

PCR Reference Card

The 27 MHz clock, the encoding split, and the four jitter/drift limits — on one page.

What a PCR is

PCR Program clock reference - a periodic snapshot of the encoder 27 MHz clock.

Job Lets the decoder rebuild the clock; PTS/DTS are read against it.

The clock

Master clock 27,000,000 ticks/s (27 MHz). One tick ~ 37 ns.

90 kHz clock $27,000,000 / 300 = 90,000$ - the PTS/DTS domain.

Tolerance $27,000,000 \pm 810 \text{ Hz} = \pm 30 \text{ ppm}$. Stay inside or playback breaks.

How the value is built

Size 42 data bits in a 48-bit field (6 bits reserved).

PCR base 33 bits, 90 kHz units = $(t / 300) \bmod 2^{33}$. Same as a PTS.

PCR ext 9 bits, 27 MHz remainder = $t \bmod 300$. Range 0-299.

Formula $\text{PCR} = \text{base} \times 300 + \text{ext}$. Carried in the adaptation field.

When the heartbeat goes wrong

Accuracy / jitter $\pm 500 \text{ ns}$ (MPEG-2) Wobbly clock; micro-stutter.

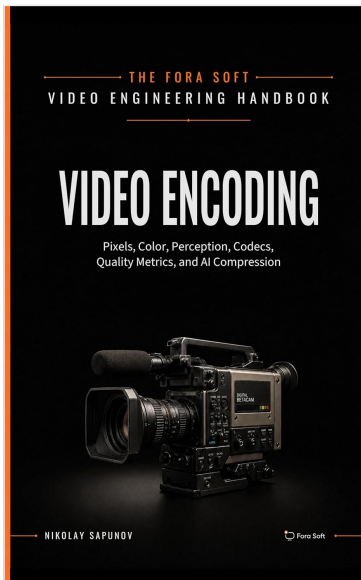
Drift rate $< 75 \text{ mHz/s}$ (DVB) Slow lip-sync drift over a long program.

Frequency offset within $\pm 30 \text{ ppm}$ Buffer fills/empties; frame drop or freeze.

Interval too long $\leq 100 \text{ ms}$; $\leq 40 \text{ ms}$ DVB Loose, drifting recovered clock.

Remember

- ☐ The PCR is the clock; PTS and DTS are positions read against it.
- ☐ It samples a 27 MHz master clock; the 90 kHz timestamp clock is that / 300.
- ☐ A PCR is 42 bits: a 33-bit 90 kHz base plus a 9-bit 27 MHz extension.
- ☐ PCRs ride in the adaptation field, every $\leq 100 \text{ ms}$ ($\leq 40 \text{ ms}$ in DVB).
- ☐ The decoder locks a PLL to the PCRs to recover its system time clock (STC).
- ☐ Jitter, drift, or offset causes stutter, freezes, or slow lip-sync drift.
- ☐ Re-stamp PCRs on any remux that moves packets - old values become a lie.
- ☐ MPEG-TS endures because it survives bad one-way channels; PCR is its heartbeat.



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This card covers the 27 MHz clock, how a PCR value is built and the four jitter and drift limits. Volume 1 places PCR inside the full encoding picture: the MPEG-TS container, timestamps and frame timing, codec output from H.264 to AV1, and the quality metrics used to check it.

WHAT YOU WILL FIND INSIDE

- MPEG-TS packets, PCR, PTS and DTS
- Containers and when to use each
- Frame timing and timestamps in encoders
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