Redstone Comparator

re article feedback

For other uses, see Redstone.

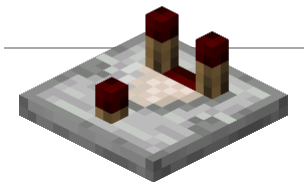
A **redstone comparator** is a block that can produce a redstone signal from its front by reading chests, lecterns, copper bulbs and similar blocks, or be used to repeat a signal without changing its strength.

It can also be set to either stop outputting a signal while its side input is receiving a stronger one (front torch off), or output a weaker signal based on its side input's signal strength (front torch on).

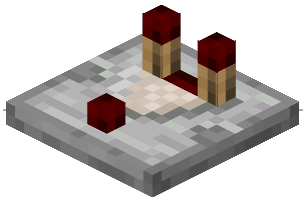
Contents

Redstone Comparator

Redstone Comparator Subtracting
Powered Powered+Subtracting



Java Edition



Bedrock Edition

Renewable	Yes
Stackable	Yes (64)
Tool	Any tool
Blast resistance	0
Hardness	0
Luminous	No
Transparent	Yes

Waterloggable	**JE:** No **BE:** Yes
Flammable	No
Catches fire from lava	No

Obtaining

Breaking

A redstone comparator can be broken instantly with any tool, or by hand, and drops itself as an item.

Block	Redstone Comparator
Hardness	0
Breaking time (secs)	
Default	*0.05*

Legend

- incorrect tool, drops nothing
- correct tool, drops nothing or something other than the block itself
- correct tool, drops the block itself
- *italicized* can be instant mined

A redstone comparator is removed and dropped as an item if:

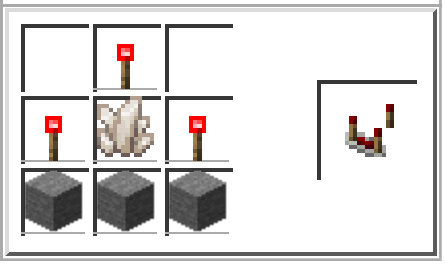
- its attachment block is moved, removed, or destroyed;
- water flows into its space;[*Java Edition only*]
- a piston tries to push it or moves a block into its space.

If lava flows into a redstone comparator's space, the redstone comparator is destroyed without dropping as an item.

Natural generation

2-9 Redstone comparators generate in ancient cities.

Crafting

Ingredients	Crafting recipe [hide]
Redstone Torch + Nether Quartz + Stone	

Usage

A redstone comparator can be placed on the top of any opaque block with a solid full-height top surface (including upside-down slabs and upside-down stairs). In *Bedrock Edition*, a comparator can also be placed on walls and fences. For more information about placement on transparent blocks, see Opacity/Placement.

The redstone comparator has a front and a back — the arrow on the top of the comparator points to the front. When placed, the comparator faces away from the player. The comparator has two miniature redstone torches at the back and one at the front. The back torches turn on when the comparator's output is greater than zero (the arrow on top also turns red). The front torch has two states that can be toggled by using the comparator:

- Down and unpowered (indicating the comparator is in "comparison mode")
- Up and powered (indicating the comparator is in "subtraction mode")

The redstone comparator can take a signal strength input from its rear as well as from both sides. Side inputs are accepted only from redstone dust, block of redstone[*Java Edition only*], redstone repeaters, other comparators, and observers in specific scenarios. The redstone comparator's front is its output.

It takes 2 game ticks (0.1 seconds) for signals to move through a redstone comparator, either from the rear or from the sides. This applies to changing signal strengths as well as simply to turning on and off.

Redstone comparators check their power state before their scheduled ticks update. This results in redstone comparators not usually responding to 1-tick fluctuations of power or signal strength — for example, a 1-clock input is treated as always off from the side, and always on from the rear. This happens because the signal changes back to its original state before the redstone comparator checks its input states. However, certain setups such as powering any input with two separate observer pulses at the same time causes a redstone comparator to respond to 2-game-tick pulses.

The redstone comparator has four functions: maintain signal strength, compare signal strength, subtract signal strength, and measure certain block states (primarily the fullness of containers).

