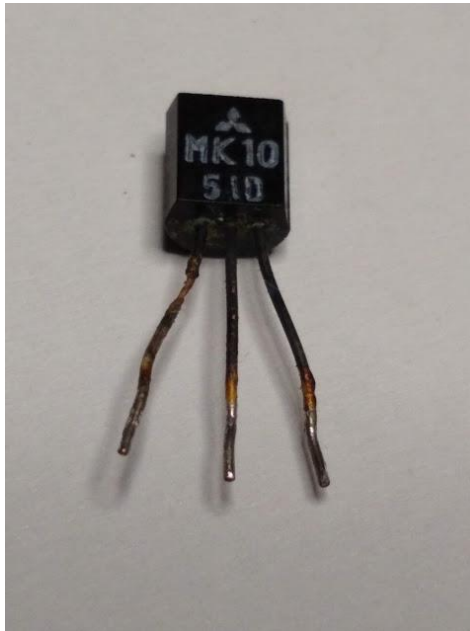


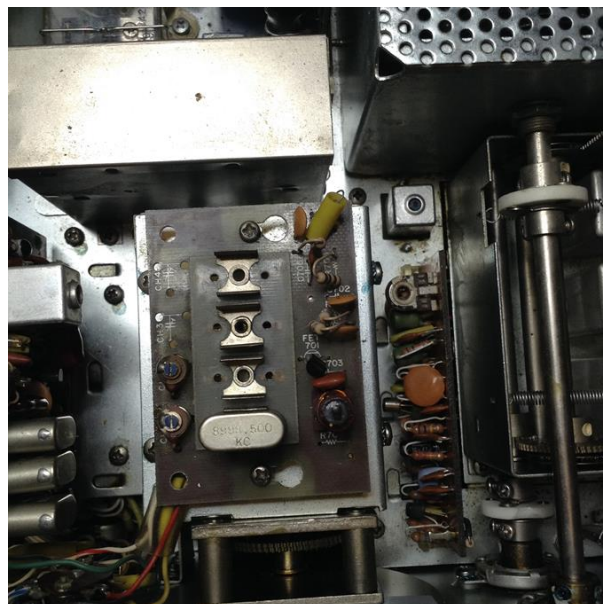
MK-10 FET REPLACEMENT IN EARLY FT101/FT101B/FT277/FT277B



In an earlier post (<https://www.facebook.com/groups/759974814527577/permalink/995640837627639>) I highlighted a problem whereby the MK-10 FETs used by Yaesu had an in-built failure mechanism which means they will degrade and eventually fail and should be replaced.

This problem affects the FT101/FT277 (no suffix) and early models of the FT101B/FT277B that use the MK10 FET on various boards.

To see if your radio is affected, lift up the radio's top cover and check the Fix board (mounted on top of the VFO). It only has one transistor fitted and if it is a MK-10 (with blackened leads) then you should consider changing all of the affected boards. See list further down.



I noticed a problem when trying to align my set. Initially power started to drop and then fluctuate, and also with the meter set to ALC going to Tx caused the needle to hit the end stop. Sometimes it would return to the proper position after a few seconds and sometimes it would stay pegged against the meter end stop. After tracing through the ALC circuitry the problem was a faulty Q1 on the mod/osc board (no processor in this radio). I initially replaced it with a W300B (= J300B) FET from the junk box and all returned to normal.

Looking online suggests that the MK series FETs are prone to failure due to an inherent design fault. These devices use silver plated wires for the component leads and after time oxidation sets in and silver migration also takes place within the device encapsulation. This causes the device to eventually fail. On the device in the photo the component leads are black, not due to paint or some other coating, but because the silver has oxidised over the years. See this page on the web - <https://ja9ttt.blogspot.com/2013/05/failure-of-mk-10-j-fet.html>

Looking in the parts list for the early 101 there are five of these devices (MK-10D, MK-10E, MK-10F) throughout the radio. So far, I've only had this one failure but I have now replaced all of these FETs.

