Scope Probe

A probe is a high quality connector cable that has been carefully designed not to pick up stray signals originating from radio frequency (RF) or power lines. They are used when working with low voltage signals or high frequency signals which are susceptible to noise pick up. Also a probe has a large input resistance which reduces the circuit loading.

A probe usually *attenuates* the signal by a factor of 10. Figure 1 shows a typical probe.

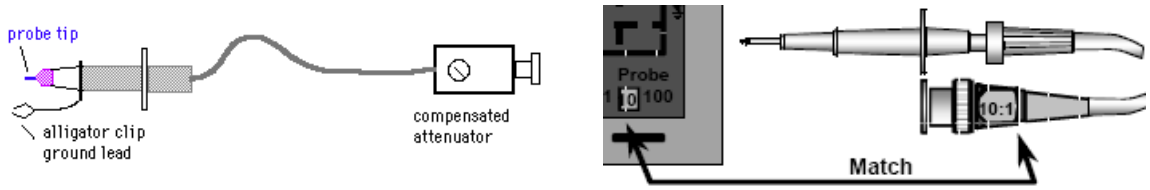


Figure 1: A typical probe

The probe usually has a small box connected to it which contains part of the attenuator (voltage divider), see Figure 2.

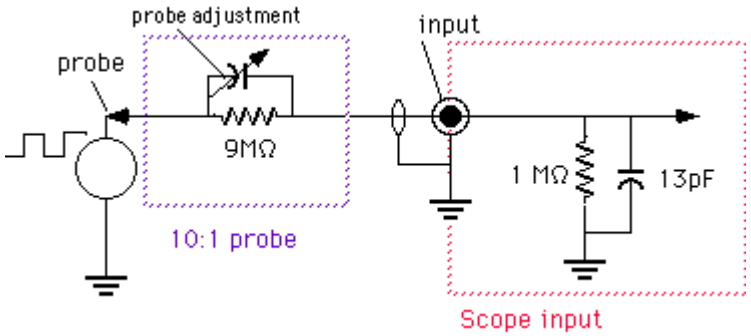


Figure 2: A **10:1** divider network of a typical probe.

Important: You need to inform the scope that you are using a 10:1 probe. **You must set the probe attenuation factor correctly or measurement voltage data will be wrong.** Notice that toggling the probe attenuation factor DOES NOT CHANGE the waveform display. IT DOES CHANGE the scale factor for channel 1 or 2 (see the status line, V/Div).

The *advantage* of using this 10:1 attenuator is that it reduces circuit loading. By adding a resistance of 9MOhm the input resistance seen by the circuit under test increases from 1 MOhm to 10 Mohm. As a result, the current that needs to be supplied by the circuit will be 10 times smaller and thus reduces the circuit loading.

You will notice that the probe has a *capacitor* over the 9 MOhm resistor. This is done in order to ensure that high frequency signals are not distorted. This is illustrated in Figure 3 for a square wave. When the probe is properly adjusted (compensated) a square wave will be displayed with a flat top. However, a poorly adjusted probe can give considerable distortion and erroneous readings of the peak-to-peak amplitude of the signal.

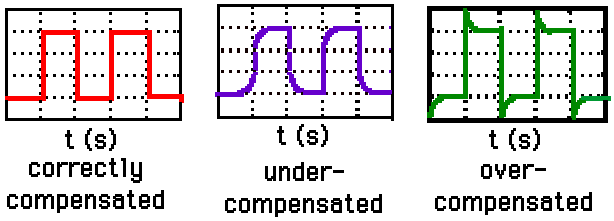
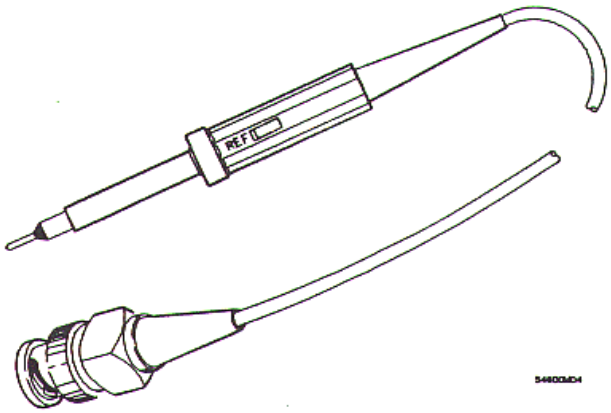


Figure 3: The effects of probe compensation: (a) **correctly adjusted** probe, (b) **undercompensated** and (c) **overcompensated** probe.

HP 10071A Oscilloscope Probe



Characteristics

Operating Temperature	–10 °C to 55 °C
Humidity	to 90%
Shock	400g 1/2 sine wave on tip end 50g 1/2 sine wave on BNC end
Propagation Delay	≈7 ns (1.5m probe cable length)
Bandwidth	150 MHz
Risetime	<2.33 ns

	HP 10071A
Attenuation Ratio	10:1
Input Resistance (when terminated into 1 MΩ)	10 MΩ
Input Capacitance	≈15 pF
Maximum Input (dc + peak ac)	450 V
Compensation Range	9 – 17 pF