Model Railroad Hobbyist

DCC IMPULSES

column

BRUCE PETRARCA

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In a prior column, I discussed a bit of consisting in the ***Mr. DCC's Workbench*** segment. This month, I'm going to dig into it a bit more with specifics for different brands of DCC systems.

But first (insert trumpet fanfare here), This is a milestone for me. I have been writing this column for four years as of the October 2015 column. Since there were a couple of columns missed along the way, so this is my 48th column. Wow, time flies, doesn't it?

Let's get our heads out of the publishing world now and back to model railroading and DCC.

What is a consist? I was discussing this column with my wife, Linda, and she asked, “Do your readers know what a consist is? I really don’t, but I hear the term all the time.”

So, lets get this out of the way. Prototype practice refers to the make up of a train as the consist. Model railroaders refer to two or more locomotives that are running together as “a consist” or as being “consisted”. We also use “consist” as a verb: “I’ll consist the two locos.”

Okay, you want some locos to run together. How do we do this?

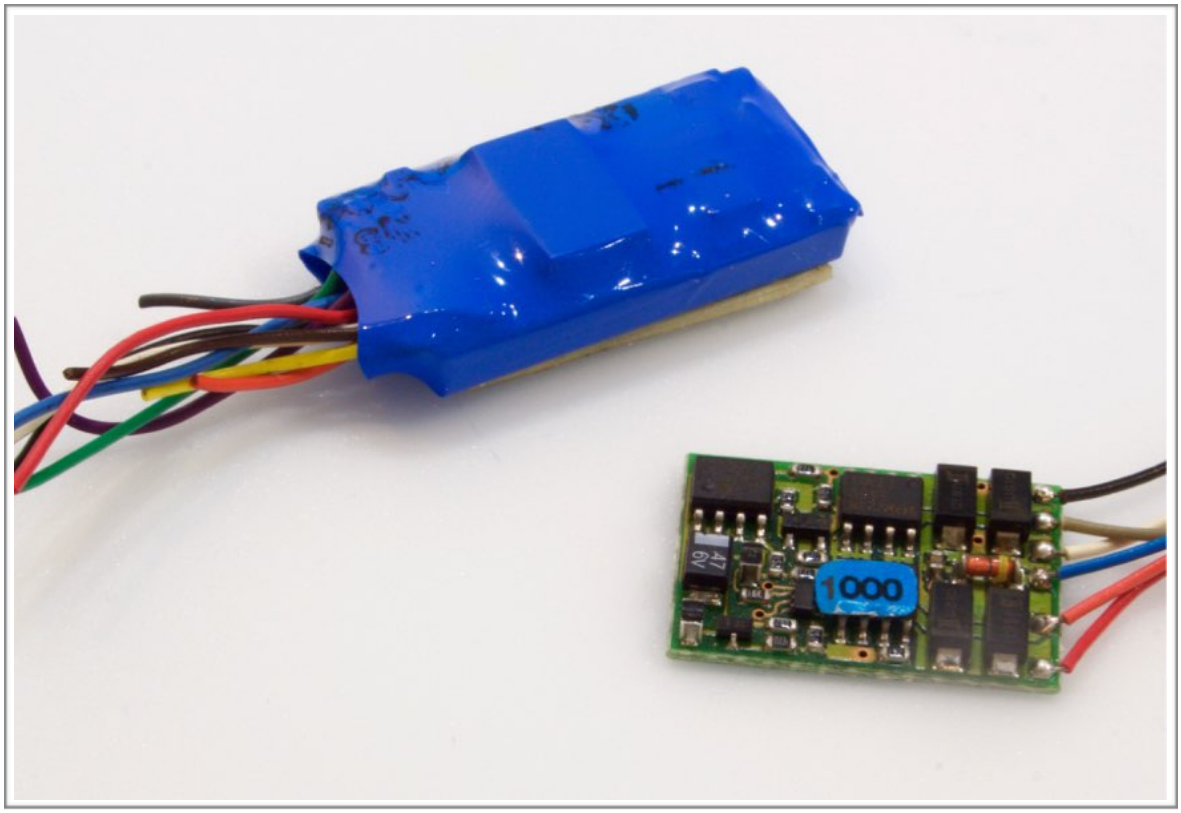
One thing to remember with consisting: the closer the match between locos (brand, model, decoder model and settings), the more successful the consist. If you are having issues with locos running well together in a consist, check out the characteristics of your various decoders. Some brands of decoders change their running characteristics when they are in a consist, vs. when they run by themselves. And, yes, I use BEMF in my consists. If the locos are properly matched up, BEMF works just fine.

Some of these methods utilize the "consist address" stored in CV 19, per NMRA recommended practices. Frequently I hear about folks having a solo loco or two that they can control the sound and lights, but won't run. If CV 19 is any value other than zero, the motor will only respond to commands on that consist address. To restore motor operation after CV 19 has been manipulated by you or a command station assisted consist, go to the programming track and set CV 19 to zero.

