LEGO Trains Glossary

Ballast - The gravel, rocks, sand and other material laid under railroad track, which provides stability and drainage to the track. For LEGO trains, this is usually done with layers of plates and tiles under the track pieces. Also "ballasting track" - building LEGO tracks with such pieces. LEGO train builders sometimes include railroad ties when talking about ballasting. [Figure 2]

Benchwork - Tables, usually custom-built to specific dimensions, on which a layout is displayed.

Buffer - Shock-absorbing devices mounted on the ends of railcars, usually one in each corner, which maintain spacing between coupled railway cars. These are common in European trains but rare in North American trains, which tend to use rigid couplers. Buffers are attached to a transverse structure across the end of the car called the buffer beam. (see <u>Bricklink part 29085c01</u> and its variants) [Figure 3]

Buffer Stop - A device used to keep a train from going past the end of the track. These may involve buffers similar to those found on train cars, or other shock-absorbing mechanisms to slow down a train. Also called bumpers, bumper posts, or stopblocks. [Figure 4]

Engine House - A building used to store and service locomotives. Sometimes built in a circular/semicircular shape called a **roundhouse**, with a turntable in the center to position and turn around engines. [Figure 5]

Hand of God / Big Hand From the Sky - When you have to use your hand to pick up or adjust your train, couple/decouple cars, or operate other functions like switches.

Coupler - The device that connects train cars together. For LEGO trains, this is usually done with specialized magnet pieces (e.g. <u>Bricklink part 29085c01</u>¹), but other methods are possible. [Figure 3]

Coupling / Decoupling - Connecting /disconnecting two train cars together

Derail - To go off the track. Slang includes "jumping the track."

Gauge - ("Track Gauge") The spacing between the two rails of a railroad track. Standard gauge, in real train terms, is 4 feet 8.5 inches (1435 mm). There are also various types of narrow gauge and broad gauge. For LEGO, "standard LEGO gauge," sometimes called L-gauge, is based on regular LEGO track (e.g. <u>Bricklink part 53401</u>). Other gauges can be modeled using other types of track pieces or by building the track out of tiles and other parts.

Locomotive - The vehicle/train car that provides the power to move the rest of the train. "Engine" is often interchangeable with "locomotive," however "engine" may also refer to the specific mechanical device (e.g. steam pistons, diesel combustion engine, etc.) which generates the power for the locomotive. Locomotives may be classified based on the type of engine or type of fuel used, or its role on the railroad, or various other characteristics.

¹ Only the magnet part is the coupler.

Main line - The primary tracks of a railway system. In LEGO train layouts, it is often (but not always) double track (two lines running side-by-side) and in a continuous loop around the layout. In collaborative layouts, the main line is usually expected to be shared between all participants. Additional tracks may come off of the main line, and are called "branch lines" or "spurs." See also: Siding.

MILS - <u>Modular Integrated Landscaping System</u>, a commonly used modular landscaping standard. While the standard defines features such as hills, rivers, and roads, in the most basic sense it means that "ground level" is raised 4 plates above the baseplate.

Operations - The <u>pastime</u> of running a model railroad as accurately as possible, to simulate a real railroad transporting things from place to place. This may involve "waybills," forms that specify an origin and destination for specific cars, routing instructions, returning of "empty" cars, and even simulated operating costs. This can be a group activity, and can be very detailed. While most AFOL train fans aren't quite so involved yet, it is a goal of some in the community.

Pantograph - The device used in electric trains to pick up electrical power from overhead wires.

Prototype - While this term can mean a mock-up or test build, more commonly among train builders it refers to the real-life thing that a scale model is supposed to represent (e.g. the actual train engine or car). Also "prototypical" - another word for realistic, or accurate to how the real thing the model is, and can refer to things beyond just appearance (e.g. "prototypical operation").

Radius - A measurement of the size of the circle traced by a curved track; in other words, how "tight" a turn is. This is measured from the center of the arc traced by the track to the centerline of the track. Standard LEGO curved track (e.g. <u>Bricklink part 53400</u>) has a 40 studs radius. Third-party LEGO-compatible curved track ranges from 24 to 120 studs radii, with additional sizes possible with 3D printing. Frequently denoted as "R40," "R120," etc.

