Redstone components

Redstone components are the blocks used to build redstone circuits. Redstone components include power source components (such as redstone torches, buttons, and pressure plates), transmission components (such as redstone dust and redstone repeaters), and mechanism components (such as pistons, doors, and redstone lamps).

There is a category for this topic!
See Category:Redstone for a list of pages relating to this topic.

This article assumes familiarity with the basics of redstone structures. This article also limits its discussion of each component to its role in redstone structures; for full details about a component, see the main article for the block.

Contents

Power components

Power components create redstone signals, either permanently or in response to player, mob, and environmental activity.

Block of redstone

Main article: Block of Redstone

A block of redstone provides a constant redstone signal. It can be moved by pistons.

Activation

A block of redstone is always active.

Block of Redstone's range of activation
It does not **power** any adjacent conductive block

Effect

A block of redstone behaves like a permanently powered block and:

- activates adjacent redstone mechanism components
- powers adjacent redstone dust, and redstone repeaters and redstone comparators facing away from the block with a redstone signal of strength 15
- when placed adjacent to a redstone comparator, the comparator behaves as if a redstone dust with a power of 15 was placed next to it, this is different from having a powered block next to the comparator

A block of redstone does not power any adjacent blocks.

Button

Main article: Button

A button is used to generate a redstone pulse. A button may be of three types: wooden, stone, or polished blackstone.

Button's range of activation
It **powers** the conductive block it is attached to

Placement

A button can be attached to any part of most opaque blocks. If the attachment block is removed, the button drops into the item form.

Activation

A button activates immediately when the player presses the Use control. A stone button stays activated for 20 game ticks (1 second), while a wooden button stays activated for 30 game ticks (1.5 seconds). A wooden button can also be activated by an arrow or trident that has been shot at it. In such a case, the button remains activated until the arrow or trident despawns (after one minute) or is taken.

Effect

While activated, a button:

- powers the block it is attached to
- activates adjacent redstone mechanism components
- powers adjacent redstone dust, and adjacent redstone repeaters and comparators facing away from the button with a redstone signal of strength 15

Calibrated sculk sensor

Main article: Calibrated Sculk Sensor

A calibrated sculk sensor functions similar to a sculk sensor (emitting a redstone signal when it detects a vibration), but with twice the range and half the cooldown of a sculk sensor. It can be filtered using a redstone signal strength level to make it only detect a specific vibration

frequency.

Calibrated Sculk Sensor's range of activation
It **powers** the conductive block beneath it

Activation

A calibrated sculk sensor is activated immediately upon receiving a vibration. The sensor stays activated for 10 game ticks (0.5 seconds), then has a cool down of 10 more ticks before it can detect another vibration.

Effect

While activated, a calibrated sculk sensor:

- powers the block beneath it
- activates adjacent redstone mechanism components
- powers adjacent redstone dust and adjacent redstone repeaters facing away from the sensor with a redstone signal whose strength that depends on the distance of the source of the vibration
- powers redstone comparators facing away from the sensor with a redstone signal whose strength depends on the type of vibration

Daylight detector

Main article: Daylight Detector

Daylight Detector's range of activation
It does not **power** any adjacent conductive block

A daylight detector that emits a redstone signal based on time of day, weather, and internal skylight levels.

Activation

A daylight detector is activated when exposed to the sky during the day. The detector can be inverted, making it activate in low light levels.

A daylight detector updates its output 20 game ticks (1 second) after a change in light level, or after being placed.

Effect

While activated, a daylight detector:

- activates adjacent redstone mechanism components
- powers adjacent redstone dust, redstone repeaters and redstone comparators facing away from the detector with a redstone signal whose strength depends on the current time of day, weather, and internal skylight

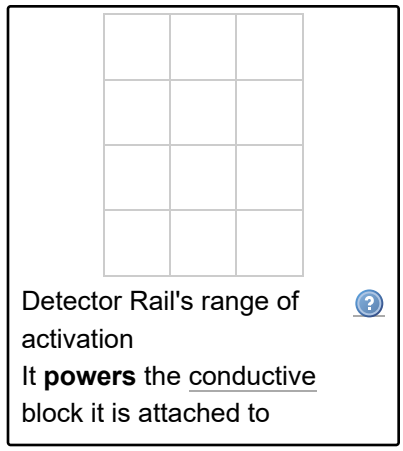
A daylight detector does not power any adjacent conductive blocks.

Detector rail

Main article: Detector Rail

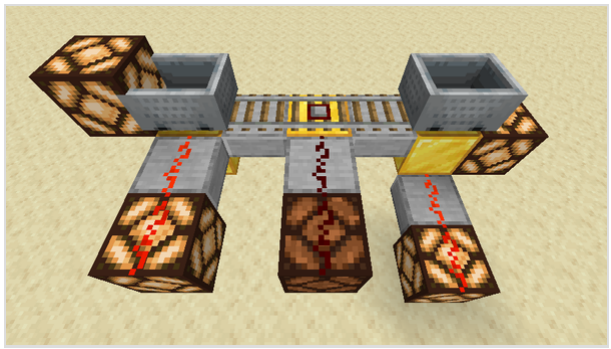
A detector rail is used to detect the passage of a minecart.

Placement


Detector Rail's range of activation
It **powers** the conductive block it is attached to

A detector rail can be attached to the **top** of any opaque block, or to the **top** of an upside-down slab or upside-down stairs. If the attachment block is removed, the detector rail drops as an item.

When placed, a detector rail lines up with adjacent rails, powered rails, and other detector rails, as well as adjacent rails one block above it. If there are two adjacent rails not on opposite sides, or three or more adjacent rails, the detector rail lines up in the east-west direction. If there are no adjacent rails, the detector rail lines up in the north-south direction. If there is an adjacent rail one block above, the detector rail slants to match it (when there is more than one adjacent rail to slant toward, the order of preference is: west, east, south, and north). Other configurations can be created by placing and removing various rail.


Detector rail as power component

Activation

A detector rail activates when a minecart moves over top of it, and deactivates when the minecart leaves.

A detector rail's activation/deactivation behavior is somewhat complex. A detector rail activates 1 game tick after a minecart's hitbox first enter the block occupied by the detector rail. A detector rail is always active for a multiple of 10 game ticks. The detector rail waits 10 game ticks after the minecart leaves its block, then deactivates at the nearest multiple of 10 game ticks. For example, if a minecart is over a detector rail for 25 game ticks, the detector rail waits another 15 game ticks before deactivating. This means the detector rail is always active for at least 20 game ticks.

Effect

While activated,a detector rail:

- powers the block it is attached to
- activates adjacent redstone mechanism components
- powers adjacent redstone dust, and redstone repeaters facing away from it with a redstone signal of strength 15
    - powers redstone comparators facing away from the rail when activated by a minecart with chest or a minecart with hopper with a redstone signal whose strength depends on the fullness of the minecart

Jukebox

Main article: Jukebox

A jukebox with a music disc playing emits a redstone signal.

Activation

A jukebox activates instantly when a music disc is inserted, and deactivates immediately when the music track ends or the music disc is removed.

Jukebox range of activation
It does not **power** any adjacent conductive block

Effect

While activated, a jukebox:

- activates adjacent redstone mechanism components
- powers adjacent redstone dust and redstone repeaters facing away from the jukebox with a redstone signal of strength 15
- powers redstone comparators facing away from the jukebox with a signal strength that depends on the inserted music disc. Comparators are powered as long as the disc is stored in the jukebox, even if it has stopped playing.

A jukebox does not power any blocks.

