

# **DDEC® VI**

# **Application and Installation**

**DETROIT DIESEL**

**DEMAND PERFORMANCE™**



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

Specifications are subject to change without notice. Detroit Diesel Corporation is registered to ISO 9001:2001.  
Copyright © Detroit Diesel Corporation. All rights reserved. Detroit Diesel Corporation is a Daimler company.

DDC-SVC-MAN-0054 Copyright © 2008 DETROIT DIESEL CORPORATION. Printed in U.S.A.

**CALIFORNIA  
Proposition 65 Warning**

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

**CALIFORNIA  
Engine Idle Limiting Standard Notice**

**Vehicles with engines certified by the State of California are equipped with software features making them compliant with the California Engine Idle Regulations. In order to meet this regulation, the engine control strategy is generally configured to automatically shut down the engine after five minutes of continuous idle operation. This shutdown feature is not an engine malfunction and is required to meet the California emission regulations.**

## **ATTENTION**

This document is a guideline for qualified personnel. It is intended to be used by vehicle manufacturers and contains Detroit Diesel's recommendations for the ancillary systems supporting the Detroit Diesel engines covered by this document. The vehicle manufacturer is responsible for developing, designing, manufacturing and installing these systems, including component qualification. The vehicle manufacturer is also responsible for furnishing vehicle users complete service and safety information for these systems. Detroit Diesel makes no representations or warranties regarding the information contained in this document and disclaims all liability or other responsibility for the design, manufacture or installation of these ancillary systems, or the preparation or distribution to vehicle users of appropriate information regarding these systems. The information contained in this document may not be complete and is subject to change without notice.

### **TRADEMARK INFORMATION**

DDEC®, Ether Start®, Optimized Idle®, ProDriver®, and Series 60® are registered trademarks of Detroit Diesel Corporation. Allison Transmission® is a registered trademark of General Motors Corporation. BorgWarner® is a registered trademark of Borg-Warner Corporation. Jake Brake® is a registered trademark of Diesel Engine Retarders, Inc. Smart Cruise® is a registered trademark of Eaton Vorad Technologies. SmartMedia® is a registered trademark of Kabushiki Kaisha Toshiba DBA Toshiba Corporation. Viton® is a registered trademark of DuPont Dow Elastomers L.L.C. Voith® is a registered trademark of JM Voith GmbH. All other trademarks and registered trademarks are the property of their respective owners.



# DDEC VI APPLICATION AND INSTALLATION

## ABSTRACT

DDEC VI offers engine controls and an extensive range of engine and vehicle options.

The detail provided will facilitate the following:

- The selection of features and settings, based on individual applications
- The fabrication and installation of a vehicle interface harness, based on individual applications
- The communication of messages & data between sensors and various electronic control modules within the installation
- The use of industry standard tools to obtain engine data and diagnostic information, as well as to reprogram key parameters

The manual is arranged as follows:

- The initial portion covers the installation, beginning with an overview and safety precautions, followed by hardware and wiring requirements, inputs and outputs, and available features.
- The second portion covers communication protocol.
- The third portion covers the tools capable of obtaining engine data and diagnostic information from the MCM and the CPC, as well as reprogramming of its key parameters.
- The final portion, the appendix, summarizes detailed information on codes and kit availability.

This manual does not cover the installation of the engine itself into various applications. For this, the reader should refer to the specific engine application and installation manual.

This manual is intended for those with an electrical background. A simple installation may require a basic understanding of electrical circuits while a more comprehensive electrical/electronics background is required to access all the capability of the DDEC VI.



# TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION</b> .....	1-1
<b>2</b>	<b>SAFETY PRECAUTIONS</b> .....	2-1
2.1	STANDS .....	2-1
2.2	GLASSES .....	2-1
2.3	WELDING .....	2-2
2.4	WORK PLACE .....	2-2
2.5	CLOTHING .....	2-3
2.6	ELECTRIC TOOLS .....	2-3
2.7	AIR .....	2-4
2.8	DIAGNOSTIC TOOLS .....	2-4
2.9	FLUIDS AND PRESSURE .....	2-4
2.10	BATTERIES .....	2-5
2.11	FIRE .....	2-6
2.12	PAINT .....	2-6
2.13	FLUROELASTOMER .....	2-6
<b>3</b>	<b>HARDWARE AND WIRING</b> .....	3-1
3.1	MOTOR CONTROL MODULE .....	3-3
3.1.1	ENGINE HARNESS .....	3-3
	MCM 120-PIN CONNECTOR FOR DD15 ENGINES .....	3-4
	MCM 120-PIN CONNECTOR FOR SERIES 60 ENGINES .....	3-8
	MCM 120-PIN CONNECTOR FOR MBE 900 ENGINES .....	3-12
	MCM 120-PIN CONNECTOR FOR MBE 4000 ENGINES .....	3-16
	CONNECTOR BRACKETS .....	3-20
	MCM 21-PIN AND 31-PIN CONNECTORS .....	3-21
3.1.2	DPF HARNESS .....	3-24
	DPF HARNESS – VERTICAL MOUNT ATD (31-PIN TO 10 PIN CONNECTOR)	3-26
	DPF HARNESS – HORIZONTAL MOUNT ATD (31-PIN TO 10-PIN CONNECTOR/2-PIN CONNECTOR) .....	3-28
3.2	COMMON POWERTRAIN CONTROLLER .....	3-31
3.2.1	ENVIRONMENTAL CONDITIONS .....	3-33
	TEMPERATURE .....	3-33
	WATER INTRUSION .....	3-33
3.2.2	CPC VEHICLE INTERFACE HARNESS .....	3-34
	FREQUENCY INPUT .....	3-35
	DIGITAL INPUTS .....	3-36
	DIGITAL OUTPUTS .....	3-36
3.2.3	VIH WIRING .....	3-40
	TRUCK APPLICATIONS .....	3-40
	VOCATIONAL APPLICATIONS .....	3-44
	COACH APPLICATIONS .....	3-48
	FIRE TRUCK APPLICATIONS .....	3-52
	CRANE APPLICATIONS .....	3-56

