Hints: Using the QSI Upgrade Chip

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Fun QSI Features

I was asked to do a write up on some of the little known features in the QSI Chip Upgrade. After downloading and digging through the QSI manuals I found many new features that I did not know even existed. I asked a number of modelers that had a number of QSI equipped locomotives if they have ever tried out these features. The answer was, what features? Not only had they not used these, most had not even head of them. It turns out that these new impressive features are fun to use once you know about them. I've have been investing my time learning how to use these features and sounds. Once you learn their operation and do a demo, it will fascinate anyone watching ... like having the throttle notched up to "run 8" while the train just crawls up a grade.

Future Upgrades and Sounds

Once the QSI Upgrade Chip in installed, you have the ability to get future software downloaded and installed in the new chips. The downloadable ability is a feature that will have a long lasting affect on sound in model railroading. This trend opens to door to all kinds of possibilities. New sounds can be added, modelers can modify a sound file to match their prototype. Modified sound files can be shared over the Internet. Software improvements are another item that can be included in the downloadable files.

New in the Chip Upgrade is RTC Control

One of the added features in the Chip upgrade is Regulated Throttle Control (RTC). This feature adds realistic momentum to the model train. RTC uses back-EMF to simulate the massive inertia of prototype locomotives. A locomotive under RTC will move through obstacles such as tight turnouts, raised track joints, and so on with little change in speed and will easily maintain speeds less than 1 scale mile hour. Still, if the locomotive encounters a long uphill grade, it will slowly reduce speed just like the prototype. If it encounters a downhill grade, it will slowly increase speed just like the prototype.

Unlike Speed Control, RTC is a true throttle control system and is controlled by the same CVs (that is CV2, CV3, CV4, CV5, CV23, CV24, and all CVs related to speed curves). Since locos under RTC slowly adjust their speed based on load, locomotives in consists tend to share power equally.

Included with this feature is an on-demand status check that announces the relative scale MPH of the moving locomotive, and an on-demand "heavy load" option that helps maintain speed no matter the terrain. This feature lets run the engine is if at full throttle and drift down hill at an idle using the same speed.

QSI's Expanded CVs

There are not enough NMRA manufacturer's assigned CVs to be able to adjust and control all the features in the QSI decoders. To solve this dilemma, QSI has come up with a scheme that takes two of the manufacturers CVs (CV49 and 50) and uses them to access "phantom" CVs.(This scheme has worked out so well that the NMRA DCC Working Group is considering using a CV31 and CV32 of their CVs for this function.) In order to work with these CVs you need to understand just how to access them. We'll get into this later.

QSI's Expanded Function Keys

Not only are we limited with the number of CVs available, but also with the added number of sounds there is a need to increase the number of function keys. Here is another innovation that "adds" more controllable functions. Even with the NMRA expansion of function key up to F19, most of us only have control of F0 to F12, and some only to F9. This means the preferable way is to have all of these neat sounds and features controlled using only F0 through F12. QSI handles this very nicely by having function keys do different things depending on the status of the engine. The statuses are defined as neutral (stopped), or moving (forward or reverse). This expands to 2 possible functions for each function key.

Sound Features

Note: This is a short description of a number of features. For full information refer to the QSI manuals listed earlier in this document.

Sound of Power

When a diesel locomotive starts to pull a heavy load, the engineer pulls the throttle and the engine cranks up before the train starts moving. With steam engines the chuffs get louder as the engineer pulls the throttle. As the train reaches the set speed, the sound level drops. When the throttle is cut back the sound level cuts back. The diesel engine should drop to an idle. These are all possible with the Sound of Power feature.

This feature works by comparing the speed set by the DCC command to the speed of the locomotive. The higher the difference between the two the higher the volume. The decoders come with CV3 and CV4 set to zero. In order to have the Sound of Power function, there needs to be some value, other than zero, set into these two CVs. This is also works with CV23 and CV24 when in a consist (CV19 not 0).

