MU'd Locomotives Speed Variations

When two locomotives are placed into a consist, they will both respond to the CONSIST speed value sent by the throttle.

It is important to understand that the throttle does not send a motor voltage value to the locomotive motor. Instead it sends a speed step value. The default throttle setting is 28 speed steps. The values are 000 [stop] to 028 [maximum speed]. On the T5000 throttle, a speed value of 6 means speed step 6 is being transmitted. The decoder decides what motor drive voltage is generated. Locomotives in a CONSIST are sent the exact same speed step value.

Lets take a look at some causes of speed variations in a CONSIST as it runs around the railroad.

Different Locomotive Types – GP7 and F3 from USA Trains will run at different speeds given the same speed value. Solution: program the fast locomotive's decoder to run slower.

Motor Variations – The motors used in locomotives are not precision motors, nor are they matched to each other for a loco having two motor. There can be differences in speed between two locomotives of the same type and age.

Different Models of AirWire Decoders – there have been multiple generations of AirWire decoders released since 2003. There is no guarantee that older decoders will operate exactly the same as newer decoders. Again, if the is a mix of old and new, program the faster locomotive to run slower.

New Locomotives Mixed with Old Locomotives – this seems obvious, but it is often overlooked. An older locomotive will always operate differently than a new version of the same locomotive.

Locomotives That Have Not Been Cleaned Or Lubricated – older locomotives have probably never been cleaned or lubricated since they left the factory. Lack of lubrication can cause binding of the gears. Solution is to clean and lube the gears at least once a season. The amount of gunk that accumulates over a season is impressive.

Out-Of-Gauge Wheels – this is more common than you might think. Since the wheel flanges are very deep, out of gauge wheels don't usually cause problems. However, running an out-of-gauge loco with an in-gauge loco can result in noticeable speed variations. The out of gauge wheels can create more friction especially around tight radius curves and turnouts. As a result, the loco will slow down in these areas. Solution is to properly gauge the wheels.

Out of Gauge Track – this is like the out of gauge wheels issue. The same result will occur. Solution is to ensure the track is gauged correctly.

Mechanical Interaction Of The MU's Locomotives – we see this a lot when we visit a railroad. It usually starts with a brief slowdown of one of the locomotives – the lead loco for example. The slowdown is usually caused by track conditions. This results in the trailing locomotive, running up against the lead loco and push it. Then the lead loco speeds up and begins to pull the trailing loco. They go down the track alternately pushing and pulling. The resultant speed variations can be heard and seen in the rolling stock. Surprisingly, changing the order or the physical orientation of locomotives can increase or decrease this interaction. The solution is to set the trailing locomotive's speed to be slightly less than the lead locomotive. Let the lead locomotive always be slightly pulling the trailing locomotive. This is done by programming the trailing locomotive to run a bit slower at the same throttle speed step value.

How to Change The Loco Speed For A Given Speed Step Value – [Excerpted From G4 User Guide] Using CV2, CV6 and CV5, you can match the speeds of two or more different locomotives. One important consideration is to determine which locomotive in a consist is the slowest. It is to this slow locomotive that you will match the other members of the consist. Always match a locomotive to the slowest member of the consist since we cannot make a slow locomotive run faster than its top speed. There are many examples given in the G4 User Guide. A similar discussion is in your Drop-In User Guide.

Link to G4X User Guide: http://cvpusa.com/doc_center/r3_MAY20_G4DecdrMan_44pg_WEB.pdf