HELLO FROM G4VBU

MODS and CONS

.....And it came to pass that in the land of Briftol 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 beloweth ! ..... 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 transcevers 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 GI4PCQ 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 (G0CEM), 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 diference 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) Gemanium (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. Disconect 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 21 MHz 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 background noise you have. Plug in antenna and yes the noise is there but thats Sky noise not internal rig noise !

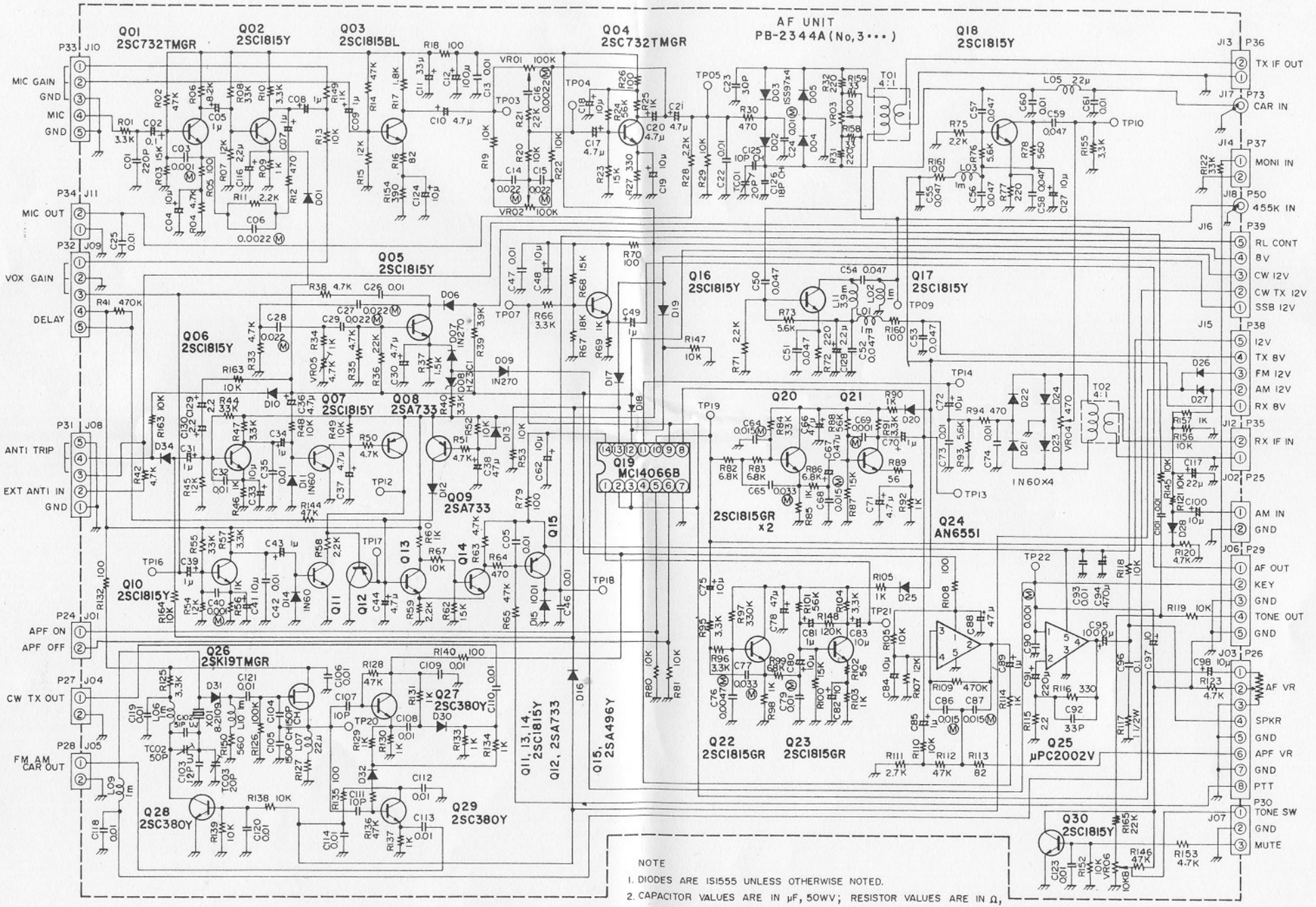
(b) Tune in to good 20 over 9 SSB signals and go up and down and note that they don't seem to splatter so much now ! (except Italy) (c) The received audio seems much better (except for Italy or U.S.S.R. or G0EOU*) this mod will not get rid of 'OLARS' or Bad modulation. (d) Switch over to 28Mhz and yes your receiver is much more sensitive now. Schottky diodes don't attenuate at higher frequencies !

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

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 analysor 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!



NOTE

1. DIODES ARE 1SI555 UNLESS OTHERWISE NOTED.
2. CAPACITOR VALUES ARE IN μF, 50WV; RESISTOR VALUES ARE IN Ω, 1/4W; AND INDUCTOR VALUES ARE IN HENRIES UNLESS OTHERWISE NOTED.