ANALOG AND DIGITAL VIDEO

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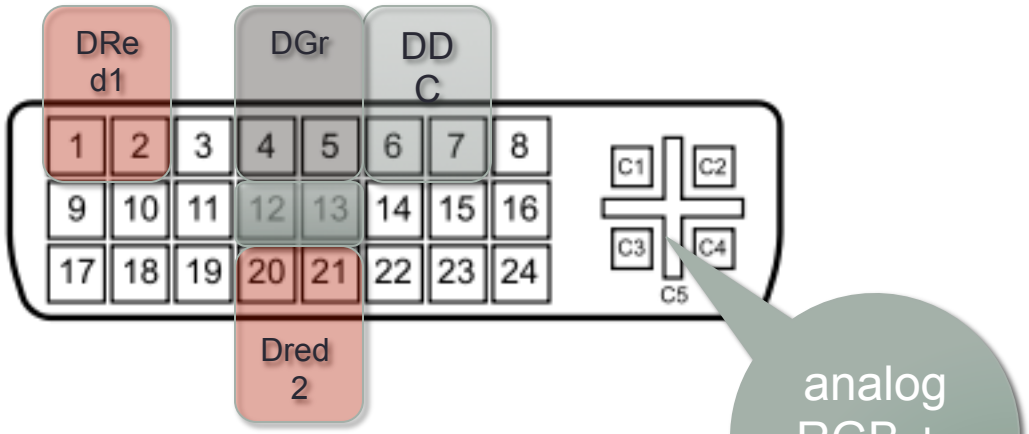
with material from Mark Handley

Video & image sources

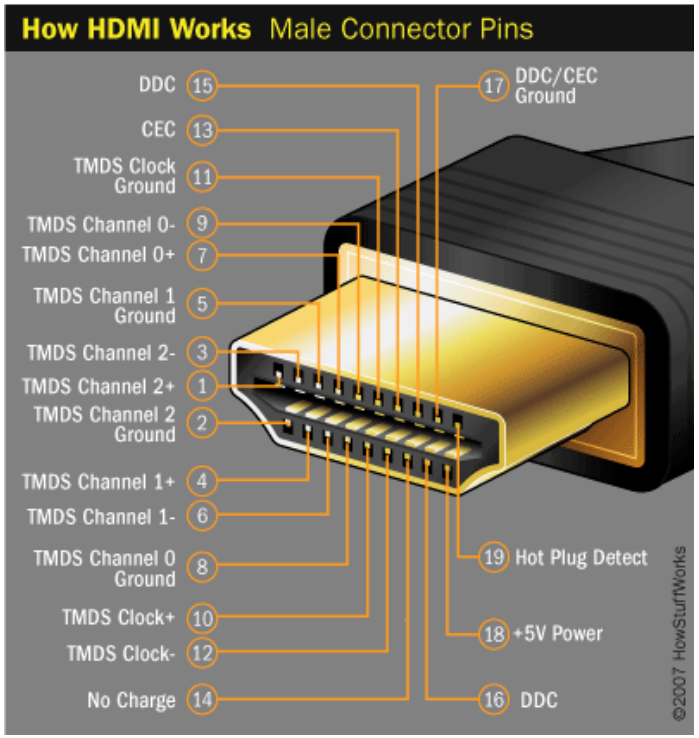
- VGA video (computer video output)
  - component video
  - R, G, B + H (horizontal sync), V (vertical sync)
- Analog video from cameras
  - NTSC or PAL coded color
  - composite or component video
- Digital images
  - scanners, copiers and fax machines
  - digital cameras
- Images = still pictures
- Video = motion pictures

