

Notes and Curiosities on Some WJ-8718/MFPs Partially Made in China

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Introduction

Some years ago, after having read the Terry O's *Premium-Rx* document of Sept. 16, 2010 concerning a 1989 sale of WJ-8718 radios to the Chinese government [1] and having seen also the picture in which Mr. Bob Glaz of Watkins-Johnson was shown while repairing the PCB of a WJ-8718A/MFP receiver in the conference room of a hotel in Beijing, China [2] (I don't think he was replacing Tantalum capacitors indeed, we'll talk about it later), I was quite surprised and intrigued. In more recent times some eBay advertisements concerned a few WJ-8718/MFPs offered for sale just from China, named *WJ-5JK* and *TYPE 8718/MFP* on their front tags and provided with strange front panels appeared, so I decided to further investigate on them and I wrote a short *Facebook* post that appeared in the *BlackRadios* Group [3] At that time one of those "*WJ-5JK*" radios was purchased by my German friend Heinz Breuer DH2FA, KM5VT [4] and he kindly sent me some pictures, in Figure 1 you can see the comparison between the stock WJ-8718A/MFP and its "Chinese" counterpart



Figure 1: A stock WJ-8718A/MFP superimposed to its "Chinese" WJ-5JK version.

Apart from the green-colored 7-segment LED displays, the first thing that catches the eye is the difference in size and position (and also in the color used for the numeric keypad buttons) of the front keys of the two receivers.

Figures 2 to 5 show a somewhat restored, a non-restored front tag and another **WJ-5JK** unit.



Figure 2: A somewhat restored WJ-5JK front tag.



Figures 3 and 4: Two non-restored examples of WJ-5JK Front Tags



Figure 5: Another WJ-5JK unit.

Before considering the “Chinese” MFP front panel in more details, it’s interesting to give a closer look at the inner of the radio and at its rear panel. The Figures 6 and 7 show the inner of the WJ-5JK chassis, and from them it seems that there are no differences at all from the stock WJ-8718 chassis; everything seems to be original and made in the U.S.A.

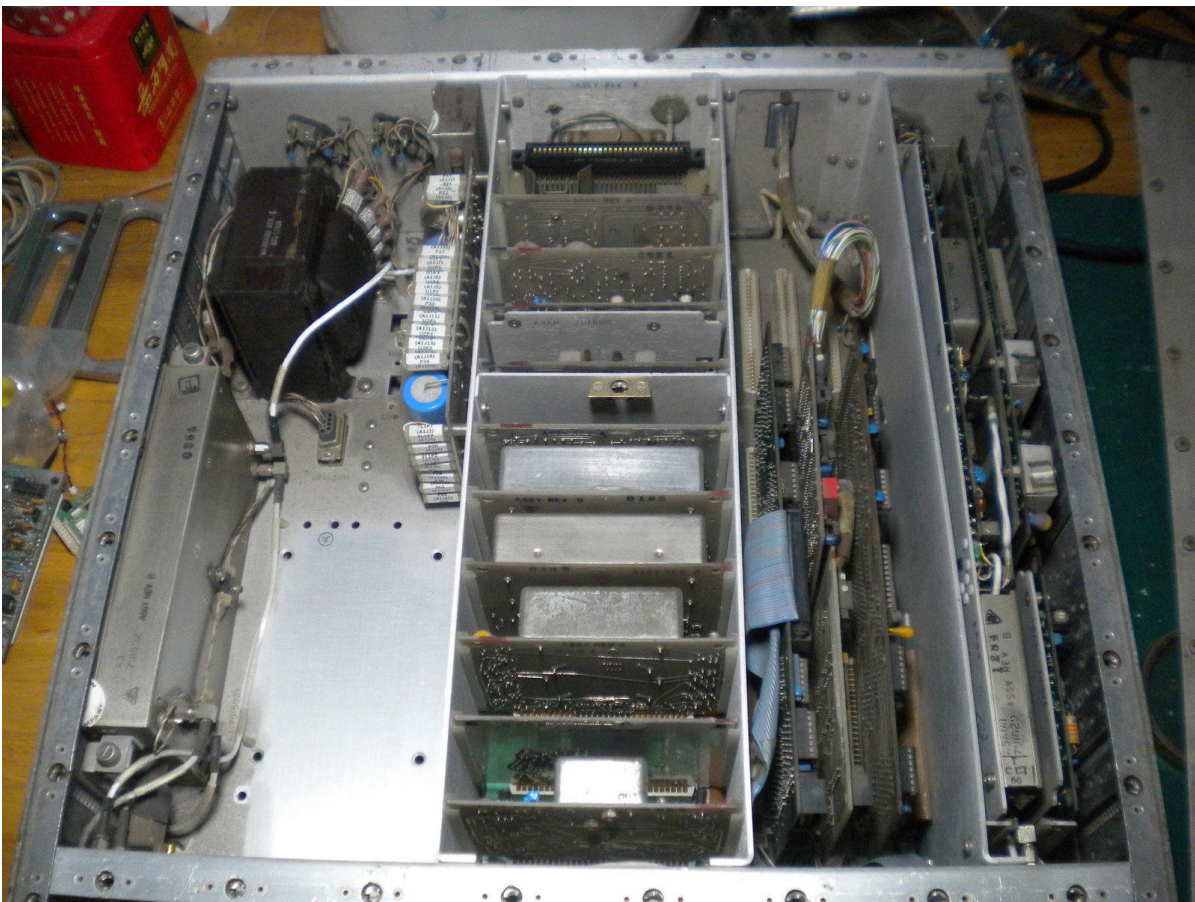


Figure 6: Inner of the WJ-5JK chassis (please note that the *Preselector* unit is not present).

