Readout Chain Nominal Parameters

- APVMUX Header/Tick: ±400mV Differential
- Optical Link Linear Range (for signals): ±300mV Differential *(~6MIPS)*
- Optical Link Gain (nominal): 0.8V/V
  - APVMUX frame/tick amplitude at ARx12 output: 800×0.8 = 640mV
  - 1MIP (nominally 100mV @ link input) = 80mV at ARx12 output
- The remaining 360mV (nominal) of the 1V input range of the FED ADC is to be used to allow for drift of the optical link output due to temperature effects, for example. Such drift will shift the whole of the APVMUX data frame, not only the APV's analogue baseline.
  - Common mode for the FED is thus the combination of APVMUX digital baseline (determined by the optical link set-up: bias, gain & ARx12 control settings) and analogue baseline (set in the APVs)
- The Control Settings chosen for an individual optical link receiver module will be used to bring the ARx12 output into the FED analogue input range.
  - X0, X1, X2, X3 control the input offset, sinking current from the input stage
  - X4, X5 control the output offset, sourcing current to the output stage

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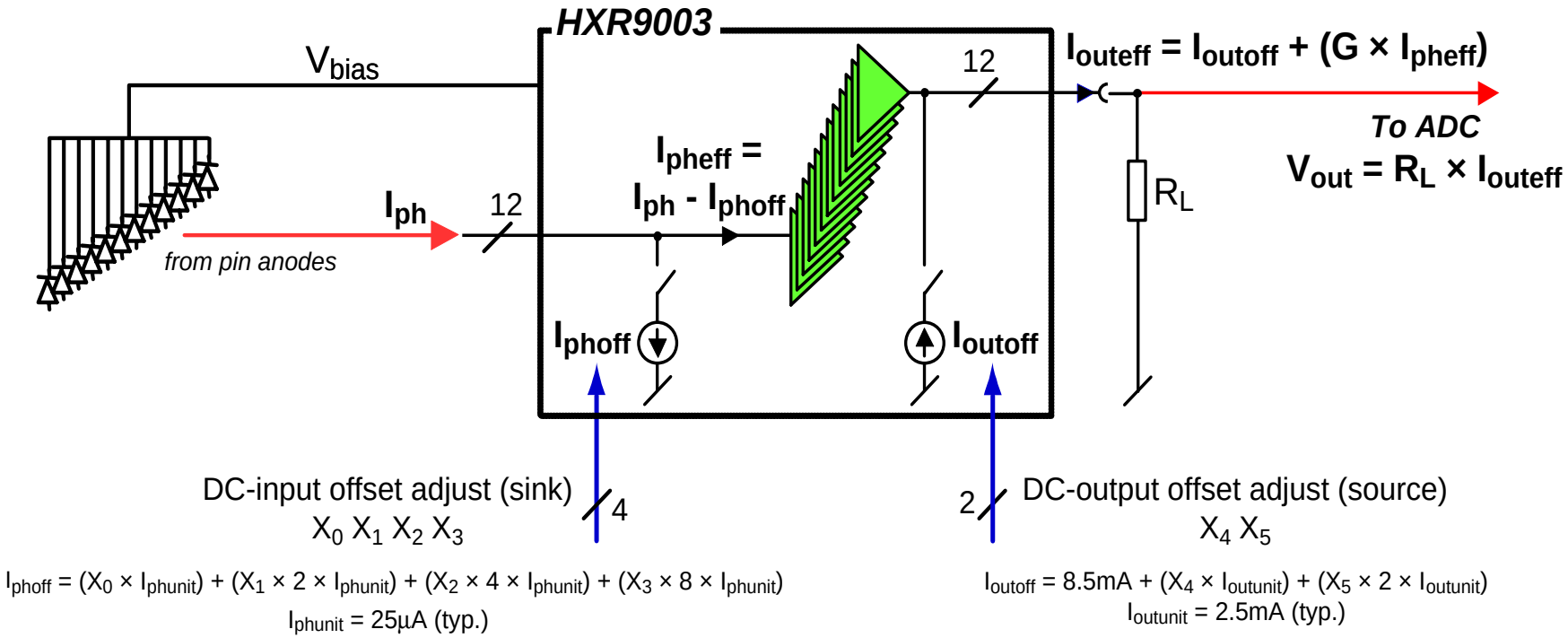
ARx12 Operation: review 1

- As extrapolated from the ARx12 specs:



