**IN THE UNITED STATES DISTRICT COURT**
**FOR THE EASTERN DISTRICT OF TEXAS**
**MARSHALL DIVISION**

| | | |
|---|---|---|
| LONGHORN AUTOMOTIVE GROUP LLC, | § | Case No. |
| | § | **JURY TRIAL DEMANDED** |
| Plaintiff, | § | |
| v. | § | |
| NISSAN MOTOR CO., LTD, | § | |
| Defendant. | § | |

**COMPLAINT FOR PATENT INFRINGEMENT**

Plaintiff Longhorn Automotive Group LLC ("LAG" or "Plaintiff") for its Complaint for patent infringement against Defendant Nissan Motor Co., Ltd. ("Nissan" or "Defendant") alleges as follows:

**THE PARTIES**

1. LAG is a limited liability company, organized and existing under the laws of the State of Texas, with its principal place of business located at 104 E. Houston Street, Marshall, Texas 75670.

2. Upon information and belief, Defendant Nissan is a Japanese corporation, with its principal place of business located at 1-1, Takashima 1-chome, Nishi-ku, Yokohama, Kanagawa, 220-8686, Japan. Upon information and belief, Nissan does business in Texas and in the Eastern District of Texas, directly or through intermediaries.

## JURISDICTION

3. This is an action for patent infringement arising under the patent laws of the United States, 35 U.S.C. §§ 1, *et seq*. This Court has jurisdiction over this action pursuant to 28 U.S.C. §§ 1331 and 1338(a).

4. This Court has personal jurisdiction over Defendant. Defendant regularly conducts business and has committed acts of patent infringement and/or has induced acts of patent infringement by others in this Judicial District and/or has contributed to patent infringement by others in this Judicial District, the State of Texas, and elsewhere in the United States.

5. Venue is proper in this Judicial District pursuant to 28 U.S.C. § 1391 because, among other things, Defendant is not a resident in the United States, and thus may be sued in any judicial district pursuant to 28 U.S.C. § 1391(c)(3).

6. Defendant is subject to this Court's jurisdiction pursuant to due process and/or the Texas Long Arm Statute due at least to its substantial business in this State and Judicial District, including (a) at least part of its past infringing activities, (b) regularly doing or soliciting business in Texas, and/or (c) engaging in persistent conduct and/or deriving substantial revenue from goods and services provided to customers in Texas.

## PATENTS-IN-SUIT

7. On August 19, 2014, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 8,810,803 (the "'803 Patent ") entitled "Lens System". A true and correct copy of the '803 Patent is available at: https://patentimages.storage.googleapis.com/b8/ee/03/9912346a786072/US8810803.pdf.

8. On July 26, 2011, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 7,987,002 (the "'002 Patent") entitled "Arrangement for Distributed

Measurement System for Measurement and Simulation in Distributed Control Systems". A true and correct copy of the '002 Patent is available at: https://patentimages.storage.googleapis.com/2e/7c/c3/eaf362f9a8faf3/US7987002.pdf.

9. On April 7, 2009, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 7,513,238 (the "'238 Patent") entitled "Directly Injecting Internal Combustion Engine." A true and correct copy of the '238 Patent is available at: https://patentimages.storage.googleapis.com/23/6c/e0/5d3e6ec82760c9/US7513238.pdf.

10. On December 15, 2009, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 7,634,666 (the "'666 Patent") entitled "Crypto-Engine for Cryptographic Processing of Data". A true and correct copy of the '666 Patent is available at: https://patentimages.storage.googleapis.com/3b/ac/ee/ebe6610877474c/US7634666.pdf.

11. On September 11, 2012, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 8,265,353 (the "'353 Patent") entitled "Method of Reconstructing an Image Acquired Using Several Imagery Modes." A true and correct copy of the '353 Patent is available at: https://patentimages.storage.googleapis.com/c3/ee/14/9676306bcc9887/US8265353.pdf.

12. LAG is the sole and exclusive owner of all right, title, and interest in the '803 Patent, the '002 Patent, the '238 Patent, the '666 Patent, and the '353 Patent (collectively, the "Patents-in-Suit") and holds the exclusive right to take all actions necessary to enforce its rights to the Patents-in-Suit, including the filing of this patent infringement lawsuit. LAG also has the right to recover all damages for past, present, and future infringement of the Patents-in-Suit and to seek injunctive relief as appropriate under the law.

13. LAG has at all times complied with the marking provisions of 35 U.S.C. § 287 with respect to the Patents-in-Suit.

## FACTUAL ALLEGATIONS

14. The '803 Patent generally relates to a plurality of lenses used for focusing and projecting the light in a plurality of directions. Such patterns include those generated by systems from an emitted light source. These patterns may be analyzed by computers to identify and determine aspects of the light patterns. The technology described in the '803 Patent was developed by inventor Matthew Bell and his company, Reactrix Systems.[1] For example, this technology is implemented in Nissan's headlight systems included in vehicles, in all trims and configurations, such as the Nissan Versa, Nissan Sentra, Nissan Altima, Nissan LEAF, Nissan Maxima, Nissan Z, Nissan GT-R, Nissan Rogue, Nissan Pathfinder, Nissan ARIYA, Nissan Kicks, Nissan Murano, Nissan Armada, Nissan Frontier, Nissan TITAN, Nissan TITAN XD, Nissan Juke, Nissan Tiida, Nissan X-Trail, Nissan Teana, Nissan Wingroad, Nissan Gran Livina, among other automotive vehicles (collectively, the "Accused Vehicles").

15. The '002 Patent generally relates to a monitoring system with a plurality of monitoring units communicating with a first interface in a first protocol which, in turn, is connected to a distributed control system using a second protocol. The technology described in the '002 Patent was developed by inventor Lars-Berno Fredriksson. For example, this technology is implemented in NissanConnect Remote Services, and all previous versions and iterations, included with vehicles, in all trims and configurations, including the Accused Vehicles.

16. The '238 Patent generally relates to novel direct injection in internal combustion engines where the shapes of the piston allow for early or late injection to optimize the direct

[1] *See* https://abcnews.go.com/Technology/story?id=5214706&page=1.

injection. The technology described in the '238 Patent was developed by inventors Ruediger Pfaff, Martin Schnabel, and Joachim Suess at DaimlerChrysler AG. For example, this technology is implemented in Nissan internal combustion engines included in vehicles, in all trims and configurations, such as the MR16DDT Engine, including the Accused Vehicles.

17. The '666 Patent generally relates to a crypto-engine for cryptographic processing, with an arithmetic unit and an interface controller for managing communications between the arithmetic unit and a host processor. The arithmetic unit has a memory unit for storing and loading data and arithmetic units for performing arithmetic operations on the data. The technology described in the '666 Patent was developed by Lee Ming Cheng, Ting On Ngan, and Ka Wai Hau. For example, this technology is implemented in car system-on-chips ("SoC"), such as the Renesas R-Car SoCs, implemented in Nissan vehicles, in all trims and configurations, including the Accused Vehicles.

18. The '353 Patent generally relates to measuring a mobile object using a plurality of imaging techniques in synchronization to provide video images of an object's state. The technology described in the '353 Patent was developed by Stéphane Bonnet and Pierre Grangeat. For example, this technology is implemented in Nissan's driver assistance systems, including Nissan's ProPILOT Assist, and all previous versions and iterations, in all trims and configurations, including the Accused Vehicles.

19. Nissan has infringed and is continuing to infringe the Patents-in-Suit by one or more of making, using, selling, offering to sell, and/or importing, and by actively inducing others to make, use, sell, offer to sell, and/or import vehicles, which are used or tested by Nissan and its direct or indirect customers or users in the United States.

## COUNT I
**(Infringement of the '803 Patent)**

20. Paragraphs 1 through 19 are incorporated by reference as if fully set forth herein.

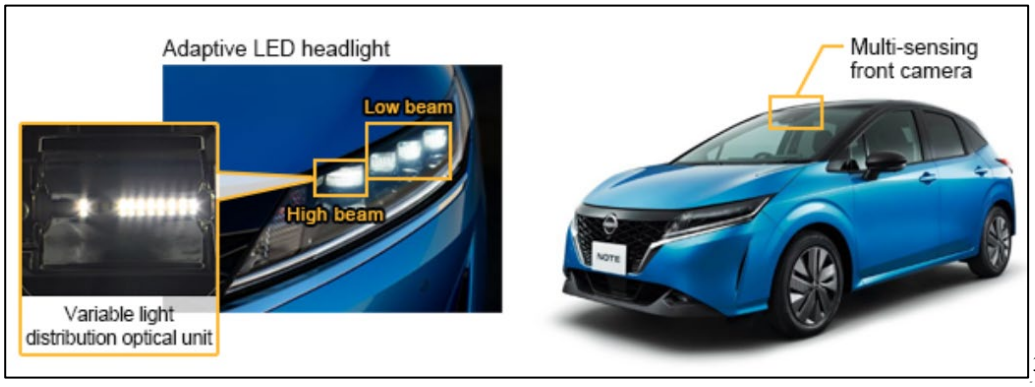
21. LAG has not licensed or otherwise authorized Defendant to make, use, offer for sale, sell, or import any products that embody the inventions of the '803 Patent.

22. Defendant has and continues to directly infringe the '803 Patent, either literally or under the doctrine of equivalents, without authority and in violation of 35 U.S.C. § 271, by one or more of making, using, offering to sell, selling, and/or importing into the United States products that satisfy each and every limitation of one or more claims of the '803 Patent. Such products include, but are not limited to, the Nissan ARIYA, among other vehicles.

23. For example, Defendant has and continues to directly infringe at least claim 15 of the '803 Patent by making, using, offering to sell, selling, and/or importing the Accused Vehicles into the United States that include LED headlights, or equivalents thereof, such as the Nissan ARIYA, among other products.

24. For example, the Nissan ARIYA comprises a system for projecting a pattern of light.

[2]




[3]

> The headlamps consist of a lamp for the low beams and a variable light distribution lamp for the high beams. Multiple LEDs are arranged in a horizontal row inside the variable light distribution lamp, and the high beam illumination distribution can be changed by turning each LED on or off independently.
> The vehicle in front of you is recognized by the multi-sensing front camera installed on the windshield. Based on the vehicle's direction and distance information, the control unit determines the area where the high beams should not illuminate and then controls the variable light distribution lamp.

[4]

This system automatically switches the headlights setting to low beam from high beam when it detects a vehicle ahead.
Frequent usage of high beams allows for earlier detection of pedestrians, supporting safer driving.


[5]

25. The Nissan ARIYA comprises a light source including a plurality of emitters configured to emit light.

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[2] https://www.nissanusa.com/shopping-tools/build-price/crossovers-suvs/nissan-ariya/2023/estimated-range-up-to-272-miles-2023_ariya_1549/29604:BACDz:A3bA/exterior/exterior-lighting/29604-A221
[3] https://www.nissan-global.com/EN/INNOVATION/TECHNOLOGY/ARCHIVE/ALH/
[4] *Id.*
[5] https://www.nissan-global.com/EN/INNOVATION/TECHNOLOGY/ARCHIVE/HBA/

> The headlamps consist of a lamp for the low beams and a variable light distribution lamp for the high beams. Multiple LEDs are arranged in a horizontal row inside the variable light distribution lamp, and the high beam illumination distribution can be changed by turning each LED on or off independently.
>
> The vehicle in front of you is recognized by the multi-sensing front camera installed on the windshield. Based on the vehicle's direction and distance information, the control unit determines the area where the high beams should not illuminate and then controls the variable light distribution lamp.

[6]


[7]

> Embracing the Japanese term *iki*, which characterizes the Ariya's chic, cutting-edge nature, the front of the vehicle appears seamless, elegant and fresh. It's highlighted by a shield – a reimagined grille for the EV era. The shield incorporates a 3-D traditional Japanese *kumiko* pattern just under the smooth surface, while protecting sensors used for driver assistance functions without the aesthetics interrupting operation. Nissan's redesigned brand logo is prominently placed at the center of the aerodynamic shield, beaming with crisp definition from the 20 LEDs that compose it.
>
> The lower section of the shield is bordered by subtle lighting that illuminates, along with the logo, when the Ariya is ready for operation. Thin LED headlamps, constructed with four 20-millimeter mini-projectors to reinvent Nissan's signature V-motion design.

[8]

26. The Nissan ARIYA comprises a cluster of lenses, each lens included in the cluster of lenses being configured to receive the emitted light from each of the plurality of emitters.

[6] https://www.nissan-global.com/EN/INNOVATION/TECHNOLOGY/ARCHIVE/ALH/
[7] *Id.*
[8] https://usa.nissannews.com/en-US/releases/2023-Ariya-Overview-and-Specs?selectedTabId=#release-9eea16a47c78109cfe96b677a0055748.

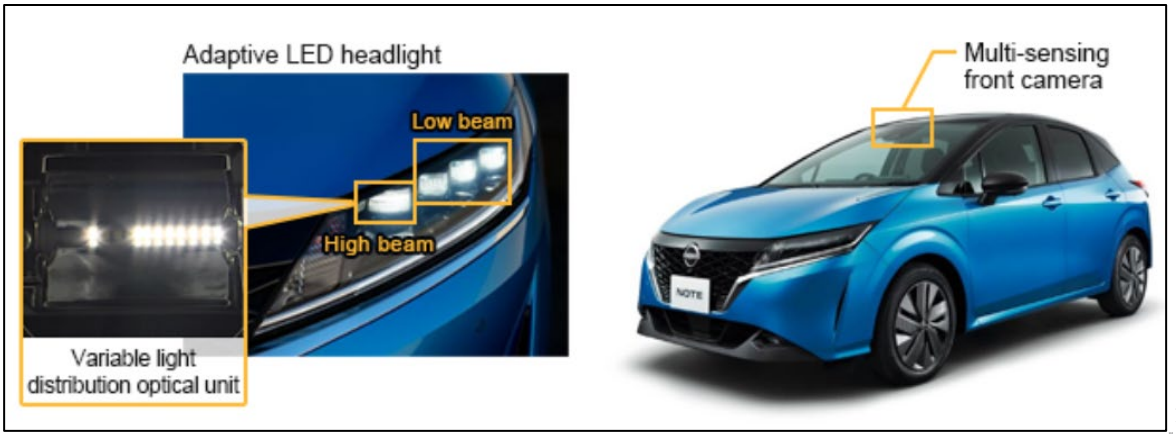
> In the Evolve trim, the Ariya features four 20mm projectors modules per side for low and high beam. The latter features matrix functionality. Within those projectors are lots of LEDs, I have no concrete information as to how many segments are used, suffice it to say: the light is simply amazing. The low beam alone will keep the road illuminated easily, the throw is better than anything I have seen so far. The Matrix high beam is the icing on the cake. Super quick, well programmed, road signs get dimmed out if the reflection is too heavy (still the light overall is so bright, that the camera struggled at times, but don't worry, for the eyes it's just phenomenal!).[9]

> The headlamps consist of a lamp for the low beams and a variable light distribution lamp for the high beams. Multiple LEDs are arranged in a horizontal row inside the variable light distribution lamp, and the high beam illumination distribution can be changed by turning each LED on or off independently.
> The vehicle in front of you is recognized by the multi-sensing front camera installed on the windshield. Based on the vehicle's direction and distance information, the control unit determines the area where the high beams should not illuminate and then controls the variable light distribution lamp.[10]

[11]

27. The Nissan ARIYA comprises a condenser lens located between said light source and said cluster of lenses, the condenser lens concentrating light from each of the plurality of emitters towards a center of the cluster of lenses.

[9] https://www.ariyaforums.com/threads/nissan-ariya-matrix-led-adaptive-high-beam-adaptive-led-headlight-in-action.427/
[10] https://www.nissan-global.com/EN/INNOVATION/TECHNOLOGY/ARCHIVE/ALH/
[11] *Id.*



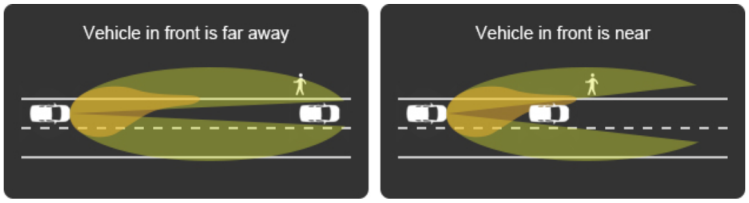

[12]

The vehicle in front of you is recognized by the multi-sensing front camera installed on the windshield. Based on the vehicle's direction and distance information, the control unit determines the area where the high beams should not illuminate and then controls the variable light distribution lamp.

[13]

## When there is a vehicle in front of you

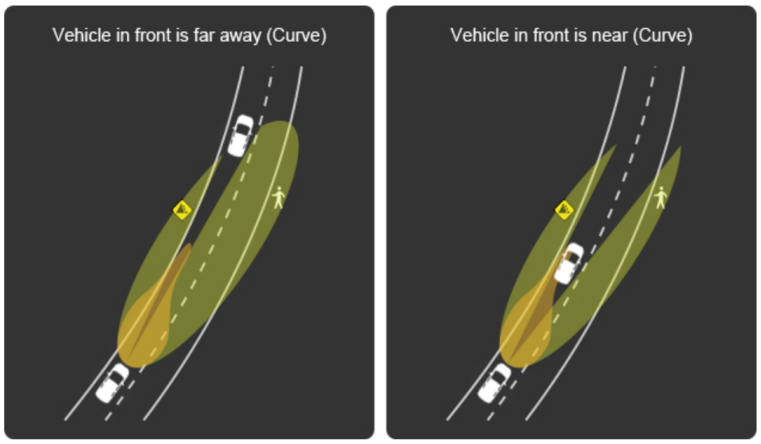
The area surrounding the vehicle in front of you is illuminated with the high beams, and the high beams are only turned off for the area in front of you. The width of the area being turned off changes according to the distance between you and the vehicle in front of you.




[14]

[12] *Id.*
[13] *Id.*
[14] *Id.*

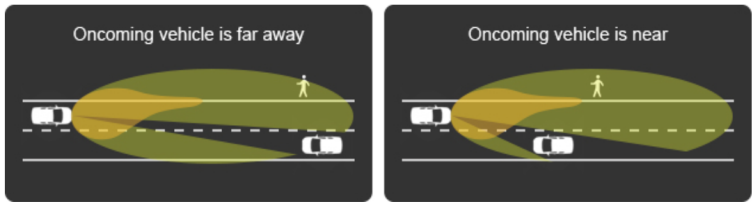
When seen from your vehicle, the angle to the vehicle in front of you changes when you are on a curve, so the high beam's direction is changed by turning off a portion of the high beams.




15

**When there is an oncoming vehicle**

Similarly, when an oncoming vehicle is approaching, the direction and width of the portion of the high beams being turned off changes according to the position of the oncoming vehicle.




16

28. Defendant has and continues to indirectly infringe one or more claims of the '803 Patent by knowingly and intentionally inducing others, including Nissan customers and end-users, to directly infringe, either literally or under the doctrine of equivalents, by making, using, offering to sell, selling, and/or importing into the United States products that include the infringing technology.

29. Defendant, with knowledge that these products, or the use thereof, infringes the

[15] *Id.*
[16] *Id.*

'803 Patent at least as of the date of this Complaint, knowingly and intentionally induced, and continues to knowingly and intentionally induce, direct infringement of the '803 Patent by providing these products to customers and end-users for use in an infringing manner. Alternatively, on information and belief, Defendant has adopted a policy of not reviewing the patents of others, including specifically those related to Defendant's specific industry, thereby remaining willfully blind to the Patents-in-Suit at least as early as the issuance of the Patents-in-Suit.

30. Defendant has and continues to induce infringement by others, including customers and end-users, with the intent to cause infringing acts by others or, in the alternative, with the belief that there was a high probability that others, including end-users, infringe the '803 Patent, but while remaining willfully blind to the infringement. Defendant has and continues to induce infringement by its customers and end-users by supplying them with instructions on how to operate the infringing technology in an infringing manner, while also making publicly available information on the infringing technology via Defendant's website, product literature and packaging, and other publications.[17]

31. LAG has suffered damages as a result of Defendant's direct and indirect infringement of the '803 Patent in an amount to be proved at trial.

32. LAG has suffered, and will continue to suffer, irreparable harm as a result of Defendant's infringement of the '803 Patent, for which there is no adequate remedy at law, unless Defendant's infringement is enjoined by this Court.

[17] *See* 2023 Nissan ARIYA Owner's Manual and Maintenance Information, available at: https://www.nissanusa.com/content/dam/Nissan/us/manuals-and-guides/nissan-ariya/2023/2023-nissan-ariya-owner-manual.pdf.

**COUNT II**
**(Infringement of the '002 Patent)**

33. Paragraphs 1 through 19 are incorporated by reference as if fully set forth herein.

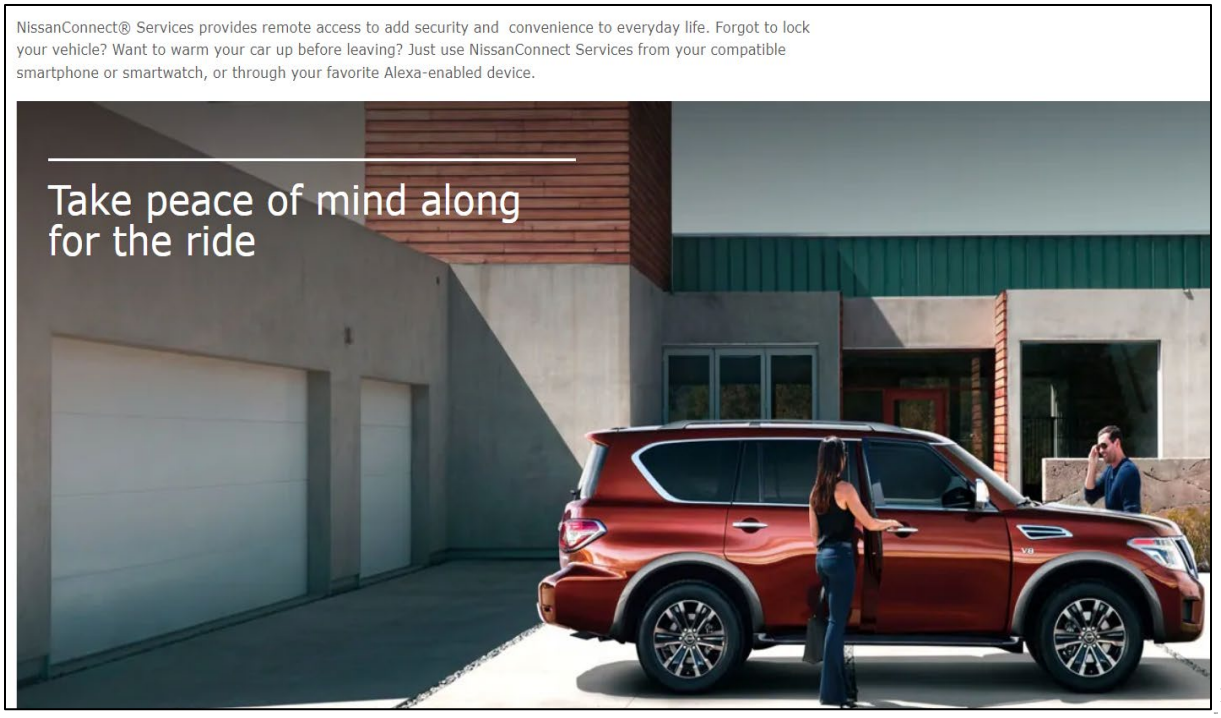
34. LAG has not licensed or otherwise authorized Defendant to make, use, offer for sale, sell, or import any products that embody the inventions of the '002 Patent.

