

## ■ LEXUS NAVIGATION SYSTEM

### 1. General

#### Outline

- The following functions have been added or changed in the LEXUS navigation system on the '10 SC 430.

Item/Outline		Added	Changed
Navigation Display	LEDs are used for the backlighting of the LCD screen.	-	○
Navigation ECU	A HDD is used for storage.	-	○
	French and Spanish have been added to Languages Supported.	○	-
	Natural Speech Technology is used for the voice recognition system.	○	-
	Hawaii and Puerto Rico have been added to the map coverage area.	○	-
	The Bluetooth Audio System is supported.	○	-
	XM Satellite Radio* is supported.	○	-
	The Diagnosis function has been changed.	-	○
	The map date update is supported.	○	-
	MOST communication is supported.	○	-
Navigation Control Switch	-	○	
Steering Pad Switch	-	○	
USB Port	○	-	

\*: Optional Equipment

- A navigation display has been provided on the instrument cluster finish panel sub-assy center as standard equipment. The display, which consists of a wide 7.0-inch Liquid Crystal Display (LCD) screen with a pressure sensitive touch panel offers improved ease of use.
- Light Emitting Diodes (LEDs), are used to provide mercury-free backlighting for the navigation display. This reduces the burden on the environment and ensures brightness.
- The Hard Disk Drive (HDD) is provided as standard on the navigation ECU.
- The control switches of the LEXUS navigation system (MAP/VOICE, DESTINATION, SET UP, INFO, DISPLAY, and OPEN/CLOSE) are located on the air conditioner control panel.
- This is a voice recognition system that uses natural speech technology to interpret a user's intent based on their natural speech pattern. The system recognizes natural speech patterns as voice recognition commands.
- The language of the screen buttons, pop-up messages and voice guidance can be selected from among English, French, and Spanish.
- Hawaii and Puerto Rico have been added to the map coverage area, ensuring marketability.
- A hands-free function for a Bluetooth-compatible cellular phone is used.

- The Bluetooth audio system enables users to enjoy music played on a portable player from the vehicle speakers via wireless communication.

*Reference*

*Portable players must correspond to the following specifications in order to be able to be connected to the Bluetooth audio system. However, note that some functions may be limited depending on the type of portable player.*

*The following profiles must be supported:*

- *Advanced Audio Distribution Profile (A2DP) Version 1.0*
- *Audio/Video Remote Control Profile (AVRCP) Version 1.0 or higher (Version 1.3 or higher recommended)*

- XM satellite radio is a service that uses the signals from 2 satellites in geostationary orbit to make it possible to capture digital radio broadcasts (XM satellite radio) from over 170 channels. XM satellite radio enables users to constantly receive their favorite programs.
- A USB port that enables operation of a portable audio player (USB type) or an iPod is provided.

*Reference*

- *Supported iPod models and firmware versions are listed below:*

Supported iPod Model	Supported Firmware Version
iPod 5G	1.2.0 or higher
iPod nano 1G	1.2.0 or higher
iPod nano 2G	1.1.2 or higher
iPod nano 3G	1.0.0 or higher
iPod touch	1.1 or higher
iPod classic	1.0.0 or higher

- *Unsupported iPod models are listed in the table below:*

Unsupported Models	iPod shuffle
	iPhone
	iPod 1G, 2G, 3G, 4G
	iPod mini

- *Mass storage class type portable audio players (USB type) are compatible.*
- *iPod is a trademark of Apple Inc. that has been registered in the U.S.A. and other countries.*

## SPECIFICATION

### 1) Lexus Navigation System

Component		Specification
Navigation Display		7.0-inch wide LCD
Navigation ECU		DENSO (Separate from Navigation Display)
Gyro Sensor		Piezoelectric Ceramic Element
HDD (Hard Disk Drive)		Capacity 40GB
Map Data Media		HDD
Languages Supported	Voice Guidance	English, French and Spanish
	Voice Recognition	English, French and Spanish

#### Reference

The map data is updated by updating the map data on the HDD.

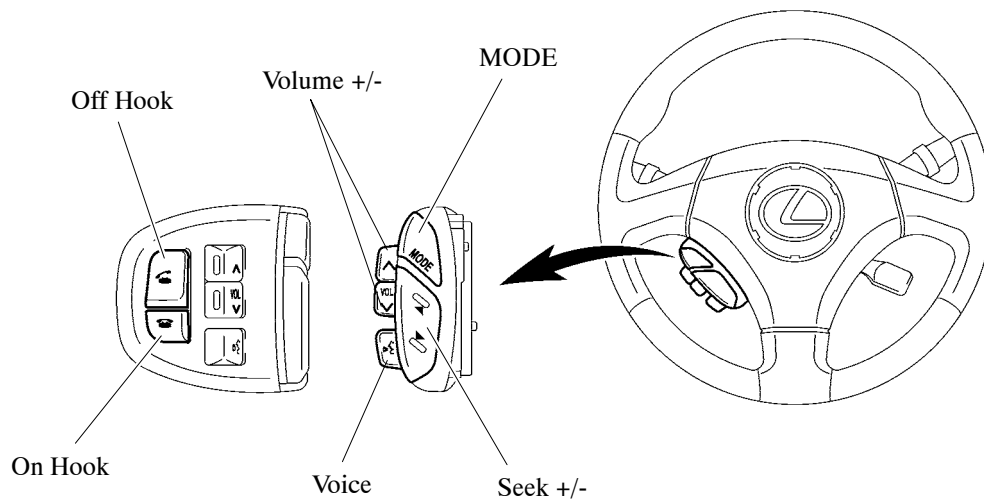
A TIS connection kit and IEEE1394 (FireWire) connection inside the cabin are used for updating the data.

For details, refer to the instruction manual provided with the kit.

### 2) Steering Pad Switch

Item	Switch	Equipment
Audio	- Volume +/- - Seek +/- - MODE	×
Phone	- On Hook - Off Hook	×
Navigation	-Voice	×

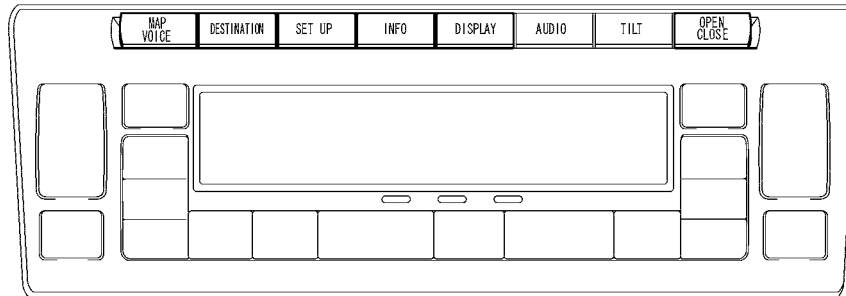
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### 3) Navigation Control Switch

The navigation control switch has been changed to MAP/VOICE, DESTINATION, SET UP, INFO, DISPLAY, AUDIO, TILT, OPEN/CLOSE.