The D/E/F suffix on the part number identifies a particular parameter that these devices were selected for. They are all made the same, but when tested are grouped and marked according to the measured parameter. In this case the suffix identifies the IDSS banding that the device falls in to. For the MK-10D IDSS=1 to 6mA, MK-10E IDSS=5 to 12 mA, and for MK-10F IDSS=10 to 20mA.

As for replacements for the MK-10D/E/F, Yaesu replaced these in later radios with the 2SK19Y and 2SK19GR, which are now obsolete types, but also have a different pinout. It is also interesting to note that on later radios the schematics and parts list still show the 2SK19GR but Yaesu did actually fit the JF1033B (also now obsolete) in some places (e.g. Q1 on the Low IF board)

A search of modern (available) FETs with the same pinout as the MK-10 and grouped into similar IDSS ranges was not successful. The closest I found was the BF256 series which has a different pinout but similar IDSS groupings. So suggested replacements are:

For MK-10D use the BF256A

For MK-10E and MK-10F use the BF256B.

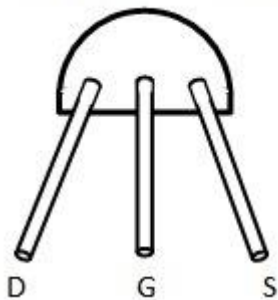
I eventually replaced all MK-10 devices in my FT277 with the BF256A and BF256B, except for Q5 on the AF board where I tried a 2N3819 with its IDSS in the correct band. That seemed to work so I left it in place.

MK10
FETS

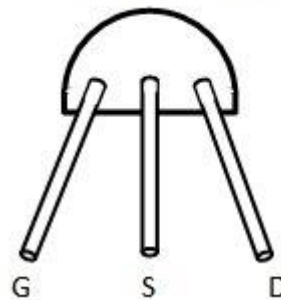
Location		Fitted Part	Suggested Replacement
PB1080A	Q1	MK-10F	BF256B
IF UNIT			
PB1081C			
AUDIO Board	Q1	MK-10F	BF256B
	Q5	MK-10D	BF256A
PB-1078A		Q1	MK-10D
Mod/Osc			
PB1060A		Q1	MK-10E or F
Fix Unit			

The BF256 pinouts are different to the MK-10 as shown in the attached diagrams.

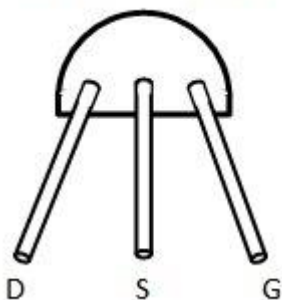
MK-10D,E,F Pin View



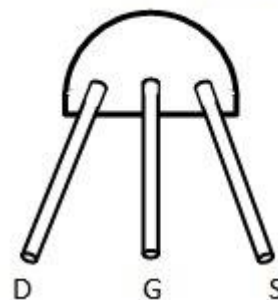
2SK19Y,GR Pin View



BF256A,B Pin View



2N3819 Pin View



As I mentioned, another alternative would be the 2N3819 (also obsolete, but still available in places, and are pin for pin compatible with the MK-10), but these are not grouped into

IDSS bands and you would manually have to test and select devices depending on the measured values of IDSS. You might need a number of devices to get the right values.

So, if replacing these MK-10 FETs with alternatives such as the BF256 just be aware of the different pinout and insulate/sleeve the legs as appropriate to fit on to the board. The photo shows the BF256B mounted on the Fix board with leads adjusted as necessary.



Selecting FETs – If you want to use FETs such as 2N3819 you should select them based on IDSS as previously mentioned. This can be simply done even if you do not have a transistor tester. You just need a 9V battery and a multimeter – see <https://stompville.co.uk/?p=112> for how to do this using the circuit below.

