

The trick is to apply the voltage developed through a sampling resistor by the magnetising current to the scope's horizontal X channel. The sampling resistor should be calculated such that at the device-under-test's rated magnetising current, about 100 to 200mV pk-pk are dropped across the resistor. Likewise, the applied primary voltage is fed to the scope's vertical Y channel, Fig. 1.

#### The procedure

With the scope still in the volt-time format, adjust the variable transformer's output to match the device under test's maximum rated primary voltage, as read on the digital multimeter.

At this stage, adjust the scope's time base to obtain at least a full waveform cycle. Adjust the vertical gain controls such that the maximum waveform amplitude fits within the graticule. Now find the scope's mathematical functions and apply integration to channel Y. You should have now a display similar to what is shown in Fig. 2a). Now remove the Y trace leaving only the integration and horizontal traces.

The last step is to change the scope format to X-Y mode. You should now have a waveform like the one in Fig. 2b). The position controls may require fine adjustment to centre the hysteresis plot to the centre of the graticule. If the curve appears mirror-image, apply the invert function to the X channel.

Remove the known-good device and replace it with a suspect device. You'll be amazed at the amount of information that may be obtained with a simple inspection of the curve.

A few words of caution. Always use an *isolated* variable transformer. Always fuse your circuit. Before plugging or unplugging the device under test, set the variable transformer all the way to zero volts and ramp up the voltage slowly. Finally, ensure that all secondary windings are open and suitably insulated. ■

#### Reference

- Garcia, F. 'View a Transformer's Hysteresis Curve with an Ultra-Simple Circuit.' *Electronic Design*, December 1999, pp. 116-117.

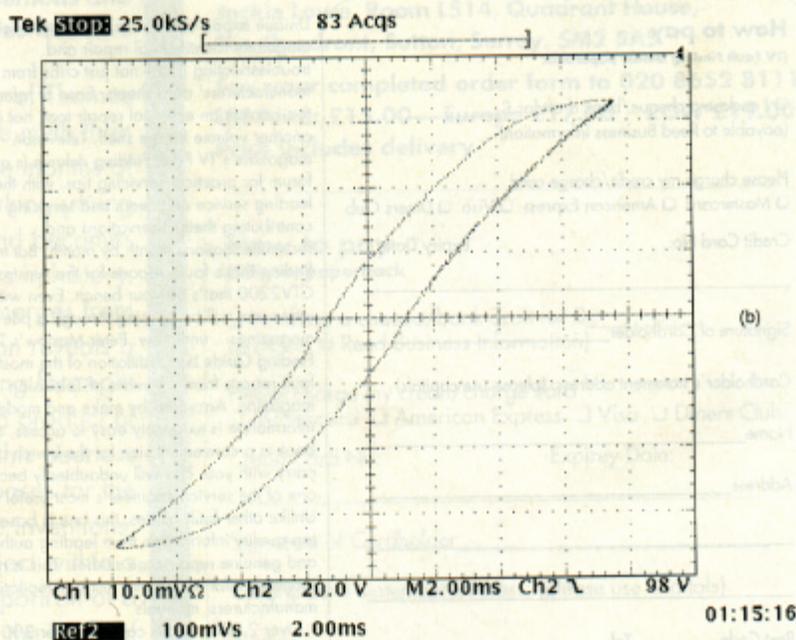
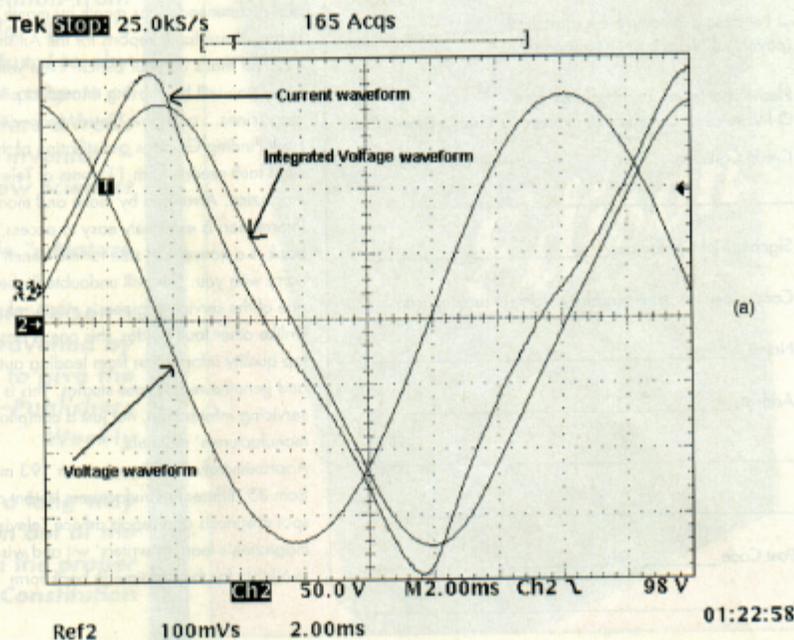


Fig. 2. In a) is an example of the type of display you should see after applying integration to the Y channel. Waveform 2b) should result after the last step of switching the scope to X-Y mode.