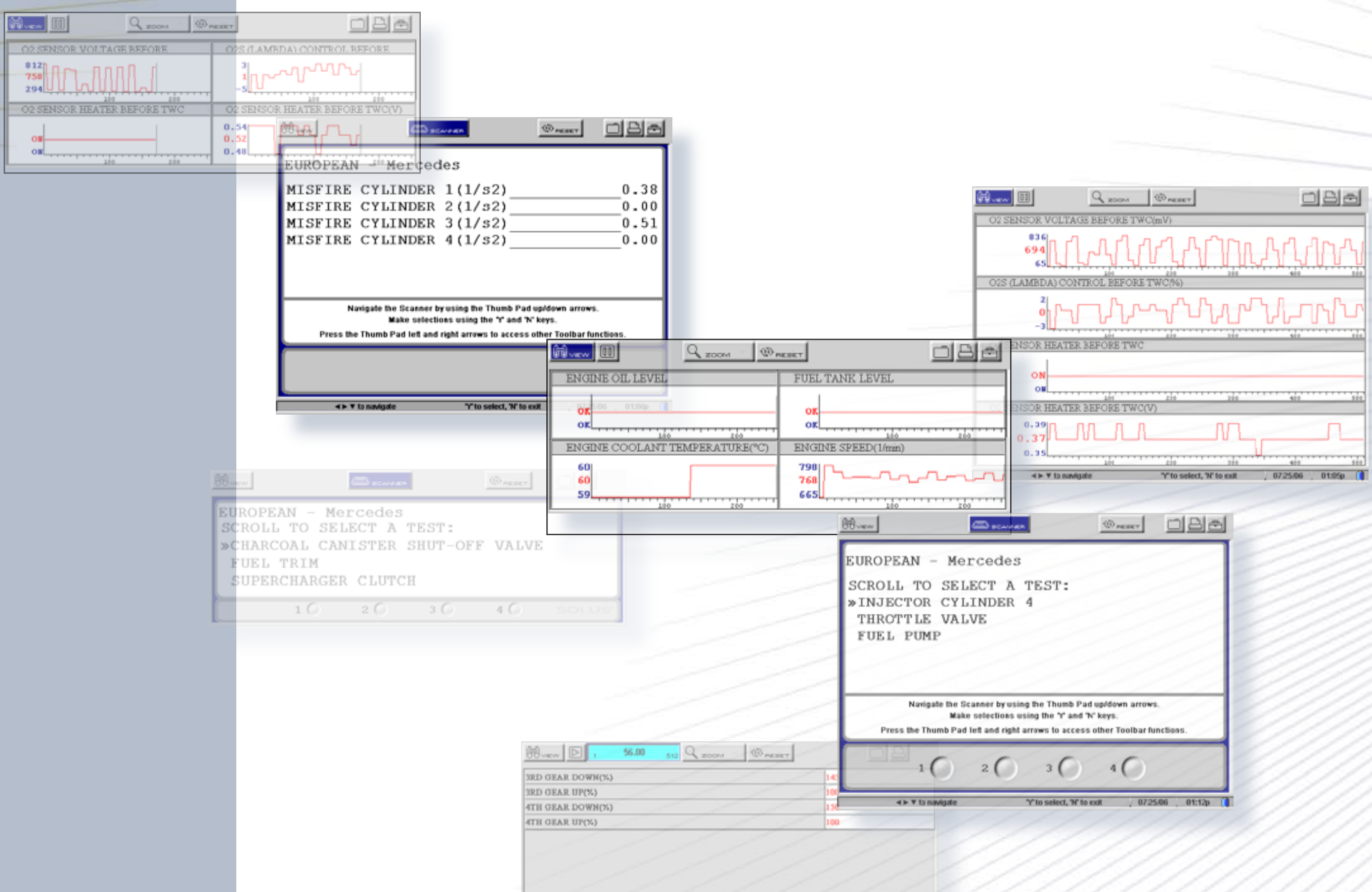
Mercedes-Benz Vehicle Communication Software Manual



Snap-on®

Mercedes-Benz Vehicle Communication Software Manual

February 2007

Snap-on®

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Safety Information

For your safety and the safety of others, read, understand and follow all safety messages and instructions in this manual, on the test equipment and in the tool user's manual.

Your diagnostic tool is intended for use by properly trained, skilled professional automotive technicians. The safety messages presented below and throughout this manual are reminders to the operator to exercise extreme care when using a test instrument.

There are many variations in procedures, techniques, tools, and parts for servicing vehicles, as well as in the skill of the individual doing the work. Because of the vast number of test applications and variations in the products that can be tested with this instrument, we cannot possibly anticipate or provide advice or safety messages to cover every situation. It is the responsibility of the automotive technician to be knowledgeable of the system being tested. It is essential to use proper service methods and test procedures and to perform tests in an appropriate and acceptable manner that does not endanger your safety, the safety of others in the work area, or vehicle or equipment being tested.

It is assumed the operator has a thorough understanding of vehicle systems before using a diagnostic tool. Understanding of these system principles and operating theories is necessary for competent, safe and accurate use of this instrument.

Before using a diagnostic tool, always refer to and follow safety messages and applicable test procedures provided by the manufacturer of the vehicle or equipment being tested. Use equipment only as described in this manual.

Safety Conventions

Safety messages in this manual contain a signal word with an icon. The signal word indicates the level of the hazard in a situation. Signal words used in this manual are explained below.

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury to the operator or bystanders.

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to the operator or to bystanders.

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in moderate or minor injury to the operator or to bystanders.

Safety messages contain three different type styles:

- Normal type states the hazard.
- **Bold** type states how to avoid the hazard.
- *Italic* type states the possible consequences of not avoiding the hazard.

An icon, when present, gives a graphical description of the potential hazard. An example is shown below.

Risk of unexpected vehicle movement.

- **Block drive wheels before performing a test with the engine running.**

A moving vehicle can cause injury.

A universal warning triangle is used when an icon for the specific hazard is not available. In these instances, the safety message is proceeded by the signal word in bold type. An example is shown below.

The engine compartment contains electrical connections and hot or moving parts.

- **Keep yourself, test leads, clothing, and other objects clear of electrical connections and hot or moving parts.**
- **Do not wear watches, rings, or loose clothing when working in an engine compartment.**
- **Do not place tools or equipment on fenders or other places in the engine compartment.**
- **Barriers are recommended to help identify danger zones in test area.**

Contact with electrical connections and hot moving parts can cause injury.

Important Safety Instructions

For a complete list of safety messages, refer to the Diagnostic Safety Manual.

Table of Contents

Chapter 1 Using This Manual

This manual contains instructions for testing Mercedes-Benz vehicles with the following Snap-on® diagnostic tools:

- MT2500 Scanner™ scan tool
- MTG2500 Color Graphing Scanner™ scan tool
- MODIS™ unit with the Scanner™ Plug-in
- SOLUS™ scan tool

Some of the Illustrations shown in this manual may contain modules and optional equipment that are not included on your system. Contact a Snap-on Sales Reperesentative for availability of other modules and optional equipment.

1.1 Conventions

This manual uses the conventions described below.

1.1.1 Bold Text

Bold text is used for emphasis and to highlight selectable items such as buttons and menu options.

Example:

- Press the **Y** button.

1.1.2 Terminology

Certain terms are used to command specific actions throughout this manual. Those terms are described below.

Select

The term “select” will be used to mean selecting a menu item or other option with the Thumbwheel (Scanner™) or Thumb pad (MODIS™, and SOLUS™) and pressing and holding the **Y** button to confirm the selection.

Example:

- Select **FUNCTIONAL TESTS**.

Scroll

The term “scroll” will be used to mean moving the cursor or changing data by turning the Thumbwheel (Scanner™) or pressing the Thumb pad (MODIS™ and SOLUS™).

Example:

- Scroll to see any other codes and the data list.

Scan Tool

The term “scan tool” will be used to refer to a diagnostic tool that runs Snap-on® vehicle communication software, such as the MT2500 Scanner™ or the Scanner™ Plug-in for MODIS™ or the SOLUS™. When necessary, the term “Snap-on® scan tool” will be used to distinguish it from another diagnostic device, such as the manufacturer’s scan tool.

1.1.3 Notes and Important Messages

The following messages appear throughout this manual.

Notes

A NOTE provides helpful information such as explanations, tips, and comments.

Example:

NOTE:
For additional information refer to...

Important

IMPORTANT indicates a situation which, if not avoided, may result in damage to the test equipment or vehicle.

Example:

IMPORTANT:
Never install vehicle communication software cartridges in both slots of the Scanner™. This can cause damage to the software cartridges.

Chapter 2 Introduction

The Mercedes-Benz Vehicle Communication Software provides extensive vehicle-specific engine, transmission, antilock brake system (ABS) and airbag trouble codes, and selected functional tests.

This manual is designed to guide you through control systems tests of Mercedes-Benz vehicles.

The first two sections of this manual overview safety and usage conventions. The remainder of this guide is divided into the following chapters:

- "Chapter 3 Scanner™ Operations" on page 5 takes you through basic Scanner™ operations from identifying the vehicle to selecting tests from a MAIN MENU screen.
- "Chapter 4 Testing" on page 35 offers testing information and procedures for transmission control systems.
- "Chapter 5 Data Parameters" on page 77 defines Mercedes-Benz data parameters and explains how they display on the screen.
- "Appendix A Printer and Remote Terminal Setup" on page 151 lists which printers and remote devices are compatible with the Scanner™ and how to set them up appropriately.
- "Appendix B Troubleshooting and Communication Problems" on page 155 offers advice for troubleshooting Scanner™-to-vehicle communication and other issues.
- "Appendix C Scanner™ Adapters & Accessories" on page 159 lists the external components available for testing with the Scanner™.
- "Appendix D Terms, Abbreviations and Acronyms" on page 165 lists abbreviations used in this manual.

Chapter 3 Scanner™ Operations

3.1 Identifying the Vehicle

The Scanner™ typically identifies a vehicle using certain characters of the vehicle identification number (VIN). The Scanner™ vehicle identification (ID) process prompts to you enter VIN characters and answer questions about the vehicle to be tested.

For some vehicles, the Scanner™ may display two or more engine choices. Be sure to scroll to confirm the number of engine choices. The engine number is stamped on the engine block or cylinder head, however, the exact location varies and is often difficult to see on an installed engine. For example, the number is often behind the water pump on V8 engines.

For 129 and 140 models, there may be multiple engine selections that are seen by scrolling after selecting the year. Typically, multiple engine choices apply to other markets and only one engine is used on North American vehicles for any given year.

Table 3-1 provides some helpful tips for selecting the correct engine.

Table 3-1 *VIN selections for North American vehicles (sheet 1 of 2)*

VIN	ENGINE SELECTION
VIN FA67	119.972 used on 1995 models only 119.982 used on 1996–2000 models
VIN FA76	120.981 used on 1995 models only 120.983 used on 1996–98 models
VIN GA32	104.990 used on 1993 models only 104.994 used on 1994 models only
VIN GA43	119.971 used on 1995 models only. 119.981 used on 1996–98 models.
VIN GA51	119.970 used on 1995 models only 119.980 used on 1996–98 models
VIN GA57	120.980 used on 1995 models only 120.982 not used on 1995 U.S. models
VIN GA70	119.970 used on 1995 models only 119.980 used on 1996–98 models
VIN GA76	120.980 used on 1995 models only 120.982 not used on 1995 U.S. models
VIN EA30 (1988–92)	103.980 not used in U.S. 103.983 used in U.S.
VIN JF72	119.980 not used in U.S. (5.0L-V8) 119.985 used in U.S. (4.2L-V8)
VIN AB54	112.942 used on 1998–2003 models
VIN AB57	112.970 used on 2003–2005 models
VIN AB72	113.942 used on 1999–2001 models
VIN AB74	113.981 used on 2000–2002 models
VIN AB75	113.964 used on 2002–2005 models
VIN AJ76	155.980 used on 2005 models
VIN FA68	113.961 used on 1999–2002 models
VIN FA76	120.983 used on 1997–2002 models

Table 3-1 *VIN selections for North American vehicles (sheet 2 of 2)*

VIN	ENGINE SELECTION
VIN KK47	111.973 used on 1998–2000 models
VIN KK49	111.983 used on 2001–2004 models
VIN KK65	112.947 used on 2001–2004 models
VIN KK66	112.960 used on 2002–2004 models
VIN PJ74	113.991 used on 2003 models
VIN PJ75	113.960 used on 2000 models
VIN PJ76	275.950 used on 2003–2005 models
VIN RF76	113.988 used on 2005 models
VIN SK74	113.992 used on 2003 models
VIN SK75	113.963 used on 2003 models
VIN SK76	275.960 used on 2004 models
VIN SK79	275.981 used on 2005 models
VIN TJ 75	113.987 used on 2003 models
VIN TJ 76	113.987 used on 2004 models
VIN UF70	113.967 used on 2003 models
	113.969 used on 2004 models
VIN UF76	113.990 used on 2004 models
VIN UF83	113.969 used on 2004 models
VIN WK56	272.963 used on 2005 models
VIN WK73	113.989 used on 2005 models

When multiple engine choices are listed, only the correct engine choice communicates with the Scanner™. If the Scanner™ does not communicate after selecting one engine, select the other engine and try again. Always scroll to verify if any additional engine choices are available.

Multiple engine systems are sometimes listed together as one selection (i.e., HFM/ME2) because vehicle systems may vary depending on country. The Scanner™ automatically identifies the correct system. See Table 4-1, “U.S. Mercedes engine application coverage,” on page 36 for more information.

If you are powering up the Scanner™ after just installing the Mercedes-Benz software cartridge, or if you pressed N from the Current Vehicle Identification screen, the following menu displays (Figure 3-1).

```
>MERCEDES PRIMARY                V 2.4

PRESS Y TO CONTINUE
PRESS N FOR HELP
```

Figure 3-1 *Software Selection menu*

To identify a vehicle:

1. Press Y to continue.

   The Mode Selection menu displays (Figure 3-2).

```
SCROLL TO SELECT
>VEHICLE SELECTION
 DEMO MODE
 CUSTOM SETUP
```

Figure 3-2 *Mode Selection menu*

NOTE:
The correct steering wheel position must be selected to display the correct vehicle diagnostic connector location screen. Make sure the appropriate “Left/Right Hand” drive option is selected. See “Custom Setup” on page 22 for details.

2. Scroll to VEHICLE SELECTION and press Y.

   The following screen displays (Figure 3-3).

```
MANUFACTURER       :MERCEDES
MODEL              :220     (S-SERIES)
US VIN             :WDBN.............
INTERNATIONAL VIN:...220...........
```

Figure 3-3 *Sample Vehicle ID screen*

3. Scroll to select the required model series and press Y.

NOTE:
The Scanner™ indicates those vehicles not available to the United States market by displaying “not available” after the US VIN.

The display now shows the model series you selected and asks for the model number for the selected series (Figure 3-4).

```
MANUFACTURER       :MERCEDES
MODEL              :220.175 (S-SERIES)
US VIN             :WDBNG75..........
INTERNATIONAL VIN:...220175........
```

Figure 3-4 *Sample Vehicle ID screen*

4. Scroll and press Y to select the model number.

   The display now shows the selected model series and model number and asks for the model year (Figure 3-5).

```
MANUFACTURER       :MERCEDES
MODEL              :220.175 (S-SERIES)
MODEL YEAR         :1999  (10TH VIN='X')
```

Figure 3-5 *Sample Vehicle ID screen*

The Scanner™ only displays those model years available with the selected model.

5. Scroll and press Y to select the model year.

   The display now shows the selected model series, model number, and the model year and asks for the engine type (Figure 3-6).

```
MANUFACTURER      :MERCEDES
MODEL             :220.175 (S-SERIES)
MODEL YEAR        :1999  (10TH VIN='X')
ENGINE            :113.960 5.0L L-V8
```

Figure 3-6 *Sample Vehicle ID screen*

After engine displacement, the Scanner™ indicates engine mount, type, and number of cylinders. For example:

- L-V8: Engine mounted in-line, V-type, 8 cylinders
- L-L6: Engine mounted in-line, in-line type, 6 cylinders

The Scanner™ only displays those engines available with the selected model and model year combination. Typically, only one engine type exists for each model and model year combination.

6. Scroll to select the engine type and press Y.

   The Scanner™ now displays the Vehicle ID Confirmation screen (Figure 3-7).

```
MERCEDES 220.175(S-SERIES) 1999
113.960 5.0L SFI L-V8

PRESS Y TO CONTINUE. PRESS N FOR NEW ID.
```

Figure 3-7 *Sample Vehicle ID Confirmation screen*

7. If the identification is correct, press Y to store the identification in memory and continue. If the identification is not completely correct, press N to return to the start of the identification process.

3.2 Selecting a System

Once you have confirmed a vehicle identification (see previous section), the System List menu displays all the ECUs in the vehicle along with a brief description, as in Figure 3-8.

```
SYSTEM LIST
>HFM    : sequential fuel injection
 LH1    : fuel injection system right
 LH2    : fuel injection system left
```

Figure 3-8 *Sample System List screen*

When the Scanner™ displays multiple systems, each line makes reference to a separate control module.

Note the following when selecting a system for testing:

- The terms “left” and “right” refer to separate engine bank control systems for 12-cylinder engines and assume left and right from the driver's seat position. OBD-II terminology uses Bank 1 and Bank 2. The Scanner™ calls Bank 1 (cylinders 1–6) on the passenger side, “(RIGHT),” and Bank 2 (cylinders 7–12) on the driver's side, “(LEFT).”
- Bank 1 is controlled by ME 1 and Bank 2 is controlled by ME 2.

- For the V12 engine, long intake runners with each bank's MAF sensor are located on the opposite side of the engine.
- For those vehicles with multiple system choices, if the Scanner™ is not able to establish communication using the first system choice, try again using an alternate system choice. See “Appendix B Troubleshooting and Communication Problems” on page 155 for help trying to establish communication.

To select a system for testing:

- Scroll to the system you would like to test (Figure 3-9) and press Y.

```
SYSTEM LIST
>HFM    : sequential fuel injection
 LH1    : fuel injection system right
 LH2    : fuel injection system left
```

Figure 3-9 *Sample System List menu*

3.3 Connecting to a Vehicle

After selecting the required system from the SYSTEM LIST, the Scanner™ displays a connection message. This screen tells you which adapter and personality key to use to connect the Scanner™ for testing (Figure 3-10).

```
CONNECTOR: DL-16 + S-17
DRIVER SIDE, UNDER DASH, NEAR HOOD
RELEASE.
PRESS Y TO CONTINUE, N FOR OTHER SYSTEM.
```

Figure 3-10 *Sample Scanner™ connection message*

Each test adapter plugs into a specific vehicle diagnostic connector and attaches to one end of the data cable. The other end of the cable attaches to the Scanner™. Captive screws secure both data cable ends.

The following adapters are available to connect the Scanner™ to Mercedes-Benz vehicles:

- MB-1—(MT2500-62) test adapter with S-20 Personality Key™ for the 38-pin underhood connector (Figure 3-14 on page 11).
- MB-2A—(MT2500-75) test adapter for the 8 or 16-pin underhood connector (Figure 3-15 on page 12 and Figure 3-16 on page 13).
- DL-16—(MT2500-68) test adapter with S-21 Personality Key™ for 1996 and later vehicles. This fits an OBD-II style connector (Figure 3-17 on page 13) that is used for all vehicle communications. When available, it is recommended to use the underhood 38-pin connector for those vehicles from approximately 1996–2001. For those vehicles with dual connectors, the underdash 16-pin may have limited functionality.

Use the following adapter + Personality Key™ combinations for the appropriate systems.

- DL16 + S4—KLA/TAU airco system (A/SLK-series)
- MB1 + S33—KLA/TAU airco system
- MB1 + S34—ZAE airbag, EWM (electronic gear selector) system

NOTE:
When a CIS-E vehicle is identified, a connector message appears instructing you to use the "MB-2 + 2.5 mm adapter cable" which is designed to be used in conjunction with the yellow lead on the MB-2 adapter. This 2.5 mm adapter is currently not available in the Scanner™ accessory package (many test lead kits may have a standard banana plug for the 2.5 mm adapter). On CIS-E, a duty ratio test reads current faults via a duty-cycle output. The vehicle diagnostic connector is a round 9-pin. Connect to pin 3 as directed by the display message (see page 43 for more information).

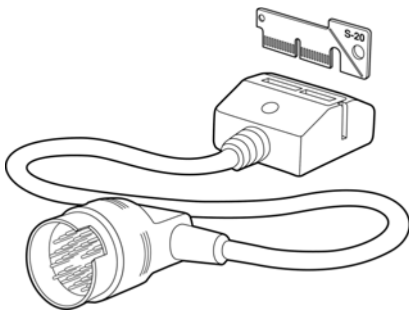

Figure 3-11 *MB-1 adapter*

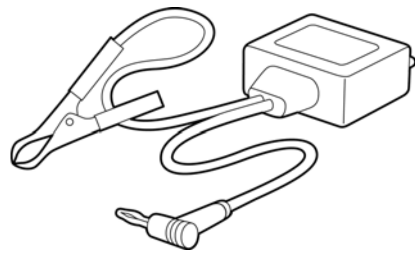

Figure 3-12 *MB-2A adapter*

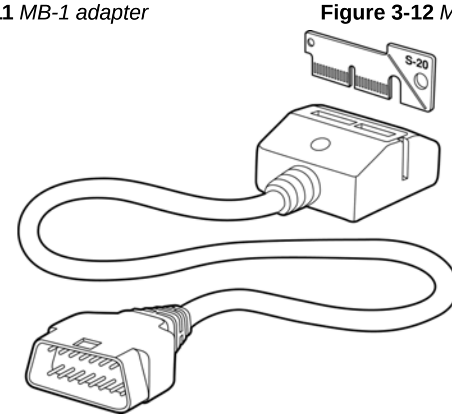

Figure 3-13 *DL-16*

Each test adapter connects to one of the following vehicle diagnostic connectors.

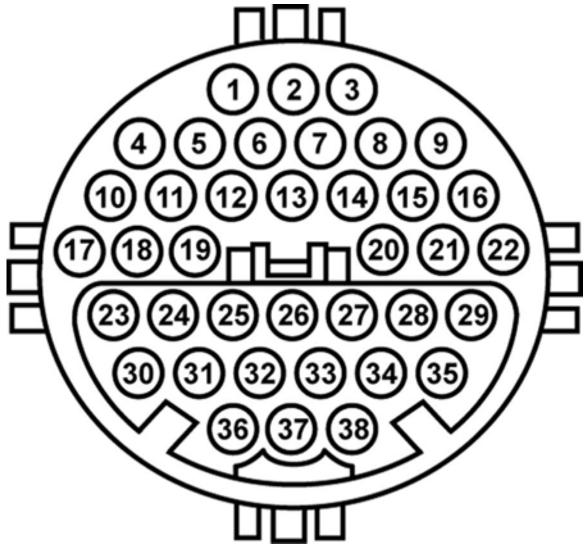

Figure 3-14 *38-pin connector—fits MB-1 adapter*

Table 3-2 *38-pin connector pinout (sheet 1 of 2)*

PIN	FUNCTION	PIN	FUNCTION
1	Ground, circuit 31 (W12, W15, electronics ground)	14	On-off ratio, engine 119 LH-SFI, engine 120 LH-SFI (right)
2	Voltage, circuit 87 or 15z	15	On-off ratio, engine 120 LH-SFI (left)
3	Voltage, circuit 30		Instrument cluster
4	Electronic diesel system	16	Air conditioning (models 124, 202, 208, 210)
	Electronic distributor-type fuel injection (diesel)		Tempmatic air conditioning (model 170)
	Electronic inline fuel injection (diesel)	17	Distributor ignition, engines 104, 119, engine 120 (right)
	HFM sequential multiport fuel injection/ignition		TD-speed signal (time division) (diesel) (model 140)
	LH sequential multiport fuel injection, engines 104, 119, 120 (right)		TN-speed signal, LH-SFI engines, HFM (model 202)
	ME sequential multiport fuel injection/ ignition, engines 119, 120 (right)	18	Distributor ignition, engine 120 (left)
5	LH sequential multiport fuel injection, engine 120 (left)	19	Diagnostic module
	ME sequential multiport fuel injection/ ignition, engine 120 (left)	20	Pneumatic system equipment (model 140)
6	Antilock brake system		Combination control module (model 210)
	Electronic traction system	21	Convenience feature (model 140)
	Acceleration slip regulation		Roadster soft top (model 129)
	Electronic stability program	22	Roll bar (model 129)
7	Electronic accelerator	23	Anti-theft alarm
	Cruise control/idle speed control	24–25	Not used
8	Base module	26	Automatic locking differential (model 202)
	Brake assist	27	Not used

Table 3-2 *38-pin connector pinout (sheet 2 of 2)*

PIN	FUNCTION	PIN	FUNCTION
9	Automatic locking differential (models 124, 129, 140)	28	Parktronic system (model 140)
10	Electronic transmission control (A/T 5-speed)	29	Not used
	Electronic transmission control	30	Airbag/ETR (SRS)
11	Adaptive damping system	31	Remote central locking
12	Speed-sensitive power steering	32–33	Not used
13	TNA-signal (gasoline) LH-SFI engines	34	Communication and navigation system
	TD-signal (diesel) (model 210)	35–38	Not used
	TN-signal (gasoline), HFM (ME)-SFI engines		

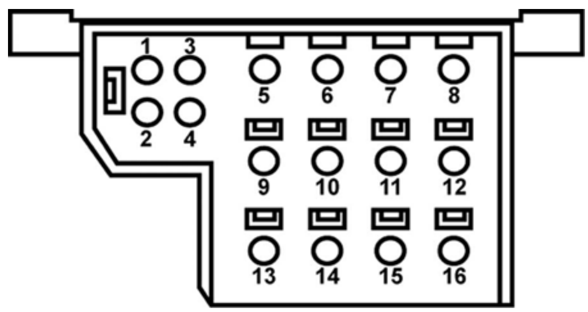

Figure 3-15 *16-pin OBD-I connector—fits MB-2 adapter*

Table 3-3 *16-pin OBD-I connector pinout (sheet 1 of 2)*

U.S. MODELS		CALIFORNIA MODELS ONLY (WITH LED)	
PIN	**FUNCTION**	**PIN**	**FUNCTION**
1	Ground	1	Ground
2	Not used	2	Push-button for on-board diagnostics
3	Continuous fuel injection	3	Continuous fuel injection
4	Electronic diesel system		Diagnostic module
5	4MATIC	4	LED
6	Airbag/ETR (SRS)	5	Automatic locking differential
7	Air conditioning (model 124)	6	Airbag/ETR (SRS)
	Roll bar (model 129)	7	Air conditioning (model 124)
8	Distributor ignition		Roll bar (model 129)
	HFM sequential multiport fuel injection/ignition	8	Distributor ignition
	Pressurized engine control		HFM sequential multiport fuel injection/ignition
9	Adaptive damping system	9	Adaptive damping system
	Roll bar (model 124)		Roll bar (model 124)
10	TN-signal (gasoline)	10	Roadster soft top (model 129)
11	Anti-theft alarm		TN-signal (gasoline)
12	Remote central locking	11	Anti-theft alarm
13	Electronic transmission control	12	Remote central locking

Table 3-3 *16-pin OBD-I connector pinout (sheet 2 of 2)*

U.S. MODELS		CALIFORNIA MODELS ONLY (WITH LED)	
PIN	**FUNCTION**	**PIN**	**FUNCTION**
14	Electronic accelerator (model 124)	13	Electronic transmission control
	Cruise control/idle speed control (model 124)	14	Electronic accelerator (model 124)
	Engine systems control module (MAS) (model 129)		Cruise control/idle speed control (model 124)
15	Not used		Engine systems control module (MAS) (model 129)
16	Circuit 15	15	Not used
		16	Circuit 15

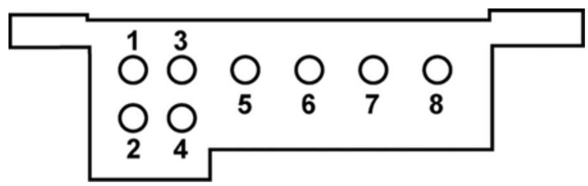

Figure 3-16 *8-pin connector—fits MB-2 adapter*

Table 3-4 *8-pin connector pinout*

PIN	FUNCTION
1	Ground
2	Not used
3	Continuous fuel injection
4	Diesel injection system
	Electronic idle speed control
	Electronic diesel
5	Automatic locking differential
	Automatic-engaged 4WD (model 124 only)
6	Airbag
7	Air conditioning
8	Not used

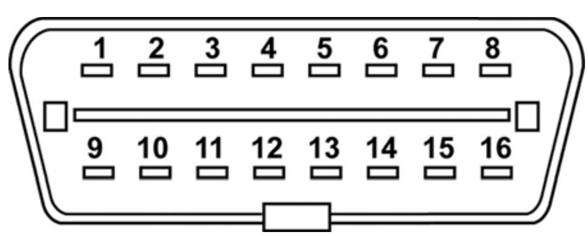

Figure 3-17 *16-pin OBD-II connector—fits DL-16 adapter*

Table 3-5 *16-pin OBD-II connector pinout (sheet 1 of 2)*

PIN	FUNCTION	PIN	FUNCTION
1	Not used	9	Electronic Traction System (ETS), model 163
2	Not used	10	Not used

Table 3-5 *16-pin OBD-II connector pinout (sheet 2 of 2)*

PIN	FUNCTION	PIN	FUNCTION
3	TNA-signal (gasoline)	11	Electronic transmission control (ETC)
4	Circuit 31, ground	12	All Activity Module (AAM)
5	Circuit 31, electric ground	13	Airbag/ETR (SRS)
6	CAN interior bus (H)	14	CAN interior bus (L)
7	Motor electronics (ME)	15	Instrument cluster
8	Circuit 87, voltage supply	16	Circuit 30, voltage supply

Note the following when connecting the Scanner™ to the vehicle:

- "LEFT" or "RIGHT," when included in the connection message, assumes that you are in the driver's seat.
- When the connection message screen refers to the MB-2 adapter, use the MB-2A adapter.
- The MB-1 and DL-16 adapters require a Personality Key™. See the on-screen connection instructions for the vehicle you are testing for the correct Personality Key™.
- The Scanner™ displays [MORE] if a message exceeds four lines. Scroll to display the additional lines.

To connect to a vehicle:

- Follow the on-screen connection instructions (Figure 3-18) and press Y.

```
CONNECTOR: DL-16 + S-17
DRIVER SIDE, UNDER DASH, NEAR HOOD
RELEASE.
PRESS Y TO CONTINUE, N FOR OTHER SYSTEM.
```

Figure 3-18 *Sample Scanner™ connection message*

3.4 Selecting a Test

After a vehicle has been identified, the Scanner™ has been connected to the appropriate vehicle test connector, and a system has been selected, a MAIN MENU specific to the identified vehicle displays (Figure 3-19), and you may begin testing.

```
MERCEDES, ME2          OTHER SYSTEMS
>DATA                  CODES
 CUSTOM SETUP          REVIEW MOVIE
 FUNCTIONAL TESTS
```

Figure 3-19 *Sample MAIN MENU*

To select a menu item:

1. Scroll so the cursor is pointing at the selection.
2. Press the **Y** button.

   Pressing the **Y** button with a menu item selected has one of two results:

- A submenu displays, prompting you for another selection.

- A test begins.

3.5 Main Menu Selections

When the Scanner™ has established a connection with the vehicle, the Scanner™ displays a MAIN MENU (Figure 3-20).

```
MERCEDES, ME2           OTHER SYSTEMS
>DATA                   CODES
 CUSTOM SETUP           REVIEW MOVIE
 FUNCTIONAL TESTS
```

Figure 3-20 *Sample Main Menu*

The Scanner™ presents menu selections only for the specific vehicle being tested. The name of the ECU under test will be displayed in the upper left-hand corner of the display.

There are two separate selections for DATA and CODES. This means that the diagnostic trouble codes will not be displayed when viewing DATA. REVIEW MOVIE appears only after a movie has been recorded in the MOVIE DATA mode.

The Mercedes-Benz MAIN MENU contains the following general functions:

- DATA—allows the monitoring of various sensors, switches, fuel adaptation values, and actuator inputs and outputs on many Mercedes-Benz vehicles (see “Data” on page 15).
- CUSTOM SETUP—programs the Scanner™ for specific needs (see “Custom Setup” on page 22).
- FUNCTIONAL TESTS—provides specific tests for the identified vehicle (see “Functional Tests” on page 26).
- OTHER SYSTEMS—allows you to pick a different system for testing without disconnecting the Scanner™ (see “Other Systems” on page 28).
- CODES—displays any one of three types of diagnostic trouble codes (see “Codes” on page 29).
- REVIEW MOVIE—appears on a menu only after a movie has been recorded (see “Review Movie Exit Menu” on page 32).

3.5.1 Data

The Scanner™ can display data parameters and their values in two viewing modes, FAST and MOVIE. When you select DATA from the Main Menu, the Scanner™ displays the following screen (Figure 3-21).

```
DATA
>FAST - fastest screen update.
 MOVIE - customized data lists, frame
         printing and data recording.
```

Figure 3-21 *Sample Data Selection menu*

Both data modes display one data parameter and value per line.

Holding a Frame of Data

A data frame is one data transmission cycle from the ECU data stream. When holding a frame, all data readings are locked at the last readings before pressing Y, the top line of the display looks similar to Figure 3-22.

If N is pressed to exit while a frame is held, the frame is held in Scanner™ memory and can be printed from the Exit menu. A held frame of data is released when you do either of the following:

- From DATA, press Y again to resume the data transmission.
- Go back to the SELECT PARAMETER GROUP screen.

To capture and hold a single frame of data:

1. Press Y while in either Data mode (FAST or MOVIE).
   “Hold” in the upper left corner indicates that a frame is held. It is now possible to scroll through the data readings to review the held values (Figure 3-22).

```
hold SELF-ADAPT. CTP(IDLE) LEFT(ms)_X.XX
SELF ADAPT CTP(IDLE) RIGHT(ms)______X.XX
SELF ADAPT.PART. LOAD FACTOR LEFT___X.XX
SELF ADAPT.PART. LOAD FACTOR RIGHT__X.XX
```

Figure 3-22 *Sample “held” frame of data*

2. Press Y again to release the held frame.

Fast Mode

In the FAST data viewing mode, the Scanner™ displays just four data parameter values from the ECU at a time. For this reason, the Fast mode provides the quickest update rate.

Selecting FAST from the DATA menu displays the SELECT PARAMETER GROUP menu (Figure 3-23).

```
SELECT PARAMETER GROUP:
>COMPLETE ENGINE DATA
 CHECK CTP, EXHAUST EMISSIONS TEST
 CHECK ENGINE
```

Figure 3-23 *Select Parameter Group menu*

Depending on vehicle application, the Scanner™ displays groups like the following:

- COMPLETE ENGINE DATA
- CHECK CTP, EXHAUST EMISSIONS TEST
- CHECK ENGINE
- COLD START
- WARM-UP

- DRIVING
- CRUISE CONTROL
- DRIVE AUTHORIZATION (DAS)
- ENGINE SMOOTHNESS
- SENSOR ADAPTATION
- FURTHER ACTUAL TESTS
- CHASSIS DYNOMETER
- SUPERCHARGER
- COMPLETED TESTS (engine management trouble code tests that have completed)

Selecting a group from a larger parameter set slows down the Scanner™ screen update rate. Selecting fewer parameters using CUSTOM SETUP (page 22) increases Scanner™ operational speed.

To view data parameters in Fast mode:

1. Scroll to the data parameter group to be viewed and press Y.

   A screen similar to Figure 3-24 displays.

```
INJECTION DURATION LEFT(ms)_________X.XX
INJECTION DURATION RIGHT(ms)________X.XX
AIR MASS(kg/h)________________________XX
HFM VOLTAGE(V)______________________X.XX
```

Figure 3-24 *Sample Data screen*

2. Scroll down through the list (Figure 3-25).

```
SELF-ADAPT. CTP (IDLE) LEFT (ms)____X.XX
SELF ADAPT CTP (IDLE) RIGHT (ms)____X.XX
SELF ADAPT.PART. LOAD FACTOR LEFT___X.XX
SELF ADAPT.PART. LOAD FACTOR RIGHT__X.XX
```

Figure 3-25 *Sample Data screen*

   With each scroll, the Scanner™ changes the display to include four new data parameters. Initially, the Scanner™ displays underscores (_) for each data parameter value. After a moment the Scanner™ replaces these underscores with data values. Depending on the ECU tested, the list might include over 100 data parameters.

3. Press N to stop viewing data parameters.

   The Scanner™ now displays the Data Exit menu, described in “Data Exit Menu” on page 18.

Movie Mode

In the MOVIE data viewing mode, the Scanner™ requests all the selected data parameter values from the ECU simultaneously. The Scanner™ update rate varies according to the baud rate (transmission speed) of the control module and the number of selected data parameters.

Select the MOVIE viewing mode if you wish to record a Movie. See “Arm Movie (Recording a Movie)” on page 20 for further information.

Selecting MOVIE from the DATA menu displays the SELECT PARAMETER GROUP menu (Figure 3-26).

```
SELECT PARAMETER GROUP:
>COMPLETE ENGINE DATA
 CHECK CTP, EXHAUST EMISSIONS TEST
 CHECK ENGINE
```

Figure 3-26 *Select Parameter Group menu*

NOTE:
In most cases, the COMPLETE ENGINE DATA selection will not perform a Movie due to the lengthy data list. Use the custom data setup to shorten data to a preferred list (see the following procedure). Also, be aware that the Snap-on® Mercedes cartridge may display significantly less captured movie frames than other manufacturers. In addition, note that current software may have memory limitations causing some engine systems to not record a movie even with only one parameter selected.

To view data parameters in Movie mode:

1. Scroll to the data parameter group to be viewed and press Y.

   The Scanner™ now displays the Custom Data List screen (Figure 3-27).

```
SCROLL & PRESS Y TO SELECT/DESELECT:
>*SELECT ALL
 *ENGINE OIL LEVEL
 *FUEL TANK LEVEL
```

Figure 3-27 *Custom Data List screen*

   This screen allows you to select which data parameters you wish to view. Select symptom-specific parameters to focus on your repair. Having the Scanner™ display fewer data parameter values provides a faster update rate.

   An asterisk (*) adjacent to a parameter title indicates that parameter is selected for display.

2. Scroll to the parameter title and press Y to select or de-select it.
3. When you have selected the desired parameters, press N to view the Customized Data List.

   Custom Data List selections are retained in the Scanner™ memory until you do one of the following:

- Identify a new vehicle.
- Pick SELECT ALL from the CUSTOM DATA LIST.
- Identify a new control system from the SYSTEM LIST Menu.

Data Exit Menu

Pressing N while in either Data mode displays the Data Exit menu (Figure 3-28). Exit options vary depending on whether you selected the Exit menu from the FAST or MOVIE viewing mode list.

```
>RESUME
 PRINT SCREEN
 PRINT FRAME          FIX LINE 1
 ARM MOVIE            RELEASE LINE 1
```

Figure 3-28 *Sample Data Exit menu*

Resume

Selecting RESUME returns you to the screen from which you exited.

Print Options

The Scanner™ gives you two choices for printing data:

- PRINT SCREEN lets you print any 4-line display of data or codes.
- PRINT FRAME lets you print one complete frame, or data transmission cycle, from the vehicle ECU, including any codes that may be present.

You can print either a screen or a frame in two different forms:

- If a frame was held when you exited from the data viewing mode, printing a screen prints the last four lines and the exact data values that you saw before exiting. Printing a frame prints the complete frame that was held when you exited. You get what you last saw.
- If a frame was not held before exiting, the Scanner™ continues to receive ECU data transmissions in the background and updates its data readings. If you print either a screen or a frame without a frame being held, you get the most current readings received by the Scanner™. If you print a screen, you get the last four lines that you viewed, but the data numerical values or trouble codes may have changed since you viewed the lines. You may not get what you last saw.

The Scanner™ must be connected to the printer with one of the optional communication cables. Refer to “Appendix A Printer and Remote Terminal Setup” on page 151 for information on setting printer switch positions.

When you select PRINT SCREEN or PRINT FRAME from the Exit menu after connecting the printer and ensuring that communication is set correctly, printing begins, and the Scanner™ displays the following (Figure 3-29).

```
PRINTING.                          WAIT.
PRESS N TO ABORT PRINTING.
```

Figure 3-29 *Printing in Process screen*

When printing is complete, the Scanner™ automatically returns to the Exit menu. If you press N to abort the printing, the Scanner™ returns to the Exit menu before printing is complete.

NOTE:
A movie printout includes the vehicle identification, though a movie display does not.

If the printer does not respond or fails during printing, the Scanner™ displays this additional message on lines 3 and 4 (Figure 3-30).

```
PRINTING.                           WAIT.
PRESS N TO ABORT PRINTING.
PRINTER NOT RESPONDING. CHECK PRINTER.
CHECK PRINTER PAPER.
```

Figure 3-30 *Printer Not Responding screen*

If you correct the printer problem, or if the printer recovers, the Scanner™ returns to the normal printing display. Lines 3 and 4 clear automatically, and the printer resumes printing.

Arm Movie (Recording a Movie)

Before you can record a movie, you must first select MOVIE from the DATA Menu (see "Movie Mode" on page 17). Use the following procedure to arm the Y button as a trigger to record a movie.

To arm the Y button as a trigger to record a movie:

1. While viewing data in MOVIE mode, press N.

   An exit menu displays (Figure 3-31).

```
>RESUME
 PRINT SCREEN
 PRINT FRAME
 ARM MOVIE
```

Figure 3-31 *Sample exit menu*

2. Scroll to ARM MOVIE and press Y.

   The Scanner™ displays the following message (Figure 3-32).

```
PRESS Y TO CLEAR MOVIE MEMORY AND ARM
MOVIE TRIGGER. FRAME NUMBERS WILL
APPEAR ON C&D SCREEN AFTER MOVIE IS
TRIGGERED.
```

Figure 3-32 *Arm Movie message*

3. Press Y to erase any previous movie stored in Scanner™ memory and arm the Y button to trigger a new movie.

   The Scanner™ automatically returns to the previously selected data mode and arm appears at the left side of the top line (Figure 3-33).

```
arm SELF-ADAPT. CTP(IDLE) LEFT(ms)__X.XX
SELF ADAPT CTP(IDLE) RIGHT(ms)______X.XX
SELF ADAPT.PART. LOAD FACTOR LEFT___X.XX
SELF ADAPT.PART. LOAD FACTOR RIGHT__X.XX
```

Figure 3-33 *Sample data display with Y button armed*

Pressing N aborts the ARM MOVIE selection and returns to the Exit menu. If a previous movie was recorded, it is erased.

Fix (Release) Line 1, 2 or 3 Options

This option allows you to change the way the Scanner™ behaves when displaying the Data List. “Fixing” a line holds it in the same displayed position as you scroll the other parameters in the data list. “Releasing” a line frees it to scroll with the other data parameters.

Mode title lines, diagnostic trouble code lines, and blank lines cannot be fixed. If any of these items are on line 1, 2, or 3, the fix-line option for that line does not appear on the Data Exit menu.

Fixed lines remain fixed as the various menu selections are entered and exited. Line selections must be released or changed through the Data Exit menu. Line selections are retained in Scanner™ memory unless the vehicle transmits different data streams or until you enter a new vehicle identification. When you identify a new vehicle, the Scanner™ automatically releases any fixed lines.

To fix or release a line:

1. After scrolling the desired line into line 1, press **N**.

   If neither lines 1, 2, or 3 are fixed, the Scanner™ displays the following Data Exit menu (Figure 3-34).

```
RESUME
PRINT SCREEN
PRINT FRAME          >FIX LINE 1
ARM MOVIE
```

Figure 3-34 *Sample Data exit menu*

2. Scroll so that the cursor points to FIX LINE 1 and press **Y**.

   The Scanner™ automatically returns to the data display. The next time the Data Exit menu is entered, the FIX/RELEASE selections have changed (Figure 3-35).

```
RESUME
PRINT SCREEN
PRINT FRAME          >FIX LINE 2
ARM MOVIE             RELEASE LINE 1
```

Figure 3-35 *Sample Data exit menu*

3. Scroll to FIX LINE 2 and press **Y**.

   The Scanner™ automatically returns to the previous data mode. If both lines 1 and 2 are fixed, the selections are RELEASE LINE 2 and FIX LINE 3.

4. Scroll to FIX LINE 3 and press **Y**.

   Again, the Scanner™ automatically returns to the previous data mode. With three lines fixed, the only option is RELEASE LINE 3 (Figure 3-36).

```
 RESUME
 PRINT SCREEN
 PRINT FRAME
 ARM MOVIE          >RELEASE LINE 3
```

Figure 3-36 *Sample Data exit menu*

5. Press Y to release line 3.

   Line 3 must be released before line 2 can be released, and line 2 must be released before line 1 can be released. If all lines are released, the Exit menu will return to its original appearance.

