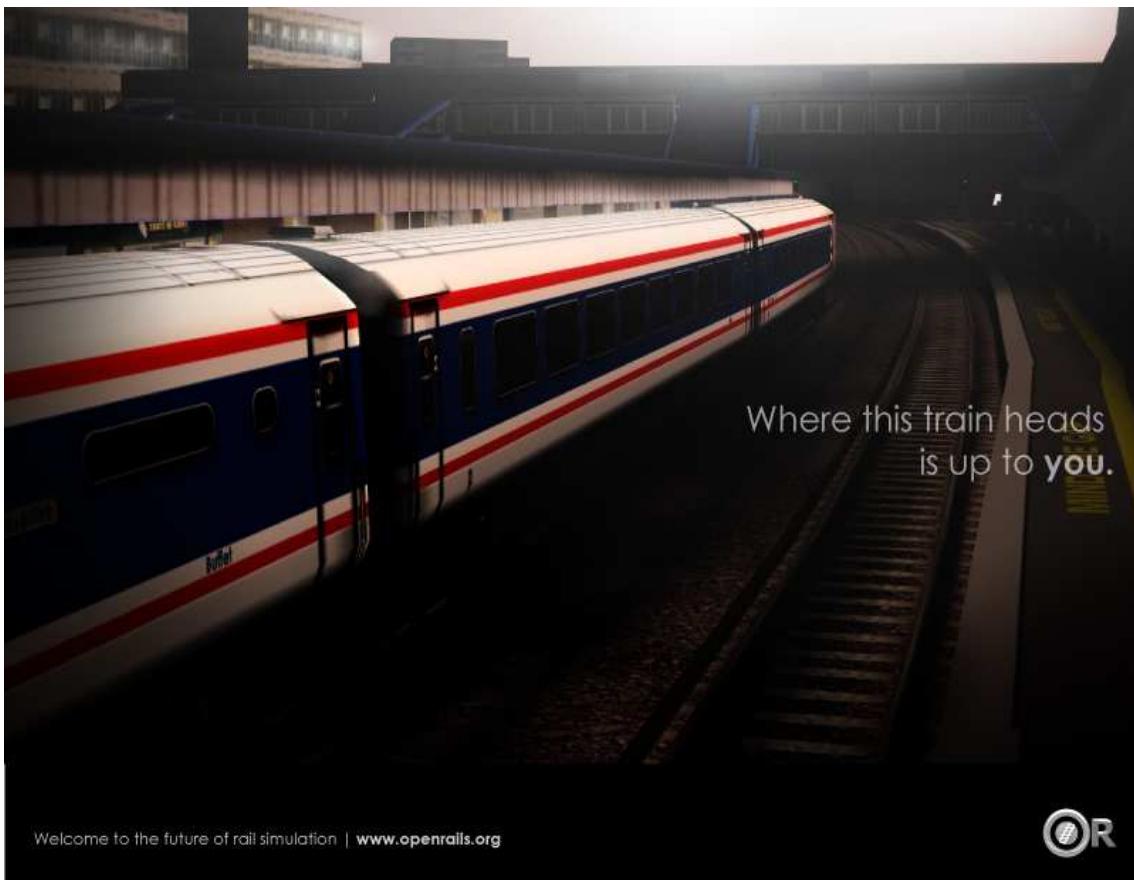




open rails™

The MSTS compatible railroad simulator.



Software Documentation

Version 0.645

Read the included End User License Agreement (EULA)

NO WARRANTIES. Open Rails.org disclaims any warranty, at all, for its Software. The Open Rails software and any related tools, or documentation is provided “as is” without warranty of any kind, either express or implied, including suitability for use. You, as the user of this software, acknowledge the entire risk from its use.

Trademark Acknowledgment

Open Rails, Open Rails Transport Simulator, ORTS, Open Rails trademark, Open Rails.org, Open Rails symbol and associated graphical representations of Open Rails are the property of Open Rails.org. All other third party brands, products, service names, trademarks, or registered service marks are the property of and used to identify the products or services of their respective owners.

Copyright Acknowledgment

©2010-2011 Open Rails.org All rights reserved.

Table of Contents

Introduction	5
About Open Rails	5
Community	6
Version	7
What's New	7
Installing Open Rails program	8
Overview	8
System Requirements	8
Supported Operating Systems	9
Technical Requirements – Software	9
Installation Procedure	10
Working installation of Microsoft Train Simulator	10
Video card supporting DirectX v9.0c or greater with Pixel Shader 2.0+	10
Microsoft XNA Framework Requirements	11
Installing Microsoft XNA Framework Redistributable 3.1	11
Upgrade of .NET Framework Requirements for Open Rails software	13
Installing Microsoft .NET Framework 3.5 Service Pack 1 (SP1) Redistributable	13
Installing OPEN RAILS software	15
Upgrading from a previous Public Download	16
How to Use RailDriver® with Open Rails	16
Setting up the RailDriver calibration file	16
Driving with your RailDriver in Open Rails	17
Getting Started	18
Overview	18
Traditional Windows Main Menu	19
Train Sim Style Menu	19
Game Loading – runactivity.exe	22
Open Rails Loading Error Messages	23
Main Viewer Window	25
Windows Main Menu Options	26
Routes Details	26
Activities Details	26

Add Folder	27
Remove.....	27
Options – Windows Style & Train Sim Style	27
Join	29
Full Screen.....	29
Resume.....	29
Game Controls.....	29
Mouse Controls	29
Keyboard Controls.....	29
Known Issues.....	31
General Display	32
Cameras.....	32
Track Display.....	32
Cab view.....	32
Trainset Physics	32
Consists.....	32
Routes	32
Environment	32
Activities	33
AI trains	33
Acknowledgements	33
License Agreement	34

Introduction

Open Rails software (OPEN RAILS) is a community developed and maintained project from Open Rails.org. Its objective is to create a new transport simulator platform that is first, compatible with routes, activities, consists, locomotives, and rolling stock created for MSTs; and second, a platform for future content creation freed of the constraints of MSTs.

Our goal is to enhance the railroad simulation hobby through a community designed and supported platform built to serve as a lasting foundation for an accurate and immersive simulation experience. By making the source code of the platform accessible to community members, we ensure that OPEN RAILS software will continually evolve to meet the technical, operational, graphical, and content building needs of the community. Open architecture ensures that our considerable investment in building accurate representations of routes and rolling stock will not become obsolete. Access to the source code eliminates the frustration of undocumented behavior and simplifies understanding the internal operation of the simulator without the time consuming trial and error experimentation typically needed today.

Open Rails software is just what the name implies – a railroad simulation platform that's open for inspection, open for continuous improvement, open to third parties and commercial enterprises open to the community, and best of all, an open door to the future.

About Open Rails

To take advantage of almost a decade of content developed by the train simulation community; Open Rails software is a complete new game platform that has backward compatibility with MSTs content. By leveraging the community's knowledge base on how to develop content for MSTs, Open Rails software provides a rich environment for community and pay ware contribution.

The primary objective of the Open Rails project is to create a railroad simulator that will provide 'true to life' operational experience. The Open Rails software is aimed at the serious train simulation hobbyist; someone who cares about loco physics, train handling, signals, AI behavior, dispatching, and most of all running trains in a realistic, prototypical manner. While the project team will strive to deliver an unparalleled graphical experience, 'eye candy' is not the primary objective of Open Rails software.

By developing a completely new railroad simulator, Open Rails software offers the potential to better utilize current and next generation computer resources, like graphics processing units (GPUs), multi-core CPUs, advanced APIs such as PhysicX, and wide screen monitors, among many others. The software is distributed in restricted source code form so the user community can understand how the software functions to facilitate feedback and to improve the capabilities of Open Rails software.

Community

At the present time, Open Rails software is offered without technical support. Therefore, users are encouraged to use their favorite train simulation forums to get support from the community.

- Train-Sim.Com <http://forums.flightsim.com/vbts/>
- UK Train Sim <http://forums.uktrainsim.com/index.php>
- Elvas Tower <http://www.elvastower.com/forums/index.php?/index>

The Open Rails team has launched a wiki <http://wiki.uktrainsim.com/display/OPENRAILS/Home> that will offer the community a central resource for technical assistance on installation, creating content, known issues, tutorials, and a place for the community to provide feedback to the Open Rails team.

The Open Rails team is NOT planning on hosting a forum on the Open Rails website. We believe that the best solution is for the current train simulation forum sites to remain the destination for users who want to discuss topics relating to Open Rails software. The Open Rails team monitors and actively participates at these forums.

