

Probing - Calibration, Time Null, and Compensation

By: Hewlett-Packard Company

Purpose:

Calibrate the HP 10430A probe by using the front panel probe compensation signal on the HP 54542A. The proper signal should look like the screen shot below.

Equipment:

- HP 54520-Series Oscilloscope
- HP 54720-66506 Application Training board

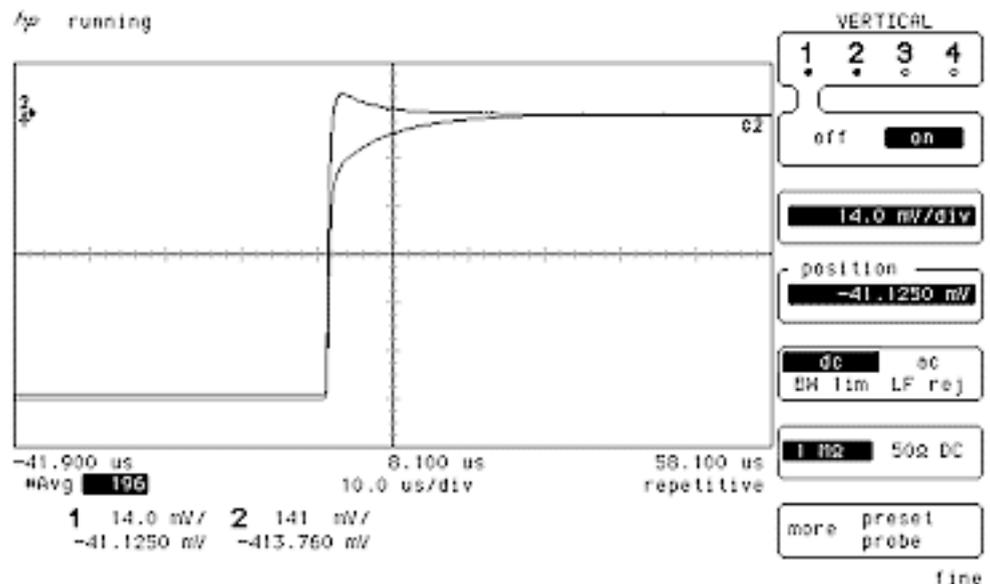
A. Low Frequency Compensation.

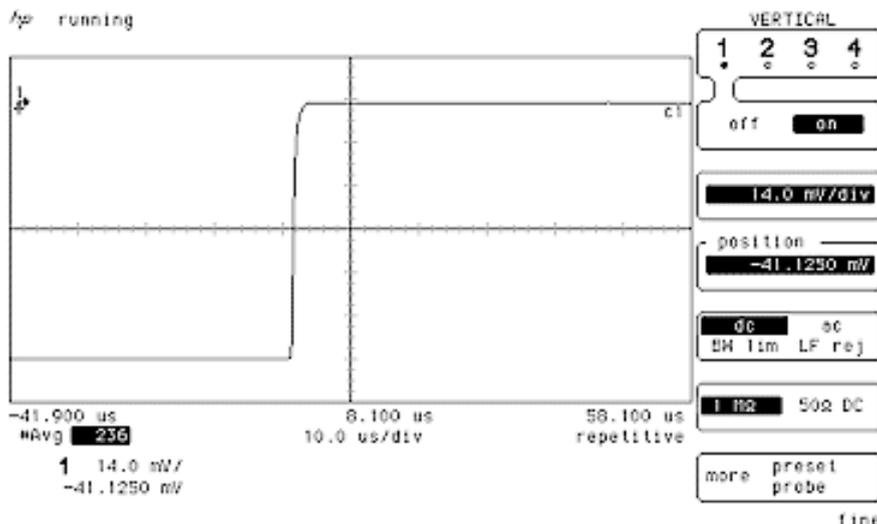
The miniature probes require two adjustment procedures: one for low-frequency compensation and one for high-frequency compensation. Low-frequency compensation is an operating adjustment and high-frequency compensation is accomplished periodically, according to maintenance schedules.

