

A Fresh Look At The Yaesu FT101ZD



*The FT101ZD is now a standard rig to be seen at
bring and buys and everyone seems to know
someone who has one. But they are getting on a bit
and have seen many changes of interest — to their
detriment occasionally. Harry Leeming, G3LLL,
describes what to look for and how to repair the
damage of old age and the dreaded 'tweakers'.*

Last month, I described the various attributes of the FT101ZD series and how it works. Perhaps more important, certainly to the new owner of a secondhand one, is how to check it over and repair it if found lacking. First though, a word of warning: be careful as close on 1000 volts is present in the power amplifier and power supply stages, and that the capacitors hold this voltage for several minutes after the rig has been switched off. So before trying to replace the PA valves or doing any work here, wait two minutes, and then short the anode caps to chassis before poking your fingers in!

Checking Out A Second Hand One

Particularly during the surge of interest in CB, many 101ZDs came into the country other than through the authorised distributors. Often these units had been left set on 220V, this being particularly prevalent with the Sommerkamp versions. Whilst many have survived, others have not. Certainly if you wish to risk blowing electrolytic capacitors or having arcover in the PA stage, running the rig at excessive voltage is the way to do it. Before you operate any unknown unit, do

check that it is stamped on the back "234 V". If it isn't, look inside and re-wire the mains transformer as explained in the instructions in the user manual.

Whilst on the power supply take out the fuse and check that it is a 3 amp quick blow type — silver paper or 20 amp fuses have caused minor faults to result in £100 plus repair bills. (This is quite profitable for yours truly, so I do hope there will still be some non 'Ham Radio Today' readers who will continue to short out their fuses!)

Re-alignment

The alignment of the FT101ZD series does not normally require much attention as long as the rig hasn't been "got at". Unfortunately, many second hand ones have at some time or another been fitted with CB crystals and the alignment has often been upset in the process. Some Cbers when doctoring the FT101ZD did little more than swop the 10 metre crystals. Others, however fitted extra relays for more crystals, re-aligned the 10 and 12 metre bands and fitted 6.5-7MHz in place of 7-7.5MHz.

If any odd bits have been fitted to the local pre-mix crystal oscillator board, it is advisable to restore things as near as possible to the original before fitting a correct set of amateur crystals. The crystal oscillators can be aligned using the instructions in the user manual. An output of 300mV is suggested in the manual, but checks on new FT101ZDs shows that they are normally factory set to give 200-300mV on the lower frequencies rising to 400-500mV on the higher frequency bands. The important point is to set the oscillator core below the point of maximum output otherwise the

oscillator will sometimes refuse to start.

Aligning The Bandpass Filters

If it has been used for operation on illegal bands, the bandpass filters will need retuning after correct coverage of the 10 and 40m bands is restored. The manual gives these details using a sweep generator, but in practice this is not usually necessary.

The cores in the bandpass filter are very difficult to get at and really an extension board is required to do the job properly. So do check that alignment really is necessary before touching the cores. If the 10m bandpass filter has been interfered with, you will probably have plenty of Tx drive at the low frequency end of 10m but will run out of steam above 29MHz. Likewise, good drive below 7MHz falling off above will indicate that the 40m bandpass filter is in need of adjustment. To adjust the filter, either borrow an extension board (not from me — sorry!) or remove the BPF board and adjust the two relevant cores by trial and error a quarter of a turn at a time until good drive is obtained over the required frequency range.

Aerial RF and Driver Alignment

Whilst alignment of the IF unit is dealt with in the user manual, that for aerial RF and driver stages seems to have escaped a mention. (Although it is covered in the workshop manual).

Unless there are obvious signs that they have been interfered with, you will be well advised not to touch the settings of the three cores that are ganged to the pre-selector control. You may wish to peak the trimmers, the positions of which are marked for the 9 and 6 band versions in Figs. 6A and 6B.

