Section 5.6
Engine Brake Controls

The Engine Brake option converts a power-producing diesel engine into a power-absorbing air compressor. This is accomplished by opening the cylinder exhaust valves near the top of the normal compression stroke and releasing the compressed cylinder charge to exhaust. The release of the compressed air to atmospheric pressure prevents the return of energy to the engine piston on the expansion stroke, the effect being a net energy loss. Fueling is cut off when this occurs.

Section 5.6.1
Operation

A dash mounted On/Off Switch is used to enable the Engine Brake option. DDEC10 will directly control the engine brake solenoids and turbocharger VGT position to produce the desired low, medium, or high braking power.

The following conditions must be met for engine brakes to be activated:

- Percent throttle <4%
- Driveline open – engine speed >1100 rpm
- Driveline closed – engine speed >800 rpm
- Road Speed > 0 mph (programmable)
- ABS not active
- Clutch pedal released (if equipped)
- Engine not fueling
- Engine not in PTO mode
- Torque converter in lockup (automatic transmission)

The following are features and options for Engine Brake:

- Cruise Control or Road Speed Limit with Engine Brake
- Engine Brake Disable
- Engine Brake Active
- Dynamic Fan Braking
- Clutch Released Input
- Service Brake Control of Engine Brakes
- Min. mph for Engine Brakes

Section 5.6.1.1
Service Brake Control of Engine Brakes

This option allows the engine brakes switches to be ON but not engage the engine brakes until the service brake is pressed.

Section 5.6.1.2
Cruise Control or Road Speed Limit with Engine Brake

The Engine Brake option can also provide Engine Brake capability when the vehicle is in Cruise Control or Road Speed Limit. For example, if the vehicle is going down hill in Cruise Control while the engine brake is selected, the ECU will control the amount of Engine Brake with respect to the Cruise Control set speed. The level of Engine Brake (low, medium, high) selected with the dash switches will be the

maximum amount of engine braking the ECU allows.

Each engine braking level has a hysteresis for actuating the engine brake or for deactivating the engine brake.

Section 5.6.1.3
Engine Brake Disable

The Engine Brake Disable option uses an input which is switched to ground whenever a vehicle system, such as a traction control device, does not allow engine braking to occur. This option is required for most automatic transmissions.

DDEC10 also supports the J1939 message to disable engine brakes (TSC1 command to source address 15).

Section 5.6.1.4
Engine Brake Active

The Engine Brake Active option uses a digital output that can be used to drive an Engine Brake Active lamp. This output is switched to battery ground whenever the engine brake is active.

Section 5.6.1.5
Dynamic Fan Braking

The Dynamic Fan Braking option turns on the cooling fan when the engine brake level is high and DDEC 10 fan control is enabled. This creates about 20 to 40 hp additional engine braking power depending on the size of the cooling fan. For additional information, refer to "5.10 Fan Control" , "Fan Controls."

Section 5.6.1.6
Clutch Released Input

The Clutch Released input will prevent the engine brakes from being turned on when the clutch is pressed. This input is required for use with manual transmissions. Refer to "4.1 Inputs" , "Inputs," for additional information.

Section 5.6.1.7
Min Vehicle Speed for Engine Brakes

This option will disable the engine brakes until a minimum vehicle speed is reached. A Vehicle Speed Sensor (VSS) is required. Refer to "3.9.7 Vehicle Speed Sensor" , "Vehicle Speed Sensor," for additional information.

Section 5.6.2
Installation

See Figure "Engine Brake for DDEC10" for a DDEC10 internal engine brake schematic.

