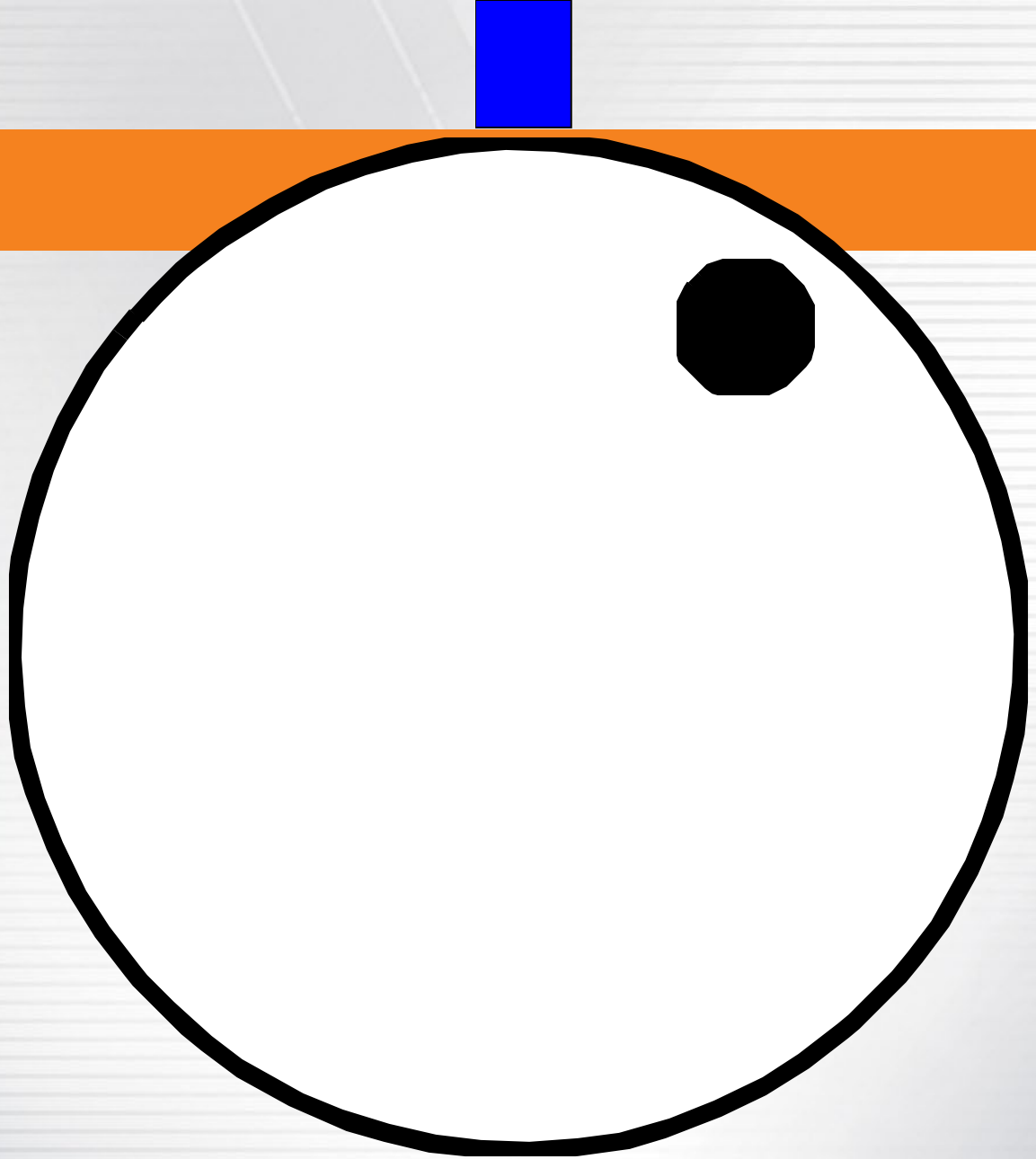
Counter example ….

