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FT102
USER GROUP
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USER

G4VBU 10 Brinmead Walk Withywood Bristol BS13 8SF England

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HELLO FROM G4VBU MODS and CONS

Hello again and yes, your Newsletter has arrived at last ! Well what happened ? Over the last couple of months I have been slaving away on various sick FT102s in for surgery. The good thing though is that our faults and cure list has many new additions. Back in late September Jim's Plastic Pig Tours was in action again running Jerry 'W1IDP' all over the U.K. I clocked up 1765 miles during Jerry's visit and even Jerry managed to pick up a very sick FT102 for me to fix when he was staying in good old Cornwall. The Plastic Pig (Reliant Robin) performed marvellously but I never want to see Manchester ever again. At 0130 the M66, M67, M6, M5 and M102 was the best maze I have ever driven on. I saw Liverpool 3 times that night. I must learn Brummy Yono wotimeean Arrie !

NEW MEMBERS

We are still getting new members to our user group, I am sorry for the delay in sending out back issues. If any member has not yet received volume 2 issue 1 and/or issue 2 then please telephone me on Bristol (0272) 781265 between 2130 and 2230.isted below are new members since our last issue:-

G0CEM	Trevor	(Bristol)
G0EOU	Brian	(Bristol)
G0JZF	Nick	(Bristol)
G3HDD	Gordon	(Dorset)
G3BEQ	Derek	(Norbury)
G6STX	Stan	(Marlow)
G0JSO	Rob	(Warrington)
W3BYI	George	(USA)
KB9MZ	Art	(USA)
VK3VF	Bruce	(Australia)
VK1AU	Col	(Australia)
VE3FXX/3	Ron	(Canada)

.....And it came to pass that in the land of Britfol there was much gnashing of teeth. Ye olde FT102 was finding it hard going on a very noisy 14 Mhz QSO with O'LORs aboveth and belowth ! The FT102 is, in my opinion, one of the best transceivers that Yaesu have ever produced. However there is one section of the design that has been badly neglected over the years. While mixer design has improved with the advent of hot carrier diodes, the receiver product detector is still using 25 year old technology (gemanium diodes). The product detector in any receiver is one of the most important sections of signal processing. In the FT102 like most modern transceivers the product detector's function is to remove the audio content from the I.F. (455 KHz input) mixed with just the right amount of carrier (455 KHz) so as to decode SSB or CW signals without distortion.

Some time ago Sean G14PCQ sent me an article that was in QST, that looked at the reason why Drake equipment, that was used in a contest, when compared with a Yaesu FT980, was able to pull in signals that the Yaesu could not separate between strong signals. Having read the article over and over again I decided to investigate the product detector in my FT102. Looking on page 54 (FT102 Manual) on the A.F. Unit circuit diagram you will see the product detector diodes D21, D22, D23 and D24 (1N60 x 4 gemanium diodes), T3002 (4:1 transformer), VR3004 (balance 470R preset pot), and low pass filter C74, R94, R93, C73, note Q18 (2SC1815Y) feeds VR3004 with the 455 Khz carrier and the audio is fed to Q19 (MC14066B) via C72. The MC14066B is a Hex switch and it is used in this circuit to select the audio pass filters for SSB Q22/Q23 and in the CW mode using Q20, Q21 and Q24 (AN6551 APF opamp).

With the exception of the first section of low pass filtering (C74, R94, R93 and C73) Yaesu have made an excellent job in the audio filtering stages. The first section however can be improved by some small changes to component values.

As I am the local FT102 Rig Doctor, I see many Rigs at my QTH and as such I get the chance to compare different makes. The TS430, TS830, and TS930 have all been compared against my FT102 and although I like the extra VFOs on the Kenwoods, my FT102 had the edge on them for pulling in the weak signals with the exception of the 28 Mhz band. I did also notice that when I compared my FT102 against Trevor's (GOCEM), that the back-ground noise on Trevor's Rig was much lower. It was when I later changed my diodes that I found out why that was !

CASE NOTES

The difference between the choice of diodes in the product detector stage are as follows :- (a) Silicon (1N4148 type) : Low priced : Easy to get : Strong signal handling : can't handle low signals .7 volt turn on : Noisy will distort on weak signals.

