Section 5.17
Optimized Idle

Optimized Idle® with DDEC10 reduces engine idle time by running the engine only when required. Optimized Idle automatically stops and restarts the engine to accomplish the following:

- Keep the engine oil temperature between factory set limits

  60°F (16°C) - 104°F (40°C)

- Keep the battery charged

  >12.2 V (12 V system)

- Keep the cab/sleeper or passenger area at the desired temperature (using the optional thermostat) - On-highway truck and coach applications

Other benefits include overall reduction in exhaust emissions and noise, and improved starter and engine life (by starting a warm engine and eliminating starting aids). Optimized Idle run times can be accessed through DDEC 10 Reports. The Optimized Idle Active Lamp is steadily illuminated when Optimized Idle run times are logged.

Section 5.17.1
OPERATION

To activate Optimized Idle, the following conditions must be met:

- Ignition ON with the vehicle idling
- Hood and cab closed
- Transmission in neutral
- Park brake set
- Idle shutdown timer must be enabled

Once the above conditions are met:

- Turn the Cruise Master Switch to the ON position (if in the ON position, turn to OFF then to ON), the Optimized Idle Active Lamp will flash.
- Turn on Thermostat Mode (if equipped and the mode is desired) by turning ON the thermostat, setting the fan controls in the bunk and cab to HIGH and enabling the vehicle heating and cooling system.

Once these conditions are met, the Optimized Idle Active Lamp will flash until the Idle Shutdown timer expires. Optimized Idle allows the operation of all DDEC 10 features such as PTO, throttle control, and Cruise Switch PTO, while the active light is flashing.

Once Optimized Idle becomes active, the engine will either shutdown if Optimized Idle parameters are satisfied or ramp to 900 RPM. While the system is active (OI Active Lamp is steadily illuminated), the throttle, PTO, Cruise Switch PTO functions are disabled and the engine speed is controlled by DDEC10.

Section 5.17.1.1

Optimized Idle Start Up Sequence

The following occurs during every OI engine start:

1. Optimized Idle Active Light is ON. DDEC10 determines when the engine needs to start to charge the battery, warm the engine, or heat/cool the vehicle interior.
2. The alarm (mounted in the engine compartment) will sound for five seconds.
3. After a short delay, the starter will engage and the engine will start. If the engine does not reach a specified RPM within a few seconds, the system will be disarmed for the rest of the ignition cycle. If the engine does not start, Optimized Idle will attempt a second engine start in 45 seconds. The alarm will sound again prior to the second engine start.
4. Once the engine starts, it will ramp up to 900 RPM (default). This value is customer selectable with DDDL or DRS.
5. Vehicle accessories will be turned on thirty seconds after any thermostat based engine start and will not be turned on for an engine mode start. If the engine is running in engine mode, and the thermostat mode is requested, the vehicle accessories will be turned on thirty seconds after the request.

If two or more conditions exist at the same time, DDEC 10 will satisfy all parameters before shutting down the engine. For example, if the engine started due to battery voltage, the engine will run for a minimum of two hours. If the thermostat becomes unsatisfied and requests the engine to run during this time, DDEC 10 will control the HVAC fans through the Vehicle Power Shutdown relay, turning them on and off as required by the thermostat. At the end of the two hours, if the thermostat was not satisfied, the engine would continue to run.

Section 5.17.1.2
OI Engine Target RPM

If an Ambient Air Temperature Sensor is installed, the speed will be determined based on the temperatures listed in Table "OI Engine Target RPM" .

Ambient Air Temperature	OI Engine Target RPM
–40°C	OI Engine Target RPM ae 0
–17.77°C	OI Engine Target RPM ae 1
4.44°C	OI Engine Target RPM ae 2
26.66°C	OI Engine Target RPM ae 3
48.86°C	OI Engine Target RPM ae 4

Table 1. OI Engine Target RPM

If an Ambient Air Temperature Sensor is not installed, the speed will be based on the parameter “OI Engine Target RPM ae 0.”

If you want the engine to only run at one speed, set all parameters to the same number.

Section 5.17.1.3
Engine Mode

Engine Mode automatically stops and restarts the engine to maintain oil temperature and battery voltage. The Optimized Idle Active Light is illuminated whenever Engine Mode is active. Optimized Idle starts

and stops the engine to keep the following parameters within limits while in Engine Mode.

Battery Voltage - The engine will start when the battery voltage drops below 12.2 Volts for 12 Volt systems. This is the default. If an Ambient Air Temperature Sensor (AAT Sensor) is installed, the customer can select an option to use a AAT Sensor vs. voltage table to determine the start threshold for the battery. The thresholds are listed in Table "Voltage Threshold Based on Ambient Air Temperature" .

