

# Product Review | FTM-400DR 144/430 MHz Dual Band Transceiver

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The FTM-400DR 144/430 MHz dual band mobile transceiver is one of Yaesu's latest in the System Fusion range. Combined with the HRI-200 WIRES-X internet linking unit, this is a highly functional digital communications system for the modern amateur.

## 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 with cooling fan
- LCD front panel complete with 3 m separation cable and mounting bracket
- Full colour 90 mm LCD high luminance TFT touch panel
- 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
- Optional camera equipped microphone



Photo 1: The FTM-400DR transceiver.

## In the box

The main unit and detached control head

- DTMF microphone (MH-48A6JA)
- Fused power cable with bare 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 free 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)



Photo 2: The HRI-200 Internet Linking Unit.

## Installation

The mounting brackets for most of the Yaesu mobiles are identical in size and the screws are interchangeable if you are replacing an existing unit. In this case I had already installed the FTM-100DR in place of the FT-7900 in the car, so this unit was installed and reviewed on the bench.

The antenna connector is a UHF type socket unlike the FT-7900 which has an N socket. I am not sure why Yaesu have changed these connectors, although it wasn't a big problem for me as I have a coax feed into the shack with a PL259 connector at the radio end. The power cables are standard 2-pin, so no problems running a short lead from the radio to the Anderson PowerPole distribution box.

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. In my case I used Velcro strips to secure the remote head to the top of the power supply unit. This provided easy access to the controls.

I plugged the control cable into the back of the remote head and the other end into the transceiver. The microphone also plugs directly into the transceiver. If you have the transceiver mounted remotely, an extension cable will be required. Then I powered up the transceiver and I am on air.

## 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. 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 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 two seconds and the LCD screen comes to life. To turn the transceiver off, press the power button again for over two seconds or you can configure the auto power off feature to turn the transceiver off after an interval of inactivity. I am not using this function in the shack although it is very useful for a mobile situation to avoid draining the car 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 key momentarily to lock and again to unlock. The FTM-400XDR has a true dual band receiver and can therefore 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 bright colour, the other is greyed out. Changing between transmit frequencies is as easy as touching the required active frequency on the screen.

There are two volume knobs on the front panel, one for band A (upper) and one for band B (lower). There are two dials on the right hand side, one for band A (upper) and one for band B (lower). These are used for adjusting the frequency, selecting a memory channel or selecting an item when programming etc. The touch screen is used for most other functions.

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):

- DX – switches the operating band communication mode (FM/C4FM etc.); activates the WIRES-X function

- Power LOCK – locks/unlocks the screen; switches the power on/off
- DISP SETUP – switches the information display between your location, received station location or GPS info screen; enters the SETUP menu
- F MW – displays the function menu; enters the memory writing mode
- GM – activates the group monitor function

In addition to the physical buttons, there are four user programmable soft function keys displayed on the lower segment of the touch screen.

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 programed to perform your most commonly used functions.

## 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 to gain a clear GPS signal. The icon (looks like a satellite) in the top right hand corner of the screen indicates a GPS lock (flashing means finding the GPS signal and stable means GPS locked).

## Available screen displays

**Dual Band screen** – shows band A at the top and band B below. At the bottom of the screen are the soft programmable function keys. By default, these are V/M (switch between VFO and memory mode); SQL (touch this to use the knob to adjust the squelch level); MUTE (to mute the sound); and SCOPE (to select the band scope function).

**Band Scope screen** – displays the band scope below the operating frequency. The width of the band scope can be set to wide or narrow as desired.

**Function Menu screen** – displays the available functions under the operating frequency. The options can be scrolled through using the forward and back functions. Pressing one of the functions displays the next level of detail or guides you through the settings. Any of the functions displayed at the top menu level can be associated with one of the four dedicated function keys.

**Compass screen** – The direction of travel of your own station and direction coordinates of the received station are displayed on the compass screen.

**Altitude Display screen** – The altitude of the current location is shown in the bar graph display.

**Timer / Clock screen** – The current time is shown in analogue and digital formats along with the date.

Other available screens include Lap Timer screen, Count down Timer screen, GPS Detail screen, Numbers and Symbols input screen, and Alphabet input screen.