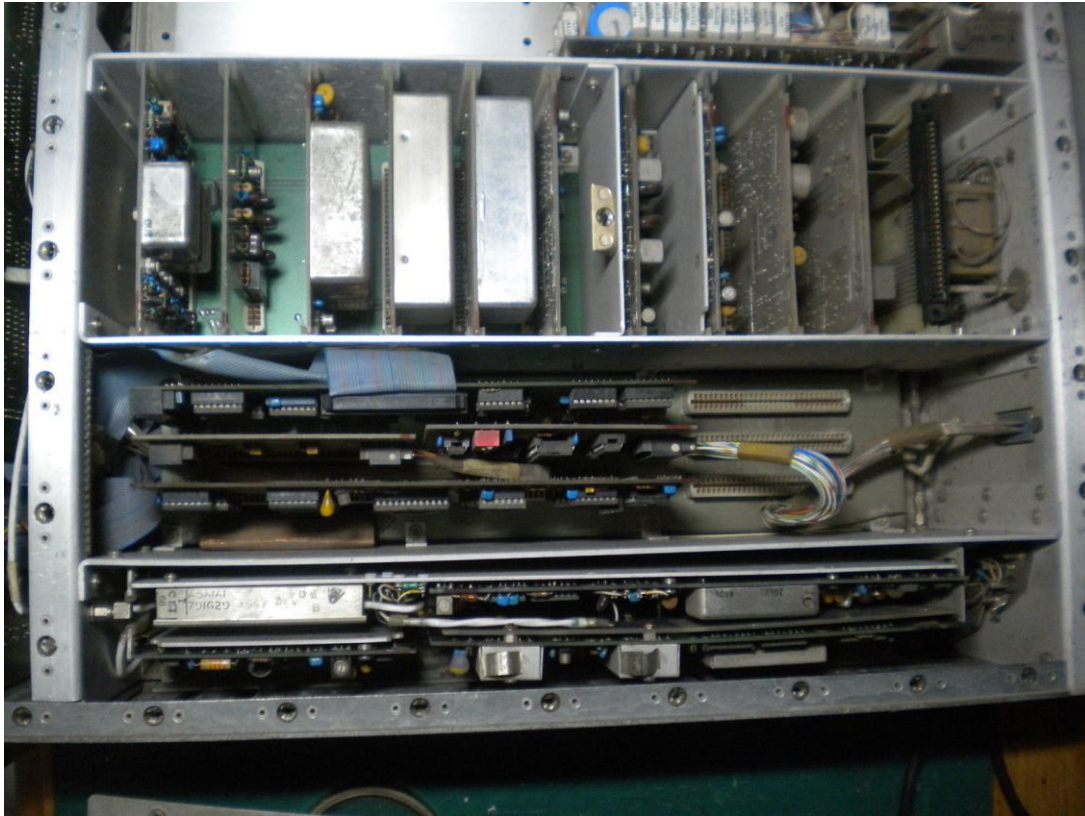


Figure 7: Details of the A4 (*IF section*), A6 (*I/O section*) and A5 (*Synthesizer section*) of a WJ-5JK radio. Please notice that all the “A4” cards (including the optional ISB 791598-1) are present, as also are the 796002 PRE-A2 *Preselector Decode* card, the 796075 *GPIB-IEEE488-A3 I/O Interface* card (in the mid row of the A6 Motherboard), the 794308-2 *MFP-A3 IF Interface* card and the 794275-X *MFP-A4 Synthesizer Interface/Memory* card in the 1st and 3rd A6 row. Also the A5 Synthesizer section seems to be original and complete.



Figure 8: The rear panel of a WJ-5JK receiver is identical to the stock WJ-8718A/MFP one and seems to have been Factory built in the U.S.A.

Luckily I have a dear Chinese friend who lives in Shanghai and who collects WJ-8718 receivers, also having some information and a lot of spare parts available [5], so I wrote and asked him to send me a complete MFP front panel of a WJ-5JK receiver ASAP, and I in about one month I had it on my workbench, look at Figure 9.



Figure 9: The WJ-5JK MFP front panel as received from my Chinese friend. (the two little beige pot knobs are temporary replacements, I already have the larger black knobs at hand and I'll replace them ASAP).

The first observations about that front panel confirmed the impressions I had from looking at the previous WJ-5JKs shots (that I had saved into a folder of my PC). Apart from the physical differences among the key sizes, colors and location, it is evident that the “Chinese” MFP front panel was built with less accuracy compared to the original unit; please give a look at the *S-Meter* cutout (very imprecise especially on its right side) and at the *Phone Level* and *RF Gain* potentiometer shaft holes etc., Figure 10.

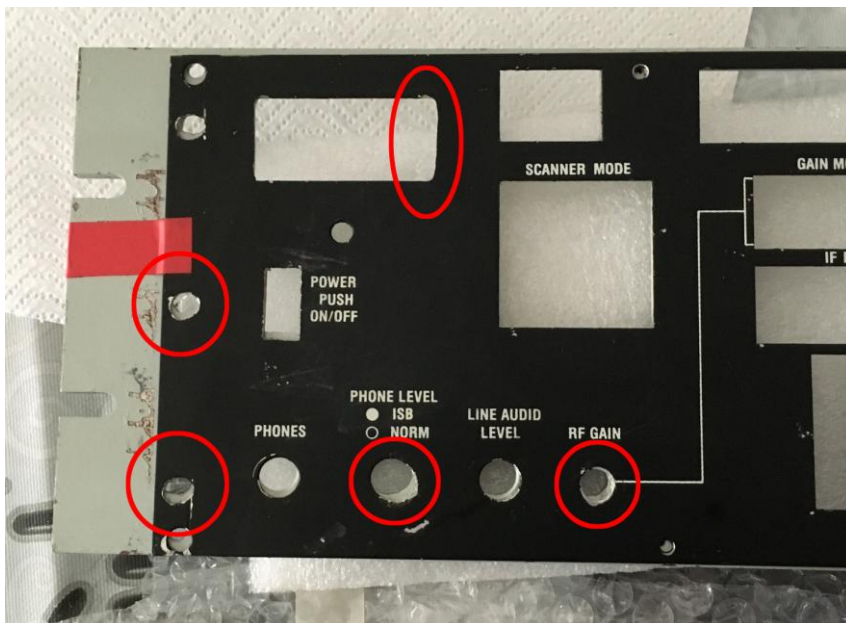


Figure 10: The many inaccuracies found in the thin black metal sheet cutouts of the WJ-5JK front panel.

It's also worth to notice that:

- While in the stock WJ-8718A/MFP the *Phone Level* potentiometer has two concentric but separate shafts and knobs (Figure 11), in the WJ-5JK receiver both the *Phone Level* and the *RF Gain* pots have single shafts and knobs (Figure 12, look also at Figure 9).

