

2002-08 ACCESSORIES & EQUIPMENT

Audio & Navigation System - Overview - MINI

COMMUNICATIONS

Model: All

Production: All

AUDIO SYSTEMS

Information and communication systems are playing an ever increasing role in the world today. People now expect these systems to be available within the automotive environment. The MINI is available with a range of facilities to fill these demands.

Purpose of the System

Audio systems that have been designed to integrate with the vehicle aesthetics and the sound tuned to the vehicle environment. They provide not only musical entertainment but traffic announcements and news information as well.

The MINI is offered with a range of audio systems from the standard stereo to a HI-FI system with a Digital Sound Processing (DSP) amplifier and Harman Kardon speakers.

MINI is standard with the CD53 Business single disc CD player. A 6 disc CD changer is optional and dealer installed.

System Components

The Standard Audio System consists of:

- CD53 Business CD Headset
- 6 Speaker System



Standard CD53 Business CD 44-08-79

Standard Audio System

Maximum power 4 x 15 watts

- 160 mm woofer, Goodmans (front doors)
- 25 mm tweeter, Goodmans (front doors)
- 160 x 220 mm woofer, Goodmans (rear side panels)

Fig. 1: Standard CD53 Business CD
Courtesy of BMW OF NORTH AMERICA, INC.

The Top Hi-Fi DSP Audio system consists of :

- CD53 Business CD Headset
- Harmon Kardon DSP Amplifier



Fig. 2: Harmon Kardon DSP Amplifier
Courtesy of BMW OF NORTH AMERICA, INC.

- 8 Speaker Harmon Kardon System

Optional 6 disc CD changer available with either System

CD53 Business CD Headset

The CD53 Business CD Headset has been designed to blend in with the vehicle interior and provide easy to read information via the display along with controls that are easy to reach and use. The radios support the following features:

- Connection to an aerial diversity system
- Speed dependent volume control (GAL)
- Diagnosis capability via DISplus
- Keyless operation for 20 minutes
- Control via multi-function steering wheel (if equipped)
- Automatic muting during a telephone call (if equipped)

Radio Functions

The radios are switched on or off by pressing the volume button on the radio. On all business spec sets the radio is operational in ignition position 1 and 2 and functions for 20 minutes after the key has been turned to position 0 or removed.

Automatic Tuning

When one of the seek tuning buttons, < or > is pressed, automatic tuning commences in the direction of the arrow on the button pressed. If no station has been found after the entire frequency band has been run through twice, the tuner stops the seek function and returns to the last set frequency. The seek function can be cancelled

by pressing the frequency band button, preset buttons, tone or - - button; this will then activate the function of the particular button pressed.

Manual Tuning

When the "m" button is pressed, manual control of the frequency search is obtained. Stepping up or down through the frequency range is performed by pressing the appropriate < or > which will adjust the frequency in a pre-determined step. Keeping the button depressed will allow the waveband to be scanned rapidly, releasing the button will then revert the operation back to the pre-determined step mode. After approx. 8 seconds the tuner will switch back to automatic tuning mode if neither of the seek tuning buttons is pressed. Manual tuning is available in all wavebands.

Scan

When the "m" button is pressed for approx 1.5 seconds the Scan facility is activated. The tuner will scan the respective waveband for all available stations and play each station for approx 7 seconds. When the tuner is set to the FM waveband and the RDS function is on, only RDS stations will be tuned in. To cancel the scan operation press the "m" button and this will revert the tuner to the last tuned station.

Tone

The tone button enables the following scroll sequence to be activated: Bass-Treble-Fader Balance-DSP functions (if equipped). Adjustment of each option is via the volume control knob. To revert the tone settings to the original mid point settings the tone button should be held for approximately 2 seconds. The setting may then be reset or the tone functions are exited via the - - button.

When the DSP amplifier is installed the final options in the tone sequence are the DSP Effects and Driver setting. Selections are made using the - - button and volume control knob. After the TONE LIN option is accessed, a further press of the Tone button will access the following scroll menu:

- Speed volume (GAL)
- TP Min - Sets Traffic announcement sound level
- PTY - Program Type Data. Can be set to Auto or Off
- RESET - Resets this menu to the original settings

Adjustment of each option is via the volume control knob or - - button.

