



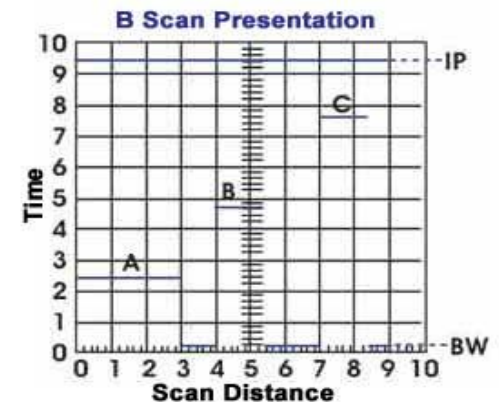
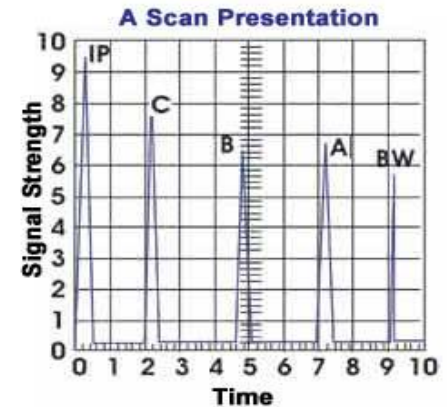
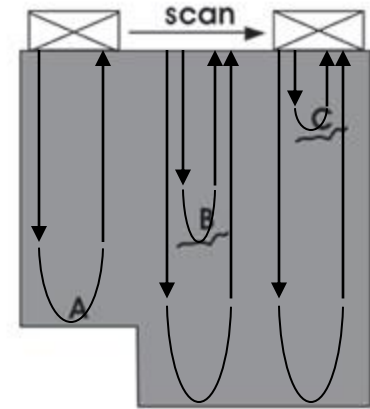
Ultrasonic Testing Methods