Ambient Air Temperature	Voltage Threshold
–40°C	12.5 V
–17.77°C	12.4 V
4.44°C	12.3 V
26.66°C	12.2 V
48.86°C	12.2 V

Table 2. Voltage Threshold Based on Ambient Air Temperature

There are three battery run modes: Normal Battery Run Mode, Alternate Battery Run Mode, and Continuous Battery Run Mode.

Normal Battery Run Mode – While in normal battery run mode, all battery voltage Optimized Idle starts are two hours long. This mode is customer selectable by setting the Alternate Time to 0, the default mode as listed in Table "Normal Battery Run Mode" .

Alternate Time	Battery Time	Single Event	First Consecutive Event	Second Consecutive Event
0	2 Hours	2 Hours	2 Hours	2 Hours

Table 3. Normal Battery Run Mode

Alternate Battery Run Mode – This mode is allowed only when the Alternate Time is set to a non-zero value. This parameter is customer selectable. While in Alternate Battery Run Mode, all voltage starts are based on Alternate Time unless a critical battery restart event is detected. A critical battery restart event is detected when the engine starts and runs to recharge the battery for the alternate time and then detects another battery start within one hour after the engine stops. At this point, the run time will change to two hours. The Alternate Battery Run Mode parameters are listed in Table "Alternate Battery Run Mode" .

Alternate Battery Run Time	Battery Time	Single Event	First Consecutive Event	Second Consecutive Event
a (Customer Selectable)	2 Hours	a	2 Hours	2 Hours

Table 4. Alternate Battery Run Mode

Continuous Battery Run Mode – In this mode, the engine continues to idle without shutting down when two consecutive critical battery restart events have occurred. This feature is customer selectable. The parameters for Continuous Battery Run Mode are listed in Table "Continuous Battery Run Mode" . A fault code is logged when this move is initiated (PID 168 FMI 14).

Alternate Battery Run Time	Battery Time	Single Event	First Consecutive Event	Second Consecutive Event	Further Events
0	2 Hours	2 Hours	2 Hours	Continuous	Continuous
a (Customer Selectable)	2 Hours	a	2 Hours	2 Hours	Continuous

Table 5. Continuous Battery Run Mode

Oil Temperature - The engine will start when the oil temperature drops below 60°F (15.55°C) and will run until the oil temperature reaches 104°F (40°C).

Section 5.17.1.4
Thermostat Mode

Thermostat Mode automatically stops and restarts the engine to maintain oil temperature, battery voltage and cab temperature. For on-highway applications, Thermostat Mode is used to keep the cab/sleeper (on-highway truck) and passenger area (coach) at the desired temperature and maintain the Engine Mode parameters. The optional thermostat must be turned ON for Thermostat Mode to be active. The Optimized Idle Active Light is illuminated whenever Thermostat Mode is active.

Engine mode parameters as well as the interior temperature are monitored in Thermostat Mode. The thermostat informs the ECU when to start/stop the engine to keep the interior warm/cool based on the thermostat setting. Ambient temperature is also monitored to determine if the ambient temperature is extreme enough that the engine should run continuously.

Any accessories (HVAC fans) connected to the Vehicle Power Shutdown relay will turn ON for Thermostat Mode engine starts. The HVAC fans will remain OFF for Engine Mode starts.

If Optimized Idle starts the engine for Engine Mode, and Thermostat Mode is then requested, the HVAC fans will turn ON approximately 30 seconds after the Thermostat Mode is requested.

Thermostat Mode can be enabled for a maximum amount of time. After which, the engine will ignore any requests from the thermostat.

Two automatic conditions which help keep the operator comfortable and reduce engine cycling are Continuous Run Mode and Extended Run Mode.

Continuous Run Mode - This mode allows the engine to run continuously if the outside temperature (determined by the skin temperature sensor or AAT Sensor if installed and configured) falls outside the hot or cold set limits and the thermostat set point can not be met. The default set limits are 25°F (-3.9°C) for heat mode and 90°F (32°C) for cool mode. When a skin temperature sensor is installed, these values are customer programmable in the thermostat and are password protected. When an ATT Sensor is installed these limits can be set by DDDL or DRS. When the thermostat is in the Continuous Run Mode, the thermometer icon will flash along with the heat or cool icon on the thermostat if a skin temperature sensor is installed. If the thermostat set point is satisfied, the engine will shutdown regardless of the outside temperature.

Extended Idle Mode - If the Continuous Run Mode is not needed and the thermostat set point is not met within 45 minutes, the engine will shutdown for fifteen minutes and restart and run for fifteen minutes. This fifteen-minute on and off cycle will continue until the thermostat set point is reached or until the thermostat is turned off. This may be an indication that the heat or cool setting on the thermostat does not match the vehicle heating or cooling system setting. It could also be an indication of low freon, blockage in the heater system or system tampering.

