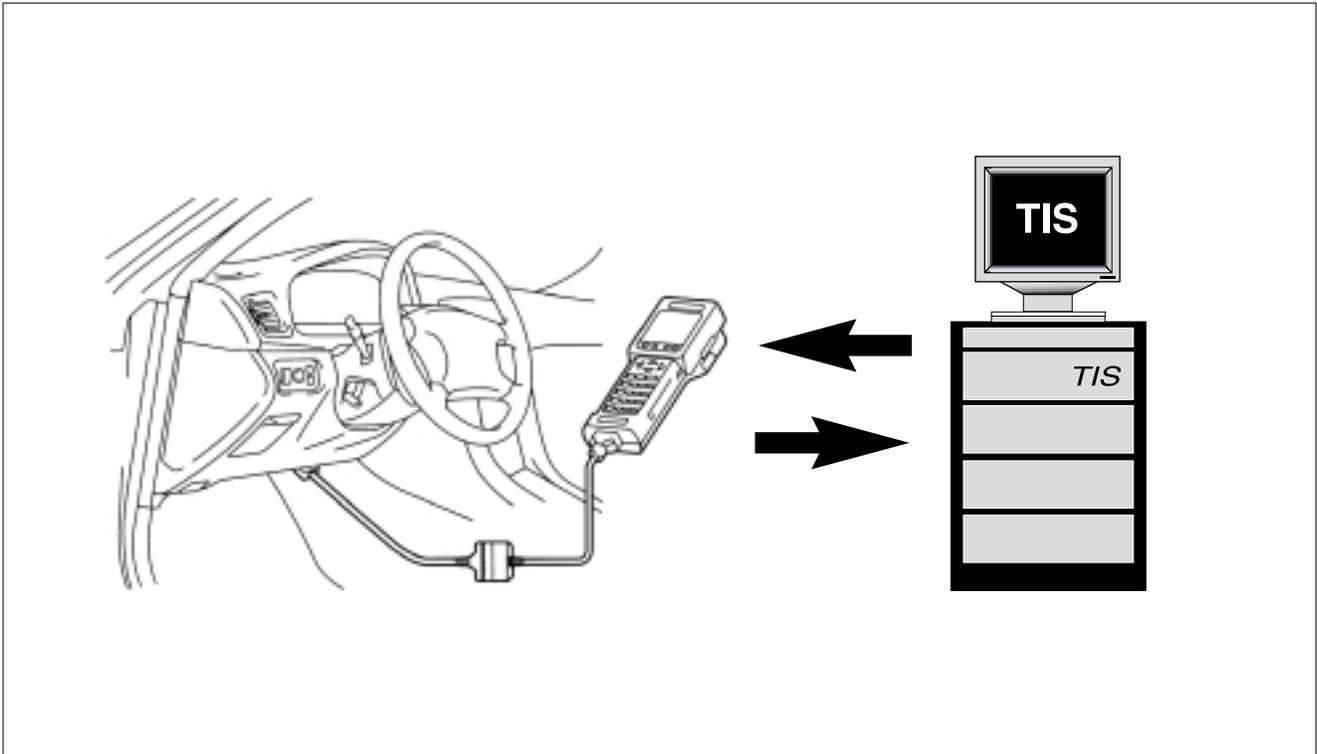


ECM Diagnosis



- Learning Objectives:**
1. Diagnose ECM specific Diagnostic Trouble Codes.
 2. Troubleshooting the diagnostic circuit.
 3. Reprogramming the ECU.

ECM Diagnosis

Overview The ECM is rarely the cause of a problem. If the ECM needed to be replaced, it was often because of a change in calibration. Now, ECMs can be reprogrammed and replacement under these conditions is no longer necessary.

Still, nearly all troubleshooting procedures involve checking all systems and subsystems connected to the ECM. Additionally, with multiplexing, there are more ECUs connected to the ECM that need to be checked.

Presently, there are some DTCs that are directly associated with the ECM.

