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UNITED STATES DISTRICT COURT

FOR THE NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

ROBERT JACOBSEN, Plaintiff, v. MATTHEW KATZER, et al., Defendants.	No. C-06-1905-JSW **DECLARATION OF ROBERT JACOBSEN IN SUPPORT OF OPPOSITION TO DEFENDANTS' MOTION FOR PARTIAL SUMMARY JUDGMENT** Date: Fri., December 4, 2009 Time: 9:00 a.m. Courtroom: 11, 19th Floor Judge: Hon. Jeffrey S. White

I, Robert Jacobsen, have personal knowledge to the facts stated herein and hereby declare as follows:

I am a party to this action. I am submitting this Declaration in Support of the Opposition to Defendants' Motion for Partial Summary Judgment.

1. I created the foundation for what has become the DecoderPro program to make it easier for model railroaders to configure ("program") the decoders that control their model locomotives. Model railroaders do this by placing specific values in “Configuration Variables” (CVs), which the decoder then uses to control how its features operate. Careful control of these features allows model railroaders to better recreate ("model") the prototypical real world in miniature. Model railroading is not just about creating static display models, but about creating a model of an entire railroad, including locomotives that move realistically going up and down hills with large and small trains. Even small differences in details such as locomotive lighting and sound are important to achieving the desired effect. All these details are controlled by decoders, which in turn are configured by CVs. DecoderPro helps model railroaders configure decoders to do a better job of modeling reality, by using the insights of decoder definition authors to better explain what each decoder's configuration variables do and how to set them.

2. Every configuration variable contains 8 bits of information. Those can be used to control the decoder in several ways.

3. The simplest way is for a single configuration variable to contain a number that controls some specific option. For example, CV 1 contains the number for the locomotive’s address. The 8-bit contents of a CV can express any number from 0 to 255.

4. Not all options are controlled this way, however. Some options require more information than fits in one CV, since a single CV can only hold the numbers from 0 to 255. For example, the primary address has to be a small number, but real locomotives often have four-digit numbers painted on them. To allow those larger numbers to be used as addresses, the NMRA specifies that CV 17 and CV 18 can be used together to make a larger address number. For another example, a “speed table” can be defined to change the way that the motor responds to different settings of the throttle. This table uses many CVs, sometimes as many as 28, but they are all configuring a single operation of the decoder.

5. Sometimes a single CV also controls more than one option. CV 29, for example, consists of a number of independent bits, each of which turns an option on or off. The least significant

bit sets whether the voltage is positive or negative to go forward; the next bit sets how fine the speed control is (14 steps or 28 steps); the next specifies whether you want the decoder to try to work on a DC (old style analog voltage) layout; etc. As another example, CV 19 has one bit to control forward or backward, along with a 7-bit number to control another operation.

6. While writing the first decoder definitions, I considered several ways of organizing them. I wanted to write them in a way that best expresses how model railroaders think about programming their decoders, best expresses the technical information to the DecoderPro program, and is easiest to maintain and extend. I made multiple drafts of different formats, talked to several people about possibilities, and even implemented two of them for testing.

7. I first wrote a CV-centered organization. Each of the 8 bits of each CV was documented in turn. From this, the program could display those bits and allow the user to set them as desired. This worked well for CVs which contain, for example, 8 bits that each turn on or off a different feature.

8. The problem with this is that most of the time, the user is not interested in individual bits. They want to, for example, set a number for the address or a volume, which uses multiple bits. Having to work with individual bits was a very abstract way of expressing this. Users would have to know which bits to set for the desired decimal number, etc.

9. Next I tried a "grouped-bit" approach. Within each CV, the file could describe a group of bits, anything from 1 to 8. The group could then be described in terms of, for example, decimal number, or a hexadecimal (computer-efficient coding), or as individual bits.

10. This worked better, but was still confusing to the users when a number has to be stored in more than one CV. People still had to manually handle the parts in those multiple CVs. More importantly, this form wasn't communicating with the users in the ways they think about decoders. They think in terms of "set the volume", "set the acceleration value", etc., not in terms of numbers.