Rail yard - A series of usually parallel, connected tracks used to store, sort, load/unload train cars, and to assemble them into trains.

Railroad Crossing - Where the train tracks cross a road or path on the same level (as opposed to a bridge or tunnel). Also called "level crossing" or "grade crossing."

Rolling Stock - Railway vehicles, including locomotives, passenger coaches, freight cars, etc.

Scale - The size of the model compared to the real thing. In traditional model railroading, various standard scales are sanctioned by groups such as the NMRA and MOROP² - for example HO being approximately 1:87 (3.5 mm representing 304.8 mm). Scale and Gauge are sometimes used interchangeably, as modeling a real track gauge in a standardized scale should in theory produce a standardized track gauge. However, for LEGO, scale-modeled LEGO trains that run on standard LEGO gauge track may have a range of scales, from about 1:64 to 1:38. [Figure 1]

² <u>National Model Railroad Association</u> (North American); <u>Organization of Model Railroaders and Railway Friends</u> <u>Europe</u> (European).

Siding - A section of track that comes off of the main line that is used for passing, storing unused rolling stock, or loading/unloading of cars. A siding may be connected at one or both ends to the main line.

Switch - A section of track which allows the train to be guided from one track to another (e.g. Bricklink part 53404 / 53407). Also called a [set of] points in the UK, or a turnout.

Switching - Also known as shunting (UK), switching is the process of sorting railroad cars and arranging cars into a train. Cars are often arranged in the sequence by which their destination will be reached, so that they can be dropped off from the end of the train. The specialized locomotives which move the cars around are called switchers or shunters. Switching has also been developed by model railroaders into a kind of game and basis for a small layout - the <u>railway switching puzzle</u>.

Tank Engine - A type of steam engine that does not use a tender, but rather carries fuel and water on the locomotive itself. More commonly used for trains that traveled short distances, due to the limited water supply, and therefore were less common in North America compared to Europe. [Figure 6]

Tender - A train car pulled immediately behind a steam engine which contains the fuel (coal, oil, etc.) and water needed for the engine to produce steam.

Tie - (usually plural, ties) Support pieces placed perpendicularly to the rails, to hold them at the correct spacing. Usually made from wood or concrete on real railroads; in LEGO they are pre-molded as part of the LEGO track pieces. Frequently builders will separately model them using black, brown, or gray tiles. Also called sleepers in the UK. [Figure 2]

Truck - The structure under a railway vehicle that carries the wheels, bearings, and suspension. The truck pivots to allow wheels to align better with curved tracks. Also called a bogie/bogey in the UK. [Figure 7]

Figure 1

Note that LEGO modeling scale is not a single defined number - the scale depends on goals and preferences of the builder. Picture: Michael Gale



Figure 2

"Ballasted" LEGO double track. Black tiles represent (wooden) ties, and gray plates represent ballast. This style of ballasting is unofficially called "PennLUG style." Photo: Cale Leiphart



Figure 4 Buffer stop example. Photo: Thomas Selander



Figure 6

Tank engine example. Water is stored in rectangular tanks in the center, and coal in a compartment in the rear. Photo: Alexander McCooke

Figure 3

Train Buffer, No.2 (Element ID 6172149), Bricklink Train Buffer Beam with Sealed Magnets (29085c10). Coupler (A), buffers (B), buffer beam (C).







Figure 7

Examples of trucks - From set 71044 (left), and a MOC freight car (right). Note: Real rail car trucks do not have attached buffer beams and couplers.





Steam engines: Basic parts



Photo: Aaron Burnett

Firebox - Fuel (coal, oil, etc.) is burned here to generate heat. Air is drawn into the firebox to feed the fire, and is heated and passed into tubes that run through the boiler.

Boiler - Tubes containing hot air from the firebox run through a water reservoir, which boils water into steam.

