Converting Pye Westminsters

SPECIAL NOTE

So far as we know, the procedures described here will apply to all *working* VHF/FM Pye Westminsters — but we cannot account for any models which are beyond our experience. Please note that a certain level of knowledge and experience will be necessary to carry out the mods.

If you're like me, you'd like to have a rig in the car permanently, but dislike the idea of leaving it in there all the time. Perhaps you could be worried about theft, or maybe you'd like to operate both mobile and fixed but can only afford one decent rig.

Chris Lorek, G4HCL, shows how to find the right one and how to get it going.

Rumours that the author has cornered the UK market in Pye Westminsters in anticipation of this article being published are (almost) entirely without foundation.

Radiotelephone manufacturers such as Pye Telecom now make microprocessor-controlled sets with digital readout and so on, in very small sizes, and older rigs like Westminsters are now readily available on the second hand market at extremely low prices (many people throw them away!). Westminsters appear in both remote and dash mount versions; the dash mount is ideal as a local club net or repeater/Raynet monitor, but is a little large for car mounting nowadays. The remote mount version is superb for fitting out of the way, in the boot or under your seat, linked to a small box under the dash with volume, squelch, and channel controls on it. This also makes the rig much more resistant to theft.

My last car was broken into twice by thieves about ten years ago. The first time, the boot was crowbarred open, the airhorns and headlamps went on and off from the alarm system. And in the panic the thieves were foiled by the chain around my three boot-mounted Westminsters. The second time a thief got into the interior and thought a control box was the radio; again he didn't hang about and went with virtually nothing. If I had had Japanese mobile gear in at the time, I would have been much worse off!

I still operate 4m, 2m, and 70cm from the car, with Pye sets albeit a little newer, but now people tend not to think of radiotelephone equipment as readily saleable gear, which is good news in a number of ways. You should be able to pick up a second-hand Pye Westminster for anything from 25p to £15 depending upon frequency band and condition; but beware, make sure you know what you are buying. Readers of my article on Pocketphone 70's (in the Jan 1986 issue of Ham Radio Today) will have heard this before: **look at the serial number plate.**

The Westminster range has AM and FM sets, with different frequencies from 32.5MHz up to 470MHz. A 68MHz AM set looks absolutely identical to a 145MHz FM set from the outside, apart from the riveted serial number plate. So how do you know which is which?

There were seven frequency ranges commonly made; these are shown in **Table 1**.

FREQUENCY	DESIGNATION	MOD	MOUNT
32.5 MHz-40 MHz	H Band	FM	Remote
40 MHz-50 MHz	G Band	FM	Remote
68 MHz-88 MHz	E Band	AM/FM	Dash/Remote
132 MHz-156 MHz	B Band	AM/FM	Dash/Remote
148 MHz-174 MHz	A Band	AM/FM	Dash Remote
405 MHz-440 MHz	T Band	FM	Remote
440 MHz-470 MHz	U Band	FM	Remote

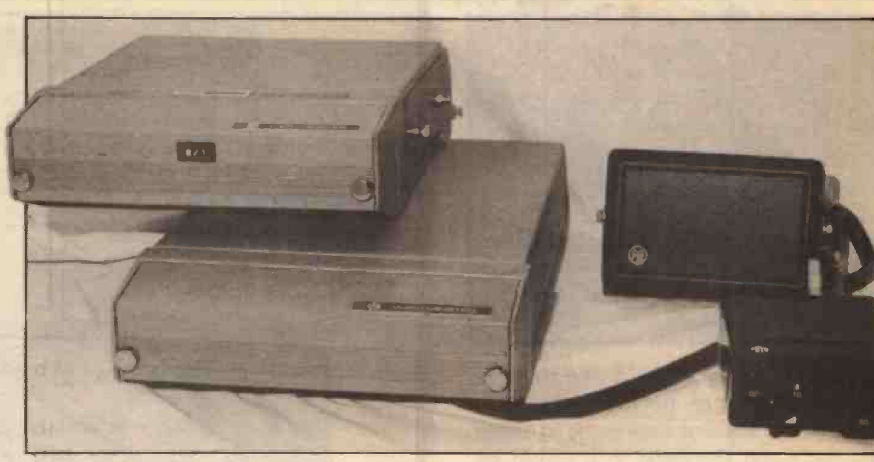
Table 1 The different Westminster frequency ranges.

