Section 5.21
Progressive Shift

The Progressive Shift option offers a high range maximum Vehicle Limit Speed to encourage the use of high (top) gear during cruise operation. Progressive Shift encourages the driver to upshift from a lower to a higher gear prior to reaching the engine's governed speed. The resulting lower engine speed in high range should result in improved fuel economy. Progressive shifting techniques should be practiced by every driver, but can be forced if fleet management considers it necessary. The benefits from progressive shifting are best realized during stop-and-go driving cycles.

The rate of acceleration will be limited below the programmed mph to encourage up shifting.

As the driver accelerates beyond a specified mph speed, the rate of engine acceleration is limited in higher RPM, to encourage (force) the operator to select the top gear.

- Progressive Shift should be used with 2100 RPM rated engines in fleet applications where the reduced driveability will not impede trip times or productivity.
- Progressive Shift is not compatible with automatic transmissions.

Note: Progressive Shift should be selected only when Spec Manager is run. Progressive Shift selection without Spec Manager could result in mismatched equipment, poor fuel economy, and poor performance. Your local Detroit Diesel Distributor will run the program.

Section 5.21.1
OPERATION

The Progressive Shift option has two sets of low ranges and one set of high range parameters, which are programmable with DDDL, DRS, or VEPS. Refer to "5.21.6 PROGRAMMING FLEXIBILITY" . The example shift pattern chart (see see Figure "Progressive Shift Chart - Represents Default") reflects default values when the Progressive Shift option is chosen and the low and high gear parameters are not modified.

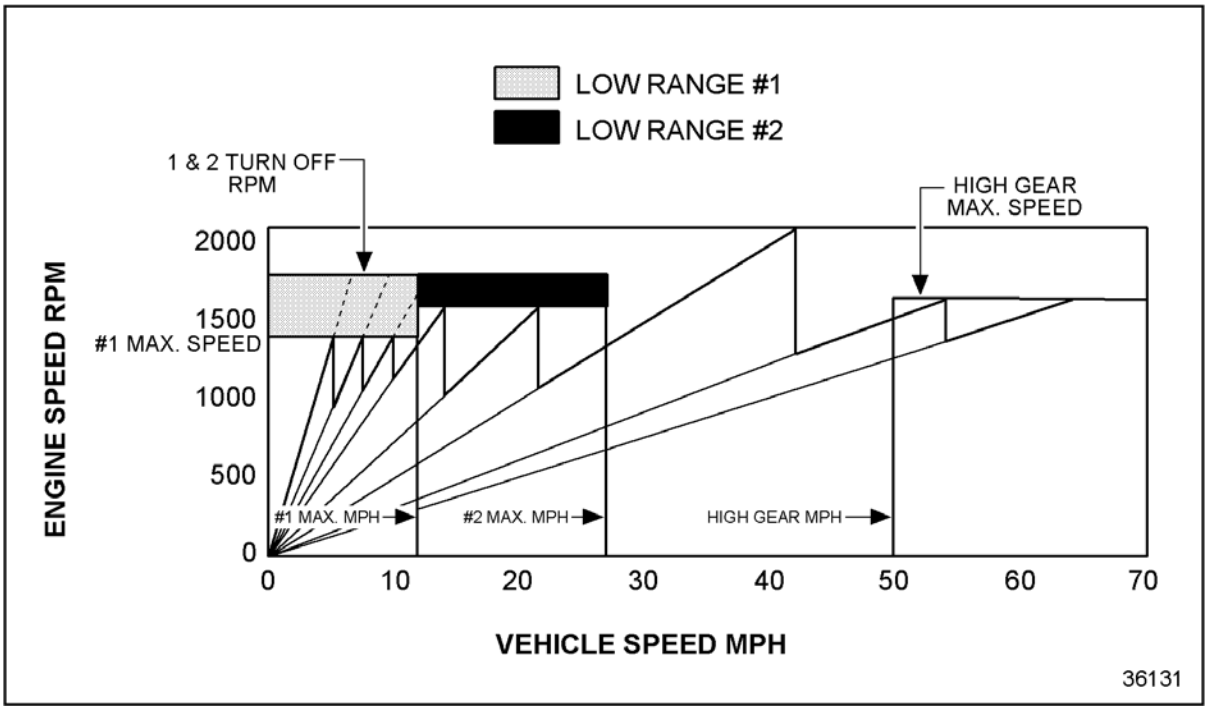

Figure 1. Progressive Shift Chart - Represents Default

An alternate use for the Progressive Shift option would be to encourage a driver (or force him/her) into top gear. Normally this condition exists when the gearing selected at the time of order allows a Vehicle Limit Speed to be reached in a gear lower than top gear. See see Figure "Progressive Shift Corrects Problem with High and Low Gears Modified" .

