



Equipment Review

By Gil Sones VK3AUI

In collaboration with:
 Kevin Phillips VK3AUQ
 Lionel Curling VK3NM
 Peter Ford VK3YTB

ICOM IC12AT 1296 MHz FM HAND-HELD TRANSCEIVER

Ten years ago, hand-held transceivers had established their place in amateur radio. They had limited channel capacity and their features were limited.

Icom have now released a 1296 MHz hand-held radio with all the features of their 144 MHz and 432 MHz hand-held radios. Just to have produced such a transceiver is quite an achievement. The performance of the transceiver is better than that of many fixed stations of 10 years ago. Hand-held radios have certainly evolved during the last 10 years.

The IC12 is a very highly developed hand-held transceiver. None of the features of Icom's other hand-helds are lacking. The IC12 comes with a complete range of memories, scanning, priority, call channel, tones and repeater operation.

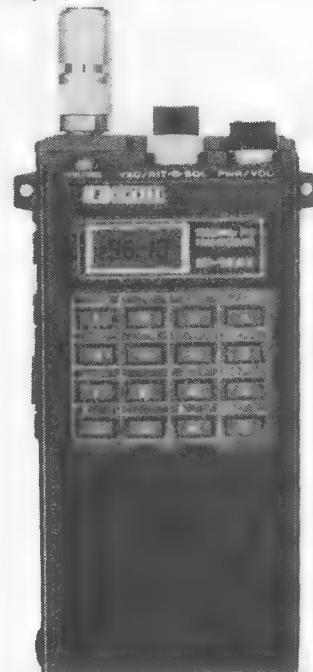
Usage of the 1296 MHz band presents a problem in testing equipment on air. However, with two units to test and the assistance of home stations, the capabilities of the IC12AT were assessed.

When first delivered, there were some qualms about the safety of use of the hand-helds. This is not peculiar to these hand-helds, but applies to any hand-held transceiver. The critical factors are the power radiated, the length of the aerial, and the distance from the operator. A higher powered hand-held with a short aerial can approach the limits for exposure to electromagnetic radiation.

Calculation of the likely electromagnetic radiation from the IC12AT indicated that it would be well below 10 mW per square centimetre under normal operation. This was later confirmed by direct measurement using an RF Radiation Monitor.

Performance measurements at 1296 MHz require relatively sophisticated test equipment. In order to obtain the figures shown, the two hand-held radios were passed to Kevin VK3AUQ. The results are shown in Figure 1.

Below: Close-up view of Key-pad and LCD Display.



The performance obtained is very satisfactory and is remarkable from such a small radio. The transceivers were operated from battery packs, so the performance is the actual performance obtained in use.

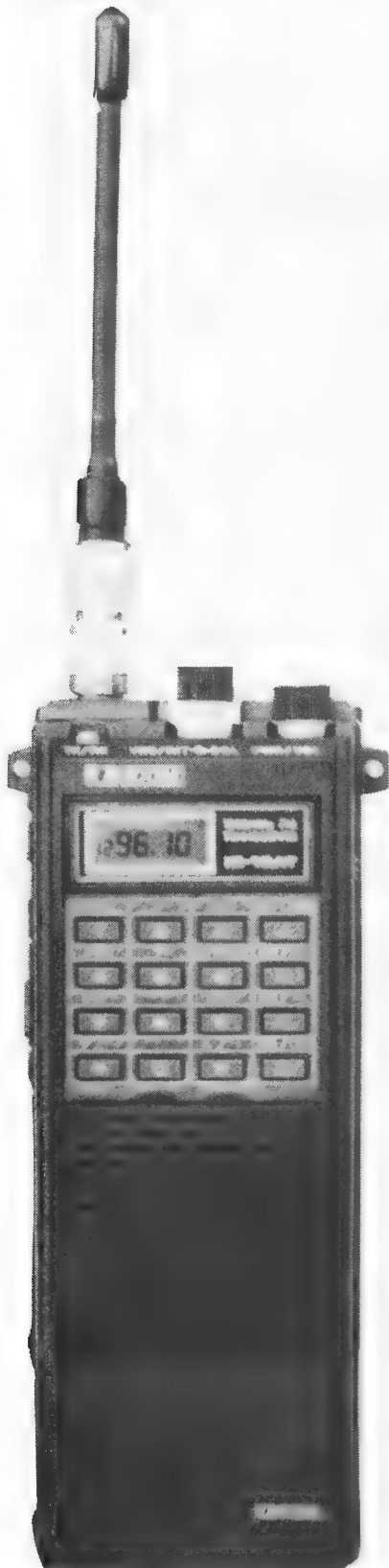


Figure 1 — Receiver Sensitivity.

