Yamar DC Power-Line Bus Gains Momentum

Yair Maryanka, founder and CEO of the Israeli firm Yamar Electronics Ltd., was working in Japan in 1992, when he hit upon the idea to create a multiplexing scheme that would use the vehicle’s power cables for communications between electronics components.

He recalled, “Japanese consumers were purchasing navigation systems in the aftermarket, but it took eight hours to get the systems installed. I said, ‘That’s crazy. It only takes eight hours to assemble an entire car.’ Then I thought, ‘What’s common to all electrical and electronics installed in the car? The power line. I had some experience with batteries, so I knew why it is difficult to use the power line. I also knew that digital communications technology could overcome those problems.”

Yamar Electronics, founded in 1994, took a few years to convince its target market, the automotive industry, that it had developed a communication methodology good enough to overcome the difficulties of the DC power line. “Until the last three or four years, no one believed it would work,” said Mr. Maryanka. “When we demonstrated it to OEMs, they looked to see if we were doing any tricks.”

He explained the major challenges to making DC power-line communications work: “First, there is noise and second, the power line is not a controllable medium for communications. At any moment the air conditioning or the lights might be switched on, which creates impulse noise. And the line impedance is unpredictable. Because it is random, there is no way to filter the noise.

“We came up with the idea that rather than try to fight the noise, we should live with it. We use forward error correction coding, so when we transmit the signal we add information that allows the receiving side to correct those errors.”

Yamar presently offers a range of seven transceivers for multiplex power-line communications using either UART/LIN, SPI or CAN protocols. The integrated circuits range in bit rate from 10 Kbps to as high as 1.7 M bps. There are transceivers that can transmit data at 250 Kbps or 500 Kbps using the CAN protocol, and at 60 Kbps using the LIN protocol.

Mr. Maryanka says the company has already shipped thousands of its transceivers to a second-tier customer that uses them to implement an aftermarket “gadget.” Part of the device is installed in a different location from the controller, with communications between the two linked via the power line.

Yamar has eight other projects in the works, four with carmakers and four with tier-one suppliers, which cover a variety of different applications. Yamar is working on two of those projects in cooperation with SPA RC (Secure Propulsion using A dvanced Redundant Control), a European Commission-funded program, whose goal is to improve traffic safety and efficiency for heavy vehicles through the application of intelligent x-by-wire technologies.

In a SPA RC project with Mercedes, Yamar is developing a 500 Kbps power-
ion, but full-sized pickup trucks only need to reach 21.3 mpg, compared with the current standard for all MY 2007 light trucks of 22.2 mpg.

The U.S. government has been less timid about regulating safety. The National Highway Traffic Safety Administration (NHTSA) is considering upgrading side impact protection (FMVSS 214) to “require automakers to provide head protection in side crashes and to enhance thorax and pelvis protection for a wider range of vehicle occupants involved in such crashes,” most practically accomplished by installing side airbags. The transportation bill signed by President Bush in August 2005 calls for passenger protection standards in side-impact crashes by 2008.

Protecting occupants in side crashes is one of NHTSA’s near-term regulatory priorities, as is preventing rollovers. Tire pressure monitors, which help prevent rollovers by alerting the driver when the tire pressure on any wheel falls below 25% of the recommended pressure, are required on 20% of carmakers’ production in MY 2006, 70% of MY 2007 and 100% in MY 2008 and thereafter.

Electronic stability control (ESC) has been proven in many studies to substantially reduce rollover incidents and, according to the Insurance Institute for Highway Safety, the safety feature could potentially save up to 7,000 lives each year in the U.S., alone, if all cars were ESC-equipped. NHTSA has planned a preliminary cost/benefit estimate of ESC for 2005, leading to speculation that a future mandate for ESC is not out of the question. The 2005 transportation bill directs NHTSA to create stability standards by 2009. Market dynamics, however, could make regulation unnecessary. According to Consumer Reports, electronic stability control was already offered in the U.S. on 60% of MY 2005 models. NHTSA lists 139 model year 2005 vehicles with available ESC. A’s consumers become better educated about the benefits and availability of ESC, and as the price comes down, take rates of optional ESC will improve, and carmakers will increasingly make it a standard feature.

