



The Starting System

In an automobile, starting system cranks the engine initially. It has replaced manual effort to crank the engine with the help of cranking rod that was used in ancient days. Initially, the engine requires cranking but once the cycle is completed it starts and runs on its own. In two wheelers, it is common to 'kick start' the engine but in recent times a number of manufacturers have introduced 'button start'. For initial cranking an electric motor is provided that gets electric current as input from battery. The mechanical energy, in the form of rotation of shaft, is transmitted to engine. This provides initial movement of crankshaft, connecting rod and piston. As soon as spark occurs the fuel is ignited and output becomes available from engine. No more cranking is needed and starting system stops working and engine runs on its own. The starting system makes starting of vehicle convenient.

Requirements of the Starting System

An internal combustion engine requires

- (i) a combustible mixture,
- (ii) compression stroke,
- (iii) a form of ignition, and
- (iv) the minimum initial starting speed (about 100 rpm) in order to start and continue running.

To meet the first three of these requirements the minimum starting speed must be attained. This is where the electric starter comes in. The attainment of this minimum speed is again dependent on a number of factors, such as;

- The rated voltage of the starting system.
- The lowest possible temperature at which the engine can still be started. This is known as the starting limit temperature.
- The torque required to crank the engine at its starting limit temperature (including the initial stalled torque).
- The battery characteristics.
- The voltage drop between the battery and the starter.
- The starter to ring gear ratio.
- The characteristics of the starter.
- The minimum cranking speed of the engine at the starting limit temperature

Construction and Working

The starting system is a combination of mechanical and electrical parts that work together to start the engine. The starting system is designed to change the electrical energy, which is being supplied by the battery, into mechanical energy. For this conversion to be accomplished, a starter or cranking motor is used.

A starting system consists of starting motor, magnetic switch, safety switch, battery, cables and ignition switch. These components are connected with each other through two circuits. One is starting circuit, in which high current flows which is used to start the engine. Second is control circuit, in which low current flows. The ignition

switch acts as switch for starting circuits also. In starting circuit, the current flows from battery to starter motor through solenoid or magnetic switch. The control circuit connects magnetic switch with, battery through ignition switch (Figure 1).

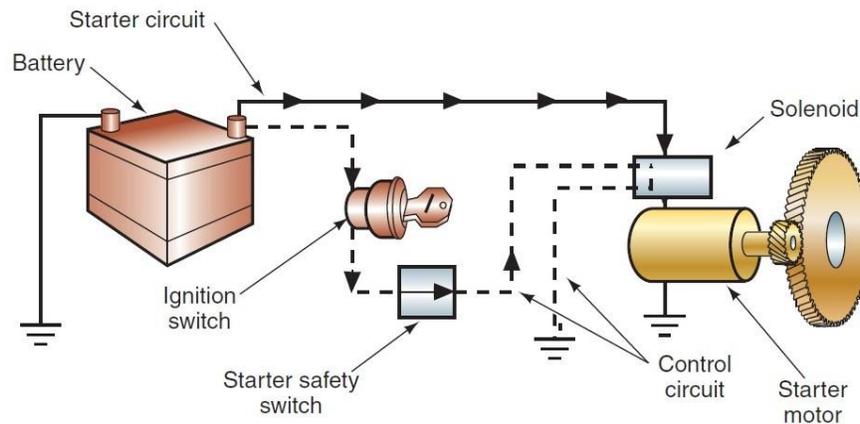


Figure 1. Major components of the starting system.

The basic starting system includes the following components (Figure 1):

1. Battery.
2. Cable and wires.
3. Ignition switch.
4. Starter solenoid or relay.
5. Starter motor.
6. Starter drive and flywheel ring gear.
7. Starting safety switch.