



# NEWSLETTER

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Digital Consultants

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**Current Central Station 3 Version – 2.4.1 (0)**

**Current Central Station 2 Version – 4.3.0 (11)**

**Current Mobile Station 2 Version – 4.1**

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We recently returned from the NMRA National Train Show in Grapevine, Texas (Dallas). This show was crazy! We were so swamped with people in the booth that we could not leave. It was great to see so many people at a show again. If you did not make it to this year's show, it will be held in Long Beach, California next year.

Our first article is about the grade when ascending or descending to another level of a layout, and our second article is about programming a shuttle route into a CS3.

## **Layout Grades**

The question has come up recently about a grade to travel to a second level on a layout. Since some (or most) Märklin, Trix, LGB, and even Minitrix and Z scale locomotives have traction tires, they are capable of ascending steeper grades than standard. Now I am not here to debate what a "standard" grade is for model railroads, that is an individual debate for the model railroader, and it usually comes down to available space and what looks realistic.

Of course, there are limitations, even with traction tires, to what a locomotive can pull, and it varies from one type of locomotive to another. We must consider the number of drive axles and tires vs. the load and grade while keeping in mind the physical output of the motor itself. There is probably an equation for this somewhere that I do not really plan on looking up and would rather follow the rule of what looks realistic with regards to a grade on a layout and the composition of a train.

With all of that said, there is a handy guide in the Märklin catalog for what I call the "Märklin Standard Grade". The grade in the catalog is 5%, which corresponds to a slope

angle of 2.86°. So, for those with an inclinometer, rounding up to 3° gives a grade of 5.24%, which should be well within the capabilities of any Märklin, Trix, or LGB locomotive with traction tires.

## Rise and Length

Back to the Märklin catalog. It shows how to use the Bridges and Ramps that are available for H0, along with the piers that are necessary to achieve the correct grade (Fig. 1). While there are not illustrations for G, N, or Z-gauge in their respective catalogs, this illustration gives an idea of what is involved to ascend/descend to another level of a layout whether bridges and piers are used or not.

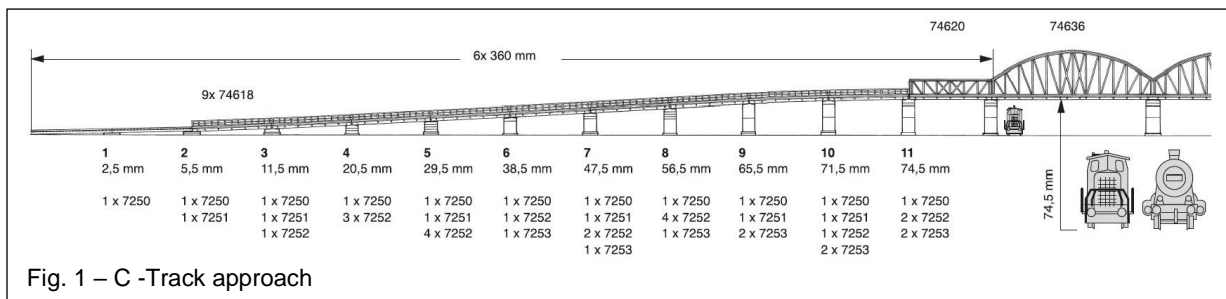


Fig. 1 – C -Track approach

No matter what gauge/scale you model, the height requirements are different if you run catenary. For example, the height for Märklin/Trix C-Track without catenary is about 3" (75.4mm). While the clearance height for catenary is about 4 1/8" (104.5mm) (Fig. 2). The reason this is important is that the higher you go, the more length is needed to go up or down if the grade is to be kept at about 5%. This means that the length of the grade is 28 3/8" (720mm) longer for the catenary grade, which is significantly longer than if there is no catenary.