3.5.2 Custom Setup

The CUSTOM SETUP selection allows you to change Scanner™ operating functions. When any CUSTOM SETUP selection appears on the menu (Figure 3-37), it always operates the same way.

```
CUSTOM SETUP
>COMMUNICATION       LEFT/RIGHT HAND
 ENGLISH/METRIC
 BACKLIGHT CONTROL   LCD SELECTION
```

Figure 3-37 *Sample Custom Setup menu*

The Custom Setup menu may include the following selections:

- COMMUNICATION
- ENGLISH/METRIC
- BACK LIGHT CONTROL (with Power Pac only)
- LEFT/RIGHT HAND
- PRINTER
- LCD SELECTION

Communication

The COMMUNICATION selection sets the operating conditions for the Scanner™ to transmit data to a printer or to another auxiliary device, such as a computer terminal. Selecting COMMUNICATION displays a screen similar to Figure 3-38.

```
COMMUNICATION:
 2400 BAUD (PRINTER ONLY)
 4800 BAUD
>9600 BAUD           19200 BAUD
```

Figure 3-38 *Sample Communication menu*

The baud rate is the speed at which the Scanner™ transmits data to another device.

The communication setting will remain in memory as long as the 9-volt internal battery of the Scanner™ has an adequate charge.

Interrupting the power supply from the internal battery causes the communication setting to return to the default.

```
COMMUNICATION:
>2400 BAUD (PRINTER ONLY)
 4800 BAUD
 9600 BAUD           19200 BAUD
```

Figure 3-39 *Sample Communication menu*

To select a new baud rate for Scanner™ communication:

1. Scroll to a new selection and press Y to change the setting.

   If N is pressed at any point in the Communication Setup menu, the Scanner™ returns to the Custom Setup menu and the setting remains unchanged.

English/Metric

The ENGLISH/METRIC selection from the Custom Setup menu allows you to choose whether to display certain data parameters in English or metric units (Figure 3-40).

```
ENGLISH/METRIC

>TEMPERATURE   [ °F] AIR PRESSURE["Hg]
 VEHICLE SPEED [MpH] OTHER PRESSURE [psi]
```

Figure 3-40 *Sample English/Metric menu*

All units remain as you select them as long as the Scanner™ battery is alive. When you change the battery, the measurement units return to their default values.

See Table 3-6 for default and optional settings.

Table 3-6 *Default and optional measurement settings*

SETTING	DEFAULT	OPTION
Temperature	degrees Celsius (°C)	degrees Fahrenheit (°F)
Air Pressure (including manifold pressure)	kilopascals (kPa)	inches of mercury (“Hg)
Speed	miles per hour (MPH)	kilometers per hour (KPH)
Other Pressures	pounds per square inch (psi)	kilopascals (kPa)

To display English or metric units:

1. Scroll to the parameter that needs to be changed.

   The current setting is shown in brackets.

2. Press Y to change back and forth between English and metric units.

Backlight Control

The BACKLIGHT CONTROL selection from the Custom Setup menu allows the setting of the automatic shut-off time for the Scanner™ back light, when operated with the Power Pac. Selecting BACKLIGHT CONTROL displays a screen similar to Figure 3-41.

```
WITH VEHICLE POWER, BACKLIGHT IS ALWAYS
ON. WITH POWER PAC, PRESS & HOLD 'N'
ANYTIME FOR 4 SECONDS TO TURN ON OR OFF.
FOR AUTO SHUTOFF SELECTIONS, PRESS Y.
```

Figure 3-41 *Backlight Control instruction screen*

This screen displays the basic operating instructions for the Scanner™ backlight. When the Scanner™ is connected to vehicle power, the backlight is always on.

When the Scanner™ is powered by the Power Pac, the backlight can be turned on and off by pressing and holding the N button for four seconds. To conserve Power Pac battery power, the Scanner™ can be set up to automatically shut off the backlight during periods of Scanner™ inactivity.

To access the auto shut-off features:

1. Press Y from the instruction screen and the Scanner™ displays the Auto Shutoff Selections menu (Figure 3-42).

```
AUTO SHUTOFF SELECTIONS (POWER PAC ONLY)
 TURN OFF AFTER 2 MINUTES OF INACTIVITY.
 TURN OFF AFTER 5 MINUTES OF INACTIVITY.
>DON'T AUTOMATICALLY TURN OFF BACK-LIGHT.
```

Figure 3-42 *Sample Auto Shutoff Selections menu*

2. Scroll to the desired automatic shut-off feature and press Y.

Left/Right Hand Steering Column

Use the LEFT/RIGHT HAND selection to identify the vehicle as having a left-hand mounted steering column or a right-hand mounted steering column. The Scanner™ needs to have the correct steering wheel position option selected in order to display the correct on-car diagnostic connector location screen. When identifying a vehicle, always select the steering column position before entering model, engine, year, and system.

NOTE:
The LEFT/RIGHT HAND selection is not available after identifying a vehicle, only from the Mode Selection menu (see Figure 3-2 on page 7).

Selecting LEFT/RIGHT HAND displays a screen similar to Figure 3-43.

```
LEFT/RIGHT HAND

>STEERING WHEEL [LEFT HAND]
```

Figure 3-43 *Sample Left/Right Hand screen*

To select a left-hand or right-hand steering column:

- Press Y to toggle from LEFT HAND to RIGHT HAND. Press N when the Scanner™ displays the correct steering column position.

Printer

Use the PRINTER selection to set up the Scanner™ to use a different printer. Selecting PRINTER from the Custom Setup menu displays the following printer choices (Figure 3-44).

```
PRINTER
>GENERIC
 DPU-411
 DP1014 (ESCPOS EMULATION)
```

Figure 3-44 *Sample Printer menu*

NOTE:
The PRINTER selection is only available from the Custom Setup menu selected from the Main Menu, not from the Mode Selection menu (Figure 3-2 on page 7).

Currently, the Scanner™ supports two specific printers, the DPU-411 and the DP1014. If another printer is used, select GENERIC, however not all special characters may print out correctly. When using the DP1014 printer, ensure that the printer is set to “ESCPOS Emulation” mode. Refer to the DP1014 Printer Manual for more information.

LCD Selection

LCD SELECTION ensures that the Scanner™ uses the correct screen character set. Selecting LCD SELECTION from the Custom Setup menu displays one of the two following screens (Figure 3-45 and Figure 3-46).

```
LCD [ORIGINAL] :'unox'='unox'
ARE THE 4 CHARACTERS ON THE LEFT SIDE
ALMOST SIMILAR TO THE 4 ON THE RIGHT ?
PRESS Y OR N.
```

Figure 3-45 *Sample LCD Selection screen 1*

```
LCD [ORIGINAL]: '0123'='0123'
ARE THE 4 CHARACTERS ON THE LEFT SIDE
ALMOST SIMILAR TO THE 4 ON THE RIGHT ?
PRESS Y OR N.
```

Figure 3-46 *Sample Selection screen 2*

3.5.3 Functional Tests

Selecting FUNCTIONAL TESTS from the Main Menu displays a menu like the following, depending on the vehicle identified (Figure 3-47).

```
FUNCTIONAL TESTS
>REVIEW ECU ID
 REVIEW CODING       REPLACE ECU
 ACTUATOR TESTS
```

Figure 3-47 *Sample Functional Tests menu*

Each selection allows you to activate and test various components and systems of the engine management system.

Review ECU ID

This test displays ECU identification information. Selecting REVIEW ECU ID and pressing Y displays a screen similar to Figure 3-48.

```
CONTROL MODULE    :ME2.0
SUPPLIER          :Bosch
MB NUMBER         :0235459732
DIAGNOSTIC VERSION:1/00
```

Figure 3-48 *Sample Review ECU ID screen*

The display may take more than four lines. Scroll to be sure you can read the complete test results.

Review Coding

This test displays the preprogrammed VIN number and other relevant information. Selecting REVIEW CODING displays a screen similar to Figure 3-49.

```
VIN                 :000043MB541326
CODE UNIT NUMBER    :000433
MODEL CONTROL NUMBER:-------
FIRMWARE VERSION    :6360U039 32 2002
```

Figure 3-49 *Sample Review Coding screen*

Replace ECU

Replace ECU automatically transfers the version coding from the old ECU to the new replacement unit. Note that the transfer only works if the old ECU data can be read. If the old ECU is bad, the new ECU will need to be manually version-coded with the information obtained using the VIN from the dealer or factory parts department. The Scanner™ currently does not perform manual version coding.

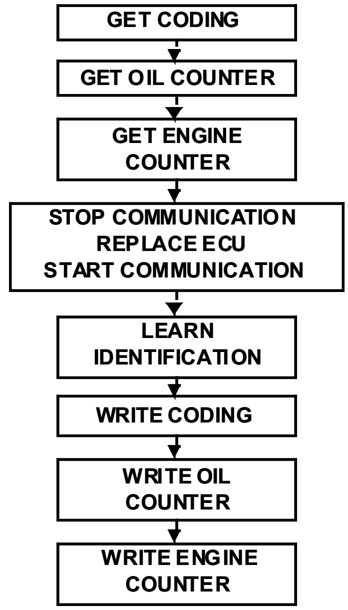

Figure 3-50 *ECU replacement flow chart*

NOTE:
Perform this test only when you are ready to replace the ECU. Do not perform this procedure unless you plan to replace the existing ECU with a new one.

To replace the ECU:

1. From the FUNCTIONAL TESTS, select REPLACE ECU and press Y.

   The Scanner™ displays a screen similar to Figure 3-51.

```
WHEN ANY ACTUATOR TEST CAUSES THE ENGINE
TO STALL, PLEASE RE-ENTER THE ACTUATOR
TESTS FROM THE FUNCTIONAL TEST MENU.
PRESS Y TO CONTINUE.
```

Figure 3-51 *Sample Replace ECU screen*

2. Press Y and the Scanner™ directs you through several screens that copies the ECU version coding from the old ECU to Scanner™ memory.

   After you have replaced the old ECU with the new one, the Scanner™ prompts you to copy the stored information onto the newly installed ECU.
3. Carefully follow the instructions on the Scanner™ screen display.

ECU Reset

Engine and transmission systems have an ECU RESET function that clears the ECU adaptation learning memory back to the base or default settings. ECU reset also clears any stored DTCs and freeze frame data.

Use ECU reset after repairs to normalize the settings before roadtesting. This makes it easier to validate the repair, checking that the new adaptation values are within specification.

NOTE:
In LH and HFM DM modules, the ECU reset command clears stored DTCs and also resets all the stored and registered tests to "NO" or "NOT RUN."

The ECU RESET selection on the Functional Tests menu clears the adaptation memory for the following:

- Sensor Gear (see page 46)
- ME Fuel (current Scanner™ software clears ME 1.0/2.0 only)
- Throttle Actuator (relearn occurs at each Ignition on, key cycle)

Actuator Tests

Actuator tests command the ECU to activate components and systems, such as injectors, the throttle valve, adaptive strategy, or the fuel pump. The Scanner™ displays only those tests available to the identified vehicle and system (ECU).

For many components, you can conduct an auditory test—a relay clicks or a pump vibrates. Be aware that actuators can be mounted anywhere in the vehicle, such as under the dashboard, hood, or trunk.

If you hear no reaction where one is expected, test the actuator circuit with a digital multimeter or a digital graphing meter such as the Vantage® Meter. Use these instruments to confirm whether the ECU properly controls the component.

For more information about engine actuator tests, see page 44. For information about transmission actuator tests, see page 58.

3.5.4 Other Systems

The OTHER SYSTEMS selection on the MAIN MENU allows you to select a different system test without removing Scanner™ power (Figure 3-52).

```
MERCEDES, ME2        >OTHER SYSTEMS
 DATA                 CODES
 CUSTOM SETUP         REVIEW MOVIE
 FUNCTIONAL TESTS
```

Figure 3-52 *OTHER SYSTEMS selection on MAIN MENU*

To select a different system for testing:

1. Scroll to OTHER SYSTEMS and press Y.

   The Scanner™ displays the following message (Figure 3-53).

```
WARNING: SELECTING ANOTHER SYSTEM WILL
CAUSE ANY STORED INFORMATION TO BE LOST.
PRESS N TO RETURN TO PRESENTLY SELECTED
SYSTEM, OR Y TO SELECT DIFFERENT SYSTEM.
```

Figure 3-53 *Other Systems Instructions screen*

2. Press Y and the Scanner™ displays a SYSTEM LIST menu similar to (Figure 3-54).

```
SYSTEM LIST:
> DM      : DIAGNOSTIC MODULE(CA ONLY)
  HFM/ME2: SEQUENTIAL FUEL INJECTOR
```

Figure 3-54 *Sample System List menu*

3. If you would like to ID a new vehicle, keep pressing the N button until you reach the beginning of the vehicle ID process. See “Identifying the Vehicle” on page 5 for information.

   If you would like to test a different system on the same vehicle, proceed to the next step.
4. Scroll to the desired system and press **Y** to select.

3.5.5 Codes

Selecting CODES from the Main Menu displays a menu similar to the following on most cars (Figure 3-55).

```
CODES
>CURRENT CODES
 REGISTERED/IRREVERSIBLE CODES
 STORED CODES
```

Figure 3-55 *Sample Codes menu*

For the ECU to set any code, certain operating conditions must be met. See page 42 for detailed explanations of Current Codes, Registered/Irreversible Codes, Stored Codes, and CIS-E blink codes.

Select one of the code selections from the Codes Menu, and the Scanner™ displays any existing codes from the ECU “live.” This means that as the ECU sets or clears a code, the Scanner™ shows or removes that code from the screen almost instantaneously.

You can hold or release the display by pressing Y. This feature operates in the same manner as it does when displaying the Data List.

Codes Exit Menu

Press N to display the Codes Exit menu.

```
>RESUME
 PRINT CODES          CLEAR CODES
```

Figure 3-56 *Sample Codes Exit menu*

Code Exit menu selections work the same as Data Exit menu selections (see page 18) except for CLEAR CODES.

Clear Codes

This selection allows the Scanner™ to clear DTCs from the ECU memory.

NOTE:
See page 43 for instructions on clearing codes from CIS-E systems.

Note the following when clearing codes:

- For each system selected from the SYSTEM LIST, each code type must be read and cleared separately.
- On vehicles with V12 engines, select the right-side ECU from the SYSTEM LIST to display CLEAR CODES on the Code Exit menu.

To clear codes:

1. Scroll to CLEAR CODES and press Y.

   The Scanner™ displays messages guiding you through the code clearing process.
2. Press Y again, and the Scanner™ displays the following screen (Figure 3-57).

```
CLEAR CODES FROM ECU MEMORY:
ARE YOU SURE? PRESS Y OR N
```

Figure 3-57 *Clear Codes Confirmation screen*

3. Press Y again, and the Scanner™ displays a screen similar to Figure 3-58.

```
CLEAR CODES FROM ECU MEMORY:

SWITCH IGNITION OFF.
(IF NOT DETECTED BY SCANTOOL: PRESS YES)
```

Figure 3-58 *Clear Codes Instruction screen*

4. Press Y and the Scanner™ displays a screen similar to Figure 3-59.

```
CLEAR CODES FROM ECU MEMORY:

WAIT FOR (10) SECONDS.
```

Figure 3-59 *Clear Codes screen*

   The Scanner™ counts down from 10 to 1 seconds, and then re-displays the screen above with “SWITCH IGNITION OFF.” If the code-clearing operation fails, the Scanner™ re-displays the Code List with the previous codes.

3.6 Review Movie

REVIEW MOVIE appears as a MAIN MENU selection only if a movie has been recorded (Figure 3-60).

```
MERCEDES, ME2          OTHER SYSTEMS
 DATA                  CODES
 CUSTOM SETUP         >REVIEW MOVIE
 FUNCTIONAL TESTS
```

Figure 3-60 *REVIEW MOVIE selection on a MAIN MENU*

Subsequent movie recording or entering a new vehicle identification erases any previous movie. The number of data frames that the Scanner™ is able to record depends on the number of data parameters selected.

See “Arm Movie (Recording a Movie)” on page 20 for information about recording a movie.

To open a recorded movie:

1. Scroll to REVIEW MOVIE and press **Y**.

   The Scanner™ now displays the movie previously recorded in Data mode (Figure 3-61).

```
   0 CUSTOM DATALIST FOR FASTER REFRESH*
00523 INTAKE AIR TEMPERATURE SENSOR-G42
01247 EVAP CANP REGULATOR VALVE-N80
ENGINE SPEED(rpm)___________________2000
```

Figure 3-61 *Review Movie screen*

2. Scroll through the movie to review the recorded data (as when viewing live codes and data). These general rules apply:

- When review movie is selected, you always enter the movie at frame 0, the trigger point.
- When you enter the movie at frame 0, the **Thumbwheel** scrolls through lines of data for frame 0. The frame number stays fixed in the upper left corner.

  Press **Y** and the **Thumbwheel** operation switches to scroll frames. In this mode, the display moves forward or backward in time. The frame number in the upper left corner changes with each **Thumbwheel** turn. A positive number indicates a frame after the trigger (Figure 3-62).

```
   1 CUSTOM DATALIST FOR FASTER REFRESH*
00523 INTAKE AIR TEMPERATURE SENSOR-G42
01247 EVAP CANP REGULATOR VALVE-N80
ENGINE SPEED(rpm)___________________2000
```

Figure 3-62 *Movie frame after the trigger point*

A negative number indicates a frame before the trigger (Figure 3-63).

```
  -1 CUSTOM DATALIST FOR FASTER REFRESH*
00523 INTAKE AIR TEMPERATURE SENSOR-G42
01247 EVAP CANP REGULATOR VALVE-N80
ENGINE SPEED(rpm)___________________2000
```

Figure 3-63 *Movie frame before the trigger point*

Press **Y** to switch **Thumbwheel** function between scrolling frames to scrolling data within a frame.

- As you scroll from frame to frame, the data lines on the screen stay in the same position. Parameter names do not change, but readings may change because different values were recorded from frame to frame.
- As you scroll data lines within a frame, the **Thumbwheel** moves the lines from top to bottom within that frame. It does not roll over into an earlier or later frame.
- Lines may be fixed using the FIX LINE options on the Review Movie Exit menu. Fixed lines remain fixed during horizontal and vertical scrolling until released through the Review Movie Exit menu. See “Fix (Release) Line 1, 2 or 3 Options” on page 21.
- When you resume reviewing a movie, **Thumbwheel** scrolling operation stays in the condition last selected before exiting.
- Press **N** to exit from the movie at any time to open the Review Movie Exit menu. When you resume reviewing a movie from the Review Movie Exit menu, you continue from the last screen and frame viewed before you exited the movie.

3.6.1 Review Movie Exit Menu

When you press N to exit from REVIEW MOVIE, the Review Movie Exit menu displays (Figure 3-64).

```
>RESUME           LED MENU
 PRINT SCREEN
 PRINT FRAME
                [PRESS N FOR MAIN MENU]
```

Figure 3-64 *Review Movie Exit menu*

This menu is similar to the Codes or Data Exit menu, but ARM MOVIE, CLEAR CODES, and CUSTOM DATA LIST are not available. The menu choices listed above operate the same as the Codes or Data Exit menu selections. (See “Data Exit Menu” on page 18 for information about Review Movie Exit menu options not discussed in this section.)

3.6.2 Resume

RESUME returns you to the same frame and line position from which you exited. It does not return you to frame 0. Thumbwheel scrolling operation and fixed lines remain as you set them before exiting.

3.7 On-screen Help

Help messages are available from the Software Selection menu and from MAIN MENU screens. These messages explain basic Scanner™ operation and offer information about MAIN MENU selections.

To access on-screen help from the Software Selection menu:

1. Press **N** at the Software Selection menu (Figure 3-65).

```
>MERCEDES PRIMARY                    V 2.4

PRESS Y TO CONTINUE
PRESS N FOR HELP
```

Figure 3-65 *Sample Software Selection menu.*

A Help message appears on-screen (Figure 3-66).

```
INSERT CARTRIDGE ONLY WITH POWER OFF.
USE THUMBWHEEL TO POINT TO SELECTION OR
SCROLL MORE LINES ONTO SCREEN. PRESS Y
TO MAKE SELECTION. [SCROLL FOR MORE]
```

Figure 3-66 *On-screen help from Software Selection menu.*

2. Scroll to read the Help message.
3. Press **N** at the end to return to the vehicle identification steps.

To access on-screen help from a MAIN MENU:

1. Scroll so the cursor is pointing to a selection (Figure 3-67).

```
MERCEDES, ME2           OTHER SYSTEMS
>DATA                   CODES
 CUSTOM SETUP
 FUNCTIONAL TESTS
```

Figure 3-67 *Sample MAIN MENU*

2. Press **N**.
   A help message for that menu selection appears on the display (Figure 3-68).

```
DATA (FAST)/DATA (MOVIE) = SHOWS DATA
RETRIEVED FROM THE ELECTRONIC CONTROL
UNIT.
DATA (FAST) SHOWS SMALL SETS OF DATA
```

Figure 3-68 *On-screen help from MAIN MENU*

3. Press N to return to the MAIN MENU.

3.8 Scanner™ Demonstration Program

The Mercedes-Benz software cartridge contains programs that demonstrate test capabilities without connecting to a vehicle. The demonstration program can help you become familiar with Scanner™ menus and operation by providing mock data and test results for a sample vehicle ID.

The demonstration program is accessed at the vehicle identification phase of Scanner™ operations (Figure 3-69).

```
SCROLL TO SELECT:
 VEHICLE SELECTION
>DEMO MODE
 CUSTOM SETUP
```

Figure 3-69 *Menu to select VEHICLE SYSTEMS*

To access a demonstration:

1. Scroll to DEMO MODE and press Y.

   The following screen displays, prompting you to identify a vehicle with “DEMO” on line 1 (Figure 3-70).

```
MANUFACTURER      :*DEMO*MERCEDES
MODEL             :107     (SL-SERIES)
US VIN            :WDBB.............
INTERNATIONAL VIN:...107...........
```

Figure 3-70 *Sample demo vehicle ID screen*

2. Press Y to select the defaults until you come to the System Selection menu (Figure 3-71).

```
SYSTEM LIST
>CIS-E  : continuous fuel injection
```

Figure 3-71 *Demo System Selection menu*

You are now in demonstration mode.

Chapter 4 Testing

This chapter provides information and procedures for using the Scanner™ with specific control systems. The Scanner™ covers the following systems:

- Engine (gas)
  - CIS-E
  - LH
  - HFM
  - ME versions 1.0, 2.0, 2.1, 2.7, 2.7.1, 2.8
  - SIM4 & SIM4/LSE
  - PEC
  - MSM
  - MME
  - ME
  - DI
- Engine (diesel)
  - Anti-Jerk Control, Idle Speed Control (AJC/ISC, ELR)
  - Electronic Diesel System (EDS)
  - IFI/DFI/DSV
  - CDI
- Transmission (EAG, EGS, EGS5.2, KGS)
- Transfer Case (VG, VGS)
- Electronic Shift Control Module (EWM203, EWM210, EWM220)
- Airbag (ZAE, AB2, ARMIN, TAU)
- Climate Control (KLA, TAU)
- Diagnostic Module (DM)
- Distributor Ignition (DI, EZ)
- Electronic Actuator/Cruise Control/Idle Speed Control (EA/CC/ISC, ETL)
- Base Module (GM)
- Brake Systems (ABS, BAS, EHB)

See “Main Menu Selections” on page 15 for general Scanner™ testing information.

4.1 Testing Engine Systems

The Scanner™ currently communicates with the following 1988–2003 engine systems:

Gas engines:

- CIS-E (1988–92)—blink codes only
- LH-SFI (1992–96)

- HFM-SFI (1993–95)
- ME-SFI (1996–2003)—versions 1.0, 2.0, 2.1, 2.7, 2.7.5, 2.8
- SIM4 and SIM4/LSE (2001–03)

Diesel engines:

- Anti-Jerk Control/Idle Speed Control (AJC/ISC, ELR)
  - 1989: 201.126 chassis
- EDS diesel (1990–93)
  - 1990–91: 124.128, 126.134/135 chassis; 603.970 engine
  - 1992–93: 124.128, 140.134 chassis; 603.971 engine
- IFI diesel (IFI, DFI, DSV)
  - 1995–99: 210.020/025 chassis; 606.912/962 engines

Table 4-1 provides application coverage for U.S. Mercedes engines.

Table 4-1 *U.S. Mercedes engine application coverage (sheet 1 of 6)*

SERIES	MODEL	YEAR	CHASSIS #	ENGINE SIZE	ENGINE #	FUEL SYSTEM
124 E Class	300CE	1992	124.051	3.0L L6	104.980	CFI (CIS-E)
		1993	124.052	3.2L L6	104.992	HFM
	300CE Cabriolet	1993	124.066			
	300D 2.5 Turbo	1992–93	124.128	2.5L L5	602.962	Diesel
	300E 2.6	1992	124.026	2.6L L6	103.940	CFI (CIS-E)
	300E	1992	124.030	3.0L L6	103.983	
		1993	124.032	3.2L L6	104.992	HFM
	300E 2.8	1993	124.028	2.8L L6	104.942	
	300E 4MATIC	1992–93	124.230	3.0L L6	103.985	CFI (CIS-E)
	300TE	1992	124.090	3.0L L6	103.983	
		1993	124.092	3.2L L6	104.992	HFM
	300TE 4MATIC	1993	124.290	3.0L L6	103.985	CFI (CIS-E)
	400E	1992–95	124.034	4.2L V8	119.975	LH
	500E	1992–94	124.036	5.0L V8	119.974	
	500TE 4MATIC	1992–93	124.290	3.0L L6	103.985	CFI (CIS-E)
	E300 Diesel	1995	124.131	3.0L L6	606.910	Diesel
	E320	1994–95	124.032 124.052 124.066 124.092	3.2L L6	104.992	HFM
	E420	1994–95	124.034	4.2L V8	119.975	LH
	E500	1994	124.036	5.0L V8	119.974	

Table 4-1 *U.S. Mercedes engine application coverage (sheet 2 of 6)*

SERIES	MODEL	YEAR	CHASSIS #	ENGINE SIZE	ENGINE #	FUEL SYSTEM
129 SL Class	300SL	1992–93	129.061	3.0L L6	104.981	CFI (CIS-E)
	500SL	1992	129.066	5.0L V8	119.960	
		1993	129.067	5.0L V8	119.972	LH
	600SL	1993	129.073	6.0L V12	120.981	LH1/LH2
	SL320	1994–95	129.063	3.2L L6	104.991	HFM
		1996	129.063	3.2L L6	104.991	HFM or ME 2.1 (8/96)
		1997	129.063	3.2L L6	104.991	ME 2.1
	SL500	1994–95	129.067	5.0L V8	119.972	LH
		1996–98	129.067	5.0L V8	119.982	ME 1.0
		1999–2002	129.068	5.0L V8	113.961	ME 2.0
	SL600	1994–95	129.076	6.0L V12	120.981	LH1/LH2
		1996–2002	129.076	6.0L V12	120.983	ME 1.0 L&R
140 S Class	300SD	1992–93	140.134	3.5L L6	603.971	Diesel
	300SE	1992–93	140.032	3.2L L6	104.990	LH
	400SE	1992	140.042	4.2L V8	119.971	
	400SEL	1993	140.043			
	500SEC	1993	140.070	5.0L V8	119.770	
	500SEL	1992–93	140.051	5.0L V8	119.970	
	600SEC	1993	140.076	6.0L V12	120.980	LH1/LH2
	600SEL	1992–93	140.057	6.0L V12	120.980	LH (L&R)
	CL 500 Coupe	1997–99	140.070	5.0L V8	119.980	ME 1.0
	CL 600 Coupe	1997–99	140.076	6.0L V12	120.982	ME 1.0 L&R
	S320	1994	140.032	3.2L L6	104.994	LH
		1995	140.032 140.033	3.2L L6	104.994	HFM
		1996	140.032	3.2L L6	104.994	HFM or ME 2.1 (8/96)
		1997–98	140.032	3.2L L6	104.994	ME 2.1
		1999	140.032 140.033			

Table 4-1 *U.S. Mercedes engine application coverage (sheet 3 of 6)*

SERIES	MODEL	YEAR	CHASSIS #	ENGINE SIZE	ENGINE #	FUEL SYSTEM
140 S Class (cont)	S320 Long Sedan	1996	140.033	3.2L L6	104.994	HFM or ME 2.1 (8/96)
		1997–98	140.033	3.2L L6	104.994	ME 2.1
	S350 Turbo	1994–95	140.134	3.5L L6	603.971	Diesel
	S420	1994–95	140.043	4.3L V8	119.971	LH
		1999	140.043	4.2L V8	119.981	ME 1.0
	S420 Long Sedan	1996	140.043	4.2L V8	119.981	ME 1.0 (9/95)
		1997–98	140.043	4.2L V8	119.981	ME 1.0
	S500	1994–95	140.051 140.070	5.0L V8	119.970	LH
		1999	140.051	5.0L V8	119.980	ME 1.0
	S500 Coupe	1996	140.070	5.0L V8	119.980	ME 1.0 (9/95)
	S500 Long Sedan	1996	140.051			
		1997–98	140.051	5.0L V8	119.980	ME 1.0
	S600	1994–95	140.057 140.076	6.0L V12	120.980	LH1/LH2
		1999	140.057	6.0L V12	120.982	ME 1.0 L&R
	S600 Coupe	1996	140.076	6.0L V12	120.982	ME 1.0 L&R (4/95)
	S600 Long Sedan	1996	140.057			
		1997–98	140.057	6.0L V12	120.982	ME 1.0 L&R
163 M Class	ML320	1998–2000	163.154	3.2L V6	112.942	ME 2.0
		6/2000–02	163.154	3.2L V6	112.942	ME 2.8
	ML350 light truck	2003	163.157	3.7L V6	112.970	
	ML430	1999–2000	163.172	4.3L V8	113.942	ME 2.0
		6/2000	163.172	4.3L V8	113.942	ME 2.8
	ML55 AMG	2000–01	163.174	5.5L V8	113.986	
		2002	163.174	5.5L V8	113.981	
	ML500 light truck	2002–03	163.175	5.0L V8	113.965	
170 SLK Class	SLK 230	1998–99	170.447	2.3L	111.973	ME 2.1
		3/2000	170.447	2.3L	111.973	SIM4
	SLK 230 Roadster	2001–03	170.449	2.3L	111.983	
	SLK 32 AMG Komp	2002–03	170.466	3.2L V6	112.960	ME 2.8
	SLK 320	2001–03	170.465	3.2L V6	112.947	
201	190E 2.3	1992–93	201.028	2.3L L4	102.985	CFI (CIS-E)
	190E 2.6	1992–93	201.029	2.6L L6	103.942	

Table 4-1 *U.S. Mercedes engine application coverage (sheet 4 of 6)*

SERIES	MODEL	YEAR	CHASSIS #	ENGINE SIZE	ENGINE #	FUEL SYSTEM
202 C Class	C220	1994–96	202.022	2.2L L4	111.961	HFM
	C230 Kompressor	1999–2000	202.024	2.3L L4	111.975	ME 2.1
	C230 Sedan	1997–98	202.023	2.3L L4	111.974	
		1999	202.029	2.8L V6	112.920	ME 2.0
	C280	1994–95	202.028	2.8L L6	104.941	HFM
		1996	202.028	2.8L L6	104.941	HFM or ME 2.1 (8/96)
		1998–2000	202.029	2.8L V6	112.920	ME 2.0
	C280 Sedan	1997	202.028	2.8L L6	104.941	ME 2.1
		1998	202.029	2.8L L6	112.920	ME 2.0
	C36 AMG	1996	202.028	3.6L L6 AMG	104.941	
	C36 Sedan	1997	202.028	3.6L L6	104.941	ME 2.1
	C43	1998–2000	202.033	4.3L V8	113.944	ME 2.0
203 C Class	C230 Kompressor Sport Coupe & Sport Sedan	2003	203.740	1.8L	271.948	SIM4
208 CLK Class	C240 Sedan	2001–03	203.061	2.6L V6	112.912	ME 2.8
	C240 Sedan 4MATIC	2003	203.081	2.6L V6	112.916	
	C240 Sport Wagon	2003	203.261	2.6L V6	112.912	
	C240 Sport Wagon 4MATIC	2003	203.281	2.6L V6	112.916	
	C32 AMG Kompressor	2002–03	203.065	3.2L V6	112.961	
	C320 Coupe	2001–03	203.064	3.2L V6	112.946	
	C320 Sedan					
	C320 Sedan 4MATIC	2003	203.084	3.2L V6	112.953	
	C320 Sport Wagon 4MATIC	2003	203.284			
	CLK 320 Coupe	1998–2000	208.365	3.2L V6	112.940	ME 2.0
		6/2000–02	208.365	3.2L V6	112.940	ME 2.8
	CLK 320 Cabriolet	1997–2000	208.465	3.2L V6	112.940	ME 2.0
		6/2000–03	208.465	3.2L V6	112.940	ME 2.8
	CLK 320 Convertible	1999	208.465	3.2L V6	112.940	ME 2.0
	CLK 430	1997–2000	208.370	4.3L V8	113.943.	
		6/2000–02	208.370	4.3L V8	113.943.	ME 2.8
	CLK 430 Cabriolet	2000	208.470	4.3L V8	113.943.	ME 2.0
		6/2000–03	208.470	4.3L V8	113.943.	ME 2.8
	CLK55 AMG Coupe	2002–03	208.374	5.5L V8	113.984	
	CLK55 AMG Cabriolet	2002	208.474	5.5L V8		

Table 4-1 *U.S. Mercedes engine application coverage (sheet 5 of 6)*

SERIES	MODEL	YEAR	CHASSIS #	ENGINE SIZE	ENGINE #	FUEL SYSTEM
209 CLK Class	CLK 320	2003	209.365	3.2L V6	112.946	ME 2.8
	CLK 500 Coupe	2003	209.375	5.0L V8	113.968	
210 E Class	E300 Diesel Sedan	1997	210.020	3.0L L6	606.912	Diesel (IFI)
	E300 Turbo Diesel	1999	210.025	3.0L L6	606.962	
	E320	1996	210.065	3.2L V6	104.995	HFM
		1997	210.065	3.2L V6	104.995	ME 2.1
		1998–2000	210.065	3.2L V6	112.941	ME 2.0
		6/2000–03	210.065	3.2L V6	112.941	ME 2.8
	E320 Sedan	1997	210.055	3.2L L6	104.995	ME 2.1
	E320 Sedan 4MATIC	1998–2000	210.082	3.2L V6	112.941	ME 2.0
		6/2000–03	210.082	3.2L V6	112.941	ME 2.8
	E320 Wagon	1998–2000	210.265	3.2L V6	112.941	ME 2.0
		6/2000–03	210.265	3.2L V6	112.941	ME 2.8
	E320 Wagon 4MATIC	1998–2000	210.282	3.2L V6	112.941	ME 2.0
		6/2000–03	210.282	3.2L V6	112.941	ME 2.8
	E420 Sedan	1997	210.072	4.2L V8	119.985	ME 1.0
	E430	1998–2002	210.070	4.3L V8	113.940	ME 2.0
	E430 4MATIC	2000–02	210.083	4.3L V8		
	E55	1999–2002	210.074	5.5L V8	113.980	
211 E Class	E320	2003	211.065	3.2L V6	112.949	ME 2.8
	E500 Sedan		211.070	5.0L V8	113.967	
215 CL Class	CL55 AMG Komp	2002	215.373	5.5L V12	113.982	ME 2.7
		2003	215.374	5.5L V12	113.986	
	CL500 Coupe	2000	215.375	5.0L V8	113.960	ME 2.0
		6/2000–03	215.375	5.0L V8	113.960	ME 2.8
	CL600	2001–02	215.378	6.0L V12	137.970	ME 2.7
	CL600 Bi-turbo	2003	215.376	5.5L V12	275.950	
220 S Class	S430	2000	220.170	4.3L V8	113.941	ME 2.0
		6/2000–03	220.170	4.3L V8	113.941	ME 2.8
	S430 Sedan 4MATIC	2003	220.183	4.3L V8	113.948	
	S55 AMG	2001	220.173	5.5L V8	113.986	
	S55 AMG Komp	2001–02	220.173	5.5L V8	113.982	
		2003	220.174	5.5L V8	113.991	
	S500	2000	220.175	5.0L V8	113.960	ME 2.0
		6/2000–03	220.175	5.0L V8	113.960	ME 2.8
	S500 (S Class Guard)	2001–03	220.175	5.0L V8		
	S500 Sedan 4MATIC	2003	220.184	5.0L V8	113.966	
	S600	2001	220.178	6.0L V12	137.970	ME 2.7
	S600 Bi-turbo	2003	220.176	5.5L V12	275.950	ME 2.7.1

Table 4-1 *U.S. Mercedes engine application coverage (sheet 6 of 6)*

SERIES	MODEL	YEAR	CHASSIS #	ENGINE SIZE	ENGINE #	FUEL SYSTEM
230 SL Class	SL55 AMG	2003	230.474	5.5L V8	137.992	ME 2.8
	SL500 Roadster	2003	230.475	5.0L V8	113.963	
463 G Class	G55 AMG	2003	463.246	5.5 V8	113.982	
	G500 light truck	2002–03	463.249	5.0 V8	113.962	

4.1.1 Note the following when testing engine systems:

- The Scanner™ reads codes and data from the those cars with the 38-pin connector or some early LH/HFM blink code only systems using the 16-pin connector.
- Blink codes are only available on the CIS-E engine system which uses either a rectangular 8- or 16-pin underhood connector.
- All Mercedes CIS-E engine systems use an analog computer which outputs blink codes only (no data).
- For OBD-I (1988–95), only California emission equipped vehicles have a Check Engine Light.
- Some Federal emission equipped CIS-E and early LH/HFM vehicles may store codes or have an “ON/OFF Duty Ratio Test” which displays current faults using a specific duty cycle percent.

4.1.2 Engine System Trouble Codes

The manner in which trouble codes are set, labeled, and then stored varies by engine management system. The Scanner™ displays digital trouble code information from the following engine management systems:

- LH (Hot Wire Mass Air Flow) contains the following sub-system ECUs:
  - DI (Distributor Ignition, also called “EZ”)
  - EA/CC/ISC (Electronic Actuator/Cruise Control/Idle Speed Control)
  - DM (Diagnostic Module)
  - BM (Base Module)
- HFM (Hot Film Mass Air Flow) contains the following sub-system ECUs:
  - CC/ISC
  - EA/CC/ISC
  - DM (Diagnostic Module)
- ME (Motor Electronics uses multi-input torque control) contains no sub-system ECUs—functions are integrated into the ME ECU.

Note the following when reading engine system trouble codes:

- LH and HFM systems use a separate diagnostic control monitor called the DM module. The DM also controls the Check Engine Light which is only used on California emission equipped vehicles. Federal emission equipped LH and HFM vehicles do not have a

Check Engine Light or a DM module, but are installed with trouble code capability in the LH or HFM control modules as well as other system modules.

- The LH and HFM systems on California vehicles may set codes which turn the Check Engine Light on. The code information from the LH or HFM control unit is communicated on the CAN bus to the DM control unit which then turns on the Check Engine Light. Each system control unit can set codes separate from the DM and not all codes will turn the Check Engine Light on. Always interrogate each module separately for code reading and clearing. This is also true for Federal emission equipped vehicles.
- Trouble Codes generated in one system can also set trouble codes in other systems. For example, a problem in the ASR (traction control system) turns on the ASR light but may also set codes in the engine ECU, turning on the Check Engine Light (MIL). An ASR problem can also cause Limp Home operation (limited RPM and throttle response).
- For each system selected from the SYSTEM LIST, each code type must be read and cleared separately.
- The HFM and LH systems may cause false codes to display on the Scanner™ during KOEO. These codes will usually refer to components not installed on the vehicle

DM, LH, HFM, and DI systems use the following trouble code categories:

- Current codes
- Registered/irreversible (pending) codes
- Stored codes
- CIS-E blink codes

Current Codes

Current codes represent problems that are presently occurring. These codes will appear and disappear as the problems appear and disappear (intermittent problems).

Registered/Irreversible (Pending) Codes

Registered/Irreversible codes will be set at the same time the current code is set and will remain set until the ignition is switched off. When a registered or irreversible code is set at the time the ignition is switched off, a counter is incremented. On the next key cycle, if the problem does not re-occur, the counter is decremented. The problem type, severity, and affected components determine the number of times the problem has to occur, the conditions that must be met, and if and when the Check Engine Light turns on.

Stored Codes

NOTE:
Stored codes are the only codes that can be cleared with the Scanner™.

If the registered/irreversible or pending code counter is incremented meeting the code setting criteria, then a stored code is set. Depending on the problem, a stored engine management code also turns the check engine light on. Usually the code will automatically clear after 40 engine starts if the problem does not re-occur.

CIS-E Blink Codes

Blink Code diagnostics started in approximately 1988. Only 1988–95 California emission-equipped vehicles have a Check Engine Light. Early blink code systems (1988–93) may also use an analog test mode called ON/OFF Ratio that outputs a duty cycle specific to a current or stored fault (most do not store faults). Increments of 10–90% indicate specific problem areas.

The Scanner™ or a multimeter, such as the Vantage® power graphing meter, can be used to read duty cycle output. Be aware that some duty ratio systems with a diagnostic LED readout connector (8- or 16-pin) may not output until a special Check mode is activated. This special mode is activated by pressing the button on the diagnostic connector which activates the LED to flash any stored trouble codes for two seconds. The system switches to Check mode after the last code has output.

Multiple control unit blink code access for vehicles using the 16-pin connector started in approximately 1990. For example, the CIS-E MAS module, controlling fuel pump relay, oxygen sensor heater relay, and AC relay has its own connector pin for accessing DTCs separate from the main engine computer.

Some of these systems may have blink code capability which the Scanner™ currently does not read. However, an impulse tester or LED test light may be available to read these systems.

To read blink codes on CIS-E systems:

1. Select CODES from the MAIN MENU. The Scanner™ displays a screen similar to Figure 4-1.

```
READING AND CLEARING CODES CAN TAKE
SEVERAL MINUTES. THIS DEPENDS ON THE
NUMBER OF CODES PRESENT IN THE CAR.
PRESS Y TO CONTINUE.
```

Figure 4-1 *Sample Codes message*

2. Press Y and the Scanner™ directs you to the screen to read the codes.

To clear codes on CIS-E systems:

1. Select CODES from the MAIN MENU.
   The Scanner™ displays a screen similar to Figure 4-2.

```
READING AND CLEARING CODES CAN TAKE
SEVERAL MINUTES. THIS DEPENDS ON THE
NUMBER OF CODES PRESENT IN THE CAR.
PRESS Y TO CONTINUE.
```

Figure 4-2 *CIS-E system code clearing screen*

2. Press Y and the Scanner™ directs you to the screen to clear the codes.

4.1.3 Actuator Tests

For a general description of Scanner™ actuator tests, see “Actuator Tests” on page 28.

Note the following when performing engine actuator tests:

- Before performing an actuator test on a component, physically check whether the component is installed on the vehicle.
- Before selecting any actuator test, turn the ignition key to the ON position. The Scanner™ cannot run the actuator test if you do not switch the ignition fully OFF to the LOCKED position, and then, when instructed, to the fully ON or START position.
- On vehicles equipped with the V12 engine, you may not find all available Actuator Tests in the Functional Tests menu for either the Left or Right side engine system. If the desired actuator test is not available on one engine side, then select the other.
- Performing actuator tests may clear any stored diagnostic trouble codes (DTCs). Always check for DTCs before performing actuator tests. Also, a DTC for a current problem may prevent certain actuator tests.
- Actuator tests for ME 2.7, ME 2.7.5, ME 2.8, SIM4, or SIM4/LSE and 2000–01 model year vehicles with ME2.7, ME2.8, or SIM4 systems are not available.
- Actuator tests can set false codes.
- Actuator tests can make the car not start if it stalls during a test (turn the ignition off for 10 seconds to rectify). If the key is not turned OFF fully before turning to the ON position, actuator tests usually will not work properly.