ICOM IC-12AT	S/N 01097			S/N 01098		
	FREQUENCY	1260	1280	1299	1260	1280
Mute opens	.08 μ V	.07 μ V	.08 μ V	.07 μ V	.06 μ V	.07 μ V
SINAD 12 dB	.23 μ V	.19 μ V	.25 μ V	.25 μ V	.21 μ V	.25 μ V
Receiver Audio O/P	> 500 mW			> 500 mW		
Distortion at 500 mW	7.6%			5.3%		
Distortion at 50 mW	6.8%			3.3%		
Receiver Current Muted	82 mA			80 mA		
Receiver Current Full Audio	230 mA			230 mA		
Transmit O/P Power High	900 mW	830 mW	890 mW	690 mW	670 mW	730 mW
Transmit O/P Power Low	91 mW	86 mW	74 mW	92 mW	87 mW	84 mW
Deviation	4.5 kHz			4.8 kHz		
Spurii	Only Spurii			2nd Harmonic		
	2nd Harmonic			-50 dB		
Frequency (Ambient 20 degrees Celsius)	1.8 kHz low			-1.1 kHz		
Transmit Current High	1.1 A	960 mA	870 mA	1.01 A	940 mA	885 mA
Transmit Current Low	490 mA	435	376	500 mA	450 mA	410 mA
FREQUENCY	1260	1280	1299	1260	1280	1299
ICOM IC-12AT	S/N 01097			S/N 01098		

Battery consumption done with 12 volts external and battery pack removed.

Field tests were carried out with the assistance of Lionel VK3NM and Peter VK3YTB. Home stations also assisted with tests. Les VK3ZBJ, provided contacts to various sites in Melbourne's eastern suburbs over distances of 35 to 40 km.

The IC12AT was very simple to operate. Signals were very clear with excellent audio quality on both transmission and reception. Flutter was greater than on two metres, but did not detract from reception.

Penetration of the signals through buildings, vegetation and hills was not as good as at two-metres. However, this was tested to extremes. The coverage overall was particularly good. A well sited home station gave excellent coverage to a mobile hand-held. Similarly, contacts of around eight to 10 km were maintained, hand-held to hand-held with suitable suburban terrain. Both ends of this contact were in elevated, but locally obstructed conditions.

A repeater on 1296 MHz would really make the IC12AT shine! Excellent coverage with small aerials would be obtained.

Battery drain is somewhat greater due to the circuitry which must be used. A spare battery pack would be a good acquisition. The batteries are NiCad and a suitable charger is supplied.

Another alternative is to use a spare pack of alkaline cells. This can usually be replenished without the waiting time for NiCads to charge.

Overall, the IC12AT is an excellent hand-held transceiver. Quite surprisingly good results were obtained.

The concept would have been an impossible dream, 20 years ago. Only 10 years ago, it would have been still a pipe dream. Today the IC12AT is an achievement Icom can be proud of.