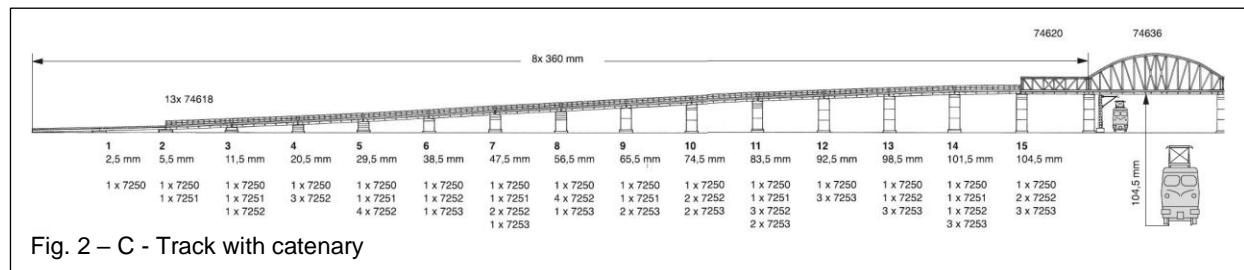
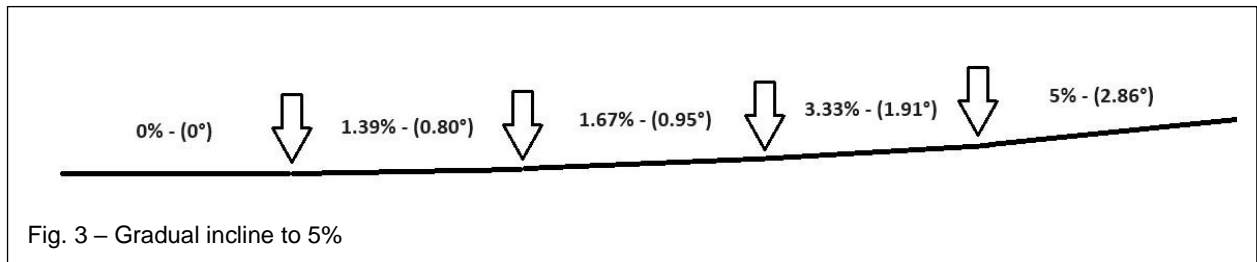


Fig. 2 – C - Track with catenary

For LGB, the minimum rise for catenary is 14" (355.6mm) using L56301 masts. So, following the math (if I calculated it correctly) the length needed would be about 32' (9.75 meters) for catenary, whereas no catenary only needs about 8 1/2" (216mm) rise and the length would be about 20'-6" (6.25 meters).

A couple of things to remember with any track system is that the incline length needs to be longer. For example, a 2160mm (85 3/64") length of C-Track on a level surface will need to be 2161.3mm (85 3/32") long on an incline. The higher the rise, the more linear feet of track is needed. I am not sure if track design software accounts for this.

The other thing that needs to be mentioned is that the incline should not be 5% from beginning to end. It is recommended to decrease the grade at the beginning and the end of the incline. This naturally lengthens the grade somewhat. If someone were to remember their 8<sup>th</sup> grade geometry, they would calculate the grade in the Märklin catalog starts at (approx.) 1.39% (0.80°) for the first section of the grade, then it is 1.67% (0.95°) for the second section and 3.33% (1.91°) for the third section until the fourth section and beyond which is 5% (2.86°), then at the end of the grade where it slowly slopes to level again in the same way (Fig 3).



If the grade is abruptly started at 5% then a longer locomotive can become “high centered” where the pilot truck and the trailing truck are on the track, but the drive wheels are lifted and therefore there is no traction. Figure 4 shows the rear drive wheels lifted off the track. Although the front drivers are on the track the traction tires are on the rear, so the wheels will just spin in this situation.



## Helix

A helix is always an efficient way to climb (or descend) a grade to another level. Usually, a helix is hidden in a mountain so the visual of seeing a locomotive climbing up a mountain is lost. In the case of a double helix, (separate “up” track and “down” track), the outer track should be the “up” track and the inner track should be the “down” track. This is because the outer track is longer and mathematically, it will decrease the grade and make it easier for a locomotive to pull wagons up the grade while the inside track is shorter, so it is mathematically a steeper grade going downhill which won’t have much effect on a model train. There is no difference between a straight ramp or a helix, the same rules of a gradual incline apply.

## Track Tuning

One thing we have noticed, as I am sure many others have, is that some locomotives do not like uneven track. One of the most particular locomotives is the Märklin S 2/6 (37015) (Fig. 5).



Fig. 5 - Märklin 37015 S 2/6

With the pilot truck and trailing truck and only two drive wheels between them, this locomotive is one of the most challenging units to get around a layout. The reason I bring this up is that this is probably the best wheel configuration to “tune in” the track on a layout, especially on the beginning and end of a grade. Once the track is tuned for this locomotive, there should not be a problem running any other locomotive.

Another handy tool would be the Märklin 46582 bubble level car. This can help see what grade the inclines are (Fig. 6 - 7).