To align, start at 160m and tune the calibrator at 1.9MHz peaking the pre-selector for maximum receive S meter signal strength. Now switch to transmit and load up as normal without touching the pre-selector adjustment, then reduce the carrier control until the PA current is about 70mA. Peak the driver and RF trimmers for maximum PA current, turning down the drive control if this exceeds 150mA. Once these two

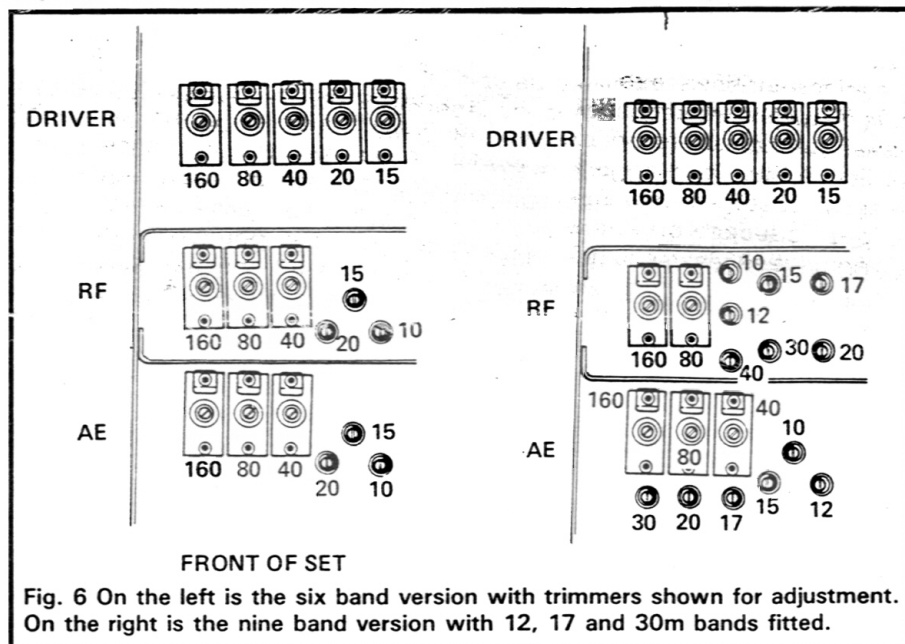


Fig. 6 On the left is the six band version with trimmers shown for adjustment. On the right is the nine band version with 12, 17 and 30m bands fitted.

trimmers are tuned to maximum, go back to receive and without touching the pre-selector, peak the aerial trimmer for maximum S meter reading on the calibrator. Repeat these adjustments until the pre-selector peaks at the same point on receive as it does on transmit.

It will only normally be possible to get the peaks on transmit and receive to coincide if an NEC or other suitable make of 12BY7A driver valve is used. Valves with different electrode capacities can only be used if TC1 on the RF unit is reset, but you are strongly advised to leave this alone and just fit the correct valve. Having aligned 160m, repeat the procedure at the centre of the 80, 40, 20 and 15 metre bands.

10, 12, 17 and 30m Bands

Having first ensured that the 80-15m bands are correctly aligned — don't touch the trimmers once they are — tune to 10m and peak up the calibrator on receive at 28.5MHz. Load up into a dummy load and back off the drive to below 100mA. Whilst rocking the pre-selector either side of maximum, adjust the 10m RF trimmer until you find the combination of pre-selector and RF trimmer settings that give maximum drive. Switch back to receive and without touching the pre-selector, adjust the aerial trimmer for maximum. Repeat the above procedure at the centre of 12, 17 and 30m bands taking care not to touch any of the trimmers previously adjusted.

The IF Unit

Although this is covered in the manual, a few points are worth noting. The fixed resistor shown in the circuit as R41 330k is in most sets replaced by a miniature 500k variable preset. This is the ALC meter sensitivity adjust, which should be set so that on bands where there is plenty of drive, the ALC meter will just reach full scale when the rig is overdriven. Later sets also have a variable preset in the hole designated C31 at the output of XF03. This controls the drive when the speech processor is switched in and should be adjusted if sufficient drive is not available in this mode.

