The Cooling System

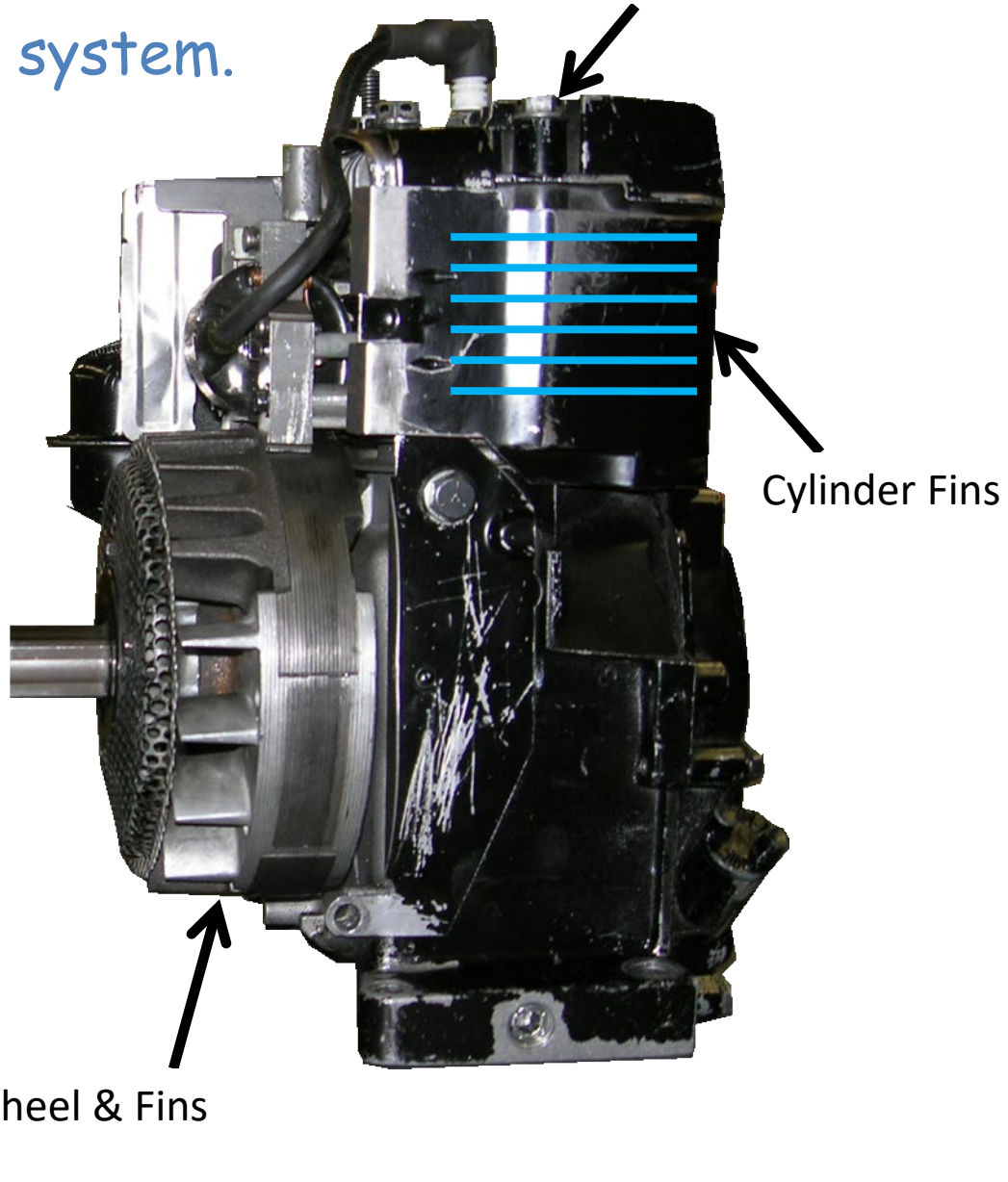
Why cooling systems are needed

When fuel is burnt in the engine so much heat is produced that if they weren't cooled the engine's parts would melt!

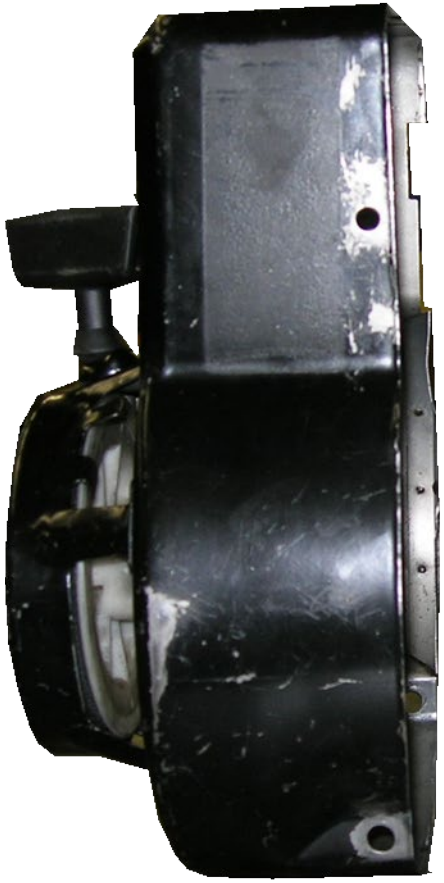
Types of engine cooling

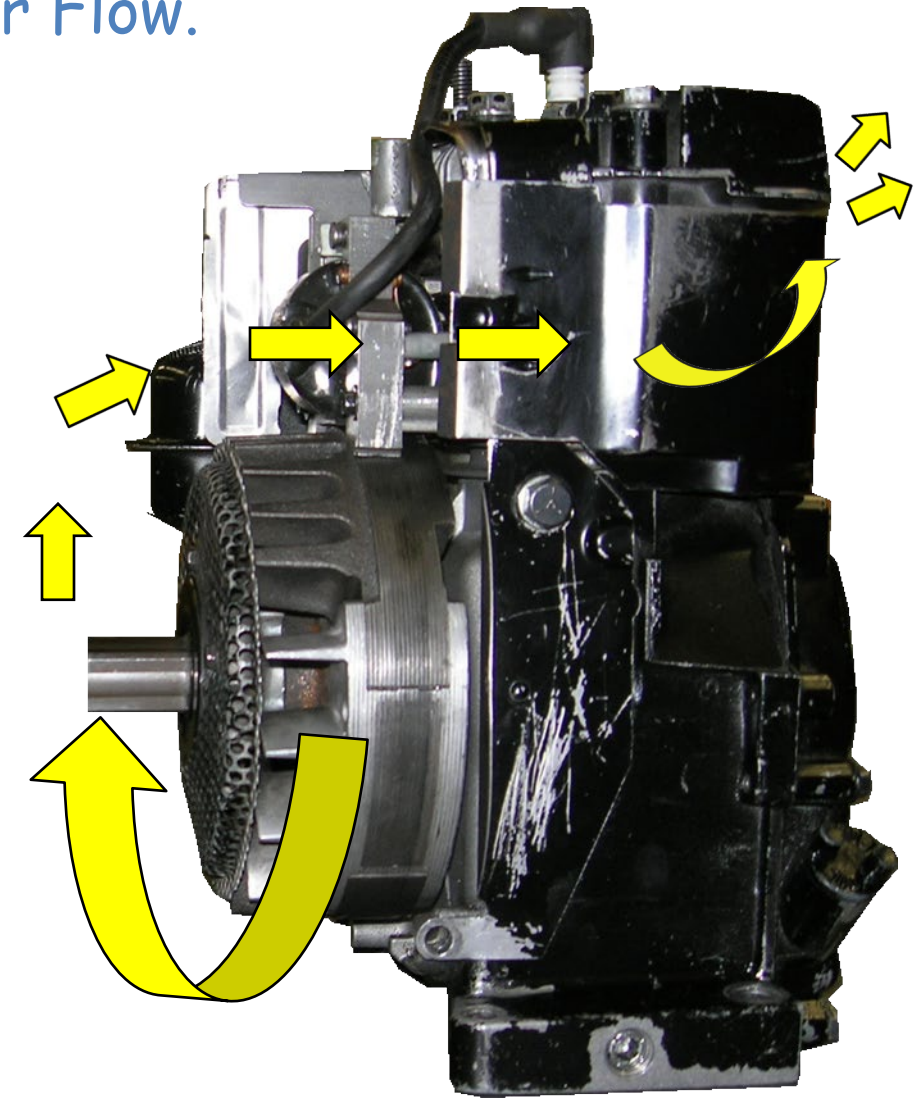
1. Air Cooling (simple & light weight)
2. Liquid Cooling (more efficient)

Parts of the B&S cooling system.



