THE ER-40-A; A FRENCH 88 SET

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A couple of years ago, I came across an example of the ER-40-A, a French manpack set which does not turn up very often in this country. From the outside, it has no obvious similarity to any other breed of set but, as later explained, it seems to be derived from the British WS 88.

The ER-40-A dates from the mid 1950s. As far as I can make out, it was developed for the French Air Force - at least, this is what the cover of the French handbook would suggest. There is also a logo on the identification plate which encloses the initials STTA (Service Technique des Télécommunications de l'Air) between a stylised pair of wings. This seems a bit curious, as the handbook clearly envisages the equipment in a ground to ground role, but I suppose that it may have been used by airborne troops.

The identification plate, which carries the name of the manufacturer (unusual in the UK) also promises a guarantee (even more unusual). To cap it all, the handbook actually gives the cost - 161,748 (old) francs!

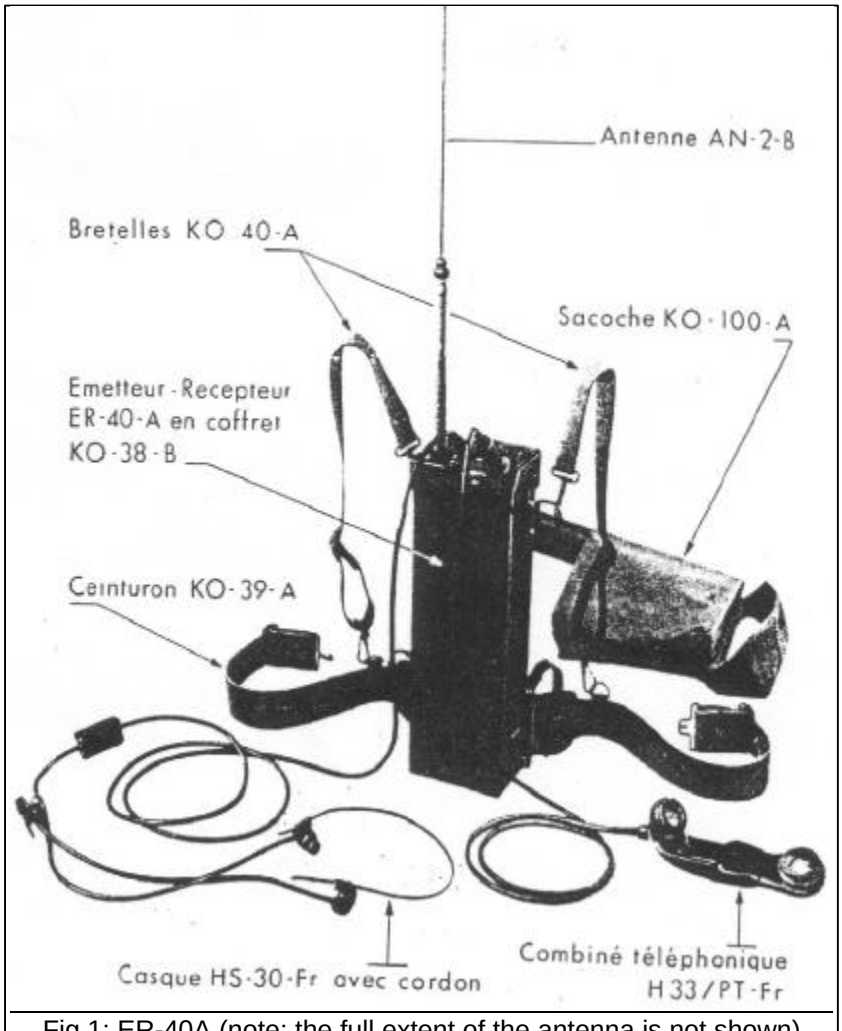


Fig.1: ER-40A (note: the full extent of the antenna is not shown)

Basic description

The ER-40-A is a VHF transceiver with four crystal controlled channels in the range 37 to 40 Mc/s – see Fig.1.

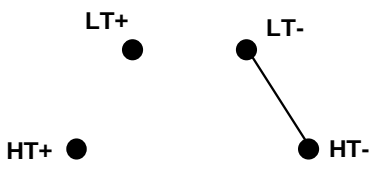
The top panel carries all controls and sockets. The case is pressed steel and has rather unusual proportions, being about 14" long and 5" by 3 ½" in cross section. Belt fittings are provided at the lower end of the case and webbing loops at the top.

The transmitter and receiver are carried on a single chassis and the battery is fastened to the far end. Changing the battery requires the whole unit to be withdrawn from the case. Consequently, it is not hermetically sealed, although the internal components in my set did not seem to have suffered much as a result.

The circuit uses 12 B7G battery valves. Six are common to the receiver and transmitter; two are used only in the receiver and four only in the transmitter. With the exception of the PA valve (a 3A4), they all have 50mA filaments.

