

Get On To 70cm With A Pye Pocketphone

One often hears Pye 'Pocket-phones' on the air, as well as being visible at rallies and junk sales, sometimes at startlingly low prices. Many amateurs shy away from these because of one reason — they are reluctant to delve inside

Chris Lorek, G4HCL,
*introduces the pheonix
of the junk heap and
brings you 70cm with a
modified Pocketphone.*

them and get them going on frequencies of interest. The vast majority of buyers only purchase them if they know someone 'in the trade' who has the necessary equipment and knowledge to get them going. It's rather a pity, as especially on 70cm you only need one or two channels for local natter user. Ask any amateur on 70cm who has spent a fortune on an FM black box, how often does his rig get shifted off the local repeater? There are of course the countrywide travellers who need a synthesized scanning box of tricks, but for 5% of the price you can indulge in 95% of your local activity!

These sets can be very useful indeed for applications such as RAYNET, where one needs a set which can stand up to being soaked in the rain and mud, be run over by cars (and ambulances!) and still carry on working. Mine did after being dropped onto a concrete road and promptly run over by a vehicle!

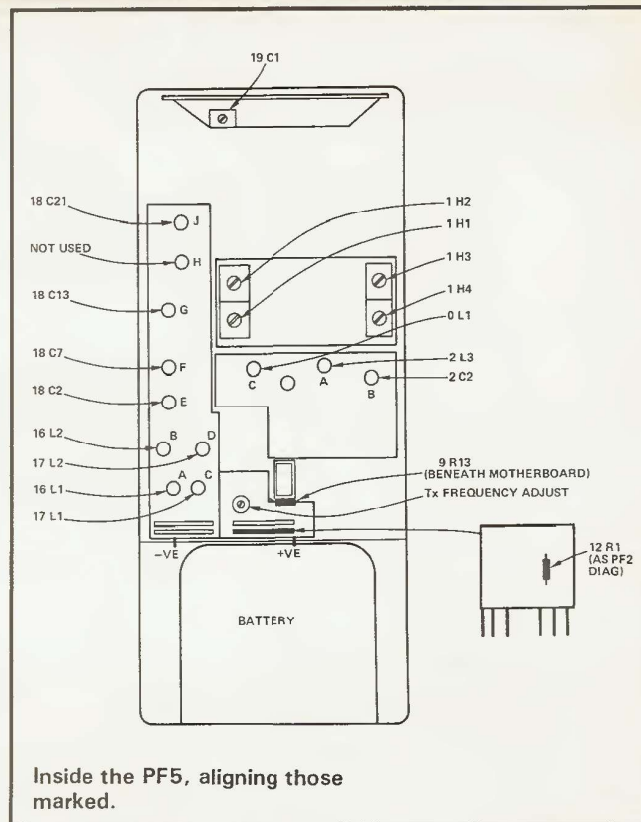
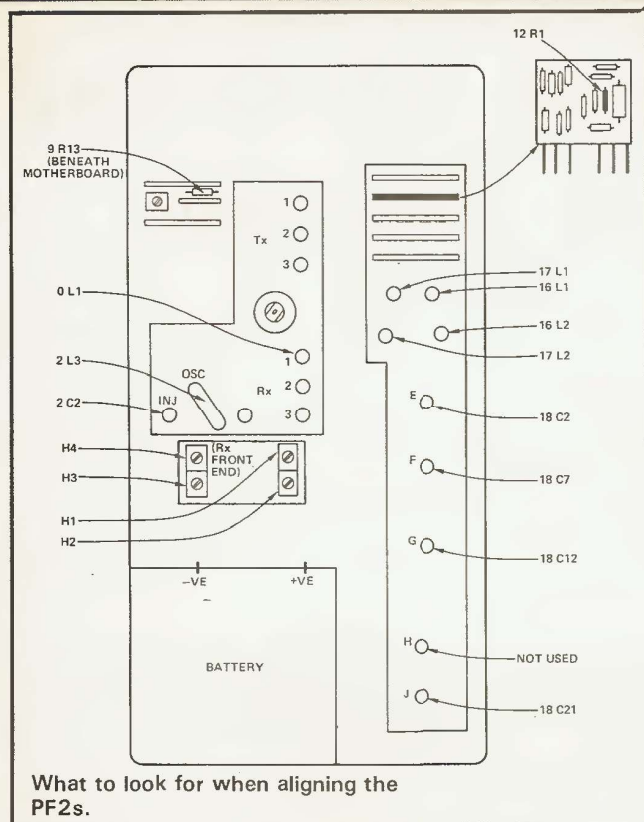
Some amateurs think you need stacks of test gear to align one of these sets onto the band. When I first purchased a second hand PF5UH in Devon ten years ago, I got it operational using only a 2m

rig — 70cm rig would have been better — a cheap power meter and a matchstick, in a basement flat shared with three other loony students. No expert knowledge, no circuit diagrams or manuals, but many mistakes! But then the saying "you learn by your mistakes" and this article will, I hope, be of some use in saving you time, trouble, and my first mistakes! Next time you see an ex-professional rig going at a low price don't shy away, you'll end up with a bargain rather than a useless piece of junk.

