to compensate the voltage divider. The capacitance would be greater than 20 pF, the input capacity of the oscilloscope!

The capacitive loading can be reduced by using a 100X probe as shown in Fig. 2-4. The output time constant of the 100X probe with 3.5 foot cable is given by:

$$TC_{out} = R_{eq}\ (C_2 + C_{scope}),$$

where R_{eq} is the shunt combination of R2 and R_{scope}.

$$TC_{out} = 100\ k\Omega\ (20\ pF + 105\ pF) = 12.5\ \mu s.$$

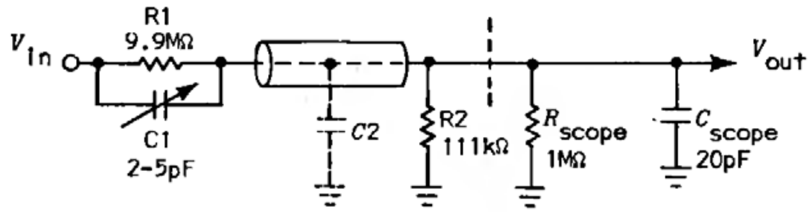

Fig. 2-4. Compensated 100X probe.

The time constant is reduced by a factor of 10 which means C1 can be reduced by 10.

$$C1 = \frac{TC_{out}}{R1} = \frac{12.5\ \mu s}{9.9\ M\Omega} = 1.26\ pF.$$

Again the environmental capacity of the probe head must be added to C1 to obtain the capacitance which shunts R1, say 3 pF. By using a 100X probe we markedly reduce loading, however, the signal is smaller because of the increased attenuation. For any given measurement, we must weigh the relative advantages-disadvantages of the 10X and 100X probes.

The non-attenuating 1X probe with a 50 Ω coax cable is essentially a large shunting capacitance with an input terminal that is located 3.5 to 9 feet from the oscilloscope input. The 1X probe presents an extremely large load to high speed signals and therefore, is normally limited to such measurements as power supply ripple with the oscilloscope input AC coupled.