

Product Review | FTM-100DR 144/430 MHz Dual Band Transceiver

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Photo 1: FTM-100DR 144/430 MHz Dual Band Transceiver.

The FTM-100DR 144/430 MHz dual band mobile transceiver is one of the latest in the Yaesu System Fusion range.

Features

- 144/430 MHz dual band transceiver with automatic detection of FM/C4FM digital communication mode
- Wide band receiver in the 108 MHz to 999 MHz range
- Transmit power of 50/20/5 W selectable
- Separable LCD front panel complete with separation cable and mounting bracket
- 1000 memory channels split between the A Band and B Band
- Supports micro-SD card for programming, backup and cloning to other transceivers
- VFO or memory scan functions
- Built in GPS receiver for display of location and movement information
- APRS function built in for communication of location and messages
- Group monitor function for information exchange between frequently communicating groups
- Support for Yaesu's WIRES-X internet linking function
- Optional Bluetooth adaptor for hands free operation
- Optional voice guidance unit provides voice announcements and recording of received audio
- ends for connection to the mobile power supply (the connector at the transceiver end is a standard 2 pin auto plug and two spare fuses are supplied)
- Mounting brackets and screws for both the transceiver and the remote head
- Manual (which is also available to download from the Yaesu web site in PDF format)
- Programming cable (SCU-20) – this is a huge addition to the box as the programming software is also available for download from the Yaesu web site
- Stereo to mono plug for connection to the external speaker jack
- 3 m controller cable (for remote head separation)

In the box

- The main unit with detachable head
- DTMF microphone (MH-48A6JA)
- Fused power cable with bare

Installation

I also acquired the Bluetooth option (BU-2) as the microphone plugs into the main unit, not the detachable head. More about installation of the BU-2 option later. As I'm replacing an FT-7900 in the vehicle with this transceiver, I will make some observations and/or comparisons with that model.

The first observation is that the mounting brackets are identical in size and the screws are interchangeable. It was very easy for me to remove the FT-7900 and fit the FTM-100DR in its place (mine is mounted under the front passenger seat). The antenna connector is a UHF type socket unlike the FT-7900 which has an N socket. I used an adaptor (N socket to UHF plug) for connection to the antenna so as not to have to change the antenna connector. The power cables are identical, so no problems with that connection.

The remote head mounting bracket comes with a double sided adhesive sheet that is designed to stick to a flat panel on top of the dash. I had the head of the FT-7900 mounted on top of the centre console located just in front of the gear shift. I'm using Velcro strips stuck to both the console and the back of the remote head so it can be easily removed. I continued to use this method with the FTM-100DR. Then I connected the remote head to the transceiver with the supplied controller cable.

The microphone plugs into the front of the main unit. This was not very convenient for me. With the main unit mounted under the front passenger seat, the curly microphone cable is way too short. You can purchase extension cables which have a 6 pin (RJ12 / 6P6C) connector at each end although I discovered that the head extension cable I had for the FT-7900 was interchangeable. I plugged one end into the microphone socket on the transceiver, the other end into a CAT6 joiner with the Microphone on the other end of the joiner. Powered up the transceiver and I'm on air.

I installed the Bluetooth module in the main unit earlier however I decided that the microphone provides more flexibility because of the buttons it provides to operate the transceiver (more about this later). To install the Bluetooth unit, remove the cover, disconnect the speaker and remove the front panel and the Bluetooth unit pushes onto a socket at the front of the transceiver. The process is reversed to replace the covers - a fairly simple process.

To check the operation of the Bluetooth unit, I found an old mobile phone Bluetooth headset, paired that with the transceiver and it worked as expected first time. You may need to change the Bluetooth PIN in the transceiver to match the device with which you are pairing. I also configured the transceiver so that the answer button acted as a PTT

toggle switch (i.e. push to transmit, push again to return to receive).

Operation

Programming software is not required to configure the transceiver although I would highly recommend using it due to the many features available and the complexity. As already mentioned, the programming cable is provided and the software is downloadable for free from the Yaesu web site. When the transceiver is first powered on, you will be asked to enter your Callsign. The LCD screen will basically guide you through this process using the main control knob to select the required letters. Up to 10 alphanumeric characters can be entered including a hyphen.

To turn the transceiver on, press the power button for over 2 seconds and the LCD screen comes to life. To turn the transceiver off, press the power button again for over 2 seconds or you can configure the auto power off feature to turn the transceiver off after an interval of inactivity. I have mine set to 1 hour, although there are several settings available from 0.5 to 12.0 hours. A warning beep sounds about 1 minute before the transceiver turns off. Pressing any button at this point will reset the timer. This is a significant improvement over the FT-7900 which beeps continuously until the transceiver powers off.

