Mercedes-Benz Vehicle Communication Software Manual

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For Technical Assistance Call:

1-800-424-7226

Safety Information

For your own safety and the safety of others, and to prevent damage to the equipment and vehicles upon which it is used, it is important that the accompanying *Safety Information* be read and understood by all persons operating, or coming into contact with, the equipment. We suggest you store a copy near the unit in sight of the operator

This product is intended for use by properly trained and skilled professional automotive technicians. The safety messages presented throughout this manual are reminders to the operator to exercise extreme care when using this 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 automotive technician's responsibility to be knowledgeable of the system being tested. It is essential to use proper service methods and test procedures. It is important to perform tests in an appropriate and acceptable manner that does not endanger your safety, the safety of others in the work area, the equipment being used, or the vehicle being tested.

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

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

Read, understand and follow all safety messages and instructions in this manual, the accompanying safety manual, and on the test equipment.

Safety Message Conventions

Safety messages are provided to help prevent personal injury and equipment damage. All safety messages are introduced by a signal word indicating the hazard level.

DANGER

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

Example:

WARNING

Risk of unexpected vehicle movement.

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

A moving vehicle can cause injury.

Important Safety Instructions

For a complete list of safety messages, refer to the accompanying safety manual.

SAVE THESE INSTRUCTIONS

Contents

Chapter 1 Using This Manual

This manual contains instructions for testing Mercedes-Benz vehicles. Some of the Illustrations shown in this manual may contain modules and optional equipment that are not included on your system. Contact your sales representative for availability of accessories 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:

- Select **OK** to continue.

1.1.2 Terminology

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

Select

The term “select” means to highlight a menu item or other option, then pressing the **Y/**a, OK, Accept, or similar button to activate it.

Example:

- Select **Functional Tests**.

Scroll

The term “scroll” means moving the cursor or changing data by using the directional arrow buttons, scroll bars, or other means.

Example:

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

Scan Tool

The term “scan tool” is used to refer to any tool that communicates directly with the vehicle data stream. When necessary, the term “Scanner” is used to distinguish Snap-on equipment from another diagnostic device, such as the Mercedes-Benz factory scan tool.

1.2 Notes and Important Messages

The following messages appear throughout this manual.

1.2.1 Notes

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

Example:

NOTE:
For additional information refer to...

1.2.2 Important

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

Example:

IMPORTANT:
To avoid incorrect TPS adjustment or component damage, be sure to follow the on-screen instructions. Refer to a vehicle service manual for complete test or adjustment procedures.

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:

- **Operations**, on page 4 takes you through basic Scanner operations from identifying the vehicle to selecting tests from a Main Menu screen.
- **Testing**, on page 14 offers testing information and procedures for transmission control systems.
- **Data Parameters**, on page 21 defines Mercedes-Benz data parameters and explains how they display on the screen.
- **Troubleshooting and Communication Problems**, on page 98 offers advice for troubleshooting Scanner-to-vehicle communication and other issues.
- **Terms, Abbreviations and Acronyms**, on page 100 lists abbreviations used in this manual.

Chapter 3 Operations

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 US models
VIN EA30 (1988–92)	103.980 not used in US
	103.983 used in US
VIN JF72	119.980 not used in US (5.0L-V8)
	119.985 used in US (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

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

VIN	Engine Selection
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
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 (for example HFM/ME2) because vehicle systems may vary depending on country. The Scanner automatically identifies the correct system.

Selecting System ID mode allows the user to go to the selected system and control unit. The scan tool displays a list of systems or modules with which the scan tool can communicate.

NOTE:
The list of systems or modules that the scan tool can communicate with is not customized to the test vehicle.

Selecting a module that is not fitted to the vehicle will result in a “No Communication” error message. Some systems will list the same systems or modules more than once; the correct choice is the only one that will communicate with the scan tool.

Selecting a System

Once you have confirmed a vehicle identification, the System List menu displays. This menu shows all the systems available for testing.

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 position of a seated driver. 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 a MAF sensor for each bank 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 A Troubleshooting and Communication Problems” on page 98 for help trying to establish communication.

Connecting to a Vehicle

After selecting from the System List, the Scanner displays a connection message that tells you which adapter and personality key to use to connect the Scanner for testing. 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—for the 38-pin underhood connector.
- MB-2A—for the 8-pin or 16-pin underhood connector.
- DL-16—for 1996 and later vehicles with an OBD-II style connector.

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 under-dash 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.

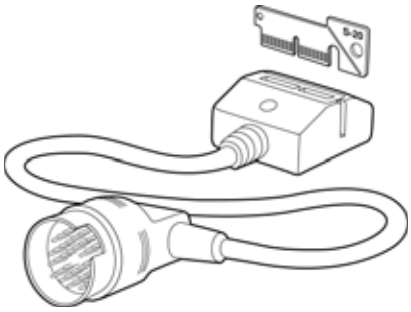


Figure 3-1 *MB-1 adapter*

Figure 3-2 *MB-2A adapter*

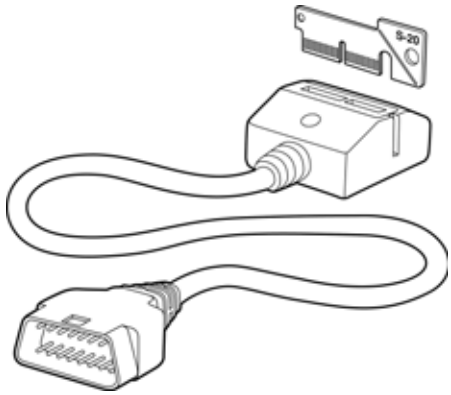
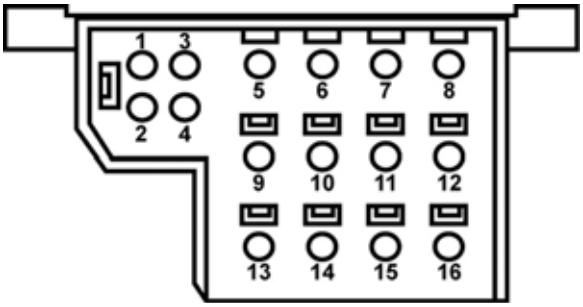


