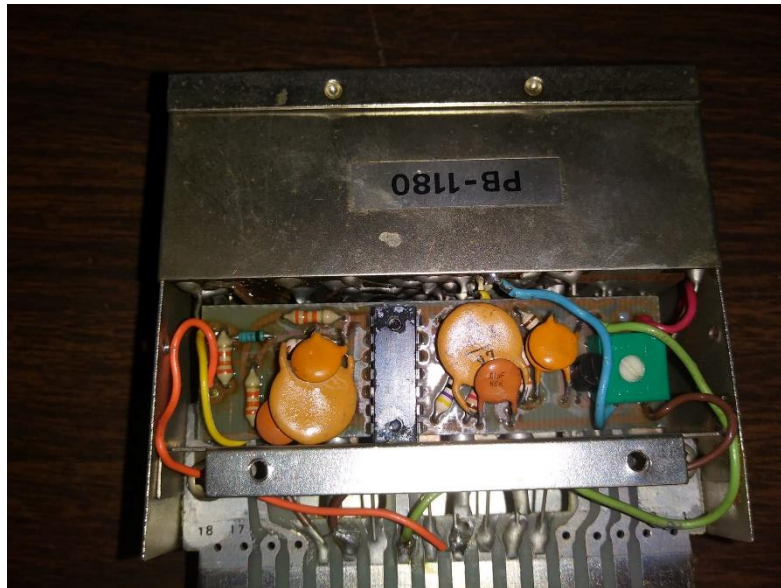


Unofficial Mixer Mods on the FT-101

Peter Roberts, G4DJB

Recently Paul Harold found an unexpected 'extra' tucked away inside the PB1180 High Frequency IF Unit in a 101 he was working on. This is a photo that Paul posted of his PB1180.

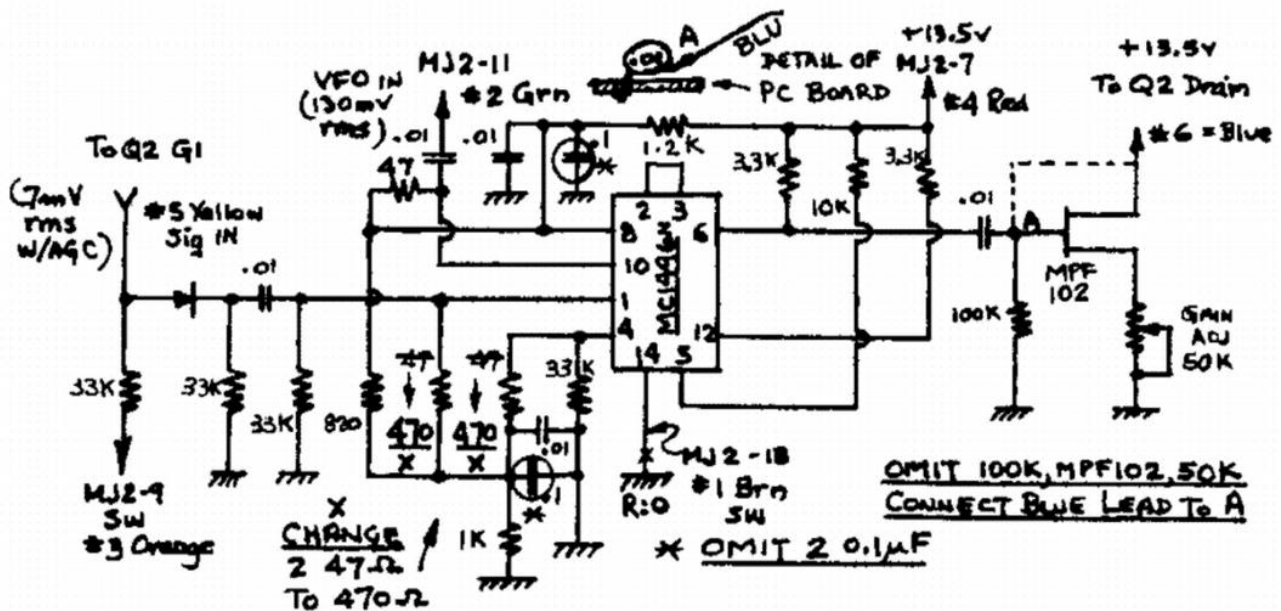


This appears to be a modification dating back to the 1970's and was designed to improve the relatively poor large-signal handling characteristics of the early models of the FT-101. The IC is a double balanced mixer (in this case a LM1496) and is wired to replace the 3SK39/3SK40 FET used as the Rx 2nd mixer.

