Feature

Buying Second-hand

Editorial announcement: Both Chris and the Editorial team are delighted by your feedback on the equipment featured. We would also encourage readers to contact us to request that particular rigs and accessories to be featured. Indeed, this series will rely on your requests and comments, along with Chris G4HCL's extensive experience to be the success we intend it to be. So, let's be hearing from you readers!

After a dual-band handheld transceiver, of which I've covered a few types in past columns, about the most-often purchased transceiver for Amateur use is that of a 144/430MHz (2m/70cm) frequency modulated (f.m.) mobile rig, for use on simplex and repeaters, either from your car or from home. As promised in the last column, this time I'll be looking at a couple of these which could well be of interest, and which have been proven second-hand bargains in the recent past.

I've deliberately chosen two sets with fairly similar features – each has 144 and 430MHz coverage with 'one band at a time' operation, i.e. without 'dual receivers' which keeps costs down. Each offers a high power of 50W on 2m and 35W on 70cm, and each has an easily detachable front panel, just like many car radios. So you can feel reasonably safe in keeping the set in view under the dashboard of your car while you're away, while you have the transceiver's front panel safely tucked into your jacket pocket.

I've used both of these sets in the past as well as fully testing a sample of each on my laboratory radio test equipment. In fact the TM-G707E transceiver, which was subsequently given to me as a birthday gift many years ago, I personally used for a number of years in my own car.

Whatever mobile radio you buy second-hand, it may sound obvious but ensure that you get the direct current (d.c.) power lead, microphone, and mobile mounting bracket hardware too. Sometimes, the seller will leave the power lead in the vehicle rather than try to strip it out. In this case you could use a 'choc block' connector with your own lead – but this doesn't help when you're trying to take the radio in and out of your car for safe keeping if it doesn't have a detachable head.

The most common 'fault', if you could call it that, is a scratched display on radios with a detachable front panel. This is usually because the user has repeatedly removed it and simply slipped it in their pocket or bag along with keys and the like.

A small cloth storage bag is a most useful accessory here! If yours does have a scratched plastic display then a proprietary 'scratch remover' paste along with a bit of 'elbow grease' can often restore it to virtually new condition. I suggest that you 'haggle' for a few pounds off the asking price to cover the cost of buying this, unless of course the asking price already reflects the damaged condition of the radio.

Anyway, now for some information on the radios I've chosen this month!

The Kenwood TM-G707E

The Kenwood TM-G707E covers 144-146 and 430-440MHz with a transmit power output of 50W maximum on 2m and 35W maximum on 70cm, with switchable low power levels of 10W and 5W on either band. Extended receive range is available, see below for a modification.

The main body measures just 140mm x 40mm x 189mm. The size is kept down by the use of a controlled fan on the rear panel together with an internal airflow-ducted heatsink.

For frequency control, a click-step rotary knob on the front, steps you through the channels, and pressing the knob face inwards momentarily changes the variable frequency oscillator (v.f.o.) to 1MHz steps so you can get from one part of the band to another more quickly. Further buttons above the tuning knob change between v.f.o. and memory operation, and selection of a quick access 'Call' channel for each band.

There are also 180 memory channels, a 'Priority' channel, and 12 extra channels to store lower and upper limits for six programmable v.f.o. scan ranges. Each of the normal memories can be user-programmed with an alphanumeric channel name of up to seven characters in place of the frequency, so that you can see what you've stored in each channel.

There's a variety of scan modes, such as memory scan, priority scan, selected limit v.f.o. scan, 1MHz range scan, etc. Indeed, there's enough to satisfy virtually all listening needs!

The set has full continuous tone codes squelch system (CTCSS) encode and decode facilities, a 1750Hz tone-burst is also built in. A CTCSS scan can also be enabled, to display which, if any, CTCSS tone is being used on the channel you're tuned to.

The radio also has the facility for 1200 or 9600baud

This month Chris Lorek G4HCL takes a look at a pair of high power dual-band 2m/70cm mobile transceivers

packet operation on either band. Removing a small cover at the bottom left of the set's front body reveals a dedicated six-way mini-DIN connector for a packet TNC.

The supplied hand microphone has the usual push-to-talk (p.t.t.) and **Up**/**D**own buttons for frequency/channel control, plus four extra buttons labelled **Call**, **VFO**, **MR** and a user-programmable function such as power on/off, squelch defeat, high/low power selection etc.

