

Servicing and improving a KW slow motion drive

Introduction

Spotting a 1960s vintage, valved KW 202 receiver on sale for a very reasonable price, described as 'for spares only', I bought it, sight unseen. However, a brief examination showed that it appeared to be physically complete, so I decided to restore it. The tuning drive felt rough as I roamed the bands. I asked around for information about access to the internals with a view to servicing the mechanicals. I was advised not to attempt it, as it was said to be quite tricky to dismantle and rebuild. As a tyro model engineer, my interest was piqued and I decided to try. The result is this record of my findings and suggestions.

Well-made or at least well-designed mechanical dial drives to operate variable capacitor VFOs are quite uncommon these days, being instead rotary encoders driving digital circuitry. But fine engineering is widely appreciated, especially in the case of the Collins, Drake and National. These manufacturers made very finely engineered VFO drives, although these did not give a direct frequency readout until the HRO 50 appeared in 1950. Until then, users had to look up the dial numbers on a chart to find the frequency in use.

Some mechanical drives still in use suffer from less than perfect 'feel', or 'square bearings' but this as often due to contamination of the reduction gear lubricant by foreign bodies or congealed grease.

Details of the mechanical speed reduction mechanisms used in Eddystone [1] [2], Redifon [3], Racal [4], (British) or American receivers Drake [5], Swan [6], Collins [7], National [8] [9], Hammarlund [10] and the generic HBR (Home Brew Receiver) designed by W6TC and K4FX, in blogs by VK5SRP and AA7EE, not to mention the G2DAF, G3RKK and G3PDM projects. Many of these used the Eddystone 898 dial and drive, which is still revered for its silky smooth 'feel' and lack of backlash [11] 70 years after its introduction. The Eddystone Users Group has a comprehensive website devoted to the Stratton Company products, including the 1952 International Marine Radio IMR 547 built for them by Eddystone and equivalent to the S700. The Electrovoice RME 4350 appears to suffer badly with seized or slipping reduction drives but the treatment



PHOTO 1: Overall view of the receiver.

described here should return them to working order, as claimed in various US forums. The KW equipment in question used the now-discontinued Jackson Brothers 4511DR 36 to 1 speed reduction drive, but the current 4511DAF is similar. Details of the Jackson Brothers rotary drives can be found at [12], where some dimensioned drawings can be inspected, and [13]. US manufacturers Oren Elliott [14] may offer a near equivalent.

I bought my KW 202 receiver for £20 sight unseen, for spares only. To this end, originality is not paramount. I fitted LEDs as dial lights and added three more in a strip at the top of the meter, hence the Kapton tape protecting the very fine 36g wire used to be inconspicuous and to avoid drilling the panel. These additions do not preclude restoration to the original state if required.

With this procedure there is no need for tricky access with long tools from above, peering down the gap between the front panel and the VFO dial.

I mention also the contemporary Geloso VFO [15] and the Electroniques 'front end' RF/VFO/Mixer unit [16], which performed quite well, and Cycloidal speed reduction device [17]. Finally, take a look at the Wikipedia entry on 'Backlash' [11], which is relevant in a general sense to this article.

Dismantling and reassembly

You will require angled tweezers, a 5mm flat blade screwdriver x 150mm long, a cocktail stick or crochet hook, and a magnifier (your preference) for reassembly.

KW used BA (British Association) screw sizes. Although now long obsolete, BA fasteners are still made for maintenance purposes. The nearest approximate metric equivalents are 2BA \approx M5, 4BA \approx M3.5 and 6BA \approx M2.8, though it's important to note these are not interchangeable (eg a M5 nut won't properly fit a 2BA screw).

Here are the eight steps to restoring the KW dial drive. As the Buddhists say, the 'Eightfold Path' to Nirvana (in this case, a smooth and gentle tuning drive).

1) Remove the central tuning control, using a 1/16 inch (1.55mm) Allen key (Photos 1 & 2). My example was very tight on the shaft and had to be levered off, whilst I tried not to mark the good paintwork or the polished aluminium. After removal I reamed the central hole with a 6.35mm (1/4") twist drill. This is the nominal diameter of the reduction gear shaft and it cured the problem, so perhaps something unseen was binding.

2) Unscrew the two very small (1mm-ish) screws. Use a small tray to catch them. At 5mm or so long they are easily lost in the



PHOTO 2: Using the Allen key to remove the inner tuning control.



PHOTO 3: The tray to catch errant screws.



PHOTO 4: Reduction drive as removed.



PHOTO 5: The reduction drive and spacer.



PHOTO 6: The drive and spacer separated.



PHOTO 7: Recessed screws in the spacer showing the clamp behind the panel and the off-centre hole.



PHOTO 8: Tapping the front panel M5.



PHOTO 9: The clutch drive 'up close'.

general debris on most workshop floors. Then remove the outer control (**Photo 3**).

3) Whilst peering down the 8mm/5-16ths hole in the spacer (while simultaneously trying to see, manipulate the screwdriver AND hold a torch), undo the two reduction drive grub screws. These are set at 90 degrees in the boss, only half a turn is required. Remove the long (4BA?) screws holding the drive and spacer to the panel. The clamp behind the panel will fall free but be retained by the VFO shaft. Withdraw the reduction drive (**Photos 4, 5, 6 & 7**).

4) At this point I travelled up a blind alley, drilling out the aluminium spacer for 5mm bolts, tapping the front panel M5 accordingly (it is thick enough to be so treated) and countersinking or counterboring the spacer, in order to recess the screws. But then I realised that there was a better way (**Photo 8**). Wash the reduction drive mechanism in white spirit or other suitable solvent to remove all old grease. When

dry, lubricate with new grease. I used spray-on lithium grease, which seems to work OK. Do not be tempted to adjust the four spring loaded clutch screws; they were set by the KW factory at the time of manufacture and should not need attention (**Photo 9**). Do not strip the slipping clutch mechanism, but re-grease before reassembling the mechanism. The grease, especially if it contains Molydip (and is therefore black), stains everything nearby so keep it away from your clothes. To reassemble, offer up the reduction drive and tighten the grub screws (**Photo 10**).

