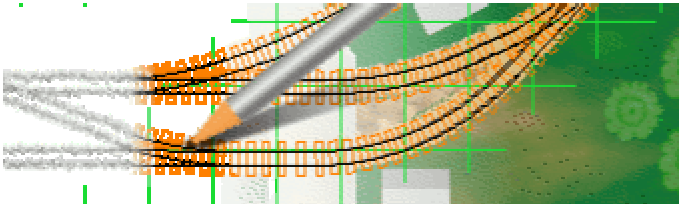


XTrackCAD User's Manual



Version 5.2.1a

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Chapter 1: Introduction To XTrackCAD

XTrackCAD is a CAD (computer-aided design) program for designing Model Railroad layouts. *XTrackCAD* supports any scale, has libraries of popular brands of turnouts and sectional track (plus you add your own easily), can automatically use spiral transition curves when joining track and has extensive on-line help and demonstrations. *XTrackCAD* lets you manipulate track much like you would with actual flex-track to modify, extend and join tracks and turnouts. Additional features include tunnels, 'post-it' notes, on-screen ruler, parts list, 99 drawing layers, undo/redo commands, bench-work, 'Print to Bitmap', elevations, train simulation and car inventory.

Using it, you can

- Design layouts in any scale and gauge,
- Use predefined libraries for many popular brands of turnouts to help you get started easily,
- Add your own favorite components,
- Manipulate track much like you would with actual flex-track to modify, extend and join tracks and turnouts,
- Automatically generated Cornu *transition curves* (easements) whenever the track radius changes.
- Test your design by running trains, including picking them up and moving them with the mouse.
- Trace tracks and other objects over a background image of a real-world location map, a scanned trackplan, or other image.
- Print the design in a scale of your choice. When printed in 1:1 scale the printout can be used as a template for laying the track to build your dream layout.

New users should run the demonstrations (via the **Help>Demos** menu) to get an overview of the many features of the program. A number of example layout designs are also available.

Be sure to visit the project web page for latest news and updates: [XTrackCAD Fork Website](#)

1.1 Why Choose XTrackCAD

Why Choose XTrackCAD

Easy to use

XTrackCAD was designed to operate in a similar way to pencil and paper: You can draw tracks by dragging the mouse, you select and place turnout "templates" anywhere on existing tracks, and you can use fixed radii for initial design.

But extra capabilities have been added that give more power by using FlexTracks (Cornu) you have tracks that automatically redraw as you drag turnouts around, creating smooth curves, you can zoom in and out, and of course, undo and deleting tracks are easier!

You don't have to be an expert CAD user to make the most of *XTrackCAD* but the program will ensure that dimensions, radii and angles are accurate.

You don't have to specify line lengths or angles and just draw. But if you want to be more precise, you can enter precise dimensions both in real-world and scale sizes.

XTrackCAD is a specialized CAD for railway modelling, it deals with tracks as tracks, not as line segments. Tracks are connected correctly to each other and with endpoints of turnouts and other components.

As you zoom in, the two rails are drawn and then ties are added.

Free

Thanks to the generosity of Dave Bullis, who wrote the program, and the active help of open-source volunteers, XTrackCAD is free to own and use. You can even take up the cudgels and help!

Available Help

On-line demonstrations show the actual operation of many of the program's features. Extensive help is available for all commands and operations. There are communities of users and developers who can answer questions.

Packed with features

XTrackCAD is designed from the ground up to be a complete tool for many aspects of Model Railroad layout design.

Active UI Prompting

As the mouse moves over the layout objects, a set of different anchors are shown to indicate what is possible in each command with each modifier key if clicked or double clicked at that location.

Train Simulation and Car Inventory

Any number of Cars and Locomotives can be placed on your layout to check clearances, siding capacities and track layout. Trains can be animated to simulate operations and switching on your layout.

The Car Inventory dialog records your cars and locomotives and these can be exported and imported from spreadsheets.

Track Manipulation

Track segments can be lengthened or shortened by simple click and drag. Tangents to a curve are created by dragging away from the curve. Tracks are extended by dragging from an Endpoint, creating new straight or curved segments. New tracks can be snapped into place or precisely placed and then Joined.

Track circles are especially handy for determining overall designs and seeing what will fit in a given area.

The Cornu flextrack features create dynamically variable tracks that optimise the curvature of tracks to ensure a prototypical appearance. They alter as the other tracks are moved just as flextrack will in the 12 inches to the foot world!

The Parallel command easily creates new straight or curved tracks, laying out yards and sidings in a few easy steps. Accurate platforms can be created with the Parallel Lines command followed by the Join Lines command.

The Join command links any two tracks (Straights, Curves, Turnouts or Turntables) with accurate aligned connecting track segments which can be easements including Cornu easements. The connected tracks are trimmed or extended as required.

The Helix Track command computes the number of turns, radius, grade and vertical separation based on your criteria.

Turntables can be constructed with any radius and can either have fixed or dynamic bay tracks

Turnout Select and Placement

The Turnout Hot Bar contains a scrolling list of Turnouts, Sectional Tracks and Structures available in the current Scale. Simply click on one and click again drop it onto the layout.

As Turnouts are dragged over existing tracks they are automatically aligned. *XTrackCAD* searches for any other tracks that align with each of the Turnout's Endpoints, and shows you the number of connections that will be made and the maximum offset as you position the Turnout. Just adjust the Turnout's position to minimize the offset to ensure the best fit.

When a turnout is placed, each Endpoint is examined to see if it aligned to an existing track. If so, the track is split to create a perfect connection to the turnout. Placing Turnouts is a 'snap'.

Layers

Layers are an important feature for managing the design for layouts of any complexity. Use one layer for the main-line and others for staging tracks, Bench-work or scenery. Multilevel designs can have groups of layers for each level.

XTrackCAD allows up to 99 layers layers can have their own button to control visibility. Each layer can have a name which is displayed as the balloon help for the layer button.

Modular Layout assembly is supported with Modular Layers which ensure their contents are moved as a set.

Tracks and other objects can be colored according to which layer they are in. Also, each layer can be frozen to prevent accidental changes to parts of the layout that are finalized.

Elevations and Profile

Elevations are one of the most powerful features of *XTrackCAD* they are dynamically recalculated as the layout changes.

Traditional layout designs (such as published in magazines) show elevations at selected spots on the layout. They may also show grades between elevations. These can be input into *XtrkCAD*.

XTrackCAD lets you define the elevation of any Endpoint on the layout. You can also have *XTrackCAD* automatically compute the elevation and grade between defined elevation points. You can define the elevation at the bottom and top of a sloped track, then have *XTrackCAD* compute the elevation at each riser position between.

Once you have defined a few elevations, you can display the Elevation Profile for the layout along a path of connected track segments. The Profile display shows the length of the track, the elevation of each defined elevation point and the grades between them. You can even adjust the elevations directly on the Profile display.

Easements (Cornu Transition Curves)

Easements are special sections of gradually curving track used to connect straight and curved tracks (or two curved tracks). Easements reduce the effects of sudden changes in track curves which can cause derailments. They also look great!

XTrackCAD can use Easements anytime the radius of the track changes. The Modify and Join commands will automatically insert Easement Track segments whenever needed. Each Easement is computed based on the radius of the neighboring tracks. You don't even have to think about it!

Flexible and Powerful Printing

Printing is an important part of a layout design program, and *XTrackCAD* has a flexible Print command to get your design onto the layout.

Printing is used for many purposes:

- A snapshot of the whole layout.
- Detailed closeups to examine areas of complicated track work.
- Full 1:1 for direct transfer to the layout.

The Print command lets you scale the printout from a one page overall view (with the handy Snap-Shot button) right up to full size 1:1.

Multiple page printouts are easy to do. A grid representing each page is drawn over the layout and you can click on the pages you want to print. The grid can be moved and rotated to any position so the orientation of the printout matches your layout. Pages can be printed in Portrait or Landscape format.

At 1:1, registration marks can be printed every 3" (or 10cm) to help align different sets of printouts. Also, the roadbed outline can be drawn at a user-specified width to assist cutting the roadbed from sheet material.

Turnout and Structure Creation

XTrackCAD comes with Turnout, Sectional Track and Structure Parameter Files for many brands of tracks and accessories. However, your brand may not be supplied. The Turnout Designer dialogs and the Group command make it easy to add your own custom definitions.

The Turnout Editor has separate screens for designing Turnouts (Regular, Curved, Wye and 3-way), Crossings, Slip-switch, Crossovers and Sectional Track. In each dialog a few measurements are required to create a new definition. Full size printouts can be made directly from the dialog to check your design.

The Group command can create Structure definitions from selected tracks, lines and shapes. You can make structures as simple as a rectangle or highly detailed. You can also modify existing designs to add details or make adjustments.

Lines, Shapes, Table Edges, Text and Notes

Layout designs are more than track!

The *XTrackCAD* Draw command is used to draw lines (straight, curved and circles) and shapes (filled boxes, circles, polylines and polygons). These can be different colors and lines can have different widths. The Polylines and Polygons can have curved sides. These are useful for drawing scenic features (rivers, bridges, mountains).

You can add Bench-work and dimension lines too.

Special types of lines are drawn by the Table Edge command are used to represent the boundary at the edge of the layout.

Text can be added to the layout.

Notes can be attached to particular spots on the layout. When selected they can display special information about that part of the layout, such as prototype features, construction details or operation notes. This includes URL links to files on the Internet.

Parts and Price Lists

The Parts List command generates a list of the number of the different types of Turnouts, Sectional Track and Structures selected on the layout. You can select everything or just the areas you are working on. As well, the total length of flex-track (for each track scale/gauge used on the layout) is listed.

You can enter the price of each type of Turnout, Sectional Track and Structure, plus the length and price of flex-track. *XTrackCAD* will compute the price of each types and the grand total. The total number of flex-track sections is also listed.

Support for Sectional Track

Numerous Sectional Track Parameter Files are included with *XTrackCAD* (Atlas, Marklin, Peco, ...). The Hot Bar allows easy selection.

The automatic alignment feature of Turnout and Sectional Track placements makes track pieces just 'snap' together.

The Connect Track command adjusts Sectional Track to smooth out the slight gaps that can arise when working with Sectional Track.

Refer to [Section 1.2](#) and [Section 1.3](#) for a listing of *XTrackCAD* features.

1.2 Key XTrackCAD Features

- Annotate with text and notes
- Automatic easement calculation
- Create Custom Designed Turnouts and Structures
- Create parallel straight and curved tracks
- Delete objects

- Describe objects
- Draw lines, arcs, polylines and polygons and filled polygons or circular shapes (for showing river edges etc.)
- Draw table edges, Bench-work and dimension lines
- Elevations, grades and profiles
- Extend (or shrink) a segment by dragging its Endpoint
- Extend a segment with a curve (or straight)
- Generate parts list for all or selected areas of the layout
- Hand-laid Turnouts
- Helix track
- Hot Bar for Turnout and Structure selection
- Join any two tracks
- Move and rotate any group of objects
- Ninety-nine drawing Layers
- On-line demonstrations, extensive help, tips and error message explanations
- On-screen ruler for measurements
- Panning and zooming via a map window and also in Pan/Zoom Mode
- Price lists can be entered to allow the layout to be priced
- Printing in any scale (up to 1:1) at any position and angle
- Straight and curved flex-track segments
- Supports any scale
- Track circles and tangent tracks
- Train Simulation
- Tunnels (hidden tracks)
- Turnouts, crossings (and sectional track such as Atlas Snap-track)
- Turntables (user defined diameter)
- Undo the last ten commands
- Zoom in and zoom out of the drawing area

1.3 Additional XTrackCAD Features

XTrackCAD has many other carefully selected features:

- Sections of track can be hidden, which can be drawn as dashed lines, or completely hidden. A Tunnel Portal is drawn when a hidden track connects with normal track.
- Sections of track can be tagged as bridge tracks which draws a bridge parapet on each side.
- Drawing Turntable stall tracks is easy, just drag from the Turntable with the Modify command. The minimum angle between tracks can be set to ensure accurate, evenly spaced tracks.
- Connections to non-visible layers are marked to an arrow head to show you the track continues on another layer.
- The Group command can be used to decorate custom designed Turnouts and Sectional Track with details to indicate switch machines, ground throws and power connections.
- Custom designed Turnouts can be modified, renamed or deleted with the Custom Management dialog.
- Flex-track connected to Turnouts is labeled with the total length to aid cutting flex-track to length.
- An on-screen ruler can be user to measure arbitrary distances.
- At 1:1 drawing (and printing) scale the track center line is drawn to make it easy to position roadbed and track.
- The balloon help for the Undo and Redo buttons shows the command that would be Undone or Redone.
- The Snap Grid can positioned at any origin and any angle. It can also be printed to help when transferring coordinates to the layout.
- The Map window is used to position the Main window on the layout. It can also be used to change the drawing scale.
- You can rescale and flip objects, trim turnouts and create block gaps.

1.4 About This Manual

Typographic Conventions

Throughout this manual the following typographic conventions are used to make finding information easier:

Bold - Shows menu, file or dialog item titles.

`Mono-spaced` - Shows commands or text entries by user. On entry fields the spelling given has to be followed exactly.

Italic - Marks a new expression, usually followed by a short description

`Capital Key` - Usually used in a sequence of key strokes or in combination with *Shift*, *Alt* or *Ctrl* key.

`Key+Key` - Combination of keys, e.g., `Ctrl+S`

`Key, Key, Key` - Sequence of key strokes, e.g., `Alt, F, S`

Selection>Selection - Sequence of selections from menu, e.g., **File>Save**

1.5 Installation

XTrackCAD is designed to operate under Linux, Apple MacOS or Microsoft Windows. Information within this section of the manual pertains to installation of the application in either of these environments.

1.5.1 Microsoft Windows Installation

XTrackCAD is shipped as a self-installing self-expanding program (executable).

1. Using Windows Explorer, locate the directory in which you downloaded or copied your new version of *XTrackCAD*.
 2. Start the installation program by double clicking on the `xtrkcad-setup-5.2.1a.exe` file icon.
 3. Follow the steps in the installation program.
 4. The installation lets you define the directory in which *XTrackCAD* is installed. The directory is created automatically if it doesn't already exist.
 5. A program folder named `XTrkCad4` will be created during the installation process. The folder contains the program, documentation, parameter and example files.
-

1.5.2 OSX Installation Mac Installation

XTrackCAD for OSX is shipped as a package containing an application.

1. Start the installation by opening the package and dragging the contained application into the *Applications* folder using the shortcut in the package. The application includes the program, documentation, parameter and example files within it.
 2. To run on Apple MacOS, the *XQuartz* package must first have been installed - see <http://www.xquartz.org>. XQuartz will need to be upgraded after each OS version upgrade.
 3. OSX Run Security When the application is first run, it will need to be authorized by OSX. There will be a OSX prompt that asks if it should be opened. And then it will still fail to run. After opening it for the first time, go to *System Preferences>Security & Privacy* and you will see that the app is named as having been blocked. Hit the *Run Anyway* button and the program should start. This sequence may be necessary after each OS upgrade.
 4. On Mac OS Catalina, the program will need to be started by right-clicking it and selecting **Open**.
-

1.5.3 Linux Installation

XTrackCAD for LINUX is shipped as a self-extracting archive (executable).

1. Installing from the self-extracting archive.
After downloading open a command line then
`./xtrkcad-setup-5.2.1a.i386.sh --prefix=/usr/local --exclude-subdir`

This will install the executable in `/usr/local/bin`. A directory named `xtrkcad` will be created in `/usr/local/share` and all files will be unpacked into it.

If you install *XTrackCAD* into another directory, set the `XTRKCADLIB` environment variable to point to that directory.

1.6 Start the Program

The *XTrackCAD* executable is named `xtrkcad.exe` on Windows and `xtrkcad` on Linux and OSX.

It is usually started by clicking on its icon, or right-click and **Open** in OSX Catalina, but there are command line options as well.

Command Line

On Windows:

```
xtrkcad [/c config] [/v] [/l logfile] [/d logcontrol] layoutfile
```

On Mac OSX:

```
cd /Applications
./open xtrkcad --args [-c config] [-v] [-l logfile] [-d logcontrol] layoutfile
```

On Linux:

```
xtrkcad [-c config] [-v] [-l logfile] [-d logcontrol] layoutfile
```

Command line parameters

`c config`
configuration to use. This allows you to have several distinct configurations (eg. parameter files, display options).

`layoutfile`
filename for the layout to load. This parameter takes precedence over the option to resume with the last layout ([Section 2.10.7](#)).

Debugging Parameters

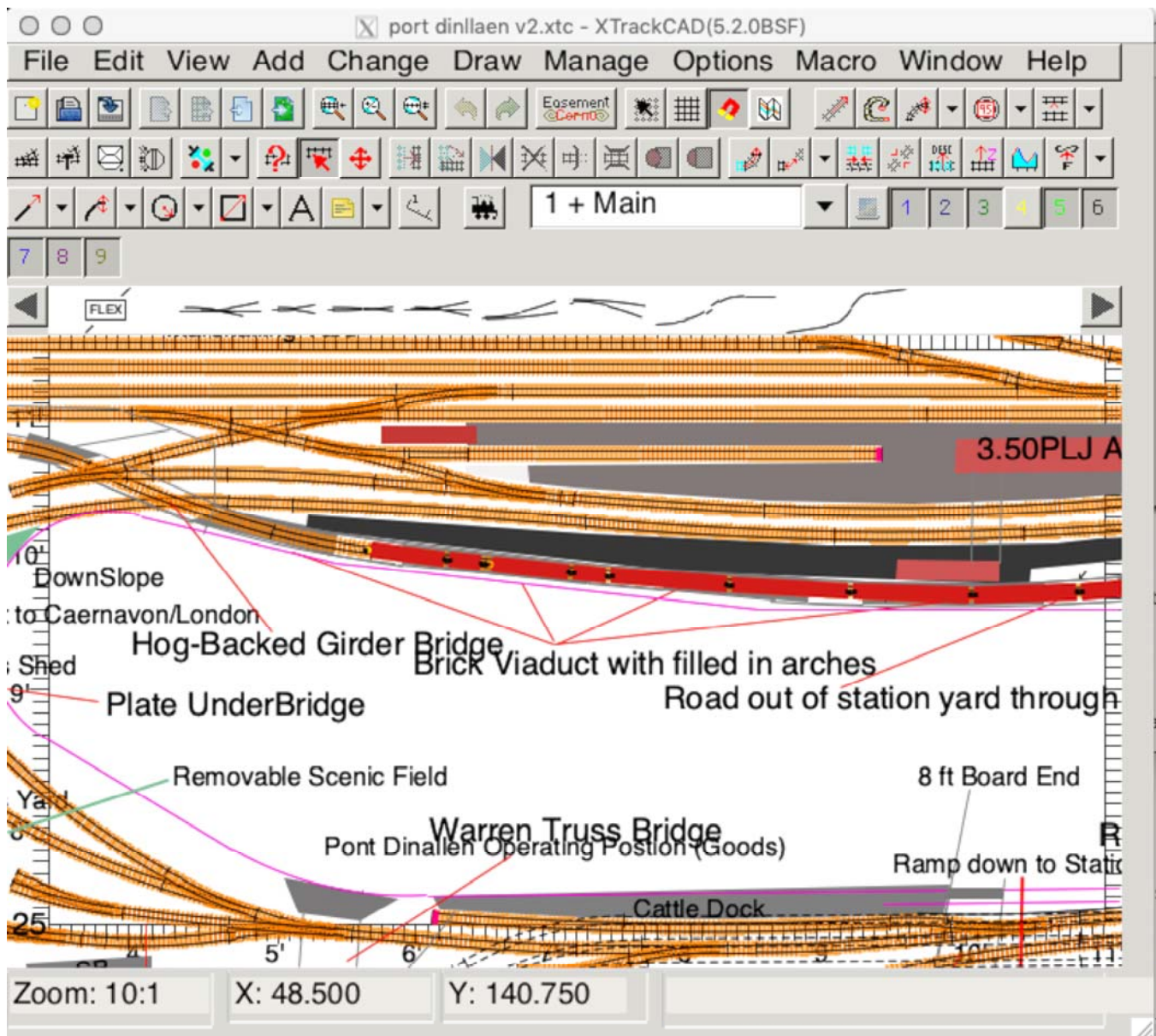
The following parameters are for debugging purposes and are mainly of interest to the developers.

`v`
verbose mode.

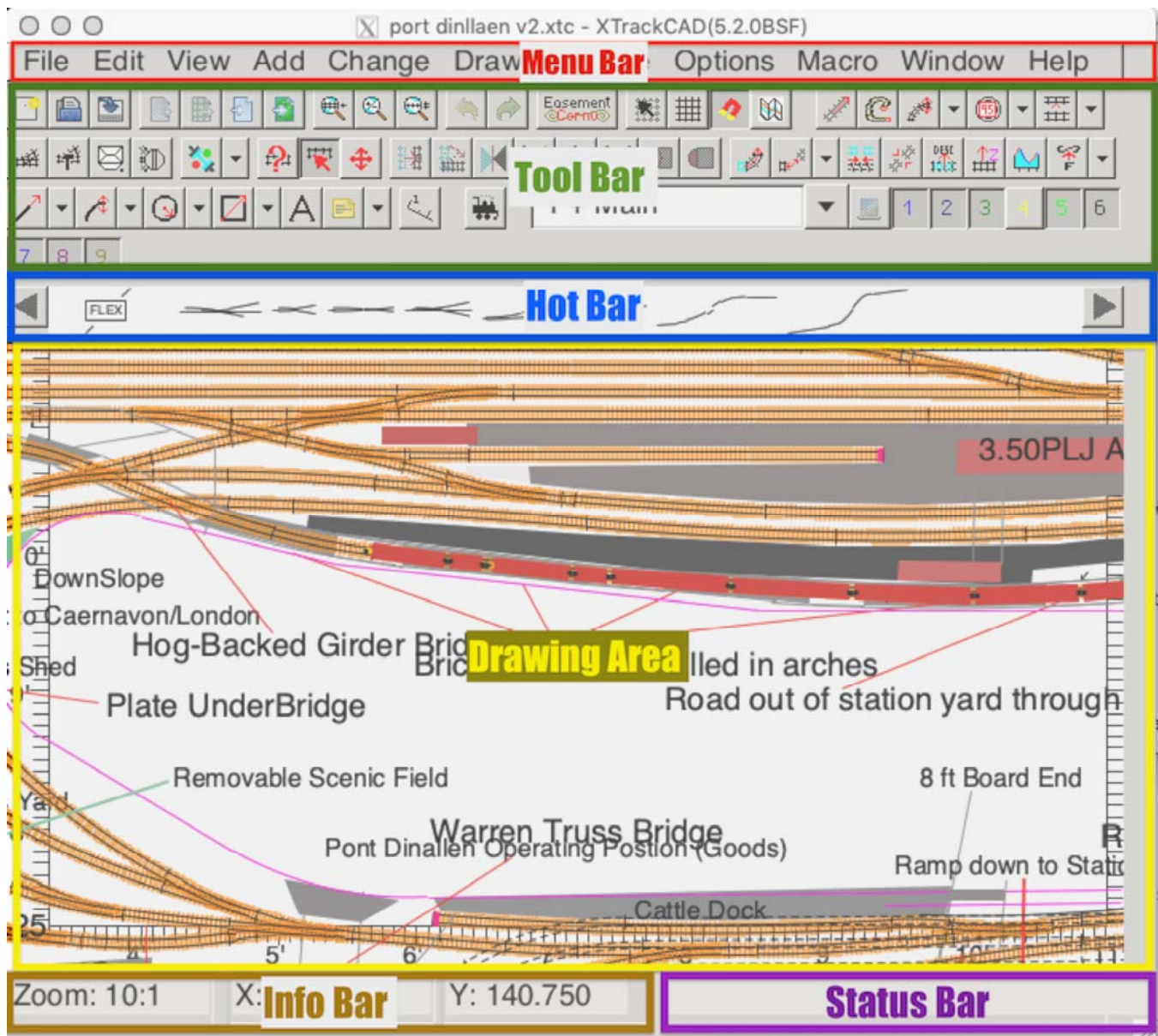
`d logcontrol`
specifies the amount of logging. The argument `logcontrol` has the format `logmodule[=level]`. `logmodule` defines the functionality that should be logged, the optional `level` specifies the loglevel. Zero means no logging. Defaults are no modules are logged and loglevel is 1 if omitted from `logonctrol` parameter.

`l logfile`
set logfile, only needed in conjunction with the debug option.

1.7 Quick Tour



When *XTrackCAD* starts, it displays the Main (Section 3.1) and Map (Section 3.2.2) windows. The Map window is used to change the origin of the Main window when the entire layout cannot be displayed at one time.



The Menu Bar across the top of the Main window contains standard Windows menus. Some of these are particularly useful to the new user:

- The **File>Exit** menu exits *XTrackCAD*. You can also exit by selecting the System menu in the upper left corner of the Window.
- The **File>Open** menu opens existing layout files and archives. When first installed, the default directory contains some example programs you can look at.
- The **Help** menu can be used to read the *XTrackCAD* Help file. Also, the **Help>Demos** menu selects a number of demonstrations which illustrate various features of *XTrackCAD*.
- The **Options>Layout** menu specifies the working scale and overall room size.
- The **Options>Preferences** menu specifies some less frequently changed items. You can use this menu to choose Metric units (Section 2.10.7).

The Tool Bar contains icons for each of the commands in the Menus. The icons shown can be customized using the **View->ToolBar** submenu.

- The main drawing Mode command is **Select** - which is shown with the red arrow icon. From this mode, selected objects can be **Modified** as well. A close second is the **Describe** mode which allows properties of Objects to be seen and Changed.
- A different mode is **Train** which allows trains to be simulated on the Layout.

Under the Tool Bar is the Hot Bar. This contains defined track and drawing objects taken from parameter files. To use a template you select it and then click on the Drawing Area.

The main part of the window is the Drawing Area, this is where the Layout is shown in 2D. The view can be zoomed or panned. The **Pan-Zoom** command whose symbol is the crossed arrows allows easiest control, but in **Select** command you can pan with the arrow keys and zoom with the trackpad or mousewheel or **Ctrl"+"** or **"-"** can affect the zoom level.

At the bottom on the screen are two more areas. The Status Bar contains messages about commands as they are being used, and the Info Bar shows the zoom level and the position of the cursor.

1.8 Performance Issues

This section lists some things that can improve the performance of *XTrackCAD*.

- On the **View** dialog ([Section 3.3.11](#)) turn off **Show Snap Grid** or **Change Grid...** to have fewer grid points.
- To speed up initialization, remove unused parameter files (See **Parameter Files** dialog - [Section 2.5.5](#)).
- Close the **Map** window if you don't need it to move about the layout. The **Window** ([Section 2.13](#)) menu can be used reopen the Map window.
- On the **Display** dialog ([Section 2.10.3](#)) turn off drawing **Endpoints**, decrease the **Two Rail Scale**, increase **Min Grid Spacing**, set **Draw Ties** to **None** and turn off **Live Map**.

1.9 Files and Directories

Information within this section of the manual identifies installation directory names, file names and directory and file locations.

1.9.1 Directories Overview

XTrackCAD uses two directories on your system:

- The *XTrackCAD Install* directory, which contains the data and parameter files used by *XTrackCAD*.
- The *XTrackCAD Working* directory, which contains configuration and Check Point files.

On MS Windows, the *Install* directory is set when you install *XTrackCAD*. All data files (parameters, demos, examples) can be found in the `share/xtrkcad` subdirectory underneath the *Install* directory. The *Working* directory is in your personal profile.

On Linux, the *Install* directory is usually `/usr/local/lib/xtrkcad/`, but you can change this by defining the `XTRKCADLIB` environment variable before starting *XTrackCAD*. The working directory is `{HOME}/.xtrkcad/`.

On Mac OSX, the *Install* directory is the application package, usually located in the `/Applications` directory. All the included parameters, demos and examples can be found inside the package under the `/Applications/xtrkcad/Contents/Resources/xtrkcad` directory. The *Working* directory is created as `.xtrkcad` - a hidden directory - under the active user's directory in `/Users`

Layout files (`*.xtc`) and export ([Section 2.5.1](#)) files (`*.xti`) can be saved anywhere you wish, as specified in the **Save File** and **Open File** dialogs.

In MacOS Catalina, the program has no access to certain directories - the Documents and Download directories in particular.

Example layouts can be found in the `example` directory under the *XTrackCAD* install directory.

1.9.2 Install Directory

- `xtrkcad.xtq` is the main parameter file which contains definitions for each scale. It also includes turnout definitions for the demos and lists the playback (`.xtr`) files for the demos.
- `params` directory contains `*.xtp` files which are the *XTrackCAD* Library parameter files. These files (`atlasn.xtp`, `pecon55.xtp`, ...) contain definitions for turnouts, sectional track pieces and structures. These files to be used are selected in the **Parameter Files** ([Section 2.5.5](#)) dialog.
- `xtrkcad.chm` (on MS-Windows) is the *XTrackCAD* help file.
- `xtrkcad.exe` (MS-Windows) or `xtrkcad` (Linux or Mac OSX) is the *XTrackCAD* program.
- `xtrkcad.tip` contains the Tip of the Day information accessible from the **Help** menu or shown during startup.
- `xtrkcad0.ini` specifies the location of the *XTrackCAD* working directory (MS-Windows only).
- `demos` directory contains `*.xtr` which are the *XTrackCAD* demonstration files which can be run via the **Help>Demos** menu item.
- `examples` directory contain some example `.xtc` files

1.9.3 Working Directory

- `xtrkcad.ckp` are the *check-point* files created periodically while running *XTrackCAD*. If your system *XTrackCAD* hangs or crashes you get the choice of loading the checkpoint file and so recover (most of) your work by saving it to your current layout file.

The check-point frequency is set by the *Check Point* field found in the **Preferences** dialog (**Options>Preferences**).

- The `xtrkcad.cus` file contains parameter information. This is mostly information created by the **Turnout Designer** dialogs ([Section 2.9.9](#)) and **Group** ([Section 2.9.4](#)) command. You can use the **Edit>Custom Management** dialog to manipulate these parameters.

- The `xtrkcad.ini` (on MS-Windows) or the `xtrkcad.rc` (on Linux or Mac OSX) file contains various parameter settings from each use of *XTrackCAD*. Most changes you make (such as scale, room size, window position) are saved in this file for the next time you use *XTrackCAD*.

1.10 Removing XTrackCAD

Remove *XTrackCAD* by deleting the *XTrackCAD Install* directory, or application (on Mac OSX), deleting any `xtrkcad.*` files from the *Working* directory, and deleting any `*.xtc` and `*.xti` files.

On MS-Windows only, you can also use the **Uninstall** icon in the *XTrackCAD* program group.

1.11 Bugs and Enhancements

This section of the manual describes how and where to report a bug or seek an enhancement.

1.11.1 Reporting Bugs

If you encounter an unreported bug please submit detail regarding such to the **Bug Tracker** located at the [XTrackCAD Fork Project Site](#).

Be sure to provide the three basic elements of a bug report: What you were doing at the time the bug occurred, what you expected to happen and what actually happened. This detail will help developers replicate the error, find and correct the offending code.

A Sample Bug Report Follows;

After completing installation of *XTrackCAD* on a Dell PC with 1024 MB of memory running Windows 7, the following error occurred when attempting to edit a Text Label;

Notice: allocateButt: Can't find 13. Do you want to save the layout?

Selecting either "Yes" or "No" results in a Windows error and *XTrackCAD* closes.

The error can be replicated by opening the file named `cascade.xtc`. Set the magnification at 4:1. Attempting to move the text label named "Granville Island" located at the approximate grid coordinates of x=8", y=4' 5". Selecting the label causes the error to occur.

The error is repeatable with other files contain text labels.

Always search the bug database first. Advice so good, we'll repeat it twice. Always search the bug database first. The odds are good that if you've found a problem, someone else found it too. If you spend a few minutes of your time making sure that you're not filing a duplicate bug, that's a few more minutes someone can spend helping to fix that bug rather than sorting out duplicate bug reports.

If you don't understand an error message, ask for help. Don't report an error message you don't understand as a bug. There are a lot of places you can ask for help in understanding what is going on before you can claim that an error message you do not understand is a bug. (Once you've understood the error message and have a good suggestion for a way to make the error message clearer, you might consider reporting it as a [XTrackCAD Feature Request](#)).

Please be brief, but don't leave any important details out. This is a fine line to walk. But there are some general guidelines:

Remember the three basics: what you were doing, what you expected to happen, and what happened.

If you can recreate the problem the **Macro>Record** command can be used to record what happened. Try to isolate the problem by creating a minimal layout and recording as few commands as possible.

Don't report bugs about old versions. Every time a new version of *XTrackCAD* is released, many enhancements are added and known bugs are fixed. If you're using a version of *XTrackCAD* that's more than two revisions older than the latest version, you should upgrade to the latest version to make sure the bug you are experiencing still exists. (It's not a bad idea to upgrade even if your version is only a version behind the most current one.)

Only report one problem in each bug report. If you encounter two or more bugs that don't appear to be related create a separate bug report for each one. This makes the task of managing work assignments easier and may result in a quicker fix for the problem.

1.11.2 Enhancement Requests

Suggestions for improvements are encouraged and welcome. Submit your suggestion to the *XTrackCAD* Feature Tracker located at the [XTrackCAD Fork Project Site](#).

1.11.3 User Support

The developers maintain a forum [XtrackCAD User Forum](#) a Wiki at [XTrackCAD Wiki](#)

Chapter 2: Command Menus

2.1 Add Menu

Straight Track	Ctrl+G
Curve Track	>
Circle Track	>
Parallel	Ctrl+Shift+P
Predefined Track	Ctrl+T
HandLaidTurnout	Ctrl+Shift+I
Structure	Ctrl+Shift+C
Helix	Ctrl+Shift+H
Custom Turntable	Ctrl+Shift+N
Control Element	>

The Add Menu has all the actions related to adding track pieces to the layout.




- Circle Track - place a circle of track by selecting radius, tangent and or center (Section 2.1.1).
- Curved Track - lay curved track pieces using different modes for selecting start and endpoints and radius (Section 2.1.2).
- Hand-laid Turnout - lay a turnout in place on the layout. (Section 2.1.4)
- Helix - Add a helix. (Section 2.1.5)
- Parallel - create parallel track or line to existing flex-track, straight or curved track. (Section 2.1.6)
- Straight Track - lay straight track pieces of arbitrary lengths
- Structure - Add a predefined structure to the layout.
- Predefined Track - select a turnout or a piece of fixed track and place on layout.
- Custom Turntable - Place a turntable. (Section 2.1.10)
- Block - Create a block. (Section 2.1.11)
- Switchmotor - Create a switchmotor. (Section 2.1.12)
- Signal - Create a signal. (Section 2.1.13)
- Control - Create a control. (Section 2.1.14)
- Sensor - Create a sensor. (Section 2.1.15)

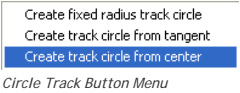
2.1.1 Circle Track



A circle track is a special form of a curved track that extends 360° and has no endpoints. The three methods (with their Shortcut keys) used to create a Circle Track are:

- (Section 2.1.1.1). Use the Fixed Radius specified on the *Circle Radius* control displayed on the Status Bar (Section 3.1). Left-Drag the Circle track into position.
- (Section 2.1.1.2). Left-Drag from tangent point (Edge) of the Circle track to the Center.
- (Section 2.1.1.3). Left-Drag from the Center of the Circle track to the edge.

A drop down menu, which allows selection of the Circle Track creation method, is invoked from the down arrow button  located on the right side the Circle track button. Dependent upon previous selection, the Circle Track button will look like  or 



If Snap Grid (Section 2.12.2) is enabled then circle centers will be constrained to the grid.

Circle tracks are useful for fitting curves into corners and other tight places. They're also handy when establishing an initial layout and finding out "what will fit".

You can join to and from circles, after which they become curved tracks.

2.1.1.1 Circle Fixed Radius



(Control-8) Use the Fixed Radius specified on the *Circle Radius* control displayed on the Status Bar (Section 3.1). Left-Drag the Circle track into position.

2.1.1.2 Circle Fixed Tangent



(Control-9) Left-Drag from tangent point (Edge) of the Circle track to the Center.

2.1.1.3 Circle From Center



(Control-0) Left-Drag from the Center of the Circle track to the edge.








2.1.2 Curved Track



Creating a curve is a two step operation.

The five methods (with their Shortcut keys) used to create a Curved Track are:

- Section 2.1.2.1. Drag out the end and then set its radius by dragging the endpoint.
- Section 2.1.2.2. Drag from the an endpoint to the center and then drag the second endpoint around that center.
- Section 2.1.2.3. Drag from the Center of the Curved track to one of the endpoints. Position the second endpoint around the center.
- Section 2.1.2.4. Drag from one endpoint to the other endpoint to form the Chord of the Curve. Drag the arc out to form the Curve.
- Section 2.1.2.5. Construct a Bezier by placing its four control points.

A drop-down menu, which allows selection of the Curved Track creation method, is invoked from the down arrow button  located on the right side the Curved track button. Dependent upon previous selection, the Curved Track button will look like      or 

Create curved track from end-point

Create curved track from tangent

Create curved track from center

Create curved track from chord

Curved Track Button Menu

For all but the Bezier Curve, two Red arrow heads will be drawn after the first step to indicate where you can Left-Drag to complete the second step.

A straight track will be created if the second endpoint is lined up with the first endpoint except for Bezier tracks.

The radius of the curve is designed to be in 1/8" increments unless the *desired radius* field is set non-zero and the radius drawn is close to that value, in which case the radius will snap to that value.

If the Snap Grid (Section 2.12.2) is enabled then the endpoints will be constrained to the grid if they are not snapped to another object. Shift ensures that other objects will be ignored.

Optionally, the curve center point and radius can be displayed for the Curve. This is enabled by the Move Label (Section 2.2.10) command.

For Beziers, the active control point will be drawn in red and the available endpoints are shown with circles.

Note: You can also create Straight and Curved tracks using section 2.2.8 by Left-Draging out extra track from an open end-point.

2.1.2.1 Curved Track from End Point



(Control-4) Drag from one endpoint in the direction of the Curve at that point and release. Left-Drag the red arrows to position the second endpoint.

While the first endpoint is being placed, and MagneticSnap (Section 2.12.1) is enabled, unless Alt is held, if the cursor is on a track, the new curve end will "Snap" to the nearest open track endpoint and you will drag out the second end in aligned to that track, once you are dragging the second end it will be restricted to an arc that has the same end angle as the first endpoint. After a track is competed, the new track will be connected to this first track. This will also happen with MagneticSnap set off - if Alt is held.

If Magnetic Snap does not find a end, if SnapGrid is enabled, the ends will snap to the nearest grid point unless Alt is held.

2.1.2.2 Curved track from Tangent



(Control-5) Drag from one of the endpoints (which will behave like the first point in "CurvedTrack From End" to the Center of the Curved track and release. Left-Drag on the arrows to position the second endpoint.

While the endpoints are being placed, if **MagneticSnap** (Section 2.12.1) is enabled, unless **Alt** is held down, they will "Snap" to an open track endpoint of the tracks underneath the cursor and you can only drag out the control point aligned to the end of those tracks. After the new track is completed, it will be connected to these existing track. If **MagneticSnap** is disabled, the snap will only happen if **Alt** is held. If **Magnetic Snap** does not find a end, if **SnapGrid** is enabled, the end will snap to the nearest grid point unless **Alt** is held.

2.1.2.3 Curved Track From Center



(Control-6) Drag from the Center of the Curved track to one of the endpoints and release. Left-Drag to position the second endpoint.

While the endpoints are being placed, if **MagneticSnap** (Section 2.12.1) is enabled, unless **Alt** is held down, they will "Snap" to an open track endpoint of the tracks underneath the cursor and you can only drag out the control point aligned to the end of those tracks. After the new track is completed, it will be connected to these existing track. If **MagneticSnap** is disabled, the snap will only happen if **Alt** is held. If **Magnetic Snap** does not find a end, if **SnapGrid** is enabled, the end will snap to the nearest grid point unless **Alt** is held.

2.1.2.4 Curved Track from Chord



(Control-7) Drag from one endpoint to the other endpoint to form the Chord of the Curve and release. Left-Click on the center of the track and Drag to form the Curve. The first end point acts like "CurvedTrack From End". If an exiting track end is selected, the Chord will only move along line orthogonal to the track.

While the endpoints are being placed, if **MagneticSnap** (Section 2.12.1) is enabled, unless **Alt** is held down, they will "Snap" to an open track endpoint of the tracks underneath the cursor and you can only drag out the control point aligned to the end of those tracks. After the new track is completed, it will be connected to these existing track. If **MagneticSnap** is disabled, the snap will only happen if **Alt** is held. If **Magnetic Snap** does not find a end, if **SnapGrid** is enabled, the end will snap to the nearest grid point unless **Alt** is held.

2.1.2.5 Curved Bezier Track



Left-Click to place one endpoint and Left-Drag out the first control point and release, Left-Click to place the second Endpoint and Left-Drag out the second control point and release. Once all 4 points are placed, you can pick one at a time and drag it to move it. Complete the Curve by pressing **Enter**, or Reject it with **Esc**.

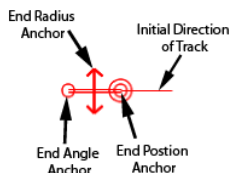
While the endpoints are being placed, if **MagneticSnap** (Section 2.12.1) is enabled, unless **Alt** is held down, they will "Snap" to an open track endpoint of the tracks underneath the cursor and you can only drag out the control point aligned to the end of those tracks. After the new track is completed, it will be connected to these existing track. If **MagneticSnap** is disabled, the snap will only happen if **Alt** is held. If **Magnetic Snap** does not find a end, if **SnapGrid** is enabled, the end will snap to the nearest grid point unless **Alt** is held.

2.1.3 Create Cornu Track



Left-Click to place each endpoint on an open track end or just on the layout. During the move to the click, if **MagneticSnap** (Section 2.12.1) is enabled, an anchor will show when the cursor is near an open end point. This can be inhibited with **Alt**. If **MagneticSnap** is disabled this will only happen if **Alt** is held. If **Magnetic Snap** does not find a end, if **SnapGrid** is enabled, the end will snap to the nearest grid point unless **Alt** is held.

Left-Drag if the endpoint not on an existing track drags out the end angle of the new track. This is shown by the Cornu endanchor.



The anchor is only drawn for Cornu ends that are not joined to existing tracks and it shows the position, direction and radius of the track, and has anchors for altering these properties. When the Cornu is joined to a track, it uses the properties of the end of that track instead. Anchor point handles are drawn outside the end of the Cornu track to allow track-pins to be edited on the track itself. Left-Click to place the second Endpoint either on a track endpoint or not. Left-Drag sets the second end angle like the first for unconnected end-points.

Complete the Curve by pressing **Enter**, or Reject it with **Esc**.

The radius and angle of the selected open Cornu end can also be set with text entry boxes in the Status Bar.

When either endpoint is being moved it will "Snap" to an open track endpoint of the tracks underneath the cursor unless **Shift** is held. You can then only move the endpoint along that track if it is splittable, or in an extension of it. After the new track is completed, it will be connected to these existing tracks.