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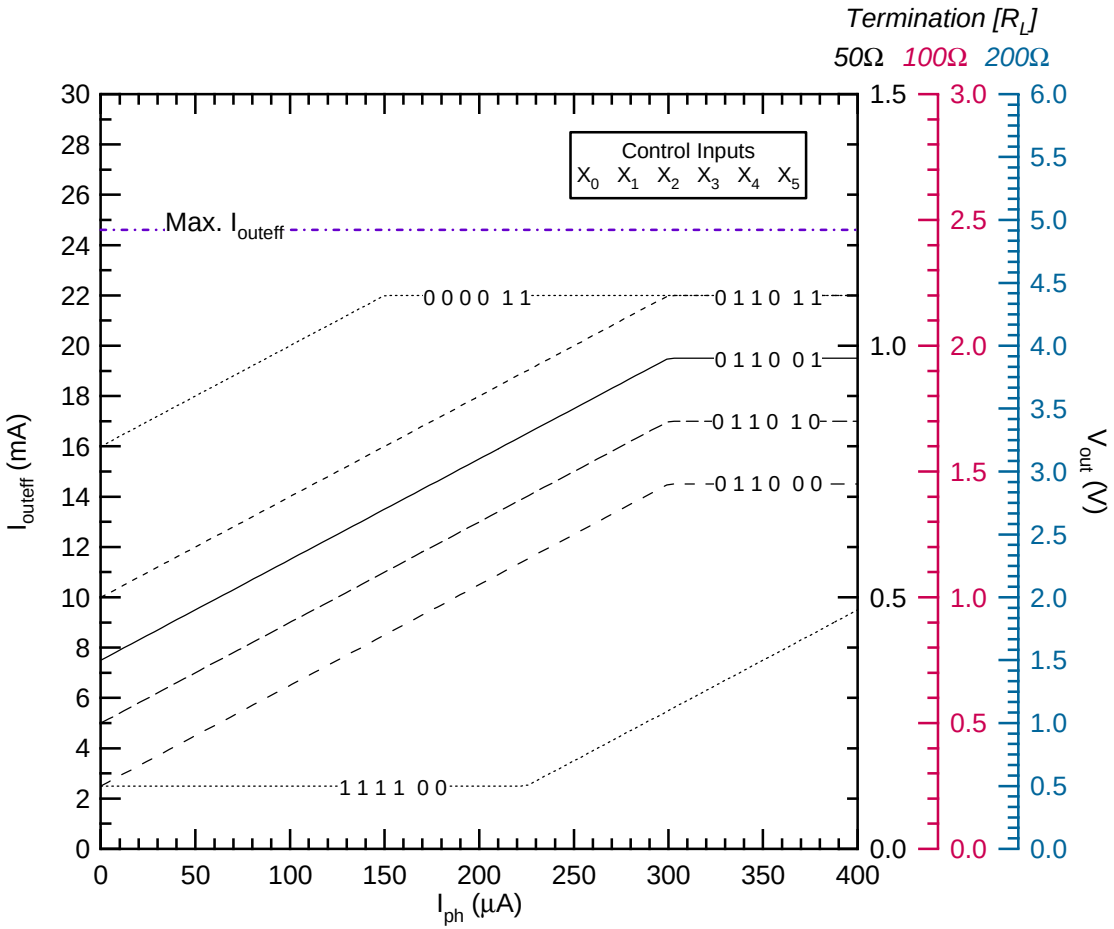
ARx12 Operation: review 2

- The previous schematic of operation together with the spec values for the various variables, yields the nominal transfer characteristic for the module:



Notes:

- The optical amplitude of an APVMUX frame at the input to the receiver ASIC will be ~160µA
- This means that the linear signal range (6MIPS) will cover ~120µA at the input or 4.8mA at the output of the optical receiver, which is equivalent to 480mV with R_T=100Ω.
- Fluctuations in the DC position of this signal range must not put it outside the ADC input range, so the control settings can be used to (coarsely) re-centre it.

  Minimum step size for this adjustment is I_{phunit} = 25µA ≡ 100mV for R_T=100Ω

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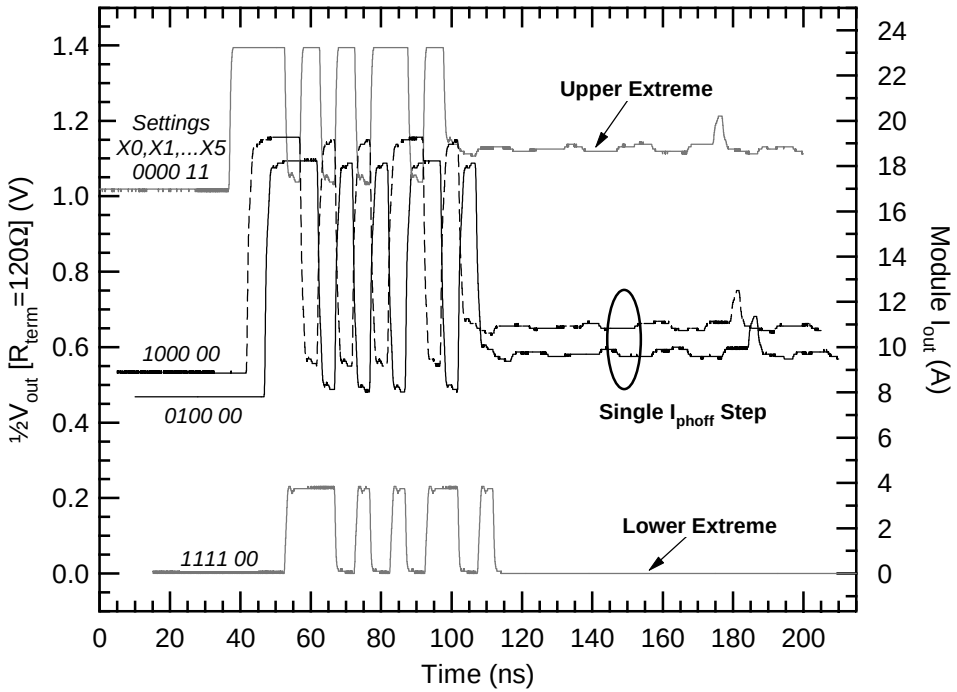
ARx12 Output Demo

- I've injected an APVMUX-like signal into a full optical link chain and varied the ARx12 control settings:



- Note that the left-hand scale is ½ of V_{out} due to double output termination on my test board & that in this case R_T is 120Ω.
- The right-hand side is current output, so you can scale this to 100Ω termination for your purposes.
- The 'nominal' control input settings are still to be defined, but 0110 00 or 1010 00 for X0-X5 are both OK assumptions. These 'nominal' settings would shift the solid-black curve in the plot downwards.
- The single-step is shown to give an idea of the step granularity.
- The upper and lower extremes of the control settings are clearly not useable because of the saturation effects.

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