Lectern

Main article: Lectern

A lectern is a block that can hold a book and quill or a written book and can produce a redstone pulse or a constant redstone signal.

Lectern's range of activation
It **powers** the conductive block beneath it

Placement

Lecterns can face north, south, east or west, facing toward the player when placed.

Activation

When the page of the book it is holding is turned, the lectern emits a redstone signal for 2 game ticks (0.1 seconds).

Effect

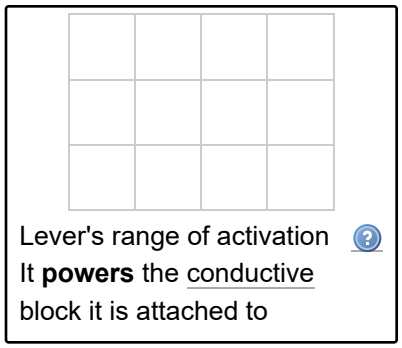
While activated, a lectern:

- powers the block beneath it
- activates adjacent redstone mechanism components
- powers adjacent redstone dust, and redstone repeaters facing away from the lectern with a redstone signal of strength 15

A lectern powers a redstone comparator facing away from the lectern, even when not activated, with a signal whose strength depends on which page the book is turned to.

Lever

Main article: Lever


Lever's range of activation
It **powers** the conductive block it is attached to

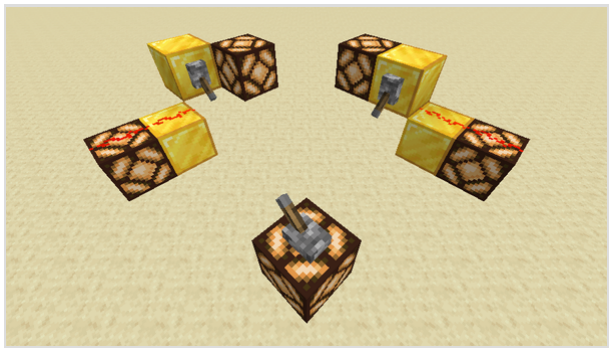
A lever is a power source that can be toggled on or off.

Placement

A lever can be attached to any part of most opaque blocks, or to the **top** of an upside-down slab or upside-down stairs. If the attachment block is removed, the lever drops as an item.

Activation

A lever activates immediately when a player right-clicks it, and stays active until the player right-clicks it again.


Lever as power component

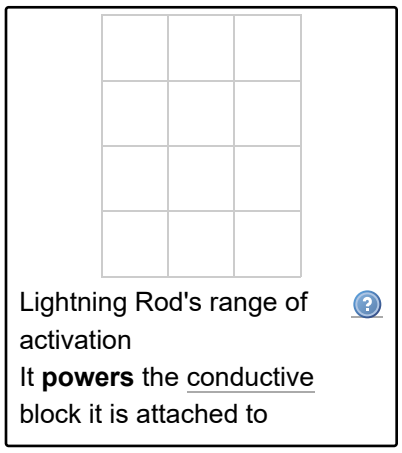
Effect

While activated, a lever:

- powers the block it is attached to
- activates adjacent redstone mechanism components
- powers adjacent redstone dust, and redstone repeaters and redstone comparators facing away from the lever with a signal of strength 15

Lightning rod

Main article: Lightning rod


Lightning Rod's range of activation
It **powers** the conductive block it is attached to

A lightning rod emits a redstone signal when struck by lightning.

Placement

A lightning rod can be placed anywhere and can face in any direction, including up or down.

Activation

A lightning rod is activated when struck by lightning during a thunderstorm, including when the player throws a trident enchanted with Channeling at the lightning rod. The lightning rod remains activated for 8 game ticks (0.4 seconds)

Effect

While activated, a lightning rod:

- powers the block it is attached to
- activates adjacent redstone mechanism components
- powers adjacent redstone dust, and redstone repeaters and redstone comparators facing away from the lightning rod with a redstone signal of strength 15

Observer

Main article: Observer

Observer's range of activation
It does not activate adjacent components
It **powers** the conductive block behind it

An observer produces a redstone signal when it detects a block change.

Placement

An observer can be placed anywhere and can face in any direction, including up or down. When placed, the observer's side that detects block changes (its face) faces away from the player and the side that produces a pulse faces the player.

Activation

An observer is activated when the block in front of its face changes state (for example, a block being placed or mined, water changing to ice, a repeater having its delay changed by a player, etc.). An observer has a delay of 2 game ticks (0.1 seconds), then emits a redstone signal for 2 ticks.

Effect

When activated, an observer produces a 1tick pulse from the side opposite its face.

An observer only provides a redstone signal from its output, which is the side of the block opposite of the block's face

While activated, an observer can:

- power a block
- activate a redstone mechanism component
- power redstone dust, a redstone repeater, or a redstone comparator facing away from the observer's output with a signal of strength 15

Pressure plate

Main article: Pressure Plate

Pressure Plate's range of activation
It **powers** the conductive block that supports it

A pressure plate emits a redstone signal when it detects players, mobs, items, or other entities. There are four types of pressure plates: wood, stone, light weighted, and heavy weighted.

Placement

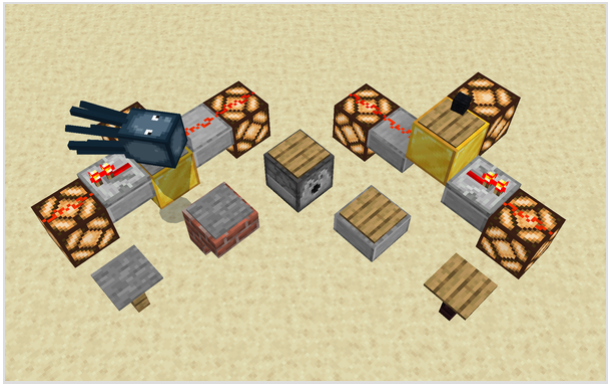
A pressure plate can be attached to the **top** of any opaque block, or to the **top** of a fence, nether brick fence, an upside-down slab or upside-down stairs. If the attachment block is removed, the pressure plate drops as an item.

Activation

Pressure plates are activated while certain entities are on top of them. Wood, light weighted, and heavy weighted pressure plates are activated by all entities, including

players, mobs, items, shot arrows, and thrown tridents. Stone pressure plates can only be activated by players and mobs.

Light weighted and heavy weighted pressure plates are always active for a multiple of 10 game ticks (0.5 seconds). For example, if an entity moves off a light weighted pressure plate after 15 game ticks, the pressure plate waits 5 ticks before turning off. Light and heavy weighted pressure plates are always active for at least 10 game ticks.



Pressure plate as power component

Wood and stone pressure plates are also always active for a multiple of 10 game ticks, but they first wait 10 game ticks after an entity moves off of them, then deactivate at the next multiple of 10 game ticks. For example, if a player moves off of a stone pressure plate after 25 game ticks, the pressure plate waits 15 more ticks before deactivating. This means wood and stone pressure plates are always active for at least 20 game ticks.

Effect

While activated, a pressure plate:

- powers the block it is attached to
- activates adjacent redstone mechanism components
- powers redstone dust, and redstone repeaters and redstone comparators facing away from the pressure plate
    - wood and stone pressure plates emit redstone signals of strength 15
    - light and heavy weighted pressure plates emit a redstone signal whose strength depends on the number of entities on the pressure plate

Considerations

A pressure plate is not solid (it cannot be used as a wall or platform). Usually a block under a pressure plate provides solid ground (for mobs to walk across, items to fall on, etc.), but when a pressure plate is placed on a block with a small collision mask, like a fence or nether brick fence, it is possible for entities to move through the pressure plate and still activate it. Thus, a pressure plate on a fence can be used to detect entities without stopping them (more compactly than a tripwire circuit).