Cornu Track Pins are further explained in Section 2.2.7.4 - they constrain the Cornu curve to smoothly pass through thier position as well as satisfying the end conditions. You can place them by clicking on the Cornu and select, *Drag* to move them around or hit *Delete* to remove them.

If the end is not connected, an anchor will enable the end-angle and radius to be set by dragging. Initially the end radius is set to be zero and the angle will be picked to create a smooth curve given the end

angle. Altering the end angle with the anchor resets the radius to zero.

2.1.4 Hand-laid Turnouts



Hand-laid turnouts are created by specifying 3 values:

- Position of *Frog*
- Angle of *Frog* (the frog number)
- Position of *Points*

First select the position for the Frog ([Section B.2](#)) on an existing track and then *Drag* away to specify the angle of the *Frog*. The angle in degrees and equivalent frog number is displayed on the status bar. When you release, the line indicating the angle jumps to one side of the track to show you the center line of the new leg of the turnout.

Next *Left-Click* and *Left-Drag* to position the *Points* ([Section B.2](#)) for the turnout. As you *Left-Drag*, tracks will be drawn showing the turnout. When you release the turnout is created.

You cannot place the *Frog* or *Points* on a turnout, circle or helix. However, you can create overlapping Hand-laid Turnouts.

There are constraints on where you can place the *Points* in relation to the *Frog*. You cannot place the *Points* too close the *Frog*. When placing Hand-laid Turnout on a curved track you may get unexpected results, especially when placing the *Points* a long way from the *Frog*. Try changing the *Frog* angle to get different results.

Note: the drawing is an approximation to show the location of the *Points* and *Frog*. The piece of track considered (by *XTrackCAD*) to be a Hand-laid Turnout is a short section of track located at the *Points* and extending toward the *Frogs*. Other track segments are created between the *Points* and *Frog* and a short straight segment is drawn after the *Frog*. These other segments are independent of the turnout and can be removed or modified, although this is probably not a good idea.

2.1.5 Helix Track

A helix track is used to change the elevation of track in a restricted space. A helix is drawn as a circle of track, but in 3 dimensions it would resemble a cork screw or the pattern of threads on a bolt.

A helix is defined by the number of *Turns* and *Radius*.

The helix dialog allows you to calculate these values based other parameters such as the *Elevation Difference*, *Grade*, *Vertical Angular Separation*. *Angular Separation* is the difference in degrees between tracks entering and exiting the helix. Changing any of these values effects the other values. For example, increasing the *Radius* decreases the *Grade*. Changing the number of *Turns* affects the *Vertical Separation* and either the *Radius* or *Grade*.

In the case where different parameters could be affected (for instance changing *Elevation Difference* can affect *Radius* or *Grade*) the last parameter you changed will be preserved. If you set the *Grade* and then *Elevation Difference* then the *Radius* will be adjusted.

Changing *Vertical Separation* affects *Turns* which must be an integer value (no fractions), and this in turn affects the *Vertical Separation*. When you set *Vertical Separation* you are specifying the minimum separation which is adjusted upwards to the actual value.

The separation is rail-head to rail-head and you need to ensure this is enough to provide clearance when track, sleepers, ballast, baseboard/benchwork is included.

Note: only the *Radius* and *Turns* are used when creating the helix. After joining the helix to other tracks, you will want to establish the heights of the endpoints at each end of the helix. You can use the *Elevation* ([Section 2.2.5](#)) command to do this.

A helix is placed the same way as a Circle Track ([Section 2.1.1](#)) with the addition that you specify the number of turns as well the as the radius of the helix. Then the helix is dragged into position on the layout.

You can join to a helix in the same way you join to a circle. However, once joined the helix is still drawn as a circle of track.

A label for the helix is drawn at it's center. If the elevations are set (either by a Defined Elevation point or connecting to a Defined Elevation point) for the two ends of the helix then the label contains the computed grade and vertical separation between layers as well as the number of turns and total length. The label can be moved or turned off by the Move Label ([Section 2.2.10](#)) command.

2.1.6 Parallel Track or Line

You can pick between two Parallel Commands:

[Section 2.1.6.1](#). You can create a new track parallel to any straight, curved, bezier, cornu or easement track.

[Section 2.1.6.2](#). You can create a line parallel to any straight, curved, bezier, cornu or easement track or straight lines, curved lines and PolyLines.

2.1.6.1 Parallel Track



Select the Track you want to parallel with **Left-Click**, and the new parallel track will appear beside it. You control which side the new track will be on by **Left-Dragging** the cursor from one side to the other of the selected track before releasing it.

Separation	<input type="text" value="2.000"/>	Radius Factor	<input type="text" value="0.000"/>
------------	------------------------------------	---------------	------------------------------------

The **Parallel Separation** control (Visible in the Status Bar) displays the intended separation between parallel tracks/line. This value can be changed before selecting a track. The value must be greater than 0.0 if the gauges are equal.

- If the gauges are equal, a value of 0.0 means that the rail of the second track is overlaid on the first to simulate dual gauge track. The railside that the new track "shares" is set by which side of center the cursor is on when released. The new track will have NoTies set on.
- The separation can be automatically increased using the **Radius Factor** value. If this is set to 0.0 (default) the separation value will be used regardless of radius. If the value is set to 1.0, the separation will be increased by a scaled 2864 inches per inch of curvature of the parallel track - this is in accordance with North American prototype practice. Other values of Radius Factor will alter by an equivalent percentage. For example, 0.5 would use 50% of this increase.

This command is very useful for creating sidings and yards as well as dual track.

- No parallel to a turnouts or a non-straight piece of sectional track is created.
- It is possible to create tracks that abut (the endpoints are very close and aligned). These endpoints will be automatically connected.

2.1.6.2 Parallel Lines



Select the Track or Line you want to parallel with **Left-Click**, and the new parallel line will appear beside it.

- Note that Lines are not joined - if you wish you can select a series of Lines and turn them into a PolyLine using [Section 2.2.7.1](#).

2.1.7 Straight Track



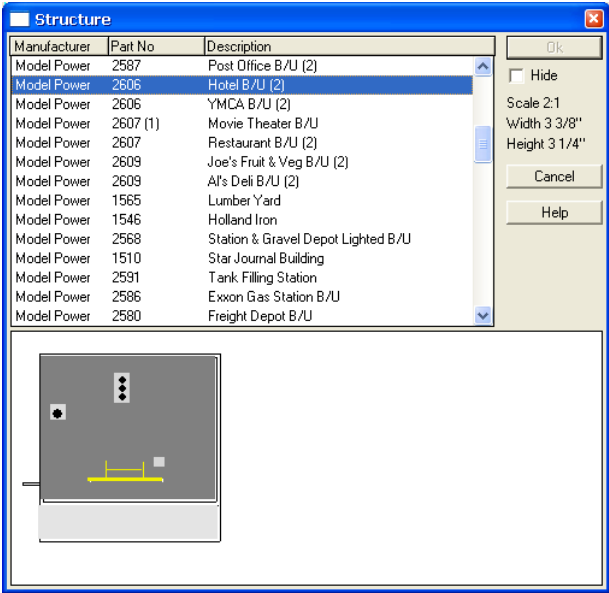
Straight track is created by **Left-Click** to select the first endpoint then **Left-Dragging** the cursor to the point where you want the second endpoint to be. Unless **Shift** is held down when the first endpoint is being placed and the cursor is on a track, the new straight end will "Snap" to the nearest open track endpoint and you can drag out the second end aligned to that track. After a track is completed, the new track will be connected to the existing track.

If the Snap Grid ([Section 2.12.2](#)) is enabled then the endpoints will be constrained to the grid.

2.1.8 Structure



The **Structure** command places diagrams of structures (buildings, bridges and other scenic elements) on the layout. The operation is similar to the Turnout ([Section 2.1.9](#)) command.



When you select a structure from the list, its diagram is drawn in the diagram canvas. The dimensions are also listed on the dialog.

The Structure Selection dialog will disappear while dragging on the layout if the Hide Check Box on the dialog is set. This is useful if you have a small screen.

See the Hot Bar (Section 2.7) command for details on placing Structures on the layout.

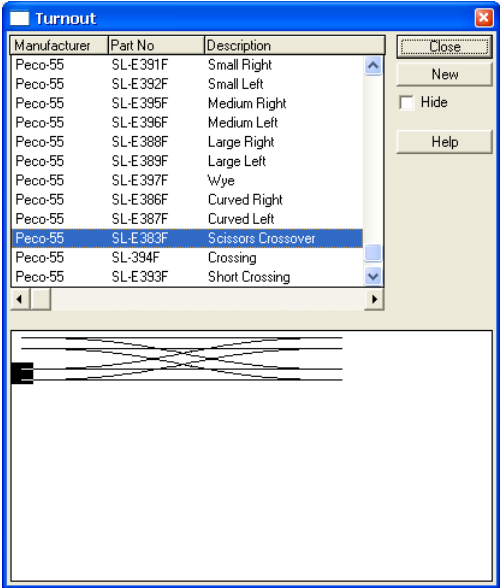
Structures are placed on the layout in same way as turnouts except that there is no *Active endpoint* and structures do not align with existing tracks.

2.1.9 Turnouts



Turnouts (and sectional track) are created by the Turnout command . When you select the turnout command, the Turnout Selection dialog is displayed which contains a list of available turnouts and sectional track for the current scale (Section 2.10.6) and a diagram of the selected turnout.

You can use the Parameter File Dialog (Section 2.5.5) to control what turnouts are available.



Select a turnout from the scrolling list by Left-Clicking on it. Move to the Layout and Left-Click where the turnout should be placed. The Turnout will snap to nearby flextracks or open endpoints. By Left-Dragging you can move the turnout around. Additional Left-Clicks change the way the turnout is placed.

The New button invokes the Turnout Designer (Section 2.9.9) dialog. This button displays a pop-up-menu list of various types of turnouts and sectional track.

The Turnout Selection window will disappear while dragging on the layout if the Hide Check Box on the dialog is set. This is useful if you have a small screen.

See the Hot Bar (Section 2.7) command for details on placing Turnouts on the layout.

2.1.10 Turntables



Turntables of specified diameter are created with the **Turntable** command.



The *Turntable Diameter* control (Visible in the Status Bar) displays the current diameter of the turntable. This value can be changed before dragging the turntable into position. The value must be greater than 0.0.

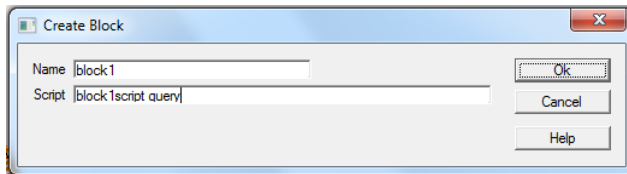
The **Modify** command (Section 2.2.8) can be used to create turntable stall tracks. Select the turntable and drag the stall track to the proper angle and length. You can also connect to a turntable with the **Join** command (Section 2.2.7).

The **Turntable Angle** control on the Preferences (Section 2.10.7) dialog controls how closely you can place tracks connected to a turntable. If you want to create stall tracks every 7.5°, set the **Turntable Angle** control to 7.5 and place the track as close to each other as allowed. *XTrackCAD* makes sure they will be separated by the correct angle.

2.1.11 Block



A block is created by first selecting the track segments in the block and then selecting **Create Block** from either the **Add** menu Section 3.3.1 or from the block menu on the hotbar. A block gets a name and a script. The name is only used for identification and the script is used by the layout control software. The script should provide whatever information is needed by the layout control software to determine block occupancy. This could be a code snippet to retrieve the state of the block occupancy or it could be the address of the sensor, etc.

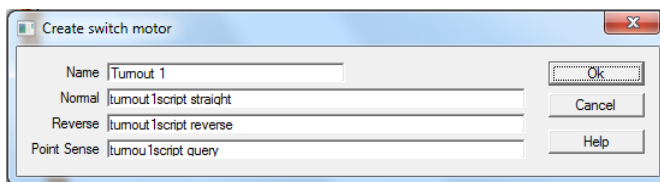


The create block dialog has spaces for two text strings. One is the name and the other is a block occupancy script. The name identifies the block and the script is information used by the layout control software to detect block occupancy. The script could be a code snippet or I/O device address information, etc.

2.1.12 Switchmotor



A switchmotor is created by selecting **Create SwitchMotor** from either the **Add** menu Section 3.3.1 or from the switchmotor menu on the hotbar and then clicking on a turnout. A switchmotor gets a name and three scripts. The name is only used for identification and the three scripts are used by the layout control software. The three scripts are for throwing the turnout to its "normal" position, throwing the turnout to its "reverse" position, and a script to read a point position sensor. These scripts could be code snippets or they could be addresses of I/O devices, etc.

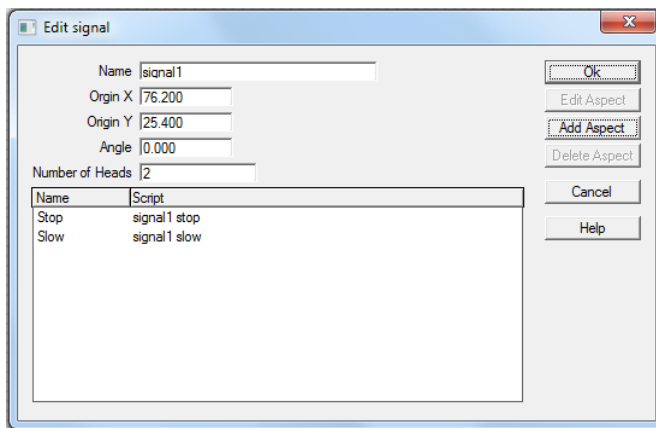


The create switchmotor dialog has spaces for four text strings. One is the name and the other three are scripts for Normal, Reverse, and Point Sense. The name identifies the switchmotor and the scripts are information used by the layout control software to throw the turnout to the normal position, throw the turnout to the reverse position, and sense the point position. The scripts could be code snippets or I/O device address information, etc.

2.1.13 Signal



A signal is created by selecting **Create Signal** from either the **Add** menu Section 3.3.1 or from the hotbar. Use the mouse to select a location (left button) and then dragging (left button down) the signal to set its orientation. Once the left button is released, a **Create/Edit Signal** dialog box is displayed, and you can fill in the signal's properties: name, fine tune the location and orientation, number of heads, and the aspects.

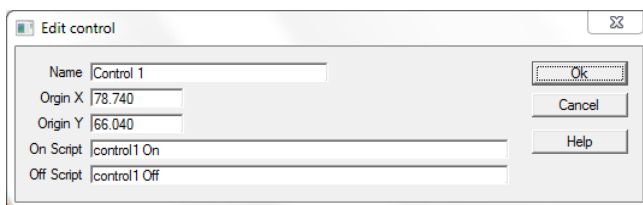


The create/edit signal dialog has spaces for the name of the signal, its location and orientation, the number of heads (1, 2, or 3), and a list of aspects. Each aspect has a name and a script. The name could be a rule book name (Clear, Approach, Stop, etc.) or the actual color(s) displayed (green, yellow, red, etc.). The script is just some information for the layout control software to actually effect the display of the aspect -- this could be the LCC event id to trigger the aspect or it could be a code snippet that causes the aspect to be displayed.

2.1.14 Control



A control is created by selecting Create Control from either the Add menu [Section 3.3.1](#) or from the hotbar. Use the mouse to select a location (left button) and then dragging (left button down) the control to where you want it. Once the left button is released, a Create/Edit Control dialog box is displayed, and you can fill in the control's properties: name, fine tune the location, and the on and off scripts.



The create/edit control dialog has entry fields for the name of the control, its location, and a pair of scripts, one to turn the control on and one to turn the control off. The scripts are just some information for the layout control software to actually effect the state on the control (on or off).

2.1.15 Sensor



A sensor is created by selecting Create Sensor from either the Add menu [Section 3.3.1](#) or from the hotbar. Use the mouse to select a location (left button) and then dragging (left button down) the sensor to where you want it. Once the left button is released, a Create/Edit Sensor dialog box is displayed, and you can fill in the sensor's properties: name, fine tune the location, and the script.



The create/edit sensor dialog has spaces for the name of the sensor, its location, and a script. The script is just some information for the layout control software to actually return the state of the sensor (on or off).

2.2 Change Menu

Properties	Ctrl+?
Select	Ctrl+E
Move	Shift+Ctrl+M
Rotate	Shift+Ctrl+R
Flip	
Modify	Ctrl+M
Join	Ctrl+J
Connect Two Tracks	Shift+Ctrl+J
Split Track	Shift+Ctrl+S
Move Description	Shift+Ctrl+Z
Raise/Lower Elevations	
Elevation	Shift+Ctrl+E
Profile	Shift+Ctrl+F
Clear Elevations	
Recompute Elevations	
Change Scale	

The Change Menu has all functions related to modifying objects that exist on the layout drawing.

Change Scale - change model scale and / or gauge of layout design. (Section 2.2.1)

Clear Elevations - remove elevation parameters from selected track(s).

Connect Two Tracks - creates a connection between track pieces with an option to slightly move the select piece(s) and the pieces they connect to. (Section 2.2.3).

Convert Tracks - changes fixed tracks (Straight, Curve, Joint, Bezier) into a Smooth Curve or vice versa. (Section 2.2.4).

Elevation - define an elevation at specified track location (Section 2.2.5).

Flip - turn selected object(s) over or around. (Section 2.2.6).

Join - connect two separate pieces of track. This command can be used to move one of the pieces of track to the endpoint of the other or to create a connection by laying a stretch of flex-track. (Section 2.2.7).

Modify - modify an existing track, or lines. (Section 2.2.8).

Move - move selected object(s). (Section 2.2.9).

Move Description - move the endpoint description of a track piece to another location. (Section 2.2.10).

Profile - display the elevation profile of a definable stretch of track (Section 2.2.12).

Properties - sets *XTrackCAD* into *Describe* mode. Whenever an object is clicked on while in this mode, the *Properties* dialog is opened. This dialog allows direct manipulation of settings such as the objects length, position or orientation. (Section 2.2.13).

Raise/Lower Elevations - raise or lower elevation of selected tracks. (Section 2.2.14).

Rotate - rotate selected object(s). (Section 2.2.15).

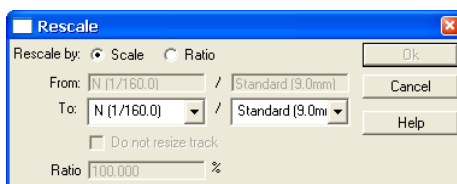
Recompute Elevations - performs a global re-computation of dynamic elevations. It should not be necessary to issue this command as elevations are recomputed as required.

Select - sets *XTrackCAD* into *Select* mode. Whenever an object is clicked on while in this mode, this selection state of this object is reversed. If an object was unselected it becomes selected, and vice versa. To unselect all objects press the ESC key, use *Deselect All* from the *Edit* (Section 2.4) menu or *Deselect All* from the *Pop-up* menu (Section 3.4.1). (Section 2.2.16).

Split - the *Split* commands are used to divide up tracks (Section 2.2.17.1) or split draw objects (Section 2.2.17.3) or use a second Object to Trim (Section 2.2.17.4). The (Section 2.2.17.1) command can be used in one of two ways;

- split a section of flex-track into two connected pieces at the point where a *Left-Click* is invoked or;
- disconnect turnouts or sectional track pieces at their point of connection.

2.2.1 Change Scale



Change Scale is used to change the size and gauge of selected (Section 2.2.16) objects. The amount to resize can be specified

- by the modeling scale, e.g., convert from HO to O scale
- by the modeled gauge, e.g., convert from standard gauge to narrow gauge, or
- by ratio (by 181.5%).

If resizing by modeling scale then track dimensions, e.g., lengths and radii, will be changed as well. An option is available to disable the resizing of the selected objects.

2.2.2 Clear Elevations

The Clear Elevations command is used to remove elevation points from selected track on the layout.

Using the Select command, select the track that is to have its elevation settings cleared then select **Change>Clear Elevations** from the menu bar to clear elevations of selected track.

2.2.3 Connect Tracks



This command is frequently used with *Sectional Track*. But it can be useful to reattach ordinary track which has become disconnected or split.

When in this connect, ends of tracks that can be selected are highlighted with a blue arrow. With *Shift* added, ends that can be tighten are highlighted with a blue "X".

There are three modes,

- a Left click on a track near a disconnected end-point followed by a second on a close-by disconnected end-point on another track will try to join two tracks
- a Shift-Left click on a connected track will "Tighten Tracks" moving other tracks connected to this track to reduce any small distance or angle differences
- Selecting a set of tracks followed by a "S" key or using the Context menu will prompt for confirmation that all selected tracks with unconnected endpoints should be joined to nearby selected track at an unconnected end point. This mode allows for an entire layout to be reconnected after a Select-All.

Notes for two track mode: Occasionally pieces of sectional track do not line up exactly, especially when creating figure-8's or passing sidings. When laying out the actual track you can compensate for this by adjusting the individual tracks to provide a bit of slack. This command simulates that process.

Click on the endpoint of each track you're trying to connect. XtrkCAD will move the tracks slightly in an attempt to overcome the gap. If the gap is too large, the connection will fail. If this occurs, try using other track pieces in your layout.

XTrackCAD adjusts the positions of tracks connected to the tracks up to a track with more than two connections. See the Demo for details.


If one (or both) the selected tracks is an adjustable section (such as Kato's Adjustable Track #20-050) then the length of the track is changed to fill the gap.



You can undo the effect of the Connect command by splitting (Section 2.2.17.2) the track to disconnect it then using the *Shift+Left-Click Connect* command on the unconnected endpoints to tighten connections between the tracks.

2.2.4 Convert Tracks

(Section 2.2.4.1). Convert Fixed to Cornu

(Section 2.2.4.2). Convert Cornu to Fixed.

A drop down menu, which allows selection of the Convert Mode, is invoked from the down arrow button () located on the right side the Convert Tracks button. Dependent upon previous selection, the

Convert Track button will look like  or 

2.2.4.1 Convert Fixed Track(s) to Cornu(s)



This command will take a pre-selected set of fixed track elements (Straights, Curves, Joint or Bezier) and convert them into a set of Cornu Tracks. If there are no selected Tracks, the user can click on a single track.

The Cornu(s) will smoothly pass through all the end points of the selected tracks and smoothly join to the end-points (if any). This may change the internal shape of the resulting track(s) due to smoothing. A subsequent section 2.2.8 can be used to fine tune the Cornu(s) by moving, adding and deleting "pins" in the combined shape.

This command is intended to help conversion of track designs that were made before Cornu Track existed to Cornu.

2.2.4.2 Convert Cornu(s) and Bezier(s) to Fixed Track(s)



This command will take a pre-selected set of Cornu and Bezier Tracks and convert them into a set of equivalent Straights or Curves,

The resulting track(s) will mimic the shape of the Cornu/Bezier(s) exactly. This command is intended to allow easier layout of smoothed shapes.

2.2.5 Elevation



The **Elevation** command changes the elevation of track endpoints. After opening this dialog, The Message Bar will show the computed elevation at the cursor. There will be an open blue circle if an endpoint will be selected with **Left-Click**. You click on the respective endpoint to set its elevation properties.

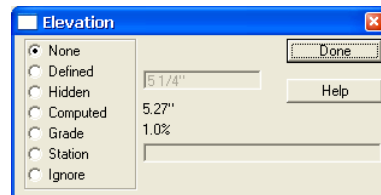
The endpoint which you are working on is indicated with a big red dot.

Moving around the layout will show you the elevation at the point indicated by a blue dot.

If you hover over a point where two unconnected tracks pass over one another, a blue square will be drawn and the Message Bar will show the two elevations and the Clearance between them.

If you add **Shift** as you move the cursor before clicking you will see a blue bar when it is over a track if a **Shift-Left-Click** will split the Track at that point (which will give you the opportunity to specify an elevation).

Adding **Ctrl** allows you to **Ctrl+Left-Click** to Select and **Left-Drag** to move Elevation Labels if both the option is set for them to be displayed and the Zoom level is correct, , Only Defined and Station endpoint labels can be moved.



An endpoint can have one of several elevation types:

- **None** - no elevation defined.
- **Defined** - a defined elevation at a specified height.
- **Hidden** - a defined elevation but not displayed on the layout.
- **Computed** - height is based on height of closest neighbors.
- **Grade** - grade is based on height of closest neighbors.
- **Ignored** - endpoint is not considered in computations.
- **Station** - assigns a name to the endpoint.

Note: Only one of these attributes can be assigned to an endpoint at a time. For example, an endpoint can not be defined as a Grade and a Station at the same time.

When an endpoint is selected on the layout by *Left-Click*, it is highlighted by a large red dot and its elevation type and values are displayed in the dialog.

Additionally, **Defined Elevation** endpoints are indicated on the layout by gold colored dots. **Ignored Elevation** endpoints are indicated by blue colored dots.

The grade at the specified endpoint is displayed next to the **Grade** radio button. For **Defined Elevation** endpoints, the grade on each side of the endpoint is displayed.

Defined Elevation endpoints are used to specify fixed heights of track endpoints. Typically, this would be where a grade changes or where clearances must be maintained. **Computed Elevations** and **Grade** markers can place between **Defined Elevation** endpoints. These values are not entered directly but are computed dynamically based on **Defined Elevations** of connected tracks. This allows labeling of elevations at intermediate endpoints without having to enter specific values. **Computed** markers can also be placed between a **Defined Elevation** point and the end of a track.

Stations are used to provide information for the Profile ([Section 2.2.12](#)) command.

All Elevation labels (including **Grade** and **Station**) are drawn on the layout in outlined boxes. These may be moved by the **Move Description** ([Section 2.2.10](#)) command. In addition, **Grade** labels have an arrow indicating the upwards direction.

2.2.5.1 Computing Dynamic Elevations

Elevations of Tracks are computed in following steps. The colors listed in each step are used as the background color of the Track Elevation Markers (if they are enabled ([Section 2.10.3](#))).

- The Shortest Paths between all *Defined Elevations* are computed. A Path stops at *Ignored* or *Defined* endpoints. The Elevation of any Turnouts on these Paths with more than two connections are computed as the average Elevation inversely weighted by distance along the tracks to the *Defined Elevation* points (*Blue*).
- The Elevation of any other tracks on the Shortest Paths are computed based on the distance along the tracks from the Turnouts computed in the first step and/or the *Defined Elevation* points (*Purple*).
- The Elevation of any remaining tracks is computed based on the average Elevation of the tracks found in the first two steps that they are (directly or indirectly) connected to, inversely weighted by geometric distance (*Gold*).
- Any remaining tracks are not connected to a *Defined Elevation* and do not have an Elevation.

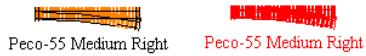
The elevation computation is performed incrementally every time the layout is changed to keep all elevations in sync. The performance of the computation is affected by the placement of the *Defined Elevation* endpoints and the number of Paths between them. Place the *Defined Elevations* at points where tracks begin to branch (such as the throat of a yard or at the ends of a siding). Also, use *Defined Elevations* to break the layout into areas so recomputation has fewer tracks and Paths to deal with.

2.2.6 Flip

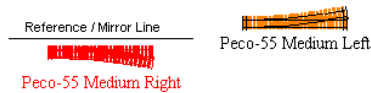


This command turns selected objects over or around, effectively mirroring the object .

1. Prior to invoking this command visualize how the selected object(s) will be flipped and determine where to draw a reference line that will act as an axis or anchor point for the flipped object(s).



2. Invoked the Flip command then *Left-Click* on one end of the reference line visualized in the proceeding step. Holding the *Left* mouse button, *Drag* the cursor across the layout to form the line visualized earlier.



3. Once a line of desired length and orientation appears, release the mouse button. The selected object(s) will then flip around the line as if it were a mirror.

Since flipped objects are mirrored, turnout titles may be modified during the flip process. Right hand turnouts will become left hand turnouts and vice versa. Such is the case in this example.

Certain turnouts, such as a Wye's, Three-Way or Crossings are symmetrical and thus titles for this type of objects are not changed. If a title change is necessary the currently loaded **Parameter Files** (Section 2.5.5) are searched for a turnout that matches the flipped turnout. If a match is not found, the turnout's title is prefixed with **Flipped**. The **Properties** (Section 2.2.13) command be used to change the title of such turnouts.

2.2.7 Join Tracks and Lines

The Join command has two variations,

(Section 2.2.7.2). Join Tracks by connecting them.

(Section 2.2.7.1). Create a PolyLine from two Draw Objects or Close a PolyLine as a Polygon.

2.2.7.1 Join Lines



The Join Line command produces a PolyLine from two Draw objects (Straight Line, Curved Line, Bezier Line or PolyLine). You select the two ends to join and the new Polyline will replace the two Draw objects, filling in any gap with a straight line segment. If the two ends are of the same PolyLine, an unfilled Polygon will be created.

2.2.7.2 Join Tracks



The Join Track command is used to bring together and connect any two segments of track. During the join process, *XTrackCAD* ensures the connecting tracks are properly aligned.

See **Help>Demo** (Section 2.6.1) for examples of how to join tracks.

For detail about:

Using complex curves If Easement is set to Cornu Section 2.2.7.4.

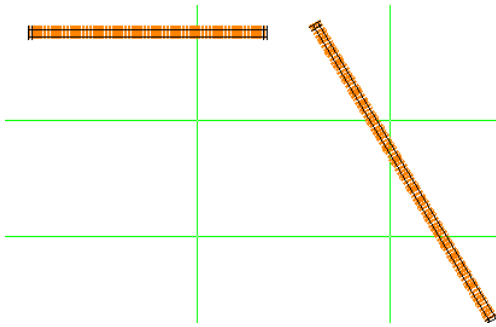
Using Normal Easements where tracks are either joined with a straight or a 'simple curve' section 2.2.7.3, e.g. one which uses a curve in a single direction as opposed to using reverse curves (Section B.2)

Using straight flex-track to join track segments refer to Section 2.2.7.6.

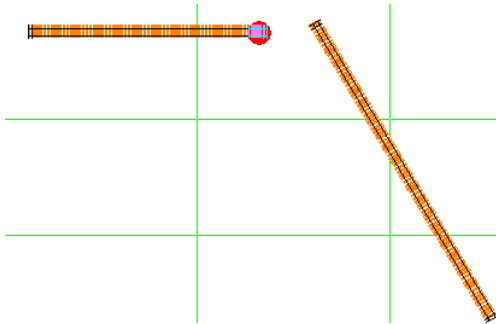
Moving one segment of track to join with another refer to Section 2.2.7.7.

2.2.7.3 Join with Normal Easement

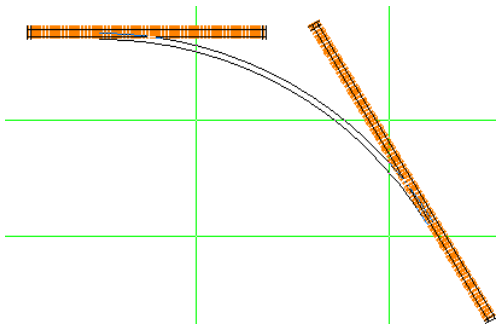
This type of Join does not work for Bezier or Cornu tracks, use Cornu Easements (Section 2.2.7.4) for these tracks instead.



1. Start the join process by clicking on the Join button ().



2. *Left-Click* the endpoint of one of the two tracks being joined. A red dot will appear as a reminder of which track has been selected.

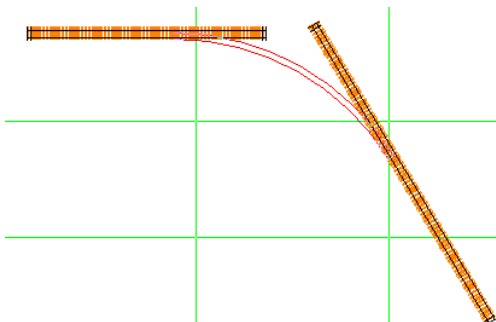


After the first track is selected, an entry field for preferred radius will be shown. A non-zero value will enable the snap anchor for the join radius.

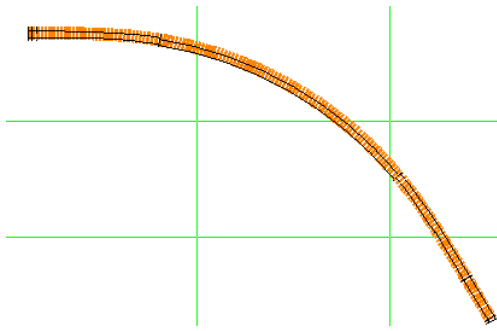
1. Move the mouse pointer over the endpoint of the other track then *Left-Click* and hold the mouse button down. A track connecting the two endpoints will appear.

If the track appears in black (and you are happy with the curve as its drawn), release the mouse button.

If the radius snap-anchor is active, and the position of the cursor is close to a position where the Join is exactly the desired radius, a blue circle will be shown. Releasing the button while it shows will snap the Join to the desired radius. If Easements are enabled as well, this fixed radius Join track will be joined to by easements.



2. If the track appears in red, it means *XTrackCAD* can't determine how to connect the first track with the second. If this occurs, while holding the left mouse button, drag the mouse back toward the first track until the connecting track appears in black. If the connecting track remains red, drag the mouse in the opposite direction until the connecting track turns black. Once the connecting track turns black, release the mouse button to finalize the *Join* command.



Throughout the above, the exact shape of the curve can be adjusted by dragging the mouse around while keeping the left mouse button held down.

Sometimes, no matter where you drag the mouse, the curve stays red and the tracks cannot be connected. This means the resulting curve is tighter than the minimum track radius set in the *Preferences dialog* (Section 2.10.7). If desired, this setting can be adjusted from the *Preferences dialog* using the *Options>Preferences* menu selection to raise the dialog. If changing the minimum track radius is not a desired option then it will be necessary to relocate one of the tracks that you're attempting to join.

You may also find that *XTrackCAD* will not create the connecting curve in the exact shape you want. If this happens it may be necessary to either move one of the end points or draw a partial curve (or straight) and try again.

If enabled, Easements (Section 2.10.4) will be automatically generated between tracks of differing radii. When using easements, there is a minimum radius as specified in the *Easement dialog*. It's not possible to join tracks with less than this radius and the connecting track's radius must be greater than the minimum radius.

If any errors occur while joining tracks (such as moving beyond the end of a track or using a curve with a radius smaller than the Easement radius), then the joint track will be drawn in Red (The default colour of Exception Track errors. See Section 2.10.1 for detail). This colouring serves as visual indication for a connecting track that doesn't meet minimum specified parameters (Section 2.10.7).

Any tracks created during the Join command will have the following properties inherited from the first track: selected state, hidden state, scale, track gauge and Layer.

A join can be made to or from a circle (Section 2.1.1) of track. Joining a track with a circle will cause the circle to be converted into a curved track.

For detail about:

Using straight flex-track to join track segments refer to Section 2.2.7.6.

Moving one segment of track to join with another refer to Section 2.2.7.7.

2.2.7.4 Join with Cornu Easement

Creating a Cornu Modifying a Cornu Cornu Easements

A Cornu is a form of curve that uses a mathematical approach to creating a curve between two sets of end conditions.

The curve is designed to change curvature linearly along its length - which is the characteristic of a railway easement because it minimizes sudden changes in acceleration towards the center of curvature.

The conditions used at each end are the radius, angle and position.

Cornus can have added constraints in the form of track "pins" that force the curve to smoothly pass through that point while still respecting the end conditions.

Cornus can be used in *XtrackCAD* to both Join tracks smoothly and form smooth curves that are not joined to other tracks.

Because Cornu are mathematically generated, they can also be regenerated at will and so Cornu Joins have the unique characteristic in *XTrackCAD* that they remain connected even if the tracks at the ends are moved or even change shape.

Cornu Joins will use whatever space is available - that is their "tightness" (rate of change of curvature) is variable and dynamic. The minimum radius is calculated and will show as an exception, but the acceptable rate of change of curvature is the choice of the designer.

It is not always the case that the Cornu will be the most efficient way to get from A to B - because of its shape it will be the smoothest. If you want to bias the result, you can add TrackPins (Section 2.2.7.5).

2.2.7.5 Cornu Track Pins

XTrackCAD Cornu can have "track pins" added that constrain the track to pass through those points in addition to meeting the end-conditions. This allows the track to be skewed or slewed around obstacles, or to suit some other constraint.

The pins can be added when Cornus are created Section 2.1.3 or during Section 2.2.8 after clicking on the track. They can be selected and then *Left-Click* dragged to alter the curve shape or deleted with *Delete*.

When a Cornu Track with pins is saved, it is split into two Cornu joined at the pin. If a Cornu that is joined to another Cornu is Modified with Section 2.2.8, the joints are rendered as Pins and the Modify is done for one continuous Cornu.

1. First, ensure that the Easement type option is set to Cornu - see section 2.10.4



2. Start the Join Track process by clicking on the Join Track button (

As you move over tracks a blue roundel will indicate the end that will be chosen with *Left-Click*.



Left-Click the open endpoint of one of the two tracks being joined. A red dot within a red circle will appear at the end of the join.

Left-Drag the endpoint to where you want it and release the button. The point will only move along the piece of track with the open endpoint (if this track type can be split) as far as the opposite end, or as an extension of that track at the selected end with the same curvature (if this track can be extended). Note that you will be able to fine-tune the end positions later.



Left-Click the endpoint of the other track being joined. Another red dot within a circle will appear at that end of the join.

Left-Drag the endpoint to where you want it and release the button. The second endpoint can only be moved along the second track as far as the other end (if it can be split) or as an extension beyond the end of this track (if it can be extended). The initial curve will be drawn - it will be red if the minimum radius is smaller than the minimum radius option.



You are now in "Select Points" mode.

You can select one end point at a time with Left-Click and move it with Left-Drag. If you drag the end point off the original track it will extend.

You can select a pin by Left-Clicking on it and move it with Left-Drag. Delete will remove the last selected Pin.

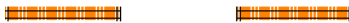
You can add a Pin by Left-Clicking on an area of the track with no Pin or end.

Once you are happy, hit *Enter* or the *SpaceBar* to finish editing the easement. Or hit *Esc* to cancel.

If you want to modify the Cornu later (even if it is joined at both ends) see [section 2.2.8.8](#)

2.2.7.6 Using Straight Flex-Track

This method of joining track may be used where the endpoints of the two tracks to be joined are on the same horizontal (x) or vertical (y) axis.



1. Start the join process by clicking on the Join button (



2. Left-Click the endpoint of one of the two tracks being joined. A red dot will appear as a reminder of which track has been selected.



3. Move the mouse pointer over the endpoint of the other track then Left-Click. A track connecting the two endpoints will appear.

When this command is used to join;

- two flex-track endpoints, one long section of flex-track without joints will result.
- two sectional track endpoints, a section of flex-track will be created between and used to join the two sectional track endpoints.
- one flex-track endpoint with one sectional track endpoint, the section of flex-track will be extended and joined with the sectional track endpoint.

Any tracks created during the Join command will have the following properties inherited from the first track: selected state, hidden state, scale, track gauge and Layer.

Turnouts and Sectional ([Section 2.7](#)) tracks can be joined to other tracks. *XTrackCAD* extends the selected endpoint with a straight track when making the connection.

A Turntable (Section 2.1.10) can be joined however it must be used as the second endpoint for normal easements but can be connected to either end with Cornu.

For detail about:

Using curved flex-track to join track segments refer to Section 2.2.7.4.

Moving one segment of track to join with another refer to Section 2.2.7.7.

2.2.7.7 By Moving Track

This method of joining track may be used to move, align and join one section of track with another.



1. Before initiating the Join command, the track that will be moved, aligned and then joined must be selected using the Select command (Section 2.2.16).



2. Once the track to be moved is selected, start the join process by clicking on the Join button .



3. *Shift+Left-Click* the endpoint of one of the two tracks being joined. A red dot will appear as a reminder of which track has been selected.



4. Then move the mouse pointer over the endpoint of the other (unselected and stationary) track with *Shift+Left-Click*. The selected track will be moved, aligned then joined to the stationary section of track.

For detail about:

Using curved flex-track to join track segments refer to Section 2.2.7.4.

Using straight flex-track to join track segments refer to Section 2.2.7.6.

2.2.8 Modify



The **Modify** command is used to change characteristics of tracks or draw elements or extend existing track by adding new track. The extend type of Modify command works with any unconnected track endpoint, or with *Turntables*, *Cornu(s)* or *Bezier* track can be modified even if connected. Selecting one Cornu which is connected to other Cornu(s) results in a single modification curve with control "Pins" at the connections.

The **Modify** command can be invoked using the **Change>Modify** menu item, the **Modify** button, by *Double-Click* in Select when hovering over a selected item or the menu raised by a *Right-Click* over the Main Canvas.

Before a track is selected for Modify, a dynamic blue anchor will show which track the command will take effect on if the cursor is close enough to a modifiable track or object. Arrows are shown to indicate if the track can be extended or trimmed and also if its radius can be modified if Shift is depressed as the cursor is moved over the track.

2.2.8.1 Extending Track

Either the left mouse button (for changing length or creating a tangent track) or the right mouse button (for extending with a new track) is used to modify an unconnected endpoint.

2.2.8.2 Modifying Objects

1. The endpoints of a *Line*, *Dimension Line*, *Table Edge* or *Benchwork* can be dragged to new positions.
2. The ends of a *Ruler* or the ends and origin of a *Protractor* can be dragged to new positions
3. A *Box* or a *FilledBox* can be modified by selecting a corner and dragging in two dimensions, or a side and dragging it orthogonally. This modifications preserve a 4-sided rectangle.
4. The controlpoints of a *Cornu Track*, *Bezier Track* or *Bezier Line* can be changed. Control "Pins" can be added, moved or selected and removed from *Cornus*.

5. *Curved Lines* are modified by dragging the end points and dragging the amount of central deflection (radius).

Any tracks created during the **Modify** command will have the following properties inherited from the first track: selected state, hidden state, scale, track gauge and Layer.

For more detail about:

Changing track length refer to [Section 2.2.8.3](#).

Creating a tangent to a curve refer to [Section 2.2.8.4](#)

Changing track radius refer to [Section 2.2.8.5](#)

Extending track length refer to [Section 2.2.8.6](#)


Modifying Draw elements refer to [Section 2.2.8.7](#)

Modifying Polygons and PolyLines refer to [Section 2.2.8.7.1](#)

Modifying a Cornu refer to [Section 2.2.8.8](#)

Modifying a Bezier refer to [Section 2.2.8.9](#)

2.2.8.3 Changing Track Length

1. Click the **Modify** button () to activate the **Modify** function.
2. With the mouse pointer hovering over the endpoint of the object to be modified, *Left+Drag* ([Section B.1](#)) to change the length of the track segment, table edge, bench-work, dimension line or line. If **MagneticSnap** is enabled, the end will snap to any close draw object. **Alt** inverts the **MagneticSnap** setting. If there is no nearby object and **SnapGrid** is enabled, the end will snap to a grid point unless **Alt** is added.

Left+Dragging the endpoint of a turnout (or other sectional track) causes a straight length of flex-track to be created from the selected endpoint to the cursor.

Left+Dragging the endpoint of a **Table Edge** ([Section 2.3](#)) allows the endpoint to be moved to a new position. If **Ctrl** is added and the endpoint is moved close to another **Table Edge** then the endpoint will be moved to it if not, the line will be a multiple of 90 degrees.

The length of a curved track can be changed to form an almost complete circle by selecting one endpoint of the curved track then dragging the cursor to the other endpoint. Going past the other endpoint creates a very small curve. Curves greater than 360° cannot be created.


