RR-Track v5

Manual

version 5.00.002

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Introduction

RR-Track is a model train layout visualization application. It is designed to easily enable anyone to create, view, and edit toy train layouts consisting of Z-, TT-, N- HO-, O-, O-27, G-, S, and standard/wide gauge track. Using **RR-Track** you can create layout designs ranging from a simple loop to complex layouts such as that typified by the Lionel® 1948 showroom layout containing nearly 500 pieces of track and over 100 accessory and scenery items.

The number of track, accessory, scenery, and other items you place in your layout is only limited by your requirements and level of detail. You can mix gauges and manufacturers as needed. You can place accessory items from **RR-Track's** standard libraries or create your own using the built-in drawing tools. As you are working, you can check the appearance of your creation using the *3D View* module, and you check your layout design from proper operation (or play train games) using the *Simulation* module.

If you are new to **RR-Track**, we suggest reading the *Getting Started* topic for a step-by-step introduction to layout design using **RR-Track**. If you are a seasoned user, feel free to study any of the topics. The Views topic discusses the different ways RR-Track can display your layout design. Choose the How Do I link for quick access to a number of topics.

Regardless of your familiarity with previous versions of RR-Track, we urge you to read up on **Track Laying Tips** and the topic on **Building Your Layout to the Plan**.

Tutorial: Getting Started with RR-Track v5

In order to get started building your dream layout, the following tutorial will guide you step-by-step through the process of building an oval of track and then modifying it to add a turnout and spur. Following that, further segments will show you how to elevate track, create bench units, add scenery, and finally run some trains.

Getting Started Part 1: Basic Track Laying

First, you must start **RR-Track**. Do this by either (1) double-clicking its icon on the Windows Desktop , or (2) pressing the **Start** button, choosing **Programs** and then **RR-Track for Windows**. You can also double-click on an existing track layout file (extension .rrt) from the Windows Explorer; Windows then automatically starts RR-Track and opens that layout.

RR-Track creates several windows when you start it and open a layout file: the main frame window, master layout window, and layout overview window. **RR-Track** has two distinct classes of options that can be set from either the menu or dialogs reached from the menu. These are global options (those that affect all layouts and are remembered between sessions) and layout options which affect only the active layout window (the one you are working on). Some of these are stored with the layout components and remembered between sessions while others can be set as defaults and affect all subsequent layout windows. See *global options dialog* and *layout options dialog* for more information.

When you first start **RR-Track**, you are presented with a window like that at left. Here you have a choice of (1) Creating a New Layout, (2) opening one of your Existing Layouts, or (3) choosing a layout from a list composed of your six most recent layouts as well as all of those in your *My RR-Track Layouts* folder. You can also choose None of the Above.

Choose "I want to create a new layout". As soon as you do, you will see a window like that below. This is the *New Track Layout Wizard* which will lead you through the process of setting up your first layout design.

(1) Set your layout size
First you must determine your starting layout size. This will be the size of a rectangular area in which your actual layout design resides (regardless of its shape). In essence, this is the size of the sandbox in which you can start to work; you can always change the size later.

Use the up/down spin buttons to set the width and depth. We want a width of 10ft and a depth of 7ft. Then press the Next button...

(2) Set your layout scale
Next, you want to set the scale of your layout. The layout scale is used for things such as automatically setting the heights of user-drawn structures such as buildings, walls, and roads. It does not affect the physical size of the track or accessories that you position on your layout.

Choose O-scale and the press Next...

(3) Set your layout type
This is an easy one. You can either choose a standard layout which includes predefined layers for track, scenery, roads, etc. or you can choose a plain layout which has only a single drawing layer defined.

Choose "Standard Layout", this will make it easier to separate various features of your layout for visibility purposes. Then press Next....

(4) Set your layout shape
Now it gets a little more interesting. **RR-Track** has the capability of creating predefined benches (whose sizes you can change later) that will produce layouts that are simple like a single table, L-shaped, C-shaped, and perimeter layouts that go around the edges of your space.

We will leave the more complex shapes for another time, for right now, choose "single bench covering the entire layout area" and then press Next...

(5) Set your layout name

Almost there. Here you have to choose a file name for your layout. We suggest typing "My First Layout" in the text box. Make sure the "use My Documents root" box is checked (it should be); the list shows the existing **RR-Track** layouts in that folder. Don't choose one of those names, you don't want to overwrite any previous layout designs.

When you are finished specifying the layout file name, press the Done button.

As soon as you press the Done button, **RR-Track** creates a new layout based on the specifications you designated. You should see a master layout window that looks like that below.

There are five tabs corresponding to the five different views you can have of your layout design. Of course there is no track for the trains to run on (yet), that comes next. If you have a small screen and need the maximum space to work in, press the Maximize button at the upper right (not the Minimize button). If you do not maximize the master layout window, your screen should look similard.
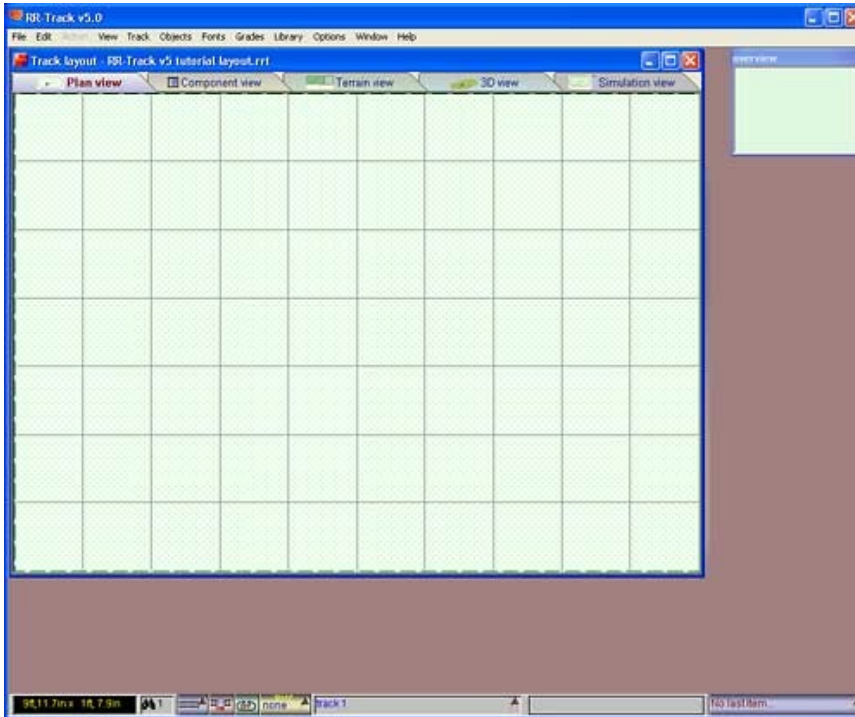
The small window at the upper right shows an overview of your layout, with a small red rectangle denoting the area currently displayed in the **Plan view** (right now we are zoomed out to show the entire layout so there is no red rectangle).

There is a menu bar across the top of the RR-Track application window. For a **Plan View** this menu has pull down sub-menus **File**, **Edit**, **Action**, **View**, **Track**, **Objects**, **Fonts**, **Grades**, **Library**, **Options**, **Window**, and **Help**.

The **Action** menu is disabled unless you have selected some track or object that may be acted upon. If the overview window isn't visible, pull down the **View** menu and choose **Show Over View**. Move the cursor to the overview window and right click with the mouse. From the pop up menu choose **Dock Upper Right**).

Note the status bar on the bottom of the **RR-Track** application window. This is not just for information purposes but allows quick access to a number of RR-Track options and parameters that may need changing as the situation requires. For example, the *layer list display* near the center should say '**track 1**'. This signifies that new items are added to the 'track 1' layer. For further information on RR-Track status bars, see the *essay on using the status bar*.

We are going to construct a layout using **Lionel O-gauge** track. We could use some other track such as **LGB G** or **Atlas c.100 HO**, but all configurations of RR-Track contain a Lionel O library, and the principles of construction are the same, regardless of the track library. Pull down the **Library** menu and choose **Lionel O**. RR-Track places a check mark next to this item to indicate that Lionel O is the current track library. Pull down the **Options** menu and check **Detailed Track Render** if it is not already checked. While you have the **Options**

menu down, verify that **Selections Include Joints** is checked. If it is not, check it. Make sure that **Detailed Track Render** and **Label Track** are also checked.

Now pull down the **Options** menu and choose **Options**. This will cause RR-Track to display the *Global Options dialog*, like that at left. The *Global Options dialog* has eight tabbed pages, but the *Track Laying* tab is the one we want to look at first. Make sure that **Allow Track Breakaways**, **Autojoin Track**, **Auto-close Loops**, and **Proximity Joining** are all checked. Once you have done this, select the *Miscellaneous* tab and verify that **Fly Over Item ID** is checked.
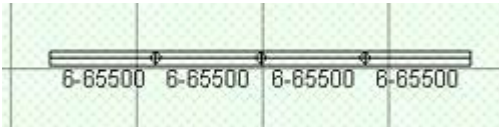
When you have verified this, press the **OK** button.

Next, right-click somewhere over the empty layout to bring up a *shortcut menu*. From this menu choose **Layout Options** (towards the bottom). This will bring up the *Layout Options dialog*. Click on the **Coordinates** tab and make sure that **Detailed** is chosen in the Symbols & Details group, and that **label track sections** is checked in the Track Labeling group. Then press **OK**.   Now it is on the laying some track.

Starting a Loop

Let us place the first piece of track. Pull down the **Track** menu and select **O-straight -> Lionel single** from the list of straight track sections. The cursor will   change to

Without clicking the left mouse button, move the track to somewhere in the lower left region of the layout, then depress and release the left mouse button (this depressing and releasing of the mouse button is termed 'releasing the track'). The point at which the origin of the track section is placed is the tip of the cursor arrow. **RR-Track** draws a straight section of Lionel track at this point, and labels the track *'6-65500'*. Since you are no longer placing a track section, the cursor returns to the Windows arrow. Now repeat this process, except use the **Last Track** command from the **Track** menu to get another piece of 10 inch straight track. Bring the left side of this section near (within 12 inches) of the right side of the previous track section, and click (depress and release) the left mouse button. The new piece of track immediately attaches itself to the first piece, forming a combination of two straight pieces of 10 inch Lionel track. Again, repeat this process, but this time move the cursor over an empty area of the layout (an area that does not have the two track sections beneath the cursor) and *double-click* the left mouse button. Another straight section of track appears under the cursor. Move this to one end of the other two track sections and click the left mouse button so that the new section automatically joins itself to the first two sections. Finally, move the cursor to the right side of the status bar near the bottom of the screen and place it over the button labeled 'single straight' and press the button. You will have yet another section of 10 inch straight track appear under the cursor. Move this over to the first three and join it to them. At this point the screen should look something like that at left. You have assembled four sections of track using all four ways of calling up a piece of track (**Track** menu -> **O-Straight -> Lionel SIngle**, **Track** menu -> **Last Track**, left mouse double-click, and *Last Item list*).

Now it is time to tackle building the first curve. We will build a semi-circular (180°) curve using four sections of O-31 curved track. Pull down the **Track** menu and select **O-Curve -> O-31(modern)45° L**, bring the left side of the curve down near the right end of the group of four straight track sections, and release it, automatically joining the curve to the four sections of straight track. To bring up another curve, use the double-click shortcut; double-click the left mouse button in a blank area to bring up another O-31 curve, bring the curve's left end up near the unattached end of the previous curve, and release to join
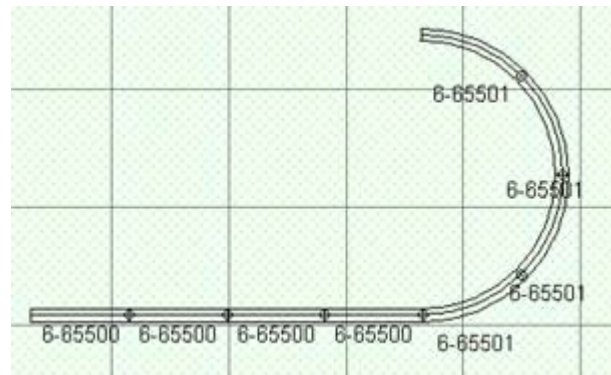
the new curve to the previous curve. Repeat this process two more time, giving you four O-31 curves in all, joined to each other to form a semicircle, with one end joined to the four straight track sections. The layout should now look like this, resembling a candy cane.

If your layout does not look similar to that in the figure, go back through the previous section and see what you left out. If the last track section was joined in an errant manner (which is any manner that is not that way you wanted) you select the **Step Back** item on the **Edit** menu until you remove the last piece of track.

Before we go on, take a moment to place the mouse pointer over one of the straight track sections. **RR-Track** displays a small window which shows you what kind of track you are over, in this case 'Lionel single straight', and the layer this track section occupies (in this case <u><<track 1>></u>). Move the mouse pointer over one of the curved track sections and stop it for a second. The hint name that appears now says 'Lionel O-31 curve 45°'. Simply by pausing the mouse pointer over a track section you can get information on that track. If you pause over a cut piece of track, the hint name also tells you the length, for a cut curve track the radius and arc angle (for a piece of flexible track **RR-Track** shows the length, minimum radius, and arc angle between the ends). As you change the extended selection mode (how RR-Track makes multiple selections), the hint window will also give height and grade information.

Move the cursor to the view tabs and click on the tab labeled **Component View**. RR-Track switches to a view of the components that make up your layout (there are five distinct views of, or ways of looking at, a layout). The top level tab, labeled **All**, should display eight total track sections; four 10 inch straight sections and four O-31 curve sections.


For your information, both left- and right-hand curves of a given radius and arc are identical; they are both included to make it a bit easier for you when placing new pieces of track. Needless to say, left- and right-hand turnouts are not identical and are listed as separate components in the layout item list. The **All** tab of in **Component View** shows a summary of all components in the layout; individual manufacturers or layer tabs are also present, further breaking down the component details. You can get more information on the utility of Component View by studying it's help topic.

If you do not have four straight sections and four curved sections of track, please add/delete sections as necessary, by switching back to **Plan View**. When finished, you can switch back to Plan View by clicking the Plan View tab.

Now pull down the **View** menu and choose **Show Select List**. The *Selected Items window* should have nothing listed because we have selected no track sections. Move the cursor over one of the straight sections of track and single-click it with the left mouse button (any of the four will do for this demo). The track section you clicked on highlights in red, and the *Selected Items window* now shows a quantity of one Lionel 10 inch straight track sections. Move the cursor over another of the straight sections of track and double-click the left mouse button. This action, if successful, causes all 8 of the track sections to highlight. If you look at the Selected Items window, it now looks like that at left.

There are four Lionel O single straight sections and four Lionel O O-31 curved sections of track listed with sub-lengths of 40.00 inches and 44.92 inches, and a total of 84.9 inches which is approximately 7 O-gauge cars (O-gauge cars are taken to be about 12 inches in length on average).

Move the cursor over the + button next to the Lionel O single straight heading and left click it. The entry expands to show all of the track sections of that type that are selected and their individual lengths.

In this case, all of the lengths are identical, but if these were custom cut to length sections of track, **RR-Track** shows the actual length for each track section. The *Selected Items window* is a good way to see if a given stretch of track is long enough to accommodate the train you want to store on it, or use as a passing siding (you can also test this directly by switching to **Simulation View** and setting up a test train, but that is a topic further along in the tutorial). You can also get the sum total length of cut track sections in this manner, letting you calculate how much track will be needed to create them.

Move the cursor back to one of the highlighted sections of straight track and double-click it again with the left mouse button. The selected track sections return to the one section beneath the cursor; this result is reflected in the *Selected Items window*. You can close the *Selected Items window* now, and deselect the highlighted track by clicking the left mouse button in a blank area of the layout.

Single-clicking selects only the item under the cursor, while double-clicking selects that track section and all of the others that are joined to it in some manner, either *physically*, *electrically*, or in *elevation* (this response is determined by the **Selections Include Joints** / **Selections Include Blocks** / **Selections Include Grades** items on the **Options** menu). This is called *extended selecting*. The current extended selection mode may be found by

- (1) pulling down the **Options** menu and checking on of these items, or

- (2) by using the *status bar*. It is a good practice to glance at the status bar from time to time to check on the state of these features since they control what happens when you double-click with the left mouse button.

As you might expect, we are going to complete the oval of track by using four more straight sections and four more curved sections, similar to what you would find under the Christmas Tree in a magazine ad out of the 1950's. The most straightforward way of accomplishing this is to repeat the process just carried out by consecutively selecting four more 10 inch straight track sections and four more O-31 curves. A faster way, the one we will use, is to:

1. copy the existing track.
2. paste it back into the layout.
3. rotate it 180°
4. join it to the first cane shaped set of track, and then
5. close the track loop.
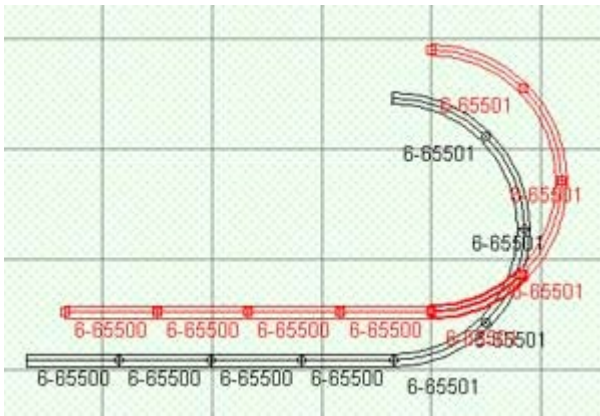
We start by selecting all of the track. Place the cursor over one of the 8 contiguous track sections (watch for the ⬚ Track cursor) and double-click the left mouse button, highlighting all 8 track sections. Pull down the **Edit** menu and select **Copy** (or click the right mouse button and select **Copy** from the *shortcut menu*). You have now copied the 8 joined track sections into the RR-Track *clipboard*. Next, we move to step two and paste the track back into the layout. Pull down the **Edit** menu and choose **Paste**. The just-duplicated cane shaped set of track should now be somewhere in the upper left portion of the layout, highlighted in red. It is worth mentioning that **RR-Track** has a **Duplicate** command which combines both **Copy** and **Paste** into one operation; we could just as well have done that.

At this point, we could pull down the **Action** menu and select **Rotate**.. in order to rotate the track into proper orientation to complete the oval loop, but there is a simpler and faster method. We will make use of the automatic track joining capabilities of RR-Track. Place the cursor over the left most straight section of track (the far end section) and depress and hold the left mouse button down (remember to let the cursor help you out). After sometime like 1/2 second the cursor changes to ⬚ Move indicating that you can now move the track sections

around the layout simply by dragging them with the mouse. While continuing to hold down the left mouse button drag the free end of the left most straight section to within one track width (in this case 1.25 inches) of the free end of the end curved section of the non-highlighted track (see *moving items* for more details).

> **Note:** while RR-Track has a capture distance for joining of 12 inches when adding new track, the capture distance changes to 1.25 inches when joining existing track, that is track sections already on the layout. The capture distance for all track libraries is one track width when joining existing track. This change in the capture distance is to avoid unwanted or unanticipated joining when manipulating track in busy areas. These distances apply to O-scale, the actual distances are 10X track width for adding new track and 1X track width for moving existing track, so for HO you would have to move it within 0.625 inches or one track width.

When you have them close enough (1X track width), release the left mouse button. **RR-Track** automatically rotates and joins the highlighted track sections to the existing track sections.
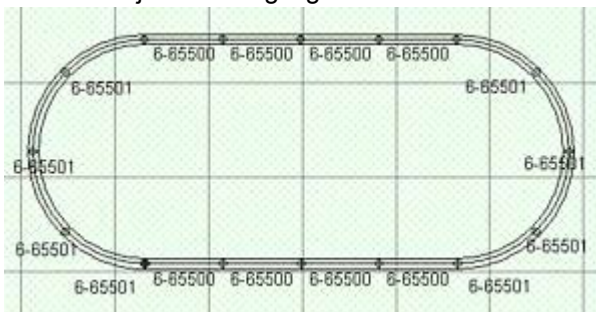
It also finds the other free end, notices that it is close enough to join, and joins that end as well, completing the loop. Your layout should now look like that at left, a complete oval of 16 track sections, 8 straight sections and 8 curves.

There, you are done with creating your first loop of track using RR-Track. In this first part of the **RR-Track Tutorial** you have learned how to create a new layout, how to set up your track joining and display options, how to add track in four different manners (and there is a fifth and sixth method we have not yet mentioned) and how to copy/paste track to speed up the track laying process.

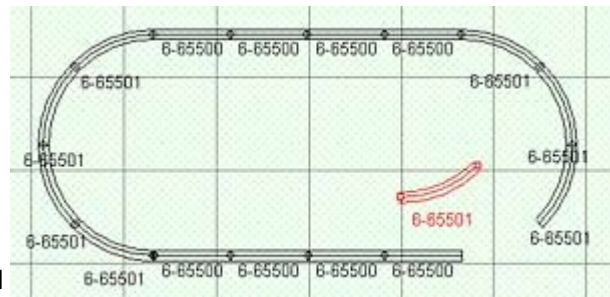## *Getting Started Part 2: Expanding and Modifying*

In the first part of the **RR-Track** Tutorial you learned to create an new layout and use the various methods of adding track to a layout to create a simple loop. Now we are going to modify that simple loop (after all watching trains go around a simple loop is pretty boring after a few minutes, even in **Simulation View**).

Adding a Turnout and Spur Track

Start by moving the mouse pointer over the O-31 curve at the lower right (watch the cursor change to show when you are over it) and select it by clicking the left mouse button (see selecting items) and holding it down. After a short pause, the curve track highlights and the cursor changes to ⬚ Move   indicating that you can now begin

to move this section.

While continuing to hold down the left mouse button, drag this curve away from the others about 1/10 of the screen width (over to the middle of the loop, say) and then release the left mouse button. RR-Track breaks the track connections and lets you move the curve to its new position. The single section of curved track should be highlighted as shown at right. There will now be a gap in the oval where the curved track used to be. Zoom in on the gap by pulling down the **View** menu and choosing **Zoom In 2X**. Center the zoom rectangle on the gap in the oval, and single-click the left mouse button (you can also right-click to get a *shortcut menu* and choose **Zoom In 2X**).

Next, pull down the **Track** menu and choose **O-Turnouts -> O-31(modern) 45° L**. Place the turnout near the gap as close as you comfortably can so that the spur end of the turnout is near the free end of the O-31 curve track and the turnout entrance is near the free end of the straight track and release it. RR-Track joins the turnout to the oval, and completes the loop since two ends of the turnout join to the two free ends of the gap in the oval. RR-Track does this by either *proximity joining* or *automatic loop closing* since both of these options were selected before we started.

> **Important note:** you removed the curved section from the existing oval by using a continuous click-hold mouse button-drag-release motion. You could just as easily reinserted the curved section you removed by reversing this process: selecting and dragging the curved section back to the gap in the oval, and releasing it when the ends were within 1.25" of the gap in the oval. Get used to this; it makes it very easy to rearrange track layouts, something useful when you are trying out new configurations, or trying to find the best arrangement of curved and straight track to cover part of your layout.

Your layout should now resemble that at right.
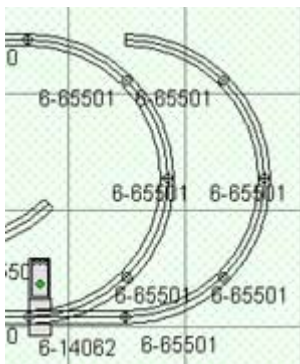
Now we move on to add the spur loop. From the **Track** menu select **O-curve -> O-31(modern) 45° L** and place it near the turnout's free end (this is the thru track). Make sure you bring the left side of the curve up to the free end. Click the left mouse button and join the two. Then, choose another O-31 curve (we will leave the method up to you) and add this to the previous curve. Repeat twice again, making four curves in all.
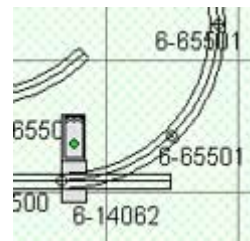
Your layout should now look like that at left. You should have four curves forming a half-circle joined to the thru track end of the turnout. Now we are going to add the second turnout in order to complete the spur siding. Before we can do this, we have to make room for it by removing a curved track from the inside loop.

Put the mouse pointer over the O-31 curve on the upper right of the oval, where the turnout will be going (this should be obvious since all our track is converging here). Single-click the left mouse button to highlight this curve, and then delete it from the layout by either pressing the **DELETE** key on the keyboard, or by pulling down the **Edit** menu and choosing **Delete**, or by pressing the right mouse button to pop up a *shortcut menu* and choosing **Delete**. When you delete this curve, you are left with three dangling track

ends perfectly positioned for an O-31 right-hand turnout. Pull down the **Track** menu and select **O-turnouts -> O-31(modern) 45° R** and place this such that it joins to all three dangling ends (RR-Track will go through two automatic joinings for the other two ends of the turnout). At this point, your layout should now look like:
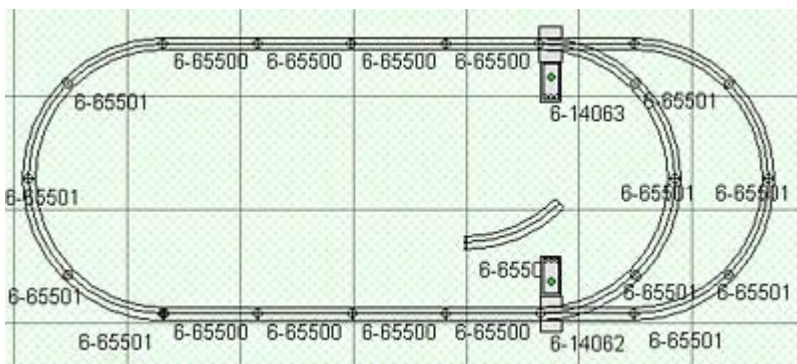
You have 20 pieces of track: 8 straight sections, 10 curved sections (actually 11 with the one we left in the middle), and two turnouts. You can check this if you like by clicking on the **Component View** tab.

Next we are going to break this extended oval into two parts and widen it.

Expanding the Loop

We are going to expand the loop vertically by breaking it in two sections and inserting filler straight sections as needed. First, we have to sel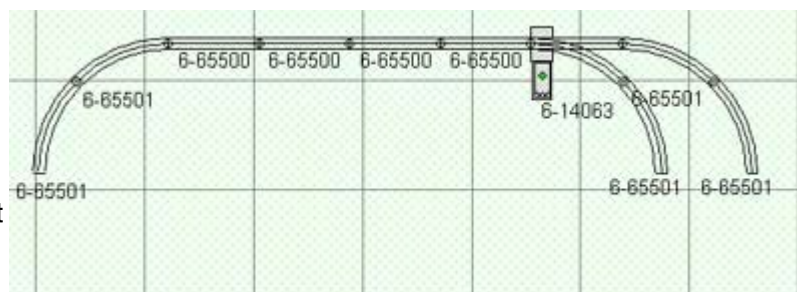ect all of the track in the upper half of the loop. We could do this by going down each piece, one by one, and clicking them with the left mouse button while holding the SHIFT key. Instead, we will use a selection box; that is we will sweep out a rectangular area on the screen that contains all of the items we want to select. Move the mouse pointer so that it is above at the left of the loop, then, while holding down the left mouse button, drag out a selection box that includes track in the upper half of the oval (see the figure at right for a guide as to how this should look).

Make sure that the track in the upper half of the loop is completely in the selection box, only items completely inside will be selected. When you have completed the selection box, release the left mouse button. All of the track in the upper half of the oval should be selected. If this is not the case, single-click in a blank area to deselect the selected items and try again.

When you have all of the track in the upper half of the loop highlighted, place the mouse pointer on one of the sections, depress and hold down the left mouse button until the cursor appears, and then drag the highlighted track upwards far enough so that when you release the left mouse button the layout will split into two halves like that at right.

The next step is to put in some filler straight sections, in this case two in each leg except the rightmost (here we are going to do something different). Pull down the **Track** menu and choose **O-straight -> Lionel single**, and join this track section to the far left free track end on the lower oval half, select another straight track section and join this to the center free track end, then repeat this process and add another straight section to each of the left and center free ends. This adds two track sections each to the left and center spurs, and nothing to the rightmost spur.
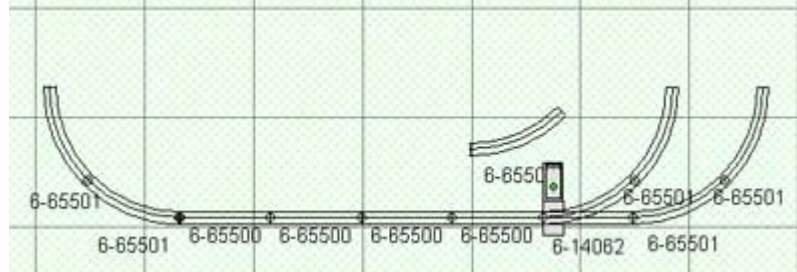
Now we want to put the oval back together by rejoining the top half (which we recently removed) to the bottom section which we have just extended by adding the three straight track sections.
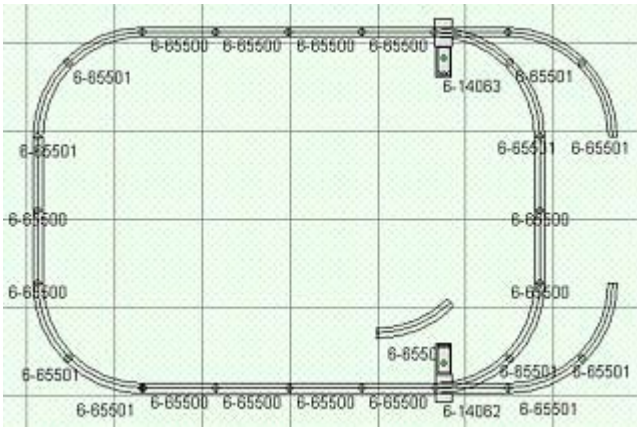
Place the mouse pointer on one of the track sections in the upper loop and double-click the left mouse button so that all of the track sections in the upper half highlight and hold the button down. When the cursor changes to ⤡ **Move** drag the half loop down close enough so that RR-Track can join up the left and middle spurs. You layout should look like that at left. This leaves us with a gap of 20 inches on the passing siding. We could fill this with two straight sections, but we won't do that. Instead we will change the curves on the passing siding to O-42 and fill the gap with a custom straight section of track, just to get in some more practice in modifying existing track arrangements and in using RR-Track's measuring tools.

With the mouse pointer, <u>select</u> (highlight) the <u>four O-31</u> curves on the passing siding and delete them (you can use the **DELETE** key for this). Next, pull down the **Track** menu and choose **O-curve -> O-42 30° L**. Join this new curve to the free end on the lower turnout. Add five more O-42 curves (it takes six for a semicircle rather than the four for the O-31 curves since each O-42 curve is a 30° arc rather than a 45° arc) placing a total of three of them on the upper spur and three on the lower. Your layout should look like that at right.