Redstone torch

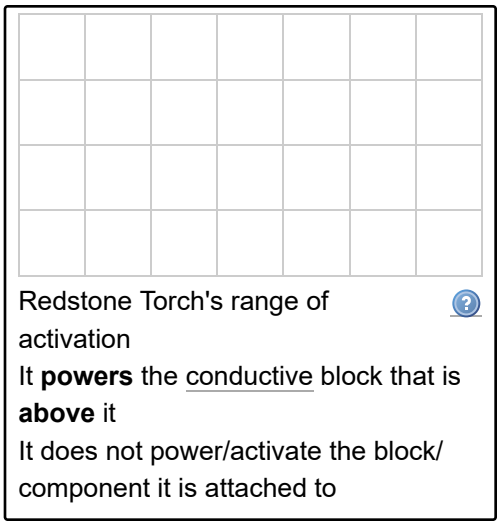
Main article: Redstone Torch

A redstone torch provides a constant redstone signal.

Placement

A redstone torch can be attached to any surface (except the bottom) of any opaque block, or to the **top** of: a cobblestone wall, a fence, glass, nether brick fence, an upside-down

slab or upside-down stairs. If the attachment block is removed, the redstone torch drops as an item.


Redstone Torch's range of activation
It **powers** the conductive block that is **above** it
It does not power/activate the block/ component it is attached to

Activation

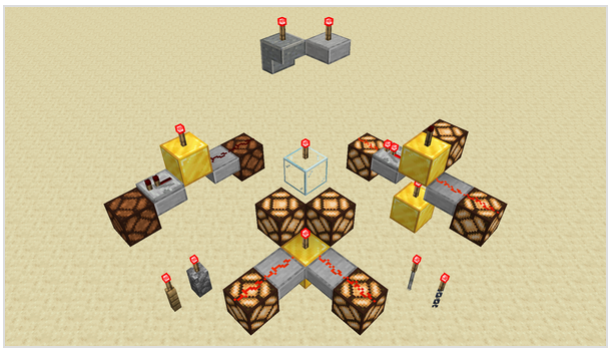
A redstone torch is active by default, but is deactivated while the block it is attached to is powered. There is a 2 game tick (0.1 seconds) delay between a redstone torch extinguishing or reigniting.

Effect

While activated, a redstone torch:

- powers the block above it
- activates adjacent redstone mechanism components
- powers adjacent redstone dust, and redstone repeaters and redstone comparators facing away from the torch with a redstone signal of strength 15

A redstone torch does not power or activate the block it is attached to.


Redstone torch as power component

Considerations

A redstone torch can burn out (stop turning on) when it is forced to flicker on and off too quickly (by powering and de-powering its attachment block). After burning out, a redstone torch re-lights when it receives a redstone update, or randomly after a short time.

One way to cause a burnout is with a **short-circuit** – using a torch to turn itself off, which then allows the torch to turn back on, etc. For example, placing redstone dust on top of a block with a redstone torch on its side, then putting another block above the torch, causes the torch to power the top block, which activates the dust, which powers the first block, turning the torch off – this feedback loop causes the redstone torch to flicker and burn out. When putting a torch underneath a block, make sure that the block isn't adjacent to redstone dust or the torch can burn out.

Sculk sensor

Main article: Sculk sensor

A sculk sensor emits a redstone signal when it detects a vibration.

Activation

A sculk sensor activates immediately upon detecting a vibration and remains active for 30 game ticks (1.5 seconds), then has a cooldown of 10 game ticks (0.5 seconds) before it can detect another vibration.

Effect

While activated, a sculk sensor:

- powers the block beneath it
- activate adjacent redstone mechanism components
- powers adjacent redstone dust and adjacent redstone repeaters facing away from the sensor with a redstone signal whose strength that depends on the distance of the source of the vibration
- powers redstone comparators facing away from the sensor with a redstone signal whose strength depends on the type of vibration

Sculk Sensor's range of activation
It **powers** the conductive block beneath it

Target

Main article: Target

A target emits a redstone signal when hit by a projectile (including arrows, tridents, eggs, snowballs, splash potions, fire charges fired from dispensers, and lingering potions, but excluding ender pearls and eyes of ender).

Target's range of activation
It does not **power** any adjacent conductive block

Activation

When a target is activated by arrows or tridents, it emits a redstone signal for 20 game ticks (1 second), while other projectiles activate the target for 8 game ticks (0.4 seconds). It may also be powered by other redstone components. A target attracts redstone dust on all four sides, so it can be powered by dust.

Effect

While activated, a target:

- activates adjacent redstone mechanism components
- powers adjacent redstone dust, and redstone repeaters and redstone comparators facing away from the target with a redstone signal whose strength depends on how close the projectile hits the target. The signal strength is 1 at the edge and 15 at the center.

A target does not power any blocks when activated, but when powered, a target powers adjacent redstone components, except dust and other targets. When powered by other redstone, a comparator can read it. This can be used to make space for more redstone inputs and outputs. A target block next to a container has the same comparator value as the container itself

Trapped chest

Main article: Trapped Chest

A trapped chest produces a redstone signal when accessed by players.

Activation

A trapped chest activates immediately when one or more players accesses it, and deactivates immediately when players stop accessing it.

Trapped Chest's range of activation
It **powers** the conductive block beneath it

Effect

While activated, a trapped chest:

- powers the block beneath it
- powers adjacent redstone dust, and redstone repeaters facing away from the chest with a redstone signal whose strength depends on the number of players simultaneously accessing the chest (up to 15)
- powers redstone comparators facing away from the chest with a signal strength that depends on the fullness of the chest

Tripwire hook

Main article: Tripwire Hook

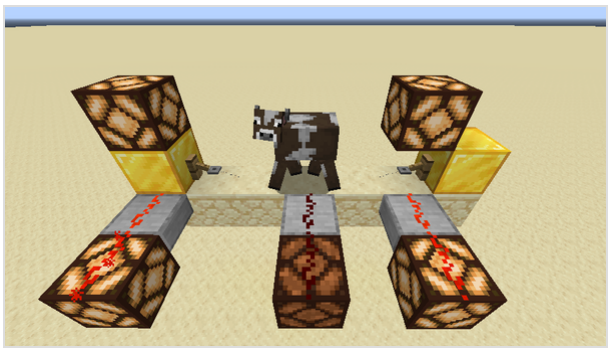
A tripwire hook produces a redstone signal when it detects players, mobs, or other entities.

Tripwire Hook's range of activation
It **powers** the conductive block it is attached to

Placement

A tripwire hook can be attached to the **side** of most opaque blocks. If the attachment block is removed, the tripwire hook drops as an item.

In order to function correctly, a tripwire hook must be part of a tripwire circuit: two opaque blocks attached to tripwire hooks, at the ends of a tripwire line (one or more blocks of tripwire).



Tripwire hook as power component – The tripwire hooks and the blocks they are attached to provide power, but the tripwire does not.

To place tripwire, right-click on an adjacent block with a string. Tripwire can be placed on the ground or in the air, and forms a valid tripwire line only if all the tripwire is of the same type. Tripwire is considered on the ground if placed on any opaque block, or on a block of redstone, a hopper, an upside-down slab, or an upside-down stairs. Tripwire is considered in the air if placed on or above any other block. Tripwire on the ground has a short hitbox (1/8 block tall), while tripwire in the air has a taller hitbox (1/2 block tall).