Maintain signal strength

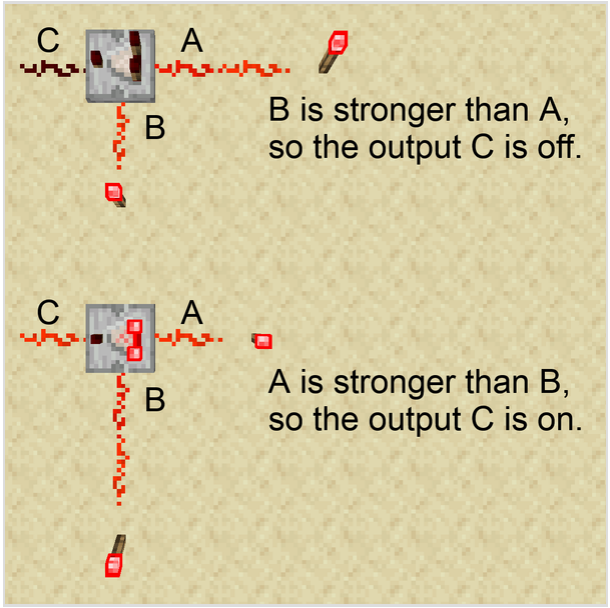
A redstone comparator with no powered sides outputs the same signal strength as its rear input, with a 1 tick delay.

Compare signal strength

A redstone comparator in comparison mode (front torch down and unpowered) compares its rear input to its two side inputs. If either side input is greater than the rear input, the comparator output turns off. If neither side input is greater than the rear input, the comparator outputs the same signal strength as its rear input.

The formula for calculating the output signal strength is as follows:

$$output = rear \times [left \leq rear \text{ AND } right \leq rear]$$



Comparators in comparison mode.

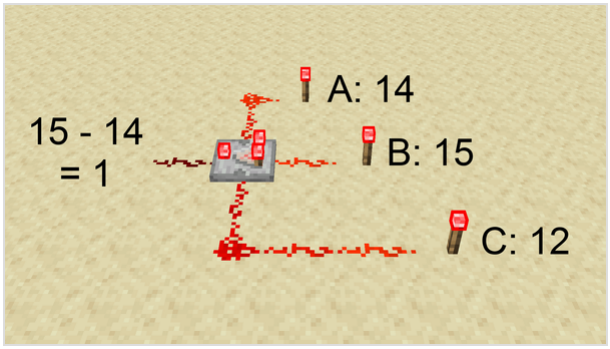
Subtract signal strength

A redstone comparator in subtraction mode (front torch up and powered) subtracts the signal strength of the greater side input from the signal strength of the rear input.

$$output = \max(rear - \max(left, right), 0)$$

For example: if the signal strength is 6 at the left input, 7 at the right input and 4 at the rear, the output signal has a strength of *max(4 − max(6, 7), 0) = max(4−7, 0) = max(−3, 0) = 0*.

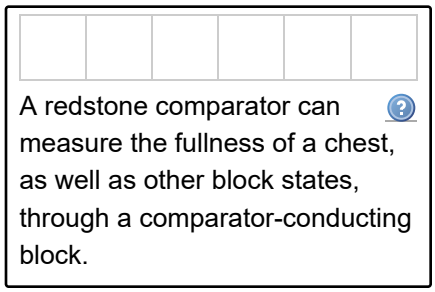
If the signal strength is 9 at the rear, 2 at the right input and 5 at the left input, the output signal has a strength of *max(9 − max(2, 5), 0) = max(9−5, 0) = 4*.



The greatest of the side inputs A and C is subtracted from the rear input B, outputting 1. If either A or C were greater than or equal to B, it would output 0.

Measure block state

A redstone comparator treats certain blocks behind it as power sources and outputs a signal strength proportional to the block's state. The comparator may be separated from the measured block by a comparator-conducting block. These blocks include all conductive blocks, but see below.


A redstone comparator can measure the fullness of a chest, as well as other block states, through a comparator-conducting block.

The comparator disregards the power level of the intervening block in this configuration.

In *Java Edition*, if the intervening block is powered to signal strength 15, then the comparator outputs 15 no matter the fullness of the container.[1] This never occurs in *Bedrock Edition*.

In *Bedrock Edition* the list of comparator-conducting blocks also includes some non-conductive blocks. This may be useful in contraptions as they do not conduct redstone signals from elsewhere like a regular conductive block would.[2] These blocks are:

- Chain
- Dirt Path and Farmland
- Piston and Sticky Piston
- Copper Grate (all variants)
- Chorus Plant and Chorus Flower
- Sniffer Egg

Fullness of containers

A redstone comparator can output a signal indicating how full a container is. (0 for empty, 15 for full, etc.) The table on the right is described more in detail, later in this section.

Note: s means stack.

Containers that can be measured by a comparator include:

- Barrel
- Blast furnace
- Brewing stand
- Chest
- Copper Chest
- Crafter
- Decorated pot
- Dispenser
- Dropper
- Furnace
- Hopper

Minimum items for container signal strength

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

- Large chest
- Large copper chest
- Large trapped chest
- Minecart with chest on top of a detector rail
- Minecart with hopper on top of a detector rail
- Respawn Anchor

- Shulker box (any color)
- Smoker
- Trapped chest

Generally speaking, the comparator output signal strength represents the average fullness of the slots, based on how many of that item form a full stack (64, 16, or 1 for non-stackable items).

