Kenwood TH-D74A
Analog and D-STAR VHF/UHF Transceiver
Digital and analog operation on 144, 222, and 430 MHz, plus a whole lot more.

At the 2016 Dayton Hamvention ® , we were expecting the release of a new Kenwood digital radio. Most of us thought that this new rig would be doing DMR (Digital Mobile Radio) although, for years, there had been rumors about Kenwood building a D-STAR radio. Some people even thought that Kenwood might go its own way with its commercial digital mode, NEXEDGE (NXDN), like Yaesu did with the System Fusion radios (C4FM).

On the first morning of the convention, I rushed directly to the Kenwood booth and saw the new D-STAR radio (at that time, it didn't have any name or model number). The representative took the radio out of the glass case. I asked him if I could film it for my friend with my small action camera, and he agreed, but I could not record any audio. That night, I posted the short video on my YouTube channel (Laboenligne.ca), and 12 hours later, it already had about 5,000 views!

This confirmed how much the ham community was waiting for this radio.

##Bottom Line
With D-STAR and analog coverage of the 144, 222, and 430 MHz bands, plus APRS and a wide-coverage receiver that includes SSB, AM, and CW on the HF bands, Kenwood's TH-D74A packs an amazing amount of capability into a handheld package.

In the past, there was only one manufacturer of D-STAR radios for the North American market. Some folks thought that it was a proprietary protocol and stayed away because of this. The truth is that D-STAR (Digital Smart Technologies for Amateur Radio) was developed by the Japan Amateur Radio League (JARL) and may be used by any manufacturer. Now, with two different vendors in the market, maybe more hams will join this digital mode.

##Introduction

Kenwood does not release a new model very often, but when it does, it's always a leap forward. The TH-D74A is a tribander, operating on 144, 222, and 430 MHz. I have a multitude of digital hotspots in my shack, and this extra band (222 MHz) is more than welcome. For years, Kenwood has been known for their Automatic Packet Reporting System (APRS) capable radios, and this one is no exception. It offers D-STAR and FM transmission on all three bands, and it can receive AM, LSB, USB, and CW as well. But that's not all - it also offers general

####reception coverage:
100 kHz to 76 MHz,
76 to 108 MHz (WFM),
108 to 524 MHz.

Yes, it covers the HF bands in all modes, along with the AM and FM broadcast bands. It's equipped with adjustable IF filters for SSB and CW reception, and you can even adjust the CW pitch. It also covers the air band in AM. For those with vision problems, you can activate the voice guidance function - a rare feature for a handheld radio.

####other features:
- built-in GPS unit,
- IP54/55 weatherproofing,
- DSP voice processing,
- Bluetooth (Ver 3.0) Class 2,
- Audio Equalizer,
- virtual COM port,
- TFT color display

The TH-D74A has a built-in GPS unit, weatherproofing meeting IP54/55 standards, as well as DSP-based voice s processing. It is Bluetooth compliant (Version 3.0, Class 2), offering audio capabilities as well as a virtual COM port. It also has a micro-SD card slot and a standard micro-USB connector for direct PC connection, so no special cable is needed.

In the box, you will find the radio; an SMA male flexible antenna; a 7.4 V , 1,800 mAh Li-ion battery; a belt clip; a wall charger; a user guide in English, French, and Spanish (North American version), and a warranty registration card.

Physical Description

This radio has a very nice color TFT display that reminds me of the Kenwood flagship HF transceiver, the TS-990S.

It is beautiful and performs well under bright conditions, such as outdoor operation on a sunny day. I must admit, at first I wondered why it didn't have a touchscreen, but after operating this unit for about 3 weeks, I'm glad it doesn't have a touchscreen. The full keypad is easy to use and allows me to completely control the radio. Radios with touchscreens are known for their intuitive controls, but if you are not careful, you may touch something accidentally while operating the radio, or even change frequency unintentionally during a contact. The

Table 1
Kenwood TH-D74A, serial number B6810261
Manufacturer's Specifications
Measured in ARRL Lab

Technical Specifications

Receiver

Frequency coverage:

Receive:

Band A receive (Mhz),
136 - 174,
216 - 260,
410 - 470 (FM, DR).

Band B receive (Mhz),
0.1 - 76,
76 - 108 (WFM),
108 - 524.

