

Buying Second-hand

This month Chris Lorek G4HCL gives some advice and useful tips on a popular 'all-round' h.f., v.h.f and u.h.f. base station transceiver.

Some months ago I detailed a couple of 'all-round' mobile h.f./v.h.f./u.h.f. mobile transceivers, the Alinco DX-70 series and the Icom IC-706 series. Since then I've been asked by several readers to look at an economic base transceiver for these bands that's readily available on the second-hand market. Indeed, Stuart Atkinson G3YPS in particular asked me if I could cover the Yaesu FT-847, including details on getting it to cover the 'top end' of the 7MHz (40m band). So here goes!

In the FT-847, Yaesu have come up with a carry-around sized set giving multi-mode transceive operation on h.f., 50, 144 and 432MHz (6, 2 and 70cm). Additionally, it also includes full-duplex satellite capability between band ranges, a cross-band repeater facility is also built in. On transmit it provides 100W output on h.f. and 6m, 50W on 144MHz and 432MHz, and with receive

coverage across 100kHz -30MHz, 36-76MHz, 108-174MHz and 420-512MHz.

Yaesu FT-847 UK Models

Models of the FT-847 supplied to the UK market also had 70MHz (4m) transmit capability added. (I'll discuss this a little more about this later).

Unlike earlier h.f./v.h.f./u.h.f. multi-mode rigs on the second-hand market the FT-847 has true switchable narrow and wide frequency modulation (f.m.) channel spacing (12.5kHz and 25kHz spacing) operation. For satellite enthusiasts it has several 'satellite memories' with Doppler shift track-tuning between bands.

Yaesu launched the FT-847 back in 1988, and I was pleased to be able to perform the UK's first ever technical review on the transceiver following a 'preview' review a few months earlier. Even though at the time I had a line-up of transceivers from h.f. up to 23cm, I was so impressed with the FT-847 that

I've had one in my shack now for over 12 years.

At the outset I must say that it wasn't (and still isn't) a 'top flight' h.f. transceiver. Indeed, my FT-990 dedicated h.f. transceiver knocked the spots off the FT-847 regarding h.f. performance. Instead in my opinion it's an excellent 50, 144 and 432MHz base transceiver, with h.f. 'thrown in' for good measure. (Although the h.f. performance can be significantly improved with additional optional filters if the owner wished).

When the FT-847 first came onto the market the price tag was a hefty £1695. However, nowadays should be able to pick up a second-hand unit for rather less than half that price now.

The receiver has an intermediate frequency (i.f.) shift and switchable attenuator, slow/fast automatic gain control (a.g.c.), i.f. noise blanker and radio frequency (r.f.) amplifier, an audio-based DSP (Digital Signal Processor) system is also included. This offers variable low and high-cut audio filtering for speech modes and selectable 25, 100, 200 and 400Hz audio bandwidths on c.w. There's also a DSP noise reduction mode, plus an automatic digital audio notch with the capability of notching multiple tones at the same time.

Ceramic i.f. filters are used for all modes, with available bandwidths of 2.3kHz (s.s.b./c.w. and narrow a.m.), 9kHz (a.m. and narrow f.m.) and 15kHz (f.m.). Optional plug-in Collins mechanical filters are also available (more of this later). On transmit, an r.f. speech



Chris Lorek's contact details are;
Chris Lorek G4HCL
PO Box 400
Eastleigh
Hampshire SO53 4ZF
Tel: (01772) 978229
E-mail: g4hcl@rsgb.org

Yaesu FT-847



Rear panel view of the FT-847.

processor for s.s.b., plus a built-in c.w. keyer are fitted, an audio monitor also lets you hear what your transmitted signal sounds like at any time.

Satellite Operation

The built-in satellite mode gives you full-duplex cross-band transceive, i.e. simultaneous transmit and receive between bands. Additionally, the push of a button allows the operator up-link (transmit) and down-link (receive) frequencies to 'track' each other. As some satellite modes use inverting transponders, it's also possible to select 'reverse tracking'; the sub-tune knob also gives the operator the capability of manual adjustment of your uplink.

