Dealers Generally Upbeat on OnStar

General Motors is continuing to promote OnStar, adding it to more vehicles, offering insurance discounts for equipped vehicles and activating it at the factory. That's bringing increased interest from dealers, who find fewer problems with the service than in the past. GM now installs OnStar on 50 of its 2004 models, up from 36 models two years ago. OnStar is also available on 15 other models made by Acura, Audi, Isuzu, Subaru and Volkswagen. While the company won't divulge figures for those who renew after their first year, the number has "increased continuously quarter to quarter," according to an OnStar spokesman.

Interviews with representatives of GM's largest sales dealerships showed increasing levels of comfort with OnStar. "Awareness is becoming much better. It's more important to women for the security aspect than it is for most men," said Bob Carpenter, general manager at Sewell Automotive in Dallas. Some buyers even seek it out. "It's more of a sales killer for cars that don't have it than it is a sales closer," Mr. Carpenter added. Improved awareness is prompting a solid percentage of auto buyers to take advantage of discount pricing to augment the "free" first year program that's bundled into the price of the vehicle. "We have about 25% who upgrade beyond the free basic coverage, going with two or three years or upgrading the service level," Mr. Carpenter said.

One salesman noted that OnStar helps lure customers who are looking at foreign vehicles, although this compliment may not excite executives at OnStar's parent office. "It's one of the few things where we can say we have a leg up on foreign cars," said Greg Warrick, Cadillac sales manager at Sewell's Cadillac division in Dallas.

G M Will Offer Radar Blind Spot Detectors in MY 2007

Full-Speed Range ACC Coming Too

Radar sensor technology has been making a very slow transition from fighter planes to cars since the early 1990s. It may have finally hit the big time in the automotive industry. In the 2007 model year, General Motors North America will launch radar blind spot detectors on the Cadillac DeVille, STS and Escalade and on the planned replacement for the Buick LeSabre—about 50,000 vehicles in the first year. Each vehicle will be equipped with two sensor/detector modules, which will be mounted on each side of the vehicle behind the plastic panel aft of the rear wheel. After 2007, GM will likely introduce the feature on other GM models including the Chevrolet Tahoe/GMC Yukon truck platform. Valeo Raytheon Systems of Auburn Hills, Michigan, beat out Visteon to supply the blind spot sensor/detectors to General Motors. A bout 40 people from Valeo Raytheon are working on radar sensors here in the States.

Valeo Raytheon Systems (VRS) executives refused to comment on their connection to General Motors, but they were happy to talk about their radar system and let me drive one of their demonstration vehicles, a 2002 Toyota Highlander. Using the blind spot detection system on the road was easy. It's always on when the vehicle is running, so there are no switches to find. Once underway I could immediately tell if a vehicle was in my blind spot by glancing at the driver or passenger side exterior mirror, as a driver naturally does before changing lanes. A yellow icon appeared on the mirror if a vehicle was in the blind spot. The system worked flawlessly. It was smart enough to turn on the warning light only when a vehicle in the blind spot was traveling at roughly the same speed as my car, or when one was entering my blind spot from behind or from the side. The warning light did not come on as I passed other vehicles in adjacent lanes. The radar sensors measure the relative velocity of adjacent vehicles and switch on the icon only when the relative velocity of the vehicle in the blind spot is zero or greater.

Perhaps the most remarkable feature of Valeo Raytheon blind spot detection is its low price. Right- and left-side detectors, including the mirror-packaged displays, could immediately retail for as little as $400 or $500 for the pair. Muth Mirror Systems of Sheboygan, Wisconsin, developed the mirror display consisting of yellow LEDs mounted behind the mirror. The LEDs project a blind spot icon through a nearly-transparent window made in the mirror using a laser etching process.

The Valeo Raytheon narrow band, multibeam scanning radar system operates in the 24 GHz ISM (Industrial, Scientific, and Medical) frequency band. It is easy to use, nothing to learn. Valeo Raytheon Systems
Blind Spot...