This leaves us with a gap, which, as we shall shortly discover, is too short of fill in with a regular straight section, and too long to fill in with a half section (unless you want to resort to serious bending and warping of the track junctions of the O-42 curves. Instead we are going to make use of the measurin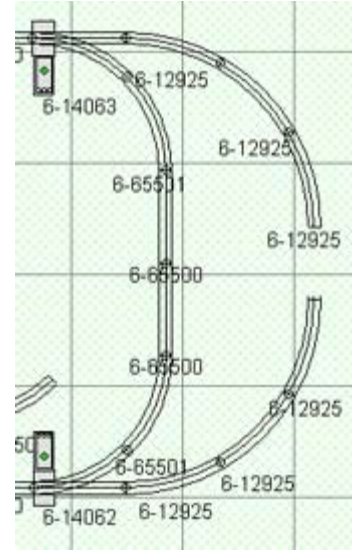g capabilities of RR-Track, and the *TrackWizard* in the O-gauge track library, to automatically cut a fitter straight section and place it in the gap.

Measuring the Gap

Now we need to find out how big a gap we have. We can snap a measurement between the track ends on either side of the gap by

- Right click over nothing bringing up the *general purpose shortcut menu*.

- Choose **Measure Track**. The cursor changes to the ruler cursor. If you want distances resolved in the track end coordinate system, choose **Measure Trk-Crd** instead. In this case the cursor will change to.

- Place the ruler hotspot where you want start the measurement and depress and hold the left-mouse button.

- While holding the left-mouse button down, drag the ruler hotspot to where you want to terminate the measurement. **RR-Track** draws a line showing the distance measured.

- Release the left-mouse button. **RR-Track** displays the measurement results in the upper right corner of the layout window.
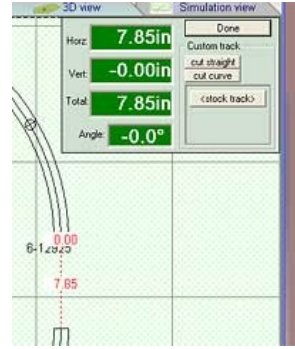
RR-Track displays the measurement results which look like that at right. This dialog shows the horizontal and vertical components of the distance measurement, as well as the total distance and the angle (in this case the distance is 7.85 inches and the angle is 90°). There is a **Done** button, to dismiss the *Distance Measurement dialog* without carrying out any further functions, and three buttons (there may be more depending on the track library) for engaging the *TrackWizard*.
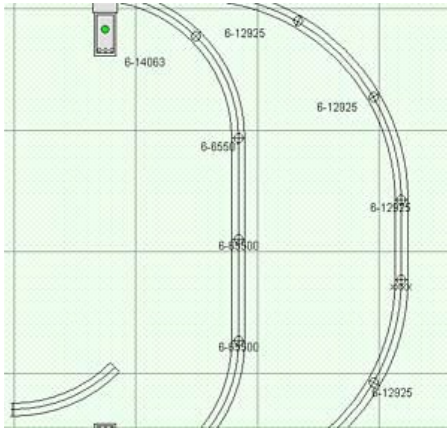
Here we want to automatically fill in the the gap so press the **<stock track>** button. This send the results of the measurement we just made to the *TrackWizard*, which examines the track ends and their orientation, and creates fitter track section(s) as needed and if possible, in order to fill the gap. In this case it is simple, cut a 7.85 inch piece of straight track and place it in the gap.

After pressing the **<stock track>** button the *Distance Measurement dialog* vanishes and your layout should now look like that at right.

You have now constructed a simple loop of track, added a spur passing siding, and then expanded the layout vertically in order to create more space for the trains to run in. In the next part of this tutorial we will add a grade and an elevated loop of track. Before we do that, just for fun, click on the **3D-VIew** tab. You should get a **3D View** of your layout that looks something like that below:
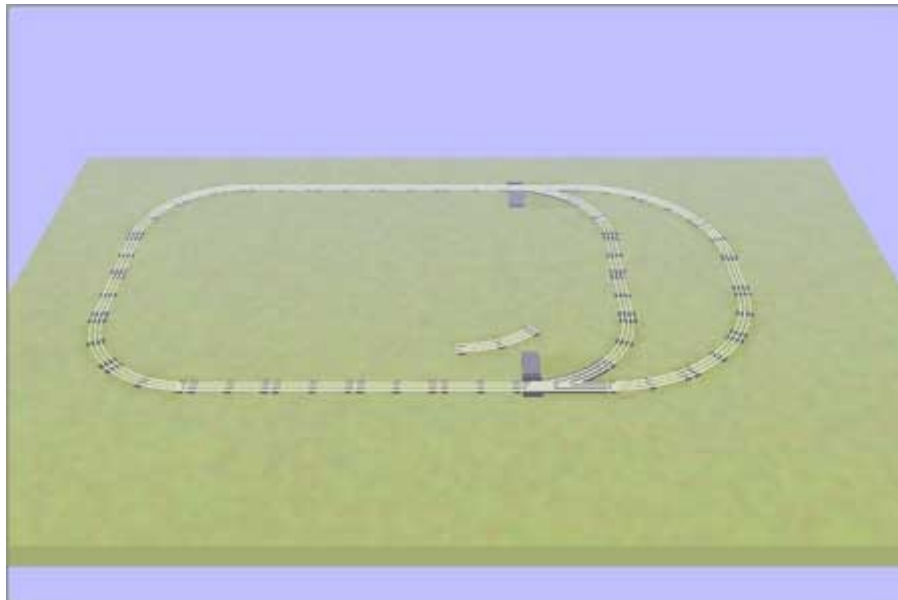
You are now ready for the next part of the basic track laying tutorial where we start elevating track and adding in grades.

Getting Started Part 3– Elevations and Grades

In this, the third part of the RR-Track Tutorial, we are going to introduce elevated track and grades.

Elevating Track

We will start the process of putting in a grade by elevating some track, and then designating other track as grades to link the elevated track with the rest of the layout. Move over to the left side of the layout and highlight both of the vertical straight track sections. You can do this by left clicking on the first track section, then holding down the SHIFT key and left-clicking on the second track section (holding down the SHIFT key tells RR-Track to add the next selection to the current selections, see *selecting items* for more information).

Next, pull down the **Grades** menu and choose *Set Track Height*. This command gives you the *Set Track Height dialog*, like that at left.

Here you have an edit control which has the absolute height above the layout base you want to place the track, up/down spin buttons from changing this height in fixed increments which you can choose from in the radio buttons below, and a check box for creating an *overpass track*. You can either use the spin buttons to move the number in the edit control to 6.00 inches, or you can select all the text in the control and type in 6 and then press **OK**. RR-Track immediately sets the height of the selected track to 6.00 inches. Your layout should look like that at right. Note that the track sections you have just elevated have their heights shown (all non-zero heights are shown if **Show Grade Heights** is checked in the *Layout Options dialog*, we did this back at the first).
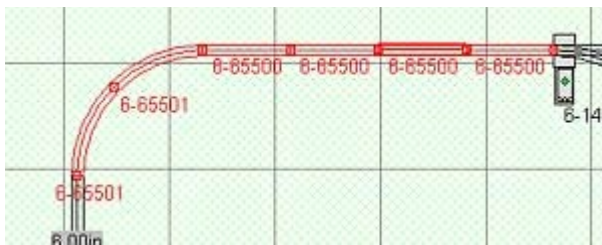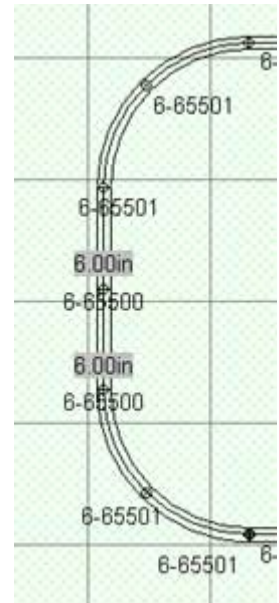
Now we have to set the grade on each side of the elevated track sections. It is a good idea to leave switches level on the layout, although we don't have to, but for the moment we will. First we set the upper grade. Move to the upper left of the oval and select all of the track the elevated sections to the turnout (both O-31 curves and four straight sections). You can either use the SHIFT-key left-click method or drag out a selection box around these six track sections until they are all highlighted as shown at left.

Now that you have these six sections highlighted, pull down the **Grades** menu and choose **Create Grade**. RR-Track smoothly interpolates all of the intermediate heights of the track sections that are required to take the elevation from a height of 0.00 at the turnout to a height of 6.00 inches at the two straight sections. RR-Track then displays a dialog that shows you the fundamental information about the grade you just created. This is shown at the left. Here we see we have a total length of 62.46 inches, and an elevation change of 6.0 inches which gives a grade of 9.6 per cent which is pretty steep, more steep than even a Lionel trestle set (this is actually too steep for even a toy train layout). For the moment we will live with this grade and press the **Done** button. They only way to decrease the grade is to either add more track sections to the grade, or to decrease the height of the elevated track.
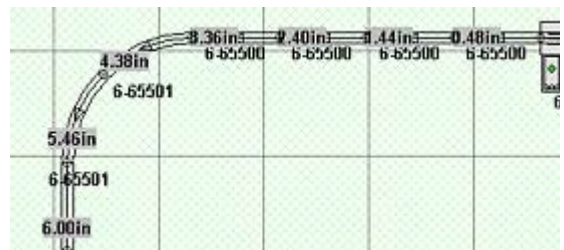
Now that we have set a grade, the upper left portion of the oval should have a series of steadily increasing track heights, like that shown at right. Note that the heights smoothly increase as you go from the turnout to the elevated track. These are the heights at the center of the track section; you can also tell RR-Track to give you the height at the upper end; the upper end height is useful for cutting risers for the track sections. You can also get the height of a track section by calling up the Item *Properties dialog*. This is done by move the mouse

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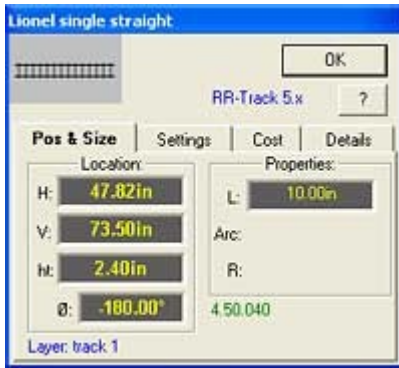
pointer over the track section you want and clicking the right mouse button. This brings up a shortcut menu. Scroll down this menu and choose **Properties...** When you do, you get a dialog like that at left. Here we have a section of Lionel O track with a horizontal location of 47.82 inches, a vertical location of 73.50 inches, and a height of 2.40 inches. It is rotated 180° and has a length of 10 inches. It is also located in the **track 1** layer since we never changed the drawing layer at the start of this tutorial. Press the **OK** button when you are done with the properties dialog.

Enough of this grade and parameter discussion, let's take a look at this from a three-dimensional perspective. Click on the 3D-View tab and, after doing a little rotating with the sliders, you should have something like that at right (if you can't get the sliders to rotate to an orientation you like, take a look at *3D-View operations*).
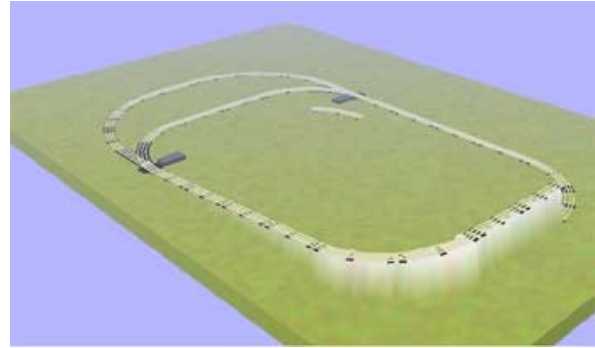
As you can see, we still have to do something with the track on the other side of the two elevated sections. Repeat the process we carried out on the upper grade track: choose all of the six of the track sections from the elevated track to the turnout, pull down the **Grades** menu and choose **Create Grade**. This will create an identical grade on the lower side of the oval. Your layout (in Plan View) should look like that below.
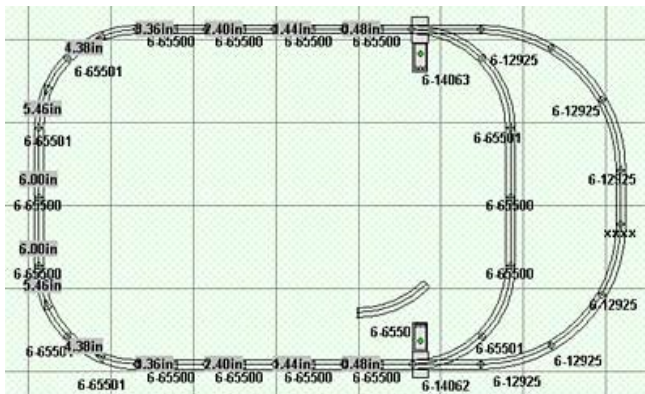
As we mentioned before, a 9.6 per cent grade is much too steep for even toy trains to traverse (real trains aren't happy with 1 per cent grades). To decrease the grade we can either decrease the height difference between the track on each end of the grade, or lengthen the grade. Lets try decreasing the height difference since lengthening the grade means expanding the layout again.

Modifying the Grade

We are going to decrease the height difference not by lowering the track at the raised end, but rather by raising the track at the lower end. Using the mouse pointer, *select* the two turnouts and the four track sections in between the spur tracks. Then pull down the **Grades** menu and choose **Set Track Height**. When the *Set Track Height dialog* appears, set a height of 2.00 inches and press **OK**. Notice that RR-Track has raised up all six sections to 2 inches, and automatically recalculated the grades we previously put in. We can find out how steep the grades are now if we use the **Grade Information** command. To use this we first have to select a grade. At the moment, the extended selecting mode (you remember that don't you) set to **Selections Include Joints**. This means that when you double-click with the left mouse button on a track section, RR-Track selects that track section and all of the others that are physically joined to it. We want to change this so that we choose all of the track on a grade or a given height instead. We do this by pulling down the **Options** menu and checking **Selections Include Grades**. Now when we double-click on an item, RR-Track chooses that track section and all of the physically connected sections that are at the same height or on the same grade.

> **Note:** when the extended selection mode is set for grade track, you can get quite a bit of grade information just by hovering the cursor over the grade / elevated track. If you hover the cursor over a single elevated track section the hint window will show the height as well as the item description and layer. If you double-click so that all of the grade track is highlighted, then hovering the cursor over any one section will show the grade length, the rise, and the grade per cent rather than the description of that track section.

By either pulling down the **Grades** menu and choosing **Grade Information** or by hovering the pointer over the

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selected grade, we can find out the new grade parameters, namely a rise of 4.0 inches (6 - 2) and a per cent grade of 6.4. Just to see how this exercise in elevating track is coming, click on the **3D-View** tab, you should see something like that below. Now the only track still flat on the table is the O42 spur loop.

To finish this off, we need to set the final grades on the O-42 passing siding. We will leave the straight track in the middle at table level, and choose the curves on each side as grade track. To set the first grade, choose all three O-42 curves on the lower right side of the oval; then pull down the **Grades** menu and choose **Create Grade**. This will give you a grade with a height change of 2.0 inches and a grade of 6.2 per cent. Repeat this for the three curves on the upper right, again creating a 6.2 per cent grade. You now have a layout that slopes down from left to right, in a fairly smooth manner. If you like, you can take a look at this in 3D by clicking on the 3D-View tab, as always.

Next we want to add a second loop of track, that is elevated above the track we already have on the layout. The best way to do this is to put this track in another layer, making future manipulations for the two track loops easier and cleaner.

Using Multiple Layers

To see that layers we currently have, pull down the **Options** menu and choose **Layers**... RR-Track shows the *Layer Setup dialog*, like that below:
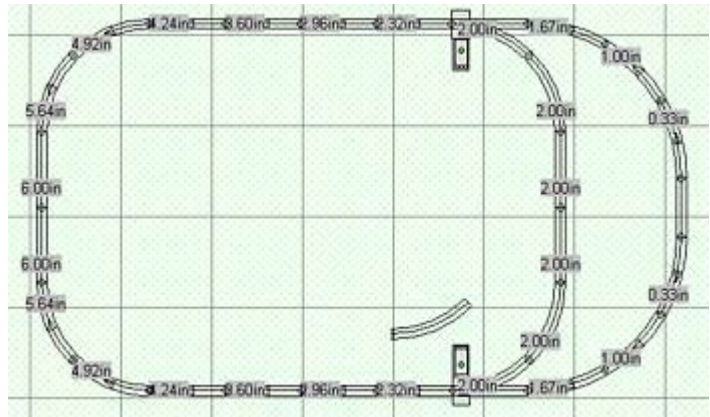
Here we see we have 12 layers already set up in our layout. The working layer, the one we add things to, is shown in red, any active layers are shown in green, inactive layers are shown in blue, grayed and hidden layers in gray. At the moment we are using the **track 1** layer (it is in red). The important thing to remember concerning the *Layer Setup dialog* is that you use this dialog to add layers, remove layers, rename layers, change layer default colors, and change layer visibility. Press the **OK** button.
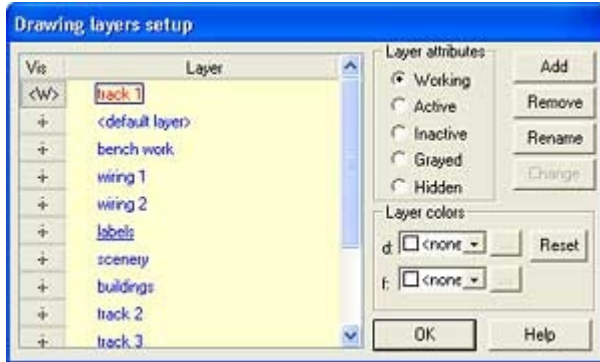
We want to put the new loop of track into another layer, say the **track 2** layer. We could go back to the *Layer Setup dialog* and make the **track 2** layer the *working layer* (the one we add things to), but there is a faster method. Move the mouse pointer down to the status bar, over the area showing . This is the layers access point on the status bar. Move the cursor over the arrowhead symbol until it changes to   , then click the left mouse button. RR-Track pops | track 1 | up a list of all the layers in the layout, colored in the same manner used in the *Layer Setup dialog*, with the current working layer selected. Move the mouse pointer over the **'track 2'** layer and click the left mouse button. RR-Track makes the **'track 2'** layer the working layer, and makes the **'track 1'** layer inactive.   For more information on these kind of shortcuts see *using the status bar*. Now that we have made the **'track 2'** layer working, we are ready to start a new loop. Note that if you hover the pointer over the track sections in the **track 1** layer, you still get the hint information but the cursor is 'grayed' indicating that you cannot select this item.

Adding an Elevated Loop

Next we want to create an upper level track loop. Get a single 10 inch Lionel straight track by your method of choice (**Track** menu or status bar **Last Track List** --- you can pop this up just like you did the layer list; RR-Track

remembers the last 10 distinct track sections used). Then, before you place it in the layout, press the ESC key on the keyboard. This turns off automatic track joining for this piece; the cursor changes to 🖰 Move to let you know joining will not
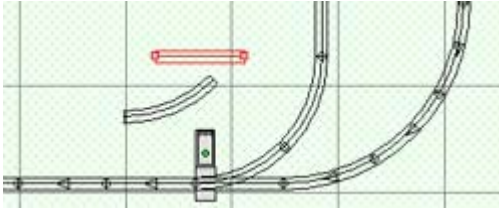
occur. Place the track section as shown at left. Next, pull down the **Grades** menu and choose **Set Track Height** (the track section should be highlighted as a result of placing it; if it is not for some reason, single-click on it with the left mouse button). You can also choose **Change Height** from the **Action** menu as well Set the height to 7.5 inches and then press **OK**.

Now get three additional straight track sections and one O-31 curve and attach them as shown below in the figure.
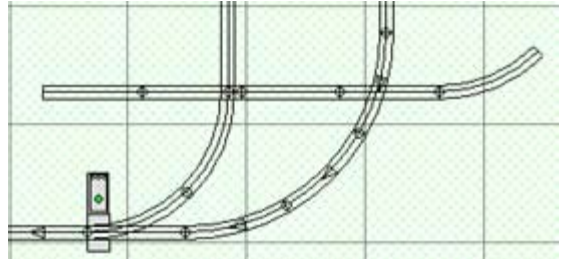
We want to set up a loop of upper level track that crosses above the lower level track. To make things a little easier to see clearly, we will gray out the **'track 1'** layer (this is the lower level track). We can do this by pulling down the **Options** menu and choosing **Layers**... which gives us the *Layer setup dialog*, or we can do it quickly from the status bar. To gray the **'track 1'** layer from the status bar, go down the the layer name and bring up the layer list like we did before. This time, instead of left-clicking on the layer, we will right click with the mouse. Move the mouse pointer over the 'track 1' layer and click the right mouse button. This pops up a shortcut menu like that at left.

Here you have choices as to how to set the layer attributes: **active**, **inactive**, **grayed**, and **hidden**. Click on grayed; RR-Track immediately grays out the 'track 1' layer. Now the upper layer stands out, but the lower level track is still visible and easy to register. You will find it convenient to either gray or hide items in other layers while your work on details in the layer of interest. Another useful feature when you are working between a pair of layers is the **Last Layer** command from the *shortcut menu* you get when right-clicking over nothing. This will make the previous layer you were using the working layer, while making the current layer inactive. Using the **Last Layer** command a second time gets you back to your starting layer configuration (very similar to using the **Zoom Last** command when going back and forth between views).
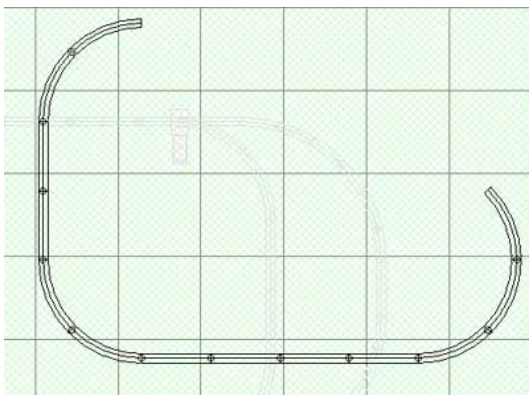
Now add six more O-31 curves and two more 10 inch straight sections until you get something that looks like that at left.

Here we are forming a triangle shaped loop of track that partly overlaps the lower level. Now lets use the *TrackWizard* to fill in the gap. To do so, we have to snap a measurement between track junctions (if you recall, we did this in part 2 of the tutorial). Right-click over nothing and choose **Measure track** from the *shortcut menu*. Then proceed as before and snap a measurement line between the two exposed track ends of the upper loop (if you have forgotten how to do this, go back to the previous chapter or take a look at the *essay on making measurements*). When the *TrackWizard* brings up the *Distance Measurement dialog*, choose **<stock track>** and the gap will be automatically filled in a fashion like that below.

TrackWizard always tries to use the largest radius curve available that will fit in a gap; in this case O-72 was the largest curve available in the Lionel O track library. To see what all of this looks like in 3D, we have to ungray the **'track 1'** layer or it will be invisible in **3D-View**, unless we tell **3D-View** specifically to do so. Go down to the status bar and pop up the *layer list*, move the pointer to the **'track 1'** layer and pop up the shortcut menu by right-clicking. Choose **Inactive** from the choices there; RR-Track redraws the layout with the lower level a normal color. Now click the **3D-View** tab and you should get something like that below.
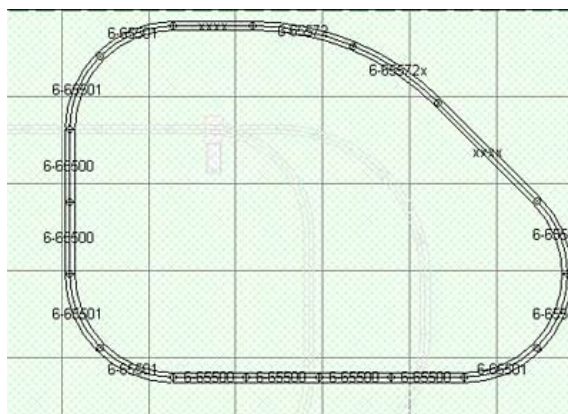
This is interesting. Notice that **3D-View** has both built up terrain underneath the elevated track (without you specifying this), but has also cut passages (tunnels?) so that the lower level track can go through.

This is the default behavior, unless track is directly flagged as tunnel track or overpass track, **3D-View** cuts away and builds up terrain so that the track has clearance.

We can make the overpass areas a bit more obvious by designating some of the upper level track as overpass track. This means that terrain will not be build up beneath it (tunnel track designation lets terrain overflow the track instead of being cut away).

Designating Overpass Track

Designating overpass track sections is easy to do. First, move the mouse pointer over four of the 10 inch straight sections and highlight them (remember to use the SHIFT key to allow you to individually highlight items). You should highlight the track sections as shown at right.
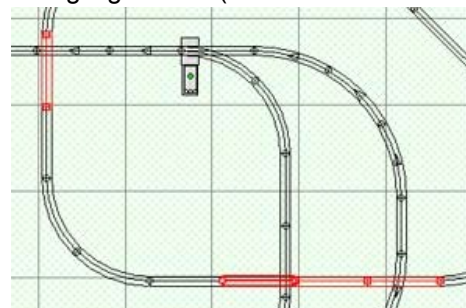
Next, with the mouse pointer over one of the highlighted track sections, click the right mouse button to bring up the *shortcut menu*. From this menu choose **Toggle Overpass**. RR-Track applies the overpass property to all four of the selected track sections. To find out how this looks, switch back to 3D-View by clicking the **3D-View tab**.

Notice that the openings for the lower level track extend the full length of the track sections that were designated overpass.
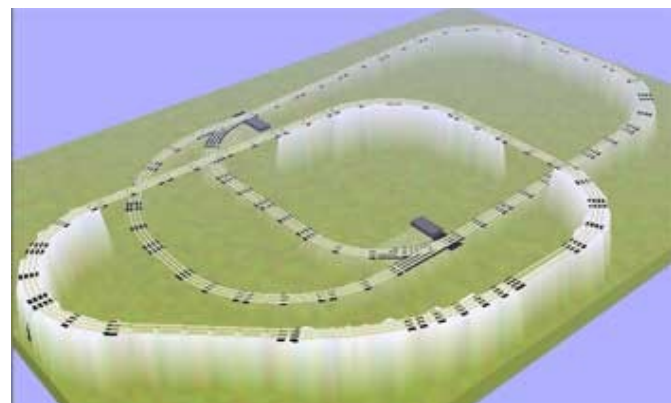
This ends the third part of the tutorial. You have learned how to create and modify grades, and elevate track. You have also learned the use of the *TrackWizard* for filling in gaps and closing loops. In the next part of the tutorial we will look into adding some scenery and terrain features.

Getting Started Part 4: Scenery, Buildings, and General Purpose Objects

In this chapter of the RR-Track Tutorial, we are going to add some scenery and other objects to the layout we have been working on.
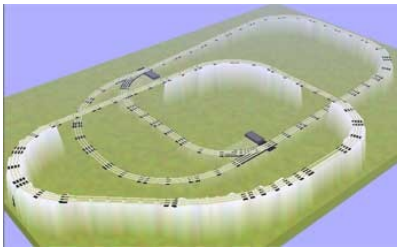
After finishing the second part of the tutorial, we have a layout that looks like that at left. Now we need to jazz this up by adding some other objects to the layout. Before we add any thing, we want to change the *working layer* to the **'buildings'** layer. If you remember how we did this, we went down to the status bar and popped up the *layer list*, then chose the layer we wanted to use as the working layer. Do this by moving the pointer to the status bar and choosing the **'buildings'** layer.

Now that we are in the **buildings** layer, pull down the **Objects** menu and choose **Buildings** and then **Truss bridge**. The cursor changes to ⊕ letting you know that you are about to **New**

denote the starting point (origin) of the truss bridge. Before you draw in the bridge, take a moment to change the snap size to 0.5 inches to make it a bit easier to draw a 5 by 32 inch bridge. Now, move the cursor to the three track sections in the upper level that cross over the lower track loop and siding.

Move the cursor to the starting point (one of the corners of the bridge, it doesn't matter which one you use, we happen to use the upper left). Depress and hold the left mouse button; the cursor changes to ⊡ so that **Size**

you know you are supposed to sweep out a rectangle. While continuing to hold down the left mouse button, move the pointer so that you begin to sweep out a rectangle that is the width and length you require for the railroad bridge (we want to make a rectangle that is 32 inches long and 5 inches wide). As you move the pointer, RR-Track draws a trial rectangle defined by your starting point and the current pointer position. RR-Track also displays a pop up window (at the upper right corner of the layout window) that shows the size as you are dragging the pointer.
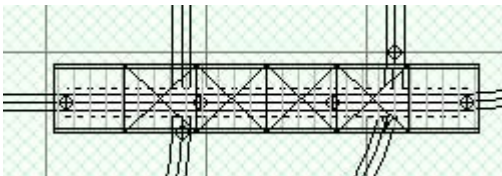
Move the pointer until you get a rectangle 32 by 5 inches, with the long dimension horizontal. The layout should look like that at left. RR-Track compares the length and width of the bridge, then sizes and spaces the trusses accordingly. The only problem we have now is that the bridge is at zero height. To remedy this, we have to set a new height. Recall that we set the upper level track loop at 7.5 inches; we will set the bridge at or slightly below this height so the track appears to pass over the bridge. Select the bridge object and then pull down the **Action** menu and choose **Change Height** (you can also right-click on the bridge and choose **Change Height**). When you get the dialog for setting the height, set it to 7.5 inches (7.4 or 7.3 will also do). This should be available as the last height as well. Then press **Set Height** to lock in the new height. Now we take a look at a 3D view of the layout. In 3D, the bridge should look like that at left.