(b) Germanium (1N60 type) : Low priced : Easy to get : Good Low signal handling .2 volt turn on : Strong signal handling not so good and not easy to match in bridge configuration : Leaky can let through carrier which can remix giving distortion : Bit noisy.

(c) Passivated Schottky (BAR28 or HP5082 - 2835) : Med priced : BAR28 is easy to get (Maplins) : Good Low Signal handling .3 volt turn on : Good Strong Signal handling : Low 1/f noise : Low distortion : Not easy to match : Very fast switching upto U.H.F.

(d) Unpassivated Schottky (Mesh diode HP5802 - 2900) : Expensive : Very hard to

get : These diodes have extremely Low 1/f noise and are ideal for low noise mixing : Very easy to match : Very low distortion. : Can only get them in U.S.A. : Can get them in a bridge package : Very fast switching upto U.H.F.

NOTES: For most of us in the U.K. I can recommend the BAR28 at 48p each but you will need to get at least 6 diodes to match the 4 required. When matching any Schottky diode it is very important that you do not apply the meter tests leads directly to the diode. Always used a 4K7 resistor in series with the positive meter lead and use the OHMS x 1000 range.

For the purist get the HP5802 - 2900 Mesh diodes I would recommend the bridge package. Each single Mesh diode will cost you \$5 each. I am still waiting for mine to arrive ! I do not have any knowledge of the price of the bridge package yet, but I am working on it ! I do have the data sheets for all the Hewlett Packard diodes thanks to KB9MZ Art.

SURGERY

1. Disconnect all leads to rig, turn rig upside down and unscrew bottom cover. Locate A.F. unit (PB-2344), remove all plugs and unscrew the P.C.B. Refer to page 54 of your Instruction Manual for the circuit diagram.

1.1 Locate and unsolder D21, D22, D23 and D24 and replace with your own choice of schottky diodes. It was at this point of time that I noticed that on my board one of the original diodes had been *fitted the wrong way around* ! The 'K' cathode is marked on each diode with a band as is the P.C.B.

1.2 Locate and unsolder R94 (470R) and replace with a 2K2 resistor.

1.3 Locate and unsolder R93 (5K6) and

replace with a 10K resistor. 1.4 Locate and unsolder C73 (10n) and replace it with a 4n7 capacitor.

1.5 Locate and unsolder C72 (10uF) and replace it with a 4.7uF tantalum capacitor. NOTE the + to TP14 !

1.6 Check your soldering and then replace P.C.B. and refit all plugs. 1.7 Take off top cover of rig and keep speaker leads connected, turn rig onto its side, insert mains lead and Ant and switch on rig, set band to 21MHz and allow to warm up.

1.8 Set mode to SSB, Shift/Width to centre, A.G.C. to fast, Switch on marker and tune in dial for max S meter reading. (Note this reading)

1.9 Looking at the S meter reading now adjust Balance pot (VR3004 on A.F. unit) for the best dip on the S meter.

2.0 Turn off marker and tune into a weak SSB station and locate T2008 on I.F. board and turn it anti-clockwise for a reduction in back-ground noise but making sure that the station signal is not reduced.

2.1 Switch on marker and turn dial for max S meter reading. Adjust VR2003 for the S meter reading noted in 1.8 of this page.

2.2 Refit top and bottom covers. You should now be able to make the following observations :-

(a) Turn volume to 9 O' clock unplug antenna and note how much less back-ground noise you have. Plug in antenna and yes the noise is there but thats Sky noise not internal rig noise !

(b) Tune in to good 20 over 9 SSB signals and go up and down and note that they don't seem to splatter so much now !

(except Italy) (c) The received audio seems much better (except for Italy or U.S.S.R. or G0E0U*) this mod will not get rid of 'OLARS' or Bad modulation. (d) Switch over to 28Mhz and yes your receiver is much more sensitive now. Schottky diodes don't attenuate at higher frequencies !

* Sorry Brian I could not resist that one ! (Ed.)