Basic Consisting – brute force

If you have a set of locos that you want to run together, you can give all the decoders the same address (whether it is a short or long address). If you want a loco to run backwards, change its direction of operation by adding one to CV 29, if it is even, or subtracting one, if CV 29 is already odd.

1. The DH83FX (blue wrap) was a flagship decoder from Digitrax until it was retired in 1998 - 17 years ago. The LE1000 (bare board) was an economy model when introduced in 2004. Both decoders support all consisting methods in this column. Neither support CV 21 or CV22 (consist function control).



Basic consisting doesn't require any special features in the decoders [1]. It creates a consist that is virtually bulletproof. It will work on any DCC system. It doesn't require any special input to the DCC system. Just dial it up and run. It only uses one location in the system memory, no matter how many locos are in the consist.

The downsides to basic consisting include the fact that the setup is a bit complex, having to set the addresses and running directions in each of the locomotives individually. Also, it is not easy to add or subtract a locomotive from the consist, so you can't run one of the locos outside the consist without doing some basic programming.

Basic consisting works with all decoders, no matter what the vintage.

Basic consisting is, also, what you are doing when you install two decoders in the same locomotive and give them the same address. It is more difficult to do with two decoders in the same loco than it is with one decoder in multiple locos. With one decoder per loco, you can physically separate the locos to program them. When you install two decoders in the same loco, you need some physical or software method to divide them to program them individually. I discussed a software method to do this in my July 2012 column.

Advanced consisting – decoder based

Most decoders these days [1] support the use of CV 19 as a way for the decoder to know that it should run on a consist address and which direction it should run. CV 19 consisting is based on the NMRA standard practices. Most of modern decoders also support the use of CVs 21 & 22 to tell each locomotive which functions it should respond to from the consist address and which need to be addressed to the locomotive directly on its main address.

Decoder based (advanced) consisting is a most elegant way to run consists.

For example, we have double- and triple-headed power on the through-trains for our PebbleCreek club. The through-trains have train numbers that are less than 127. So we've used the train number as a consist address and programmed it into CV 19. See [2] for the rear loco on train 103.

If the loco runs backwards in the consist, we tell the decoder that in CV 19, too. Then, in CVs 21 and 22 (bottom of [2]), we tell each loco what function commands they should respond to.

For example, we tell the loco at each end of a double-headed consist not to respond to the F0R (reverse light) function. That way, we don't have the lights on between units.

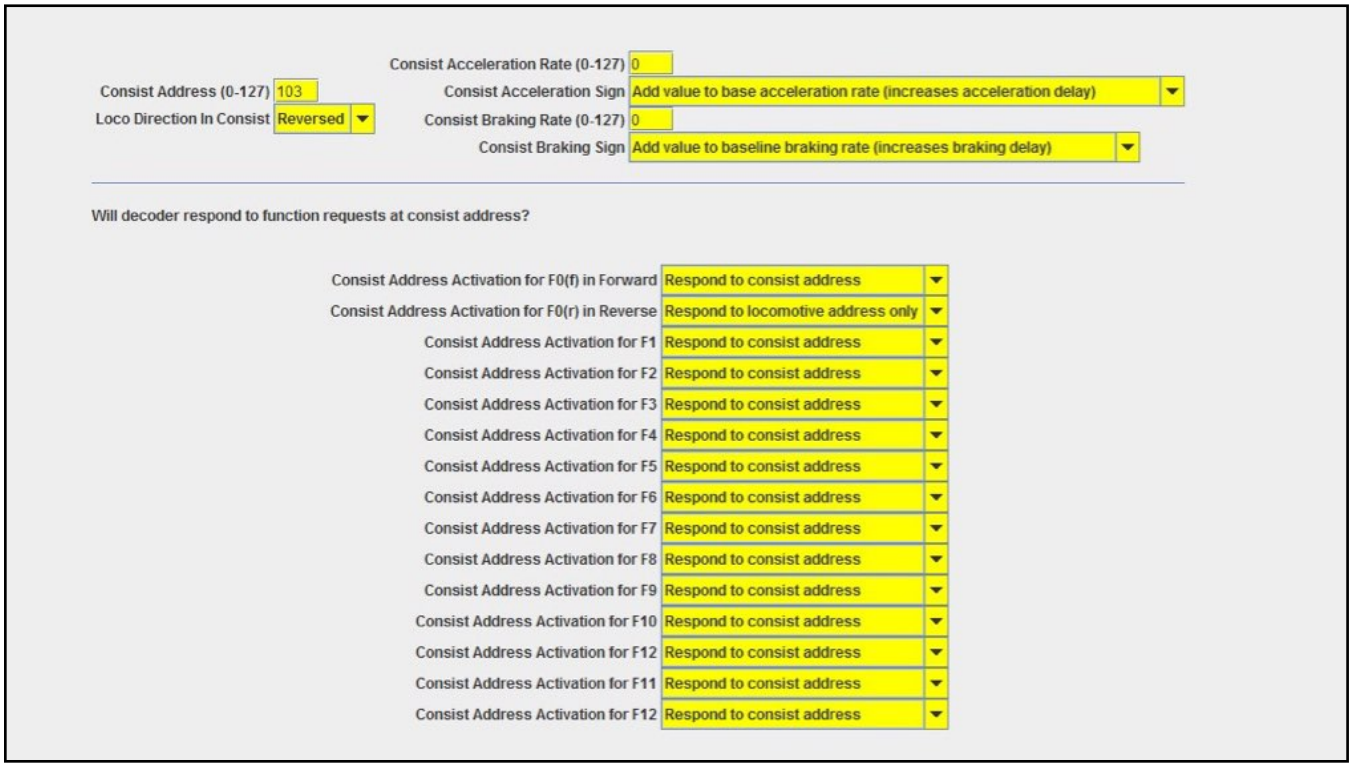
Units that are set up this way take only one system location and they can be moved between systems with impunity, just like the basic consisting. Once CVs 21 and 22

