

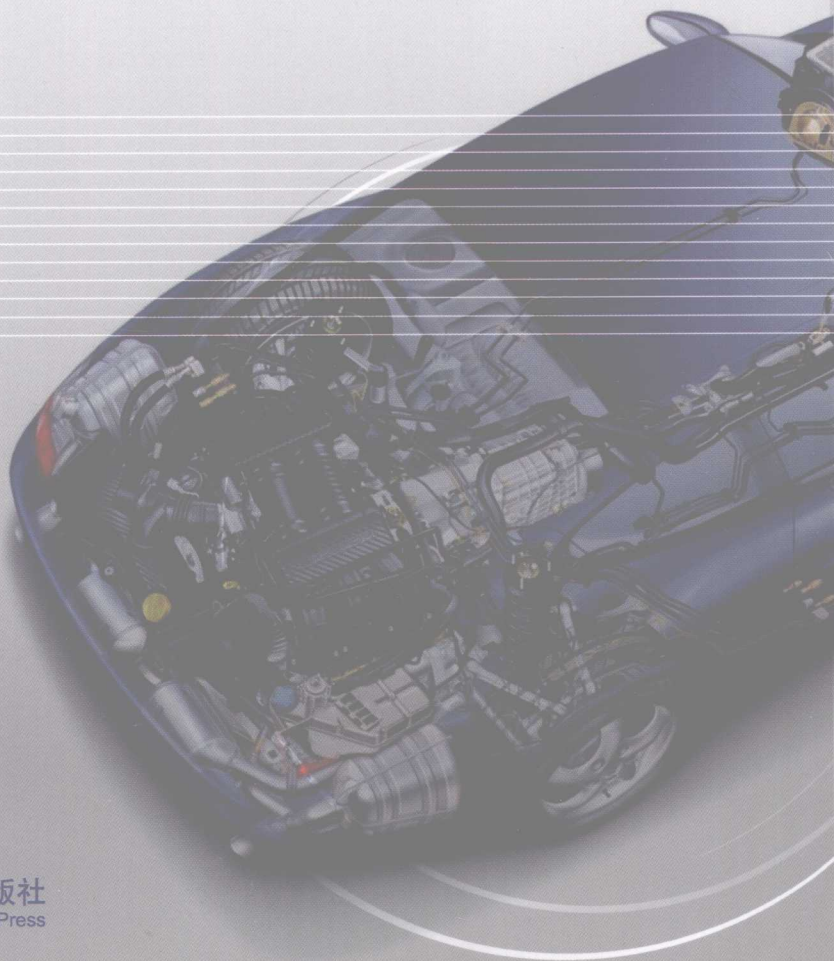


普通高等教育“十一五”国家级规划教材

汽 车 运 用 与 维 修 专 业 系 列

汽车实用英语

■ 韩建保 编著



高等教育出版社
Higher Education Press

普通高等教育“十一五”国家级规划教材

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内容提要

本书是普通高等教育“十一五”国家级规划教材。

本书共 30 个单元,阐述现代轿车大部分系统或总成的工作原理、常见故障及其诊断与维修技术,分析世界最新车型新技术特征对技师专业知识和技能的挑战,介绍汽车发展史,检修工具百年演变,维修车间高效运作的设备布置方案,美国汽车技师资格认证协会(ASE)管理模式、考试形式以及试题的编写原则,选购二手车的好处及其检测项目等方面的内容。

本书可作为高等职业院校、高等专科院校、成人高校、民办高校及本科院校举办的二级职业技术学院汽车类专业的教学用书,也可作为相关从业人员的业务参考书及培训用书。

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前 言

本书在结构体系上具有以下几方面的特点:

1. 学习单词和专业术语与熟悉汽车技术英语惯用表达并重。拆卸零部件或查找故障原因的过程都比较复杂,为了避免繁琐和“不必要的”重复,汽车技术英语语句常会出现“丢三落四”,内容“跳跃”不连贯的现象。因此,本书在课文的选材和编写形式上,都力图培养学生的根据前后文提供的线索以及“先验的”专业知识,准确把握汽车技术英语含义的“潜意识”。

