

7. MEASUREMENT OF INTENSITIES

of a loss of signal amplitude, from the slow component due to the positive ions; in addition, the shielding effect is much less pronounced. Accordingly, counting rates up to at least $10^{11} \text{ s}^{-1} \text{ m}^{-2}$ are possible with parallel-plate PSD's (Stümpel, Sanford & Goddard, 1973; Peisert, 1982; Hendrix, 1984).

7.1.6.2.3. Current ionization PSD's

For the very highest counting rates, it is necessary to abandon all methods in which individual X-ray photons are counted and instead to measure the ionization current produced by the incident X-rays on either cathode or anode. Fig. 7.1.6.6 shows the principles of a cathode read-out linear PSD. The cathode is

divided into strips, each of which is connected to a capacitor and to an input terminal of a CMOS analogue multiplexer. The charge accumulated on each capacitor in a given time period is transferred to a charge-sensitive amplifier when the associated channel is selected by an addressing signal. The output voltage of the amplifier is digitized by means of an analogue-to-digital converter. The complete pattern is scanned by incrementing the addresses sequentially: The resolution is that of the strip spacing ($\sim 0.5 \text{ mm}$) and the principle can be extended to two dimensions (Hasegawa, Mochiki & Sekiguchi, 1981; Mochiki, Hasagawa, Sekiguchi & Yoshioka, 1981; Mochiki, 1984; Mochiki & Hasegawa, 1985). Global count rates in excess of 10^9 s^{-1} are possible with this method. Lewis (1994) has published a

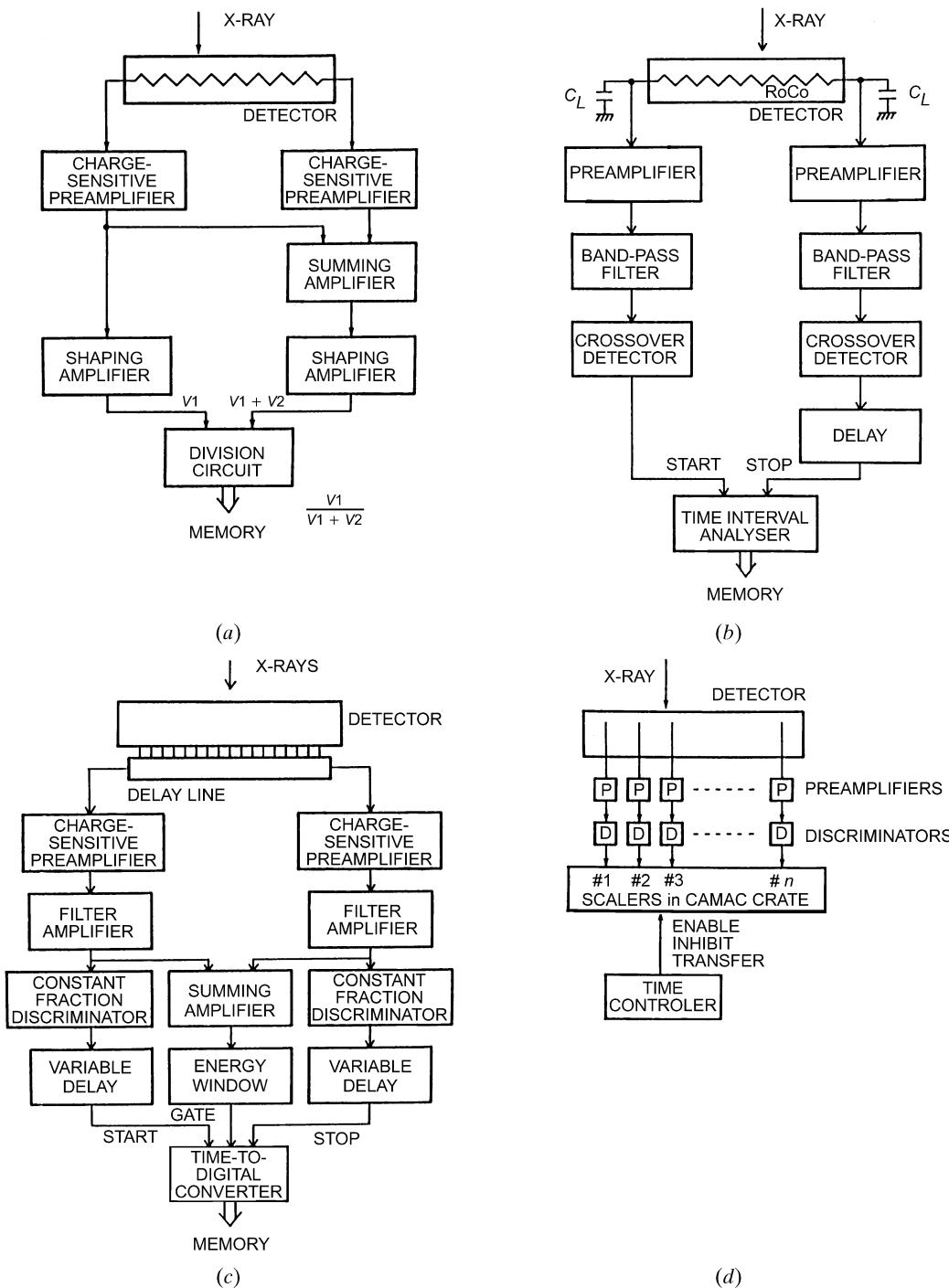


Fig. 7.1.6.4. Read-out methods for gas-filled LPSD's. (a) Charge division with low-resistance anode wire. (b) Rise-time method with high-resistance anode. (c) Delay-line read-out. (d) Amplifier-per-wire method. From Mochiki (1984); courtesy of K. Mochiki.