This press pack accompanied the UK launch of the second generation Prius in 2003, ahead of the model's sales introduction in 2004. Changes to the model during its time on sale can be tracked using the Timeline feature on the Prius archive web page. More information about the Prius range can be obtained from the Toyota press office.

TOYOTA PRIUS PAVES THE WAY AHEAD

Key points

- The world's cleanest family car
- 65.7mpg combined fuel consumption with 0-62mph in 10.9 seconds
- Prius is the world's first and most successful hybrid power vehicle, more than 130,000 sold worldwide since 1997
- New generation Prius launches ultra clean and efficient Toyota Hybrid Synergy Drive®
- New Prius is D segment car with fuel economy to rival B segment diesels
- Single body style – five-door, five-seat hatchback
- 104g/km CO_2 emissions, band AA for Vehicle Excise Duty
- Available in the UK in three grades – T_3, T_4 and T Spirit
- Prius exempt from London Congestion Charge – representing a saving of £1,250 per annum to a commuter
- All grades feature eight airbags, ABS, Electronic Brakeforce Distribution (EBD), Brake Assist (BA), Electronic Traction Control (E-TRC) and Vehicle Stability Control Plus (VSC+)
- T_4 models feature nine speaker JBL premium audio with six-disc CD autochanger, cruise control and fog lamps
- T Spirit models add Bluetooth™ telephone interface and DVD-based full-map satellite navigation, with voice recognition and touch screen controls
- Up to 16 functions, including audio, ventilation and communications controls, all positioned on the steering wheel for safer operation

- Advanced electric air conditioning system causes no loss in performance or fuel efficiency
- On sale in the UK 2 January
- On the road prices are £17,495 for T_3, £18,295 for T_4 and £19,995 for T Spirit grade (all excluding £1,000 Powershift grant)
- Insurance groups 7E (T_3 and T_4) and 8E (T Spirit)

Six years after the launch of the original Prius and with more than 130,000 examples sold worldwide, Toyota is unveiling an even more advanced version of the world's most successful hybrid power car.

The second generation Prius is a blend of futuristic design and technology that delivers D-segment levels of space, comfort and performance with B-class economy to today's motorists.

Toyota Prius is not intended to be an eco-car that sacrifices driving pleasure, comfort and space as a trade-off for low emissions. Instead, it goes a lot farther by bringing the future of motoring into the present.

With its unique and advanced Toyota Hybrid Synergy Drive®, the latest Prius is the cleanest car currently available to the motoring public and successfully demonstrates that being 'green' does not equate to dull performance or compromised packaging.

The new Toyota Prius can return a fuel consumption that is comparable to the best B-segment diesels. Production of CO_2 and NOx is also radically low, while particulate matter emissions are non-existent. Figures for consumption are 65.7mpg for combined and 67.3mpg for extra-urban driving. In the urban cycle, Prius returns 56.5mpg, which beats every B-segment car on the market by a large margin. At the same time, this D-segment car can accelerate from 0 to 62mph in less than 11 seconds.

The new hybrid system, making its debut in the Toyota Prius, is the first to be developed according to a revolutionary concept, Hybrid Synergy Drive®. Current generation hybrids rely on the petrol engine to produce peak performance, with the electric motor as an ancillary. Toyota Hybrid Synergy Drive® gives the electric motor a more significant role and also focuses on stronger performance.

The new Prius substantially exceeds EURO IV emission standards. Hydrocarbon and nitrogen oxides emissions are respectively 80 and 87.5 per cent lower than required by

EURO IV regulations for petrol engines. Furthermore, at a time when most diesel engines on the market don't even comply with EURO IV, Prius NOx emissions are 96 per cent below the EURO IV level for diesel cars. In addition, Prius produces only 104g/km of CO_2 exhaust emissions (on the combined cycle), and breaks the 100g/km barrier on the extra-urban cycle (99g/km).

A more powerful 1.5-litre petrol engine works together with the smaller, more efficient electric motor to deliver performance that positions the Prius as a serious contender in the D-segment. The electric motor is now more powerful than most 1.0 to 1.2-litre internal combustion engines and, at 400Nm from 0 to 1,200rpm, the Prius's torque surpasses that of modern V6 diesels.

As a result, 0 to 62mph is accomplished in less than 11 seconds, making Prius almost 3 seconds faster than the first generation model and comparable to a conventional 2.0-litre diesel engine.

LONG HERITAGE OF TOYOTA HYBRID POWER

Toyota might have hit the headlines when it launched the original Prius to world acclaim in 1997, but its credentials in developing sustainable transport stretch back nearly 40 years to 1965 when it started investigating the feasibility of using gas turbines to power an electric drive system for cars.

In 1977, Toyota showcased its futuristic thinking then in the Sports 800 gas turbine hybrid. By using a performance-orientated sports car, Toyota demonstrated an imaginative approach to the question of environmentalism, creating a concept that would evolve into today's Hybrid Synergy Drive®.

In 1997, Toyota unveiled a production hybrid bus, the Coaster, and the world-beating Prius, the first production hybrid car. Prius broke new ground in delivering ultra low emissions in urban conditions and an unlimited driving range and employing a regenerative braking system that recycled unwanted energy back into the car's storage batteries.

Since then Toyota has also launched the word's first four-wheel drive hybrid – the Estima – and a mild hybrid version of its Crown saloon, as well as an experimental fuel cell vehicle.

Toyota's new Prius is the most technically advanced car on sale anywhere in the world. It is also the cleanest. Combine those facts with its taut handling and head-turning design and you have a car that can truly live up to its name; appropriately, Prius is Latin for "ahead of its time".

The principle of the new hybrid system, Toyota Hybrid Synergy Drive®, addresses both the need to protect the environment and the desire of drivers to enjoy dynamic performance.

STYLISH AND EFFICIENT DESIGN

- Extensive use of lightweight materials
- Class-beating Cd figure of 0.26
- Full-size, five-seat D-segment design

The Prius takes full advantage of the latest lightweight materials technology. Everything from the bodyshell to the accelerator has been subjected to a weight-loss programme since less mass to haul around helps reduce fuel consumption and emissions as well as enhance vehicle performance.

And while the Prius is on the move its class-leading Cd figure of 0.26 ensures that it cleaves the air with minimum resistance, another weapon in the impressive Prius armoury against emissions and fuel consumption. The clean, aerodynamic design also cuts down wind noise, giving driver and passengers a quieter ride.

The new Prius is a full-size D-segment vehicle with ample space for driver and up to five passengers plus their luggage. While the new car is instantly recognisable as an evolution of the original Prius, at 4450mm it is 135mm longer than its predecessor, and has a wheelbase longer by 150mm at 2700mm.

The stylish interior features rear seats that fold flat and have a 60:40 split. The front seats boast a 575mm class-leading hip-point height, which not only makes getting in and out easier, but also provides the driver with a higher driving position for good all-round visibility. Toyota's designers have paid special attention to the cabin's interior ergonomics with the innovative use of design features and technologies such as Bluetooth® telephone interface and the location of many controls on the steering wheel.

Toyota profiles typical Prius drivers as 'early adopters', those keen to make use of the latest technologies and devices. Aged in their 40s, predominantly male, professionals or executives with above average income, they usually live and/or work in metropolitan areas. These are the same sort of people who would typically use Bluetooth® technology and the latest electronic personal organisers in their daily working and social life. They also have a socio-environmental conscience, but still want to enjoy their driving and might currently drive one of the sportier diesel cars in the D-segment or small-premium sector. They are interested in low fuel consumption and low emissions and are willing to pay extra for these benefits because of their lower impact on the environment.

By adopting the new Toyota Hybrid Synergy Drive® and reducing vehicle weight, the new Prius has achieved a 15 per cent reduction in fuel consumption, compared with the previous model.

PIONEERING NEW TECHNOLOGIES

- First application of electric air conditioning system
- Full drive-by-wire control system
- Touch screen and voice recognition functions

The Prius is the first production car to adopt an all-electric air-conditioning system. It is equipped with an electric-inverter compressor driven by an alternating current provided by the A/C inverter, which is built into the inverter of the hybrid system. As a result, the air conditioning system operates independently of the engine, so helping to reduce fuel consumption. A humidity sensor function has been added to the system's room temperature sensor in order to optimise the amount of dehumidification effort during operation. A compact, lightweight, and highly efficient electrical water pump has also been adopted, to ensure proper heater performance while the engine is stopped.

Many of the new technologies used in the Prius – some unique to the car and world firsts – have been made possible by Toyota's bold move to redefine the vehicle's powertrain and electrical architecture. The higher voltages created by the batteries and converter have enabled Toyota's engineers to equip the Prius with a far larger suite of 'drive-by-wire' technologies than has previously been seen in any production car. Throttle, transmission and braking is all electronically controlled and free of the traditional mechanical linkages.

ABS, EBD (Electronic Brakeforce Distribution) and a new version of the Vehicle Stability Control system, called VSC+, operate through an electric/electronic circuit. A central electronic brain, the Skid Control ECU, co-ordinates all these systems to create perfect synergy between them. The VSC+ works in conjunction with the electric power steering system in emergency situations, making it possible to improve vehicle reaction times and so help avoid or minimise the impact of accidents.

New Prius benefits from voice recognition functions for the audio system, air conditioning and satellite navigation, letting the driver keep his or her attention on the road instead of having to adjust control buttons. The system has been designed to respond to an extensive command list. The versatility of the navigation system, fitted as standard to the T Spirit model, allows it to react immediately to commands: for example, the spoken command "hotel" will produce a list of hotels in the neighbourhood, to which a route can be automatically programmed.

Driver distraction is further reduced by the location of more control functions on the steering wheel than ever before. Sixteen functions for audio, ventilation, voice recognition activation and, where fitted, telephone systems are all positioned on the steering wheel pad, right in front of the driver.

UK GRADE STRUCTURE

The new Prius moves from a single model range to offer three distinct grades in the UK market: T_3, T_4 and T Spirit.

The entry-level T_3 grade offers a comprehensive inventory of safety, comfort and convenience features. The active and passive safety package includes front and side airbags and front and rear curtain airbags, front seatbelts with pretensioners and load limiters, ABS with Electronic Brakeforce Distribution (EBD) and Brake Assist (BA), Electronic Traction Control (E-TRC) and Vehicle Stability Control Plus (VSC+).

All Prius come with a sophisticated electric climate control system, electric front and rear windows and door mirrors, remote central door locking, electric power steering, immobiliser with alarm, 60:40 split-folding rear seats, height adjustable driver's seat, tilt-adjustable steering wheel, six-speaker sound system with single disc CD player and controls for audio, ventilation and trip information mounted conveniently on the steering wheel pad.

The T_4 grade adds front fog lamps, cruise control and a premium JBL audio system with six-disc CD autochanger, while the T Spirit benefits from additional DVD-based full-map satellite navigation with voice recognition and Bluetooth™ telephone interface.

KEY FACTS ABOUT THE TOYOTA PRIUS

Concept and market information

- First production hybrid car in the world
- First hybrid vehicle to surpass 100,000 cumulative sales
- Prius showcases breakthrough technologies
- 2004 sales target: 1,500 units in UK, 5,000 in Europe, 76,000 worldwide
- Prius will be available in Europe for the same price of a D-segment diesel car
- In September, the new Prius gathered around 27,500 advance orders in the US and Japan

Toyota Hybrid Synergy Drive®

- First hybrid system to bring together advantages of “serial” and “parallel” hybrid systems
- Engine is the world’s best in terms of thermal efficiency among petrol powerplants
- Electric motor has the best output density among all electric motors produced by Toyota
- The electric motor is now more powerful than most 1.0 to 1.2-litre internal combustion engines
- This motor is also able to attain the world’s highest level of output to weight/volume
- The hybrid battery achieves the highest output density in the world for its weight and size
- New Hybrid Synergy Drive® has more new patents (530) than the first Toyota Hybrid System (300)
-

Body and chassis

- Prius has a drag coefficient of 0.26, the best in class and among the best in the world
- Extensive use of lightweight materials such as aluminium, resin and ultra high-strength steel
- Driving dynamics capitalise on experience gathered in the development of Avensis and Corolla
- UK 7E and 8E insurance classifications for Prius match the best diesel D-segment cars

Environmental and driving performance

- EV driving mode button allows driver to select fully electric driving mode for the first time
- Prius performance beats all cars with equivalent fuel consumption
- Prius demonstrates new technologies do not require compromises in performance or sophistication
- 10.9 sec. for nought to 62mph acceleration competes with D-segment diesels
- Fuel efficiency and emissions rival best B-segment diesel vehicles
- Prius can cover more than 600 miles on a single tank of fuel (combined EC cycle)
- Driving a Prius saves one tonne of CO_2 per year compared to performance of the best D-segment diesels *
- Prius NOx emissions are 96 per cent less than diesel EURO IV levels, with zero particulates emissions
- Toyota Prius produces the lowest NOx and HC emissions of any internal combustion production car in Europe
- First car to comfortably meet EURO IV and Japan and US J-ULEV and AT-PZEV emission regulations at the same time
- Prius saves 32 per cent CO_2 emissions in Life Cycle Assessment compared to a normal petrol car

- Prius is the first Toyota to use vinyl chloride-free wire harnesses
- The car is also easier to dismantle for end-of-life purposes

* Calculation based on the Combined EC cycle, with 12,000 miles driving distance per year

Safety

- First car in the world to use “by-wire” technology for throttle, brakes and gearshift simultaneously
- First vehicle in the world to use a motor-driven traction control system (E-TRC)

- First vehicle to use a stability control system coordinated with steering torque assist (VSC+)
- Both the Electric Power Steering and Skid Control ECUs are 32-bit
- For the first time an advanced CAN Multiplex connects all body control systems
- Eight airbags provided as standard equipment
- Impact-absorbing knee panel and replacement of ignition key cylinder with starter button help protect driver’s knees in a crash

Interior

- Dashboard design, “by-wire” technology and steering pad switches mark a new departure in ergonomics
- Perceived quality is intelligently combined with the use of recyclable materials
- User-friendliness was the priority when developing all the Prius’s advanced features
- World-first electric air conditioning system, using an electric-inverter compressor
- Navigation system uses most advanced voice recognition system in the segment
- First car in the segment with a standard seven-inch liquid crystal display
- Steering pad switches allow the control of 16 different functions (best in the segment)
- Premium JBL audio system is standard in top grade
- Hip-point height and front-rear hip-point distance are class-leading
- Best in segment interior storage capacities
- Flat-folding system for rear seats

CONCEPT AND MARKET INFORMATION
A MAJOR ACHIEVEMENT IN AUTOMOTIVE ENGINEERING

- Most technically advanced car on the road today
- Available in Europe for the same price as a D-segment diesel car
- Prius has sold almost 130,000 units worldwide since 1997
- 2004 sales target: 1,500 units in the UK, 5,000 in Europe, 76,000 worldwide
- Eight-year/100,000-mile warranty for hybrid components
- Prius gathered close to 27,500 advance orders from American and Japanese customers in September 2003
- Target buyer prefers “clean” performance and is receptive to technology
- Available in three grades, with an excellent level of standard equipment
- Seven choices of exterior colour, one refined interior trim

THE CONCEPT BEHIND PRIUS

Toyota’s latest Prius is the most technically advanced car on sale anywhere in the world. It is also the cleanest family car. Combine those facts with its efficient handling and head-turning design and you have a car that can truly live up to its name: appropriately, Prius is Latin for “Ahead of its time”.

