

IISE Transactions L^AT_EX Template

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Abstract



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1 Documentation conventions

..

abbreviations

2 Introduction

explicar los distintos protocolos que se hablaran a continuacion

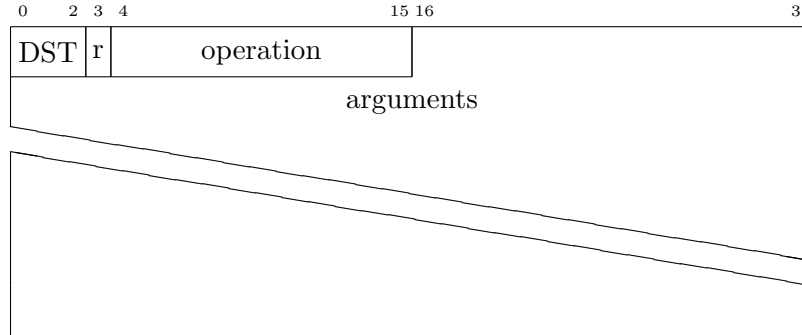


Figure 2.1: Packet structure

2.1 Destiny

explain

reference to the interconnected blocks

DST[2]	DST[1]	DST[0]	Destination
0	0	0	ServerManagerPetition
0	0	1	ServerPetition
0	1	0	ClientConnectorPetition
0	1	1	ClientPetition
1	X	X	<i>Reserved</i>

Table 2.1: DST bits meaning

2.2 Response

Some of the petitions have return objects. Those petitions will return to the sender (Tester-Connector) with the same code, but with a '1' on the Response parameter. In that case, the parameter Destiny now means 'Origin'.

Some petitions have async "returns" (for example: examples). Those will be sent using petitions without return's operations (so, petitions without a mirror petition with a '1' as Response), marked as responses (Response bit at '1').

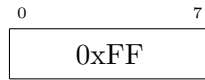


Figure 2.3: True packet with all bits at 1

2.4.4 Float

Floats are 4-bytes floating-point numbers. They are represented following the IEEE 754¹.

2.4.5 String

Strings are arrays of characters. Refer to the respective subsections for more information.

2.4.6 Array

Arrays are a set of n elements of the same type.

The structure is a 2-byte **first (0..7) MSB, then (8..15) LSB** integer (representing the number of elements, n), followed by n elements of the same type. As a note here, by representing the size with a 2-byte integer the maximum number of elements per array is 65,535.

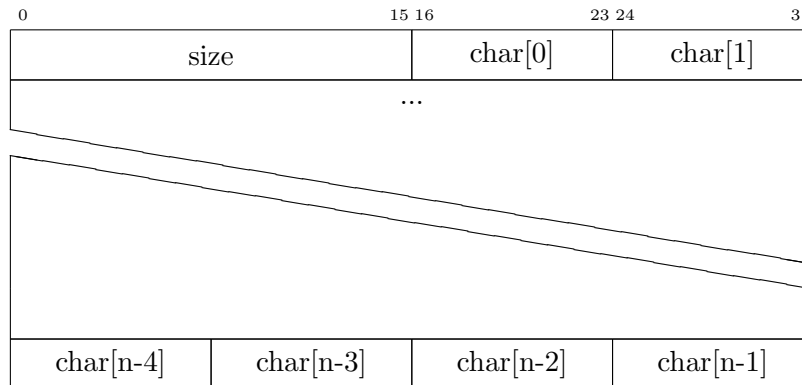


Figure 2.4: Structure of a String

Arrays can be multidimensional, holding n arrays of the same type. It's worth mentioning that they don't have to be arrays of the same length, as can be seen in Figure 2.5, Example of a string array.

¹This standard should be used by C, Java and Python. **cite?**

0		15 16		23 24		31	
2 [number of arrays]			5 [str[0]'s length]				
h		e		l		l	
o		6 [str[1]'s length]				w	
o		r		l		d	
!		next type					

Figure 2.5: Example of a string array

2.4.7 File

Similar to the Array, a File is a name (String), followed by a group of bytes.

The problem here is that if we stick with the Array structure, the maximum size of a file will be around 8kB. To solve this, the File structure implements some kind of 'extended array', that extends the 'size' parameter to 32 bits. That way, the file size restriction by protocol definition² is 4GB.

²Besides defining here what's allowed, remember that this packet will be inside a TCP payload **definition?**. This means that the maximum file size will be probably redefined by the machine's TCP firewalls.

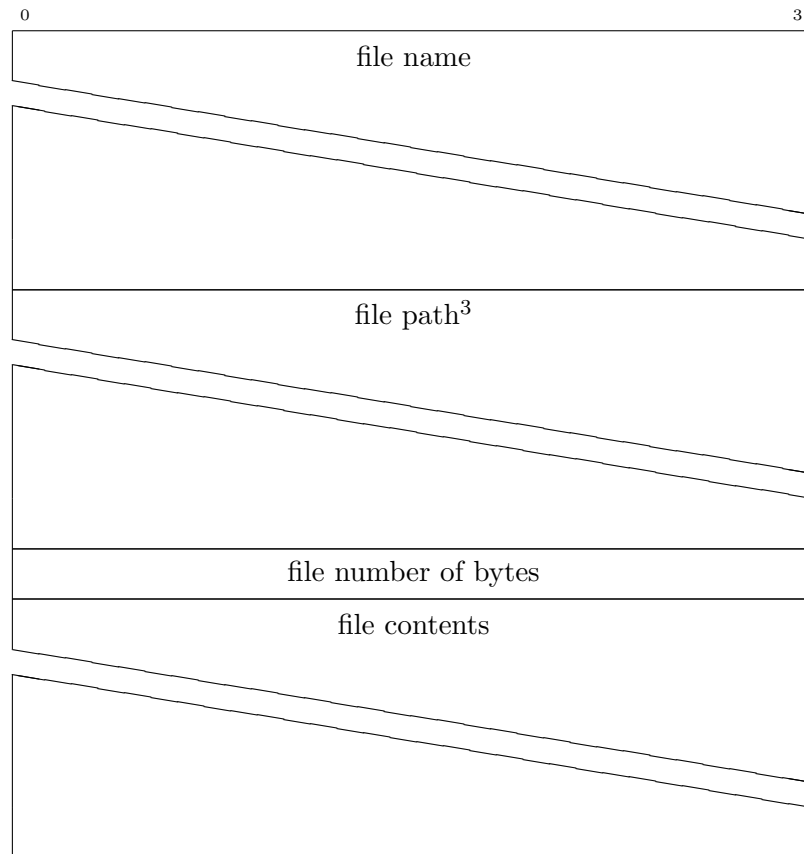


Figure 2.6: File structure

2.4.8 Server type

The Server type specifies the Minecraft server.

As a standard, we only support Spigot (?) and Paper (?), but for scalability reasons this parameter is a String specifying the server type.

2.4.9 Block

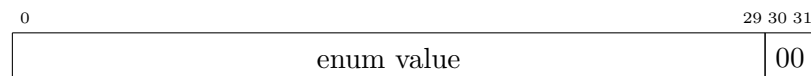


Figure 2.7: Structure of a Block

³The path must be relative, and you can't go outside the Server directory (using '../'). Both " and '../' means the root of the Server directory.

unsigned 4-bytes integer. 2MSB forced at 00 (01, 10 and 11 reserved for Complex/Basic Blocks (if made)), others as Enum value

Enum value	Block name	First Minecraft version
0	AIR	1.8

Table 2.2: Block enum

2.4.10 Item

...

3 Server manager petition

...

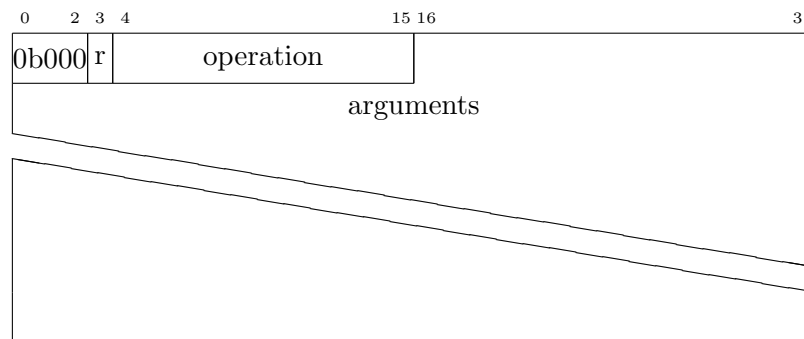


Figure 3.1: Server manager petition structure

Table of operations

You don't have to implement the NOP operation in this destiny block because the timeout happens inside the Server petition block. That is, if you don't call operations (or send NOPs) to the Server petition for a long time, the server will stop, and because the server stopped the Server manager will close the established connection.

3.1 Start server operation

...

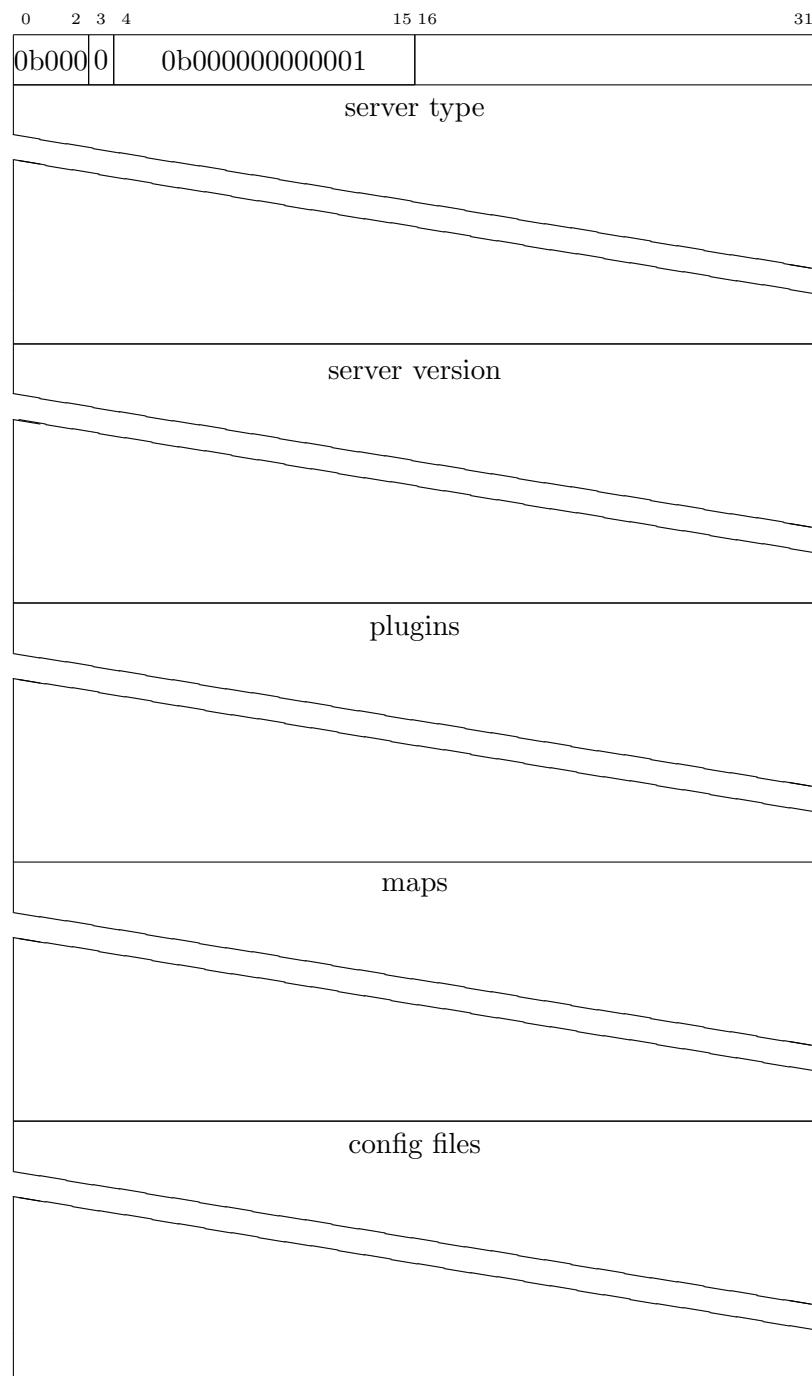


Figure 3.2: Start server petition structure

Once a 'start server' request is received the program should create a server with the specified arguments, and return its IP:Port (for example, '127.0.0.1:25565', a 15-characters string; see Figure 3.3, Start server response structure). The IP to send the Server Petitions is the same, but the next port (IP:<port+1>).

If it's not possible to create it (for example: one argument is invalid, the user sent a plugin when it's specified that only Usual Plugins are allowed **explain**, or there's no free servers of that type), then an empty IP is returned (see Figure 3.4, Start server error response structure).