HELPLINE

For technical information you can telephone Jim at Bristol (0272) 781265. The best time to phone will be between 2130 - 2230 (Week-Days) or 0930 - 1130 (Saturdays).

T.V.I and R.F.I

One of the most common problems with T.V.I. is faults within the T.V. receiving equipment. The FT102 is an exceptional transceiver with regard to not putting out unwanted sprogs due to the fact that its P.A. stage is well filtered. It was pleasing to look at the output of my FT102 using a spectrum analyser. I did however note that if you plan to use a transverter connected to the R.F. out socket (P7) then you must use a low pass filter as the output comes from T36 (R.F. board) without any low pass filtering. This low level output is full of harmonics and sprogs and on a spectrum analyser shows that if you were to drive any transverter from this, Boy you would have problems ! So be warned ! With regard to any T.V.I. complaint I would recommend the following procedure:

1. You can hardly expect your neighbour to understand that their T.V. or video equipment is faulty. So telling them that their equipment is 'Crap' will not go down too well!

Use diplomatics, tell them how you had to study hard to get you licence. Take your time to explain about keeping your Log, that your station is open to inspection by the D.T.I. (F.C.C. in the U.S.A).

2. You must put yourself over as some one who will sort it out. Get as much information from them as possible. Take your log book in with you as this will help you to see what band or bands are giving them interference.

3. One of the first things to check is their T.V. coax feeder. Take off the coax plug and look at the screen for any signs of corrosion (copper brade green or black) and if this is the case then water has got into the coax. It will have formed a diode junction down the feeder. Most people neglect this, you often find that the coax feed has been up for many years. Tell them that this is the problem and offer to replace it. At a cost of about `3.50 in the U.K. it is best that you pay for it ! don't expect them to pay it's your hobby that will suffer if you don't sort it out !

4. If the coax looks ok then the next stage is to fit a high pass filter to their T.V. and get an Amateur friend or your wife to look at the T.V. while you make a test transmission. If after fitting the filter the interference is worse then this usually indecates that the T.V. antenna is at fault. If the dipole of the antenna is one-ended then its feed impedance will be wrong. Your filter will have an input line impedance of 75R any mismatch at the coax will show up as an increase of interference.

5. Until you sort out this problem keep off any band that is giving your neighbour interference. Remember that if you can't be bothered to sort it out, that neighbour may be the one who objects to the planning permission for your 60ft tower !

BURN IN

It is that time again to put in a new set 'BOTTLES' (tubes) in your FT102. So what ! it's easy init ! ... is it ? read on O.M.

In the good old days of 'BOTTLES' when you ordered a new set of valves for you transmitter the manufacturer would 'Burn in the valves' in sets before sending them out with a certificate listing the 'spec'. Sadly like the Cats whisker 'Burn in' is a thing of the past. So What was the advantage then ?

Well lets say that we have a new car, if when we picked it up from the dealer we drove it like a bat out of hell, how far would we get before it seized up ? ... Get the picture ! We run it in not run it out ! So don't put in 3 x 6146Bs in your FT102 then and run at full power but 'Burn them in'.

PROCEDURE

1. Fit new 6146Bs, switch on rig, switch on heaters, leave rig on 7MHz receive for about 10 minutes, then Tune up for 50 Watts, take dip and turn down drive to 25 Watts. Leave mode switch in 'TUNE' position and leave 'MOX' switch on, let rig transmit a carrier for 3 minutes.

2. Switch off 'MOX' and switch in 'LSB' position and adjust bias pot on Rect A Unit for 75 mA. Switch in 'TUNE' position, 'MOX' switch on, then Tune up for 75 Watts, take dip and turn down drive to 50 Watts. Leave mode switch in 'TUNE' position, leave 'MOX' switch on and let rig tranmit a carrier for 2 minutes.