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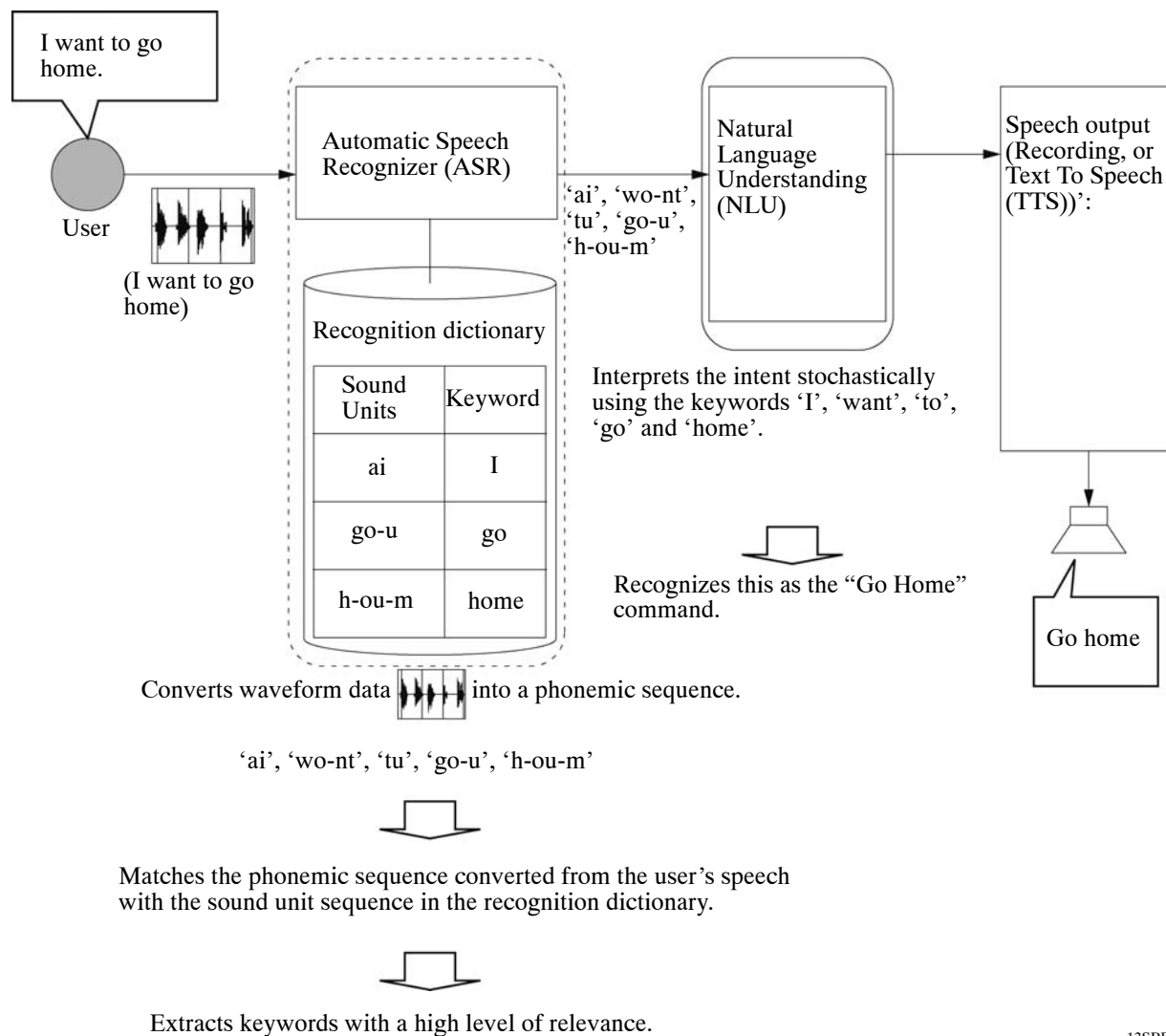
## MAIN FEATURES

### 1) Voice Recognition System

- When the voice recognition system starts operating, the commands that the system is able to recognize are displayed on the navigation display.
- The natural speech technology\* adopted for this voice recognition system can recognize a user's natural speech as voice recognition commands. ("natural speech" refers to naturally spoken utterances that include several keywords.)
- Natural speech technology enhances the voice recognition task achievement rate because the system does not have to memorize voice recognition commands exactly. This technology also shortens the time taken to accomplish speech recognition (task) because it does not require step-by-step input of speech recognition commands (interaction).
- Natural speech technology uses the system's Automatic Speech Recognizer (ASR) and Natural Language Understanding (NLU) to recognize voice recognition commands.
  - The ASR extracts keywords from a user's natural speech using a phonemic sequence (the units of sound that make up a phrase or sentence).
  - The NLU analyzes these extracted keywords based on their probable meaning, interpreting the intent of the user's utterances.

\*: Natural speech technology does not apply to French or Spanish.

Example of 'I want to go home':



- In order to interpret the intent of a user’s speech, the NLU unit records key words in a data table.
- The data table is organized by task, and the data is used to interpret the probable meaning of the user.
  - The data table for the Go Home task is shown below.
  - The key words [Destination: Home] are shown in the key word column. If both the word ‘Destination’ and the word ‘Home’ are included in the user’s speech related to the Go Home task, the system is able to recognize the intention. (‘Home’ can be recognized from either ‘Home’, ‘House’, or ‘Home base’.)

Task	Key words
Go home	destination (home)
	directions (home)
	take me (home)
	go (home)
	route (home)
	(home)

- The Go Home command can be recognized even if the user doesn’t actually say ‘Destination: Home’, or ‘Go Home’, and instead uses phrases like “My destination is home.” or “I want to go home.”, which contain extra words such as “I” and “to”.

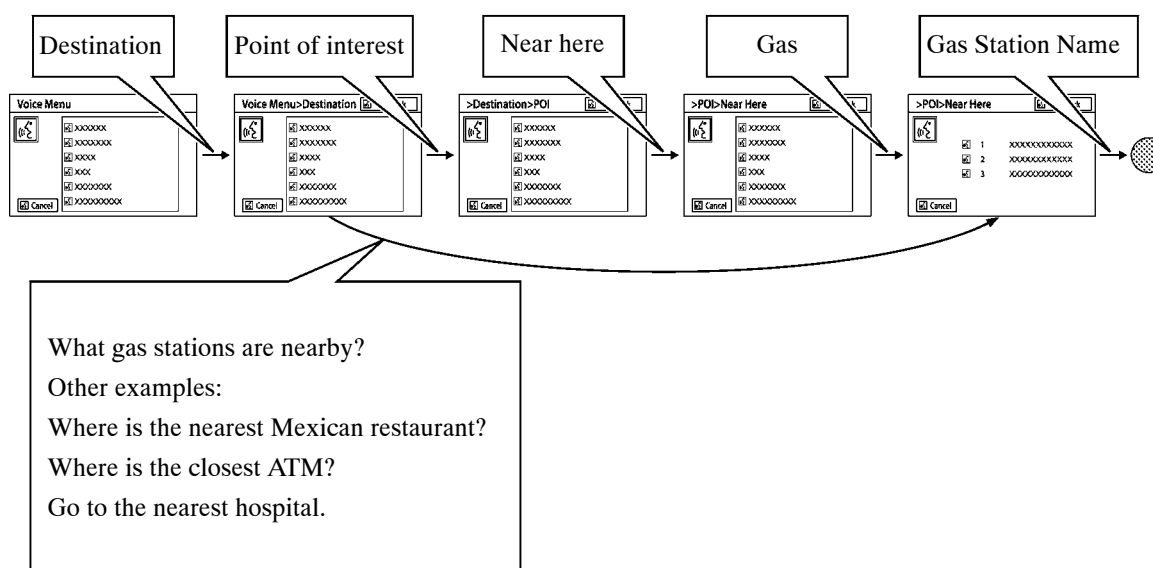
*Reference*

The natural speech technology used by the voice recognition system does not function in the following cases.