NHTSA also has plans to further study driver distraction, indirect vision systems, headlight glare, lighting and signaling standards, new braking technologies, roadway departure warning systems, rear-end collision warning and drowsy driver warning systems.

Brake assist, which uses sensors to detect panic stops and quickly applies full braking pressure, is migrating to more non-luxury vehicles, for example the Kia Spectra in the U.S. A’s part of its pedestrian protection initiative, the European Union proposed a regulation that would require carmakers to install brake assist in new vehicles beginning in 2008. NHTSA will be testing and researching brake assist from 2006–2008. A plying full brake pressure immediately in an emergency cuts stopping distances considerably.

Laser- or radar-based sensing systems that anticipate crashes and activate safety systems in the vehicle have been available for a few years on high-end models from Mercedes, from Honda and Toyota in Japan, and others, but are still a long way from mainstream. The new Audi Q7 SUV, due in 2006, will offer 24 GHz radar-based blind spot detection that warns a driver changing lanes if a car is approaching rapidly from behind.

Audio systems that play MP3 or WMA-formatted CDs are becoming common, as are auxiliary input jacks for iPods or other portable audio devices. GM offers iPod connections on its HHR retro-style SUV, the Impala and Monte Carlo, as well as the Pontiac Solstice, Saturn Vue and Ion, the Buick Lucerne and the Cadillac DTS. In Japan, Nissan, Mazda and Daihatsu offer proprietary iPod compatible stereos. In Nissan vehicles, iPod can be operated via the touch-screen navigation display. BMW was first to offer an integrated iPod connection. A according to Aipple, five carmakers currently offer integrated iPod connectivity, and seven more soon will.

DVD entertainment systems and even navigation sales are on the rise in North America. The Consumer Electronics Association, which tracks the U.S. market, predicts that factory sales of combination mobile video/navigation devices will reach 935,000 by the end of 2005. Alpine Electronics forecasts penetration of dashboard displays will reach 22% of new cars by 2010, worldwide.

All-wheel drive (AWD) is becoming more widely available as well. The U.S. Department of Energy noted that in MY 2005, AWD was offered on 50 car models (not including light trucks) in the U.S., compared with just ten models in 1999.

Rear vision cameras to prevent accidents and assist in parking maneuvers are becoming more widely available, usually bundled with a navigation system.

Feature highlights

What follows is a sampling of some of the electronics features carmakers are offering for the current model year.

In the newly-redesigned 2006 BMW 3 series, stability control, side bags and side curtain airbags are standard, as are two-stage LED brake lights. BMW’s Brake Force Display, already standard on the 7 and 5 series, expands the number of LEDs illuminated in sudden panic braking according to the rate of deceleration detected by A BS sensors. A vailable options include: auto-dimming mirrors, run-flat tires, active steering, adaptive cruise control, rear park distance control and adaptive headlights. Not standard, iDrive comes bundled with the optional voice navigation system.

The Hansen Report on Automotive Electronics

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ISSN 1040-1105
**New Features...**

BMW says it is the first carmaker to offer a digital radio receiver as a factory-installed option. Drivers of the 2006 7 series sold in the U.S. will be able to tune in CD-quality FM broadcasts and static-free AM from any local radio stations that have licensed iBiquity Digital’s HD Radio technology.

Infrared night vision and Gentex’s SmartBeam automatic headlamps control will be offered on 2006 BMW 5-, 6- and 7-series models.

Chrysler’s 2007 Dodge Caliber, the new entry-level replacement for the Neon, is due in mid-2006. A continuously variable transmission will improve fuel economy by 6% to 8% compared with a traditional 4-speed automatic transmission. Electronically controlled all-wheel drive is available. Chrysler will use the new, fuel-saving 4-cylinder World Engine, jointly developed with Hyundai Motors and Mitsubishi Motors, for the first time in the Caliber. A turbo-diesel Caliber will be offered in Europe.

The new Jeep Commander, a large SUV, provides standard multi-stage front airbags with occupant classification for the passenger side. Optional side curtain airbags for all three rows of seats work with the Electronic Roll Mitigation feature, which uses sensors to measure the severity of the crash and deploy the side airbags accordingly. When an airbag is deployed (front or side), the standard Enhanced Accident Response System (EA RS) unlocks the doors, shuts off fuel and turns on both the interior lights and exterior hazard lights. Also standard are electronic stability control and brake assist. Options include SmartBeam headlamps, navigation, U-Connect Bluetooth cell phone node and rear object detection.