Transmit (Mhz),
Band A/B
144 - 148,
222 - 225,
430 - 450.

Operating Modes:

Receive:
CW, AM, SSB, FM, DR, Data.
Transmit:
FM, DR, Data.

Sensitivity:

Noise figure:
14/50/144/430 MHz,
10/8/9/7 dB.

SSB 10 dB S/N:
0.4 µV (1.8 54 MHz),
0.79 µV (54 - 76 MHz),
0.16 µV (144 - 148, 430 - 450 MHz),
0.2 µV (222 - 225 MHz).

AM sensitivity:

For 10 dB S/N,
4.0 µV (0.3 0.52 MHz),

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                1.59 µV (0.52 - 1.8 MHz),
                0.63 µV (1.8 - 54 MHz),
                1.12 µV (54 - 76 MHz),
                0.5 µV (118 - 174 MHz),
                0.63 µV (200 - 250 MHz),
                1.12 µV (382 - 412 MHz).

#####FM sensitivity:
        Band B,
            12 dB SINAD,
                0.32 µV (28 - 54 MHz),
                0.56 µV (54 76 MHz),
                0.36 µV (118 - 144,
                        148 - 175,
                        200 - 222,
                        225 - 250,
                        400 - 412,
                        415 - 430,
                        450 - 524 MHz);
        Band A,
            12 dB SINAD,
                0.18 µV (144 MHz),
                0.2 µV (220 and 430 MHz).


    Noise floor (MDS):
         for CW,
            1 kHz measured bandwidth,
                    Band B:
                     0.137 MHz, -112 dBm;
                     0.475 MHz, -124 dBm;
                     1.0 MHz, -133 dBm;
                     3.5 MHz, -133 dBm;
                     14 MHz, -136 dBm;
                     50 MHz, -138 dBm;
                     70 MHz, -133 dBm;
                     144 MHz, -137 dBm;
                     223 MHz, -138 dBm;
                     430 MHz, -139 dBm.


###Power
        power supply:
            7.4 V , 1,800 mAh Li-ion battery,


        Current consumption (A):
            Transmit -
                (external 13.8 V dc)
                    1.4 A (H), 0.9 A (M), 0.6 A (L), 0.4 A (EL);
                (battery, 7.4 V dc)
                    2.0 A (H), 1.3 A (M), 0.8 A (L), 0.5 A (EL).

            Single receiver -
                260 mA (rated power), 135 mA (standby), 48 mA (power save on).
            Dual receiver -
                310 mA (rated power), 185 mA (standby), 50 mA (power save on). GPS logger
                 on, 115 mA.

        Power consumption:
            Transmit (H/M/L/EL),
                ext 13.8 V dc input:
                    1.32/0.89/0.59/0.37 A (146 MHz);
                    1.38/0.89/0.57/0.36 A (223 MHz);
                    1.31/0.79/0.50/0.32 A (440 MHz).

                battery 8.2 V dc:
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1.88/1.29/0.75/0.48 A (146 MHz);
1.95/1.26/0.94/0.47 A (223 MHz);
1.90/1.29/0.75/0.48 A (440 MHz).

####Transmitter output power

Transmitter Power output:
5.0 W (high),
2.0 W (medium),
0.5 W (low),
0.05 W (extra low).

Spurious signal/harmonic suppression: ≥ 60 dB (high/medium), ≥ 50 dB (low), ≥ 40 dB (extra low).

lighted keypad (see Figure 1) is very smooth, but it's not sensitive enough to interfere with normal operation. Ergonomically, I found this radio to be very well designed.

The TH-D74A is the heaviest of my extensive collection of handhelds. With the stock antenna and battery, the average weight is 10.75 ounces, while the TH-D74A is 12.3 ounces. This heft

10 dB (S+N)/N, 1 kHz, 30% modulation, 3 kHz measured bandwidth, Band B: 1.0 MHz, 0.59 µV; 3.8 MHz, 0.48 µV 29 MHz, 0.47 µV; 50.4 MHz, 0.47 µV; 70.4 MHz, 0.71 µV; 120 MHz, 0.63 µV; 144.4 MHz, 0.40 µV; 222.4 MHz, 0.31 µV; 432.4 MHz, 0.31 µV.

