Ailunce HS-2 1.8MHz to 432MHz SDR Transceiver

Ailunce is a relatively new name in the amateur market. So I looked forward to testing this new transceiver.

I've been aware of the Ailunce HS-2 transceiver for a little while. Ailunce, a Chinese manufacturer, wanted to design an SDR transceiver for the amateur market. In this article I will look at what you can do with the transceiver and how it performs in day-to-day operation.

The review period had a bit of a false start. When the transceiver arrived, I connected it up eagerly but could not receive any signals. I thought perhaps I had missed something, but after an hour or so, trying various parameters, I'd still had no luck. It would transmit fine, but no receive. I contacted Chris Taylor at Moonraker, who'd kindly lent me the review model, to discuss the fault. A replacement unit was quickly on the way, with Chris having diagnosed the original unit as faulty.

The HS-2 arrived well packaged, in a plastic carrying case, along with a microphone and power lead. Taking the rig out of the box, the first impression is of a well-built unit. The aluminium case has a pleasant finish.

The front panel is fairly small and quite 'busy' with a large number of buttons but a nicely sized display. Powering the unit up from 12V (you can use anything from 5 to 32V DC), the set goes through a start-up routine, checking what options and extra units have been installed. I was happy to find that the replacement review rig was receiving just fine as I tuned across some of the HF bands.

Once powered up, the display is quite easy to read although quite small. The waterfall display works well, showing adjacent activity. There's an S-meter as well as power and SWR meters. The power meter did not seem to be calibrated as the readings it gave did not correspond to my shack power meter. The selected filter is indicated along with many other features.

In contrast to the nicely substantial main unit, the microphone is rather lightweight and feels plasticky.

Ailunce is a relatively new name in the amateur market. The HS-2 is an SDR transceiver.

Getting on the air

One of the first things that caught my eye on the HS-2 was the CW decoder. Although I spend a lot of time on digital modes, I enjoy CW too and I'm always looking for ways for newcomers to Morse operating to 'dip a toe in the water'. CW decoders don't do as good a job as a well-trained ear, but if they help a novice CW operator enjoy the mode, it's all good as far as I am concerned. A few experiments tuning across 40m and 20m showed that like many decoders, the HS-2 is very sensitive to how the CW signal is tuned in. As you might expect, it did better with strong signals and machine-sent Morse. Even then, accuracy was maybe around 50-60%. The HS-2's CW decoder might help you decode a call or two, but I don't think you'd want to rely on it. If you want to 'do' Morse-by-ear better, by the way, have a look at CWops CW Academy programme (https://cwops.org/cw-academy/cw-academy-options/).

There's a CW keyer built into the rig and there is a 3.5mm jack plug provided on the back of the rig for you to plug your key or paddle into. To set the keyer up as you wish, long press the Band button and you will find the CW menu. You can adjust sidetone volume, keyer speed and CW delay. There's a training mode, so you can use the HS-2 as a practice oscillator! Curiously, if you are in CW mode and hit the PTT on the microphone, the keyer sends a string of dots.

Data modes

With its low power output (5W or so) the HS-2 lends itself to data modes operation, so I decided to try it out on FT8. This proved to be very simple indeed, although the manual suggests that the HS-2 will only work with computers running the Windows 10 operating system. This sounded rather limiting, so I checked online and quickly found some details of how to use the HS-2 on Linux (https://www.ailunce.com/blog/How-to-configure-WSJTX-for-Ailunce-HS2-on-Linux-System). There is a suggestion that it should work with OS X but I couldn't find much detail when I looked quickly.

The front panel is fairly small with a nicely sized display.

(which delighted me with 8W), but the audio was very muffled with virtually no high-end. In fact, he said, and I didn't take it amiss, that it sounded like I was talking through a sock! Testing on a monitor receiver, the SSB audio also lacked the clarity I would have liked. I am not sure whether this is down to the microphone supplied with the HS-2 or the signal processing within the rig.

into the DFU mode required to update the firmware. The instruction manual and a video both said that you need to press the band and power buttons at the same time. I may have been missing some finer point of this instruction, but I could *not* make it work, so I was unable to upgrade the firmware. I tried this on both the original and replacement units, with the same issue. I am perfectly prepared to assume that this was me doing something wrong, but I'm also working on the basis that if *I* have problems with something, some of you might do so as well.

Fortunately, my shack computer runs Windows 10, so it was just a case of running a USB cable from the HS-2 to the computer. No need for separate audio connections. Plugging the USB cable to the computer will set up a virtual COM port. You can then configure WSJT-X (or JTDX). The HS-2 emulates the Yaesu FT-817, so select FT-817 as your transceiver in WSJT-X. You should be able to select the HS-2 in the Sound dialog for both In and Out. You then need to set up the CAT interface, which will point at the virtual COM port set up a moment earlier.

