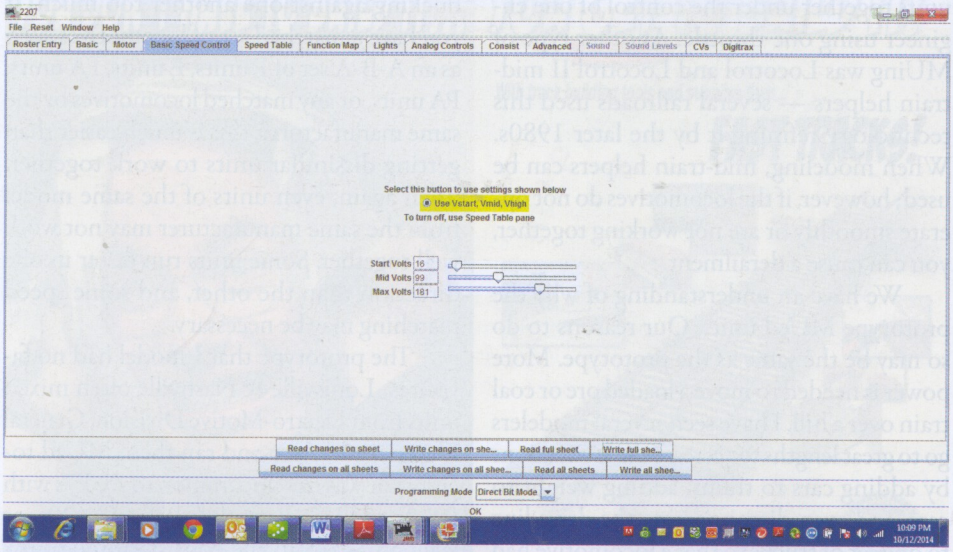
Above: **The Worthville turn returns to DeCoursey yard lead by a three-unit lash-up headed by U28B 2502, GP40 3009, and GP35 1117.**

friends who are prototype engineers tell me that EMD and GE units "load up" differently and that at a given throttle position, they pull differently. This makes for an interesting proposition: if different units on the prototype operate differently, why bother getting units to speed match? The answer to that question lies within the desires of the individual. How much bucking and pushing can you tolerate?

The first step that I recommend before setting up a series of units in an MU is to match the speeds of all units that will be in the consist. I have observed and tried several methods over the years. Our goal is to have all units within the consist work together as if they were one. The approach that makes the most sense is to me was written by Bill Beranek and posted on the North Colorado Model Railroad Club website: http://www.ncmrc.org/howto/Speed_Matching DCC.pdf

Bill's approach takes the shortest distance between two points. I will summarize his approach as well as add some of my preferences: Determine the maximum speed desired and set all locomotives to run at that speed at full throttle. Set each locomotive just to begin moving consistently at the first notch of the throttle. Once these two settings are made, the locomotives will be speed matched. Now for the details, read below.

First, run the locomotives for a period of time to warm up the mechanism so that they are running freely. A cold set of gears and motor do not work as freely as units that have been run and are "limbered up." Then, temporarily disable several functions that may compensate for a sticky mechanism: BEMF (CV10), V-Start (CV2), V-Max (CV5), and V-Mid (CV6), acceleration rate (CV3) and deceleration rate (CV4). Check to see if you are operating on 14, 28, or 128 speed steps. It is best if you can operate on 128. If your system or some of the decoders limit you to something less, use the highest setting available.



Above: **DecoderPro start voltage, max voltage and V-mid.**

To speed match, you will need a method to measure the speed of the locomotive. You can do this with a stopwatch on a pre-measured stretch of track or use any one of the commercially available speed traps. A speed trap will be much more accurate because it has a faster reaction time than we do. I have had no desire to buy a speed trap for any reason other than for this application. I think it would be a good investment.

If you do not have an electronic speed measuring device, you can use the following information to measure the speed by timing how long it takes to travel between two points. Miles per hour (MPH) = 3,600 (seconds/hour)/ Δt (lapse time in seconds between mile markers). So, if it takes 60 seconds (a mile a minute), you are traveling at 60 m.p.h. That is how the old hands measured their speed before the days of speedometers. As a modeler, we want to measure scale speed over a scale mile (smile). Take 5,280 feet per mile divided by your scale factor (22.5 for G, 48 for O, 64 for S, 87 for HO, 160 for N, 220 for Z, and so forth). In HO, a smile is about 60 feet, 8¼ inches. Not many have that much space available. Therefore, if we can find 10 feet or so, we can change the formula above to measure speed.

In general for any scale: MPH = $[(3{,}600 \times D/(5{,}280/SF)]/\Delta t$, where SF is your scale factor (87 for HO), D is the distance between start timing and stop timing in feet (length of speed trap), and Δt is the lapse time between the two points above in seconds.

For example, if I have a distance of 10 feet in HO and the lapse time is 9.25 seconds, I can substitute the numbers and calculate the speed as MPH = $[(3{,}600 \times 10/(5{,}280/87)]/9.25 = 64.1$ mph, more or less.

Run each locomotive through your speed trap at a speed higher than you would normally run. This will help you find the slowest locomotive, assuming CV5 has been disabled. You can adjust downward the max speed of faster locomotives but cannot make a slower locomotive run faster.

Decide what you want the maximum speed to be; is it 70 mph, 60 mph, 55 mph or something else? Then set V-Max (CV5)