20dB. It requires just 0.01 to 0.02 pF of capacitive coupling for sustained oscillation. At the very close component spacings of modern equipment, some kind of static screen becomes essential. **Fig. 3** shows the usual format.

A single screen may provide sufficient electrostatic screening but do little to prevent magnetic coupling between the coils. This poses a real problem. While vertically mounted coils require the least space a single flat screen between the input and output coils does little to intercept the connecting magnetic flux. The only way to preclude all magnetic coupling is to enclose totally one set of coils — usually the input — in a screen can. For HF through to VHF, the same effect can be obtained by winding the resonant coils on toroidal cores. This way the flux is trapped totally within the core and cannot leak out to cause feedback problems.

The screen shown in **Fig. 3** may provide sufficient isolation although a better layout would have been to arrange L3 flat on the PCB groundplane so that its stray flux is at right angles to the input coils with the consequent reduction in stray coupling.

Pretty rather than functional

Excessive component lead or PCB track lengths can also cause problems. When a circuit oscillates around signal frequency even though the screening appears satisfactory, then you have either done something very silly like leaving off the gate 2 decoupling capacitor or, more likely, you have employed more artistry than common sense in the PCB layout. For instance, excessive track length or component lead length in the source circuit of the hypothetical example will turn what should be a nice, stable predictable design into a low stability Colpitts oscillator. **Fig. 4** indicates the feedback mechanism. Careless layout can also lead to other stability problems which are much more difficult to tackle.

UHF not VHF

3) "I've built the pre-amp and it appears to tune up OK although the supply current seems rather on the high side. It's a bit strange . . . the gain doesn't seem to be particularly high and it seems to affect the squelch control setting. Bringing my hand close to the pre-amp output lead seems to make the squelch open for no apparent reason. The amplifier doesn't appear to make the rig more sensitive either."

What you have in this case is almost certainly UHF instability. As a general point, the problem has become exacerbated in recent years paradoxically because semi-conductor devices have improved beyond measure. Most parts which are specified for HF or VHF service will show respectable gain right through to UHF. This is particularly true of dual gate MOSFETs and the RF type JFETs. Unless one of these devices is operating near its cutoff frequency, it will nearly always require some kind of parasitic suppression very much like the grid and anode stopper resistors of valve designs. The rule is that the source terminal should be taken to ground by the shortest, lowest inductance route while a ferrite bead on the gate 1 terminal, and possibly on the drain lead as well will preclude tendency to UHF oscillation. In addition, it is essential to decouple G2 with a low inductance capacitor. A small 1nF unit is often preferable to a physically larger 10nF part. Low value resistors — in the region of 100 ohms — placed in series with the gate 1 and drain leads cause no drop in performance at VHF and virtually ensure parasitic stability. See **Fig. 5**.

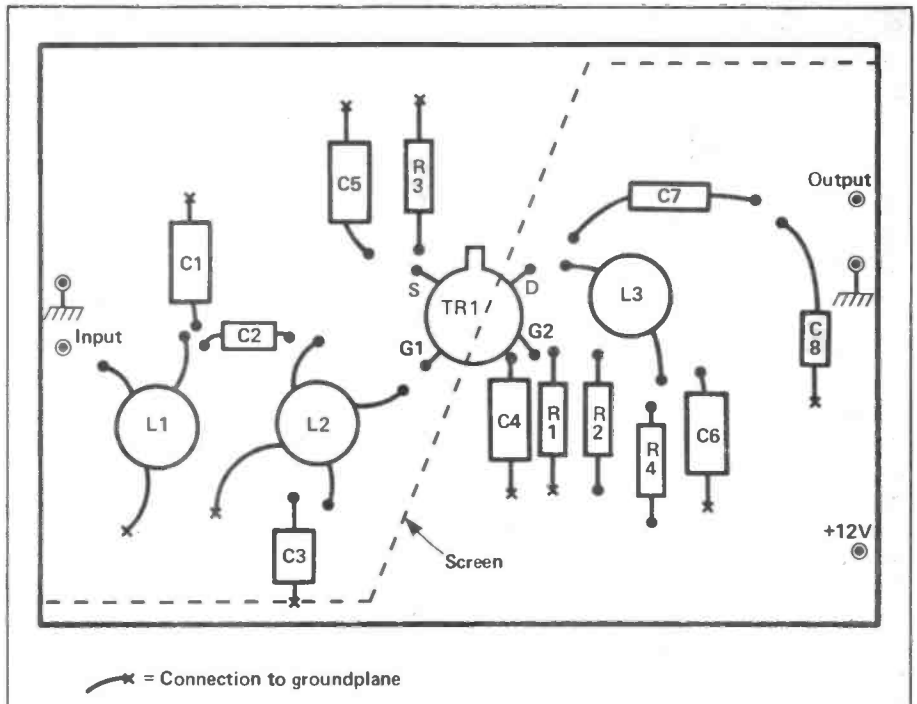

Fig. 3. Typical layout of VHF dual-gate MOSFET preamp

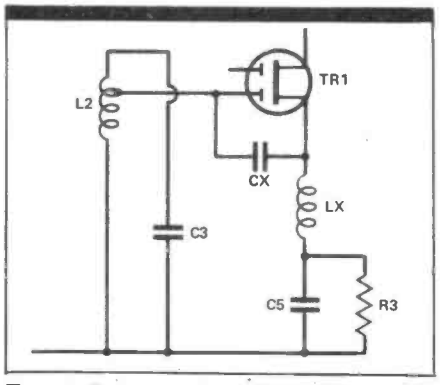

Fig. 4. Pretty rather than functional layouts can lead to excessive stray inductance and . . . oscillation

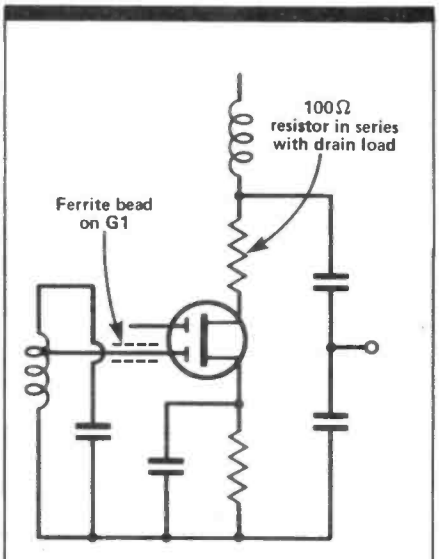

Fig. 5. Parasitic stoppers