Continued from page 1

A computer analyzes the blind spot when a vehicle has entered the blind spot. The camera-based blind spot detection is less expensive than radar, according to Valeo Raytheon C CO, Helmut Wodrich, the technology is vulnerable to varying light conditions, which could cause either low contrast or blooming, making detection difficult. A major disadvantage of camera blind spot detection is the added cost that comes with having to make the exterior mirrors bigger to accommodate the cameras.

Wile other radar suppliers have initially focused on precrash sensing, full speed range adaptive cruise control or backup assist, Valeo Raytheon has first gone after blind spot monitoring. Blind spot detection is completely independent of other vehicle systems. Once blind spot applications are well underway VRS will pursue other radar applications. VRS business development manager, Scott Pyles, believes that blind spot detection could penetrate as much as 20% of vehicle production by 2010. With high-volume blind spot production in place, VRS should be able to address the other radar applications with a low cost product.

Full Speed Range
A daptive Cruise Control (A CC)

A ccording to Toyota, the world's first laser cruise control system appeared on the Japanese domestic market Aug. 1997, on the Toyota Celsior. Mercedes, BMW and Jaguar were the first carmakers to introduce ACC based on radar sensors. Considered more robust than laser, radar can see through fog, rain, snow, mud and plastic fascia. Mercedes' radar sensors are today supplied by ADC & M/A-Com; BMW's come from Bosch and Jaguar's from Delphi. Today, the A CC feature is offered by Volkswagen on the Phaeton, by BMW, Mercedes, Jaguar, Fiat, Cadillac on the 2004 XLR, Infiniti models, Lexus, Toyota and Honda. In March 2004, Siemens VDO announced the availability of a radar blind spot detection system. Most A CC systems employ radar sensors to keep track of the vehicle traveling in the same lane ahead of the vehicle. But A CC systems are expensive and they don't work so well in heavy traffic and when vehicles cut in front. Typical A CC systems shut down at speeds lower than 30 kilometers per hour.

In order to improve the way the systems work in traffic, Toyota has recently announced that it has developed an A CC system that features a low-speed mode that operates at speeds from 30 km/h down to zero. When a vehicle traveling ahead in the same lane stops, the A CC-equipped Toyota automatically applies the breaks, bringing the vehicle to a full stop.

The feature will be introduced on a new Toyota vehicle in Japan sometime this coming summer. According to insiders, Mercedes and BMW will also introduce full-speed range A CC systems. The Toyota system uses laser sensors; Mercedes will employ both a long-range radar sensor and a short-range radar sensor. Mercedes will introduce the feature in 2005.

Walter Hagleitner, who until last year was marketing and sales manager for Automotive Distance Control (A DC), is presently organizing a project to promote the use of such systems to European consumers. A DC is now a division of Conti Temic. Mr. Hagleitner believes that if more was known about the safety benefits of A CC, consumers might be more interested in the system. Continued on following page

THE HANSEN REPORT ON AUTOMOTIVE ELECTRONICS

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have greater interest in the feature. "ACC makes drivers more conscious of safe following distances, and because ACC quickly brakes automatically at 20% to 30% of full power, the driver is better equipped to avoid rear-ending vehicles ahead," said M r. Hagleitner. "A ACC also avoids pile-ups by giving the following driver more time to react once he sees the brake lights ahead." M r. Hagleitner can be reached at whagleitner@aon.at.

**Radar Prices to Come Down**

Only about 50,000 radar sensors are sold for automotive applications each year worldwide—the majority of which are used for ACC. That's a pretty small market, particularly for a product that was first introduced in 1987. M/ACom (Lowell, Massachusetts), which ships about 30,000 radar units per year to Mercedes and Eaton Vorad, is probably the world's top selling radar sensor supplier. The biggest hold-up of the market for radar sensors remains their high cost. The opening of the blind spot detector market will go a long way toward bringing down the cost of near-range radar sensors through economies of scale, and in several years the market will open up for not only full-speed range ACC, but also back-up aids and pre-crash sensing. Delphi is marketing radar back-up aids to OEMs and the aftermarket in competition with ultrasonic sensor technology.