For detail about:

Creating a tangent to a curve refer to [Section 2.2.8.4](#)

Changing track radius refer to [Section 2.2.8.5](#)

Extending track length refer to [Section 2.2.8.6](#)

2.2.8.4 Creating a Tangent to a Curve

1. Click the **Modify** button () to activate the **Modify** function.
2. With the mouse pointer hovering over the endpoint of the object to be modified, *Left+Drag* ([Section B.1](#)) to change the length of the track segment.

If a *Left+Drag* is continued beyond the radius of a curved track ([Section 2.1.2](#)) (not a Circle) a tangent to the curve will be created.

Creation of the tangent begins when the distance from the curved track center to the cursor is greater than 110% of the radius. If the cursor is moved within the radius of the curve then the current command exits and the *Changing Track Length* ([Section 2.2.8.3](#)) command is executed instead.

If **Easements** ([Section 2.10.4](#)) are enabled then an easement curve will be generated (if required) to connect the old and new tracks.

For detail about:


Changing track length refer to [Section 2.2.8.3](#).

Changing track radius refer to [Section 2.2.8.5](#)

Extending track length refer to [Section 2.2.8.6](#)

2.2.8.5 Changing Track Radius

This command is used to change the radius of a curved track or to curve a section of straight track.

1. Click the **Modify** button () to activate the **Modify** function.
2. *Shift+Left+Drag* the unconnected endpoint of a curved track to change the radius of track segment. Alternately, *Shift+Left+Drag* the unconnected endpoint of a straight track to add a radius to the track segment.
 - o For this command to work, the endpoint opposite that being manipulated must be connected to another track.

This command can be used to change straight tracks into curved track and vice versa.

For detail about:


Changing track length refer to [Section 2.2.8.3](#).

Creating a tangent to a curve refer to [Section 2.2.8.4](#)

Extending track length refer to [Section 2.2.8.6](#)

2.2.8.6 Extending Track Length

This command is used to extend the length of a straight or curved section of track.

1. Click the **Modify** button  to activate the **Modify** function.
2. With the mouse pointer hovering over the endpoint of the object to be modified, *Right+Drag* ([Section B.1](#)) to extend the length of the track segment.

The selected endpoint determines the position and angle of the first endpoint of the new track. The cursor is dragged to set the second endpoint. A curved or straight track will be created, depending on the position of the second endpoint.

If [easements](#) ([Section 2.10.4](#)) are enabled then an easement curve will be generated (if required) to connect the old and new tracks.

For detail about:

Changing track length refer to [Section 2.2.8.3](#).

Creating a tangent to a curve refer to [Section 2.2.8.4](#)

Changing track radius refer to [Section 2.2.8.5](#)

2.2.8.7 Modifying Draw Elements

Draw elements have blue handles that show how they can be modified. They also have text entry boxes that allow precise entry of parameters. These values become active when a *Tab* is entered, or the cursor is moved out of the text box.

There is a context menu accessed via *Right-Click* for Draw Objects that can change the edit mode from the initial "Points Mode" to "Origin Mode" where *Click* sets the position of the drawn object's origin - which will cause subsequent rotations using [Section 2.2.8](#) or [Section 2.2.13](#) to be centered about that point.

The context menu can be used to go back to Points Mode, or to set the origin to one of a number of defined points. There are text shortcuts - "o" for Origin Mode and "p" for Points Mode.

In Origin Mode, the context menu allows the origin to be set to be -

Absolute (shortcut "0") with the origin at the layout origin or
Relative by dragging the origin to a point, or snapping to the position of the first 4 corner points (shortcut "1" through "4"), or to the middle/centroid of the shape (shortcut "m"). For a Polygon or Polyline the *Relative* origin can be snapped to a last selected node (shortcut "l").

In Points Mode,

Lines have end points that can be dragged. *Shift+Drag* will snap the end to the end of a nearby Draw object, while *Ctrl+Drag* will snap to any point on a nearby Draw object. They have text entry boxes for length and angle.

Curves have end points that work like Lines but also have a middle anchor that can be used to alter the curve radius. They have text box entry for Arc Length (in degrees) and Radius.

Boxes have anchors for all corners and the middle of all sides. They have text entry boxes for width and height.

Bezier Lines - see [Section 2.2.8.9](#)

2.2.8.7.1 Modifying PolyLines and Polygons

When a Polygon or a PolyLine is modified, open blue circle anchors show the position of its "nodes", these are selected with **Left-Click** and are shown as filled circles.

- **Left-Drag** of a selected node of a *PolyLine* or *Polygon* moves that node to a new position, and if moved close enough to a neighboring node will merge the two nodes and delete the edge between them.
- **Delete** will remove a selected node.
- **Left-Clicking** on an edge will create a new node that can be dragged to position it.
- Multiple points can be selected using **Shift+Left-Click**. If these are then **Left-Dragged** all the selected points move together, preserving relative position.
- There is a context menu that has controls for a selected point. It has options to alter the node into a rounded node (shortcut "r") or a smooth node (shortcut "s"). To turn it back into a sharp (vertex) node (shortcut "v").
- If *Shift* is held down while dragging, the relative angle for the first selected point to its predecessor point will be locked to a multiple of 90 degrees.
- When a node or nodes is/are selected, text entry boxes for length and relative angle (the deviation angle from the direction of preceeding side) can be used to fine-tune the position of the first node in the sequence. A arc indicator identifies the angle in question.

If no nodes are selected,

- A context menu can be used to close a polyline into a polygon (shortcut "g") or open it (shortcut "l") into a non-filled polygon between its last and first nodes.
- A unfilled polygon can also be filled (shortcut "f") or a filled one emptied (shortcut "u").

Notes


A selected Polygon or Polyline node can only be deleted if there are at least three nodes left. It can only be round or smooth if long as it isn't an end node of a Polyline.

Smoothed nodes implement a short Bezier curve that goes from halfway along the line of to the next node and which has a control arm that ends at the node. These are typically of most use to fine-tune a series of nodes that simulate a complex curve.

Rounded nodes start at a distance that is half the shorter of the lines from the last node and to the next node and has control arms that extend to the half-way point to the node. This produces an arc whose radius is determined by the distance of the closet node. By manipulating the nearest node (for example, by adding a point) the radius at the node can be controlled.

2.2.8.8 Cornu Easements Modifying a Cornu Track

Because a Cornu Track is defined by its end points position, angle and radius - it can only be directly modified by dragging an end point along a track, or altering its end conditions if it is not joined to another track. It can also have added "Pins" which constrain the curve to smoothly pass through a point.


1. Click the **Modify** button () to activate the **Modify** function.
2. Click on the Cornu track. The track ends will turn into roundels. If any other Cornus are connected at either end, the entire connected set will be modifyable as one Cornu with intermediate "Pins" at the connections.
3. *Left-Click* an endpoint and *Left-Drag* it to move the endpoint along a connected track, or beyond it if you want that track extended. If there is no track the endpoint is free to move.
4. For an unconnected end point, *Left-Click* on the Radius or Angle anchors and *Left-Drag* it to adjust them.
5. *Left-Click* an Pin and *Left-Drag* it to move the pin and make the curve to pass through it.
6. *Left-Click* the track where a Pin doesn't exist to add a Pin and *Left-Drag* it to alter the curve to pass through a defined point.
7. *Delete* to delete the last seelcted Pin, the curve will change to meet the end conditions and pass through any remaining Pins.
8. Repeat with the other end-point or Pins if desired
9. Once you are happy, hit the *spacebar* or *Enter*, or to cancel hit *Escape*.

Note: If the Modify command contained Pins, *spacebar* or *Enter* it will output a set of connected Cornu(s) joined at the Pin points.

Note: A Cornu can also be modified by moving or rotating a connected track.

2.2.8.9 Modifying a Bezier

Because a Bezier is defined by its control points position - its shape can only be modified by dragging an control point.

1. Click the **Modify** button () to activate the **Modify** function.
2. Click on the track. The control points will appear
3. *Left-Click* a control point and *Left-Drag* it to move it.
4. Repeat for another end point if desired
5. Once you are happy, hit the *spacebar* or *Enter*, or to cancel hit *Escape*.

Note: A Bezier's end point will only be modifyable if it is not connected. Both internal control points can be modified even if the track is connected.

2.2.9 Move



This command is used to move selected (Section 2.2.16) objects around the layout.

The Move command can be invoked using the **Change>Move** menu item or the **Move** button and from the menu that's raised by a *Right-Click* over the **Main Canvas** or by the *Shift+Left+Drag* command when in **Select** mode.

Successful use of this command requires selection of the object(s) to be moved before attempting to move it. An object is selected by using the *Left-Click* command. A group of connected objects can be selected using the *Shift+Left-Click* command.

A move can be achieved using one of the following methods;

Left+Drag using the mouse. See Section 2.2.9.1 for detail.

Selecting fixed or specified amounts of translation in the X and Y directions using a *Right-Click* menu. See Section 2.2.9.2 for detail.

During a Move of tracks, and **MagneticSnap** (Section 2.12.1) is enabled, if one of the end-points of the selected objects is close to an open end of a unselected point, two anchors (an open an closed blue

ball) will appear. This indicates that the two points will auto-join and that all the moved tracks will align to the unselected point if the Move is stopped. This behaviour can be suppressed with *A/t*. If **MagneticSnap** is disabled, the alignment will only occur if *A/t* is pressed.

Note: If the moved track is connected but the track it is connect to is not moved, it will be disconnected, unless that track or the last selected track is a Cornu, in which case the Cornu concerned will be modified (if possible) to remain connected.

Note: Cornu tracks connected to a turntable will be modified if it is moved or rotated. They remain connected at the point on the radius where they started, so it may be desirable to delete and redraw them if the rotation is large.

2.2.9.1 Using Mouse

Once object(s) are selected, *Left+Drag* is used to move them around the layout using the mouse.

Alternatively, *Shift+Ctrl+Arrow* can be used to micro-move the selected object(s). The amount micro-moved is dependent on the zoom in use. To move by smaller increments, zoom in further. My moving to macro-zoom modes extremely fine adjustments can be made.

Remember that unattached objects can also be moved to exact positions using the [Section 2.2.13 Command](#) or by the [Section 2.2.9.2](#).

2.2.9.2 Using Values of X and Y Translation

Move An Object Using Fixed or Specified amounts of X and Y Translation.

A pop-up menu with additional menu items allows you to Move the selected object(s) through through any amount you specify.



The **Move** command is executed as follows;

1. Select the object(s) to be moved.
2. *Shift+Right-Click* to raise the Move/Rotate menu.

Any amount of precise translation may be entered by *Left-Clicking* the Enter **Move...** menu item then entering a desired amount of translation in X and Y in the dialog window that appears.



2.2.10 Move Description



This command is used to enable and move Elevation, Grade, Station ([Section 2.2.5](#)), Straight Track ([Section 2.1.7](#)), Curved Track ([Section 2.1.2](#)), Bezier ([Section 2.1.2.5](#), Cornu ([Section 2.1.3](#)), Helix ([Section 2.1.5](#)) and Structure or Turnout ([Section 2.7](#)) Labels.

The **Move Description** command can be invoked using the **Change>Move Description** menu item or the **Move Description** button.

Click the **Move Description** button to activate the **Move Description** command. As the cursor passes close to an object that can display a label it will be highlighted. A dark blue indicates a label that has "Show Description" set on, a light blue set off.

Use *Left+Drag* to move the label to a new position and unhide if hidden. Once moved, the label becomes fixed in a position relative to the object. Subsequent moves of that object will cause the label to move as well.

This operation can also be invoked by *Ctrl+Left+Drag* when in Select command ([Section 2.2.16](#)).

The letter "h", can be used to hide display of individual Curved Track, Bezier Track, Cornu, Helix or Turnout Labels. The letter "s" will show a hidden description. The letter "d" will enable and disable detailed descriptions. There is a **Context Menu Show/Hide Toggle** as well.

Note - existing defined elevation labels can be moved, but controlling thier visibility is done with the [Section 2.2.5](#) command.

2.2.11 Pan/Zoom



This command is used to move or resize the viewport using the mouse or keyboard. *Left+Drag* Pans the viewport up and down, left and right keeping it within the boundaries of the layout. *Ctrl+Left-Drag* selects an area of the screen to zoom into. The "0" or "o" - key resets the display to the origin but leaves the zoom as is. Keys between 1 and 9 set the zoom to that zoom level. The "e" - key resets the origin to zero and the zooms to show the whole layout.

There is a context menu that contains these text based items as well.

Zoom/Pan Shortcut Keys

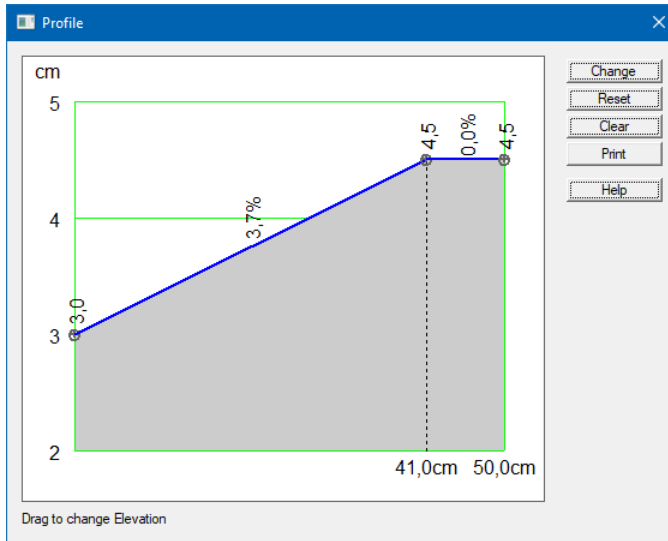
- Keys '1'-9 set the zoom to between 1::1 and 1::9.
- Key 'e' sets the zoom to a value that allows all the room to be shown and moves the origin of the bottom left of the window to 0,0

- Key '0' or 'o' keeps the zoom as is, but moves the origin of the bottom left of the window to 0,0
- Key 'c' moves the center of the window to the cursor position but leaves the zoom alone

As the window is Zoomed In and out, the setting of **Constrain Drawing Area to Room Boundaries** setting in the **Display** [Section 2.10.3](#) dialog determines where the zoom is about. If it is not set, the center of the Drawing Area will stay fixed as the zoom changes. Otherwise, position of the Drawing Area will be constrained so any grey area will be to the right or above the room boundaries.

2.2.12 Profile

The Profile dialog draws a profile showing elevations, distances and grades for a path on the layout.



Choose a path by using *Left-Click* on endpoints. As each endpoint is chosen, the path is extended via the shortest route. Selecting the end of the path trims the path back to a last **Defined Elevation** point (if any, otherwise the path is cleared).

If no route is possible an error message is displayed. There are several reasons why this might happen:

- The tracks are not connected. You can see this more easily if you turn on **Display->Option->"Display Unconnected End Points"** as Exception. You can also check this by using *Shift+Left-Click* on one track using the **Select** command ([Section 2.2.16](#)). This selects all tracks connected (directly or indirectly). See if the other track is selected.
- One of the endpoints on the route is **Ignored** ([Section 2.2.5](#)). Look for blue dots on the expected path when using the **Profile** or **Elevation** ([Section 2.2.5](#)) commands.
- The only route connects to a section of track that is already on the path and is not the end of the path. Remove the end of the path until the connected track is not on the path.

The path is drawn in the Profile Color ([Section 2.10.1](#)) (default Purple) on the layout.

If the shortest path is not what you want, you can choose endpoints that are closer to the end of the path. Also, you can **Ignore** ([Section 2.2.5](#)) endpoints to prevent the path from choosing a route through that endpoint. *Shift+Right-Click* ([Section 3.4](#)) displays a pop-up menu that allows you to change the specified endpoint to be a **Defined**, **Ignored** or **None** Elevation endpoint.

Each **Defined Elevation** endpoint on the path is drawn as a Vertical bar, labeled with its height and distance from the beginning of the path.

The **Grade** between points is displayed between the vertical bars. The **Grade** line is drawn in Blue if that portion of the path does not contain more than one **Shortest Path** between **Defined Elevation** endpoints. Otherwise it is drawn in Red, to indicate the grade is an average and the actual grade may vary for any particular track segment. See **Computing Dynamic Elevation** ([Section 2.2.5.1](#)) for more details.

Stations on the path are displayed along the bottom of the **Profile**.

The heights of **Defined Elevations** can be changed by using *Left+Drag* on the profile window. As you **Drag**, the new elevation and grades to each side are displayed at the bottom of the profile dialog.

The **Change** button makes the changes in the Profile dialog permanent.

The **Reset** button deletes all changes since the last press of **Change** or the start of the dialog.

The **Clear** button preserves elevation settings established along the current profile path, removes all profile points and leaves the **Profile** dialog open for selection of the next set of profile points. This function is useful when there's a need to view elevations along multiple profile paths.

The **Print** button prints the dialog. The aspect ratio is preserved on the print-out. You will probably want to print in landscape format.

The dialog can be closed with the 'X' button in the window's titlebar.

2.2.13 Properties



Clicking on the Properties (Describe Mode) button cancels all active commands, closes any open dialog windows and places focus on the main window.

Until an object is selected, the object under the cursor that will be selected with *Left-Click* is highlighted in blue. Objects in Frozen Layers will only be highlighted and selected if **Shift** is added.

A *Left-Click* on an object while in Properties mode causes a properties dialog window to appear. The properties dialog contains information pertaining to the selected objects size, position, size, color and layer as appropriate for each type of object. Certain values can be changed to modify the object. Some values, e.g., endpoint positions, can not be changed if, for example, a Track is joined to another Track. The values will take effect when Enter, Tab is pressed or the cursor leaves the entry field.

Turnout (T2)

End Pt 1: X,Y

79.2500

27.0000

Angle

270.000

Z1

0.0000

End Pt 2: X,Y

89.4075

27.0000

Angle

90.000

Z2

0.0000

End Pt 3: X,Y

89.4075

26.0000

Angle

102.000

Z3

0.0000

Grade

0.000

Origin: X,Y

79.2500

27.0000

Angle

0.000

Manufacturer

Peco

Name

RH Long Turnout, Electrofrog

Part No

SL-E188

End Pts

3

Segments

4

Layer

1 + Main

Done

Cancel

Help

The selected object is highlighted by a grey area.



2.2.13.1 Draw Object Describe Fields

2.2.13.1.1 Common Draw Object Fields

If the Object is a Line, Curve, Circle or Polygon object, and the rotation origin is non-zero, a large blue cross will show its position. If it is zero, the command starts with the **Lock Origin** field unticked and the **Rotate By** field greyed out.

Some fields are used by multiple types of objects - these are listed below

- Line Width
- The width of the line for a line, curve or unfilled object can be set. 0 means a pixel width at all scales. Other values are the width of the line in scale units. If the value is negative, it is the absolute value of pixels wide at all scales.
- Pivot
- The Pivot control can be set to fix in place the start, or the middle or the end, and it applies to the Length, Line Angle and Angular Length controls. When these are changed the new dimensions are applied so as to keep the locked position in place.
- Rotation Origin
- By default the rotation origin is the Layout origin {0,0}. If the origin is not at the Layout origin, it will be displayed with a blue cross. When the origin is changed with the **Lock** off, the object is not moved. But if the origin is changed with the **Lock** on, the object will be moved as well. Enabling the **Lock To Origin** allows subsequent Rotations to be about the origin. This may be especially useful when using creating larger groups of Draw objects.
- Lock To Origin
- Locking to the rotation origin makes the distance between the First Point and the origin fixed. If this is set on, altering either the First Point or the Rotation Origin will move the both values. This value is initially set to locked if the Draw origin is non-zero when the [Section 2.2.13](#) command is started but can be unset to allow repositioning of the Rotate Origin without moving the object in the layout. If the Rotate Origin is set to {0,0}, the Object has an *Absolute* origin.
- Rotate By
- Some Draw objects (Polygon, Polyline, Lines, Curves, Circles, Text) can be rotated about their rotation origin in Describe. In order to rotate them, the **Lock To Origin** must be enabled. After the rotation completes, the rotation angle will be set back to zero and all the points of the object will be adjusted to their absolute position in the layout. Negative values of rotation are counter-clockwise. Note that for Text objects, the Rotation also changes the **Text Angle**.
- Layer
- The layer of the object. The object can be moved between layers if the layer is not frozen. Only non-frozen layers are listed as options.
- Color
- The color of the line or the fill can be set

2.2.13.1.2 Straight Line Objects Describe Fields

- End Pt 1
- For Straight Lines the object has a starting position (or first point) - altering this value causes the whole object to move relative to the layout origin.

End Pt 2

Straight Lines have a second point, altering this, moves just that end of the line, altering its length as needed.

Line Angle

Straight Lines have an angle - this is the angle between the two points, altering this moves the ends so as to respect the **Pivot** control setting.

Length

The Length control can add to the start or end or both of a Line object depending on the setting of the **Pivot** control setting.

2.2.13.1.3 Dimension Line Objects

Size

The size of the arrows and text can be set to Tine, Small, Medium or Large.

2.2.13.1.4 BenchWork Objects Describe Fields

Lumber

A set of standard dimensions of timber sizes that are often used to construct benchwork. They are specified in "nominal" dimensions but drawn in "actual" dimensions.

Orientation

The timber can be orientated "On Edge" which will draw the smaller dimension or "Flat".

2.2.13.1.5 Curved and Circle Objects Describe Fields

Center

Curved Lines and Circles have a center. Moving this moves the object.

CW Angle and CCW Angle

Curved Lines have an angle relative to the center that the arc starts and and one where it ends.

Angular Length

For Curved Lines this is the length of the arc in degrees. If altered it will move the arc to respect the **Pivot** control setting.

2.2.13.1.6 Polygon Objects Describe Fields

Fill

Some draw objects (Circles, Polygons) can be filled or emptied - note that PolyLines can not be filled - they have to be closed first.

Open

Unfilled Polygons can be opened to become PolyLines or PolyLines closed to become Polygons. Note that PolyLines can't be filled, they have to be closed first.

Point Count

Polygons and PolyLines have a count of nodes - this is read-only.

Height and Width

Rectangular Polygons have two properties that can alter the Height and Width of the Polygon

Line Type

Straight and Curved Lines, PolyLines, Polygons and Structures can be drawn with dotted, dashed, dash-dotted and dash-dot-dotted lines.

2.2.13.1.7 Text Objects Describe Fields

Text Angle

For Text objects, the Text Angle determines the absolute angle the text is rendered at.

This will be set by itself or by rotation of the starting position about the Rotation Origin with **Lock to Origin** set.

2.2.13.2 Structures, Sectional Track and Turnouts Describe Fields

Pivot

The Pivot fixes the point about which the Angle of Rotation will occur to be the Start (Bottom Left) Point, the middle of the object, or End (Top Right) of the object. These relative positions are calculated as though the object was rotated by zero degrees.

Angle

The Angle rotates the object about the Pivot point.

2.2.13.3 Describe Track Fields

2.2.13.3.1 Common Track Object Fields

End Pt 1

For the starting position (or first point) - altering this value causes the whole object to move relative to the layout origin. This can only be changed if the track is unconnected at that end. The elevation is shown beneath the X,Y as a read-only Z value.

End Pt 2

The end position (or second point), altering this, moves just that end of the line, altering its length as needed. This can only be changed if the track is unconnected at that end. The elevation is shown beneath the X,Y as a read-only Z value.

Grade

The calculated grade between the two end-points

Layer

The layer of the object. The object can be moved between layers if the layer is not frozen. Only non-frozen layers are listed as options.

Length

The length of the track object. This can be set for a Straight Track if it is not connected, and will respect the value of the **Pivot** field.

Pivot

The Pivot control can be set to fix in place the start, or the middle or the end, and it applies to the Length, Track Angle and Angular Length controls. When these are changed the new dimensions are applied so as to keep the locked position in place.

2.2.13.3.2 Straight Track Describe Fields

Track Angle

The angle of the Track object. This can be set if the track is not connected. It respects the value of the **Pivot** field

2.2.13.3.3 Curved Track Describe Fields

Center

The center point of the curve. The center can only be modified if both ends are unconnected.

Radius

The radius of the curve. The radius can only be modified if one end is not connected.

Angular Length

The length of the curve in degrees. Modifications respect the **Pivot** value and are only available if at least one end is disconnected.

CCW Angle

The Counter-Clockwise Angle (the angle from the center to the first position). Can only be modified if the first end of the curve is not connected.

CW Angle

The Clockwise Angle (the angle from the center to the end position). Can only be modified if the second end of the curve is not connected.

2.2.13.3.4 Cornu Track Describe Fields

End Angle

Each end has an angle which helps determine the curve shape. It can only be set if the Track is not joined at that end.

End Radius

Each end has an radius which helps determine the curve shape. It can only be set if the Track is not joined at that end.

End Pt

Each End Point has a position. It can only be set if the Track is not joined at that end.

Center

Each End shows the center of the curve of the end segment - this is a read-only field. If the radius is zero, the field will show {0,0}.

Minimum Radius

This is the approximate smallest radius along the curve based on curve fitting to the Cornu.

Maximum Rate of Curvature

The maximum rate that the radius is changing over its length based on curve fitting. It gives an idea of the "sharpness" of the curve.

Total Winding Angle

The number of degrees that the curve executes - this number will rise if there are loops in the curve.

2.2.13.3.5 Cornu Track Describe Fields

Ctl Pt

The positions of the two Bezier control points. These will only be adjustable if the end they control is not attached to another track.

End Angle

Each end has an angle which is set by the control arm at that end - this is a read-only field

End Radius

Each end has an radius which is driven by the curve shape - this is a read-only field

End Pt

Each End Point has a position. It can only be set if the Track is not joined at that end.

Center

Each End shows the center of the curve of the end segment - this is a read-only field. If the radius is zero, the field will show {0,0}.

Minimum Radius

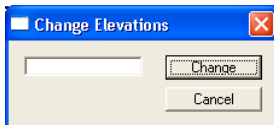
This is the approximate smallest radius along the curve based on curve fitting to the Bezier.

Most commands return to **Properties** mode then they terminate unless the command is sticky ([Section 2.10.8](#)).

Note: the Default Command radio button on the **Command Options** ([Section 2.10.2](#)) dialog controls whether the **Properties** or the **Select** ([Section 2.2.16](#)) command is used as the default command.

2.2.14 Raise or Lower Elevation

This command allows you to raise or lower the elevation of all selected tracks.



The entered value is added to all Defined Elevations on the Selected tracks. A negative value will lower the Elevations.

2.2.15 Rotate



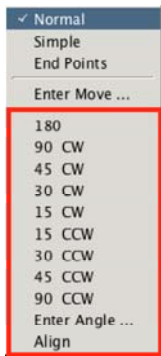
This command is used to rotate selected ([Section 2.2.16](#)) objects.

The **Rotate** command can be invoked using the **Change>Rotate** menu item, the **Rotate** button, the menu raised by a *Right-Click* over the **Main Canvas** or by the *Ctrl+Right-Drag* command when over a selected track in **Select** mode.

Successful use of this command requires selection of the object(s) to be rotated before attempting to rotate it. An object is selected by using the *Left-Click* command. A group of connected objects can be selected using the *Shift+Left-Click* command, or individual tracks added with *Ctrl+Left-Click*.

A pop-up menu with commands controlling how objects move during the **Rotate** function can be activated by entering a *Shift+Right-Click* command while hovering over the **Main Canvas**.

Note that a **Rotate** command for a Draw object does not use the Rotation Origin of that Object, even if has been defined as non-zero, instead it uses the position defined by the mouse or context command, and does not rotate the rotation origin.



Rotation can be achieved using one of the following methods;

Left+Drag using the mouse. See [Section 2.2.15.1](#) for detail.


Selecting fixed or specified degrees of rotation using a *Right-Click* menu. See [Section 2.2.15.2](#) for detail.

Aligning the selected object with another object on the layout. See [Section 2.2.15.3](#) for detail.

During Rotation of a track, if **MagneticSnap** ([Section 2.12.1](#)) is enabled, if one of the end-points of the selected objects is close to an open end of a unselected point, two anchors (an open and a closed blue ball) will appear. This indicates that the two points will auto-snap and the moved track will align to the unselected point if the Rotation is stopped. This does not happen if *Alt* is used. If **MagneticSnap** is disabled, the snap will only occur if *Alt* is held. Note that this also applies to [Section 2.2.9](#).

2.2.15.1 Using Mouse

Rotate An Object Using the Mouse

1. Select the object(s) to be rotated.
2. Click the Rotate button  to activate the Rotate function.
3. Visualize an axis point on the object that's to be rotated then place the mouse pointer over that point. If the track is a turntable, the point will be snapped to the turntable center if the mouse is within a quarter of the radius length of it.
4. Click and hold the left mouse button then drag (*Left+Drag*) the mouse away from the axis point to create a "handle". This handle will be used to rotate the object. While continuing to hold the left mouse button, drag (*Left+Drag*) the handle in the desired direction of rotation. **Note:** If the *Shift+Ctrl* key is pressed in conjunction with *Left+Drag*, the object will rotate in increments of 15°.
5. Release the mouse key once desired rotation is obtained.
1. If **Magnetic Snap** is enabled and the *Alt* button is not pressed, or if the *Alt* button is pressed when it is disabled, a magnetic anchor will be displayed if an end of the rotated tracks is near an open end. If the anchor shows and the rotate is completed, the tracks will Snap to Alignment and Join.

Rotation can also be achieved through use of one of these alternate methods;

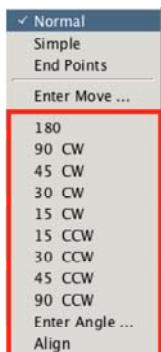
Selecting fixed or specified degrees of rotation using a *Right-Click* menu. See [Section 2.2.15.2](#) for detail.

Aligning the selected object with another object on the layout. See [Section 2.2.15.3](#) for detail.

2.2.15.2 Using Degree's of Rotation

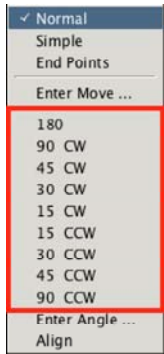
Rotate An Object Using Fixed or Specified Degree's of Rotation

A pop-up menu with additional menu items allows you to Rotate the selected object(s) through various predefined angles or through any angle you specify.



The Rotate command is executed as follows;

1. Select the object(s) to be rotated.
2. Click the Rotate button  to activate the Rotate function.
3. With the mouse pointer hovering over the point about which the object(s) are to be rotated, *Shift+Right-Click* to raise the Rotate menu then select the desired degree and direction of rotation from the list of predefined angles (180°, 90° CW, 45° CW, 30° CW, 15° CW, 15° CCW, 30° CCW, 45° CCW, 90° CCW).

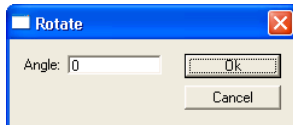


Alternately, any angle may be entered by *Left-Clicking* the Enter Angle... menu item

1. Select the object(s) to be rotated.
2. With the mouse pointer hovering over the point about which the object(s) are to be rotated, *Shift+Right-Click* to raise the Rotate menu and then select the *Enter Angle...* option.



And then entering a desired angle in the Rotate dialog window that appears.



Rotation can also be achieved through use of one of these alternate methods;


Left+Drag using the mouse. See Section 2.2.15.1 for detail.

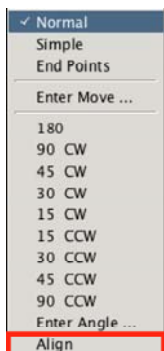
Aligning the selected object with another object on the layout. See Section 2.2.15.3 for detail.

2.2.15.3 Aligned With Another Object

Rotate and Align An Object With Another Object

A pop-up menu with additional menu items allows you to **Align** the selected object(s) with any other object on the layout. The **Align** command is executed as follows;

1. Select the object(s) to be rotated.
2. Click the Rotate button  to activate the Rotate function.
3. With the mouse pointer hovering over the point about which the object(s) are to be rotated, *Shift+Right-Click* to raise the Rotate menu then select **Align**.



4. *Left-Click* on the (selected) object that is to be rotated.

5. *Left-Click* on the object with which you want the selected object aligned. The selected object will rotate to align with the reference object.

Rotation can also be achieved through use of one of these alternate methods;

Left+Drag using the mouse. See [Section 2.2.15.1](#) for detail.

Selecting fixed or specified degrees of rotation using a *Right-Click* menu. See [Section 2.2.15.2](#) for detail.

2.2.16 Select



Clicking on the **Select** button cancels all active commands, closes any open dialog windows and places focus on the main window.

In combination with the mouse, the **Select** command can be used as follows:

Unselected Objects that will be added to the selected set with a *Left-Click* are highlighted in Blue as the mouse moves over them. Items that will be deselected are highlighted in Gold.

Objects that are part of a **Module Layer** are selected or deselected together.

Left-Click - If the **SelectMode** in [Section 2.10.2](#) is set to Single Item Mode it selects just an object near the cursor. If it is set to Add Item Mode, it will add the nearby object or remove it if it is already selected. Already selected objects appear in red (unless changed in the **Color** ([Section 2.10.1](#)) dialog) and a blue selection box surrounds all currently selected objects. If **SelectZero** is selected in [Section 2.10.2](#) and an point that is not near to any object is selected, all objects are deselected.

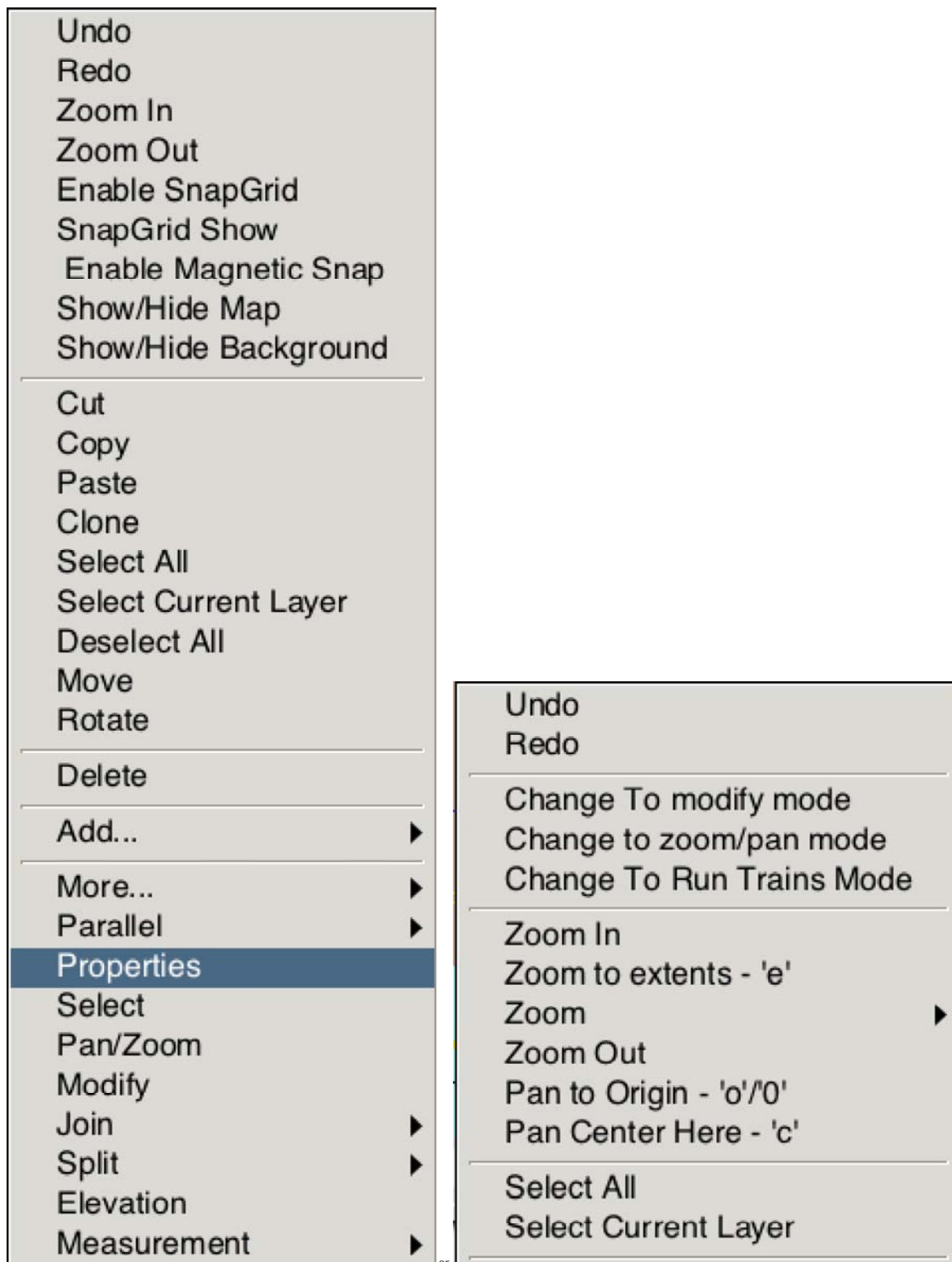
Ctrl+Left-Click - If **SelectMode** in [Section 2.10.2](#) is set to Single Item Mode it adds an object near to the cursor to the selected objects, or removes if it is already selected. If set to Add Item Mode, it will select only the nearby object and deselect all the others. Already selected objects appear in red (unless changed in the **Color** ([Section 2.10.1](#)) dialog) and a blue selection box surrounds all currently selected objects. If **SelectZero** is selected in [Section 2.10.2](#) and an point that is not near to any objects is selected, all objects are deselected.

Shift+Left-Click - selects all unselected tracks connected to a track you select. Selection stops at already selected tracks. Caution: This can select all tracks on the layout.

Left+Drag - highlights an area, and all the objects within the area are selected, if **SelectMode** is in [Section 2.10.2](#) is set to "Add", already selected objects outside the area remain selected, otherwise "Only", they are deselected.

Right-Drag - highlights an area, and all the objects within the area are unselected regardless of **SelectMode**.

Right-Click and *Shift-Right-Click* - either display a pop-up menu of commands or a set of context commands for the item under the cursor depending on the setting of "Right-Click" in [Section 2.10.2](#).



Double-Click - invokes [Section 2.2.8](#) on the object after selecting it for eligible objects. Otherwise it acts as *Left-Click*.

"?" - displays the Property menu for the object hovered over

"c" - moves the center of the window (i.e., Pans) to be at the cursor position

Hovering over a selected object (inside the blue highlight area) displays an anchor. The Anchor shows the actions available -

- If the *Shift* key is depressed, a "cross-arrows" anchor shows that a [Section 2.2.9](#) will occur with *Left-Click*.
- If the *Ctrl* key is depressed, a "rotation-circle" anchor shows that a [Section 2.2.15](#) will occur with *Left-Click*.
- With neither depressed a "target" anchor shows that a *Double-Click* will invoke [Section 2.2.8](#) within *Select* for the object hovered over.

Shift+Ctrl plus the *Arrow Keys* will move the selected items a pixel at a time at the current zoom level. No autosnap will occur to permit fine tuning.

Shift+Right-Click or *Right-Click* (depending on the setting of **Right-Click** in [Section 2.10.2](#)) - Shows context menu items that allow you to perform actions on the selected item(s) including rotating them by various angles and moving them fixed amounts.

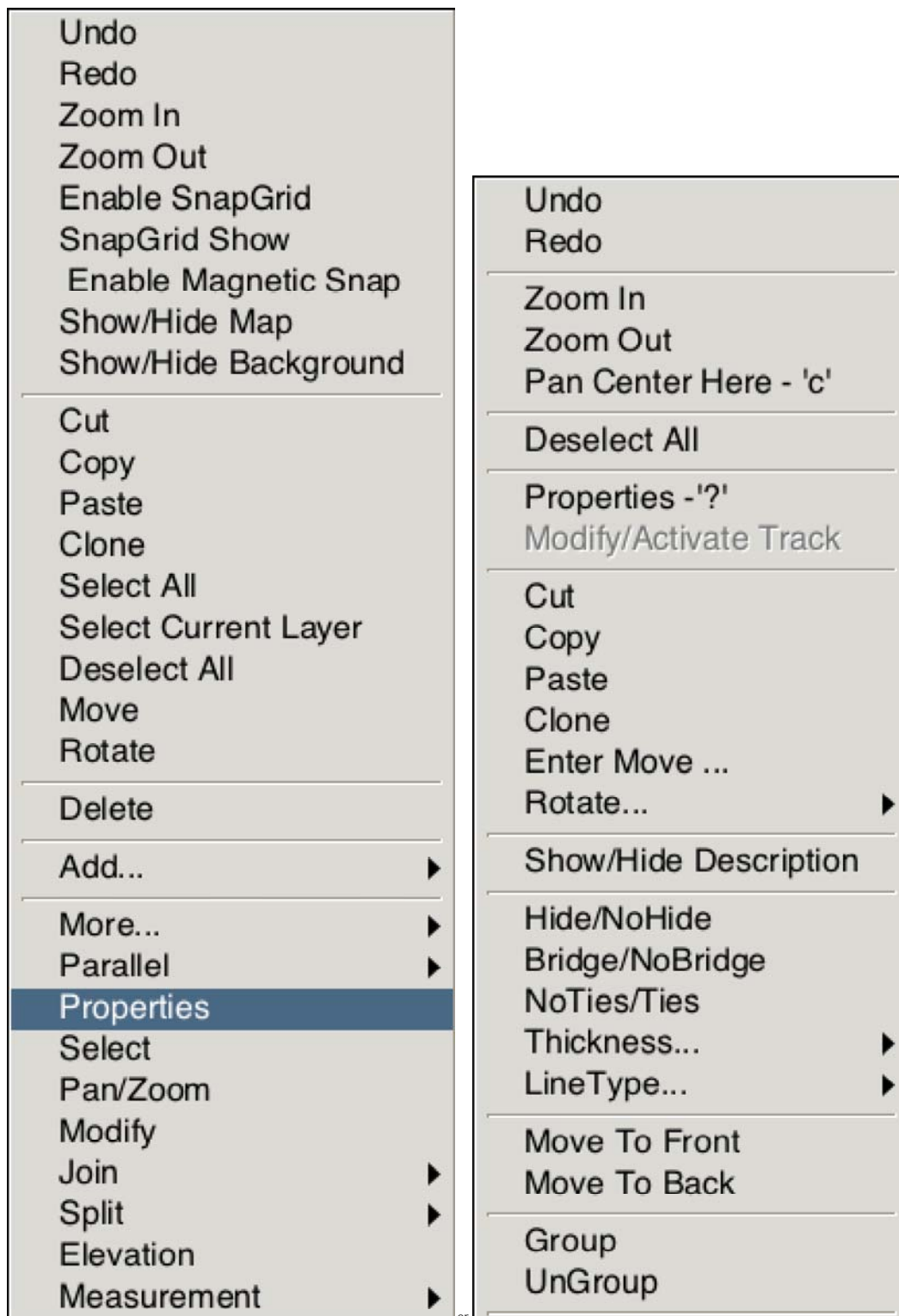
Shift+Left-Click+Drag - on a selected object moves the selected objects (the **Move** ([Section 2.2.9](#)) command).

Ctrl+Left-Click+Drag - on a selected object rotates the selected objects (the **Rotate** ([Section 2.2.15](#)) command).