The efficient use of our planet’s natural resources is one of mankind’s biggest challenges and an essential strategic consideration for the global automotive industry. This dictates that the car of the future should deliver minimal exhaust emissions and have the lowest possible impact on the environment, although the importance of driving pleasure must not be forgotten. In addition, it will break new ground in terms of safety, passenger comfort and convenience.

With this in mind, Prius uses the most advanced technologies to bring us a taste of the future today. Its new hybrid system is the first to be developed using a revolutionary concept called Toyota Hybrid Synergy Drive®, a principle that addresses the demands of both environmental concern and the desire for performance and driving pleasure.

Current generation hybrid systems rely on the petrol engine to produce peak performance, using the electric motor as an ancillary. The concept of Toyota Hybrid Synergy Drive® gives the electric motor a more important role when powering the vehicle, both in delivering fuel efficiency and peak performance, intensifying the synergy of electric and petrol power.

As the electric motor is much more powerful than before, the petrol engine will be used less, so reducing exhaust emissions. And as the electric motor is significantly more efficient than the petrol unit, better fuel economy will be achieved, in spite of the improved performance. These qualities are demonstrated in the Prius's combined fuel consumption of 65.7mpg and extra low CO_2 emissions of 99g/km in the extra-urban cycle. Furthermore, 0 to 62mph acceleration is achieved in 10.9 seconds.

Hybrid Synergy Drive® is just the starting point for a raft of new technologies that Toyota is employing on this car, many of them appearing on a production car for the first time.

In spite of being ahead of its time, the Toyota Prius sales price will be within the range of current D-segment diesel models, reinforcing its appeal for European car buyers.

The prospect is made even more interesting by the fact that the Prius's hybrid components will be covered by an eight-year/100,000-mile warranty. In addition, the Prius is covered by Toyota's standard three-year/60,000-mile warranty.

TECHNOLOGICAL SHOWCASE

- EV driving mode
- Extensive use of "by-wire" technology
- Breakthrough IT features
- Lightweight materials

Although the hybrid powertrain is the most advanced piece of technology inside Prius, this car benefits from many other ground-breaking features, most of them seen for the first time in a production vehicle.

The new Toyota Prius is equipped with an EV driving mode button. When pressed, the Prius is powered by the electric motor alone, allowing zero-emission performance and a very low level of noise and vibration.

Technology only works when it serves a clear purpose. A large number of the innovations introduced in Prius are used to provide higher levels of safety, comfort and convenience.

The Prius is the first car to use a new kind of stability control system, the Vehicle Stability Control + (VSC+). In addition to the known advantages of VSC, it can provide the right amount of steering torque assist in order to help the driver bring the car under control more quickly. Prius is also the first production car in the world to use an Electric Traction Control system (E-TRC) and Uphill Assist Control, which respond more quickly than conventional systems. This vehicle also incorporates more “by-wire” technology than any other car on the road. Throttle, brakes and gearshift all use this advanced approach that replaces mechanical or hydraulic links with electric and electronic controls. This technology provides quicker responses, which improves safety, reduces the vehicle’s weight and allows for improvements in packaging and ergonomics.

Passenger comfort and convenience ranked high on the list of development priorities. Prius is equipped with the most advanced air conditioning system yet seen in a production car, providing more comfort with less burden on the car’s performance and fuel consumption.

The Prius Multi-information Display is a seven-inch, touch-sensitive LCD that allows the occupants to control the audio system and air conditioning, as well as accessing trip and hybrid system management and energy information. On T Spirit models Prius is equipped with the most advanced navigation system on the market today, equipped with voice recognition, as well as a Bluetooth® phone hands-free system.

Although only available in Japan, the Intelligent Parking Assist system makes Prius the first car in the world capable of parking itself.

The Prius also takes full advantage of the latest lightweight materials technology: everything from the body shell to the accelerator has been reduced in weight since having less mass to haul around helps lower fuel consumption and emissions, as well as enhance vehicle performance.

And while the Prius is on the move, its class-breaking Cd figure (0.26) ensures that it cleaves the air with minimum resistance, further helping to bring down emissions and fuel consumption. Although the Prius combines more new technology than any other car on the road, every bit of innovation was developed with user-friendliness firmly in mind. Unlike many other hi-tech cars available today, every feature of the Prius is easy to understand and operate.

GLOBAL SALES SUCCESS

Since its introduction in 1997, almost 130,000 Prius have been sold globally, making it the most successful hybrid vehicle on the planet. But Prius has achieved more than that: it

helped educate the world to the idea of cars powered by a means other than purely petrol or diesel. It started motorists thinking and beginning to understand that green doesn't have to equal boring.

Today, Toyota is the world's largest manufacturer of hybrid vehicles with almost 140,000 sold since 1997. That figure is set to increase rapidly as the new Prius becomes available in the USA, Japan and Europe. In 2004, its first full sales year in the UK, Toyota expects to sell 1,500 units, contributing to 5,000 in Europe and 76,000 worldwide. In September this year it gained close to 27,500 advance orders from American and Japanese customers.

COMPETITIVE ON THE ROAD PRICING

The new Toyota Prius is priced to rival the best of the D-segment diesel market. The T_3 entry level model has an OTR price of £17,495, but qualifies – along with all other Prius models – for a £1,000 grant under the Government's PowerShift scheme, bringing the cost to the customer down to £16,495.

Taking the Prius T_3's comprehensive specification of safety, comfort and convenience features into account, it works out better value for money than its established, high volume competitors. Balanced against the OTR price and specification of equivalent Vauxhall Vectra, Renault Laguna and Ford Mondeo models, the Prius works out anything up to 7.8 per cent better value. And that is before you factor in the lower running costs achievable thanks to the car's fuel efficiency, servicing requirements and the cost of replacement parts.

Full details of how the new Prius competes on pricing against key rivals is provided in the table below (prices correct at the time of writing).

TOYOTA PRIUS COMPETITOR PRICE COMPARISON

	TOYOTA PRIUS T_3	VAUXHALL VECTRA SXi 2.0 TDi	RENAULT LAGUNA DYNAMIQUE 1.9 DCi	FORD MONDEO ZETEC 2.0 TDCi
On the road price	£17,495	£16,845	£17,075	£17,300
PowerShift grant	(£1,000)	-	-	-
Adjusted price	£16,495	£16,845	£17,075	£17,300
SPECIFICATION				
Air conditioning	✓	✓	✓	✓
Climate control	✓	×	×	✓
Electric front windows	✓	✓	✓	✓
Electric rear windows	✓	×	✓	✓
Electric door mirrors	✓	✓	✓	✓
CD player	✓	✓	✓	✓
Steering wheel audio controls	✓	✓	✓	✓
Leather steering wheel trim	×	✓	✓	✓
Rear spoiler	✓	×	✓	×
Front reading lights	✓	×	✓	×
Illuminated vanity mirrors	✓	×	✓	✓
Fuel consumption computer	✓	×	✓	✓
60:40 split-folding rear seats	✓	✓	✓	✓
ABS with EBD and Brake Assist	✓	✓	✓	✓
Cruise control	×	✓	×	✓
Front fog lights	×	✓	✓	✓
Driver & passenger front airbags	✓	✓	✓	✓
Front side airbags	✓	✓	✓	✓
Front and rear curtain airbags	✓	✓	✓	✓
Electronic traction control	✓	✓	×	×
Vehicle stability control	✓	×	×	×
Alarm system	✓	✓	✓	✓
Sunroof	×	×	✓	×
Specification adjustment	-	£685	£700	£430
Specification adjusted price	£16,495	£17,530	£17,775	£17,730
Percentage difference	-	+6.3	+7.8	+7.5

LOW MAINTENANCE AND REPAIR COSTS

Although the new Prius boasts more advanced technology features than any other car in its class, there is no penalty for owners in terms of its servicing schedule or the cost of maintenance and crash replacement parts.

Taking the price of like-for-like components, the new Prius is actually cheaper overall to maintain and repair than many of its key market rivals – its stablemate, the new Toyota Avensis, being the notable exception.

Calculating the collective price of front and rear body parts commonly replaced following a collision, such as wings, bonnet and bumpers, the bill for the new Prius is up to £762 cheaper than the most popular D-segment models. On maintenance items, such as filters and brake pads, the combined cost works out up to £35 less than the competition.

More than that, the Prius's advanced powertrain does not call for more frequent servicing. In common with all contemporary Toyota passenger cars, the maintenance programme requires a major service only every 20,000 miles, with interim "health and safety" checks with oil change every 10,000 miles.

Further peace of mind is provided by the eight-year/100,000-mile warranty on all the Prius's hybrid components.

Full details of how the new Prius measures up against its main segment rivals in terms of repair and maintenance costs are provided in the table below.

NEW PRIUS COMPETITOR COMPARISONS

	NEW PRIUS	TOYOTA AVENSIS	RENAULT LAGUNA	VOLKSWAGEN PASSAT	FORD MONDEO	VAUXHALL VECTRA	MAZDA 6
FRONT CRASH PARTS							
Bonnet	£119.51	£118.88	£197.00	£142.81	£139.86	£198.00	£145.36
Radiator grille	£0.00	£63.31	£42.60	£46.44	£57.93	£34.11	£37.29
Front bumper	£106.90	£94.54	£200.00	£167.65	£99.30	£195.00	£138.96
Front wing	£97.88	£79.79	£84.00	£85.00	£76.41	£84.00	£78.85
Headlamp (excl. bulb)	£78.91	£95.23	£112.00	£199.00	£102.50	£123.00	£94.06
Radiator	£162.53	£149.26	£220.00	£127.69	£200.26	£151.00	£137.36
A/C condenser	£230.99	£199.38	£431.00	£321.00	£192.42	£164.00	£163.81
Total front	£796.73	£800.39	£1,286.60	£1,089.59	£868.68	£949.11	£795.69
Percentage difference	-	+0.5	+61.5	+36.8	+9.0	+19.1	(0.1)
REAR CRASH PARTS							
Rear bumper	£106.90	£86.66	£182.00	£265.93	£99.30	£184.00	£148.27
Tailgate	£184.42	£168.95	£240.00	£149.00	£188.67	£192.98	£187.00
Rear quarter panel	£135.41	£130.47	£269.00	£187.34	£95.91	£132.10	£185.14
Rear lamp cluster (excl. bulbs)	£72.87	£42.92	£80.80	£57.00	£46.96	£48.20	£45.62
Total rear	£499.61	£429.00	£771.80	£659.27	£430.84	£557.28	£566.03
Percentage difference	-	(14.1)	+54.5	+32.0	(13.8)	+11.5	+13.3
Total front & rear	£1,296.33	£1,229.39	£2,058.40	£1,748.86	£1,299.52	£1,506.39	£1,361.72
Percentage difference	-	(5.2)	+58.8	+34.9	+0.2	+16.2	+5.0
MAINTENANCE PARTS							
Oil filter	£7.00	£7.00	£6.20	£5.73	£5.17	£8.35	£7.10
Air filter	£12.40	£11.00	£14.95	£13.00	£11.27	£6.35	£14.27
Front brake pads	£33.02	£42.59	£36.30	£59.00	£50.95	£46.85	£59.98
Rear brake pads/shoes	£36.04	£26.01	£45.00	£34.00	£57.99	£27.05	£41.10
Total maintenance	£88.46	£99.85	£102.45	£111.73	£125.38	£88.60	£122.45
Percentage difference	-	+12.9	+15.8	+26.3	+41.7	+0.2	+38.4
Grand total	£1,384.79	£1,329.24	£2,160.85	£1,860.59	£1,424.90	£1,594.99	£1,484.17
Percentage difference	-	(4.0)	+56.0	+34.4	+2.9	+15.2	+7.2

All prices are recommended retail, exclude VAT and are correct at the time of printing (November 2003). Source: Statagem Marketing and Business Services

TARGET BUYER PROFILE

Potential customers for the second generation Prius are seen as 'early adopters' rather than the 'innovators' who bought the original model.

Typical 'early adopters' are in their 40s, predominantly male, professionals or executives with a higher level of education and above average income, usually living and/or working in metropolitan areas. These are the same sort of individuals who would typically use Bluetooth® technology and the latest electronic personal organisers as part of their daily working and social lives. They also have a socio-environmental conscience, but still want to enjoy their driving and might currently drive one of the sporty diesel cars in the D-segment or small-premium sector. They are interested in low fuel consumption and low emissions and are willing to pay extra for these benefits because of their reduced impact on the environment.

Moreover, with congestion charging now a reality in London – and likely to spread to other cities in the UK and Europe – these 'early adopters' are looking for ways to avoid these fees. Cars like the Prius are currently exempt from London's congestion charge.

COLOUR AND GRADE SPECIFICATION

The new UK model Prius comes with three specification levels: T_3, T_4 and T Spirit. Even the entry-level T_3 model has standard equipment features that are more commonly found on more expensive, executive segment cars.

Amongst the standard list of equipment is: a full range of electronic body control systems, front, side and curtain airbags, a protective knee panel, push button start, UV-cut glass. Also included as standard equipment are: heated door mirrors, twin power outlets; six speaker audio system with DSP and a 7-inch colour Multi-information Display screen.

T_4 adds cruise control, nine speaker JBL audio with six disc CD changer and front fog lights. T Spirit adds DVD navigation system with voice recognition and Bluetooth® telephone interface.