Buyers of the 2006 Dodge Ram Mega Cab pickup can opt for a $1,500 navigation system.

Mercedes’ newly designed S Class is of course loaded with advanced safety and convenience features including infrared night vision (from Automotive Lighting, a subsidiary of Magneti Marelli), PreSafe active safety system, first introduced on the M Y 2003 S Class, and in Europe, flashing brake lights to warn approaching drivers of emergency stopping. That feature was recently approved by the European Union but rejected by NHTSA, which said that Mercedes hadn’t proved that flashing lights provide a major safety benefit, so the steady light requirement for brake lights would apply in the U.S.

Ford’s Explorer, the SUV that begat industry-wide rollover prevention and mitigation measures, features standard electronic stability control, Ford’s trademark Roll Stability Control and a tire pressure monitoring system in the 2006 model. Aiso standard are multi-stage front airbags and front side airbags with occupant classification system for the passenger side. Side curtain airbags are an option. The V6 version meets California’s ULEV II (ultra-low emission vehicle) standard, the same low emission levels achieved by the Escape Hybrid. The V8-equipped Explorer meets California’s LEV II classification.

Ford’s Fusion, an all-new midsize car, comes with standard dual-stage front airbags with front passenger weight sensor and driver seat-position sensor. Side airbags and side curtain airbags are optional, as is ABS. The 4-cylinder engine meets California PZEV (partial zero emission vehicle) standards; the 6-cylinder meets California ULEV II. A hybrid version “in a later model year” will be Ford’s next hybrid offering, following the Escape, M ercy M ariner and Maza Tribute hybrids.

The M Y 2007 Saturn Vue coming out in mid-2006 from General Motors will have an integrated starter generator. GM predicts the mild hybrid will produce 10% savings in fuel economy.

The Pontiac Solstice compact convertible offers no ABS, side airbags or stability control. Standard on most GM models, OnStar is part of the “Power Package” option, which bundles power windows and door locks, keyless entry and remote start. An auxiliary input jack on the audio system is standard.

The 2006 Cadillac DeVille replacement, DTS, comes loaded with safety and convenience features including: dual-stage front passenger airbag with occupant post-

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**Freedonia Group Forecasts 7.5% Growth in Auto Electronics**

**World OEM Automotive Electronics Demand 2004 - 2009 in $ Billions**

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2009</th>
<th>Annual Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>27.8</td>
<td>38.0</td>
<td>6.5%</td>
</tr>
<tr>
<td>Western Europe</td>
<td>26.1</td>
<td>34.8</td>
<td>5.9%</td>
</tr>
<tr>
<td>Asia/Pacific</td>
<td>26.3</td>
<td>39.5</td>
<td>8.5%</td>
</tr>
<tr>
<td>Other Regions</td>
<td>6.3</td>
<td>11.7</td>
<td>13.2%</td>
</tr>
<tr>
<td>Worldwide Total</td>
<td>86.5</td>
<td>124.0</td>
<td>7.5%</td>
</tr>
</tbody>
</table>

The Freedonia Group’s recently released World OEM Automotive Electronics study predicts the global market for auto electronics will reach $124 billion in five years, with the Asia/Pacific region surpassing North America as the largest market. According to the report, growth in emerging markets “is being helped by the rapid transfer of new product designs from Triad [Western Europe, the U.S. and Japan] markets—a change from the past when obsolete designs were used in na-

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The 396-page study, published in June 2005, is available for $5,200. To order, or for more information, call 440-684-9600 or visit www.freedoniagroup.com.
Headquarters: 1-1-8, Nishi-Gotanda, Shinagawa-ku, Tokyo 141-8501, Japan; www.alpine.com
FY 2004 Sales: ¥222,779 million ($1,982 million)
R&D Expenses*: 10.1%
Net Margin: 3.6%
FY 2004 Net Cash Provided by Operating Activities: ¥12,472 million ($110.9 million)
Stockholders’ Equity: ¥80,336 million ($714.6 million) as of March 31, 2005
Market Capitalization: about ¥106,019 million ($943 million) as of August 1, 2005
FY 2004 Return on Equity: 9.4%
FY 2004 Return on Assets: 5.3%
Working Capital: ¥54,546 million ($485.2 million) as of March 31, 2005
Employees: 8,350 as of March 31, 2005
Sales per Employee: ¥26.68 million ($237,300)
Products: Automotive audio and navigation equipment
Top Customers: #1 Honda/Acura, #2 Mercedes
Ownership: Alps Electric Co. Ltd. owns 46.02% of the company.
*Includes labor and other expenses reported as cost of sales
Note: Alpine’s fiscal year 2004 ended March 31, 2005.

