

# *IISE Transactions* L<sup>A</sup>T<sub>E</sub>X Template

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## Abstract



*Keywords:* *IISE Transactions*; L<sup>A</sup>T<sub>E</sub>X; Manuscript format; Taylor & Francis.

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# 1 Documentation conventions

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abbreviations

## 1.1 Glossary

**async** Asynchronous; returned non-sequentially. 14

**IEEE 754** IEEE Standard for Floating-Point Arithmetic (IEEE 754) is a standard for computing floating-points operations. For more details about it check Rajaraman (2016). 16

**Least significant bit** The Least significant bit is the bit with the lowest index number. 7, 15

**Most significant bit** The Most significant bit is the bit with the higher index number. 33

**Multidimensional array** Array of arrays. 16

**NOP** No OPeration. It represents a valid operation that means 'do nothing'. 15

## 2 Introduction

explicar los distintos protocolos que se hablaron a continuacion

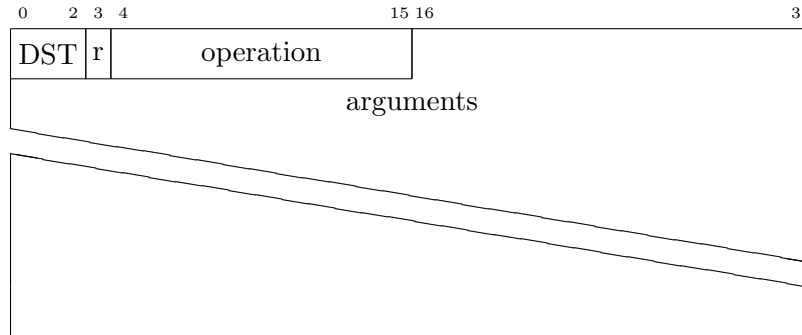


Figure 2.1: Packet structure

### 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      | ClientsManagerPetition |
| 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').

## 2.3 Operation

The Operation parameter specifies the desired request. Those change according to the Destiny, so they will be discussed in more detail in their respective sections.

The only exception is the all-zeroes operation (0b000000000000) which represents a NOP request. That way, if you need to perform a long test, you won't be **explain the 'kicked by inactivity' concept** kicked by inactivity if you send this request every few minutes.

## 2.4 Arguments

The Arguments parameter specifies the arguments (if any) to the *Operation* request. Those change according to the Destiny, so the amount of arguments, and their types and order will be discussed in more detail in their respective sections.

Now there will be discussed the most common data types, so they will be independent of any programming language.

### 2.4.1 Character

Characters are sent as a 1-byte integer, representing its ASCII **ref?** value.

### 2.4.2 Boolean

Booleans are 1-bit element that represents *true* (0b1), or *false* (0b0).

For alignment **define?** reasons, booleans will be sent as 1-byte element. To avoid misunderstandings, let's define *false* as 0x00, and *true* as 'not **define?** *false*'. That way, this two packets are valid *true* elements:

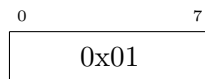


Figure 2.2: True packet with the LSB at 1

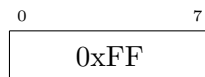


Figure 2.3: True packet with all bits at 1

### 2.4.3 Double

Doubles are 8-bytes floating-point numbers. They are represented following the IEEE 754<sup>1</sup>.

### 2.4.4 String

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

### 2.4.5 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.

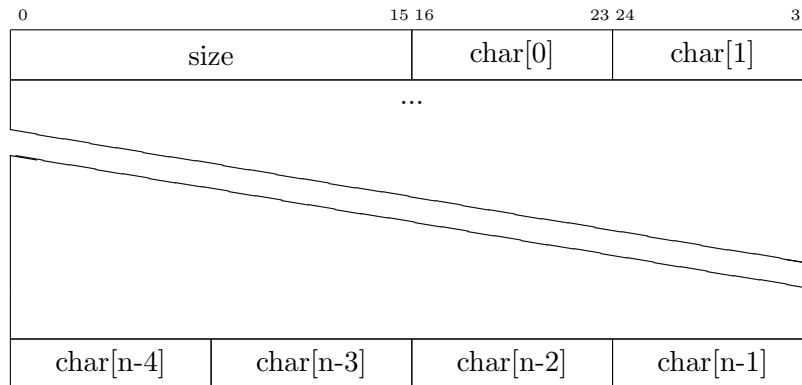


Figure 2.4: Structure of a String

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.

---

<sup>1</sup>This standard should be used by C and Java. **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

## 2.4.6 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 definition<sup>2</sup> is 4GB.

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<sup>2</sup>Besides 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.

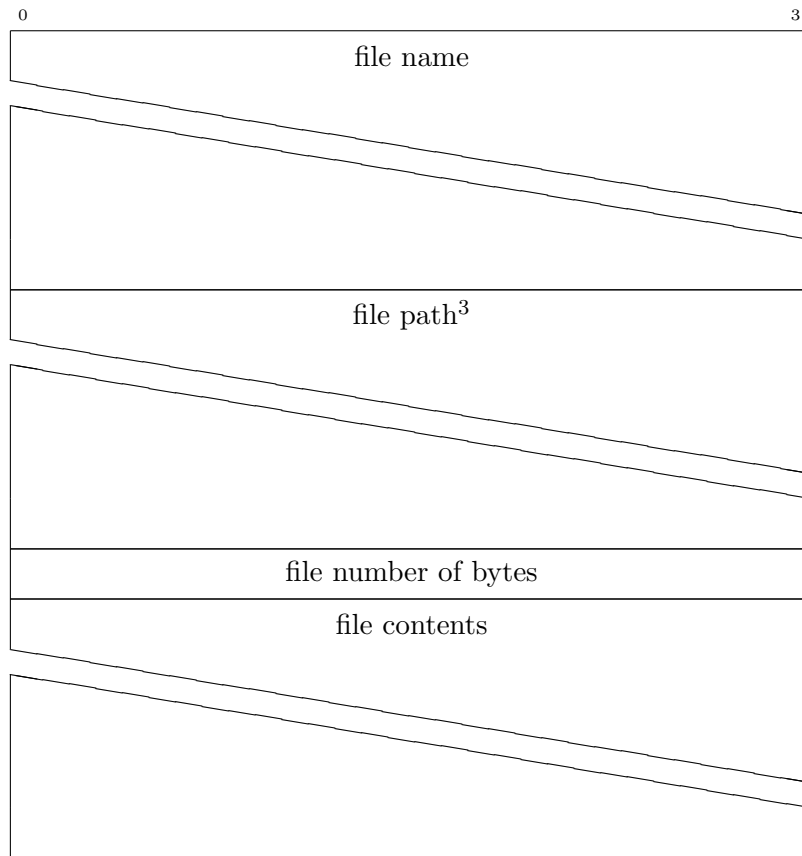


Figure 2.6: File structure

## 2.4.7 Server type

The Server type specifies the Minecraft server.

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

## 2.4.8 Position

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---

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

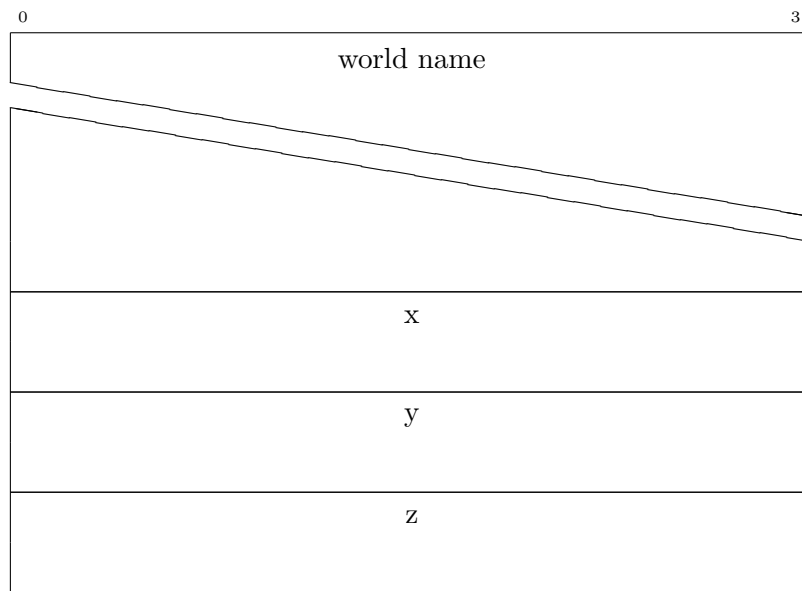


Figure 2.7: Position structure

## 2.4.9 Block

... 56 bytes

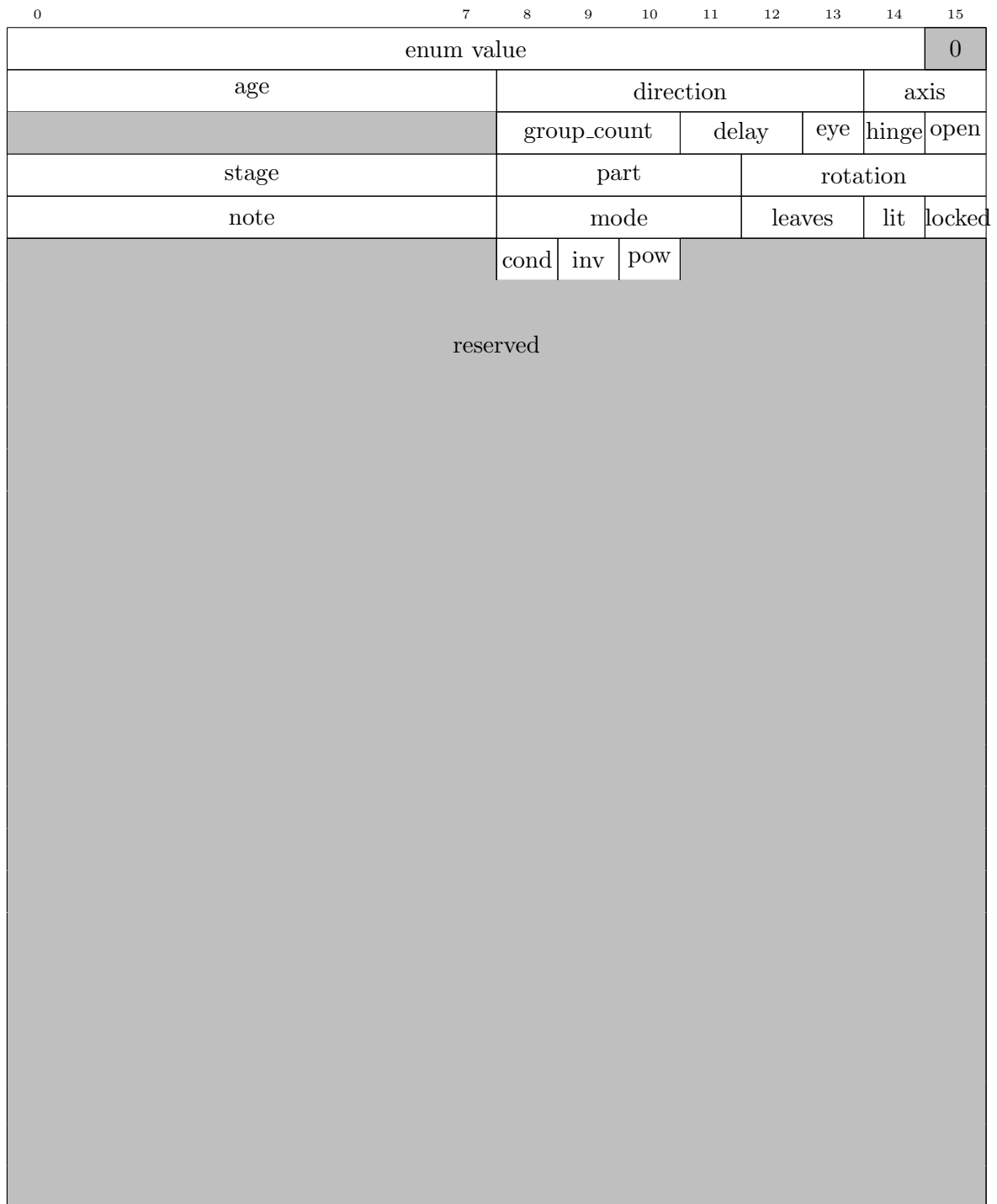


Figure 2.8: Structure of a Block

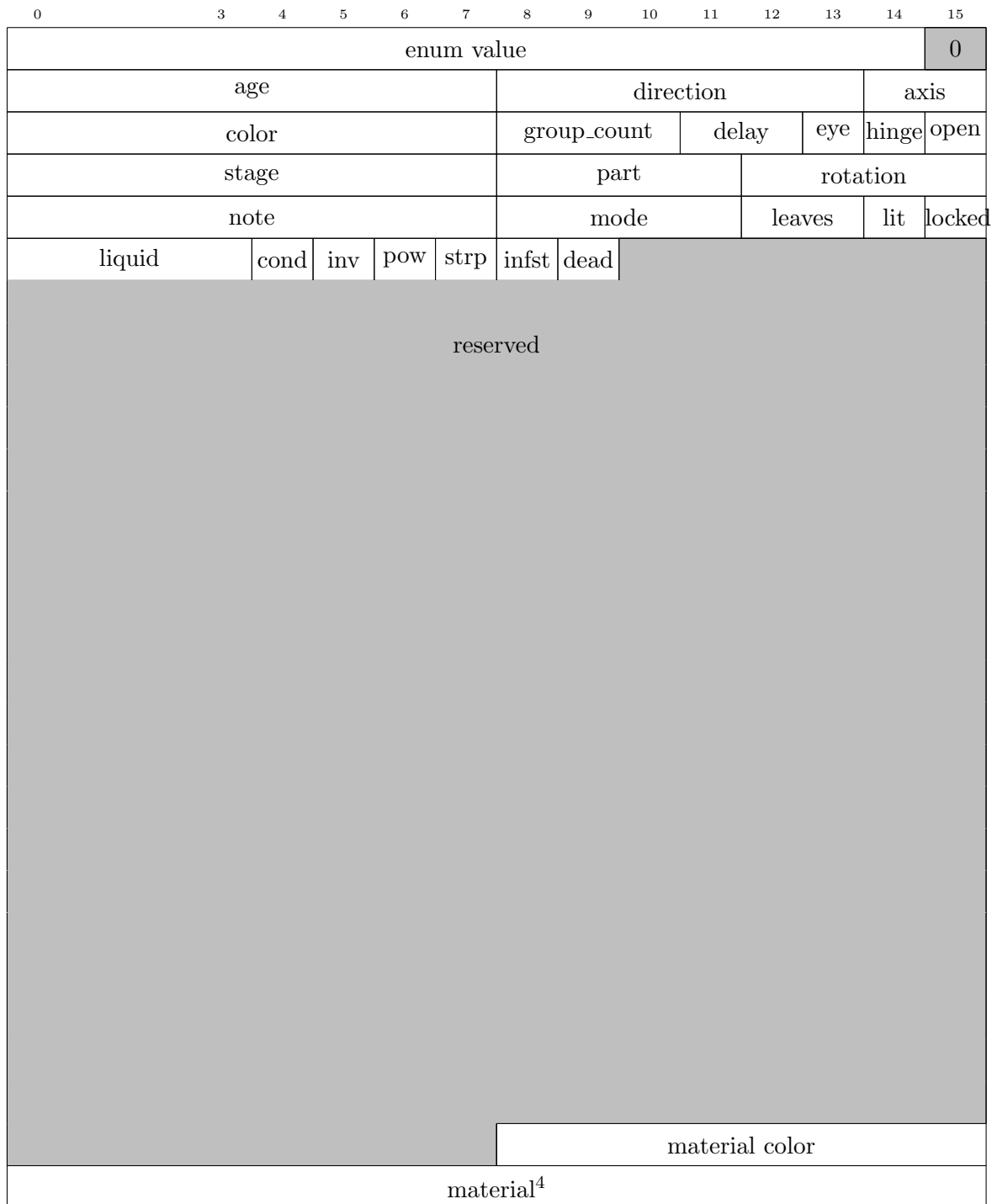


Figure 2.9: Structure of a Block

---

<sup>4</sup>Some blocks (like slabs) are made of other materials.