2. 本书不采用基础英语教程中对语法现象详细解释的方式,而是通过给出注释语句的参考译文,让同学们熟悉语法难点。如果仍然详解语法,显然只是对基础英语的重复,而且会误导同学们的学习重点,削弱对那些富有专业特征的英语语句表达形式的关注。通过揣摩注释语句的参考译文,有助于学生消化英语语法知识,增强学生阅读翻译时的“联想思维”能力。

3. 课文主要选自美国的汽车专业杂志“**MOTOR**”的最新技术报告类文章,没有采用汽车科普类的文章,期望学生在学习汽车专业英语的同时,还能够了解世界汽车技术的最新知识。在课堂上学习英语技术资料原文有助于提高学生阅读汽车英语技术资料的“技能”。

本书内容涵盖了现代汽车(特别是轿车)大部分系统或总成的工作原理、常见故障症状、诊断与维修技术、二手车的选购等主题。

本书由北京理工大学机械与车辆工程学院韩建保教授编著。邢台职业技术学院宋红英审阅了全稿。

由于本人水平有限,书中疏漏之处在所难免,殷切希望广大读者对书中误漏之处予以批评指正。

编著者
2009年1月

郑重声明

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E - mail: dd@hep.com.cn

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Unit 1

History and Basic Components of Automotives

(第一单元 汽车发展简史及其基本组成部件)



教学导读

1. 本单元概略介绍了汽车发展史、汽车的主要组成部分及其功能和工作原理。要求掌握汽车各总成及其主要部件的英文名称,能够应用课文中比较简单的英文语句描述汽车各系统(例如点火和起动系统等)的基本功能和工作原理。
2. 重点讲解课文注释中的6个句子。掌握描述系统的安装位置和组成部件的句型。建议同学们熟读第3、4、6个注释语句。
3. 课文中出现的常用动词或形容词,建议进行一些联想式扩张练习,例如,针对第三段第一句中的动词“contain”,便可启发同学们联想其他具有相同含义的动词,如: consist of, compose, make up of, form, include, comprise, cover, embrace, restrain 和 involve 等可以用在该句中替代 contain,这样在活跃课堂学习气氛的同时,还可有效地复习英语基础知识。

In 1867, the first workable four stroke internal combustion (IC) engine was invented in Cologne, Germany, by a young merchant's assistant named Nikolaus Otto. In 1883, Gottlieb Daimler laid the foundations for a motorized society by developing the world's first high-speed four stroke gasoline engine. Its compact dimensions permitted this gasoline engine to be installed in every vehicle at that time.¹ Subsequently, the world's first automobiles with gasoline-powered IC engines were completed almost simultaneously and independently in 1886 by Carl Benz in Mannheim, Gottlieb Daimler and his collaborator Wilhelm Maybach in Stuttgart, respectively. Between 1885 and 1888, Daimler and Maybach used the compact engine to motorize a carriage, a ship, a streetcar, a fire-fighting pump, an airship and the world's first motorcycle. Daimler's dream of the motorization “on land, on water and in the air” began to become reality. This was followed by a great revolution in personal mobility.²

In 1893, Henry Ford in Dearborn, Michigan, USA, placed his first car on the road. With the development of the sturdy, low-priced Model T in October 1908, Henry Ford made his company the biggest in the industry. Assembly-line production methods introduced by Henry Ford in 1913 enabled the price of this five-seat touring car to drop from \$ 850 in 1908 to \$ 300 in 1925. Fig. 1-1 shows an ear-



ly assembly workshop of Ford Automotive Co. Through the period from 1900 to the mid 1920s, development of automotive technology was rapid. Key developments included electric ignition and the electric self-starter, independent suspension, and four-wheel brakes.