Fig. 6 - Level car



Fig. 7 - Level car

### Calculating a Grade

Now I am sure that someone has checked my math and thinks that I am some kind of genius for figuring out all these grades and conversions to different scales. Well, they are not very far off, but I do have to confess that I used my old “Model Calc” (Fig 8). Unfortunately, these are no longer available, however, there are still some out there, if you can find one. It easily calculates grade, length, in mm or inch, and can quickly convert between the two in any scale. It can even mix metric and standard lengths and calculate them – I used this because I don’t remember my 8<sup>th</sup> grade geometry!

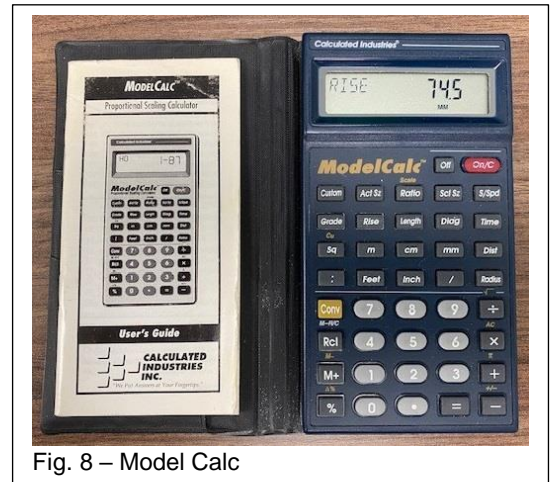


Fig. 8 – Model Calc

I hope this helps you to understand how to set up a grade for a layout, and I do confess that I have looked at the grade illustration in the Märklin catalog hundreds of times over the years and never realized that it was a gradual incline at the beginning and the end of the grade.

**Enjoy your hobbies!**

**Rick Sinclair**

## The Macro Shuttle

The Shuttle event is designed for a single point to point line and a single consist. In this article, I will illustrate the basic elements for setup and how to create a shuttle in an event using the Macro Shuttle.

To use the 'Macro Shuttle', you first create an event, then use the '+' add button to access the Macro Shuttle selection. If you do not see the Macro, you will need to enable the extended track features within the CS3's settings (Fig. 1). Once selected, a new event container, labeled 'SHUTTLE', will be created in both the event step list and overall event list (Fig. 2).

To understand the components needed for a Shuttle train, open the Shuttle event to display the options that you will need to set. Fig. 3 shows the options. Three of them are track elements, the rest are settings that relate to the train in use for that shuttle line.

You can see that three of them have '?' icons in the upper left corners. These three elements are the track sensors, you will need to have at least two of them installed on your layout.

The third optional element is only required if you wish to create a mid-line stopping point such as a depot stop.

If you are unfamiliar with track sensors, then you will want to research information regarding the S88 module. You can send me an email to request an article or article index on this topic "Digital@marklin.com".

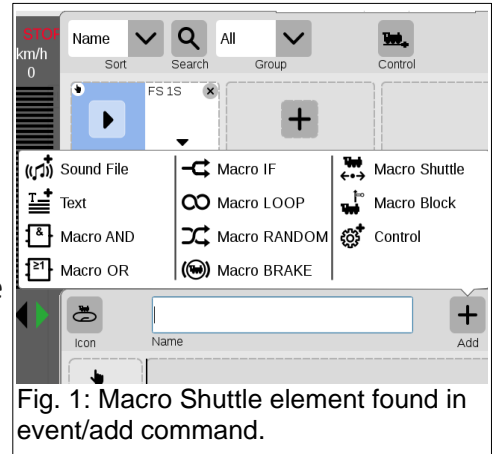


Fig. 1: Macro Shuttle element found in event/add command.



Fig. 2: Shuttle container in event list (top) and event steps (bottom)

