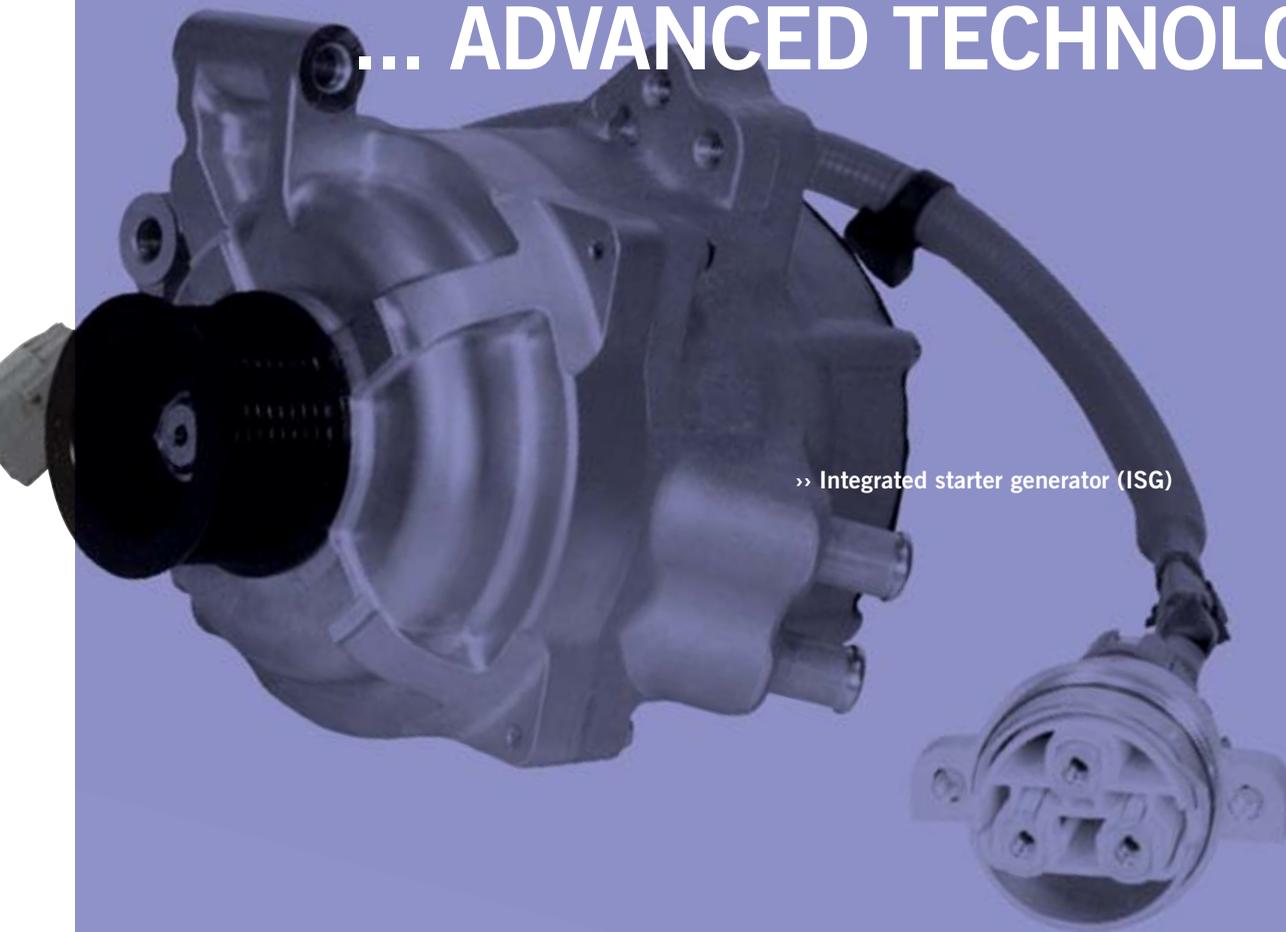


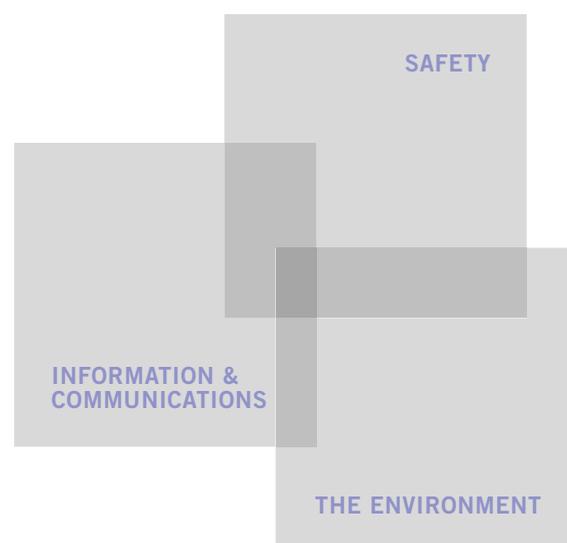
DENSO's drive to develop new technologies is focused on three strategic areas—safety, information and communications, and the environment. As a leading automotive component supplier, our ultimate goal is to create automobile systems that enhance car safety and comfort and reduce the impact of the car on the environment, while at the same time transcending existing product categories and fields. With a product lineup that covers these three areas and proprietary expertise ranging from design to control systems, DENSO has the resources needed to reach this objective.

... ADVANCED TECHNOLOGIES



» Integrated starter generator (ISG)

DENSO'S THREE STRATEGIC AREAS



SAFETY: **NEW LEVELS OF SOPHISTICATION**

DENSO is developing automobile safety technology in two distinct areas: active safety systems for collision prevention and avoidance, and passive safety systems for damage minimization in the event of collision.

In active safety, we are enhancing the performance of DENSO driver support systems already on the market. One example is our adaptive cruise control (ACC) system, which uses a laser radar to scan the road ahead vertically and horizontally. This radar is linked to a distance control unit that works to ensure a safe distance between vehicles. Another example is an engine electronic control unit (ECU) that uses information gleaned from car navigation systems to make appropriate adjustments to the car's gears when road conditions change; braking into a corner for example. This brings enhancements to both driveability and safety. DENSO also has some exciting new technologies under development—sensors that use biosigns such as heart rate and eye

movement to monitor driver drowsiness and fatigue, and control systems that respond as required to the driver's condition. We are also developing a system that aids driver night-vision using infrared technology.