Prior to the period in 1886 when Karl Benz patented the first vehicle, most people of the world including Europe and Japan were not able to travel more than 35 km from their homes except armyman and religious travelers. Without Benz's knowledge, his wife Bertha Benz secretly set out on a promotional tour from Mannheim one morning in August 1888, together with their two sons. In the evening of the same day, the trio arrived at Bertha's mother's place in Pforzheim. This was the world's first long-distance journey in an automobile, and proved the suitability of the Benz patent motor car for everyday use. The Benz's invention in his patent was not just an existing vehicle to which an engine was fitted. Instead, Benz developed the first modern automobile in which engine, powertrain and chassis formed an independent entity, respectively.³

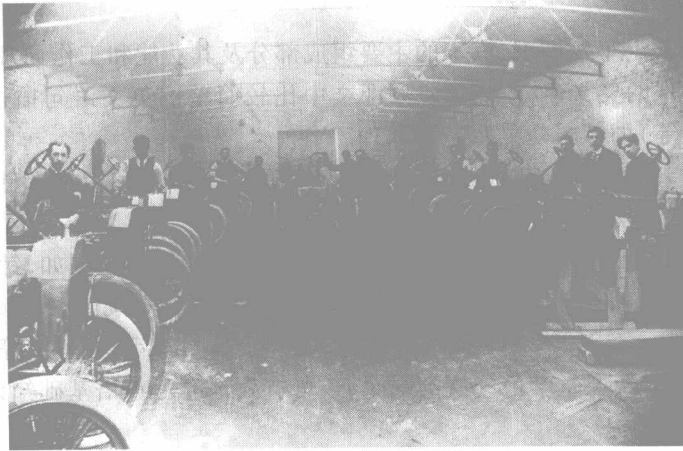


Fig. 1-1 Early vehicle assembly workshop of Ford Automotive Co. in Dearborn.

In 1901, the Daimler motor company predicted that worldwide car sales would never exceed 1 million because the population at large could not provide more than a million people capable of learning how to drive their vehicle.⁴ It is now well known that Daimler grossly underestimated. Fig. 1-2 is a photo in which Gottlieb Daimler and his employees as well as the company's signboard appear, where "Daimler-Motoren-Gesellschaft" on the signboard is the company's German name. From this historical standpoint, it becomes interesting to see how the road vehicle has become the great liberator in terms of personal and mass mobility. Early in the Second World War the world vehicle fleet was less than 50 million units, but by 1987 the total unit has grown to approximately 516 million, of which 395 million were passenger cars.⁵

A typical passenger car of today contains more than 15 000 separate, individual parts that must work together. These parts can be grouped into four major categories: engine, body, chassis and elec-





Fig. 1-2 Daimler and his employees around the company's signboard and the vehicles

trical equipment, referred to Fig. 1-3. The engine acts as the power unit located normally at the front of the car, followed immediately by a clutch, gear box, propeller shaft, universal joint, differential, back axle, etc.⁶ Internal combustion engine is most common on automobiles. It obtains its power by burning liquid fuel inside the engine cylinder. There are two types of engine; gasoline (also called a spark-ignition engine) and diesel (also called a compression-ignition engine). Both engines are called heat engines. The burning fuel generates heat which causes the gas inside the cylinder to increase its pressure and supply power to rotate a shaft connected to the transmission.