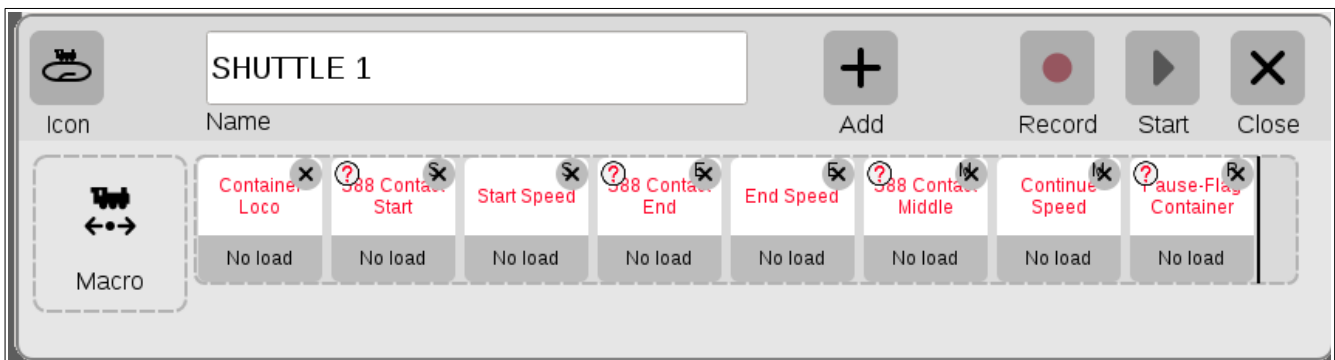


Fig. 3: Macro Shuttle attribute containers

## Track Sensors

The hardware decision that you will need to consider are what sensor types to use with the S88 feedback module. Contact tracks would be the best choice for 3-rail operation, but you may also use circuit tracks (center slider detection). For 2-rail operation, you can use magnetic sensors. Contact tracks need to be placed far enough away from the ends of the line to ensure enough time for the shuttle to stop before hitting the end of the line. In other words, the contact must be triggered first by the consist wheels, then allow time for the train to halt. Magnetic reed circuit tracks also need to be placed using the same concept, but they must also be placed to allow for location of the triggering device on the train. This means the sensors may be offset at each end, because a slider on the loc will be closer to one end of the shuttle line but further away from the end on the opposite side of the line. Fig. 4 shows examples of placement for the Contact track (top) and a circuit track (loc slider detection) at the bottom.

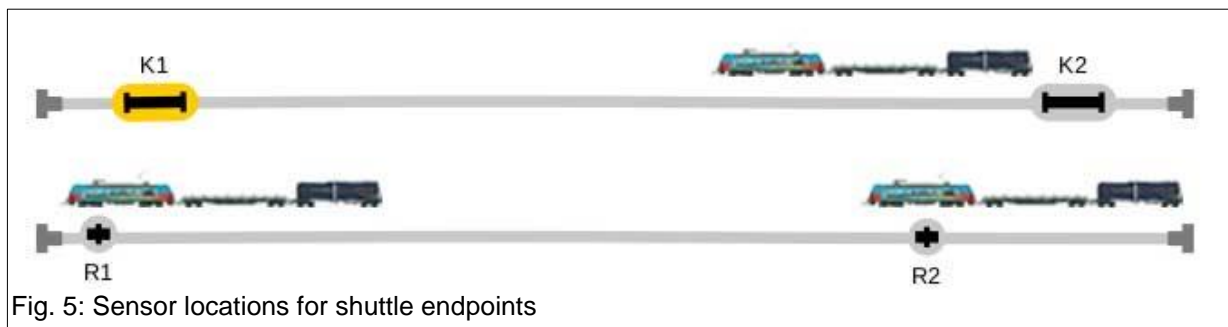


Fig. 5: Sensor locations for shuttle endpoints

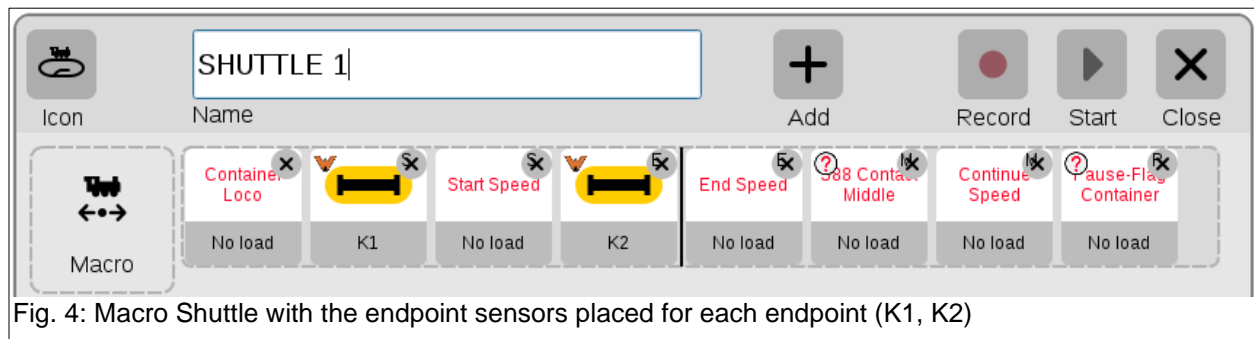


Fig. 4: Macro Shuttle with the endpoint sensors placed for each endpoint (K1, K2)

To set the sensors conditions into the Macro, you can drag and drop the contact icons into the start and end containers of the Macro Shuttle. This is illustrated with the contact tracks 'K1' and 'K2' placed into the 'S88 Contact Start' and 'S88 Contact End' containers shown in Fig. 5.