P0605: The Internal Control Module Read Only Memory Error, is displayed when the ECM has detected a problem in the read only memory area. At the time of this publication, when this DTC is displayed the ECM must be replaced.

P1600: ECM BATT malfunction is stored when there is no power to the BATT terminal of the ECM. Battery voltage is supplied to the BATT terminal even when the ignition switch is OFF. The ECM uses this power for memory and adaptive memory values such as A/F Ratio control. If DTC P1600 is displayed, the ECM does not store another DTC. The BATT circuit must be checked and confirmed normal before replacing the ECM.

P1633: ECM Malfunction (ETCS Circuit), is stored when the ECM detects an internal problem with the electronic throttle control circuit. At the time of this publication, when this DTC is displayed the ECM must be replaced.

Troubleshooting the Diagnostic Circuit

On rare occasions, you will find that the Malfunction Indicator Lamp or the Diagnostic Tester fails to operate properly. The following information is designed to help you determine a diagnostic course of action when you encounter this situation.

Malfunction Indicator Lamp Check

Before connecting your Diagnostic Tester it is important to confirm that the Malfunction Indicator Lamp (MIL) is functioning normally. A bulb check of the MIL is performed when the ignition is switched ON. If the MIL does not illuminate, it indicates that a problem exists in the MIL sub-system. This condition must be corrected before any further diagnostic work can be performed. See the diagnostic procedures for inoperative MIL in the repair manual.

Once the engine is started the MIL should turn off. If the MIL remains on after the engine is running, the diagnostic system has detected a problem in the engine control system.

Failure of Diagnostic Tester to Establish Communications with ECM

After MIL operation is confirmed, connect the Diagnostic Tester to the appropriate DLC and program for the on-board diagnostic system supported by the vehicle. Once the tester is programmed for the correct vehicle and diagnostic system, you should be able to display an ALL DATA LIST.

If any of the following messages are received you must correct this condition before proceeding with troubleshooting:

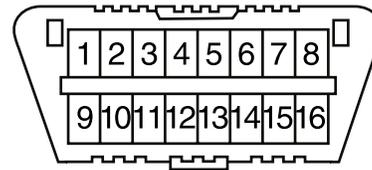
- NO COMMUNICATION WITH VEHICLE
- UNABLE TO CONNECT TO VEHICLE
- OBD II COMMUNICATIONS TIME OUT

There are several possibilities when the Diagnostic Tester fails to communicate with the vehicle. The problem could simply be the way you programmed the tester, or connecting to the wrong DLC. Once you have confirmed correct programming and proper lead connection, you will need to establish whether the problem is in the tester or the diagnostic circuit

To isolate a tester problem from a vehicle problem, simply try the tester on another vehicle. If the tester communicates normally with another vehicle, it is probably O.K. and the vehicle diagnostic system must be inspected.

DLC3 (OBD II) Connector

The vehicle's ECM uses the ISO 9141-2 communication protocol. The terminal arrangement of DLC3 complies with SAE J1962 and matches the ISO 9141-2 format.