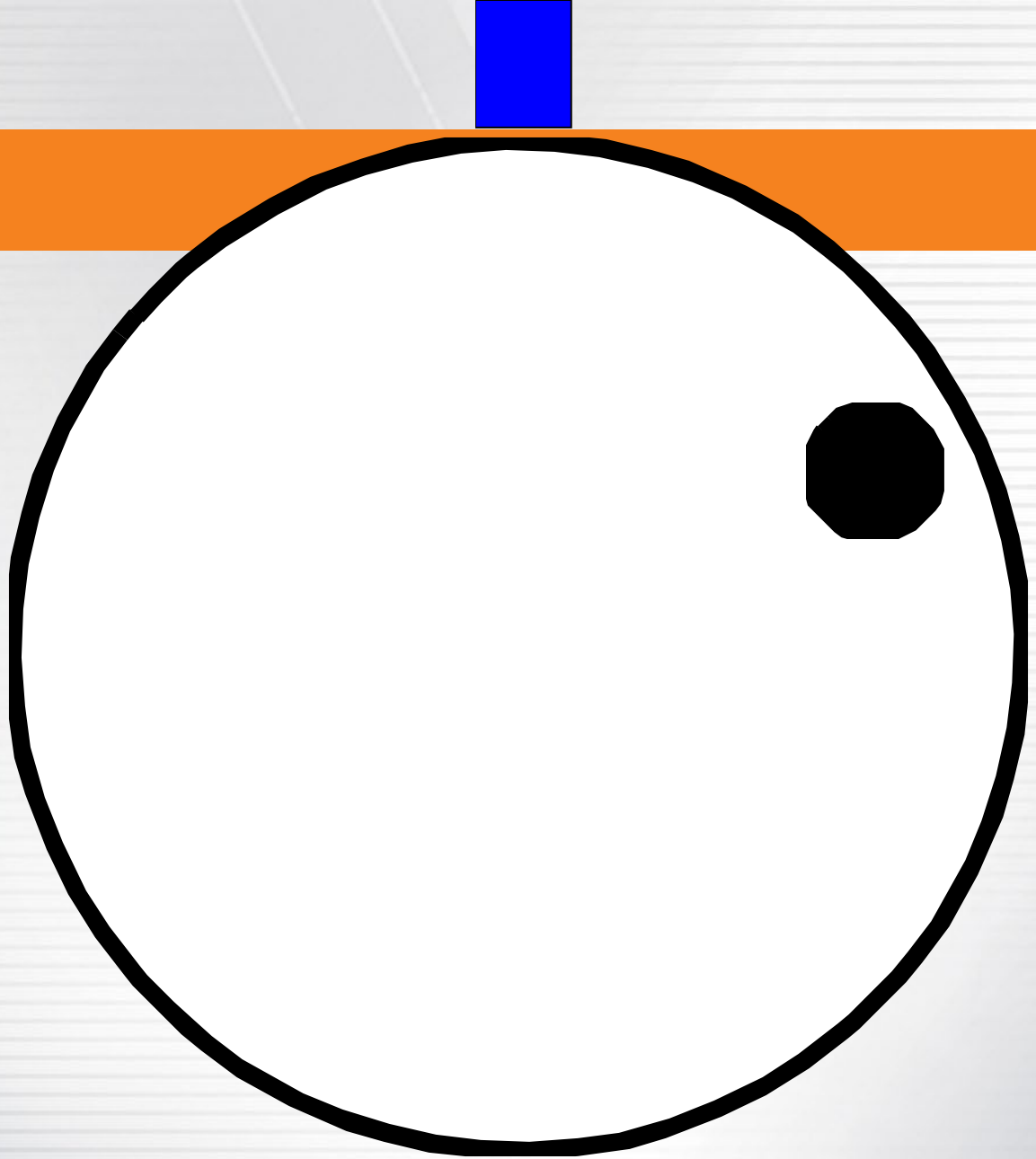
Counter Example

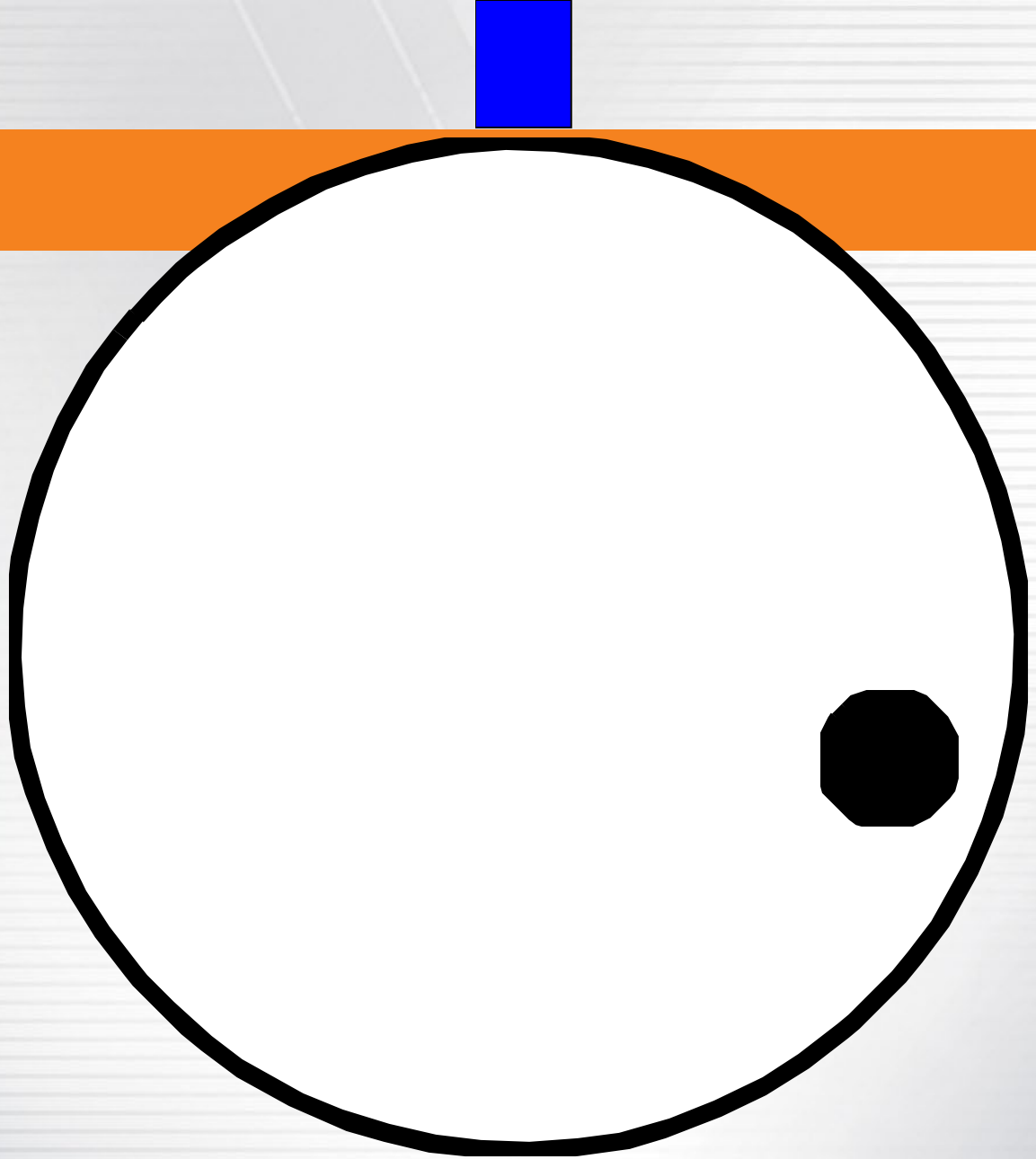


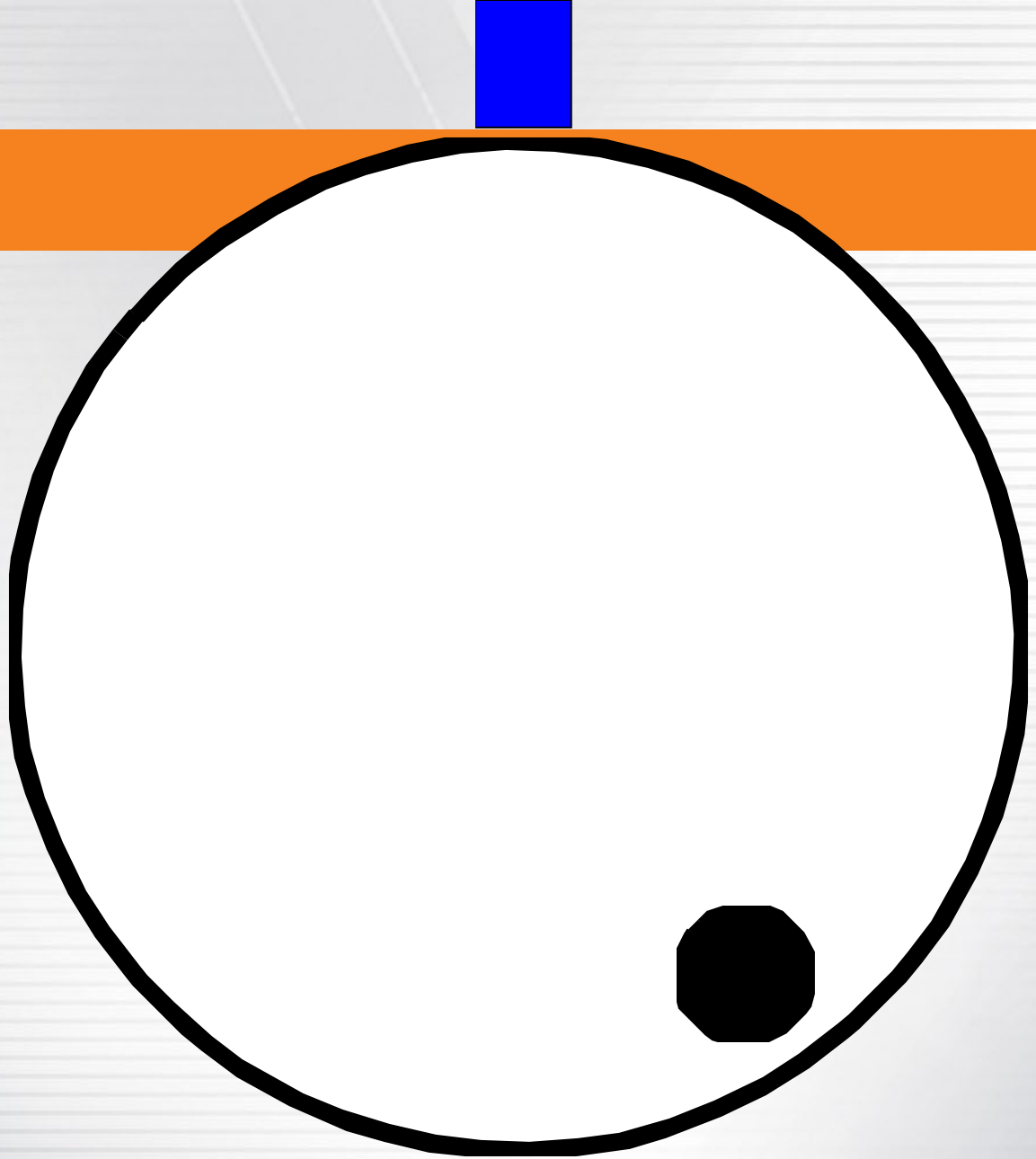
0

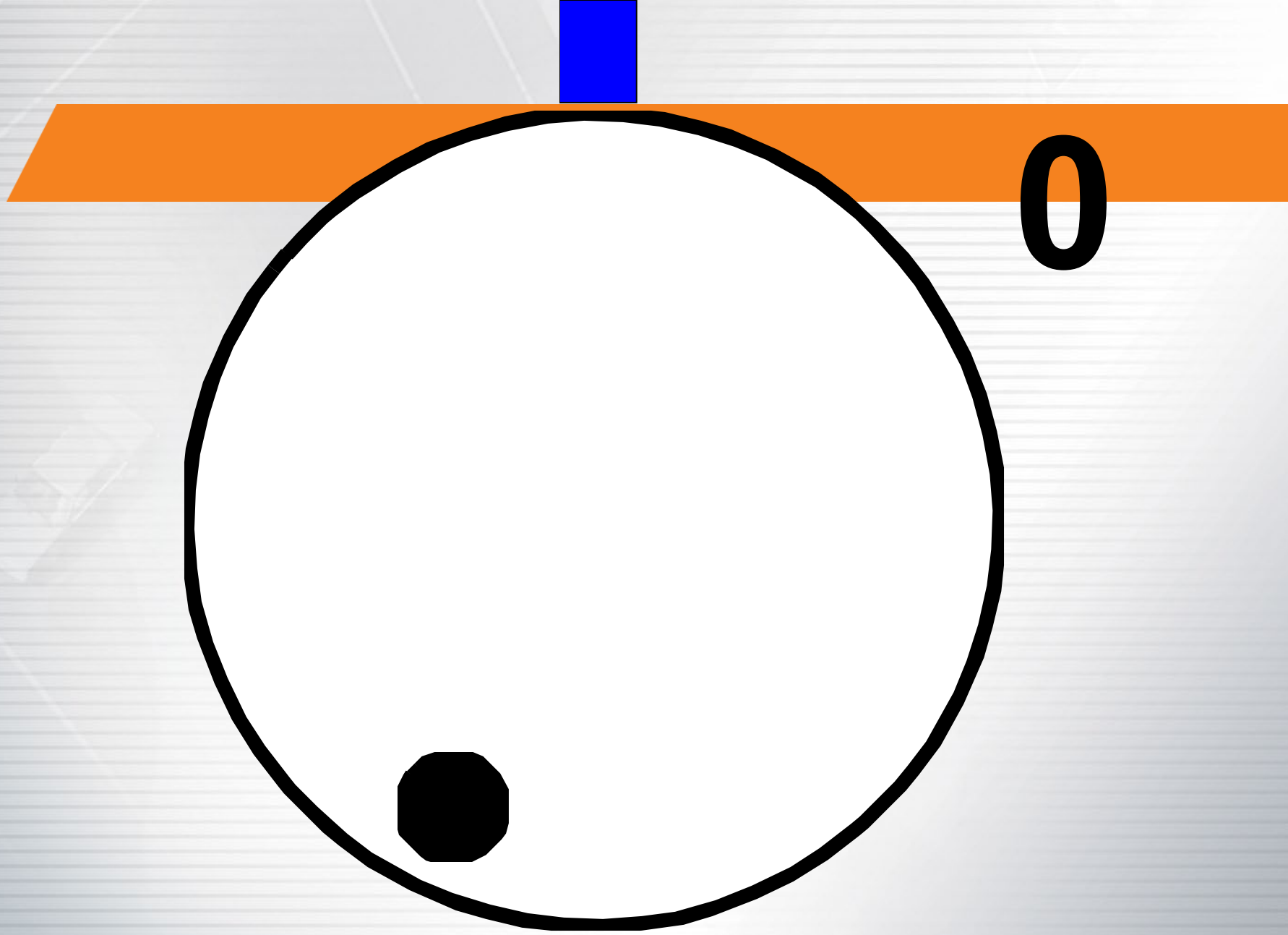


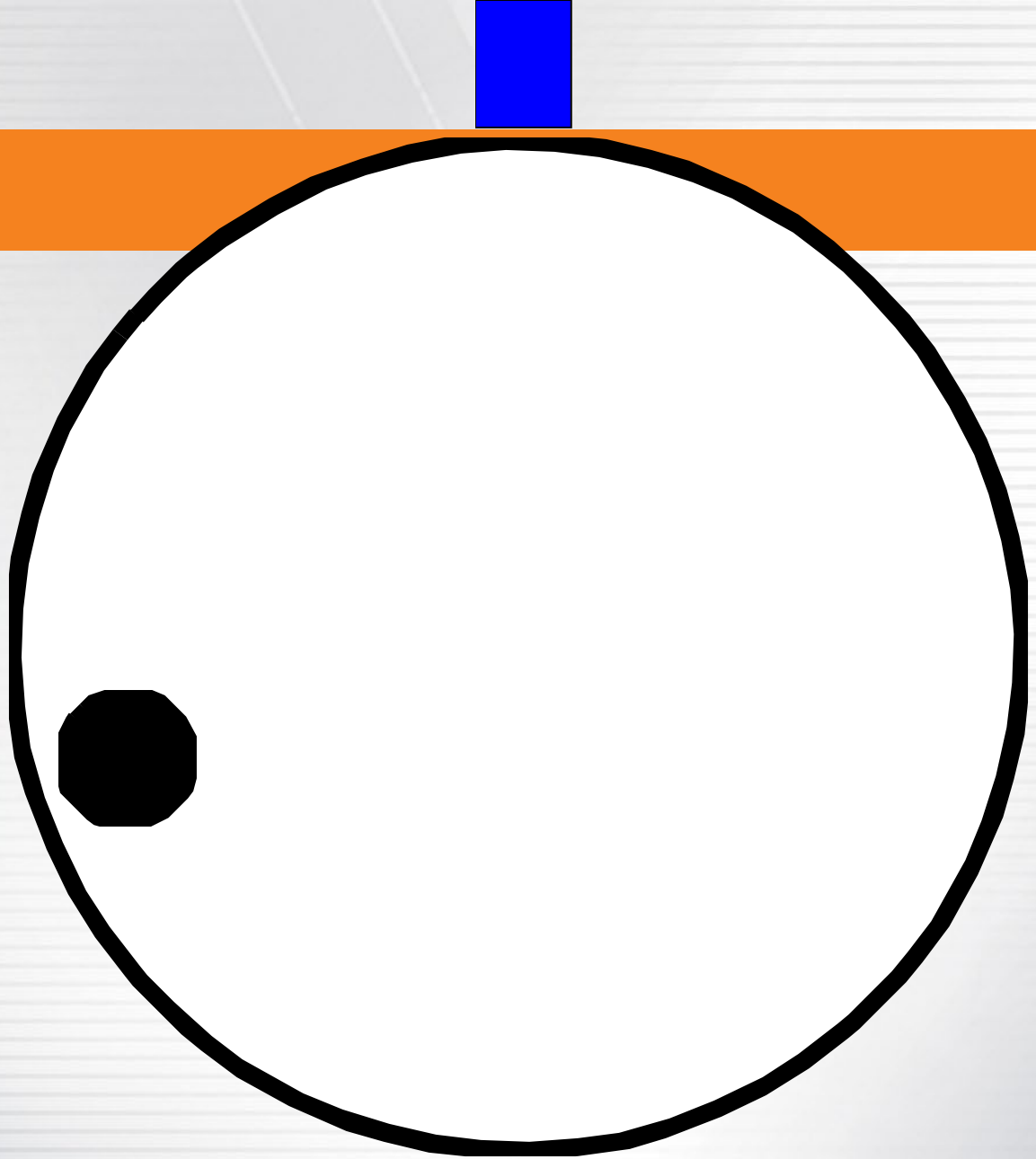

0

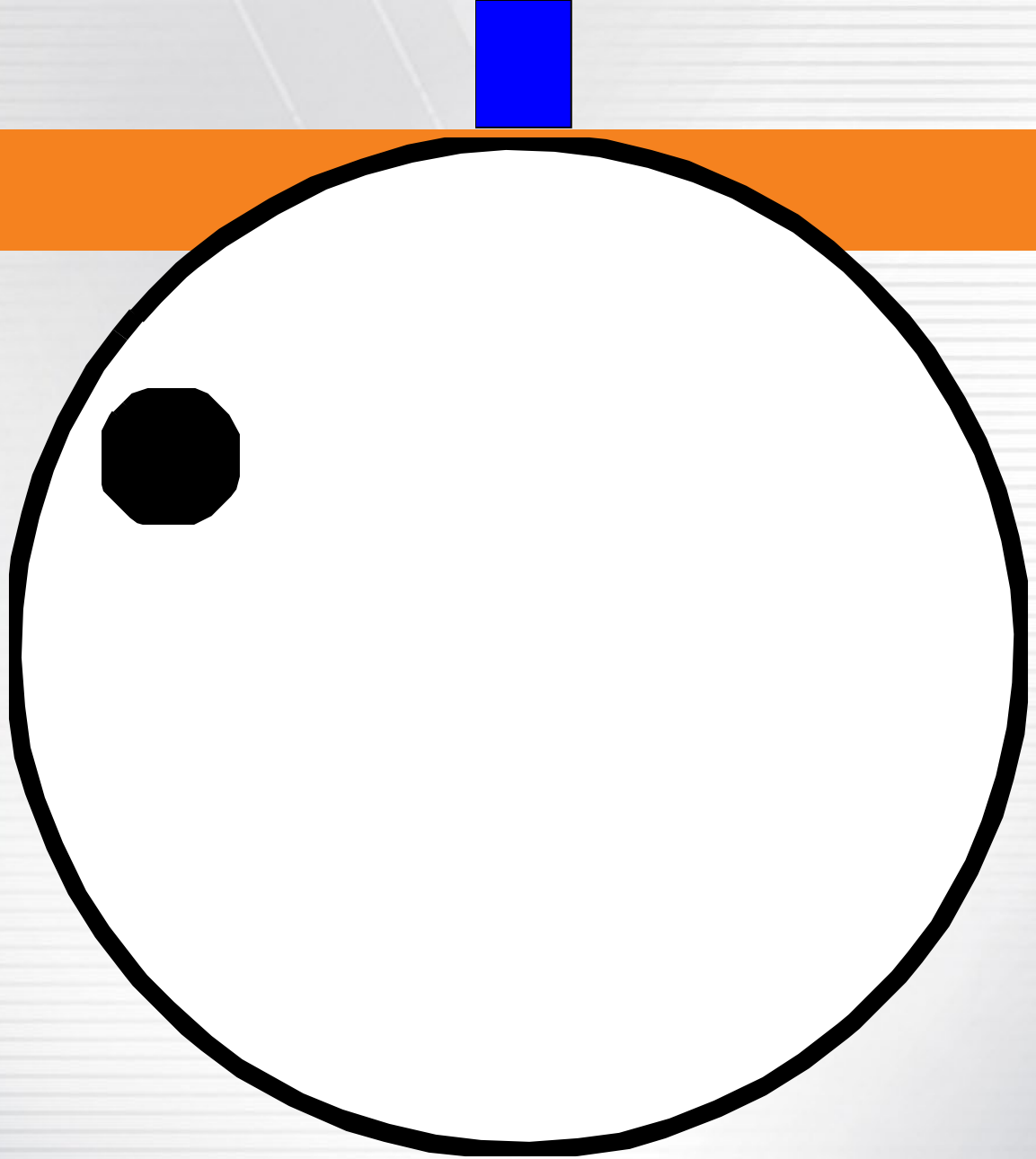

0

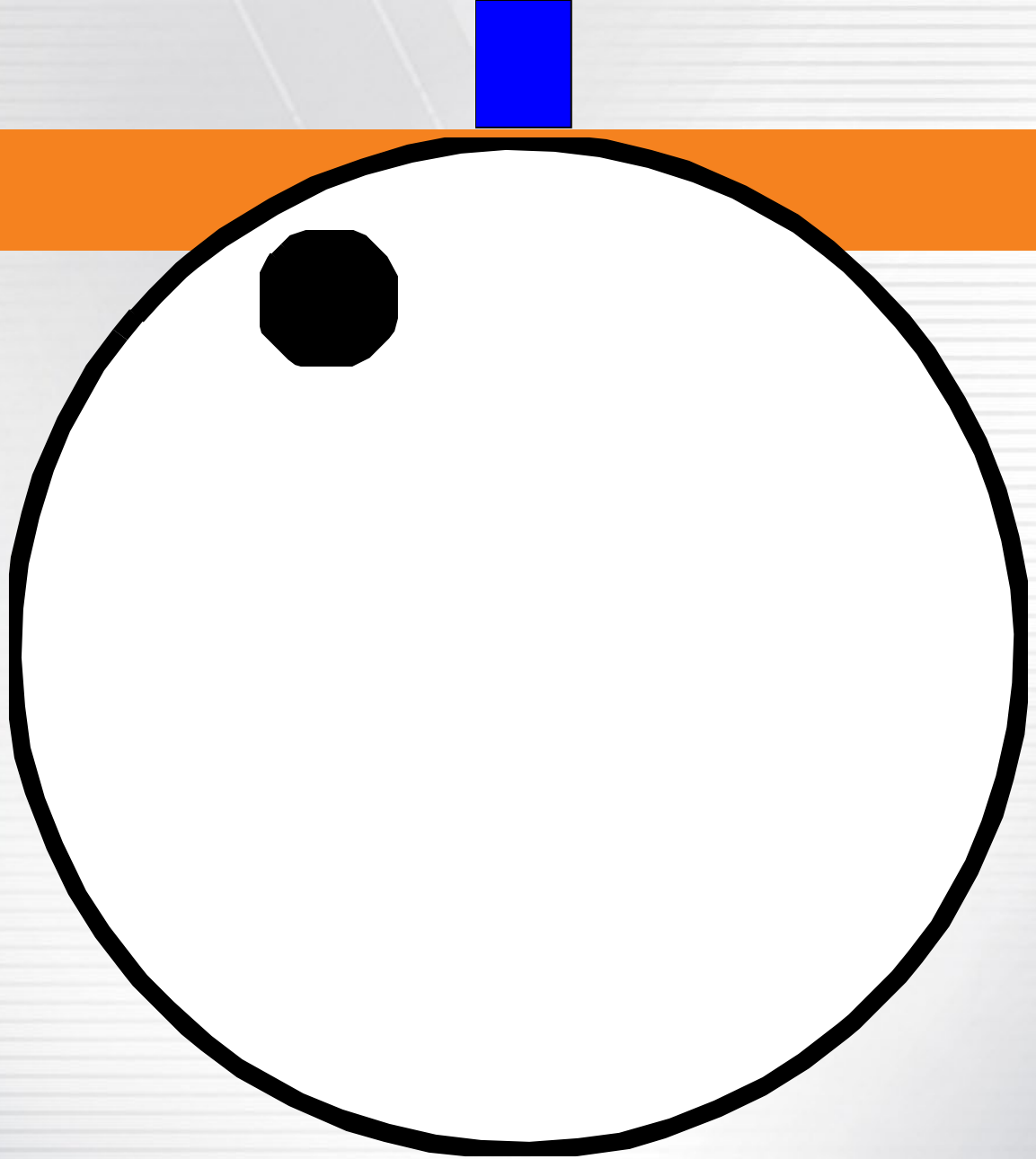

0

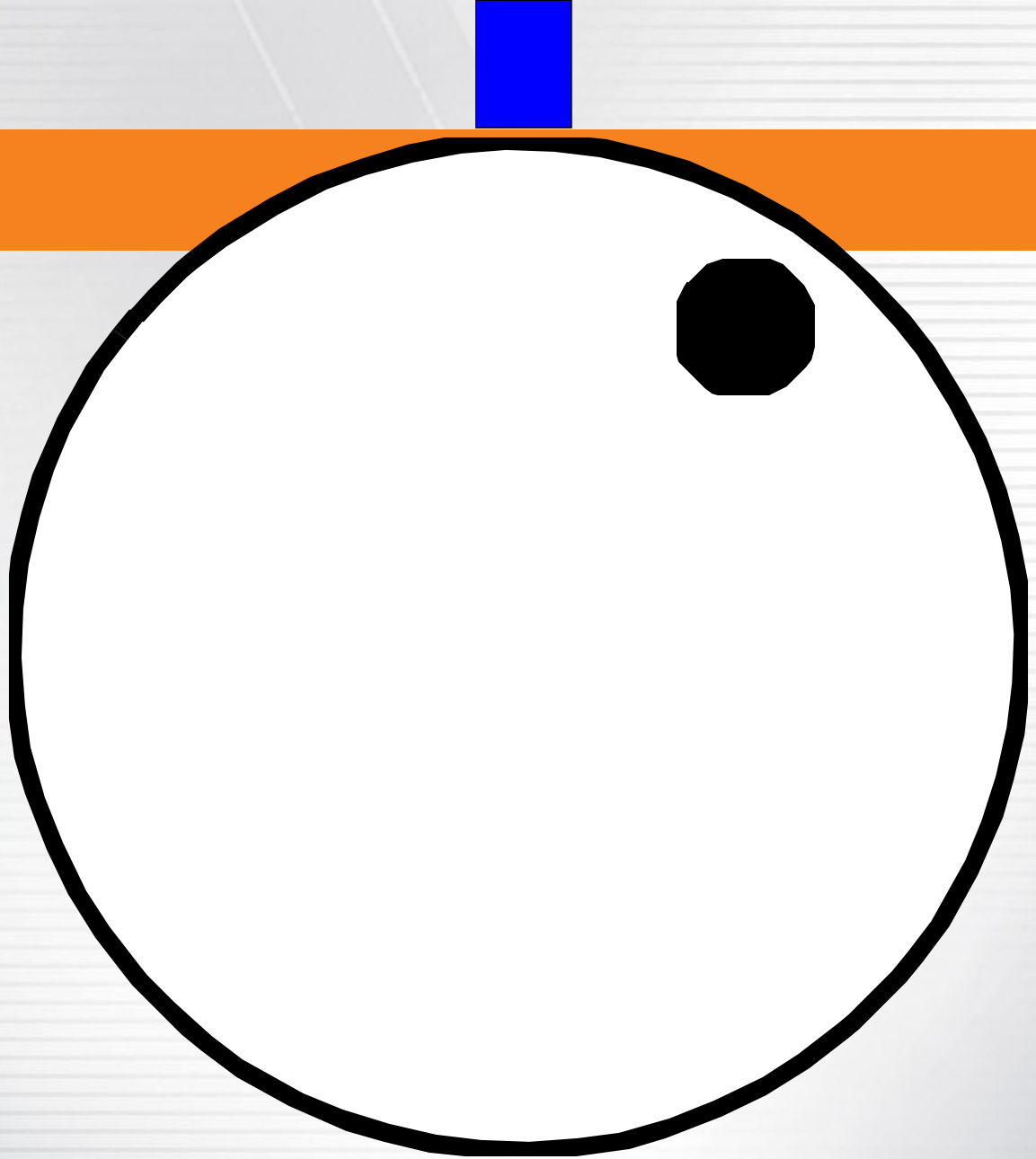


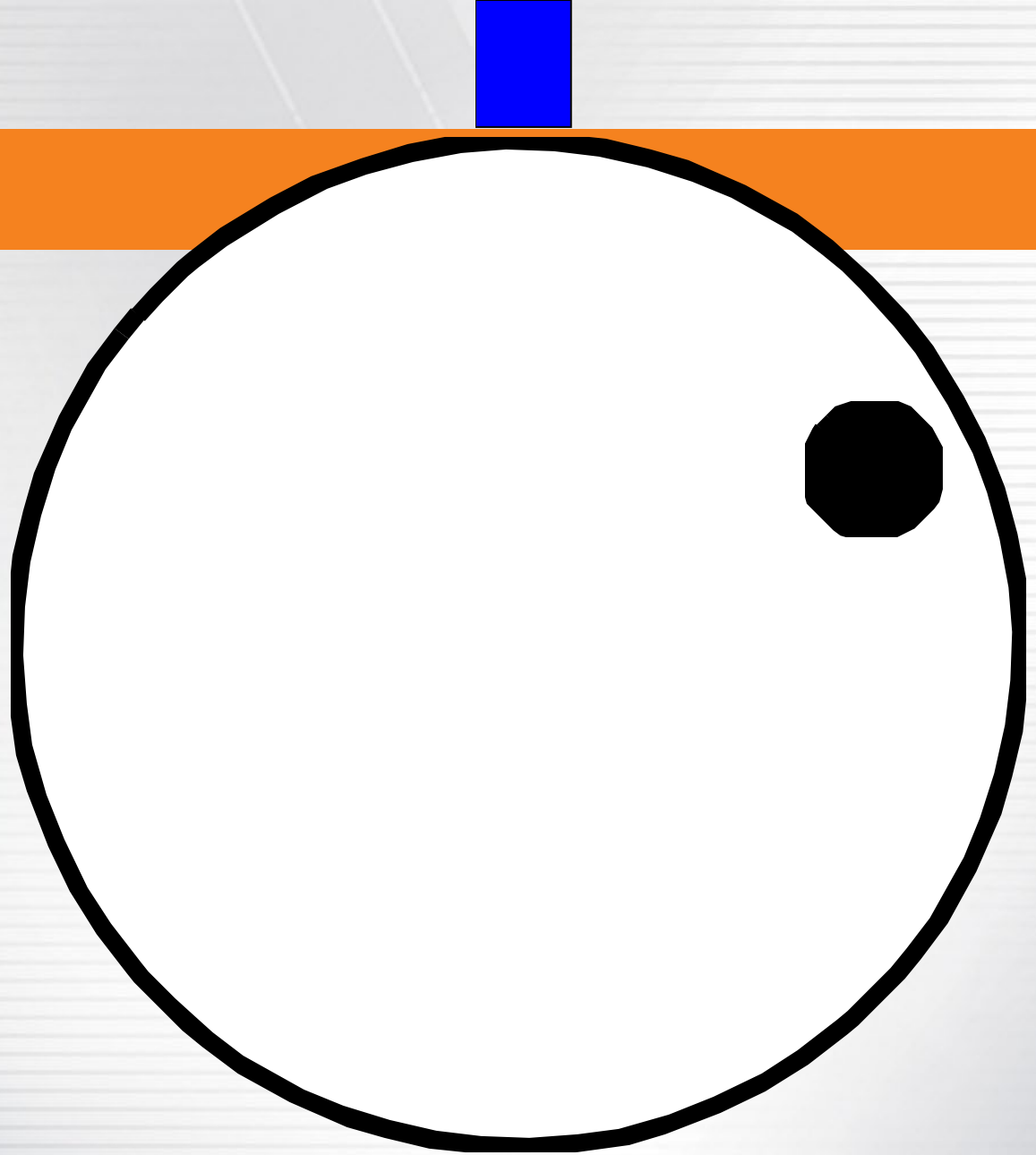

0

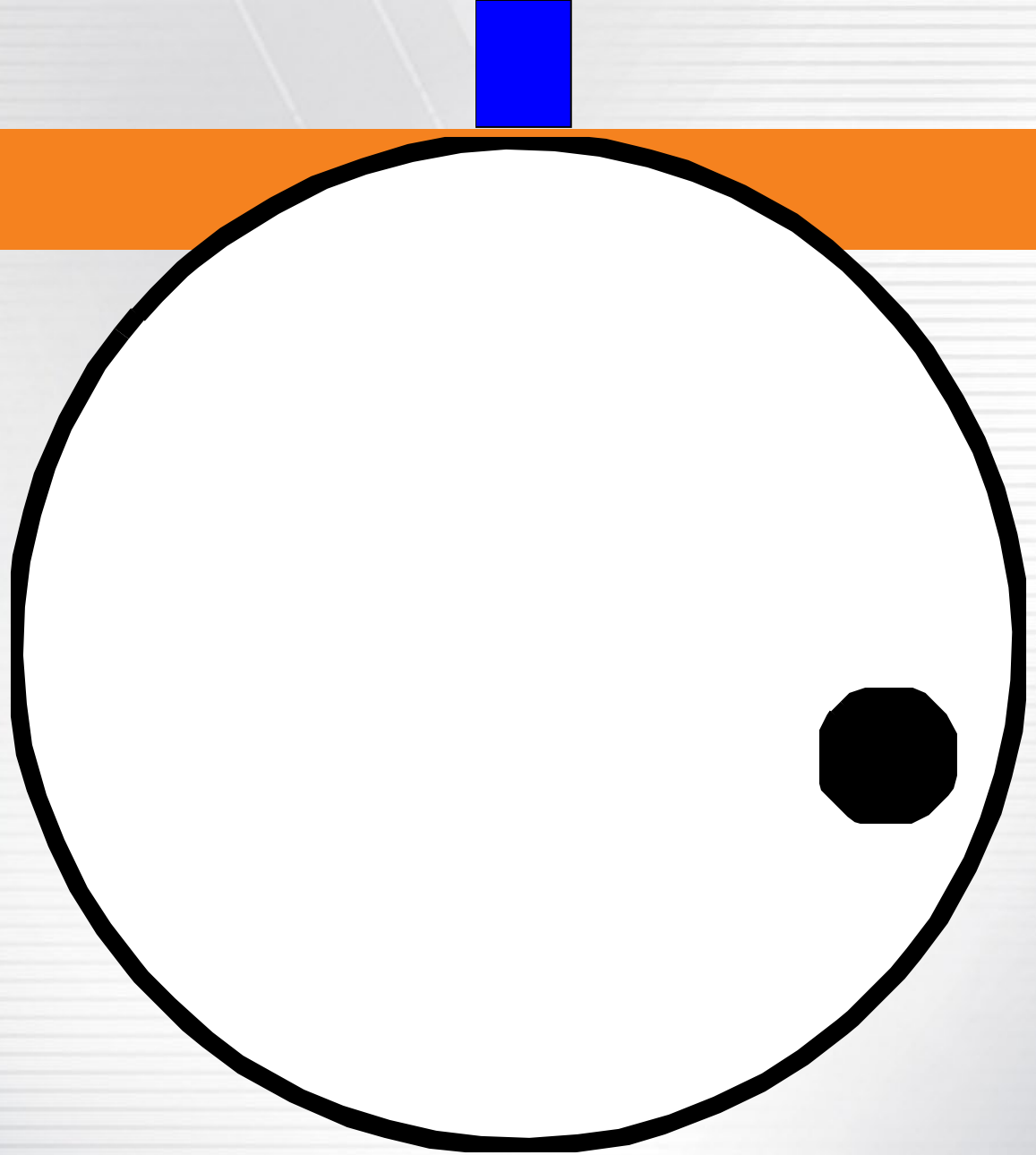

0

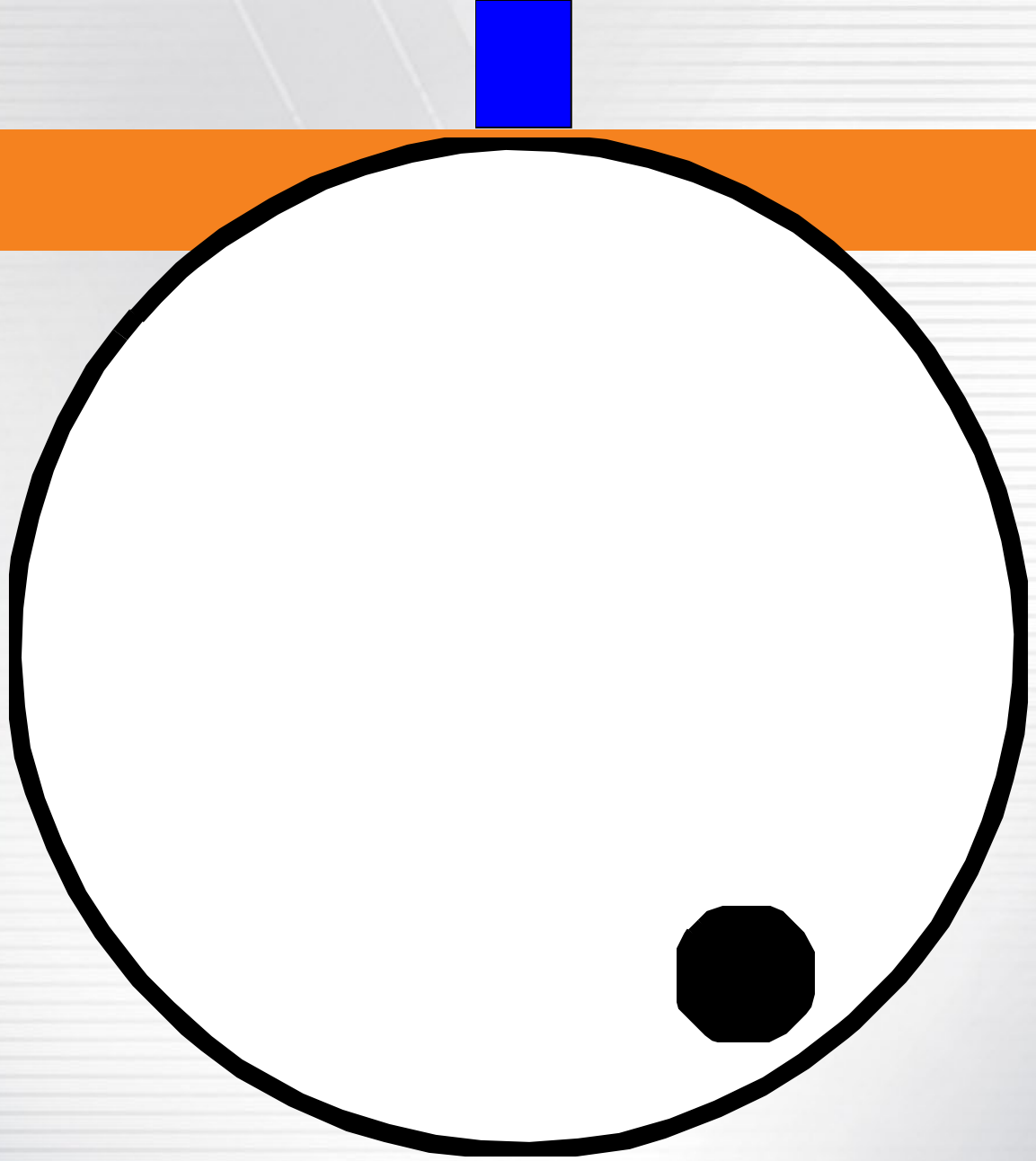

0

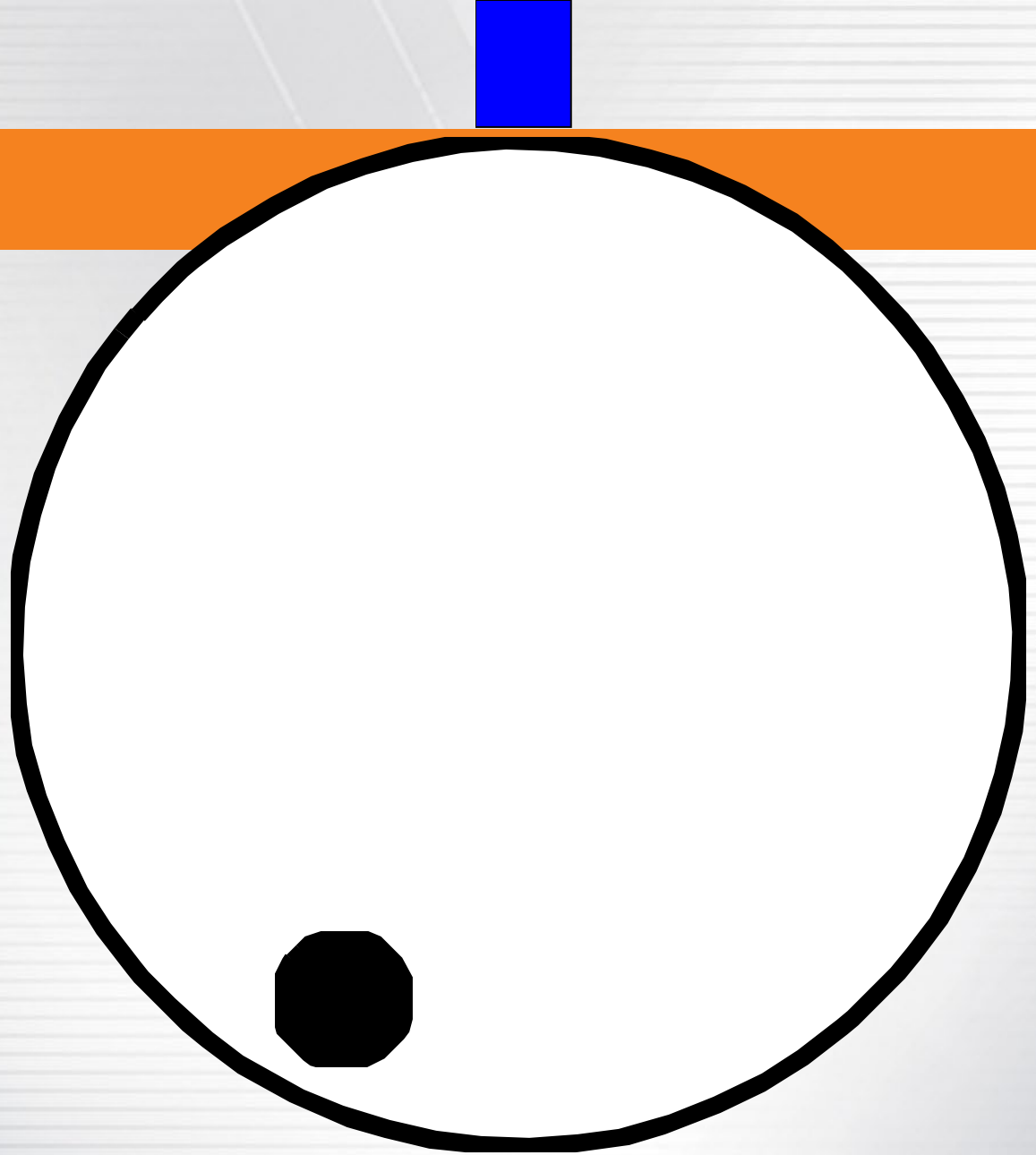

0


1

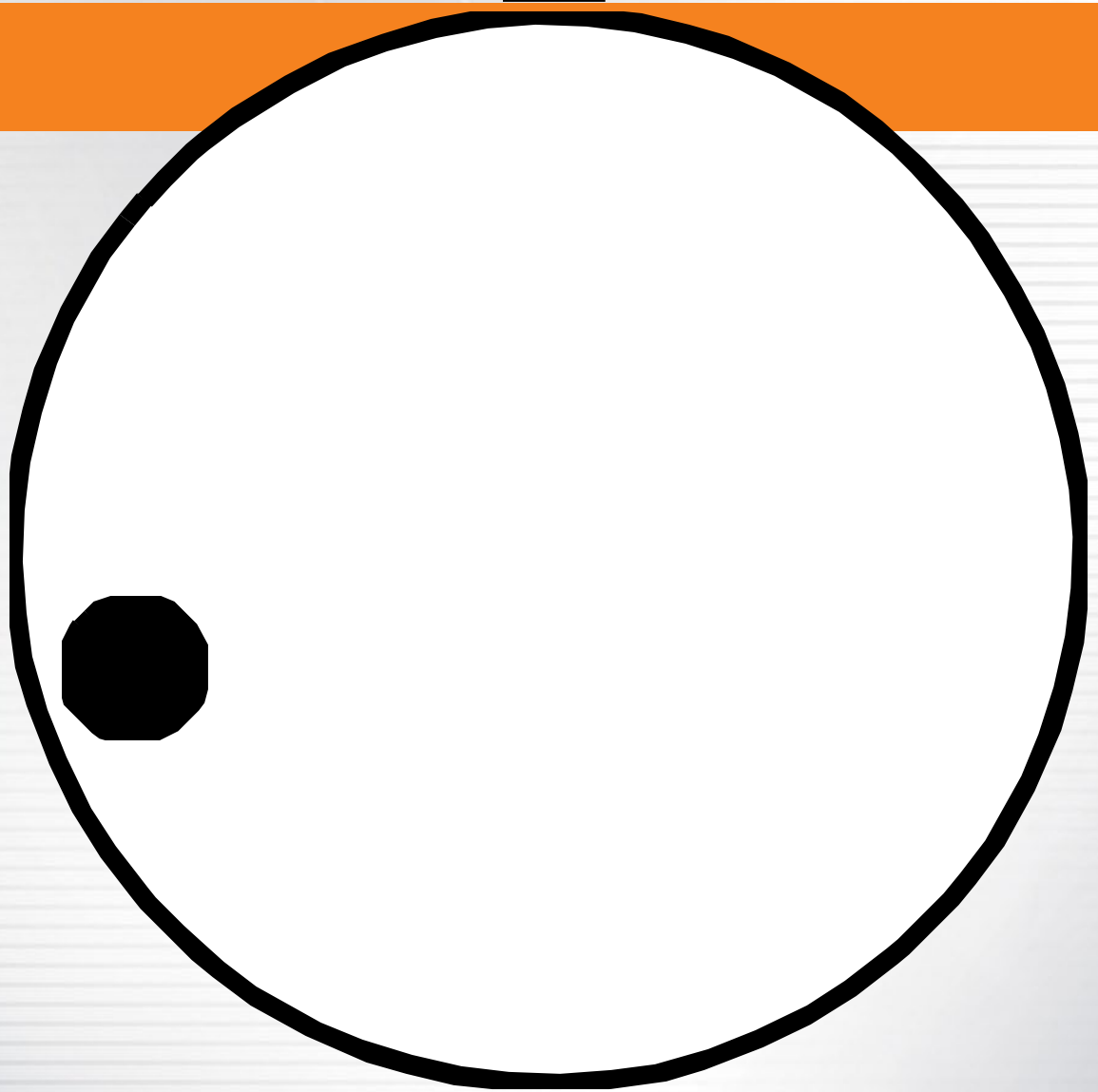

1



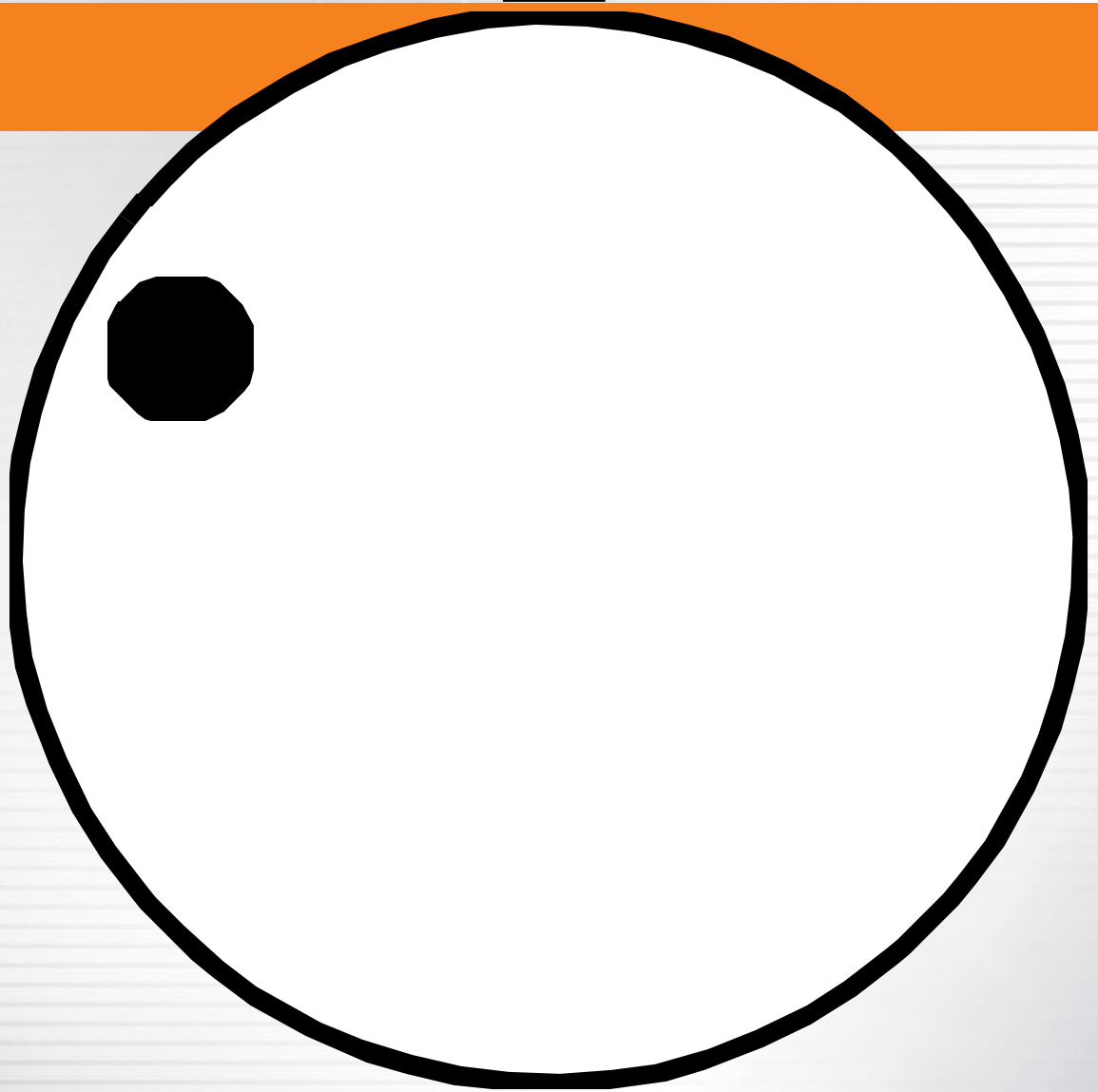


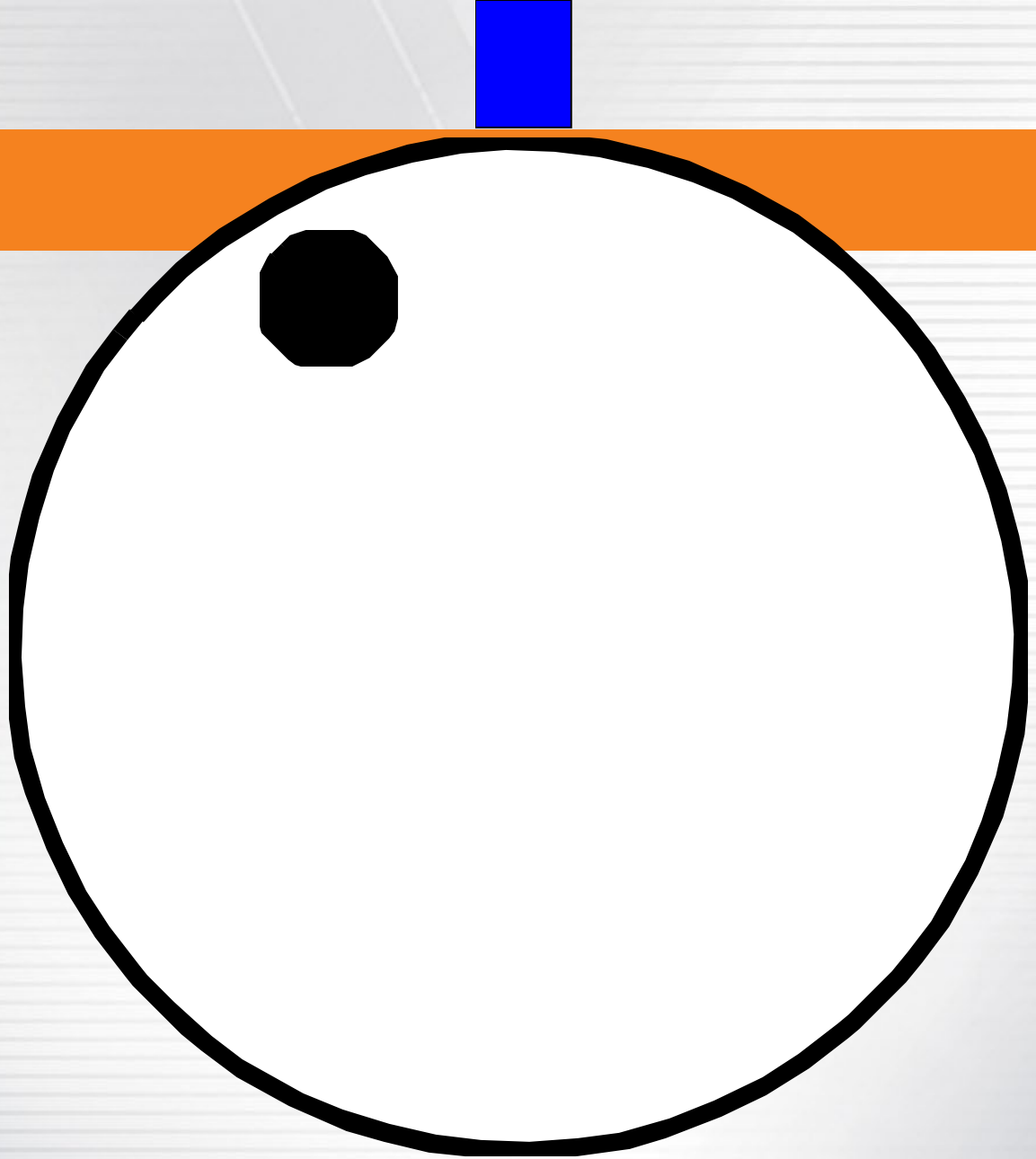

1

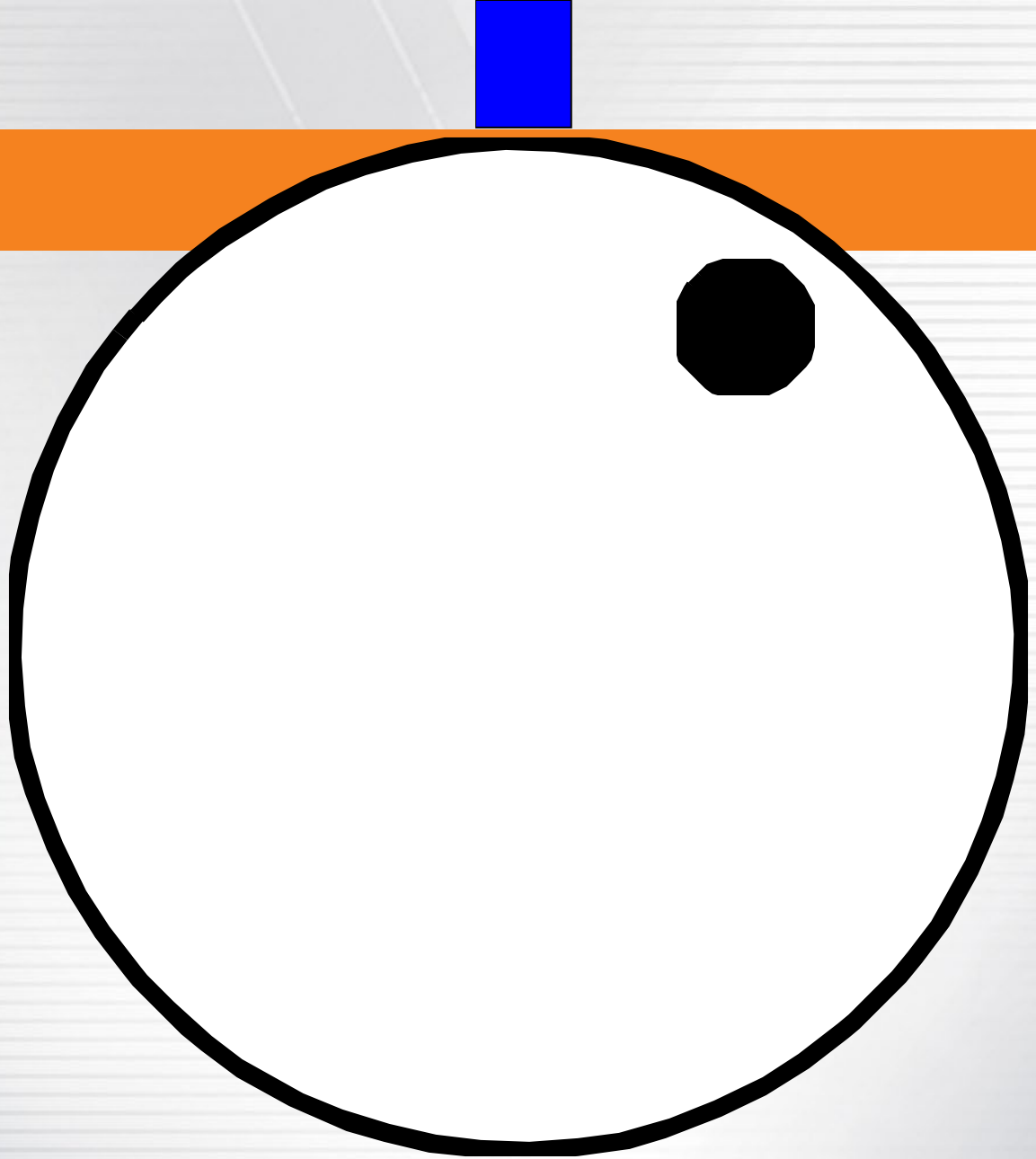
1

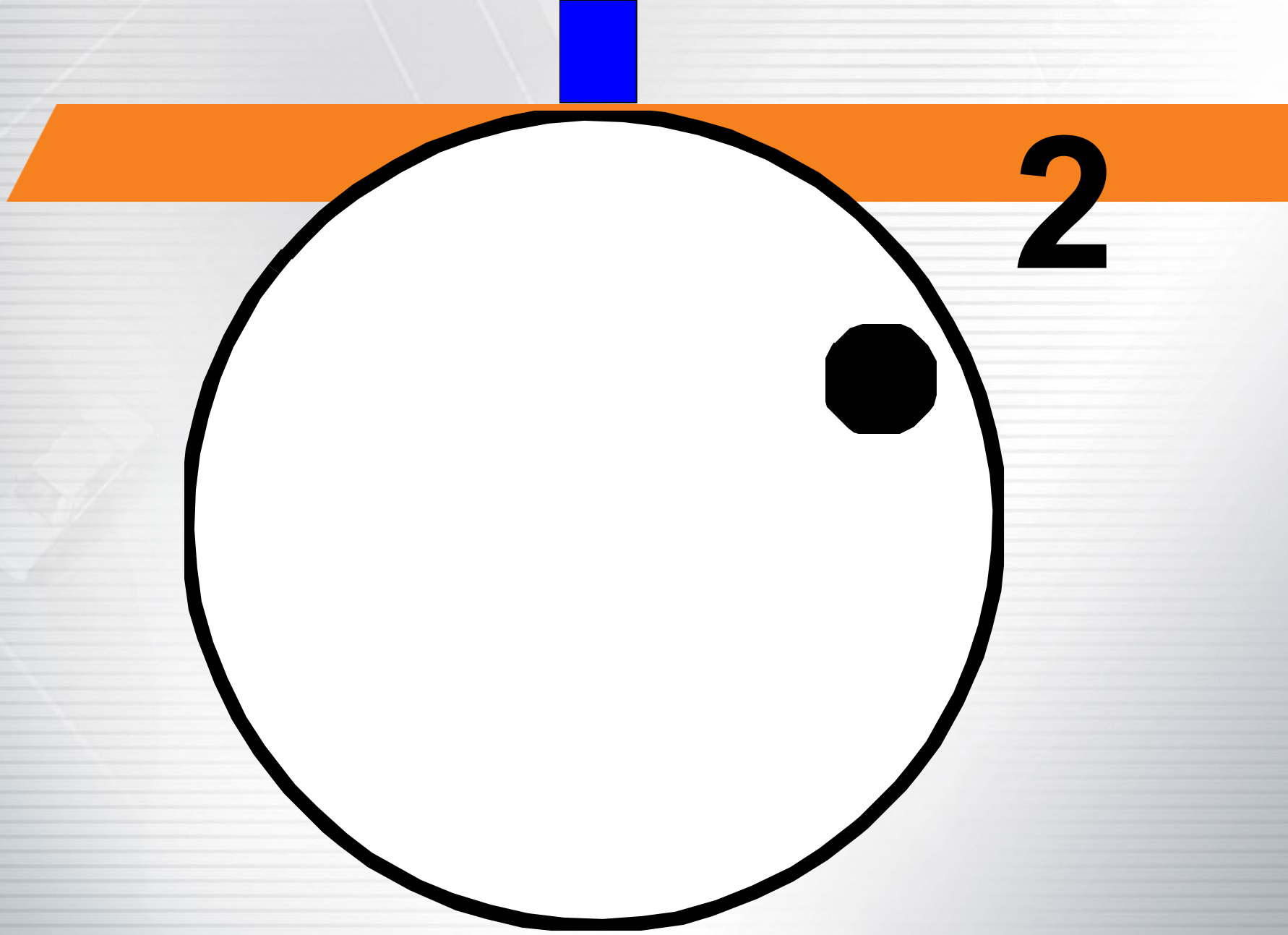


