

NOTE

Upsizing to 9-inch Display for AVN and Development of Dedicated Installation Kit by Car Model

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Introduction

In the trend of Japanese AVN market, universally installable 7.0 VGA display had been the mainstream product. However, the needs of wider screen are growing from the perspective of visibility and operability. Based on this background, FUJITSU TEN has developed the AVN equipped with "9.0 VGA display" that is the industry-largest screen size. Since the 9-inch AVN has a different aperture size, a genuine cluster panel cannot be diverted and installed in the vehicle. Thus, dedicated installation kits by vehicle model must be developed at the same time. In installing the AVN using the dedicated kit by vehicle model, "simplified installation" and "appearance having a sense of unity with the vehicle after installation" are required. Therefore, we have developed the direct power conversion harness that is capable of easily connecting a vehicle connector to an AVN connector, and the dedicated installation kit by vehicle model to ensure the installation having a sense of unity with the vehicle.

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9-inch AVN-ZX02i

9-inch AVN-ZX02i is the product that is based on AVN-Z02i, 2012 summer model for the aftermarket, having a common main unit and a display upsized from 7-inch to 9-inch. Regarding the outer size of the display, the 9-inch (138.5 mm in height × 223 mm in width) display provides the drawing area which is approximately 1.8 times as large as that of the 7-inch (100 mm in height × 180 mm in width) display (Fig. 1). This enables the enlargement of the button size and the character size, thus, the operability and the visibility are greatly improved. In addition, as with the base model, AVN-ZX02i is equipped with an illuminance sensor for improving the visibility of the screen when exposed to the sunlight, and is compatible with flick operation as well.



Fig.1 Comparison of screen size between 7-inch AVN and 9-inch AVN

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Dedicated Installation Kit by Vehicle Model

(1) Composition of kit

The main components are, a dedicated cluster panel by vehicle model, a dedicated bracket by vehicle model, and a dedicated power conversion harness required for each automobile manufacturer.

(2) Introduction of components

The shape of the dedicated cluster panel by vehicle model is changed for 9-inch AVN, based on the genuine shape. Main changes include, for example, the change in aperture size from 7-inch to 9-inch, the change in external shape to respond to the change in the position for installing the 9-inch AVN, the reduction of the number of hooks within the range that meets the specifications required for aftermarket products (e.g.: hooks were reduced from 7 to 4, in the case of PRIUS) and the simplified shape of the cluster panel (Fig. 2). These changes have reduced the tooling cost (by 30 %).

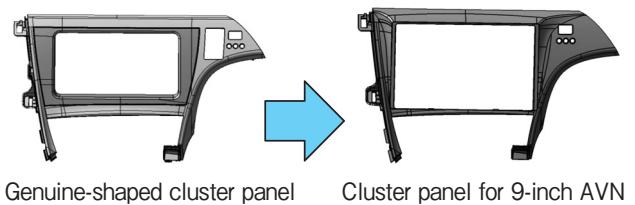


Fig.2 Shape of cluster panel for PRIUS

The installing angle and the installing position of the dedicated bracket by vehicle model have been changed to install the 9-inch AVN, based on the genuine shape. Through the elimination of the drawing and the flange shape, and through the increased thickness, strength has been secured (Fig. 3). The simplified shape enables the manufacturing by the in-house turret punch press⁽¹⁾ instead of the single operation die, and has reduced the tooling cost drastically (by 90%).

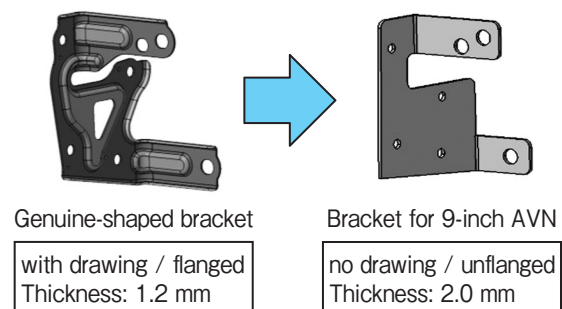


Fig.3 Shape of bracket for PRIUS

The power conversion harness whose end is the bullet terminal has been prepackaged in the conventional AVN for the aftermarket so that the harness is connectable to the harness set by manufacturer of commonly-marketed vehicles. This time, however, we have set the power conversion harness that is capable of directly connecting the

* (1) A type of press machine that places multiple dies with different shapes under numerical control, and performs the processing for forming the material.

power connector of 9-inch AVN to the power connector on the vehicle of each automobile manufacturer.

(3) Design concept

We have designed the dedicated cluster panel by vehicle model, aiming at a sense of unity and a good fit with the vehicle same as the genuine panel. The shape, the surface treatment and the color of the dedicated cluster panel have been finished as close to the genuine panel as possible, and we have realized a sense of unity with the peripheral components. In addition, we have realized a good fit, aiming at 1 mm of the clearance between components as a target.