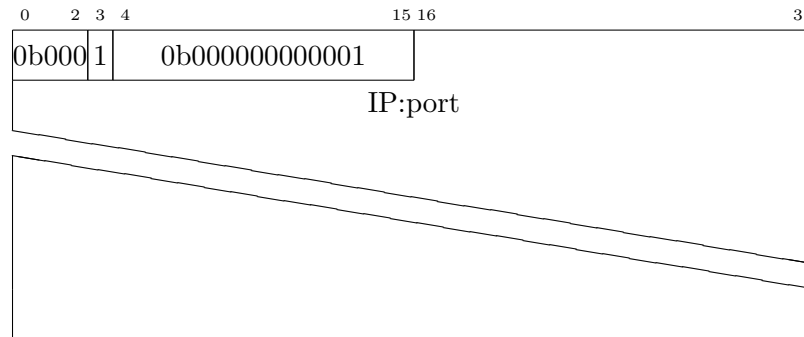


Figure 3.3: Start server response structure

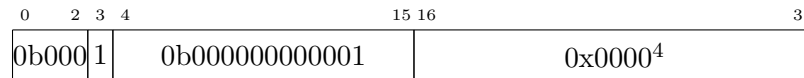


Figure 3.4: Start server error response structure

3.1.1 Maps

Array of maps (worlds; Map[]). To have more information about arrays check the subsection 2.4.6, Array.

About the Map type, Minecraft is divided on different worlds (?). By default there's only three, but with some plugins this number can increase.

In order to properly test some plugins, there may be needed some kind of known place. To avoid overusing the Set block operation **link** you can send using this argument your(s) world(s).

Map in more detail

⁴Being the argument an array, the first 2 bytes specifies its size. As we must return an empty array, the argument should be exactly 16 zeroes.

3.1.2 Plugins

Array of plugins (Plugin[]). To have more information check the subsection 2.4.6, Array.

About the Plugin type, there's three types of plugins:

1. Usual plugins

The Usual plugins are plugins that you expect everyone to have for being extremely common, like WorldGuard (?), or to allow the user to test plugins with Premium plugins⁵ dependencies. This allows both security and performance.

Something to highlight is the fact that, as mentioned in the operation Allows non usual plugins [reference](#), some ServerManager will only allow plugins that are already in the machine.

As can be seen in the Figure 3.5, Usual plugin structure, the first argument (that specifies the Plugin type) is 0x00.

The plugin version is optional, and can't be specified in the parameter *name*. If no version is provided (an empty string) then the Server Manager will pick the plugin with the highest version that is compatible with the desired server version.

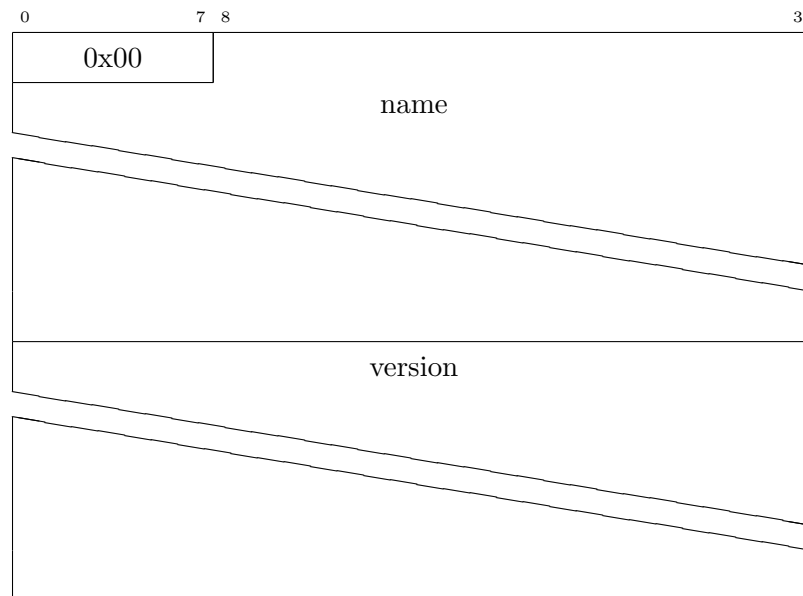


Figure 3.5: Usual plugin structure

⁵Premium plugins are paid plugins. For that reason, only the purchaser can download them (so you can't send a link to the plugin), and sending them through the internet via file upload may not be legal, so the plugin must be already downloaded in the machine.

2. Uploaded plugins

The Uploaded plugins are plugins available in some website, thus can be sent through an URL.

structure?

3. File plugins

File plugins are plugins that are non-usual and aren't uploaded in any website, so they must be sent as a file.

As can be seen in the Figure 3.6, File plugin structure, the first argument (that specifies the Plugin type) is 0x02.

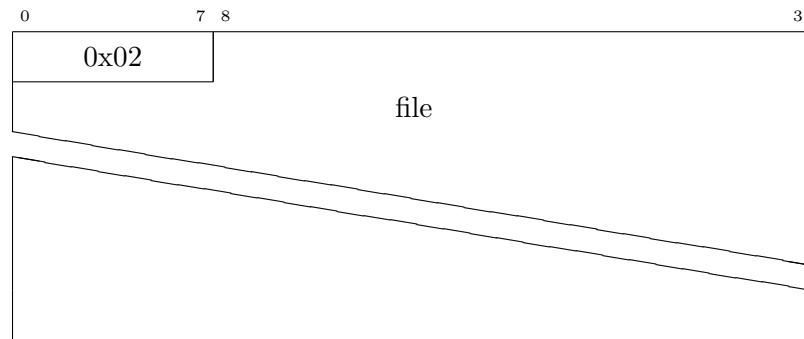


Figure 3.6: File plugin structure

mixed plugin types example?

3.1.3 Server version

String specifying the server type's version. For example, '1.12.2'.

3.1.4 Config files

...

3.2 Server started notification

After a Start server operation the server will start. Due to the unpredictable amount of time that the server takes to start up you'll receive a Server started notification once the server socket is available.

You may notice that there's another Server started notification under the Server petition section. That notification goes to the ServerManager ref?, while this goes to the Tester ref?. Also, the Server one have a token that is only shared between Server and the ServerManager, and the Tester doesn't have to know it too.

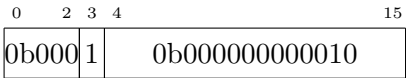


Figure 3.7: Server started notification structure

3.3 Error notification

...

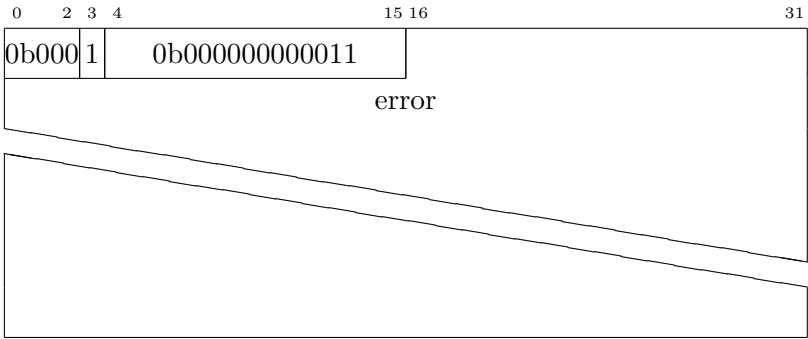


Figure 3.8: Error notification structure

4 Server petition

...

The server petitions are a bit different from the rest. The server petitions are designed in a way that everyone have some common operations, and then you can add some others optionally (and even non-standard ones). We'll define this 'set of operations' as groups.

For that reason, the operation field (defined on the Figure 2.1, Packet structure) becomes the group, and then the operation is defined on the next 2 bytes, as shown in the Figure 4.1, Server petition structure.

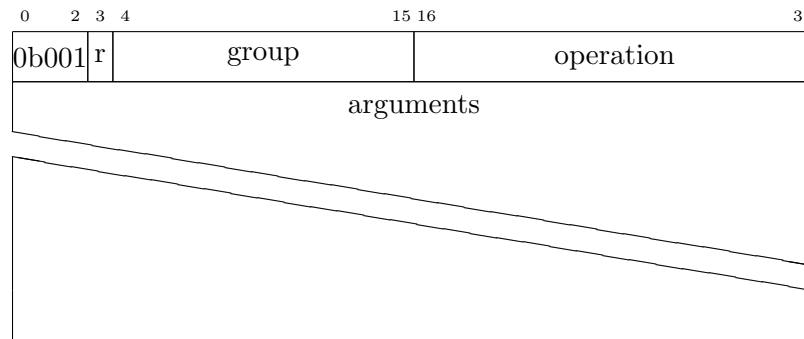


Figure 4.1: Server petition structure

4.1 Server petition group

The group tells which kind of petitions we're talking about.

The MSB **abbreviation?** tells if the group is one of the standards, thus must be followed by specification, or if it's non-standard, so the petition can be whatever the user want it to be. This is useful if you want to implement a petition not followed by the standard, or if the petition only makes sense in your personal environment.

The 0b00000000000001 group represents the 'base group'. This group implements some basic operations, and must be implemented. All the others are optional.

type[15]	type[14..4]	Extended type
0	0b000000000000	NOP ⁶
0	0b000000000001	Base operations
0	0b000000000010	Performance operations
0	0b000000000011	WorldGuard operations
0	0b000000000100	Residence operations
1	XXXXXXXXXXXX	Reserved for internal use

Table 4.1: Extended types

If you’ve implemented an extended type and you believe that it makes sense to be part of the standard contact contact@watchwolf.dev to reserve one of the addresses.

4.2 Server petition operation

Like the parameter Operation, it specifies the desired request. For more information, refer to the subsection 2.3, Operation.

The only reserved operation is the all-zeroes operation (0x0000). It represents the question ‘is this extended petition implemented?’. The server must response (with the response bit at 1) with *true* (group implemented on this machine) or *false* (unknown/unimplemented group), as it can be seen in Figure 4.2, Implemented group response structure.

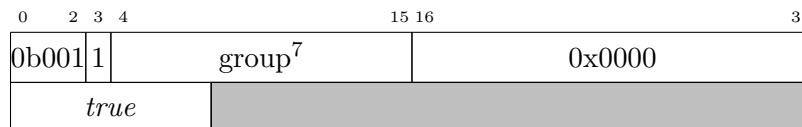


Figure 4.2: Implemented group response structure

4.3 Base operations

...

‘is implemented’ (all zeroes) optional

⁶As stated on the subsection 2.3, Operation, the all-zeroes operation represents a NOP request.

⁷except for groups 0b000000000000 and 0b000000000001

4.3.1 Server stop operation

...

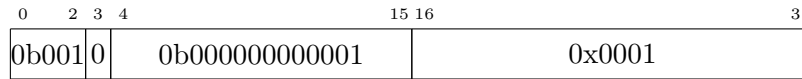


Figure 4.3: Stop server operation structure

4.3.2 Server stopped notification

... response to...

To have more information about the *server id* parameter check the Subsection 4.3.3, Server started notification.

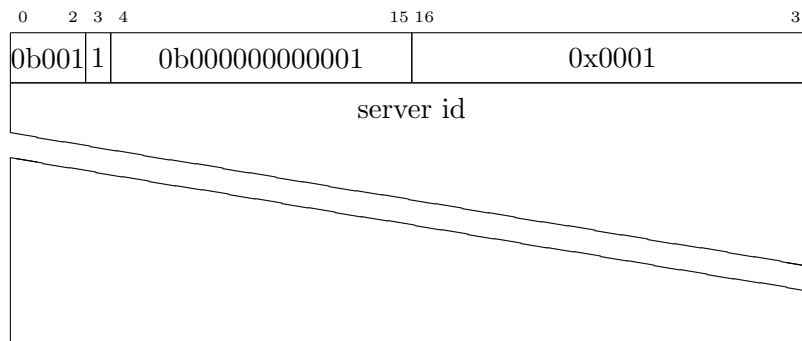


Figure 4.4: Server stopped response structure

4.3.3 Server started notification

This notification is sent to the Server Manager [ref?](#), as a response for the Start server operation, thus not really a response of a Server's operation.

As one IP can have multiple servers, a string that identifies the server must be sent with the response. This argument can be whatever you want (for example, <server ip>:<server port> will be unique), but must be shared between both the Server Manager and the Server. For security reasons [cite IP spoofing or similar](#) (because the Tester [ref?](#) also knows the server's IP and port) a hash function is encouraged to be used.