	TRANSIT BUS APPLICATIONS .....	3-60
	VIH TO MCM CONNECTOR WIRING .....	3-64
	VIH POWER WIRING .....	3-67
	WIRE RESISTANCES .....	3-69
	COMMUNICATIONS – SAE J1939 DATA LINK .....	3-69
	COMMUNICATIONS – PROPRIETARY ENGINE-CAN DATA LINK .....	3-71
3.2.4	POWER SUPPLY – 12 VOLT SYSTEM .....	3-71
	AVERAGE CURRENT DRAW .....	3-72
	BATTERY ISOLATOR .....	3-72
	MAIN POWER SHUTDOWN .....	3-73
3.2.5	FUSES .....	3-74
3.2.6	CONNECTORS .....	3-76
	DATA LINK CONNECTOR .....	3-78
3.3	WIRES AND WIRING .....	3-79
3.3.1	GENERAL REQUIREMENTS .....	3-79
3.3.2	GENERAL WIRE .....	3-79
3.3.3	CRIMP TOOLS .....	3-80
3.3.4	DEUTSCH TERMINAL INSTALLATION AND REMOVAL .....	3-80
	DEUTSCH TERMINAL INSTALLATION GUIDELINES .....	3-80
	DEUTSCH TERMINAL REMOVAL .....	3-82
3.3.5	SPLICING GUIDELINES .....	3-84
	CLIPPED AND SOLDERED SPLICING METHOD .....	3-84
	SPLICING AND REPAIRING STRAIGHT LEADS-ALTERNATE METHOD 1 .....	3-86
	SPLICING AND REPAIRING STRAIGHT LEADS - ALTERNATE METHOD 2 .....	3-89
	SHRINK WRAP .....	3-91
	STAGGERING WIRE SPLICES .....	3-92
3.4	CONDUIT AND LOOM .....	3-93
3.5	TAPE AND TAPING .....	3-95
3.6	SENSORS .....	3-97
3.6.1	FACTORY-INSTALLED SENSORS .....	3-98
3.6.2	OEM-INSTALLED SENSORS .....	3-103
3.6.3	AMBIENT AIR TEMPERATURE SENSOR .....	3-104
	AMBIENT AIR TEMPERATURE SENSOR INSTALLATION .....	3-105
3.6.4	ENGINE COOLANT LEVEL SENSOR .....	3-106
3.6.5	TURBO COMPRESSOR IN TEMPERATURE SENSOR .....	3-110
3.6.6	VEHICLE SPEED SENSOR .....	3-111
	MAGNETIC PICKUP .....	3-112
	SAE J1939 DATA LINK .....	3-114
	VSS ANTI-TAMPER .....	3-114
3.7	LAMPS .....	3-115
3.7.1	AGS2 BACKUP LAMP .....	3-115
	AGS2 BACKUP LAMP REQUIREMENTS AND GUIDELINES .....	3-115
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	3-115
3.7.2	AGS2 CHECK TRANS LAMP .....	3-116
	AGS2 CHECK TRANS LAMP REQUIREMENTS AND GUIDELINES .....	3-116
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	3-116
3.7.3	AGS2 TRANS TEMP LAMP .....	3-117