- If the *Shift* key is pressed while dragging in rotation then rotation will occur in 15° increments.
- If the selected items(s) are moved or rotated using the cursor, and an open end of unselected tracks is close to an end of the selected tracks that will be open after the move, a pair of anchors shows that an autosnap with alignment will occur. Upon release of the button, all the selected tracks will be moved and aligned and the tracks joined.

Double-Click - on a eligible object such as a Link Object will Activate it, and on a Modifyable object will go into Modify Mode ([Section 2.2.8](#)) within Select.

Right-Click and *Shift-Right-Click* - either display a pop-up menu of commands or a set of context commands for the Items selected depending on the setting of "Right-Click" in [Section 2.10.2](#). The options effects depend on the type of object(s) selected and hovered over.



Once Objects are

Once objects are selected, the following commands operate on them:

- Move (Section 2.2.9) the selected objects.
- Rotate (Section 2.2.15) the selected objects.
- Flip (Section 2.2.6) (mirrors) the selected objects.
- Delete (Section 2.4.3) selected objects.
- Hide (or unhide) in a Tunnel (Section 2.4.4).
- Move Above or Below (Section 2.4.1).
- Parts List (Section 2.9.6) of the selected objects.
- Change the width of the tracks' rails.
- Export (Section 2.5.1) the selected objects.

- **Group** Creates a structure or turnout definition (Section 2.9.4) from the objects.
- **Rescale** (Section 2.2.1) the selected objects.

The Cut, Copy, Clone and Paste commands found on the **Edit** (Section 2.4) menu will also operate on selected objects.

Notes:

- Connections between selected and unselected tracks will be broken when selected tracks are moved. If the Drawing Scale is 8:1 or smaller, these about-to-be broken connections are marked with a red X.
- During Move or Rotate operations, if an track end that will be disconnected during the operation comes close to a disconnected end of track that isn't selected, a pair of blue circles (one empty and one filled) will turn on. This shows that if the drag is stopped, those two points will be joined and the other selected tracks aligned. This represents a faster alternative to the Section 2.2.7.7 command.
- The **Select All** item on the Edit (Section 2.4) menu can be used to select all objects on the layout.
- The Default Command radio button on the Command Options (Section 2.10.2) dialog controls whether the *Properties* (Section 2.2.13) or *Select* command is used as the default command.
- Pressing the *Escape* key will deselect all selected tracks. Alternatively left-clicking on an empty area will also work.

2.2.17 Split Commands

There are two split commands, Section 2.2.17.1 and Section 2.2.17.3.

2.2.17.1 Split Track



The **Split Track** command provides several functions. It can be used to disconnect the joint between two sections of connected track, to divide a section of track into two pieces at a selected point or to place block gaps at an existing joint.

Until a split point is selected, the split point under the cursor will have a blue marker and if it is near a connected end a blue "X" will indicate that a split will occur.

For detail about:


Disconnecting the joint between two sections of track see Section 2.2.17.2.

Dividing a section of flex track into two connected pieces or trimming a turnout see Section 2.2.17.2.1.

Creating block gaps at an existing joint see Section 2.2.17.2.2.

2.2.17.2 Disconnect Joint

Disconnecting a joint between two pieces of connected track;

1. Click the **Split** button () to activate the **Split** command.
2. Place the mouse pointer right over the joint between the two track endpoints (so the "X" is shown) then *Left-Click*.
3. A blue marker will show where a split will occur, but if the cursor is a near connected joint, it will show a blue "X".

When the **Split** command completes, the joint at the two track endpoints will show three lines rather than one. The three lines represent abutted, disconnected track endpoints.



Joint prior to split



Joint following split


For detail about:

Dividing a section of track into two connected pieces see Section 2.2.17.2.1.

Creating block gaps at an existing joint see Section 2.2.17.2.2.

2.2.17.2.1 Divide Track

Dividing a section of flex track into two connected pieces;

1. Click the **Split Track** button () to activate the **Split Track** command.
2. Place the mouse pointer over the point on the track where it should be divided. A blue anchor bar across the track under the cursor will indicate the current split point. Then *Left-Click*.
3. To divide a Turnout, *Shift* must be held. The result will be a shorter Turnout with plain track replacing the rest of it. Note that the program will not stop division of the turnout between the switch

blades and the frog - which would not be desirable in the real world.

When the Split Track command completes, a connected joint will appear in the track at the point of selection. To split and disconnect at a point, execute the Split track command twice. The first command will split the track, the second command will disconnect it.



Track prior to split



Track following split

It's not possible to create a track shorter than the *Minimum Track Length* (Section 2.10.7).

This command is useful for placing tunnel portals or elevation points (Section 2.2.5) at specific track locations.

Normally a turnout cannot be split however, if the *Shift* key is held when executing this command then the turnout can be *trimmed*. *Trimming* replaces the portion of track between the split point and the turnout's endpoint with flex-track. For turnouts with more than one set of points (Section B.2), such as a slip switch or scissors crossover, a *trim* point cannot be selected between the *points* of the turnout.

For detail about:

Disconnecting the joint between two sections of track see Section 2.2.17.2.

Creating block gaps at an existing joint see Section 2.2.17.2.2.

2.2.17.2.2 Adding Block Gaps

The Split command can be used to add block gaps (Section B.2) at the point where two track endpoints join. Block gaps are drawn as a thick line and can be placed in either of the rails or both if total isolation is required.



No Block Gaps



Block Gap in top rail



Block Gap in bottom rail



Block Gaps in both rails

After starting the Split command use the *Shift+Right-Click* over a joint (with the blue "X" anchor showing) to display one of two pop-up menus which can be used to add, change or remove *block gaps* for the selected endpoint.



This menu appears if track runs in a horizontal direction.



This menu appears if track runs in a vertical direction.

For detail about:

Disconnecting the joint between two sections of track see Section 2.2.17.2.

Dividing a section of track into two connected pieces see Section 2.2.17.2.1.

2.2.17.3 Split a Draw Object

The Split Draw command can be used to split many draw object (Straight Lines, Curved Lines, Circles, Polygons, PolyLines).

Until a split point is selected, the split point under the cursor will have a blue marker.

- 1. If the object being split is a Polyline, the split will either result in a Straight Line and a PolyLine or two PolyLines depending on where the split is along the line. (PolyLines must always have at least 2 segments).
- 2. Filled Circles and Polygons will be unfilled after the split.
- 3. If the split object is a Circle, the result is an circular arc split at the point with a small (5 degree) gap.
- 4. If the split object is a Polygon, a PolyLine with two end points at the split results.

2.2.17.4 Trim a Draw Object using another Draw object

The Trim Draw command can be used to trim many draw objects (Straight Lines, Curved Lines, Circles, Polygons, PolyLines). Polygons and Circles are split into PolyLines and Curves.

- 1. First a Trimming object (draw object) is selected with Left-Click. Until the trim draw object is selected, a draw object under the cursor will be highlit in blue. Once it is selected it will be highlit in the current Select Color.
- 2. Next the point of intersection between the trim object and an object to be trimmed is selected. Until a split point is selected, a suitable split point under the cursor will have a blue trim anchor that is a T shape aligned with the trimming object.

The trim anchor base has an arm that indicates which side of the trimmed object will be deleted. A Left-Click will trim the object.

If the trimmed object is a circle or a polygon, the result will be the same as a Split (Section 2.2.17.3), a 355 degree circle and an open polyline with ends at the split will result.

Once a trim has occured, the trimming object remains selected for another trim.

To leave the command use the spacebar. If Sticky (Section 2.10.8) is set for Split commands you will be able to select another trim object.

2.3 Draw Menu

Draw commands are used to draw lines, arcs and other shapes. These can be used to represent water edges, bridges and other scenic features.



There are 4 command buttons on the tool-bar used to draw Straight Objects, Curved Lines, Circles and other Shapes. Each command button is followed by a button that changes the action (and Icon) on the command button.

Draw Curve from End	Shift+Ctrl+S
Draw Curve from Tangent	Shift+Ctrl+%
Draw Curve from Center	Shift+Ctrl+^
Draw Curve from Chord	Shift+Ctrl+&
Draw Bezier	

Functions for drawing basic shapes and objects like lines and curves can be accessed from this menu.

- Circle Lines - draw empty or filled circles. (Section 2.3.1)
- Curved Lines - are created in the same manner as curved tracks. (Section 2.3.2)
- Note - attach a note icon to a specific location on the layout. (Section 2.3.3)
- Ruler - create ruler and set visibility (Section 2.3.4)
- Protractor - create protractor and set visibility (Section 2.3.5)
- Shapes - draw boxes, polygons and poly-lines. (Section 2.3.6)
- Straight Objects - draw straight objects. (Section 3.3.3.5)
- Text - allows entry of text directly onto the layout. (Section 2.3.9)

Some commands display controls on the Status Line (Section 3.1) to change line width, color or other attributes of the object.

2.3.1 Circles and Filled Circles

Draw Circle from Tangent	Ctrl+Shift+9
Draw Circle from Center	Ctrl+Shift+0
Draw Filled Circle from Tangent	Ctrl+Alt+9
Draw Filled Circle from Center	Ctrl+Alt+0

Before a Circle is drawn its line width and color can be set. For Filled Circles, the color can be set. The Circle Line Width field is a scaled dimension in inches if >0. If 0 it is a 1 pixel wide line at all zooms. If the value is negative, it is a scale-independent number of pixels wide.

Circles and Filled Circles are created by selecting either the center position or a point on the edge of the circle and dragging to specify the radius.

Section 2.3.1.1. Draw a Circle from the Edge.

[Section 2.3.1.2.](#) Draw a Circle from the Center.

[Section 2.3.1.3.](#) Draw a Filled Circle from the Edge.

[Section 2.3.1.4.](#) Draw a Filled Circle from the Center.

2.3.1.1 Draw Circle from Tangent



Left-*Drag* a point from the edge of the circle to the center to specify the radius.

2.3.1.2 Draw Circle from Center



Left-*Drag* from the center of the circle to the edge to specify the radius.

2.3.1.3 Draw Filled Circle from Tangent



Left-*Drag* from the edge of the circle to the center to specify the radius.

2.3.1.4 Draw Filled Circle from Center



Left-*Drag* a point from the center to the edge of the circle to specify the radius.

2.3.2 Curved Lines

Draw Curve from End	Ctrl+Shift+4
Draw Curve from Tangent	Ctrl+Shift+5
Draw Curve from Center	Ctrl+Shift+6
Draw Curve from Chord	Ctrl+Shift+7

Before a Curved Line is created, its width and color can be set. The Curved Line Width or Bezier Line Width field is a scaled dimension in inches if >0. If 0 it is a 1 pixel wide line at all zooms. If the value is negative, it is a scale-independent number of pixels wide.


Curved Lines are created in the same manner as curved tracks.

([Section 2.3.2.1](#)). Drag out the end point and then curve it.

([Section 2.3.2.3](#)). Select the center and then an endpoint and drag out the curve.

([Section 2.3.2.2](#)). Select the end and drag out the center.

([Section 2.3.2.4](#)). Drag from one end of the curve to the other to form the chord of the curve.

([Section 2.3.2.5](#))  Left-*Drag* out control point from one end of the curve and then Left-*Drag* out the second control point from the other end.

If MagneticSnap ([Section 2.12.1](#)) is enabled, the curve ends will snap to the nearest part of nearby Draw objects unless *Alt* is held. If Magnetic Snap is disabled, snapping to objects will only occur if *Alt* is held.

If Grid Snap is on and magnetic snap does not find a draw object, the curve ends will snap to the grid. *Alt* suppresses this snap.

The precise values of Radius and Arc Length can be set using the text boxes on the bottom rail once the mouse button is released.

To adjust the curve, Left-*Click* and Left-*Drag* an end or a the radius. Hit *Enter* or *Space* to accept, *Esc* to reject.

2.3.2.1 Draw Curve from End Point



Left-*drag* from the start of the curve and drag in the direction of the curve. Then Left-*drag* to form the curve.

If the cursor is over a Draw object and **MagneticSnap** (Section 2.12.1) is on, the first position will snap to the nearest part of that object. If *Alt* is held the snap will be suppressed. If **MagneticSnap** is disabled, the snap will happen if *Alt* is held. If **GridSnap** is enabled and **MagneticSnap** does not find a position, the first position will snap to the Grid. This is suppressed if *Alt* is held. The second end will act similarly.

2.3.2.2 Draw Curve from Tangent



Select one end of the curve and **left-drag** to the center. Then **left-drag** the curve around the center.

The first and second ends will act like Section 2.3.2.1 with **MagneticSnap** (Section 2.12.1) unless *Alt* is held. If **GridSnap** is enabled and **MagneticSnap** does not find a position, the first position will snap to the Grid. This is suppressed if *Alt* is held.

To complete the command, drag on the red arrows to adjust the curve from the initial end.

2.3.2.3 Draw Curve from Center



Select the center of the curve and **left-drag** to one end. If **GridSnap** is enabled, the first position will snap to the Grid. This is suppressed if *Alt* is held.

2.3.2.4 Draw Curve from Chord



left-drag from one end of the curve to the other to form the chord of the curve.

The first and second ends will act like Section 2.3.2.1 with **MagneticSnap** (Section 2.12.1) and **SnapGrid** unless *Alt* is held.

If the mouse is over a draw object the second position will snap to the nearest part of that object. If *Shift* is held the snap will be suppressed.

To complete the command, drag on the red arrows to adjust the curve.

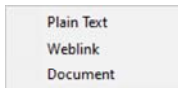
2.3.2.5 Draw Bezier Curve



Left-Drag out control point from one end of the curve and then **Left-Drag** out the second control point from the other end. Repeat for the other end and control point.

The first and second ends will act like Section 2.3.2.1 with **MagneticSnap** and **SnapGrid** unless *Alt* is held.

2.3.3 Note Variants



The **Note** command allows you to

Attach **plain text notes** (Section 2.3.3.1),

Attach **weblinks** (Section 2.3.3.2) or

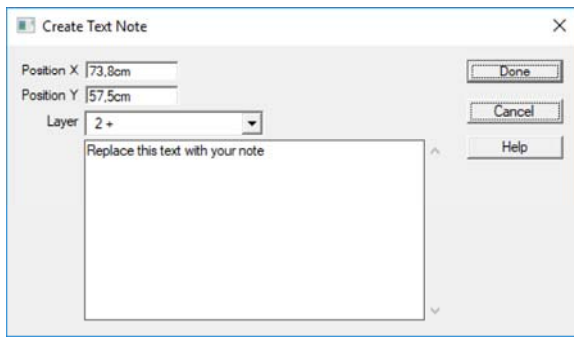
Attach **document references** (Section 2.3.3.3) to selected places on the layout.

2.3.3.1 Plain Text




Click and drag on the Main Canvas (Section 3.1) to place the note.

When you release, the *Note Editor* dialog is displayed. You can enter the note in the text area. Text is limited to about 10 thousand characters.

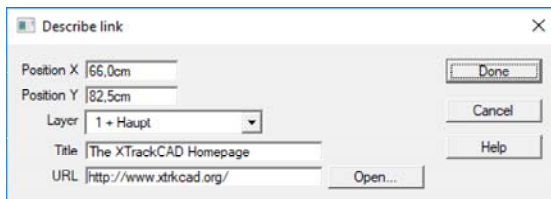


When in Properties (Section 2.2.13) mode, clicking on a *Note* will display the *Property Sheet* to let you read or modify the note.

2.3.3.2 Weblink

 Similar to text notes you can place a weblink on the layout.

After releasing the mouse button, the *Link Editor* dialog is displayed.



You can enter the URL of the website and a short description. When clicking on the Open button, your default browser is used to display the website.

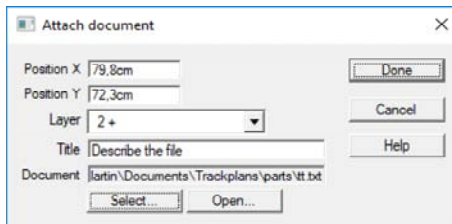
When in Properties (Section 2.2.13) mode, clicking on a *Weblink Note* will display the *Property Sheet* to let you read or modify the URL or the description.

Double clicking on a weblink icon opens the website in your default browser.

2.3.3.3 Document

 Similar to text notes you can place a reference to a file on the layout.

After releasing the mouse button, the *Document Editor* dialog is displayed.



You can select the file and enter a short description. When clicking on the Open button the file is opened with the default program for that file type.

When in Properties (Section 2.2.13) mode, clicking on a *Document Note* will display the *Property Sheet* to let you read or modify the filename or the description.

Double clicking on a document reference icon opens the document in the default program.

2.3.4 Ruler



The **Ruler** command displays a ruler on the layout. Click where you want the ruler to begin and drag the cursor to measure distances from the origin. The measured length is displayed in the **Status-bar** (Section 3.1).

You can use the **Modify** (Section 2.2.8) command to change the length of the Ruler.

Subsequent clicks on the **Ruler** button will hide or display the ruler.

2.3.5 Protractor



The **Angle** command displays a *Protractor* on the layout. Click for the protractor origin and **Left- drag** the cursor to set the base angle. Adding **Ctrl** will snap the angle to a multiple of 90 degrees.

Then (Left-Drag the second line. Adding **Ctrl** will snap the angle to 90 degree relative to the base line. The angle between the lines is displayed.

Subsequent clicks on the **Angle** button will hide or display the *Protractor*.

The points of the *Protractor* can be modified using the **Modify** (Section 2.2.8) command.

2.3.6 Shapes

Draw Box	Ctrl+Shift+[
Draw Filled Box	Ctrl+Alt+[
Draw Polyline	Ctrl+Shift+2
Draw Polygon	Ctrl+Alt+2

Shapes are drawn by:

- (Section 2.3.6.1). Boxes
- (Section 2.3.6.2. Filled Boxes
- (Section 2.3.6.3. Polygons
- (Section 2.3.6.4. Filled Polygons
- (Section 2.3.6.5. PolyLines

If *Sticky* is set for draw line and curve objects, after the object is created, precise dimensions can be entered to alter the new object, before it is completed either with a **Space** or **Return** or by selecting a new operation.

The **Polygon** and **PolyLine** shapes are finished by pressing the **Space** or **Return** key or by selecting another operation. Before they are finished, precise dimensions can be entered for the last side drawn. All PolyLines and Polygons must have more than 2 corners to be created successfully.

Note that Section 2.2.8 can be used on a Polygon or a Polyline after it has been finished to alter individual points and to make them curved or rounded points.

2.3.6.1 Draw Box



Before the box is drawn, the line width and color can be specified. The **Box Line Width** field is a scaled dimension in inches if >0. If 0 it is a 1 pixel wide line at all zooms. If the value is negative, it is a scale-independent number of pixels wide.

Boxes are created by selecting one corner and dragging the opposite corner.

2.3.6.2 Draw Filled Box



Filled Boxes are created by selecting one corner and dragging the opposite corner.

2.3.6.3 Draw Polygon



Before the polygon is started the line width and color can be set. The **PolyGon Line Width** field is a scaled dimension in inches if >0. If 0 it is a 1 pixel wide line at all zooms. If the value is negative, it is a scale-independent number of pixels wide.

Polygons are created by either a series for **Left-Clicks** or **Left+Drags**, and a new "node" is placed for each. When using **Left- drag**, the node will be positioned when you release the button.

If **MagneticSnap** (Section 2.12.1) is enabled, An anchor point will be shown on nearby draw objects that the next point will be snapped to unless **Alt** is held. If it is disabled, the snap will only occur if **Alt** is held.

If **Ctrl** is held down when a new point is placed, it will snap the relative angle of the new side to a multiple of 90 degrees from the previous side. On the first polygon side this will be at a multiple of 90 degrees to the axes. The line from the previous point will be highlighted in Blue.

A special blue square anchor will show when the cursor is in a position such that it is 90 degrees away from both the last point and the first point of the Polygon.

The last polygon segment dimensions can be altered using the text boxes that appear showing the segment length and the relative angle to the previous segment.

A polygon is closed if the next node is place over the start of the polygon

The polygon is ended using **Enter** or **Space**. The polygon will be auto-closed.

2.3.6.4 Draw Filled Polygon



Before the Polygon is started, the fill color can be set.

Filled Polygons are created by either a series for `Left-Clicks` or `Left+Drags`, and a new "node" is placed for each. When using `Left-drag`, the node will be positioned when you release the button.

The fill color can be adjusted using the color control at the bottom of the window
If `MagneticSnap` (Section 2.12.1) is enabled, An anchor point will be shown on nearby draw objects that the next point will be snapped to unless `Alt` is held.
If it is disabled, the snap will only occur if `Alt` is held.
If `Ctrl` is held down when a new point is placed, it will snap the relative angle of the new side to a multiple of 90 degrees from the previous side.

On the first polygon side this will be at a multiple of 90 degrees to the axes. The line from the previous point will be highlighted in Blue.

A special blue square anchor will show when the cursor is in a position such that it is 90 degrees away from both the last point and the first point of the Polygon.
The last polygon segment dimensions can be altered using the text boxes that appear showing the segment length and the relative angle to the previous segment.
The polygon is closed if the next node is place over the start of the polygon
The Filled Polygon is ended using `Enter` or `Space`. The polygon will be auto-closed.

2.3.6.5 Draw PolyLine



Before the polygon is started the line width and color can be set. The **Polyline Line Width** field is a scaled dimension in inches if >0. If 0 it is a 1 pixel wide line at all zooms. If the value is negative, it is a scale-independent number of pixels wide.

PolyLines are created by either a series for `Left-Clicks` or `Left+Drags`, and a new "node" is placed for each. When using `Left-drag`, the node will be positioned when you release the button.

If `MagneticSnap` (Section 2.12.1) is enabled, An anchor point will be shown on nearby draw objects that the next point will be snapped to unless `Alt` is held.
If it is disabled, the snap will only occur if `Alt` is held.
If `Ctrl` is held down when a new point is placed, it will snap the relative angle of the new side to a multiple of 90 degrees from the previous side. On the first polyline segemnt this will be at a multiple of 90 degrees to the axes. The line from the previous point will be highlighted in Blue.
A special blue square anchor will show when the cursor is in a position such that it is 90 degrees away from both the last point and the first point of the Polyline.
The last drawn polyline segment dimensions can be altered using the text boxes that appear showing the segment length and the relative angle to the previous segment.
The polyline is ended using `Enter` or `Space`.
While drawing the Polyline certain short cuts are available by keystroke and via the Context Menu:
'p' - to cover to a Polygon
's' - to smooth the last selected point
'r' - to make the last selected point round
'v' - to make the last selected point sharp (a vertex)
'o' - to change to Section 2.3.8 mode

2.3.7 Straight Objects

Draw Line	Ctrl+Shift+I
Draw Dimension Line	Ctrl+Shift+D
Draw Benchwork	Ctrl+B
Draw Table Edge	Ctrl+Shift+3

Straight Objects are created by a *Left+Drag* (Section B.1) on the layout.

- (Section 2.3.7.1). Creates a Straight Line
- (Section 2.3.7.2). Creates a Dimension Line of various sizes.
- (Section 2.3.7.3). Creates Bench-work using different types and orientation of lumber.
- (Section 2.3.7.4). Creates a Table Edge

2.3.7.1 Draw Straight Line



Creates a **Straight Line** of specified color and width. The **Straight Line Width** field is a scaled dimension in 75ths of an inch if >0. If 0 It is a 1 pixel wide line at all zooms. If the value is negative, it is a scale-independent number of pixels wide.

If `Ctrl` is held down during `Left+Drag` the line will snap the angle of the new side to a multiple of 90 degrees.

If *Sticky* is set for draw line and curve objects, after the object is created, precise dimensions can be entered to alter the new object, before it is completed either with a `Space` or `Return` or `Tab` or by selecting a new operation.

With `MagneticSnap` (Section 2.12.1) enabled, the new line start position will snap to the nearest draw object, as shown by the anchor. If `Alt` is held down, the magnetic Snap is reversed. If `GridSnap` is enabled and `MagneticSnap` does not find a postion, the first position will snap to the Grid. This is suppressed if `Alt` is held.

The **Width** field is a scaled dimension in inches if >0. If 0 it is a 1 pixel wide line at all zooms. If the value is negative, it is a scale-independent number of pixels wide.

2.3.7.2 Draw Dimension Line



Creates a Dimension Line of various sizes.

With **MagneticSnap** (Section 2.12.1) enabled, the new line start position will snap to the nearest draw object, as shown by the anchor unless **Alt** is held down. If it is disabled, it will only snap if **Alt** is held. If **GridSnap** is enabled and **MagneticSnap** does not find a position, the first position will snap to the Grid. This is suppressed if **Alt** is held.

If **Ctrl** is held down during **Left+Drag** the line will snap the angle of the new side to a multiple of 90 degrees. If **Sticky** is set for draw line and curve objects, after the object is created, precise dimensions can be entered to alter the new object, before it is completed either with a **Space** or **Return** or **Tab** or by selecting a new operation.

2.3.7.3 Draw Benchwork.



Creates **Bench-work** using different types and orientation of lumber.

Bench-work Notes

Lumber is drawn using the Dressed size which is 0.25" smaller than the indicated size: a 1" x 2" actually measures 0.75" x 1.75". The drawn height of *Girders* is 0.5" smaller.

Girders can be drawn in a variety of orientations: normal, inverted or rotated. *L-Girders* can be drawn with the flange to the Left or Right.

When using metric units (Section 2.10.7), a 1" x 2" is labeled 50mm x 25mm

With **MagneticSnap** (Section 2.12.1) enabled, the new line start position will snap to the nearest draw object, as shown by the anchor unless **Alt** is held down. If it is disabled, it will only snap if **Alt** is held. If **GridSnap** is enabled and **MagneticSnap** does not find a position, the first position will snap to the Grid. This is suppressed if **Alt** is held.

If **Ctrl** is held down during **Left+Drag** the line will snap the angle of the new side to a multiple of 90 degrees. If **Sticky** is set for draw line and curve objects, after the object is created, precise dimensions can be entered to alter the new object, before it is completed either with a **Space** or **Return** or **Tab** or by selecting a new operation.

2.3.7.4 Draw Table Edge



Creates a Table Edge

With **MagneticSnap** (Section 2.12.1) enabled, the new line start position will snap to the nearest draw object, as shown by the anchor unless **Alt** is held down. If it is disabled, it will only snap if **Alt** is held. If **GridSnap** is enabled and **MagneticSnap** does not find a position, the first position will snap to the Grid. This is suppressed if **Alt** is held.

If **Ctrl** is held down during **Left+Drag** the edge will to a end point of another table edge or to a multiple of 90 degrees if that isn't available.

If **Sticky** is set for draw line and curve objects, after the object is created, precise dimensions can be entered to alter the new object, before it is completed either with a **Space** or **Return** or **Tab** or by selecting a new operation.

2.3.8 Draw Objects Origin

Some objects will a natural rotation point within them. By setting the object origin to this point, subsequent rotation will be about that point and not the layout origin. This is referred to as a *Relative* origin and will be present if the origin is non-zero. When an object with a Relative is moved or rotated, the origin and angle are adjusted but the relative draw point values remain the same. If an object has a zero origin, it is called Absolute. If it is moved or rotated, the origin and angle remain zero, but all the object point(s) are adjusted.

You can choose to set the origin to make it Relative or put it back to Absolute (origin zero) during Section 2.3.6 or Section 2.2.8 or by using the Section 2.2.13 settings.

As a practical matter, the object will appear identical until a subsequent rotation value is entered in the Section 2.2.13 window in both cases.

In Origin Mode (entered using 'o' or the Context Menu, there are certain shortcuts available -

- 'p' Go to Points Mode
- '0' Move to Absolute (Origin to 0,0)
- '1-4' Move the Relative Origin to the shape point 1 to 4
- 'l' Move the Relative Origin to the last selected point
- 'm' Move the Relative Origin to the middle of the shape (centroid).

2.3.9 Text



The Text command lets you enter text on the layout at the selected position. You can use the Tab key to format the text to fixed tab positions and CTRL+Enter to enter a newLine character.



The font size can be changed by the Font Size drop list on the Status-bar (Section 3.1). The font size is scaled along with everything else on the layout so text is always the same relative size as other layout objects.

The font can be selected by the Font Selection (Section 2.10.5) dialog invoked by the Options>Fonts menu item or by Shift+Right-Click (Section 3.4).

The position where text is to be placed on the layout must be selected prior to text entry. The position is select by `Left-Clicking` on the layout at the point where the text is to appear. Desired text is entered after the position is selected. If necessary, the location can be changed once text entry begins by `Left-Click+Dragging` the text to any desired postion on the layout.

The **Properties** (Section 2.2.13) command can be used to modify the contents of existing **Text** objects and to draw boxes around them.

Note: loading fonts (or changing sizes) can take a noticeable amount of time.

2.4 Edit Menu

Undo	Ctrl+Z
Redo	Ctrl+R
Cut	Ctrl+X
Copy	Ctrl+C
Paste	Ctrl+V
Delete	Ctrl+D
Move To Current Layer	
Select All	Ctrl+Shift+A
Select Current Layer	
Deselect All	Alt+Shift+A
Invert Selection	
Select Stranded Track	
Tunnel	Ctrl+Shift+T
Above	Ctrl+Shift+B
Below	Ctrl+Shift+W
Thin Tracks	Ctrl+1
Medium Tracks	Ctrl+2
Thick Tracks	Ctrl+3

The Edit Menu shows commands affecting the **Main Canvas** (Section 3.1).

- Above** - Moves selected object to foreground.
- Below** - Moves selected object to background.
- Copy** - Copies the selected objects to the clipboard.
- Clone** - Copies the selected objects to the clipboard and duplicates them offset from the original. Repeated Clone commands result in a series of offset copies. The new objects are selected and the old ones un-selected.
- Cut** - Moves the selected objects to the clipboard.
- Delete** - Deletes the selected objects.
- Deselect All** - unselects all objects on the layout. The same action can be achieved by pressing the ESC key.
- Invert Selection** - selects all unselected objects and unselects all previously selected objects.
- Move To Current Layer** - move all selected objects to the current Layer (Section 2.9.5).
- Paste** - Copies the contents of the clipboard to the layout. Using the paste Menu command it will be placed at the center of the screen. If the context menu paste is used or the short-cuts *Ctrl+V* or *Shift+Insert*, the parts will be placed at the cursor position. Repeated Pastes without moving the cursor result in overlaid copies. The newly pasted parts are in **Selected** state and can easily be moved into place. Any previously selected objects are unselected.
- Redo** - Undoes the last Undo command. The Redo command can also be invoked by the Redo button (Section 2.4.7).
- Select All** - Selects all objects on the layout.
- Select Current Layer** - selects all objects in the current Layer (Section 2.9.5).
- Select Stranded Track** - selects all track pieces that are not connected to any other objects. This helps cleaning up a drawing after many changes have been made.
- Thin, Medium and Thick Tracks** - set displayed rail width of selected tracks.
- Tunnel** - Hides or reveals selected tracks and adds a tunnel portal symbol where the track passes from one to the other.
- Bridge** - Adds parapet symbols to the sides of the track.
- Undo** - Reverses the last command. Up to the last ten commands can be undone. If there are no commands that can be undone the **Undo** item is disabled. The **Undo** command can also be invoked by the Undo button (Section 2.4.7).

For more information on working with selected objects, see the **Select** (Section 2.2.16) command.

2.4.1 "Move To Front" and "Move to Back"



The Move to Front and Move To Back commands move the selected objects (Section 2.2.16) to the top of the drawing list - the **Foreground** or to the bottom of the list - the **Background** making them more or less visible or prominent.

The effect is to make the objects move to be in front of all or behind all other objects. This command is useful when dealing with filled shapes (Section 2.3).

Selected objects moved to the **Background** become unselected.

2.4.2 Additional Shortcut Keys

Additional Shortcut keys perform the following:

Shift+Backspace - Undo

Ctrl+Insert - Copy

Shift+Insert - Paste

Shift+Delete - Cut

Esc - Deselect All

2.4.3 Delete



The Delete button is used to delete selected objects. Remember, the **Undo** (Section 2.4 or Section 2.4.7) command can be used to restore a delete object.

Deleting a track that is connected to an easement (Section 2.10.4) causes the easement to be deleted as well.

The *Delete* key invokes the Delete command.

2.4.4 Tunnel (Hide Tracks)



The Tunnel command is used to hide selected (Section 2.2.16) tracks (as in a tunnel).

Select the tracks you want to hide in a tunnel. Selecting a hidden track 'reveals' it.

A tunnel portal is drawn where a hidden track connects with an 'unhidden' track. You can split (Section 2.2.17.1) a track to place a tunnel portal at a particular spot.

The Draw Tunnels Radio button group on the **Options>Display** dialog (Section 2.10.3) controls whether hidden tracks are not drawn, drawn as dashed lines or drawn as normal lines.

2.4.5 Bridge (Draw Abutments)

The Bridge command is used to add abutments to a track (as on an underbridge).

Select the tracks you want to be a bridge. Bridge abutments are drawn alongside the track. You can split (Section 2.2.17.1) a track to shorten the length of the bridge, or to add an extra pier to the drawing.

If you perform this action (or use Tunnel) the bridge is removed.

2.4.6 Ties (Draw or Hide Ties)

The Ties command is used to hide Ties (or reshow them). This may be useful for overlapping track, like dual gauge, or in areas like docks or yards where the track is covered.

Select the tracks you want to hide or show ties for.

2.4.7 Undo and Redo



The **Undo** and **Redo** buttons invoke the same actions as the **Edit** menu items. The name of last command will be displayed as the Balloon Help (Section B.1) for the *Undo* button. The name of last undone command will be displayed as the Balloon Help for the *Redo* button.

2.5 File Menu

New	Ctrl+N
Open ...	Ctrl+O
Save	Ctrl+S
Save As ...	Ctrl+A
Revert	
Print Setup ...	
Print...	Ctrl+P
Import	Ctrl+Alt+I
Export to Bitmap	Ctrl+Shift+Q
Export	Ctrl+Alt+X
Export DXF	
Parameter Files ...	Ctrl+Alt+S
Notes ...	Ctrl+Alt+T
cascade.xtc	
katoxing.xtc	
Exit	

The File Menu shows file oriented commands for loading and saving layout files. File Types The main two filetypes that XTrackCAD uses are normal Layout Files (*.xtc) and Archive Files (*.xtce). The internals of both formats are described in the XtrkCAD Wiki at [Wiki FileFormats](#).

Layout File The layout file is named with a *.xtc extension and is a text-based description file of all the objects used in the layout plus some information about the options currently in use. Archive An archive is named with a *.xtce extension, is a zipped collection of -

- a *manifest* JSON file that lists the contents,
- the .xtc layout file, and
- any other content listed in the manifest -> such as referenced image files. Initially the only such content is the background image which is added to the archive if it is present.

Exit - Exits *XTrackCAD*. You will be asked to confirm your choice if there are unsaved changes.

Export - Exports the selected objects to a file in *XTrackCAD* (*.xti) format. The exported file can then be imported into another layout design. Refer to the Import command listed below.

Export to Bitmap - Creates a bitmap file (Section 2.5.2) of the layout. The bitmap will be saved in PNG format.

Export to DXF - Exports the selected objects to a file in DXF format (Section B.2). The exported file can then be imported into other CAD programs.

File List - List of the five most recently used *XTrackCAD* files or archives.

Import - Displays the file selection dialog which allows selection of an existing *XTrackCAD* Import (Section 2.5.1 *.xti) files. This function can be used to transfer parts like a yard design from one layout design to another.

Import Module - Displays the file selection dialog which allows selection of an existing *XTrackCAD* Import (Section 2.5.1 *.xti) file. The imported parts are put into a empty layer, sets the layer name to the imported filename and sets the layer to be a module - see (Section 2.9.5).



New - Clears the current layout. In case there are any unsaved changes on the current plan, a warning pop-up will be displayed and you'll have the option to cancel the operation. After that the Layout Options (Section 2.10.6) dialog will be opened.

Notes - Displays a simple notepad editor which you can use to enter information about the layout. Typically this could include prototype, period, theme, layout style, height, construction, type of track and turnouts used, control system and anything else of interest. (There is also a **Note** command (Section 2.3.3) which allows attaching notes to particular parts of the layout.)



Open - Displays the File Open dialog which allows an existing *XTrackCAD* file or archive to be selected and opened. In case there are any unsaved changes on the current plan, a warning pop-up will be displayed and you'll have the option to cancel the operation.

Parameter Files - Displays the Parameter Files dialog (Section 2.5.5) to choose parameter files.

Print Setup - Shows the Printer Setup Dialog (Section 2.5.8).

Print - Invokes the Print command (Section 2.5.7).

Revert - Undoes all changes and returns to the last saved layout plan.

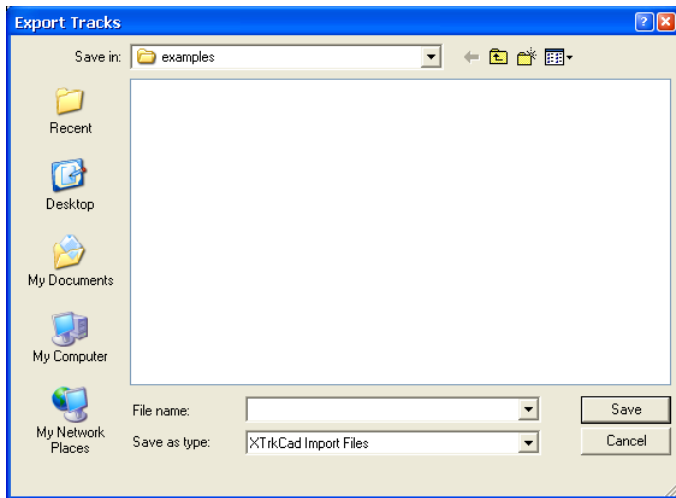


Save - Saves the layout under the current file name and with the same file type as was opened. If a filename has not yet been assigned then the File Save dialog is shown so you enter a file (*.xtc) or archive name (*.xtce).

Save As - This command lets you make a copy of the track plan you are currently working on as an file (*.xtc) or an archive (*.xtce). It differs from the regular Save command. Save stores your data back into the folder (directory) it originally came from in the same filetype. "Save As" lets you give your plan a different name and/or put it in a different folder on your hard disk and change its filetype using the selection box at the bottom of the list of files or by hardcoding the extensions .xtc or .xtce (for an archive).

2.5.1 Export

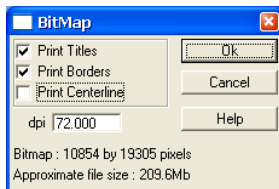
This menu item displays a file selection dialog where a file name for exported objects can be entered. All selected (Section 2.2.16) objects are exported to the file. The export file will have an xti extension.



Using the Import command ([section 2.5.4](#)), an exported file can be imported into another layout design.

2.5.2 Export to Bitmap

This menu item creates a bitmap file of the layout.



The Bitmap dialog specifies the style and size of the bitmap. The three check-boxes (Print Titles, Print Borders and Print Centerline) control whether the Layout Title ([Section 2.10.6](#)), the borders or the track centerlines are printed on the bitmap. The size of the bitmap is smaller if these are disabled.

Printing the track centerlines (also seen when zoomed in 1:1) is useful when you later print the bitmap full size for laying out track.

If the Snap Grid ([Section 2.12.2](#)) is visible then it will be printed on the bitmap.

The DPI (or DPCM if using metric units ([Section 2.10.7](#))) control specifies the number of pixels per inch (or centimeter) in the bitmap. You can enter values from 0.1 to 100. Larger values will result in a larger bitmap file. bitmaps must be less than 32000 pixels in height or width.

The bitmap width, height and approximate file size is indicated.

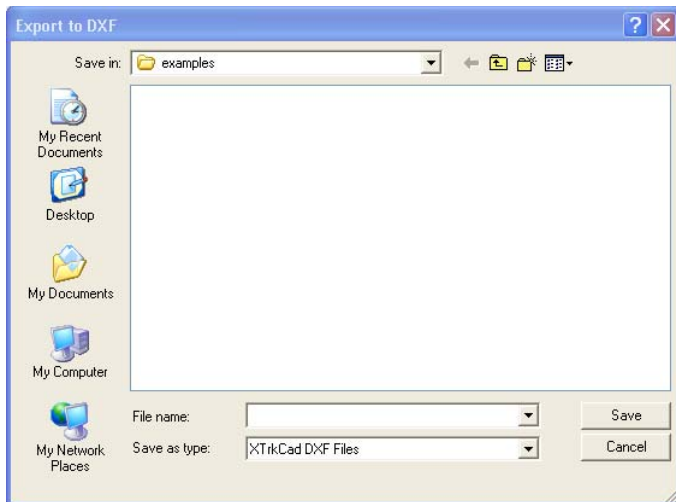
Note: This command can create a very large file and consume a lot of memory and time.

Pressing the OK button invokes a File Save dialog so you can choose the file name for the Bitmap.

The format of the file is PNG on all operating systems.

2.5.3 Export to DXF

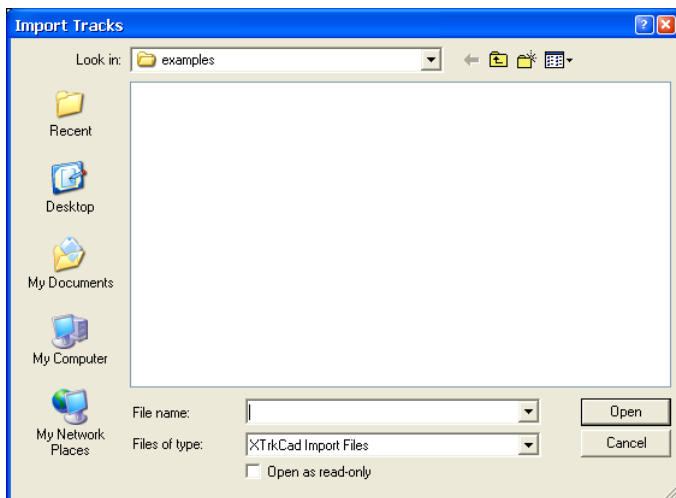
This menu item displays a file selection dialog where a file name for exported objects can be entered. All selected ([Section 2.2.16](#)) objects are exported to the file. The export file will have an `.xtr` extension.



Exported files can then be imported into other CAD programs.

2.5.4 Import

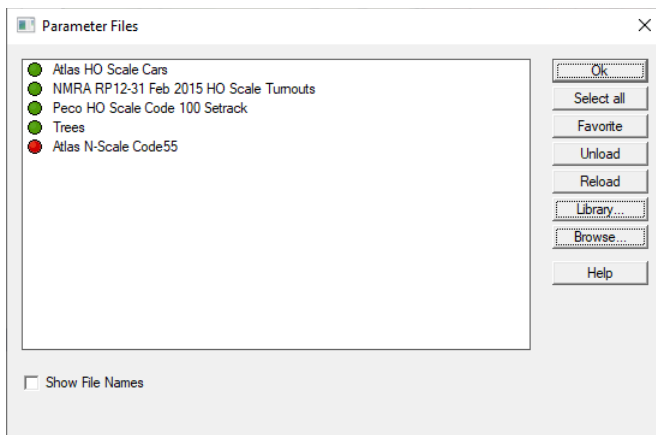
Importing displays a file selection dialog to specify the file to import.



After importing the objects from the file, the imported objects are in selected state and therefore are drawn in red. This allows you to easily move and rotate the imported objects to their final position.