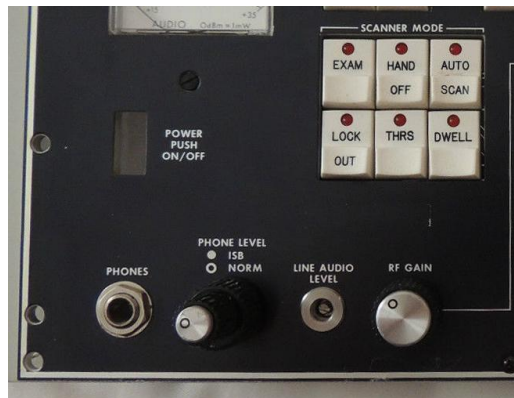


Figure 11: The stock WJ-8718A/MFP front panel has concentric but separate knobs for the *ISB* and *Normal* Phone Levels.



Figure 12: The *Phone Level* and the *RF Gain* control of the WJ-5JK have single knobs and miniature shafts.

It's also curious to notice that many typos and misprints appear in the front panel writings and on the engraved push-button writings: please look at “*AUDID*” (instead of “*AUDIO*”) in Figure 13.



Figure 13: The “*AUDID*” misprint on the WJ-5JK front panel.

Among the other misprints that were found on the engraved front push-button covers, I already quoted some of them on my FB post of Ref. [3]: please notice the wrong writings “SIGAL STR” (instead of “SIGNAL STR”), “REMTE” (instead of “REMOTE”), “RECAL” (instead of “RECALL”) in Figure 14.

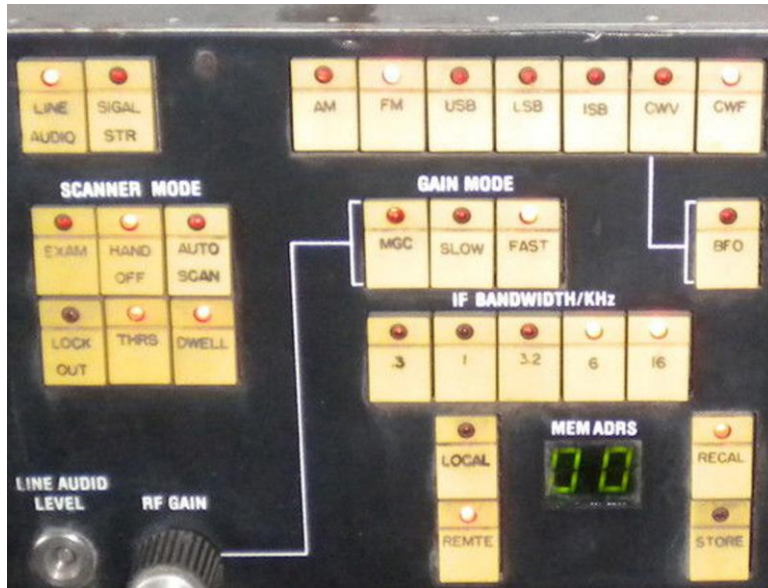


Figure 14: Some misprints that were found on the engraved push-button covers lettering.

Almost surprisingly, I didn't find the typo “SLON” (instead of “SLOW”, that I had previously noticed on the *Tune Rate* pushbutton of other WJ-5JKs, Ref. [3]) in the MFP front panel that I recently received, look at Figure 15 (Left/Right).

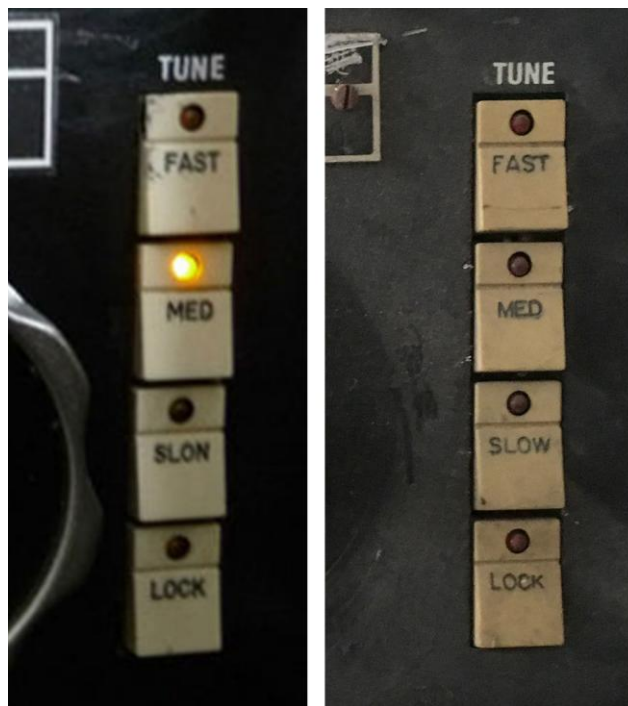
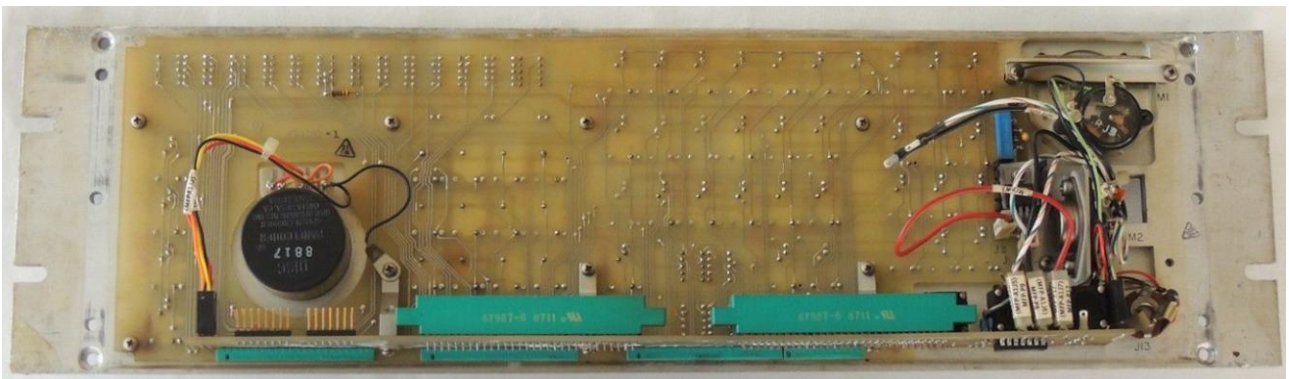
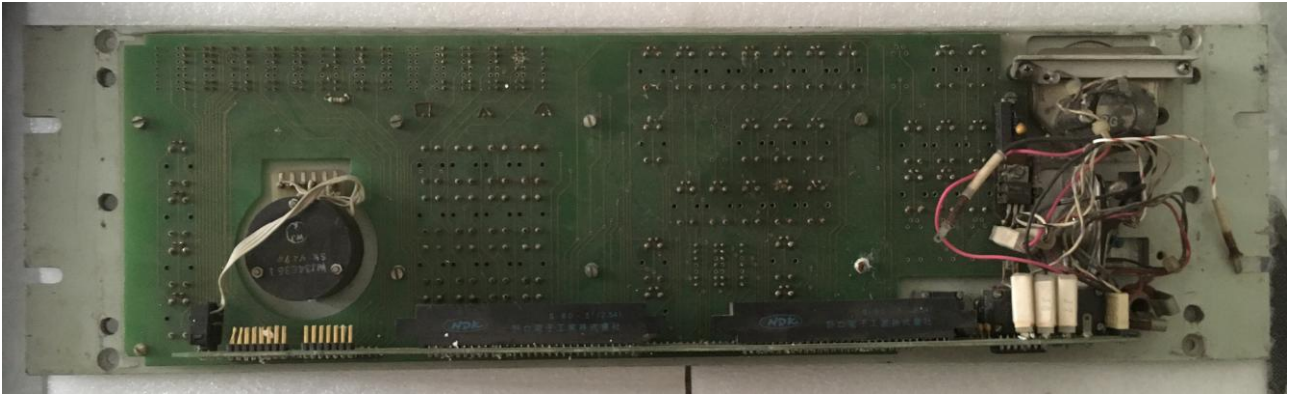


