

# DETROIT DIESEL



## Installation Instructions

### 18SP546\* – Install DDEC II to DDEC IV Wire Harness and Hardware Conversion Kit on 1991-1993 Series 60<sup>®</sup> On-Highway Manual Transmission Trucks

\*Revision – 12/14/04

#### Introduction

Service kit R23529490 permits conversion of a Detroit Diesel Series 60<sup>®</sup> DDEC<sup>®</sup> II engine to a DDEC IV configuration. The kit includes the items listed in Table 1.

Kit Part Number	Qty.	Description
R23519307	1	ECM
23512307	8	Isolator
23513558	1	Engine Harness
23517986	1	Power Harness Adaptor
23518358	1	Injector Harness, Jake Brake <sup>®</sup>
23520380	1	Coolant Level Sensor (CLS)- 1/4" -18 NPTF
23520381	1	Coolant Level Sensor (CLS) - 3/8"-18 NPTF
23518206	1	Adaptor Module, Coolant Level Sensor
23518359	1	Harness Asm., Coolant Level Sensor Jumper Liner
23515251	1	Coolant Temperature Sensor (CTS) - 3/4 in. brass
23519124	1	Heat Shield, Exh. Manifold
23509744	3	Stud Bolt, M10, 1.5x120
11506101	3	Nut, M10
23515250	1	Air Temperature Sensor (ATS)
23517875	3	Intake Manifold Gasket
18SP546	1	Installation Instructions


**Table 1 DDEC II to DDEC IV Conversion Kit, P/N: 23529490**


Following are instructions for installing the parts in the kit. Refer to the current *Series 60 Service Manual*,

6SE483 and the *DDEC III/IV SECM Troubleshooting Guide*, 6SE497 for instructions on removing, installing, and testing the other parts required for kit installation.

#### DDEC II ECM Removal

Remove the ECM as follows:

 <b>WARNING:</b>
<b>PERSONAL INJURY</b>
<b>To avoid injury from hot surfaces, wear protective gloves, or allow engine to cool before removing any component.</b>

 <b>WARNING:</b>
<b>PERSONAL INJURY</b>
<b>To avoid injury from accidental startup while servicing the engine, disconnect the starting system.</b>

1. With the engine at ambient temperature (cool to the touch) and the starting system disconnected/ disabled, disconnect the power harness from vehicle batteries.
2. Loosen the wire harness connector hold-down screws, and gently disengage the connectors from ECM sockets.
3. Remove the DDEC II injector and engine sensor harness from the engine.

- Loosen the wire harness connector hold-down screws, gently disengage connectors, and remove DDEC II ECM from vehicle.

#### DDEC IV ECM Installation

Conversion kit components are listed in Table 1. Refer to the *Series 60 Service Manual* and install parts as follows:

- Install the Engine Sensor Harness (P/N: 23513558), included in the kit. See Figure 1. Refer to Section 8.6 of Service Manual.
- Install the Injector/Jake Brake® harness (P/N: 23518358) included in the kit.
- Install new Coolant Level Sensor (CLS) (either 1/4" P/N: 23520380 or 3/8" P/N: 23520381). Refer to Section 2.34 of Service Manual.
- Install the CLS adaptor module (P/N: 23518206) and jumper adaptor (P/N: 23518359).
- Install the Coolant Temperature Sensor (CTS) (P/N: 23515251) at right rear of head. Refer to Section 2.31 of Service Manual.
- Install the heat shield (P/N: 23519124) using stud bolts (P/N: 23509744) and nuts (P/N: 11506101).
  - If the engine has current exhaust manifold, install heat shield "as is."
  - If the engine has former style manifold, the heat shield may need to be altered prior to installation.
- Remove the air intake manifold and discard old gaskets.
- Using a drill press and a 9/16" drill, drill and tap a 3/8" pipe port for the Air Temperature Sensor (ATS), between #3 and #4 intake air ports in manifold. See Figure 2.
- Clean the air intake manifold thoroughly to remove drill chaff.
- Install ATS (P/N: 23515250). Torque to 11-16 N·m (8-12 lb·ft).
- Using new gaskets (P/N: 23517875), install the air intake manifold.