Power requirements

Power is supplied to the chassis via a four-pin plug, which is similar to the larger type used on combination batteries for 1950s valve portables. The connections are as follows, viewed from the pins:



The requirements are 1.5V LT and

105V HT, the latter being a bit higher than that used on the WS 88. Based on my own measurements, the power consumption is roughly:

	Receive	*Send*
LT at 1.5 volts	400mA	620mA
HT at 90 volts	15mA	41mA

The power supply can take the form of a dry battery; the type is PS14, which I have not seen. It was about half the size of the WS 88 battery, and must have had a correspondingly shorter working life.

As a French built set, however, the ER-40-A would not have been complete without some sort of an inverter. This is a vibrator pack, which directly replaces the dry battery[1]. It should include three silver-zinc accumulators, giving 4.5V, for the vibrator and a further one to provide the LT supply. The latter is fed through the coil of a relay which starts the vibrator when filament current is drawn.

The accumulators were missing from my set, and would probably have been useless anyway, but judging from the space allotted to them, would have had a very high ratio of capacity to volume (energy density is the technical term, I think). Those supplying the vibrator were rated at 15Ah; the LT accumulator was 5Ah. At a 1:9 send:receive ratio, fully charged accumulators were expected to give 10 hours service.

I imagine that the use of silver-zinc accumulators was driven by the very limited space available. One does not come across them very often and their main drawback is presumably cost - the only other example I have met in the radio field[2] is the Soviet R-126, where such things may have been worked out on a less than free market basis! I am no expert on this topic and would welcome a contribution from someone who is more knowledgeable

With an external supply of 4.5V, my vibrator pack did just about work, although its output voltage was rather low: 65V on RECEIVE - I did not bother with SEND. In that state it drew about 0.7A. With equipment in better condition, I assume that the figure should have been rather higher, but don't know what it ought to be[3].

Design

Inside, the chassis layout is immediately recognisable as that of the WS 88, give or take a few components. There are some variations, however. The most obvious of these is the omission of the two 1A3 valves which the WS 88 uses in the discriminator circuit. These are replaced with solid state diodes - not an entirely new innovation, if you think of the Westector used in the WS 38, but nevertheless an example of technological development between the mid 1940s, when the WS 88 was designed, and ten years later. Apart from anything else, this modification considerably reduces the LT power consumption, as each indirectly heated 1A3 takes no less than 100mA.

One other minor difference is that the ER-40-A uses a 1L4 as the final AF amplifier, rather than a 1S5. This may have been done in order to reduce the number of different types of valve.

A less obvious departure from the WS 88 is in the local oscillator. This works on the basis of multiplying the fundamental frequency of the crystal by four (taking the second harmonic from the oscillator, and doubling that) rather than six (third harmonic, doubled).

With an IF of 3 Mc/s (the same as that of the WS 88) and using the crystals on my set as an example, the arithmetic works out as follows:

		Frequency (Mc/s)	
Channel	*Crystal*	*LO*	*Signal*
1	8.925	35.7	38.7
2	8.750	35.0	38.0
3	8.625	34.5	37.5
4	8.575	34.3	37.3

These frequencies are in the same general band as the WS 88B, which operates from 38.01 to

[1] A vibrator pack for the WS 88 was developed in the early 1950s, but not put into service (see *Wireless for the Warrior Vol 2*).

[2] They are used in missiles, I believe, where space and weight would also be major considerations.

[3] Simply working back from the capacity of the accumulators and the service life between charges, one would expect 1.25A and 3.75A on RECEIVE and SEND respectively.

39.70Mc/s. None of the channels corresponds exactly, although Channel 2 is pretty close to Channel H on the WS 88B[4].

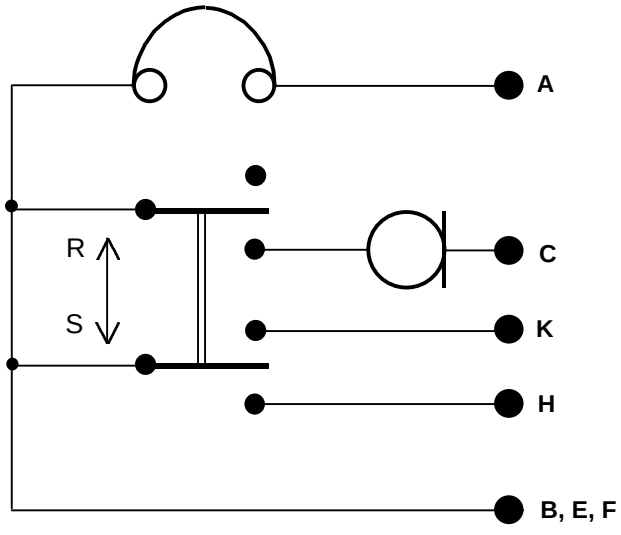
Controls and headgear arrangements

Externally, the top panel of the set is completely different from that of the WS 88, although it is functionally the same. Most noticeably, there is a single switch which combines the on/off function with that of channel selection: a good simplification in theory, but possibly less of an advantage in practice. As with the WS 88, there is no provision for varying the AF volume, nor is there a squelch function.