Letting your DCC system help you set up your consists is frequently easier than doing it yourself, but you need to understand exactly what your system is doing.

are setup, locos can be added to or taken out of the consist by merely programming CV 19 on the main.

Since our club uses Digitrax, we empty the slots after each operating session to minimize throttle conflicts. See ***Mr. DCC's Workbench*** from last month's column for more info on that. Purging the throttle assignments could drop Digitrax UniVersal consists, but these manually created advanced consists are unaffected.

2. DecoderPro screen shot – setting up CVs 19, 21 & 22 within the Consist panel from the PCMRC layout. Note that this decoder supports different acceleration and deceleration (braking) rates for the consist vs. the decoder alone. Also, note that Consist address response for F0R is disabled for the consist, but will still work when the loco is operating by itself. This is the trailing loco in the consist and runs backwards, so the Loco Direction box shows "Reversed".



DCC system assisted consisting

Many DCC systems [12] help you to set up an advanced consist. Some merely lead you through setting the consist address in CV 19. Some assist with the break down, as well by resetting CV 19 to zero in all the decoders together with a few button presses. Some remember the consists built this way and others require you to remember what you did. The support varies between manufacturers. The realism of the running experience varies between DCC brands, too.

Some DCC systems [12] offer support for Universal (or old-style) consists. These euphemisms refer to a way where the command station remembers which locos run together and sends the motor commands to all locos in the consist. This style became popular before the NMRA standardized on CV 19 as a consist address. Again the support varies by manufacturer. Most decoder and system manufacturers have trended away from universal consisting as advanced consisting has taken hold. Newer decoders support CVs 21 and 22 to separate function commands, thereby enhancing the operating experience.

For maximum future fun, break up command station built consists before you remove the locos from the layout.

I highly recommend you break down any consist on the system where it was built before moving the locos to another layout. Failure to follow this may have you with locos that you cannot talk to for no apparent reason. You may have forgotten that you had it in a consist. When all else fails, take your loco to the programming track and read CV 19. If CV 19 is not zero, then the loco still thinks it is in a consist. Set CV 19 to zero to remove the loco from the consist. This will not undo anything stored in the DCC system where you built the consist, but it will free up your loco.

In recent columns, I have discussed the features or drawbacks of two manufacturers' systems. This raised the hackles of some readers. So, I contacted many manufacturers for input to this column and got varied responses from them. So, let's look at the details of their systems.

