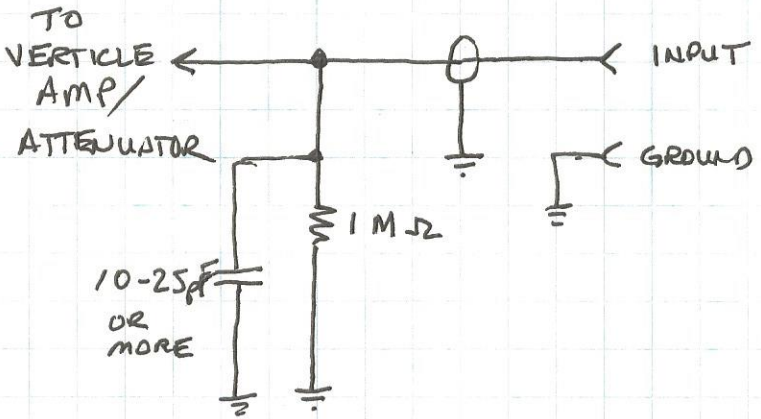
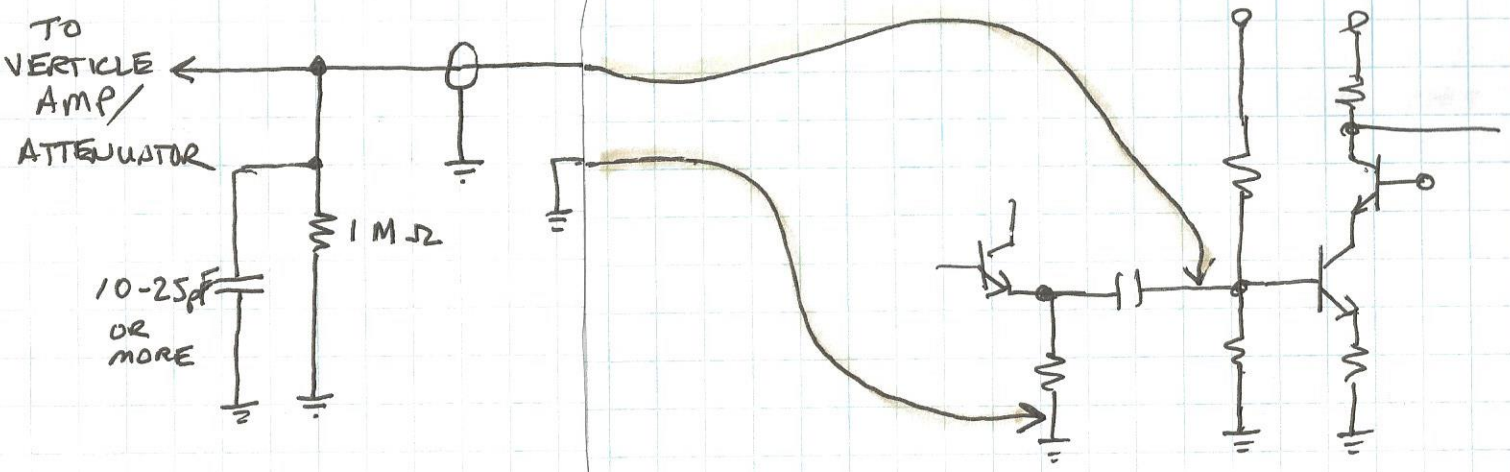
OSCILLOSCOPE INPUT



HOW DO WE CONNECT THIS TO THE CIRCUIT?

OSCILLOSCOPE INPUT

WHY NOT SIMPLY USE WIRES?