All of this was simpler than it may sound, and I quickly had the HS-2 talking to the computer and decoding FT8. As it happened, the 6m band was open around Europe with a nice Sporadic-E opening and I quickly worked T77C and HB0WR running the 5W from the HS-2 to a vertical aerial, along with several other European stations. Switching to 20m, I quickly made some more European QSOs on FT8 as well as being heard in the USA, not bad with the 5W to a rather ancient Butternut HF6V vertical.

10MHz is a great band for both CW and FT8 if you're running low power, so I switched the HS-2 to 10MHz and had a listen. Everything seemed good, so I decided to call CQ – only to be confronted with a message saying '10M-disable'. I had a quick look in the firmware to see if this was something that could be switched on, but it wasn't. It seemed odd to me that the 10MHz band had been disabled, as I can see the 10MHz band is available in China. I wondered whether the intention had been to provide a facility to disable the 10 *metre* band, but there had been confusion in the implementation of the feature. Assuming that this is a mistake, it would presumably be easy in future of the firmware for 10MHz transmit to be enabled.

SSB/AM

Although I did not spend much time operating on SSB or AM, I thought I would try a CQ call on 3615kHz on AM. Steve, GW1XVC replied straight away to my call and said that the signal was strong enough

Receive filtering

Receive filtering, although not continuously variable, is relatively flexible and reasonably adequate for the majority of band conditions. I must admit, when I was listening to the 80m AM activity, I enjoyed the ability to widen out the filters and enjoy the quality of the audio.

Built in ATU and VSWR meter

The HS-2 has a built in ATU, which operates between 1.8MHz and 54MHz. It claims to be able to match impedances between 16.7 and 150Ω. Assume then that your antennas are going to need to be a fairly decent match (say around 3:1 or better) and the ATU on the HS-2 will bring that down to 1.5:1 or thereabouts. The HS-2's ATU is not going to be good at matching most long wires, for example. To operate the ATU, you can short press the Tune button. If it is able to tune the antenna you'll see a green T on the top line of the display. If it fails to tune, the T will go grey. Short press Tune again to come out of tuning mode. If you want to use an external tuner, then a nice trick is to press the • button, which sends a carrier, allowing you to tune an antenna manually.

Band change

The facility to change band was rather quirky. Most of the time it would work fine, but occasionally I would select, say, 430MHz and the display would change to 2GHz (which the receiver doesn't cover). I experienced the same effect from time to time on some of the HF bands too. Although this was inconvenient, I could still change band using the Up/Down keys to change the frequency.

Upgrading the firmware…

I thought I'd better see if I could update the firmware to the latest release, as very often there have been developments whilst the rig has been in the supply chain and it's good (usually!) to have the latest and greatest firmware installed. Try as I might (and I spent a lot of time on this), I could not get the HS-2

VHF/UHF FM operation

The HS-2 boasts VHF/UHF capability, so I decided to connect up the V-2000 vertical again and try the rig on the local repeaters. My first impression was that the rig was rather insensitive on 2m and 70cm, as signals seemed poorer than expected. That impression was rather false though. I had to go into the RF menu and switch a preamp on (note that you can't just leave it switched on when you are operating on the HF bands, as you will probably find the receiver swamped). Having done that and tweaked the RF Gain setting, the 70cm repeater, GB3SP and the 2m repeater, GB7PD were much more like the signals I would expect.

Setting up the different receive and transmit frequencies for the repeaters and the CTCSS tone was not difficult. The problem came when I looked to save the parameters into a memory. It was a rather fundamental problem: there are no memories on the HS-2! I quickly asked Chris Taylor about this and he tells me that it is planned for a later version of the firmware. As it is, though, you cannot save a repeater's configuration, so you will have to set up the split and CTCSS tones each time you want to use the repeater.

Undaunted, I put a call through the 70cm repeater GB3SP and Martin, GW3XJQ kindly gave me a critical report that the audio was rather thin-sounding. I switched to Wide FM in the hope that it would improve the level of deviation, which it did to some extent. Speaking closer to the microphone improved things further, but the general impression was that the audio was 'OK' but when I switched to my normal shack rig for FM, a Yaesu FTM-400XDE, I think Martin breathed a sigh of relief. The same was true on receive. GB3SP, even with the RF gain control peaked and the preamp on, was noisy. Switching the aerial to the FTM-400XDE, GB3SP was a comfortable S7. I wondered whether these

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The rear panel of the HS-2 has a number of connections, see text.

issues were peculiar to 70cm, but similar tests on GB7PD on 2m showed the same results. So, if you plan to use the HS-2 on 2m or 70cm it's worth bearing in mind that it is usable, but performance is a little disappointing.

Power measurements

Using the tune facility, I made some measurements of the power output. On HF, power varied between 4W on 160m rising to around 8W on 12/15m before dropping back to 6W on 10m. On 6m, output was 5W; on 2m, 8W and on 70cm, 5W. I did not see anything like the 20W mentioned in Ailunce's publicity.

