PROGRESSIVE SHIFTING AND UNDERSTANDING THE ISX ENGINE TECHNOLOGY

Driving Cummins ISX engines requires drivers to understand some very important features in order to get the best performance and fuel economy. It is important that you make these features work for you.

POWER, TORQUE AND RPMs

The power and torque curves have been designed to operate best at lower RPMs. The key to operating them efficiently and effectively is to operate them in the top gear as much as possible. Up shift quickly to get to top gear fast, and stay there as long as possible. When climbing grades, do not downshift too early. Allow the engine to pull down. The ISX engine has peak torque available as low as 1000 RPMs. A good rule of thumb is if you can top the grade without the RPMs falling below 1000 RPM, stay in top gear. For steep, long grades downshift at around 1300 RPM. The older 370 hp N14 engine trucks ran at 65 mph at 1600 RPM, while the newer 430 hp ISX engine trucks run at 1502 RPMs. The reason is that the older N14 trucks have a 3.90 rear gear ratio and the 430 hp ISX has the 3.70 rear gear ratio. Some of the newer Ultra Shift trucks are now coming in with a 3.55 rear gear. This puts the truck at the optimum torque and performance range of the engine at 1450 RPM.

LOAD BASED SPEED CONTROL (LBSC)

The first feature that impacts your driving the ISX is Load Based Speed Control (LBSC). This feature works in gear 1 thru 8 only. It was designed to encourage drivers to shift through the gears quickly, and at low RPMs. Under normal or light demands on the engines, LBSC is designed to limit the engine RPMs to its most efficient range. The ISX engine is most efficient when operating at 1450 RPM. The engine is least efficient when operating at or near 1800 RPM when shifting up through the gears. The ISX is programmed to limit RPMs to 1500 in gears 1 – 7 and 1600 in gear 8 when there is a low power demand on the engine, i.e. when operating on flat terrain or with empty or lightly loaded trailers.

If the engine is demanding high levels of power in these gears, the operating range will be extended to 2000 RPMs. While it is understood that the engine will NOT be operating in its most efficient range, there are situations where drivability would be impacted severely by limiting the operating range to lower RPMs. Examples include entering an interstate highway via a steep on-ramp or climbing steep grades.

GEAR DOWN PROTECTION

The next feature that impacts your driving the ISX is Gear Down Protection. This feature is designed to limit 9th gear to 55 mph, in most cases. It will let you get to 62 mph under some short-term conditions, but will move you back to 55 again. You must not attempt to drive in 9th gear; you must use 9th gear as a transition gear.

ROAD SPEED GOVERNOR

The last feature that impacts driving the ISX engines is the Road Speed Governor. In 10th gear, you are limited to 68 mph. These engines will be very strong in 10th gear, so get there quickly and stay there as long as possible. Remember not to down shift before dropping to 1200 or lower.

SMART TORQUE

The Cummins ISX engine is equipped with a feature called Smart Torque. Smart Torque is available only in the top two gears (9 and 10). When operating in top gear, you will have 100 ft lbs more torque.
available. Remember, to operate your engine most efficiently, get in top gear as soon as possible and stay in top gear as long as possible. Your reward for staying in top gear is MORE available torque and BETTER performance.

There are many other driving suggestions, but if you focus on the above ideas, the truck will perform better and the miles per gallon will be very good.

Other suggested driving methods include starting out without using the accelerator pedal; if in the proper start gear, just let your foot off the clutch and the truck will start out. 4th gear is not the proper start gear for a loaded truck; if you start out in the lower gears, you will start out more smoothly. Don’t let the engine warm up too long; once it starts to idle smooth, you can start moving. In temperatures below 10 degrees Fahrenheit, make sure engine is at 130 degrees to avoid pulling jelled fuel into the fuel filter and stalling the truck. These engines run hotter (up to 225 degrees) than older N14 engine trucks. The ECM runs the fan and turbo. They may seem to be cycling on or off at odd times. This is different, but normal. Reduce your idle as much as possible, get a fuel fired bunk heater installed for winter and when you idle there is no need to bump up the idle on the trucks for heat or cooling.

These ISX engines have more power and better drivability features than our N14s, but they require that you understand how to drive them properly to get the full benefits of those features. Please try to follow these suggestions. The fuel manager can provide further information if needed.