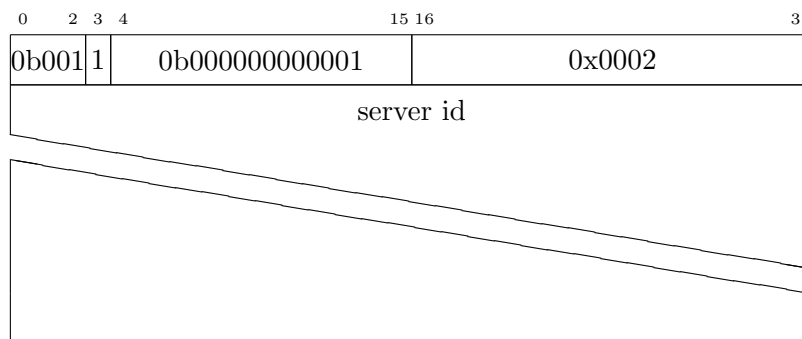


Figure 4.5: Server started response structure

4.3.4 Whitelist player operation

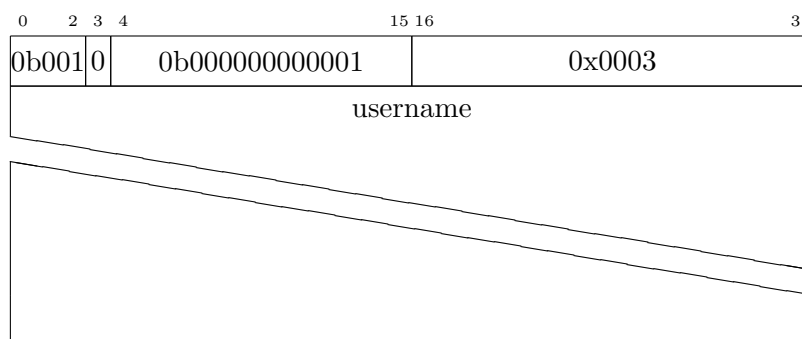


Figure 4.6: Whitelist player operation structure

4.3.5 OP player operation

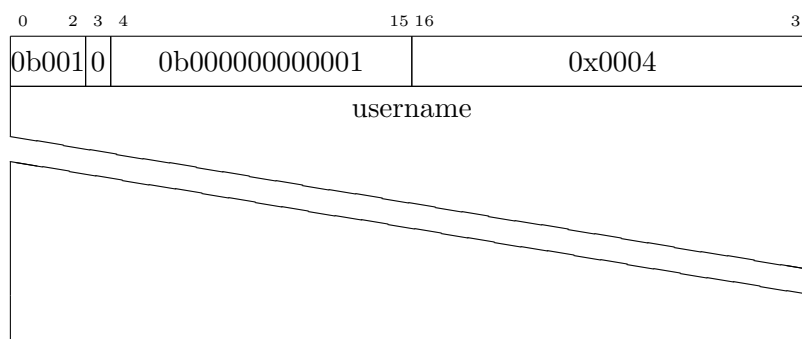


Figure 4.7: OP player operation structure

4.3.6 Error notification



4.4 Performance operations



4.5 WorldGuard operations



4.6 Residence operations



5 ? petition

First-level headings should be in bold.

5.1 *Subsection heading 3.1*

Second-level headings should be in bold italics.

5.1.1 *Sub-subsection heading 3.1.1*

Third-level headings should be in italics.

5.2 *Subsection heading 3.2*

5.3 *Subsection heading 3.3*

6 Revision history

Date	Revision	Changes
date	1	Initial release.

Table 6.1: Revision history

A Blocks

To generate the blocks enum Spigot 1.19 was used. That means that all the block names *should* be the exact same as ?.

A.1 Material modifiers

There's one downside on using Spigot's Material: it doesn't describes perfectly the block. In some aspects it will, for example, distinguish between wood types, but it won't differentiate between a wooden stair and a wooden stair with water.

That's why there's some prefixes and suffixes (that will be discussed in the following subsections) surrounding the original Spigot name, to make every possible Minecraft block combination appear in the block enum. Just to clarify, all the block modifiers has also been extracted from Spigot (all ?'s subinterfaces).

A.1.1 Unused modifiers

There's some Spigot modifiers that beside existing it won't be imported because there aren't a distinguished block in their own. You can find those in Figure A.1, Unused Spigot BlockData's modifiers.

Modifier name	Reason for discarding
has_bottle_X	Inventory dependent
has_record	Inventory dependent
enabled	Adjacent redstone dependent
triggered	Adjacent redstone dependent
instrument	Bottom-block dependent
occupied	Entity dependent
persistent	Admin block
unstable	Admin block
distance	Block dependent
stage	Same block
short	Tick dependent

Modifier name	Reason for discarding
attached	Block dependent
disarmed	Block dependent
power	Block/event dependent
tilt	Entity dependent
can_summon	Admin block
shrieking	Entity dependent
bloom	Admin block
bottom	Bottom-block dependent
has_book	Inventory dependent
sculk_sensor_phase	Admin block
signal_fire	Bottom-block dependent
north=tall	Top-block dependent
south=tall	Top-block dependent
east=tall	Top-block dependent
west=tall	Top-block dependent
hatch	Unable to concatenate
thickness	Block dependent
snowy	Block dependent

Table A.1: Unused Spigot BlockData’s modifiers

In addition to this, some modifiers applied to certain blocks doesn’t change the block itself. Those are mentioned in Figure A.2, Unused Spigot BlockData’s modifiers on certain blocks.

Block name	Modifier name
CAVE_VINES	age
CACTUS	age
FIRE	age
KELP	age
SUGAR_CANE	age

Block name	Modifier name
MANGROVE_PROPAGULE	age
TWISTING_VINES	age
WEeping_VINES	age
ANDESITE_WALL	up
BLACKSTONE_WALL	up
BRICK_WALL	up
COBBLED_DEEPSLATE_WALL	up
COBBLESTONE_WALL	up
DEEPSLATE_BRICK_WALL	up
DEEPSLATE_TILE_WALL	up
DIORITE_WALL	up
END_STONE_BRICK_WALL	up
GRANITE_WALL	up
MOSSY_COBBLESTONE_WALL	up
MOSSY_STONE_BRICK_WALL	up
MUD_BRICK_WALL	up
NETHER_BRICK_WALL	up
POLISHED_BLACKSTONE_BRICK_WALL	up
POLISHED_BLACKSTONE_WALL	up
POLISHED_DEEPSLATE_WALL	up
PRISMARINE_WALL	up
RED_NETHER_BRICK_WALL	up
RED_SANDSTONE_WALL	up
SANDSTONE_WALL	up
STONE_BRICK_WALL	up
ACACIA_DOOR	powered
ACACIA_FENCE_GATE	powered
ACACIA_TRAPDOOR	powered
ACTIVATOR_RAIL	powered
BELL	powered

Block name	Modifier name
BIRCH_DOOR	powered
BIRCH_FENCE_GATE	powered
BIRCH_TRAPDOOR	powered
CRIMSON_DOOR	powered
CRIMSON_FENCE_GATE	powered
CRIMSON_TRAPDOOR	powered
DARK_OAK_DOOR	powered
DARK_OAK_FENCE_GATE	powered
DARK_OAK_TRAPDOOR	powered
IRON_DOOR	powered
IRON_TRAPDOOR	powered
JUNGLE_DOOR	powered
JUNGLE_FENCE_GATE	powered
JUNGLE_TRAPDOOR	powered
LECTERN	powered
MANGROVE_DOOR	powered
MANGROVE_FENCE_GATE	powered
MANGROVE_TRAPDOOR	powered
NOTE_BLOCK	powered
OAK_DOOR	powered
OAK_FENCE_GATE	powered
OAK_TRAPDOOR	powered
POWERED_RAIL	powered
SPRUCE_DOOR	powered
SPRUCE_FENCE_GATE	powered
SPRUCE_TRAPDOOR	powered
TRIPWIRE	powered
WARPED_DOOR	powered
WARPED_FENCE_GATE	powered
WARPED_TRAPDOOR	powered

Block name	Modifier name
------------	---------------

Table A.2: Unused Spigot BlockData’s modifiers on certain blocks

A.1.2 Age

Represents the different growth stages that a crop-like block can go through.

Defaults to 0.

Material	Age range
BEETROOTS	0-3
BAMBOO	0-1
CARROTS	0-7
CHORUS_FLOWER	0/5 ⁸
COCOA	0-2
FROSTED_ICE	0-3
MELON_STEM	0-7
NETHER_WART	0-3
POTATOES	0-7
PUMPKIN_STEM	0-7
SWEET_BERRY_BUSH	0-3
WHEAT	0-7

Table A.3: Ageable materials

A.1.3 Attachment

Denotes how the bell is attached to its block.

Defaults to floor.

⁸The block is the same from age 0 to 4, and it changes in age 5. That’s why age=5 is considered as age=1, and age=0-4 as age=0, as you may notice in Figure A.1, Modifier concatenation.

Material	Options
BELL	ceiling/double_wall/floor/single_wall

Table A.4: Attachable materials

A.1.4 Axis

Represents the axis along whilst this block is oriented.

Except for NETHER_PORTAL (which defaults to x), it defaults to y.

Material	Age range
NETHER_PORTAL	x/z
ACACIA_LOG	x/y/z
ACACIA_WOOD	x/y/z
BASALT	x/y/z
BIRCH_LOG	x/y/z
BIRCH_WOOD	x/y/z
BONE_BLOCK	x/y/z
CHAIN	x/y/z
CRIMSON_HYPHAE	x/y/z
CRIMSON_STEM	x/y/z
DARK_OAK_LOG	x/y/z
DARK_OAK_WOOD	x/y/z
DEEPSLATE	x/y/z
HAY_BLOCK	x/y/z
INFESTED_DEEPSLATE	x/y/z
JUNGLE_LOG	x/y/z
JUNGLE_WOOD	x/y/z
MANGROVE_LOG	x/y/z
MANGROVE_WOOD	x/y/z
MUDDY_MANGROVE_ROOTS	x/y/z
OAK_LOG	x/y/z
OAK_WOOD	x/y/z

Material	Age range
OCHRE_FROGLIGHT	x/y/z
PEARLESCENT_FROGLIGHT	x/y/z
POLISHED_BASALT	x/y/z
PURPUR_PILLAR	x/y/z
QUARTZ_PILLAR	x/y/z
SPRUCE_LOG	x/y/z
SPRUCE_WOOD	x/y/z
STRIPPED_ACACIA_LOG	x/y/z
STRIPPED_ACACIA_WOOD	x/y/z
STRIPPED_BIRCH_LOG	x/y/z
STRIPPED_BIRCH_WOOD	x/y/z
STRIPPED_CRIMSON_HYPHAE	x/y/z
STRIPPED_CRIMSON_STEM	x/y/z
STRIPPED_DARK_OAK_LOG	x/y/z
STRIPPED_DARK_OAK_WOOD	x/y/z
STRIPPED_JUNGLE_LOG	x/y/z
STRIPPED_JUNGLE_WOOD	x/y/z
STRIPPED_MANGROVE_LOG	x/y/z
STRIPPED_MANGROVE_WOOD	x/y/z
STRIPPED_OAK_LOG	x/y/z
STRIPPED_OAK_WOOD	x/y/z
STRIPPED_SPRUCE_LOG	x/y/z
STRIPPED_SPRUCE_WOOD	x/y/z
STRIPPED_WARPED_HYPHAE	x/y/z
STRIPPED_WARPED_STEM	x/y/z
VERDANT_FROGLIGHT	x/y/z
WARPED_HYPHAE	x/y/z
WARPED_STEM	x/y/z

Table A.5: Orientable materials

A.1.5 Berries

Indicates whether the block has berries.

Defaults to false.

Material	Values
CAVE_VINES	true/false
CAVE_VINES_PLANT	true/false

Table A.6: Materials with berries

A.1.6 Bites

Represents the amount of bites which have been taken from this slice of cake.

Defaults to 0.

Material	Values
CAKE	0-6

Table A.7: Cake

A.1.7 Candles

Represents the number of candles which are present.

Defaults to 1.

Material	Values
BLACK_CANDLE	1-4
BLUE_CANDLE	1-4
BROWN_CANDLE	1-4
CANDLE	1-4
CYAN_CANDLE	1-4
GRAY_CANDLE	1-4
GREEN_CANDLE	1-4
LIGHT_BLUE_CANDLE	1-4
LIGHT_GRAY_CANDLE	1-4
LIME_CANDLE	1-4

Material	Values
MAGENTA_CANDLE	1-4
ORANGE_CANDLE	1-4
PINK_CANDLE	1-4
PURPLE_CANDLE	1-4
RED_CANDLE	1-4
WHITE_CANDLE	1-4
YELLOW_CANDLE	1-4

Table A.8: Materials with candles

A.1.8 Charges

Represents the amount of times the anchor may still be used.

Defaults to 0.

Material	Values
RESPAWN_ANCHOR	0-4

Table A.9: Charged materials

A.1.9 Conditional

Denotes whether this command block is conditional or not.

Defaults to false.

Material	Values
CHAIN_COMMAND_BLOCK	true/false
COMMAND_BLOCK	true/false
REPEATING_COMMAND_BLOCK	true/false

Table A.10: Conditionable materials

A.1.10 Delay

Propagation delay of a repeater.

Defaults to 1.

Material	Values
REPEATER	1-4

Table A.11: Delayable materials

A.1.11 Down

Set which faces of the block textures are displayed on.

Except for BROWN_MUSHROOM_BLOCK, MUSHROOM_STEM and RED_MUSHROOM_BLOCK (which defaults to true), it defaults to false.

Material	Values
CHORUS_PLANT	true/false
GLOW_LICHEN	true/false
SCULK_VEIN	true/false
BROWN_MUSHROOM_BLOCK	true/false
MUSHROOM_STEM	true/false
RED_MUSHROOM_BLOCK	true/false

Table A.12: Materials with down option

A.1.12 North, South, East and West

Set which faces of the block textures are displayed on.

As the *tall* option is unused (check Table A.1, Unused Spigot BlockData's modifiers), *none* and *low* will be considered as *false* and *true*, respectively.