Extended Idle Mode can be disabled with a customer selectable parameter. After running 45 minutes, the engine will shutdown instead of cycling at 15 minute intervals.

Disable OI Thermostat Mode Based on Ambient Air Temperature - This feature allows the thermostat mode to be disabled if the ambient air temp is below a programmable value. The thermostat disable feature could be used to avoid starts in cold ambient air conditions (i.e. if an external heater system is attached and the maintenance of cab temperature is not necessary by optimized idle). If the thermostat disable feature is active then all OI engine start requests are ignored if the ambient air temperature is below a programmable value. In this case the vehicle power shutdown relay will not be energized.

Parameters	Description	Options	Default	Access Level
OI Enable Therm Ext Mode	Enables / Disables the feature of disabling OI thermostat mode based on ambient air temperature	0 – Disable 1 – Enable	0 - Disable	DDDL, DRS, VEPS
OI Lower Limit Continuous Run	Limit for disabling OI Thermostat Mode	-40-100’C	-4’C	DDDL, DRS, VEPS

Table 6. Parameters

Section 5.17.2
INSTALLATION

Optimized Idle utilizes the following inputs: Park Brake, Neutral Switch, Hood Tilt Switch, OI Thermostat (optional), and Cruise Enable. Optimized Idle utilizes three digital outputs: Vehicle Power Shutdown Relay, OI Alarm, and the Optimized Idle Active Light. A hardwired Vehicle Speed Sensor is required. See see Figure "Optimized Idle System " for the Optimized Idle overall system schematic.

Prior to installation, check the following items:

- The transmission must provide a reliable neutral signal (switch) — hardwired or via J1939.
- A Vehicle Speed Sensor (VSS) must be installed.
- There must be an electric starter; air starters cannot be used with Optimized Idle.
- Automatic transmissions may be used, but they must have a Starter Lockout Feature installed based on a reliable neutral signal.

New installations must be approved by Detroit Diesel. See Figure "Optimized Idle System " for the Optimized Idle overall system schematic.