4 Design Method of Cluster Panel for 9-inch AVN

(1) Method of creating data of panel and panel design

In order to design the dedicated cluster panel by vehicle model, CAD data of vehicles are required. However, we cannot receive the CAD data from vehicle manufacturers because products are sold on the aftermarket. That is why we have created the data of the instrument panel of the vehicle by using a 3D scanner (Fig. 4). First, the installation is discussed by use of the scanned point cloud data. Next, the position and the shape size of the hole for fitting into the vehicle are measured. The point cloud data is converted into the CAD data (referred to as "reverse"). The procedure proceeds to the detailed design and the surface design implemented by CAD data.

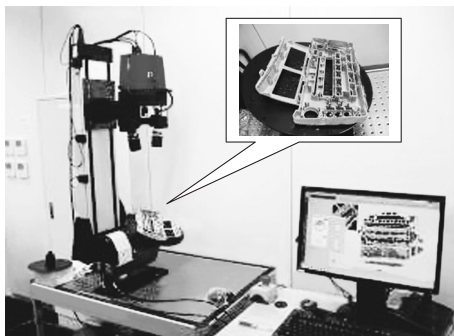


Fig.4 3D scanner

(2) Problems and solutions of design utilizing 3D scan

The 3D scanner uses the principles of photography, takes photos of an object with a camera, and converts the images into the point cloud data. Although four problems came out of the practical operation when capturing the data, we were able to capture the data by taking measures without any difficulty. Problems and countermeasures are described below.

① Difficulty of collecting data of the reflecting surface and the deep part on the component surface

With regard to the reflection of the light on the component surface, the component surface has been coated with an anti-reflective material, and the point cloud has been increased by about 20-30% than the uncoated state. As for the tangled deep part of the component shape, we have increased the frequency of shooting and the shooting angle to increase the point cloud data as much as possible.

② Difficulty of determining the parting of the panel shape

Since there are much missing point cloud data by

scanning in the corner radius of the panel design surface, it is difficult to render the surface in the small area. Therefore, we couldn't determine the parting (intersection of design surfaces) of the component shape, and couldn't create a design shape for 9-inch AVN. There, we have reserved the surface on the scanned data by putting the colored (contour enhancement) tapes for covering the problem caused by the small area so that we may determine the parting (Fig. 5).

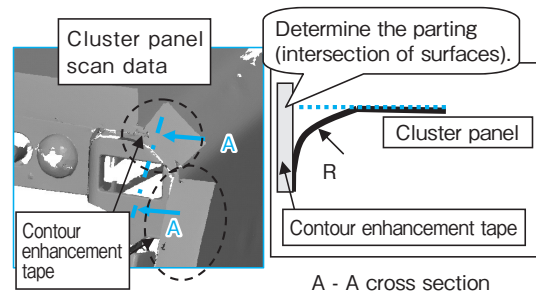


Fig.5 Method for determining the parting of panel shape

③ No fiducial point as a basis for combination of the scanned data

The scanned data have a fiducial point for each component; however, there is no fiducial point for combining the data. Then, we have decided that the fiducial point for combination is the center of the AVN screen, and have made a jig for realizing the fiducial point on the scanned data. Through attaching the jig to the AVN and performing the scan, the centering mark of the jig has been able to be viewed as a fiducial point (Fig. 6).

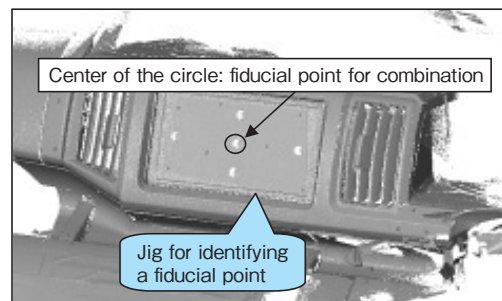


Fig.6 Jig for identifying fiducial point

④ Effect on cluster panel shape by strain when installed in the vehicle

The cluster panel is formed into the shape along the instrument panel in the state where it is installed in the vehicle, because of the force applied to the fixed part such as hooks. However, the cluster panel is warped in the state of a single item because it is unfixed (5 mm or more of warpage in the outmost panel). Therefore, when a single component is measured, the cluster panel needs to be the same shape artificially as the state where it is installed in the vehicle. Then, we have made a jig for fixing the panel, and have performed the scan by attaching the component to this jig when performing the scan.

5 Means to expand target vehicle models

In order to install the 9-inch AVN in the vehicle, a register (air-conditioning outlet), a heater control unit, a haz-

ard button and others, which are located around the space for installation, are demanded not to interfere with the 9-inch AVN. Usually, vehicles have only a space for 7-inch AVN. Spaces need to be reserved by various ways for each vehicle model to install the 9-inch AVN. Next section introduces those techniques.