All the four microphone buttons are, in fact, programmable in this way, giving you a remote control to suit your needs. Pressing the **PM** button on the front panel brings up a sub-display of '1', '2', '3' and '4', and each is appropriately just above the four buttons next to the liquid crystal display (l.c.d.). All you need do is press the appropriate button to change between 'personalities'. This can be useful when you're switching between, say, shack and mobile use of the rig.

There's also a selectable Advanced Intercept Point (**AIP**), which switches out the front-end pre-amplifier to improve the strong-signal handling of the set, albeit with a slight loss in sensitivity. A transmit time-out-timer is fitted, which limits the transmission time to 10, 5, or 3 minutes. This can't be disabled and personally speaking, I found it a bit of a pain to use – but others may disagree!

On The Air

Within the 77-page user manual is a one-page, seven step, *Your First QSO* guide, which helps to get you on the air quickly. Besides normal operation the transceiver also has an 'Easy Operation' mode, where the first three buttons on the front panel just select between three pre-programmed memory channels, with the fourth button selecting the transmit power level.

Operating the set this way was just like using a car radio. After I'd tuned into a frequency, a press of one of the channel buttons for more than a second automatically stored that into memory, recall being a quick press of the same button.

The detachable front panel contains all the user controls – and an optional 'remote' kit is available so that you can mount the control/display unit wherever you wish, the main body unit fitting elsewhere. When I tested the set over a prolonged period, I found the receiver to be exceptionally sensitive on 144MHz, easily capable of receiving distant repeaters. The high transmit power level allowing me to reciprocate in getting back to the distant repeaters to join in.

Incidentally, I often suffer from strong-signal breakthrough when I use a dual-band rig from home with it connected to my rooftop antenna system, primarily with hand-helds but it also occurs with the occasional mobile. However, I'm pleased to say I've had no problems at all with the TM-G707E here.

Out and about operating mobile, the set performed equally impeccably, with good and loud audio from the set's top-panel mounted speaker. It also has a very easily to read display, which I certainly appreciated. My lab tests confirmed the good on-air performance, and I ended up using a TM-G707E as r y personal choice for quite a number of years.

Extended Coverage Ranges

Let's now look at extended receive and transmit ranges and here, you may find that your transceiver's already had this modification done by a previous owner. But if it's restricted to just the Amateur bands on receive and transmit and you'd like it extended, or indeed 'reverse' the modification to get the radio back to original – here's how.

First, remove the detachable front from the transceiver, and then remove the bottom case lid. Next, position the transceiver in front of you, upside down, with the antenna connecter pointed towards you.

In the upper right hand corner, behind the display adapter, you'll see a small set of vertical printed numbers, 0, 1, 2 and 3, next to a group of four small surface-mount 'zero-ohm' resistor links. For extended receive range, use a soldering iron and carefully lift the resistor marked 0.

You'll find it easier to heat the solder at one end of the resistor, then quickly transfer to the other end and use the soldering iron to lift that end. Then transfer back to the other to remove the resistor. After this, you'll find the receiver will cover the following bands;
Receive band 1; 118-136MHz a.m.
Receive band 2; 136-174 MHz f.m.
Receive band 3; 300-400 MHz f.m.
Receive band 4; 400-520 MHz f.m.
Receiver band 5; 800-999 MHz f.m.

If you'd also like extended range on transmit then, while you've the set open, remove resistor 3 in the same way. After this, the transmitter will cover the following bands;
Transmit band 2; 136-174 MHz f.m.
Transmit band 4; 400-520 MHz f.m.

If you ever want to reverse these modifications, you can just use a short piece to wire soldered across the original resistor positions to restore the original band limits.

Transmit Deviation

If your set has too much deviation on 144MHz, as they originally came set with ±5kHz peak deviation for 25kHz channel spacing for both 2m and 70cm operation. It's relatively easy to adjust and you won't need to open the set up to do this.

You'll first need to place the radio into 'Service Adjustment Mode' by shorting pins 3 (PKS) and 6 (SQC) on the data connector on the front left side of the radio,

you'll find this under the small oval-shaped removable cover.

To locate which pin is which, while you're looking at the connector from the front of the transceiver with the connector on the left hand side, pin 3 is at the 3 o'clock position and pin 6 is at the 10 o'clock position.

