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Classic FRG-7000

Chris Lorek G4HCL steps into the *Valve & Vintage* 'shop' to give some handy advice and tips on the Yaesu FRG-7700 h.f. receiver.

In my *Buying Second Hand* column in the July 2011 issue of *PW,* I covered the 'classic' Trio 9R-59DS h.f. receiver. I've subsequently been asked by a number of readers if I could also feature a more modern, albeit more expensive, h.f. receiver with good performance and a digital readout, that's readily available on the second-hand market.

In particular, several readers have specifically asked me if I could cover the Yaesu FRG-7700 receiver. Your wish is my command!

Excellent History

Yaesu have had an excellent history with general coverage h.f. receivers. Starting with the FRG-7, then came the FRG-7000 (I still have one of these here in my shack), and in 1978 they launched the FRG-7000's successor, the hugely popular FRG-7700 which lasted up to 1986 when it was succeeded by the FRG-8800.

At an original selling price of around £250-£300 for the basic receiver, an FRG-7700 can now be obtained in the UK second-hand for a typical price of between £100-£200 depending on the receiver's condition and any accompanying accessories that are 'thrown in'.

A faulty receiver (see later for typical faults and how to easily fix these!) can be obtained from around £50 upwards.

Receiver Features

The FRG-7700 is an h.f. communications receiver covering 150kHz to 30MHz in 1MHz band ranges, selected by a click-step 'MHz' knob together with an analogue tuning dial to select the frequency you wish to listen to.

A digital display above the analogue dial gives frequency readout to the nearest 1kHz. The reception modes include amplitude modulation (a.m.), c.w. (Morse), lower sideband (l.s.b.), upper sideband (u.s.b.) and frequency modulation (f.m.), again manually selected using a front panel selector knob.

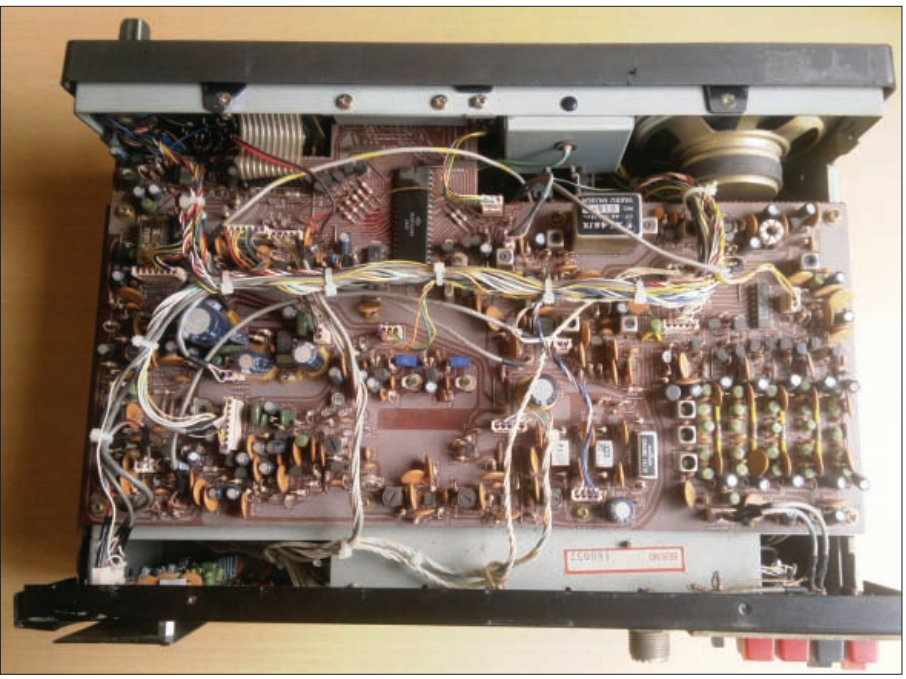
Don't expect a remote PC control facility however – you'll need a more modern receiver for this! The receiver's serial number will tell you the set's age, the first digit gives the last digit of the year, e.g. in the case of my receiver it's '2' which indicates 1982. The next is a letter which indicates the month of manufacture; 'A' for January, 'B' for February and so on, in my case it's 'H' indicating August.