Figure 3-3 *DL-16*

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

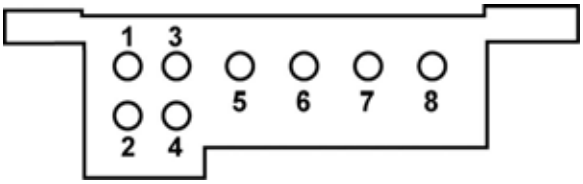
Pin	Function	Pin	Function
1	Ground, circuit 31 (W12, W15, electronics ground)	14	On-off ratio, engine 119 LH-SFI, engine 120 LH-SFI (right)
2	Voltage, circuit 87 or 15z	15	On-off ratio, engine 120 LH-SFI (left)
3	Voltage, circuit 30		Instrument cluster
4	Electronic diesel system	16	Air conditioning (models 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
9	Automatic locking differential (models 124, 129, 140)	28	Parktronic system (model 140)
10	Electronic transmission control	29	Not used
11	Adaptive damping system	30	Airbag/ETR (SRS)
12	Speed-sensitive power steering	31	Remote central locking
13	TNA-signal (gasoline) LH-SFI engines	32–33	Not used
	TD-signal (diesel) (model 210)	34	Communication and navigation system
	TN-signal (gasoline), HFM (ME)-SFI engines	35–38	Not used

Figure 3-4 *38-pin connector—fits MB-1 adapter*



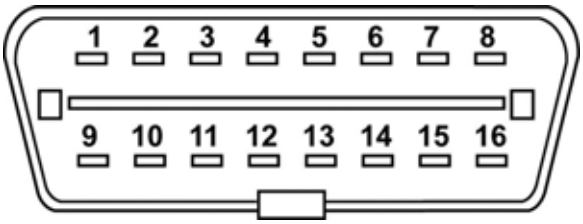
US Models		California Models Only (With LED)	
Pin	**Function**	**Pin**	**Function**
1	Ground	1	Ground
2	Not used	2	Push-button for on-board diagnostics
3	Continuous fuel injection	3	Continuous fuel injection
4	Electronic diesel system		Diagnostic module
5	4MATIC	4	LED
6	Airbag/ETR (SRS)	5	Automatic locking 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
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 3-5 *16-pin OBD-I connector—fits MB-2 adapter*



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 3-6 *8-pin connector—fits MB-2 adapter*



Pin	Function	Pin	Function
1	Not used	9	Electronic Traction System (ETS), model 163
2	Not used	10	Not used
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

Figure 3-7 *16-pin OBD-II connector—fits DL-16 adapter*

Note the following when connecting the Scanner to the vehicle:

- "Left" or "Right," when included in the connection message, assumes that you are seated in the driver 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.

Follow the on-screen instructions to connect the scan tool to the vehicle.

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, and you may begin testing.

Main Menu Selections

The Main Menu presents selections only for the specific vehicle being tested.

The Mercedes-Benz Main Menu contains the following general functions:

- Codes—displays one of three types of diagnostic trouble codes (see "Codes" on page 11).
- 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 11).
- Functional Tests—provides specific tests for the identified vehicle (see "Functional Tests" on page 12).
- Stop Communication—disables the active communication link between the Scanner and the vehicle control module.
- Review ECU ID—displays identification characteristics of the active control module.

Codes

Select Codes from the Main 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.

Data

Select Data from the Main Menu and the Scanner displays a menu of data groups. Each data group includes only parameters that relate to that particular function. The number of groups

available, The type of data available, and the order in which the groups are listed varies by model. A typical data group listing would include:

- Oil Information
- Adaptation Values
- Speed Regulation
- Fan Status
- Start Enable
- Values at Idle
- Air Conditioner Values
- Lambda Pairs
- Lambda Control Downstream
- Lambda Control Upstream
- Engine Running Values
- Air Pump Values
- Knock Values
- Injection/Ignition
- Spark Current 1—8
- Fault Counter
- Cruise Control
- Running Temperature

Combining data into groups results in a much shorter data list and allows for a faster update rate.

Functional Tests

Selecting FUnctional Tests from the Main Menu displays a menu that varies depending on the vehicle identified.

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

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 PRO™ Meter. Use these instruments to confirm whether the ECU properly controls the component.

Special Functions

This selection opens a menu of unique tests, such as relearn procedures. Follow the on-screen instructions to check status and reprogram learned values.

Review Coding

This test displays the programmed VIN number and other relevant information.

Review ECU ID

This test displays ECU identification information. Highlight and select **Review ECU ID** to access the information. The display may take more than one screen, scroll to read the complete test results.

Stop Communication

This selection severs the communication link between the Scanner and the vehicle ECU. Use it to end a test session before switching the Scanner off or disconnecting the data cable.

Scanner Demonstration Program

The Mercedes-Benz software 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.

To access a demonstration:

1. Open the Mercedes-Benz database.
2. Highlight and select **Training Mode**.
   A series of vehicle identification screens display.
3. Select a vehicle identification
   The System Selection menu displays and you are in demonstration mode.

Chapter 4 Testing

This chapter provides limited information and procedures for the following control 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 11 for general Scanner testing information.

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 integrated all operations 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 4-1 *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

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.

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 door lock 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 as features were added 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.

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, a remote control module 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.

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.

Table 4-2 *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

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

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.

Table 4-3 *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

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

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 the DAS 2a system and has similar functionality. This system also added exterior RCL IR receivers.

Table 4-4 *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 synchronization activation requires a scan tool procedure which the Scanner currently does not perform.

Table 4-5 *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 4-6 *DAS 3 characteristics*

Triggered By	Signal Type	Authorization Checked By	Operator Feedback	Authorized Start Result
Microprocessor 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 shift 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 key track
- 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 must be variant coded before it can be used. Technicians have reported successfully resetting the counter to 0 on a test ECU at about count 20 by removing the version coding and ECU power for 10 to 30 minutes.

Chapter 5 Data Parameters

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 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 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 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.

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

Engine Parameters

A/C COMPRESSOR
Range: ON/OFF

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

ABS. INT. MANIF. PRESS. DI1
ABS. INT. MANIF. PRESS. DI2
ABS. INTAKE MANIFOLD PRESSURE
Range: 0 to 1000 or ±100 mbar

Used on DM systems. These 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
Range: 0 to 100%

Used on ERE/EVE/ASF (IFI Diesel) systems. This parameter indicates the position of the accelerator pedal (sensor) as a percentage. Normally, readings range from 0 to 2% at idle, and 75 to 95% at wide open throttle.