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

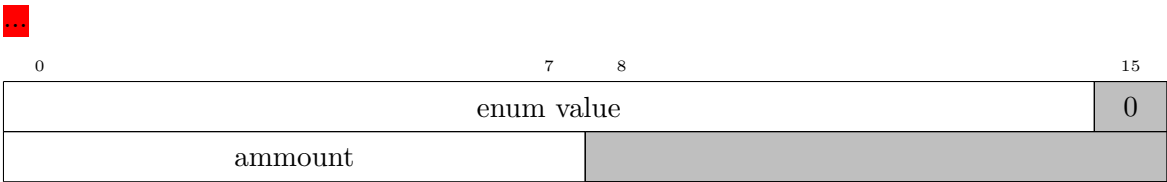


Figure 2.10: Structure of an Item

| Enum value | Item name | First Minecraft version |
|------------|-----------|-------------------------|
| 0          | AIR       | 1.8                     |

Table 2.3: Item enum

2.4.11 Entity

...

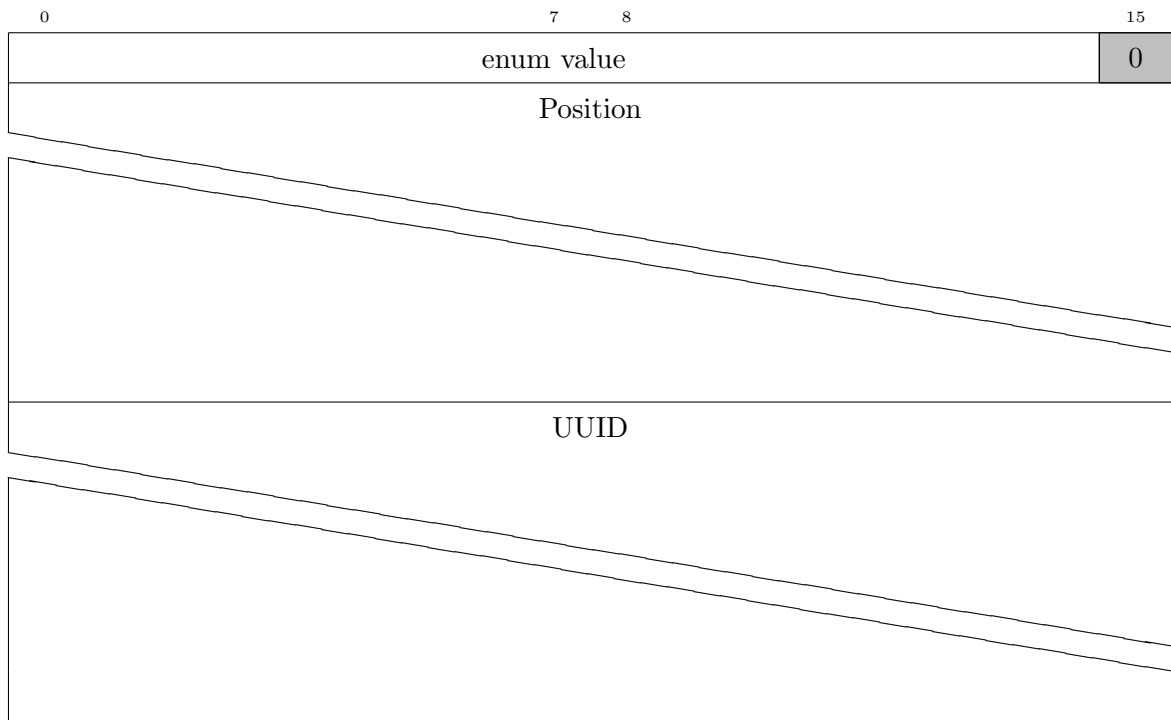


Figure 2.11: Structure of an Entity

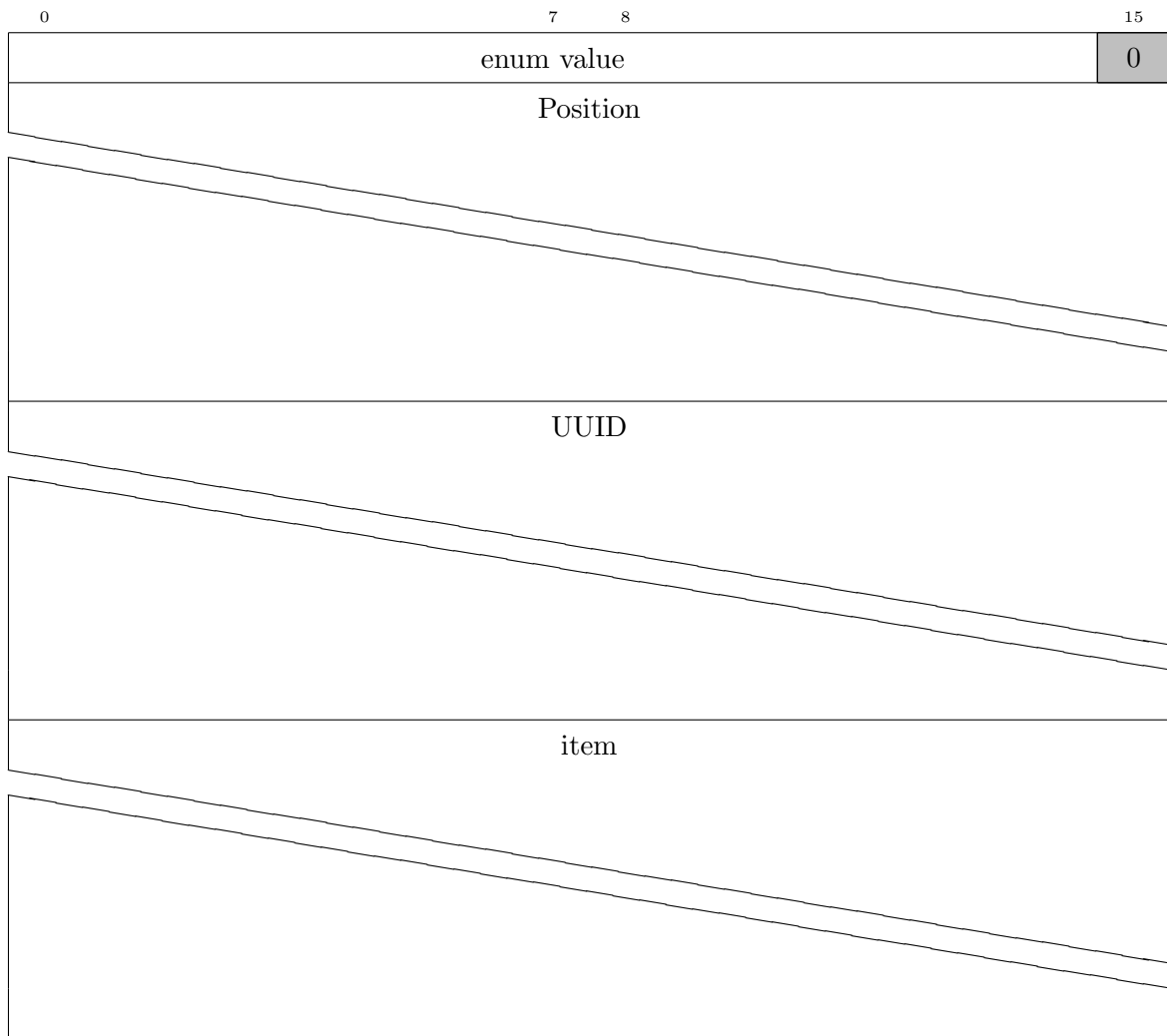


Figure 2.12: Structure of a `DroppedItem`

## 2.4.12 Container





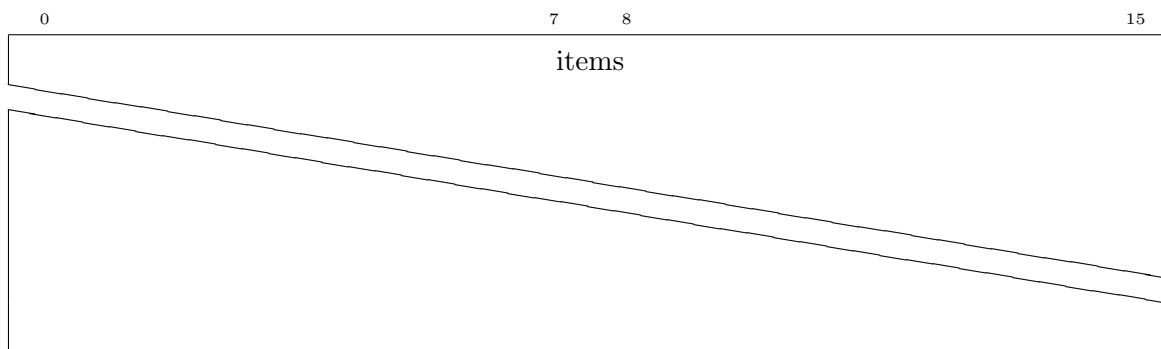


Figure 2.13: Structure of a Container

| Enum value | Entity name | First Minecraft version |
|------------|-------------|-------------------------|
| 0          | ZOMBIE      | 1.8                     |

Table 2.4: Entity enum

### 3 Server manager petition

...

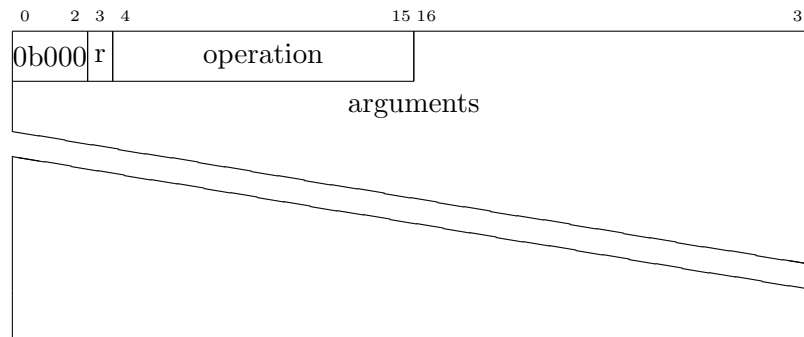


Figure 3.1: Server manager petition structure

#### 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

...

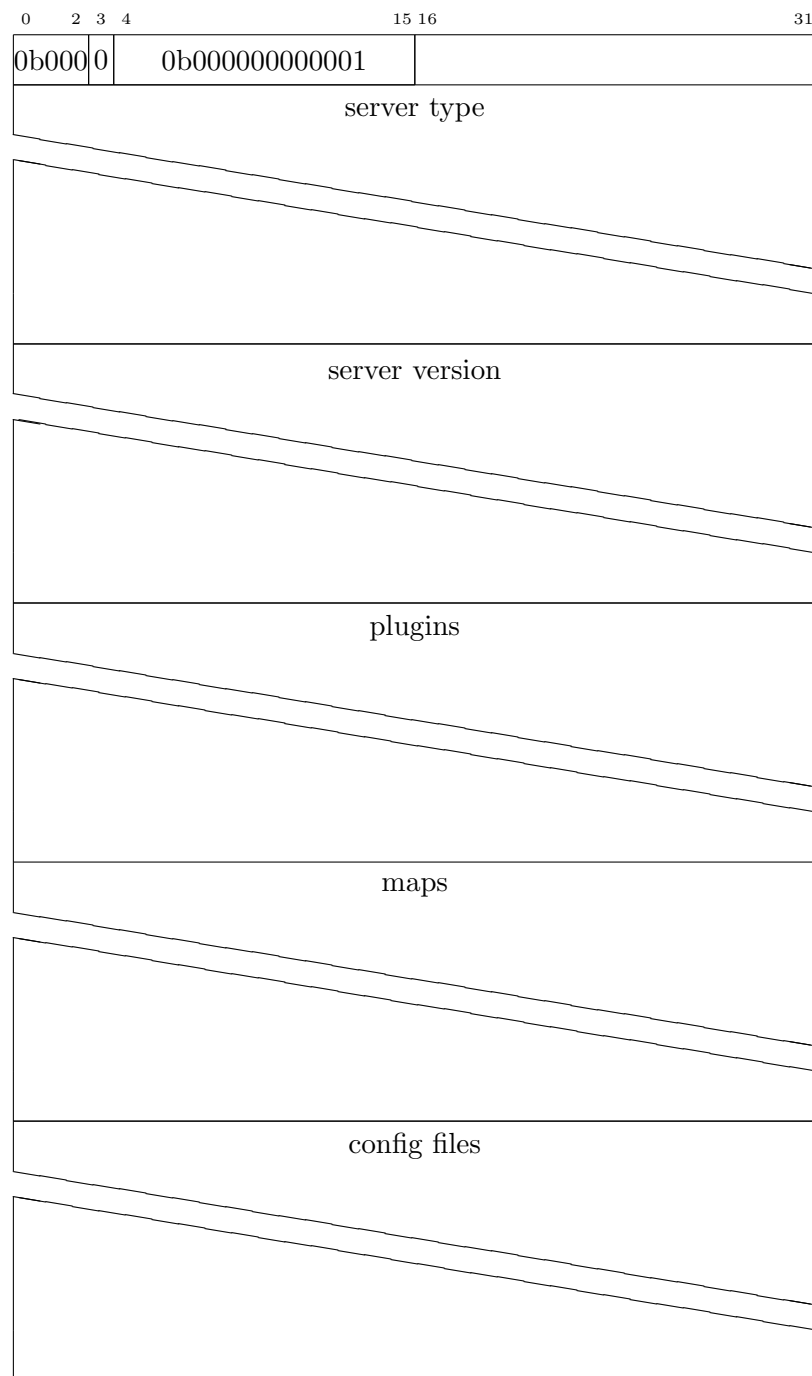


Figure 3.2: Start server petition structure

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).