Material	Options (default on bold)
ACACIA_FENCE	true/ false
BIRCH_FENCE	true/ false
BLACK_STAINED_GLASS_PANE	true/ false
BLUE_STAINED_GLASS_PANE	true/ false
BROWN_STAINED_GLASS_PANE	true/ false

Material	Options (default on bold)
CHORUS_PLANT	true/ false
CRIMSON_FENCE	true/ false
CYAN_STAINED_GLASS_PANE	true/ false
DARK_OAK_FENCE	true/ false
FIRE	true/ false
GLASS_PANE	true/ false
GLOW_LICHEN	true/ false
GRAY_STAINED_GLASS_PANE	true/ false
GREEN_STAINED_GLASS_PANE	true/ false
IRON_BARS	true/ false
JUNGLE_FENCE	true/ false
LIGHT_BLUE_STAINED_GLASS_PANE	true/ false
LIGHT_GRAY_STAINED_GLASS_PANE	true/ false
LIME_STAINED_GLASS_PANE	true/ false
MAGENTA_STAINED_GLASS_PANE	true/ false
MANGROVE_FENCE	true/ false
NETHER_BRICK_FENCE	true/ false
OAK_FENCE	true/ false
ORANGE_STAINED_GLASS_PANE	true/ false
PINK_STAINED_GLASS_PANE	true/ false
PURPLE_STAINED_GLASS_PANE	true/ false
RED_STAINED_GLASS_PANE	true/ false
SCULK_VEIN	true/ false
SPRUCE_FENCE	true/ false
TRIPWIRE	true/ false
VINE	true/ false
WARPED_FENCE	true/ false
WHITE_STAINED_GLASS_PANE	true/ false
YELLOW_STAINED_GLASS_PANE	true/ false
BROWN_MUSHROOM_BLOCK	true /false

Material	Options (default on bold)
MUSHROOM_STEM	true /false
RED_MUSHROOM_BLOCK	true /false
ANDESITE_WALL	none /low/tall
BLACKSTONE_WALL	none /low/tall
BRICK_WALL	none /low/tall
COBBLED_DEEPSLATE_WALL	none /low/tall
COBBLESTONE_WALL	none /low/tall
DEEPSLATE_BRICK_WALL	none /low/tall
DEEPSLATE_TILE_WALL	none /low/tall
DIORITE_WALL	none /low/tall
END_STONE_BRICK_WALL	none /low/tall
GRANITE_WALL	none /low/tall
MOSSY_COBBLESTONE_WALL	none /low/tall
MOSSY_STONE_BRICK_WALL	none /low/tall
MUD_BRICK_WALL	none /low/tall
NETHER_BRICK_WALL	none /low/tall
POLISHED_BLACKSTONE_BRICK_WALL	none /low/tall
POLISHED_BLACKSTONE_WALL	none /low/tall
POLISHED_DEEPSLATE_WALL	none /low/tall
PRISMARINE_WALL	none /low/tall
REDSTONE_WIRE	none /low/tall
RED_NETHER_BRICK_WALL	none /low/tall
RED_SANDSTONE_WALL	none /low/tall
SANDSTONE_WALL	none /low/tall
STONE_BRICK_WALL	none /low/tall

Table A.13: Orientable materials

A.1.13 Up

Set which faces of the block textures are displayed on.

Except for CHORUS_PLANT, FIRE, GLOW_LICHEN, SCULK_VEIN and VINE (which defaults to false), it defaults to true.

Material	Options
CHORUS_PLANT	true/false
FIRE	true/false
GLOW_LICHEN	true/false
SCULK_VEIN	true/false
VINE	true/false
BROWN_MUSHROOM_BLOCK	true/false
MUSHROOM_STEM	true/false
RED_MUSHROOM_BLOCK	true/false

Table A.14: Materials with up option

A.1.14 Eggs

Number of eggs which appear in the block.

Defaults to 1.

Material	Values
TURTLE_EGG	1-4

Table A.15: Materials with eggs

A.1.15 Extended

Denotes whether the piston head is currently extended or not.

Defaults to false.

Material	Values
PISTON	true/false
STICKY_PISTON	true/false

Table A.16: Extendable materials

A.1.16 Eye

Defaults to false.

Material	Values
END_PORTAL_FRAME	true/false

Table A.17: Materials with eye

A.1.17 Face

Represents the face to which a lever or button is stuck.

Defaults to wall.

Material	Directions
ACACIA_BUTTON	wall/floor/ceiling
BIRCH_BUTTON	wall/floor/ceiling
CRIMSON_BUTTON	wall/floor/ceiling
DARK_OAK_BUTTON	wall/floor/ceiling
GRINDSTONE	wall/floor/ceiling
JUNGLE_BUTTON	wall/floor/ceiling
LEVER	wall/floor/ceiling
MANGROVE_BUTTON	wall/floor/ceiling
OAK_BUTTON	wall/floor/ceiling
POLISHED_BLACKSTONE_BUTTON	wall/floor/ceiling
SPRUCE_BUTTON	wall/floor/ceiling
STONE_BUTTON	wall/floor/ceiling
WARPED_BUTTON	wall/floor/ceiling

Table A.18: Directional materials

A.1.18 Facing

Represents the face towards which the block is pointing.

Material	Options (default on bold)
HOPPER	down /north/south/east/west
OBSERVER	up/down/north/ south /east/west
BARREL	up/down/ north /south/east/west
CHAIN_COMMAND_BLOCK	up/down/ north /south/east/west
COMMAND_BLOCK	up/down/ north /south/east/west
DISPENSER	up/down/ north /south/east/west
DROPPER	up/down/ north /south/east/west
PISTON	up/down/ north /south/east/west
PISTON_HEAD	up/down/ north /south/east/west
REPEATING_COMMAND_BLOCK	up/down/ north /south/east/west
STICKY_PISTON	up/down/ north /south/east/west
ACACIA_BUTTON	north /south/east/west
ACACIA_DOOR	north /south/east/west
ACACIA_FENCE_GATE	north /south/east/west
ACACIA_STAIRS	north /south/east/west
ACACIA_TRAPDOOR	north /south/east/west
ACACIA_WALL_SIGN	north /south/east/west
ANDESITE_STAIRS	north /south/east/west
ANVIL	north /south/east/west
ATTACHED_MELON_STEM	north /south/east/west
ATTACHED_PUMPKIN_STEM	north /south/east/west
BEEHIVE	north /south/east/west
BEE_NEST	north /south/east/west
BELL	north /south/east/west
BIG_DRIPLEAF	north /south/east/west
BIG_DRIPLEAF_STEM	north /south/east/west
BIRCH_BUTTON	north /south/east/west
BIRCH_DOOR	north /south/east/west
BIRCH_FENCE_GATE	north /south/east/west
BIRCH_STAIRS	north /south/east/west

Material	Options (default on bold)
BIRCH_TRAPDOOR	north /south/east/west
BIRCH_WALL_SIGN	north /south/east/west
BLACKSTONE_STAIRS	north /south/east/west
BLACK_BED	north /south/east/west
BLACK_GLAZED_TERRACOTTA	north /south/east/west
BLACK_WALL_BANNER	north /south/east/west
BLAST_FURNACE	north /south/east/west
BLUE_BED	north /south/east/west
BLUE_GLAZED_TERRACOTTA	north /south/east/west
BLUE_WALL_BANNER	north /south/east/west
BRAIN_CORAL_WALL_FAN	north /south/east/west
BRICK_STAIRS	north /south/east/west
BROWN_BED	north /south/east/west
BROWN_GLAZED_TERRACOTTA	north /south/east/west
BROWN_WALL_BANNER	north /south/east/west
BUBBLE_CORAL_WALL_FAN	north /south/east/west
CAMPFIRE	north /south/east/west
CARVED_PUMPKIN	north /south/east/west
CHEST	north /south/east/west
CHIPPED_ANVIL	north /south/east/west
COBBLED_DEEPSLATE_STAIRS	north /south/east/west
COBBLESTONE_STAIRS	north /south/east/west
COCOA	north /south/east/west
COMPARATOR	north /south/east/west
CREEPER_WALL_HEAD	north /south/east/west
CRIMSON_BUTTON	north /south/east/west
CRIMSON_DOOR	north /south/east/west
CRIMSON_FENCE_GATE	north /south/east/west
CRIMSON_STAIRS	north /south/east/west
CRIMSON_TRAPDOOR	north /south/east/west

Material	Options (default on bold)
CRIMSON_WALL_SIGN	north /south/east/west
CUT_COPPER_STAIRS	north /south/east/west
CYAN_BED	north /south/east/west
CYAN_GLAZED_TERRACOTTA	north /south/east/west
CYAN_WALL_BANNER	north /south/east/west
DAMAGED_ANVIL	north /south/east/west
DARK_OAK_BUTTON	north /south/east/west
DARK_OAK_DOOR	north /south/east/west
DARK_OAK_FENCE_GATE	north /south/east/west
DARK_OAK_STAIRS	north /south/east/west
DARK_OAK_TRAPDOOR	north /south/east/west
DARK_OAK_WALL_SIGN	north /south/east/west
DARK_PRISMARINE_STAIRS	north /south/east/west
DEAD_BRAIN_CORAL_WALL_FAN	north /south/east/west
DEAD_BUBBLE_CORAL_WALL_FAN	north /south/east/west
DEAD_FIRE_CORAL_WALL_FAN	north /south/east/west
DEAD_HORN_CORAL_WALL_FAN	north /south/east/west
DEAD_TUBE_CORAL_WALL_FAN	north /south/east/west
DEEPSLATE_BRICK_STAIRS	north /south/east/west
DEEPSLATE_TILE_STAIRS	north /south/east/west
DIORITE_STAIRS	north /south/east/west
DRAGON_WALL_HEAD	north /south/east/west
ENDER_CHEST	north /south/east/west
END_PORTAL_FRAME	north /south/east/west
END_STONE_BRICK_STAIRS	north /south/east/west
EXPOSED_CUT_COPPER_STAIRS	north /south/east/west
FIRE_CORAL_WALL_FAN	north /south/east/west
FURNACE	north /south/east/west
GRANITE_STAIRS	north /south/east/west
GRAY_BED	north /south/east/west

Material	Options (default on bold)
GRAY_GLAZED_TERRACOTTA	north /south/east/west
GRAY_WALL_BANNER	north /south/east/west
GREEN_BED	north /south/east/west
GREEN_GLAZED_TERRACOTTA	north /south/east/west
GREEN_WALL_BANNER	north /south/east/west
GRINDSTONE	north /south/east/west
HORN_CORAL_WALL_FAN	north /south/east/west
IRON_DOOR	north /south/east/west
IRON_TRAPDOOR	north /south/east/west
JACK_O_LANTERN	north /south/east/west
JUNGLE_BUTTON	north /south/east/west
JUNGLE_DOOR	north /south/east/west
JUNGLE_FENCE_GATE	north /south/east/west
JUNGLE_STAIRS	north /south/east/west
JUNGLE_TRAPDOOR	north /south/east/west
JUNGLE_WALL_SIGN	north /south/east/west
LADDER	north /south/east/west
LECTERN	north /south/east/west
LEVER	north /south/east/west
LIGHT_BLUE_BED	north /south/east/west
LIGHT_BLUE_GLAZED_TERRACOTTA	north /south/east/west
LIGHT_BLUE_WALL_BANNER	north /south/east/west
LIGHT_GRAY_BED	north /south/east/west
LIGHT_GRAY_GLAZED_TERRACOTTA	north /south/east/west
LIGHT_GRAY_WALL_BANNER	north /south/east/west
LIME_BED	north /south/east/west
LIME_GLAZED_TERRACOTTA	north /south/east/west
LIME_WALL_BANNER	north /south/east/west
LOOM	north /south/east/west
MAGENTA_BED	north /south/east/west

Material	Options (default on bold)
MAGENTA_GLAZED_TERRACOTTA	north /south/east/west
MAGENTA_WALL_BANNER	north /south/east/west
MANGROVE_BUTTON	north /south/east/west
MANGROVE_DOOR	north /south/east/west
MANGROVE_FENCE_GATE	north /south/east/west
MANGROVE_STAIRS	north /south/east/west
MANGROVE_TRAPDOOR	north /south/east/west
MANGROVE_WALL_SIGN	north /south/east/west
MOSSY_COBBLESTONE_STAIRS	north /south/east/west
MOSSY_STONE_BRICK_STAIRS	north /south/east/west
MUD_BRICK_STAIRS	north /south/east/west
NETHER_BRICK_STAIRS	north /south/east/west
OAK_BUTTON	north /south/east/west
OAK_DOOR	north /south/east/west
OAK_FENCE_GATE	north /south/east/west
OAK_STAIRS	north /south/east/west
OAK_TRAPDOOR	north /south/east/west
OAK_WALL_SIGN	north /south/east/west
ORANGE_BED	north /south/east/west
ORANGE_GLAZED_TERRACOTTA	north /south/east/west
ORANGE_WALL_BANNER	north /south/east/west
OXIDIZED_CUT_COPPER_STAIRS	north /south/east/west
PINK_BED	north /south/east/west
PINK_GLAZED_TERRACOTTA	north /south/east/west
PINK_WALL_BANNER	north /south/east/west
PLAYER_WALL_HEAD	north /south/east/west
POLISHED_ANDESITE_STAIRS	north /south/east/west
POLISHED_BLACKSTONE_BRICK_STAIRS	north /south/east/west
POLISHED_BLACKSTONE_BUTTON	north /south/east/west
POLISHED_BLACKSTONE_STAIRS	north /south/east/west

