

KENWOOD

TH-D74A/E

Operating Tips



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In creating and writing this commentary, the following people gave us cooperation.

WB4APR Mr. Bob Bruninga

W6GPS Mr. Don Arnold

I would also like to thank the amateur radio operators who are responsible for maintaining and preserving the APRS and D-STAR systems operating around the world.

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1 Getting Started

1.1 For publication of this document

This manual has been developed with the user of the TH-D74A/E in mind. Its intent is to enable the user to enjoy the features of their radio in both APRS and D-STAR. In addition to the information shared on the TH-D74A/E, descriptions are provided on the MCP-D74 software.

Like the previous and existing handheld models, the TH-D7A/E and TH-D72A/E equipped with the APRS feature set, these models and their predecessors were developed for data communications along with voice. With the TH-D74A/E series, these features have been greatly enhanced and expanded to make operation easier for both new and experienced APRS users. Not only the enjoyment received by the use of APRS, D-STAR has been added to offer true digital communications. D-STAR was developed by the Japan Amateur Radio League (JARL) as a digital protocol for amateur radio.

We have placed great efforts in the development of high-performance and high-functionality equipment that offer power and performance. The TH-D74A/E is equipped with a high visibility, color transreflective liquid crystal display (TFT), the first in the industry in a handheld amateur radio (as of November 2017). Building on the popularity of the wideband frequency receive feature of the TH-F6A/F7E, the TH-D74A/E supports DSP processing for CW / SSB reception with the added addition of IF bandwidth filtering.

Features such as APRS and D-STAR require positional information from the transceiver the TH-D74A/E has a highly-sensitive internal GPS receiver. As with the previous and existing models, GPS Log Mode is available to track movement.

The TH-D74A/E supports the USB interface, Bluetooth, and a microSD card slot for easier programming, data transfers, and general communications between peripheral devices such as your computer or tablet.

These features of the TH-D74A/E enhance the user experience and will be explained more in the following pages. Please read through this document along with your User Manual to better understand how to best enjoy your radio.

http://manual.kenwood.com/en_contents/search/keyword.

TH-D74A/E Development Team, December 2017

Note) This manual (PDF version) is the addition of drawings and images to the contents of the booklet distributed at "DAYTON HAMVENTION 2017"

2 ENJOYING APRS (by BOB BRUNINGA, WB4APR)

2.1 APRS Overview

The TH-D74A/E APRS / D-STAR handheld transceiver is the latest in the long series of KENWOOD APRS radios and it brings the whole new dimension of digital voice (D-STAR) that not only allows the internal global data and messaging by callsign (APRS) but now global Voice by callsign through D-STAR networks. It is hard to fully grasp what this power can bring to Amateur Radio operation once these radios are in the hands of the motivated operator and experimenter. The radio continues the evolution of the fundamental principles of APRS as a common information resource channel for facilitating human-to-human communication and now voice. To see how this fits in, it is first necessary to understand the history of APRS and packet radio.

2.2 Packet Radio History

The roots of the Automatic Packet Reporting System (APRS) go back to the late 1970s as the AMRAD (Amateur Radio Research and development) Group was excitedly beginning to experiment with AX.25 packet radio. This was before the Internet, and as we spent our free time in our shacks, we were in fact all socially-networked by the AMRAD voice repeater. On evenings and weekends, someone was working on something or developing something new and sharing the excitement with the others on the repeater channel. We hung onto our handheld transceivers everywhere we went like kids these days hang onto their iPads and smartphones to keep up with the excitement.



The History of APRS from VIC-20 to TH-D74A/E

Since only RTTY was legal in the USA at the time, we developed a RTTY chat channel to augment our repeater communications. We wanted a digital channel that worked just like a voice repeater. That is, anyone who had info transmitted it, and everyone monitoring captured it. Advancing from RTTY, AMRAD developed the AX.25 spec and as soon as it was legal, we were on the air as a chat group using real-time Unconnected Information (UI) packet messaging. One field activity of this technical group was the annual

communications support for the Old Dominion 100 mile endurance run. For this event in the mid-1980s, the first vestige of APRS used Vic-20s and packet radio to share information on the hundreds of runners and horses across the hundreds or so square miles over the 24-hour event.