35. Defendant has and continues to infringe the '002 Patent, either literally or under the doctrine of equivalents, without authority and in violation of 35 U.S.C. § 271, by one or more of making, using, offering to sell, selling, and/or importing into the United States products that satisfy each and every limitation of one or more claims of the '002 Patent. Such products include, but are not limited to, the Accused Vehicles equipped with Nissan Connect Remote Services technology, or the equivalent thereto, included in the Accused Vehicles, in all trims and configurations.

36. For example, Defendant has and continues to directly infringe at least claim 15 of the '002 Patent by making, using, offering to sell, selling, and/or importing into the United States products that include the NissanConnect Remote Services, such as the Nissan ARIYA, among other products.

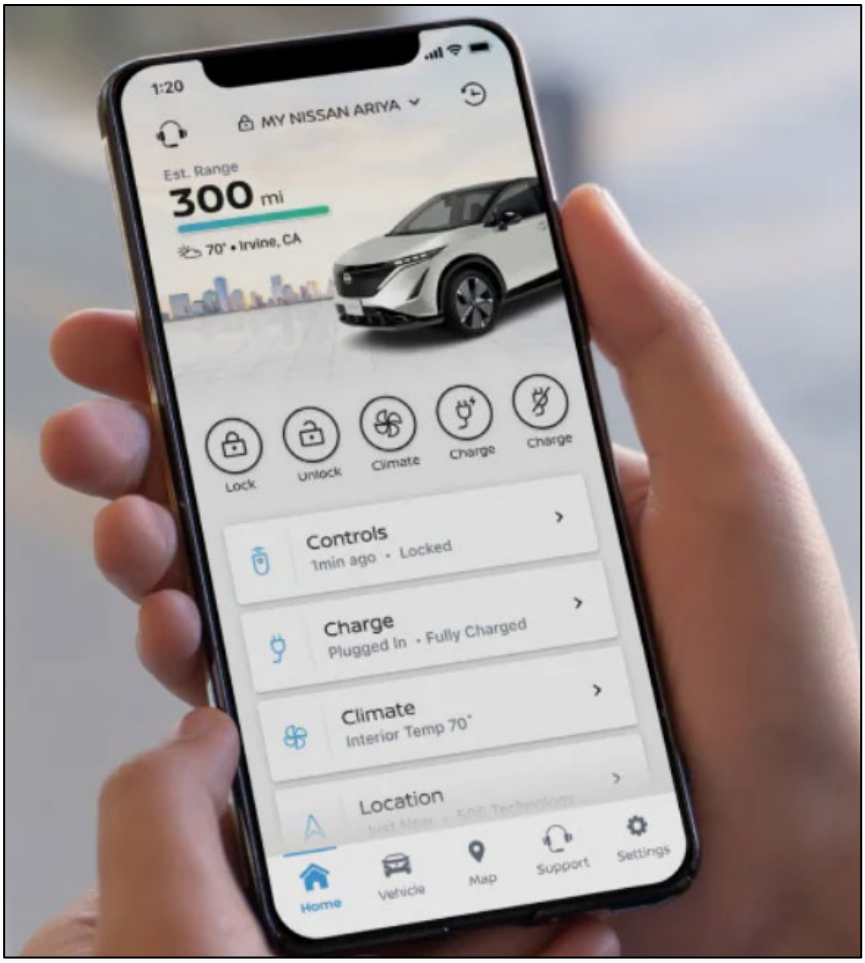
37. For example, the Nissan ARIYA comprises a monitoring system.


[18]




[19]

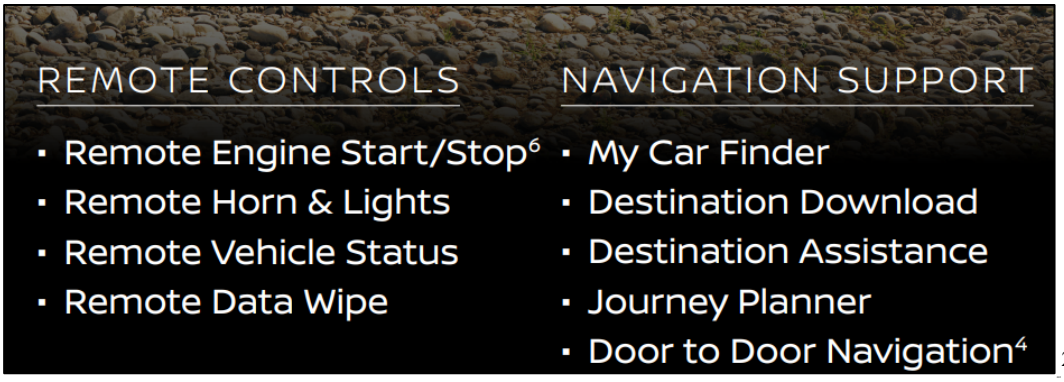
[18] https://www.nissanusa.com/connect.html
[19] https://www.nissanusa.com/connect/features-apps.html



[20]

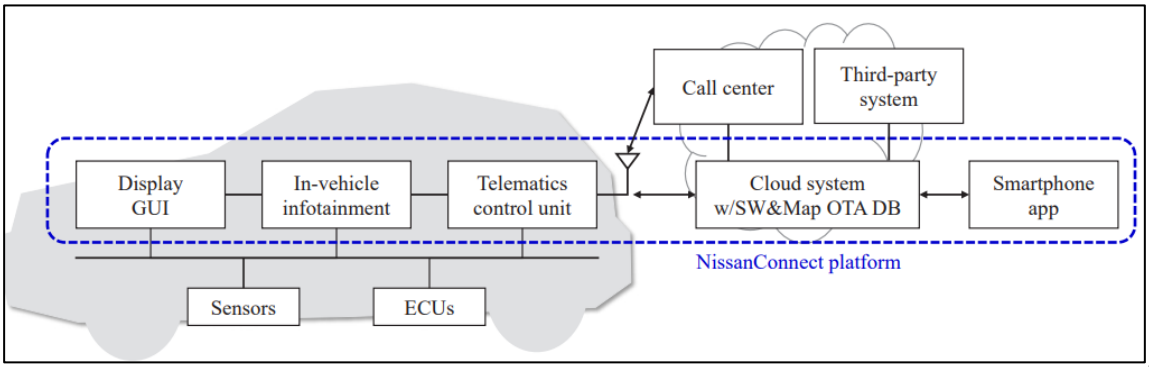
38. The Nissan ARIYA comprises a plurality of monitoring units (*e.g.*, the NissanConnect Remote Services) configured to communicate with at least one interface unit (*e.g.*, TCU) using a first protocol (*e.g.*, cellular network), wherein the at least one interface unit is communicably connected to a distributed control system (*e.g.*, Body Control Module and/or Engine Control Module), and the at least one interface unit is further configured to receive data values from the distributed control system using a second protocol (*e.g.*, CAN communication).

[20] *Id.*



[21]

The Applied Vehicles are equipped with a wireless communication device called a Telematics Communication Unit (TCU). With an active NissanConnect[SM] Services subscription, the TCU communicates with the NissanConnect[SM] Services Data Center to provide various security and convenience services.
[22]



[23]

[21] https://www.nissanusa.com/content/dam/Nissan/us/nissanconnect/nissanconnect-brochure.pdf
[22] https://static.nhtsa.gov/odi/tsbs/2021/MC-10186833-0001.pdf
[23].https://www.nissan-global.com/EN/TECHNICALREVIEW/PDF/TOPIC/NISSAN_TECHINICAL_REVIEW_88_En_ALL.pdf

> An overview of the NissanConnect system is shown in Fig. 2. The vehicle is equipped with an in-vehicle infotainment (IVI) system comprising a display and graphical user interface (GUI) as well as a telematics control unit (TCU), which communicates with the cloud. Connections to the other electronic control units (ECUs) and sensors of the vehicle are via LAN. The TCU communicates with the cloud using a mobile phone network. The cloud system is accessible by call centers and third-party information providers that offer services and information to users. In addition, a dedicated app on a user's smartphone collaborates with the cloud system. The IVI, display, IVC, cloud system, and apps comprise the NissanConnect platform.

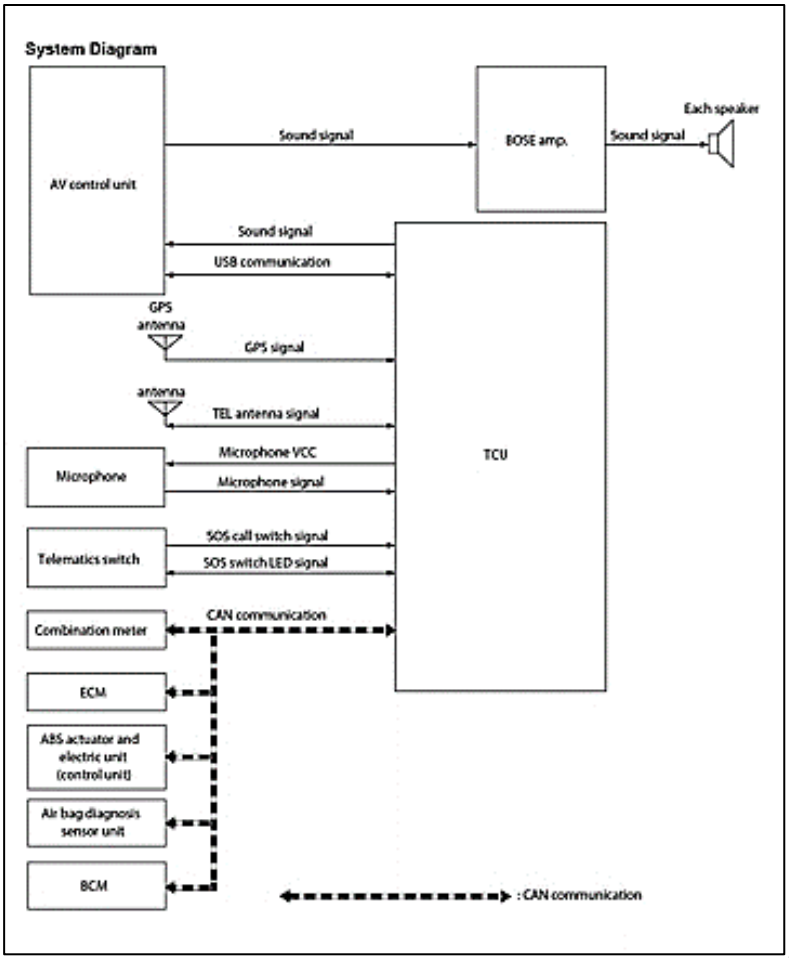
[24]

> NissanConnect Services uses a telematics control unit that is embedded in the vehicle, connecting to a compatible cellular network to access the suite of services. The Services work using wireless communication networks and the Global Positioning System ("GPS") satellite network. Not all NissanConnect Services are available everywhere, particularly in remote or enclosed areas. The area in which you are driving may affect the service that can be provided, including but not limited to routing and GPS services such as our ability to determine your Vehicle's precise location.

[25]

[24] *Id.*

[25] https://www.nissanusa.com/connect/support-faqs.html

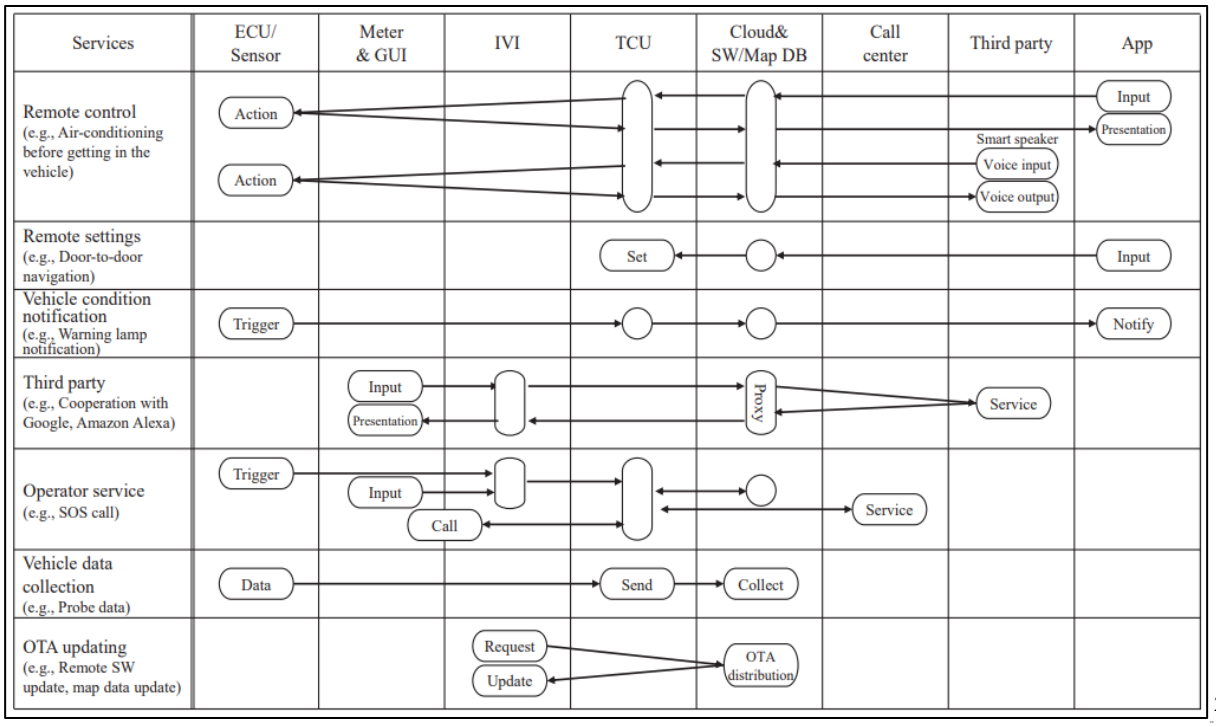



[26]

[26] http://www.nissantechnicianinfo.mobi/htmlversions/2015_June-July%20Issue%202/TCU.html

Fig. 3 shows the sequential overview of various services provided by this platform. For example, for the remote function that enables vehicle operation from an app, the user input to the app is used as the trigger to establish a communication path between the cloud server and TCU; subsequently, the commands are sent to the TCU. The TCU operates the vehicle according to the received command and sends the results to the app via the cloud system. In addition, for services that coordinate with third-party information when the vehicle is traveling, user input to the IVI is used as the trigger to convert the cloud system to a proxy, which subsequently connects to the third-party system for service provision. Hence, numerous services can be provided by configuring the functions on the NissanConnect platform.

[27]




[28]

[27] https://www.nissan-global.com/EN/TECHNICALREVIEW/PDF/TOPIC/NISSAN_TECHINICAL_REVIEW_88_En_ALL.pdf

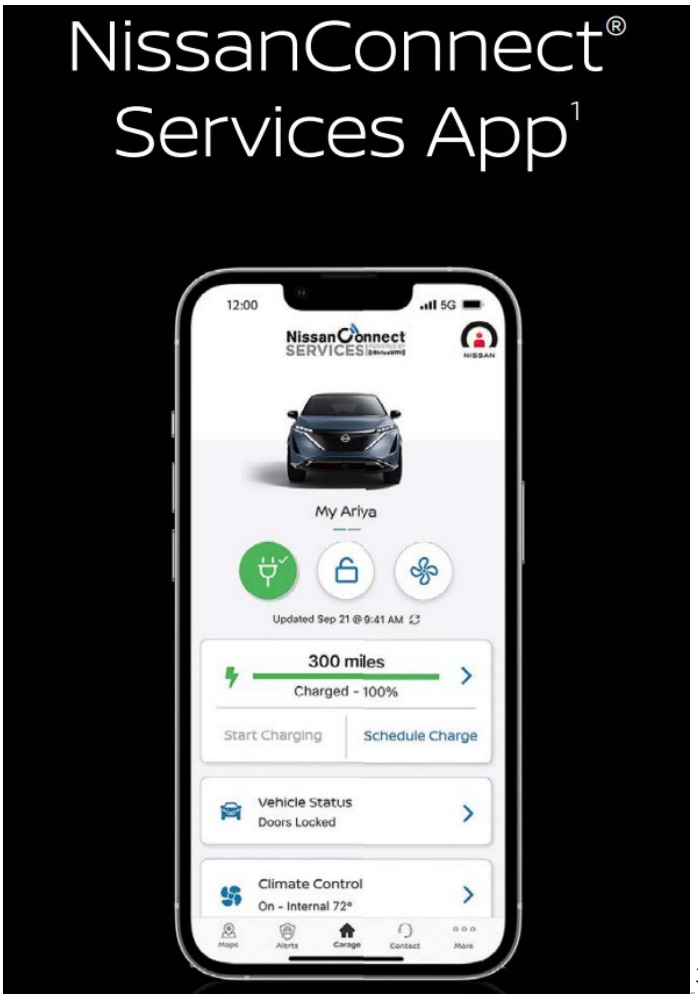
[28] *Id.*

> • A **CAN Bus** module that manages all the communication with the vehicle ECUs. Many of the commercially available telematics devices also support OBD II, MOST, LIN interfaces.The TCU communicates with the vehicle ECUs through CAN bus and fetches crucial information such as engine performance, vehicle speed, data from the Tire Pressure measuring Sensors, etc.A telematics system may also use K/Line bus to alert the user about theft (by notifying the user if the vehicle is switched on by anyone), or to enable remote locking and unlocking of the vehicle.

[29]

39. The Nissan ARIYA comprises a plurality of monitoring units (*e.g.*, NissanConnect Remote Services) wherein the plurality of monitoring units comprises at least one complex monitoring unit (*e.g.*, NissanConnect Server Platform) and at least one basic monitoring unit (*e.g.*, NissanConnect Service App or MyNissan App with Connect Remote Service).

[29] https://www.embitel.com/blog/embedded-blog/tech-behind-telematics-explained-how-does-a-vehicle-telematics-solution-work



[30]

[30] https://www.nissanusa.com/content/dam/Nissan/us/vehicle-brochures/2024/NissanConnect-Brochure-Ariya.pdf

**Remote Engine Start/Stop (if so equipped):**

If the vehicle is equipped with both TCU (Telematics Control Unit) and Remote Engine Start, customers can remotely start the engine via the NissanConnect® Services website or app.

**Remote Door Lock/Unlock:**

The Remote Door Lock/Unlock feature allows the customer to access the vehicle remotely from the NissanConnect® Services website or app to send lock or unlock commands to the vehicle.