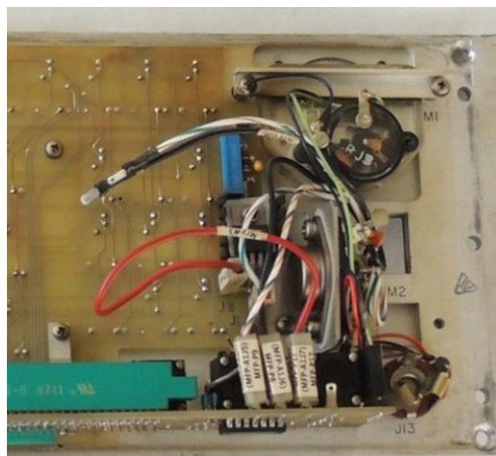
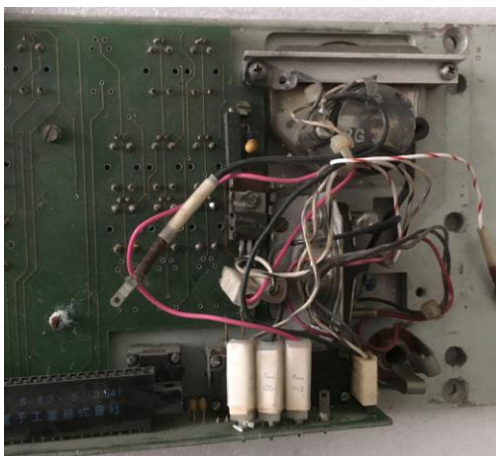
Figure 15: In the left picture a pushbutton with the typo “SLON” is shown, while in the right one it appears the same key with the proper writing.

WJ-5JK front panel inner details

The printed circuit board that sits behind the front metal plate is similar (but not identical) to the stock WJ-8718A/MFP one. From the comparison of Figures 16 (the WJ-5JK PCB is shown in the top, the stock WJ-8718A/MFP PCB in the bottom), you can notice some differences both in the position of the switches and of the 7-segment LEDs, and also noticeable are the differences due to the use of alternate-type pushbutton switches. Almost identical are the circuits in the vicinity of the RF/Audio meter instead, Figures 17 (A/B).



Figures 16 (A/B): The WJ-5JK front panel PCB is shown in the top, in the bottom the stock WJ-8718A/MFP appears.



Figures 17: Comparison between the PCB sections near the meter (WJ-5JK at left, WJ-8718A/MFP at right); both the circuits are substantially identical.

More details about the PCB tracks differences between the “Chinese” and the “stock” WJ-8718A/MFP units on the 794309 MFP-A1A2 and on the 794310 MFP-A1 boards can be seen in Figures 18 and 19 below.

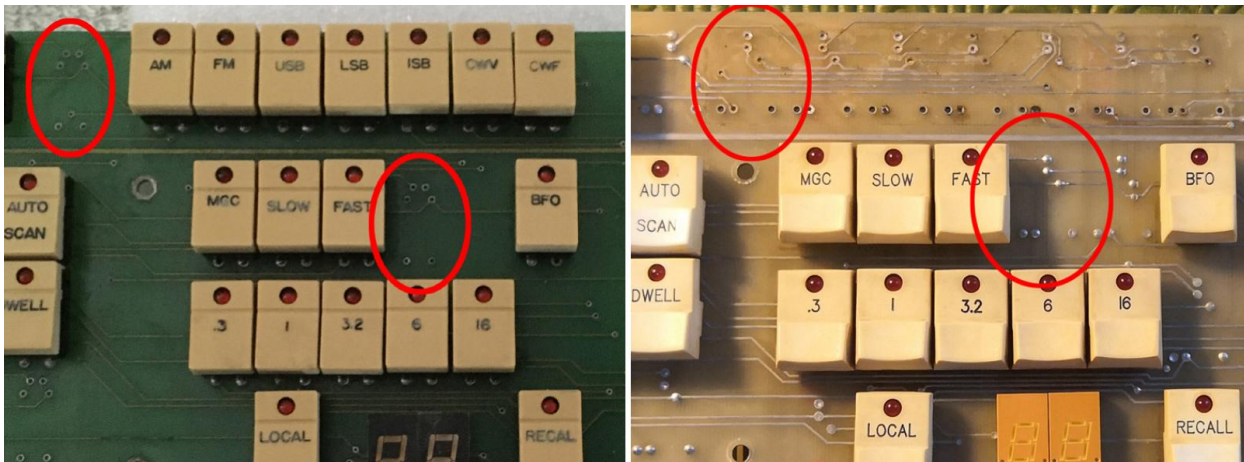


Figure 18: Comparison between the front PCB tracks on the front panel assembly of the WJ-5JK receiver (left picture) and of the stock WJ-8718A/MFP (right picture).

