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Communication Systems

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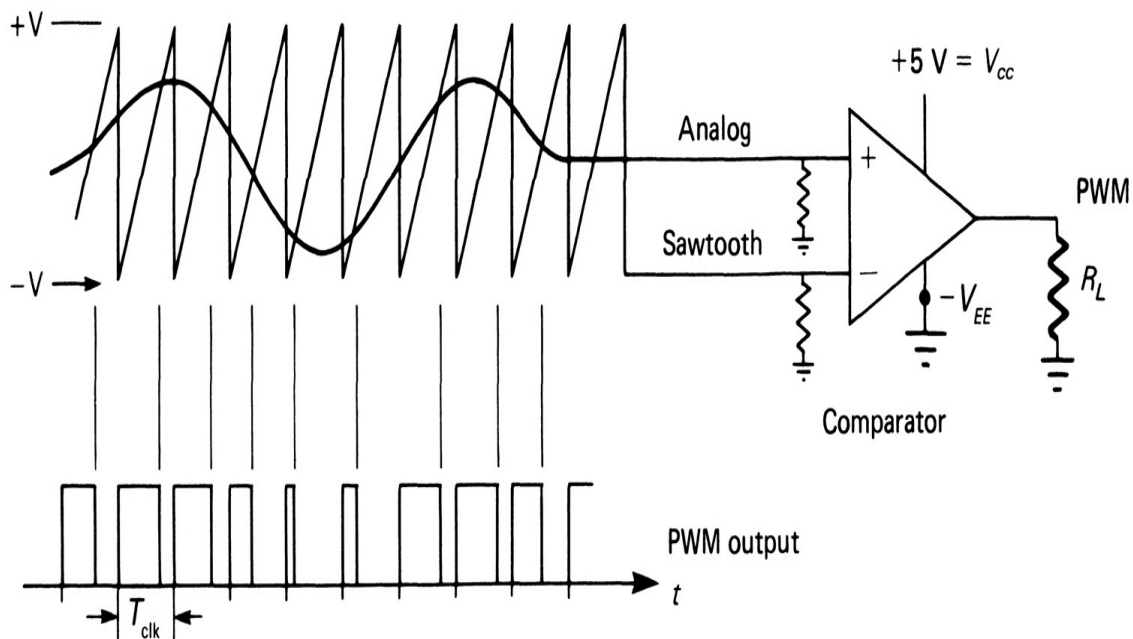
PWM & PPM Modulations

In Pulse width modulation (PWM), the width of each pulse is made directly proportional to the amplitude of the Information Signal.

In Pulse Position modulation (PPM), the width pulses are constant, and they are used, and the position or time of occurrence of each from some reference time is made directly proportional to the amplitude of the Information Signal.

PULSE WIDTH MODULATION

Circuit Diagram of PWM:



▶ 圖 11-12 脈衝寬度調變器。

PULSE WIDTH AND PULSE POSITION MODULATION

The figure shown below has a PWM Modulator. Here, this circuit is simply a high gain comparator that is switched ON and OFF by the Sawtooth waveform which is derived from a very stable frequency oscillator.

It is noticed that the output will go to $+V_{cc}$, the instant the analog signal exceeds the Sawtooth voltage.

The output will go to $-V_{cc}$, the instant the analog signal is less than the Sawtooth voltage. With this circuit the average value of both inputs should be nearly the same.

This is easily achieved with equal value resistors to ground. Also the $+V$ and $-V$ values should not exceed V_{cc} .