ACCELERATION ENRICHMENT
Range: ON/OFF

Used on LH systems. This 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
Range: 0 to 5.0 V

Used on ME10 systems. This parameter indicates the position of the accelerator pedal (sensor) as voltage.

ACTUAL EGR LIFTING SENDER
Range: not available

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

ACTUAL INJECT.QTY. PER STROKE
Range: 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
Range: 0 to 1000 mbar

Used on EDS systems. This 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
Range: 0 to 1000 mbar

Used on ERE/EVE/ASF (IFI Diesel)) systems with turbocharged engines. This 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
Range: 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
Range: 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 R1
ACTUATOR ACT.VALUE POT.METER R2
ACTUATOR SIGNAL 1
ACTUATOR SIGNAL 2
Range: 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
Range: 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, and is controlled by the Electronic accelerator/Cruise Control/Idle Speed Control (EA/CC/ISC) module. Voltage varies depending on operating conditions. The higher the count, the greater the throttle actuator is opening the throttle valve.

ADAPT. RANGE 2 GEAR, 6000-3000
ADAPT. RANGE 2 GEAR, 6000-4000
ADAPT. RANGE 4 GEAR, 2500-1500
ADAPTED RANGES L1
ADAPTED RANGES L2
ADAPTED RANGES L3

Range: **ON/OFF**

Used on ME20 systems. These parameters indicate whether 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

Range: **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

Range: **ON/OFF**

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

ADR RPM ADJUSTMENT

Range: **ON/OFF**

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

AFTER-START ENRICHMENT

Range: **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

Range: **ON/OFF**

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

AIR FLAP

Range: **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

Range: **0 to 120°**

Used on HFM systems. This parameter indicates the opening of the air flap in degrees. The ECU uses this signal to regulate supercharger boost. When the supercharger is providing boost, the reading should be greater than 85°.

AIR LOGIC CHAIN
Range: YES/NO

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

AIR MASS
Range: 0 to 500 kg/h or 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
Range: YES/NO or 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
Range: YES/NO

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

AIR PUMP SWITCHOVER VALVE
AIR PUMP SWITCHOVER VALVE, LEFT
AIR PUMP SWITCHOVER VALVE, RIGHT
Range: 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 PRESSURE
ALTITUDE PRESSURE
Range: 0 to 1000, ±100 mbar
AMBIENT PRESSURE
Range: 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 kilopascal (kPa). A typical reading at sea level is approximately 1000 mbar. Readings decrease as altitude increases.

ASR INTERVENTION
Range: 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
Range: 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
Range: 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
Range: 0 to 1000 kPa

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

BOOST PRESSURE CONTROL
Range: ON/OFF

Used on ERE/EVE/ASF (IFI Diesel)) systems. This 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
Range: ON/OFF

Used on ERE/EVE/ASF (IFI Diesel)) systems. This 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
Range: 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
Range: 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 ADJUSTMENT
CAMSHAFT CONTROL
CAMSHAFT SOLENOID
CAMSHAFT TIMING
Range: ON/OFF

Used on DM, DM2, LH, HFM and SIM4 systems. These 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, RIGHT
CAMSHAFT ADJUSTMENT VALVE, LEFT
Range: ON/OFF

Used on ME27 and ME28 systems. This 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
Range: YES/NO

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

CAMSHAFT REFERENCE MARK SIGNAL
Range: YES/NO

Used on DM2 systems. This 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 BANK
CAMSHAFT SIGNAL, LEFT BANK
Range: **YES/NO**

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

CAMSHAFT SOLENOID
Range: **ON/OFF**

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

CAN DATA EXCHANGE
Range: **YES/NO**

Used on DM and DM2 systems. This 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
Range: **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
Range: **OK/NOT OK**

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

CAN RECEPTION FROM DI1
CAN RECEPTION FROM DI2
Range: **OK/NOT OK**

Used on EZ and LH systems. These parameters indicate whether 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
Range: **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-SFI
CAN RECEPTION FROM LH2-SFI
Range: OK/NOT OK

Used on EZ and LH systems. These parameters indicate whether the controller area network (CAN) is receiving data from the 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 DI1
CAN 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-SFI
CAN TRANSMISSION FROM LH2-SFI
Range: OK/NOT OK

Used on LH systems. These parameters indicate whether the controller area network (CAN) is receiving communication from the 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 CYCLE
CANISTER PURGE VALVE DUTY CYCLE
Range: 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
Range: 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
Range: ON/OFF

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

CHARCOAL CANISTER
Range: 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
Range: 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 15
CIRCUIT 50
Range: 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 OUTPUT
CIRCUIT 50 INPUT
Range: 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
Range: 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
Range: ON/OFF

Used on ERE/EVE/ASF (IFI Diesel)) and SIM4 systems. This 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. 1/4
COIL FAULT COUNTER T1/1 CYL. 2/5
COIL FAULT COUNTER T1/2 CYL. 2/3
COIL FAULT COUNTER T1/2 CYL. 3/4
COIL FAULT COUNTER T1/3 CYL. 1/6
Range: 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. 1/4
COIL SPARK DURAT. T1/1 CYL. 2/5
COIL SPARK DURAT. T1/2 CYL. 2/3
COIL SPARK DURAT. T1/2 CYL. 3/4
COIL SPARK DURAT. T1/3 CYL. 1/6
Range: 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. 1/4
COIL SPARK VOLTAGE T1/1 CYL. 2/5
COIL SPARK VOLTAGE T1/2 CYL. 2/3
COIL SPARK VOLTAGE T1/2 CYL. 3/4
COIL SPARK VOLTAGE T1/3 CYL. 1/6
Range: 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. 1
COMBUSTION TIME CYL. 2
COMBUSTION TIME CYL. 3
COMBUSTION TIME CYL. 4
COMBUSTION TIME CYL. 5
COMBUSTION TIME CYL. 6
COMBUSTION TIME CYL. 7
COMBUSTION TIME CYL. 8
Range: 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
Range: 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
Range: variable

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

COOLING FAN OUTPUT DEMAND ENGINE
Range: ON/OFF
COOL.FAN OUTP.DEMANDED BY ENGINE
Range: 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 disables the fan.

COOL.FAN OUTP.DEMAND CLIMATE CTRL
COOL.FAN OUTP.DEMAND.BY CLIM.CTRL
Range: 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. Reads OFF when the fan is switched off and the compressor is disengaged.