The headgear connections are completely different. There are two possibilities - a standard US U-79/U 10 pt socket and an extra jack plug for headphones such as the HS-30.

The 10 pt socket provides connections not only for the headphone and microphone, but also for the send/receive switch. **Beware**, however: its wiring is not the same as that on American equipment. Only the French variety of the H-33/PT handset will work.

As far as I can see, the connections must have been as follows:



In addition, pin J is connected, via a 1M resistor, to the grid of the limiter valve. This was apparently used for rebroadcast purposes, although I am not sure how: the arrangement seems more to do with biasing the limiter than with providing an IF output.

It is quite easy to make up a substitute lead, but you will need to remember that the pressel switch carries a fairly heavy current, especially on SEND, and the use of a normal microphone cable may result in a considerable voltage drop.

There is one other alteration from the WS 88 which is worth mentioning in this context. On that set, the pressel not only switches over the LT supplies but also changes the operating conditions of the limiter. On RECEIVE, the valve is designed to work on a very low anode voltage, in order to improve its limiting function. On SEND, the pressel shorts out part of the resistance in the anode circuit, thus increasing the voltage. Presumably the relative strength of the signal from the master oscillator is the reason for this, although I haven't worked it out. The ER-40-A, however, seems to do without this feature: it would be interesting to have it properly explained.

Comparison with the WS 88

I have long felt that the WS 88 was unjustly neglected. True, it is of limited appeal to the amateur and is rather uninteresting in terms of knobs that you can play around with! However, I see no reason in theory why it could not be made to work on 6m - and believe that this has been done. I also understand that both the WS 88 and the ER-40-A have been converted to 10m by members of the Surplus Radio Society in Holland (where the ER-40-A is relatively common), which is possibly an easier process.

But the real interest of the WS 88, at least to me, is in its design. It is difficult to fault this: compact, robust and reliable, based largely on standard and well tried components. Ergonomically, it scores well and in my view better than the ER-40-A. The only slight criticisms are the annoyingly dangly pressel

[4] I started by assuming that the rather odd frequency of 38.01Mc/s, used in the WS88, came about from the desire to use a crystal frequency which was a round number – 5835kc/s, in that case. But that logic does not seem to apply to some of the other channels.

switch[5] (not found on the ER-40-A) and possibly the portage arrangements. As noted by Murray McCabe, in his recent article on the A40, the WS 88 was not entirely convenient if the operator had to lie on his front. The ER-40-A was meant to be carried on the operator's back: due to its length, chest portage could have been rather inconvenient even when standing upright.

Compared with its predecessors, I think the WS 88 would have been a revelation to the user. It certainly was to me when we switched to it at school, having previously used the WS 38 in that sort of role. Indeed, I have always thought that the claimed ranges of a mile or so, depending on country, were unnecessarily conservative. In my experience, it compared well with the WS 18, although lack of interference had something to do with this. And I never tried it out in a built up area (let alone a jungle!), which might have been rather more of a test.

Performance of the ER-40-A

By contrast, however, I have heard and read some rather unflattering remarks about the ER-40-A. I am not sure if these simply reflect opinions of its interest to amateurs (even if they lean towards historic equipment) or are actually based on service use.

The latter would not altogether surprise me, however. While the specified technical performance of the ER-40-A is - naturally - very similar to that of the WS 88, it is based on technology which was a decade old by the time it entered service: indeed, at just about the time we were replacing the WS 88 with the A40. The design compromises, referred to below, may also have had an effect.

The ER-40-A as a derivative

There are quite a few well known examples of sets which have been developed on the basis of another nation's design: the WS 31, from the BC 1000, is an obvious example. But by and large the ancestry is clearly visible, and changes are usually confined to matters such as headset connections.

The ER-40-A, however, goes much further than this. The designer has taken the basic chassis, and built a rather different radio around it.

I am not sure that the process was all that successful. The most important design change is the inclusion of the power supply in the same unit - perfectly normal, of course, in other cases, but because the original chassis was not designed to be used in that way, limiting the practical size of the power supply and thus the time in service between battery changes. The resulting compromise is also rather ungainly in its physical proportions.

The final question which arises is whether the WS 88 was actually the starting point. As far as I know, it was indeed a British design, but so many of our other sets have actually been developments of other (almost invariably US) sets, that one just has a nagging feeling that the ER-40-A and the WS 88 may share a common ancestor. Is any reader able to confirm or deny this point?

Acknowledgements

My thanks are due to Louis Meulstee and Bob Warner, for the information which they have kindly supplied.

Apart from that, these notes are based mainly on what I have been able to deduce from my set, to the extent that I could do this 'non-invasively' - in other words, without unsoldering things in order to trace the circuit diagram. Any further information would be gratefully received, should any reader be able to provide it.

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[5] One item of equipment, not often found and I suspect not often used, was a strap designed to hold the pressel to the left hand wrist; but I doubt if it made much difference.