I intend to deal with the VHF FM Westminster in this month's issue; next month will reveal all on the UHF types.

The usual set will have W15**** marked on its plate, together with its original frequency; if the riveted plate has been removed then leave well alone! Following the W15 will be AM or FM, self explanatory, followed by B or D, signifying boot (remote) mount or dash mount respectively. The final letter, will if appropriate (VHF sets) indicate the channel spacing, and hence filter width:

N: 50kHz spacing, ± 15kHz filters;
V: 25kHz spacing, ± 7.5kHz filters;
S: 12.5kHz spacing, ± 3.75kHz filters.

Look out for a V set if you want it for 2m; you will suffer from adjacent channel interference with an N set (fairly old and hence rare), and from distortion on receive with an S set (newer and hence more common). If you do end up with a set with unsuitable spacing then Garex Ltd, amongst others, can sell you suitable filters.



W15FMB VHF set on top of W15U UHF set.

Don't be tempted to buy an AM set hoping to convert it to FM, it just isn't worthwhile unless you're a glutton for work. Even if you already have an AM set, I'm afraid it is often cheaper to throw the AM set in the bin. Sorry but that's how it is!

There may be another number at the end of the equipment code: this shows how many channels the set is capable of being used on, normally 1,3,6, or 10. A look inside the covers would be a wise move before purchase though, to see how many crystal positions are available on the printed circuit boards (two needed per channel).

Boot and Dash Mounts

The circuitry used in the equipment is virtually the same in dash and boot mounts, the difference being only in the control. A multiway connector on the boot mount connects to an 'umbilical' cable terminated in a small box with the controls; two models of control box have been made with identical circuitry. Do, however, make sure you get a box and cable if you buy a boot mount set: often installers remove the sets from cars along with the control box, but leave the cable due to difficulties of removal, so don't get caught out! Don't worry too much if neither microphone nor speaker come with the set, any 3 to 8 ohm speaker and 500 to 2000 ohm dynamic microphone will work, although the originals will usually give the best performance. The microphone plug usually is a five-pin 270 degree DIN, commonly available, although some dash mount models have the mic cable permanently wired in. Fig.1 shows the connection format.

VIEW FROM WIRING SIDE OF PLUG
NOTE NON-STANDARD NUMBERING

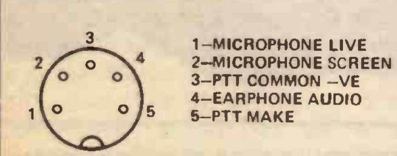
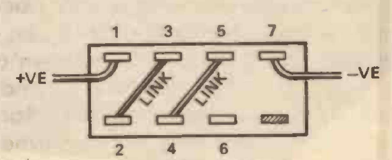


Fig. 1 Microphone connections.