The default bridge color is light gray; you can change this to whatever you want by right clicking on the bridge and then choosing **Properties** from the shortcut menu. The *Object Properties Inspector* lets you change any or all of the object properties, including the color (you can also change the size and height by typing in new values if you want).   Now, go ahead and draw in a 5 by 12 inch girder bridge. Here you will have to create the bridge, then rotate it by 90° and raise it up to 7.5 inches height (the reason you have to rotate the bridge is that RR-Track assumes the horizontal direction is along the track for bridges, while the vertical dimensions defines the width --- otherwise you would not be able to create a short and wide bridge). Repeat the above steps, only this time keep the horizontal length to 12 inches. In order to rotate the bridge by 90° to align it with the track, you can choose one of three methods: (1) manual rotation where you select the bridge, pull down the **Action** menu and choose **Rotate**, (2) quick rotation where you right click on the bridge and choose **Rotate** from

the *shortcut menu*, or (3) keyboard rotation where you select the bridge and then use the up and down arrow keys to rotate the bridge incrementally until you get the orientation you want. We are going to use the third method.
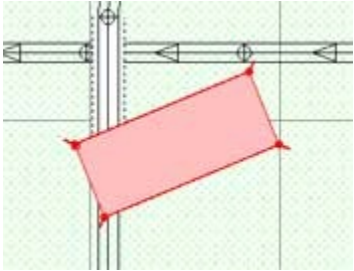
Select the bridge, then hold down the **CONTROL** key and press the **up arrow key** on the keyboard. You should see the bridge rotate by a small amount CCW, like that at left. Press the up arrow key again; the bridge rotates a little further. Keep hitting the up arrow key until the bridge is straight up. After you have set the bridge height to 7.5 inches, and made sure you have it positioned correctly for carry the 10 inch straight section over the lower track, click on the **3D-View** tab to see what it looks like.
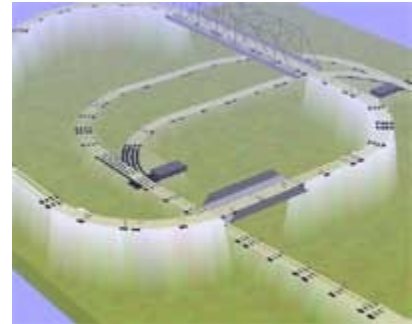
You can add any number of other objects to represent whatever structures you have/need on your layout.

As an exercise, we will add a six-sided polygon, and then extrude it to represent a solid object. Verify that you are still in the **buildings** layer, then pull down the **Objects** menu and choose **Filled Polygon**. from the **Basic Shapes submenu**. The cursor changes to ▩ indicating you are to designate the initial vertex (origin) of the polygon. Move the pointer to where you want to set the first point (in the bullseye), and then click the left mouse button (don't hold it down). RR-Track sets the initial vertex at this location, then changes the cursor to ▱ so you know you are still in polygon creation mode and a left mouse click designates the next vertex.

Move to the next position and click the left mouse button. RR-Track draws the polygon segments out as you designate each new point. As soon as you have set two points and are moving to the third, RR-Track shows where the return line will be if the next point is the last point (you must have at least three points to have a polygon). When you get to the sixth point, double-click the left mouse button, or right-click --- either one tells RR-Track that this point is the last point. RR-Track closes the polygon and then changes the pointer to the standard arrow. When you finish the six sided polygon, you should have something that looks like that at left.
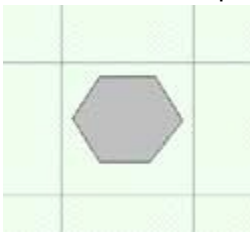
We placed the hexagon in the lower left corner, but anywhere will do for this tutorial; if you don't like where you placed it, just move it to a new location (see *moving items* if you need a reminder on how to do this). Now let's give it some depth. Select the hexagon you just created, pull down the **Action** menu and choose **Extrude** (or right-click on the hexagon and choose **Extrude**). When you do so, you will see the *Object Extrusion dialog*. Either by using the up/down spinners or typing in the number, set the extrusion depth to 5.0 inches. When you click on 3D-View, your extrude hexagon should look like this.
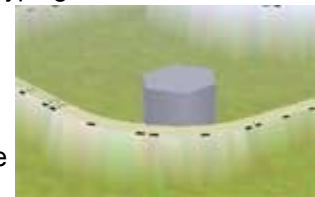
Gray is the normal default color for RR-Track general purpose objects. To change the extruded hexagon's color, right click on it and choose **Properties**... This brings up the *Object Properties Inspector*. Press on the **Color and Style** tab to reach the page where you can view and set the draw and fill colors. Using the drop-down selection list, choose a new fill color, such as brown. Then press the **Close** button at the bottom of the *Object Properties Inspector* to dismiss it. You will now have a brown colored hexagon.

Grouping Objects

To make something more complex, we need to practice grouping objects. This lets you make a complicated object out of several, and then manipulate them as a collective entity (like creating *modules* out of track and other items, but more simple). We will start by making something you see on lots of railroads, a trackside tank platform.

First, select the hexagon we just made and delete it by pressing the Delete key. Now, draw in a filled rectangle 18.0 inches long and 6 inches wide by pulling down the Object menu and choosing Filled Rectangle from the Basic Shapes submenu (you designate a rectangle just like you did the railroad bridges earlier, using a left

mouse down - drag - release mouse button sequence). Next select it and extrude it 1.0 inch and then change the color to some sort of light tan (or whatever you want). You should have something that looks like that at left.

Next we are going to draw an oil tank. Pull down the **Objects** menu and choose **Filled Circle** from the **Basic Shapes submenu**. The cursor changes to ⊕ (New) . Position the mouse pointer somewhere near the platform you just made and depress and hold down the left mouse button. The cursor changes to ○⇨ (Size) indicating you are to drag out the radius of the circle (we will want 2.5 inches). While holding down the left mouse button, drag the pointer to the right. RR-Track draws a circle of increasing diameter as you move the pointer; when you reach 2.5 inches radius (as shown in the pop up information window) release the left mouse button. RR-Track draws a 2.5 inch radius, 5.0 inch diameter circle.

Now we have to both extrude it and raise it up to the platform height. *Select* the circle and extrude it 5 inches by pulling down the **Action** menu and choosing **Extrude**. You should now have something that looks like that at left.

Now we have to place the tank on the platform, and raise it up to platform level, 1.0 inch. Move the tank, using either the mouse pointer or the keyboard so that it is centered on the left end of the platform. Next, raise the tank up by (1) selecting it, and then (2) pulling down the **Action** menu and choosing **Change Height** (or right-clicking and choosing **Change Height**), then setting 1.0 inch in the edit box and pressing the **Set Height** button (you can also call up the *Object Property Inspector* by right clicking on the tank and then choosing **Properties**... You can then type in the height directly). Now get another identical tank by right clicking on the tank and choosing **Duplicate** from the *shortcut menu*. Place this new tank adjacent to the first one. When you are done with this you should have something that looks like the figure at right.
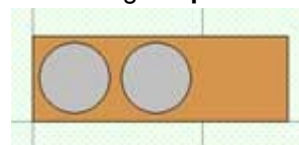
Now we are going to place a control shed on the right end of the platform. Pull down the **Objects** menu and choosing **Simple Building** from the **Buildings submenu**. This is designated like a rectangle (like we did the bridge and the platform). Drag out the pointer to make a building 3.5 inches wide and 4.0 inches in depth, then place it next to the two tanks like that at left. Make sure you have set the height of the control shed to 1.0 inch to put it on top of the platform, otherwise it will by drawn sticking through the platform.
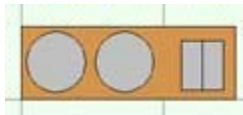
Now, draw a cross-connection structure at the top by dragging a filled rectangle out to 6 inches long and 1 inch deep, change the color to dark gray, and place it across the two tanks like so (you will have to change the snap size to 0.25 inches in order to center it as shown). Make sure you set the height to 5.5 inches (or 6 inches if you want it completely on top). You can change any of the individual colors if you want.
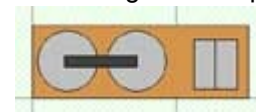
To group the five separate objects into one object, drag a *selection rectangle* around all of the, so they are all highlighted. Then pull down the **Action** menu and choose **Group Objects**. RR-Track compiles all of the objects into one so that now if you click on any part of the group, all items highlight. You can copy, paste, duplicate the entire group as if it were one object. To modify the group, you first have to ungroup it, make your changes, then regroup the objects.

Scenery

Now lets add a few trees. First, change the *working layer* to the **Scenery** layer (either use the *Layer Setup dialog* or the status bar for this). Pull down the **Objects** menu and choose **Spring Tree** from the **Scenery submenu**. As usual, the cursor changes to ⊕ (New) indicating you are going to designate the origin of a new object. Move the pointer to where you want the tree and depress and hold down the left mouse button. The cursor changes to ○⇨ (Size) to let you know you have to set the object size by dragging out a radius (just like you did for the filled circles in the platform). While holding down the left mouse button, drag the radius out to 2

inches (this will give a large 4 inch diameter tree). When you reach the 2 inch radius, release the mouse button. RR-Track draws the tree, looking something like that at left. RR-Track randomizes the edges (trees are considered polygons), and blends the colors. Now repeat the above process, drawing several more trees. You can go up to the **Objects** menu to choose the tree again, or you can press the SPACEBAR to get a new object instance (this is the same as choosing from the menu and is the object equivalent of double-clicking over nothing for getting a new instance of track). In any event, after a few trees you should have something like the 3D-View at right.

Go ahead an draw in a few other trees, and other tree varieties if you like. You can manually set the colors of trees by going to the *Object Properties Inspector*, just as you would for any other object.

This ends the fourth part of the tutorial In the next section we are going to see how to add terrain features and bench units to the layout.

Getting Started Part 5: Benchwork and Terrain

In the fifth part of the RR-Track Tutorial, we are going to play with creating layout bench units and adding terrain features to the layout design. So far, we have worked on a one-table layout; we have a solid 10ft x 7ft rectangular bench. Most real layouts are not like that, and some are quite complex in their bench configuration and arrangement.

In order to successfully create a layout with an irregular shape, you must create and place *layout bench units* All RR-Track layouts start out as rectangular, regardless of the actual shape of the real layout. In this rectangular area (sandbox if you will) you place layout bench units which are exactly analogous to benches you build to support your layout. For instance, an L-shaped layout would have a rectangular shape that encompasses the L, with at least two rectangle base units forming the arms of the L. When you use the **RR-Track New Layout Wizard** to start a new layout, standard shapes include L-shaped, C-shaped, and perimeter layouts which automatically place required rectangular bench units accordingly.

To create new layout bench units you have to switch to **Terrain View**. This is done by clicking on the *Terrain View tab*, just as you would for **Plan View** or **Component View**. A **Terrain View** of our layout is below.

Terrain View shows an *overview* of your layout, with track and terrain indicated. Track is drawn with bold, brown centerlines (dashes for overpasses). You also have a window that shows a *data sheet* of all terrain base and contour items (there is one at present). At the moment we have **Terrain View** set to not show the *cross-section view*; this can be enabled using the **Terrain View Options dialog**.

We are going to modify the one base on the existing layout and then add additional base units to create a non-rectangular layout. What we end up with is not necessarily something you may choose to actually build, but it will illustrate how you can combine bench units to get the shapes you need.
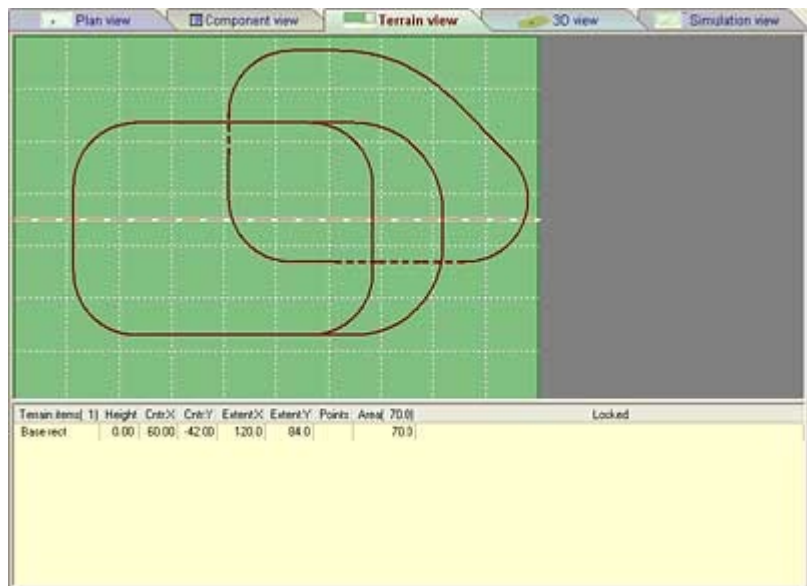
There are <u>five</u> types of bench units available in RR-Track: (1) *rectangles* (the most common on any type of layout), (2) *triangles*, (3) *semi-circles*, (4) *quarter-circles*, and (5) *polygons*. Triangles, semi- and quarter-circles are really special cases of polygons. Triangles are polygons limited to three points (duh!), while semi- and quarter-circles are polygons with many points that you designate in the manner of a circle (like a tree object) but are slices of the circle limited to 180° and 90° respectively.

The first step is to resize the one rectangular bench unit we already have to make space on either side of other shapes. Start by setting the snap size to 12 inches to make it easier to resize on 1ft boundaries. This can be done either by (1) pulling down the **Options** menu and choosing **Terrain Options** and setting the snap size using the **Terrain Options dialog**, or (2) by going to the *status bar*, popping up the list of *Terrain View snap sizes*, and choosing 12 inches (see *Terrain View status bar* for further information).

Quick Tips:

To Resize the Rectangular Bench Unit

- click on it with the left mouse button to select it. It will highlight in a red cross-hatch when selected.
- Move the pointer over one of the left side *edit handles* (either bottom or top corner), the cursor changes to 🖰 Edit pt when you are there.

- Depress and hold the left mouse button and drag the corner rightward two feet. Release the left mouse button when you have done this.
- Go to the right hand side *edit handles* and do the same thing as you did to the left side, moving it leftward two feet. Release the left mouse button when you have done this.
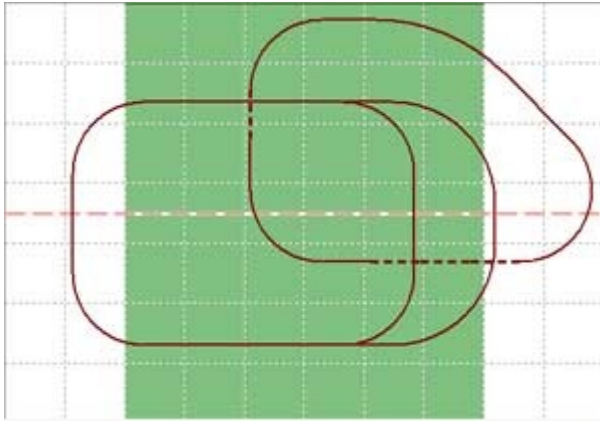
You should have something that looks like that below at this point. Now there is room on each side to make the layout shape more interesting. First, we will add a small filler rectangular base unit to the left side, then cap this with top and bottom quarter circles.

Go down to the *Terrain View status bar* to the **New Base** button, place the cursor over the up arrow and press the left mouse button to bring up the layout base list, like that at left You need to move the pointer up and choose **rectangle**. Placing a rectangular base is the same as placing any other rectangle object .

To Make a Rectangular Base

- Choose the **rectangle** from the **New Base list**. As you move the pointer over your the Terrain Overview, the cursor changes to   .
- Move the pointer to the spot where you wish to position the first corner (it does not matter which one). Depress and hold down the left mouse button; the cursor changes to   .
- While continuing to hold the left mouse button down, drag the pointer to the opposite corner. RR-Track draws the outline of the rectangle as you move the pointer providing visual cues to the size and position of the rectangular object.
- When you are satisfied with the size and shape of the rectangular object, release the left mouse button. RR-Track immediately draws the object, changing the cursor to the standard arrow.
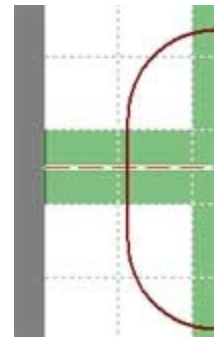
.You should end up with something like that at right.   If you don't end up with the rectangular base exactly at this point, just grab it with the pointer and move it to where it is needed, just as you would any other object (see *moving items*).

Now we want to fill in the lower cut out with a 2ft radius quarter circle. To do this, navigate to the status bar, pop up the **New Base** list and choose 1/4 circle from the choices. Designating the quarter-circle is like drawing a tree or any other circle-derived object, you start by designating the center point and then dragging out to the appropriate radius and angle.

To Make a Quarter Circle

- Choose the **1/4-circle** from the **New Base** list. As you move the pointer over the Terrain Overview, the cursor changes to   .
- Place the pointer hotspot at the location you want the center point of the quarter-circle. Press and hold the left mouse button. This both designates the center, and changes the cursor to   indicating you are now supposed to designate the

  radius.
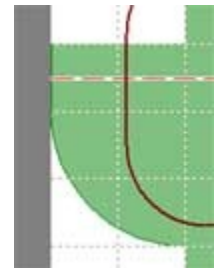
- While holding down the left mouse button, drag the pointer out to the desired radius (RR-Track displays a small window at the upper right of the *Terrain Overview* showing the current radius). The current circle is drawn and redrawn as you change the radius.
- When you reach the desired radius and orientation (you may have to move the cursor around some to get the correct orientation), release the left mouse button. RR-Track immediately draws the quarter-circle and returns the pointer to the standard arrow.

When dragging out a quarter or semi-circle, the line from the designated center to the cursor forms one of the terminating edges. As you move the end point around in an arc, RR-Track outlines where the quarter or semi-circle will be. You can read more about creating and designating base units in the how to topic on general purpose objects.
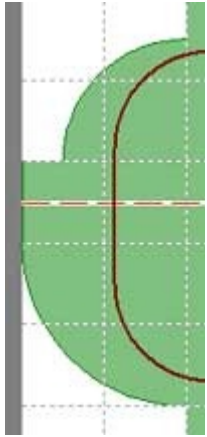
You should have something like that above right.

We want to finish off this end of the layout base units by placing another quarter-circle filling much of the upper cutout, but a little smaller (18 inch radius). To make this work you need to reset the snap size to 6 inches (something less than 12 inches). When you are done, you want to have something that looks like that at left. You would probably never build something like this, but this does demonstrate the kind of shapes and configurations that may be achieved.

Now we have to go work on the other end. Here we will use a combination of triangles and polygons to create a non-simple boundary. For the upper right we want to fill this are using a quadrilateral (four point polygon). To do this we have to choose a polygon base unit from the New Base list and then start designating vertex points. Leaving the Terrain View snap size at 6 inches carry out the following instructions:

To Make a Polygon Base

- Choose the **polygon** base from the **New Base** list on the *Terrain View status bar*. As you move the pointer across the Terrain Overview, the cursor changes to , indicating RR-Track awaits your designation of the first polygon vertex.
- When you have the pointer at the desired initial vertex point, click the left mouse button. The cursor changes to indicating RR-Track is now ready for the next vertex.
- Move the pointer to the desired position of the next polygon vertex and click the left mouse button. Repeat this step until you have designated all of the points save the last one. Once you have designated the first two points, RR-Track shows you the projected return line.
- When you reach the last vertex, double-click the left mouse button or single-click the right mouse button. This tells RR-Track that this is the last vertex. RR-Track closes the polygon, draws it, and returns the cursor to the standard arrow.
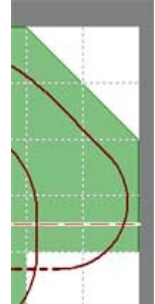
When you are finished, you want a polygon base that looks like that at right. The next move is to fill in the bottom with a triangle base unit (this is a polygon limited to three sides -- it is a special case in **Terrain View** because these are used a lot for fillers on inside corners, etc.). You designate a triangle base in exactly the same you did the polygon base unit above, except that RR-Track automatically terminates the polygon at the third point, i.e. you will not have to double-click or right-click to tell RR-Track to close the triangle. When you finish with the triangle, you should have a Terrain View of your benches that look like that at left. Unlike the left side of this demo layout we finished the right side with some angular, blocky bench units.

If you take a look at the results in **3D-View**, you should have something resembling that below.

Not mainstream, but it demonstrates making an odd-shaped layout.

Adding Contour Objects

Now that we have set the layout bases/benches, we need to put in some vertical terrain. RR-Track has three contour objects for defining vertical terrain. These are

- (1) Contour *points*,
- (2) Open contour *lines*
- (3) Closed contour *lines*.

Contour points are just that, individual points. Contour *lines* are like a *polyline;* a collection of individual points at the same height. A closed contour is like a *polygon* in that all of the contour points are at the height, and a line connects the last point to the first. In all cases heights are keyed on the individual contour points.

You can get a new contour object of any type by either pulling down the **Action** menu and choosing the **new contour** object of your choice, or by navigating to the status bar to the **New Contour** button. You press the button to get another contour object like that named, or press the up arrow to get a list of all available contour objects.

For starters, we are going to add a single contour point. Before we begin, we are going to set the current contour height by using the **Contour Height** button the the status bar.

- Press the **Contour Height** button which brings up the *Contour Height dialog* like that at right. Use the up down spinner or type in a height of 18 inches and press **Set Height**.
- Next go over to the **New Contour** button. If it is not reading '**Point'**, hover over the up arrow and press it to bring up the Contour Objects list. Choose Point from the list.
- The cursor moves to the center of the *Terrain View overview window* and the cursor changes to indicating you need to designate the contour object's first (and in this case only) point.
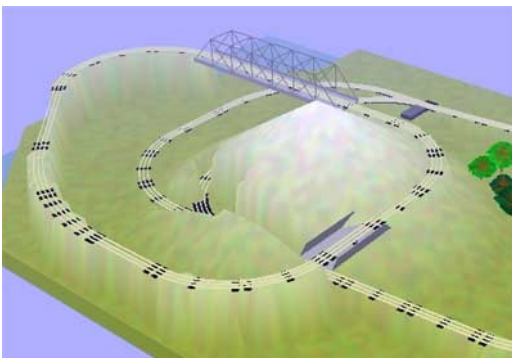
- Move the cursor to somewhere in the space near the center of the layout where the upper and lower level tracks form a rectangular space, and click the left mouse button. Terrain View places a small yellow circle at the location of the new contour point.

Now we need to take a look at this in more than two dimensions. Click on the **3D-View** tab; you should see something like that below.

Note that 3D-View has automatically cut the terrain away to

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compensate for the existing track in both the upper and lower level loops (if the overlapping terrain is not cut away as needed, you need to consult the *3D-View Options* and make sure **Terrain Follows Track** is enabled). Move the view around to examine this from as many angles as you need to see.

Now lets add another mountain, this time in the blank area at the lower right. Set the current contour height to 14 inches this time, and repeat the steps that you carried out above for the next point. You should have something like that at left. Before taking a look at the new terrain in 3D, place the mouse pointer over one of the contour points and pause for a second, just as you would a piece of track or an accessory.

Terrain View shows a hint window that tells you the contour item type as well as it's height (18 inches for the first point and 14 for the second). Further, if you right-click you get a shortcut menu that lets you do, among other things, alter the contour height. Before we add some more trees, first go and take a look at the 3D tab.
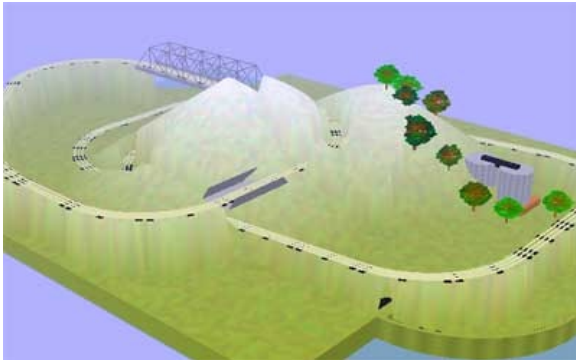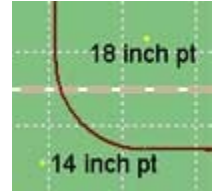
Notice that the upper level track has had an embankment automatically cut away between both contour peaks. You can go ahead and add more points, or move the existing ones around, or change their heights if you want (to change a contour height, select it with the mouse pointer and then pull down the **Action** menu and choose **Set Contour Height**, or right click over the contour you want to edit and choose **Set Contour Height** from the *shortcut menu*.

You can also take a look at the data sheet window, which is a list of all of the terrain objects in the layout. Here we show six base/bench units and two contour objects with their heights and locations. Notice also that the total area of the layout bases/benches is just under 57 sqft.

Terrain items(8)	Height	CntrX	CntrY	ExtentX	ExtentY	Points	Area(56.9)
Base poly	0.00	108.00	54.00	24.0	48.0	4	6.0
Base qtr-cir	0.00	9.66	21.66	24.0	24.0	20	3.1
Base qtr-cir	0.00	13.24	58.76	18.0	18.0	20	1.8
Base rect	0.00	60.00	42.00	72.0	84.0		42.0
Base rect	0.00	12.00	42.00	24.0	12.0		2.0
Base triangle	0.00	104.00	28.00	24.0	24.0	3	2.0
point contour	18.00	64.00	50.00				
point contour	14.00	48.00	29.00				
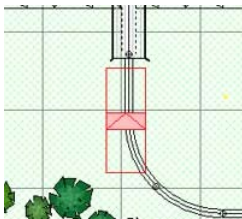
Tunnels

Just to show how tunnel portals work, we will add a couple on the upper level of track, between the two mountains and between the two overpasses. Go back to **Plan View**. You should still be in the buildings layer. Pull down the **Objects** menu and choose **tunnel portal** from the **Buildings** submenu. Move the tunnel portal over the track junction just below the left side overpass, and then rotate it around (by your method of choice, see *rotating objects*) until you have something like that at left. The 'arrow' on top of the portal designates the outward direction. Don't worry about the height, tunnel portals automatically get their base height from the track below them.
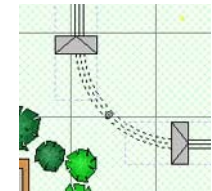
Now do the same (another tunnel portal) for the track junction that is immediately to the left of the lower overpass. Finally, hover the cursor over the curved track sections between the tunnel portals (one at a time), right click and choose **toggle tunnel** from the *shortcut menu*. When you are done, **Plan View** should look like that at right. RR-Track indicates that track sections have *tunnel attributes* by drawing them with dashed lines. Tunnel attribute means that **Terrain View** and **3D-View** are free to let terrain flow over these track sections, as if they were 'under' the terrain.
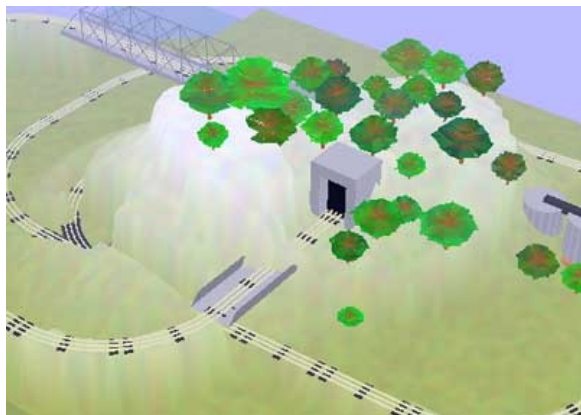
Shown at left is a 3D rendering with one more contour height point added and a few trees. While you are in the **3D-View**, move your vantage point around an examine the hill from a number of different angles. You can customize the terrain as much as you like, here were are using a small number of

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height points.

This ends the fifth part of the RR-Track Tutorial.

Getting Started Part Six: Running Trains
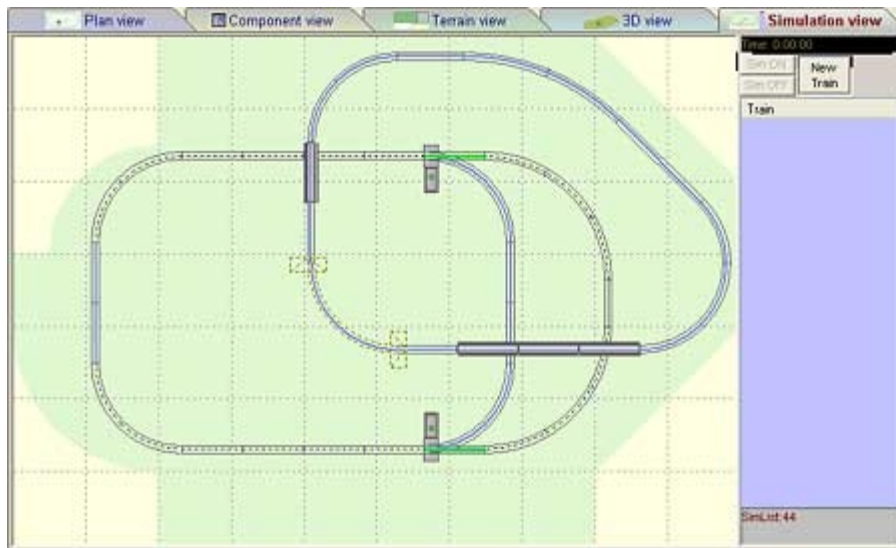
Now its time to do something a little different and simulate running some trains on our demonstration layout. Above is the **Simulation View** of our layout (you get this by clicking the **Simulation View** tab). The background is pale yellow, layout base/bench units are in light green, over pass track is bold, and switch throws are in red/green (depending on their state).

There are no trains yet, so the *Train List* is empty. Start by pressing the **New Train** button at upper right. This gets you the **New Train Builder dialog**, like that at right. You can build as large a consist as you like, but we want to start off simple. Press the **+** sign next to the Locomotives heading in the left pane to get a list of available motive power. Go down the list and highlight **SW1500 diesel switcher** and press the **Add>>** button. You should now have a single entry for an SW1500 in the right pane, which is your assembled train. Press **OK**. RR-Track changes the cursor to ⇦ Set Train and puts it in the center of the *simulation overview window*.

We want to place this train on track on the lower loop because that is where we have a couple of turnouts to play with. Move the cursor down to some of the straight track near the bottom of the loop and hover it. All track sections needed for the initial route track will highlight in green and the cursor will change to ⬚ Set Train indicating you are allowed to place this consist at this location. Click the left mouse button to drop the SW1500 on the track at this location. You should have something that looks like that at left. .There are several things to note in this figure regarding the SW1500 consist. *First*, all track considered as route track (track the consist is either occupying or about to occupy) is highlighted in **yellow**. *Second*, the direction of travel is marked by the end of the locomotive that has a headlight (this is true even of steam power where the motive unit has both an engine and a tender, reverse has lights on the rear of the tender). *Third*, the direction light is **white** which means this train is 'live', i.e. has a cab to control it. A red direction light indicates a train is 'dead' and can't be moved (yet).

The figure at right shows an abbreviated version of the *Train List window*, which is on the right side of **Simulation View**. There is a single train listed "**T1: SW1500 diesel switcher**". **T1** means it is the first train on the train list. Train's take their names from the name associated with the first powered unit in the consist, unless you choose to change the name to something you want. **T1** is in red because it is live, dead trains are in black.

Since this train is live, it has a cab, which was automatically created and attached to

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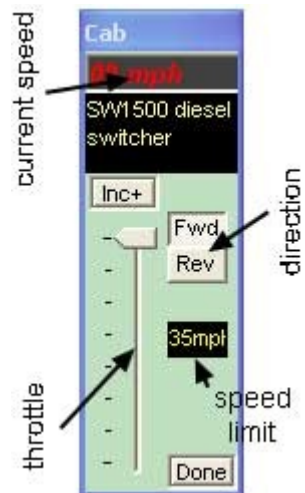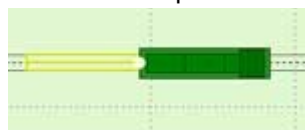
this train when we placed it on the tracks. At right is a depiction of the cab associated with our train with the various controls annotated.   At the top is the current speed, in scale MPH. Below that is the name of the train the cab controls. The slider at left is the throttle, used to set the current speed. A pair of push buttons set the direction (fwd/rev), and a small window below that denotes the speed limit (which depends on the motive power) for this consist. The Done button lets you close a cab out and make the associated train dead.

