



Lecture 3

The Physical Layer



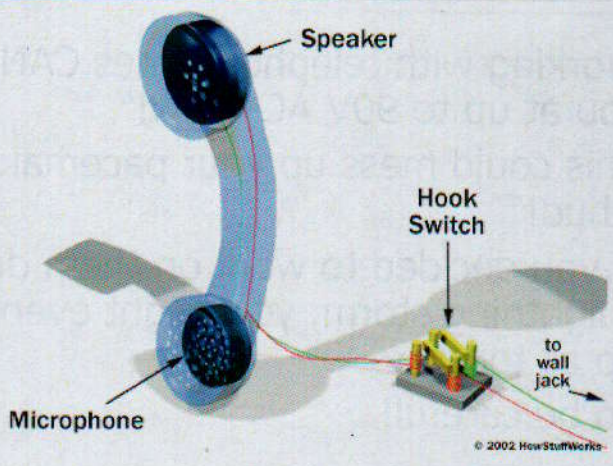
Telephone Safety


- Working with telephone lines CAN shock you at up to 90V AC—"ow!"
- This could mess up your pacemaker—"thud!"
- If you decided to work on them during a lightning storm, you might even end up as toast
- So be careful!

PART I

■ TELEPHONE BASICS


A simple telephone:





Ring and Tip

- There are two and only two wires required to power your home telephone: Red and Green.
- Red = Ring
- Green = Tip



Red vs. Green

- Red is -48 V DC
- Green is 0 V DC
- This simply means that when you lift the phone off its hook, the current flows from Green to Red to light your keypad and provide you with a dial tone.



Ring

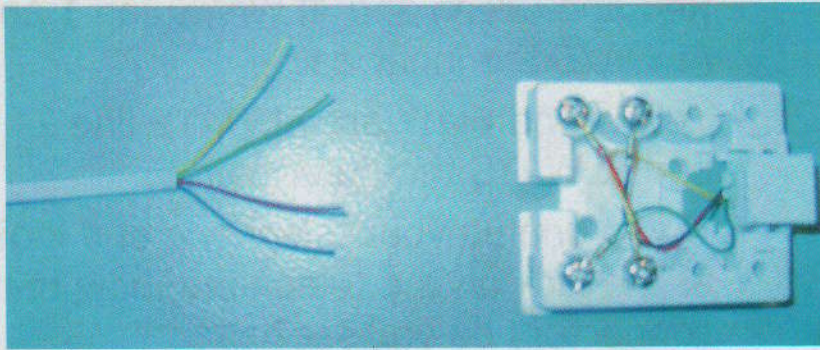
- When your telephone rings, the circuit itself requires even more current, up to 90 V AC, in fact, to power the ringer in your telephone.
- This can shock you
- To avoid this, you can leave the phone "off-hook" while working on the line.



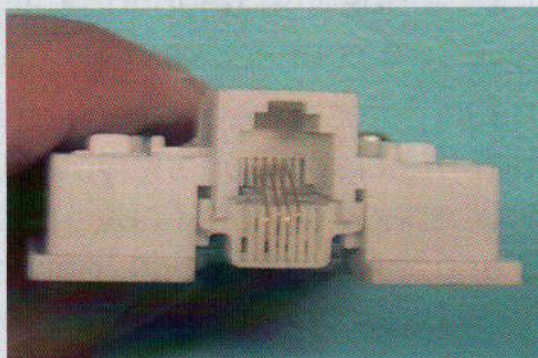
Residential wiring

- Most houses are wired with 4 conductor stranded wire. If you look at any jack in your house, you will likely see four gold connectors inside the jack. This means you can have two phone lines per jack.
- Red = Ring
- Green = Tip
- Yellow = Ring
- Black = Tip

Inside the telephone jack:



Telephone jack (RJ-11 style)



NOTE 4 PINS
INNER TWO PINS: RED AND GREEN
OUTTER TWO PINS: YELLOW AND BLACK



Using two lines

- Red and Green are ALWAYS line 1 and ALWAYS the inner pair
- Yellow and Black are ALWAYS line 2 and ALWAYS the outer pair.
- If you unplug your telephone and look at the jack on the telephone, how many connectors do you see?



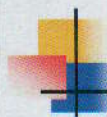
...2 connectors! (usually)

- If it's a one line telephone, it will only have two connectors
- In fact, most telephone wire that comes with the crappy phone you buy at Radioshack will only have two wires in it, and, as you'll notice, only have the inner two connectors at either end.



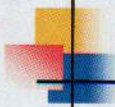
PART II

- RESPONSIBILITY FOR WIRING



Who is responsible for keeping your telephone line working?

- It depends on who owns it, and THAT depends on where it is.
- Back in the day, your local telephone company was responsible for the wiring leading up to and INTO your house. All the way to your telephone jack, in fact.
- But now...



"There is a line drawn in the sand"

- Your local telephone company wants to make it very clear to you WHO is RESPONSIBLE for WHAT.
- This also translates into: who fixes it when it breaks

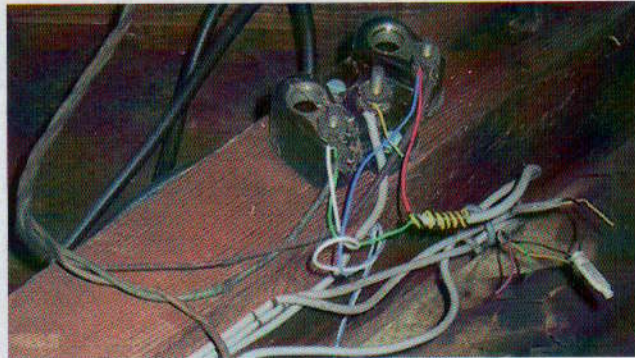


Definition:

- Demarcation point, a.k.a. "the minimal point of entry"
 - This is where the telephone company's responsibility ends, and yours, as the customer, begins.
 - It is where the wiring from the telephone company meets the wiring in your house

Old School

- This is a picture of the MPOE in a residence built in 1949:



Things to notice on previous slide:

- Grungy wires leading into the block on extreme left—the original wires from the telephone company leading into the house
- Brighter grey house telephone wires meeting the grungy ones on the block
- Note that these wires are in fact RED and GREEN