If the attachment block under ground tripwire is removed, the tripwire drops as string.

A tripwire circuit is properly placed when the tripwire hooks are fully extended and the tripwire line runs continuously between the tripwire hooks. Tripwire lines from separate

tripwire circuits can be placed next to each other (in parallel), above each other, and can even intersect each other.

Activation

A tripwire hook is activated when an entity (mob, item, etc.) crosses of falls on the hook's tripwire (but not the tripwire hook itself). The tripwire hook is always active for a multiple of 10 game ticks (0.5 seconds). When an entity moves off the tripwire, the tripwire hook waits until the next multiple of 10 game ticks. For example, if an entity moves off of the tripwire after 25 game ticks, the tripwire hook waits 5 game ticks before deactivating.

A tripwire hook is not activated if shears are used to cut the tripwire. Breaking the tripwire hook itself, or its attachment block does not activate the hook.

Effect

While activated, a tripwire hook:

- powers the block it is attached to
- activates adjacent redstone mechanism components
- powers adjacent redstone dust, and redstone repeaters and comparators facing away from the tripwire hook with a redstone signal of strength 15

Tripwire itself provides no power.

Transmission components

Transmission components propagate signals and pulses from power components to mechanism components. Complex effects can also be produced by allowing a signal to affect itself or its circuit.

Redstone dust

Main article: Redstone dust

Redstone dust transmits a redstone signal.

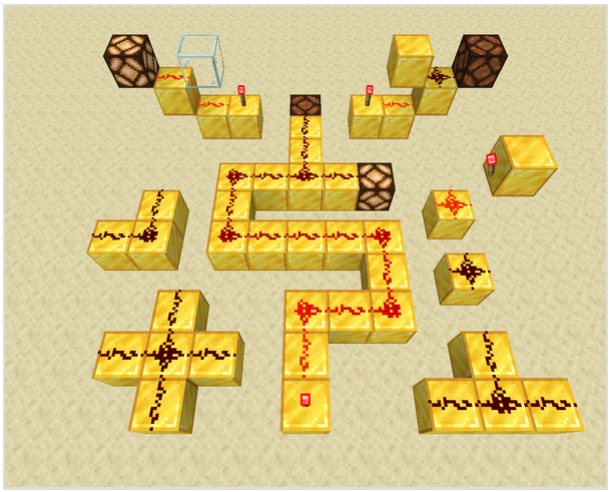
Redstone Dust's range of activation
It **weakly powers** the conductive blocks beneath it and it points to

Placement

Redstone dust is placed by right-clicking with redstone dust. Redstone dust can be attached to the **top** of any opaque block, or to the **top** of glowstone, an upside-down slab or upside-down stairs. If the attachment block is removed, the redstone dust drops as an item.

When placed, redstone dust configures itself to point toward adjacent redstone dust (at the same level or one level up or down), correctly-facing redstone repeaters and redstone comparators, and power components. If there is only one such neighbor, redstone dust forms a line pointing toward and away from that one neighbor (which can cause it to point toward blocks it wouldn't normally point toward). If there are multiple such neighbors, redstone dust forms either a

line, an "L", a "T", or a "+". If there are no such neighbors, redstone dust forms a large directionless dot. Redstone dust does not automatically configure itself to point toward adjacent mechanism components, it must be arranged to do so.


Redstone dust as redstone component

When two redstone dust trails are placed vertically diagonally (one block over and one up, or one over and one down), the lower dust trail appears to crawl up the side of the higher block to join the other dust. This linking can be cut by a conductive block above the lower trail, which prevents the two trails from connecting. If the higher trail is on an upside-down slab or upside-down stairs, the higher trail configures itself to point toward the lower trail (and other adjacent dust), but the lower trail (although visually) does not configure itself to point toward the higher trail (including not appearing to crawl up the side of the slab or stairs).

The directions in which redstone dust configures itself can affect whether it powers adjacent conductive blocks and mechanisms.

Activation

Redstone dust can be powered by an adjacent power component, another transmission component, or a strongly powered block. When a redstone signal is transmitted through multiple redstone dust, the redstone signal decreases in strength by 1 for every block traveled. Redstone dust can transmit a redstone signal up to 15 blocks away.

For non-conductive blocks, redstone dust can transmit power diagonally upward (one block up and one block over), but power cannot be transmitted diagonally down a transparent block (including top slabs and upside down stairs).

Effect

Powered redstone dust activates mechanisms components the dust points to, or is placed on top of. Powered redstone dust weakly powers conductive blocks that it points to or is placed on top of.

Redstone repeater

Main article: Redstone Repeater

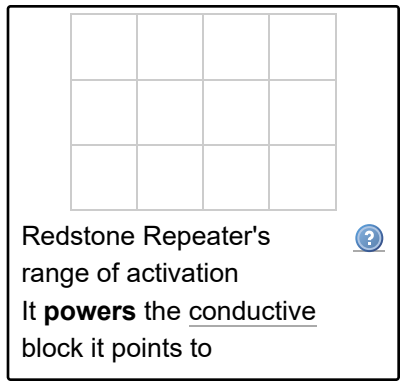
A redstone repeater can transmit, strengthen, and delay redstone signals.

Placement

A redstone repeater can be placed on top of most full solid blocks, and some non-full blocks with solid surfaces such as top slabs or upside down stairs. If the attachment block

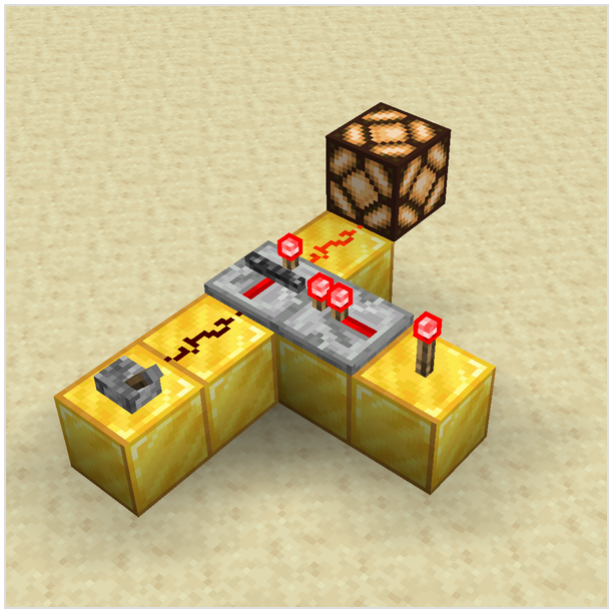
is removed, the repeater drops as an item.

A redstone repeater has a triangular arrow that point towards its front. The front of the repeater is the output, and the back is the input. The repeater also has an adjustable torch to set its delay, which can be adjusted by right-clicking.


Redstone Repeater's range of activation
It **powers** the conductive block it points to

Activation

A redstone repeater can be powered by a power component, transmission component, or a strongly or weakly powered block providing a redstone signal to the back input of the repeater. The repeater can also be powered from the side by another redstone repeater or a redstone comparator to lock it (see below).


Redstone repeater as redstone component

Effect

A redstone repeater always outputs a redstone signal strength of 15 when it receives a redstone signal, and can activate mechanism components, power transmission components, or strongly power a block. The repeater also adds a delay of 2 to 8 game ticks (0.1 to 0.4 seconds), depending on the position of the block's torch, which can be adjusted by right-clicking.

