Replacing FL101 in the R-390A Rev 2

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The stock R390A has both a safety issue and now a major problem with GFCI outlets. FL101 has a leakage of about 5 to 6 mA when ungrounded which can be life-threatening in moist situations. This is a result of the dual .019uF capacitors on each input wire inside the filter. The rear panel warns the user not to use the receiver without an appropriate ground.

Up to now the path of least resistance solution is to use a three wire grounded plug with the green wire connected to the chassis and call it a day.

Some ambitious souls have opened the case and replaced the .019 caps with smaller values then re-assembled it to keep the original appearance. This is really not a good solution for several reasons.

"As the FL101 filter design employs "brute force" filtering, one needs to calculate the X_c value at 60 Hz. Then with the new capacitors try to measure the ungrounded leakage. Also then what is its RF attenuation value? The older ferrite chokes as utilized in the stock FL101 are not as efficient as the modern computer power supply chokes.

An alternative FL101 modification was suggested by a college of mine. His wondered if one wanted to keep the "original" filter look if he could remove the four .019 capacitors and replace them with the "safety capacitors" sold by Just Radios and others. The ones I have are .047 uF/ 600 VAC rated. If one was to wire them from the L1 to L2 terminals only. This would solve the ungrounded leakage problem but I don't how good the RF/external interference would be attenuated. YMMV.

Then lastly you're still stuck with a permanently attached fixed power cord.

Now with the introduction of new electrical codes we are seeing the requirement to add GFCI receptacles throughout an entire residence, not just wet locations such as bathrooms, kitchens and laundry room as were the requirements in the past.

So we are faced with the prospect of not having our receiver being plug and play on any handy household outlet.

There is a small loophole in the National Electrical code. If an appliance such as a refrigerator or freezer is going to be permanently plugged in then the GFCI requirement can be waived. This is because of the problems with nuisance tripping from locations with poor utility supplied power. I also believe from my experience that consumer GFCI units have less than reasonable performance. Losing over $250 of frozen food while being on vacation was my experience. Also since they are a form of circuit breaker, every time they trip some ampacity is lost so they become more prone to nuisance tripping. I found this out by having to replace a number in several houses.

The good news is now there is a simple and very easy solution to the problem and with a little bit of scrounging the $4 part needed may be free. I used a Corcom 3EEA1 which seems to be one of the most commonly available parts as the R390A draws about 240 watts. The first numeral in its part number stands for its ampacity rating. I have seen them available in 1, 3, 5 and 10 amp configurations. It comes with both known attenuation and ungrounded AC leakage whitch is less than 500µA. Also it has the approval of all official electrical codes.

This is accomplished because the computer style filter uses a balanced transformer to aid RF cancellation and better quality RF suppression capacitors.

The part needed is the RFI filter used in computer power supplies and other instruments. A good feature as in the design is the physical mounting footprint is all the same for all ampacity ratings. They just get longer with an increased ampacity. In a bit of serendipity the mounting holes match the original FL101 studs. With a small amount of cutting and filing the new filter will fit in the

vacated hole.

Many computer shops have a pile of dead computer power supplies and will give you one or two for salvage. As a bonus many still have good cooling fans. If you have to buy one, Mouser and all other large suppliers have a plethora of choices. The higher priced ones are the medical grade types which have extremely small amounts of ungrounded leakage but they are overkill for B/A use.

How I did it after I got my filter.

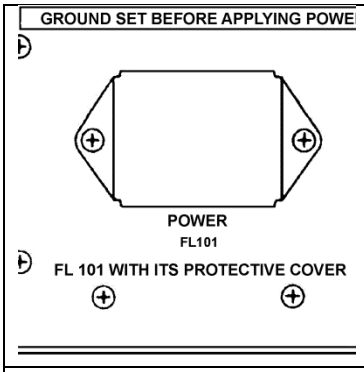

Fig. 1

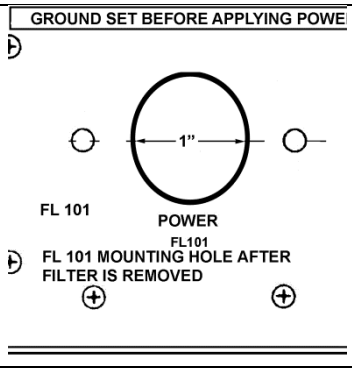

Fig. 2

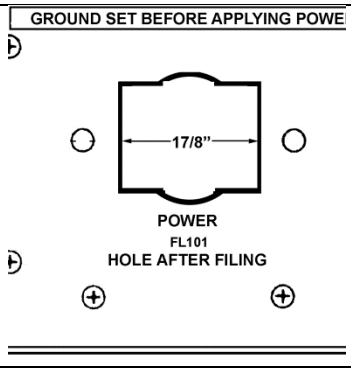

Fig. 3

Fig. 1 shows the typical back of the receiver with the cover over FL 101. Fig 2 the hole with the filter removed and Fig. 3 the modified hole.

The nuts securing the filter are 1/4 inch width. Remove the cover, set aside the nuts then remove whatever wiring there is from the two studs.

Removing the OEM filter takes a bit of finesse if you want to avoid removing the PTO. The same screws used to secure the cover are used on the inside to hold the filter in place. Now they have been tightened down for maybe 60 years and are probably quite stiff.

Now move FL101 and unsolder the wires going to the radio. A right angle Phillips screwdriver is very useful.

The hole diameter for FL101 measures 1 inch. The width of the filter is 1 7/16 inches so a little side cutting and filing is needed. I found this easy to do. As the filter height is about .8 inches, just some side filing is required.

After mounting the new filter a little rewiring is needed.

The "hot" lead from the new filter needs to go directly to F101. The output from F101 needs to be rewired so the "hot" lead goes to the power switch and then into the receiver power transformer and the "neutral" to the non-switched power transformer lead. The original OEM wiring on the "A", SP 600 and HQ 180 receivers all have the same type of AC input wiring and for both safety and code reasons should be rewired as well.

Additional Note

With the new style filter there is ample room to put a CL-90 in series from the fuse output to the power switch lead and it will have the free air space is needs to operate properly. Also there's still ample space to install a MOV from the fuse output to the "neutral" wire.

SAFETY- Please Do Not Skip

Please, no matter which filter modification you choose you must check and recheck the wiring with an Ohmmeter BEFORE applying power.