## 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-400XDR 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-400DR 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 configured all of the 2 m repeaters for VIC (50 of) in Band A and 70 cm repeaters (65 of) in Band B. The 500+500 available memory channels will be more than adequate for most users in Australia. This was a simple copy and paste from the FTM-100DR repeater configuration file I setup earlier in the year.

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 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-400XDR 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.

Unfortunately, I can't tell you where to find all the repeaters here, although I know there are several in VIC, NSW, QLD and WA. I hope to have a full list available for the 2017 Callbook.

### APRS feature

Setting up the APRS feature on this radio was fairly straightforward after

having done it before for the FTM-100DR using the right frequency (145.175 MHz) and band 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.

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 (HRI-200)

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

Photo 3: The transceiver and associated equipment set up to operate as a WIRES-X radio node.



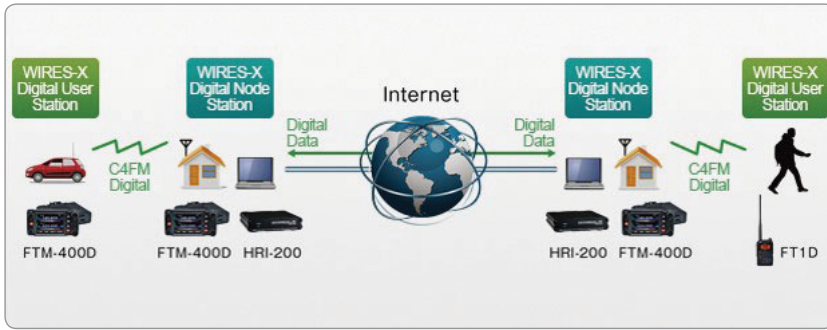


Photo 4: A functional diagram of the WIRES-X communications system.

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).

To establish a node, you first need to register with Yaesu. You will need to complete a web form and have the serial number of your HRI-200 internet linking unit handy. The process was very easy and was completed within 24 hours. You can find out more about WIRES-X and where to find nodes at the following web site: <https://www.yaesu.com/>

[jp/en/wires-x/index.php](http://jp/en/wires-x/index.php) (click on the WIRES-X ID list button). If you also click on Asia, Oceania then sort by country, all of the Australia nodes will be at the head of the list. My DTMF node ID is 14090. I count 39 nodes currently listed in Australia at the time of writing.

If the node is active, you can find its frequency on the WIRES-X Active ID List. When operational, I put my node on 439.125 MHz as this frequency shows up as an internet linking frequency in the current WIA band plan. With the current location of the antenna, my node can be heard throughout the Eastern Suburbs of Melbourne.

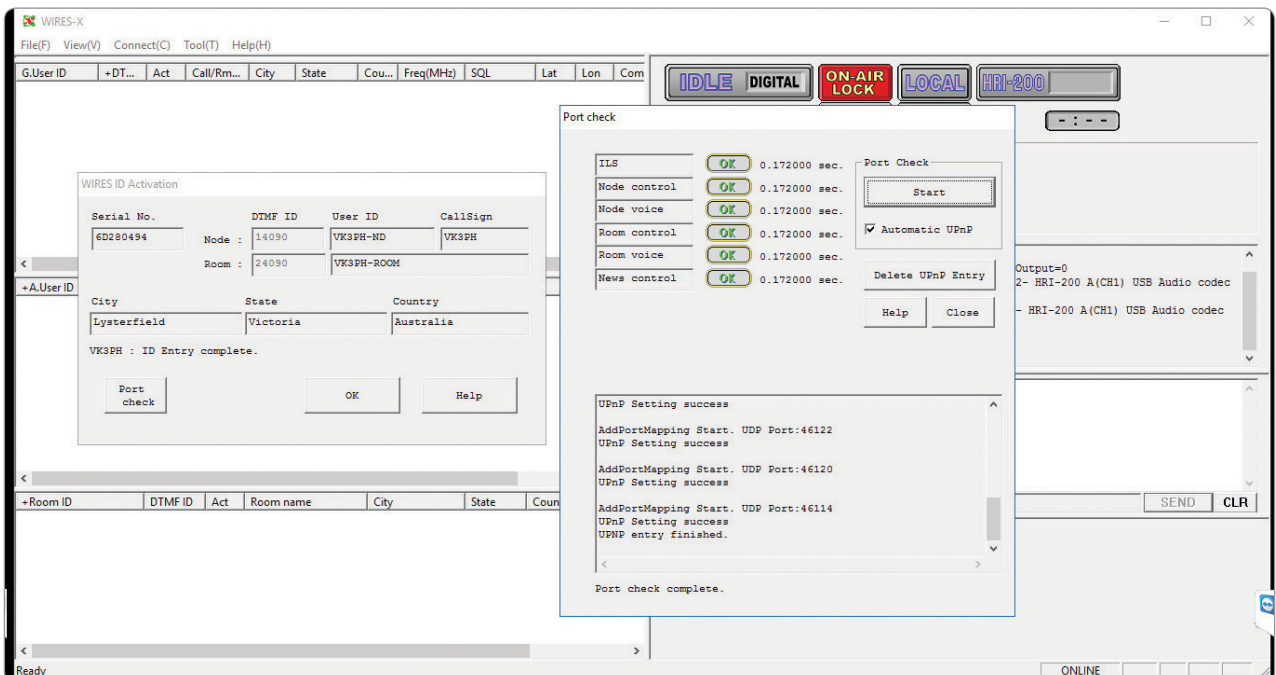
There don't appear to be any other nodes on this frequency within range.