Material	Options (default on bold)
POLISHED_DEEPSLATE_STAIRS	north /south/east/west
POLISHED_DIORITE_STAIRS	north /south/east/west
POLISHED_GRANITE_STAIRS	north /south/east/west
PRISMARINE_BRICK_STAIRS	north /south/east/west
PRISMARINE_STAIRS	north /south/east/west
PURPLE_BED	north /south/east/west
PURPLE_GLAZED_TERRACOTTA	north /south/east/west
PURPLE_WALL_BANNER	north /south/east/west
PURPUR_STAIRS	north /south/east/west
QUARTZ_STAIRS	north /south/east/west
REDSTONE_WALL_TORCH	north /south/east/west
RED_BED	north /south/east/west
RED_GLAZED_TERRACOTTA	north /south/east/west
RED_NETHER_BRICK_STAIRS	north /south/east/west
RED_SANDSTONE_STAIRS	north /south/east/west
RED_WALL_BANNER	north /south/east/west
REPEATER	north /south/east/west
SANDSTONE_STAIRS	north /south/east/west
SKELETON_WALL_SKULL	north /south/east/west
SMALL_DRIPLEAF	north /south/east/west
SMOKER	north /south/east/west
SMOOTH_QUARTZ_STAIRS	north /south/east/west
SMOOTH_RED_SANDSTONE_STAIRS	north /south/east/west
SMOOTH_SANDSTONE_STAIRS	north /south/east/west
SOUL_CAMPFIRE	north /south/east/west
SOUL_WALL_TORCH	north /south/east/west
SPRUCE_BUTTON	north /south/east/west
SPRUCE_DOOR	north /south/east/west
SPRUCE_FENCE_GATE	north /south/east/west
SPRUCE_STAIRS	north /south/east/west

Material	Options (default on bold)
SPRUCE_TRAPDOOR	north /south/east/west
SPRUCE_WALL_SIGN	north /south/east/west
STONECUTTER	north /south/east/west
STONE_BRICK_STAIRS	north /south/east/west
STONE_BUTTON	north /south/east/west
STONE_STAIRS	north /south/east/west
TRAPPED_CHEST	north /south/east/west
TRIPWIRE_HOOK	north /south/east/west
TUBE_CORAL_WALL_FAN	north /south/east/west
WALL_TORCH	north /south/east/west
WARPED_BUTTON	north /south/east/west
WARPED_DOOR	north /south/east/west
WARPED_FENCE_GATE	north /south/east/west
WARPED_STAIRS	north /south/east/west
WARPED_TRAPDOOR	north /south/east/west
WARPED_WALL_SIGN	north /south/east/west
WAXED_CUT_COPPER_STAIRS	north /south/east/west
WAXED_EXPOSED_CUT_COPPER_STAIRS	north /south/east/west
WAXED_OXIDIZED_CUT_COPPER_STAIRS	north /south/east/west
WAXED_WEATHERED_CUT_COPPER_STAIRS	north /south/east/west
WEATHERED_CUT_COPPER_STAIRS	north /south/east/west
WHITE_BED	north /south/east/west
WHITE_GLAZED_TERRACOTTA	north /south/east/west
WHITE_WALL_BANNER	north /south/east/west
WITHER_SKELETON_WALL_SKULL	north /south/east/west
YELLOW_BED	north /south/east/west
YELLOW_GLAZED_TERRACOTTA	north /south/east/west
YELLOW_WALL_BANNER	north /south/east/west
ZOMBIE_WALL_HEAD	north /south/east/west
AMETHYST_CLUSTER	up /down/north/south/east/west

Material	Options (default on bold)
BLACK_SHULKER_BOX	up /down/north/south/east/west
BLUE_SHULKER_BOX	up /down/north/south/east/west
BROWN_SHULKER_BOX	up /down/north/south/east/west
CYAN_SHULKER_BOX	up /down/north/south/east/west
END_ROD	up /down/north/south/east/west
GRAY_SHULKER_BOX	up /down/north/south/east/west
GREEN_SHULKER_BOX	up /down/north/south/east/west
LARGE_AMETHYST_BUD	up /down/north/south/east/west
LIGHTNING_ROD	up /down/north/south/east/west
LIGHT_BLUE_SHULKER_BOX	up /down/north/south/east/west
LIGHT_GRAY_SHULKER_BOX	up /down/north/south/east/west
LIME_SHULKER_BOX	up /down/north/south/east/west
MAGENTA_SHULKER_BOX	up /down/north/south/east/west
MEDIUM_AMETHYST_BUD	up /down/north/south/east/west
ORANGE_SHULKER_BOX	up /down/north/south/east/west
PINK_SHULKER_BOX	up /down/north/south/east/west
PURPLE_SHULKER_BOX	up /down/north/south/east/west
RED_SHULKER_BOX	up /down/north/south/east/west
SHULKER_BOX	up /down/north/south/east/west
SMALL_AMETHYST_BUD	up /down/north/south/east/west
WHITE_SHULKER_BOX	up /down/north/south/east/west
YELLOW_SHULKER_BOX	up /down/north/south/east/west

Table A.19: Directional materials

A.1.19 Half

Denotes which half of a two block tall material this block is.

Material	Options (default on bold)
ACACIA_STAIRS	bottom /top

Material	Options (default on bold)
ACACIA_TRAPDOOR	bottom /top
ANDESITE_STAIRS	bottom /top
BIRCH_STAIRS	bottom /top
BIRCH_TRAPDOOR	bottom /top
BLACKSTONE_STAIRS	bottom /top
BRICK_STAIRS	bottom /top
COBBLED_DEEPSLATE_STAIRS	bottom /top
COBBLESTONE_STAIRS	bottom /top
CRIMSON_STAIRS	bottom /top
CRIMSON_TRAPDOOR	bottom /top
CUT_COPPER_STAIRS	bottom /top
DARK_OAK_STAIRS	bottom /top
DARK_OAK_TRAPDOOR	bottom /top
DARK_PRISMARINE_STAIRS	bottom /top
DEEPSLATE_BRICK_STAIRS	bottom /top
DEEPSLATE_TILE_STAIRS	bottom /top
DIORITE_STAIRS	bottom /top
END_STONE_BRICK_STAIRS	bottom /top
EXPOSED_CUT_COPPER_STAIRS	bottom /top
GRANITE_STAIRS	bottom /top
IRON_TRAPDOOR	bottom /top
JUNGLE_STAIRS	bottom /top
JUNGLE_TRAPDOOR	bottom /top
MANGROVE_STAIRS	bottom /top
MANGROVE_TRAPDOOR	bottom /top
MOSSY_COBBLESTONE_STAIRS	bottom /top
MOSSY_STONE_BRICK_STAIRS	bottom /top
MUD_BRICK_STAIRS	bottom /top
NETHER_BRICK_STAIRS	bottom /top
OAK_STAIRS	bottom /top

Material	Options (default on bold)
OAK_TRAPDOOR	bottom /top
OXIDIZED_CUT_COPPER_STAIRS	bottom /top
POLISHED_ANDESITE_STAIRS	bottom /top
POLISHED_BLACKSTONE_BRICK_STAIRS	bottom /top
POLISHED_BLACKSTONE_STAIRS	bottom /top
POLISHED_DEEPSLATE_STAIRS	bottom /top
POLISHED_DIORITE_STAIRS	bottom /top
POLISHED_GRANITE_STAIRS	bottom /top
PRISMARINE_BRICK_STAIRS	bottom /top
PRISMARINE_STAIRS	bottom /top
PURPUR_STAIRS	bottom /top
QUARTZ_STAIRS	bottom /top
RED_NETHER_BRICK_STAIRS	bottom /top
RED_SANDSTONE_STAIRS	bottom /top
SANDSTONE_STAIRS	bottom /top
SMOOTH_QUARTZ_STAIRS	bottom /top
SMOOTH_RED_SANDSTONE_STAIRS	bottom /top
SMOOTH_SANDSTONE_STAIRS	bottom /top
SPRUCE_STAIRS	bottom /top
SPRUCE_TRAPDOOR	bottom /top
STONE_BRICK_STAIRS	bottom /top
STONE_STAIRS	bottom /top
WARPED_STAIRS	bottom /top
WARPED_TRAPDOOR	bottom /top
WAXED_CUT_COPPER_STAIRS	bottom /top
WAXED_EXPOSED_CUT_COPPER_STAIRS	bottom /top
WAXED_OXIDIZED_CUT_COPPER_STAIRS	bottom /top
WAXED_WEATHERED_CUT_COPPER_STAIRS	bottom /top
WEATHERED_CUT_COPPER_STAIRS	bottom /top
ACACIA_DOOR	lower /upper

Material	Options (default on bold)
BIRCH_DOOR	lower /upper
CRIMSON_DOOR	lower /upper
DARK_OAK_DOOR	lower /upper
IRON_DOOR	lower /upper
JUNGLE_DOOR	lower /upper
LARGE_FERN	lower /upper
LILAC	lower /upper
MANGROVE_DOOR	lower /upper
OAK_DOOR	lower /upper
PEONY	lower /upper
ROSE_BUSH	lower /upper
SMALL_DRIPLEAF	lower /upper
SPRUCE_DOOR	lower /upper
SUNFLOWER	lower /upper
TALL_GRASS	lower /upper
TALL_SEAGRASS	lower /upper
WARPED_DOOR	lower /upper

Table A.20: Two-blocks materials

A.1.20 Hanging

Denotes whether the block is hanging.

Defaults to false.

Material	Values
LANTERN	true/false
MANGROVE_PROPAGULE	true/false
SOUL_LANTERN	true/false

Table A.21: Hangable materials

A.1.21 Hinge

Indicates which hinge this door is attached to and will rotate around when opened.

Defaults to left.

Material	Options
ACACIA_DOOR	left/right
BIRCH_DOOR	left/right
CRIMSON_DOOR	left/right
DARK_OAK_DOOR	left/right
IRON_DOOR	left/right
JUNGLE_DOOR	left/right
MANGROVE_DOOR	left/right
OAK_DOOR	left/right
SPRUCE_DOOR	left/right
WARPED_DOOR	left/right

Table A.22: Doors

A.1.22 Honey level

Represents the amount of honey stored in the hive.

Defaults to 0.

Material	Values
BEEHIVE	0/5 ⁹
BEE_NEST	0/5 ⁹

Table A.23: Hives

⁹The block is the same from honey-level 0 to 4, and it changes in age 5. That's why age=5 is considered as age=1, and age=0-4 as age=0, as you may notice in Figure A.1, Modifier concatenation.

A.1.23 In wall

in_wall = false(ACACIA_FENCE_GATE)in_wall = false(BIRCH_FENCE_GATE)in_wall = false(CRIMSON_FENCE_GATE)in_wall = false(DARK_OAK_FENCE_GATE)in_wall = false(JUNGLE_FENCE_GATE)in_wall = false(MANGROVE_FENCE_GATE)in_wall = false(OAK_FENCE_GATE)in_wall = false(SPRUCE_FENCE_GATE)in_wall = false(WARPED_FENCE_GATE)
inverted=false (DAYLIGHT_DETECTOR)
layers=1 (SNOW)
leaves=none (BAMBOO)
level=0 (COMPOSTER) level=0 (LAVA) level=0 (WATER) level=1 (POWDER_SNOW_Cauldron)level=1(WATER_Cauldron)
lit=false (BLACK_CANDLE)lit = false(BLACK_CANDLE_CAKE)lit = false(BLAST_FURNACE)lit = false(BLUE_CANDLE)lit = false(BLUE_CANDLE_CAKE)lit = false(BROWN_CANDLE)lit = false(BROWN_CANDLE_CAKE)lit = false(CANDLE)lit = false(CANDLE_CAKE)lit = false(CYAN_CANDLE)lit = false(CYAN_CANDLE_CAKE)lit = false(DEEPSLATE_REDSTONE_ORE)lit = false(FURNACE)lit = false(GRAY_CANDLE)lit = false(GRAY_CANDLE_CAKE)lit = false(GREEN_CANDLE)lit = false(GREEN_CANDLE_CAKE)lit = false(LIGHT_BLUE_CANDLE)lit = false(LIGHT_BLUE_CANDLE_CAKE)lit = false(LIGHT_GRAY_CANDLE)lit = false(LIGHT_GRAY_CANDLE_CAKE)lit = false(LIME_CANDLE)lit = false(LIME_CANDLE_CAKE)lit = false(MAGENTA_CANDLE)lit = false(MAGENTA_CANDLE_CAKE)lit = false(ORANGE_CANDLE)lit = false(ORANGE_CANDLE_CAKE)lit = false(PINK_CANDLE)lit = false(PINK_CANDLE_CAKE)lit = false(PURPLE_CANDLE)lit = false(PURPLE_CANDLE_CAKE)lit = false(REDSTONE_LAMP)lit = false(REDSTONE_ORE)lit = false(RED_CANDLE)lit = false(RED_CANDLE_CAKE)lit = false(SMOKER)lit = false(WHITE_CANDLE)lit = false(WHITE_CANDLE_CAKE)lit = false(YELLOW_CANDLE)lit = false(YELLOW_CANDLE_CAKE)lit = true(CAMPFIRE)lit = true(REDSTONE_TORCH)lit = true(REDSTONE_WALL_TORCH)lit = true(SOUL_CAMPFIRE)
locked=false (REPEATER)
mode=compare (COMPARATOR) mode=load (STRUCTURE_BLOCK)
moisture=0 (FARMLAND)
note=0 (NOTE_BLOCK)
open=false (ACACIA_DOOR)open = false(ACACIA_FENCE_GATE)open = false(ACACIA_TRAPDOOR)open = false(BARREL)open = false(BIRCH_DOOR)open = false(BIRCH_FENCE_GATE)open =