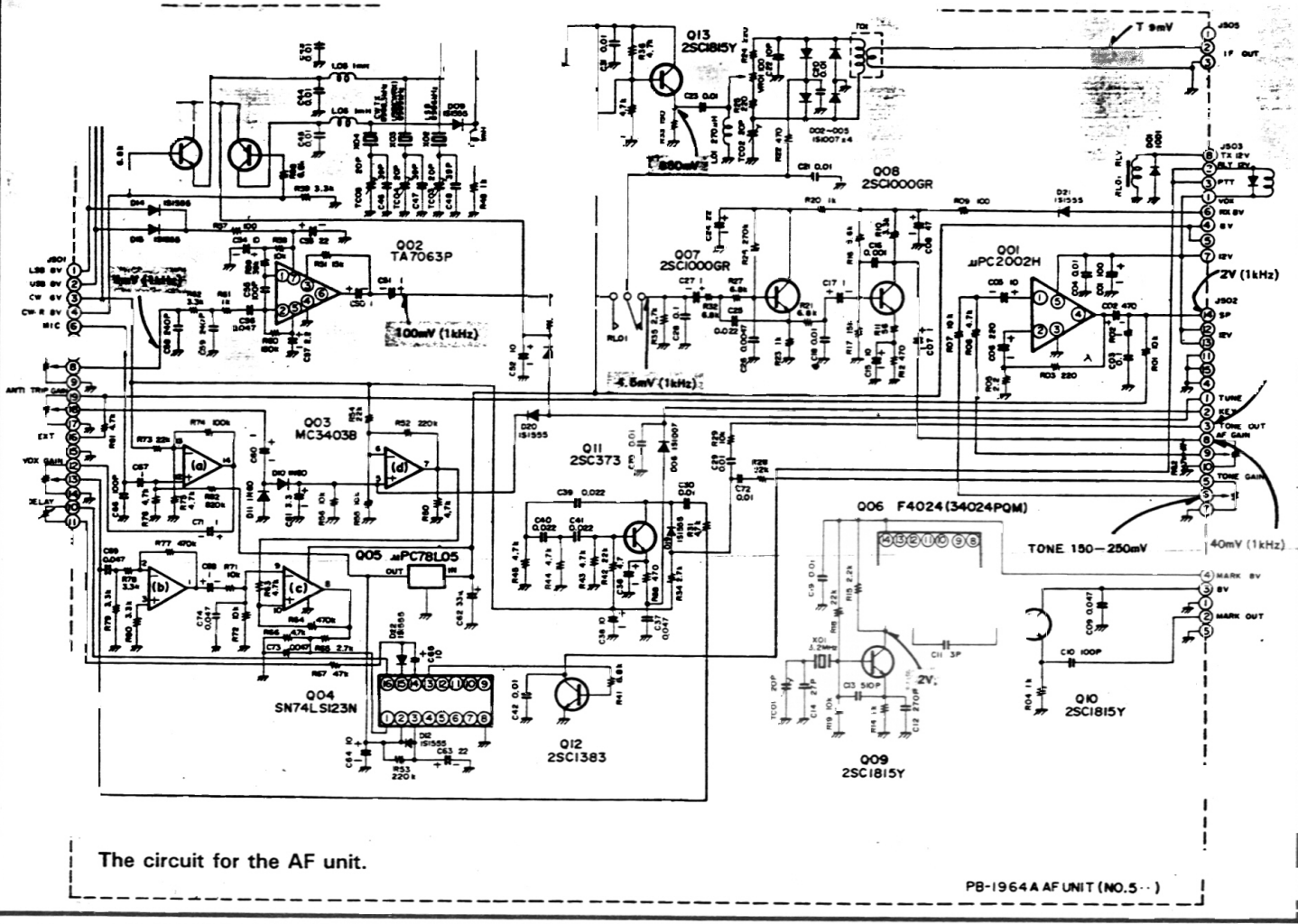
A Few Faults To Look Out for...

Frequency Drift or Jump

Long term, temperature affected drift in the VFO can be very expensive and time consuming to cure, although thankfully it seldom occurs. What can be troublesome in the 101ZD is frequency jump because of bad contacts on the VFO 'INT', 'EXT' or 'TX'/'RX' clarifier buttons. The cure here is to clean or replace the switches.

Tx Distortion and/or VOX Locking

Early FT101ZDs often suffered with poor quality transmit audio and VOX problems due to RF feedback via the microphone socket. The cure is to fit three 0.01F disc ceramic capacitors with the shortest possible leads between all three live pins and chassis on the rear of the microphone socket.