AT A GLANCE EVALUATION OF THE ICOM IC12AT HAND-HELD TRANSCEIVER

Serial Nos 01097 and 01098

APPEARANCE

Packaging

***Single carton with foam insert. Individual packaging of accessories and transceiver inside.

Weight and Size

**Not the lightest hand-held, but very acceptable.

External Finish

****Very well finished combination of metal and plastic.

Construction Quality

****Excellent.

FRONT PANEL

Location of Controls

****A very neat layout. Well thought out.

Size of Controls

**Pretty hard to make them bigger.

Labelling

****Excellent.

LCD Display

****Excellent, with status indicators and light if needed.

RECEIVER OPERATION

Sensitivity

****Excellent.

Received Audio

****Excellent.

Memories

***Ten, with priority, call frequency and repeater offset.

S-Meter

***Bar-graph for comparative use.

TRANSMITTER OPERATION

Power Output

***Very good considering size, the frequency and the battery operation.

Transmit Audio

****Excellent.

Output Indicator

***Bar-Graph of relative output.

Instruction Manual

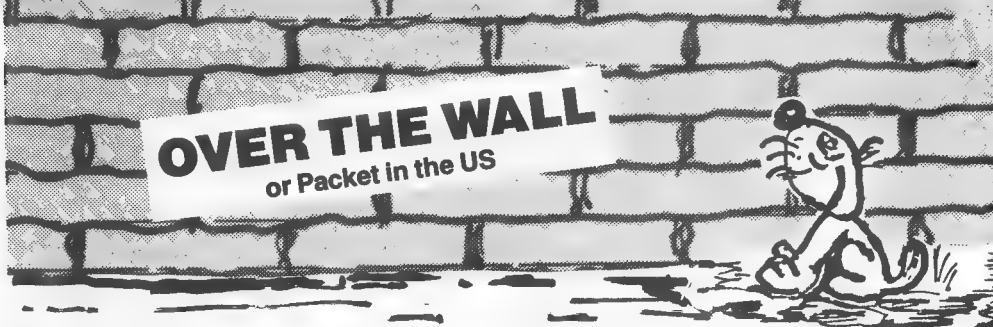
***Comprehensive manual covering all aspects of operation. Circuit provided.

Overall Rating

****An excellent hand-held radio, which is even more remarkable considering the operating frequency.

RATING CODE

* Poor; ** Satisfactory; *** Very Good; **** Excellent.



Packet radio is unique to amateur radio. I read in a recent newspaper article that amateur radio operators were generally considered to be a group very "tolerant of eccentrics," presumably because the hobby is generally solitary. Until packet radio came along, amateur radio consisted mostly of interaction between man and his radio. If you could not get your voice heard or message through with 50 watts, well, crank up the power or tune the antenna. There was very little co-operation required between amateurs; and when it was, a few could (and can) mess up everything.

Packet changes all of that. Without a well-designed communications protocol, we could not recognise anything coming from somewhere else. Without a lot of co-operation and goodwill, our very fragile network of digipeaters will simply stop working. That is why the extension of digipeaters to the western slope and on to Utah, and theoretically to California, is such a remarkable feat. California has W6AMT, with 12 or so digipeaters bearing his call sign, to form the backbone of WESTNET. The east coast has many amateurs who can get together to buy and put up a digi here and there.

We have some wonderful sites, but darned few people and even less money; but with what we have, we've built a successful Level 2 link between Denver and Salt Lake City. Now that the sites are there, and people are used to the strange buzzing noises they sometimes hear on 145.010 MHz, we will be ready when true Level 3 networking comes, with higher speeds and better channel utilisation. Until that happens, though, we are stuck with what we have got, which is a link that works — sometimes. Here is some information on the Colorado portion of the link, and to the extent I know about it, the people who helped put the digipeaters up!

N0BRI-1 is the first link in the chain. It is located on Santoy Mountain, near Kremmeling, several metres from the Kremmeling VOR, a well-known aircraft navigational aid. Since it is located approximately 75 miles (120 km) due west of Boulder, it ought to be easy to hit it — but the continental divide is in the way! However, K0ZCO (and several others) in Denver, KE6LT in Boulder and W0HJX in Greeley have been able to work this digipeater consistently. The digi was installed earlier this year by N0BRI, whose name in the call book is Louis, but everyone calls him Sunshine. He lives in Eagle, and is an electrician in Vail. The digipeater runs 25 watts and uses a Kantronics TNC. Ironically, Sunshine cannot work his digipeater from his house. It also does not hit Vail, and Sunshine and Phil W0KEA, will probably install another digipeater on Bellyache Ridge, between Eagle and Vail so that Phil can use packet. The Eagle/Vail amateurs have been very active in the use of packet to exchange golf scores during the Annual Jerry Ford Golf Tournament.