Section 5.21.2
LOW RANGE #1

The low range #1 area of operation is bound by a maximum vehicle speed, a maximum engine speed and a maximum turn-off speed. In the first illustration (see see Figure "Progressive Shift Chart - Represents Default") the default values are 12 mph (approximately 19.3 kmh), 1400 RPM and 1800 RPM, respectively. During vehicle acceleration, when the vehicle speed is below selected maximum vehicle speed for range #1, the maximum rate the engine can be accelerated is reduced to 33 RPM/s. During light load operation, the driver will feel this and be encouraged to up-shift to regain his/her rate of acceleration. If the engine continues to be operated above the low range #1 maximum speed, it may eventually reach the low range #1 turn-off speed. When the low range #1 turn-off speed is obtained, no additional increase in engine speed will be allowed. At this point, the transmission must be up-shifted if the vehicle is to continue accelerating.

Section 5.21.3
LOW RANGE #2

The low range #2 area of operation is bounded by a maximum speed (mph), a maximum vehicle speed and a maximum engine turn-off speed. In the first illustration (see see Figure "Progressive Shift Chart - Represents Default") the default values shown are 27 mph (approximately 43.5 km/h), 1600 RPM and 1800 RPM, respectively. (The lower vehicle speed boundary is the low range #1 maximum speed value.)

The engine acceleration rate for low range #2 is 25 RPM/sec.

Section 5.21.4
HIGH RANGE

Two high range parameters should be selected; a high range maximum vehicle speed (mph) and a high range maximum engine speed (RPM). The default values shown in the first illustration (see see Figure "Progressive Shift Chart - Represents Default") are 50 mph (approximately 80.5 km/h) and 1650 RPM, respectively. Once the high range maximum engine speed is attained, the engine will not be allowed to operate above the high range maximum engine speed. This is meant to encourage up-shifting to high gear in order to increase vehicle speed (see see Figure "Progressive Shift Corrects Problem with High and Low Gears Modified"). Spec Manager should be used if the HIGH GEAR mph is set such that it reduces the vehicle speed and the engine mph; this limit will not work as desired.

Note: The HIGH GEAR maximum engine speed could change the maximum Vehicle Limit Speed if the high gear maximum engine speed (RPM) limits the Vehicle Limit Speed. With Progressive Shift enabled, the high gear RPM limit overrides the rated speed of the engine rating.