Cylinder - Steam from the boiler is routed into cylinders, where the steam pressure is applied to a piston which turns the driver wheels. Steam locomotives may have 2, 3, or 4 cylinders, mounted inside and/or outside the locomotive frame.

Smokebox - Smoke and hot air from the firebox are exhausted through the chimney. Additionally, steam exhausted from the pistons is also forced out of the chimney, which creates the characteristic "chuff" sound, creating a draft and drawing fresh air into the firebox.

Sanding Dome - Sand is stored here, and dropped or blown (by steam) in front of the drivers to increase traction.

Cab - Where the controls are located, and where the engine operators sit. Most steam engines are operated by an *engineer* (sitting on the right on American trains) who controls the throttle and "drives" the train, and a *fireman*³ (on the left) who is in charge of maintaining the fire and operating the boiler.

Lead(ing) Truck - Used to support the front of the locomotive and to guide it into curves. A lead truck with only 1 axle is sometimes called a "pony truck."

Drivers - These wheels turn to provide all of the pulling force to move the train. Generally more drivers are used to support a heavier engine, which provides a greater friction to the track, which allows the engine to apply more pulling power. Larger diameter drivers allowed faster top speed. Drivers have counterweights to cancel out the vibrations caused by the connecting rods and the asymmetrical force of the piston on the wheels.

Trailing Truck - Used to support the firebox and cab at the rear of the locomotive. Some later American locomotives also had booster engines fitted to the trailing trucks to provide additional power when starting from a stop.

Drawbar - The linkage coupling the tender to the locomotive.

Side Rod / Coupling Rod (yellow) - Connects the driver wheels together

Connecting Rod / Main Rod (blue) - Connects the piston to the drivers

Valve Gear - Mechanical linkages which control the timing of steam inlet and exhaust into the piston.

³ Gender-specificity should be taken in its historical context. In some languages and situations (e.g. naval steam engines), the term "stoker" was also used.

Steam Engines: Wheel Arrangements:

Steam engines can be classified based on the number and arrangement of their wheels. There are several ways to denote this, the most common (in the American LEGO train community) is called Whyte notation, written as a series of numbers denoting the number of unpowered wheels in front, the number of main driver (powered) wheels, followed by the number of wheels in the rear of the locomotive. Railroads often gave nicknames to various wheel arrangements as well.

Examples:

2-6-2 "Prairie"



4-6-2 "Pacific"

4-4-0 "American"





4-8-4 "Northern"

Photo: Tony Sava



4-6-6-4 "Challenger"

Photo: Cale Leiphart



LEGO Train Power Systems

Powered Up

Powered Up (PUp) is the current "official" power system for LEGO trains. Components can be purchased separately, or as part of the current (2020-2021) assortment of train sets. PUp is based on Bluetooth communication.

The basic system involves the PUp Controller, the PUp Hub, and a PUp Train Motor. The system requires 4 AAA batteries for the controller, and 6 AAA batteries in the Hub to feed the electronics and motor. There is no official rechargeable battery option, though we'd recommend using high-quality rechargeable AAA batteries such as Eneloop brand.

Instead of the Controller, the Hub may be paired with a phone/tablet using the PUp app. You can use the preset app controller profiles, or create your own controller profile or autonomous program. In this mode, you can use other PUp motors, lights, and sensors.

PUp is good for use at home and use at smaller public venues. It is also good for kid-interaction, due to the reliable response and not needing line-of-sight. In larger venues (e.g. Brickworld Chicago), the Bluetooth connection may be unreliable or unusable. Also, while not impossible to work around, it is more difficult to power more than one motor from a PUp Hub, so PUp may be better suited for smaller trains. The system, while approaching 2 years old, is still undergoing development, with additional future functions and products promised.

Power Functions

Power Functions (PF) was the previous generation of power system for LEGO trains. These components are officially out of production, so are becoming harder to find/more expensive.

The basic PF system consists of the IR-based PF Controller, a PF Battery Box, the PF IR Recevier, and the PF Train Motor. It is possible to use the PF Medium, Large, and XL motors as well. There are two options for battery boxes - the AAA Battery Box, where you supply your own (6) AAA batteries, or the lithium-polymer Rechargeable Battery Box. Due to being a discontinued product, it generally will not be cost effective to use the Rechargeable Battery Box if you do not already have one.