Cookbook for Probe compensation:

- Connect probe to oscilloscope channel one input.
- Connect probe tip to oscilloscope calibrator output with ground to BNC ground.
- Press **Auto-scale**.
- Rotate the **Horizontal** knob to set sweep speed to 10 usec/div.
- Select **Repetitive** mode in the **Horizontal** menu.
- Use average mode in the **Display** menu to smooth the waveform.
- Use adjustment tool (supplied accessory) to adjust C1 (through opening in cover of probe chassis) for the flattest possible pulse top.

*Wrong! Overshoot/Undershoot
Right! Flattest Possible Pulse .top..*





Purpose:

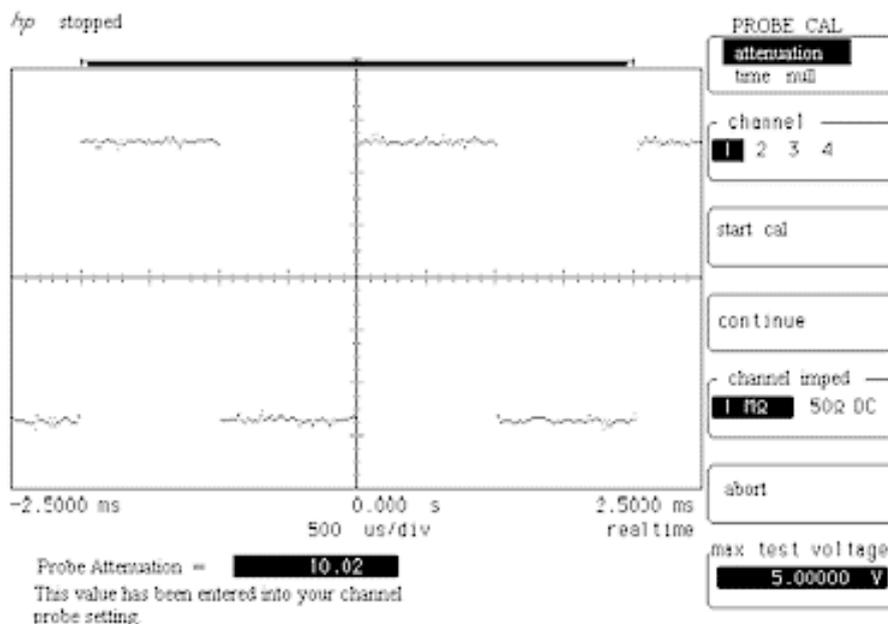
Use the probe cal menu to automatically calibrate the probe to the scope to get the scope to use the exact attenuation factor of the probe.

B. Probe Calibration.

In addition to compensating the probe, it's a good idea to perform a PROBE CAL to ensure accurate measurement results. This will calibrate the scope to the probe's exact divider ratio to provide the most accurate voltage measurements.

Cookbook for Probe Attenuation setting.

- Press the **Utility** key, then press the **probe cal menu** softkey, and set the top softkey to **attenuation**.
- The 10430A probe should already be connected to the front panel Cal. from the previous lab.
- Press the **start cal** softkey, then follow the directions on the display.
- The scope will calibrate the channel gain down to the probe tip. Notice the probe attenuation factor at the bottom of the screen. Rather than use the specified attenuation factor of 10:1, the scope now uses the actual attenuation factor of the probe to calculate all measurement values.
- What is the Probe Attenuation setting shown on the CRT? _____



Note the Probe Attenuation factor shown on screen.