	AGS2 TRANS TEMP LAMP REQUIREMENTS AND GUIDELINES .....	3-117
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	3-117
3.7.4	AMBER WARNING LAMP .....	3-118
	AWL AND PASSMART .....	3-118
	AMBER WARNING LAMP REQUIREMENTS AND GUIDELINES .....	3-118
3.7.5	CRUISE ACTIVE LAMP .....	3-119
	CRUISE ACTIVE LAMP REQUIREMENTS AND GUIDELINES .....	3-119
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	3-119
3.7.6	DECELERATION LAMP .....	3-120
	DECELERATION LAMP REQUIREMENTS AND GUIDELINES .....	3-120
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	3-120
3.7.7	DPF REGENERATION LAMP .....	3-121
	DPF REGENERATION LAMP REQUIREMENTS AND GUIDELINES .....	3-121
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	3-121
3.7.8	HIGH EXHAUST SYSTEM TEMPERATURE LAMP .....	3-122
	HIGH EXHAUST SYSTEM TEMPERATURE LAMP REQUIREMENTS AND GUIDELINES .....	3-122
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	3-122
3.7.9	LOW BATTERY VOLTAGE LAMP .....	3-124
	LOW BATTERY VOLTAGE LAMP REQUIREMENTS AND GUIDELINES .....	3-124
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	3-124
3.7.10	LOW COOLANT LEVEL LAMP .....	3-125
	LOW COOLANT LEVEL LAMP REQUIREMENTS AND GUIDELINES .....	3-125
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	3-125
3.7.11	LOW OIL PRESSURE LAMP .....	3-126
	REQUIREMENTS AND GUIDELINES .....	3-126
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	3-126
3.7.12	MALFUNCTION INDICATOR LAMP .....	3-127
	MALFUNCTION INDICATOR LAMP REQUIREMENTS AND GUIDELINES .....	3-127
3.7.13	OPTIMIZED IDLE ACTIVE LAMP .....	3-128
	OPTIMIZED IDLE ACTIVE LAMP REQUIREMENTS AND GUIDELINES .....	3-128
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	3-128
3.7.14	RED STOP LAMP .....	3-129
	RED STOP LAMP REQUIREMENTS AND GUIDELINES .....	3-129
3.7.15	WAIT TO START LAMP .....	3-130
	WAIT TO START LAMP REQUIREMENTS AND GUIDELINES .....	3-130
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	3-130
3.7.16	WATER-IN-FUEL LAMP (R2.0 OR LATER) .....	3-131
	WATER-IN-FUEL LAMP REQUIREMENTS AND GUIDELINES .....	3-131
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	3-131
<b>4</b>	<b>INPUTS AND OUTPUTS .....</b>	<b>4-1</b>
4.1	INPUTS .....	4-3
4.1.1	AIR CONDITION STATUS .....	4-4
	INSTALLATION .....	4-4
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-4
4.1.2	ABS ACTIVE .....	4-5

	INSTALLATION .....	4-5
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-5
4.1.3	AUXILIARY SHUTDOWN #1 .....	4-6
	INSTALLATION .....	4-6
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-6
4.1.4	CLUTCH SWITCH .....	4-7
	INSTALLATION .....	4-7
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-7
4.1.5	CRUISE CONTROL ON/OFF SWITCH .....	4-8
	INSTALLATION .....	4-8
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-8
4.1.6	CRUISE CONTROL RESUME/ACCEL SWITCH AND SET/COAST SWITCH .....	4-9
	INSTALLATION .....	4-9
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-10
	DIAGNOSTICS .....	4-10
4.1.7	DIAGNOSTIC REQUEST SWITCH .....	4-11
	INSTALLATION .....	4-11
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-11
4.1.8	DPF REGENERATION INHIBIT SWITCH AND REGEN SWITCH (CPC R2.0 OR LATER AND MCM V61 FOR SERIES 60, MCM V8 FOR MBE OR LATER) .....	4-12
	INSTALLATION .....	4-13
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-13
4.1.9	DUAL-SPEED AXLE SWITCH .....	4-14
	INSTALLATION .....	4-14
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-14
4.1.10	ENGINE BRAKE DISABLE .....	4-15
	INSTALLATION .....	4-15
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-15
4.1.11	ENGINE BRAKE LOW & MEDIUM .....	4-16
	INSTALLATION .....	4-16
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-16
4.1.12	FAN OVERRIDE .....	4-16
	INSTALLATION .....	4-16
4.1.13	FAST ENGINE HEAT UP SWITCH .....	4-17
	INSTALLATION .....	4-17
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-17
4.1.14	IDLE VALIDATION 1 & IDLE VALIDATION 2 .....	4-18
	INSTALLATION .....	4-18
4.1.15	LIMITERS FOR TORQUE, ENGINE SPEED, AND VEHICLE SPEED .....	4-18
	INSTALLATION .....	4-18
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-18
4.1.16	OPTIMIZED IDLE HOOD TILT SWITCH .....	4-19
	INSTALLATION .....	4-19
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-19
4.1.17	OPTIMIZED IDLE THERMOSTAT .....	4-20
	INSTALLATION .....	4-20
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-20