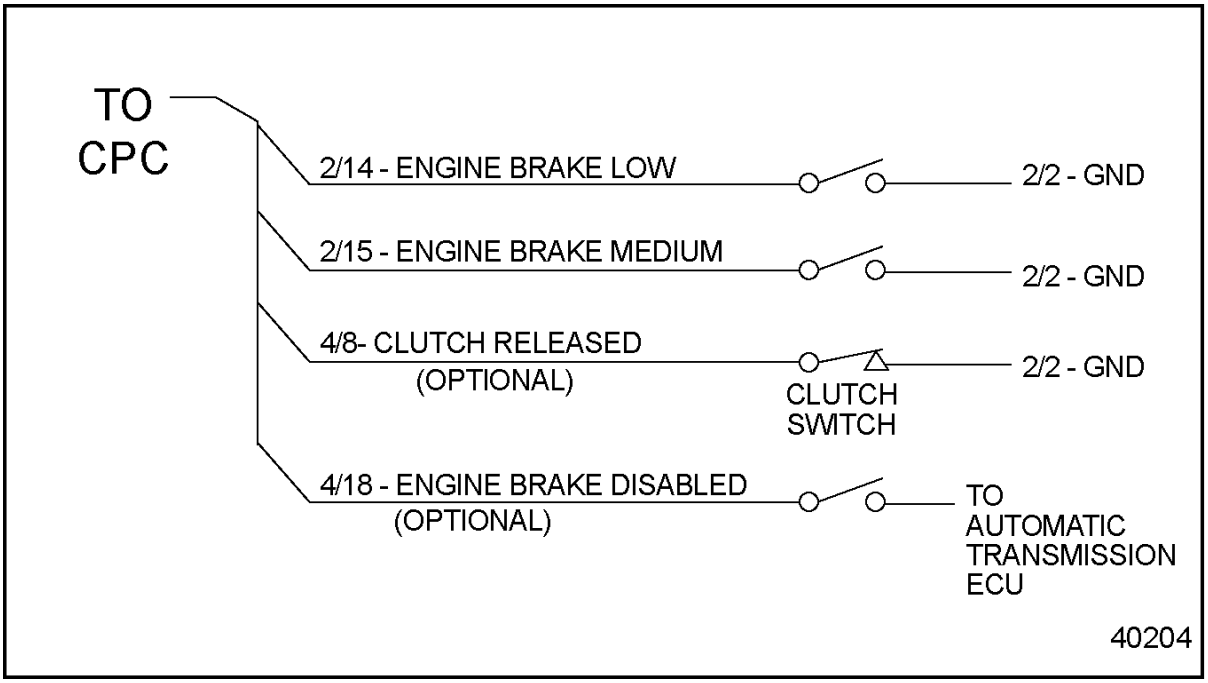

Figure 1. Engine Brake for DDEC10

Section 5.6.3
Programming Requirements and Flexibility

Engine Brake must be specified at the time of engine order. This enables the two digital outputs required in the MCM2. The Jake Brake configuration parameters are listed in Table "CPC2+ Configuration Parameter for Jake Brake Applications" .

CPC2+ Parameter Group	Parameter	Description	Options	Settings	Access
10	Engine Brake Configuration	Enables the type of engine brake required	0 = No Engine Brake 1 = Decompression Valve Only or Exhaust Flap Only 2 = Decompression Valve & Exhaust Flap 3 = Jake Compression Brake or Brake Gate	3	VEPS, DRS
		Mask determines which	0 = No Engine Brake 16 = Exhaust Flap Only 17 = Jake Brake 2nd Stage		

		device turns on for low braking	64 = Decompression Valve Only or Jake Brake 1st Stage 80 = Decompression Valve & Exhaust Flap 81 = Decompression Valve & Brake Gate or Jake Brake 3rd Stage		
10	Stage 1 Mask Engine Brake			64	VEPS, DRS
10	Stage 1 Factor Engine Brake	Factor determines the amount of low braking	0 – 100%	100	VEPS, DRS
10	Stage 2 Mask Engine Brake	Mask determines which device turns on for medium braking	0 = No Engine Brake 16 = Exhaust Flap Only 17 = Jake Brake 2nd Stage 64 = Decompression Valve Only or Jake Brake 1st Stage 80 = Decompression Valve & Exhaust Flap 81 = Decompression Valve & Brake Gate or Jake Brake 3rd Stage	17	VEPS, DRS
10	Stage 2 Factor Engine Brake	Factor determines the amount of medium braking	0 – 100%	100	VEPS, DRS
10	Stage 3 Mask Engine Brake	Mask determines which device turns on for high braking	0 = No Engine Brake 16 = Exhaust Flap Only 17 = Jake Brake 2nd Stage 64 = Decompression Valve Only or Jake Brake 1st Stage 80 = Decompression Valve & Exhaust Flap 81 = Decompression Valve & Brake Gate or Jake Brake 3rd Stage	81	VEPS, DRS
10	Stage 3 Factor Engine Brake	Factor determines the amount of high braking	0 – 100%	100	VEPS, DRS
			0 = No Engine Brake 16 = Exhaust Flap Only 17 = Jake Brake 2nd Stage		