If you're unsure of poking wires into the connector, then you could get yourself a PC keyboard extension cable and use this to plug into the set and link the wires on it, the connector is exactly the same.

With the pins linked, simultaneously press the **F** key and **Tone** key while you switch the set on. Then select v.f.o. mode and tune to a 144MHz frequency, which you can monitor on another receiver, or even better a radio communications test set to measure transmit deviation if you have access to one (or use a PC and monitor receiver, read on in this month's column).

Next press 'MNU' to select the adjustment mode, and use the keys to select 'DEVI'. Press the mic PTT and speak into the mic, and use the rotary encoder knob to adjust the transmit deviation until you get to the right level. You'll see the display will indicate a two-character level as you adjust this. Once you're at the right deviation level, ideally 2.5kHz maximum deviation, press the 'OK' button to save this adjustment level into the set's memory.

Then press the **MNU** button to return the set into v.f.o. mode. If you need to adjust the 430MHz deviation level, you can simply tune to a 70cm channel to do the same series of operations. The deviation level for v.h.f. and u.h.f. is stored separately inside the transceiver. When you're finished, switch the set off and remove the wire short on the connector.

The Icom IC-207

Next, I'm turning to the Icom IC-207, a set that provides you a 50W 144MHz rig and a 35W 430MHz rig squeezed into the same box, a 'band' button switching between the two bands. Wide-band coverage is also available (see later for this) the modification for this. The set's case measures a very small 140x40x185mm, so you should be able to fit it in into the tiniest of available positions in a car.

The transceiver's front panel offers a number of operating knobs and buttons. A detachable microphone cover reveals a fully-fledged remote control system for the set, with each button being backlit for night-time use.

The microphone control even provides Up/Down volume and squelch controls, as well as handy facilities such as a reverse-repeater monitor and transmit power selection. There are 150 memory channels plus extra 'call' channels and the like available for frequency storage and one-touch scanning. A bright yellow back-lit liquid crystal display is used, with the functions for the six push-buttons below the panel also being shown on the display.

Along with the detachable front panel, a 'separation kit' is also available, so the transceiver itself can be mounted remotely with just the small display fitted in a more easily-viewed position on your dashboard. Together with a 1750Hz tone-burst facility from the microphone for repeater access, the IC-207H also has full CTCSS (sub-audible tone) encode and decode built in, and 'tone scan' lets you check which, if any, sub-tone is being used on an active channel.

For packet radio use, a 6 pin mini-DIN connector is fitted to the rear panel, the transceiver accommodating both 1200 and 9600baud speeds.

On The Air

When I used the set, I found it was very easy to operate and within a few minutes of switching on I was enjoying a QSO on my local repeater. I found the set's front panel controls were intuitively very simple to use.

With the plastic cover in place on the supplied microphone, it offers a smaller number of controls, such as you'd typically use for 'normal' operation, like Up/Down frequency or channel change, VFO/memory switching, band switching, and so on.

About the only awkward operation mode I found with the set was that of generating a 1750Hz tone for initial repeater access – this needed the microphone's plastic cover removed, with a sequential press of two different buttons beneath the cover. I found this rather awkward in practice, although if you know the CTCSS access tone for the area you're using the set in and pre-program it, this isn't too much of a problem.

This rig also includes a handy facility, which consists of five 'scratch pad memories' for each band. Here, the set automatically memorises the operating frequency every time the p.t.t. is pressed, storing the last five frequencies (including repeater shifts) on each band into separate memory channels. Recalling these just needs a quick press of the 'M/Call' button, the tuning knob then selecting between them – very useful and especially handy when on the move.

Operating from home, with the set connected to my rooftop collinear, it showed a good level of performance without a trace of the 'typical' intermodulation problems I've learned to expect on 144MHz in my r.f. congested location. Icom have also usefully incorporated an automatic attenuator in with the squelch control – turning this beyond around the mid-way point gradually adds up to around 10dB of front end attenuation, to help guard against strong signal problems without a lot of button-pushing.

I found operating with the transmitter on high power for long 'ragchew' periods did cause the heat-sink panel to get very hot and I usually found I needed to drop down to the 'next lower' power level for this. However, programming the set to keep the rear panel fan on continually helped, as long as I didn't mind the fan's constant low-level 'whirring' noise on receive.