4.1.18	PARK BRAKE SWITCH .....	4-21
	INSTALLATION .....	4-21
	PROGRAMMING REQUIREMENTS & FLEXIBILITY .....	4-21
4.1.19	REGEN SWITCH .....	4-22
4.1.20	REMOTE THROTTLE SELECT SWITCH .....	4-22
	INSTALLATION .....	4-22
	PROGRAMMING REQUIREMENTS & FLEXIBILITY .....	4-22
4.1.21	REMOTE PTO SWITCH .....	4-22
	INSTALLATION .....	4-23
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-23
4.1.22	RPM FREEZE .....	4-23
	INSTALLATION .....	4-23
	PROGRAMMING REQUIREMENTS & FLEXIBILITY .....	4-23
4.1.23	SERVICE BRAKE RELEASED SWITCH .....	4-24
	INSTALLATION .....	4-24
	PROGRAMMING REQUIREMENTS & FLEXIBILITY .....	4-24
4.1.24	STOP ENGINE OVERRIDE .....	4-25
	INSTALLATION .....	4-25
	.....	4-25
4.1.25	THROTTLE INHIBIT .....	4-26
	INSTALLATION .....	4-26
	PROGRAMMING REQUIREMENTS & FLEXIBILITY .....	4-26
4.1.26	TRANSMISSION NEUTRAL SWITCH .....	4-27
	INSTALLATION .....	4-27
	PROGRAMMING REQUIREMENTS & FLEXIBILITY .....	4-27
4.1.27	TRANSMISSION RETARDER ACTIVE .....	4-28
	INSTALLATION .....	4-28
	PROGRAMMING REQUIREMENTS & FLEXIBILITY .....	4-28
4.2	SWITCH INPUTS RECEIVED OVER J1939 DATA LINK .....	4-29
4.3	DIGITAL OUTPUTS – CPC .....	4-33
4.3.1	AGS2 BACKUP LAMP .....	4-35
	INSTALLATION .....	4-35
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-35
4.3.2	AGS2 CHECK TRANS LAMP .....	4-36
	INSTALLATION .....	4-36
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-36
4.3.3	AGS2 TRANS TEMP LAMP .....	4-37
	INSTALLATION .....	4-37
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-37
4.3.4	AMBER WARNING LAMP .....	4-37
	INSTALLATION .....	4-37
4.3.5	CRUISE ACTIVE LAMP .....	4-38
	INSTALLATION .....	4-38
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-38
4.3.6	DECELERATION LAMP .....	4-39
	INSTALLATION .....	4-39
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-39

4.3.7	DPF REGENERATION LAMP (HARDWIRED AND J1939) .....	4-40
	INSTALLATION .....	4-40
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-40
4.3.8	ENGINE BRAKE ACTIVE .....	4-41
	INSTALLATION .....	4-41
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-41
4.3.9	ETHER START .....	4-42
	INSTALLATION .....	4-42
	PROGRAMMING REQUIREMENTS & FLEXIBILITY .....	4-42
4.3.10	HIGH EXHAUST SYSTEM TEMPERATURE LAMP (HARDWIRED AND J1939) .....	4-43
	INSTALLATION .....	4-43
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-43
4.3.11	LOW BATTERY VOLTAGE LAMP .....	4-44
	INSTALLATION .....	4-44
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-44
4.3.12	LOW COOLANT LEVEL LAMP .....	4-45
	INSTALLATION .....	4-45
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-45
4.3.13	LOW OIL PRESSURE LAMP .....	4-46
	INSTALLATION .....	4-46
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-46
4.3.14	MALFUNCTION INDICATOR LAMP (MIL) .....	4-46
	INSTALLATION .....	4-46
4.3.15	OPTIMIZED IDLE ACTIVE LAMP .....	4-47
	INSTALLATION .....	4-47
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-47
	DIAGNOSTICS .....	4-47
4.3.16	OPTIMIZED IDLE ALARM .....	4-48
	INSTALLATION .....	4-48
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-48
	DIAGNOSTICS .....	4-48
4.3.17	RED STOP LAMP .....	4-49
	INSTALLATION .....	4-49
4.3.18	STARTER LOCKOUT .....	4-49
	INSTALLATION .....	4-49
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-49
4.3.19	TOP2 SHIFT SOLENOID .....	4-50
	INSTALLATION .....	4-50
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-50
	DIAGNOSTICS .....	4-50
4.3.20	TOP2 SHIFT LOCKOUT SOLENOID .....	4-51
	INSTALLATION .....	4-51
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-51
	DIAGNOSTICS .....	4-51
4.3.21	VEHICLE POWER SHUTDOWN .....	4-52
	INSTALLATION .....	4-52
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-52