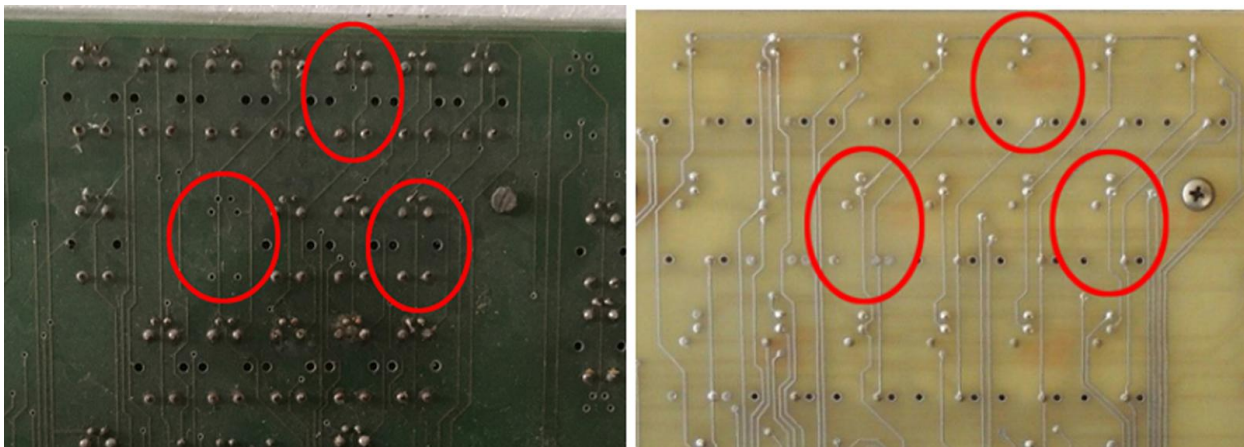


Figure 19: Comparison between the rear PCB tracks on the front panel assembly of the WJ-5JK receiver (left picture) and of the stock WJ-8718A/MFP (right picture).

Please notice that in my humble opinion the differences in the PCB tracks (as well as in the size and position of the front pushbuttons of the WJ-5JK receiver are mainly due to the choice of different types of tactile switches, we'll talk again later about this topic.

Other differences between the Chinese and the U.S.A. versions that are worth mentioning are:
- Alternate 7-segment displays (green colored and marked “BS343” in the WJ-5JK radio, HP 5082-7613 or 7623-7633 - depending on the color - in the stock WJ-8718A/MFP, look at Figure 20;

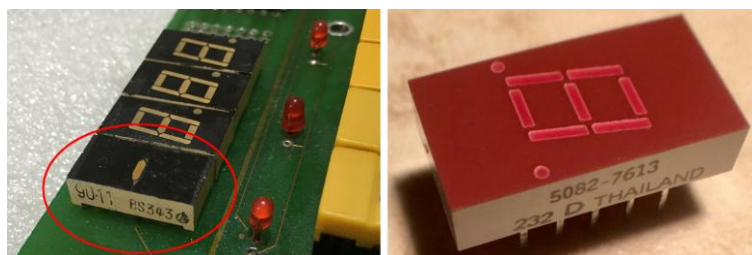
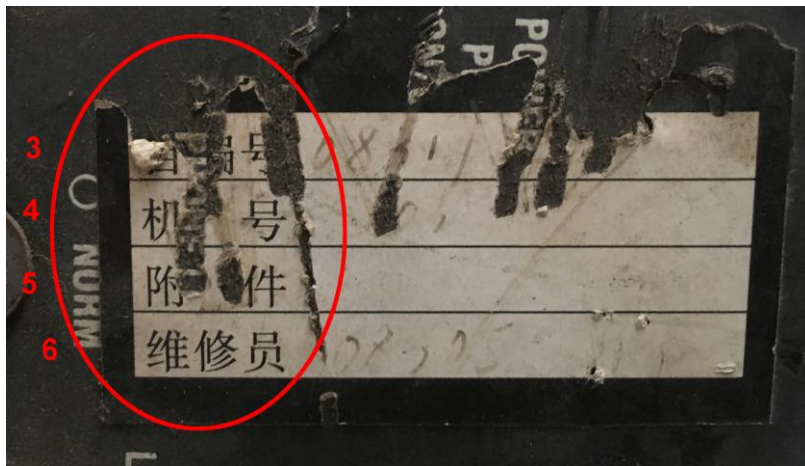


Figure 20: The WJ-5JK 7-segment LEDs and an example of the HP types used in the WJ-8718A/MFP radio.

- Use of slotted and metric threaded non-Inox screws in the WJ-5JK's front panel assembly instead of the U.S. threaded Phillips screws employed in the WJ-8718A/MFP receivers. Of course I replaced the rusty and oxidized ones with Inox Phillips types.
- The three 90° aluminum brackets between the MFP-A1 and MFP-A1A2 PCBs are missing in the WJ-5JK units.

An attempt to investigate the Chinese writings

As the WJ-5JK front panel came with some writings in Chinese language on the front tag, on an attached sticker and on the comb connectors of the MFP-A1 Front Panel Switch/Encode board (look at Figures 21, 22 and 23), I asked my Chinese friend to translate them for me in the hope of discovering some important detail.



Figures 21, 22 and 23: Some Chinese writings found on the WJ-5JK front panel assembly.

Unfortunately those writings do not contain much information... it seems that the translations of the seven details mean:

- 1: The code name of the General Staff ;
- 2: The unit serial number;
- 3: The self-number (?);
- 4: The machine number;
- 5: The part number;
- 6: The maintenance number;
- 7: *Japan Noguchi Electronics Co., Ltd. Production* (the Japanese manufacturer of the comb sockets).

Some Technical Checks

After my almost unsuccessful attempt at research, I decided to proceed with the restoration of the WJ-5JK front panel and to test its operation by using my “MFP Front Panel Tester” [6]; in Figure 24 the Chinese front panel is shown after some cleaning and restoration.



Figure 24: The partially restored Chinese MFP front panel. Please note that the two beige knobs in the left have been used temporarily only, the original ones are larger and black, look at Figure 1.

As shown in the Figures from 25 to 32, all the green-colored 7-segment displays and all the other red LEDs are OK and perform correctly without any problem.



Figure 25: Frequency Display check.



Figure 26: Memory Display check.



Figure 27: BFO Display check.



Figure 28: Service LEDs check.



Figure 29: J1 & J2 continuity check.

