Fine tuning locomotive operation

The factory settings of the D408SR normally provide good performance for most locomotives in O-Scale or G Gauge. You may want to improve or fine tune performance by adjust the starting characteristics or top speed .

There are four CVs that define:
- ✎ The voltage at which the motor starts
- ✎ How much 'kick' the motor gets to start it turning
- ✎ The maximum speed
- ✎ The response characteristics or 'speed curve'.

Start Voltage - CV2 (Vstart):
Before programming the start voltage we recommend programming CV65 (Kick Start) to zero. Kick start is used to overcome the 'stiction' of the motor by giving it a voltage 'kick' when starting from a stop. We don't want it getting in the way of setting Vstart.

We prefer using Operations Mode Programming (Program on the Main) to set CV2 so the locomotive is **just able to maintain movement** at speed step 1 . You can also use the programming track... it just takes a bit longer to find the right setting for CV2.

Kick Start - CV65
After the start voltage is set . Program CV65 to provide a smooth and reliable start when you advance the throttle from stop. The high frequency drive pulses of the D408SR act more like smooth DC voltage than the low frequency pulses of a standard decoder making it harder for the decoder to overcome that starting 'stiction' of the motor. This is why the Kick start CV is needed. If the value is too low the motor will not start moving reliably, too high and the locomotive will lurch or leap as it starts.

Vmax - CV5:
If your locomotive runs too fast you can use CV5 to lower its maximum speed. Setting CV5 to 255 uses the maximum possible voltage to run the motor when full speed is requested. If you set CV5 to a smaller value you can reduce the top speed. A value of 128 will yield approximately ½ full voltage to the motor at top speed. 192 will provide about ¾ full voltage. All speeds from the middle speed step to the maximum will be proportionally reduced (see diagram below). If CV5 is set to 0 the decoder will use 255 for maximum speed.

Vmid - CV6:
CV6 determines how the motor responds through its middle speed ranges to advancement of the throttle. If you set CV6 lower than half the maximum speed you'll have smaller increases in motor speed through the lower speed ranges. Then, as you hit the upper speed ranges there will be larger increases between speed steps. In the diagram below you can see this best illustrated by the factory default line. If you set Vstart larger than 0 you'll will most likely want to raise Vmid so a reasonable slope is maintained in the 'speed curve'. If CV6 is set to 0 the decoder will use 70 as the value.

Motor Drive Frequency - CV9:
When CV9 is set to 0 the Silent Running™ motor drive frequency of 15,625 Hz is used. If a value of 1-255 is programmed into CV9 the motor drive frequency will be calculated by the formula: Frequency = 1/(CV9 * .000128).

Motor 'Speed Curve'