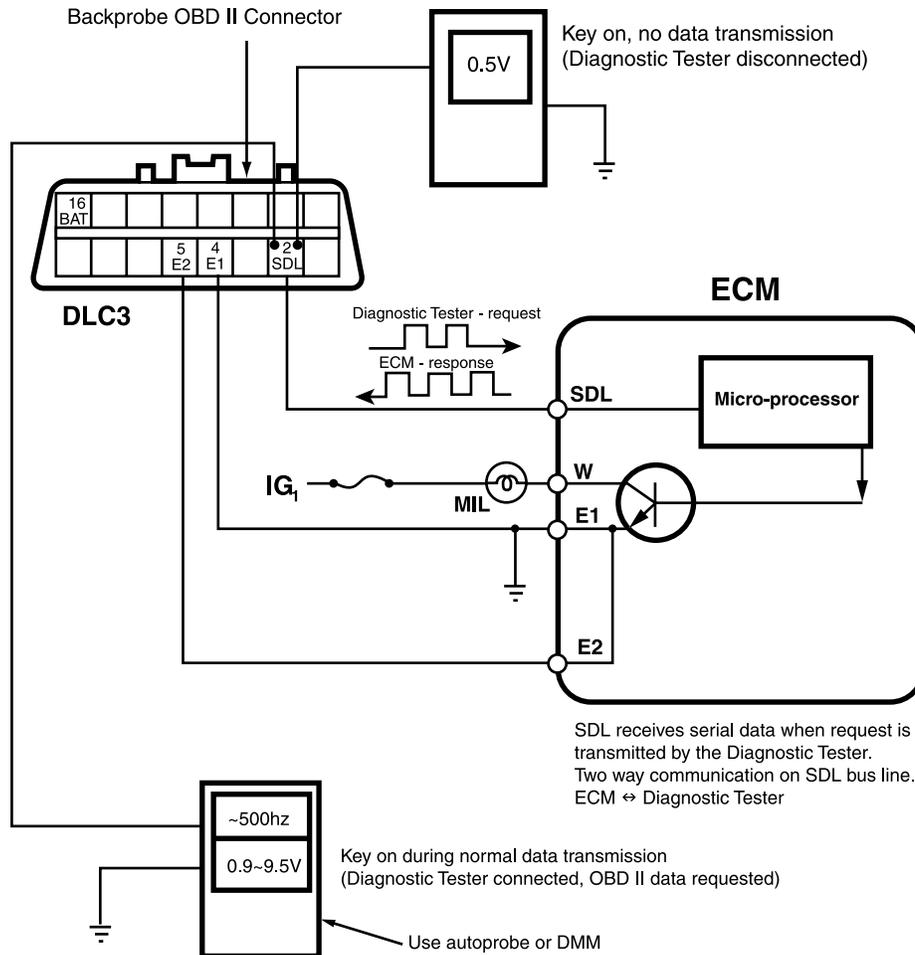


DLC3

Terminal No.	Connection/Voltage or Resistance	Condition
7	Bus \oplus Line/Pulse generation	During Transmission
4	Chassis Ground \leftrightarrow Body Ground/1 Ω or less	Always
5	Signal Ground \leftrightarrow Body Ground/1 Ω or less	Always
16	Battery Positive \leftrightarrow Body Ground/9 – 14V	Always

Fig. 11-1
TL874f1101

DLC3 Circuit



SDL receives serial data when request is transmitted by the Diagnostic Tester. Two way communication on SDL bus line. ECM ↔ Diagnostic Tester

1. CE light inoperative
 - Test W circuit
 - Test IG1 circuit
 - Test Vc circuit, circuit short to ground
 - Test E1 circuit
2. Cannot establish communication between ECM and Diagnostic Tester
 - Test Diagnostic Tester on another car

Fig. 11-2
TL874f1102

Inspection of the OBD II Diagnostic Circuit

The OBD II diagnostic circuit is shown in the schematic. DTC functions, serial data, active test functions, and all OBD II functions are communicated across the SDL (Serial Data Link) circuit. The Diagnostic Tester initiates communication by sending a data request signal to the ECM on the SDL circuit. The ECM will respond by sending a Variable Pulse Width signal back to the tester.

DTC(s) and all data are transmitted to the Diagnostic Tester on the SDL wire in the form of serial data. The tester monitors this Variable Pulse Width signal, translates the signal, and displays the data or DTC(s). As with the OBD system, if the microprocessor develops a problem, the Diagnostic Tester will not function and the MIL will not illuminate at bulb check.