For 12 dB SINAD**: Band B - 29 MHz, 0.26 µV; 52 MHz, 0.26 µV; 70 MHz, 0.41 µV; 146 MHz, 0.26 µV, 162 MHz, 0.48 µV; 223 MHz, 0.18 µV; 440 MHz, 0.19 µV. Band A - 146 MHz, 0.19 µV, 162 MHz, 0.19 µV, 223 MHz, 0.19 µV, 440 MHz, 0.18 µV. 100 MHz, 1.35 µV (WFM)

Band B**: 20 kHz offset - 146 MHz, 61 dB † ; 223 MHz, 59 dB; 440 MHz, 61 dB † . 10 MHz offset - 146 MHz, 87 dB; 223 MHz, 63 dB; 440 MHz, 62 dB. Band A**: 20 kHz offset - 146 MHz, 67 dB † ; 223 MHz, 69 dB; 440 MHz, 62 dB † . 10 MHz offset - 146 MHz, 79 dB; 223 MHz, 75 dB; 440 MHz, 69 dB.

Receive: Band A - 136 - 173.995, 216 - 259.995, 410 - 469.995 MHz. Band B - 0.1 - 75.999.98 MHz (AM, CW, SSB), 76 - 107.9 MHz (WFM), 108 - 135.995 MHz (AM, CW, SSB), 136 - 173.995 MHz (AM, FM, CW, SSB, DR),174 - 215.995 MHz (AM, FM, CW, SSB), 216 - 469.995 MHz (AM, FM, CW, SSB, DR). T ransmit - 144 - 147.995, 222 - 224.995, 430 - 449.995 MHz.

As specified.

Dual receive* *(8.2 V dc battery): 390 mA** (no signal, max volume and lights); 248 mA* *(standby, max lights); 108 mA (standby, lights off); 42 mA (battery save on), 1 mA (off).*

Manufacturer's Specifications
Measured in ARRL Lab
Adjacent-channel rejection: Not specified.

Spurious rejection:
Band B - VHF ,

Transmitter

Squelch on, S-9 signal: 86 ms on all bands.

Receive-transmit turnaround time ('tx delay'):
146 MHz, 34 ms;
223 MHz, 33 ms;
440 MHz, 32 ms.

Size (height, width, depth): 5.8 × 2.3 × 1.3 inches; antenna length, 7.3 inches. Weight, 12.3 oz.

Price: TH-D74A, $620. Options: KBP-9 battery case (6 AAA cells), $35; PG-2W fused dc cord, $18; PG-3J cigarette lighter cord, $37; KSC-25LSK drop-in rapid charger, $45; KNB-74L 1,100 mAh Li-ion battery, $75; KNB-75L 1,800 mAh Li-ion battery, $85.

*Single receiver measurements are typically 50 mA lower.
**Narrow FM (NFM) mode increases sensitivity by 0.02 µV and increases adjacent channel rejection by 3 dB. Some interaction between receivers was noted. See sidebar. † Measurement was noise limited at the value indicated.
contributes to the perception of quality while holding it. The TH-D74A is also the longest (tallest), but the width is average, making it very comfortable to hold. It fits my hand naturally. If you consider all the included features, this transceiver may be the most compact unit after all.

I remember my old Kenwood TH-28 handheld radio with its slide-in battery pack. You had to be careful, as it was very easy to accidentally release the

battery, and it would fall on the floor. The TH-D74A has a very solid mechanism for its battery, and it won't fail on you. The antenna connector is a standard SMA female (on the radio) that uses an SMA male antenna.

When I wrote this article, there was no protective case available as an accessory. Considering the price and weight of this radio, that would be a valuable option if you carry the radio into the field.

Figure 1 - The TH-D74A lighted keypad in complete darkness.

Software
Kenwood provides MCP-D74 programming software free of charge (see Figure 2). The radio uses a standard micro-USB cable that you can find in any electronic store or cell phone booth for a few dollars or less. If you have a Bluetooth-compatible PC, you don't even need the micro-USB cable - you can use the virtual COM port. Note that there are no Mac OS or Linux versions of the software, only Windows .

I had the TH-D74A for about a month, and within that period, Kenwood updated the firmware and the repeaters list twice. I appreciate that they included details about what was updated in each release.