A redstone repeater can be locked by powering the it from the side with another redstone repeater or a redstone comparator. The repeater stays locked until it is no longer powered from the side. A locked repeater does not change its output, even if the back input changes. While locked, the repeater's adjustable torch is replaced by a bar with the texture of bedrock, but remains adjustable.

Redstone comparator

Main article: Redstone Comparator

A redstone comparator can retransmit a redstone signal, compare or subtract redstone signals, or read the block state of certain blocks (for example, the fullness of containers).

Placement

A redstone comparator can be placed on top of most full solid blocks, or non-full blocks or non-solid blocks that have a solid surface (for example, top slabs, top of scaffolding). If the attachment block is removed, the redstone comparator drops as an item.

A redstone comparator is marked with an arrow that point toward its **front**. The comparator takes a signal from its back as its input, and outputs a signal to the block in front of it. The comparator has two optional side inputs that can be used to modify the back input signal (see below).

A redstone comparator has two **modes**. Pressing the use control while looking at it toggles between comparison mode (front torch down/off) and subtraction mode (front torch up/on).

Redstone Comparator's range of activation
It **powers** the conductive block it points to

Activation

A

Minimum items for container signal strength

Containers								
Total slots	**1**	**3**	**5**	**9**	**27**	**54**	**1**	**9**
Power level	**Number of items**						**Music disc**	**No. of slots**
0	0	0	0	0	0	0	No disc	0
1	1	1	1	1	1	1	*13*	1
2	5	14	23	42	1s 60	3s 55	*cat*	2
3	10	28	46	1s 19	3s 55	7s 46	*blocks*	3
4	14	42	1s 5	1s 60	5s 51	11s 37	*chirp*	4
5	19	55	1s 28	2s 37	7s 46	15s 28	*far*	5
6	23	1s 5	1s 51	3s 14	9s 42	19s 19	*mall*	6
7	28	1s 19	2s 10	3s 55	11s 37	23s 10	*mellohi*	7
8	32	1s 32	2s 32	4s 32	13s 32	27s	*stal*	8
9	37	1s 46	2s 55	5s 10	15s 28	30s 55	*strad*	9
10	42	1s 60	3s 14	5s 51	17s 23	34s 46	*ward*	-
11	46	2s 10	3s 37	6s 28	19s 19	38s 37	*11* *Creator (Music Box)*	-
12	51	2s 23	3s 60	7s 5	21s 14	42s 28	*wait* *Creator*	-
13	55	2s 37	4s 19	7s 46	23s 10	46s 19	*Pigstep* *Precipice*	-
14	60	2s 51	4s 42	8s 23	25s 5	50s 10	*Otherside* *Relic*	-
15	1s	3s	5s	9s	27s	54s	*5*	-

redstone comparator is powered when its back input receives a redstone signal. The comparator can be powered in the ways other transmission components can be powered: a power component producing a signal, or a powered transmission component transmitting a signal.

The comparator also has a unique property where it can be powered by reading the block state of certain blocks. For example, a comparator can read the "fullness" of a container such as a chest, and output a redstone signal proportional to how full the chest is, essentially treating the chest as a power source. There are other, non-container blocks that have unique interactions with a comparator.

Like a redstone repeater, the comparator can also be powered if there is a conductive block between the comparator and the power source.

Effect

A powered redstone comparator can power other transmission components, strongly power a block, or activate a mechanism component located at the comparator's output. When there is no signal supplied to the comparator's side inputs, the comparator outputs a redstone signal equal to the strength of the back input signal. The comparator does not power any other adjacent blocks.

When one or both side inputs receive a redstone signal, the output of a comparator may be modified depending on what mode the comparator is in. The side inputs must receive a signal from a transmission component (redstone dust, redstone repeater, redstone comparator), or a block of redstone. Other power components cannot power the side inputs.

- In **comparison mode**, if the comparator's back input is greater than or equal to the largest side input, the comparator outputs the back signal; otherwise it outputs no signal.
- In **subtraction mode**, the comparator outputs a signal equal to: back input minus largest side input, and outputs no signal if the answer is 0 or negative.

Fullness of containers

A redstone comparator that is powered by a container outputs a power level in proportion to how full the container is (rounded up, so a single item in a container produces a power level of at least 1). A container's fullness is measured by stacks: for example, a single shovel (a non-stackable item), 16 signs, or 64 sticks are all considered to be equivalent, full stacks.

The **Comparator Output Table** (right) shows the minimum stacks ("s") plus items required to produce a specific power level from a container. For example, to get power level 5 from a hopper, put 1 stack plus 28 items in the hopper. Divide items by 4 and round up for items with a stack maximum of 16. The values for the chest, dispenser, furnace and hopper apply to minecarts with those components as well (when on a detector rail).

Some blocks (such as crafting tables, enchantment tables, etc.) can hold items temporarily while the player uses the block's interface – the items are returned to the player if the player exits the interface with items still inside. Other blocks (such as beacons) only consume items. Putting items in these blocks never activates a redstone comparator.

Other block states
A comparator can also be powered by:
beehive/bee nest

cake
calibrated sculk sensor
cauldron
chiseled bookshelf
composter
copper bulb
command block
creaking heart
end portal frame
item frame
jukebox
lectern
respawn anchor
sculk sensor

See main article for details.

Mechanism components

Mechanism components are blocks that are activated when they receive a redstone signal and perform an action, such as moving a block, producing light or sound, exploding, etc. These components can be activated by a power or transmission component, or by a powered block.

Activator rail

Main article: Activator Rail

An activator rail causes unique actions with different kinds of minecarts.

Placement

Activator rails can be placed on top of most full solid blocks, or on top of non-full blocks with a solid surface such as top slabs or upside down stairs. If the attachment block is removed, the activator rails drops as an item.

When placed, an activator rail configures itself to line up with adjacent rails, activator rails, powered rails, and detector rails, as well as such adjacent rails one block above. If there are two such adjacent rails not on opposite sides, or three or more such adjacent rails, an activator rail lines up in the east-west direction. If there are no such adjacent rails, an activator rail lines up in the north-south direction. An activator rail slopes upward to match with a rail above it (when there is more than one such rail, the order of preference is: west, east, south, and north). Other configurations can be created by placing and removing various rails.

Activation

When an activator rail is activated by one of the usual methods, that activator rail can activate other connected activator rails up to 8 blocks away. A single activator rail can activate up to 16 other activator rails (8 in front, and 8 behind). The strength of the redstone signal that the original activator rail receives does not affect how many other activator rails it can activate. Only the original activated activator rail can activate other

activator rails.

Effect

An activator rail affects certain minecarts passing over it. The effects vary with the type of minecart:

- Regular minecarts with an entity riding it (mob or player) eject that entity if the activator rail is active.
- A minecart with hopper is deactivated by an activated activator rail (it stops sucking up items in its path, or transferring items to containers as it passes them), and re-activated by an unactivated activator rail.
- A minecart with TNT is ignited by an active activator rail.
- A minecart with command block executes its command every 4 game ticks (5 times per second).
- Minecarts with chest and minecarts with furnace are not affected by activator rails.

Bell

Main article: Bell

Bells can be rung using a redstone signal.

Placement

Bells can be placed on the top, bottom, or side of most full solid blocks. Bells can also be placed on top of trapdoors that occupy the top half of a block.

Activation

A bell activates in the same game tick that it receives a redstone signal.

Effect

When a bell is activated, it rings (sways side to side and makes a sound) one time upon receiving a redstone signal. The bell does not ring again until the redstone signal stops, and a new signal is supplied.

An observer can detect when a bell starts or stops receiving a redstone signal (corresponding to the `powered` block state. Sculk sensors can detect a bell's activation, which produces a vibration with a frequency of 11.

