dd Raw block copier

START HERE

`lsblk`
Find the right device

`dd if=/dev/zero of=`*`<file>`* **`bs=1M count=100`**
Make a 100 MiB file

`dd if=`*`<in>`* **`of=`***`<out>`* **`bs=4M status=progress`**
Copy with progress

`dd if=`*`<in>`* **`of=`***`<out>`* **`count=1`**
Copy one block only

`dd if=`*`<iso>`* **`of=/dev/`***`<usb>`* **`bs=4M conv=fsync`**
Write an image to USB

`kill -USR1 $(pidof dd)`
Show progress now

`dd if=/dev/`*`<disk>`* **`of=`***`<img>`* **`bs=1M`**
Disk to image file

`sync`
Flush writes to disk

if= input file or device → read ibs → **dd** conv= converts → write obs → **of=** output file or device

CONCEPTS

Danger
dd overwrites whatever of= points at, with no prompt. A wrong device letter destroys that disk. Check lsblk twice before pressing Enter.

Operands are NAME=VALUE with no dashes and no spaces around the equals sign. Without if= it reads stdin, without of= it writes stdout.

dd copies raw bytes and knows nothing about filesystems. It is just a block copier, which is why it fits images and devices.

BASICS

`dd if=`*`<in>`* **`of=`***`<out>`*
Copy a file or device

`bs=`*`<size>`*
Block size for read and write

`count=`*`<n>`*
Copy only n input blocks

`skip=`*`<n>`*
Skip n blocks of input first

`seek=`*`<n>`*
Skip n blocks of output first

`status=progress`
Show running transfer stats

`status=none`
Print only errors

`bs=4M`
Good default for disks and USB

`ibs=`*`<size>`* **`obs=`***`<size>`*
Separate read and write sizes

`count=`*`<n>`***`B`**
Count bytes instead of blocks

`skip=`*`<n>`***`B`**
Skip bytes instead of blocks

`kill -USR1 $(pidof dd)`
Print stats once, keep copying

`watch -n1 kill -USR1 $(pidof dd)`
Poll stats on a dd already running

Size suffixes: K=1024, M=1024*1024, G=1024^3. kB, MB, GB are powers of 1000. Plain bs=1M means MiB.

WRITING AND FLUSHING

`conv=fsync`
Flush data and metadata at the end

WRITING AND FLUSHING (cont.)

`conv=fdatasync`
Flush data only at the end

`oflag=sync`
Synchronous writes, slow and safe

`oflag=direct`
Bypass the page cache on write

`iflag=direct`
Bypass the page cache on read

`conv=notrunc`
Do not truncate the output file

`conv=excl`
Fail if the output exists

`conv=nocreat`
Fail if the output is missing

`oflag=append conv=notrunc`
Append to the output

`iflag=fullblock`
Fill whole blocks when reading pipes

`iflag=nocache oflag=nocache`
Drop cached pages after use

Without conv=fsync dd can report done while data still sits in the cache. Wait for the prompt, then run sync before unplugging a USB stick.

CONVERSIONS AND ERRORS

`conv=noerror,sync`
Continue on read errors, pad with zeros

`conv=sparse`
Skip all-zero blocks, make a sparse file

noerror alone shifts data after a bad block. Always pair it with sync so offsets stay aligned. For failing disks prefer ddrescue.

DISKS AND IMAGES

`lsblk -o NAME,SIZE,MODEL,TRAN,MOUNTPOINT`
Identify the target device

`dd if=`*`<iso>`* **`of=/dev/`***`<usb>`* **`bs=4M conv=fsync status=progress`**
Write an ISO to a USB stick

`dd if=/dev/`*`<disk>`* **`of=`***`<disk.img>`* **`bs=4M status=progress`**
Back up a whole disk

DISKS AND IMAGES (cont.)