Background

In 1967 Alps Electric and Motorola formed a joint venture to produce eight-track and cassette tape players for the automotive market. M ot orola sold its equity in the joint venture in 1978, and the business became Alpine Electronics, founded as a consolidated subsidiary of Alps Electric. Although Alpine Electronics stock is traded on the Tokyo Stock Exchange, Alps Electric remains the major stockholder with just over 46% of the total outstanding shares.

Alpine's sales have grown more slowly than the market, but its net profits have grown from ¥3,098 million ($27.6 million) in FY 1999 to ¥7,932 million ($70.6 million) in FY 2004, a 20.7% annual growth rate. Alpine strives to maintain return on assets of more than 5%, a goal it reached in FY 2004, when income reached 5.3% of assets. At its annual meeting on June 28, 2005, Alpine announced an annual dividend of ¥10 per share for the fiscal year ending March 31, 2005.

Today Alpine is a world-class supplier of premium mobile audio, video and navigation systems for OEMs and the aftermarket, with an expanding product portfolio that includes integrated multimedia, driver-assist and communications systems.

The market for Alpine’s products is extremely competitive. OEM customers, who account for 75% of Alpine’s sales, are fighting tooth and nail to cut costs. As carmakers move toward all-inclusive multimedia systems that integrate the audio head unit with navigation, video and communications functions, competitive pressures will escalate further. The automotive multimedia segment already has too many suppliers. Alpine faces stiff competition for valuable center-stack real estate from much larger players such as Denso, Bosch, Siemens VDO, Aisin Seiki and Delphi, as well as from the navigation and audio equipment specialists like Panasonic, Pioneer and Harman-Becker.

The Company Profile Continued

Alpine Sales by Region and by Market

<table>
<thead>
<tr>
<th>FY 2004 Sales: ¥222,779 million ($1,982 million)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>By Region</strong></td>
</tr>
<tr>
<td>Other, 5.3%</td>
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<tr>
<td>Europe, 39.3%</td>
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<tr>
<td><strong>By Market</strong></td>
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<tr>
<td>Aftermarket, 25%</td>
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Alpine’s Served Market, 2005 and Ten-Year Forecast

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2010</th>
<th>2015</th>
<th>Annual Growth Rate</th>
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</thead>
<tbody>
<tr>
<td>Audio</td>
<td>14,900</td>
<td>13,300</td>
<td>11,800</td>
<td>-2.3%</td>
</tr>
<tr>
<td>Visual</td>
<td>5,600</td>
<td>10,600</td>
<td>15,600</td>
<td>10.8%</td>
</tr>
<tr>
<td>Navigation &amp; Communications*</td>
<td>5,500</td>
<td>10,600</td>
<td>15,600</td>
<td>11.8%</td>
</tr>
<tr>
<td>Driver Assist**</td>
<td>600</td>
<td>1,200</td>
<td>3,000</td>
<td>17.5%</td>
</tr>
<tr>
<td><strong>Alpine’s Served Market</strong></td>
<td>26,600</td>
<td>35,700</td>
<td>46,000</td>
<td>5.6%</td>
</tr>
</tbody>
</table>

*Telematics
**Driver assist sensors including vehicle camera, night view, radar, sonar

Data: Alpine, Roland Berger, Fuji Chimera Research

Global Markets

A Alpine claims a 33% share of its served OEM navigation market in the United States. A Alpine makes a navigation system for the Acura TL, a navigation and communications system for the Acura RL and an audio/video/navigation system for the Chrysler 300C. It also makes products for the Mercedes M class, for BMW and for Toyota vehicles made in the U.S.