The final set of controls which play a part in the train operation simulation are the *simulation start - stop* buttons located just above the *train list window*. Above these is the *simulation clock*, which shows you how much simulated time you have spent running trains (this is not the same as a fast clock for model RR clubs). When *Sim OFF* is depressed, the clock stops and nothing moves. This is like pushing a crash stop button on a real model RR which cuts electric power to the track. Pressing *Sim ON* is like applying power to the track. Right now, **Sim OFF** should be pressed. You can see this interaction for yourself by grabbing the throttle slider and moving it downward so that the current speed indicator no longer reads 00 mph. The SW1500 still does not move because we haven't started the simulation clock. Before we start, return the throttle to the top of its travel so the current speed read 00 mph, unless you are partial to jack-rabbit starts.

Now press Sim ON to start the clock (apply power to the track). The simulation clock turns on and immediately begins to update every second. The SW1500 still does not move; so grab the throttle with the pointer and move it down to read about 10 mph. The SW1500 immediately begins to move to the left, adding route track in front and dropping it behind as needed. When you get to the first set of curves, stop the simulation clock (press Sim OFF) so that we can take a look. The route track sections are both O31 curves (where we stopped it) and there is a significant amount of overhand on the outer rail at each end with some underhang at the center of the inside of the curve. One of the questions that comes up frequently in discussions of layout design is clearances on curves (concentric or otherwise) between tracks and between track and wayside objects such as signals, structures, trees, etc. You can get some answers to these questions by right-clicking on the SW1500 train unit and choosing **TU Properties** (not *Train properties*) from the shortcut menu. If you do that right now you will get *Train Unit Properties dialog* like that at right.
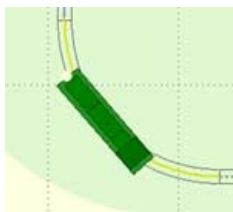
First things: **ID** refers to the internal TU ID that **Simulation View** uses on this train, while **Pos** is the numerical location in the consist (starting at the front) for this TU (obviously for a one unit train that is 1).

Dist run: distance traversed by this train unit during the simulation in scale miles -- 0.028 here.

Time run: time (hrs:min:sec) this train unit has been run (14 seconds in our case, this only includes time at non-zero speeds).

OVERHANG group

cntr-cntr: the distance at the front and rear between the center of the car body and the centerline of the track. This is a function of the curved radius, the truck spacing, and the front/rear car body overhang past the truck centers.

plus width: the above dimension with the half-width of the car body added. This is now the overhang past the track centerline.

past rail: the number you may actually want. This is the previous calculated distance with the track width taken into account, i.e. how far the end of the car body hangs beyond the outer rail.

UNDERHANG group

cntr-cntr: the distance at the mid point between the trucks between the car body centerline and the track centerline. Like the overhang, this is a function of the curve radius, and the truck spacing.

plus width: the above number plus the half-width of the car body. This is how far the car body extends inside of the track centerline.

past rail: as for overhangs, the above number with the track half-width accounted for. This is the distance the car body extends inward past the inside rail.

So at the center of this sharp, O31 curve (an R-07 curve approximately for HO railroads), a relatively short yard switcher extends nearly 1 inch past the inside rail and about 1.2 inches past the outside rail on each end. The

moral of the story is don't put signals next to the track on the either side of O31 curves, unless you want to shove them aside with your expensive, scale SW1500 switcher, never mind something with a longer wheelbase (SD-80?) or longer front/rear overhangs (4-8-4 steamers). You can let the SW1500 proceed well into the next set of straight track (to minimize clearances) and then stop it to see the minimum overhang/underhang values.
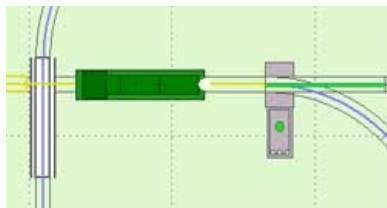
Go ahead and run the SW1500 around the upper part of the loop, until you nearly reach the O31 RH turnout, stopping before the turnout itself is added to the route track (highlighted in yellow). Right now, the turnout is set so that the SW1500 will proceed from the turnout entrance to exit along the mainline, that is the meaning of the heavy **green** line drawn along the thru track. Hover the pointer over the turnout so that it changes to ⬚↑↓ . This

cursor means that you can change (toggle) the switch state by clicking the left mouse button. Do this once; you should now have a turnout throw state that looks like that at right.   Now the switch state is drawn along the spur track in heavy red. If the SW1500 enters the switch now, it will take the track to the right. Click it again and the turnout throw state returns to the thru track. For all two-state turnouts (this includes Wye turnouts) you can go back/forth between throw states by clicking on the turnout.
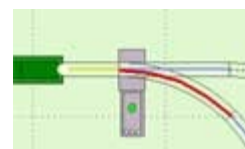
> **Note:** you do not have to stop trains or suspend the simulation clock to change turnout throw states. You can do this '*on the fly*' while trains are in motion as long as the turnout is neither *occupied*, nor already included in a train's *route track* (outlined in yellow). If you hover the cursor over an occupied turnout you will get this cursor ⬚↑↓ , which means the turnout cannot be toggled between throw states. You can also zoom in and zoom out, as well as pan and scroll the view around the simulation overview window while trains are running. If the track arrangement is tight and the trains are moving fast, you have to be on your toes.

Click the turnout one more time to choose the spur track (**red** throw state) and press the **Sim ON** button to resume the simulation clock. Watch as the SW1500 proceeds through the turnout, adding it to the route track and then traversing the spur like that figure at right shows. As the lead truck nears the exit of the turnout, RR-Track adds the next track section to the route list, and drops unneeded trailing track sections. Continue to let the SW1500 proceed down to the next turnout, where it will enter the turnout from the nominal exit track end rather than the entrance track end. Here we have a different
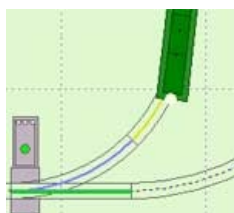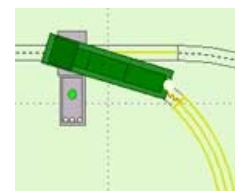
situation; the O31 LH turnout's throw state is set for the thru track, but we are coming in on the spur track. We could go ahead and toggle this throw state as well, but we don't have to: RR-Track assumes all turnouts are non-derailing and will adjust the throw state as needed to keep the train on the track. Watch as the SW1500 enters the turnout and the throw state changes to the spur track. Go ahead an let the SW1500 proceed around the loop, but go up and toggle the upper turnout throw state so it has to take the outer path, as shown in the

figure at right. There is no need to toggle the lower turnout since all turnouts are non-derailing; RR-Track will change it's throw state as needed. Go ahead and run the SW1500 around the loop some, and then move to the next section where we manipulate more than one train.
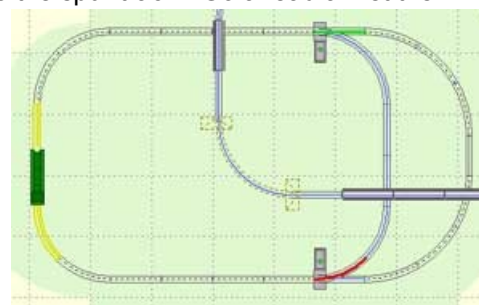
Making and Breaking Trains

Go ahead and stop the SW1500 about where you originally placed it on the tracks. Right click it on and choose **Train Properties** (rather than **TU properties**). This brings up the *Train Properties Dialog*, like that at right.

At the top is the **name** of the train, which you can edit and change by pressing the **Edit Name** button and typing in a new name. Below that is a list of all of the train units in the train consist (in this case only one). The train units are in numerical list order with their *type*, *description*, and *lengths* shown. The length is a combination of the distance between the trucks over the length overall.

Below the train unit list are 10 fields showing various statistics about the train.

#TU: this is the number of train units.

Len: the overall occupied length along the tracks. For this single SW1500 train unit, this is 6.0 inches, the truck separation.

ID: internal identifier that RR-Track creates for its own use. Below this is a field that specifies whether the train is *live* or *dead*.

Cpl: number of coupling/uncoupling operations carried out by this train.

Crnt speed: the speed setting, in MPH.

MAX speed: the throttle speed limit, in scale MPH.

Avg speed: average speed this train has run at during the simulation.

Run tm: total time this train has been in motion (at a non-zero speed).

Run dst: total scale distance this train has run.

Time to put some other train units on the track and play around. Go back and press the **New Train** button to bring up the *New Train Builder dialog*. This time we are going to make a non-powered set of revenue cars that we will 'pick up' with the SW1500. Click the **+** sign next to the *Freight* category
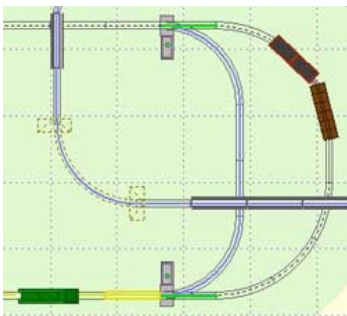
and highlight **40ft box car** from the list of revenue cars. The press the **Add>>** button to move it to the train unit list on the right. For variety, next highlight a **40ft PS-2 hopper car** and add it to the train unit list. You should have a list like that at right. Press **OK** and then place this new train on one of the sets of track between the two O31 turnouts as shown at left. Exactly where they are placed isn't that important, nor is whether they are on the inner or outer sets of track (could be called a passing siding). Now we need to go get them and assemble them with the SW1500 we already have. Before we start, note that the *Train List* now shows *two trains*, the SW1500 in **red** (because it is live) and the train "T2: 40ft box car" in black because it is **dead**. Our cab is still connect to the SW1500 so we are ready to go.

> **Note:** we could connect our cab to the two revenue cars, even though they do not have a powered train unit with them. This is because, for the purposes of positioning consists for yard simulations, etc., it is sometimes necessary to move non-powered consists. RR-Track lets you do this, but limits the maximum speed to 10 MPH.
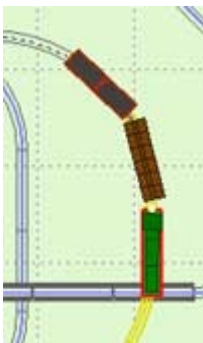
Go to the **SW1500 cab** and press the **Rev** pushbutton, you will see **Simulation View** change the end of the SW1500 that has a headlight, indicating the direction. Now press **Sim ON** (if it isn't) and advance the throttle slowly and start backing the switcher down towards the parked revenue cars. Make sure that the O31 LH turnout is set so that the switcher can in fact get to the parked consist and not go around it. When you get close (i.e. the SW1500 route track overlaps route track taken up by the parked revenue cars), Simulation View outlines the potentially colliding train units in red (as shown at left) and flashes a warning symbol in the cab. When the couplers overlap, RR-Track stops the *encroaching train* (this is automatic) and asks if you want to couple the trains. Press the Yes button. The two consists are coupled into one consist. Train direction is also automatically reversed, note the headlight on the other end of the SW1500. Also, a peek at the Train List shows we now have one train; before we had two trains. You can take a look at the

Train Propertes dialog by right-clicking somewhere on the coupled train and choosing **Train properties** from the *shortcut menu*. The newly coupled train inherits the properties of the SW1500 since it was the powered train of the pair of trains coupled up.

Go ahead and take it out for a spin, the three-unit train consisting of the SW1500 plus the two 40ft revenue cars. The coupling operation we just carried out is key to making and breaking trains in Simulation View. You can build up trains by moving around a yard with a switcher, just as you would on your actual train layout. After a bit, bring this train to a stop somewhere so we can uncouple cars. Move along the train consist hovering the cursor. When you are over a train unit the
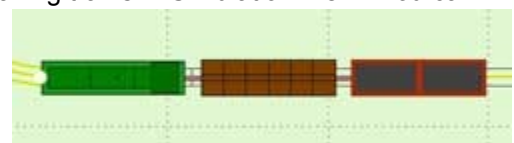
cursor changes to ⬉ Train and a pop up hint window appears detailing both the train name and the position and description of the train unit under the cursor. As you hover over the coupler bar between train units, RR-Track changes the cursor to ⬌ Un couple suggesting it is possible to uncouple these train units.
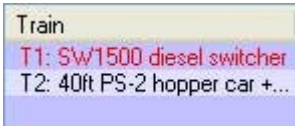
Position the cursor between the last two revenue cars, wait for the uncoupling cursor, and click the left mouse button. RR-Track uncouples the two cars, breaking the train into two trains, as you can see from the Train List at left. A slow advance of the cab throttle pulls the SW1500 and its entourage of one box car away, like we have at right. You can easily put this train back together by stopping, and then backing down and re-coupling, like we did when the train was assembled. Instead of doing that, hover the cursor over the SW1500 train and right-click to bring up the *shortcut menu*. Choose **Flip Train direction**. This reverses the order of the train units in the train, and changes the train direction as well, although you could look at it as preserving the train direction. You should have something like that at left after flipping the train. Now if we advance the throttle we will be able to couple the PS-2 hopper to the front coupler on the SW1500. Go ahead and carry this operation out, you should have a train that looks like that below.
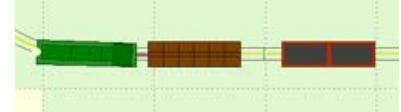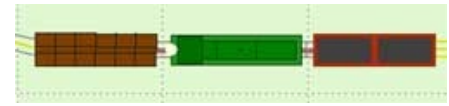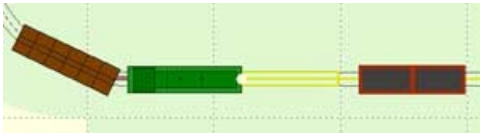
Now you have the SW1500 in the middle of the train consist, this is irrelevant to RR-Track as long as there is a powered train unit in the consist. This is not an uncommon configuration for a switcher on yard duties, pulling some train units all the while pushing others as it goes about its business of making and breaking trains.

Our demonstration layout is really quite tight when it comes to using larger sized equipment. You will note that train operations were demoed with a yard switcher (SW1500) and 40ft revenue cars, relatively short for modern time periods. Even though locomotives and cars exist that can navigate sharp, O31 curves, it is instructive to try and place a train on this layout that is build from larger equipment. Go back and press the **New Train** button and use the *New Train Builder dialog* to construct a consist like that at right. Press **OK** and place this on some of the track at the left side of the lower level loop.
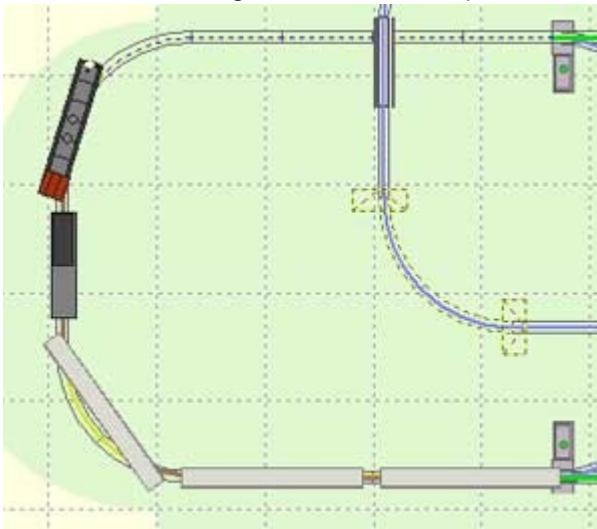
RR-Track will let you place this train, but it is obvious that there is no way you are going to get anything close to realistic operation out of 80ft passenger coaches on a layout with O31 curves. The underhang for the first coach car is more than 2.75 inches past the rail while the overhangs at each end are 1.5 inches past the outside rail. Given the extreme coupler angles at car-car junctions on the curves, it is unlikely that a real train would stay on the track, pushed or pulled.

We could just as well have run our test trains on the upper level, but with no turnouts on our demo design, it was more instructive to show train operations on the lower level.

This concludes the six part RR-Track Tutorial and layout design.

RR-Track Views

When you open or start a train layout, **RR-Track** creates a <u>master layout window</u> which is a container for five different views of, or ways of looking at, your layout plan. Each of these views may be accessed by clicking on the appropriate tab along the top of the master layout.
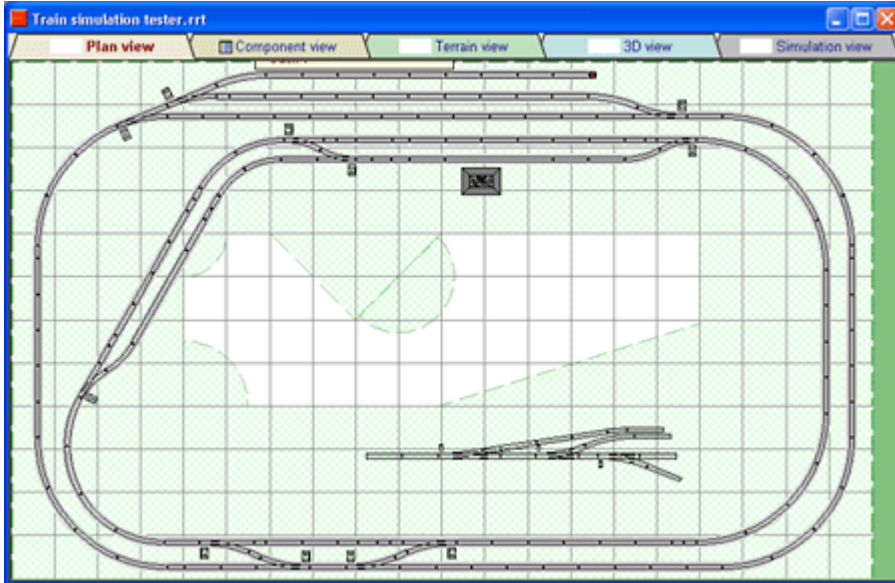
Above is a typical RR-Track layout window with the five views and their associated tabs. These ways of viewing your layout are (L/R): **Plan View**, **Component View**, **Terrain View**, **3D View**, and **Simulation View**. Pressing on each of these, in turn, will display the associated view of your train layout.

You do your positioning of track, accessories, and other items (scenery, roads, buildings) in the **Plan View** tab. The **Component View** tab shows all of the items that make up your train layout, split out by manufacturer. The **Terrain View** is used to position layout bench units (bench work) and terrain features. The **3D View** is used to get an idea of how your train layout will appear. Finally, the **Simulation View** lets see how your layout design will run trains in an interactive environment. Together, these five views present a comprehensive examination of your train layout design.

To change from one view to the other you simply click the tab with the appropriate name, for example, if you are working in **Plan View** and want to look at the component breakdown of your layout, click the **Component View** tab.

Plan View

This is where it all starts, and mostly lives, the **2D Plan View** of your layout. This is a view from above, showing the relationship of the components in your layout to each other. In the Plan View you do all of your positioning of track, accessories, objects such as scenery, roads, create and remove grades. With the exception of the **Terrain View**, all manipulation of layout components occurs in Plan View.

All views but **Component View** in RR-Track also have an associated status bar where you may quickly access the most needed features for that view. Below is a folded image of the *Plan View status bar*:
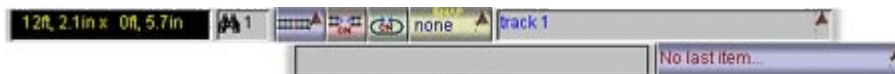
There are nine displays/controls on the **Plan View status bar**:

> **Pointer Position:** layout coordinates of the mouse pointer.

> **Zoom Factor:** ranges from 1 to 128. See the essay on *changing the zoom* for more information,

> **Extended Selection Mode:** push button displays a list letting you choose the extended selection mode.

> **Automatic Track Joining:** push button lets you toggle automatic track joining on/off.

Automatic Loop Closing: push button lets you toggle automatic loop closing on/off. See *closing track loops* for more information.

Snap Size: push button toggles using a snap setting on/off; clicking over the uparrow displays a list letting you choose the current snap grid size.

Working Layer: shows the name of the current *working layer*; clicking over the uparrow lets you choose another working layer or set the visibility attributes of any current layer. Double-clicking invokes the **Drawing Layer Setup dialog** which allows you to configure any layer or add and remove layers.

Info Box: shows the item the pointer is hovering over.

Last Item List: push button gives you another instance of the last track/accessory item added from the Track or Accessory menu. Pressing the up-arrow displays a list of the last 10 distinct items any of which you may choose to add to the current layout.

Plan View Windows

The **Plan View** is dominated by the 2D plan view of your layout. A typical layout plan view is shown at left. This is where you add track, delete track, move track sections around, insert, edit and remove scenery objects, and just about any other item that is part of your layout design.

There are also several auxiliary windows and lists that can be visible as well when you work in plan view.

Overview window: the overview window is what it is named, an overview of your entire layout regardless of how your are zoomed in in Plan View. When you are zoomed in, the overview window shows a small, dotted line rectangle that depicts how much of the layout your current field of view covers. You can move the view around by hovering the cursor over the view rectangle (changes to a crosshair indicating you are over the view rectangle), and dragging it by depressing and holding the left mouse button.
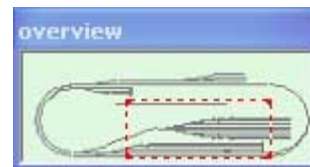
Hot Item List window: the Hot List window contains up to 20 items from any library that you may customize for quick, one-click access to your most used items. You can edit the list as needed, see Hot Item List for more information.
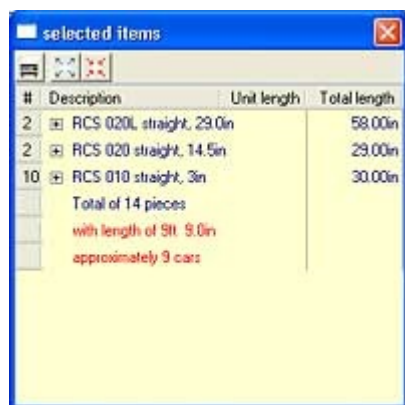
Selected Items List: this window, displayed when you choose the Show Select List command from the View menu, shows all of the items that are currently selected, their individual lengths, and their combined lengths. This is useful for checking the lengths of sidings to see if they will accommodate the consists you plan to run. The data sheet is similar to the layout of Component Viewer. You can expand / collapse each item by clicking on the box next to its name, the can expand/collapse all items using the second and third buttons on the toolbar above the data sheet, and you can print a list of the items by pressing the button with the printer icon.

Current Modules window: here you have a list of the *modules* that are currently available for addition to the layout. You can add a module, like a big piece of track, by selecting it from the module list. For more information on
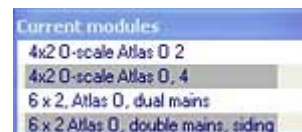
using modules, see the article on *module compiler*.

Plan View Menu Bar

The **Plan View** has a menu bar divided up into commands under *File*, *Edit*, *Action*, *View*, *Track/Accessory*, *Objects*, *Fonts*, *Grades*, *Library*, *Options*, *Window*, and *Help*.

File menu:

New Layout...: creates a new layout design.

Open layout... opens an existing layout design.

Close: close the active layout design. If changes have been made since the last save, you will be prompted to save your design.

Save: save the active layout design. You should save frequently.

Save as... save the active layout design under a new name. This is good for creating variations on a theme.

Save all: save all open layout designs.

Print layout... print all or part of the layout plan view.

Printer setup... calls the Printer Setup dialog provided by the current printer driver.

Clone layout: creates a fresh copy of your layout design and opens it in a new *master layout window*.

Create module... takes the current layout design and passes it to the RR-Track Module compiler so that you may turn it into a RR-Track module.

Export: copies the image of the current plan view to either a standard bitmap image file (.BMP) or copies this bitmap image to the Windows Clipboard.

Exit: closes all RR-Track windows and terminates the RR-Track application.

Edit menu:

Undo last track: removes the last track or accessory item added to the layout design.

Step back: backs the layout design configuration to the previous *restore point*.

Cut: removes the selected items from the layout and places them in the RR-Track clipboard.

Copy: copies the selected items to the RR-Track clipboard.

Paste: pastes the contents of the RR-Track clipboard into the layout design.

Repeat paste: pastes the clipboard contents at locations you designate with the pointer. Press the ESC key to exit this command.

Delete: deletes the selected items.

Duplicate: copies the selected items to the clipboard and then pastes them back into the layout.

Duplicate parallel: lets you duplicate the selected track at a fixed offset from itself. Useful for initiating parallel mainlines and sidings.

Select all: select all of the items in your layout design, including hidden items.

Select all in layer...select all of the items in a given layer, which you will be prompted.

Select all visible: select all of the items in the layout design which are visible.

De-select all: un-select everything that is highlighted.

Action menu:

Rotate... rotates the selected items. You can enter an arbitrary angle or choose one of the preset angles. See *Manual Rotate dialog* for more information.

Move... incrementally moves the selected items using the *Quick Move dialog*.

Change height.... sets the absolute height of the selected items. Heights default to zero.   See *Set Height dialog* for more information.

Move to layer... moves the selected items from the current layer to one of the other layers in your layout design.

Extrude: set the vertical dimension for a basic object (not track or accessories). See ***Object Extrusion dialog*** for further information.

Unjoin selected track: breaks the track junctions between the selected track components and the rest of the track in your layout.   Does not alter the physical location of the selected track.

Join to nearest track: joins the nearest unoccupied compatible track junction on the selected track items to those on your layout design.

Close contiguous loop: finds and closes gaps between track junctions in the selected track items. Does not alter the physical position of the track.

Break joint: breaks the joining between the track sections at a junction you designate with the pointer.

Align: these three items let you align track and objects with other items.

Align to -> Coordinate Grid: aligns the an edge of the selected item(s) with the underlying layout coordinates.

Align to -> Designated Object: aligns an edge of the selected item(s) with an edge of an item you designate with the mouse pointer.

Align to -> Nearest Track: aligns the selected track with the nearest compatible track. Like joining without actually coupling these track sections.

Group objects: groups the selected objects together.   Does not apply to track or accessory items. See *grouping and ungrouping objects* for more information.

Ungroup objects: ungroups the objects in the selected group.

Move to front: moves the selected items to the top of the display list, where they will be drawn last and appear on top of those that are drawn before them.

Send to back: moves the selected items to the bottom of the display list where they will be drawn first, underneath other items.   Terrain items are always at the bottom of the display list. For the above two commands see *changing the drawing order* for more information.

Set/clear block break: sets or removes a soft electrical block break at a track junction you designate with the pointer.

Clear all block breaks: removes all soft electrical block breaks in the layout design.

Create block: sets a soft electrical block break at the ends of the selected track.

Lock selected items: locks the location, size, orientation, attributes of the selected items. You must unlock the items to change any attributes.

Unlock selected items: removes the lock status of the selected items so you can alter their attributes. More discussion on these two commands may be found in *locking and unlocking items*.

Relax selected track configuration: lets you adjust the position of the selected track to minimize gaps and alignment errors.

The **Action** menu will only be available if you have selected an item for RR-Track to act on. If no items are selected (highlighted) this menu is grayed out.

View menu:

Zoom in 2x - Zoom in 4x: lets you double or quadruple the screen scale. The exact zoom area you designate with the mouse pointer.

Zoom out 2x - Zoom out 4x: zooms the view back out by a factor of two or four, to a maximum of 1:1 (entire layout visible). For more information on the zoom commands, see *zooming the view*.

Last view: return you to the previous view.   Handy for toggling between zooming in to look at something in detail and then backing out for a wider view.

Home view: zooms back to 1:1 to display the entire layout

Fit in window: both zooms back to 1:1 and rescales the layout to make better use of the window aspect ratio.

Redraw: forces a redraw of the layout.

Show locked items: selects (highlights) all locked items. Good to use before unlocking all locked items. See *locking and unlocking items* for more information.

Show overview: toggles the display of the *layout overview window*.

Show status bar: toggles the display of the *status bar* at the bottom of the screen.

Show select list: toggles the display of a summary of all currently selected (highlighted) items. You can use the infomation in the *Select List window* to check siding lengths among other things.

Show hot list: toggles the display of the *Hot List*, which gives you one-click access to track/accessory items of your choosing.

Show modules: toggles the display of the *Module List*, which gives you one-click access to any modules you have created.

Show display list: brings up the *Display List*. This is a linear list of all objects in your layout in drawing order (first to last). You can individually access and remove hard-to-find items from the display list through the **Display List dialog**.

Switch to 3D: switch to 3D layout view. Same as clicking the 3D View tab.

Switch to Terrain map: switch to the Terrain View Same as clicking the Terrain View tab.

Switch to Component View: switch to Component View showing your layout inventory. Same as clicking the Component View tab.

Object menu:

The following choices are available for **Basic shapes:**

Outline rect: rectangle with unfilled interior.

Filled rect: rectangle with filled interior.

Cross-filled rect: rectangle with filled interior and cross lines from corner to corner.

Outline circle: circle with unfilled interior.

Filled circle: circle with filled interior.

Simple line: single-segment line.

Poly line: multi-segment line.

Wide line: multi-segment, variable width line.

Tangent line: a dashed line that is indexed to the postion and angle of a track end. Used for design and notional purposed.

Outline polygon: polygon with unfilled interior.

Filled polygon: polygon with filled interior.

The following choices are available for **Buildings:**

flat building: rectangular building with flat roof.

simple building: rectangular building with simple barn-style roof.

hip-roof building: rectangular building with hipped roof.

water tower: square footprint RR-style water tower.

turntable: generic circular turntable.

tunnel portal: a single track tunnel portal you can position to show the entrance/exits of your tunnels. Tunnel portals are used by both the **Terrain View** and the **3D View** to establish terrain heights.

girder bridge: simple girder-style RR bridge.

plate bridge: simple plate-style RR bridge.

truss bridge: over-the-track style truss bridge.

The following choices are available for **Scenery:**

Yucca tree: pointy southwestern style scrub tree.

bush: generic roughly circular low shrub.

evergreen tree: confier style tree.

fall tree: bright colored deciduous tree.

spring tree: green colored deciduous tree.

random tree: trees are selected at random from the three styles above.   Useful for quickly filling in a mixed plantation.

plain boulder: constant color six sided rock.

random boulder: random color six sided rock.

4-tone heap: conical heap with lighter shade towards the top.

pond: polygonal body of water.

river: linear body of water.

2-lane road: single striped road.

4-lane road: triple striped road.

country road: non-striped road.

The following choices are available for **Special objects:**

Text label:

Font menu:

Track labels: font used to draw the labels on track and accessory items.

List windows: font used in lists, such as the Selected Items List.

Status bar: font used by all the status bars

Grade menu:

Create grade: this takes the selected track sections, examines the height of the first non-selected connected track at each end, and interpolates all the intermediate heights.