The power button also doubles as a lock key to stop any accidental

Photo 2: Front panel.



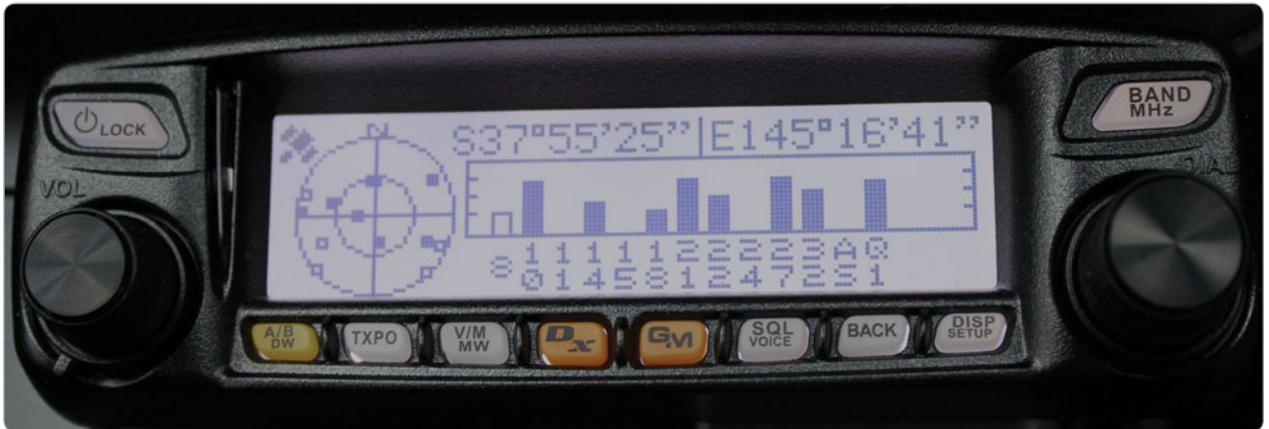


Photo 3: GPS Detail Display.

operation of the transceiver. Press the key momentarily to lock and again to unlock. The volume control is self-explanatory. On the right hand side of the front panel is the BAND MHz button. Pressing this button momentarily changes the operating band, pressing and holding for over 1 second allows the frequency to be adjusted in 1 MHz steps. The large dial on the right is for changing frequency, memory channels or selecting configuration options.

The other buttons on the front panel provide the following functions (in each case, select the first function with a momentary press and the second function by pressing and hold for over 1 second):

- A/B DW – switches between the operating Band A or Band B; toggles the dual watch function on and off
- TXPO – toggles the transmission power setting between 50/20/5 W output; toggles the signalling setting (tone on/off etc.)
- V/M MW – toggles between VFO and memory mode; enters the memory registration screen
- DX – switches the operating band communication mode (FM/C4FM etc.); activates the WIRES-X function
- GM – activates the group monitor function; displays the logging screen
- SQL VOICE – press to adjust the

scquelch level with the main dial; activate VOICE mode (when the optional FVS-2 is installed)

- BACK – enables the selected value and returns to the previous screen
- DISP SETUP – switches the information display between your location, received station location or GPS info screen; enters the SETUP menu

The supplied microphone (MH-48A6JA) also supports most of the above functions so that the transceiver can be operated without touching the front panel. In addition, there are four function keys that can be programmed to perform your most commonly used functions.

The transceiver is not a true dual band receiver as it will only receive on one frequency at a time. To work around this, it provides a dual watch capability that periodically scans the home channel of the current band at an interval of from 0.3 to 10 seconds (selectable). The dual watch function can be toggled on and off from the front panel.

Built in GPS

The GPS reception antenna is located in the detachable front panel (top centre). For this reason, it is recommended that the front panel is mounted on the dash or at the front side of the centre console (which is where mine is mounted) to gain a clear GPS signal. The strange looking icon in the top left

hand corner of the screen indicates a GPS lock (flashing means finding the GPS signal and stable means GPS locked).

The compass displays the direction of travel which can be configured as either North up or heading up. Alongside the compass is the direction (N, S, E, W, etc.) and the current speed in km/h. Pressing the DISP button will display detailed GPS coordinates and heading direction. This can be switched between my station (MY) and the received station (YR), assuming there is another station transmitting using the C4FM mode – more about this later.

The FTM-100DR has a built in clock. The date and time can be set manually or automatically when a signal is received by the GPS. Make sure you set the time-zone correctly; there is no automatic adjustment for daylight savings time. The sub display can be configured to show the sub band frequency, clock or voltage. I prefer to see the sub band display with repeater Callsign displayed.