The new Prius comes in a selection of seven colours: Pure White, Silver Steel, Astral Black, Regency Red, Aztec Bronze, Sileni Green and Glacier Blue. For the interior trim, Millbeck grey cloth is used.

HISTORY OF HYBRID TECHNOLOGY

NEW PRIUS IS THE RESULT OF FOUR DECADES OF HYBRID EXPERIENCE

- Toyota's research into hybrid power began almost 40 years ago
- 1977 Sports 800 hybrid inspiration for Toyota Hybrid Synergy Drive® philosophy
- 1997 marks the launch of the world's first hybrid bus (Coaster HV) and car (Prius)
- In 2000 an improved version of Prius launched in Europe and the USA
- 2001 brings first 4WD hybrid, the Estima Hybrid
- Hybrid introduces a host of technologies, including world's first brake-by-wire system
- First mild hybrid application in 2001 (Crown Mild Hybrid with THS-M)
- World's first production fuel cell car (Toyota FCHV) uses hybrid power as well
- Alphard HV launched in 2003, Toyota now offers six different hybrid production models
- The future starts now, with the new Toyota Prius

THE ROOTS OF HYBRID TECHNOLOGY

Toyota might have hit the headlines when it launched the original Prius to world acclaim in 1997, but its history of developing environmentally-friendly hybrid vehicles stretches back nearly 40 years to 1965 when it started investigating the feasibility of using gas turbines to power an electric drive system for cars.

In 1969 Toyota developed a bus equipped with this system, but with a two-shaft engine. Six years later the same technology was applied to a passenger car with the display of the gas turbine/electric Toyota Century hybrid, a version of Toyota's flagship model in Japan.

In 1977, Toyota displayed its future thinking in the Toyota Sports 800 gas turbine hybrid. The application of a prototype hybrid system in this purpose-built sports car embodied a concept that Toyota engineers already had in their minds – performance with respect for the environment. This is exactly the same philosophy that is being followed today with Toyota's latest Hybrid Synergy Drive®.

TOYOTA'S COMMITMENT TO THE ENVIRONMENT

Now the world's third largest producer of vehicles and its best-selling brand, Toyota passionately believes it has a responsibility to protect the environment, while ensuring the daily transport needs of everyone and providing efficient, cost-effective transport for future generations. This is not a trendy 'green' stance but a strategic element to Toyota's long-term plans.

Toyota has a well-founded history of developing practical, intelligent solutions to achieve the long-term goal of reducing emissions and fuel consumption, whatever the powertrain. Toyota is working on a wide spectrum of advanced combustion technologies such as Variable Valve Timing-intelligent (VVT-i) petrol engines and high pressure, common-rail diesel engines.

Since that journey began nearly four decades ago with the turbine car, Toyota has achieved a number of significant milestones.

In 1997, Toyota unveiled its Coaster HV, a small bus that was the world's first hybrid vehicle, powered both by an electric motor and a petrol engine. Designed for transportation and sightseeing in areas such as theme parks and resort facilities, the Coaster combines an electric motor with a 1.5-litre petrol engine, has far cleaner emissions, and is much quieter under acceleration.

In the same year, the world-beating Prius was introduced, the first production hybrid passenger car. The Prius delivered ultra-low emissions in urban conditions, an unlimited driving range and a regenerative braking system that recycled surplus energy back into the car's storage batteries. All this was made possible thanks to the THS (Toyota Hybrid System).

The Prius was an immediate success and, among its more unusual accolades, it became the first hybrid car to finish an FIA sanctioned rally, 14th in the gruelling, three-week, 5,000 mile Midnight Sun to Red Sea Rally of 2002.

In the space of three years the Prius gathered no fewer than 20 prestigious awards from around the world, including the 1997 Japanese Car Of The Year title and the 1999 Global 500 Award for Environmental Commitment from the United Nations.

With outstanding fuel economy – 55.4mpg on the EC combined cycle – and carbon dioxide emissions of 120g/km, the Prius could still cruise at 100mph and reach 62mph in 13.4 seconds.

While Prius was gathering all the awards, Toyota engineers were not resting on their laurels. They were busy developing both existing petrol and diesel engines in a never-ending quest to reduce their environmental impact.

THE NEXT STEPS IN HYBRID TECHNOLOGY

In 2000 Prius benefited from a host of improvements, giving it better performance and still lower emissions. Styling and equipment enhancements were introduced and Prius was launched in Europe and the USA, starting the “hybrid revolution” in the world’s largest car markets.

In June 2001 Toyota brought hybrid powertrains to the fast-growing four-wheel drive market with the introduction of the Estima Hybrid in Japan. The car launched a revolutionary body control system which delivers levels of stability and agility that have never before been seen in an MPV. The system uses world-first ‘by-wire’ braking which works in close coordination with the vehicle’s ABS, EBD, Brake Assist, Traction Control (TRC) and Vehicle Stability Control (VSC).

In addition, the Estima's hybrid power plant can generate up to 1500 watts of auxiliary 100-volt AC, making it ideal for use as an emergency vehicle or mobile office. Telematics and ITS (Intelligent Transport System) functions add further safety, convenience and entertainment benefits.

The Estima Hybrid uses a CVT in a compact front transaxle to transmit main motor energy, together with a rear transaxle that combines a second motor and differential gear in a single unit, creating a lightweight, compact structure that enables four-wheel drive without a driveshaft. The Estima Hybrid can travel up to 625 miles on one tank of fuel, achieving twice the fuel efficiency of Japan's 2010 standards, and one quarter of the HC and NOx levels stipulated in Japan's latest regulations.

The Estima Hybrid was followed by a hybrid version of Toyota’s Crown luxury saloon powered by a mild-hybrid (mybrid) that improves fuel efficiency by about 15 per cent.

The Crown retains its three-litre, direct injection engine producing 203bhp and 294Nm of torque, but this is augmented by a three-kilowatt electric motor/generator which supplies an additional 56Nm of torque between zero and 300rpm.

The THS-M (Toyota Hybrid System-Mild) comprises a small motor-generator connected to a high-efficiency engine by an electrical accessories-powering belt, a compact 36V secondary battery for appropriate power supply to the motor and a control unit. The system's 36V battery (in the world's first in-car 42V power system) is able to meet both the large electrical power demands of the hybrid system and the increasing electrical load of modern cars. The higher voltage and resulting smaller current possible in a 36V battery system allow the wire harnesses to be much thinner than those in standard 12V systems, contributing to overall weight reduction and less demand on materials resources.

In 2001, Toyota introduced the FCHV-4, its latest experimental fuel cell hybrid vehicle. FCHV-4 incorporates a fuel cell and a battery to ensure a constant supply of electrical power. To manage this hybrid combination of power sources, Toyota has used the same computerised control technologies as deployed in the THS. An improved version of the FCHV-4 is now being marketed with the name FCHV.

Toyota started limited marketing of the Toyota FCHV sport utility vehicle in Japan and the United States around the end of 2002, much earlier than originally planned. Thus far, 20 units have reached the road in the US and Japan. Powered by pure compressed hydrogen gas, the FCHV is an SUV with a kick. Its Toyota FC stack puts out an impressive 90kW and 260Nm of torque — more than four times that of Toyota's first fuel cell car in 1996, giving it a top speed of 97mph, and a cruising range of 187 miles.

This year Toyota introduced its second hybrid MPV to the Japanese market, the Alphard HV. The vehicle shares the same components with the Estima HV, which itself received a host of improvements for 2003. The arrival of the Alphard HV increased the number of Toyota hybrid models to six, three times as many as any other manufacturer has managed to put on the market.

2003 also brings the second generation Prius, equipped with many technical innovations that bring the future of motoring into the here and now.

TOYOTA HYBRID SYNERGY DRIVE® IN DETAIL
BRINGING FUTURE AND PRESENT CLOSER TOGETHER

- Hybrid Synergy Drive® provides performance with low impact on the environment
- Ultra-efficient electric motor has a greater role in powering the vehicle
- 10.9 sec. 0-62mph acceleration and 65.7mpg combined fuel consumption
- EV driving mode lets driver choose totally electric drive at the push of a button
- High Voltage Power Circuit gives more power with lower electrical current
- World's most powerful electric motor for its weight and size
- Atkinson cycle petrol engine is the most efficient petrol unit in production
- Smart Regenerative Braking System saves energy using the car's kinetic energy
- Petrol engine is automatically turned off when Prius is stopped in traffic

WHAT IS TOYOTA HYBRID SYNERGY DRIVE®?

- A new philosophy and a new powertrain
- Brisk acceleration with low fuel consumption
- Performance with low impact on environment
- EV driving mode sets it apart from previous hybrids

When the Toyota Prius was launched in 1997, it set the standard for other manufacturers wanting to develop hybrid cars commercially. Now, with nearly six years experience and almost 140,000 hybrid vehicles sold worldwide, Toyota's engineers have taken the opportunity with the second generation Prius to up the pace and establish new parameters for hybrid vehicles.

The latest Prius has more technology, performance, economy, space, equipment and dynamics and greater ride quality. Furthermore, there's fewer exhaust emissions, which also means lower fuel consumption.

The new Toyota Prius can return fuel consumption comparable to the best B-segment diesels. Fuel consumption figures are 65.7mpg Combined and 67.3mpg for Extra Urban driving. In the Urban Cycle, new Prius consumes only 56.5mpg, which beats every car on the UK market by a large margin. Production of CO_2 and NOx are also radically low, while particulate matter emissions are non-existent. At the same time, this D-segment car can also accelerate from 0 to 62mph in less than 11 seconds.

The new hybrid system, which makes its debut in the Toyota Prius, is the first to be developed according to a revolutionary concept, Hybrid Synergy Drive®. Current-generation hybrids rely on the petrol engine to produce peak performance, with the electric motor as an ancillary. Hybrid Synergy Drive® gives the electric motor a more significant role and gives performance a new emphasis.

As well as making the Prius environmentally friendly, Toyota engineers were keen to develop a car that is rewarding to drive and, therefore, a truly viable alternative to conventional diesel or petrol-only vehicles.

Hybrid Synergy Drive® is not just an evolution of the original Toyota Hybrid System (THS). It is an entirely new departure that is designed to provide the best solution for those who want both driving pleasure and the lowest impact on the environment. In fact, Hybrid Synergy Drive® involved the registration of more patents than the original THS: 530 versus 300.

A more powerful 1.5-litre petrol engine works together with a smaller, more efficient electric motor to deliver performance that positions the Prius as a serious contender in the D-segment. The electric motor is now more powerful than most 1.0 to 1.2-litre internal combustion engines and, at 400Nm from 0-1200rpm, the Prius's torque figure surpasses that of V6 diesels. As a result, 0 to 62mph acceleration falls below 11 seconds, making it almost three seconds faster than the current model and comparable to a conventional 2.0-litre diesel car.

Because the hybrid's advanced control system uses the electric motor as the main power source, it displays exceptional smoothness. Acceleration is powerful but linear, especially from 30 to 50mph, while noise and vibration are minimal.

For the first time in a hybrid car, the driver can use the EV (Electric Vehicle) driving mode simply by pressing a button on the dashboard. This allows the exclusive use of the electric motor to power the vehicle, producing zero emissions and very low noise – ideal when city commuting (see chapter nine for further information).

HIGH VOLTAGE POWER CIRCUIT

The high voltage power circuit is a revolutionary new technology that supports the new hybrid system. By providing a newly developed high-voltage power circuit inside the power control unit, both the motor's and generator's voltage have been increased from 274V in the original Prius to a maximum of 500V in the new model. The high voltage power circuit increases power by upping the voltage from 202V to a maximum of 500V while keeping the

current constant. Furthermore, for the same power level, increasing the voltage and reducing the current minimises energy loss, resulting in even better efficiency. This is only possible due to the IGBT (Insulated Gate Bipolar Transistor). This unique transistor has been finely tuned down to the crystal level.

As a result, electrical power can be supplied to the motor by using a smaller current, thereby contributing to increased efficiency (see chapter nine for further information).

The battery voltage in new Prius is lower than that of the previous model. However, a new converter (similar to an electric turbo-charger) boosts the total system voltage to 500V when in use.

ELECTRIC MOTOR

Toyota has been able to increase power supply by 1.5 times over the original Prius from 33kW to 50kW, even though the motor hasn't increased in size.

This electric motor is of the AC synchronous type. The permanent Neodymium magnets are arranged in an optimum 'V' configuration to maximise drive torque and increase overall output. This, combined with a larger power supply that is achieved by an increase in the power supply voltage, has resulted in the 150 per cent power hike. This makes it the most powerful motor for its weight and size of its kind in the world.

While output in the low and high-speed ranges in the original Prius was good, Toyota has developed a new over-modulation control that improves the pulse width in the medium range resulting in a 30 per cent increase in output.

GENERATOR

As with the electric motor, the generator is also an AC synchronous type and, in order to supply sufficient power to the high output mode, the generator spins at 10,000rpm. Compared to more conventional motors that rev at about 6500rpm, the new generator has a strengthened rotor to cope with the high rotational stresses. The high rpm enhances the power supply in the medium-speed range thereby improving mid-range response and acceleration.

PETROL ENGINE

This is a development of the unit used in the previous model. The Atkinson cycle is still used to provide unparalleled efficiency. However, several modifications have been introduced in order to improve performance and economy:

- Combustion chamber is now oval
- Piston wall thickness has been optimised to reduce weight and inertia
- Piston rings have lower tension and valve spring load is lower
- The thickness of the wall of the exhaust manifold has been decreased
- Engine ECU has been upgraded to 32-bit
- Through a 500rpm increase in maximum engine speed, maximum power is improved by 4kW and maximum torque is achieved at a lower speed

POWER CONTROL UNIT

This houses the inverter that converts the battery's DC current into AC for driving the motor as well as the DC/DC converter for conversion to 12V.

In addition, it incorporates a High Voltage Power Circuit to increase the voltage of the power supply from 202V to a maximum of 500V. Increasing the voltage makes it possible to reduce the current which, in turn, enables the inverter to be made smaller. By integrating the control circuits, the overall size of the power control unit is virtually unchanged.

HYBRID BATTERY

A new high-performance, nickel-hydride battery has been specially developed for the latest Prius. It is 14 per cent lighter than the version used in the first generation model and has an input/output density 35 per cent better. These improvements give the hybrid battery the highest output density in the world for its weight and size.