The next three numbers are the manufacturing batch followed by the final three numbers indicating the serial number of the radio from that batch. The receivers hardly differed at all over their lifetime, with only minor changes, such as a felt ring coupling of the dial mechanism to the frequency scale in early receivers which was changed to a spring in later versions.

The receiver operates from an a.c. mains supply, a rear panel voltage selector changing between 100-120V and 220-240V operation. If you're in Europe and buy your set from the USA, make sure you change the voltage setting before plugging in!

It would also be an idea to check the rating of the fitted rear panel fuse, this should be 0.5A for 230V operation and 1A for 110V operation; it may have been changed to a different rating by a previous owner. A rear panel option adds 12V d.c. operation but not all sets have this – check if this is important to you before your purchase.

Separate antenna connectors are



An inside view of the rig. No surface mount devices (SMDs) here!

fitted on the rear panel for short wave and low frequency broadcast band antennas. An SO-239 coaxial connector is wired in parallel with the 'SW/BC' and 'E' (Earth) connectors, and a separate 'BC' connector allows use of a long wire for the l.f. broadcast bands.

If you just want to use one antenna for all bands, then a useful hint is to simply add either an external wire link, or a 100Ω resistor, between the 'SW/BC' and 'BC' connectors.

A rear panel 'DX/Local' switch allows an attenuator to be switched in to help prevent signal overload. Additionally, there's a front panel variable attenuator control which reduces the gain of the receiver's internal pre-amplifier.

Other front panel controls include an f.m. squelch, a mode switch with three a.m. bandwidths of; 2.7, 6 and 12kHz, Fast/Slow automatic gain control (a.g.c.), NB (Noise Blanker) On/Off to reduce the level of pulse type interference, a display dimmer, and clock controls.

The receiver has a 12 hour clock display together with a clock timer facility with 'On', 'Off', and 'Sleep' time settings. Front panel sockets are fitted for headphones and a 'Record' output. The built-in clock timer also controls start/stop remote contacts on the rear panel accessory connector for a tape recorder. There's also a rear panel connector for an external speaker, and an 'Acc' connector with a.g.c. output, receiver mute input, 11V d.c. output and earth connections.

Internal Options

The most desirable internal option to look for in an FRG-7700 in my opinion is the MU-7700 memory unit. This unit bolts onto the rear of the set's housing and extends the depth of the centre section of the otherwise flat rear panel of the receiver. It provides the facility of 12 memory channels which are selectable from the set's front panel, as well as a 'fine tune' facility.

Don't confuse Memory option with the f.m. unit, which is on a rectangular plate that's mounted entirely flush with the rear panel. All receivers have the front panel memory channel selector plus 'M', 'MR' buttons and a 'M Tune' knob which adds a 1kHz 'fine tune' facility to the receiver, but these are all inoperable unless your receiver has the optional memory unit fitted.

To identify what's what, simply take a look at the rear panel and see if the unit is fitted. If, instead of a 'bulge' there's a blanking plate on a flat rear panel, then there's no memory option fitted. In my set, there's a hole and a set of multi-way leads where the memory unit would have been connected! The memory option uses a set of three AA sized batteries as a memory back-up, these are fitted on a battery unit on the underside of the radio beneath another plate.

However, if you find your set does actually have a memory unit fitted but it isn't holding memories, then remove the lower plate and take a look at this battery bank. The cells may indeed have gone flat!

Other internal options include the DC-7700, which is simply a rear panel connector and internal plug-in lead to add the facility of 12V d.c. operation and an FF-5. This is a low-pass radio frequency (r.f.) filter to reject signals above 500kHz to help prevent cross-modulation and intermodulation from strong broadcast stations above 500kHz.

