
Looking Back the Last 20 Years of AVN Development

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Abstract

The year 2017 marks the 20th anniversary of the “AVN”, the product combining audio, visual and navigation system, launched in 1997. DENSO TEN realized integration of all functions in a 2DIN size unit ahead of other companies, and created various advantages such as excellent usability, matching with vehicle interior design, easy installation, deterring theft and others. This type of AVN soon became the standard in the car navigation industry.

Since then, DENSO TEN developed only-one products that no other company had. Many functions that made use of integrated technology they were good at, and many functions and services that were considered to be advanced when it was launched later became the standard in the industry. Furthermore, the AVN was sold not only on the domestic market but also on the overseas markets.

This paper describes the development background of the first AVN and the summary of original products that were launched in the past while looking back the last 20 years of AVN development.

1. Introduction

Although today there are many companies who have developed car navigation products that use displays of various sizes in 2DIN-size housing, when DENSO TEN first released our product in 1997, the technology to provide the three elements of Audio, Visual, and Navigation in one package was itself far ahead of our competitors. This year we are celebrating the 20th anniversary of that AVN.

From its release, DENSO TEN’s unique functions and services, and highly concentrated technology allowed us to develop various AVN units that could not be matched by our competitors. DENSO TEN continues to lead the car navigation industry with the announcement in 2014 of *Future Link*, a leading-edge service concept driven by sophisticated communication technology that uses data for inside and outside the vehicle.

To memorialize the 20th anniversary of AVN, this paper discusses the story and history of AVN, as well as the various transitions and main models introduced since its introduction.

2. The AVN Story

2.1 History of AVN Development

The development of AVN was started in the fall of 1995. Before then, the most common configuration was use of hideaway car navigation system and on-dash type monitor. With the goal of increasing our retail market share, DENSO TEN initiated AVN development by setting the mission to develop products our competitors did not offer as a starting point. Key words for the planning stage in those days were “Downsizing”, “World-first/Industry-first”, and “Quality that provides security and safety” from which the AVN concept was originated. The project was

launched at the same time as the AVN concept was solidified.

2.2 Development Issues

The development of AVN, as the first product developed by DENSO TEN jointly in collaboration with partnering companies, faced three major issues.

2.2.1 Size

The first issue was fitting the entire AVN into a 2DIN size (H: 100 mm x W: 178 mm) housing. The necessity to put CD and MD decks, and audio and navigation boards into this size housing started the “Turf Battle”. Given these conditions, it became possible to overcome this problem by making each device smaller and with increased integration, as well as developing new devices.

2.2.2 Heat Generation

Another major issue was that, with the internal parts of an AVN laid out in an extremely dense configuration, as the sources of heat generation from the navigation board increased, there was nowhere for the heat to escape due to the close contact with neighboring parts such as the deck. A heat-radiation fan was equipped for the first time to the rear face of the product in order to resolve this issue. However, an onboard muffled fan did not exist at that time, resulting in a problem with fan operating noise. Trial and error testing resulted in muffling the fan working together with the fan manufacturer, thereby resolving the issue.

2.2.3 Noise

Noise countermeasures also became a major issue due to the extremely dense parts layout and design of AVN. Noise has various negative effects such as that on the AVN’s internal receiver and unnecessary noise radiation that has affects outside of the device. Countermeasures to this noise included strengthened shielding,

making devices low in noise, and applying board design know-how.

2.3 Birth of AVN

Development required some two years to resolve these various types of problems with the first generation AVN introduced in 1997. Although the CD-ROM navigation system had a price of 298,000 yen, extremely higher than the systems offered by competing companies at the time and therefore causing concern to the persons involved, appeals to customers through promotional activities and advertising resulted in the product being judged to be highly marketable, which served to dispel the concerns. Catch phrases used at the time included “Media in One Body”, “Feel Conscious”, and “Just Fit”, while the product received high praise such as, “It fits perfectly,” “It’s easy to install,” and “Close-at-hand CD changing makes it easy to use.”



Fig. 1 E7707AVN (Released July 1997: 298,000 yen)

3. Transition of AVN

AVN, equipped with various functions and services, has been produced on a commercial basis since its release in 1997. This section introduces the main models that have been sold in Japan and overseas retail markets, as well as the transition of the AVN. Fig. 2 shows the transition of the Japanese retail market.