The HRI-200 comes with a standard USB cable for connection to the PC. The unit is powered by this connection. It also comes with a 10 pin to 10 pin mini-DIN cable for connection to a digital radio and a 10 pin to 6 pin mini-DIN cable for connection to an analogue (FM) radio. The HRI-200 supports connection to up to 2 radios. I'm using the FTM-400XDR as the digital radio and the FT-7900 as an FM radio node (for those that don't have C4FM).

Connect the HRI-200 to the PC using the standard USB cable and then install the WIRES-X software. The PC must have a connection to the internet and the router must be capable of port forwarding. My router is connected via ADSL and has the automatic UPnP setting enabled. This is a much simpler way of setting up the required ports to forward as the software takes care of that for you.

The next step is to run the software and register your node.

Photo 5: A screenshot of the WIRES-X Activation screen.



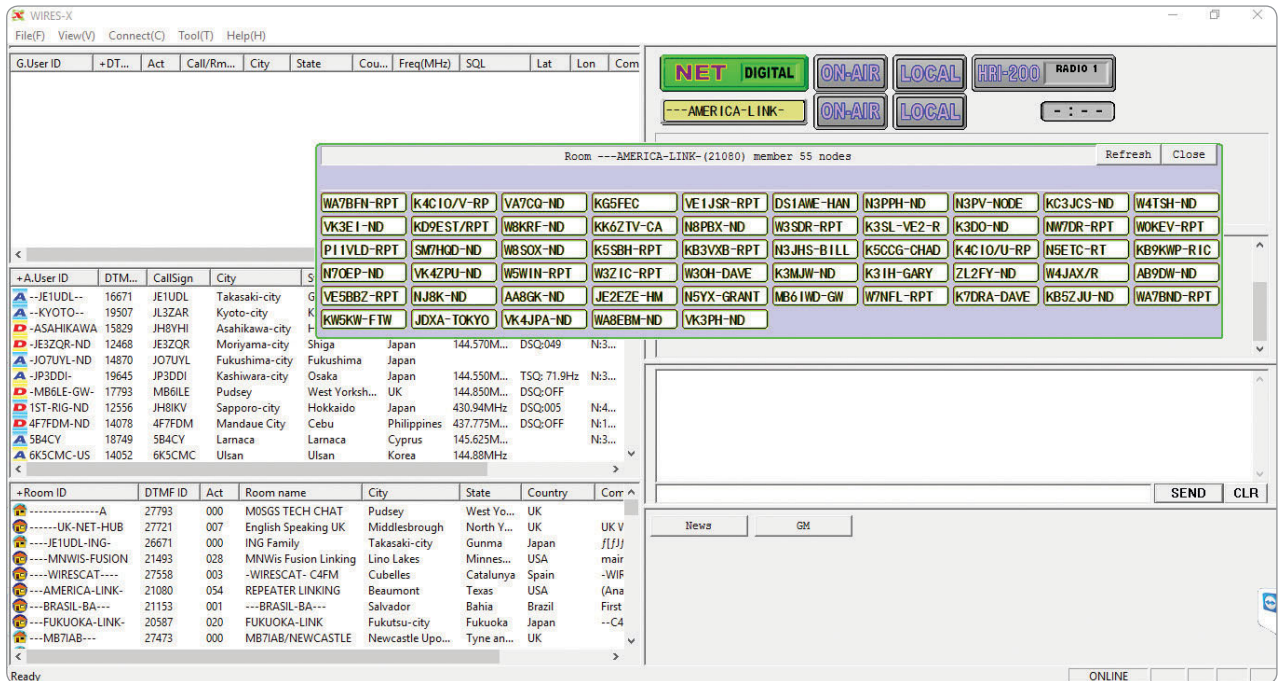


Photo 6: A screenshot of the WIRES-X Activation Software when connected to the America Link node.

Run the port check function to ensure the server can be contacted and if all ports show OK, you are up and running. Active nodes will display in the node window and active rooms in the rooms window. To connect to a node or a room from the software, simply right click on the room you want to connect to and select the connect option.

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). 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 around 10 am Sunday morning EST if you would like to join in.

To start the FTM-400XDR in WIRES-X mode – turn the

transceiver off. Press the DX and GM buttons at the same time as the power button to start the WIRES-X mode.