N0BRI-1 has also proven popular with vacationers, and given the terrain, it should be able to connect to N0CCZ-1, which is just over 100 miles (160 km) to the south-east. Some of the links in Utah are over 200 miles (320 km) and they seem to work well. However, no one has thus far been able to get from Santoy to Colorado Springs directly.

About 59 miles (94 km) south-west of N0BRI-1 is K0GUZ-1, which is located on Sunlight Peak, which in turn is at 10500 feet about 12 miles (19 km) south-west of Glenwood Springs. This digi was installed in May 1985, so it has the distinction of being the oldest one on the western slope. It was a joint venture between a lawyer, Bob K10G, and the county judge, Steve K0GUZ, and a computer consultant and instructor, Bob K9MWM. The digi is in the same building as the K0CL 07/67

repeater, and consists of an old Motorola Moxy single-channel rig running 18 watts or so, and a GLB TNC. The combination has proven extraordinarily reliable, which is a good thing since the site is not accessible during the winter except on snow shoes or by snow cat.

There are several active packet stations served by this digi, including K0GUZ and Mel W0HLD in Rifle, K10G and K9MWM in Glenwood Springs; Neal K0TIV in Carbondale; and Rob K0YBX in Aspen.

The next digipeater is W0RRZ-1, Grand Junction, located on Black Ridge, just west of Colorado National Monument. W0RRZ-1 is 79 miles (136 km) from Sunlight, but the path is unusually excellent — except during the hot summer when it almost seems as if the shimmering heat waves distort the signals so much that it is not entirely reliable. The digi has been installed by several people who have formed a western slope club; among them were, KA0WCZ, WB0ECV, KA0SLV, KC0GU, W0MTK, WB0PDU, and KB0NF. KB0SW, in nearby Collbran can also use the digi. Most of these amateurs are actively engaged in computer engineering or are employed in communications, working for Mountain Bell, GTE Spacenet or one of the local television stations.

Earl KA0WCZ, has succeeded at the monumental task of writing, from scratch, a WORLI/WA7MBL bulletin board system in Basic to run on his S-100 bus system. The BBS, KA0WCZ-1, has now been on the air for several months, and most of the bugs have been worked out of it. It will automatically receive and forward messages to the eastern slope and send and receive files (within reason) and monitor the frequency. . . just as the others will do.

Located on Blue Mountain, near Dinosaur, CO, is the newest digi, WB7WAB-1, alias BLU. BLU is located 95 miles (152 km) north-west of K0GUZ-1 and 77 miles (123 km) due north of W0RRZ-1. It should be possible to hit it reliably from either one. It is the first of the digis in the chain installed by the "Utah Group," which has been actively installing digipeaters fanning out from Salt Lake City. First, they reached Los Angeles, now they are going north to Boise, east to Colorado and west to Reno, Nevada.

The only person to be reached on this digi is Gary NB7B, who has had a packet rig in Vernal, Utah for 18 months and nobody to talk to.

Then, there is another digi in central Utah, 25 miles (40 km) north-west of Price on Ford Ridge, near Scofield Reservoir. It is KD7YG-1, alias FORD. This provides a reliable link to Snowbird, a mountain-with-ski-resort located at 11 000 feet, near Salt Lake City. The Snowbird digi is KD7YK-2.

From KD7YK-2, I have worked the WA7UZO bulletin board; WA7YAZ, KA7WAG and N7BHC, all in the greater Salt Lake area. KE6LT and W0HJX, among others, have at least managed to connect to Salt Lake City from the Denver/Boulder/Greeley areas using these paths (via N0BRI-1, K0GUZ-1, BLU, FORD, KD7YK-2) but the connection is not very reliable.

From Salt Lake City you can theoretically link south of Provo, then to Cedar City (a leap of nearly 200 miles (320 km); Las Vegas and then Los Angeles. That is the theory, but in practice it is somewhat different: nobody has been able to do it so far!

Everyone keeps repeating it: the 145.010 MHz digipeaters were never meant to handle long distance networking. However, assuming that everything is working and everyone co-operates to avoid hogging the frequencies, they do a pretty good job.

—Written by K0GUZ in the RMPRA > PACKET and taken from Gateway, The ARRL Packet-Radio Newsletter Vol 3, No 4