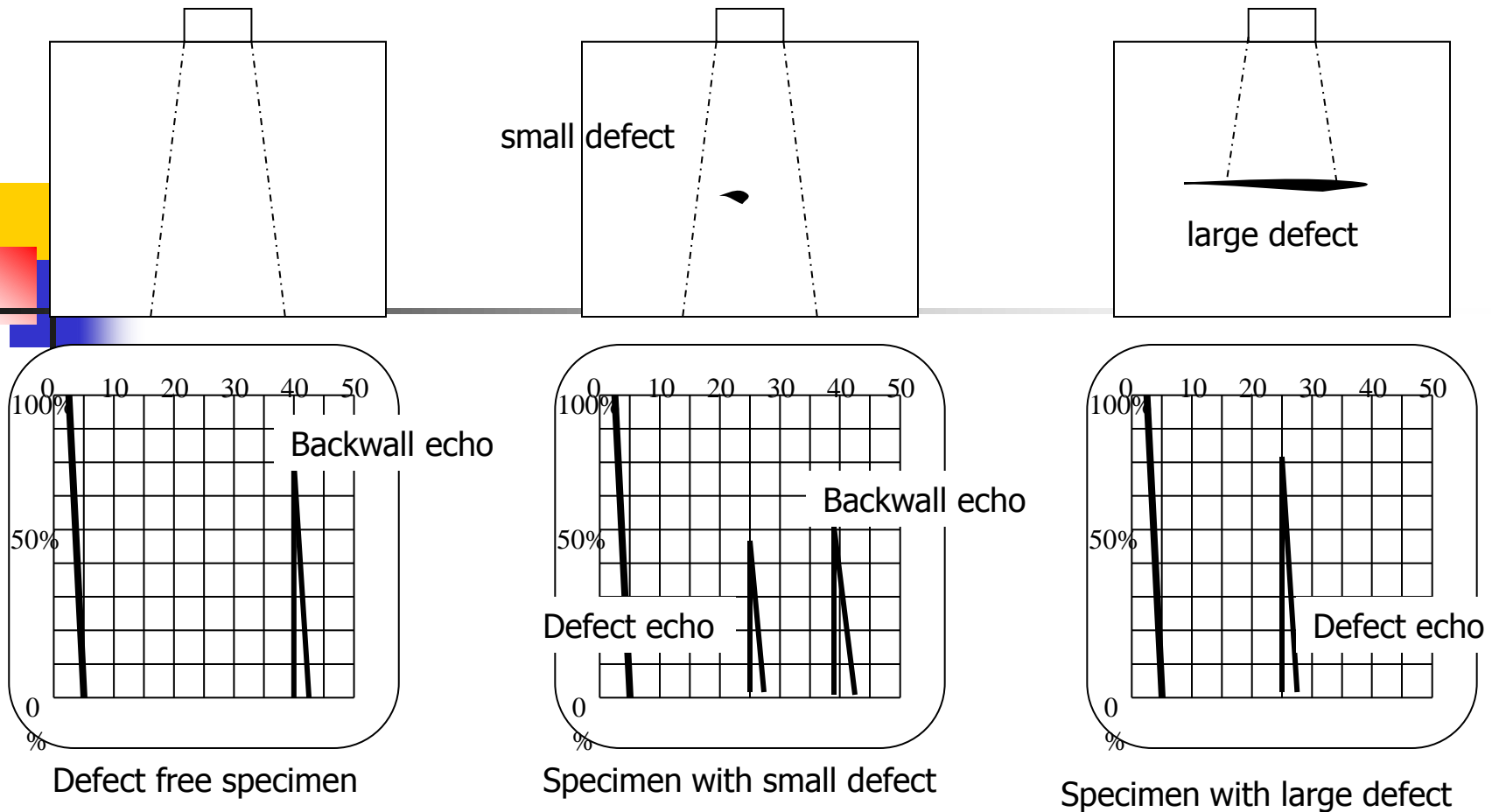


**PULSE ECHO METHOD
THROUGH TRANSMISSION METHOD**

PULSE ECHO METHOD

- US projected perpendicularly into the specimen-generally longitudinal waves
- With single crystal probe acts as emitter and receiver at the same time
- CRT indicate transmission pulse, backwall echo and flaw echo



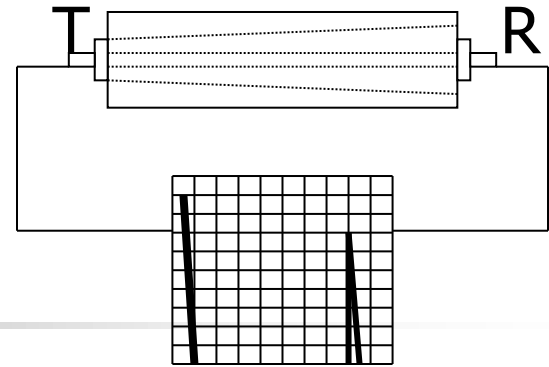


- Anything that reflect sound wave is called reflector (e.g defect and backsurface)
- Flaw size indicated by the signal height
- Flaw depth indicated by by echo position on the time base
- If no flaw-only transmission pulse and backwall echo presented.

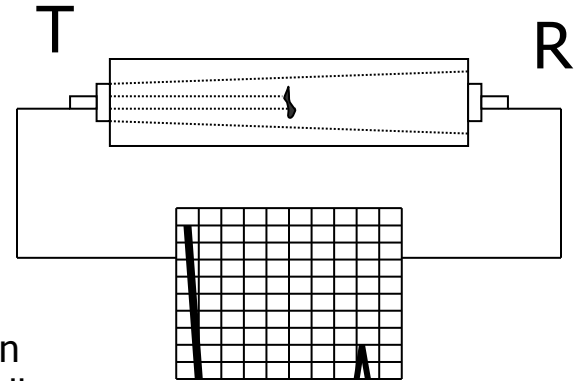
Through Transmission Technique

- Oldest method in UT
- Use 2 probes one as emitter another as receiver
- compare sound intensity from flawless and with flaw signal
- flaw shade the sound energy
- Reduction or loss of signal indicates the presence of defect