The development of silicon germanium (SiGe) integrated circuits will further improve the cost picture. By about 2009, high-frequency SiGe ICs will begin replacing expensive gallium arsenide circuits in radar applications. That should bring the cost of a complete radar sensor down by as much as 20%. **Infineon**, the world's number-two automotive semiconductor supplier, announced a year ago that it had successfully demonstrated the feasibility of a 77 GHz automotive radar sensor based on SiGe.

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**OnStar...**

Salesmen are bullish about GM’s decision to activate OnStar at the factory, freeing them from a process that took up to 45 minutes. That was particularly welcome in Dallas, where incompatible wireless phone technologies have always posed a problem. M any carriers in the Dallas area switched to digital technologies some time ago, making it difficult for OnStar's analog technology to link up. "For a long time, it was extremely difficult to activate it—we had to go through a painstaking process. The salesmen’s attitude towards OnStar is much better now," M r. Warrick said.

The latest of GM’s ongoing promotional efforts for the industry’s largest telematics service is its Hot Button contest and insurance discounts. The $50 million Hot Button contest, which ran in January and February, gave those who pressed the OnStar button a chance to win a free car. It received lukewarm interest. "Most of the people hitting the button are already here for service," said Daniel Blackerby, inventory control manager at Serra Chevrolet, Birmingham, A labama. However, he noted that "a good bit of traffic" has come from people entering expressly to push the button, and "a few" led to sales. "It's so slow right now we're happy to have the extra traffic," M r. Blackerby said.

In a longer-term move, G M A C Insurance began offering discounts to OnStar subscribers, saying their safe driving records would bring discounts up to 20%. Low mileage drivers can get up to 40% off because OnStar can verify their mileage. But independent insurers including A lstate and State Farm aren’t following suit. "We offer no discounts for any type of subscription service, anti-theft service or any others," said a State Farm corporate spokesman.

G M A C Insurance also offers a discount to dealers who use OnStar for theft deterrence. But not all salespeople are convinced that’s a good idea. "It’s not the greatest theft recovery system. It won’t work in a parking garage or if the battery is removed. I use that as a selling tool for Lqjack," said James Turner, aftermarket sales manager at Brown and Brown Chevrolet in M esa, A rizona.

OnStar will be equally ineffective for those trying to sell their cars. "Kelley Blue Book lists no additional value for options on a used vehicle that require a subscription," said Kelley Blue Book’s executive editor, Charlie Vogelhiem.

Overall, salesmen say that growing awareness of OnStar’s benefits is improving the renewal rate, though they note that most renewals are handled by GM, not the dealers.

"We’re starting to see repeat customers trading in who definitely want it," said Rosa Trujillo, customer service director at Landmark Chevrolet of H ouston. Dealers vary on whether renewals remain at the basic $16.95 per month level or move up to premium services. "The majority stay with basic service. All they need is to get directions when they’re lost," M r. Blackerby added.

But other dealerships see it differently. "Most of the people who renew go to a premium service, not the basic package, which surprises me," said Paul M cA llister, a salesman at Buff Whelan Chevrolet in S tirling H ights, M ichigan. "Most people who don’t renew it are people who didn’t use it during their first year, it’s more than a money thing," he added.

Many salespeople note that buyers of more expensive vehicles renew more often, while the renewal rates drop with the cost of the vehicle. "If you can afford a Cadillac, you can at least afford the basic package," M r. W arrick said.
The Company Profile...

Leoni Background

The origins of the company go back to 1569, when its founder moved from Lyon, France, to Germany and began making superfine gold and silver wires. Leoni’s present configuration goes back just to 1917, when three companies merged to form Leonische Werke Roth-Nürnberg A G, from which today’s Leoni AG evolved. The company has been making cables since the early 1930s and cable assemblies since the 1950s. In 2000, Leoni acquired the former Lucas Rists wiring assemblies since the early 1930s and cable assemblies since the 1950s.

