

# STATE- OF-THE-ART

## Two metre pre-amp

By TIMOTHY EDWARDS\*

This is an entirely new version of the 'High Performance 2 metre Pre-Amp', a well known and popular design by Timothy Edwards published early last year in another magazine. Nearly 1000 of the units are now in use and various comments from readers have been evaluated and incorporated into the Mk2 design.

It has become apparent that several 2m transceivers are more sensitive than originally thought and the fitting of the Mk1 Pre-Amp did not always produce the improvement expected. In most commercial equipment the limiting factor of sensitivity will be the aerial changeover relay loss, not the noise figure of this pre-amplifier. The inter-modulation performance of any receiver will, of course, be degraded if a pre-amp is fitted. However, if you don't live close to a taxi rank transmitter or similar then the improvement in sensitivity is well worthwhile. Cross-mod and inter-mod in the pre-amp itself is not very likely as the BF981 is very robust and in this circuit has a 1dB compression point of +10dBm (10mW).

The main problem with the original Mk1 design was the use of the NEC transistor 3SK88, the choice of this FET was mainly influenced by its excellent performance at 900MHz and by the assurance of the UK representatives that its performance at 145MHz was significantly better. Unfortunately after pressing NEC for a firm specification at 145MHz none was forthcoming. Indeed it appears that the noise figure bottoms out at around 500MHz and does not

continue to fall to 100MHz as originally anticipated. Although the original samples showed excellent noise figures at 145MHz this has not been the case with production samples. Just after the original article was printed the author became aware of a new device made by Philips, the BF981, distributed by Timestep Electronics Ltd., which has a noise figure of only 0.7dB at 200MHz when operated with a drain current of 5-10mA and gate 2 at 4-5 volts. This device seemed too good to be true but reference to the Philips Data Book confirmed that these figures were in fact guaranteed. Extended optimization tests with an Adret Synthesised Signal Generator resulted in an FM Sensitivity using a Trio 2300 of 0.07uV for 12dB SINAD. This is the best result ever achieved in the author's laboratory. It has since been confirmed by an independent laboratory.

As the original article had several misprints, in particular the capacitive taps on the input and output and the component layout and printed circuit board appeared to be upside down, a new PCB was designed which eliminates these errors and also allows the fitting of the BF981 which has slightly larger legs. As all of the values have

been changed to incorporate the BF981 it is not recommended that this device be fitted to the Mk1 Pre-Amp.

### CIRCUIT DESCRIPTION

The capacitive tap on the inductor L1 matches the 50ohm input to gate 1 of the MOSFET. The values of C1 and C2 were optimised with a noise figure test set. The gate 2 bias was derived to set the optimum current recommended for the BF981 by Philips. The capacitively tapped output network was adjusted to give 26dB gain which is 4dB more than the original. The gain on the Mk1 version was found to be lacking in some instances. The resistor R3 is fitted to stop spurious oscillations in the range of 1 to 2GHz.

### CONSTRUCTION

Mount all the components leaving the coils and cans until last, the coils will need the pips cutting off with a sharp knife or sidecutters so that they sit down on the PCB properly. Don't forget to solder the can legs of L1 and L2 and also the source leg of Q1 to both sides of the PCB. The pre-amplifier must be installed in the coaxial cable to the receiver. You must make sure that this is the