Example: DVI connector



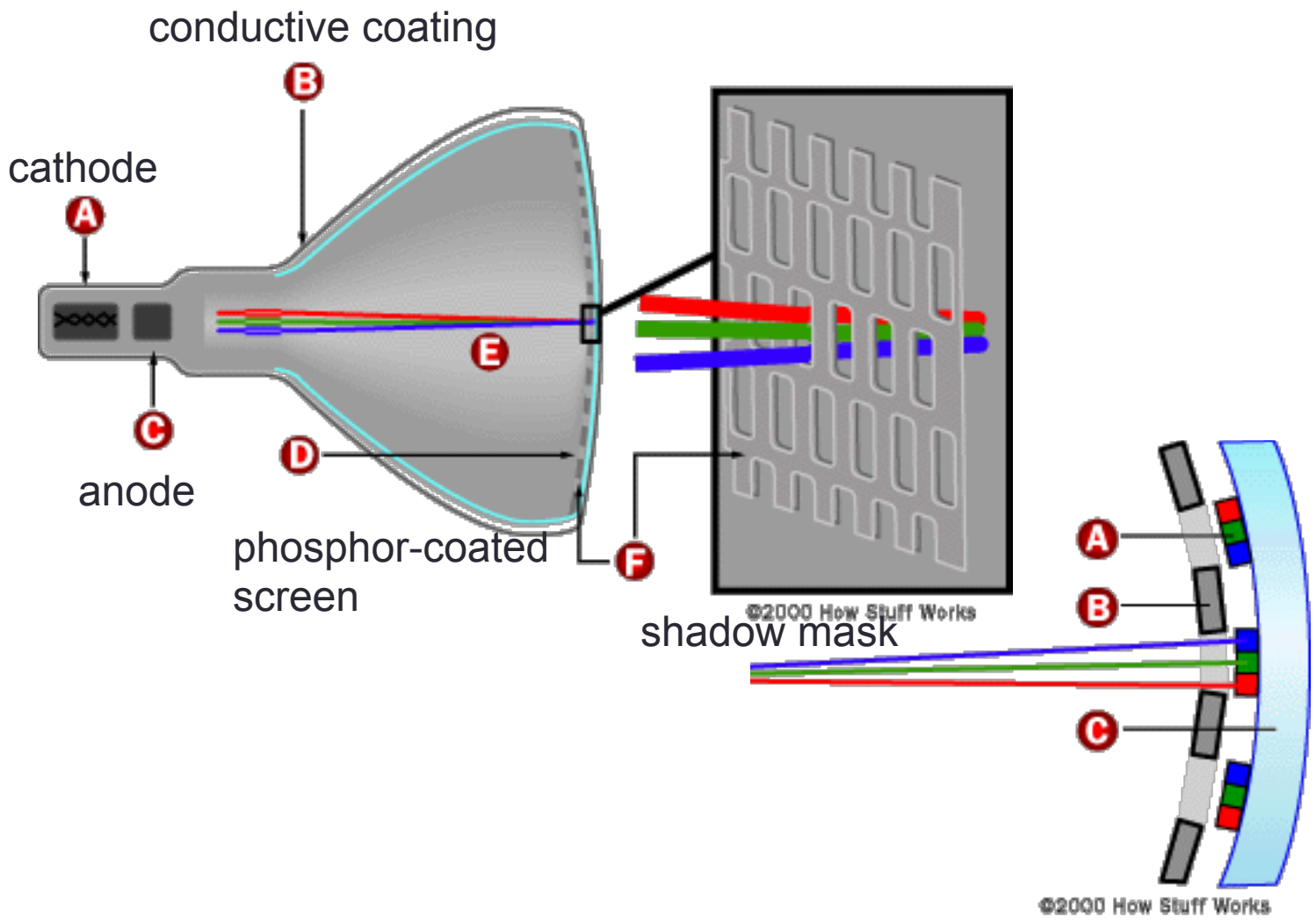
video only (no audio)

Example: HDMI connector



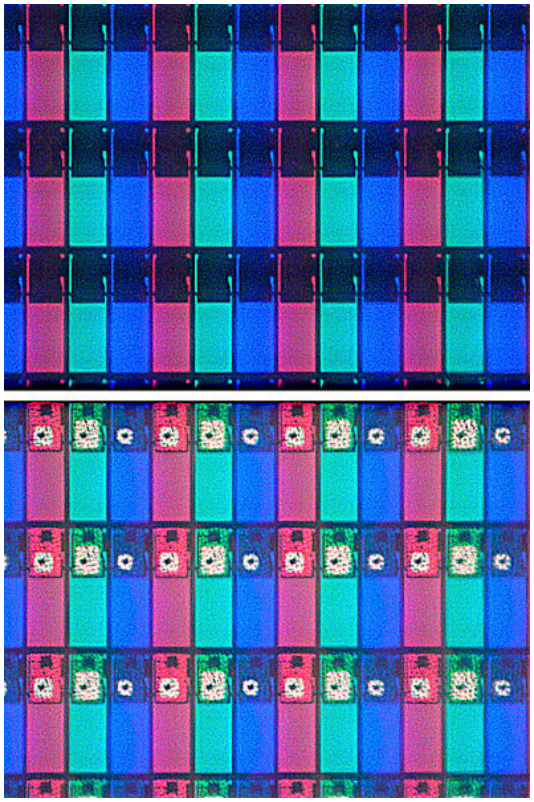
- fully digital signal
- audio
- video (similar to DVI)
- remote control signals
- no closed captioning