First — Find Your Animal

The Pye Pocketfone 70 range of equipment is just what it says, a *range*. There is absolutely *no* outside difference, besides the real label, between a 78MHz AM rig and a 432MHz FM rig in the range. Your friend may think he recognises one by sight at a rally, and may unwittingly recommend one to you for purchase because it 'looks like' the one he's got. Also beware of the advert or description of a rig as a 'PF70'. *There is no*





such rig as a 'PF70'.

If someone describes a rig he's selling as a PF70 then beware — *he doesn't have a clue what he's talking about*. So many people have been conned in the past, often due to ignorance on both sides. If you are looking for a rig suitable for 70cm, then examination of the rear label will reveal an equipment type number. If it is one of those below, then it is a bargain.

PF2UB — three channel UHF FM bodyworn rig, with external speaker/microphone.

PF2UH — three channel UHF FM handheld rig, with internal speaker/microphone.

PF5UH — single channel UHF FM handheld rig, with internal speaker/microphone and internal aerial.

Sometimes the equipment type number will be followed by '2e', for example 'PF5UH2e'. Unless you're desperate for one, or it is very cheap, I would recommend you leave it alone. This is special, intrinsically safe equipment designed for use in hazardous areas such as oil rigs, where sparks or whatever could be very unwelcome! Of course, if you work in a petrol station... The insides of these are

coated with a rubbery 'gunge' which is extremely difficult to remove when fault finding, they give lower Tx output power, and — theoretically — need special tools to remove batteries and so on.

If you see a low audio frequency marked on the 'code' section of the label, ie code 94.81Hz, then I would also recommend you choose another, this shows that the set is fitted with a sub-audible tone lock circuit. It is possible to remove this and fit required links to enable normal operation. This requires removal of the main board from the case, but it is much easier to choose a different one from the inevitable pile on the rally stand. These tone lock sets are fairly rare though and only exist on the PF2UH and PF2UB.

The PF2UB can be stuck in your pocket or fixed onto your belt and clip the speaker/mike to your lapel — saving your top pocket from being weighed down but still enabling you to hear a call without deafening everyone around you. The aerial socket is a miniature TNC which is sometimes difficult and expensive to get plugs for. Make sure you get a matching aerial or change the socket for a BNC or similar, although this will involve a bit of filing. The transmit audio has

a characteristic 'tight trousers' effect from the external mike, due to its small enclosure.

The PF2UH is basically a PF2UB inside, but with a mechanical switch Tx/Rx changeover rather than a miniature relay. The speaker/mike is internal to the set making the case size slightly longer. The transmit audio is improved over the PF2UB and the set gives better range because you have to hold the rig to your face to talk, ie away from your body. This may, of course, be done with the PF2UB but requires two-handed operation as a result. The aerial socket is a standard size TNC, which is again difficult to get hold of, but replacement with a BNC is mechanically easier due to their similarity in size.

The PF5UH is a small handy size which means there is not much room inside for a toneburst unless you are good at miniature construction. The aerial is internal to the set, thereby giving slightly worse performance than an external aerial. This may be removed and a BNC can easily be fitted to the set top, possibly offering worthwhile improvement. The circuitry is similar to the PF2UH but with the absence of three channel capability.