The *Minimum items for container signal strength* table (right) shows the minimum ***full-stack-equivalent (FSE)*** to produce different signal strengths from common containers. A ***full-stack-equivalent*** quantifies how many normal 64-stackable items are needed to output a corresponding signal strength. The 's' is a constant 64, with the additional amount needed following after.

One may also consider the terms: ***cumulative-weight*** or ***weighted-sum*** instead of ***full-stack-equivalent***.

Items that stack to a max of 16 (snowballs, signs, ender pearls, etc.), contribute +4 to the *full-stack-equivalent* for each unity (count of 1 item). Similarly, items that stack to 1 (minecart, boat, etc.) contribute +64, and items that stack to 64 contribute +1.

Example 1: 3 ender pearls contribute a 3×4 = 12 *full-stack-equivalent*.

Example 2: 16 ender pearls and 60 redstone dust contributes a 16×4 + 60×1 = 124 *full-stack-equivalent*.

Example 3: 1 minecart and 60 redstone dust contributes a 1×64 + 60×1 = 124 *full-stack-equivalent*.

Example 4: To produce a signal strength of 10 from a hopper, one requires a *full-stack-equivalent* of at least 3s + 14 = 206 but strictly less than 3s + 37 = 229. This can be done with 3 minecarts, and 14 dirt.

When a comparator measures a large chest or large trapped chest, it measures the entire large chest (54 slots), not just the half directly behind the comparator. in *Java Edition*, a chest or trapped chest that cannot be opened (either because it has a conductive block or a sitting cat above it) always produces an output of 0 no matter how many items are in the container — shulker boxes can always be measured, even if they cannot open.

Calculating signal strength from items

> When a container is empty, the output is off.
>
> When it is not empty, the output signal strength is calculated as follows:
>
> ***signal strength*** = floor(1 + ((***sum of all slots' fullnesses***) / (***number of slots in container***)) × 14)
>
> fullness of a slot = ***number of items in slot / max stack size for this type of item***

Example: 300 blocks in a dispenser (which has 9 slots), where each block stacks to a maximum of 64 has a 300 *full-stack-equivalent.* This produces an output with a signal strength of 8:

> 1 + ((300 items / 64 items per slot) / 9 slots) × 14 = 8.292, floored is 8

Calculating items from signal strength

It can be useful in redstone circuits to use containers with comparators to create signals of a specific strength. The number of items required in a container to produce a signal of desired strength is calculated as follows:

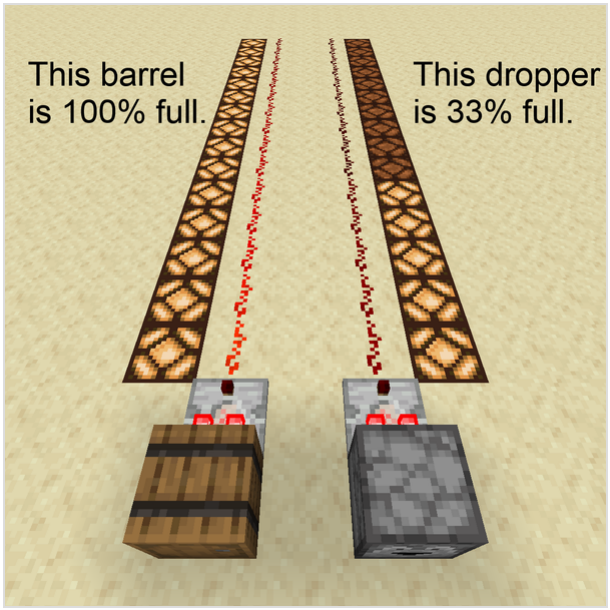
`items required = max(`***`desired signal strength`***`, ceiling((`***`total slots in container`***` × 64 / 14) × (desired signal strength − 1)))`

Example: To use a furnace (which has 3 slots) to create a strength 9 signal, players need 110 items:

> max(9, (3×64/14) × (9−1)) = 109.714, rounded up is 110

Miscellaneous

Some non-container blocks can also be measured by a redstone comparator:



Comparators used to measure containers.

Beehive and bee nest
A hive or nest outputs a signal strength equal to the amount of honey in the hive/nest.