Dual frequency displays are provided, and there's a dedicated satellite 'memory' variable frequency oscillator system. These can store up to 12 operating modes into different memories, e.g. for different satellites and modes

Rear Panel Connectors & Remote Operation

On the rear panel of the transceiver are separate antenna sockets for h.f., 50, 144MHz and 432MHz and you can select the h.f. socket to also be used for 6m if you wish. For example if a compact h.f./50MHz yagi or multi-band vertical antenna is used. The dedicated 'Tuner' socket interfaces with Yaesu's FC-20 optional external tuner, or their ATAS-100 auto-tuning antenna system.

The 'Stby' socket carries separate transmit switching lines for each band range for use with separate linear amplifiers and masthead pre-amplifiers. Additionally, an RS-232 CAT socket allows remote control using one of the many readily-available Amateur Radio logging and rig control programs.

Note: I personally use *FT-847 SuperControl*, finding this to be a great asset to using the set at home. This also (uniquely) allows the transceiver to be used as a full dual-way cross-

band repeater rather than a 'one-band to another' one-way repeater. This is a very useful for remote operation around my house – allowing me to use a tiny 2m or 70cm hand-held to work through to another band!

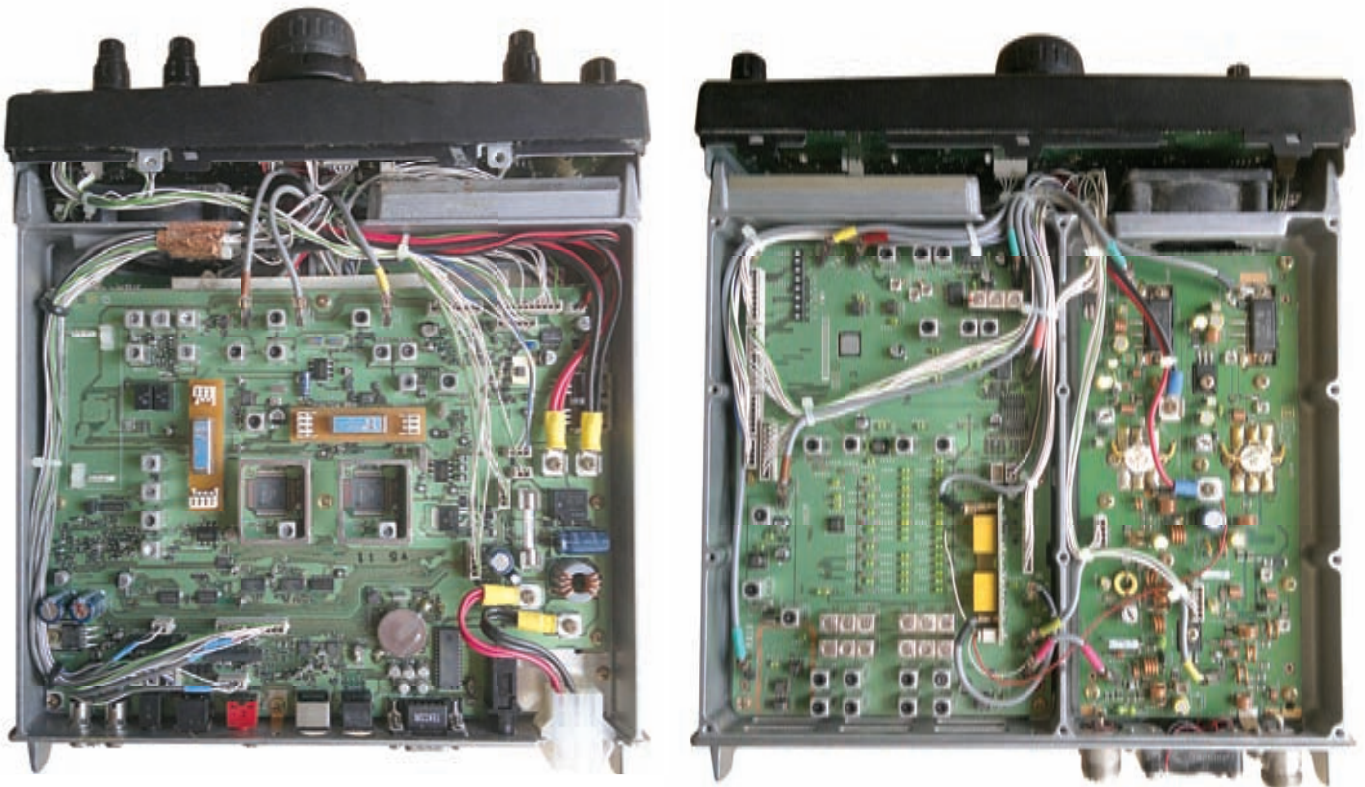
High Frequency Improvements

For s.s.b. and c.w., the transceiver is fitted with a pair of 2.3kHz bandwidth 455kHz ceramic i.f. filters on plug-in boards. One is used for transmit and the other used for receive. Two filters are employed because in satellite full-duplex mode both filters need to be used simultaneously and whether or not the transceiver is operating in satellite mode the receiver filter is always used in the receive path and the transmit filter always in the transmit path.