COOLANT TEMPERATURE
Range: –40 to 199°C or –40 to 390°F

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

CORRECTED INT.MANIFOLD PRESS
Range: 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
Range: 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 CODING
CRANKSHAFT SEGMENT ORDER
Range: YES/NO

Used on DM2 systems. These 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 CONTROL
CRUISE CONTROL ENGAGED
Range: 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 VARIABLE
CRUISE CONTROL LEVER SIGNAL IMPLAUSIBLE
CRUISE CONTROL OFF
CRUISE CONTROL RESTART
CRUISE CONTROL SET AND ACCELERATE
CRUISE CONTROL SET AND DECELERATE
Range: 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
Range: 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
Range: 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
Range: 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
Range: ON/OFF
CRUISE CONTROL SWITCH A
CRUISE CONTROL SWITCH B
CRUISE CONTROL SWITCH ACCELERATE
CRUISE CONTROL SWITCH DECELERATE
Range: 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, RIGHT
CSO, IDLE F.TRIM CYL.4-6, RIGHT
CSO, IDLE F.TRIM CYL.7-9, LEFT
CSO, IDLE F.TRIM CYL.10-12, LEFT
Range: –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, RIGHT
CSO, LOW.P.LOAD F.TRIM CYL 4-6, RIGHT
CSO, LOW.P.LOAD F.TRIM CYL 7-9, LEFT
CSO, LOW.P.LOAD F.TRIM CYL 10-12, LEFT
Range: 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 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 programmed low partial load base cell values.

CTP (IDLE) ADJUSTMENT VALUE
Range: not available

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

CTP (IDLE)
CTP (IDLE) CONTACT
CTP (IDLE) INFORMATION
CTP (IDLE) RECOGNITION
Range: YES/NO or 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
Range: not available

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

CYL. 1 to 12
Range: 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 12
CYLINDER SHUT-OFF VALVE, RIGHT
CYLINDER SHUT-OFF VALVE, LEFT
Range: 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 MATCHED
DAS AND ECM COMPATIBLE
DAS AND ENGINE CTRL. MOD. COMPATIBLE
Range: YES/NO
DAS CONTROL MODULES
Range: 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. Engine starting is prohibited unless the authorized key is used and a start enable signal from the DAS module is received by the ME-SFI module.

DECELERATION
Range: YES/NO
DECELERATION SHUT-OFF
Range: ON/OFF

Used on DM2, EGS, HFM, LH, ME10 and ME20 systems. These parameters indicate whether 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 power surge.

DESIRED ENGINE SPEED
Range: 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.
Range: 0 to 100%

No information is available at this time.

DRIVE AUTH. RCL & ECM COMPATIBLE
Range: 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
Range: 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
Range: not available

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

DWELL TIME, CYLINDER 1 to 12
Range: 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
Range: 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 IDENTIFIED
ENGINE CONTROL MODULE IDENTIFIED
Range: 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 LOCKED
ENGINE CONTROL MODULE LOCKED
Range: YES/NO

Used on ERE/EVE/ASF (IFI Diesel)), ME10, ME20 and HFM systems. These parameters 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 LH1
ENGINE COOLANT TEMP. 1
ECT LH2
ENGINE COOLANT TEMP. 2
Range: 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 for starting, after start enrichment, during 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 upshift delay, camshaft adjustment, overheat protection and anti-knock control.

ECT OPERATING TEMPERATURE
ECT SENSOR
ECT VALUE RANGE
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
Range: 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.

EGR
EGR ACTIVATION
EGR LOGIC CHAIN
EGR VALVE
Range: 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
Range: 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
Range: ON/OFF
EGR VALVE
Range: 0 to 100%

Used on ERE/EVE/ASF (IFI Diesel)). In systems without a turbocharger, the ECU controls the EGR vacuum transducer by applying a variable current. The EGR Valve parameter ia a calculated value based on the applied 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
Range: 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 only operate during cold and warm-up conditions.

ELECTRIC COOLING FAN
Range: ON/OFF

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

ENGINE BRAKE TORQUE
Range: variable

Used on HFM systems. This parameter is an ECU-calculated value that indicates engine torque as newton-meters (Nm). Engine load partially determines engine brake torque.

ENGINE COOLANT TEMPERATURE(V)
Range: 0 to 5.00 V
ENGINE COOLANT TEMPERATURE(°)
Range: –40 to 255°C or –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 displays either the voltage drop created by the resistance of the engine coolant temperature (ECT) sensor, or the calculated temperature based on the voltage signal. 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).

ENGINE LOAD
Range: 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
Range: OK/NOT OK

Used on ME10 systems. This parameter indicates whether 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
Range: –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).

ENGINE SPEED
Range: 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 LIMITER
ENGINE START CONTROL
Range: ON/OFF

Used on HFM, ME27 and ME28 systems. This parameter indicates whether 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
Range: –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).

ETS INTERVENTION
Range: ON/OFF
ETS
Range: YES/NO

Used on HFM systems. These parameters indicates whether 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
Range: 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 TEMPERATURE
EXHAUST TEMPERATURE (TWC MODEL)
Range: not available

Used on HFM, LH, ME10, ME27 and ME28 systems. These parameters are 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).

EXHAUST TEMPERATURE LEFT
EXHAUST TEMPERATURE RIGHT
Range: 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/C
FAN CAPACITY REQUEST BY ENGINE
FAN CAPACITY, EFFECTIVE
Range: 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
Range: 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.
Range: –50 to 30 HPA or 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 about 2.9 to 3.0 volts.

FUEL LEVEL
Range: 0 to full tank capacity

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

FUEL PUMP
Range: 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
Range: 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
Range: variable

Used on EDS diesel systems. The display shows the fuel rack position in millimeters. With the accelerator not depressed, the display should read approximately 10 mm. The value should increase to about 20 mm at WOT as the accelerator pedal is slowly depressed.

FUEL TANK CAP
Range: OK/NOT OK

Used on ME10 systems. This parameter indicates whether 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
Range: OK/NOT OK

Used on ME10 and ME20 systems. This parameter indicates whether 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
Range: –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 electro-hydraulic fuel cut off valve on the main injection pump. The measurement units can be changed from degrees Celsius (°C) to degrees Fahrenheit (°F).

FULL LOAD DETECTION
Range: 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
Range: YES/NO

Used on HFM systems. This parameter indicates whether a functional problem exists with a specific component or system. The reading is YES if a fault is detected and NO if not.