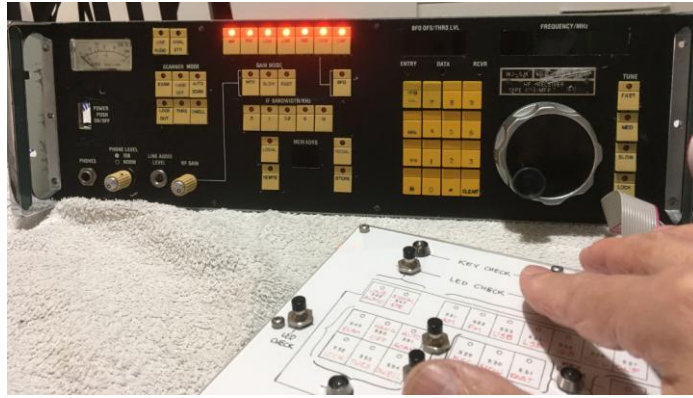


Figure 30: Mode LEDs check.



Figure 31: Bandwidth LEDs check.



Figure 32: Tuning Rate LEDs check.

Some problems (and this was not much surprising to me, based on my past experiences with some stock WJ-8718A/MFP receivers that I found in Turkey in the past years [7]) involve many of the push-button switches that are mounted on the front panel PCB and that always show some undue contact resistance (instead of a secure and reliable momentary short when pressed and a total contact insulation when released).

The presence of such problems was confirmed by the use of my MFP front panel tester, in which a green light appears when a switch check is successful (an example is shown in Figure 33) or remains off (or dimly lit only) if the test fails, look at Figures 34 and 35.



Figure 33: A successful switch check.



Figure 34: A failed switch check.



Figure 35: Another switch check that has failed.

So, re-reading in the light of this bad issue the story of Mr. Bob Glaz (who is said to have replaced some *Tantalum* capacitors on the WJ-8718A/MFP that had been sent to China [Ref. 2]), I started thinking that he didn't replace *Tantalum* capacitors, he tried to fix the pushbutton failures instead. A sort of confirmation comes from attentively looking at Figures 36 and 37.



Figure 36: Mr. Bob Glaz is shown while repairing a front panel MFP PCB.



Figure 37: This picture enlargement shows clearly that Mr. Glaz is repairing an assembly formed by the Type 794309 MFP-A1A2 *Front Panel Switch* board and by the Type 794310 MFP-A1 *Front Panel Switch/Encode* board. Please notice that in both those boards there are no *Tantalum* capacitors!

A possible Debouncing problem?

As you can read from Ref. [8], “When we press a pushbutton or toggle switch or a micro switch, two metal parts come into contact to short the supply. They don’t connect instantly but the metal parts connect and disconnect several times before the actual stable connection is made, and the the same thing happens while releasing the button. This results the **false triggering or multiple triggering** like the button is pressed multiple times. It’s like falling a bouncing ball from a height and it keeps bouncing on the surface, until it comes at rest.

Simply we can say that the **Switch Bouncing** is the non-ideal behavior of any switch which generates **multiple transitions of a single input** (look at Figure 38) . It is not a major problem when we deal with the power circuits, but it cause problems while we are dealing with the logic or digital circuits.

Hence, to remove the bouncing from the circuit, a **Switch Debouncing circuit** is used.

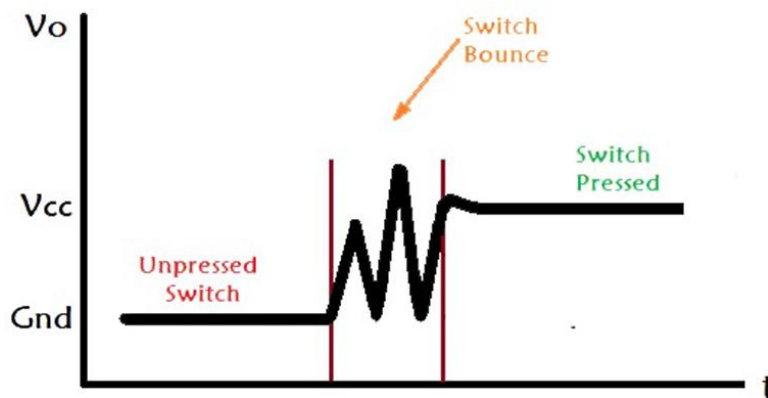


Figure 38: The **Bouncing** effect in a switch, taken from Ref. [8].

So it’s not unlikely that the **Bouncing** effect can affect the WJ-8718A/MFP pushbuttons, especially when the receiver is exposed to dust, dirt, moisture, adverse weather, etc.

And maybe the Chinese technicians tried to fix that problem on their WJ-5JK radios by building different front MFP panel assemblies, using alternate type pushbutton switches and other PCB track routes.

They were unsuccessful, however: the checks I made by using the MFP Front Panel Tester showed that the problem still affects both the Chinese and the U.S.A. designed front panel assemblies.

Could the addition of a **Debouncing** circuit (a simple parallel capacitor or an R/C network) have produced better effects? Maybe.

Other differences between the Chinese WJ-5JK radio and the stock WJ-8718A/MFP

Beyond the above mentioned differences in the front panel assemblies, I found that also the WJ-5JK MFP-A1A1 **Front Panel Encode** card seems to have been built in China and it differs from the stock Type 796056-1, despite the majority of the components that were employed was the same of the stock card.

In Figure 39 you can see the comparison between the front of the MFP-A1A1 WJ-5JK card (top picture) and the stock card (bottom picture), while in Figure 40 the comparison between the two rear side appears.

Please also notice that the only writing on the Chinese MFP-A1A1 card is just the one that appears in its front left corner, Figure 41.

In Figure 42 some pushbuttons (and their front covers) used in the stock WJ-8718A/MFP are shown.