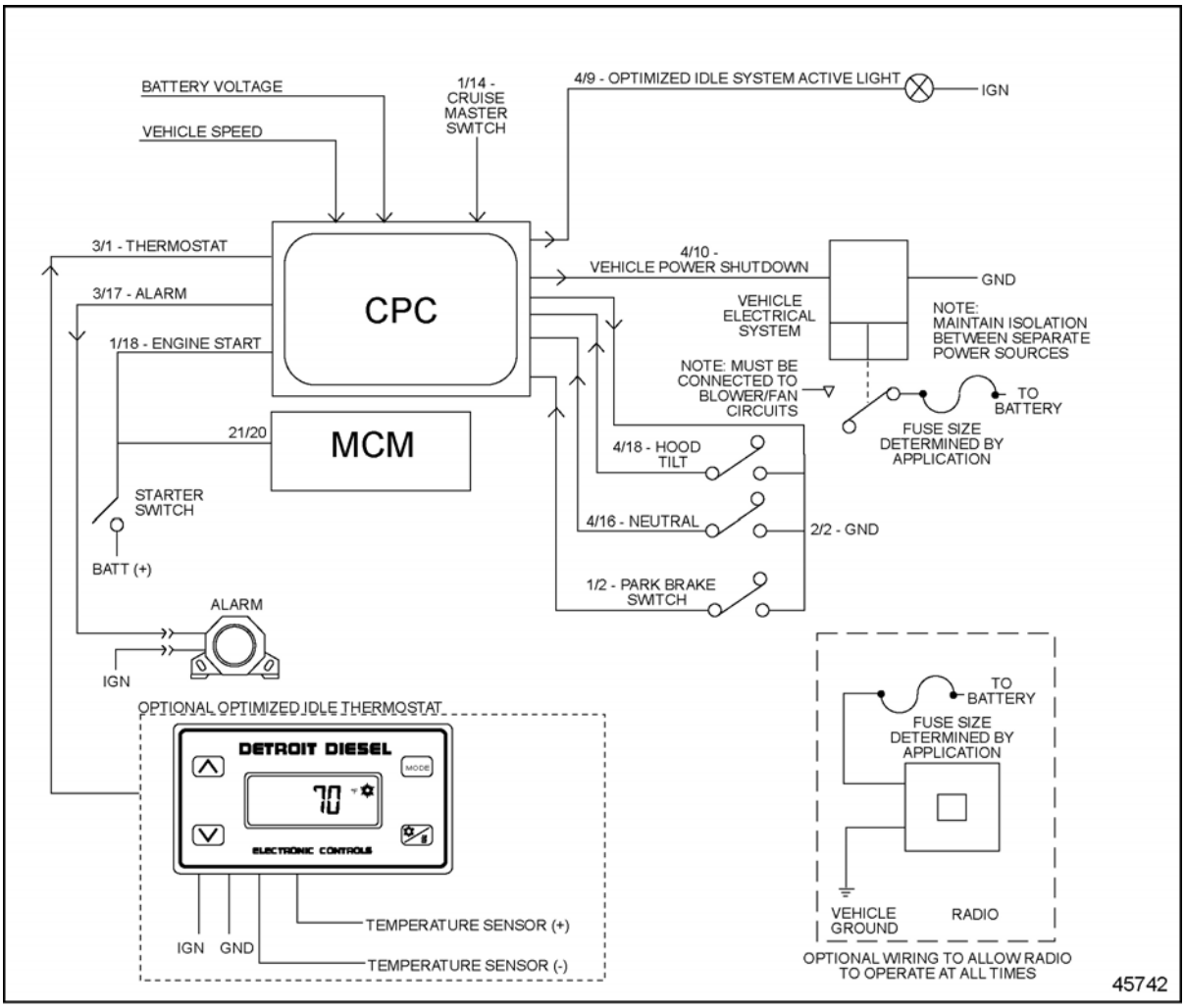

Figure 1. Optimized Idle System

Section 5.17.3
PROGRAMMING REQUIREMENTS AND Flexibility

The digital inputs and outputs listed in Table "Optimized Idle Digital Inputs and Digital Outputs" can be programmed.

Parameter Group	Parameter / Description	Setting
12	Optimized Idle Enable	1 = Enable
8	Vehicle Speed Sensor	4 = Magnetic Pickup
13	3 01 AI Selection	0 = No Sensor 2 = OI Thermostat input
13	Trans Neutral Input Config	0 = Hardwired (manual trans) 1 = J1939 (J1939 trans)
13	Park Brake Switch Config	0 = Hardwired

13	4 18 DI Selection	2 = Enable Engine Hood
35	4 09 DO Selection	10 = OI Active Lamp
35	4 10 DO Selection	3 = Vehicle Power Shutdown
35	3 17 DO Selection	4 = OI Alarm
17	Enable Idle Shutdown	1 = Enable with Park Brake
17	Enable PTO Shutdown	1 = Enable with park Brake
MCM2	Starter Type Control	1 = Starter Activated via MCM2
13	1 02 DI Selection	1 = Enable, Park brake Interlock
35	3 17 DO Fault Detection	1 = Enable
35	4 09 DO Fault Detection	1 = Enable
35	4 10 DO Fault Detection	1 = Enable
17	Enable Idle PTO Shtn Override	0 = Vehicle speed, throttle pedal

Table 7. Optimized Idle Digital Inputs and Digital Outputs

Optimized Idle options for battery charging and continuous run are listed in Table "Optimized Idle Options" .

Parameter	Description	Range	Default
OI Continuous Batt Time Enable	When enabled and OI has started the engine for battery three consecutive times, the engine will run continuously in OI Mode	0 = Disable 1 = Enable	0 = Disable
OI Variable Volt Thres Enable	When enabled, the battery voltage threshold will be based on ambient air temperature.	0 = Disable 1 = Enable	0 = Disable
OI Alternate Battery Run Time	Sets the alternate run time for battery starts.	0–30600 sec.	0 sec.
OI Upper Limit Continuous Run Temp	Set the continuous run upper limit. When the ambient air temperature is above this limit, the engine will run continuously.	40°C-100° C	32°C
OI Lower Limit Continuous Run	Sets the continuous run lower limit. When the ambient air temperature is below this limit, the engine will run continuously.	40°C-100° C	—4°C
OI Thermostat Max Time	Maximum amount of time the engine can run in Thermostat Mode.	0–459000 sec.	0 sec.
OI Target Engine RPM	Sets the speed the engine will operate at in OI Mode.	800–1000 rpm	1000 rpm

Table 8. Optimized Idle Options

Optimized Idle installations should have the parameters listed in Table "Engine Protection Parameters" set to Shutdown.

NOTICE:

DDC recommends that Shutdown be enabled for all Engine Protection parameters with Optimized Idle

installations.

Parameter	Description	Setting
Coolant Temp Engine Protect Shtn	Indication of the type of engine protection based on high engine coolant temp.	1 = Engine Shutdown
Oil Press Eng Protect Shtn	Indication of the type of engine protection based on low engine oil pressure.	1 = Engine Shutdown
Coolant Level Engine Protect Shtn	Indication of the type of engine protection based on low coolant level.	1 = Engine Shutdown

Table 10. Engine Protection Parameters

Section 5.17.4
INTERACTION WITH OTHER FEATURES

The Vehicle Power shutdown feature is used by Optimized Idle to turn off all accessory loads when the engine is shutdown. Optimized Idle will turn these loads on for Thermostat Mode starts.

No other DDEC10 features can be used when Optimized Idle is active.