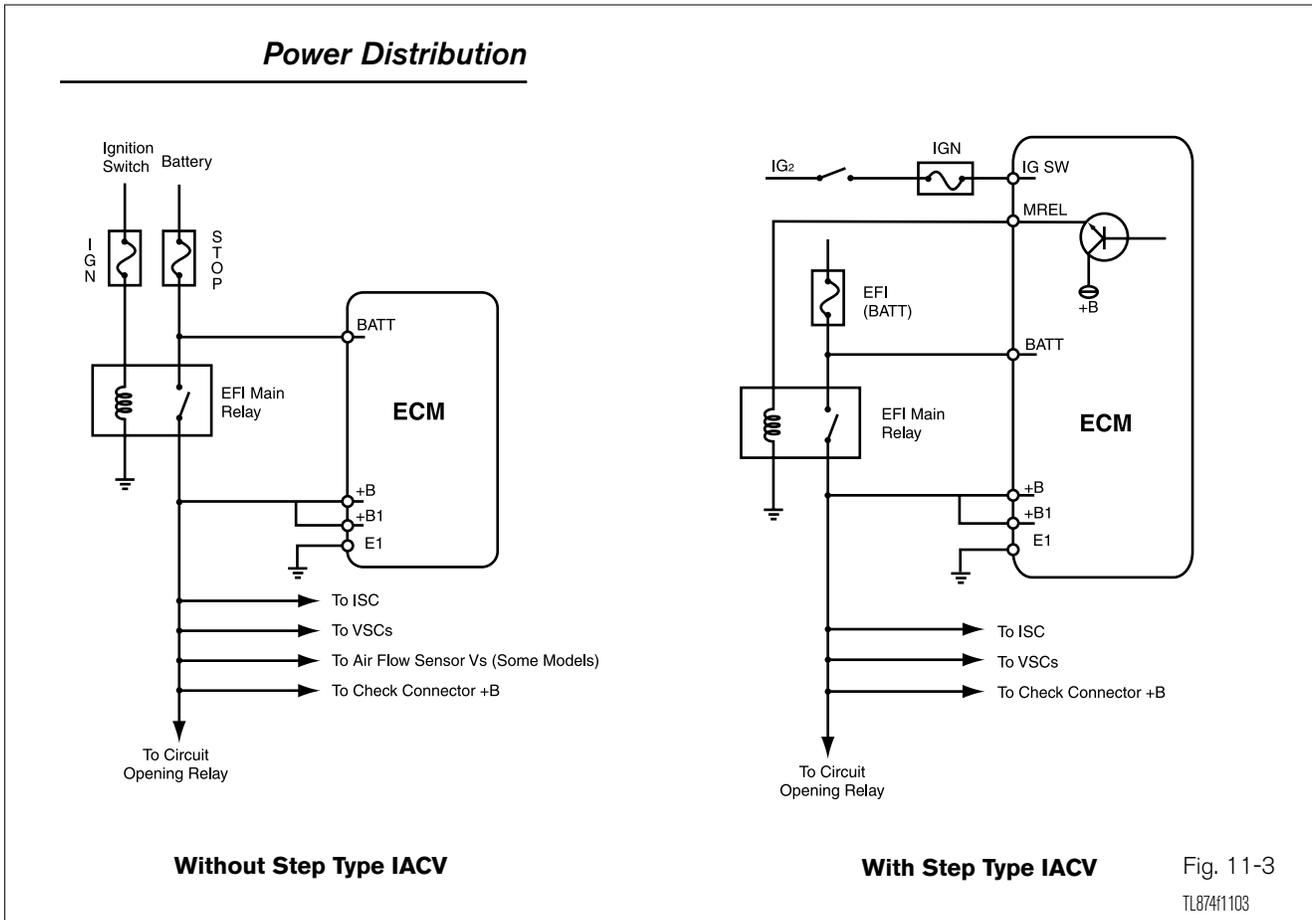
- Troubleshoot Communication Failure Between ECM and Diagnostic Tester
- Disconnect the tester and inspect the following circuits at DLC3
- Check terminal SDL (pin #2) for approximately 5 volts DC with ignition on, if not:
- Check for open or short to ground in SDL circuit
- Check for good continuity between E1 (pin #4) and -B at the battery ($< 1\Omega$)
- With Diagnostic Tester connected to DLC3, CARB or ENHANCED OBD II data requested
- Backprobe SDL terminal with digital multimeter; should vary between 0.9V and 9.5V
- Backprobe SDL terminal with frequency counter; should indicate 500 hz \pm 50 hz