A Alpine benefits from its association with its largest customer, Honda, one of the world’s most innovative carmakers, who is gaining share in the global automotive market. A Alpine’s number-two customer, Mercedes Car Group, is also a major innovator, among the world’s first carmakers to aggressively integrate audio with video and navigation systems.

A Alpine has definitely entered the fray in the German OEM market for high-end infotainment systems, which has been dominated by companies with German roots, namely Harman-Becker, Siemens VDO and Bosch. However, in the fall of 2007, A Alpine will begin shipping integrated audio-navigation systems for installation in Mercedes A-, M- and E-Class vehicles. The deal is worth a total of about ¥100 billion ($890 million) in sales. A Alpine grew annually at the rate of just 5.4%, which is considerably slower than its 9% annual growth during the prior five-year period ending in 1999.

A Alpine Electronics vice president for brand marketing, Steve Witt, sales growth slowed during the period for two reasons. First, the mobile electronics aftermarket, which accounted for 25% of A Alpine sales in FY 2004, has declined since 2002 because carmakers are leaving little room for aftermarket competition. On new vehicles, factory-installed audio and navigation systems are often as good as or better than what’s available in the aftermarket.

Distinctions Claimed by Alpine

- Introduced the world’s first navigation system in 1981, jointly developed with Honda Research
- World’s first company to offer Sirius and XM satellite receivers
- World’s first OE supplier to implement automotive iPod connectivity, through BMW
- First U.S. mobile equipment aftermarket supplier to introduce head units with iPod connectivity in September 2004
- Number-two (after Pioneer) mobile electronics brand in the U.S.
- Number-one U.S. aftermarket brand in CD/DVD head units priced over $250

Why U.S. aftermarket consumers choose Alpine products:
- Brand reputation
- System capability
- Connectivity: the ease with which iPods and satellite radios can be connected to Alpine head units. Alpine’s Ai-NET architecture lets consumers purchase a head unit and later add on capability, for example a 5 1/2 Dolby surround processor or navigation.

New Business Booked

Alpine has booked these major confirmed pieces of business:
- CD radios for Honda valued at ¥20 billion ($178 million) in sales over the project’s lifetime start shipping in 2006.
- ¥25 billion ($222 million) order from Chrysler for DVD head units for all vehicle lines starts in 2006.
- ¥25 billion ($222 million) order from General Motors for an integrated audio/navigation/display/HDD head unit starts shipping in 2007.

Improved Profitability

From FY 1999 through FY 2004, A Alpine grew annually at the rate of just 5.4%, which is considerably slower than its 9% annual growth during the prior five-year period ending in 1999.

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Alpine Electronics

Second, Alpine had to walk away from some OEM business to maintain predictability during a time when some of its customers, most notably Ford, were asking suppliers to significantly lower prices. “There was business available that A Alpine declined to bid because it made little financial sense,” he explained. In 1999 Ford was Alpine’s fourth largest customer. Today Ford accounts for just 3% of Alpine’s OEM sales.

Alpine’s decision in 2000 to be more selective about what business to book was an important factor in the company’s improving profits. Net margins steadily improved from 1.8% in FY 2000 to 3.6% in FY 2004. In FY 2005 Alpine is expecting net margin to increase again, to 4.8% of sales.

iPod Connectivity Is Hot

Twenty-four million Apple iPods have been sold since the wildly popular portable digital music players were first offered to the market in October 2001. The influence of iPod’s fantastic growth continues to be felt by car multimedia systems manufacturers worldwide, as consumers look for ways to conveniently play their music in their cars.

A Alpine says it was the first company in the world to provide products with iPod connectivity, both in the aftermarket and to carmakers, namely BMW. Throughout 2005 the demand for iPod connectivity in the U.S. aftermarket has been so great that A Alpine hasn’t been able to maintain sufficient stock.

Within its Ai-NET aftermarket product line, A Alpine offers nine different head-unit models that are compatible with its iPod interface adapter. The iPod interface lets users search and select iPod listening options from the head-unit display. According to M r. Witt, iPod connectivity helped to make Alpine, with 45% market share, the number-one brand in the U.S. for head units priced over $250. A long with the demand for satellite radios, the iPod interface helped enliven the mobile audio market, which had been in decline for three years.