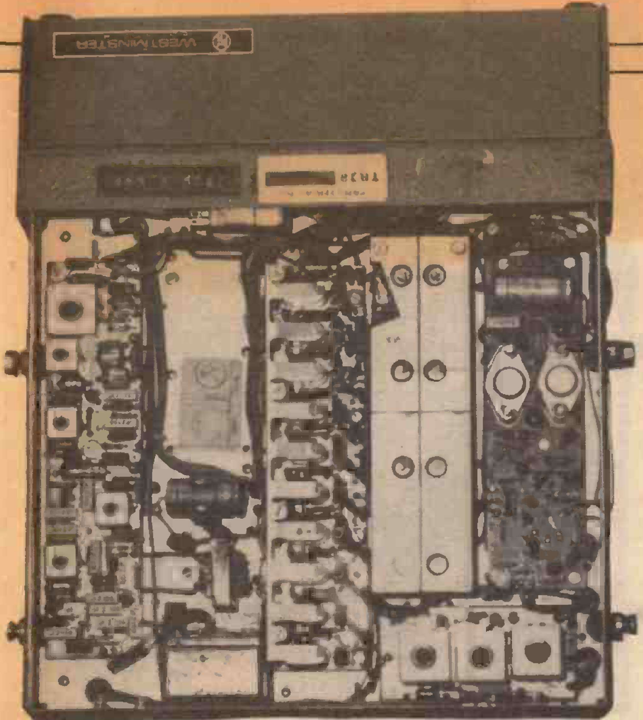


VIEW FROM WIRING SIDE OF PLUG, IE: FRONT OF SET CONNECTIONS

Fig. 2 Negative earth DC plug wiring.

Rx Crystal = (Rx Freq MHz-10.7)/2MHz (68-88 MHz the 4m band)
or
(Rx Freq in MHz −10.7)/3MHz (132-174 MHz including 2m)

Tx Crystal = (Tx Freq in MHz)/24MHz (68-88 MHz for 4m)
or
(Tx Freq in MHz)/36MHz (132-174 MHz for 2m)



W15FMB 10 channel VHF, internal bottom view.

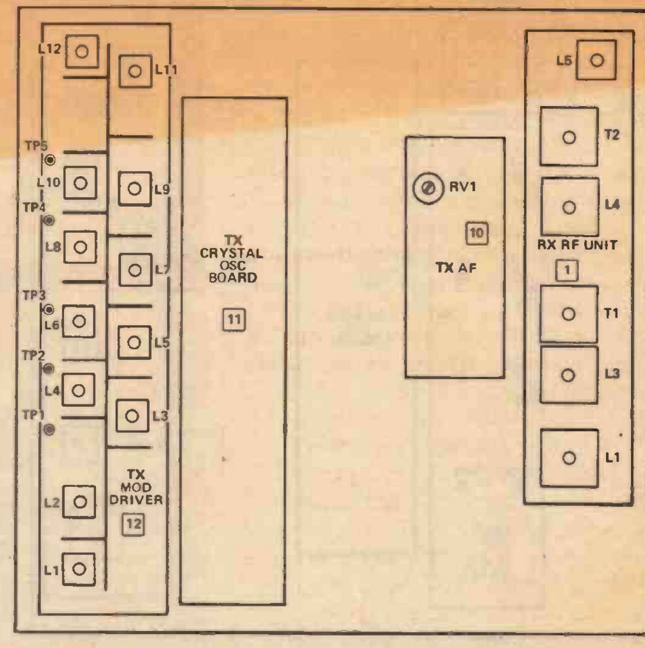


Fig. 3 W15FM bottom view of alignment points.

The power lead with the plug is also sometimes missing, and many amateurs have tried in vain to wire one up without the correct information, Fig.2 reveals all! I would advise fitting a five amp fuse in line.

Getting It Going

First obtain some crystals for your desired channel, whether this be the local repeater, club net, or channel used by Raynet. The frequencies needed are given by the formulae below.

Both crystals are HC6/U size and types suitable for common frequencies are available ex-stock from PM Electronic Services and Quartzlab, although any reputable crystal firm will no doubt be pleased to supply to order.

Transmitter Alignment

Don't be put off by amateurs saying "you need stacks of test gear to get it going". With my first Westminster I had QSO's after 20 minutes using a cheap multimeter and an even cheaper power meter, followed by the help of other amateurs on the local repeater. A frequency meter helps a lot, though, but most amateurs who don't own one can bribe, cajole, or otherwise con someone into lending them one!

Start by plugging the crystal in, applying 13.8V DC supply, and terminate the aerial connection into a load (preferably non-radiating!) via a power meter if you have one. Connect the multimeter negative to power supply negative, and set it to a voltage range of 10V or thereabouts. Find yourself a matchstick, old knitting needle, or similar non-metallic object and file the end down to give a tuning adjustment tool for the ferrite cores in your set.