false(*BIRCH*_T*RAPDOOR*)*open* = *false*(*CRIMSON*_D*OOR*)*open* = *false*(*CRIMSON*_F*ENCE*_G*ATE*)*open* =
false(*CRIMSON*_T*RAPDOOR*)*open* = *false*(*DARK*_O*AK*_D*OOR*)*open* = *false*(*DARK*_O*AK*_F*ENCE*_G*ATE*)*open* =
false(*DARK*_O*AK*_T*RAPDOOR*)*open* = *false*(*IRON*_D*OOR*)*open* = *false*(*IRON*_T*RAPDOOR*)*open* =
false(*JUNGLE*_D*OOR*)*open* = *false*(*JUNGLE*_F*ENCE*_G*ATE*)*open* = *false*(*JUNGLE*_T*RAPDOOR*)*open* =
false(*MANGROVE*_D*OOR*)*open* = *false*(*MANGROVE*_F*ENCE*_G*ATE*)*open* = *false*(*MANGROVE*_T*RAPDOOR*)*open* =
false(*OAK*_D*OOR*)*open* = *false*(*OAK*_F*ENCE*_G*ATE*)*open* = *false*(*OAK*_T*RAPDOOR*)*open* =
false(*SPRUCE*_D*OOR*)*open* = *false*(*SPRUCE*_F*ENCE*_G*ATE*)*open* = *false*(*SPRUCE*_T*RAPDOOR*)*open* =
false(*WARPED*_D*OOR*)*open* = *false*(*WARPED*_F*ENCE*_G*ATE*)*open* = *false*(*WARPED*_T*RAPDOOR*)
orientation=*north*_{up}(*JIGSAW*)
part=*foot* (*BLACK*_B*ED*)*part* = *foot*(*BLUE*_B*ED*)*part* = *foot*(*BROWN*_B*ED*)*part* =
foot(*CYAN*_B*ED*)*part* = *foot*(*GRAY*_B*ED*)*part* = *foot*(*GREEN*_B*ED*)*part* = *foot*(*LIGHT*_B*BLUE*_B*ED*)*part* =
foot(*LIGHT*_G*RAY*_B*ED*)*part* = *foot*(*LIME*_B*ED*)*part* = *foot*(*MAGENTA*_B*ED*)*part* =
foot(*ORANGE*_B*ED*)*part* = *foot*(*PINK*_B*ED*)*part* = *foot*(*PURPLE*_B*ED*)*part* = *foot*(*RED*_B*ED*)*part* =
foot(*WHITE*_B*ED*)*part* = *foot*(*YELLOW*_B*ED*)

A.1.24 Pickles

Indicates the number of pickles in this block.

Defaults to 1.

Material	Values
SEA_PICKLE	1-4

Table A.24: Materials with pickles

A.1.25 Powered

Indicates whether this block is in the powered state or not (emitting current).

Defaults to false.

Material	Powered value
ACACIA_BUTTON	true/false
ACACIA_PRESSURE_PLATE	true/false
BIRCH_BUTTON	true/false

Material	Powered value
BIRCH_PRESSURE_PLATE	true/false
COMPARATOR	true/false
CRIMSON_BUTTON	true/false
CRIMSON_PRESSURE_PLATE	true/false
DARK_OAK_BUTTON	true/false
DARK_OAK_PRESSURE_PLATE	true/false
DETECTOR_RAIL	true/false
JUNGLE_BUTTON	true/false
JUNGLE_PRESSURE_PLATE	true/false
LEVER	true/false
LIGHTNING_ROD	true/false
MANGROVE_BUTTON	true/false
MANGROVE_PRESSURE_PLATE	true/false
OAK_BUTTON	true/false
OAK_PRESSURE_PLATE	true/false
OBSERVER	true/false
POLISHED_BLACKSTONE_BUTTON	true/false
POLISHED_BLACKSTONE_PRESSURE_PLATE	true/false
REPEATER	true/false
SPRUCE_BUTTON	true/false
SPRUCE_PRESSURE_PLATE	true/false
STONE_BUTTON	true/false
STONE_PRESSURE_PLATE	true/false
TRIPWIRE_HOOK	true/false
WARPED_BUTTON	true/false
WARPED_PRESSURE_PLATE	true/false

Table A.25: Powerabled materials

A.1.26 Rotation

Denotes where the block is looking.

Defaults to 0 and goes up to 15.

Rotation value	Direction
0	South
4	West
8	North
12	East

Table A.26: Relation between rotation and where is looking

Material
ACACIA_SIGN
BIRCH_SIGN
BLACK_BANNER
BLUE_BANNER
BROWN_BANNER
CREEPER_HEAD
CRIMSON_SIGN
CYAN_BANNER
DARK_OAK_SIGN
DRAGON_HEAD
GRAY_BANNER
GREEN_BANNER
JUNGLE_SIGN
LIGHT_BLUE_BANNER
LIGHT_GRAY_BANNER
LIME_BANNER
MAGENTA_BANNER
MANGROVE_SIGN
OAK_SIGN

Material
ORANGE_BANNER
PINK_BANNER
PLAYER_HEAD
PURPLE_BANNER
RED_BANNER
SKELETON_SKULL
SPRUCE_SIGN
WARPED_SIGN
WHITE_BANNER
WITHER_SKELETON_SKULL
YELLOW_BANNER
ZOMBIE_HEAD

Table A.27: Directional materials

A.1.27 Shape

$\text{shape}=\text{north}_{\text{south}}(\text{ACTIVATOR}_{\text{RAIL}})\text{shape} = \text{north}_{\text{south}}(\text{DETECTOR}_{\text{RAIL}})\text{shape} =$
 $\text{north}_{\text{south}}(\text{POWERED}_{\text{RAIL}})\text{shape} = \text{north}_{\text{south}}(\text{RAIL})$

$\text{shape}=\text{straight}(\text{ACACIA}_{\text{STAIRS}})\text{shape} = \text{straight}(\text{ANDESITE}_{\text{STAIRS}})\text{shape} =$
 $\text{straight}(\text{BIRCH}_{\text{STAIRS}})\text{shape} = \text{straight}(\text{BLACKSTONE}_{\text{STAIRS}})\text{shape} = \text{straight}(\text{BRICK}_{\text{STAIRS}})$
 $\text{straight}(\text{COBBLED}_{\text{DEEPSLATE}_{\text{STAIRS}}})\text{shape} = \text{straight}(\text{COBBLESTONE}_{\text{STAIRS}})\text{shape} =$
 $\text{straight}(\text{CRIMSON}_{\text{STAIRS}})\text{shape} = \text{straight}(\text{CUT}_{\text{COPPER}_{\text{STAIRS}}})\text{shape} = \text{straight}(\text{DARK}_{\text{OAK}_{\text{STAIRS}}})$
 $\text{straight}(\text{DARK}_{\text{PRISMARINE}_{\text{STAIRS}}})\text{shape} = \text{straight}(\text{DEEPSLATE}_{\text{BRICK}_{\text{STAIRS}}})\text{shape} =$
 $\text{straight}(\text{DEEPSLATE}_{\text{TILE}_{\text{STAIRS}}})\text{shape} = \text{straight}(\text{DIORITE}_{\text{STAIRS}})\text{shape} =$
 $\text{straight}(\text{END}_{\text{STONE}_{\text{BRICK}_{\text{STAIRS}}}})\text{shape} = \text{straight}(\text{EXPOSED}_{\text{CUT}_{\text{COPPER}_{\text{STAIRS}}}})\text{shape} =$
 $\text{straight}(\text{GRANITE}_{\text{STAIRS}})\text{shape} = \text{straight}(\text{JUNGLE}_{\text{STAIRS}})\text{shape} = \text{straight}(\text{MANGROVE}_{\text{STAIRS}})$
 $\text{straight}(\text{MOSSY}_{\text{COBBLESTONE}_{\text{STAIRS}}})\text{shape} = \text{straight}(\text{MOSSY}_{\text{STONE}_{\text{BRICK}_{\text{STAIRS}}}})\text{shape} =$
 $\text{straight}(\text{MUD}_{\text{BRICK}_{\text{STAIRS}}})\text{shape} = \text{straight}(\text{NETHER}_{\text{BRICK}_{\text{STAIRS}}})\text{shape} =$
 $\text{straight}(\text{OAK}_{\text{STAIRS}})\text{shape} = \text{straight}(\text{OXIDIZED}_{\text{CUT}_{\text{COPPER}_{\text{STAIRS}}}})\text{shape} =$
 $\text{straight}(\text{POLISHED}_{\text{ANDESITE}_{\text{STAIRS}}})\text{shape} = \text{straight}(\text{POLISHED}_{\text{BLACKSTONE}_{\text{BRICK}_{\text{STAIRS}}}})$

straight(*POLISHED_BLACKSTONE_STAIRS*)*shape* = *straight*(*POLISHED_DEEPSLATE_STAIRS*)*sh*
straight(*POLISHED_DIORITE_STAIRS*)*shape* = *straight*(*POLISHED_GRANITE_STAIRS*)*shape* =
straight(*PRISMARINE_BRICK_STAIRS*)*shape* = *straight*(*PRISMARINE_STAIRS*)*shape* =
straight(*PURPUR_STAIRS*)*shape* = *straight*(*QUARTZ_STAIRS*)*shape* = *straight*(*RED_NETHER_BRICK_S*
straight(*RED_SANDSTONE_STAIRS*)*shape* = *straight*(*SANDSTONE_STAIRS*)*shape* =
straight(*SMOOTH_QUARTZ_STAIRS*)*shape* = *straight*(*SMOOTH_RED_SANDSTONE_STAIRS*)*shape* =
straight(*SMOOTH_SANDSTONE_STAIRS*)*shape* = *straight*(*SPRUCE_STAIRS*)*shape* =
straight(*STONE_BRICK_STAIRS*)*shape* = *straight*(*STONE_STAIRS*)*shape* = *straight*(*WARPED_STAIR*
straight(*WAXED_CUT_COPPER_STAIRS*)*shape* = *straight*(*WAXED_EXPOSED_CUT_COPPER_STAIRS*)
straight(*WAXED_OXIDIZED_CUT_COPPER_STAIRS*)*shape* = *straight*(*WAXED_WEATHERED_CUT_C*
straight(*WEATHERED_CUT_COPPER_STAIRS*)

A.1.28 Type

type=*bottom* (*ACACIA_SLAB*)*type* = *bottom*(*ANDESITE_SLAB*)*type* = *bottom*(*BIRCH_SLAB*)*type* =
bottom(*BLACKSTONE_SLAB*)*type* = *bottom*(*BRICK_SLAB*)*type* = *bottom*(*COBBLED_DEEPSLATE_SL*
bottom(*COBBLESTONE_SLAB*)*type* = *bottom*(*CRIMSON_SLAB*)*type* = *bottom*(*CUT_COPPER_SLAB*)*ty*
bottom(*CUT_RED_SANDSTONE_SLAB*)*type* = *bottom*(*CUT_SANDSTONE_SLAB*)*type* =
bottom(*DARK_OAK_SLAB*)*type* = *bottom*(*DARK_PPRISMARINE_SLAB*)*type* = *bottom*(*DEEPSLATE_BRI*
bottom(*DEEPSLATE_TILE_SLAB*)*type* = *bottom*(*DIORITE_SLAB*)*type* = *bottom*(*END_SSTONE_BRICK_SL*
bottom(*EXPOSED_CUT_COPPER_SLAB*)*type* = *bottom*(*GRANITE_SLAB*)*type* = *bottom*(*JUNGLE_SLAB*)
bottom(*MANGROVE_SLAB*)*type* = *bottom*(*MOSSY_COBBLESTONE_SLAB*)*type* = *bottom*(*MOSSY_STO*
bottom(*MUD_BRICK_SLAB*)*type* = *bottom*(*NETHER_BRICK_SLAB*)*type* = *bottom*(*OAK_SLAB*)*type* =
bottom(*OXIDIZED_CUT_COPPER_SLAB*)*type* = *bottom*(*PETRIFIED_OAK_SLAB*)*type* =
bottom(*POLISHED_AANDESITE_SLAB*)*type* = *bottom*(*POLISHED_BLACKSTONE_BRICK_SLAB*)*type* =
bottom(*POLISHED_BLACKSTONE_SLAB*)*type* = *bottom*(*POLISHED_DEEPSLATE_SLAB*)*type* =
bottom(*POLISHED_DIORITE_SLAB*)*type* = *bottom*(*POLISHED_GRANITE_SLAB*)*type* =
bottom(*PRISMARINE_BRICK_SLAB*)*type* = *bottom*(*PRISMARINE_SLAB*)*type* = *bottom*(*PURPUR_SLA*
bottom(*QUARTZ_SLAB*)*type* = *bottom*(*RED_NETHER_BRICK_SLAB*)*type* = *bottom*(*RED_SANDSTONE_S*
bottom(*SANDSTONE_SLAB*)*type* = *bottom*(*SMOOTH_QUARTZ_SLAB*)*type* = *bottom*(*SMOOTH_RED_SA*
bottom(*SMOOTH_SANDSTONE_SLAB*)*type* = *bottom*(*SMOOTH_SSTONE_SLAB*)*type* =
bottom(*SPRUCE_SLAB*)*type* = *bottom*(*STONE_BRICK_SLAB*)*type* = *bottom*(*STONE_SLAB*)*type* =

$bottom(WARPED_SLAB)type = bottom(WAXED_CUT_COPPER_SLAB)type = bottom(WAXED_EXPOSED_CUT_COPPER_SLAB)type = bottom(WAXED_OXIDIZED_CUT_COPPER_SLAB)type = bottom(WAXED_WEATHERED_CUT_COPPER_SLAB)type =$
 $bottom(WEATHERED_CUT_COPPER_SLAB)type = normal(MOVING_PISTON)type =$
 $normal(PISTON_HEAD)type = single(CHEST)type = single(TRAPPED_CHEST)$

A.1.29 Vertical direction

Represents the dripstone orientation.