I'm not sure if you can update the firmware via Bluetooth, but I would not try it, and I strongly recommend using the micro-USB cable for this specific application. Y ou can find all the software, the firmware update, and a full manual online. 1

Kenwood also provides, free of charge, the ARFC-D74 program for controlling the TH-D74A's frequency from a PC via the wired USB port or Bluetooth. With a small audio cable connected between the speaker output of the speaker/mic jack and your PC sound

With battery or 13.8 V dc (H/M/L/EL): 146 MHz, 5.2/1.9/0.55/0.07 W 223 MHz, 5.5/2.2/0.7/0.15 W 440 MHz, 5.0/1.8/0.42/0.05 W

As specified. Meets FCC requirements.

Band B, 20 kHz offset**: 146 MHz, 61 dB; 223 MHz, 65 dB; 440 MHz, 61 dB. Band A, 20 kHz offset**: 146 MHz, 67 dB; 223 MHz, 72 dB; 440 MHz, 62 dB.

IF rejection: Band B - 14 MHz CW, 24 dB; 50 MHz CW, 12 dB; 146 MHz, 125 dB; 223 MHz, >132 dB; 440 MHz, >131 dB. Band A - 146 MHz, 98 dB; 223 MHz, 94 dB; 440 MHz, 101 dB.

Image rejection: Band B - 14 MHz, 55 dB; 50 MHz, 85 dB; 146 MHz, 81 dB; 223 MHz, 97 dB; 440 MHz, 65 dB. Band A - 146 MHz, 77 dB; 223 MHz, 76 dB; 440 MHz, >132 dB

Squelch range: Band B - 146 MHz, 0.08 - 1.0 µV; 223 MHz, 0.11 - 1.0 µV; 440 MHz, 0.09 - 1.44 µV. Band A - 146 MHz, 0.12 - 0.87 µV; 223 MHz, 0.12 - 0.98 µV; 440 MHz, 0.11 - 1.41 µV.

Range at -6 dB points: CW, 295 - 1310 Hz (1015 Hz); SSB, 240 - 1635 (1395 Hz); AM, 214 - 1683 Hz (2938 Hz).

###Operating the TH-D74A
The Kenwood TH-D74A is a full-featured digital and analog VHF/UHF transceiver with GPS features. Its general coverage receiver spans 100 kHz to 524 MHz. In addition to AM reception, it has the ability to tune SSB and CW transmissions in 20 Hz steps below 76 MHz. Considering that this handheld might be used for HF listening or in conjunction with

an HF QRP transmitter, I took a look at the sensitivity. As shown in Table 1, the minimum discernible signal (MDS) is quite low, and receiver sensitivity is on par with typical HF transceivers. Don't expect high-level performance in the dynamic range department, though. Due to AGC action, a single strong adjacent signal that is 20 kHz away at -53 dBm (20 dB/S-9) will cause the speaker audio to drop. This can happen with other, more expensive receivers when the AGC cannot be turned off.

Over the past few years, we have tested VHF/UHF radios that include narrow FM (NFM) as well as standard FM. In most cases, we found that switching between FM and NFM had no effect on receiver performance, only on the transmitted bandwidth. The TH-D74A includes NFM, and we found a slight increase in sensitivity and adjacent channel rejection using that mode. Also note that Band A's adjacent channel rejection is a little better than Band B. If the extra receiver performance is needed under unusual conditions, use Band A.

Sometimes, there is some slight interaction between receivers in dual-band handhelds. Such is the case here, when Band A is tuned to the 2-meter band and Band B is tuned to either general coverage or the 222 MHz band. Sensitivity decreases from 0.19 µ V to 0.37 µ V.

Finally, both receivers use a first IF frequency that falls within the range of TV Channel 2 (54 - 60 MHz). Because the IF rejection is poor, when Band B is tuned to 0.1 to 76 MHz, it is quite possible to receive interference from a Channel 2 transmitter, no matter where the Band B receiver is tuned. The good news is that there appear to be very few stations left on this channel, most of which are low power. To check for a Channel 2 TV station transmitting at 54 - 60 MHz in your area, use the FCC database search at www.fcc.gov/media/television/tv-query . Note that almost all stations that are branded Channel 2, or appear as Channel 2 on a cable or satellite box, no longer transmit on 54 - 60 MHz.