Direction of Cooling Air Flow.





What do cooling fins do?

Just like with radiant heating systems, by providing a larger surface area, the cooling fins increase the contact with the surrounding air helping to transfer heat to the air.

Maintenance

Air cooled systems are easy to maintain. ..

1. Keep cooling passages clear of debris (grass, leaves, etc.)
2. Maintain systems integrity; Keep all cooling tin components attached .

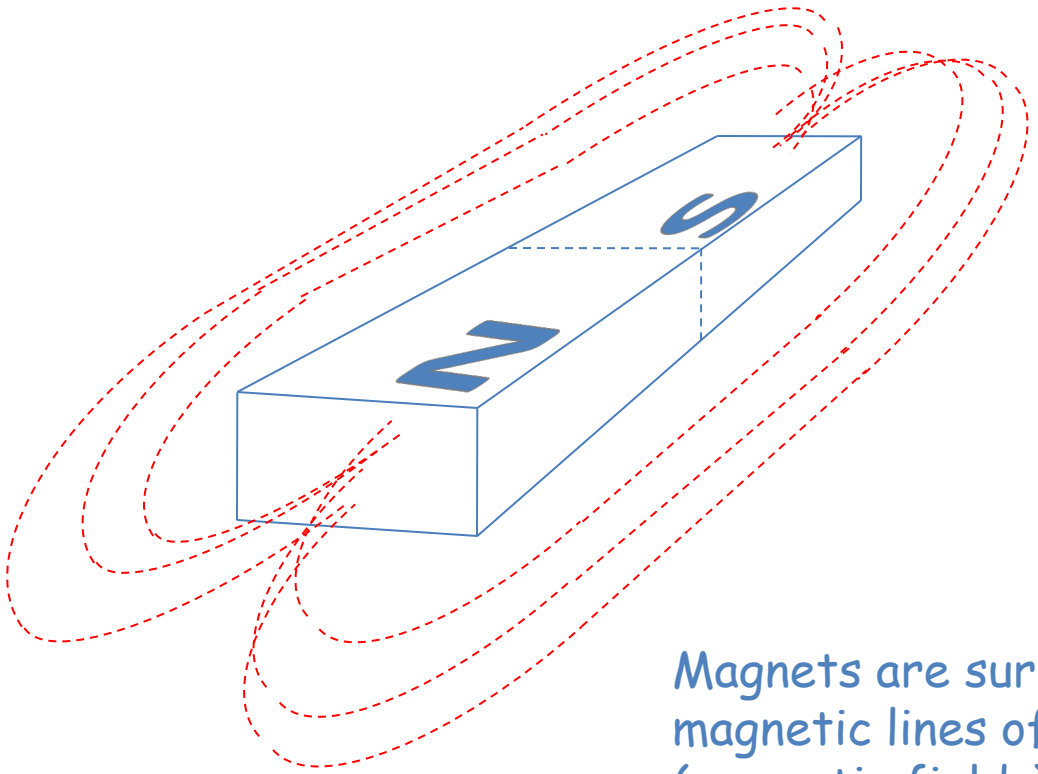
The Magneto Ignition

Purpose/Goal of the Ignition System

1. To generate a high enough voltage (16,000 volts) to push electrons across an air gap at the spark plug.

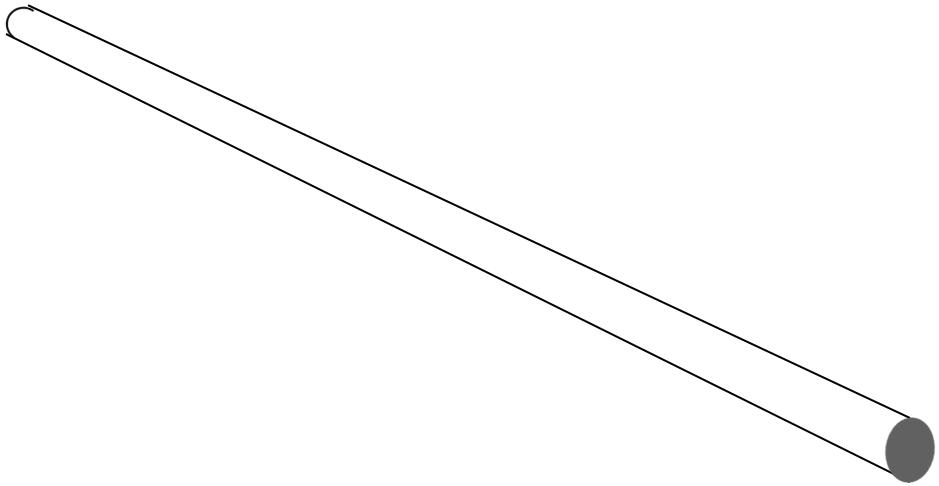
2. To have the spark occur at the correct moment in time.