Navigation

Factory-installed A Alpine navigation systems have received the highest customer satisfaction ratings in four of the last six years since J.D. Power and Associates began its annual survey of U.S. consumers. In the latest study, consumers liked A Alpine navigation systems with voice recognition especially for its ease of use and ease of inputting the destination.

Navigation equipment is A Alpine's hottest-selling OEM product category. A Alpine expects to sell 800,000 OEM and aftermarket navigation systems in the U.S. in the year 2006, giving it anywhere from a 35% to a 40% share of the market for navigation devices installed in vehicles.

A Alpine is presently Honda's principal source of navigation equipment. A Alpine is slated to supply InterNavi platforms to the Japanese aftermarket. InterNavi is Honda’s telematics service provider.

According to A Alpine, navigation systems will increasingly rely on the infrastructure. A central server off the vehicle will store the map data and send it to the onboard system wirelessly, as required. “The direction is clear,” noted M r. Witt, “the future of navigation lies with connected systems.” Japan was the first of the world’s regions to widely use wireless communications to update digital maps stored onboard the vehicle. In Europe, where a single communications technology, GSM, is well entrenched, the market for connected navigation systems will get underway in about three years. According to Alpine, the picture in the United States is less clear, because wireless communications providers have not yet revealed their plans to install robust 3G or 2.5G systems that cover the whole country.

New Ten-Year Strategic Plan

A new ten-year strategy called Vision 2015, adopted in February 2005, directs A Alpine to focus on becoming a “mobile solutions company” that creates “visionary value.” The company will continue new product development within its core product lines: audio, visual, navigation and communications (telematics not including cellular handsets), with an added focus on driver assist products.

A Alpine expects its new strategy to deliver ¥300 billion ($2.7 billion) in sales by 2010, a 6.7% annual growth rate from 2005, largely due to increased sales of navigation and communications products, including telematics solutions. During the same period, A Alpine expects its served market to grow from ¥26.6 billion in 2005 to ¥35.7 billion by 2010, a 6.1% annual growth rate.

By 2015, the company is targeting ¥500 billion ($4.4 billion) in sales. The increase over 2010 will also come mainly...
from navigation and communications products, which will grow annually at 14.9%, from ¥100 billion ($890 million) to ¥200 billion ($1.8 billion) during the five-year period. A. lpine's newest product line, driver assistance systems, will grow much faster: 58.5% per year, from ¥10 billion ($88 million) in 2010 to ¥100 billion by 2015. During the period between 2010 and 2015, audio and visual product sales will stay relatively flat.

**Product Strategy: Add Driver Assistance to AVNC**

"A lpine's success over the years is a result of staying on our ten-year product plans," said M r. Witt. "In the early days we were focused on delivering outstanding audio performance. Our next task was to build on audio by adding the visual component. Most recently we have been concentrating on multimedia integration."

Each new product strategy builds on the last with new opportunities and broader core competencies.

In the mid-term, A lpine will continue to focus on multimedia and telematics products or AVNC, which at A lpine stands for audio, visual, navigation and communications products. "Over the next three to five years, that's our core product," said M r. Witt. "Our goal is to develop this flexible AVNC platform with both software architecture and hardware that can be realized as either an O E M product or an aftermarket product. The form factors could be wildly different depending on front panel design and graphical user interface. The key, though, is to have this highly integrated product available at competitive prices." A lpine's AVNC platform will make use of at least part of the W indows M obile platform from M icrosoft's automotive business unit.

As a key component of its long-term Vision 2015 strategic plan, A lpine will also focus on driver assistance, starting with systems based on inputs from video cameras. A lpine won't manufacture video cameras; it will develop technologies that take video signals and make use of them by combining A lpine's estimable graphics, human-machine interface and system integration experience with pattern recognition and other software technology.

A lpine's first camera systems would help drivers maneuver their vehicles in tight spaces. "Imagine parking while looking at a visual display that gives you a view of your vehicle as if there was a camera 20 feet above the car roof," suggested M r. Witt. A lpine is currently testing such a system and has begun showing its video-based driver-assist technology to carmakers. By 2007 those systems might also be offered to aftermarket customers.

The fact that driver assistance systems often rely on video monitors builds nicely on the upward trend of displays in new vehicles. "Carmakers are putting screens in new cars because displays are perceived by consumers as having high value," said M r. Witt. By 2010, according to A lpine forecasts, 22% of all new vehicles sold worldwide will come with displays.