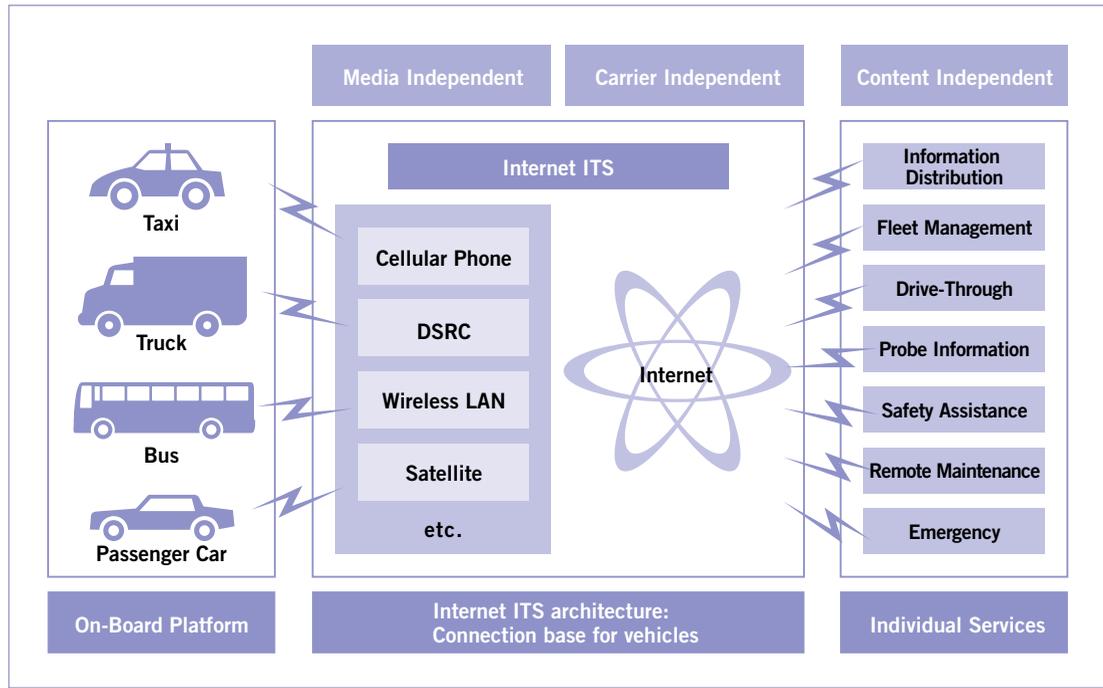
In passive safety, our main focus lies in the development of next-generation airbag sensing systems. DENSO has already captured a commanding lead in this product category. We are planning to reinforce this position by incorporating the latest technologies and looking ahead to our next-generation products. Our goal is to make airbag sensing systems more accurate in detecting collisions, more responsive in deployment, and increasingly sensitive to the size, weight, and position of vehicle occupants. To achieve this, we are targeting the development of dispersed sensing and car occupant sensing technologies, while more advanced ECUs will improve the speed and deployment of the airbag itself using data gleaned from these sensors. DENSO is also developing millimeter wave technology to accurately identify potential obstacles a split second prior to collision,

thereby allowing quicker operation of safety equipment.

INFORMATION AND COMMUNICATIONS: **FROM THE ROAD INTO CYBERSPACE**

The automobile continues to evolve from a simple mode of transport into a mobile terminal seamlessly integrated into information networks. Driving this change is the latest Internet-enabled ITS technology (Internet ITS). Internet ITS uses Internet Protocol Version 6 (IPv6) to ensure the vehicle is always connected to the Internet; anytime, anywhere. This opens up a wealth of possibilities by enabling vehicle occupants to freely access web-based services while on the road. Internet ITS creates other benefits—with on-board electronic components wired into the Internet, their performance can be constantly monitored from a remote location.

Japan is making important strides in this area. DENSO has joined hands with public and private organizations to initiate the Internet ITS Project (<http://www.InternetITS.org/>). This project is aimed at establishing a common



INTERNET ITS

Internet ITS provides a limitless range of services for access anytime, anywhere.

communications infrastructure for ITS applications, thereby facilitating the development of on-board ITS equipment and software. A number of Internet ITS pilot programs have already started in Japan, the biggest involving 1,570 taxis in Nagoya, conducted from January through March 2002. DENSO supplied on-board equipment for the program.

DENSO has been involved in the development of electronics for automobile components since the transistor age. We will leverage this wealth of knowledge and our experience in telecommunications and network technology in the new field of on-board ITS devices.

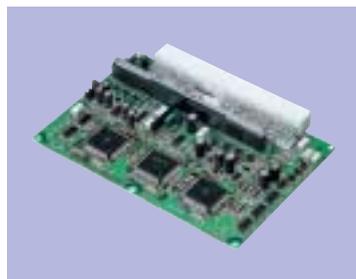
THE ENVIRONMENT: CARS WITH LESS IMPACT

The majority of the world's car air conditioners use a hydrofluorocarbon refrigerant called HFC-134a. Although this substance does not harm the ozone layer, it does have a high global warming potential (GWP). With DENSO's accumulated expertise in air conditioners, we are naturally at the forefront of efforts to find