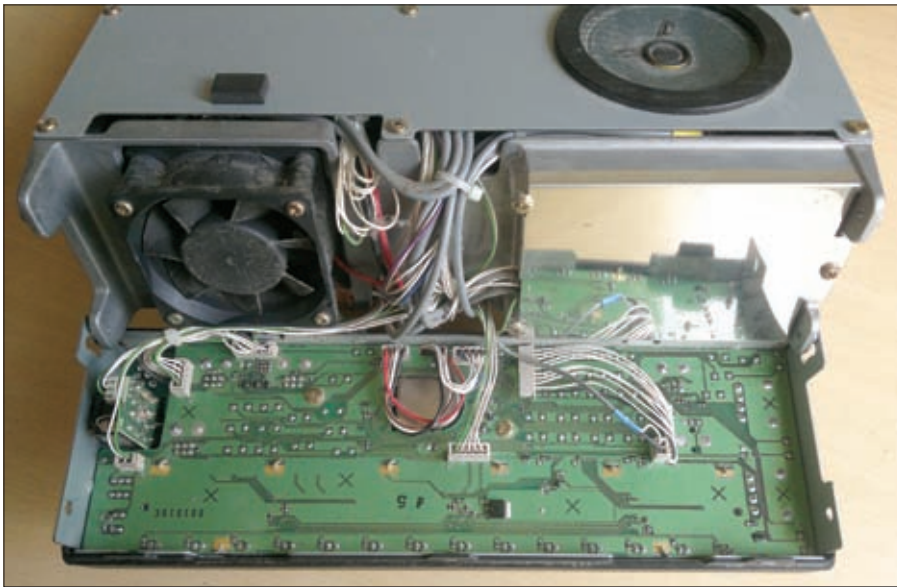
There's the facility of replacing one or both ceramic plug-in filters with optional plug-in YF-112S-02 Collins mechanical 2.3kHz bandwidth filters. Additionally there's also an empty space for the addition of an optional plug-in YF-115C Collins mechanical 500Hz bandwidth c.w. filter on receive.

On s.s.b. and c.w. receive (compared to the fitted ceramic filter) the Collins mechanical filter will provide a much deeper suppression of interference to the side of the current operating frequency. However, the -6dB 'nose' bandwidths of both the ceramic and mechanical filters on s.s.b. are the same at 2.3kHz (the c.w. filter, of course, being much narrower).

The use of an optional mechanical filter on the s.s.b. transmit side has the advantage of providing a very flat, natural-



Internal views of the FT-847.



The front panel unscrewed.

sounding frequency response which has very little ripple to give a more faithful reproduction of the operator's microphone audio. Also, if you're using data over air, such as PSK, the low group delay of this filter should provide a higher data throughput. Note: My transceiver still has the ceramic filters fitted – but I'm on the lookout for some mechanical filters!

Transmit Modifications

Next, I'll describe the 1.8 and 7MHz band modifications – providing the 'official' transmit extension modification from the manufacturers themselves for wide-band h.f. settings, enabling owners to expand the h.f. coverage of the FT-847 to 500 kHz per band. My thanks go to Yaesu for permission to reproduce this. The modification will also extend v.h.f. and u.h.f. coverage and will modify some other settings as shown in the accompanying table.

Important note: Don't forget it's the responsibility of every licenced Radio Amateur to ensure they don't transmit outside of our permitted bands! These modifications will also clear any memories and individual changes to settings – so make a note of these before you carry out this procedure. Here's how!

