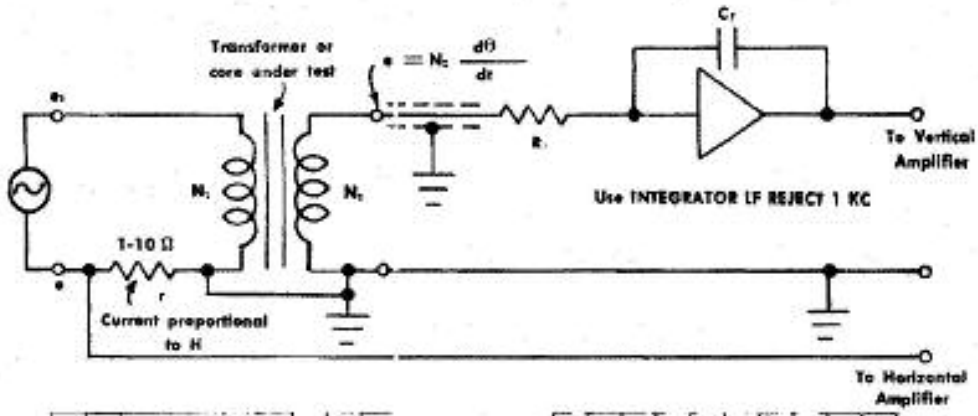
28. Displaying B-H Curves for Magnetic Materials

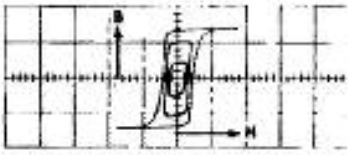
B-H curves for magnetic materials can be displayed using this circuit. A transformer is constructed using a core of the test material and the transformer is excited from the output of a variable autotransformer. The magnetic intensity H in the core is proportional to the current through the primary winding. The voltage across a current sampling resistor in the primary circuit is applied to the horizontal deflection system of the oscilloscope. Horizontal deflection on the oscilloscope is thus proportional to H.

The output voltage obtained from the secondary winding is proportional to the time rate of change of the flux. The transformer secondary voltage is applied to an integrator circuit which gives an output voltage proportional to the flux. The output of the integrator is applied to the preamplifier where it produces vertical deflection of the crt beam. Since the flux density B is equal to ϕ/A (where A is the cross sectional area of the core), the oscilloscope vertical deflection is also proportional to B.

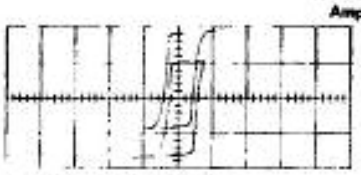
The end result of the signals applied to the horizontal and vertical deflection systems is to produce patterns similar to those indicated. Vertical deflection is proportional to B and horizontal deflection is proportional to H.

If it is desired to determine quantitative measurements of a transformer core from the oscilloscope display, the proportionality constants relating the horizontal and vertical deflections to H and B must be determined (see page 4-4).

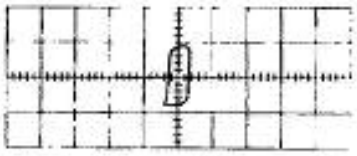




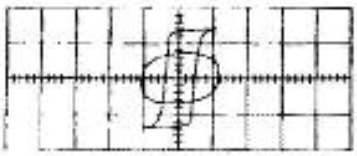
(a) Three levels of supply voltage to an inductor.



(c) Top: Normal B-H curve. Bottom: Small dc offset bias effect.



(b) Same inductor, indicating residual magnetism.



(d) Normal B-H curve compared with case of one shorted turn.