The circuit for the AF unit.

PB-1964A AF UNIT (NO.5...)

Intermittent Rx Audio

If you have this, and the S meter still reads correctly and it cures itself if the microphone is keyed, then the trouble is probably the small relay on the AF unit. Remove the plastic lid, and apply some non-oily switch cleaner. Trouble with this relay can also cause intermittent transmission.

Dead on One Band (often 80m)

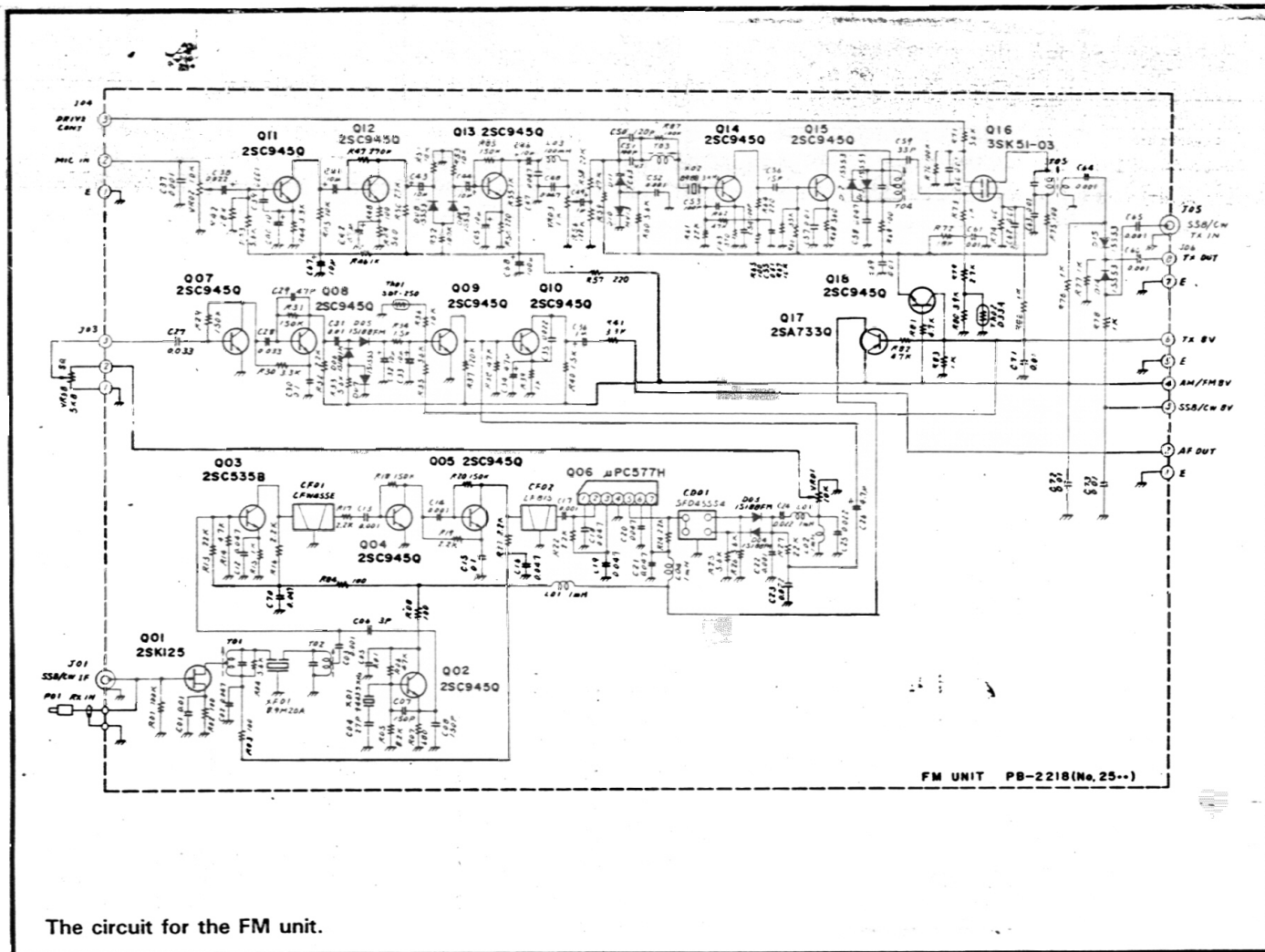
This is usually due to a faulty crystal on the local pre-mix oscillator board. Check that there is no output on the affected band by measuring the RF voltage at the common point where all the diodes meet — it should be between 150 and 500mV. If you are sure that the crystal is faulty, you have a 50% chance of curing it if you try heating it with a soldering iron until the solder just starts to melt. (Try this on a good crystal and you have a 50% chance of ruining it!) Do note that this fault can also occur on 10 and 40 metres if the rig has been peaked up with a CB crystal in. In this case, try adjusting the relevant oscillator core before cooking the crystal.