Checking out the Sound of Power

First if you do not have CV3 and CV4 set, increase the speed to about 50% and listen to the sound. Then stop the engine. Set CV3 and CV4 to some value. I like to set CV4 as half of CV3, try about 50 in CV3 and 25 in CV4. This can be done by programming-on-the-main, Ops mode programming. Next repeat starting the locomotive at about 50% of top speed. The sound volume should increase more than it did and the engine should start up slowly. For diesels the engine should rev up as it starts to roll. For steam the chuffs should be louder. The sound level will drop when the locomotive reaches the set speed. Now cut the throttle back as the engine reaches the desired speed. The sound should cut

back. Then reduce the speed to 0 and the diesel will drop to an idle and the steam to drifting. The engines will just coast. Just try a couple of different CV settings and enjoy the sounds. You get the feeling that you can run the engine independent of the locomotive speed…sort of the ability to "play the throttle". (Note that if you use the Momentum on the NCE cab to set CV3 and 4 with the read-back sound on, only CV3 will be set. The cab sends both CVs and the decoder stops listening to the commands while speaking and misses the CV4 setting.)

Braking

There is even more speed control by braking with F7. As the engine is coasting, with speed set to zero, F7 will act as a brake with the added sound of the brake squeal. When you press F7 you will hear an air release. The longer you press, the faster the braking. This adds to the fun of switching. If you haven't tried Sound of Power, do so, you'll enjoy the challenge of running an engine more like the prototype.

Heavy Load

There is one more control of the engine sounds, that of the Heavy Load feature. It always bothered me that up hill or down hill, the model engine sounded the same. Going up a grade with a load should have the engine at full throttle, even when the train is just crawling up the grade. Down the other side of the hill, the engine should drop to an idle and the steam engine just drift. The QSI Heavy Load feature fixes this. It works by giving you control of the motor or steam sounds with the speed control while the engine changes speed very slowly. It does this with the F9 function while moving.

With an engine running at slow speed, press F9, the horn or whistle should give you one toot to let you know the Heavy Load function is active. You can now control the sound of the engine with the speed only changing very slowly over a long period of time. Press F9 again and you will get two toots to let you know that the Heavy Load feature is disconnected and you now have control of the engine speed.

The Doppler Effect

Sound waves move at the speed of sound. As a train approaches the speed of the train vs the speed of sound causes the sound wave to get compressed and the pitch of the sound seems to increase. When the engine passes by the opposite happens and the sound waves are stretched and the sound pitch drops. The faster the speed, the more the shift in the sound frequencies as the engine passes by you.

Checking out the Doppler Feature

Model locomotives do not move fast enough to make much of a shift in sound frequency. The Doppler feature needs to be triggered as the locomotive passes. There are two ways in the DCC Upgrade to trigger the Doppler feature. First, with the whistle blowing for longer than a second, quickly release the whistle/ horn key and then reapply. This quick drop out of the whistle signal to the will trigger a drop in the sound frequency, simulating the Doppler effect. The second way is to use F6 key. F6 is used for startup when the engine is stopped, when the locomotive is moving F6 is used to trigger the Doppler effect. The change in sound is impressive as the engine passes, sounds like the real thing. The faster the speed, the more pronounced is the effect.

I used three different DCC systems to try out the Doppler feature. Using this feature requires some practice. Blow the whistle as the train approaches, then as it gets to a point ready to pass, quickly release the whistle and then reapply. You may have to try it a couple of times to get the hang of it. Remember, the whistle needs to be on for at least one second before you release and press again. With the NCE system quickly releasing the horn key seems to work, With Digitrax I find the best way is to quickly release the F2 (horn) the tap F6 and reapply F2.

Verbal Response

Talking Back

One of the QSI decoder's ability is speaking back in response to a command. The verbal response feature can be turned on by programming CV62 = 1. Conversely, CV62 =0 will turn off the verbal response. This allows you to very your programming like read back.

If you use the Program-on-the-Main feature with the verbal response on, you can hear the results of the program command. This is better than sending a command to a decoder and just hope that it gets there.

QSI's Response to:"Can't read CV"

When the NMRA standards were written, they did not anticipate decoders with the larger capacitors used for sound and decoders that can also be used with DC. Hence the read-back problem on the program track for many types of Sound Decoders. QSI came up with a novel solution for reading back the value in a CV. They have the locomotive talk back to you with the value in the CV! The secret (its in the manual if you dig it out) is CV64. You use Program-on-the-main and write to CV64. The value you write to CV64 is the CV that you need the value from. If you use Program-on--the-Main and write to CV64 with a value of 2, the engine will give you a verbal response "CV two equals one, four".(or what ever is in CV2). If you want to know the Version level of the chip you would use CV64=7 for a readout of the version number.