10	Trans Mask Engine Brake	—	64 = Decompression Valve Only or Jake Brake 1st Stage 80 = Decompression Valve & Exhaust Flap 81 = Decompression Valve & Brake Gate or Jake Brake 3rd Stage	81	VEPS, DRS
10	Trans Factor Engine Brake	Factor determines the amount of high braking	0–100%	100	VEPS, DRS
13	4 18 DI Selection (Optional)	—	0 = Disable 1 = Enable Engine Door Bus 2 = Enable Engine Hood 3 = AGS2 PTO Feedback 4 = RPM Freeze 5 = Engine Brake Disable 6 = Fast Engine Heat-up Switch	0	VEPS, DRS
13	Eng Brake Switch Config	—	0 = Hardwired 1 = Info from J1939 255 = Not Available	0	VEPS, DRS
10	J1939 Steps Engine Brake	—	0 = Variable Controlled Brake 1 = 1 Step 2 = Low/High Steps 3 = Low/Med/High Steps 255 = Not Configured	2 or 3	VEPS or DRS
10	J1939 Engine Retarder Config	—	3 = Jake or Constant Throttle Brake 4 = Exhaust Flap 255 = Not Configured	3	VEPS or DRS
	ACC Mask Engine		0 = No Engine Brake 16 = Exhaust Flap Only 64 = Decompression Valve Only or Jake Brake 1st Stage		VEPS or

10	Brake	80 = Decompression Valve & Exhaust Flap 81 = Decompression Valve & Brake Gate or Jake Brake 3rd Stage	81	DRS
10	OI Mask Engine Brake	0 = No Engine Brake 16 = Exhaust Flap Only 64 = Decompression Valve Only or Jake Brake 1st Stage 80 = Decompression Valve & Exhaust Flap 81 = Decompression Valve & Brake Gate or Jake Brake 3rd Stage	64	VEPS or DRS

Table 1. CPC2+ Configuration Parameter for Jake Brake Applications

The parameters listed in Table "Cruise Control and Road Speed Limit Engine Brake Parameters" are for the Cruise Control and Road Speed Limit Engine Brake option.

CPC2+ Parameter Group	Parameter	Description	Options	Default	Access
10	Cruise Control Enable Eng Brk	Allows the engine brake to be used while on cruise control or the road speed limit if the vehicle exceeds the cruise set speed or road speed limit. Automatic engine brake with Cruise Control.	0 = Disable 1 = Enable	0 = Disable	VEPS, DRS, DDDL
10	Hi Eng Brk Max Cruise RSL Spd	CC/RSL vehicle-over-speed for engine brake stage 3 activation	0–48 km/h	10 km/h	VEPS, DRS, DDDL
10	Hi Eng Brk Min Cruise RSL Spd	CC/RSL vehicle-over-speed for engine brake stage 3 deactivation	0–48 km/h	6 km/h	VEPS, DRS, DDDL
10	Low Eng Brk Max Cruise RSL Spd	CC/RSL vehicle-over-speed for engine brake stage 1 activation	0–48 km/h	5 km/h	VEPS, DRS, DDDL
10	Low Eng Brk Min Cruise RSL Spd	CC/RSL vehicle-over-speed for engine brake stage 1 deactivation	0–48 km/h	2 km/h	VEPS, DRS, DDDL
10	Med Eng Brk Max Cruise RSL Spd	CC/RSL vehicle-over-speed for engine brake stage 2 activation	0–48 km/h	7 km/h	VEPS, DRS, DDDL
10	Med Eng Brk Min Cruise RSL Spd	CC/RSL vehicle-over-speed for engine brake stage 2 deactivation	0–48 km/h	5 km/h	VEPS, DRS, DDDL

10	Min Eng Spd for Engine Brakes	Minimum engine speed for Engine Brake operation.	0–4000 rpm	1100 rpm	VEPS, DRS, DDDL
10	Road Spd Limit Max Stage Num	Enables engine brake on road speed limiter. Engine brake will come on automatically if value >0.	0 = Off 1 = Low 2 = Medium 3 = High	0	DRS, VEPS

Table 2. Cruise Control and Road Speed Limit Engine Brake Parameters

The optional digital output listed in Table "Optional Digital Output for Engine Brakes" can be used to drive an Engine Brake Active Lamp.