My impression was that power dropped somewhat as the rig warmed up. This is probably a good moment to mention the fan that didn't come on during these tests. Within the firmware, you can adjust the temperature at which the fan comes on – the default is 45°C. Maybe setting it a little lower might lessen the thermal effects on power output.

FM Radio

The HS-2 contains an FM radio (88-108MHz), which is controlled by means of an app in the MENU. It seemed to be fairly sensitive and sounded fine. I couldn't make it automatically search the band and populate the apps memory channels though, although I was able to tune up and down the band manually and select stations to listen to.

Ergonomics

At the beginning of the review, I mentioned that the front panel was busy with a lot of buttons. Those of us with fatter fingers and poorer eyesight than we once had may not find the rig so easy to use. This is particularly the case with the tuning controls, which are the arrow keys on the right side of the front panel. Tuning up and down the band is not the pleasurable experience it would be with a tuning knob, or even a mouse-wheel control! This does affect the use of the rig in 'standalone' mode.

However, all is not lost and one of the benefits of the rig being built with SDR

architecture is that it can easily be controlled from your computer. The HS-2 manual gives details of how to set up HDSDR software on your PC to interface with the rig. This certainly gives some options for easier control and a bigger display. The manual also gives directions for interfacing with Ham Radio Deluxe and N1MM software. Controlling the rig from the computer is certainly a much more enjoyable experience.

I was excited to read that the HS-2 included Bluetooth and that an app called QRadioBLE had been developed by BA7JZL for both iOS and Android devices to communicate with the HS-2. The iOS app costs £2.49 on the App Store at the time of writing.

Unfortunately, however, when I went into the Bluetooth menu on the HS-2, I could not activate any of the features to pair with a phone. On looking in the HS-2 manual for further details it says 'Temporarily unavailable'. This is a shame, because the app looks quite well designed and it looks as if you may be able to set up memories in the apps, circumventing the lack of memories on the HS-2 itself. There is, however, some Bluetooth capability in the HS-2 as, when I was checking the Bluetooth settings on my phone, I could see it was present, so I suspect the Master/Slave mode was incorrect and could not be switched.

Ailunce's publicity for the HS-2 mentions the 'HamBox' app to run on a mobile phone, but I could not find this app on either the Apple Store or Play Store so am not sure if it is still available.

Rear panel connections

The rear panel of the HS-2 has a number of connections. There's USB, audio out, a PTT socket to control an amplifier (on a 3.5mm jack); there's also a GPS antenna connection if you have the optional GPS module fitted.

I was curious about the Host USB interface socket. I plugged a USB lead in and a small plume of smoke appeared. 'This doesn't happen to Peter Hart' I thought, and quickly switched off the rig. Removing the lead and switching back on, nervously, I was delighted that it was still functioning. But it shouldn't have done that. The manual says that the port is reserved for charging equipment.

There's a LAN port on the back of the HS-2 that, the manual says, is 'used for remote control and remote firmware upgrade' but I cannot find any details on this so am not convinced whether these features are available now. It's a shame as remote controlling the rig across the internet as would be an interesting feature and the

HS-2 might make a useful building block in remotely controlled stations.

Features not tested

Ailunce advertise optional modules for the HS-2: a GPS module and a LORA module. The review model did not come with those modules, so I was not able to test them. It looks like the GPS module should enable APRS functionality within the HS-2 of some sort. It was not clear to me whether the HS-2 could receive APRS messages or data. The LORA module looks interesting too and seemed as if it might feature a chat system sent by the low power LORA protocols.

Conclusions

The HS-2 is a rig whose possibilities had intrigued me for some time. It is full of potential and there are many good features. Equally there are many features that do not quite work as they should or are 'temporarily unavailable'.

I spent some time thinking about who the rig would appeal to. As a low power rig, it might appeal to Foundation licensees, but because of its quirks I think it might be frustrating to people starting their amateur radio journey. It might appeal to more experienced operators who enjoy low power operation. It worked very easily on FT8 using the WSJT-X program, but you could just as easily use FT4, Q65 or WSPR using the same program. Using the N1MM software, you could try some low power RTTY. Similarly, CW operation isn't bad, you can either key it manually or with the built in keyer.

Because the reports of transmitted audio were rather poor, I felt that the rig was probably more at home on either CW or data modes, at least until Ailunce can make some improvements to the transmitted audio quality.

I think the rig might also appeal to people who spend more of their time listening, especially if those people are experienced with using SDR software.

The HS-2 could be great, but that will depend if Ailunce continue to develop and improve the firmware. My concern would be that the development effort would dwindle over time and that it would remain 'middle of the road'. For now, I feel that if you are prepared to work around the shortcomings of the rig, you may well enjoy it, but be prepared that you may feel a little like a 'beta tester' for the rig. Views vary and I spoke to someone who'd used an HS-2 and he felt it represented 'exceptional value for money'. I would be a little more guarded.

My grateful thanks to Chris Taylor of Moonraker for the loan of the HS-2 and for putting up with my questions. The Ailunce HS-2 costs £649.99 including VAT. www.moonraker.eu.