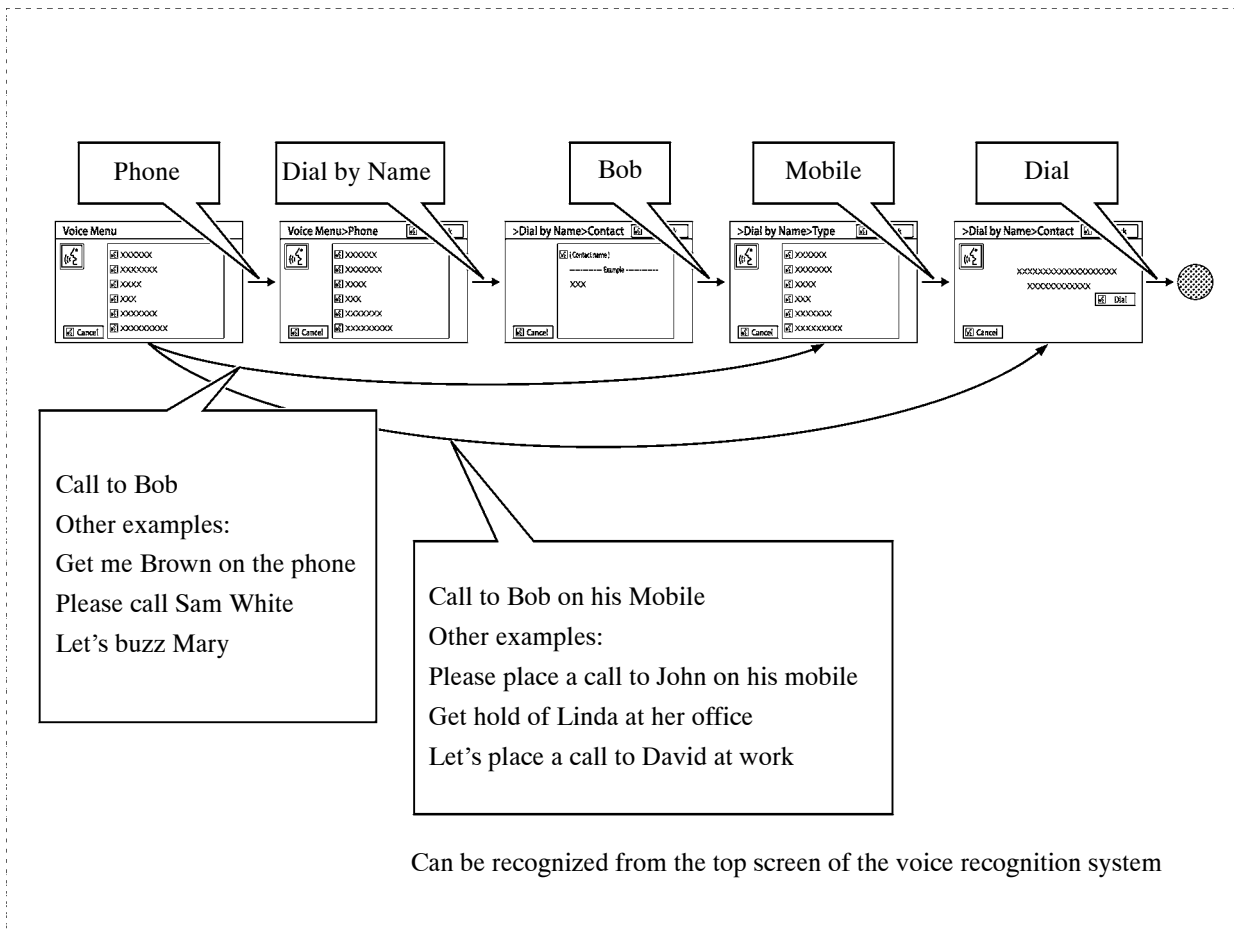
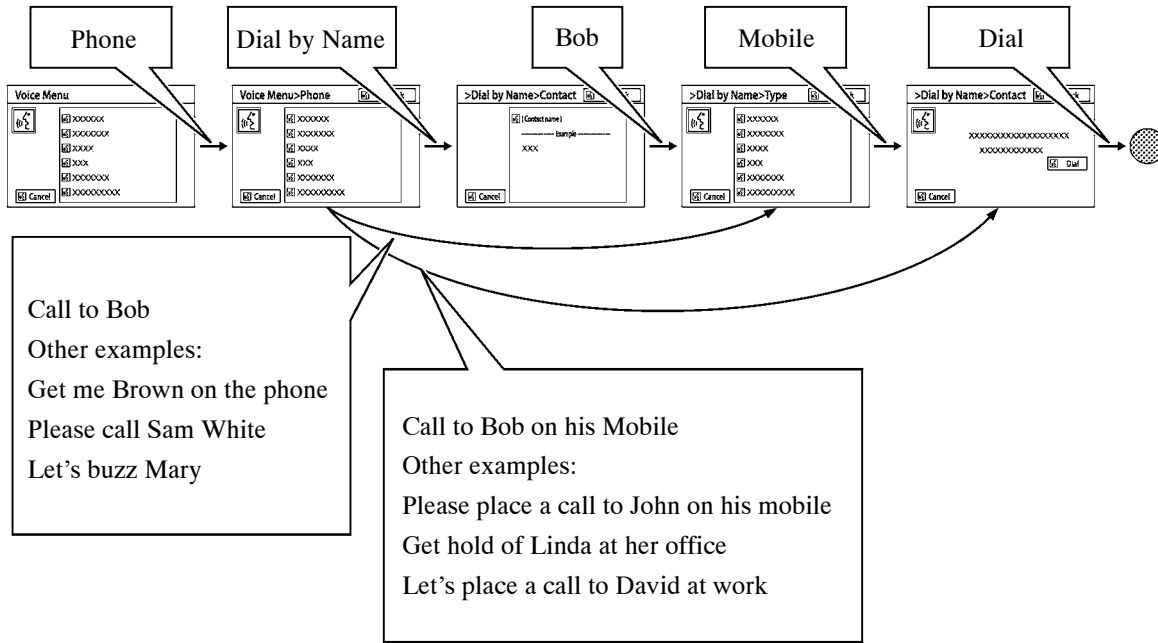
- When the key words used are not in the data table
- When inputting address elements such as the city name on the address input screen
- When a phrase includes several intentions (Ex. “Go home... actually, no... I want to call Bob.”)
- When spoken instructions are for a level that can not be recognized by the system. (Ex. When the user attempts to carry out a task from a different level while another task is still in progress, such as trying to make a phone call while the Destination screen is being displayed after giving the ‘Destination’ command.)

- Natural speech technology enables the user to carry out tasks using shortcuts after switching from the top screen of the speech recognition system to the top screen for “Destination”, “Phone”, “Audio”, or “Information”. Also, for “Phone” tasks only, it is possible to carry out tasks using shortcuts from the top screen of the speech recognition system.