Background Theory - Magnetic Field's Effect on Conductors



Magnets are surrounded by magnetic lines of force (magnetic fields) called Flux

Background Theory - Magnetic Field's Effect on Conductors

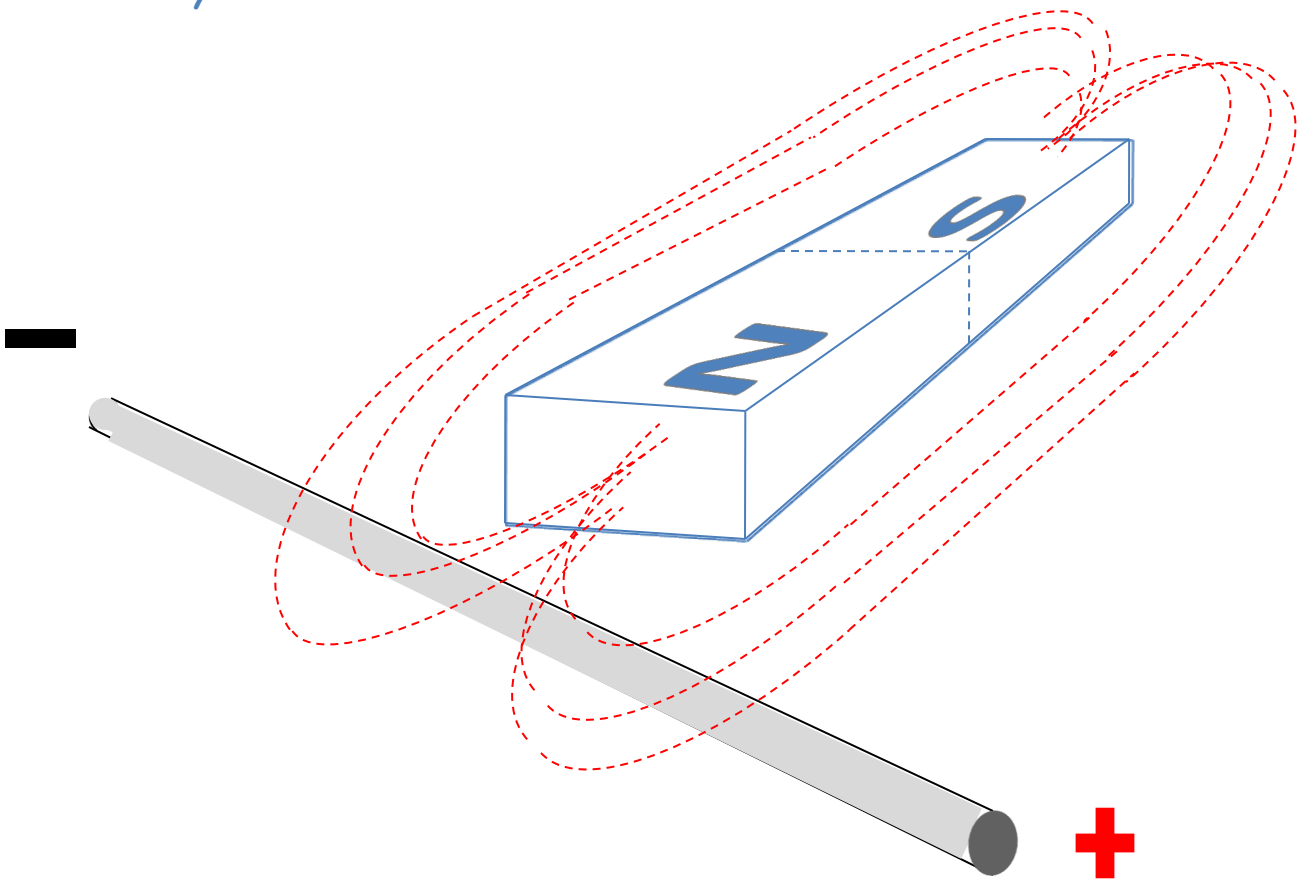


Conductors are affected by magnetic fields.

Background Theory - Magnetic Field's Effect on Conductors

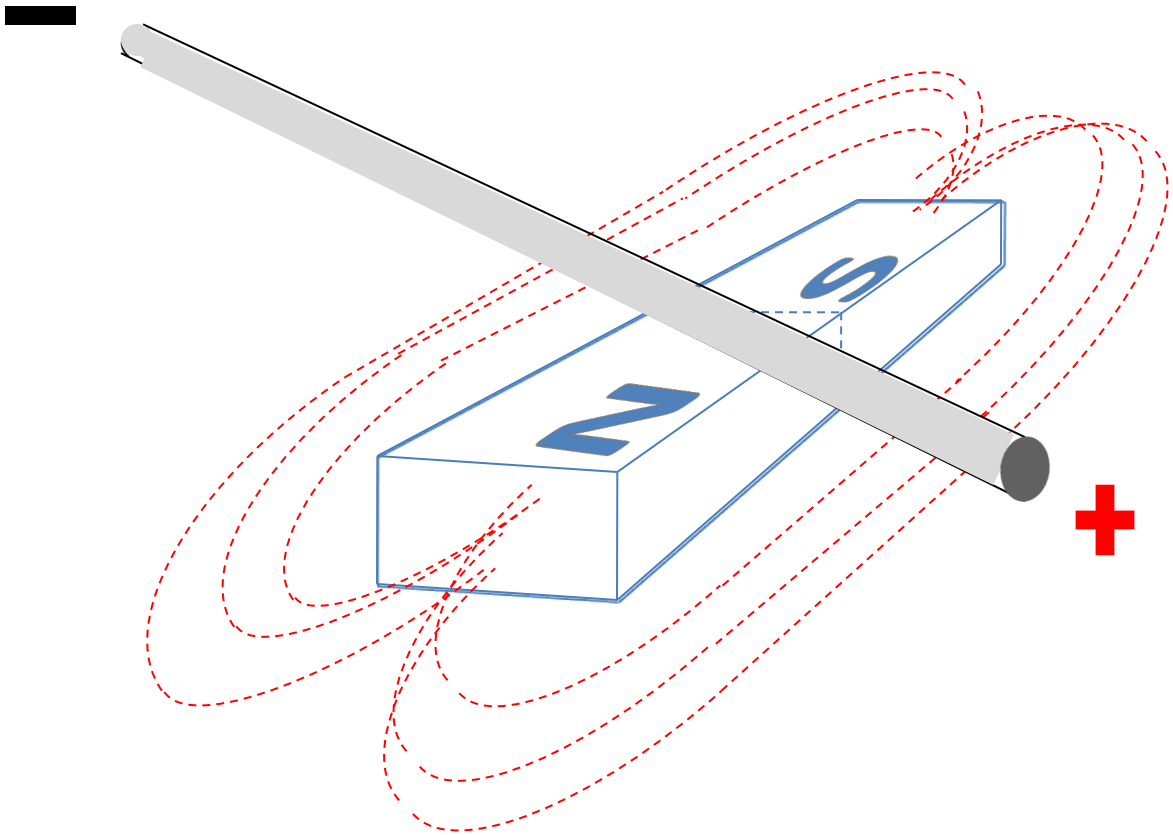
Michael Faraday

"When a moving magnetic field 'cuts' through a conductor electricity is induced in the conductor"