HFM VOLTAGE
HOT FILM VOLTAGE
HOT WIRE VOLTAGE
HOT FILM MASS AIR FLOW SENSOR
Range: 0 to 5.00 V

Used on ME10, ME20, ME27, ME28, HFM and LH systems. These parameters show 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.

HOT WIRE AIR MASS
HOT FILM MASS AIR FLOW SENSOR
Range: 0 to 500 kg/h

These parameters are 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.

HFM-SFI MAP
Range: not available

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

HOLD GEAR
Range: 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. Reads ON when a specific gear is being held, and OFF during normal driving conditions.

IDLE FUEL TRIM ADAPTATION LEFT
IDLE FUEL TRIM ADAPTAT. RIGHT
Range: –1 to 1ms
IDLE FUEL TRIM CYL. 1-3 RIGHT
IDLE FUEL TRIM CYL. 4-6 RIGHT
IDLE FUEL TRIM CYL. 7-9 LEFT
IDLE FUEL TRIM CYL. 10-12 LEFT
Range: –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 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 CONTROL
IDLE SPEED DETECTION
IDLE SPEED RECOGNITION
Range: YES/NO

Used on DM, ERE/EVE/ASF (IFI Diesel)), ME27, ME28, and SIM4 systems. These parameters indicate whether the idle speed control circuit is on or off.

IFI/DFI RECEIVING FROM ETC (722.6)
Range: ON/OFF
IFI/DFI RECEIVING FROM ETS/ABS
IFI/DFI RECEIVING FROM ETS/ABS/ASR
IFI/DFI RECEIVING MESSAGE 1 FROM IC
IFI/DFI RECEIVING MESSAGE 2 FROM IC
IFI/DFI TRANSM. TO ASR/ESP/ A/C /ETC
IFI/DFI TRANSM. TO IC/ASR/ETC (722.6)
IFI/DFI TRANSMITTING TO ETC/ASR
IFI/DFI TRANSMITTING TO ETC/IC
Range: YES/NO
ENGINE CONTROL MODULE OR CAN-BUS
Range: OK/NOT OK

Used on ERE/EVE/ASF (IFI Diesel)) (IFI Diesel). These parameters indicate 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 ANGLE
IGNITION ANGLE
IGNITION FIRING POINT CYLINDER 1
Range: –30 to 60 degrees

Used on DM2, EZ, HFM, ME10, ME20, ME27, ME2, and SIM4 systems. These parameters 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. 1
IGNITION FAULT COUNTER CYL. 2
IGNITION FAULT COUNTER CYL. 3
IGNITION FAULT COUNTER CYL. 4
IGNITION FAULT COUNTER CYL. 5
IGNITION FAULT COUNTER CYL. 6
Range: 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
Range: 0 to 500 V

Used on EZ systems. The “1 to 12" in the parameter name represent 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
Range: ON/OFF

Used on SIM4 systems. This parameter indicates whether the immobilizer (anti-theft system) circuit is on or off.

INDICATED ENGINE TORQUE
Range: 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
Range: 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
Range: 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%.

INJECTOR
INJECTION DURATION
INJECTION DURATION LEFT
INJECTION DURATION RIGHT
INJECTION TIME
Range: 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
Range: 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 ADAPTATION
INJECTION SHORT-TERM ADAPTATION
INJECTION SYSTEM
INJECTOR ACTIVATION
Range: 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 BANK
INJECTION TIME, RIGHT BANK
INJECTION TIME, CYLINDER 1 to 3
INJECTION TIME, CYLINDER 4 to 6
INJECTION TIME, CYLINDER 10 to 12
Range: 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
Range: YES/NO

Used on ME27 and ME28 systems. The “1 to 12" in the parameter name represents 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
Range: –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 MANIFOLD
INTAKE MANIFOLD SW.-OVER VALVE
Range: ON/OFF

Used on DM2 and HFM and ME20 systems. These parameters display 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
Range: 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
Range: 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 VALUE
IRREGULAR RUNNING
Range: not available

Use on SIM4 systems. The ECU computes this millisecond (ms) time variable for different engine speed and load ranges as an indicator of engine smoothness based on crankshaft sensor input. Irregular Running displays the actual live reading, while the 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).

KICKDOWN
KICKDOWN SWITCH
Range: ON/OFF

Used on EAG, EGS, ME27 and ME28 systems. These automatic transmission system parameters indicate whether the kickdown switch has been activated.

KNOCK CONTROL
KNOCK CONTROL LEFT
KNOCK CONTROL RIGHT
Range: ENABLED/DISABLED
KNOCK CONTROL ACTIVE
Range: ON/OFF

Used on EZ, ME27, ME28 and SIM4 systems. These parameters indicate 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
Range: YES/NO

Used on HFM, ME10 and ME20 systems. This parameter indicates whether the ECU is allowing knock control, which retards ignition spark to prevent engine detonation when 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 8
KNOCK IGNITION ANGLE CYL. 1 to 12
Range: 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 represent 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 SENSOR
KNOCK SENSOR SIGNALS
KNOCK SENSOR CYLINDER 1 to 4
KNOCK SENSOR FRONT
KNOCK SENSOR LEFT
KNOCK SENSOR LEFT FRONT
KNOCK SENSOR LEFT REAR
KNOCK SENSOR REAR
KNOCK SENSOR RIGHT
KNOCK SENSOR RIGHT FRONT
KNOCK SENSOR RIGHT REAR
Range: 0 to 5.00 V
KNOCK SIGNAL
KNOCK SENSOR EVALUATION
Range: 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
Range: YES/NO

Used on ME27, and SIM4 systems. This 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 12
LAMBDA, UPSTREAM CAT, LEFT
LAMBDA, UPSTREAM CAT, RIGHT
Range: 0.750 to 1.250

Used on ME27 and ME28 systems. The “1 to 12" in a parameter name represent 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 R1
LE ACTUATOR ACT.VALUE POT.MTR R2
Range: 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
Range: 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
Range: 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 to maintain the correct idle speed.

LEFT FRONT VSS
Range: 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
Range: 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
Range: 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
Range: 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.

LEFT O2S (LAMBDA) CONTROL W/O O2S2
Range: –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
Range: YES/NO

Used on ME10 systems. This 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 ACCELERATE
LEVER POSITION DECELERATE
LEVER POSITION OFF
Range: ON/OFF

Used on ME27 and ME28 systems. These parameters indicate the state of the switches on the cruise control lever positions.