Leoni is organized into three business segments: Wire, Cable and Wiring Systems. A list of all the Wiring Systems Division’s products are shipped to car, truck and commercial vehicle makers as well as their component suppliers. The Cable Division serves the automotive, electrical appliance, telecommunications, data technology and capital goods markets. The Wire Division’s primary market is the cable industry, as well as manufacturers of electrical, electromechanical and electronic components.

According to the company, sales were down 2% in 2003, due largely to the sharp rise in the value of the euro, and also because German car production was flat compared with 2002. But in 2004, Leoni anticipates about 10% growth in sales. “Fully in line with our corporate philosophy,” wrote management board chairman, Klaus Probst, in the 2003 annual report, “we will be able to enhance our competitive position ... with a sharp focus on the customer and the highest possible degrees of flexibility and quality. In doing so we will rely on our employees, to whom we have given a high degree of personal responsibility and decision-making powers in a very lean and decentralized organizational structure.”

Twenty percent of Leoni is owned by Groga Beteiligungsgesellschaft mbH, consisting of Nürnberger Versicherungsgruppe and Hella KG Hueck & Co., owns 20%.

Leoni/Intedis

Slow Growth Expected from Automotive Wiring Market

This question is topmost on every wiring harness maker’s mind: With carmakers adopting so many multiplexing networks, such as CAN, LIN and MOST, where instead of using one circuit per signal, multiple signals travel on one data-bus “highway” to different destinations, won’t the demand for automotive wiring harnesses decline? Wireless networks such as Bluetooth will also substitute for some wiring. Nevertheless, says Alfons Härtl, managing director of Leoni Wiring Systems, as more electronics features are added to vehicles, “We see the trend that the number of leads needed in cars is still slowly growing.” Presently the number of cut leads ranges from 500 per vehicle, for low-priced compact cars, up to 2,000 leads for the Mercedes S class. Typical vehicle wiring systems include about 1,200 individual wires, each with an average length of 498.4 individual wires, each with an average length of 1,200 individual wires, each with an average length of 498.4...

2003 Total Sales: €1.08 billion ($1.33 billion)

Wiring Systems, 52%

Cable, 41%

Germany, 47%

EU (without Germany), 22%

Non EU Countries, 31%

Leoni Sales by Region

Leoni Sales by Product

Leoni Sales and Net Margin

1997 to 2003 Annual Growth Rate of Sales: 17.7%

in € millions ($ millions)


406.1 497.8 617.9 962.0 1,096.8 1,102.7 1,079.9

(498.4) (610.9) (758.3) (1,180.5) (1,345.9) (1,353.2) (1,325.1)

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The Company Profile Continued

Leoni Wiring Systems Division Sales in € millions ($ millions)

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<th>Year</th>
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1999 to 2003 Annual Growth Rate: 12.6%

Thumbnail Sketch

Wiring Systems Division

Headquarters: Flugplatzstrasse 74, 97318 Kitzingen, Germany; Tel. 49 9321 304 0
2003 Sales: €557.8 million ($684.5 million)
2003 EBIT*/Sales: 4.7%
Employees: 16,402 at year-end 2003, a 20% increase over the prior year
2003 Wiring Systems Sales per Employee: €34,008 ($41,733)

Key Market: Automotive applications account for 97% of sales.
Major Competitor: Delphi

*Earnings before interest and taxes

Top Leoni Wiring Systems Customers

#1 DaimlerChrysler
#2 Volkswagen Group
At a distance behind:
#3 General Motors
#4 Trucks and commercial vehicles
#4 Top tier suppliers (Bosch, JCI, Siemens VDO)
#5 Porsche
#6 BMW

of 1.5 meters, plus terminals, seals, fuse holders and cable ducts.

Leoni Wiring System Division (Leoni Bordnetz Systems)

According to the company, Leoni serves a €7 billion ($8.6 billion) European automotive wiring systems market. Leoni’s Wiring Systems Division sales of €558 million ($685 million) in 2003 accounted for an 8% share of that European market, and Leoni says its share will grow to about 13% in four years. Leoni estimates the global automotive market for wiring systems at €15 billion to €17 billion ($18 billion to $21 billion), or roughly €220 ($270) per vehicle.