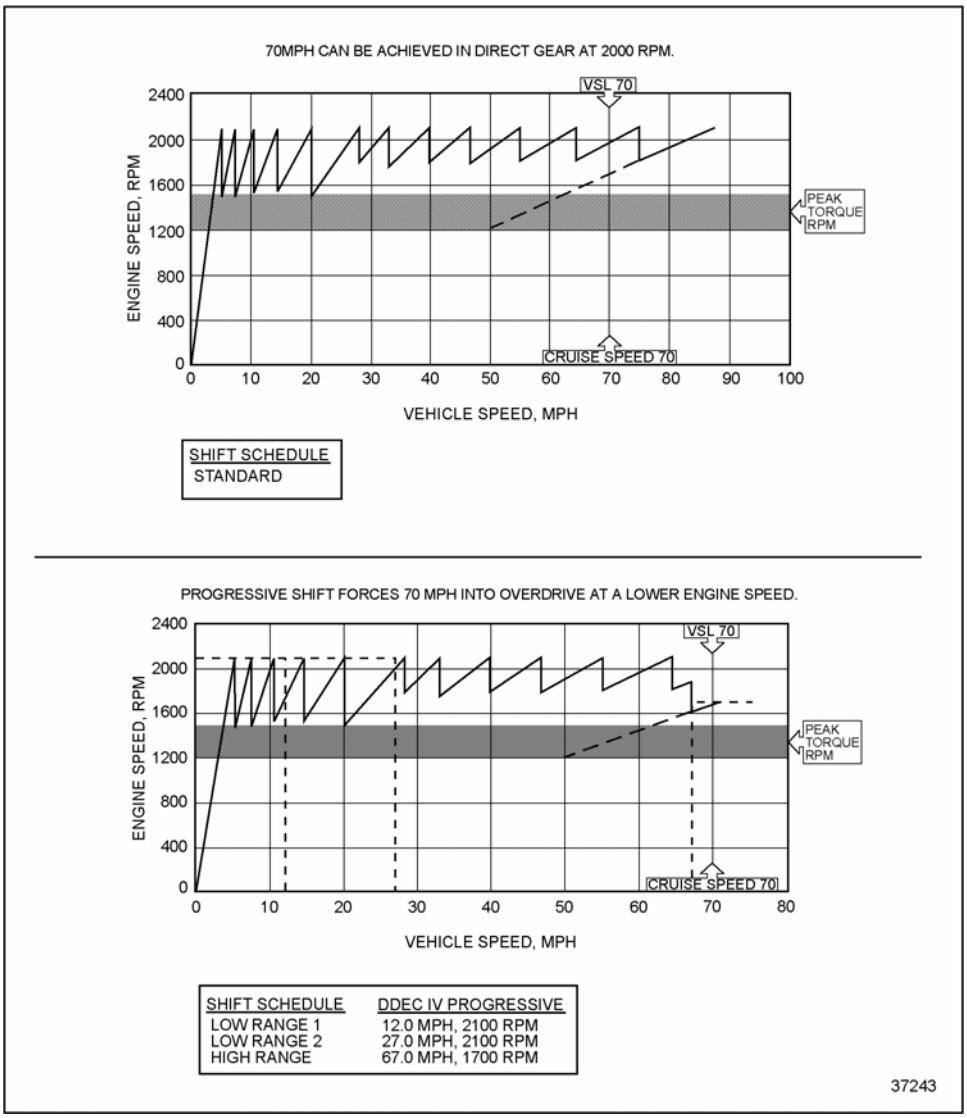

Figure 2. Progressive Shift Corrects Problem with High and Low Gears Modified

Section 5.21.5
INSTALLATION INFORMATION

A Vehicle Speed Sensor (VSS) must be installed. It must be enabled, and all proper calculations entered into the ECU with DRS, DDDL, or VEPS. Refer to "3.9.7 Vehicle Speed Sensor" , "Vehicle Speed Sensor," for additional information.

The Spec Manager program should be utilized to determine maximum vehicle speed for low range #1 and #2. If the maximum engine speed and maximum vehicle speed coincide, the Progressive Shift logic may not correctly compensate faster or slower on either side of the maximum vehicle speed. Spec Manager can alert the programmer to this dilemma and advise accordingly on maximum vehicle speed set points.

Example: If the maximum vehicle speed #1 was 12 mph (approximately 19.5 kmh), the Progressive Shift logic may not determine if the maximum engine speed is 1400 or 1600 RPM. Spec Manager would advise moving the maximum vehicle speed #1 plus or minus 2 mph (approximately 3.2 kmh) to eliminate any possible confusion.

Section 5.21.6
PROGRAMMING FLEXIBILITY

Enabling all areas required for Progressive Shift can be performed with DDDL, VEPS, or DRS.

The Progressive Shift option has two sets of low gear and one set of high gear parameters as listed in Table "Progressive Shift Programming" .

Parameter Group	Parameter	Description	Range	Default
23	Progressive Shift Enable	Indicates the enabled/disabled status of the progressive shift feature.	0 = Disabled 1 = Enabled	0 = Disabled
23	PS Low Gear 1 Max Vehicle Spd	Sets the low gear #1 turn off speed.	0–250 km/h	28.96 km/h
23	PS Low Gear 1 RPM Limit	Sets the low gear #1 RPM limit.	0–4000 RPM	1600 RPM
23	PS Low Gear 1 Max RPM Limit	Sets the low gear #1 maximum RPM limit.	0–4000 RPM	1600 RPM
23	PS Low Gear 2 Max Vehicle Spd	Sets the low gear #2 turn off speed.	0–250 km/h	72.42 km/h
23	PS Low Gear 2 RPM Limit	Sets the low gear #2 RPM limit.	0–4000 RPM	1700 RPM
23	PS Low Gear 2 Max RPM Limit	Sets the low gear #2 maximum RPM limit.	0–4000 RPM	1700 RPM

23	PS High Gear On Vehicle Spd	Sets the high gear turn on speed.	0–250 km/h	72.42 km/h
23	PS High Gear RPM Limit	Sets the high gear RPM limit.	0–4000 RPM	1800 RPM

Table 1. Progressive Shift Programming

Section 5.21.7
INTERACTION WITH OTHER FEATURES

When Progressive Shift is enabled DDEC10 will treat "HIGH GEAR RPM LIMIT" as the rated speed of the engine. Vehicle maximum speed or maximum Cruise Control settings can not be set higher then engine speed will allow based on the VSS data entered.