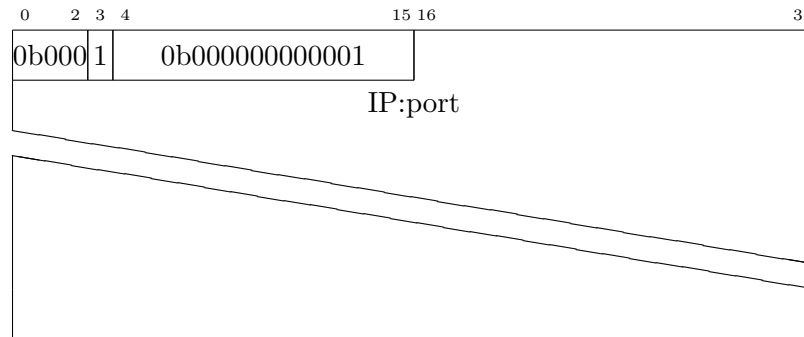


Figure 3.3: Start server response structure

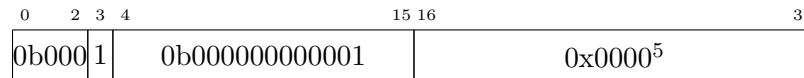


Figure 3.4: Start server error response structure

### 3.1.1 Maps

Array of maps (worlds; Map[]). To have more information about arrays check the subsection 2.4.5, Array.

About the Map type, Minecraft is divided on different worlds (*World - Minecraft Wiki* (n.d.)). 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**

<sup>5</sup>Being 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 2.4.5, 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 (*WorldGuard* (n.d.)), or to allow the user to test plugins with Premium plugins<sup>6</sup> 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.

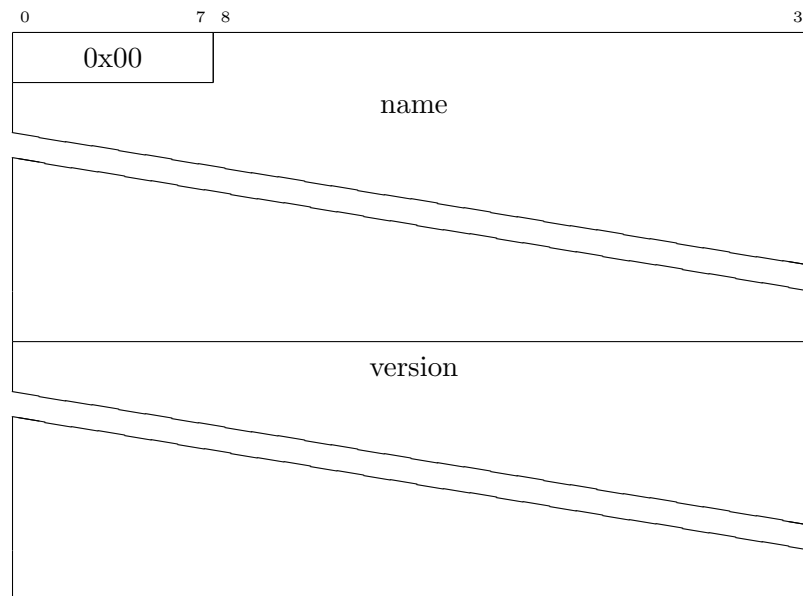


Figure 3.5: Usual plugin structure

---

<sup>6</sup>Premium 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.

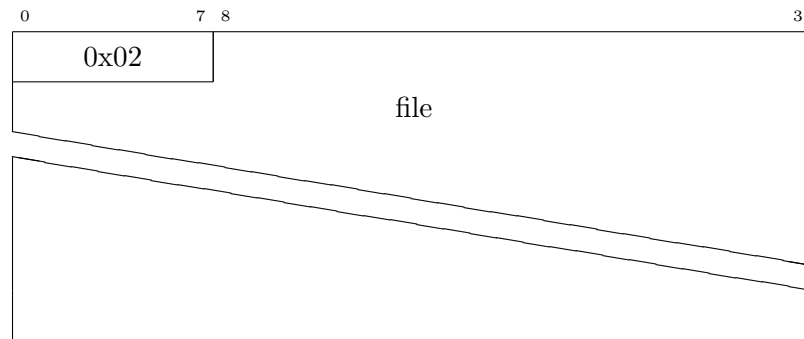


Figure 3.6: File plugin structure

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.

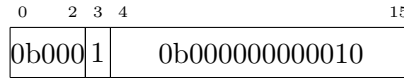


Figure 3.7: Server started notification structure

### 3.3 Error notification

...

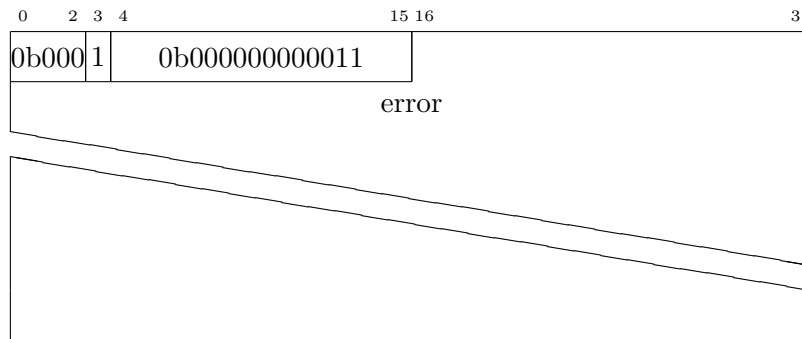


Figure 3.8: Error notification structure

### 3.4 Get coverage operation

... get combined JaCoCo binary files of all the servers that the current connection has started

#### 3.4.1 Get coverage request

...

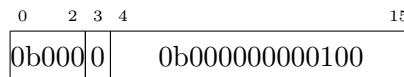


Figure 3.9: Get coverage operation structure

#### 3.4.2 Get coverage response

...

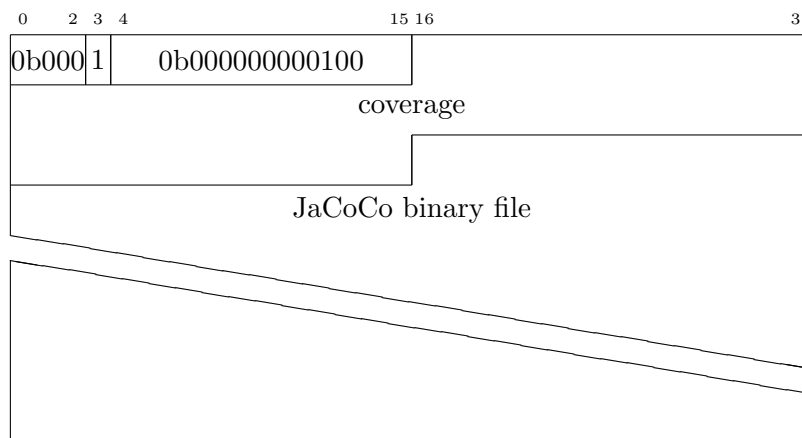


Figure 3.10: Get coverage response structure



## 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.

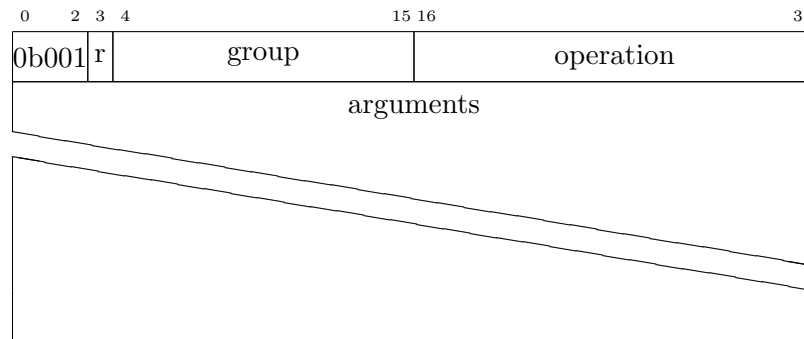


Figure 4.1: Server petition structure

### 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.



### 4.3.1 Server stop operation

...