Version

This document is based on version 0.645.

What's New

Since the last public download (v360) Open Rails software has been extensively upgraded and improved. A dedicated team of worldwide volunteers has been hard at work delivering on our mission of the most "realistic" train simulator. The Open Rails team would like to gratefully acknowledge the generous support of real world experts and historical societies from across the globe in signaling, interlocking, dispatching, train engine manufacturing, and railway design and construction. Their input and patience as we've gone about turning their intimate knowledge into simulation code has been utterly invaluable and has contributed immensely to the authenticity of the experience provided by Open Rails Train Simulator.

Among the areas that have been upgraded since the last release are train physics across steam, diesel and electric locomotives towards prototype realism; an all new interlocking and signaling module that will set the standard for train simulations for the future; new self-aware AI capabilities that allow for dynamic changes to Activities; replacement of the irrKlang sound engine with an Open AL implementation; a 20% -30% improvement in Frame per Second performance; Phase 1 special effects; integration with RailDriver; and much more.

Major Enhancements in v6xx Listed here in no particular order.

1. Upgraded dynamic shadows and lighting effects. Specular lighting has been added back via new, more efficient implementation. Shadows now respect ambient lighting/overcast effect. Hidden setting (ShadowAllShapes) added to make everything cast shadows. Shadows are fixed in position and don't flutter.
2. Working Crossing Gates and Car Spawners. Sounds associated with Crossing Gates and flashing light animation have NOT been implemented. Cars can interact (slow down and stop when gate is closed, acceleration and move when no obstacle).
3. Full integration with RailDriver and its API's.
4. Phase 1 special effects have been added. Steam and smoke effects are displayed using a brand new particle physics module developed by the Open Rails team. At the present time, Open Rails software reads the effects data from the engine file. However, this new foundation means that the community need not be forced to accept artificial limits in the number and types of emitters per engine, nor restricting the types of emitters per engine. The foundation means special effects, in the future, will be configurable for any object in the Open Rails 3D world.

5. F1 keyboard assignments and printable copy. Since the last version, Open Rails software has changed some of the keyboard assignments. To make these changes and all key assignments easily accessible, Open Rails software shows that information in this F1 display.

6. Significant improvements in FPS performance especially when dynamic shadows and other realism effects are enabled. The Open Rails team has also done some adjustments in the shaders to better simulate lighting in the 3D world.

7. New Window Presentation Forms Main Menu. Users will now have the choice of different user interfaces, both the existing traditional Windows system and an all-new WPF-based menu system. The interfaces can be switched between at will and customized to the user's preference.

8. Dynamic shadows and improved lighting. Shadows now respect ambient lighting/overcast effect. They are fixed in position and don't flutter. A new system of cascading shadow maps reduce graphics VRAM usage by over 75% without loss of visual quality, enabling use of older and less memory-loaded graphics cards. Settings have been added in code to make everything cast shadows. Specular lighting, lighting highlights on objects related to the angle of reflectivity, are now working properly.

Installing Open Rails program

Overview

Open Rails software has very specific technical requirements that the user must install before the open rail software program will work properly. Since the Open Rails software is in development stage, the User is entirely responsible to install any third party software or update their hardware system to the proper Direct X level, including any other software or system dependencies.

System Requirements

Currently, Open Rails software requires a similar hardware specification as Microsoft Train Simulator with one major exception: Open Rails software requires a video card compatible with DirectX 9.0c and Pixel Shader 2.0.

One of the major breakthroughs achieved by the Open Rails software is that it places less demands on the CPU for processing information and rendering of the graphics. These requirements are now placed on the GPU, instead of the CPU. For this reason, Open Rails recommends a video card with 256MB GPU RAM for decent performance. In addition, Open Rails will spread the game execution threads across four CPUs so users with multi-core CPUs

will experience significantly better performance than users with single core CPUs. Certainly, a single core 2.8+ GHz CPU will experience acceptable game performance.

As Open Rails software offers the ability to have richer, more detailed route environments, professional grade physics simulation, and other more compute costly features, the performance of Open Rails will be in a direct ratio with the quality of the system it's running on.

For the future

Open Rails software is aimed at the serious hobbyist. Open Rails software is being developed specifically for a train sim community member who cares about loco physics, train handling, signals and intelligent AI behavior. We believe those users are willing to invest in a more powerful computer to ensure they get the results they want. Therefore, development of the Open Rails software will be focused on optimizing its performance on multi-core CPU systems with mid-to-high end graphics cards. It would be nice to support the less powerful computers, and it's technically possible to do so, but with limited resources, the Open Rails development team assigns a lower priority to this.

Supported Operating Systems

Open Rails software strives to support Windows XP (SP2 and later), Windows Vista (SP1, 2) and Windows 7. Recent changes to Windows security may require the User to run the Open Rails software as "administrator".



Open Rails software does not certify any operating system as "supported".

Any operating systems listed as "supported" are based on Community User's claims to have the Open Rails software running on them. Note, your system and configuration may be different than another person's setup. Therefore, Open Rails software may require configuration changes to your individual system to run the Open Rails software or to get the same performance as another user.

Technical Requirements – Software

The User must have the following installed and properly configured:

1. A working installation of MSTs
2. DirectX v9.0c or greater with Pixel Shader 2.0
3. Microsoft XNA Framework Redistributable 3.1
4. Microsoft .NET Framework 3.5 SP1 Redistributable
5. Open Rails software.
6. [Optional] Installing Raildriver® for use with Open Rails

Installation Procedure

Working installation of Microsoft Train Simulator

A working installation of Microsoft Train Simulator (MSTS) including all the main folders, such as Global, Routes, Sound and Train folders is required for Open Rails software. Open Rails software uses the Microsoft Train Simulator entries in the Windows registry to locate where your Microsoft Train Simulator files are located on your computer. If you have MSTS installed on a non-default drive, or if you have multiple MSTS installation folders for route grouping, please pay particular attention to the “add folder” section of the installed application later addressed in this document. In addition, route, consists, activities, and services files must be present in their correct folders for the Open Rails software to read them into the game engine.

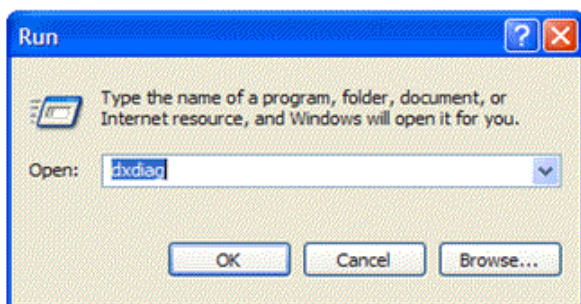
i *Installation of Open Rails software does not modify any MSTS files. Nor does Open Rails software modify any MSTS files during game play. The Open Rails software is not responsible for User's inability to access any MSTS train sets, activities, consists, services or routes. Those are set by your configuration of the MSTS setup. The only reason that MSTS software must be installed is to make available to your routes certain original and default MSTS files which they depend upon for running.*

Video card supporting DirectX v9.0c or greater with Pixel Shader 2.0+.

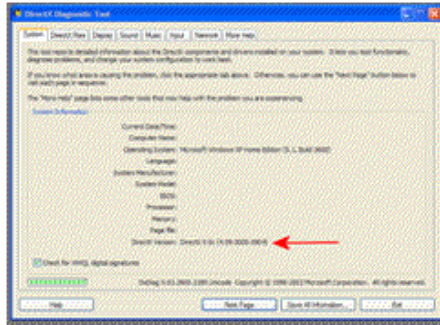
Pixel Shader 3.0 is required for a full implementation of new dynamic shadows features.

To determine if your system has DirectX v9.0c or greater installed, follow these instructions:

- Go to **START** menu
- Select **RUN** command; a dialog box as shown below appears



- Type *dxdiag* into the dialog box. **Click** OK button
- After the window appears, the last line (indicated by the arrow) will show which version of DirectX is currently installed on your computer.



Although the current version of DirectX is ver11, you only need ver9.0c in order to run Open Rails. If this test shows that you already have v9.0c, then upgrading to a higher version is not needed, and it may not be supported by your video card. In addition, if your version of DirectX is less than v9.0c, your video card may not support a higher version. If indeed you have a version less than v9.0c, you are **strongly** urged to update your system with a new video card rather than risk updating your old card with a new version of DirectX.

