Measuring Aerial Current

by Colin Guy G4DDI

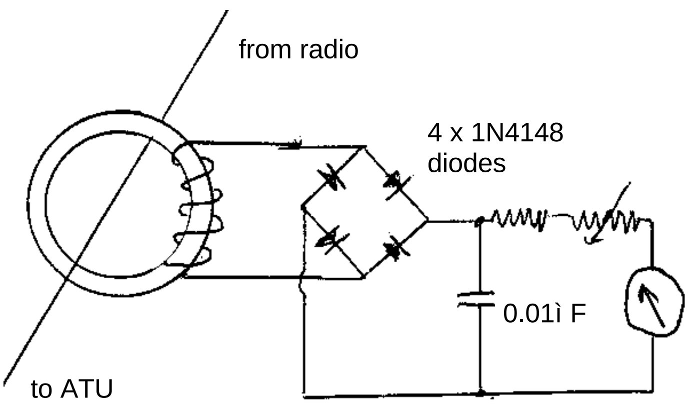
The most foolproof way of measuring the RF current in the aerial that I know of is to use the traditional thermocouple RF meter. In these, the RF to be measured passes through a low resistance heater, which is bonded to a thermocouple which produces a DC voltage which is then measured by a normal DC meter. These devices, however are easily burned out by even a slight overload, and whilst the break in the element can often be repaired, there comes a time when this is no longer possible. RF meters were once quite easily obtainable, and if I saw one at a rally for a pound or two, I would add it to my collection. However in recent years they seem to have become about as available as the proverbial hen's tooth, and when my last remaining meter finally measured its last, an alternative was needed.

Those of you who are familiar with the 19 set variometer will know that a different method of indicating aerial current is used in this and many other pieces of military kit, that of an RF current transformer and rectifier to feed a DC meter. The RF transformer consists of a toroidal core with a few turns of wire around it, feeding a bridge rectifier, the RF being fed along a single wire which passes through the centre of the toroid.

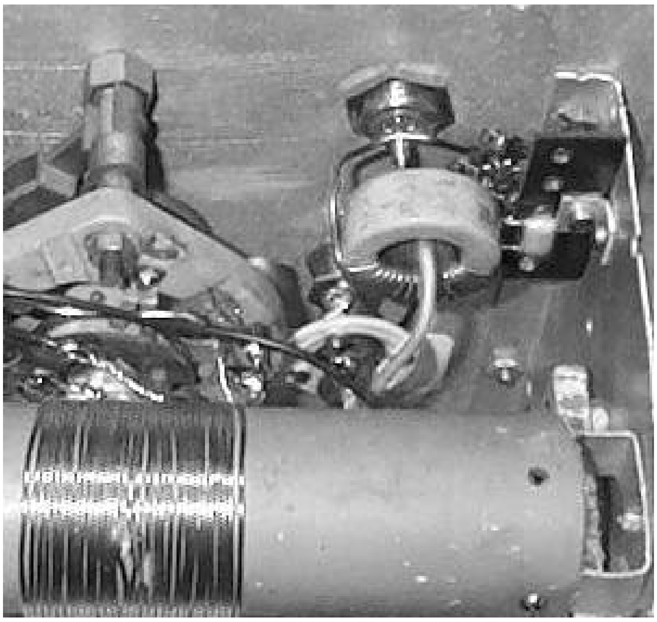
Some small toroids were soon found in my junk pile, in the form of mains input filters in scrap TV chassis. A bit of experimenting soon revealed that the type or size of toroid was not critical, and around eight to ten turns around it produced enough output to drive a robust 10mA meter from a 6 watt transmitter on Topband, using four 1N4148 diodes for the rectifier, a 0.01µF decoupling capacitor and a fixed and variable resistor to keep the meter on scale.

Some experimentation will be needed with the number of turns needed, and the values of resistors, as all depend on the toroid characteristics, the transmitter power and the meter used.

Also, there has always been some argument as to where the current is best measured, I have always placed the meter in the feed between the transmitter and the ATU, in the belief that, as this is a low impedance point, a more consistent reading will be obtained over a wide range of frequencies, whereas if it is measured at the base of the aerial, as it is in most military equipment, very different readings will be obtained on different bands, because of the different impedance of the aerial on each band.



In practice, however, it doesn't really matter as we are not really trying to measure an absolute value of aerial current, just using the meter as an indicator of maximum current. It's also worth pointing out that the readings will be far from linear, due to the characteristics of the diodes, but this doesn't matter, the original thermocouple meters were like that anyway.



This picture shows a current transformer incorporated into a 160/80m ATU. The toroid with the wire passing through it is clearly visible, as is the 0.01mF decoupling capacitor. The four diodes are mounted on the tag strip adjacent to the toroid.

In the unit shown, the fixed and variable resistors were each 5kΩ, and a 10mA meter was used. If a more sensitive meter and/or greater transmit power is used, fewer turns on the toroid and higher value resistors may be needed.

This method of indicating aerial current has the added advantage that it can be used as a remote indicator by passing the DC back through the feeder via a couple of RF chokes, just as it is in the 19 set.

Another source of small toroids that I have recently discovered is in scrap computer power supply units, which have suddenly become plentiful after the summer storms! Each unit contains three or four toroids, so it's worth asking at your local computer shop.