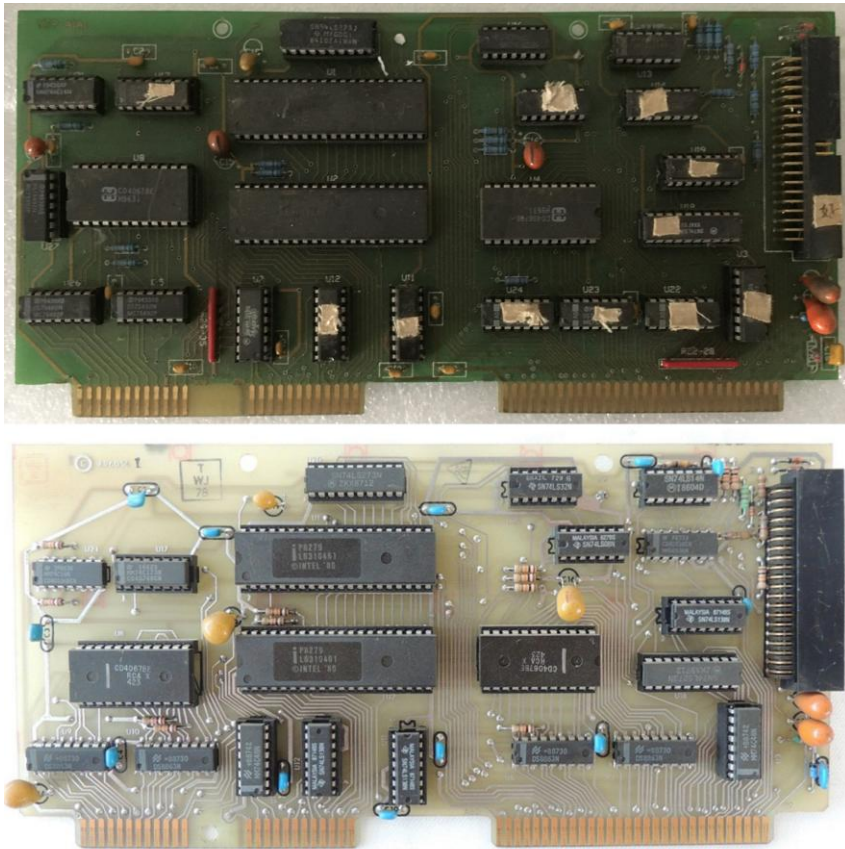


Figure 39: MFP-A1A1 cards front comparison.

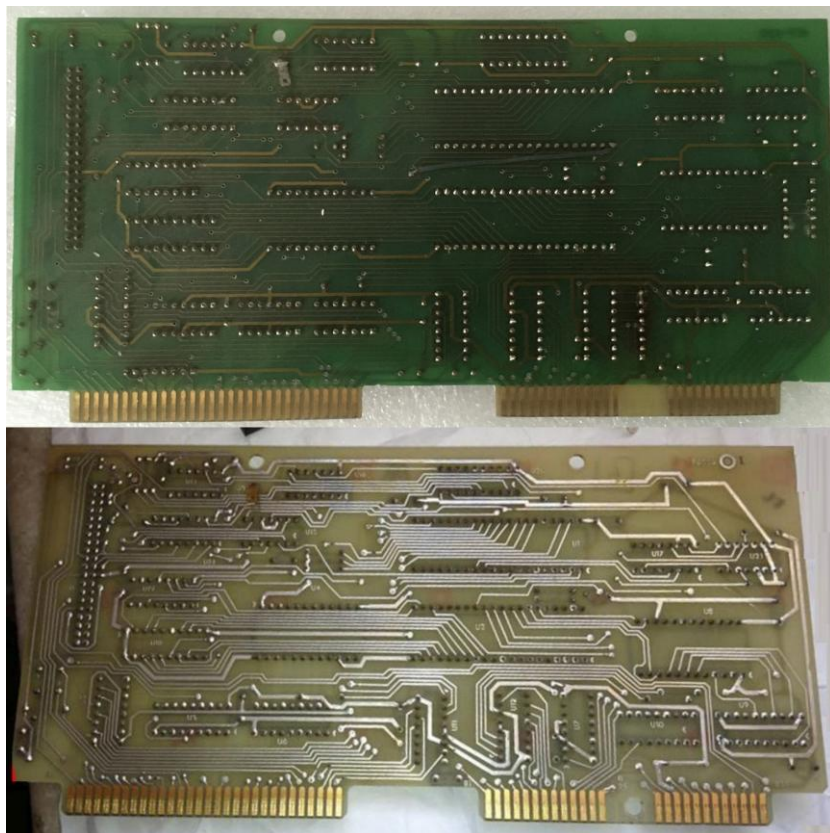


Figure 40: MFP-A1A1 cards rear comparison

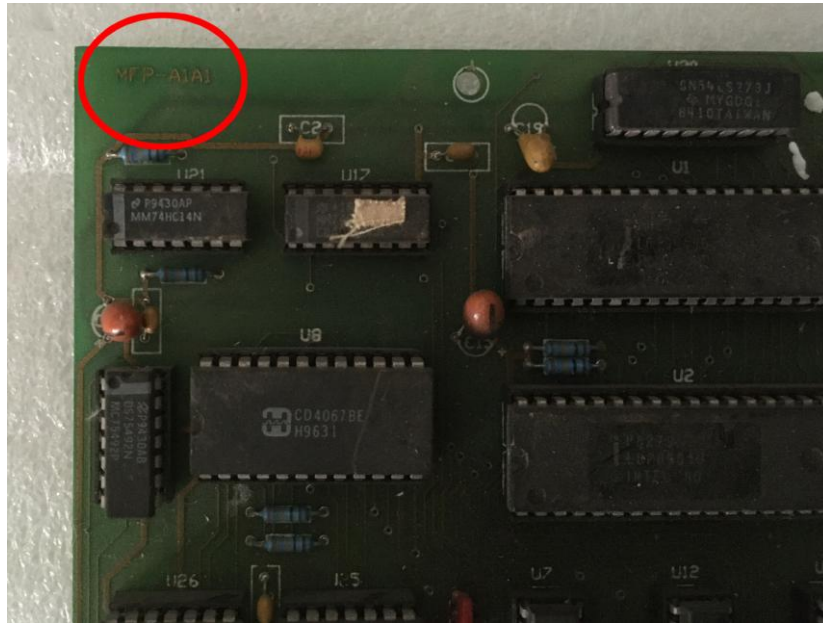


Figure 41: The only writing that appears on the Chinese MFP-A1A1 cars is located on its top left side.