The Wiring Systems Division expects sales to increase roughly 18% in 2004, to €660 million ($810 million). Over the five years starting in 2003, Leoni expects the division to grow by nearly 14% per year. Part of that growth will come from business Leoni picked up with General Motors last year, Leoni’s biggest project ever. Leoni is the principal supplier for all the wiring for the new generation of Opel Astra and Zafira models, except for engine and transmission wiring. For this vehicle platform, a joint Leoni-Intedis-Hella project team, under the program management of Intedis, developed a completely new electrical distribution system. A new, 40,000-square-meter plant in Strýj, Ukraine, that will handle the Opel project began operations in July 2003, and the existing Leoni Poland facility was expanded.

The Wiring Systems Division began building a second plant in Ilava, Slovakia, to serve BMW (1 and 3 series) starting in 2004. Leoni currently serves BMW from a new facility opened in September 2003 in Romania, where it also produces cable harnesses for the M etro class.

While 69% of Leoni’s Wiring Division shipments are made to customers in Europe, the company plans to follow its customers Ford, GM and DaimlerChrysler to North America and to China.

Leoni competes intensely for automotive wiring business with Delphi, its major competitor, as well as with Lear, Yazaki and A Icoa Fujikura Ltd. (A FL). Unlike Yazaki and Delphi, who make their connectors in-house, Leoni typically uses outside suppliers to develop and manufacture connectors. However, Leoni does make some special connectors for applications like ABS for the truck industry, or when customers can’t get what they need off the shelf.

Except for its acquisition of the Lucas Rists wiring harness business in 2000, Leoni has shown little interest in acquiring automotive wiring harness manufacturers. At the time of the acquisition, Lucas Rists was a major wiring supplier to Rover, then owned by BMW.

Wiring Systems Division Strengths

According to Dr. Härtl, Leoni is seen as a company that is fast, flexible and focused on project management during the period two to three years in advance of production, when the vehicle is being designed. “Our components have to be designed in when the customer is designing his car. Customers like our fast response times and appreciate our project management skills,” said Dr. Härtl.

Leoni believes it stands tall compared with its competition because of a strong focus on customers and a flat organizational structure. “Our simple organization makes us more flexible than the bigger players,” said Dr. Härtl, “for example, Yazaki, where management control comes strongly from Japan. While we are an international company with a strong European focus, we are a leaner, flatter organization. The customer knows that when he brings a problem up, he is not far from the management level. Communications are very efficient.”

Leoni is organized around customer business units where the unit leader for a customer like GM/Fiat is in charge of all activities concerned with that customer, worldwide. “If something goes wrong in South Africa for GM, the GM unit leader would have direct involvement down to the shop floor,” explained Dr. Härtl. “The unit leader is in charge of sales, quality, production and engineering.”

Leoni Wiring Systems Division is organized around the following customer focused business units: BMW, Daimler-Chrysler, First Tier Suppliers, General Motors/Fiat, Global Commercial Vehicles, Porsche, United Kingdom (caters to Ford PAG and others) and the Volkswagen Group.

continued on following page
Optimizing Manufacturing

Wiring Systems Division director Dr. Härzl says that the key to making money in the hypercompetitive automotive wiring market is production. “A significant part of our value added is made by manual labor. We do not have a lot of sophisticated production machines like in electronics. It is a manual process. So we have to go into those countries that have low labor costs.” Today Leoni’s main manufacturing locations are in Eastern European countries such as Slovakia, Poland and Hungary. Dr. Härzl noted that manufacturing is moving into the second wave of Eastern European countries, those not yet part of the European Community, specifically Romania and Ukraine, where hourly wages run about €1 ($1.23) per hour compared with about €25 ($31) per hour for Germany. “Leoni is one of the first companies to invest in Ukraine,” said Dr. Härzl. “We have invested about €50 million ($61 million) in our plant there, which is in the final stages of completion.” By 2005 the plant will employ a total of 4,000 people. Dr. Härzl believes that is the optimum size for an automotive wiring systems plant. With many more employees you would need “sub-organizations,” which would disproportionately drive up overhead costs.