Defaults to up.

Material	Values
POINTED_DRIPSTONE	up/down

Table A.28: Dripstone

A.1.30 Waterlogged

Denotes whether this block has fluid in it.

Besides underwater blocks¹⁰ (which defaults to true), it defaults to false. All the possible options are true or false.

Material	Aquatic block ¹¹
ACACIA_FENCE	X
ACACIA_LEAVES	X
ACACIA_SIGN	X
ACACIA_SLAB	X
ACACIA_STAIRS	X

¹⁰BRAIN_CORAL, BRAIN_CORAL_FAN, BRAIN_CORAL_WALL_FAN, BUBBLE_CORAL, BUBBLE_CORAL_FAN, BUBBLE_CORAL_WALL_FAN, CONDUIT, DEAD_BRAIN_CORAL, DEAD_BRAIN_CORAL_FAN, DEAD_BRAIN_CORAL_WALL_FAN, DEAD_BUBBLE_CORAL, DEAD_BUBBLE_CORAL_FAN, DEAD_BUBBLE_CORAL_WALL_FAN, DEAD_FIRE_CORAL, DEAD_FIRE_CORAL_FAN, DEAD_FIRE_CORAL_WALL_FAN, DEAD_HORN_CORAL, DEAD_HORN_CORAL_FAN, DEAD_HORN_CORAL_WALL_FAN, DEAD_TUBE_CORAL, DEAD_TUBE_CORAL_FAN, DEAD_TUBE_CORAL_WALL_FAN, FIRE_CORAL, FIRE_CORAL_FAN, FIRE_CORAL_WALL_FAN, HORN_CORAL, HORN_CORAL_FAN, HORN_CORAL_WALL_FAN, SEA_PICKLE, TUBE_CORAL, TUBE_CORAL_FAN and TUBE_CORAL_WALL_FAN

Material	Aquatic block ¹¹
ACACIA_TRAPDOOR	✗
ACACIA_WALL_SIGN	✗
ACTIVATOR_RAIL	✗
AMETHYST_CLUSTER	✗
ANDESITE_SLAB	✗
ANDESITE_STAIRS	✗
ANDESITE_WALL	✗
AZALEA_LEAVES	✗
BIG_DRIPLEAF	✗
BIG_DRIPLEAF_STEM	✗
BIRCH_FENCE	✗
BIRCH_LEAVES	✗
BIRCH_SIGN	✗
BIRCH_SLAB	✗
BIRCH_STAIRS	✗
BIRCH_TRAPDOOR	✗
BIRCH_WALL_SIGN	✗
BLACKSTONE_SLAB	✗
BLACKSTONE_STAIRS	✗
BLACKSTONE_WALL	✗
BLACK_CANDLE	✗
BLACK_STAINED_GLASS_PANE	✗
BLUE_CANDLE	✗
BLUE_STAINED_GLASS_PANE	✗
BRICK_SLAB	✗
BRICK_STAIRS	✗
BRICK_WALL	✗
BROWN_CANDLE	✗
BROWN_STAINED_GLASS_PANE	✗
CAMPFIRE	✗

Material	Aquatic block ¹¹
CANDLE	✗
CHAIN	✗
CHEST	✗
COBBLED_DEEPSLATE_SLAB	✗
COBBLED_DEEPSLATE_STAIRS	✗
COBBLED_DEEPSLATE_WALL	✗
COBBLESTONE_SLAB	✗
COBBLESTONE_STAIRS	✗
COBBLESTONE_WALL	✗
CRIMSON_FENCE	✗
CRIMSON_SIGN	✗
CRIMSON_SLAB	✗
CRIMSON_STAIRS	✗
CRIMSON_TRAPDOOR	✗
CRIMSON_WALL_SIGN	✗
CUT_COPPER_SLAB	✗
CUT_COPPER_STAIRS	✗
CUT_RED_SANDSTONE_SLAB	✗
CUT_SANDSTONE_SLAB	✗
CYAN_CANDLE	✗
CYAN_STAINED_GLASS_PANE	✗
DARK_OAK_FENCE	✗
DARK_OAK_LEAVES	✗
DARK_OAK_SIGN	✗
DARK_OAK_SLAB	✗
DARK_OAK_STAIRS	✗
DARK_OAK_TRAPDOOR	✗
DARK_OAK_WALL_SIGN	✗
DARK_PRISMARINE_SLAB	✗
DARK_PRISMARINE_STAIRS	✗

Material	Aquatic block ¹¹
DEEPSLATE_BRICK_SLAB	✗
DEEPSLATE_BRICK_STAIRS	✗
DEEPSLATE_BRICK_WALL	✗
DEEPSLATE_TILE_SLAB	✗
DEEPSLATE_TILE_STAIRS	✗
DEEPSLATE_TILE_WALL	✗
DETECTOR_RAIL	✗
DIORITE_SLAB	✗
DIORITE_STAIRS	✗
DIORITE_WALL	✗
ENDER_CHEST	✗
END_STONE_BRICK_SLAB	✗
END_STONE_BRICK_STAIRS	✗
END_STONE_BRICK_WALL	✗
EXPOSED_CUT_COPPER_SLAB	✗
EXPOSED_CUT_COPPER_STAIRS	✗
FLOWERING_AZALEA_LEAVES	✗
GLASS_PANE	✗
GLOW_LICHEN	✗
GRANITE_SLAB	✗
GRANITE_STAIRS	✗
GRANITE_WALL	✗
GRAY_CANDLE	✗
GRAY_STAINED_GLASS_PANE	✗
GREEN_CANDLE	✗
GREEN_STAINED_GLASS_PANE	✗
HANGING_ROOTS	✗
IRON_BARS	✗
IRON_TRAPDOOR	✗
JUNGLE_FENCE	✗

Material	Aquatic block ¹¹
JUNGLE_LEAVES	✗
JUNGLE_SIGN	✗
JUNGLE_SLAB	✗
JUNGLE_STAIRS	✗
JUNGLE_TRAPDOOR	✗
JUNGLE_WALL_SIGN	✗
LADDER	✗
LANTERN	✗
LARGE_AMETHYST_BUD	✗
LIGHTNING_ROD	✗
LIGHT_BLUE_CANDLE	✗
LIGHT_BLUE_STAINED_GLASS_PANE	✗
LIGHT_GRAY_CANDLE	✗
LIGHT_GRAY_STAINED_GLASS_PANE	✗
LIME_CANDLE	✗
LIME_STAINED_GLASS_PANE	✗
MAGENTA_CANDLE	✗
MAGENTA_STAINED_GLASS_PANE	✗
MANGROVE_FENCE	✗
MANGROVE_LEAVES	✗
MANGROVE_PROPAGULE	✗
MANGROVE_ROOTS	✗
MANGROVE_SIGN	✗
MANGROVE_SLAB	✗
MANGROVE_STAIRS	✗
MANGROVE_TRAPDOOR	✗
MANGROVE_WALL_SIGN	✗
MEDIUM_AMETHYST_BUD	✗
MOSSY_COBBLESTONE_SLAB	✗
MOSSY_COBBLESTONE_STAIRS	✗

Material	Aquatic block ¹¹
MOSSY_COBBLESTONE_WALL	✗
MOSSY_STONE_BRICK_SLAB	✗
MOSSY_STONE_BRICK_STAIRS	✗
MOSSY_STONE_BRICK_WALL	✗
MUD_BRICK_SLAB	✗
MUD_BRICK_STAIRS	✗
MUD_BRICK_WALL	✗
NETHER_BRICK_FENCE	✗
NETHER_BRICK_SLAB	✗
NETHER_BRICK_STAIRS	✗
NETHER_BRICK_WALL	✗
OAK_FENCE	✗
OAK_LEAVES	✗
OAK_SIGN	✗
OAK_SLAB	✗
OAK_STAIRS	✗
OAK_TRAPDOOR	✗
OAK_WALL_SIGN	✗
ORANGE_CANDLE	✗
ORANGE_STAINED_GLASS_PANE	✗
OXIDIZED_CUT_COPPER_SLAB	✗
OXIDIZED_CUT_COPPER_STAIRS	✗
PETRIFIED_OAK_SLAB	✗
PINK_CANDLE	✗
PINK_STAINED_GLASS_PANE	✗
POINTED_DRIPSTONE	✗
POLISHED_ANDESITE_SLAB	✗
POLISHED_ANDESITE_STAIRS	✗
POLISHED_BLACKSTONE_BRICK_SLAB	✗
POLISHED_BLACKSTONE_BRICK_STAIRS	✗

Material	Aquatic block ¹¹
POLISHED_BLACKSTONE_BRICK_WALL	✗
POLISHED_BLACKSTONE_SLAB	✗
POLISHED_BLACKSTONE_STAIRS	✗
POLISHED_BLACKSTONE_WALL	✗
POLISHED_DEEPSLATE_SLAB	✗
POLISHED_DEEPSLATE_STAIRS	✗
POLISHED_DEEPSLATE_WALL	✗
POLISHED_DIORITE_SLAB	✗
POLISHED_DIORITE_STAIRS	✗
POLISHED_GRANITE_SLAB	✗
POLISHED_GRANITE_STAIRS	✗
POWERED_RAIL	✗
PRISMARINE_BRICK_SLAB	✗
PRISMARINE_BRICK_STAIRS	✗
PRISMARINE_SLAB	✗
PRISMARINE_STAIRS	✗
PRISMARINE_WALL	✗
PURPLE_CANDLE	✗
PURPLE_STAINED_GLASS_PANE	✗
PURPUR_SLAB	✗
PURPUR_STAIRS	✗
QUARTZ_SLAB	✗
QUARTZ_STAIRS	✗
RAIL	✗
RED_CANDLE	✗
RED_NETHER_BRICK_SLAB	✗
RED_NETHER_BRICK_STAIRS	✗
RED_NETHER_BRICK_WALL	✗
RED_SANDSTONE_SLAB	✗
RED_SANDSTONE_STAIRS	✗

Material	Aquatic block ¹¹
RED_SANDSTONE_WALL	✗
RED_STAINED_GLASS_PANE	✗
SANDSTONE_SLAB	✗
SANDSTONE_STAIRS	✗
SANDSTONE_WALL	✗
SCAFFOLDING	✗
SCULK_SENSOR	✗
SCULK_SHRIEKER	✗
SCULK_VEIN	✗
SMALL_AMETHYST_BUD	✗
SMALL_DRIPLEAF	✗
SMOOTH_QUARTZ_SLAB	✗
SMOOTH_QUARTZ_STAIRS	✗
SMOOTH_RED_SANDSTONE_SLAB	✗
SMOOTH_RED_SANDSTONE_STAIRS	✗
SMOOTH_SANDSTONE_SLAB	✗
SMOOTH_SANDSTONE_STAIRS	✗
SMOOTH_STONE_SLAB	✗
SOUL_CAMPFIRE	✗
SOUL_LANTERN	✗
SPRUCE_FENCE	✗
SPRUCE_LEAVES	✗
SPRUCE_SIGN	✗
SPRUCE_SLAB	✗
SPRUCE_STAIRS	✗
SPRUCE_TRAPDOOR	✗
SPRUCE_WALL_SIGN	✗
STONE_BRICK_SLAB	✗
STONE_BRICK_STAIRS	✗
STONE_BRICK_WALL	✗

Material	Aquatic block ¹¹
STONE_SLAB	✗
STONE_STAIRS	✗
TRAPPED_CHEST	✗
WARPED_FENCE	✗
WARPED_SIGN	✗
WARPED_SLAB	✗
WARPED_STAIRS	✗
WARPED_TRAPDOOR	✗
WARPED_WALL_SIGN	✗
WAXED_CUT_COPPER_SLAB	✗
WAXED_CUT_COPPER_STAIRS	✗
WAXED_EXPOSED_CUT_COPPER_SLAB	✗
WAXED_EXPOSED_CUT_COPPER_STAIRS	✗
WAXED_OXIDIZED_CUT_COPPER_SLAB	✗
WAXED_OXIDIZED_CUT_COPPER_STAIRS	✗
WAXED_WEATHERED_CUT_COPPER_SLAB	✗
WAXED_WEATHERED_CUT_COPPER_STAIRS	✗
WEATHERED_CUT_COPPER_SLAB	✗
WEATHERED_CUT_COPPER_STAIRS	✗
WHITE_CANDLE	✗
WHITE_STAINED_GLASS_PANE	✗
YELLOW_CANDLE	✗
YELLOW_STAINED_GLASS_PANE	✗
BRAIN_CORAL	✓
BRAIN_CORAL_FAN	✓
BRAIN_CORAL_WALL_FAN	✓
BUBBLE_CORAL	✓
BUBBLE_CORAL_FAN	✓
BUBBLE_CORAL_WALL_FAN	✓
CONDUIT	✓

Material	Aquatic block ¹¹
DEAD_BRAIN_CORAL	✓
DEAD_BRAIN_CORAL_FAN	✓
DEAD_BRAIN_CORAL_WALL_FAN	✓
DEAD_BUBBLE_CORAL	✓
DEAD_BUBBLE_CORAL_FAN	✓
DEAD_BUBBLE_CORAL_WALL_FAN	✓
DEAD_FIRE_CORAL	✓
DEAD_FIRE_CORAL_FAN	✓
DEAD_FIRE_CORAL_WALL_FAN	✓
DEAD_HORN_CORAL	✓
DEAD_HORN_CORAL_FAN	✓
DEAD_HORN_CORAL_WALL_FAN	✓
DEAD_TUBE_CORAL	✓
DEAD_TUBE_CORAL_FAN	✓
DEAD_TUBE_CORAL_WALL_FAN	✓
FIRE_CORAL	✓
FIRE_CORAL_FAN	✓
FIRE_CORAL_WALL_FAN	✓
HORN_CORAL	✓
HORN_CORAL_FAN	✓
HORN_CORAL_WALL_FAN	✓
SEA_PICKLE	✓
TUBE_CORAL	✓
TUBE_CORAL_FAN	✓
TUBE_CORAL_WALL_FAN	✓

Table A.29: Waterlogged materials

¹¹If it's an underwater block (defaults to true).