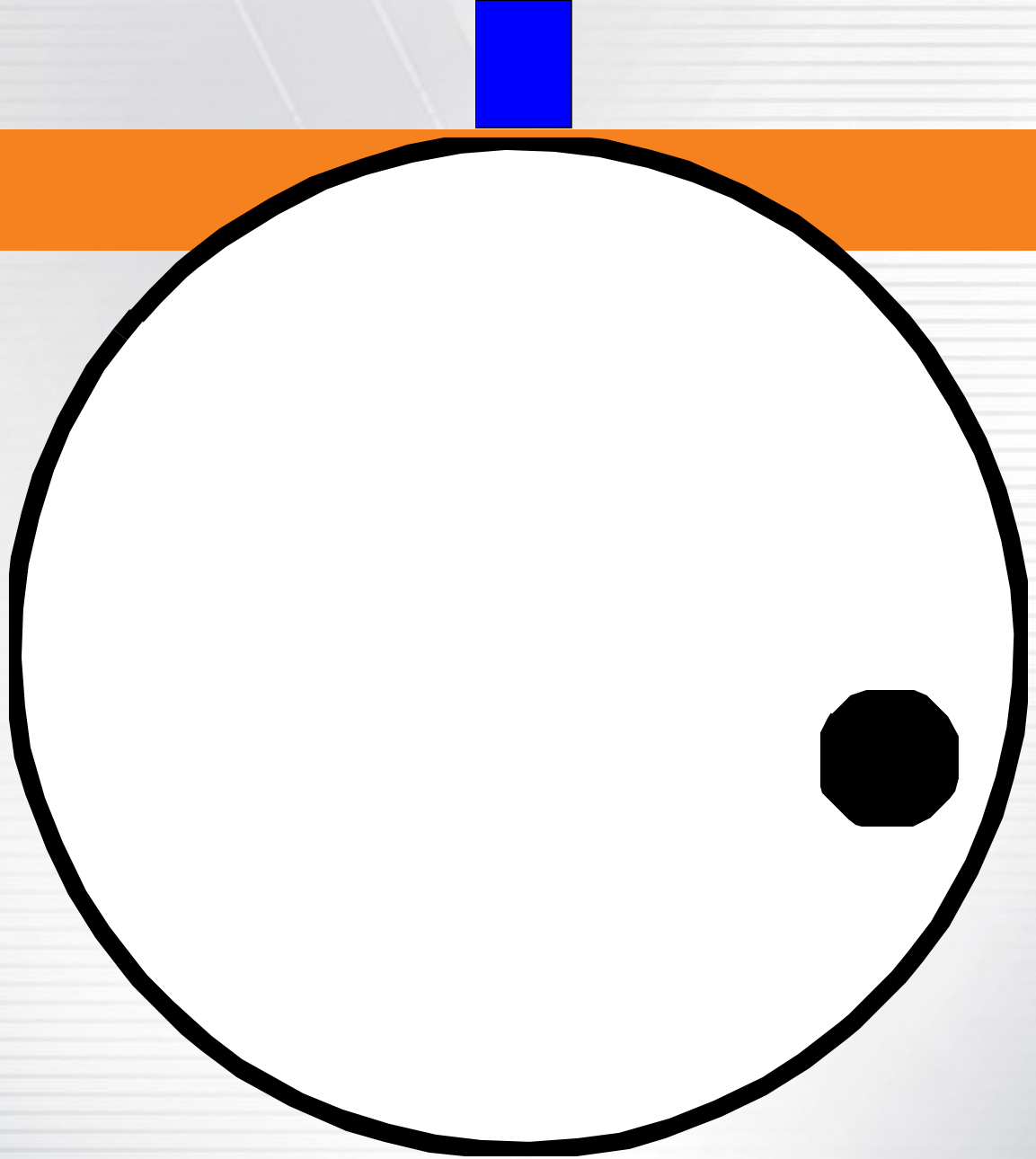
1

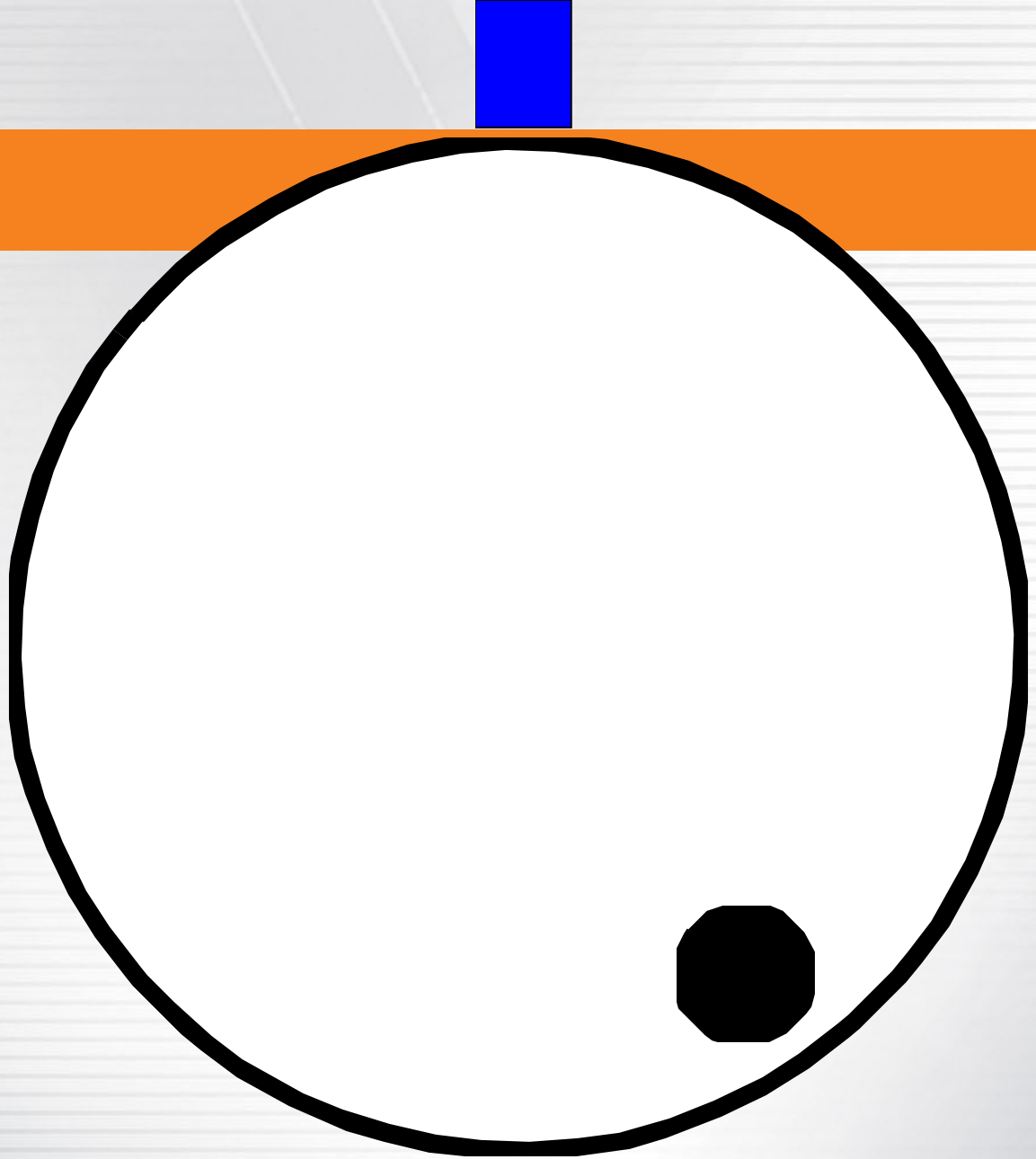


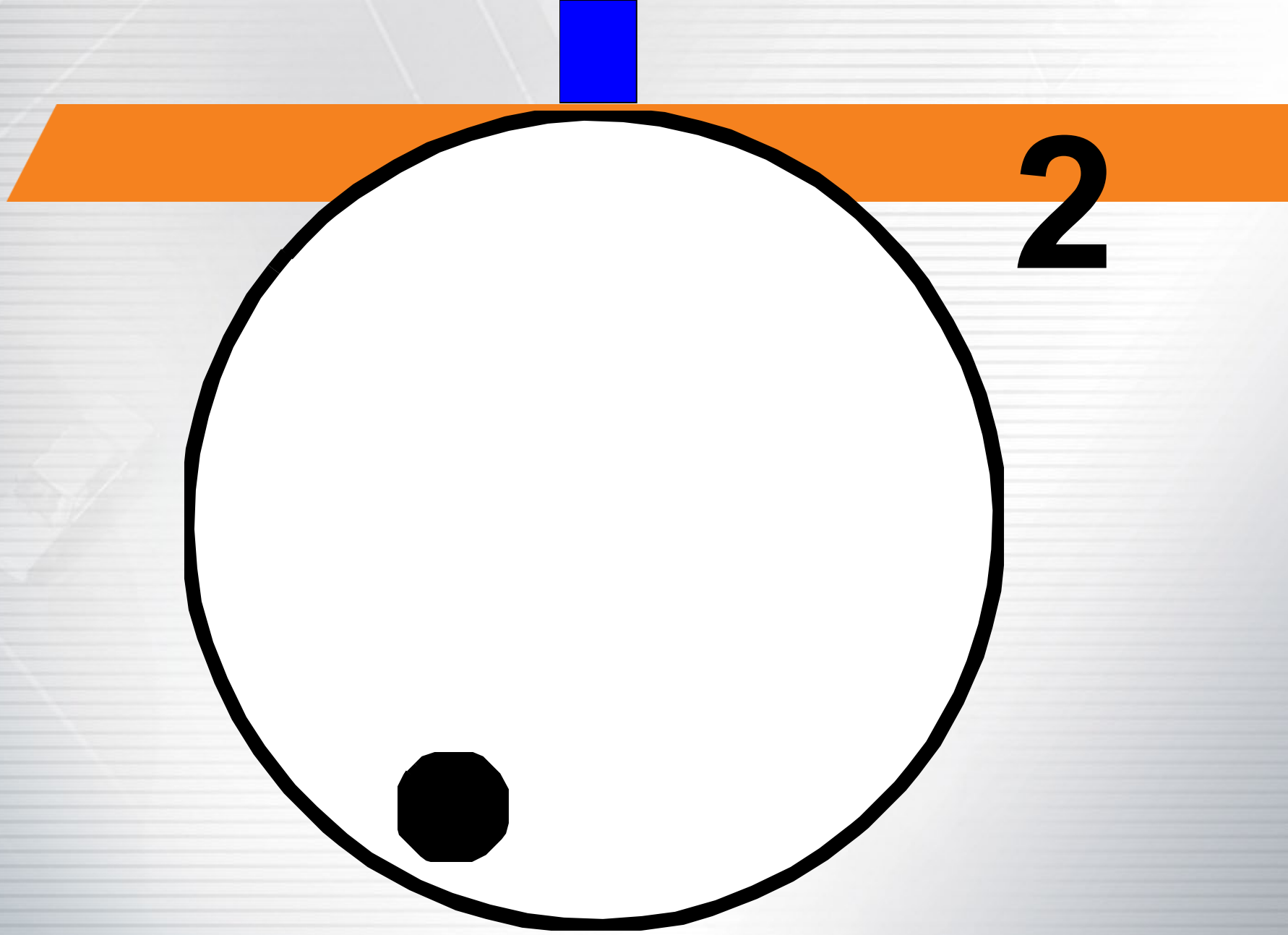

1

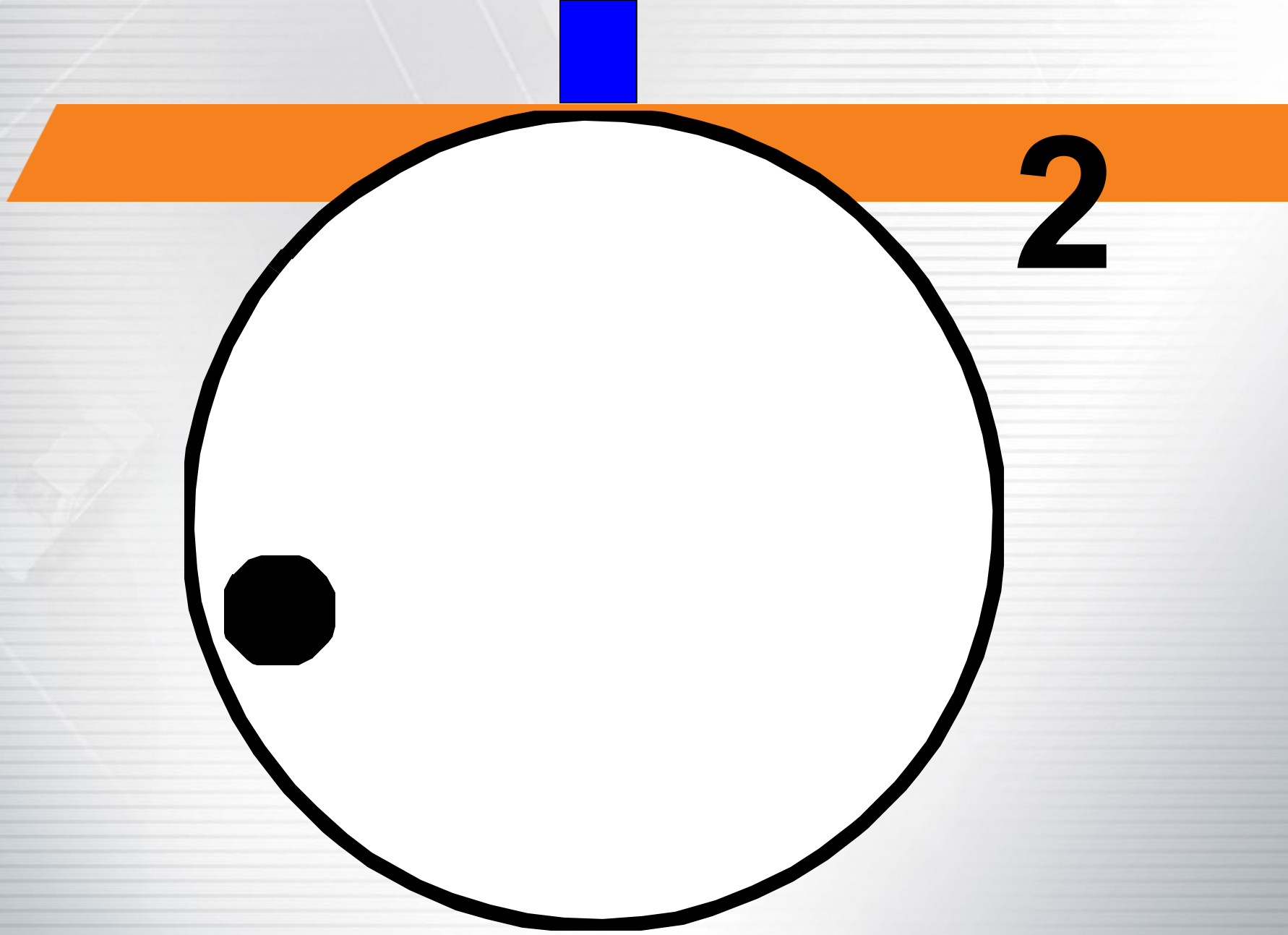

2

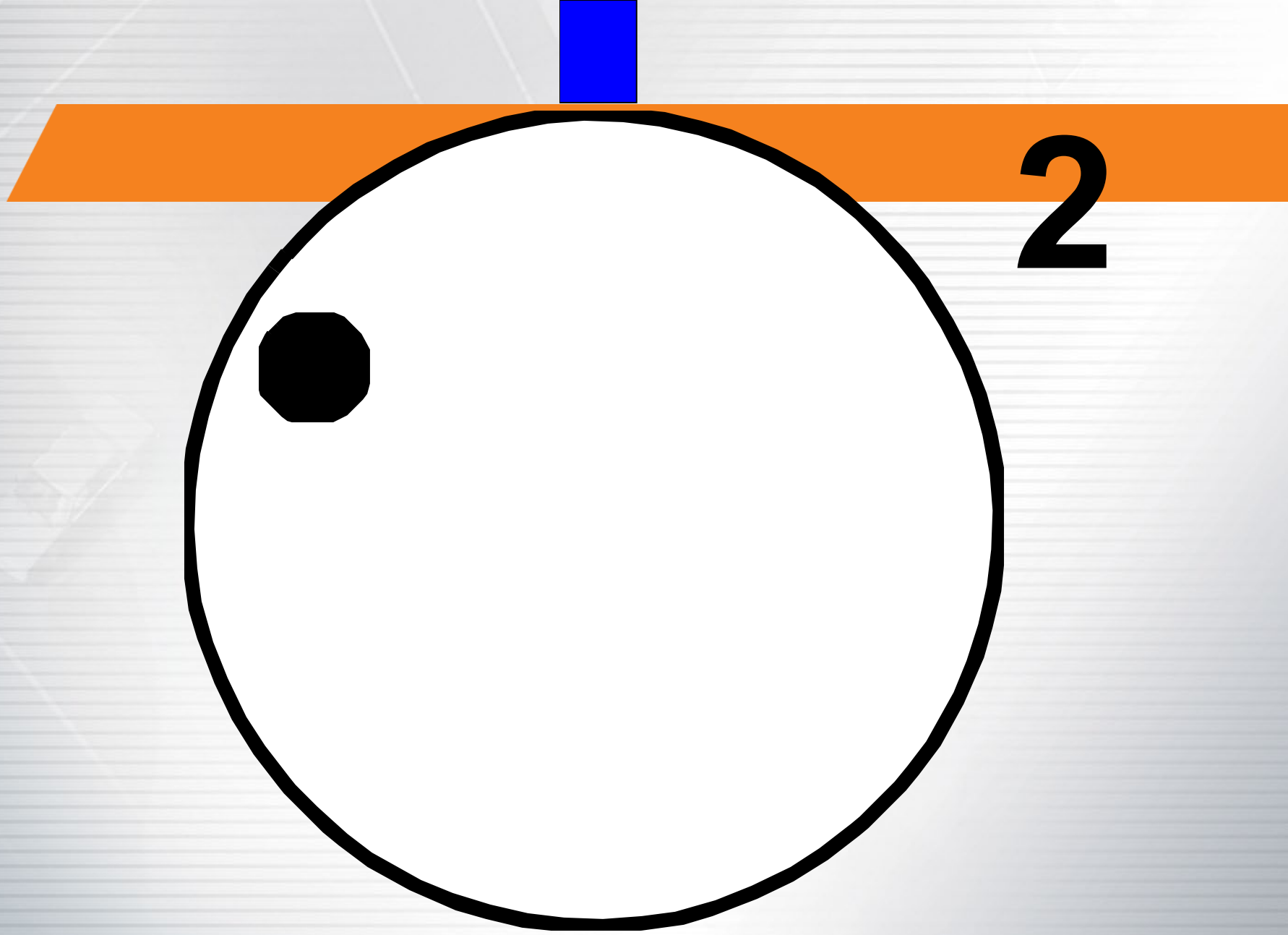

2

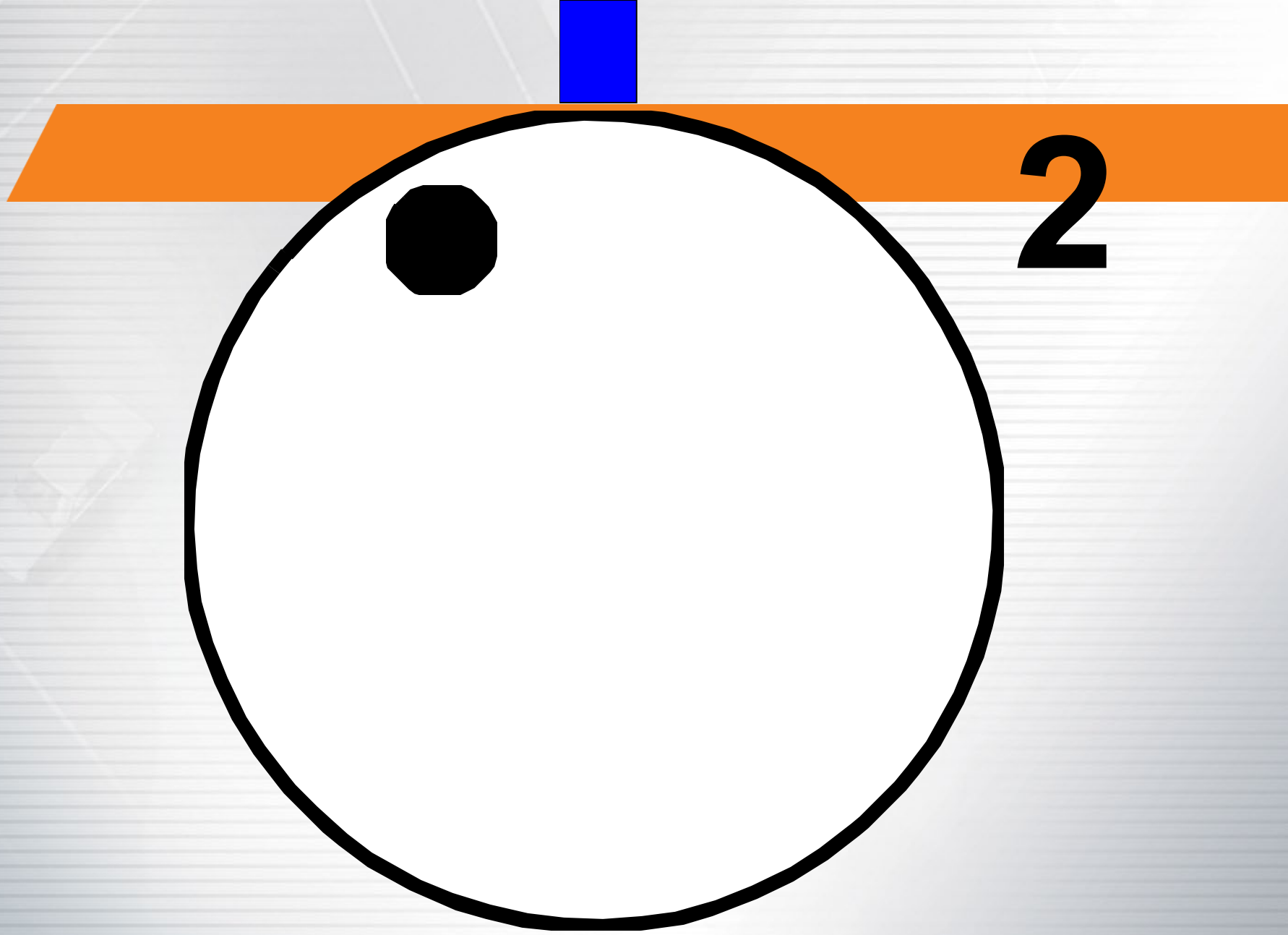

2

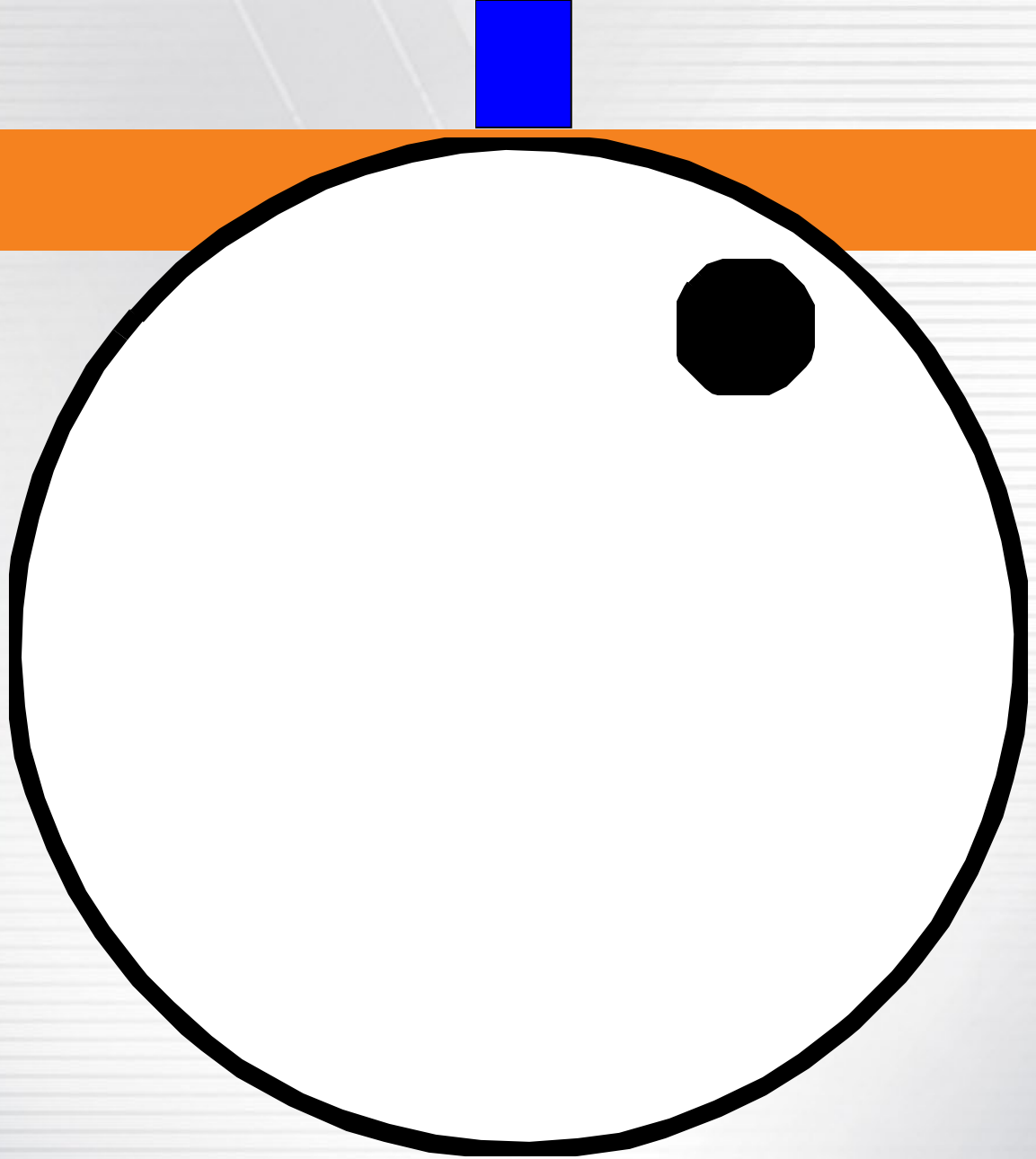

2


2

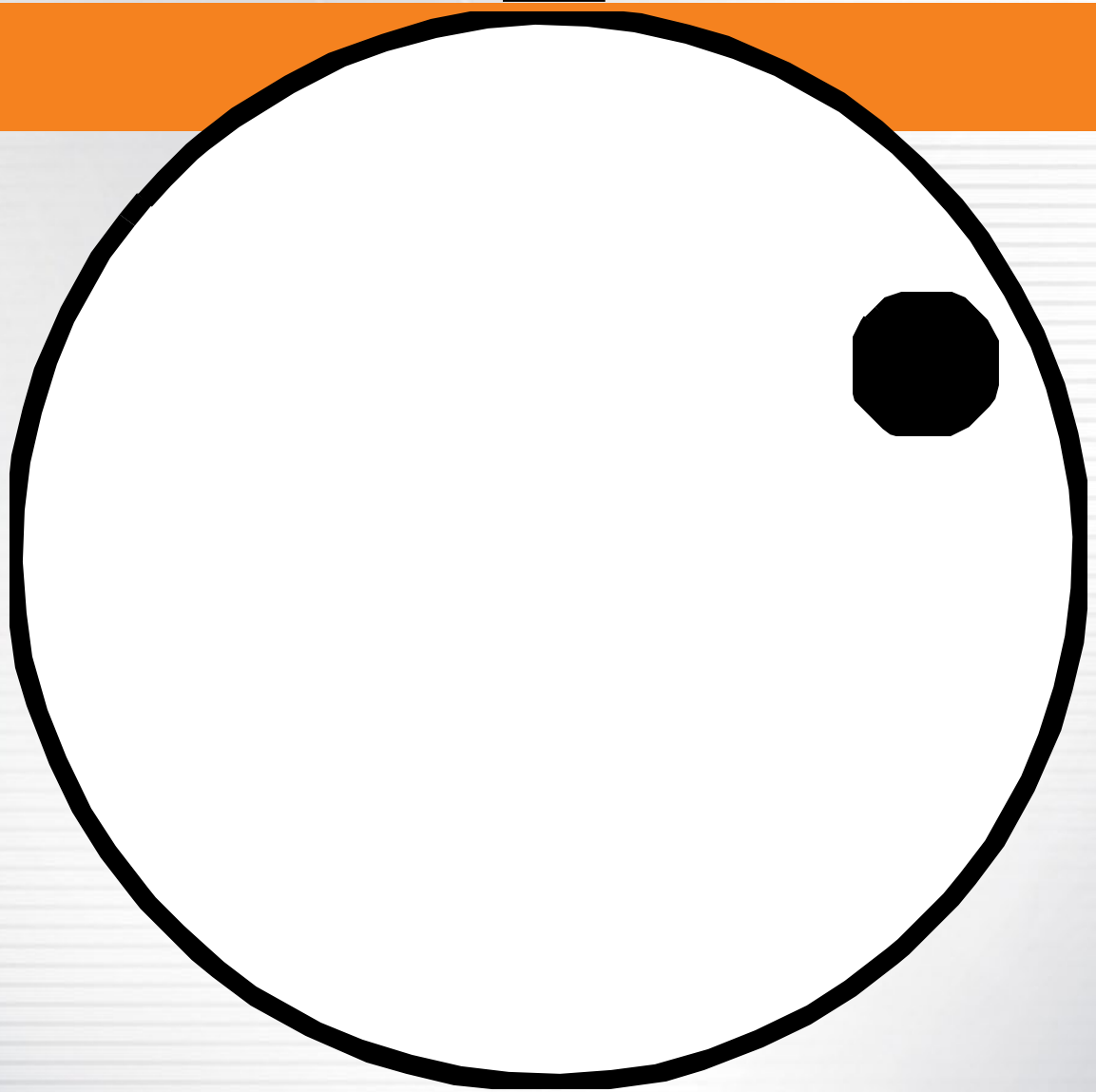

2

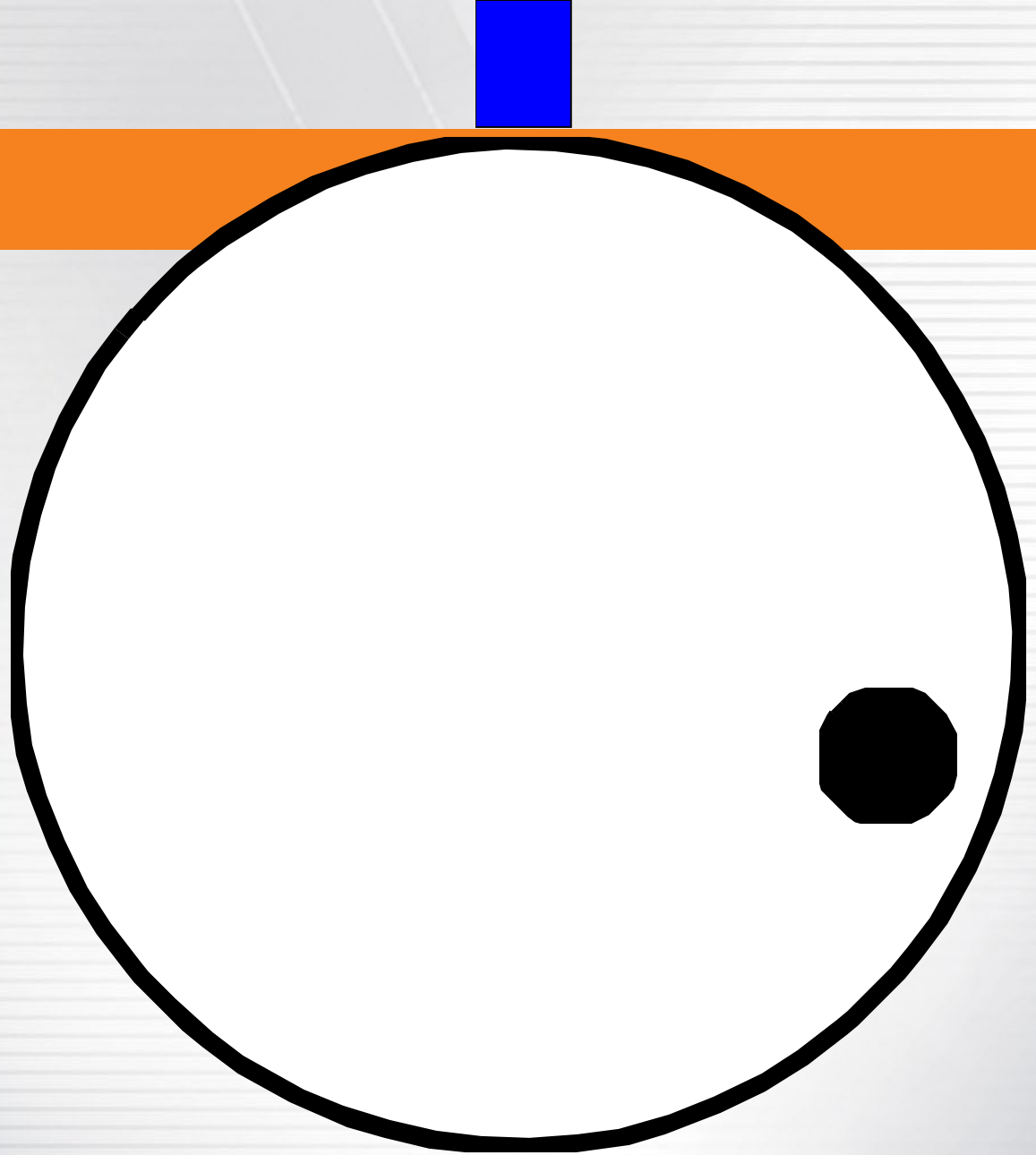

2

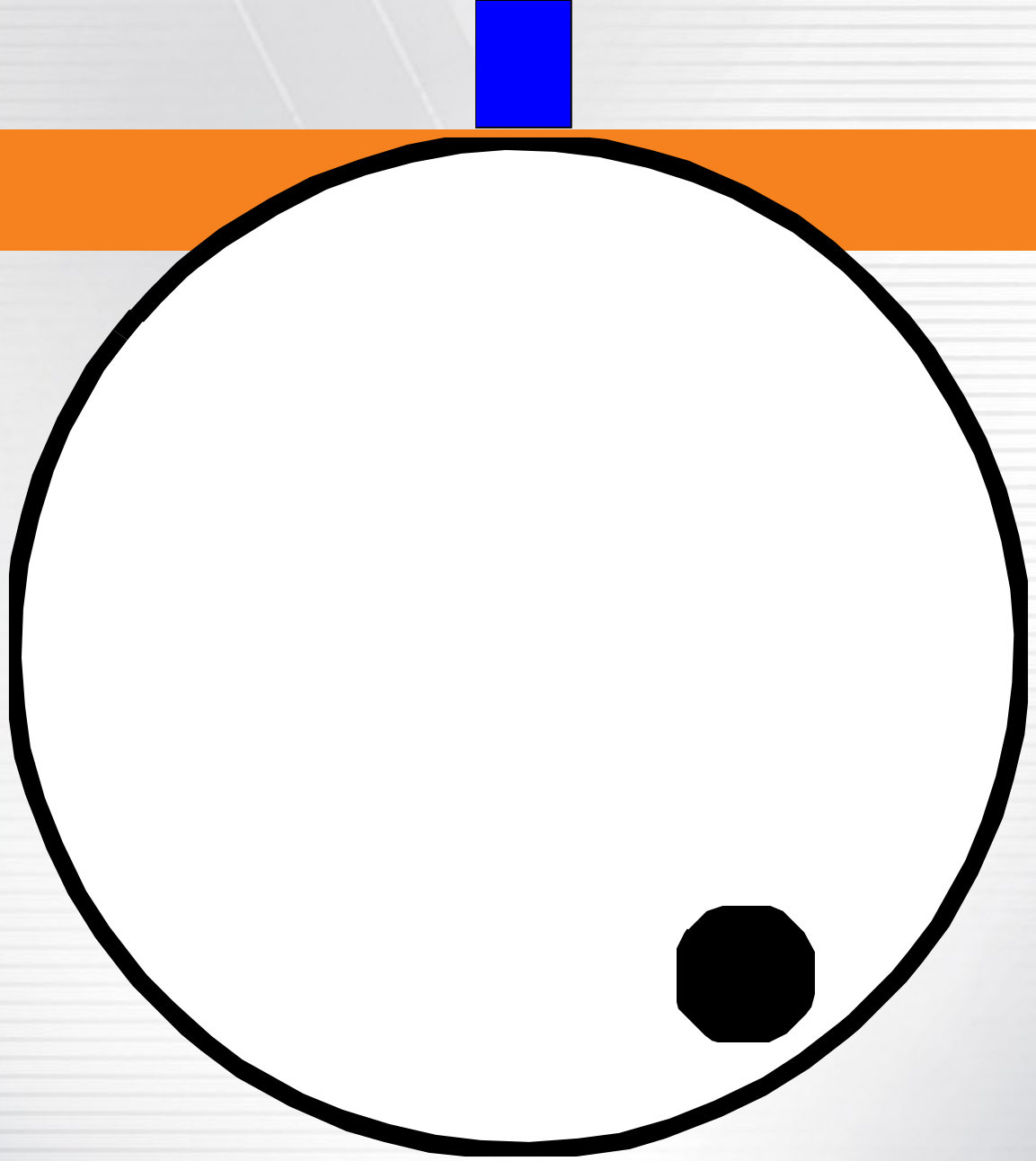

2

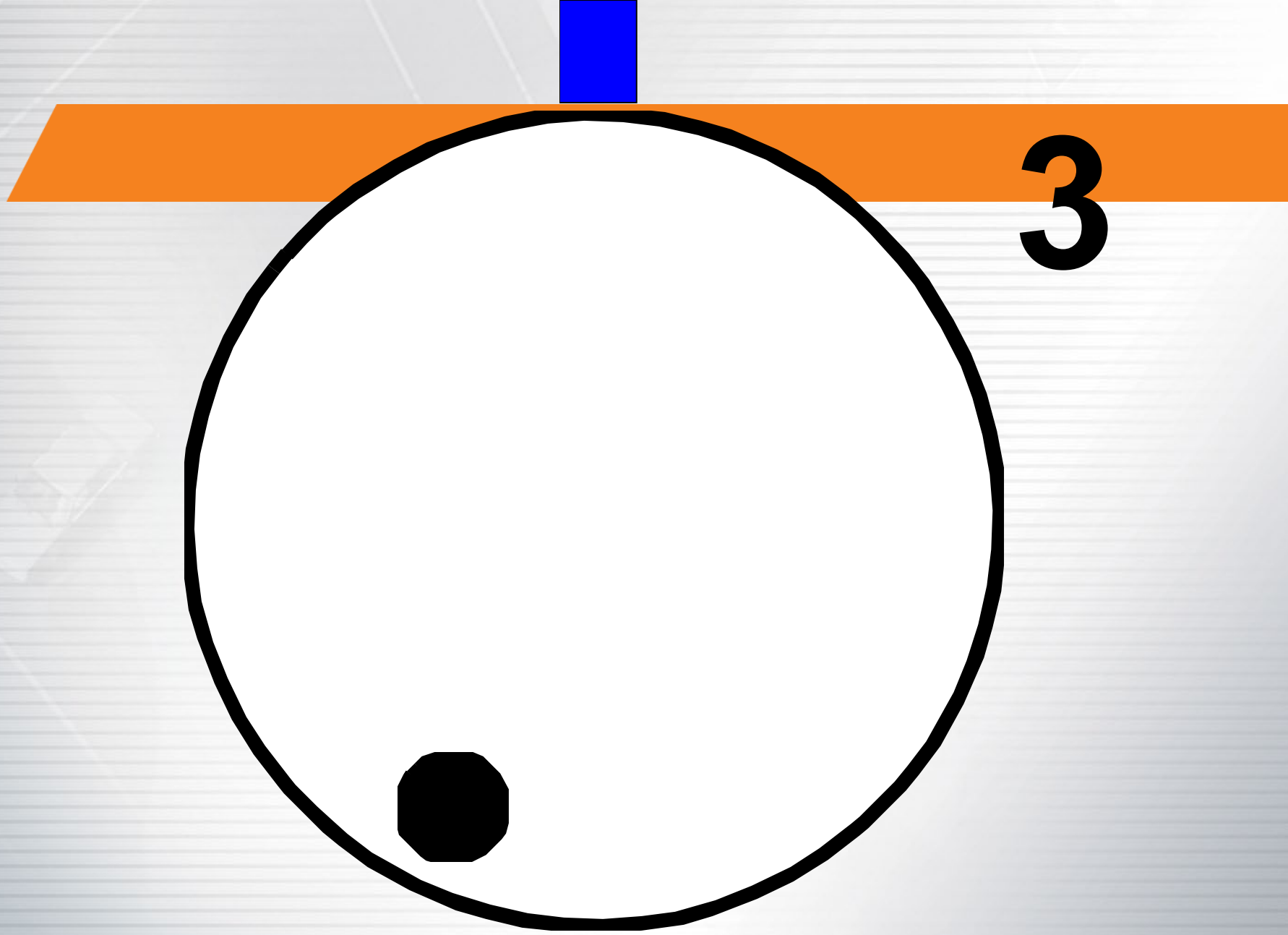

3

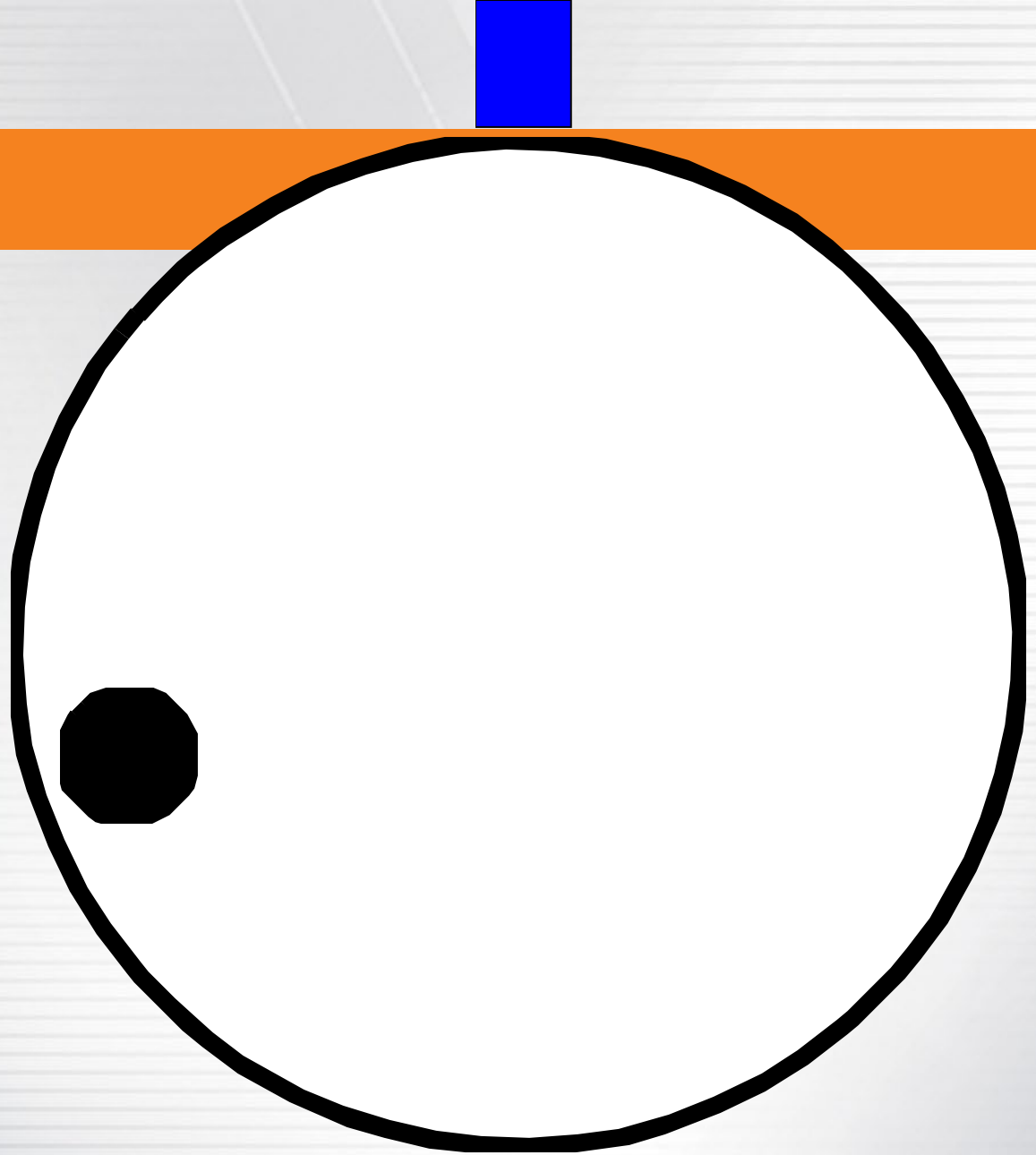
3

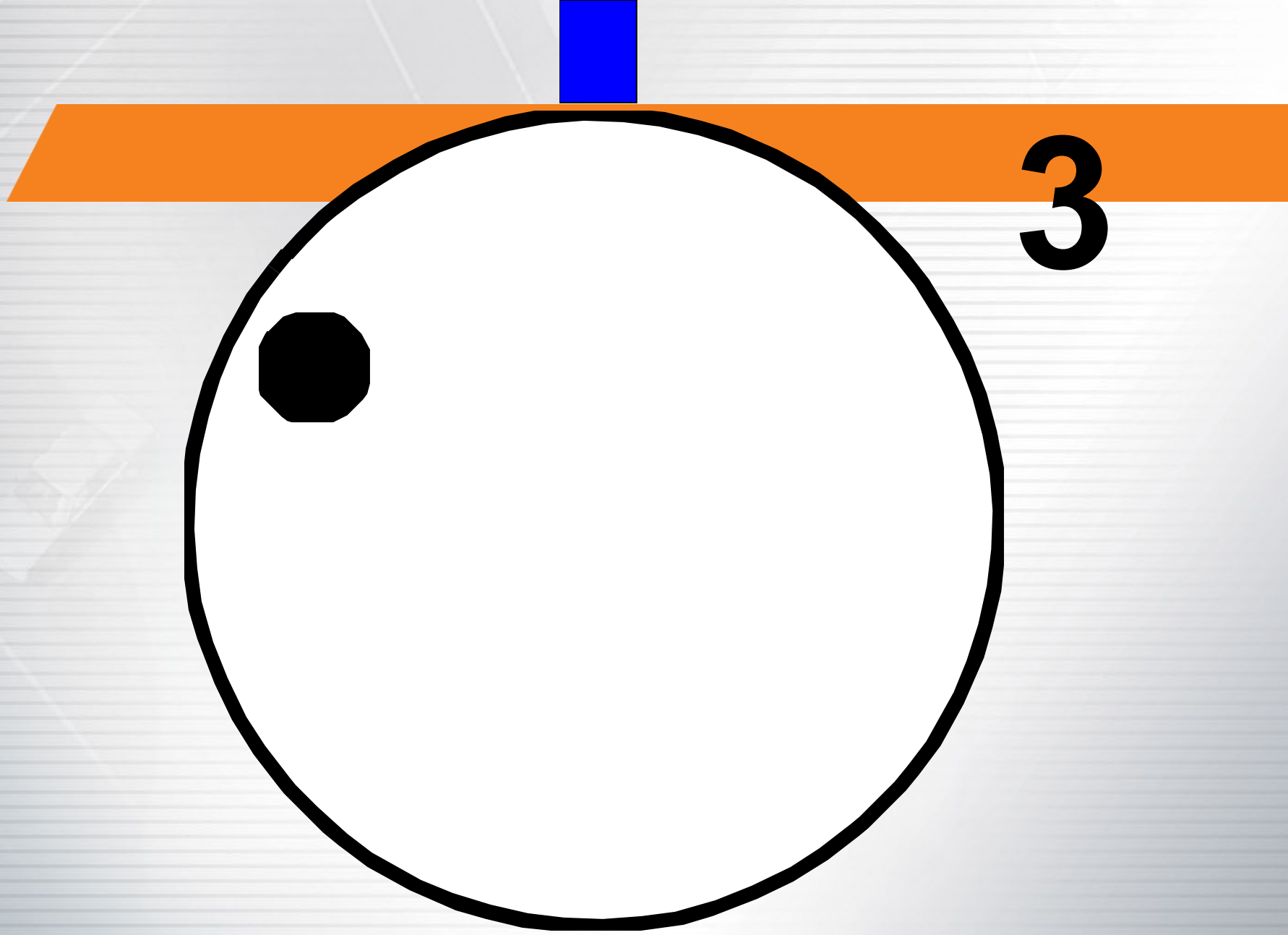


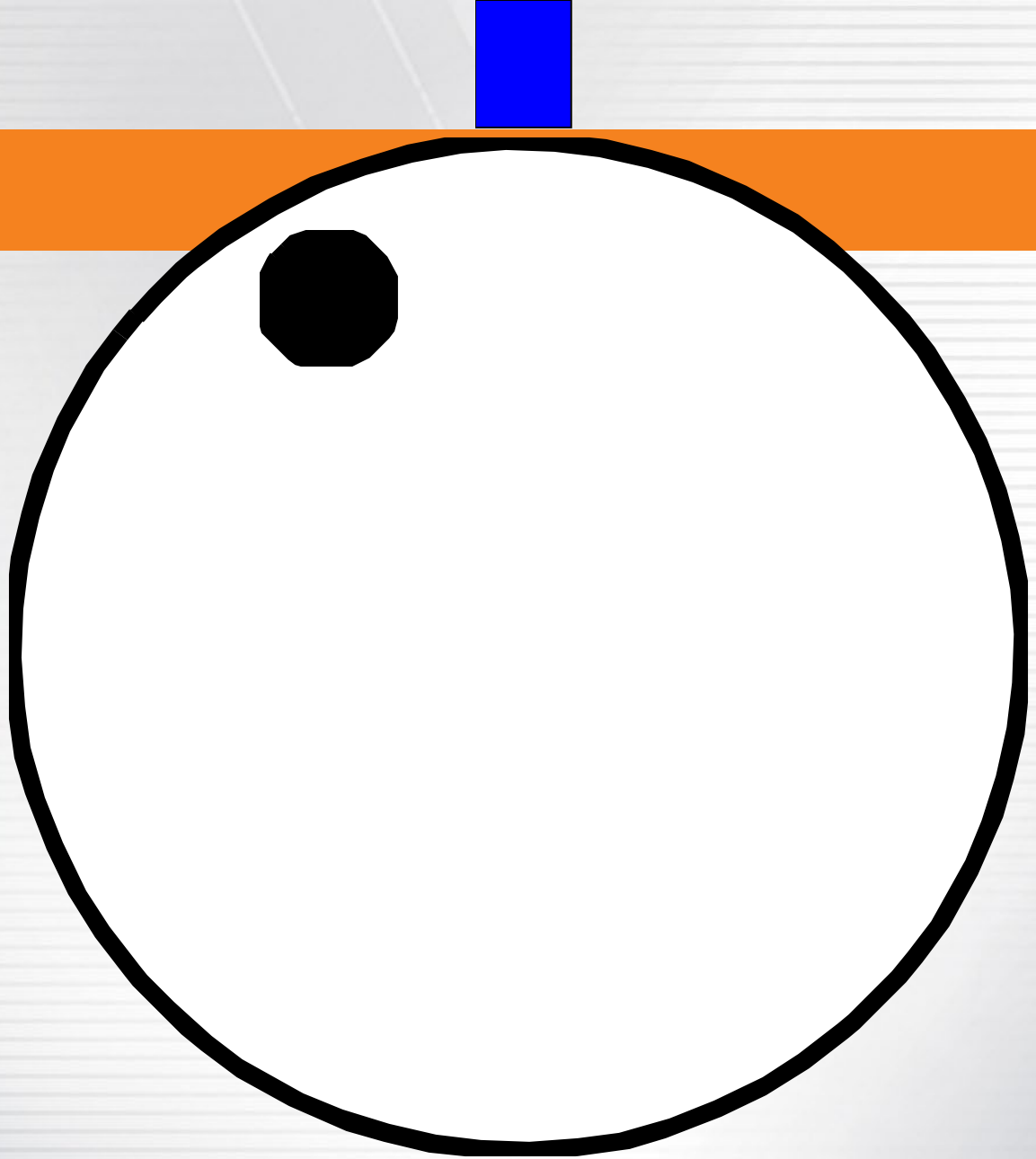

3

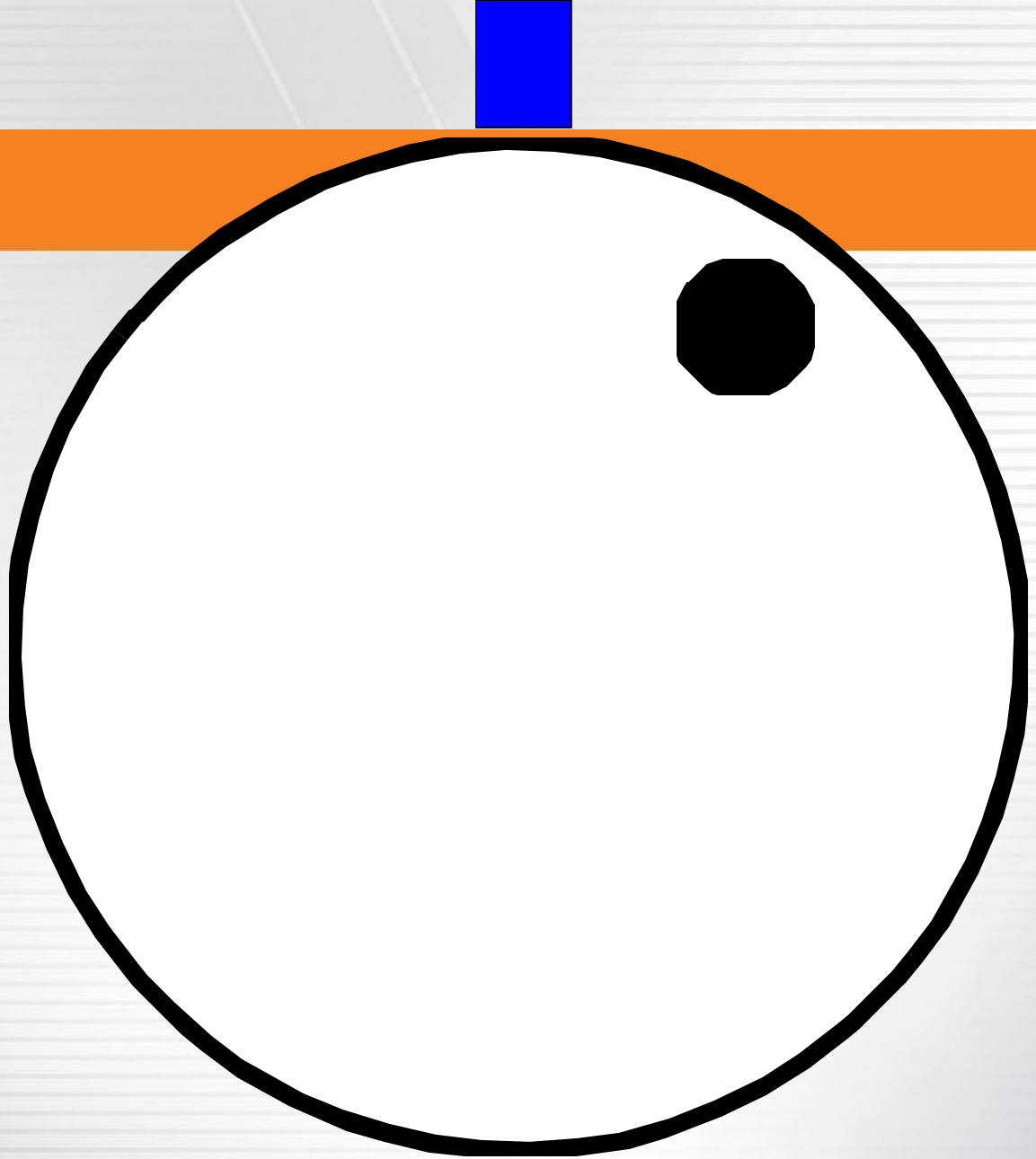



3

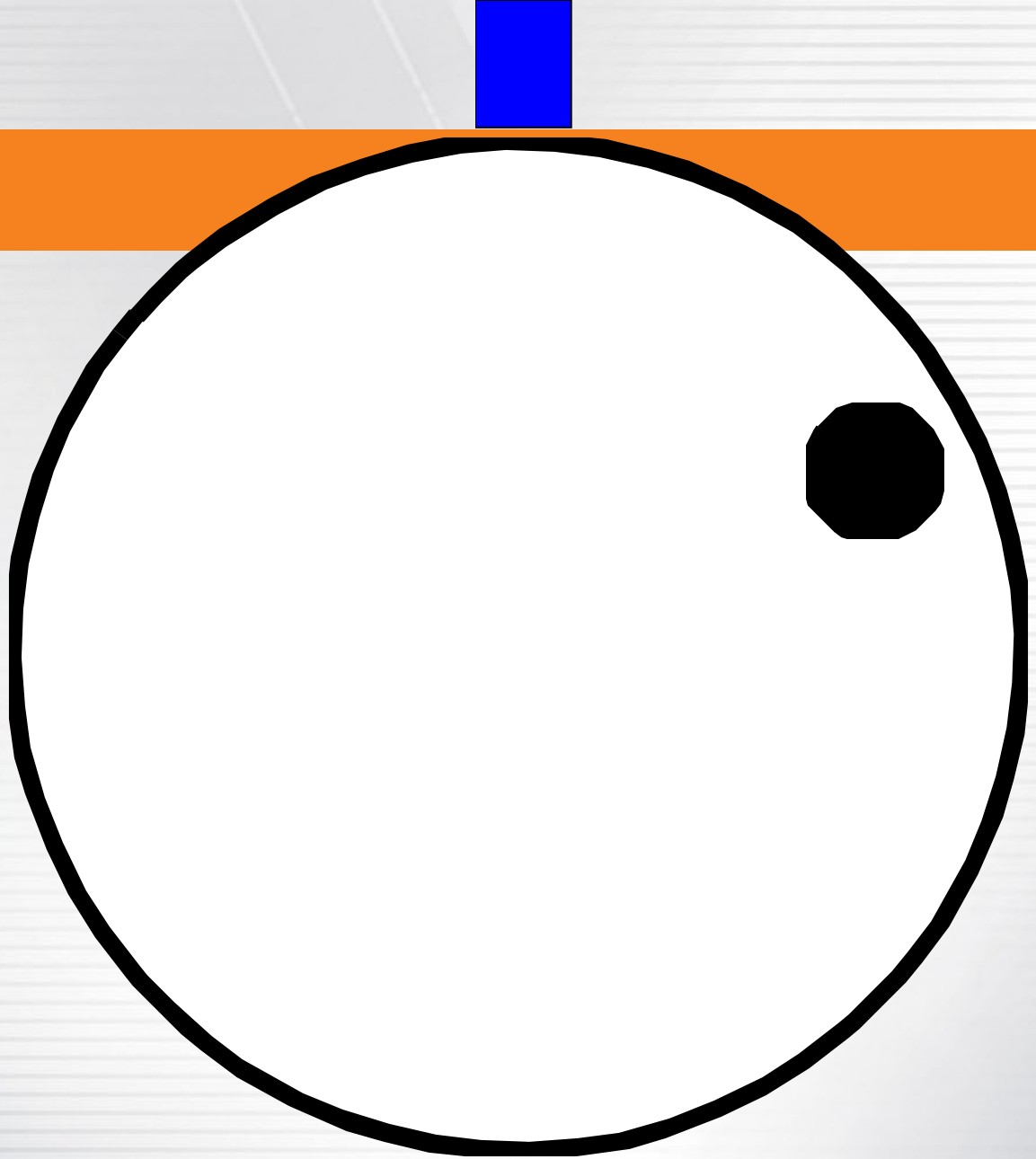

3


3

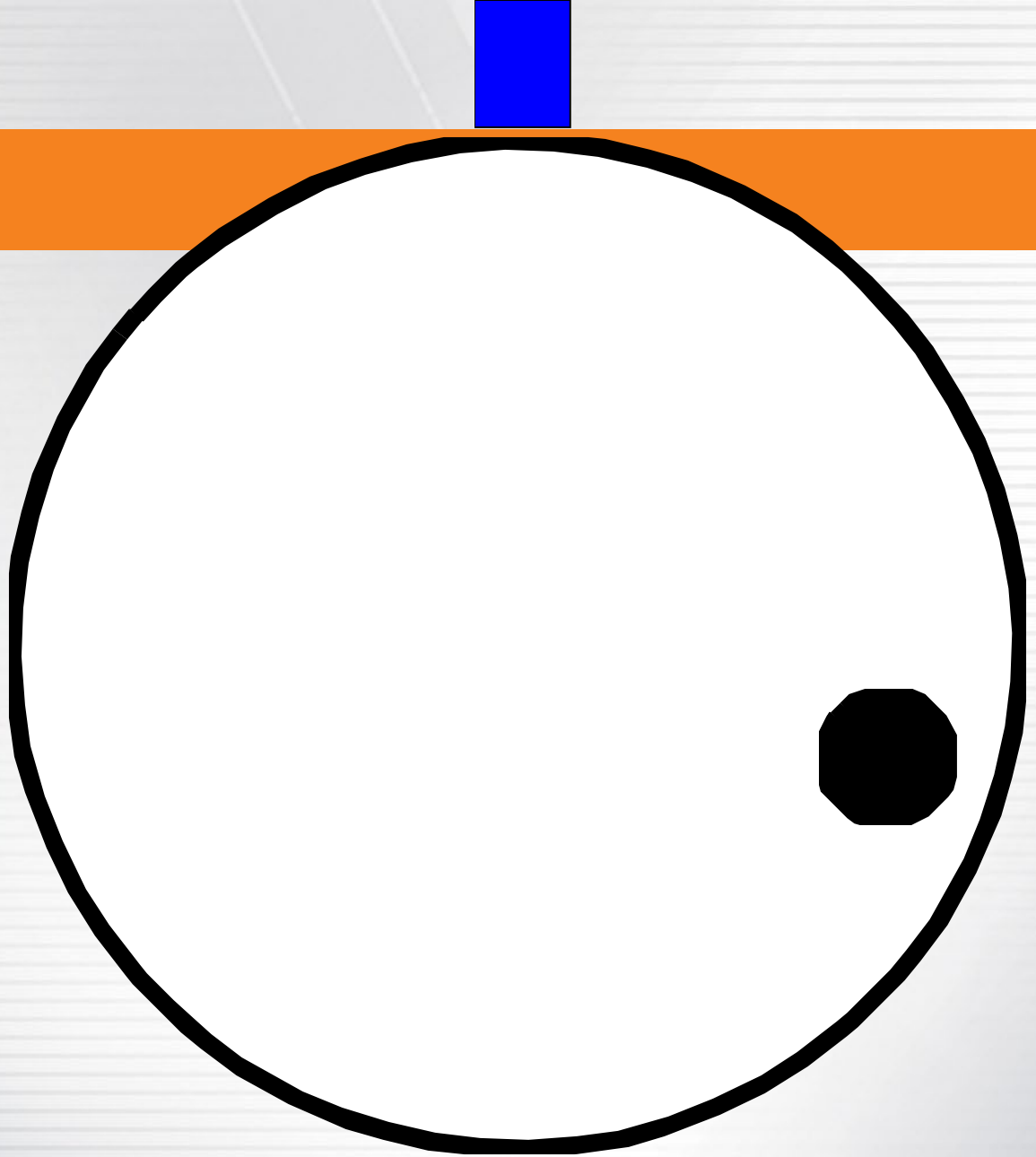

3


4