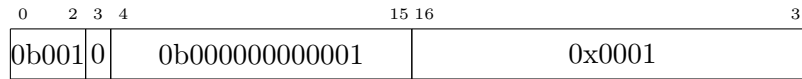


Figure 4.3: Stop server operation structure

### 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.

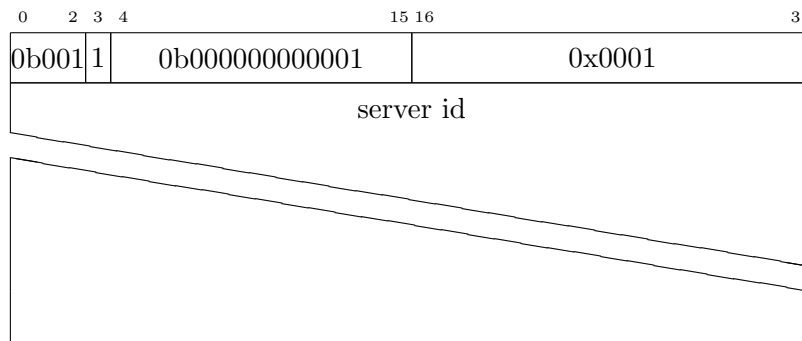


Figure 4.4: Server stopped response structure

### 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.

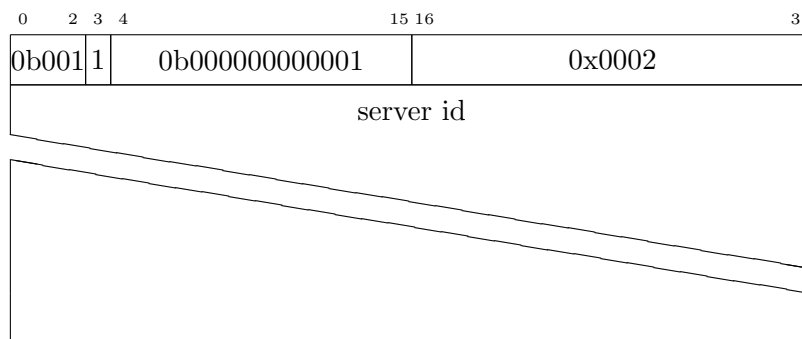


Figure 4.5: Server started response structure

#### 4.3.4 Whitelist player operation

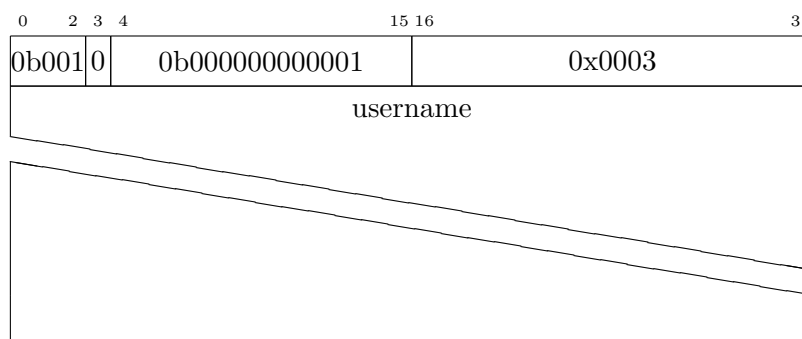


Figure 4.6: Whitelist player operation structure

#### 4.3.5 OP player operation

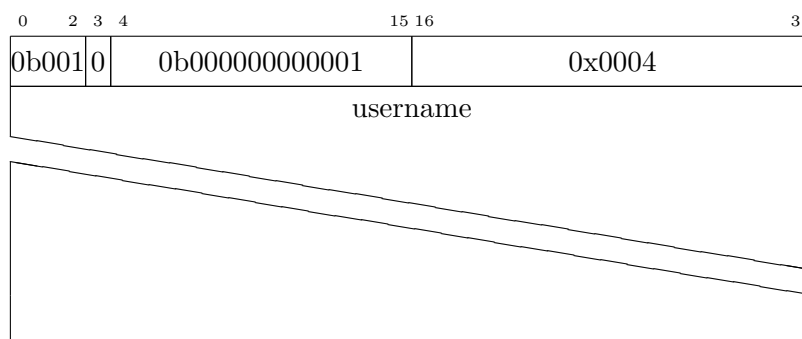


Figure 4.7: OP player operation structure

4.3.6 Set block operation

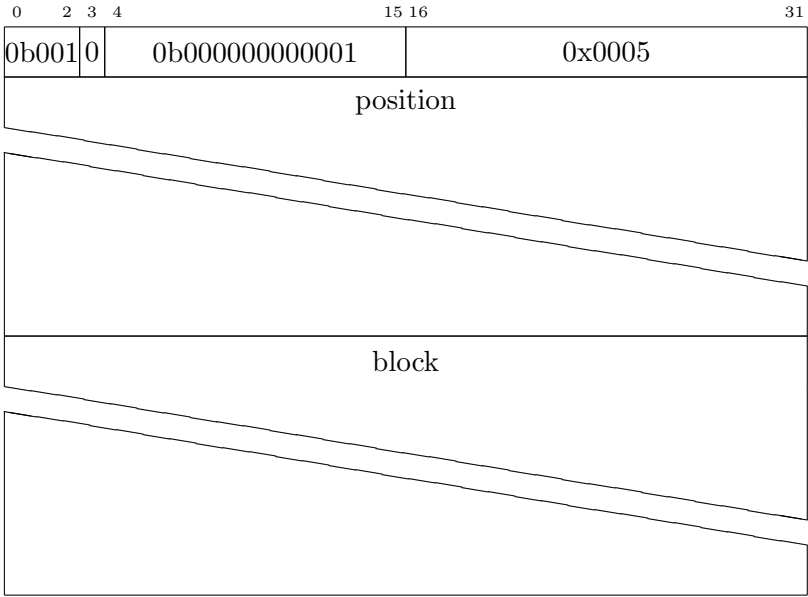


Figure 4.8: Set block operation structure

4.3.7 Get block operation

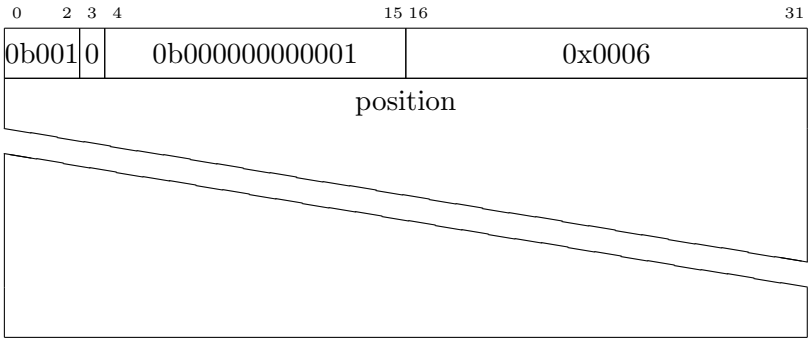


Figure 4.9: Get block operation structure

4.3.8 Get block response



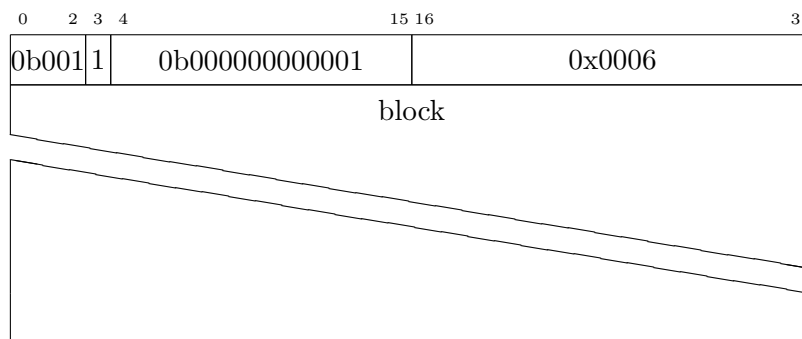


Figure 4.10: Get block operation structure

### 4.3.9 Get player position operation

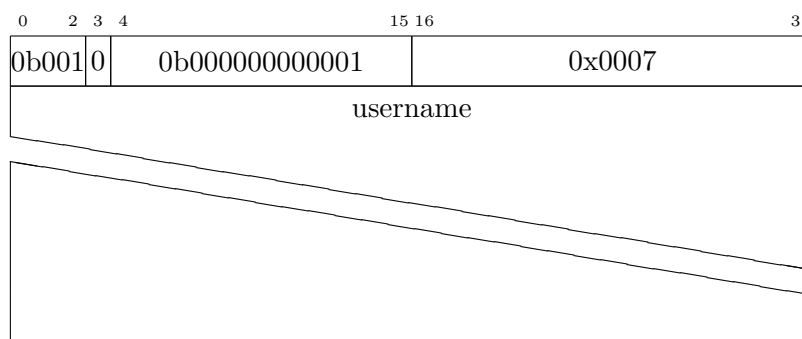


Figure 4.11: Get player position operation structure

### 4.3.10 Get player position response

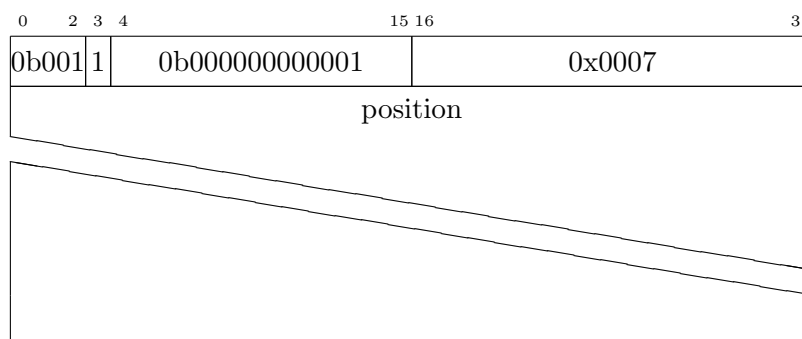


Figure 4.12: Get player position response structure

### 4.3.11 Give item to player operation

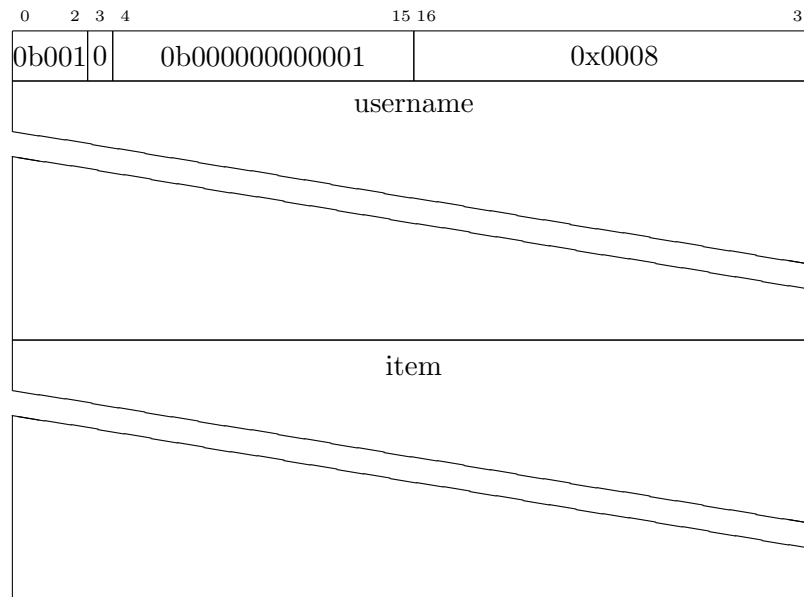


Figure 4.13: Give item to player operation structure

### 4.3.12 Run command operation

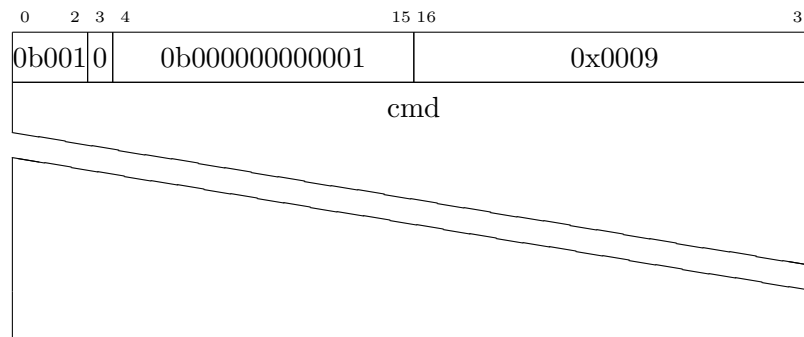


Figure 4.14: Run command operation structure

### 4.3.13 Get players operation



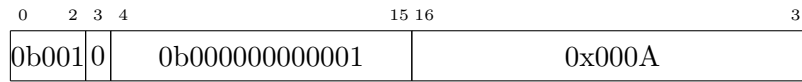


Figure 4.15: Get players operation structure

#### 4.3.14 Get players response

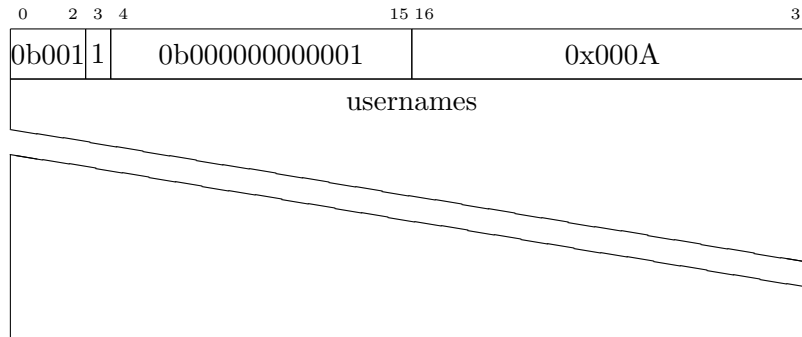


Figure 4.16: Get players response structure

#### 4.3.15 Synchronize operation

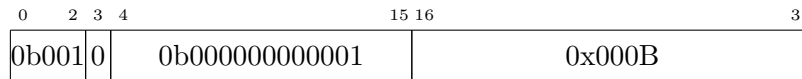


Figure 4.17: Synchronize operation structure

#### 4.3.16 Synchronize response

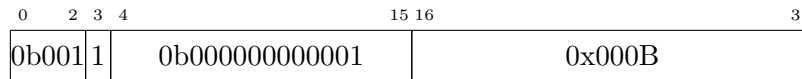