3. Switch off 'MOX' and switch in 'USB' position and readjust bias pot on Rect A Unit for 75 mA. Leave rig on receive for 10 minutes. Turn band switch on to 29MHz, tune up for 150 mA IC meter reading and adjust P.A Neutralization as for (2) on page 40 (Instruction Manual).
4. For the next 8 hours of Transmissions keep tune up IC down to 250 mA (3.5MHz to 24.5MHz SSB) and 175 mA (28MHz SSB). After about 8 hours of transmissions then you can tune up for 350 mA (3.5MHz to 24.5) and 300 mA on 28MHz (SSB) YES 350 mA ! Tune up and during SSB transmissions IC will peek at 220 mA for 180 Watt P.E.P. output (3.5MHz to 24.5MHz).
5. When running CW on (3.5 to 24.5) keep max IC below 300 mA. On 29MHz FM Tune up to 200 mA and keep F.M. carrier below 195 mA. On 28MHz SSB you can tune up for 300 mA and run at 125 Watt P.E.P. with no problems.

NOTES: No matter what power you wish to run at, it is best always to tune up for max safe I.C. at 350 mA (3.5MHz to 24.5MHz) or 300 mA (28MHz SSB) or 200 mA (29MHz FM). The 'Tune up procedure' is not always fully recognized by the user. The purpose of this procedure is to adjust the transmitter output impedance to the correct input impedance of your antenna (Load).

Don't assume that your antenna impedance is 50 ohms, as it will be more likely to be between (40 to 85 ohms) regardless of a good S.W.R. reading. The 'Dip' at max power will indicate that your output impedance is equal to your input (Load impedance) and taking a final 'Dip' at a lower power level will not give the correct output impedance. If you want to run QRP then use the processor and adjust your output power with the drive control. It's very easy to run at 1 Watt SSB this way.

Letter From Japan

After some discussion on the UK 40m Net about recommended levels of Ic to run on various Bands, a query was sent to Yaesu, which brought the following reply (G14PCQ)

We recommend restricting plate current to around 200 mA during RTTY, FM or long transmissions in any mode. Power output at this level will vary with tube condition and band; being lower on 10m. Operating with higher plate current will of course provide more output, but at the expense of reduced tube life. Therefore the best way to handle this might be to make a short call with high power (if necessary), and then to drop back to 200 mA or less when connection is established.

Very truly yours,

YAESU MUSEN CO., LTD.



YAESU MUSEN CO., LTD.

Edward J. Coan

Edward J. Coan, Manager
Public Relations Department

FAULTS

IDENT:	FAULT:	REMEDY:
T23001	No TX and Max tune up current at 75 mA. Also RF. preamp not working.	Check Pin 7 of 12BY7A on R.F. board for plate volts and if missing then change L15 (1mH R.F.C.)
T23002	Very poor sigs when R.F. preamp switched on.	Change Q01 and Q02 (2SK125Y) on R.F. board.
T23003	Can't get any HV or FM discriminator or Compression reading on Meter 1.	Change the 10n capacitor that is fitted across Meter 1.
T23004	When using R.F. preamp the preselect control needs to be in diferent position to its transmit position.	Change L15 (1 mH R.F.C.) on R.F. board. If the R.F.C looks cooked then also fit new 12BY7A.
T23005	Noise blanker not working.	Check D53, D54, D55 and D56 on I.F. board for dry joints.
T23006	Intermittant or no Frequency display.	Check J05 (P58) on counter board for dry joints.
T23007	H.F. whistling noise as main tuning dial is turned every 25 KHz or so.	Unsolder C18 on counter board cut legs shorter and resolder flat on underside of board.
T23008	After nice long over on SSB bias reading creeps up and fuse blows.	Thermal Runaway Old Boy 1 fit new set of 'Bottles' and refer to 'BURN IN' procedures.
T23009	Very poor FM receive.	Change Q08 (MC3359)
T23010	No CW sidetone.	Check all components around Q05 (2SC1815Y) phase shift oscillator on AF board for dry joints.

ADVERTS

SP102 at £45, FV102DM at £150 and 3 matched GEC 6146Bs plus 1 12BY7A at £30 from Les West 5 Fairview Drive, Colkirk, Norfolk.

Millions of People every day ... Pick up a tin of Beans and say ... Where's the damn Tin-opener !

I do hope that all our members had a very happy Christmas and very nice start to 1990. It looks like being a very good year for DX with cycle 22 still climbing. 73s de Jim G4VBU.

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