Set track height: sets the absolute height for the selected track. This is used to establish heights at various points on your layout design which are then connected with grades.

Zero track height: set the selected track height to zero.

Grade information: displays information about the selected grade track, such as length, vertical relief, and per cent grade.

Calculator: used to game out the trade-offs between grade length, vertical relief, and grade per cent.

Show grade track: highlight all track that is on a grade. This is not the same as elevated track, see

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grade track.

Show elevated track: highlight all track sections not at zero height that are not part of grades. See *elevated track*.

Library menu

The Library menu consists of a list of all of the track/accessory libraries you purchased/installed in your RR-Track system. These are sorted by gauges, with accessories (i.e. trackside structures) at the bottom. A check mark indicates the current active library. Only one library may be active at any time, however you may store items from any library on the Hot Item List, or tearoff and paste menus from any track/accessory library onto your desktop. To change the current library, pull down the Library menu and choose the track/accessory system that you want to make active.

Using these methods, it is possible to have components from more than one library available at any given time

Options menu:

Resize layout: lets you increase/decrease your layout size. This just sets the size of the 'sandbox' you have to work in, it does not dictate the shape/arrangement of your actual layout benches/platforms.

Layers: lets you add/remove layers from your design, change existing layers names, and assign visibility attributes to your layers.

6in/12in/24in/48in/10ft/No grid: choose the size of the coordinate overlay grid.

Detailed track render: when checked, track is drawn with full detail, i.e. correct number of rails. When cleared, only the track centerline is drawn.

Label track: show track labels. The location can be specified under *Layout Options*.

Snap objects to grid: make item origins snap to a hidden set of location points with a specified spacing.

Set snap size: choose the spacing of the underlying snap points.

Auto-join new track: enabled newly added track sections to automatically be joined to the closest compatible existing track. Also enabled automatic joining when moving around existing track sections.

Automatic loop closing: when checked enables automatic checking for and closing of track loops (like ovals, figure eights, anything that comes back to itself).

Selections include joints: sets the extended selection mode to include all track physically joined to the selected track.

Selections include blocks: sets the extended selection mode to include all track that is both physically and electrically connected to the selected track.

Selections include grades: sets the extended selection mode to include all track that is physically connected and on the same grade or at the same elevation.

Options: brings up the *Global Options dialog*.   This is used to set RR-Track options that affect all master layout windows.

Repair track joining: disconnects all track and then rejoins it using physical proximity. Sometimes good for getting you out of some situation you don't know how you got into.

Show restore points: shows the current set of restore points. RR-Track remembers the last 20 restore points. Use the **Step Back** command under the **Action** menu to go to the previous configuration.

Window menu:

These are all standard Windows multiple document window commands.

Cascade: arranges all master layout windows in a cascade starting at the upper left corner of the RR-Track application window.

Tile: arranges the master layout windows in a tiled patter in the RR-Track application window.

Arrange icons: organizes all of the minimized master layout windows.

Close all: closes all open master layout windows.

Help menu:

Contents: opens the RR-Track Help system to the contents page.

Search for help on: opens the RR-Track Help system to the search page.

Getting started: opens the RR-Track Help system to the track laying tutorial.

Check for RR-Track updates: starts your web browser and goes to the RR-Track 5.0 updates page on the RR-Track website, www.rrtrack.com.

Curve calculator: opens the Curve Calculator help system.

Turnout calculator: opens the Turnout Calculator help system.

About RR-Track 5.0...:displays RR-Track build number, serial number, libraries and modules information.

Tearoff Menus

RR-Track provides multiple ways that you can use to access track and accessory items for addition to your layout design. Tear-off menus are a feature of RR-Track that give you another way to quickly access track and accessory items during layout design.

One method is to pull down the *Track/Accessory menu* and choose the item you want from the sub-menus for that particular library. For libraries with many items (some accessory libraries have nearly 400 items), repeatedly going to the main Track/Accessory menu can become tedious. A second method is to go down to the *Plan View status bar*, move over to the *Last Item list* on the far right, click the uparrow to bring up the **Last Item list**, and choose from among the 10 most recent distinct additions. A third method is to populate the **Hot Item List** with up to 20 of your favorite components from any library and choose from there. All of these have their strengths and weaknesses. Using the main menu allows full access but navigating the nested menus can be tedious. Bringing up the **Last Item list** and choosing requires two clicks and what you need may not be among th the last 10 items. The **Hot Item List** must be pre-populated, is limited to 20 items, and you may not want to temporarily add components here. This brings us to the Tear-Off menu.

Tear-off menus apply only to sub-menus of track and accessory libraries. None of the other **Plan View** menus implement tear-off capabilities. When you tear off a menu, you can position it anywhere on your screen; tear-off menus support docking on the inside left/right edges of the main RR-Track application window. You can have as many tear-off menus as you can stand to clutter your screen. An example of a tear-off menu is at right. Any tear-off menus you have are only visible when working in 2D Plan View, all other views hide tear-offs (if any).
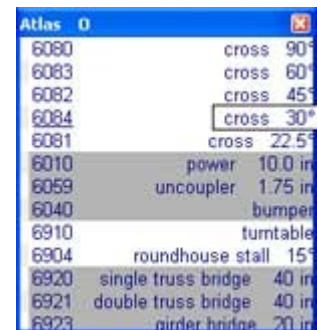
To Tear Off a Menu

- Pull down the **Track/Accessory** menu.

- Position the cursor over the desired sub-menu so that Windows displays it.

- Place the cursor over any item on the sub-menu and click with the right-mouse button.

- RR-Track creates a tear-off menu which you can then position where you prefer by dragging it to its new position like you would any other window.

If you move the left/right edges of the tear-off menu near the left/right borders of the RR-Track application window, they will automatically dock to that window border. When docked, tear-off menus move when you move or resize the RR-Track application window, preserving your layout. If undocked they remain in place on your display.

To Choose an Item

- Position the cursor over the tear-off menu that contains the item you want to add.
- Click the left mouse button. RR-Track positions the cursor with the item beneath in the Plan View window just as if you had chosen the item from the Track/Accessory menu.

You can remove a tear-off menu by clicking the X button on the tear-off caption.

> **Note**: RR-Track does not remember any tear-off menus between sessions. You will have to re-create them if you need them.

Component View

Component View is a flat-file database of the items from the various manufacturers that comprise your layout design.

You can view a summary of all of the components organized by source (manufacturer), or click on tabs that display each manufacturers contribution to the layout design. Alternatively, you can have Component Viewer split items by layer.

There is a toolbar along the top of Component View that gives quick access to commonly used commands. The menu bar lets you access all commands available in Component View.

To Show a Summary of all Layout Components

- Select the **All** tab

To Show a Specific Manufacturer's Components

- Pull down the **Options** menu and choose **Sort Items by Vendors**
- Select the *vendor's tab* that you want to study.

To Show a Specific Layer's Components

- Pull down the **Options** menu and choose **Sort Items by Layers**
- Select the *layer tab* that you want to study.

When in either a vendor's tab or a layer's tab, you can show all of the items of a given ID by clicking on the + symbol. To collapse the individual items press the - symbol. You may also apply this to all items.

To Expand/Collapse all Items

- Pull down the **Options** menu and choose either **Sort Items by Vendors** or **Sort Items by Layers**.
- Select the *vendor or layer tab* you want to study.
- Pull down the **Action** menu and choose **Expand All Items** to show all details or **Collapse All Items** to show summaries.

The above commands may also be accessed from the toolbar along the top of the Component View.

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- Pull down the **File** menu and choose **Print Item List**. Component View invokes **RR-Print** where you can choose how you wish your component list printed.

Component View Toolbar

The *Component View toolbar* lets you access eight commands quickly and displays the total cost and total number of items on the current tab. At right of the command buttons are summaries of the total cost and number items in ths current tab.

 Press this button to save an item list as a simple text (TXT) file that you can edit with any word processing application including MS NotePad.

 Press this button to send the current tab to RR-Print for printing.

 Press this button to sort the layout's components by layers.

 Press this button to sort the layout's components by vendor (manufacturer). This is the default sorting method.

 Press this button to select (highlight) all of the instances of the item entry you have highlighted in Component View.

 Press this button the de-select all of the instances of an item that you selected. This is the same as a de-select all command in Plan View.

 Press this button the expand all items in either a vendor or layer tab.

 Press this button to collapse all items in either a vendor or layer.

Terrain View
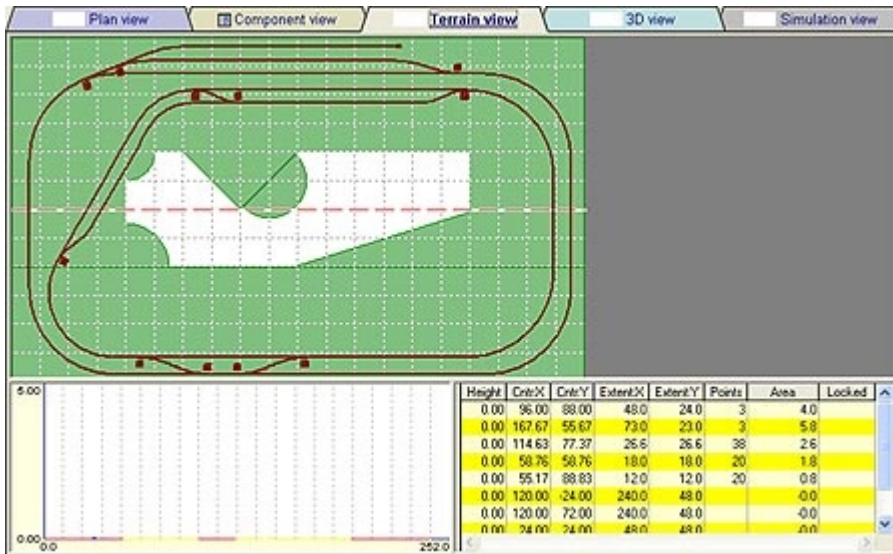
Terrain View shows the layout bench units and contour height points that together create the terrain on your layout design. With Terrain View, RR-Track allows you to set up realistic terrain features for your layout. The terrain objects you place in your layout interact closely with 3-D Viewer to automatically generate realistic looking topographic features with minimal user input.

In the Terrain Overview window you can add layout bench units (analogous to benches) and contour objects, set contour heights, modify layout bench and contour objects, and remove terrain objects. To do so you use the same methods used to add, modify, and delete items in the Plan VIew window.

To switch to **Terrain View** from **Plan View** (or any other view) just click on the **Terrain View** tab.

Below is a folded view of the Terrain View status bar:

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Terrain View Status Bar

To the left is a small pane that shows the pointer position when it is hovering over the Terrain Overview Window. The next button, as for the Plan View status bar, allows you to set the snap grid size for the Terrain Overview. Pressing the uparrow displays a list of snap sizes you can choose from. The next button (default height) displays the current contour height setting. Pressing this button displays a small dialog letting you input a new contour height. The default height is used for all subsequent contour objects (until reset). The third button (new layout base) lets you choose to add another layout base by clicking it. To choose a different base, click the uparrow button to show a list of all available base types (rectangle, polygon, triangle, semicircle, quartercircle). The fourth button (new contour) lets you choose to add another contour height point(s) identical to the previous. As for the snap size and new base buttons, pressing the uparrow lets you choose from a list of the available contour height point types.

At the far right is the **Options** button. Pressing this brings up the *Terrain View Options dialog*, allowing you to customize Terrain View.

Terrain View Windows
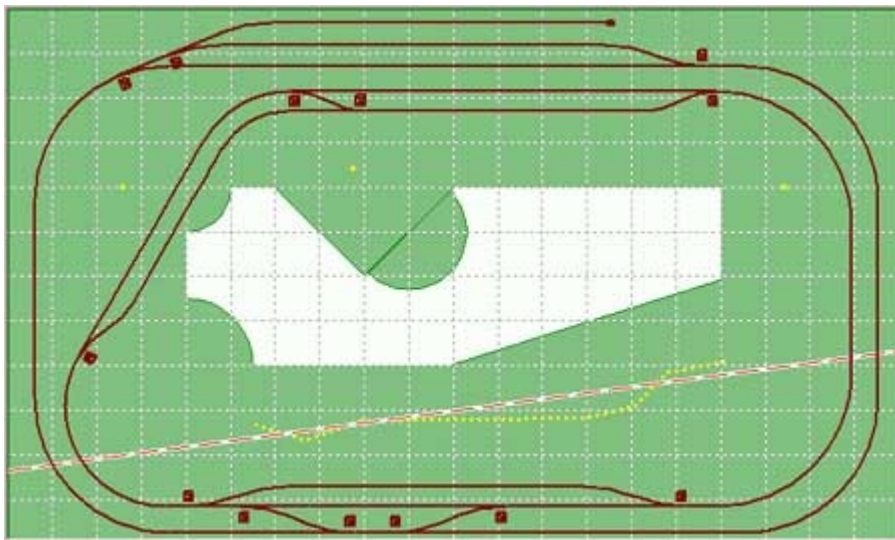
Terrain Overview window: this is the main workspace when you are in Terrain View. The primary layout components show in Terrain View are the track plan, the layout bench units (in green), the height contours (in yellow), and sample cross-section line. Other objects such as scenery items like trees, rivers, ponds, user-created structures, and general purpose drawing objects are not revealed (some scenery items such as rivers, lakes, roads may be displayed, see *Terrain Options dialog* for more information).

Cross-section window: this window shows a height cross-section of the layout along the line denoted by the cross-section path The cross-section path is a white line with red dashes as shown above. You can move one or both endpoints of the cross-section path using the Cross-section Endpoints dialog accessed through the Set X-section Endpoints command under the Action menu. Terrain View shows the terrain heights in red, track in blue, and points that are not above a terrain base object in yellow.

Terrain Items Data Sheet window: lists all of the terrain objects in the layout along with their relevant parameters; these include layout bench units and contour height points. These may be sorted in several ways to meet your needs.

Along with each terrain object, the data sheet window details the height, horizontal and vertical positions of the object origin point, the x and y extents (size) of the object, the number of points (if open or closed contour, or base polygon), the area, and the locking status (whether you are allowed to move

or edit the object).

The data sheet may be sorted by any of the first five columns (name, height, horizontal and vertical positions) by double clicking on the title bar above the column. When you do so, the data sheet sorts in ascending fashion.

If you right-click on one of the terrain items in the data sheet window you get a shortcut menu that lets you:

select: highlights the item (same as left clicking on it). Selecting an item deselects any other items that may be already selected.

delete items: deletes the terrain object from the item list.

edit item: selects the item and invokes the **Terrain Item Edit dialog** where you can make changes (using the keyboard) in the item's properties.

Terrain View Menu Bar

Action menu:

new contour - point: choose this to add a new single height point.

new contour - open line: choose this to add a series of points at the same height.

new contour - closed loop: choose this to add a series of points at the same height in a closed loop configuration.

The above commands use the current contour height, and are accessible from the Terrain View status bar as well.

new base - rect: choose this to add a new rectangular layout base unit to your layout design.

new base - polygon: choose this to add a new polygonal layout base unit to your layout design.

new base - triangle: choose this to add a new triangular layout base unit to your layout design. Same as above but limited to three vertices.

new base - semicircle: choose this to add a new semi-circular layout base unit to your layout design.

new base - quarter circle: choose this to add a new quarter-circularlayout base unit to your layout design.

The above commands are accessible from the Terrain View status bar as well.

rotate: use the Quick Rotate dialog to rotate the selected items.

set contour height: set the height of the selected contour(s).

set cross-section endpoints: move the endpoints of the cross-section line shown in the cross-section pane.

Edit menu:

copy: copies the selected terrain items to the clipboard.

paste: pastes the contents of the clipboard into the Terrain View at the current insertion point.

delete: deletes the selected terrain items from the layout.

cut: removes the selected terrain items from the layout and copies them to the clipboard.

select all bases: selects (highlights) all layout base units (benches).

select all contours: selects (highlights) all layout contour height points.

de-select all: deselects everything that is currently selected (highlighted).

View menu:

zoom in 2x: choose this to zoom in by a factor of two. You can choose the zoom rectangle using the

pointer.

zoom out 2x: choose this to zoom out by a factor of two.

home: return the zoom to a full view of the layout region.

redraw: force a redraw of the the Terrain View overview window.

Options menu:

mask base units: when checked prohibits the accidental selection of layout base units. Useful when only manipulating contours and you do not wish to accidentally select/edit base units.

terrain options: invokes the *Terrain View Options dialog* allowing customization of the terrain colors, what objects are shown/hidden, which data windows are shown.

Window menu:

cascade: arranges master layout windows in a cascade. Standard Windows MDI command.

Help menu:

Contents: starts the RR-Track v5 Help file at the Terrain View page.

About: displays the description dialog for Terrain View.

3D – View

3D View is where RR-Track lets you visualize train layout designs in a virtual three-dimensional space. 3D View minimizes user input in taking a layout design from the 2D plan view world of RR-Track to the virtual three-dimensional space of 3D View. You may change your point of view, zoom in or out, move the viewing point, change the color scheme, and a number of other parameters.

You do not manipulate the location and orientation of individual track, accessory, or other items in 3D-View (you do that in Plan View), but you may examine your layout from all angles and all locations. 3D-View automatically generates solid filled or smooth shaded terrain for your layout based on terrain information that you provided using Terrain View. You may choose to have **3D-View** automatically adjust the heights of scenery items such as trees and buildings to match the terrain features. 3D-View can also adjust the terrain to compensate for track and accessories letting you visualize features such as elevations and tunnels.

Viewing your layout in 3D could not be simpler, simply click the **3D View** tab from any of the other views. You can switch back to the **Plan View** or **Terrain View**, make some changes to your layout design, and immediately inspect them in 3D by choosing the **3D View** tab.

Note: OpenGL is the 3-D graphics rendering system used by 3-D View. OpenGL is derived from the GL2 graphics library created by Silicon Graphics Inc. and is used in almost all high-end graphics workstations.

3D-View Status Bar

The **3D-VIew** status bar has a number of controls giving quick access to the most used functions. At left is a pane that shows the current azimuth and pitch angle of the 3D Viewer. 0° is facing the layout along the bottom edge, 90° in pitch is looking straight down. Following this pane is a four-way button that lets you quickly move your viewpoint in azimuth (L/R) by clicking the horizontal arrows, and move your viewpoint in altitude/pitch (U/D) by clicking the vertical arrows.

The next pane shows the current offset of the view from the layout center. (0.0, 0.0) means your are looking at the very center of the layout. Following this is another four-way button that lets you pan in x-position (L/R arrows) and y-position (U/D arrows) by clicking the appropriate button region.

The third pane shows the current view magnification. A two-way button is to the right of this pane; clicking the (+) region zooms in while clicking the( )- region zooms out.

At the right end of the bar is the **Options** button. Pressing this brings up the *3D-View Options dialog* allowing you to customize various features of 3D-View.

3D-View Windows
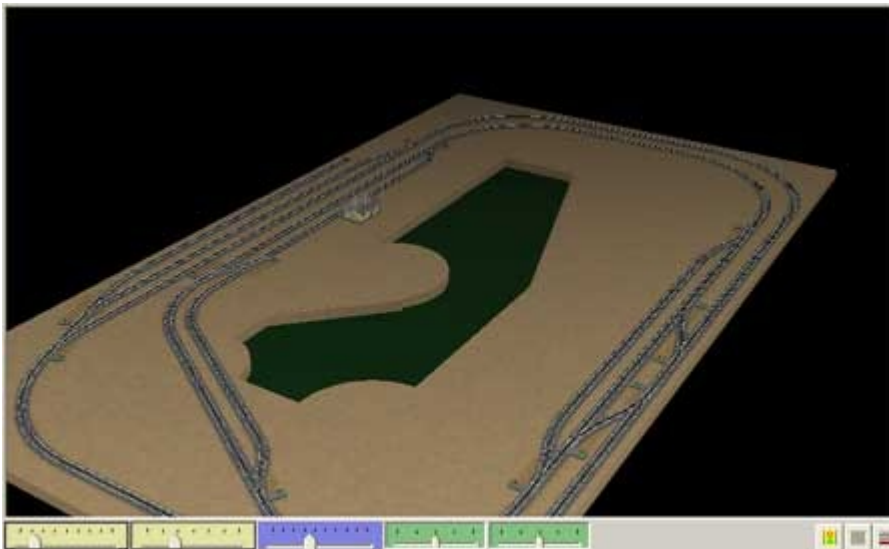
Visualization window: 3D-View's windows are dominated by the 3D visualization window itself.

Below this is a bar area that contains controls for the most common viewing orientation / magnification / view center manipulations. These are located on the left, while there are three buttons on the right that let you start / stop animation and anti-alias the 3D rendering for a smoother appearance.

All of the orientation, magnification, and view point offsets may be adjusted from the status bar as well. For those that need very fine control of the 3D orientation and magnification, these parameters may be adjusted from the *Orientation and Center Point dialog* as well.

Orientation and Viewpoint

The five sliders below the visualization window let you (from L/R) set the azimuth, altitude, magnification, x-offset, and y-offset of the view. You can change these parameters by grabbing the slider with the cursor (press and hold the left-button when you are over the slider) and moving it from side-to-side along its range. **3D-View** dynamically updates the visualization window as you adjust the view, showing your entire layout space, layout bench units, and track as single line, transparent, filled objects. When you release the slider, **3D-View** renders the full scene using the new viewing parameters.

Animation and Smoothing

The three buttons at the lower right (from L/R) let you start an animation sequence, stop an animation sequence, and smooth the visualization by anti-aliasing.

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3D-View Menus

Action menu

Copy view: copies a bitmap image of the current 3D view to the Windows clipboard. From here you can paste it into other documents, or edit using various image editing applications.

Save view: saves a bitmap image of the current 3D view to your Windows file system.

Print view: sends a bitmap image of the current 3D view to **RR-Print** for printing.

View menu

Redraw: forces a manual redraw of the 3D view.   Helps to eliminate screen artifacts that can sometimes occur under the cursor.

Re-render: tells 3D View to re-calculate the entire layout scene and redraw it.

Anti-alias: jitters the point-of-view slightly and averages the resulting renderings to smooth out aliasing features such as jagged edges and Moire effects.

Anti-alias more: a more intense version of the above using 16 scenes. Only use for serious Moire issues.

Show axis: toggles the appearance of center-point coordinate axes.

Show berms: builds up berms under elevated and grade track. Not needed if using layout base units with full terrain rendering.

Perspective: choose this viewing transformation for a 3D rendering that takes into account the distance of the observer from the layout scene. Looks more realistic.

Orthographic: choose this viewing transformation to get more of an engineering drawing appearance. This viewing transformation places the observer an infinitely far distance away.

Set center point: this command lets you use the cursor to choose the point which the view will be centered on.   The center point can also be manipulated using the X-Y slider controls on the 3D View.

Set orientation...:displays the *Orientation and Center Point dialog* where you can set the exact altitude and azimuth angles as well as the precise offset from the layout center for the current view.

Special views

Left front: shows the layout from a point 45° to the left and 35° above horizontal.

Right front: shows the layout from a point 45° to the right and 35° above horizontal.

Center front: shows the layout from a point directly in front and 35° above horizontal.

Profile: shows the layout from directly in front.

Left rear: shows the layout from a point 135° to the left and 35° above horizontal.

Right rear: shows the layout from a point 135° to the right and 35° above horizontal.

Center rear: shows the layout from a point 180° from the front and 35° above horizontal.

Left side: shows the layout from 90° to the left and 35° above horizontal.

Right side: shows the layout from 90° to the right and 35° above horizontal.

Overhead: shows the layout from directly overhead. Like train magazine views.

Animation menu

Load path..: displays the *Animation Path dialog*.   This lets you set up an animation path, or load an existing path from a file.

Start: starts an animation. You must have loaded an animation path in order for this command to be

accessible.

Stop: stops the current animation.

Resume: resumes a stopped animation from the stopping point. This is different from Start which begins the animation at the first path point.

Options menu

Skeleton mode: toggles a basic display mode where only track and bases with no terrain are rendered. Vertical lines extend from the layout bases to all elevated track sections to give a sense of the vertical relief in the layout.

Options: displays the *3D Display Options dialog* where you can adjust many of the parameters 3D View uses in its rendering.

Window menu

Cascade: standard Windows Multiple Document command that arranges all top-level master layout windows in a cascade.

Help menu

Contents: opens the RR-Track Help file to the **3D View** topic.

About RR-View 3D: displays the RR-View 3D information dialog.

Shortcut Menu (invoked by right-clicking in 3D View)

Rotate left: rotates in azimuth a small amount to the left.

Rotate right: rotates in azimuth a small amount to the right.

Rotate up: rotates in altitude a small amount to the up.

Rotate down: rotates in altitude a small amount to the down.

Set Center point: lets you use the cursor to choose the point which the view will be centered on.

Options: displays the *3D Display Options dialog* where you can adjust many of the parameters **3D View** uses in its rendering.

Simulation View
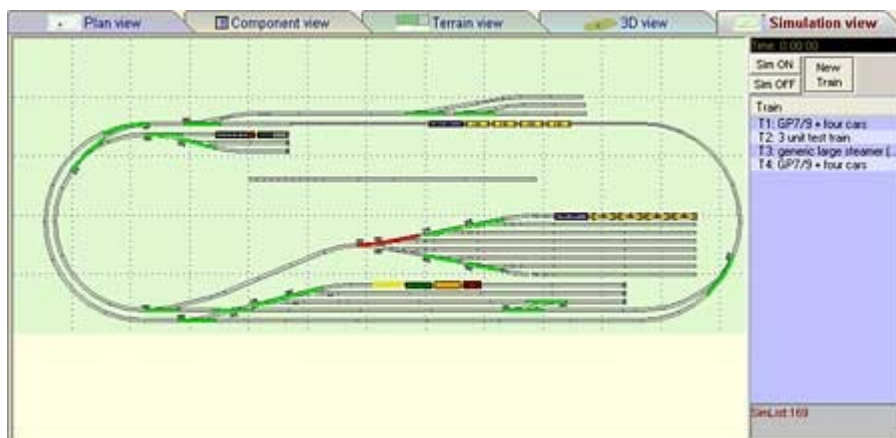
Simulation View is where you can test our your layout design and see if it will in fact allow for the train operation than you envisage. These include, but are not limited to, checking siding lengths, checking clearances in both storage yards and mainlines, switching operations.

Simulation View lets you have as many trains as you like, but only one cab. At any given time a single train is under cab control (moving or stopped); you may switch between trains that are 'live' as you need in order to test your layout design.

Limitations: RR-Track simulator assumes all turnouts are non-derailing, i.e. trains entering on spur tracks automatically cause a switch throw to that spur. Physics is not taken into account on

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If you make any changes to your layout in **Plan View**, all trains are immediately cleared from **Simulation View** since there current track may no longer exist. You can easily re-set them on track by choosing them from the consist list. For more thoughts on problems with legacy layouts, see *Simulation View Operational Notes*.

When you choose the **Simulation View** tab, RR-Track displays a window that looks like that above.   On the left is your layout shown in plan view, similar to the **Plan View** display. At right is a panel that contains controls for starting/stopping the simulation, constructing a new train, and a train list window that lists all of the trains currently in the simulation.

Simulation Status Bar

At the far left is a start/stop button for the train operations simulator. Pressing this starts/stops the main simulation clock. This is identical to pressing the Sim START/STOP buttons located at the upper right of the main Simulation View window.
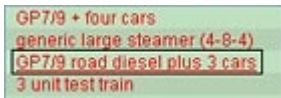
Next is a button that lets you access the consist list. Pressing this pops up a list of pre-built train consists (both stored and local) that you can choose from to quickly add a ready-to-go train to the simulation.

Finally, at right is the **Options** button. Pressing this brings up the *Simulation View Options dialog* allowing you to customize some aspects of Simulation view.

Simulation View Menus

Action menu

New Train: shows the New Train dialog where you put together a consist and then add a new train to the simulation.

Clear All Trains: removes all trains from the simulation. You are asked to verify this.

Reset Sim Clock: resets the simulation clock to 0:00.00.

Print Sim View: invokes **RR-Print** so that you can print a screen display of the current simulation.

Edit Consists: displays the stored consist list so that you can remove items if you need to do so.

Options: displays the *Simulation Options dialog* letting you set various parameters that govern the train operation simulation.

View menu

Re-render All: re-calculates the entire simulation overview, and then re-draws it.

In 2X: zoom in by a factor of 2. This is the standard RR-Track zoom in command, more information on zooming in may be found here.

Out 2X: zoom out by a factor of two.

Home: restore the zoom factor to one and reset the origin so the entire layout simulation becomes visible.

Redraw: re-draws the simulation overview.

Window menu

Cascade: standard Windows MDI command that arranges all master layout windows in a cascade starting at the upper left.

Help menu

> Contents: opens the RR-Track Help file to the Simulation View topic.

> About Simulator: displays the information dialog for RR-Track Layout Simulation.

Shortcut menus (invoked by right-clicking over the simulation)

General shortcut menu

> Zoom in 2X,4X: zoom in by a factor of 2 or 4. This is the standard RR-Track zoom in command, more information on zooming in may be found here.

> Zoom out 2X,4X: zoom out by a factor of 2 or 4.

> Zoom last: return to the previous zoom level and viewport.

> Home: restore the zoom factor to one and reset the origin so the entire layout simulation becomes visible.

> New train: shows the *New Train Builder dialog* where you assemble a consist and then place it on the simulated layout.

> Options: displays the *Simulation Options dialog* letting you set various parameters that govern the train operation simulation.

Train specific shortcut menu

> Make train live: connect this train with a cab so you can move it. If another train is live, you will be asked for confirmation. See train operations for more information.

> Flip train direction: reverses the consist's train unit order, exchanging back for front.

> Store consist: add this consist the list of permanent consists. You will be asked for a name. See train operations for more information.

> Delete train: removes the train from the simulation.

> Train properties: displays the *Train Properties dialog* giving statistical and other information about the train under the cursor.

> TU properties: displays the *Train Unit Properties dialog* giving statistical and other information on the train unit under the cursor.

Module Compiler

The **RR-Track Module Compiler** takes a small layout design and compiles it into a module (an monolithic item that can be treated as a complex piece of track). In this manner you can create modular layouts by arranging and re-arranging these 'custom' track components.

Modules can contain any of the components that make up a standard RR-Track layout: track, accessories, objects.   The Module Compiler lets you choose which track ends are available for joining to other modules, or other track.

Modules take on the track compatibility profile of the first exposed end (i.e. if the first exposed track end is Lionel FasTrack, the entire module is considered a FasTrack compatible module; likewise for Atlas HO). Internal to a module you can mix/match track manufacturers (subject to RR-Track joining rules) as you would a normal layout, but externally all of the exposed track ends must be from the same manufacturer.

RR-Track module files (extension .rrm) are stored in a folder called **modules** under the root folder of your RR-Track My Layouts in your My Documents folder.