Remember, safety first and always. Control your speed and remember that most serious accidents are the result of going too fast for conditions. Don’t let that happen to you. Be careful and cautious at all times and do not practice aggressive driving. When you are descending a hill, start down one gear lower than you climbed up the same hill. When in doubt, start lower than you project. ALWAYS DRIVE SAFELY.

**SHIFTING TECHNIQUES/PROGRESSIVE SHIFTING**

It is important that we work to drive our trucks as efficiently as possible in order to conserve fuel and get extended engine life. Please work on the following areas of professional driving techniques.

**Start out in whatever gear the truck will begin to move without touching the throttle.** This is always the proper starting gear. If you have to push the throttle then the gear is too high. You will be slipping the clutch to get the truck in motion. Slipping the clutch will reduce the life of the clutch, increase fuel consumption and is not the most efficient way to put a truck in motion.

**Shift to the next highest gear as soon as the truck can handle the load.** Aggressive driving is not needed; with high torque low RPM engines, there is no need to wind the truck out in each gear, bump the governor and then shift. This is not the fastest way to get the truck up to speed. By using the progressive shifting method, you can get the truck up to highway speed on average four seconds faster then maxing the RPM for each gear. The RPM shift points will change on the truck depending upon load, terrain and weather. It is smoother and easier on you and the truck to shift at lower RPMs in the lower gears and gradually go higher with more RPM for each gear as you go up.

You should get to top gear as quickly as you can and stay there as long as you can. The best fuel economy is always in top gear. The new ISX engine trucks provide 100 ft lbs more torque in top gear than in 9th gear. Don’t down shift too soon on a hill; the max torque of the ISX is from 1250 to 1650
RPM. Above 1650 RPMs, over revving of the engine reduces the output torque. When climbing a hill do not downshift from 10th until around 45 or 50 miles per hour. 9th gear max speed with the ISX is 55 mph, and 62 if heavy and on a hill. If you downshift at 65 on a hill you most likely will be at 55 prior to the engine fueling and starting to pull.

Progressive shifting basics are as follows:

- Start in whatever gear the truck will begin to move without the need for any throttle
- Get to the next highest gear as soon as the truck can handle the load
- Get to top gear as quickly as you can
- Stay in top gear as long as you can

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<thead>
<tr>
<th>Gear</th>
<th>RPM to up shift</th>
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<td>1</td>
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<td>1500</td>
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<td>9</td>
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When you are going up a hill and feel the urge to downshift – wait. The engine can drop as low as 1000 RPM without lugging; never downshift from 10th until you are below 55 mph or you will end up there anyway. This is not referenced as lugging. Often the engine will pick back up on its own and no shift will be needed. This saves fuel and work on your part.

The Ultra Shift will use these techniques and will out pull a driver who doesn’t understand the ISX and how to shift properly. When driving an Ultra Shift, LBSC will not be in effect while in Drive but will take control in Manual. The transmission will provide optimum performance depending on throttle position. When starting out, the truck will go up through the gears and get up to speed quickly when lighter on the throttle. Mashing it to the floor the truck will run higher RPMs and take longer to shift between gears, increasing the time to get up to speed.

**IDLE**

The biggest waste of fuel is excess idling. There is no need to let the truck idle if the temperature is above ZERO. Please shut it off. Shut if off when you are in the terminal, the truck stop, fueling, the customer, etc. Professionals do NOT waste fuel idling. This is an old driver’s habit that must change in today’s environment and economy. Idling the truck while the driver is inside is for driver comfort only. Why wait five minutes for the engine warning light to flash, then shut down the idle override to get out
and fuel, eat, load, unload etc? If you are trying to save time, but you keep doing this all day, how much time will you waste? There are 20 minutes wasted on the four items above alone. That is all the time you would save by driving faster in an entire day.

**OVER SPEEDING THE ENGINE**

Engines have been lost because drivers went downhill in too low of a gear and overran the engine.

1. **Always** downshift at the top of the hill to the lowest gear possible.
2. **Never** go down a hill in Neutral or try to downshift while speeding downhill.
3. **Always** plan ahead. A professional never gets out of control.