Over the next decade, A lpine's driver-assist products will be able to process more information than what is available from video cameras. Future products, not yet defined in detail, will capture information from a variety of sources, on and off the vehicle. For instance, location or traffic information could be combined with data from video cameras, radar or laser sensors to present more helpful information to the driver.

A lpine Expand G lobally

A lpine is expanding its production capability in Asia. In 2004 it completed a new production facility Taicang, China, its third Chinese plant. To take advantage of opportunities in China, in 2004 the company also commenced operation of the A lpine Dalian Development Center, its second most important development center after the one in Japan. A lpine is in the process of expanding its production footprint in Tailand as well.

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**Alpine's Core Technologies**

In service of its AVNC (audio, visual, navigation and communications) product lines, Alpine creates value with these core technologies.

**Human Machine Interface**
- Vehicle centric tactile design
- Visibility and display design
- Lighting technology
- Voice recognition and processing
- Sensing technology

**Evaluation**
- Driving data
- Global evaluation center
- EMC robustness evaluation
- Vehicle sound analysis evaluation
- Vehicle diagnostics

**Acoustic**
- Digital broadcast/satellite/terrestrial radio tuners
- DSP vehicle-customized sound design
- High-speed ripping

**System Integration**
- Vehicle system design: 2D/3D/4D
- Heat, sound, noise solutions
- IDB-1394 (FireWire)/MOST/CAN
- Hardware/software installation technology
- High-density packaging
- EMC design
- Computer aided engineering
- Real-time signal processing

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**Alpine Products and Core Technologies**

<table>
<thead>
<tr>
<th>Category</th>
<th>Core Device</th>
<th>Core Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVD Player</td>
<td>Mechanisms</td>
<td>Virtual 5.1 channel surround processing technology</td>
</tr>
<tr>
<td></td>
<td>Single &amp; in-dash multi-disc changer</td>
<td>Optimized human machine interface</td>
</tr>
<tr>
<td></td>
<td>Tuners</td>
<td></td>
</tr>
<tr>
<td>CD Player</td>
<td>Mechanisms</td>
<td>DSP for compressed media (e.g. MP3)</td>
</tr>
<tr>
<td></td>
<td>Single &amp; in-dash multi-disc changer</td>
<td>Optimized human machine interface</td>
</tr>
<tr>
<td></td>
<td>Tuners</td>
<td></td>
</tr>
<tr>
<td>Amplifier</td>
<td>Digital power supply</td>
<td>High stability circuit design</td>
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<tr>
<td>Speaker</td>
<td>Core</td>
<td>Magnet design technology</td>
</tr>
<tr>
<td>Audio Processor</td>
<td>DSP</td>
<td>Audio processing technology</td>
</tr>
<tr>
<td>Navigation</td>
<td>Core CPU (joint development)</td>
<td>Navigation database algorithm technology</td>
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<td>Gyro (joint development)</td>
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<tr>
<td>A/V (incl. monitor)</td>
<td>PulseTouch® monitor (Alps joint development)</td>
<td>Visual processing technology</td>
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<td>Shuttle monitor mechanism</td>
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*Alpine's PulseTouch technology provides tactile feedback to touch-screen displays. Piezoelectric elements embedded in the display simulate what it feels like when you push a button. Several button styles can be simulated.
DC Bus... Continued from page 1

line communications bus based on the CAN protocol. The bus will permit data communications between a heavy-duty truck and its trailer. This project is fairly easy to justify economically, according to Mr. Maryanka, because customers don’t need any additional wires or connectors for the standard trailer hook-up in order to integrate vehicle control systems between truck and trailer.

In the second SPA RC project, iQ Power Deutschland (Munich) is making batteries with Yamar transceivers inside, which use the power line and the LIN protocol to communicate data about the batteries’ state-of-charge and state-of-health. In this application, two independent batteries are connected to each other and to an energy management system. iQ Power Deutschland is a wholly-owned subsidiary of iQ Power AG (Zug, Switzerland), which supplies the auto industry with electrical energy management systems, components and consulting services.

Yamar has also been working with DaimlerChrysler on a new concept in support of the carmaker’s next-generation safety systems. Some of that work was documented in a paper published by the SAE called “The Vehicle Power Line as a Redundant Channel for CAN Communication,” 2005-01-1542.