Using Module Compiler

First, you have to create a layout which serves as the source for the module. Below is a 4 x 2 layout which we will use as a source for a module. This layout conforms for the most part to NMRA Standard MS-1.0 for modular

layouts in O-scale.
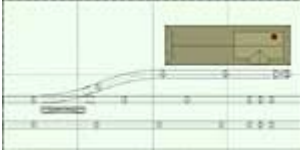
From **Plan View**, pull down the **File** menu and choose **Create Module**. This brings up the **Module Compiler** window. There are three main displays shown by Module Compiler. At upper left is a listing of the available free track ends and their locations. At lower left is a listing of the module components broken down by track sections, accessories, terrain, and other items. Dominating the Module Compiler display, at right, is a schematic plan view of the module. Green circles denote free track ends (those that will be exposed as junctions for other modules and track), and red denotes track ends too far from the edges to be considered usable. Bright green denotes track ends that are open (exposed) and dark green those that are closed (not exposed to the rest of the layout).

Since the spur track terminates with a bumper, there are no unusable track ends (red circles). If you hover the cursor over one of the green circles it will change to indicate you are over a track end (CP). If the cursor is grayed you will not be able to change whether the CP is open/closed (it is not usable). Clicking on usable track ends (those that are some shade of green) toggles them between open and closed (bright green and dark green). As you toggle the open/closed state of usable track ends, the free track end list at the upper left changes to reflect this. Changing the exposure state of free track ends is the only editing you can do in Module Compiler (if you want to change the arrangement of any of the items in the module you must return to Plan View by closing the Module Compiler window).
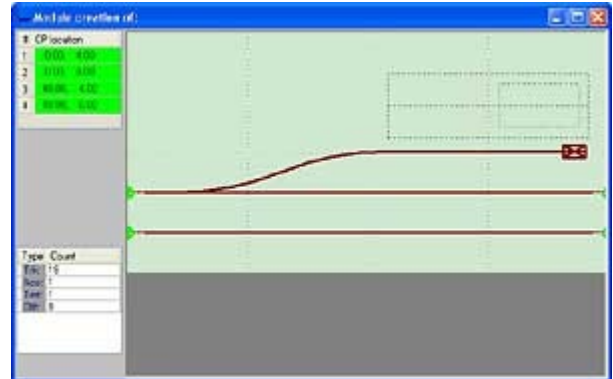
To Create a Module

Pull down the **Action** menu and choose **Build Module**. This brings up the *Module Compiler Save dialog*, like that at left. You need to enter three sets of text: module name, module description, and module author. The module name is the moniker this module goes by on the Module List window and Component View. The description tells you the general makeup of the module, and the author name is obvious. Press Make Module when you are ready to add this to the module list, or Cancel to abort.

When you make a module, Module Compiler immediately adds it to the *Module List*, whose visibility is controlled by selecting the **Show Modules** command on the **View** menu when you are in **Plan View**.

RR-Track then closes the Module Compiler.

All module compiler operations are initiated from **Plan View**.

To Add a Module to the Layout

- Pull down the **View** menu and choose **Show Modules** if the *Module List window* is not visible.

- Choose one of your modules from the *Module List*. RR-Track places that module under the cursor in the active layout window.

- Move the module to where you want it, and click the left-button to snap it in place.   RR-Track positions and/or joins the module just as if it were a track section.

For joining/unjoining purposes, RR-Track treats modules as if they were an ordinary track section. You remove a module from a layout like you would any other item, by deleting it.

To Change the Name of a Module

- Pull down the **View** menu and choose **Show Modules** if the *Module List window* is not visible.

- Right-click on the entry whose description you want to change.

- Choose **Edit Description** from the shortcut menu.

- Type in the new description in the top-most field of the *Edit Module Description dialog*.

- Press the **Change** button to lock-in your new description, or press **Cancel** if you don't want to change anything.

You can view the relevant parameters of any of your modules by right-clicking its name on the *Module List* and choosing **Show Properties**.

To Remove a Module

- Pull down the **View** menu and choose **Show Modules** if the *Module List* window is not visible.

- Right-click on the entry whose description you want to change.

- Choose **Delete Module** from the shortcut menu.

- You will be asked to confirm this, deletes are final.

RR-Track removes the module file from the modules folder and rebuilds the module list. Deleting a module as no effect on modules that are already in layout files. If you need to restore a module after deleting it, you must go back and open the original RR-Track source layout and choose **Create Module** from the **File** menu.

Module Compiler Menus

Action menu:

Build Module: choose this command to take the layout shown in the Module Compiler plan view window and turn it into an RR-Track module. You will be asked to provide a name, description and author.

Close Module Compiler: terminates the Module Compiler and returns to RR-Track.

Window menu:

Cascade: standard Windows Multiple Document Interface command to arrange all top-level windows in a cascade starting at the upper left.

Help menu:

Contents: brings up RR-Track Help opened to the Module Compiler help topic.

Module specs...: brings up a dialog displaying all of the current RR-Track Module definition files with their summary specifications.

About MComp: shows the about dialog for the Module Compiler.

Printing with RR-Print

RR-Print is the coordination point for all printing in RR-Track. Whether you are printing the 2D **Plan View**, a list of components from **Component View**, a screen shot from **3D View** or **Simulation View**, all is funneled through **RR-Print**.

Each view handled by RR-Print can select its own output printer from the list of installed printers in Windows. The display in RR-Print, regardless of view, is an accurate preview of your layout's appearance on the printing device you choose*.

Menus for RR-Print

Print Selected Pages: spools the selected pages to the current printer. Same as pressing the button

Print From Setup: displays the *Printers Setup & Selection dialog*. Here you can choose a different

printer and change the page selection.

Printer Setup: displays the *Printer Setup dialog*. Here you can change print settings and/or printers, but you cannot print. Same as pressing the   button.

Page Setup: displays the *Page Setup dialog*. This lets you set margins and position the page headers.

Close RR-Print: dismisses the RR-Print utility and returns you to RR-Track.

About: displays the information dialog for RR-Print.

Plan View Printing

When you choose to print one of your views, **RR-Print** starts and presents you with a view like one of these.

First is the **RR-Print utility for the 2D Plan View.** This is where you will do most of your printing, and there are options to specify the pages to print, the page offset from the layout origin, the page margins,.the layout scale and whether to use fixed or automatic scaling, and a set of options which control the appearance of the overlay
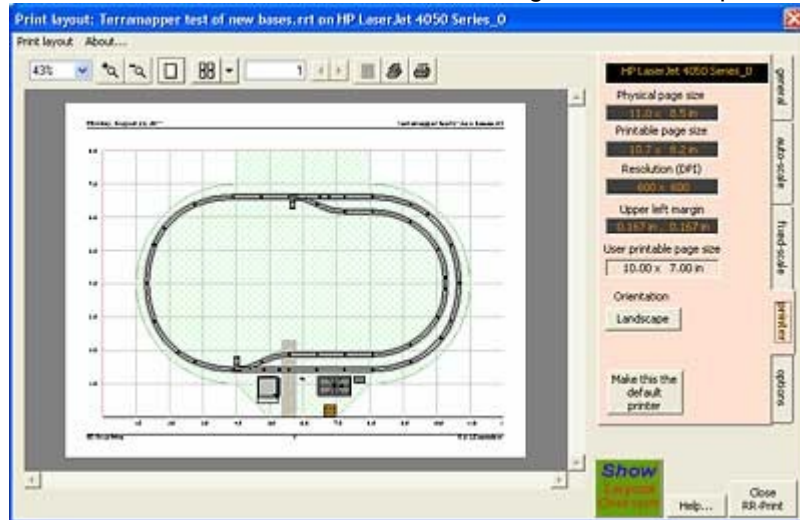
coordinate grids, item labels, track features, terrain features, etc.

On the left is a *print preview window* showing how your layout will look on the actual printer page in its current orientation and scale. At upper right is a collection of five tabs that both display current print settings and let you access features and options of RR-Print. These tabs are divided up into general, auto-scale, fixed scale, printer, and options. There is a large button at lower right which lets you toggle between showing a *page printing preview* (how your layout pages appear on the selected printer) and a *page layout overview* (how your layout pages tile your actual layout design). There is a **Help** button to take you to the RR-Print help topic and a **Close RR-Print** button to take you back to your master layout window.

Notes: RR-Print will spool a maximum of **256** pages to your printer. This limits the smallest scale factor that can be attained. Any scale factors (such as 1:1) that will produce more than 256 pages are grayed out and not accessible. You will either need to use a larger page size, or not print at that small a scale.

Page Preview Window
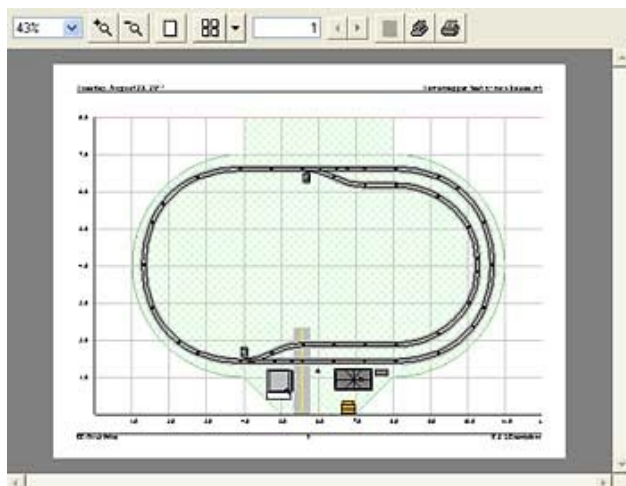
The *Page Preview window* consists of two distinct regions: a set of toolbar buttons, drop down lists, and page list controls along the top, and a window that displays how your RR-Track layout will print on the current printer.

Using either the mouse pointer or the controls on the toolbar, you can zoom into any location on the page preview up to 1000 per cent. All of the toolbar controls have tooltips that will momentarily display the use of a control if you hover the mouse pointer over it.

Printing Toolbar

The **Page Preview toolbar** consists of a series of

controls that let you change the zoom, number of pages displayed, and quickly access printer setup and printing.

From left to right, the first three controls let you set the zoom level of the page preview. You can choose a zoom factor from the drop-down menu at left, or use the + and - buttons to zoom in and out. If you position the cursor over the preview, left clicks zoom in and right clicks zoom out.

The function of the individual buttons is discussed in detail below.

Pressing the **single page button** toggles the page preview to show only a single page, setting the zoom accordingly.

Pressing the **multiple pages button** switches the preview to show more than one page. Press the drop-down to up to 12 pages at once, in a variety of formats (1x2, 2x2, 2x3, etc.)

You can set the current page by either typing in a page number or using the **left/right spin buttons** to navigate to the page you want. You can also choose the current page by scrolling through them using the left/right arrow keys on the keyboard.

Pressing the **printer setup button** invokes the Printer Setup dialog for the current printer. Here you can change things like the page orientation, printing quality, and change printers as well (if you have more than one available printer).

Pressing the print **current page button** immediately spools the current page to the current printer. This is the fastest way to get a print of your layout.

If you set a scale that causes your layout to span more than one full printer page, you can re-configure the page preview to show more than one page, up to a maximum of 12. At right is a preview of four pages with the current page highlighted. You can change the current page by either typing in a new value, using the page selection spin buttons, or using the left/right arrow keys on the keyboard. The highlighted page is the one that will print if you press the **print current page button**. You can zoom in on the current page by clicking on it with the left mouse button (right clicking zooms out).

Page Layout Window

The page layout window shows an overview of how the current printer's pages at the current scale and orientation will tile your layout.

Below the page layout window are a set of **spin controls** and readouts which let you position the printer page origin at an arbitrary location. This is very useful for repositioning the tiling pattern to avoid awkward seams.

Press the L/R spin buttons to change the horizontal (x) and vertical (y) offsets, press the **Reset Offset button** to return the printing offsets to zero. RR-Print updates the page layout window dynamically as you change the offsets to reflect the new page locations.

Print Settings Tabs

All of the Plan View printing setting are contained in the five tabs located on the right side of the Plan View Print Preview.

General Tab: the general tab is informational only and displays current parameters relevant to the printing process. These include the printable page area, how this related to the actual layout at the current scale, the x-y offset (relative to the layout coordinates) of the printer page's lower left corner, and then a summary of layout statistics. No print settings are changed in this tab.

Auto-scale tab: the auto-scale tab is pretty simple. There are two buttons, one doubles the scale each time you press it (like zooming in by 2X) and the other halves the scale each time your press is (like zooming out by 2X). In both cases the scale is determined automatically by matching the layout's horizontal extent to the printable page width and the layout's vertical extent to the printable page height (these can be swapped if you toggle between portrait and landscape orientations). Any change you make in scale is reflected immediately in the print preview or layout preview window. As you double or halve the scale, RR-Print displays the new scale and the total number of pages required to tile your layout.

> **Note**: It is important to remember that if you want to make maximal use of your printer page, you should match the longest side of the page to your layout's longest extent.

Fixed-scale tab: the fixed scale tab lets your choose from a number of pre-defined scales that determine the physical relationship between distances on your layout and those on the printer page, rather than letting RR-Print determine these for you.

There are nine total scales to choose from:

- 1" = 20ft (1:240)
- 1" = 10ft (1:120)
- 3/16" = 1ft (1:64)
- 1/4" = 1ft (1:48)
- 1/2" = 1ft (1:24)
- 3/4" = 1ft (1:16)
- 1" = 12" (1:12)
- 1" = 6" (1:6)
- 1" = 1" (1:1)
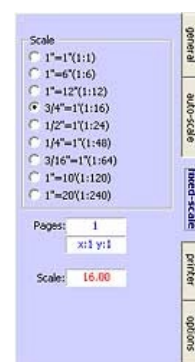
As for the auto-scale tab, changes you make on the fixed-scale tab are reflected immediately in either the page preview or page layout windows. For each fixed scale you choose, RR-Print shows the total number of printer pages required to tile your layout, and the number in each row and column.

Of the fixed scales, the two that are the most useful for transferring measurements on your print to those on the physical layout are 1:12 and 1:16 (architectural scale). If you use the architectural scale of 1:16, then measurements made using the 16s scale of a standard engineering ruler translate directly to inches.

Printer tab: the printer tab is both informational and provides access to one of the most used printer settings, the page orientation.

RR-Print shows the name of the current printer, the physical paper size (8.5 x 11 say), the printable page size (the actual area the printer can use), the printer resolution in DPI (dots per inch), and offset of the upper left margin from the physical page size (this should be zero for a PDF printer as shown), and the user printable page size (this is the accessible printing area taking into account the top/bottom left/right margins which may be adjusted from page setup.

There is a button for quickly toggling between portrait (vertical) and landscape (horizontal) page orientations. There is also a button that lets you make the current printer the default printer for RR-Print.

Any changes made to the page orientation are immediately reflected in the page preview or page layout windows.

Options tab: the options tab is where you select which printing feature are or are not present. Unlike the previous tabs, changes made here are not updated in the page preview window (or the actual print) until you

press the Apply Options button. From top to bottom these are:

Show

    Coordinates: you can turn on/off both the coarse (large scale grid) and a secondary (small scale grid). The default is to show the coarse grid and hide the secondary grid. Both grid sizes are calculated automatically by RR-Print depending the the longest layout dimension on the printer page (i.e. the smaller the scale, the smaller the grids).

    Track junctions: toggles whether you want track joining symbols displayed or not.

    Item labels: toggles whether you want to show item labels and where they should appear (above, below, or centered).

    Terrain features: toggles whether to show terrain items (layout bench units, contours) or not.

    Track in color: toggles whether track should be drawn using the colors you have set (the default), or only in black.

    Units: lets you choose between English (feet/inches) and Metric units, independent of your layout settings.
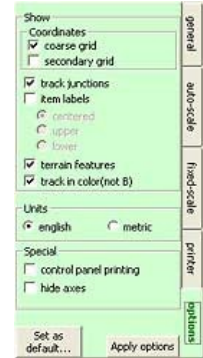
Special

    Control Panel printing: in this mode, all track is drawn using the center-line only with a single bold line. If Track in color is checked, the track colors will be used. No accessories or objects are drawn, but coordinate grid overlays are unless turned off.

    Hide axes: toggles the appearance of the outside X-Y axes and their labels.

Your must press the **Apply Options** button in order to make any of these changes appear on the page preview.

Component View Printing

A typical displace for RR-Print printing a **Component View** appears below. RR-Print shows exactly the item list that you had open when you chose to print. If you want certain, or all, items expanded, then you need to do that before choosing to print (expansion of items is only available in tab component, or layer views).

Printing Toolbar

The **Page Preview toolbar** consists of a series of controls that let you change the zoom, number of pages displayed, and quickly access printer setup and printing.
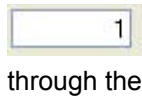
From left to right, the first three controls let you set the zoom level of the page preview. You can choose a zoom factor from the drop-down menu at left, or use the + and - buttons to zoom in and out. If you position the cursor over the preview, left clicks zoom in and right clicks zoom out.

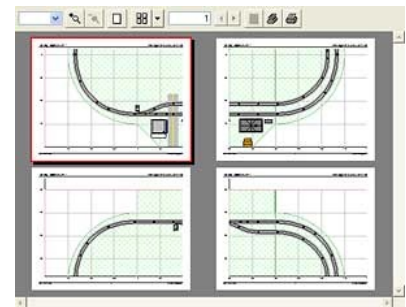The function of the individual buttons is discussed in detail below.

Pressing the **single page button** toggles the page preview to show only a single page, setting the zoom accordingly.

Pressing the **multiple pages button** switches the preview to show more than one page.   Press the drop-down to up to 12 pages at once, in a variety of formats (1x2, 2x2, 2x3, etc.)

You can set the current page by either typing in a page number or using the **left/right spin buttons** to navigate to the page you want. You can also choose the current page by scrolling

through them using the left/right arrow keys on the keyboard.

Pressing the **printer setup button** invokes the Printer Setup dialog for the current printer. Here you can change things like the page orientation, printing quality, and change printers as well (if you have more than one available printer).

Pressing the print **current page button** immediately spools the current page to the current printer. This is the fastest way to get a print of your layout.
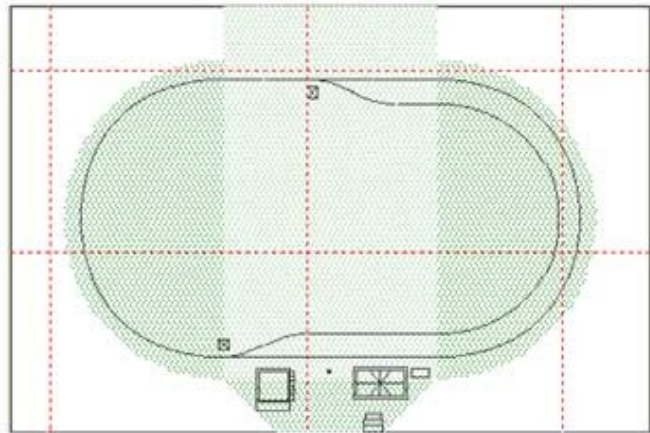
3D View Printing

A typical display for RR-Print printing a 3D View appears at left. RR-Print shows a screen capture (bitmap) of your 3D rendering when you chose to print. If you want a different orientation or magnification, you need to close RR-Print and return the **3D View** and set those conditions.

The printing toolbar is identical to that for *Plan View printing* and *Component View printing*, see the previous explanation for these.
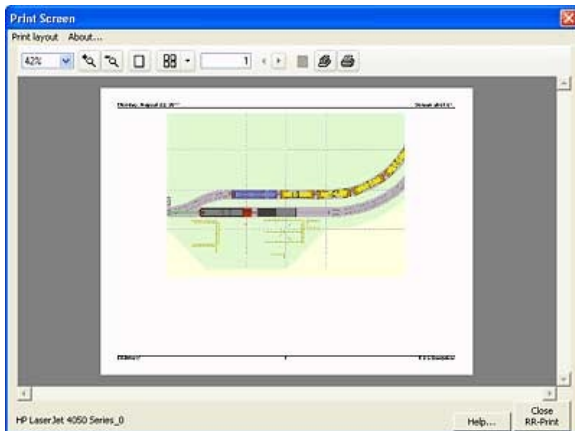
Simulation View Printing

A typical display for RR-Print printing a **Simulation View** appears below. RR-Print shows a screen capture (bitmap) of your layout simulation when you chose to print. If you want a different zoom or train arrangement, you need to close RR-Print and return the **Simulation View** and set those conditions.

The printing toolbar is identical to that for *Plan View printing* and *Component View printing*, see the previous explanation for these.

Essays on Standard RR-Track Operations

These are descriptions of some of the common things you do with RR-Track while working on a layout design. There are more topics than are contained here in the RR-Track v5 Help system that you access using the Help menu.

Selecting Items

Before you can do anything useful with track sections, accessories, or objects you have already placed in the layout, they must first be selected. Items must be selected before they may be moved, copied, cut, deleted, rotated, joined, aligned, closed, and relaxed.

Track selection is an action performed almost entirely with the mouse cursor (the exceptions are the **Select** commands in the **Edit** menu), but is modified by the enabling/disabling of the *extended selection mode* (*Selections Include Joints*, *Selections Include Blocks*, *Selections Include Grades*) on the **Options** menu and the status bar.

Extended selections occur when you double-click the left mouse button instead of single clicking. The current extended selection mode is denoted by a check mark in front of it on the **Options** menu. When the extended selection mode is set to Selections Include Joints, then all of the track physically joined to the track under the cursor will be highlighted when you make an extended selection. When the extended selection mode is set to Selections Include Blocks, then all of the track sections electrically connected to the section under the cursor are highlighted. This mode is very useful for checking the arrangement of electrical blocks on your layout. When the extended selection mode is set to Selections Include Grades, all of the track that is either on the same grade or at the same elevation as the track under the cursor is highlighted. This will let you quickly choose elevated track, and is helpful for some of the commands found under the **Grades** menu.
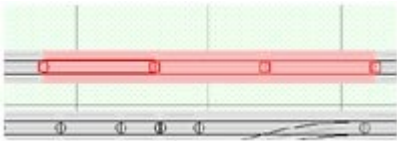
Among track in the selected track list, the first track section is called the *lead selection*. This section is highlighted with larger control points than the secondary selections and bold lines. The graphic above illustrates this. Note that the leftmost section has the large, filled squares denoting its control points. Circles denote points that are joined, while hollow squares are unused control points. The lead selection is the track section about which rotations occur, moves are referenced to, and which determines who is moved to whom when aligning or joining track and there is more than one possibility for movement. The lead selection is drawn with bold lines, while the other track sections are drawn using a single width pen.

Selecting Items

You can select track and any other item in a layout in two distinctly different manners using the mouse pointer. The first way is to draw, or drag out a selection box around the items you want to select. The second lets you select each object in turn, and is slower but more precise.

Selecting with a selection box

- With the Windows arrow cursor showing (i.e. you aren't in the middle of some other procedure), position the cursor in an area where there are no items, and you wish to start the selection rectangle.

- Depress and hold the left mouse button. The cursor changes to   indicating that you can now begin to sweep out a selection rectangle.

- While continuing to hold down the left mouse button, sweep out a rectangle containing the objects you wish to select. It will be drawn as you move the cursor using dashed blue lines. The items you want to select must be located entirely within the selection rectangle for RR-Track to choose them (actually their bounding boxes have to be located in the selection rectangle and this can be somewhat bigger than the track sections, especially for sharp curves and turnouts).

- When you are satisfied with the selection rectangle you have drawn, release the left mouse button. All track and other objects within this region are placed into the select list and highlighted. The cursor

returns to the Windows arrow.

Using this method, the lead selection will be the first track section found in the item list that is in the selection rectangle (RR-Track scans the item list from back to front, that is most recently added to least recently added). Be aware that using the selection box does not select track that is not in the box, regardless of the setting of the extended selection mode, i.e. there are no extended selections when using a selection box. You can further fine tune the selections by individually selecting/deselecting items using the SHIFT-left mouse combination as described below.

Selecting items with the mouse pointer

- With the Windows arrow cursor showing (i.e. you aren't in the middle of some other procedure), position the cursor over the track section or object you wish to select and single-click the left mouse button. RR-Track highlights the item in red.

- To add objects or track sections to the select list, position the cursor in turn over the next objects and, while holding down the SHIFT-key, single-click the left mouse button. The new object is highlighted. If this item was already selected (highlighted) it will be deselected instead.

- Repeat step 2 until you have selected all the track or objects you need.

> **Hint**: you may both select and move at item in one operation by placing the cursor over that item, then depress and hold down the left mouse button for 1/4 to 1/2 second. RR-Track will assume you want to move the object(s) under the cursor, highlight them and then change to the cursor . In this manner you do not need two separate mouse clicks to initiate moving an object
>
> **Note**: you can use the left mouse click combined with the SHIFT-key to fine-tune a group of selections made using a selection rectangle. Just choose the items initially by sweeping out a selection rectangle with the mouse pointer, and then add or subtract additional items as needed to pare the select list to just the items you need..

Making Extended Selections

To make an extended selection, you <u>double-click the left mouse button</u> when over the first track section you want to select. Depending on which extended selection mode is currently set (Joints, Blocks, or Grades), RR-Track will choose the track section under the cursor and all of the others joined to it, modified by the extended selection mode (the track section under the mouse pointer becomes the lead selection). If more than one track section is currently highlighted, and the left mouse button is double-clicked, RR-Track collapses the selected track to only that track section under the cursor, regardless of whether the multiple selections occurred because of a previous double-click or not. In other words, to return multiple selections to only the track under the pointer you can double-click when over this section rather than manually deselecting track items using the SHIFT-left mouse combination. Identical to single-clicking the left mouse to make a selection, double-clicking and holding down the left mouse button after the second click will cause RR-Track to change to the   cursor after 1/4 to 1/2 second (this delay time is user settable with the *Global Options dialog*). In this manner, a single double-click allows you to select a chunk of track and then move it to a new location.

Changing the Lead Selection

In order to change the lead selection of track that has already been selected, position the cursor over the track section you wish to become the lead selection and single-click the left mouse button. In this manner if you need to change the center of rotation, you can do so without having the de-select and re-select items..

De-selecting Items

To deselect items, position the mouse pointer over the already selected item (it will change to indicate you are over something) and, while holding down the SHIFT-key, single-click the left mouse button. The item is removed from the select list, and highlights disappear. To deselect all of the items, simply move the cursor to an empty area of the layout and single-click the left mouse button. You may also de-select all items by pulling down the **Edit** menu and choosing **De-select All**.

Selecting using the Edit Menu

There are three Select commands under the **Edit** menu which can be used to select large groups of items without using the mouse pointer. These are **Select All**, **Select All In Layer**, and **Select All Visible**. Items selected using these commands can be manipulates just as if you had individually selected them using the mouse pointer.

Select All: this command selects all of the items in a layout, regardless of visibility or layer, except terrain objects in the *Terrain Layer*. If you want to remove everything and start over, this is a good way to start.

Select All In Layer: this command lets you select all of the items in any layer except the *Terrain Layer*. RR-Track shows the *Select Layer dialog* when you choose this command. Use this dialog to choose the layer, and then press **OK**. All of the items in the layer are selected and highlighted.

Select All Visible. This command selects all of the items in the layout that are in layers that are either working, active, or inactive (see working with layers for more information on layers). Another good way to clear out a lot of stuff at once.

Selecting Using the Display List dialog

You can also select and highlight items singly (for removal from the layout) using the *Select List dialog*. You can bring this dialog up by choosing the **Show Display List** command under the **View** menu.

Changing the Zoom and Moving the View

There are four zoom commands on the View menu which let you change the magnification, or zoom factor on your layout plan view. These are Zoom In 2X, Zoom Out 2X, Zoom in 4X and Zoom Out 4X. You can also change both the zoom factor and view location by selecting the Home View, Fit in Window, and Last View commands.

To Zoom in by 2 or 4

- Pull down the **View** menu and choose **Zoom in 2X** (or **4X** if you want to move in further). The cursor changes to a square with four inward point arrows, and a zoom box representing a 2x or 4x magnification surrounds the cursor.

- Move the cursor around the layout until you are satisfied with the location of the zoom box.

- Press the left mouse button. The portion of the track layout inside the zoom box is magnified until it fills the screen, representing a zoom in of 2 or 4 depending on whether you chose 2X or 4X. The zoom factor in the status window updates reflecting the new magnification. The cursor returns the standard Windows arrow.

You can zoom in to a maximum magnification of 64X. You may also access the zoom commands from a shortcut menu.

To Zoom out by 2 or 4

- Pull down the **View** menu and choose **Zoom Out 2X** (or **4X** if you really want to move out). The center of the old view becomes the center of the new view, with the magnification reduced by 2 or 4 respectively.

To View the Entire Layout

Pull down the **View** menu and choose **Home View** or **Fit in Window**. These commands are similar, but have different actions if the layout window has been resized at any time. **Home View** goes to a zoom of 1 and sets up upper left corner of the layout to the upper left corner of the window. **Fit in Window** does the same, but also adjusts the scale to make maximal use of the layout window area.

Panning and Scrolling Around the Layout

You may move the current view around your layout using either the mouse, the keyboard, or the *Overview*

WIndow. When using the keyboard, the arrow keys (usually found in a cluster near the lower right) are used by RR-Track to get the panning or scrolling direction.

To pan or scroll using the keyboard:

- Without pressing any other keys, press the left or right arrow keys to pan left and right, and press the up or down arrow keys to move up or down. Each time you press a key, RR-Track moves 10 per cent of the layout extent in that direction

- When you are located where you wish to be, stopping pressing the arrow keys.

RR-Track will not let you pan or scroll more than 25 per cent of the layouts extent over the edge in any direction. For more information on this and other keyboard shortcuts, see keyboard shortcuts.

To pan or scroll using the mouse cursor:

- Move the cursor to the layout edge in the direction you wish to pan or scroll (i.e. move to the left edge to go left, top edge to go up, etc.)

- When you near the edge, the cursor changes to either Scroll or Pan with an arrow appropriate for that edge.

- Left click the mouse. RR-Track pans/scrolls the layout view 10 per cent of the layout extent in the respective direction. You cannot scroll or pan more than 25 per cent of the layout window extent beyond the edge of the layout.

- Repeat step 3 as many times as required.

To move the view using the Overview Window

- Move the cursor to the *Overview Window*.

- Position it over the red-bordered rectangle (there won't be a rectangle if you are zoomed out to view then entire layout). The cursor changes to a + when you are over the current view (as denoted by the rectangle).

- Depress the left-mouse button. The cursor changes to a hand. While holding the left-button down, drag the rectangle to where you want the view.

- Release the left-button. RR-Track draws the **Plan View** in the new location.

You may also pan/scroll the view when the cursor is over the Plan View by using the mouse wheel. Rolling the wheel causes the view to move up or down, rolling the wheel while holding the SHIFT key down causes the view to pan left/right.