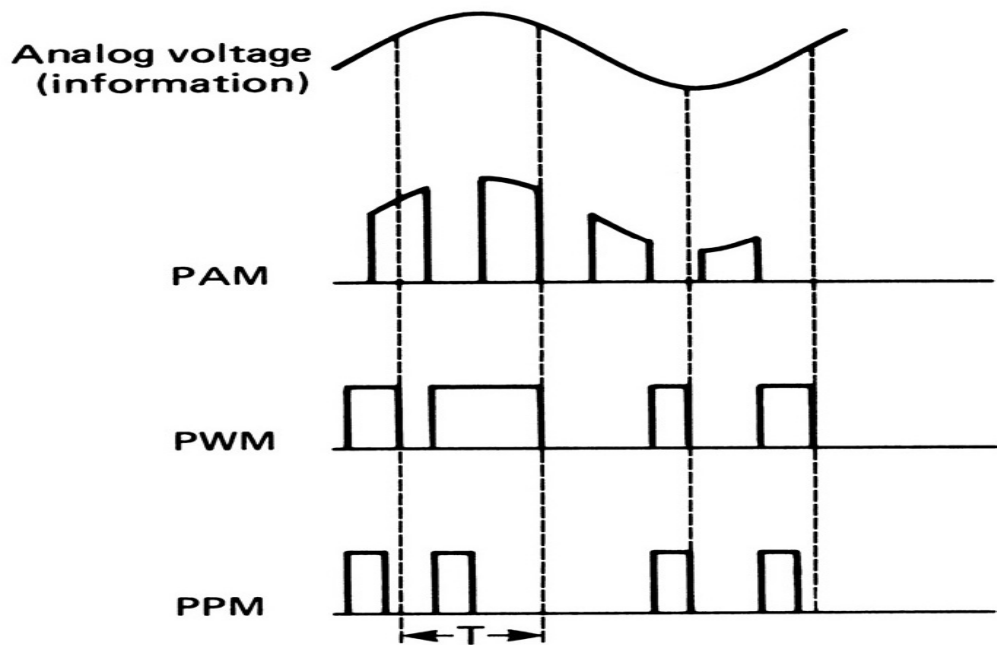
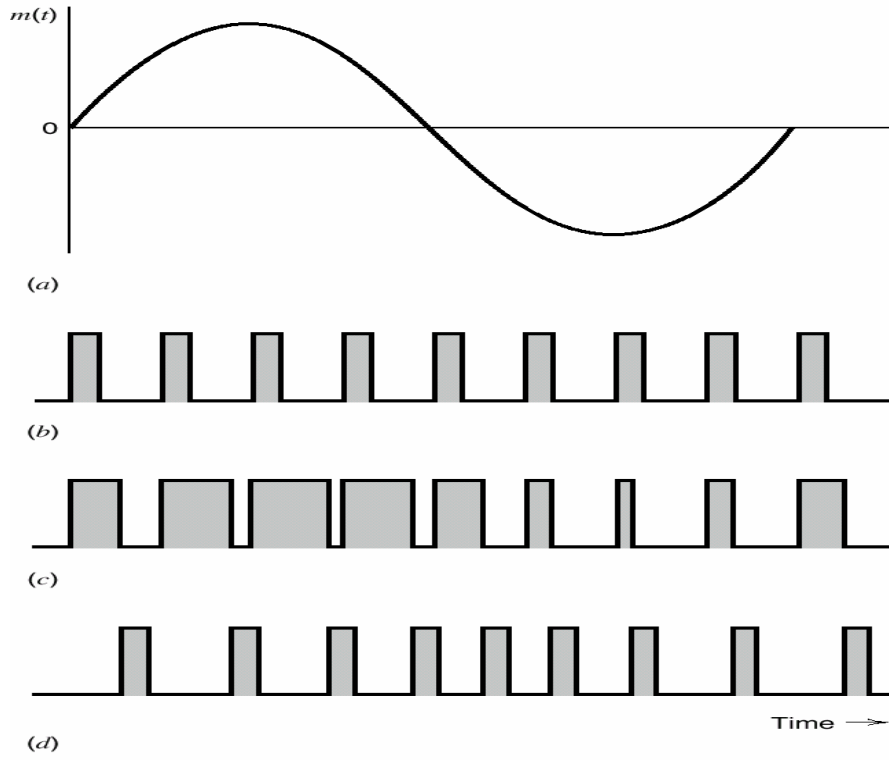
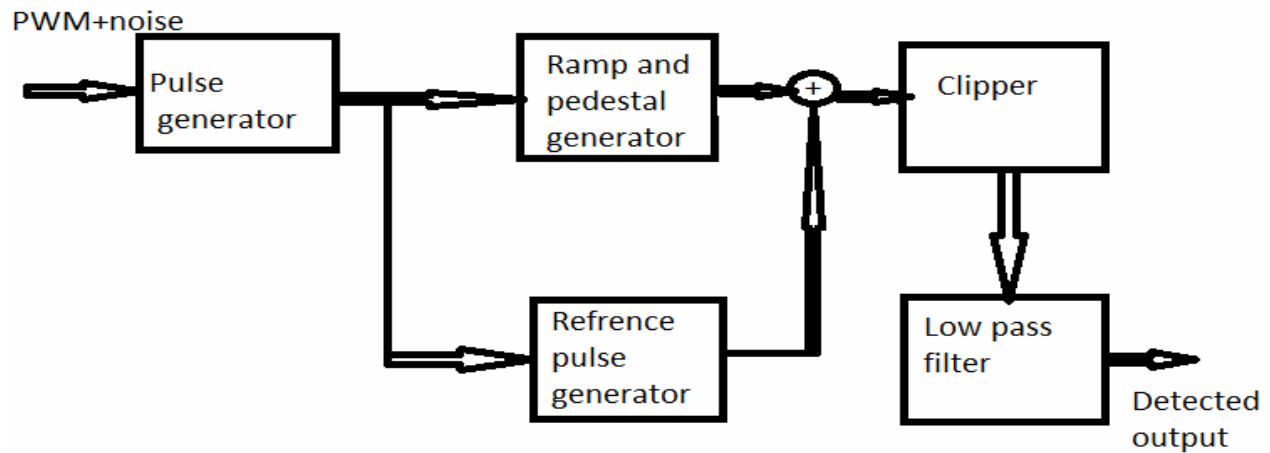


