PIONEER SHOWCASES AUTOMOTIVE TECHNOLOGIES TO ENHANCE EVERY DRIVE

Pioneer Europe (January 9, 2019) – At this year's Consumer Electronics Show (CES) 2019, Pioneer showcases key technologies to enhance the driving and the vehicle ownership experience – including innovations in both aftermarket and automotive OEM technologies. Featured in the booth is Pioneer's full line of aftermarket products that offer entertainment, smart connectivity including advanced services and quality audio enhancements to upgrade practically any vehicle. Pioneer carries on its automotive industry leadership by continuing to evolve its vision for driving technology, demonstrating technologies for the automobile of the future & supporting both autonomous and piloted driving modes.

At the CES booth, visitors will experience the next iteration of connected car solutions through Pioneer's partnership CalAmp®, an established leader in mobile and automotive technology solutions and owner of the LoJack brand, plus Pioneer's latest automotive aftermarket integration of Android Auto™, Apple CarPlay™ and new for the US in 2019, Amazon Alexa (available in US region only). Demonstrations include Pioneer's Advanced UX Cockpit, Light Detection - & Ranging (LiDAR) systems, and Advanced Map Data to support autonomous vehicles. Technologies on display include:

Advanced Concept Cockpit demonstration for automated driving

- In-car simulation, showcasing a fully automated (Level 5) driving system
- Various Human-Machine Interfaces (HMIs) assisting the driver's operation of the vehicle
- Driver Monitoring System: The driver's status must be monitored in order to determine if he or she is alert and capable of resuming control of the vehicle during the transition from fully automated driving to manual driving. Pioneer's Driver Monitoring System is designed to detect driver status with image recognition technology to calculate estimated attentiveness, drowsiness, tension and fatigue.
  - Drowsiness Detection Camera for condition and status of the driver
  - Seat mounted Microwave Heart-rate Sensor for condition and status of the driver
  - Steering Wheel Sensor
  - Seat Vibration to improve level of alertness

- <u>Sensory UI</u>
  During highly automated driving conditions, the driver will not be required to monitor the vehicle's status. However, the driver is expected to be available for occasional control but with a sufficiently comfortable transition time. The Sensory UI demonstration promotes safe and reliable operation during the automated driving mode and the critical hand-off between automated driving and manual driving. Pioneer's Sensory UI incorporates the use of light, directional sound, intuitive touch and video for improvement of driver recognition and responsiveness to manual driving commands.

- 3D-AUI with AR (Audio/Sound)
- Laser Head Up Displays with augmented reality technology (Video)
- Dash LED (Light)
- Active Feely (Touch)
- Seat Vibration (Feel)

- Entertainment For Automated Vehicles
  Autonomous and assisted driving will also allow the driver to experience secondary tasks and consume more information, with entertainment features / options playing a larger role.
  - Center Multimedia Display (Entertainment)
  - Sound Generator (Relaxation)
  - Seat Vibration
  - Automated Seat Position Control

3D-LiDAR

- New Pioneer LiDAR sensor prototype
- Micro Electro Mechanical Systems (MEMS) mirror-type 3D-LiDAR sensors
- Technologies to support 3D-LiDAR mapping
- Camera and LiDAR sensor combination systems
- Flexible system configuration for cost reduction and downsizing
- Multiple Pioneer developed configurations of LiDARs for various applications and design requirements
  - High Resolution Telescopic
  - Medium Range
  - Semi-wide View and Wide View

- Advanced Map Data Ecosystem
  - Collects dynamic environmental information from vehicles on the road and updates data automatically.
  - Global HD (high definition) map offering to support vehicles across all levels of Automation. Development partnership between HERE Technologies, the Netherlands-based global provider of mapping and location services, and IPC, a mapping subsidiary of Pioneer Corporation for HD mapping, a vital technology in ensuring autonomous vehicles can transport passengers safely, efficiently and comfortably.

At the CES booth, Pioneer demonstrates its latest products that integrate smart connectivity, including Advanced Driver Assistance, Car-To-Home integration, and vehicle monitoring. Audio products on display include compact, lightweight, energy efficient and even weather resistant products to suit a variety of applications in the aftermarket category for those looking to upgrade their sound.

To deliver this message, three vehicles with aftermarket upgrades will be on display in the Pioneer CES 2019 booth, two Toyota FJ Cruiser vehicles and one iconic 1971 Toyota FJ40 Land Cruiser. The FJ Cruisers feature nearly identical preparation, including the new for 2019 Pioneer AVIC-Z920DAB in-dash receiver and Pioneer D-series component speakers and subwoofers. One FJ Cruiser is dedicated to demonstrations of Android Auto Wireless (available in US region only) and Google Assistant integration, with the second reserved for demonstrations of Pioneer's latest implementation of Apple CarPlay connectivity. The classic FJ40 Land Cruiser showcases Pioneer's innovative SPH-10BT, an in-dash receiver that is specifically designed to integrate with the Pioneer Smart Sync app for system control and infotainment display and also features a unique smartphone cradle that physically holds the user's smartphone in place.

Pioneer will also demonstrate Amazon Alexa integration (available in US region only) via its Pioneer Smart Sync app and on its 2019 Weblink compatible navigation and multimedia headunits, allowing users to enjoy personalised music and other connected content in order to stay informed and entertained during their drive.

Lastly, Pioneer will showcase both its present and future Marine audio products, including multiple headunits, remote controllers, amplifiers, speakers and subwoofers designed for installation in harsh environments with increased moisture, dust and UV exposure.

To check out all of Pioneer's technology demonstrations and new products, please visit Pioneer in the North Hall of the Convention Center, booth #3902.

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Contacts:

Girish Janday
Pioneer Europe NV
Sales & Marketing Division
Girish.janday@pioneer.eu

Marnix Van Ruysseveldt
Pioneer Europe NV
Sales & Marketing Division
marnix.van.ruysseveldt@pioneer.eu