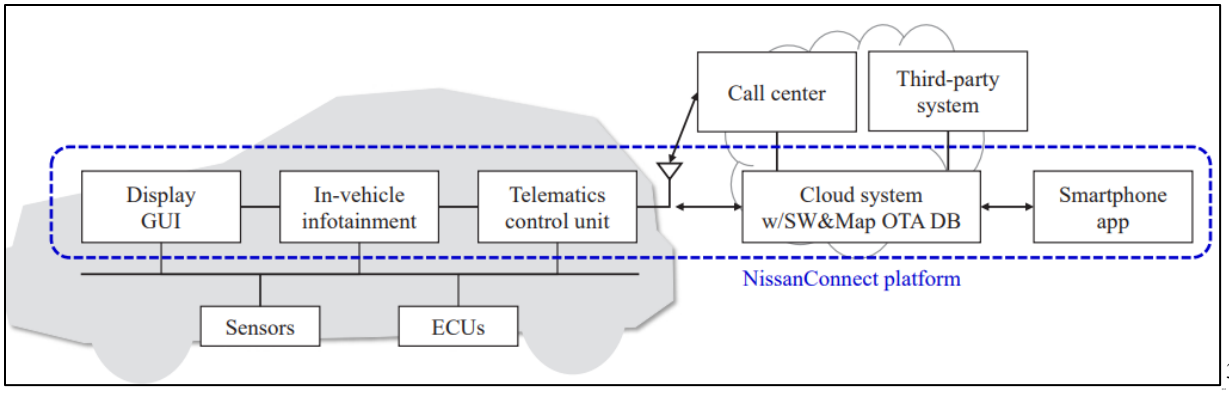
☞ "Connecting to Interactive Voice Menu" (page 5-13)

**Remote Horn & Lights:**

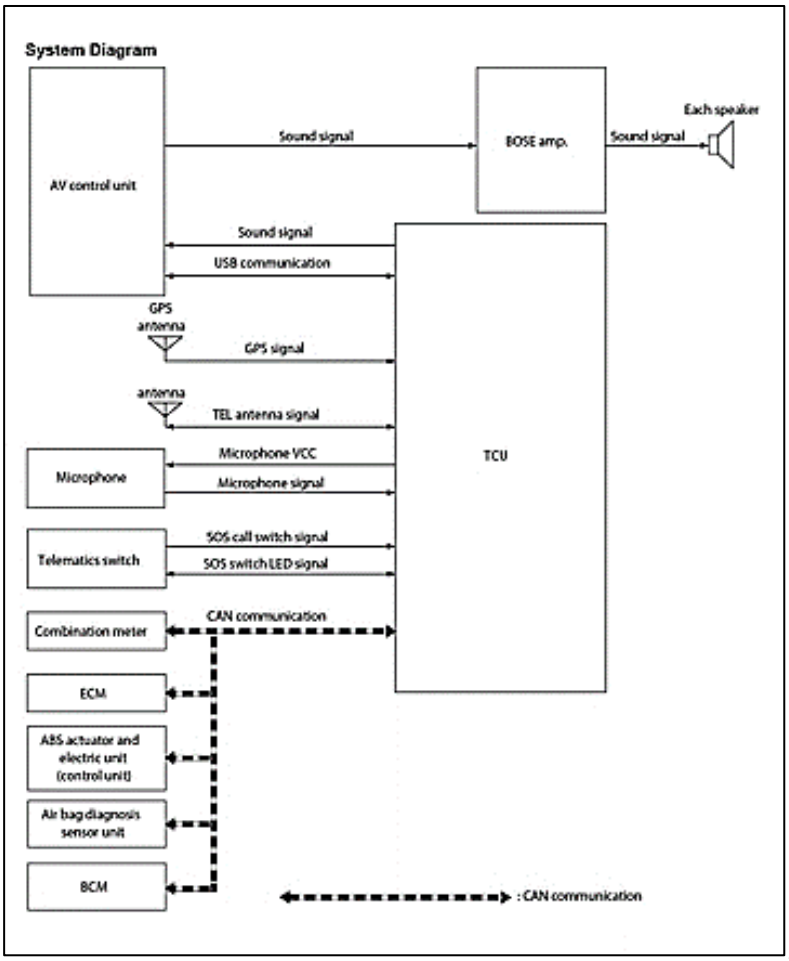
Customers can activate the vehicle's headlights and horn via the NissanConnect® Services website or app.[31]

40. The Nissan ARIYA comprises a plurality of monitoring units wherein the at least one complex monitoring unit (*e.g.*, NissanConnect Server Platform) is configured to receive a plurality of data values (*e.g.*, engine information, vehicle speed, and other data) from the at least one interface unit using the first protocol (*e.g.*, cellular network and/or Bluetooth) and to generate programmatic instructions for the at least one basic monitoring unit (*e.g.*, NissanConnect Service App or MyNissan App with Connect Remote Service).

[31] https://www.nissanusa.com/content/dam/Nissan/us/manuals-and-guides/shared/2023/2023-nissan-connectA-navigation-manual.pdf




[32]



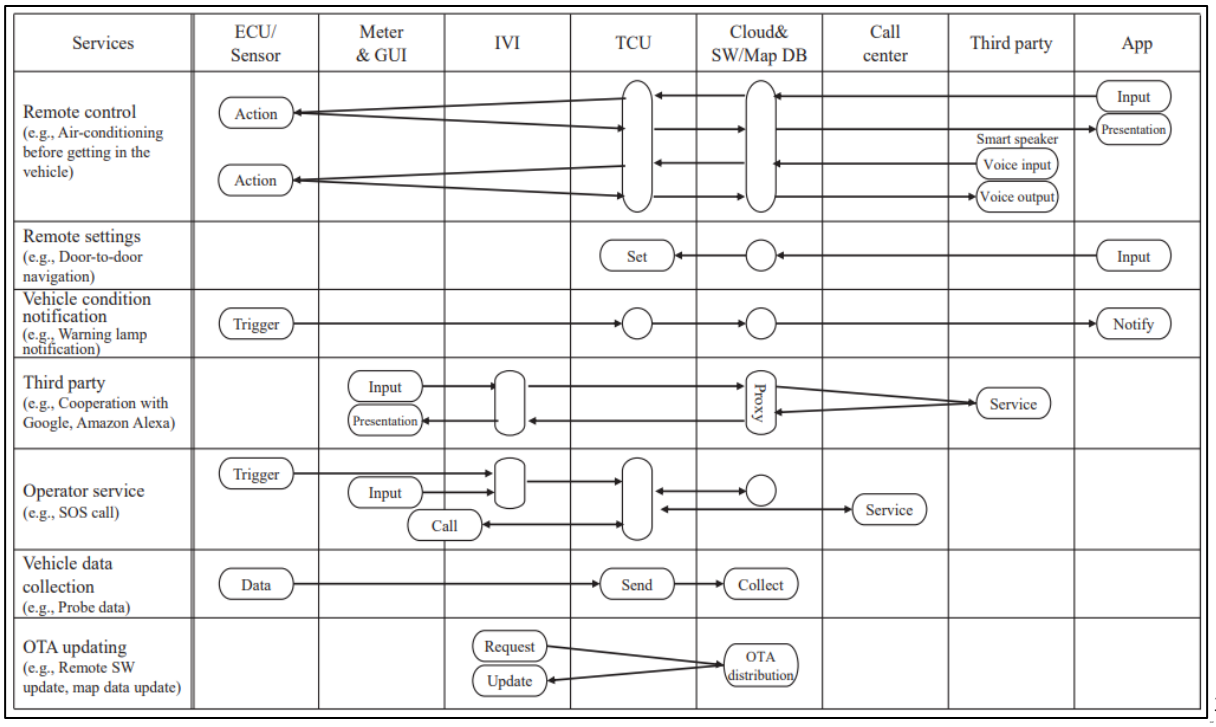

[33]

[32] https://www.nissan-global.com/EN/TECHNICALREVIEW/PDF/TOPIC/NISSAN_TECHINICAL_REVIEW_88_En_ALL.pdf

[33] http://www.nissantechnicianinfo.mobi/htmlversions/2015_June-July%20Issue%202/TCU.html

Fig. 3 shows the sequential overview of various services provided by this platform. For example, for the remote function that enables vehicle operation from an app, the user input to the app is used as the trigger to establish a communication path between the cloud server and TCU; subsequently, the commands are sent to the TCU. The TCU operates the vehicle according to the received command and sends the results to the app via the cloud system. In addition, for services that coordinate with third-party information when the vehicle is traveling, user input to the IVI is used as the trigger to convert the cloud system to a proxy, which subsequently connects to the third-party system for service provision. Hence, numerous services can be provided by configuring the functions on the NissanConnect platform.

[34]




[35]

[34] https://www.nissan-global.com/EN/TECHNICALREVIEW/PDF/TOPIC/NISSAN_TECHINICAL_REVIEW_88_En_ALL.pdf

[35] *Id.*

**How does Remote Engine Start/Stop work?**

When you start your vehicle with Remote Engine Start the engine will run for 10 minutes. After sending two Remote Engine Start commands from the MyNISSAN App or Owner Portal or if you have not started your vehicle's engine in the last 14 days, you will need to start your engine with the Nissan Intelligent Key before sending additional Remote Engine Start commands.

The device communicates through a cellular network. Connection and signal strength may vary and be limited by location.

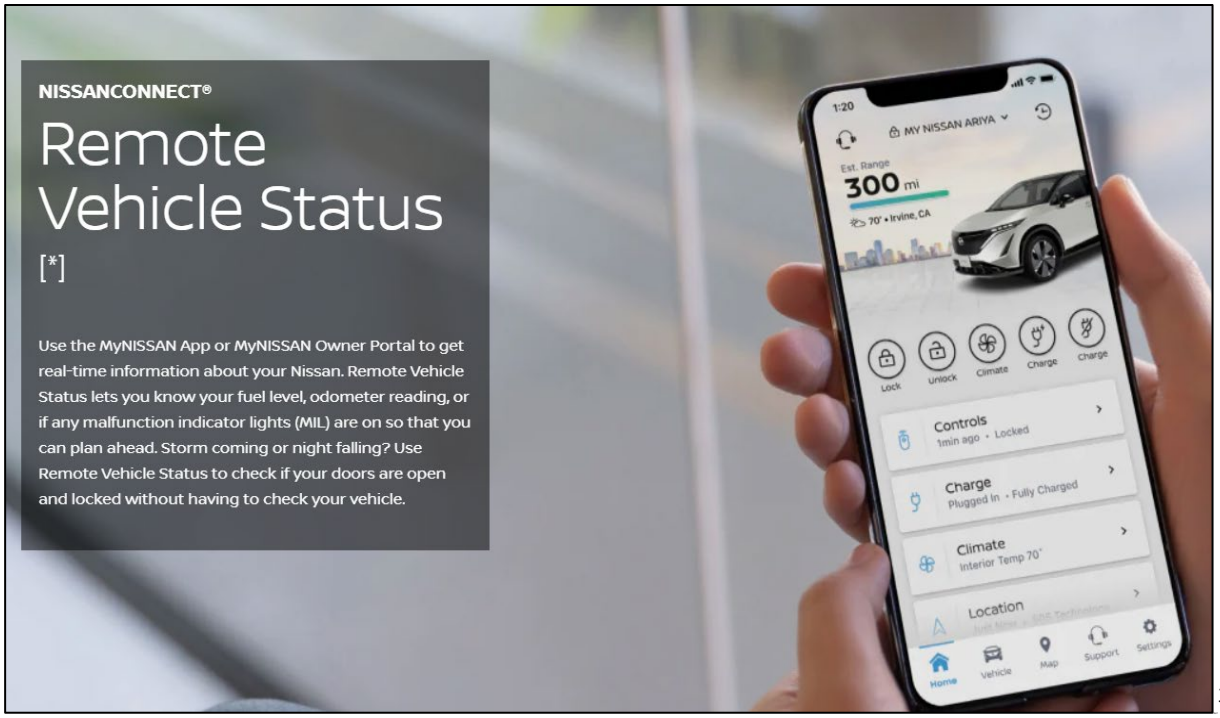
The following conditions must be met for your vehicle to be started remotely:

1. Vehicle doors must be closed and locked
2. Hood must be closed
3. Windows up
4. Transmission must be in 'Park'
5. Nissan Intelligent key must be outside of the vehicle
6. Brake pedal cannot be depressed

36

41. The Nissan ARYIA comprises a plurality of monitoring units wherein the at least one basic monitoring unit (*e.g.*, NissanConnect Service App or MyNissan App with Connect Remote Service) is configured to receive the programmatic instructions (*e.g.*, vehicle status data) and in response thereto to receive a subset of the plurality of data values (*e.g.*, engine information, vehicle speed, and other data) from the at least one interface unit (*e.g.*, the TCU) using the first protocol (*e.g.*, cellular network and/or Bluetooth).

[36] https://www.nissanusa.com/connect/features-apps/remote-engine-start.html

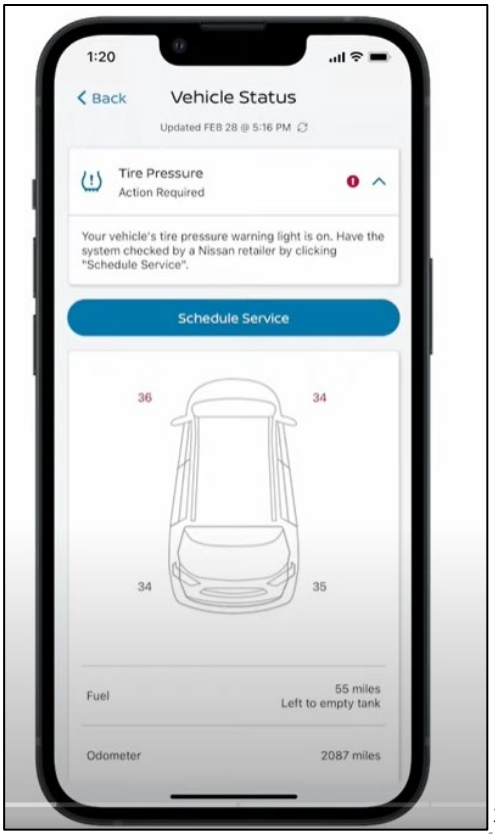


[37]

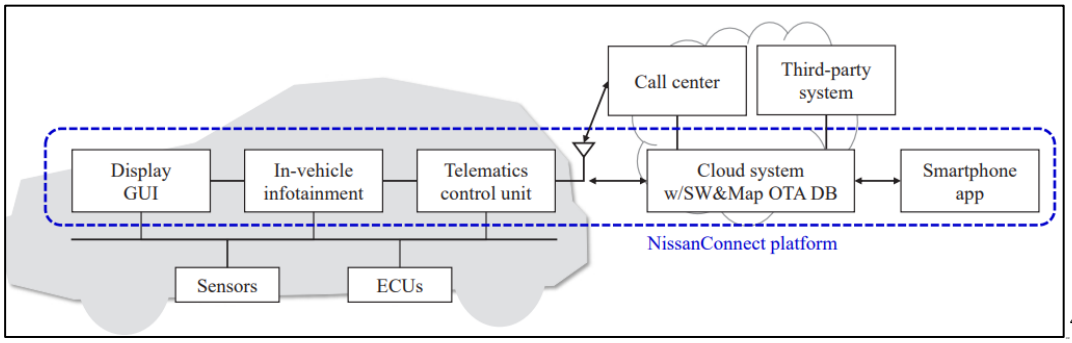
[37] https://www.nissanusa.com/connect/features-apps/remote-vehicle-status.html

[38]

[38] https://www.youtube.com/watch?v=1uDnfXj3jC0



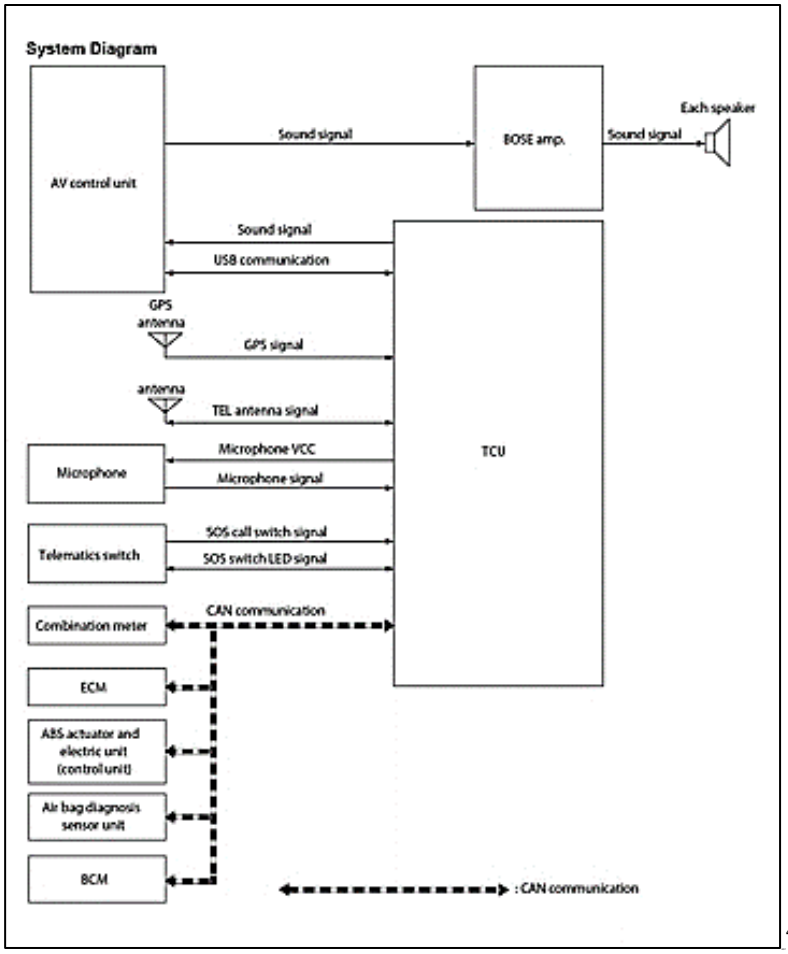
[39]



[40]

[39] *Id.*

[40] https://www.nissan-global.com/EN/TECHNICALREVIEW/PDF/TOPIC/NISSAN_TECHINICAL_REVIEW_88_En_ALL.pdf




41

Fig. 3 shows the sequential overview of various services provided by this platform. For example, for the remote function that enables vehicle operation from an app, the user input to the app is used as the trigger to establish a communication path between the cloud server and TCU; subsequently, the commands are sent to the TCU. The TCU operates the vehicle according to the received command and sends the results to the app via the cloud system. In addition, for services that coordinate with 42

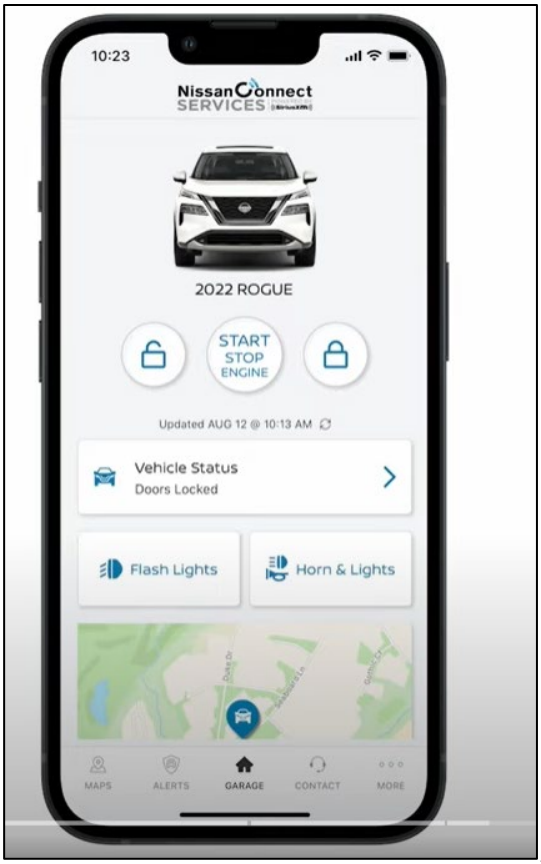
[41] http://www.nissantechnicianinfo.mobi/htmlversions/2015_June-July%20Issue%202/TCU.html
[42] https://www.nissan-global.com/EN/TECHNICALREVIEW/PDF/TOPIC/NISSAN_TECHINICAL_REVIEW_88_En_ALL.pdf

> ARIYA is equipped with 78 electrical control units (ECUs) that provide the "intelligence" control for the car, which is more than twice that of the conventional Nissan electric vehicle, LEAF. This advancement required the development of systems for high-speed data communication and expansion of the data-writing process, which can be manufactured at the production plant.[43]

> Remote Door Lock/Unlock allows you to remotely unlock or lock your Nissan's doors through the MyNISSAN App or MyNISSAN Owner Portal from any location. If you forget to lock your vehicle, or if you need to open it and don't have the keys, you can send a remote request. If available in your vehicle, the doors will automatically relock if a door has not been opened within a minute after a successful remote unlock request.[44]

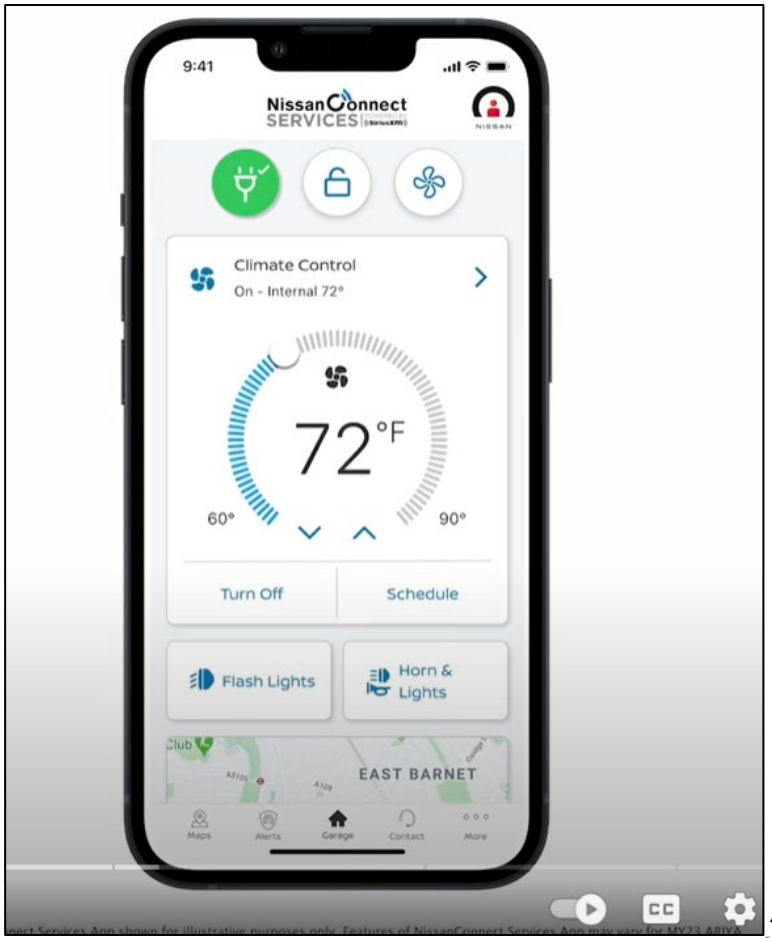
> When you start your vehicle with Remote Engine Start the engine will run for 10 minutes. After sending two Remote Engine Start commands from the MyNISSAN App or Owner Portal or if you have not started your vehicle's engine in the last 14 days, you will need to start your engine with the Nissan Intelligent Key before sending additional Remote Engine Start commands.
>
> The device communicates through a cellular network. Connection and signal strength may vary and be limited by location.[45]

[43] https://www.nissan-global.com/EN/TECHNICALREVIEW/PDF/TOPIC/NISSAN_TECHINICAL_REVIEW_88_En_ALL.pdf
[44] https://www.nissanusa.com/connect/support-faqs.html
[45] *Id.*



[46]

[46] https://www.youtube.com/watch?v=1uDnfXj3jC0




47

**Will I be notified if remote commands are successful or unsuccessful?**

You can be notified of the success or failure of remote commands if you have downloaded the MyNISSAN App and have enabled push notifications. You will also be shown the status of the command within the mobile app. If you have not started your vehicle's engine in the last 14 days, you will need to start your engine with the Nissan Intelligent key before your vehicle will initiate Remote Engine Start/Stop commands.

