# YAESU FT-1000X T/R ANTENNA CHANGEOVER RELAY REED SWITCH REPLACEMENT

**PLEASE DO NOT ATTEMPT THE FOLLOWING UNLESS YOU ARE EXPERIENCED WITH SOLDERING, REPLACEMENT OF COMPONENTS AND REPAIR OF EQUIPMENT. I AM NOT RESPONSIBLE IF YOU ATTEMPT THIS REPLACEMENT.**

A few years ago I offered to look at a ham friend's FT-1000. His FT-1000's receiver had gone nearly deaf.

I asked the Groups IO FT-1000 group about receiver issues. Several hams provided worthwhile suggestions. Unfortunately, none resolved the FT-1000 receive issue.

Using a signal generator I injected an RF signal at the radio's antenna jack. With the signal at the RF board input I checked at the output, nothing. I had a decision to make. Dig inside the radio's RF board or possibly find a used one. Adam, W4AJF *(eBay Hamguy123 & on this group)* had one, so I took that route. Bingo, the receiver came alive again. End of story or so I thought for my friend. A while later receive failed again.

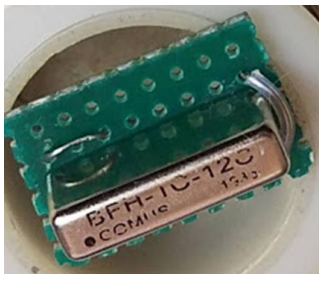
With a schematic I began to trace the original RF board's signal path and found several defective diodes *(D1005/6)*. (These same diodes failed on the used RF Board.) What had caused these diodes to fail?

My tracing next took me to the T/R antenna changeover relay on the LPF board. As we know this relay switches the radio's antenna connection between receive and transmit. If the antenna changeover relay fails to switch the receiver, the RF board diodes will almost certainly be an issue.

Using my DVM I tested the antenna changeover relay's reed switch contacts. Instead of normally open *(NO)* with the coil not energized, the contacts were a dead short.

I checked for a replacement antenna changeover reed relay. A new relay was not available from Yaesu, the Japanese manufacturer or any source I could find.

Some hams have substituted other reed relays. A COMUS reed relay is available from Mouser, DigiKey, etc. for around $30. On eBay I found a CP Clare reed relay with similar specifications including both normally open *(NO)* and normally closed *(NC)* contacts for $10.

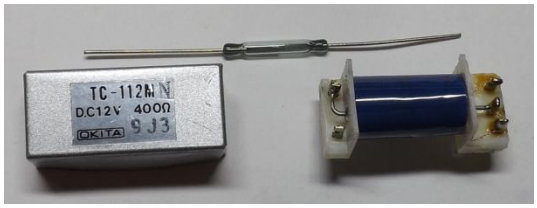


Using the COMUS or CP Clare relay would work, but required a daughter card with wire pigtails as the original Yaesu OKITA reed relay used a different pin configuration.

I did more investigation. On YouTube I found a series of FT-1000X repair videos from John, M0XFX. In part 3 John talks about rebuilding the changeover relay by replacing the reed switch with a Littelfuse MDSM-10. The MDSM-10 has specifications similar to the original OKITA relay's normally open *(NO)* reed switch. Replacing the reed switch is the path I took.

I carefully unsoldered the 5 pins *(2 for the coil, 2 for the switch and 1 soldered to the ground plane)* on the LPF board. I checked the relay's coil to make sure it was ok. The coil tested "good" at around 450 ohms.

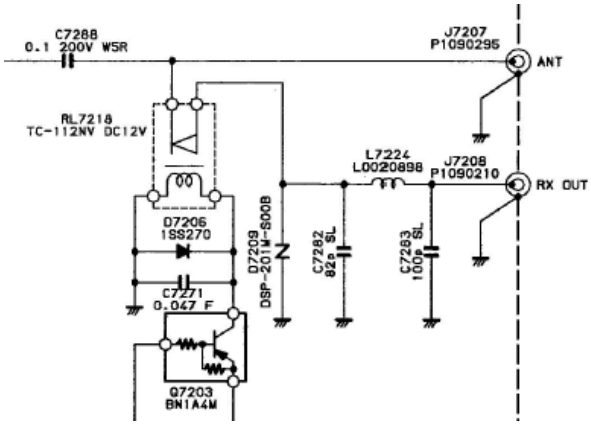
The antenna changeover relay's metal cover is formed from a single piece of metal with the sides bent downward at a 90 degree angle. I used a small flat bladed screwdriver to carefully pry off the cover. The relay cover's sides opened slightly enabling me to remove from its base.




Next, I unsoldered the 2 reed switch standoff connectors making sure to keep my soldering iron's tip away from the thin coil wire and standoffs. Fortunately, the reed switch leads were tack soldered to the connector standoffs. Once the solder was removed, the reed switch came free. *(Note: I found the base near the 2 relay coil standoffs to have experienced high heat.)* The coil wires are thin, so be very careful soldering near them.

I carefully bent the replacement reed switch leads to approximately match the failed reed switch. (*Note: The reed switch's glass envelope can be easily damaged if too much pressure is applied to the leads. The Internet has good information about handling and cutting reed switch leads.)* I cut the switch leads at the standoff connectors "after" they were soldered. Soldering provides needed support for cutting the leads. Before soldering the relay to the LPF board I checked to make sure the reed switch was "NO" *(normally open)* using a small magnet to simulate "closed" operation.

The relay cover provides physical protection for the relay. The cover fits very tightly when installed on the relay base. Once I am assured the antenna changeover relay issue is fixed, I will put it back on. I plan to add thin insulating tape to the cover's inside ends. I don't want a chance for the metal cover ends to short the coil or reed switch pins.




After reinstalling the relay I discovered an issue with the reed relay switching circuit flyback diode. I learned the flyback diode is connected across a relay coil *(see schematic)* to prevent voltage spikes when the relay is turned off, thereby protecting other components in the circuit from damage. I noticed the flyback diode had one lead that was broken at the point of where one side entered the solder hole on the LPF board. I could not see a way to re-solder, so I replaced it with a 1SS270 diode I found on eBay. The BN1A4M switching transistor is also available from multiple sources, if need be.

The final step was to make sure the antenna changeover relay was working. (*To recap the antenna changeover relay is normally open (NO) when the radio is off with no voltage applied to the relay coil. Turning the radio on applies voltage to the relay coil thereby closing the reed switch. This completes the RF receive path between the antenna and RF (receiver) board. When transmitting, voltage is removed from the relay coil and opens the reed switch. This changes the RF path to the transmitter.)*

The easiest way I found to verify the antenna changeover relay works was a DVM and measuring the connectivity across the reed switch. Space is very limited on the reed relay to connect normal size alligator clips. I built a special set of leads using mini-hook clips. Mini-hook clips work perfectly with the small amount of space on the relay base.

With the radio off I clipped the mini-hook test leads to each side of the reed switch. Next I set my DVM to continuity. I powered up the FT-1000 and with power applied to the antenna changeover relay coil, the DVM showed continuity. Next I connected the FT-1000 to a dummy load and pushed in the MOX switch. The relay reed switch contacts opened indicating the relay was working as it should switch between receive and transmit.

*An old radio will have problems. This project helped regain lost and obtain new troubleshooting knowledge. Fixing an older radio gave me a real sense of accomplishment.* *(W4RJP version 4)*