- LOTS OF STRAY INDUCTANCE

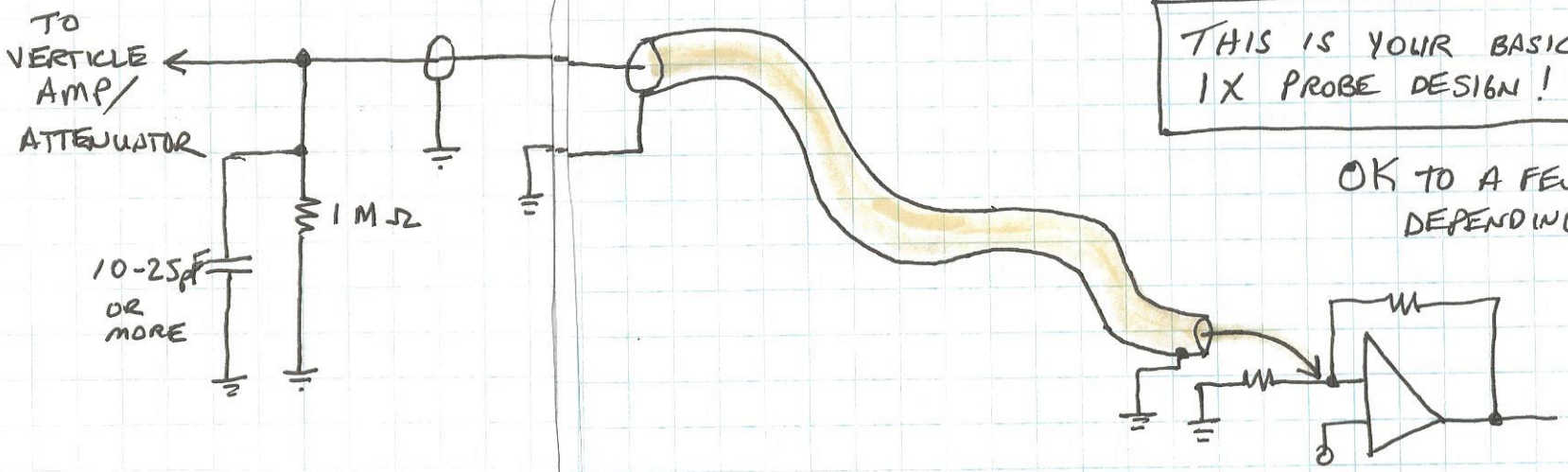
→ - WIRES ARE ANTENNAS, WILL PICK UP ALL SORTS OF NOISE

- WIRES WILL COUPLE TO OTHER PARTS OF THE CIRCUIT

- OK FOR LOW FREQUENCY, LARGE SIGNALS

OSCILLOSCOPE INPUT

REPLACING THE WIRES WITH COAXIAL CABLE SOLVES SOME OF THE PROBLEMS



THIS IS YOUR BASIC 1X PROBE DESIGN!

OK TO A FEW MHz DEPENDING ON CIRCUIT

THE GOOD:

- MINIMIZES STRAY SIGNAL PICKUP
- MINIMIZES COUPLING TO OTHER PARTS OF CIRCUIT

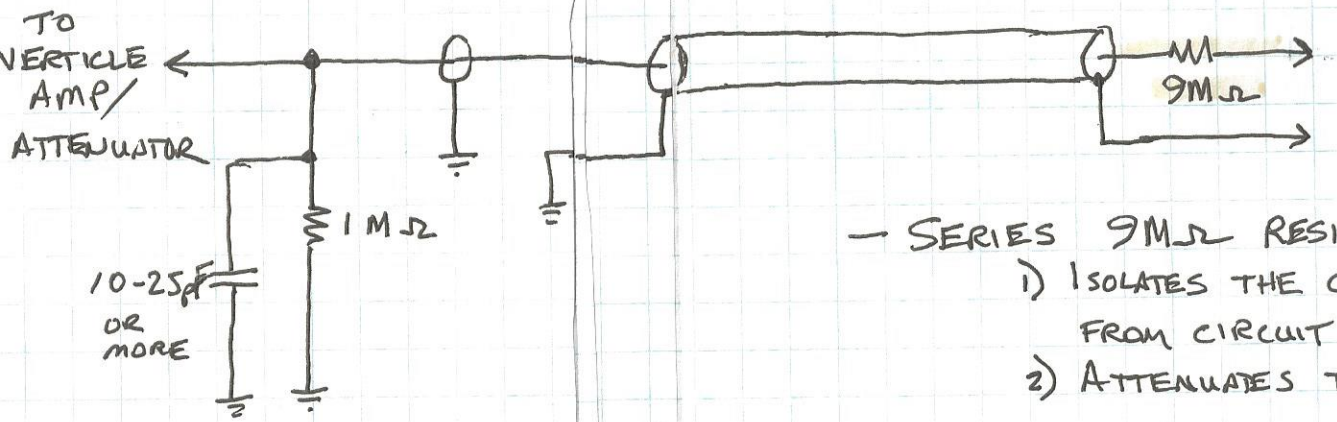
THE BAD:

- ADDS TO CAPACITIVE LOADING
  COAX IS TYPICALLY ≈ 30pF PER FOOT!