2.5.5 Parameter Files

Parameter Files contain turnout, sectional track and structure definitions. Loaded Parameter Files are managed with the Parameter Files dialog.



The dialog contains a list of parameter files. Each file is preceded by a color indicator. These indicators show whether a parameter file contains definitions that are usable in the current scale and gauge.

Definitions from this file are a perfect fit for the current layout options. The file has been loaded and will be visible in the **HotBar**. For track this means that gauge and scale of the track elements are identical to the layout settings. Prototype definitions (Scale "") are always a perfect fit. Turnouts and Sectional Track must have the same gauge and usually the same scale unless the scale/gauge combination has been defined to fit. OO layouts use HO track as an example.

Definitions from this file can be used with this layout but do not fit perfectly. A typical example is On30 where HO scale track can be used because the gauge is the same. But differences in scale may make the track look out of scale. Structures are considered compatible if the scale is within +/-20%. Cars are compatible if the gauge is the same, but the scale can be +/-20%. Exceptions to this can be defined in the scale definitions.

This parameter file doesn't contain any usable definitions with current settings. You may want to change the layout options if you want to use elements from this file (for example altering the Layout Scale).

This file is loaded but hidden. If it is marked as favorite it will be kept on the list between runs.

Parameter files can be marked as *favorite*. The indicator for favorites is a star. The meaning of the colors isn't changed.

Loaded definition files that are marked with a yellow or a green indicator appear on the **Hot Bar** (Section 2.7).

If you *unload* a file the definitions are removed from the selection lists and the **Hot Bar**. If the unloaded file was marked as a favorite it can be *reloaded* by selecting the **Reload** button.

Files that are still loaded can be *reloaded* as well. In that case the old definitions are refreshed and extended by the rereading the file. This can be useful if you want to check changes you made by hand-editing a parameter file.

Note that loading a file does not change the existing definitions in the layout. To do that after loading, use Section 2.9.10.

It is possible to change the state of several files at once. The **Select All** button allows you to select all parameter files for the next operation.

In case unloaded files are marked as favorite, their state will be preserved between runs of the program. This makes it possible to keep a list of preferred parameter sets between runs of XTrackCAD but hide temporary unused files from the hotbar. That way the hotbar contents can be kept short containing only the currently needed elements.

In order to update the definition of an already loaded file from disk, you can use the **Reload** button. This will reload the file contents - with any changes made. It is the equivalent of using **Browse** and selecting the file again.

Files can be listed by either their file name or by their contents description. This is controlled by the **Show File Names** check box.

The **Library** button opens the *Choose Parameter File* dialog (Section 2.5.6) this shows the all files included the system library so they can be added.

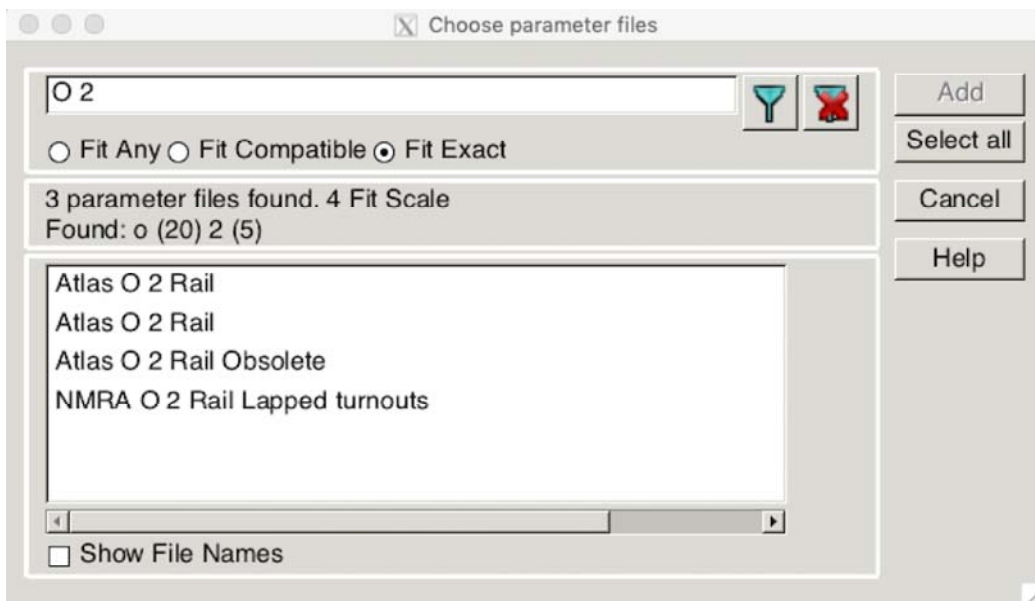
The **Browse** button opens a file window that allows the user to add additional files to directly load other non-system *parameter files* such as provided by other users or downloaded from the Internet.

When first installed, parameter files for all common scales are loaded. You can unload parameter files you don't use to speed up XTrackCAD startup time.

The order in this list controls the order of turnouts and structures on the **Hot Bar** (Section 2.7). You can move a parameter file to the end of the list by *Unloading* it, and then loading it via the **Browse** button.

2.5.6 Choose Parameter Files

Selecting and loading additional parameter files from the System Library is done in the **Choose Parameter Files** dialog.



Using the Search function you can find and select parameter files that are part of the XTrackCAD installation. Enter a set of one or more words and select the Search button. Search results are shown in the list box. Pressing the Clear Filter button shows the complete list again.

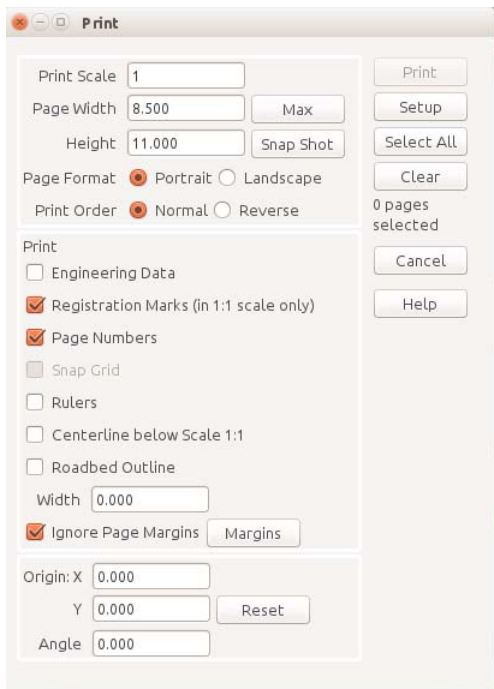
You can subset the search to only search for parameter files who start with contents that fit the current Layout Scale using the Fit Mode. The options are "Fit All", "Fit Compatible" and "Fit Exact". Fit Compatible means that structures with Note that the code only looks at the first Turnout, Structure or Car entry to decide on the scale for the entire file. They will correspond to the color icons on the Parameter Files menu once they are loaded [Section 2.5.5](#) when the same Layout scale is in use.

Select the files you're interested in and press the Add button to add them to your parameter list.

2.5.7 Printing

The Print command (File>Print) is used to print all or a portion of the layout.

When the Print command is selected a grid, which represents each printed page, is drawn on the layout. Pages can be selected or unselected for printing by placing the mouse over a grid section and clicking the left mouse button.



The Print dialog contains a number of control areas:

The size of each page is controlled by:
Scale - up to 1:1.

Width, Height - scaled size of each page. Values for **Width** and **Height** can be manually entered, overriding the maximum values. Values larger than the page size times the *Scale* cannot be entered.

Max - sets Width and Height to the maximum for the print *Scale*.

Snap Shot - adjusts the *Scale*, *Origin* and *Angle* to produce a one-page snap shot of the layout.

Format - Portrait or Landscape.

Page printing order is controlled by the **Print Order** option.

Relative to the Print Grid:

Normal order is Columns first, Top to Bottom, Left to Right.

Reverse order is Rows first, Left to Right, Bottom to Top.

Whether tracks are printed with one or two lines (representing the center line and rails) depends on the **Print Scale**. If this value is smaller than or equal to twice the Two Rail Scale on the Display ([Section 2.10.3](#)) dialog then tracks are drawn with two lines. This corresponds to the way tracks are drawn on the main window, adjusted to account for the greater resolution of most printers. At 1:1 tracks are also drawn with a center line.

Other options:

Engineering Data - show title, user, date and other information in a box at the bottom of the printout.

Registration Marks - at 1:1 scale, print location markers every 3" (or 10cm). This option is only enabled at 1:1. This is useful for aligning multiple pages printed at different angles.

Page Numbers - to help positioning the individual pages the page number is printed in the center of the page in the format (x/y). x is the page position from left to right, y in from bottom to top, So (1/1) is the page at the bottom left. As an additional aid, the numbers of the next pages are printed on each edge.

Snap Grid - if the Snap Grid ([Section 2.12.2](#)) is visible then it may be drawn on the printout. This option is only enabled if the *Snap Grid* is visible.

Rulers - print rulers on all edges of the page. This option is only enabled if the **Angle** is 0.000.

Centerline below Scale 1:1 - dotted line down the center of the Track/Roadbed. This line will always be printed at Scale 1:1, but selecting this option will print it at smaller scales. This option is disabled if tracks would be drawn with only one line (instead of two).

Roadbed Outline - lines representing the edge of the Roadbed. The Roadbed will be printed if the *Width* is greater than the track gauge. Note: this option is most useful at 1:1. This option is disabled if tracks would be drawn with only one line (instead of two).

Ignore Page Margins - use the physical page size. This allows the printouts to abut without trimming.

Margins - examine and update the printer margins for the current printer. ([Section 2.5.9](#))

The orientation of the print grid is controlled by:

X - X co-ordinate.

Y - Y co-ordinate.

Angle - of the grid.

These values can be set directly or by dragging on the layout. **Shift+Left+Drag** moves the grid and **Shift+Right+Drag** rotates the grid. The **Reset** button resets the values to 0.

The **Print** button prints the selected pages and closes the **Print** dialog. It is not enabled until you have selected some pages to print.

The **Setup** button invokes the Printer Setup ([Section 2.5.8](#)) dialog.

The **Select All** button selects all pages for printing.

The **Clear** button unselects all selected pages, so no pages will be printed.

Suggested Uses:

Use the **Snapshot** button to set the scale and orientation for a one-page printout of the layout. Also set **Engineering Data** to add the Layout Title, Scale and other data for a summary.

Use **Layers** ([Section 2.9.5](#)) to control which tracks are visible (and printed). Put bench-work, scenery or different tracks levels in separate layers and hide the layers you are not working with.

To transfer the drawing to the layout without printing at 1:1, make the Snap Grid ([Section 2.12.2](#)) visible and orient it to match your room or layout table.

Check the **Print Snap Grid** toggle and use the printed grid to transfer measurements to your layout space. You may want to change the color ([Section 2.10.1](#)) of the **Snap Grid** to make it more visible on the printout.

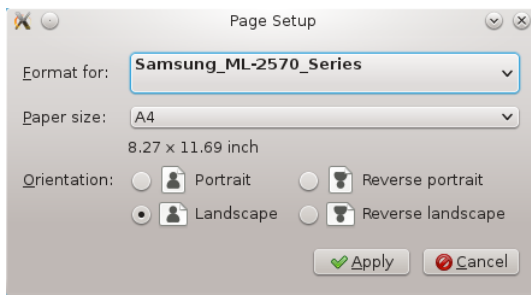
When you print multiple pages you can check **Ignore Page Margins** so pages can be placed next to each other. The tracks will line up correctly without trimming or overlapping the pages. Note: depending on your printer there will be an unprintable margin around the edge of the page.

If you print at 1:1 for direct transfer to the sub-roadbed, check **Print Roadbed Outline** and set **Width** to show lines for making cuts.

If you make printouts in strips at different angles at 1:1 (to follow tracks around a curve), check *Print Registration Marks* to be able to align the separate strips.

2.5.8 Printer Setup

2.5.8.1 Linux



The Printer Setup dialog allows you to configure the application's use of the printer.

The Printer Setup window contains:

Format for - a list to select a particular printer. The entries on this list are defined by `printer` lines in the `~/ .xtrkcad/xtrkcad.rc` file. The first entry, 'File', causes printouts to be sent to a file. You will be prompted for a file name when doing a print.

Paper Size - a list of various supported paper sizes.

Orientation - a Radio button to select various Landscape or Portrait formats. This setting is ignored, use the **Page Format** entry on the **Print** dialog.

Apply - updates the data and ends the dialog.

Cancel - ends the dialog without update.

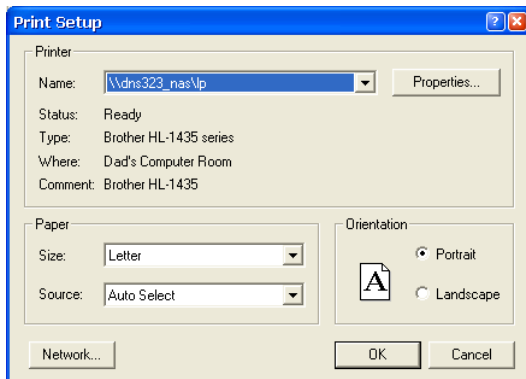
Note - Printing uses a default of 600ppi. It scales the print and text from a default size of 72dpi. This is often the expected value for a standard printer driver to work correctly, but will not work if the driver is not accurately setting the ppi available. To override the printer ppi you can use either the configuration file settings for print or environmental variables. These values are set in the Preferences section.

1. Preferences.PrintScale - The floating point ratio of the real printer dpi to 72.
2. Preferences.PrintTextScale - The floating point ratio of the real printer text support to a dpi of 72. This value has no effect unless PrintScale is set to > 0.0.

These values can also be set using environmental variables if the configuration preference values are not set or they are set to <=0.0.

1. XTRKCADPRINTSCALE
2. XTRKCADPRINTTEXTSCALE

2.5.8.2 Microsoft Windows



The Windows Printer Setup dialog allows you to configure the application's use of the printer.

The Printer Setup window contains:

Name - a drop down list for selection of a particular printer. Entries in this list are defined by windows.

Status - the current status of the selected printer.

Type - the type and model of printer selected.

Where - The location of the printer if it's defined in the printers properties.

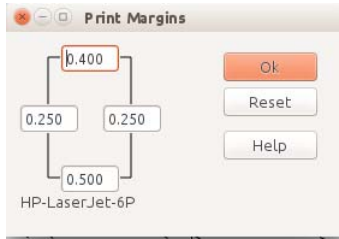
Comment - Any comments defined that are defined in the printers properties.

Paper Size - a list of various North American and European paper sizes.

Paper Source - a list of various paper tray locations associated with the selected printer.

Orientation - a Radio button to select either Landscape or Portrait format. This setting is ignored, use the **Page Format** entry on the **Print** dialog.

2.5.9 Printer Margin



The **Printer Margins** dialog allows you to configure the selected printer's margins.

The margins for the four edges of the printed page are displayed. The default values are fetched from the Operating System. You can enter updated values if the System values don't match your actual printer.

The **Reset** is enabled if the displayed values don't match the System values and will reload the System's values.

To check your printer's margin:

Set Scale to 1

Set Origin and Angle to 0.000 by clicking the **Reset** button

Enable **Registration Marks** this prints crosshairs every 6" at scale 1:1.

Enable **Ignore Page Margins**

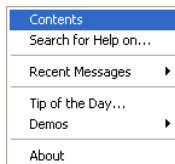
Select and **Print** the lower left page of you layout

Measure the distance from the left and bottom edges to the Registration Mark at (3",3") or (10cm,10cm).

Update the **Printer Margin** values for the left and bottom edges. You can also update the top and right edges.

Margins values are stored for each printer.

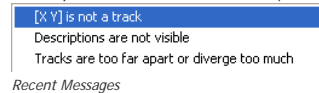
2.6 Help Menu



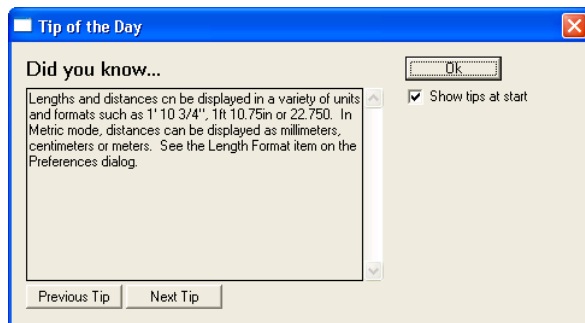
The **Help** Menu displays information on various topics. The contents of the menu vary depending on the operating system.

The **Help** command opens the Help Window at the Contents Page.

The **Help Command Context** command opens the Help Window at the page for the current Command.

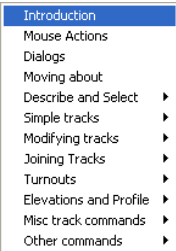


The **Recent Messages** command opens a cascading menu containing recent error messages and notices you have received. Selecting one of them displays additional information about the message (Section C.2).



Tip of The Day

The **Tip of the Day** item displays a useful tip about the operation of *XTrackCAD*. By default, a new tip is displayed each time you start the program.



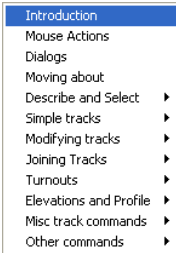
Demo Menu

The Demos command (Section 2.6.1) opens a cascading menu which invokes various demonstrations of *XTrackCAD* features.

The Examples command displays the list of included example programs which you can examine.

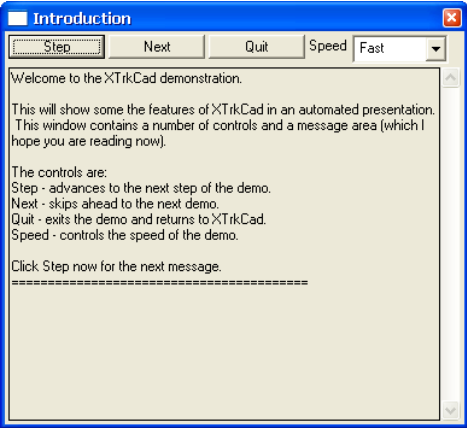
2.6.1 Demo Mode

The Demos menu item, under the Help (Section 2.6) menu, shows a cascading menu of choices to demonstrate various features and commands.



In demonstration mode *XTrackCAD* is driven by a script file (such as created by the Record (Section 2.8) command). The cursor is simulated on the Main Window (Section 3.1) and the *XTrackCAD* windows (except the Demo window) are inactive. Also, simulated input on dialogs is indicated by a border momentarily drawn around the control.

The Demo dialog is displayed which contains a number of control buttons and a text area that shows comments on the demonstration being run.



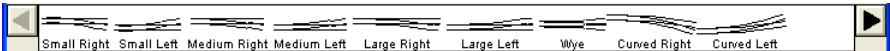
- Next - skip to the next demonstration. If you hold down the *Shift* key then you will jump back to the previous demonstration.
- Quit - quit demonstration mode.
- Speed - controls the speed of the demonstration.
- Step - advance to the next step of the current demonstration.

The state of the layout is saved when running demonstrations.

A number of options and controls (such as scale) are changed while running demonstrations. These will be restored when the demonstration is finished.

You can adjust Window sizes and positions while the demonstration is running to better see what is happening.

2.7 Hot Bar



The *Hot Bar* starts with a flextrack of the current gauge, and then a scrolling list of all the turnouts, sectional track and structures available through the Turnout (Section 2.1.9) and Structure (Section 2.1.8) commands. The Description and/or Part Number under each object can be displayed by enabling the *Hot Bar Labels* radio button on the Display (Section 2.10.3) dialog.

Only those items taken from files which are in the current scale/gauge are displayed in the HotBar. They are shown in order - A FlexTrack - then the Contents of Files in the File->Parameter Files... List in listed order - and then any Custom objects created in this Layout as listed in the Manage->Custom Defined Parts dialog.

The arrow buttons on either side of the *Hot bar* move the list one object to the right or left. Holding down the Shift key will move the list by greater amounts. About eight Shift+Clicks are required to move the list through the entire range of objects. Also, pressing the keys 1 through 9 and 0 will cause the *Hot Bar* to jump relative spots on the list.

A Right-Click over the *Hot Bar* will display a pop-up menu listing the files with contents on the *Hot Bar*. Selecting an item from this list causes the *Hot Bar* to jump to the relative spot on the whole list.

Objects on the *Hot Bar* are placed on the drawing canvas by first selecting an object by *Clicking* it on the *Hot Bar*. Then *Click* and *Drag* on the Main window, rotating it with Right-*Drag* to position it, and then pressing the Space key to set it in place.

For *Turnouts*, see below for additional details on the *Active EndPoint*.

2.7.1 FlexTrack

A FlexTrack unit can be placed for convenience on the left-hand side of the HotBar. This is can be hidden by an option in Section 2.10.7. It can be recognised because it is the only diagonally facing track element and has a label "FLEX". It is used by Left-Click selecting it, and Left-Click clicking on the layout where the first end should be placed, and then Left-Click for the second end. If either end is over an unconnected end and Shift was not held, the flextrack will be connected to the track and the end angle and radius will be set from the track. If an end was not over an unconnected end, it can be manipulated by left dragging out the end angle before releasing. If the second end is not on a track end, differing end angles will produce a smooth curve, if both ends are unconnected, simply Left-Click without dragging produces a straight track. Once both ends have been defined, the track can then be manipulated like a section 2.2.8.8 Cornu Curved Track, by selecting and moving ends, adding and removing "pins" and altering the end anchor angle and radius if the flextrack is not connected at that end. If the disconnected end is dragged and the button released while over an open end of another track, it will be connected to it in the manner of a Join with a Cornu easement.

A FlexTrack will form a Straight Track if the ends have zero radius and are in a line with opposed end angles. If the ends are not aligned but the end angles are opposed it will be a simple S-curve. It will be a smooth monotonic curve if the ends are not in a line and the end angle lines and chord form a triangle. Otherwise it will be a complex S-curve. .

2.7.2 Structures

Structures are placed on the layout in the same way as turnouts (Section 2.7.3) except no Active EndPoint exists and they do not align with existing track.

Refer to Section 2.1.8 for information pertaining to use of the *Structure* dialog.

2.7.3 Turnouts

Turnouts have an *Active EndPoint* (Section B.2) which is the handle used to position the *Turnout*. You can change the *Active EndPoint* by a Shift+Left-Click which causes the next endpoint to become Active.

If you Left+Drag a turnout onto a track, the Active EndPoint (Section B.2) is aligned with the selected track. On flex-track, you can flip the turnout by moving the cursor from one side of the track centerline to the other. On another turnout, the new turnout will be placed at the endpoint closest to the cursor.

XTrackCAD will automatically connect the turnout's endpoints to any other tracks they are aligned with. The number of endpoints that will be connected is displayed on the Status Bar, as well as the Maximum displacement between these endpoints and the tracks they will be connected to. *XTrackCAD* will adjust the position of the Turnout to give you the best fit for locating the turnout. You can override this adjustment by holding down the Shift key while *Dragging*.

Right+Drag or Ctrl+Left+Drag (Section B.1) can be used to rotate the turnout on the layout. Shift+Right-Click (Section 3.4) displays a pop-up menu allowing you to rotate the turnout by various angles.

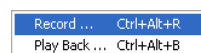
When you press the Space key, the turnout is positioned on the layout. Any tracks that are aligned with any of the turnout's endpoints will be connected to the turnout automatically. If you are using the Turnout (Section 2.1.9) command then you can also click the *OK* button on the dialog.

If you choose another turnout or change commands after beginning to place a turnout on the layout, the turnout will be created as if it is attached to another track. Otherwise it will be removed.

If the Drawing Scale is smaller or equal to the Label Scale (Section 2.10.3) then Turnouts will be labeled with their description when drawn. The individual labels can be can be turned off by the Move Description(Section 2.2.10) command, or all Turnout labels can be disabled by using the Display (Section 2.10.3) dialog. As well, the length of any connected Flex-track will be indicated at each endpoint.

Refer to Section 2.1.9 for information pertaining to use of the *Turnout* dialog.

2.8 Macro Menu



The Macro Menu shows commands that can be used to Record and Playback commands.

Record - Displays the Record dialog (after prompting for a file name). The current layout state and most subsequent actions will be saved in the recording file.

- Messages can be inserted into the recording file by pressing the *Message* button on the Record dialog then entering a message in the text display.
- Press the *End* button to end entry of the message and resume recording.
- Press the *Stop* button to stop recording.

Playback - Displays the Playback dialog (after prompting for a file name). This is used to playback previously recorded sessions. Note: the layout state will be saved during playbacks and restored after.

The Record command is useful if it becomes necessary to report a bug in *XTrackCAD*.

2.9 Manage Menu

Train	
Turnout Designer...	►
Layout Control Elements	Ctrl+Alt+C
Group	Ctrl+Shift+G
Ungroup	Ctrl+Shift+U
Custom defined parts...	Ctrl+Alt+U
Update Turnouts and Structures	
Car Inventory	Ctrl+Alt+V
Layers ...	Ctrl+Alt+Y
Parts List ...	Ctrl+Alt+L
Price List...	Ctrl+Alt+Q

The Manage Menu shows commands affecting the Main Canvas (Section 3.1).

- Car Inventory - displays the dialog (Section 2.9.1) to update your list of cars and locomotives.
- Custom Management - displays the Custom Management (Section 2.9.2) dialog to manipulate custom turnout, structure and rolling stock designs.
- Layout Control Elements - display the Layout Control Elements (Section 2.9.3) dialog to manipulate blocks, turnout motors and signals.
- Group - creates a Structure or Turnout definition from the selected (Section 2.2.16) objects. See the Group command (Section 2.9.4) for details.
- Layers - displays the Layer (Section 2.9.5) dialog.
- Parts List - Invokes the Parts List (Section 2.9.6) command. This command produces a list of all selected turnouts and sectional tracks and the total length of flex-track.
- Price List - Displays the Price List (Section 2.9.7) dialog to specify prices for tracks and structures.
- Train - Run trains on the designed layout
- Turnout Designer - displays a menu list of Turnout Designer (Section 2.9.9) dialogs.
- Ungroup - breaks apart any selected (Section 2.2.16) turnouts and structures into their basic lines (Section 2.3) and track segments.
- Update Turnout and Structures - replaces (Section 2.9.10) any selected (Section 2.2.16) Turnouts and Structures with the definitions from updated parameter files (Section 2.5.5).

2.9.1 Car Inventory

This dialog is used to manage your list of cars and locomotives.

Car Inventory								Find
Sort By		Index	Scale	Manufacturer	Part No			Edit
Index	Scale	Manufacturer	Part No	Type	Description	Roadname	Rep	Add
20	N	Atlas	32851	Freight Car	Hopper, 45'3-Bay w/Load	Canadian National	(A)	Delete
1000	N	Atlas	32851	Freight Car	Hopper, 45'3-Bay w/Load	Canadian National	(A)	Import
1001	N	Arnold	5320	Freight Car	Box, 86'	Santa Fe	(A)	Export
1002	N	Arnold	5320	Freight Car	Box, 86'	Santa Fe	(A)	List
1003	N	Atlas	37221	Freight Car	Box, 60'	Grand Trunk Western	(A)	Close
1004	N	Atlas	37221	Freight Car	Box, 60'	Grand Trunk Western	(A)	Help
1005	N	Atlas	37223	Freight Car	Box, 60'	Grand Trunk Western	(A)	
1006	N	Atlas	32851	Freight Car	Hopper, 45'3-Bay w/Load	Canadian National	(A)	
1007	N	Con Cor	105103	Freight Car	Reefer, 40	Canadian National	(A)	
1008	N	Con Cor	105103	Freight Car	Reefer, 40	Canadian National	(A)	
1009	N	Con Cor	105103	Freight Car	Reefer, 40	Canadian National	(A)	

The main part of this dialog contains a detailed list of each car and locomotive in your inventory. The list can be sorted on different columns by selecting column names in the Sort Drop Down Lists along the top of the dialog. The width of the columns can be adjusted by *Left+Drag* on the lines between the column titles.

Cars are placed on the layout by using the Train Simulation (Section 2.9.8) command.

The Find button will center the Main Window (Section 3.1) on the selected car. This button is only enabled for cars which are on the Layout (indicated by Layout in the Location column). If the car on a track that is hidden and Trains on Hidden Track (Section 2.10.3) is set to Hide, then the car (and any attached cars) will be made visible.

The Edit button invokes the Car dialog (Section 2.9.1.1) to modify the selected car. This button is disabled if more than one (or no) car is selected or if the selected car is on the Layout.

The Add button is to add a new Car. Refer to Section A.3 if an error occurs when attempting to add inventory to this list.

The Delete button removes the selected cars from your inventory. This button is disabled if any of the selected cars are on the layout.

The **Import** and **Export** buttons read and write a *Comma-Separated-Value (CSV)* file. This file format can be read and written by many applications. It can be used to transfer car inventory data between different applications. This file contains the following columns (the first four are required when Importing):

Scale - example: H0, H0n3, N, O etc

Manufacturer and Partno

Prototype - example: GP40

Index - an unique numeric identifier (optional)

Roadname, Repmark and Number - example: Burlington Northern, BN, 1234

Type - enter one of the following:

- 10101(Diesel),
- 10201(Steam),
- 10301(Electric),
- 30100(Freight),
- 50100(Passenger),
- 70100(M-O-W) or;
- 90100(Other)

Options - 2 (Locomotives), 4 (Body Mounted Couplers)

CarLength, CarWidth, CoupledLength, Truch Center Offset and *TruckCenter* - car dimensions in inches

Color - encoded as (Red * 65535 + Green * 256 + Blue)

PurchPrice, CurrPrice, PurchDate and *ServiceDate* - numeric values

Condition - enter one of the following:

- 100(Mint),
- 80(Excellent),
- 60(Good),
- 40(Fair),
- 20(Poor) or;
- 0(N/A)

Notes - free form text

The **List** button creates a text file listing your inventory.

2.9.1.1 Car Item Dialog

This dialog is invoked from the **Car Inventory** (Section 2.9.1) and the **Custom Management** (Section 2.9.2) dialogs.

The dialog can be displayed in three different ways and is used to create or edit **Car Items**, **Car Part** definitions or **Prototype** definitions.

The **Add** button creates a new definition. The dialog remains open so you can enter multiple definitions. You can **Close** the dialog when you are finished. If you are editing an existing definition then the **Add** button will be replaced by the **Update** button which updates the selected definition and closes the dialog.

The **New** button on the **Car Item** dialog invokes the **Car Part** or **Car Prototype** dialog which you can use to create new part or prototype definitions for your cars. The **New** button on the **Car Part** dialog invokes the **Car Prototype** dialog.

Car Item Dialog

The dialog contains:

Car Description which contains lists of **Manufacturer**, **Prototype** and **Part Number** which are used to select the Car Part. The **Manufacturer** list contains the entries **Custom** and **Unknown** for special Car Parts. For these entries you can enter the **Part Number** and **Description** fields.

- If the manufacturer of your car is not listed in the **Manufacturer** list you can type in the new name. Also, if the **Part** is not listed you can enter a new part number. The new part will be added to the list of Custom Car Parts (Section 2.9.2).

The **Mode** Radio button group lets you choose between the **Information** controls described here or the **Customize** controls described in the next section. You would use the **Customize** option to change Road name, Number or Color if you have repainted the car or to adjust the dimensions.

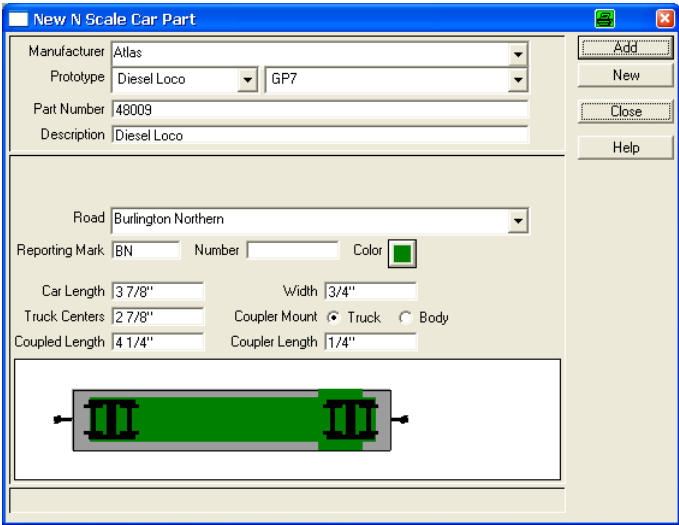
Details about the individual car item such as **Index**, **Price** and **Condition**, **Dates** and **Notes**. The **Index** value must be unique for all car items.

- To enter multiple **New Cars** you can set the **Quantity** field to a value greater than one. The **Numbers** Radio button group specifies whether the new car's numbers will be sequential (such as 1234, 1235, ...) or repeated.

Message Line which will contain instructions if there any fields that need to be completed.

2.9.1.2 Car Part Dialog

This dialog is similar the the Car Item dialog except that the **Car Item Information** section is not displayed. The **Manufacturer** Drop Down List is editable so you can enter a new manufacturer, and you must enter a **Part Number**. If you are adding a new car part, the **Part Number** field will be incremented (if it is a numeric value) so you can enter a number of car parts.



The middle section contains:

The **Road**, **Reporting Mark**, **Number** and **Color**. You can choose a **Road** name from the list of known road names or enter a new value. If known, the *reporting mark* (road name abbreviation) is filled in.

Car Dimensions which contain the major dimensions of the car and how the coupler is mounted on the car. The **Coupler Length** is measured from the edge of the car body to the pulling face of the coupler. It is equivalent to half the separation between two coupled cars.

- When entering values, the **p** key will convert a prototype measurement to a scale measurement.
- The length dimension has the following relationship, so changing one value will affect the others:

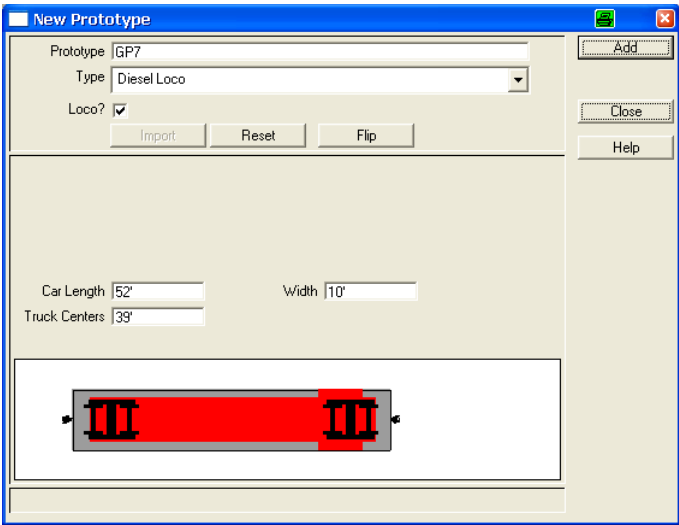
$$\text{Coupled Length} = \text{Car Length} + 2 * \text{Coupler Length}$$

The *Center Offset* moves the center of the two trucks from the center of the Car. This is a common feature of steam locomotives and means the envelope of the engine requires greater separation between tracks on small radius curves. The minimum clearance needed can be seen by placing the car with the greatest distance from the center of the trucks to the corner on the inner radius and the car with the greatest distance between the trucks on the outer radius. See NMRA TN-7 Curved Track Centerline and Obstacle Clearance Calculation Methodology.

A diagram showing the position of the trucks and couplers.

2.9.1.3 Car Prototype Dialog

This dialog is used to create or edit prototype definitions.



The first section contains the name of the **Prototype** and its **Type**.

If this dialog was invoked from the **Car Item** or **Car Part** dialog then the prototype diagram will be copied from the selected part. Otherwise, the prototype is drawn as the default image which is a simple blue rectangle or, if it is a locomotive, with one end angled.

The **Import** button creates a prototype definition from the selected (Section 2.2.16) lines and shapes. To use this, first create a set of shapes (**Filled Rectangles**, **Polygons**, **Circles**, **Lines** etc) using the **Draw** (Section 2.3) commands on the main canvas. Select the shapes and use the **Import** button.

The **Reset** button will reset the figure to the default image.

If this dialog is invoked by the **New** button on the **Car** or **Car Part** dialog then the initial image will be copied from the prototype displayed on those dialogs. You can use this to make variations of existing prototypes.

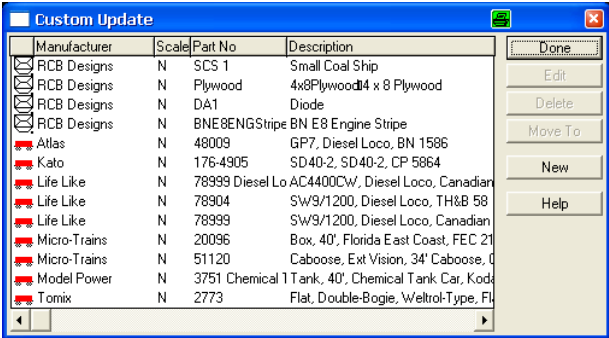
The **Color** control on the **Car Part** dialog will replace any color of the **Imported** shapes which is not Black or a shade of gray with the selected hue.

The **Flip** button flips the diagram horizontally. For locomotives, the forward direction is to the right.

Unlike the other dialogs, dimensions in this dialog are in prototype units. When entering values, the **s** key will convert a scale measurement to a prototype measurement.

2.9.2 Custom Management

The **Custom Management** dialog allows you change the properties of turnouts, sectional track, structures, car parts and prototypes you have designed with the **Turnout Designer** (Section 2.9.9), **Group** (Section 2.9.4) or **Car** (Section 2.9.1.1) commands. You can also move selected objects to a **Parameter File** (Section 2.5.5).



The **Edit** button invokes the appropriate designer or editor dialog for the selected item. This button is disabled if more than one (or no) object is selected.

The **Turnout Designer** (Section 2.9.9) is used to modify the selected turnout design. If you wish to modify cosmetic details on a turnout or sectional track use the **Group** (Section 2.9.4) command to add them to an existing definition.

Structures and old **Turnout Designs** use the **Rename Dialog** to change the Manufacturer, Description or Part Number values. For these objects the **Edit** button's label changes to **Rename**. Structures are not edited using this dialog but by using the **Ungroup** (Section 2.9.11) and **Group** (Section 2.9.4) commands.

The **Car** (Section 2.9.1.1) dialog is used to modify **Car Prototype** and **Car Parts**.

The **Delete** button removes the selected entries from the `xtzrkcad.cus` (Section 1.9) file when you exit the dialog.

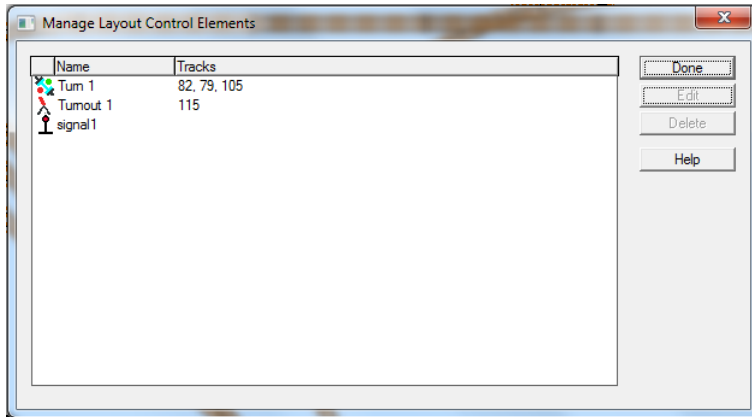
The **Move To** button moves the selected entries to a **Parameter File** (Section 2.5.5). If the **Parameter File** does not currently exist than you will be prompted to supply a contents description line for the file. In case the parameter file already exists, the selected entries are appended to this file.

The **New** buttons invokes the **Car** (Section 2.9.1.1) dialog to create a new **Car Prototype** or **Car Part**.

2.9.3 Layout Control Elements Dialog

This dialog is used to manage layout control elements (blocks, switchmotors, and signals).

Control Elements are elements related to layout control: blocks (occupancy detection), switchmotors (actuators to "throw" turnouts), signals, controls (other actuator or output devices), and sensors (other sensor or input devices). These elements don't relate to directly "physical" items on the layout, but instead refer to the elements used by the layout control software. These elements contain "scripts", which are really just textual items that provide information for the layout control software and provide a bridge between physical layout elements (like tracks or turnouts) and the layout control software. These textual items could be actual software code or could be LCC Events (for I/O device elements on a LCC network) or DCC addresses for stationary decoders, etc. XTrackCAD does not impose any sort of syntax or format -- that is left up to other software that might load and parse the XTrkCAD layout file. All that XTrackCAD does is provide a unified place for this information to be stored and to provide a mapping (association) between this control information and the layout itself.

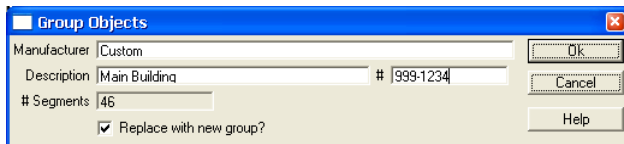


The main part of this dialog contains a list of the currently defined layout control elements (blocks, switchmotors, signals, controls, and sensors), along with the tracks they relate to. These elements are added to the layout either from their Hotbar menus or from the Add menu.

The Edit button allows for editing a control element. And the Delete button deletes the selected element(s).

2.9.4 Group Dialog

The Group command combines the selected (Section 2.2.16) Lines and Shapes (Section 2.3) to create structures (Section 2.7). You can give the structure (Section 2.7) a title consisting of Manufacturer, Description and Part Number on the Group dialog.



The title will be pre-populated with the title of the last Structure you ungrouped (Section 2.9).

You can include Turnouts, Sectional, Straight or Curved tracks in the selected objects which allows you to add cosmetic details to a Turnout definitions, or create a new Turnout definition. This can also be used to if there are fixed track locations on a structure, like on an engine shed.

To modify a Structure or Turnout definition, first place the object on the layout, select and then Ungroup the object. Now the parts of the object can be edited using the Modify (Section 2.2.8), Draw (Section 2.3) or other commands. Once completed, select the object parts and use the Group command to update the definition (or create a new one by changing the title).

The Group dialog shows the Manufacturer, Description and part number (Title) of the new definition. Initial values are based on selected turnouts and structures or on the last Ungrouped object (Section 2.9.11). The dialog also contains a toggle button (Replace with new group?), which is used if you want to replace the selected objects with the new definition. All fields listed in this dialog window must contain data.

The definition data will be added to the xtrkcad.cus (Section 1.9) file for later use. Please consider contributing this information for others to use.

If you modify a definition from a XTrackCAD Library parameter file, the new definition will replace the existing definition on the Hot Bar (Section 2.7), otherwise it will be added to the end of the Hot Bar. You can use the Custom Management (Section 2.9.2) dialog to change the title or delete custom definitions.

Note: There is a limit of 128 track segments in a group.

2.9.5 Layers Dialog

Each object is contained in a layer - which is a custom group of objects that do not have a particular visual order, but can be treated as a set for certain commands. Objects which are created independently of other objects (such as straight tracks (Section 2.1.7) or text (Section 2.3.9)) are created in the current layer. Objects which are associated with other objects (such as tracks created by the Modify (Section 2.2.8) or Join (Section 2.2.7) commands) are created in the same layer as the associated object(s).

The Layers dialog allows you to change various attributes of each of the 99 possible layers.