48

| Activation period [*] | Set an extension | Notification of failed request |
|---|---|---|
| Once Remote Engine Start is activated your Nissan vehicle will run for 10 minutes. If you haven't driven away by the time that period lapses, your engine will shut down automatically. | On the MyNISSAN App or MyNISSAN Owner Portal, you will be notified by email when a new Vehicle Health Report is ready for viewing. | If your vehicle fails to start following a remote command, you'll be notified by the push notification preference you set on the MyNISSAN app or MyNISSAN Owner Portal. |

49

42. Defendant has and continues to indirectly infringe one or more claims of the '002 Patent by knowingly and intentionally inducing others, including Nissan customers and end-users,

[47] https://www.youtube.com/watch?v=1uDnfXj3jC0
[48] https://www.nissanusa.com/connect/support-faqs.html
[49] https://www.nissanusa.com/connect/features-apps/remote-engine-start.html

to directly infringe, either literally or under the doctrine of equivalents, by making, using, offering to sell, selling, and/or importing into the United States products that include the infringing technology.

43. Defendant, with knowledge that these products, or the use thereof, infringe the '002 Patent at least as of the date of this Complaint, knowingly and intentionally induced, and continues to knowingly and intentionally induce, direct infringement of the '002 Patent by providing these products to customers and end-users for use in an infringing manner. Alternatively, on information and belief, Defendant has adopted a policy of not reviewing the patents of others, including specifically those related to Defendant's specific industry, thereby remaining willfully blind to the Patents-in-Suit at least as early as the issuance of the Patents-in-Suit.

44. Defendant has and continues to induce infringement by others, including customers and end-users, with the intent to cause infringing acts by others or, in the alternative, with the belief that there was a high probability that others, including end-users, infringe the '002 Patent, but while remaining willfully blind to the infringement. Defendant has and continues to induce infringement by its customers and end-users by supplying them with instructions on how to operate the infringing technology in an infringing manner, while also making publicly available information on the infringing technology via Defendant's website, product literature and packaging, and other publications.[50]

45. LAG has suffered damages as a result of Defendant's direct and indirect infringement of the '002 Patent in an amount to be proved at trial.

[50] *See* 2023 Nissan ARIYA Owner's Manual and Maintenance Information, available at: https://www.nissanusa.com/content/dam/Nissan/us/manuals-and-guides/nissan-ariya/2023/2023-nissan-ariya-owner-manual.pdf.

46. LAG has suffered, and will continue to suffer, irreparable harm as a result of Defendant's infringement of the '002 Patent, for which there is no adequate remedy at law, unless Defendant's infringement is enjoined by this Court.

**COUNT III**
**(Infringement of the '238 Patent)**

47. Paragraphs 1 through 19 are incorporated by reference as if fully set forth herein.

48. LAG has not licensed or otherwise authorized Defendant to make, use, offer for sale, sell, or import any products that embody the inventions of the '238 Patent.

49. Defendant has and continues to infringe the '238 Patent, either literally or under the doctrine of equivalents, without authority and in violation of 35 U.S.C. § 271, by one or more of making, using, offering to sell, selling, and/or importing into the United States products that satisfy each and every limitation of one or more claims of the '238 Patent. Such products include, but are not limited to, the Accused Vehicles equipped with an internal combustion engine, in all trims and configurations.

50. For example, Defendant has and continues to directly infringe at least claim 1 of the '238 Patent by making, using, offering to sell, selling, and/or importing into the United States products that include the MR16DDT Engine, such as the Nissan Juke, among other products.

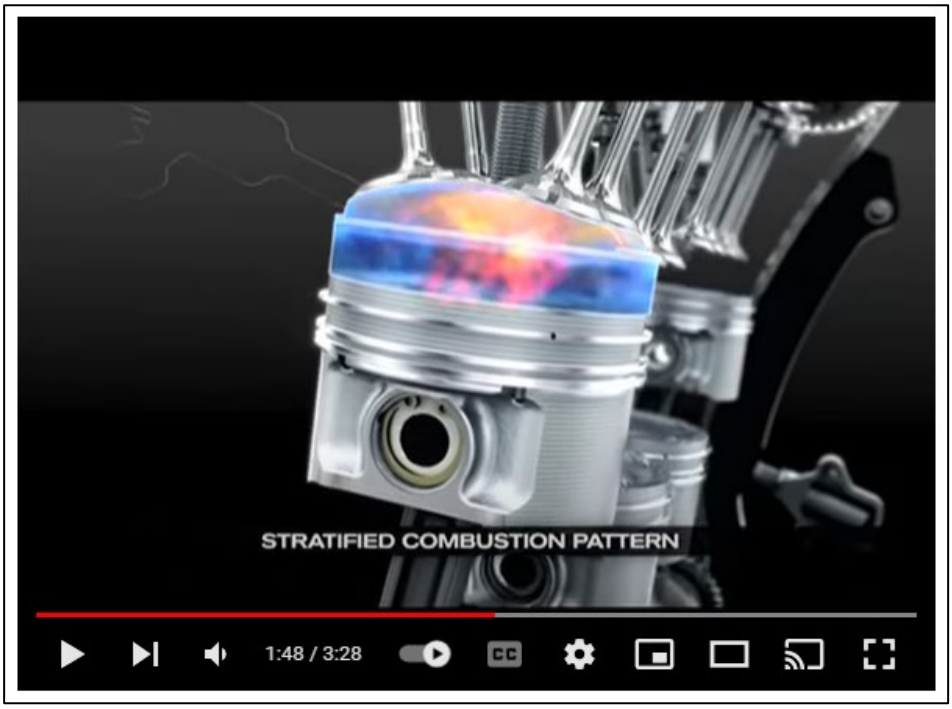
51. The Nissan Juke comprises a directly injecting internal combustion engine, comprising at least one cylinder which has a combustion space.

52. The Nissan Juke comprises a directly injecting internal combustion engine, comprising at least one cylinder which has a combustion space in which a piston executes an oscillating movement, and an injection nozzle for injection of fuel into the combustion space, wherein the piston has a piston recess, which, in a central region thereof, has an elevation extending in a cylinder head direction, and a surface of the piston recess adjoining the elevation in a recess

edge direction is connected to the elevation via a radius so that an injection jet impinging the surface and injected as early as possible is distributed both in an elevation direction and in the recess edge direction, and the surface is substantially planar and has an ascending gradient in the recess edge direction, such that an injection jet injected as late as possible impinges onto the surface, the last-mentioned injection jet being distributed both in the elevation direction and in the recess edge direction.

> The MR16DDT combines high performance with an environmentally conscious design, employing a gasoline direct injection mechanism that improves engine charging and combustion efficiency, and a range of fuel combustion efficiency enhancing technology/friction reduction technology, matched with technology that improves output (engine power), such as a compact high-efficiency turbocharger.

[51]




[52]

[51] https://www.nissan-global.com/EN/INNOVATION/TECHNOLOGY/ARCHIVE/MR16DDT/
[52] https://www.youtube.com/watch?v=Rz9t1u5F6Uo&ab_channel=NissanEurope

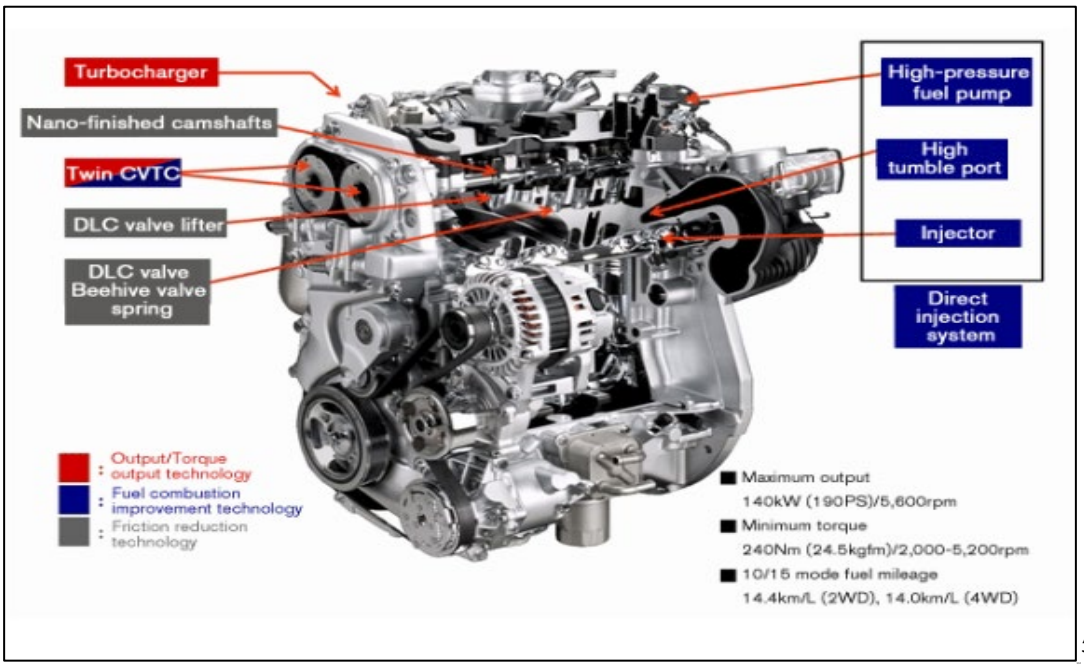
The MR16DDT is a direct injection engine that injects fuel directly into the cylinders. Injecting the liquid gasoline into the cylinder generates vaporized heat and the internal temperature of the cylinder goes down. This makes it more difficult for knocking to arise, thus improving combustion efficiency and realizing improved fuel efficiency. Direct injection engines also have the advantage that they are able to reduce fuel consumption by precisely controlling the amount of fuel burned. Through the direct injection engine's fine control of fuel, immediately after initiating the engine can form a dense air-fuel mixture around the spark plug and have it combust in a stratified charge. Doing this increases the exhaust temperature and the catalyst activates quickly, making the catalyst work quickly. After warming up, it forms a highly homogenous air-fuel mixture, raising fuel combustion efficiency.

[53]


[54]

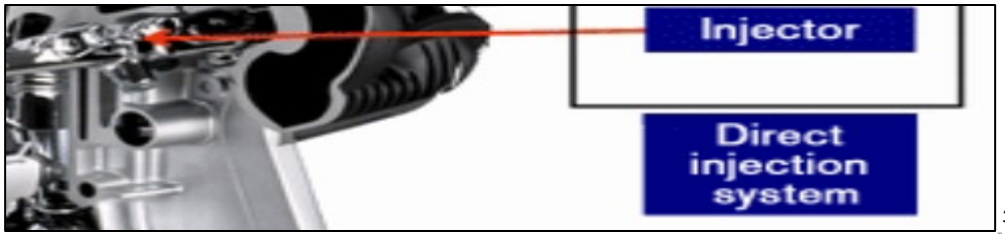
[53] https://www.nissan-global.com/EN/INNOVATION/TECHNOLOGY/ARCHIVE/MR16DDT/
[54] https://www.youtube.com/watch?v=L7uLUs8jO28&t=1354s&ab_channel=speedkar99


[55]

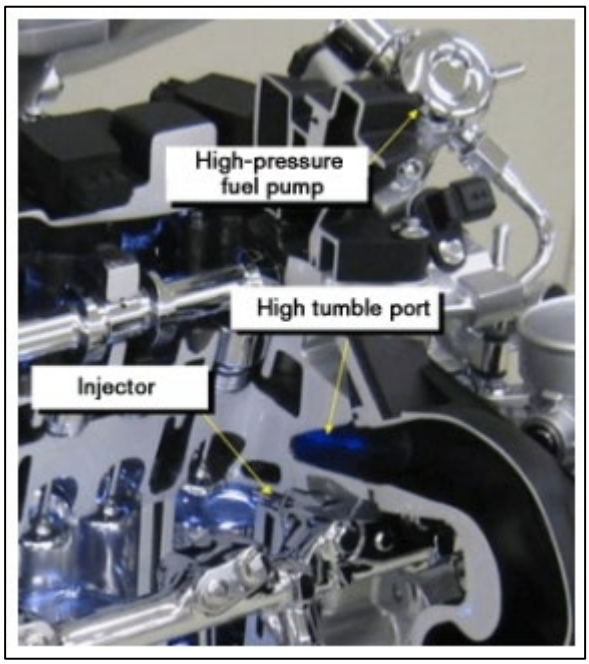



[56]

[55] https://www.youtube.com/watch?v=Rz9t1u5F6Uo&ab_channel=NissanEurope
[56] https://nissan-global.com/EN/INNOVATION/TECHNOLOGY/ARCHIVE/MR16DDT/




[57]




[58]

**Primary and Secondary Fuel Injection.** Two levels of fuel injection give you the perfect one-two punch. By spraying fuel directly into the combustion chamber twice before ignition, the combustion pattern is optimized. Meaning greater efficiency, torque and power. Now, that's a knockout.

[59]

[57] *Id.*
[58] *Id.*
[59] https://pictures.dealer.com/bramptonnorthnissantc/fffc3db70a0d02b700f007ad2e59944f.pdf

[60]

[61]

53. Defendant has and continues to indirectly infringe one or more claims of the ’238 Patent by knowingly and intentionally inducing others, including Nissan customers and end-users,

[60] https://www.youtube.com/watch?v=Rz9t1u5F6Uo&ab_channel=NissanEurope
[61] https://www.youtube.com/watch?v=L7uLUs8jO28&t=1354s&ab_channel=speedkar99

to directly infringe, either literally or under the doctrine of equivalents, by making, using, offering to sell, selling, and/or importing into the United States products that include the infringing technology.

54. Defendant, with knowledge that these products, or the use thereof, infringe the '238 Patent at least as of the date of this Complaint, knowingly and intentionally induced, and continues to knowingly and intentionally induce, direct infringement of the '238 Patent by providing these products to customers and end-users for use in an infringing manner. Alternatively, on information and belief, Defendant has adopted a policy of not reviewing the patents of others, including specifically those related to Defendant's specific industry, thereby remaining willfully blind to the Patents-in-Suit at least as early as the issuance of the Patents-in-Suit.

55. Defendant has and continues to induce infringement by others, including customers and end-users, with the intent to cause infringing acts by others or, in the alternative, with the belief that there was a high probability that others, including end-users, infringe the '238 Patent, but while remaining willfully blind to the infringement. Defendant has and continues to induce infringement by its customers and end-users by supplying them with instructions on how to operate the infringing technology in an infringing manner, while also making publicly available information on the infringing technology via Defendant's website, product literature and packaging, and other publications.[62]

56. LAG has suffered damages as a result of Defendant's direct and indirect infringement of the '238 Patent in an amount to be proved at trial.

[62] *See* 2017 Nissan Juke Owner's Manual and Maintenance Information, available at: https://owners.nissanusa.com/content/techpub/ManualsAndGuides/JUKE/2017/2017-JUKE-owner-manual.pdf.

57. LAG has suffered, and will continue to suffer, irreparable harm as a result of Defendant's infringement of the '238 Patent, for which there is no adequate remedy at law, unless Defendant's infringement is enjoined by this Court.

**COUNT IV**
**(Infringement of the '353 Patent)**

58. Paragraphs 1 through 19 are incorporated by reference as if fully set forth herein.

59. LAG has not licensed or otherwise authorized Defendant to make, use, offer for sale, sell, or import any products that embody the inventions of the '353 Patent.

60. Defendant has and continues to infringe the '353 Patent, either literally or under the doctrine of equivalents, without authority and in violation of 35 U.S.C. § 271, by one or more of making, using, offering to sell, selling, and/or importing into the United States products that satisfy each and every limitation of one or more claims of the '353 Patent. Such products include, but are not limited to, the Accused Vehicles equipped with Nissan's ProPILOT Assist, or the equivalent thereto, included in Nissan vehicles, in all trims and configurations.

61. For example, Defendant has and continues to directly infringe at least claim 1 of the '353 Patent by making, using, offering to sell, selling, and/or importing into the United States products that include Nissan's ProPILOT Assist, such as the Nissan ARIYA, among other products.

62. The Nissan ARIYA performs a method of forming an image of a mobile object.

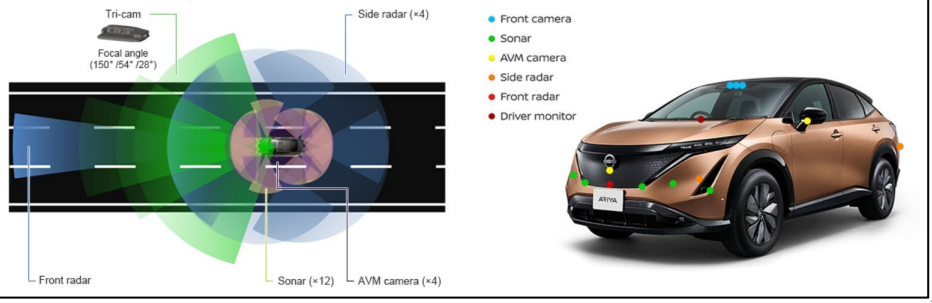
> ProPILOT Assist is a hands-on driver assist system that combines Nissan's Intelligent Cruise Control and Steering Assist technologies and includes a stop and hold function that can bring the vehicle to a full stop, hold in place and can bring you back up to speed when traffic starts moving again. [*]

The Nissan ARIYA features ProPILOT Assist 2.0 giving you the option to experience hands-off single-lane driving, as well as hands-on guided lane changing abilities. ProPILOT Assist 2.0 can give you the control you need. [*]

63

**2. 360-degree sensing**

Detects lane markers, signs and surrounding vehicles using 7 cameras, 5 radar sensors and 12 sonar sensors.

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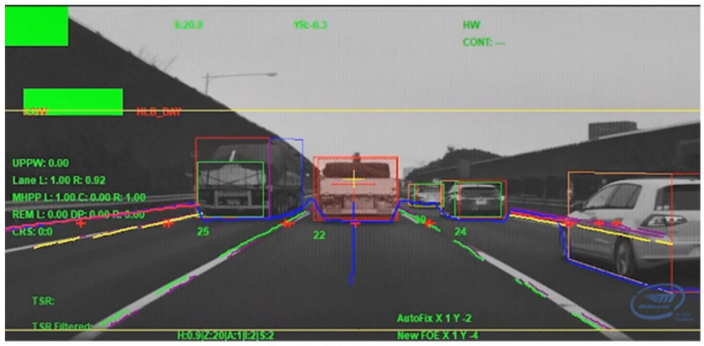



Sensing data in the system

**3. Intelligent interface**

Assesses the road, surrounding conditions and system control in real time and determines lane change timing interactively.

[63] https://www.nissan-global.com/EN/INNOVATION/TECHNOLOGY/ARCHIVE/AD2/
[64] *Id.*


65

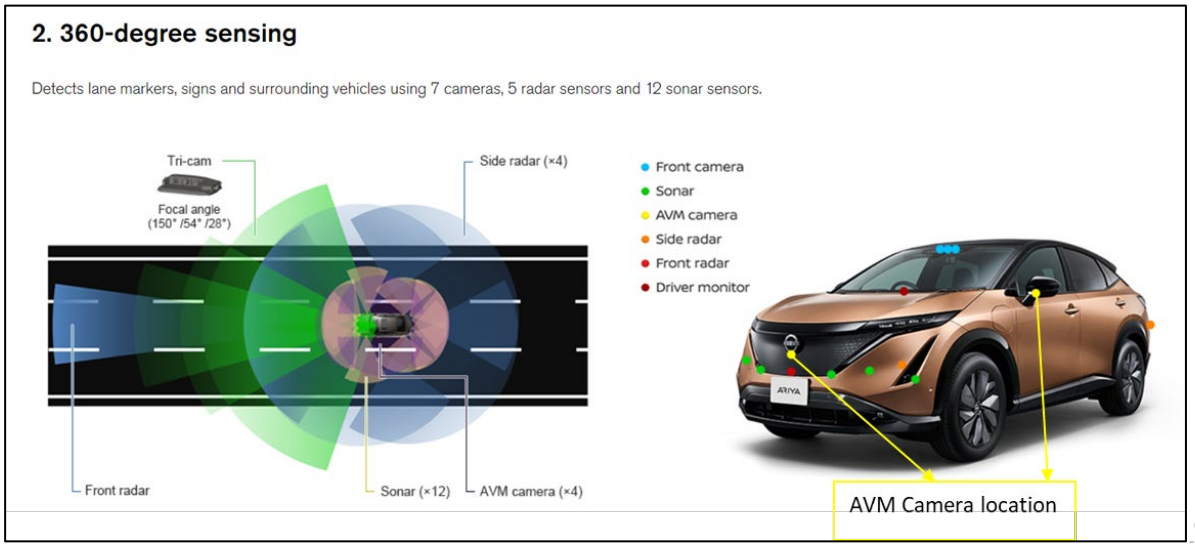

66

65 *Id.*

66 https://www.youtube.com/watch?v=Oj4Q7GSrSq4&ab_channel=Nissan


[67]

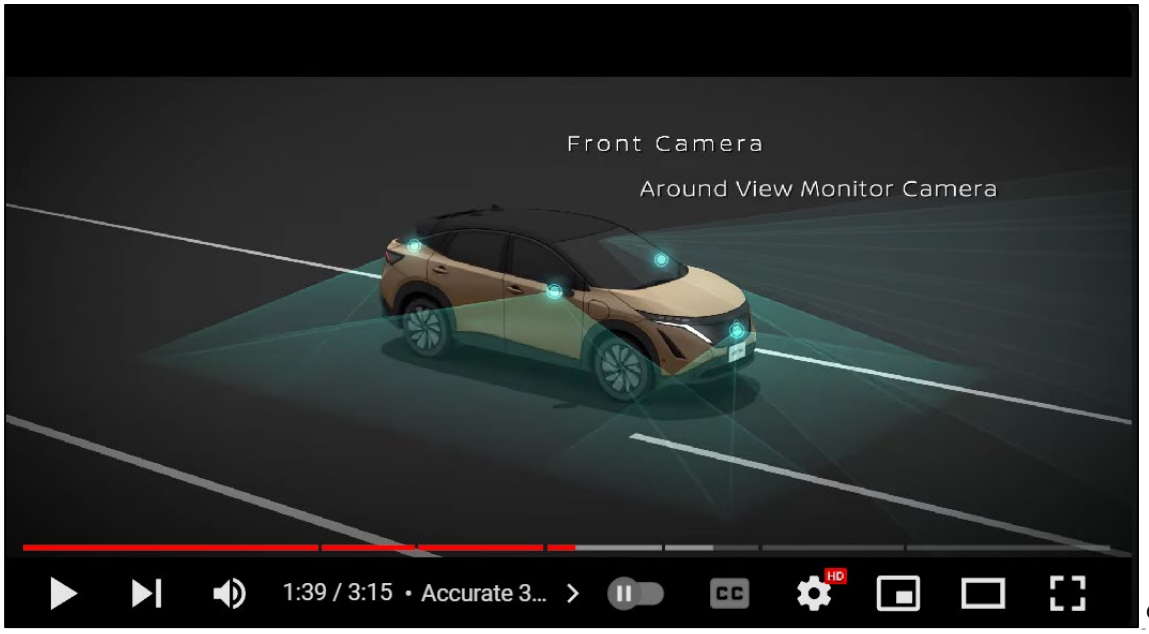
63. The Nissan ARIYA performs the step of obtaining a plurality of first images of the mobile object using a first imaging technique (*e.g.*, the Around View Monitor ("AVM")) while obtaining a plurality of first measurements corresponding to movements of the mobile object using a first sensor system (*e.g.*, sonar sensors), the first sensor system being independent from the first imaging technique.