In a step to further optimize productivity, Leoni co-developed with Komax, maker of wire cutting, stripping and crimping machines, a way to more quickly change to different crimping tools. The crimping tool press-fits brass terminals onto the cut and trimmed wire. “We want to run those machines at a rate above 60% (per 24 hour period), which is kind of an industry standard,” said Dr. Härzl.

Flat Wire/Cable

According to the company, extruded flat wire is one of Leoni’s most promising new product developments. Dr. Härzl estimated that flat wire could someday account for 5% to 10% of the total market for automotive wiring. “Flat wire is typically used in headliners because there you don’t have the space to route a thick cable bundle,” he said. Other flat-cable applications include doors, instrument panels or mirrors, anywhere space is severely limited. Leoni’s exFC® extruded flexible flat cable can be used to create a sealed interface between cables and components, between two flat cables or between flat and round conductors.

Leoni claims to be the first company in the world to make extruded flat wire for high volume production applications in vehicles. Leoni has begun producing flat cables for the large order received from Opel for the Astra and Zafira. While flexible flat cable (FFC) is 10% to 15% more expensive than conventional round wire, its geometry provides better heat dissipation, so it can carry more current. For the same current capacity flat wire is 20% lighter, and in practical applications it takes up two-thirds the space of round wire cables. In some cases, because of a lack of available space or other packaging constraints, flat cable is the only solution.

Using the same materials as round wire and similar manufacturing processes, flat wire starts from round copper, which is rolled into a rectangular form typically 100 to 200 micrometers thick and 1 to 10 millimeters wide. A flat crimped wire, plastic insulation is extruded around the copper conductors making an individual flat wire or a flat ribbon-like cable with a diameter of up to 15 wires. While the number of different types and sizes of flat wire terminals and connectors is still limited, Leoni is working with its largest connector suppliers to develop more. It is even possible to integrate electronic components like LEDs or even a LIN controller directly onto FFC.

Flexible Printed Circuits

Flexible printed circuits (FPCs) are similar to flat cables in that each technology can be used to make ribbon-like multicore cables. However, FPCs can accommodate more complex electronic and electrical components to make special electronics assemblies where limited packaging space is a consideration. Leoni and its affiliate Intedis are working on a number of projects that use FPCs to package components such as multicolored LED illumination, switches and network interface components along with the cable/connector assembly. Oliver Gold, managing director of Intedis, explained, “Multicolored LEDs could be built into the headliner assembly to personalize the vehicle’s atmosphere.” Intedis is also working on some integrated tail lamp/break light applications with CAN controllers and LEDs all on FPCs.

Leoni stopped producing flexible printed circuits in house on December 23, 2003, when it sold Leoni Flex S.A. to Arous S.A of Starnberg, Germany, an investment company. Leoni had acquired Nicolitch S.A., based in Burnhaupt, France, in 1999 with the expectation that the market for flexible printed circuits in autos would quickly grow to account for about 15% of the total automotive market. That was not at all the case. A nd...
Further, "we decided that the production of FPC's had little to do with our manufacturing process," said Dr. Härtl. "Nevertheless, we [still] know how to make flexible printed circuits. If a customer is asking what is the best solution or if there is a hybrid solution between the extruded flat cable, the round cable or FPC, we can make that analysis." Leoni Flex employed about 140 people and had €9 million ($11 million) in sales in 2003, down from €11 million ($13.5 million) in 2002.

Harness Integrated Fuse Boxes

Leoni sees good business potential for prewiring fuse boxes into the wiring harnesses it ships to carmakers. "Often hundreds of wires must connect to the fuse boxes," said Dr. Härtl, "so it makes sense to integrate the box with the whole wiring system."

