In the Shop with Harry Leeming G3LLL

Harry G3LLL explains what the 'Sorta Balun' is as well as looking at the many variants in the Yaesu FT-101ZD series of rigs.

The FT-101ZD series was available in many different versions.

Most antenna tuning units (a.t.u.s) are unbalanced and have only a coaxial output. Feeding a length of 300Ω ribbon by fitting a conventional balun can cause problems as I explained last month. This is where **Frank Ogden G4JST**'s, 'Sorta Balun' comes in. Basically, it consists of a coil of coaxial cable, used to form a choke.

As shown in **Fig. 1**, the technique chokes-off r.f., which would otherwise flow down the outside of the coaxial cable and also prevents the earthed antenna tuning unit (a.t.u.) unbalancing the antenna by pulling one side of the feeder down to ground. This arrangement is cheap and avoids placing a large electrical stress on a conventional balun, by operating it at a high standing wave ratio (s.w.r.).

Commercial versions of the arrangement described above can be obtained; they are known as choke baluns and in place of the series inductance formed by a coil of coaxial cable, they incorporate ferrite cores. They work just as well but you have to pay for them!

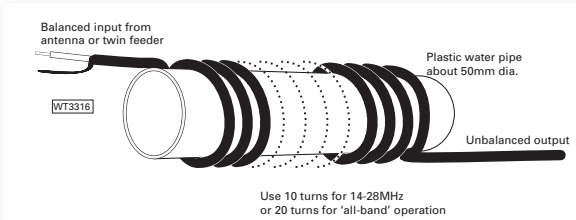

Fig. 1: Frank Ogden G4JST's design for a 'Sorta Balun'.

Which Rig Is Which? – The FT-101 Series

When the Yaesu FT-101E was due for replacement, a few FT-101Fs were made. I've never seen one of these, as they only seem to have been released in the USA but as far as I can gather these were a re-badged version of the latest FT-101E. The real replacement for the whole FT-101 series was the FT-101ZD.

The FT-101ZD is basically an economy version of the FT-901, which I talked about last month. While the power level is still just over 100W output, a slightly lighter mains transformer is fitted. Originally, there was also no memory, peak or notch filter, automatic keyer, a.m. or f.m.

The number of plug-in circuit panels was reduced, and a large portion of the circuitry was built on a large intermediate frequency (i.f.) panel. The radio frequency (r.f.) performance was, however, very similar to the FT-901 and it was an instant success.

Over the next few years, Yaesu gradually incorporated improvements and with each consignment, I can well remember wondering, "What have they done this time?" The model number never changed but to try and keep tabs unofficial suffixes were added by the late **Milton Lowens**, who ran the International Fox Tango Club. (The current reformed FT Club is at **http://foxtango.org/foxtango001.htm**)

The FT-101ZD MkI came out in 1978 and didn't include a.m. or the new 10, 18 and 24MHz bands. The FT-101ZD MkII came along a little later, with an a.m. position added to the mode switch. Whether one of these units actually included an a.m. board or offered it is an optional extra, depended on how it was ordered. So, don't presume that it's included if you purchase a second-hand unit. The a.m. reception is received via the s.s.b. filter and so while the transmit quality is okay, the received a.m. audio is a little muffled on these units.

The FT-101ZD MkIIA is quite desirable, as the new 10, 18, and 24MHz bands are added to this version (although wire links had to be removed to activate them) and the improved r.f. board and counter unit, as found in the FT-902 are incorporated.

The FT-101ZD MkII is the last and the most popular model of the series. As well as the new bands, an f.m. or a.m. option is included and also a not very effective audio peak and notch filter.

The FT-101ZD model can be identified by looking at the mode switch. one position is marked AM/FM. As with the MkII, whether an a.m., or an f.m. board is fitted, depends on how it was originally ordered.

All FT versions were available at lower cost fitted with an analogue dial, as in the FT-101Z. At one time, the counter was available as an optional extra but these have long since sold out. (Everyone and his uncle seems to be after them, sorry I can't help with sourcing these).

Valve Tester

As some types of power amplifier (p.a.) valves become difficult to obtain and are increasingly very expensive, many people are hunting through their own and their friends' junk boxes and coming up with valves of doubtful history. Simply plugging-in any old 6146, 6KD6, or 6JS6C and the like, into a valuable rig can be a bit risky, as an internal short circuit could result in a lot of damage.

It should also be noted that p.a. valves

are usually operated in parallel and need to be approximately matched, so that one does not do most of the work and soon burn out. To solve this problem, many years ago, I put together a very basic GO/NO-GO tester and quite a number of people have asked for more details and copied it. My sample, which I still use, is so rough that I dare not publish a photo! So, I am including a picture sent to me by **Ron G0GJE** of his unit (**Fig. 2**).

The circuit is shown in **Fig. 3** and is extremely simple. Holders for 6GK6, 6JS6C, 6146 and any other 6.3V power amplifier valves that it you test, are wired in parallel and fed with the necessary voltages. It is, of course, essential to check the connections carefully as not all valves that use the same holder are wired to the same pins.