[68]

[67] *Id.*

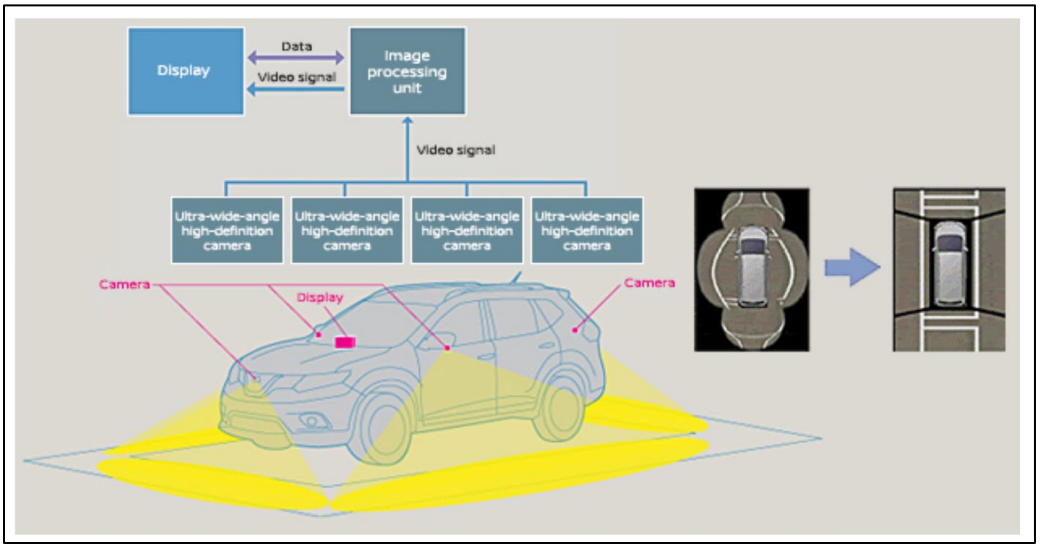
[68] https://www.nissan-global.com/EN/INNOVATION/TECHNOLOGY/ARCHIVE/AD2/



[69]

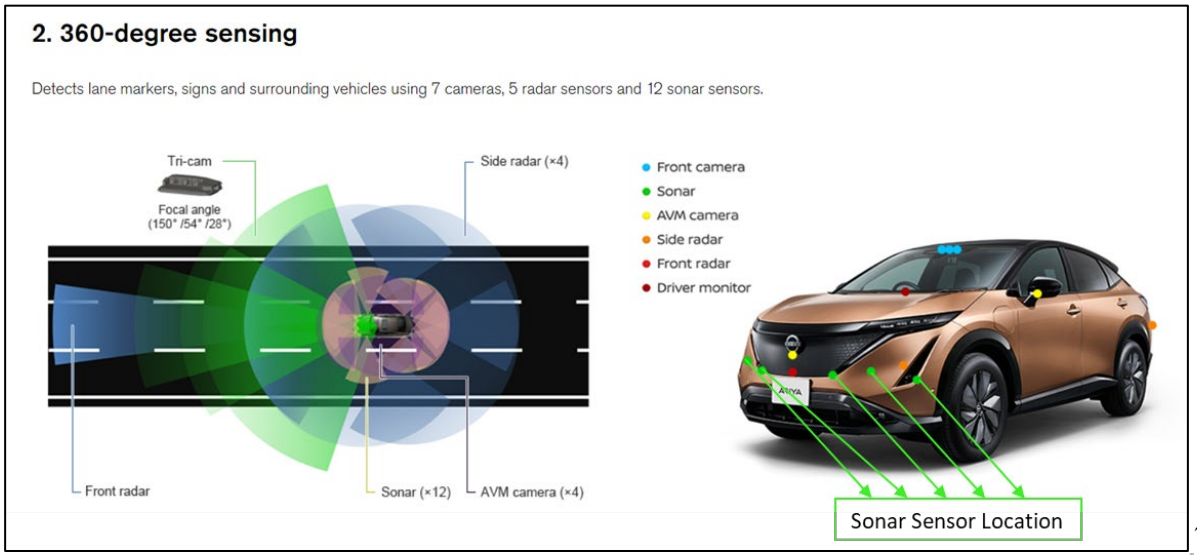
The system is composed of four wide-angle cameras installed on the front, rear, and sides of the vehicle, an image processing unit and a center display unit. The image signals from the cameras are collected, and the image processing unit morphs the perspective in real-time to display a bird's-eye view image.

By performing image processing of the image signals from four cameras, the system can identify moving objects around the vehicle in real-time and warn the driver with a warning chime and yellow frame on the screen.




[69] https://www.youtube.com/watch?v=Oj4Q7GSrSq4&ab_channel=Nissan

[70]



[71]

[70] https://www.nissan-global.com/EN/INNOVATION/TECHNOLOGY/ARCHIVE/IAVM/
[71] https://www.nissan-global.com/EN/INNOVATION/TECHNOLOGY/ARCHIVE/AD2/


[72]

64. The Nissan ARIYA performs the step of associating the plurality of first images (*e.g.*, from the AVM camera) with first movement states of the mobile object using the first measurements (*e.g.*, sonar sensor data).

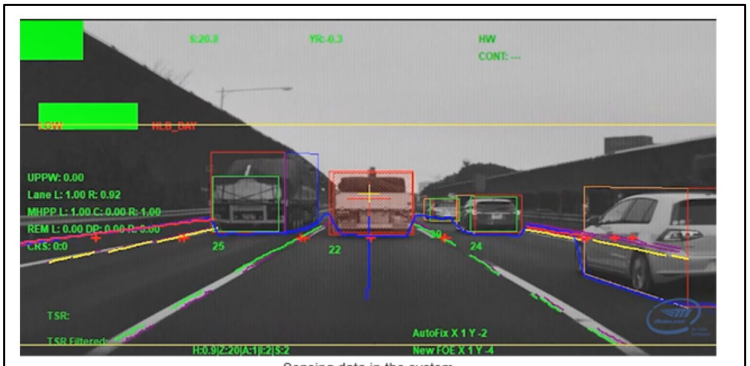
**3. Intelligent interface**

Assesses the road, surrounding conditions and system control in real time and determines lane change timing interactively.


[73]

[72] https://www.youtube.com/watch?v=Oj4Q7GSrSq4&ab_channel=Nissan
[73] *Id.*

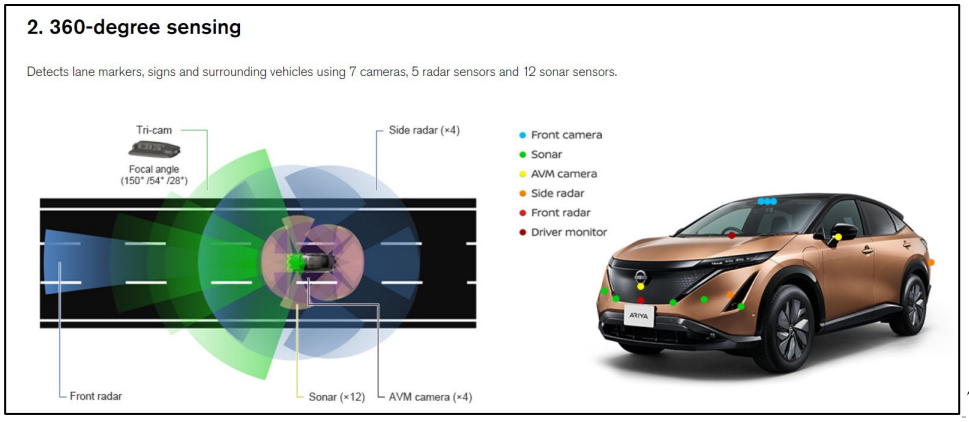

[74]


Sensing data in the system

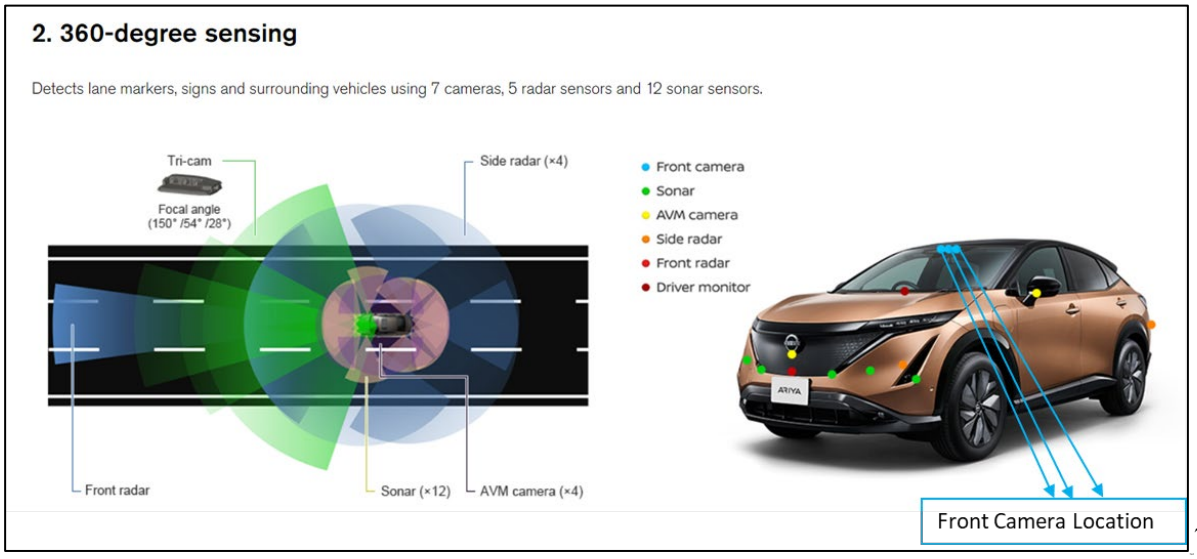
[75]

[74] https://www.youtube.com/watch?v=Oj4Q7GSrSq4&ab_channel=Nissan
[75] *Id.*



[76]

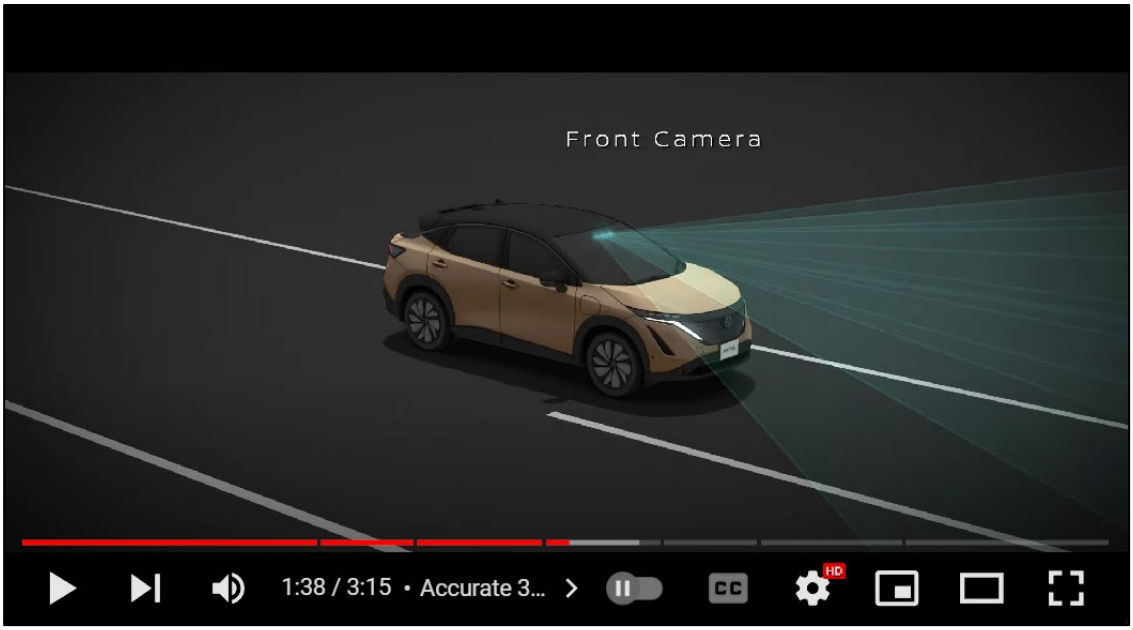
65. The Nissan ARIYA performs the step of obtaining a plurality of second images of the mobile object using a second imaging technique (*e.g.*, via the front camera) while obtaining a plurality of second measurements corresponding to movements of the mobile object using a second sensor system (*e.g.*, the radar sensors), the second sensor system being independent from the second imaging technique (*e.g.*, the front camera).



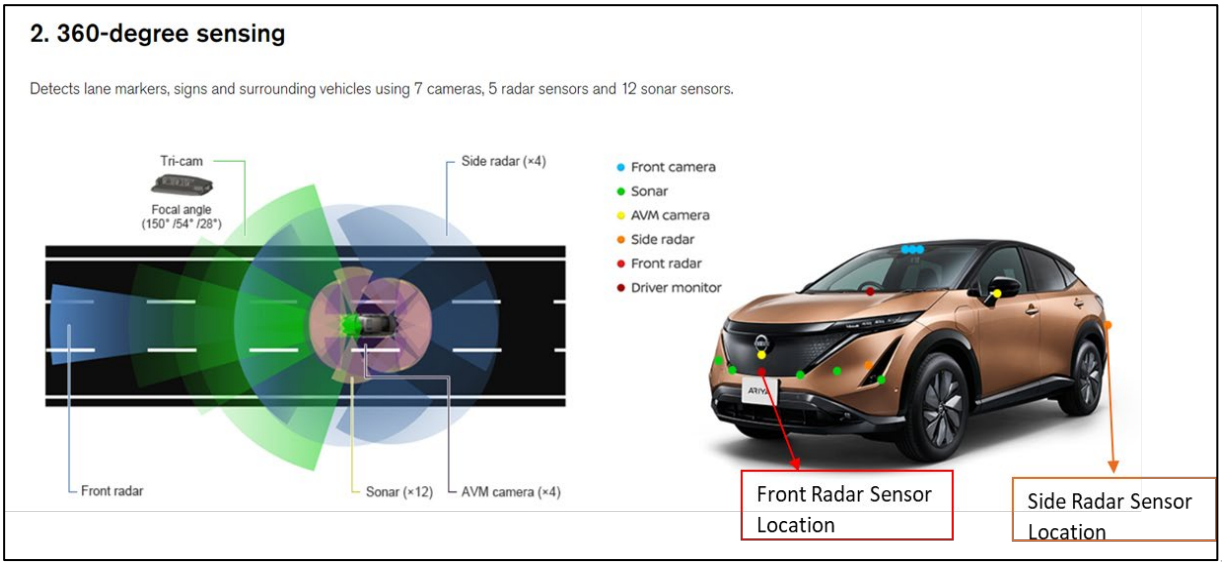
[77]

[76] *Id.*

[77] https://www.nissan-global.com/EN/INNOVATION/TECHNOLOGY/ARCHIVE/AD2/

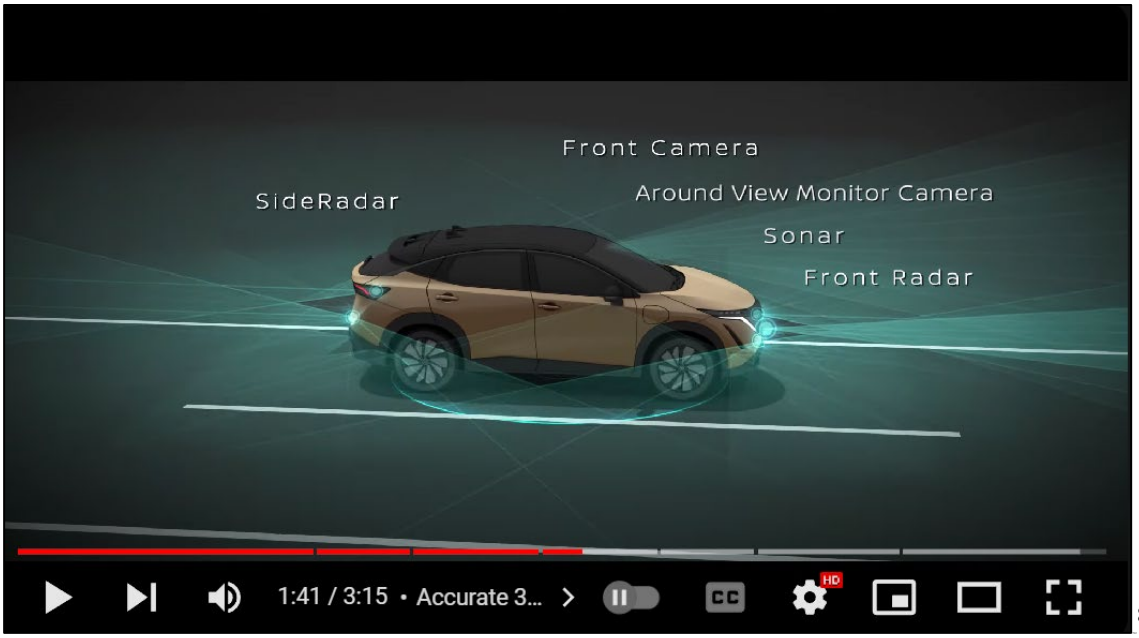



[78]




[79]

[78] https://www.youtube.com/watch?v=Oj4Q7GSrSq4&ab_channel=Nissan
[79] https://www.nissan-global.com/EN/INNOVATION/TECHNOLOGY/ARCHIVE/AD2/



[80]

66. The Nissan ARIYA performs the step of associating the plurality of second images (*e.g.*, from the front camera) with second movement states of the mobile object using the first measurements (*e.g.*, radar sensor using the sonar sensor data).

**3. Intelligent interface**

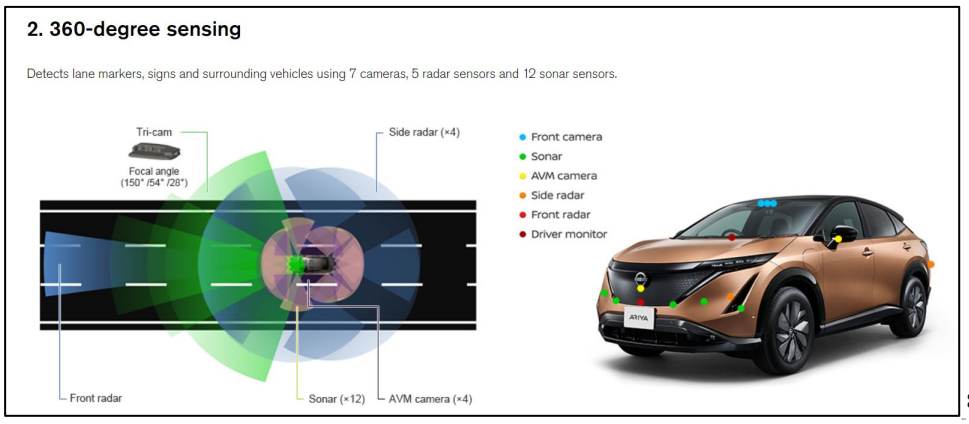
Assesses the road, surrounding conditions and system control in real time and determines lane change timing interactively.