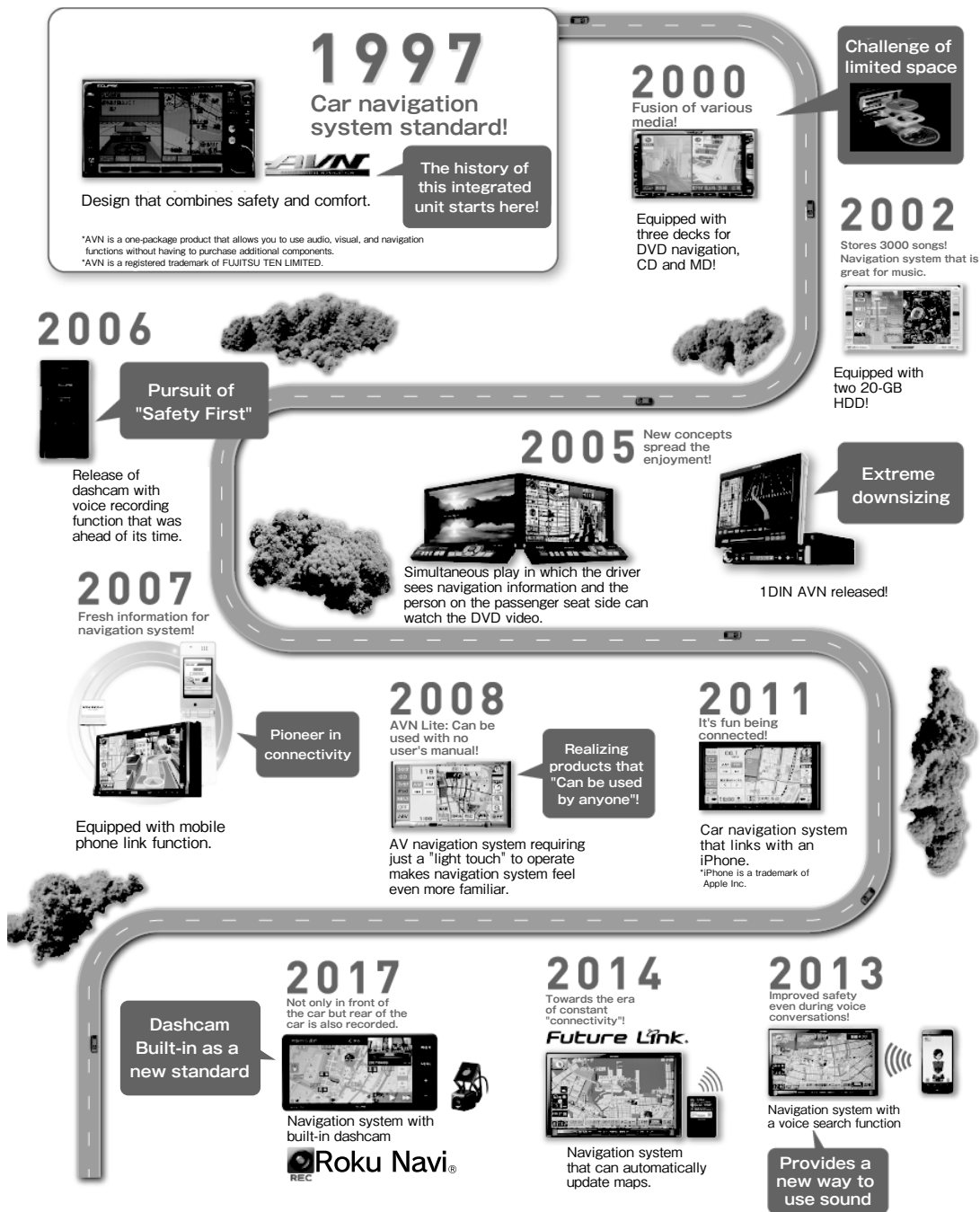


Fig. 2 Transition of AVN

■ 1997: First Generation AVN (Fig. 1)

There is no need to purchase any accessories for this one-package product that includes audio, visual, and navigation systems and allowed use of all their basic functions. The merits of this integrated unit, which is easy to install to vehicles, has a sleek look, and close-at-hand CD switching, were highly praised.

■ 2000: DVD-AVN with Three Built-In Decks (Fig. 3)

The integration of DVD navigation system with audio/visual unit, as well as even more highly integrated technology resulted in the ability to fit the DVD, CD, and MD decks into the 2DIN space. This building-in of three decks firmly established DENSO TEN's "Downsizing" technology.