To upgrade your system, please go [here](#) to download the correct version of DirectX. Many major video card manufacturers will install the optimal version of DirectX as part of the installation of the video card drivers.



Before changing or upgrading your system, you must make sure your system hardware supports DirectX v9.0c or higher and Pixel Shader 2.0. Do not upgrade or change your system software unless you are knowledgeable on how to do it.

Your video card must also support Pixel Shader Model 2.0 or better. Video cards built in 2005 or later should be compatible, but please check with the manufacturer to be certain. We do not have a suggestion on how you can determine this yourself. The best way to find this out is to run the software and see if it works. Most reasonably modern video cards support Pixel Shader 2.0.

Microsoft XNA Framework Requirements

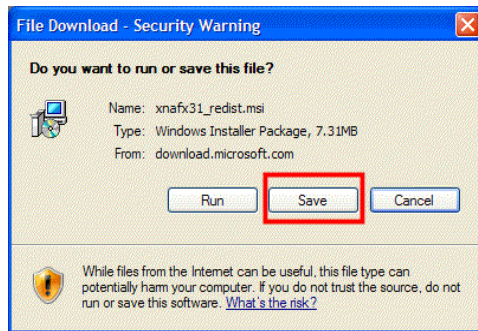
There are certain Microsoft runtime libraries that must be installed for the Open Rails software to function properly. These runtime libraries are included in the Microsoft XNA Framework Redistributable 3.1. XNA Framework Redistributable 4.0 is NOT compatible with Open Rails software.

Installing Microsoft XNA Framework Redistributable 3.1

Please download and install this software from the Microsoft website [here](#).

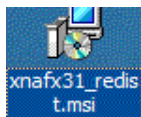
Select the **Download** button to download the software from the website.

Select **Save** to choose where the Microsoft XNA Framework Redistributable 3.1 .msi file will temporarily be stored on your computer.



i Since this file will only be used to install the Microsoft XNA Framework one time, an easy location to save this file to is your desktop.

Once the download is complete, the following icon will be on your Windows desktop. Double click on the icon to begin the installation process for the Microsoft XNA Framework.



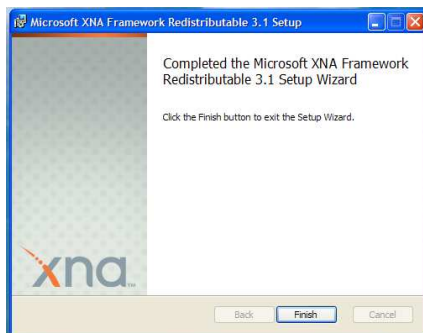
A security warning will appear, select **Run** to unpack the msi file.



When the Microsoft installation Wizard appears, select **Next** to begin the installation process.



Once you have successfully completed the installation of the XNA Framework, you will see the final installation screen. Select **Finish** to complete the installation process.



Congratulations, you have successfully installed the Microsoft XNA Framework. Next, it's important to install the correct version of Microsoft .NET.

Upgrade of .NET Framework Requirements for Open Rails software

This must be installed for Open Rails software to function properly. Previous versions of OR required .NET Framework 3.0. Be sure that you are running v3.5 SP1 before attempting to run v6xxx of Open Rails software. Also, while you may have .NET Framework v4 installed on your system, this is not compatible with Open Rails software. There is no need to remove it. Simply download the install file for v3.5 SP1 and install it as well.

You can easily determine which version or versions of .NET Framework are installed on your system. Open the "Add or Remove Programs" system application, which is found on your Control Panel. If you do not find the following exact entry in the list of installed programs, "*Microsoft .NET Framework 3.5 SP1*", then you'll need to install it. Please download and install this software from the Microsoft website [here](#).

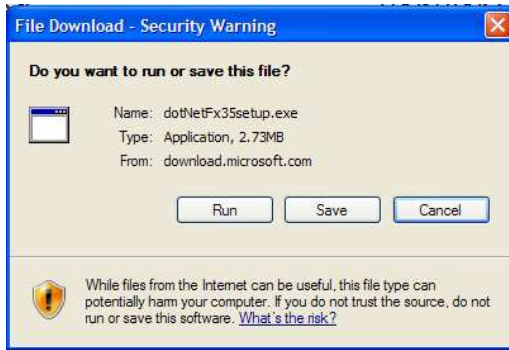


Prior versions of Open Rails v128, v360 required only .NET 3.0

Installing Microsoft .NET Framework 3.5 Service Pack 1 (SP1) Redistributable

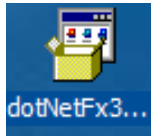
Select the **Download** button to download the software.

Select **Save** to choose where the Microsoft .NET Framework 3.5 Service Pack 1 Redistributable .msi file will temporarily be stored on your computer.



i Since this file will only be used to install the Microsoft .NET Framework one time, an easy location to save this file to is your desktop.

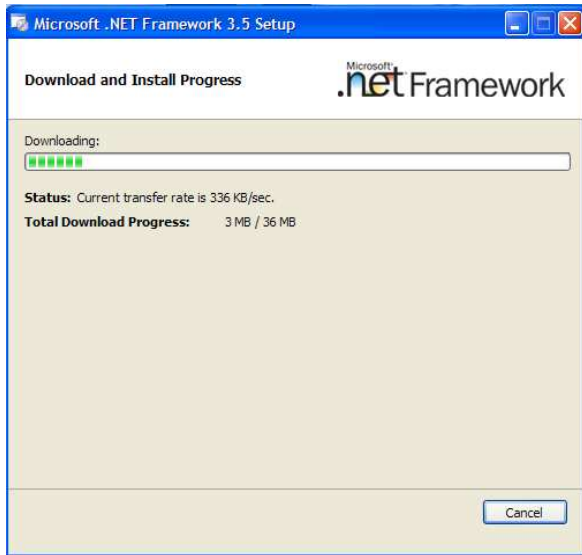
Once the download is complete, the following icon will be on your Windows desktop. Double click on the icon to begin the installation process for the Microsoft .NET Framework.



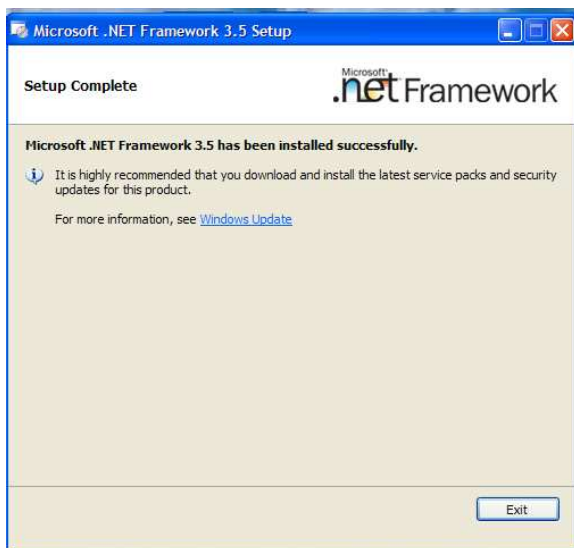
A security warning will appear, select **Run** to unpack the msi file and start the download from the Microsoft website.



When the Microsoft installation Wizard appears, select **Next** to begin the installation process. Please note the .NET package is 2.8 MB, so plan the download depending on your Internet connection speed.



Once you have successfully completed the installation of the .NET Framework, you will see the final installation screen. Select **Finish** to complete the installation process.



Congratulations, you have successfully installed the Microsoft .NET Framework 3.5.

Installing OPEN RAILS software

You can download the zipped install file [here](#). The Open Rails software may periodically, but rarely, be unavailable for download because the team disables the link while preparing an updated version or while fixing a software problem.



Open Rails team recommends that you install the software in a separate folder from where your MSTs is installed. Since there is not an automated uninstall process,

segregating your Open Rails software from your MSTs or any other software ensures that you can accurately remove the Open Rails software by just deleting the folder. In addition, updating the Open Rails software will be much easier if it is located in an easy-to-find, separate folder on your system.

Upgrading from a previous Public Download.

If you have previously installed an earlier public download, upgrading Open Rails software is easy. Download the latest public version from the Open Rails website. Unzip the contents into any folder. Users have two options: (1) copy and paste the new Open Rails files and folders into their existing Open Rails installation, overwriting the files and folders; or, (2) unzip the Open Rails software into a new folder.

Multiple instances of Open Rails software can exist on your computer without any conflicts. Please check the path of any desktop shortcuts you may have created to ensure they reference the desired version of Open Rails software.