First, disconnect the transceiver from any power source and then remove the top and bottom covers. Next, turn the transceiver upside down to locate the jumpers. All normal precautions to protect against static electricity should be followed. To extend the transmit ranges, JP1001, JP1002 and JP1006 should be shorted and JP1003, JP1004, JP1005, JP1007, JP1008 and JP1009 should be open circuit. **Leave all the other jumpers as they are.**

Next, re-fit the covers, plug the power supply back in and then while

pressing the 'Fast' and 'Lock' buttons on either side of and just below the main v.f.o. knob, switch the set on. The modification can be reversed by re-linking the original jumper settings and again re-setting the transceiver on switch-on. So it could be worthwhile taking a note of the original jumper settings.

The frequency ranges following modification are;

Transmit coverage;

1.80 - 2MHz
3.50 - 4MHz
7 - 7.50MHz
14 - 14.50MHz
21 - 21.50MHz
24.50 - 25MHz
28 - 30MHz
50 - 54MHz
140 - 154MHz
420 - 470MHz

Receive Coverage;

100kHz - 30MHz
33MHz - 56MHz
76 - 108MHz
108 - 54MHz
420 - 470MHz

The default channel spacing on v.h.f. is set at 12.5kHz and for u.h.f. 25kHz, and default repeater shifts are set to 100kHz for h.f., 500kHz for 6m., 600kHz for v.h.f. and 1.6MHz for u.h.f.

Operation On 70MHz

The UK models of the FT-847 had 70MHz transceive enabled. However, very early models (i.e. with serial numbers commencing '8', signifying 1998) reportedly had a firmware limitation, which was later addressed by Yaesu.

Later 1988 models, and those with from 1999 onwards, are reportedly quite okay, i.e. serial numbers beginning

with '9' onwards. When I first tested an early 1998 model I found that on 4m the transceiver gave around 35W output but that it drew over 18A from my power supply. "Something's wrong!" I thought.

Two other very early FT-847 users in the UK who I talked to at that time also found the same. A test with my spectrum analyser showed that the transmitter was putting out a 'hedgehog' of out-of-band spurious emissions with the worst spuri being just 9dB below the 4m output power level. A check by another FT-847 user who also had a spectrum analyser revealed the same.

So, if you're an owner intending to use the '747 on 70MHz I'd advise you first perform a quick check with an r.f. power meter to ensure you're putting out around 40W or more on this band – and with a current drain from your power supply of less than around 12A. If your interest is 4m operation, check this before buying if at all possible, or if you're buying from a distance – ask the seller to do this and to verify it's okay.

On-Off Power Switch Failure

Apart from rear panel fan noise, which isn't a fault but a bit of an annoyance (more of this later), a common failure I know of with FT-847s is the front panel on-off power switch. After around ten years of everyday use mine went intermittent and I'd often have to fiddle with it to get the transceiver to switch on. Opening the transceiver up showed this was a tiny two-pole changeover switch, with only two of the contacts used to switch the radio on.

Examination of the circuit diagram show this switches positive d.c. voltage to the coil of an internal power relay. This coil sensibly has a back-EMF protection diode fitted to prevent switch burn-out due to voltage peaks. Even so, I guess years of use had just worn the switch out due to current inrush to the coil, and a search showed that this was a common failure with other FT-847s around the world.

Rather than trying to replace the switch, which is a major job involving front panel dismantling, I simply used a pair of short wires to bridge the two poles of the switch solder contacts on the front panel p.c.b. – so that both of these would be used in parallel, see the accompanying photo. Yes, I've subsequently seen another photo on a 'mod sheet' with much tidier soldering than mine!

To get to the switch solder contacts you'll need to remove the top and bottom lids, then the four side screws holding the front panel to the body, and then simply hinge the front panel

forward. This 'doubling up' of the switch contacts would I feel be a useful 15-20 minute preventative measure against subsequent failure if you buy or own an FT-847.

Fan Noise

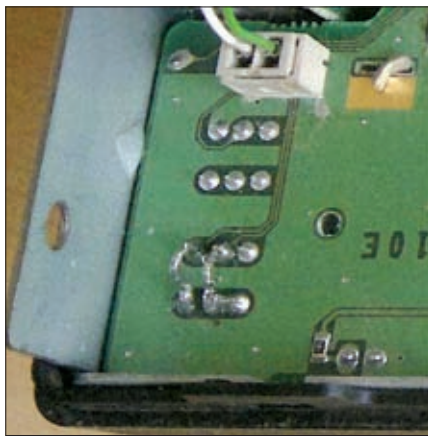
The transceiver has two fans, a larger controlled-speed internal one behind the front panel and a smaller rear panel fan – which runs continuously and is rather noisy for its small size. I simply unplugged it to save my ears when using the radio on receive, see the accompanying photo and I know that many other FT-847 users have done the same.