The reason for needing the mod is that the early model FT-101 did perform poorly when numerous large signals were present. In the 1970's there were many high-power shortwave broadcast stations transmitting from 7.1 MHz upwards and operating 40m in the evenings (especially in Europe) was problematic. The receiver was filled with spurious signals and wideband noise that the 101's front end (PB1077/PB1181) and the PB1084/PB1180 mixer generated from these broadcast signals. Switching in the attenuator did help reduce these unwanted signals, but also lost the weaker wanted signals.

If you have a copy of the Fox Tango Newsletters then there are many reports of this problem in 1972 and 1973 and people searched for a cure. One Australian amateur, Don Millar VK5PX, identified the main culprit as the 2nd Rx mixer in the PB1084/PB1180 High Frequency IF Unit and formulated a cure in the form of replacing this mixer with a double balanced mixer, the MC1596. He created a sugar-cube sized encapsulated unit (dubbed the VK 'blob') which was wired into the PB1084/PB1180 module. The newsletters also indicate the problems associated with purchasing the VK 'blob' from Australia, especially for hams in the USA. For this reason, the Fox Tango Club started to manufacture their own version on a pcb, which is what I believe Paul has inside his PB1180. It was also stated that the VK 'blob' could also be used to replace the 1st Rx mixer stage on the HF unit PB1077/PB1081 to give some extra performance lift.

The following is the schematic of the Fox Tango board:



This schematic was taken from the [LU8RQ website](http://www.lu8rq.com) .