4.3.22	WAIT TO START LAMP .....	4-53
	INSTALLATION .....	4-53
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-53
4.3.23	WATER-IN-FUEL LAMP .....	4-54
	INSTALLATION .....	4-54
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-54
4.4	ANALOG OUTPUTS – CPC .....	4-55
4.4.1	PIN 3/05 – ANALOG OUTPUT .....	4-55
4.4.2	PIN 3/06 – ANALOG OUTPUT .....	4-55
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-55
4.5	PWM OUTPUT — CPC .....	4-57
4.5.1	PWM OUTPUT — PIN 4/12 PWM SELECTION .....	4-57
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	4-57
<b>5</b>	<b>FEATURES .....</b>	<b>5-1</b>
5.1	ACCELERATION LIMITER .....	5-3
5.1.1	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-3
5.2	AUTO-ELEVATE IDLE .....	5-5
5.2.1	OPERATION .....	5-5
5.2.2	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-5
5.3	CALIFORNIA ENGINE IDLE LIMITING .....	5-7
5.3.1	OPERATION .....	5-7
	IDLE CONDITIONS .....	5-7
	PTO CONDITIONS .....	5-8
	OVERRIDE CONDITIONS .....	5-8
	DIAGNOSTIC TOOLS (DDDL OR DDRS) .....	5-8
	HIGH IDLE REGENERATION .....	5-8
5.3.2	INTERACTION WITH OTHER FEATURES .....	5-9
5.4	CLEAN IDLE .....	5-11
5.4.1	OPERATION .....	5-11
5.4.2	INTERACTION WITH OTHER FEATURES .....	5-11
5.4.3	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-11
5.5	COLD START – MBE 900, MBE 4000 AND DD15 .....	5-13
5.5.1	OPERATION .....	5-13
	INITIALIZATION .....	5-13
	PREHEATING STATE .....	5-13
	WAITING FOR ENGINE START .....	5-14
	ENGINE START .....	5-14
	POST-HEATING STATE .....	5-14
	COOLING OFF .....	5-14
	OFF .....	5-14
5.5.2	INSTALLATION .....	5-14
5.5.3	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-16
5.5.4	DIAGNOSTICS .....	5-16
5.6	COMMON DRIVER REWARD .....	5-17
5.6.1	OPERATION .....	5-17
	CALCULATION OF CDR .....	5-18

	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-19
5.7	CRUISE CONTROL .....	5-21
5.7.1	OPERATION .....	5-21
	ENGINE BRAKES IN CRUISE CONTROL (OPTIONAL) .....	5-22
	CRUISE AUTO RESUME (OPTIONAL) .....	5-22
	ADAPTIVE CRUISE (OPTIONAL) .....	5-22
	CRUISE POWER .....	5-22
	CRUISE ENABLE .....	5-22
	SET / COAST .....	5-23
	RESUME / ACCEL .....	5-23
	PAUSE SWITCH .....	5-23
	CLUTCH RELEASED (MANUAL TRANSMISSIONS) .....	5-23
	SERVICE BRAKE RELEASED (AUTOMATIC AND MANUAL TRANSMIS- SIONS) .....	5-24
	SOFT CRUISE .....	5-24
	CRUISE V SPEED MAY EXCEED RSL .....	5-24
5.7.2	INSTALLATION .....	5-25
5.7.3	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-26
5.7.4	INTERACTION WITH OTHER FEATURES .....	5-30
5.8	DIAGNOSTICS .....	5-31
5.8.1	OPERATION .....	5-31
	FLASHING FAULT CODES WITH AWL / SEL .....	5-33
	PROGRAMMING REQUIREMENTS & FLEXIBILITY .....	5-34
5.9	DUAL SPEED AXLE .....	5-35
5.9.1	OPERATION .....	5-35
5.9.2	INSTALLATION .....	5-35
5.9.3	PROGRAMMING FLEXIBILITY & REQUIREMENTS .....	5-35
5.10	ENGINE BRAKE CONTROLS – MBE 900 AND MBE 4000 .....	5-37
5.10.1	OPERATION .....	5-37
	CRUISE CONTROL OR ROAD SPEED LIMIT WITH ENGINE BRAKE .....	5-38
	ENGINE BRAKE LEVEL .....	5-38
	SERVICE BRAKE CONTROL OF ENGINE BRAKES .....	5-39
	ENGINE BRAKE ACTIVE .....	5-39
	ENGINE BRAKE DISABLE .....	5-39
	ENGINE FAN BRAKING .....	5-40
	CLUTCH RELEASED INPUT .....	5-40
	MIN VEHICLE SPEED FOR ENGINE BRAKES .....	5-40
5.10.2	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-40
	CONFIGURATION FOR MBE 900 EXHAUST FLAP APPLICATIONS .....	5-40
	CONFIGURATION FOR MBE 900 COMPRESSION BRAKE ONLY APPLICATIONS .....	5-43
	CONFIGURATION FOR MBE 900 COMPRESSION AND EXHAUST BRAKE APPLICATIONS .....	5-46
	CONFIGURATION FOR MBE 4000 COMPRESSION BRAKE AND BRAKE GATE APPLICATIONS .....	5-49
	CRUISE CONTROL OF ENGINE BRAKE OPTION .....	5-52
	ENGINE BRAKE OPTION WITH SERVICE BRAKE .....	5-53