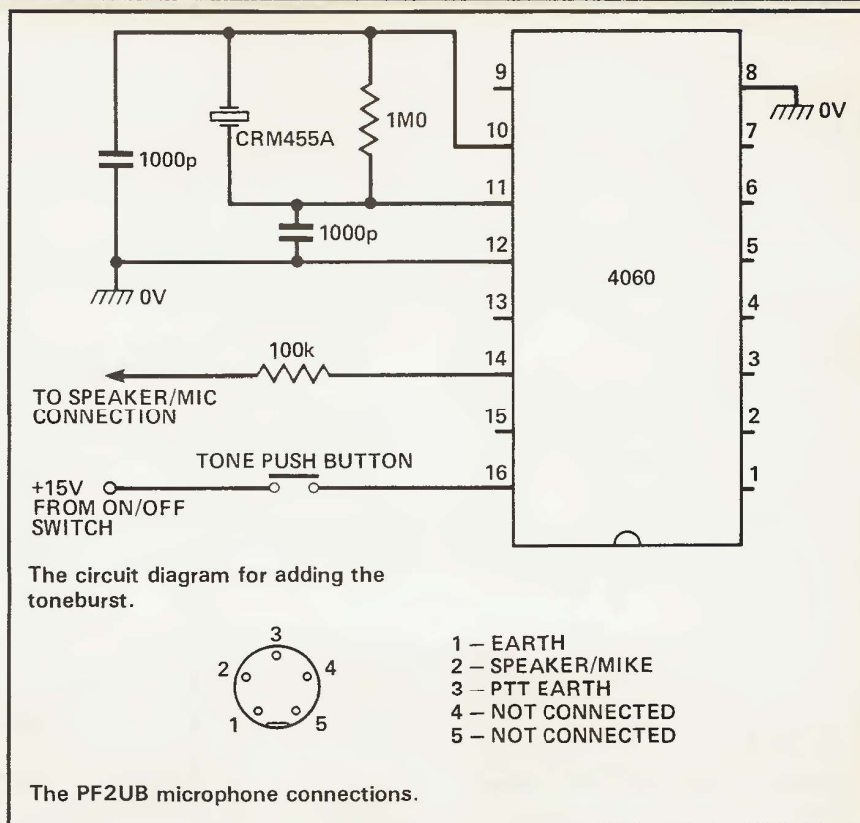
All three sets use a similar 15V

NiCad battery. It is important to ensure you get one of these included in your purchase as spare batteries are more rare than the sets themselves. Internally, they are made up of several series-connected cells. If your battery is not charging or is only developing a low voltage, it may be prised open with care and the faulty cell(s) identified and replaced. Spare cells are available from Radiospares. Note that for home use, a stabilised 13.8V power supply is ideal for powering the set — a PF2UB makes a useful three channel base rig.

The circuitry comprises several 'daughter' boards on a larger 'mother' board. This makes fault finding and component replacement fairly easy, as the boards can easily be desoldered if required. There are two different types of receiver front end, — passive and active. The passive front end is fitted to earlier sets and is identified by a rectangular metal block with two large tuning screws on top, which form miniature tunable cavities. The active front end is identified simply by the absence of the metal block, which is replaced by a board with four small coil cans, one at each corner, with PTFE type tuning slug adjusters. The passive front end is good at getting rid of unwanted signals and would, therefore, make a good 'listen through' receiver, although it is slightly less sensitive than the active front end model. This may be worthwhile checking before purchase.

Getting It Tuned Up

No, they don't need 'converting' to 70cm! The sets are made in two frequency ranges: 405-440MHz and 440MHz-470MHz. Most of those available on the secondhand market in this country will be the latter of the two. However, there is very little difference in circuit values between them and, unless you wish to use the set below 432MHz, you would be very unlucky indeed if your set didn't tune down easily. I have never had any problems and have adjusted over 50 sets, because of a built-in 'overlap' provided by the manufacturers. Sometimes, the active front end tuning adjusters are right at the bottom, because the coils are different between the



bands. But reasonable sensitivity is still achieved and it is just not worth the hassle in trying to change them for one extra dB or so in receive performance. The passive front end has no problem in covering right down beyond 430MHz.

The ideal equipment for alignment is, of course, professional gear such as a signal generator and the like. Owners of this type of equipment will not need me to tell them how to use it. If you have these then by all means ignore my suggested methods and do it the proper way following the basic procedure. To others, a tunable 70cm or 2m rig with 'S' meter is useful, and some form of 70cm power indication, a field strength meter, absorption wavemeter, or in-line power meter and aerial/load.

Crystals

First of all, the rig has to be crystallised on the required channel. The formulae are: receiver, xtal freq = (carrier freq — 23.455 MHz)/5; transmitter, xtal freq = (carrier freq)/27.

Both crystals are wire-ended HC18/u size, and may be obtained for about £5.50 a pair (check first) ex-stock on popular amateur fre-

quencies from:

PM Electronic Services, 2 Alexander Drive, Heswall, Wirral, Merseyside L61 6XT. Tel. 051 342 4443;
Quartzlab Marketing Ltd, PO Box 19, Erith, Kent. DA8 1LH. Tel. 01-318 4419.