Poor CW Keying When Hot

Slight leakage in Q1001 on PB1968 will cause dots and dashes to run together on the transmission while everything sounds okay on the side tone monitoring. If you do get odd reports, listen on a separate receiver and watch your power output meter when keying the rig after it has been hot for an hour or so. Before replacing the transistor, try connecting a 4.7k resistor between the collector of Q1001 and chassis. Even a new transistor will sometimes have enough leakage to cause the trouble without the help of the resistor.

Poor Receiver and Weak Calibrator Signals

The obvious candidate here is Q1 on the RF unit. (Lightning in the vicinity or a flashing over 12BY7A is the usual cause of this blowing). It can be replaced by most common dual gate FETs such as the 40763 or 3N201, if an original is not available. Another fairly common cause of this trouble is the J310 FET designated Q02 in early FT101ZDs and the Q03



The circuit for the FM unit.

in later models. Whilst any small signal N channel FET such as the MPF102 will do to get the rig on the air (providing you get the connections right), the J310 is a special high signal handling type and the correct replacement will give better results.

Poor Receiver But Calibrator Still S9+

If an enormous signal comes down the antenna (a mobile nearby or another rig on a different antenna), a protection lamp mounted near the antenna changeover relay is designed to blow. The set will spring to life if this is shorted out but you are advised to fit a 6-12V 100mA lamp to ensure protection in the future.

Loose Tuning

Replacing the eqicycle drives on the early series of the FT101s was, fortunately, simple as it gave quite a lot of trouble. The drive on the FT101ZD is a different story as whilst it does not often give trouble, its replacement is a major operation

requiring the removal of the VFO. Rather than go to this trouble and expense, you can repair drives that are not too bad by removing the main tuning knob and fitting a felt washer between this and the front of the rig. **Shortage of Drive on CW Narrow**

The FT101ZD transmits CW through the CW filter, hence the carrier oscillator must be correctly set especially if a narrow CW filter is fitted. To check this, switch to CW narrow, tune up and note if much more drive is required than in the CW wide position. If drive is down on the CW narrow position, leave the key down and set the drive control to give about 80mH of PA current. Whilst transmitting trim TC505 (next to the CW crystal on the AF board underneath the FT101ZD) for maximum PA current backing off the drive as necessary to avoid overheating the PA valves.

Tx Audio Frequency Response and Mic Gain

I have always thought that Japanese microphones, by and large,

suit Japanese voices — many are too bassy for European and American voices. The FT101ZD sounds quite good with normal hand microphone providing the speech processor is not turned up too much — then it definitely sounds muffled and nasal. One way to improve things is to fit a series capacitor of about 0.05uF in the microphone lead. Even better, fit the capacitor and change the microphone for a Shure 444D if clarity of speech in adverse condition is what you are interested in. The mic gain of the FT101ZD is a little on the low side if you speak quietly. If you require more gain, increase the value of R51 on the AF unit to say 33k. This will give you about 6dB more gain, do not try to get too much extra gain or hum and RF feedback problems will raise their heads.

The FM Board

The FT101ZD was not originally designed with FM in mind and various problems with hum have occurred due to earth loops. There

is cut and dried cure to these. However, one answer to hum is by trial and error finding out which earth connections via the screen of the co-axial cables are needed and which are not. In some rigs the mic gain control is in circuit on FM and in others it is not. Generally less hum occurs if the input to the FM board is wired direct to the mic socket and the Tx audio is set by the preset mic gain on the FM board. This is VR2502 nearest to the edge at the end where two preset pots are fitted. The other pot at this end is VR2503, the deviation control, and this is best left alone. The pot at the opposite end is VR2501 and is the preset squelch. This should be set so that the squelch control at the front of the set works in the centre of its range.