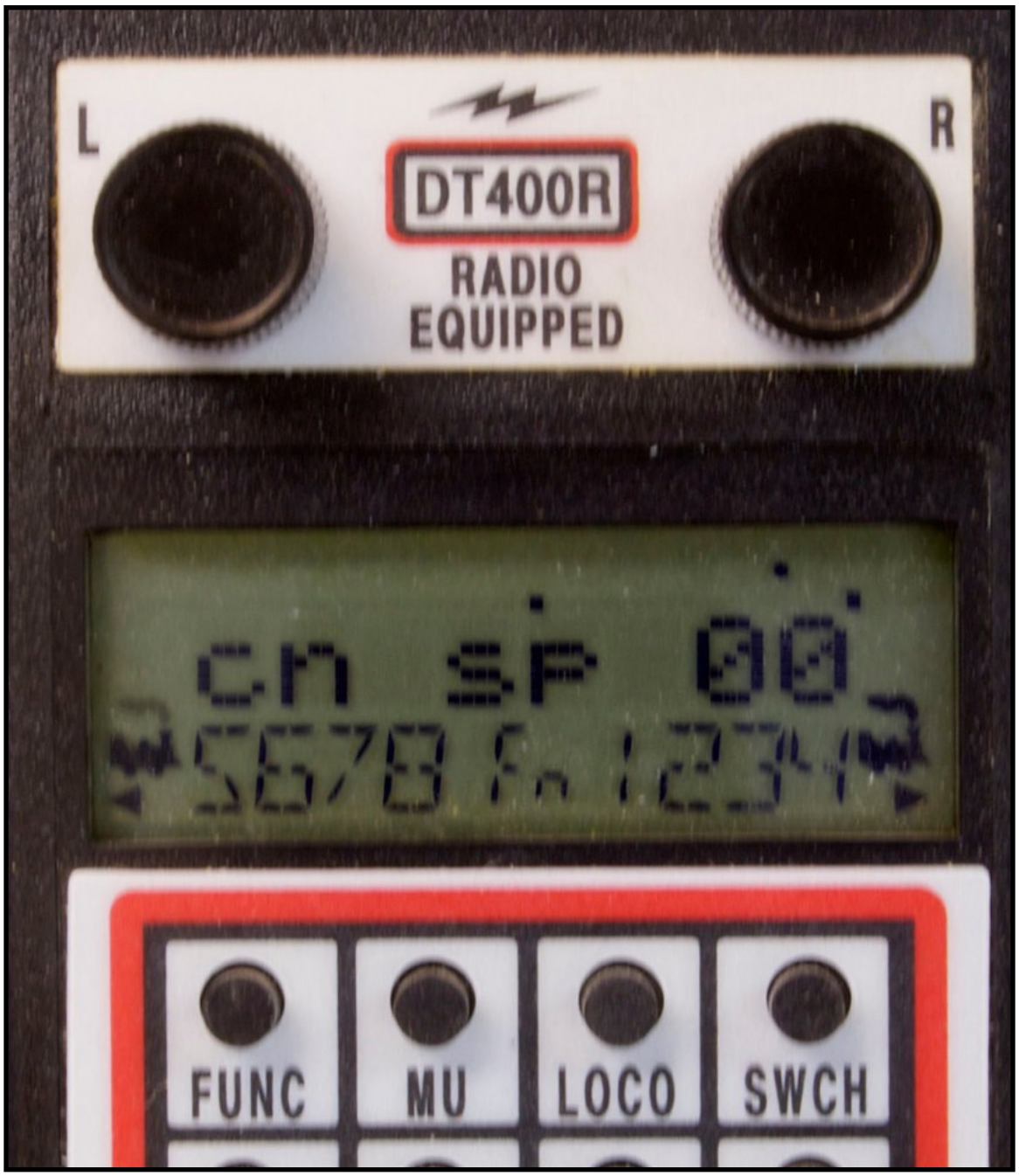
Let's look at some different DCC systems and how they deal with consists. They are listed here alphabetically.

Digitrax

Digitrax only offers what it calls UniVersal (yes, that's the way they capitalize it) command station assisted consisting. It is easy to set up on their DT40x series throttles [3]. UniVersal consists can be built with the Zephyr system, too. However, due to the limited display and available buttons, it is more difficult to do there than it is on the DT40x throttles.

As previously discussed the Digitrax system will readily handle advanced consists that you create manually. We have been running advanced consists on our Digitrax club layout for years.

3: UniVersal consisting on a Digitrax DT400R throttle – 1234 is in the lead and 5678 is in the rear, with locos facing away from each other. Yes, they read from right to left. The right button is the "master" and that's where the consist starts. This screen shot is what it looks like after pressing the MU button and then the + button.



You select the lead loco on the right knob and the next loco on the left. You adjust the direction of each loco until both are physically going the same direction on the track. Then you press the MU button then the + button (in the row below the MU key). To add

more locos, select the new loco on the left knob and set its direction and repeat the MU and + button presses.

To remove a loco from the consist, select the consist on the right knob and the specific loco to be removed on the left knob and press MU then the – (next to the +) key.

While this is simple to use, it takes up a system slot for each loco in the consist. If you have a limited system like the Zephyr, with only 10 slots, you can run out of slots very quickly.

