

Answer on Question #55044, Physics Electric Circuits

explain ALT and CHOP mode of dual trace oscilloscope

Answer:

ALT. - The ALT (alternate) mode (figure 1) of obtaining a dual trace uses the techniques of GATING between sweeps. This control allows the signal applied to channel 1 to be displayed in its entirety; then, channel 2 is displayed in its entirety. This method of display is continued alternately between the two channels. At slow speeds, one trace begins to fade while the other channel is being gated. Consequently, the ALT mode is not used for slow sweep speeds. The CHOP mode, shown in figure 6-36 (explained next), will not produce a satisfactory dual sweep at high speeds. The ALT mode is deficient at low speeds. Therefore, both are used on dual-trace oscilloscopes to complement each other and give the scope a more dynamic range of operation.

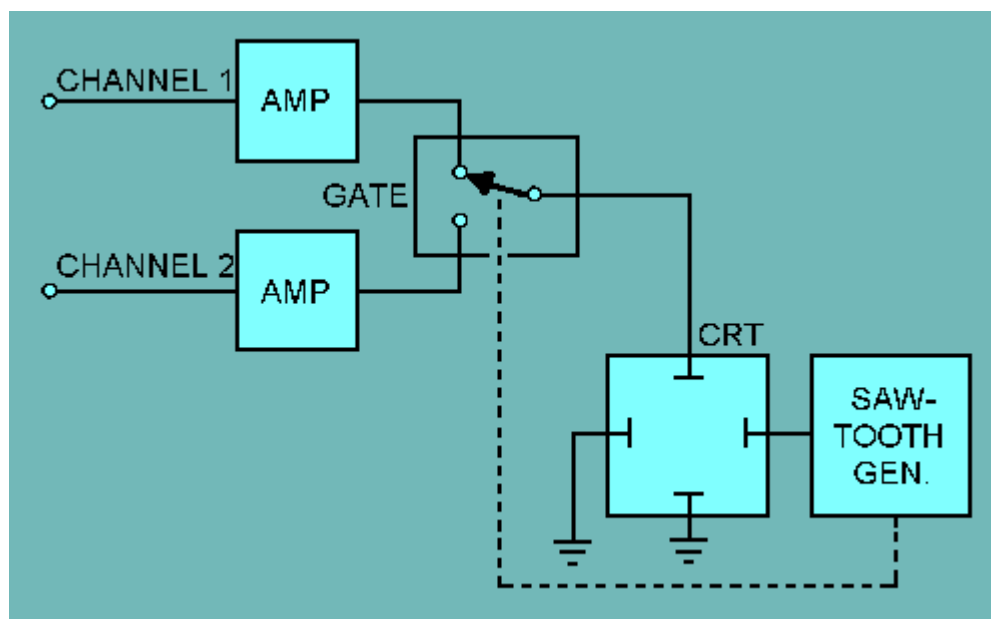


Figure 1. - ALT (alternate) mode.

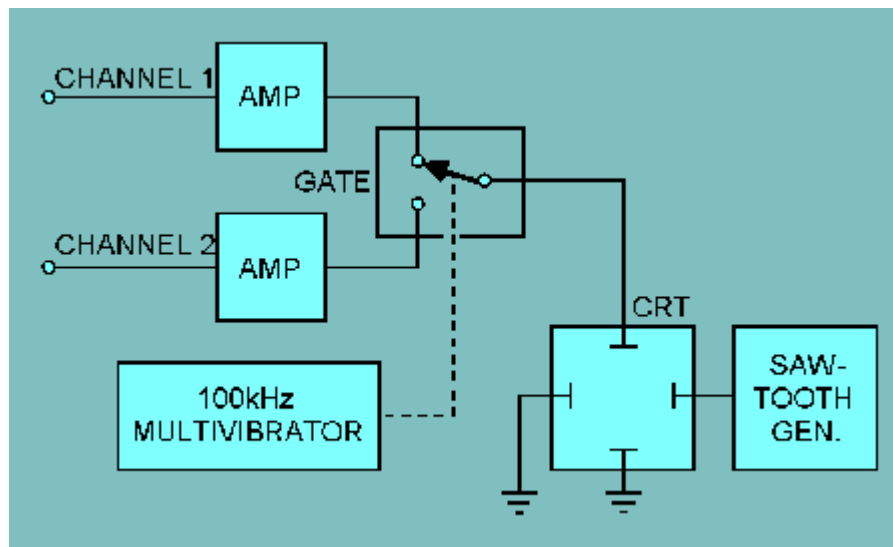


Figure 2. - CHOP mode.

The output dc voltage References on each of the amplifiers are independently adjustable. Therefore, the beam will be deflected by different amounts on each channel if the voltage reference is different at each amplifier output. The output voltage from each amplifier is applied to the deflection plates through the gate. The gate is actually an electronic switch. In this application, it is commonly referred to as a BEAM SWITCH.

Switching is controlled by a high-frequency multivibrator in the CHOP mode. That is, the gate selects the output of one channel and then the other at a high-frequency rate (1200 kilohertz in most oscilloscopes). Because the switching time is very short in a good-quality oscilloscope, the resultant display is two sets of horizontally dashed lines, as shown in figure 3, view A.