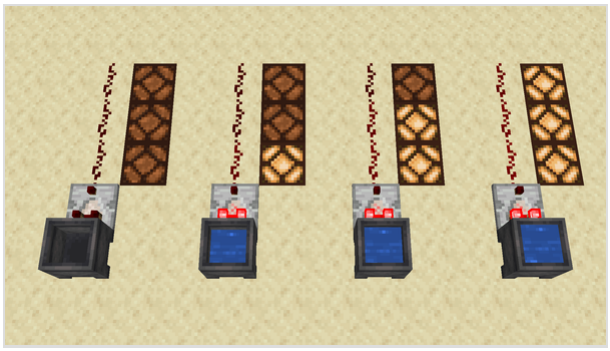
Cake
A cake outputs a signal strength relative to the amount of cake remaining. Each slice is worth 2 signal strength, with 7 total slices, for an output of 14 for a full cake.

Cauldron
A cauldron outputs different signal strengths depending on how much water or powder snow is inside. From completely empty to completely full, the output values are 0, 1, 2, and 3. If lava is inside, the strength is always 3.

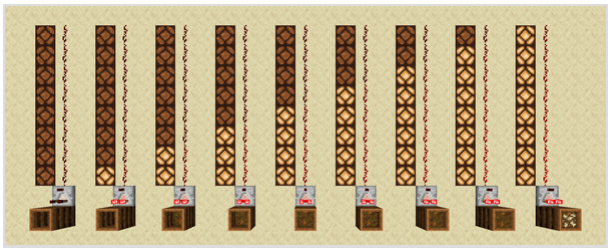
Chiseled bookshelf
A chiseled bookshelf outputs a signal strength between 1 and 6 indicating the last slot interacted with. When no slot has been interacted with yet, it outputs 0.

Composter
A composter outputs different signal strengths depending on the level inside. From

completely empty to completely full, the output values are 0, 1, 2, 3, 4, 5, 6, 7 and 8. Note that under normal circumstances, a Composter will only temporarily produce power level 7 before automatically updating itself to level 8.



Cauldron signal strength



Composter signal strength

Copper bulb

A copper bulb at any oxidation stage emits a full signal of 15 when lit and 0 otherwise.

Copper Golem Statue

A copper golem statue emits a signal strength from 1 to 4 based on its pose.

Command block

A command block stores the "success count" of the last command executed, which represents the number of times the most recently used command of this command block succeeded. A "success" is defined by the command's success conditions: if a red error message is returned in the chat, the command was not successful.

Most commands can succeed once per execution, but certain commands (such as those that accept players as arguments) can succeed multiple times, and the comparator outputs the number of times it succeeded (maximum 15 when sent to redstone dust, but in the code it is able to go up to the 32-bit integer limit, and can be used in contraptions with no redstone dust with those values).

A command block continues to store the success count of the last command executed until it executes its command again, thus the comparator continues to output the same signal strength even after the command block is no longer being activated (it doesn't turn off when the signal to the command block turns off).

Crafter

A crafter outputs a signal strength equal to the number of crafting slots that are either disabled or occupied by an item. An empty crafter with no disabled slots does not output any signal through a comparator. A crafter with at least one slot disabled or filled outputs a signal through a comparator, with strength corresponding to the number of occupied slots.

Creaking heart

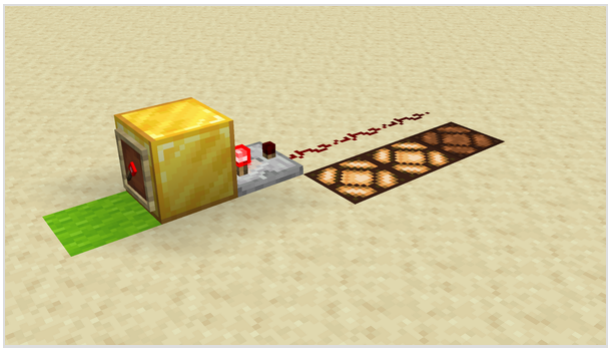
An active creaking heart with a creaking linked to it outputs a signal strength dependent on the Euclidean distance between the heart and its creaking. The strength is calculated as follows:

$$\text{output} = 15 - \text{floor}(\textit{distance} / 32 \times 15)$$

End portal frame

An end portal frame outputs a full signal of 15 if it contains an eye of ender and 0 otherwise.

Item frame and glow item frame



A comparator can measure the presence and rotation of an item frame's contents.

A comparator can measure the state of an item frame's contents. An item frame comparator outputs 0 if the item frame is empty, or 1 to 8 for any item depending on its rotation: 1 at initial placement, plus 1 for each 45° of rotation for a maximum of 8. For an item frame that holds a map, a unit of rotation is 90° instead of 45°, but a comparator still outputs power levels 1 to 8. It takes two full rotations to cycle through all comparator outputs, and each orientation of the map corresponds to two output levels that differ by 4.
The item frame must be attached to a full block, and the comparator must be placed behind this block, facing away from the item frame.

Jukebox

A jukebox outputs a signal strength indicating which music disc is currently playing. See the *Minimum Items for Container Signal Strength* table above.