The Scanner™ actuator tests can include the following actuator tests depending on the engine system:

- CAMSHAFT
- AIR PUMP
- INJECTORS
- THROTTLE VALVE
- FUEL PUMP
- PURGE ALL
- CHARCOAL CANISTER SHUT-OFF VALVE
- EGR
- MIXTURE ADAPTATION
- ELECTRIC COOLING FAN
- SUPERCHARGER CLUTCH
- AIR FLAP
- INTAKE MANIFOLD
- EXHAUST FLAP

Example: Fuel Trim Actuator Test

An example of an actuator test procedure is FUEL TRIM. Selecting ACTUATOR TESTS from the FUNCTIONAL TESTS Menu displays the following instructions (Figure 4-3).

```
WHEN ANY ACTUATOR TEST CAUSES THE ENGINE
TO STALL, PLEASE RE-ENTER THE ACTUATOR
TESTS FROM THE FUNCTIONAL TEST MENU.
PRESS Y TO CONTINUE.
```

Figure 4-3 *Sample Actuator Test instructions*

To perform a Fuel Trim actuator test:

1. Press Y from the instruction screen (Figure 4-3) and the Scanner™ displays an Actuator Test Selection menu (Figure 4-4).

```
SCROLL TO SELECT A TEST:
>INJECTOR CYLINDER 1
 INJECTOR CYLINDER 2
 INJECTOR CYLINDER 3
```

Figure 4-4 *Sample Actuator Test Selection menu*

2. Scroll to FUEL TRIM and press Y.
3. Follow the displayed directions.
4. Press Y again, and the Scanner™ displays the FUEL TRIM Actuator Test screen (Figure 4-5).

```
MIXTURE ADAPTATION(%)________________-100
MISFIRE CYLINDER 1(1/S2)_____________0.00
CYL.2________0.00        CYL.3______0.00
>ZERO<       RICH  LEAN  CYL4-6     HELP
```

Figure 4-5 *Sample Fuel Trim Actuator Test screen*

These test screens include up to three lines with data parameters and one with various user-initiated commands. The Fuel Trim test includes the following commands:

- ZERO adjusts the fuel adaptive strategy to the default value stored in the ECU.
- RICH and LEAN instruct the ECU to enrich or dilute the fuel mixture.
- CYL 4-6 prompts the Scanner™ to display data parameters for cylinders 4, 5, and 6 on the second and third lines. For example, selecting CYL 4-6 displays a screen similar to Figure 4-6.

```
MIXTURE ADAPTATION(%)________________-100
MISFIRE CYLINDER 1(1/S2)_____________0.00
CYL.5________0.00        CYL.6______0.00
>ZERO<       RICH  LEAN  CYL1-3     HELP
```

Figure 4-6 *Sample CYL 4-6 screen*

NOTE:
Notice that the Scanner™ replaced the command CYL 4-6 with CYL 1-3 so that you have a means of redisplaying the misfire data parameters for cylinders 1 to 3.

- HELP provides technical assistance for the specific component or system you are testing. The Scanner™ displays MORE when it has more than four lines of instructions. In this case, scroll to read the complete file.

NOTE:
The actuator test mode does not offer "live," automatically updated data. Each time you wish to see updated data, press Y with the desired test command selected. For many of the actuator tests, you must press and release Y repeatedly to successfully increase or decrease test values.

To select a command:

1. Scroll the command indication (> <) until it surrounds the command name.
2. Press Y to execute the selected command and display current data parameters.
3. Press N to end the actuator test (Figure 4-7).

```
FUEL TRIM
TEST HAS BEEN COMPLETED.
PRESS Y TO REPEAT TEST.
PRESS N FOR ACTUATOR TEST MENU.
```

Figure 4-7 *Actuator Test Completed screen*

4.1.4 Sensor Gear (Rotor) Adaptation

This Sensor Gear (Flywheel) adaptation may be required on ME-SFI 1.0, 2.0, 2.1, 2.8. Sensor Gear adaptation started approximately in 1998 with the ML 112/113 engines. This adaptation re-configures the ME controller for increased sensitivity for misfire detection.

NOTE:
The current Scanner™ software only performs sensor gear reset on ME1 and ME2 systems.

The following drive train conditions can influence misfire detection:

- Crankshaft flex
- Motor mount movement
- Torque Converter Lock-up operation
- Automatic transmission shift characteristics
- Drive shaft and differential vibration

Misfire detection using the crankshaft position sensor requires sensor gear adaptation whenever the following components are replaced:

- Flywheel or Starter Ring Gear
- Crank sensor (L/5)
- ECM
- Motor mounts

In some cases, sensor gear adaptation must be performed after a misfire code is set.

NOTE:
Sensor Gear adaptation is not erased by disconnecting the battery. A scan tool is the only method possible to erase this adaptation.

Load Range L2 (load between 34–60%) and speed range N1 (1750–2450 RPM) must be adapted first, then ME-SFI will adapt the other segments automatically as the vehicle is driven.

Driving vehicles up to 01/98:

1. In 4th gear, increase RPM to 2500, then decelerate to <1500 RPM.
2. In 2nd gear, increase RPM to 6100, then decelerate to <4100 RPM. Increase RPM to about 6100 RPM, then decelerate to <3000 RPM.
3. Check Scanner™ data “Sensor Rotor Adaptation” for YES/NO status. YES means an adaptation is required. Also check adaptation status “Sensor Rotor Adaptation Completed” YES/NO.

Driving vehicles as of 02/98:

1. In 3rd gear, increase RPM to 2100 and maintain for approximately 50% load.
2. Check Scanner™ data “Sensor Rotor Adaptation” for YES/NO status.

   YES means an adaptation is required. Also check adaptation status “Sensor Rotor Adaptation Completed” YES/NO.

NOTE:
If a misfire occurred at L2 and speed range N2 (2450–3300 RPM), be sure to adapt that specific range before returning the vehicle to the owner as this is a very noticeable speed range for the driver.

The ECU Reset command on the Functional Tests menu clears the adaptations in three systems:

- Sensor Gear
- ME Fuel
- Throttle Actuator

To reset the sensor gear (rotor) adaptation:

- From the Functional Tests menu, scroll to ECU RESET and press Y.

4.1.5 Service Light Reset

For most systems, there are two basic manual reset procedures for the Service light (Flexible Service System): one for models with multifunction steering wheel control, and one for models without multifunction steering wheel control.

NOTE:
Prior to resetting, turn the ignition off, close all doors and wait until all instrument displays are off (may take up to 45 seconds).

To reset the service light on a vehicle without multifunction steering wheel control:

1. Switch the ignition ON.
2. Immediately press the dash button twice (instrument cluster button with a plus and zero sign).
3. The Tool Wrench light should turn ON in the dashboard (the same light that comes on when Oil/Service is required).
4. Turn the ignition OFF.
5. Press and hold the same dash button while switching the ignition ON.
6. While still holding the button, a new service interval should appear in the odometer display (10,000 mi. or 15,000 km) accompanied by a beeping sound.
7. Release the button.
8. Switch the ignition OFF.

To reset the service light on a vehicle with multifunction steering wheel control:

1. Turn ignition key to position II.
2. Repeatedly press the steering air bag, left side bottom button until both the total and trip mileages appear in the odometer display.
3. Repeatedly press the steering air bag, top left button (directly above first selection button) until the service symbol and the actual remaining mileage, time, or service exceeded indication is displayed.
4. Press the “R” button on the instrument cluster for about 3 seconds until the message “DO YOU WANT TO RESET THE SERVICE INTERVAL?” displays.
5. Confirm by pressing the “R” button.
6. Within 5 seconds, press the “R” button until the new service interval appears in the odometer display (10,000 mi or 15,000 km), then release the “R” button.
7. Turn the ignition OFF.

To reset the service light for Model 170 (SLK) 6/1/97:

1. Turn the key to position I.
2. Press and hold the button on the instrument cluster between the fuel gauge and the speedometer.
3. Turn the key to position II.
4. After 10 seconds, a signal will sound and the maintenance indicator should display 7,500 miles.
5. Release the button.

4.1.6 Battery Power Loss

The table below describes the possible effects of battery power loss on various engine systems.

ENGINE SYSTEM	EFFECT OF BATTERY POWER LOSS
LH	LH module trouble codes are usually erased.
	DM module trouble codes should not erase.
	CC/ISC or EA/CC/ISC module trouble codes are usually erased.
	Self-adaptation values are usually reset.
	Code Freeze frame data is usually erased.
DI or EZ (Distributor Ignition)	DI module codes are usually erased.
EA/CC/ISC or CC/ISC	EA/CC/ISC or CC/ISC module codes are usually erased.
HFM	HFM module trouble codes are usually erased.
	DM module trouble codes should not erase.
	CC/ISC or EA/CC/ISC module trouble codes are usually erased.
	Self-adaptation values are usually reset.
	Code Freeze frame data is usually erased.
ME	ME module trouble codes should not erase.
	ME does not have a DM, CC/ISC or EA/CC/ISC module.
	Self-adaptation values should not reset.
	Code Freeze frame data is usually still erased.

Note the following after experiencing battery power loss to engine systems:

- Code Freeze Frame is not currently available on the Scanner™.
- Special caution for DAS (anti-theft) equipped vehicles:
  - Don't disconnect the battery with the ignition key in the ignition (may loose rolling code or damage key transponder).
  - Don't connect a jump starter battery charger (voltage spikes may damage the system). Use a jumper battery or charge the battery out of the vehicle.
- Try to avoid no power to modules if possible. Use a jumper battery to power the system if replacing a battery. Total power loss may result in memory loss to the following:
  - Radio security code required to re-activate (radio removal may be required)
  - Window auto settings
  - Seat settings
  - Mirror settings
  - Sunroof auto settings

4.1.7 Coding/Programming FAQ

Does the Scanner™ perform version coding?

Yes, the Scanner™ version of the coding function is called REPLACE ECU. The process automatically transfers the old ECU version coding information to the new ECU.

NOTE:
There is currently no manual version coding capability.

What is ECU version coding? Is there a difference between ECU programming and version coding?

From the Factory, most ECUs are pre-programmed with the main resident data (operational control maps). However, for the program to work on the correct vehicle and emission application, the ECU needs additional information. This additional information is called ECU version coding. The following list provides some examples of the type of information that needs to be input before an ECU becomes functional in the vehicle:

- Specific model information
- National version (country and emission certification where vehicle is located and operated)
- With or without lambda control (closed loop O2S control)
- Specific automatic or manual transmission information

Note the following regarding ECU version coding:

- Some late model ECUs are now blank from the factory and are flashed or programmed by the factory scan tool at the local dealer or distribution center.
- For 2003, a 32-digit software calibration number (SCN) is now added during the version coding of the engine ECU. This number uniquely identifies the control module version installed in the vehicle and was added to help prevent incorrect version coding. Generic scan tool software can also read the SCN.

Do all years and models require ECU version coding?

No. Most vehicles and ECU systems up through the late eighties and early 1990s did not require ECU version coding. LH (1992–93) and early (1993) HFM systems did not require ECU version coding. Later HFM systems (1994–95) however did require ECU version coding. All ME systems (1996–2003) require ECU version coding and some 2002–03 systems now also require programming.

Can you order pre-version coded control units from the Factory?

Yes. For example, transmission ECUs can be ordered pre-coded by VIN. Most other control units cannot be ordered pre-coded at this time.

This means that in most cases, ECU replacement (version coding information transferred from an old control unit to a new control unit) should not be selected when replacing the transmission ECU.

On vehicles equipped with DAS (Drive Authorization System), is it possible to replace the engine or DAS ECU with a used ECU (either for testing or permanent installation)?

No. It is not possible to use a used engine or DAS ECU (DAS see page 71). The engine ECU and the DAS ECU become interlocked (electronically married to each other). If a new ECU is installed for test purposes, it first needs to be version coded and then it can be used for up to 40 engine starts before the interlocking takes place. After interlocking takes place, the engine control unit will not start the vehicle until it receives the proper signal from the DAS control unit.

NOTE:
The ME engine control system is always equipped with an immobilizer.

4.2 Testing Transmission Systems

The following sections contain Scanner™ testing information for transmission systems.

Table 4-2 provides application coverage for U.S. Mercedes transmissions.

Table 4-2 *U.S. Mercedes transmission application coverage (sheet 1 of 6)*

SERIES	MODEL	YEAR	CHASSIS #	ENGINE #	TRANSMISSION
124 E Class	300CE	1992	124.051	104.980	722.359
		1993	124.052	104.992	722.369
	300CE Cabriolet	1993	124.066		
	300D 2.5 Turbo	1992–93	124.128	602.962	722.418
	300E 2.6	1992	124.026	103.940	722.429
	300E	1992	124.030	103.983	722.358
		1993	124.032	104.992	722.369
	300E 2.8	1993	124.028	104.942	722.433
	300E 4MATIC	1992–93	124.230	103.985	722.342
	300TE	1992	124.090	103.983	722.358
		1993	124.092	104.992	722.369
	300TE 4MATIC	1993	124.290	103.985	722.342
	400E	1992–95	124.034	119.975	722.354
	500E	1992–94	124.036	119.974	722.365
	500TE 4MATIC	1992–93	124.290	103.985	722.342
	E300 Diesel	1995	124.131	606.910	722.435
	E320	1994–95	124.032 124.052 124.066 124.092	104.992	722.369
	E420	1994–95	124.034	119.975	722.366
	E500	1994	124.036	119.974	722.370
*“XX” indicates that more detailed information is not currently available.					

Table 4-2 *U.S. Mercedes transmission application coverage (sheet 2 of 6)*

SERIES	MODEL	YEAR	CHASSIS #	ENGINE #	TRANSMISSION
129 SL Class	300SL	1992–93	129.061	104.981	722.500
	500SL	1992	129.066	119.960	722.353
		1993	129.067	119.972	722.364
	600SL	1993	129.073	120.981	722.362
	SL320	1994	129.063	104.991	722.507 (EAG)
		1995–96	129.063	104.991	722.507
		1997	129.063	104.991	722.605
	SL500	1994–95	129.067	119.972	722.364
		1996–98	129.067	119.982	722.620
		1999–2001	129.068	113.961	722.624
	SL600	1994–95	129.076	120.981	722.362
		1996–2001	129.076	120.983	722.621
140 S Class	300SD	1992–93	140.134	603.971	722.367
	300SE	1992	140.032	104.990	722.502
		1993	140.032	104.990	722.502 (EAG)
	400SE	1992	140.042	119.971	722.366
	400SEL	1993	140.043	119.971	722.366
	500SEC	1993	140.070	119.770	722.370
	500SEL	1992–93	140.051	119.970	722.370
	600SEC	1993	140.076	120.980	722.362
	600SEL	1992–93	140.057	120.980	722.362
	CL 500 Coupe	1997–99	140.070	119.980	722.620
	CL 600 Coupe	1997–99	140.076	120.982	722.621
	S320	1994	140.032	104.994	722.502
		1995	140.032 140.033	104.994	722.508
		1996	140.032	104.994	722.508
		1997–98	140.032	104.994	722.605
		1999	140.032 140.033	104.994	722.605
	S320 Long Sedan	1996	140.033	104.994	722.508
		1997–98	140.033	104.994	722.605
	S350 Turbo	1994–95	140.134	603.971	722.367
*"XX" indicates that more detailed information is not currently available.					

Table 4-2 *U.S. Mercedes transmission application coverage (sheet 3 of 6)*

SERIES	MODEL	YEAR	CHASSIS #	ENGINE #	TRANSMISSION
140 S Class (cont)	S420	1994–95	140.043	119.971	722.366
		1999	140.043	119.981	722.622
	S420 Long Sedan	1996–98			
	S500	1994–95	140.051 140.070	119.970	722.370
		1999	140.051	119.980	722.620
	S500 Coupe	1996	140.070		
	S500 Long Sedan	1996	140.051		
		1997–98			
	S600	1994–95	140.057 140.076	120.980	722.362
		1999	140.057	120.982	722.621
	S600 Coupe	1996	140.076		
	S600 Long Sedan	1996–98	140.057		
163 M Class	ML320	1998	163.154	112.942	722.6XX
		1999–2001	163.154	112.942	722.662
		2002	163.154	112.942	722.6XX
	ML350 light truck	2003	163.157	112.970	
	ML430	1999–2001	163.172	113.942	722.663
	ML55 AMG	2000–01	163.174	113.986	722.666
		2002	163.174	113.981	722.6XX
	ML500 light truck	2002–03	163.175	113.965	
170 SLK Class	SLK 230	1998	170.447	111.973	722.605
		1999–2000	170.447	111.973	722.605 717.460
		2001	170.449	111.983	722.616 (Auto) 716.630 (Manual)
	SLK 230 Roadster	2001–03	170.449	111.983	722.6XX
	SLK 32 AMG Komp	2002–03	170.466	112.960	
	SLK 320	2001	170.465	112.947	722.618 (Auto) 716.618 (Manual)
		2002–03	170.465	112.947	722.6XX
201	190E 2.3	1992–93	201.028	102.985	722.408
	190E 2.6	1992–93	201.029	103.942	722.409
*"XX" indicates that more detailed information is not currently available.					

Table 4-2 *U.S. Mercedes transmission application coverage (sheet 4 of 6)*

<table>
<tr><th>SERIES</th><th>MODEL</th><th>YEAR</th><th>CHASSIS #</th><th>ENGINE #</th><th>TRANSMISSION</th></tr>
<tr><td rowspan="13">202
C Class</td><td>C220</td><td>1994–96</td><td>202.022</td><td>111.961</td><td>722.423</td></tr>
<tr><td>C230 Kompressor</td><td>1999–2000</td><td>202.024</td><td>111.975</td><td>722.605</td></tr>
<tr><td rowspan="2">C230 Sedan</td><td>1997–98</td><td>202.023</td><td>111.974</td><td>722.600</td></tr>
<tr><td>1999</td><td>202.029</td><td>112.920</td><td>722.606</td></tr>
<tr><td rowspan="3">C280</td><td>1994–96</td><td>202.028</td><td>104.941</td><td>722.424</td></tr>
<tr><td>1998–99</td><td>202.029</td><td>112.920</td><td>722.6XX</td></tr>
<tr><td>2000</td><td>202.029</td><td>112.920</td><td>722.606</td></tr>
<tr><td rowspan="2">C280 Sedan</td><td>1997</td><td>202.028</td><td>104.941</td><td>722.604</td></tr>
<tr><td>1998</td><td>202.029</td><td>112.920</td><td>722.606</td></tr>
<tr><td>C36 AMG</td><td>1996</td><td>202.028</td><td>104.941</td><td>722.424</td></tr>
<tr><td>C36 Sedan</td><td>1997</td><td>202.028</td><td>104.941</td><td>722.604</td></tr>
<tr><td rowspan="2">C43</td><td>1998–99</td><td>202.033</td><td>113.944</td><td>722.6XX</td></tr>
<tr><td>2000</td><td>202.033</td><td>113.944</td><td>722.631</td></tr>
<tr><td rowspan="7">203
C Class</td><td>C230 Kompressor Sport Coupe & Sport Sedan</td><td>2003</td><td>203.740</td><td>271.948</td><td>722.6XX</td></tr>
<tr><td rowspan="2">C240 Sedan</td><td>2001</td><td>203.061</td><td>112.912</td><td>722.696 (Auto)
716.623 (Manual)</td></tr>
<tr><td>2002–03</td><td>203.061</td><td>112.912</td><td rowspan="5">722.6XX</td></tr>
<tr><td>C240 Sedan 4MATIC</td><td>2003</td><td>203.081</td><td>112.916</td></tr>
<tr><td>C240 Sport Wagon</td><td>2003</td><td>203.261</td><td>112.912</td></tr>
<tr><td>C240 Sport Wagon 4MATIC</td><td>2003</td><td>203.281</td><td>112.916</td></tr>
<tr><td>C32 AMG Kompressor</td><td>2002–03</td><td>203.065</td><td>112.961</td></tr>
<tr><td rowspan="5">203
C Class
(cont)</td><td rowspan="2">C320 Coupe</td><td>2001</td><td>203.064</td><td>112.946</td><td>722.618</td></tr>
<tr><td>2002–03</td><td rowspan="2">203.064</td><td rowspan="2">112.946</td><td rowspan="4">722.6XX</td></tr>
<tr><td>C320 Sedan</td><td>2001–03</td></tr>
<tr><td>C320 Sedan 4MATIC</td><td>2003</td><td>203.084</td><td rowspan="2">112.953</td></tr>
<tr><td>C320 Sport Wagon 4MATIC</td><td>2003</td><td>203.284</td></tr>
<tr><td colspan="6">*“XX” indicates that more detailed information is not currently available.</td></tr>
</table>

Table 4-2 *U.S. Mercedes transmission application coverage (sheet 5 of 6)*

SERIES	MODEL	YEAR	CHASSIS #	ENGINE #	TRANSMISSION
208 CLK Class	CLK 320 Coupe	1998	208.365	112.940	722.6XX
		1999–2000	208.365	112.940	722.607
		2001	208.365	112.940	722.618
		2002	208.365	112.940	722.6XX
	CLK 320 Cabriolet	1997–2003	208.465		
	CLK 320 Convertible	1999–2000	208.465	112.940	722.607
	CLK 430	1997–98	208.370	113.943.	722.6XX
		1999–2000	208.370	113.943.	722.623
		2001	208.370	113.943.	722.632
		2002	208.370	113.943.	722.6XX
	CLK 430 Cabriolet	2000	208.470	113.943.	722.632
		2001–03	208.470	113.943.	722.6XX
	CLK55 AMG Coupe	2002–03	208.374	113.984	722.636
	CLK55 AMG Cabriolet	2002	208.474	113.984	722.6XX
209 CLK Class	CLK 320	2003	209.365	112.946	
	CLK 500 Coupe	2003	209.375	113.968	
210 E Class	E300 Diesel Sedan	1997	210.020	606.912	722.600
	E300 Turbo Diesel	1999	210.025	606.962	722.608
	E320	1996	210.065	104.995	722.6XX
		1997	210.065	104.995	722.605
		1998	210.065	112.941	722.6XX
		1999–2000	210.065	112.941	722.607
		2001	210.065	112.941	722.618
		2002–03	210.065	112.941	722.6XX
	E320 Sedan	1997	210.055	104.995	722.605
	E320 Sedan 4MATIC	1998	210.082	112.941	722.6XX
		1999–2001	210.082	112.941	722.664
		2002–03	210.082	112.941	722.6XX
	E320 Wagon	1998–2003	210.265		
	E320 Wagon 4MATIC	1998–2003	210.282		
	E420 Sedan	1997	210.072	119.985	722.625
	E430	1998	210.070	113.940	722.6XX
		1999–2001	210.070	113.940	722.623
		2002	210.070	113.940	722.6XX
	E430 4MATIC	2000–01	210.083	113.940	722.669
		2002	210.083	113.940	722.6XX
	E55	1999–2000	210.074	113.980	722.624
		2001	210.074	113.980	722.636
		2002	210.074	113.980	722.6XX
211 E Class	E320	2003	211.065	112.949	
	E500 Sedan	2003	211.070	113.967	
*“XX” indicates that more detailed information is not currently available.					

Table 4-2 *U.S. Mercedes transmission application coverage (sheet 6 of 6)*

SERIES	MODEL	YEAR	CHASSIS #	ENGINE #	TRANSMISSION
215 CL Class	CL55 AMG Komp	2001	215.373	113.986	722.633
		2002	215.373	113.982	722.6XX
		2003	215.374	113.986	
	CL500 Coupe	2000–01	215.375	113.960	722.633
		2002–03	215.375	113.960	722.6XX
	CL600	2001	215.378	137.970	722.628
		2002	215.378	137.970	722.6XX
	CL600 Bi-turbo	2003	215.376	275.950	
220 S Class	S430	2000–01	220.170	113.941	722.632
		2002–03	220.170	113.941	722.6XX
	S430 Sedan 4MATIC	2003	220.183	113.948	722.6XX
	S55 AMG	2001	220.173	113.986	722.633
	S55 AMG Komp	2001–02	220.173	113.982	722.6XX
		2003	220.174	113.991	
	S500	2000–01	220.175	113.960	722.633
		2002–03	220.175	113.960	722.6XX
	S500 (S Class Guard)	2001–03			
	S500 Sedan 4MATIC	2003	220.184	113.966	
	S600	2001	220.178	137.970	722.628
	S600 Bi-turbo	2003	220.176	275.950	722.6XX
230 SL Class	SL55 AMG	2003	230.474	137.992	
	SL500 Roadster	2003	230.475	113.963	
463 G Class	G55 AMG	2003	463.246	113.982	
	G500 light truck	2002–03	463.249	113.962	
*"XX" indicates that more detailed information is not currently available.					

4.2.1 Scanner™ Communication With the ETC

On M-Class vehicles, the Scanner™ communicates with the electronic transmission controller (ETC) through the same diagnostic connector used for engine testing via the DL-16 adapter with the S-17 Personality Key®.

On most vehicles with the 722.5 and 722.6 transmission, the Scanner™ communicates with the ETC through the 38-pin connector, even if there is an OBD-II connector available. Follow the instructions from the connection screen to locate the 38-pin connector.

NOTE:
Because the Scanner™ does not affect ETC operation, the vehicle can be driven in the DATA mode.

The Scanner™ displays either codes only, or codes and data from two transmissions: EAG and EGS.

The EAG (722.5) hydraulic 5-speed was used in the U.S. 129 and 140 chassis, from 1990 through 1996. The 722.6 fully-electronic 5-speed came out in 1996 and is used exclusively in all models. For 2002–03, an enhanced 722.6 with Touch Shift came out called the EGS5.2 series transmission. This transmission has an expanded data list displaying more TCC and shift control parameters.

Note the following when testing transmission systems:

- For the transition years of 1995–96, the Scanner™ may list EGS (722.6) or EAG (722.5) incorrectly due to global vehicle identification. Use Table 4-3 to identify the 722.5. All other 1996 and later models have the 722.6 transmissions.
- For 1996 129.063 with EAG 772.5 transmission, identify the vehicle as a 1995 to get the correct EAG transmission selection.

Table 4-3 *722.5 transmission codes and data coverage*

MODEL	YEAR	CHASSIS #	ENGINE #	CODES & DATA
300SE	1992–93	140.032	104.990	Codes & Data
300SL	1990–93	129.061	104.981	Blink codes only
SL320	1994–96	129.063	104.991	Codes & Data
SL320 Sedan	1994–96	140.032	104.994	
SL320 Long Sedan	1995–96	140.033	104.994	

4.2.2 722.6 Electronic Transmission

The Automatic 722.6 transmission is an electronically-controlled 5-speed transmission with a lock-up clutch in the torque converter. The ratios for the gear stages are achieved by three planetary gear sets. The 5th gear is designed with a step-up ratio as an overdrive. All shifting is electronically-controlled.

The electrohydraulic control unit is bolted to the bottom of the transmission housing. The electronic transmission control module (TCM) is linked via CAN Bus to the ECU as well as other drivetrain systems such as ABS, ASR, etc. The TCM controls the solenoid valves for modulating the shift pressures and gear changes. The basic shift program includes up and downshift points for all five gears. The control module adapts the shift program according to driving style, accelerator pedal position, and vehicle speed variations.

The 722.6 has two settings:

- Standard (“S”)
- Winter (“W”)

The “W” setting starts from rest in 2nd gear and shifts at lower RPM than the “S” setting, which improves driver control on slippery roads.

Other features include:

- limp-home mode
- automatic cruise control
- downshifting going downhill

- wear tolerance compensation (adaptation)

The torque converter is small, helping to reduce power loss through slippage. The Torque Converter Clutch (TCC), locks up to the engine in varying degrees (pulse width modulated) in 3rd, 4th and 5th gears to minimize abrupt changes.

722.6 EGS52 Touch Shift Transmission

The 722.6 EGS52 Touch Shift transmission can be identified by the selector lever shift gate having 4 positions: P, R, N, and D.

Shift ranges “4”, “3”, “2”, and “1” are replaced with the selector lever having transverse touch function:

- + Touch—upshift by one gear
- - Touch—downshift by one gear

Note the following with the 722.6 EGS52 Touch Shift transmission:

- All late model 722.6 transmissions with Touch Shift have an Electronic Shift Control Module (ESM). This module may have separate trouble codes from the transmission control module, some may turn the Check Engine Light on.
- The ESM is coded to the vehicle and cannot be installed in another vehicle. It is also not possible to temporarily install a test unit for diagnosis.

4.2.3 Actuator Tests

Actuator tests command the electronic transmission controller (ETC) to activate components and systems, such as solenoid valves and shift programs.

The Scanner™ displays only those tests available to the identified transmissions 722.5 or 722.6. These tests can include:

- MODULATOR PRESSURE REGULATING SOL. VALVE
- SHIFT PRESSURE REGULATING SOL. VALVE
- PWM TORQ. CONV. LOCK-UP CLUTCH SOL. VALVE
- SHIFT VALVES
- R/P LOCKOUT
- TORQUE CONVERTER LOCK-UP
- SHIFT PROGRAM
- RESET TRANSMISSION OIL MONITOR
- RESET ADAPTATION DATA

NOTE:
Before selecting any actuator test, turn the ignition key to ON.

Reset Adaptation Data

The RESET ADAPTATION DATA selection is used to diagnose and service the EGS 722.6 transmission.

NOTE:
The actual adaptation reset option does not appear until N is pressed from any of the adaptation screens.

The Resetting adaptation data explanation in this book has three parts:

- Part 1: Interpreting the electronic transmission controller (ETC) adaptation values.
- Part 2: Resetting the transmission adaptation values.
- Part 3: Teaching the transmission (ETC) new adaptation values.

Part 1: Interpreting the ETC Adaptation Values

Transmission adaptation is the automatic adaptation of data in the transmission control module to optimize shifting comfort. The following functions are automatically performed to compensate for wear tolerances (shift member clearances):

- Shift (response) time
- Filling (charge) time
- Filling (charging) pressure
- Torque converter lock-up clutch control

The ETC constantly monitors shift performance. To achieve the best possible shift quality, the ETC modifies the fill pressure used to engage the shift member.

“Adaptation values” collectively refers to the following:

- The amount of correction the ETC applies at various engine loads.
- Transmission output shaft speeds.

By examining the current adaptation values, you can evaluate the mechanical condition of the transmission.

The transmission adaptation reset should be performed after the following conditions:

- Replacement of complete automatic transmission.
- Installation of replacement transmission electronic control module (ETC).
- A customer complains of poor shift quality (teaching the transmission new values to optimize the shifts).

NOTE:
Before resetting, be sure to first record adaptation values, as current software does not print adaptation data. We recommend storing the adaptation values as an individual screen and saving to a PC with Snap-Link™, and then printing).

Note the following when interpreting adaptation limit values:

- If the Filling Time and shift switching time are at the adaptation limit, it usually indicates an internal transmission hydraulic problem and also affects other gearshift adaptation values

- If the Filling Pressure adaptation value is in the high positive range, it usually indicates internal transmission damage and may result in severe impairment of shift quality.
- If the Filling Pressure adaptation values are in the negative range, it usually does not indicate a problem and does not affect shift quality.
- Combinations of adaptation values may provide indications of internal transmission damage. Look for the following:
  - Clutch filling time more than 10 cycles.
  - Shift time for the power shift (high load/high engine speed) is near adaptation maximum limit.
  - Shift time for high load/high speed and low load/high speed is near adaptation maximum limit (approximately 75%).
  - Shift time for the power downshift, high load/high engine speed is in the upper range of positive values.

The Reset Adaptation Data test displays twenty-four transmission data parameters useful in diagnosing the 722.6 transmission. These parameters can only be viewed by selecting the FUNCTIONAL TESTS > ACTUATOR TESTS > RESET ADAPTATION DATA. These parameters do not appear after selecting the FAST or MOVIE data display modes from DATA.

Select ACTUATOR TESTS from the FUNCTIONAL TESTS Menu and the Scanner™ displays the following list (Figure 4-8).

```
SCROLL TO SELECT A TEST:
>MODULATOR PRESSURE REGULATING SOL. VALVE
 SHIFT PRESSURE REGULATING SOL. VALVE
 PWM TORQ.CONV.LOCK-UP CLUTCH SOL. VALVE
```

Figure 4-8 *Sample Actuator Tests menu*

To reset transmission adaptation data:

1. Scroll to RESET ADAPTATION DATA from the Actuator Tests menu and press Y.

   The Scanner™ displays the first acceleration data parameter (Figure 4-9).

```
ACCEL. 1-2(Nm)_ _ _ _ _ _ _ _ _ 36_ _ _ 15
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ 12_ _ _ 102
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _-21_ _ _ 0
                     <NEXT>
```

Figure 4-9 *Sample Reset Adaptation Data screen*

2. Press N.

   An Exit menu displays with a RESET ADAPTATION DATA selection.

NOTE:
You may press N at any point in the list of adaptation data screens to see the RESET ADAPTATION DATA selection.

3. Select RESET ADAPTATION DATA and press Y.

   As described on the next several pages, the twenty-four RESET ADAPTATION DATA parameters may be divided into six groups:

- Acceleration from a lower to a higher gear

- Acceleration from a higher to a lower gear
- Deceleration from a lower to a higher gear
- Deceleration from a higher to a lower gear
- Fill pressure for specific upshifts
- Fill time for specific clutch and brake pack shift members

Acceleration from a Lower to a Higher Gear

This group includes the following parameters:

- ACCEL.1-2(Nm)
- ACCEL.2-3(Nm)
- ACCEL.3-4(Nm)
- ACCEL.4-5(Nm)

The Scanner™ displays six values for each parameter in this group:

```
ACCEL. 1-2(Nm)_ _ _ _ _ _ _ _ _(A)_ _ _(B)
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _(C)_ _ _(D)
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _(E)_ _ _(F)
                     <NEXT>
```

Figure 4-10 *Acceleration from a lower to a higher gear*

The value range varies according to the number of engine cylinders:

- 8- and 12-cylinder ±210 Nm (upper and lower limit)
- 6-cylinder ±180 Nm (upper and lower limit)
- 4-cylinder ±150 Nm (upper and lower limit)

The ETC calculates these adaptive torque values based on other inputs, and stores them in memory. As indicated in Table 4-4, the ETC stored each value during one of six engine load and speed conditions.

Table 4-4 *Engine load and speed conditions*

	ENGINE SPEED	
	A: High Load, Low Speed	B: High Load, High Speed
ENGINE LOAD	C: Low Load, Low Speed	D: Low Load, High Speed
	E: Very Low Load, Low Speed	F: Very Low Load, High Speed

Changes from lower to higher values indicate that the ETC is decreasing fill pressure to lengthen the apply. Changes from higher to lower values indicate that the ETC is increasing fill pressure to shorten the apply. When the values reach their limits, shift quality decreases, as the ETC is no longer able to compensate for a loose or tight clutch pack. Since the ETC stores six different values according to engine speed and load conditions, match the same conditions when duplicating a shifting problem.

Acceleration from a Higher to a Lower Gear

This group includes the following parameters:

- ACCEL.2-1(Nm)
- ACCEL.3-2(Nm)
- ACCEL.4-3(Nm)

- ACCEL.5-4(Nm)

The Scanner™ displays four values for each parameter in this group:

```
ACCEL. 2-1(Nm)_ _ _ _ _ _ _ _ _(A)_ _ _(B)
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _(C)_ _ _(D)

 PREV                    <NEXT>
```

Figure 4-11 *Acceleration from a higher to a lower gear*

The ETC calculates these adaptive torque values based on other inputs, and stores them in memory. As indicated in Table 4-5, the ETC stored each value during one of four engine load and speed conditions.

Table 4-5 *Engine load and speed conditions*

	ENGINE SPEED	
ENGINE LOAD	A: Low Load, Low Speed	B: Low Load, High Speed
	C: Very Low Load, Low Speed	D: Very Low Load, High Speed

The value range varies according to the number of engine cylinders:

- 8- and 12-cylinder ±210 Nm (upper and lower limit)
- 6-cylinder ±180 Nm (upper and lower limit)
- 4-cylinder ±150 Nm (upper and lower limit)

Changes from lower to higher values indicate that the ETC is decreasing fill pressure to lengthen the apply. Changes from higher to lower values indicate that the ETC is increasing fill pressure to shorten the apply. When the values reach their limits, shift quality decreases, as the ETC is no longer able to compensate for a loose or tight clutch pack. Since the ETC stores four different values according to engine speed and load conditions, you should be able to easily reproduce the problem during a road test.

Deceleration from a Lower to a Higher Gear

This group includes the following parameters:

- DECEL.1-2(Nm)
- DECEL. 2-3(Nm)
- DECEL. 3-4(Nm)
- DECEL. 4-5(Nm)

The Scanner™ displays two values for each parameter in this group:

```
DECEL. 1-2(Nm)_ _ _ _ _ _ _ _ _(A)_ _ _(B)
DECEL. 2-1(Nm)_ _ _ _ _ _ _ _ _(A)_ _ _(B)

 PREV                    <NEXT>
```

Figure 4-12 *Deceleration from a lower to a higher gear*

The ETC calculates these adaptive torque values based on other inputs, and stores them in memory. As indicated in Table 4-6, the ETC stored each value during one of two engine load and speed conditions.

Table 4-6 *Engine load and speed conditions*

	ENGINE SPEED	
ENGINE LOAD	A: Very Low Load, Low Speed	B: Very Low Load, High Speed
	A: Very Low Load, Low Speed	B: Very Low Load, High Speed

The value range varies according to the number of engine cylinders:

- 8- and 12-cylinder ±210 Nm (upper and lower limit)
- 6-cylinder ±180 Nm (upper and lower limit)
- 4-cylinder ±150 Nm (upper and lower limit)

Changes from lower to higher values indicate that the ETC is decreasing fill pressure to lengthen the apply. Changes from higher to lower values indicate that the ETC is increasing fill pressure to shorten the apply. When the values reach their limits, shift quality decreases, as the ETC is no longer able to compensate for a loose or tight clutch pack. Since the ETC stores two different values according to engine speed and load conditions, you should be able to easily reproduce the problem during a road test.

Deceleration from a Higher to a Lower Gear

This group includes the following parameters:

- DECEL. 2-1(Nm)
- DECEL. 3-2(Nm)
- DECEL. 4-3(Nm)
- DECEL. 5-4(Nm)

The Scanner™ displays four values for each parameter in this group:

```
DECEL. 2-1(Nm)_ _ _ _ _ _ _ _(A)_ _ _(B)
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _(C)_ _ _(D)

 PREV                   <NEXT>
```

Figure 4-13 *Deceleration from a higher to a lower gear*

The ETC calculates these adaptive torque values based on other inputs, and stores them in memory. As indicated in Table 4-7, the ETC stored each value during one of four engine load and speed conditions.

Table 4-7 *Engine load and speed conditions*

	ENGINE SPEED	
ENGINE LOAD	A: Low Load, Low Speed	B: Low Load, High Speed
	C: Very Low Load, Low Speed	D: Very Low Load, High Speed

The value range varies according to the number of engine cylinders:

- 8- and 12-cylinder -210 Nm to 0 Nm (lower and upper limit)
- 6-cylinder -180 Nm to 0 Nm (lower and upper limit)
- 4-cylinder -150 Nm to 0 Nm (lower and upper limit)

Changes from lower to higher values indicate that the ETC is decreasing fill pressure to lengthen the apply. Changes from higher to lower values indicate that the ETC is increasing fill pressure to shorten the apply. When the values reach their limits, shift quality decreases, as the ETC is no longer able to compensate for a loose or tight clutch pack. Since the ETC stores four different values according to engine speed and load conditions, you should be able to easily reproduce the problem during a road test.

Fill Pressure for Specific Upshifts

This group includes the following parameters:

The ETC calculates these adaptive values based on the current draw from the solenoid shift and modulated shift pressure valves. This pressure compensates for the tolerances within the values, and for pressure lost through sources such as worn clutch packs, leaking sealing rings, low fluid, and worn bushings.

FILL PRESSURE 1-2(mbar)_XXXX (range: 0 to 1600 mbar)

FILL PRESSURE 2-3(mbar)_XXX (range: 0 to 800 mbar)

Higher values indicate that the ETC is increasing fill pressure to create a harder shift. Lower values indicate that the ETC is decreasing fill pressure to create a softer shift. A value of about 0 mbar means that either the ETC has not stored an adaptive value, or that the shift member does not require correction. A value at the upper limit of the parameter, along with poor shift quality, indicates the need for repair, or insufficient ATF level.

Fill Time for Specific Clutch and Brake Pack Shift Members

This group includes the following parameters:

FILL TIME K1 IN 2ND GEAR CYCLE_XX (range: 0 to 15 cycles)

FILL TIME K2 CYCLE_XX FILL TIME K3 CYCLE_XX

FILL TIME B1 CYCLE_XX FILL TIME B2 CYCLE_XX

FILL TIME K1 IN 4TH GEAR CYCLE_XX

These data parameters display adaptations to the length of time it takes to fill the clutch (K) and brake (B) shift members with ATF to remove the clearances just before application. These adaptations compensate for the condition of the clutches, the number of steel plates, and the clearance between the steel plates.

The ETC sends an amplitude-modulated current to the fill solenoids. The greater the signal amplitude, or difference between the crests and troughs of the signal, the greater the pressure. The ETC can only change signal amplitude once per 20 milliseconds (ms), which prevents overcorrection. Each cycle displayed by these data parameters equals one 20-ms period. If the Scanner™ reports a fill time adaptation of 3 cycles, this means that it took three periods of 20 ms each (60 ms) to alter pressure enough to accomplish the correct application of the shift member.

The maximum fill correction time is 15 cycles, or 300 ms. A value of 0 cycles indicates no fill correction was needed.

Part 2: Resetting the ETC Adaptation Values

NOTE:
Before resetting the adaptation values, set aside one hour afterwards to teach the ETC new adaptation values. This drive cycle requires a driver and a passenger.

Before resetting the adaptation values, the following engine and transmission operating conditions must be met:

- The engine must be running.
- The transmission oil temperature (ATF) as displayed by the data parameter TRANSMISS. OIL TEMP. R/3/4/3/2/1 must be higher than 140° F (60°C).
- The gear selector must be in “D” or “R.”

To reset adaptation values:

1. From the ACTUATOR TESTS menu, select RESET ADAPTATION DATA and press Y.

   The Scanner™ displays the first acceleration data parameter (Figure 4-9).

```
ACCEL. 1-2(Nm)_ _ _ _ _ _ _ _ 36_ _ _ 15
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ 12_ _ _ 102
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _-21_ _ _ 0
                           <NEXT>
```

Figure 4-14 *Sample Reset Adaptation Data screen*

2. Press N.

   The following screen displays (Figure 4-15).

```
RESET ADAPTATION DATA:


PERFORM RESET? (Y/N)
```

Figure 4-15 *Reset Adaptation Data Confirmation screen*

3. Press Y and the Scanner™ resets all of the transmission adaptive data parameters to zero, except for one value included with the following data parameters:

- ACCEL.2-1(Nm)
- ACCEL.3-2(Nm)
- ACCEL.4-3(Nm)
- ACCEL.5-4(Nm)

For these data parameters, the Scanner™ displays a -30 Nm as the value for high load at low engine speed. The following screen displaying the ACCEL. 2-1(Nm) parameter provides an example (Figure 4-16).

```
ACCEL. 2-1(Nm)_ _ _ _ _ _ _ _-30_ _ _  0
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _  0_ _ _  0

 PREV                      <NEXT>
```

Figure 4-16 *Sample ACCEL. 2-1(Nm) parameter*

Part 3: Teaching the ETC New Adaptation Values

Teaching the ETC new adaptation values requires the driver to operate the vehicle repeatedly through various loads, speeds, and shifts while maintaining several data parameter values within a specified range.

The following tables provide adaptation torque requirements for various engines.

Table 4-8 *Adaptation torque requirements for 104, 111, 112, and 113 engines*

SHIFTS	SHIFT COUNTS	104.941 104.991 104.994 104.995	111.973 111.975	111.974	112	113.940 113.941 113.943
1–2	4	14–37 Nm	14–37 Nm	14–28 Nm	12–37 Nm	13–40 Nm
2–3	4	17–59 Nm	17–59 Nm	17–59 Nm	17–59 Nm	25–50 Nm
3–4	3	17–45 Nm	17–46 Nm	17–46 Nm	17–45 Nm	22–70 Nm
4–5	3	0–121 Nm	0–121 Nm	0–82 Nm	0–121 Nm	0–110 Nm
Max. Engine Speed	2400 RPM					

Table 4-9 *Adaptation torque requirements for 606 engines*

SHIFTS	SHIFT COUNTS	606.912	606.962
1–2	4	14–27 Nm	14–37 Nm
2–3	4	20–55 Nm	20–59 Nm
3–4	3	15–54 Nm	20–59 Nm
4–5	3	0–81 Nm	0–121 Nm
Max. Engine Speed	1800 RPM		

Table 4-10 *Adaptation torque requirements for M119 and M120 engines*

SHIFT MEMBER	UPSHIFT	DOWNSHIFT	ENGINES	
	Very Light Throttle	Idle Throttle (w/o Shifter)	M119 4.2L	M119 5.0L & M120
K1	1–2	-	20 to 40 Nm	20 to 50 Nm
K2	2–3	-	20 to 70 Nm	20 to 80 Nm
K3	3–4	-	0 to 60 Nm	0 to 140 Nm
B1	4–5	-	0 to 110 Nm	0 to 140 Nm
B2	-	4–3	0 to -50 Nm	0 to -50 Nm
K1	-	5–4	0 to -50 Nm	0 to -50 Nm
Max. Engine Speed	1800 RPM			

There are two methods for teaching the ETC new adaptation values:

- Method 1—driving to achieve results according to the factory charts
- Method 2—using the prescribed roadtest (experience-based)

To teach the ETC new adaptation values with Method 1:

1. Warm up the vehicle until the automatic transmission fluid has reached a temperature from 140–221°F (60–105°C).
2. Throughout the drive cycle, monitor the TRANSMISS. OIL TEMP parameter value, and maintain the ATF within this range.