LH-SFI REF. RESISTOR
Range: 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
Range: 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
Range: 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
Range: 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, RIGHT
LOWER P. LOAD F. TRIM CYL 4-6, RIGHT
LOWER P. LOAD F. TRIM CYL 7-9, LEFT
LOWER P. LOAD F. TRIM CYL 10-12, LEFT
Range: 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 ECU 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
Range: 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.1
M39(RECIR. AIR FLAP ACT.)VOLT.2
Range: not available

Used on SIM4 supercharged systems. The supercharger air flap directs 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
Range: 0 to 1000, ±100 mbar or 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
Range: 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
Range: 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 TORQUE
MIN. INDICATED ENGINE TORQUE
Range: **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
Range: **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 8
MISFIRE CYLINDER 1 to 12
Range: **not available**

Used on ME10 and ME20 systems. The “1 to 8" and “1 to 12" in the parameter names represent 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 12
MISFIRE COUNTER CYLINDER 1 to 4
Range: **variable**

Used on ME10, ME20, ME27, ME28 and SIM4 systems. The “1 to 4" and “1 to 12" in the parameter names represents 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
Range: **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.
Range: **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
Range: **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
Range: **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
Range: 0 to engine max

Used on ARA/ELR, ERE/EVE/ASF (IFI Diesel)), HMF, ME10, and ME20 systems. This 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
NOMINAL INJ. TIM. ADV. TRAVEL
NOMINAL MANIFOLD ABSOL. PRESS.
NOMINAL PRESSURE DISTRIB. PIPE
NOMINAL SLIDE VALVE ACTUATOR
NOMINAL START OF INJECTION
Range: variable mm, mbar, or degrees
NOMINAL VEHICLE SPEED
Range: 0 to vehicle max
OPERATING ACTUAL RPM
OPERATING NOMINAL RPM
Range: 0 to engine max

Used on ERE/EVE/ASF (IFI Diesel)) systems. These 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
Range: 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. A locked 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;10-12
O2 CONTROL UPSTREAM CAT, CYL 1-3;4-6;7-9;10-12
O2 CONTROL, DOWNSTREAM CAT, LEFT
O2 CONTROL, DOWNSTREAM CAT, RIGHT
O2 CONTROL, UPSTREAM CAT, LEFT
O2 CONTROL, UPSTREAM CAT, RIGHT
Range: 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; 10-12
O2 SENSOR, DOWNSTREAM CAT
O2 SENSOR, DOWNSTREAM CAT, LEFT
O2 SENSOR, DOWNSTREAM CAT, RIGHT
O2 SENSOR, UPSTREAM CAT, CYL 1-3; 4-6; 7-9; 10-12
O2 SENSOR, UPSTREAM CAT
O2 SENSOR, UPSTREAM CAT, LEFT
O2 SENSOR, UPSTREAM CAT, RIGHT

Range: **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. Normally, 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

Range: **–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

Range: **YES/NO**

Used on DM2 systems. This parameter shows whether 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 TWC
O2S (LAMBDA)CTRL AFT. TWC LEFT
O2S (LAMBDA)CTRL AFT.TWC RIGHT

Range: **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 TWC
O2S (LAMBDA) CTRL BEF. TWC RIGHT
O2S (LAMBDA) CTRL BEFORE TWC LEFT
O2S CONTROL, UPSTREAM CAT(%)

Range: **–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
Range: 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
Range: 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 HEATER
O2S 1 (BEFORE TWC) HEATER
O2S 2 HEATER
Range: 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 VOLTAGE
O2S 2 VOLTAGE
Range: –200 to 1000 mV

Used on DM2 and HFM systems. These parameters are the feedback voltage signal delivered to the ECU by the oxygen sensors (O2S) on cylinder banks number one and two. During closed loop the value should switch rapidly from below 450 mV to above 450 mV.

O2S CONT.SHIFT MILEAGE COUNTER
Range: 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 12
O2S UPSTREAM CAT, CYL 1 to 12
O2S DOWNSTREAM CAT, LEFT
O2S DOWNSTREAM CAT, RIGHT
O2S UPSTREAM CAT, LEFT
O2S UPSTREAM CAT, RIGHT
Range: 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 names indicate up to twelve separate parameters, one for each cylinder.

O2S HEATER AFTER TWC
O2S HEATER BEFORE TWC
Range: 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 TWC
O2S VOLTAGE AFTER TWC LEFT
O2S VOLTAGE AFTER TWC RIGHT
Range: 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 VOLTAGE
O2S VOLTAGE BEFORE TWC
O2S VOLTAGE BEFORE TWC LEFT
O2S VOLTAGE BEFORE TWC RIGHT
Range: –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 displayed value should switch rapidly between a low reading (below 450 mV) and a high reading (above 450 mV).

O2S (LAMBDA) CONTROL AFTER TWC
O2S (LAMBDA) CTRL AFT. TWC LEFT
O2S (LAMBDA) CTRL AFT. TWC RIGHT
Range: 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
Range: variable

Used on ME27, ME28, and SIM4 systems. This parameter displays the oil level in the sump in millimeters (mm).

OIL LEVEL SWITCH
Range: 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
Range: 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
Range: –50 to 200°C or –58 to 392°F

Used on ME27, ME28 and SIM4 systems. This 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(%)
Range: 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
Range: 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(%)
Range: 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
Range: 0 to engine max

Used on EAG and EGS systems. This parameter is the engine output shaft speed in RPM.

OXYGEN SENSOR (O2S)
Range: YES/NO

Used on DM systems. Indicates whether the oxygen sensor (O2S) is active or not.

P/N RECOGNIZED
Range: YES/NO

Used on HFM systems. This 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
Range: 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. LEFT
PART LOAD FUEL TRIM ADAPTAT. RIGHT
Range: 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 ECU 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 1
PEDAL VALUE SNSR REF.POT.MTR R1
PEDAL VALUE SENSOR SIGNAL 2
PEDAL VALUE SNSR REF.POT.MTR R2
Range: 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
Range: 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
Range: ON/OFF

Used on ERE_EVE_ASF (IFI Diesel). This parameter should read ON whenever 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
Range: ON/OFF

Used on ME27 and ME28 systems. This parameter indicates whether the purge control valve is on or off.