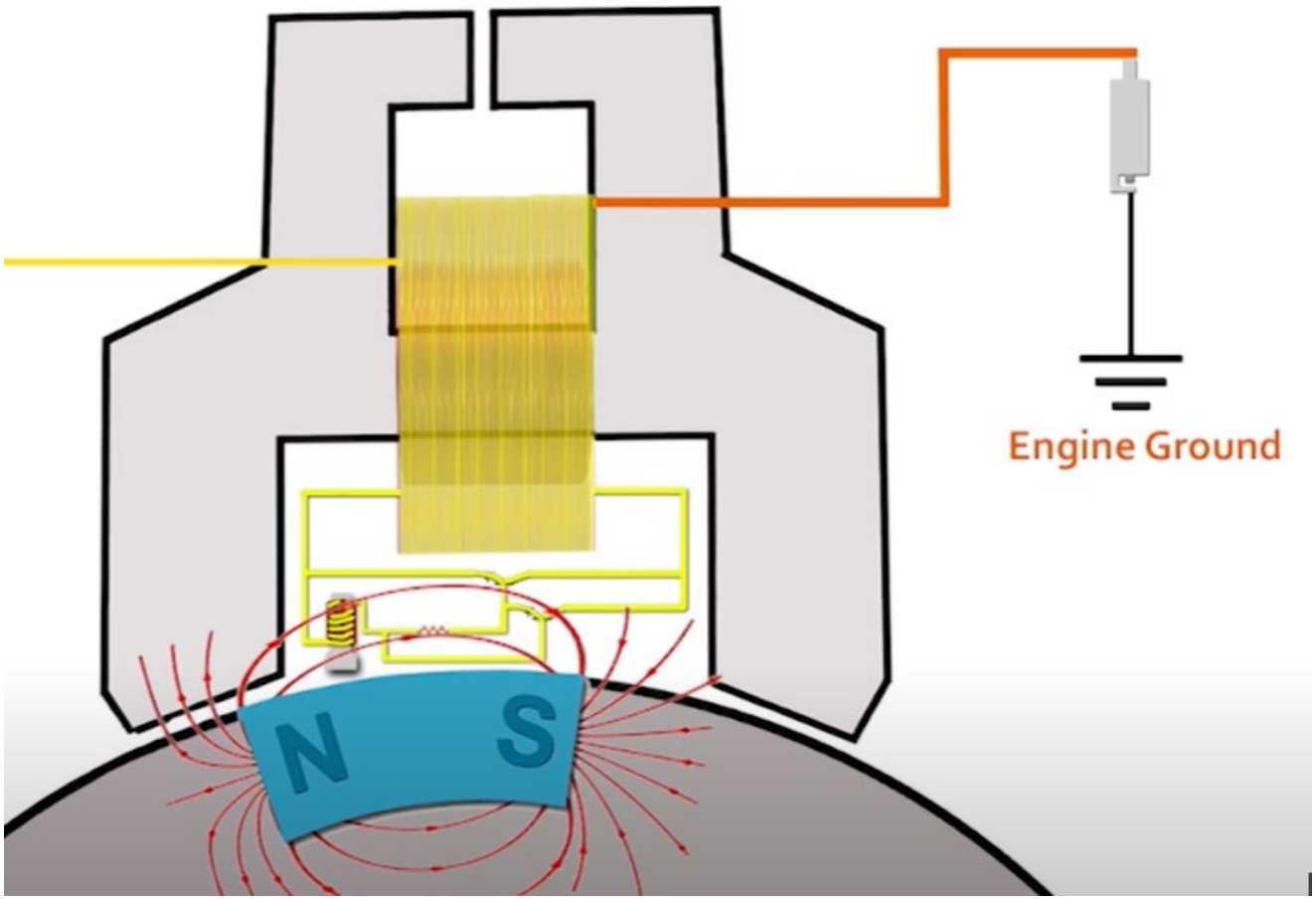


Background Theory - Magnetic Field's Effect on Conductors

The effect is the same no matter whether the conductor passes through the magnetic field or the magnetic field is passed through the conductor.



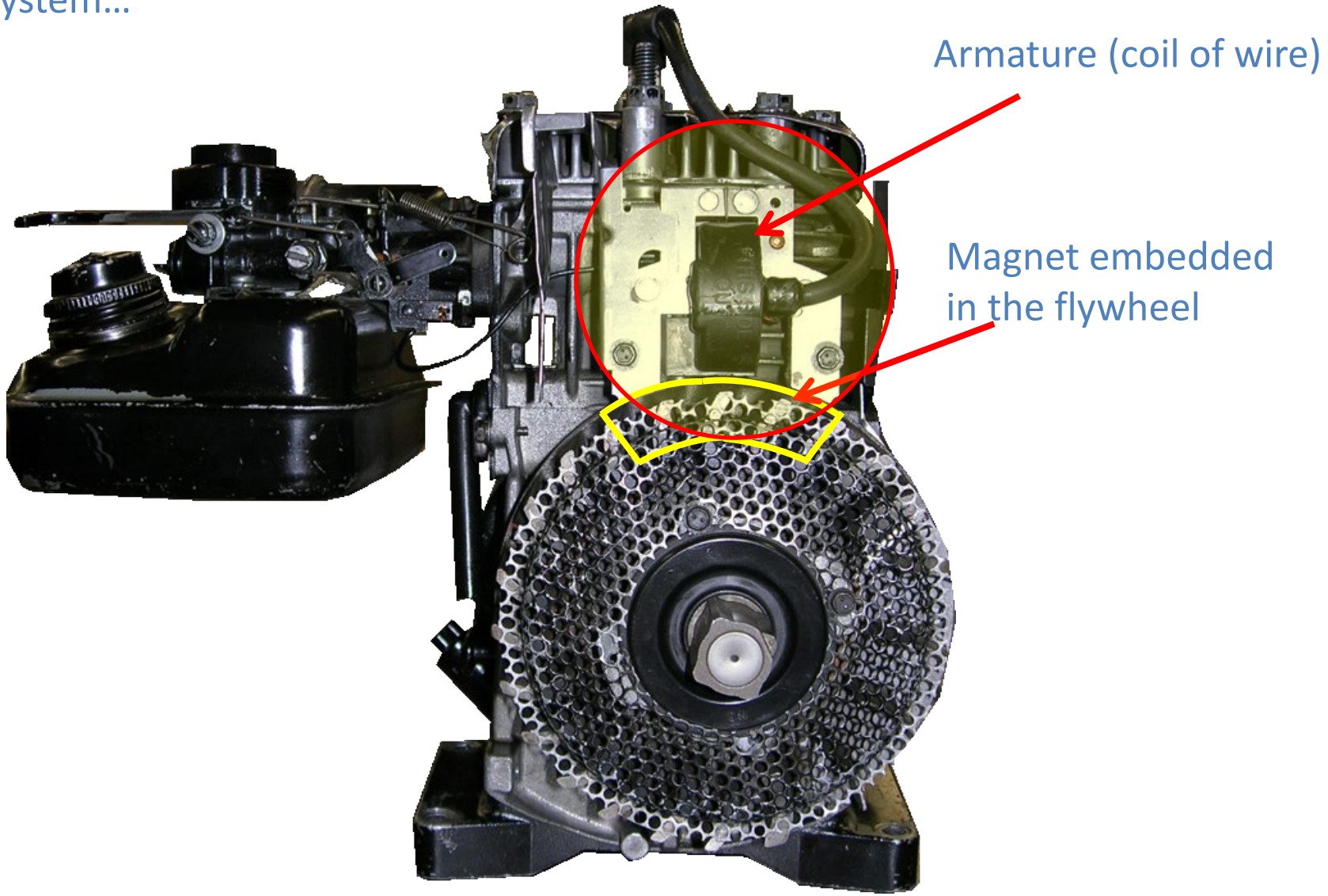
Background Theory - Magnetic Field's Effect on Magneto