The PF system is simple and works similarly to a TV remote. The PF system has an advantage over the PUps system in that receiver outputs may be stacked - you can power two (or more) motors from the same output port. This can allow for a more powerful engine, with some caveats.

Among North American LEGO train builders, PF is the most common system. Also, there are aftermarket control and battery systems that are designed to work with PF.

9V

9V was the generation of train power system prior to LEGO's conversion to plastic track. The system worked by delivering electrical power from a wall-plug transformer via metal tracks and metal wheels to the train motors. This is how most traditional model railroads work.

However, 9V is essentially a collector's item, expensive and increasingly difficult to find. Many LEGO train fans are still dedicated to this system, especially in Europe and Asia. Recently there has been renewed interest in aftermarket replacements, via 3D printing and more recently the Fx Track System, and interest not only in reviving the old 9V system but adding other functions such as programmable control signals via the metal rails.

There are yet other LEGO train systems, such as the short-lived RC system, and older 4.5V and 12V systems.

Powered Up - basic setup



It is possible to plug a second motor into the second port on the Hub. However, each motor can only be controlled separately.

Power Functions - basic setup



The Rechargeable Battery Box is shown here, but the AAA Battery Box would work exactly the same. The throttle (orange dial) on the battery box is not functional when using the IR receiver.

Power Functions - 2-motor setup



In this kind of setup, the motors would typically be mounted with the wires pointing toward the center of the vehicle. Therefore, a PF Switch is needed to reverse the direction of one of the motors. Both motors are controlled from the same dial.

Two motors will allow a locomotive to have greater traction and pulling power. They will also drain the batteries faster.

Links

http://texasbrickrr.com/

Texas Brick Railroad website - our LUG's main page. We post our upcoming events, review past events, and post a blog on some of our members' builds and LUG activities here.

https://groups.google.com/g/tbrr

Texas Brick Railroad Google Group. This is our main forum, where discussions about LUG activities, LEGO talk, and just general chat takes place. Everyone is welcome to join (you'll need to submit a join request, just so we can keep the bots out).

http://l-gauge.org/wiki/index.php?title=Reference Instructions

This website is maintained by Michael Gale, of ParLUGment and FxBricks. There is a wealth of technical information about track options, as well as various proposed standards for tracks and roads. We often refer to this site as a reference for ballasting track.

https://brickmodelrailroader.com/

Brick Model Railroader is a fan media/blog for the LEGO train community, as well as seller of scale-model train instructions, decals, and aftermarket train parts. You can also download past issues of **Railbricks**, a now-defunct LEGO train fan magazine.

https://bonahoombuilds.com/srw/

Sava Railways Locomotive Works is where Tony Sava, of TBRR, sells instructions for his engines and train cars.

https://bricktraindepot.com/

Brick Train Depot is a seller of train instructions produced by various people in the community. They also offer a way to order 3D printed train wheels.

http://www.bigbenbricks.com/

Big Ben Bricks is a long-established aftermarket producer of injection-molded train wheels.

https://www.bricktracks.com/

Brick Tracks is an aftermarket producer of injection-molded plastic tracks. They offer wide radius curves and switches.

https://trixbrix.eu/

Trix Brix is a European aftermarket producer of 3D printed track products. They also produce an automation system to control switches.

https://sbrick.com/

Sbrick is an aftermarket control system based on Bluetooth, which can be used with the Power Functions system for train control.

https://buwizz.com/

Buwizz is an aftermarket control and battery system, also based on Bluetooth. They produce combination battery-controller products that are compatible with both Power Functions and Powered Up.

https://fxbricks.com/

FxBricks is an aftermarket producer of various train accessories. FxBrick is a Bluetooth and Power Functions-IR compatible control system with programmable functions and sound and light output. More recently, they have launched the FxTrack system of injection-molded, 9V-style metal rail track.