PURGE FACTOR F 1
PURGE FACTOR F 2
PURGE FACTOR F 3
PURGE FACTOR F 4
Range: 0 to 100%

Used on HFM systems. These parameters display the opening of the canister purge valve as a percentage.

PURGE VALVE DUTY CYCLE
Range: variable

Used on HFM, ME10, ME20, ME27, and ME28 systems. The range varies by system:

- HFM; 5 to 15%
- ME10; 0 to 20%
- ME20; 0 to 20%
- ME27; 0 to 95%
- ME28; 0 to 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
Range: 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
Range: 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
Range: 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
Range: 0 to 5.00 V
REFERENCE RESISTOR
Range: variable

Used on EZ and HFM systems. These parameters indicate 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. ACTUAL
RESONANCE FLAP INTAKE PIPE ACTUAL
Range: OPEN/CLOSED
RESONANCE FLAP INT. LINE NOM.
RESONANCE FLAP INT. MANIF. NOMINAL
RESONANCE FLAP INTAKE PIPE NOMINAL
Range: 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 R1
RI ACTUATOR ACT.VALUE POT.MTR R2
Range: 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
Range: 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
Range: 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
Range: YES/NO

Used on ME10 systems. This 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
Range: –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
Range: 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
Range: 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
Range: 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 CONTACT
SAFETY FUEL SHUT-OFF
Range: ON/OFF

Used on ERE/EVE/ASF (IFI Diesel)), HFM, LH, ME10, ME20, ME27, and ME28 systems. These parameters indicate 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
Range: P,R,N,1,2,3,4

Used on HFM, LH, ME10, and ME20 systems. This parameter 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
Range: PN/RD1

Used on EGS, ERE/EVE/ASF (IFI Diesel)), 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 the transmission is operating in.

SELF-ADAPT THROTTLE VALVE-ACT
Range: 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
Range: ON/OFF or 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)
Range: –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)
Range: ±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 reading.

SELF-ADAPTATION DELAY TIME
Range: –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

Range: X.XX kg/h or –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

Range: –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 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 continues until either the fuel mixture problem is corrected or long-term correction reaches its limit and a DTC is set.

SELF-ADAPTATION, IDLE SPEED

Range: –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

Range: –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

Range: 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) LEFT
SELF-ADAPT. CTP (IDLE) RIGHT
Range: –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 LEFT
SELF-ADAPT. DELAY TIME RIGHT
Range: –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. LOAD
SELF-ADAPTATION LOWER PART. LOAD
SELF-ADAPTATION PARTIAL LOAD
Range: 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 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. 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 RIGHT
SELF-ADAPT.PART. LOAD FACTOR LEFT
Range: 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 FACTOR
SENSOR GEAR FILTER 1
SENSOR GEAR FILTER 2
Range: _____ **not available**
SNSR GEAR ADAPT. MEAN VALUES SEG. A TO E
Range: _____ **variable**
SENSOR ROTOR ADAPTATION
SENSOR ROTOR ADAPTATION COMPLETED
Range: _____ **YES/NO**

These parameters are all related to crankshaft sensor misfire detection sensitization. An adaptation procedure to enhance the sensitization and reduce false misfire reporting is used on some models.

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
Range: 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
Range: 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 N4
SNSR GEAR ADAPT. MEAN VALUES SEG.A to E
Range: range: variable

Used on ME10 systems. This parameter 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
Range: variable

Used on ME27 and ME28 systems. The “1 to 8" represents eight separate parameters, one for each cylinder. These parameters indicate cylinder detonation, or knock, as 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
Range: YES/NO

Used on HFM systems. This parameter shows whether 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
Range: variable

Used on DM systems. This parameter is the vehicle speed sensor (VSS) input signal to the ECU.

START APPROVAL
Range: _____ **YES/NO**

Used on LH systems. This shows whether 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
Range: _____ **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
Range: _____ **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
Range: _____ **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
Range: _____ **not available**

Used on ERE_EVE_ASF (IFI Diesel)). This parameter 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
Range: **YES/NO**
STARTER LOCK-OUT OUTPUT
STARTER LOCK-OUT REED CONTACT
STARTER LOCK-OUT STATUS
Range: **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
Range: **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
Range: **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. CONTACT
STOP LAMP SWITCH N.O. CONTACT
Range: **ON/OFF**

Used on ERE_EVE_ASF (IFI Diesel)). No information is available.

SUPERCHARGER CLUTCH
Range: **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
Range: **variable**

Used on ME20 systems. This parameter indicates the ECU-calculated supercharger efficiency factor, which reflects supercharger performance. 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
Range: **OK/NOT OK**

Used on ME20 systems. This parameter indicates whether 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
Range: **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 SWITCH
TEMPOMAT SWITCH(ACCELERATE)
TEMPOMAT SWITCH(DECELERATE)
TEMPOMAT SWITCH(STORE)
Range: ON/OFF

Used on ME10 and ME20 systems. These parameters indicate the state of the cruise control switch. The display reads ON when the indicated switch is energized, and OFF if it is not.

THROTTLE VALVE ACTUATOR SIGN. 1
THROTTLE VALVE ACTUATOR SIGN. 2
Range: 0 to 5.00 V

Used on ME27, ME28, and SIM4 systems. These parameters indicate 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 ANGLE
THROTTLE VALVE POSITION
Range: variable

Used on DM2, HFM, LH, ME10, ME20, ME27, ME28, and SIM4 systems. These parameters indicate 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
Range: 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
Range: 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
Range: 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).

TORQUE
TORQUE CORR. VALUE DURING SHIFT
TORQUE DIFFERENCE SUM
TORQUE LOSS
Range: variable

Used on EGS, ME10, and ME20 systems. This parameter is an ECU-calculated engine torque shown 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. SWITCH
TRANSMISSION OVERLOAD PROTECTION
TRANSMISSION OVERLOAD PROTECTION INTER
TRANSMISSION PROTECTION
Range: 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 DELAY
TRANSMISSION UPSHIFT DELAY
UPSHIFT DELAY 1
Range: ON/OFF

Used on LH, HFM, and ME20 systems. This parameter indicates whether 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
Range: 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
Range: 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
Range: 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, RIGHT
UPPER P. LOAD F. TRIM CYL 4-6, RIGHT
UPPER P. LOAD F. TRIM CYL 7-9, LEFT
UPPER P. LOAD F. TRIM CYL 10-12, LEFT
Range: 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 long-term 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
Range: ON/OFF

Used on LH systems. This parameter indicates whether or not the ECU shift delay program for second gear is active. This value normally reads OFF. The display only reads ON if the ECU is holding the transmission in second gear to more rapidly heat up the catalytic converter following a cold engine start.