My lab tests back in the days when the set was

launched showed the transceiver worked well, especially the strong signal rejection performance, although the 12.5kHz adjacent channel rejection wasn't quite up to the mark of the TM-G707E. But even so it offers very good performance for a dual-band set which was originally sold at a quite reasonable price when new, so second-hand models should (hopefully also they shouldn't be expensive either).

Extended Ranges

As with the TM-G707E, you may find that one of the previous owners has extended the receive and transmit coverage range. But if not and you'd like extended coverage, or in fact if you'd like to reverse the mod – here's how you do it.

First, remove the four screws securing the bottom cover of the set and remove this cover, you might find it's quite a tight fit. Then position the set with the front panel towards you and the opened-up side facing you.

You'll then see a row of three surface-mount diodes at the extreme top right, these will be in a neat row from top to bottom as you look at them. Let's call these diodes 1, 2 and 3 from top to bottom. Next, using a hot soldering iron, lift off diodes 2 and 3.

Then, follow the line of the diodes downwards and you'll see a normal discrete type resistor, vertically mounted (i.e. sticking up), this is 'W14'. Use a pair of wire cutters and make a cut in the lead of this, moving the lead ends away from each other away so they don't connect. Finally, replace the radio's lid and switch the power on while you're simultaneously holding the **Set** and **SMW** buttons down.

This will perform a reset of the radio – you'll lose stored memory information (take a look at page 69 of the user manual for more information on this). So make a prior note of anything important to you which you've programmed into the set so that you can re-program it if needed.
After the reset you'll now have;
118-135MHz receive.
136-174MHz transmit and receive.
320-399MHz receive.
400-479MHz transmit and receive.
849-950MHz receive.

Deviation Adjustment

The IC-207 came supplied from the factory with 144 and 430MHz both set with ±5kHz transmit deviation, for 25kHz channel spacing. If you find you need to reduce the 144MHz deviation down to ±2.5kHz, then with the bottom cover removed and with the controls of the set towards you, you'll see a screened rectangular section at the middle front of the set, this housing the transmit synthesiser.

At the bottom left hand corner of the synthesiser and a little towards you, you'll see a pre-set trimmer potentiometer, R158 – the v.h.f. transmit deviation adjustment. Carefully turn this until you get the required ±2.5kHz 144MHz transmit deviation while you're monitoring on an adjacent receiver, or using a radio test set (or a PC and monitor receiver, see below).

If you need to alter the 430MHz deviation, this is achieved with a further pre-set trimmer potentiometer, R161. This is at the lower right corner of this metal screened rectangular section, again a little towards you.

Easy Deviation Adjustment

Here's an easy way of deviation adjustment without expensive test equipment! This technique applies to any transmit deviation adjustment you may need to do, either now or in the future. Your aim is to get your early production second-hand transceiver's peak transmit deviation to that of ±2.5kHz on 144MHz, typically reduced from the ±5kHz it was supplied with from new. You'll need a monitor receiver for this, and a PC with a sound card input.

First, locate and install one of the many 'PC Oscilloscope' or 'Software Oscilloscope' freeware programs that are readily available. Note: *PW*'s sister magazine, *Radio User* (for example) had a massive 4-DVD collection of all known Amateur Radio public domain, freeware, and shareware software available worldwide, in their December 2009 and January 2010 issues – the collection's still available (an E-mail to **software@qsp73.co.uk** will bring you information).

Then, link up your monitor receiver's external speaker audio jack to the 'virtual oscilloscope' with a 3.5–3.5mm connector audio lead, tune your receiver to your local 144MHz repeater (which will typically be very accurately set to ±2.5kHz peak) and note the levels of the upper and lower peaks of the displayed audio waveforms on your PC screen. (You might use a couple of pieces of sticky tape on your PC screen to mark these levels).

Leave your monitor receiver volume at the same setting and re-tune the receiver to a nearby unused 2m frequency, key up your 2nd hand 2m transceiver on this, and with a loud shout into the microphone (a 'long 'four' works well) adjust the deviation until your displayed audio peak level exactly matches that which you've monitored off-air. That's it, you're up and ready, simple eh?

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Next Column

Again, as promised, in the next of these bi-monthly columns (in the Sept 2010 cover-dated issue of *PW*) I'll be featuring a selection of 'get you going' h.f. transceivers available at low cost together with a number of tips on how to get the very best out of them. See you then!