This has been achieved by reducing the battery's internal resistance by improving the electrode material and employing an entirely new connection structure between the battery cells.

And, more importantly, the new battery's static current drop was reduced by 23 per cent compared with the former version. This means the new battery will lose its charge much more slowly when not in use.

REGENERATIVE BRAKING SYSTEM

In a conventional car, each time the brakes are applied to slow down, kinetic energy is wasted. Not so in the Prius, as this energy is captured and fed back into the battery as electrical energy to keep the battery fully charged. This is particularly useful during city stop-start driving.

Under braking the electric motor operates as a generator converting the vehicle's kinetic energy into electricity, which is used to keep the battery fully charged. Each time the footbrake is applied the system controls the coordination between the hydraulic brake, the Electronically Controlled Brake System (ECB) and the regenerative brake to preferentially use regenerative braking, thereby recovering energy even at very low vehicle speeds. ECB (a brake-by-wire system) also brings a huge improvement in terms of regenerative braking performance.

Additionally, by minimising the friction loss in the drive system, such as in the transmission, the energy that used to be wasted during deceleration is now recovered, significantly increasing the total amount of regenerated energy.

POWER SPLIT DEVICE

This is housed within the hybrid transmission along with the generator, electric motor and reduction gears and divides the engine power between the wheels and the generator. In this way the motive power from the engine is transmitted through two routes: mechanical and electrical. It also transmits the electric motor's torque to the wheels.

The power split device uses a combination of planetary gears and a sun gear (so called because the planetary gears orbit the central sun gear like the solar system) to divide the engine power.

The rotational shaft of the planetary carrier inside the gear mechanism is linked directly to the engine and transmits power to the outer ring gear and the central sun gear via pinion gears. Meanwhile, the outer ring gear transmits power via a rotating shaft to the wheels as the central sun gear drives the generator via its own driveshaft (see chapter nine for more information).

STOP AND GO SYSTEM

When Prius has to stop at a traffic light or in a traffic jam, the petrol engine is automatically turned off in order to save energy. This also has a positive impact on fuel consumption. If prompt acceleration is needed when moving away from stationary, the petrol engine will automatically intervene to deliver maximum performance smoothly.

HOW DOES IT ALL WORK?

A significant difference between the original Prius and other competitor hybrid systems was its ability to choose the most suitable operating mode for every situation, ranging from entirely electric power (for maximum efficiency) to engine-plus-motor-plus-battery power (for performance). With Hybrid Synergy Drive®, this capability has been significantly improved.

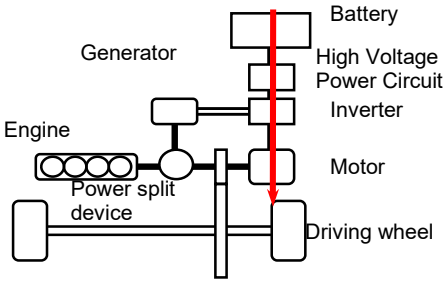
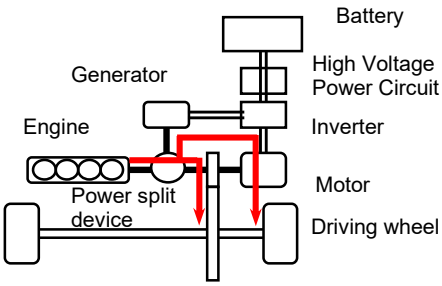
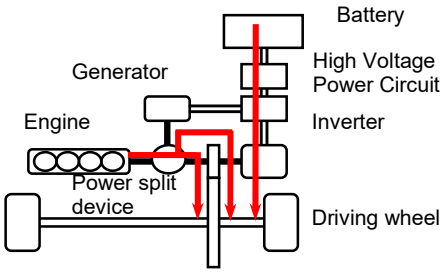
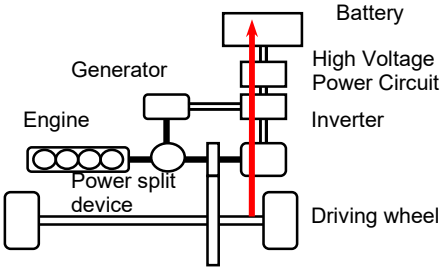
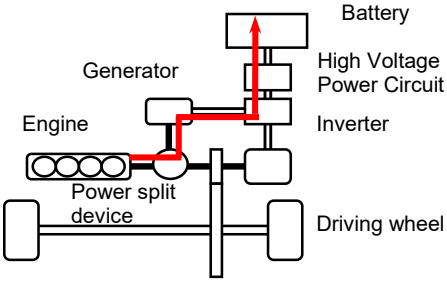
If the engine is running at low efficiency, the vehicle will operate exclusively on power generated by the motor. Under normal conditions, both the highly efficient engine and the electric motor power the wheels. The system selects an efficient engine domain to drive the vehicle and continuously controls the efficiency ratios of power generation and drive power distribution.

With the improvement of motor efficiency, the ratio of motor usage has been increased, meaning that the engine can be stopped completely when its efficiency levels reach a certain low level. This broadens the operating band within which the vehicle will run from power generated by the motor alone.

Furthermore, by using the high-output motor as a high performance generator during deceleration and braking, and coupling this with the higher performance battery, greater energy regeneration is achieved. All these features combine to form a foundation for the quest to achieve the world’s best fuel efficiency.

SYSTEM OPERATION

Mechanical transmission Electrical transmission

Operational status	
At acceleration from start and at low to mid-range speeds The engine is stopped when it encounters a poor-efficiency range under a wider range of operational conditions such as acceleration from standing start and up to mid-range speed. The vehicle runs entirely on power generated by the motor.	
During driving under normal conditions Power generated by the engine is distributed two ways by the power split device. One power stream is used to drive the generator, which in turn drives the motor. The other power stream is used to directly drive the wheels. The distribution of these power streams is controlled to provide maximum efficiency.	
During sudden acceleration During sudden acceleration, extra power is supplied from the battery while the engine adds drive to the high-output motor, providing good response and a smooth drive, as well as improved acceleration performance.	
During deceleration, such as through braking During deceleration, for instance under braking, the high-output motor functions as a large capacity generator, controlling power distribution to the wheels. The system functions as an efficient regenerative braking system recovering the vehicle's kinetic energy as electrical energy. The recovered energy is then stored in the high-performance battery.	
While the battery is recharging The battery is controlled to maintain a certain level of charge. When the charge level becomes low the generator kicks in to recharge it.	
When the vehicle is stopped, the engine automatically stops.	

BODY AND CHASSIS

FORM AND FUNCTION COMBINED FOR MAXIMUM EFFICIENCY

- Development of exterior design moves away from the conventional saloon to a versatile hatchback
- World beating aerodynamics reduce energy consumption and improve performance and driving stability
- Prius's dimensions move it into the D-segment
- Suspension developed using experience gained from Corolla and Avensis
- Electric Power Steering now uses a more efficient 32-bit ECU
- Michelin tyres provide appreciable amounts of grip with a low friction coefficient

INNOVATIVE DESIGN

- Use of the "triangle monoform" theme

Not only is the Prius the most technically advanced car on the market, it also has one of the most radical and intelligent designs.

The striking styling marks a new departure from the appearance of the original Prius, evolving from a traditional four-door saloon bodystyle to a versatile five-door hatchback. Some styling cues established by the original version are retained, however.

WORLD-LEADING AERODYNAMICS

- Class-leading Cd 0.26
- Special roof shape reduces frontal area
- Flat underfloor improves stability

Aerodynamics plays a significant role in helping to improve fuel economy and performance and in this respect Prius enjoys a class-leading coefficient of drag (Cd) of 0.26. In addition, front and rear coefficient of lift are -0.004 and 0.074 respectively, providing excellent high speed stability.

Hundreds of hours of wind tunnel testing were undertaken to fine tune the car's dynamic profile and achieve a suitable balance of style and aerodynamic efficiency. The result is a body shape that is not just pleasing to the eye but also delivers quiet and stable performance at speed. The Prius's reduced frontal area, achieved using a special roof design, means it cleaves the air more efficiently than other cars. The car's underside is smooth (apart from

the area of the rear suspension) and this plays a significant role in reducing overall drag and generating downforce.

To further improve aerodynamic performance, a rear spoiler has been integrated within the rear hatch. The airflow under the car aft of the rear wheels is regulated by a rear air extractor beneath the rear bumper, similar to the system used on many racing cars.

The aerodynamic foil beneath the engine and the front bumper liner has been redesigned for optimum performance. Additional spats and a front spoiler have been provided to smooth out the airflow around the tyres and reduce air resistance when the vehicle is in motion.

At the front, the line of the bonnet tapers towards its leading edge and the Toyota symbol. The bumper has a smooth surface with a sharp centre crease line. The short nose and slanted headlight configuration are reminiscent of the first-generation Prius, but they move the design forwards to give the vehicle a fresh look.

From the rear, the Prius is easily identified by its high-deck hatchback design with an integrated smooth, arching spoiler. Beneath the spoiler there is a second rear window section which ensures good rear visibility and emphasises the vehicle's wide stance.

From the side, the Prius is distinguished by its sleek and aerodynamic cab-forward design, its basic triangular one-piece form and its long wheelbase.

BIGGER BUT MORE EFFICIENT

- Prius outperforms D-segment rivals
- Class-leading interior measurements
- Lower repair costs than D-segment diesels

While the new car is instantly recognisable as an evolution of the original Prius, it is bigger in every respect and a true D-segment car: at 4,450mm long overall, it is 135mm longer than its predecessor. All importantly, the wheelbase has been extended by 150mm over the old car to 2,700mm, so maximising space for passengers. The new Prius is significantly larger than the outgoing model moving it up into the D segment.

The five-seat interior features rear seats that fold flat and have a 60:40 split function. The front seats have a class-leading 575mm hip-point height which not only makes it easier to get in and out of the car, but also provides the driver with a commanding position at the wheel and better all-round visibility.

DIMENSIONS		2003 PRIUS	2000 PRIUS
Length (mm)		4,450 (+135)	4,315
Width (mm)		1,725 (+30)	1,695
Height (mm)		1,490 (+15)	1,475
Wheelbase (mm)		2,700 (+150)	2,550
Overhang	Front (mm)	890 (+65)	825
	Rear (mm)	860 (-80)	940
Kerb weight (kg)		1,300* (+35)	1,265*
Luggage room (m^3)		0.408 (+0.018)	0.390
Coefficient of drag (Cd)		0.26 (-0.03)	0.29

* Running order weight, measured with one passenger on board

Toyota engineers also paid attention to repair costs. With the new Prius, the radiator support and centre brace, previously welded into place, have been replaced by bolt-on components to make repairs simpler and quicker. Likewise, the support brackets for the headlights are now separate items, helping protect them from damage in low speed knocks. This means the headlight housing can be reused, replacing the damaged support bracket with a new one.

Prius insurance classifications match the level of the best D-segment diesels in both the UK (7E or 8E, according to grade) and Germany (class 15, target figure). Scheduled maintenance up to 60,000 miles takes only 4.2 hours to complete. This matches the Avensis 2.0 D-4D, which currently has the shortest maintenance time among D-segment diesel cars.

LIGHTWEIGHT MATERIALS TO THE FORE

- Aluminium and ultra high strength steel play key role
- Rigid structure enhances dynamics
- Weight reduction achieved right down to nuts and bolts
- Vehicle dynamics tuned for European demands

Kerb weights have been increasing throughout the car industry, thanks to the general increase in equipment levels, such as air-conditioning systems and infotainment technologies, as well as the proliferation of airbags and other safety related items. This has the potential to raise fuel consumption and, consequently, emissions.

Toyota's engineers have tackled this problem by making extensive use of lightweight materials such as high strength steel and aluminium.

Ultra high-strength sheet steel and hot-stamp material have been adopted in the ‘B’ pillar reinforcements and roof cross members in order to achieve a body structure that is both strong and lightweight.

Ultra high-strength sheet steel has approximately 1.6 times the strength of conventional high-strength sheet steel; the hot-stamp material is approximately 2.5 times stronger. Therefore, a weight reduction of approximately 40 per cent can be achieved with ultra high-strength sheet steel, and approximately 60 per cent with the hot-stamp material while providing the same degree of robustness as high-strength sheet steel.

Aluminium is now used for both the bonnet and the rear hatch panel. As a result, a weight reduction of 36 per cent (3.2kg) has been achieved for the bonnet, and 43 per cent (6kg) for the tailgate, compared to using steel.

Aluminium is also used in the brake calliper cylinder, together with a weight-saving phenol resin piston. Using aluminium for the steering knuckles helps to reduce unsprung mass further and improve driving feel and dynamics.

The judicious use of strengthening sections within the car’s structure also aids ride and handling. Rigidity around the cowl has been increased by adding reinforcements which join the front suspension towers and the instrument panel reinforcements, either side of the cowl.

Dash panel reinforcements join the cowl with the upper area of the floor tunnel and the right and left front side members. This improves the rigidity of the cowl and restrains the vibration of the dash panel.

Large reinforcements have also been placed around the quarter windows to help dissipate the forces from the rear suspension towers and provide greater rigidity.

Additional reinforcements have been located around the rear wheel housings. In addition, brackets to join this area to the upper battery case have been adopted to improve the vehicle’s torsional rigidity.

ELECTRIC POWER STEERING

- More powerful 32-bit ECU
- System saves fuel and provides better feel

Good steering feedback is important to European motorists, who generally dislike an insulated feel from their car as they drive. As with the original Prius the new model uses a rack-and-pinion system with speed sensing Electric Power Steering (EPS) as standard. Because the EPS system is linked to the Prius electronic stability control network, it can constantly gauge how much power assistance the steering system might or might not require, feeding in the precise amount of corrective torque only when it is needed. A more powerful 32-bit processor for the EPS ECU provides better performance. The system also offers excellent fuel economy as power assist is provided by the DC motor, mounted on the steering column. This consumes energy only when power assistance is demanded.

SUSPENSION

- Front suspension derived from Avensis
- Evolution of Corolla rear suspension
- Ride stability a priority
- Efficient control of body motion

European drivers demand very different vehicle dynamics from those in the USA and Japan, the two other principal Prius markets.

To ensure the new Prius satisfied European demands, a team from Toyota Europe travelled to Japan in 2002 to assess early development models and make recommendations to their Japanese colleagues. A year later they were putting development cars through their paces on roads ranging from smooth German autobahns to Belgian pave cobbles and the rough surfaces of British country lanes.