Analog TV: CRT

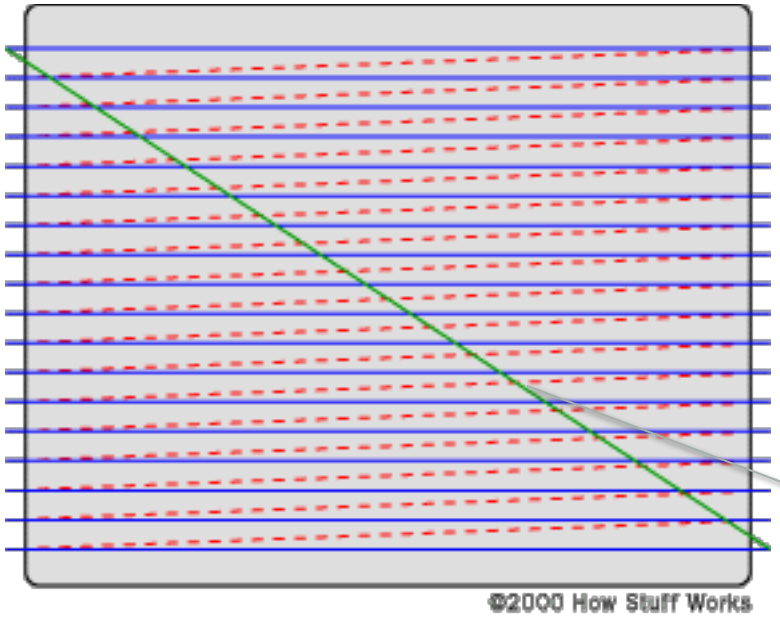


howstuffworks.com

TFT LCD



Analog TV



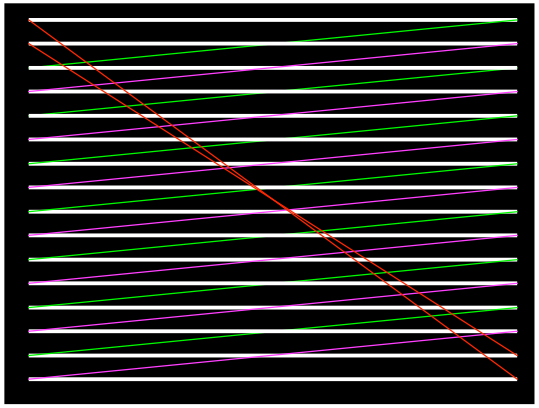
scan lines

vertical retrace

How many frames?

- Movies use 24 fps
  - Not scanned – just photographs
  - Flicker, with undersampling (stroboscopic) problems
  - dark environment → less sensitivity to flicker
- TV
  - scanned
  - fairly bright environment
  - → use *interlacing* to reduce flicker

