

# Product Review: FT2D

## 144/430 MHz Dual Band Handheld Transceiver

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The FT2D 144/430 MHz dual band handheld transceiver is one of Yaesu's latest in the System Fusion range. Complete with GPS, APRS, WIRES-X, C4FM digital and a large 160 x 160 dot LCD screen and touch panel, there is not much more you would want from such a compact handheld transceiver.

### Features

- Digital communication with C4FM (Quaternary FSK), FDMA system
- Equipped with AMS (Automatic Mode Select) function – 144/430 MHz dual band transceiver with automatic detection of FM/C4FM digital communication mode
- External power supply connection
- Simultaneous reception on two different bands or within the same band
- Wide band receiver in the 500 kHz to 999.900 MHz range
- Independent switching keys for A-band and B-band with TX/BUSY display
- Waterproof design equivalent to IPX5, which protects transceiver from rain and splashes
- Large 160 x 160 dot LCD screen and touch panel
- WIRES-X connection support
- Equipped with GM (Group Monitor) function
- Large capacity 1266 channels with 24 memory banks
- Displays memory tags of up to 16 characters
- A wide variety of scan functions
- Built in GPS unit allowing display of your current location and heading information
- Ready for APRS communication using the world standard 1200 / 9600 bps AX25 modem
- High resolution band scope function (will display up to 35 channels)
- Equipped with the smart navigation function
- A variety of individual selective calling functions such as CTCSS and DCS
- Vibrator to alert you of signal reception in addition to the audible bell
- New pager function for calling only specific stations
- LED backlight for easy viewing of the LCD outdoors
- Battery save function to extend battery operating time
- Data terminal for communication with external equipment and firmware updates
- Compatible with microSD cards
- Snapshot function (with optional MH-85A 11U camera microphone)
- Transmit power of 5 W (@ 7.2 VDC or EXT DC) – in addition 3 low power options are selectable to save battery life.

### In the box

- The main unit / handheld transceiver
- Standard flexible rubber dual band antenna
- Long life lithium ion battery pack (7.2 V 2,200 mAh)



*Photo 1: The FT2D transceiver.*

- Battery charger
- Belt clip and battery pack protective cap
- Hand strap
- USB cable (for firmware updates only – it is not a programming cable)
- Quick manual, operating manual and warranty card.

## Installation

Not much installation is required out of the box. Carefully install the antenna on top of the transceiver. Be sure to hold the thick base of the antenna while installing it to avoid damage to the SMA connector.

Next, either install the protective cap supplied to the back of the battery or attach the belt clip to the battery. Attach the hand strap to the transceiver then install the battery.

Make sure the transceiver is turned off. Insert the charging cable and power on the charger. The manual says that it takes about 9 hours to fully charge a flat battery however the battery supplied typically takes about 6 hours to charge from flat. As the battery is a lithium ion type, you don't need to wait for the battery to be fully discharged before charging.

Once the battery is charged, power on the transceiver. The battery will typically last about 10 hours with normal use before recharging. The transceiver can be run from a 12-14 V power supply using the optional E-DC-6 cable.

## Operation

Programming software is not required to configure the transceiver although I would highly recommend using it due to the many features available and their complexity. The programming cable is NOT provided although the software is downloadable for free from the Yaesu web site. The microSD card can be used for programming the device (see later). 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 touch screen 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 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. This feature is very useful for a portable situation to avoid draining the battery if the transceiver is accidentally left on.

The power button also doubles as a lock key to stop any accidental operation of the transceiver. Press the power key momentarily to lock and again to unlock. The FT2D is a true dual band receiver therefore can receive signals on two frequencies at the same time (either on the same band or on different bands). The screen is split in two showing the details of each frequency

being received. The active or the current transmitting frequency is shown in bold, the other is greyed out. Changing between transmit frequencies is as easy as touching the required active frequency on the screen.

The volume can be set independently using the volume ring on top of the transceiver for each band while it's the active band. The dial above the volume ring is used for adjusting the frequency, selecting a memory channel or picking a function. The touch screen is used for most other functions in combination with the dial.



Photo 2: Dual Band Display.

The other buttons on the front panel provide the following functions:

- BACK – press to return to the previous function or back to operation
- DISP – press to show the GPS / compass display or hold to show the setup menu



Photo 3: Function Display.

