How to enable a consist's lighting and sound effects when using Advanced Consisting

By William Sparks
Beaverton Modular Railroad Club,
Beaverton, OR

Let's say you've got an impressive multi-engine consist on your DCC-powered layout. You're using Advanced Consisting, so you know how to employ CV19 in each of your engines and you've already programmed CV19 properly in each engine's decoder (If needed please refer to our article on how to use CV19,) and of your engines move together beautifully. You push your throttle's F0 button to activate your headlamp and….nothing happens. Or- if you have a sound-equipped engine- you press F1 to sound the bell, and again, nothing. In fact, no sounds work as they should What the heck is going on? Those lights and sounds worked properly before putting the engine in a consist. Did I screw something up? No, you just need to tell each decoder which function you wish to work while in a consist, and it's done using two CVs- numbers 21 and 22.

Firstly, you need to determine which lighting and sound effects you wish to be active when your engine is in a consist. I will outline a few common situations and how to go about programming your engines' decoders to obtain the desired results. Program each engine individually, starting with CV19 first, and- if needed- then CV21 and CV22 on each of your engines' decoders. All of the following examples and scenarios assume you've already programmed CV19 with the consist address, and- if needed- the proper changes to NDOT, the normal direction of travel.

Please refer to the following table to determine the numerical values for each of the functions you wish to be operational while in a consist.

CV21

Functions and value
F1=1
F2=2
F3=4
F4=8
F5=16
F6=32
F7=64
F8=128

CV22

Functions and value
F0F=1
F0R=2
F9=4
F10=8
F11=16
F12=32

Please note that the F0 button has two outputs, forward and reverse (F0F and F0R, respectively,) and refers to the lamp that is lighted when the engine is moved in said direction when not in a consist. If you have remapped your decoder to make your lamps non-directional, you would ignore the F0 buttons and instead program the appropriate function button to which you've remapped the lamp(s).

Please bear in mind that at the time of writing, most decoders do not support consist function buttons above F12. However, by the time you read this the situation may well have changed, so please refer to your decoder's literature or the manufacturer's website for more information.

Typically consists will fall into two categories, all DCC-only locomotives, aka 'silent' decoders, or all-DCC & sound locomotives, and therefore I have divided my scenarios into DCC-only and DCC-Sound examples. There is, however, a third type of consist comprising a mix of engines with either a silent or a sound decoder. Assuming you have them speed-matched and they run well together, function button programming is essentially identical a process to that described in the Sound-equipped consist scenarios. As mentioned earlier, it is assumed you have already properly programmed CV19 in every decoder

DCC-Only Consists

-All engines within the consist are equipped with 'silent' decoders-

Scenario One: Commonly you would have two or more non-sound DCC locomotives consisted on your layout, and you've programmed CV19 in each engine already. The leading engine has its front headlamp facing forward, so you'll want that lamp to work. Look at the tables for F0F, which falls under CV22, and you'll see that F0F has a value of 1. You probably will not want the rear lamp to be operational while in a consist, so you'll ignore F0R. So, knowing F0F has a value of 1, program that value into CV22.

Let's say, however, the leading engine has its rear facing forward while in a consist. Again, you've programmed CV19 with the consist number plus the value that has reversed the normal direction of travel [NDOT] while in a consist. This time you would instead program

CV22 with a value of 2, because you'd want that lamp- F0R- to be operational. You would ignore F0F, because you wouldn't want it to be operational. Your decoder will automatically turn the rear lamp on when the engine is moving in the consists forward direction, assuming you've properly programmed CV 19 to reverse the engine's NDOT while in a consist.

Your middle engines usually won't have any lighting effects active while in a consist, with the possible exception of number board lights, if fitted. Nor will your last (trailing) engine ordinarily have any lighting effects active, again with the possible exception of lighted number boards. Therefore, you normally won't need to program either CVs 21 or 22 in those locomotives.

Should you have additional functions you want to make functional while in a consist, such as ditch lights, beacon, number boards, cab lights, etc., refer to the CV table and determine which function buttons activate each lighting output, add the values and program them to the appropriate CVs.

Scenario Two: Let's say our lead engine is facing forward in the consist, and we want the headlamp (F0F), ditch lights (F1 on our engine,) beacon (F2,) lighted number boards (F5,) and cab light (F10) to all be available while in a consist. Look at the tables and we'll find the CVs which control each function button and their values. Take a piece of paper and write two columns, one for CV21 and one for CV22.

We see CV21 controls F1, which has a value of 1, F2 a value of 2, and F5 a value of 16. 1+2+16=19, so we'll program CV21 to 19. Now we look to see CV22 controls your loco's headlamp (F0F) with a value of 1, and our cab light, F10, with a value of 8. Add the values, 1+8=9, so program 9 to CV22. Now your lead locomotive, while in a consist, will have functions 1, 2, 5, 10 and forward headlamp available to use.