圖 11-11 類比脈衝調變訊號。

FIG: ANALOG/PULSE MODULATION SIGNALS

DETECTION OF PWM SIGNALS:



ADVANTAGES OF PWM:

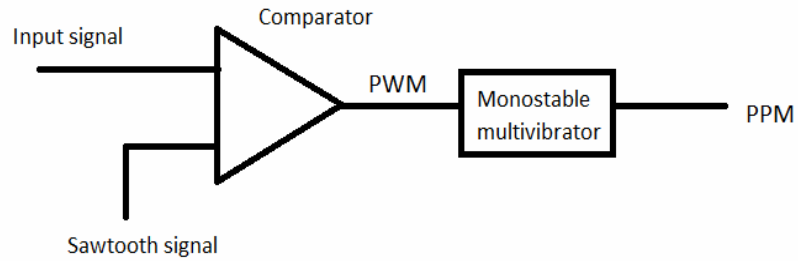
- 1) Less Effect of Noise .
- 2) Possible to reconstruct PWM Signals.

DISADVANTAGES OF PWM:

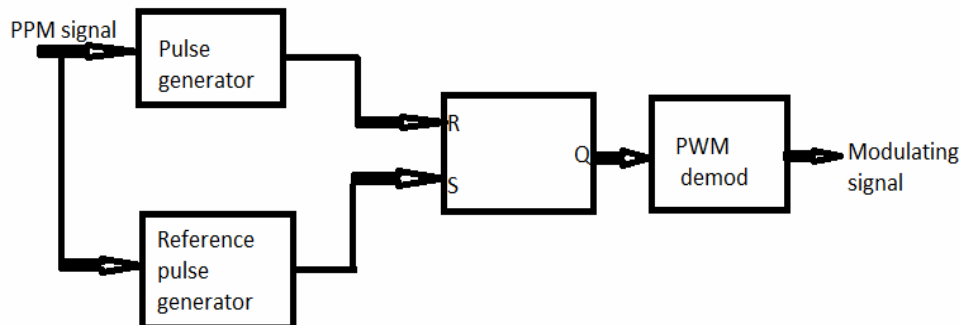
- 1) Average power transmitted can be as low as 50% of the maximum power.

GENERATION OF PPM:

PPM GENERATION:



DETECTION OF PPM:



ADVANTAGES OF PPM:

- 1) Due to constant amplitude of PPM pulse, the information not contained in

the amplitude. Hence noise added to PPM signal does not distort the information.

- 2) To reconstruct PPM signal from the noise contaminated PPM signal.

DISADVANTAGES OF PPM:

- 1) Large bandwidth is required to ensure the transmission of undistorted pulse.
- 2) A transmitter has to send pulses to operate timing signal at receiver end. Without them the demodulation may not be possible.