Attributes associated with a layout are stored within the associated layout file and apply only to the layout that's open at the time of a change. It is possible to apply attributes from one layout file to another using the Load and Save buttons.

The drop down list at the top of the dialog selects the Layer you are interested in. Frozen layers are preceded by a *, Module layers are preceded by a m, non-empty layers are preceded by a + and empty layers by a -.

The Name edit box contains the name of the Layer. This name is listed in the Current Layer drop down list on the Tool-bar (Section 3.1). Also the Name is displayed as the balloon help for the corresponding Layer Button.

The Color button specifies the color of tracks if either of the two Color Layers (Section 2.10.3) radio buttons on the Display dialog is checked and the Use Color button for this layer is checked.

The Visible check-box controls whether the Layer is drawn on the Main (Section 3.1) window.

The Frozen check-box indicates that tracks in that Layer can not be modified or deleted.

The On Map check-box controls whether the Layer is drawn on the Map (Section 3.2.2) window.

The Module check-box controls whether the Layer is selected/deselected and so moved or rotated as a group - this can be used to denote a track module in a modular layout - allowing the modules to be positioned as units. Objects in a Module Layer can not be individually modified. One way of getting a modules in is to build a library with Export and then Import As Module - this creates one layer per module, names it and sets the Module check-box.

The No Button check-box selects if the Layer has a button to hide/show it. You may choose not to have a button if the layer is empty or if it is a sub-layer controlled by another layer.

The Linked Layers text box can contain a semi-colon-delimited set of layer numbers that will be shown and hidden along with this layer when its show/hidden state is changed. A blank means no layers are linked. The layers can have buttons or not.

You cannot uncheck Visible or check Frozen for the Current Layer.

The Load Settings specifies a settings (.xset) filename in the XTrackCAD working directory that is loaded when this layer is made current. Only the values contained in the file will be set. If this name is blank the default values (all those in use when any layer that has no Load Settings file value was last used) will be reloaded (or retained). The dropbox contains all the names of files in that directory.

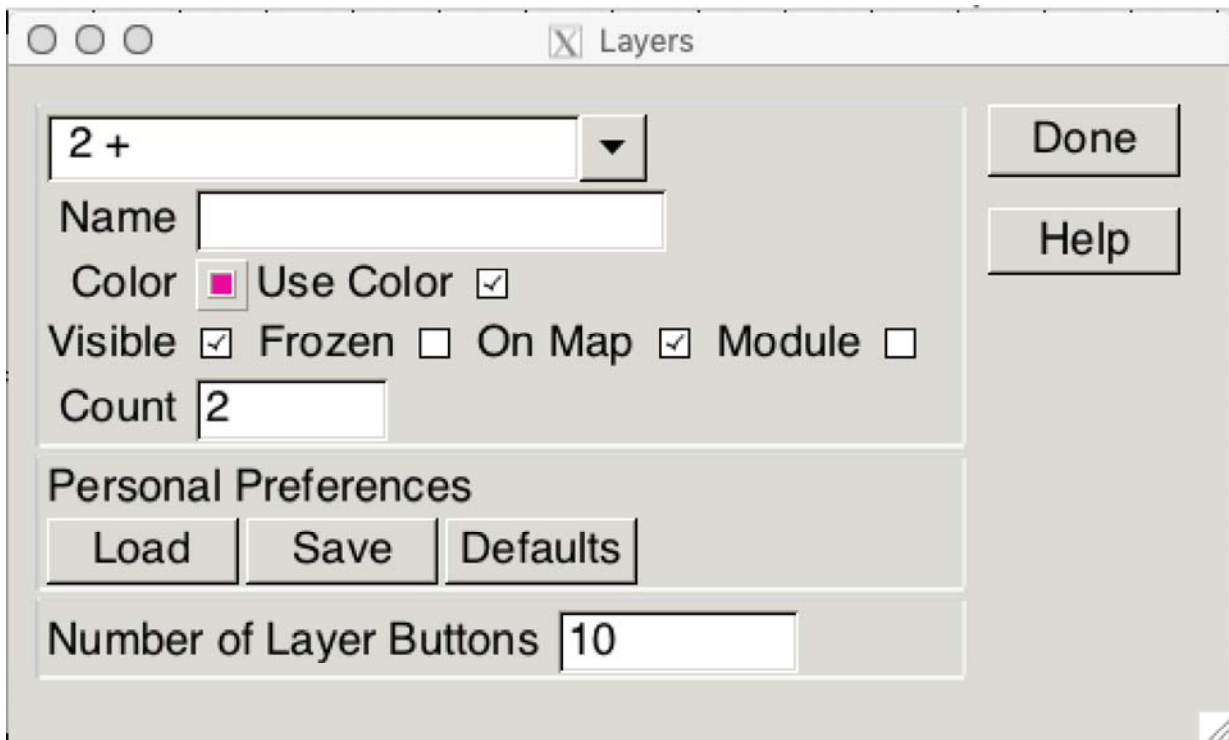
The Count field displays the number of objects in the selected Layer.

The Save button stores layer attributes in the xtrkcad.ini file so they may be loaded into an existing or new file. Once saved and unless reset to XTrackCAD Default, modified layer information is applied to each new file.

The Load button reads layer attributes from the xtrkcad.ini file then applies it to each layer of the current layout file.

The Defaults button restores layer attributes to default XTrackCAD settings.

The bottom of the dialog contains the Number of Layer Buttons integer edit box. This controls the number of Layer Buttons displayed on the Tool-bar (Section 3.1). These buttons make it easy to switch between layers. The maximum number of Layer Buttons that can be displayed is 99. Layers with "no-button" set do not count towards the Number of Layer Buttons.



The Layer Buttons on the Tool-bar (Section 3.1) control which layer is the current Layer and which Layers are displayed on the Main Canvas. These buttons are a short cut for the Visible check-box on the Layers dialog for the corresponding layer.

The current layer is selected by picking a value from the drop down layer list. If the Layer you've selected was not visible, it will be shown.

You can hide (or show if not visible) the different layers by pushing one of the Layer Buttons on the Tool-bar (if you have configured the tool-bar (Section 2.12.3) to show the Layer buttons). If a layer is not visible then the corresponding layer button will be raised. The active or current layer cannot be hidden.

The color of each layer button shows the color that will be used to draw tracks or draw objects in that layer, if you have selected the Color Layers (Section 2.10.3) on the Display dialog. The Use Color button allows this layer to opt in or out - which can be useful if you want to color other layers but a layer contains pre-colored objects (like Structures or Scenery).

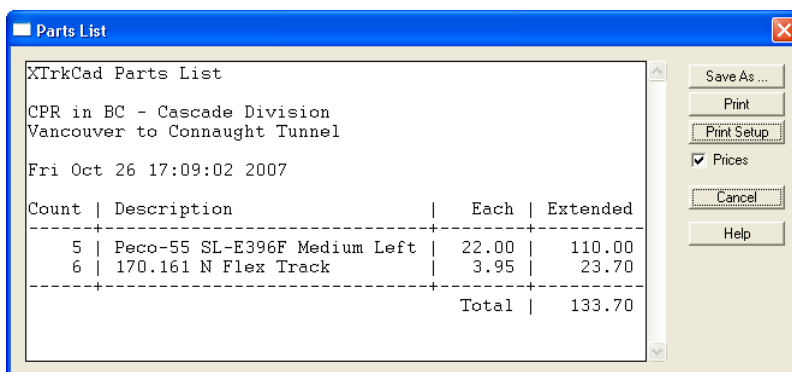
Any selected objects are unselected when the Layer is set to not visible. If a layer is not visible, you cannot select objects in the Layer. It is as if the objects do not exist until you show the layer again.

The Move To Current Layer command on Edit menu (Section 2.4) will move all selected (Section 2.2.16) tracks to the current Layer.

Objects are drawn on the map window, if the Layer they are on has On Map checked.

2.9.6 Parts List

The Parts List command produces a list of all selected (Section 2.2.16) turnouts, sectional track and bench-work. It also computes total length of selected flex-track.



The Save As... button opens a File Save dialog window that's used to name and save the parts list to a file.

The Print button opens the Print dialog which is used to facilitate printing of the parts list.

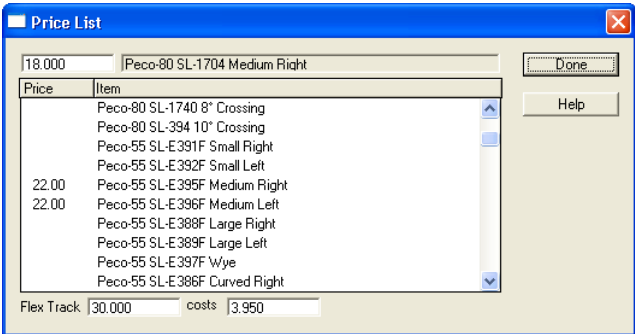
The Close button terminates the Parts List command.

The Parts List dialog will list pricing for selected objects if the Prices check box is checked. Prices are set using the Price List (Section 2.9.7) dialog.

Hint: use the Parts List command to measure the length of selected flex-track.

2.9.7 Price List

The Price List dialog allows entry of prices for Turnouts, Sectional Track and Structures. Only those objects from loaded Parameter Files (Section 2.5.5) or *Custom Designs* for the current Scale (Section 2.10.6) are listed.




The price of a selected object can be changed in the *Cost* edit box that's located above the "Price" column.

The price of a length of *Flex Track* for the current Scale (Section 2.10.6) is listed at the bottom of the dialog. You can specify the *Length* in *Inches* or *Centimeters*. To specify the price for other *Scales* change Scale (Section 2.10.6) on the Layout (Section 2.10.6) window.

The Parts List (Section 2.9.6) dialog lists prices for selected objects if the *Prices* check box on the dialog window is selected.

2.9.8 Train

 The Train command lets you place and run Trains on the layout.

During this command, the Tool Bar and Hot Bar are changed. Most of the Tool Bar buttons are replaced by the *Go/Stop* and *Exit* buttons. The *Go/Stop* button toggles between Pausing all Trains and allowing Trains to Run. The *Exit* button terminates the Train Simulation and returns to Layout Design mode.



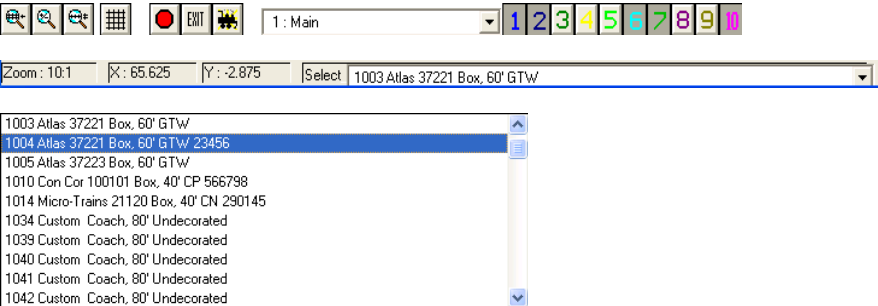
Selecting New Cars

The Hot Bar contains the Cars and Locomotives which have not been placed on the Layout . Cars are created and managed using the Car Inventory (Section 2.9.1) dialog.

Each item on the Hot Bar can represent a group of Cars. Cars can be grouped by Prototype, Manufacturer and/or Part Number. They can also be listed as individual Car Items. This grouping is controlled by *Car Labels* Drop Down List on the Display (Section 2.10.3) dialog.

To place a Car, select it from the Hot Bar. If the Hot Bar is displaying Cars in groups (and not as individual Car Items) then a Drop Down List is displayed on the Status Bar (Section 3.1) containing the individual Car Items in that group.

If you are not displaying the Hot Bar, then the *New Car* button () will be shown on the Tool Bar. Pressing this button will display the Drop Down List on the Status Bar (Section 3.1) containing all of your Car Items that have not yet been placed on the layout.



Placing Cars

Once you have selected a new Car, or have selected an existing Car on the Layout, you can position it by using the mouse to drag it around the Layout. If the Car is coupled to other Cars then the whole set of Cars is moved. If you place the Car on a Track, that Car (and the other coupled Cars) will be aligned along the track.

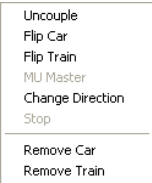
Note: If you move the tracks but not the cars (or vice-versa) using the Move (Section 2.2.9) or Rotate (Section 2.2.15) commands the cars will not remain attached to the tracks. If the cars are moved close to a track, then they will be aligned when the *Train Simulation* command is next invoked.

Coupling Cars

If a Car is moved along a track to another Car then the Cars will be coupled together.

Uncoupling Cars

To uncouple Cars, Right-Click between the Cars then select *Uncouple* from the pop-up menu.



Change Train or Car Orientation

The orientation of a Train or Car can be reversed by Right-Click over the appropriate object then selecting either *Flip Train* or *Flip Car* from the pop-up menu.

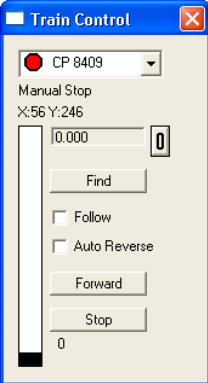
Remove Train or Car From Layout

To remove a Train or Car from the layout, Right-Click over the appropriate object then select either *Remove Train* or *Remove Car* from the pop-up menu.

Trains

A Train consists of one or more Locomotives coupled to other Cars. One Locomotive will be the *MU Master* for the Train. The *MU Master* can be changed by Right-Clicking on a Locomotive and selecting *MU Master* from the pop-up menu. The *MU Master* is drawn with a solid Yellow head light indicating the direction is moving. If a Train is split by uncoupling between Locomotives, then two Trains will be created, each with their own *MU Master*.

Train Control



The *Train Control* dialog is used to set the speed and direction of Trains. The dialog contains a list of Trains (listed by their *MU Master* Locomotive). Before each Train on the list is either a Red circle (indicating the Train is stopped) or a Green circle (indicating the Train is moving).

Any number of Trains can be running, although it might be difficult to keep track of more than a few.

For the selected Train, the Train Control dialog lists

Train status: indicating that the Train is moving, is paused or the reason if the Train is stopped.

The position of the Train

A slider which controls the speed of the Train in Scale Miles-Per-Hour or Kilometers-Per-Hour.

The Odometer which measures the total distance travelled by the train, which can be reset by pressing the *O* button.

The *Find* button which positions the Main Window (Section 3.1) to show the Train. If the Trains on a track that's hidden and Hide Trains on Hidden Track (Section 2.10.3) is *Enabled* then the Train will be made visible until the next time it moves.

The *Follow* toggle button which causes the Main Window (Section 3.1) to follow the Train as it moves. The *Follow* toggle can only be set on one Train at a time, and it is cleared if you press the *Find* button or otherwise manually move the main canvas.

The *Auto Reverse* toggle button which causes the Train to change direction when it hits the end of a track.

The Direction radio button group which controls the direction (*Forward* or *Reverse*) of the Train.

The *Stop* button which sets the Trains speed to 0.

Train Operation

Once a Train is moving, it will continue to move until it is Stopped manually, hits the end of track or an open Turnout. If the Train 'runs into' other Cars, those Cars will be coupled to the Train. If Trains speed is faster than the Max Coupling Speed (Section 2.10.7) then the Train will crash and must be manually moved back onto the track.

If two Trains are coupled, one of the two *MU Masters* will be chosen as the *MU Master* for the combined Train.

The motion of all Trains can be Paused by clicking the *Go/Stop* button on the Main Window Tool Bar. Pressing the *Escape* key has the same effect as clicking on the *Stop* button. This allows you set Turnout positions or make other changes. When Train command starts, the *Go/Stop* button is in the *Stop* position and must be clicked before Trains move.

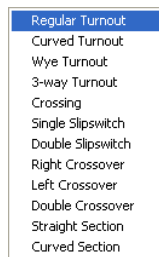
Turnouts and Turntables

Turnout positions are indicated by Red lines connecting the endpoints on the route through the Turnout. Trains will follow this route through the Turnout. If you *Shift+Left-Click* on the Turnout, the next position will used and Red line changed to indicate the new position.

Turntables can be turned by using *Shift+Left-Click* on the endpoint you want the Turntable to move to. To turn the Turntable 180°, *Shift+Left-Click* on the endpoint again.

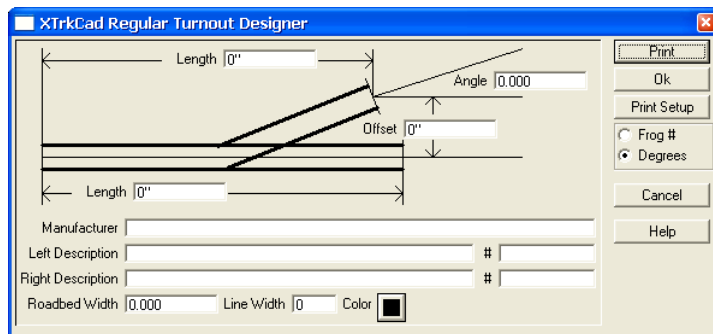
2.9.9 Turnout Designer

The Turnout Designer allows you to define new turnouts and sectional track pieces.



The Turnout Designer sub-menu is pictured above. As demonstrated by the sub-menu a number of different dialogs are available for creation of custom turnout and sectional track components. New turnouts and sectional track is added to Custom Management (Section 2.9.2) and Turnout Manager (Section 2.1.9) using the Turnout Designer.

The follow dialog is for a regular turnout.



Each dialog shows a diagram of the turnout and has fields to enter dimensions. The dimensions should be as accurate as possible. The various types of dimensions are:

Length - measured from the base of the turnout to the centerline at the end of the turnout. Length is measured parallel to the centerline of the straight leg of the turnout. For track that ends on a curve (such as the curved leg of a regular turnout) measure the distance from the base to each rail and average the values.

Offset - measured from the centerline of the straight leg of the turnout to the centerline of the track at the end of the turnout.

Angle - angle at the end of turnout to the centerline of the straight leg of the turnout. This angle may not be the same as the *Frog* angle of the turnout if the rails curve past the *Frog*. The *Frog Number*|*Degrees* Radio button group controls whether the value is expressed in Frog Number or Degrees.

Manufacturer - name of the Manufacturer

Description - description of the turnout including size and rail code number, e.g., 'Left Hand #4'. This information is shown when a place the mouse pointer over the respective symbol on th Tool-bar. Therefor it should be made sure that the data entered here are helpful in finding the correct turnout.

- part number, e.g., '999-123'.

Roadbed Width - if greater than the track gauge then lines are drawn along the edges of the turnout to represent the attached roadbed available on some types of sectional track and turnouts.

Line Width - the width of the roadbed lines, measured in pixels when the layout drawing scale (Section 2.12) is 1:1.

Color - color of the roadbed lines.

The rail height (*Code*) can be added to the **Manufacturer**, e.g., Peco-55, or the **Description**, e.g., Medium Right, Code 55.

The scale is the current scale from the **Scale Drop Down List** on the **Layout** dialog (Section 2.10.6).

Manufacturer, **Description** and **Part Number (#)** comprise the title of the turnout. These values are used in the **Turnout Selection** dialog (Section 2.1.9) and the **Parts List** (Section 2.9.6). For regular and curved turnouts there are separate **Descriptions** and **Part Numbers** for the right and left hand turnouts.

The **Print** button prints a full size diagram of the turnout. You can use this to check your dimensions and make any required changes. You should expect to make several printouts as you refine your dimensions.

The **OK** button completes the design. The new turnout is added to the list in the **Turnout Selection** dialog. The turnout data is saved in the `xtrkcad.cus` (Section 1.9) file for the next time you use *XTrackCAD*. Please consider contributing this information for others to use via the on-line addresses. You can change the Parameters or Title of existing designs by using the **Custom Management** (Section 2.9.2) dialog.

The **Cancel** button removes the **Turnout Designer** dialog.

Creating Turnout Designs

- It is best to start by marking the endpoints of the turnout on a piece of paper. Extend the curved leg of the turnout (try attaching a straight sectional track) and measure the angle. Frog numbers are easiest to calculate.
- Enter your data and press **Print**, if you have an accurate printer. Check the dimensions of the turnout against the printout and make adjustments as necessary. Concentrate on the lengths and offsets first, then adjust the angles.

- The resulting turnout is an approximation. In particular the curves will not be correct, but this is not important for placing turnouts.
- The new Cornu Turnouts allow you to build turnouts that have curved ends. The dialogs include radius information that can be set to zero for a straight end. The turnouts will be composed of simple curves and tracks and when extended the end radius will be used.
- The Group (Section 2.9.4) command can be used to add cosmetic details to Turnout definitions.

2.9.10 Update Turnouts and Structures

This command updates (or refreshes) selected turnouts, sectional tracks and structures on your layout with the current definitions from the loaded parameter files (Section 2.5.5). Each selected object that is found in a parameter file is updated with the current definition.

If an object can be found and if a new track definition fits in the same footprint, (i.e., has the same number of endpoints and all the endpoints have the same position and angle) then a dialog is displayed which contains suitable definitions that you can choose from. You can Skip the current object or Cancel to skip all the remaining objects.

Otherwise the update fails and must be done manually using Delete and Add.

If an object has been updated then it is unselected, otherwise it will remain selected at the end of this command.

2.9.11 Ungroup

Ungroup allows existing definitions to be modified and the resulting objects recombined with the Group (Section 2.9.4) command to update the definition. Turnouts are composed of individual straight and curved segments. Segments that form the points (Section B.2) of the turnout remain combined as an *Ungrouped Turnout*, and the other segments are replaced by straight and curved tracks.

2.10 Options Menu

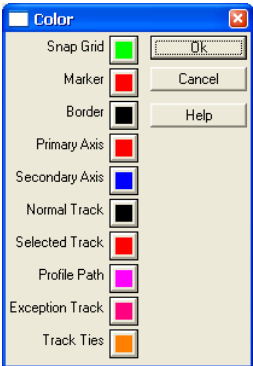
Layout ...	Ctrl+Alt+A
Display ...	Ctrl+Alt+D
Command ...	Ctrl+Alt+M
Easements ...	Ctrl+Alt+E
Fonts ...	Ctrl+Alt+F
Sticky ...	Ctrl+Alt+K
Preferences ...	Ctrl+Alt+P
Colors ...	Ctrl+Alt+C

The Options Menu shows commands to change configuration options.

- Colors - Displays the Colors (Section 2.10.1) dialog.
- Command - Displays the Command Options (Section 2.10.2) dialog.
- Display - Displays the Display (Section 2.10.3) dialog.
- Easement - Displays the easement (Section 2.10.4) dialog which controls how easements (spiral transition curves) are used to join tracks.
- Fonts - Displays the font selection (Section 2.10.5) dialog which selects the font used by the text (Section 2.3.9) command. This command is only available on UNIX based systems.
- Layout - Displays the layout (Section 2.10.6) dialog.
- Preferences - Displays the Preferences (Section 2.10.7) dialog.
- Sticky - Displays the Sticky Commands (Section 2.10.8) dialog.

2.10.1 Colors Dialog

The Colors dialog is invoked from the Options (Section 2.10) menu

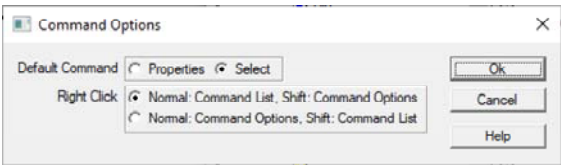


The Colors dialog controls the color that various objects are drawn.

- Border - Sets color of Rulers, Room Boundaries and Table Edges.
- Exception Track - Sets color of *Exceptional Tracks* (Section 2.10.6). Those which exceed the specified grade or are have a radius smaller than the minimum set.
- Marker - Sets color of short lines drawn on the Ruler of the Main (Section 3.1) window to indicate cursor position.
- Normal Tracks - Sets color of normal track.
- Primary Axis - Sets color of the large cross displayed when positioning the Snap Grid (Section 2.12.2) or the Print Grid (Section 2.5.7).
- Profile Path - color of the path when using the Profile (Section 2.2.12) command.
- Secondary Axis - Sets color of the large cross displayed when positioning the Snap Grid (Section 2.12.2) or the Print Grid (Section 2.5.7).
- Selected Tracks - Sets color of Selected track.
- Snap Grid - the Grid displayed by the Snap Grid (Section 2.12.2) dialog.
- Track Ties - color of ties (if drawn).

2.10.2 Command Option Dialog

The Command Option dialog is invoked from the Options (Section 2.10) menu

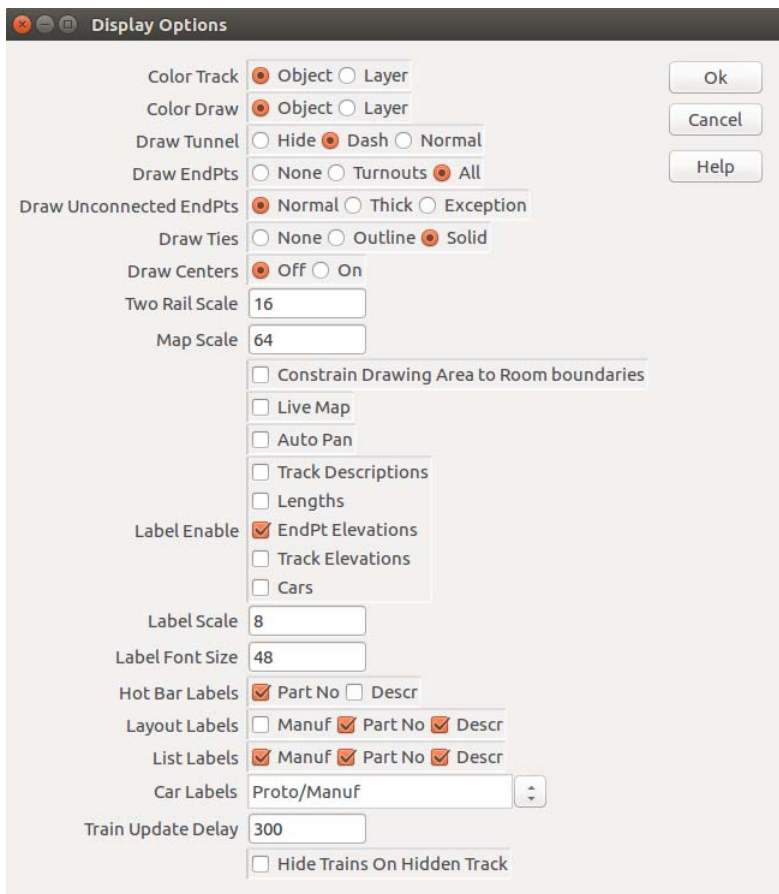


The Command Option dialog contains items which control the behavior of some commands.

- Default Command - selects the Properties (Section 2.2.13) or Select (Section 2.2.16) as the default command which is invoked when any other command (if not Sticky (Section 2.10.8)) is canceled or completed.
- Right-Click - will either display a pop-up menu of available commands or command-specific options depending on whether the *Shift* key is being held down or not. This option allows you to choose which operation occurs.
- Select-Mode - will either (a) only select the current item unless Ctrl is added or (b) will add the current item to the selection unless Ctrl is added in which case it will only select this item.
- Select-Zero - if selected will perform Deselect All if the selection is not on an object.

2.10.3 Display Dialog

The Display dialog is invoked from the Options (Section 2.10) menu



The Display dialog contains items which control the display of objects on the Main window.

Auto Pan - if enabled, dragging near the edge of the Main Canvas (Section 3.1) will cause the canvas to move to follow the mouse.

Car Labels - controls the grouping and display of Cars on the Hot Bar (Section 2.7) during the Train (Section 2.9.8) command. This can be a combination of Prototype, Manufacturer, Part Number and Item.

Color Tracks - when set to layers, tracks are drawn with color of the layer (Section 2.9.5) they belong to and not the normal track color. This can be disabled in the Layer dialog for each Layer by unchecking the Use Color checkbox.

Color Draws - when set to layers, non-tracks (lines, table edges and structures) are drawn with color of the layer (Section 2.9.5) they belong to rather than based on their own object setting. This can be disabled in the Layer dialog for each Layer by unchecking the Use Color checkbox.

Constrain Drawing Area to Room Boundaries - when Zooming and moving the Main Canvas (Section 3.1) may show areas beyond the boundaries of the room. Setting this option constrains the Main Canvas to minimize these areas (the grey area).

Dont Hide System Cursor - when XTrackCAD substitutes a specialized cursor to show actions that will occur (or are occurring) it will normally hide the System Cursor. This option suppresses this behaviour and leaves the system cursor in place.

Draw EndPts - when to draw endpoints between connected track: never, only for turnouts or for all tracks.

Draw Unconnected EndPts - how to draw unconnected endpoints: normally, with a thick line or with a thick line in the exception color.

Draw Ties - how to draw ties under the rails when the drawing Scale is smaller than half of the Two Rail Scale. Note that Section 2.4.6 can be used to hide ties for selected tracks.

Draw Centers - enable or disable drawing of center markings (ie. crosshairs) for curved track.

Draw Tunnel - how to draw hidden tracks (Section 2.4.4), either not at all, as dashed lines or as normal solid lines (which might be faster).

Hide Trains On Hidden Track - controls whether trains (Section 2.9.8) on invisible layers (Section 2.9.5) or hidden tracks (Section 2.4.4) (if hidden tracks are not drawn) are displayed.

Hot Bar Labels - controls the format of titles for objects on the Hot Bar (Section 2.7).

Label Enable - individual control over whether to display various types of labels. You may want to turn some of these off if your layout is too cluttered.

- *Cars* - Reporting mark labels on cars.
- *EndPt Elevations* - Elevation markers attached to endpoints.
- *Lengths* - Length of flex-track attached to ends of turnouts.
- *Track Descriptions* - Title of each turnout and sectional track, optional details of each piece of Flexible Track.
- *Track Elevations* - Computed elevations at the center of each track.

Label Font Size - controls font size for Labels on layout.

- Layout Labels - controls the format of titles for turnouts and structures displayed on the Layout.
- Label Scale - draw labels only when the drawing Scale is smaller or equal to this value.
- List Labels - controls the format of titles for turnouts and structures displayed in lists (such as the **Parts List** (Section 2.9.6)).
- Live Map - if checked then the Main Window (Section 3.1) will be updated as you drag on the **Map Window** (Section 3.2.2). Note that this can be slow.
- Map Scale - scale of the Map (Section 3.2.2) window. Increase this value to make the **Map** window smaller when working with large layouts. **Note:** you cannot make the **Map** window larger than the screen.
- Train Update Delay - number of milliseconds between updates in the **Train Simulation** (Section 2.9.8) mode. A lower value will generate a smoother display but reduces system responsiveness.
- Two Rail Scale - draw tracks using two lines when the drawing Scale is smaller than this value.

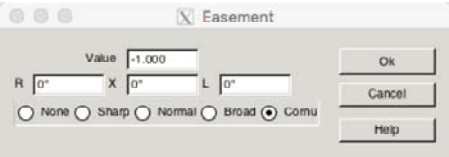
2.10.4 Easements

Easements are special sections of gradually curving track used to connect straight and curved tracks (or two curved tracks). Easements reduce the effects of sudden changes in track curves which can cause jerky motion and derailments.

Easements can be created every time you **Join** (Section 2.2.7) tracks, **Extend** (Section 2.2.8.6) a track or create a **Tangent** (Section 2.2.8.4) track.

When using easements, an error message will be generated if tracks have a radius that is too small or are too short for the transition curve.

The Easement dialog is invoked from the Options (Section 2.10) menu.



- Value - allows fine tuning of the easement parameters (restricted to values >= 0.5).
- R - minimum radius of the curved track.
- X - offset between a straight and curved track.
- L - length of the transition track.
- Radio button group with **None**, **Sharp**, **Normal**, **Broad** and **Cornu**. Corresponding **Values** for these buttons are 0, 0.5, 1.0, 2.0 and -1.0. Select **None** to turn easements off.

For traditional fixed sharpness easements see section 2.10.4.2, for Cornu Easements see section 2.10.4.1.

2.10.4.1 Cornu Easements

The Cornu Easements work in a different way to the other easements. They use all the space available to minimize sharpness, so you can control the sharpness for each curve you draw by the distance apart, radius and angle of the two end points.

The Cornu is a mathematical curve that has the property that the curvature (inverse of the radius) varies linearly along its length. Using an open-source Cornu library written by Dr Raph Levin, we can calculate an Cornu easment to suit the end conditions of radius, curve center, angle and position. A Cornu easement can be constructed between two tracks by using the values of these parameters.

To draw an cornu easement see section 2.2.7.4, to Modify it afterwards see section 2.2.8.8.

2.10.4.2 Easements with Fixed Sharpness

The values **R**, **X** and **L** are read-only. They are set using the radio buttons or the **Value** field which can be set to 0 (No Easment) or between 0.21 (sharpest Easement) 100 (broadest Easment).

These values indicate the worst case of joining a straight track with a curve of radius **R**. The two tracks are separated by the offset **X** while the easement curve extends for **L/2** inches or centimeters to each side of the endpoints.

The formula used to draw non-Cornu easements is:

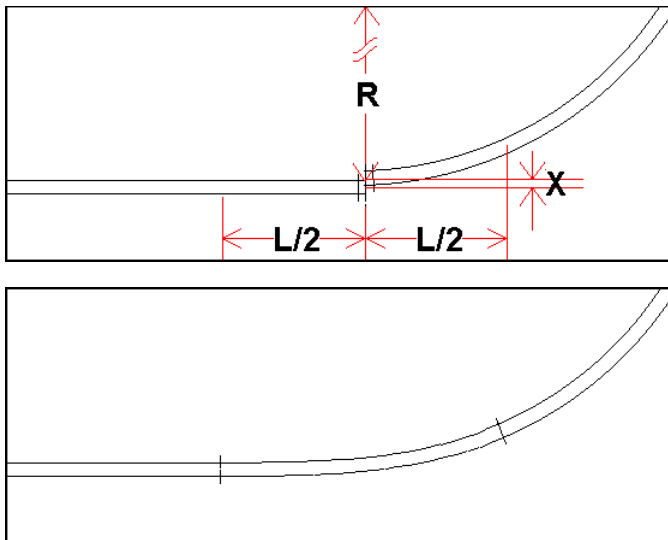
$$x = l * l * l / (6 * R * L)$$
$$r = L * R / l$$

where

- l is the distance along the tangent to the easement.
- R is the final radius of the easement.
- L is the total length of the easement along the tangent.
- x is the offset from the tangent at l.
- r is the radius of easement curve at l.

The Easement Button (Easement Normal) on the Main Window (Section 3.1) changes its label to indicate the current easement value.

The following diagrams illustrates the **R**, **X** and **L** values and the resulting easement curve.



If curves with a radius larger than R or two curves (that bend in the same direction) are being connecting then the easement curve will be shorter and the offset smaller. If the computed offset is small then no easement is generated.

A curved track that bends in one direction and then bends in the opposite direction is an *S-curve*. This will generate the worst case easement which is two easement curves placed end to end.

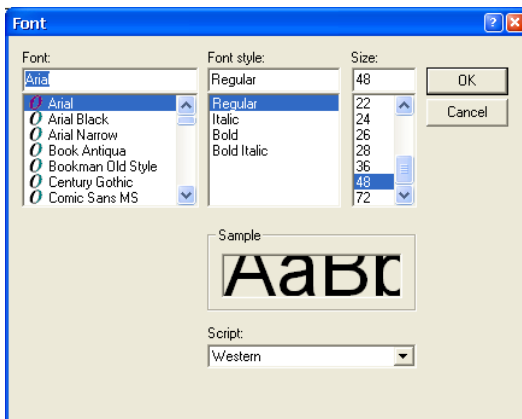
Refer to instruction in [section 2.10.4.3](#) when using sectional track.

2.10.4.3 Easements and Sectional Track

Easements require the possibility of creating track with arbitrary radii. Therefore easements are not possible if sectional track is used. It is best to turn **Easements** off when using sectional track.

2.10.5 Font Selection

The font selection dialog allows selection of the font used by the text ([Section 2.3.9](#)) command. This command is valid only on UNIX based systems.



2.10.6 Layout Dialog

The Layout Options dialog, displayed by the Options ([Section 2.10](#)) or the File ([Section 2.5](#)) menu, contains items controlling the current layout.

Layout Options

Room Width

96.0

Height

48.0

Layout Title

Subtitle

Scale

HO (1/87.1)

Gauge

Standard (16.5mm)

Min Track Radius

18.0

Max Track Grade (%)

5.000

Background File Path

ers/richardsa/Downloads/Bethesda 1918.png

Browse ...

Clear

Background PosX, Y

0.0

0.0

Background Size

240.0

Background Screen %

0

Background Angle

0.000

Gauge - Drop down menu used to select track gauge.

Height - Height of layout drawing which, depending on the Unit setting (English or Metric) established in the Preferences dialog (Section 2.10.7), is measured in inches or centimeters.

Room Width - Width of layout drawing which, depending on the Unit setting (English or Metric) established in the Preferences dialog (Section 2.10.7), is measured in inches or centimeters.

Scale - Drop down menu used to select track scale.

Title - Two lines that can be used to enter title and subtitle descriptions for the layout. Information entered in these fields will be shown on any printout of your layout design.

Maximum Track Grade - Specifies maximum track elevation expressed as a percent (%). Tracks with a larger elevation are considered exceptional and drawn in the exception (Section 2.10.1) color.

Minimum Track Radius - Specifies minimum track radius (in inches or centimeters). Curved tracks with a smaller radius are considered exceptional and drawn in the exception (Section 2.10.1) color.

Background File Name - The last 40 characters of the full file pathname for the image used for a temporary background behind all the drawn objects. It is set using the Browse and reset with the Clear buttons. It is also cleared along with all the other background values after a Open or New command. The file is initially specified to be in the local file system. In order to send it along with the layout, use Save As command and specify the Archive Archive format (*.xtce). This will create a single zipped package file containing the layout and the image file which can be sent and will open on a different system. If this has been done, after Open of the archive, the image file path will point into the extracted archive file directory. It can be changed to a new local file and the next Save will rebuild the package using the new image file instead of the old one.

Background Pos X, Y - The offset of the bottom left corner of the background image from the origin (in inches or centimeters) after rotation.

Background Size - The model size (in inches or cm) to scale the base of the background image to (measured from bottom left to bottom right as displayed after any rotation has been applied). Note - A value of 0.0 means that no scaling is applied and the image is shown at its current size in pixels regardless of scale or zoom.

Background Screen - The amount of screening (from 0 to 100%) to apply to the background image. Screening allows objects drawn over the image to be seen more clearly. 0 means no screening, while 100% means noting will be shown.

Background Angle - The rotation angle to apply to the background image (in degrees) about its center before it is moved so that its bottom left corner is offset by the Background Pos setting.

2.10.7 Preferences Dialog

This dialog controls some parameters which likely will not be changed frequently.

Layout Options

Room Width: 1050.000 Specifies the size of the room (in inches)

Layout Title: Co-ords feature tester 01

Subtitle:

Scale: G (1/22.5) Gauge: Standard (45)

Min Track Radius: 173.397 Max Track Grade (%): 5.000

Background File Path: Browse ...

Background PosX,Y: 0.000 0.000

Background Size: 0.000

Background Screen %: 0

Background Angle: 0.000

Named Settings File: Write Read

Angles - controls the angle system. Polar: 0° is up and angles are measured clockwise, or Cartesian: 0° is to the right and angles are measured counter-clockwise.

AutoSave AutoSave - specifies the number of Check Points taken before an AutoSave. The same number of checkpoints are retained in a circular archive set in the (Section 1.9.3) named for the layout file. Setting this value to 0 disables AutoSave.

Balloon Help - disables the display of Balloon Help (Section B.1) which usually is shown when the cursor is placed over a control.

Show FlexTrack - disables the display of FlexTrack (Section B.2) which is shown on the left of the Toolbar.

Check Point AutoSave - specifies the Check Point frequency: the number of modifications made to the layout since the last save. The layout is automatically saved to the Check Point file (Section 1.9.3) when the Check Point frequency is reached. Setting this value to 0 disables use of the Checkpoint file *and* AutoSave. Upon restart, if the program was not saved normally, the user will be prompted to see if they want to resume at the last checkpoint.

Connection Angle - as below for Connection Distance for the angle between endpoints.

Connection Distance - the maximum distance between endpoints that can be connected. This affects the Join (Section 2.2.7) command and auto-connection during Parallel (Section 2.1.6) commands and placing Turnouts (Section 2.7). The default value for this field is 0.100 inches or 0.254 CM. Changing this value is not recommended.

Drag Distance - controls how far you can move the cursor (in pixels) before XTrackCAD considers the action to be a drag instead of a click.

Drag Timeout - controls how long you can hold a mouse button down (in milliseconds) before XTrackCAD considers the action to be a drag instead of a click.

Length Format - controls how lengths are displayed. Combinations of feet and inches (or meters, centimeters and millimeters) with support for decimal or fractional measures. **Note:** lengths can be entered in any format and are converted on entry.

Max Coupling Speed - trains (Section 2.9.8) moving faster than this speed will crash when running into other trains or hitting the end of a track or an open turnout. Crashed trains must be manually moved back onto the track.

Min Grid Spacing - minimum distance between Grid (Section 2.12.2) lines (in pixels). If the grid lines are closer then drawing them is suppressed.

Min Track Length - specifies the minimum length of a track. Shorter tracks will not be created.

On Program Startup - if set to 'Load Last Layout', XTrackCAD will automatically re-open the layout file that was open when XTrackCAD last closed. Selecting 'Start New Layout' opens a blank layout canvas.

Turntable Angle - minimum angle between adjacent tracks connected to a Turntable (Section 2.1.10).

Units - choose between English (inches) or Metric (centimeters) measurements.

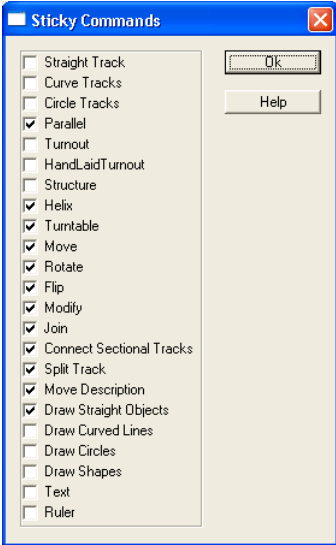
Write Settings - Save the current settings to a named settings file

Read Settings - Load settings from a named settings file

2.10.8 Sticky Dialog

By default, when commands complete, the defined **Default Command** (Section 2.10.2) becomes active. If a command is **sticky**, the defined **Default Command** is ignored and the current command remains active after completion.

The Sticky dialog controls which commands remain active after completion.



Selecting a command makes it sticky. Un-selecting a command causes the defined **Default Command** to become active after command completion.

2.11 Status Bar

The *Status Bar* contains fields that can be modified depending on command:

The Line Width and Color for *Straight Line*, *Curved Line*, *Circle*, *Polygon*, *Box* or *PolyLine* objects. The Line Width is specified in pixels for the current Drawing Scale. Zooming (Section 2.12) in or out causes the lines to be drawn wider or narrower.

The Color for *Filled Circles* or *Polygons*.

The size of a *Dimension Line* (*Tiny*, *Small*, *Medium* or *Large*)

The type, size and orientation of lumber used for *Bench-work* (regular rectangular, L-Girder or T-Girder).