I've never had any problems of the transmitter power amplifier (p.a.) heat-sink overheating, although if you use the transceiver for long 'ragchews' on maximum power I'd advise against disconnecting this. Or more usefully you could add a small rear panel toggle switch to enable it when needed, or instead internally wire it to the p.a. fan which operates at a low speed on receive and at a higher speed on transmit.

However, if you're buying second-hand, take a quick look inside the radio in case an earlier user has disconnected this, you might like to reconnect it! Earlier users may have alternatively modified the wiring to this or possibly fitted a thermostatic switch, again a quick look inside will reveal all.

Other Modifications & Improvements

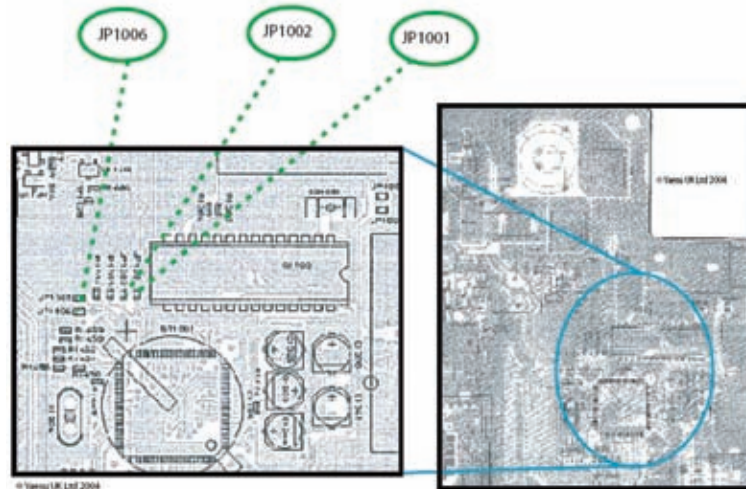
There are numerous other documented modifications for performance improvements, including 4m mods and enhancements, fan modifications, volume control mods, alignment, an SSTV interface and so on. If readers would like a copy of these together with the user manual, technical service



The On/Off switch linked.



The real panel fan disconnected from J4009.



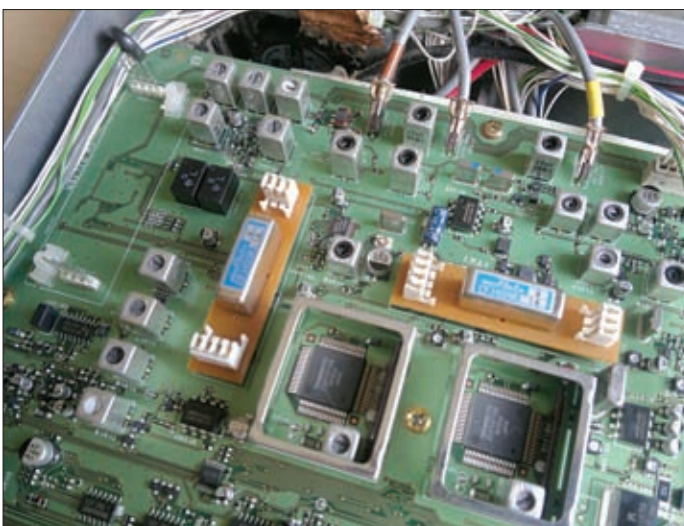
Expansion link locations.

manual, schematic diagrams etc. all in electronic PDF format on a data CD (the total file sizes, are too large to print or E-mail – I'll also include the 54Mb sized FT-847 SuperControl program on the CD) 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).

Alternatively just either send £2 in coins taped to a card or a PO/cheque for £2 (made out to me) together with your postal address and I'll provide

the sleeved CD, CD mailer and return postage. See below for my contact details.

That's it for my bi-monthly feature this time. My last column on the Trio 9R-59DS h.f. receiver brought a tremendous response from readers – including scores of requests for further information. And I thank you for your many kind comments. I've plenty of ideas lined up for future *Buying Secondhand* columns, but if readers would like a specific type of equipment covered then please do get in touch, I'm all ears! Cheerio for now.



Optional filters may be plugged in.



FT-847 SuperControl.