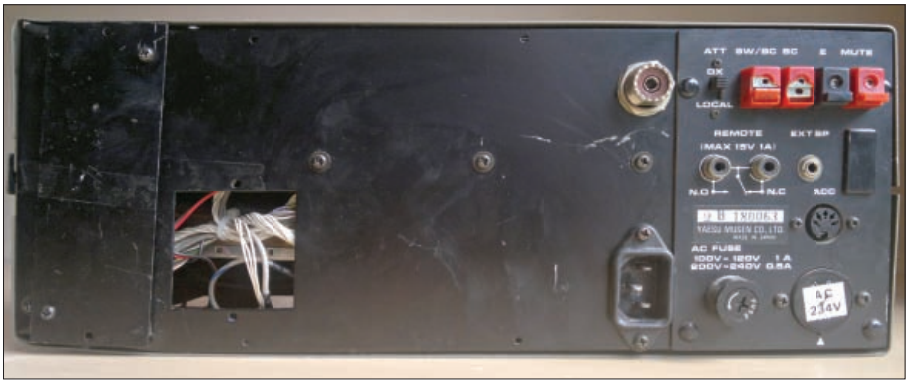
External Accessory Units

There are three external accessory units that are available for the FRG-7700, housed in slim matching set-top boxes. The FRT-7700 is a compact h.f. antenna tuner to give greater selectivity, a selectable 0-60dB attenuator is also fitted to help prevent overload from strong signals.

If you're not fortunate in having an external antenna, then the FRA-7700 is an active set-top antenna unit with a variable pre-amplifier gain control – it's fitted with a 1.2m telescopic whip together with band and tuning controls.

Finally, for adding v.h.f. coverage to the receiver, the FRV-7700 is a converter for receiving three v.h.f. bands. **Note:** Be aware that there are six different models of this converter, so check which one if any is offered along with the second-hand FRG-7700 you're considering buying.

Model 'A' covers 118-130, 130-140 and 140-150MHz, Model 'B' covers



The classic 'rear view'. Simplicity in the extreme!

50-59, 118-130 and 140-150 MHz, Model 'C' covers 140-150, 150-160 and 160-170MHz. Model 'D' covers 70-80, 118-130 and 140-150MHz, Model 'E' covers 118-130, 140-150 and 150-160MHz, and Model 'F' covers 118-130, 150-160 and 160-170MHz.

You'll be very fortunate if you find a complete 'line-up' of FRG-7700 set-top units offered along with a receiver! But if you do and you don't require one or more of the set-top unit's you'll certainly find a ready second-hand market for the units you don't want!

Distance Buying

If you're buying from a distance rather than collecting personally or from a club sale or radio rally, the FRG-7700 weighs 6kg and measures 334 x 129 x 225mm. The optional memory unit and battery pack adds around 0.5kg to this plus an extra 50mm or so to the set's 225mm depth.

As usual if you're asking the seller to package and send you the receiver, ensure it's well protected against rough handling by the carrier. The most likely part to be damaged is the large front tuning knob so ensure this is well padded!

Common Problems

If the receiver has either been either well-used or placed in store for a while, the most common operational problem will be intermittent contacts on the switches and in particular the volume control. A careful spray of electrical contact cleaner (not an oil based lubricant!) to these while the control or switch is moved back and forth will often effect an instant cure.

Should you find your receiver seems 'deaf' then check the 'DX/Local' attenuator switch on the rear panel next to the antenna connectors. This can sometimes also become intermittent so again a quick spray of switch cleaner here can work wonders. Do use common sense and make sure you unplug the receiver from the mains before you delve inside!

A minor irritation rather than a problem, is dial illumination, where a dial lamp has burnt out with age. These are small 12V 100mA types with long wires; you can easily replace these with a similar type if you're handy with a soldering iron, or just put up with the lack of illumination.

If your FRG-7700 is fitted with a memory unit and it doesn't work, check the backup batteries as I mentioned earlier, many former owners forget about these!

Other Problems

It's worth mentioning mains hum, distorted s.s.b and 39MHz display problems.