   Temperatures that range from 176°–194°F (80–90°C) are optimal.

NOTE:
Observe transmission oil temperature with the engine idling and the transmission engaged in either Drive or Reverse.

3. Identify the vehicle engine number for chart identification (see Table 4-2 on page 51).
4. Connect the Scanner™.
5. From the DATA selection on the transmission MAIN MENU, select the FAST data display mode.
6. View the following data parameters:

- TRANSMISSION OIL TEMPERATURE
- ACCELERATOR PEDAL or PEDAL VALUE (%)
- ENGINE SPEED(1/min)
- ENGINE TORQUE(Nm)

Always use two people—one to drive and one to monitor the data.

7. Turn the A/C off, and drive the vehicle on a level road with light throttle. Monitor the ACCELERATOR PEDAL(%) values to maintain these conditions.

   The road should be as level and as without traffic as possible. Avoid uphill or downhill grades (downhill grades of 7% or less are OK).
8. Maintain the engine speeds specified for the appropriate engine in the tables starting on page 66.

   Constantly monitor the ENGINE SPEED(1/min) data parameter value. Adjust speed accordingly.

NOTE:
It is important not to exceed the specified RPM during the adapting procedure as this may stop the adaptation process.

9. While maintaining the values of the previous parameters within range, drive the vehicle so that the value the Scanner™ displays for ENGINE TORQUE(Nm) matches the appropriate value in the table for your engine and gear shift.
10. After achieving the proper torque value, shift the transmission using the shift lever to and from the prescribed gears in the tables starting on page 66.

    Repeat this procedure for every set of listed gears. Be sure to allow the shift members time to fully apply and release and note the following:

- The vehicle must be driven with very light throttle loads.
- Do not exceed 10–75% accelerator pedal position.
- Ideal RPM during the shift moment is about 1200–1600 RPM.
- Do not exceed 1800 RPM during the shift process.
- You cannot perform an adaptation with heavy throttle loads or high engine torque.

- For both acceleration and deceleration, repeat this step eight times on M119 and M120 engines, and four times on M104, M111, and OM606 engines.

11. Allow the engine to run ten minutes after completing all of the gear shifts to allow time for ETC memory transfer, assuring that the ETC stores the new adaptation values.

To teach the ETC new adaptation values with Method 2:

1. Reset adaptation values using the Scanner™ (“Part 2: Resetting the ETC Adaptation Values” on page 65).
2. Make sure transmission oil temperature reads at least 176°F (80°C).
3. Turn off all engine accessories to minimize engine load.
4. Perform a test drive with the gear selector in Drive. If possible, use back streets, let the transmission shift from 1st to 2nd gear and then from 2nd to 3rd gear at very light throttle. Repeat at least 7 or 8 times.
5. Proceed to a faster moving street for a speed of approximately 45 mph. Allow the transmission to shift from 3rd to 4th gear and then from 4th to 5th gear. Repeat 4 or 5 times.
6. Allow the transmission to cycle through all the downshifts, 5th to 4th, 4th to 3rd, 3rd to 2nd, and 2nd to 1st while decelerating down to a stop 4 or 5 times.
7. Using caution and discretion, drive more aggressively performing higher engine load upshifts and higher speed downshifts.

   If possible, try to obtain a couple of 4-2 and 3-1 downshifts when accelerating out of a turn.
8. Allow the engine to idle ten minutes after completing the road test to allow time for ETC memory transfer, assuring that the ETC stores the new adaptation values.

Transmission Adaptation FAQ

Can I leave the shift lever in drive or should the upshifting always be done manually?

Upshifting using the shift selector lever is an effective method because of the very light required engine torque. However, some technicians prefer keeping the selector lever in Drive and driving with very light throttle in between shifts, allowing the transmission to shift to help achieve the correct engine RPM/torque for each gear. It is extremely important to keep the throttle at the minimum level but still maintain acceleration (at the low engine torque level, see the tables starting on page 66). The right decision on which method is best is left to personal preference. Technicians in high traffic urban areas have found that leaving the shift lever in Drive may be easier.

NOTE:
Do not use (or move) the selector lever for any deceleration or downshift learning.

What is the correct manual shift learning procedure?

1. Driving slowly, place the shift selector in position 1.
2. Lightly accelerate the vehicle, and then gently reduce the throttle position to bring engine/ torque to a permissible value.

NOTE:
The Scanner™ display is not instantaneous. Allow torque value to stabilize.

3. When engine torque is within the correct range, move the shift selector to position 2.
4. Reduce speed and bring the shift selector back to position 1.

   You must repeatedly perform this low speed up-and-down shifting technique. Repeat these steps up to ten times if necessary.
5. Repeat the same steps with the shift selector in position 2, upshifting to position 3 up to ten times if necessary.
6. Continue with this same procedure for the 3-4 upshift and the 4-5 upshift accordingly.

Note the following when performing the adaptation procedure:

- Be aware that each shift and each shift member has specific control module adaptation requirements (except Reverse).
- Adaptation values are established during shifting with extremely light loads.
- If the adaptation is successful, then the transmission should be adapted optimally for all the other driving conditions.
- Eight to ten shifts per shift member may be required to effectively improve the adaptation values. Some may require more, but suspect a possible transmission problem if the new adaptation values are not improving the shift quality after a significant number of learned shifts (15–20).
- The engine must continue to run for ten minutes after the adaptation procedure to allow the control module to record and store new adaptation values into memory (the vehicle can either be driven or at idle). If the engine is turned off prior to the required ten minute time interval, all new adaptation values will be lost and the control module will default to previous values.

Does the adaptation procedure change depending on whether it is performed on a new or repaired transmission versus re-adapting for a shift complaint?

The adaptation procedure for new or repaired transmissions may be shorter than if re-adapting to correct for shift quality complaints.

- For new or repaired transmissions it may be necessary to only perform the following:
  - ACCELERATION UPSHIFTS 1 to 2 and 2 to 3
- For shift quality complaints, perform all of the following:
  - ACCELERATION UPSHIFTS 1 to 2 and 2 to 3
  - ACCELERATION UPSHIFTS 1 to 2, 2 to 3, to 4, 4 to 5
  - DECELERATION DOWNSHIFTS (coasting) 5 to 4, 4 to 3

4.3 Testing EA/CC/ISC Systems

LH and HFM fuel management systems have a separate module that controls the electronic actuator, cruise control, and idle speed control (EA/CC/ISC). The ME control module on 1996 and later vehicles discontinued the separate module and has it integrated into the ME control system.

The exact Electronic Actuator (EA), Cruise Control (CC), and Idle Speed Control (ISC) module variations (i.e., EA/CC/ISC, CC/ISC, and ISC) are dependent on installed options like cruise control and traction control (ASR). Vehicles with ASR usually have an orange warning light on the instrument cluster.

Table 4-11 *1992–96 Mercedes EA/CC/ISC application coverage*

SERIES	MODEL	YEAR	CHASSIS #	ENGINE #
124	300CE	1993–95	124.052/092	104.992
	300E	1993	124.028	104.942
		1993–95	124.032	104.992
	400E	1992–95	124.034	119.975
	500E	1992–94	124.036	119.974
140	300SE	1992–93	140.032	104.990
	400SE	1992	140.042	119.971
	400SEL	1993–95	140.043	
	600SEC	1993–95	140.076	120.980
	600SEL	1992	140.057	
	S320	1994–96	140.032	104.994
202	C280	1994–95	202.028	104.941

4.3.1 Note the following when testing EA/CC/ISC systems:

- The EA/CC/ISC modules are on the CAN bus and can turn the Check Engine Light on. Always check, repair and clear any EA/CC/ISC codes.
- The ECU or other modules may also report a code pointing to a fault at the EA/CC/ISC.

4.4 Testing DAS (Immobilizer) Systems

The Drive Authorization System (DAS) is the name for the Mercedes Immobilizer system combining vehicle access and drive authorization. Prior to 1996, DAS was separated from the engine control module, and ignition switch operation was based solely on a mechanical key. An early version of DAS was first introduced in approximately 1993 when Mercedes started networking DAS, the engine, transmission, ABS, and traction control systems on a common data bus called CAN.

The Mercedes pneumatic control doorlock system has been in existence since the early 1980s, and although now it is much more advanced, it is still in use today. It steadily became more sophisticated, adding features like central locking, starter lock-out, and steering lock-out.

NOTE:
Some late models, such as ML- and C-class series, have completely eliminated the pneumatic control system and now use a fully electronic door lock system.

4.4.1 Central Locking

Central Locking is the ability to lock or unlock the complete vehicle at one time and from multiple locations using either an infrared beam or a radio frequency signal. The infrared remote control (IFZ) was introduced in late 1992 as a standard feature. With central locking, lock actuators are no longer connected electrically, therefore the central locking, anti-theft, and convenience systems can no longer be operated with the mechanical key. Instead, remote control operates the complete vehicle locking system through the pneumatic control module. This keyless entry system consists of a remote control module, transmitter, pneumatic control module, and two receivers.

The infrared remote control can only be operated with a vehicle-specific transmitter as they are matched to one another. The remote control transmitter signal consists of a fixed code that must match the receiver. The code is “rolling,” which means it is changed each time it is actuated.

NOTE:
The mechanical key can still be used in emergency to open the driver's door or trunk. All door locks are equipped with micro switches which should disable the anti-theft alarm (ATA) if the correct key is used to unlock the door. If the ATA does not disarm, insert the key into the ignition and turn the ignition switch to the ON position.

4.4.2 DAS Versions

In approximately 1991, the ATA system added the K38 relay which controlled starter motor operation. In approximately 1993, this function was added to the RCL control module, introducing the immobilizer system which added additional RCL control functions: interruption of ignition, fuel, starter or vacuum. The important difference is that the RCL control module communicates on a CAN bus to other control modules.

NOTE:
If the vehicle is unlocked with the mechanical key, the ignition switch may not operate to start the vehicle. The vehicle may need to be unlocked using the remote key to unlock the immobilizer, which then permits the engine to start.

DAS 2

DAS 2 integrated the immobilizer function and engine control into one system. Activation and deactivation occurs whenever the car is locked or unlocked either with the remote transmitter or the mechanical key.

This system introduced the rolling code for the remote control on the C, E and S/SL class in 1996. Rolling code changes the access code each time the transmitter (in the remote key) and receiver (in the vehicle) communicate. Once the receiver authorizes the received code, it sends a new code back to the remote key.

The engine and DAS control modules are locked together with a common identification code that cannot be erased. Engine and DAS control modules have to be version coded if replaced.

NOTE:
On some models, the green and red LEDs on the rearview mirror flash alternately if the engine will not start because DAS is activated.

Table 4-12 *DAS 2 characteristics*

TRIGGERED BY	SIGNAL TYPE	AUTHORIZATION CHECKED BY	OPERATOR FEEDBACK	AUTHORIZED START RESULT
Remote or door and trunk switches	Remote locking IR or door and trunk switches	RCL N-54	Mirror LEDs	NO fuel injection

DAS 2a

DAS 2a was used from January to June in 1996 on the E420. Activation and deactivation no longer occur automatically when locking or unlocking the car. Previously, if the vehicle was unlocked, DAS allowed the vehicle to start. The change with this system is that the locked or unlocked condition of the vehicle no longer affects the ability of the engine to start. In other words, the RCL and DAS functions are now separated.

DAS 2a introduced the transponder, which adds another level of security to the ignition switch. For the key to work in the ignition, radio wave transmission from an in-dash transmitter is sent to the transponder in the key, which is then sent from the key to DAS for evaluation. If DAS accepts the code, then the ignition switch operates to start the vehicle.

The transponder system automatically changes the codes each time the key is placed in the ignition. Each key has a uniquely-coded chip assigned to the mated DAS control module. The vehicle originally came with 2 remote keys and one valet key.

NOTE:
DAS 2a can be identified by the presence of a transponder ring around the ignition lock and the absence of exterior IR receivers.

Table 4-13 *DAS 2a characteristics*

TRIGGERED BY	SIGNAL TYPE	AUTHORIZATION CHECKED BY	OPERATOR FEEDBACK	AUTHORIZED START RESULT
Transponder in key	Inductively coupled RF	RCL N-54	Mirror LEDs	NO fuel injection

DAS X

DAS X was installed on all 1997 vehicles starting in June 1996. This system uses two separate control units, one for DAS and one for the Remote Central Locking (RCL). It uses a key transponder like DAS 2a and has similar functionality. This system also added exterior RCL IR receivers.

Table 4-14 *DAS X characteristics*

TRIGGERED BY	SIGNAL TYPE	AUTHORIZATION CHECKED BY	OPERATOR FEEDBACK	AUTHORIZED START RESULT
Transponder in key	Inductively coupled RF	DAS N54/1	Mirror LEDs on 202/210	NO fuel injection; 202 no crank

DAS 2b

DAS 2b (170/129/140) was introduced in 1998. This system uses a three-button remote with both infrared and radio wave transmissions. The vehicle is locked or unlocked when either the infrared or radio transmits an uninterrupted signal. The three remote key buttons are for:

- Locking doors
- Unlocking doors
- Unlocking the trunk

Note the following regarding DAS 2b systems:

- DAS 2b also added convenience closing and summer opening of windows and sunroof (uses infrared signal only).
- DAS 2b also permits global locking/unlocking (doors, trunk lid, and fuel filler flap) or selective unlocking (driver's door and fuel door only).
- When the vehicle is locked using the remote control, the hazard lights flash 3 times and when unlocked, they flash once.
- For both DAS 2a and DAS 2b, new replacement keys do not require any special learning procedure to start the engine—the emergency mechanical key also contains the transponder to operate the ignition switch.
- For 1998 ML 163 series, key syncronization activation requires a scan tool procedure which the Scanner™ currently does not perform.

Table 4-15 *DAS 2b characteristics*

TRIGGERED BY	SIGNAL TYPE	AUTHORIZATION CHECKED BY	OPERATOR FEEDBACK	AUTHORIZED START RESULT
Transponder in key	Inductively coupled RF	RFL N54/3	None	NO fuel injection; may crank briefly

To synchronize the remote:

1. Turn the ignition ON.
2. Turn the ignition OFF.
3. Remove the key from the ignition.
4. Press the remote button.

   The remote should now lock and unlock the vehicle.

DAS 3

DAS 3 is the most sophisticated and advanced generation of DAS. DAS 3 was introduced on the C, E and CLK class in 1997 and the S class in 1998 (210/208/202), increasing each year with more models phased in.

This system has all the same features of DAS 2b except that the ignition switch is now fully electronic (the mechanical key is used only for vehicle access). This means that with DAS 3, both access and drive authorization are fully electronic.

Access authorization using the remote key uses both infrared and radio transmission, but the electronic key drive authorization only uses infrared. The electronic key transfers a radio wave code to the electronic ignition and starter switch (EIS).

Table 4-16 *DAS 3 characteristics*

TRIGGERED BY	SIGNAL TYPE	AUTHORIZATIO N CHECKED BY	OPERATOR FEEDBACK	AUTHORIZED START RESULT
Microprocess or in key	IR Infrared	EIS N73	None	NO fuel injection; NO ignition switch; NO steering lock release

Note the following when working on DAS 3 systems:

- The electronic key is completely separate from the remote key access system and does not require the transmitter battery of the remote control. Instead, it is powered by the EIS, which means that the electronic key can be used to start the vehicle even if the remote control battery is dead.
- The side of the electronic key also contains a slide out emergency mechanical key which allows access to the vehicle if the remote battery is dead. It also can be used to lock the glove compartment and the trunk.
- The engine control unit (ECU), electronic shifter control module (ESM or EWM) and the electronic ignition control module (EIS) are all locked together permanently.

Workshop Key (Green Key)

A special one-time key from the factory may be necessary under the following conditions:

- when cancelling the disablement of a keytrack
- after replacing an ECU that is security-related
- after replacing an EIS

For Mercedes Dealers only, a workshop key and EIS are ordered from the factory. The workshop key and EIS must be ordered together. After installation, the workshop key is then inserted into the EIS for final programming. Once this procedure is finished, the workshop key is returned to the factory.

Electronic Steering Lock is optionally available with DAS 3. The steering column is locked and unlocked by means of an electric motor. The control unit of the electric steering lock is directly connected to the electronic ignition (EIS) by the CAN bus, which automatically locks the steering lock when the key is removed and unlocks when the key is inserted. The same setup may be used on an electronic selector lever on some models.

Keyless Go (Optional)

The optional Keyless Go replaces the DAS 3 electronic key. The first generation Keyless Go used a chip card carried by the driver which is used to lock or unlock, start and re-lock the vehicle. The engine is started by pressing a start/stop button on the gear selector lever. A button on the chip card can be pressed to check whether the vehicle is locked or unlocked. It can also can be programmed for selective or global locking. The system uses seven frame antennas in the doors and in the rear of the vehicle to determine the position of the Keyless Go chip to know where to unlock or lock. The antennas are also used to know if the chip card is internal or external of the vehicle. This system uses special door handles with pull/push contacts and capacitive sensors. The 2nd generation Keyless Go no longer uses a separate chip card but has the Keyless Go chip card integrated into the remote key housing.

Note the following with the Keyless Go:

- Some Keyless Go vehicles may not have any emergency key door access. In the case of a dead battery, the emergency key can be used to open trunk to access battery, which can then be charged. The remote key is then used to open the doors.

All DAS Versions

Note the following when testing DAS systems:

- DAS or RCL module replacement means that all of the remote transmitters and transponder keys must be synchronized and version-coded using the factory scan tool.
- The ME control module and either the EIS (DAS 3) or DAS control module are electronically permanently married to each other after 40 engine starts. There is no factory procedure to undo this. This means that a used engine, EIS or DAS control unit cannot be used on another vehicle. A new control unit can be installed for testing provided the 40 engine starts are not exceeded. Note that the new control unit will need to be variant coded before it can be used. Technicians have reported successfully resetting the counter to 0 on a test ECU at approximately count 20 by removing the version coding and ECU power for 10 to 30 minutes.

Chapter 5 Data Parameters

This chapter provides definitions and operating ranges for the Mercedes-Benz data stream parameters that display on the Scanner™.

When DATA is selected, the Scanner™ displays all of the operating parameters available from the electronic control unit (ECU) of the vehicle. The ECU provides two basic kinds of parameters: digital (or discrete) and analog:

- Digital (discrete) parameters are those that can be in only one of two states, such as on or off, open or closed, high or low, rich or lean, and yes or no. Switches, relays, and solenoids are examples of devices that provide discrete parameters on the ECU data list.
- Analog parameters are displayed as a measured value in the appropriate units. Voltage, pressure, temperature, time, and speed parameters are examples of analog values. The Scanner™ displays them as numbers that vary through a range of values in units, such as pounds per square inch (psi), kilopascal (kPa), degrees Celsius (°C), degrees Fahrenheit (°F), kilometers per hour (KPH), or miles per hour (MPH).

The Scanner™ displays some data parameters in numbers that range from 0 to 100, 0 to 255, or 0 to 1800. These ranges are used because in each case, it is the maximum number range that the ECU transmits for a given parameter. However, many parameter readings never reach the highest possible number. For example, you never see a vehicle speed parameter reading of 255 MPH.

For Mercedes-Benz vehicles, the maximum range of a parameter often varies by year, model, and engine. On these applications, the word “variable” appears in the range heading. However, typical sampled values observed under actual test conditions are in the parameter description when available.

Parameters may also be identified as input signals or output commands.

- Input or feedback parameters are signals from various sensors and switches to the ECU. They may be displayed as analog or discrete values, depending upon the type of input device.
- Output parameters are commands that the ECU transmits to various actuators, such as solenoids and fuel injectors. They are displayed as discrete (ON/OFF parameters, analog values or as a pulse-width modulated (PWM) signal.

In the following section, parameters are presented as they appear on the Scanner™ screen. Most parameter descriptions are in alphabetical order, but there are exceptions. Often, the same parameter goes by a similar, but different, name when used on more than one model, engine, or control system. In these instances, all of the applicable parameter names, as displayed on the Scanner™, are listed in alphabetical order before the description.

To find the description of a parameter, locate it in the alphabetical index, then go to the indicated page. Parameters are listed in the index as they appear on the Scanner™ screen.

The data parameter descriptions in this manual were created from a combination of sources. For most parameters, some basic information was provided by Mercedes-Benz, then expanded through research and field-testing. Parameter definitions and ranges may expand as more test results become available. For some parameters, no information is currently available.

The Scanner™ may display names for some data parameters that differ from names displayed by the Mercedes-Benz factory tool and other scan tools.

Always use a power graphing meter, such as the Snap-on® Vantage® meter or a lab scope, to further validate the displayed values. If data is corrupted on multiple data parameters, do not assume that the ECU may be faulty. This corrupt data may be caused by improper communication between the Scanner™ and the ECU controller. See “Appendix B Troubleshooting and Communication Problems” on page 155 for more details on communication problems.

5.1 Alphabetical Parameter List

Numerics

A

B

C

D

E

F

G

H

I

K

L

M

N

O

P

R

S

T

U

V

W

5.2 Engine Parameters

A/C COMPRESSOR ______ ON/OFF

Used on DM2, HFM, ME10 and ME20 systems. This discrete parameter indicates the condition of the A/C compressor. The display reads ON with air conditioning compressor activated (compressor engaged).

ABS. INT. MANIF. PRESS. DI1ABS. INT. MANIF. PRESS. DI2ABS. INTAKE MANIFOLD PRESSURE______ 0 to 1000, ±100 mbar

Used on DM systems. These analog parameters, which display intake manifold absolute pressure in millibars, are used by the ECU for making camshaft timing adjustments and for detecting EGR flow on vehicles equipped with EGR systems. The “ABS.” in the parameter name is an abbreviation for absolute, not anti-lock brake.

ACCEL. PEDAL POSITION SENSOR ______ 0 to 100%

Used on ERE/EVE/ASF (IFI DIESEL) systems. This analog parameter indicates the position of the accelerator pedal (sensor) in percentage. Normally, the Scanner™ displays 0–2% at idle, 75–95% at wide open throttle.

ACCELERATION ENRICHMENT ______ ON/OFF

Used on LH systems. This discrete parameter indicates if the ECU is adjusting the fuel mixture to compensate for heavy acceleration. The display should read OFF with the engine running at idle, and should read ON when the throttle is snapped to about 4000 RPM.

ACCELERATION SENSOR ______ 0 to 5.0 V

Used on ME10 systems. This analog parameter indicates the position of the accelerator pedal (sensor) in volts.

ACTUAL EGR LIFTING SENDER ______ not available

Used on ERE/EVE/ASF (IFI DIESEL) systems. This parameter displays the EGR lifting sender position (equivalent to an EGR pintle position sensor) in millimeters (mm). The greater the value, the wider open the EGR valve.

ACTUAL INJECT.QTY. PER STROKE ______ variable

Used on ERE/EVE/ASF (IFI DIESEL) systems. This parameter displays the actual fuel quantity injected per stroke. Normal warm engine idle readings vary from 30 to 33. A fuel quantity actuator mounted to the main injection pump housing moves a control rod to regulate the quantity of injected fuel.

ACTUAL INTAKE AIR PRESSURE ______ 0 to 1000 mbar

Used on EDS systems. This analog parameter displays the actual air intake pressure in millibars. The Scanner™ relies on a pressure sensor that measures intake manifold pressure for this value.

ACTUAL PRESSURE DISTRIB.PIPE ______ 0 to 1000 mbar

Used on ERE/EVE/ASF (IFI DIESEL) systems with turbocharged engines. This analog parameter displays the actual pressure in the distribution pipe or intake manifold, indicating boost pressure. This parameter relies on the intake manifold pressure sensor (MAP).

ACTUAL SLIDE VALVE ACTUATOR ______________________________ variable

Used on ERE/EVE/ASF (IFI DIESEL) systems. This parameter displays the slide valve actuator position in millimeters (mm).

ACTUAL VALUE POT.METER VOLTAGE______________________________ 0 to 5.0 V

Used on HFM systems. The HFM system does not use a drive-by-wire electronic throttle actuator. Instead, it uses a mechanical throttle linkage linked to an electronic actuator located at the throttle body. The actuator has an integral clutch mechanism that overrides the mechanical linkage under certain conditions. The system is used to control idle, cruise control and Accelerator Slip Regulation controlled by the Electronic Accelerator/Cruise Control/Idle Speed Control (EA/CC/ISC) module. The voltage range varies depending on operating conditions. Higher voltages indicate a greater throttle opening.

ACTUATOR ACT.VALUE POT.METER R1ACTUATOR ACT.VALUE POT.METER R2 ACTUATOR SIGNAL 1ACTUATOR SIGNAL 2 ____________________________ 0 to 5.0 V

Used on ME10 and ME20 systems. This drive-by-wire system has no mechanical throttle linkage. An electronic actuator controls the throttle valve under different operating conditions to regulate idle speed, cruise control operation, driving on the basis of accelerator position, traction control (Acceleration Slip Regulation), Electronic Stability Program (ESP) and emergency running. The position of the accelerator pedal is detected by two potentiometers that transmit input signals to the ECU. Based on these signals, the ECU in turn controls the electronic throttle actuator. One potentiometer is in the pedal value sensor and the other one is in the electronic actuator. The potentiometer in the electronic throttle actuator supplies a reference value for a plausibility check. In an emergency, if one potentiometer fails, the system switches over to the second one. A quick plausibility check is to add both actuator signal readings (R1 and R2 or SIGNAL 1 and SIGNAL 2) together at various throttle positions. They should always add up the same value, usually between 4.5 to 4.9 volts.

ACTUATOR OUTPUT VALUE ____ 0 to 255

Used on HFM systems. This parameter is the count value of the stepper motor type electronic throttle actuator. The HFM system does not use a drive-by-wire electronic throttle actuator. Instead, a mechanical throttle linkage attaches to an electronic actuator located at the throttle body. The actuator uses an integral clutch mechanism that overrides the mechanical linkage under certain conditions. The system regulates idle, cruise control and Accelerator Slip Regulation controlled by the Electronic accelerator/Cruise Control/Idle Speed Control (EA/CC/ISC) module. Voltage range varies depending on operating conditions. The higher the count, the greater the throttle actuator is opening the throttle valve.

ADAPT. RANGE 2 GEAR, 6000-3000ADAPT. RANGE 2 GEAR, 6000-4000ADAPT. RANGE 4 GEAR, 2500-1500ADAPTED RANGES L1ADAPTED RANGES L2ADAPTED RANGES L3 ____ ON/OFF

Used on ME20 systems. These discrete parameters indicate if the engine and transmission control modules are working together to optimize engine speed and torque for any one given driving condition.

ADJUST. CAMSHAFT TIMING SOLENOID______________________________ ON/OFF

Used on ME10 and ME20 systems. Camshaft timing is adjustable and this discrete parameter indicates the state of the camshaft timing solenoid. When the display reads ON, the solenoid is energized and when the display reads OFF it is not. Engine speed influences when the display reads ON or OFF. OFF indicates full retard position, and ON, full advance. The solenoid should be OFF at speeds below 2000 RPM, ON at speeds between 2000 RPM and 4300 RPM, and OFF at speeds over 4300 RPM.

ADR ACTIVE____ON/OFF

Used on ERE/EVE/ASF (IFI DIESEL) systems. This discrete parameter indicates whether the ADR system is active or not. No further information is available.

ADR RPM ADJUSTMENT ______________________________________ON/OFF

Used on ERE/EVE/ASF (IFI DIESEL) systems. This discrete parameter indicates whether the ADR RPM adjustment is on or off. No further information is available.

AFTER-START ENRICHMENT____________________________________ON/OFF

Used on HFM. LH, ME10, ME20, ME27, ME28 and SIM4 systems. This parameter indicates if the ECU is providing a rich fuel mixture after a cold start. The display reads ON with fuel enrichment at cold start, then switches to OFF once the engine warms up.

AIR CONDITIONING____ON/OFF

Used on ME27, ME28 and SIM4 systems. This discrete parameter indicates whether the ECU is commanding the air conditioning system is on or off.

AIR FLAP ____ 0 to 100%

Used on ME20 systems. This parameter indicates the opening of the air flap as a percentage. At 0% the air flap is fully open, and at 100% is completely closed. The air flap controls supercharger boost based on air flap position, which is ECU pulse-width modulated. At 100% the air flap is closed; at 11 to 99% boost control is in part load range; and at 10% or less the air flap is open.

AIR FLAP SWITCHOVER ANGLE_______________________________ 0 to 120°

Used on HFM systems. This parameter indicates the opening of the air flap in degrees. The ECU uses this signal to control supercharger boost. Under boost, the display should read greater than 85°.

AIR LOGIC CHAIN ____YES/NO

Used on DM2 systems. This discrete parameter indicates whether the onboard diagnostic secondary air system tests have run (YES) or not run (NO).

AIR MASS____0 to 500 kg/h

AIR MASS____ 0 to 500 mg/S

Used on DM2, EDS, ERE/EVE/ASF (IFI DIESEL), HFM, ME10, ME20 and SIM4 systems. The ECU generates this parameter based on the input signal from the mass airflow sensor. The reading indicates the mass of the intake air charge in kilograms per hour (kg/h), or milligrams per stroke (mg/S). Values on a warmed-up vehicle vary by system and by engine.

Table 5-1 *Typical idle readings*

SYSTEM	ENGINE	TYPICAL IDLE READING
HFM	4-cylinder	8–15 kg/h
	6-cylinder	13–22 kg/h
	8-cylinder	15–25 kg/h
	12-cylinder	12–22 kg/h
ME10 & ME20	4-cylinder	8–15 kg/h
	6-cylinder	10–20 kg/h
	8-cylinder	12–25 kg/h
	12-cylinder	10–20 kg/h
SIM4	-	10–20 kg/h

AIR PUMP ____ YES/NO

AIR PUMP ____ ON/OFF

Used on DM, DM2, HFM, LH, ME10 and ME20 systems. This parameter indicates the state of the secondary air pump. The display reads YES or ON when the pump is activated, and reads NO or OFF when the pump is off. Secondary air is pumped into exhaust system to reduce emissions under certain operating conditions. On HFM systems the pump should be on (YES) when engine temperature is below 40°F (4°C).

AIR PUMP ACTIVATION ____ YES/NO

Used on DM2 systems. This discrete parameter indicates whether the ECU has commanded the air pump to activate.

AIR PUMP SWITCHOVER VALVEAIR PUMP SWITCHOVER VALVE, LEFTAIR PUMP SWITCHOVER VALVE, RIGHT _________________________________ OPEN/CLOSED

Used on ME27, ME28 and SIM4 systems. These discrete parameters indicate whether the air pump switch-over solenoid valves are open or closed. At cold start and during warm-up, solenoid valve should be in OPEN or up position, which directs air pump flow into the exhaust manifold to help reduce emissions. With the engine fully warmed up, the solenoid valve should read CLOSED, shutting or closing the air pump chamber to the exhaust manifold.

The SIM4 system does not have an air pump, but instead uses the supercharger as an air-pump during warm-up. The Recirculating Air Flap actuator is used to direct air into exhaust manifold and also is used to generate an Air Pump Switchover Valve position status.

BAROMETRIC PRESSUREALTITUDE PRESSURE_____________ 0 to 1000, ±100 mbar

AMBIENT PRESSURE____ 0 to 1000 kPa)

BAROMETRIC PRESSURE is used on CD12, EAG, EDS, ERE/EVE/ASF (IFI DIESEL), EZ, LH, and HFM systems. ALTITUDE PRESSURE and AMBIENT PRESSURE are used on SIM4 systems. The ECU calculates the barometric pressure based on the input signal from the barometric pressure (BARO) sensor. Readings display in millibar (mbar) or kilopascals (kPa). A typical reading at sea level is approximately 1000 mbar. Readings decrease as altitude increases.

ASR INTERVENTION ______ ON/OFF

Used on ME20 systems. This parameter indicates the operating state of the acceleration slip regulation (ASR), or traction control, system. The display reads ON when ASR is activated and OFF when it is inactive.

BASIC INJECTION DURATION ______ 0 to 30 ms

Used on LH systems. This parameter displays the length of time in milliseconds (ms) that the ECU commands the fuel injectors to remain on. Normal range is approximately 3 to 5 ms at idle.

BATTERY VOLTAGE ______ 0 to 25 V

Used on ARA/ELR, EDS, ERE/EVE/ASF (IFI DIESEL), EZ, LH, HFM, ME10, ME20, ME27, ME28, and SIM4 systems. This parameter represents the supply voltage provided by the charging system through the battery. Although the measurement range is 0 to 25 V, actual readings should be close to normal regulated charging system voltage with the engine running, typically 12.0 to 15.5 volts.

BOOST PRESSURE ______ 0 to 1000 kPa

Used on SIM4 systems. This analog parameter displays the boost pressure. The measurement units can be changed from kilopascals (kPa) to pounds per square inch (psi). The preset measurement is kPa.

BOOST PRESSURE CONTROL ______ ON/OFF

Used on ERE/EVE/ASF (IFI DIESEL) systems. This discrete parameter indicates whether the boost pressure control is on or off. The boost pressure is controlled by the Inline Fuel Injection (IFI) control module. Boost is increased (closing the waste gate) when the boost pressure control valve is closed by the boost pressure control vacuum transducer through the vacuum unit. The boost pressure transducer is actuated by the control module with variable current and regulates the boost pressure vacuum unit.

BRAKE LAMP SWITCH VIA CAN ______ ON/OFF

Used on ERE/EVE/ASF (IFI DIESEL) systems. This discrete parameter indicates whether the parking brake lamp switch (via the controller area network (CAN) bus) is on or off.

The CAN is a broadcast type of bus. This means that all modules "hear" all transmissions. There is no way to send a message to just a specific module; all modules invariably pick up all traffic. However, CAN hardware provides local filtering so each module reacts only to data whose identifiers are stored in its acceptance list. This very high frequency transmission requires a "twisted pair" of wires to address electromagnetic interference (EMI) concerns. Two wires also ensure communication if one wire is damaged and provide the ability to recognize a CAN circuit fault. The two lines must not be interchanged as each represents either high or low level.

BRAKE SWITCH ______ ON/OFF

Used on ME10 systems. This parameter is an ECU input that indicates brake pedal position. The display should read ON with the brake pedal depressed and OFF at all other times.

CAMSHAFT HALL-EFFECT SENSOR ________________________________ variable

Used on ME10, ME20, ME27 and ME28 systems. This parameter indicates the state of the signal from camshaft position (CMP) sensor. On ME10 and ME 20, the reading switches between “55” and “AA,” depending on whether the Hall-effect signal is high or low. The value should by constantly switching whenever the engine is running, and the frequency of the switching increases and decreases in proportion to engine speed. Be aware, readings may be outside the normal range when the engine is cranking.

On ME27 and ME 28 systems, the parameter should read “Running” when the engine is running and “Not Running” when the engine is not running.

CAMSHAFT ADJUSTMENTCAMSHAFT CONTROLCAMSHAFT SOLENOIDCAMSHAFT TIMING ________________________________ ON/OFF

Used on DM, DM2, LH, HFM and SIM4 systems. These discrete parameters display the ECU signals to the variable camshaft timing solenoid. When ON, the ECU is energizing the solenoid to advance camshaft timing. Typically on 119 and 120 engines, the display reads OFF at idle and switches to ON at 2000 RPM. For all other engines, the display waits until 4000 RPM before switching to ON.

CAMSHAFT ADJUSTMENT VALVE, RIGHTCAMSHAFT ADJUSTMENT VALVE, LEFT ________________________________ ON/OFF

Used on ME27 and ME28 systems. This discrete parameter indicates whether the variable camshaft timing solenoid is on or off. Below 1500 RPM, the camshaft timing solenoid is OFF or de-energized—cam timing is retarded to reduce valve overlap which reduces residual exhaust gas. Between 1500 and 4000 RPM the camshaft timing solenoid is ON or energized. Cam timing is advanced to reduce mixture loss and improve performance. Above 4000 RPM, the camshaft timing solenoid is OFF or de-energized. Cam timing is retarded to improve cylinder re-charge.

CAMSHAFT CONTROL LOGIC CHAIN ________________________________ YES/NO

Used on DM2 systems. This discrete parameter indicates whether the onboard self diagnostic tests have run for the variable camshaft control system.

CAMSHAFT REFERENCE MARK SIGNAL ________________________________ YES/NO

Used on DM2 systems. This discrete parameter indicates whether the camshaft reference mark signal is on (YES) or off (NO). The Scanner™ normally displays NO with the key on, engine off, and when a camshaft position sensor fault exists.

CAMSHAFT SIGNAL, RIGHT BANKCAMSHAFT SIGNAL, LEFT BANK _______ YES/NO

Used on ME27 and ME28 systems. These discrete parameters indicate whether there are camshaft signals from the left and right engine banks.

CAMSHAFT SOLENOID ________________________________ ON/OFF

Used on HFM systems. This discrete parameter indicates whether the camshaft solenoid is on or off.

CAN DATA EXCHANGE ________________________________ YES/NO

Used on DM and DM2 systems. This discrete parameter indicates whether the controller area network (CAN) bus data exchange signal is active or not active.

The CAN is a broadcast type of bus. This means that all modules "hear" all transmissions. There is no way to send a message to just a specific module; all modules invariably pick up all traffic. However, CAN hardware provides local filtering so each module reacts only to data whose identifiers are stored in its acceptance list. This very high frequency transmission requires a "twisted pair" of wires to address electromagnetic interference (EMI) concerns. Two wires also ensure communication if one wire is damaged and provide the ability to recognize a CAN circuit fault. The two lines must not be interchanged as each represents either high or low level.

CAN RECEPTION FROM ASR____________________________________ OK/NOT OK)

Used on EZ systems. This parameter indicates if the controller area network (CAN) is receiving data from the acceleration slip regulation (ASR) module. The CAN is a serial data transmission bus and the ASR is the traction control system. The display should read OK at all times. The ASR system is disabled if the display reads NOT OK.

CAN RECEPTION FROM DAS_____________________________________ OK/NOT OK

Used on ERE/EVE/ASF (IFI DIESEL) systems. This discrete parameter indicates if the controller area network (CAN) is receiving data from the DAS module. The display should read OK at all times. A reading of NOT OK indicates a loss of communication between the ECU and DAS module.

CAN RECEPTION FROM DI1CAN RECEPTION FROM DI2OK/NOT OK) Used on EZ and LH systems. These parameters indicate if the controller area network (CAN) is receiving data from distributor ignition modules 1 or 2 (DI1 or DI2). The display should read OK at all times. A reading of NOT OK indicates a loss of communication between the ECU and DI1 or DI2, which prevents ECU control of ignition.

CAN RECEPTION FROM EA,CC,ISC ______________________________ OK/NOT OK

Used on EZ and LH systems. This parameter indicates whether the controller area network (CAN) is receiving data from the electronic accelerator (EA), cruise control (CC) and idle speed control (ISC) modules. The display should read OK at all times. A reading of NOT OK indicates a loss of communication between the modules. When the display reads NOT OK, the electronic accelerator, cruise control and idle speed control functions are disabled and default values are being substituted.

CAN RECEPTION FROM LH1-SFICAN RECEPTION FROM LH2-SFI______ OK/NOT OK

Used on EZ and LH systems. These parameters indicate if the controller area network (CAN) is receiving data from the sequential fuel injection (LH 1-SFI or LH2-SFI) modules. The display should read OK at all times. A NOT OK indicates a loss of communication between the modules.

CAN TRANSMISSION FROM DI1CAN TRANSMISSION FROM DI2 _ (range OK/NOT OK

Used on EZ systems. These parameters indicate whether the controller area network (CAN) is receiving a status transmission from the distributor ignition (DI1 and DI2) modules. The display should read OK at all times. A NOT OK means the ignition module is not responding to the ECU.

CAN TRANSMISSION FROM LH1-SFICAN TRANSMISSION FROM LH2-SFI OK/NOT OK

Used on LH systems. These parameters indicate whether the controller area network (CAN) is receiving communication from the sequential fuel injection (LH 1-SFI or LH 2-SFI) modules. The display should read OK at all times. A NOT OK indicates a loss of communication between modules.

The CAN is a broadcast type of bus. This means that all modules "hear" all transmissions. There is no way to send a message to just a specific module; all modules invariably pick up all traffic. However, CAN hardware provides local filtering so each module reacts only to data whose identifiers are stored in its acceptance list. This very high frequency transmission requires a "twisted pair" of wires to address electromagnetic interference (EMI) concerns. Two wires also ensure communication if one wire is damaged and provide the ability to recognize a CAN circuit fault. The two lines must not be interchanged as each represents either high or low level.

CANISTER PURGE DUTY CYCLECANISTER PURGE VALVE DUTY CYCLE __0 to 100%

Used on LH and SIM4 systems. This parameter indicates the duty cycle of the ECU-controlled canister purge solenoid. The pulse width modulated solenoid is energized to activate purging and switched off to prevent purging. A reading of 0% indicates purging is being prevented and a reading of 100% indicates the solenoid is fully energized for maximum purging. When purge is activated, duty cycle should gradually increase. This prevents rapidly dumping vapors into the intake charge, which would momentarily create an overly rich mixture.

CATALYST SELECTED ____ YES/NO

Used on EZ systems. This parameter indicates whether the system configuration is designed to operate with or without a catalytic converter. On U.S. models, the Scanner™ should display YES.

CATALYTIC CONVERTER HEATER ___________________________________ ON/OFF

Used on ME27 and ME28 systems. This discrete parameter indicates whether the catalytic converter heater is on or off.

CHARCOAL CANISTER ____ ON/OFF

Used on ME20 systems. This parameter shows the ECU control status for charcoal canister purging. Purging is active when ON is displayed and prevented when OFF is displayed.

CHECK ENGINE AFTER FULFILLING FAULT SEQUENCE _________________ YES/NO

Used on ME10 systems. This parameter indicates the check engine light status after an ECU diagnostic self-test. A reading of YES indicates a fault was detected during the self-test and the check engine light should be illuminated. A reading of NO indicates that no faults were present during the self-test.

CIRCUIT 15CIRCUIT 50____ ON/OFF

Used on ERE/EVE/ASF (IFI DIESEL) and LH systems. This parameter indicates the state of circuit 15 or 50, which is the starter circuit. The display should read ON when the starter is engaged during cranking and OFF after engine starts.

CIRCUIT 50 OUTPUTCIRCUIT 50 INPUT ________________________________ ON/OFF

Used on ERE/EVE/ASF (IFI DIESEL) systems. These parameters indicate the input or output state (on or off) of circuit 50, which is the starter circuit. When the starter cranks, both parameters should display ON.

CLUTCH DEPRESSED____ ON/OFF

Used on HFM systems. This parameter indicates the state of the clutch switch input to the ECU. The display should read ON whenever the clutch pedal is depressed, and read OFF when the clutch pedal is not depressed.

CLUTCH SWITCH____ ON/OFF

Used on ERE/EVE/ASF (IFI DIESEL) and SIM4 systems. This discrete parameter indicates whether the clutch switch is in the ON or OFF position. ON means the clutch is being depressed.

COIL FAULT COUNTER T1/1 CYL. 1/4COIL FAULT COUNTER T1/1 CYL. 2/5COIL FAULT COUNTER T1/2 CYL. 2/3COIL FAULT COUNTER T1/2 CYL. 3/4COIL FAULT COUNTER T1/3 CYL. 1/6 ____ 0 to 255

Used on HFM distributorless systems. These parameters are numerical fault counters for the ignition coils. This is an ECU input used for monitoring coil output.

The abbreviations “T1/1,” “T1/2,” and “T1/3” refer to the three ignition coils; the numbers that follow, “1/4,” “2/5,” “2/3,” “3/4,” “1/6” refer to the cylinders the coils fire.

When the engine operates normally, the parameter values should be 0 or near 0. The greater the number, the more severe the misfire. Once a misfire causes the counter to reach 255, the ECU resets the parameter to 0. These parameters assist in troubleshooting misfires by pinpointing the problem to at least one of two cylinders.