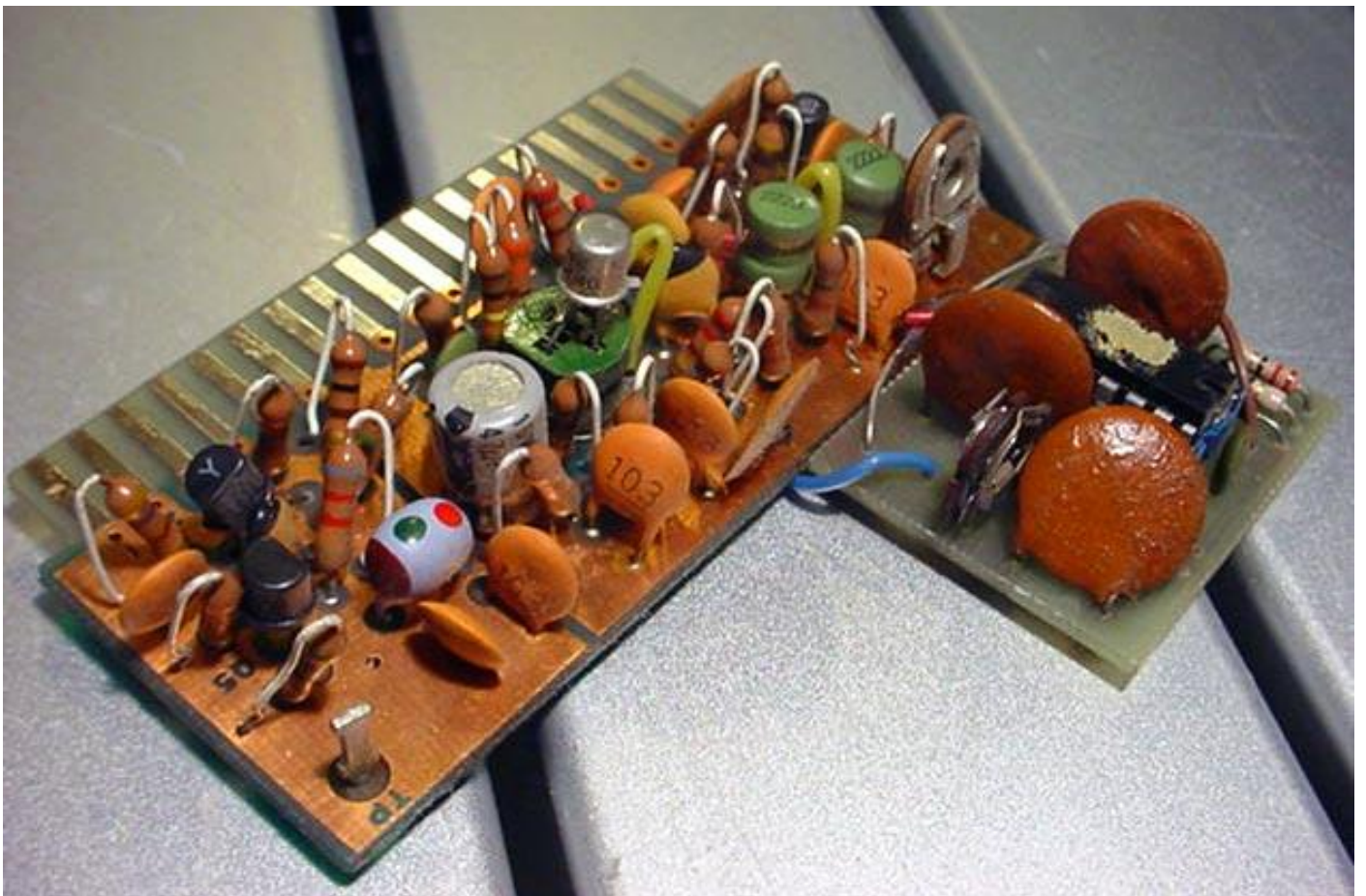
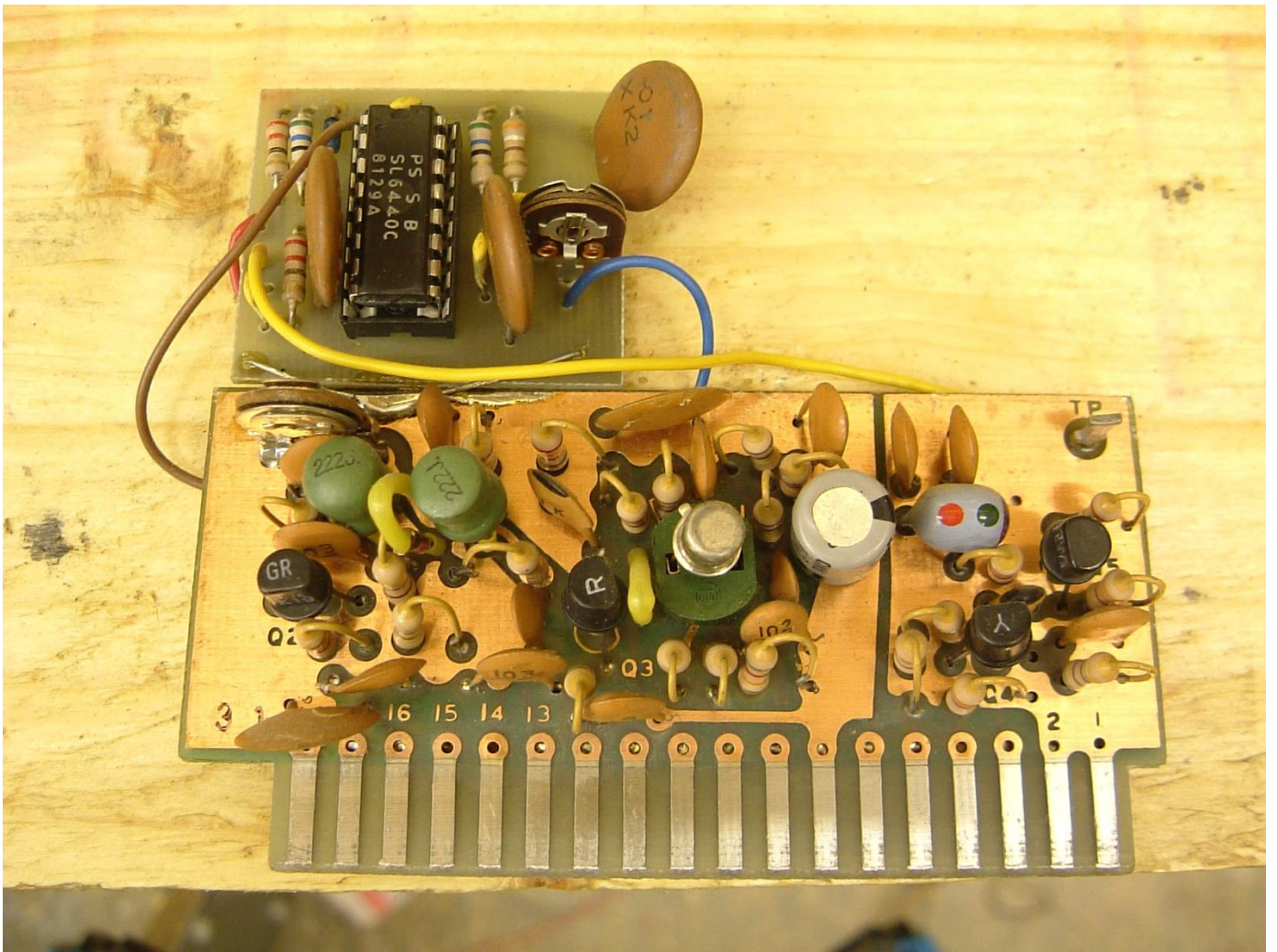
Note that the VK 'blob' was never intended to increase Rx gain, just to improve strong signal handling. The mod also tended to reduce noise generated within the receiver.