① Forward-jutting installation of AVN [Case of Honda Fit]

When the 9-inch AVN is installed in the same depth position equivalent to the genuine panel, the interference with the instrument panel prevents the AVN to fit into the space. We have moved the AVN to the vehicle cabin side by 35 mm to avoid the interference (Fig. 7).

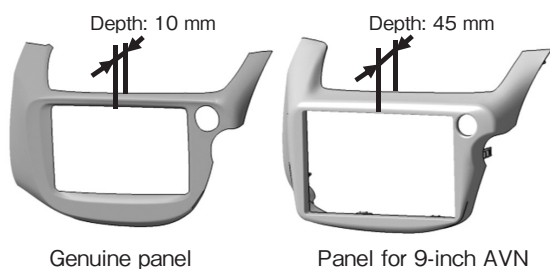


Fig.7 Comparison of cluster panels for FIT

② Processing of vehicle parts and AVN [Case of NOAH/VOXY and PRIUS α manufactured by TOYOTA]

Since the AVN and the cluster panel interfere with each other, we have partially cut the cluster panel of the vehicle and have assembled the cluster panel of the kit in order to avoid the interference (Fig. 8).

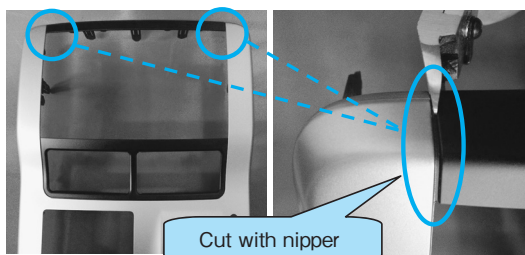


Fig.8 Processing of cluster panel for NOAH/VOXY

Further, in order to avoid the interference, the edge of the heater control unit has been cut, and the frame panel of the AVN has been also partially cut (Fig. 9) (Fig. 10).

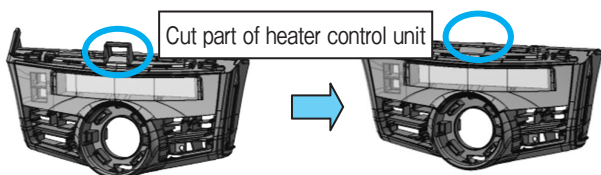


Fig.9 Processing of PRIUS α heater control unit

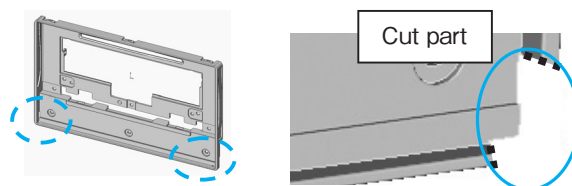
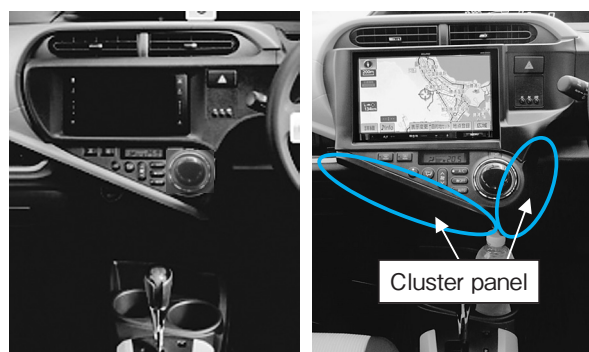


Fig.10 Processing of AVN frame panel for installing in PRIUS α

③ Relocation of AVN peripheral components, Addition of components [Case of Toyota Aqua]

Since the vehicle has no space for installing the 9-inch AVN, the heater control unit located under the AVN needs to be moved downward by 50 mm. We have set a relay holder to move and fix the heater control unit. In addition, we have set two part numbers for cluster panels to respond to the change in the design shape (Fig. 11).



Genuine 7.0 display-installed AVN 9.0 display-installed AVN

Fig.11 Photo of AVN installed in AQUA

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Conclusion

Prior to the launch of the 9-inch AVN, because of the dedicated setting by vehicle model, the expansion of target vehicle models and the short-term development were required to increase the sales.

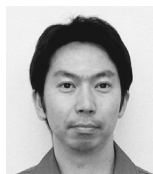
In the development of the installation kit for 9-inch AVN, by utilizing the newly-introduced 3D scanner, through the way of directly connecting the design data to Monozukuri such as die making and the cooperation with the related departments, currently, the target vehicle models have been expanded up to 16 models.

Finally, we express our gratitude to those who have been involved in the development.

Profiles of Writers



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