COIL SPARK DURAT. T1/1 CYL. 1/4COIL SPARK DURAT. T1/1 CYL. 2/5COIL SPARK DURAT. T1/2 CYL. 2/3COIL SPARK DURAT. T1/2 CYL. 3/4COIL SPARK DURAT. T1/3 CYL. 1/6 ____ 0 to 5 ms

Used on HFM systems. These parameters represents the spark line duration, or burn time, in milliseconds (ms) from the ignition coils.

The abbreviations “T1/1,” “T1/2,” and “T1/3” refer to the three ignition coils; the numbers that follow, “1/4,” “2/5,” “2/3,” “3/4,” “1/6” refer to the cylinders the coils fire.

With the engine running at idle, readings between 0.8 and 1.5 ms are normal for 111 engines. At idle, readings between 1.5 and 1.9 ms are normal for all other engines.

COIL SPARK VOLTAGE T1/1 CYL. 1/4COIL SPARK VOLTAGE T1/1 CYL. 2/5COIL SPARK VOLTAGE T1/2 CYL. 2/3COIL SPARK VOLTAGE T1/2 CYL. 3/4COIL SPARK VOLTAGE T1/3 CYL. 1/6 ____ 0 to 500 V

Used on HFM systems. These parameters represents the primary coil spark line, or burn time, voltage from the ignition coils.

The abbreviations “T1/1,” “T1/2,” and “T1/3” refer to the three ignition coils; the numbers that follow, “1/4,” “2/5,” “2/3,” “3/4,” and “1/6” refer to the cylinders that the coils fire.

Normal range for most engines running at idle is from 34 to 37 V. With a 111 engine running at idle the normal range is from 38 to 42 volts.

COMBUSTION TIME CYL. 1COMBUSTION TIME CYL. 2COMBUSTION TIME CYL. 3 COMBUSTION TIME CYL. 4COMBUSTION TIME CYL. 5COMBUSTION TIME CYL. 6 COMBUSTION TIME CYL. 7COMBUSTION TIME CYL. 8 __________________ 0 to 5 ms

Used on EZ systems. This parameter represents the spark line duration, or burn time, in milliseconds for each cylinder. Normal range for an engine running at idle is 1.5 to 1.9 milliseconds (ms).

COMPRESSOR CLUTCH ____ ON/OFF

Used on HFM and ME20 systems. This parameter shows the condition of the A/C compressor clutch. The display reads ON with air conditioning compressor clutch engaged and OFF when the clutch is disengaged.

COMPRESSOR EFFICIENCY FACTOR _________________________________ variable

Used on HFM systems. This parameter is an ECU-calculated factor of supercharger efficiency. Typically, the display should read greater than 1.3 when driving in third gear at 3500 RPM under full load.

COOLING FAN OUTPUT DEMAND ENGINE _____________________________ ON/OFF

COOL.FAN OUTP.DEMANDED BY ENGINE _____________________________0 to 100%

Used on HFM and ME20 systems. This parameter indicates whether or not the ECU is commanding the cooling fan to turn on based on engine temperature. The display reads ON or 100% when the ECU is enabling the fan and OFF or 0% when the ECU switches the fan off.

COOL.FAN OUTP.DEMAND CLIMATE CTRLCOOL.FAN OUTP.DEMAND.BY CLIM.CTRL ____ ON/OFF

Used on HFM and ME20 systems. This parameter indicates whether or not the ECU is commanding the cooling fan to turn on based on the climate control system engaging the A/C compressor. The display reads ON when the ECU is enabling the fan and the compressor is engaged. The display reads OFF when the fan is switched off and the compressor is disengaged.

COOLANT TEMPERATURE __________________________-40 to 199°C or -40 to 390°F

Used on SIM4 systems. This analog parameter monitors engine coolant temperature. The measurement units can be changed from degrees Celsius (°C) to degrees Fahrenheit (°F). The preset measurement is °C.

CORRECTED INT.MANIFOLD PRESS _____________________________ 0 to 1000 mbar

Used on EAG systems. This parameter, which displays the corrected manifold absolute pressure reading in millibars (mbar), is used by the ECU for making camshaft timing adjustments. On vehicles equipped with EGR, the ECU also uses this parameter to detect EGR flow.

CR. CTRL SHUT-OFF BRAKES APPLIED _______________________________ ON/OFF

Used on HFM systems. This parameter represents the signal from the brake switch to override and disengage cruise control. With the cruise control engaged, the display should read OFF while driving and ON whenever the brake pedal is depressed. When the display reads ON, the brake pedal is depressed, and cruise control operation should be suspended.

CRANKSHAFT MAGNET CODINGCRANKSHAFT SEGMENT ORDER ________ YES/NO

Used on DM2 systems. These discrete parameters indicate whether the crankshaft position sensor ECU inputs are working correctly. The self diagnostic tests the crankshaft position sensor for adequate voltage output and for proper crankshaft gear timing signature.

CRUISE CONTROLCRUISE CONTROL ENGAGED________________________ ON/OFF

Used on ME10, ME20 ME27, ME28 and HFM systems. These parameters represent the status of the cruise control system. The display reads ON when cruise control is engaged and OFF when disengaged.

CRUISE CONTROL LEVER POSITION VARIABLECRUISE CONTROL LEVER SIGNAL IMPLAUSIBLECRUISE CONTROL OFFCRUISE CONTROL RESTARTCRUISE CONTROL SET AND ACCELERATECRUISE CONTROL SET AND DECELERATE _ ACTIVE/INACTIVE

Used on SIM4 systems. These parameters represent the status of the cruise control system. The display reads ACTIVE when cruise control is running and INACTIVE when not running.

CRUISE CONTROL SHUT-OFF FUNCTION ______________________________ ON/OFF

Used on ME10 and ME20 systems. This parameter represents the cruise control system status. Note the parameter is a shut-off function, so the display reads OFF when cruise control is engaged and ON when disengaged.

CRUISE CONTROL SHUT-OFF SAFETY ________________________________ YES/NO

Used on ME10 and ME20 systems. This parameter represents the status of the cruise control safety switch in the electronic accelerator actuator. The ECU connects to the safety switch in the electronic accelerator actuator. Normal operation sends a positive signal to ECU. If throttle opening is more than the position specified and cruise control is not engaged, the switch sends a ground signal to the ECU, which turns off fuel injection. Injection switches on once engine speed is below 1200 RPM.

CRUISE CONTROL/SPEED LIMITER INTERVENT ________________________ ON/OFF

Used on ME10 systems. This parameter indicates if the ECU is disabling the cruise control system due to excessive engine speed. The display reads ON if the maximum engine speed limitation is reached and cruise control operation is suspended. The display should read OFF during normal cruise control operation.

CRUISE CONTROL SWITCH ____ ON/OFF

CRUISE CONTROL SWITCH ACRUISE CONTROL SWITCH BCRUISE CONTROL SWITCH ACCELERATECRUISE CONTROL SWITCH DECELERATE _________ YES/NO

Used on ERE/EVE/ASF (IFI DIESEL) and HFM systems. This parameter indicates the status of the cruise control switch. ON or YES means that the switch is in the ON position.

CSO, IDLE F.TRIM CYL.1-3, RIGHTCSO, IDLE F.TRIM CYL.4-6, RIGHTCSO, IDLE F.TRIM CYL.7-9, LEFTCSO, IDLE F.TRIM CYL.10-12, LEFT ________ -0.700 to 0.700 ms

Used on ME27 systems. These parameters indicate the fine tuning long term fuel trim correction to the fuel injection pulse width in milliseconds (ms). Cylinder shutoff (CSO) mode is used on the V12 engines with separate bank fuel control. Information on CSO mode is limited, however field technicians believe that if correct cruise conditions are met, cylinder groups are shut down to conserve fuel. (See the description for CYLINDER SHUT-OFF 1.) In this mode, mixture adaptation is modified for the active cylinders, compensating for variations in air mass and pressure ratios. This number is learned by the ECU and used to correct small differences between engines and engine wear. Each change in the Long Term Fuel Trim is equivalent to a change of the Short Term Fuel Trim over its entire range. When the Short Term Fuel Trim reaches its upper/lower limit, it resets back to the beginning, and moves Long Term Fuel Trim up or down by one count. The Short Term Fuel Trim continues to move very quickly and if the limits are reached, it will increment the Long Term Fuel Trim again. This will continue until either the fuel mixture problem is corrected or long term fuel reaches it limit, causing a DTC to set.

This fine tuning fuel trim correction is also called Additive Mixture Adaptation because it can modify the duration of injection by adding or subtracting to the base injection time in each fuel map cell. It thus affects the entire engine speed range or all fuel map cells, but is most noticeable at idle because of the minimal amount of adjustment capability.

CSO, LOW.P.LOAD F.TRIM CYL 1-3, RIGHTCSO, LOW.P.LOAD F.TRIM CYL 4-6, RIGHT CSO, LOW.P.LOAD F.TRIM CYL 7-9, LEFTCSO, LOW.P.LOAD F.TRIM CYL 10-12, LEFT ____________ 0.750 to 1.280

Used on ME27 systems. Cylinder shutoff (CSO) mode is used on the V12 engines with separate bank fuel control. Information on CSO mode is limited, however field technicians believe that if correct cruise conditions are met, cylinder groups are shut down to conserve fuel. (See the description for CYLINDER SHUT-OFF 1.) In this mode, mixture adaptation is modified for the active cylinders, compensating for variations in air mass and pressure ratios. These fuel trim numbers represent the long term correction to the injection system when the engine is under partial load and in CSO mode. This number is learned by the ECU and is used to correct small differences between engines and engine wear. When the short term correction (O2 Integrator) is outside the window defined in the ECU's memory, the long term fuel trim (FTRIM) is changed. PART LOAD F.TRIM can modify injector duration using a self-adaptation factor. A 1.0 reading represents the base point. Readings greater than 1.0 indicate that the system is running lean and to correct—the injection duration is increased. Readings less than 1.0 indicate that the system is running rich and to correct—the injection duration is decreased.

These parameters display a long-term correction factor applied to the CSO pre-programmed low partial load base cell values.

CTP (IDLE) ADJUSTMENT VALUE____________ not available

Used on ME10 and ME20 systems. No information is available at this time.

CTP (IDLE)CTP (IDLE) CONTACTCTP (IDLE) INFORMATIONCTP (IDLE) RECOGNITION ____________ YES/NO

CTP (IDLE)CTP (IDLE) CONTACTCTP (IDLE) INFORMATIONCTP (IDLE) RECOGNITION ____________ ON/OFF

Used on DM, DM2, ERE/EVE/ASF (IFI DIESEL), HFM, LH, ME10 and ME20 systems. These parameters indicate the state of the throttle switch. The display should read YES or ON when the throttle is closed and NO or OFF when the throttle is open.

CTP (IDLE) LONG-TERM ADAPT. VALUES ____________ not available

Used on ME10 and ME20 systems. No further information is available at this time.

CYL. 1 to 12 ____ ON/OFF

Used on LH, ME10, ME20, systems. These parameters indicate whether or not fuel injector operation has been suspended to reduce fuel consumption during cruise. The “1 to 12" in the parameter name indicates twelve separate parameters, one for each cylinder. The display reads OFF when fuel injection is suspended and ON during normal fuel injection operation.

CYLINDER SHUT-OFF 1 to 12CYLINDER SHUT-OFF VALVE, RIGHTCYLINDER SHUT-OFF VALVE, LEFT ____ ON/OFF

Used on ME27 (V12) and ME28 systems. These parameters indicate whether or not cylinder operation has been suspended to reduce fuel consumption during certain cruise conditions. The “1 to 12" in some of the parameter names indicate up to twelve separate parameters, one for each cylinder. The display reads OFF when a cylinder or engine bank has been shut down. It reads ON if that cylinder or bank is in normal operation. For those cylinders or bank shut-off, fuel injection is eliminated and ignition spark is drastically reduced. For the ME27 V12 engine, cylinder shutoff may disable up to 6 cylinders, usually all on the left engine bank (cylinders 7-12), depending on engine load requirements. Cylinder shutoff starts with the number 7 cylinder or the number 12 cylinder. Exhaust valves are shut off first, followed by the intake valves. This maintains exhaust gas pressure in the cylinder, preventing crankcase oil from being drawn up due to vacuum. Oil pressure is used to operate coupling valve levers which can engage or disengage rocker arms. In the disengaged mode, valves do not open and remain permanently closed during cylinder shutoff operation.

On ME28 engines, complete left or right engine bank is disabled using ME-controlled solenoids that disable all the valves on one bank simultaneously.

DAS AND DSV MODULES ARE MATCHEDDAS AND ECM COMPATIBLEDAS AND ENGINE CTRL. MOD. COMPATIBLE______________________________ YES/NO

DAS CONTROL MODULES ______________________________ OK/NOT OK

Used on ERE/EVE/ASF (IFI DIESEL), ME10 and ME20 systems. These parameters show if the drive authorization system (DAS) or anti-theft system and the ECU have correctly identified each other at startup. The display reads YES if the modules identify each other and NO if they do not. The ECU and DAS module are permanently interlocked, after a fixed number of starts when replacing the ECU, by an identification code that cannot be erased. Therefore, it is not possible to interchange modules from another vehicle for test purposes. Interchanges can only be done with a matched pair of modules. The ME-SFI module has an immobilizer. When the vehicle is locked, the DAS sends a signal to the ME-SFI that inhibits injection. The engine only starts when the authorized key is used and the DAS module sends a start enable signal to the ME-SFI module.

DECELERATION ____ YES/NO

DECELERATION SHUT-OFF ______________________________________ ON/OFF

Used on DM2, EGS, HFM, LH, ME10 and ME20 systems. These parameters indicate if the ECU has temporarily shut off fuel injection during deceleration to reduce emissions. The display reads ON or YES if the ECU commands the injectors off during deceleration, and reads OFF or NO at all other times.

Certain conditions must be met to activate: engine coolant temperature must be above 122°F (50°C), engine speed must be above 2100 RPM, and vehicle speed over 22 mph. The ECU recognizes deceleration when the throttle valve position is less than that required for a specific engine speed, or when the ECU senses closed throttle idle contacts. Once RPM drops to 1000, the injectors switch back on. The ignition timing is momentarily retarded to avoid a surge in power.

DESIRED ENGINE SPEED ______________________________________0 to 1500 RPM

Used on HFM systems. This parameter indicates the target idle speed that the ECU is attempting to maintain. With a normal running engine, actual and desired engine speeds should be equal or close to each other.

DISTRIBUTOR SHAFT ACTUAL POS.DISTRIBUTOR SHAFT NOMINAL POS. 0 to 100%

No information is available at this time.

DRIVE AUTH. RCL & ECM COMPATIBLE _______________________________ YES/NO

Used on HFM systems. This parameter indicates whether the remote controller locking (RCL) system and the ECU correctly identified each other. The display reads YES if the modules are properly coded. Coding cannot be erased, so swapping modules for testing cannot be done unless a matched pair is used.

DRIVE AUTHORIZ.,IMMOBOLIZER _________________________ ACTIVE/NOT ACTIVE

Used on ME27 and ME28 systems. This parameter indicates whether the driver immobilizer is active or not active. The driver immobilizer is that part of the antitheft system that allows the vehicle to be remotely disabled via satellite. Often this parameter may read ACTIVE with a faulty or wrong ignition key.

DRIVER GIVEN TORQUE ____ not available

Used on HFM systems. No information is available at this time.

DWELL TIME, CYLINDER 1 to 12__________________________________ not available

Used on ME27 and ME28 systems. This parameter displays the dwell timing (coil saturation time) for the various cylinder banks in seconds.

EBR INTERVENTION____ ON/OFF

Used on ME10 systems. This parameter indicates the state of the engine brake regulation (EBR), or traction control, system. Display reads ON when EBR has been activated and OFF during normal driving.

ECM IDENTIFIEDENGINE CONTROL MODULE IDENTIFIED________________ YES/NO

Used on ERE/EVE/ASF (IFI DIESEL), ME10, ME20 and HFM systems. These parameters indicate whether the drive authorization system (DAS) and ECU have correctly identified each other. The display reads YES if the modules have correctly identified each other and will read NO if they have not correctly identified each other. The modules are coded together and the mutually shared code cannot be erased.

ECM LOCKEDENGINE CONTROL MODULE LOCKEDYES/NO

Used on ERE/EVE/ASF (IFI DIESEL), ME10, ME20 and HFM systems. These show if the drive authorization system (DAS) and ECU have correctly identified each other. If the display reads YES, the modules have not identified each other and the engine is prevented from starting.

ECT LH1ENGINE COOLANT TEMP. 1ECT LH2ENGINE COOLANT TEMP. 2 _0 to 5.00 V

Used on DM and LH systems. These parameters display the voltage drop created by the resistance of the engine coolant temperature (ECT) sensors. The ECT is a negative temperature coefficient (NTC) sensor, so resistance decreases as temperature increases. The display should read high voltage on a cold startup, then gradually drop as the engine warms up. The ECU uses the ECT signal to regulate fuel injection during start-up, after start enrichment, warm-up enrichment, acceleration enrichment, deceleration fuel shutoff; ignition timing at startup, warm-up, closed throttle and deceleration shut-off; catalyst warm-up, charcoal canister purge, 2-3 up-shift delay, camshaft adjustment, overheat protection and anti-knock control.

ECT OPERATING TEMPERATUREECT SENSORECT VALUE RANGE ________ YES/NO

Used on DM and DM2 systems. These parameters indicate that the ECU self diagnostic tests for the engine coolant sensors have run.

EFFECT.COOL.FAN OUTPUT DUTY CYCLE ____________________________ 0 to 95%

Used on HFM systems. This parameter displays the effective output of the cooling fan. The display shows the duty cycle of the cooling fan, which is controlled by the ECU.

EGREGR ACTIVATIONEGR LOGIC CHAINEGR VALVE ____________________ ON/OFF

Used on DM, LH and ME20 systems. These parameters indicate the state of the exhaust gas recirculation (EGR) system. On LH systems, EGR is controlled by the LH module through the EGR switch-over valve. On ME20 systems the ECU processes engine speed, air mass and coolant temperature input signals to control EGR. The display reads ON when the ECU is commanding recirculation and OFF when EGR is off. Approximately 10 to 15% of the exhaust gas is recirculated. On LH systems, the ECU prevents EGR until the engine coolant temperature reaches 149°F (65 °C). On ME20 systems, engine coolant temperature must reach 118°F (48 °C), and the closed throttle position switch must be open to allow EGR.

EGR LOGIC CHAIN ____ ON/OFF

Used on DM2 systems. This parameter indicates that the ECU on-board diagnostic tests for the EGR system have run. Any problem would be reported as a diagnostic trouble code.

EGR____ ON/OFF

EGR VALVE ____ 0 to 100%

Used on ERE/EVE/ASF (IFI DIESEL). In systems without a turbocharger, the ECU controls the EGR vacuum transducer using a varying current. EGR VALVE displays an ECU-calculated value based on the varying current. The greater the percentage, the larger the EGR valve opening.

Turbo systems rely on the ECU to vary current to the EGR switchover valve, which regulates vacuum to the EGR valve. The greater the control current, the greater the EGR flow.

ELECTRIC AIR PUMP ____ ON/OFF

Used on ME27 and ME28 systems. This parameter indicates the state of the electric air pump, on or off. The air is forced into the exhaust manifold through the air pump switchover valve. These air injection systems are upstream only, operating during cold and warm-up operation.

ELECTRIC COOLING FAN ____ ON/OFF

Used on HFM and ME20 systems. This parameter indicates the state of the electric cooling fan. The ECU should switch the fan ON when engine coolant temperature reaches a certain temperature.

ENGINE BRAKE TORQUE ____ variable

Used on HFM systems. This ECU-calculated parameter displays engine torque in newton-meters (Nm). Engine load partially determines engine brake torque.

ENGINE COOLANT TEMPERATURE(V) ____ 0 to 5.00 V

ENGINE COOLANT TEMPERATURE(°C) ____ -40 to 255°C)

ENGINE COOLANT TEMPERATURE(°F) ____ -40 to 491 °F

Used on ARA/ELR, DM, DM2, EDS, ERE/EVE/ASF (IFI DIESEL), EZ, HFM, ME10, ME20, ME27, and ME28 systems. This parameter is the voltage drop created by the resistance of the engine coolant temperature (ECT) sensor. The ECT is a negative temperature coefficient (NTC) sensor, so resistance decreases in proportion to temperature increases. The display should read high voltage on a cold startup, then gradually drop as the engine warms up. In most cases the engine coolant temperature will be displayed in °C. The measurement units can be changed from degrees Celsius (°C) to degrees Fahrenheit (°F). The preset measurement is °C.

ENGINE LOAD ____ 0 to 100%

Used on ME10, ME20, ME27, ME28, and SIM4 systems. This parameter is an ECU-calculated engine load displayed as a percentage. The ECU determines engine load based on RPM, number of cylinders, airflow, and cylinder air charge. Input sensor readings are compared to a theoretical air charge that occurs at standard ECU temperature and pressure (volumetric efficiency). The resulting ratio, called engine load, is expressed as a percentage. With the engine running at idle under a normal load readings should be between 20 to 40%. During normal driving, load should be lower than 80%.

The ME-MOTRONIC engine management system uses torque-led control, which means it calculates the internal torque produced during combustion. This is the physical force produced by gas pressure during the compression and power strokes. The actual net torque of the engine has to account for friction, gas transfer losses and drive power for ancillary equipment, such as the water pump, alternator and AC compressor. The ME program contains the optimal specifications for charge density, injection duration, and ignition timing for any desired torque, which makes it possible to obtain optimal emissions and fuel consumption for every operational mode. Operational demands are prioritized and coordinated individually to use the appropriate control to achieve the specified torque. Torque based control is possible because the electronic accelerator permits throttle valve control beyond the pedal value inputs.

ENGINE OIL LEVEL ____ OK/NOT OK

Used on ME10 systems. This parameter indicates if there is or is not enough engine oil in the crankcase. Display should read OK at all times. The display only reads NOT OK if the engine oil falls below a certain level, which indicates the possibility of engine damage.

ENGINE OIL TEMPERATURE __________________________-60 to 116°C or -76 to 240°F

Used on ME20 systems. This parameter is based on the input signal of the engine oil temperature sensor, and displays engine oil temperature. The measurement units can be changed from degrees Celsius (°C) to degrees Fahrenheit (°F). The preset measurement is °C.

ENGINE SPEED ____ 0 to engine maximum

Used on all systems. This parameter is the engine crankshaft speed displayed as revolutions per minute (RPM). RPM is internally calculated by the ECU based on reference pulses from the ignition system or the crankshaft position (CKP) sensor.

ENGINE SPEED LIMITERENGINE START CONTROL________________________ ON/OFF

Used on HFM, ME27 and ME28 systems. This parameter indicates if the ECU is limiting engine speed. The display should read OFF under normal operating conditions. A reading of ON indicates the ECU is taking preventive measures to avoid internal damage. To protect the engine, torque converter and powertrain, the ECU limits engine speed under specific operating conditions by leaning the air-fuel mixture, cutting off fuel delivery, or retarding ignition timing.

ENGINE START TEMPERATURE ________________________ -6 to116°C or -21 to 240°F

Used on HFM, ME10, ME20 ME27, ME28 and SIM4 systems. This parameter displays what the engine coolant temperature was when the engine was started. The parameter resets with each key cycle, and shows engine start temperature. The measurement units can be changed from degrees Celsius (°C) to degrees Fahrenheit (°F). The preset measurement is °C.

ETS INTERVENTION ____ ON/OFF

ETS ____ YES/NO

Used on HFM systems. This parameter indicates if the electronic traction system engaged. The display reads ON or YES when the electronic traction system is engaged, and OFF or NO when disengaged.

ETS INTERVENTION ____ ON/OFF

Used on ME20, ME27 and ME28 systems. This parameter shows the state of the exhaust flap, which is positioned on one side of the exhaust system between the three-way catalyst (TWC) and the rear muffler. The display reads ON when the ECU is commanding the vacuum-operated valve to close, and OFF when the valve is open. The purpose of the flap is to increase back-pressure in the exhaust and to minimize noise during cruise conditions when fuel is shut-off on one bank of cylinders to conserve fuel. Typically, the exhaust flap closes (ON) at speeds up to approximately 2300 to 2500 RPM when cylinder shut off is ON. The flap does not completely seal off the exhaust pipe, but restricts it enough to dampen noise and to equalize temperature between banks.

EXHAUST GAS TEMPERATUREEXHAUST TEMPERATURE (TWC MODEL) __not available

Used on HFM, LH, ME10, ME27 and ME28 systems. This parameter is the ECU calculated exhaust gas temperature based on multiple input signals, and shows exhaust gas temperature. The measurement units can be changed from degrees Celsius (°C) to degrees Fahrenheit (°F). The preset measurement is °C.

EXHAUST TEMPERATURE LEFTEXHAUST TEMPERATURE RIGHT _____ not available

Used on ME10 systems. These parameters are ECU-calculated exhaust gas temperatures for the left and right cylinder banks based on multiple input signals, and shows exhaust temperature. The measurement units can be changed from degrees Celsius (°C) to degrees Fahrenheit (°F). The preset measurement is °C.

FAN CAPACITY REQUEST BY A/CFAN CAPACITY REQUEST BY ENGINEFAN CAPACITY, EFFECTIVE____0 to 100%

Used on ME27, ME28, and SIM4 systems. These parameters indicate the amount of the fan capacity used, as requested by the A/C system or the engine.

FRONT AXLE SPEED ____ 0 to vehicle max

Used on ME27 and ME28 systems. This parameter indicates the speed of the front axle based on input signals to the ECU from the wheel speed sensors. The measurement units can be changed from KPH to MPH.

FUEL CANISTER PRESSURE DIFF.______________________________ -50 to 30 HPA

FUEL CANISTER PRESSURE DIFF._____________________________________0 to 5 V

Used on ME27, ME28 and SIM4 systems. This parameter indicates fuel canister pressure difference. This pressure sensor is integral to the fuel level sender assembly. It detects pressure in the fuel evaporative system. Pressure varies with the pulsed actuation of the purge control valve. At sea level with the gas cap removed, normal voltage should be approximately 2.9 to 3.0 volts.

FUEL LEVEL ____0 to full tank capacity

Used on SIM4 systems. This parameter displays the fuel level in liters.

FUEL PUMP ____ ON/OFF

Used on LH systems. This parameter indicates the state of the fuel pump. The display reads ON when the fuel pump is energized and OFF when the pump is not running.

FUEL RACK TRAVEL ____ variable

Used on ERE/EVE/ASF (IFI DIESEL) diesel systems. The amount of travel is measured in millimeters. With the engine warm at idle, the normal travel range is 7.5 to 9.5 mm. Cold engine travel range is from 12 to 18 mm. With the engine fully warm, under load, fuel rack travel should read more than 12 mm. The fuel rack integral to the main fuel injection pump controls the fuel volume to the injectors, and works in conjunction with the fuel quantity actuator. The fuel rack position sensor measures the amount of travel of the fuel quantity actuator control rod.

FUEL RACK POSITION____ variable

Used on EDS diesel systems. The Scanner™ displays fuel rack position in millimeters. With the accelerator not depressed, the display should read approximately 10 mm. After depressing the accelerator slowly, the display should increase to approximately 20 mm at WOT.

FUEL TANK CAP ______________________________ OK/NOT OK

Used on ME10 systems. This parameter indicates if the fuel tank cap is properly installed. The display reads OK if the cap is correctly installed. A reading of NOT OK indicates a cap not sealing, or a major evaporative emissions system leak.

FUEL TANK LEVEL ______________________________ OK/NOT OK

Used on ME10 and ME20 systems. This parameter indicates if there is the proper amount of fuel in the fuel tank to run an evaporative emissions (EVAP) test. The display reads OK if the fuel level is within test range, and NOT OK if the fuel level is outside the test range.

FUEL TEMPERATURE______________________________-6 to 116°C or -21 to 240°F

Used on ERE_EVE_ASF (IFI Diesel). Fuel temperature is measured in order to calculate the fuel density. It is also used for a substitute signal in the event of a coolant temperature sensor failure. This parameter relies on the fuel temperature sensor, which is located in the electrohydraulic fuel cut off valve on the main injection pump. The measurement units can be changed from degrees Celsius (°C) to degrees Fahrenheit (°F). The preset measurement is °C.

FULL LOAD DETECTION ______________________________ ON/OFF or YES/NO

Used on ME27, ME28 and SIM4 systems. This parameter reads YES or ON when the engine fuel management system is functioning in full load operating mode.

FUNCTION FAULT ______________________________YES/NO

Used on HFM systems. This parameter indicates if a functional problem exists with a specific component or system. The display reads YES if a fault is detected and NO if there are no faults.

HFM VOLTAGEHOT FILM VOLTAGEHOT WIRE VOLTAGEHOT FILM MASS AIR FLOW SENSOR ______________________________0 to 5.00 V

HOT FILM MASS AIR FLOW SENSOR ______________________________0 to 500 kg/h

Used on ME10, ME20, ME27, ME28, HFM and LH systems. This parameter is the voltage required to maintain a 320°F (160 °C) temperature in the heated circuit of the mass air flow sensor. Normal ranges vary between systems. On ME systems, expect to see 1.4 to 1.5 volts (10 to 20 kilograms per hour (kg/h)) with a hot engine running at idle and all accessories off and 2.0 and 2.2 volts at 3000 RPM. For HFM systems idle readings should be about 0.7 to 0.9 volts and readings at 3000 RPM about 1.7 to 1.9 volts. With a LH system, look for readings between 0.7 and 1.7 volts at idle. The hot film airflow sensor controls the temperature of the heating resistor (Rh) with a variable voltage. Temperature is maintained at 320°F (160 °C) above the intake air temperature detected by the temperature resistor (Rl). The sensor (Rs) monitors heating resistor (Rh) temperature. If the temperature changes, the ECU alters voltage applied to the heating resistor (Rh) until the correct temperature difference is again achieved.

HFM-SFI MAP ______________________________not available

Used on HFM systems. No information is available at this time.

HOLD GEAR ____ ON/OFF

Used on ME10 and ME20 systems. This parameter is a cruise control input that indicates if the ECU is maintaining a transmission range during hill climbing or other high-load condition. Display reads ON when a specific gear is being held in and OFF during normal driving conditions.

HOT WIRE AIR MASS ____ 0 to 500 kg/h

HOT WIRE AIR MASS ____ 0 to 5.00 V

Used on LH systems. This parameter is an ECU calculation of the mass of the intake air charge in kilograms per hour (kg/h) based on the input of the hot film mass airflow sensor. Normal hot idle values vary depending on engine. In general, readings from 15 to 30 kg/h are normal for a hot engine running at idle with all accessories switched off.

IDLE FUEL TRIM ADAPTATION LEFTIDLE FUEL TRIM ADAPTAT. RIGHT____ -1 to 1ms

IDLE FUEL TRIM CYL. 1-3 RIGHTIDLE FUEL TRIM CYL. 4-6 RIGHTIDLE FUEL TRIM CYL. 7-9 LEFTIDLE FUEL TRIM CYL. 10-12 LEFT ____________________ -0.7 to 0.7ms

Used on ME27 and ME28 systems. These fuel trim numbers represent the fine tuning long term correction to the fuel injection pulse width to either individual banks or groups of cylinders. This number is learned by the ECU and used to correct small differences between engines and engine wear. When the short term correction is outside the window defined in the ECU's memory, the long term fuel trim is changed. Each change in the Long Term Fuel Trim is equivalent to a change of the Short Term Fuel Trim over its entire range. When the short-term Fuel Trim reaches its upper or lower limit, it resets back to the beginning, and moves the long term fuel trim up or down by one count. The short term fuel trim continues to move very quickly and if the limits are reached, it again will increment the long term fuel trim. This will continue until either the fuel mixture problem is corrected or long term fuel trim reaches its limit and a DTC sets.

This type of adaptation adjusts long term fuel trim in small, incremental amounts. It is also called Additive Mixture Adaptation because it can modify the duration of injection by adding or subtracting to the entire fuel map by a incrementally small amount, which affects all cells equally the same. It thus affects the entire engine speed range or all fuel map cells, but is most noticeable at idle because of the minimal amount of adjustment capability.

Additive Mixture adaptation addresses faults that are most severe at idle, and lessen in severity as engine speed increases. A vacuum leak would be a typical example. This type of adaptation is not dependent on base injection duration.

IDLE SPEED CONTROLIDLE SPEED DETECTIONIDLE SPEED RECOGNITION YES/NO

Used on DM, ERE/EVE/ASF (IFI DIESEL), ME27, ME28, and SIM4 systems. This parameter indicates whether the idle speed control circuit is on or off.

IFI/DFI RECEIVING FROM ETC (722.6)__________________________________ ON/OFF

IFI/DFI RECEIVING FROM ETS/ABSIFI/DFI RECEIVING FROM ETS/ABS/ASRIFI/DFI RECEIVING MESSAGE 1 FROM ICIFI/DFI RECEIVING MESSAGE 2 FROM ICIFI/DFI TRANSM. TO ASR/ESP/ A/C /ETCIFI/DFI TRANSM. TO IC/ASR/ETC (722.6)IFI/DFI TRANSMITTING TO ETC/ASRIFI/DFI TRANSMITTING TO ETC/IC____________ YES/NO

ENGINE CONTROL MODULE OR CAN-BUS _________________________ OK/NOT OK

Used on ERE/EVE/ASF (IFI DIESEL) (IFI Diesel). Indicates whether controller area network (CAN) data bus communications are properly received by individual control units. The total of the data blocks, the short pause between two transmission cycles, and other properties of the CAN data bus, are constantly checked. Any faults detected are stored.

IGNITION ADVANCE ANGLEIGNITION ANGLEIGNITION FIRING POINT CYLINDER 1 _ - 30 to 60 degrees

Used on DM2, EZ, HFM, ME10, ME20, ME27, ME2, and SIM4 systems. This parameter displays the ignition spark angle, or timing, in degrees. The display shows timing advance as a positive (+) value and retard as a negative (-) value. Timing advance changes with engine speed and load, varying model and engine. See the Vehicle Emissions Certification Identification (VECI) sticker for the ignition spark angle range at idle.

IGNITION FAULT COUNTER CYL. 1IGNITION FAULT COUNTER CYL. 2IGNITION FAULT COUNTER CYL. 3IGNITION FAULT COUNTER CYL. 4IGNITION FAULT COUNTER CYL. 5IGNITION FAULT COUNTER CYL. 6 _____________________ 0 to 255

Used on HFM systems. These parameters display the number of OBD ignition misfire faults detected per cylinder.

IGNITION VOLTAGE CYL. 1 to 12 ____________________________________ 0 to 500 V

Used on EZ systems. The “1 to 12" in the parameter name indicates twelve separate parameters, one for each cylinder. These parameters display the primary coil spark line, or burn time, voltage per cylinder. Normal range is 34 to 37 V on a hot engine running at idle.

IMMOBILIZER STATUS ____ ON/OFF

Used on SIM4 systems. This parameter indicates whether the immobilizer (anti-theft system) circuit is on or off.

INDICATED ENGINE TORQUE ____________________________________ not available

Used on HFM, ME27 and ME28 systems. This parameter is ECU-calculated, displaying engine torque in Newton meters (Nm). The parameter value varies according to engine load.

INERTIA FUEL SHUTOFF __________________________________ ON/OFF or YES/NO

Used on ME27 and ME28 systems. This parameter indicates if the ECU has temporarily shut off fuel injection during deceleration to reduce emissions. The display reads ON or YES if the ECU commands the injectors off during deceleration, and reads OFF or NO at all other times. Certain conditions must be met to activate: engine coolant temperature must be above 122 °F (50 °C), engine speed above 2100 RPM, and vehicle speed over 22 mph. The ECU recognizes deceleration when the throttle valve position is less than that required for a specific engine speed, or when the throttle idle contacts are closed. Once RPM drops to 1000, the injectors switch back on and the ignition timing is momentarily retarded to avoid a surge in power.

INJECTION DURATION CORRECTION ________________________________0 to 100%

Used on LH systems. This parameter displays the additional time that the ECU is commanding the fuel injectors on to compensate for natural flow rate inconsistencies. As injectors open and close they induce pressure waves in the fuel lines that cause flow rate inconsistencies. An adaptation factor correlated to engine speed and injector duration is used to compensate. Under normal conditions the correction should be less than 25%.

INJECTORINJECTION DURATIONINJECTION DURATION LEFTINJECTION DURATION RIGHTINJECTION TIME ____ variable

Used on HMF, ME10, ME20 and SIM4 systems. These parameters display the length of time in milliseconds (ms) that the ECU is commanding the indicated fuel injectors to turn on, or open. Display varies by engine, speed, and load. Normal ranges for an HFM system with the engine running at hot idle are: 11 to 17 ms for a 104 engine, and 3 to 5 ms or 14 to 16 ms for a 111 engine. Normal range for ME10, ME20, and SIM4 systems running at hot idle is 2 to 5 ms.

INJECTION TIME ADV. TRAVEL___________________________________ not available

Used on ERE_EVE_ASF (IFI Diesel). This parameter is the actual injection timing advance in millimeters (mm). The ECU controls injection timing inside the main injection pump. An actuator adjusts the injection cam to advance or retard positions.

INJECTION LONG-TERM ADAPTATIONINJECTION SHORT-TERM ADAPTATION INJECTION SYSTEMINJECTOR ACTIVATION_____________________________ YES/NO

Used on DM and DM2 systems. These parameters indicate whether the onboard diagnostic system has run tests for the injection system. YES indicates that the system has run the test.

INJECTION TIME, LEFT BANKINJECTION TIME, RIGHT BANKINJECTION TIME, CYLINDER 1 to 3INJECTION TIME, CYLINDER 4 to 6INJECTION TIME, CYLINDER 10 to 12 ____ variable

Used on ME27 and ME28 systems. These parameters display the injector on time in milliseconds (ms) for either bank or cylinder groups. Display varies by engine, speed, and load. Typical range for normal hot idle readings are 2 to 5 ms.

INJECTION SHUT-OFF CYLINDER 1 to 12 ______________________________ YES/NO

Used on ME27 and ME28 systems. The “1 to 12" in the parameter name indicates twelve separate parameters, one for each cylinder. These parameters indicate whether the fuel injection has been shut-off or not to the various cylinders. The ECU may shut down fuel to individual cylinders when misfire thresholds are reached. This protects the catalytic converter, limits excessive emissions, and prevents engine damage. Specific cylinders may also be shut down during cruise condition fuel economy and low emission operating mode. YES indicates that fuel injection to a particular cylinder has been shut off.

INTAKE AIR TEMPERATURE _________________________-60 to 65 °C or -76 to 150 °F

Used on DC12, DM, DM2, EDS, ERE/EVE/ASF (IFI DIESEL), EZ, HFM, LH, ME10, ME20, ME27, ME28, and SIM4 systems. This parameter displays the temperature of air coming into intake manifold in °C or °F. Reading is based on the input signal of the intake air temperature (IAT) sensor. On Diesel system ERE/EVE/ASF (IFI DIESEL), this parameter is used for fuel metering control, which limits smoke emissions, for controlling EGR, and for intake pressure control. The measurement units can be changed from degrees Celsius (°C) to degrees Fahrenheit (°F). The preset measurement is °C.

INTAKE MANIFOLDINTAKE MANIFOLD SW.-OVER VALVE__________________ ON/OFF

Used on DM2 and HFM and ME20 systems. This discrete parameter displays the state of the resonance flap used in the air induction system. When the display reads OFF, the flap is closed with the engine running at low speeds. When the display reads ON, the flap is open with the engine running at high speeds. The pneumatically controlled resonance flap is located on intake manifold, and effectively creates two different intake manifold lengths. The resonance flap is connected to the intake manifold switchover valve, which is controlled by the ECU. At low engine speeds, with the resonance flap closed, air is directed into the longer intake runners. This increases low-end torque by using the ram air effect. At high engine speeds, with the resonance flap open, intake air is fed into the short intake runners. This increases the volume of air to meet the higher demands of the engine.

INTAKE MANIFOLD ABS. PRESSURE___________________ 0 to 1000 mbar, ±100 mbar

Used on DM2 and ERE/EVE/ASF (IFI DIESEL) systems. This parameter, which displays a manifold absolute pressure reading in millibars (mbar) is used by the ECU for making camshaft timing adjustments and for detecting EGR flow on EGR-equipped vehicles. On ERE/EVE/ASF (IFI DIESEL) systems, the pressure sensor is also used for full load metering limiting, EGR, and intake pressure control to regulate boost.

IRREGULAR RUNNING SHUTOFF VALUE_________________________________ variable

Used on ME27 and ME28 systems. The ECU computes this time variable for different RPM/load ranges as an indicator of engine smoothness based on crankshaft sensor input. The ECU calculates this time variable either once per second (1/s) or twice per second (1/s2). If engine smoothness deteriorates, this number increases. At a certain threshold value, misfiring cylinder(s) are shutoff. Compare this value with data parameters SMOOTH RUNNING OF CYL. XX and MISFIRE FAULT COUNTER CYLINDER XX to diagnose specific problem cylinder(s).

IRREGULAR RUNNING SHUTOFF VALUEIRREGULAR RUNNING _______ not available

Use on SIM4 systems. The ECU computes this millisecond (ms) time variable for different RPM/Load ranges as an indicator of engine smoothness based on crankshaft sensor input. IRREGULAR RUNNING displays the actual live reading, while IRREG(IRREGULAR)RUNNING SHUTOFF VALUE displays the shutoff threshold. If engine smoothness deteriorates, this number increases. At a certain threshold value, misfiring cylinder(s) are shutoff. Compare this value with data parameters SMOOTH RUNNING OF CYL. XX and MISFIRE FAULT COUNTER CYLINDER XX to diagnose specific problem cylinder(s).

KICKDOWNKICKDOWN SWITCH____ ON/OFF

Used on EAG, EGS, ME27 and ME28 systems. This parameter indicates whether the kick-down switch has been activated. Used on automatic transmission systems.

KNOCK CONTROLKNOCK CONTROL LEFTKNOCK CONTROL RIGHT ENABLED/DIS-

ABLED

KNOCK CONTROL ACTIVE ____ ON/OFF

Used on EZ, ME27, ME28 and SIM4 systems. This discrete parameter indicates whether the knock control and ignition spark retard systems are active in preventing engine detonation. The reading is based on the ECU input signal from the knock sensor (KS). The display reads ENABLED or ON when the ECU is retarding spark to prevent detonation, and reads DISABLED or OFF when no detonation is detected.

KNOCK CONTROL APPROVAL ____ YES/NO

Used on HFM, ME10 and ME20 systems. This discrete parameter indicates whether the ECU is allowing knock control, which retards ignition spark, to prevent engine detonation when all the predetermined conditions are met. The display reads YES when conditions are met and the ECU is allowing spark retard to prevent detonation, and reads NO when conditions to enable knock control have not been met. In this case, the ECU does not adjust spark timing to control detected detonation.

KNOCK IGNITION ANGLE CYL. 1 to 8KNOCK IGNITION ANGLE CYL. 1 to 12 _ 0 to 60°

Used on EZ, HFM, ME10, ME20, ME27, ME28 and SIM4 systems. The “1 to 8" and “1 to 12" in the parameter names indicate up to twelve separate parameters, one for each cylinder. These parameters indicate the amount of spark advance, in degrees, removed by the ECU when the knock sensor (KS) senses detonation. Timing is retarded from the optimal advance for existing speed and load. Knock ignition angle does not indicate that timing is retarded after top dead center. Rather, it indicates the number of degrees of advance subtracted per cylinder until detonation stops.

KNOCK SENSORKNOCK SENSOR SIGNALSKNOCK SENSOR CYLINDER 1 to 4 KNOCK SENSOR FRONTKNOCK SENSOR LEFTKNOCK SENSOR LEFT FRONT KNOCK SENSOR LEFT REARKNOCK SENSOR REARKNOCK SENSOR RIGHTKNOCK SENSOR RIGHT FRONTKNOCK SENSOR RIGHT REAR_________________ 0 to 5.00 V

KNOCK SIGNALKNOCK SENSOR EVALUATION __________________________ YES/NO

Used on DM, ME10, ME20, ME27, ME28 and SIM4 systems. These parameters indicate the signal voltage provided to the ECU by the indicated knock sensor (KS). The display reads 0.0 V when no detonation is detected by the KS. Voltages greater than 0.0 V indicate detonation. As voltage increases, so does the intensity of the detonation.

LAMBDA CONTROL ACTIVE ____ YES/NO

Used on ME27, and SIM4 systems. This discrete parameter indicates whether the oxygen sensor and lambda fuel control circuit is currently adjusting the fuel mixture (closed loop). When this parameter displays YES, the ECU is in closed loop operation.