Lectern

A lectern outputs a signal strength that depends on which page of the lectern's book is opened. The calculation used is:
$$\textit{signal strength} = \mathtt{floor}(1 + ((\textit{current page} - 1) / (\textit{number of pages in book} - 1)) \times 14)$$
This results in page 1 having a signal strength of 1, and the last page having a signal strength of 15. The exception is a single page book, which outputs a signal strength of 15. For example, a book with 15 pages outputs a signal equal to the current page number. A book with 5 pages outputs signal strengths of 1, 4, 8, 11 and 15 for the different pages. A book with 100 pages has the signal strength increase to the next level on pages 1, 9, 16, 23, 30, 37, 44, 51, 58, 65, 72, 79, 86, 93 and 100.

Respawn anchor

A respawn anchor outputs a signal strength of 0, 3, 7, 11, or 15, depending on the "charged" value.

Sculk sensor

A sculk sensor outputs a signal strength depending on the type of vibration that is detected.

Shelf

A shelf outputs a signal strength of 1, 2, or 4 if an item is in the left, middle, or right slot respectively. Shelves with items in multiple slots sum the signal strengths, up to a total of 7.

Sounds

Generic

Java Edition:

stone sound type [hide]								
Sound	Closed captions	Source	Description	Identifier	Translation key	Volume	Pitch	Attenuation distance
	Block broken	Blocks	Once the block has broken	block.stone.break	subtitles.block.generic.break	1.0	0.8	16
	Block placed	Blocks	When the block is placed	block.stone.place	subtitles.block.generic.place	1.0	0.8	16
	Block breaking	Blocks	While the block is in the process of being broken	block.stone.hit	subtitles.block.generic.hit	0.25	0.5	16
	Something falls on a block	*Entity-Dependent*	Falling on the block with fall damage	block.stone.fall	subtitles.block.generic.fall	0.5	0.75	16
	Footsteps	*Entity-Dependent*	Walking on the block	block.stone.step	subtitles.block.generic.footsteps	0.15	1.0	16

Bedrock Edition:

comparator sound type [hide]							
Sound	Closed captions [*upcoming: BE 26.0*]	Source	Description	Identifier	Translation key [*upcoming: BE 26.0*]	Volume	Pitch
	?	Blocks	Once the block has broken	dig.wood	?	1.0	0.8-1.0
	?	Blocks	When the block is placed	dig.wood	?	1.0	0.8
	?	Blocks	While the block is in the process of being broken	hit.wood	?	0.23	0.5

Unique

Java Edition:

Sounds [hide]								
Sound	Closed captions	Source	Description	Identifier	Translation key	Volume	Pitch	Attenuation distance
	Comparator clicks	Blocks	When a comparator is set to subtraction mode	`block.comparator.click`	`subtitles.block.comparator.click`	0.3	0.55	16
	Comparator clicks	Blocks	When a comparator is set to comparison mode	`block.comparator.click`	`subtitles.block.comparator.click`	0.3	0.5	16

Bedrock Edition:

Sounds [hide]							
Sound	Closed captions [*upcoming: BE 26.0*]	Source	Description	Identifier	Translation key [*upcoming: BE 26.0*]	Volume	Pitch
	?	Blocks	When a comparator is set to subtraction mode	`block.click`	?	0.2	0.55
	?	Blocks	When a comparator is set to comparison mode	`block.click`	?	0.2	0.5

Data values

ID

Java Edition:

Name	Identifier	Form	Translation key [hide]
Redstone Comparator	`comparator`	Block & Item	`block.minecraft.comparator`

Name	Identifier [hide]
Block entity	`comparator`

Bedrock Edition:

Redstone Comparator	Identifier	Numeric ID	Form	Item ID[i 1]	[hide] Translation key
Unpowered block	`unpowered_comparator`	`149`	Block & Ungiveable Item[i 2]	Identical[i 3]	—
Powered block	`powered_comparator`	`150`	Block & Ungiveable Item[i 2]	Identical[i 3]	—
Item	`comparator`	`522`	Item	—	`item.comparator.name`

1. ID of block's direct item form, which is used in savegame files and addons.
2. Unavailable with `/give` command
3. The block's direct item form has the same ID as the block.

Name	Savegame ID [hide]
Block entity	`Comparator`

Block states

See also: Block states

Java Edition:

Name	Default value	Allowed values	Description [hide]

facing	`north`	`east`
		`north`
		`south`
		`west`
			The direction from the *output* side to the *input* side of the comparator,
			or the opposite from the direction the player faces while placing the comparator.

mode	`compare`	`compare` `subtract`	Specifies the current mode of the redstone comparator.
powered	`false`	`false` `true`	True if the redstone comparator is being powered.