Yamar’s trademarked DC-BUS got some attention at the 2004 Convergence meeting in Detroit, where Ford demonstrated a rear-mounted video camera linked to an LCD unit on the dashboard via the car’s DC power line and Yamar transceivers. Multiple cameras could send video data over the same power line using its built-in multiplex network capability.

Another application of the Yamar DC-BUS in development puts controls for an entertainment system in a rear door, without separate wiring or bus network. Control of the car’s rear lights via the power line is also possible.

Self-funded since 1994 by its technology development projects, as Yamar begins to book high-volume production orders the company will consider potential equity partners who could contribute not only financial support, but also market development expertise. With sales in the hundreds of thousands of euros per year, Yamar is owned by Mr. Maryanka and the employees, who include seven engineers.

The company wants to make its technology available to all comers, on a nonexclusive basis.

Yamar established the DC-BUS Alliance in 2000 to define a power-line communication standard, to secure suitable silicon development and to reduce the cost of production and engineering. That effort has been discontinued, said Mr. Maryanka, because “when it came to legal issues— to synchronize the agreement among carmakers—we were unable to deal with it. Today we work directly with almost all of the companies that were part of that alliance.”

New Features... Continued from page 3

ation sensing, StabiliTrak, Magnetic Ride Control (electronically controlled damping), parking sensors front and rear, rain-sensing wipers, heated and cooled front seat, heated steering wheel and back seat.

The 2006 Acura RL Technology Package option includes Honda’s Collision Mitigation Braking System and Electronic Stability Program. A grille-mounted millimeter wave radar sensor detects a possible collision and alerts the driver with audible and visual signals and adjusts the seatbelt with motorized pretensioners. The system applies braking automatically if needed. The Technology Package also includes adaptive cruise control.

The 2005 Frankfurt A u t o Show introduced an all-new Civic for Europe with standard stability control (Honda’s Vehicle Stability Assist). The 2006 Civic Hybrid, due in the U.S. in October 2005, will be a full hybrid, featuring Honda’s new i-VTEC engine and Integrated Motor Assist. The new engine should achieve 5% greater fuel efficiency and 20% more power. The engine shuts off when the car stops and also at low cruising speed (unlike the Toyota Prius).

The Kia Rio, an entry-level compact will feature six airbags (front, front side and side curtain) standard for MY 2006.

Hyundai’s A c c ent for 2006 also features six airbags along with occupant classification system. Four-wheel A BS is an option in the entry level A c c ent, but standard in the new Sonata and A zera sedans. A ISO standard in the A zera are adjustable foot pedals, impact-sensing automatic door unlocking, electrochromic rearview mirror and in all but the lowest trim level, HomeLink, the integrated remote garage door opener made by Johnson Controls.

The all-new Infiniti M35 and M45 sedans from Nissan come with standard dual-stage front, side and side curtain airbags. Options include: lane-departure warning, which first appeared on the 2005 Infiniti FX, DVD navigation with a multifunction switch and display user interface, adaptive headlights, adaptive cruise control and rear camera imaging system for parking and backing out of driveways.

The Toyota FJ Cruiser, a new S U V based on a modified 4Runner platform, is due at dealers early in 2006. Stability control, ABS and brake assist are standard. Rear parking assist is optional as are side and side curtain airbags and a multifunction display.

The automatic transmission version of the newly redesigned Lexus IS for 2006 offers radar adaptive cruise control and Toyota’s Pre-Collision Safety System, which activates seatbelt preten- sions and brake assist. Navigation, including a rear back-up camera system, is also available. Vehicle Dynamics Integrated Management, optional on the IS 350, is Toyota’s latest-generation stability control, which integrates steering, braking, electronic stability and traction controls for smoother operation. The Lexus IS comes with steering-linked adaptive headlights and an auxiliary audio input jack.

The Volkswagen Passat for 2006 comes with electromechanical power steering with “active-return steering and straight ahead driving correction assistance.” Standard safety features include eight airbags, stability control, brake assist, tire pressure monitoring and foot pedals that descend on serious impact. The Passat also has an electronic parking brake, optional navigation, optional adaptive headlights and on some models, park distance control.