RDS

RDS is a transmit and receive system that operates in the FM waveband. The data service provides information that is broadcast inaudibly alongside the audio signal. The station name will be displayed when the RDS system is active and tuned to a broadcasting station.

If the reception quality of the tuned station deteriorates and no alternative frequency is available the tuner will start to search. If the tuner cannot find a transmitter for the same program that offers adequate reception quality, the tuner will revert to the last frequency received.

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The RDS on/off mode can be user selected. To select the RDS function the left button marked - - should be depressed. The main display will show 'RDS ON' for 3 seconds. To cancel the RDS function the same button should be depressed again. The main display will show 'RDS OFF' for 3 seconds.

Mode

The Mode button allows the user to switch between the different listening modes, ie: Tuner, Tape, CD, or CDC. Each change is accompanied by a short mute pause during which the mode selection will change on the display. When switching between modes the settings previously set are retained for each individual mode.

Speaker Systems

Standard Stereo Speaker System

The standard Stereo Speaker System consists of 6 loudspeakers.



Tweeters Mounted in Door 44-08-80

2 *Tweeters* (25mm) mounted in the door adjacent to the interior door release handle.

Fig. 3: Tweeters Mounted In Door
Courtesy of BMW OF NORTH AMERICA, INC.



Woofers Mounted in Front Doors 44-08-81

2 *Front Woofers* (160mm) mounted in the lower front door panel.

Fig. 4: Woofers Mounted In Front Doors

Courtesy of **BMW OF NORTH AMERICA, INC.**



Woofers Mounted in Rear Quarter Panels 44-08-81

2 Rear Woofers (160 x 220) Mounted in the rear quarter panel trim.

Fig. 5: Woofers Mounted In Front Doors

Courtesy of **BMW OF NORTH AMERICA, INC.**

Standard Speaker Specifications

All 6 of the Standard Speakers are rated at 4 Ohms of Impedance and for a maximum power of 30 watts

The Tweeters are connected in parallel with the front woofers. The wires of the loudspeaker wiring harness are twisted and the harness is integrated into the main wiring harness.

Harmon Kardon 8 Speaker System

The optional Harmon Kardon 8 Speaker System consists of the following:

- CD53 Business CD (or Cassette) Headset (Same as in Standard System)
- DSP Active Amplifier
- 8 Harmon Kardon speakers (10 discrete channels)

DSP (Digital Sound Processing Amplifier)

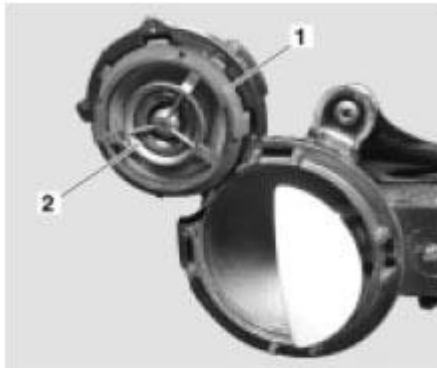
The DSP function allows five unique processed sound types to be selected along with the standard setting. The five types are:

- Electronic
- Spatial

- Festival
- Instrumental
- MINI Harmon Kardon

The DSP function also allows for an on/off switching of the speaker time alignment facility (Driver function). This function enhances the stereo image of the sound by allowing for the fact that as the driver does not sit centrally in the car one speaker is closer to the listener than the other, hence the sound reaches the listener at different times; time alignment enables the sound to reach the listener at the same time thereby improving the stereo image. The Driver function is not available for the Spatial or Festival settings.

All DSP user functions are controlled from the radio headset using the Tone key and volume control knob. The DSP amplifier is located in the right of the luggage compartment behind the rear light.



44-08-91

DSP Tweeter/Mid Bass

Located in Front door Adjacent to interior door handle

1. Mid-Bass
2. Tweeter

Fig. 6: DSP Tweeter/Mid Bass

Courtesy of BMW OF NORTH AMERICA, INC.

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44-08-92

DSP Front Woofer

Located in Lower Front door.

Fig. 7: DSP Front Woofer

Courtesy of BMW OF NORTH AMERICA, INC.