Bedrock Edition:

Name	Metadata Bits	Default value	Allowed values	Values for Metadata Bits	Description [hide]

minecraft:cardinal_direction	Not Supported	`south`	`east`
			`north`
			`south`
			`west`
				`Unsupported`	The direction from the *output* side to the *input* side of the comparator, or the opposite from the direction the player faces while placing the comparator.

output_lit_bit	`0x8`	`false`	`false` `true`	`0` `1`	True if the redstone comparator is being powered.
output_subtract_bit	`0x4`	`false`	`false` `true`	`0` `1`	Specifies the current mode of the redstone comparator.

Block data

A redstone comparator has a block entity associated with it that holds additional data about the block.

Java Edition:

See also: Block entity format

Block entity data

Tags common to all block entities

OutputSignal: Represents the strength of the analog signal output of this redstone comparator.

Bedrock Edition:

See Bedrock Edition level format/Block entity format.

Advancements

Icon	Advancement	In-game description	Actual requirements (if different) [hide]
	The Power of Books	Read the power signal of a Chiseled Bookshelf using a Comparator	Place a comparator on any side of a chiseled bookshelf, or the chiseled bookshelf against a comparator with the back of the comparator running into it.

Videos

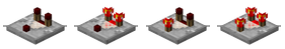
History

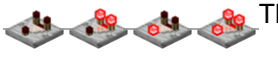
There is an associated page listing all historical changes related to the appearance and/or sounds associated with this block in further detail than below; see /Asset history.
There is an associated technical blocks page for the internal item form of this block; see Technical blocks/Redstone Comparator.

Development

November 24, 2012 (https://youtube.com/watch?v=YG9RNyRhlow&t=6m56s)	Jeb stated that there may be a "capacitor" in Minecraft.
December 27, 2012 (https://twitter.com/Dinnerbone/status/284388625595125760)	Dinnerbone released pictures (https://web.archive.org/web/20190710120115/https://imgur.com/a/FBKed) of the first version of the "comparator", stating it was a replacement for the "capacitor" idea that has variable, alternate inputs.
January 2, 2013 (https://twitter.com/Dinnerbone/status/286428595423965184)	Dinnerbone released one more picture (https://web.archive.org/web/20220330074328/https://media.dinnerbone.com/uploads/2013-01/screenshots/2013-01-02_12.06.47.png) of the comparator. The picture itself showing a digital-to-analog converter, using the comparator as the main block.

Java Edition

Java Edition		[hide]
1.5	**13w01a**	 Added redstone comparators.
		Redstone comparators have 0 delay.
	13w01b	A delay of 1 game tick has now been added to redstone comparators to fix bugs.
		The ability to measure containers to redstone comparators has now been added.
	13w02a	 The appearance of redstone comparators has now been changed - the top texture has changed to show quartz in the middle and the sides now use the smooth stone texture rather than the smooth stone slab side texture.
		The algorithm for measuring containers has now been changed so that redstone comparators output a signal with as few as 1 item in the container.
	13w02b	The algorithm for measuring containers has been changed again, as a result the amount of items corresponding to each signal level is now different (for example, a comparator reading a hopper with 22 items inside now outputs signal strength 1, instead of signal strength 2).
		Redstone comparators now treat large chests as a single container.
		Comparators now always output signal strength 0 when reading chests that cannot be opened because they have a conductive block or a sitting cat above them.
	13w03a	Redstone comparators now output success count of command blocks.
		Redstone comparators now measure container minecarts on detector rails.
	13w04a	Redstone comparators now measure jukeboxes.
	13w05a	Redstone comparators no longer cause constant block updates. The delay has now been made consistent, and side input no longer causes a pulse output.
	13w05b	Redstone comparator delay has now been changed from 1 game tick to 2 game ticks.
	13w09c	The redstone signal strength from a redstone comparator next to a brewing stand with 3 water bottles in it is now the same as one with 3 water bottles and 1 ingredient in it.
1.6.1	**13w18a**	Redstone comparators now measure cauldrons and end portal frames.
1.8	**14w04a**	Redstone comparators now measure item frames.
	14w10a	The torches under redstone comparators have now been shortened, which has changed the underside appearance from  to .
	14w25a	 The torches on comparators are now subject to directional shading.
		Comparators set to subtract mode appear to be powered as well regardless of incoming power. The subtracting-only model still exists and can be achieved through `/setblock`.
	14w25b	 The powered front torch when in subtraction mode is now lower.
		Comparators set to subtract by hand now appear normally again.