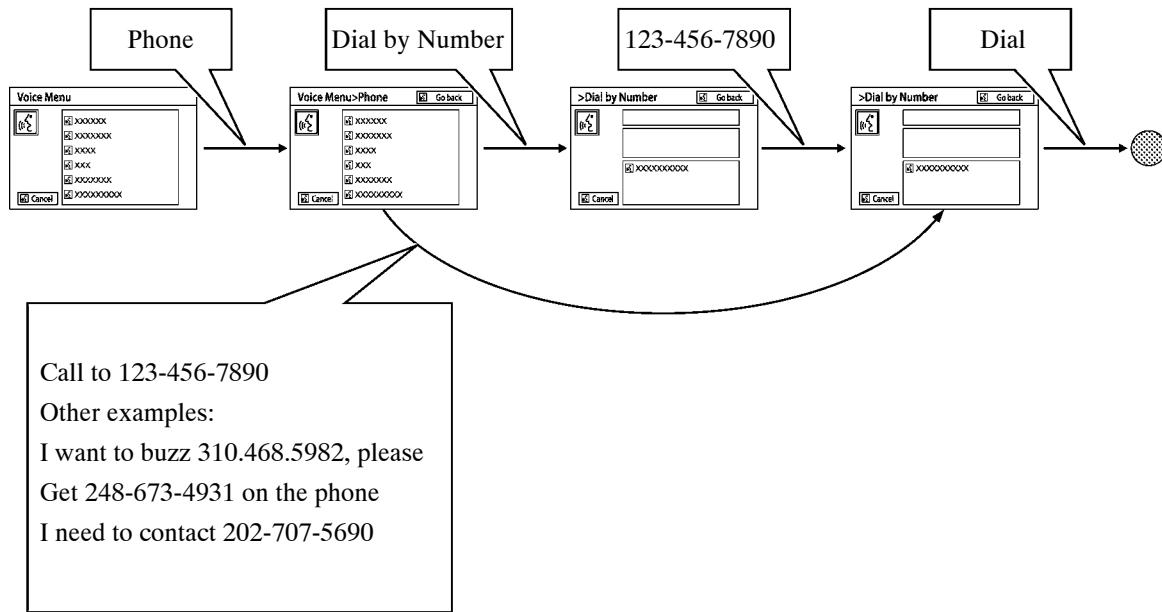
Examples of spoken phrases for the Destination screen:



Examples of spoken phrases for the Phone screen (1):

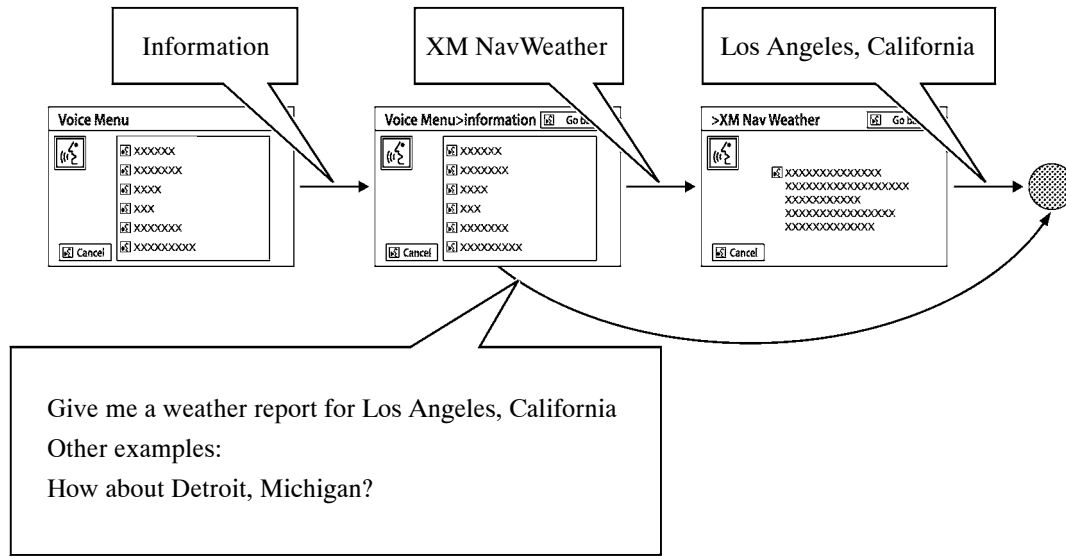


Examples of spoken phrases for the Phone screen (2):

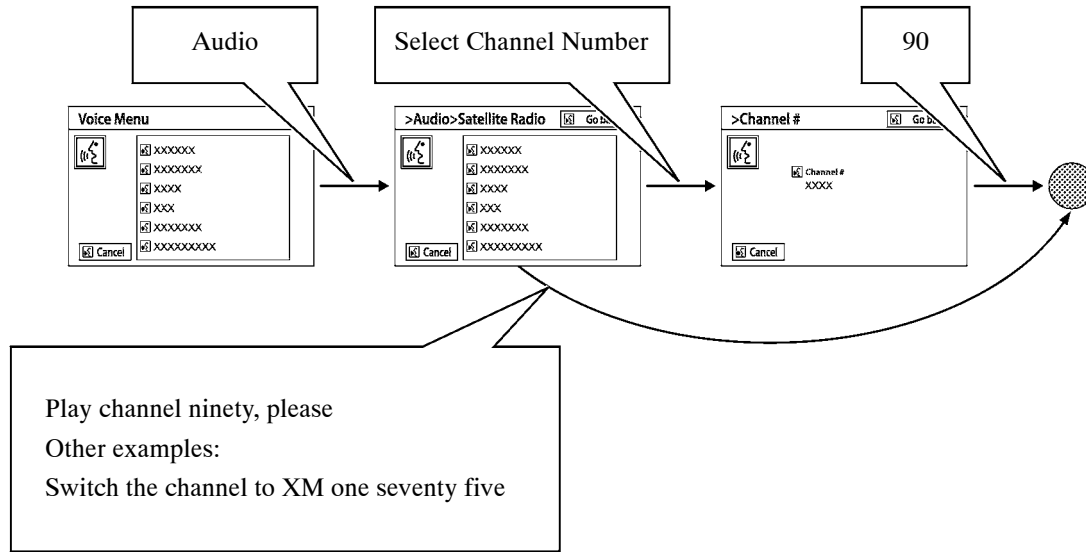




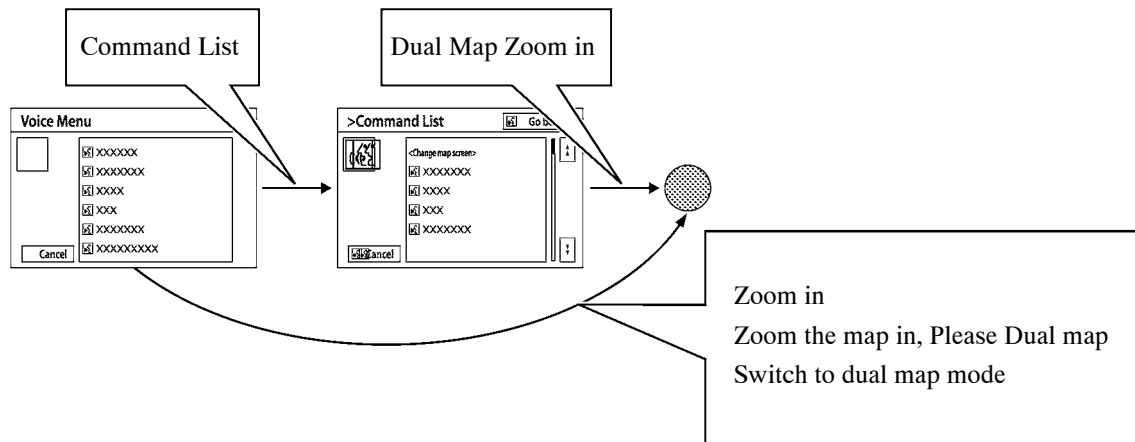
Examples of spoken phrases for the Information screen:



Examples of spoken phrases for the Audio screen (Audio mode is set to satellite radio):



Examples of spoken phrases for the top screen of the voice recognition system:



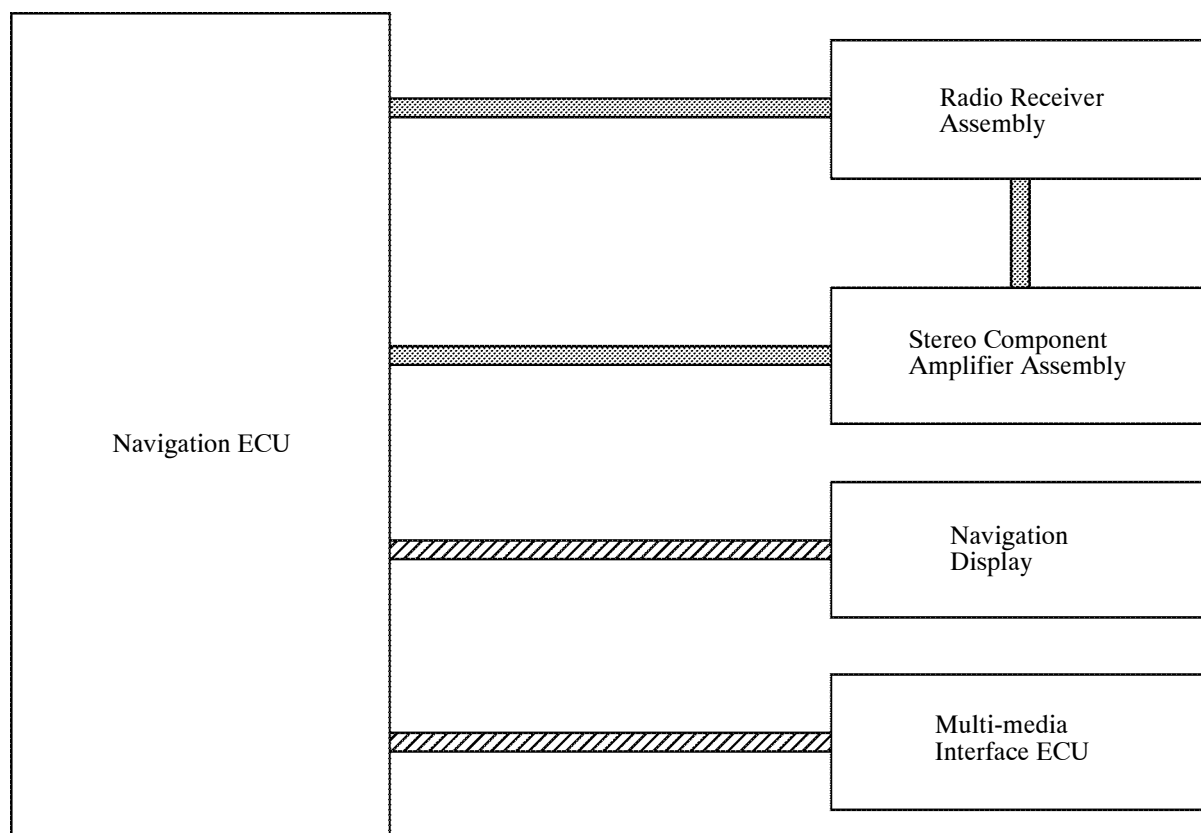
2) The main functions of the navigation display are listed below.

Function		Outline
Navigation System		Through the use of the Global Positioning System (GPS) and map data which is stored on a HDD, the navigation system analyzes the position of the vehicle and indicates the position on the map that is displayed on the screen. In addition, it is possible to use the system to register memory points and navigate to a destination.
Audio/Video System		Serves as the display and controls for the following: <ul style="list-style-type: none"> <li>• Radio operation</li> <li>• XM satellite radio operation</li> <li>• DVD changer operation</li> <li>• Bluetooth-compatible portable player operation</li> <li>• Portable audio player operation (USB type)</li> <li>• iPod operation</li> </ul>
Hands-free System		When a Bluetooth-compatible cellular phone is registered to the navigation display, the driver can make and receive calls or talk hands-free on the cellular phone by operating the switches on the screen/steering pad.
Speech Command System		Operates the navigation systems based on voice commands.
Others	Maintenance Information	The maintenance information function can be used to inform the driver of the inspection or replacement timing for the following items based on the calendar function and distance driven. <ul style="list-style-type: none"> <li>• Engine oil: Replace engine oil</li> <li>• Oil filter: Replace engine oil filter</li> <li>• Rotation: Rotate tires</li> <li>• Tires: Replace tires</li> <li>• Battery: Replace battery</li> <li>• Brake pad: Replace brake pads</li> <li>• Wipers: Replace wiper blades</li> <li>• Coolant: Replace engine coolant</li> <li>• Brake oil: Replace brake fluid</li> <li>• Trans. fluid: Replace ATF</li> <li>• Service: Scheduled maintenance</li> <li>• Air filter: Replace air filter</li> <li>• Personal: New information items can be created separately from the provided items</li> </ul>
	Calendar	The calendar screen is displayed using time information from the GPS.
	Language Select	The language of the screen buttons, pop-up messages and voice guidance can be changed. English, French and Spanish are available.
	Screen Setting	This enables automatic return to the navigation screen from the audio screen.
	Keyboard Layout	The keyboard layout can be changed.