Fig. 3 AVN5510D (Released July 2000: 280,000 yen)

■ 2001: DVD-AVN with Touch Panel (Fig. 4)

Use of a touch panel system for the monitor made for more intuitive and speedy operation. This system had massive impact on the market as it did away with the joystick operation that was common at the time and replaced it with directly touching the buttons displayed on the screen, with this system later becoming the main type of car navigation system. Additionally, our adoption of a film antenna affixed to the front windshield was well before other companies, and it served to reduce installation work and improve the comfort of the vehicle cabin environment.



Fig. 4 AVN5501D (Released July 2001: 283,000 yen)

■ 2002: Twin HDD-AVN (Fig. 5)

Equipped with two 20-GB HDD, with each being used separately for navigation system and audio unit to provide high-speed access to navigation system as well as the "Music Juke" function allowing up to 3,000 songs to be stored, making it the biggest hit product up until then.



Fig. 5 AVN9902HD
(Released November 2002: 375,000 yen)

■ 2004: DVD-AVN for US and Chinese Markets (Fig. 6)

DENSO TEN first released a DVD navigation system based on Japanese retail market models to the US retail market. Following that, the company also released it to the Chinese retail market. The all-in-one package was highly popular just like the package product sold domestically.



Fig. 6 AVN2454 (Released February 2004: 3,000 USD)

■ 2005: Dual-AVN (Fig. 7)

The monitor displays the navigation information to the driver and the DVD video on the passenger seat side. This model is equipped with a “Dual Display”, a single monitor that displays different images that change depending on the viewing angle. This supports safe driving and improves comfort for the person sitting in the passenger seat.



Fig. 7 AVN7905HD
(Released November 2005: 375,000 yen)

■ 2005: 1DIN AVN (Fig. 8)

All audio, visual, and navigation functions are built into a 1DIN size, with all of the same functions of a 2DIN AVN, such as HDD navigation system, Music Juke, DVD/CD-compatible deck, TV/radio tuner, and 7-inch display, contained within a 1DIN size. This product, which provides all the functions without need for other units in vehicles with a 1DIN opening, received great response not only in Japan but also in countries abroad.



Fig. 8 AVN075HD
(Released November 2005: 265,000 yen)

■ 2007: AVN with Built-in Full-Segment Tuner (Fig. 9)

With the spread of terrestrial digital television broadcasting at the time, this model was given a built-in terrestrial digital tuner (full-segment) and also has a built-in slot for a B-CAS card that is necessary for television viewing. The film antenna, with a total of four channels (two front and two rear channels), is standard equipment, winning the product praise for its receiving capability.



Fig. 9 AVN687HD
(Released November 2007: discretionary price)

■ 2009: AVN with Overseas-Dedicated Memory(Fig. 10)

DENSO TEN developed a model especially designed for countries other than Japan, with the model being sold in the US, Europe, Australia, and China. This was the first AVN marketed by DENSO TEN with a built-in Bluetooth® function,

the main hands-free audio system overseas at the time.



Fig. 10 AVN726E (Released April 2009: 1,200 USD)

■ 2011: AVN with Globally Compatible Memory(Fig. 11)

With the intention of also providing Japan-specific functions, such as one-segment compatibility and VICS, DENSO TEN created a dedicated platform compatible with global specifications and marketed products for the whole world. Overseas market models featured a built-in voice recognition function (command type) that allows the driver to perform operations such as setting the destination or choosing a song without having to look at the screen to improve comfort as well as safety while driving.



Fig. 11 AVN827GA (Released August 2011: 2,199 AUD)

■ 2012: Ultra AVN (Fig. 12)

This model increased the surface area of DENSO TEN’s standard seven-inch size model by about 1.8 times to provide a large screen of nine inches. Perfect-fit installation is provided by use of a car model-dedicated kit that was designed specifically for each model, while it is

also compatible with “Kuruma de DS” (meaning “Use the DS in the Car”), for a product that makes driving fun for passengers as well.



Fig. 12 AVN-ZX02i (Released July 2012: discretionary price)

■ 2014: Connected AVN packaged with communication unit (Fig. 13)

The included communication unit enables a constant connection between the AVN and server while driving so that road information is updated monthly without having to do anything and drivers can always search for the most up-to-date information about facilities. This resolved a chronic problem that has existed since the original generation of car navigation systems in that information in onboard devices becomes old over time.



Fig. 13 AVN-SZ04i (Released November 2014: discretionary price)

■ 2016: AVN “Roku Navi” with Built-in Dashcam (Fig. 14)

This AVN has a built-in dashcam. In addition to the attractive feature of activating the dashcam just by connecting the image recording camera to the AVN, this unit has many merits due to

various built-in functions such as buttons for the recording microphone and manual recording being shared with the AVN, the high precision values of the AVN being used for latitude/longitude and speed information to be recorded, as well as the video images of the rear camera connected to the AVN also being recorded.