Big dripleaf

Main article: Big dripleaf

Big dripleaf is a unique plant block that provides a temporary horizontal barrier for mobs and entities, and can place the player in a crawl, similar to a trapdoor. A redstone signal can be used to prevent the big dripleaf from collapsing, and to restore it to its original state.

Placement

Big dripleaf can be placed on clay, coarse dirt, dirt, farmland, grass blocks, moss blocks, mycelium, podzol, rooted dirt.

Effect

A big dripleaf initially provides a solid horizontal barrier that prevent mobs and entities from moving through it. After 20 game ticks (1 second), the big dripleaf's `tilt` blockstate changes to `full`, and mobs and entities fall through the big dripleaf. After 100 game ticks (5 seconds), the big dripleaf returns to its original state; if the player is on the same y-level as the big dripleaf, the player goes into a crawl. Items, such as lanterns, cannot be placed on a big dripleaf like they can with a closed trapdoor.

When activated, the big dripleaf immediately returns to its original state, and does not change states until the redstone signal stops. Providing a redstone signal to an attached big dripleaf stem does not affect the big dripleaf.

Copper bulb

Main article: Copper bulb

A copper bulb is a light source that can be toggled on or off using a redstone pulse.

Activation

A copper bulb has no delay and immediately changes its state upon activation.

Effect

When a copper bulb first receives a redstone signal, the bulb becomes lit and starts producing light if it was unlit; or if the bulb was already lit, then it becomes unlit. The amount of light produced depends on the oxidation state of the bulb.

While the bulb is receiving a redstone signal, a red dot appears in the middle of every face of the block, acting as an indicator that the bulb is currently receiving a redstone signal. This red dot is also visible when the bulb is unlit, but still receiving a redstone signal.

An observer can detect when a copper bulb starts or stops receiving a redstone signal (the red indicator light turns on or off).

A redstone comparator facing away from a copper bulb emits a redstone signal strength of 15 when the bulb is lit, regardless of its oxidation state.

Crafter

Main article: Crafter

A crafter is a block that can be used for automatic crafting.

Dispenser

Main article: Dispenser

A dispenser ejects items into the world, or performs a unique action when it contains certain items.

Placement

A dispenser has an input, which faces they player when the dispenser is placed.

Activation

A dispenser activates 4 game ticks after receiving a redstone signal, and does not respond to additional redstone signals during that time. The dispenser does not activate again until the redstone signal stops, and a new signal is received. A dispenser can also be activated by quasi-connectivity.

Effect

When activated, a dispenser ejects one item. If multiple slots are occupied by items, a random occupied slot is chosen for ejection.

When a dispenser contains certain item, it exhibits unique behavior:

Dispenser Behavior

Item	Effect
Armor Elytra Heads Shield	Equips on a player within a one-block distance (any armor, made from any material)
Arrow Bottle o' Enchanting Egg Fire Charge Snowball Splash Potion	Fired in the direction the dispenser is facing, as if a player had used the item themselves
Boat	Placed as entity (i.e., a right-clickable vehicle) onto the block in front of the dispenser, if it is water or air above water; otherwise dropped (see below)
Firework Rocket	Placed as entity (i.e., a flying firework) onto the block in front of the dispenser
Bone Meal	Increments the growth stage of beetroot crops, carrots, cocoa pods, crops, melon stems, potatoes, pumpkin stems, and saplings in front of the dispenser; grows grass, dandelions, and roses, if a grass block is in front of the dispenser; grows a huge mushroom if facing a mushroom; otherwise remains unused
Bucket	Collects lava or water in front of the dispenser (replacing the empty bucket in the dispenser with a lava bucket or water bucket); otherwise dropped (see below)
Flint and Steel	Ignites the block the dispenser is facing; reduces the remaining durability of the used flint and steel
Lava Bucket Water Bucket	Places lava or water in the block in front of the dispenser (replacing the lava or water bucket in the dispenser with an empty bucket), if the block in front of the dispenser is one that the player could use a lava or water bucket on (e.g., air, flowers, grass, etc.); otherwise dropped (see below)
Minecart Minecart with Chest Minecart with Command Block Minecart with Furnace Minecart with Hopper Minecart with TNT	Placed as entity (i.e., a right-clickable vehicle) in the block in front of the dispenser, if the dispenser is in front of a type of rail; otherwise dropped (see below)
TNT	Ignites TNT on the block in front of the dispenser
Shears	Shears sheep within a one-block radius
Glowstone	If a respawn anchor is one block away, it fills the respawn anchor by 1 as if a player had right clicked with glowstone. If the respawn anchor is full, the dispenser does nothing
Others	Dropped—ejected toward the block in front of the dispenser, as if the player had used the Drop control (default Q)

Considerations

A dispenser is a conductive block and can be powered and activate adjacent mechanism

components.

Door

Main article: Door

A door is a switchable barrier that can allow or prevent mobs and entities from moving through it. A wooden door can be manually opened or closed by the player, or with a redstone signal. An iron door can only be opened with a redstone signal.

Placement

A door can be placed on top of most full solid blocks, and on top of some non-full blocks with solid surfaces such as top slabs or upside down stair. The door drops as an item if the attachment block is broken. A door is placed on the edge of the block facing the player. The door's hinge can be located on the left or right, depending on which side of the block the player clicks while placing it. If the door is placed next to another door, the door may orient its hinge to form a double door.

Activation

A door activates immediately upon receiving a redstone signal.

Effect

A door has two states: closed (the same orientation as when the door is placed) and open. When a door receives a redstone signal, the door opens, or stays open if it was already open. When the redstone signal stops, the door closes. When activated, any entities on the door fall off, unless they are standing on the hinge.

A door doesn't actually move (the way a piston arm or a pushed block moves), it simply disappears from one side and re-appears on another; therefore, it does not push entities as it opens.

Dragon head

Main article: Dragon Head

The dragon head opens and closes its mouth repeatedly while activated.

Activation

A dragon head activates immediately upon receiving a redstone signal and stays activated until the signal stops.

Effect

The dragon head opens and closes its mouth repeatedly while activated. An observer can detect when a dragon head starts and stops receiving a redstone signal.

Dropper

Main article: Dropper

A dropper can eject items into the world or into containers (including other droppers).

Placement

A dropper has an input, which faces the player when the dropper is placed.

Activation

A dropper activates 4 game ticks after receiving a redstone signal, and does not respond to additional redstone signals during that time. The dropper does not activate again until the redstone signal stops, and a new signal is received. A dropper can also be activated by quasi-connectivity.

Effect

When activated, a dropper ejects one item. If multiple slots are occupied by items, a random occupied slot is chosen for ejection.

If the dropper is facing a container, the ejected item is transferred into the container. Otherwise, the item is ejected in the direction the dropper is facing, as if the player had used the Drop Item control.

Considerations

A dropper is a conductive block and can be powered and activate adjacent mechanism components (including other droppers).

Fence gate

Main article: Fence Gate

A fence gate is a switchable barrier that can allow or prevent mobs and entities from moving through it.

Placement

A fence gate can be placed on the top of most blocks. Once placed, the block beneath it may be removed without the fence gate dropping as an item.

Activation

A fence gate activates immediately upon receiving a redstone signal.

Effect

A fence gate has two states: closed (the same orientation as when the fence gate is placed) and open. When a fence gate receives a redstone signal, the fence gate opens, or stays open if it was already open. When the redstone signal stops, the fence gate closes. Unlike a door or trapdoor, while active, a fence gate is completely non-solid (lacks a collision mask) to all entities.