44-08-93

DSP Rear Subwoofer/ Woofer

Located in the Rear
Quarter Panel.

Fig. 8: DSP Rear Subwoofer/Woofer

Courtesy of BMW OF NORTH AMERICA, INC.

MFL

All radio headsets are compatible with the Multi-Function Steering Wheel. There are two sets of switches fitted on the back of the steering wheel, one on the left side and one on the right side. The right switch controls the volume up/down and the MODE function while the left switch enables the up/down selection of the preset stations on the chosen waveband. If the manual button is activated the left switch will manually up/down search the chosen frequency band and by pressing the switch > 4 seconds the frequency band will be fast searched.

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MFL Rear View

44-08-94

1. Volume up/down Switch
2. Mode Button
3. Frequency up/down Switch

Fig. 9: Identifying MFL Rear View

Courtesy of BMW OF NORTH AMERICA, INC.

CD Changer (CDC)

The CD changer (CDC) is fitted into the right side of the luggage compartment. The CDC works in conjunction with all the MINI radio headsets. The CD magazine holds 6 discs and locates in an opening in the front of the unit. A sliding cover is closed off the magazine aperture and prevents dirt and dust ingress into the mechanism. A button located by the magazine is used to eject the magazine from the unit. Data is transferred and the CDC is controlled via the K-bus.



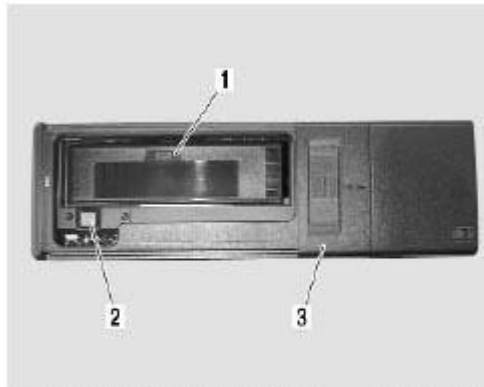
CD Changer

44-08-96

1. CD Changer
2. Mounting Bracket

Fig. 10: CD Changer

Courtesy of BMW OF NORTH AMERICA, INC.



CD Changer with Magazine 44-08-95
1. CD Magazine
2. CD Magazine Eject Button
3. Sliding cover

Fig. 11: Identifying CD Changer With Magazine
Courtesy of BMW OF NORTH AMERICA, INC.

K-bus Interface

The headset is connected to the systems by means of the K-bus. The following functions are controlled through communication via the K-bus:

- Anti-theft system
- Control via multi function steering wheel
- Changing of CD's by the CDC
- Diagnosis by means of DISplus
- DSP operation, illumination

Security

The radio headsets are no longer protected by a manually entered security code system. If a valid K-bus message isn't received, the radio will remain inoperative ('Disabled' status). Normal radio operation will commence once the radio has received a valid K-bus message. Each time the radio power supply is disconnected and reconnected a K-bus message is sent to the radio and if OK, the radio operation recommences. This security function also applies to the CD Autochanger when equipped.

Diagnosis

All units have diagnostic capability using DISplus.

Service Mode

All MINI radios have an on board service mode. This enhanced mode can be used to interrogate the unit settings and also diagnose the reception quality and audio acoustics.

Activating the service mode

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The service mode can be activated within the first 8 seconds after switching on the radio unit. This is achieved by pressing and holding the "m" button (after 1.5 seconds, the SCAN mode is activated, the m button should not be released until the service test mode is entered. SN * * * * * will be shown). The radio will then automatically switch to service test mode. Switching off the radio deactivates the service mode.