11. So I rewrote the draft from something that was primarily oriented around CVs, to something that was primarily oriented around "variables". A variable is something that I, or another

definition author, thinks the model railroader might want to set in a particular way. Setting that might involve one bit in one CV, or multiple bits across multiple CVs; the user doesn't know, and doesn't want to know. It's the decoder definition author's job to figure out what are the right variables, and then write down what values users might want to set those to, and what values will then be put in what CVs.

12. That means JMRI decoder definitions often have multiple "variable" elements that name the same CV. They're talking about different variables inside that CV, which are usually (not always), just different sets of bits in the CV.

13. As an example of how JMRI decoder definitions also define multiple CVs are a single variable, consider the "extended address". This is controlled by the contents of two CVs, not one. We don't want the user to have to think about "extended address upper half" and "extended address lower half". That isn't how users think, and to force them to do that is just making their life harder. So JMRI defines a single variable that talks about the value to place in both of those CVs. We then choose to omit a separate definition for the 2nd CV by itself, because there's no point to the user manipulating it independently.

14. The speed table is another example of this. The speed table is just one thing in the mind of the user: "Set the speed table to ramp up faster" is much more the way users think than "set CV64 a higher than it is, CV65 much higher, then adjust CV66 and CV67 to make a smooth transition". The user wants to say the first one, and have the program deal with the second one. So we just define a speed table variable that starts at a particular CV and extends across the rest. There's no need to explicitly describe the rest, and you really don't even want to, because people should be changing them through the table instead of individually.

15. The overall idea can be understood by analogy: Telephone white pages are organized by names of individual people. Everybody has exactly one listing. But when you want to find a place to get your car fixed, that's not what you want. You want a name that stands for any of several people, who can do a specific thing for you. Hence you want a yellow pages directory. It's organized very differently, even though it contains the same phone numbers. We did the equivalent of function-based yellow pages for options in each decoder.

16. In the course of developing the files, I also moved past the "variable-based" approach to investigate a "wizard-based" approach. Here, instead of basing the definition on describing what the user can set, the variables, I looked at basing the definition on what the user wanted the locomotive to do. For example, the definition would be "To set for diesel running, turn on the horn and turn off the whistle" instead of providing access to "whistle on/off" and "horn on/off". After some consideration, this method was abandoned because model railroaders are an eccentric bunch, and it didn't seem realistic to create a complete set of wizards that would do everything that they wanted.

17. Our variable-based organization has been a success. It works well for users, particularly when the definition author names and describes these variables in the way that model railroaders usually think about them. This involves talking to people, listening to all the many ways they describe what they do, and finding some common way of expressing all the variations in a decoder definition. The variable-based approach provided a more flexible, while still understandable, way for me to describe decoders.

18. Our variable-based approach does not simply replicate the approach of the National Model Railroad Association (NMRA). The NMRA publishes "Standards" and "Recommended Practices". Conformance to Standards is mandatory for NMRA certification of a product. Recommended Practices, although recommended, are not mandatory. The NMRA describes the difference this way:

> "WHAT IS A STANDARD AND HOW DOES IT DIFFER FROM A RECOMMENDED PRACTICE?"
>
> A Standard is a figure, relationship or dimension that is mandatory, it is "cut in stone" so to speak and must be followed to facilitate interchange or interface, whichever the case may be. Standards can be changed from time to time but ONLY by the vote of the NMRA membership after proper policy procedures have been followed and the membership has been fully informed.
>
> RPs (Recommended Practices) are those figures, relationships or dimensions that the Engineering Committee has established through actual tests and feel are beneficial to operation. These are not required to be voted by the membership except when in a package such as the Module Standards and RPs. These are presented to the Board of Trustees (BOT) for their study and approval.
>
> As charged by the NMRA CHARTER and CONSTITUTION, NMRA STANDARDS provide the primary basis upon which Interchange between

> equipment and various North American scale model railroads is founded. Under this requirement NMRA STANDARDS include only those factors that are considered vital to such Interchange. For less critical matters see the NMRA RECOMMENDED PRACTICES.