	14w28a	Redstone comparators now measure cakes.
1.9	**15w42a**	With the addition of the blaze powder fuel slot, brewing stands now have 5 slots instead of 4. Their original comparative power values from redstone comparators are listed below: **Original values** [show]
	15w46a	Mobs no longer spawn on redstone comparators.
	15w47a	Redstone comparators' side inputs now take power from redstone blocks.[3]
1.11	**16w39a**	Redstone comparators now measure shulker boxes.
1.13	**17w47a**	Redstone comparators now render their underside, which has changed their undersides from  to  .
1.14	**18w43a**	 The textures of redstone comparators have now been changed.
	19w02a	Redstone comparators now measure lecterns.
	19w03a	Redstone comparators now measure composters.
	19w12b	Redstone comparators can now be placed on glass, ice, glowstone and sea lanterns.
1.15	**19w34a**	Redstone comparators now measure how much honey is inside beehives and bee nests.
1.16	**20w06a**	The way to calculate the input signals of redstone comparators has now been changed.
	20w11a	The changes to the way of calculating the input signals of redstone comparators from 20w06a have now been reverted.
	20w16a	Redstone comparators now measure Pigstep music discs in jukeboxes.
1.17	**20w45a**	Redstone comparators now measure lava cauldrons.
	20w46a	Redstone comparators now measure powder snow cauldrons.
1.18	**21w41a**	 The texture of powered redstone comparator have now been changed.
1.19	**22w13a**	Redstone comparators now generate as part of ancient cities.
1.19.3 — Experiment — **Update 1.20**	**22w42a**	Redstone comparators now measure chiseled bookshelves.
1.20.2	**23w33a**	Redstone comparators now use stone sounds instead of wood sounds.[4]
1.20.3	**23w41a**	Redstone comparators now measure decorated pots.
1.20.3 — Experiment — **Update 1.21**	**23w42a**	Redstone comparators now measure crafters.
1.21.2	**24w33a**	 The models for redstone comparators have changed.

1.21.2 — **Experiment** — **Winter Drop**	**pre1**	Comparators connected to creaking hearts now output a signal strength dependent on the distance to the connected creaking.

Bedrock Edition

Pocket Edition Alpha [hide]		
v0.14.0	**build 1**	 [*verify*] Added redstone comparators.
Pocket Edition [hide]		
1.0.0	**alpha 0.17.0.1**	Redstone comparators now measure end portal frames.
1.0.5	**alpha 1.0.5.0**	Redstone comparators now output success count of command blocks.
1.1.0	**alpha 1.1.0.0**	Redstone comparators now measure shulker boxes.
Bedrock Edition [hide]		
1.2.0	**beta 1.2.0.2**	Redstone comparators now measure jukeboxes.
		Redstone comparators now render their underside, which has changed their undersides from  to 
1.10.0	**beta 1.10.0.3**	 The textures of redstone comparators have now been changed.
1.11.0	**beta 1.11.0.1**	Redstone comparators now measure smokers, blast furnaces, lecterns and composters.
1.18.10	**beta 1.18.10.20**	 The texture of powered redstone comparator have now been changed.
1.20.50	**Preview 1.20.50.20**	Redstone comparators now measure decorated pots.
1.20.50 — **Experiment** — **Update 1.21**	**Preview 1.20.50.21**	Redstone comparators now measure crafters.

Legacy Console Edition

Legacy Console Edition [hide]							
Xbox 360	Xbox One	PS3	PS4	PS Vita	Wii U	Switch	
TU19	CU7	1.12	1.12	1.12	Patch 1	1.0.1	 [verify]  Added redstone comparators.
TU31	CU19	1.22	1.22	1.22	Patch 3		Redstone comparators can now measure item frames and cakes.
TU46	CU36	1.38	1.38	1.38	Patch 15		Redstone comparators' side inputs now take power from redstone blocks. [*is this the correct version?*]
TU53	CU43	1.49	1.50	1.49	Patch 23	1.0.3	Redstone comparators now measure shulker boxes.
TU57	CU49	1.57	1.56	1.56	Patch 27	1.0.7	Redstone comparators can now be crafted from granite, andesite, diorite and their polished variants.
			1.90				 [verify]  The textures of redstone comparators have now been changed.
			1.91				Redstone comparators now measure smokers, blast furnaces, lecterns and composters.

New Nintendo 3DS Edition

New Nintendo 3DS Edition [hide]	
0.1.0	 [verify]  Added redstone comparators.

Data history

Java Edition

Java Edition [hide]		
1.5	13w01a	At this point, block ID 149 was used for unpowered comparators, and block ID 150 for powered comparators.
	13w05a	Block 150 (later `powered_comparator`) is no longer used; powered state is now represented by the 8s bit on block 149 (later `unpowered_comparator`).
1.13	17w47a	All 3 IDs for the redstone comparator have now been merged into one ID: `comparator`.
		Prior to *The Flattening*, these blocks' numeral IDs were 149 and 150, and the item's 404.
		As a result, the formerly unused comparator ID is now technically used again, due to both unpowered and powered versions being merged into a single comparator block ID. This can also be analyzed as a removal of the unused ID.