First, a known good valve should be tested; this acts as its own rectifier and indicates on the meter. Other good samples of the same type of valve, should give readings within 15% of this. The tester does not indicate any exact parameters but if two valves of the same type and make are tested and give readings that differ by less than about 5% they can be considered suitable for operation as a matched pair.

Please remember that the voltage on the top cap of the valve is potentially lethal, **so keeping one hand in your pocket is a must when testing**. The on/off switch used should also be of the spring-loaded type, so that the high voltage supply cannot accidentally be left on!

Turning the Power Down

Since the advent of the novice licence and then the foundation and intermediate grades, there has been a constant stream of 'L-plated' operators who want to keep the rules but are not too sure as to how to go about operating the average 100W rig at or below the 10 or 50W levels. As far as Morse (c.w.) operation is concerned there's no problem. You just need to make sure you have an accurate power meter, either separate or in your a.t.u., then, with the rig connected to a dummy load, press the key down and adjust the drive control until the power meter indicates your licensed power or less. When operating on s.s.b., however, it's not quite so easy.

The licensed s.s.b. power output of a transmitter is its peak envelope power (p.e.p.). This only occurs for a tiny fraction of a second on voice peaks; normal power meters don't read it accurately and even those with a p.e.p. setting are often 'way out'. The p.e.p. output of a transmitter can be accurately monitored with the use of an oscilloscope but the complications involved mean this method is not to be recommended.

Some modern solid-state transmitters are fitted with a front panel r.f. power control that sets the a.l.c. system and this simplifies the solution to the problem. When using one of these it's normally only necessary to set this control in the c.w. mode for the licensed power output and the s.s.b. output should then be okay. To double check the setting, turn the microphone gain to about halfway, whistle into the microphone with one pure tone and you should then only see your licensed output, no matter how loud you whistle!

Older solid-state transmitters normally have a front panel drive control that will adjust the output in the c.w. mode but that has no effect on the s.s.b. power. You can, of course, reduce power by turning the microphone gain down but when doing this it's extremely difficult to monitor the output and you will lose considerable 'talk power' as the a.l.c. system will not operate.

With this type of older transmitter the best move is to consult the service manual and then to locate the internal a.l.c. The alignment instructions will advise that this control should be set to give 100W (or whatever other power the rig is rated at) as part of the alignment procedure. It must **not** be set to give more output, as this could cause expensive trouble but it should be set to give 50 or 100W, to ensure that the licences conditions are kept. If this sounds too complicated, follow the second of the two procedures for valve rigs given below.

Valved rigs are difficult to effectively turn down the power on, unless provision for this was made in manufacture. The Japanese have had 20W novice allocations for many years and so some rigs were available in low power versions. While these were not generally exported, it's sometimes possible to find the 20W settings on some rigs.

To find the 20W settings may involve reducing the h.t. to half voltage by re-tapping the secondary of the mains transformer or by rewiring a voltage doubler arrangement. One of the output valves will also need disabling, this is best done by removing the screen grid voltage. Removing one valve is not an option, as this will throw out the alignment and in some rigs will disconnect the heater supply to the other valve. Unfortunately, I do not have any exact data on the above, so you will have to do a little experimenting.

If none of the aforementioned solutions are suitable, the simplest approach is to use a speech processor. This needs to be some kind of clipper, like the one fitted to the FT-101ZD or an external unit such as one of the Datong units.

With the rig set-up into a dummy load and the clipper on, whistle into the microphone. As you do this, set the output of the clipper so that no matter how loud you whistle, the power does not exceed the licensed power. If you are using the rigs internal clipper the output control may be labelled 'drive', otherwise, with an external clipper the rig's microphone gain will control how much output from the clipper goes into the transmitter.

That's all for this time, see you next month. ●

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Harry's waiting to hear from You!
As I am now retired, I like to hear about problems with older equipment, particularly pre-1990 Yaesu rigs. If you want a direct reply please remember to send me your E-mail address or enclose a stamped addressed envelope. Send your letters to the address above.

Remember the mains supply is potentially lethal. Unless you really know what you are doing, always pull the mains plug out, do not just switch off at the wall socket, when working on equipment.

Fig. 2: Ron G0GJE's version of G3LLL's p.a. valve tester unit.

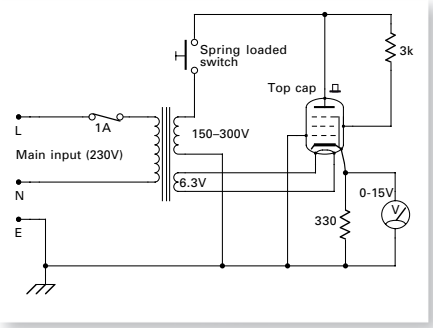

Fig. 3: The GO/NO-GO p.a. valve tester circuit.