Service mode functions

When the service mode is activated the radio unit automatically switches to radio mode (FM1/RDS on). Only manual tuning is available in the service mode. The range of functions in Service mode is selected by using the - - button:

SERVICE MODE FUNCTIONS

- | | |
|-----------------|---|
| • SN | Serial Number |
| • SV - MM | Software Version |
| • RS - OO | Revision Level |
| • GAL | Selection of GAL Curve |
| • Tuner 1 | Setting and Data for the Listening Receiver |
| • DSP0 V00 | DSP Setting |
| • TP-V | TP Volume Setting (Traffic Report) |
| • Blank Display | Pixel Display Check |
| • Region Set | Country Program |
| • AF Auto | AF Setting |

Description of service mode functions

DESCRIPTION OF SERVICE MODE FUNCTIONS

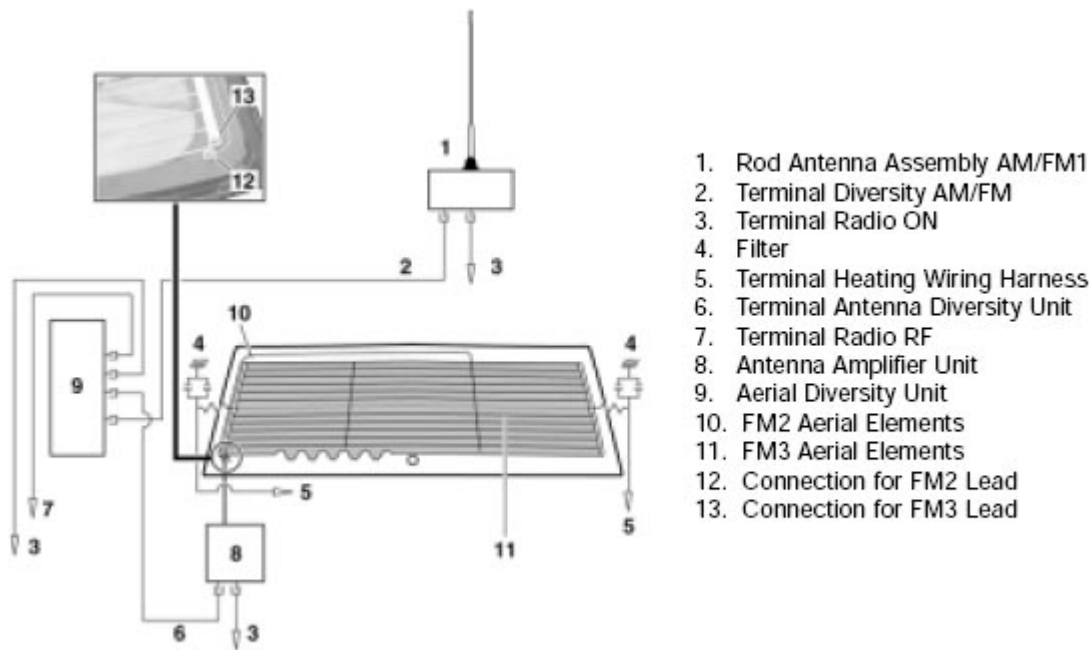
SN	The serial number of the unit is displayed, this cannot be altered.
SV MM	This displays the software version installed in the unit. In addition to the calendar week and year, the information also contains a version number.
RS 0.0	This displays the radio unit revision level.
GAL	Displays the current GAL curve setting. Pressing the preset buttons 1 to 6 can set a new GAL curve.
Tuner 1	Displays the frequency set (FM waveband), the signal strength and the quality of the signal received. In AM mode, the frequency set and signal strength are indicated.
SP0 V00	Indicates if DSP is fitted and in communication with the headset. DSP 0 will be shown if DSP is not fitted and DSP 1 will be shown if DSP is fitted. V is for the volume level, 00 is minimum. The volume control knob changes volume.
TP-V	The minimum TP volume can be adjusted within a range from -9 to +9. Preset station button 1 (- direction) will reduce the level by one step. Preset station button 2 (+ direction) will increase the level by one step. The volume can be made louder or quieter by repeatedly pressing the buttons until the desired level is found.
Blank Display	The blank display is the test mode for the display pixels. Pressing the preset button 1 to 4 will change the type of display: All pixels ON, all pixels OFF, chessboard 1 and chessboard 2.

Area	This function is only on business radio headsets. This function enables the unit to be market
Setting	programed to the correct region. Options are: Europe, USA, Japan, Oceanic and Canada.
AF Auto	The Alternative Frequencies (AF) can be switched between auto setting and off.

AERIAL SYSTEMS

The MINI includes an antenna diversity system which uses the heated rear window (FM2/3) in addition to the rod aerial.

