05HQK–01

SYSTEM DESCRIPTION

1. GENERAL

(a) This system has a television camera mounted on the luggage compartment door to display the rear view of the vehicle on the display panel of the multi–display. The display panel also shows a composite view consisting of the rear view and parking guidelines to assist the driver in parking the vehicle by monitoring the rear view.

(b) This system consists of the following components: television camera ECU, television camera assy, multi–display, steering angle sensor, and navigation ECU.

(c) This system is equipped with a self–diagnosis system, which is operated on a dedicated window that appears on the display panel, just as in the navigation system.

2. FUNCTION OF COMPONENTS

(a) The television camera ECU controls the system by using information from the following components.

Item	Function
Television Camera Assy	Mounted on the luggage compartment door to transmit the rear view of the vehicle to the television camera ECU.
Television Camera ECU	Transmits video signals, which contain a composite of the rear view of the vehicle taken with the television camera and the parking assist guidelines, to the multi–display. Furthermore, it effects overall control of the system by receiving the signal from the sensors and the navigation ECU.
Multi–display	Receives video signals containing a composite of the rear view of the vehicle and the parking assist guideline signals from the television camera ECU, and displays them on the display panel.
Navigation ECU	Uses the yaw rate detected by the gyro sensor that is built into the navigation ECU to transmit the movement of the vehicle to the television camera ECU.
Steering Angle Sensor	Detects the angle of the steering wheel and sends the resulting signals to the television camera ECU through communication. When a steering angle sensor malfunction data is received or a steering angle sensor signal cannot be received, the problem can be checked on the diagnostic screen.
Vehicle Speed Signal	A vehicle speed signal transmitted from the combination meter through communication.
Neutral Start Switch	Transmits a reverse shift position signal to the television camera ECU through communication. This signal switches the display of the multi–display to operate this system.

3. OPERATION EXPLANATION

(a) The ECM, through the CAN communication system, inputs the R position signal from the neutral start switch to the television camera ECU when the shift lever is moved to the R position.
After receiving the R position signal, the television camera ECU switches the display signal for the multi–display from the navigation system to the back guide monitor system.

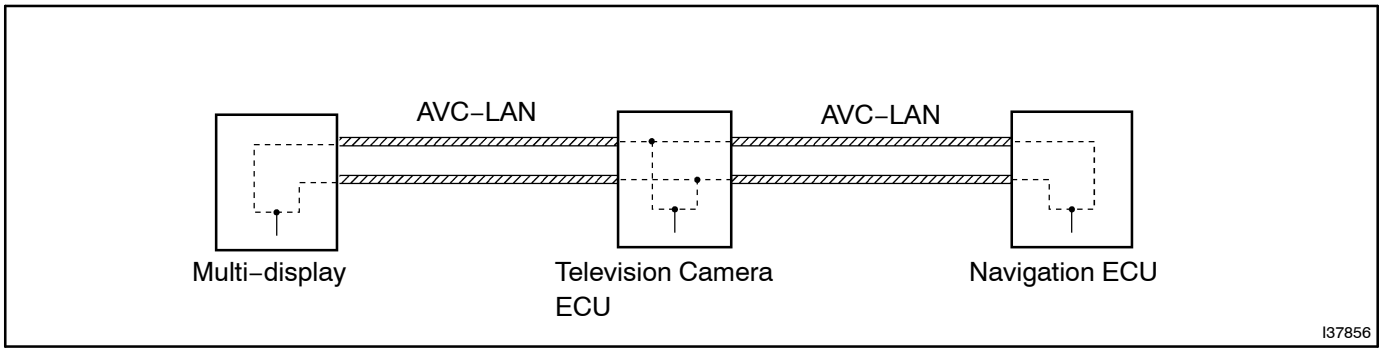
(b) In serial parking assist mode, an appropriate steering angle and timing information can be provided for the driver while serial parking. This is based on the information from the steering angle sensor signal and the vehicle angle data signal that are sent to the television camera ECU through the CAN communication system.

HINT:

- In manual assist mode, the steering angle sensor signal and the vehicle angle data signal are not used to control parking assist.
- Vehicle speed signal is required to adjust the steering angle neutral point.

4. COMMUNICATION SYSTEM

(a) This back guide monitor system communicates between the components by AVC–LAN. Also, ”SERIAL PARKING ASSIST MODE” judges the vehicle angle data transmitted via AVC–LAN from the navigation ECU (the data is calculated by the navigation ECU by integrating the yaw rate of the gyro built in the navigation ECU).



5. DIAGNOSTIC FUNCTION

(a) This back guide monitor system has a diagnostic function (displayed in ”NAVIGATION SYSTEM” of the multi–display).

(b) A three–digit ”unit code (physical address)” number (in hexadecimal notation) is set in each component that makes up AVC–LAN.