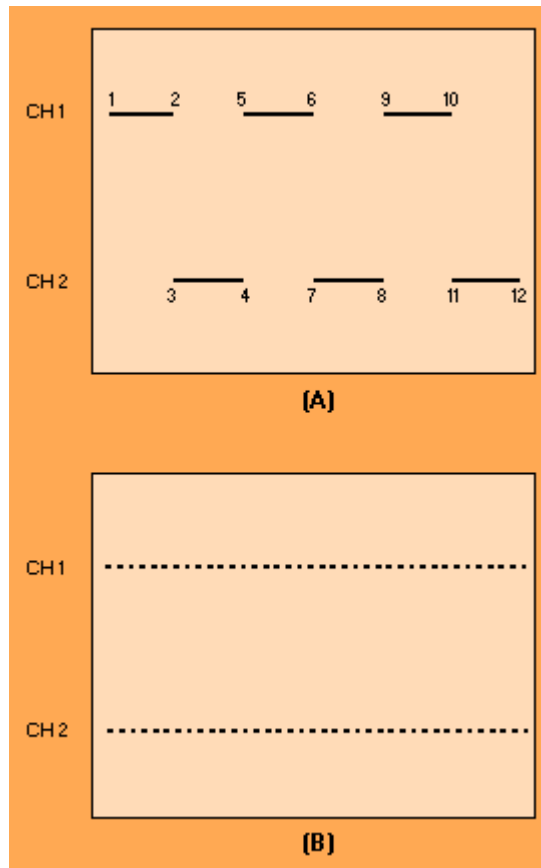
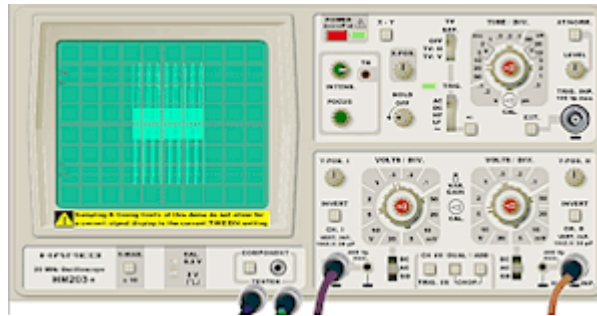


Figure 3. - Displaying CHOP mode.

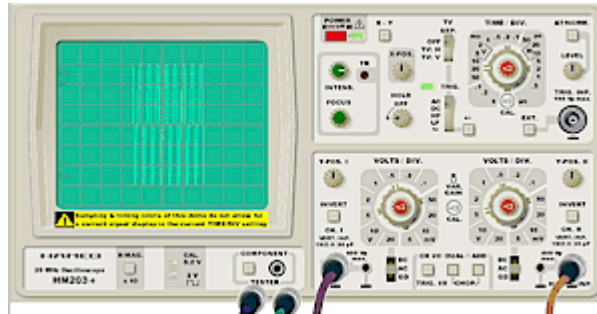
Dashed line CH 1 is the output of one channel, while line CH 2 is the output of the other. The trace moves from left to right because of the sawtooth waveform applied to the horizontal plates. A more detailed analysis shows that the beam moves from CH 1 to CH 2 while the gate is connected to the output from one channel. Then, when the gate samples the output of the CH 2 during time 3 to 4, the beam is at a different vertical LOCATION. (This is assuming that CH 2 is at a different voltage reference.) The beam continues in the sequence 5 to 6, 7 to 8, 9 to 10, and 11 to 12 through the rest of one horizontal sweep.

When the chopping frequency is much higher than the horizontal sweep frequency, the number of dashes will be very large. For example, if the chopping occurs at 100 kilohertz and the sweep frequency is 1 kilohertz, each horizontal line would then appear as a series of closely spaced dots, as shown in figure 6-37 view B. As the sweep frequency becomes lower compared to the chopping frequency, the display will show apparently continuous traces; therefore, the CHOP mode is used at low sweep rates.

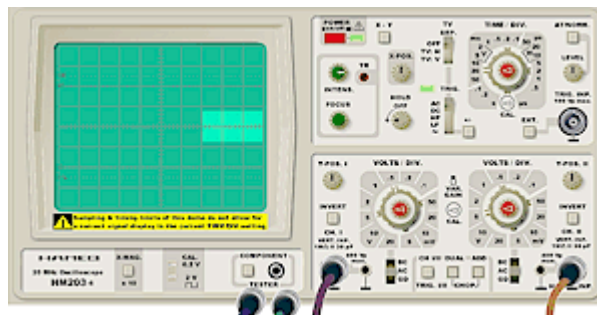
When signals are applied to the channel amplifiers (view A of figure 4), the outputs are changed according to the triggering signal (view B). The resultant pattern (view C) on the screen provides a time-base presentation of the signals of each channel.



Long Time/Div . setting and Dual mode (without Chop-mode).



First sweep in Chop-mode: The signal of channel 1 is processed.



Second sweep in Chop-mode: The signal of channel 2 is processed.