Interlacing

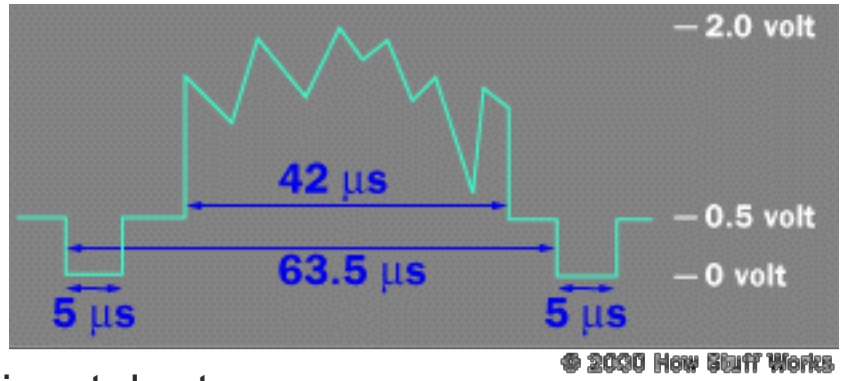


Interlacing artifacts

motion

scene change

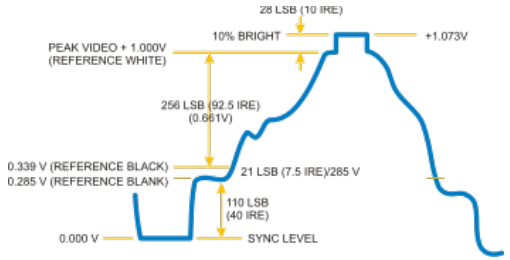
Composite video



white

black

horizontal retrace
vertical: 400-500 µs



howstuffworks.com
Wikipedia

Color

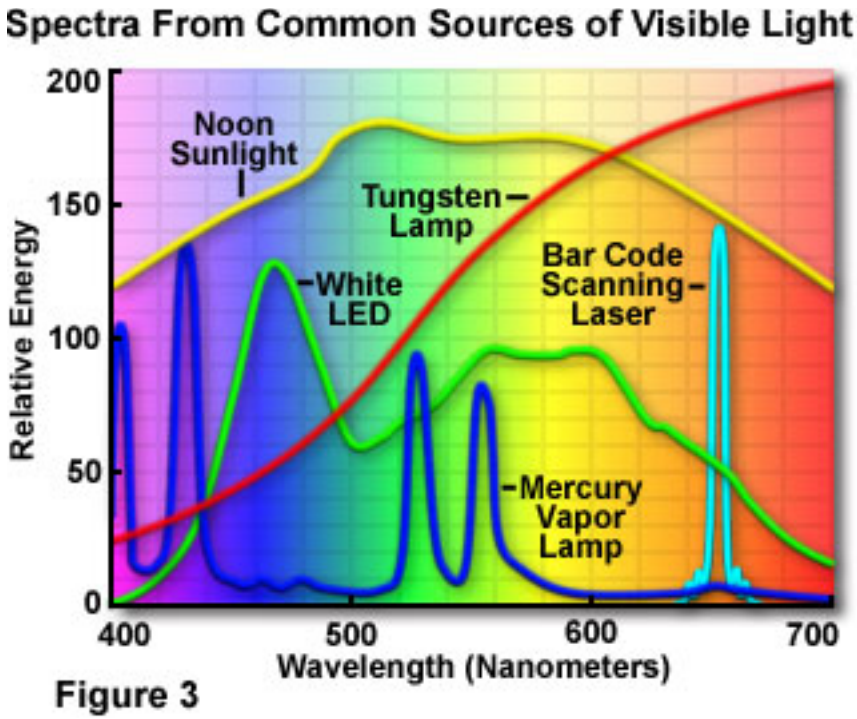
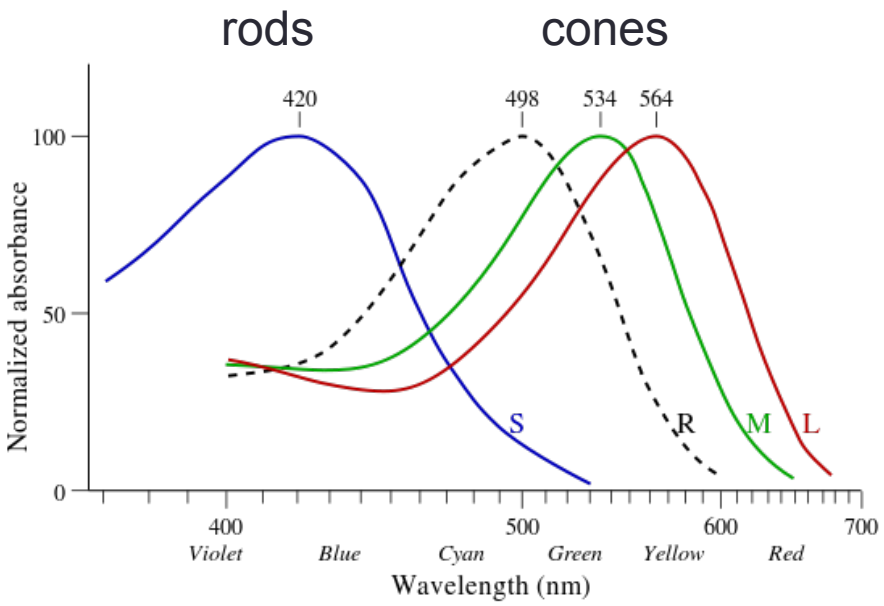
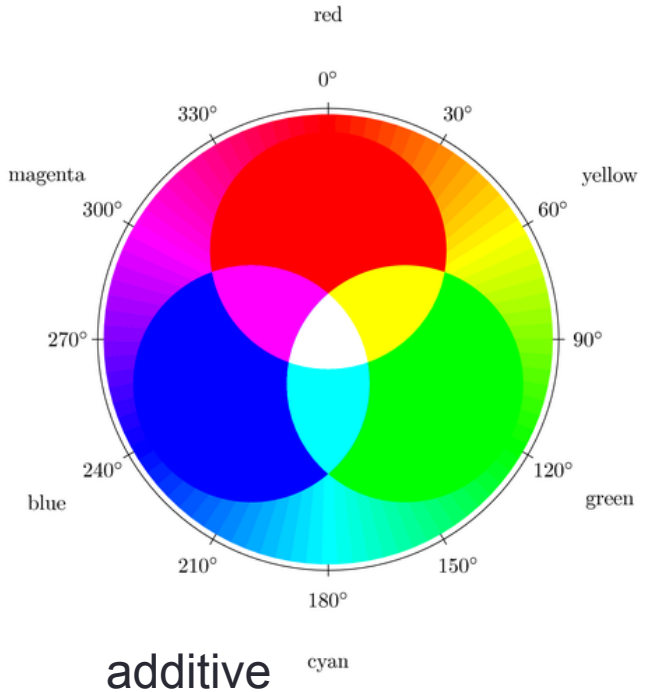