ENGINE BRAKES OPTION WITH MINIMUM VEHICLE SPEED .....	5-53
5.10.3 INTERACTION WITH OTHER FEATURES .....	5-53
5.11 ENGINE BRAKE CONTROLS – SERIES 60 AND DD15 .....	5-55
5.11.1 OPERATION .....	5-55
SERVICE BRAKE CONTROL OF ENGINE BRAKES .....	5-55
CRUISE CONTROL OR ROAD SPEED LIMIT WITH ENGINE BRAKE .....	5-56
ENGINE BRAKE DISABLE .....	5-56
ENGINE BRAKE ACTIVE .....	5-56
ENGINE FAN BRAKING .....	5-56
CLUTCH RELEASED INPUT .....	5-56
MIN VEHICLE SPEED FOR ENGINE BRAKES .....	5-56
5.11.2 INSTALLATION .....	5-57
5.11.3 PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-58
5.11.4 INTERACTION WITH OTHER FEATURES .....	5-61
5.12 ENGINE PROTECTION .....	5-63
5.12.1 OPERATION .....	5-63
WARNING .....	5-64
SHUTDOWN .....	5-64
5.12.2 STOP ENGINE OVERRIDE OPTION .....	5-64
5.12.3 PROGRAMMING FLEXIBILITY .....	5-65
5.13 ENGINE RATINGS .....	5-67
5.13.1 PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-67
5.14 ENGINE STARTER CONTROL .....	5-71
5.14.1 PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-72
STARTER OVER TEMP CRANK DELAY PROTECTION .....	5-72
5.15 ETHER START – SERIES 60 .....	5-75
5.15.1 OPERATION .....	5-75
5.15.2 INSTALLATION .....	5-76
INJECTOR NOZZLE .....	5-77
VALVE AND CYLINDER ASSEMBLY .....	5-77
TUBING AND METERING ORIFICE .....	5-79
WIRING HARNESS .....	5-80
5.15.3 PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-80
5.16 FAN CONTROL .....	5-81
5.16.1 OPERATION .....	5-81
5.16.2 SINGLE-SPEED FAN (FAN TYPE 4) .....	5-82
SINGLE-SPEED FAN INSTALLATION .....	5-82
PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-83
5.16.3 SINGLE-SPEED FAN (FAN TYPE 7) .....	5-85
SINGLE-SPEED FAN INSTALLATION .....	5-85
PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-86
5.16.4 DUAL FANS (FAN TYPE 6) .....	5-88
DUAL FANS INSTALLATION .....	5-89
PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-90
5.16.5 TWO-SPEED FAN .....	5-92
TWO-SPEED FAN INSTALLATION .....	5-93
PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-94

5.16.6	VARIABLE SPEED FAN (FAN TYPE 3) WITHOUT FAN SPEED FEEDBACK .....	5-96
	INSTALLATION .....	5-97
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-98
5.16.7	VARIABLE SPEED FAN (FAN TYPE 2) WITH FAN SPEED FEEDBACK .....	5-100
	INSTALLATION .....	5-101
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-102
5.17	FLEET MANAGEMENT .....	5-105
5.17.1	OPERATION .....	5-105
5.17.2	DDEC DATA .....	5-105
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-106
5.17.3	DDEC REPORTS .....	5-107
5.18	FUEL ECONOMY INCENTIVE .....	5-113
5.18.1	OPERATION .....	5-113
5.18.2	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-114
5.18.3	INTERACTION WITH OTHER FEATURES .....	5-114
5.19	IDLE ADJUST .....	5-115
5.19.1	OPERATION .....	5-115
5.19.2	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-116
5.20	IDLE PROTECTION .....	5-117
5.20.1	OPERATION .....	5-117
5.20.2	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-117
5.21	IDLE SHUTDOWN TIMER AND PTO SHUTDOWN .....	5-119
5.21.1	OPERATION — IDLE SHUTDOWN NON-PTO MODE .....	5-119
5.21.2	OPERATION — PTO SHUTDOWN .....	5-120
5.21.3	IDLE SHUTDOWN TIMER AND PTO SHUTDOWN OPTIONS .....	5-121
	IDLE / PTO SHUTDOWN OVERRIDE .....	5-121
	IDLE SHUTDOWN WITH AMBIENT AIR TEMP .....	5-121
	IDLE SHUTDOWN WITH AMBIENT AIR TEMP CONTINUOUS OVERRIDE .....	5-122
	VEHICLE POWER SHUTDOWN .....	5-123
	MAXIMUM ENGINE LOAD SHUTDOWN .....	5-123
5.21.4	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-124
5.22	LIMITERS .....	5-127
5.22.1	OPERATION .....	5-127
5.22.2	INSTALLATION .....	5-128
5.22.3	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-129
5.23	LOW GEAR TORQUE REDUCTION .....	5-131
5.23.1	OPERATION .....	5-131
	EXAMPLE 1 – ONE TORQUE LIMIT .....	5-131
	EXAMPLE 2 – TWO TORQUE LIMITS .....	5-132
5.23.2	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-133
5.24	OPTIMIZED IDLE .....	5-135
5.24.1	OPERATION .....	5-135
	OPTIMIZED IDLE START UP SEQUENCE .....	5-136
	OI ENGINE TARGET RPM .....	5-136
	ENGINE MODE .....	5-137
	THERMOSTAT MODE .....	5-138
5.24.2	INSTALLATION .....	5-139