Rod Aerial with Diversity



44-08-97

Fig. 12: Identifying Antenna Diversity System Components
 Courtesy of BMW OF NORTH AMERICA, INC.

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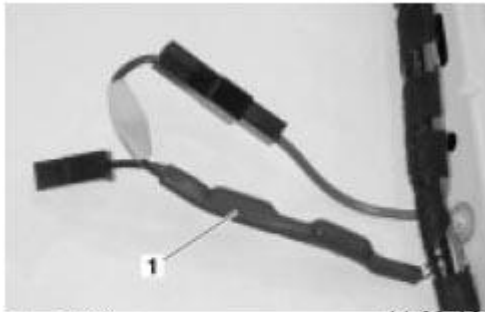
Rod Aerial 44-08-99

Located on the roof just ahead of tail-gate opening

1. Detachable Rod Aerial
2. Base Unit

Fig. 13: Rod Aerial

Courtesy of BMW OF NORTH AMERICA, INC.



Aerial Filter 44-08-100

Located in the wiring Harness close to the HRW Element connections.

1. Aerial Filter

Fig. 14: Aerial Filter

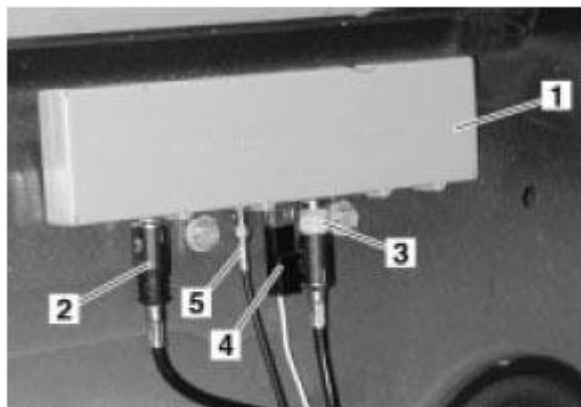
Courtesy of BMW OF NORTH AMERICA, INC.



1. Aerial Amplifier Unit
2. Connectors to Heated Rear Window element
3. Co-axial Lead to Aerial Diversity Unit
4. Radio ON lead

Aerial Amplifier Unit 44-08-102
Located in the Tailgate on the left side

Fig. 15: Identifying Aerial Amplifier Unit
Courtesy of BMW OF NORTH AMERICA, INC.



1. Aerial Diversity Unit
2. RF Lead from Rod Aerial Assembly
3. RF Lead to Radio Headset
4. Radio ON lead
5. RF Lead from Aerial Amplifier Unit

Aerial Diversity Unit 44-08-101
Located on the right rear quarter panel behind the trim.

Fig. 16: Identifying Aerial Diversity Unit
Courtesy of BMW OF NORTH AMERICA, INC.

The Aerial Diversity Unit has coaxial inputs from the roof aerial and the rear screen aerial amplifier unit. The unit also has the output coaxial to the radio headset and a radio on wire. The switching action of the diversity unit is configured to ensure that no noise is heard through the radio (diversity crackle). The unit constantly scans the aerial inputs for the best signal, which is then fed to the radio headset via the coaxial cable. The diversity function is only operational in the FM mode, when AM stations are being received the diversity function is deactivated.

Note:

NAVIGATION SYSTEM

The navigation computer generates the appropriate visual display output to support navigation functionality. This is communicated to the display unit via an RGB video link for the LCD display. The navigation computer also generates the audible navigation instructions (speaker level) that are transmitted through the front channels of the stereo system speakers. The GPS receiver is an integral part of the navigation computer.

Purpose of the System

A modern satellite navigation system is an in-car guidance system that uses information transmitted from satellites orbiting the earth. From this information, the navigation computer can pinpoint the present position of the vehicle. The system computes this information against other data, which is generated in the car, and is able to calculate a route for the driver to take to reach his/her destination. The information is displayed on a monitor in the vehicle and is accompanied by computer generated audio instructions informing the driver when and where to maneuver.

The Navigation System consists of the following components:

- CD Rom Navigation Computer
- GPS Antenna
- Gyro Sensor
- Distance Sensors
- Display

System Components

CD ROM Navigation Computer



CD Navigation Computer

44-08-110

The navigation computer is located under the right front seat.