[81]

[80] https://www.youtube.com/watch?v=Oj4Q7GSrSq4&ab_channel=Nissan
[81] *Id.*

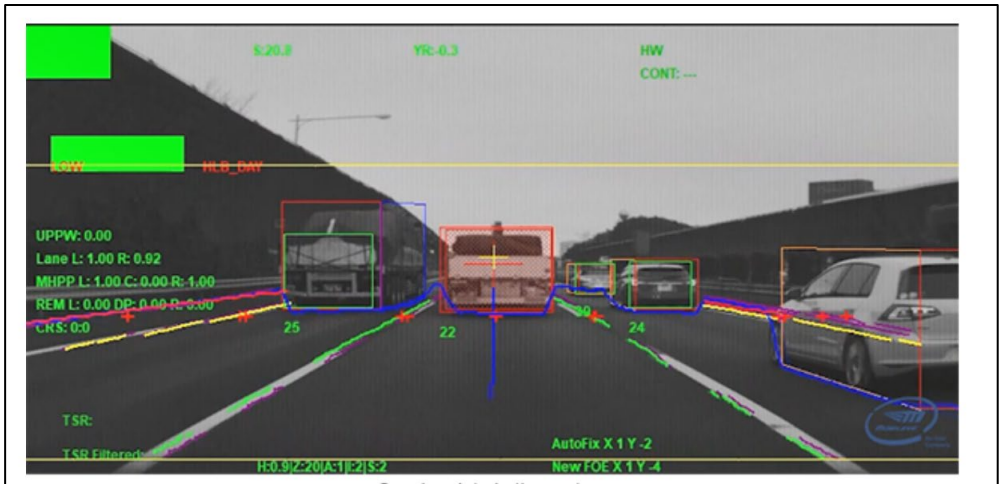


82




83

[82] https://www.youtube.com/watch?v=Oj4Q7GSrSq4&ab_channel=Nissan
[83] https://www.nissan-global.com/EN/INNOVATION/TECHNOLOGY/ARCHIVE/AD2/



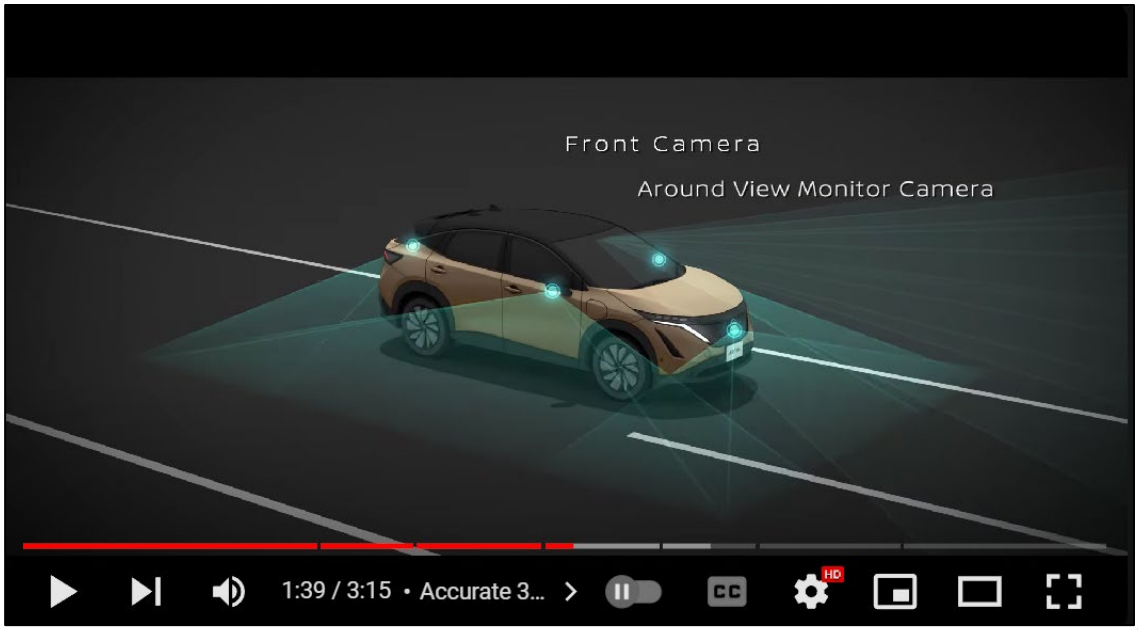
Sensing data in the system

84

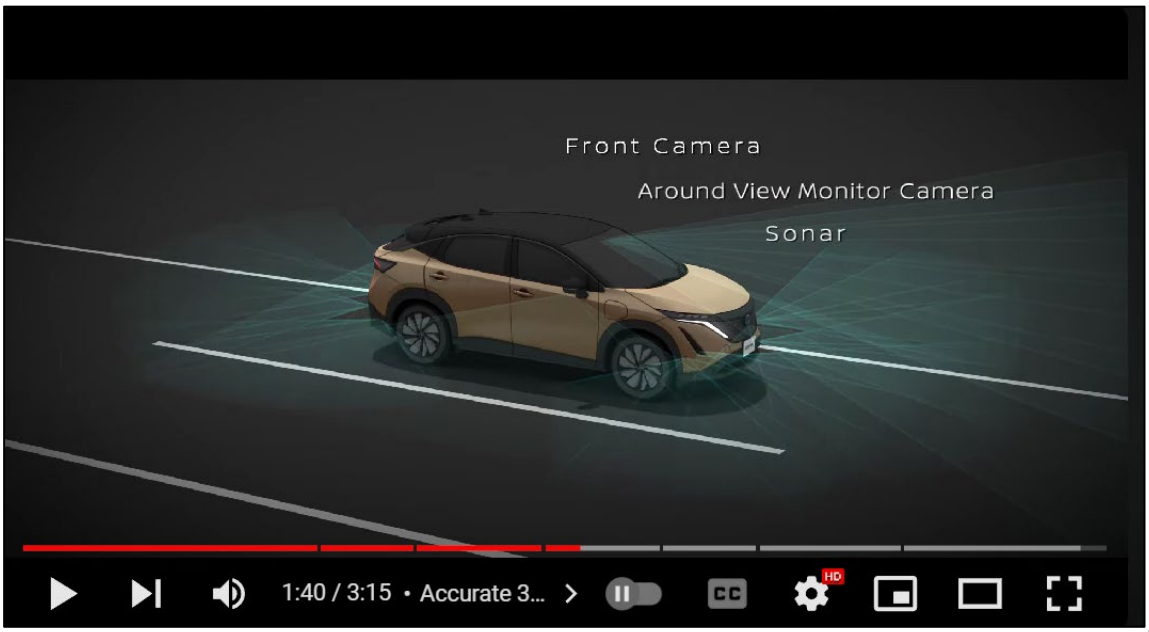

85

84 *Id.*

85 https://www.youtube.com/watch?v=Oj4Q7GSrSq4&ab_channel=Nissan

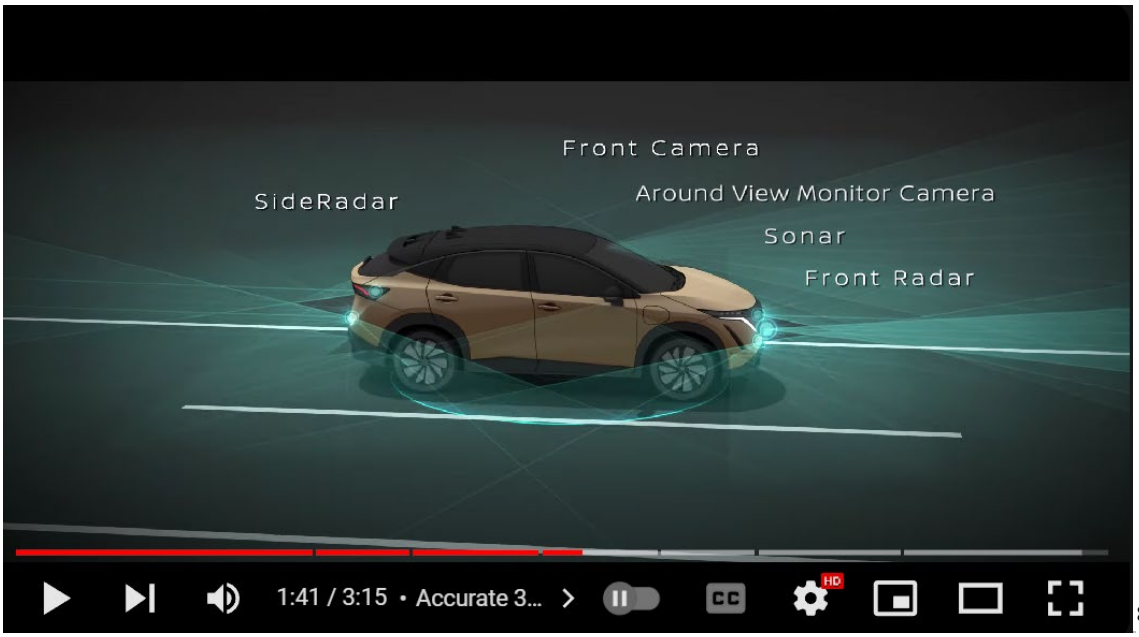



[86]




[87]

[86] *Id.*
[87] *Id.*



[88]

67. The Nissan ARIYA performs the step of forming an image of the mobile object based on said plurality of first images (*e.g.*, combination of images from the AVM camera), said associated plurality of first movement measurements and said first movement states (*e.g.*, sonar sensors) and on said plurality of second images (*e.g.*, from the front camera), said associated plurality of second movement measurements, and said second movement states (*e.g.*, radar sensors), wherein the first imaging technique (*e.g.*, the AVM camera) is different from the second imaging technique (*e.g.*, front camera).

**3. Intelligent interface**

Assesses the road, surrounding conditions and system control in real time and determines lane change timing interactively.

[88] *Id.*

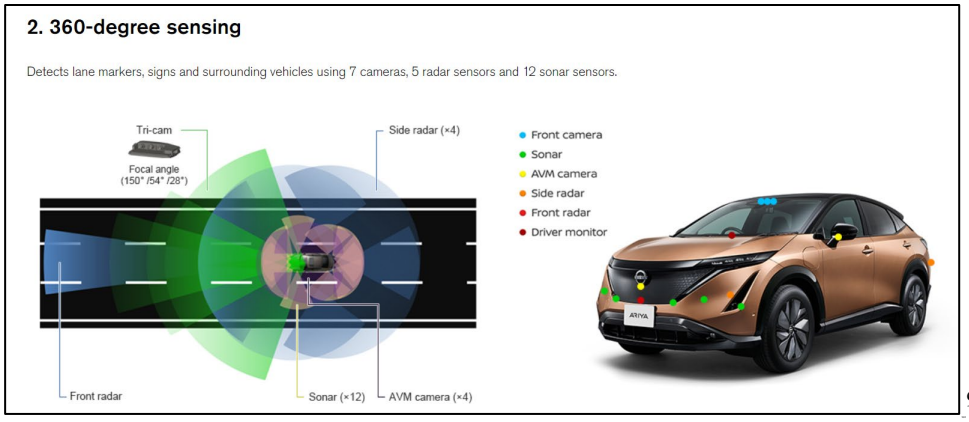

89



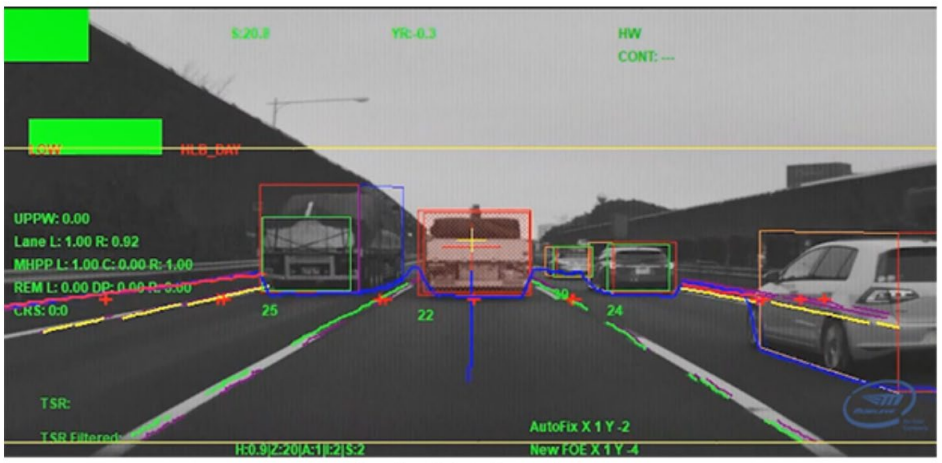
90

89 *Id.*

90 https://www.youtube.com/watch?v=Oj4Q7GSrSq4&ab_channel=Nissan



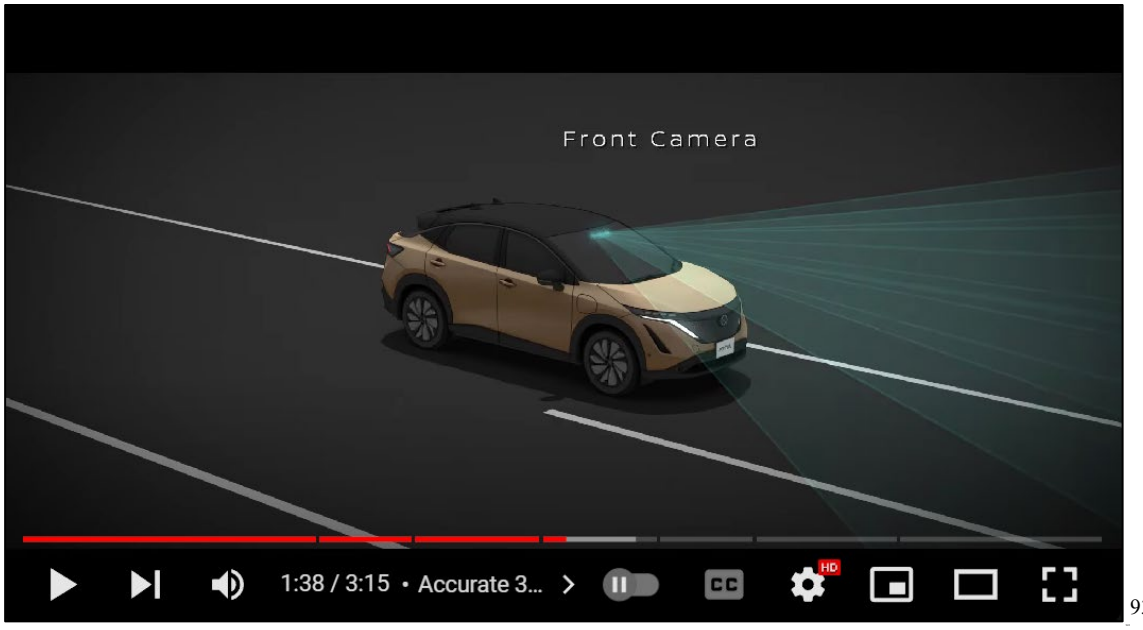

[91]




Sensing data in the system

[92]

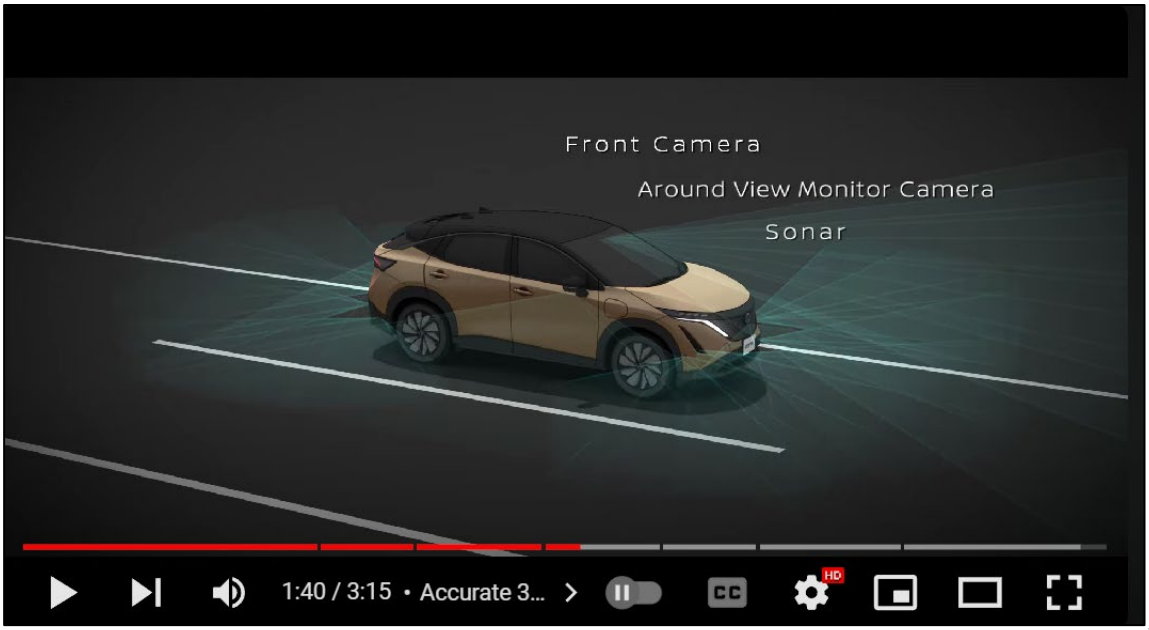
[91] https://www.nissan-global.com/EN/INNOVATION/TECHNOLOGY/ARCHIVE/AD2/
[92] *Id.*




[93]


[94]

[93] https://www.youtube.com/watch?v=Oj4Q7GSrSq4&ab_channel=Nissan
[94] *Id.*

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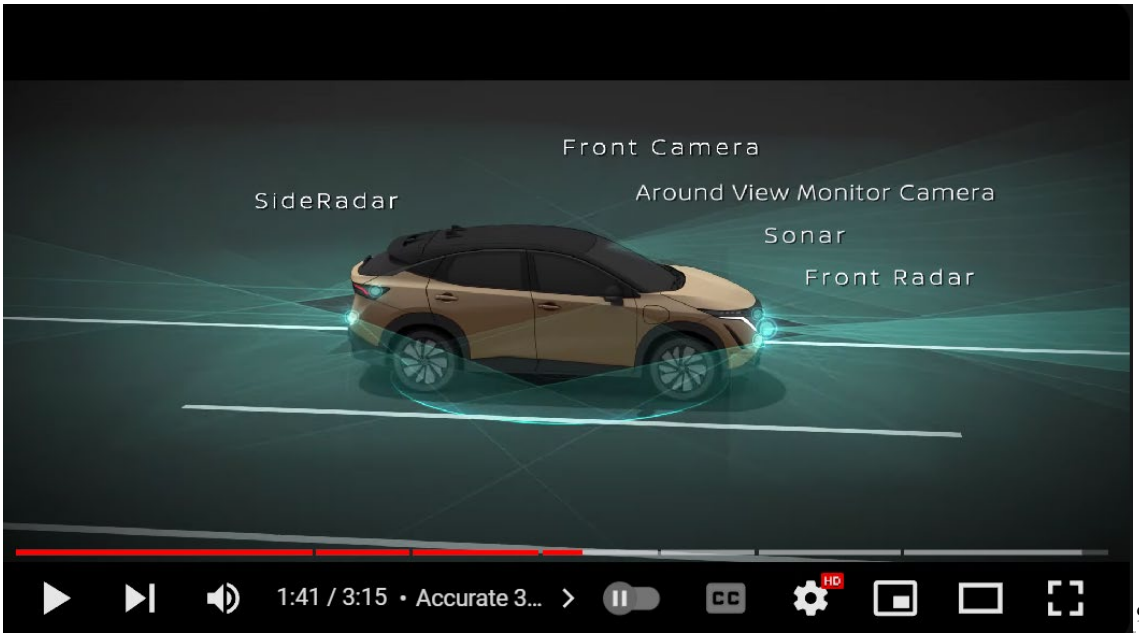



96

68. Upon information and belief, Nissan employees regularly travel to the United States to test and/or troubleshoot the Accused Vehicles, thereby performing the method of at least claim 1 of the '353 Patent and directly infringing the '353 Patent. Upon further information and belief,

[95] *Id.*
[96] *Id.*

Nissan displays and operates the Accused Vehicles around the United States at events, such as car shows.

69. Defendant has and continues to indirectly infringe one or more claims of the '353 Patent by knowingly and intentionally inducing others, including Nissan customers and end-users, to directly infringe, either literally or under the doctrine of equivalents, by making, using, offering to sell, selling, and/or importing into the United States products that include the infringing technology.

70. Defendant, with knowledge that these products, or the use thereof, infringe the '353 Patent at least as of the date of this Complaint, knowingly and intentionally induced, and continues to knowingly and intentionally induce, direct infringement of the '353 Patent by providing these products to customers and end-users for use in an infringing manner. Alternatively, on information and belief, Defendant has adopted a policy of not reviewing the patents of others, including specifically those related to Defendant's specific industry, thereby remaining willfully blind to the Patents-in-Suit at least as early as the issuance of the Patents-in-Suit.

71. Defendant has and continues to induce infringement by others, including customers and end-users, with the intent to cause infringing acts by others or, in the alternative, with the belief that there was a high probability that others, including end-users, infringe the '353 Patent, but while remaining willfully blind to the infringement. Defendant has and continues to induce infringement by its customers and end-users by supplying them with instructions on how to operate the infringing technology in an infringing manner, while also making publicly available information on the infringing technology via Defendant's website, product literature and

packaging, and other publications.[97]

72. LAG has suffered damages as a result of Defendant's direct and indirect infringement of the '353 Patent in an amount to be proved at trial.

73. LAG has suffered, and will continue to suffer, irreparable harm as a result of Defendant's infringement of the '353 Patent, for which there is no adequate remedy at law, unless Defendant's infringement is enjoined by this Court.

**COUNT V**
**(Infringement of the '666 Patent)**

74. Paragraphs 1 through 19 are incorporated by reference as if fully set forth herein.

75. LAG has not licensed or otherwise authorized Defendant to make, use, offer for sale, sell, or import any products that embody the inventions of the '666 Patent.

76. Defendant has and continues to infringe the '666 Patent, either literally or under the doctrine of equivalents, without authority and in violation of 35 U.S.C. § 271, by one or more of making, using, offering to sell, selling, and/or importing into the United States products that satisfy each and every limitation of one or more claims of the '666 Patent. Such products include, but are not limited to, the Accused Vehicles equipped with Renesas R-Car System-on-Chips ("SoCs"), or the equivalent thereto, included in Nissan vehicles, in all trims and configurations.

77. For example, Defendant has and continues to directly infringe at least claim 1 of the '666 Patent by making, using, offering to sell, selling, and/or importing into the United States products that include the Renesas R-Car SoCs, such as the Nissan LEAF, among other products.

[97] *See* 2023 Nissan ARIYA Owner's Manual and Maintenance Information, available at: https://www.nissanusa.com/content/dam/Nissan/us/manuals-and-guides/nissan-ariya/2023/2023-nissan-ariya-owner-manual.pdf.

78. The Nissan LEAF comprises a crypto-engine (*e.g.*, the Cortex-A57) for cryptographic processing (*e.g.*, ARMv8 cryptography) of data comprising an arithmetic unit operable as a co-processor for a host processor (*e.g.*, an integrated NEON co-processor) and an interface controller for managing communications between the arithmetic unit and host processor.