Oscillation and Instability on FM Receive

This is often due to a dry joint on

the screen of the input cable. If this fails to cure the trouble, slightly adjust T01 and T02 (the coils nearest XF01) for the best compromise to give good gain and stability on a weak FM signal.

If, after fitting an FM board, you find that the FM carrier is 20 or 30kHz off frequency and has no modulation, do not despair. Due to previously mentioned hum problems Yaesu have isolated the earth connections on later boards so that the earthy end of the transmit circuit is not common with the receive circuit. Check that the screens of the input and output leads are actually connected to chassis if you have this difficulty as a disconnected screen which possibly cured a hum on a previous board will stop a later board transmitting correctly on FM.

New Bands

Early "WARC" FT101ZDs were fitted with the new 30, 17 and 12m

bands, but would not transmit them — presumably to comply with import regulations in some countries. FT101ZDs fitted with these bands but non operative, will be found to have the driver switch wired as in Fig. 7A. Rewire it as per Fig. 7B and everything should function.

How Long Is It Going To Last?

Experience with earlier Yaesu rigs show that equipment looked after and stored in a heated dry room will be good for anything up to 20 years or so providing as always, that spares are available. In this connection, do stock up with spare valves as whilst they may seem expensive at the moment, the writer would be very surprised if they don't at least double in price in the next few years. One wonders how long suitable valves will be available at any price.

Of course, if you store the rig in a cold damp room and then insist on smoking heavily when using it, you probably will not need to stock up with spare valves! Actually the FT101ZD is not too allergic to cigarette smoke but it certainly does not help. The model that followed the FT101ZD, the FT102 has proved to need a new set of five relays every 18 months or so if used by a very heavy smoker — but that's another story.

If you intend writing to G3LLL, please send it to Amateur Electronics/Holdings, 45 Johnston Street, Blackburn BB2 1EF, enclosing an SAE.

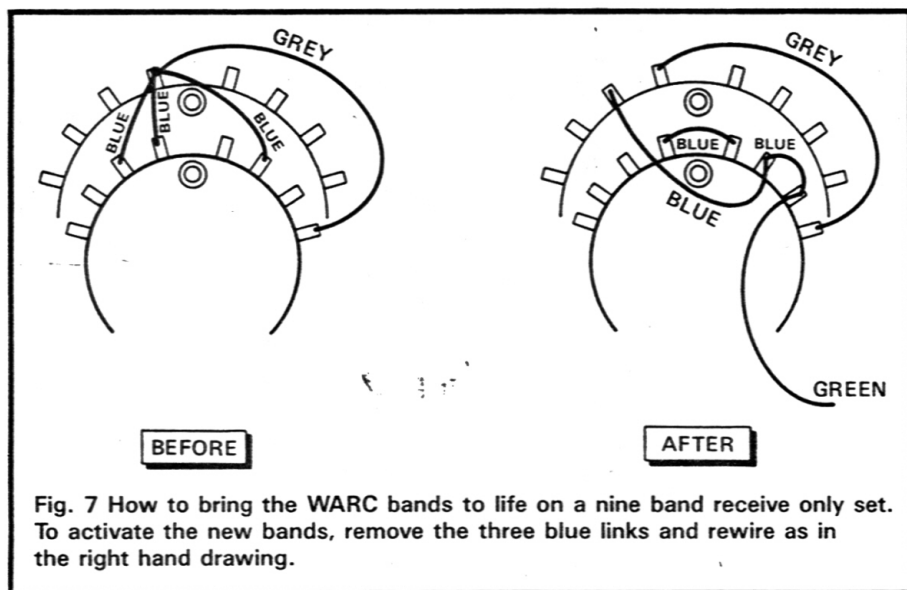


Fig. 7 How to bring the WARC bands to life on a nine band receive only set. To activate the new bands, remove the three blue links and rewire as in the right hand drawing.

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