LAMBDA, UPSTREAM CAT, CYL 1 to 12LAMBDA, UPSTREAM CAT, LEFTLAMBDA, UPSTREAM CAT, RIGHT ____ 0.750 to 1.250

Used on ME27 and ME28 systems. The “1 to 12" in a parameter name indicates twelve separate parameters, one for each cylinder. These parameters indicate the short-term fuel trim (STFT) control factor which attempts to maintain a 14.7 to 1, or 1.0 Lambda, air-fuel ratio based on the oxygen sensor output. On the display, a 1.0 Lambda reading is the base adjustment or neutral starting point. Readings over 1.0 Lambda represent a lean condition with a rich correction, or increased injector time. Readings lower than 1.0 Lambda represent a rich condition with a lean correction, or reduced injector time.

LE ACTUATOR ACT.VALUE POT.MTR R1LE ACTUATOR ACT.VALUE POT.MTR R2 0 to 5.00 V

Used on ME10 systems. These parameters indicate the signal provided to the ECU by the electronic actuator control potentiometer sensors (R1 and R2). These parameters are used on drive-by-wire systems that do not have a mechanical throttle linkage. An electronic actuator controls the throttle valve under different operating conditions to regulate idle speed, cruise control operation, driving on the basis of accelerator position, traction control (Acceleration Slip Regulation), the Electronic Stability Program (ESP), and emergency running. Accelerator pedal position is detected by two potentiometers that transmit input signals to the ECU. Based on these signals, the ECU controls the throttle actuator. One potentiometer is the pedal value sensor and the other is the electronic actuator. The throttle actuator supplies a reference value for a plausibility check. If one potentiometer fails, the system switches over to the other one. A quick check is to add both readings (R1 and R2) together at various throttle positions. They should add up to the same value, usually between 4.5 to 4.9 volts.

LEAN/RICH RESPONSE TIME ____________________________________ 0 to 200 ms

Used on DM2 systems. This parameter is the lean to rich response time, or rise time, of the oxygen sensor (O2S) in milliseconds (ms). The display reflects quality of the O2S feedback signal to the ECU, and how well the ECU is correcting for changes in the air-fuel mixture. In general, the lower the reading, the faster the ECU is responding.

LEARN VALUE THROTTLE VALVE STOP ____________________________ 0 to 100%

Used on ME10 and ME20 systems. This parameter indicates the amount of ECU correction, or the learned value, for throttle stop position as a percentage. Each time the throttle closes it must return to a set tolerance of the previous voltage. If it varies more than the tolerance, the ECU then learns a new closed throttle position. Typically, readings should be low. Higher readings indicate the ECU is actively making adjustments in order to maintain the correct idle speed.

LEFT FRONT VSS ____ 0 to vehicle max

Used on HFM systems. This parameter indicates the input signal voltage provided to the ECU by the left front wheel speed sensor. Display should increase and decrease in proportion to the rotational speed of the wheel.

LEFT O2S (LAMBDA) CONTROL ACTIVE ________________________________ YES/NO

Used on ME10 systems. This parameter indicates whether or not the system is operating in closed loop and the ECU is responding to the left bank oxygen sensor (O2S) feedback signal. The display reads YES when operating in closed loop, and NO when in open loop.

LEFT O2S (LAMBDA) CONTROL AUTHORIZED___________________________ YES/NO

Used on ME10 systems. This parameter indicates whether or not the ECU is allowing closed loop operation. The display reads YES when closed loop operation is allowed, and NO when the ECU is holding the system in open loop.

LEFT O2S (LAMBDA) CONTROL FAULT________________________________ YES/NO

Used on ME10 systems. This parameter indicates whether or not the ECU has recognized a failure on the left oxygen sensor (O2S) circuit. The ECU prevents closed loop operation if a fault is detected. The display normally reads NO, a reading of YES indicates a fault is present.

LEFT O2S (LAMBDA) CONTROL W/O O2S2_________________________ -25 to +25%)

Used on ME10 systems without a downstream O2S. This parameter represents the short-term fuel metering correction based on the signal of the upstream O2S on the left cylinder bank. Lambda control determines the injector duration required to maintain a 14.7:1, or 1.0 Lambda, air-fuel ratio. Zero is the base setting, no correction. Positive readings indicate increased injector duration to correct a lean condition, and negative readings indicate reduced on time to correct a rich condition.

LEFT WOT (FULL LOAD)/DECEL.SHUT-OFF _____________________________ YES/NO

Used on ME10 systems. This discrete parameter indicates whether or not the ECU has shut off fuel delivery to the left cylinder bank to reduce emissions on deceleration. Display should read YES on deceleration following wide-open throttle (WOT) and NO at all other times.

LEVER POSITION ACCELERATELEVER POSITION DECELERATELEVER POSITION OFF____ ON/OFF

Used on ME27 and ME28 systems. These parameters indicate the cruise control lever positions.

LH-SFI REF. RESISTOR ____ YES/NO

Used on LH systems. This parameter indicates the sequential fuel injection (SFI) reference resistor installed. The resistor changes the fuel injection and ignition maps in the ECU. Up to seven resistors with different calibrations may be activated by relocating plugs in a housing with an integral resistance matrix. This allows adapting ignition timing to compensate for different fuel types (random octane number (RON) 91 or 95).

LOAD ____0 to 100%

Used on DM2 and HFM systems. This is an ECU-calculated engine load displayed as a percentage. The ECU determines engine load based on RPM, number of cylinders, airflow, and cylinder air charge. Input sensor readings are compared to a theoretical air charge that occurs at standard temperature and pressure (volumetric efficiency). The resulting ratio, or engine load, is expressed as a percentage. On an engine running at idle under a normal load, the reading should be between 20 to 40%. Load should always be lower than 80%.

LOAD CORRECTION FACTOR_____________________________________ variable Nm)

Used on ME10, ME20, ME27 and ME28 systems. This is an ECU-calculated engine torque in Newton meters (Nm). Readings vary according to engine load. The ME-MOTRONIC system uses torque-led control, which means it calculates the internal torque produced during combustion. This is the physical force produced by gas pressure during the compression and power strokes. The actual net torque of the engine has to account for friction, gas transfer loss and drive power for the water pump, alternator, and A/C compressor. The ME program contains optimal specifications for charge density, injection duration and ignition timing for any torque. This makes it possible to obtain optimal emissions and fuel consumption for any operational mode. ME27 and ME28 system engines operating at normal warm idle should range from 0.700 to 1.300 Nm.

LOW VOLTAGE ____ YES/NO

Used on DM2 systems. This parameter indicates whether the battery voltage is low, causing the ECU to behave erratically.

LOWER P. LOAD F. TRIM CYL 1-6, RIGHTLOWER P. LOAD F. TRIM CYL 4-6, RIGHT LOWER P. LOAD F. TRIM CYL 7-9, LEFTLOWER P. LOAD F. TRIM CYL 10-12, LEFT ____ variable

Used on ME27 and ME28 systems. These fuel trim numbers represent the long term correction to the fuel injection pulse width when the engine is under partial load. This number is learned by the ECU and is used to correct small differences between engines and engine wear. When the short term correction is outside the window defined in the ECUs memory, the long term fuel trim (P. LOAD F. TRIM) is changed. P. LOAD F. TRIM can modify injector duration using a self-adaptation factor. A 1.0 reading represents the neutral base adjustment point. Readings greater than 1.0 indicate that the duration of injection is currently being extended because the system is running lean. Readings less than 1.0 indicate that the duration of injection is currently being shortened because the system is running rich. This injection corrective factor affects only those adaptive learn memory cells controlling long term fuel correction in the part-load operation (lower to mid-range). The pre-programmed base pulse width (original fuel, RPM/Load mapping with no correction) determines the actual corrected injector pulse. For ME27 systems the parameter values range from 0.750 to 1.280; for ME28 systems, the values range from 0.680 to 1.320.

LR VSS ____0 to vehicle max.)

Used on EGS systems. This parameter indicates the speed of the left rear wheel based on input signals to the ECU from the wheel vehicle speed sensor (VSS). The measurement units can be changed from KPH to MPH.

M39(RECIR. AIR FLAP ACT.)VOLT.1M39(RECIR. AIR FLAP ACT.)VOLT.2 _not available

Used on SIM4 supercharged systems. This supercharger air flap has the dual function of directing supercharged compressed air into exhaust manifold during engine warm-up or into the engine at the intake manifold. This system uses a dual potentiometer as a back-up reference check.

MANIFOLD AIR PRESSURE ______________________________ 0 to 1000, ±100 mbar

MANIFOLD AIR PRESSURE ______________________________________0 to 5.12 V

Used on ME27, ME28 and SIM4 systems. The manifold absolute pressure (MAP) sensor provides an analog voltage parameter that varies with manifold pressure. The voltage is low when the absolute pressure is low and is high when the absolute pressure is high. Either the ECU or the Scanner™ calculates a manifold absolute pressure reading in millibars (mbar) from the MAP sensor voltage signal.

MANIFOLD ABS. PRESSURE (MAP)MANIFOLD AIR PRESSURE DIFF _ 0 to 1000, ±100 mbar

Used on EZ, ME10 and ME20 systems. This parameter displays intake manifold absolute pressure in millibars (mbar), and is used for adjusting camshaft timing and detecting EGR flow. NOTE: Some ME10 and ME20 systems also display MAP sensor voltage, which ranges from 0 to 5.12 volts.

MASS AIR FLOW SENSOR____ YES/NO

Used on DM and DM2 systems. This parameter indicates whether the mass air flow (MAF) sensor is operating correctly or not.

MAX. INDICATED ENGINE TORQUEMIN. INDICATED ENGINE TORQUE______ variable

Used on HFM systems. These parameters display the ECU-calculated minimum and maximum engine torque in Newton meters (Nm).

MISF.RECOGN. SH-OFF THRESHLD ____________________________________ variable

Used on ME10 and ME20 systems. This parameter is the specified threshold that a misfire must surpass before it is considered a misfire. Crankshaft acceleration is measured for each cylinder-firing event. If acceleration drops below a specified threshold, a misfire occurred.

MISFIRE CYLINDER 1 to 8MISFIRE CYLINDER 1 to 12 ________________ not available

Used on ME10 and ME20 systems. The “1 to 8" and “1 to 12" in the parameter names indicate twelve separate parameters, one for each cylinder. These parameters are only active if a misfire occurs. The display represents the actual RPM drop for each individual cylinder, which must drop below the shutoff threshold before it registers.

MISFIRE FAULT COUNTER CYLINDER 1 to 12MISFIRE COUNTER CYLINDER 1 to 4 ____ variable

Used on ME10, ME20, ME27, ME28 and SIM4 systems. The “1 to 4" and “1 to 12" in the parameter names indicate up to twelve separate parameters, one for each cylinder. These parameters represent the number of times a particular cylinder has registered a misfire. To register a misfire, the RPM of the cylinder must fall below the shutoff threshold.

MIXTURE ADAPTATION ______________________________ INHIBITED/NOT INHIBITED

Used on ME27 and ME28 systems. This parameter states whether the short-term ECU is permitting fuel metering correction to maintain a stoichiometric (14.7:1), or 1.0 Lambda, air-fuel ratio. NOT INHIBITED indicates a 1.0 Lambda air-fuel ratio. INHIBITED indicates an air-fuel ratio other than 1.0 Lambda.

MULTIPLE COMBUST MISF. TWC PROT.MULTIPLE COMBUST MISF. EMISS. LIM. MULTIPLE COMBUST MISF. I/M PROGR.MULTIPLE IGN. MISF. TWC PROTECT. MULTIPLE IGN. MISFIRE I/M PROGR.MULTIPLE IGN. MISFIRE EMISS. LIM. __ YES/NO

Used on DM2 systems. These parameters indicate whether the onboard tests for misfire monitoring programs have run or are running.

MULTIPLE MAP ADJUSTMENT ACTIVE _________________________________ ON/OFF

Used on HFM systems. This parameter indicates whether multiple MAP adjustment system is on of off. No further information is available at this time.

NOMINAL AIR MASS____ 0 to 255 mg/S

Used on EDS and ERE/EVE/ASF (IFI DIESEL). This parameter reports the desired air mass reading for a normal running engine in milligrams per second (mg/S). Most port fuel injection engines have an airflow sensor to measure the mass, or weight, of air entering the engine.

The airflow sensor delivers a signal that indicates the mass airflow in milligrams per second at any given instant. The ECU uses the signal from the airflow sensor and other sensors to determine the air-fuel ratio needed by the engine and the amount of fuel to be injected.

NOMINAL ENGINE SPEED __________ 0 to engine max

Used on ARA/ELR, ERE/EVE/ASF (IFI DIESEL), HMF, ME10, and ME20 systems. This analog parameter displays the desired engine speed that the ECU is trying to maintain. If there is a large difference between actual speed and desired RPM readings, the ECU may have reached its control limit, and can no longer control engine speed. This may be due to a basic mechanical or electrical problem with the engine.

NOMINAL FUEL RACK TRAVEL __________ variable mm

NOMINAL INJ. TIM. ADV. TRAVEL __________ variable mm

NOMINAL MANIFOLD ABSOL. PRESS. __________ variable mbar

NOMINAL PRESSURE DISTRIB. PIPE __________ variable mbar

NOMINAL SLIDE VALVE ACTUATOR __________ variable mm

NOMINAL START OF INJECTION __________ variable °

NOMINAL VEHICLE SPEED __________ 0 to vehicle max

OPERATING ACTUAL RPM __________ 0 to engine max

OPERATING NOMINAL RPM __________ 0 to engine max

Used on ERE/EVE/ASF (IFI DIESEL) systems. These analog parameters are the measurements that the ECU is trying to maintain. If there is a large difference between actual measurements and desired readings, the ECU may have reached its control limit without being able to control the engine. This may be due to a basic mechanical or electrical problem with the engine.

NUMBER OF STARTS WITH NON-LOCKED ECM __________ 1 to 25

Used on ME10 and ME20 systems. This parameter displays the number of engine starts since ECU installation. A program coding option can be configured to lock or not lock the ECU to the vehicle it is installed in. This feature locks or codes the ECU to a specific vehicle after a certain number of engine starts (up to 25). This prevents this ECU from being used on another vehicle (ECU must be sent to Mercedes-Benz to be uncoded from a specific vehicle).

O2 CONTROL DOWNSTREAM CAT, CYL 1-3;4-6;7-9;10-12O2 CONTROL UPSTREAM CAT, CYL 1-3;4-6;7-9;10-12O2 CONTROL, DOWNSTREAM CAT, LEFTO2 CONTROL, DOWNSTREAM CAT, RIGHTO2 CONTROL, UPSTREAM CAT, LEFTO2 CONTROL, UPSTREAM CAT, RIGHT __________ ON/OFF

Used on ME27 and ME28 systems. These parameters display the state of the downstream and upstream oxygen sensors (O2S) and circuits for each bank or groups of cylinders. The terms “1-3,” “4-6,” “7-9,” and “10-12” refer to four separate groups of parameters. ON indicates that the ECU is using a particular O2S and its circuit.

O2 SENSOR, DOWNSTREAM CAT, CYL 1-3; 4-6; 7-9; 10-12O2 SENSOR, DOWNSTREAM CATO2 SENSOR, DOWNSTREAM CAT, LEFTO2 SENSOR, DOWNSTREAM CAT, RIGHTO2 SENSOR, UPSTREAM CAT, CYL 1-3; 4-6; 7-9; 10-12O2 SENSOR, UPSTREAM CATO2 SENSOR, UPSTREAM CAT, LEFTO2 SENSOR, UPSTREAM CAT, RIGHT ______________________________ 0 to 2.00 V

Used on ME27 and ME28 systems. The terms “1-3,” “4-6,” “7-9,” and “10-12” refer to four separate groups of parameters. The oxygen sensor (O2S) is the primary sensor that indicates whether the engine is running rich or lean. O2Ss have a range of 0.0 to 1.2 volts (V). A high 0.48 to 1.00 V signal indicates a rich mixture; a low signal indicates a lean mixture. In normal operation, the O2S voltage ranges from 0.1 to 1.0 V. The O2S must be hot, and the ECU must be in closed loop before the ECU will respond to the sensor signal. On some applications, individual cylinder sets of O2S readings are useful for determining specific cylinder fuel mixture and misfire diagnosis.

O2S (LAMBDA) CONTROL ______________________________ -10 to 10%

Used on DM, HFM and LH systems. This parameter is the short-term fuel metering correction based on O2S input. Lambda control determines the injection time in order to maintain a stoichiometric (14.7:1), or 1.0 Lambda, air-fuel ratio. Zero is the base setting, no correction. Positive readings indicate increased injector duration to correct a lean condition, and negative readings indicate reduced time to correct a rich condition.

O2S (LAMBDA) CONTROL APPROVED ______________________ YES/NO

Used on DM2 systems. This parameter shows if the system is in closed loop, and if the ECU is responding to oxygen sensor (O2S) feedback signals. The display reads YES in closed loop and NO in open loop.

O2S (LAMBDA) CONTROL AFTER TWCO2S (LAMBDA)CTRL AFT. TWC LEFTO2S (LAMBDA)CTRL AFT.TWC RIGHT ______________________ not available

Used on ME10 and ME20 systems. These parameters are the outputs in milliseconds of lambda control based on the downstream oxygen sensor (O2S) signals. No operation or range information is available at this time.

O2S (LAMBDA) CONTROL BEFORE TWCO2S (LAMBDA) CTRL BEF. TWC RIGHTO2S (LAMBDA) CTRL BEFORE TWC LEFTO2S CONTROL, UPSTREAM CAT(%) -25 to 25%

Used on ME10 and ME20 and SIM4 systems. These parameters represent the short-term fuel metering correction required to maintain a stoichiometric (14.7:1), or 1.0 Lambda, air-fuel ratio. Fuel corrections are based on the indicated O2S signals. Zero is the base setting, no correction. Positive readings indicate increased injector duration to correct a lean condition, and negative readings indicate reduced on time to correct a rich condition.

O2S (LAMBDA) CTRL CTP (IDLE) MEAN _____________________0 to 100%

Used on HFM systems. This is the average short-term fuel metering correction required at idle to maintain a stoichiometric (14.7:1), or 1.0 Lambda, air-fuel ratio. The display shows the correction factor as a percentage of total injector on time.

O2S (LAMBDA) CTRL PART. LOAD MEAN ____________________0 to 100%

Used on HFM systems. This parameter represents the average Lambda short-term fuel correction required at partial load to maintain a stoichiometric (14.7:1), or 1.0 Lambda, air-fuel ratio. The display shows the correction factor as a percentage of total injector on time.

O2S 1 HEATERO2S 1 (BEFORE TWC) HEATERO2S 2 HEATER ______________ ON/OFF

Used on HFM, ME10 and ME20 systems. These parameters display the state of the upstream oxygen sensor (O2S) heater circuits. A reading of ON indicates the heater circuit is energized and OFF indicates power is not being applied to the heater.

O2S 1 VOLTAGEO2S 2 VOLTAGE ________________________________ -200 to 1000 mV

Used on DM2 and HFM systems. These parameters are the feedback voltage signal delivered to the ECU by the oxygen sensor (O2S) on cylinder banks number one and two. During closed loop the display should switch rapidly from low (below 450 mV) to high (above 450 mV).

O2S CONT.SHIFT MILEAGE COUNTER ___________________________________ variable

Used on HFM systems. This is a count of the mileage driven since the oxygen sensor (O2S) was replaced in mph or kph. When the elapsed mileage reaches the O2S replacement interval, the ECU turns on a warning lamp on the dash. The counter must be reset when the O2S is replaced.

O2S DOWNSTREAM CAT, CYL 1 to 12O2S UPSTREAM CAT, CYL 1 to 12O2S DOWNSTREAM CAT, LEFTO2S DOWNSTREAM CAT, RIGHTO2S UPSTREAM CAT, LEFTO2S UPSTREAM CAT, RIGHT ___________________________ READY/NOT READY

Used on ME27 and ME28 systems. These parameters indicate whether the oxygen sensor (O2S) is at operating temperature, and ready or not ready to send reliable data. The “1 to 12" in the some of the parameter names indicate up to twelve separate parameters, one for each cylinder.

O2S HEATER AFTER TWCO2S HEATER BEFORE TWC ____________________ ON/OFF

Used on ME10 and ME20 systems. These parameters show the state of the upstream and downstream oxygen sensor (O2S) heater circuits. A reading of ON indicates the heater circuit is energized and a reading of OFF indicates power is not applied.

O2S VOLTAGE AFTER TWCO2S VOLTAGE AFTER TWC LEFTO2S VOLTAGE AFTER TWC RIGHT ____ 0 to 1000 mV

Used on ME10 and ME20 systems. These parameters are the feedback voltage signals delivered to the ECU by the downstream oxygen sensors (O2S). Normally, with a good catalytic converter, with engine fully warmed up, and in closed loop operation, the display should show a steady voltage reading within the operating range.

O2S VOLTAGEO2S VOLTAGE BEFORE TWCO2S VOLTAGE BEFORE TWC LEFTO2S VOLTAGE BEFORE TWC RIGHT _________________________________ -200 to 1000 mV

Used on LH, ME10 and ME20 systems. These parameters are the feedback voltage delivered to the ECU by the upstream oxygen sensors (O2S). During normal closed loop operation, the display should switch rapidly between a low reading (below 450 mV) and a high reading (above 450 mV).

O2S (LAMBDA) CONTROL AFTER TWCO2S (LAMBDA) CTRL AFT. TWC LEFTO2S (LAMBDA) CTRL AFT. TWC RIGHT __________________________________ not available

Used on ME10 and ME20 systems. These parameters are the outputs in milliseconds (ms) of lambda control based on the downstream oxygen sensor (O2S) signals. No operation or range information is available at this time.

OIL LEVEL ______ variable

Used on ME27, ME28, and SIM4 systems. This parameter displays the oil level in the sump in millimeters (mm).

OIL LEVEL SWITCH ______ OK/NOT OK

Used on ERE/EVE/ASF (IFI DIESEL) systems. This parameter indicates the status of the oil level switch. It should always read OK.

OIL QUALITY ______ 1.0 to 4.0

Used on ME27 and ME28 systems. This ECU-calculated parameter evaluates oil condition by taking into consideration mileage and the number of engine run times since the last oil change. Typically, the average reading ranges from 2.0 to 2.2.

OIL TEMPERATURE ______ -50 to 200°C or -58 to 392°F

Used on ME27, ME28 and SIM4 systems. This analog parameter monitors engine oil temperature. The measurement units can be changed from degrees Celsius (°C) to degrees Fahrenheit (°F). The preset measurement is °C.

ON OFF RATIO/O2S (LAMBDA) CONTROL(%) ______ 0 to +100%

Used on LH systems. This parameter represents the short-term fuel metering correction required to maintain a stoichiometric (14.7:1), or 1.0 Lambda, air-fuel ratio. Fuel metering corrections are based on O2S input signals before the three-way catalyst (TWC). The display is duty cycle. A 50% duty cycle is the base point, so a 50% reading indicates no ECU fuel correction. Readings above 50% indicate the ECU is correcting a lean condition, readings below 50% indicate the ECU is reducing fuel.

OUTPUT DEMAND DUTY CYCLE ______ 0 to 100%

Used on ME20 systems. This parameter displays the duty cycle of the ECU output to the engine cooling fan. The display is only active when the fan is operating. Readings vary with fan speed and cooling demand.

OUTPUT DEMAND DUTY CYCLE(%) ______ 0 to +100%

Used on ME20 systems. This parameter displays the duty cycle of the ECU output to the engine cooling fan. The display is only active when the fan is operating, readings vary with fan speed and cooling demand.

OUTPUT SHAFT SPEED ______ 0 to engine max

Used on EAG and EGS systems. This parameter displays the engine output shaft speed in RPM.

OXYGEN SENSOR (O2S) ______ YES/NO

Used on DM systems. This parameter indicates whether the oxygen sensor (O2S) is active or not.

P/N RECOGNIZED ______ YES/NO

Used on HFM systems. This discrete parameter displays the status of the Park/Neutral position (PNP) switch signal to ECU. The display should read YES (OK to engage starter) when the selector lever is in the park or neutral position, and NO when the selector is in any other range.

PARKING BRAKE ______ ON/OFF

Used on ERE/EVE/ASF (IFI DIESEL) systems. This parameter indicates whether the parking (hand) brake is on or off.

PART LOAD FUEL TRIM ADAPTAT. LEFTPART LOAD FUEL TRIM ADAPTAT. RIGHT ______ variable

Used on ME27 and ME28 systems. These fuel trim numbers represent the long term correction to the fuel injection pulse width when the engine is under partial load. This number is learned by the ECU and is used to correct small differences between engines and engine wear. When the short term correction (O2 Integrator) is outside the window defined in the ECUs memory, the long term fuel trim is changed. PART LOAD FUEL TRIM can modify injector duration using a self-adaptation factor. A 1.0 reading represents the base point. Readings greater than 1.0 indicate that the system is lean, and to correct, the duration of injection is increased. Readings less than 1.0 indicate that the system is rich, and to correct, the duration of injection is decreased. This correction factor affects only those adaptive learn memory cells controlling long term fuel correction in the part-load operation (lower to mid-range). This type of fuel trim adaptation is also called multiplicative because the change to injector duration is proportional to the base injector duration. This adaptation addresses faults that increase with engine speed, such as faulty injectors. In this case, the amount of adaptation needs to multiply injector pulse in proportion to the speed increase.

The actual fuel mixture adjustment in each cell depends on the pre-programmed base pulse width, base injection duration, original fuel, and RPM/Load mapping with no correction. On ME28 systems, the data parameter display ranges from 0.680 to 1.320; on ME27 systems, from 0.750 to 1.280.

PEDAL VALUE SENSOR SIGNAL 1PEDAL VALUE SNSR REF.POT.MTR R1PEDAL VALUE SENSOR SIGNAL 2PEDAL VALUE SNSR REF.POT.MTR R2______ 0 to 5.00 V

Used on ME10, ME20, ME27, ME28, and SIM4 systems. These parameters display the ECU input signals from the pedal position and electronic throttle actuator sensors. This is a drive-by-wire system with no mechanical throttle linkage. An electronic actuator controls the throttle valve to regulate the idle speed, cruise control operation, driving on the basis of accelerator position, traction control system, Electronic Stability Program (ESP), and emergency running. The accelerator pedal position is detected by two potentiometers that transmit input signals to the ECU. Based on these signals, the ECU controls the electronic throttle actuator. One pot is in the pedal value sensor and the other is in the electronic actuator. The throttle actuator supplies a reference value for a plausibility check. If one pot fails, the system switches to the other one. The voltages from both pots should change simultaneous with throttle change. The display should read between 0.2 and 0.5 volts (V) at idle. Typical normal readings at idle for Sensor 1 are 0.20 to 0.50V; Sensor 2 are 0.10 to 0.40V. At wide open throttle (WOT), typical normal readings for Sensor 1 are 4.30 to 4.80 V; Sensor 2 are 2.10 to 2.50V.

PEDAL VALUE ______ 0 to 5.00 V

Used on HFM systems. This parameter displays the ECU input signal from the pedal position sensor. Voltage varies according to operating conditions. The HFM system does not use a drive by wire electronic throttle actuator. Instead, a mechanical throttle linkage connects to an electronic actuator on the throttle body. The actuator has an integral clutch that overrides the mechanical linkage under certain conditions. The System controls idle, cruise control, and accelerator slip regulation (ASR), which is controlled by the EA/CC/ISC module.

PRESSURE CONTROL ____ ON/OFF

Used on ERE_EVE_ASF (IFI Diesel). Reads ON when turbo boost is controlled by the ECU. The boost pressure transducer is actuated by the ECU with variable current which regulates the boost pressure vacuum unit. The pressure control valve is closed by the boost pressure control valve vacuum transducer through the vacuum unit which directs exhaust gas against turbine wheel.

PURGE CONTROL____ ON/OFF

Used on ME27 and ME28 systems. This parameter indicates whether the purge control valve is on or off.

PURGE FACTOR F 1PURGE FACTOR F 2PURGE FACTOR F 3PURGE FACTOR F 4 0 to 100%

Used on HFM systems. These parameters display the percentage opening of the purge valve.

PURGE VALVE DUTY CYCLE____ variable

Used on HFM, ME10, ME20, ME27, and ME28 systems. The table below lists what ranges apply to which systems:

HFM	5–15%
ME10	0–20%
ME20	0–20%
ME27	0–95%
ME28	0–95%

These parameters display the duty cycle of the purge valve, which is the amount of on time the ECU is commanding. The display is only active when the purge valve is open (ON) and the value varies with operating conditions, but should always be within the specified range.

PURGING ____ ON/OFF

Used on DM, ME10, and ME20 systems. This parameter displays the status of the evaporative emissions (EVAP) purge valve. The display reads ON with the valve open and purge activated, and OFF with the valve closed and purge deactivated. When the display reads ON, the PURGE VALVE ON-OFF RATIO/DUTY CYCLE parameter should be displaying a value.

REAR AXLE SPEED ____________________________________ 0 to vehicle max

Used on ME27 and ME28 systems. This parameter indicates the speed of the rear axle based on input signals to the ECU from the wheel speed sensors. The measurement units can be changed from KPH to MPH.

RECIRCULATED AIR FLAP POSITION _____________________________0 to 100%

Used on ME20 and SIM4 systems. This parameter indicates the opening of the air flap as a percentage. The air flap controls supercharger boost and the signal is pulse-width modulated. At 0% the air flap is fully open and at 100% it is completely closed. At 11 to 99% boost control it is in part load range; and at 10% or less the air flap is open.

REFERENCE RESISTOR VOLTAGE ________________________________ 0 to 5.00 V

REFERENCE RESISTOR ____ variable

Used on EZ and HFM systems. This indicates the value of the reference resistor used for determining the internal fuel injection and ignition maps of the ECU. Up to seven resistors with different calibrations can be activated by relocating plugs in a housing with an integral resistance matrix. This permits adapting ignition-timing characteristics for different fuel types. The RON (Research Octane Number) is the anti-knock quality of fuel. The higher the number, the greater the resistance to knocking. Ignition timing can be retarded from 4 to 6 degrees, depending on whether RON 91 or 89 fuel is being used.

RESONANCE FLAP INT. MANIF. ACTUALRESONANCE FLAP INTAKE PIPE ACTUAL ____OPEN/CLOSED

RESONANCE FLAP INT. LINE NOM.RESONANCE FLAP INT. MANIF. NOMINAL RESONANCE FLAP INTAKE PIPE NOMINAL _______________________ not available

These parameters are used on ERE/EVE/ASF (IFI DIESEL) systems. They display the state of the two resonance flaps for the air induction system: the intake line resonance flap (nominal) and the intake manifold resonance flap (actual). The display should read OFF, flap closed, with the engine running at low speeds (610-710). It should read OPEN at 1300-2800 and read open with the engine running at high speeds (>2800).

When actuating the Inline Fuel Injection (IFI) accelerator greater than 50%, the intake line resonance flap opens. The resonance intake manifold switch delivers a signal to the IFI control module when the intake manifold resonance flap is completely open. The resonance intake pipe switch delivers a signal when the intake line resonance flap is completely open.

The pneumatically controlled resonance flap is located on the intake manifold, and effectively makes two different intake manifold lengths. At low engine speeds, resonance flap closed, air is directed into the longer intake runners. This increases low-end torque by using the ram air effect. At high engine speeds, resonance flap open, intake air is also feed into the short intake runners. This increases the volume of air to meet the higher demands of the engine.

RI ACTUATOR ACT.VALUE POT.MTR R1RI ACTUATOR ACT.VALUE POT.MTR R2 _ 0 to 5.00 V

Used on ME10 systems. These parameters display the ECU input signal voltage from the pedal position and electronic throttle actuator sensors. This is a drive-by-wire system with no mechanical throttle linkage. An electronic actuator controls the throttle valve under different operating conditions to regulate idle speed, cruise control operation, driving on the basis of accelerator position, traction control (Acceleration Slip Regulation), Electronic Stability Program (ESP) and emergency running. The accelerator pedal position is detected by two potentiometers that transmit input signals to the ECU. Based on these signals, the ECU controls the electronic throttle actuator. One potentiometer is in the pedal value sensor and the other is in the electronic actuator. The electronic throttle actuator supplies a reference value for a plausibility check. If one of the potentiometers fails, the system switches over to the other one. A quick check is to add both actuator signal readings (R1 and R2) together at various throttle positions. The two readings should always add up the same value, usually between 4.5 to 4.9 volts.

RIGHT O2S (LAMBDA) CONTROL ACTIVE______________________________ YES/NO

Used on ME10 systems. This parameter indicates whether or not the system is operating in closed loop and the ECU is responding to the right bank oxygen sensor (O2S) feedback signal. The display reads YES when operating in closed loop, and NO when in open loop.

RIGHT O2S (LAMBDA) CONTROL AUTHORIZED _________________________ YES/NO

Used on ME10 systems. This parameter indicates whether or not the ECU is allowing closed loop operation. The display reads YES when closed loop operation is allowed, and NO when the ECU is holding the system in open loop.

RIGHT O2S (LAMBDA) CONTROL FAULT________________________________ YES/NO

Used on ME10 systems. This discrete parameter indicates whether or not the ECU has recognized a failure on the left oxygen sensor (O2S), or Lambda control, circuit. The ECU prevents closed loop operation if an O2S fault is detected. The display reads NO during normal operation, a reading of YES indicates a fault is present.

RIGHT O2S (LAMBDA) CONTROL W/O O2S2__________________________ -25 to +25%

Used on ME10 systems without a downstream O2S. This parameter represents the short-term fuel metering correction based on the signal of the upstream O2S on the right cylinder bank. Zero is the base setting, no correction. Positive readings indicate the ECU is correcting for a lean condition by increasing injector on time, while negative readings indicate the ECU is correcting for a rich condition by reducing injector on time.

RIGHT WOT (FULL LOAD)/DECEL.SHUT-OFF ____________________________ YES/NO

Used on ME10 systems. This parameter indicates if the ECU has shut off fuel delivery to the right cylinder bank to reduce emissions during deceleration. The display should read YES on deceleration following wide-open throttle (WOT), full load operation, and NO at all other times.

RON CORRECTION____ variable

Used on HFM systems. This parameter indicates the ECU ignition timing adjustment for different octane fuels. The research octane number (RON) represents the anti-knock quality of fuel. The higher the RON, the greater the resistance to knocking. Depending on the system, ignition timing may retard 4 to 6 degrees to compensate for the fuel being used.

RON INDEX ____ ON/OFF

Used on HFM systems. This is the value of the reference resistor used for determining the internal fuel injection and ignition maps of the ECU. The research octane number (RON) is the anti-knock quality of fuel at lower speeds. Motor Octane Number (MON) is the anti-knock quality of fuel at higher speeds. U.S. government legislation simplified the issue requiring pumps to post the minimum octane number determined by “Cost of Living Council” (CLC). The CLC number is derived from both RON and MON. On this system the higher the RON, the greater the resistance to knocking. Depending on the reference resistor, ignition timing may be retarded 4 to 6 degrees.

SAFETY CONTACTSAFETY FUEL SHUT-OFF ____________________________ ON/OFF

Used on ERE/EVE/ASF (IFI DIESEL), HFM, LH, ME10, ME20, ME27, and ME28 systems. This parameter indicates the state of the safety contacts in the electronic accelerator actuator. The display normally reads OFF and ON when the safety contacts are closed. The ECU is connected to safety switch contacts in the electronic accelerator actuator or the cruise control/ idle speed control actuator. During normal operation, the switch sends a positive signal to the ECU. If the throttle opens more than the position specified by the accelerator pedal and the cruise control is not engaged, the switch sends a ground signal to the ECU. In response, the ECU switches the fuel injectors off. Injection switches back on when engine speed drops below 1200 RPM.

SELECTED GEAR ____ P,R,N,1,2,3,4

Used on HFM, LH, ME10, and ME20 systems. This indicates the gear selector lever position. The display shows the selected range position, not the current gear that the transmission is operating in.

SELECTOR LEVER POSITION ____ PN/RD1

Used on EGS, ERE/EVE/ASF (IFI DIESEL), HFM, LH, ME10, ME20, ME27, and ME28 systems. This indicates the gear selector lever position. The display shows the selected range position, not the current gear that the transmission is operating in.

SELF-ADAPT THROTTLE VALVE-ACT__________________________________ variable

Used on ME27 and ME28 systems. This parameter indicates the ECU adaptation in degrees for the throttle valve actuator. This adaptation is made to compensate for wear, based on voltage signal from the throttle valve actuator potentiometer.

SELF-ADAPTATION ____ ON/OFF

SELF-ADAPTATION _____________________________________ ENABLED/DISABLED

Used on HFM, ME27, ME28, and SIM4 systems. This parameter indicates whether or not the ECU is attempting to compensate for tolerances in the mixture by means of long term adaptation, or long term fuel trim (LTFT) adjustments. The display only reads ON or ENABLED when the ECU is making LTFT adjustments.

SELF-ADAPTATION CTP (IDLE) __________________________________ -1.0 to 1.0 ms

Used on LH and ME20 systems. This is the closed throttle (idle) fuel correction the ECU is commanding to maintain a 14.7:1, or 1.0 Lambda, air-fuel ratio. The display is the adjustment in addition to base injector time. There are three different ranges in which self-adaptation, or long-term fuel trim (LTFT) is performed: closed throttle; lower part throttle, and upper part throttle. If the short-term fuel trim (STFT) or O2S Lambda control constantly drifts out of mid-control range, the ECU shifts the Lambda map to recreate a control factor of about zero. The millisecond readout is added to or subtracted from the air mass inducted by the engine for determining injector time. For example, base injector time is 3.0 ms and SELF-ADAPT CTP (IDLE) reads 0.3 ms. This means the ECU is using a computed value of 3.3 ms to determine injector duration.

SELF-ADAPTATION CTP (IDLE) _____________________________________ ±850 kg/h

Used on LH and HFM systems. This parameter displays the closed throttle position (CTP), or idle, correction factor that the ECU is commanding. The displayed kg/h reading is added or subtracted to the AIR MASS sensor value in order to determine injection time.

For example, the SELF-ADAPTATION CTP (IDLE) reading is 0.500 kg/h and the AIR MASS sensor reading is 18 kg/h. The ECU will use a value of 18.5 kg/h to calculate the final injection quantity, thus compensating for a lean mixture. Positive values are added to the AIR MASS sensor reading and negative values are subtracted from the AIR MASS sensor reading.

SELF-ADAPTATION DELAY TIME ________________________________-1.0 to 1.0 ms

Used on ME20 systems. This parameter is the adaptation for injector delay time, which is supplementary injection duration based on battery voltage. Injector duration varies according to battery voltage. There can be substantial time lag before the injector opens completely, especially during cold starts or with a partially discharged battery. The display is the supplementary injector time added to the base duration to compensate.

SELF-ADAPTATION IDLE SP. AIR ___________________________________X.XX kg/h

SELF-ADAPTATION IDLE SP. AIR __________________________________ -15 to 15%

Used on LH and HFM systems. This parameter displays the closed throttle position (CTP), or idle, correction factor that the ECU is commanding to maintain a steady idle. The display for most systems is in kilograms per hour (kg/h) with zero being the base point. On some HFM systems, a percentage is displayed. For all systems, negative readings indicate the ECU is decreasing the idle valve opening and positive values indicate an increase in idle valve opening. The data mass variable is kilograms per hour (kg/h).

SELF-ADAPTATION, IDLE SPEED ______________________________-0.50 to 0.50 ms

Used on SIM4 systems. This fuel trim number represents the fine tuning long-term correction to the fuel injection pulse width. This type of long term fuel trim adjustment is also called Additive Mixture Adaptation because it can modify the duration of injection by adding or subtracting to the base injection time in each fuel map cell (affects all cells by the same amount). It thus affects the entire engine speed range or all fuel map cells, but is most noticeable at idle because of the minimal amount of adjustment capability. This number is learned by the ECU and used to correct small differences between engines and engine wear.

When the short term correction is outside the window defined in the ECU's memory, the long term fuel trim is changed. Each change in the Long Term Fuel Trim is equivalent to a change of the Short Term Fuel Trim over its entire range. When the Short Term Fuel Trim reaches its upper/lower limit, it resets back to the beginning, and moves Long Term Fuel Trim up or down by one count. The Short Term Fuel Trim continues to move very quickly and if the limits are reached, it again will increment the Long Term Fuel Trim. This will continue until either the fuel mixture problem is corrected or long-term correction reaches its limit and a DTC is set.

SELF-ADAPTATION, IDLE SPEED ______________________________-0.50 to 0.50 ms

Used on SIM4 systems. This parameter displays the closed throttle position (idle) fuel correction to maintain a 14.7:1, or 1.0 Lambda, air-fuel ratio. The display is the adjustment made in addition to basic injector on time. If short-term fuel trim (STFT) or O2S Lambda control constantly drifts out of mid-control range, the ME control module shifts this long-term Lambda map to recreate a control factor of about 0 ms. This is also called Additive Mixture Adaptation because it can modify the duration of injection by adding or subtracting to the base injection time in each fuel map cell. It thus affects the entire engine speed range or all fuel map cells, but is most noticeable at idle because of the minimal amount of adjustment capability.

SELF-ADAPTATION PARTIAL LOAD ________________________________-25 to 25%

Used on SIM4 systems. These parameters represent the long-term fuel metering correction required to maintain a stoichiometric (14.7:1), or 1.0 Lambda, air-fuel ratio. Fuel corrections are based on the indicated O2S signals and short term fuel trim. Positive readings indicate increased injector duration to correct a lean condition, and negative readings indicate reduced on time to correct a rich condition.

This is a long-term correction factor applied to the pre-programmed low partial load base cell values (original fuel, RPM/Load mapping with no correction).

SELF-ADAPTATION UPPER PART. LOAD ___________________________ 0.85 to 1.15

Used on LH systems. This parameter indicates the upper partial load self-adaptation factor, which is one of three factors that the ECU uses to make long-term fuel trim (LTFT) corrections to maintain a 14.7:1, or 1.0 Lambda, air-fuel ratio. On the display, a 1.0 reading is the base point. Readings over 1.0 are a rich correction, or increased injector time and readings lower than 1.0 are a lean correction, or reduced injector time. The ECU attempts to compensate for tolerances in the mixture by means of LTFT adjustments. All corrections are made in three ranges: closed throttle position, lower partial load, and upper partial load. The ECU multiplies the actual mass of the air inducted into the engine by the correction factor to determine the injection time. For example, if the actual air mass is 150 kg/h and the Scanner™ reading is 1.10, a computed air mass value of 165 kg/h (150 x 1.1 = 165) is used for injection time.

SELF-ADAPT. CTP (IDLE) LEFTSELF-ADAPT. CTP (IDLE) RIGHT ______ -1.0 to 1.0 ms

Used on ME10 and ME20 systems. These parameters display the closed throttle position (idle) fuel correction for the indicated cylinder bank the ECU is commanding to maintain a 14.7:1, or 1.0 Lambda, air-fuel ratio. The display is the adjustment made in addition to basic injector on time. There are three ranges in which self-adaptation, or long-term fuel trim (LTFT) is performed: closed throttle; lower part throttle, and upper part throttle. If short-term fuel trim (STFT) or O2S Lambda control constantly drifts out of mid-control range, the ME control module shifts the Lambda map to recreate a control factor of about 0%. Idle speed-learn, or SELF-ADAPT, is in millisecond output. The readout is added to or subtracted from the air mass inducted by the engine for determining injector time. For example, base injector time is 3.0 ms and SELF-ADAPT CTP (IDLE) LEFT reads 0.3 ms. This means that the ECU is using a computed value of 3.3 ms for determining injection time on the left bank.

SELF-ADAPT. DELAY TIME LEFTSELF-ADAPT. DELAY TIME RIGHT____ -1.0 to 1.0 ms

Used on ME10 and ME20 systems. These parameters display the left and right cylinder bank adaptation for injector delay time. Delay time is supplementary injection duration based on battery voltage. Injector duration varies according to battery voltage and there can be substantial time lag before the injector opens completely, especially during cold starts or with a partially discharged battery. The display represents the supplementary injector on time in (ms) that is being added to the base duration to compensate for this effect on the left cylinder bank.

SELF-ADAPT. FACTOR LOWER PART. LOADSELF-ADAPTATION LOWER PART. LOAD SELF-ADAPTATION PARTIAL LOAD ________________________________ 0.85 to 1.15

Used on LH and HFM systems. This parameter displays the lower partial load self-adaptation factor, which is one of three factors the ECU uses to make longterm fuel trim (LTFT) corrections to maintain a 14.7:1, or 1.0 Lambda, air-fuel ratio. A 1.0 reading represents the base point. Readings greater than 1.0 indicate a rich correction, or increased injector time, and readings below 1.0 indicate a lean correction, or reduced injector time. The HFM-SFI control module attempts to compensate for tolerances in the mixture by means of LTFT adjustments. All corrections are made in three ranges: closed throttle position, lower partial load and upper partial load. The ECU multiplies the actual mass of the air inducted into the engine by the displayed correction factor to determine the injection time. For example, if the actual air mass is 150 kg/h and the Scanner™ reading is 1.10, a computed value of 165 kg/h (150 x 1.1 = 165) is being used.

