At the Repair Bench – MFJ-998RT – December 2025

Shortly before our 2025 HamFest, I received a communication from a gentleman located in Dover, Delaware who had some questions for me regarding his remote HF station and some problems he was currently experiencing. His system incorporates an Icom IC-7300, and MFJ-9987RT auto-tuner, and a BLA-350 linear amplifier. His problem was that the BLA-350 was dropping out on transmission due to a loss of input signal at the appropriate frequency. He described an earlier failure that he had attempted to repair. That failure was the annihilation of an RF hash choke at the signal input stage of the MFJ-998RT auto-tuner. After talking it through for a bit, we decided that the auto-tuner was the heart of his ongoing difficulties, and that he should bring it to me for repairs. He did so after the HamFest on that rainy Sunday afternoon.

Figure 1 - MFJ-9987RT installed on tower

A brief description of the MFJ-998RT and its input circuit is called for here. Refer to the schematic excerpt at Figure 2 as you continue here. As the transmitted signal enters the auto-tuner, a sample of that signal is taken off at an input transformer (T1 in the schematic). It then passes through a 1mH RF hash choke. This choke is identified in the schematic as L41 and as being 1000µH, an equivalent value. Its location is clearly visible with the yellow oval on the photo in Figure 3 – the black cylinder near the right of the oval. This is the choke that had been completely burned up in the failure event that started this odyssey. The owner, who is not a technician but who does try to make his own repairs, was told by another user online what the correct value of the choke should be, exactly what he should buy, and exactly where he should buy it. Unfortunately, that information was incorrect, as that user told the owner to purchase a 100µH choke when the schematic clearly calls for a value of 1000µH here. However, that was only a small part of the overall problem.

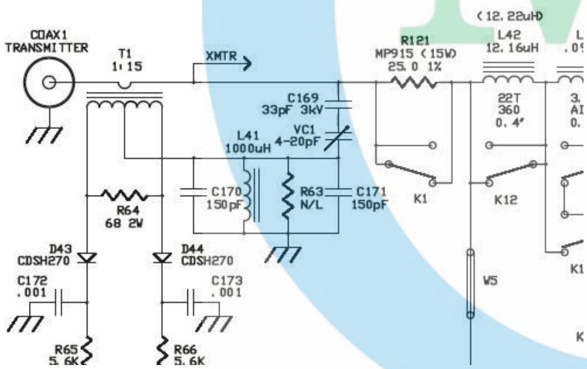

Figure 2 - MFJ-998RT schematic excerpt

My initial overall physical exam of the unit revealed a small daughterboard, mounted to the mainboard in the vicinity of the input section, that showed some distinct charring. This board holds four resistors, and all of them exhibited signs of having been severely overheated. I decided that a closer look was called for here, so I removed the daughterboard for a better look at it, and I also identified it in the schematic.

According to the schematic, this board was serving as R121, stated to be a 25Ω 15W 1% resistor. According to the color code on the resistors, they were 100Ω each, which makes sense, as they were wired in parallel. Four 100Ω resistors in parallel would of course produce 25Ω net resistance. I desoldered one end of each of the four resistors to check them each individually. What I found was that three of the four resistors were open, and the fourth exhibited a measured resistance of 1065Ω – a far cry from the 25Ω called for in the schematic.

Figure 3 - MFJ-998RT mainboard exposed

There were a couple of indications that these resistors had already been replaced. First of all was their size. In order for an array of four parallel resistors to provide 15W of power capability, each resistor would need to be rated at 3.5 watts. These resistors were the same exact size as the 2W resistors in my inventory. Further, the resistors installed there were, according to their color codes, 5% tolerance rather than the 1% called for in the schematic. These points led me to believe that the resistors had been replaced at some point in the history of this unit, and not with the correct specification parts.

The daughterboard, also located within the yellow oval in Figure 3, was heavily charred in the vicinity of the one remaining "working" resistor – that is, the only one that was not open-circuit. Needless to say, this was because of two problems – a) all of the current flowing through the one resistor, and b) the inadequate power-handling capability of that one resistor. I decided that a better scheme was called for in the replacement of these resistors.

As I normally do not stock resistors rated higher than two watts, I set out to source some appropriate resistors for this job. What I found was that 3.5W resistors are not offered by my major suppliers. I then opted for 5W types – four 100Ω 5W 1% resistors in parallel would produce 25Ω ±1% at twenty watts – a good solution. However, five-watt resistors are readily available only as wirewound resistors. Naturally, we do not want to introduce wirewound resistors into an RF circuit due to their inherent inductance. However, at least one manufacturer, Vishay, makes resistors of equivalent physical and electrical specifications available with non-inductive (Ayrton-Perry) windings. This seemed like a good option, but they are *very* expensive. I was hesitant to spend the better part of a hundred dollars of the customer's money for this, so I went to bed that night with the problem on my mind. At about 0230, I awoke with a possible solution in mind. It would still not be exactly cheap pricewise, but it would be far better than the non-inductive wirewound alternative.

What I came up with was the idea of building ten series strings of resistors, using one each of a 240Ω 2W 1% metal-film resistor and a 10Ω 2W 1% metal-film resistor. This would give me ten strings of 250Ω ±1% each, which when taken in parallel, would provide a net resistance of 25Ω ±1%, and would do so at a power-handling capability of forty watts – two watts each at twenty pieces. I mounted five strings each to a pair of 40mm x 60mm proto-boards, and then I connected the boards in parallel.

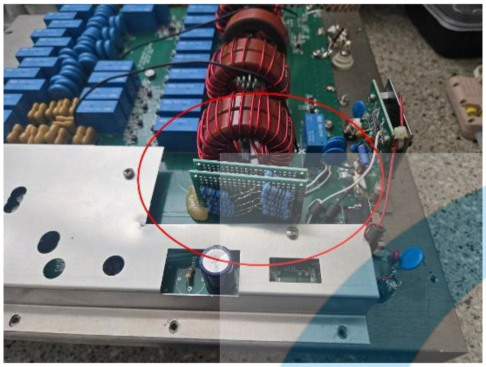

Figure 4 - Resistor array installed

I identified a suitable location on the mainboard to install this board sandwich, and after attaching a pair of solder lugs for securement to existing mounting screw locations, I secured the board arrangement to the mainboard. The location of this board sandwich can be seen within the red oval in the Figure 4 illustration. It should be noted that I did need to slightly trim the mainboard shield to provide clearance for the resistor array. The array is connected to the mainboard via the two white wires visible in the photo, which are secured to the mainboard at the R121 location where the original daughterboard had been installed.

The repair was not complete at this point, however. I still needed to replace the RF hash choke with one of the correct value. While I normally stock this particular choke, a 5258-RC 1mH choke with a 0.55Ω DC resistance and a one-ampere current rating, I happened to be out of stock on it, but I already had it coming in my weekly stock order. This was a lucky break for the customer, as no shipping charges would be applied for any special-order parts.

We set up a try-out session for the day that he would come to pick up the repaired unit, in which I used my Icom IC-746 PRO and the Club's antenna array as a test platform. This permitted the customer to see the unit in proper operation before heading back to Dover with the repaired unit. I particularly appreciate the opportunity for the customer to see a repaired unit operating normally when it is returned after a repair. Such an opportunity provides a level of satisfaction for the customer and a level of protection for me at the same time.

One important end note. The question that must be asked is how did this failure happen in the first place? I do not have any satisfactory answer to that question. One thing that came out in our conversations, however, was the fact that there was no lightning protection at all on this system. While this is not likely to be related to this failure, as the failure was on the tuner input side, it is nonetheless always recommended to have proper lightning protection on your system.