I've been reliably told by an experienced repair technician who's had a multitude of FRG-7700s on his bench – that the bridge rectifier unit on the internal mains power circuitry in the receiver is under-rated and that it often fails, causing either a hum on received signals and typically distorted s.s.b. and c.w. audio. This problem can also give an indicated display of '39MHz' due to low voltage.

If your receiver is suffering similar problems, simply replace the bridge rectifier, pin for pin, with a more substantially rated type. It's the black plastic-encapsulated block with four leads adjacent to the large electrolytic capacitor in the mains unit printed circuit board, which itself is next to the mains transformer. You can use any type of bridge rectifier rated for at least 2A and a voltage of around 50V or greater, or use four similarly rated diodes.

Memory Frequency 1kHz Error

A problem that has been acknowledged by Yaesu is a 1kHz error in frequencies recalled from the memory function. To correct this you'll need to delve into the memory unit with your soldering iron and wire cutters – you'll also need two 1N60 Germanium diodes or similar and a small 3.3kΩ resistor.

First of all, cut the p.c.b. track between pin 11 of Q12 (74LS192) and pin 12 of Q04 74LS123). Fit one of the diodes between these two points, with the diode's cathode (the 'bar' end of the diode) to Q04 pin 12 and the anode (the other end of the diode!) to Pin 11 of Q12. Then connect the other diode between pin 11 of Q12 and pin 13 of Q11, with the cathode (again the 'bar' end of the diode) to pin 13 of Q11. Finally fit the 3.3kΩ resistor between pin 11 of Q12 and +5V, which you'll find at pin 16 of Q12.

No Tuning?

Do other controls such as audio, clock, mode switch, etc., work on the receiver but you find it doesn't tune using the front panel tuning knob? Fortunately, another acknowledged problem by Yaesu was a faulty batch of the phase-lock-loop IC Q38, which is an MC145104. It's only lot No. 7944 that was reportedly affected and this number will be marked on the IC beneath the type number, but this could also be a failure on other sets.

You can replace this by first cutting the legs off from the existing IC, then de-soldering the individual remaining legs from the p.c.b., then replacing the IC with a similar type. This simple low cost repair can make an otherwise 'scrap' FRG-7700 receiver into a fully working one!

Better FM Audio

Many FRG-7700 owners have reported f.m. reception as being muffled due to the low frequency response of the filtering circuitry on the f.m. board, which also affects data decoding of packet radio, SSTV, etc., on f.m. (The f.m. board is mounted on a removable panel on the inside of the rear panel of the receiver).

To give a higher frequency response simply cut away one leg of C13, which is a small blue tantalum capacitor on the f.m. board. Then bend this capacitor body away so that the cut leg contacts no longer make contact (or simply remove the capacitor itself). Purists might like to replace this capacitor with one of 10nF in value to simply filter out any remaining 455kHz intermediate frequency (i.f.) signal.

Technical Documentation & Mods

I hope the article helps in identifying a potential semi-modern h.f. full-coverage receiver that's readily available, and the options you should look out for in an FRG-7700 that's offered on the second-hand market. If readers would like a copy of the FRG-7700 User Manual (32 pages), Circuit Diagrams (4 pages), Technical Service Manual including troubleshooting charts (114 pages). Just send me £2 in coins taped to a card or a PO/cheque for £2 payable to myself together with your postal address and I'll provide the sleeved CD, CD mailer and return postage. My contact details are given in this article.

There are also plenty more mods which I haven't room for here including the excellent 15 page FRG-7700 *Survival Guide* by **Wim Penders PA0PGA**, all in PDF form on a PC-readable CD (at over 31Mb it's unfortunately too much to print or E-mail) I'll be pleased to oblige by post in return for a sleeved blank recordable CD plus with a stamped self-addressed return mailer (remember to add sufficient postage to each, typically 'large letter' stamps of 75p each).

That's it for my bi-monthly feature this time. As before I've plenty of ideas lined up for future *Buying Second-hand* columns, but if readers would like a specific type of equipment covered then please do get in touch, I'm all ears!

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