In C4FM digital mode, the GPS location information and voice signals are transmitted simultaneously. Therefore, the direction and location of the received station can be calculated and displayed in real-time, even while communicating. When such a signal is received, the transceiver displays the Callsign, bearing and

distance to the received station on the LCD screen.

The transceiver has a function that enables GPS information to be logged to the micro-SD memory card (when one is installed). This saved information, for example, can be extracted at a later date using a personal computer to import into mapping software to display the route travelled.

Programming the transceiver

There are a few options available for programming the transceiver. The most basic option is via the front panel. You will probably want to load it with a large list of local repeaters therefore I would highly recommend using programming software. After all, the transceiver comes with a programming cable and the Yaesu software can be downloaded from their web site for free.

I use RT Systems software for programming all of my transceivers; therefore I downloaded a copy of the FTM-100DR radio programmer which cost me \$25 USD (\$35 AUD). The RT Systems software will work with the Yaesu supplied cable or a micro-SD card. The FTM-100DR is not yet listed on the CHIRP web site although I'm sure it will appear soon given the popularity of this software.

The best place to get the latest repeater files is from the WIA web site. There is a CSV file available that can be massaged and imported directly into the programmer. When

you run the programmer, you will notice that there are two bands available (Band A and Band B). Yaesu has decided to remove the memory bank functionality from this transceiver to help reduce its complexity. I personally think this was a wrong move because organising memories into banks is great for travelling and grouping favourite channels together.

I initially configured all of the 2 m repeaters for VIC (50 of) in Band A and 70 cm repeaters (65 of) in Band B. Having used the transceiver on the road for a few weeks, I think I'll move everything to Band A and program my favourites into Band B. This will make for quicker access to the channels I use regularly and enable me to scan my favourites. This approach may seem a bit wasteful as I will have about 10 favourites occupying space that can accommodate up to 500 channels. I have roughly 115 repeaters and 5 simplex channels programmed into memory. The 500+500 available memory channels will be more than adequate for most users in Australia.

In addition to the Band A and Band B memories, there are nine pairs of limit memories that can be programmed for each band; five home channels and the initial VFO frequencies can be set. All of the other functions can be set via tabs on the menu settings window. There are too many functions to go through here. Once you have saved the

transceiver configuration, you have the option of communicating with it via the supplied cable or saving the configuration to a micro-SD card.

Micro-SD card

The micro-SD memory card slot is located at the front of the main body. The letters SD are displayed on the front panel when a card is detected in the transceiver. Note that a micro-SD card is not supplied with the transceiver. The micro-SD card can be used for the following functions:

- Backing up the information and settings of the transceiver
- Saving GPS log data for use in a personal computer
- Saving data downloaded using the GM and WIRES-X functions
- Exchanging data with other transceivers

The transceiver supports micro-SD cards from 2 GB to 32 GB in size. According to the manual, not all commercial micro-SD cards will work and the card must be initialised in the transceiver to ensure proper operation. I used an 8 GB SanDisk Ultra without a problem. The transceiver supports the FAT32 file system. Note that if you format the card in the transceiver according to the initialisation procedure, all data on the card will be lost.

The micro-SD card is a very convenient way to program or re-program the transceiver after it has been installed in a vehicle. It is a

Photo 4: Configuration screen.





Photo 5: APRS Weather Information.

much easier alternative to removing the transceiver or having to take your laptop and cable out to the vehicle. Simply insert it in the transceiver, select write to micro-SD card and remove it. Insert the micro-SD card into a personal computer. The programming software allows you to read from it, make whatever changes you need and then write back to it. Re-insert it into the transceiver, perform a read from micro-SD card and you are up and running with the changes you just made.

C4FM digital mode

As you can see, this transceiver is packed with features, but the main attraction is the C4FM digital mode. The FTM-100DR transceiver is equipped with an Automatic Mode Select (AMS) function which automatically selects one of four transmission modes depending on the signal received. If AMS is off, the mode can be set manually:

- DN (voice / data simultaneous transmission mode) – This is the standard mode for C4FM digital. Transmission is less prone to interruptions due to detection and correction of voice signals. GPS data (if available) is transmitted along with the voice data and the transmitting stations Callsign. The LCD screen will display the Callsign and distance to the received station (if GPS data is available).
- VW (voice full rate mode) – digital voice data is transmitted

using the full 12.5 kHz bandwidth which enables high quality voice communication

- DW (high speed data communication mode) – data is transmitted using the full 12.5 kHz bandwidth for image and message transmission
- FM (analogue FM mode) – standard FM mode of transmission which supports communications with stations not able to transmit using a digital mode.

