Harry Leeming's

in the shop

This month Harry Leeming G3LLL looks at some annoying faults and provides some clues on how to find them.

Welcome to *In The Shop* (*ITS*) – where I remember my days in the trade and where I'm starting by remembering a potentially damaging fault that **Fred** reported in an E-mail, when he was having trouble with his FT-401. He reported that when he pressed his push-to-talk (p.t.t.) or Morse key and increased the drive, the pilot lamps dimmed, but the front panel I/C meter did not indicate any increase of power amplifier (p.a.) current.

Fred's reported fault is a pretty common problem with valved transceivers, which if not recognised can cause a lot of damage. Despite the reading on the meter, it can be taken that when the lamps dim, the p.a. valves are passing a lot of current – the problem being that although the current is flowing, but the meter isn't indicating it. If you own a rig like this and the same symptoms appear, reduce the drive to minimum, and you will then notice that the standing current of around 50mA (0.05A) is not registering either.

If the meter works okay as an S-meter on receive, then it's obviously not faulty and there are two main possibilities. Firstly the IC/ALC/PO switch on the front of the rig may not be making contact (Or it has been left in the wrong position!). Or secondly, the transmit-receive relay that switches the meter from its use as an S-meter on receive, to a current meter on transmit, may not be making contact.

To check the rig, 'wiggle' the I/C switch whilst it's in the transmit mode at minimum drive and see if the meter then starts to indicate the standing current. If this fails try tapping the relay and flicking the p.t.t. One way or the other, you should then usually get a reading on the meter. Once you have established as to where the problem lies, you should clean the offending item.

The slide switch is best cleaned – **believe it or not** – with WD40 penetrating fluid, while it's in situ. The relay should be unplugged and the cover removed. Obtain some sparking plug feeler gauges, and draw these through the contacts whilst applying a cleaning fluid, such as Aero-Klene 50, which does not contain a lubricant that's obtainable from Maplin.

In 95% of cases following the above procedure should result in a cure. If this fails, measure the small voltage that appears on the cathode pins of the output valves in the transmit mode at minimum drive. You should then be able to follow this voltage through the switching and relay wiring to the meter and then find where it disappears.

Computer Monitor Resurrection

Most men like to show off, (I'm not expecting to be deluged with letters from lady readers disagreeing with that!) and we all have our favourite party pieces! At the shop, we sold among other things the odd second-hand computer monitor and occasionally one would be returned with a large 'splodge' of unwanted colour on the screen.

When faced with such a such monitor I would connect it, look at the picture, agree with the customer that all wasn't well and then plug in an electric drill. This was switched on, and while watching the look of surprise or horror on the customer's face, I approached the screen with the drill.

Of course, the picture on the screen went wild due to the magnetic field of the drill. However, as I 'wiped' the screen and then drew the drill away, the unwanted band of colour disappeared, and the monitor was returned in good order.

What happened to cause the problem originally? The answer is that a monitor's cathode ray tube screen is covered with millions of coloured dots, at the back of which is a fine mesh, the 'shadow mask'. This is critically aligned so that the red, green and blue electron guns at the rear, can only hit their own colour of dot.

If the shadow mask, or any part in the vicinity of the tube becomes

Fig. 1: Using a drill can be a useful tool to fix colour 'splodges' that sometimes appear on older, but otherwise still useful monitors. But it is a 'non-contact' fixing method! My screen (shown) survived the drill treatment!

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Fig. 2: One intermittent fault with an FT-747, caused its owner to ask 'How much do you charge an hour Harry?"

magnetised the beam alignment is thrown out, and the beams hit the wrong dots. The purity of the colours is then degraded-hence the coloured splodge.

Early colour TVs were so sensitive to magnetic fields that even the magnetism of the earth upset them. They had to be finally aligned and tiny 'purity' magnets adjusted once the set was installed in a customer's house. More modern cathode ray tube (c.r.t.) TVs and monitors, have an automatic de-gausser built in, which is intended to neutralise any unwanted magnetism. In most cases this is in operation before the picture itself appears after a 'cold' switch-on.

Sometimes the automatic system isn't powerful enough and needs a little help. But as not everyone has a de-gausser in their tool kit, a substitute is required. A powerful mains operated electric drill, has a very strong external magnetic field, which is reversing at mains frequency. If you switch the drill on a few feet away from the monitor and then bring it near to the screen, the tube will be alternatively magnetised north/south, and then south/north 50 times a second.