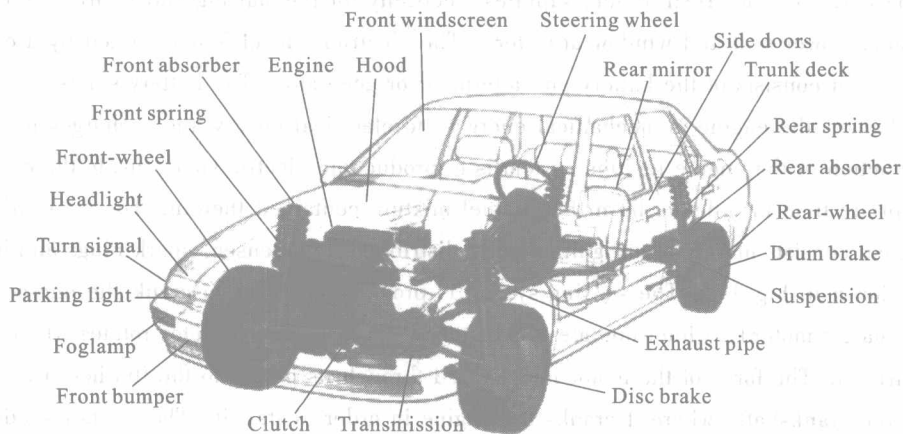


Fig. 1-3 Major assemblies and components of a passenger car

A car body is a sheet metal shell with windows, doors, a hood and a trunk deck built into it. It provides a protective covering for the engine, passengers and cargo. The body is designed to keep



passengers safe and comfortable. The body styling provides an attractive, colorful, modern appearance. The chassis is an assembly of those systems that are the major operating parts of a car. It includes the transmission, suspension, steering and brake systems. The transmission system is a speed and power changing device and conveys the drive to the wheels. Its main components comprise the transmission case, input shaft, output shaft, countershaft, driving gear, transmission fork, etc. A common transmission has a gear arrangement of neutral position, reverse gear, first gear, second gear, third gear, etc., where the reverse gear permits a car to reverse its direction.

The suspension system is used to absorb the road shocks and reduce the impact and dynamic loads which are transmitted to the sprung weight. The sprung weight (including body, engine, power train, etc.) is suspended by the front and rear springs. The steering system controls the direction of the car's movement. Two types of steering system are commonly used on cars: manual system and power system. The manual steering system is composed of steering wheel, shaft and column, steering gear and pitman arm, steering knuckles and ball joint, spindle assembly, etc. The power steering system is made up of a hydraulic pump, fluid reservoir, hoses, a power steering gear assembly, etc.⁷ There are several manual steering gears in current use like the rack and pinion type, the worm and tapered pin steering gear, and the worm and roller steering gear.⁸ All power steering systems require a power steering pump attached to the engine. Most late model cars with power steering utilize either a power rack and pinion system, or an integrated power steering gear system.

The brake system slows down the running car. In general, the front brakes of a car are "disc" type, wherein friction pads in a brake caliper are forced against machined surfaces of a rotating disc at each wheel to slow and stop the car. The rear brakes are "drum" type, wherein internal expanding brake shoe assemblies are forced against the machined surface of a rotating drum at each wheel to slow and stop the car. The electrical system supplies electricity for the starting and ignition systems, horn, lights, heater, power seat and window adjusters. The electricity level is maintained by a charging circuit. This circuit consists of the battery and alternator or generator. The battery stores electricity. The alternator changes the engine's mechanical energy into electrical energy and recharges the battery.

The function of the engine ignition system is to produce an electric spark inside the cylinder at the most appropriate time in order to burn the air-fuel mixture contained therein. The conventional engine ignition system consists mainly of an ignition coil, distributor, condenser, spark plugs and high-voltage cables, as shown in Fig. 1-4. The starting system is provided in order to crank the engine by using a DC motor (starter motor), which operates on battery voltage. The DC motor rotates when the ignition switch is turned on. The force of the motor is delivered through its pinion to the flywheel ring gear that is attached to the crankshaft, where it cranks the engine in order to start it. The lights include the headlights, parking lights, direction signal lights, side marker lights, stoplights, backup lights, tail lights, and the interior lights. The interior lights cover the instrumental panel lights, various warning, indicator, and courtesy lights.⁹