Working with QSI CVs

This is a brief description of the different types of CV setting used in the QSI decoders. Review the QSI DCC Reference Manuals for a more complete description.

QSI CVs

There are a number of different styles of CVs used in QSI decoders. Three different ways are used to write to the CVs. First is the Standard when you use Programming on the Main (POM).

And have the verbal response turned on (CVXX = X) you will hear "CVXX equal X".

Second is the CVs that use the indexed system. This is two CVs setup as a index of rows and columns. CV49 is the Primary Index (PI) and CV50 is the

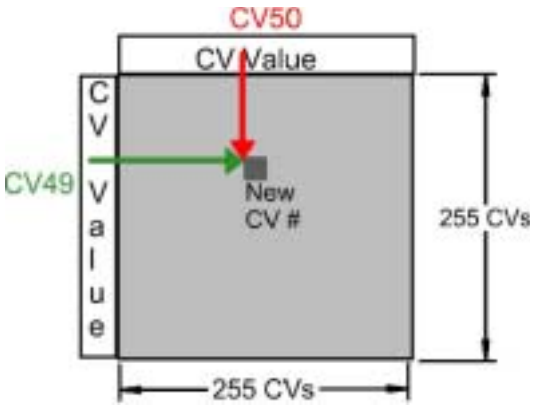
Secondary Index (SI). These two act as pointers to the “phantom” CVs.

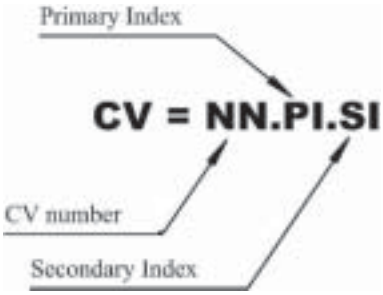
The indexed CVs are shown in the manual as “CV= NN.PI.SI”. The NN is the CV number, PI is the Primary Index and SI is Secondary Index.

There are two variations on this arrangement. The two step and three step methods. The two step is shown as CV NN.PI and the three step as CV NN.PI.SI.

A sample of a two step would be “CV 51.1". The Primary address,49, is set to 1 and the CV is 51. If you wanted to change the value in this CV the first step would be set the primary index (PI) to 1. [1] POM to set CV49 to 1. [2] second step would be to use POM to set CV51 to 32. In this case we are setting a value of 32 to the CV 51.1.

A sample of a three step would be “CV 55.70.10". [1] The primary address is 49 set to 70 and in this case the [2]secondary address (50) is set to10. [3]The third step CV 55 set to 32. In this case we have changed the highlight dimming value to 32.





Sources for QSI Upgrade Information

QSI has done a great job producing manuals to go with the new upgrade. Gerry Pruss of QSI deserves a lot of credit for making these documents available in a timely fashion. These manuals are downloadable from QSI Solutions. There are three manuals released that cover operation with the Upgrade, one for steam and one for diesel. These two manuals cover both analog (DC) and digital (DCC) operation. The manuals are just over 20 pages each and show the differences between operations when stopped (neutral) and running in forward or reverse.

Steam Locomotive Operation Manual for Quantum Software Version 7. Release 4.1

Diesel Locomotive Operation Manual for Quantum Software Version 7. Release 4.1

The third document includes the complete DCC Reference Manual. This document is 253 pages long and is release Version 4.0.2 for firmware Version 7 software.

NMRA DCC Reference Manual for QSI Quantum® Q1a HO Equipped Locomotives.

This is a big manual, but has all the detailed information for setting up CVs to other than the standard configuration. You should read pages 6 to 25 for a good back ground of the operation of version 7.I’ve downloaded all three of these along with other information on the upgrade and keep them in a three ring binder. I encourage you to get these manuals for reference. They contain a lot of very interesting features and details on about the control of the decoder. Some of the more impressive features are covered in this manual.

Using CV2 (Start Voltage) to Fine Tune your Upgrade Performance.