Figure 4.18: Synchronize response structure

#### 4.3.17 Tp player operation





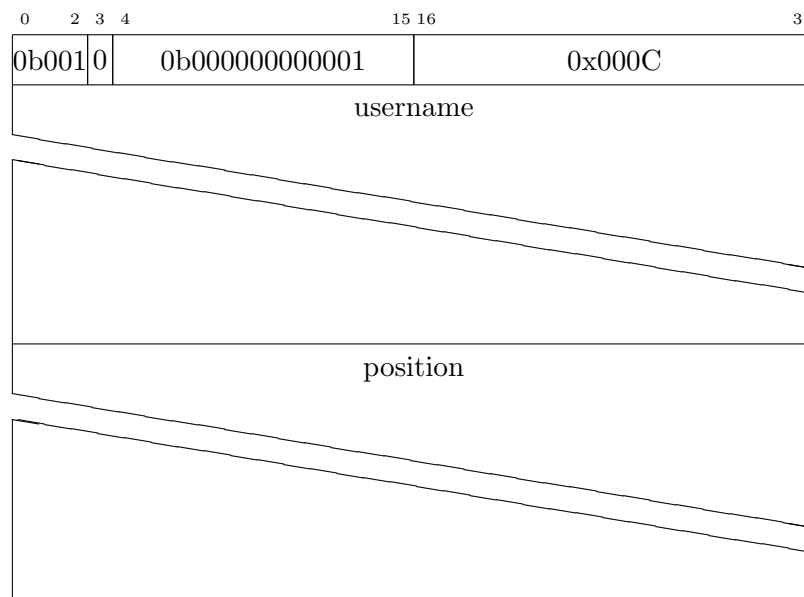


Figure 4.19: Tp player operation structure

### 4.3.18 Get player pitch operation

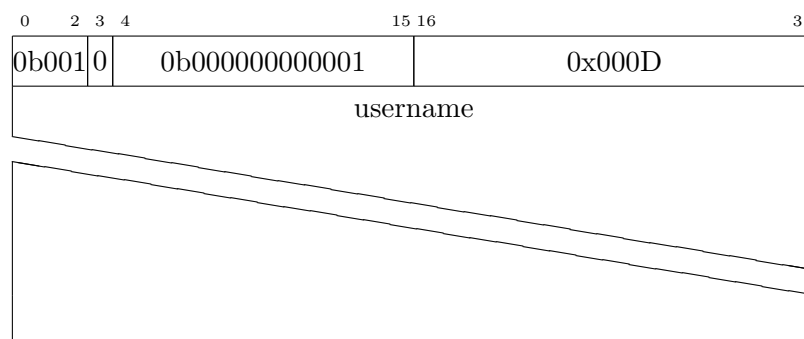


Figure 4.20: Get player pitch operation structure

### 4.3.19 Get player pitch response



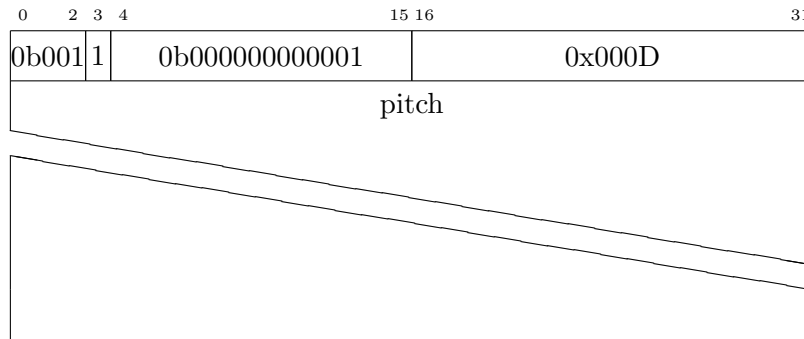


Figure 4.21: Get player pitch response structure

#### 4.3.20 Get player yaw operation

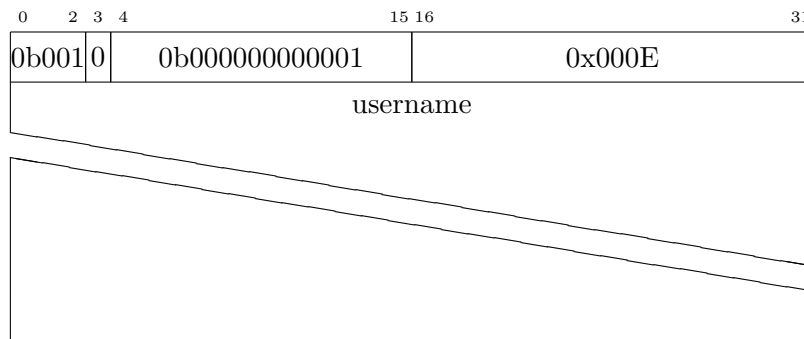


Figure 4.22: Get player yaw operation structure

#### 4.3.21 Get player yaw response

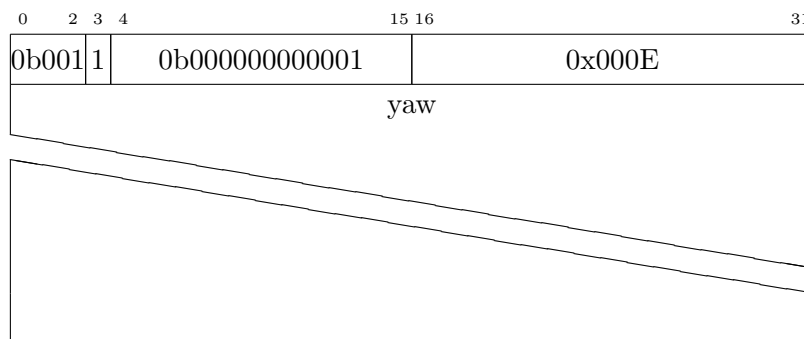


Figure 4.23: Get player yaw response structure

4.3.22 Get player inventory operation

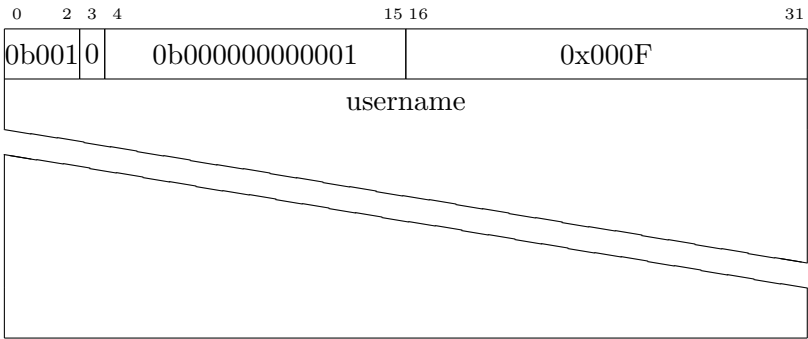


Figure 4.24: Get player inventory operation structure

4.3.23 Get player inventory response

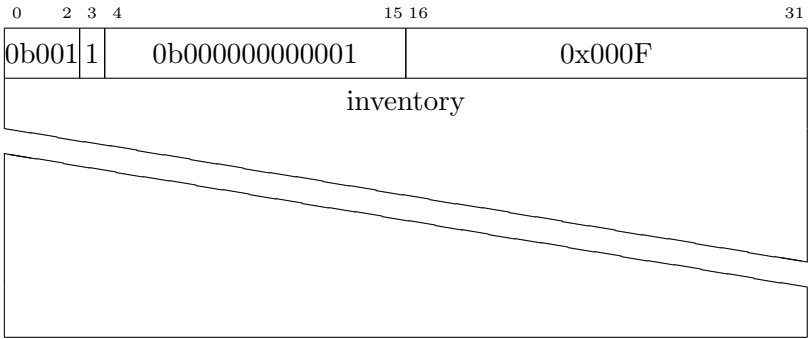


Figure 4.25: Get player inventory response structure

4.3.24 Get entities operation



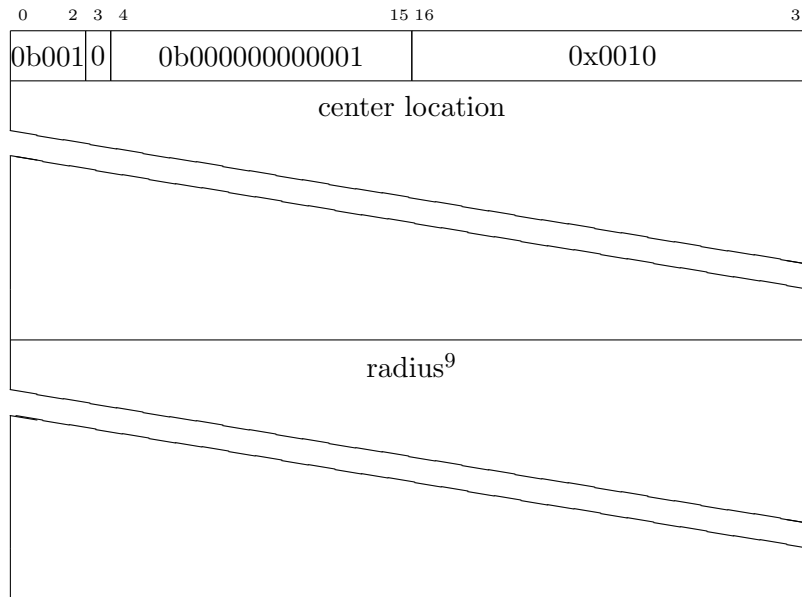


Figure 4.26: Get entities operation structure

#### 4.3.25 Get entities response

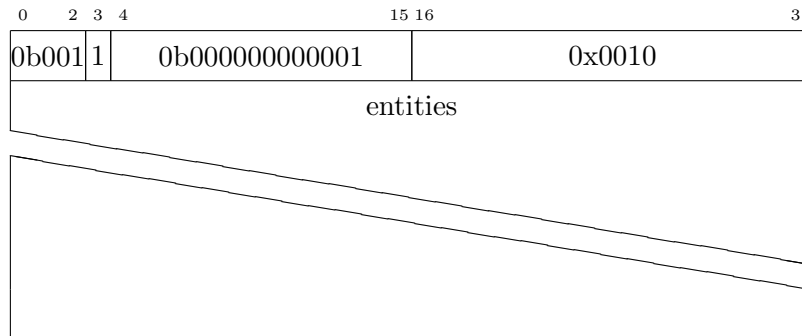


Figure 4.27: Get entities response structure

## 4.4 Performance operations



## 4.5 WorldGuard operations



<sup>9</sup>Large radius or locations in unloaded chunks may return unexpected data.

## 4.6 Residence operations



# 5 Clients manager petition

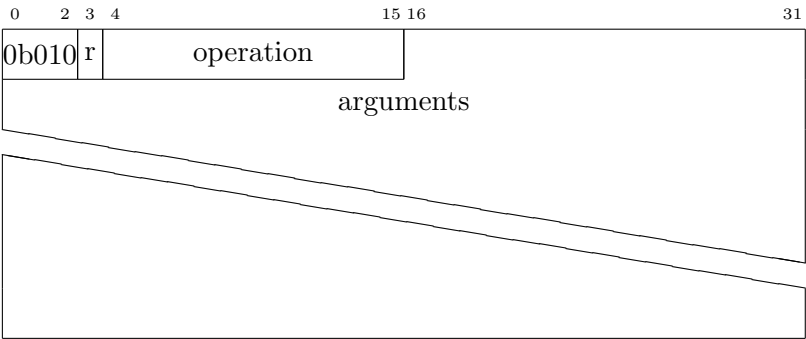


Figure 5.1: Clients manager petition structure

## 5.1 Start client operation

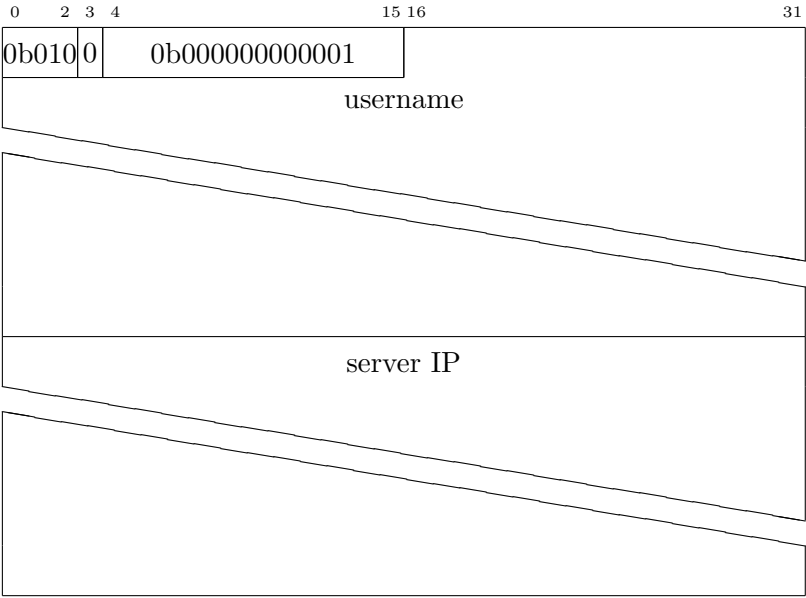


Figure 5.2: Start client petition structure

## 5.2 Client started response operation



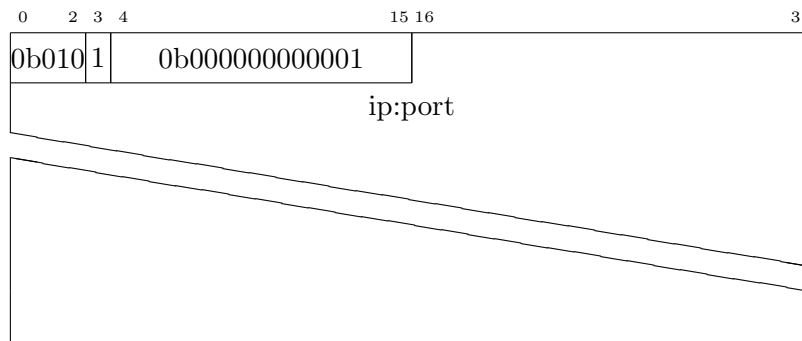


Figure 5.3: Client started petition response structure

## 6 Client petition

...

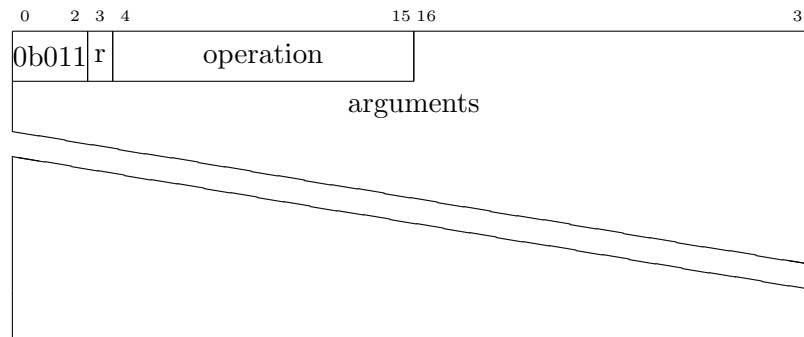


Figure 6.1: Client petition structure

### 6.1 Stop client operation

...