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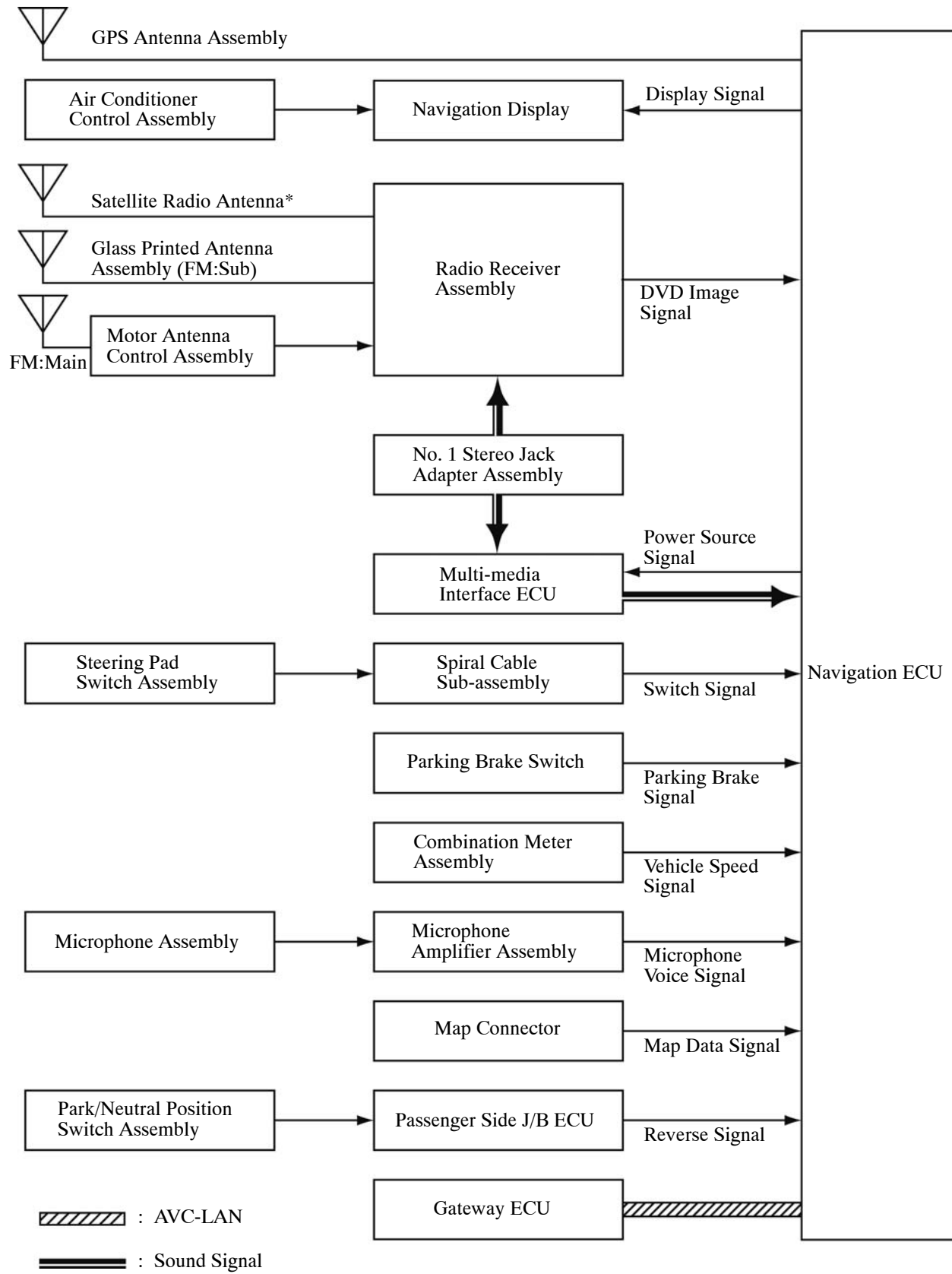
Function		Outline
Others	Delete Personal Data	<p>The following personal data can be deleted or returned to their default settings:</p> <ul style="list-style-type: none"> <li>• Maintenance conditions</li> <li>• Maintenance information “off” setting</li> <li>• Address book (Memory point)</li> <li>• Areas to avoid</li> <li>• Previous points</li> <li>• Route trace</li> <li>• Phonebook data</li> <li>• Dialed numbers and received calls</li> <li>• Speed dial</li> <li>• Bluetooth phone data</li> <li>• Voice tag data</li> <li>• Volume setting</li> <li>• Details setting</li> </ul>
	Screen Adjustment	<p>The brightness or contrast of the screen can be adjusted to suit the brightness of the surroundings.</p>
Diagnosis		<p>This menu contains the following items:</p> <ul style="list-style-type: none"> <li>• Failure Diagnosis <ul style="list-style-type: none"> <li>- System Check</li> <li>- HDD Check</li> <li>- MM Diagnosis Recorder</li> </ul> </li> <li>• Function Check/Setting <ul style="list-style-type: none"> <li>- Panel &amp; Steering Switch</li> <li>- Touch Switch</li> <li>- Mic &amp; Voice Recognition</li> <li>- Color Bar</li> <li>- GPS &amp; Vehicle Sensors</li> <li>- Vehicle Signal</li> <li>- Hands-free Volume Settings</li> </ul> </li> <li>• Program Update</li> </ul>

