

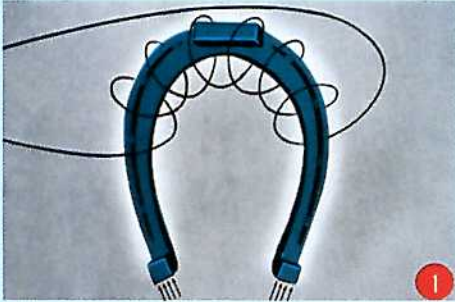
# WHAT IS A SOLENOID?

Prepared by

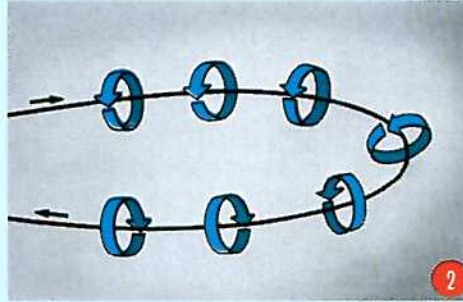


**to promote a better understanding of the  
basic operation of AC Industrial Grade Solenoids**

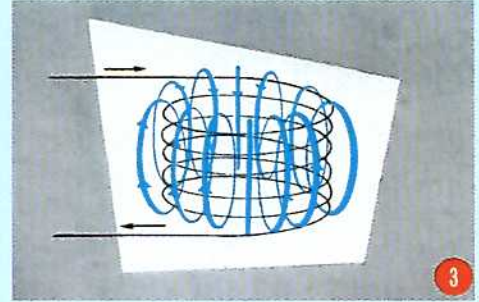
# WHAT IS A SOLENOID?



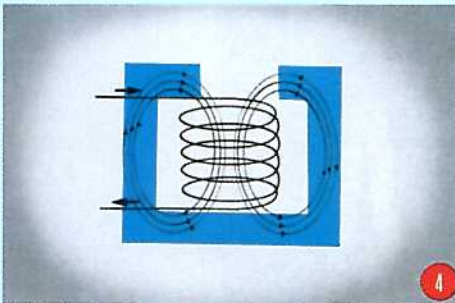
A solenoid is simply a specially designed electro-magnet. Here's how it works.



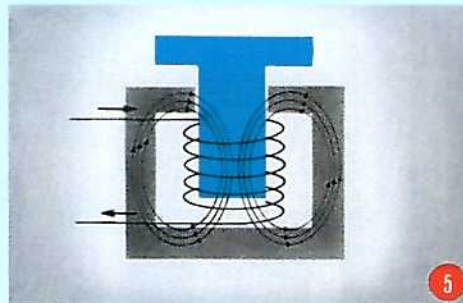
When current flows through a wire, a magnetic field is set up around the wire.



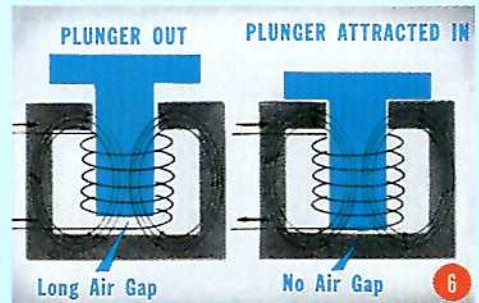
If we make a coil of many turns of wire this magnetic field becomes many times stronger, flowing around the coil and through its center in a doughnut shape.



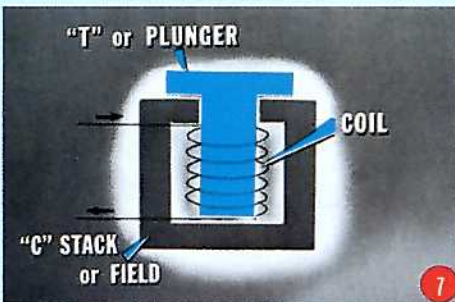
Although this magnetic field will flow in air, it flows much more easily through iron or steel – so we add an iron path, or “C” stack around the coil which concentrates the magnetism where we want it.