Working with Grades

RR-Track allows you to change the elevation (height) of a section or sections of track so you can create layout designs using track locations that vary up and down as well as horizontally..

RR-Track distinguishes track that is not at zero height (flat on the table or ground) as one of two types; elevated track or grade track. *Elevated track* are those sections, which are contiguous, that are all at the same height. *Grade track* are those sections, on one or more sides of an elevated track, that have both non-zero height and a non-zero slope (i.e. the track sections one either side are at different elevations). Grade track is denoted by a small arrow symbol at the center which points in the direction of increasing elevation.

You can use two commands, both under the **Grades** menu, to change the height of track; **Set Track Height** or **Zero Track Height**. Choose **Set Track Height** to set a non-zero height (either above or below the the terrain base) or **Zero Track Height** to return the selected track sections to zero, i.e. flat on the terrain base.

Simple things first:

To set the track height to zero:

- <u>Select</u> the track whose height you wish to return to zero.

- Pull down the **Grades** menu and choose **Zero Track Height**. All of the selected track's height is set to zero. Any grades connected to the newly zeroed track are automatically recalculated.

To set the track to a non-zero height:

- <u>Select</u> the track whose height you want to set.

- Pull down the **Grades** menu and choose **Set Track Height**. RR-Track shows the *Set Track Height dialog*; use this dialog to designate the height you want to use. Press **OK** to set the new height, or **Cancel** to revert to the old height.

  Hint: you can choose all of the track at a given height or on a given grade by setting the extended selecting mode to Selections Include Grades and double-clicking with the left mouse button when over one of the track sections at that elevation.

You can also create track on grades. *Grade track* connects track at one elevation with track at another. Each track section on a grade is at a different which RR-Track interpolates to smoothly take the track height from that on one side to that on the other side. RR-Track does not restrict the steepness of the grade you create, that is for you to decide (see a word on grades for a discussion on the tradeoffs with grades). In order to create a grade, there must be track connected to each end of the prospective grade track that are at different heights, like that shown above.

Here we have 9 sections of track that connect sections of straight track at zero height at the right to a single section at a height of 5 inches on the left. <u>We would not be able to turn this into a grade if we had also selected either of the end track sections</u>. You set a grade by selecting the track you want to use on the slope, and then choosing the **Create Grade** command.

To add to a grade

- <u>Select</u> all of the track on the grade you want to increase in length.

- Using the SHIFT key in conjunction with the left mouse button, select additional track sections on one or both sides to add to the existing grade (all of the sections must be contiguous);

- Pull down the **Grades** menu and choose **Create Grade**. RR-Track takes the old grade, adds the new sections to it, and recalculates all of the intermediate heights.

To subtract from a grade:

- <u>Select</u> the track section(s) at either end of the grade that you want to remove from the grade.

- Pull down the **Grades** menu and choose **Set Track Height**. RR-Track shows the *Set Track Height dialog*. Using this dialog, set the new track height, usually to that of the track section that terminates the grade. Press **Set Height**. RR-Track sets the selected track to the new height, and immediately recalculates any and all of the connecting grades.

Below shows the grade example rendered in 3D. Note the flat lead-in straight sections on both ends. With a 5.0 inch height change, this grade is 5.4 per cent, steep by anyone's standards.

65
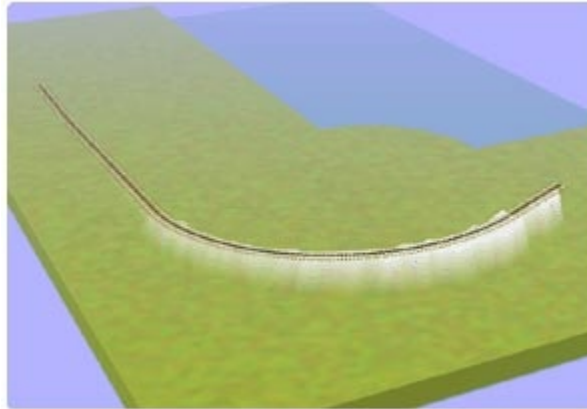
A Word on Grades

Almost everyone who envisions a dream layout has a mental image of trains cruising around sweeping curves, up and down hills, intertwining and crossing over each other. The reality of creating this kind of a layout is daunting; in order for the trains to look good and run well curves should be large and grades should not be steep. Both of these requirements translate into a lot of real estate. Consider that real railroads view a one per cent grade as steep, and that a standard Lionel trestle set is about a 7.5 per cent grade. When a train goes up a grade, it must do extra work as it has to raise itself up against the earth's gravity; this means a greater load on the locomotive and a reduction in the maximum train length. If you don't think that a 7.5 per cent grade sounds steep (this means a one inch rise for every 13.33 inches traveled) try taking a bicycle up a 7.5 per cent grade --- you will quickly be convinced of the work required (watch the Tour de France when they are in the Alps). There is also more strain on the couplers between cars, especially on the coupler between the locomotive and the first revenue car since all of the load of the cars on the grade is on this coupler --- which can lead to nasty uncouplings during operation..

> **Note**: Grades are expressed in terms of a per cent. Mathematically, this is the tangent of the grade angle multiplied by 100. In more practical terms, the grade percentage expresses the amount the track rises up (or sinks down) in a given distance. For example, a 10 per cent grade (way too steep) rises 1 inch for every 10 inches of horizontal run. A one per cent grade rises 1 inch for every 100 inches (8 and 1/3 feet) of horizontal run. O-gauge trains require around a 6 inch clearance to pass over each other (5.5 according to the NMRA) --- this means using a one per cent grade you would need a horizontal run of 600 inches (50 feet) to pass over another O-gauge train. For HO these dimensions may be halved giving a 25 foot run (remember to include track support structure when calculating the height change you need). To further examine the interplay between grade length, grade rise, and per cent grade, pull down the **Grades** menu and choose **Calculator**.

Train layouts may be roughly divided into two types: a *toy train layout* (colorful operating accessories, no real concern for scale sizes), and a *model railroad* (more or less realistic train operation, concern for scale sizes).

Toy Train Layouts: If you are designing a toy train layout, then you may not be concerned with the steep grade due to a standardized trestle set. Typical grades can be in the four to five per cent range. You have to be careful on the throttle when going up (and more importantly coming down since electric trains have no brakes) and the number of cars in your consist will be limited by the steep grades (the steeper the grade, the more traction your locomotive needs to pull the train up the hill). Toy train layouts usually operate trains with short consists (three or four cars).

Model Railroads: If you are designing a model railroad you need to restrict yourself to grades of 2 or at most, 2.5, per cent. This is double what a real railroad uses, but is still not too steep for the purpose of realism in both looks and operation. The primary impact of this maximum grade restriction on layout design is the amount of space that must be allocated for the grade track. A 2 per cent grade means the track must have a horizontal run of 50 inches for each 1 inch rise in height. For a 6 inch height change (for O-gauge) you must have a run of 300 inches (25 feet) in order to keep the grade at 2 per cent. In some cases you can reduce this by having the lower

track go down while the upper track goes up splitting the height change between them.

When setting aside real estate for grade track, you can utilize curves at layout corners in order to conserve space. Bear in mind that trains on curves, especially long wheel base steamers, encounter extra friction between the wheels and the rails which increases the load on the locomotive (you can observe this yourself by setting a constant voltage on a locomotive and watching it slow down when going through sharp curves and speeding up on straight sections). Both the increased friction in the curve and the work of pulling the train up the grade add together to increase the load on the locomotive. For O-gauge this means you should try to restrict curves on a grade to O72 or larger (curves are measured by diameter in O-gauge, not radius) and for HO R-18 or larger.

From an operational standpoint, having a lot of grades (or having a lot of sharp curves) means you have to be on the throttle to keep the train moving at a steady pace (this may be somewhat mitigated with the newer locomotives with speed control electronics, but is an issue for all older trains, some of which are not too old). Where possible, a simpler solution is to have more than one level of track on independent loops. In this manner you can get the visual interaction of the trains without the headaches of deciding where to stash the grades and how to regulate the operation.

Measuring Distances

Often it is useful and even crucial to know the distances between objects and track sections on the layout in order to correctly space switch yards, unloading docks, or find out what length of track you need to fill a gap. Distances are simply measured using the ruler function in RR-Track.

There are two distinct classes of measuring distances (or using the ruler function) in RR-Track: measuring between arbitrary points, or measuring between either track ends or object edit points. Measuring between track ends is further subdivided into resolving the distances in the layout coordinate system (x-y values correspond to the horizontal/vertical directions on the screen) or resolved in the source track end coordinate system (x values are along a *tangent line* starting at the track end and y-value correspond to departures above or below this tangent line).

There are also two different methods for carrying out the process of designating the beginning and ending points. The first method makes use of ruler commands found on the *general purpose shortcut menu* and the left-mouse button. The second method makes use of the right-mouse button and the keyboard. Either may be used; the second method is included for compatibility purposes with previous releases of RR-Track.

Measuring Between Arbitrary Points

Left-mouse method:

- Right click over nothing bringing up the *general purpose shortcut menu*.

- Choose **Measure Gen**. The cursor changes to the ruler cursor.

- Place the ruler hotspot where you want start the measurement and depress and hold the left-mouse button.

- While holding the left-mouse button down, drag the ruler hotspot to where you want to terminate the measurement. RR-Track draws a line showing the distance measured.

- Release the left-mouse button. RR-Track displays the measurement results in the upper right corner of the layout window. Click **Done** when you are finished reviewing them.

Right-mouse method:

- With the cursor showing the Windows arrow (i.e. you aren't in the middle of some other operation such as drawing an object), place the tip of the arrow where you wish to anchor one end of the distance line.

- While holding down the SHIFT-key, depress and hold the right mouse button. The cursor changes to the ruler cursor.

- Still holding the SHIFT and right mouse buttons, drag the ruler hotspot to where you wish to end the

measurement. RR-Track draws a line showing the distance that will be measured.

- Release the SHIFT-key and right mouse button. RR-Track displays the measurement results in the upper right corner of the layout window. Click **Done** when you are finished reviewing them.

In either case, the measurement results show the X-Y components and the total distance, as well as the angle with respect to the layout coordinate system. If the current track library has capability for cutting or bending track, these measurements will be passed to it if you choose one of the further options for creating custom track sections. Otherwise, press Done to end the measurement display.

Measuring Between Track Ends

Left-mouse method:

- Right click over nothing bringing up the general purpose shortcut menu.

- Choose **Measure Track**. The cursor changes to the ruler cursor. If you want distances resolved in the track end coordinate system, choose **Measure Trk-Crd** instead.

- Place the ruler hotspot where you want start the measurement and depress and hold the left-mouse button.

- While holding the left-mouse button down, drag the ruler hotspot to where you want to terminate the measurement. RR-Track draws a line showing the distance measured.

- Release the left-mouse button. RR-Track displays the measurement results in the upper right corner of the layout window. Click **Done** when you are finished reviewing them.

Right-mouse method:

- With the cursor showing the Windows arrow (i.e. you aren't in the middle of some other operation such as drawing an object), place the tip of the arrow where you wish to anchor one end of the distance line.

- While holding down the ALT-key, depress and hold the right mouse button. The cursor changes to the ruler cursor.

- Still holding the ALT and right mouse buttons, drag the ruler hotspot to where you wish to end the measurement. RR-Track draws a line showing the distance that will be measured.

- Release the right-mouse button and then the ALT-key. RR-Track displays the measurement results in the upper right corner of the layout window. Click **Done** when you are finished reviewing them.

In both of these cases, the measurements are resolved in the coordinates of the layout.   Much of the time, when measuring between track ends, it is more useful to have the distances resolved in terms of the track end tangent. You can do this for the right-mouse method by holding down the CONTROL key rather than the ALT key. For the left-mouse method, just choose **Measure Trk-Crd** from the shortcut menu.

When you snap a measurement between track ends, RR-Track checks to see if the track ends form a gap (i.e. they are not connected to each other through existing track). If this is the case, and the working track library contains support for *TrackWizard*, the measurement results contains additional buttons that tell TrackWizard how you would like it to try and fill the gap. For more information see the underlined essay on using TrackWizard.

Measuring Between Objects

Left-mouse method (only supported method)

- Right-click over nothing to bring up the general purpose shortcut menu.

- Choose **Measure Obj**. The cursor changes to the ruler cursor.

- Place the ruler hotspot where you want start the measurement and depress and hold the left-mouse button. RR-Track snaps the start point to the nearest object edit point, regardless of its location.

- While holding the left-mouse button down, drag the ruler hotspot to where you want to terminate the measurement.

- Release the left mouse button. RR-Track snaps the measure end point to the nearest object point, draws a line showing the distance measured and displays the measurement results in the upper right corner of the layout window. Click **Done** when our are finished reviewing the measurement results.

Measuring between objects is functionally the same as measuring between track ends, the difference is the snap points are the nearest object *edit handles* rather than track junctions.

Using TrackWizard

RR-Track has wizards in <u>libraries that support flexible or cut track</u> that can automatically fill in gaps in track plans for you.

Sometimes it is difficult to see how to join up two track ends, and you get involved with a lot of trial and error cutting and bending of track. RR-Track has 'wizards' in many of the track libraries which can automate this process, and at least provide you with a starting basis for track selection. *TrackWizard* may be configured on a library-by-library basis, see track wizard setup for more information.

Using the track wizards in RR-Track is very simple, all you have to do is make a measurement between the track ends you want to join up. Below we have a typical situation, two track ends that we need to join with some combination of straight and curved track.
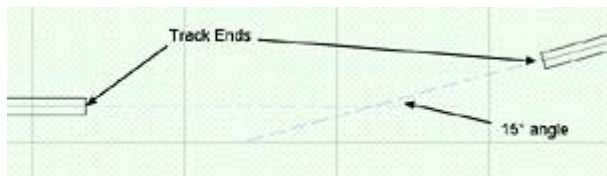
We are using Ross Custom Switches O-gauge track for our example, but we could use any manufacturers track that allows cutting and has flexible track. Snap a ruler measurement between the track ends (see the essay on measuring distances for instructions on doing this). Performing this task with the track situation above generates a dialog, in the upper right corner of your layout window, like that at right.

Here we have a distance measurement of 36.05 inches horizontally, 3.60 inches vertically, and 36.23 inches diagonally. Although it is not shown, there is also an angular difference of 15° between the track ends. If all we want to know is the distance between the ends, we can push the **Done** button and dismiss the dialog. We summon the RCS O track library *TrackWizard* by pushing one of the buttons in the <u>Custom Track group</u>. We don't want to cut a straight track section since that won't work, and it is unlikely that a standard cut sectional curved track will work. Rather than worry about this, we push the stock track button (this gives us a pieces of custom configured straight and curved track) and let TrackWizard figure this out.

Doing so results in a track configuration like that at right. *TrackWizard* put in the largest radius curve that would fit. This required a lead-in fitter straight section 14.2 inches in length mated to a O128 curve with a 15° arc, followed by a 5.5 inch exit fitter straight section. This was just one of several ways we could have filled the gap since we could obviously have used a smaller radius curve as well.
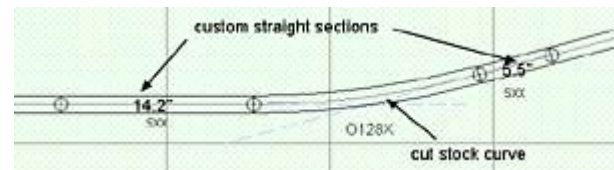
Fill Types

Since the Ross Custom Switches library has both sectional track that you can cut to smaller length, and flexible track that you can use to create your own custom curves, all of the standard wizard choices are available. These are **<stock track>**, **<radius curve>**, and **<general curve>**. Pressing any of these buttons invokes *TrackWizard* and tells it to use the type or style of track that corresponds to the command button.

stock track This instructs *TrackWizard* to use stock straight and curved sections, cutting them as necessary. This restricts the choices for curve radii to those offered in the track library (for GarGraves this is O-32, O-42, O-54, O-63, O-72, O-80, O-89, O-96, O-106, and O-138). The wizard will assemble the required pieces of track in the correct order and insert them into the layout at the correct location between the track ends used for measurement. The <stock track> command can also fill in straight

track between track ends that are in alignment, with a maximum offset error of 1/4 track width.

radius curve This instructs *TrackWizard* to use flexible track to create the required constant radius curve and straight fitter sections to fill in the gap between the measurement track ends. The difference between choosing <radius curve> and <stock track> is that any track radius can be used, not just those provided by the stock track in the library. Like the <stock track> command, the <radius curve> command can also fill in straight track between track ends that are in alignment.

general curve A general curve is a curve of continuously varying radius that takes a track section from a location with a given starting radius of curvature, and brings it to another location with a given ending radius of curvature (the starting and ending radius of curvatures may be the same). A general curve is the 'smoothest' fit between the two endpoints since it automatically eases the curve. It is also the hardest curve to recreate by the builder of the layout. Remember, there is small profit in being able to calculate and design something that you cannot easily build. You can also select from three types of general curves using the **Setup**... command on the **Track** menu. These three types are

- • (1) straight plus radius curve,

- • (2) straight plus opposed cubic easements, and

- • (3) continuous curve. In all three cases the general curve is a piece of flexible track which you can later edit with the mouse pointer.

We can return to the above track gap filling problem and change our choice of filling method. This time we choose **<radius curve>,** this gives the results at right. Here we have a single fitter straight section (the lead-in , 8.7 inches) and a custom curve with a radius of 105.7 inches and an arc of 15°. Of course you have to make this curve yourself from a piece of flexible track; in the previous example using stock track sections you only had to cut up an O-128 curve.

custom straight section 8.7"
constant radius curve R-105.7, 15°
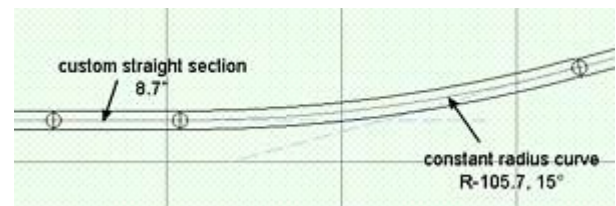
Dist	Offset	
0.00	0.00	
3.61	-0.00	
7.21	-0.00	
10.82	0.02	
14.42	0.10	
18.03	0.29	
21.63	0.62	

Finally, we can fill the gap by using a single flexible track section, with varying radius, rather than using two or three separate track sections. We get this by choosing **<general curve>** as our filling method. This gives the results at right, a single track section with a minimum radius of R-74.7 and a length of 36.5 inches. You can further increase this radius by smoothing the flexible track (**smooth** command after right-clicking) to get a result closer to R-100. The *centerline* points may be accessed by right-clicking on the flexible track section and choosing **Properties** from the *shortcut menu*. Clicking on the **Details** tab shows something like that at left. The entire list of *centerline* points may be copied to the clipboard so that you can print them out for the purpose of making a guide to use for forming the track section.

TrackWizard Setup

Many of the RR-Track libraries that have a *TrackWizard* allow you to specify a number of parameters that may be used to restrict the wizard 's choices of track. These may be accessed by pulling down the **Track** menu and choosing **Setup**...

When you do this, you will see a dialog like that at right. There are three separate sets of parameters accessed by clicking on the appropriate tab: **general**, **flex track**, and **stock track**.

General Tab

Track Lengths: here you can specify the minimum and maximum lengths used for cut-to-fit straight track. The minimum you can type in, the maximum you select from the radio button choices in the 'for fill use'

Wizard setup

70
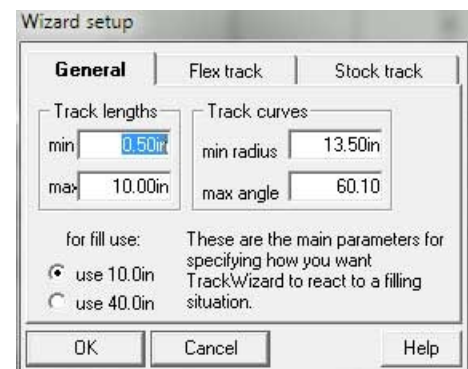
section just below (in the case of the Atlas track library in the example you have a choice between using 10 inch or 40 inch straight sections, so the maximum cut track length is correspondingly 10 or 40 inches).

Track curves: here you can specify the minimum radius used for custom radius fill sections (the default is the minimum radius stock track curve) and the maximum arc angle allowed for any given custom radius curve section (the default is just over 60°).

Flex Track tab

Pressing the flex track tab shows a set of controls like that at right. There are controls for specifying the minimum radius (again, default is the smallest radius stock curve), the maximum length (default is double the length of a standard piece of flexible track), and the type of curve used.
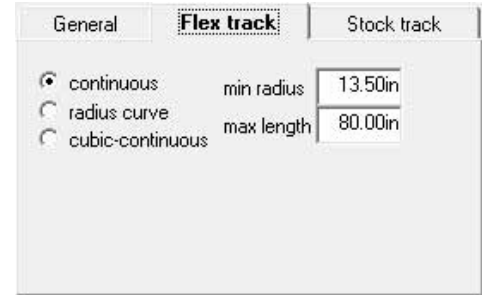
Continuous: this is the most general style of curve. The radius of curvature varies continuously with the track end points matching the angle and curvature of the track being joined at either end.

Radius curve: this is the least general style of curve. The radius of curvature is constant (like a stock curve) and incorporates a filler straight section at one end which is part of the flex track section.

Cubic-continuous: this is a hybrid curve where each end of the interpolated curve is modeled on a cubic polynomial (like for an easement curve) with the curvature at each end of the flex track section zero. This is best for smoothly matching up with straight track on either side of the gap you are filling.

Stock Track tab

Pressing the stock track tab shows a set of controls like that at right. You have a list of the available stock track sections on the left and a list of those that track wizard can use for filling on the right. The default is all of the available stock curves.
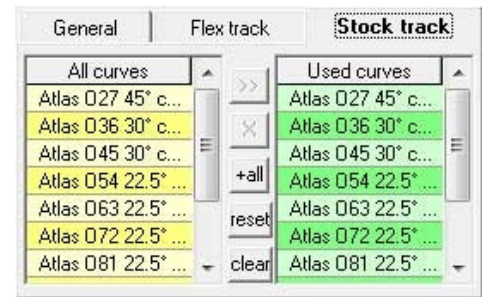
To Add A Curve to the Working Set: highlight the curve in the left-pane and then click the **>> button.**

To Remove a Curve from the Working Set: highlight the curve in the right-pane and click the **X button**.

To Add All Curves to the Working Set: press the **+All button.**

To Remove All Curves from the Working Set: press the **Clear button**.

Example: if you don't want TrackWizard to use curves smaller than O72, highlight each of the O27, O36, O45, O54, O63 curves in turn and press the X button.

Press the **OK** button to save your changes, or **Cancel** to exit without changing anything.

Working With Layers

Layers are a feature of RR-Track which allow you to create very complex layouts without necessarily having to be aware of the complexity at all times. A layer is simply a grouping of track and objects which have some common feature (such as they are all on the ground level, or they are all on the upper level, or they are all on the inner loop, etc.)

Layers are nothing more than a way to help organize a complex layout, and most layouts get complex after a while. A layer has assignable attributes which govern its visibility, selectability, and color. For example, a train layout with two levels of track can, at the very least, have two layers --- the layer that has the lower level of track and that which has the upper level (you can further divide this into a layer for the transition track as well). In this manner you can hide the upper level while you work on the lower level, and vice

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versa.

Every layout you create automatically sets up one layer for itself which it names **<default layer>**. This <default layer> can neither be renamed or removed in order to safeguard you against accidentally creating a layout with no layers. Making a layout with only a <default layer> is the equivalent of previous releases of RR-Track which used only one drawing layer. When you create a new layout, the <default layer> is set as the working layer, i.e. the layer in which items are added. Layers that you subsequently add can have any name you like, up to 48 characters in length. You should choose names that have significance for you.

When you create a new layout, you have the option to create a standard layout as opposed to a plain layout. A standard layout sets up a layout with a number of pre-defined layers for track, bench work, wiring, scenery, etc. These may be renamed or removed as required, just like any other layer. You can also add your own layers if you like. A plain layout, in contrast, has only the <default layer>.

To add a layer, modify a layer, or remove a layer from a layout, pull down the **Options** menu and choose **Layers**... (you can also double-click on the working layer pane in the status bar). You will see the *Drawing Layer Setup dialog* like that above:

The data sheet pane shows the typical set of layers when you create a standard layout. There are three track layers, two wiring layers, a scenery, buildings, bench work, and labels layer. If you decide to rename some of these layers, be aware that the layer named bench work is somewhat special; 3-D Viewer will search for this layer if you choose to display in skeleton mode in 3-D.

You can change the sorting of the layers by clicking on the Vis header or the Layer header. Clicking on Vis sorts the layers by visibility, with the working layer first, followed by active layers, inactive layers, grayed layers, and hidden layers. Clicking on the Layer header sorts the layers alphabetically by name. RR-Track shows the working layer as a <W> (in red), active layers as a -a-, inactive layers with -i-, grayed layers with -g-, and hidden layers with -h-.

The attributes of the currently selected layer are shown in the Layer Attributes radio button group to the left of the data sheet pane. There are four command buttons for modifying layers: Add (to add a new layer), Remove (to remove the selected layer), Rename (to change the layer name), and Change (to execute an attribute change). Overall layer drawing and fill colors may be set using the drop down lists in the Layer Colors group. The layer color overrides the drawing color set for a given library, however, a color set for an individual track section will override the layer color.

Layer Attributes

A layer can have one of five attributes (listed in decreasing order of activity): **working**, **active**, **inactive**, **grayed**, and **hidden**.

> The **working layer** is the layer that items are added to when you add track, accessories, or objects to your layout; there can be only one working layer. You can select items in the working layer, move them, join them, unjoin them, rotate them, and delete them. Obviously, the working layer is visible.

> An **active layer** is the same as a working layer, except that items are not added to an active layer, only to the working layer. As for the working layer, items in an active layer can be selected, moved, joined, unjoined, rotated, and deleted. Any number of layers can be active layers; active layers are visible.

> An **inactive layer** is visible, just as for the working and active layers, but items in inactive layers cannot be selected (the are invisible to the mouse), and hence cannot be manipulated (until you change the layer attributes). Inactive layers are similar to Windows wallpaper; you can seem them but you can't touch them. A good use for inactive layers is for bench work while you are working on the track.

> **Grayed layers** are like inactive layers but items in grayed layers are drawn using a pale gray pen; objects and accessories are only drawn in rough outline form. Grayed layers are useful when you need to see underlying items for the purpose of registration with other items, but you don't want to be plagued with all of the details.

> **Hidden layers** are just that; they are not visible at all. Hidden layers are useful when you don't want the details of upper level track to bother you while you are working on the lower level. They are also useful for storing items if you are partial to the palette method of layout design.

The table below summarizes the properties of the various types of layers:

Attribute	Visible	Selectable	Addition
working	Y	Y	Y
active	Y	Y	N
inactive	Y	N	N
grayed	partial	N	N
hidden	N	N	N

If you are adding a new layer, removing an existing layer, or modifying the attributes of an existing layer, you will use the controls in the **Layer Attributes** section of the *Drawing Layer Setup dialog*. The **Change** button is only enabled when one of the attributes radio buttons is clicked.

The following actions are frequently executed using the **Layer Attributes** control group.

To Add a Layer

- Pull down the **Options** menu and choose **Layers**... RR-Track shows the *Drawing Layer Setup dialog*.

- Press the **Add** button. RR-Track shows the *New Layer Name dialog*.

- Type the name for the new layer in the dialog and press **OK** (press **Cancel** to abort adding a new layer). RR-Track creates the new layer with the name you specified and sets its visibility attribute to inactive. No drawing or fill colors are assigned at this time.

- You can assign non-default dawing/fill colors, and you can set the layer's visibility attributes by using the drop-down color choosers and checking the appropriate radio button.

- Press **OK** to dismiss the *Drawing Layer Setup dialog*.

You can change the new layer's attributes and colors to whatever you want using the attributes radio buttons and the colors drop down lists.

To Remove a Layer

- Pull down the **Options** menu and choose **Layers**... RR-Track shows the Drawing Layer Setup dialog.

- <u>Select</u> the layer you want to remove by clicking on it with the left mouse button on the layer data sheet.

- Press **Remove**. If the layer contains no items, RR-Track immediately removes it. If the layer is occupied, then RR-Track tells you this and aborts removing the layer.

- Press **OK** to dismiss the *Drawing Layer Setup dialog*.

You can only remove layers that contain no items. You cannot remove the <default layer>.

To Rename a Layer

- Pull down the **Options** menu and choose **Layers**... RR-Track shows the *Drawing Layer Setup dialog*.

- <u>Select</u> the layer you want to rename by clicking on it with the left mouse button on the layer data sheet.

- Press the **Rename** button. RR-Track shows the *Layer Name dialog* with the current name displayed.

- Type the new name for the layer and press **OK**. RR-Track renames the layer and updates the layer data sheet.

- Press **OK** to dismiss the *Drawing Layer Setup dialog*.

You can rename any layer except the <default layer> which cannot be renamed.

To Change a Layer's Attributes

- Pull down the **Options** menu and choose **Layers**... RR-Track shows the *Drawing Layer Setup dialog*.

- Select the layer you want to modify by clicking on it with the left mouse button on the layer data sheet.

- Go to the Layer Attributes radio buttons and select the attribute you want from the choice of working, active, inactive, grayed, and hidden.

- Press the **Change** button (this is important, RR-Track does not change the visibility attribute until you lock them in with the **Change** button).

- Press **OK** to dismiss the *Drawing Layer Setup dialog*.

You can change the visibility attributes of any layer, including the <default layer>.

Layer colors

Layers can have a default drawing and fill color which will override the intrinsic color for a track library (but not for the intrinsic colors used for accessories and objects). In this manner you can change the default color of track by assigning the track to another layer, and then setting the default layer colors to that which you want for the track. For instance, if you have two loops of track, one of which is the outer mainline and the other the inner mainline used for connection to yards, sidings, etc., you could place the track in the outer loop in a layer (called Outer Mainline) and the inner loop in a layer (called Inner Mainline). If you assign the Inner Mainline layer a drawing color different from that normally used by the track library then the two loops of track are drawn with different colors. You can set the default layer drawing and fill colors by selecting them from the drop down lists in the Layer Colors group. You can set track library colors from the Library Color page on the Global Options dialog. Individual track colors can also be assigned, and these will override the color set for a layer.

You can also set individual track drawing color using the Track Color command on the track shortcut menu. The hierarchy of colors for drawing track is: track color, layer color, library color.

To Change a Layer's Colors

- Pull down the **Options** menu and choose **Layers**... RR-Track shows the *Drawing Layer Setup dialog*.

- Select the layer whose color(s) you want to modify by clicking on it with the left mouse button on the layer data sheet.

- To change the drawing color, choose a color from the drop-down list box next to the D:; to change the fill color, choose a color from the drop-down list box next to the F:. To set a custom color, choose 'cust' from the choices, and then press the ellipsis button adjacent to the color control. This will bring up the Windows Color Chooser from which you can select a custom color.