How to Use RailDriver® with Open Rails

You can now use RailDriver® to run Open Rails, even on Windows Vista and Windows 7. Just follow the steps in this section.

Setting up the RailDriver calibration file.

If you already have a RailDriver installation where you have calibrated your RailDriver, you're in luck, as there is very little to do. Simply find your RailDriver software folder (C:\Program Files\PI Engineering\RailDriver, or something similar). With luck, Open Rails will find it there. (A Registry entry LOCAL MACHINE/SOFTWARE/PI Engineering/PIBUS/RailDriver should identify the location. If you're not familiar with Registry navigation, don't try.)

If you can find it, but Open Rails software cannot, look in a folder named controller and copy the *ModernCalibration.rdm* file to your main Microsoft Train Simulator folder. You're done! Hook up your RailDriver and launch Open Rails software

If you don't have a ModernCalibration.rdm file or you want to re-calibrate your RailDriver, here is the suggested procedure:

1. If you have an existing RailDriver software installation, find the installation folder (C:\Program Files\PI Engineering\RailDriver, or something similar). If you don't, you'll have to install the RailDriver software from your RailDriver CD or from the RailDriver website, at <http://www.raildriver.com/support/downloads.php>. Use the MSTs version, halfway down the page. (If you like, you can uninstall it at the end of this calibration procedure.) Using the RailDriver Calibration application, this procedure will have you create an independent copy of just the calibration file.

2. Now that you have located or installed your RailDriver software folder, create a new folder in any place of convenience to hold just the files needed for calibration. Name the folder something like RDcalibration.

3. Now you're going to fill the new RDcalibration folder from the RailDriver software folder. Copy the following eight files from the RailDriver software folder to the new RDcalibration folder:

RDcalibration.cnt	RDcalibration_ger.hlp
RDcalibration.exe	RDCalReadme.txt
RDcalibration.hlp	RDLanguage.ini
RDcalibration_ger.cnt	PIEHid.dll

Also, copy the controller folder (along with the two files in it) to your RDcalibration folder.

4. If you haven't hooked up your RailDriver already, do so now – power and USB cable, at least.

5. You're ready to calibrate the RailDriver. Launch RDcalibration.exe by double-clicking it. (If you get a window from User Account Control asking your permission to proceed with the launch, click Allow.) Then, follow the RailDriver calibration instructions to their completion.

After you click Finish at the end of the procedure, and if you're running Windows Vista or Windows 7, you may get a Program Compatibility Assistant notification that the setup may not have succeeded. If the calibration seemed to go smoothly, you can click "This program installed correctly." If it didn't, let us know.

6. After the RailDriver calibration program exits, check the controller folder in your RDcalibration folder. The calibration program should have modified the two files in the controller folder (with a "Date modified" of approximately the time you clicked Finished).

7. Copy the ModernCalibration.rdm file to your main Microsoft Train Simulator folder.

8. You're done! (If you had to install the RailDriver software from your RailDriver CD, you can uninstall it now, if you want.)

Driving with your RailDriver in Open Rails.

Now that you have a calibration file in a place where Open Rails knows to look, you're ready to fire up an operating session.

1. Power up your RailDriver, but without the USB cable plugged in. The LED display is blank.

2. Plug in the USB cable. Windows will detect new hardware and respond by installing a generic human interface driver. Assuming the installation is successful, the LED display is "rd".

3. Launch Open Rails (V471 or greater) with your selected route and activity to load. The LED's now contain "---".

4. Press the RailDriver Run/Stop button. The LED's contain "0.0" (speed).
5. If you hit Run/Stop again while operating, the LED's will turn to "---", and if you hit it again, the LED's will return to report your speed.
6. With RailDriver still active, if you hit RailDriver's ESC button, Open Rails will exit normally, and the LED's will turn blank

In general, you should experience the following start-up sequence.

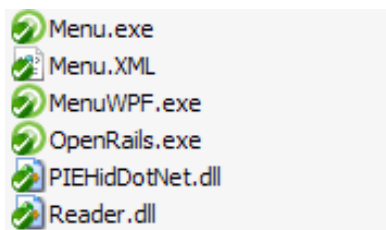
1. When you click Start on the Open Rails main menu, Open Rails looks for a RailDriver. If it finds one, the interface is initialized and the RailDriver LED's are set to three dashes.
2. Next, the calibration file (ModernCalibration.rdm) is read. The code first looks for a calibration file in the train simulator folder that contains the route. If no file is found there, the code checks in the folder pointed to by Registry entry LOCAL MACHINE/SOFTWARE/PI Engineering/PIBUS/RailDriver. If a calibration file is not found there, Open Rails blanks the LED's and uses default values instead of the calibration file. (Your RailDriver probably won't work properly if there is no calibration data that matches your particular RailDriver. It will be to your advantage to perform the calibration procedure.)
3. Whether a calibration file is used or default values are used, the RailDriver starts in the inactive state and you need to press the Run/Stop button to activate the RailDriver.
4. Most of the RailDriver buttons work the same as with Microsoft Train Simulator. Buttons that don't have an Open Rails equivalent do nothing at all.

Getting Started

Overview

Start the Open Rails software by navigating to the Folder where you unzipped the software.

To start of Open Rails software, double click on the *Open Rails.exe* file. This will start Open Rails software with the traditional Windows style menu. You can switch to the Windows Presentation Format menu via the **switch menu** button, or double click on the *MenuWPF.exe* file to start Open Rails with a new train simulator style menu. The software will remember which menu style was opened last.

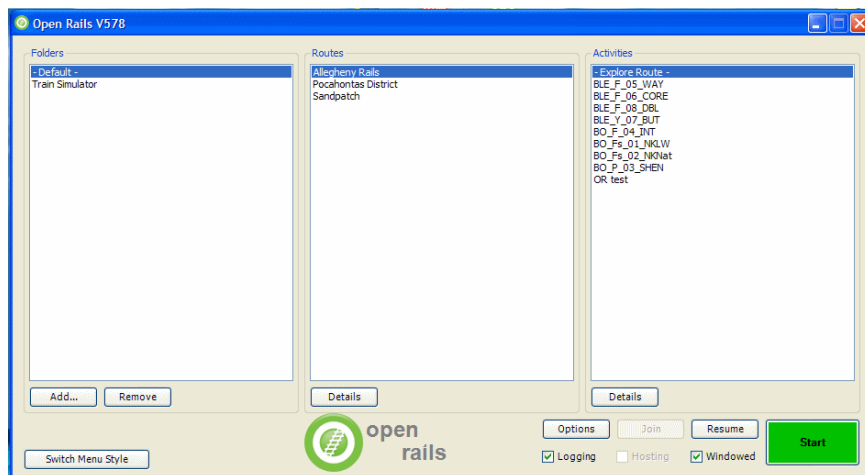


Since the Open Rails software is not registered with either of the major video card developers (ATI or NVidia), the video card default of "application controlled" for the video card settings is

recommended at the present time. In future versions, Open Rails will automatically set the default Anti-Aliasing and Anisotropic filtering levels that provide the best graphic display.

Traditional Windows Main Menu

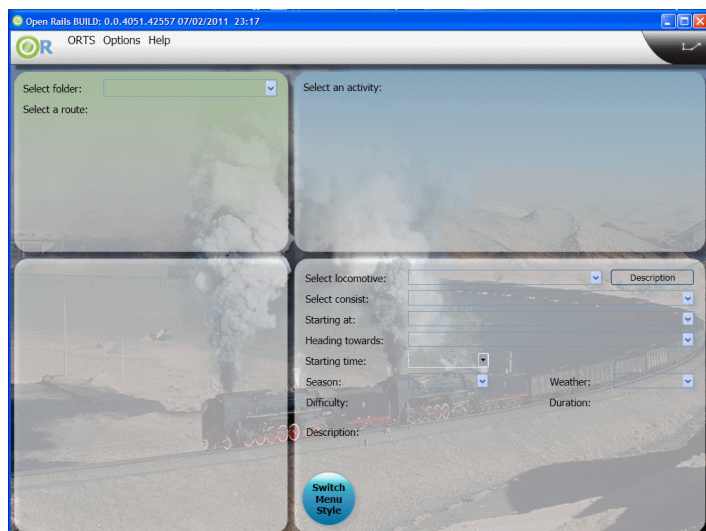
Once the Open Rails software loads, a Main Menu screen appears listing the Folder location of your MSTs installation, active Route(s) and Activity(s) within your MSTs installation.