Geoff Theasby, G8BML
geofftheasby@gmail.com



PHOTO 10: The clutch showing the grub screws and the 14mm spacers.

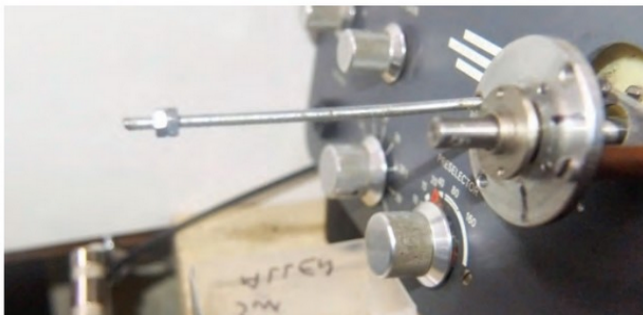


PHOTO 11: The M3 threaded rod used in reassembly.

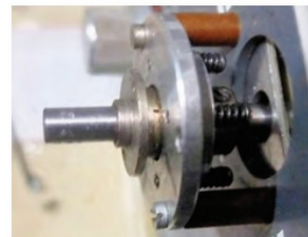


PHOTO 12: Spacers fitted to the receiver.



PHOTO 13: The Allen key supporting the outer control during reassembly.



PHOTO 14: The felt disc between inner and outer controls.

5) Feed the M3 threaded rod through the screw holes and do it up so it is just finger tight. Its purpose is to hold the clamp bar against the rear of the panel whilst a temporary M3 x 10mm screw is inserted in the other position, briefly, to hold the clamp bar steady (**Photo 11**). Returning to the original threaded rod, this can be removed and the proper component inserted with its associated spacer. As an aside, I cannot imagine why this form of assembly was not used in the original design, in view of its advantages for access. Check that the drive operates direct though the clutch to the VFO unit and that the slow-motion mechanism operates without binding or scraping on its companions.

6) Discard the aluminium spacer and replace it with 2 x M3 clearance x 14mm long tubular spacers. This provides much-needed space to reach the grub screws mentioned in 3), and to re-engage with the clamp bar (**Photos 7 & 12**). Note that the VFO spindle is not central in the front panel hole. The clamp is to hold the reduction drive hard against the front panel on re-assembly.

7) Attach outer control knob, use the tray as in 2) and, whilst the screw is being replaced, insert the Allen key temporarily in the other screw location to hold the knob in place during this delicate operation (or use something like Blu Tack®). Check that it operates smoothly (**Photo 13**).

8) Make a felt disc to fit over the VFO shaft to add friction and prevent any contact between inner and outer controls (**Photo 14**), then fit the inner control. Fasten the grub screw with the Allen key. Check that the controls operate smoothly. The drive should feel much silkier in operation.

If the drive needs to be removed at a future date, the small changes noted ensure that the entire assembly can be dismantled and rebuilt within five minutes or so.

Additional comments

The vintage Swan 500 and 700 [6] mentioned earlier are more powerful than most desktop transceivers, with outputs of 350W and 700W respectively. Several US amateurs have said that, after attention, the smooth tuning mechanism is 'wonderful'. WQ9E said it was the best tuning mechanism he ever encountered, properly operated and lubricated. I think that this procedure will enable readers to achieve the same level of satisfaction without great expenditure.

As an aside, the Cyclo Harmonic speed reduction drive is discussed in the *Model Engineer* magazine discussion forum in December 2017 [17] and a humorous diversion [18] into weird and wonderful dial drives that cause so much frustration to repair technicians will raise an ironic chuckle.

Websearch

- [1] <http://eddytoneusergroup.org.uk/eddytone-components/>
- [2] <http://eddytoneusergroup.org.uk/Data%20Sheets/imr%2054%20sales%20leaflet.pdf>
- [3] <https://www.m5poo.co.uk/redifon-r551n-receiver/>
- [4] <https://www.radiomuseum.co.uk/racal.html>
- [5] <http://www.zerobeat.net/drakelist/drakemod/drmod33.html>
- [6] Swan 500/700 <https://tinyurl.com/bzbp2ukx> (warning: dangerous electrical setups shown)
- [7] <https://www.antiqueradios.com/forums/viewtopic.php?f=5&t=289311>
- [8] www.prismnet.com
- [9] <https://www.radioblvd.com/National%20HRO.htm>
- [10] www.antiqueradios.com/forums/
- [11] [https://en.wikipedia.org/wiki/Backlash_\(engineering\)](https://en.wikipedia.org/wiki/Backlash_(engineering))
- [12] https://www.royalsignals.org.uk/jackson_bros_caps/
- [13] <https://www.mainline-group.com/collections/reduction-drives-classic-6-1>
- [14] <http://www.orenelliottproducts.com/>
- [15] http://www.g4kfk.co.uk/KW_Geloso_4-104_VFO_SWM_195808.pdf
- [16] <https://www.vintage-radio.net/forum/showthread.php?t=151500>
also look at <http://www.dghwells.clara.net/radio> in particular the images IFstrip0001 through 0006 and tuner01 through 06
- [17] <https://www.model-engineer.co.uk/forums/postings.asp?th=132667>
- [18] <https://www.rfcafe.com/references/radio-electronics/radio-dial-mechanism-radio-electronics-november-1953.htm>