SELF-ADAPT.PART. LOAD FACTOR RIGHTSELF-ADAPT.PART. LOAD FACTOR LEFT ____ variable

Used on ME10 (0.77–1.28 range) and ME20 (0.68–1.32 range) systems. These parameters display the lower partial load self-adaptation factor for the indicated cylinder bank. Lower partial load self-adaptation factor is one of three factors the ECU uses to make long-term fuel trim (LTFT) corrections to maintain a 14.7:1, or 1.0 Lambda, air-fuel ratio. A 1.0 reading represents the base point, or no correction. Readings above 1.0 indicate a rich correction, or increased fuel, and readings below 1.0 indicate a lean correction, or reduced fuel. All corrections are made in three ranges: closed throttle position, lower partial load and upper partial load. The ECU multiplies the actual mass of the air inducted into the engine by the correction factor (% positive or negative) to determine the injection time. For example, if the actual air mass is 150 kg/h and the Scanner™ reading is 1.10 (positive 10%), a computed air mass value of 165 kg/h (150 x 1.1(10%) = 165) is used for injection time.

The MIL will come on when self-adaptation reaches the range limit.

SENSITIZATION FACTORSENSOR GEAR FILTER 1SENSOR GEAR FILTER 2 not available

SNSR GEAR ADAPT. MEAN VALUES SEG. A TO E _______________________ variable

SENSOR ROTOR ADAPTATIONSENSOR ROTOR ADAPTATION COMPLETED YES/NO

These parameters are all related to crankshaft sensor misfire detection sensitization. Some vehicles have an adaptation procedure to enhance the sensitization and reduce false misfire reporting (see “Testing Engine Systems” on page 35).

Sensor Gear (Flywheel) adaptation may be required on ME-SFI 1.0, 2.0, 2.1, and 2.8. Sensor Gear adaptation started approximately in 1998 with the ML 112/113 engines. Later ME 2.8 and SIM4 may also use this function. The adaptation re-configures the ME controller for increased sensitivity for misfire detection.

Drive train influences on misfire detection are:

- crankshaft flex
- motor mount movement
- torque converter lock-up operation
- automatic transmission shift characteristics
- drive shaft and differential vibration

Misfire detection using the crankshaft position sensor requires sensor gear adaptation whenever the following components are replaced:

- flywheel or starter ring gear

- crank sensor (L/5)
- ECU
- motor mounts

In some cases, sensor gear adaptation must be performed after a misfire code.

The engine is constantly monitored for misfire to protect the catalytic converter. The engine is analyzed by evaluating the crankshaft position sensor using a sophisticated mathematical method to determine whether precise time synchronism exists between individual combustions. Each individual combustion must produce a characteristic acceleration at the flywheel. If misfire occurs, flywheel rotation slows slightly. These parameters are the amount of correction the ECU is making to filter out vibration and prevent setting false misfire codes. The ECU sets irregular engine running analysis or misfire detection to a less sensitive setting when driving on a poor road surface. The body acceleration sensor, or electronic vibration module, detects a rough road and sends this information to the ECU. The misfire sensitivity level can also be altered with the Scanner™ as a Functional Test. A lower threshold enables the ECU to detect less severe misfires indicated by reading the RPM decrease and misfire fault counter for each cylinder.

The crankshaft sensor gear adaptation mean value reflects the addition of a supplementary correction factor designed to compensate for phase error in the crankshaft sensor. This information is used to compute actual ignition timing. Each segment represents the duration between each new ignition cycle. Ignition, injection and engine speed derived from segment duration are recalculated for each segment.

SENSOR GEAR ADAPTATION ENDED __________________________________ YES/NO

Used on ME and SIM4 systems. This parameter indicates whether the sensor gear adaptation memory has been cleared. The display reads YES if the adaptation has ended and NO if adaptation memory has run and is active. Sensor gear adaptation memory is cleared when the Scanner™ performs an ECU reset functional test command.

SHIFT POINT SHIFT____ not available

Used on HFM systems. This parameter indicates the transmission shift point variability. No other information is available at this time.

SNSR GEAR ADAPT. MEAN VAL. SEG.A to E; N1 to N4SNSR GEAR ADAPT. MEAN VALUES SEG.A to E____ range: variable

Used on ME10 systems. This indicates the correction the ECU is making to filter out vibrations and prevent setting false misfire codes.

The crankshaft sensor gear adaptation mean value reflects the addition of a supplementary correction factor designed to compensate for phase error in the crankshaft sensor. This information is used to compute actual ignition timing. Each segment represents the duration between each new ignition cycle. Ignition, injection, and engine speed derived from segment duration are recalculated for each segment.

SMOOTH RUNNING OF CYL. 1 to 8 _____________________________________ variable

Used on ME27 and ME28 systems. The “1 to 8" indicates eight separate parameters, one for each cylinder. These parameters indicate cylinder detonation or knock provided to the ECU by the various knock sensors. The ECU calculates a new value once per second. The measurement is the actual knock sensor frequency output. High numbers on individual cylinder(s), may indicate a specific problem limited to that cylinder(s). High numbers on all cylinders may indicate a general engine detonation or pinging problem.

SP.DEV.BT. FR/RR AXLES TOO HIGH ___________________________________ YES/NO

Used on HFM systems. This shows if the ECU is receiving input signals indicating too much deviation between the speed of the front and rear axles. The display reads YES if speed deviation is too high, and reads NO at all other times. Traction control activates when YES displays.

SPEED SIGNAL ____ variable

Used on DM systems. This parameter is the vehicle speed sensor (VSS) input signal to the ECU. The measurement units can be changed from kilometers per hour (KPH) to miles per hour (MPH).

START APPROVAL ____ YES/NO

Used on LH systems. This shows if the ECU will allow starting based on input from the anti-theft system. The display reads YES if the correct input from the anti-theft system is received, and NO if the incorrect input signal was received and startup is being prevented.

START ATTEMPT MADE WITH DAS LOCKED ____________________________ YES/NO

Used on ME and SIM4 systems. This parameter indicates whether an attempt to start the engine was made with the drive authorization system (DAS) or anti-theft system locked. The display normally reads NO and only reads YES if there was a start attempt with the DAS or anti-theft system locked. The ECU and DAS module are permanently interlocked by means of an identification code that cannot be erased. Therefore, it is not possible to interchange control modules from another vehicle for test purposes. Control model interchanges can only be performed using a matched pair of control modules. The ME-SFI module is equipped with an immobilizer. When the vehicle is locked, the DAS transmits a signal to the ME-SFI on the CAN bus that inhibits injection. The engine can start only when the vehicle is unlocked with the authorized key, and when the DAS control module transmits a start enabled signal to the ME-SFI control module.

START ATTEMPT W.IMPLAUS.INPUT SIGN ______________________________ YES/NO

Used on LH systems. This parameter indicates whether an attempt to start the engine was made with the anti-theft system locked. The display normally reads NO, and only reads YES if there was a start attempt with the anti-theft system locked.

START AUTHORIZATION ____ YES/NO

Used on ERE/EVE/ASF (IFI DIESEL), HFM, ME, and SIM4 systems. This parameter indicates whether the drive authorization system (DAS), or anti-theft system, and the engine control module (ECU) have correctly identified each other. The display reads YES at startup if the modules correctly identify each other. A NO reading indicates the modules cannot identify each other and starting is disabled. The ECU and DAS module are permanently interlocked by means of an identification code that cannot be erased. Therefore, it is not possible to interchange control modules from another vehicle for test purposes. Control model interchanges can only be performed using a matched pair of control modules. The ME-SFI module is equipped with an immobilizer. When the vehicle is locked, the DAS transmits a signal to the ME-SFI on the CAN bus that inhibits fuel injection. The engine can start only when the vehicle is unlocked with the authorized key and the DAS control module transmits a start enabled signal to the ME-SFI control module.

START OF INJECTION____ not available

Used on ERE_EVE_ASF (IFI DIESEL). Indicates the actual start of injection (RI value, start of delivery after TDC) in degrees. Adjustment is performed on main injection pump using an injection timing tester.

STARTER CONTROL ____ YES/NO

STARTER LOCK-OUT OUTPUTSTARTER LOCK-OUT REED CONTACTSTARTER LOCK-OUT STATUS____ ON/OFF

Used on HFM and EGS systems. These parameters indicate whether the immobilizer system is locking out the starter system. The display reads YES/ON if the starter system is disabled.

STARTER SIGNAL CIRCUIT 50____ ON/OFF

Used on HFM systems. This parameter indicates the state of circuit 50, which is the starter circuit. The display reads ON when the starter is cranking, then switches to OFF after the engine starts.

STOP LAMP SWITCH ____ ON/OFF

Used on ME10, ME20, ME27, ME28 and SIM4 systems. This parameter indicates the state of the brake light switch. The display reads ON if the brake light switch circuit is closed, brake lights on, and OFF when the circuit is open.

STOP LAMP SWITCH N.C. CONTACTSTOP LAMP SWITCH N.O. CONTACT ___ ON/OFF

Used on ERE_EVE_ASF (IFI DIESEL). No information is available.

SUPERCHARGER CLUTCH ____ ON/OFF

Used on ME20 systems. This parameter indicates the state of the supercharger clutch. The display reads ON if the supercharger clutch is engaged to increase boost, and OFF when the clutch is disengaged.

SUPERCHARGER EFFICIENCY FACTOR _________________________________ variable

Used on ME20 systems. This parameter indicates the ECU-calculated supercharger efficiency factor, and reflects supercharger performance. Display readings vary with speed and load. Typically, if driving in third gear at 3500 RPM under full load, the reading should be greater than 1.3.

TANK FILL LEVEL ____ OK/NOT OK

Used on ME20 systems. This parameter indicates if there is the proper amount of fuel in the fuel tank to run an evaporative emissions (EVAP) test. The display reads OK if the fuel level is within test range and NOT OK if the fuel level outside the test range.

TANK PRESSURE DIFFERENCE _______________________________________ variable

Used on ME10 and ME20 systems. This parameter, which displays in millibar (mbar), indicates the results of an ECU-performed fuel tank leak test. This test is part of the OBD-II monitoring system. The fuel tank pressure test uses an internal fuel tank pressure sensor.

To perform this leak test, the ECU closes the canister shut-off valve to the activated charcoal canister and opens the purge control valve. This allows intake manifold vacuum into the fuel tank, where it is detected by the fuel tank pressure sensor. Tank pressure difference must read about -7 mbar within about 10 seconds or a major leak exists. If no major leak is detected, the ECU closes the purge control valves and monitors vacuum for 30 seconds to ensure there is no decrease due to a minor leak.

TEMPOMAT SWITCHTEMPOMAT SWITCH(ACCELERATE)TEMPOMAT SWITCH(DECELERATE)TEMPOMAT SWITCH(STORE) ____________________ ON/OFF

Used on ME10 and ME20 systems. These discrete parameters indicate the state of the cruise control switch. The display reads ON when the indicated cruise control switch is energized, and OFF if it is not.

THROTTLE VALVE ACTUATOR SIGN. 1THROTTLE VALVE ACTUATOR SIGN. 2 ___ 0 to 5.00 V

Used on ME27, ME28, and SIM4 systems. This parameter indicates throttle opening angle in volts based on the input signal of the throttle valve actuator signals. Readings vary with throttle opening. This drive-by-wire system has no mechanical throttle linkage. An electronic actuator controls the throttle valve under different operating conditions to regulate idle speed, cruise control operation, driving on the basis of accelerator position, traction control (Acceleration Slip Regulation), Electronic Stability Program (ESP), and emergency running. The position of the accelerator pedal is detected by two potentiometers that transmit input signals to the ECU. Based on these signals, the ECU controls the electronic throttle actuator. One potentiometer is the pedal value sensor and the other one is the electronic actuator. The electronic throttle actuator potentiometer supplies a reference value for a plausibility check. In an emergency, if one potentiometer fails, the system switches over to the second one. A quick plausibility check is to add both actuator signal readings (SIGNAL 1 and SIGNAL 2) together at various throttle positions. They should always add up the same value, usually between 4.5 to 4.9 volts.

THROTTLE VALVE ANGLETHROTTLE VALVE POSITION __________________ variable

Used on DM2, HFM, LH, ME10, ME20, ME27, ME28, and SIM4 systems. This parameter indicates throttle opening angle in degrees based on the input signal of the throttle valve potentiometer. Readings vary with throttle opening. Normal idle range is 0.3 to 2.5 degrees for all engines except the 111. Normal idle range for the 111 engine is 1.8 to 3.5 degrees.

THROTTLE VALVE STOP LEARNED ___________________________________ YES/NO

Used on ME10, ME20, ME27, ME28, and SIM4 systems. This parameter indicates whether or not the ECU has gone through the correct learn procedure for the throttle valve stop setting and has adjusted the idle accordingly. The display reads YES if the ECU completed the throttle valve stop learn procedure and successfully adjusted the idle speed. A reading of NO indicates the ECU has not successfully executed the throttle stop learn procedure.

TIME SINCE START____ variable

Used on ME10 systems. This is a clock that displays the elapsed time of engine running since the last start. The timer resets with each key cycle.

TOP SPEED LIMITATION ____ ON/OFF

Used on ERE-EVE_ASF (IFI DIESEL). This parameter reads ON when the ECU has engaged the Engine Maximum Speed Governing System. The control unit detects the engine speed and adjusts the fuel rack to approximately 5400 RPM (no engine load).

TORQUETORQUE CORR. VALUE DURING SHIFTTORQUE DIFFERENCE SUMTORQUE LOSS ____ variable

Used on EGS, ME10, and ME20 systems. This is an ECU-calculated engine torque in newton meters (Nm). Display varies according to engine load. The ME-MOTRONIC engine management uses torque-led control, which means it calculates the internal torque produced during combustion. This is the physical force produced by gas pressure during the compression and power strokes. The actual net torque of the engine has to account for friction, gas transfer losses, and drive power for equipment such as the water pump, alternator, and AC compressor. The ME program contains the optimal specifications for charge density, injection duration, and ignition timing for any desired torque. This makes it possible to obtain optimal emissions and fuel consumption for every operational mode. Operational demands are prioritized and coordinated individually to use the appropriate control to achieve the specified torque. Torque based control is possible because the electronic accelerator permits throttle valve control beyond the pedal value inputs.

TRANSM. OVERLOAD PROTEC. SWITCHTRANSMISSION OVERLOAD PROTECTION TRANSMISSION OVERLOAD PROTECTION INTERTRANSMISSION PROTECTION ON/OFF

Used on EZ, HFM, ME10, ME20, ME27, and ME28 systems. These parameters show whether or not the ECU is operating the automatic transmission in an overload protection mode. The display normally reads OFF and reads ON if transmission overload protection mode is active. In overload mode the ECU disables the torque converter clutch and overdrive.

TRANSMISSION SHIFT DELAYTRANSMISSION UPSHIFT DELAYUPSHIFT DELAY 1ON/OFF

Used on LH, HFM, and ME20 systems. This parameter indicates if the ECU shift delay program is active. The display reads OFF during normal operation, and ON if the ECU is delaying upshifts to more rapidly heat up the catalytic converter after a cold startup.

TRIP SINCE ERASING FAULT ____ 0 to 255

Used on ME10 systems. This parameter indicates the number of trips since a specified diagnostic trouble code was erased.

TWC HEATING AT IDLE ____ ON/OFF

Used on HFM, ME10, and ME20 systems. This parameter indicates the state of the three-way catalyst (TWC) heating circuit. During normal operation the Scanner™ should display OFF, and at a cold startup or during prolonged idle, the Scanner™ should display ON. The TWC contains an electric heating element to help it maintain optimal temperature for reducing emissions. The ECU energizes the heater if internal temperatures drop below a preset threshold during prolonged idle. The heater is also energized at cold startup when the catalytic converter temperature is below 86°F (30°C). The ECU activates the electric TWC heater for a maximum of 50 seconds during one cycle.

TWC TEMPERATURE FROM OBD 2 ________________________________ variable

Used on HFM systems. This parameter displays the ECU-calculated temperature of the three-way catalyst (TWC) for OBD-II vehicles.

UPPER P. LOAD F. TRIM CYL 1-6, RIGHTUPPER P. LOAD F. TRIM CYL 4-6, RIGHT UPPER P. LOAD F. TRIM CYL 7-9, LEFTUPPER P. LOAD F. TRIM CYL 10-12, LEFT 0.750 to 1.280

Used on ME2.7 systems. This parameter is the upper partial load self-adaptation correction factor that the ECU uses to make longterm fuel trim (LTFT) corrections to maintain a 14.7:1, or 1.0 Lambda, air-fuel ratio. This is a long-term correction factor applied to the pre-programmed upper partial load base cell values (original fuel, RPM/Load mapping with no correction). On the display, a 1.0 reading is the base point. Readings over 1.0 are a rich correction, or increased injector time and readings lower than 1.0 are a lean correction, or reduced injector time. This correction factor affects only those adaptive learn memory cells controlling long term fuel correction in the upper-load operation.

UPSHIFT DELAY 2ND GEAR ______________________________________ ON/OFF

Used on LH systems. This parameter indicates whether or not the ECU shift delay program for second gear is active. Display normally reads OFF. Reads ON if the ECU is holding the transmission in second gear to more rapidly heat up the catalytic converter after cold engine start.

VARIABLE SPEED LIMITATION ____________________________________ variable

Used on ME27 and ME 28 systems. Range may be ON/OFF or ACTIVE/NOT ACTIVE. No information is available at this time.

VEHICLE LOCKED WITH DAS ______________________________________ YES/NO

Used on ERE/EVE/ASF (IFI DIESEL) and ME10 systems. This parameter indicates whether the drive authorization system (DAS) and the engine control module (ECU) have correctly identified each other. The display reads YES at startup if the modules correctly identify each other and NO if they do not. The ECU and DAS module are permanently interlocked by means of an identification code that cannot be erased. It is not possible to interchange modules from another vehicle for test purposes. Module interchanges can only be made using a matched pair of modules. Also, the ME-SFI module has an immobilizer. When the vehicle is locked, the DAS transmits a signal to the MESFI on the controller area network (CAN) bus that inhibits injection. The engine only starts if the vehicle is unlocked with the authorized key and the DAS module transmits a start enable signal to the ME-SFI module.

VEHICLE SPEED ____ 0 to vehicle max

Used on CD12, DM, DM2, EGS, ERE/EVE/ASF (IFI DIESEL), HFM, LH, and SIM4 systems. This parameter indicates the speed of the vehicle based on input signals to the ECU from the wheel speed sensors. The measurement can be changed from kilometers per hour (KPH) to miles per hour (MPH).

VEHICLE SPEED FRONT AXLEVEHICLE SPEED REAR AXLE_______ 0 to vehicle max

Used on ME 10, ME 20 and SIM4 systems. These parameters indicate the speed of the front and rear axles based on input signals to the ECU from the wheel speed sensors. The measurement can be changed from kilometers per hour (KPH) to miles per hour (MPH).

VEHICLE SPEEDVEHICLE SPEED SIGNAL (VSS)VSS______________0 to vehicle max

Used on DM, DM2, HFM, LH, and ME10 systems. This parameter indicates the vehicle speed based on the vehicle speed sensor (VSS) input signal to the ECU. Measurement units can be changed from kilometers per hour (KPH) to miles per hour (MPH). The preset value is KPH.

VMIN NOT MAINTAINED ____YES/NO

Used on HFM systems. This parameter indicates if the charging system is maintaining the minimum required voltage. The display reads NO during normal operation and reads YES when charging system output falls below the minimum voltage requirement.

WARM-UP____ON/OFF

Used on HFM and LH systems. This parameter indicates whether or not the ECU is operating the engine in warmup mode following a cold start. The display reads OFF during normal driving with a warm engine and reads ON from a cold start with engine in warmup mode.

WOT (FULL LOAD) CONTACTWOT (FULL LOAD) INFO. LOADWOT (FULL LOAD) RECOGNITIONWOT (FULL LOAD)_____________________________________ON/OFF

Used on DM2, HFM, LH, ME10, and ME20 systems. This discrete parameter indicates the state of the wide-open throttle (WOT) switch. The display reads OFF during normal driving and reads ON with throttle at wide open under full load acceleration.

WOT (FULL LOAD) INFO.THR.VLV.POS ________________________________ON/OFF

Used on DM2 systems This parameter shows the state of the wide-open throttle (WOT) switch. The Scanner displays OFF during normal driving, and ON during operation at wide open throttle under full load acceleration. The ECU relies on the electronic accelerator actuator input signal to determine whether the engine is at full load acceleration.

5.3 Transmission Parameters

5TH GEAR ____ON/OFF

Used on the EAG system. This parameter indicates whether the electronic transmission controller (ETC) has engaged 5th gear (overdrive). ON means that overdrive is engaged.The 4th to 5th gear upshift at full throttle may not occur until reaching the cutoff speed. This means that under full throttle conditions, high-powered vehicles may not shift into fifth gear below 155 mph (250 km/h).

3RD GEAR DOWN3RD GEAR UP4TH GEAR DOWN4TH GEAR UP5TH GEAR DOWN 5TH GEAR UP ____not available

Used on the EGS system. Do not use at this time. See “Reset Adaptation Data” on page 59.

ACCELERATOR PEDAL(%)____ 0 to 100%

Used on the EGS system. This parameter is derived from a CAN signal via the engine management system. When the accelerator pedal is not depressed, the parameter value is 0 percent. With the pedal fully depressed in the kick-down position, the value rises to 100 percent.

The CAN is a broadcast type of bus. This means that all modules "hear" all transmissions. There is no way to send a message to just a specific module; all modules invariably pick up all traffic. However, CAN hardware provides local filtering so each module reacts only to data whose identifiers are stored in its acceptance list. This very high frequency transmission requires a "twisted pair" of wires to address electromagnetic interference (EMI) concerns. Two wires also ensure communication if one wire is damaged and provide the ability to recognize a CAN circuit fault. The two lines must not be interchanged as each represents either a high or low level.

ACCELERATOR PEDAL DELAY(%) ____________________________________ 0 to 100%

Used on the EGS system. No information is available at this time.

ACTUAL GEAR ____ P, R, R2, N, 5, 4, 3, 2, 1

Used on the EGS system. This parameter indicates the current gear the electronic transmission controller (ETC) is commanding for a given driving condition. This parameter normally shows the desired gear (normal shift line), but the value may be different. The ETC may override the shift line to avoid transmission damage, or to secure vehicle safety.

In winter mode, R2 may be displayed (uses different reverse gear ratio). Also, first gear may not display because in winter mode the transmission starts in second gear unless first gear is manually selected or unless the vehicle is accelerated quickly. Also, with engine not running, this parameter may display "O" for Neutral or all other ranges except Park.

ADAPTATION TORQUE (Nm)ADAPTATION TORQUE DEVIATION (Nm)_______ variable

Used on the EGS system. These parameters display the amount of adaptation torque and adaptation torque deviation for a controlled shift. Adaptive learning specifications are contained within eight cells or memory bocks. Each memory block contains specific input values (comparisons) as well as adaptive learning output commands.

A transmission is most susceptible to damage when a shift is in process. Typically, transmission shifts take approximately 0.4 to 1.35 seconds to complete. The time when a component is not fully released or fully applied is called “shift overlap.” Shift overlap varies with operating parameters and transmission condition. High torque engines can cause severe damage to clutches during shift overlap. Therefore, during the shift it is beneficial to limit torque during shifts.

As the electronic transmission controller (ETC) receives various input, such as, gear ratio, shift solenoid position, TPS, and RPM, it can determine when a shift is about to occur. Currently, the technique calls for a momentary reduction (or retard) of spark advance. The spark retard can be as much as 57 crankshaft degrees, delaying torque output up to as much as 20 milliseconds. This allows the shift to occur with reduced engine torque during the points of the shift overlap, thus reducing the strain on the clutches.

Adaptive torque memory updating and storage will continue unless battery power is lost to the ETC. If battery power is lost, the ETC will default to the base settings.

ALTITUDE FACTOR (%) ____ 0 to 100%

Used on EGS system. This analog parameter displays the altitude correction factor as a percentage. The electronic transmission controller (ETC) uses this information to adjust line pressures according to changes in altitude, which translates into an altitude factor. As elevation changes occur, air density changes, as does engine torque output. Altitude factor enables shift pressure adjustment to compensate for elevation changes.

CNTRL VALVE CURRENT-MP(nominal)(ma)CNTRL VALVE CURRENT-MP(current)(ma) CNTRL VALVE CURRENT-SP(nominal)(ma)CNTRL VALVE CURRENT-SP(current)(ma) ______ variable

Used on EGS systems. This parameter displays modulating and shift pressure (MP and SP, respectively). The electronic transmission controller (ETC) converts a variable current into a proportional hydraulic pressure.

"Nominal" in the name represents the calculated value stored in the transmission control module. "Current" in the name represents the actual or live milliamp reading.

Modulating pressure is adjusted at the regulating solenoid valve. The height of the modulating pressure is dependent on engine load. It acts on the working pressure control valve and the pressure overlap control valves. Modulating pressure influences the height of the working pressure, which determines, together with the shift pressure, the regulated pressure at the pressure overlap control valve.

The shift pressure regulating valve and shift pressure control valve determines the maximum shift pressure. Additional pressure from clutch K2 acts on the annular surface of the shift pressure control valve and as a result, the shift pressure in 2nd gear is reduced.

The purpose is to regulate the pressure in the shift element to be engaged during the shifting phase. This determines, together with the modulating pressure, the pressure overlap control valve regulated pressure at the disengaging shift element. Also, modulating and shift pressure initialize working pressure for the 2nd gear limp-home mode (electrical fail safe).

Normal range for both shift and modulating control valve current at idle, warm engine in Park varies from 500 to 800 mA.

CONVERSION ______ not available

Used on the EGS system. No information is available at this time.

CONVERTED TORQUE (Nm) ______ variable

Used on the EGS system. This parameter indicates the amount of torque transferred through the transmission, and includes the torque multiplication effect of the torque converter. It is an internal transmission torque calculation by the electronic transmission controller (ETC). The number is low with minimal load and torque output, and should go high with maximum load and torque output.

DECELERATION(%)______ not available

Used on the EGS system. This display indicates the amount of deceleration used by the transmission control module for downshift adaptation control.

DELAY (DOWNSHIFT)DELAY (UPSHIFT)______ 500 to 1000 RPM

Used on EGS systems. This parameter indicates the low engine speed range when under certain low RPM operating conditions, during an upshift, or when the ECU applies a downshift delay.

DESIRED GEAR____P, R, R2, N, 5,4, 3, 2, 1

Used on the EGS system. This parameter displays the position of the driver-operated gear selector. During shifting, this parameter usually follows ACTUAL GEAR, with a short delay. This parameter value normally mimics ACTUAL GEAR with the electronic transmission controller (ETC) selected. During certain driving conditions, however, the ETC may override the desired gear to prevent transmission damage or to ensure driving safety.

In winter mode, R2 may be displayed (uses different reverse gear ratio). Also, first gear may not display because in winter mode the transmission starts in second gear unless first gear is manually selected or unless the vehicle is accelerated quickly. Also, with engine not running, this parameter may display “O” for Neutral or all other ranges except Park.

DRIVE PROGRAM SWITCHG/S PROGRAM SELECTION SWITCH ____________ S, G, E

Used on the EGS system. These parameters display “S” for the standard drive program which starts in first gear. “G” or “E” may also be displayed, and represents the winter drive program. This program starts in 2nd gear except if the shift lever is in position “1,” full throttle take off, or kick down. For the EGS system, the winter drive program may have a different gear ratio for reverse.

DRIVER STATUS INFORMATION _______________________________________ 0 to 25

Used on the EGS system. This parameter displays a value that indicates how the vehicle is shifted while driven. A “0” indicates a “normal” shifting style, while a “25” indicates a more aggressive, sports-like shift style. As the value increases, the electronic transmission controller (ETC) modifies the adaptation.

The ECU relies on the following inputs to calculate the output value: vehicle acceleration and deceleration, rate of change and position of the throttle pedal, lateral acceleration, and gear change frequency. The ETC does not have long-term memory adaptation for driving style. The system uses the default setting of “0” to begin every key cycle.

ENGINE RUN TIME LONG TERM MONITORENGINE RUN TIME SHORT TERM MONITOR ____ not available

Used on the EGS system. These parameters display engine run time, either on a long or short term monitor, and indicate how long the engine has been running. The timer is reset to zero each time the ignition is turned to the OFF position.

ENGINE SPEED (1/MIN) ______________________________________ 0 to engine max

Used on all systems. This parameter displays engine crankshaft speed in revolutions per minute (RPM). The ECU updates this calculated value once per minute, and relies on reference pulses from the ignition system or the crankshaft position (CKP) sensor.

ENGINE TORQUE ____ -200 to 800 Nm

Used on the EGS system. This parameter displays the ECU-calculated engine torque in newton meters (Nm). The value varies according to engine load.

The ME-MOTRONIC engine management uses torque-led control, which means it calculates the engine internal torque produced during combustion. This is the physical force produced by gas pressure during the compression and power strokes. The actual net torque of the engine has to account for friction, gas transfer losses and drive power for equipment such as the water pump, alternator, and AC compressor. The ME program contains the optimal specifications for charge density, injection duration, and ignition timing for any desired torque. This makes it possible to obtain optimal emissions and fuel consumption for every operational mode.

Operational demands are prioritized and coordinated individually to use the appropriate control to achieve the specified torque. Torque based control is possible because the electronic accelerator permits throttle valve control beyond the pedal valve inputs. Engine torque deviates when shifting gears. The nominal or desired valve is stored in the ECU. As the ECU briefly retards the ignition timing during the shifting process, engine torque decreases, and shift quality improves.

FILL CORRECTION TIME (CYCLE)FILL MEASUREMENT TIME (CYCLE)_ 0 to 15 cycles

Used on the EGS system. Do not use at this time. See “Reset Adaptation Data” on page 59.

FRONT AXLE SPEED ______________________________ 0 to vehicle max

Used on ME27 and ME28 systems. This parameter indicates the speed of the front axle based on input signals to the ECU from the wheel speed sensors. The measurement units can be changed from KPH to MPH.

FRICTIONAL OUTPUT ______________________________ not available

Used on the EGS system. No information is available at this time.

GEAR COMPARISON COUNTER ______________________________ not available

Used on the EGS system. No information is available at this time.

GRADE(%) ______________________________ -30 to 30%

Used on the EGS system. This parameter displays the grade of the roadway in percentage. Positive percentages represent an uphill grade; negative percentages represent a downhill grade. The transmission control module (TCM) relies on this calculated value to make shift adjustments. While the vehicle drives unloaded on level ground with a zero percent grade the value should be between -2.5 and 2.5 percent.

HOLD GEAR ______________________________ ON/OFF

Used on ME10 and ME20 systems. This parameter indicates whether the ECU is holding the transmission in a certain gear during high-load driving, such as hill climbing. This parameter represents an ECU cruise control input to the transmission control module (TCM). ON means a gear is being held.

INCREASED MODULATING PRESS.STATUS ______________________________ 0 to 100%

Used on the EGS system. This parameter displays the command state of the modulated pressure regulating solenoid valve in percentage. Modulating pressure influences the amount of the working pressure, and is dependent on engine load. Increased modulated pressure acts on the working pressure to the overlap control valves, and together with the shift pressure, determines the regulated pressure at the pressure overlap control valve.

The electronic transmission controller (ETC) regulates modulated pressure as needed for shift timing. This assures consistent shifting and increases transmission life. As transmission components wear, shift overlap time increases. By adjusting pressure, the ETC compensates for increasing shift overlap times.

INDUCED TORQUE(Nm) ____ not available

Used on the EGS system. This parameter indicates that the control module is controlling engine torque by changing spark, or injector pulse, or both, to protect the transmission.

KICK DOWNKICK DOWN SWITCH____ ON/OFF

Used on EAG, EGS, ME27, and ME28 systems. These parameters indicate if the kick-down switch had been activated. ON means the switch is depressed.

LIMP-HOME ____ YES/NO

Used on EGS systems. This parameter indicates if the ECU or electronic transmission control module (ETC) initiated the limp-home mode. A fault within the ME system, sequential fuel injection (SFI) system, traction system, an electrical transmission failure, or a mechanical transmission failure may cause the ECU or ETC to engage limp-home mode. YES means that the limp-home mode is engaged.

When you suspect a transmission electrical failure caused the limp-home mode to engage, look for the following conditions for confirmation:

- The last successful gearshift remains engaged until the ignition key is cycled;
- If the transmission is in 2nd or reverse, after the key is cycled, the torque converter lockup clutch shuts off while modulating and shift pressures rise to their maximum values.

When you suspect a transmission mechanical failure caused the limp-home mode to engage, look for the following condition for confirmation:

- After the mechanical fault occurs, the transmission resets itself to 3rd gear. Cycling the ignition switch causes the transmission to shift normally until the ETC detects another fault. The transmission again resets itself to third gear, repeating the same cycle.

LOW RANGE PROGRAM ____ ON/OFF

Used on the EGS system. This parameter indicates whether the low range program for the transfer case is engaged or not. ON means that the program is engaged, and is adjusting the transmission shift schedule. This program normally activates when the selector lever is placed in the Neutral position while the engine runs in a stationary position.

LR VSS (1/MIN) ____ 0 to vehicle max

Used on the EGS system. This parameter displays the CAN signal from the traction system or from the left rear wheel speed senor. The electronic transmission controller (ETC) samples this value once per minute. The value should increase and decrease in proportion to the rotational speed of the wheel.

MAP(%) ____0 to 100%

Used on EGS systems. No information is available at this time.

NOM. PRESS. TORQ. CONV. LOCK-UP(MBAR)REG. PRESS. TORQ. CONV. LOCK-UP(MBAR) ____ not available

Used on the EAG system. These parameters display a variable current in millibars. Changing operating conditions such as engine load and gear shifting determines when the torque convertor locks up. No further information is available.

OIL CONDITION LONG TERM MONITOROIL CONDITION SHORT TERM MONITOR_ not

available

Used on the EGS system. These parameters display transmission oil condition. Transmissions on EGS system vehicles use ATF certified for the life of vehicle. The manufacturer has no scheduled recommended fluid changes. No further information is available at this time.

OPTIMAL CALC. MOD. PRESSURE(MBAR)OPTIMAL CALC. SHIFT PRESSURE(MBAR) ____not available

Used on the EGS system. These parameters display the desired modulating and shift pressure as calculated by the electronic transmission control module (ETC). Modulating and shift pressure values depend on vehicle operating conditions.

OUTPUT SHAFT SPEED (1/MIN)________________________________0 to vehicle max

Used on EAG and EGS systems. This parameter displays current output shaft speed. The electronic transmission control module (ETC) samples output shaft speed once per minute.

PLANET. SPEED SENSOR (N2)(NOM.)PLANET. SPEED SENSOR (N2)(CUR.)PLANET. SPEED SENSOR (N3)(NOM.)PLANET. SPEED SENSOR (N3)(CUR.)_____ -50 to 50 RPM

The data parameters above with “nominal” in their name indicate the calculated value for the planetary gear speed stored in the electronic transmission control module (ETC). Those parameters with “current” in their name indicate the current speed.

The Hall-effect planetary speed sensors, sometimes called RPM sensors, are mounted on the valve bodies, and are permanently attached to the carrier via the contact tabs.

A leaf spring that rests against the valve body presses the sensors against the transmission housing. This insures a precise distance between the sensor tip and the front sun gear and planet carrier.

To check, place the Start Engine Program Mode switch in position “W,” and the selector lever in position “P.” The difference between the nominal and current values should not be greater than 50 RPM.

P/N RECOGNIZED ____ON/OFF

Used on HFM systems. This discrete parameter displays the status of the Park/Neutral position (PNP) switch signal to the ECU. ON indicates that the selector lever is in the Park or Neutral position, and OFF that the selector lever is in a position other than Park or Neutral.

PWM SOLENOID VALVE STATUS___________________________ CLOSED/SLIP/OPEN

Used on the EGS system. This parameter indicates the state of the electronic transmission control module (ETC) output commands to the PWM (pulse width modulated) solenoid valve. This valve engages the torque converter lockup clutch. The solenoid converts a PWM signal into a corresponding regulated pressure (see SHIFT VALVE DUTY CYCLE for more information).

CLOSED means that the ETC is sending a duty cycle greater than 80% to the PWM solenoid, thus engaging the torque converter lockup clutch.

SLIP means that the ETC is sending a duty cycle between 10 and 80 percent to the PWM solenoid, setting the torque converter lockup clutch to its regulating position.

OPEN means that the ETC is sending a duty cycle of 0 percent to the PWM solenoid, shutting off the torque converter lockup clutch.

RECOGNIZED TRANSMISSION GEAR ____________________________________ 0, F, 3F

Used on the EGS system. This parameter displays the status of the transmission limp-home mode. “0” indicates that the limp-home mode is not engaged; “F,” that the electronic transmission controller (ETC) has detected a DTC, and placed the transmission in 2nd gear; “3F,” that the ETC has engaged limp-home, and placed the transmission in 3rd gear.

R/P LOCK-OUT OUTPUT ____ ON/OFF

Used on the EGS system. The R/P lock solenoid is activated by the electronic transmission controller (ETC), and moves the lever in direction of the cam, locking the shift shaft. The supporting lever holds the lever in a position if the solenoid is not energized and can automatically engage under severe vibrations. ON means that current is applied to lockout solenoid, which prevents the transmission from being shifted into Reverse or Park above approximately 6 mph. OFF means that no current is being applied to R/P lock solenoid which allows the transmission to be shifted into Reverse or Park.

RR VSS(1/MIN) (RPM) ____ 0 to vehicle max

Used on the EGS system. This parameter displays the CAN signal from the traction system of the right rear wheel speed senor. Display should increase and decrease in proportion to the rotational speed of the wheel. The electronic transmission controller (ETC) updates this value once per minute.

The CAN is a broadcast type of bus. This means that all modules "hear" all transmissions. There is no way to send a message to just a specific module; all modules invariably pick up all traffic. However, CAN hardware provides local filtering so each module reacts only to data whose identifiers are stored in its acceptance list. This very high frequency transmission requires a "twisted pair" of wires to address electromagnetic interference (EMI) concerns. Two wires also ensure communication if one wire is damaged and provide the ability to recognize a CAN circuit fault. The two lines must not be interchanged as each represents either a high or low level.

SELECTOR LEVER POSITION ____ PN/RD1

Used on EGS, ERE/EVE/ASF, HFM, LH, ME10, ME20, ME27, and ME28 systems. This parameter indicates the gear selector lever position. The display shows the selected range position, not the current gear that transmission is operating in. Selector lever downshifts are not performed if high engine RPM is sensed. In order to use the engine braking effect when driving on declines with the cruise control engaged, active downshifts can go as low as 3rd gear. These downshifts become effective at about 4 mph (6 km/h) and speeds below 78 mph (126 km/h). In addition, under non-cruise control operation, declines are recognized by comparison of engine load with driving resistance, then the shift points may be altered. Downshifts under load may cross several gear changes, as they are performed directly and not in individual steps.

SHIFT ABORTSHIFT APPROVEDSHIFT DOUBLESHIFT FREQUENCY ________ YES/NO

Used on the EAG and EGS electronic transmission control (ETC) systems. These parameters indicate the status of the ETC gearshift control variables. No further information is available at this time.

SHIFT LINE EVALUATION ______________________________________ 1, 2, 3, 4, 5

Used on the EGS electronic transmission controller (ETC) system. This parameter evaluates gear selector position for gears 1, 2, 3, 4, and 5.

In Park or Neutral, this parameter may read "1."

SHIFT POINT ____ ON/OFF

Used on HFM systems. ON means that the transmission has shift point variability.

SHIFT PRESSURE DEVIATION(MBAR) __________________________ not available

Used on the EGS system. Shift pressure is monitored during gear change. The nominal valve is stored in the electronic transmission controller (ETC) and is used as a base for adaptation to compensate for wear. The shift pressure is defined as the time it takes to disengage one shift member while another is being applied. Shift pressure deviation is the ability of the ETC to electronically alter the time it takes to go from one gear to another. The ETC optimizes shift pressure for smoother shifting and reducing clutch wear. The control module adapts the shift program according to driving style, accelerator pedal position and deviation of vehicle speed. The following factors influence the shift program: road condition, incline, decline, altitude, trailer operation, loading, catalytic converter warmup, cruise control operation, sporty driving style, and low or high ATF temperature.

SHIFT VALVE 1-2/4-5SHIFT VALVE 2-3SHIFT VALVE 3-4 _____________ OPEN/CLOSED

Used on the EGS system. These parameters display the state of the shift solenoids. OPEN means that the valve is energized, or ON, and is allowing fluid to pass. CLOSED means that the valve is de-energized, or OFF, and is not allowing fluid to pass.

The up/down shift solenoids function as follows: If a solenoid is energized, it opens and transmits shift valve pressure to the corresponding command valve. The solenoid valve remains energized and open until the shift process is completed. When the solenoid valve is de-energized, the pressure in the shift valve pressure line to the command valve is reduced to zero.

SHIFT VALVE DUTY CYCLE _____________________________________ 0 to 100%

Used on the EGS system. This parameter displays torque converter PWM solenoid duty cycle in percent (not shift valve). The PWM solenoid valve with defined slippage, controls the operating phase of the torque converter lockup clutch. A duty cycle of 80 percent or greater means that the torque converter is fully locked up. The torque converter clutch is applied only in 3rd, 4th, or 5th gears, and when certain conditions are met: accelerator pedal position, altitude, transmission shift functions, ATF temperature, oil-monitoring status, load conditions, and engine management.

In order to equalize tolerances and wear, data is stored permanently in the electronic transmission controller (ETC). The modulating working pressure determines the torque converter lockup control pressure and regulates the torque converter lockup control valve. The PWM solenoid controls the lockup clutch placing it in an engaged, disengaged, or a slipping condition.

In the bottom position of the torque converter lockup control valve (lockup without pressure), the lubrication flows through the torque converter and the fluid cooler back into the transmission. In its regulation position (slipping, lockup clutch pressurized) a reduced lubrication amount flows through the annular gap directly through the cooler to the transmission bypassing the torque converter. The remaining portion of the oil is routed through an orifice into the torque converter for cooling the lockup clutch.

The PWM solenoid is also used to control the rate of torque converter clutch apply and release. The solenoid ability to “ramp” apply and release pressure results in a smoother apply and release of the torque converter clutch in all conditions. Also see PWM SOLENOID VALVE STATUS for more information.

SLIPPAGE RPM (NOM. VALUE)(1/MIN)SLIPPAGE RPM (CUR. VALUE)(1/MIN) _ (- 500 to 3000 RPM

Used on the EGS system. This parameter displays the difference between the engine RPM and the RPM of the front sun gear of the transmission. A negative value indicates that the engine RPM is less than the front sun gear (deceleration). A positive value indicates that the engine RPM is greater than the RPM of the front sun gear. The nominal value (NOM. VALUE) is stored in the electronic control module as a base reference for adaptation calculation. The current value (CUR. VALUE) is the amount of converter slippage and the state of the torque converter lock up. The electronic transmission controller (ETC) samples these values once per minute.

SLV DEMAND____ not available

No information is available at this time.

SPEED DEV. DISENGAGE CLUTCH(1MIN) __________________________ not available

Used on the EAG system. No other information is available at this time.

STARTER CONTROLSTARTER LOCK-OUT OUTPUTSTARTER LOCK-OUT REED CONTACTSTARTER LOCK-OUT STATUS ______________________________ ON/OFF

Used on the EGS system. These parameters display whether the anti-theft system and the engine control module (ECU) have correctly identified each other. The display reads ON at startup if modules correctly identify each other. OFF indicates the modules cannot identify each other, and that starting is disabled.

The starter lockout contact is located on the valve body and recognizes the selector valve position in “P” and “N.” A cam rail actuates a starter lockout contact that is located on the detent plate. In selector lever positions “P” and “N” the permanent magnet is moved away from the reed contact. This opens the reed contact and the electronic transmission controller (ETC) receives an electrical signal. The ETC activates the starter lock-out relay module. This closes the electrical circuit to the starter in selector lever positions “P” and “N” via the starter lock-out relay.

STOP LAMP SWITCH ____ ON/OFF

Used on ME20 systems. This parameter indicates the state of the brake light switch. The display reads ON if the brake light switch circuit is closed (brake lamps lit), and OFF when circuit is open (brake lamps extinguished).

SUM EVALUATION ____ not available

Used on the EGS system. No information is available at this time.

