

## Clansman VRC 321 VOGAD modification

The Clansman 321 is sometimes quoted as having poor performance on AM. This is due to its AM modulation depth of just 65% modulation. When the 321 was in its requirements gathering tendering and procurement days in the 1960's.

Initial design studies leading to the development of the Clansman system began in the mid 1960's. The objective was to produce a range of interoperable radios to replace the British Army range of radio's known as Larkspur, existing at that time. User trials of prototype systems started in 1970 and continued until 1972. Following evaluation of the trial results, the individual radio's which make up the Clansman range began to enter production in 1976 - 1979. The equipment was seen entering extensive service by 1980. Clansman was used by both combatants during the Falklands conflict and was also used by both sides during the Iran/Iraq war. Development and production funding amounted to £500 million by the end of 1985. At this point procurement funding was split equally between domestic and export orders.

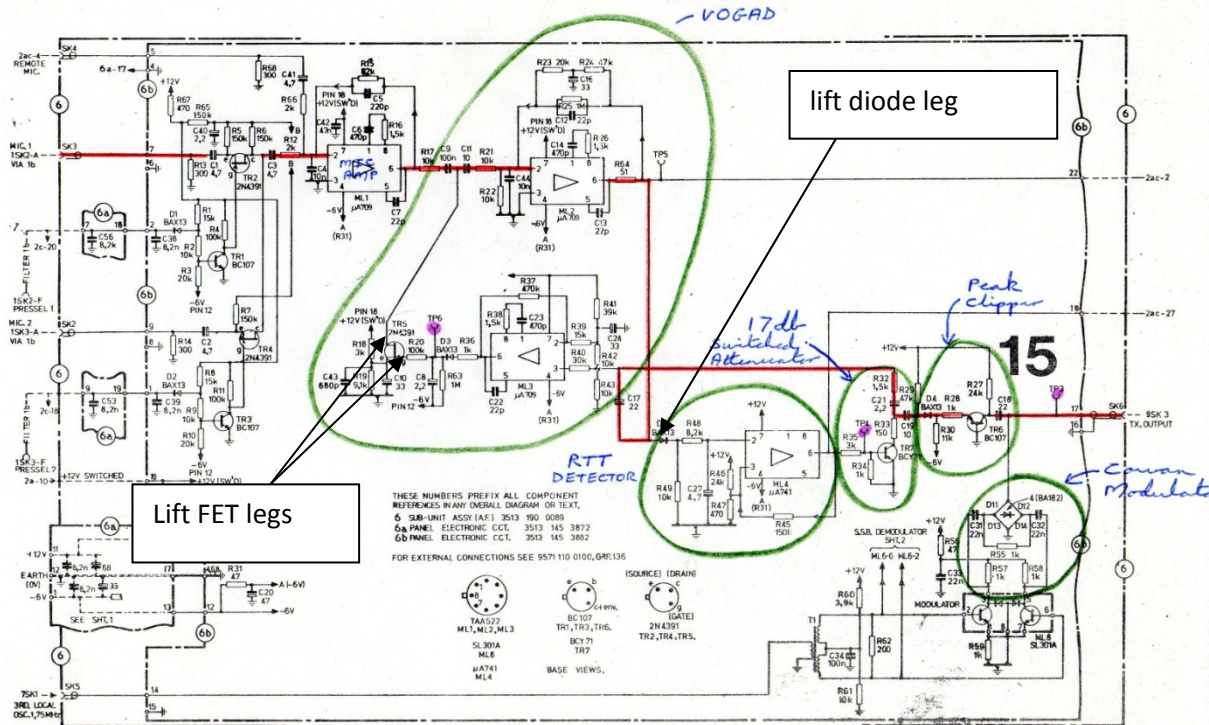
For the Clansman 321 its basic MOD interoperable requirements for AM were just for backwards compatibility with Larkspur sets that could only offer AM rather than SSB. SSB (USB only) being the preferred method of (Combat Net Radio (CNR))voice communication for the British Army at that time going forward. So as you can imagine, the focus was on SSB and AM was considered to be phasing out.