Easy DCC

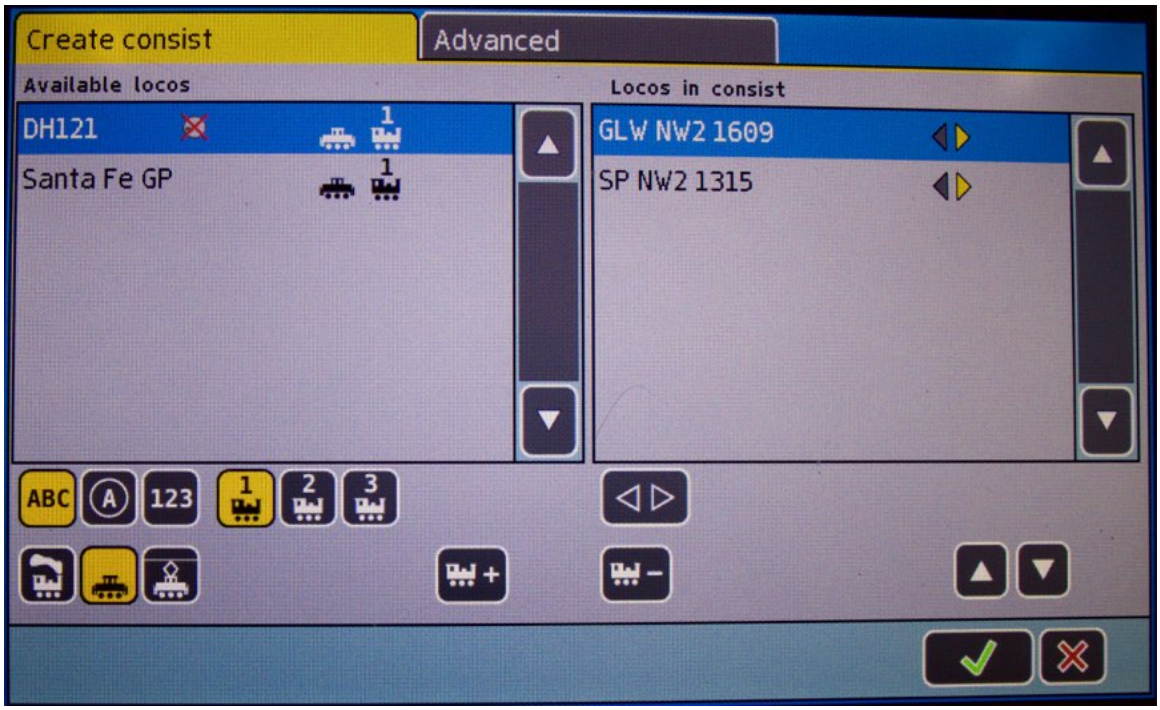
Yes, all you Easy DCC fans out there, I was looking out for you and contacted CVP for input to this column. As I am finishing this column in mid-November, they have not gotten back to me. Since I don't want to make unsubstantiated claims, I have nothing to share with you. Sorry.

ESU

The ECoS system builds (universal) consisting. It is set up fairly easily using their color touch-screen command station [4].

The ECoS system does not assist the user in building advanced consists. As with any DCC system, it will support them if you build them manually, through programming CVs 19, 21 and 23.

4. ESU ECoS system setting up a consist between two locos (1315 & 1609)



Once the consist is built, it is in the database in the command station and is selected in the same manner as any loco.

I haven't found a way to differentiate which locos respond to which function commands with the ECoS system.

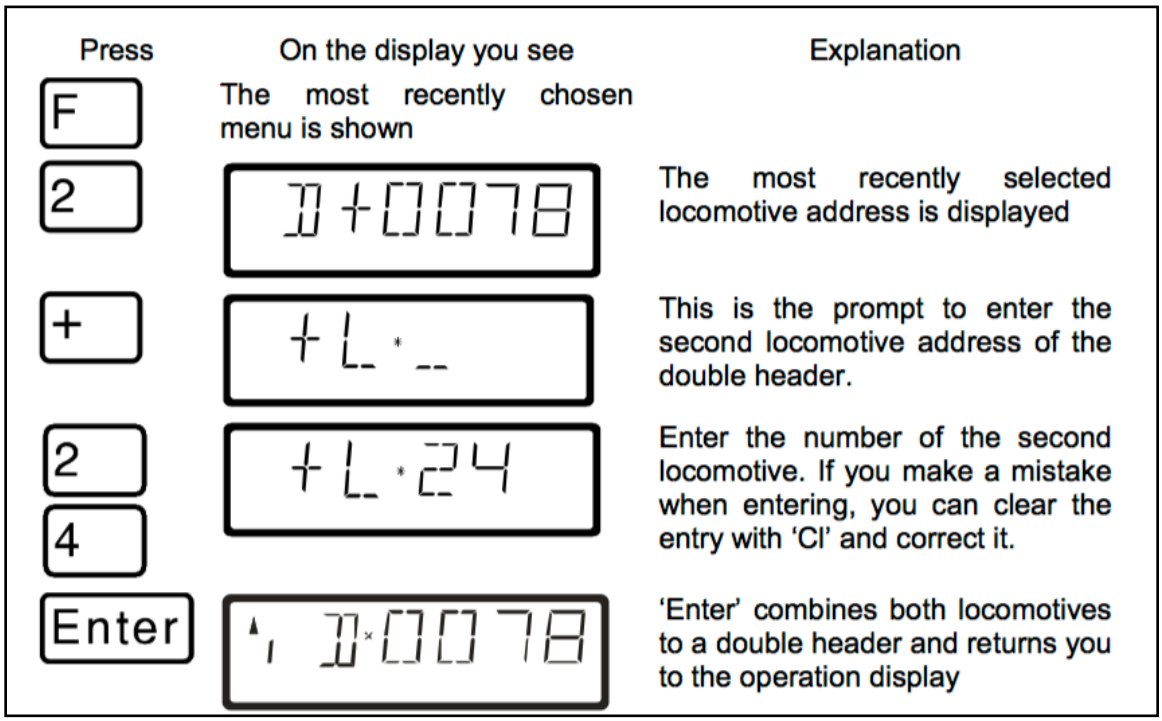
Breaking down the consist is pretty straight forward. Once it is selected on a throttle, tap on the little wrench icon and tap on the DELETE LOCO pop up, exactly the same way you do when deleting a loco from the database.