CV21	CV22
F1= 1	F0F=1
F2= 2	F10=8
F5=16	
19	9

Once again, engines in the middle of your consist and the trailing engines ordinarily won't have any active lighting functions. However, let's say your models have functional lighted number boards and you want them to work while in a consist (which is prototypical for many railroads,) you'd program each of your middle and trailing locomotives with the value for that function. Our example locomotives use F5 for number board lights, and F5=16. We see that CV21 is the appropriate CV for F5, therefore we'd program CV21 to 16. Now our number boards will illuminate when Function 5 is pressed.

This is all good and well for non-sound-equipped locos, you say, but what about those of us with sound-equipped DCC locos? Read on, dear friend….

DCC-Sound Consists

-All engines within the consist are equipped with sound decoders-

Scenario One: Let us assume you have two or more sound-equipped locomotives you wish to consist. Typically, you'd want your lead engine to have access to all available sound functions as well as the lamp which faces forward- usually F0F- in your consist. The lamp in the opposite direction- usually F0R- will ordinarily not be functional, as it would only be lighting up the loco behind it.

Being as you'd want all of your sound function buttons to be operative in your lead engine, we'd refer to the table below to see that the values for F1 through F8 add up to 255 and fall under CV21, therefore we'd program CV21 with a value of 255.

If our lead engine's front lamp is facing forward in the consist, we'd look to see that F0F, plus functions F9 through F12 (again, omitting F0R because we don't want it to be functional within our consist,) we see that it adds up to a value of 61, so we'd program CV22 to 61. If your lead engine is reversed in the consist, F0R would be activated and F0F would be ignored, for a value of 62 in CV22.

Your trailing engines would not want either the front or rear lamp to be functional, nor any other lights with the possible exception of lighted number boards, if your engines are so equipped. Nor would you want every single sound effect to be active. For example, as with the prototype locomotives, you would not want the bell or whistle/horn to work on any engine apart from the lead engine, but you would want the engine sounds, spitters, brake sounds, etc. to be functional.

The following table is typical of of several popular sound-decoder brands for North American prototype locomotives. The value of each function button will be consistent irrespective of whether it is a sound or light function. Though the actual sound played can vary from one brand to another, the value will remain consistent, eg- F3 is the coupler sound on some decoders, and short horn/whistle on others; yet the value for F3 is 4 in either case, so please don't be concerned if your function outputs differ from the following table. If desired, you can place your engine on a powered track and go through each function button and write down each output's sound and- if equipped- additional lighting effects such as ditch lights, beacons, lighted number boards, cab lights, etc.

Typical Lighting and Sound Outputs

CV21	Value
F1- Bell	1
F2- Airhorn or whistle	2
F3- Short airhorn or whistle	4
F4- Dynamic Brakes (diesel only)	8
F5- Lighted Number Boards, if equipped. Can be other functions as well.	16
F6- Beacon, if equipped. Can be other functions as well.	32
F7- Dimmer	64
F8- Engine sounds/ Mute	128

CV22	Value
F0F- Forward lamp	1
F0R Rear lamp	2
F9- Radiator Fans	4
F10- Air Compressor	8
F11- Brake squeal/release	16
F12- Coupler clank	32

The easiest method I have found to program each locomotive is as follows: Place each engine on a table and orient them precisely as they would be within a consist, with each engine facing the way it would... Next, take a scrap of paper and write down the functions you wish each engine to have available within the consist.

For example, if your lead engine is facing backward in the consist, you'd want F0R to be functional, as well as all of the available sound functions. So, jot down the values of each function for each CV as described in the table. We want F1 through F8, which adds up to 255 in CV21, and we want F0R and F9 through F12, which adds up to a value of 62 for CV22.

Now, for all of the trailing engines, we want F4 for the dynamic brakes, F5 for the number boards, F8 for engine and mute function, F9 for the radiator fans, F10 for the air compressor, F11 brake squeal, and lastly F12 for the coupler clank. We ignore the horn/whistle and the bell, because prototypically they'd only be functional on the lead engine. We add up the values for the buttons we desire and we get the following values: CV21=152 CV22=60

So that's about everything you'd ever want to know about lighting and sound effects within an Advanced Consist. It takes no more than a couple minutes to calculate values and program two or three locos once you get the hang of it. Please don't be intimidated, go

ahead and give it a go. Even if you make an error along the way, you can always change CV19, CV21 and CV22 each back to 0, and you'll be right back where you began.

Best of luck, happy railroading, and I am always more than happy to answer questions should you need assistance. Contact me through the Beaverton Modular Railroad Club and I will do my best to help. Cheers!