VARIABLE SPEED LIMITATION
Range: 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
Range: 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
Range: 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 AXLE
VEHICLE SPEED REAR AXLE
Range: 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 SPEED
VEHICLE SPEED SIGNAL (VSS)
VSS
Range: 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).

VMIN NOT MAINTAINED
Range: 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
Range: ON/OFF

Used on HFM and LH systems. This parameter indicates whether or not the ECU is operating the engine in warm-up mode following a cold start. The display reads OFF during normal driving with a warm engine, and ON from a cold start with engine in warm-up mode.

WOT (FULL LOAD) CONTACT
WOT (FULL LOAD) INFO. LOAD
WOT (FULL LOAD) RECOGNITION
WOT (FULL LOAD)
Range: ON/OFF

Used on DM2, HFM, LH, ME10, and ME20 systems. This 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
Range: 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.

Transmission Parameters

5TH GEAR
Range: 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 DOWN
3RD GEAR UP
4TH GEAR DOWN
4TH GEAR UP
5TH GEAR DOWN
5TH GEAR UP
Range: not available

Used on the EGS system. Do not use at this time.

ACCELERATOR PEDAL(%)
Range: 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(%)
Range: 0 to 100%

Used on the EGS system. No information is available at this time.

ACTUAL GEAR
Range: 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)
Range: 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 (%)
Range: 0 to 100%

Used on EGS system. This 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)
Range: 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 milliampere 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
Range: not available

Used on the EGS system. No information is available at this time.

CONVERTED TORQUE (Nm)
Range: 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. The value is an internal calculation made 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(%)
Range: 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)
Range: 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
Range: 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 SWITCH
G/S PROGRAM SELECTION SWITCH
Range: S, G, E

Used on the EGS system. These parameters display “S” for the standard drive program which starts in first gear. when the winter drive program is engaged, either a “G” or “E” is displayed. with the winter program active, the vehicle starts in 2nd gear unless if the shift lever is in position “1,” or a full throttle take off or kick down condition is sensed. For the EGS system, the winter drive program may have a different gear ratio for reverse.

DRIVER STATUS INFORMATION
Range: 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 MONITOR
ENGINE RUN TIME SHORT TERM MONITOR
Range: 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)
Range: 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
Range: –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 shifts, engine torque decreases and shift quality improves.

FILL CORRECTION TIME (CYCLE)
FILL MEASUREMENT TIME (CYCLE)
Range: 0 to 15 cycles

Used on the EGS system. Do not use at this time.

FRONT AXLE SPEED
Range: 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
Range: not available

Used on the EGS system. No information is available at this time.

GEAR COMPARISON COUNTER
Range: not available

Used on the EGS system. No information is available at this time.

GRADE(%)
Range: –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
Range: 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
Range: 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)
Range: 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 DOWN
KICK DOWN SWITCH
Range: ON/OFF

Used on EAG, EGS, ME27, and ME28 systems. These parameters indicate if the kickdown switch had been activated. ON means the switch is depressed.

LIMP-HOME
Range: 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
Range: 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)
Range: 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(%)
Range: 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)
Range: 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 MONITOR
OIL CONDITION SHORT TERM MONITOR
Range: 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)
Range: 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)
Range: 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.)
Range: –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 move the gear selector lever into position “P.” The difference between the nominal and current values should not be greater than 50 RPM.

P/N RECOGNIZED
Range: ON/OFF

Used on HFM systems. This 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
Range: 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
Range: 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
Range: 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)
Range: 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
Range: 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 ABORT
SHIFT APPROVED
SHIFT DOUBLE
SHIFT FREQUENCY
Range: 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
Range: 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
Range: ON/OFF

Used on HFM systems. An ON reading means that the transmission has shift point variability.

SHIFT PRESSURE DEVIATION(MBAR)
Range: 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 warm-up, cruise control operation, sporty driving style, and low or high ATF temperature.

SHIFT VALVE 1-2/4-5
SHIFT VALVE 2-3
SHIFT VALVE 3-4
Range: 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
Range: 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)
Range: –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
Range: not available

No information is available at this time.

SPEED DEV. DISENGAGE CLUTCH(1MIN)
Range: **not available**

Used on the EAG system. No other information is available at this time.

STARTER CONTROL
STARTER LOCK-OUT OUTPUT
STARTER LOCK-OUT REED CONTACT
STARTER LOCK-OUT STATUS
Range: **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
Range: **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
Range: **not available**

Used on the EGS system. No information is available at this time.

THROTTLE VALVE REDUCTION
Range: **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
Range: **not available**
TORQUE DIFFERENCE SUM(Nm)
Range: **0 to 762 Nm**
TORQUE LOSS(Nm)
Range: **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)
Range: **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 PROTECTION
TRANSMISSION OVERLOAD PROTECTION INTER
TRANSMISSION OVERLOAD PROTECTION FEEDBACK
Range: 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)
Range: 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)
Range: 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
Range: 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)
Range: 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)
Range: not available

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

VALVE PRESSURE (MBAR)
Range: not available

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

UNFILTERED SELECTOR LEVER POSITION
Range: 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
Range: 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 Troubleshooting and Communication Problems

Startup Troubleshooting

If the display does not light up when you 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 or if recorded data is not retained in the Scanner memory.

If the display is very dim or nearly 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.

See “Communication Problems” on page 98 for information on what to do if a vehicle does not communicate with the Scanner.

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 require the Scanner to communicate with the vehicle control module. The ignition must be on to establish communication. After selecting Data or Codes, the Scanner displays an initializing message.

If communication is not established within 5 seconds, the Scanner displays a “no communication” message. Return to the System List Menu and check the items listed below under Common Problems.

Common Problems

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 99 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.

Common Symptoms

If the Scanner displays the no communication message, 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.

Check Scanner Connection and Operation

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.

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.

Appendix B Terms, Abbreviations and Acronyms

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.
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. Scroll to place the cursor at the desired function on a menu and press **Y** to enter the function.

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	antilock 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 rear view 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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