Bedrock Edition

Bedrock Edition [hide]		
1.20.30	**Preview 1.20.30.20**	Redstone comparators now use the `minecraft:cardinal_direction` block state instead of `direction`.

Issues

Issues relating to "Comparator*" are maintained on the bug tracker. Issues should be reported and viewed there (https://bugs.mojang.com/issues/?jql=project%20in%20%28MC%2C%20MCPE%29%20AND%20%28resolution%20is%20EMPTY%20OR%20resolution%20in%20%281%2C%202%2C%206%29%29%20AND%20%28summary%20~%20%22Comparator%2A%22%29%20ORDER%20BY%20resolution%20DESC).

Trivia

- Comparators do not emit redstone particles when powered, unlike redstone torches and repeaters.[5]

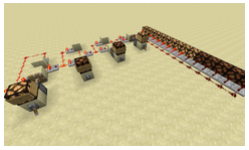
Gallery

Screenshots

Dinnerbone showing how comparators work.

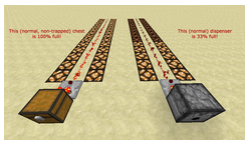
Dinnerbone showing how comparators work.

Dinnerbone showing how comparators work.

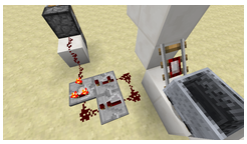


A contraption incorporating comparators.

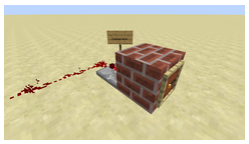
Comparators in action.



Output specific signals.



Another comparator in use.



Rotating the torch in the item frame adjusts the comparator's output.

References

1. MC-64394 — Comparators prefer containers through blocks, except when block power level is 15 — resolved as "Works As Intended".
2. MCPE-138549 — Comparators can read inventories through chains
3. MC-5951
4. MC-182820 — Repeaters and comparators use wood sounds for placing/breaking despite being made mostly of stone — resolved as "Fixed".
5. MC-51692 — Powered comparators do not produce redstone particles — resolved as "Works As Intended".

Navigation

Redstone [hide]

Redstone circuits & tutorials [show]

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

Blocks [hide]

Structural [show]

Ornamental [show]

Natural [show]

Utility [hide]

Interactable	Anvil (Chipped, Damaged), Barrel, Beacon, Brewing Stand, Cartography Table, Chest (Ender, Copper), Crafting Table, Enchanting Table, Furnace (Blast, Smoker), Grindstone, Lectern, Loom, Shulker Box (Dyed), Sign (Hanging), Smithing Table, Stonecutter
Utilizable	Banners (Ominous), Beehive, Beds, Bell, Bookshelf, Cake (with Candle), Campfire (Soul), Cauldron, Chiseled Bookshelf, Composter, Conduit, Copper Golem Statue, Decorated Pot, End Gateway, End Portal, End Portal Frame, Farmland, Fletching Table, Flower Pot, Frosted Ice, Heads (Skeleton, Wither Skeleton, Zombie, Creeper, Piglin, Dragon), Heavy Core, Jukebox, Ladder, Lodestone, Monster Spawner, Nether Portal, Respawn Anchor, Scaffolding, Shelf, Sponge (Wet), Suspicious Gravel, Suspicious Sand, TNT, Trial Spawner (Ominous), Vault (Ominous)
Redstone/ Mechanical	Buttons (Wooden, Stone, Polished Blackstone), Copper Bulb, Crafter, Daylight Detector, Dispenser, Dropper, Doors (Copper, Iron, Wooden), Honey Block, Hopper, Lever, Lightning Rod, Note Block, Observer, Piston (Sticky), Pressure Plates (Wooden, Stone, Polished Blackstone, Heavy Weighted, Light Weighted), Rail (Activator, Detector, Powered), Redstone Lamp

***BE* & *edu* only**	Redstone Wire (Comparator Repeater Torch) Slime Block Target Trapped Chest Trapdoors (Copper Iron Wooden) Fence Gates Tripwire Hook (Tripwire) Allow Border Chalkboard Compound Creator Deny Element Constructor Heat Block Item Frame (Glow) Lab Table Material Reducer Underwater TNT Underwater Torch
Creative or commands only	[show]
Removed	[show]
Unused	[show]
Unimplemented	[show]
Joke	[show]
Extreme metadata variants	[show]

Retrieved from "https://minecraft.wiki/w/Redstone_Comparator?oldid=3344312"