Whilst the SSB modulation design for the 321 is of an acceptable standard using 4 diodes in a double bridge ring modulator array (albeit the choice of diode has been commented upon), the method of obtaining AM is most unusual and almost an afterthought. AM is accomplished by unbalancing the double bridge ring by feeding a small DC voltage from the AM switch into one of the 4 diodes. This has the effect of the unbalanced bridge ring modulator producing both sidebands and carrier from it.

For SSB a Voice Operated Gated Analogue Device (VOGAD) is used to limit the speech feeding the double bridge ring modulator as a form of AGC, so as not to over modulate the transmitter. This is also in circuit for the AM mode, so limiting AM to just 65%. Since we are not operating in tanks and armoured vehicles with our equipment anymore, it was thought that if we remove the VOGAD operation, we should be able to increase the AM modulation and hopefully also on SSB we will not produce over deviation too. Field experiments have proved fruitful and with the VOGAD removed, we can produce up to 95% AM and SSB modulation is still maintained without over deviating producing spurious. Should we be running these in tanks or with high background noise, in operating conditions under high stress, this would be a different result.

Another interesting area in the modulation area is a RTTY detector, which on detection of a tone for a short period of time, the modulation will be attenuated. Since it is possible to activate this with the human voice, this too could be removed with no ill effects to the set.

# The 321 TX modulator Circuit



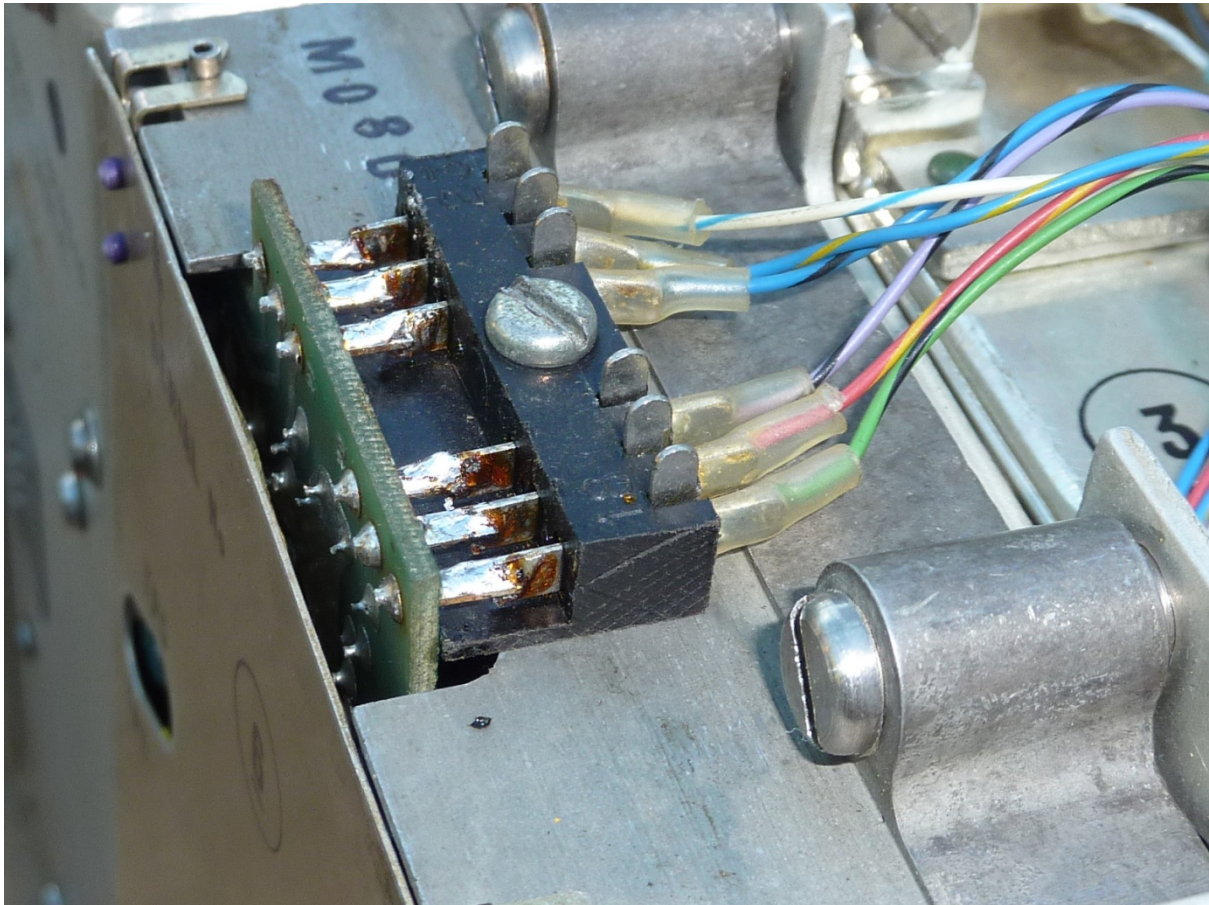
The PCB of the above circuit is easily accessible. It is part of unit 6 of the 321 and is seen on the front left hand side of the equipment, having removed the front case.