a better refrigerant. DENSO's answer to this problem is air-conditioning systems, currently under development, that utilize naturally occurring compounds such as carbon dioxide (CO₂). Natural refrigerants have an exceptionally low GWP compared with fluorocarbon refrigerants. We have successfully developed an air-conditioning and heat-pump system that uses a CO₂ refrigerant for Toyota's prototype Fuel Cell Hybrid Vehicle (FCHV-4). The FCHV-4, equipped with our system, began public road tests in August 2001. Limited sales are slated to begin at the end of 2002. An earlier spin-off of our research efforts in this area was the development of a household heat-pump water heater that uses CO₂ as the refrigerant. This unit is more economical and has less impact on the environment than the widely used combustion type heat-pump water heaters. Demonstrating its superiority is the strong demand for this technology from home-builders, electric utilities, and electric appliance makers since its launch in May 2001.

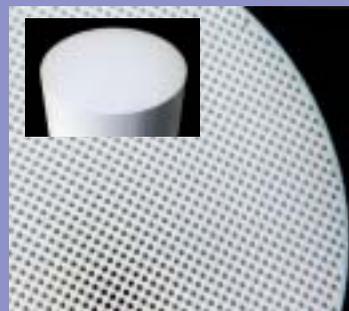
Gasoline engine management systems pose equally difficult challenges. Customers

A CO₂ REFRIGERANT AIR-CONDITIONING AND HEAT-PUMP SYSTEM



A CAR NAVIGATION SYSTEM-LINKED ENGINE ECU

A DIESEL PARTICULATE FILTER (DPF)



are demanding engines that are cleaner and offer improved fuel consumption and higher performance. But meeting these requirements and supplying competitively priced components is a daunting prospect. At DENSO, though, we are rising to the challenge with our technological expertise in engine management components used in intake, combustion, and exhaust processes, as well as our control algorithms that ensure both optimal and precise management of combustion parameters such as the air/fuel ratio. One example in this area is our latest, pioneering fuel-injection technology that achieves new levels of fuel atomization, thereby significantly reducing levels of hydrocarbons in exhaust gases. DENSO's advanced processing technology was a vital factor in creating the unique apertures in the fuel injector nozzles that made this improvement possible.

In diesel engine technology, the key issue is not fuel consumption. Instead, engineers are working on ways to reduce concentrations of harmful substances such as particulate matter (PM) and nitrogen oxides (NOx) in

exhaust gases. DENSO is also making great strides in this area, with diesel common rail systems, a technology originally created for trucks and more recently applied to diesel passenger cars. DENSO's new diesel common rail systems use a high injection pressure—at 1,800 bar, the highest in the world—and multiple injections during each combustion stroke to reduce PM and NOx in exhaust gases. With this technology, we have comfortably cleared the regulatory standards set by the European Union in its EURO 4 emission regulations, due to come into force in 2005. DENSO has also developed a diesel particulate filter (DPF) for Toyota's diesel particulate-NOx reduction (DPNR) system. In diesel engine technology, our goal is to prevent exhaust gas issues from standing in the way of more people benefiting from the fuel efficiency and power of diesel engines.

DENSO is also actively developing components for hybrid electric vehicles (HEVs). HEVs, which combine a conventional engine with a battery powertrain, significantly cut fuel consumption and emissions, particularly

in traffic-congested cities. The idea is simple. Power is supplied by the battery instead of the engine when exhaust gas emissions and fuel efficiency would be at their worst—car starts and low speeds. DENSO supplies a range of HEV components, including integrated starter generators (ISGs), inverters, DC-DC converters, and battery ECUs, that make this technological sleight of hand possible. Our reputation for innovation extends to the HEV field: DENSO's development of a belt-driven ISG that enables an idle-stop function was an industry first and was equipped to several HEV models from 2001.