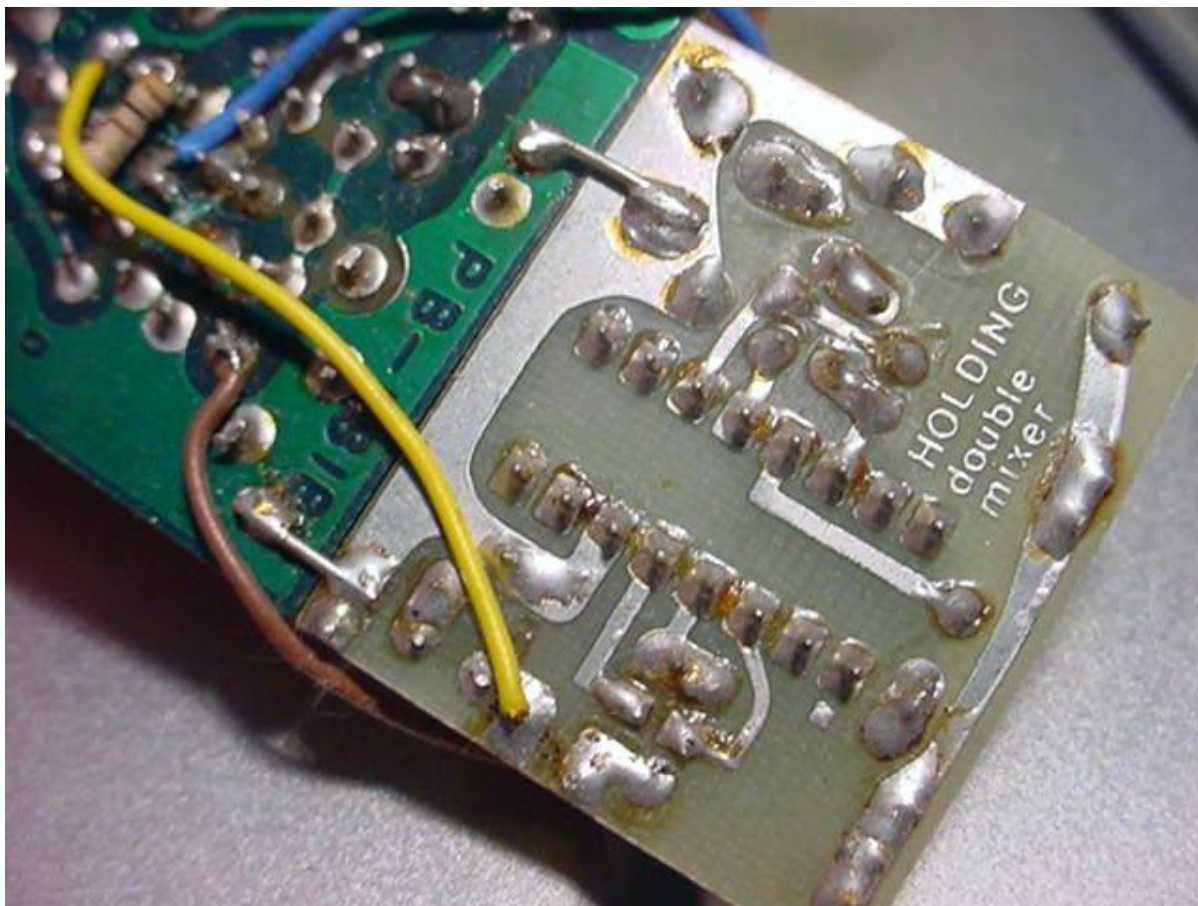
The Yaesu factory said that they were unable to incorporate this modification as the MC1596 (and its lesser spec alternative, MC1496) were not readily available in Japan. They did, however, bring out an upgrade kit for owners of the early FT-101 that included newer versions of the HF unit (PB1181 to replace PB1077) and the HF IF Unit (PB1180 to replace PB1084) that improved performance significantly.