- BAND – press to change band in VFO mode or bank in memory mode
- X – press to activate the WIRES-X function (transceiver must be in digital mode)
- GM – press to activate the group monitor function
- A/B – press to switch between band A and band B
- V/M – press to switch between VFO and memory operation.

In addition to the physical buttons, there are three soft function keys displayed on the lower segment of the touch screen. They are:

- FMW – press to show the operating menus
- TXM – press to fix the communication mode on the transmission side
- MODE – press to toggle between FM, AMS (Automatic Mode Select), DN (Digital Narrow band C4FM), VW (Digital Wide band) modes.

Photo 4: GPS Compass Display.



## Built in GPS

The GPS reception antenna is located at the top centre of the transceiver. The GPS icon (looks like a satellite) can be found at the top near middle of the screen which indicates a GPS lock (flashing means finding the GPS signal and stable means GPS locked).

Activating the GPS function enables the transceiver to automatically obtain the internal clock setting and your location information from received GPS data. When transmitting in C4FM mode, the GPS position is transmitted simultaneously with the voice signals. This enables the transceiver to display the distance and direction to the receiving station while communicating.

The GPS position can be automatically saved onto the microSD card for later retrieval using commercially available mapping software to display your trip.

## On the move

I took the radio away with me on a cruise ship in August to test it out on the move. It proved to be a very useful device as we cruised from

Sydney, up the east coast stopping at Airlie Beach, Yorkeys Knob, Port Douglas, Willis Island and back to Sydney via Brisbane. Most of time we cruised about 30 to 40 km from

the coast and I could access most available repeaters in various cities along the way. Where mobile phone reception was a bit flaky, accessing a repeater from up on deck was a breeze.

The GPS would report accurate position and heading data when compared to the mobile phone. Where the radio excelled was

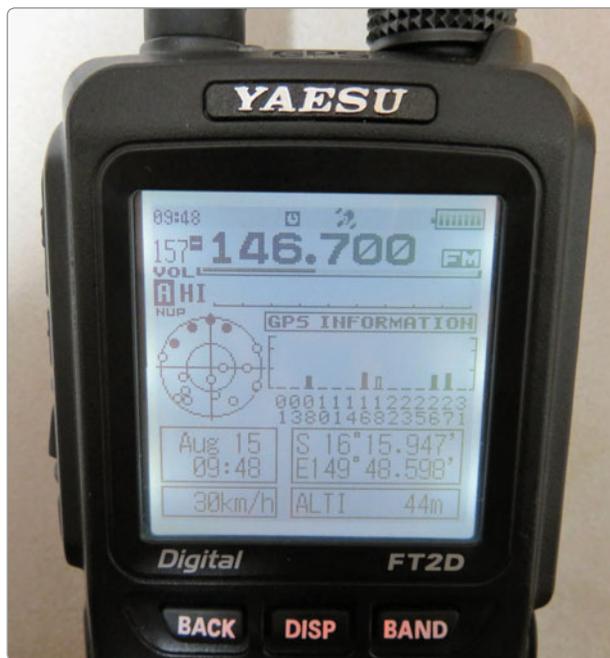


Photo 5: GPS Display Willis Island.

out at Willis Island where there was no mobile phone reception. Unfortunately, there are no repeaters out there either, although I could capture the position data (see image), input that into maps on the mobile phone and see exactly where we were.

### 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. The transceiver does NOT come with a programming cable although the Yaesu software can be downloaded from their web site for free (using the microSD card).

I use RT Systems software for programming all my transceivers, therefore to complete the set I downloaded a copy of the FT2D radio programmer which cost me \$25 USD (~\$35 AUD). The RT Systems software will work with the optional Yaesu supplied cable or a microSD card. The FT2D is not yet listed on the CHIRP web site although I'm sure it will appear soon given the popularity of this software. The FT1D is listed on CHIRP and given these transceivers are identical except the touch screen, it should work.

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). There are 24 banks available for grouping your favourite channels and repeaters.

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 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 optional programming cable or saving the configuration to a microSD card.

Photo 6: Setup Menu.