Background Theory - Magnetic Field's Effect on Conductors

https://www.youtube.com/watch?v=Fv6N2WVtkEw

How this all relates to your engine's ignition system…

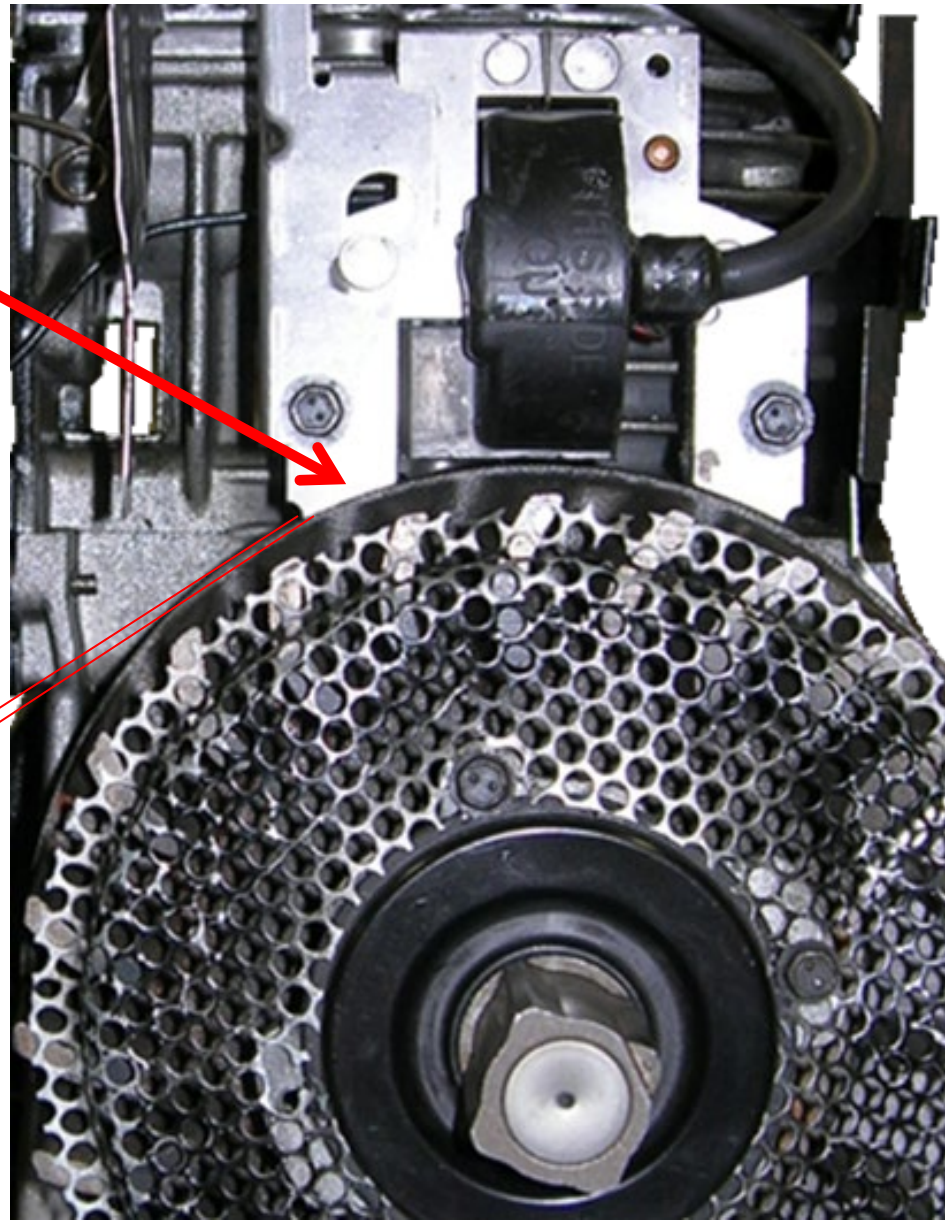


How this all relates to your engine's ignition system…

A small ‘air gap’ exists between the armature and the flywheel.

This gap is adjustable and must be set to a very exacting tolerance.

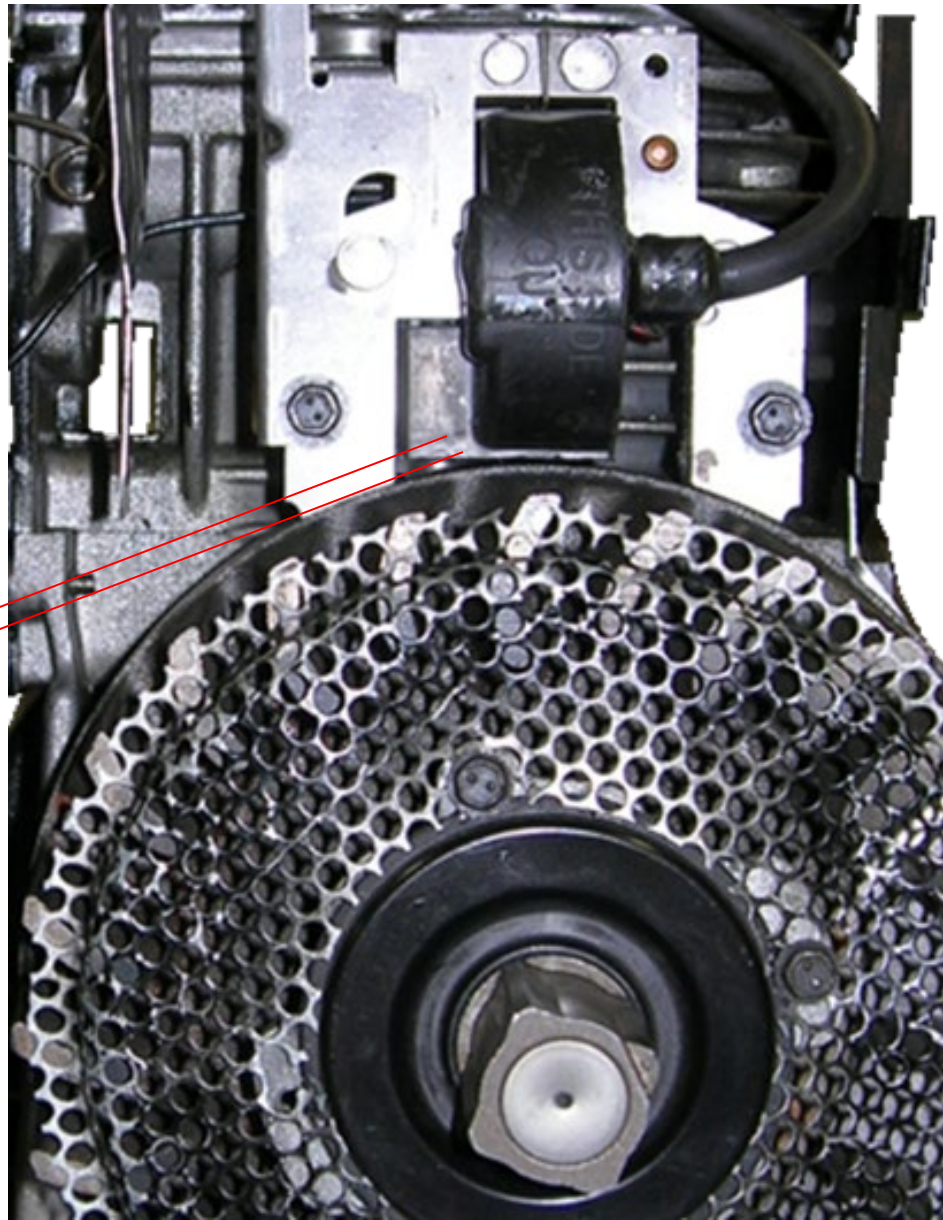
The gap cannot be too big or too small.



The Air gap for the armature is .006” - .010”

Air Gap Too Big…

The magnetic field will have less effect on the armature and the voltage generated will be low.