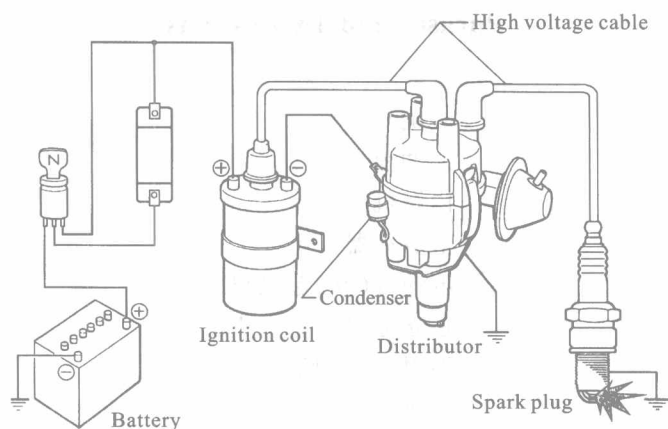


Fig. 1-4 The main components of a conventional engine ignition system

New Words

merchant	n. 商人, 贸易商, 店主
collaborator	n. 合作者
sturdy	adj. 坚固的, 耐用的
patent	vt. 取得……的专利权
	n. 专利
trio	n. 三重唱, 三个人一组
suitability	n. 适用性, 适宜性, 相配
chassis	n. 汽车底盘, 飞机机架
mobility	n. 机动性, 可动性
category	n. 种类
universal	adj. 普遍的, 通用的
foglamp	n. 雾灯
countershaft	n. 中间轴, 副轴
worm	n. 蜗杆, 螺纹
horn	n. (牛、羊等的)角, 喇叭
distributor	n. 分电器
condenser	n. 电容器
pinion	n. 小齿轮
crankshaft	n. (发动机)曲轴



Phrases and Expressions

.....

assembly workshop	装配车间
four stroke	四冲程
internal combustion (IC)	内燃机
electric ignition	电点火器
electric self-starter	电动自(动)起动机
independent suspension	独立悬架
passenger car	乘用客车, 轿车
transmission fork	变速叉
neutral position	空挡
reverse gear	倒挡
first gear	第一挡
steering gear	转向机
pitman arm	转向臂
steering knuckle	转向节
ball joint	(转向节)球头
spindle assembly	转向轴总成
friction pad	(盘式制动器)摩擦衬块
brake caliper	制动钳
gear arrangement	齿轮排列
ignition system	点火系统
electric spark	电火花
air-fuel mixture	空气-燃油混合物
DC motor	直流电动机
starter motor	起动机
on battery voltage	利用蓄电池电压
ignition coil	点火线圈
spark plug	火花塞
high-voltage cable	高压电缆
ignition switch	点火开关
flywheel ring gear	飞轮齿圈

Notes to the Text

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1. In 1883, Gottlieb Daimler laid the foundations for a motorized society by developing the world's first high-speed four stroke gasoline engine. Its compact dimensions permitted this gasoline engine



to be installed in every vehicle at that time.

1883 年,戈特利布·戴姆勒(Gottlieb Daimler)研制出世界上第一台高速四冲程汽油发动机,为机动化的社会奠定了基础。这款发动机结构紧凑使其能够应用于当时的每一种车辆。

2. Between 1885 and 1888, Daimler and Maybach used the compact engine to motorize a carriage, a ship, a streetcar, a fire-fighting pump, an airship and the world's first motorcycle. Daimler's dream of the motorization "on land, on water and in the air" began to become reality. This was followed by a great revolution in personal mobility.

1885 年至 1888 年,戴姆勒和迈巴赫(Maybach)将结构紧凑的发动机应用于轨道客车、轮船、道路客车、灭火泵、飞艇和世界上第一辆摩托车。戴姆勒的“在陆地、水上和空中”实现机动化的梦想开始变为现实。

戴姆勒是“梅塞德斯-奔驰”(Mercedes-Benz)轿车品牌的奠基人,迈巴赫是豪华轿车品牌“迈巴赫”(Maybach)的奠基人。梅塞德斯-奔驰汽车标志中的三叉星即代表戴姆勒研制“陆海空”运载技术的梦想。

3. The Benz's invention in his patent was not just an existing vehicle to which an engine was fitted. Instead, Benz developed the first modern automobile in which engine, powertrain and chassis formed an independent entity, respectively.