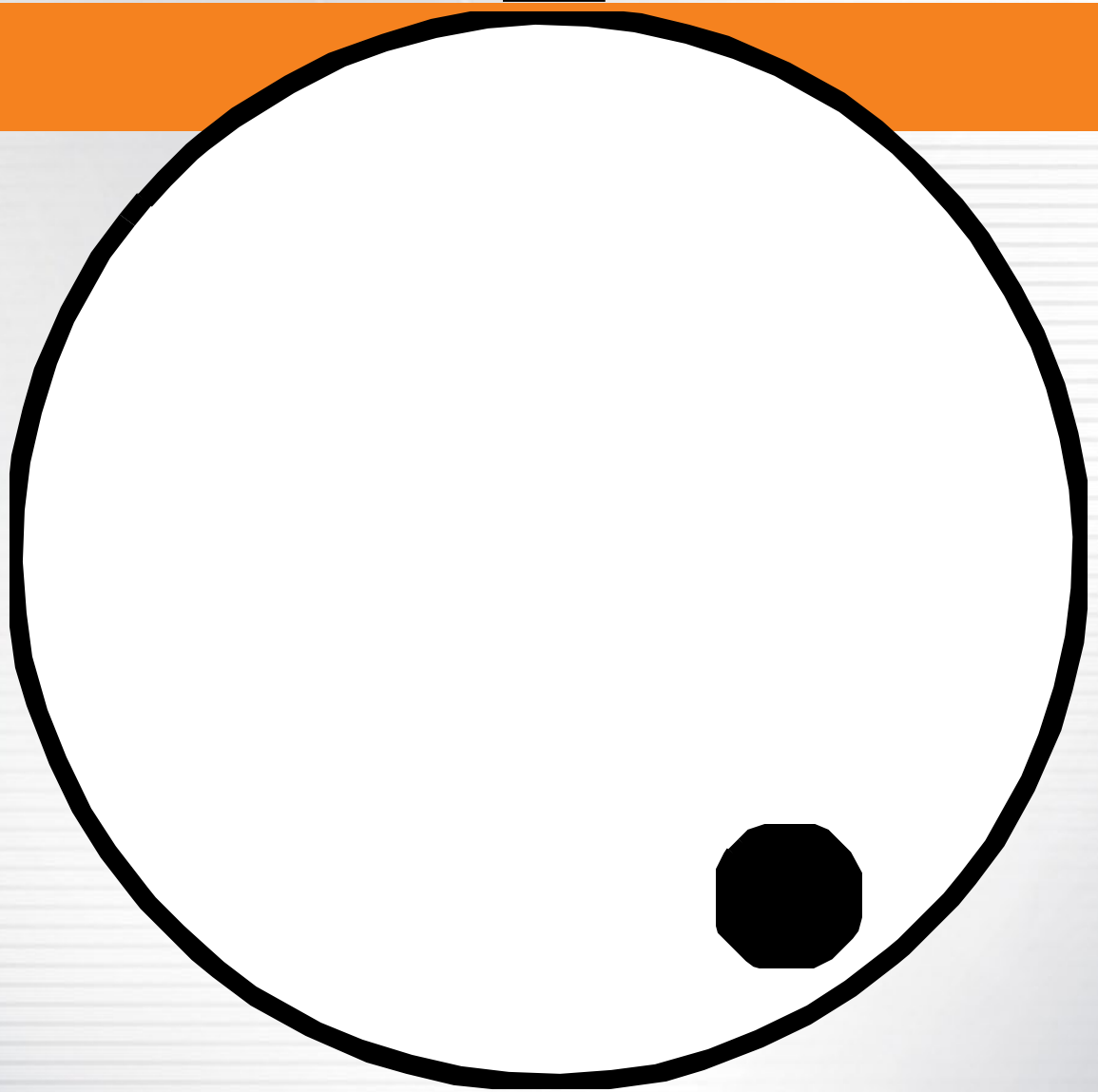
4



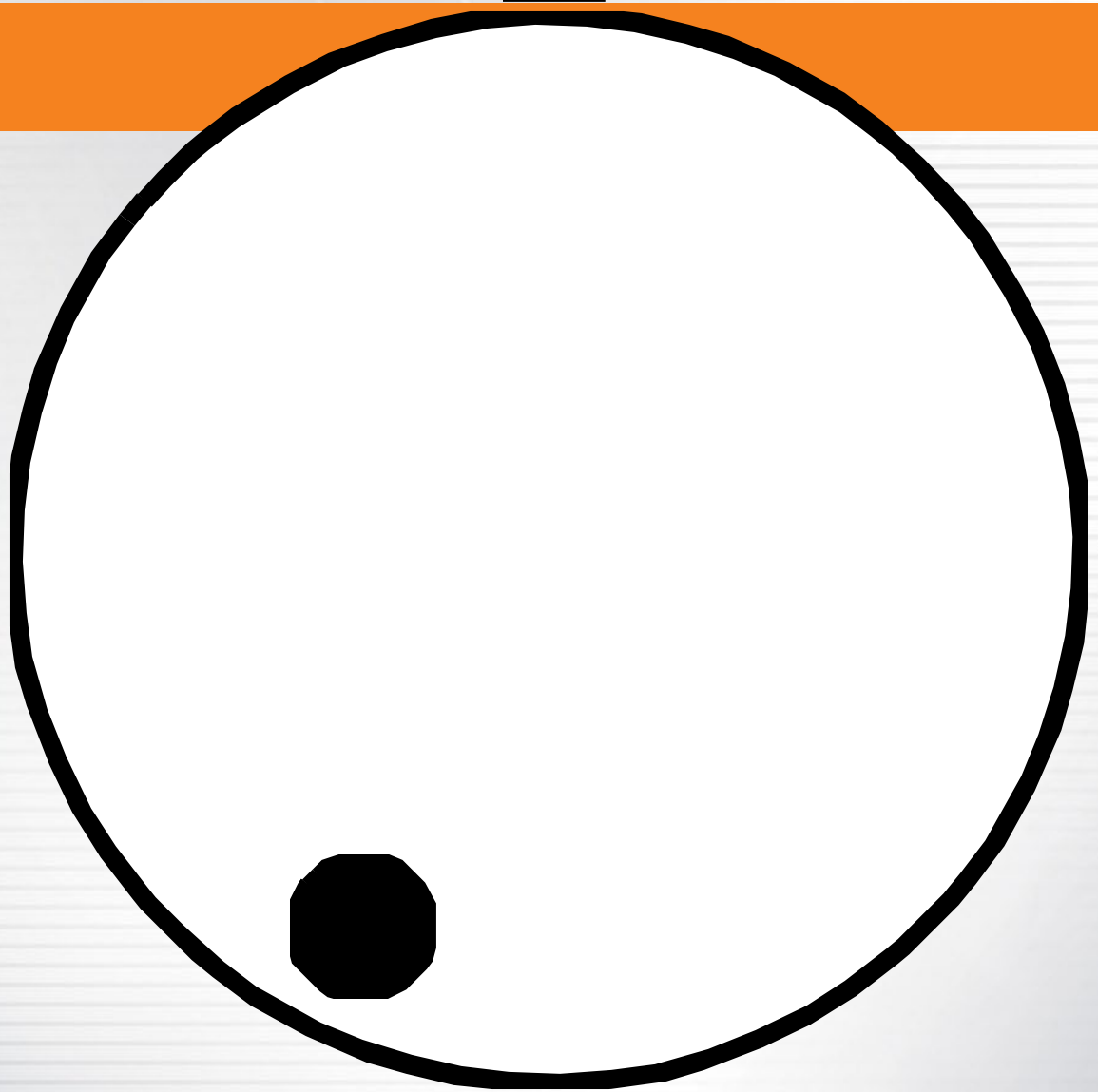
4



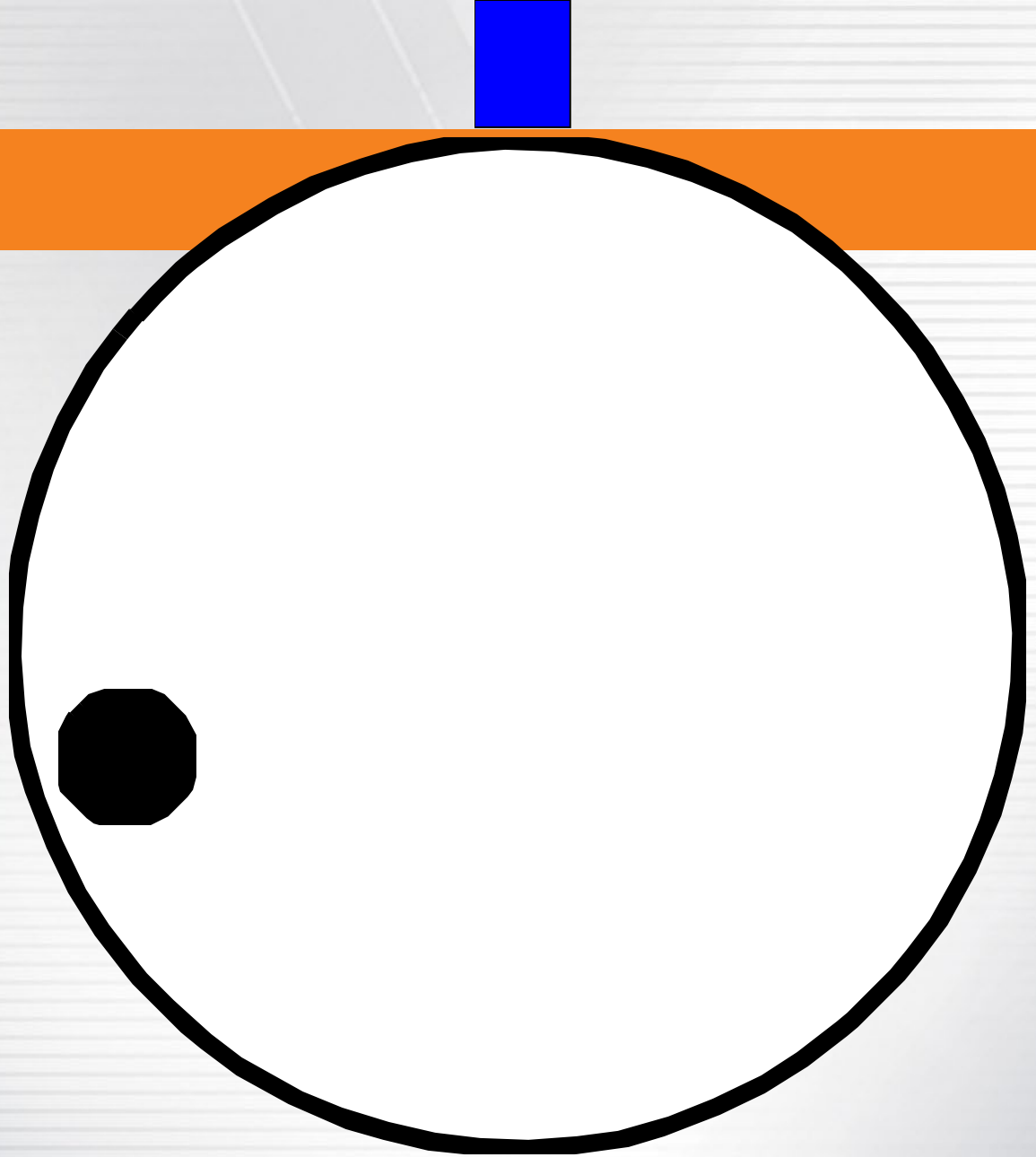
4

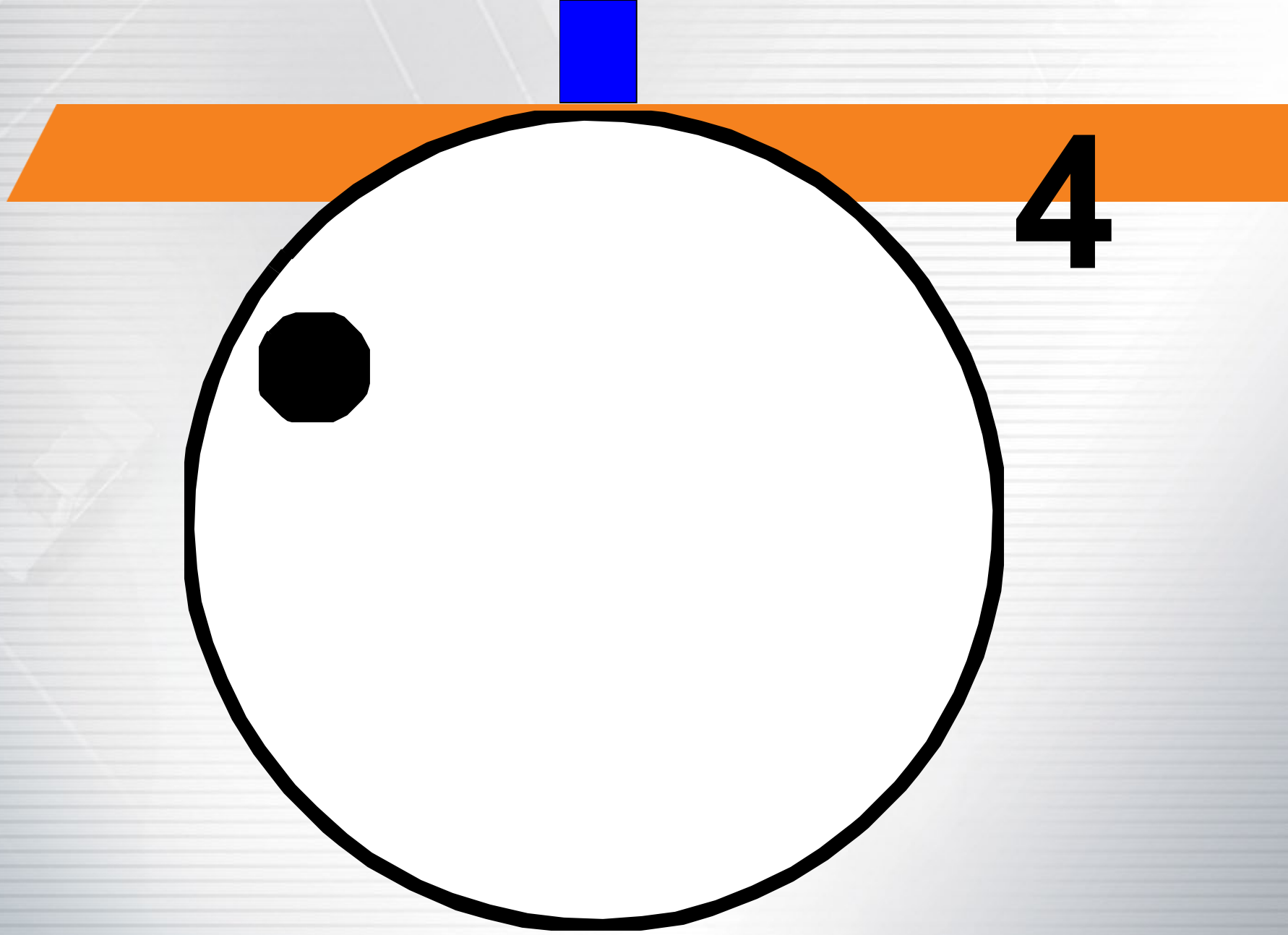


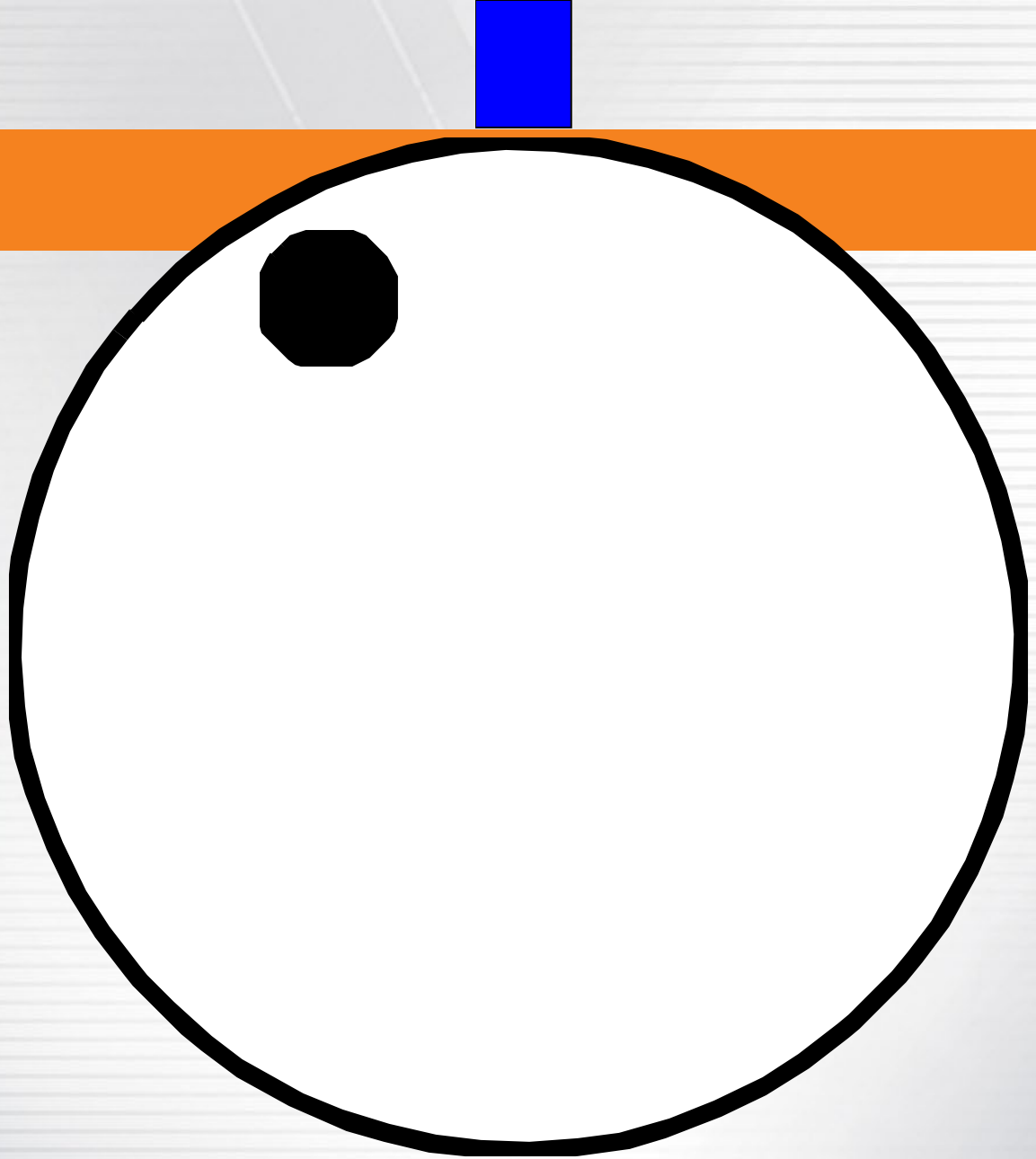
4

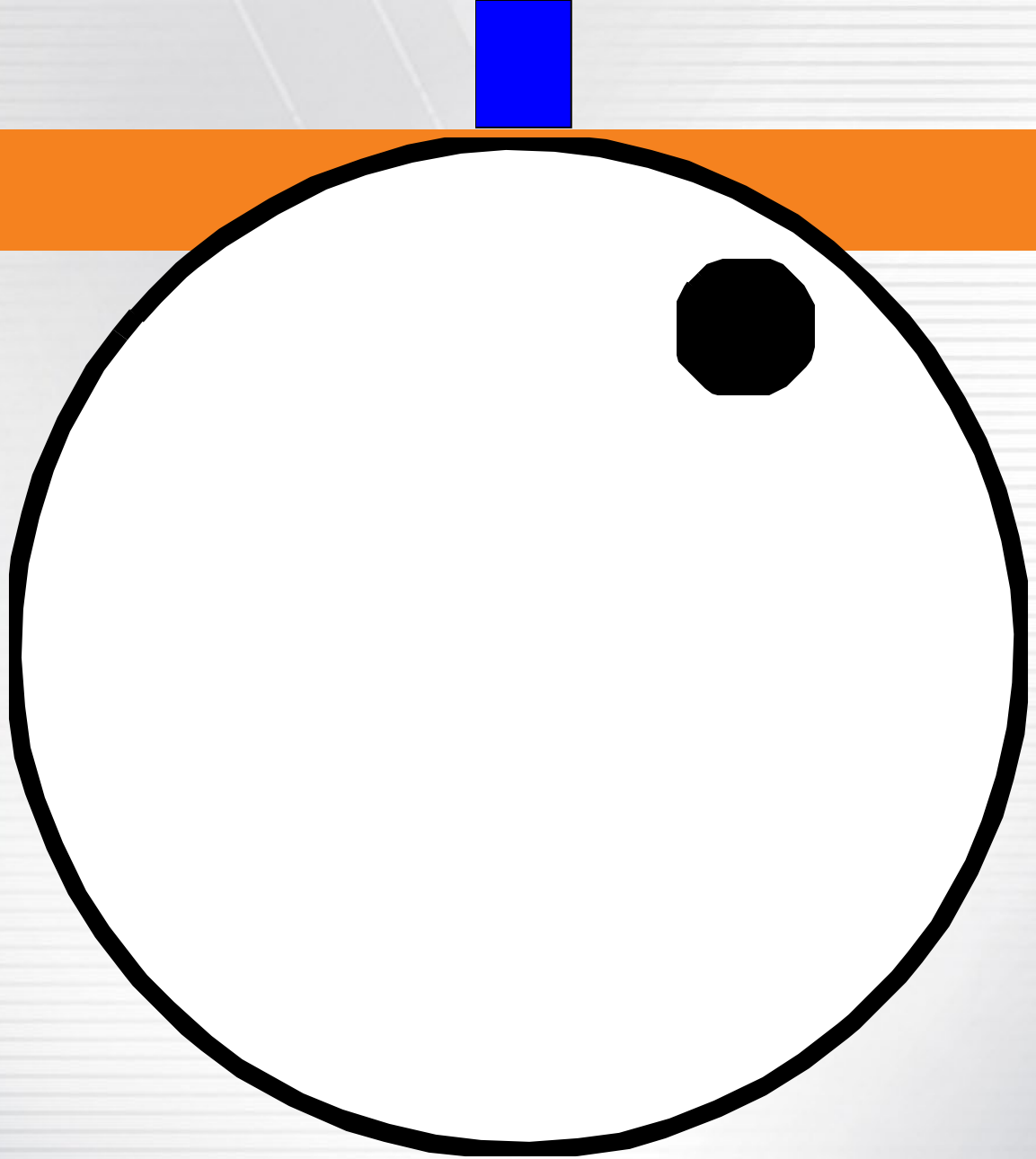


4

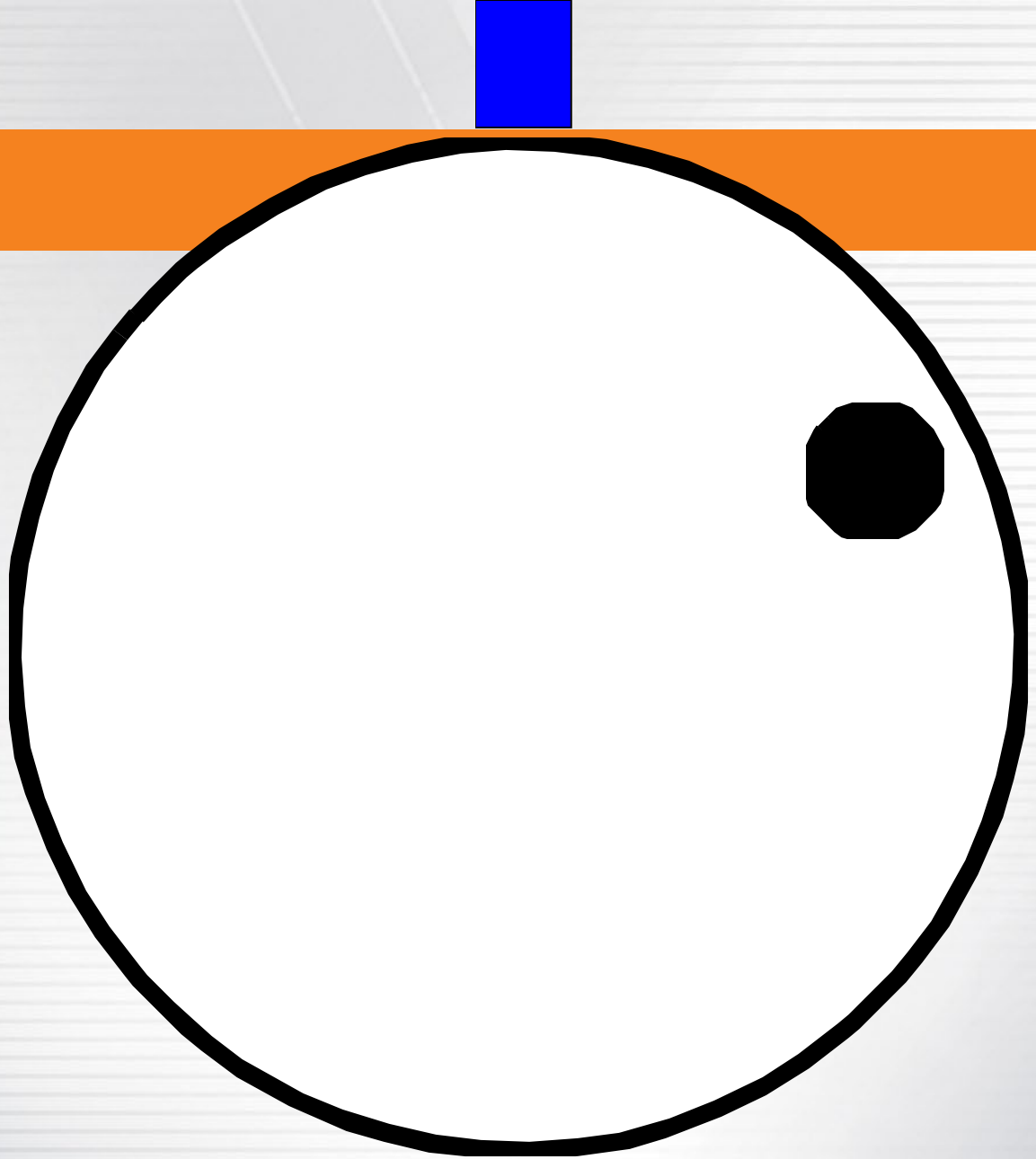



4

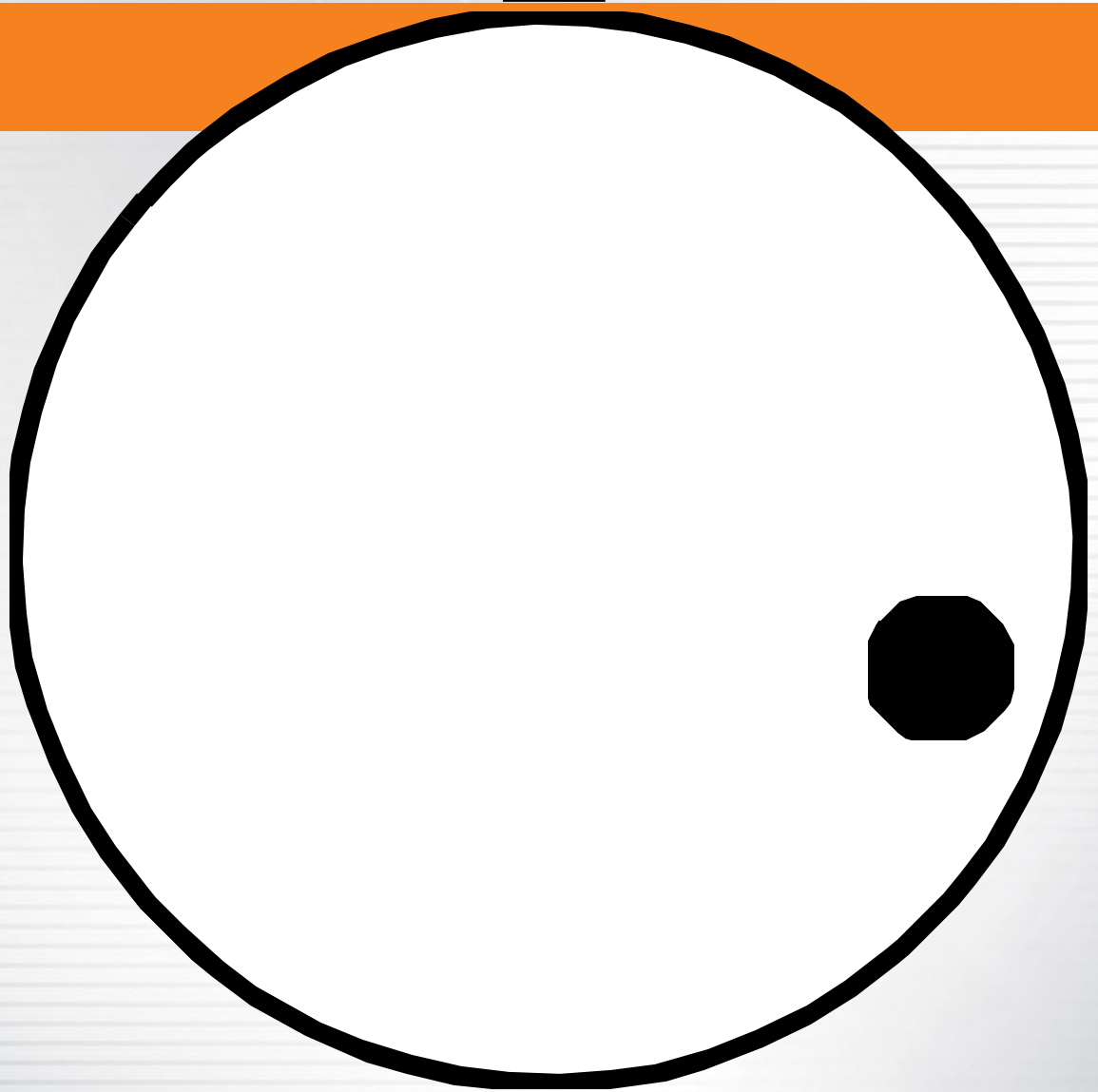

4


5

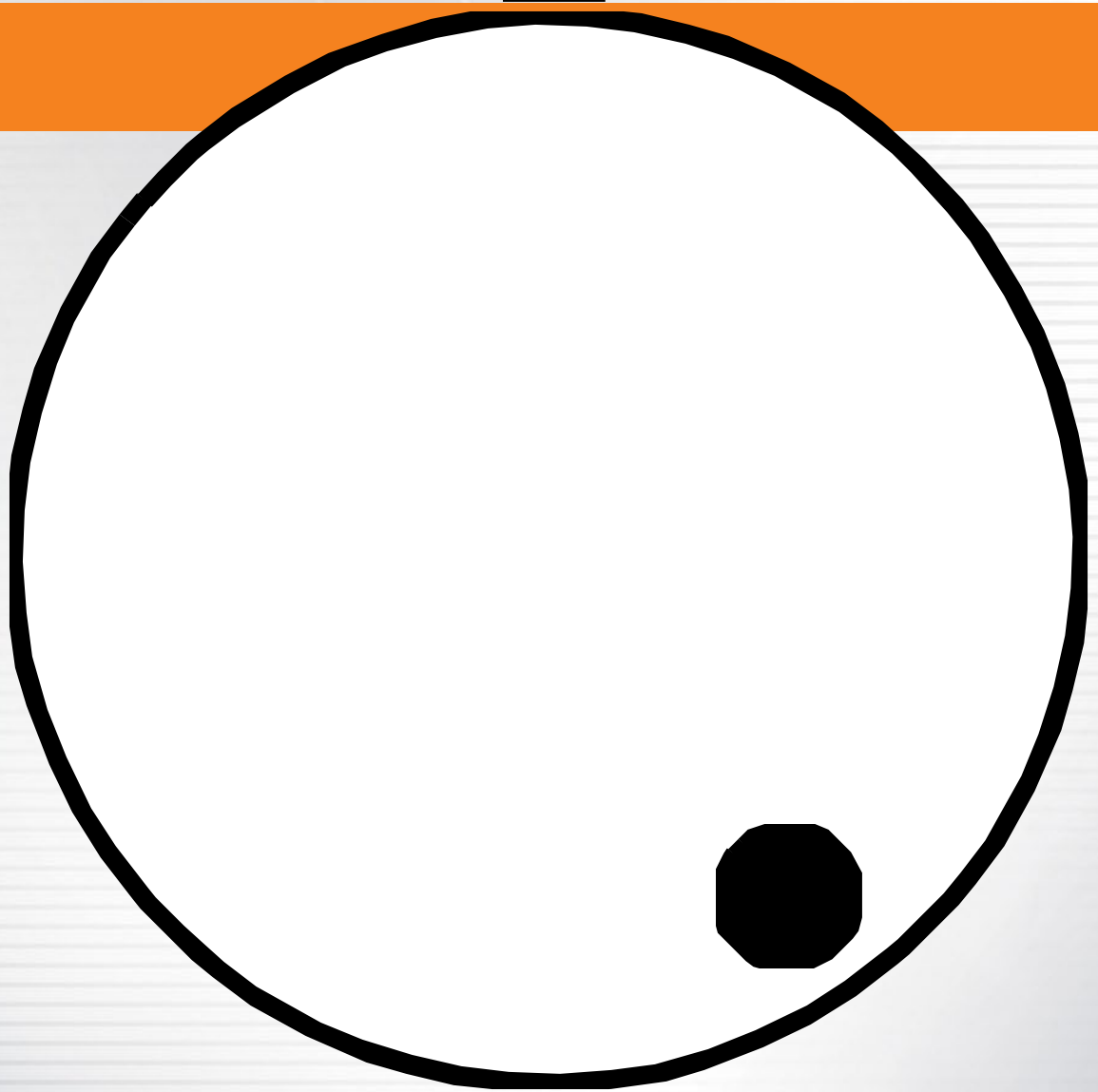
5

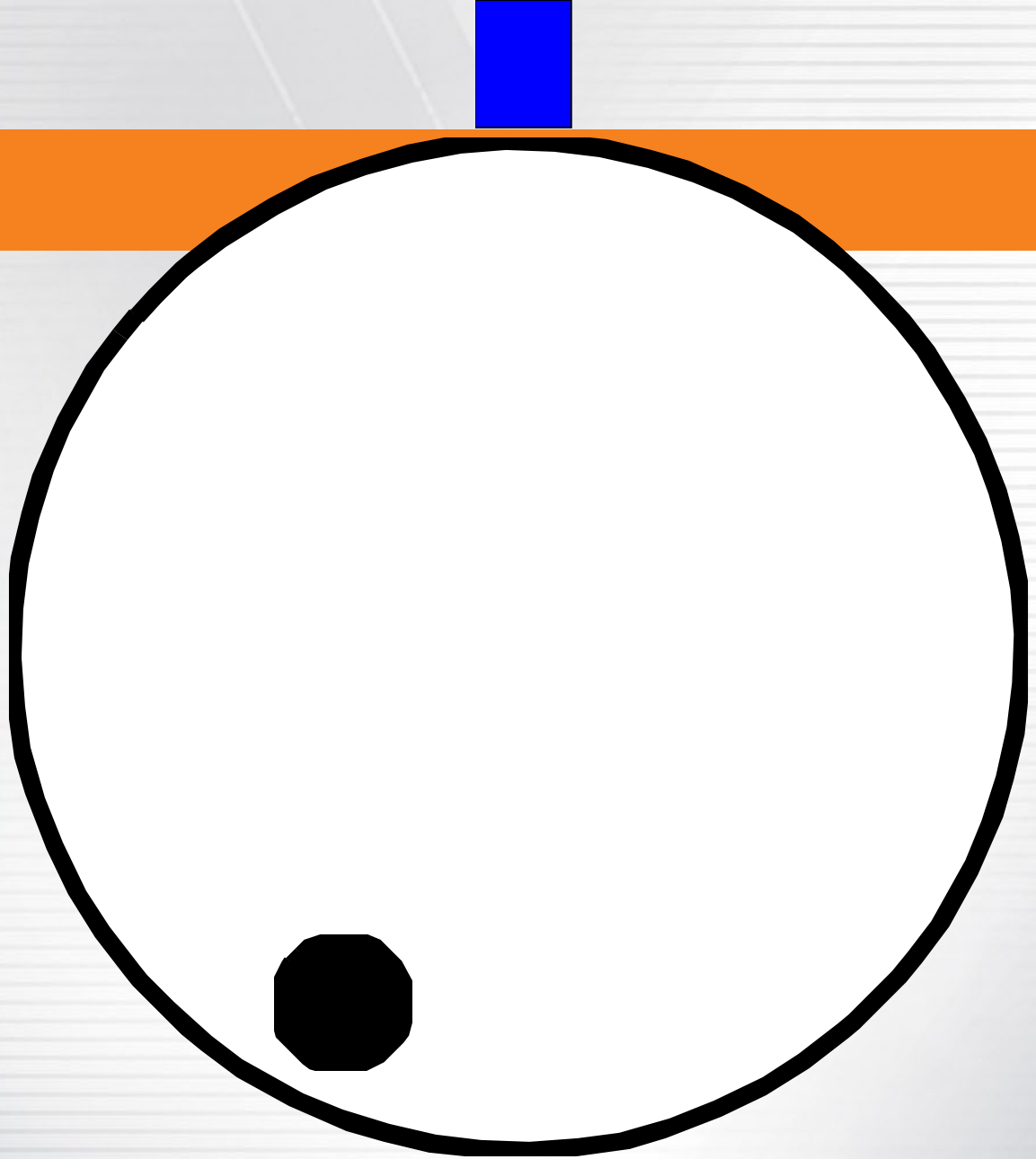


5

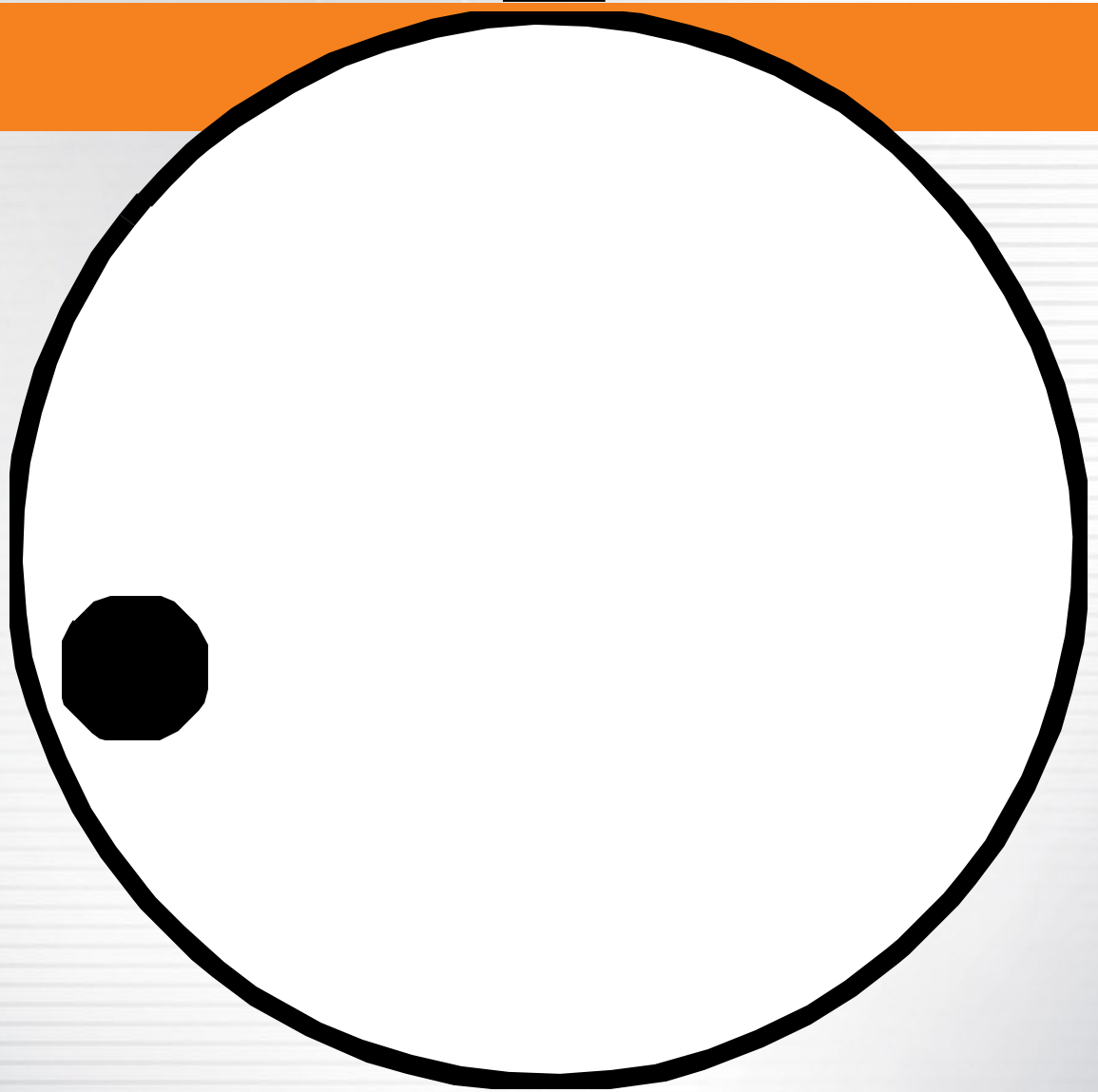


5

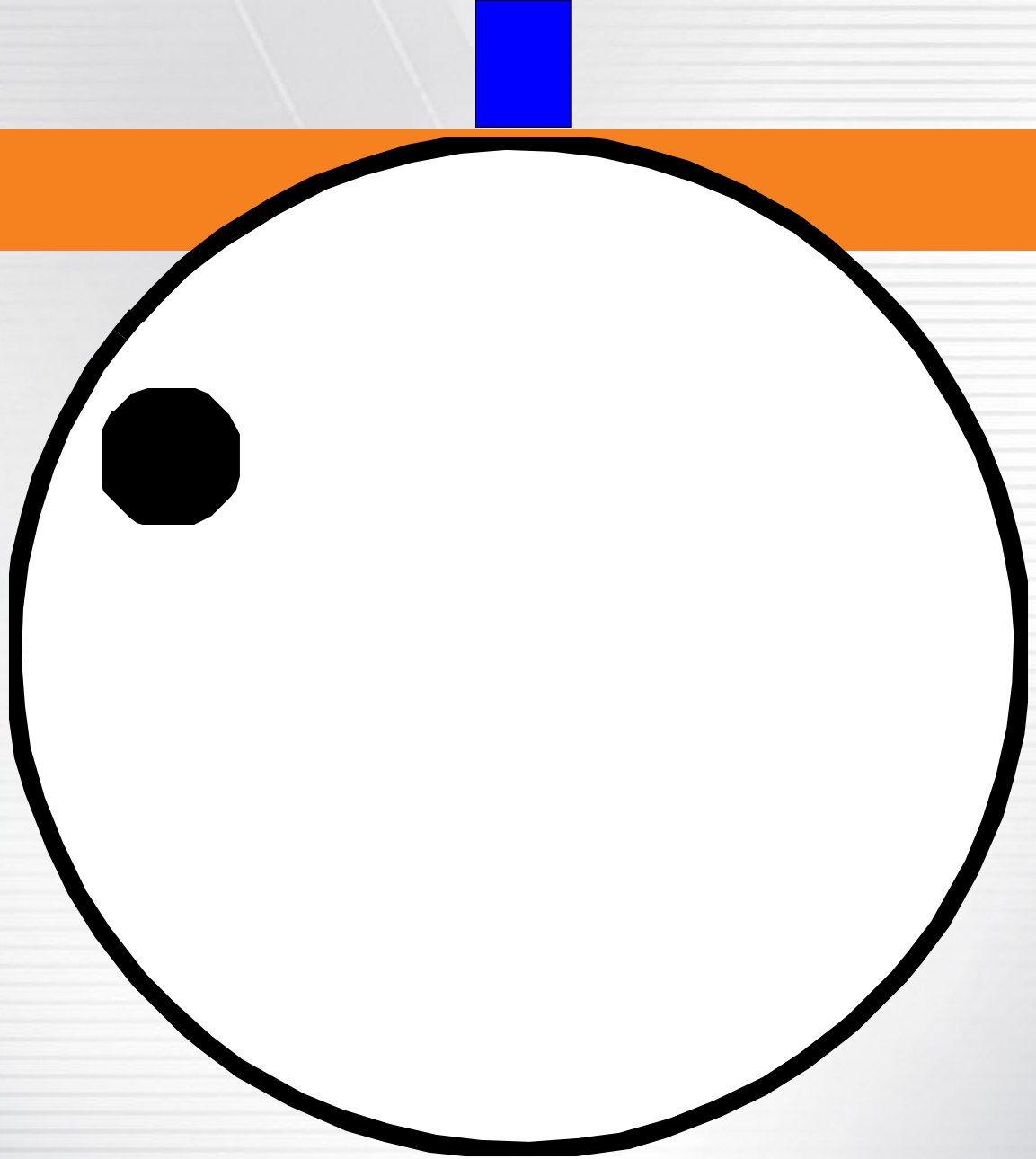



5

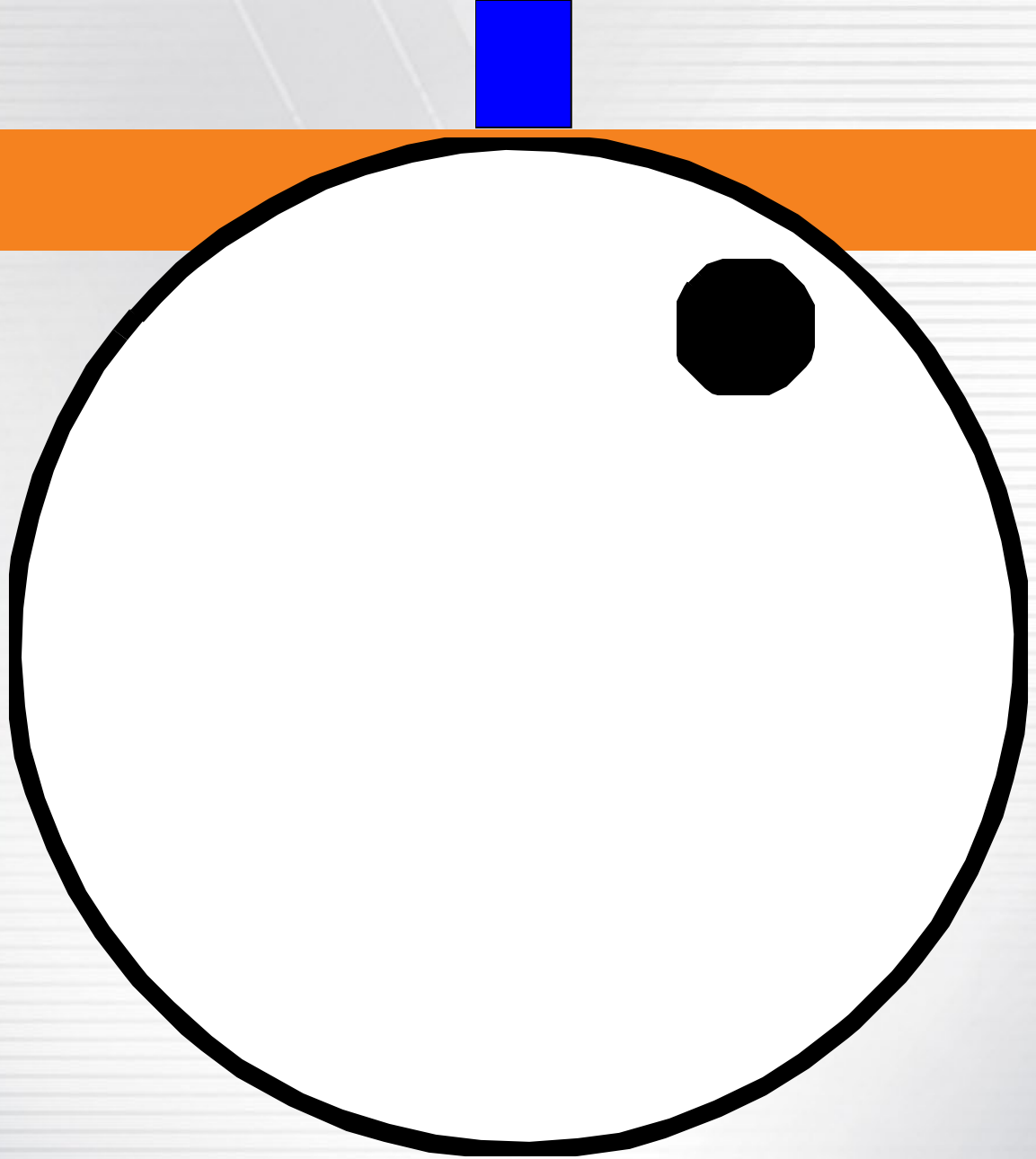
5



5

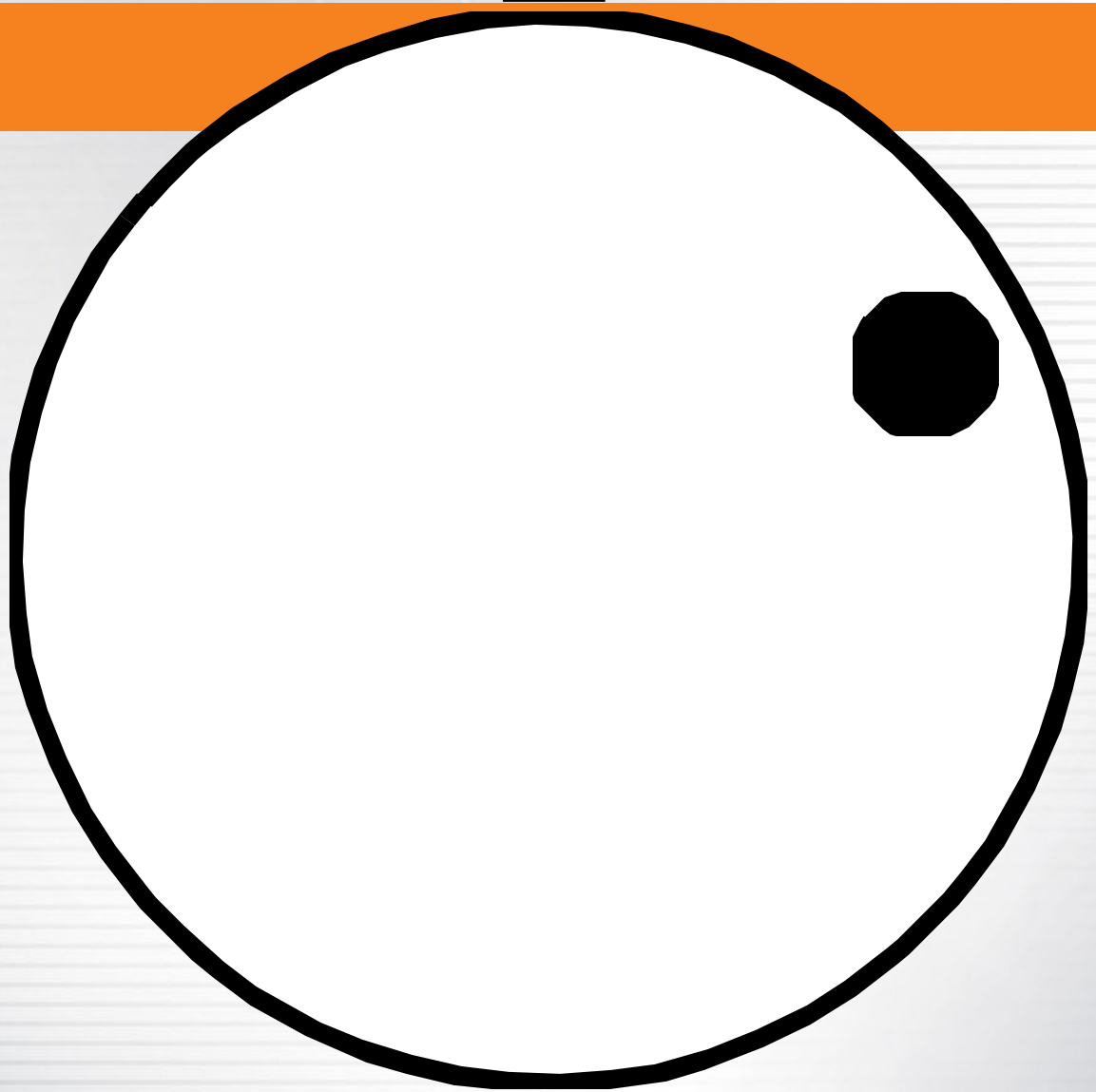


5

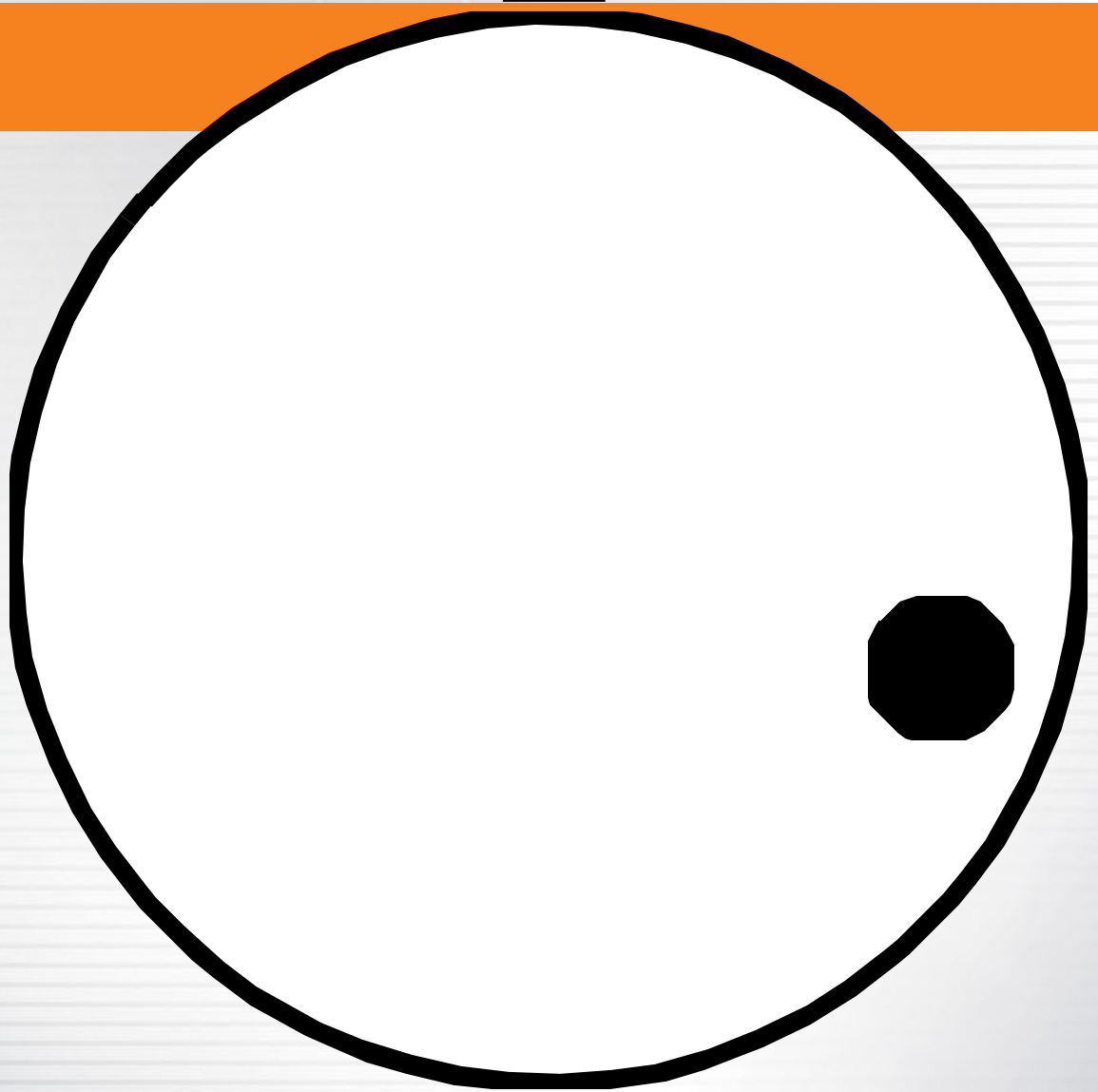


6

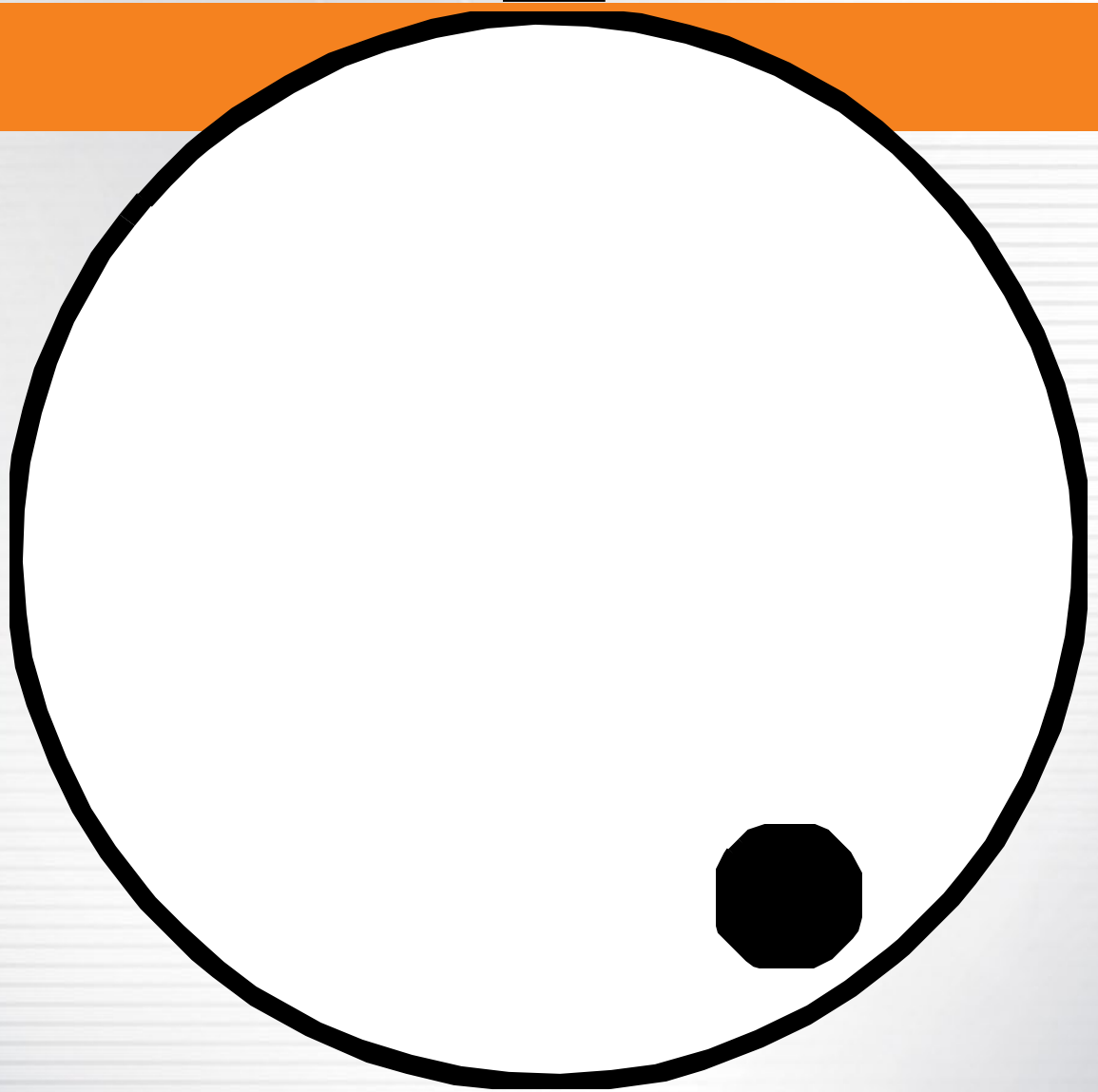
6

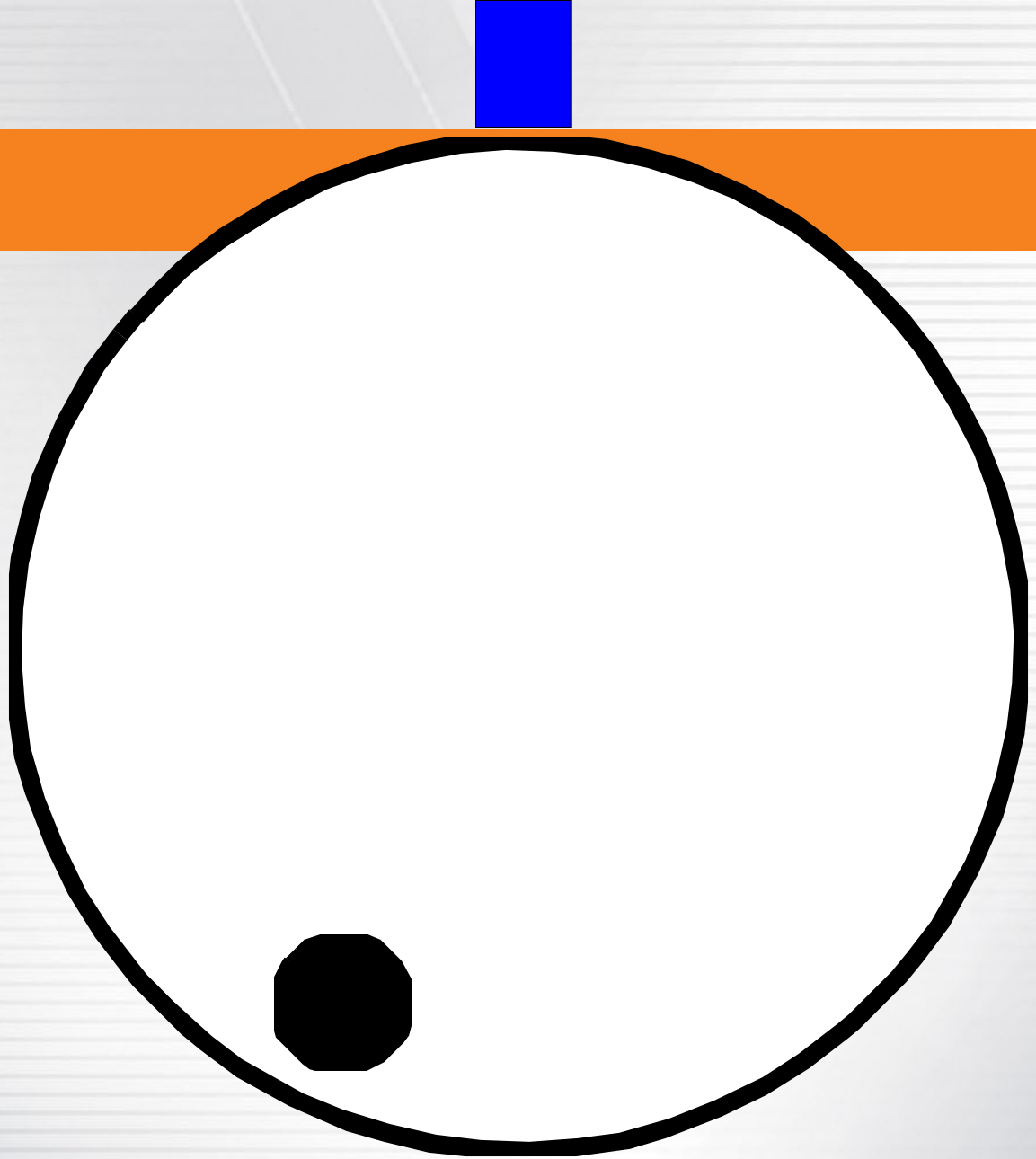


6