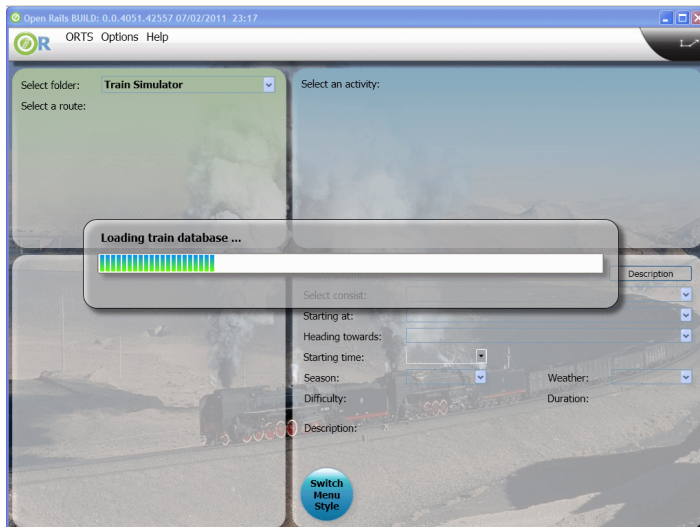
To start game, simply highlight the route and activity, then click the **Start** button. The **Switch Menu Style** changes the main menu from traditional Windows style to Train Sim style menu. The choices, selection and operation of both the Windows style and the Train Sim style menus are identical.

Train Sim Style Menu

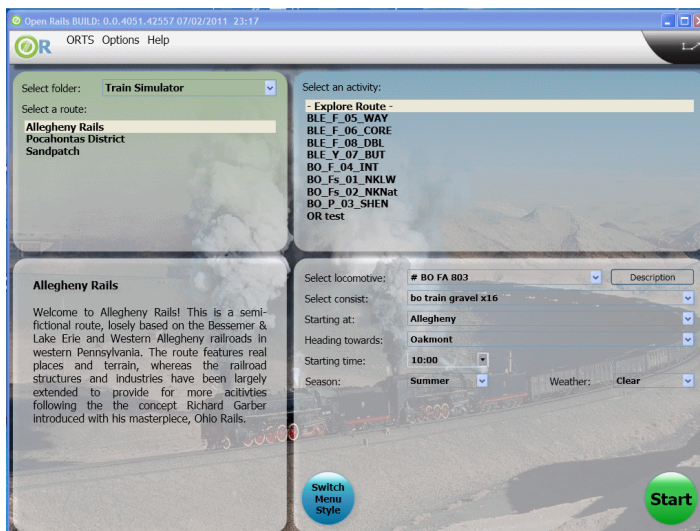
Open Rails software introduces a new menu style that is similar to familiar train sim main menus as shown below.



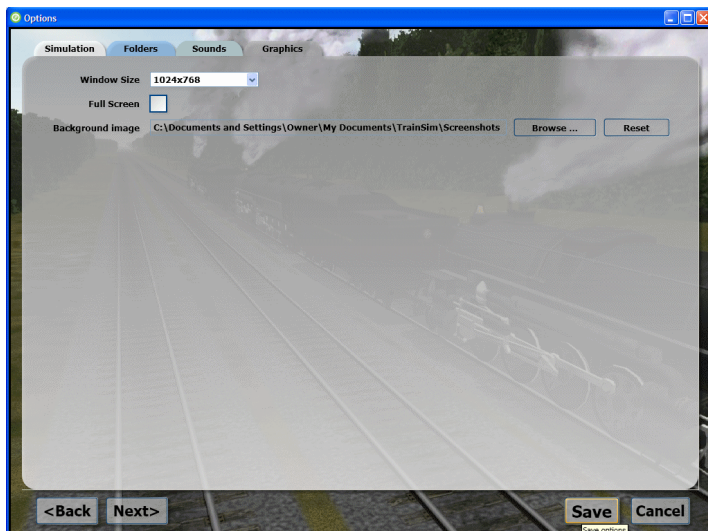
Upon first loading of the train sim style menu, all fields will be blank. In the **Select Folder** pane, navigate to the location of your MSTs location or choose **Default**. The menu will read the train information from your MSTs folders to populate the menu selections.



Once the train database has been loaded, active routes, consists, activities will be shown.

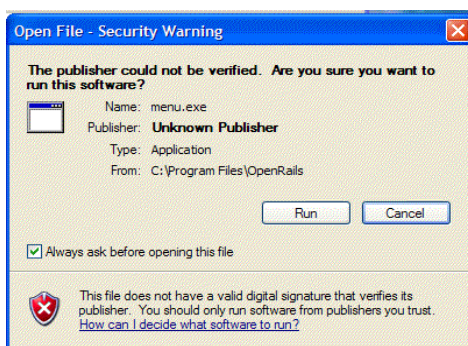


The train sim style menu can be customized by selecting **Options** in the navigation bar and choosing **Graphics** from the menu options. A custom background graphic can be used. You must select **Save** for the graphic change to take effect.



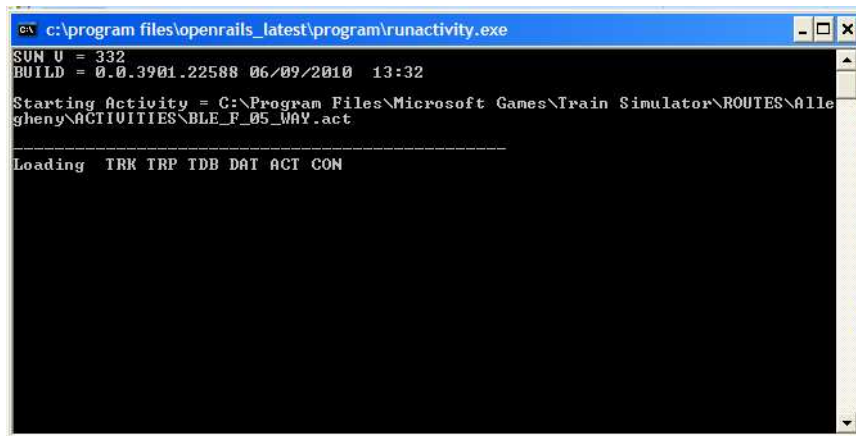
i **Open Rails software is fully compatible with Train Store. Only “unstored” Routes, Consists, Activities, and Trainsets will be displayed in the Open Rails Main Menu Window.**

You may receive a Windows security warning when you start the Open Rails program, such as illustrated below. Select the **Run** button to start the Open Rails program. Clear the checkbox **Always ask before opening this file** to avoid this pop up security warning appearing each time the Open Rails game is started.



Game Loading – runactivity.exe

Clicking on the **START** button initializes the *runactivity.exe* and opens a dialog box. The path of the Activity selected in the Main Menu is displayed. The *runactivity.exe* program starts to load the key data sets needed to build the simulation environment.



The *runactivity.exe* module verifies that the specified folder contains a .trk file for either MSTS or ORTS. It creates either Tr_RouteFile (MSTS) or ORTRKData (ORTS), which parses the respective file. The software then verifies the tdb file in the selected routes folder. The TSectionDat process verifies the track sections and shapes. Similar actions are done against the Activity and Consist files. The process can be monitored in the Loading line (TRK TDB DAT ACT CON) of the *runactivity.exe* window.

Open Rails software proceeds to:

- Initialize the start time of the activity.
- Aligns all switches to their default positions, as specified by the activity. The internal Track Data Base (TDB) data structure is traversed in order to do this.
- Places the player train.
- Places static consists.
- Signals will be initialized (when implemented)
- Creates a queue of AI trains.

After this process is complete, the Open Rails software launches its Viewer. The Viewer proceeds to:

- Set up user game settings
- Creates and initializes the sound engine (IrrKlang 3D Sound Engine version 1.1.3)
- Initializes the environment according to the activity (time and weather)
- Reads TTYPE.DAT and builds an internal data structure.

- Instantiates a Tile class object whose constructor initializes an 8x8 (x, z) buffer of tile objects.

During the loading of the Viewer, the user may see error messages like those shown below.

```
ERROR: While loading c:\program files\microsoft games\train simulator\routes\all
egheny\textures\ Could not find a part of the path 'c:\program files\microsoft g
ames\train simulator\routes\alleggheny\textures\'.
```

In the *runactivity.exe* window, the loading of the game elements can be monitored. Different initials indicated the type of game file being loaded by the Open Rails software. Error messages will be generated for each file that presents a problem. All output from *runactivity.exe* is available in the Open RailsLog.txt file.