Remove the unit 6 cover, which is just clipped in place:

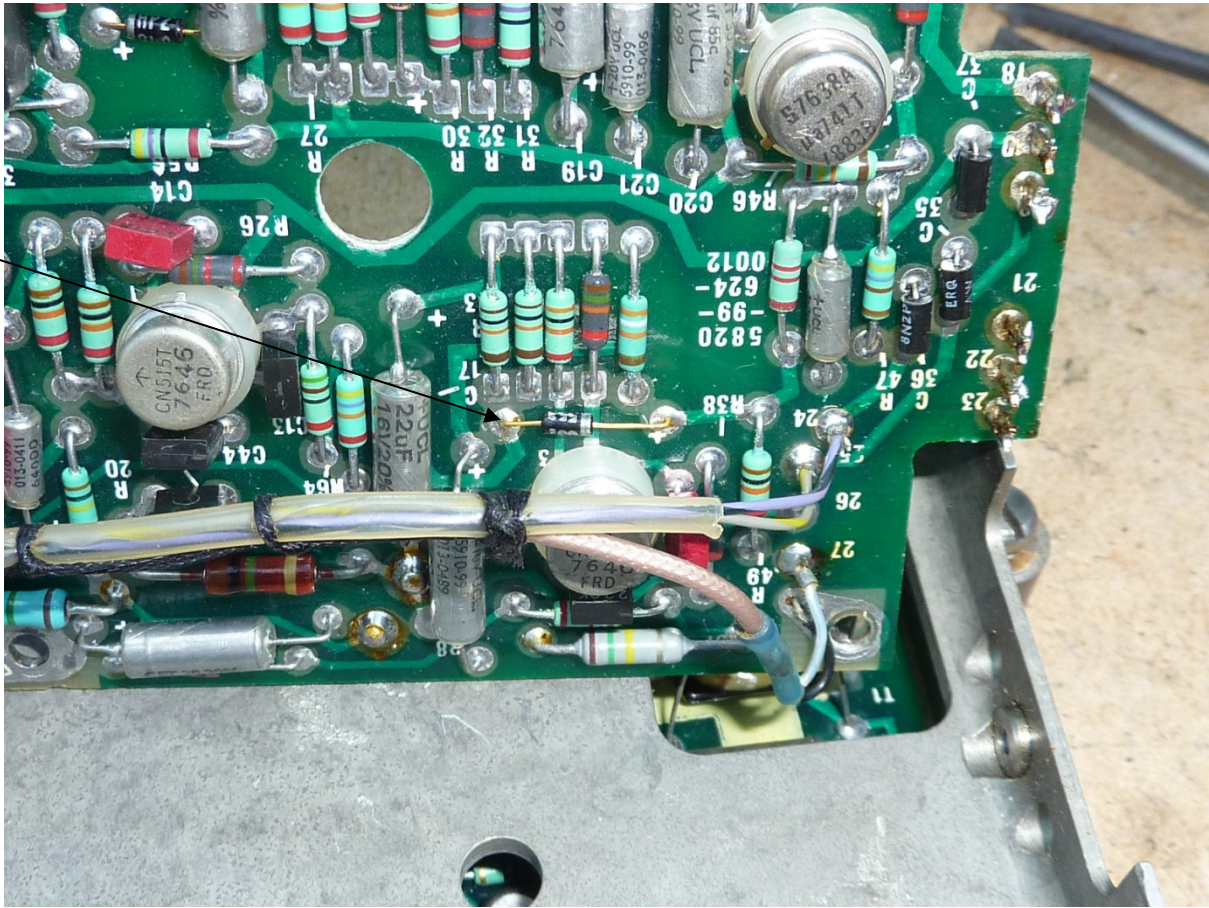


Desolder these joints only which carry AF (This is just for ease of manipulating the board). 321 joints are unusual in that you heat them up and with screwdriver at the same time, slide them back to disengage the joint, so freeing the module