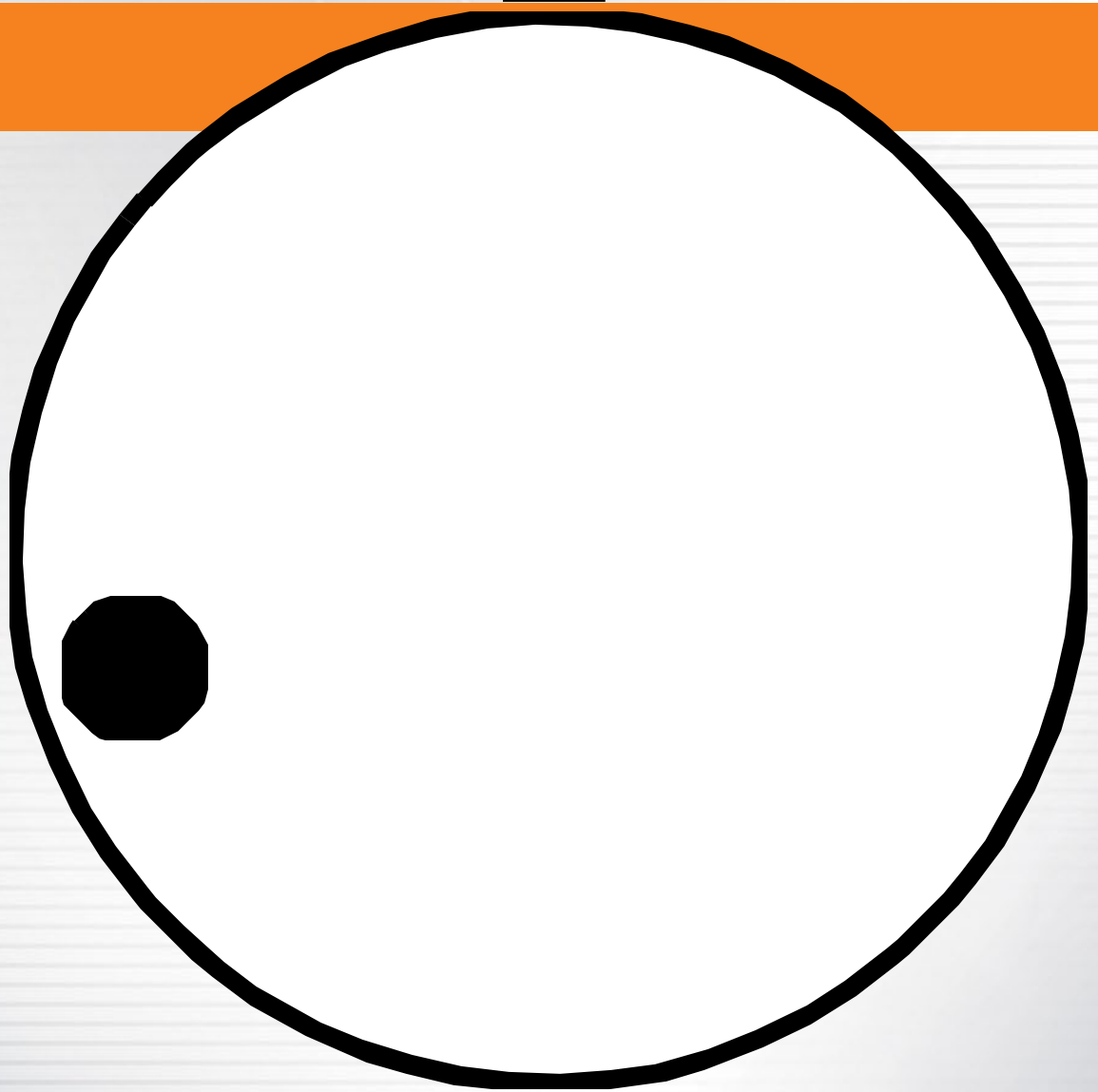


6



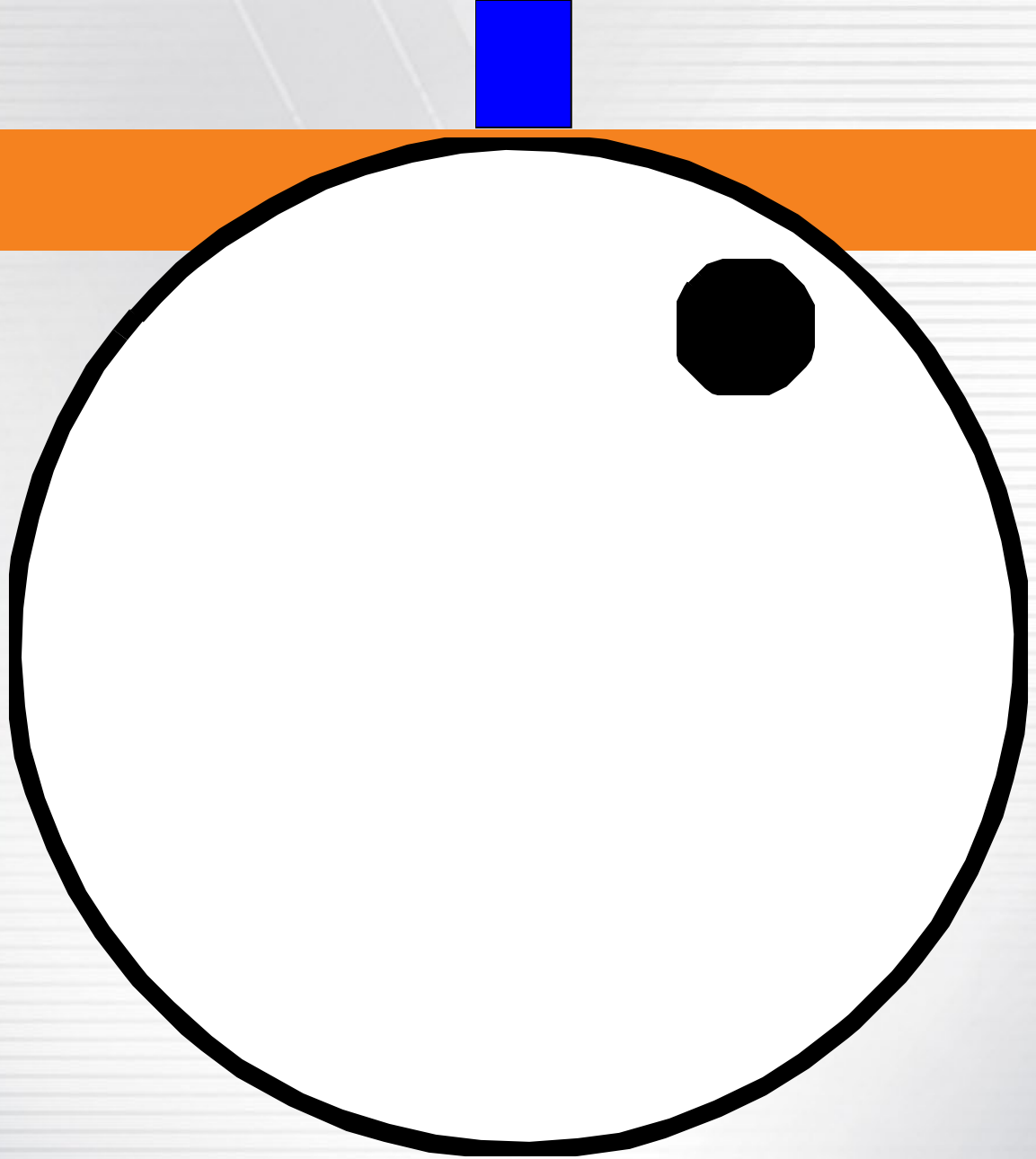


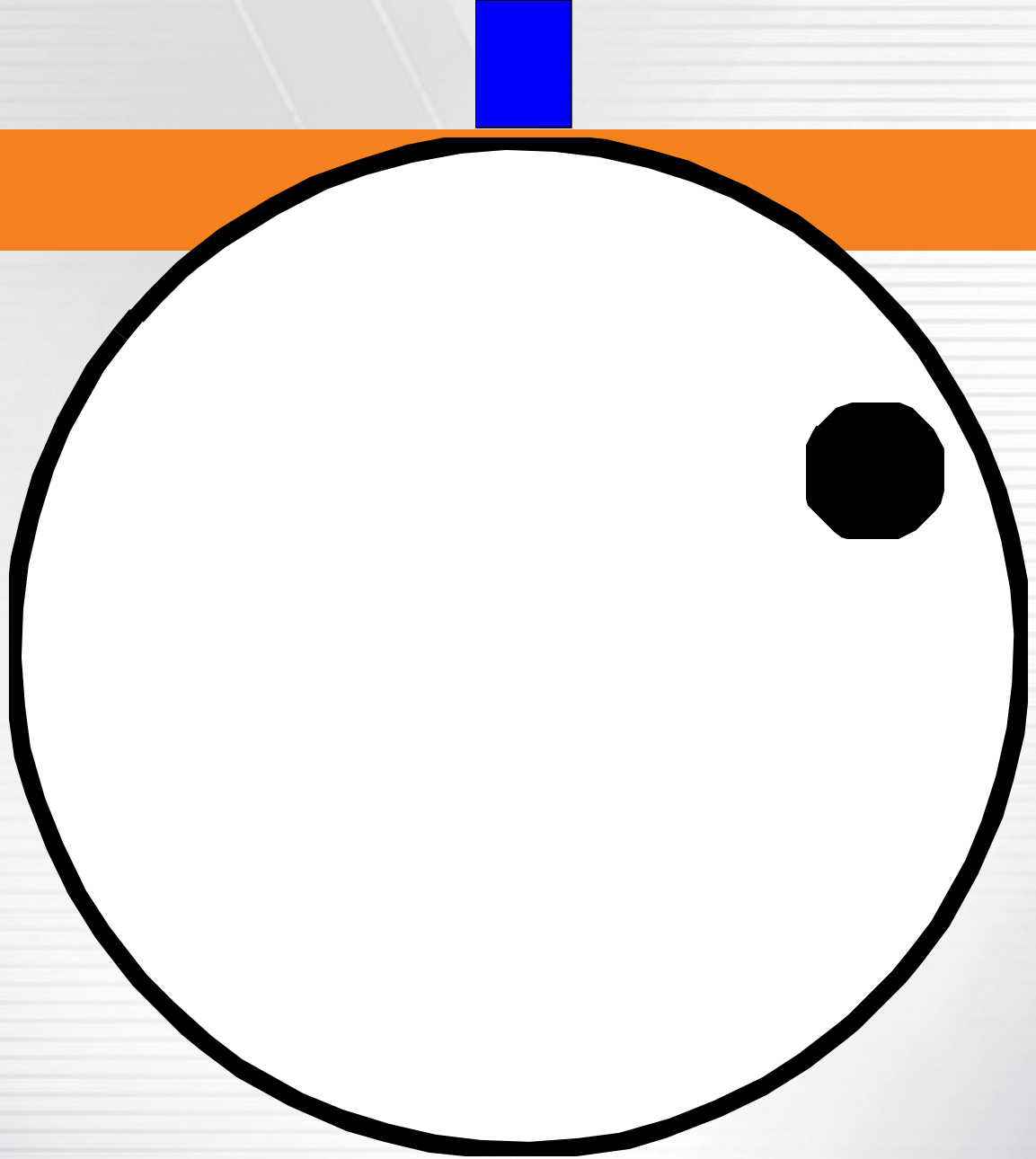
6



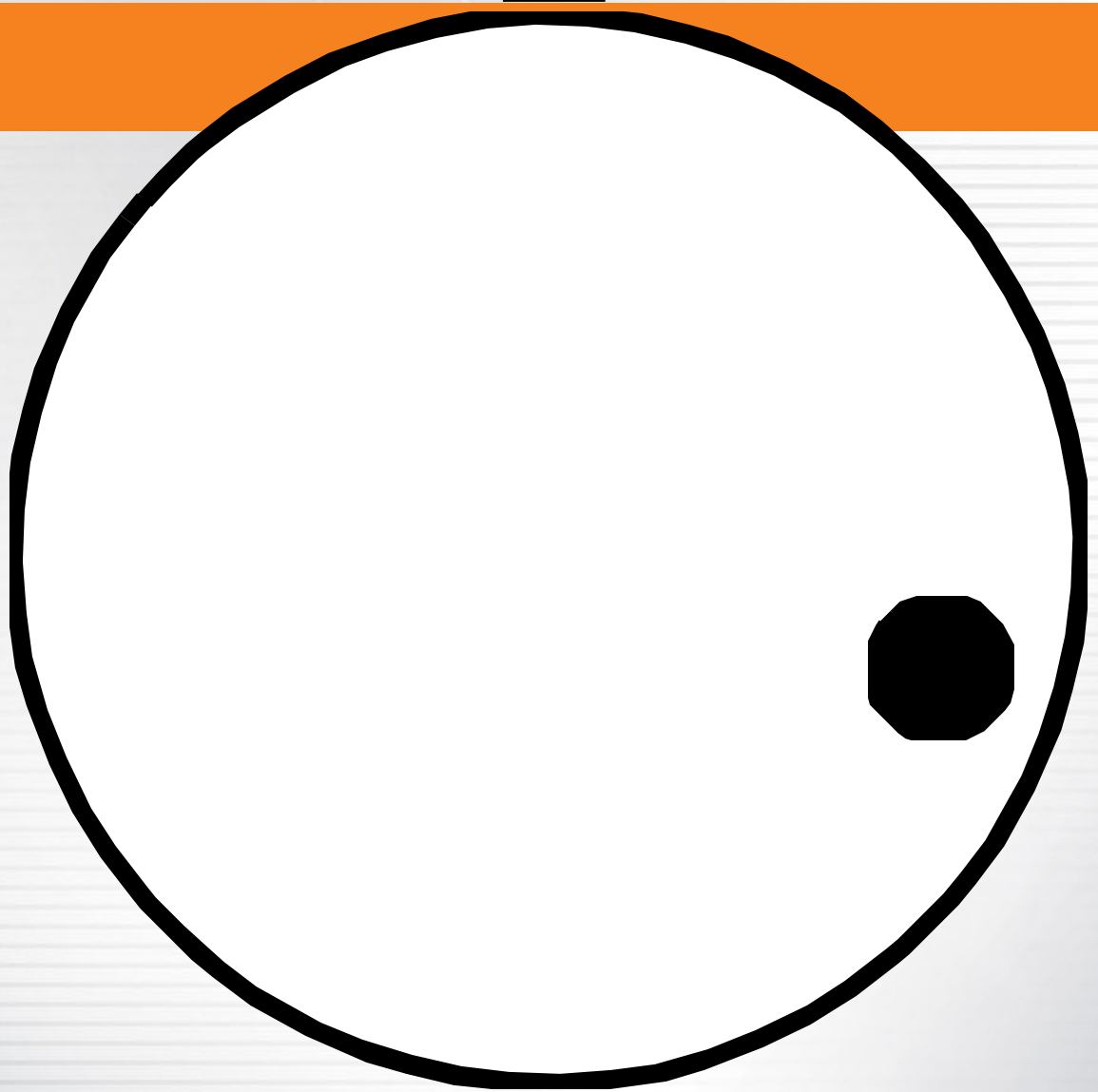
6

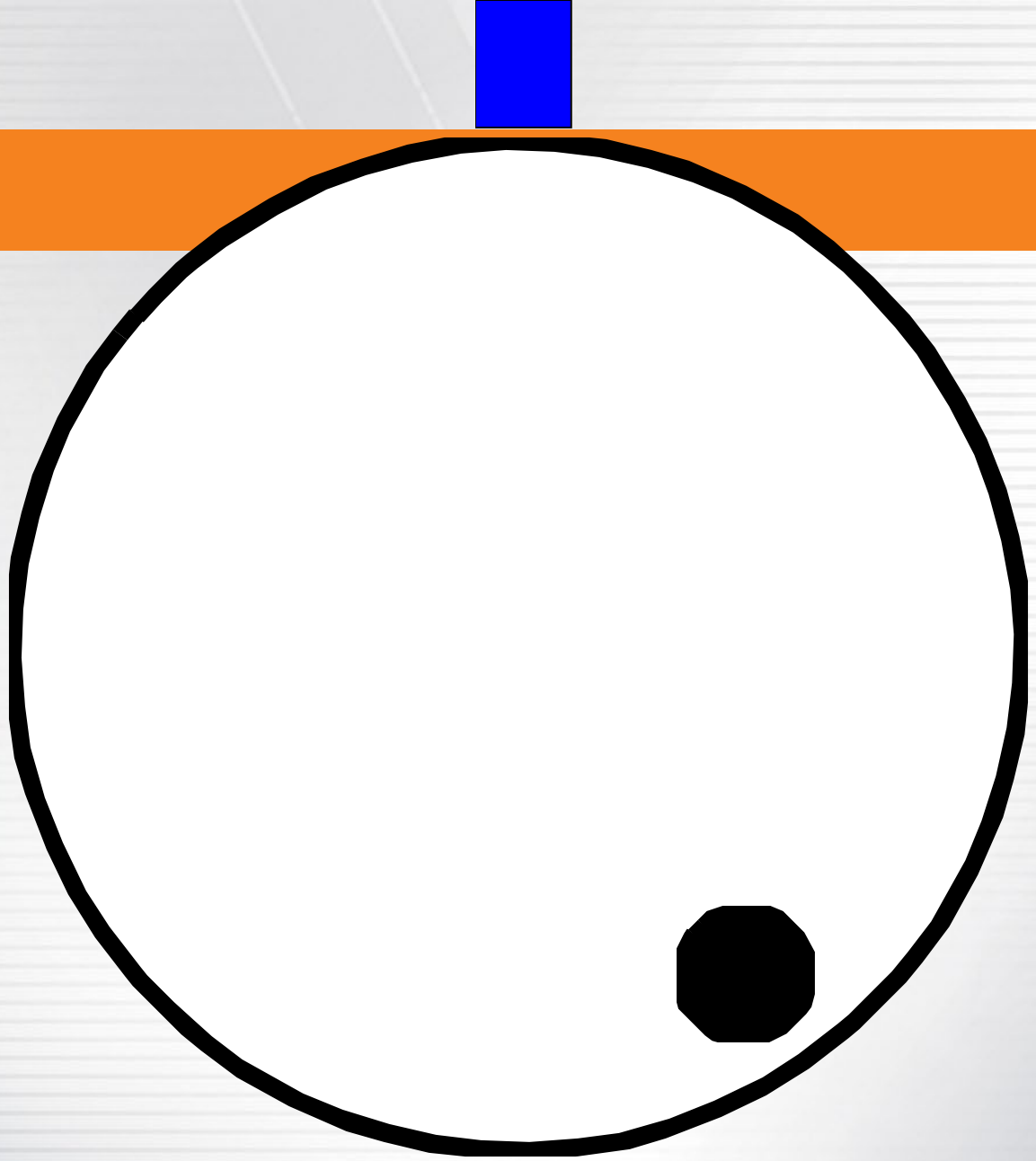
6

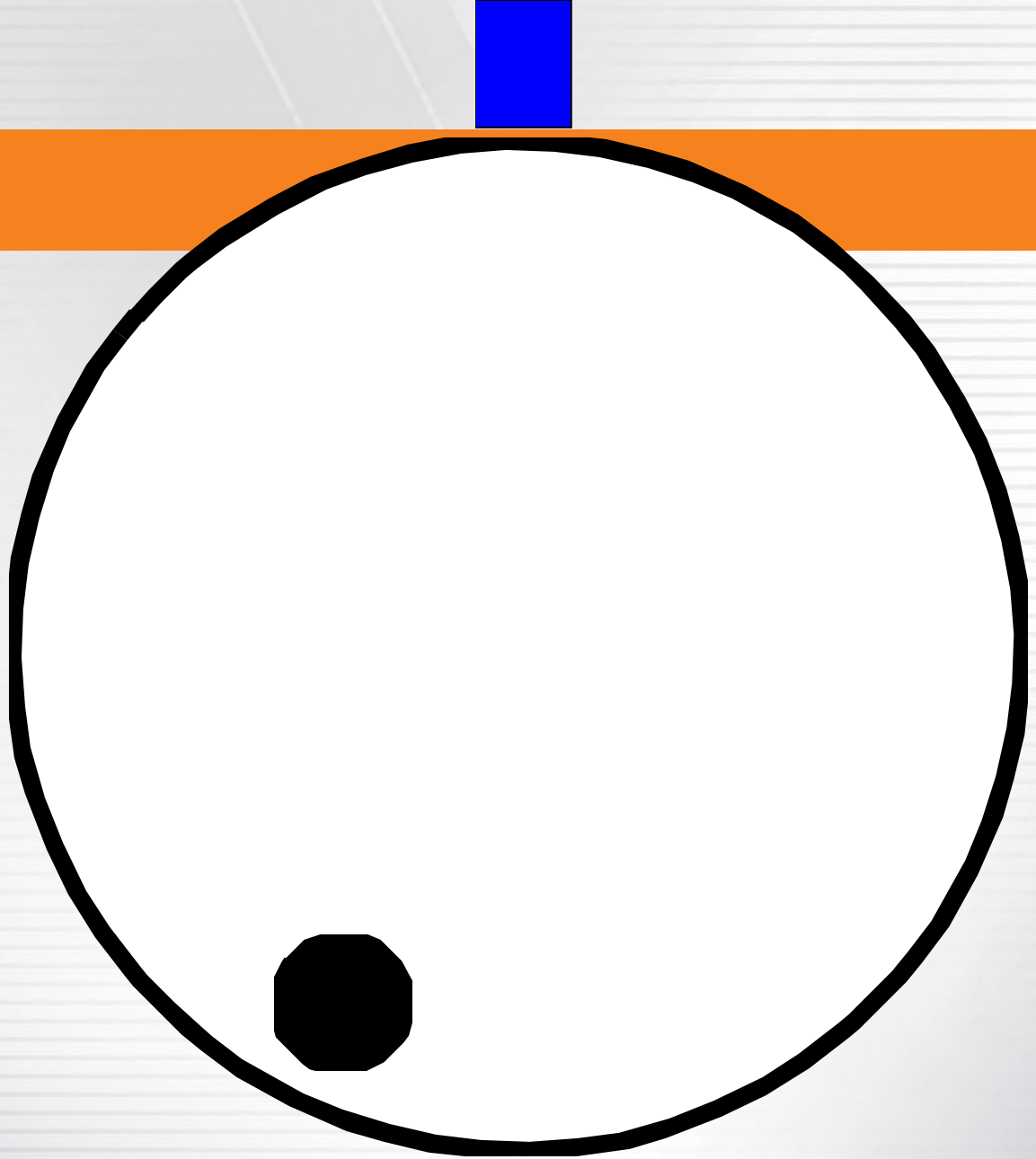




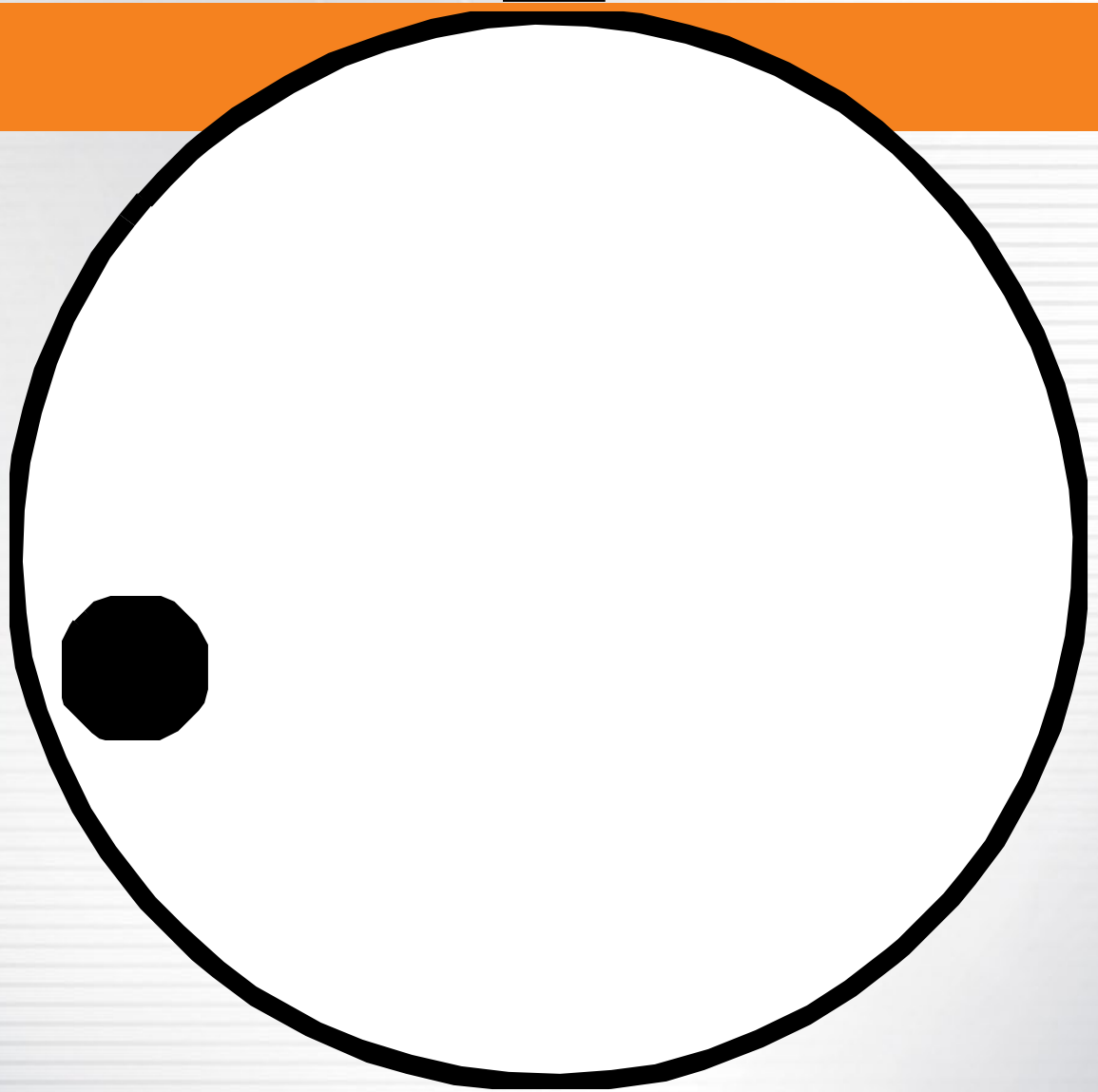
7

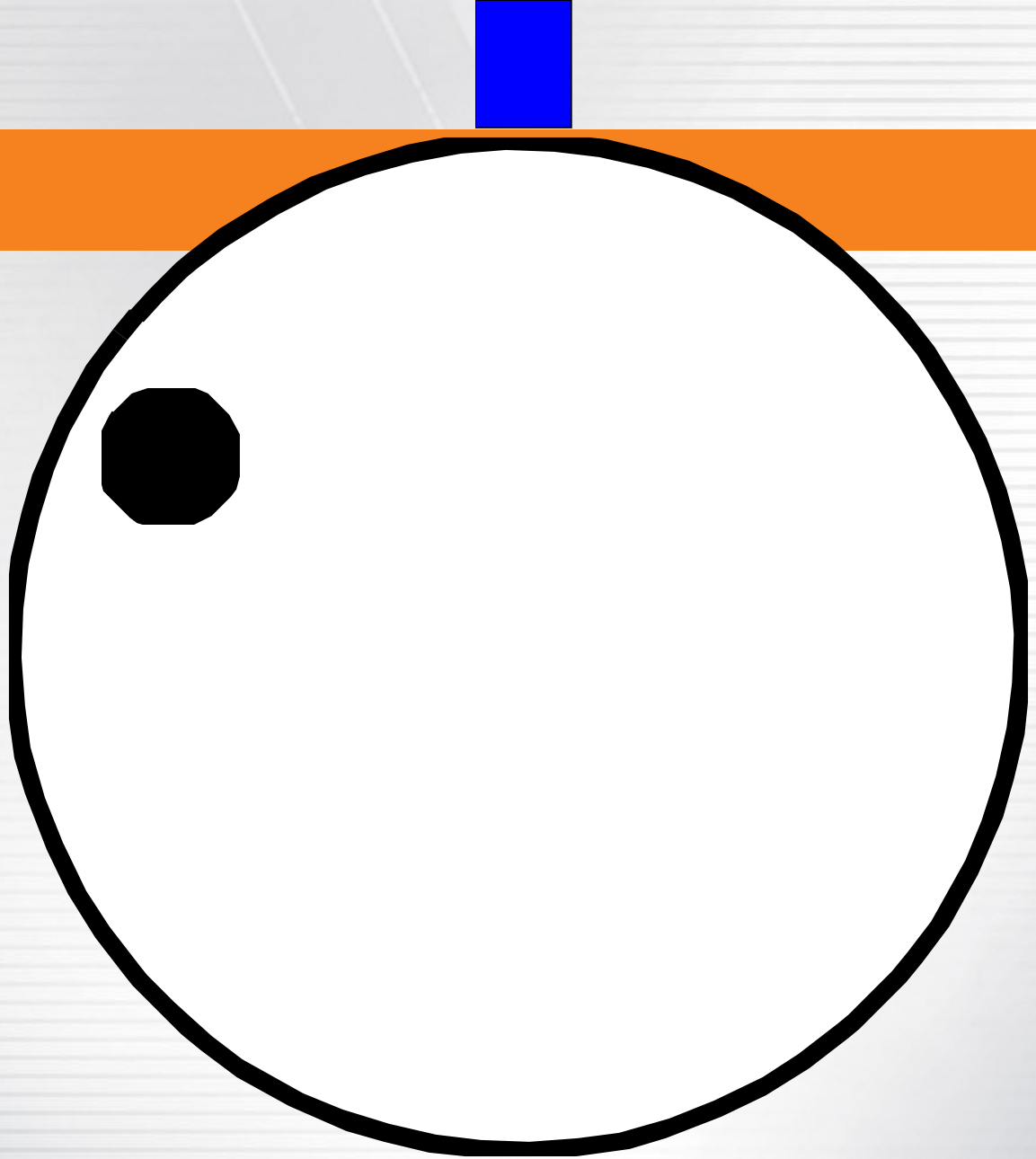


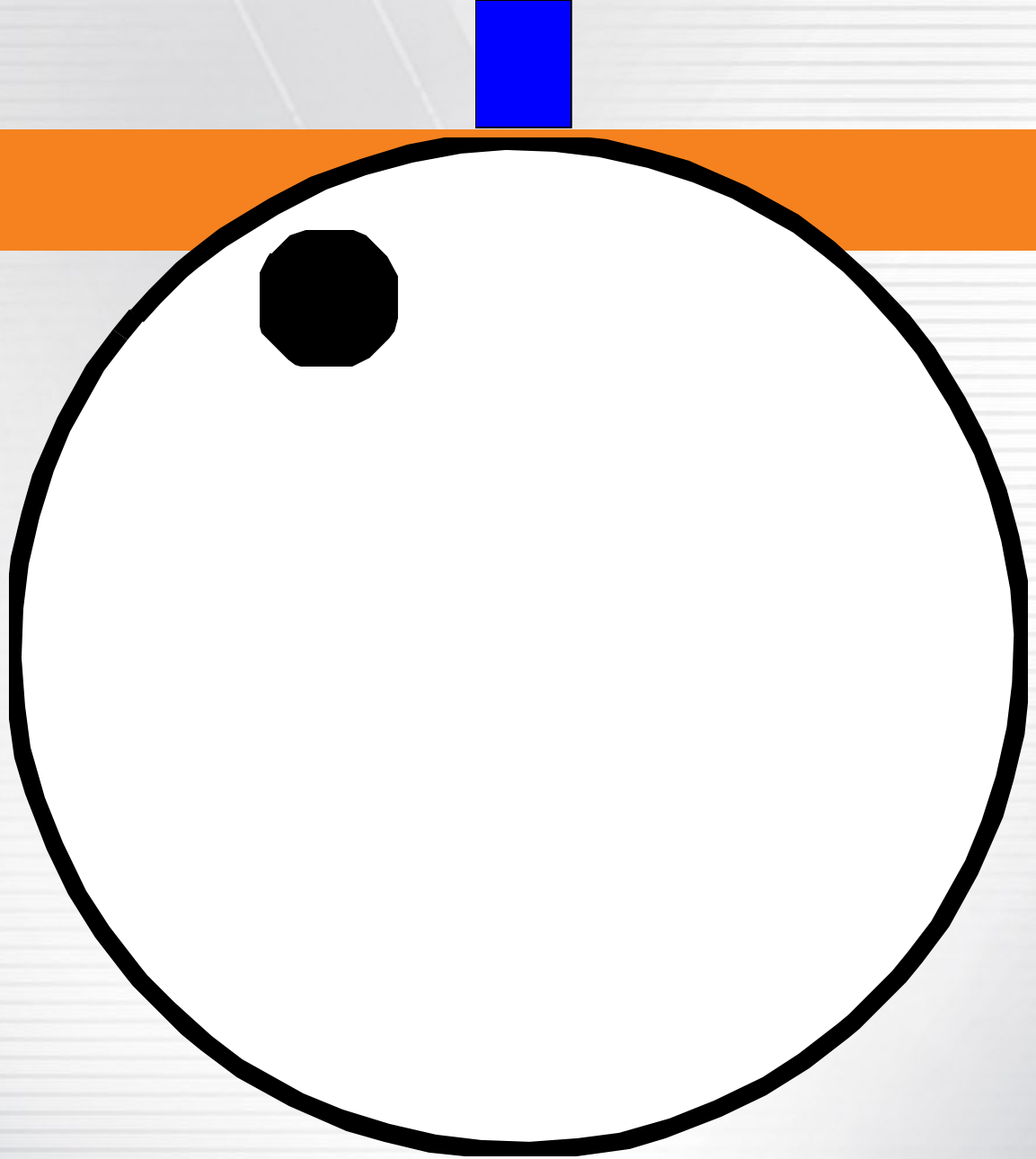


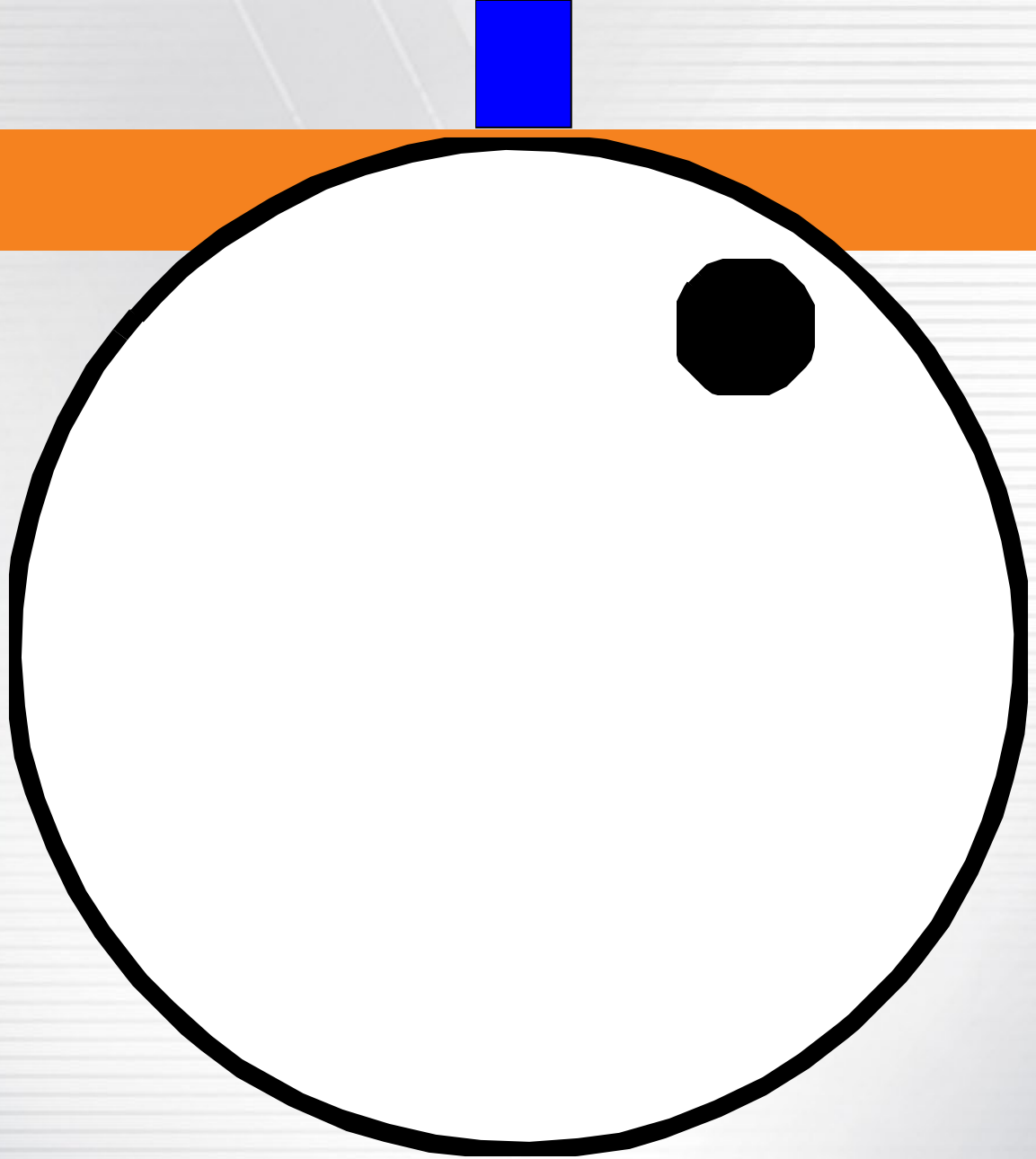


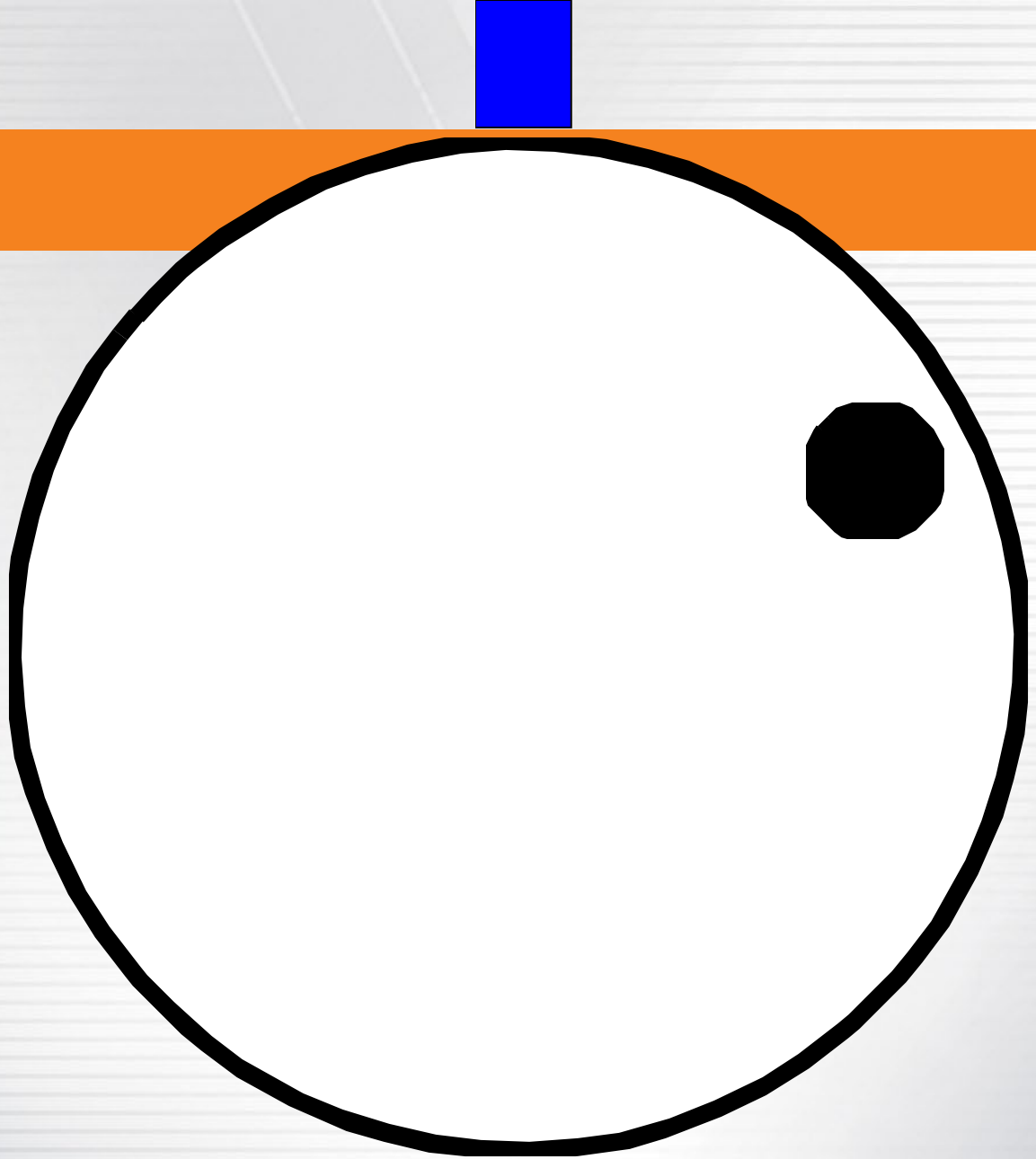
7

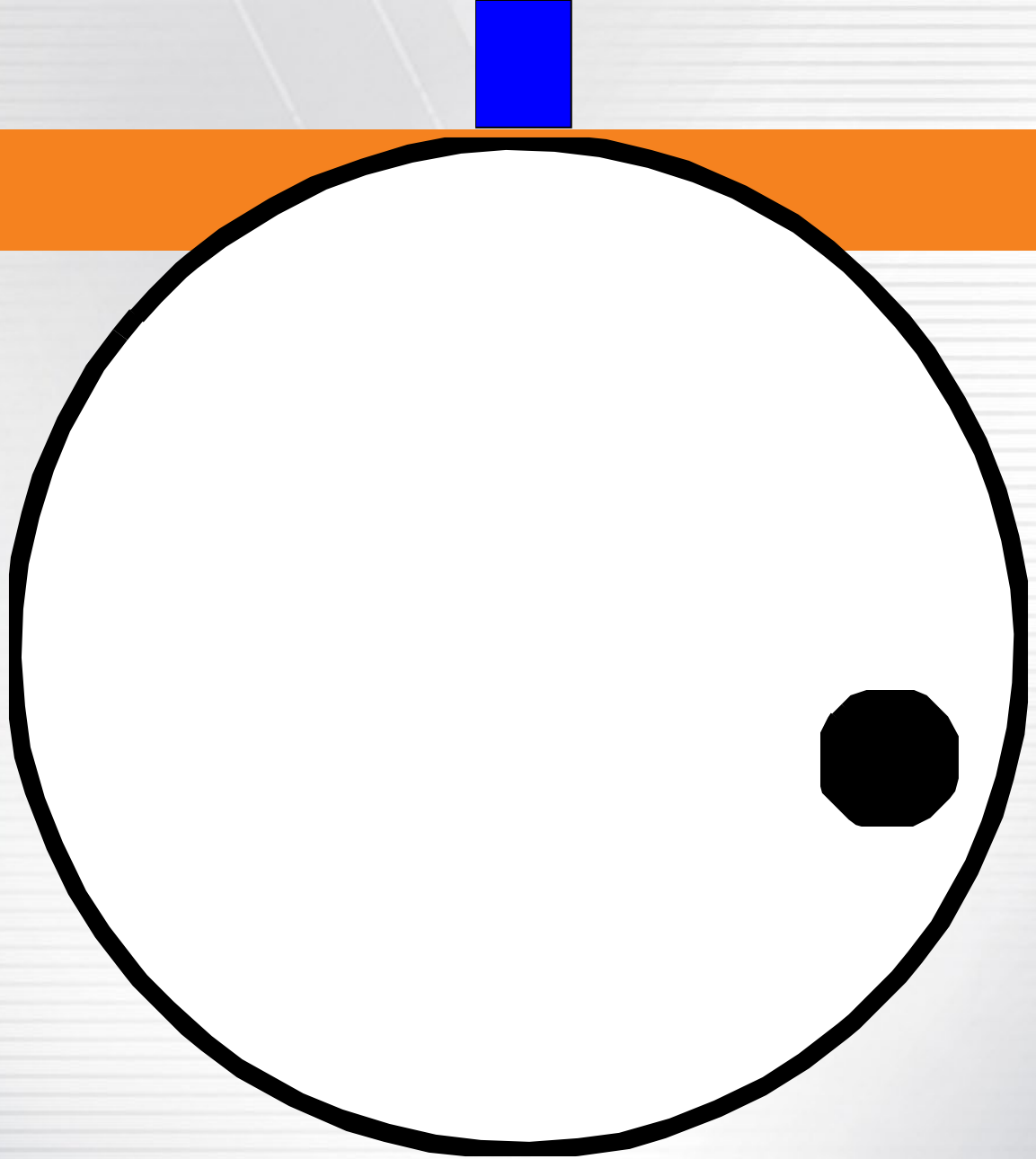



7

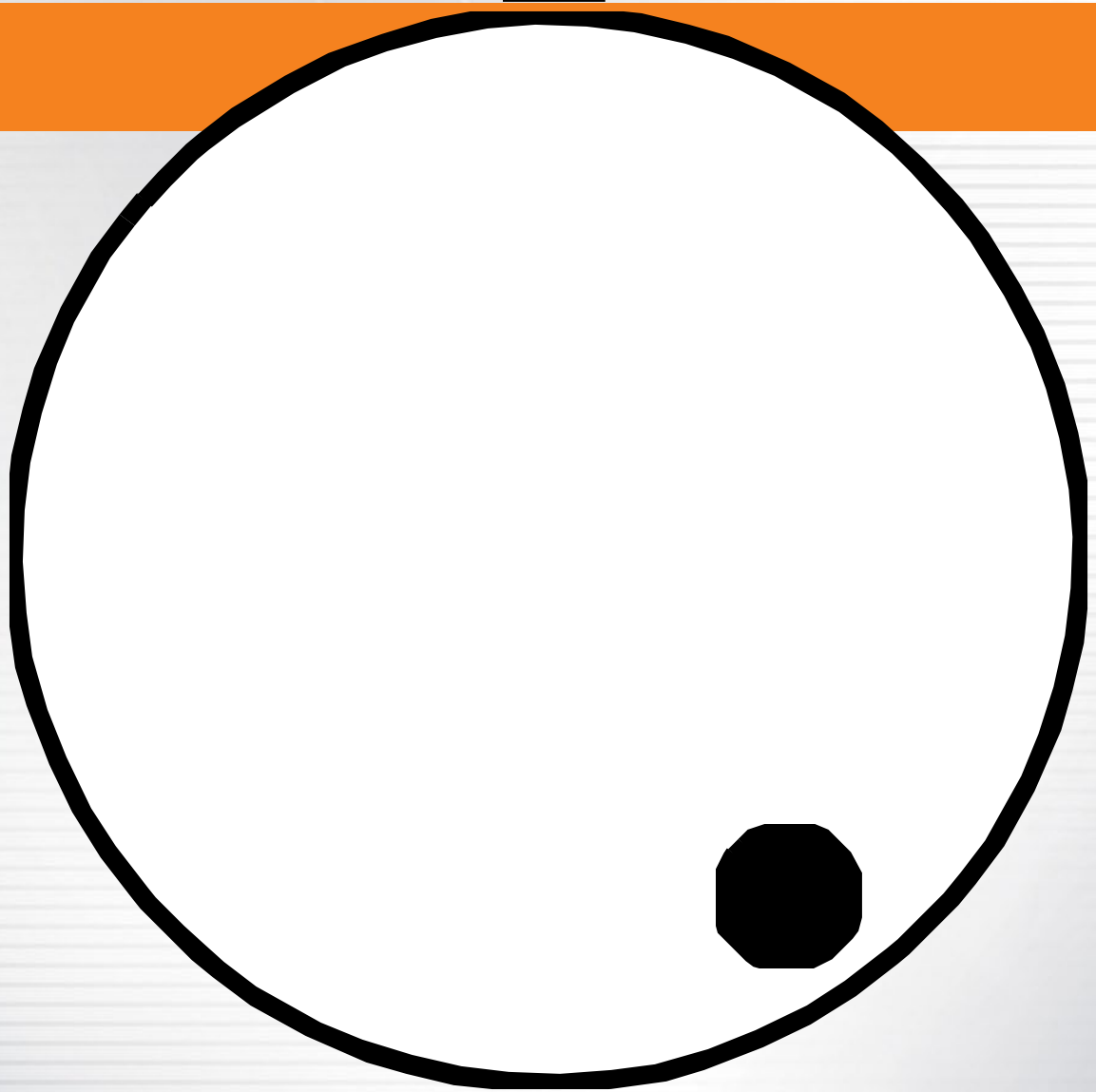


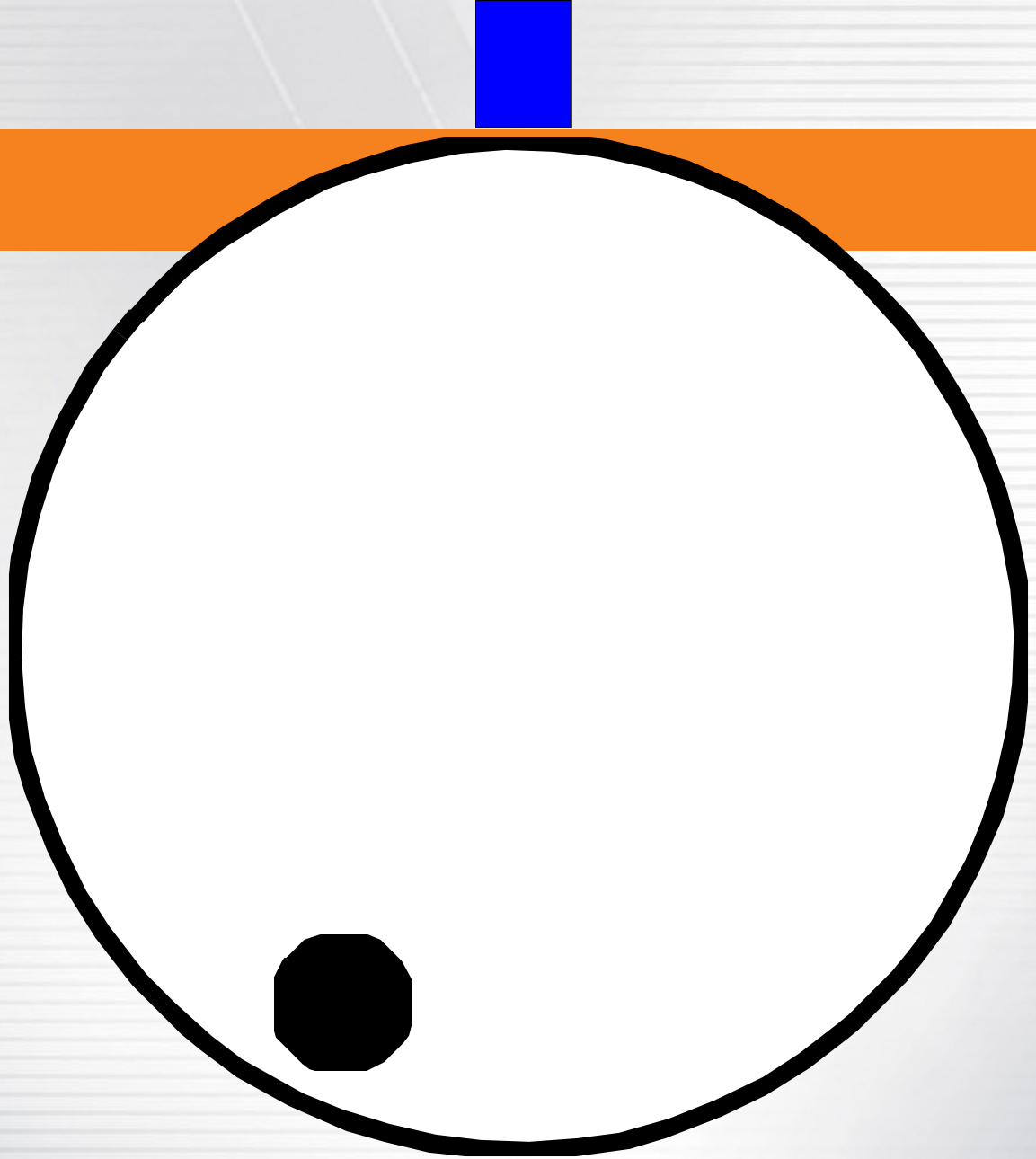


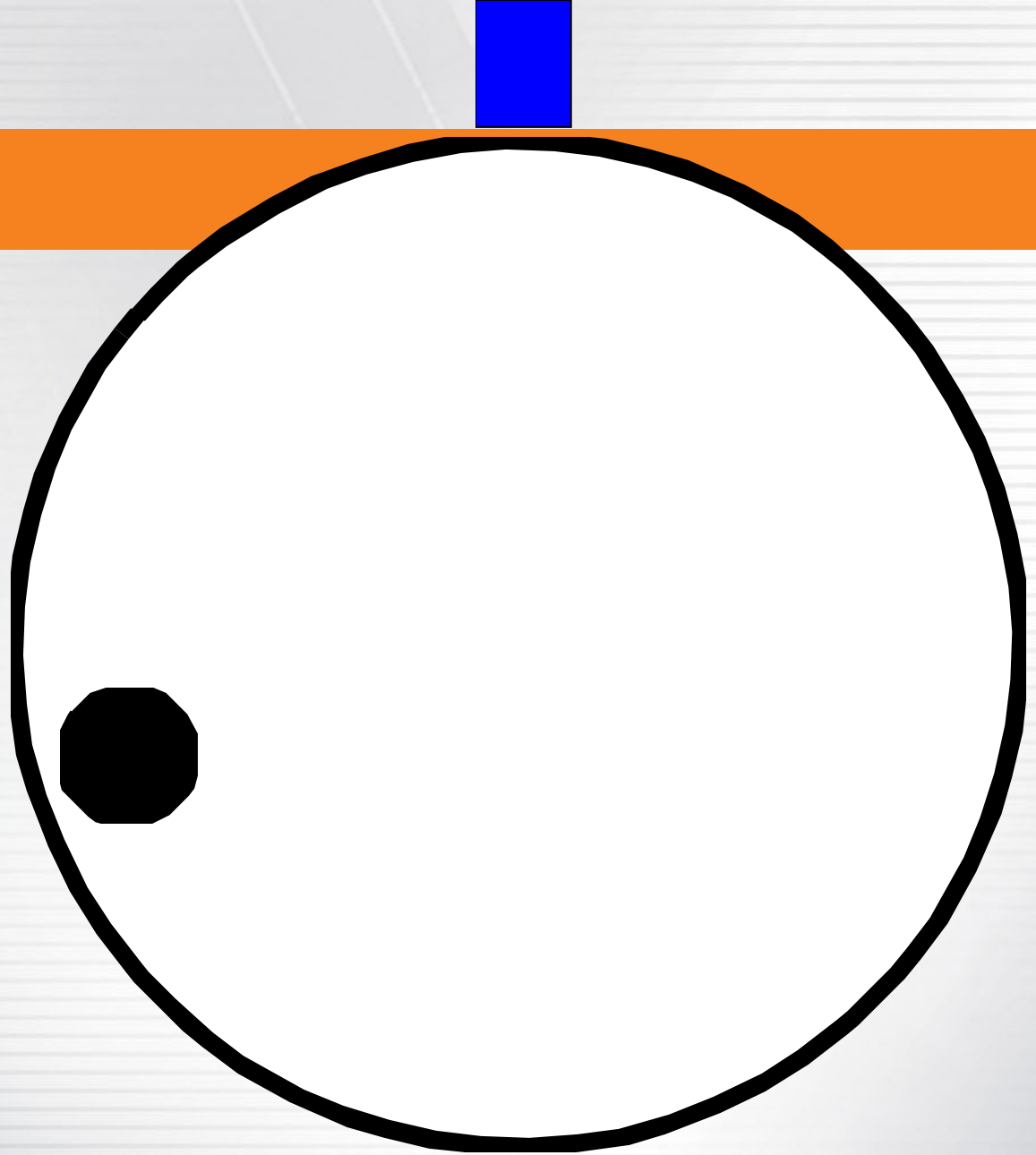


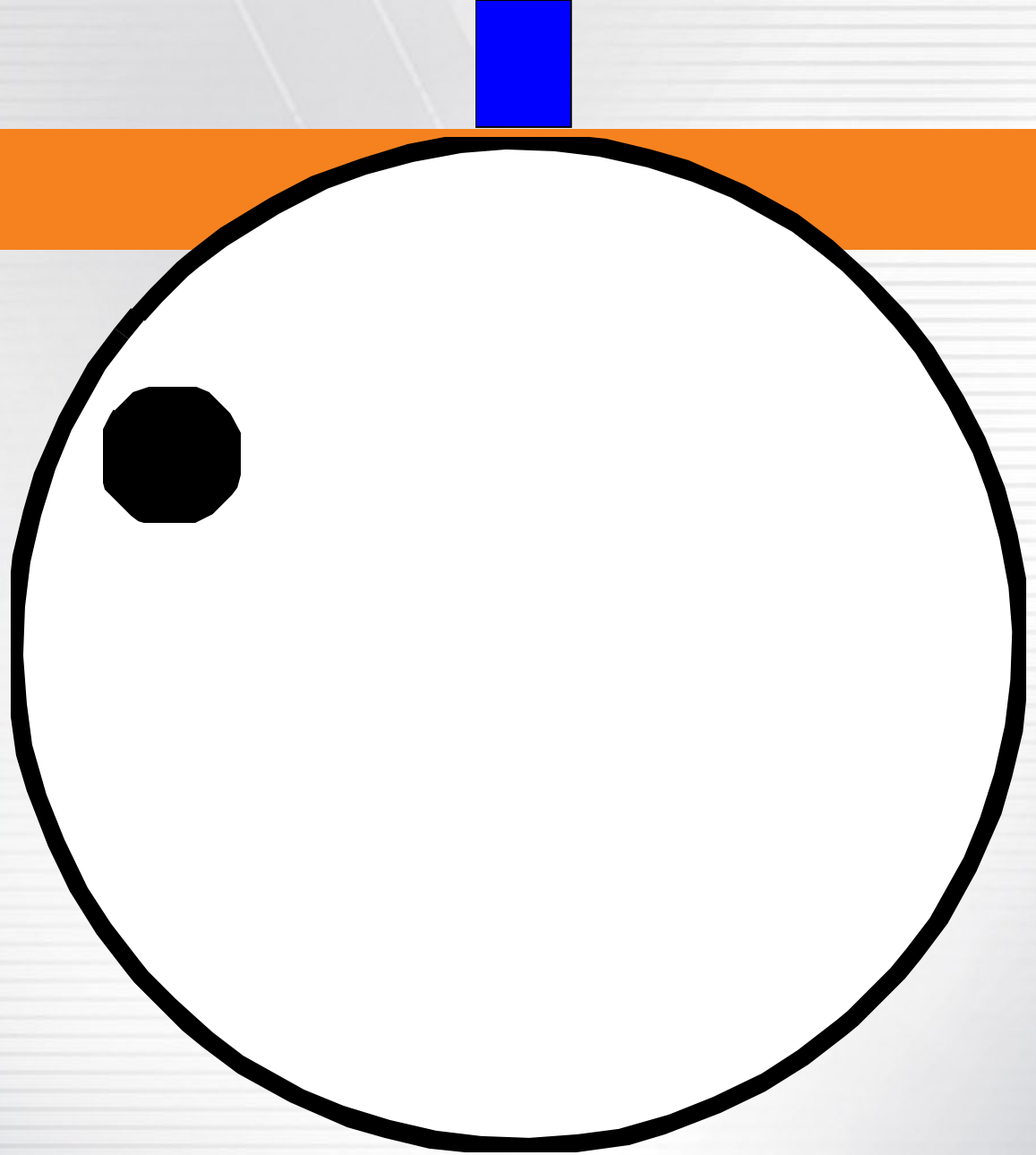


8

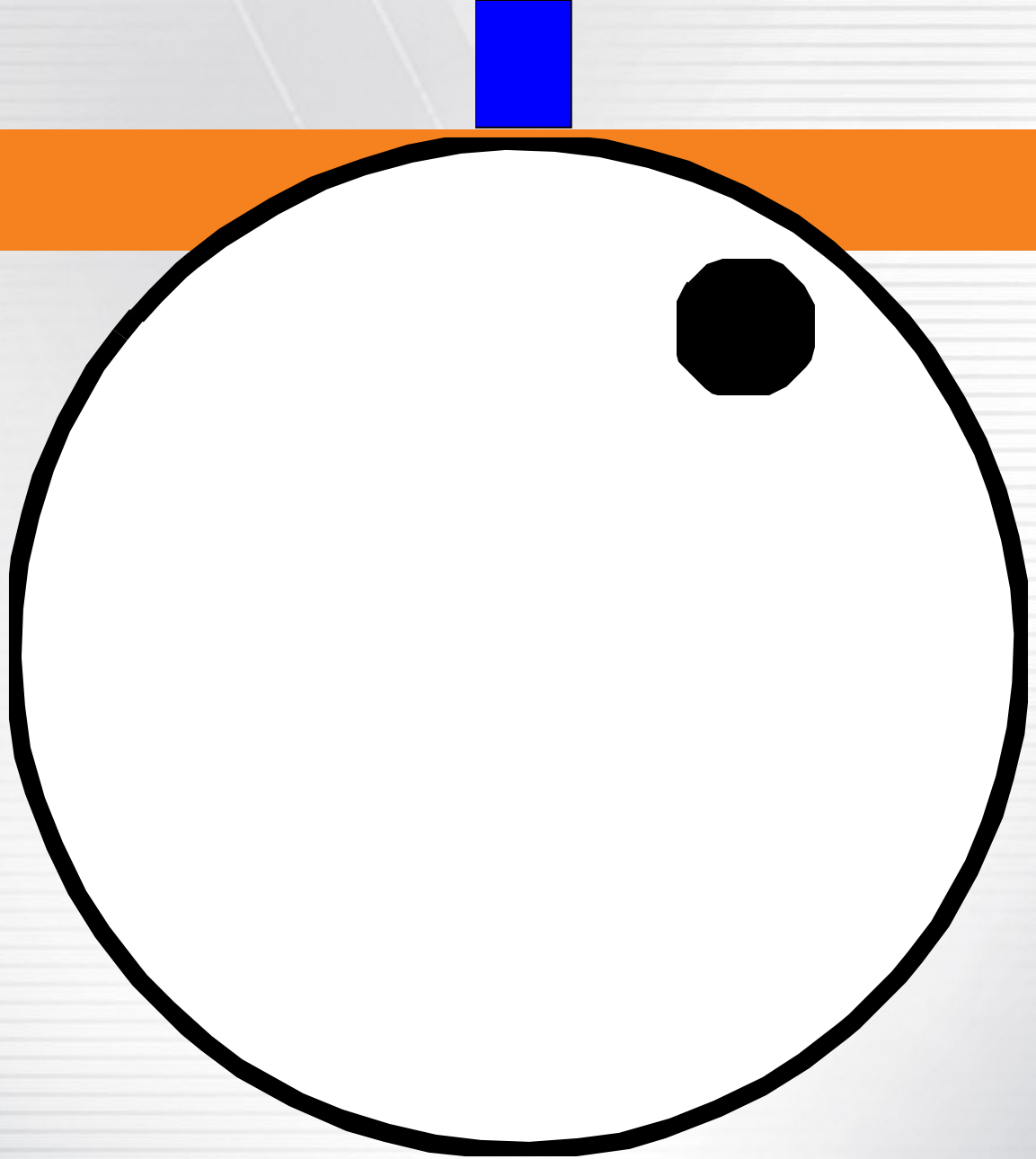


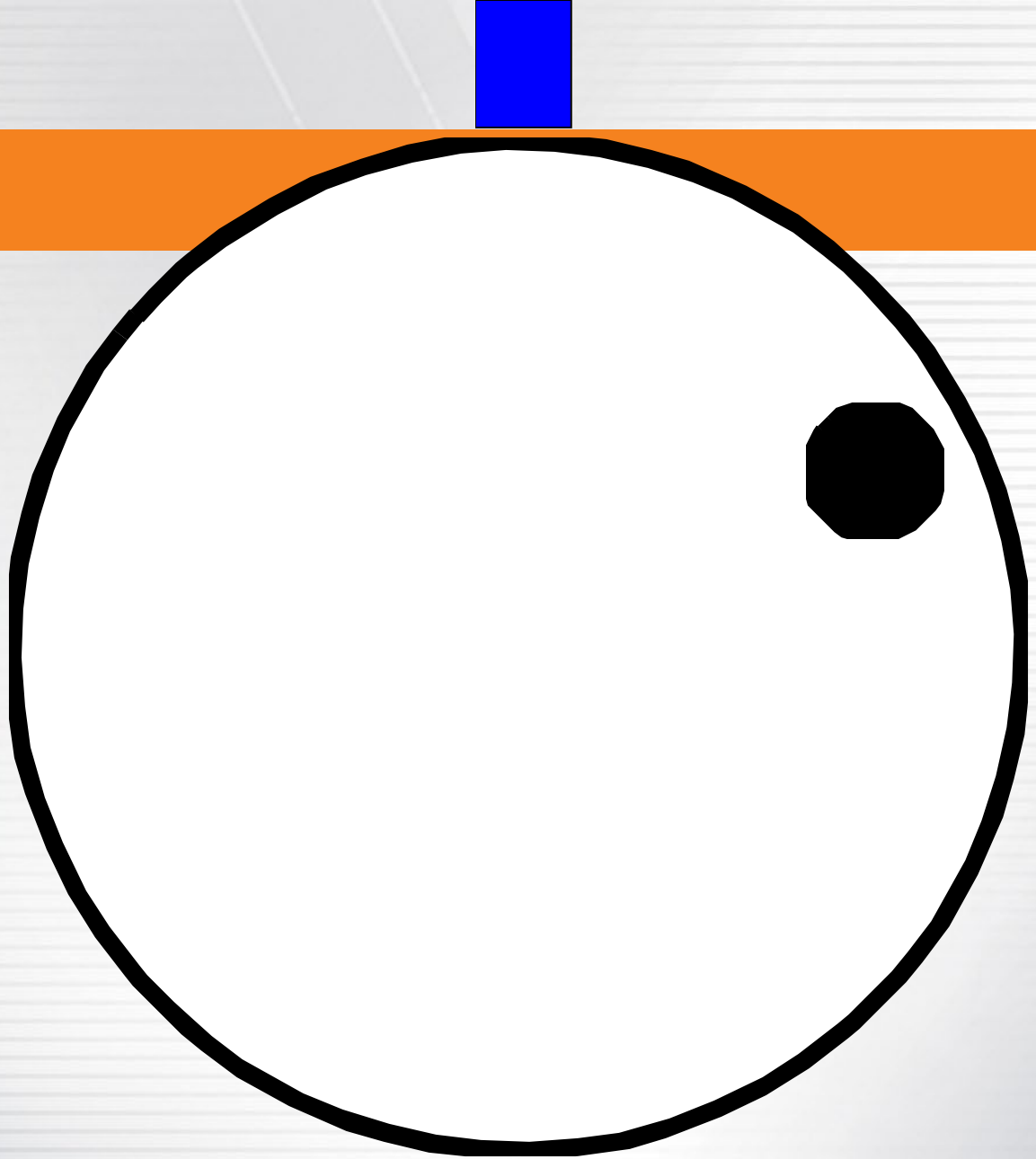