September 7, 2017


*Renesas' SoC and MCU Adopted by Nissan for its New LEAF Automated-Parking System*

**TOKYO, Japan, September 7, 2017** — Renesas Electronics Corporation (TSE:6723), a premier supplier of advanced semiconductor solutions today announced that its R-Car system-on-chip (SoC) for car infotainment and advanced driving assistant systems (ADAS) as well as its RH850 automotive control microcontroller (MCU) have been adopted by Nissan for the **ProPILOT Park**, a full-fledged automated-parking system, of its new LEAF, Nissan's new 100 percent electric vehicle which debuted on September 6, 2017.

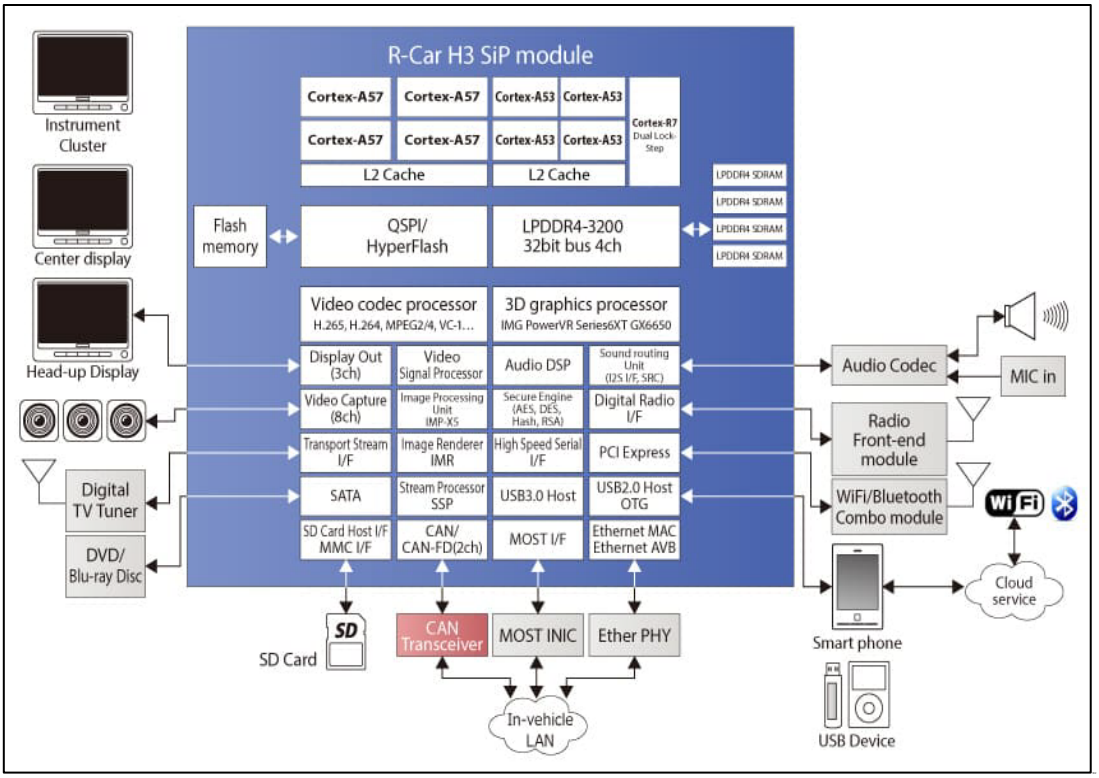
The R-Car SoC adopted in the ProPILOT Park of the new Nissan LEAF recognizes spaces adequate for parking, verifies that there are no obstacles in the way, and handles the role of issuing control commands for acceleration, braking, steering and shifting. The R-Car SoC includes Renesas' exclusive parallel image processor (IMP) dedicated for image processing. The IMP takes the high-resolution images from the latest automotive CMOS digital cameras and performs high-speed, low-power signal processing. The RH850 MCU accepts the chassis control commands from the R-Car SoC and transmits these commands to the various electronic control units (ECUs) used. This enables the Nissan LEAF's ProPILOT Park to achieve safe and reliable parking operation.[98]

| | |
|---|---|
| **R-Car H3**<br>**R-Car H3e** | The R-Car H3e is an automotive SOC for high-end computing, able to process large volumes of information from vehicle sensors accurately in real-time. Its applications are broad, including for example in-vehicle infotainment systems or integrated cockpit.<br>A 2GHz version (H3e-2G) is also available, providing increased CPU power. |
| **R-Car H3N**<br>**R-Car H3Ne** | The R-Car H3Ne is a scaled-down version of H3e, with similar positioning. It has more narrow data throughput and some peripherals optimized out. Its applications are broad, including for example In-Vehicle Infotainment systems or integrated cockpit. |
| **R-Car M3**<br>**R-Car M3e** | The R-Car M3e can be used in a wide range of automotive applications requiring medium-class computing, including for example in-vehicle infotainment, low-end integrated cockpit, connected gateway, and central server.<br>A 2GHz version (M3e-2G) is also available, providing increased CPU power. |
| **R-Car M3N**<br>**R-Car M3Ne** | The R-Car M3Ne optimizes out the functions and performance of the R-Car M3e. It can be used in a wide range of automotive applications requiring medium-class computing, including for example entry in-vehicle infotainment systems, digital clusters and connected gateway.<br>A 2GHz version (M3Ne-2G) is also available, providing increased CPU power. |

[99]

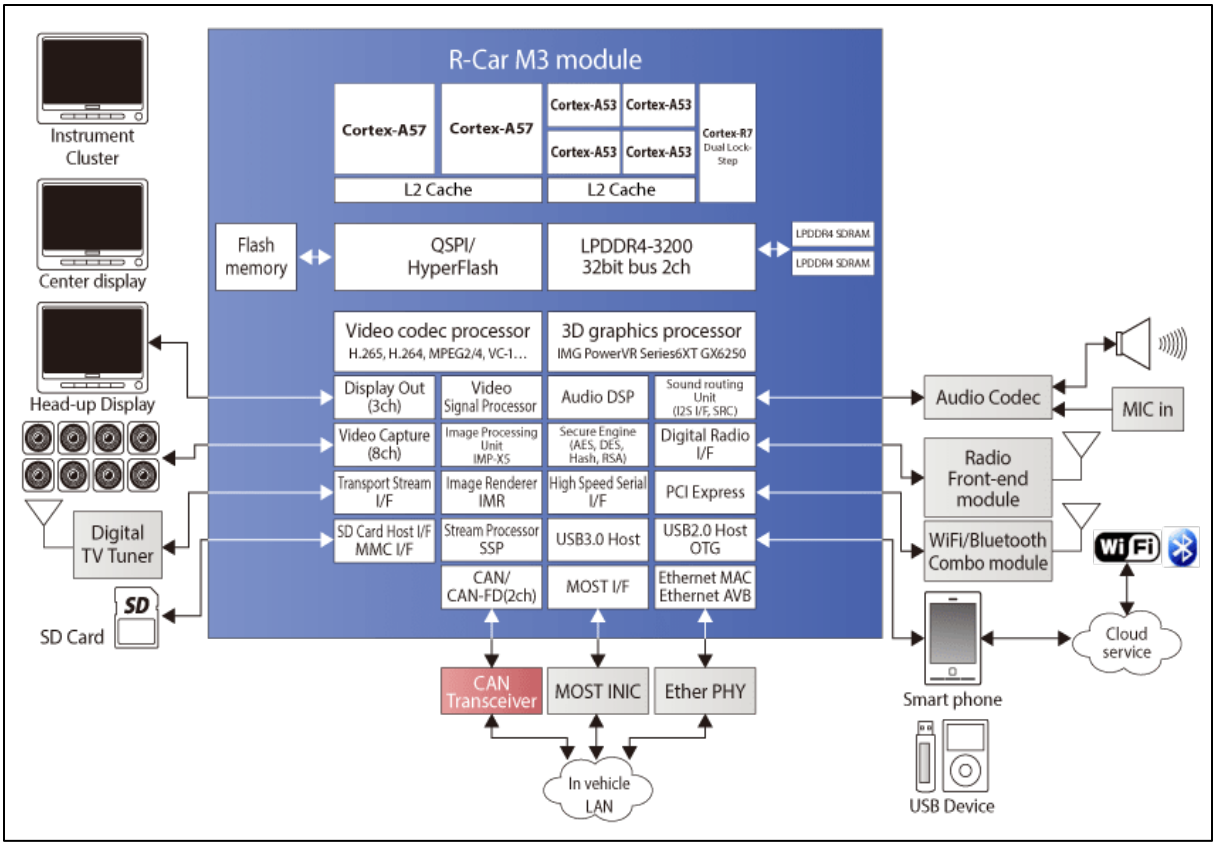
[98] https://www.renesas.com/tw/en/about/press-room/renesas-electronics-high-performance-automotive-chips-adopted-nissan-its-new-leaf-automated-parking

[99] https://www.renesas.com/us/en/products/automotive-products/automotive-system-chips-socs



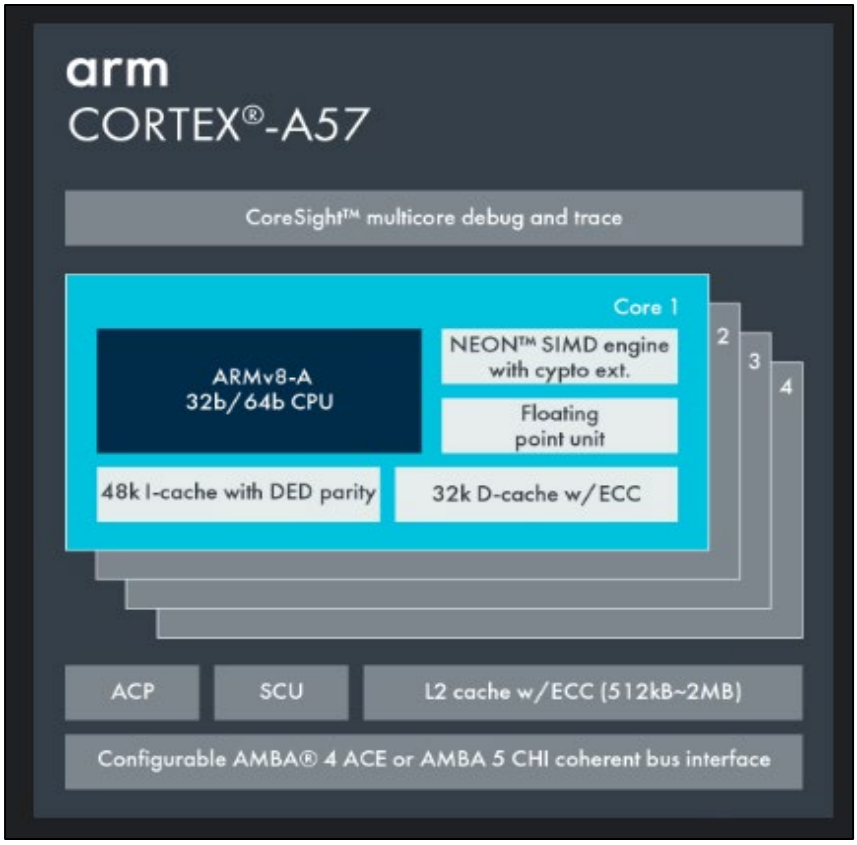
100

[100] https://www.renesas.com/us/en/products/automotive-products/automotive-system-chips-socs/r-car-h3e-r-car-h3h3eh3e-2g-high-end-automotive-system-chip-soc-vehicle-infotainment-and-integrated-cockpit#overview




101

[101] https://www.renesas.com/us/en/products/automotive-products/automotive-system-chips-socs/r-car-m3ne-r-car-m3nm3nem3ne-2g-automotive-system-chip-soc-ideal-medium-class-automotive-computing-systems#overview




102

**About the Cortex-A57 processor Cryptography engine**

The Cortex-A57 processor Cryptography engine supports the ARMv8 Cryptography Extensions. The Cryptography Extensions add new instructions that the Advanced SIMD can use to accelerate the execution of AES, SHA1, and SHA2-256 algorithms.

103

## Fundamentals of Armv8 Neon technology

Armv8-A includes both 32-bit and 64-bit Execution states, each with their own instruction sets:

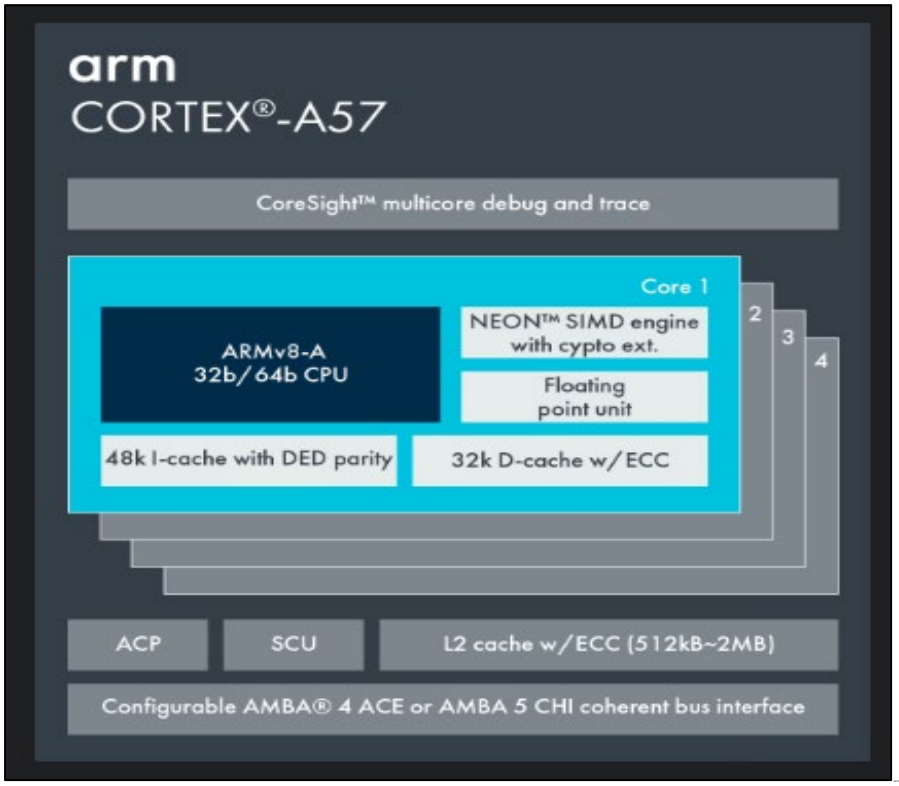
- AArch64 is the name used to describe the 64-bit Execution state of the Armv8-A architecture. In AArch64 state, the processor executes the A64 instruction set, which contains Neon instructions (also referred to as SIMD instructions). GNU and Linux documentation sometimes refers to AArch64 as ARM64.
- AArch32 describes the 32-bit Execution state of the Armv8-A architecture, which is almost identical to Armv7. In AArch32 state, the processor can execute either the A32 (called ARM in earlier versions of the architecture) or the T32 (Thumb) instruction set. The A32 and T32 instruction sets are backwards compatible with Armv7, including Neon instructions.

This guide will focus on Neon programming using A64 instructions for the AArch64 Execution state of the Armv8-A architecture.

104

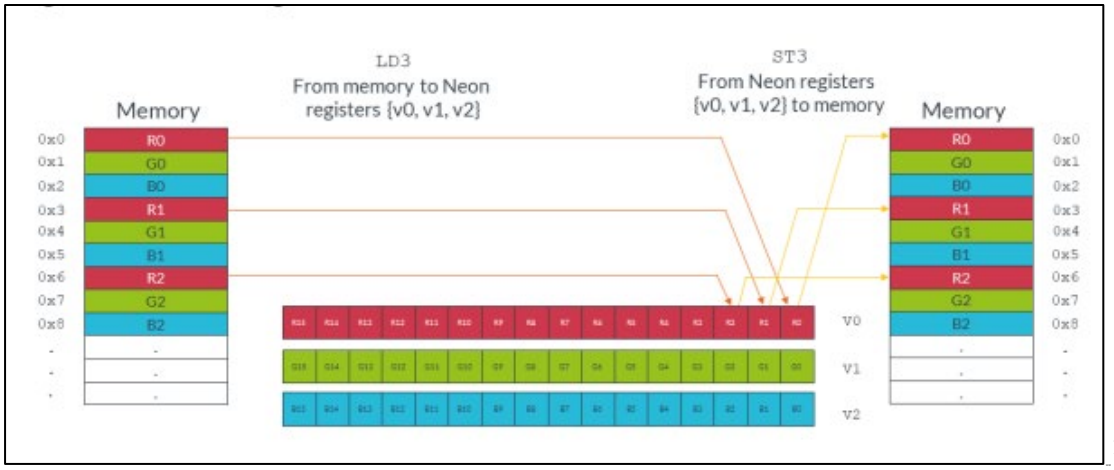
[102] https://developer.arm.com/Processors/Cortex-A57
[103] https://developer.arm.com/documentation/ddi0514/g/introduction/about-the-cortex-a57-processor-cryptography-engine
[104] https://developer.arm.com/documentation/102474/0100/Fundamentals-of-Armv8-Neon-technology

79. The Nissan LEAF comprises a memory unit for storing and loading data (*e.g.*, the processor), the memory unit including (*e.g.*, a shared Level 2 (L2) cache): an input switch for selecting input-interim data (*e.g.*, the L1 cache, the L2 cache, or main memory); a plurality of Static Random Access Memory elements for receiving and storing the input/interim data from the input switch (*e.g.*, L1 and L2 caches constructed using SRAM elements); and a plurality of output switches connected to the memory elements (*e.g.*, Single Instruction, Multiple Data (SIMD) architecture on the NEON unit).



105

[105] https://developer.arm.com/Processors/Cortex-A57




106

## Fundamentals of Armv8 Neon technology

Armv8-A includes both 32-bit and 64-bit Execution states, each with their own instruction sets:

- AArch64 is the name used to describe the 64-bit Execution state of the Armv8-A architecture. In AArch64 state, the processor executes the A64 instruction set, which contains Neon instructions (also referred to as SIMD instructions). GNU and Linux documentation sometimes refers to AArch64 as ARM64.
- AArch32 describes the 32-bit Execution state of the Armv8-A architecture, which is almost identical to Armv7. In AArch32 state, the processor can execute either the A32 (called ARM in earlier versions of the architecture) or the T32 (Thumb) instruction set. The A32 and T32 instruction sets are backwards compatible with Armv7, including Neon instructions.

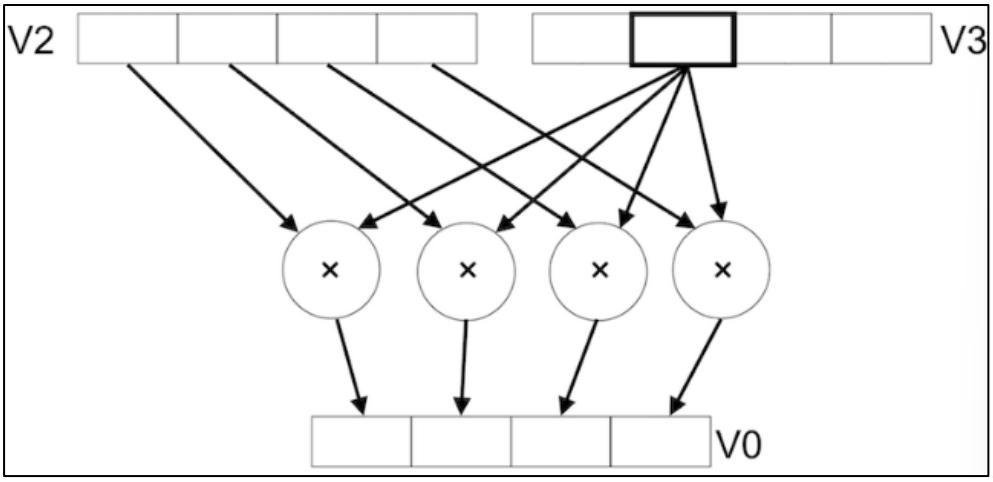
This guide will focus on Neon programming using A64 instructions for the AArch64 Execution state of the Armv8-A architecture.

107



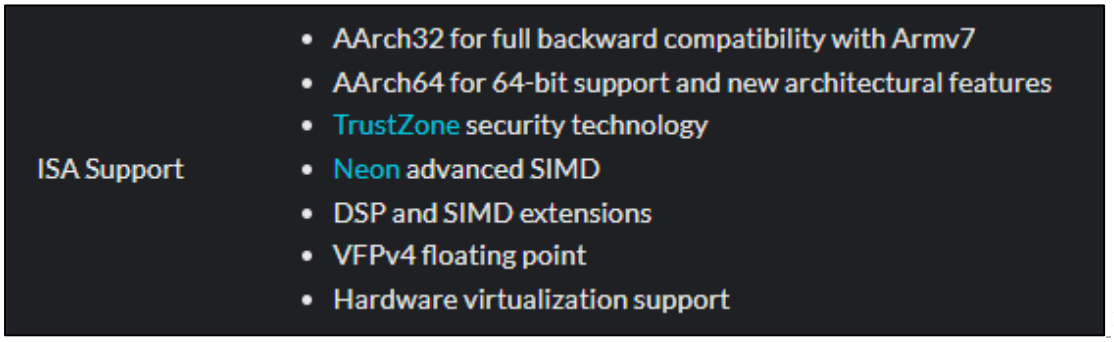
108

[106] https://developer.arm.com/documentation/102159/latest/
[107] https://developer.arm.com/documentation/102474/0100/Fundamentals-of-Armv8-Neon-technology
[108] https://developer.arm.com/Processors/Cortex-A57



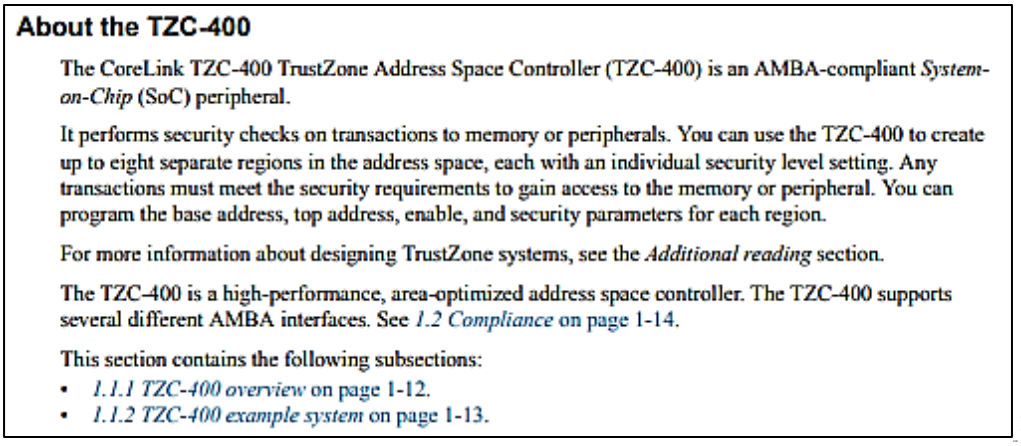
[109]

80. The Nissan LEAF comprises an address controller for controlling flow of the data through the switches and memory elements (*e.g.*, the TZC-400 establishing a distinct address space dedicated to the memory components utilized by the processor).