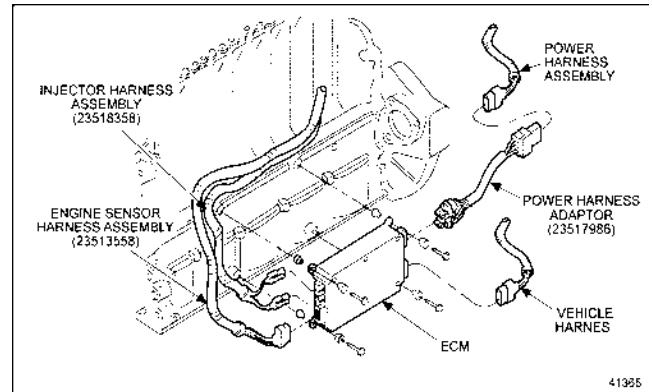
## WARNING:

### PERSONAL INJURY

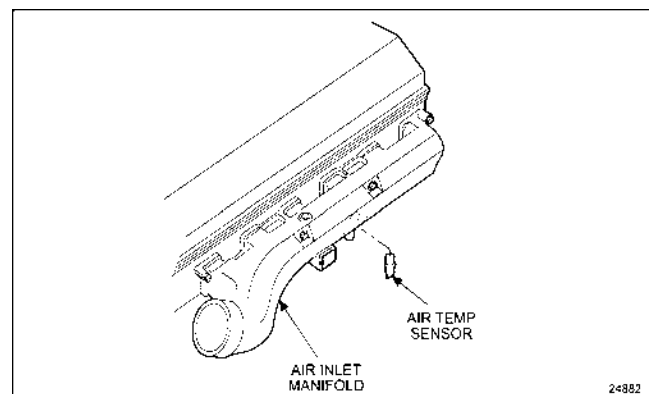
Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

- Always start and operate an engine in a well ventilated area.
- If operating an engine in an enclosed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system or emission control system.

- Reconnect starting power. Start the engine and check for proper DDEC system operation.



**Figure 1 DDEC IV ECM and Wiring Harness Locations**



**Figure 2 Air Temperature Sensor Location**

## **Powernet Engine Order Entry, Change Unit Information**

In order for the newly installed DDEC IV ECM to be programmed, a mainframe file must be established. To ensure that the ability to program the DDEC IV ECM is established, the attached FAX form (See Figure 5) *must* be filled out and sent to the DDC Customer Support Center at (313) 592-5888. See Table 2 for the appropriate 6N4D and 6N4M groups.

### **Important Information – Please read.**

You must use the updated fax request in these instructions, or request the mainframe update to “DDEC IV,” otherwise the wrong calibration could be assigned.

The DDEC IV ECM in this kit is only for use with 12-volt systems.

Within the ratings listed, you will find the original DDEC II-III ratings and a cross-reference to the comparable DDEC IV version.

With the following features now found within the DDEC system, it is possible to cover a wide variety of requests with fewer ratings:

- Low gear torque limiting will modify the max. torque for the application.
- Progressive shift will limit the max RPM for the user.

### **NOTE:**

Vehicle speed sensors must be used for these two features to operate properly.

For example, there is only one DDEC IV rating released for the 11 liter engines: 6N4D7275 is a 400/357 @ 1800/2100-1350 lb-ft.

To reduce the maximum torque from 1350 to 1250 lb-ft:

- Set the low gear torque limit to 1250
- Set the threshold to 0.1

To reduce the maximum rated speed from 2100 to 1800 rpm, set progressive shift as follows:

- LG1 rpm limit - 1800
- LG1 max rpm - 1800
- LG1 max mph - 12
- LG2 rpm limit - 1800
- LG2 max rpm - 1800
- LG2 max mph - 44
- HG max rph - 1800
- HG min mph - 45

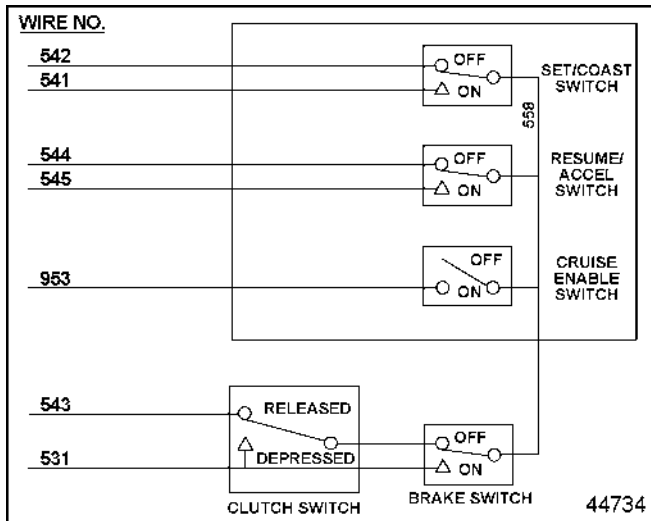
DDEC II to DDEC IV UPC groups are listed in Table 2. To ensure that the engine is serviced properly after being converted from DDEC II to DDEC IV, and to ensure that other modifications may be made, DDC's unit history file must be updated. If this is not done, subsequent engine service and/or repair work might be done using incorrect parts. Complete the attached FAX form and send it to the DDC Customer Support Center. See Figure 5.