Access to the CD-ROM slot on the front of the navigation computer is from the rear

Fig. 17: CD Navigation Computer

Courtesy of BMW OF NORTH AMERICA, INC.

The navigation computer consists of a CD-ROM drive, the hardware for navigation computation and a gyro sensor. The navigation computer generates the appropriate visual display output to support navigation functionality. Additionally the computer will provide the HMI (Human Machine Interface) for the On Board Computer. This is communicated to the display unit via an RGB video link for the LCD display. The navigation computer also generates the audible navigation instructions (speaker level) that are transmitted through the front channels of the stereo system speakers. The GPS receiver is an integral part of the navigation computer.

GPS Antenna



GPS Antenna

44-08-111

The GPS antenna (1) is located centrally below the dash upper at the base of the windshield.

Fig. 18: GPS Antenna

Courtesy of BMW OF NORTH AMERICA, INC.

The GPS antenna receives information from the constellation of GPS satellites in the sky. The signals are 'line of sight' transmissions i.e. there must be an unobstructed view between the satellites and the GPS antenna. The antenna is able to pick up signals through glass and non-electrically conducting trim - but not through metallic objects, buildings etc.

GPS Receiver

The GPS receiver generates and maintains the almanac. The GPS receiver determines the vehicles current position and compares it to the "dead reckoning position". The dead reckoning position is determined from the gyro-sensor and the wheel speed signal overlaid on the CD-ROM database. At any given point in time the computer can determine the vehicle's current position by reconciling the dead reckoning position with the GPS positioning.

Gyro Sensor

To provide a directional input to the system a gyro sensor is installed within the navigation computer.

Distance Sensors

The distance input to the navigation computer is a square wave output in proportion to vehicle speed from the ABS\ASC\DSC module (right hand rear wheel speed sensor). This signal is used by the Navigation Computer to match the position of the vehicle to the map.

Display

The color display is a 5.8" 16:9 aspect ratio color TFT LCD. An HMI processor integral to the navigation computer generates the display graphics for all modes of operation. The display has an RGB Video input for the graphics information from the navigation computer. The frame rate (60 Hz) automatically adjusts to match the source signal. The screen frequency is controlled by a K-bus message.

Audio Mute Key

The audio mute key is used to toggle the navigation audio instructions on or off. When audio mute is active the mute LED is illuminated to inform the user.

Re-route Key

The re-route key is used to request a new route when the navigation system is providing guidance information. There is no function for this button when the navigation system is not providing guidance, although the K-bus message will always be transmitted.

Repeat Key

The repeat key is used to request the last spoken navigation message to be repeated if appropriate.

Audio Systems

The system will function in conjunction with the radio headsets. K-bus messages will provide radio muting during navigation messages. The navigation audio output will be via the radio headset unless a Digital Signal Processing amplifier is fitted.

Reverse Light Signal Input

This signal is used by the Navigation Computer to determine the direction of vehicle travel. The signal is supplied from the gearbox reverse light switch (manual versions). On the ECVT gearbox the signal is supplied from the starter inhibitor/reverse light switch.

On Board Computer (OBC)

The trip computer is displayed and operated via the LCD screen. The trip computer calculates and displays the following information:

- Trip distance
- Range
- Average fuel consumption 1
- Average fuel consumption 2
- Estimated journey time
- Average speed
- Limit

Service Mode

Selecting the SET menu item and then confirming with the rotary control knob enters Service Mode. The MENU button should then be pressed and held for eight seconds. This will display the Service Mode menu screen.

The Service Mode has five main items displayed on its menu as follows:

- On-board monitor
- NAVIGATION / GRAPHIC ELEMENT
- GPS
- Sensor check

To access the functions: turn the rotary control knob to select the desired function and then press to enter.