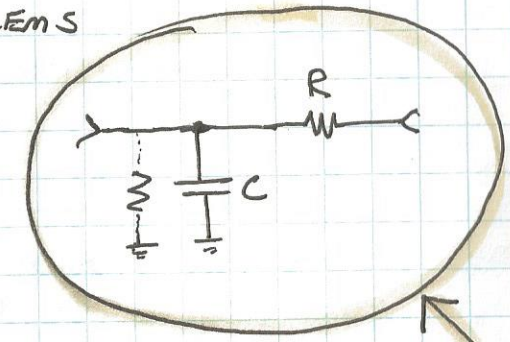
2.5' OF COAX + SCOPE INPUT CAPACITANCE CAN EASILY BE 100pF!

100pF IS ≈ 50Ω @ 30MHz!

OSCILLOSCOPE INPUT



10x PROBE SOLVES SOME OF THE LOADING & CAPACITANCE PROBLEMS



- SERIES 9MΩ RESISTOR DOES 2 THINGS
  1) ISOLATES THE COAX + SCOPE CAPACITANCE FROM CIRCUIT
  2) ATTENUATES THE SIGNAL BY 10x

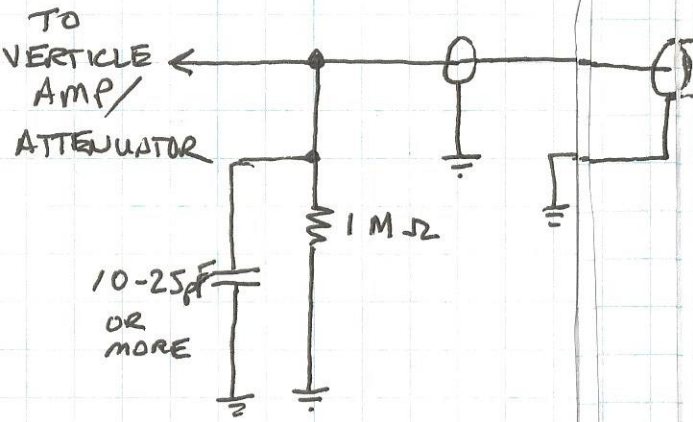
... BUT ...

- THE 9MΩ RESISTOR & THE COAX + SCOPE CAPACITANCE FORM A RC LOW PASS FILTER!

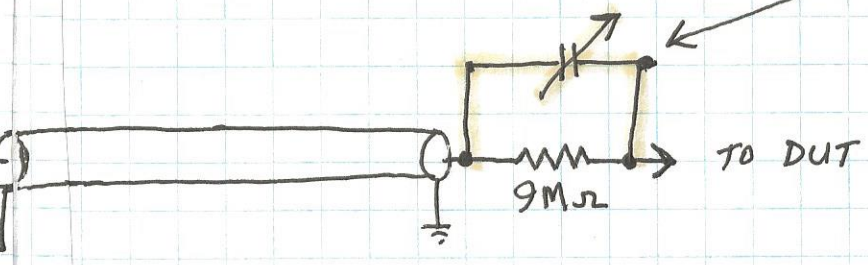
∴ THE 10x ATTENUATION GETS WORSE AS FREQUENCY INCREASES

→ THERE IS A SIMPLE FIX FOR THIS!

OSCILLOSCOPE INPUT



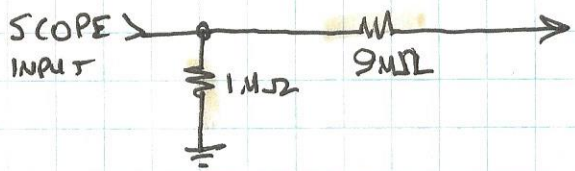
A TRIMMER CAPACITOR IS ADDED TO THE PROBE TO COMPENSATE THE FREQUENCY RESPONSE



THE COMPENSATION CAPACITOR IS VARIABLE TO ACCOUNT FOR DIFFERENT SCOPE INPUT CAPACITANCES!

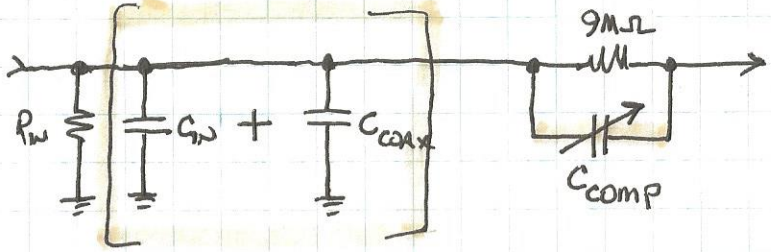
SO NOW...

AT LOW FREQUENCIES...



... THE RESISTORS FORM THE 10X ATTENUATION

AT HIGH FREQUENCIES...



... THE COMPENSATION CAP AND COAX/SCOPE CAP FORM THE 10X ATTENUATION