Gradually draw the drill away, and as the magnetic field reduces, so will the unwanted residual magnetism in the monitor. (A similar idea, on a much larger scale, was used to de-magnetise ships during the Second World War, to stop them setting off magnetic mines)

I must emphasis that whilst this trick has always worked for me, it's only to be tried when all else fails! Don't get too enthusiastic with the drill, and let it come near to the rear of the tube – as it would then be possible to demagnetise some of the purity magnets!

Incidentally, you may think that c.r.t. monitors are 'old hat' nowadays. Despite this, I'm typing this onto my computer while watching using a 19in NEC c.r.t. monitor that I picked up for £15 at a charity shop and I much prefer it to my previous flat screen model, **Fig. 1**!

Power Output Tests

After repairing a rig, one of my final tests was to check the power output. For some reason the FT-901 that I had just finished would only deliver about 65W and I tried a few moves, such as swapping the output bottles but it was no go. I then started checking voltages and they all seemed to be rather low, but there was no obvious reason!

Eventually 'the penny dropped' and I checked the mains voltage. For some odd reason I found that it had dropped to well below 220V – no wonder the power output was low. I managed to step up the voltage using a transformer but after struggling on like this for a few days I gave the electricity supplier a phone call. Within a few hours they had corrected the situation. That was years ago – now I would have nothing to complain about.

As most readers are probably aware, the standard mains voltage in the UK was 240V ±6%. However, there had been moves for many years to standardise the mains voltage throughout Europe, and as a compromise it was decided that the voltage within the EEC would be 230V.

Now while this sounded a good idea, it was likely to be an expensive project. Just think of the tens of thousands of substations that would have to be adjusted, a lot of people were going to have to work overtime, and perhaps in some cases new transformers would be required. But then the bureaucrats solved the problem.

Without the need for a single adjustment, at the stroke of a pen, the mains voltage throughout the EEC became 230V overnight! Their magic? With the stroke of a pen, they merely widened the tolerance to 230V +10-6%! From now on then you can be sure that anywhere in the EEC the voltage will be (or at least should be) somewhere between 216 and 253V. Now wasn't that clever way to solve the problem? Or was it?

Nothing has changed as most of us in the UK are still get around 240 volts and the rest of Europe 220 – but on paper the mains voltages are harmonised. Any new equipment made in, or imported into, the EEC has to be set at 230V and must of course be designed so that it will function – not getting too hot, on any voltage supply within the stated limits.

Note for our Continental friends: Please don't plug your FT-101 set on 220V into a UK mains socket without checking the voltage with a meter first. It might not like having 253 volts applied to it and our friends at Brussels will not buy you a new one!

Intermittent Faults

Let's look at intermittent faults now and here, I was asked "How Much do you charge an Hour Harry?" The question arose, as an FT-747, **Fig. 2**, came in which occasionally went almost dead on either receive or transmit. Touch it, move it, or re-key the microphone and it was then okay then for a few more hours. So, I re-soldered various connections, and several times I was sure that I had cured it but every time I returned it to the customer – within a couple of weeks it would be back again!

Leaving the rig in a 'fridge, or blowing hot air on it from a hair dryer would sometimes trigger the fault. In fact, I eventually managed

to established that the signal was disappearing in the vicinity of the crystal filters.

On the '747 there's a separate board that's mounted over the main circuit board, which looks like something of an 'after thought' and which contains an a.m., c.w., and an s.s.b. filter, along with the necessary diode switching, as per **Fig. 3**. I suspected that something was wrong with the switching, and so I left a meter measuring the voltage at point **X**, which from memory I think was about 1V.

After a few hours the rig went dead, and a glance at the meter showed that the reading had increased by a few volts. An increase of voltage indicated that current was no longer flowing through the switching diodes, and down to chassis via R01 and L01, hence the diodes were switched off, making the set dead. This indicated that R01 and L01 were no longer connected between chassis and the diodes, but of course as soon as I tried to check, the fault cleared again.

A careful examination of the board revealed two things. One that L01 and R01 and also their 'twins' on the other side of the filter were reversed, so that the resistors and not the chokes were at the earthy end of the chain, and two that as they relied on a 'plated-through' connection to make their contact. I suspected the plated-through connection (see later) as being the source of the trouble

I ended up wiring L01 and R01 directly between the pin on J01, and the earth plane of the printed circuit board (p.c.b.), and to make really sure, did the same with L02 and R12. The set never failed again!