[110]

[109] https://developer.arm.com/documentation/102474/0100/Fundamentals-of-Armv8-Neon-technology
[110] https://developer.arm.com/Processors/Cortex-A57



**About the TZC-400**

The CoreLink TZC-400 TrustZone Address Space Controller (TZC-400) is an AMBA-compliant *System-on-Chip* (SoC) peripheral.

It performs security checks on transactions to memory or peripherals. You can use the TZC-400 to create up to eight separate regions in the address space, each with an individual security level setting. Any transactions must meet the security requirements to gain access to the memory or peripheral. You can program the base address, top address, enable, and security parameters for each region.

For more information about designing TrustZone systems, see the *Additional reading* section.

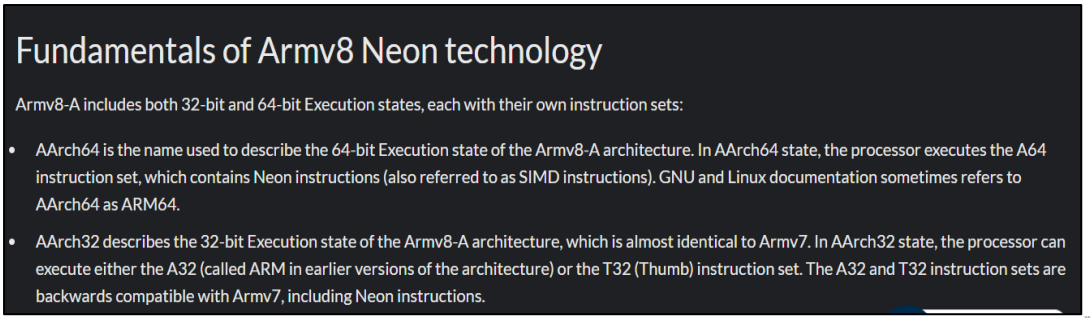
The TZC-400 is a high-performance, area-optimized address space controller. The TZC-400 supports several different AMBA interfaces. See *1.2 Compliance* on page 1-14.

This section contains the following subsections:

- *1.1.1 TZC-400 overview* on page 1-12.
- *1.1.2 TZC-400 example system* on page 1-13.

[111]

81. The Nissan LEAF comprises a multiplication unit, an addition unit, and a sign inversion unit for performing arithmetic operations on said data, the multiplication unit, the addition unit, and the sign inversion unit each having an output (*e.g.*, NEON incorporating an arithmetic and logic unit ("ALU") equipped with a diverse array of operation units).



Fundamentals of Armv8 Neon technology

Armv8-A includes both 32-bit and 64-bit Execution states, each with their own instruction sets:

- AArch64 is the name used to describe the 64-bit Execution state of the Armv8-A architecture. In AArch64 state, the processor executes the A64 instruction set, which contains Neon instructions (also referred to as SIMD instructions). GNU and Linux documentation sometimes refers to AArch64 as ARM64.
- AArch32 describes the 32-bit Execution state of the Armv8-A architecture, which is almost identical to Armv7. In AArch32 state, the processor can execute either the A32 (called ARM in earlier versions of the architecture) or the T32 (Thumb) instruction set. The A32 and T32 instruction sets are backwards compatible with Armv7, including Neon instructions.

[112]

[111] https://developer.arm.com/documentation/100325/latest/

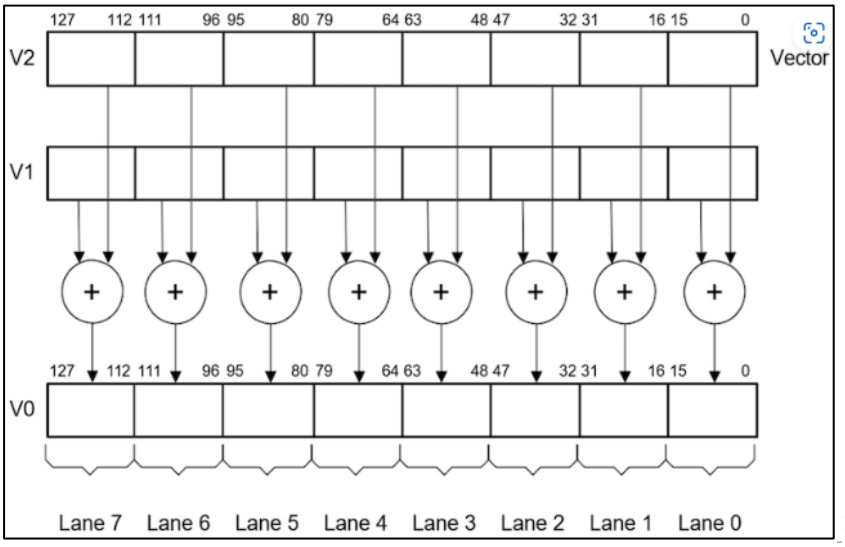
[112] https://developer.arm.com/documentation/102474/0100/Fundamentals-of-Armv8-Neon-technology

**Integer execute**

The integer execute unit includes:

- Two symmetric *Arithmetic Logical Unit* (ALU) pipelines.
- Integer multiply-accumulate and ALU pipelines.
- Iterative integer divide hardware.
- Branch and instruction condition codes resolution logic.
- Result forwarding and comparator logic.

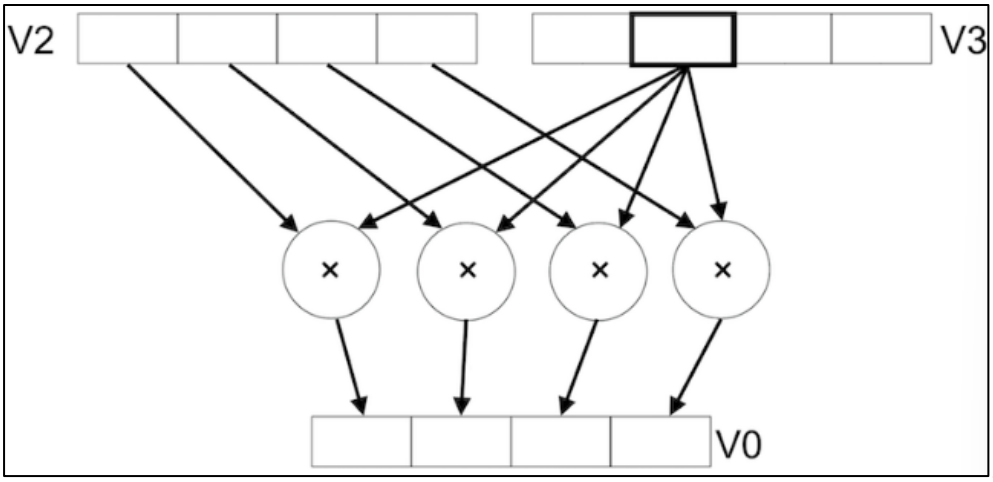
[113]




[114]

[113] https://developer.arm.com/documentation/ddi0488/h/?lang=en

[114] https://developer.arm.com/documentation/102474/0100/Fundamentals-of-Armv8-Neon-technology




115

This method allows software to control when the flags are updated or not updated. The flags can be used by subsequent condition instructions. Let's take the following code as an example:

```
SUBS       X0, X5, #1
AND      X1, X7, X9
B.EQ     label
```

The SUBS instruction performs a subtract and updates the ALU flags. Then the AND instruction performs an and operation, and does not update the ALU flags. Finally, the B.EQ instruction performs a conditional branch, using flags set as result of the subtract.

The flags are:

- N - Negative
- C - Carry
- V - Overflow
- Z - Zero

116

[115] https://developer.arm.com/documentation/102474/0100/Fundamentals-of-Armv8-Neon-technology

[116] https://developer.arm.com/documentation/102374/0101/Data-processing---arithmetic-and-logic-operations

| Pipeline (mnemonic) | Supported functionality |
|---|---|
| Branch (B) | Branch μops |
| Integer 0/1 (I) | Integer ALU μops |
| Multi-cycle (M) | Integer shift-ALU, multiply, divide, CRC and sum-of-absolute-differences μopμops |
| Load (L) | Load and register transfer μops |
| Store (S) | Store and special memory μops |
| FP/ASIMD-0 (F0) | ASIMD ALU, ASIMD misc, FP misc, FP add, FP multiply, ASIMD integer multiply, FP divide μops, crypto μops |
| FP/ASIMD-1 (F1) | ASIMD ALU, ASIMD misc,FP misc, FP add,FP multiply,ASIMD shift μops |

[117]

82. The Nissan LEAF comprises an arithmetic controller for controlling the storing and loading of data by the memory unit (*e.g.*, data retrieval from the memory unit and the subsequent storage of process outputs) and for enabling the multiplication, addition, and sign inversion units (*e.g.*, Cortex-A57 execution pipeline for the retrieval and execution of instructions related to arithmetic processes), wherein the outputs of the multiplication unit, the addition unit and the sign inversion unit are feedback to the arithmetic controller.

**Integer execute**

The integer execute unit includes:

- Two symmetric *Arithmetic Logical Unit* (ALU) pipelines.
- Integer multiply-accumulate and ALU pipelines.
- Iterative integer divide hardware.
- Branch and instruction condition codes resolution logic.
- Result forwarding and comparator logic.

[118]

[117] https://developer.arm.com/documentation/uan0015/b/
[118] https://developer.arm.com/documentation/ddi0488/h/?lang=en

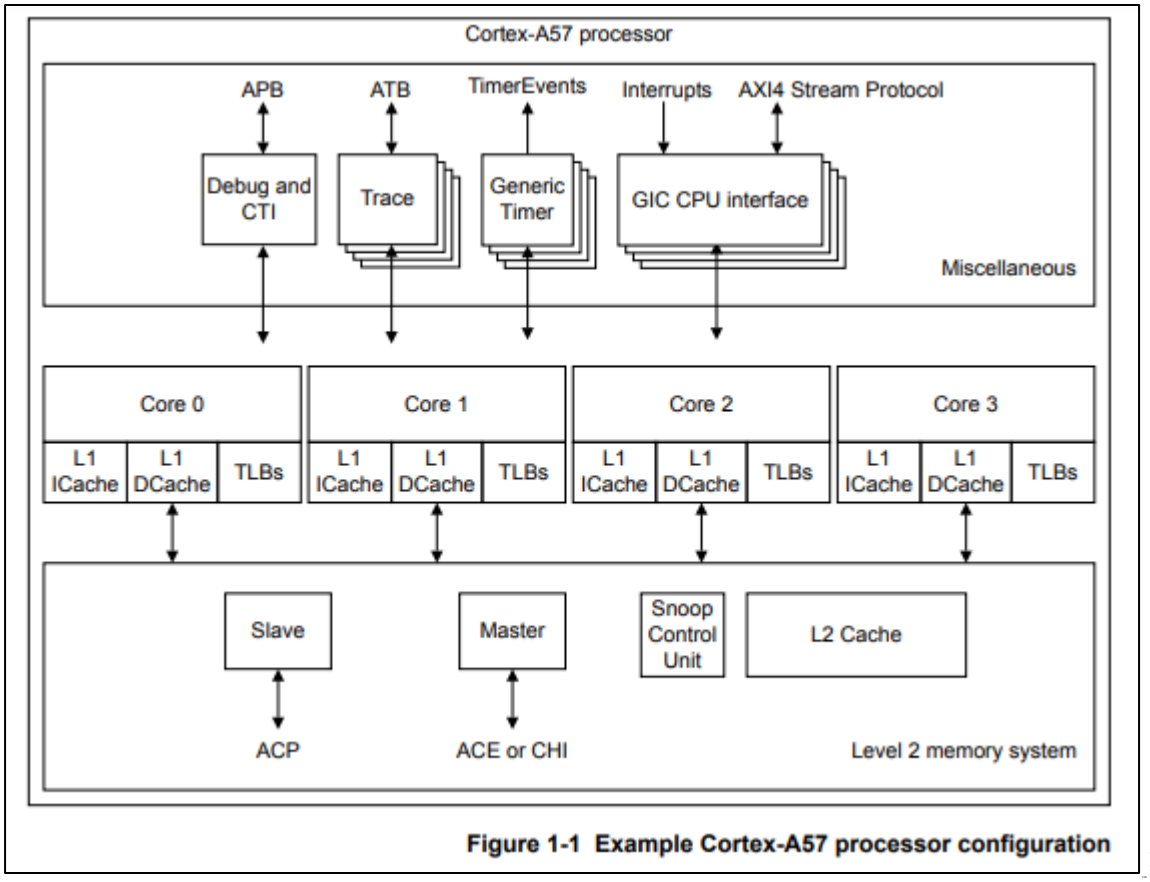
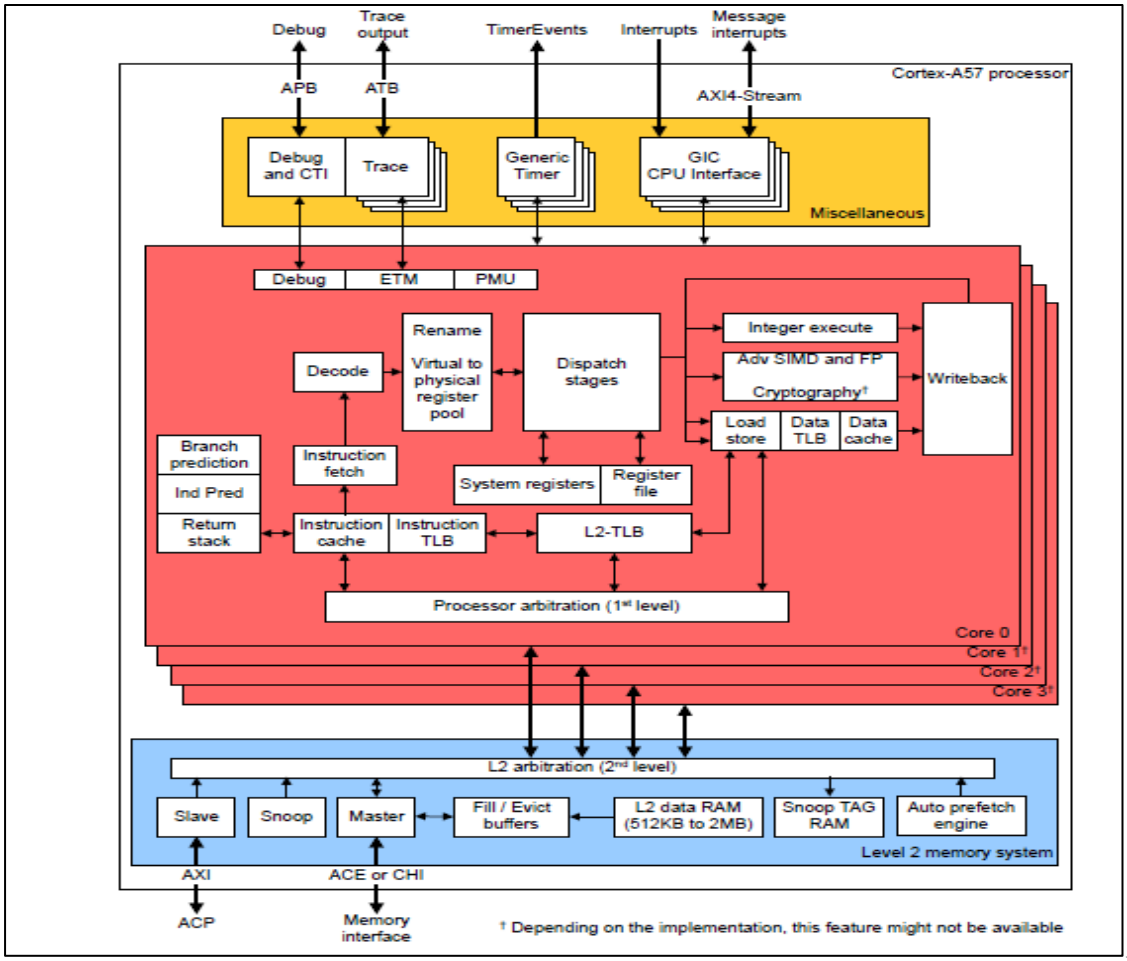



**Figure 1-1 Example Cortex-A57 processor configuration**

[119]

[119] https://developer.arm.com/documentation/ddi0488/h/?lang=en



[120]

The parts of the instruction are as follows:

- Operation defines what the instruction does. For example, ADD does addition and AND performs a logical AND. An S can be added to the operation to set flags. For example, ADD becomes ADDS. This s tells the processor to update the ALU flags based on the result of instruction. We discuss ALU flags in the section on generating condition code.

[121]

[120] https://developer.arm.com/documentation/ddi0488/h/?lang=en

[121] https://developer.arm.com/documentation/102374/0101/Data-processing---arithmetic-and-logic-operations

This method allows software to control when the flags are updated or not updated. The flags can be used by subsequent condition instructions. Let's take the following code as an example:

```
SUBS       X0, X5, #1
AND     X1, X7, X9
B.EQ    label
```

The SUBS instruction performs a subtract and updates the ALU flags. Then the AND instruction performs an and operation, and does not update the ALU flags. Finally, the B.EQ instruction performs a conditional branch, using flags set as result of the subtract.

The flags are:

- N - Negative
- C - Carry
- V - Overflow
- Z - Zero

[122]

83. Defendant has and continues to indirectly infringe one or more claims of the '666 Patent by knowingly and intentionally inducing others, including Nissan customers and end-users, to directly infringe, either literally or under the doctrine of equivalents, by making, using, offering to sell, selling, and/or importing into the United States products that include infringing technology.

84. Defendant, with knowledge that these products, or the use thereof, infringe the '666 Patent at least as of the date of this Complaint, knowingly and intentionally induced, and continues to knowingly and intentionally induce, direct infringement of the '666 Patent by providing these products to customers and end-users for use in an infringing manner. Alternatively, on information and belief, Defendant has adopted a policy of not reviewing the patents of others, including specifically those related to Defendant's specific industry, thereby remaining willfully blind to the Patents-in-Suit at least as early as the issuance of the Patents-in-Suit.

85. Defendant has and continues to induce infringement by others, including customers and end-users, with the intent to cause infringing acts by others or, in the alternative, with the

[122] https://developer.arm.com/docuentation/102374/0101/Data-processing---arithmetic-and-logic-operations

belief that there was a high probability that others, including end-users, infringe the '666 Patent, but while remaining willfully blind to the infringement. Defendant has and continues to induce infringement by its customers and end-users by supplying them with instructions on how to operate the infringing technology in an infringing manner, while also making publicly available information on the infringing technology via Defendant's website, product literature and packaging, and other publications.[123]

86. LAG has suffered damages as a result of Defendant's direct and indirect infringement of the '666 Patent in an amount to be proved at trial.

87. LAG has suffered, and will continue to suffer, irreparable harm as a result of Defendant's infringement of the '666 Patent, for which there is no adequate remedy at law, unless Defendant's infringement is enjoined by this Court.

## DEMAND FOR JURY TRIAL

Plaintiff hereby demands a jury for all issues so triable.

## PRAYER FOR RELIEF

WHEREFORE, LAG prays for relief against Defendant as follows:

a. Entry of judgment declaring that Defendant has directly and/or indirectly infringed one or more claims of the Patents-in-Suit;

b. An order pursuant to 35 U.S.C. § 283 permanently enjoining Defendant, its officers, agents, servants, employees, attorneys, and those persons in active concert or participation with it, from further acts of infringement of the Patents-in-Suit;

[123] *See* 2020 Nissan Leaf Owner's Manual, available at: https://www.nissan-cdn.net/content/dam/Nissan/pr/vehicles/leaf/2020/2020-nissan-leaf-owner-manual.pdf.

c. An order awarding damages sufficient to compensate LAG for Defendant's infringement of the Patents-in-Suit, but in no event less than a reasonable royalty, together with interest and costs;

d. Entry of judgment declaring that this case is exceptional and awarding LAG its costs and reasonable attorney fees under 35 U.S.C. § 285; and

e. Such other and further relief as the Court deems just and proper.

Dated: May 31, 2024

Respectfully submitted,

*/s/ Vincent J. Rubino, III*

Alfred R. Fabricant
NY Bar No. 2219392
Email: ffabricant@fabricantllp.com
Peter Lambrianakos
NY Bar No. 2894392
Email: plambrianakos@fabricantllp.com
Vincent J. Rubino, III
NY Bar No. 4557435
Email: vrubino@fabricantllp.com
**FABRICANT LLP**
411 Theodore Fremd Road, Suite 206 South
Rye, NY 10580
Telephone: (212) 257-5797
Facsimile: (212) 257-5796

John Andrew Rubino
NY Bar No. 5020797
Email: jarubino@rubinoip.com
Michael Mondelli III
NY Bar No. 5805114
Email: mmondelli@rubinoip.com
**RUBINO IP**
51 J.F.K. Parkway
Short Hills, NJ, 07079
Telephone: (201) 341-9445
Facsimile: (973) 535-0921

***ATTORNEYS FOR PLAINTIFF, LONGHORN AUTOMOTIVE GROUP LLC***