A fence gate doesn't actually move (the way a piston arm or a pushed block moves), it simply disappears from one state and re-appears in another, so it does not push entities as it opens.

Hopper

Main article: Hopper

A hopper is used to move items to and from containers (including other hoppers).

Placement

A hopper can be placed so that its output faces in any direction except up.

Effect

While *not* activated, a hopper pulls items from a container above it (or item entities in the space above it) into its own slots and pushes items from its own slots into a container it is facing. Both types of transfers occur every 8 ticks (0.4 seconds), and pushes are processed before pulls. A hopper always pulls items into the leftmost available slot, and pushes items from leftmost slots before rightmost slots (it does not start pushing items from the second slot before the first is empty, from the third slot before the second is empty, etc.).

While activated, a hopper does not pull items from above or push them out, but may receive items from other mechanism components such as droppers, and may have its items removed by another hopper beneath it.

Note block

Main article: Note Block

A note block is used to produce a player-chosen sound.

Placement

After being placed, a note block's pitch can be adjusted over a two-octave range by right-clicking the note block, and its timbre can be adjusted by placing different blocks beneath it.

Effect

When activated, a note block produces a sound and send out block updates to all adjacent blocks. A note block must have air above it to activate.

Considerations

A note block is a conductive block, so powering it directly can cause adjacent mechanism components (including other note blocks) to activate as well.

Piglin Head

Main article: Piglin Head

The piglin head moves its ears repeatedly while activated.

Activation

A piglin head activates immediately upon receiving a redstone signal and stays activated

until the signal stops.

Effect

The piglin head moves its ears repeatedly while activated. An observer can detect when a piglin head starts and stops receiving a redstone signal.

Piston

Main article: Piston

A piston is used to move blocks or entities. A piston may be of two types: a regular piston only pushes blocks, while a sticky piston pushes and pulls blocks.

Placement

A piston has a stone base and a wooden head, and can be placed so the head faces in any direction (its front).

Activation

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You can help by expanding it.

Effect

When activated, a piston pushes the block in front of its arm, and up to 11 more blocks in front of that (up to 12 blocks total). When deactivated, a regular piston pulls its arm back (leaving an air block in front of the piston), while a sticky piston pulls back both its arm and one block (leaving an air block on the other side of the pulled block).

A moving piston or block can also push an entity such as a mob or item.

Some blocks (bedrock, obsidian, end portal frame, etc.) cannot be moved by a piston. Some blocks (flowers, leaves, torches, etc.) are destroyed, but may drop items (as if destroyed by the player). For full details of how pistons interact with other blocks, see Pushing Blocks.

Slime blocks stick to blocks and make them move when adjacent blocks are moved. The 12 block limit still holds.

Considerations

In *Java Edition*, when a sticky piston is activated by a pulse *shorter than 1.5 ticks*, it *pushes* the block in front of it, but *fails to pull back* the pushed block on the end of the pulse. If that sticky piston is activated again by any pulse, it *can still pull back* the block. Thus, a sticky piston running on fast pulses (for example, 1-tick pulses) pushes and pulls a block every *other* pulse.
A piston is a transparent block, so powering it directly does not cause adjacent mechanism components (including other pistons) to activate (for exceptions see Quasi-Connectivity).

Powered rail

Main article: Powered Rail

A powered rail is used to propel a minecart.

Placement

A powered rail can be attached to the **top** of any opaque block, or to the **top** of an upside-down slab or upside-down stairs. If the attachment block is removed, the powered rail drops as an item.

When placed, a powered rail configures itself to line up with adjacent rails, powered rails, and detector rails, as well as such adjacent rails one block up. If there are two such adjacent rails on non-opposite sides, or three or more such adjacent rails, a powered rail lines up in the east-west direction. If there are no such adjacent rails, a powered rail lines up in the north-south direction. If a rail it would line up with is one block up, a powered rail slants upward toward it (with multiple options to slant upward to, a powered rail prefers, in order: west, east, south, and north). Other configurations can be created by placing and removing various rail.

Activation

In addition to the methods above, a powered rail can also be activated by other adjacent activated powered rails. A powered rail can transmit activation up to 9 rails (the first originally-powered powered rail, and up to eight additional activated rails). Activation transmitted in this way cannot power any redstone components except powered rails, but the power change states can be detected by observers.

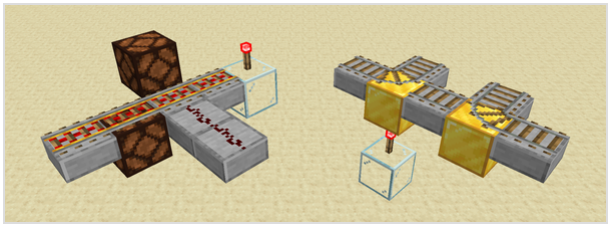
Effect

While activated, a powered rail boosts the speed of a minecart passing over it, or starts a minecart moving away from an adjacent solid block it is in contact with.
While not activated, it acts as a brake, reducing the speed or even stopping a minecart passing over it.

Rail

Main article: Rail

A rail is used to switch the track of a minecart.



Rails and powered rails as mechanism components

Placement

A rail can be attached to the **top** of any opaque block, or to the **top** of an upside-down slab or upside-down stairs. If the attachment block is removed, the rail drops as an item.

When placed, rail configures itself to line up with adjacent rails, powered rails, and detector rails, as well as such adjacent rails one block up. If there are two such adjacent rails on non-opposite sides, the rail curves from one to the other. If there are three or four such adjacent rails, the rail curves between two

of them (when choosing which directions to curve between, a rail prefers south over north, and east over west). If there are no such adjacent rails, the rail lines up in the north-south direction. If a rail it would line up with is one block up, a rail slants upward toward it *without* curving (with multiple options to slant upward to, a rail prefers, in order: west, east, south, and north). Other configurations can be created by placing and removing various rails.

Effect

When activated, a rail in a "T" junction flips to curve the other way (activating a rail in another configuration has no effect).

Redstone lamp

Main article: Redstone Lamp

A redstone lamp is used to provide light.

Activation

A redstone lamp activates normally, but takes 2 ticks to deactivate.

Effect

While activated, a redstone lamp has block light level 15 (so produces block light level 14 in all adjacent transparent spaces). An activated redstone lamp is transparent to sky light.

Considerations

A redstone lamp is a conductive block, so powering it directly can cause adjacent mechanism components (including other redstone lamps) to activate as well.

TNT

Main article: TNT

TNT is used to create an explosion.

Activation

TNT can be activated by a redstone signal, flint and steel, fire, explosions, flaming arrows, or projectiles that create fire or explosions.

Effect

When a TNT block is activated, the block is replaced with an entity called Primed TNT, which creates the explosion. If not activated by an explosion, TNT explodes after 80 game ticks (4 seconds). If activated by an explosion, TNT explodes at a random time between 10 to 30 game ticks (0.5 to 1.5 seconds).

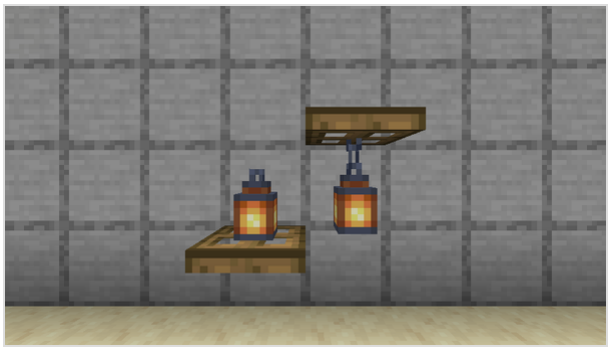
Considerations

TNT is a non-conductive block; supplying a redstone signal to a TNT block does not cause other adjacent TNT blocks to activate (but they can still be activated by the explosion).