Fig. 14 AVN-D7W

(Released December 2016: discretionary price)

4. Future Outlook

Amid the ongoing price competition that commoditization of the car navigation market has also brought, DENSO TEN is seeking differentiation from competing companies by use of large screens and communication functions to prevent prices from dropping.

In response to the rising demand for safety and security, DENSO TEN is currently focusing on expanding functions and providing system connectivity with AVN as the base point in the form of models we have discussed above such as those with a built-in dashcam, and units that can detect obstacles based on images from the rear camera and notify the driver accordingly.

In the near future, we expect displays to become standard equipment for cars and for autonomous driving to become fully realized, resulting in a period of massive changes in the automotive after-sales market. It will be necessary to develop products that accurately correspond to these types of changes and trends in the future.

5. Conclusion

We have provided a brief overview of the history and future of AVN to commemorate the 20th anniversary of the first AVN product. We looked back on how it started with the 2DIN size package, followed by equipping

with touch panels, film antenna, a full-segment tuner, and various other functions, resulting in many of DENSO TEN pioneering products and technology serving as basic templates for the current car navigation industry. DENSO TEN takes pride and has confidence as a pioneer of AVN, such that we will continue to conform to the needs of these times to develop products that are truly desired and bring people joy as well by challenging ourselves to create new technology.

[Appendix]

Over these 20 years, DENSO TEN has received numerous awards, within Japan and abroad, in recognition of our technical prowess and product competitiveness. Some examples of these awards are shown below.

Japan

Car Accessory Award, Nikkan Jidosha Shimbun (Japan Automotive Daily)

Year	Category	Received for
1998	Multimedia Division Award	E7707AVN
2006	Grand Prize	"Dual AVN" AVN7905HD
2008	Car Navigation Division Award	AVN687HD
2014	Car Navigation/AV Division Award	"Ultra AVN" AVN-ZX03i
2015	Car Navigation/AV Division Award	"Connected Navi" AVN-SZ04i / SZ04iW / SZ04i
2017	Car Navigation/Car AV Division Award	"Roku Navi"® AVN-D7 / AVN-D7W

*Held by the Nikkan Jidosha Shimbun Inc. Selected from the perspective of "Technical development capabilities for products", "Planning capabilities", "Uniqueness", and similar aspects.

Good Design Award

Year	Received for
2002	AVN8802D
2003	AVN3303D
2003	AVN8803HD/AVN7703D/AVN5503D/AVN4403D /AVN2203D
2003	AVN9903HD
2008	AVN118M

*Held by the Japan Institute for Design Promotion. It is the only comprehensive design evaluation and recommendation structure in Japan.

Overseas

SEMA Show AWARD

Year	Award Name	Received for
2005	SHOW AWARD	AVN7000

*This event, held by the Specialty Equipment Market Association (SEMA), can boast of being the world's largest after-sales market trade show.

+X AWARD

Year	Category	Received for
2006	"Innovation"、"Ease of Use"	AVN8826
2007	"Innovation"	AVN2227p、AVN7000

*It is an honorable award for new innovative electrical products in Germany. The prize is administered by influential groups in the electrical devices industry (such as magazine companies, news website managing companies). Representatives of each company gather to select the awarded products.

CES Innovation Award

Year	Award Name	Received for
2007	Innovation Award	AVN2210p
2009	Best of Innovation	AVN726E
2009	Innovation Award	AVN4430

*The Consumer Electronics Show (CES), held annually in January by the Consumer Technology Association (CTA), is the world's largest exhibition focusing on consumer home electronics. Products with outstanding technology or design are selected as excellent products for an "Innovation Award" by each product category.

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- AVN Lite is a registered trademark of DENSO TEN Limited.
- **Future Link** is a registered trademark of DENSO TEN Limited.
- Roku Navi is a registered trademark of DENSO TEN Limited.
- Music Juke is a registered trademark of DENSO TEN Limited.
- Bluetooth® is a registered trademark of Bluetooth SIG, Inc.

- Kuruma de DS is a registered trademark of Nintendo Co., Ltd.

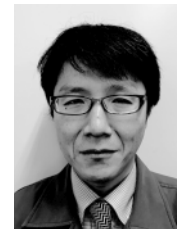
Profiles of Writers



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