19. The NMRA describes decoder configuration variables in Recommended Practice 9.2.2 "DCC Configuration Variables". RP 9.2.2 describes the use of about 67 CVs, while allowing unrestricted use by manufacturers, and reserving the remainder for future use. This is a Recommended Practice, not a Standard.

20. Within the recommended-but-not-required framework of a Recommended Practice, RP 9.2.2 characterizes CV functions as "Mandatory", "Recommended" or "Optional". Specifically, it says:

> Mandatory (M), Recommended (R) or Optional(O). CVs identified as Mandatory (M) must be implemented in order to conform to this Recommended Practice, while those marked as Recommended (R) are strongly encouraged, and those marked Optional (O) are at the manufacturer's discretion.

Note that "Mandatory" refers only to the requirement that the CV be implemented, not that it be described in any particular way. The NMRA puts no limitation on the language to be used to explain to users what CVs do.

21. Only CVs 1, 7, 8 and 29 are marked as "Mandatory" for locomotive decoders. That is only four of more than 60 described.

22. When describing different decoders, JMRI will sometimes use different names for the CV. The author of a given decoder definition will select a name that he thinks best communicates what the CV does, using an NMRA definition, or one from a manual, or from common usage, or perhaps making up one that he thinks communicates the idea better. For example, CV1 is given five different names in various JMRI decoder definitions: “Address”, “Decoder Address”, “Primary Address”, “Primary Address (1-127)”, “Short Address”. (Some primary addresses are 1-99, some are 1-127, hence the qualifier).

23. For another example, consider CV9. The NMRA calls this "Total PWM Period".

24. Decoders have to control the speed of the motor by controlling the voltage & current to it. The problem is how to handle say a 50% power level. "Analog" electronics would put 1/2 the power into the motor by absorbing the other half in the decoder as heat. Decoders are small

and in constrained spaces; this is hard to do. Instead, they use a digital approach of alternating turning the motor on and off very fast. If the motor is on 50% of the time and off 50% of the time, and you do it fast enough, you get the average: 50% power. 25% on is 25% power, etc. This is called "pulse width modulation" (PWM), because what you vary (modulate) to control power is the width of the “on” pulse.

25. Generally, you want the frequency of those pulses to be as high as possible, so the time-average is better. But there are limits, and generally you can only get it just above the hearing range of people. Unfortunately, sometimes the locomotive casing or other mechanical parts resonate at exactly that drive frequency, which causes annoying noise. Model railroaders would like to be able to vary the frequency a little to avoid that. Some decoders provide that capability, and CV9 is how you configure it.

26. Different JMRI definition files refer to this several ways:

* Total PWM Period

* Motor PWM Period

* EWF frequency

* Motor drive frequency

(There are also a couple other names for cases when the decoder manufacturer used CV9 for something else entirely)

27. Different JMRI authors have used different criteria to pick which name to use. The first is the NMRA name. Note that the NMRA name doesn't even mention the motor; it's not really something that points the user to the right place. But it is a NMRA recommendation, and early authors used that as a starting point. The second version has "motor" in the name, making it more recognizable to the model railroader, but still talks about this abstract "PWM period" that it took paragraphs to explain above.

28. The third terminology uses "frequency", which is more what the model railroader is going to understand, but takes a detour to "EWF". That’s a technically correct acronym, but not something model railroaders will recognize.

29. The fourth seems to me to be the best way to communicate the idea, so I used it in some of

my files.

30. As another example, when the engineer of a real train increases the throttle, it may take a long time for the train to speed up. Trains are heavy, and locomotives have varying amounts of power with which to increase their speed. When he decreases the throttle, the train's speed will decrease very slowly, unless he applies one of the braking systems. CV 3 and CV 4 configure a decoder to simulate these delays. CV 3 acts when a model railroader asks the decoder to speed the train up, and CV 4 when there's a request to slow down.