HINT

If your display shows UNABLE TO CONNECT TO VEHICLE when you have connected the cable of the Diagnostic Tester to the DLC3, turned the ignition switch ON, and turned on the Diagnostic Tester, there is a problem on the vehicle side or tool side.

If communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.

If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.



Power Distribution System

When the ignition is switched on, the engine control system is designed to power the ECM by energizing the Main Relay. The Main Relay supplies power to the ECM +B ignition feed circuits and all sub-system Vacuum Switching Valves (VSVs) and relays.

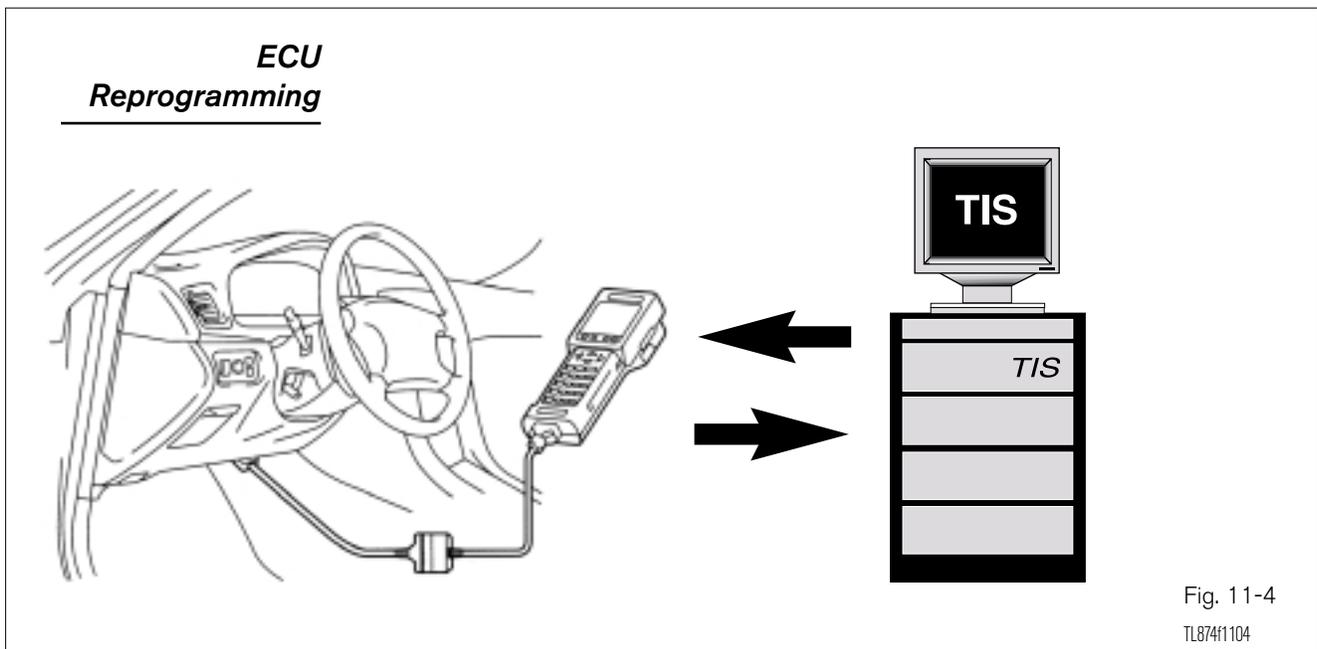
There are two basic types of Main Relay control circuits used on fuel injection engines:

- **Without step type IAC:** Uses a simple ignition switch controlled Main Relay. To energize the relay, current from the ignition switch flows through the Main Relay pull-in winding, to ground. This energizes the relay and powers all of the circuits mentioned above.
- **With step type Idle Air Control (IAC):** Uses an ECM controlled Main Relay. To energize the relay, the ECM monitors the IG SW input. When the ignition switch is turned to the ON position, current flows to the ECM through the IG SW circuit. This signals the ECM to send control current through the MREL circuit, through the Main Relay pull-in winding, to ground. This causes the relay power contacts to close, sending current to the ECM, all VSVs, and the Circuit Opening Relay.

Inspection Circuit quick checks: If the MIL illuminates when the ignition is switched to the ON position, the Main Relay is functional and current is flowing to the ECM +B terminals. If the MIL does not illuminate, use a Voltmeter to monitor the +B terminal of DLC1.

If battery voltage is available at DLC1 +B terminal, the Main Relay is functional. Further circuit troubleshooting will be required to determine if current is flowing to the ECM consult the repair manual.

Circuit Inspection Using V-BoB: Inspect the following signals for behavior indicated above; +B, +B1, EI, IGSW, MREL. Refer to the appropriate Repair Manual circuit inspection charts and to the Engine Control System schematic in the EWD for troubleshooting details.



ECU Re-programming Beginning with some 2001 model year vehicles, the ECM is capable of being reprogrammed. It is called ECU reprogramming because this procedure may be applicable for multiple processors.

This procedure allows the ECM to be updated on an as needed basis without replacement. A TSB will inform you which vehicles are to be re-programmed. TIS provides the needed re-programming information and procedure. To find the latest information, log on to TIS, go to DIAGNOSTICS, ECU FLASH REPROGRAMMING. In the ECU FLASH REPROGRAMMING section you will find the latest instructions, calibration programs, and vehicles requiring re-programming.

Here are some general guidelines:

- If a Recalibration Label is present, the vehicle has already been recalibrated and no further action is required.
- The ECU recalibration program is confirmed using the Diagnostic Tester.
- Check battery voltage. To avoid battery fluctuations while reprogramming the Engine ECU turn off all electrical accessories (i.e. radio, lights, interior fan). Confirm battery voltage is greater than 11.5V. Charge battery as necessary.

NOTE

If battery voltage drops below 11.4V during ECU recalibration, damage to the Engine ECU will occur.

- Ensure that all electrical systems are turned off and doors and trunk are closed. Once the recalibration process has started, do not operate the doors or accessories.
- Recalibration can take up to 45 minutes. The length of time to reprogram will vary, depending on the type ECM and reprogram file.
- It may take up to 2 minutes for the progress bar to begin moving.

NOTE

Do not move the Diagnostic Tester or cable during recalibration to prevent recalibration failures.

- Confirm that the new calibration has successfully installed.
- If applicable, attach a new calibration sticker.



WORKSHEET 11-1 ECU Reprogramming

Vehicle	Year/Prod. Date	Engine	Transmission

Worksheet Objectives

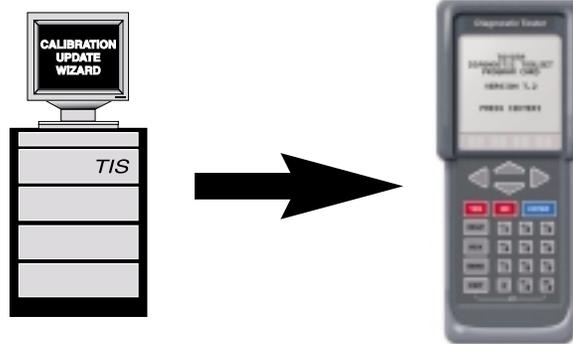
In this worksheet, you will become familiar with the procedure required to identify the vehicle calibration ID, search for updated calibrations, download calibrations from TIS, and using the Diagnostic Tester replace the vehicle ECM's calibration.