2. System Diagram



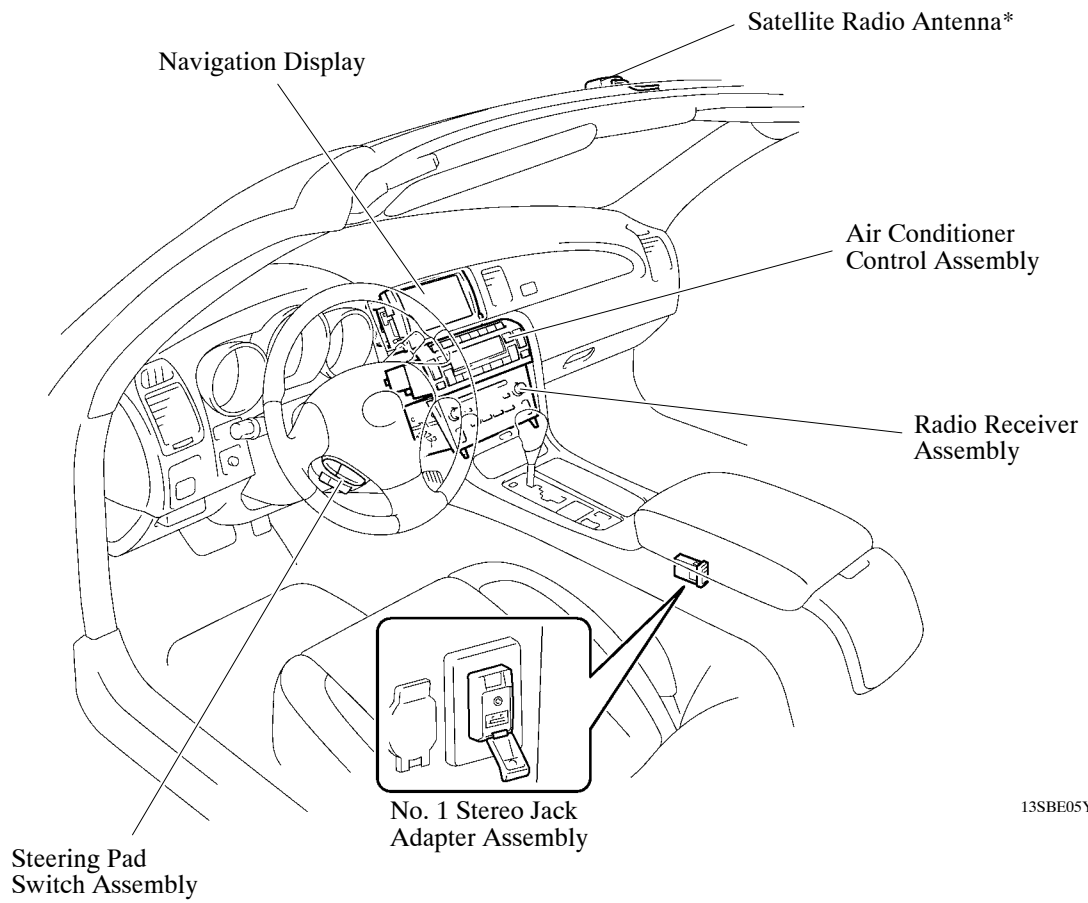
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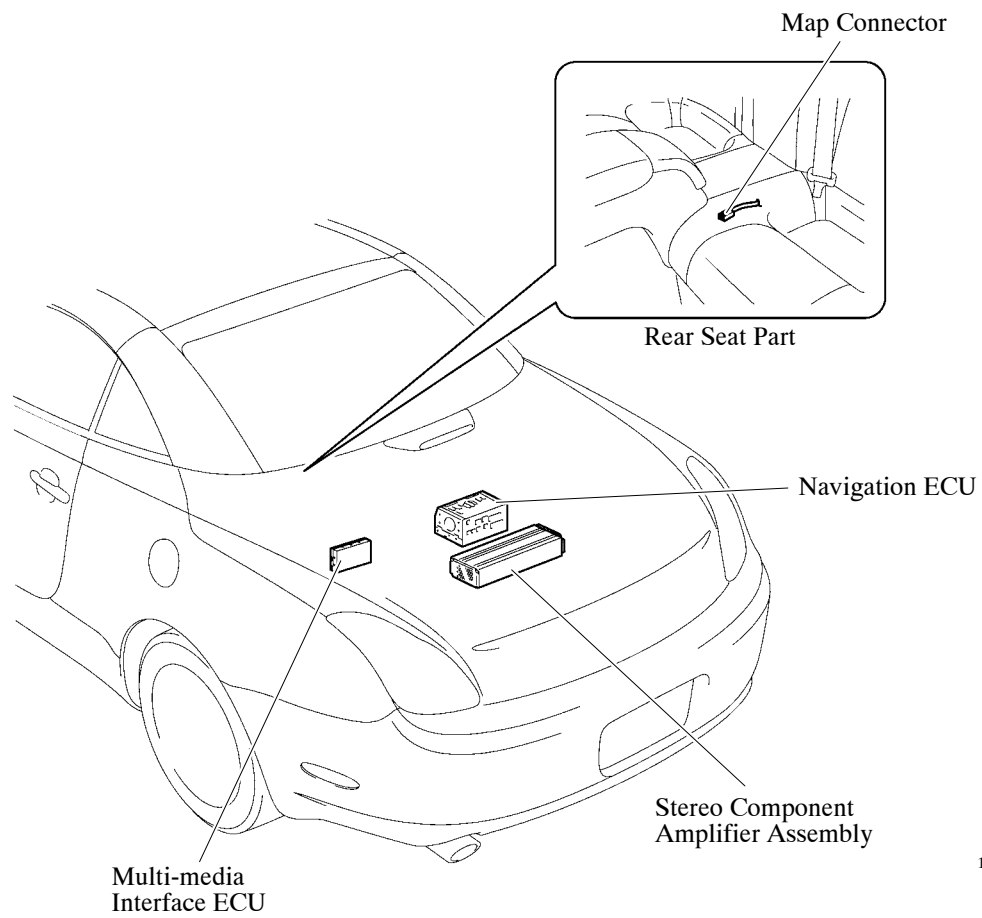


\*: Models with Satellite Radio System

### 3. Layout of Components



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\*: Models with Satellite Radio System

## 4. Details

### FUNCTION

#### 1) Navigation Screen

- The navigation ECU calculates the present position, direction of travel, and distance the vehicle has been driven based on the following information sources. This information is displayed on the navigation display.
  - Map data in the HDD
  - Global Positioning System (GPS) Satellites
  - Built-in Gyro Sensor
  - Vehicle Speed Signal
  - XM NavTraffic Signal
  - XM NavWeather Signal\* (Models for the U.S.A.)

\*: NavWeather service available in the continental U.S.A.

- The functions of the navigation screen display are listed below.

	Item	Function
Map Display	Linear Touch Scroll	Enables smooth scrolling by connecting the touch points on the screen.
	Map Color Change	Depending on the position of the light control switch, the screen changes to day mode or night mode.
	Taillight-interlocked Map Color Change	Changes the color of the map screen that is displayed when the taillights are turned on.
	North Up/Heading Up	<ul style="list-style-type: none"> <li>• If North Up is selected, regardless of the direction of vehicle travel, north is always up.</li> <li>• If Heading Up is selected, the direction of vehicle travel is always up.</li> </ul>
	Multi-step Scale Display	Changes the map scale in 14 steps.
	Direct Scale Change	Directly selects and displays the map scale.
	Street Name Indication on Scrolled Map	Displays the street name and city name even when the map screen is being scrolled.
	Stepless Scale Display	Changes the scale of the map from the basic 14 steps to an even finer range of scales.
	Footprint Map	Displays a map on a scale of 25 m (75 ft.). (for specific areas in the following cities: Detroit, Chicago, New York, and Los Angeles.)
	Building Tenant Information (for Footprint Map Areas)	Displays information on the tenants in a building.
	Road Number Sign Board Display	Displays the road number on the map.
	Point of Interest Display	Displays selected types of points of interest as marks on the map.
	Split-view Display	Displays different modes on a screen that is split into two views.
	Compass Mode Screen	Displays the direction of travel and detailed data of the present location.
	On-route Scroll (Route Preview)	Scrolls the center of the cursor forward and backward constantly along the route.
	Route Trace	It is possible to store up to the last 200 km (124 miles) of a travelled route and retrace the route on the display.
XM NavTraffic Display	Displays the XM NavTraffic icon, arrow and indicator when the XM NavTraffic service is being received.	
XM NavWeather Display*	Displays weather information icons when XM NavWeather service information is being received.	

\*: NavWeather service available in the continental U.S.A.

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	Function	Outline
Destination Search	Preset Destination Memory Search	Sets a pre-registered point as a destination point while driving.
	Address Search	A destination can be set in 2 ways: <ul style="list-style-type: none"> <li>• Information can be input in the order of: city name, street address and house number.</li> <li>• Information can be input in the order of: house number, street address and city name.</li> </ul>
	Point of Interest Search (Name/Category/Phone No.)	A destination can be set in 3 ways: <ul style="list-style-type: none"> <li>• The name of a point of interest can be entered and then searched for from City or Category.</li> <li>• A Point of Interest category can be selected and a point of interest searched for near the present location, along the current route, near the city center or near the destination.</li> <li>• The phone number of a point of interest can be entered to search for it.</li> </ul>
	Previous Destination Search	Stores the coordinates, names, and date of up to 100 locations that have been set as destinations in the past.
	Address Book (Memory Point) Search	Sets a destination from the registered Address Book (Memory Point).
	Emergency Search	Performs a specific search for police stations, hospitals, dealers, and fire stations.
	Intersection Search	By specifying 2 streets, the point at which they intersect is set as the destination point.
	Freeway Entrance or Exit Search	Searches for the destination by the name of the street that connects to a freeway entrance or exit.
	Map Search	A destination can be set by scrolling the cursor on the map.
	Coordinate Search	A destination can be input by entering its coordinates.
Route Search	Voice-recognition Search	A destination can be set up by voice command input.
	Multiple Destination Setting	Sets multiple destinations. It can also rearrange the sequence of the destinations.
	Multiple Route Search	Searches for multiple routes.
	Search Condition Designation	Searches for the recommended, alternative, and shortest routes.
	Detour Search	Changes the route to detour around a section of the route.
	Regulated Road Consideration	Performs searches which consider regulated roads.
	Avoidance Area	Searches for a route that avoids a designated area.
	Adjacent Road Search	Searches for a route adjacent to the current road.
	Auto Avoid Traffic Search	Automatically changes to another route to avoid heavy congestion or inclement weather.
National Border Conscious Search	Searches for routes that do not cross the border between the U.S.A. and Canada.	