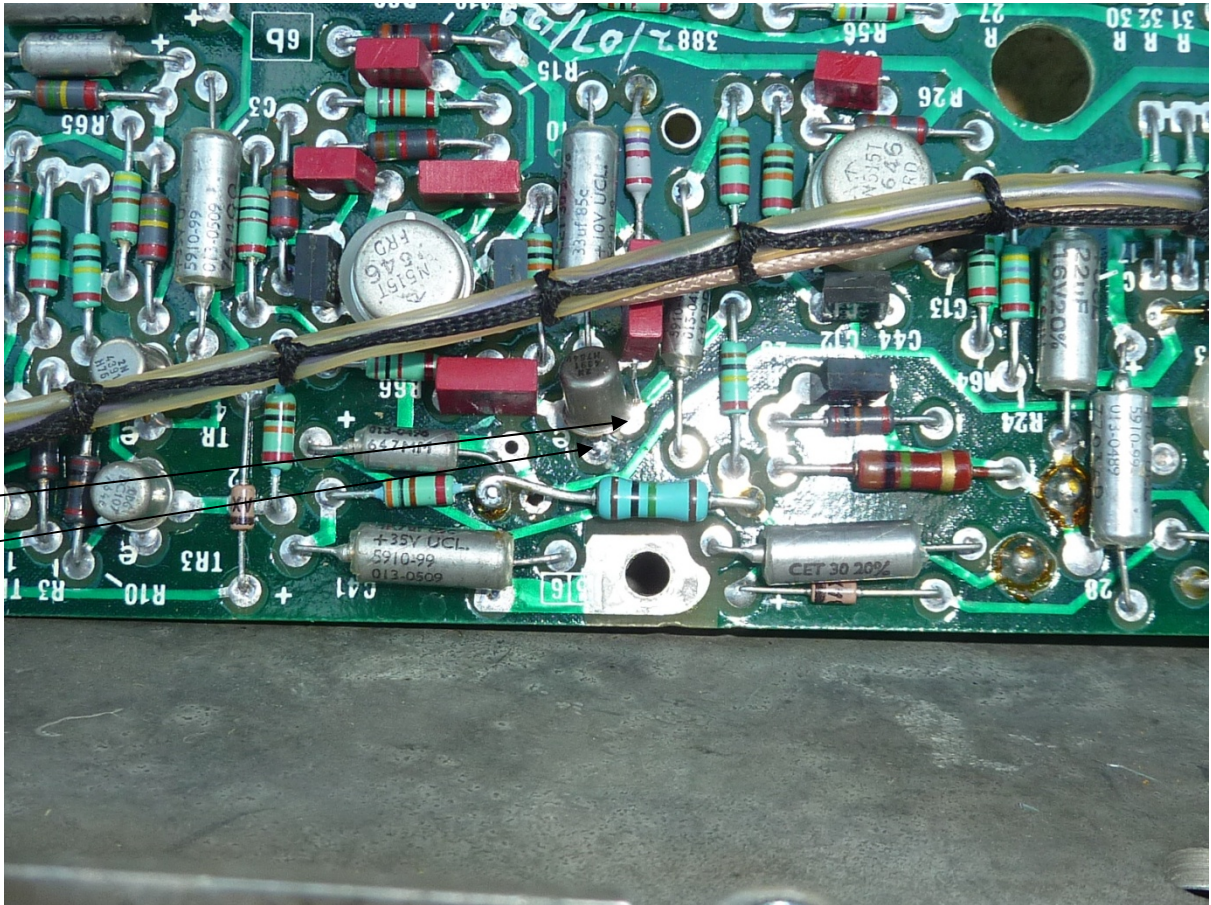


Remove the SMA plugs on unit 6, noting colours on cables equate to the socket numbers. Then unscrew the unit 6 PCB board and flip it over carefully

Desolder and lift the RTTY detector diode leg:



Desolder and lift the FET legs:



Put everything back together in reverse order and you should have 95% AM modulation.