5.24.3	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-141
5.24.4	INTERACTION WITH OTHER FEATURES .....	5-142
5.25	PARKED REGENERATION .....	5-143
5.25.1	OPERATION .....	5-143
	REGENERATION OPTIONS (MCM V61.4 OR LATER; MCM V9.6.1 OR LATER) .....	5-144
5.25.2	DPF PARKED (STATIONARY) REGENERATION FOR HAZARDOUS APPLICATIONS ONLY .....	5-145
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-146
5.26	PASSMART .....	5-149
5.26.1	OPERATION .....	5-149
5.26.2	INSTALLATION .....	5-150
5.26.3	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-151
5.26.4	INTERACTION WITH OTHER FEATURES .....	5-151
5.27	PASSWORDS .....	5-153
5.27.1	OPERATION .....	5-153
	BACK DOOR PASSWORD .....	5-154
	CHANGING THE PASSWORD .....	5-154
5.28	PROGRESSIVE SHIFT .....	5-155
5.28.1	OPERATION .....	5-155
5.28.2	LOW RANGE #1 .....	5-156
5.28.3	LOW RANGE #2 .....	5-156
5.28.4	HIGH RANGE .....	5-157
5.28.5	INSTALLATION INFORMATION .....	5-159
5.28.6	PROGRAMMING FLEXIBILITY .....	5-159
5.28.7	INTERACTION WITH OTHER FEATURES .....	5-160
5.29	SOFT CRUISE .....	5-161
5.29.1	OPERATION .....	5-161
5.29.2	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-161
5.30	STARTER LOCKOUT .....	5-163
5.30.1	OPERATION .....	5-163
5.30.2	INSTALLATION .....	5-164
5.30.3	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-164
5.31	TACHOMETER DRIVE .....	5-165
5.31.1	OPERATION .....	5-165
5.32	THROTTLE CONTROL/GOVERNORS .....	5-167
5.32.1	AUTOMOTIVE LIMITING SPEED GOVERNOR - ON-HIGHWAY .....	5-167
	ALSG ACCELERATOR PEDAL .....	5-167
	ALSG ACCELERATOR PEDAL INSTALLATION .....	5-167
	ALSG ACCELERATOR PEDAL ASSEMBLY DIAGNOSTICS .....	5-168
5.32.2	POWER TAKE-OFF .....	5-169
	PTO SWITCH CONFIGURATION .....	5-170
	CAB PTO – CRUISE SWITCH PTO .....	5-171
	CRUISE SWITCH PTO PROGRAMMING REQUIREMENT AND FLEXIBILITY .	5-174
5.32.3	REMOTE PTO — PREPROGRAMMED SET SPEEDS .....	5-176
	PULSED INPUT USING PIN 2/9 .....	5-177
	INSTALLATION .....	5-178

	GRAY CODED USING PINS 2/9, 1/11, 2/11 AND BINARY CODED .....	5-179
	INSTALLATION FOR GRAY CODED OR BINARY INPUT .....	5-180
	REMOTE PTO PROGRAMMING REQUIREMENT AND FLEXIBILITY .....	5-180
	REMOTE ACCELERATOR CONTROL FOR PTO OR ALSG .....	5-182
	REMOTE ACCELERATOR CONTROL EXAMPLE .....	5-182
	INSTALLATION .....	5-183
5.32.4	RPM FREEZE .....	5-184
	PROGRAMMING REQUIREMENTS & FLEXIBILITY .....	5-184
5.33	TRANSMISSION INTERFACE .....	5-185
5.33.1	MANUAL TRANSMISSIONS .....	5-185
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-185
5.33.2	MERCEDES AGS2 TRANSMISSION .....	5-185
	INSTALLATION .....	5-186
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-188
5.33.3	EATON TOP2 OPERATION .....	5-189
	INSTALLATION .....	5-190
	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-190
	DIAGNOSTICS .....	5-191
5.33.4	ALLISON TRANSMISSION .....	5-191
5.33.5	EATON ULTRASHIFT TRANSMISSION .....	5-193
5.33.6	EATON AUTOSHIFT TRANSMISSION .....	5-194
5.33.7	ZF ASTRONIC TRANSMISSION .....	5-196
5.34	VEHICLE SPEED LIMITING .....	5-197
5.34.1	OPERATION .....	5-197
	VSS DIAGNOSTIC LIMITS (CPC R2.0 OR LATER) .....	5-197
5.34.2	INSTALLATION .....	5-197
5.34.3	PROGRAMMING REQUIREMENTS AND FLEXIBILITY .....	5-197
5.34.4	INTERACTION WITH OTHER FEATURES .....	5-198
5.35	VEHICLE SPEED SENSOR ANTI-TAMPERING .....	5-199
5.35.1	PROGRAMMING FLEXIBILITY .....	5-199
<b>6</b>	<b>COMMUNICATION PROTOCOLS .....</b>	<b>6-1</b>
6.1	OVERVIEW .....	6-3
6.2	SAE J1587 DATA LINK .....	6-4
6.2.1	MESSAGE FORMAT .....	6-4
6.2.2	SAE J1708/J1587 MESSAGE PRIORITY .....	6-5
6.2.3	SAE J1587 PIDS REQUIRING ACTION .....	6-5
	DATA REQUEST .....	6-5
	COMPONENT SPECIFIC REQUEST .....	6-5
	J1587 OUTPUTS - SINGLE BYTE PARAMETERS .....	6-6
	DOUBLE BYTE PARAMETERS .....	6-14
	VARIABLE LENGTH PARAMETERS .....	6-17
6.3	SAE J1939 MESSAGES AND MESSAGE FORMAT .....	6-28
6.3.1	SAE J1939 SUPPORTED MESSAGES .....	6-29
	ACC1 – ADAPTIVE CRUISE CONTROL .....	6-29
	ACK/NACK – ACKNOWLEDGE / NEGATIVE ACKNOWLEDGE .....	6-30
	AETC – ADVERTISED ENGINE TORQUE CURVE .....	6-30