Compared to other digital modulations within FDMA, C4FM has excellent communication quality, Bit Error Rate (BER) characteristics. Presently, C4FM is the standard method for professional communication devices in FDMA, and is therefore expected to continue to be the main stream digital communication in the future.

On air, the number of repeaters and users of C4FM devices is starting to grow. I have had many contacts while testing this transceiver and I can say that the audio quality certainly lives up to expectation both through the local repeaters and via simplex communications. The ability of the transceiver to drop back to conventional FM mode when it hears one of these signals is simply amazing.

I understand that sales of C4FM repeaters (DR-1X) in Australia are growing as this mode of communication becomes more popular here. As Editor of the *WIA Callbook*, I have asked the National Repeater List

Coordinator if we can identify these repeaters in next year's *Callbook* so that people know where to find them.

I live in Lysterfield, Victoria. The local repeaters are as follows:

- VK3RFY 438.400 MHz Tone 91.5 Hz Hillside, Melbourne FM/C4FM EchoLink/IRLP
- VK3RGW 438.500 MHz Tone 91.5 Hz Grovedale, Geelong West FM/C4FM
- VK3RDY 439.600 MHz Tone 91.5 Hz Mt Waverly, Melbourne FM/C4FM
- VK3RBY 439.625 MHz Tone 88.5 Hz Bayswater, Melbourne FM/C4FM

Unfortunately, I can't tell you where to find the other ones although I know there are several in NSW, QLD and WA.

APRS feature

The Automatic Packet Reporting System (APRS) was developed by Bob Bruninga WB4APR and is an amateur radio based digital communications system for local, tactical, real-time exchange of information among all members of a net, including map based displays for situational awareness.

Upon receiving an APRS signal from another station, information such as the identity, direction, speed and distance to that station can be displayed on the screen of the transceiver. Additional data such as messages and weather information can also be exchanged.

I have not used APRS before, so



Photo 6: APRS Digi-repeater Indication.

this was a learning curve for me. In the end though, it was fairly easy to setup once I found the right frequency (145.175 MHz) and baud rate (1200 baud). Turning on the APRS modem suddenly brought the transceiver to life displaying station information as far away as VK5, VK7 and VK2. Turning on the auto beacon feature enabled me to contribute my position.

One small note of caution, remember to turn off the beacon function before changing frequency otherwise you might bombard other amateurs with a horrible noise (especially if you are moving to a repeater). The configuration options for APRS are quite extensive therefore I won't go through them here. Suffice to say Yaesu provides a separate instruction manual for APRS that is available for download from their web site.

WIRES-X feature

The WIRES-X feature is a system that links to other users via the internet which enables communication world-wide regardless of the distance

Specifications – General

Frequency range	TX 144 – 148 MHz 430 – 450 MHz RX 108 – 137 MHz (Air Band) 137 – 174 MHz (Incl. Ham) 174 – 400 MHz (GEN1) 400 – 480 MHz (Incl. Ham) 480 – 999 MHz (GEN2)
Channel steps	5/6.25/8.33/10/12.5/15/20/25/50/100 kHz
Emission type	F1D, F2D, F3E, F7W
Frequency stability	+2.5 ppm -20oC to +60oC
Antenna impedance	50 Ω
Supply voltage	Nominal 13.8 VDC negative ground
Current consumption	0.5 A receive 12 A transmit (50 W TX)
Operating temperature	-20oC to +60oC
Case size	Radio unit: 140 x 45 x 164 mm Front panel: 140 x 45 x 29 mm
Mass	1.1 kg total

Specifications – Transmitter

RF power output	50/20/5 W
Modulation type	F1D, F2D, F3E: variable reactance modulation, F7W: 4FSK (C4FM)
Spurious emission	At least 60 dB below
Microphone impedance	About 2 kΩ
Data terminal input impedance	About 10 kΩ

Photo 7: APRS Digi-repeater Indication.