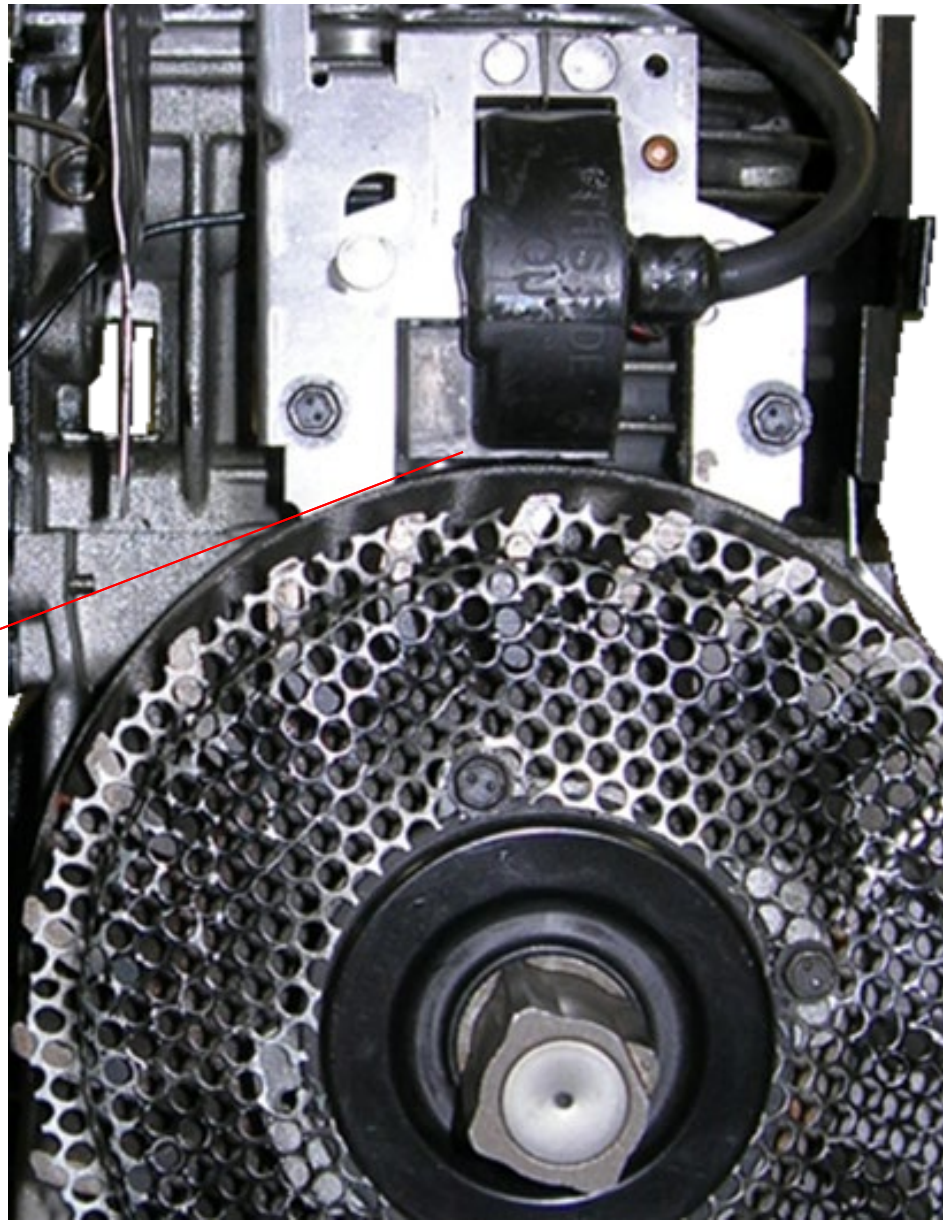
Result:

Electrical push (voltage) will not be strong enough to force electrons across the spark plug gap.

= no spark or intermittent spark

Air Gap Too Small…

Even though the gap may seem ok when the engine is cold, the flywheel will expand as the engine warms up resulting in mechanical contact.



Result:

Flywheel & Armature contact.

= engine stops or parts damaged

Amazingly, your engine's magneto ignition system produces around 16,000 volts!

Voltage is electrical push or pressure. The high voltage is necessary to be able to force electrons to jump across the spark plug's air gap.

