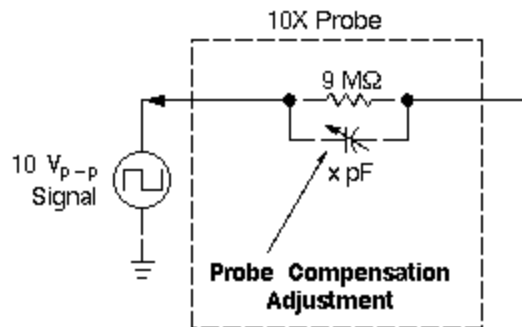
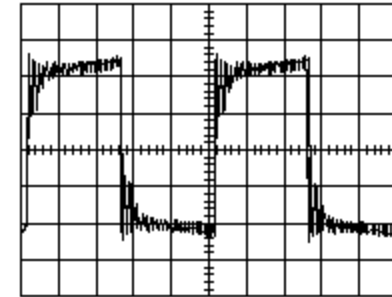
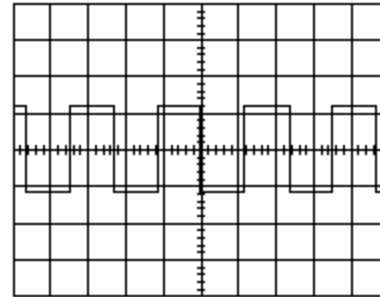


Line compensation



Probe Compensated Correctly

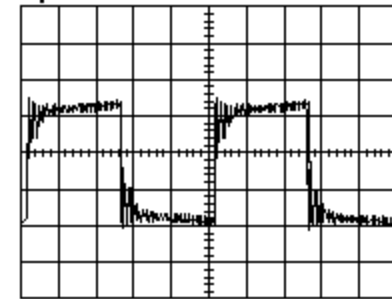
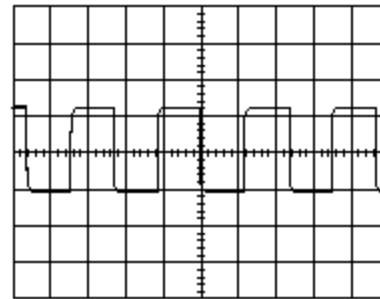
Probe Adjustment Signal



Note Proper Amplitude of a 1 MHz Test Signal

Probe Undercompensated

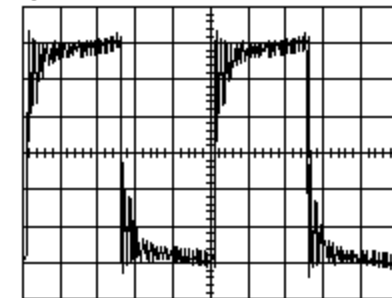
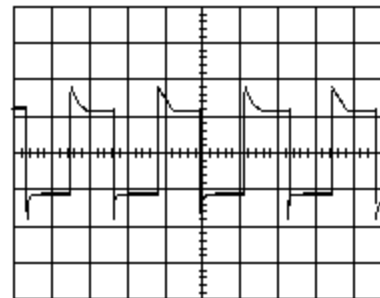
Probe Adjustment Signal



Note Reduced Amplitude of a 1 MHz Test Signal

Probe Overcompensated

Probe Adjustment Signal



Note Increased Amplitude of a 1 MHz Test Signal

ElectroMagnetic Interference

EMI

- ▶ Near field – inductive ($1 / r^2$)
- ▶ Far field – plane wave ($1 / r$)
 - Wavelength – some consideration
 - RF (GSM – switched packet)
 - Impulsive signals – motors
 - Oscillators (Micro-waves, Carrier)
- ▶ Shielding and Filtering (Power supplies)
 - L's, C's, cages, Coaxial cables

Ground and earth connections

- ▶ Ground == 0V (signal reference)
- ▶ earth == Local potential ($1-10\text{m}$, $1/r^2$, $1/r$)
 - Connection to a low impedance earth point.
 - Copper wire under the ground ($>1\text{m}$, 18mm)
- ▶ 50Hz AC
 - Brown/Black – “live”
 - Blue – “neutral”: Earth on the originate connector
PT (5% allowed, 1% nominal) – Power ground
 - Yellow.Green – earth (section immediately above)

Earth

▶ Leaks

- Current returning from protective ground instead of the power ground
- Ground-fault interrupter
 - Differential flux return path
 - “Cheater adapter”
 - Physiological effects on humans
 - Current sensibility : 100mA (DC) up to 1A (1MHz)

Ground

- ▶ Power ground
 - Return current path
- ▶ Signal ground
 - Reference to circuit design
 - Return path to signals
 - Analog and Digital (ground planes)
- ▶ Chassis and shielding
 - EMI protection
 - Inductive and capacitive coupling

Ground loops

► Sources

- Ground planes
- Current loops
 - dB/dt (+)
 - Spurious noise (+)
 - Capacitive coupling (-)
 - Common-mode noise (-)