The QSI Upgrade Chip factory default setting for CV 2 is 8. This was chosen to give good average performance for a wide range of loco types. Since each loco is different you can enhance a specific locomotives overall performance by programming CV 2 as described in the instructions below. It is best to use, "Programming on the Main" or "Operations Mode Programming" to do this.

1) Change Locomotive from RTC, (Regulated Throttle Control) default, to STC (Standard Throttle Control). You can do this by Programming on the Main, CV 49= 4 and CV 56=0. The loco will give a voice response when each CV is programmed

2) Set your throttle to the 128 speed step range and advance throttle speed to speed step 8.

3) Program CV2 to Increase CV2 values until the locomotive starts to move.

4) Program CV2 to Decrease CV2 values until the locomotive just stops.

5) Return to RTC, (Regulated Throttle Control). Again you can do this by Programming on the Main CV 49= 4 and CV 56=1.The loco will give a voice response when each CV is programmed. Note that CV 49=4 must be programmed here again even though you programmed it above to the same value.

This last CV2 value is the one that is used. The reason for setting CV2 when the locomotive just moving or stopping is to ensure that it can achieve the minimum speed. Sometimes, because of sticky gears, CV2 can be very large to get the locomotive going but much lower for stopping. If this difference is large, say 10 or more, then the locomotive might start out fine at speed step eight but would still be moving when reduced to speed step 4, 2, etc. and would never get to the minimum speed. The default value of CV2= 8 that QSI uses is arbitrary and is chosen to provide enough headroom for locomotives that may be smoother running and would start sooner. Also, setting CV2 in this way allows for more reliable consisting of locomotives since they all start out at approximately the same value.

Operational Warning:

There are several new features in the software upgrade (Disconnect, Standby or Shutdown) that when (accidentally or intentionally) enabled will make your loco not respond to speed commands.

Pressing F9 two times (accidentally or intentionally) while in neutral (Zero Speed) will put the engine into (Disconnect, Standby or Shutdown). Pressing F6 (Startup) two times when your loco is in (Disconnect, Standby or Shutdown) will return your engine into normal speed commands). Also, when your loco is in (Disconnect, Standby or Shutdown), pressing F10 (Status) will cause the engine to speak out its Disconnected state.

Note: (Disconnect, Standby or Shutdown) is considered a single description for this application and is stated as such because the different systems produce different vocal responses . NCE: Disconnect, MRC: Disconnect, LENZ : Standby, DIGITRAX : Disconnect

How to Use the Impressive QSI Upgrade Doppler Effect!

There has been some confusion surrounding the exact implementation of the Doppler effect on the QSI Upgrade Chips.

How not to do it!

First let's address the two common ways that users think they are implementing the Doppler effect.

First is to use function 6, theoretically this is correct, but the way you use it will greatly affect the outcome. Some people think that you blow and hold the whistle, engage function 6, and then release the two at exactly the same moment. This will give you a slight shift in tone but not really the full sweep of sound you would expect.

Second, I'd try to blow the whistle for more than a second, quickly release and give a second short tap on it. With most of the steam locos this will give a neat sort of tailing effect on the whistle (on the diesels it doesn't do anything). This tailing effect is what a lot of people were confusing with the Doppler effect, this is not the actual Doppler though the correct method to implement it is very similar.

How to do it!

To experience the full sweep you'd expect from the Doppler effect:

1: Hold the whistle/horn button for more than a second.

2: Very briefly release the button and re-engage it, but unlike the tailing effect this time hold the button for roughly another second. Upon the second touch of the button you should hear a dramatic Doppler shift.

3: Using Function 6. To implement the Doppler push function 6 while at speed and without the whistle/horn engaged and then blow the whistle. The difference between this and the double touch method is that the sound sweep here is much more subtle, the whistle drops from high pitch to low pitch very quickly, almost imperceptibly so.

The important thing to remember about the Doppler effect in these locomotives is that it is a speed responsive effect. The faster you are going the more pronounced the effect. If you want the effect to be more pronounced at lower speeds I recommend that you adjust CV 5 (V-High or Max Speed) and turn the maximum speed of the locomotive down so that the Doppler responds more dramatically at scale speed. I set the value on my tester to 200 with good results.