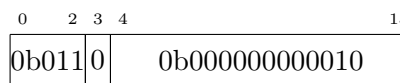


Figure 6.2: Stop client petition structure

### 6.2 Send message operation

... don't use this to run commands

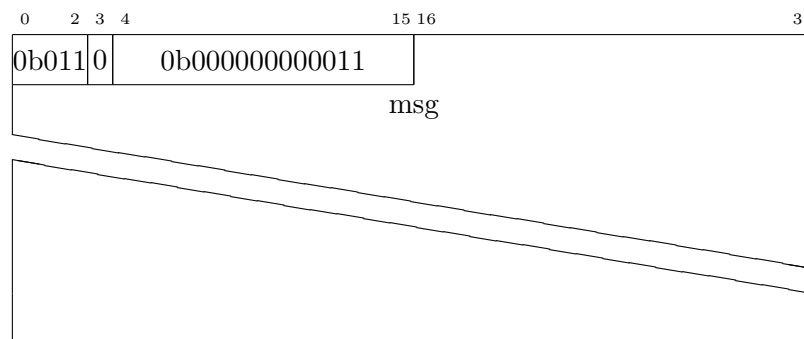


Figure 6.3: Send message petition structure

### 6.3 Got message notification

... async



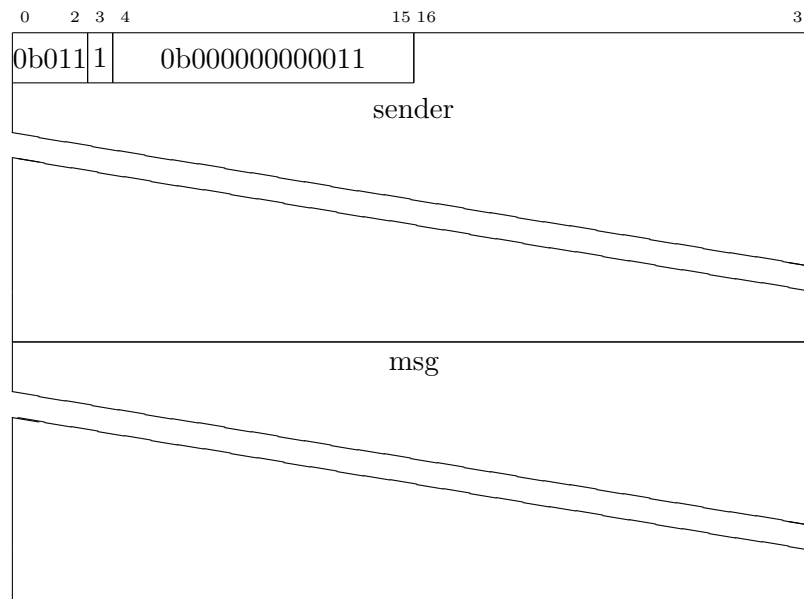


Figure 6.4: Got message notification structure

## 6.4 Run command operation

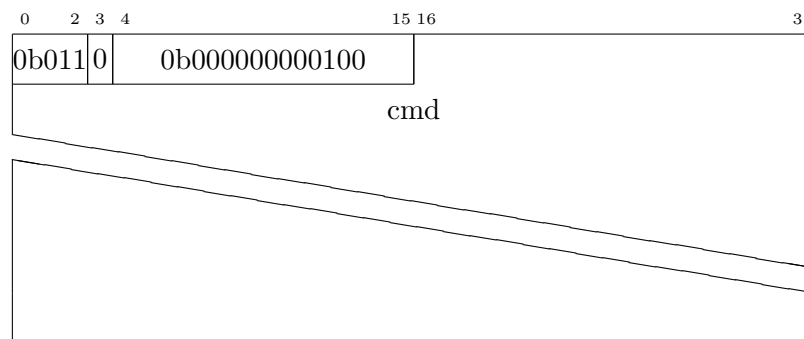


Figure 6.5: Run command petition structure

## 6.5 Break block operation



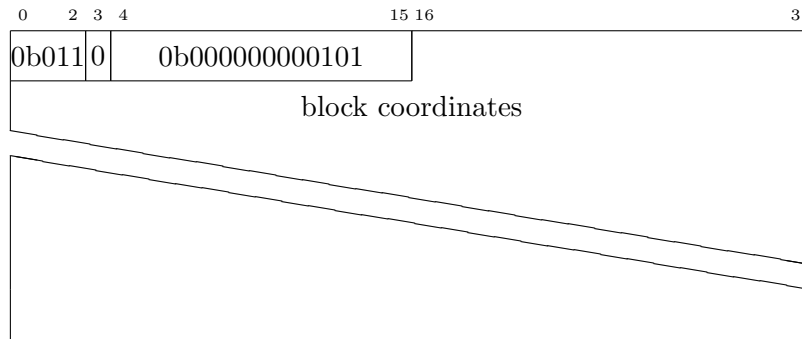


Figure 6.6: Run command petition structure

## 6.6 Equip item in hand operation

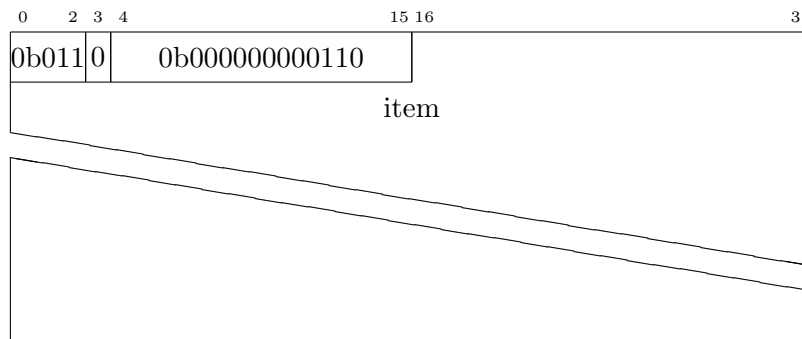


Figure 6.7: Run command petition structure

## 6.7 Move at operation

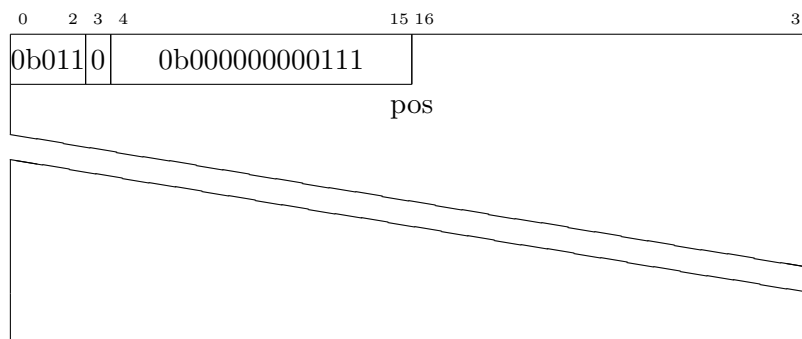


Figure 6.8: Move at petition structure

6.8 Look at operation

...

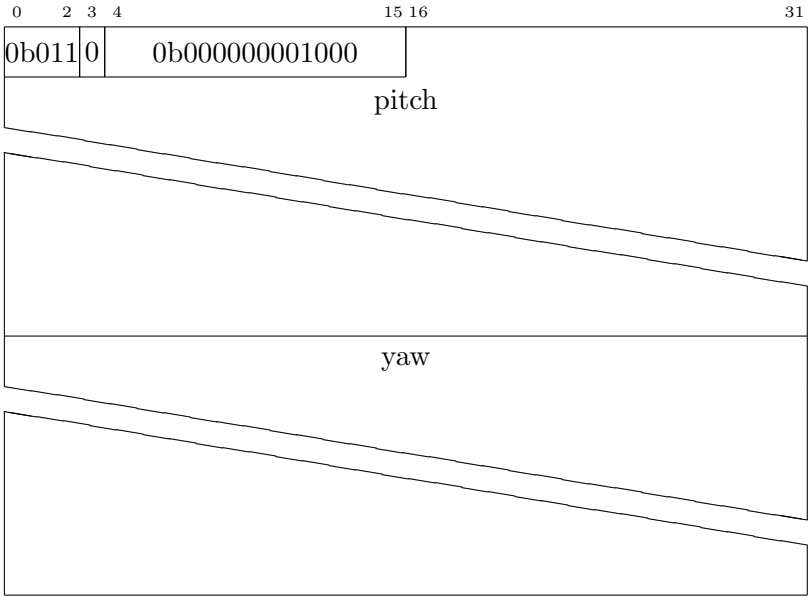


Figure 6.9: Move at petition structure

6.9 Synchronize operation

...

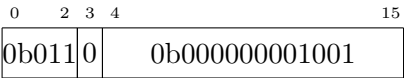


Figure 6.10: Synchronize petition structure

6.10 Synchronize response

...

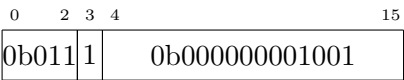


Figure 6.11: Synchronize petition response structure

6.11 Hit operation

... left click with item in hand

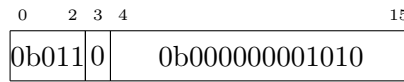


Figure 6.12: Hit petition structure

## 6.12 Use operation

... right click with item in hand

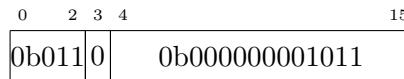


Figure 6.13: Use petition structure

## 6.13 Place block operation

... place current item in hand

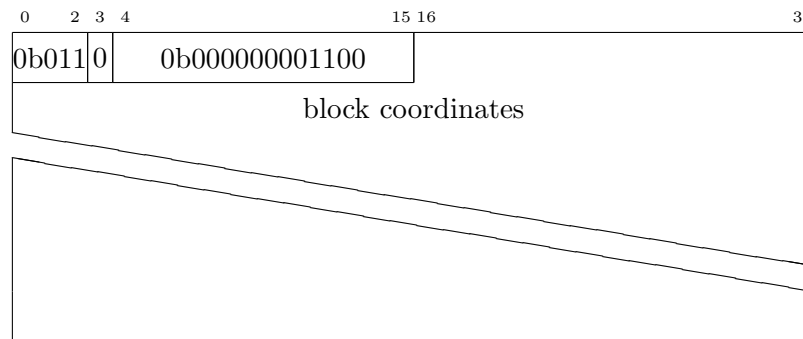


Figure 6.14: Place block petition structure

## 7 Revision history

| Date | Revision | Changes          |
|------|----------|------------------|
| date | 1        | Initial release. |

Table 7.1: 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 *Spigot - Enum Material - 1.19* (n.d.).

### A.1 Unused material 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              |
| 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                 |

| Modifier name | Reason for discarding  |
|---------------|------------------------|
| 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        |
| in_wall       | Same block             |
| moisture      | 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           |
| 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            |

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



| Block name          | Modifier name |
|---------------------|---------------|
| 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       |
| SMOKER              | lit           |
| FURNACE             | lit           |
| CHEST               | type          |
| TRAPPED_CHEST       | type          |

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

## A.2 Material modifiers

### A.2.1 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 <sup>10</sup> |
| 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.2.2 Attachment

Denotes how the bell is attached to its block.

Defaults to floor.

| Material | Options                               |
|----------|---------------------------------------|
| BELL     | ceiling/double_wall/floor/single_wall |

Table A.4: Attachable materials

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<sup>10</sup>The 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 ??, Modifier concatenation.

### A.2.3 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     |
| OCHRE_FROGLIGHT       | x/y/z     |
| PEARLESCENT_FROGLIGHT | x/y/z     |
| POLISHED_BASALT       | x/y/z     |
| PURPUR_PILLAR         | x/y/z     |

| Material                | Age range |
|-------------------------|-----------|
| 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.2.4 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.2.5 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.2.6 Candles

Represents the number of candles which are present.

Defaults to 1.

combine with cake if  $\neq 0$

| 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    |
| MAGENTA_CANDLE    | 1-4    |
| ORANGE_CANDLE     | 1-4    |

| Material      | Values |
|---------------|--------|
| 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.2.7 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.2.8 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.2.9 Delay

Propagation delay of a repeater.

Defaults to 1.

| Material | Values |
|----------|--------|
| REPEATER | 1-4    |

Table A.11: Delayable materials

## A.2.10 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.2.11 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/ <b>false</b>        |
| BIRCH_FENCE              | true/ <b>false</b>        |
| BLACK_STAINED_GLASS_PANE | true/ <b>false</b>        |
| BLUE_STAINED_GLASS_PANE  | true/ <b>false</b>        |
| BROWN_STAINED_GLASS_PANE | true/ <b>false</b>        |
| CHORUS_PLANT             | true/ <b>false</b>        |
| CRIMSON_FENCE            | true/ <b>false</b>        |

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



| Material                       | Options (default on bold) |
|--------------------------------|---------------------------|
| REDSTONE_WIRE                  | <b>none</b> /up/slide     |
| ANDESITE_WALL                  | <b>none</b> /low/tall     |
| BLACKSTONE_WALL                | <b>none</b> /low/tall     |
| BRICK_WALL                     | <b>none</b> /low/tall     |
| COBBLED_DEEPSLATE_WALL         | <b>none</b> /low/tall     |
| COBBLESTONE_WALL               | <b>none</b> /low/tall     |
| DEEPSLATE_BRICK_WALL           | <b>none</b> /low/tall     |
| DEEPSLATE_TILE_WALL            | <b>none</b> /low/tall     |
| DIORITE_WALL                   | <b>none</b> /low/tall     |
| END_STONE_BRICK_WALL           | <b>none</b> /low/tall     |
| GRANITE_WALL                   | <b>none</b> /low/tall     |
| MOSSY_COBBLESTONE_WALL         | <b>none</b> /low/tall     |
| MOSSY_STONE_BRICK_WALL         | <b>none</b> /low/tall     |
| MUD_BRICK_WALL                 | <b>none</b> /low/tall     |
| NETHER_BRICK_WALL              | <b>none</b> /low/tall     |
| POLISHED_BLACKSTONE_BRICK_WALL | <b>none</b> /low/tall     |
| POLISHED_BLACKSTONE_WALL       | <b>none</b> /low/tall     |
| POLISHED_DEEPSLATE_WALL        | <b>none</b> /low/tall     |
| PRISMARINE_WALL                | <b>none</b> /low/tall     |
| RED_NETHER_BRICK_WALL          | <b>none</b> /low/tall     |
| RED_SANDSTONE_WALL             | <b>none</b> /low/tall     |
| SANDSTONE_WALL                 | <b>none</b> /low/tall     |
| STONE_BRICK_WALL               | <b>none</b> /low/tall     |

Table A.13: Orientable materials

## A.2.12 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.2.13 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.2.14 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.2.15 Eye

Defaults to false.

| Material         | Values     |
|------------------|------------|
| END_PORTAL_FRAME | true/false |

Table A.17: Materials with eye

## A.2.16 Face

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

**WALL\_SIGN**

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.2.17 Facing

Represents the face towards which the block is pointing.

| Material | Options (default on bold)          |
|----------|------------------------------------|
| HOPPER   | <b>down</b> /north/south/east/west |

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

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

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

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

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



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

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

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

Table A.19: Directional materials

## A.2.18 Half

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

| Material        | Options (default on bold) |
|-----------------|---------------------------|
| ACACIA_STAIRS   | <b>bottom</b> /top        |
| ACACIA_TRAPDOOR | <b>bottom</b> /top        |

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

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

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

Table A.20: Two-blocks materials

## A.2.19 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.2.20 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.2.21 Honey level

Represents the amount of honey stored in the hive.

Defaults to 0.

| Material | Values            |
|----------|-------------------|
| BEEHIVE  | 0/5 <sup>11</sup> |
| BEE_NEST | 0/5 <sup>11</sup> |

Table A.23: Hives

### A.2.22 Inverted

Denotes whether this daylight detector is in the inverted mode.

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<sup>11</sup>The 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 ??, Modifier concatenation.

Defaults to false.

| Material          | Values     |
|-------------------|------------|
| DAYLIGHT_DETECTOR | true/false |

Table A.24: Invertible blocks

### A.2.23 Layers

Represents the amount of layers of snow which are present in this block.

Defaults to 1.

| Material | Values |
|----------|--------|
| SNOW     | 1-8    |

Table A.25: Snow

### A.2.24 Leaves

Represents the size of the leaves of the bamboo block.

Defaults to none.

| Material | Values           |
|----------|------------------|
| BAMBOO   | none/small/large |

Table A.26: Bamboo

### A.2.25 Level

Represents the amount of fluid contained within this block, either by itself or inside a cauldron.

Defaults on 0 except for POWDER\_SNOW\_CAULDRON and WATER\_CAULDRON (which defaults on 1).



| Material             | Values |
|----------------------|--------|
| COMPOSTER            | 0-8    |
| LAVA                 | 0-7    |
| WATER                | 0-7    |
| POWDER_SNOW_CAULDRON | 1-3    |
| WATER_CAULDRON       | 1-3    |

Table A.27: Levelled materials

## A.2.26 Lit

Denotes whether this block is currently lit.