Trapdoor

Main article: trapdoor

A trapdoor is a switchable barrier that can allow or prevent mobs and entities from moving through it. A wooden trapdoor can be open or closed manually by the player or using a redstone signal. An iron trapdoor can only be opened with a redstone signal.



Closed trapdoors acting as solid surfaces

Placement

A trapdoor can be placed on the top, bottom, or side of most blocks. When placing on the side of a block, the trapdoor can be attached to the top or bottom half of the block. If the attachment block is removed, the trapdoor does not drop as an item.

Activation

A trapdoor activates immediately upon receiving a redstone signal.

Effect

A trapdoor has two states: closed (the same orientation as when the trapdoor is placed) and open. When a trapdoor receives a redstone signal, the trapdoor opens, or stays open if it was already open. When the redstone signal stops, the trapdoor closes. A trapdoor doesn't actually move (the way a piston arm or a pushed block moves), it simply disappears from one state and re-appears in another, so it does not push entities as it opens. When a trapdoor closes, it can put the player into a crawl if the trapdoor is one block above the ground.

Considerations

A closed trapdoor occupying the top half of a block can act as a solid surface for items to be placed on top of. A closed trapdoor occupying the bottom half of a block can act as a solid surface for items to be placed underneath (acts as a ceiling). If the trapdoor is opened, the attached blocks may drop if they require a supporting block.

Command block

Main article: Command Block

A command block is used to execute a server command. Command blocks can be obtained only by placing it or giving it to the player with commands.

Types

A command block have 3 types: impulse (execute a command once), chain (execute a command when triggered), and repeat (execute a command for 2 or more ticks when powered)

Placement

After being placed, the player can set the command to be executed by using the command

block.

Effect

When activated, a command block executes its defined command *once*. To make a command block constantly execute its command, it must be run on a clock circuit or using a repeating command block.

Like other mechanism components, an already-activated command block does not respond to other redstone signals. To make a command block execute its defined command more than once it must be deactivated and re-activated repetitively.

Considerations

A command block is a conductive block, so powering it directly can activate adjacent mechanism components (including other command blocks) as well.

Structure block

Main article: Structure Block

A Structure Block is used to save and load structures. Structure blocks can be obtained only by placing it or giving it to the player with commands.

Placement

After being placed, the player can set the mode or the structure to save/load by right-clicking the structure block.

Effect

Redstone signals can be used to automate some of the structure block's functions.

Like other mechanism components, an already-activated structure block does not respond to other redstone signals. To make a command block execute its defined command more than once it must be deactivated and re-activated repetitively.

Mobile components

Mobile components are blocks (entities) that can travel from the stationary blocks in a circuit and perform actions such as collecting or transporting items or mobs.

Boat with chest

Main article: Boat with chest

A boat with chest can be used to transport mobs and items over water.

Behavior

A boat with chest behaves like a normal boat, except that it has an inventory, and can carry only one passenger at a time. A boat with chest can transport both mobs and items. Hoppers can be used to insert and extract items from a boat with chest.

Minecart

Main article: Minecart

A minecart is used to transport a mob or player over rails.

Behavior

The player can move a minecart by pushing against it while outside the minecart (whether the minecart is on rails or not), or by pressing the Forward control key (by default, W) while inside the minecart (only while the minecart is on rails). A minecart resting on powered rails configured to point at an adjacent opaque block is propelled away from the opaque block when the powered rails are activated. A minecart traveling over activated powered rails gets a speed boost. When a minecart passes over an activated activator rails, the entity inside it is ejected out.

Minecart with chest

Main article: Minecart with Chest

A minecart with chest is used to store and transport items over rails.

Behavior

A minecart with chest accepts items from a hopper and allows a hopper underneath it to pull items from it.

Minecart with command block

Main article: Minecart with Command Block

A minecart with command block is used to execute commands.

Behavior

A minecart with command block executes its command every 4 game ticks (0.2 seconds) while on an activator rail.

Minecart with furnace

Main article: Minecart with Furnace

A minecart with furnace[*Java Edition only*] (a.k.a. furnace minecart, powered minecart) is used to push other minecarts over rails.

Behavior

A minecart with furnace propels itself and other minecarts without requiring powered rails.

Activation

A minecart with furnace can be activated by pressing the use key while facing the minecart with furnace and holding fuel (coal, lava, wood, etc.). It continues to move until the fuel runs out.

Minecart with hopper

Main article: Minecart with Hopper

A minecart with hopper is used to collect, transport, and distribute items over rails.

Behavior

A minecart with hopper pulls items from containers above it and can have items pulled from it with *hoppers* below (the number of items transferred can depend on how long its velocity allows it to remain within reach of the containers). It also picks up items that have fallen on the rails. If a minecart with hopper passes over a powered activator rail, it stops transferring items indefinitely until it passes over an unpowered activator rail.

Minecart with TNT

Main article: Minecart with TNT

A minecart with TNT is used to create explosions.

Behavior

A minecart with TNT that passes over a powered activator rail explodes.

Videos

Navigation

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Redstone basics	Redstone components · Redstone mechanics · Conductivity
Redstone circuits	Clock circuits · Logic circuits · Memory circuits · Miscellaneous circuits · Pulse circuits · Transmission circuits
Featured tutorials	Advanced redstone circuits · Block update detector (BUD) · Comparator update detector (CUD) · Flying machine · Mechanisms · Piston circuits · Quasi-connectivity · Redstone music

Redstone components [hide]

Power emission	Block of Redstone, Buttons (Wooden, Stone, Polished Blackstone), Daylight Detector, Detector Rail, Jukebox, Lectern, Lever, Lightning Rod, Observer, Pressure Plates (Wooden, Stone, Polished Blackstone, Light Weighted, Heavy Weighted), Redstone Comparator, Redstone Torch, Sculk Sensor (Calibrated), Target, Trapped Chest, Tripwire Hook (Tripwire)
Signal transmission	Redstone Wire, Redstone Repeater, Conductive and non-conductive blocks
Item and entity transportation	Allay, Boat with Chest (Bamboo Raft), Copper Golem, Crafter, Dispenser, Dropper, Hopper, Minecart (with Chest, with Furnace, with Hopper), Rail (Activator, Powered), Water (Bubble Column)
Comparator-readable	Barrel, Bee Nest (Hive), Brewing Stand, Cake, Cauldron, Chest (Copper), Chiseled Bookshelf, Composter, Copper Golem Statue, Decorated Pot, End Portal Frame, Furnace (Blast, Smoker), Item Frame (Glow), Respawn Anchor, Shulker Box
Observer-related	Redstone Ore (Deepslate), Scaffolding, Sculk Catalyst, Sculk Shrieker, Wall
Pistons/related	Piston (Sticky), Honey Block, Slime Block, Movable and immovable blocks
Sculk sensor-related	Block of Amethyst, Wool (Carpet)
Mechanisms/misc.	Armor Stand, Bell, Big Dripleaf, Copper Bulb, Creaking Heart, Doors (Copper, Iron, Wooden), Fence Gate, Head, Note Block, Redstone Lamp, Shelf, TNT (Minecart), Trapdoors (Copper, Iron, Wooden)
Creative or commands only	Command Block (Minecart), Minecart with Monster Spawner, Structure Block, Test Block