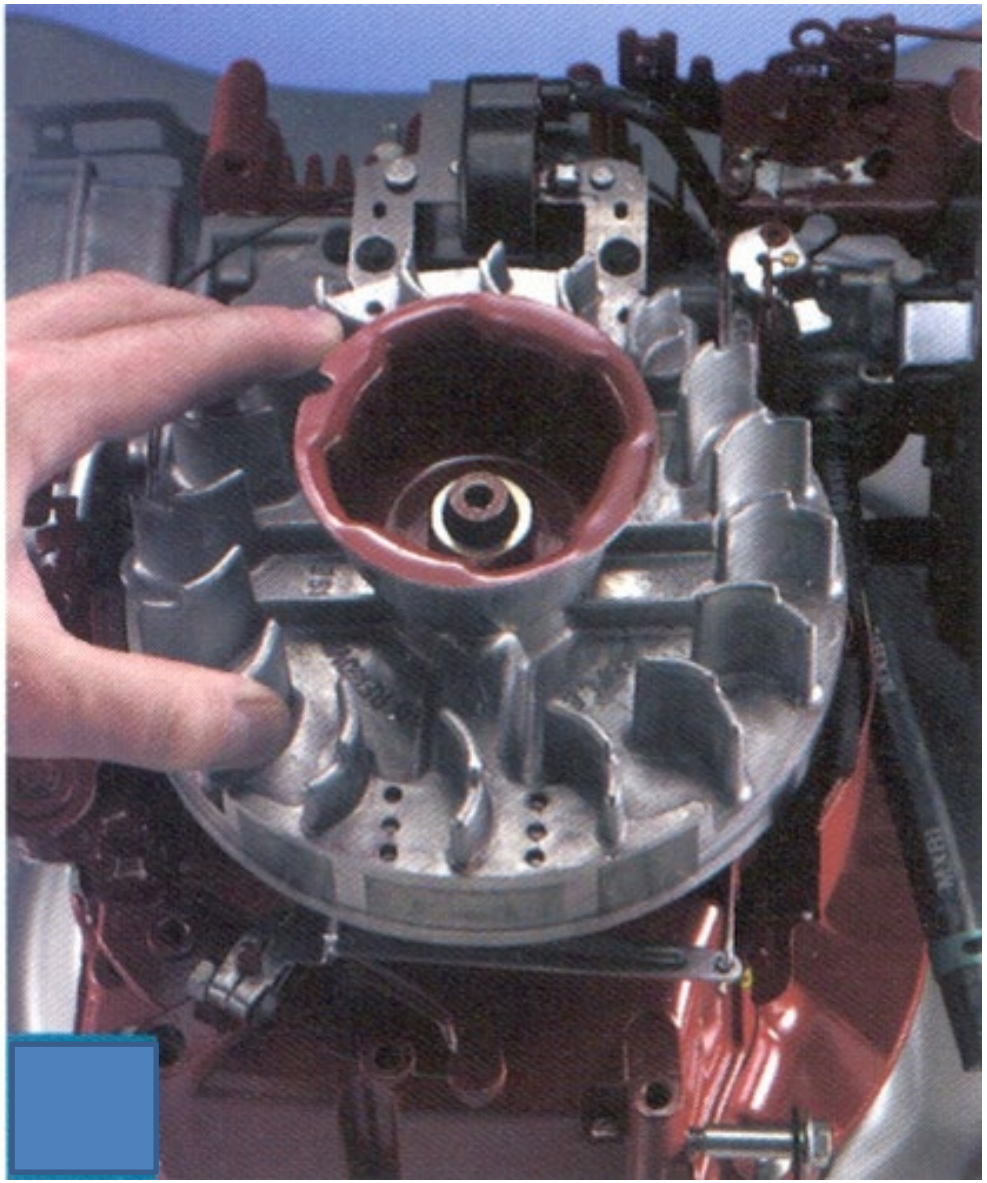
4 Simple steps for adjusting air gap

Step 1

loosen armature screws

Step 2

Rotate flywheel to position magnets away from armature

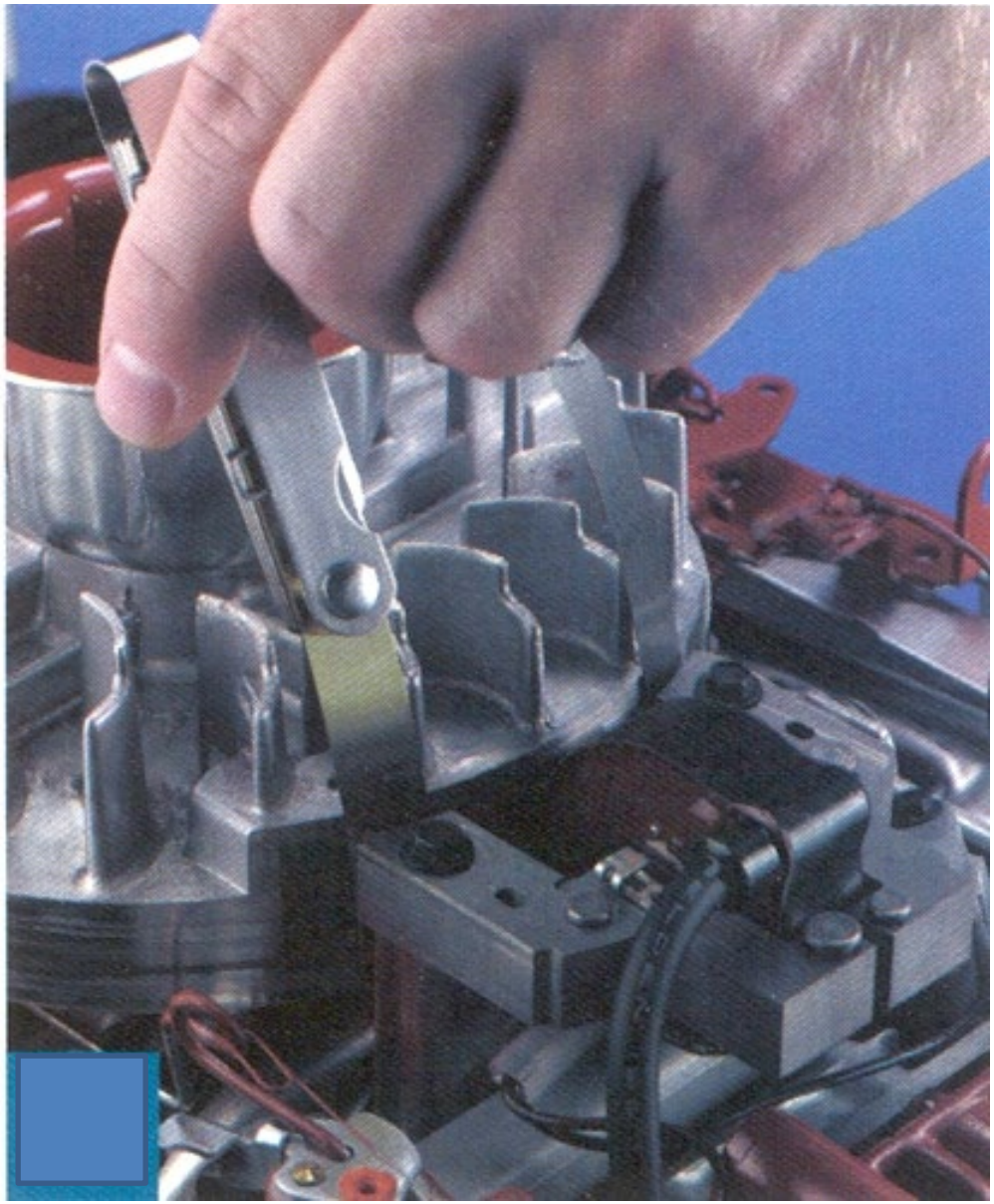


Step 3

place a brass shim between armature and flywheel

then…

press armature against shim and flywheel



Step 4

lightly tighten screws to secure armature

then…

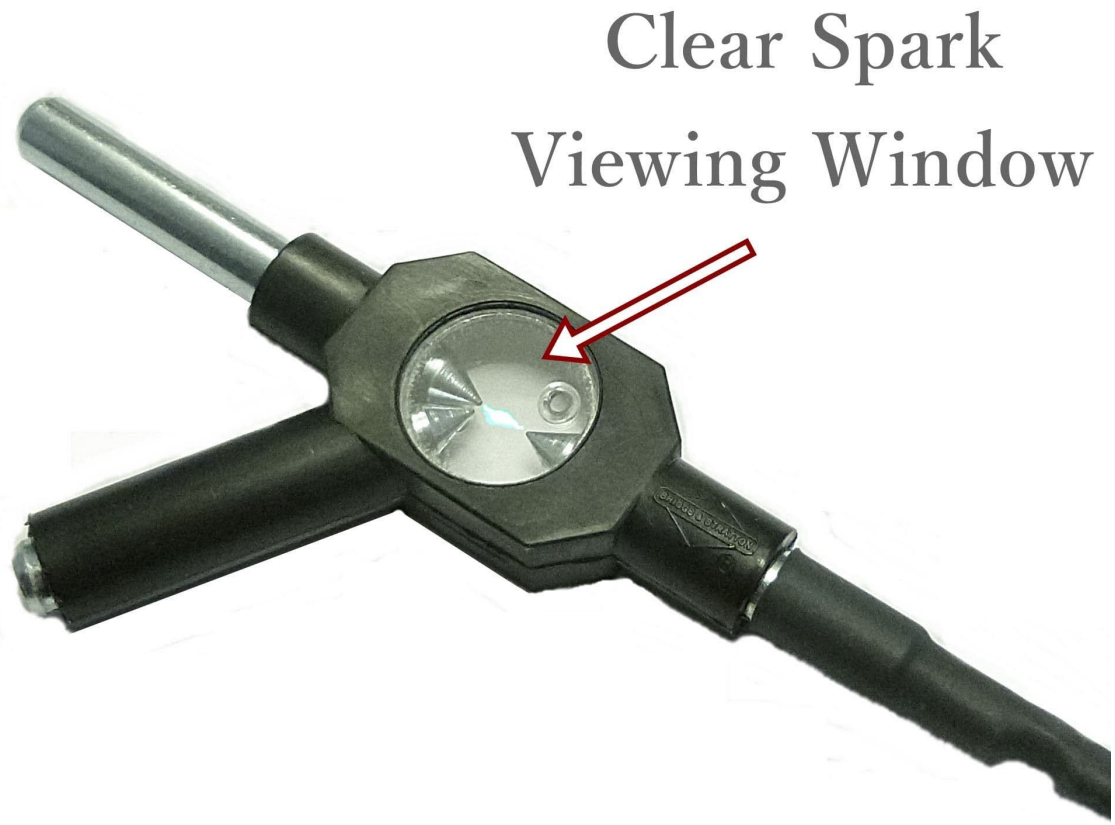
rotate flywheel to remove shim

Testing the Magneto & Spark Plug
Job 9

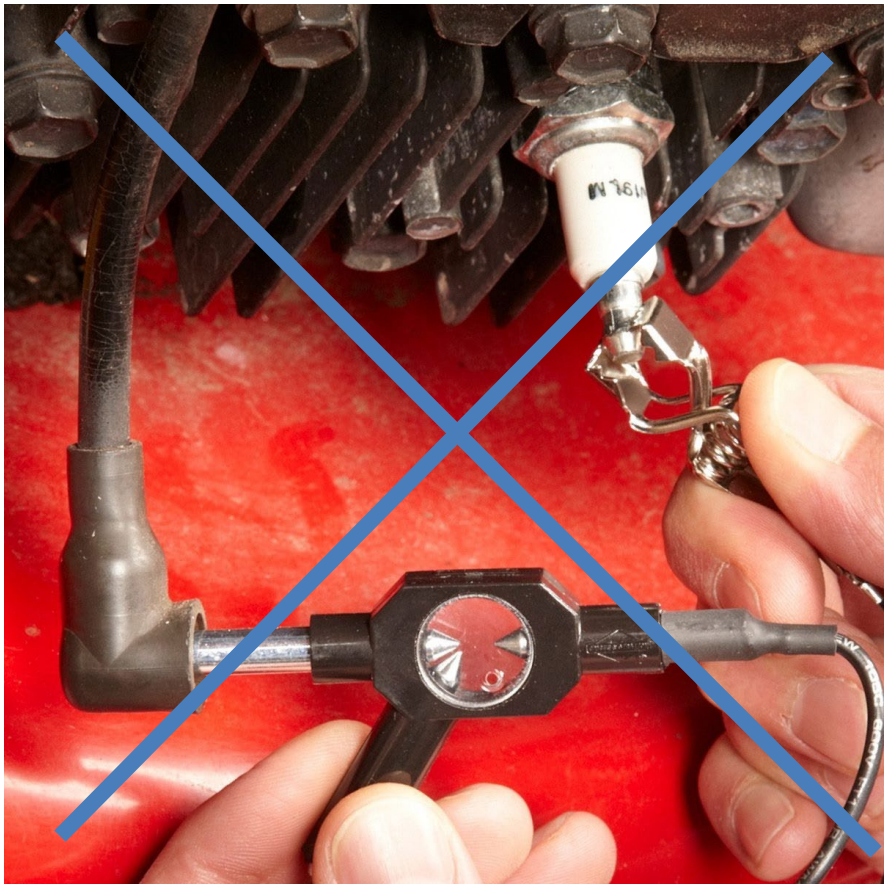
Now that the air gap has been set correctly to between 0.006” – 0.010” it is time to test to see if you get a voltage being produced by the Magneto.

