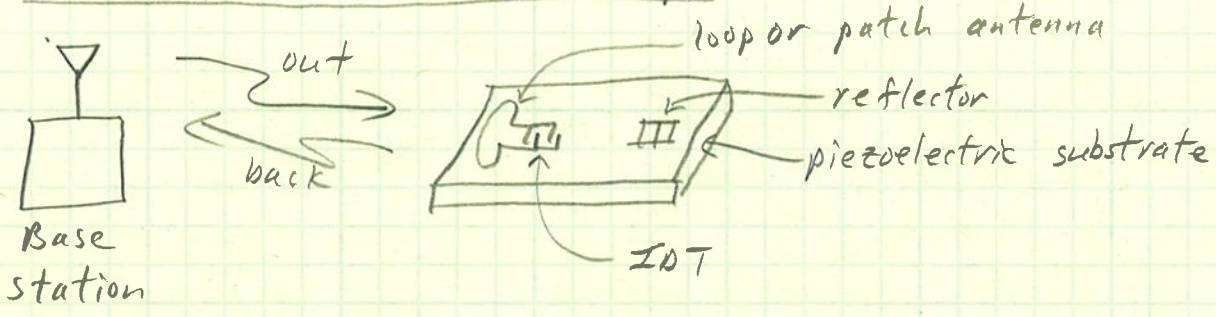
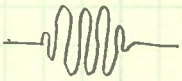
1. Wireless SAW Sensor Example



↳ send out a modulated ping: 

and counts time until ping returns

or looks for amplitude/freq change in return pulse

Applications / Characteristics

① Many types of sensors are possible: strain, temp, pressure, etc.

② Wide operating temperature range

③ Relatively simple

④ Fabrication similar to IC's and MEMS

Possible Disadvantages

① Rigid substrate

② Multi-sensor implementations add complexity

③ Difficulty in realizing a sensor with high selectivity to one environmental parameter only

2. RFID

→ Radio-Frequency Identification

→ Mostly used for wireless automatic identification data collection

→ Applicable to wireless sensors too

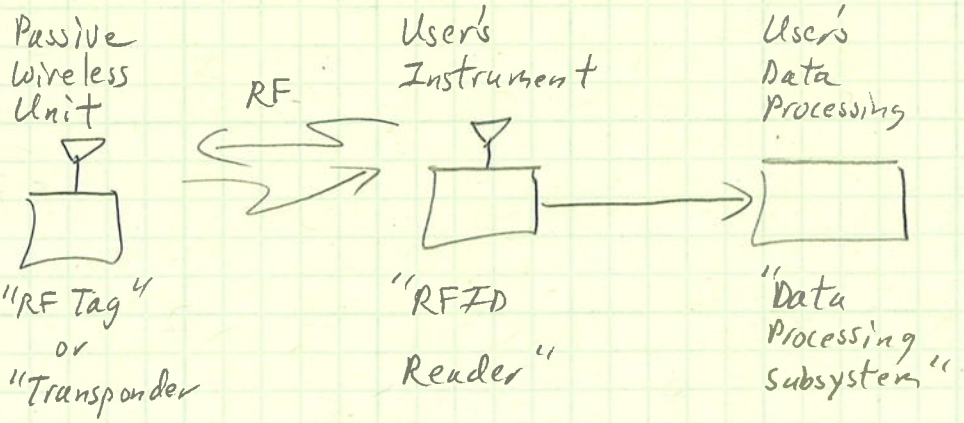
a. RFID History

Origin was the WW II Identification, Friend or Foe (IFF) system

→ The British developed a system that worked with their air defense radars to return a signal based upon being illuminated with the radar: Mark I and Mark II systems. The later Mark III system was a little more sophisticated. Instrumental in the Battle of Britain to distinguish RAF aircraft from German aircraft

→ The Germans developed a comparable system, but the British built a unit to trigger it, thus causing it to give away the position of night flying German fighter planes

b. Introduction To RFID



Carrier Frequency: typically between 125 kHz and 2.45 GHz +

a. Typical tag reading protocol:

① Reader continuously sends out a carrier frequency and waits for a return signal

② If a Tag receives the carrier signal, it begins to power up off of it

③ Once powered up, the Tag divides down the carrier frequency and uses this clock signal to clock out its data

④ The Reader receives the data and processes it accordingly

b. Wireless Communication Technique

① Lower Frequency Use

→ Inductive coupling → magnetic field

→ to transmit power to the Tag and data to the reader

→ to transmit data, the Tag uses a transistor to short its coil (i.e. the transformer secondary) which changes the load seen on the primary (Reader's) side.

→ this slightly changes the carrier amplitude at the Reader, which is detected as 1's and 0's → amplitude modulation

② High Frequency Use

→ RF Link use "Backscatter Modulation"

→ The Tag still shorts its antenna with a transistor, but this time its effect is like changing the radar cross-section (RCS), which affects the carrier amplitude at the Reader

→ The effect is small, maybe 100mV on a 100V reader carrier sinewave