If you want to return the layer colors to 'none', i.e. no default colors, press the **Reset** button.

Rotating, Moving, and Adjusting Items

Most positioning of track, accessories, and objects in RR-Track is done with the mouse pointer. RR-Track also provides methods for precision positioning in small increments using the Quick Rotate and Quick Adjust dialogs.

Quick Rotate dialog:

When you right-click and choose **Rotate** from a shortcut menu, RR-Track shows the *Quick Rotate dialog*.

The controls are straight-forward. To rotate items, grasp the vertical slider control with the mouse and push it up or down. The angle display shows the current rotation change and RR-Track dynamically updates the item's orientation to show you what the is the new appearance. You can also increment the rotation angle by clicking the + and - buttons just below the angle slider.

You can change the angle increment value by click on the **Angle button** (displaying the current

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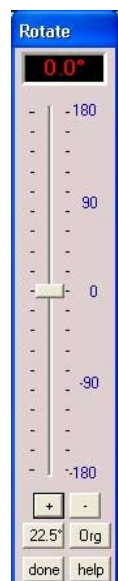
increment) just below the + button. The available increments are 1°, 2.5°, 5°, 7.5°, 15°, and 22.5°. These correspond to 1/360, 1/144, 1/72, 1/48, 1/24, and 1/16 circles.

You can change where the center of rotation lies (item origin or center) by pressing the **Org/Ctr button**. RR-Track dynamically shows the rotation center on the item(s) you are rotating.

When you have reached a satisfactory rotation angle, press the **Done** button the dismiss the Quick Rotate dialog.

Keyboard Rotate

You can also rotate items by using the keyboard up and down arrow keys in conjunction with the CONTROL key. This is probably the quickest and fastest way to quickly orient items.

To Rotate Using the Keyboard

- Select the items you want to rotate.

- Hold down the CONTROL key and press either the up arrow key to rotate CCW or the down arrow key to rotate CW. Each time you press the key, RR-Track rotates the selected items about the lead selection's origin an amount equal to the current setting of the quick rotate increment (see discussion above).

- Repeat step 2 until you are satisfied.

Quick Move dialog:

When you pull down the **Action** menu and choose **Move**, RR-Track shows the *Quick Move dialog*. This dialog is similar in its action to the Quick Rotate dialog, but translates the item(s) vertically and horizontally rather than in orientation.

The controls are straight-forward. To translate vertically, click the **up/down arrow buttons**. To translate horizontally, click the **left/right arrow buttons**. Each click moves the items by one unit of the current snap size.

To change the current snap size, press the **Inc** button. This brings up the *Snap Size dialog* letting you choose a new snap increment. Check the **1/2 step** button in order to translate in half snap increment steps.

Press **OK** when you have finished re-positioning, or press **Cancel** to return the item(s) to their original position
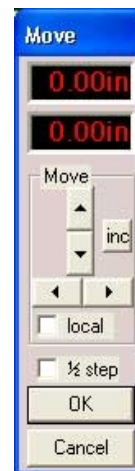
Quick Adjust dialog:

When you right-click over nothing and choose **Adjust**, RR-Track displays the *Quick Adjust dialog*. The Quick Adjust dialog combines the actions of the Quick Rotate dialog with that of the Quick Move dialog.

To Rotate:

Grasp the vertical slider control with the mouse and push it up or down. The angle display shows the current rotation change and RR-Track dynamically updates the item's orientation to show you what the is the new appearance. You can also increment the rotation angle by clicking the up/down arrow buttons at the right of the angle slider.

You can change the angle increment value by click on the **Angle** button (displaying the current increment) just below the + button. The available increments are 1°, 2.5°, 5°, 7.5°, 15°, and 22.5°. These correspond to 1/360, 1/144, 1/72, 1/48, 1/24, and 1/16 circles.

You can change where the center of rotation lies (item origin or center) by pressing the **Org/Ctr** button. RR-Track dynamically shows the rotation center on the item(s) you are rotating.

To Move:

To translate vertically, click the **up/down arrow** buttons. To translate horizontally, click the **left/right arrow** buttons. Each click moves the items by one unit of the current snap size.

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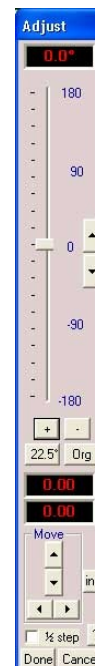
To change the current snap size, press the **Inc** button. This brings up the *Snap Size dialog* letting you choose a new snap increment. Check the **1/2 step** button in order to translate in half snap increment steps.

Press **OK** when you have finished re-orienting and positioning or press **Cancel** to return the item(s) to their original orientation and position.

Simulating Train Operations

Adding Trains to a Simulation

You can add trains to your layout by either building new trains, or choosing an existing consist from either the stored consists, or recently added consists.

To Build a New Train

- Press the **New Train button**, or pull down the **Action** menu and choose **New Train**, or right-click over nothing and choose **New Train** from the shortcut menu. RR-Simulate displays the *New Train Builder dialog*.

- Use the list of locomotives, freight, and passenger cars in the *New Train Builder dialog* to assemble a consist.

- Press **OK** to begin the process of setting the new train where you need to place it on the layout, or press **Cancel** to abort adding a train.

To Choose a Stored Train Consist

- Go to the Simulation status bar and move the cursor over the consist list. Left-click to pop up the consist list.

- Navigate through the consist list and left-click on the consist you want to add to the simulation. This begins the process of placing the consist on the track at the desired position (see placing a train).

- If you don't want to add any of these consists, move the cursor outside the consist list; RR-Simulate hides the list.

You can save up to eight permanent consists that you can recall and place on the tracks at any time.

To Place a Train on the Tracks

- Either use the **New Train** command to start construction of a new consist, or select a train from the stored consists. RR-Simulate positions the cursor at the center of the simulation.

- Hover the cursor over the track location you want to place the end of the train. RR-Simulate highlights (in green) the track sections you need for the train. If you get a beep, you do not have enough contiguous space for this train (or another train already occupies some of the track needed) and you need to find another location.

- Press the left-mouse button. RR-Simulate places the train starting at the track section under the cursor, arranging the train consist from back to front.

If you decide you don't really want to add this train, left-click over a non-track location. You will be asked if you want to try again, just choose **No**. If this is an accidental miss, then choose **Yes** for another attempt. Only one train can occupy a track section, if you try and place a train on an existing train, you will get a beep and be asked if you want to try again, or just cancel adding the new train.

To Remove a Train from the Simulation

- Hover the cursor over any unit on the train (it changes to when you are over a train).

- RIght-click to bring up the shortcut menu.

- Choose **Delete Train**. RR-Simulate deletes the selected train.

<p align="center">**Note**: deletions of trains are final, there is no undo.</p>

Running Trains

You can run all of the trains on your layout, one at a time. A train must be attached to a cab in order to run it.

Trains come in two flavors, live and dead. Dead trains are just that, they don't move (you can make them live). Live trains are connected to a cab and they can move.   So you must make your train live.

To Start a Train

- Hover the cursor over the train you wish to make live and right-click the mouse.

- From the shortcut menu choose **Make Train Live**. If you have an already running train RR-Simulator will ask if you want to stop it. Choose **Yes**.

- RR-Simulator shows a cab window. The controls on the cab window are used to run the selected train.

- Press the **Sim ON** button to start the simulation clock.

- Grab the throttle slider with the cursor (hover over it and press and hold the left-button) and drag it down so that the speed no longer reads 00.

- Release the throttle when you are at the desired speed.

RR-Simulate remembers the previous speed setting for existing trains. If you terminated a train (made it dead) while at a non-zero speed, when you make it live the last speed setting is restored. As soon as you press the Sim ON button the train will move at the previously set speed.

To Stop a Train

There are several ways to stop a train:

- Grasp the throttle slider with the mouse and move it upwards until the speed readout is 00. The simulation clock keeps running, and this train is still live

-or-

- Press the **Done** button the throttle. This will make this train dead, and stop the simulation clock.

-or-

- You can also press the **Stop sign** on the simulation status bar or press the **Sim OFF** button, both stop the simulation clock. The train is still live.

To Throw a Turnout

You can choose the path through a turnout by toggling the switch throw state. RR-Simulate shows the current switch throw state with a sold green or red path drawn from the turnout entrance to the turnout exit spur.

- Hover the cursor over the turnout until the cursor appears.

- Press the left-mouse button to toggle to the next switch throw state (this is back/forth between thru/spur track for two-turnouts and from spur-to-spur for more complex turnouts like three-way and four-ways).

RR-Simulate treats slip-switches as a pair of back-to-back two-way turnouts. You separately throw each side of the slip-switch by toggling with the left-mouse button.

Modifying Trains

You can modify existing trains by either (1) coupling trains together, or (2) uncoupling an existing train/consist.

To Couple Trains

- Slowly bring the moving train down the track to another, dead train.

- When the route tracks overlap (yellow outlines) a warning flag appears on the cab.

- When the running and standing train's couplers overlap, RR-Simulate stops the moving train and asks if you want to couple these trains.

- Press **Yes** to couple them, the train list updates to reflect the new set of trains.

RR-Simulate does not (at present) take physics into account and cause a train crash if you run the trains together at high speed. You can only couple trains at their ends.

To Uncouple a Train

- <u>Hover</u> the cursor between the train units where you want to break the train until the cursor changes to .

- Click the left-mouse button. RR-Simulate breaks the train into two trains at this point, the *Train List* updates to reflect the new set of trains in the simulation.

There is no undo command for coupling and uncoupling. If you uncouple a train and then change your mind, you must re-couple them as discussed above.

Using Train Builder to Create Trains

In order to add a train to a layout simulation, you must first build it. This is done using the *New Train dialog*..

New Train Builder dialog

When you choose to construct a new train rather that add an existing consist to your simulation, assembly of said train is carried out using the *New Train Builder dialog*, like that at right.

There are two sets of lists (the left contains the available train units and the right contains the train units added to the new consist in the order in which they are linked). Basically, you add train units one-by-one from the list of available TUs on the left to the train you are building on the right. As you add TUs to your new train, Train Builder updates the consist in the right list. Think of the two lists as a source of train units (left list) and a destination of train units (right list)
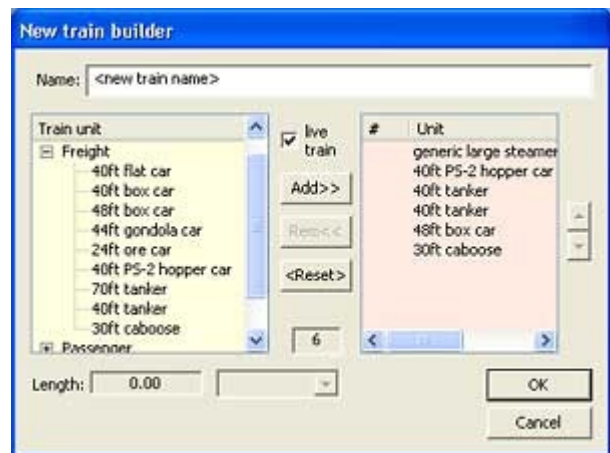
Train Units

Train units are divided into locomotives, freight, and passenger categories. Each of these may be expanded by left-clicking on the + sign in front of the category.

To Add a Train Unit to the Train

- <u>Highlight</u> a train unit in the train unit list at left.

- Press the **Add>>** button. Train Builder updates the new train.

Train units of any type may be placed in the destination consist. When you add one of the steam locomotives (medium steamer: think 4-6-2 here; large steamer: think 4-8-4 here; 0-4-0 switcher) you also are adding the associated tender behind the locomotive. These are added/subtracted as a pair, and you cannot uncouple them.

All train units physical sizes are calculated to scale, and are not actually assigned until a train is placed on a set of tracks. You can make some choices in the default scale used for a given gauge track, this can be set in the *Simulation Options dialog*. The other item that impacts both a trains length and its ability to traverse curved track is the coupler distance. You can choose between using toy-train style couplers (longer coupler distance) and scale couplers (much closer coupling). See RR-Track v5 Help for further information.

To Remove a Train Unit from the Train

- Highlight the train unit you want to remove in the train list on the right.

- Press The **Rem<<** button. Train builder updates the new train.

To Change the Position of a Train Unit in the Train

- Highlight the train unit you want to move.

- Press the **^** button to move it one unit towards the front of the train.

- Press the **v** button to move it to the end of the train.

Before you finish with your train, it is a good idea to give it a name that means something to you. This is the name that the *Train List* uses, and appears in the information window when you hover the cursor over the train.

When you are finished creating your new train, press the **OK** button to begin the procedure of *setting the train on the tracks*. Press **Cancel** if you don't want to add a train at this time.

Track Laying Tips

(1) Use the zoom-in and zoom-out commands and the view stack. I have found it to be effective to start with a large overview, not necessarily of the entire layout but a large fraction of it, and then zoom in to where I want to do some work, the return to my overview using the Last View command under the View menu. Occasionally I move around the layout at high zoom factor using the scroll bars, or holding down the SHIFT key while moving the pointer near a border, but I find this less effective. You can also move around the layout at the current zoom level by dragging the view box in the Overview window.

(2) Make use of the extended selection modes. Remember, clicking once with the left-mouse button on a track section selects just that section; double-clicking with the left-mouse button selects that section and all of the contiguous track sections. Which sections are chosen depends on the extended selection mode you have checked on the Options menu: Selects Include Joints selects all of the physically joined track (the whole loop, sidings, etc.) while Selects Include Blocks chooses all of the electrically connected track (everything between the block break symbols); Selects Include Grades only chooses track either on the same grade or elevation. If you haven't set any block breaks, then Selections Include Joints and Selections Include Blocks are identical in action. Double-clicking on an extended selection causes that selection to collapse to only the track section under the pointer. By using these, and pausing for the Move cursor to come in, you can quickly go back and forth between choosing one piece of track and many pieces of track.

(3) Work with AutoJoin turned on. Always use the Autojoin mode, and override this as necessary by hitting the escape key as needed, to temporarily turn Autojoin off. You may also override automatic joining simply by placing the newly added track far enough away from existing track to be outside the capture radius (6" for HO, 12" for O-gauge, 18" for G-gauge, etc.). Bring the ends that you want joined as close as possible, and then click the mouse. Autojoin can fail if you are trying to add track in a densely populated area with a number of loose ends; sometimes the end you aren't watching is closer to another section of track than the end you are watching, in that case the **Step Back** command under the **Edit** menu is your friend. Remember that the Autojoin mode also applies to moving pieces of track. If you get free ends within a track width, RR-Track will join them for you without you having to do this yourself. This can be a problem in dense areas, such as switch yards, where you may want to turn this off, or rely on the aforementioned **Step Back** command, there are 20 levels of undo in RR-Track.

(4) Work with Allow breakaways turned on. This makes it much faster to unjoin track from existing configurations. You merely have to drag it 10 per cent or more of the screen size, and RR-Track will break the junctions for you. When combined with Automatic Track Joining, which lets you put track back together simply by bringing the ends within one track width, reconfiguring layouts is much quicker.

(5) Work with automatic loop closing and proximity joining turned on. I generally use these modes since mistakes are rare and it forces me to not try and bend too many track sections to close gaps bigger than a track width, minimizing the chances of designing a layout that has sections likely to cause derailments. If you leave too big a gap, trains run in Simulation View will crash when they encounter a large gap, even if the track sections are 'joined'.

(6) Make use of Copy ,Paste, Duplicate, and Duplicate Parallel. I use this combination frequently to duplicate 90° and 180° curved arcs of track in order to quickly throw a new loop together, or whole parallel sidings when designing a switch yard. The **Duplicate** function is very useful for replicating custom bent or cut track sections

where you aren't interested in making a number of copies. **Duplicate Parallel** is handy for creating sets of parallel tracks in switch yards, etc.

(7) Use multiple drawing layers. Setting up even simple, small layouts with multiple layers is a real help. You can put scenery in a layer, accessories in a layer, track in a layer. In this way you can set the track layer to inactive so that you can see it but you can't select it so that it doesn't get in your way when you are setting up accessories and scenery. This same thing is true for scenery: you can draw some scenery, then set that layer to inactive, and then adjust track and/or accessory positions as necessary without the scenery getting in the way. See the essay on working with layers for more information. The utility of having multiple layers cannot be overstressed; we have seen many customer's layout designs where all items were dumped in one layer making it difficult to edit effectively

(8) Use the Select List Window to tell you details on selected track. The select list window automatically totals the highlighted track sections, giving you the total length and the estimated number of average size cars this track will accommodate. This is a handy way to find out if either a passing siding, or a reversing loop, is long enough to handle the trains you plan to run. You can also use the listing to see if you have a track power section in an electrical block when you set the extended selection mode to Selects Include Blocks. For track systems that have dedicated electrical connection tracks, this is a handy way to make sure you have adequately set up your track power connections. By setting the extended selection mode to Selections Include Grades, you can use the **Select List Window** to show you the length of all of the track on a grade; this information can also be obtained by pulling down the **Grades** menu and choosing Information. Of course the final judge of whether your layout will run properly is to use the **Simulation View** to run test trains.

(9) Use the Lock/Unlock functions to fix track sections you don't want to move. One of the most irritating things is moving the wrong block of track accidentally. If you have a hard, or a large loop and want to use this as a fixed reference for other track, then select it and choose the **Lock** command from the **Action** menu. This will keep you from accidentally moving, deleting, or rotating these items.

(10) Add elevations and grades last. It is usually better to design all, or almost all of the track plan before you begin raising/depressing track sections. Introducing elevations and grades always adds to the complexity of the layout, and makes it more difficult to change design parameters later (short of removing the entire elevation, which you can do by using the **Zero Track Height** command).

Building Your Layout to the Plan

Now that your plan, or plans, are done and you are ready to begin construction of your benches/roadbed and track work, it is worth spending a little time thinking about what can wrong during construction and how to avoid egregious errors between your carefully laid plans and the reality of your layout.

While a plan on paper looks reasonably simple to execute, it is frightfully easy for the best laid plans to go astray. For the most part, errors between your RR-Track plan and your actual layout can be traced to either (1) faulty bench work, or (2) faulty track joining.

Bench Work. Faulty bench work is generally simple to deal with. First and foremost, make sure your bench

units are square! This is easiest to verify by using your tape measure and checking the diagonal measurements of each rectangular bench unit; they should agree within a small fraction of an inch (1/8 to 1/4). Non-rectangular bench units are more difficult to verify, but they can usually be decomposed into blocks that have some rectangular characteristics; these may be verified using the diagonal measurements (for really odd-shaped benches one needs to develop some surveying skills!). After individual sections have been verified, cross-measurements across the assembled bench units should be checked against the layout plan in order to spot any slightly misaligned bench units. Even if your bench units are placed against existing building walls, this is no guarantee that they will be square. Most residential and commercial construction is out
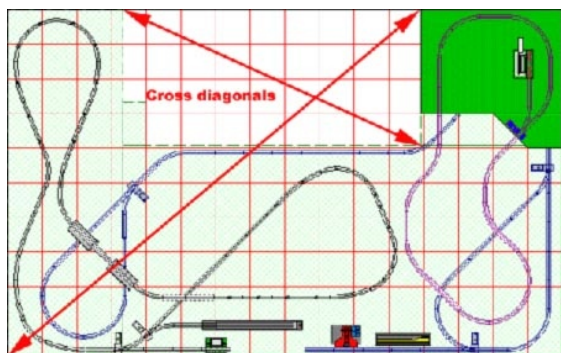
of square by some amount --- sometimes rooms can be as much as 1/2 foot out of square. If you are constructing an L or C shaped layout the obvious cross measurement is between the legs of the C, or the two legs of the L. It is important to make the bench work agree as closely as possible with the plan since bench edges are the obvious reference point when laying the track work. At left is a simple C-shaped Lionel O layout with two of the obvious cross diagonals shown: It is important to both cross-check the inside of the C and choose a longer diagonal, as shown, to check overall squareness.

Track Work. It is equally, and arguably more, important to check the overall 'squareness' of the track work as it is for the bench work. Track work errors are generally subtle, but can have very far reaching effects. The most common error occurs when assembling multiple curves, either at the ends of loops or at 90° corners. Regardless of the track manufacturer, it is very easy to create angular joining errors when assembling the curves (you can even do this for straight runs if you are not assiduous in sighting down them, looking for misalignment). As an example, a 1° error when assembling 90° curves generates a 2 inch lateral error after just 10 feet of straight track (for larger layouts, the error is proportionally greater). As these errors accumulate, the reliability of cut track measurements in the plan goes to nearly zero.

The trick is to choose some part of the track work as an 'origin' or 'anchor' from which the position of other track sections is measured (usually areas where a number of switches are in close proximity, or joined to each other, is a good choice). Almost every layout plan has some critical section of track work that can be carefully assembled and fastened down to use as an anchor point for triangulating all of the other track work. In essence, you are going to have to do what real railroads do, survey the terrain your layout is on. For the above layout, the back-to-back O31 switches at the lower left makes a good anchor.

Assemble these and fasten to the bench work. Next, assemble the curved track to the left of the two switches, as shown in cyan in the drawing below (don't fasten the track to the bench work at this time).

Now, go to your RR-Track layout plan and snap measurements between the track ends as shown. According to the layout plan, the two junction to junction measurements are 42.0 and 54.8 inches. Get your handy measuring tape out and check to see if your partially assembled track measures as shown. If it does not, pivot the curved track sections around until the cross-measurements agree.

At this points fasten the assembled but not yet nailed down track to the bench work with a couple of screws (after all of the track is assembled and positioned you can go back and put in the rest of the screws).

Next, keep adding track to the current leg as shown below, until you get to the top of the kidney-shaped curve; as before assemble the track but don't fasten to the bench work yet.
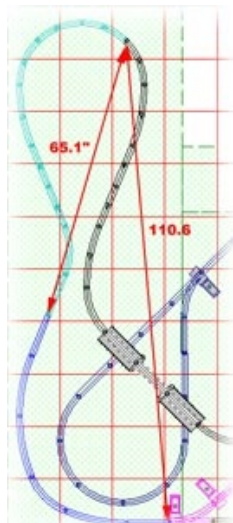
As before, snap a pair of measurements between the anchor switches and the end of the curve, and the end of the track that you just fastened down and the end of the new curve. You should get measurements of 65.1 inches and 110.6 inches. Pivot the newly added sections around, and then fasten with a couple of screws. Keep going around the contiguous loop of track in this fashion, always choosing a two or more track junction measurements for purposes of verifying your track laying. This is especially important when you have multiple levels of track, where one loop crosses over another. In this case a further important measurement is the relative distance between track sections on the upper and lower layers. As you verify and lightly fasten down consecutive track sections you will find additional cross-checks that you can employ in verifying your track work. Don't be too concerned about the effect of grades on the track junction positions: the grades on train layouts are sufficiently small that any displacement error is as small, or smaller, than errors in track joining, and, in some cases, manufacturing tolerances..

Conclusion: the important point to take away from all of this is that the only assumption RR-Track or any other CAD system can assume is perfect joining of track (all track

pins/joiners are fully seated, all track junctions have a deviation of 0.0° from true, all track sections are manufactured to zero tolerances). Any other assumptions will lead to even more errors.   It is up to the builder to follow the layout design, and cross-check the actual track positions during construction to those calculated plan.

Definitions and Terms

3D View	Computer-generated 3D rendering of all of the visible items on your layout. You can move around your layout and sample its appearance from all angles.
Accessories	Components from a given manufacturer that, unlike track components, typically do not link together to form more complex structures. Think buildings such as stations, and track side signals. Some accessory components may also act as track.
Component View	A look at your layout from the perspective of its component parts. These are typically divided up by manufacturer but may also be sorted by layers.
Contour Height pts	Individual or collective points manipulated in the Terrain Viewer that are used as a basis for interpolating heights in a layout design.
Current page	The page that is highlighted in the Page Preview window. This is the page that will print if you click the printer icon in the Page Preview window.
Current printer	The printer that any print requests will be spooled to. You can change this using the Printer Setup dialog.
Current scale	The scale that will be used when printing your layout. This is the physical relationship between the size of your layout and its size on the printer page(s).
Dead train	Any train in Simulation view that is not under cab control. Dead trains do not move.
Default printer	This is the printer your PC uses if it has not been told to use another printer. You set the default printer in Printers folder in your Control Panel.
Display list	The Display List is a linear list of all of the items in an RR-Track layout. They are listed in the order they are drawn, i.e. from back to front.
Draw color	The color used to draw the rails and outlines of track components and outlines of objects.
edit handle	These are the points that define a drawing object such as a rectangle, polygon, line. When these objects are selected, edit handles appear as solid red circles that you can grab with the cursor and drag to re-configure.
Electrical block break	Electrical block breaks create electrically isolated sections of track. A single break will only isolate track if the other end of the track is a dead-end.
Elevated track	These are sections of track that are at non-zero heights, and are not part of a grade (not part of a contiguous range of track connecting track at one height to track at a different height). Elevated track can have both positive (above base) and negative (below base) heights.
Extended selection mode	When selecting a track section, a double-click invokes an extended selection. Extended selections are all track physically connected to the selected track. This may be further modified by restricting the extended selection to all track that is electrically connected (i.e. in the same block) or all track that is height connnected (i.e. at the same height or in the same grade).

Fill color	The color used to fill solid parts of track and objects.
Global Options	These are settings in RR-Track that affect all master layout windows. These include things like track joining parameters, plan view back ground colors, default library colors, autosave
Grade track	Track that is part of a contiguous range of track connecting track sections at one height with track sections at a different height. While grade track sections may have non-zero height (and generally do) the adjacent track sections do not have the same height.
Hot Item list	This is a handy list of up to 20 items from multiple RR-Track libraries that you can quickly access to add these components to your layout design.
Last Item list	The Last Item list contains up to 10 of the most recently added, distinct, track or accessory items. It is located at the right end of the Plan View status bar.
Layer	A layer is simply a grouping of track and objects which have some common feature (such as they are all on the ground level, or they are all on the upper level, or they are all on the inner loop, etc.). Layers can be Working, Active, Inactive, Grayed, or Hidden.
Layout Bench Units	These are the rectangular and polygonal objects that form the bench arrangement of your layout design. Generally track is laid on the bench units, but not in the case of track spanning spaces such as walkways.
Layout Options	These are settings in RR-Track that affect only the current layout. These include things such as grid overlay size and color, snap sizes, unit system, joining and grade symbols, layout scale. These can be set as system defaults for subsequent RR-Track layouts.
Lead selection	This is the first item in a list of multiple track sections or objects. The lead selection is drawin with bold outlines, and, for items that may be edited, drawn with edit handle.
Library	RR-Track libraries are typically composed of a single manufacturer's track/accessory components in a given gauge/code. For example: Lionel O27 or Atlas c83 HO. At any given time you can have one library active on the 2D Plan View Track/Accessory menu.
Live train	A train in Simulation view that is under cab control. Live trains do not have to be in motion.
Main application window	This is the window that appears when you first start RR-Track and serve as the 'container' for all the other RR-Track windows such as master layout windows, overview windows, and status bars.
Master layout window	This is the container window that collects together the five views that RR-Track uses for your layout design. Each of these (Plan View, Component View, Terrain View, 3D View, and Simulation View) can be accessed by pressing the appropriate tab.
Menu Bar	Bar containing commands running across the top of a window just under the caption. Most (but not all) of these are sub-menus which drop further menus down when clicked.

Module	Modules are self-contained collections of track, accessories, objects, and terrain that are treated as one big piece of track. They are unlimited in size and scope, but there may be only 12 exposed track ends. Mostly useful for designing/maintaining modular train layouts.
Module List	The Module List is a selectable list of all the modules you have in your module library.
Overview window	The overview window, usually located at the upper right of the RR-Track main application window, shows an overview of your train layout whenever you switch to a plan view. The overview shows the entirety of the layout regardless of the zoom factor in the plan view. A small rectangle depicts the area of the layout current in the plan view; you may grab this rectangle with the pointer and drag it to change the viewport in the plan view.
Page margins	These are the areas at the top/bottom and left/right edges that are not used for printing. They can exceed the physical margins but not be less than them.
Plan View	A 2D view of your layout, from above. This is the window/view where you do all of your designing (except terrain and benches).
Printing offset	The X-Y distance between the lower left corner of the layout and the location of the printer's page boundary. For single page printing this should be zero.
Restore point	Whenever a change is made to a layout design, RR-Track creates a restore point. Changes including adding/removing track, moving track, joining/unjoining track, orienting items, etc. You can back up incrementally through restore points to recover from a mistake. Basically a global undo command. RR-Track keeps track of the last 20 changes.
RR-Track clipboard	The clipboard is a general purpose holding area for any combination of track, accessories, and objects that you want to replicate somewhere else in your current, or another, layout design.
RR-Track Layout File	A binary file system object, stored on your hard drive, USB drive, or optical drive, that contains all of the items needed to define an RR-Track train layout.
Shortcut menu	Context-sensitive menu of commonly used commands accessed by right-clicking over items or an empty area of the layout.
Simulation View	An examination of your layout from the standpoint of railroad operation. You can position trains/consists and use a cab to move them around, make/break trains, etc. to test the operational strengths and weaknesses of your design.
Skeleton mode	A display mode for 3D Views that shows track with single-line supports and no terrain to give an idea of support structure needed.
Snap Size	The spacing between imaginary points on a grid superimposed over a plan view. This limits the number of locations an object may be placed at (such as on 0.25 inch boundaries) simplifying positioning items accurately with the mouse pointer.
Tangent Line	These are dashed lines connected at one end to a track junction of your choice, and drug out as far as needed. Tangent lines are drawn at the joining angle of the starting track end. Once drawn, they are treated as any other line object and are not attached to the source track end.

Tear-off menu	A track or accessory sub-menu that you can position where you like and choose from as you would the track/accessory menu on the Plan View menu bar.
Terrain item	A component item that is considered a terrain object. These include all contour height points and all layout bench units.
Terrain Layer	Special layer where RR-Track places all of a layout's terrain objects such as layout bench units and contours.
Terrain View	A 2D view of the bench work and terrain of your layout. Track is shown but this view is used solely for design and configuration of your layout's supports and terrain.
Track	Components from a manufacturer (such as GarGraves Trackage) which have ends that mate with each other and compatible components from other manufacturers and are used to create a 'road' for your trains to operate upon. Multiple track components can be joined together to form complex structures.
Train	A linked set of train units (cars) that are controlled and move as a unit during layout simulation.
Train unit	A single piece of rolling stock. Multiple train units, when linked together, form a train.
Turnout	Track component that is used to divert a train from one exit route to another. Most turnouts are two-way and have a single entrance track and two exit tracks. More complicated turnouts are available with up to eight exit tracks and multiple entrance tracks. Also referred to as a 'switch'.
Working Layer	This is the layer that you currently add items (track, accessories, or objects) to. Other layers may be visible, but this is the one you are 'working' in.

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