If **NO VOLTAGE** is produced by the Magneto – you will **NOT** get a spark… ☹

Magneto Tester (Optimum generation will produce a thin blue spark).



DO NOT attach the tester to the spark plug for this test.



Connect the magneto tester between the spark plug wire and a good engine ground. (a good ground being any non-painted metal surface).

Attempt to start the engine by pulling the rewind cord.

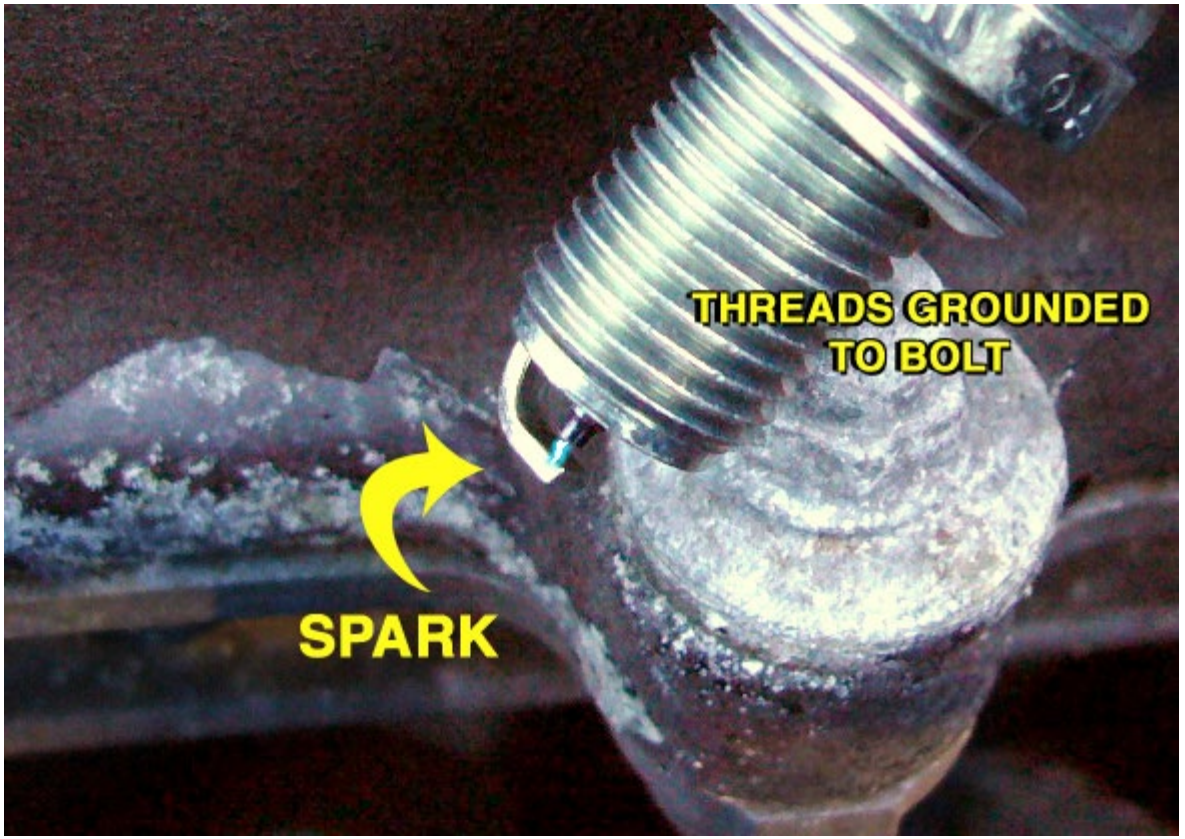
If the Magneto is good, you will see a think blue spark/line

If **NO SPARK** is produced using the Magneto Tester, either the Magneto is bad or the **air gap is not correct**…☹. **Double Check** the Air Gap before thinking you have a bad Magneto.

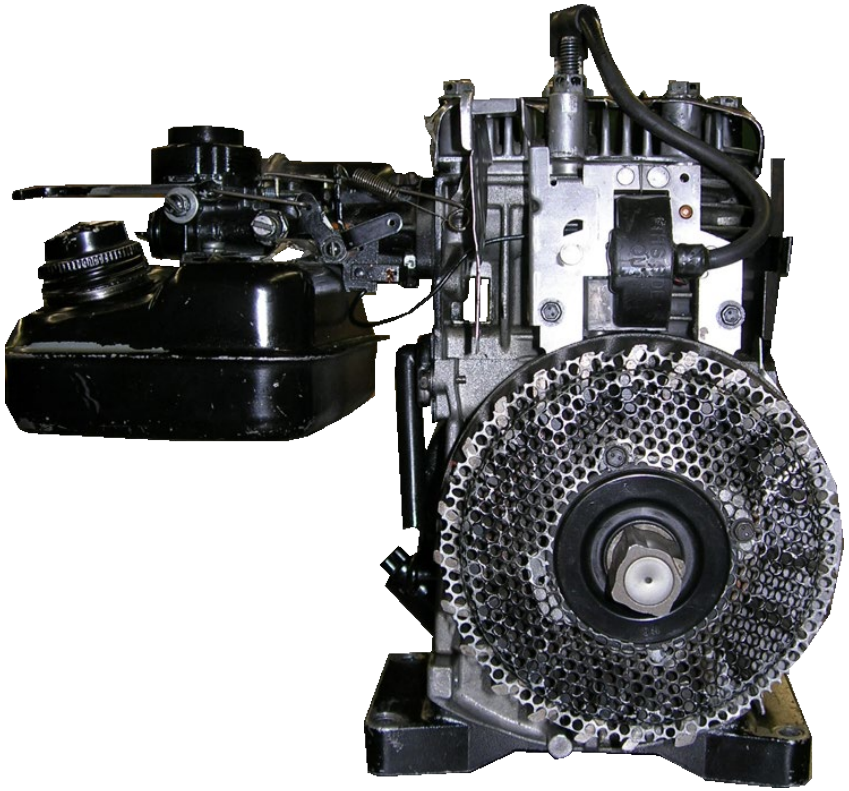
If you do not have a Magneto Tester, you can perform a test with just the spark plug.

Remove the spark plug, re-attach the spark plug wire and then ground the spark plug to any non-painted metal surface on the engine.

Attempt to start the engine by pulling the rewind cord and you should see/hear the spark.



Ensure when you re-install the Spark Plug that you torque it to the correct specification of 1**80inlbs**, so you get a good ground, and it seals so no gases escape.



The spark plug test is not an absolute test as it is **more difficult for the spark to fire under compression.** If the spark plug is questionable, do not hesitate to install a new one.