The fuse box is evolving to include more electronics—electronics to monitor battery state of charge and state of health, plus body electronics for convenience features such as keyless entry, light dimming and seat heaters. "More and more we are seeing body control functions move into the fuse box," said Dr. Härtl, adding, "By integrating electronics modules into the fuse box, you save a lot of wires and use the boxes also as interface connections." Other changes to fuse boxes include the use of electronically controlled fuses that automatically reset. On some large, highly-featured cars from Mercedes, the fuse box comes with a large relay that automatically switches off the battery's positive voltage when an airbag is deployed, to reduce the risk that an electrical spark would start a fire should the fuel tank rupture. A number of carmakers have placed Leoni/Intedis in charge of designing and optimizing the electrical architecture composed of smart fuse/relay boxes and wiring harnesses. A team of engineers from Leoni, Intedis and Hella developed the electrical distribution system including body electronics and the fuse box for the new Opel Astra, which came to market in Europe in April 2004.

Auminum Wire

In the long term, demand for aluminum wire could grow, particularly if the price of fuel skyrocketed and automakers get very careful about the weight of the vehicles they build. According to Leoni, car wiring can weigh as much as 20 kilograms (44.1 pounds). The challenge with aluminum is the difficulty in attaching contacts. "If you use a lot of pressure to crimp-on a terminal, the aluminum starts to get liquid," explained Dr. Härtl. "You either have to use a very precise amount of pressure or conductive glues; both are complicated processes." For now, aluminum applications are restricted to four- or five-meter long power cables to the engine when the battery is kept in the trunk. Leoni makes aluminum battery cables up to 150 sq. mm. A nother downside of aluminum is that it is not as good an electrical conductor as copper, so it requires a 60% larger cross-sectional area for the same amount of current.

Intedis (Integrated Electronic Distribution Systems)

To keep pace with the competition, in 2001 Leoni and Hella, maker of lighting, sensors and electronics, formed Intedis, a 50-50 joint venture that would enable the partners to compete for electrical distribution system business that involves both wiring and electronics. This is especially important as electronics networking continues to substitute for automotive wiring, and as more carmakers turn over electrical distribution system responsibility to suppliers. Siemens VDO Automotive and Yazaki cooperate in a similar manner, and Delphi and Lear both have electronics and wiring under the same roof. A long with its own engineers, Intedis shares engineering resources with both its parents, depending on the project's requirements. In Europe, Intedis competes with Delphi, Siemens-Yazaki, Lear and Valeo.

Electrical/Electronics Distribution Architecture

Intedis was instrumental in Leoni's winning the Astra/Zafira business from Opel. Intedis was asked by Opel to consider what would be the optimum number and placement of smart junction, body and comfort electronics boxes for the new Astra in order to minimize the total cost of the electronics, wiring and connectors, while best utilizing available packaging space. "After looking at the system as a complete network, we were able to eliminate some existing high-current fuse boxes and some additional stand-alone controllers and integrate them into two electronics boxes, one under the hood and one in the rear of the passenger compartment," explained Oliver Gold.

While much depends on the functional content, available space and the carmaker's unique preferences, one centralized body/comfort/smart junction box would generally work best for a small compact car. However, M. Gold noted, "If you have lots of content including a large infotainment system, bus networks and a lot of high level comfort features, then one front and one rear box would be best, so you can reduce the number of individual wires in the circuit."
Asian Carmakers Outperform ROW in E/E Reliability

In the last decade, overall electrical system reliability has improved, even as more electrical and electronics features and controls are added even to entry-level models. High-end luxury models like the BMW 7 series and Mercedes E class, with new and complex electronic/electrical systems, are still more likely to have something go wrong. However, Japanese luxury car quality doesn't seem to be affected to the same degree. Lexus owners reported 1.3 problems per hundred vehicles, compared with 4.0 and 4.9 per hundred for BMW and Mercedes, respectively.

Noteworthy in our analysis this year is Volkswagen’s improvement in electrical quality—to become the best of the three European carmakers, even edging out GM. For a second year the Hyundai Group did as well as the Japanese carmakers.

Each year, The Hansen Report takes a close look at Consumer Reports’ electrical reliability ratings results for the most recent model year. We weight the magazine’s survey results with U.S. sales data for each model to tabulate a ranking for the major carmakers’ electrical system reliability.