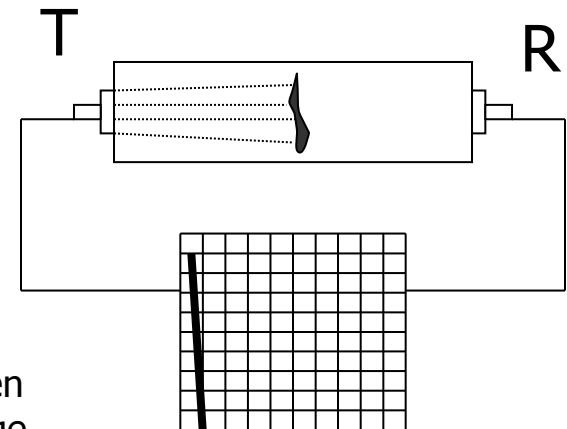
Defect free specimen



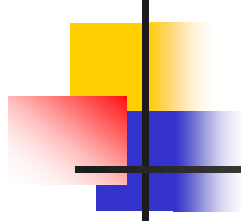
Specimen with small defect



Specimen with large defect

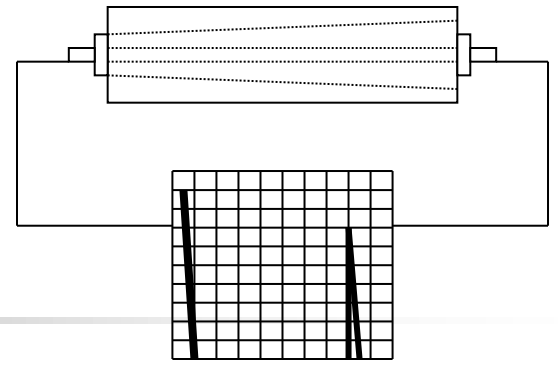


Through Transmission Technique

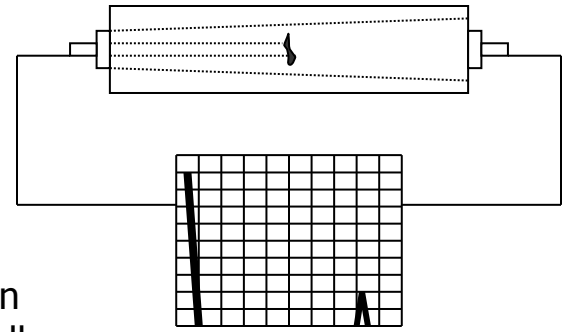


- normally large flaw shade more energy
 - Normally applied for large ingot and castings inspection (attenuation is high)
 - limitations:
 - variation of amplitude due to couplant and different geometries of sample
 - Require good coupling and alignment between transducer
- And receiver
- no information on the depth and size of flaw