AMB – AMBIENT CONDITIONS .....	6-31
ATI2 - AFTERTREATMENT INTAKE GAS 2 .....	6-31
ATO2 - AFTERTREATMENT OUTLET GAS 2 .....	6-32
CCSS – CRUISE CONTROL / VEHICLE SPEED SETUP .....	6-32
CCVS – CRUISE CONTROL / VEHICLE SPEED .....	6-33
CI – COMPONENT IDENTIFICATION .....	6-36
CM1 – CAB MESSAGE1 .....	6-36
DM1 – ACTIVE DIAGNOSTIC TROUBLE CODES .....	6-38
DM2 – PREVIOUSLY ACTIVE DIAGNOSTIC TROUBLE CODES .....	6-39
DM3 - DIAGNOSTIC DATA CLEAR/RESET OF PREVIOUSLY ACTIVE DTCS .	6-40
DM11 — DIAGNOSTIC DATA CLEAR/RESET FOR ACTIVE DTCS .....	6-40
DM13 — STOP START BROADCAST .....	6-41
EBC1 -- ELECTRONIC BRAKE CONTROLLER #1 .....	6-42
EBC2 – WHEEL SPEED INFORMATION .....	6-43
EC – ENGINE CONFIGURATION .....	6-44
EEC1 -- ELECTRONIC ENGINE CONTROLLER #1 .....	6-46
EEC2 -- ELECTRONIC ENGINE CONTROLLER #2 .....	6-48
EEC3 -- ELECTRONIC ENGINE CONTROLLER #3 .....	6-49
EEC4 – ELECTRONIC ENGINE CONTROLLER #4 .....	6-49
EFL/P1 – ENGINE FLUID LEVEL/PRESSURE1 .....	6-50
EFL/P2 – ENGINE FLUID LEVEL/PRESSURE #2 .....	6-50
ERC1 - ELECTRONIC RETARDER CONTROLLER #1 .....	6-51
ET1 – ENGINE TEMPERATURE #1 .....	6-52
ET2 – ENGINE TEMPERATURE #2 .....	6-52
ETC1 -- ELECTRONIC TRANSMISSION CONTROLLER #1 .....	6-53
ETC2 -- ELECTRONIC TRANSMISSION CONTROLLER #2 .....	6-54
ETC7 – ELECTRONIC TRANSMISSION CONTROLLER #7 .....	6-55
FD – FAN DRIVE .....	6-56
HOURS – ENGINE HOURS, REVOLUTIONS .....	6-57
IC1 – INLET/EXHAUST CONDITIONS #1 .....	6-57
IC2 – INLET/EXHAUST CONDITIONS #2 .....	6-58
IO — IDLE OPERATION .....	6-58
LFC – FUEL CONSUMPTION (LIQUID) .....	6-59
LFE – FUEL ECONOMY (LIQUID) .....	6-59
PTC1 – PARTICULATE TRAP CONTROL 1 .....	6-60
PTO – POWER TAKEOFF INFORMATION .....	6-63
RC – RETARDER CONFIGURATION .....	6-64
REQUESTS .....	6-66
RF – RETARDER FLUIDS .....	6-66
SHUTDOWN — IDLE SHUTDOWN .....	6-67
SOFT – SOFTWARE IDENTIFICATION .....	6-69
TC — TURBOCHARGER .....	6-70
TCFG2 — TRANSMISSION CONFIGURATION .....	6-71
TCO1 — TACHOGRAPH .....	6-72
TD — TIME/DATE .....	6-73
TSC1 — TORQUE SPEED CONTROL .....	6-73
VD — VEHICLE DISTANCE .....	6-75

<b>I</b>	VDC1 – VEHICLE DYNAMIC STABILITY CONTROL 1 .....	6-75
	VDHR – HIGH RESOLUTION VEHICLE DISTANCE .....	6-76
	VEP – VEHICLE ELECTRICAL POWER .....	6-76
	VH — VEHICLE HOURS .....	6-76
	VI – VEHICLE IDENTIFICATION .....	6-77
	WFI — WATER-IN-FUEL INDICATOR .....	6-77
	<b>APPENDIX A: HARNESS WIRING DIAGRAMS .....</b>	<b>A-1</b>
	<b>APPENDIX B: ACRONYMS .....</b>	<b>B-1</b>
	<b>APPENDIX C: PARAMETER LIST .....</b>	<b>C-1</b>
	<b>INDEX .....</b>	<b>INDEX-1</b>