## Locomotive Attributes within the Macro Shuttle

The locomotive attributes in the Macro Shuttle are primarily shuttle selection and speed according to direction of travel. If you drag and drop a locomotive from your loc library into

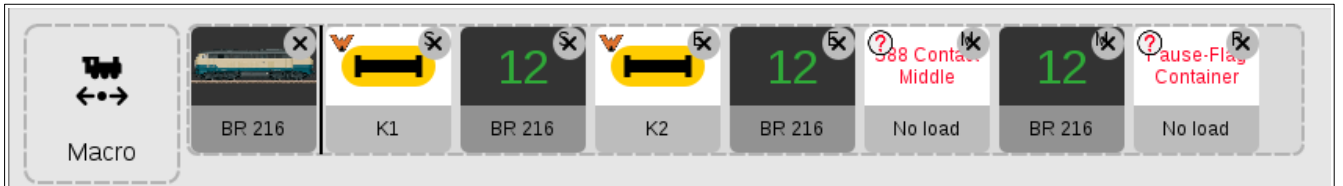


Fig. 6: Loading a Loc will auto fill a value into each speed container.

the 'Container Loco' attribute, it may autofill a default value into all three speed containers. You may want to adjust each set of speed values accordingly if your forward or reverse speeds behave differently. You can see the result of this action in Fig. 6  
 This configuration is the basic shuttle setup completed. Please note that this does not include a midpoint stop. I will cover that later in the article.

### Starting the Shuttle

To operate the shuttle train, startup is simple. The one recommendation is to place the locomotive in between sensors so that none of the sensors are active (i.e., yellow). Once you have placed the loc in the middle, it should be safe to start the shuttle.

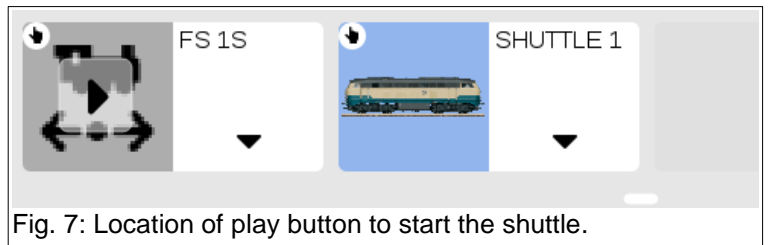


Fig. 7: Location of play button to start the shuttle.

This is done by simply opening your events and clicking the play button on the event where you added the Macro Shuttle ('FS1S' in Fig. 7). You can see from the illustration that there is no play button on the macro itself, nor is the event triggered by any contact on the track (i.e., the event is a manually controlled event). Clicking on the play button will start the train at the speed settings set within the macro.

Once the shuttle operation has been started, the play button will switch to a pause button. Click on this if you wish to halt the shuttle operation altogether.

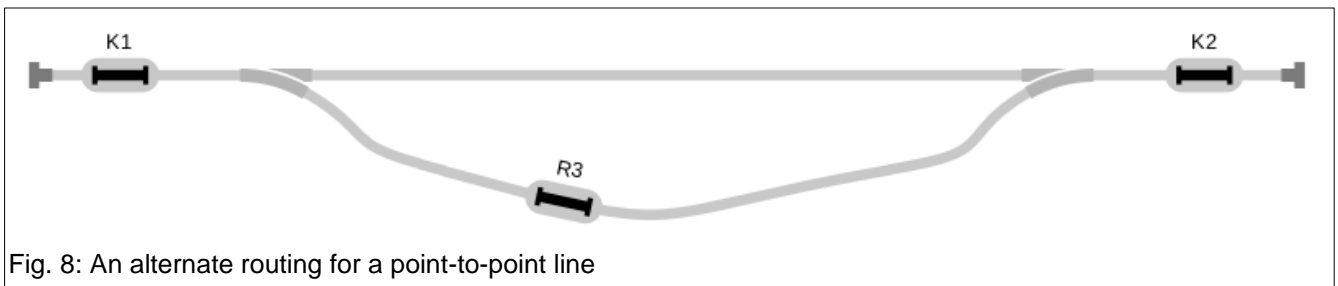


Fig. 8: An alternate routing for a point-to-point line

### Entering a Mid-Point Stop

A single mid-point stop can be entered into the shuttle line by adding a third contact into the route. Bear in mind that there could be a lopsided visual effect if are using circuit tracks (loc slider contact), or if your return route is different from the starting route. This may or may not be intentional depending on what you desire. Fig. 8 demonstrates how a loop line shuttle may be accomplished with a mid-point stop on one leg of the journey.