There will be a 23.000MHz crystal in each set, which should be left alone as it is the receiver conversion crystal. In the PF2UB and UH the crystals are located beneath the channel switch/Rx, IF screen. To remove this, first undo the channel switch nut carefully, then using a pair of long-nose pliers remove the larger notched round nut securing the screen. Remove the screen, and fit the required crystals in the marked positions, replacing the screen after of course. There will be a piece of insulated wire sticking out of a hole in the screen, remember to re-thread this through the hole as it can be used later. On the PF5UH the transmit crystal is plugged into the lower part of the set and is often visible, although sometimes it has a piece of sponge above it to hold it in place. The receive crystal is beneath the Rx IF screen, which may be removed by undoing two or three screws and lifting off. Remember to re-thread the insulated wire through the hole.

Tx Alignment

Initially supply the set with 10V only, if you only have 13.8V or 15V from the battery then place a few diodes such as 1N4001's in series with the power leads to drop 0.6V for each diode. Monitor the current taken with a multimeter, set at around the 100mA range. Key the transmitter and tune 16L1, 16L2, 17L1 and 17L2 in that order for maximum current drawn. If you don't have a multimeter, then monitor the transmitter frequency on an adjacent 70cm receiver — or even one-third of the frequency on a 2m receiver — and tune for maximum signal. You may like to do this even if you have a multimeter, to help you. Don't use a metallic object such as a jeweller's screwdriver, as this will alter the correct tuning points. Use a plastic tool or a filed down matchstick or cocktail stick. When you have got an absolute maximum by tuning and re-tuning until you can't get any more, increase the supply voltage to 13.8V, or 15V if you've only got the battery as a voltage source.

Place a power meter in the aerial line, or look at the deflection on a field strength meter or similar. Using a larger non-metallic tool shaped as a flat-bladed screwdriver, tune 18C2, 18C7, 18C13 and 18C21 for maximum output, re-tuning as required for absolute maximum. These will each need about three or four turns clockwise to get onto 70cm. On the PF5UH tune 19C1 for maximum radiation when using the internal aerial.

The transmitter deviation will already be set to near the required amount and I suggest that you leave well alone. However, for those with access to a suitable deviation meter who wish to set their deviation to within that last half a kilohertz, a select-on-test resistor, 12R1, may be altered in value for the required level. Note that the microphone gain is designed as a fixed level and may not be adjusted, this is a peak deviation adjustment only.

This concludes the Tx power alignment, and you may now net the frequency by the trimmer next to the Tx crystal. This may be done by looking at the centre-zero meter, or by tuning to zero beat on SSB,

on an adjacent receiver either on 2m or 70cm, or at a pinch for the best readability (least distortion) with another amateur. Those with a digital frequency meter will no doubt know how to use it of course!

Receiver Alignment

This is where we need that bit of insulated wire poking out of the receiver. Connect a multimeter, set to the 10V range, positive to the wire and negative to any screen. Using your filed down matchstick again, tune 2L3 for a dip in the meter reading. This will be at about three turns of the core into the former from being flush with the top.

Now we must find a 70cm signal, preferably variable in level. This can be either a local station with changeable aerial arrangements like a rotatable beam or variable power, or a local repeater that a friend can bring up for you. A very useful means of tuning is a 2m transmitter at a third of your receive frequency — monitor the weaker third harmonic radiated. Variation in level can be achieved by switching in different aerials at the transmitter and/or receiver and using the portable's aerial and varying its position for weak signals, tuning as necessary. In the past, I have used the third harmonic of a 2m rig, wandering down the road, rig and adjuster in hand, tuning as I went. The neighbours odd looks were casually ignored!

First of all, try to get the receiver roughly on frequency by tuning the receive crystal trimmer, OL1, for best reception (least distortion) on a strongish signal. This will ensure that you will at least hear something when tuning the rest of the receiver! In the active front end, use the non-metallic screwdriver-shaped adjuster previously employed on the transmitter PA and tune the four slugs, H1,2,3 and 4 for the best quieting signal. In the passive front end with the metal block, first loosen slightly the small locking screws in each of the adjusters, just enough to allow rotation of the two large adjusters. Tune the two adjusters, not necessarily with a non-metallic tool, for the best quieting signal. Note the tuning will be fairly sharp. Then tighten the two locking screws, checking that

this doesn't alter the tuning position.