Except for CAMPFIRE, REDSTONE\_TORCH, REDSTONE\_WALL\_TORCH and SOUL\_CAMPFIRE (which defaults to true), it defaults to false.

| Material               | Options    |
|------------------------|------------|
| BLACK_CANDLE           | true/false |
| BLACK_CANDLE_CAKE      | true/false |
| BLAST_FURNACE          | true/false |
| BLUE_CANDLE            | true/false |
| BLUE_CANDLE_CAKE       | true/false |
| BROWN_CANDLE           | true/false |
| BROWN_CANDLE_CAKE      | true/false |
| CANDLE                 | true/false |
| CANDLE_CAKE            | true/false |
| CYAN_CANDLE            | true/false |
| CYAN_CANDLE_CAKE       | true/false |
| DEEPSLATE_REDSTONE_ORE | true/false |
| GRAY_CANDLE            | true/false |
| GRAY_CANDLE_CAKE       | true/false |
| GREEN_CANDLE           | true/false |
| GREEN_CANDLE_CAKE      | true/false |
| LIGHT_BLUE_CANDLE      | true/false |

| Material               | Options    |
|------------------------|------------|
| LIGHT_BLUE_CANDLE_CAKE | true/false |
| LIGHT_GRAY_CANDLE      | true/false |
| LIGHT_GRAY_CANDLE_CAKE | true/false |
| LIME_CANDLE            | true/false |
| LIME_CANDLE_CAKE       | true/false |
| MAGENTA_CANDLE         | true/false |
| MAGENTA_CANDLE_CAKE    | true/false |
| ORANGE_CANDLE          | true/false |
| ORANGE_CANDLE_CAKE     | true/false |
| PINK_CANDLE            | true/false |
| PINK_CANDLE_CAKE       | true/false |
| PURPLE_CANDLE          | true/false |
| PURPLE_CANDLE_CAKE     | true/false |
| REDSTONE_LAMP          | true/false |
| REDSTONE_ORE           | true/false |
| RED_CANDLE             | true/false |
| RED_CANDLE_CAKE        | true/false |
| WHITE_CANDLE           | true/false |
| WHITE_CANDLE_CAKE      | true/false |
| YELLOW_CANDLE          | true/false |
| YELLOW_CANDLE_CAKE     | true/false |
| CAMPFIRE               | true/false |
| REDSTONE_TORCH         | true/false |
| REDSTONE_WALL_TORCH    | true/false |
| SOUL_CAMPFIRE          | true/false |

Table A.28: Lightable materials

### A.2.27 Locked

Denotes whether the repeater is in the locked state or not.

Defaults to false.

| Material | Values     |
|----------|------------|
| REPEATER | true/false |

Table A.29: Repeater

### A.2.28 Mode

Indicates what mode the block will operate in.

| Material        | Options (default on bold) |
|-----------------|---------------------------|
| COMPARATOR      | <b>compare</b> /subtract  |
| STRUCTURE_BLOCK | <b>load</b> /corner/save  |

Table A.30: Materials with mode

### A.2.29 Note

Specified tuned pitch that the instrument will be played in.

Defaults to 0.

| Material   | Values |
|------------|--------|
| NOTE_BLOCK | 0-24   |

Table A.31: Note block

### A.2.30 Open

Denotes whether this block is currently opened.

Defaults to false.

| Material          | Values     |
|-------------------|------------|
| ACACIA_DOOR       | true/false |
| ACACIA_FENCE_GATE | true/false |

| Material            | Values     |
|---------------------|------------|
| ACACIA_TRAPDOOR     | true/false |
| BARREL              | true/false |
| BIRCH_DOOR          | true/false |
| BIRCH_FENCE_GATE    | true/false |
| BIRCH_TRAPDOOR      | true/false |
| CRIMSON_DOOR        | true/false |
| CRIMSON_FENCE_GATE  | true/false |
| CRIMSON_TRAPDOOR    | true/false |
| DARK_OAK_DOOR       | true/false |
| DARK_OAK_FENCE_GATE | true/false |
| DARK_OAK_TRAPDOOR   | true/false |
| IRON_DOOR           | true/false |
| IRON_TRAPDOOR       | true/false |
| JUNGLE_DOOR         | true/false |
| JUNGLE_FENCE_GATE   | true/false |
| JUNGLE_TRAPDOOR     | true/false |
| MANGROVE_DOOR       | true/false |
| MANGROVE_FENCE_GATE | true/false |
| MANGROVE_TRAPDOOR   | true/false |
| OAK_DOOR            | true/false |
| OAK_FENCE_GATE      | true/false |
| OAK_TRAPDOOR        | true/false |
| SPRUCE_DOOR         | true/false |
| SPRUCE_FENCE_GATE   | true/false |
| SPRUCE_TRAPDOOR     | true/false |
| WARPED_DOOR         | true/false |
| WARPED_FENCE_GATE   | true/false |
| WARPED_TRAPDOOR     | true/false |

Table A.32: Openable materials

### A.2.31 Orientation

Direction the block is facing.

Defaults to north\_up, and can take any of the values shown in Table A.33, Jigsaw orientations.

| Orientation |
|-------------|
| north_up    |
| south_up    |
| east_up     |
| west_up     |
| up_north    |
| up_south    |
| up_east     |
| up_west     |
| down_north  |
| down_south  |
| down_east   |
| down_west   |

Table A.33: Jigsaw orientations

| Material |
|----------|
| JIGSAW   |

Table A.34: Jigsaw

### A.2.32 Part

Denotes which half of the bed this block corresponds to.

Defaults to foot.

| Material  | Values    |
|-----------|-----------|
| BLACK_BED | foot/head |

| Material       | Values    |
|----------------|-----------|
| BLUE_BED       | foot/head |
| BROWN_BED      | foot/head |
| CYAN_BED       | foot/head |
| GRAY_BED       | foot/head |
| GREEN_BED      | foot/head |
| LIGHT_BLUE_BED | foot/head |
| LIGHT_GRAY_BED | foot/head |
| LIME_BED       | foot/head |
| MAGENTA_BED    | foot/head |
| ORANGE_BED     | foot/head |
| PINK_BED       | foot/head |
| PURPLE_BED     | foot/head |
| RED_BED        | foot/head |
| WHITE_BED      | foot/head |
| YELLOW_BED     | foot/head |

Table A.35: Openable materials

### A.2.33 Pickles

Indicates the number of pickles in this block.

Defaults to 1.

| Material   | Values |
|------------|--------|
| SEA_PICKLE | 1-4    |

Table A.36: Materials with pickles

### A.2.34 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    |
| 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    |

| Material | Powered value |
|----------|---------------|
|----------|---------------|

Table A.37: Powerabled materials

### A.2.35 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.38: 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 |



| Material              |
|-----------------------|
| LIME_BANNER           |
| MAGENTA_BANNER        |
| MANGROVE_SIGN         |
| OAK_SIGN              |
| 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.39: Directional materials

### A.2.36 Shape - Rails

Represents the current layout of a minecart rail.

Defaults to north\_south, and it can take any value of those mentioned in Table A.40, Rail directions.

| Shape       |
|-------------|
| north_south |
| east_west   |
| north_east  |
| north_west  |
| south_east  |

| Shape           |
|-----------------|
| south_west      |
| ascending_north |
| ascending_south |
| ascending_east  |
| ascending_west  |

Table A.40: Rail directions

| Material       |
|----------------|
| ACTIVATOR_RAIL |
| DETECTOR_RAIL  |
| POWERED_RAIL   |
| RAIL           |

Table A.41: Rails

## A.2.37 Shape - Stairs

Represents the texture and bounding box shape of these stairs.

Defaults to straight.

| Material          | Shape   |
|-------------------|---|
| ACACIA_STAIRS     | straight/inner_right/inner_left/<br>outer_right/inner_right |
| ANDESITE_STAIRS   | straight/inner_right/inner_left/<br>outer_right/inner_right |
| BIRCH_STAIRS      | straight/inner_right/inner_left/<br>outer_right/inner_right |
| BLACKSTONE_STAIRS | straight/inner_right/inner_left/<br>outer_right/inner_right |
| BRICK_STAIRS      | straight/inner_right/inner_left/<br>outer_right/inner_right |

| Material                  | Shape   |
|---------------------------|---|
| COBBLED_DEEPSLATE_STAIRS  | straight/inner_right/inner_left/<br>outer_right/inner_right |
| COBBLESTONE_STAIRS        | straight/inner_right/inner_left/<br>outer_right/inner_right |
| CRIMSON_STAIRS            | straight/inner_right/inner_left/<br>outer_right/inner_right |
| CUT_COPPER_STAIRS         | straight/inner_right/inner_left/<br>outer_right/inner_right |
| DARK_OAK_STAIRS           | straight/inner_right/inner_left/<br>outer_right/inner_right |
| DARK_PRISMARINE_STAIRS    | straight/inner_right/inner_left/<br>outer_right/inner_right |
| DEEPSLATE_BRICK_STAIRS    | straight/inner_right/inner_left/<br>outer_right/inner_right |
| DEEPSLATE_TILE_STAIRS     | straight/inner_right/inner_left/<br>outer_right/inner_right |
| DIORITE_STAIRS            | straight/inner_right/inner_left/<br>outer_right/inner_right |
| END_STONE_BRICK_STAIRS    | straight/inner_right/inner_left/<br>outer_right/inner_right |
| EXPOSED_CUT_COPPER_STAIRS | straight/inner_right/inner_left/<br>outer_right/inner_right |
| GRANITE_STAIRS            | straight/inner_right/inner_left/<br>outer_right/inner_right |
| JUNGLE_STAIRS             | straight/inner_right/inner_left/<br>outer_right/inner_right |
| MANGROVE_STAIRS           | straight/inner_right/inner_left/<br>outer_right/inner_right |
| MOSSY_COBBLESTONE_STAIRS  | straight/inner_right/inner_left/<br>outer_right/inner_right |

| Material                         | Shape   |
|----------------------------------|---|
| MOSSY_STONE_BRICK_STAIRS         | straight/inner_right/inner_left/<br>outer_right/inner_right |
| MUD_BRICK_STAIRS                 | straight/inner_right/inner_left/<br>outer_right/inner_right |
| NETHER_BRICK_STAIRS              | straight/inner_right/inner_left/<br>outer_right/inner_right |
| OAK_STAIRS                       | straight/inner_right/inner_left/<br>outer_right/inner_right |
| OXIDIZED_CUT_COPPER_STAIRS       | straight/inner_right/inner_left/<br>outer_right/inner_right |
| POLISHED_ANDESITE_STAIRS         | straight/inner_right/inner_left/<br>outer_right/inner_right |
| POLISHED_BLACKSTONE_BRICK_STAIRS | straight/inner_right/inner_left/<br>outer_right/inner_right |
| POLISHED_BLACKSTONE_STAIRS       | straight/inner_right/inner_left/<br>outer_right/inner_right |
| POLISHED_DEEPSLATE_STAIRS        | straight/inner_right/inner_left/<br>outer_right/inner_right |
| POLISHED_DIORITE_STAIRS          | straight/inner_right/inner_left/<br>outer_right/inner_right |
| POLISHED_GRANITE_STAIRS          | straight/inner_right/inner_left/<br>outer_right/inner_right |
| PRISMARINE_BRICK_STAIRS          | straight/inner_right/inner_left/<br>outer_right/inner_right |
| PRISMARINE_STAIRS                | straight/inner_right/inner_left/<br>outer_right/inner_right |
| PURPUR_STAIRS                    | straight/inner_right/inner_left/<br>outer_right/inner_right |
| QUARTZ_STAIRS                    | straight/inner_right/inner_left/<br>outer_right/inner_right |

| Material                          | Shape   |
|-----------------------------------|---|
| RED_NETHER_BRICK_STAIRS           | straight/inner_right/inner_left/<br>outer_right/inner_right |
| RED_SANDSTONE_STAIRS              | straight/inner_right/inner_left/<br>outer_right/inner_right |
| SANDSTONE_STAIRS                  | straight/inner_right/inner_left/<br>outer_right/inner_right |
| SMOOTH_QUARTZ_STAIRS              | straight/inner_right/inner_left/<br>outer_right/inner_right |
| SMOOTH_RED_SANDSTONE_STAIRS       | straight/inner_right/inner_left/<br>outer_right/inner_right |
| SMOOTH_SANDSTONE_STAIRS           | straight/inner_right/inner_left/<br>outer_right/inner_right |
| SPRUCE_STAIRS                     | straight/inner_right/inner_left/<br>outer_right/inner_right |
| STONE_BRICK_STAIRS                | straight/inner_right/inner_left/<br>outer_right/inner_right |
| STONE_STAIRS                      | straight/inner_right/inner_left/<br>outer_right/inner_right |
| WARPED_STAIRS                     | straight/inner_right/inner_left/<br>outer_right/inner_right |
| WAXED_CUT_COPPER_STAIRS           | straight/inner_right/inner_left/<br>outer_right/inner_right |
| WAXED_EXPOSED_CUT_COPPER_STAIRS   | straight/inner_right/inner_left/<br>outer_right/inner_right |
| WAXED_OXIDIZED_CUT_COPPER_STAIRS  | straight/inner_right/inner_left/<br>outer_right/inner_right |
| WAXED_WEATHERED_CUT_COPPER_STAIRS | straight/inner_right/inner_left/<br>outer_right/inner_right |
| WEATHERED_CUT_COPPER_STAIRS       | straight/inner_right/inner_left/<br>outer_right/inner_right |

| Material | Shape |
|----------|-------|
|----------|-------|

Table A.42: Stairs

### A.2.38 Type

Represents the type of piston which that block corresponds to, or represents what state the slab is in.