Tools and Equipment

- Vehicle
- Vehicle Repair Manual, EWD, & NCF
- Diagnostic Tester
- TIS Access
- Hand Tools, Fender Covers, Floor Mats, and Shop Towels

Step 1: Select Calibration ID from TIS

To upload the latest ECU calibration, use the Technical Information System and access the Calibration Update Wizard. Follow the instructions on the screen to download the appropriate Calibration ID to the Diagnostic Tester.



1. What two service publications could also contain a hyperlink to access the Calibration Update Wizard?

2. When the Diagnostic Tester is turned ON and ECU RE-PROGRAMMING is selected the tester screen indicates that PC communication is "DISCONNECTED". What does "DISCONNECTED" mean?

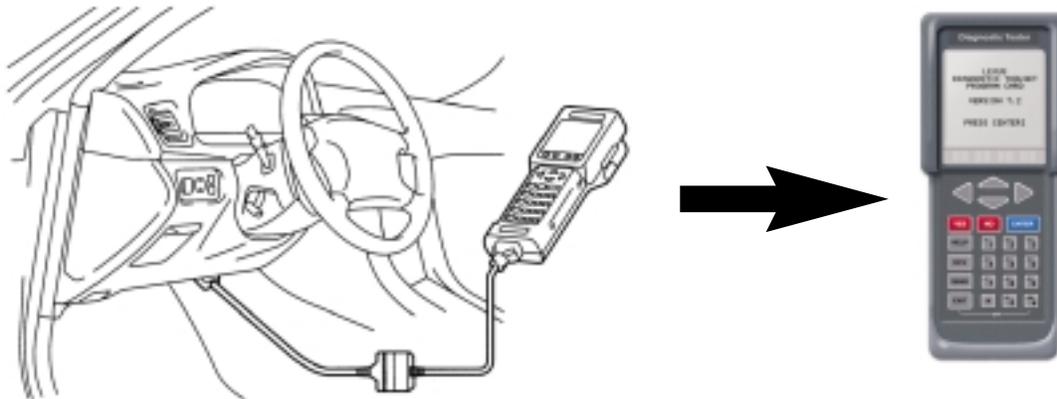
3. Use the TIS to locate the new calibration for a vehicle designated by the instructor. What is the issue date?

4. What are the two CPU numbers and calibration IDs.

5. What are the new calibrations?

Step 2: Retrieve the Current Calibration ID from the Vehicle.

Use the Diagnostic Tester to check the current CAL ID stored in the vehicle ECM.



1. Identify the main menu selection to access the current ECU calibration

2. What are the current vehicle ECU calibration ID numbers?

Step 3: Install New Calibration ID

Use the Diagnostic Tester to update the ECU calibration.

1. What items must be confirmed prior to updating the ECU calibration?

2. Match current calibration ID number with the new ID number. What calibration ID was matched?

3. When reprogramming is interrupted, damage to the ECU is likely. If the ECU is damaged, what is the proper repair?

4. Why would the electrical load precaution be important to the reprogramming procedure?

Step 4: Installing Second New Calibration IDs

1. How is the new calibration selected for reprogramming?

Step 5: Verify New Calibration ID is Installed.

1. How can one ensure that the new calibration(s) have been installed?



Notes

ECM Reprogramming

Name: _____ Date: _____

Review this sheet as you are doing the worksheet. Check each category after completing the worksheet and instructor presentation. Ask the instructor if you have questions. The comments section is for you to write where to find the information, questions, etc.

I have questions

I know I can

Topic			Comment
Diagnose ECM specific diagnostic trouble codes			
Locate fuses, relays, and grounds connected to the ECM using the EWD and RM			
Trace power flow to the ECM using the EWD and RM			
Test ECM power circuits and compare to specs. to determine condition			
Test ECM ground circuits and compare to specs. to determine condition			
Test DLC 3 circuits for continuity			
Describe precautions when handling the ECM			
Reprogram the ECU			