Meanwhile, in the UK, Harry Leeming, G3LLL, worked on his own version of the double balanced mixer modification and his version used a Plessey SL6440 which had better specification than the 1496/1596 devices but was more expensive. He noted that the Fox Tango board made a considerable improvement on the Mk1 FT-101 with a noticeable but less dramatic enhancement in later models. His experiments with the Plessey SL6440 device gave disappointing results when used with the 2nd mixer (PB1180) but had better results when replacing the first mixer (PB1077/PB1181). He said that this noticeably improved the receiver of FT-101s from the Mk2 onwards and dramatically improved the Mk1. He notes that when installing such a circuit in the 1st mixer replacing the 2nd mixer does not seem to make much further improvement.

The following photos show the G3LLL double balanced mixer using the SL6440 installed on the HF board, PB1181, and also a (very rough) schematic of the board and how it is wired into the PB1181.

So, there you have it. This mod was intended for the early FT-101 models and did make an improvement. However, people found that results did vary so if you do try this mod it may or may not make a noticeable improvement. Yaesu did continue to develop the FT-101 circuitry and so large-signal handling was less of a problem on later models without having to do this mod.





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The unit that was made in Australia was originally labelled 'the blob' as that is what it looked like.

Ours used an SL6440 made by Plessey and was on a small PCB that mounted on the top edge of the RF board but if you could find an I/C ? you could easily make one. They were used in quite a few top end military receivers, so someone must have them in as spares.

Try putting the SL6440 into a search engine and see what happens. 73's Harry.

Taking apart



the FT101

Cross modulation

Prior to the crystal filter most stages in the receiver have to handle all the unwanted signals for a few hundred kilohertz either side of the wanted station. Consider the 40 metre band after dark. Hundreds of powerful stations in some cases running Megawatts, are operating inside and just outside the amateur band, and if a great deal of amplification is used, these signals will completely overload the front end of the receiver and cross modulate with each other producing a steady background mush. Reducing the amount of amplification or switching in an attenuator will reduce the overload but then the weaker amateur signals will tend to become lost in receiver noise. Over the years Yaesu have altered component values and played with stage gain to try and strike the best possible compromise, and from the FT101 Mk2 onwards results — whilst not perfect — have been reasonable.

Part 3

Improvements and modifications By Harry Leeming G3LLL

Some unofficial mods

The original FT101 Mark 1 was pretty bad for cross modulation, and in desperation many owners fitted the 'VK blob'. This was a double balanced mixer made with miniature components and encapsulated in a blob of resin about the size of a sugar cube. If you purchase a second hand FT101 Mark 1 look for this item squeezed inside the second mixer module PB1080. The blob is no longer made but a similar circuit on a small printed circuit board is available from the FT-Club in America. Fitting these units to the FT101 Mark 1 results in a considerable improvement, with a noticeable but less dramatic enhancement in later models.

A couple of years ago Plessey introduced a high signal level double balanced mixer integrated circuit and I decided to have a go at using this. The results obtained by fitting it in the second mixer, VK blob style, were disappointing; but after some experimenting a small circuit board was made up fitting in place of the first mixer. This noticeably improved the receiver of FT101s from the Mark 2 onwards, and dramatically improved the Mark 1. It was decided to market this unit and it is now available commercially, and takes about ten minutes to wire to an FT101. When this double balanced first mixer is installed, using a double balanced mixer in the second stage does not seem to make much further improvement.

AGC system

Fig. 1 shows how the automatic gain control voltage is applied to the gate of Q1 in the RF unit. For maximum gain Q1 has about four volts on its gate when no signal is being