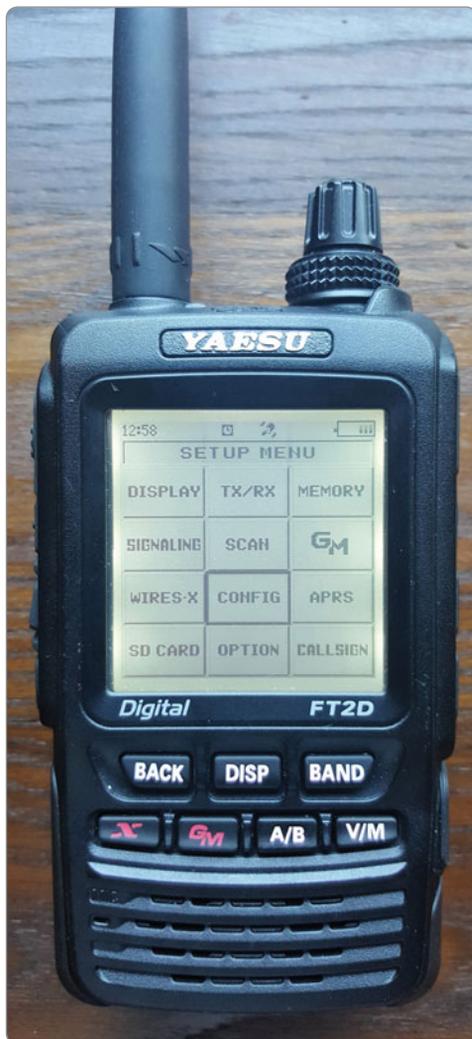
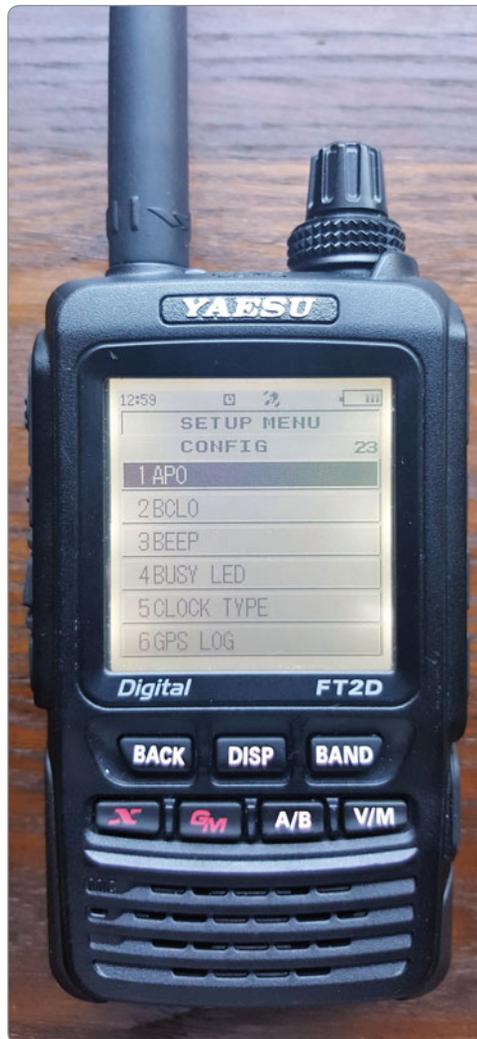


Photo 7: Config Menu.



## microSD card

The microSD memory card slot is located at the side of the main body. The letters SD are displayed on the front panel when a card is detected in the transceiver. Note that a microSD card is not supplied with the transceiver. The microSD 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 microSD cards from 2 GB to 32 GB in size. Per the manual, not all commercial microSD 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 per the initialisation procedure, all data on the card will be lost.

## C4FM digital mode

As you can see, this transceiver is packed with features, but the main attraction is the C4FM digital mode. The FT2D 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.

The current group of C4FM repeaters published in the 2017 Callbook include:

Output	Input	Callsign	Location	Service area
438.1125	432.7125	VK2RBV	Sydney	Sydney
146.675	146.075	VK2REE	Mt Ganghat	Taree-Glou
438.325	433.325	VK2REE	Mt Ganghat	Taree-Glou
146.800	146.200	VK2RSC	Parrots Nest	Lismore
144.9375	145.5375	VK3RDQ	Outer Eastern Suburbs	Melbourne
438.400	433.400	VK3RFY	Hillside	Melbourne
438.500	433.500	VK3RGW	Grovedale	Geelong West
439.600	434.600	VK3RDX	Mt Waverley	Melbourne
438.225	432.825	VK4RPH	Mt Haren	Kuranda
147.300	147.900	VK4RCN	Manoora	Cairns
438.325	432.925	VK4RCN	Manoora	Cairns
439.825	434.825	VK5RSC	Mt Terrible	Adelaide

**Note:** I know there are many more, especially in VK6, so please let the repeater list manager know (Steve Ireland VK2MD) about the others so that they can be listed too.