The separation and radius factor for Parallel commands

The diameter of a Turntable

After and add or during a Modify of a Draw object or segment, length, radius and/or relative angles are shown in modifiable fields. These will change the dimensions of the last object when Enter or Tab is pressed or the cursor leaves the entry field.

2.12 View Menu



The View Menu shows commands affecting the display of the **Main Canvas** (Section 3.1).

Change Grid - Displays the Snap Grid dialog. The Snap Grid forces the cursor (for some commands) to be on a grid to control track placement.

Enable SnapGrid - Enables (or disables) the Snap Grid (Section 2.12.2).

Redraw - Redraws the Main Canvas.

Redraw All - Redraws the Main Canvas and the Map Window (Section 3.2.2).

Show Snap-Grid - Toggles display of the Snap Grid on and off.

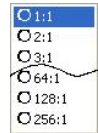
Magnetic Snap On/Off - Toggles Magnets (Section 2.12.1) for Add Operations on and off. The magnets make tracks auto-align and shapes touch when the cursor or object is close. They can be defeated on each operation by holding down *Alt*. If the Magnets are off, holding down *Alt* will enable them.



Show/Hide Map - Toggles display of the Map Window on and off.

Tool-bar - Command button groups displayed on the Tool-bar are selected using the Tool-bar Configuration Menu (Section 2.12.3).

Pan/Zoom - move or resize the viewport using the mouse (Section 2.2.11).



Zoom - This sub-menu is used to select a specific drawing scale ratio for the Main Canvas.

Zoom In - Increases magnification of the Main Canvas.

Zoom Out - Decreases magnification of the Main Canvas.

When zooming in or out, the corresponding highlighted area of the Map Window (Section 3.2.2) changes size to match that which appears on the Main Canvas (Section 3.1).

2.12.1 Magnetic Snap

The **MagneticSnap** feature eases constructing and assembling Tracks and Draw objects by "snapping" the end of new objects to existing objects. For existing track objects the point snapped to is always an open end point. The snap operates when "close" to the object (a few pixels distant) and an anchor point (a blue circle) is displayed when this will occur if the mouse is clicked.

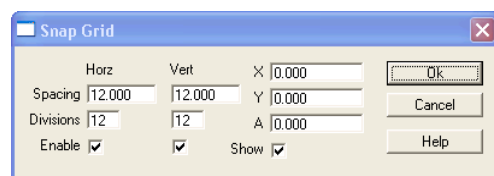
When Adding Draw line objects, the snap point is the nearest point on the existing object. A snap to the end of a line object can be selected by positioning the cursor close to the end of the line but off it, in the direction of the line. This will ensure the closest point is the end.

The **MagneticSnap** feature is enabled and disabled using either the magnet icon which is part of the **SnapGrid** Toolbar button set, or using the View (Section 2.12) menu.

For each part of an Add or Move or Rotate operation, the current state of **MagneticSnap** can be temporarily inverted using the **Alt** key. This enables snapping to be inhibited for a single part of an operation (or conversely enabled for just one part).

2.12.2 Grid Dialog

The Grid dialog, displayed by **Change Grid** on the View (Section 2.12) menu, specifies the origin, angle and other parameters of the Snap Grid. The Snap Grid can be used to snap the position of the cursor during the Curve (Section 2.1.2), Circle (Section 2.1.1), Cornu (Section 2.1.3), Modify (Section 2.2.8), Straight (Section 2.1.7), Draw (Section 2.3) and Turntable (Section 2.1.10) commands.



The Grid dialog contains controls affecting the horizontal and vertical snap grid lines. Each dimension can be independently controlled.

The **Spacing** value specifies the distance between major grid lines, which are drawn as solid lines on the layout. The value of the distance is entered in either inches or centimeters depending on the value of the **Units** setting in Options->Preferences (Section 2.10.7) menu.

The **Divisions** value adds the minor Grid lines between the major Grid lines, which are drawn as a series of dots on the layout. Specifying a value of 0 or 1 as the division value removes the minor grid lines.

The Grid can be enabled or disabled in each dimension via the **Enable** check box. The action of snapping is secondary to **Magnetic Snap** if enabled, and is suppressed if **Alt** is held.

The X and Y coordinates relate to the anchor point of the X and Y Axis. Default values for X and Y are zero (0). Entering a value of one for X causes the Main grid line on the Drawing Canvas to shift left one unit. Entering a value of two causes the Main grid line to shift by two units and so on. The Y axis is affected in the similar manner except the grid moves down rather than left.

Negative values can be used for X and Y values. Using such cause the Main Grid to shift right for the X Axis and up for the Y Axis.

The A coordinate relates to the Angle of grid rotation. The default value for this coordinate is zero. Entering a value greater than 0 and less than 90 will cause the Main Grid to rotate clockwise by the number of degrees entered. Entering a negative value causes the grid to rotate counter-clockwise.

The origin and angle of the Grid can be adjusted directly or by dragging on the layout. *Left+Drag* moves the origin of the Grid, and *Right+Drag* rotates the grid. *Shift+Right-Click* (Section 3.4) displays a pop-up menu allowing rotation of the grid by various predefined angles.

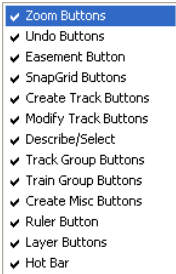
Whether the Snap Grid is drawn is controlled by the **Show** check-box. Also, if the layout is Zoomed Out (Section 2.12.4) the minor and major grid lines may be too close together to be drawn. The minimum pixel distance between grid lines is controlled by the **Min Grid Spacing** value on the Preferences (Section 2.10.7) dialog.

Note: on slow machines drawing the Grid can take noticeable time. Performance can be improved by selecting a larger value for Min Grid Spacing.



Grid Buttons on the Tool-bar ([Section 3.1](#)) can be used to Enable/Disable and to Show/Hide the Snap Grid.

2.12.3 Tool-bar Configuration



Command button groups displayed on the Tool-bar are selected using the Tool-bar Configuration Menu ([Section 2.12.3](#)). If none of the command button groups are selected, the Tool-bar is not shown.

2.12.4 Zoom



The Zoom In and Zoom Out actions can also be accessed using buttons on the Tool Bar or usig the Pan/Zoom Mode button. The Mouse Wheel, PAGE DOWN and PAGE UP keys can also be used to zoom in and out.

Holding down the Shift key while clicking the Zoom In or Zoom Out buttons sets the Drawing Scale to a *Programmed Zoom* value.

Zoom/Pan Shortcut Keys

- Keys '1'-'9' set the zoom to between 1::1 and 1::9.
- Key 'e' sets the zoom to a value that allows all the room to be shown and moves the origin of bottom left of the window to be 0,0
- Key '0' or 'o' keeps the zoom as is, but moves the origin of the bottom left of the window to 0,0
- Key 'c' moves the center of the window to the cursor position

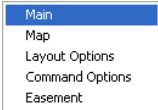
Normally a zoom in more of more than 1:1 is not possible, however if the Ctrl key is held down while the Zoom In button is pressed a zoom less than 1:1 can be achieved. This function is useful when working on detail.

Pressing the middle Zoom button on the Tool Bar pop-ups a list of Zoom factors that can be select from.

Note - The value of Zoom 1:1 will be set using 96 dpi as a default, it can be overridden using a Configuration Value in the Preferences section of ScreenDPI.

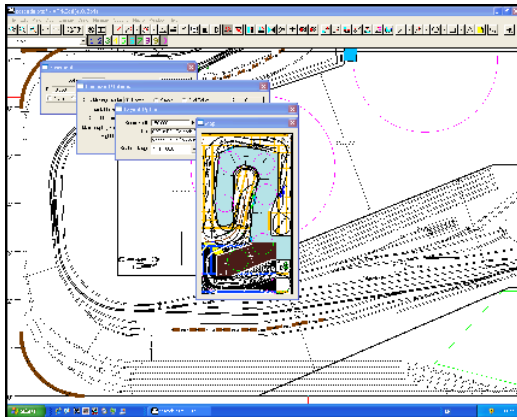
The Pan function can be accessed using the Mouse Wheel with *Shift* of the *Mouse Middle Button*. Adding *Ctrl* as well as *Shift* chnages Up to Left and Down to Right. Pan Left and Right can also be driven by the Horizontal Mouse Wheel (if available) or the Scroll Left/Right Guestures (if mapped by the Operating System).

2.13 Window Menu



The Window Menu typically contains selections for bringing any open window into view. It's used as follows:

XTrackCAD permits multiple dialog windows to be open at any one time. When a large number of windows are open it can become difficult to locate and bring a specific window into focus. Use the Window Menu function to select and bring the desired window to the top of the screen.



Apart from bringing the Map Window (Section 3.2.2) to the foreground, the Map menu item can also be used to re-open a closed Map Window.

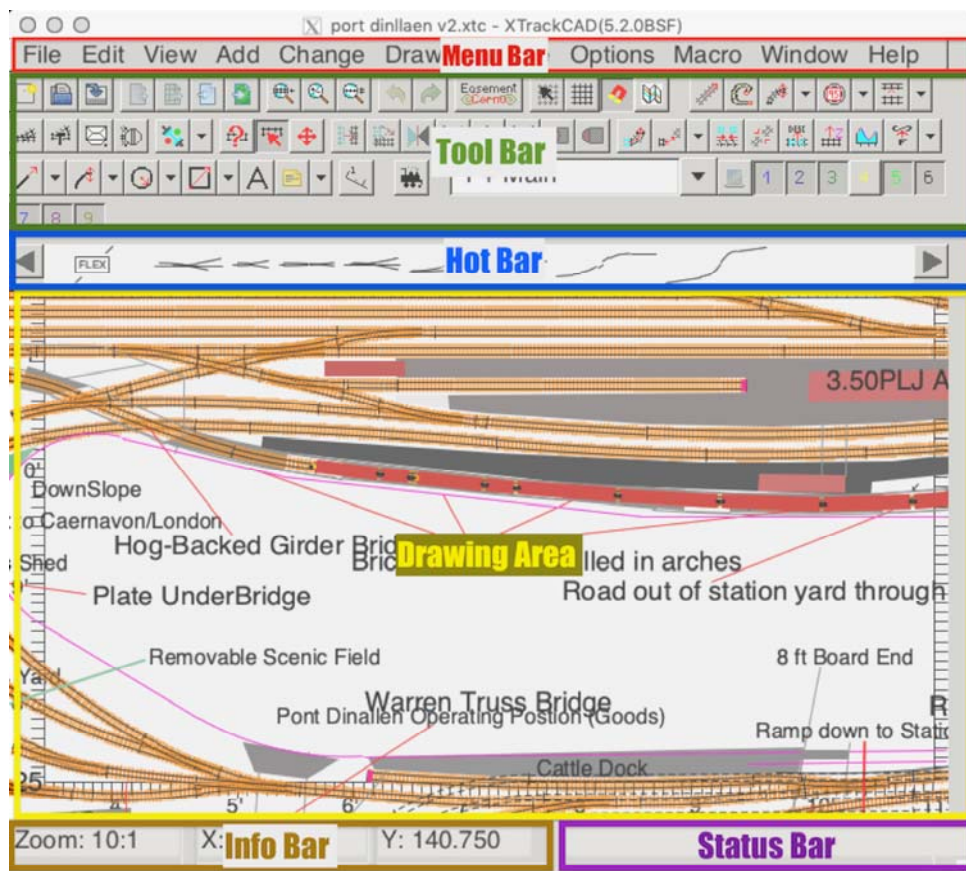
Chapter 3: Navigation

The Main Window includes a title bar along the top that describes the contents of the window, followed by a tool bar that contains user interface buttons. Most of the window's remaining area is used to display the layout. A footer border contains information including system messages.

Most windows can be opened, closed, resized, minimized, and moved around the screen. The close, minimize, and zoom buttons are located on the right side of the title bar. Minimizing a window will close the contents of the window, but store a reference to it in the Task bar. Closing a window will make it disappear completely (so you may be asked to save your changes first). To move a window, click on the title bar and drag the window where you want it.

3.1 Main Window Overview

Main Window Overview



The size of the main window can be changed by dragging on the resizing borders.

Minimizing the *Main Window* will minimize all *XTrackCAD* windows.

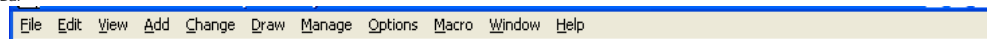
The Main Window contains (from the top down):

Title bar



Current filename, *XTrackCAD* version number, and window manager buttons. An asterisk (*) after the filename indicates that there are unsaved changes.

Menu Bar



Contains from left to right:

- File (Section 2.5)
- Edit (Section 2.4)
- View (Section 2.12)
- Add (Section 2.1)
- Change (Section 2.2)
- Draw (Section 2.3)
- Manage (Section 2.9)
- Options (Section 2.10)
- Macro (Section 2.8)

- Window (Section 2.13) and;
- Help (Section 2.6) menu buttons.

Tool Bar

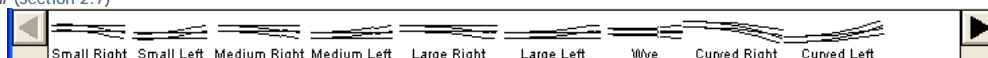


Manipulate track and other objects The toolbar buttons size can be adjusted using a User Preference in the .ini or .rc file (on Windows or Mac/Linux) in the xtrkcad directory. If running Linux or Mac a line "Preference.LargeIcons: 1.5" can be added. The scale value can be from 1.0 to 2.0 only. The corresponding configuration Windows would be

```
[Preference]
LargeIcons=1.5
```

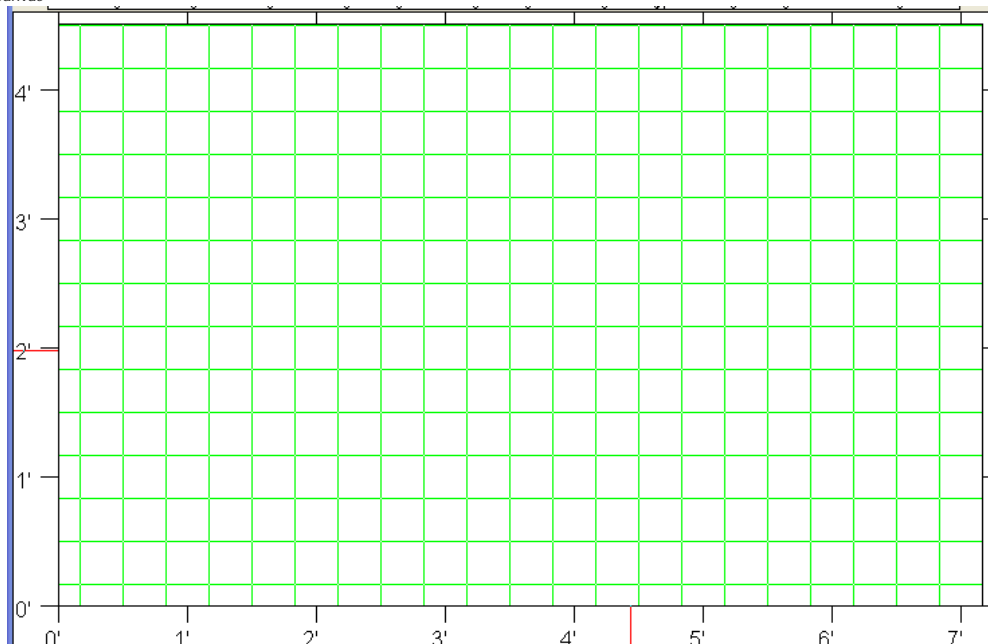
Note The configuration file uses the language specific definitions for the decimal separator. Eg. in Germany, where the comma is used, the correct value would be LargeIcons=1,5.

Hot Bar (Section 2.7)



Scrolling list of Turnouts and Structures

Main Canvas



Main drawing area with rulers along each side.

The Main Canvas is where all tracks and objects (and optional background image) are drawn.

The Background Image is drawn on the main canvas if specified in the Section 2.10.6 menu.

The center of the Main Canvas can be moved (Panned) using the;

- ARROW Keys
- Left-Click and drag in Section 2.12.4
- "@" key in Select, Modify and Pan/Zoom.
- Mouse Wheel - adding Shift key or the Mouse Middle Button will Pan the screen. adding Ctrl as well makes up Pan left and down Pan right.
- Horizontal Mouse Wheel - adding Shift or the Mouse Middle Button will Pan the screen left and Right (if available)
- Scroll Left and Right - if the scroll left and right gestures are mapped to the trackpad by the operating system, with Shift depressed the screen will Pan.

The Main Canvas can be panned so that the area beyond the room boundaries is shown (the grey area). The Constrain Drawing Area to Room Boundaries option on the Display (Section 2.10.3) dialog under the Options (Section 2.10) menu forces the Main Canvas stop panning once the room boundary is reached. Holding the Control key while panning will invert the value of this setting.

The scale of the Main Canvas can be changed using the;

- Zoom selections (Section 2.12.4) under the View (Section 2.12) menu
- Zoom buttons on the Tool-bar
- Mouse Wheel
- PAGE UP and PAGE DOWN keys
- Pan/Zoom Section 2.2.11 button on the Tool-bar

Note: If The scale 1:1 is reached, "Macro Zoom" mode can be entered using CTRL+PageDown - with repeated presses a scale of 10::1 is possible.

When **Zooming**, the Main Canvas will retain the center of the display if **Constrain Drawing Area to Room Boundaries** is not set. Otherwise, as much of the room as possible is displayed, and any grey area will be to the right and above the room.

Tracks will be drawn with two lines and ties if you zoom in. When the drawing scale is 1:1 a dashed centerline is also drawn for each track.

The ARROW keys move the Canvas left, right, up or down by half a screen. If Shift is used together with the arrow keys, the movement will be 1/20th of screen in the selected direction.

In many commands, the result that will result from clicking the mouse is shown by *anchors* which highlight the track object or feature in blue that will be affected as the mouse is dragged over the canvas and becomes close enough to select it.

Map Window



You can change which portion of the layout is displayed by using the **Map Window** (Section 3.2.2).

Status Bar



Contains from left to right;

- Drawing scale of the Main Canvas,
- X position of the cursor,
- Y position of the cursor,
- Status and informational messages

3.2 General Operation

Most Windows open with three standard dialog buttons:

Cancel - Cancels dialog. Layout reverts back to its previous state.

Help - Invokes on-line help for current command or dialog.

OK - Completes the dialog action. Layout is updated with current changes.

3.2.1 Entering Values

Lengths and Distances can be entered in a variety of formats;

12ft 4 1/2in, 12' 4.5", 148.500, 1.234m, 123.4cm or 1234mm are all valid values.

Adding the Equal Sign (=) key after an entry will reformat the value entered to your preferred length format (Section 2.10.7).

Adding the "p" key after an entry will convert a prototype measurement to a scale measurement by dividing the value entered by the ratio for the current scale.

Adding the "s" key after an entry will convert a scale measurement to a prototype measurement.

The conversion will happen when the *Tab* key is used, or the cursor is moved to a different entry box.

3.2.2 Map Window



The *Map Window* area shows the complete layout at a reduced scale. A highlighted (reverse video) area shows what portion is visible in the Main Window (Section 3.1). The highlighted area can be Left+Dragged (Section B.1) around the layout to change the origin of the Main Canvas. The highlighted area changes size as Zoom In (Section 2.12) and Zoom Out (Section 2.12) are selected.

You can also Right+Drag (Section B.1) on the Map window to set the origin and scale of the Main Canvas.

The size of the *Map Window* changes when you change the Room Size (see Section 2.10.6). You can also change the Map Scale (Section 2.10.3) on the Display (Section 2.10.3) dialog to change the size of the *Map Window*.

If you close the *Map Window*, you can reopen it by the *Window* menu.

Visibility of the *Map Window* can be toggled by pressing *Ctrl+Space*

3.3 Keyboard Shortcuts

The term Shortcut key refers to specific key combinations which are used to accomplish an action which otherwise would be accomplished by moving a MOUSE and /or selecting from a Menu. Shortcut keys are often key combinations consisting of the letter key pressed along with the Alt or Ctrl key.

Instead of using the menus or the buttons on the Tool-bar (Section 3.1), most *XTrackCAD* commands may be invoked through use of Shortcut keys.

The RETURN key has the same effect as pressing the OK button on the current dialog.

The ESCAPE key cancels the current command. All selected tracks are unselected. The Properties (Section 2.2.13) or Select (Section 2.2.16) command becomes the current command.

The F1 key opens the Help page for the currently selected command. Shift+F1 opens the Contents Help Page.

The PAGE UP and PAGE DOWN keys will zoom out or zoom in.

The ARROWS key will pan the canvas right, left, up and down.

The DELETE key invokes the Delete (Section 2.4.3) command.

Several Shortcut key commands are used in conjunction with the mouse. These commands are listed in Section 3.4.

3.3.1 Add Commands

Add Commands

Create

- Circle track from
 - center - *Ctrl+O*
 - fixed radius circle - *Ctrl+8*
 - tangent - *Ctrl+9*
- Curve track from
 - center - *Ctrl+6*
 - chord - *Ctrl+7*
 - endpoint - *Ctrl+4*
 - tangent - *Ctrl+5*
- Hand laid turnout - *Ctrl+Shift+I*
- Straight track - *Ctrl+G*
- Turntable - *Ctrl+Shift+N*

Helix dialog and construction tool - *Ctrl+Shift+H*

Structure dialog - *Ctrl+Shift+C*

Turnout dialog - *Ctrl+T*

3.3.2 Change Commands

Change Commands

Connect two sectional tracks - *Ctrl+Shift+J*

Elevation dialog - *Ctrl+Shift+E*

Join two tracks - *Ctrl+J*

Properties dialog - *Ctrl+?*

Modify or extend track - *Ctrl+M*

Move

- description - *Ctrl+Shift+Z*
- selected object - *Ctrl+Shift+M*

Profile dialog - *Ctrl+Shift+F*

Rotate selected object - *Ctrl+Shift+R*

Select tool - *Ctrl+E*

Split flex track - *Ctrl+Shift+S*

3.3.3 Draw Commands

3.3.3.1 Add Text

Add Text

Add Text to drawing area - *Ctrl+Shift+X*

3.3.3.2 Draw Circles

Draw Circles

Draw circle outline from

- center to tangent point (Edge) - *Ctrl+Shift+0*
- tangent point (Edge) to center - *Ctrl+Shift+9*

Draw circle filled from

- center to tangent point (Edge) - *Ctrl+Alt+0*
 - tangent point (Edge) to center - *Ctrl+Alt+9*
-

3.3.3.3 Draw Curved Lines

Draw Curved Lines

Draw curved lines from;

- center to endpoint - *Ctrl+Shift+6*
 - chord - *Ctrl+Shift+7*
 - endpoint in direction of curve - *Ctrl+Shift+4*
 - endpoint to center - *Ctrl+Shift+5*
-

3.3.3.4 Draw Shapes

Draw Shapes

Draw shape

- Box outline - *Ctrl+Shift+[*
 - Filled Box - *Ctrl+Alt+[*
 - Filled Polygon - *Ctrl+Alt+2*
 - Poly-line - *Ctrl+Shift+2*
-

3.3.3.5 Draw Straight Objects

Draw Straight Objects

Draw straight object

- Bench-work - *Ctrl+B*
 - Dimension Line - *Ctrl+Shift+D*
 - Straight Line - *Ctrl+Shift+1*
 - Table Edge - *Ctrl+Shift+)*
-

3.3.3.6 Note Dialog

Note Dialog

Note dialog ([Section 2.3.3](#)) - *Ctrl+Alt+N*

3.3.4 Edit Commands

Edit Commands

Copy select objects to the clipboard - *Ctrl+C* or *Ctrl+Insert*

Cut select objects - *Ctrl+X* or *Shift+Delete*

Draw selected tracks with

- thin lines - *Ctrl+1*
- medium lines - *Ctrl+2*
- thick lines - *Ctrl+3*

Delete selected object(s) - *Delete* or *Ctrl+D*

Deselect all objects - *Alt+Shift+A* or *Esc*

Hide selected tracks in a Tunnel - *Ctrl+Shift+T*

Move Selected tracks

- above others - *Ctrl+Shift+B*
- below others - *Ctrl+Shift+W*

Paste from clipboard to layout - *Ctrl+V* or *Shift+Insert*

Redo last undone command - *Ctrl+R*

Select all objects - *Ctrl+Shift+A*

Undo last command - *Ctrl+Z* or *Shift+Backspace*

3.3.5 File Commands

File Commands

Create a new layout - *Ctrl+N*

Edit layout description Note (Section 2.3.3) - *Ctrl+Alt+T*

Export

- Selected objects to a *.xti* file - *Ctrl+Alt+X*
- To Bitmap (Section 2.5.2) - *Ctrl+Shift+Q*

Import from a *.xti* file - *Ctrl+Alt+I*

Manipulate Parameter Files (Section 2.5.5) - *Ctrl+Alt+S*

Open layout file - *Ctrl+O*

Print Command (Section 2.5.7) - *Ctrl+P*

Save As another file - *Ctrl+A*

Save the current layout - *Ctrl+S*

3.3.6 Hot Bar

Hot Bar

These actions take effect if the Hot Bar has keyboard focus.

- Move Hot Bar multiple entries
 - left - *Shift+Left Arrow*
 - right - *Shift+Right Arrow*
- Move Hot Bar one entry
 - left - *Left Arrow*
 - right - *Right Arrow*
- Pop-up menu of Hot Bar categories - *Right-Click*
- Set relative position of Hot Bar - *1, 2 ... 9, 0*

3.3.7 Macro Commands

Macro Commands

Play Back a macro file ([Section 2.8](#)) - *Ctrl+Alt+B*

Record a macro file ([Section 2.8](#)) - *Ctrl+Alt+R*

3.3.8 Main Drawing Canvas

Main Drawing Canvas

These actions take effect if the Main Drawing Canvas has keyboard focus.

Move Canvas:

- Down - *Down Arrow*
- Left - *Left Arrow*
- Right - *Right Arrow*
- Up - *Up Arrow*

Map Window:

- On / Off - *Ctrl+Space*

3.3.9 Manage Commands

Manage Commands

Car Inventory dialog - *Ctrl+Alt+V*

Custom Management dialog ([Section 2.9.2](#)) - *Ctrl+Alt+U*

Generate a Parts List ([Section 2.9.6](#)) - *Ctrl+Alt+L*

Group objects ([Section 2.9.4](#)) - *Ctrl+Shift+G*

Layers dialog ([Section 2.9.5](#)) - *Ctrl+Alt+Y*

Ungroup objects ([Section 2.9.4](#)) - *Ctrl+Shift+U*

Update Prices ([Section 2.9.7](#)) - *Ctrl+Alt+Q*

3.3.10 Option Commands

Options Commands

Colors dialog ([Section 2.10.1](#)) - *Ctrl+Alt+C*

Command Options dialog ([Section 2.10.2](#)) - *Ctrl+Alt+M*

Display dialog ([Section 2.10.3](#)) - *Ctrl+Alt+D*

Easement Options dialog - *Ctrl+Alt+E*

Font dialog ([Section 2.10.5](#)) - *Ctrl+Alt+F*

Layout dialog ([Section 2.10.6](#)) - *Ctrl+Alt+A*

Preferences dialog ([Section 2.10.7](#)) - *Ctrl+Alt+P*

Sticky commands dialog ([Section 2.10.8](#)) - *Ctrl+Alt+K*

3.3.11 View Commands

View Commands

Redraw

- all - *Ctrl+Shift+L*
- main window - *Ctrl+L*

Snap Grid dialog ([Section 2.12.2](#)) - *Ctrl+Alt+G*

Zoom

- in - *Ctrl++*, *Page Down*
- out - *Ctrl+-*, *Page Up*

3.4 Mouse Actions

XTrackCAD uses the left and right mouse buttons when manipulating tracks and other objects on the layout. Their meaning depends on the particular command:

Select Command

The *Select* command actions are affected by the mode selected in **Options->Command->Select**. Note - Objects in a Module Layer are selected and deselected as a group.

Left-Click

Single Item Mode -> Selects one object at a time, deselects other objects. Add Item Mode -> Adds unselected objects, deselects if the object is already selected. If the click is on an area without objects and **SelectZero** is set, all objects are deselected.

Shift+Left-Click

Selects all connected tracks from the one clicked up to the next selected item in each direction.

Ctrl+Left-Click

Single Item Mode -> Adds an object to the selection, deselects if the object is already selected. Add Item Mode -> Selects just this item and deselects other objects. If the click is on an area without objects and **SelectZero** is set, all objects are deselected.

Double-Left-Click

Opens Modify for Cornu and Draw Objects other than Text, Activates Link and Document Notes, otherwise opens Describe.

Left+Drag

Single Item Mode -> Selects all objects in an rubber-banded area and deselects all others. Add Item Mode -> Adds items in the rubber-banded area.

Shift+Left-Drag

Moves selected objects if in a selected area, if off selected objects, like Left-Drag.

Ctrl+Left-Drag

Rotates selected objects if in a selected area, if off selected objects, like Left-Drag.

Right-Click

Displays a pop-up menu of context commands (in Select, Move, Modify and Rotate commands). If some track is selected, the menu has operations to perform on it, if not, it will have a command context menu.

Shift+Right-Click

Displays a pop-up menu of commands. Displays the other context menu than Right-Click.

Right+Drag

Deselects all objects in an rubber-banded area from the current set.

Rotate Wheel

Zooms drawing area in and out. Modern computers with Trackpads often map this gesture to two-finger drag.

When Moving and Rotating (Placing Turnouts and Structures, Moving the Print and Snap Grids, ...):

(Shift+Left+Drag)

Moves the objects or grid.

(Ctrl+Left+Drag)

Rotates the objects or grid about the pivot point, which is the point you started the drag operation.

Some other commands use the **Shift** or **Ctrl** key to modify the meaning of button presses.

3.4.1 Context Sensitive Menus

For all commands listed below, a *Right-Click* will display a context sensitive pop-up command list menu. For some commands (noted below), a *Shift+Right-Click* will display a context sensitive pop-up command options menu. The operation of *Right-Click* and *Shift+Right-Click* can be reversed by an item on the Command Options (Section 2.10.2) dialog.

The Shortcut key for each command is listed after the command name.

Circle Track Command (Section 2.1.1)

Drag from

- center to circle tangent point (Edge) - *Ctrl+0*
- circle tangent point (Edge) to center - *Ctrl+9*

Position fixed radius circle - *Ctrl+8*

Connect Command (Section 2.2.3) - *Ctrl+Shift+J*

Remove adjustments starting from an unconnected endpoint - *Shift+Left-Click*

Select endpoints to connect - *Left-Click*

Curved Track Commands (Section 2.1.2)

Drag from 1st endpoint

- in curve direction - *Ctrl+4*
- to Center - *Ctrl+5*
- to 2nd endpoint (Chord) - *Ctrl+7*

Drag from Center to 1st endpoint - *Ctrl+6*

Properties Command (Section 2.2.13) - *Ctrl+?*

Display property sheet for the object - *Left-Click*

Elevation Command (Section 2.2.5) - *Ctrl+Shift+E*

Choose endpoint - *Left-Click*
 Move Elevation Marker - *Right+Drag*
 Split track and choose endpoint - *Shift+Left-Click*

Flip Command (Section 2.2.6)

Draw Mirror line - *Left+Drag*

Hand-laid Turnout Command (Section 2.1.4) - *Ctrl+Shift+I*

Define

- frog position and angle - *(1st Left+Drag)*
- points position - *(2nd Left+Drag)*

Helix Track Command (Section 2.1.5) - *Ctrl+Shift+H*

Position Helix - *(Left+Drag)*

Join Command (Section 2.2.7) - *Ctrl+J*

Join tracks - *(Left+Drag)*

Move selected tracks to join with unselected endpoint - *Shift+Left-Click*

Modify Command (Section 2.2.8) - *Ctrl+M*

Change

- length or make tangent to curve - *Left+Drag*
- radius - *Shift+Left+Drag*

Extend track - *Right+Drag*

Move Command (Section 2.2.9) - *Ctrl+Shift+M*

Command Options: how to draw moving objects (Section 3.4) - *Shift+Right-Click*

Move Selected objects - *Left+Drag*

Move Description Command (Section 2.2.10) - *Ctrl+Shift+Z*

Move Description - *Left+Drag*

Toggle Label display for Curved, Helix and Turnout tracks (Section 3.4). - *Shift+Right-Click*

Note Command (Section 2.3.3) - *Ctrl+Alt+N*

Position Note - *Left+Drag*

Parallel Command (Section 2.1.6) - *Ctrl+Shift+P*

Position Parallel track relative to selected track - *(Left+Drag)*

Print Command (Section 2.5.7) - *Ctrl+P*

Command Options: rotate by specified amount (Section 3.4) - *(Shift+Right-Click)*

Move Print grid - *Shift+Left+Drag*

Rotate Print grid - *Shift+Right+Drag*

Select or unselect pages - *Left-Click*

Profile Command (Section 2.2.12) - *Ctrl+Shift+F*

Add tracks to path from path end to chosen endpoint - *(Left-Click)*

Command Options: change Elevation type - *(Shift+Right-Click)* (Section 3.4)

Rotate Command (Section 2.2.15) - *Ctrl+Shift+R*

Command Options: how to draw moving objects and rotate by specified amount (Section 3.4) - *Shift+Right-Click*

Rotate Selected objects - *Left+Drag*

- in increments of 15° - *Ctrl+Left+Drag*

Ruler Command (Section 2.3.4)

Position Ruler - *Left+Drag*

Angle Command (Section 2.3.5)

Position Protractor - *Left+Drag*

Select Command (Section 2.2.16) - *Ctrl+E*

Command Options: how to draw moving objects and rotate by specified amount (Section 3.4) - *Shift+Right-Click*

Move

- selected objects - *Shift+Left+Drag*
- labels - *Ctrl+Left+Drag*

Rotate selected objects - *Ctrl+Left+Drag*

- in increments of 15° - *Ctrl+Shift+Left+Drag*

Snap Grid Command (Section 2.12.2) - *Ctrl+Alt+G*

Command Options: rotate by specified amount (Section 3.4) - *Shift+Right-Click*

Move Snap Grid - *Left+Drag*

Rotate Snap Grid - *Right+Drag*

Split Track Command (Section 2.2.17.1) - *Ctrl+Shift+S*

As above, plus trim turnouts - *Shift+Left-Click*

Change block gaps (Section 3.4) - *Shift+Right-Click*

If at endpoint: disconnect track, otherwise: split track - *Left-Click*

Straight Track Command (Section 2.1.7) - *Ctrl+G*

Place 1st and 2nd endpoints - *Left+Drag*

Structure Command (Section 2.1.8) - *Ctrl+Shift+C*Command Options: rotate by specified amount (Section 3.4) - *Shift+Right-Click*Place Structure - *Left+Drag*Rotate - *Right+Drag*Text Command (Section 2.3.9) - *Ctrl+Shift+X*Command Options: change Font (Section 3.4) - *Shift+Right-Click*Position text - *Left+Drag*

Train Simulation Command (Section 2.9.8)

Command Options: uncouple car, flip or remove cars or Trains, set MU Master - *Right-Click*Move a Car or Train - *Left+Drag*Switch a *Turnout* or rotate a *Turntable* - *Shift+Left-Click*Turntable Command (Section 2.1.10) - *Ctrl+Shift+N*Position Turntable - *Left+Drag*Turnout Command (Section 2.1.9) - *Ctrl+T*Choose next Active endpoint when placing Turnouts - *Shift+Left-Click*Command Options: rotate by specified amount (Section 3.4) - *Shift+Right-Click*Place Turnout - *Left+Drag*Rotate - *Right+Drag*Suppress auto-adjustment positioning when placing Turnouts - *Shift+Left+Drag*

Appendix A: Frequently Asked Questions

A.1 Moving from Design to Roadbed

Your design is complete and your now ready to lay track. How do you go from the computer screen to the roadbed?

The best way to move your design from computer to roadbed is to print out a full scale copy (or portions) of the layout. During the print process the orientation of the print grid can be adjusted so the printout will line up with the tracks.

If you have cut-sheet printer (like a laser or ink-jet) set the Ignore Page Margins toggle on the print dialog. Normally there is an unprintable margin around the edge of the page and *XTrackCAD* only prints on the printable area, which means you would have to trim or overlay the pages. Setting the Ignore Page Margins toggle makes *XTrackCAD* ignore this margin so you can just abut the paper. Also, turn on Print Roadbed Outline and set your roadbed width.

For large scale printouts, the ability of many platforms to print as PDF is very helpful. Commercial printers can often print very large strips of paper.

Once you have a full scale print-out of your layout (or portion, if you have a larger layout you don't want to do it all at once) you need to transfer this to the roadbed. Here's two methods that can be used:

- Use a spray adhesive (such as 3M Super 77) to glue the print-out to the roadbed. This is very messy, takes more glue than expected and is very unforgiving of mistakes. You may want to use this method only for small sections of very complicated track-work.
- Tape the print-out to the roadbed then using a tracing wheel (available at Sewing shops), trace the center-line of the track and roadbed outline. At this point consider places when you'll want to widen the roadbed to support signals, switch machines, joints etc.
- Some users have reported that they successfully used the DXF export to get a file into Computer Controlled Machines that can cut out trackbed.

A.2 Hot Bar Items Missing!

After installing *XTrackCAD* the Hot Bar is not active; the arrows to the left and the right of the Hot Bar are a grey colour instead of black, the Hot Bar is blank and also does not scroll.

There's nothing wrong, you just need to load a track or structure Parameter file. Open the **Parameter dialog** window (**File>Parameter**) then click on Browse. A list of *.xtp files with names like atlasn55.xtp should appear. Select whichever file or files are appropriate for your needs then click the OK button. Click OK on the Parameter File dialog and you should now have objects displayed on the Hot Bar.

Notes:

1. Only elements that fit the selected scale are available in the Hot Bar. Thus if you're sure the parameter file has been loaded via the **File>Parameter** dialog, make sure the correct scale has been selected for the layout (**Options>Layout**).
2. If a long list of parameter files is selected, movement within the Hot Bar can be slow. If you right-click on the Hot Bar, a list of available parameter sets is shown. By *Left-Clicking* the desired parameter set, the Hot Bar is immediately scrolled to the first element in that parameter set.

3. When a new layout is created or when *XTrackCAD* is started for the first time, the scale of the layout defaults to N scale. Do not forget to change the scale in order to see tracks from other scales in the Hot Bar!

A.3 Unable to Add Cars to Inventory!

After installing *XTrackCAD* you're unable to add cars to the Car Inventory list; a message stating "No Car Prototypes are defined..." appears when you attempt to add cars to the Car Inventory list.

There's nothing wrong, you just need to load a Prototype definition file.

XTrackCAD includes a parameter file which defines many common North American Prototypes. The file is named `protoam.xtp`. It's loaded into *XTrackCAD* in the same way that a track, structure or car Parameter file would be loaded.

- Open the **Parameter dialog** window (File>Parameter) then click on Browse. Scroll through the list of *.xtp files to locate the file named `protoam.xtp`. Select this file then click the OK button. Click OK on the Parameter File dialog to complete installation of the prototype file. You should now be able to add cars to the Car Inventory list.

Other prototype definitions can be created using the Car Prototype dialog. Refer to [Section 2.9.1.3](#) for detail.

A.4 How Do I Place and Join Tracks

How do I join tracks, place turnouts, build a yard etc?

First take a look at the help file. Then try the demos (Help>Demos menu). This should answer a lot of questions on how to use *XTrackCAD*. Please visit [The XTrackCAD Wiki](#) if you need help, especially if you find the documentation unclear or think some area needs improvement.

Appendix B: Glossary

This section contains a helpful listing of Window and *XTrackCAD* terminology.

B.1 Window Terms

Menu and sub-menu items are indicated by *File>Open*, which means select the *File* menu and then select the *Open* menu item.

Balloon Help - short help message which is displayed as you move the mouse pointer over a control.

Canvas - an area within a window where objects are drawn.

Check Box - a button with a small square indicator to the left of its text. A check mark appears in the indicator when the button is selected.

Click - press and then release the left mouse button.

Drag - press and hold down the left mouse button and move the mouse to 'drag' the cursor on the screen.

Dialog - a type of window in which you input information.

Drop Down List - a list-box which is only displayed when you click on the 'drop-down' button.

Edit Box - an area where you can enter a String, Integer or Floating Point value.

FlexTrack - an automatic object on the ToolBar that creates a Cornu Track element

Highlighted - an area on the Canvas which is in inverse-video.

Left-Click - same as *Click*, used in contexts where *Right-Click* is also used.

Left+Drag - same as *Drag*, used in contexts where *Right+Drag* is also used.

Mouse Pointer - is most often an arrow that is you can use to point at different objects on your screen. When the pointer is over an object, you can *Click* a mouse button to perform an action on that object (such as selecting the object).

Press - click on a button.

Radio Button - a button with a small round indicator to the left of its text. The indicator is filled when the button is selected.

Radio Button Group - a group of radio buttons which indicate mutually exclusive choices.

Resizing Border - a thick border around re-sizable windows that you can use to change the window size.

Right-Click - press and then release the right mouse button.

Right Drag - press and hold down the right mouse button and move the mouse to 'drag' the cursor on the screen.

Select - click on an object to indicate you want to do something with it.

Shift+Left-Click - *Left-Click* while holding down the *Shift* key.

Shift+Right-Click - *Right-Click* while holding down the *Shift* key.

B.2 XTrackCAD Terms

Active Endpoint - when placing a turnout, the endpoint which is used as a 'handle' when moved along other tracks.

Auto-connect - when placing turnouts ([Section 2.7](#)) and creating parallel ([Section 2.1.6](#)) tracks, the new track will automatically be connected to other tracks if the tracks are aligned properly.

Block Gap - provides control by dividing the layout into electrically isolated blocks, where trains can be slowed or stopped by lowering or cutting the power to a block. Dividing a layout into blocks also permits operators to run more than one train on a layout with much less risk of a fast train catching up with and hitting a slow train. Blocks can also trigger signals or other animated accessories on the layout, adding more realism (or whimsy) to the layout. Three-rail systems will often insulate one of the common rails on a section of track, and use a passing train to complete the circuit and activate an accessory.

Cornu - * Cornu curves are a family of mathematically defined curves that define spirals that Euler spirals and elastica come from. They have the useful property for us that curvature increases linearly along the curve which means the acceleration towards the center of the curve also increases evenly. Railways have long understood that smoothly changing the radius is key to passenger comfort and reduced derailments. The railway versions of these curves were variously called easements, Talbot or Euler spirals.

DXF Format - Abbreviation of Data Exchange File, a two-dimensional graphics file format supported by virtually all PC-based CAD products. It was created by AutoDesk for the AutoCAD system.

Easement - special sections of gradually curving track used to connect straight and curved tracks (or two curved tracks). Easements reduce the effects of sudden changes in track curves which can cause derailments. They also look great!

Endpoint - One of the most important concepts in *XTrackCAD* is the endpoint. A piece of flex-track has an endpoint at each end. An endpoint has a position and an angle and it can be connected to other endpoints. The endpoints control where the track is placed and how it is connected.

- Turnouts have several endpoints (normally 3).
- Turntables have a varying number.

Error Message - an error message displayed in the Status Bar ([Section 3.1](#)) accompanied by a beep.