Consumer Reports’ Annual Auto Issue, published each April, includes a detailed reliability ratings section, which gives readers the reliability history of most high volume light vehicle models sold in the U.S., over 200 models in all. Based on 675,000 survey responses, Consumer Reports’ analysts rate potential trouble spots that could compromise a model’s reliability by tabulating the number of respondents who report serious problems in each of 14 categories. A problem is considered serious if it is costly to repair, causes a failure, compromises safety or results in downtime for the vehicle.

| Percentage of Light Vehicles With Electrical System Problems |
|-------------------|----------------|----------------|
|                    | 1993 | 2002 | 2003 |
| Honda/Acura       | 1.9  | 1.0  | 1.0  |
| Toyota/Lexus      | 1.8  | 1.0  | 1.0  |
| Subaru            | —    | 1.0  | 1.1  |
| Hyundai/Kia       | —    | 1.0  | 1.3  |
| Nissan/Infiniti   | 3.3  | 1.3  | 1.4  |
| Mazda             | 3.3  | 1.0  | 1.5  |
| Ford              | 3.6  | 2.5  | 2.1  |
| Chrysler          | 4.3  | 2.2  | 2.5  |
| Volkswagen        | —    | 4.1  | 2.7  |
| General Motors    | 4.5  | 2.5  | 2.8  |
| DaimlerChrysler*  | —    | 2.3  | 2.8  |
| BMW               | —    | 3.5  | 4.0  |
| Mercedes          | —    | 2.8  | 4.9  |

*Mercedes and Chrysler vehicles combined score

Note: A dash indicates we did not rank that carmaker in 1993 due to insufficient data.

Windows Automotive on the Road

In April 2003, Microsoft released its fifth version of Windows CE for Automotive, now called simply Windows Automotive, an in-vehicle computing and telematics software platform based on the Windows CE.NET 4.2 real-time operating system. Windows Automotive has been adopted by eight carmakers and four tier-one suppliers for production vehicle applications, according to Microsoft.

BMW 7 Series (since MY 2002)

Siemens VDO, who supplies the navigation component of BMW’s iDrive system, uses Windows Automotive in the control display.

Citroen C5 and Xsara (since 2000)

Citroen was the first carmaker with a Windows CE-based telematics system. A telematics option on the MY 2004 Xsara provides turn-by-turn navigation, voice recognition and synthesis, remote color display, voice recorder, traffic information, maintenance status and wireless synchronization of data with mobile devices.

Clairon AutoPC, Joyride (since 1998)

Clairon’s Joyride multimedia entertain-

ment and navigation system replaced the AutoPC in the States. AutoPC sales in the U.S. and Japan have been very slow.

Fiat Lancia Thesis (since 2002)

The infotainment system, supplied by Siemens VDO, provides navigation, location-based services and text-to-speech, plus CD player, AM/FM radio and audio management interface.

Honda Accord (MY 2003, 2004)

Windows Automotive is used in the aftermarket navigation display available for the Accord in the U.S. A Jpine supplies the navigation system.

Hyundai Mobis makes an aftermarket AutoPC.

Mercedes 2004 S Class

The S Class in-dash navigation system uses Windows Automotive.

Mitsubishi Mirage Dingo, Airtrek, Lancer Cedia and Chariot Grandis

Mitsubishi Motors’ navigation system incorporates turn-by-turn instructions plus, in some models, wireless synchronization of data with mobile devices.

Nextech Carman-i

Nextech makes a Windows Automotive-based in-dash entertainment/telematics system for the Korean aftermarket.

Subaru Legacy Lancaster

In Japan, Subaru’s Active Driving Assist system combines navigation, lane departure warning, intelligent cruise control and other safety features. Windows Automotive is not used in any safety-critical functions.

Toyota G-Book

Toyota launched G-Book, its subscription telematics service in Japan, on the WiLL Cypha in October 2002. Toyota announced it will roll out G-Book on 50 additional models in Japan and has agreements with Mitsubishi, Daihatsu, Subaru and Mazda to offer G-Book service.

Volvo S60, S80, V70, Cross Country (since MY 2002)

Volvo’s navigation system incorporates location-based services and the Traffic Message Channel.