### APRS feature

Setting up the APRS feature on this radio was straightforward after having done it before for the FTM-100DR and FTM-400XDR once you select 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 add my position.

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 between stations. To establish a WIRES-X node, the WIRES-X connection kit (HRI-200) and an internet connected PC is required. Yaesu provide

separate instruction manuals for WIRES-X setup (HRI-200) and operation (for each model transceiver). For more details see my previous review in the August 2016 edition of *AR* magazine.

From your handheld or other transceiver, you can access the local node by tuning to the node frequency and pressing the X button (or using DTMF for the FM node). Once connected to the node, you can now have a normal conversation with the remote station or group of stations connected to the room. There is a regular net conducted in the Americas room at 11 am Sunday morning EST if you would like to join in.

### Specifications – General

Frequency range	TX-A/B	144 – 148 MHz 430 – 450 MHz
	RX-A	520 – 1710 kHz 1.8 – 30 MHz 30 – 88 MHz 88 – 108 MHz 108 – 137 MHz 137 – 134 MHz 174 – 222 MHz 222 – 420 MHz 420 – 800 MHz 800 – 999 MHz
	RX-B	108 – 137 MHz (Air Band) 137 – 174 MHz (Incl. Ham) 174 – 222 MHz 222 – 420 MHz 420 – 470 MHz (Incl. Ham) 470 – 580 MHz
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 -20°C to +60°C
Antenna impedance		50 Ω
Supply voltage		Nominal 7.2 V DC negative ground 11 – 16 V DC negative ground with optional EXP DC jack
Current consumption		180 mA dual band receive 1.6 A transmit (5 W TX 144 MHz) 1.8 A transmit (5 W TX 430 MHz)
Operating temperature		-20oC to +60oC
Case size		Radio unit: 63 x 110 x 32.5 mm
Mass		310 g total with antenna

### Specifications – Transmitter

RF power output	5 W @ 7.2 V DC or EXT DC
Modulation type	F1D, F2D, F3E: variable reactance modulation, F7W: 4FSK (C4FM)
Spurious emission	At least 60 dB below

## Specifications – Receiver

Circuit type	Double conversion super-heterodyne Direct conversion (AM / FM radio)
Intermediate frequencies	A Band 1 <sup>st</sup> 47.25 MHz, 2 <sup>nd</sup> 450 kHz B Band 1 <sup>st</sup> 46.35 MHz, 2 <sup>nd</sup> 450 kHz
Sensitivity (for 12 dB SINAD)	3 $\mu$ V (0.5 – 30 MHz AM) 0.35 $\mu$ V (30 – 54 MHz NFM) 1 $\mu$ V (54 – 76 MHz NFM) 1.5 $\mu$ V (76 – 108 MHz WFM) 1.5 $\mu$ V (108 – 137 MHz AM) 0.2 $\mu$ V (137 – 140 MHz NFM) 0.16 $\mu$ V (140 – 150 MHz NFM) 0.2 $\mu$ V (150 – 174 MHz NFM) 1 $\mu$ V (174 – 222 MHz NFM) 0.5 $\mu$ V (300 – 350 MHz NFM) 0.2 $\mu$ V (350 – 400 MHz NFM) 0.18 $\mu$ V (400 – 470 MHz NFM) 1.5 $\mu$ V (470 – 450 MHz NFM) 3 $\mu$ V (540 – 800 MHz NFM) 1.5 $\mu$ V (800 – 999 MHz NFM) 0.19 $\mu$ V TYP for BER 1% (digital mode)
Selectivity	FM, AM 12 kHz / 35 kHz (-6 dB / -60 dB)
AF output	700 mW (8 $\Omega$ , THD 10%, 13.8 V) internal speaker 300 mW (8 $\Omega$ , THD 10%, 13.8 V) optional MLS-200-M10
AF output impedance	4 – 16 $\Omega$

## Conclusion

The FT2D 144/430 MHz dual band handheld 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 handheld transceiver of this nature, it supports digital (C4FM) mode, APRS, GM (group monitor), WIRES-X and comes equipped with built in GPS.

## Acknowledgements

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