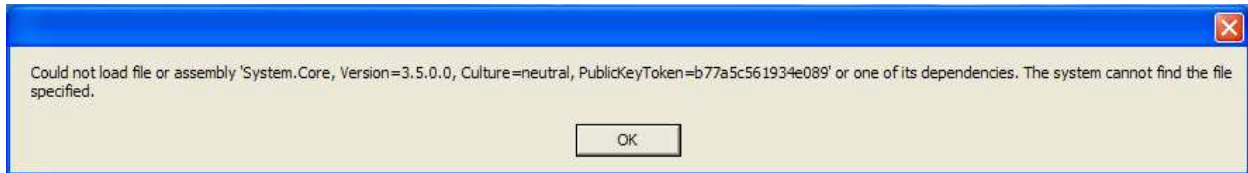
```
ERROR: STF Error in C:\Program Files\Microsoft Games\Train Simulator\trains\tra
iset\B&O_EL\sound\ELcab.sms
Line 57: Unexpected FrequencyCurve
TTTTTTTTWWSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSS
SSSSSSSSSS
ERROR: Error loading shape: C:\Program Files\Microsoft Games\Train Simulator\ROU
TES\Allegheny\shapes\gn_bigsandyhigh.s
Object reference not set to an instance of an object.
SSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSS
SSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSS
ERROR: Error loading shape: C:\Program Files\Microsoft Games\Train Simulator\ROU
TES\Allegheny\shapes\bud_store1.s
Object reference not set to an instance of an object.
SSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSS
ERROR: While loading c:\program files\microsoft games\train simulator\routes\all
egheny\textures\ Could not find a part of the path 'c:\program files\microsoft g
ames\train simulator\routes\alleggheny\textures\'.
```

Initials Table: T = route tile; W = world file; S = shape file; C = Wagon or Engine file' \$ = World Sound file

Finally, the software creates two or three subsidiary threads, one for rendering, one for loading, and (if the PC has multiple processors) one for updating.

Open Rails Loading Error Messages

The Open Rails software offers extensive error “trapping” and messages to assist the user to identify problems with Trains, Consists, Shapes and Texture file loading. If the following message is displayed, the Open Rails software encountered an error that prevented the game from loading correctly.



Other types of messages related to Open Rails software loading serve as warnings about errors, which users can safely ignore.

In addition, this release includes enhanced Warnings and Error messaging to allow the Open Rails team the ability to better diagnose and potentially fix problems. Common Warnings are as follows:

Water Layer Warning: MSTS environment files have a water layer count of 3 and then four water layers. The code is ignoring the last one in each case. The Open Rails development team speculates that it is possible MSTS counted this list from 0 (unlikely) or the extra was an unfinished feature (likely); the "error" is reported as informational only; it's not actually an error.

runactivity.exe : Warning : 0 : Ignoring extra world_water_layer in C:\Program Files\Microsoft Games\Train Simulator\ROUTES\Allegheny\ENVFILES\Sun.env:line 303

at ORTS.ORTSListener.TraceEvent(TraceEventCache eventCache, String source, TraceEventType eventType, Int32 id, String format, Object[] args)

at System.Diagnostics.TraceInternal.TraceEvent(TraceEventType eventType, Int32 id, String format, Object[] args)

at System.Diagnostics.Trace.TraceWarning(String format, Object[] args)

at MSTS.EnvFile..ctor(String filePath)

at ORTS.Viewer3D.ReadEnvFile()

at ORTS.Viewer3D.Initialize()

at ORTS.Program.Start(IEnumerable`1 settings, String[] args)

at ORTS.Program.Main(String[] args)

Sound Warnings: .Unexpected stream .sms sound Errors identifies the syntax error that MSTS silently ignores. Open Rails will identify the line where the error occurred to assist in correcting the .sms file. It's actually informational; Open Rails will play the sound file normally.

runactivity.exe : Error : 0 : Unexpected Stream in C:\Program Files\Microsoft Games\Train Simulator\trains\trainset\Bessemer719\sound\F7eng.sms:line 347

at ORTS.ORTSListener.TraceEvent(TraceEventCache eventCache, String source, TraceEventType eventType, Int32 id, String format, Object[] args)

at System.Diagnostics.TraceInternal.TraceEvent(TraceEventType eventType, Int32 id, String format, Object[] args)

at System.Diagnostics.Trace.TraceError(String format, Object[] args)

at MSTS.STFException.ReportError(STFReader reader, String message)


```
at MSTS.STFReader.SkipUnknownBlock(String token)
at MSTS.ScalabilityGroup..ctor(STFReader f)
```

Stream mismatch .sms Error identifies the syntax error that MSTS silently ignores. Open Rails will identify the line where the error occurred to assist in correcting the .sms file. It's actually informational; Open Rails will play the sound file normally.

```
runactivity.exe : Error : 0 : Stream count mismatch in C:\Program Files\Microsoft Games\Train
Simulator\trains\trainset\Bessemer719\sound\F7eng.sms:line 346
```

```
at ORTS.ORTTraceListener.TraceEvent(TraceEventCache eventCache, String source, TraceEventType eventType,
Int32 id, String format, Object[] args)
at System.Diagnostics.TraceInternal.TraceEvent(TraceEventType eventType, Int32 id, String format, Object[] args)
at System.Diagnostics.Trace.TraceError(String format, Object[] args)
at MSTS.STFException.ReportError(STFReader reader, String message)
at MSTS.SMSStreams..ctor(STFReader f)
at MSTS.ScalabilityGroup..ctor(STFReader f)
at MSTS.Tr_SMS..ctor(STFReader f)
```



Open Rails software may not properly load a Route, Consist, or Trainset that MSTS toolsets show as having 'no errors'. The Open Rails development team is aware of the issue and is working to identify those errors to fix them.

As a first step in diagnosing the root cause of the problem, the Open Rails team suggests using the standard MSTS tools, such as RouteRiter among many others to ensure proper installation of routes, trainsets, sounds and other game elements.

Main Viewer Window

Once the main viewer screen appears, the game is ready to play.





The user must either minimize the *runactivity.exe* window or click on the main viewer window for the game controls to be activated. Do NOT close the *runactivity.exe* window, or the game will exit.

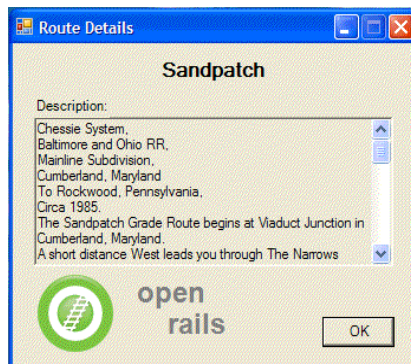
The main viewer window is set to a default size of 1024 x768. If the default aspect ratio of your display is smaller, the Open Rails viewer window will automatically be reduced in size to fit your display. You may change the default size of the main Viewer window in the *Options* Tab of the Main Menu.

To maximize the viewer windows to full screen, click on **Alt + Enter** keys. To exit the Open Rails viewer window, click **Escape** key or click on the close button of the window. The software returns to the Main Menu window on closing the viewer window.

Windows Main Menu Options

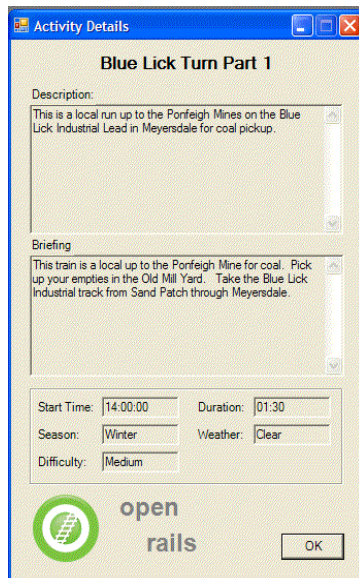
Routes Details

The **Routes Details** button opens a separate window displaying the Route's text description contained within the route .trk file of the route highlighted in the Main Menu window. Click **OK** to return to the Main Menu window.



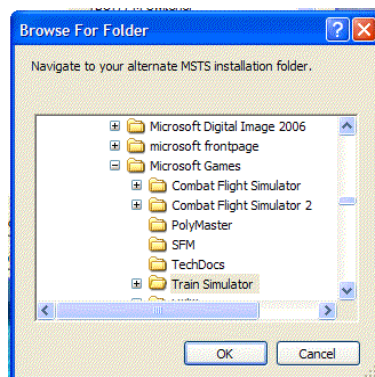
Activities Details

The **Activities Details** button opens a separate window displaying the text within the Activity Description and Activity Briefing of the activity highlighted in the Main Menu window. The Activity Details window also displays the Start Time, Duration, Season, Weather and Difficulty of the selected activity. Click **OK** to return to the Main Menu window.