Figure 3

Color



metamerism: tristimulus values



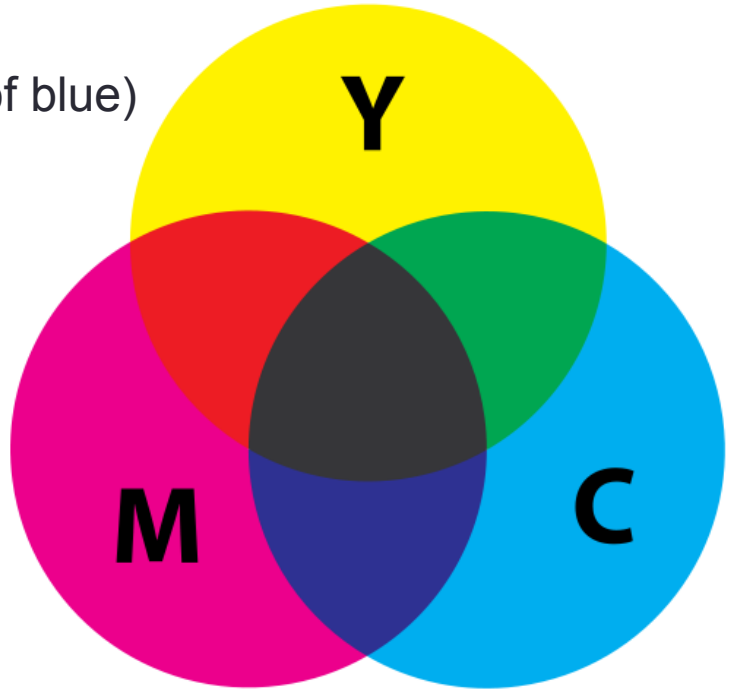
additive

Wikipedia
TeXample.net

Subtractive color: printing

yellow
(complement of blue)

magenta
(complement of green)



cyan
(complement of red)

Color representation

- Luminance (Y) = brightness
- Chrominance
- RGB (red, green, blue)
  - basic analog components
- YP_bP_r (Y, B-Y, R-Y)
  - color space for component video
  - YUV
  - YCbCr
    - digital representation

Color mapping

- True color
  - RGB in 8 bits each (common) → 16.7 million colors
  - RGB in 16 bits each → 281 trillion
  - Eye: 10 million colors
- Indexed color
  - color table
  - 8 bit index → RGB 24 bit
  - approximate using dithering
  - see “web safe colors”