**Purpose:**

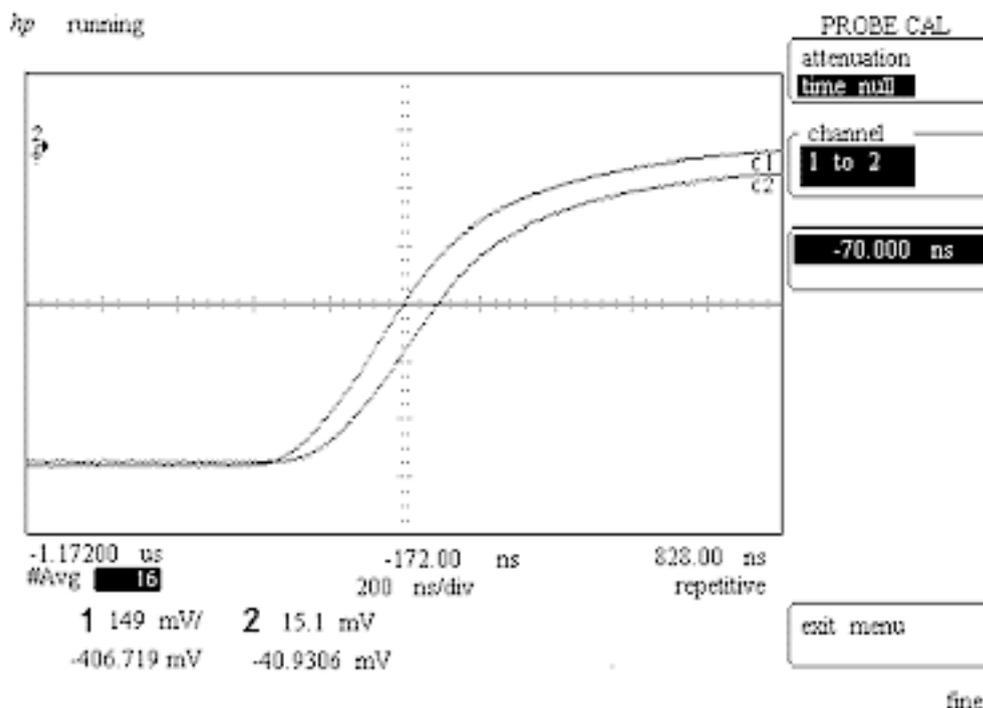
Use the probe cal menu to automatically correct for any channel-to-channel time skew variations due to cable length and signal path differences.

C. Time Null.

When using a scope for channel-to-channel measurements, it's recommended to perform a **time null**. **Time null** sets the timing of all channels to correspond to each other at the probe tip. This eliminates time discrepancies between channels, and channel-to-channel skew variations. This is useful to manually correct for any differences in cable length and signal paths inside the scope.

Cookbook for doing time null.

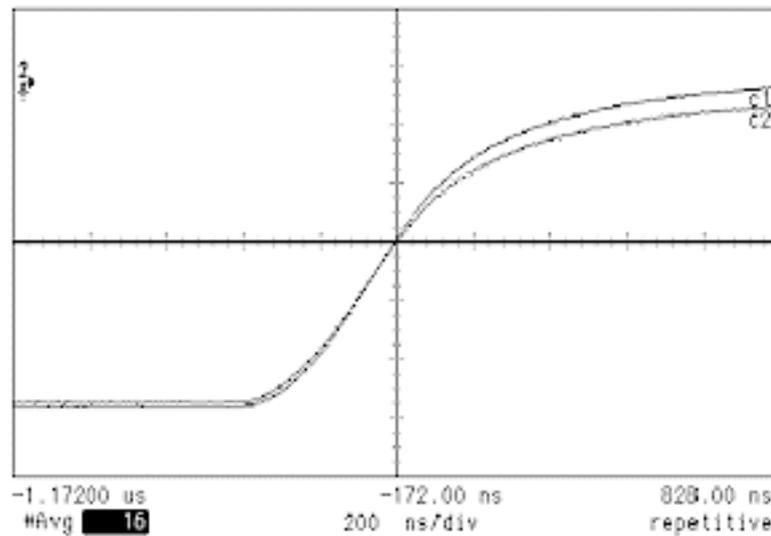
- Connect probes to channel 1 and channel 2 and probe the **Cal** signal.
- Press **Auto-scale**.
- Use the **HORIZONTAL** control to set the time base to 200 ns/div.
- Press the **Utility** key, then press the **probe cal menu** softkey
- Select the top softkey to **time null** and set the **channel** softkey to **1 to 2**.
- Adjust the general entry knob until the traces overlap at approximately their 50% amplitudes.



Note time offset between probe paths.



hp running



PROBE CAL

attenuation
time null

channel
1 to 2

14.000 ns

-1.17200 us #Avg 16 200 ns/div 828.00 ns repetitive

1 149 mV / -406.719 mV 2 15.1 mV / -40.9306 mV

exit menu

fine

Note probe path length differences nulled out.