Referring to Fig. 3, key the PTT, and connect meter +ve to board 12 TP1 and tune L1 and L2 for maximum, returning as required to give absolute maximum, then tune L3 for minimum reading. Transfer the meter +ve to TP2 and tune L4 and then L3 for maximum, then L5 for minimum. Simple isn't it? Transfer to TP3 and tune L6 and then L5 for maximum, then L7 for minimum. Connect to TP4 and tune L8 then L7 for maximum, then L9 for minimum.

Next use this driver board as a low-power transmitter by disconnecting the coax at the end of the board, next to L11, and feeding the RF into a power meter or 50 ohm resistor with a diode probe across it (from our RAE days we all, of course, know how to knock one of these up using a few components). The more basic of us may choose to use a light bulb in an emergency, although this will not give exactly 50 ohms. Tune L10, L11, and L12 in that order for maximum power (around ¼ watt), then retune L10, L9, L11 and L12 for absolute maximum.

We start on the real power alignment by reconnecting the coax we removed, and twiddling the PA on the other side of the chassis. Transfer the multimeter +ve to TP1 on the PA board, and tune C1 and C2 for maximum. (You may need a different-shape trimming tool here, as these trimmers have screwdriver-sized slots in them). Then transfer to TP2 and tune C6 and C7 for maximum; transfer again to TP3 and tune C11 and C12, again for maximum. By now, you should experience that magical feeling when you see your in-line RF power meter rising, showing that you're in business. Tune C17 and C18 for maximum 'smoke' into the 50 ohm load, and if you're aligning a 2m set then it's safe to go back and tune the remaining trimmers on the PA for absolute maximum. If it's a 4m set, then leave the others alone, you should be getting plenty of power, in the order of 12-18W in each case.

A frequency meter or local amateur with a centre-zero meter on his receiver can help in setting your exact frequency: the adjuster is the small ceramic capacitor next to the appropriate crystal. The deviation should already be set to some level that will make you heard, but you will no doubt need

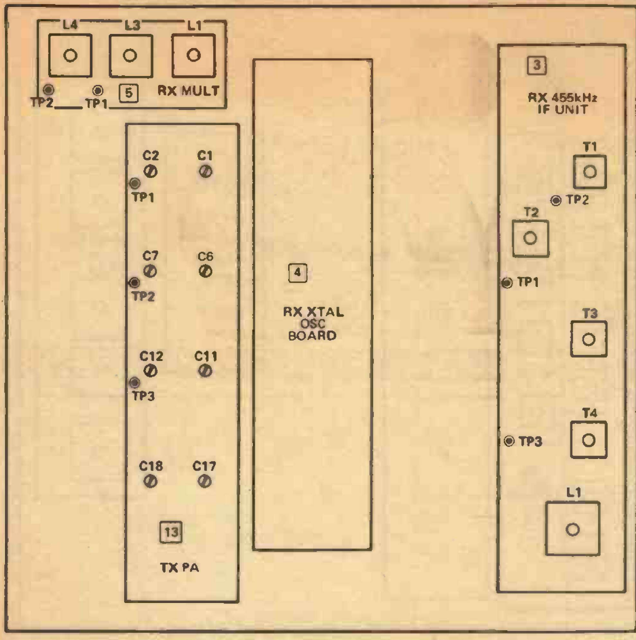
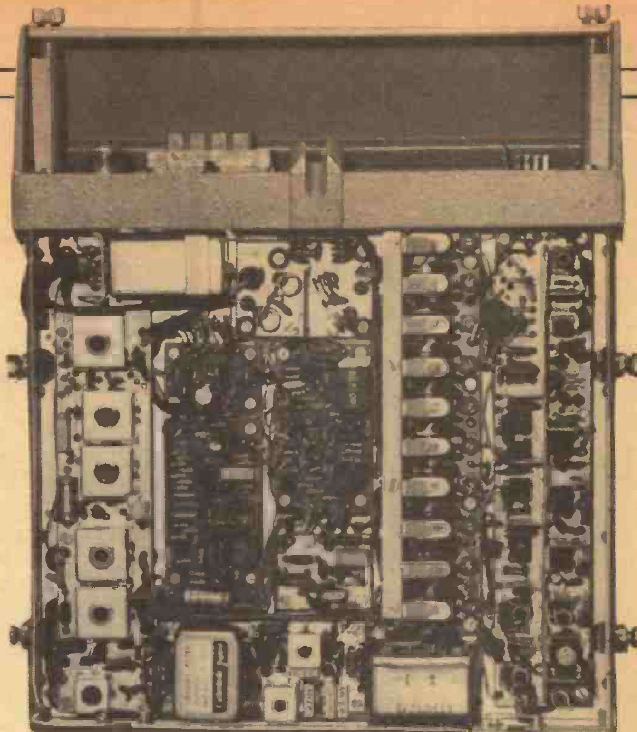