Repeat the tuning of 2L3 for best dip and the front end alignment above as necessary to give absolute best in quieting signal. Carefully adjust 2C2 for the best quieting with the screwdriver-shaped tool. This tuning is sharp and there will be two tuning points — choose the one which gives the best quieting. Now, using an accurate frequency source such as a repeater, tune the receiver finally onto frequency with OL1 for least distortion on a modulated signal.

The squelch is pre-set with a select-on-test resistor and normally should not require modification. However, you may vary the squelch threshold by changing the value of 9R13, or in fact even fitting a small potentiometer in its place.

Fitting A Toneburst

There are many toneburst circuits around that are suitable for fitting into these rigs. About five years ago, I knocked up a simple circuit that has proved popular with many local amateurs, no doubt someone else has a similar circuit. It is about the only circuit I have found that will perform well in a PF5UH without suffering from RF instability, due to the proximity of the transmitting aerial plate. With care in construction, by soldering components directly to the legs of the IC, it may be fitted on top of the Tx/Rx switch. In the PF2 there is ample room of course.

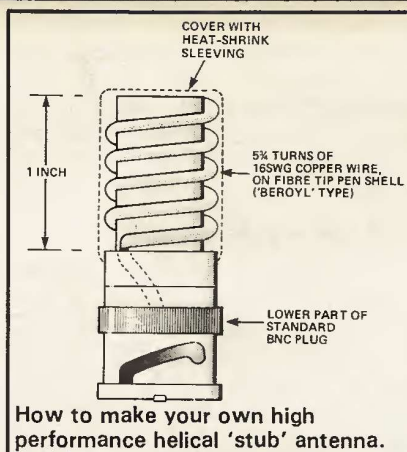
The ceramic resonator deliberately oscillates at slightly lower than 455kHz due to the two 1000pF capacitors to ground and is divided to 1750Hz in the 4060 IC, appearing as a square wave at pin 14. This waveform has only components at odd harmonics, which means it is nicely converted to a sine wave by the transmit audio filtering circuits in the pocketphone! The CRM455A type resonator is available from Cirkitt and Tandy, the remainder of the components from any good electronics retailer.

Take power via a 'tone' push button from the on/off switch on the volume control. Any of the screens in the set may be used as a negative supply. Feed the toneburst audio output to the

speaker/microphone directly (make sure you choose the unearthed side!) in the PF2UH, or PF5UH — this is the yellow wire on the small plug/socket connection on the PF5UH — or to the speaker/microphone connection shown below in the case of the PF2UB. In this case, the 'Tx' push button on the PF2UB case, which is wired in parallel to the PTT on the mic, makes an excellent tone button (remember to disconnect the original wires first).

Replacement Aerial

Sometimes you may find it difficult to obtain a rig with an aerial, they always have a habit of getting lost before appearing for sale, or you may wish to fit a BNC to couple an external aerial for home use. Rather than purchase an expensive Japanese portable whip or helical with BNC base, I have found my portable helical design shown below to be a reasonable performer. In a test using accurate



laboratory equipment, when mounted on a Yaesu FT708R, it was found to outperform the supplied 1/4 wave whip by 0.6dB! Excellent results are also given on the PF5UH and PF2UH. A number are in use by several amateurs in my locality.

Conclusion

I hope this may give some amateurs at least an insight as to

how simple it is to get a cheap, abundant rig, going on the air. It is beyond the scope of this article to give fault-finding information with complete circuit diagrams. However, I have found that the vast majority of faults in the past have been mechanical problems such as broken battery connections, faulty on/off switch, or flattening by bulldozers (often evident, this one!).

Sometimes solder joints between daughter boards and mother board become open circuited from mechanical shock, such as dropping the set, and in this case flexing the board gives intermittent operations. If this happens, carefully remove the main board, in the PF5UH by unscrewing the three retaining screws, in the PF2UB/UH by removing the securing nuts on the controls. Carefully 'hinge' the board out and spend half an hour or so resoldering all the connections, being wary of solder bridges.

Good luck and have fun on 70cm!

HAM

RADIO TODAY

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This HF transmitter and general coverage receiver has been really put through its paces by Chris Lorek, G4HCL, and he comes up with one or two interesting results!

AERIAL BENT IN EIRE

A DXpedition to get across the pond on 2m
Dave Green, G4OTV, relates this rather wet and windy tale.

PSE, PSE, PSE QSL!

John Heys, G3BDQ, describes what some fanatics will do to receive that elusive QSL card from Outer Mongolia.

HOW TO CONVERT A PYE WESTMINSTER

Okay so they're a bit big and bulky, but they're one of the cheapest ways of getting onto 70cm.