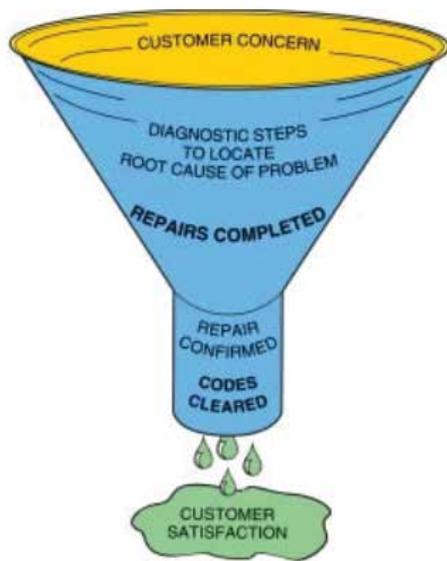




## Engine Performance Diagnosis and Testing

Many different things can cause an engine performance problem or concern. The service technician has to narrow the possibilities until the cause of the problem is found and corrected. A funnel is a way of visualizing a diagnostic procedure. At the wide top are the symptoms of the problem; the funnel narrows as possible causes are eliminated until the root cause is found and corrected at the bottom of the funnel. All problem diagnosis deals with symptoms that could be the result of many different causes. The wide range of possible solutions must be narrowed to the most likely and these must eventually be further narrowed down to the actual cause. The following section describes eight steps the service technician can take to narrow the possibilities to one cause.



**Step #1: Verify the Problem** - Before one minute is spent on diagnosis, be certain that a problem exists. After the nature and scope of the problem are determined, the complaint should be verified before further diagnostic tests are performed. A sample of a form that customers could fill out with details of the problem can be seen in the visual. Perform a thorough test drive under similar conditions to verify the complaint (problem or concern).

**Step #2: Perform a Thorough Visual Inspection and Basic Tests** - The visual inspection is the most important aspect of diagnosis! Most experts agree that between 10 and 30% of all engine performance problems can be found simply by performing a thorough visual inspection.

**Step #3: Retrieve the Diagnostic Trouble Codes** - If a diagnostic trouble code (DTC) is present in the computer memory, it is signalled by illuminating a malfunction indicator lamp (MIL), commonly labelled "check engine"

or "service engine soon." See Figure 31–9. The code(s) displayed if the MIL is on is called a hard code. Any code(s) that is displayed when the MIL is not on is called a soft code. A soft code is sometimes called an intermittent code and indicates that the computer detected a fault in the circuit represented by the DTC. Because the MIL is not on, this indicates that the fault is no longer present. Although this soft code is helpful to let the technician know that a fault has, in the past, been detected, further testing will be needed to find the root cause of the problem. Most vehicle manufacturers state that the diagnostic procedure for a DTC is for a hard code only.

**Step #4: Check for Technical Service Bulletins** - Check for corrections in bulletins that match the symptoms. See Figure 31–10. According to studies performed by automobile manufacturers, as many as 30% of vehicles can be repaired following the information, suggestions, or replacement parts found in a service bulletin. (DTCs must be known before searching for service bulletins because bulletins often include information on solving problems that involve a stored diagnostic trouble code.)

**Step #5: Look at Scan Tool Data** - Starting in 1981, Import vehicle manufacturers have been giving the technician more and more data on a scan tool connected to the data link connector or DLC. Beginning technicians are often observed scrolling through scan data without a real clue to what they are looking for. When asked, they usually reply that they are looking for something unusual, as if the screen will flash a big message "LOOK HERE—THIS IS NOT CORRECT." That statement does not appear on scan tool displays.



## Engine Performance Diagnosis and Testing

**Step #6: *Narrow the Problem to a System or Cylinder*** - Narrowing the focus to a system or individual cylinder is the hardest part of the entire diagnostic process.

**Step #7: *Repair the Problem and Determine the Root Cause***- The repair or part replacement must be performed following vehicle manufacturer's recommendations. Also follow manufacturers' recommended repair procedures and methods.

**Step #8: *Verify the Repair and Clear Any Stored DTCs***-

1. Test drive to verify that the original problem (concern) is fixed.
2. Verify that no additional problems have occurred during the repair process.
3. Clear all diagnostic trouble codes. (This step ensures that the computer will not make any changes based on any stored DTC.)
4. Before returning the vehicle to the customer double check that
  - The vehicle is clean.