“Tuning the chassis to suit European tastes was a priority,” says Jos de Boes, general manager of the Vehicle Engineering Division at Toyota Europe. “For Prius the biggest priority was achieving stability in all driving conditions. Because this car can reach higher speeds we had to ensure it was safe at those speeds, even during an emergency lane change.

"Our second priority was control of the roll motion. We wanted to avoid excessive roll during cornering. What we ended up with was adopting rebound springs at the front and rear of the Prius for Europe – which are not fitted to Japan and USA versions, where driving conditions are very different.”

Both Japanese and European Prius engineers were working from a very sound basic structure. The new generation Prius adopts front MacPherson strut independent suspension from the already acclaimed new Toyota Avensis. The rear suspension is an evolution of the Corolla's torsion beam set-up that allows a degree of anti-lift geometry and toe-out under hard cornering giving exceptional stability and control.

Stable and predictable handling is further enhanced by Toyota's adoption of 'Nachlauf' geometry for the front suspension in which the kingpin axis is in front of the axle carrier, so aiding straight-line stability and steering feel. The front suspension also has a degree of negative camber that helps ensure a stable vehicle attitude under hard cornering.

WHEELS AND TYRES

- Sporty wheel design
- Optimum balance between grip and low friction

The rim size was also specially chosen and tuned to European demands. The seven-spoke lightweight aluminium wheels (16-inch) use wheel caps to reduce the weight of each rim and to protect the alloy wheel from damage. The 195/55 R 16 Michelin tyres deliver good all-weather grip together with a lower than average friction coefficient.

OVERALL PERFORMANCE

DRIVING PLEASURE WITH THE LOWEST IMPACT ON ENVIRONMENT

- Hybrid Synergy Drive® is the key to achieving performance with low fuel consumption
- The Prius paradox: 0-62mph in 10.9 sec. with combined fuel consumption of 65.7mpg
- 400 Nm electric motor beats best V6 diesels on the market for torque performance
- Electronic shift lever allows quicker gearchanges through shift-by-wire technology
- Prius can cover more than 600 miles on a single tank of fuel (EC combined cycle)
- CO_2 emissions are the lowest of any vehicle on the market
- NOx emissions are 96 per cent less than diesel EURO IV levels
- Prius is the best-performing internal-combustion production car in the world in terms of NOx and HC emissions
- Per year, Prius produces 1 ton less CO_2 than the best D-segment diesels on the market *
- 32 per cent less CO_2 emissions than a normal car in Life Cycle Assessment
- Extensive use of high-recyclability materials, inside and out
- Huge efforts made to reduce use of substances of concern (SOCs)
- Prius specially developed to facilitate end-of-life dismantling

* Calculation based on the Combined EC cycle, with 12,500 miles driving distance per year

AN ARDUOUS TASK

The Toyota Prius development team had a tough goal in creating the second-generation Prius: to deliver a level of performance that rivals diesel D-segment cars, but with an impact on the environment (fuel consumption, emissions, Life Cycle Assessment and others) comparable to a city car. In order to achieve this aim, more efficient use of energy had to be found. This was achieved through:

- Adoption of a more dynamic and efficient hybrid system (Hybrid Synergy Drive®)
- Reduction of air resistance
- Reduction of friction losses in various components (engine, transaxle, etc.)
- Reduction of electrical loads and losses (higher voltage for hybrid powertrain, LED stoplights, etc.)
- Adoption of electric air conditioner with electric-inverter compressor
- Reducing overall vehicle weight through lightweight components

ENGAGING PERFORMANCE

- Torque to surpass a modern V6 diesel
- Sub-11 seconds from 0 to 62mph
- Sporting in-gear acceleration
- Shift-by-wire for quicker operation

The new Toyota Prius is, without doubt, the cleanest D-segment vehicle currently available to the motoring public. Yet it simultaneously delivers sparkling performance thanks to its unique Hybrid Synergy Drive® powertrain technology.

A more powerful 1.5-litre petrol engine works together with the smaller, more efficient electric motor to deliver performance that positions the Prius as a serious contender in the D-segment. In fact the electric motor is now more powerful than most 1.0 to 1.2-litre internal combustion engines and with 400Nm from 0-1200rpm, the Prius's torque figure surpasses that of modern V6 diesels. As a result, 0-62mph takes less than 11 seconds, making it almost three seconds faster than the current model.

Because the hybrid's advanced control system uses the electric motor as the main power source, it displays exceptional smoothness. Acceleration is powerful – just 7.4 seconds to 50mph – but linear, especially from 38-62mph (7.2 seconds) and 50-75mph (8.4 seconds), thanks to the impressive spread of torque available at low engine speeds. Noise and vibration are minimal throughout the power range.

Everything about the Prius is new, even the gear lever. The fascia-mounted Electronic shift lever, just a hand's span away from the steering wheel, looks more like a control from a computer console than a conventional gear lever.

It is a momentary shift type that returns to the home position when the driver takes his or her hand off the lever. Its action is so light, it can be shifted with a fingertip, and the ergonomically designed shifting pattern makes it simple to use.

CLEANEST CAR YET

- Unmatched fuel consumption
- NOx, HC and PM emissions lower than for any other production car
- EV driving mode for zero-emissions running
- High recyclability rate
- Excellent overall LCA performance
- Effort invested in reducing SOCs

Although delivering a high level of driving performance, new Prius can be exceptionally frugal, with a fuel consumption comparable to the best diesel B-segment cars: 65.7mpg for the combined cycle and 67.3 for extra urban driving. In addition, on the urban cycle Prius achieves 56.5mpg, which beats every car on the market by a large margin. On the combined cycle Prius has a driving range of more than 600 miles.

Prius was the first car to simultaneously surpass EURO IV, J-ULEV (Japanese) and AT-PZEV (US) emission regulations. Hydrocarbons (HC) and nitrogen oxides (NOx) emissions are respectively 80 and 87.5 per cent lower than required by EURO IV regulations for petrol engines. Prius NOx emissions are also 96 per cent below diesel-specific EURO IV regulations.

Emissions (g/km)	**New Prius**	**Current Prius**	**EURO IV (petrol)**	**EURO IV (diesel)**
NO_x	0.01 (- 96%)	0.05	0.08	0.25
HC	0.02	0.05	0.10	-
CO	0.18 (- 64%)	0.63	1.0	0.50
Particulate matter	-	-	-	0.025

( ) comparison with EURO IV diesel figure

Taking into account all kinds of exhaust emissions, Prius is by far the cleanest D-segment car on the planet (among those equipped with an internal combustion engine). NOx and HC emissions are lower than any other petrol, hybrid or diesel car on the road. Particulate emissions, one of the drawbacks of diesel power, are zero with the Prius. In addition, Prius produces only 104g/km of CO_2 (on the combined cycle), better than the current best B-segment diesel cars. Compared to the best-performing diesel D-segment cars on the market, a Prius can save one ton of CO_2 emissions per year.*

Although a low emissions world-beater, Prius can do even better. A special button on the dashboard allows the driver to use the EV driving mode. When pressed, the Prius will use only the electric motor to power the wheels, producing zero emissions and a very low level of noise and vibration – the ideal for city driving. The EV driving mode can be used for up to one and a quarter miles, with a maximum speed of 30mph.

* Calculation based on the Combined EC cycle, with 12,500 miles driving distance per year

For even greater environmental responsibility, Toyota improved Prius's performance in terms of Life Cycle Assessment (LCA), a method standardised under ISO 14040. LCA quantifies the emissions produced during different stages of the car's life: materials production, vehicle production, driving, maintenance and disposal. The Toyota Prius, compared to a conventional petrol car of the same size, manages to undercut CO_2 emissions by as much as 32 per cent across the entire LCA.

The Prius development team also insisted on the use of several recyclable materials and with a high recyclability rate. Toyota's own TSOP (Toyota Super Olefin Polymer) has a higher recyclability rate than conventional plastics. It has been used throughout the vehicle, together with TPO (thermoplastic olefin) and PP (polypropylene), mainly on the bumpers and some interior parts. The amount of chloride used in these plastics was kept to a minimum. In total, Prius has a recyclability rate of around 90 per cent.

Prius also takes the lead in the reduction of substances of concern (SOCs). For example, it became the first Toyota to use vinyl chloride-free wire harnesses. This reduced the amount of vinyl chloride used to one tenth of that in the first generation Prius. The level of lead was also reduced to one tenth of the average Toyota amount in 1996. In the air-conditioning system the amount of HCF-134a was reduced by 10 per cent**,** in spite of an increase in the system's cooling power.

All Prius parts are carefully marked and can be easily dismantled at the vehicle's end-of-life stage. For instance, the main wire harnesses have a pulling string in order to make their removal easier.

ACTIVE AND PASSIVE SAFETY
FUTURE TECHNOLOGY DELIVERS EXTRA PEACE OF MIND

- By-wire braking system is lighter, allows quicker response and better brake power distribution per wheel
- VSC+, an evolution of VSC, adds steering torque assist to usual stability control capabilities
- First-ever Electric Traction Control (E-TRC) reacts more promptly than normal systems
- Uphill Assist Control helps uphill start on steep gradients with slippery surfaces
- Skid Control ECU and Electric Power Steering ECU are now 32-bit for more efficient operation
- LED stop lights activate 10 times faster than conventional bulbs for better safety
- Body reinforcements provide high cabin integrity in impacts
- Eight airbags available as standard
- Replacement of ignition key cylinder with starter button and impact-absorbing knee panel improve protection for driver's legs
- Steering column equipped with an energy absorbing mechanism
- Circuit Break Sensor automatically cuts electrical current in the event of a crash

"BY-WIRE" SYSTEM ENHANCES SAFETY AND DYNAMICS

- ABS, EBD and Brake Assist linked to advanced VSC+
- Quicker response and lighter than conventional systems
- Hill start assist function

The new Toyota Prius is ahead of its time in many ways, not just for its leading-edge powertrain system.

By adopting this radical approach for its motive power and increasing the voltage, Toyota's engineers have been able to adopt an equally futuristic approach to other vehicle systems such as the steering and braking. By using electricity to power and control these functions, Toyota has been able to integrate them to a far higher degree than has been possible in the past.

Many of the new technologies featured in the Prius – some unique to this car and a world first – have been made possible by Toyota's bold move to redefine the vehicle's powertrain and electrical architecture. The higher voltages created by the batteries and converter have

enabled Toyota's engineers to equip the Prius with a far larger suite of 'drive-by-wire' technologies than has previously been seen in a production car.
Prius uses "by-wire" technology for throttle, brakes and gearshift. By suppressing mechanical and hydraulic links and replacing them with electric and electronic connections it's possible to achieve shorter activation times. In addition, the communication between all these systems will be faster. "By-wire" also brings advantages in weight reduction and saves precious space that can be used to house other systems (please check chapter nine for further information on the braking system).

New Prius adopts the Electronically Controlled Brake system (ECB), the world's first "by-wire" braking system, used originally in the Estima Hybrid. As well as improving braking performance, ECB also allows better brake energy regeneration than was possible in the original Prius. ECB calculates the required braking force based on the amount of pedal effort and force applied by the driver. The system then applies the required braking force, which comprises regenerative brake force and brake force generated by the hydraulic brake system. The amount of regenerative brake force available for each braking operation is higher than before.

In the Hybrid Synergy Drive® system, the engine, generator, motor and wheels are linked via the power split device. Most of the engine power is converted to electrical energy by the generator and the high output, high-response motor drive. As a result, if there is an abrupt change in traction because of an icy or other very slippery road surface or the wheels locking under braking, a control logarithm similar to that in conventional traction control prevents sudden voltage fluctuation or increase in speed of the planetary gears within the power-split device.

By utilising these characteristics of the Hybrid Synergy Drive®, Toyota's engineers have developed the E-TRC, the world's first production electric traction control that utilises the characteristics of the high-output, high-response motor to restore traction once wheel slippage is detected. Because all the traction control is entirely electric, this allows much quicker action than a conventional system.

Another unique feature is the Uphill Assist Control, which prevents the Prius from sliding downhill when the brake is released during start-up on a steep slope. Because the motor has a highly sensitive speed sensor, it can detect the angle of slope. In these circumstances, the system will add more drive power to prevent the car from sliding backwards (see chapter nine for further information).

ABS, EBD, Brake Assist and an evolution of the original Vehicle Stability Control system, called VSC+, operate through a complete electric/electronic circuit. The VSC+ is the first

stability control system in the world to work together with the electric power steering system, acting in unison when an emergency situation occurs. By providing the appropriate steering torque assist, it is possible for the driver to manoeuvre the steering wheel more quickly. This improves the steering reaction time, which could prove useful in avoiding or minimising potential accidents. All these systems work through the ECB brake-by-wire system. ECB is more versatile in splitting braking force to each wheel than a conventional hydraulic system, an important feature of the performance of the EBD and VSC+.

The Electric Power Steering ECU has been upgraded to 32-bit in order to allow more effective cooperation with the VSC+. The upgrade also allows for improvements in the software, opening up more possibilities for the system's tuning.

All these active safety system are controlled by a main computer, the Skid Control ECU. While in other vehicles this ECU is usually a 16-bit processor, in the new Prius it has been upgraded to 32-bit, in order to make it faster and to provide better control of the more complex active safety systems.

The rear LED brake lights react 10 times faster than conventional filament bulbs. This represents an increment in active safety by giving following drivers a quicker warning of braking. In addition, they provide a minor improvement in fuel consumption.

PASSIVE SAFETY

- Safety cell minimises cabin deformation
- Eight airbags as standard
- Improved knee protection features
- Advanced electric cut-off system

An equal amount of attention and thought has gone into developing the new Prius's passive safety systems.

The vehicle's safety structure has received several reinforcements that make the car not only safer in the event of a crash, but also provide greater body rigidity, which is fundamental to safe and predictable handling. Reinforcements in the front bumper, underfloor, floor tunnel and on the rocker door belt line dissipate frontal impact forces and minimise cabin deformation during a collision.

Side impacts are absorbed throughout the body via pillar reinforcements, side impact protection beams and floor crossmembers, reducing cabin deformation to a minimum.

The energy absorbing mechanism in the steering column consists of a breakaway bracket, intermediate shaft, main shaft and column tube, with the steering column mounted to the instrument panel reinforcement via a breakaway bracket. The steering column and the steering gearbox are connected by a contracting intermediate shaft.