Add Folder

The **Add Folder** button opens a separate window, allowing you to select the drive, directory and folder where your MSTs installation is located. The Open Rails software reads the Window registry to determine where the MSTs directory is located. However, if you have a non-standard installation, mini routes, or an installation location in addition to the main MSTs location, use the **Add Folder** button to navigate to the location of your MSTs directory. The highlighted folder must be the one named “Train Simulator” and must have the complete train sim folder set within it. Click **OK** to return to the Main Menu window.



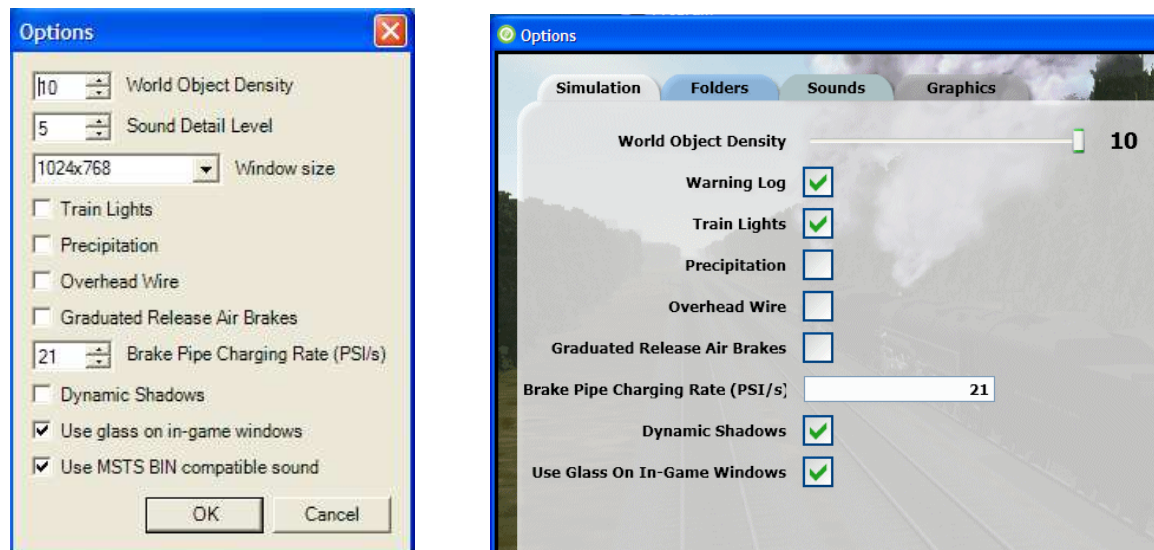
Remove

The **Remove** button clears the Open Rails Menu of all information about the location of the MSTs files, available routes and activities. Use the **Add Folder** button to populate the Open Rails Menu screen.

Options – Windows Style & Train Sim Style

The Option button opens another window that allows the User to customize setting within the Open Rails game. By default, all options are disabled in the game with the exceptions of **Use glass on in-game windows** and **Use MSTs BIN compatible sound**. Once the Open Rails

game is shut down, the Option window will default to the profile of options selected at shutdown. Thus, the options window remembers the Users preferred setup of options



Higher numerical settings increase the density of scenery and sound object within the game environment. Higher settings will increase the amount of system resources required to run the game.

Also included is a Window Size list box that enables you to display the game in many common window sizes. If you specify a window size that is not supported by your hardware, the largest size your hardware *does* support is used.

Train Lights is disabled by default. To enable lights on the lead engine of the train select the box. Each time you start the game you will have to select the box to activate the engine lights feature.

Precipitation is disabled by default. Open Rails software will display the environment (sunny, rain, snow) that is determined in the ACTIVITY file only if the Precipitation option is enabled. Otherwise, the game displays a cloudy day with no precipitation. To disable Open Rails software environment, uncheck the box.

Overhead wire is disabled by default as this feature has not been implemented. Once this feature has been implemented, selecting the box will enable the display of Gantry wire.

Graduated Release Air Brakes is disabled by default. This setting applies to the player train ONLY at the present time. If this is disabled, train brakes physics and setting will mimic North American freight train braking. If selected, braking will copy passenger braking systems.

Dynamic Shadows is disabled by default. Selecting will enable dynamic shadow for all weather and time conditions.

Use glass on in-game windows is enabled by default. This provides a semi-transparent effect on all Monitor popup windows – F4, F8, F9, and F10. Deselecting this option makes the Monitor windows opaque.

Use MSTS BIN compatible sound is enabled by default. This option allows Open Rails to correctly use the full complement of sound triggers allowed by BIN upgrade .sms files.

Join

The **Join** button is not functional at the present time; this placeholder button will allow User to join a multi-player game. Click **OK** to return to the Main Menu window.

Full Screen

Selecting the **Full Screen** button displays the Open Rails game at the native resolution of your monitor. Otherwise, the Open Rails software defaults to the selected window size.

Resume

The **Resume** button restarts the running activity from the point of the last save.

Game Controls

The table contains the keyboard controls for the Open Rails game. All other MSTS keyboard controls are not implemented at the present time.

Mouse Controls

To change worldview via the mouse, hold right-click and move mouse to rotate camera.



To change the value of the Train Controls the keyboard command must be pushed and released. Train Throttle and Brake keyboard commands can be increased and decreased by holding down the key.

Keyboard Controls

Train Controls	Keyboard
Game Quit	Escape
Game Fullscreen	Alt + Enter
Game Pause	Pause
Game Save	F2
Game Speed Up	Control + Alt + Num 9
Game Speed Down	Control + Alt + Num 3
Game Speed Reset	Control + Alt + Num 7
Game Overcast Increase	Control + =
Game Overcast Decrease	Control + -
Game Clock Forwards	=
Game Clock Backwards	-
Game ODS	F5
Game Logger	F12
Game Debug Keys	Alt + F1
Game Debug Lock Shadows	Alt + S
Game Debug Log Render Frame	Alt + F12
Game Debug Signaling	Alt + F11

Game Debug Weather Change	Alt + P
Window Tab	Shift
Window Help	F1 (+ Shift)
Window Track Monitor	F4
Window Switch	F8
Window Train Operations	F9
Window Next Station	F10
Window Compass	0
Camera Cab	1
Camera Outside Front	2
Camera Outside Rear	3
Camera Trackside	4
Camera Passenger	5
Camera Brakeman	6
Camera Free	8
Camera Head Out Forward	Num 7
Camera Head Out Backward	Num 1
Camera Toggle Show Cab	Shift + 1
Camera Move Fast	Shift
Camera Move Slow	Control
Camera Pan Left	Num 4 (+ Shift) (+ Control)
Camera Pan Right	Num 6 (+ Shift) (+ Control)
Camera Pan Up	Num 8 (+ Shift) (+ Control)
Camera Pan Down	Num 2 (+ Shift) (+ Control)
Camera Pan In	Num 9 (+ Shift) (+ Control)
Camera Pan Out	Num 3 (+ Shift) (+ Control)
Camera Rotate Left	Alt + Num 4 (+ Shift) (+ Control)
Camera Rotate Right	Alt + Num 6 (+ Shift) (+ Control)
Camera Rotate Up	Alt + Num 8 (+ Shift) (+ Control)
Camera Rotate Down	Alt + Num 2 (+ Shift) (+ Control)
Camera Car Next	Alt + Num 9
Camera Car Previous	Alt + Num 3
Camera Car First	Alt + Num 7
Camera Car Last	Alt + Num 1
Switch Ahead	G
Switch Behind	Shift + G
Switch With Mouse	Alt
Uncouple With Mouse	U
Locomotive Switch	Control + E
Locomotive Flip	Shift + Control + F
Reset Signal	Tab
Control Forwards	W
Control Backwards	S
Control Reverser Forward	W
Control Reverser Backwards	S
Control Throttle Increase	D
Control Throttle Decrease	A
Control Train Brake Increase	,
Control Train Brake Decrease	;
Control Engine Brake Increase]
Control Engine Brake Decrease	[

