

# Starting Systems



**BOSCH**  
Invented for life

## Starting Systems

### Battery Condition

1. The battery should be fully charged. Terminal voltage OCV for maintenance free batteries must be 12.6 volts at 100% charge. A minimum of 12.4 volts at 75% charge is necessary to properly test the system. Terminal voltage OCV of new batteries must register a minimum of 12.5 volts before installation. Recharge and retest, per manufacturer's specifications, any battery that does not meet the requirement above
2. Check condition of battery connections. All battery cable connections must be clean, free of corrosion, and tight. If cable ends are corroded, **do not replace just the cable ends, replace the entire battery cable**
3. Check condition of ground strap from battery to engine, frame and body. All connections must be clean and tight.

### Starter Operation

With a properly charged battery, start the engine and listen to how well the starter turns the engine over.

1. Any unusual noises present? If yes, inspect the engine ring gear, or pinion gear of starter. If either is damaged, remove and replace.
2. Engine starts poorly or not at all. Check engine compression, ignition, fuel system, etc.
3. If engine cranks slowly or not at all, proceed to fault diagnosis.

### Fault Diagnosis

#### With a properly charged battery.

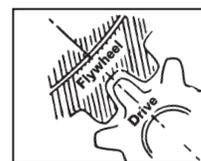
1. While cranking, check the voltage at the battery terminal of the solenoid switch; it should be at least 9.6V or to manufacturer's specs. If it is not, check for a voltage drop between the battery and the starter solenoid battery terminal. Clean the battery posts or replace the battery cables. (It is not recommended to repair the battery cable ends; entire cables should be replaced.)

2. While cranking, check the voltage at the starter terminal. It should also have a minimum of 9.6V. If it does not, remove and clean the cable connections. If cleaning does not cure the problem, starter solenoid is defective...remove and replace.
3. While cranking, perform a "Voltage Drop Test" with the positive probe of digital volt meter on the starter case and negative probe of digital volt meter on battery negative post. If reading exceeds .1 volt, clean or replace battery to engine cable or connection.

#### Battery is in good condition, but starter will not crank engine:

1. If starter solenoid does not engage, check for a poor connection to ignition switch or a voltage drop at the ignition switch. Repair the circuit or replace the ignition switch as needed. Minimum solenoid pull in voltage is 8 volts. The solenoid grounds through the starter. Poor starter grounds or poor connections at the solenoid to starter terminal will cause solenoid engagement problems.

#### Starter solenoid engages, but pinion gear does not mesh into flywheel:



Check installation of starter. A misaligned or loose starter will need reinstallation or shims. Check pinion on starter; if damaged...replace starter.

#### Starter continues to spin momentarily after key is released.:

Starter drive is defective...remove and replace starter.

#### Optional current draw test:

1. If engine manufacturer's specifications are available, utilize a current/voltage tester to individually check the starting system circuits.
2. Remember to check engine mechanical condition, ignition and fuel system, oil viscosity and temperature as all of these elements will affect the outcome of tests performed on the vehicle's starting system.