APRS reception and beacon transmit, analog (FM) on a repeater with tone squelch, receive HF CW and SSB, listened to broadcast radio, programmed memories, and so on. For operators who are not into computers, this radio is a good choice. It's also possible to save and restore your transceiver's configuration on a micro-SD card (not included).

D-STAR

There are two D-STAR modes (see Figure 3) - DV (Digital V oice) for simplex or hotspot operations and DR (Digital Repeater) for repeater operations. When you are in DR mode, you only have access to the repeaters list (see below) and can't set up a digital simplex frequency in VFO mode. To do so, you need to switch to DV mode. You do have access to DR or DV if you use a memory channel.

D-STAR (DV and DR) is available on both VFO A and VFO B, but only one at a time. If you are in digital on VFO A, you won't be able to select digital with VFO B and vice versa.

By default, the radio includes a D-STAR repeaters list that allows you to select the closest digital repeater from your GPS location (see Figure 4). This is very useful when you travel, and you can then easily use call sign routing to reach your friends around the globe. You can update the repeaters list from the Kenwood website - just download the file and use the MCP-D74 software to update the list. Figure 5 shows the D-STAR reception screen.

D-STAR has a reputation for very basic, communications-quality audio. Let's be honest: it's normally highpitched and nasal. The TH-D74A can improve the audio quality with its integrated four-band parametric equalizer (EQ) in transmit mode (TX), and in reception mode (RX) with its five-band EQ. Normally you only find this type of feature on an HF rig. Y ou can set the TX EQ independently for D-STAR and analog FM, but the RX EQ settings

Figure 3 - The TH-D74A D-STAR menu for choosing the DV (Digital Voice) and DR (Digital Repeater) modes.

Figure 4 - If you're traveling, you can find nearby D-STAR repeaters based on your GPS location.

apply to all modes (see Figure 6).

I had two TH-D74As for testing, and I could test the audio in between the two units. Y ou

can hear the difference in the D-STAR audio comparison (EQ off/on) in the digital edition video.

####Analog FM

This radio performs very well in analog. It's very sensitive and the reception is good. I did compare with four different handhelds using the same antenna, and it is equal, if not maybe even a little bit above average, in performance. Please note that the EQ also works in analog FM, but because it's not compressed like D-STAR, it has less impact. You can still improve the audio quality using this adjustment.

####Shortwave Listening

You can listen to HF on all modes with this little radio, and you can even set different DSP filters for each mode and vary the CW pitch. There is an internal bar antenna for the low bands, but you can also menu-select an external antenna using the SMA port. With an adapter, you can use a dipole or any other external antenna. I tried the HF

Figure 5 - The TH-D74A D-STAR reception screen.

bands using my external HF antennas, and it performed surprisingly well. Please note that the HF bands, along with AM, CW, and SSB modes, are only available in VFO B. Accessing all those frequencies and modes could not be more compact than it is with this unit.

This is a great rig for new hams, as it offers three bands to experiment with using either analog or digital (and even 2-meter SSB), plus it allows reception of all of the HF bands. With all these features, a new ham can decide what mode of operation to try next.

####APRS (Automatic Packet Reporting System)

With its internal GPS, color display, and ease of use, the TH-D74A honors the Kenwood tradition of making a good APRS radio (see Figure 7). The APRS modem can operate in VFO A or B, and you can also mute the audio.

The radio supports SmartBeaconing. You can use the TH-D74A as a TNC modem for an external device APRS application, such as a PC (wired or Bluetooth), tablet, or cell phone.

Figure 6 - Receive and transmit audio can be adjusted using the parametric equalizer menus.Figure 7 - TH-D74A APRS.

####Conclusion

The TH-D74A is a beauty to look at and very easy to operate. I loved the feel of it, the interface, the sound, and almost everything about it. I'm just afraid to drop it, and would appreciate a leather case to protect the unit. This radio is expensive for a handheld, but it does so much, and does it so well, that it offers a lot of value for the money.

The TH-D74A is a new direction for Kenwood with digital communica tions. I hope that they will develop a matching D-STAR-capable mobile radio and something along the lines of their TS-2000 HF/VHF/UHF esktop radio that includes D-STAR. d