Lenz

Lenz offers Universal consisting, called a double header. It requires a LH100 throttle. Double header, as the name implies, is only usable for two locomotive consists.

There are detailed instructions in section 7 of the Lenz LH100 manual, as shown in [5].

5. Excerpt from the Lenz LH100 manual - how to build a double header, starting with loco 78 and adding loco 24.



There are a few memory locations in the Lenz command station (in some cases only one) for double headers. You may run out of capabilities if you want to run a bunch of double headers.

Smart Consisting is the Lenz name for advanced consisting. It is also referred to as MU or multi-unit consisting within the Lenz documentation. Either the LH100 or the LH090

throttle can be used to set up Smart Consisting. All decoders must be in 28 speed step mode.

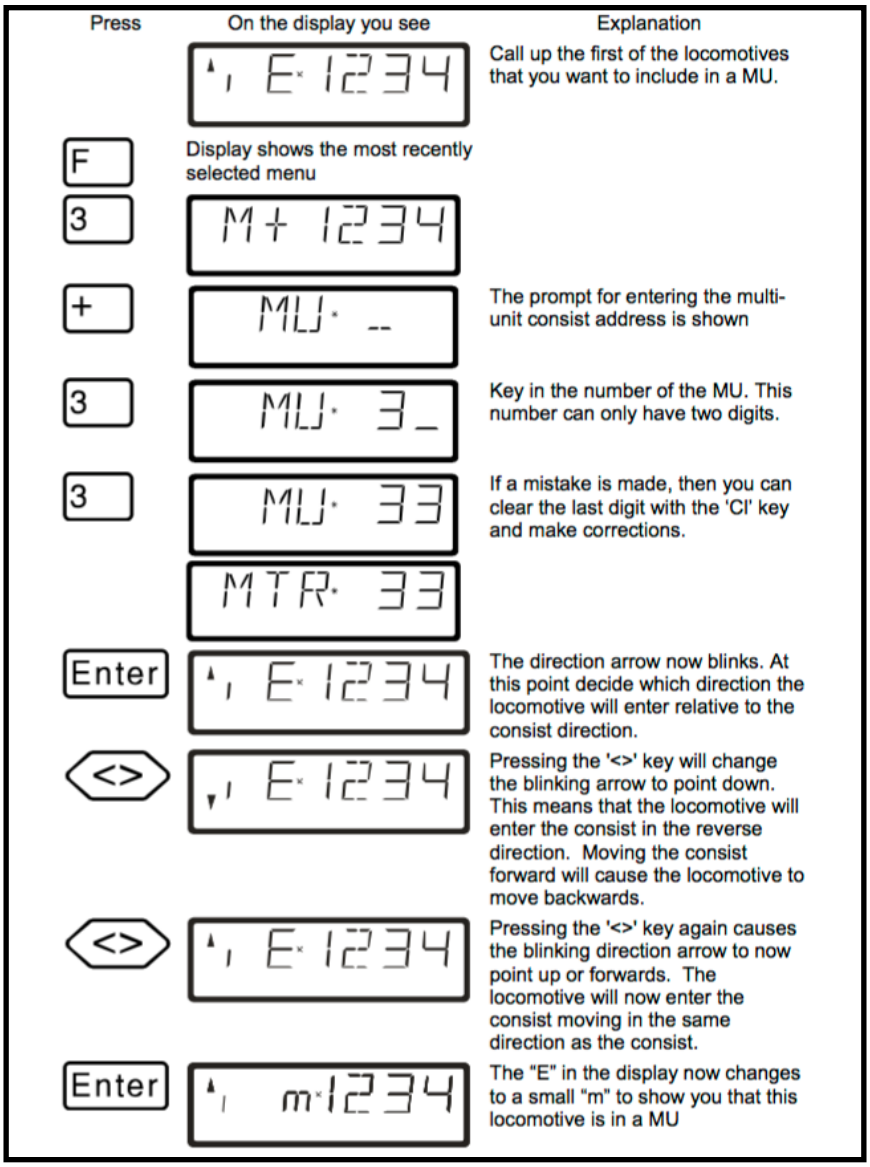
Smart Consisting uses one locomotive address in the command station for each loco consisted and one for the consist address. Fortunately, Lenz systems have 256 locomotive address slots, or registers. You are unlikely to overload your system's capabilities with a few Smart Consists.