### Cross band repeater function

There is a nifty undocumented feature of the FTM-400XDR: that it will operate as a cross band repeater. To start the FTM-400XDR in cross band repeater mode, select the receive and transmit frequencies on the A band and B band and turn the transceiver off. Press all three buttons on the right hand side and the power on button simultaneously and the unit will start up in cross band repeater mode. It works a treat!

### Conclusion

The FTM-400XDR 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 Ross Keogh from Strictly Ham in Bayswater for the supply of all equipment for the review. Next month, I will be reviewing the FT2D dual band digital handheld.



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## 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 -20°C to +60°C
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	-20°C to +60°C
Case size	Radio unit: 140 x 40 x 125 mm w/o fan Front panel: 140 x 72 x 20 mm
Mass	1.2 kg total

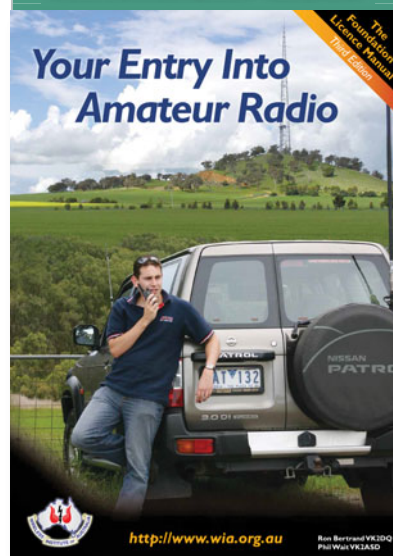
## Specifications – Transmitter

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

## Specifications – Receiver

Circuit type	Double conversion super-heterodyne
Intermediate frequencies	A Band 1st 47.25 MHz, 2nd 450 kHz B Band 1st 44.85 MHz, 2nd 450 kHz
Receiver sensitivity	108 – 137 MHz (AM) 0.8 μV typ. for 10 dB SN 137 – 140 MHz (FM) 0.2 μV for 12 dB SINAD 140 – 150 MHz (FM) 0.2 μV for 12 dB SINAD 150 – 174 MHz (FM) 0.25 μV for 12 dB SINAD 174 – 222 MHz (FM) 0.3 μV typ. for 12 dB SINAD 222 – 300 MHz (FM) 0.25 μV typ. for 12 dB SINAD 300 – 336 MHz (AM) 0.8 μV typ. for 10 dB SN 336 – 420 MHz (FM) 0.25 μV for 12 dB SINAD 420 – 470 MHz (FM) 0.2 μV typ. for 12 dB SINAD 470 – 520 MHz (FM) 0.2 μV for 12 dB SINAD 800 – 900 MHz (FM) 0.4 μV typ. for 12 dB SINAD 900 – 999 MHz (FM) 0.8 μV typ. for 10 dB SINAD Digital mode 140 – 150 MHz (Digital) 0.19 μV typ. For BER 1% 420 – 470 MHz (Digital) 0.19 μV typ. For BER 1%
Squelch sensitivity	0.16 μV (144/430 MHz)
Selectivity	FM, AM 12 kHz / 35 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
Strength of secondary radio waves	4 nW and below

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