Control Dynamic Brake Increase	,
Control Dynamic Brake Decrease	.
Control Bail Off	/
Control Initialize Brakes	Shift + /
Control Handbrake Full	Shift + '
Control Handbrake None	Shift + ;
Control Retainers On	Shift +]
Control Retainers Off	Shift + [
Control Brake Hose Connect	\
Control Brake Hose Disconnect	Shift + \
Control Emergency	Back
Control Sander	X
Control Wiper	V
Control Horn	Space
Control Bell	B
Control Light	L
Control Pantograph	P
Control Headlight Increase	H
Control Headlight Decrease	Shift + H
Control Dispatcher Extend	Shift + Tab
Control Dispatcher Release	Shift + Control + Tab
Control Injector 1Increase	K
Control Injector 1Decrease	Shift + K
Control Injector 1	I
Control Injector 2Increase	L
Control Injector 2Decrease	Shift + L
Control Injector 2	O
Control Blower Increase	N
Control Blower Decrease	Shift + N
Control Damper Increase	M
Control Damper Decrease	Shift + M
Control Firing Rate Increase	R
Control Firing Rate Decrease	Shift + R
Control Fire Shovel Full	Control + R
Control Cylinder Cocks	C
Control Firing	Control + F

Known Issues

At the present time, the Open Rails software is in the process of being developed. Therefore, users may find things that do not work or function like MSTs. If a specific capability or function is not working doesn't mean the Open Rails software is incapable of having it in the future. The development team's object is serve the serious train simulation hobbyist; someone who cares about loco physics, train handling, signals, AI behavior, dispatching, and most of all running trains in a realistic, prototypical manner. Please consult the [Open Rails website](#) for more information.

General Display

At the present time, there are known alpha sorting and z-bias issues that may cause lights and other “see thru” effects do not properly display such as terrain cutouts for tunnels. The display of the sky dome may not extend all the way to the ground. Users may experience “moiré” patterns on the track bed. Increasing AntiAliasing may or may not reduce the “moiré”.

Cameras

Open Rails Cameras do not behave exactly like MSTs. Please consult the Camera Controls for more information.

Track Display

There may be some display issues with some specialized Track types, such as Narrow Gauge XTracks. These may exhibit discontinuities that don't affect train operations except to make them “more exciting”.

Cab view

While Open Rails has implemented 2D Cab view, dynamic sprite engine controls have not been implemented. In addition, the outside ‘up’ key and ‘down’ camera views are positioned identically along the vertical and 'length' axes are same as the interior cab view, the outside position is just moved along the 'width' axis. The result is the outside view is not necessarily where the cab is located on the engine.

Trainset Physics

Full compatibility with MSTs physics and train handling capabilities are not implemented in this version. Basic physics have been implemented including steam generation, Davis curves for resistance, grade and other physical properties. Full Diesel, Electric and Steam engine physics have yet to be implemented.

Consists

Some static consists or player consists may be flipped compared to MSTs.

Routes

In general, interactive objects are not supported in this version. Very, very basic signaling has been introduced. Static objects for most interactive are substituted.

Routes objects may be misplaced relative to the terrain, such as bridges or buried signals.

There are display issues with far-field terrain where it can vary in apparent size as the camera view approaches.

Environment

Open Rails program does not support any MSTs environment files or environmental modification such as Kosmos – all environment effects have been independently implemented in the Open Rails program. At the present time, Open Rails environment files cannot be modified by the community.

Distant Mountains have not been implemented for this release.

Activities

Work Orders are not implemented at the present time. Saving and resuming Activities is not fully supported for AI trains.

AI trains

AI trains may not behave properly; they may not stop at the same point as MSTs.

Open Rails AI Dispatcher functions are only beginning to be implemented; train priorities, Full multi-player gaming,

Acknowledgements

The Open Rails team would like to acknowledge the following for their work, without which Open Rails would not be possible.

- John Sandford, Jim Jendro, Wes Card. For deciphering the MSTs tile files and providing computer algorithms that go a long way toward helping us do the same.
- Riemer Grootjans. For his informative web tutorials and detailed code, and for his book, "XNA 3.0 Game Programming Recipes."
- Jan Vytlačil. For showing us how to make it rain and snow.
- Paul Bourke. For the high-resolution star maps of the northern and southern hemispheres.

And Wayne Campbell. For inspiring this improbable journey.

License Agreement

Open Rails transport simulator

(*“Open Rails”*)

End User License Agreement

IMPORTANT-READ CAREFULLY: THIS END-USER LICENSE AGREEMENT (“EULA”) IS A LEGAL AGREEMENT BETWEEN YOU (EITHER AN INDIVIDUAL OR A SINGLE ENTITY HEREBY REFERRED TO AS “YOU”) AND OPEN RAILS.ORG FOR THE ABOVE REFERENCED SOFTWARE PRODUCT(S), WHICH INCLUDES COMPUTER SOFTWARE AND MAY INCLUDE DOWNLOADED BINARY OR SOURCE CODE FILES, AND “ONLINE” OR ELECTRONIC DOCUMENTATION. THE SOFTWARE PRODUCT INCLUDES ANY UPDATES, SUPPLEMENTS, PATCHES, OR MAINTENANCE PACKS PROVIDED BY OPEN RAILS.ORG. BY INSTALLING, COPYING OR OTHERWISE USING THE SOFTWARE, YOU AGREE TO BE BOUND BY THE TERMS OF THIS EULA. IF YOU DO NOT AGREE TO THE TERMS OF THIS EULA, DO NOT INSTALL OR USE THE SOFTWARE. YOU SHALL INFORM ALL USERS OF THE SOFTWARE OF THE TERMS AND CONDITIONS OF THIS EULA.

This EULA, grants You, the user, a non-exclusive license to use the Software under the terms and conditions stated herein. You agree that all updates, enhancements, maintenance releases, patches, bug-fixes or other modifications to the Software provided to You, on a when and if available basis, shall be governed by the terms and conditions, including the limited warranty, exclusive remedies and limitations of liability provisions, contained in this EULA, or the then-current version of this EULA.

You may: (I) use the Software on any number of computers You own; (II) make modifications to the original source code of the software for your own personal use; (III) distribute the compiled version of the software; (IV) distribute software plug-ins, add-on files, and any other secondary content created for the software; (V) make copies of the Software, documentation or other user information, tools, or content accompanying the Software for back-up purposes; (VI) make a copy of or print documentation provided in electronic form for Your internal use only; and, (VII) use Open Rails trademarks solely for these purposes, but You must incorporate all patent, copyright, trademark and other notices included on the materials on any copies that You make.

You may not: (I) sell, sublicense, rent, or lease the Software to another party; (II) disseminate any modification, revision, correction, or change, in any manner, to the Software source code except and only to the extent that such activity is expressly permitted by this EULA or by written permission of Open Rails.org; (II) transfer or assign Your rights to use the Software; (IV) use the Software in violation of applicable local, federal or International laws or regulations; (V) use the Software for any purpose other than as permitted in this EULA; or, (VI) remove, destroy, erase, alter or otherwise modify Open Rails trademarks.

NO WARRANTIES. Open Rails.org disclaims any warranty, at all, for its Software. The OPEN RAILS software and any related tools, or documentation is provided “as is” without warranty of any kind, either express or implied, including suitability for use. You, as the user of this software, acknowledge the entire risk from its use.

NO LIABILITY FOR CONSEQUENTIAL DAMAGES. In no event shall Open Rails.org or its suppliers be liable for any damages whatsoever (including, without limitation, damages for loss of business profits, business interruption, loss of business information, or any other pecuniary loss) arising out of the use of or inability to use this product, even if Open Rails.org has been advised of the possibility of such damages.

COPYRIGHT. Any intellectual property or content which may be accessed through the use of Open Rails software program is the property of the respective property or content owner and may be protected or prohibited by its applicable copyright. You, as the user of the software, must determine the applicability of any third party intellectual property or content. This EULA grants you no rights to use such content. The Open Rails software program(s) itself, title and copyrights, any accompanying documentation, and copies of the software program are the property of Open Rails.org.

Trademark Acknowledgment

Open Rails, OPEN RAILS Transport Simulator, OPEN RAILS, OPEN RAILS trademark, Open Rails.org, OPEN RAILS symbol and associated graphical representations of OPEN RAILS are the property of OPEN RAILS.org. All other third party brands, products, service names, trademarks, or registered service marks are the property of and used to identify the products or services of their respective owners.

Copyright Acknowledgment

© 2010 - 2011 Open Rails.org All rights reserved.