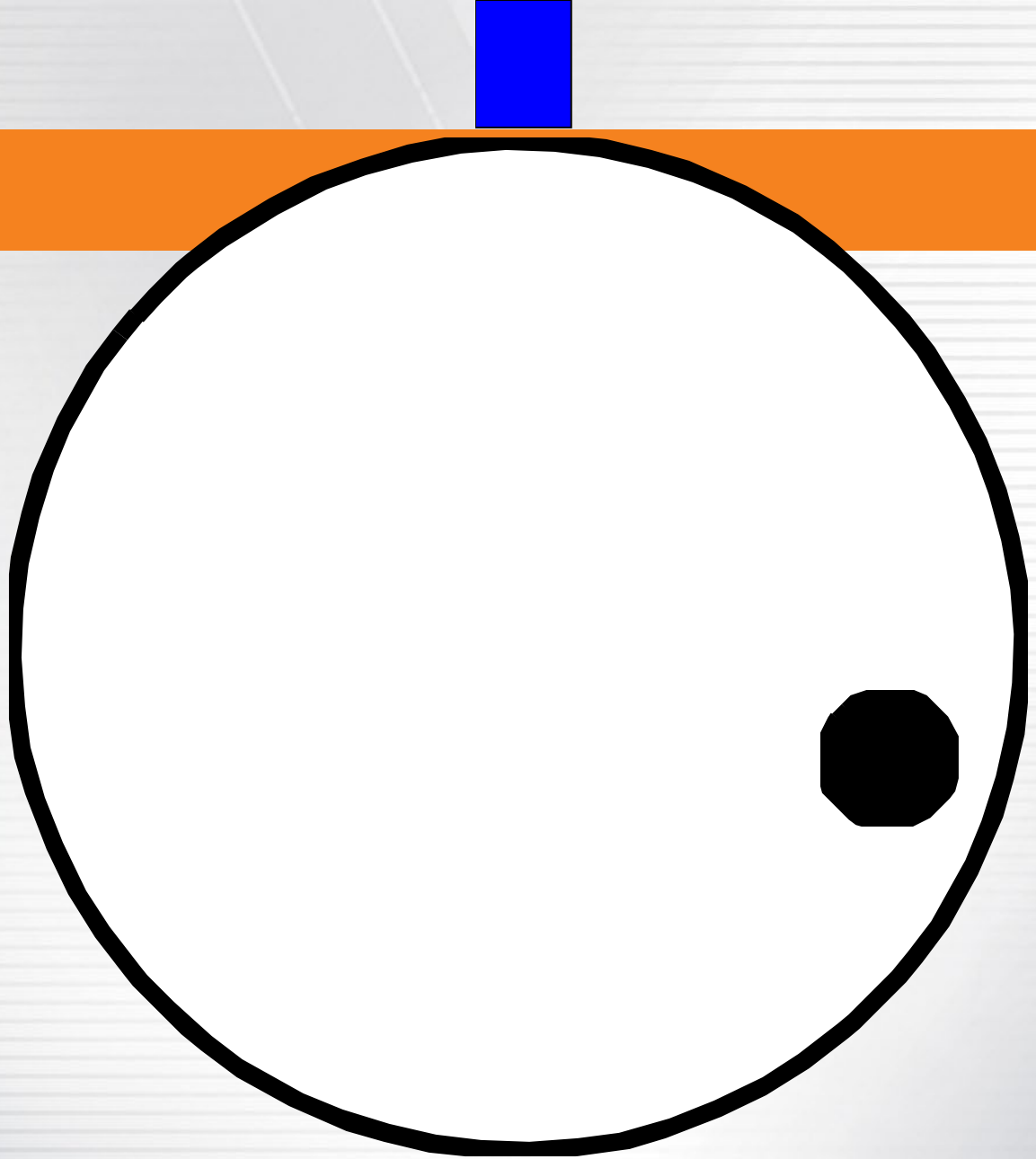


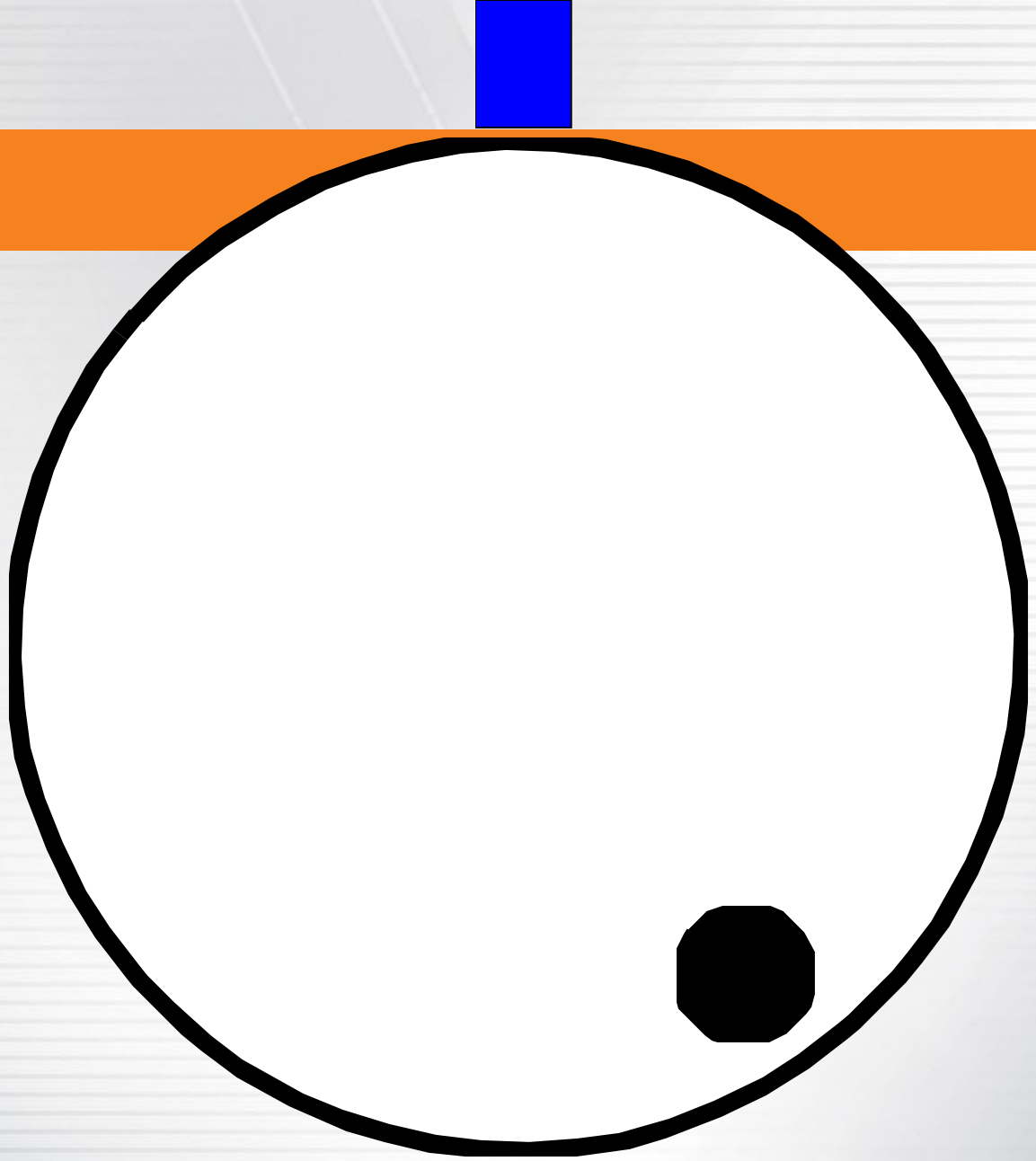


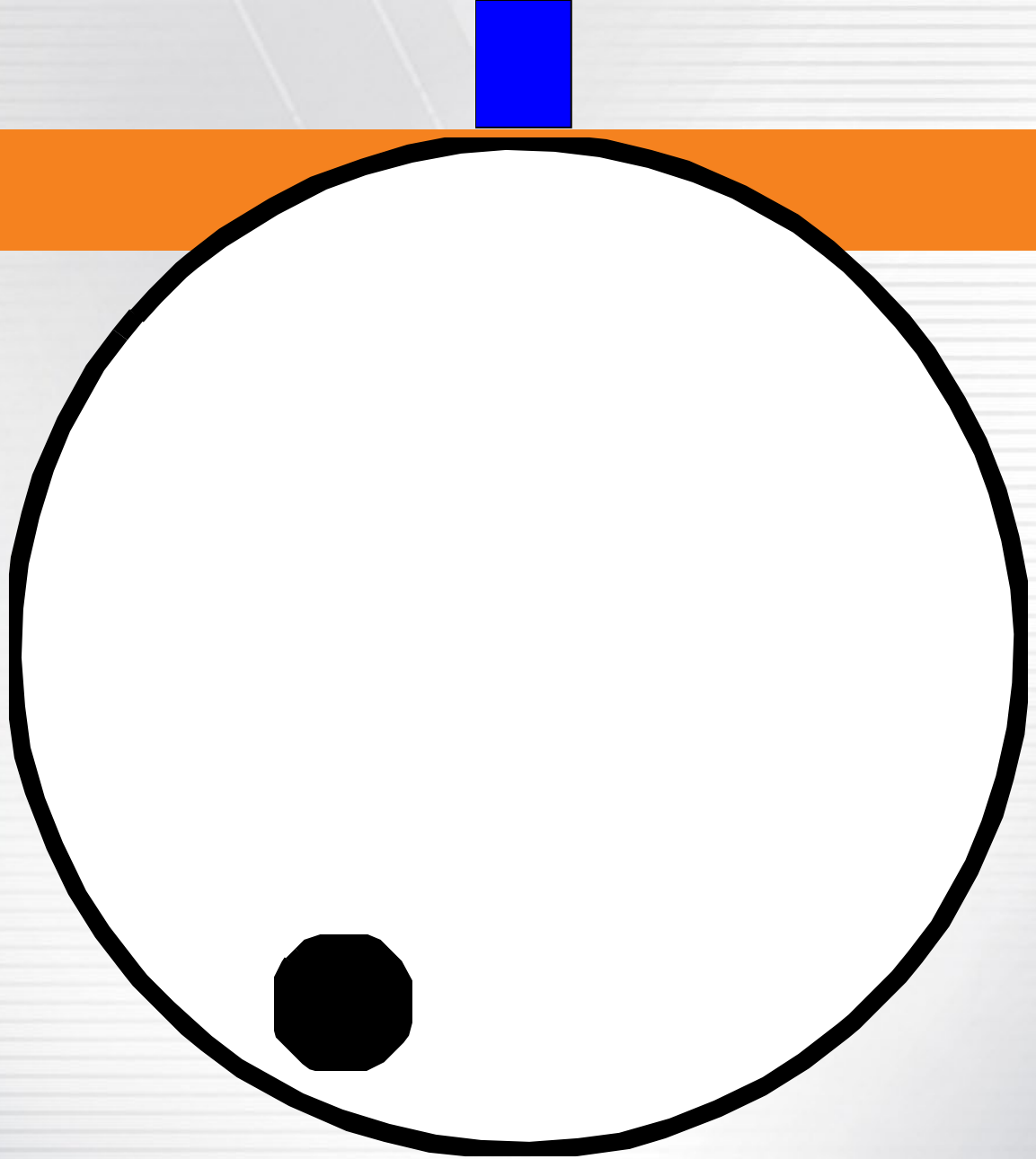
8


9

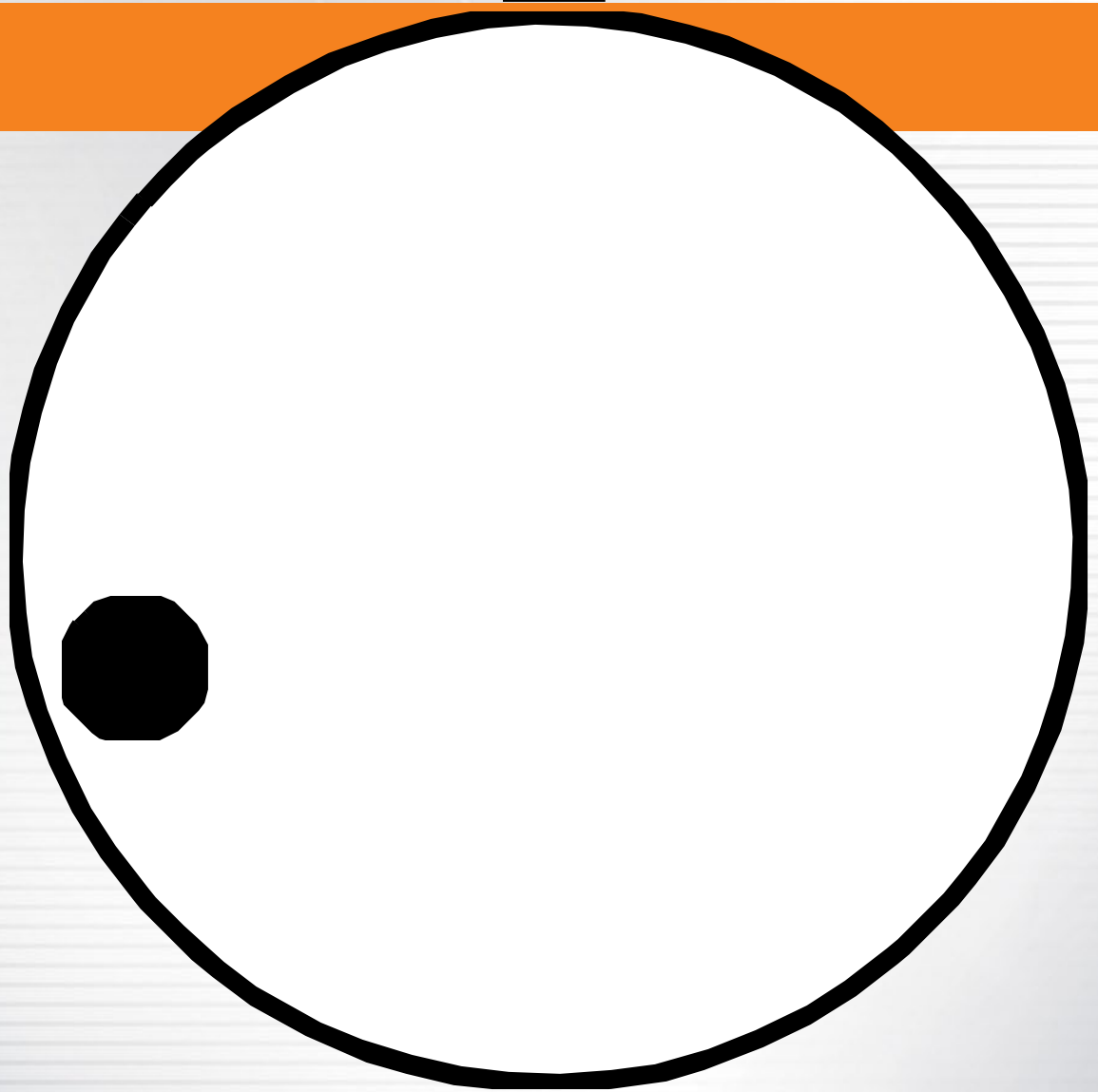


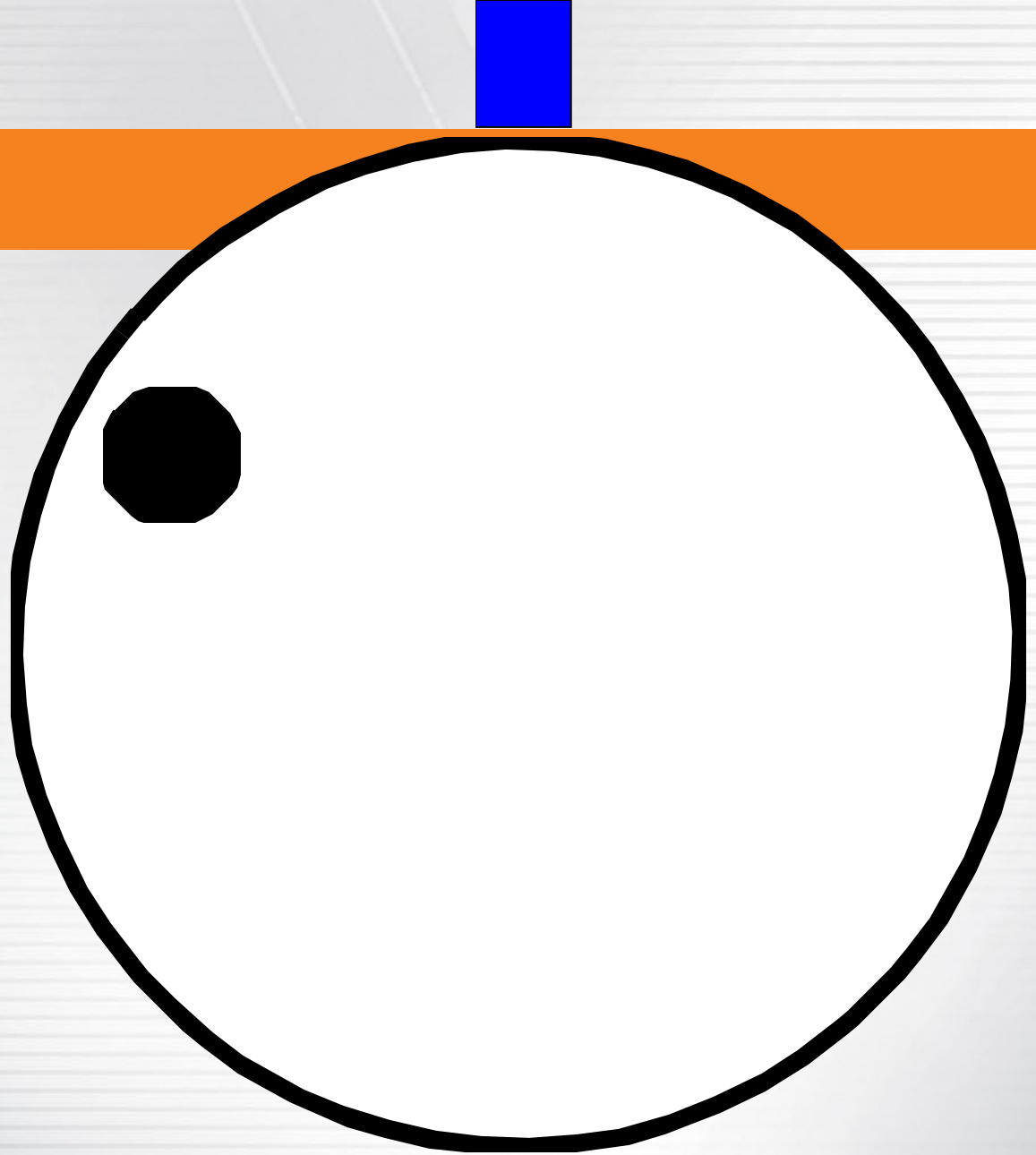


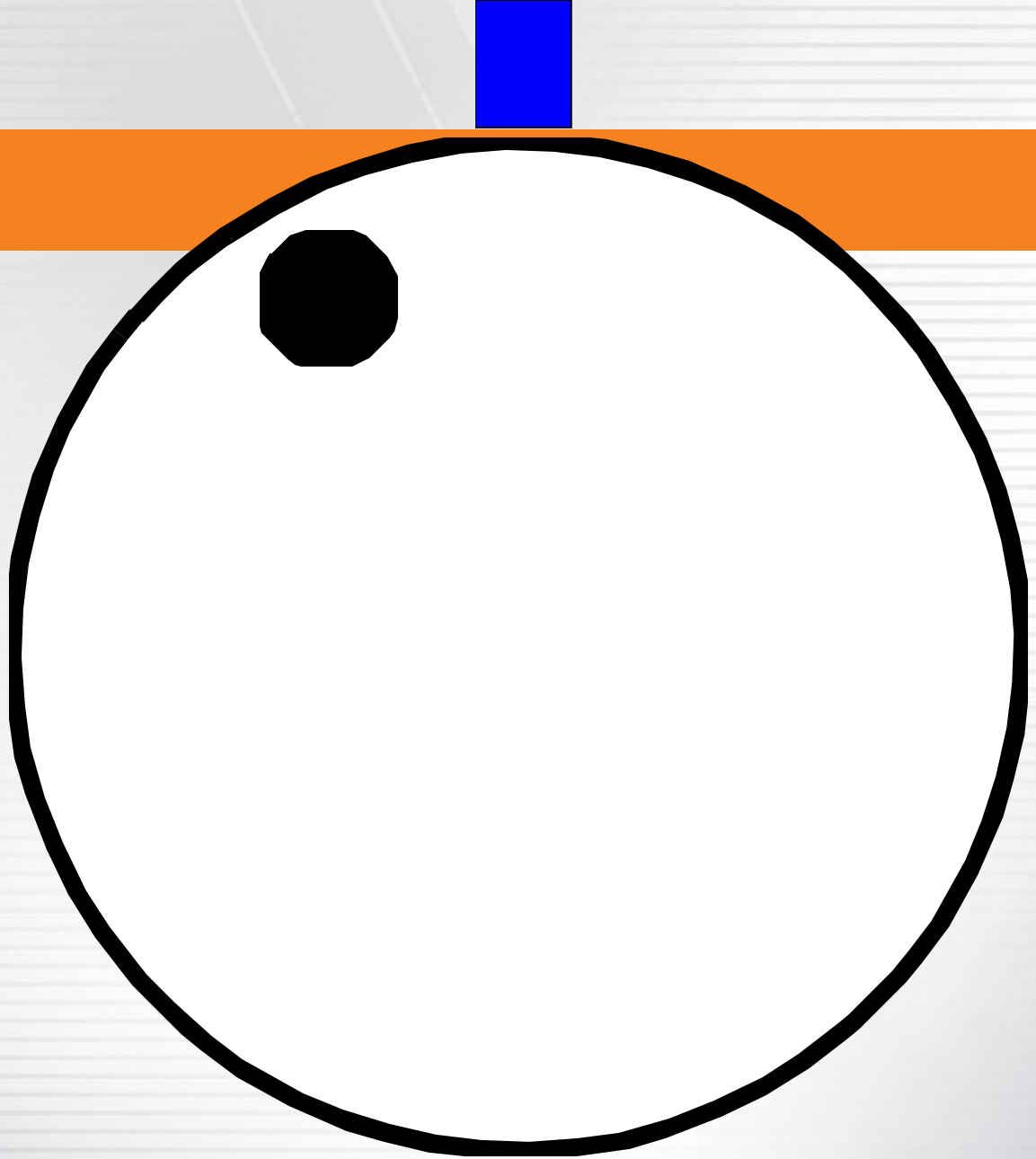


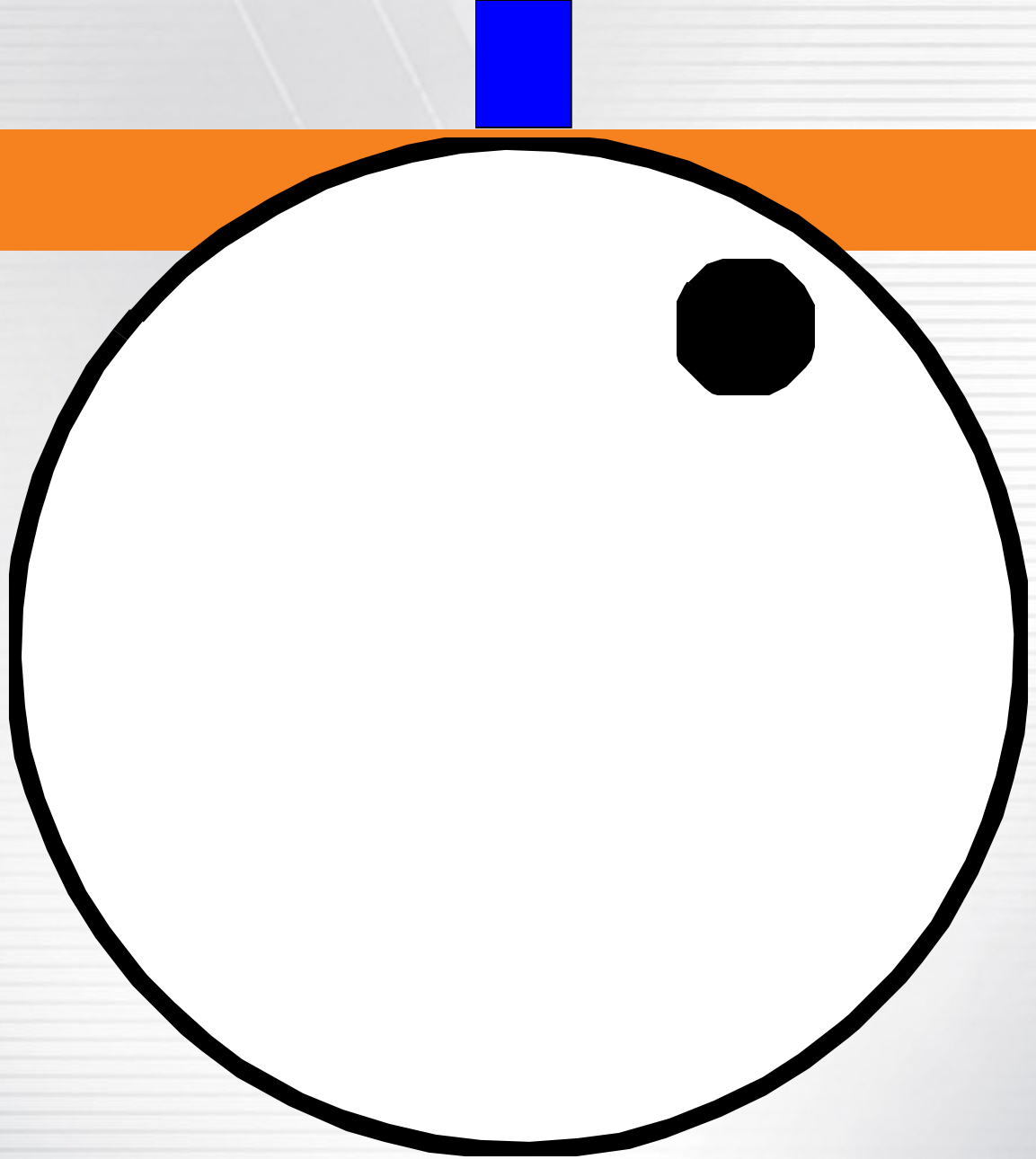


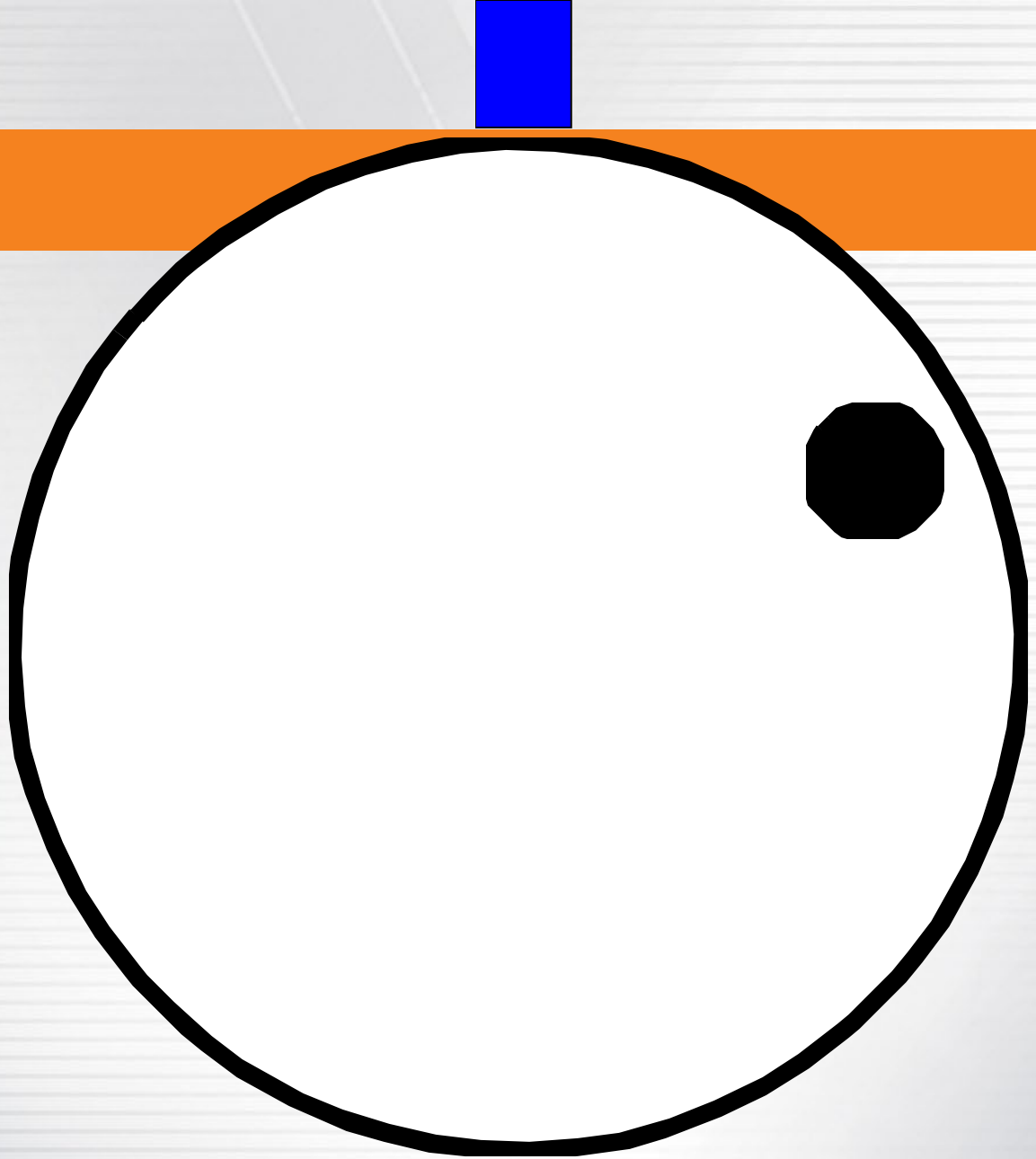
9



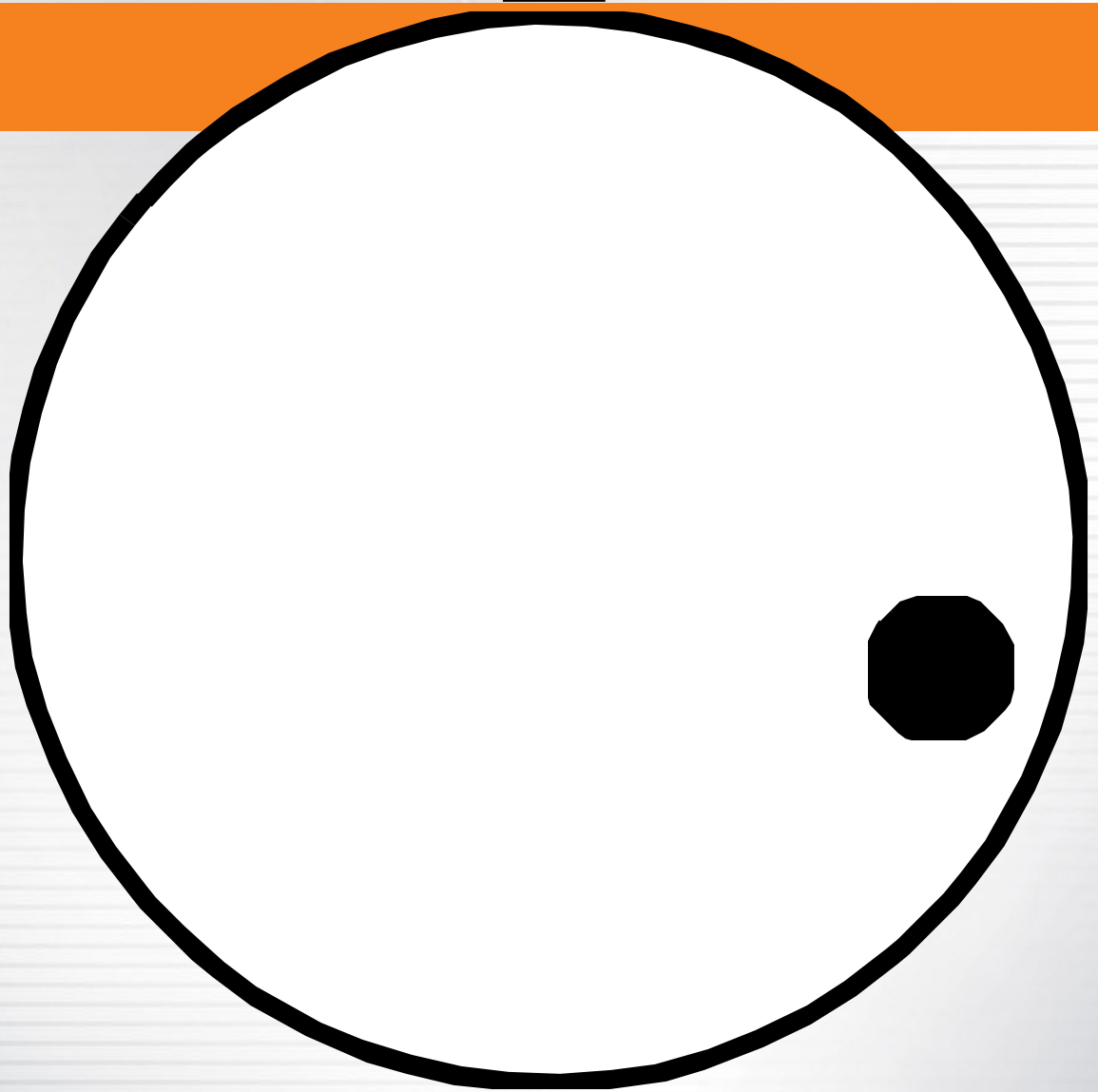

9

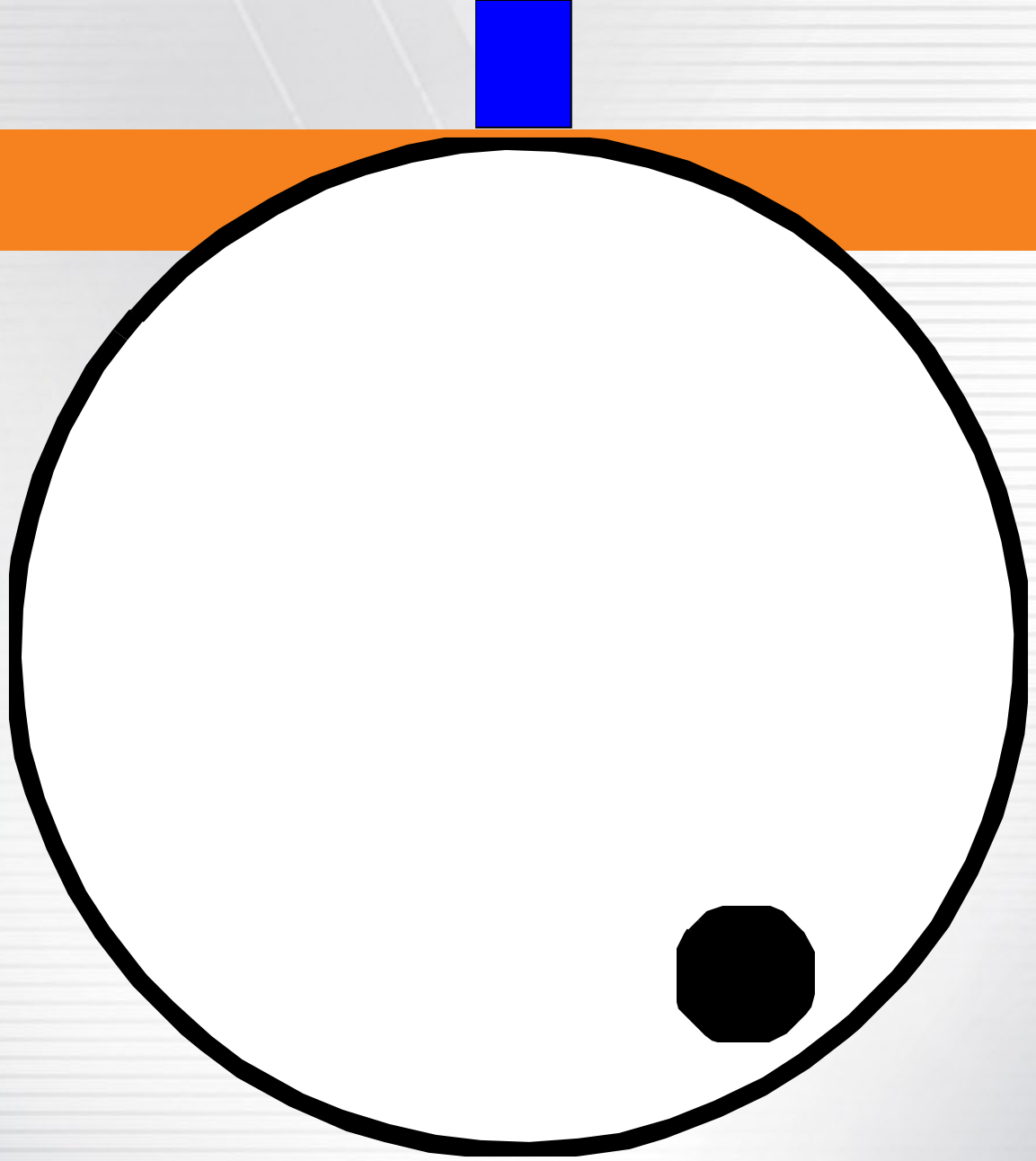



10

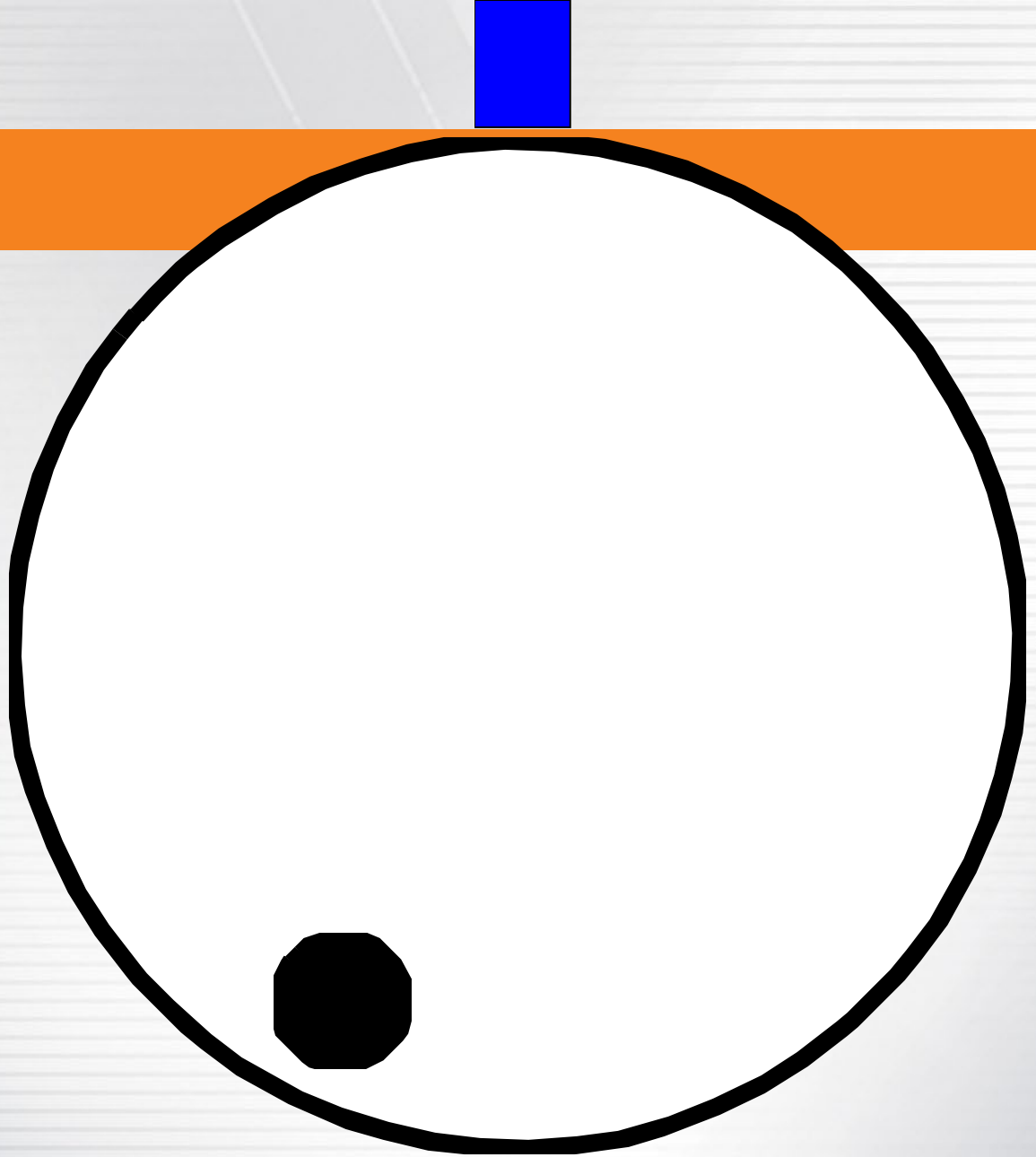


10

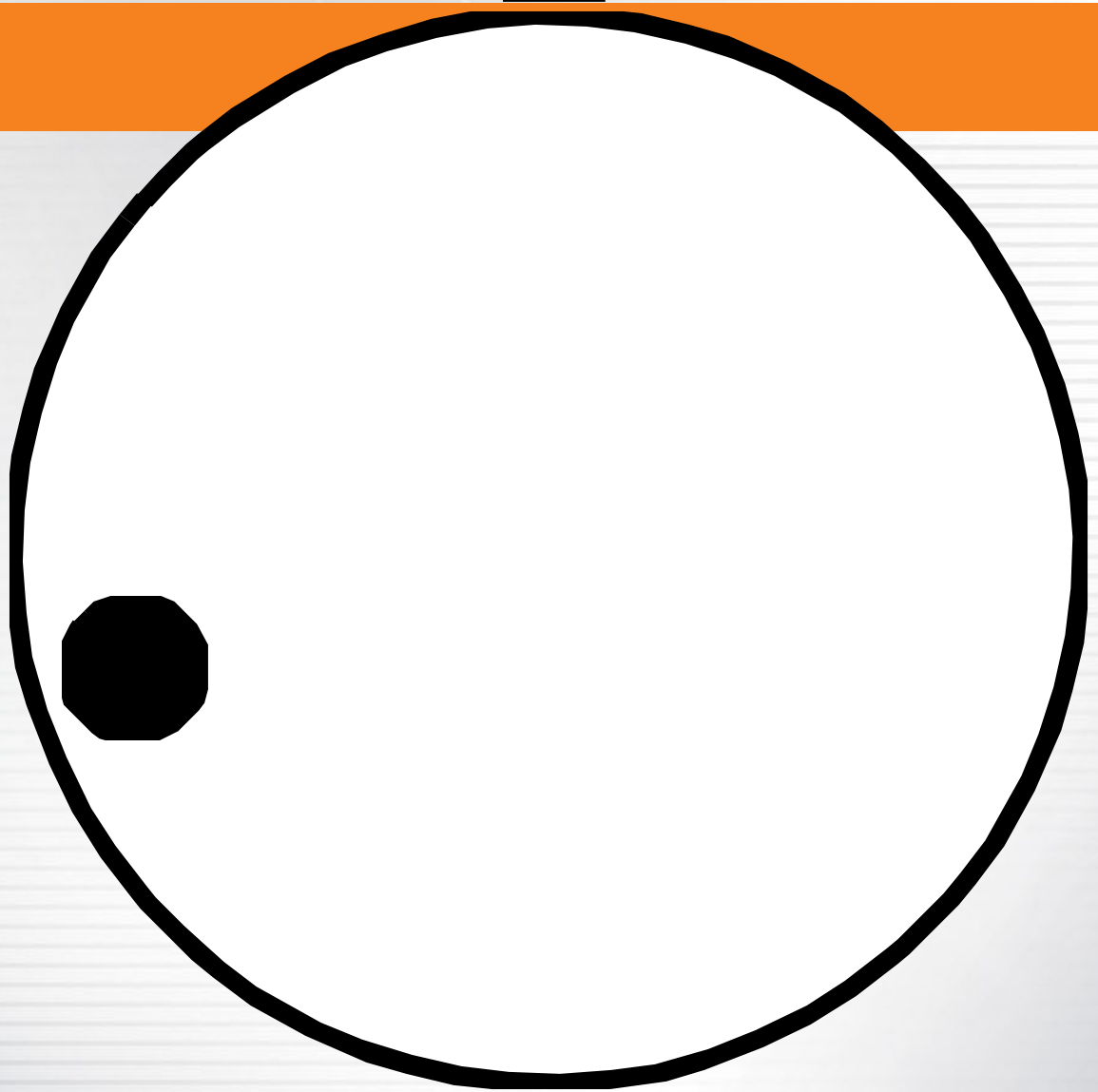




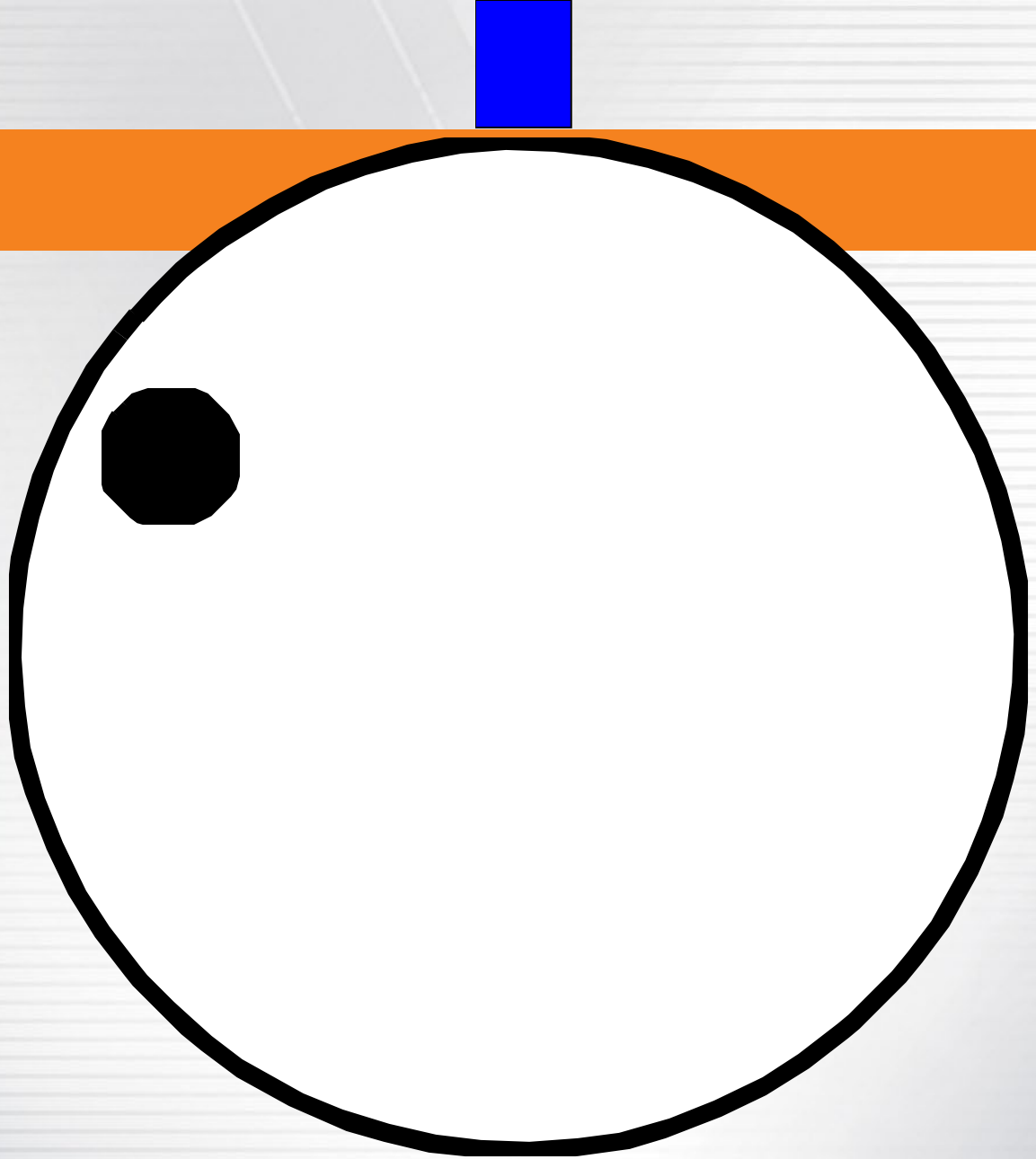
10



10



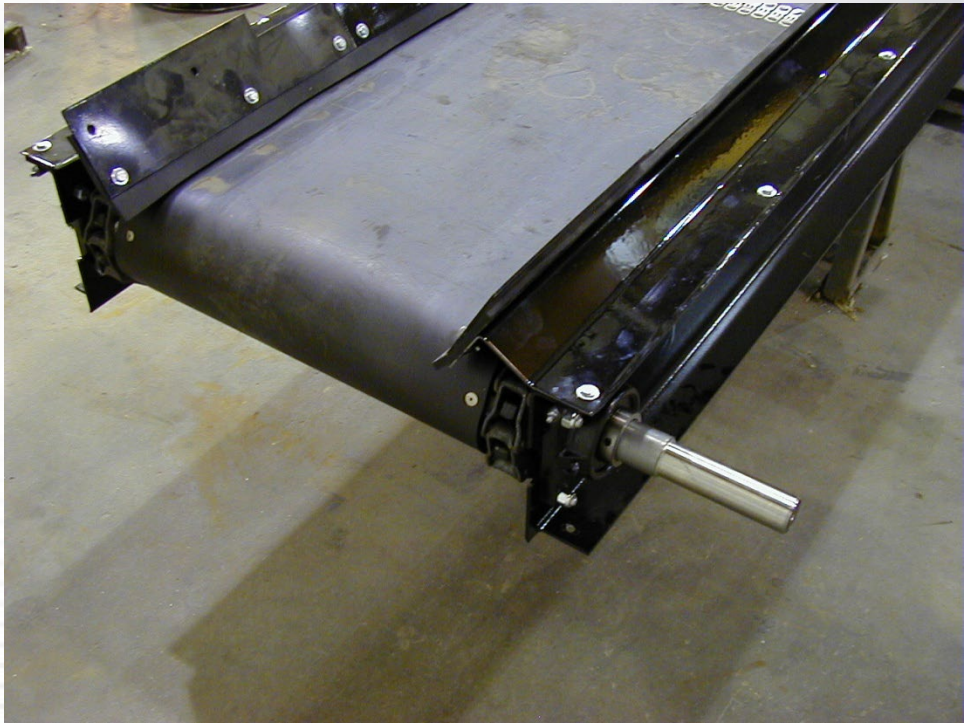
10



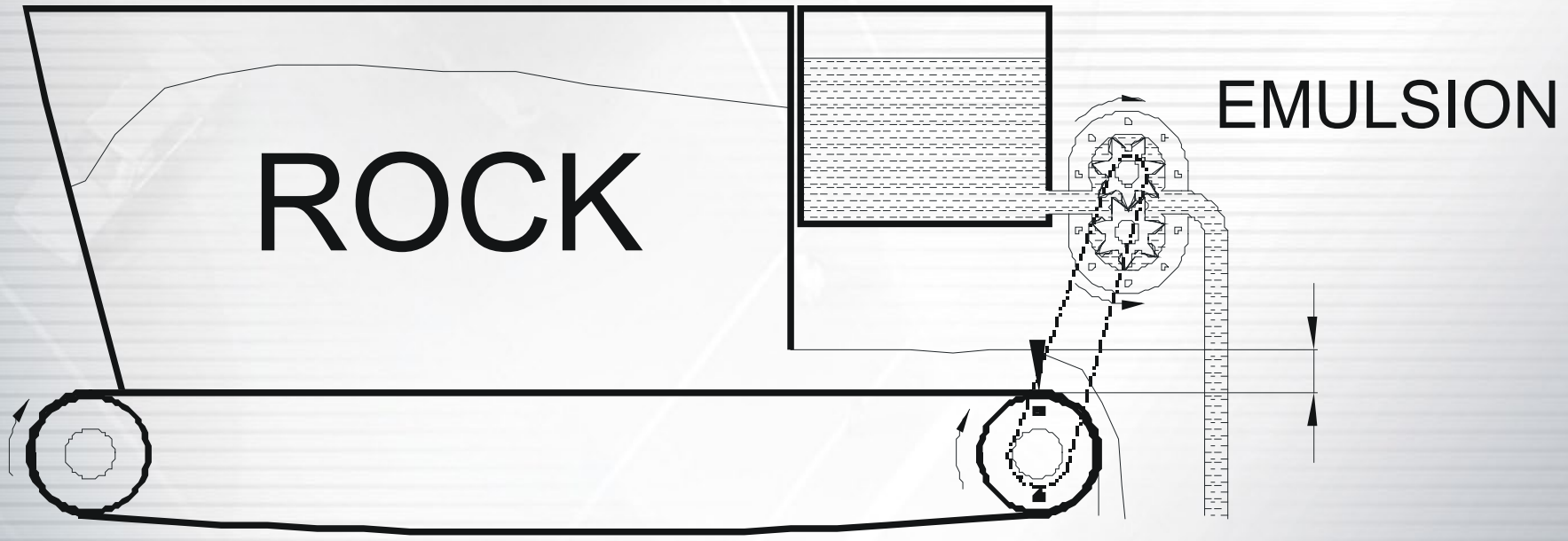
10

Machine Operation

The aggregate is delivered by a conveyor belt, delivering a consistent amount of aggregate (at a given gate setting) from the hopper into the pugmill.