If we also add an iron path, known as a “T” or plunger, in the center of the coil, the magnetism is concentrated still more.

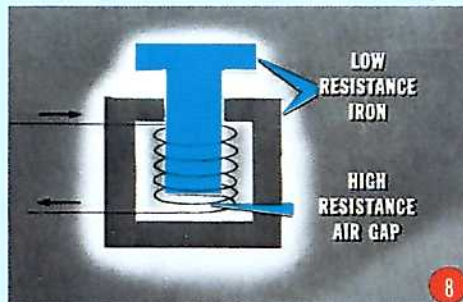


Because iron is an excellent magnetic conductor and air is a poor one, the movable iron “T” or plunger is drawn by the magnetic field into a position where the magnetism can travel 100% through the metal conductor.

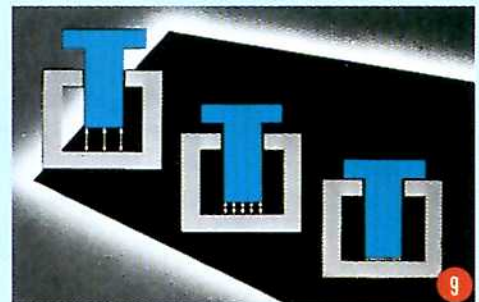


With the addition of this movable plunger we have the basic solenoid as it is today.

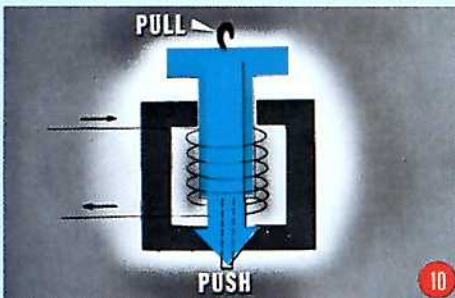
Now, let's look at some refinements.



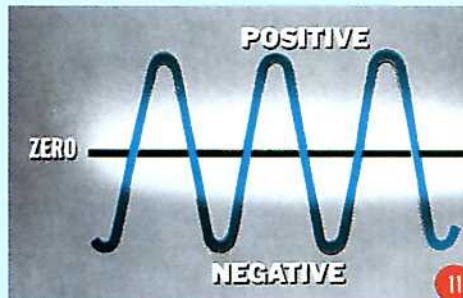
Remember, a solenoid operates because the magnetism tries to reduce the high resistance air gap at the bottom of the plunger. When the plunger is completely closed, the magnetic field flows 100% through a low resistance iron path.



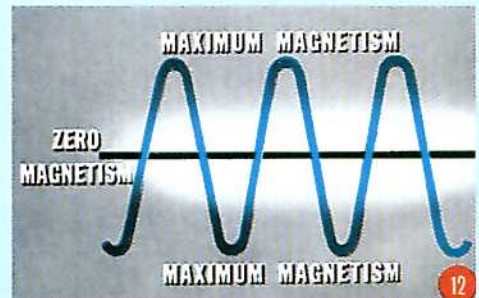
As the plunger is pulled into the coil, the air gap under the plunger is reduced, making the magnetic field stronger and increasing solenoid force. So ... as the solenoid closes, it becomes more powerful.



We have shown that a coil's magnetic field provides motion in only one direction – into the center of the coil. How, then, can we get a push and pull action? To pull, we simply hook on to the top of the plunger. We push from the bottom of the plunger.



An A.C. solenoid operates on current which looks like this. It alternates from positive through “zero” to negative sixty times a second.



The magnetic field is strongest when the alternating current is at its positive and negative peaks. As the current goes through zero, the magnetism and solenoid force decrease, and the load forces the plunger out. When magnetism and force build up again, the plunger is pulled back in. This motion of the plunger, in and out, makes the solenoid buzz or chatter.