奔驰在他的专利中提出的发明创造不仅仅是一辆装有发动机的实用车辆,(对汽车技术而言)更为重要的是,奔驰发明的是一辆将发动机、传动系和底盘分别作为独立实体(总成)的现代化车辆。

4. In 1901, the Daimler motor company predicted that worldwide car sales would never exceed 1 million because the population at large could not provide more than a million people capable of learning how to drive their vehicle.

1901 年,戴姆勒汽车公司预测,在世界范围内汽车的销售量是不会超过 1 百万辆的,因为那时的人口规模不可能有 1 百万人能够学会驾驶车辆。

5. Early in the Second World War the world vehicle fleet was less than 50 million units, but by 1987 the total unit has grown to approximately 516 million, of which 395 million were passenger cars.

在第二次世界大战的初期,全世界的车辆总数还不足 5 千万辆,但是到了 1987 年,全世界车辆的总数已经增加到了大约 5 亿 1 千 6 百万辆,其中 3 亿 9 千 5 百万辆为乘用车和轿车。

6. The engine acts as the power unit located normally at the front of the car, followed immediately by a clutch, gear box, propeller shaft, universal joint, differential, back axle, etc.

发动机作为动力单元一般位于轿车的前部,其后为离合器、变速箱、传动轴、万向节、差速器和后桥等。

7. The manual steering system is composed of steering wheel, shaft and column, steering gear and pitman arm, steering knuckles and ball joint, spindle assembly, etc. The power steering system is made up of a hydraulic pump, fluid reservoir, hoses, a power steering gear assembly, etc.

手动转向系统包括方向盘、转向轴和转向柱、转向机、转向臂、转向节、转向节球头以及转向轴总成等部件。动力转向系统由液压泵、液体储罐、软管、动力转向机总成等组成。

8. There are several manual steering gears in current use like the rack and pinion type, the worm and



tapered pin steering gear, and the worm and roller steering gear.

目前(在轿车中)应用的手动转向机有好几种形式,如齿条齿轮式、蜗杆锥形销式以及蜗杆滚柱式等。

9. The lights include the headlights, parking lights, direction signal lights, side marker lights, stop-lights, backup lights, tail lights, and the interior lights. The interior lights cover the instrumental panel lights, various warning, indicator, and courtesy lights.

车灯包括前大灯、驻车灯、转向信号灯、侧灯、停车灯、倒车灯、尾灯和车内灯等。其中,车内灯包括仪表板灯、各种警示灯、指示灯和门控灯等。



Unit 2

Challenges for Repair Shops from Car's Innovative Features

(第二单元 轿车新技术特征对检测维修工作的挑战)



教学导读

1. 本单元论述轿车新技术对汽车维修业带来的挑战和机遇,用实例说明汽车专业英语知识对于及时了解新技术、掌握正确的故障诊断方法和维修操作的重要性。
2. 课文比较长,课堂上建议只讲解前5段,即本田(Honda)新车型的新技术特征的内容。其他部分留作课外阅读。为了检查课外阅读练习的效果,应安排时间与学生讨论课文最后两段有关CVT的内容。
3. 描述系统的组成或部件的相互位置时,常应用插图。结合插图的文字解释,了解插图的内容。重点讲解第1个至第6个注释语句,熟悉车型的命名惯例。

Innovative technical features of the new car models of 2003, including a high-capacity CVT (continuously variable transmission), and a W8 engine, promise fresh challenges for independent repair shops.¹ The Honda Accord is such a best-seller that even if it were the only all-new import nameplate for 2003 it would be significant. However, there's a lot more, of course, including the new Mercedes E-Class and CLK, the Saab 9-3, the Mazda 6 and the Subaru Baja. There's also a revival of the Nissan Z, an Altima-based Nissan Murano SUV, plus three Infiniti rear-drive models.² Under the hood are the first W-shaped engine, the W8 from VW in the new Passat, and lots of new engineering in the Jaguar S-Type. Toyota's only new 2003 car Corolla came out in February 2002.³ In this unit, let's take a look and see especially what's new with the models for 2003-nameplate by Honda and VW.

