PCR Reference Card

Fora Soft Learn

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 +/- 810 Hz = +/- 30 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) mod 2^33. Same as a PTS.
PCR ext	9 bits, 27 MHz remainder = t mod 300. Range 0-299.
Formula	PCR = base x 300 + ext. Carried in the adaptation field.

When the heartbeat goes wrong

Accuracy / jitter	**+/- 500 ns (MPEG-2)**	Wobbly clock; micro-stutter.
Drift rate	**< 75 mHz/s (DVB)**	Slow lip-sync drift over a long program.
Frequency offset	**within +/- 30 ppm**	Buffer fills/empties; frame drop or freeze.
Interval too long	**<= 100 ms; <= 40 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 <= 100 ms (<= 40 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.