Flex-track - Prefabricated flexible sections of track used on a layout. It usually comes in straight, three-foot-long sections which can be bent or shaped as needed. This term is also used for hand-laid track.

Frog - the place on a turnout track where one rail crosses the other.

Gauge - The distance between the inside of the heads of track rails. Most real railroads in North America and Europe are built to a standard gauge of 4'-8 1/2". Narrow gauge means rails with a width less than standard gauge. For example, On3 means O scale trains with three scale feet between the rails.

Handlaid - Track that's built with handmade ties, rail, and spikes.

Helix - A rising curve which turns around an axis like a corkscrew. Used on multilevel layouts to allow trains to go from one level to another.

Info Message - an informational message displayed in the Status Bar ([Section 3.1](#)).

Object - an item on the layout, such as a track segment, table edge, line, note or text.

Points - the part of the Turnout that moves to select a path.

Reverse Curve - a piece of track which curves in one direction then changes direction without any appreciable length of straight track between the two curves.

S-Curve - a curve which bends in one direction and then the other, forming an S-like shape.

Sectional Track - prefabricated track which cannot be bent, split or changed.

Selected Endpoint - when selecting track for various reasons the selected endpoint is the one closest to the selection point.

Tangent - A line, curve, or surface meeting another line, curve, or surface at a common point.

Track Segment - any piece of flex-track, turnout or sectional track.

Turnout - A piece of track that allows a train to go from one track to another. Called a switch on a real railroad. Referred to by number. For example, a no. 6 turnout spreads one unit for each six units of travel measured from the frog (the point at which two rails join to form a V).

- In *XTrackCAD*, *Turnouts* also include sectional Tracks, crossings and forms of prefabricated (non-flex) track.

Turnout Frog - the place on the turnout track where one rail crosses the other.

Turnout Number - the ratio of the number of units along the center line of a switch frog traversed for each unit the frog spreads to the sides. A No. 4 frog diverges 1 unit for every 4 it moves ahead; a No. 6, 1 for every 6 units. Although we usually refer to a turnout or switch number, in reality the measurement is for the frog.

Turnout Points - the part of the Turnout that moves to select a path.

Unconnected Endpoint - an endpoint which is not connected to another.

B.3 Control Element Scripts and the Model RR System's Dispatcher

Notes about control element scripts and the Model RR System's Dispatcher program in OpenLCB mode:

When using the Model RR System's Dispatcher program in OpenLCB mode to create CTC panels, the panel elements can have their LCC event IDs automatically populated from the information in the XTrackCAD file, if the proper syntax is observed.

A LCC event id is a 64-bit number, represented as eight pairs of hexadecimal digits (0-9, a-f/A-F) separated by periods (.).

Each pair represents one 8-bit byte of the event id. This event id is either produced by a sensor or logic element or is consumed by a control/device or a logic element.

For blocks the occupancy script contains a pair of LCC event ids, separated by a colon (:). The first LCC event id is produced by the occupancy detector when the train enters the block and the second LCC event id is produced by the occupancy detector when the train leaves the block.

For switchmotors the point sense script contains a pair of LCC event ids, separated by a colon (:). The first LCC event id is produced by the point sensor when the points are aligned in the "normal" position (typically aligned to the main) and the second LCC event id is produced by the point sensor when the points are aligned in the "reverse" position (typically aligned to the spur). The normal and reverse script each contain a signal LCC event id. These events are produced by the CTC Panel when the control point Code button is pressed (clicked) and are consumed by the switch motor.

For signals, the aspect name is a space separated list of the color(s) of the signal heads from top to bottom and the aspect script is a LCC event id that is consumed to produce that aspect. Presumably, the LCC event id is produced by a logic element (presumably a mast group in a Tower-LCC or similar device) or virtual track circuit in a Tower-LCC or similar device.

Appendix C: Messages and Explanations

C.1 Message Types

XTrackCAD generates three types of messages:

Notices, which appear in their own window and require you to press a button to make a choice or dismiss them.

Error messages, which appear in the Status-bar ([Section 3.1](#)) and are accompanied by a beep.

Information messages, which appear in the Status-bar ([Section 3.1](#)) without a beep.

Notices and *Error messages* that might be encounter are listed here with a explanation. The **Recent Messages** menu item on the **Help** ([Section 2.6](#)) menu contains a list of the most recent messages. Selecting one of the entries presents information on the particular message.

The notation *abc/xyz* indicates the message can appear with either of the values (*abc* or *xyz*). Items in *UPPERCASE* indicate numeric (such as lengths) or string (such as filenames) values.

[Section C.2](#) provides detail explanation of each information or error message.

C.2 Message Explanations

C.2.1 A Helix must have one or more loops of track.

A Helix cannot be created with less than one complete loop of track. Anything less than one loop is considered a section of curved track.

C.2.2 A frozen layer contains selected track. Command cannot be executed.

This operation cannot be executed as segments of Selected track are present on a frozen layer. Track changes or deletions may be performed only on unfrozen layers. Deselect objects that appear on frozen layers or unfreeze the layers.

Refer to [section 2.9.5](#) for detail.

C.2.3 A large font has been selected....

A large font has been selected. Large fonts (or changing fonts sizes) may take a noticeable amount of time to load.

Refer to [section 2.3.9](#) for detail.

C.2.4 All description fields present in the Turnout...

Turnout descriptions should be as accurate as possible. All description fields listed in the **Turnout Designer** must contain appropriate information.

Refer to [section 2.9.9](#) for detail.

C.2.5 All fields listed in the Group dialog must contain data....

The **Group** dialog shows the Manufacturer, Description and part number (Title) of the new definition. Initial values are based on selected turnouts and structures or on the last **Ungrouped** object. The dialog also contains a toggle button (**Replace with new group?**), which is used if you want to replace the selected objects with the new definition. All fields listed in this dialog window must contain data.

Refer to [section 2.9.4](#) for detail.

C.2.6 All values specified in the Turnout Designer must be...

Turnout dimensions should be as accurate as possible. All values specified in the **Turnout Designer** must be greater than 0.

Refer to [section 2.9.9](#) for detail.

C.2.7 Angle must be between 0° and 360°.

The angle specified for a curve must be between 0° and 360°.

C.2.8 Are you sure you want to delete the NNN definition(s)?

You are about to delete a custom turnout or structure design from the **Custom Design** file (`xtrkcad.cus`) file. This action cannot be undone.

Refer to [section 1.9.2](#) and [section 1.9.3](#) for an explanation of the files used by *XTrackCAD*.

C.2.9 Bitmap create or write function failed.

Your attempt to create or write a bitmap file failed. This could be due to the bitmap being too large or a lack of system resources. Try creating a smaller Bitmap or freeing system resources by closing other applications and dialog windows.

C.2.10 Bitmap is too large.

A Bitmap must be less than 32000 pixels in height or width. Try increasing the DPI (or DPCM) value.

Refer to [section 2.5.2](#) for detail.

C.2.11 Can't delete multiple points at once

Polygons and Poly Lines points can only be deleted one at a time.

C.2.12 Cannot Enable Grid; spacing must be greater than 0

Before the horizontal or vertical Snap Grid can be Enabled, the corresponding *Spacing* value(s) on the Grid dialog must be set to a value greater than 0.

Refer to [section 2.12.2](#) for detail.

C.2.13 Cannot Group Bumper Track. The track has been unselected.

Bumper tracks (tracks with 1 endpoint) are not supported by the Group command.

C.2.14 Cannot Group selected track type %s.

Group objects are formed from Straight, Curved, Turnout or Sectional track or Structures or Draw elements. The selected objects include an object which is not one of these. Reselect the objects, including only elements of these types.

Refer to [section 2.9.4](#) for detail.

C.2.15 Cannot Join Bezier or Cornu track if Easement is not Cornu

You must change the Easement value to Cornu in order to join Bezier or Cornu Tracks

C.2.16 Cannot Join; Easements do not align or abut.

You are trying to Join two *easement* curves. This can be achieved only if the two curves abut and are aligned. Otherwise, you can delete the *easement* curves and try to Join to connected tracks.

Refer to [section 2.2.7](#) for detail.

C.2.17 Cannot Join; Selected endpoints are on same track.

You are trying to **Join** a section of track with itself. Different tracks must selected when using the **Join** command.

Refer to [section 2.2.7](#) for detail.

C.2.18 Cannot Join; Selected endpoints are on same track.

You are trying to **Join** a section of track with itself. Different tracks must selected when using the **Join** command.

Refer to [section 2.2.7](#) for detail.

C.2.19 Cannot Join; Selected tracks are parallel.

These tracks cannot be joined as they are parallel to each other and the selected *endpoints*, point in opposite directions. To **Join** these two tracks, pick *endpoints* that point in the same direction.

Refer to [section 2.2.7](#) for detail.

C.2.20 Cannot Show Grid; spacing must be greater than 0

Before the **Snap Grid** can be **Shown**, corresponding horizontal or vertical *Spacing* value(s) on the **Grid** dialog must be set to a value greater than 0.

Refer to [section 2.12.2](#) for detail.

C.2.21 Cannot change elevation mode.

In the **Profile** command, the **Elevation** mode for this *endpoint* can be change only if it is **Defined**, **Ignored** or **None**. The **Elevation** command can be used to change this *endpoint*.

Refer to [section 2.2.5](#) for detail.

C.2.22 Cannot freeze current layer

The current **Layer** is where most new objects are created. It's not possible to freeze this layer, since it would not be able to create objects. Change the current **Layer** to some other **Layer** before trying to freeze this **Layer**.

Refer to [section 2.9.5](#) for detail.

C.2.23 Cannot hide current layer

The current **Layer** is where most new objects are created. It's not possible to hide this layer, since it would not be possible to see the objects. Change the current **Layer** to some other **Layer** before trying to hide this **Layer**.

Refer to [section 2.9.5](#) for detail.

C.2.24 Cannot join from a turntable, try to a turntable

You cannot select a **Turntable** as the second track in **Join** command. If you wish to **Join** to a **Turntable** then select the **Turntable** as the first track in the **Join** command.

Refer to [section 2.2.7](#) for detail.

C.2.25 Cannot open New Parameter File: FILENAME

During the processing of **Parameter Files** after updating to a new version of *XTrackCAD*, one of updated **Parameter Files** could not be found. Check that the installation had no errors. You can use the **Parameter Files** dialog to locate the parameter file.

Refer to [section 2.5.5](#) for detail.

C.2.26 Cannot select a frozen layer

The current **Layer** is where most new objects are created. It's not possible to select a frozen **Layer**, since it would not be possible to create objects. Unfreeze this **Layer** before trying to make this the current **Layer**.

Refer to [section 2.9.5](#) for detail.

C.2.27 Cannot split TYPE track

This type of track cannot be **Split**. Only Straight, Curved, Circle and Easement tracks can be **Split**. To **Split** a Turnout, hold down the Shift key then *Left-Click* on the position where the track should be **Split**.

Refer to [section 2.2.17.1](#) for detail.

C.2.28 Cannot turn current layer into a Module

The current **Layer** is where new objects are created. It's not possible to turn this layer into a module, since then the objects can't be changed or added. Change the current **Layer** to some other **Layer** before trying to make this **Layer** into a module.

Refer to [section 2.9.5](#) for detail.

C.2.29 Cannot write to parameter file: FILENAME

The specified parameter file can not be written to. Make sure the file and or directory is not marked as read only.

C.2.30 Car Index number duplicated.

Each Car in your inventory must have a unique index value. If a duplicate index number is found during the **Import** process it will be replaced with a new, unused value.

C.2.31 Connection parameters reset to maximum values.

The parameters *Minimum Track Length*, *Connection Angle* and *Connection Distance* have maximum values that cannot be set to bigger values. The maximum values are 1.0"/0.254cm, 10° and 1.0"/0.254cm respectively.

Refer to [section 2.10.7](#) for detail.

C.2.32 Connection parameters reset to minimum values.

The parameters *Minimum Track Length*, *Connection Angle* and *Connection Distance* have minimum values that cannot be set to smaller values. The minimum values are 0.1"/0.254cm, 1° and 0.1"/0.254cm respectively.

Refer to [section 2.10.7](#) for detail.

C.2.33 Copy/Paste buffer is empty. There is nothing to Paste.

An attempt was made to **Paste** an object onto the layout however the Copy/Paste buffer was empty. This error generally occurs when the **Paste** command is executed without first executing the **Copy** command.

Refer to [section 2.4](#) for detail.

C.2.34 Critical file damaged!...

A critical file is corrupt. Unfortunately it will be necessary to reinstall the software or contact the XTrackCAD project development team at SourceForge in order to overcome this error.

Please report this error to the *XTrackCAD* project development team at SourceForge. The process for reporting errors is outlined in [section 1.11.1](#).

C.2.35 Crossover length is too short. Correct...

The length of crossover segments must be greater than the track gauge.

C.2.36 Curved track is too large.

The length of the curved track is limited to sum of the room dimensions. This limitation prevents creation of curves that are unreasonably large. Adjust the mouse position to create a smaller Curve.

C.2.37 Definition name is already in use. Saving this...

The definition you're attempting to create uses the same name as an existing definition. Saving the definition with the same name will cause *XTrackCAD* to replace the existing definition, making the existing definition inaccessible. If the previous definition must be preserved, then choose a different name for the new definition. If necessary, the **Custom Management** dialog can be used to change definition names.

Refer to [section 2.9.2](#) for detail.

C.2.38 Do you want to save the changes made to your Layout?

The **Exit** command was selected without first saving changes that have been made to the layout. This notice gives you the chance to save your changes before the program ends.

C.2.39 Duplicate column headers found in Car Import file.

The **Car Import** function reads car values from a Comma-Separated-Value (CSV) file. The import file must contain headers for at least the *Scale*, *Prototype*, *Manufacturer* and *Partno* columns. In addition, the following column headers may also be included: *Index*, *Type*, *Description*, *Roadname*, *Repmark*, *Number*, *Options*, *CarLength*, *CarWidth*, *CoupledLength*, *TruckCenter*, *Color*, *PurchPrice*, *CurrPrice*, *Condition*, *PurchDate*, *ServiceDate* and *Notes*.

It appears the CSV file that you're attempting to **Import** contains more than one row of column headers. Review the CSV files content and ensure only one row of header data exists.

Refer to [section 2.9.1](#) for detail.

C.2.40 Endpoint already on Path.

An *endpoint* that is already on the Profile Path has been selected. Select a different *endpoint*; one that is on a track that is not drawn in Purple.

Refer to [section 2.2.12](#) for detail.

C.2.41 File version %ld is greater than supported...

The parameter file that you're attempting to load was designed for a newer version of *XTrackCAD*. In order to load this file it will be necessary to upgrade your version of *XTrackCAD* to at least the version identified within the error message.

Take full advantage of the latest features within *XTrackCAD* by visiting the [XTrackCAD Fork Website](#) and downloading the latest release.

C.2.42 File version %ld is greater than supported...

The parameter file that you're attempting to load was designed for a newer version of *XTrackCAD*. In order to load this file it will be necessary to upgrade your version of *XTrackCAD* to at least the version identified within the error message.

Take full advantage of the latest features within *XTrackCAD* by visiting the [XTrackCAD Website](#) and downloading the latest release.

C.2.43 File version %ld is greater than supported...

The layout file that you're attempting to load was created using a newer version of *XTrackCAD*. In order to load this file it will be necessary to upgrade your version of *XTrackCAD* to at least the version identified within the error message.

Take full advantage of the latest features within *XTrackCAD* by visiting the [XTrackCAD Website](#) and downloading the latest release.

C.2.44 File version %ld is greater than supported...

The layout file that you're attempting to load was created using a newer version of *XTrackCAD*. In order to load this file it will be necessary to upgrade your version of *XTrackCAD* to at least the version identified within the error message.

Take full advantage of the latest features within *XTrackCAD* by visiting the [XTrackCAD Fork Website](#) and downloading the latest release.

C.2.45 First/Second track is already connected.

To **Join** one track with another, the *endpoints* selected for connection cannot be connected with any other track. Pick another track with an unconnected *endpoint* or disconnect one of the *endpoints* using the **Split** command.

Refer to [section 2.2.7](#) for detail regarding the **Join** command or [section 2.2.17.1](#) for detail regarding the **Split** command.

C.2.46 Frog angle prevents placement of points. Move points to opposite side of frog.

The frog angle prevents points from being placed on this side of the frog. Place points on opposite side of frog or retry this command and create the frog in the opposite direction.

Refer to [section 2.1.4](#) for detail.

C.2.47 Frog/Points cannot be placed on a turnout, circle or helix.

The frog or points of a hand-laid turnout cannot be placed on a turnout, circle or helix track. Choose a straight or curved section of track or use the **Split** command to create a curve from the circle track.

Refer to [section 2.1.4](#) for detail regarding hand laid turnouts or [section 2.2.17.1](#) for detail regarding the **Split** command.

C.2.48 Insufficient space between existing stall tracks.

There is insufficient space between the two existing turntable stall tracks to place a new stall track. Either place the new stall track on a different part of the turntable or decrease the *Turntable Angle* using the **Command Options** dialog.

Refer to [section 2.1.10](#) for detail regarding turntables or [section 2.10.2](#) for detail regarding the **Command Options** dialog and *Turntable Angles*.

C.2.49 Joining tracks with differing elevations (N.NNN)

You are connecting two *endpoints* which differ in heights by N.NNN. The elevation of the connection will be the average of the two heights. You should check if this is a problem.

C.2.50 Label description is hidden

The **Move Description** command can only be used when labels are visible on the layout. Labels can be hidden using the Context Menu.

Use the Context Menu to toggle a track's visibility on and off.

C.2.51 Label descriptions not visible

The **Move Description** command can only be used when labels are visible on the layout. Labels will not be visible when the **Label Scale** is set to a smaller value than the current drawing scale or when no items are enabled in the **Label Enable** section of the **Display Options** dialog.

Check the **Display Options** dialog (**Options>Display**) to determine if;

- the **Label Scale** is set to a value smaller than or equal to the current drawing scale.
- at least one attribute within the **Label Enable** section is selected. You will of course want to ensure the type of label you wish to move is selected.

Refer to [section 2.2.10](#) for detail regarding **Description** movement or [section 2.10.3](#) for detail regarding **Display** attributes.

C.2.52 Length of object is too short.

The specified length for the object being modified is too short. Increase the objects length.

C.2.53 Maximum allowed page size is W x H

Values for **Page Width** and **Height** can be manually entered thus overriding maximum values. For example, smaller values could be specified if each printed page is to contain an integral number of feet. Values larger than the selected paper size multiplied by the *Scale* cannot be entered.

Refer to [section 2.5.7](#) for detail.

C.2.54 New Parameter File has no CONTENTS line: FILENAME.

Each **Parameter Files** contains a line which identifies the contents. The specified file is missing this line.

Please report this error to the *XTrackCAD* project development team at SourceForge. The process for reporting errors is outlined in [section 1.11.1](#).

C.2.55 No Car Prototypes are defined....

No Car Prototypes are defined. Load a car prototype definition file (such as protoam.xtp) using the **Parameter Files** dialog or create a prototype definition using the **Car Prototype** dialog.

Refer to [section 2.5.5](#) for detail regarding the **Parameter Files** or [section 2.9.1.3](#) for detail regarding the **Car Prototype** dialog.

C.2.56 No Cars are defined for the current scale....

No Cars are defined for the current layout scale. Either set the scale to the value of already defined cars, or use the dialog to select cars of the current scale and add them to the **Car Inventory**.

Refer to [section 2.9.1](#) for detail.

C.2.57 No Parameter File Map for CONTENTS

The parameter file for CONTENTS has been moved or deleted. Use the **Parameter Files** dialog to locate the **Parameter Files**.

Refer to [section 2.5.5](#) for detail.

C.2.58 No Turnouts/Structures are available.

The **Update Turnouts and Structures** command updates (or refreshes) selected turnouts, sectional tracks and structures on your layout with the current definitions from the loaded parameter files ([Section 2.5.5](#)). Each selected object that is found in a parameter file is updated with the current definition.

If an object can not be found or if the new definition does not fit (same number of endpoints and all the endpoints have the same position and angle) then a dialog is displayed which contains suitable definitions that you can choose from. In the case of turnouts, this list is populated with turnouts having the same number of endpoints as the selected turnout. If turnouts with the same number of endpoints exist then this message is displayed.

Refer to [section 2.9.10](#) for detail.

C.2.59 No data present in Car Import file.

The **Car Import** function reads car values from a Comma-Separated-Value (CSV) file. The import file must contain headers for at least the *Scale*, *Prototype*, *Manufacturer* and *Partno* columns. In addition, information relative to at least one car must be included in the file otherwise this error occurs.

Refer to [section 2.9.1](#) for detail.

C.2.60 No layer was found that has no contents, so the module can not be imported

The import module function needs an empty layer to work with, but none could be found. Clear a layer and retry.

C.2.61 No layer was found that wasn't frozen. Layer 0 is unfrozen.

There has to be one layer that isn't frozen, Layer 0 will be unfrozen

C.2.62 No pages selected for printing.

Pages are selected for printing by clicking on the print grid on the layout. Use the **Zoom Out** command to bring more of the layout into view ([Section 2.12.4](#)). The print grid can be moved using the *Shift+Left+Drag* command or rotated using the *Shift+Right+Drag* command.

Refer to [section 2.5.7](#) for detail.

C.2.63 No path between Profile and selected endpoint.

There is no path of track between the end of the **Profile** and the *endpoint* you have clicked on.

Refer to the [section 2.2.12](#) for detail.

C.2.64 No track(s) selected!

The current command operates on Selected tracks of which there are none. Select the desired track and try the command again.

Refer to [section 2.2.16](#) for detail.

C.2.65 Numeric values on the Car Description...

Numeric values on the Car Description dialog (Car Length, Car Width, Truck Centers, Coupled Length and Coupler Length) must be greater than zero.

Refer to [section 2.9.8](#) for detail.

C.2.66 Object has moved beyond room boundaries.

The last operation moved the object outside of room boundaries; room width and height. The **Undo** command can be used to move the object back.

Refer to [section 2.10.6](#) for detail regarding room boundaries and [section 2.4.7](#) for detail regarding the **Undo** command.

C.2.67 Parallel separation must be greater than 0, or the new gauge must be different than the old.

A parallel track with an identical gauge and separation of 0 or less cannot be created. Specify a positive value in the **Separation** field that appears in the Status Bar, or select a track with a different gauge.

Refer to [section 2.1.6](#) for detail.

C.2.68 Part Number for this Manufacturer already exists....

The *Part* definition you're attempting to create uses the same Manufacturer and Part Number as an existing definition. Saving the definition with the same Manufacturer and Part Number will cause *XTrackCAD* to update the existing definition. If the previous definition must be preserved, then choose a different Part Number for the new definition.

Refer to [section 2.9.1.2](#) for detail.

C.2.69 Playback file version %ld is...

The layout file that you're attempting to load was created using a newer version of *XTrackCAD*. In order to load this file it will be necessary to upgrade your version of *XTrackCAD* to at least the version identified within the error message.

Take full advantage of the latest features within *XTrackCAD* by visiting the [XTrackCAD Fork Website](#) and downloading the latest release.

C.2.70 Playback: Cannot find list entry: NAME

This error is most likely caused by trying to **Playback** an incompatible *XTrackCAD* recording or demo file.

Refer to [section 2.8](#) for detail.

C.2.71 Playback: unknown action NNN

This error is most likely caused by trying to **Playback** an incompatible *XTrackCAD* recording or demo file.

Refer to [section 2.8](#) for detail.

C.2.72 Please select a printer from the Print Setup dialog.

Printer Margins are specific to the selected printer, but no selected printer is chosen. You can select a printer from the Print Setup dialog.

C.2.73 Points are too close to frog; move away.

The points are being placed too close to the frog. Move the points away from the frog and try again.

Refer to [section 2.1.4](#) for detail.

C.2.74 Poly shapes must have at least 3 sides.

Polygons and Poly Lines must have at least 3 sides. You're attempting to create a Poly shape with only 2 sides by deleting the third.

C.2.75 Prototype name already exists....

The *Prototype* definition you're attempting to create uses the same name as an existing definition. Saving the definition with the same name will cause *XTrackCAD* to update the existing definition. If the previous definition must be preserved, then choose a different Part Number for the new definition.

Refer to [section 2.9.1.3](#) for detail.

C.2.76 Radius must be greater than 0.

It's not possible to create a Circle or Helix with a radius of 0° or less. Specify a positive value in the **Radius** field that appears in the Status Bar.

C.2.77 Radius must be less than 10000.

It's not possible to create a Circle or Helix with a radius of 10000° or more. Specify a smaller value in the **Radius** field.

C.2.78 Required column headers missing from Car Import file.

The **Car Import** function reads car values from a Comma-Separated-Value (CSV) file. The import file must contain headers for at least the *Scale*, *Prototype*, *Manufacturer* and *Partno* columns. In addition, the following column headers may also be included: *Index*, *Type*, *Description*, *Roadname*, *Repmark*, *Number*, *Options*, *CarLength*, *CarWidth*, *CoupledLength*, *TruckCenter*, *Color*, *PurchPrice*, *CurrPrice*, *Condition*, *PurchDate*, *ServiceDate* and *Notes*.

Refer to [section 2.9.1](#) for detail.

C.2.79 Rescaled tracks do not fit within layouts room parameters...

While using the **Change Scale** command to enlarge the layout, *XTrackCAD* determined that rescaled tracks do not fit within the layout rooms parameters. Using the **Layout** dialog, the rooms parameters (Height and width) should be set so as to accommodate the rescaled track.

Refer to [section 2.10.6](#) for detail regarding **Layout** options or [section 2.2.1](#) for detail regarding the **Change Scale** command.

C.2.80 Second track must be selected/unselected

The **Move To Join** command moves the selected tracks so an *endpoint* is joined with the *endpoint* of an unselected track. If you choose the selected *endpoint* first then you must choose an unselected *endpoint* second, and vice versa.

Refer to [section 2.2.7.7](#) for detail.

C.2.81 Select position prior to entering Text.

The position where text is to be placed on the layout must be selected prior to text entry. The position is select by *Left-Clicking* on the layout at the point where the text is to appear. Desired text is entered after the position is selected. If necessary, the location can be changed once text entry begins by *Left-Click+Draging* the text to any desired position on the layout.

Refer to [section 2.3.9](#) for detail.

C.2.82 Selected page is out of bounds.

During execution of the **Print** command an attempted was made to select a page that's outside the layouts boundaries.

Refer to [section 2.10.6](#) for detail regarding layout boundaries or [section 2.5.7](#) for detail regarding the **Print** command.

C.2.83 Selected shapes must define a rectangular area ...

The **Import** command (Button) on the **Car Prototype** dialog is used to create the image of an car from the shapes selected on the layout prior to opening the **Car Prototype** dialog. The car is assumed to be oriented horizontally so its length must be greater than its height. The selected shapes do not meet this requirement.

Refer to [section 2.9.1.3](#) for detail.

C.2.84 Selected tracks deviate too much or are too far apart from each other.

The **Connect** command is used to remove small gaps that may result when using sectional track. The chosen sectional track *endpoints* must be close together and nearly aligned. The selected tracks deviate too much or are too far apart from each other.

Refer to [section 2.2.3](#) for detail.

C.2.85 Specified command disabled.

The specified command has been disabled in error.

Please report this error to the *XTrackCAD* project development team at SourceForge. The process for reporting errors is outlined in [section 1.11.1](#).

C.2.86 Split position between Turnout Points

The **Split** position must be between an endpoint and the position where the turnout's track segments diverge (the turnout points). Select a position closer to the endpoint.

C.2.87 Split position not on unique path

The **Split** position must be between an endpoint and the position where the turnout's track segments diverge (the turnout points). Select a position closer to the endpoint.

C.2.88 The Circle or Helix will not fit within the layouts room parameters (Height and Width).

The defined circle can not fit within the defined layout parameters. Either specify a smaller value in the **Radius** field, or increase the room parameters in the **Layout** dialog.

C.2.89 The current layer was defined as frozen. It is now unfrozen.

The current layer has to be unfrozen

C.2.90 The curves created by the Turnout Designer for a cornu curve have more than 128 segments....

Too complex a curve set to be used. Respecify Turnout Designer values.

Refer to [section 2.9.9](#) for detail.

C.2.91 The entered text is too long. Maximum length is %d.

The text entered into a field is longer than the maximum allowed length and was truncated. Please check the shortened text and edit as necessary.

C.2.92 The entered text was too long for the text object. It was truncated.

Text objects are limited to about 10k characters.

C.2.93 The following car has no Part Number...

The car import file must contain headers for at least the *Scale*, *Prototype*, *Manufacturer* and *Partno* columns. In addition, car information relative to these columns must be included in each line of the file otherwise this error will occur.

Refer to [section 2.9.1](#) for detail.

C.2.94 The following car has no dimensions and a...

The car import file does not specify car dimensions and the specified *Partno* can not be found. Edit the import file and either add car dimensions or add/update the *Partno*. This will allow *XTrackCAD* to locate information for the car being imported.

Refer to [section 2.9.1](#) for detail.

C.2.95 The following column in the Car Import file will be ignored:...

An invalid column in the Car Import file will be ignored. Valid column names are:

Index, Scale, Manufacturer, Type, Partno, Prototype, Description, Roadname, Remark, Number, Options, CarLength, CarWidth, CoupledLength, TruckCenter, Color, PurchPrice, CurrPrice, Condition, PurchDate, ServiceDate and Notes.

Refer to [section 2.9.1](#) for detail.

C.2.96 The position of a turnout or turntable cannot be changed while occupied by a train.

The position of a turnout or turntable cannot be changed while occupied by a train.

Refer to [section 2.9.8](#), *Turnouts and Turntables* for detail.

C.2.97 There are no structures to choose from in the structure...

This error occurs when;

- no structures are available in the structure selection list or;
- the scale setting of the layout and Parameter Files does not match.

Using the **File>Parameter Files** menu, check which Parameter files are loaded. Ensure the scale of the loaded files match that of the layout. Alternately a new Structure could be created using the **Group** command.

Refer to [section 2.5.5](#) for detail regarding Parameter Files or [section 2.9.4](#) for detail regarding the **Group** command.

C.2.98 There are no turnouts to choose from in the turnout...

This error occurs when;

- no turnouts are available in the turnouts selection list or;
- the scale setting of the layout and Parameter Files does not match.

Using the **File>Parameter Files** menu, check which Parameter files are loaded. Ensure the scale of the loaded files match that of the layout. Alternately a new turnout could be created using the **Turnout Designer** command.

Refer to [section 2.5.5](#) for detail regarding Parameter Files or [section 2.9.9](#) for detail regarding the **Turnout Designer** command.

C.2.99 There are no unconnected end points for this track

The current command operates on the unconnected *endpoint* of a track, but the *endpoints* of the chosen track are all connected to other tracks. Use the **Split** command to disconnect the desired *endpoint* of this track or choose another track.

Refer to [section 2.2.17.1](#) for detail.

C.2.100 There are too few sections in this loop.

The **Connect** command operates by adding small gaps between other track to make up for the larger gap between the tracks you have selected. In this case you are attempting to close a loop of track with too few sections. Try creating a loop with more sectional track pieces.

Refer to [section 2.2.3](#) for detail.

C.2.101 There is nothing to redo!

Either the **Undo** command has not been used or another command has been used since, thus no Undo operations are available to be undone.

Refer to [section 2.4.7](#) for detail.

C.2.102 There is nothing to undo!

Either no operations have been performed since the current file was opened or all previous operations (up to 10) have been undone.

Refer to [section 2.4.7](#) for detail.

C.2.103 Too many segments in Group.

A group is limited to a maximum of 128 track segments. The number of segments within the selected group of tracks exceed this number. Select a smaller number of tracks then try again.

Refer to [section 2.9.4](#) for detail.

C.2.104 Track cannot be changed.

Modifications can only be made to straight or curved tracks.

C.2.105 Track endpoint is within turntable radius.

An attempt has been made to create the *endpoint* of a track within the radius of the **Turntable**. Move the *endpoint* of the track (mouse pointer) outside of the radius of the **Turntable**.

Refer to [section 2.1.10](#) for detail.

C.2.106 Track intersection not possible; move points away from frog.

The track angle at the current point position does not intersect with the angle of the diverging leg of the new turnout. The points need to be relocated to a position that will allow the angle of the track to intersect the angle of the diverging leg of the new turnout.

Refer to [section 2.1.4](#) for detail.

C.2.107 Track is too short by N.NNN

The operation will create a track that is shorter than the minimum length specified on the **Preferences** dialog. Adjust the position of the mouse to increase the length of the track by moving away from the *endpoint*.

Refer to [section 2.10.7](#) for detail.

C.2.108 Track radius (N.NNN) is smaller than easement minimum (N.NNN).

An attempt was made to create a curved track with a radius smaller than the minimum specified in the **Easement** dialog. Try moving the mouse to different position, creating a curve with a larger radius.

Refer to [section 2.10.4](#) for detail.

C.2.109 Tracks in a frozen layer cannot be modified.

This operation cannot be executed as the selected track is present on a frozen layer. Track modifications may be performed only on unfrozen layers. Move the object to a **Layer** that's not frozen or unfreeze the layer.

Refer to [section 2.9.5](#) for detail.

C.2.110 Tracks in a module cannot be modified.

This operation cannot be executed as the selected track is present in a module layer. Track modifications may be performed only on unfrozen, non-module layers.

Refer to [section 2.9.5](#) for detail.

C.2.111 Turnout definition contains non-track segments....

Turnout definitions can include lines and other shapes that represent switch machines, switch stands, roadbed or other objects. Such items can be included when editing Turnout definitions. These same items can also be removed if there's a need to start over again.

Refer to [section 2.9.2](#) for detail.

C.2.112 Turntable diameter must greater than 0.

It's not possible to create a turntable with a diameter of less than or equal to 0. Specify a positive value in the Diameter field that appears in the Status Bar.

C.2.113 Undo assertion failure %s:%d...

Please report this error to the *XTrackCAD* project development team at SourceForge. The process for reporting errors is outlined in [section 1.11.1](#).

C.2.114 While processing Layout file %s, %d lines were skipped because they were not recognized.

The layout file that you loaded contained records that were not recognized. This could be because the file was written by a higher level of *XTrackCAD* or because it was corrupted.

Take full advantage of the latest features within *XTrackCAD* by visiting the [XTrackCAD Fork Website](#) and downloading the latest release.

C.2.115 While processing Parameter file %s, %d lines were skipped because they were not recognized.

The parameter file that you loaded contained records that were not recognized. This could be because the file was designed for a higher level of *XTrackCAD* or because it was corrupted.

Take full advantage of the latest features within *XTrackCAD* by visiting the [XTrackCAD Fork Website](#) and downloading the latest release.

C.2.116 You have specified a large Bitmap....

Bitmaps can use a large amount of system resources. They may also take a long time to generate and create a large file.

Refer to [section 2.5.2](#) for detail.

C.2.117 [X Y] is not a track

The current command operates on a track object and a track was not found at the current location (given as X and Y).

Appendix D: Upgrade From Earlier XTrackCAD Version

This section contains helpful information regarding program changes and the effects such may have with respect to layout files made with previous versions of *XTrackCAD*.

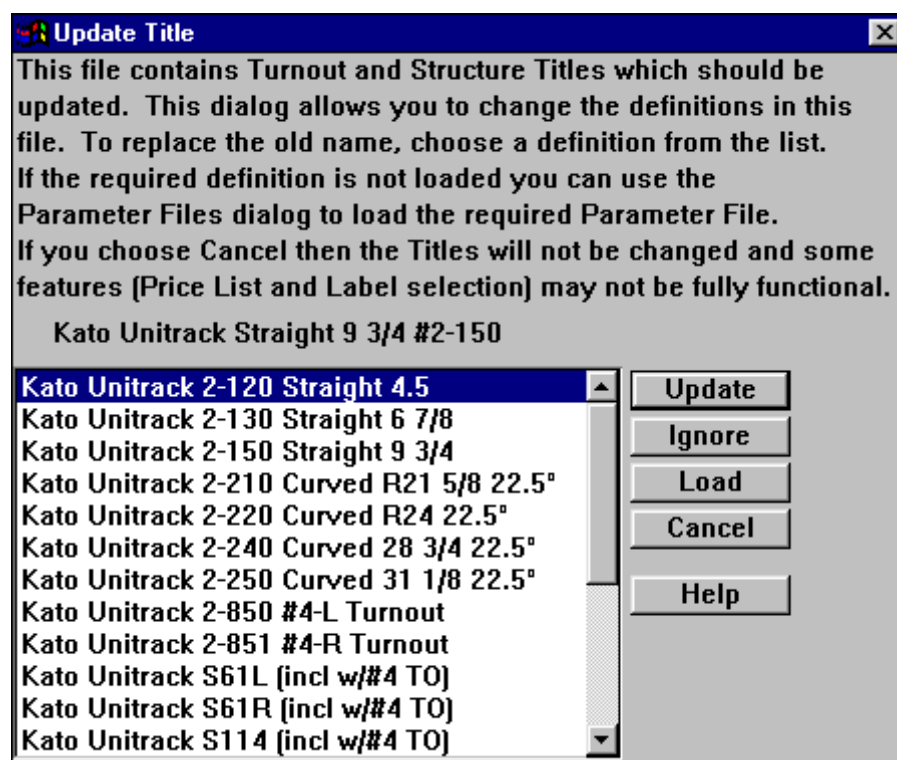
D.1 Version 5.x

Version 5.x.x of XTrackCAD introduced many enhancements and additions including Layout Control Objects, Cornu Tracks and Bezier Tracks and Lines. It is upward compatible from earlier versions but if the new objects are included in layouts, the files will not be readable by earlier versions.

Users should take a backup of their Layout files if they will want to use the previous level of code before opening them.

D.2 Version 2.x

Updated Titles



Version 2.0.0 of *XTrkCad* introduced a change in the way Turnouts and Structures are named. The new method splits the title into 3 parts: Manufacturer, Description and Part Number.

To help you when upgrading to the new version, when loading an old *XTrkCad* layout file, *XTrackCAD* detects if the layout uses Turnouts and Structures that have titles in the old format. If so this dialog is displayed which allows you to change the titles in your layout to the new format.

The title of each different type of Turnout is collected and presented in this dialog. Simply select the Turnout on the list that matches the one displayed and click 'Update'. Repeat for each type of Turnout in your layout.

If there is no matching Turnout, click on Ignore. The Turnout will retain the old name as the Description, with a blank Manufacturer and Part Number.

Click Cancel to continue loading the file without updating the titles.

If you Save your file without updating all the titles you will not be able to update the titles later.

If you are looking at old files without making changes then Click on Cancel to load the file without Updates.

Not updating the titles prevents the customization of the way titles are presented in various lists and on the layout. Basic operation of *XTrackCAD* is not affected.

D.3 Version 4.0.3

Internationalization

Internationalization or the ability to localize *XTrackCAD* for use with various languages was adopted during this version upgrade. *XTrackCAD* is now available with balloon help and daily tips written in US English, Finnish and German. The *XTrackCAD* development team welcomes anyone who wishes to volunteer with translation of various support files. Let them know by submitting an offer to assist to the *XTrackCAD* Feature Tracker located at the [XTrackCAD Fork Project Site](#) or the *XTrackCAD* Wikka Wish List located at the [XTrackCAD Wiki: WishList](#).

Minor Fixes and Enhancements

- Thanks to Martin Fischer, the Button Bar has a much cleaner and sharper look.
- Several selections within various Option Menus (Layout, Display, Command and Preferences) have been re-arranged. In some case the order or grouping of menu items changed. In other cases menu items were move to a different menu; still within the sub-set of Option Menus. Our hope is that we've made it easier to locate parameter settings that in past were difficult to locate.
- An new option that allows *XTrackCAD* to automatically re-open the last layout file has been added to the **Options>Preferences** menu. For detail refer to the 'On Program Startup' item found in [Section 2.10.7](#).
- Significant updates were made to the Atlas N and HO scale parameter files. Diesel engine and freight car information is now contained in four separate parameter files; Atlas HO Scale Cars (*atlascho.xtp*), Atlas HO Scale Diesel Engines (*atlaseho.xtp*), Atlas N Scale Cars (*atlasn.xtp*) and Atlas N Scale Diesel Engines (*atlasen.xtp*).
- Twenty-one prototypes were added to the American Prototype parameter file (*protoam.xtp*). The additional prototypes are;
 - Diesel Engines
 - Dash 8-32BWH, Dash 8-40B, Dash 8-40BW, Dash 8-40C
 - FP7A
 - H15-44, H16-44, H15/16-44
 - RS4/5
 - RSD12
 - S1, S2, S3, S4
 - SD35, SDP35

- Freight Cars
 - Caboose, NE-6
 - Flat, 42'
 - Tank, 55' and Tank, 65'
 - Reefer, 36'
- *XTrackCAD* users reported difficulty when attempting to activate grid lines in version 4.02. The problem was noticeable only on new installations. A default grid size of zero was found to be the cause of the problem. The default grid size has been changed to 1 thus eliminating the problem.
- A small bug preventing Zooms of less than 1:1 (Refer to [Section 2.12.4](#) for detail.) was accidentally introduced in version 4.0.1. This problem has been corrected in version 4.0.3.
- When new scale definitions were added to XTrkCad 4.0.2, a small bug broke the file format for some scales (eg., N UK). This problem has been corrected in version 4.0.3.
- Some users of the Linux based application reported the *Sticky Commands* menu would exceed screen length. Spacing between *Sticky Commands* options has been improved in order to prevent this problem.
- We've no idea when certain demo's broke however thanks to the work of Mikko Nissinen, many broken demos are now fixed.

Name Change

With release of this version of *XTrackCAD* there's been a subtle change in the spelling and punctuation of the applications name. From this version forward, the application will be know as *XTrackCAD*. Please note the spelling and capitalization of the name.

Why was the name changed? This release gives *XTrackCAD* developers an opportunity to included a much sought after feature; Internationalization (Through i18n). On the surface this doesn't sound that big however having the ability to internationalize or localize the product has great advantages for all users. Not only is there great potential for the application to become available to a larger audience, our hope it that the developer pool will expand which should result in more features being added to the application.

D.4 Version 4.0.x

Check-point Files

Version 4 of *XTrkCad* introduces a new way of handling check-point files. This will allow resuming your work after a system crash much easier than before.

If you start *XTrkCad* V.4.0.x the first time after an upgrade from a earlier version, a pop-up with the question: "Program was not terminated properly. Do you want to resume working on the previous track plan?"

Select "Ignore" only if you're sure that the work from your last session has been correctly saved. If uncertain or restarting after an earlier failure select "Resume".

Help System

The built in help system has been converted to a much more flexible and widely used HTML format. With many new

graphics and extensively rewritten text the help information is now up-to-date with recent development.

Layer Colour Settings

Your personal layer color settings are now stored in your preferences. This allows you to apply the same settings to other layouts you design.

Parameter Files Updated

Thanks to Ralph Boyd, Dwayne Ward, Casey Sterbenz and others, many new and updated parameter files were added to this release.

Wheel mouse

The wheel on a wheel mouse can now be used to zoom in and out on a layout design.

Appendix E: Warranty, License and Copying

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XTrackCAD Fork is a project for further development of the original *XTrackCAD* software. Refer to the project homepage at <http://www.xtrkcd.org/> for news and current releases.

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