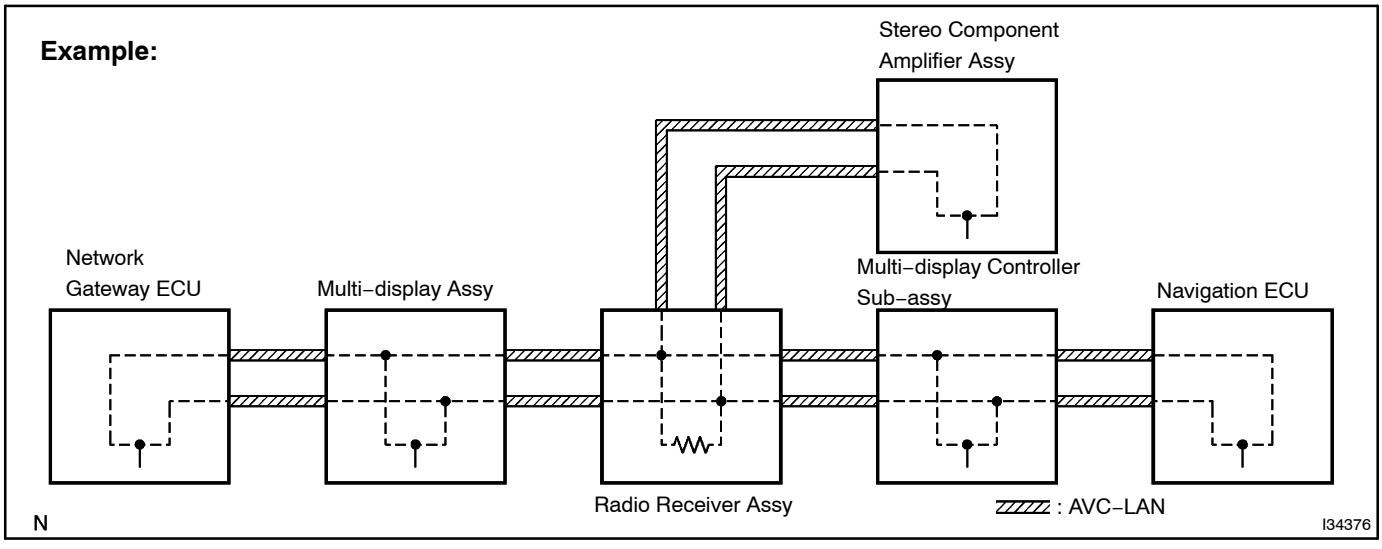
(c) A two–digit ”logical address” number (in hexadecimal notation) is set in each function of the components that makes up the AVC–LAN.

6. OUTLINE OF AVC–LAN

(a) What is AVC–LAN?

AVC–LAN is the abbreviation for Audio Visual Communication–Local Area Network. This is a unified standard co–developed by 6 audio manufacturers associated with Toyota Motor Corporation.

The unified standard includes signals such as audio, visual, and signals for switch indication and communication.



(b) Objectives

Recently, developments in car audio systems have been rapid and functions have been changed drastically. The conventional system has been switched to the multi–media type such as a navigation system. At the same time, customers want to upgrade their audio systems. This is the factor that lies behind this standardization.

The concrete objectives are explained below.

(1) When products by different manufacturers were combined, malfunctions such as sound failure occurred. This problem can be solved by standardization of signals.

(2) Various types of after market products are available.

(3) Because of the above (2), each manufacturer has been able to concentrate on developing products in their strongest field. This has enabled the development of inexpensive products.

(4) In general, a new product developed by one particular manufacturer could not be used due to a lack of compatibility with other manufacturers products. By developing this new standard, users can enjoy a range of compatible products from different manufacturers anytime they want.

HINT:

- When +B short or GND short is detected in AVC–LAN circuit, communication stops, and the audio system does not function normally.
- When audio system is not equipped with a navigation system, the audio head unit is the master unit. When the audio system is equipped with a navigation system, the multi–display is the master unit.
- The radio receiver is equipped with a resistor (60 to 80 Ω) for communication.
- The car audio system using AVC–LAN circuit has a diagnostic function.
- Each product has its own specified number called a physical address (three–digit number). Numbers are also allotted to each function within a product, which are called logical addresses (two–digit number).

7. NOTES FOR BACK GUIDE MONITOR

(a) Notes for back guide monitor.

(1) The back guide monitor may not function properly if subjected to a severe blow by any hard object.

(2) Do not ”scrub” the cover part of the camera (resin made). Scrubbing it may scratch the cover and affect the image. Prevent organic solvents, waxes, bond removing solvents, or glass coating from adhering to the cover. Clean it off immediately, and wash with water.

(3) Exposing the camera to sudden temperature change may affect proper function.

(4) A clear image may not appear if the camera is dirty with snow, mud, etc. In that case, wash with water and wipe off. Use a detergent to remove dirt if necessary.

(b) Images are difficult to discern even in normal conditions if:

(1) Camera screen is frosted over (the image immediately after turning the ignition switch to the ON position may be blurred or darker than normal).

(2) A strong beam of light, such as a sunbeam or headlamp, hits the camera.

(3) It is too dark around the camera (at night, etc.).

(4) The ambient temperature around the camera is either too high or too low.

HINT:

When a strong light, such as a sunbeam reflected off the vehicle’s body, hits the camera, the image may be blurred. This is called the ”SMEAR” phenomenon, peculiar to the CCD camera.