31. JMRI decoder files use several different names for these CVs:

CV 3	**CV 4**
Acceleration	Deceleration
Acceleration Rate	Deceleration Rate
Accel	Decel
Acceleration – Normal Mode	Deceleration – Normal Mode
Base Acceleration Rate	Base Deceleration Rate
Acceleration momentum	Brake momentum
Acceleration Momentum (1-31)	Deceleration (Brake) Momentum (1-31)
Acceleration Momentum (1-255)	Deceleration (Brake) Momentum (1-255)
Acceleration Momentum (0-255)	Deceleration (Brake) Momentum (0-255)
	Braking Rate

32. The different names for CV 3 and CV 4 reflect JMRI authors decisions on how best to represent these ideas to the model railroader using DecoderPro. In particular, note how some authors stress the "rate" of change, others rely on "momentum" to convey the idea of a slow-to-change speed, and others just talk about acceleration alone. For CV 4, there is the additional choice of whether or not to describe the train as braking to a stop, vs. its momentum carrying it on at a fixed speed. All of these are things considered by JMRI authors before making their selections for specific locomotive decoders, and Defendants copied all of the resulting descriptions from JMRI definitions into their template files.

33. The NMRA provides one description for each option in the approximately 67 CVs that it defines. JMRI decoder definitions provide up to eight different descriptions, in addition to the NMRA recommendation. Most CVs have multiple additional names. In total, there are more than 250 additional descriptions in the JMRI definitions. All of these were copied into the templates that Defendants distributed as their version 304.

34. In some cases, the NMRA provides descriptions for individual bits in specific CVs. In addition to using the NMRA descriptions, JMRI decoder definitions provide more than 80 additional descriptions for those bits.

35. I have examined the JMRI QSI_Electric.xml file from JMRI version 1.7.1.

36. That version of the QSI_Electric JMRI file contains definitions for over 200 separate variables, which in turn define the contents of 42 CVs.

37. I have compared that file to the QSI manual listed in the counterclaim. I have also compared it to the NMRA RP 9.2.2 Recommended Practice for DCC configuration variables.

38. The JMRI definition for the content of at least 25 CVs contain expression that is in neither the QSI manual nor the NMRA Recommended Practice.

39. I have examined Defendants' QSI_Electric template file from version 304 of their product.

40. Defendants' template file contains expression for those 25 CVs from the JMRI definition.

41. The JMRI QSI_Electric definition omits specific definitions of 20 CVs because they are included in variables that define larger functions – extended address and speed table.

42. Defendants' template file omits those same 20 CVs.

43. I have reviewed examples the definition of CV1 in the JMRI definition, written by Howard Penny.

44. The JMRI definition for CV 1 omits minimum and maximum values.

45. I have been harmed by Defendants' acts in multiple ways.

46. First, developers have decided to reduce their involvement in JMRI due to Defendants' action. Why would they work hard on something that others will get credit for? JMRI is a volunteer effort, which succeeds only when it progresses through the contributions of volunteer developers. Reducing developer effort slows that, makes JMRI less attractive to model railroaders, and therefore makes the project less viable. For example, Howard Penny was a prolific contributor to JMRI. In addition to decoder definitions, he wrote code that moved JMRI in new directions for new user communities. Because of Defendants' actions, he is no longer doing this, which has significantly slowed down JMRI's development and it's appeal to new users. I have put significant effort into JMRI, and anything that reduces

JMRI's impact makes that effort less valuable.

47. Second, Defendants' improper statements about the origin of their software have confused model railroaders, and resulted in fewer JMRI users. Some model railroaders decide which software to adopt based on which is the "leading" one, and Defendants' failure to acknowledge that JMRI created their decoder definitions has created a false impression about their Decoder Commander product. At the 2005 NMRA convention, I heard comments to this effect from numerous model railroaders.

48. Third, Defendants' claim to have written software that was actually based on the JMRI decoder definitions has adversely effected my reputation as a software developer. I wrote parts of the JMRI decoder definitions, including much of the basic structure, and have developed a reputation as a software developer that rests in part on their success. Defendants' claim to have produced a "better" solution, even though it was actually based on my work, has diluted that reputation.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed this 13th day of November, 2009, in Berkeley, California.

By ______________________

Robert Jacobsen