CPC2+ Parameter Group	Parameter	Setting	Options	Default	Access
35	3 09 DO Selection	3 = Engine Brake Active	0 = Disabled 1 = Not Used 2 = AGS2 Backup Lamp 3 = Engine Brake Active 4 = Oil Temp High Lamp* 5 = FUSO Engine Brake Active Lamp*	0 = Disabled	VEPS, DRS

Table 3. Optional Digital Output for Engine Brakes

**Not Supported in NAFTA*

The parameter listed in Table "Service Brake Control of Engine Brakes Parameter" is for Service Brake Control of the Engine Brakes option.

CPC2+ Parameter Group	Parameter	Description	Options	Default
10	Service Brk Enable Eng Brakes	When this function is enabled, an input from the service brake is required in order to activate the engine brake.	0 = Disable 1 = Enable automatic engine brake when applied service brake 2 = Operator selection and service brake for engine	0 = Disable

	brake activation

Table 4. Service Brake Control of Engine Brakes Parameter

The parameter listed in Table "Minimum mph for Engine Brakes Option" is the Minimum Vehicle Speed needed for engine braking to occur.

CPC2+ Parameter Group	Parameter	Description	Options	Default
10	Min Road Spd Eng Brk Operation	The minimum vehicle speed required before engine braking will occur.	0–200 KPH	0 KPH

Table 5. Minimum mph for Engine Brakes Option

Section 5.6.3.1
Evobus 5-Stage Retarder

A 5-Stage Retarder Feature is available for Evobus. The CPC processes digital input signals coming from a 5-stage retarder lever that is wired in the following manner:

2 14 DI Selection	Stage #1
2 15 DI Selection	Stage #2
2 08 DI Selection	Stage #3 (remote throttle or fast engine heat up switch can not be used)
1 17 DI Selection	Stage #4 (throttle inhibit input can not be used)
2 13 DI Selection	Stage #5.(fan override switch can not be used)
1 10 DI Selection	Off position monitoring input

The retarder torque request is mapped in equal increments according to the lever position (e.g. stage #1 equals 20%, stage #2 equals 40 %,etc.). The requested retarder percentage is transmitted on the J1939 link to the Retarder ECU using the message ERC1, SPN1716 Retarder Selection, non engine. The source address of the message is set to 0x21 whenever the Retarder Lever Enable Parameter is calibrated.

Note: When using multiplexed EBM switches, enabling of the DiFlex13 and DiFlex14 inputs is not necessary.

Input State	Parameter	CPC2 Pin	Retarder Selection
Stage 0 (off):	1 10 DI Selection	1 / 10	0%
Stage 1:	2 14 DI Selection	2 / 14	20%
Stage 2:	2 15 DI Selection	2 / 15	40%
Stage 3:	2 08 DI Selection	2 / 8	60%
Stage 4:	1 17 DI Selection	1 / 17	80%
Stage 5:	2 13 DI Selection	2 / 13	100%

Table 7. Retarder Selection and Function

Parameter Group	Parameter	Description	Options	Default	Access

13	Evobus Retarder Level Enable	Evobus 5 stage retarder switch enable	0=disable, 1=enable	0	DRS, VEPS
13	1 10 DI Selection	Configuration input DiFlex20	0=disable, 1=enable AUX shutdown, 2=FUSO Accelerator switch, 3=Evobus retarder lever stage0	0	DDDL 7.X, DRS, VEPS
13	2 14 DI Selection	Configuration input DiFlex13	0=disable, 1=engine brake low, 2=Evobus retarder lever stage1	1	DRS, VEPS
13	2 15 DI Selection	Configuration input DiFlex14	0=disable, 1–engine brake high, 2=Evobus retarder lever stage2	1	DRS, VEPS
13	2 08 DI Selection	Configuration input DiFlex16	0=disable, 1=Remote-Throttle enable, 2=Fast Engine Heat Up Switch, 3=Evobus retarder lever stage3	0	DDDL 7.X, DRS, VEPS
13	1 17 DI Selection	Configuration input DiFlex07	0=disable, 1=throttle inhibit, 2=Evobus retarder lever stage4	1	DRS, VEPS
13	2 13 DI Selection	Configuration input DiFlex12	0=disable, 1=fan override switch, 2=Evobus retarder lever stage5	1	DRS, VEPS

Table 8. Evobus 5-Stage Retarder Option

Section 5.6.4
Interaction with Other Features

DDEC 10 will respond to requests from other vehicle systems via SAE J1939 Data Link to disable the engine brakes.