DDEC IV	DDEC II/III	CWC	Rated HP	@RPM	Other HP	@RPM	FT-LB	@RPM	Inj. P/N	Inj. P/N
<b>6N4D-7275</b>	<b>6N4D-6309</b>								<b>5234935</b>	<b>5235605</b>
N/A	6N4M-6149	235	350	1800			1250	1200		
N/A	6N4M-6153	239	320	1800			1250	1200		
N/A	6N4M-6167	354	320/350	1800			1250	1200		
<b>6N4D-7275</b>	<b>6N4D-6310</b>								<b>5234935</b>	<b>5235605</b>
N/A	6N4M-6214	414	365	1800			1350	1200		
N/A	6N4M-6215	413	350	1800			1350	1200		
N/A	6N4M-6203	371	325	1800			1350	1200		
N/A	6N4M-6216	415	325/350	1800			1350	1200		
<b>6N4D-7275</b>	<b>6N4D-6311</b>								<b>5234935</b>	<b>5235605</b>
N/A	6N4M-6154	240	320	1800			1150	1200		
N/A	6N4M-6157	243	285	1800			1150	1200		
N/A	6N4M-6371	478	285/320	1800			1150	1200		
<b>6N4D-7275</b>	<b>6N4D-6312</b>								<b>5234935</b>	<b>5235605</b>
N/A	6N4M-6148	234	320	2100	350	1800	1250	1200		
<b>6N4D-7275</b>	<b>6N4D-7127</b>								<b>5234935</b>	<b>5235605</b>
6N4M-7815	6N4M-6916	1261	357	2100	400	1800	1350	1200		
<b>6N4D-7274</b>	<b>6N4D-6313</b>								<b>5234935</b>	<b>5235605</b>
6N4M-7811	6N4M-6374	433	450	2100-1800			1450	1500-1200		
6N4M-7812	6N4M-6211	416	430	2100-1800			1450	1500-1200		
6N4M-7813	6N4M-6200	253	425	2100-1800			1450	1200		
6N4M-7814	6N4M-6372	479	425/450	2100-1800			1450	1200		
<b>6N4D-7272</b>	<b>6N4D-6314</b>								<b>5234970</b>	<b>5235695</b>
6N4M-7804	6N4M-6212	417	430	1800			1450	1500-1200		
6N4M-7805	6N4M-6164	250	400	1800			1450	1200		
6N4M-7806	6N4M-6166	252	365	1800			1450	1200		
N/A	6N4M-6213	359	365/400	1800			1450	1200		
<b>6N4D-7272</b>	<b>6N4D-6315</b>								<b>5234940</b>	<b>5235600</b>
6N4M-7804	6N4M-6212	417	430	1800			1450	1500-1200		
6N4M-7805	6N4M-6164	250	400	1800			1450	1200		
6N4M-7806	6N4M-6166	252	365	1800			1450	1200		
6N4M-7807	6N4M-6213	418	365/430	1800			1450	1200		
<b>6N4D-7273</b>	<b>6N4D-6316</b>								<b>5234940</b>	<b>5235600</b>
6N4M-7808	6N4M-6161	247	400	2100	425	1800	1450	1200		
6N4M-7809	6N4M-6165	251	365	2100			1450	1200		
6N4M-7810	6N4M-6202	373	365/400	2100			1450	1200		

**Table 2 1991-1993 Series 60 DDEC II to DDEC IV Conversion – On-Highway Trucks with Manual Transmissions**

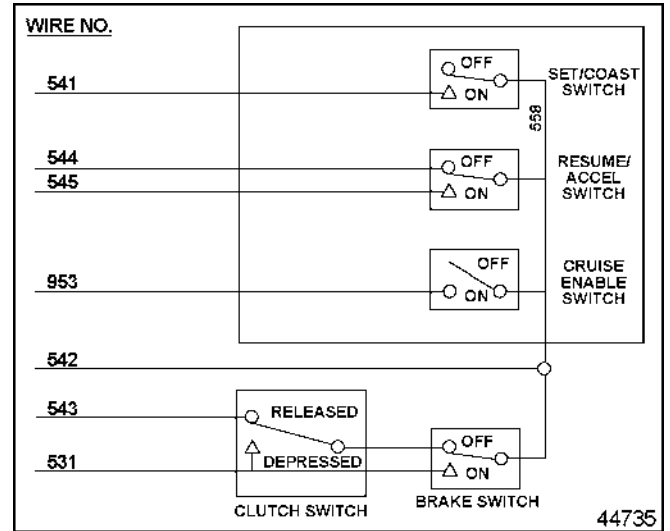
## DDEC II to DDEC IV Conversion Cruise Control Switch Wiring Modifications

Figure 3 illustrates a typical DDEC II cruise control wiring schematic. Wiring modifications to the Cruise Enable Switch and the Set/Coast Switch are required whenever a DDEC II to DDEC IV conversion is made on a vehicle using the DDEC II cruise control feature.