On-board Monitor

The ON-BOARD MONITOR VERSION information will appear as follows:

- SW level:
- HW level:
- DIAG index:
- BUS index:
- Encoding index:
- Supplier

Selecting FUNCTIONS causes pop-up menu to appear allowing the selection of:

FUNCTIONS DESCRIPTION

- | | |
|-------------------|--|
| • VERSION | This displays the ON-BOARD MONITOR VERSION screen as described above. |
| • KEY
FUNCTION | This allows each key, including the rotary control knob, on the display unit control panel to be checked for correct operation. Each key is allocated a letter or number, which is displayed when pressed or turned. The screen display shows FF if no key is pressed, FEH if multiple keys are pressed: |
| • BRIGHTNESS | This enables the brightness of the display to be adjusted via a slider control on the screen that is controlled with the rotary control knob. Rotation in either direction will brighten or darken the LCD screen in a range from -10 to +10. Pressing the rotary control knob will select the chosen setting. |

Access to these functions is possible using the rotary control knob.

Selecting FUNCTIONS will return to the pop-up menu or selecting < RETURN will return to the Service Mode menu.

Navigation/Graphic Element

The navigation computer version information will appear as follows:

- SW level:
- HW level:
- DIAG index:
- BUS index:
- Encoding index:
- Supplier:

Select < RETURN to go back to the Service Mode menu.

GPS

The GPS VERSION information will appear as follows:

- Receiver Version
- Receiver SW Date

Select FUNCTIONS: A pop-up menu appears which allows the selection of:

- GPS VERSION
- GPS STATUS
- GPS TRACKING INFO

Access to these functions is possible using the rotary control knob.

Sensor Check

The display screen provides visual checks that all input sensors are operating. The following sensor status is displayed:

SENSOR STATUS

Wheel sensors	Wheel speed sensors used by the ABS\ASC\DSC system calculate the vehicle speed. When the vehicle is stationary the wheel speed sensor boxes will show zero. When the car is driven the values should increase in proportion to the vehicle speed. When the vehicle is driven in a straight line, the values should be similar.
GPS satellites	Displays the number of satellites visible to the system at that time.
GPS status	Displays the number of satellites visible and the GPS system status. The GPS statuses displayed are as follows:GPS Error: - There is a communication error between the GPS receiver and the navigation computer. Satellite Search: - The system is searching for satellites and may indicate a failure of the GPS system. Ensure that the GPS antenna is not covered and check harness connections between the GPS receiver and the antenna. Satellite Contact: - The system is tracking a number of satellites. This message shows that the system is functioning correctly, but there is not enough information to determine the vehicle position. Check that the GPS antenna is not covered in any way. It may take several minutes for the GPS system to locate enough satellites to determine the vehicle position. Position Known: - The system is tracking a number of satellites and has a current fix on the vehicle position. This shows that the system is functioning correctly.
Gyro	The navigation computer has a gyro which determines changes of vehicle direction. When the vehicle turns to the left, the direction icon should move anti-clockwise and the displayed value should decrease. When the vehicle turns to the right the direction icon should move clockwise and the displayed value should increase. The amount movement of the direction icon and of increase or decrease in the displayed value depends on the tightness of the turn.
Direction	The direction sensor determines whether the vehicle is travelling forward or backward. With the vehicle in any forward gear or neutral or 'park' for automatic transmission, the display will show 'Forward'. When reverse gear is engaged the display should show 'Backward'.

Selecting FUNCTIONS will return to the pop-up menu or selecting < RETURN will return to the Service Mode menu.

Service Mode is exited by pressing the MENU button on the control panel which returns the system to the main navigation.

Software Loading/Configuration

All vehicles with navigation systems are delivered with the latest software installed and the language versions set to the appropriate market configuration. The system can have software loaded by the dealer, when new software is released for example.

Software can be loaded from a CD that is inserted into the navigation computer. The computer automatically senses that a software CD has been inserted and will display a software loading screen on the display unit LCD or the instrument cluster message center and begin to load the software. The LCD will display that software loading has commenced and the software version. The languages being loaded will also be displayed where appropriate.

Diagnostics

The diagnostic socket allows the exchange of information between the navigation system components and DIS. The diagnostic socket is located in the driver's footwell. A dedicated diagnostic bus is connected between the socket and the instrument cluster and allows the retrieval of diagnostic information and coding of certain functions to be performed using DISplus. The instrument cluster forms the gateway for the K-bus link to the navigation components. The cluster translates diagnostic messages from DISplus into K-bus messages recognized by the navigation system components.