Machine Operation



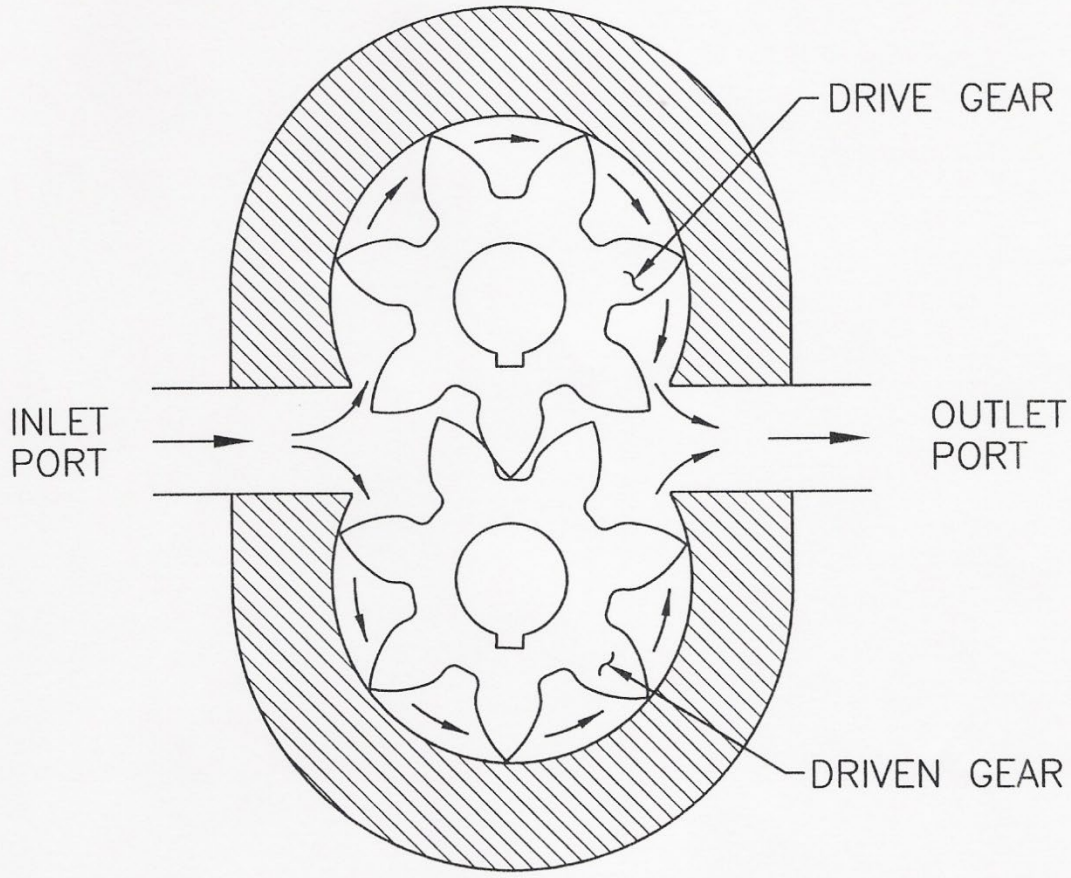
Machine Operation

Emulsion is delivered by a pump.

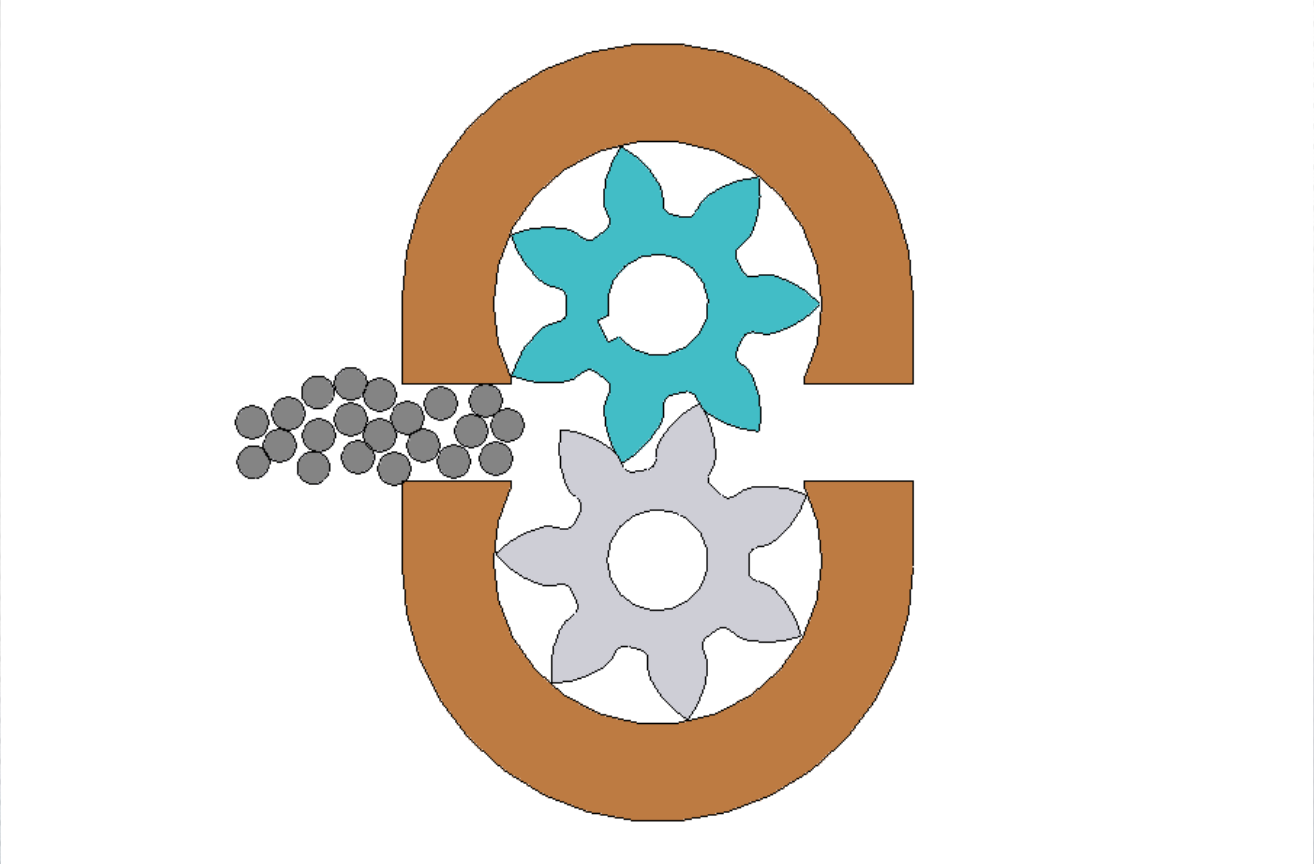
- **Positive Displacement**
  - **Gear Pump**

Gear Pump with strainer

Gear Pump (Positive Displacement)

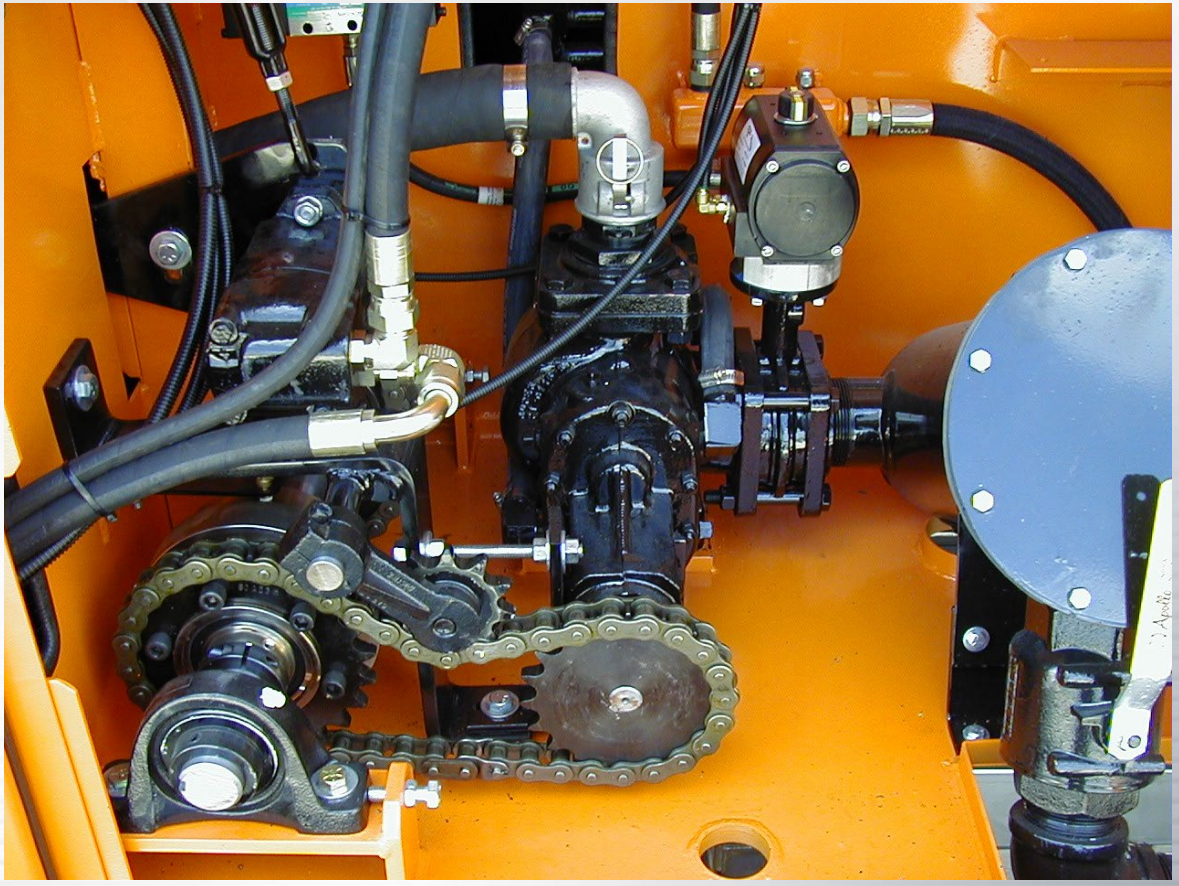


GEAR PUMP

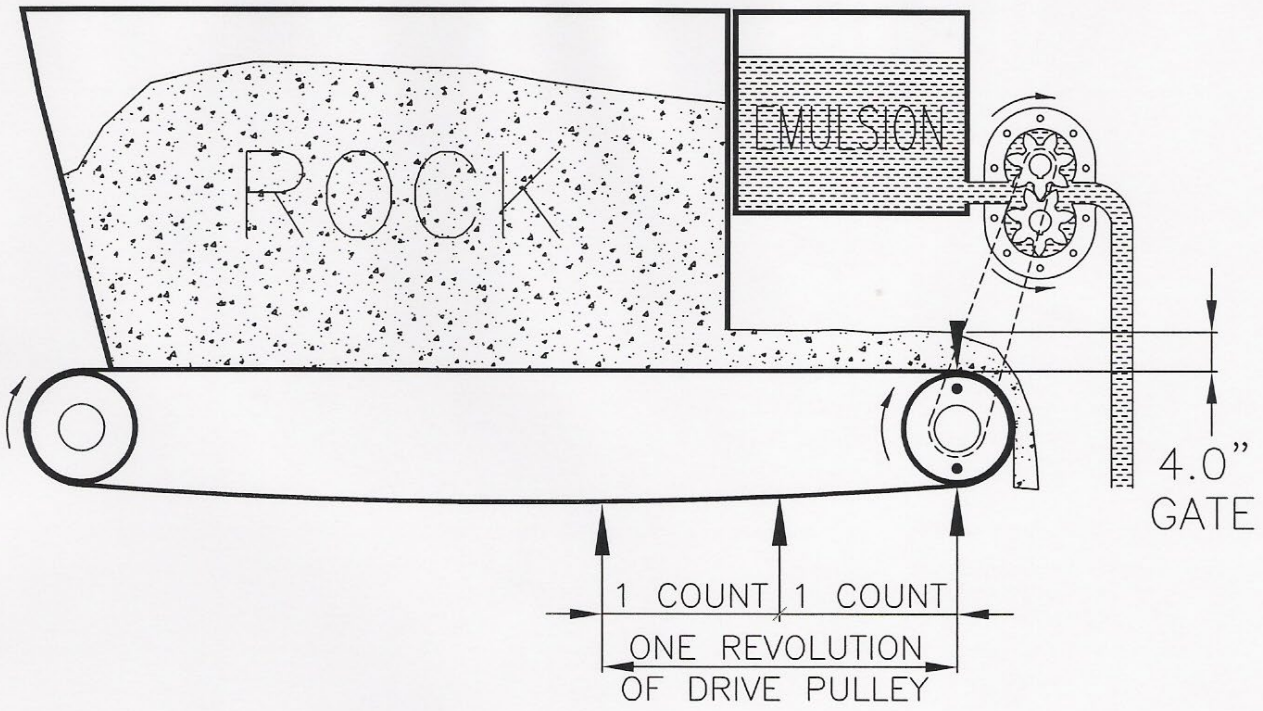


Machine Operation

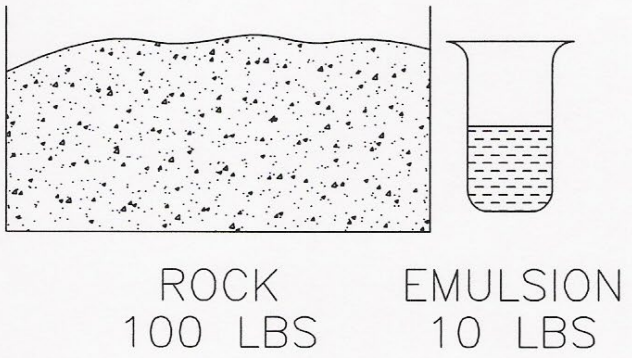
The aggregate belt and the emulsion pump are mechanically tied together to ensure a consistent mix.



Machine Operation

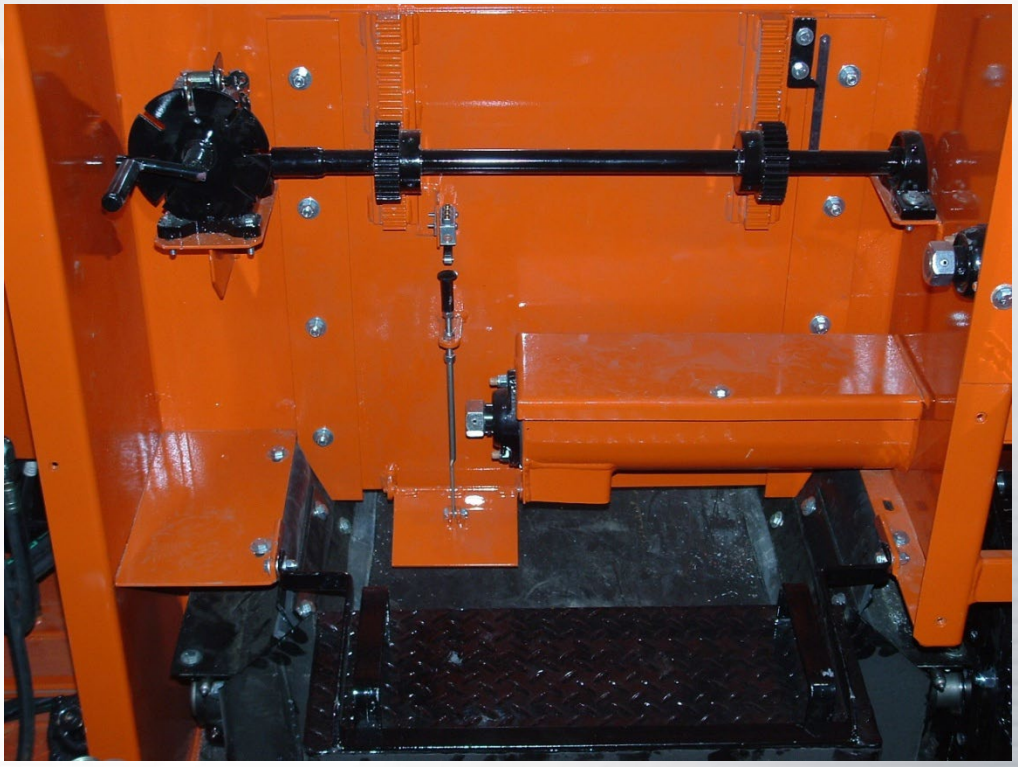


$$\frac{\text{10 lbs emulsion}}{\text{100 lbs rock}} = 10\%$$

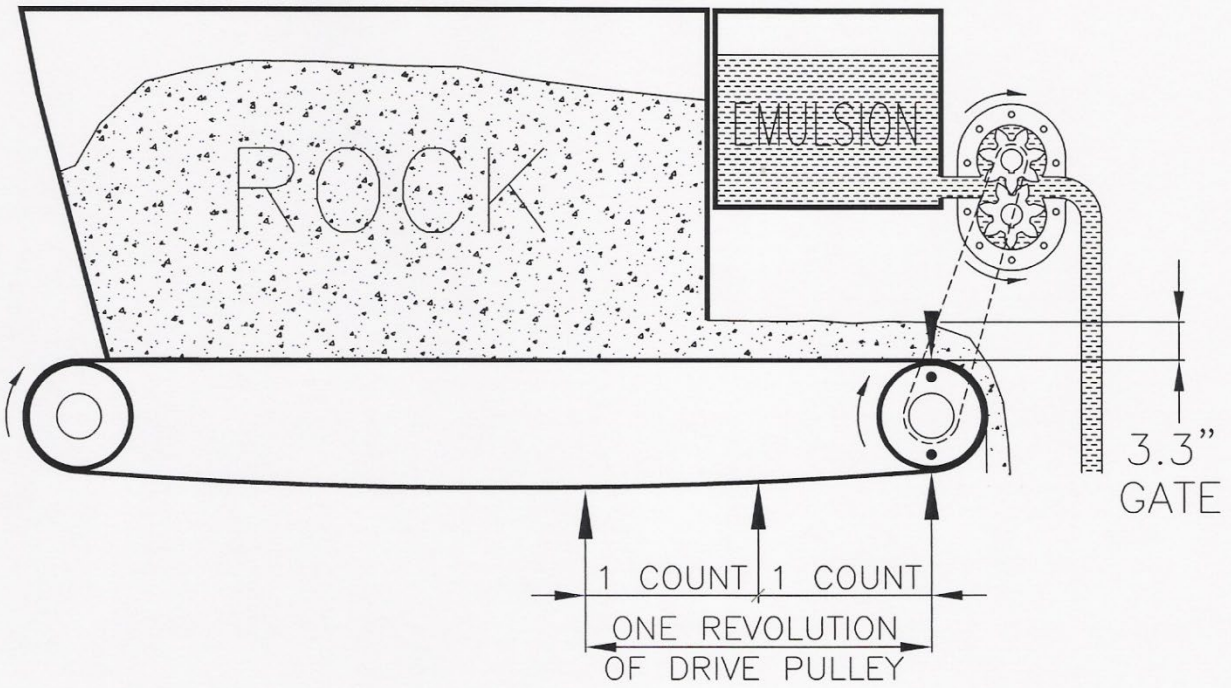


How do we calibrate?