When the steering box moves during a primary collision, the intermediate shaft retracts, reducing the chance that the steering column and steering wheel will intrude into the cabin.

During a secondary collision, the steering wheel and the driver's airbag help to absorb the impact. In addition, the breakaway bracket separates, and the column tube contracts with the friction resistance of the sliding portion absorbing the energy.

The impact absorbing structure of the new Prius can help absorb the energy of impact effectively in the event of a front or side collision. This structure also contributes to occupant protection through the use of reinforcements and members that help reduce cabin deformation.

An ISOFIX bar for securing child seats is provided behind the rear seat cushion and CRS anchor brackets for securing a child seat have also been fitted behind the rear seat backrest.

The Prius has a total of eight airbags. Those at the front are dual stage Supplemental Restraint System (SRS) airbags for the driver and front passenger. The driver's seat has a position sensor which also helps the airbag system ECU to better calculate the deployment speed, relative to the driver's distance from the wheel. The side and curtain shield airbags help reduce shocks to the head and chest of the driver, the front passenger, and rear outer seat passengers in the event of a side impact collision.

Knee protection has also been improved in the new Prius. The traditional ignition key cylinder has been replaced by a starter button and a special knee panel is fitted to the lower part of the dashboard on the driver's side. In the event of a crash this panel deforms in order to absorb the knee impact energy.

The High Voltage Power Circuit in the hybrid system is also equipped with a Circuit Break Sensor. In the event of an accident, the crash sensors will report the information to the Circuit Break Sensor, which will automatically disconnect the High Voltage Power Circuit, even before the airbags are deployed.

INTERIOR INNOVATION BRINGS PASSENGER COMFORT AND CONVENIENCE

- Innovative fascia design; Electronic Shift Lever and steering wheel-mounted controls mark new directions in ergonomics
- Smart combination of high perceived quality with recyclable materials
- All advanced features in Prius have user-friendliness as a priority
- Push button starting system
- All-electric air conditioning is the most advanced yet installed in a production car
- Multi-information Display with touch-sensitive LCD screen allows easy monitoring and control of several features
- Voice recognition facility for satellite navigation, audio and air conditioning operation
- Sixteen different functions can be controlled without removing the hands from the steering wheel using steering pad switches
- Customised Body Electronics System allows several electronic systems to be tailored to individual customer preference

INITIATING NEW CONCEPTS IN INTERIOR DESIGN

- The welcoming environment of a living room
- Major advances in ergonomics
- Improvements in perceived quality and recyclability
- User-friendliness as a priority

Being a car of the future, Prius is set to revolutionise the way car interiors are conceived. The main concept was to create the same comfortable atmosphere as in a modern living room.

The fascia is dominated by a central binnacle flanked by twin polished metal inserts, echoed by smaller inserts at either end of the dashboard. With the digital readouts located directly in the driver's line of sight, immediately beneath the windscreen, the whole structure is clean and uncluttered by unnecessary shutlines; even the passenger's airbag is hidden out of sight behind a discreet 'door'.

Instead of a conventional centre console tunnel, the dashboard is separated from the centre armrest to create a free area between the two front seats. This innovative concept has several advantages: it makes the interior more light and open; makes it easier to move across from one front seat to the other – something that's useful in tight parking spaces; and provides room for items such as shopping bags.

Another new concept is the Electronic Shift Lever, located just a hand's span from the steering wheel and shaped more like a computer control than a gear lever. It is electronically linked to the hybrid transmission system and automatically returns to a central position when the driver releases it. Immediately above the Electronic Shift Lever is the Parking Switch. This electronically operates the park function at the push of a button. Controls are clustered around the steering wheel within easy reach of the driver and are augmented by air-conditioning, audio, trip information, voice recognition and phone controls mounted on the steering wheel itself. The Bluetooth built-in hands free system (standard with navigation system on the T Spirit grade), has a roof-mounted microphone for easy use. In total, the steering pad switches can control 16 different functions, more than any other car in the segment.

The level of perceived quality has been much improved compared to the previous generation Prius. For instance, gaps between some parts of the dashboard have been reduced by as much as 60 per cent. The B-pillar design and materials coordinate better with the rear door trim and the pillar now has a better quality feel thanks to the use of a new composite finish material. The smooth cloth and the colour combination for the trim provide an added touch of quality.

As well as addressing quality, great efforts were made to use highly recyclable materials. Toyota's Super Olefin Polymer was used throughout the interior, together with thermoplastic olefin and recycled polypropylene. In addition, Toyota's own RSPP (Recycled Sound Proof Products), a material made from car shredder residue, has also been introduced.

User-friendliness was another target area for the development team. Although the New Prius boasts a host of advanced features, it was a prime concern to make them easy to understand and operate. Unlike other hi-tech cars, everything in Prius is user-friendly, just like it should be in a car of the future.

PUSH BUTTON START SYSTEM

In all three grades the hybrid system is activated by the starter button, which replaces the conventional key cylinder (see chapter nine for further information).

RADICAL NEW AIR CONDITIONING SYSTEM

The Prius is the first production car to adopt an all-electric air conditioning system with an electric-inverter compressor driven by an alternating current provided by the air conditioning inverter. The air conditioning inverter is built into the inverter of the hybrid system and, as a

result, operates independently of the engine. This means the air conditioning can be used with no penalty in fuel consumption or engine performance.

In addition, because it is powered by the hybrid battery, it can work at maximum efficiency even when the engine is switched off. A humidity sensor function has been added to the room temperature sensor in order to optimise the air conditioning's dehumidification capacity. A compact, lightweight, and highly efficient electrical water pump has also been added to ensure the proper heater performance while the engine is stopped.

Fuzzy control has been adopted for calculating the required outlet air temperature and the blower volume in the automatic air conditioning control system, taking into account the ambient temperature inside the car. The appropriate vents, temperature and blower speed are all automatically selected (see chapter nine for further information).

In addition to a pollen filter, the evaporator has a special anti-bacterial treatment to eliminate bad odours and prevent the propagation of germs.

The air conditioning can be adjusted using the Multi-information Display's touch panel, with principle functions also controlled by switches on the steering pad.

MULTI-INFORMATION DISPLAY

The seven-inch LCD Multi-information Display, located in the centre cluster panel, is standard equipment and features a pressure sensitive touch panel for ease of use.

It accesses the following functions:

- Navigation system (T Spirit)
- Hybrid system status display (energy monitor and fuel consumption)
- Audio system
- Air conditioning
- Telephone operation (T Spirit)
- Language selector
- Warning messages display

The optional full-map DVD navigation system is one of the most sophisticated currently available on the market, providing quick operation, together with new search and guidance possibilities (see chapter nine for further information).

ADVANCED HUMAN-MACHINE INTERFACE

The technology in the Prius makes it the most advanced car on the road, but it has been developed so that it is easy and instinctive to use.

The seven-inch Multi-information Display screen is touch-sensitive and can also be equipped with a voice recognition system (standard with the navigation system on T Spirit grade). This is the most advanced system currently available in the D-segment, allowing control of the navigation system, audio and air conditioning through almost 300 different vocal commands, in English or German. This allows the driver to maintain total concentration on driving.

For convenience, the following switches have been relocated to the steering wheel: audio, navigation, vehicle information, voice recognition, air conditioning, cruise control, and telephone operation. In total, the driver can control 16 different functions without even taking his or her hands off the steering wheel – more than in any other car on the road today (see chapter nine for further information).

Furthermore, the four-spoke steering wheel is slightly oval in shape, to improve the visibility of the central gauges.

QUALITY AUDIO SYSTEM

The front panel of the audio unit has a black-smoke finish for modern, high-quality look. The volume and tuning knobs fit flush to the surface, with a pop-up action for operation. A Panasonic audio system with AM/FM tuner, CD player and 40W distributed by four channels is standard on the T_3 grade. A JBL Premium Sound System with AM/FM tuner, cassette player and in-dash six-CD changer, 45W x four-channel amplifier, nine speakers, Digital Signal Processor and Automatic Sound Leveliser is fitted as standard equipment on the T_4 and T Spirit grades.

The audio system can be controlled both through the steering pad switches or voice recognition, although the latter is only available as an option with the navigation system.

CUSTOMISED BODY ELECTRONICS SYSTEM

This advanced feature allows several different systems to be customised according to the owner’s taste.

Up to 42 settings can be programmed by Toyota centres to customer preference, covering everything from the door lock system to the air conditioning and push button start system (see chapter nine for further information).

SPACE AND VERSATILITY

The large number of advanced features in the new Toyota Prius and the adoption of the hybrid system have not compromised accommodation. In fact, some interior space measurements are class-leading, including the 575mm hip-point height of the front seats**.** The front-rear hip-point distance is also the best in the segment, at 950mm. In total, the Prius interior measures 4.6m^3.

The number and size of storage spaces is far ahead of anything else that can be found in the D-segment. There are eight different storage compartments around the cabin, including a double glovebox, a feature carried over from that benchmark of practicality, the Toyota Yaris. In addition, there are four cup holders (two in the front, two in the rear).

The Prius's boot capacity is also appreciable: 408 litres, 18 litres more than in the previous model. This is possible thanks to the more compact hybrid battery and rear suspension. A practical underfloor storage compartment in the boot is handy for storing smaller objects securely.

When extra space is needed, the rear seats can be folded down with a 60:40 split to provide a perfectly flat load floor.

TECHNICAL GLOSSARY
THE MOST ADVANCED CAR ON THE MARKET TODAY

ALL-ELECTRIC AIR CONDITIONING SYSTEM

All versions of the Toyota Prius are equipped as standard with the most advanced air conditioning system that you can find in any car on the road today

All-electric operation

Conventional A/C systems are powered by the engine, but in the Prius the electric-inverter compressor and the electric water pump are respectively powered by the A/C inverter and DC inverter, which are built into the hybrid system's inverter. As a result, the A/C system doesn't depend on the engine's operation, yielding several advantages:

- The A/C can work at its maximum efficiency even when the engine is stopped
- It contributes to a fuel consumption reduction of 15 to 20 per cent in real-world conditions
- As the A/C is independent from the engine, its operation doesn't cause any loss in driving performance

Three-way automatic A/C control

The A/C system automatically controls the blower outlet temperature and blower speed. It can also select the most appropriate air vents in order to deliver the most comfortable results for passengers. New Prius is the first D-segment car to be equipped with an A/C system that can provide an automatic control at three different levels.

Humidity sensor

For the first time in a car A/C system, there is a sensor which monitors the cabin's humidity level, feeding accurate data to the A/C ECU where previously calculation formulae were relied upon. The practical advantage of this is that the dehumidication effort produced by the A/C system is optimised, which has a positive impact on the compressor's power consumption. Most importantly it prevents the cabin from becoming too dry and avoids dry throat or skin discomfort for driver and passengers.

Non-linear fuzzy control

When operating in the automatic mode, the A/C system uses fuzzy control methods to calculate the required blower air temperature and volume.

In a conventional automatic A/C system, the outlet air temperature is calculated by the ECU according to a predetermined formula and inputs from the several sensors. Although this linear calculation method offers good results in stable conditions, it has some difficulty in keeping up when cabin conditions (temperature, amount of sunlight and others) change frequently. In addition, the linear method also governs other controls (such as blower air speed) based on the outlet air temperature, which offers a very low level of freedom (the calculation is done by an aggregation of linear systems).

However, the fuzzy control used by the Prius A/C system independently determines the desired levels of temperature deviation, ambient temperature and solar radiation by defining their respective mathematical functions. In addition, it uses another fuzzy calculation method (the centre of gravity method, through the algebraic product addition) to determine the required outlet air temperature and blower volume.

The temperature deviation can be defined within nine different conformity levels, according to the actual room temperature and the set temperature; as for the solar radiation, there are four different levels, in accordance with the solar sensor. The ambient temperatures can be qualified within six different conformity levels (mid-winter, winter, spring-autumn, spring-summer and mid-summer) according to the ambient temperature sensor.

Advanced control panel

Instead of the conventional heater control panel, which can be found in every car, the Prius A/C system is controlled through the touch-sensitive Multi-information Display, a unique feature in the segment. In addition, for the first time in a production car, the driver can also use switches on the steering wheel pad to control temperature selection, automatic operation selection, choice of fresh or recirculated air flow, as well as front or rear defogging.

Other features

In addition to the conventional cleaning air filter installed in the air blower, that removes dust and pollen, the A/C’s evaporator has been coated with a special antibacterial agent that minimises foul odours and the propagation of bacteria.

Although the cooling capacity of the A/C has been increased from 4200W to 4500W (compared to the first generation Prius), the system has the same power consumption and the amount of refrigerant (HCF-134a) has been reduced by 10 per cent. This again reduces the impact on environment without sacrificing passenger comfort.

Both the condenser and the evaporator, the largest components in an A/C system, are respectively 57 per cent and 35 per cent more compact than before. This contributes to a decrease in weight of the entire A/C system and allows a better use of space.

ATKINSON CYCLE ENGINE

Even the internal combustion engine installed in Prius is not an ordinary one. Although it uses conventional 95 RON petrol fuel, it runs according to the Atkinson cycle (or High Expansion Ratio Cycle) instead of the conventional Otto cycle. This cycle was developed by James Atkinson and later improved by R. H. Miller, allowing the adjustment of intake valve opening/closing timing.

The difference to the conventional cycle is in the increase of the expansion ratio through the reduction of the combustion chamber volume. In addition, the chamber is only evacuated after the explosion force has sufficiently fallen. Because of this, this type of cycle can extract more from the explosion energy, being more heat-efficient.

As a result, this engine is the world's best in terms of thermal efficiency. Currently, Toyota is the only manufacturer to use Atkinson cycle engines in production cars.

BLUETOOTH® HANDS-FREE SYSTEM

Toyota Prius is the first car in the segment (and one of the first on the market) to be equipped with a Bluetooth hands-free phone system (optional feature, available with the navigation system on T Spirit models). This system enables the user to make and receive calls or talk hands-free on a compatible cellular phone by operating the Multi-information Display touch-sensitive LCD or the steering wheel pad switches. The Multi-information Display system in Prius uses the HFP (Hands Free Profile) and OPP (Object Push Profile) Bluetooth® profiles.

In addition to the hands-free capabilities of the system, the user can also transfer all the phone numbers in a mobile phone or a Personal Digital Assistant (PDA) to the Multi-information Display.