THROTTLE VALVE REDUCTION____________________________________not available

Used on EAG systems. This parameter is used on systems with electronic throttle control. It indicates that the ECU is decreasing throttle in order to reduce the torque load on the transmission. Usually this command occurs during shifting in order to make shifts and torque converter clutch engagement smoother.

TORQUE ____not available

TORQUE DIFFERENCE SUM(Nm) ___________________________________0 to 762 Nm

TORQUE LOSS(Nm) ____0 to 150 Nm

Used on the EGS system. These parameters display the electronic transmission controller-calculated torque. This value represents the amount of engine torque multiplication through the torque converter while the engine runs at a steady speed when starting to drive.

TORQUE CORR. VALUE DURING SHIFT(Nm)__________________________0 to 150 Nm

Used on the EGS system. This parameter indicates the adaptation torque reduction correction amount. This amount indicates how much torque the electronic transmission controller (ETC) has to subtract or add for smoothness when shifting gears or applying the torque converter clutch. The ETC increases and decreases the torque by retarding or advancing spark timing.

TRANSMISSION OVERLOAD PROTECTIONTRANSMISSION OVERLOAD PROTECTION INTERTRANSMISSION OVERLOAD PROTECTION FEEDBACK_ ON/OFF

Used on EZ, HFM, ME10 and ME20 and EAG systems. These parameters show whether or not the ECU is operating the automatic transmission in an overload protection mode. The display normally reads OFF, and reads ON if transmission overload protection mode is active. In overload mode the ECU disables the torque converter clutch and overdrive.

TRANSMISSION SENSOR B49(1/MIN) ________________________________not available

This parameter displays the CAN signal from the traction system. The value should increase and decrease in proportion to the rotational speed of the wheel.

The CAN is a broadcast type of bus. This means that all modules "hear" all transmissions. There is no way to send a message to just a specific module; all modules invariably pick up all traffic. However, CAN hardware provides local filtering so each module reacts only to data whose identifiers are stored in its acceptance list. This very high frequency transmission requires a "twisted pair" of wires to address electromagnetic interference (EMI) concerns. Two wires also ensure communication if one wire is damaged and provide the ability to recognize a CAN circuit fault. The two lines must not be interchanged as each represents either a high or low level.

TRANSMISS. OIL TEMP.R/D/4/3/2/1(°C)TRANSMISS. OIL TEMP.R/D/4/3/2/1(°F) not available

Used on the EGS system. These parameters display the electronic transmission controller (ETC)-calculated ATF temperature. The ETC relies on the transmission temperature sensor voltage signal for this parameter value. Current temperature can only be read with selector lever in positions R, D, 4, 3, 2, 1, with STARTER LOCK-OUT REED CONTACT displaying ON, and LIMP-HOME displaying NO. Transmission oil temperature has an influence on the shift time and shift quality. The transmission temperature sensor is connected in series with the starter lockout reed contact switch.

TRANSMISSION RANGE D5 ______ ON/OFF

Used on the EAG system. This parameter indicates if 5th gear is selected. Although 5th gear is selected, the 4 to 5 up shift at full throttle will not occur until reaching the cutoff speed. Under these conditions high-powered vehicles may never shift into 5th gear below 155 mph (250 km/h).

TURBINE SPEED (1/MIN) ______ 0 to 8000 RPM

Used on EGS systems. The electronic transmission controller (ETC) receives an A/C signal from the front planetary sensor, which senses the speed of the front planetary gear. The ETC then changes this analog signal into a digital signal, and compares it to an internal fixed clock signal to determine actual turbine speed. The ETC performs this operation once per minute.

VALVE CURRENT 1 (MA)VALVE CURRENT 2 (MA) ______ not available

Used on EAG systems. No information is available at this time.

VALVE PRESSURE (MBAR) ______ not available

Used on EAG systems. No information is available at this time.

UNFILTERED SELECTOR LEVER POSITION ______ PN/RD1

Used on EGS, ERE/EVE/ASF, HFM, LH, ME10, ME20, ME27, and ME28 systems. These parameters indicate the gear selector lever position. The display shows selected range position, not the current operational transmission gear.

W/S PROGRAM SELECTION SWITCH ______ W/S

Used on the EGS system. This parameter displays whether the electronic transmission controller (ETC) has engaged the winter drive program (W). “S” indicates that the ETC is operating using the standard drive program.

To drive the vehicle using the standard drive program, start the engine with the W/S switch in the “S” position. The transmission automatically starts in 1st gear.

Appendix A Printer and Remote Terminal Setup

Data from the Scanner™ can be printed using any one of the following printers:

- Snap-on MT1670 Scribe
- Seiko DPU-411
- Seiko DPU-414

In order for the Scanner™ to communicate with any of these printers, the Snap-on® printer cable (part# MT2500-400) must be connected between the Scanner™ and the serial port on the printer, and the Scanner™ baud rate must be set appropriately (see sections below for details). Refer to “Printer” on page 25 for instructions on setting the Scanner™ baud rate.

A.1 Printer Setup

To set up a printer for Scanner™ communication:

1. Set the DIP switch positions for these printers as explained in the following sections.
2. Turn the printer off then back on. Printers only read the DIP switch positions when power is first turned on.

A.2 Snap-on MT1670 Scribe

The internal DIP switch for the Scribe must be set for RS-232 communication and the baud rate must be set to 2400. Set the external DIP switches as follows for communication with the Scanner™:

Table A-1 *Snap-on MT1670 Scribe DIP switch settings*

Switch No.	Position
1	On
2	Off
3*	On or Off
4	On
5*	On or Off
6	Off
7	Off
8	On
9	On
10	On
*Switches 3 and 5 do not affect Scanner™ and printer communication. They may be left in their normal positions for use with other Snap-on equipment.	

A.3 Seiko DPU-411

The Seiko DPU-411 printer has two banks of DIP switches on the bottom of the printer, an 8-switch bank (bank 1), and a 6-switch bank (bank 2). The switches must be set for RS-232 communication. Set the DIP switches as follows for communication with the Scanner™.

Table A-2 *Seiko DPU-411 DIP switch settings*

Switch Bank 1		Switch Bank 2	
Switch No.	**Position**	**Switch No.**	**Position**
1	Off	1	On
2	Off	2	On
3	On	3	On
4	On	4*	Off
5	Off	5*	Off
6	Off	6*	Off
7	On	—	—
8	On	—	—
*These switches control the baud rate. See below for details.			

Switches 4, 5, and 6 on switch bank 2 control the baud rate. The settings above are for 9600 baud. See Table A-3 below for alternate settings.

Table A-3 *Seiko DPU-411 DIP switch settings for baud rates 2400 and 4800*

Switch Bank 2, Switch No.	2400 Baud	4800 Baud
4	Off	Off
5	On	Off
6	Off	On

A.4 Seiko DPU-414

NOTE:
The Seiko DPU-414 requires an additional adapter (MT2500-509) for use with the Scanner™.

Also, the Seiko DPU-414 printer does not have DIP switches on the bottom of the printer. Instead, you must access a DIP switch setting mode through the “Online” and “Feed” buttons on the printer. The switches must be set for RS-232 communication, and the Scanner™ baud rate must be set appropriately (see footnote in Table A-4 below). See the DPU-414 Operation Manual for instructions on how to set the DIP switches, then set them as follows for communication with the Scanner™:

Table A-4 *DPU-414 DIP switch settings .*

Switch Bank 1		Switch Bank 2		Switch Bank 3	
Switch No.	**Position**	**Switch No.**	**Position**	**Switch No.**	**Position**
1	Off	1	On	1	On
2	On	2	On	2	On
3	On	3	On	3	On
4	Off	4	Off	4	Off
*These switches control the baud rate. See below for details.					

Table A-4 *DPU-414 DIP switch settings (Continued).*

Switch Bank 1		Switch Bank 2		Switch Bank 3	
Switch No.	Position	Switch No.	Position	Switch No.	Position
5	On	5	On	5*	Off
6	Off	6	On	6*	On
7	On	7	On	7*	On
8	Off	8	Off	8*	On
*These switches control the baud rate. See below for details.					

Switches 5, 6, 7, and 8 on switch bank 3 control the baud rate. The settings above are for 9600 baud. See Table A-5 below for alternate settings.

Table A-5 *DPU-414 DIP switch settings for baud rates 2400 and 4800*

Switch Bank 3, Switch No.	2400 Baud	4800 Baud
5	On	On
6	Off	Off
7	Off	Off
8	On	Off

A.5 Other Remote Terminal Communication

The Scanner™ can display data on a VT100 remote terminal. This communication feature is designed to work with equipment that operates in a VT100 format, which is a common industry standard for terminal operation. If the Scanner™ is used with a personal computer (PC), VT100 emulation software, such as Snap-Link™, must be installed.

All remote terminal displays will be in the same format as the four-line Scanner™ display screen except the Data modes. In these modes, the remote terminal can display a full screen of data. The Review Movie function provides a similar display.

All Scanner™ operations can be controlled from the remote terminal keyboard or from the Scanner™. Using the Scanner™ with a remote terminal requires an optional terminal communication cable that connects to the RS-232 communication port on the top right of the Scanner™.

The VT100 terminal adapter cable (MT2500-500) for the Scanner™ has a 25-pin (DB25) female connector. The Scanner™ transmits data on pin 3 and receives data on pin 2 at the DB25 connector. If the remote terminal connector matches this arrangement, the VT100 cable can be used. If it does not, an adapter (usually called a “null modem” adapter) or a special cable may be required. Refer to the installation manuals for specific equipment for connector and cable information.

To connect the Scanner™ to the terminal and use the communication program:

1. Use the COMMUNICATION program on the CUSTOM SETUP menu to set the Scanner™ at a baud rate that is compatible with the terminal. The baud rate should match

the baud rate selected on the Scanner™. Refer to “Communication” on page 22 for instructions on setting the Scanner™ baud rate.

2. Refer to the terminal manufacturer’s instructions for information on baud rates and any required switch settings or startup conditions for the terminal. The communication parameters for a PC should be set to N,8,1.
3. Connect the terminal communication cable to the Scanner™ and to the terminal. The Scanner™ can be connected to vehicle power and at any menu or test mode when the cable is connected.
4. Press the **Y** or **N** button or the up arrow or down arrow key (s or t, or equivalent) on the terminal to start the Scanner™ communication with the terminal.
5. Use either the Scanner™ controls or the terminal keyboard to operate all Scanner™ functions. The **Y** and **N** keys on the keyboard correspond to the **Y** and **N** buttons on the Scanner™. The up arrow and down arrow keys on the keyboard correspond to the forward and backward directions of the **Thumbwheel**.
6. On some keyboards, the arrow keys may be combined with the number keys on a numeric keypad. Such keyboards include a NUM LOCK key, which locks the keys in the numerical condition. Be sure the NUM LOCK key is unlocked, or off, so that the arrow keys act as the Scanner™ **Thumbwheel**.
7. After completing operation of the Scanner™ with the remote terminal, disconnect the Scanner™ from the terminal. Then disconnect it from vehicle power to remove it from the communication mode.

Terminal communication is most useful for displaying a full screen of codes and data, as well as similar diagnostic modes (including REVIEW MOVIE). If the vehicle data list requires more than four lines, the display can be scrolled with the Scanner™ **Thumbwheel** or the keyboard arrow keys. Because more data is visible at one time for each data frame, the update rate on the larger screen is slower than it is on the Scanner™ display. The Scanner™ continues to receive all data transmitted by the vehicle, however, and a Scanner™ movie records every data frame for detailed review.

Other diagnostic tests also can be made from the remote terminal. Any FUNCTIONAL TEST that requires the **Y** button to be held down operates normally when controlled by the Scanner™ **Y** button. However, it may not operate satisfactorily from the remote terminal keyboard, because the automatic repeat function of the keyboard interrupts the continuous signal from the **Y** button that is required for such tests.

If the **Y** button on the Scanner™ is pressed and released rapidly while operating in the VT100 mode, the beeper may sound rapidly and test indications may fluctuate.

Appendix B

Troubleshooting and Communication Problems

B.1 Startup Troubleshooting

If the display does not light up when you use the Quick ID Button or connect the Scanner™ to vehicle power, check:

The Scanner™ battery, located under the left handgrip.

For a blown cigarette lighter fuse on the vehicle if using the cigarette lighter power cable.

For bent or broken pins on both ends of the data cable and on the test adapter.

For a loose cable connection.

For an open ground wire in the vehicle connector wiring harness.

For correct connection at the battery if you are using the battery power adapter.

Replace the internal battery if the Scanner™ operates erratically in any way when you use the Quick ID button or if recorded data is not retained in the Scanner™ memory.

If the display is very dim or virtually blank when you apply power to the Scanner™, remove the internal battery with the Scanner™ disconnected from vehicle power. Hold down the Quick ID Button for 5 seconds to clear the Scanner™ memory. Then reinstall the battery.

If one or more segments of the display do not light during the display check, you may not get valid readings when viewing data or doing functional tests.

If the Scanner™ displays incomplete characters, remove the cartridge and carefully clean the edge connector with a Pink Pearl® pencil eraser, or equivalent. Wipe off eraser dust with a clean cloth.

See "Communication Problems" on page 156 for information on what to do if a vehicle does not communicate with the Scanner™.

B.1.1 Low Internal Battery Voltage

If the internal battery is low, but still has enough power to light the display, you will see this message:

```
KEEP-ALIVE BATTERY VOLTAGE IS LOW
REPLACE SOON.
BATTERY IS LOCATED UNDER LEFT HANDGRIP.
PRESS Y TO CONTINUE.
```

Figure B-1 *Low Scanner™ battery screen*

If the battery is very low but still has enough power to light the display, the low-voltage message may appear when you press the Quick ID Button. The screen may then go blank before the cartridge selection display appears. In this case, replace the battery immediately, or you cannot use the Quick ID button. Also, custom setup selections and recorded data may not be saved in memory when the Scanner™ is disconnected from the vehicle.

B.2 Communication Problems

To test Mercedes control systems, the Scanner™ must communicate with the engine or transmission controller and receive vehicle data over a data link.

The speed at which the Scanner™ operates and displays data depends on the number of data parameters and how busy the control system is on the vehicle.

This can affect how quickly the data changes on the Scanner™ display and the length of time it takes to display a movie. Differences in Scanner™ operation will vary from vehicle to vehicle. On one car, data readings may appear to change almost instantly, while on another vehicle, data changes may occur much slower.

The DATA and CODES selections from the MAIN MENU requires that the Scanner™ communicates with the control module. The ignition must be on to establish communication. After selecting DATA or CODES, the Scanner™ displays this following message (Figure B-2).

```
INITIALIZING COMMUNICATION
       PLEASE WAIT
       IN PROGRESS
```

Figure B-2 *Initializing Communication screen*

If communication is not established within 5 seconds, the Scanner™ displays the following screen (Figure B-3).

```
NO COMMUNICATION WITH ECU.
PLEASE CHECK CONNECTION AND SELECTED
VEHICLE. IGNITION MUST BE ON.
PRESS Y TO CONTINUE.
```

Figure B-3 *No Communication screen*

Press Y to return to the SYSTEM LIST Menu.

B.3 Common Problems

Mercedes-Benz control systems have few problems communicating with the Scanner™. Nevertheless, an electronic control unit (ECU) or electronic transmission controller (ETC) may fail to communicate with the Scanner™. If a problem exists with the vehicle wiring or other circuit parts, the Scanner™ may not be able to communicate with the ECU. Failure of a vehicle to perform a test may also be a symptom for diagnosing a driveability problem.

Some common problems that may prevent communication between the Scanner™ and ECU are listed below:

1. Vehicle identification—Check the vehicle identification entered from the VIN plate. If in doubt, reenter the identification.
2. Scanner™ connections—See “Check Scanner™ Connection and Operation” on page 157 for information on Scanner™ cables and connections.
3. Ignition off when connecting Scanner™—Be sure the ignition is off when connecting and disconnecting the Scanner™. If the ignition is on when the Scanner™ is connected or disconnected, Scanner™ memory may be disrupted. Erase and reenter the vehicle identification if this occurs.
4. Loss of power to the computer—The computer receives battery voltage through one or more fusible links in the wiring harness. Use a wiring diagram to check computer connections for battery voltage and ground. If a fusible link is open, the computer cannot communicate with the Scanner™.
5. Loss of power to the Scanner™ when using the optional Power Pac kit accessory—The Power Pac provides external battery power to the Scanner™, independently of the vehicle. The Power Pac requires periodic charging using the adapter included in the kit. A discharged Power Pac can cause the Scanner™ display to flicker or extinguish without warning, terminating communication.

B.4 Common Symptoms

If the Scanner™ displays the message, NO COMMUNICATION, it means that the Scanner™ and the vehicle computer simply cannot communicate with each other for some reason. If the NO COMMUNICATION message appears, check the vehicle battery state of charge, and check the Scanner™ data cable continuity as described below.

B.4.1 Check Scanner™ Connection and Operation

If the Scanner™ works properly on other Mercedes-Benz vehicles, the problem is probably in the vehicle, not the Scanner™. If the Scanner™ fails to light up or if the readings are unsteady, the Scanner™ may be at fault. If the Scanner™ intermittently resets or goes blank, a wire may be opening intermittently in one of the cables or in the adapter. Use an ohmmeter to check continuity of the Scanner™ data cable from pin to pin between the connectors at either end of the cable.

NOTE:
Using a discharged Power Pac may also cause the Scanner™ display to suddenly flicker and go blank.

Check the following points:

- Use an ohmmeter to test the continuity of the Scanner™ power cable.
- Use an ohmmeter to test the continuity of the Scanner™ data cable. Measure continuity pin to pin from the connectors at each end of the cable.
- Verify that the Scanner™ operates properly on the internal battery when the Quick ID button is held down.

Appendix C Scanner™ Adapters & Accessories

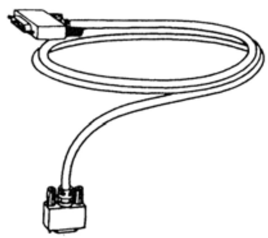

Figure C-1 *MT2500-5000 Data Cable*
MT2500-300 8-foot Extension Cable

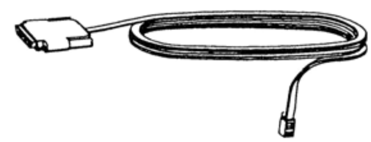

Figure C-2 *MT2500-400 Printer Cable (male)*
MT2500-410 Printer Cable (for MT3010)
MT2500-500 Display Cable, VT100 (female)

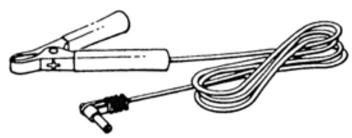

Figure C-3 *MT2500-200 Battery Power Cable*

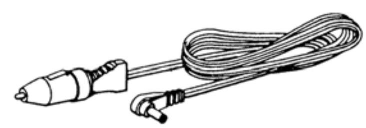

Figure C-4 *MT2500-100 Lighter Power Cable*

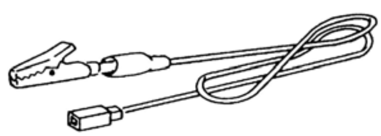

Figure C-5 *MT2500-41 Ground Adapter*

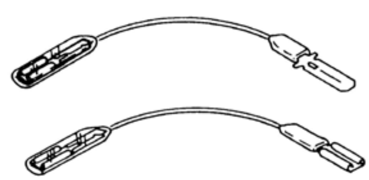

Figure C-6 *MT2500-43 Terminal Converters (Asian Imports)*

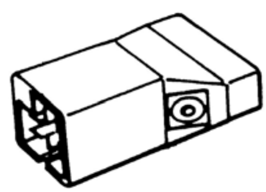

Figure C-7 *MT2500-30 Chrysler-1 Engine Adapter*

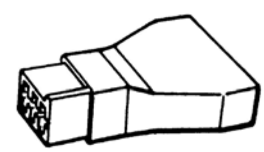

Figure C-8 *MT2500-31 Chrysler-2 CCD Adapter*

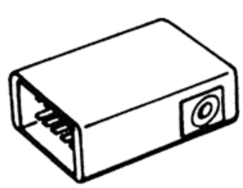

Figure C-9 *MT2500-10 GM-1 Adapter (12-pin)*

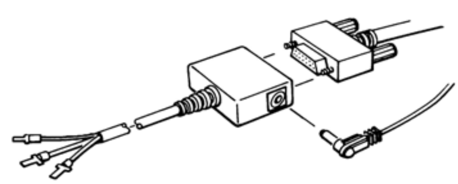

Figure C-10 *MT2500-70 Ford FRD-4 Adapter*

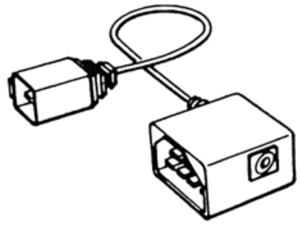

Figure C-11 *MT2500-20A FORD-1A Adapter (EEC-IV, ABS, Ride Control)*

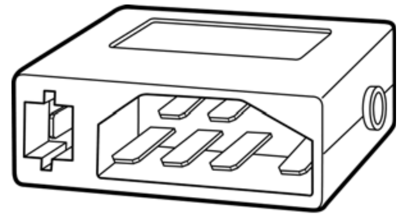

Figure C-12 *MT2500-20B FORD-1B Adapter (EEC-IV, ABS, Ride Control without pigtail)*

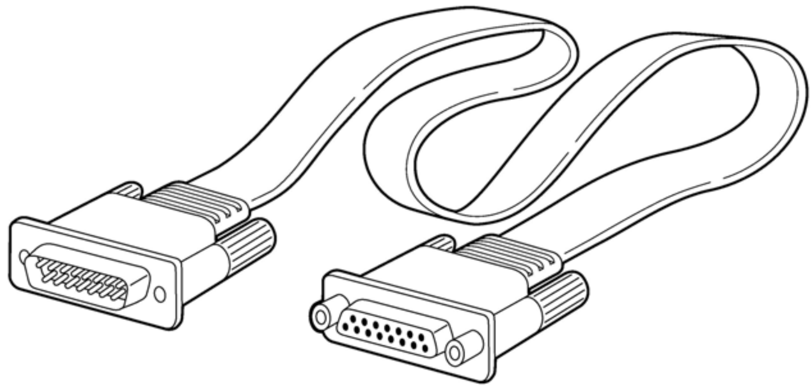

Figure C-13 *MT2500-302 OBD-II Ribbon (flat) Data Cable Extension*

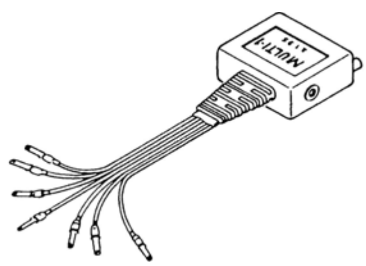

Figure C-14 *MT2500-90 MULTI-1 Adapter (Some GM, Ford, and Asian Imports)*

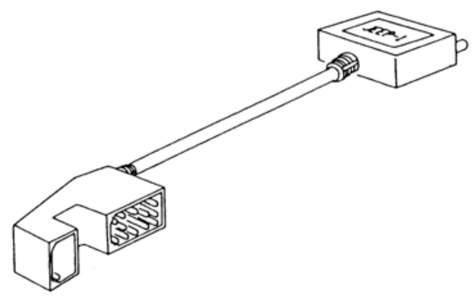

Figure C-15 *MT2500-49 JEEP-1 Adapter*

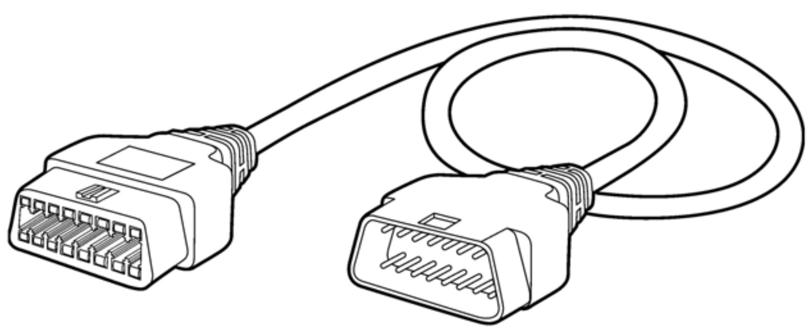

Figure C-16 *MT2500-301 OBD-II Data Cable Extension*

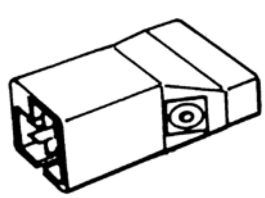

Figure C-17 *MT-2500-50 TOYOTA-1 Adapter*

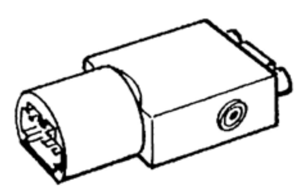

Figure C-18 *MT-2500-52 TOYOTA-2 Adapter*

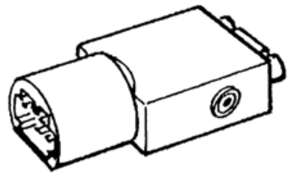

Figure C-19 *MT-2500-53 MAZDA-1 Adapter*

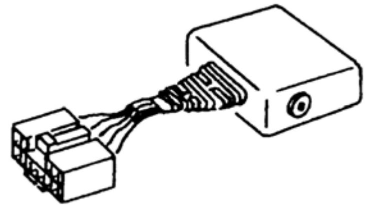

Figure C-20 *MT-2500-51 HYUNDAI-2 Adapter*

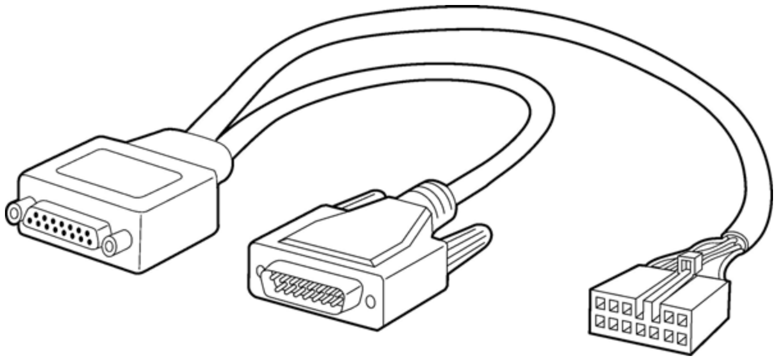

Figure C-21 *MT-2500-55 MITSU-1 Adapter*

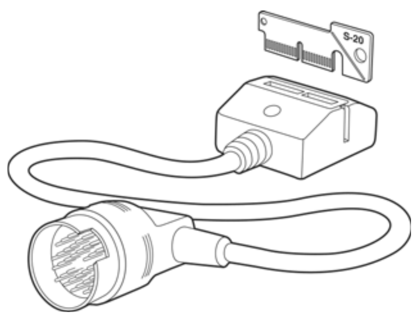

Figure C-22 *MT2500-62 Mercedes-Benz MB-1 Adapter with Personality Keys®*

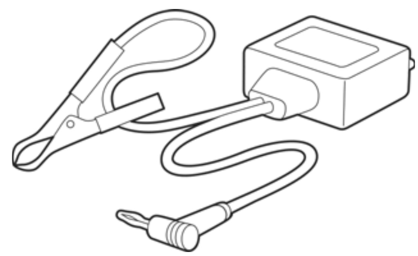

Figure C-23 *MT2500-75 Mercedes-Benz MB-2A Adapter*

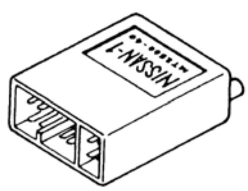

Figure C-24 *MT2500-40 NISSAN-1 Adapter (12-pin)*

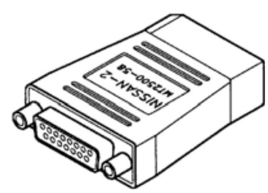

Figure C-25 *MT2500-58 NISSAN-2 Adapter (16-pin)*

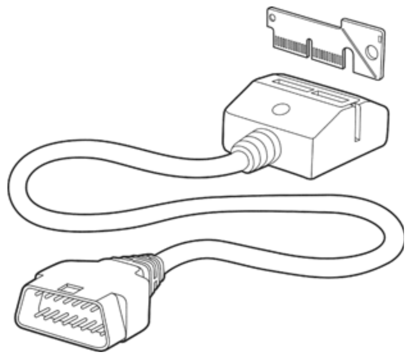

Figure C-26 *MT2500-68 DL-16 OBD-II Adapter with Personality Key®*

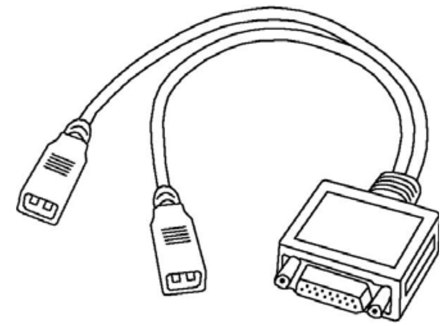

Figure C-27 *MT2500-56 VW-1 Adapter*

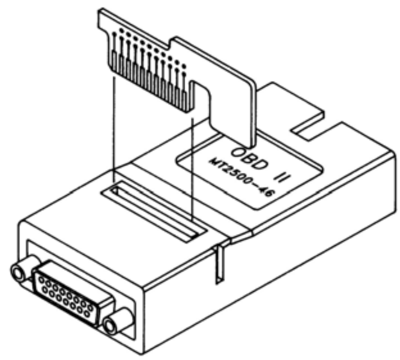

Figure C-28 *MT2500-46 OBD-II Adapter with Personality Keys®*

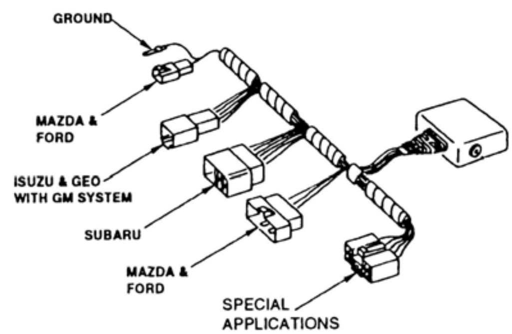

Figure C-29 *MT2500-42 MULTI-2 Asian Adapter*

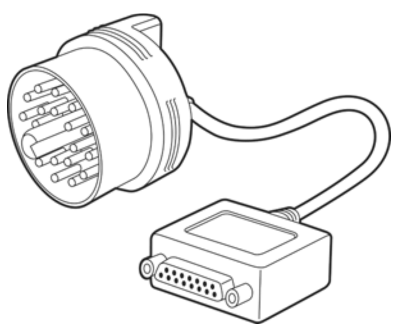

Figure C-30 *MT2500-74 BM-1B BMW adapter*

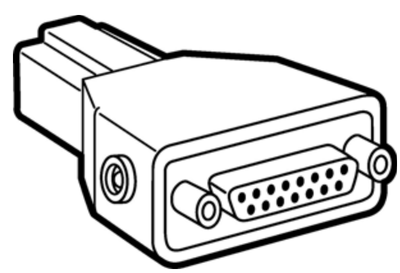

Figure C-31 *MT2500-77 HON-1 adapter*

C.1 Super Power Pac (External Battery) Kit

The optional MT2500-600A-1 Super Power Pac kit provides external battery power to the Scanner™ independently of the vehicle. Unlike the internal Scanner™ battery, the external Super Power Pac provides full Scanner™ power for all available menu choices. The rechargeable Power Pac attaches to the data cable receptacle on the top left of the Scanner™. The standard data cable then attaches to the Power Pac and is held in place with two captive screws. The Power Pac and data cable may be left attached at all times or removed for storage.

When fully charged, the nicad batteries inside the Super Power Pac provide a minimum of two hours of continuous use. A slide switch on the Power Pac turns off battery power to the Scanner™ and enables Scanner™ power from the vehicle. Turn off the Power Pac between vehicle testing by switching the Power Pac slide switch to the vehicle (VEH) position. This allows you to use the Scanner™ during the entire workday. The Power Pac may then be recharged at night using the Power Pac Charger. When fully discharged, the Super Power Pac takes approximately 14 hours to fully recharge.

To recharge the Super Power Pac:

1. Disconnect the Scanner™ from the vehicle.
2. If you are charging the Super Power Pac with it attached to the Scanner™, make sure the Super Power Pac slide switch is in the vehicle (VEH) position. This electrically disconnects the Power Pac from the Scanner™ and prevents battery discharge during charging.
3. Connect the Super Power Pac charger output to the CHARGER INPUT on the side of the Super Power Pac.
4. Plug the charger power cord into a standard AC electrical outlet. The CHARGE MODE lamp on the charger remains on during charger operation.

Appendix D Terms, Abbreviations and Acronyms

D.1 Terms

The following terms are used throughout this manual to explain certain operations and displays:

blink code	A type of vehicle control system that has no serial data. Any trouble codes the control system set are extracted either by flashing the malfunction indicator lamp (MIL) or using special digitized break-out box.
code	A numerical code, generated by the vehicle control system to indicate a fault has occurred in a particular subsystem, circuit, or part.
cursor	The arrow that appears on menus and some other displays. In most displays, the cursor moves as you scroll the thumbwheel.
fix	To lock a single line of the display in a fixed position on the screen to prevent it from scrolling. Data readings remain live while the parameter categories are fixed.
frame	One complete data package, or transmission cycle, from a vehicle that provides serial data of control system operating parameters.
hold	To capture and hold a single data frame for review or printing. Data readings (measured values) are locked at the frame that is held, while parameter and code lines can be scrolled. A data frame may be held while selected lines are either fixed or released.
movie	A vehicle data record whose length depends on the number of selected data parameters.
menu	A list of vehicle tests or programs from which a selection can be made. Use the thumbwheel to place the cursor at the desired function on a menu and press **Y** to enter the function.

D.2 Abbreviations and Acronyms

The following terms abbreviations and acronyms are used in diagnostic trouble code definitions displayed by the Scanner™, or used in Mercedes literature.

4MATIC	Automatically controlled four-wheel drive
AAC	Automatic Air Conditioning
AAM	All activity Module
AB	Airbag
ABC	Active Body Control
ABL	Exterior lights
ABS	Anti-lock Brake System

ABW	Distance warner
A/C	Air Conditioning (Automatic or Tempmatic)
ACRS	Automatic Child Seat Recognition
ADM	Automatic Dimming Mirror, inside rear view
ADS	Automatic Damping System, electronic suspension
AFE	Automatic lane recognition
AG	Automatic transmission
AGW	Audio gateway
AHV	Trailer hitch
AIR	Secondary air injection
AKR	Anti-knock control
AKSE	Automatic child seat recognition
ALDA	Barometric pressure/charge air pressure compensation
AP	Accelerator Pedal
APS	Auto Pilot System
ARF	Exhaust gas recirculation
ARMIN	Airbag with integrated emergency call system
AS	Antenna System
ASA	Automatic dimming mirror
ASD	Automatic Slip Differential, limited-slip
ASF	IFI Diesel System
ASG	Sequentronic automated manual transmission
ASR	Acceleration Slip Regulation, traction control
AT	Automatic Transmission
ATA	Anti-Theft Alarm
ATS	Antenna systems
AWR	Distance warning radar
BA	Backup Assist
BARO	Barometric pressure
BAS	Brake Assist
BCAPC	Barometric Charge Air Pressure Compensation
BDC	Bottom Dead Center
BM	Base Module, also called General Module (GM) or Controller Area Network (CAN) Bus Module
BPC	Barometric Pressure Compensation
CA	Cooling/Closing Assist
CAN	Controller Area Network
CC	Cruise Control
CCM	Combination Control Module
CDC	Compact Disc Changer

CDI	Common rail Diesel Injection
CDW	CD changer
CF	Convenience Feature
CFI	Continuous Fuel Injection
CKA	Crankshaft Angle
CKP	Crankshaft Position
CL	Central Locking
CLUS	Instrument Cluster
CMP	Camshaft Position
CNS	Communication and Navigation System
COMAND	Cockpit Management and Data system
CST	Cabriolet/Convertible Soft Top
CTEL	Cellular Telephone
CTP	Closed Throttle Position
CTU	Central Triggering Unit
CV	Convertible soft top
D2B	D2 Bus
DAS	Drive Authorization System
DBE	Overhead control panel control module
DCM	Door controller
DH	Diagnosis manual
DI	Distributor Ignition
DI1	DI for right bank of 12-cylinder
DI2	DI for left bank of 12-cylinder
DM	Diagnostic Module
DMAN	Diagnosis Manual
DSV	Drive authorization Shut-off Valve
DTC	Diagnostic Trouble Code
DTR	Distronic (autonomous intelligent cruise control)
EA	Electronic Accelerator
EAG	Electronic Transmission 722.5
EAM	Extended Activity Module
EATC	Electronic Automatic Transmission Control
EBR	Electronic Braking Regulation
E-call	Emergency call system
ECI	Electronic Controlled Ignition
ECL	Engine Coolant Level
ECT	Engine Coolant Temperature
EDC	Electronic Diesel Control

EDR	Electronic Diesel Regulation
EDS	Electronic Diesel System
EDW	Anti-theft alarm system
EFH	Power windows
EFP	Electronic accelerator
EGR	Exhaust Gas Recirculation
EGS	Electronic Transmission 722.6
EHD	Electronic high-pressure diesel injection system
EI	Electronic Ignition, distributorless
EIFI	Electronic Inline Fuel Injection
EIS	Electronic Ignition and Starter switch
EL	Exterior Lighting
ELR	Electronic idle speed control
ELV	Electric steering lock
EMSC	Electric Mirror and Steering Column, heated and adjustment
ENR	Electronic level adjustment
EPC	Electronic Power Control
ERE	IFI Diesel System
ESA	Electric Seat Adjustment
ESC	Electric Steering Column adjustment
ESCM	Engine Systems Control Module, also called MAS
ESL	Electric mirror, steering column adjustment, heated mirror
ESP	Electronic Stability Control, traction control
ESV	Electric seat adjustment
ETC	Electronic Transmission Control
ETR	Emergency Tensioning Retractor, supplemental restraints
ETS	Electronic Traction System
ETSL	Electric Steering Lock
EVAP	Evaporative emission control system
EVE	IFI Diesel System
EVL	Electrically adjustable steering column
EWM	Electronic selector module
EZ	DI or Distributor Ignition Module
EZS	Electronic ignition switch control module
FAN	Fanfare horns
FBN	Drive authorization system (commercial vehicles)
FBS	Drive authorization system
FDS-VR	Right front dynamic seat
FDS-VL	Left front dynamic seat

FFS	Frame Floor System
FFZ	Radio frequency locking
FFZ/IFZ	Radio frequency locking/infrared remote central locking
FG	Function Group
FOM	Folding Outside Mirrors
FP	Fuel Pump
FR	Drive control unit
FSA	Hands-free system
FSS	Flexible Service System
FUG	Function subgroup
GES	Vehicle speed signal
GM	General Module, also called Base Module (BM)
GPS	Global Positioning System
GUB	Seat belt extender
GUS	Emergency tensioning retractor
HAL	Rear axle steering
HAU	Automatic heater
HCS	Headlamp Cleaning System
HDF	Remote trunk lid release
HDFS	Remote trunk lid locking
HFM	Hot Film engine Management system
HFM-SFI	HFM with Sequential Fuel Injection
HHS	Heated rear window
HHT	Hand-Held Tester
HM	Heated Mirrors
HS	Heated Seats
HZS	Trunk lid auxiliary lock
IAT	Intake Air Temperature
IC	Instrument Cluster
ICL	Interior Central Locking
ICS	Information and Communication System
IDC	In-Dash Controller
IFI	In-line Fuel Injection
IFZ	Infrared remote control of central locking
IL	Interior Lighting
IMS	Interior protection (Interior Motion Sensor)
IR	Infrared
IRCL	InfraRed remote Central Locking
IRM	Inside Rear view Mirror

IRS	Interior protection
ISC	Idle Speed Control
IZV	Interior control locking
KAF	Retractable rear head restraints
KAT	Three-way catalytic converter
KFB	Convenience feature (a standard term for convenience closing until DAS 2, which can also be controlled with the mechanical key from the door lock)
KG	Keyless Go
KI	Instrument cluster
K-KLA	Comfort automatic air conditioning
KLA	Automatic air conditioning
KLS	Climate-controlled seat
KS	Knock Sensor
KSG	Easy-shift manual transmission (Sequentronic)
KSS	Knock Sensor System
KW	Crank angle
LCP	Lower Control Panel
LDH	Lamella roof
LH	Lambda Hot wire mass airflow system
LH1SFI	LH with Sequential Fuel Injection for right bank of 12-cylinder
LH2SFI	LH with Sequential Fuel Injection for left bank of 12-cylinder
LH-SFI	LH with Sequential Fuel Injection
LHS	Left Hand Steering
LL	Left-hand drive
LLR	Idle speed control
LOC	Low Compression
LRH	Steering wheel heater
LS	Power steering gear
LS, LSA	Loudspeaker System
LWR	Headlamp range adjustment
MAF	Mass Air Flow
MAP	Manifold Absolute Pressure
MAS	Motor Aggregate Systems
ME	Mercedes-Benz Electronic control system
ME-SFI	ME with Sequential Fuel Injection
MG	Manual transmission
MKL	Multicontour backrest
MIL	Malfunction Indicator Lamp
MR	Engine control
MRA	Residual engine heat utilization system

MRM	Steering column module
MRS	Multifunction restraint system
MSA	Quantity injection timing and exhaust control
MSC	Mirror, Steering Column, electric heated and adjustable
MSR	Engine braking regulation
MSS	Special vehicle multifunction control module
MT	Manual Transmission
MVA	Manifold Vacuum Assist
MWH	Main Wiring Harness
NS	Networked Systems, CAN
NV	Low compression
O2S	Oxygen Sensor
OBD	On-Board Diagnostics
OC	Oxidation Catalytic converter
OCP	Overhead Control Panel
ORM	Outside Rearview Mirror
OSB	Orthopedic Seat Backrest
PEC	Pressurized Engine Control (also PMS)
PFDS	Dynamic seat pump
PL	Power Locking system
PLA	Pneumatic idle speed increase
PML	Speed-sensitive power steering
PMP	Partial intake Manifold Preheater
PMS	Gasoline injection and ignition system (pressurized engine control)
PNP	Park Neutral Position
PS	Power Steering
PSE	Pneumatic System Equipment
PSV	Partial intake manifold preheater
PTS	Parktronic System
PW	Power Windows
PWM	Pulse Width Modulation
R	Reverse gear
RA	Repair instructions
RB	Roll Bar
RCL	Remote Central Locking
RD	Radio
RDK	Tire pressure monitor
RDS	Radio data system
RDU	Tire pressure monitor

REST	Residual Engine heat utilization
RH	Retractable Hardtop
RHR	Retractable rear Head restraints
RHS	Right Hand Steering/Rear Heated Seats
ROW	Rest Of World
RPM	Engine speed, Revolutions Per Minute
RRE	Trip computer
RST	Roadster Soft Top
RTG	Retractable Trunk lid Grip
RTR	Remote Trunk Release
RV	Roadster soft top
RWD	Rear Window Defroster
SA	Special equipment
SAM	Signal acquisition and actuation module
SBC	Sensotronic Brake Control
SBE	Seat Belt Extender
SBL	Seat ventilation
SBS	Voice control system
SD	System Diagnosis
SHD	Tilting/sliding roof
SIF	Heated rear seats
SIH	Heated seats
SIM4	Siemens Integrated Management (4-cylinder)
SKF	Multi-function control module
SLO	Starter Lock Out
SOR	Seat Occupied Recognition
SOHC	Single Overhead Camshaft
SPH	Mirror heater
SPK	Folding outside mirrors
SPS	Speed-sensitive Power Steering
SR	Sliding Roof
SRA	Headlamp cleaning system
SRS	Supplemental Restraint System
SRU	Manifold vacuum assist
STH	Stationary heater
TAU	Tempmatic (air conditioning)
TB	Throttle Body
TC	Transfer Case
TCM	Transmission Control Module

TD	Time Division, speed signal
TDC	Top Dead Center
TIC	Transistorized Ignition Control
TN	Time Notification, speed signal from ignition module
TPC	Tire Pressure Control
TPM	Cruise control
TRAP	Trap oxidizer, Diesel emission controls
TS	Towing Sensor
TSG	Door control module
TVV	Tank Vent Valve
TWC	Three-Way catalytic Converter
URB	Roll bar
VAF	Volume Air Flow
VSS	Vehicle Speed Signal
WFS	Immobilizer
WIS	Workshop Information System
WS	Wiper System
WSP	Immobilizer (commercial vehicles)
WOT	Wide Open Throttle
ZAE	Central triggering unit (airbag)
ZAS	Cylinder shut-off
ZGW	Central gateway
ZUH	Heater booster
ZV	Central locking

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