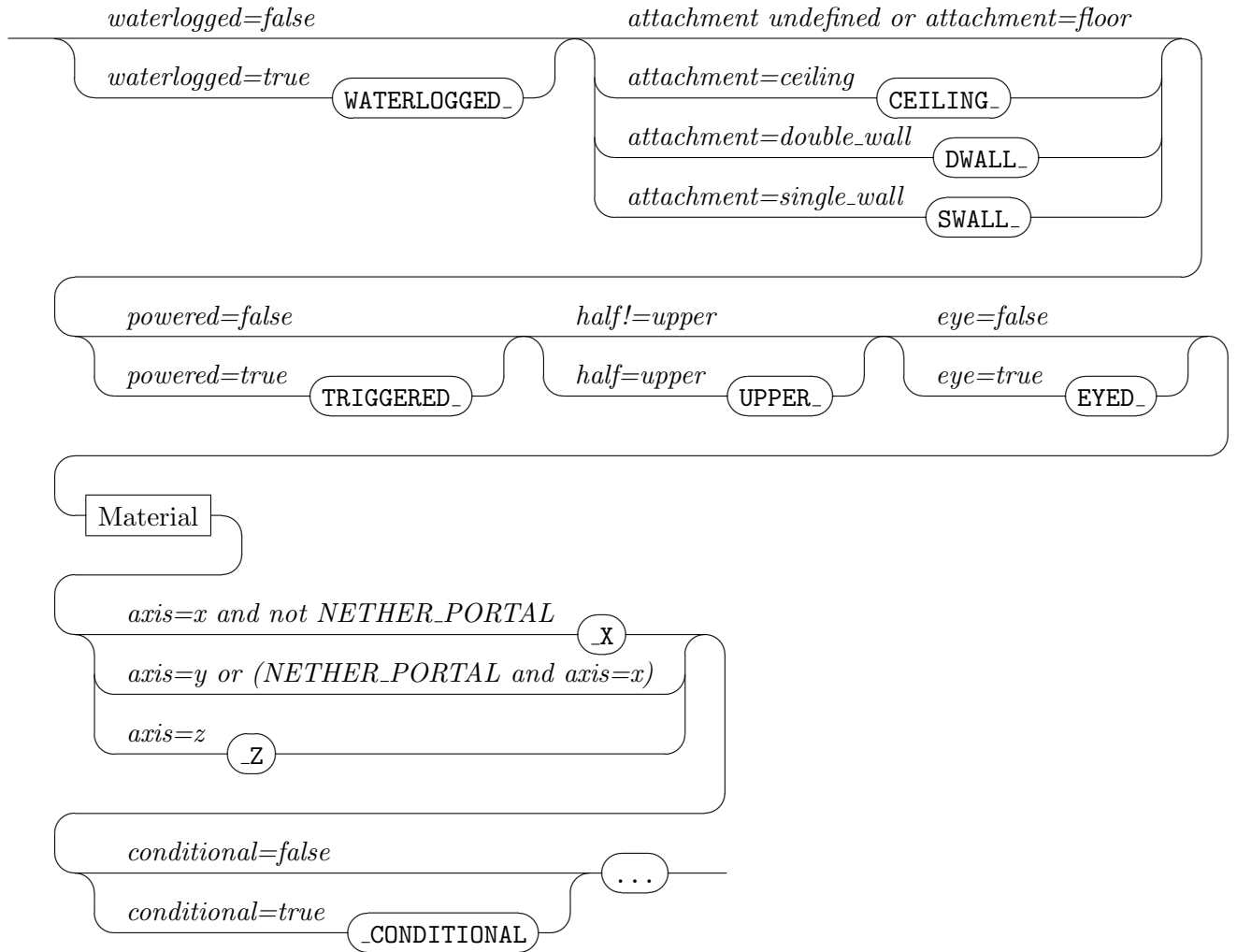


Figure A.1a: Modifier concatenation

A.2 Material modifiers concatenation

... (how to join modifiers)

If a material doesn't have the attribute that the diagram is checking it will assume that the attribute value is the default one (0 or false, in most of the cases), resulting in ignoring that property.

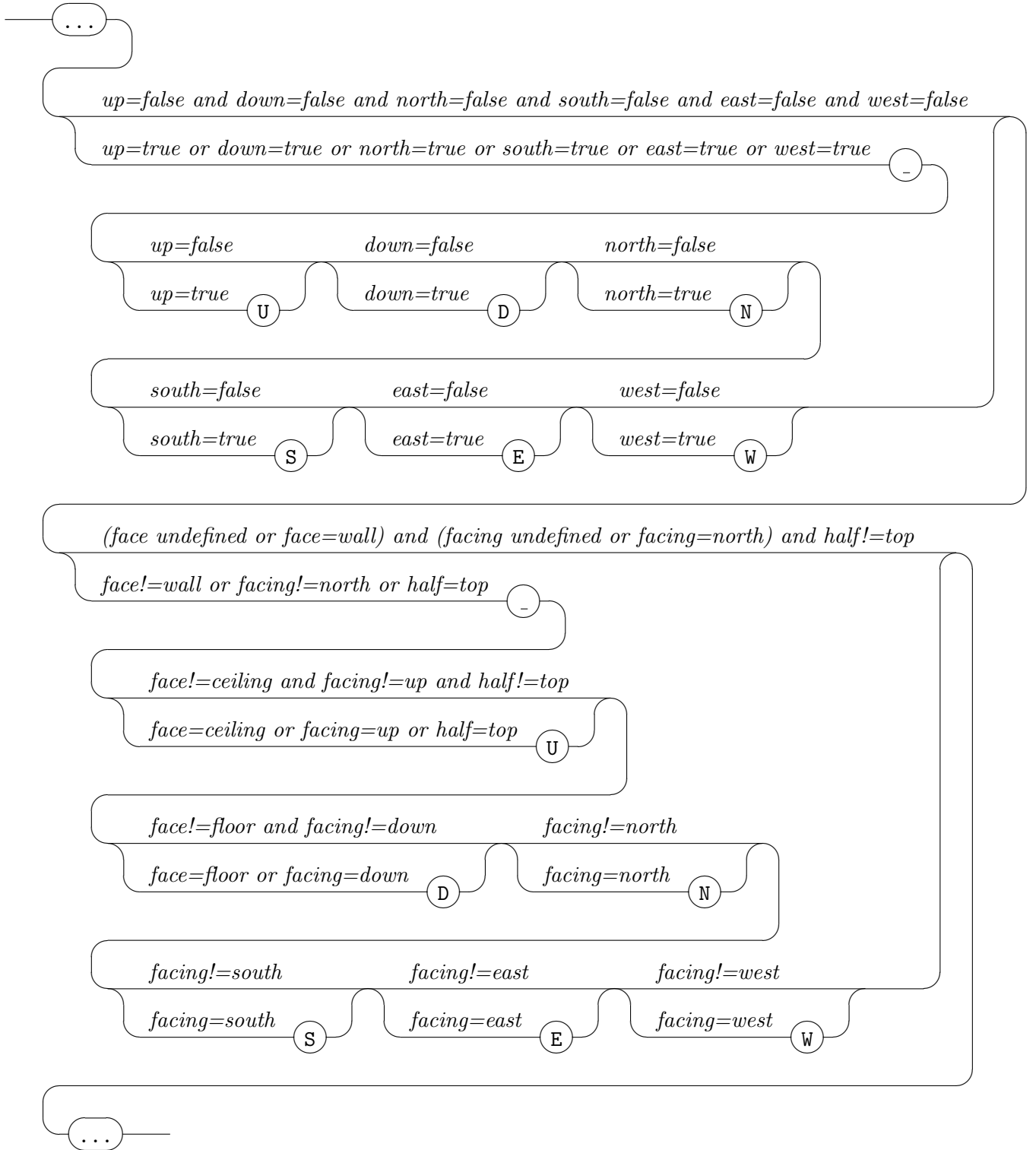


Figure A.1b: Direction modifier concatenation

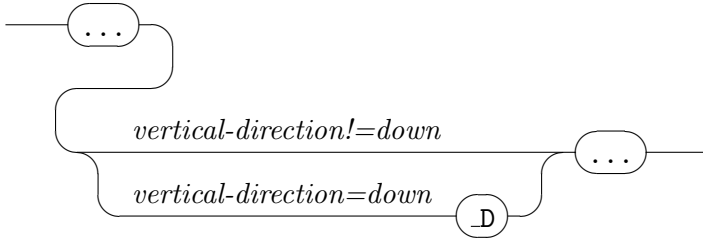


Figure A.1c: Direction modifier concatenation 2

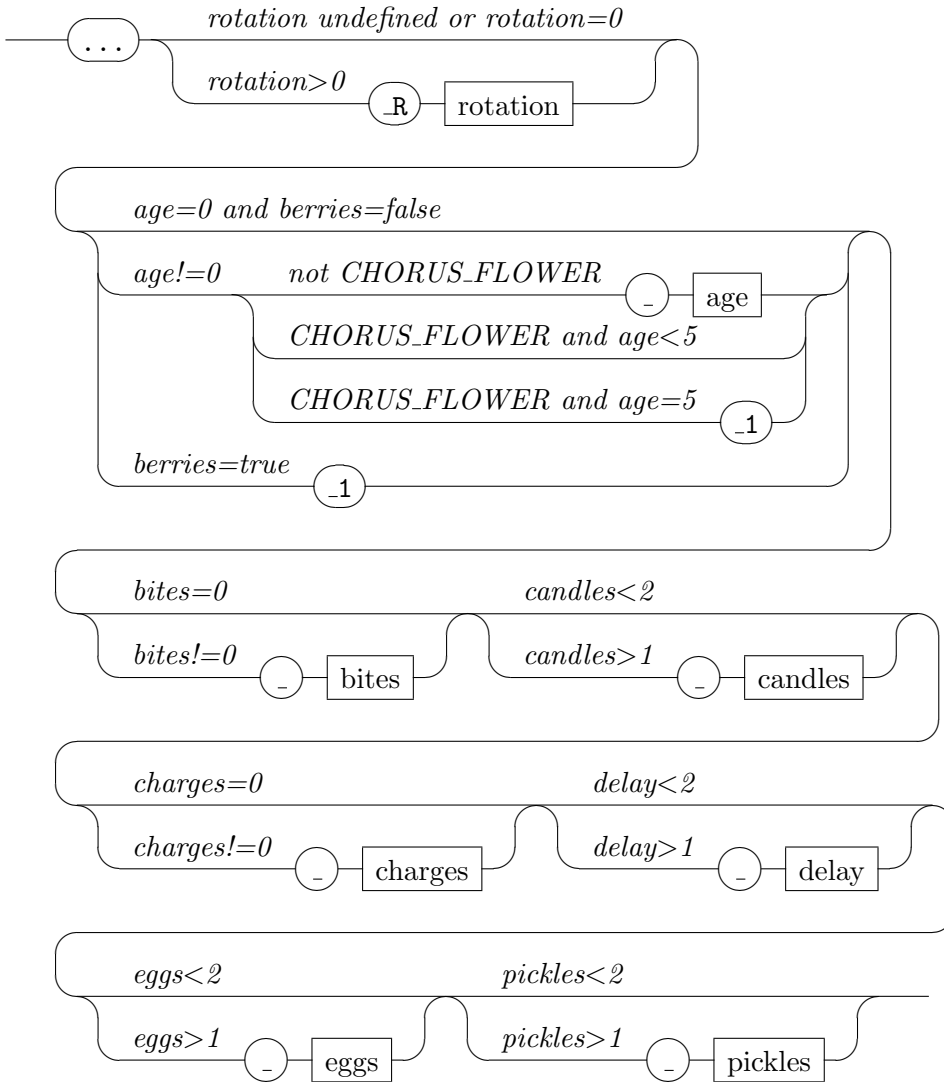


Figure A.1d: Integer modifier concatenation