Bluetooth is a highly advanced wireless communication system, working on a very high frequency (2.4 GHz) and has a communication speed of 1 Mbps (Mega-byte per second). To use this system, the user must bring a Bluetooth-enabled mobile phone into the cabin and register it in the Multi-information Display (this operation only needs to be done once for each phone). A maximum of four different phones can be registered, but only one can be used at a time.

The Bluetooth system in Prius has a series of interesting features:

Item	Outline
Incoming Call Screen	If a call comes in to the telephone that is registered, this screen appears. The user can receive the call by operating the incoming call button that appears on the screen or the incoming switch on the steering wheel pad.
Call Dialling Screen	The user can press the numeric keypad that appears on the LCD to enter the telephone number and press the call button that appears on this screen or the call switch on the steering wheel pad to make a call. This function is disabled when the vehicle is in motion.
Telephone Directory Screen	This screen shows telephone directory data stored in the Multi-information Display memory, which has a maximum capacity of 1,000 numbers. The user can make a call by selecting a telephone number from this directory and pressing the call switch on this screen or the call switch on the steering wheel pad. This function is disabled when the vehicle is in motion.
Redial Screen	This screen shows redial data stored in the Multi-information Display memory, which has a maximum capacity of five numbers. The user can make a call by selecting a telephone number from the redial list and pressing the call switch on this screen or the call switch on the steering wheel pad. This function is disabled when the vehicle is in motion.
Call History Screen	This screen shows incoming call history data stored in the Multi-information Display memory, which has a maximum capacity of five numbers. The user can make a call by selecting a telephone number from this list and pressing the call switch on this screen or the call switch on the steering wheel pad. This function is disabled when the vehicle is in motion.
One-Touch Call Screen	The user can select telephone numbers from the telephone directory or the incoming call history data and record them on this screen as one-touch call data, which has a maximum capacity of 17 numbers. The most recent redial data (one number) is always recorded as part of the one-touch call data. The user can make a call by selecting a telephone number from the list of one-touch call numbers and pressing the call switch on this screen or the call switch on the steering wheel pad.
Point-of-Interest Info Screen	The user can make a call by selecting a telephone number that appears on the point-of-interest screen of the navigation system and pressing the call switch on this screen or the call switch on the steering pad.

Bluetooth features continued

Item	Outline
Hands-Free Setup Screen	The data from the telephone directory in a cellular phone or PDA can be transferred to the telephone directory in the Multi-information Display. A maximum of 1000 numbers can be transferred. By registering the pass-key of the user's Bluetooth-compatible cellular telephone on this screen, the user can make and receive calls to the registered telephone numbers or talk hands-free by operating the switches on the multi display or the switches on the steering pad. A maximum of four Bluetooth-compatible cellular telephones can be registered. However, only one cellular telephone can be used at a time.
Current compatible cellular telephones	**Software Version**
Nokia: 6310i, 8910i, 3650	Bluetooth 1.1
Sony Ericsson T68i, T610	Hands Free Profile 1.0
Siemens S55	Object Push Profile 1.1

"BY-WIRE" TECHNOLOGY

"By-wire" technology was originally developed for the aerospace industry, where certain mechanisms had to be activated without any hydraulic or mechanical link. The only way to achieve this was through an electronic connection and electric activation. This technology not only saves weight and space, but also provides a more immediate action than hydraulic or mechanical links, with even higher reliability.

For this reason, Prius uses more "by-wire" technology than any other car on the road today. Throttle, brakes, shift lever, Traction Control and Vehicle Stability Control Plus use this technology to improve their operation or even to provide improved ergonomics (as in the case of the shift lever and parking switch).

CAN MULTIPLEX COMMUNICATION

Although Multiplex communication is nothing new in the automotive industry, the Toyota Prius uses a system that is a step ahead of other cars.

Vehicles use CAN (defined according to an ISO protocol) Multiplex communication systems to interconnect the components of the stability control system (skid ECU, steering angle sensor, yaw rate and deceleration sensor), which demand a higher amount of data processing in a shorter period, as other circuits use less capable Multiplex technology. CAN has a communication speed of one Mbps, 10 times greater than a conventional Multiplex communication system.

However, in Prius, CAN is not only used in the Brake Control System (which integrates ABS, ECB, E-TRC and VSC+), but also provides a link between engine ECU, HV ECU (the computer that controls the hybrid system), battery ECU and EPS (Electric Power Steering) ECU. This contributes to a much higher efficiency in the operation of the powertrain and main active safety systems than can be found in conventional cars.

CUSTOMISED BODY ELECTRONICS SYSTEM

This revolutionary feature allows settings for a range of the Prius's features and equipment to be customised according to the owner's taste.

The Customised Body Electronics System allows the adjustment of up to 42 different parameters. These adjustments can be performed by every Toyota centre to customer demand.

The customising possibilities cover features such as the wireless door lock remote control, door lock system, theft deterrent system, intelligent illuminated entry system and air conditioning.

ELECTRONICALLY CONTROLLED VARIABLE TRANSMISSION (E-CVT)

Although not equipped with a real CVT, the transmission of the Toyota Prius works according to the same theoretical process of a continuously variable transmission.

The Power Split Device gathers the torque from the electric motor and the petrol engine and delivers it either to the wheels or the electric generator. By selectively controlling the speed of the power sources it is possible to simulate a continuous variation of the transmission current ratio, in the same way as with a normal CVT.

ELECTRONIC SHIFT LEVER

The Toyota Prius uses shift-by-wire technology. This incorporates a compact and ergonomic control installed in the instrument panel. Its positioning on the dashboard provides easier operation and quicker action, as it is located closer to the driver than conventional gear levers.

In addition, it can be operated using just a fingertip and it always returns to the original position after each operation. This shift lever is also illuminated, for easier night-time operation.

The Electronic Shift Lever has four different selections: N (neutral), D (drive), R (reverse) and B (engine braking and regenerative braking operation). The parking switch has the same function as the P position in a conventional automatic transmission.

ELECTRIC TRACTION CONTROL (E-TRC)

E-TRC stands for Electric Traction Control. When the Skid ECU registers wheel slippage, it commands a split-second cut in the torque transfer from the electric motor to the wheels and not from the engine, as in conventional systems. In addition, brakes are also electrically activated through the ECB by-wire braking system.

Prius is the first car in the world to be equipped with a traction control that is electrically activated through an electric motor. The electric and by-wire control bring advantages over a conventional system, as they enable communication between all the key components to be effected much more quickly, which positively reflects on the level of active safety.

ELECTRONICALLY CONTROLLED BRAKE (ECB) SYSTEM

The Prius is equipped with a sophisticated brake-by-wire system. In most cars, pressing the brake pedal will activate the brake booster, which engages a hydraulic system that will stop the vehicle. In Prius, by pressing the brake pedal the driver is actually activating an electric and electronic circuit that will stop the car.

This system has advantages over a conventional, hydraulic braking system. It has a quicker response and the fact that it is electric provides a better interaction between the other active safety systems. In addition, the ECB by-wire system is superior to a conventional hydraulic system in situations that demand a constant braking power split between all wheels, which might frequently occur when EBD and VSC+ are activated.

ECB is also used to help improve the efficiency of the regenerative braking system, achieving important gains in terms of recovered energy.

As a safeguard in case the vehicle experiences an electric power failure, ECB contains a Power Source Backup. 28 capacitor cells store electricity that might be later used in case there is a sudden power loss in the electrical circuit.

This system was introduced by Toyota in June 2001 on the Estima Hybrid as a world first. An evolved version of this same system is used in the new Toyota Prius.

EV DRIVING MODE

The new Toyota Prius is the first hybrid car in the world in which the driver can make the choice between petrol engine power or pure electric drive.

EV (Electric Vehicle) driving mode can be activated through a button located on the dashboard. By doing so, Prius will run with zero exhaust emissions. This mode allows a top speed of around 30mph and a maximum range of 1.25 miles (depending on the battery charge).

HYBRID TRANSAXLE

The hybrid transaxle is directly linked to the petrol engine and comprises the electric motor, generator and the Power Split Device, which is basically a planetary gear unit.

With the Power Split Device, one of the output shafts is connected to the motor and the wheels, while the other is connected to the generator. In this way, the motive power from the engine is transmitted through two routes, i.e., a mechanical route and an electrical route. This means that the engine can power the generator when needed, but both the electric motor and petrol engine can power the wheels at the same time.

Transmission friction losses have been reduced by 30 per cent by using ball bearings and low viscosity oil. Although integrating an electric motor and generator, the whole system has been made as compact as a normal transmission.

HIGH VOLTAGE POWER CIRCUIT

By providing this newly developed circuit inside the power control unit, the voltage of the motor and generator has been increased from 274V in the original THS to a maximum of 500V in the new Hybrid Synergy Drive® system. The IGBT (see below) transforms a current of 202V of the initial circuit into 500V. As a result, electrical power can be supplied to the motor using a smaller current, thus contributing to an increase in efficiency.

The rationale is explained by two simple formulae:

Power (P) = Voltage (V) x Current (I)

Calorie (J) = Current^2 (I) x Resistance (r)

The second formula is known as Joule's law. It states that the lower the current, the lower the amount of heat loss (calories). By correlating the two formulae, we conclude the power loss is reduced by one quarter, if resistance is maintained at a constant.

In conclusion, the new High Voltage Power Circuit increases power by increasing voltage while the current is constant. At the same time, energy loss is reduced, which improves efficiency.

In the event of a collision, a sensor in the engine compartment immobilises the complete Hybrid Synergy Drive and power supply is switched.

The HV battery is protected by a special casing and the battery cables are protected against short circuit by specially insulated cables.

INSULATED GATE BIPOLAR TRANSISTOR (IGBT)

IGBT is a semiconductor-switching device that is part of the High Voltage Power Circuit. It boosts the voltage from the battery and converts the boosted DC power into AC power for driving the motor. Since the current to be switched is large, minimising heat generation is important. Therefore, Toyota has developed a unique transistor, finely tuned down to the crystal level. This device is 20 per cent smaller than the similar device used in the first generation Prius hybrid system (THS) and operates with low heat generation and high efficiency.

LED STOP LIGHTS

In the new Toyota Prius LED technology is adopted specifically for stop lights. The use of a "reflector-type" light arrangement creates a particularly strong visual effect, as the lights actually look dark when the brake pedal is not being pressed. The replacement of the conventional light bulbs by LED lights serves three distinct purposes:

- Safety: LED elements light up 10 times faster than lamp bulbs, two to 25 milliseconds as opposed to 150 to 200 ms. This represents something like six metres of reaction time at 62mph, distance that could be crucial in avoiding a collision.
- Fuel efficiency: LEDs use less energy than conventional filament bulbs. They account for almost one per cent in terms of fuel consumption improvement.
- Design: LEDs are more compact and allow greater freedom in terms of arrangement and design of the rear lights.

LIGHTWEIGHT FEATURES

In order to benefit performance and minimise fuel consumption and emissions, the development team applied several lightweight features to the new Toyota Prius.

Aluminium alloy components are used throughout the vehicle: bonnet, rear hatch, bumper reinforcements, steering knuckles and front brake calliper cylinders. As an example, the use of aluminium for the bonnet and rear hatch brought weight reductions of 36 and 43 per cent respectively. By reducing the body mass in the front and rear ends it's possible to decrease

the yaw moment of inertia and achieve ideal weight distribution, which improves handling. In the same way, the aluminium components used in the suspension and brakes reduce unsprung weight, which improves the suspension efficiency, both in handling and in comfort.

In addition, the front brake calliper pistons are made of phenol resin. A multiplex layered plastic fuel tank was also used to replace the conventional metal fuel tank, bringing advantages in terms of weight and the amount of lead used in the car's construction.

Ultra high-strength steel and hot-stamp material are used for the construction of the centre pillar reinforcements and roof crossmembers. Ultra high-strength steel is 1.6 times stronger than conventional high-strength steel and allows a 40 per cent weight reduction. In the same way, hot-stamp material is 2.5 times stronger and delivers a 60 per cent weight saving when compared to the high-strength steel.

In addition, the hybrid system's overall weight was reduced by 13kg. The battery pack is also more compact (thanks to the reduction of the number of modules) and lighter. The A/C's condenser and evaporator are respectively 57 and 35 per cent more compact, which brings a weight reduction.

All these measures have contributed to remove 140kg from the scale. The new Prius's kerb weight is 1300kg, representing a mere 35kg increase compared with the first generation model, in spite of bigger exterior dimensions and higher levels of standard equipment. This compares with the Toyota Avensis D-4D five-door kerb weight of 1,400kg.

MULTI-INFORMATION DISPLAY

This standard feature is a seven-inch, touch-sensitive digital centre display that allows the occupants to operate several advanced features:

Function		Outline
On-screen Display		• Displays the audio status at the upper area of the screen when it is showing a display other than the audio screen display • Constantly shows a warning indicator on the screen when a warning is issued
Navigation Screen Display (T Spirit)		• Shows Navigation system information
Information Display	Energy Monitor Screen Display	The following information is displayed in accordance with the signals from the HV ECU (and meter ECU): • Energy transmission direction • Hybrid Battery state of charge display • Outside temperature display • Instant fuel consumption
Information Display	Fuel Consumption Screen Display	The following information is displayed in accordance with the signals from the meter ECU (and HV ECU) • Instant fuel consumption • Average fuel consumption after refuelling • Driven distance after refuelling • Regenerated energy display • Outside temp. display
Warning Screen Display		Forces a warning screen to appear when the master warning light of the combination meter illuminates
Audio Screen Display		Status of audio equipment and audio operation screen indication.
Air Conditioning Screen Display		• Displays the outside temperature • The operation and control of the air conditioning system can be effected through the Multi-information Display and the touch switch that appears on the display
Telephone Operation Screen Display (T Spirit)		• When a Bluetooth-compatible cellular telephone is registered on the system, the user can make and receive calls or talk hands-free on the cellular telephone by operating the switches on the screen or the steering wheel pad
Language Selector Screen Display		• The language of the text displayed on the multi display and of the voice guidance can be selected from eight languages: English, German, French, Dutch, Italian, Danish, Swedish and Spanish
Adjustment Screen Display		• Changes screen colour (green, blue, grey, and beige)
		Image quality adjustment screen indication
Diagnosis Screen Display		• Service check menu • Display check • Navigation check

NAVIGATION SYSTEM

The Prius navigation system is one of the most sophisticated currently available on the market. The main feature is the voice recognition system. It allows the user to control the navigation system and the audio through vocal commands in two languages: English and German.