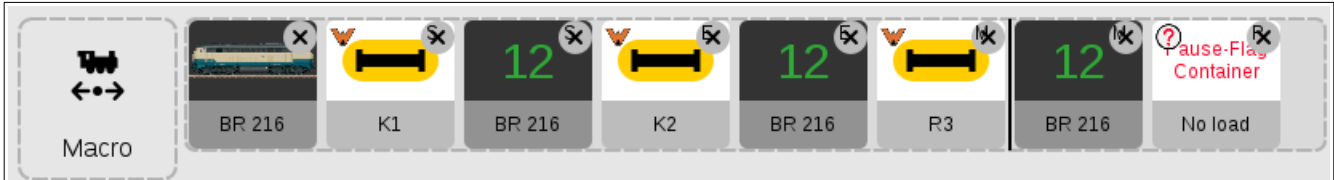


Fig. 9: Macro Shuttle with mid-point contact entry (R3)

Of course, you can have the mid-point stop with a single line route and the shuttle train would stop at the same area in either direction. Just keep in mind that with circuit tracks, the train will stop at the location of the center slider contact.

This Macro shuttle modification would resemble Fig. 9, as you will be placing the third contact within the 'S88 Contact Middle' container.

### Setting Duration of Stops

Within each of the contact containers, there is a delay setting. The default is set for 3 seconds. This timing is designed to countdown after the train makes contact. The step will countdown the delay, then proceed to the directional speed. This can be altered according to your preference.

### The Pause-Flag Container

The final container/attribute to discuss is the 'Pause-Flag Container'. This container uses a 4th track sensor to halt/pause the shuttle line whenever it is active. If you have a track crossing for instance, you may set up a contact track on the crossing line. While the crossover point is active, you can prevent the shuttle from operating normally. You can also activate this extra sensor manually.

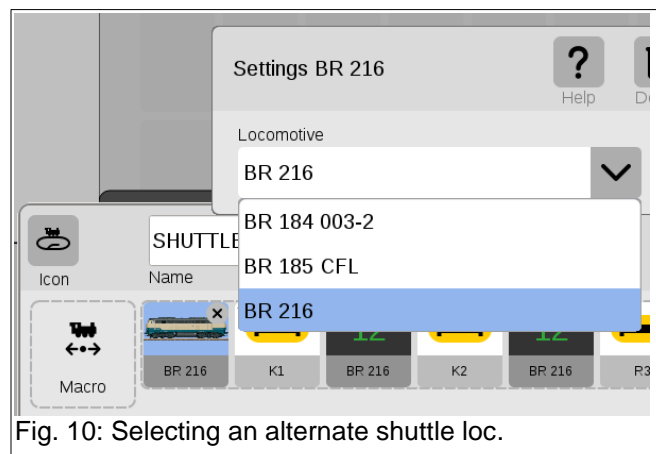


Fig. 10: Selecting an alternate shuttle loc.

In addition, you can use a control contact in this container. The control contact is like a standard contact, but it does not require a physical track component (i.e., circuit or contact track). This is a software construct that can be placed within a track plan. It looks like a contact track but is just a screen button that can activate an event.

### Changing Loks within the Macro Shuttle

The CS3 makes it easy to swap out shuttle trains without having to create another Macro Shuttle. By selecting the loc container of the Macro Shuttle you can access a list of all your loaded loc entries in the Central station. You simply just need to select your loc of choice,

and it will then be controlled by the Macro Shuttle (Fig. 10). Once you change Loc, however, you will probably need to alter all your speed parameters within the macro as each loc will operate differently with varied speed settings.

- **Curtis Jeung**

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**Upcoming appearances:**

- **ONLINE Webinar**  
October 11, 2023

**To contact Rick and Curtis for help with your Digital, technical and product related questions:**

**Phone: 650-569-1318 Hours: 8:00am – 5:00pm CT. Monday through Friday.**

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