| Material                | Options (default on bold) |
|-------------------------|---------------------------|
| ACACIA_SLAB             | <b>bottom</b> /top/double |
| ANDESITE_SLAB           | <b>bottom</b> /top/double |
| BIRCH_SLAB              | <b>bottom</b> /top/double |
| BLACKSTONE_SLAB         | <b>bottom</b> /top/double |
| BRICK_SLAB              | <b>bottom</b> /top/double |
| COBBLED_DEEPSLATE_SLAB  | <b>bottom</b> /top/double |
| COBBLESTONE_SLAB        | <b>bottom</b> /top/double |
| CRIMSON_SLAB            | <b>bottom</b> /top/double |
| CUT_COPPER_SLAB         | <b>bottom</b> /top/double |
| CUT_RED_SANDSTONE_SLAB  | <b>bottom</b> /top/double |
| CUT_SANDSTONE_SLAB      | <b>bottom</b> /top/double |
| DARK_OAK_SLAB           | <b>bottom</b> /top/double |
| DARK_PRISMARINE_SLAB    | <b>bottom</b> /top/double |
| DEEPSLATE_BRICK_SLAB    | <b>bottom</b> /top/double |
| DEEPSLATE_TILE_SLAB     | <b>bottom</b> /top/double |
| DIORITE_SLAB            | <b>bottom</b> /top/double |
| END_STONE_BRICK_SLAB    | <b>bottom</b> /top/double |
| EXPOSED_CUT_COPPER_SLAB | <b>bottom</b> /top/double |
| GRANITE_SLAB            | <b>bottom</b> /top/double |
| JUNGLE_SLAB             | <b>bottom</b> /top/double |
| MANGROVE_SLAB           | <b>bottom</b> /top/double |
| MOSSY_COBBLESTONE_SLAB  | <b>bottom</b> /top/double |

| Material                       | Options (default on bold) |
|--------------------------------|---------------------------|
| MOSSY_STONE_BRICK_SLAB         | <b>bottom</b> /top/double |
| MUD_BRICK_SLAB                 | <b>bottom</b> /top/double |
| NETHER_BRICK_SLAB              | <b>bottom</b> /top/double |
| OAK_SLAB                       | <b>bottom</b> /top/double |
| OXIDIZED_CUT_COPPER_SLAB       | <b>bottom</b> /top/double |
| PETRIFIED_OAK_SLAB             | <b>bottom</b> /top/double |
| POLISHED_ANDESITE_SLAB         | <b>bottom</b> /top/double |
| POLISHED_BLACKSTONE_BRICK_SLAB | <b>bottom</b> /top/double |
| POLISHED_BLACKSTONE_SLAB       | <b>bottom</b> /top/double |
| POLISHED_DEEPSLATE_SLAB        | <b>bottom</b> /top/double |
| POLISHED_DIORITE_SLAB          | <b>bottom</b> /top/double |
| POLISHED_GRANITE_SLAB          | <b>bottom</b> /top/double |
| PRISMARINE_BRICK_SLAB          | <b>bottom</b> /top/double |
| PRISMARINE_SLAB                | <b>bottom</b> /top/double |
| PURPUR_SLAB                    | <b>bottom</b> /top/double |
| QUARTZ_SLAB                    | <b>bottom</b> /top/double |
| RED_NETHER_BRICK_SLAB          | <b>bottom</b> /top/double |
| RED_SANDSTONE_SLAB             | <b>bottom</b> /top/double |
| SANDSTONE_SLAB                 | <b>bottom</b> /top/double |
| SMOOTH_QUARTZ_SLAB             | <b>bottom</b> /top/double |
| SMOOTH_RED_SANDSTONE_SLAB      | <b>bottom</b> /top/double |
| SMOOTH_SANDSTONE_SLAB          | <b>bottom</b> /top/double |
| SMOOTH_STONE_SLAB              | <b>bottom</b> /top/double |
| SPRUCE_SLAB                    | <b>bottom</b> /top/double |
| STONE_BRICK_SLAB               | <b>bottom</b> /top/double |
| STONE_SLAB                     | <b>bottom</b> /top/double |
| WARPED_SLAB                    | <b>bottom</b> /top/double |
| WAXED_CUT_COPPER_SLAB          | <b>bottom</b> /top/double |
| WAXED_EXPOSED_CUT_COPPER_SLAB  | <b>bottom</b> /top/double |
| WAXED_OXIDIZED_CUT_COPPER_SLAB | <b>bottom</b> /top/double |

| Material                        | Options (default on bold) |
|---------------------------------|---------------------------|
| WAXED_WEATHERED_CUT_COPPER_SLAB | <b>bottom</b> /top/double |
| WEATHERED_CUT_COPPER_SLAB       | <b>bottom</b> /top/double |
| PISTON_HEAD                     | <b>normal</b> /sticky     |

Table A.43: Type materials

### A.2.39 Vertical direction

Represents the dripstone orientation.

Defaults to up.

| Material          | Values  |
|-------------------|---------|
| POINTED_DRIPSTONE | up/down |

Table A.44: Dripstone

### A.2.40 Waterlogged

Denotes whether this block has fluid in it.

Besides underwater blocks<sup>12</sup> (which defaults to true), it defaults to false. All the possible options are true or false.

| Material      | Aquatic block <sup>13</sup> |
|---------------|-----------------------------|
| ACACIA_FENCE  | <b>✗</b>                    |
| ACACIA_LEAVES | <b>✗</b>                    |

<sup>12</sup>BRAIN\_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 <sup>13</sup> |
|--------------------------|-----------------------------|
| ACACIA_SIGN              | ✗                           |
| ACACIA_SLAB              | ✗                           |
| ACACIA_STAIRS            | ✗                           |
| 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               | ✗                           |

| Material                 | Aquatic block <sup>13</sup> |
|--------------------------|-----------------------------|
| BROWN_CANDLE             | ✗                           |
| BROWN_STAINED_GLASS_PANE | ✗                           |
| CAMPFIRE                 | ✗                           |
| 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        | ✗                           |

| Material                  | Aquatic block <sup>13</sup> |
|---------------------------|-----------------------------|
| DARK_OAK_WALL_SIGN        | ✗                           |
| DARK_PRISMARINE_SLAB      | ✗                           |
| DARK_PRISMARINE_STAIRS    | ✗                           |
| 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             | ✗                           |

| Material                      | Aquatic block <sup>13</sup> |
|-------------------------------|-----------------------------|
| IRON_BARS                     | ✗                           |
| IRON_TRAPDOOR                 | ✗                           |
| JUNGLE_FENCE                  | ✗                           |
| 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            | ✗                           |

| Material                   | Aquatic block <sup>13</sup> |
|----------------------------|-----------------------------|
| MEDIUM_AMETHYST_BUD        | ✗                           |
| MOSSY_COBBLESTONE_SLAB     | ✗                           |
| MOSSY_COBBLESTONE_STAIRS   | ✗                           |
| 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     | ✗                           |

| Material                         | Aquatic block <sup>13</sup> |
|----------------------------------|-----------------------------|
| POLISHED_ANDESITE_STAIRS         | ✗                           |
| POLISHED_BLACKSTONE_BRICK_SLAB   | ✗                           |
| POLISHED_BLACKSTONE_BRICK_STAIRS | ✗                           |
| 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          | ✗                           |

| Material                    | Aquatic block <sup>13</sup> |
|-----------------------------|-----------------------------|
| RED_NETHER_BRICK_WALL       | ✗                           |
| RED_SANDSTONE_SLAB          | ✗                           |
| RED_SANDSTONE_STAIRS        | ✗                           |
| 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            | ✗                           |

| Material                          | Aquatic block <sup>13</sup> |
|-----------------------------------|-----------------------------|
| STONE_BRICK_SLAB                  | ✗                           |
| STONE_BRICK_STAIRS                | ✗                           |
| STONE_BRICK_WALL                  | ✗                           |
| 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                      | ✓                           |



| Material                   | Aquatic block <sup>13</sup> |
|----------------------------|-----------------------------|
| 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             | ✓                           |
| TUBE_CORAL_WALL_FAN        | ✓                           |

Table A.45: Waterlogged materials

### A.3 Material name attached modifiers

Some materials have modifiers already attached to the material name.

#### A.3.1 Color

... wool/glass/bed/candle/banner/GLAZED\_TERRACOTTA

| Index | Color      |
|-------|------------|
| 0     | none       |
| 1     | black      |
| 2     | blue       |
| 3     | brown      |
| 4     | cyan       |
| 5     | gray       |
| 6     | green      |
| 7     | light_blue |
| 8     | light_gray |
| 9     | lime       |
| 10    | magenta    |
| 11    | orange     |
| 12    | pink       |
| 13    | purple     |
| 14    | red        |
| 15    | white      |
| 16    | yellow     |

Table A.46: Colors

#### A.3.2 Wood type

...

<sup>13</sup>If it's an underwater block (defaults to true).

| Index | Wood     |
|-------|----------|
| 0     | acacia   |
| 1     | birch    |
| 2     | crimson  |
| 3     | dark_oak |
| 4     | jungle   |
| 5     | mangrove |
| 6     | oak      |
| 7     | spruce   |
| 8     | warped   |

Table A.47: Wood types

saplings

### A.3.3 Liquid recipient

... cauldron

| Index | Liquid      |
|-------|-------------|
| 0     | none        |
| 1     | water       |
| 2     | lava        |
| 3     | powder_snow |

Table A.48: Liquid types

### A.3.4 Flower

... pot

| Index | Type           |
|-------|----------------|
| 0     | none           |
| 1     | acacia_sapling |

| Index | Type                  |
|-------|-----------------------|
| 2     | allium                |
| 3     | azalea_bush           |
| 4     | azure_bluet           |
| 5     | bamboo                |
| 6     | birch_sapling         |
| 7     | blue_orchid           |
| 8     | brown_mushroom        |
| 9     | cactus                |
| 10    | cornflower            |
| 11    | crimson_fungus        |
| 12    | crimson_roots         |
| 13    | dandelion             |
| 14    | dark_oak_sapling      |
| 15    | dead_bush             |
| 16    | fern                  |
| 17    | flowering_azalea_bush |
| 18    | jungle_sapling        |
| 19    | lily_of_the_valley    |
| 20    | mangrove_propagule    |
| 21    | oak_sapling           |
| 22    | orange_tulip          |
| 23    | oxeye_daisy           |
| 24    | pink_tulip            |
| 25    | poppy                 |
| 26    | red_mushroom          |
| 27    | red_tulip             |
| 28    | spruce_sapling        |
| 29    | warped_fungus         |
| 30    | warped_roots          |
| 31    | white_tulip           |

| Index | Type        |
|-------|-------------|
| 32    | wither_rose |

Table A.49: Plantable materials

### A.3.5 Piston head

... si head meecans extended

| Index | Type            |
|-------|-----------------|
| 0     | piston          |
| 1     | extended_piston |
| 2     | piston_head     |

Table A.50: Piston types

### A.3.6 Stripped

... boolean; log/wood

### A.3.7 Infested

... silverfish in block; boolean; stones

### A.3.8 Dead

... coral outside water; boolean; coral

### A.3.9 Heads

...

| Material        | Values |
|-----------------|--------|
| ZOMBIE          | 0      |
| PLAYER          | 1      |
| CREEPER         | 2      |
| DRAGON          | 3      |
| SKELETON        | 4      |
| WITHER_SKELETON | 5      |
| ZOMBIE          | 0      |

Table A.51: Heads

### A.3.10 Heads

...

| Material        | Values |
|-----------------|--------|
| ZOMBIE          | 0      |
| PLAYER          | 1      |
| CREEPER         | 2      |
| DRAGON          | 3      |
| SKELETON        | 4      |
| WITHER_SKELETON | 5      |

Table A.52: Heads

### A.3.11 Sizeable

...; AMETHYST\_BUD & DRIPLEAF

## A.4 Material modifiers aggregation

some modifiers are similar, so let's add them together

### A.4.1 Direction aggregation

modifier, followed by the condition to set the bit to 1

| Property           | U             | D                | N                   | S                   | E                 | W                 |
|--------------------|---------------|------------------|---------------------|---------------------|-------------------|-------------------|
| up                 | true          |                  |                     |                     |                   |                   |
| down               |               | true             |                     |                     |                   |                   |
| north              |               |                  | true                |                     |                   |                   |
| south              |               |                  |                     | true                |                   |                   |
| east               |               |                  |                     |                     | true              |                   |
| west               |               |                  |                     |                     |                   | true              |
| face               | ceiling       | floor            |                     |                     |                   |                   |
| attachment         | ceiling       | floor            |                     |                     |                   |                   |
| half               | top or upper  | bottom or lower  |                     |                     |                   |                   |
| facing             | up            | down             | north               | south               | east              | west              |
| vertical-direction | up            | down             |                     |                     |                   |                   |
| type               | top or double | bottom or double |                     |                     |                   |                   |
| orientation        | up_X          | down_X           | X_north or north_up | X_south or south_up | X_east or east_up | X_west or west_up |

| Property | U           | D | N                          | S   | E                                     | W                        |
|----------|-------------|---|----------------------------|---|---------------------------------------|--------------------------|
| shape    | ascending_X |   | ascending_north or north_X | ascending_south or south_X or north_south | ascending_east or X_east or east_west | ascending_west or X_west |
| hanging  | true        |   |                            |   |                                       |                          |

Table A.53: Direction aggregation

#### A.4.2 Axis aggregation

modifier up to 2b

| Property   | MSB         | LSB         |
|------------|-------------|-------------|
| axis       | Y or Z      | X or Z      |
| attachment | double_wall | single_wall |

Table A.54: Axis aggregation

#### A.4.3 Age aggregation

modifier up to 8b

| Property |
|----------|
| age      |
| berries  |



| Property    |
|-------------|
| honey_level |

Table A.55: Age aggregation

#### A.4.4 Grouped materials aggregation

modifier up to 3b

| Property |
|----------|
| candles  |
| eggs     |
| pickles  |

Table A.56: Grouped materials aggregation

#### A.4.5 Stages aggregation

modifier up to 8b

| Property |
|----------|
| charges  |
| level    |
| bites    |
| layers   |

Table A.57: Stages aggregation

#### A.4.6 Parts aggregation

modifier; up to 4b

| Property |
|----------|
| part     |

| Property    |
|-------------|
| type        |
| piston_head |
| stair_shape |
| heads       |

Table A.58: Parts aggregation

#### A.4.7 Material aggregation

modifier; up to 16b iron and gold pressure plates have their name as 'heavy/light weighted pressure plate' MOSS\_CARPET

| Property  | Value                      |
|-----------|----------------------------|
| wood_type | 0x8000   <i>wood value</i> |
| iron      | 0xC000                     |
| gold      | 0xC001                     |
| material  | <i>material value</i>      |

Table A.59: Material aggregation

#### A.4.8 Liquid aggregation

modifier; up to 4b

| Property    | value               |
|-------------|---------------------|
| liquid      | <i>liquid value</i> |
| waterlogged | 1 <sup>14</sup>     |

Table A.60: Liquid aggregation

---

<sup>14</sup>1 is the liquid value of water.

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