Specifications – Receiver

Circuit type	Double conversion super-heterodyne
Intermediate frequencies	1st 47.25 MHz, 2nd 450 kHz
Receiver sensitivity	108 – 137 MHz (AM) 0.8 μ V typ. for 10 dB SN 137 – 140 MHz (FM) 0.2 μ V for 12 dB SINAD 140 – 150 MHz (FM) 0.2 μ V for 12 dB SINAD 150 – 174 MHz (FM) 0.25 μ V for 12 dB SINAD 174 – 222 MHz (FM) 0.3 μ V typ. for 12 dB SINAD 222 – 300 MHz (FM) 0.25 μ V typ. for 12 dB SINAD 300 – 336 MHz (AM) 0.8 μ V typ. for 10 dB SN 336 – 420 MHz (FM) 0.25 μ V for 12 dB SINAD 420 – 470 MHz (FM) 0.2 μ V typ. for 12 dB SINAD 470 – 520 MHz (FM) 0.2 μ V for 12 dB SINAD 800 – 900 MHz (FM) 0.4 μ V typ. for 12 dB SINAD 900 – 999 MHz (FM) 0.8 μ V typ. for 10 dB SINAD
	Digital mode
	140 – 150 MHz (Digital) 0.19 μ V typ. For BER 1% 420 – 470 MHz (Digital) 0.19 μ V typ. For BER 1%
Selectivity	NFM, AM 12 kHz / 30 kHz (-6 dB / -60 dB)
AF output	3 W (8 Ω , THD 10%, 13.8 V) internal speaker
	8 W (4 Ω , THD 10%, 13.8 V) optional MLS-200-M10
AF output impedance	4 – 16 Ω

between stations. To establish a WIRES-X node, the WIRES-X connection kit (HRI-200) is required. As I didn't acquire one of these kits, I

was not able to review this function (I may be able to make it the topic of a future review).

Conclusion

The FTM-100DR 144/430 MHz dual band transceiver is a compact mobile device that manages to pack a huge amount of functionality into a very flexible package. In addition to the normal functions you would expect from an amateur transceiver of this nature, it supports digital (C4FM) mode, APRS, GM (group monitor), WIRES-X, Bluetooth (option) and comes equipped with built in GPS. In addition, it comes with a programming cable, remote head separation kit (3 m cable and bracket) and a micro-SD card slot for backup, programming and storage of data.

Acknowledgements

I would like to thank Akiko Shiragami from Yaesu Japan for her support and rapid turnaround for answers to my questions during this review. I would also like to thank Ross Keogh from Strictly Ham in Bayswater for the supply of all equipment for the review. I will be reviewing the FT2D dual band digital handheld in an upcoming issue.

Over to you

AR

Recruiting new amateurs

To the Editor AR,

After reading the comment in AR April by Rob VK3NBC, I would like to share my views on the subject of recruiting new members and to address some of the statements made by Rob.

Firstly there has been a portion of amateurs who have the view that the introduction of the Foundation licence is a "dumbing down" of the standards required. Let me state clearly here I do not support that view at all. I believe this has been a great step forward for the hobby and has encouraged many new hams into the hobby who would have never otherwise joined our ranks. Now the clear goal here is also that these new hams go on and through exposure to others more experienced in radio continue their education and upgrade to Standard or Advanced licences. I am pleased to say I personally now many "F" calls that have done just that. The important point here is most would never have done this as to go straight to the old novice or limited call would have seemed too daunting so was never attempted yet here they are now as standard or advanced calls. So the idea of the Foundation licence as a stepping stone does indeed work.

As to those Foundation calls who do not ever upgrade, fine they are on the air participating in our hobby, out at special events and field days etc. They continue to add to our ranks and enjoy what they are doing within the limits of their privileges, no problem with that at all.

Now where I do disagree with Rob's comments is with that of his statement "We need to grow. If the system needs to be made easier for this to happen so be it", he goes on to say "if the powers at be decided to give every Foundation holder an upgrade to Advanced tomorrow, it would not bother me as long as they know and understand the regulations". Really, seriously Rob? There is a reason that there is a technical component to gaining access to using radio equipment, would you really see it as a good idea that those with little proven (this is what an exam does in the main) knowledge of electrical and radio theory have access to high powered transmitters of up to 400 watts? Even 50 or 100 watts into a high gain antenna at VHF or UHF frequencies is capable of vastly exceeding safe EMR limits not mention the potential

for other problems with interference to other services with poor installation practices.

The other point is our hobby is about the "investigation of art and science of radio" to quote a term from the ARRL but one that I feel is very appropriate. If we remove all entry requirements are we then attracting persons who are genuinely interested in radio technology or persons who can simply afford to pay the licence fee? This is the core of our hobby and if that test of real interest is taken away then I see that we are no longer a group of like-minded people and would cease to exist as a hobby.

For those with learning difficulties there is much help already given, there are many very patient volunteers who will help those they can through the process and where necessary the exams are read out and answered verbally. That said though if the applicant truly cannot grasp just the basics required in the Foundation course then at the risk of seeming arrogant they are simply not suited to our hobby.

Regards,
Stuart Jones VK2ZX.

AR