Honda

The 2003 Accord has a look somewhere between the Acura RSX and VW Passat, but under the hood it's pure Honda, with a lot that's new for '03 in both the four and V6. The engines were turned around, so the belt-driven accessories are on the passenger's side as shown in Fig. 2-1. Why? Turning the four (which represents about 70% of Honda's sales) puts the exhaust manifold at the rear, short-



ening the exhaust, which results in faster catalytic converter warmup.⁴ This also smoothes out exhaust flow, which doesn't hurt performance, either. The ignition distributor and timing marks are gone, replaced by a coil-on-plug system. The four now is 2.4 liters, up from 2.3. That may not sound like much, but it's really a newer engine with chain-driven double-overhead camshafts replacing the timing belt. Honda introduced this engine last year in the CRV-V, which first used the 180° engine repositioning. Power is up from 150 to 160 hp., torque from 152 to 161 ft.-lbs. and at lower rpm (4 500 vs. 4 900).⁵

The electronic/hydraulic engine mount long used by Honda fours and located at the rear now is on the front side, apparently in part because of the engine's 180° rotation. The entire mounting system, however, also was reengineered. As part of Honda's across-the-board improvements in emissions control, however, all four-cylinder engines and the redesigned V6 have the more precise linear air/fuel ratio sensors, not the conventional toggling-voltage type. The V6 still has a timing belt, but the engine has been extensively reworked in other respects, and produces 240 hp., up 40 from 2002 models. It has a three-lobe variable-lift setup on the continuously variable intake camshaft.⁶

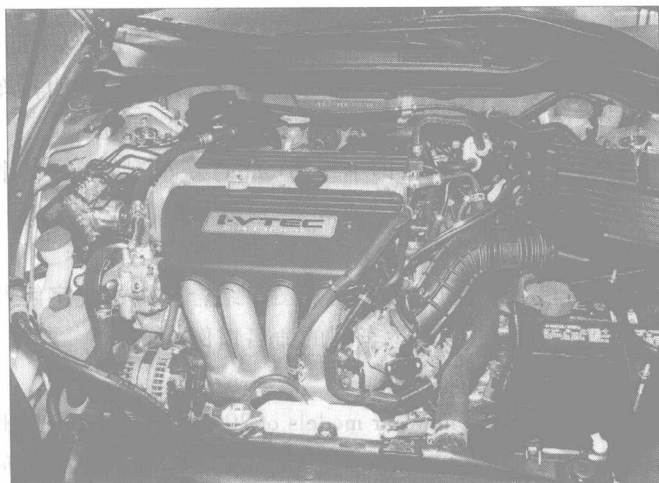


Fig.2-1 Honda's new 2003 engine is a 2.4L four that's rotated 180° so the intake is on the front side of the transverse engine and the accessory belt drive is on the passenger side. The distributor is gone.

The new Accord is a "CAN (Controller Area Network)" car as shown in Fig. 2-2. In fact, it has both high-speed and low-speed CANs. The gateway module for both CANs is located in the instrument panel. According to Honda service training, the early report is that OBD II diagnostics will continue to be displayed on generic scan tools.

If you want to take the plunge into gasoline-electric hybrids, the first Honda "mainstream" car is out—the Civic Hybrid.⁷ The electric powertrain is a modified version of the one in the Honda Insight, but the engine is a new 85-hp., 1.3L four-cylinder, compared with the 67-hp., 1.0L three-cylinder