Fig. 4 W15FM top view of alignment points.



W15FMB 10 channel VHF, internal top view.

to give this a quick twiddle also with the help of another amateur, unless of course you have access to a deviation meter! RV1 on the Tx AF board (board 20, both clearly marked) sets the peak deviation; mic gain is pre-set and not adjustable. A useful hint is to use the local repeater, shouting a loud 'four' or whatever into the microphone while another station quickly checks repeater input and output for the same loudness on both signals — most repeaters are very accurately set and maintained.

Receiver Alignment

Again, a multimeter is useful here, as is a strong local signal on the band. First of all, plug the aerial in and connect speaker and 13.8V DC. Because the receiver switching bandwidth is less than that of the transmitter, it would be useful to tune the receiver on the channel nearest the centre of your desired operational frequency range, although this is only important if you need to operate on, for example, a repeater as well as a frequency on the lower part of the band.

Connect the multimeter negative to the negative supply line, and positive to board 5 TP1. On the centre channel, tune L1 and L3 for maximum, then transfer to TP2 and tune L4 for maximum, returning L1, L3, and L4 for absolute maximum on TP2.

Turn the set over and align the front end for literally the best received signal. This may take the form of a local signal with variation of the other station's power, variation of both transmitter and your aerials in type and beam handling, and so on. Those lucky enough to have access to a signal generator will of course not need me to tell them how to use it!

An initial tuning aid is TP1 on board 3; tune all coils on the front end board (board 1) for maximum voltage on TP1, reducing the received signal as necessary to keep the reading at around 0.7V. Final tuning is carried out on a weak signal, tuning L1, L3, T1, L4, T2 and L5 on board 1 for best quieting. If the set has been used in service before, then the IF and squelch circuitry will have been aligned and I would recommend that you leave well alone. Misalignment of these on the "twiddle everything you see until you can hear something mate" principle can cause a lot of headaches later on unless you have access to IF generators and the like.

Netting the receiver onto frequency may initially be done by tuning the coil adjacent to the respective crystal for best (least distorted) reception. A more accurate check may be performed by connecting your multimeter to board 3 TP3, and tuning for zero voltage. The more enthusiastic amongst us may even fit a centre-zero meter to this point if desired.

And that's it, piece of cake! Typical receiver sensitivity is in the order of 0.35uV for 12 dB SINAD, possibly a little deaf by today's standards but certainly useful for most operation with local signals. The sensitivity may be improved by fitting a simple preamp, and I can recommend the Timestep Electronics BF981 job which is very reasonably priced indeed. Alternatively by replacing TR3 and TR5 (2N3819's) on the front end board with J310 transistors, and varying the values of R6 and R14 (120R originally) for 10mA current through them to suit, a useful improvement may be obtained.

I hope this article has proved useful in identifying a possible solution as to what to do for a cheap, useful mobile or base monitor rig. Next month the series continues with a look at the UHF Westminster, and how to considerably ease problems by getting the correct crystals.

Useful Addresses:

Garex Electronics Ltd, 7 Norvic Road, Mansworth, Tring, Herts HP23 4LS (0296 668684)

PM Electronics Services, Alexander Drive, Heswall, Wirral, Merseyside L61 6XT (051 342 4443)

Quartzlab Marketing Ltd, PO Box 19, Erith, Kent DS8 1LH (01 318 4419)