So what did I charge? Prices have increased somewhat since I was in business, but I then aimed at around £25 an hour. I reckoned that I had spent around 15 hours on this job. So does an invoice "To soldering and remaking four connections £375 + VAT", sound reasonable, No ? Well I obviously charged a lot less – but as this has since proved to be quite a common fault with the '747, I have been able to recoup my loss by charging other customers with the same fault for my knowledge and experience!

Experience and knowledge are worth money! How about Google? Started by two university students in a bedroom, **it gives away free access to other people's knowledge and experience – including even mine!** By doing so it has somehow managed to become one of the richest companies in the world. It makes you think!

Plated-Through Connections.

Finally, let's take a look at plated-through p.c.b. connections. As you will appreciate, if it's necessary for conductors to crossover each other, this cannot be done using tracks on the same side of a printed circuit panel. To get over this problem both sides of the circuit board can be used (a double sided p.c.b.), but then it's necessary to make connections between the tracks on the opposite sides. There are various ways of doing this – and all of which can cause intermittent problems.

A component such as a transistor or a resistor can be mounted so that its connections are soldered on both sides of the board. This is difficult, the top side of the board cannot then be flow soldered in a bath of hot solder without destroying the components. So it has to be hand soldered, with the risk that the operator will make a dry joint.

Similarly a pin can be soldered into the board to make the connection, but as owners of the FDK-750 found out, this can also result in dry joint problems. The best way, as used on many modern double sided p.c.b.s, is to use plated-through connections. Here the tracks on both sides are connected together through a hole, as part of the circuit board manufacturing process. Even these are not 100% fool proof, (what is?).

Finally, I get quite a few requests for a source of touch-up paint for the older equipment, has anyone any suggestions? Cheerio until next time! ●

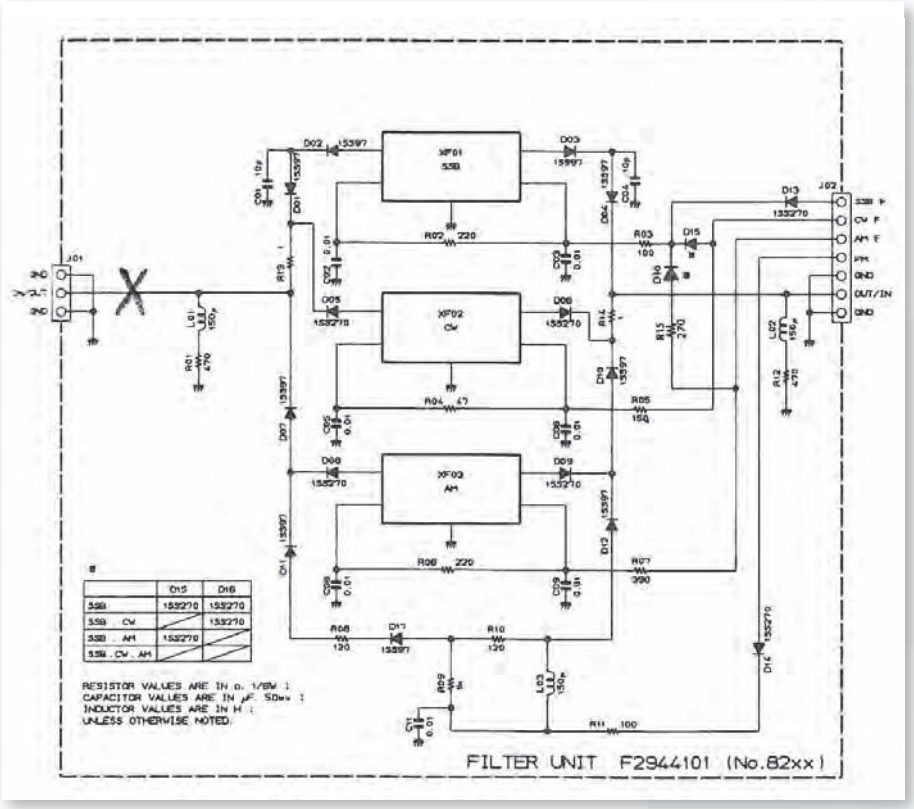

Fig. 3: The area the filter board, that was the cause of the intermittent fault on the FT-747.

Harry & Problems

I like to hear about problems with older equipment, particularly pre-1990 Yaesu rigs. Please E-mail me, (add some radio related term in the subject heading, to differentiate against spam), or write and enclose a stamped addressed envelope. Remember that electricity is dangerous, if you are not familiar with safety precautions you must never work on your equipment whilst it is plugged into the mains. (Switching off at the wall socket does not necessarily make equipment safe).