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Function		Outline
Guidance	Voice Guidance	Provides voice guidance about the distance and the direction of travel to a destination point based on road conditions and vehicle speed.
	Rotary Guidance	Provides guidance with a special voice phrase in a rotary (traffic circle).
	Next Turn Guidance	Provides guidance about the distance to the next turn and indicates the direction of the turn using an arrow.
	Freeway (Highway) Mode Display	Displays the distance to the next junction and exit, or POIs in the vicinity of the freeway exit.
	Freeway (Highway) Direction of Travel Display	Displays the direction of travel to take on the freeway.
	Freeway Shield Icon Display	Freeway shield icons are displayed on the 3D guidance screen.
	Intersection Zoom-in Display	Zooms in the image when approaching an intersection.
	Turn List Display	Displays a turn list on the right side of the 2-screen display.
	Arrow Display	Displays the direction of the next turn and the distance to the turn on the right side of the 2-screen display.
	Distance Display Destination	Displays the distance from the present location to the destination.
	Estimated Arrival Time Display	Displays the estimated arrival time.
	Off-route Arrow Display	Displays the route ahead on the route guidance line in case of being off the route during the guidance.
Others	Voice Recognition	Recognizes pre-programmed system commands spoken to operate the navigation system.
	Help	Explains what operation can be performed when a “?” on the display is touched.

## 2) Information/Phone Screen

- The functions of the Information/Phone screen display are listed below.

Item		Function
Hands-free phone	Enter a Bluetooth Phone	A maximum of 4 Bluetooth-compatible cellular phones can be registered. In addition, connection with automatically registered Bluetooth-compatible cellular phone is available.
	Call and Receive on the Bluetooth Phone	The following 6 methods are available to make a call: <ul style="list-style-type: none"> <li>• By Dial</li> <li>• By Phonebook</li> <li>• By Speed Dial</li> <li>• By Call History</li> <li>• By Voice Recognition</li> <li>• By Point of Interest Search (POI) Call</li> </ul> When a call is received, the incoming call screen will be displayed. The following operations are available: <ul style="list-style-type: none"> <li>• Talk on the phone</li> <li>• Adjust the volume</li> <li>• Hang up the phone</li> <li>• Mute voice</li> <li>• Transfer the call</li> </ul>
Calendar	Calendar	The current date is highlighted in yellow.
Map	Map Coverage Information Display	Displays the map area that is recorded in the HDD.

## 3) Setup Screen

- The settings for the functions of the navigation display are available from the setup screen.

Item		Function
Setup	General Setting	<ul style="list-style-type: none"> <li>• The language can be selected.</li> <li>• Voice recognition language can be selected.</li> <li>• Automatic screen change from audio to map after audio controls are operated can be selected.</li> <li>• The keyboard layout can be changed.</li> <li>• The distance unit can be changed.</li> <li>• Registered information (personal data) can be cleared.</li> </ul>
	Clock Setting	<ul style="list-style-type: none"> <li>• The time zone can be set.</li> <li>• Used for changing time zones and the on/off settings of daylight saving time.</li> </ul>
	Voice Setting	<ul style="list-style-type: none"> <li>• The voice guidance volume can be adjusted or switched off.</li> <li>• Voice guidance during route guidance can be set.</li> <li>• Voice guidance while using the audio system can be set.</li> <li>• Voice recognition talkback can be set.</li> <li>• The speech command system can be operated without pressing the talk switch more than once.</li> <li>• The voice guidance of the traffic information function can be set.</li> <li>• The voice guidance sound image location can be set.</li> <li>• The voice guidance of the XM NavWeather function can be set.</li> </ul>

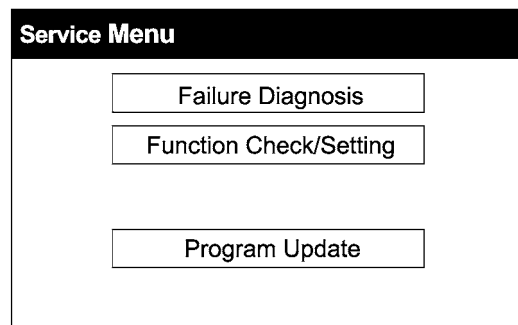
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Item	Function
Setup	<p>The Navigation Settings can be used to:</p> <ul style="list-style-type: none"> <li>• Set up Home.</li> <li>• Set up Preset Destinations.</li> <li>• Set up the Address book.</li> <li>• Set up Areas to Avoid.</li> <li>• Delete previous destinations.</li> <li>• Set detailed navigation settings such as:                             <ul style="list-style-type: none"> <li>- Average cruising speed</li> <li>- An automatic input function</li> <li>- Voice guidance for the next street name</li> <li>- Display of traffic restrictions and seasonally restricted roads</li> <li>- Traffic flow on a freeway, shown with an arrow</li> <li>- Displayed POI icon categories</li> <li>- Buttons displayed on the map screen when “OFF” is selected</li> <li>- Manual adjustment of the current vehicle position mark</li> <li>- Display of pop-up messages</li> </ul> </li> </ul>
	<ul style="list-style-type: none"> <li>• Voice and ring volume adjustment</li> <li>• Initial registration and settings for a Bluetooth phone</li> <li>• Setting the phonebook</li> <li>• Information in a registered Bluetooth phone can be displayed and the settings can be changed.</li> <li>• Detailed phone settings can be set.</li> </ul>
	<ul style="list-style-type: none"> <li>• Sound quality can be adjusted.</li> <li>• A Bluetooth audio device can be registered.</li> <li>• A registered Bluetooth compatible portable audio player can be selected.</li> </ul>
	<ul style="list-style-type: none"> <li>• Settings can be changed for the following maintenance items:                             <ul style="list-style-type: none"> <li>- Engine oil</li> <li>- Oil filter</li> <li>- Rotation</li> <li>- Tires</li> <li>- Battery</li> <li>- Brake pad</li> <li>- Wipers</li> <li>- Coolant</li> <li>- Brake oil</li> <li>- Trans. fluid</li> <li>- Service</li> <li>- Air filter</li> <li>- Personal</li> </ul> </li> </ul>

## CONSTRUCTION

### 1) Diagnosis

- The Diagnosis Menu has been changed to the Service Menu. The Service Menu contains the three items below.
- For details on the procedure required to enter the Service Menu screen, see the 2010 LEXUS SC430 Repair Manual (Pub. No. RM13S0U).



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Mode	Details
Failure Diagnosis	Shows a screen for checking a specific portion of the System Check, HDD Check and MM Diagnosis Recorder.
Function Check/Setting	Displays the diagnosis results for the switches and sensors, etc.
Program Update	Updates the HDD map date.