There are 98 consist addresses (1-99) available. Any locos on the layout with short addresses will reduce your choices for the consist addresses. There cannot be any address conflicts, or you will end up running a loco and your consist at the same time. You get to choose the consist address as part of the setup process. Selecting any loco in the consist gets you to the stored data, so you don’t need to remember (or write down) the consist address.

To set up a Smart Consist with your Lenz system, I refer you to the manual for the model of throttle you will be using. The LH100 and LH090 throttles both can set up Smart Consists. The methodology is much easier with the LH100 [6], so I'll talk a bit about that here.

The procedure covered in section 8 of the LH100 manual shows how to add one loco (1234) to a MU, as the manual calls it. Note that you set the direction of operation of the locos in the consist individually in this process, allowing back-to-back or elephant-style consists, or a mix of the two. The process is repeated as many times as needed to get all the locos into the consist.

6. Excerpt from the Lenz LH100 manual - how to build a Smart Consist (MU), starting with loco 1234. This process is repeated as many times as necessary to get all the locos into the consist.



Once you have the consist together, you can get it to move by calling up the consist address (33 in [5]) or the address of any loco in the group. If you want to activate functions (lights or sounds), you need to be addressing the specific loco that you want to change.

MRC

The MRC Prodigy Express^2 system automates the advanced consisting somewhat [6]. It will set the consist address of your choice and the direction of running into CV 19 of the locos you select. However, this system does not remember consist addresses or their

relationship to locomotives. As you can see in the instructions [7], the manual specifically tells you to write it down.

7. Instructions for setting up an advanced consist with the MRC Prodigy Express² DCC System

1. Press **PROG** until "Cons SET" flashes in the LCD display. Then press **ENTER**.
2. "Cons #" will display, prompting you to enter a consist number. Enter a consist number (a short address 1-127) followed by **ENTER**.

Write down the consist number. You will need it later to clear the Advanced Consist.

3. "Add Loco" will display, prompting you to add a loco into the consist group. Enter the address of a loco you want to add. Press **DIRECTION** if you want the loco's direction reversed (forward is the default setting). Then press **ENTER**.
4. "Add Loco" will display again, prompting you to add another loco into the consist group. You can add as many locos into the consist as you would like. To end programming, press **ENTER**.

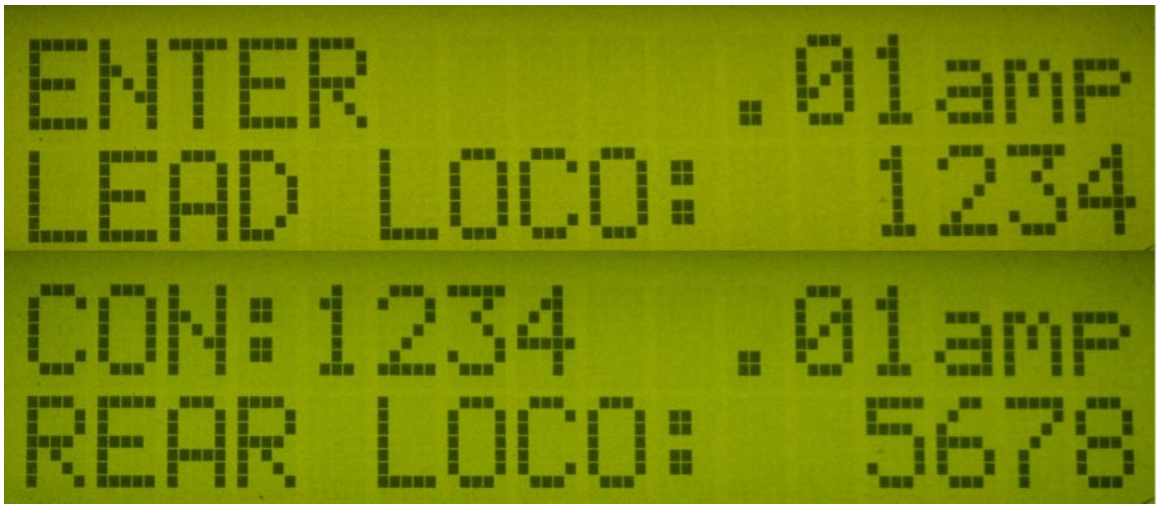
The MRC system also automates breaking down the consist. All it takes is a few button presses, but you must manually enter the consist number. Hopefully, you wrote it down.