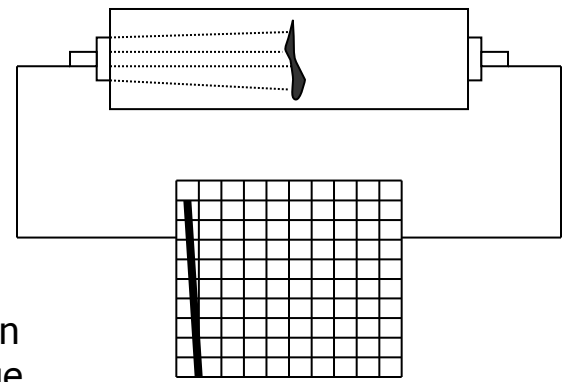
Defect free specimen



Specimen with small defect



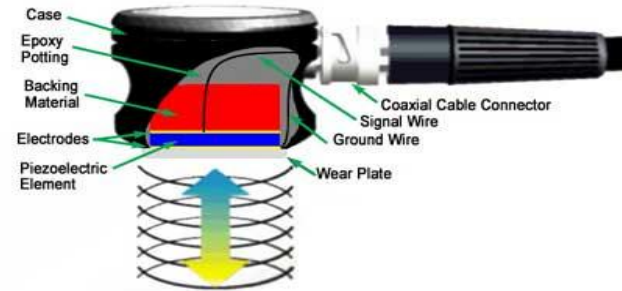
Specimen with large defect





ULTRASONIC SENSORS

Piezoelectric transducer

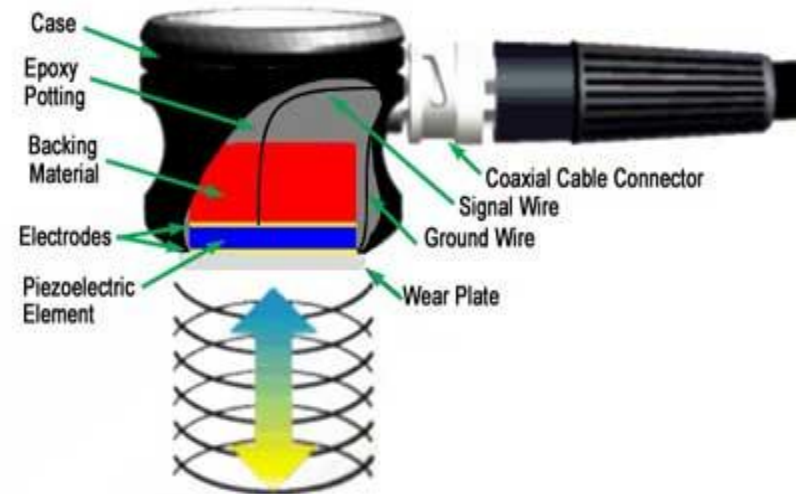
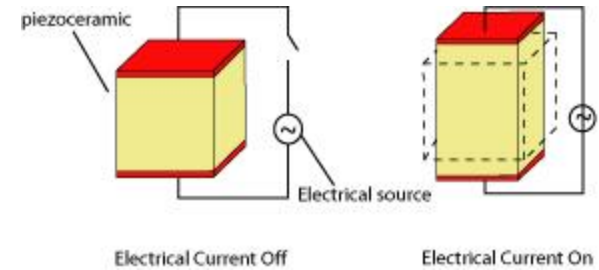


- Probe normally excited by voltage pulse of less than $10\mu\text{sec}$ duration
- Pulse consists of band of frequency with maximum amplitude at resonance frequency of the transducer

TRANSDUCER CONSTRUCTION

PROBE CONSISTS OF:

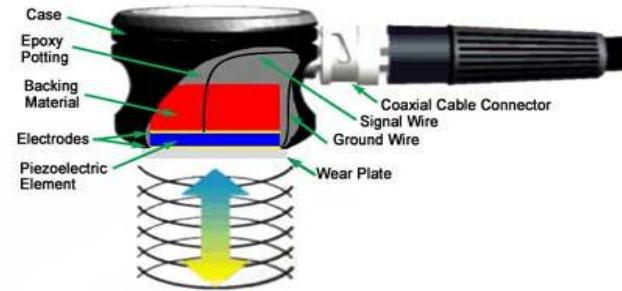
- PIEZOELECTRIC CRYSTAL
- BACKING MATERIAL
- CASE TO HOLD PROBE
- OFTEN INCORPORATE A WEAR PLATE TO PROTECT THE MATCHING LAYER AND ACTIVE ELEMENT FROM SCRATCH.



TRANSDUCER
CROSS
SECTION



Backing material



- Function
 - Holding firm the crystal in place
 - Damping the vibration thus avoid ringing-like shock absorber on automobile
 - Absorb sound propagated by the back side of the crystal, thus eliminate backward vibration
- Sensitivity: ability to obtain maximum response from a small discontinuity
- Resolution: ability to define closely associated small discontinuities