**Figure 3 Typical DDEC II Cruise Control Wiring Schematic**

Remove the wire identified as DDEC circuit #542 from the Set/Coast Switch. At a convenient point, splice circuit #542 into the cruise control switched ground circuit. Cruise control switched ground is the circuit that is “open” when the Cruise Enable Switch is turned OFF and “grounded” when the Cruise Enable Switch is turned ON. If necessary, use a volt-ohm meter to verify the circuit before splicing in circuit #542. Depending on the application, the switched ground circuit may be identified as DDEC circuit #558 or a branch of DDEC battery ground, such as circuit #953A, #953B, or #953C, etc. See Figure 4.




**Figure 4 Cruise Control Wiring Schematic after Modification**

### Testing of Cruise Control Switch and Wiring

To speed up the testing of cruise control switches, quick check tables have been developed. These tests are to be run with the ignition ON, and the engine not running. A DDR / DDDL must be plugged into the connector. All three quick check tables must be completed to properly check the cruise control wiring and switches. See Tables 3, 4 and 5.

#### NOTE:

When all tests pass, the unit is ready for road testing.


**CAUTION:**

**LOSS OF VEHICLE CONTROL**

To avoid injury from the loss of vehicle control, do Not use cruise control under these conditions:

- When it is not possible to keep the vehicle at a constant speed (on winding roads, in heavy traffic, in traffic that varies in speed, etc.)
- On slippery roads (wet pavement, ice-or snow-covered roads, loose gravel, etc.)

Step	Cruise Enable Switch	Set/Coast Switch	Res/Accel Switch	DDR/DDDL Readout	DDR/DDDL Display	Okay ?	Go To
1	Off	Off	Off	Cruise Enable	Off	Yes	—
					On	No	Refer to Sec. 10.7 of DDEC III/IV SECM TS Manual
2	On	Off	Off	Cruise Enable	Off	No	Refer to Sec. 10.7 of DDEC III/IV SECM TS Manual
					On	Yes	—

**Table 3 Cruise Control Quick Check Table, Testing Cruise Enable Switch and Wiring**

Step	Cruise Enable Switch	Brake Pedal	Clutch Pedal	DDR/DDDL Readout	DDR/DDDL Display	Okay ?	Go To
1	On	Released	Released	Service Brake Release	On	Yes	—
					Off	No	Refer to Sec. 10.7 of DDEC III/IV SECM TS Manual
2	On	Depressed	Released	Service Brake Release	On	No	Refer to Sec. 10.7 of DDEC III/IV SECM TS Manual
					Off	Yes	—
3	On	Released	Released	Clutch Release	On	Yes	—
					Off	No	Refer to Sec. 10.7 of DDEC III/IV SECM TS Manual
4	On	Released	Depressed	Clutch Release	On	No	Refer to Sec. 10.7 of DDEC III/IV SECM TS Manual
					Off	Yes	—

**Table 4 Cruise Control Quick Check Table, Testing Brake and Clutch Switch and Wiring**

Step	Cruise Enable Switch	Set/Coast Switch	Res/Accel Switch	DDR/DDDL Readout	DDR/DDDL Display	Okay ?	Go To
1	On	Off	Off	Set/Coast	Off	Yes	—
					On	No	Refer to Sec. 10.7 of DDEC III/IV SECM TS Manual
2	On	On	Off	Set/Coast	Off	No	Refer to Sec. 10.7 of DDEC III/IV SECM TS Manual
					On	Yes	—
3	On	Off	Off	Res/Accel	Off	Yes	—
					On	No	Refer to Sec. 10.7 of DDEC III/IV SECM TS Manual
4	On	Off	On	Res/Accel	Off	No	Refer to Sec. 10.7 of DDEC III/IV SECM TS Manual
					On	Yes	—

**Table 5 Cruise Control Quick Check Table, Testing Set/Coast and Resume/Accel Switches and Wiring**

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# FACSIMILE COVER SHEET

**To:** Customer Support Center  
**Company:** Detroit Diesel Corporation  
**Phone:** 313-592-5800  
**FAX:** 313-592-5888

**From:**  
**Company:**  
**Phone:**  
**FAX:**

**Date:**

We have scheduled or completed the conversion of a Series 60 engine from DDEC II to DDEC IV. We require a Powernet Entry Change for the engine serial number listed below to enable reprogramming of the DDEC IV remanufactured ECM.

**Serial Number:** \_\_\_\_\_

**Model Number:** \_\_\_\_\_

**Requested Rating:** \_\_\_\_\_

Figure 5

**DETROIT DIESEL**

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13400 Outer Drive, West, Detroit, Michigan 48239-4001  
Telephone: 313-592-5000  
[www.detroitdiesel.com](http://www.detroitdiesel.com)

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