Compared with navigation systems installed in other Toyota models, this new version features the following innovations:

- Much quicker route search and screen scrolling capabilities
- The map display colour is automatically changed by season
- A compass mode displays information about the current location
- Upgraded search capabilities
    - by junction by introducing two street names
    - Search for the name of a street that connects to a motorway
    - Search by coordinates
    - It allows the introduction of multiple destinations
    - Quick points of interest can be selected by the user
- Improved guidance
    - Motorway lane guidance available in UK, Denmark and Benelux
    - Displays a border mark when crossing a border
- Others
    - System can be customised for three different users, with memory
    - New, improved graphic design
    - Screen colour selection by the user (four choices)

Usually, map coverage for the whole of western Europe is stored on a DVD. This navigation system can be controlled on the Multi-information Display's seven-inch touch-sensitive LCD. Also, as a reference, this navigation system is one among very few on the market that combines both touch sensitive screen and voice recognition features.

REGENERATIVE BRAKING SYSTEM

The regenerative brake function operates the electric motor as a generator while the vehicle is decelerating or braking and stores the electrical energy produced in the HV battery. At the same time, it utilises the operating resistance that the motor exerts during the generation of electricity, as a braking force.

The drive axle and the electric motor are joined mechanically. When the drive wheels rotate the motor and cause it to operate as a generator, a regenerative brake force of the motor is transmitted to the drive wheels. This force is controlled by the Hybrid Synergy Drive® system, which manages the generation of electricity.

The regenerative braking system does not rely solely on the normal brake system to supply the brake force required by the driver. Instead, by effecting cooperative control with the hybrid system, it provides a joint braking force generated by the regenerative brake and the normal brake. As a result, this control minimises the loss of the kinetic energy associated with the normal brake and recovers this energy by converting it into electrical power.

On the new Prius, the power output of the motor has increased through the adoption of the new Hybrid Synergy Drive® system, which has resulted in improvement of the regenerative brake force. In addition, the distribution of the brake force has been improved through the adoption of the ECB system, effectively increasing the use range of the regenerative brake. These attributes enhance the system's ability to recover electrical energy, which in turn contributes to better fuel economy.

PUSH BUTTON START SYSTEM

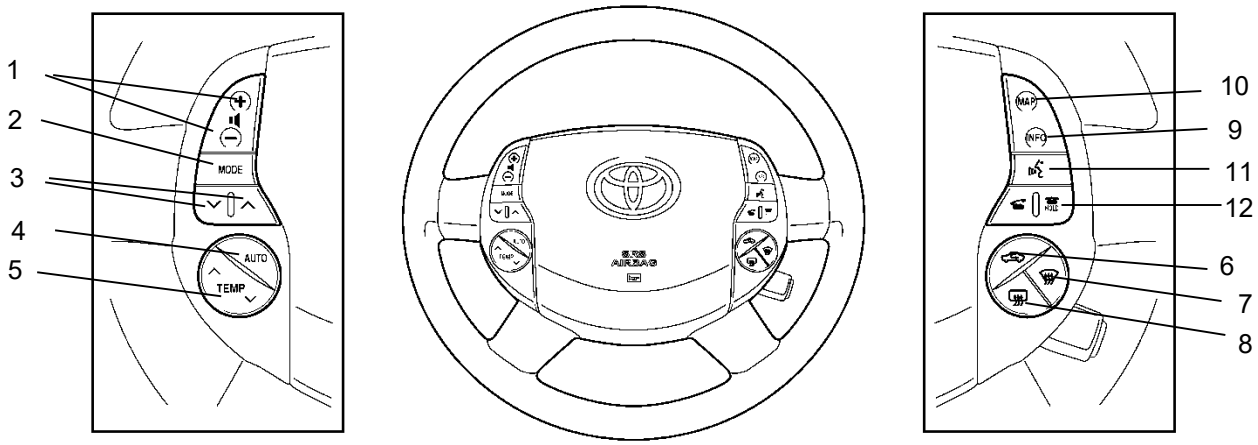
The power mode will change through three different stages (OFF – ACC – Engine ON – READY) each time the power button is pressed. When pressing the brake pedal while pushing the power button, the power mode will jump straight to READY. In this stage the vehicle will be ready to start after selecting D position with the Electronic Shift Lever.

Power Switch	Indicator Light
OFF	**OFF**
ACC	**ON (Green)**
Engine ON	**ON (Amber)**
READY	**OFF**
System malfunction	**Blink (Amber)**

STEERING WHEEL PAD SWITCHES

The Toyota Prius's steering wheel incorporates a complete control console. Through the set of buttons in the steering wheel the driver can control the audio, access trip information and control navigation and telephone (where available). However, for the first time in a production car, the driver can also control the air conditioning using the steering wheel buttons.

In total, the steering wheel pad switches can control 16 functions, more than in any other car in the segment. This feature improves the level of convenience by giving the driver the control of several features without having to take his or her hands off the steering wheel.



SWITCH NAME		BUTTON	FUNCTION		
Audio	Volume	1	UP/DOWN for audio system volume		
	Mode	2	Switch AM/FM of radio, tape or CD		
	Seek	3		Press for a short period	Press for a long period
			Radio	Channel UP/DOWN	UP/DOWN to select a station
			CD	Track UP/DOWN	Disc UP/DOWN
			Tape	Search FF/REW	FF/REW
Air conditioning	AUTO	4	ON/OFF for the automatic air conditioning system		
	TEMP	5	Air conditioning temperature setting UP/DOWN		
	FRESH/RECIRC	6	FRESH/RECIRC selection		
	Front Defogger	7	Front defogger ON/OFF		
	Rear Defogger	8	Rear defogger ON/OFF		
INFO		9	Switching trip information		
Navigation (T Spirit)	Map	10	Map including present vehicle position on multi display		
	Voice recognition	11	Voice recognition ON/OFF		
Telephone (T Spirit)		12	Receive or hang up telephone call		

UPHILL ASSIST CONTROL

When the vehicle is starting on a steep slope, this system automatically recognises the degree of incline and adds more drive power to prevent the car from sliding backwards.

In addition, when the vehicle is loaded or the slope is very steep, the system will still provide enough drive power to start the vehicle and help the driver.

VOICE RECOGNITION

Toyota Prius is, besides Toyota Avensis, the only vehicle among mainstream D-segment vehicles to be equipped with a voice recognition system (standard with DVD full-map navigation system). Through its use, the driver can control the navigation, audio system and air conditioning with added safety, while concentrating all attention on the road and on driving.

After pressing a button on the steering wheel, the driver can give verbal commands in English or German, which will be picked-up by a microphone installed in the front roof upper console.

As with Toyota Avensis, a lot of development work was conducted in Europe in order to achieve a voice recognition success rate of more than 90 per cent. However, the user has to respect certain conditions in order to take full advantage of the system:

- Voice activation shouldn't be used with the windows open at certain speeds because the exterior wind noise could temporarily affect the system's effectiveness.
- When the user is giving verbal commands, there shouldn't be other people talking at the same time.
- The system can recognise words at all speech speeds. However, there should always be clear pronunciation of all words.

VEHICLE STABILITY CONTROL + (VSC+)

Toyota introduced the world's first dynamic stability control system, VSC (Vehicle Stability Control), in 1995. Eight years later, Toyota introduces another significant evolution of the original system, VSC+. This is the first stability control system on the market capable of interacting with the EPS (Electric Power Steering) in order to provide the correct amount of steering torque assist in any unexpected situation.

In essence, VSC+ works according to the same logic as the normal VSC. However, in most situations, when VSC+ is activated, the EPS ECU is ordered to provide additional assist torque in order to allow the driver to turn the steering wheel more quickly. However, when the front wheels skid during cornering, the driver sometimes has the tendency to turn the front wheels excessively, which only worsens the situation. In this case, EPS would generate low torque assist in order to avoid an excessive steering angle.

VSC+ applies the same theoretical principle of Brake Assist to the steering control. As Brake Assist provides additional assistance to the brake pedal to allow the driver to use full stopping power at the right moment, VSC+ will provide the right steering assist to allow a more prompt manoeuvring of the steering wheel by the driver.

When left and right wheels brake on surfaces with different friction coefficients, a difference will be created between the braking force applied to the wheels on each side, according to the braking force. This will generate a yaw moment which may require a steering manoeuvre. In this situation, VSC+ will command the EPS ECU to provide torque assist in the direction that cancels out the generated moment.

In addition, the Skid Control ECU (the electronic brain that controls ABS, EBD, E-TRC and VSC+) is a 32-bit processor, as well as the EPS ECU. By comparison with conventional vehicles, where these ECUs are only 16-bit, they have a much higher speed of calculation, which allows quicker and more efficient systems initiation.

TOYOTA PRIUS EQUIPMENT LIST

SAFETY	**T_3**	**T_4**	**T Spirit**
Driver and passenger front airbags	✓	✓	✓
Front side airbags	✓	✓	✓
Front and rear curtain airbags	✓	✓	✓
ABS with EBD and Brake Assist	✓	✓	✓
Electronic Traction Control (E-TRC)	✓	✓	✓
Vehicle Stability Control Plus (VSC+)	✓	✓	✓
Front seatbelt pretensioners	✓	✓	✓
Three three-point rear seatbelts	✓	✓	✓
Anti theft system (immobiliser and alarm)	✓	✓	✓
ISOFIX child seat restraint system	✓	✓	✓
Child-proof rear door locks	✓	✓	✓
INSTRUMENTS AND CONTROLS	**T_3**	**T_4**	**T Spirit**
7" Electronic Multi-Vision (EMV) Display	✓	✓	✓
Touch screen controls for audio, air conditioning, trip information	✓	✓	✓
Steering wheel controls for audio and air conditioning	✓	✓	✓
Electric Vehicle mode control	✓	✓	✓
Push button start	✓	✓	✓
Foot release parking brake	✓	✓	✓
Drive, shift and brake by wire	✓	✓	✓
COMFORT & CONVENIENCE	**T_3**	**T_4**	**T Spirit**
Front and rear electric windows	✓	✓	✓
Driver’s window with ‘one-touch down’ and anti-trap functions	✓	✓	✓
Electric door mirrors with wide angle lens	✓	✓	✓
Electric motor assisted power steering	✓	✓	✓
Tilt-adjustable steering wheel	✓	✓	✓
Headlight levelling switch	✓	✓	✓
Remote fuel filler release	✓	✓	✓
Cruise control	×	✓	✓
DVD-based full-map satellite navigation with voice recognition	×	×	✓

Bluetooth™ telephone interface	×	×	✓
AUDIO	**T_3**	**T_4**	**T Spirit**
Six-speaker AM/FM radio with single CD player	✓	×	×
Nine-speaker JBL AM/FM radio with six-disc CD autochanger	×	✓	✓
VENTILATION	**T_3**	**T_4**	**T Spirit**
Electric climate control air conditioning	✓	✓	✓
SECURITY	**T_3**	**T_4**	**T Spirit**
Immobiliser with alarm system	✓	✓	✓
Remote central door locking	✓	✓	✓
SEATING & UPHOLSTERY	**T_3**	**T_4**	**T Spirit**
Cloth seat upholstery	✓	✓	✓
60:40 split folding rear seats	✓	✓	✓
Height adjustable driver's seat	✓	✓	✓
Adjustable front head restraints	✓	✓	✓
Three adjustable rear head restraints	✓	✓	✓
EXTERIOR & BODY	**T_3**	**T_4**	**T Spirit**
16-inch wheels with full covers and locking wheel nuts	✓	✓	✓
Space saver spare wheel	✓	✓	✓
Colour keyed door mirrors	✓	✓	✓
Colour keyed door handles	✓	✓	✓
Colour keyed bumpers	✓	✓	✓
Integrated rear tailgate spoiler	✓	✓	✓
Front fog lamps	×	✓	✓
Metallic paint	OPT	OPT	OPT

PRIUS TECHNICAL SPECIFICATIONS

ENGINE	
Type	4-cylinder in-line, high expansion cycle
Valve mechanism	16-valve DOHC VVT-i
Fuel system	Electronic Fuel Injection
Fuel type	95 octane petrol (or higher)
Bore x Stroke (mm)	75.0 x 84.7
Displacement (cc)	1,497
Compression ratio	13.0:1
Max. power (bhp/rpm)	76 @ 5,000
Max. torque (Nm/rpm)	115 @ 4,000
MOTOR	
Type	Synchronous, permanent magnet
Rated voltage	500
Max. power (bhp/rpm)	67 @1,200-1,540
Max. torque (Nm/rpm)	400 @ 0-1,200
BATTERY	
Type	Sealed nickel-metal hydride
Nominal voltage	201.6
Modules	28 modules with 6 cells joined together
Linkage	Series
Capacity Ah (hrs)	6.5 (3h)
HYBRID POWERTRAIN	
Type	Serial-parallel
Torque transfer type	Planetary gear unit
Combined max. power (bhp/mph)	112 – more than 52mph
Combined max. torque (Nm/mph)	478 – below 22mph

PERFORMANCE	
0-62mph (sec)	10.9
Max.speed (mph)	106
FUEL CONSUMPTION AND EMISSIONS	
Combined (mpg)	65.7
Extra Urban (mpg)	67.3
Urban (mpg)	56.5
Emission Compliance Level	Euro 4
VED Band	AA
CO_2 g/km	104
DIMENSIONS	
Overall length (mm)	4,450
Overall width (mm)	1,725
Overall height (mm)	1,490
Wheelbase (mm)	2,700
Tread width (mm) front	1,510
Tread width (mm) rear	1,480
Overhang (mm) front	890
Overhang (mm) rear	860
Coefficient of Drag	0.26
Fuel tank capacity (l)	45
Minimum turning radius (m)	5.1
Luggage compartment m^3	0.408
WEIGHTS (kg)	
Gross vehicle weight	1,725
Kerb weight	1,300
SUSPENSION	
Front	MacPherson strut with stabilizer bar
Rear	Torsion beam with stabilizer bar
BRAKES	
Front	225mm ventilated disc, with regenerative brake system
Rear	269mm solid disc
STEERING	
Type	Rack and pinion, electric power steering
Ratio	19.1:1
Turns (lock to lock)	3.61
TYRES AND WHEELS	
Wheel size	16”x6JJ aluminium
Tyre size	195/55 R16