

KNOWLEDGE PROBE 1: Phase-Locked Loops Theory of Operation

Learning Objectives

1. Define phase-locked loop (PLL).
2. Identify the main components of a PLL.
3. Describe the operation of a PLL.
4. List the main specifications of a PLL and explain the importance of each.

1. Which of the following is NOT a part of all PLLs?
 - a. Frequency divider
 - b. Loop filter
 - c. Phase detector
 - d. VCO
2. A PLL is a?
 - a. Feedback control circuit
 - b. Frequency divider
 - c. Frequency synthesizer
 - d. Type of filter
3. What changes the frequency of the VCO?
 - a. Capacitor
 - b. DC input voltage
 - c. Inductor
 - d. Manually tuning
4. The output of the VCO may be a?
 - a. Rectangular wave
 - b. Sine wave
 - c. Either of the above
 - d. None of the above
5. Which output controls the VCO?
 - a. Frequency divider
 - b. Frequency multiplier
 - c. Loop filter
 - d. Phase detector



6. A phase detector produces an error signal when there is a(n)?
 - a. Amplitude difference between the two input signals
 - b. Frequency difference between the two input signals
 - c. One signal missing
 - d. Phase difference between the two input signals
7. The loop filter is a?
 - a. Band pass filter
 - b. Band reject filter
 - c. High pass filter
 - d. Low pass filter
8. Which of the following does the loop filter do?
 - a. Filters out interfering signals
 - b. Removes the feedback signal
 - c. Resonates at the incoming signal frequency
 - d. Smooths the phase detector output into a DC voltage
9. If the VCO output is exactly equal to the input signal in a PLL, the circuit is said to be?
 - a. Balanced
 - b. Locked
 - c. Range bound
 - d. Unstable
10. If the input signal frequency decreases, the VCO output will automatically?
 - a. Increase
 - b. Decrease
 - c. Remain the same
 - d. Drop to the free-running frequency
11. If the input frequency to the PLL changes continuously, the PLL?
 - a. Gets confused
 - b. Produces the complement of the input
 - c. Reverts to the free-running frequency
 - d. Tracks or follows the input changes
12. The range of frequency over which the VCO can be varied is called the?
 - a. Bandwidth
 - b. Capture range
 - c. Latency
 - d. Lock range



13. In order for a PLL to become initially locked, the input frequency must be within the?
 - a. Capture range
 - b. Lock range
 - c. Response time
 - d. Tracking range
14. If the input frequency becomes outside the tracking range, the VCO output will be?
 - a. The free-running frequency
 - b. The same as the input frequency
 - c. Twice the input frequency
 - d. Zero
15. The tracking range of a VCO is from 2 MHz to 3.5 MHz. The capture range is from 2.5 to 3 MHz. Will the PLL become locked if the input frequency is 2.75 MHz?
 - a. Yes
 - b. No
16. The tracking range of a VCO is from 2 MHz to 3.5 MHz. The capture range is from 2.5 to 3 MHz. If the input frequency increases to 3.4 MHz, the VCO output will be?
 - a. 2.5 MHz
 - b. 2.75 MHz
 - c. 3.0 MHz
 - d. 3.4 MHz
17. There is usually a phase shift between the input signal and the VCO signal when a PLL is locked?
 - a. True
 - b. False
18. The speed with which a VCO output frequency changes is referred to as the?
 - a. Bandwidth
 - b. Clock rate
 - c. Latency
 - d. Time constant
19. What circuit in the PLL is most responsible for the speed of response of the VCO to an input frequency change?
 - a. Frequency divider
 - b. Loop filter
 - c. Phase detector
 - d. VCO