`dd if=`*`<disk.img>`* **`of=/dev/`***`<disk>`* **`bs=4M conv=fsync`**
Restore a disk image

`dd if=/dev/`*`<disk>`* **`bs=4M | gzip > `***`<disk.img.gz>`*
Compressed disk image

`gunzip -c `*`<disk.img.gz>`* **`| dd of=/dev/`***`<disk>`* **`bs=4M`**
Restore compressed image

`dd if=/dev/`*`<disk>`* **`of=`***`<mbr.bin>`* **`bs=512 count=1`**
Save the first sector (MBR)

`dd if=`*`<mbr.bin>`* **`of=/dev/`***`<disk>`* **`bs=446 count=1`**
Restore boot code, keep partitions

`dd if=/dev/`*`<part>`* **`of=`***`<part.img>`* **`bs=4M`**
Image a single partition

`dd if=/dev/`*`<disk>`* **`bs=4M | ssh `***`<host>`* **`'dd of=`***`<disk.img>`***`'`**
Image a disk over SSH

`dd if=`*`<disk.img>`* **`bs=4M | sha256sum`**
Hash the image to verify

`cmp `*`<iso>`* **`/dev/`***`<usb>`* **`-n $(stat -c %s `***`<iso>`***`)`**
Verify what was written

Unmount the target first (umount /dev/<usb>*). Use the whole device (/dev/sdb), not a partition (/dev/sdb1), for bootable ISOs.

WIPING AND TEST FILES

`dd if=/dev/zero of=`*`<file>`* **`bs=1M count=`***`<n>`*
File of n MiB zeros

`dd if=/dev/zero of=`*`<file>`* **`bs=1 count=0 seek=`***`<size>`*
Sparse file, no data written

`dd if=/dev/urandom of=`*`<file>`* **`bs=1M count=`***`<n>`*
File of random bytes

`dd if=/dev/zero of=/dev/`*`<disk>`* **`bs=4M status=progress`**
Zero a whole disk

`dd if=/dev/urandom of=/dev/`*`<disk>`* **`bs=4M status=progress`**
Overwrite with random data

`dd if=/dev/zero of=/dev/`*`<disk>`* **`bs=1M count=10`**
Wipe start of disk (old signatures)

WIPING AND TEST FILES (cont.)

`truncate -s `*`<size>`* ***`<file>`***
Resize or create a sparse file

SSDs remap blocks, so overwriting is not a secure erase. Use blkdiscard or the drive's secure erase instead.

BENCHMARKING AND EXTRACTION

`dd if=/dev/zero of=`*`<file>`* **`bs=1G count=1 oflag=direct`**
Rough write speed

`dd if=`*`<file>`* **`of=/dev/null bs=1M`**
Rough read speed

`echo 3 | sudo tee /proc/sys/vm/drop_caches`
Drop caches before a read test

`dd if=`*`<file>`* **`of=/dev/null bs=1M iflag=direct`**
Read speed without the cache

`dd if=`*`<in>`* **`of=`***`<out>`* **`bs=1 skip=`***`<off>`* **`count=`***`<len>`*
Cut a byte range from a file

`dd if=`*`<in>`* **`of=`***`<out>`* **`bs=1 seek=`***`<off>`* **`conv=notrunc`**
Patch bytes at an offset

Tests with /dev/zero can mislead on compressing or deduplicating storage. Use fio for serious benchmarks.

RECIPES

Make a bootable USB stick

```
lsblk -o NAME,SIZE,MODEL,TRAN
sudo umount /dev/sdX*
sudo dd if=distro.iso of=/dev/sdX bs=4M conv=fsync status=progress
sync
```

Back up and verify a disk

```
sudo dd if=/dev/sdX bs=4M status=progress | gzip > disk.img.gz
# restore later
gunzip -c disk.img.gz | sudo dd of=/dev/sdY bs=4M conv=fsync
```

Clone a failing disk as far as possible

```
sudo dd if=/dev/sdX of=rescue.img bs=64K conv=noerror,sync status=progress
# smaller bs loses less per bad block
```

Back up and restore the MBR

```
sudo dd if=/dev/sdX of=mbr.bin bs=512 count=1
sudo dd if=mbr.bin of=/dev/sdX bs=512 count=1
```