If you have a Prodigy Advance Cab, you can create within your Prodigy Express² system what MRC calls a Universal (Old-Style) consist. Universal consists are limited to one per system with up to 4 locos consisted. One loco is chosen as the master loco and the rest of the locos are piggybacked on that loco's address with motor commands being sent to all consisted locos. The Old-Style consists are broken down with a few button presses.

NCE

NCE automates Advanced consisting with some different wrinkles. If CVs 21 & 22 are already set up, they will help control the functions the decoders respond to. The system assigns the consist address automatically [8]. You needn't write it down, as the system will always get you to the consist by the loco numbers included in it. Note that you set the direction of operation of the locos in the consist individually in this process, allowing back-to-back or elephant-style consists, or a mix of the two.

8. Setting up a consist with the NCE PowerCab: 1234 front, 5678 rear



Here is the slick part. Think about a consist with 1234 on one end and 5678 on the other. If you select 1234 and say, “Go forward”, the consist will move together with 1234 in the lead. When you reach the end of your turn, you run around the train and get set to run back. Selecting 5678, the train will run forward for 5678 (the opposite direction from earlier) when you select forward on the throttle.

9. Killing a consist with the NCE PowerCab

You can press the DELETE (consist) button [9] and then enter 1234 or 5678 (or any other loco contained in the consist) and the consist will be removed, as long as the locos are still on the layout.

NCE recognizes any address from 0 to over its throttle capabilities (9999 maximum) as a long address. If you only run your locos on NCE systems, I recommend that you use long addresses for loco addresses, leaving all the short addresses available for the system to use as consists. For example, if you have a loco that has a cab number of 24, you enter 24 as the short and as the long address using the NCE system or DecoderPro and tell it you want to make the long address active. When you want to run the loco, just select 024 on your throttle. The leading zero tells the NCE system that you are asking for the long address of 24.

NCE supports (but seemingly discourages) old-style consists. They are set up and broken down similarly to advanced consists.

Zimo

Zimo has brought out a new system recently. This system uses the (MX10 box with the MX32 [10] throttle). This is the system that is currently available. Zimo has not finalized the firmware to allow this system to assist you in building consists. I've been told that it should be in the next one or two software updates. It is expected that the operations will be similar to the prior system, as the MX32 has a T P key on it.

10. Zimo MX32 throttle has the T P key (to the left of the slider) available, presumably for future universal consisting.

DCC Impulses - Details of DCC Consisting

The older system (MX1 box with MX31 [11] throttle) automates universal consisting. The key with the labels of T P on it is used to add the active loco to the consist or to remove it from the consist.

Addressing any loco in the consist will move the consist and allow control of the functions of that specific locomotive.

11. Zimo MX31 cab - locos are added to or removed from the consist using the T P key to the left of the slider.

As with any DCC system, all Zimo systems will run basic or advanced consists that have been built manually.

Summary

All command stations will run basic consists and advanced consists that you create yourself. Command stations help automate the setup and breakdown of some types of consists. Table [12] shows what each manufacturer supports and what they call them.

12. Table showing command station assisted consisting types by DCC manufacturer. "Not assisted" means that the command station won't walk you through setting up the consist. Any system will run a manually built advanced or basic consist.

Manufacturer	Advanced NMRA CV 19	Universal Old Style
Digitrax	Not assisted	UniVersal
ESU ECoS	Not assisted	Consisting
Lenz	Smart (MU)	Double header
MRC	Advanced	Universal
NCE	Advanced	Old Style
Zimo	Not assisted	Universal

With command station assisted consists [12], loss of command station memory (changing battery, for example) will drop the consist information. In this case, it is just as if you took the consist to a new layout, you start over from scratch.

I favor manually created advanced consisting. While it is a bit more difficult to create, it is system independent and transportable. It only uses one system slot for the consist, no matter how many locos are in it. If you set it up manually (instead of having the command station do it for you) it will work anywhere. It is impervious to Digitrax slot purging. However, you loose some command station features, like NCE's ability to

If you aren't going to move your locos between layouts or systems, command station assisted consists [12] may be exactly what you need.

select the direction of the consist by using different loco numbers within the consist.

Thanks

Many folks contributed to this column with eMail and phone support and by proofreading what I wrote about their products. As you can tell by now, covering all the different way folks attack consisting was a far bigger maze than I anticipated when I started this column. I didn't want to make incorrect representations for various systems.

So a tip of Mr. DCC's hat to the following folks who represent the manufacturers:

American Hobby Distributors (Lenz Importer): Eric and John

Digitrax: Dave

ESU: Matt

Lenz (Germany): Peter

MRC: Doug

NCE: Jim

Zimo: Art

Folks always seem to have additional ideas to share. Just click on the Reader Feedback icon at the beginning or the end of the column. While you are there, I encourage you to rate the column. “Awesome” is always appreciated. Thanks.

Until next month, I wish you green boards in all your endeavors.