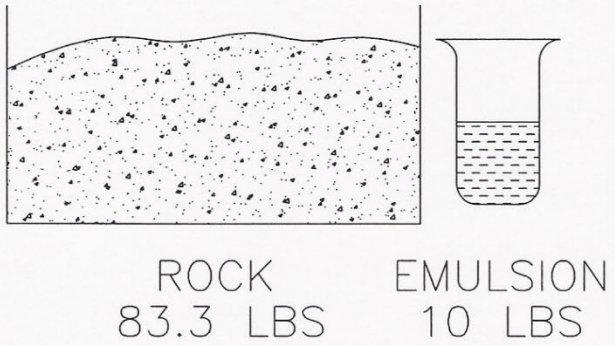
- **For systems with positive displacement pumps, the gate setting of the hopper is varied to achieve different emulsion/aggregate ratios.**



How do we calibrate?



$$\frac{\text{10 lbs emulsion}}{\text{83.3 lbs rock}} = 12\%$$



How do we calibrate?

- How do we determine that a 3.3 inch gate setting was required to get a 12% mix design?

- That will be covered with the demonstrator machine and calibration example we'll do next.

Effects of water on rock calibration.

- **Moisture content describes the amount of moisture in the rock. When calibrating, we want to weigh only the rock.**

$$\text{Moisture content} = \frac{(\text{weight of wet rock} - \text{weight of dry rock})}{(\text{weight of wet rock})}$$

Questions?

Thank You!