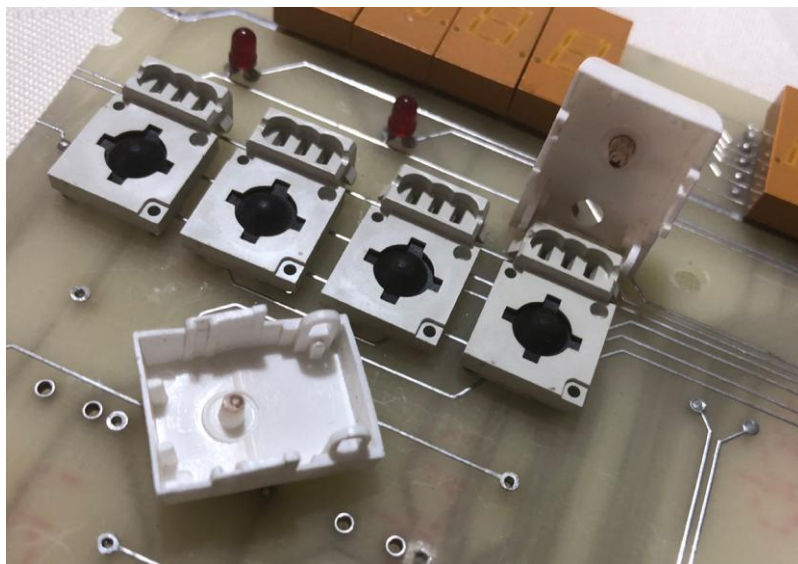


Figure 42: The tactile pushbuttons that are used in the stock WJ-8718A/MFP and some of their covers.

Other problems found in all the MFP receivers and possible solutions

The WJ-8718A/MFP radios for sure are wonderful and very versatile units (99 memories, pushbutton selections, remote control availability, BITE, etc.), but unfortunately they are not free from drawbacks, being a bit more delicate and less reliable.

For sure the choice of better quality pushbutton switches could have lead to more rugged radios, but probably at their designing time the Watkins-Johnson engineers did not have anything better available.

Nowadays a lot of progress has involved the keyboards and the single tactile switches: there are many excellent components available (not cheap however!) that are used in the PC keyboards designed especially for “*Gamers*” (so are named the PC game enthusiasts) . Their price can reach also a kilobuck, but their performances are guaranteed against any failure and aging.

Of course, it’s unthinkable to rebuild the needed WJ-8718A/MFP front PCBs from scratch using those premium pushbuttons (you can find a lot of types by a Google search however)... but it’s always a possibility, hi!

Another downside of the MFP receivers is represented by bad contacts between the golden plated card edges and the comb socket of the motherboards, especially between the MFP-A1A1 card and the two MFP-A1 Front Panel Switch/Encode sockets: dust, dirt and age are great enemies of these radios!

Sometimes this drawback involves also the contacts between the MFP-A3 *IF Interface* card (and/or between the MFP-A4 *Synthesizer Interface* card) and their sockets on the A6 Motherboard, but these are almost rare cases.

There is not a secure solution, but you can slightly bend the involved cards back and forth several times, trying also to clean the gold-plated comb contacts using a soft eraser.

After that you can apply some drops of “*Deoxit-5*” to the sockets (SPARINGLY, as it can corrode the contacts!).

Conclusions

Even if the WJ-5JK mystery is unsolved (it is not fully clear the reason why the Chinese developed and built the WJ-5JK receiver with a different front panel assembly yet), some progress has been made and I am now able to express my thoughts.

I repeat my humble opinion: the WJ-8718A/MFPs are wonderful receivers (when they work without problems...), but if you need a more reliable and robust unit that almost never fails, the WJ-8718 (or the WJ-8718A or else the WJ-8718-9 , that are built like a tank) is the best choice.

In any case... please *caveat emptor!*

Of course comments, opinions, criticism or further info from readers will be very welcome!

And that’s all for now, best 73!

Paolo Viappiani, Italy

December 2022

References:

[1]: Look at:

http://mailman.qth.net/pipermail/premium-rx/2010q3/006395.html?fbclid=IwAR0i7BGjINbZgVHxLU3A4TN6_tgeoEcGyYOfdPapGjKhejAOYRJbkEQIrOU

[2]: Look at:

<https://www.facebook.com/groups/174047703539572/permalink/244807069796968/?app=fbl>

Terry O' wrote in that post: *"After President Nixon opened up relations with China, WJ sold a batch of WJ-8718s to them. The contract stipulated that shipping would be via Chinese military transport planes. These planes had unheated and unpressurized cargo areas which stressed the tantalums and led to premature failures. Bob Glaz & Archie Fosdick went over to do the repair work. So when you see a WJ-8718 for sale out of China, as far as I know, they were all manufactured in the US, though they may have some replacement parts that were home-brewed."*

[3]: Look at:

<https://www.facebook.com/groups/174047703539572/permalink/244051879872487/?app=fbl>

[4]: The e-mail addresses of Heinz Breuer DH2FA- KM5VT are (or were): dh2fa@me.com and hbreuer@debitel.net; he is also a member of the **Premium-Rx** group and of the **BlackRadios FB Group**.

[5]: Mr. Wangjian Wang, RM 1005 No.1 Lane 16, Kwan Yu Road, Jiading District, Shanghai 201821, China. His e-mail address is: 373003434@qq.com

[6]: Look at: [http://blackradios.terryo.org/documents/hobby-tech-articles/WJ-871x-MFP-Front-Panel-Tester-Rev4-final-\(Paolo-Viappiani\).pdf](http://blackradios.terryo.org/documents/hobby-tech-articles/WJ-871x-MFP-Front-Panel-Tester-Rev4-final-(Paolo-Viappiani).pdf)

[7]: The problem of bad pushbutton switch contacts was found by me for the first time after having purchased a WJ-8718A-9/MFP front panel from my Turkish friend and part supplier Murat Ahyan of Ankara, Turkey (e-mail addresses: olvidodranas6218@gmail.com, g.alasun@hotmail.com, ebay current user ID: *prusias16*). I tried to trace the cause of the problem (that later arose also on other WJ-8718/MFP front panels) and I wasn't able to assume other than the following:

- Scarce reciprocal insulation (or semi-shorts) of the PCB tracks on the Type 794309 MFP-A1A2 **Front Panel Switch** or on the Type 794310 MFP-A1 **Front Panel Switch/Encode** boards;
- Scarce quality of the pushbutton switches employed in the MFP front panels;
- Pushbutton switches failure due to aging;
- Foreign substances (dust, sand, etc.) that entered the switches due to climate or weather events;
- Influence of the small currents circulating thru the switches;
- Lack of **debouncing capacitors** (or other proper circuits) between the switches contacts.

Whatever the cause, this is a serious problem affecting the proper working of the MFP radios.

It's also worth to report that in some instances the pushbutton contact resistance measured by an Ohmmeter seems to vary in time and to have some sort of polarization (just as when you measure an electrolytic capacitor)

[8]: About the need of **debouncing**, please look at: <https://circuitdigest.com/electronic-circuits/what-is-switch-bouncing-and-how-to-prevent-it-using-debounce-circuit>.