There was no such thing as GPS. The system consisted of simply a packet channel where each checkpoint beamed information and objects about arrivals and then transferred object responsibility as it was taken over by the next checkpoint. At any instant, everyone could see on their screens, a list of the objects reported at each station and their status. New information was beamed at a high rate for immediate delivery but decayed rapidly to reduce channel loading so that fresh information had priority with minimum collisions. This was the core concept that became APRS.

2.3 Packet Network Growth

Beginning in 1983, we added VHF, HF and a phone line to the club packet BBS to provide a store and forward capability and began expanding to the Commodore 64. It was linked with other systems on 145.01 MHz and had the first dual-port HF link onto the 10.149 MHz HF packet frequency we still use today for APRS. It was an exciting time, but packet radio was being used more and more for connected point-to-point traffic and then to BBS systems and the real-time connectivity between operators was being lost. By that time, live beacons to announce real-time activity and to conduct group chats by UI messaging was not only disappearing but were actually being outlawed on the congested/shared BBS channels. Even UI digipeating was being disabled in all packet nodes to make sure that no one beamed or chatted on the BBS network and dozens of restricted/exclusive use packet frequencies. Everything was evolving to store-forward messaging (like internet email became over the next decade) and real-time digital human connectivity was lost.

But we still wanted that live operator-to-operator UI packet chat capability and we still needed a tactical real-time local communications and information distribution channel for rapidly exchanging digital data of immediate value to local operators and operations. In 1992, we abandoned the Commodore 64 and switched to the new IBM AT personal computer running at 4 MHz and changed the name from the Connectionless Emergency Traffic System (CETS) to Automatic Packet Reporting System (APRS) since it matched my callsign so nicely.

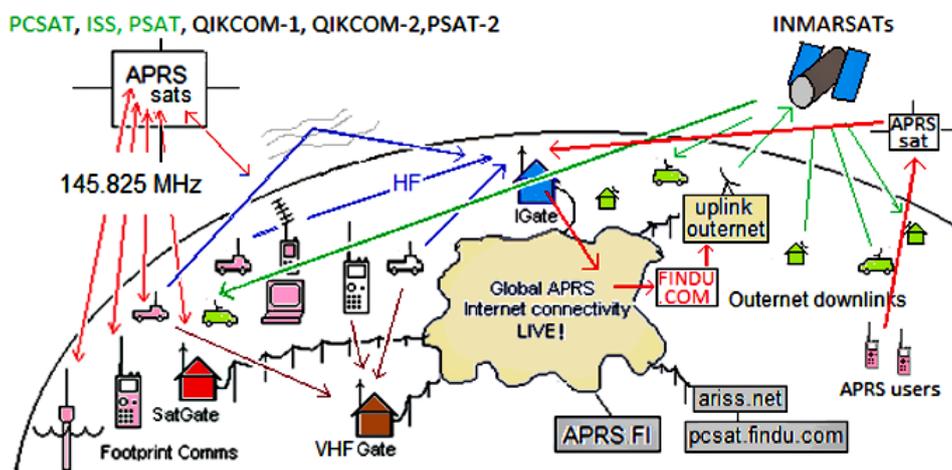


2.4 APRS in 1990s

I formally presented APRS at the TAPR/ARRL Digital Conference in 1992. APRS really took off as the cost of GPS got below \$500 each and I manually digitized maps of the entire U.S.A. and some other countries using coordinates measured from paper maps. It was during these times that the “P” in APRS was temporarily called “Position” to highlight this new capability. Unfortunately, this was a mistake.

Over the next decade as GPS became readily available, too many hams only saw the position maps of APRS and not the broad communication applications for human-to-human tactical ham radio information exchange in real time.

Too many operators bought transmit-only GPS trackers and further ignored the real-time human communications element. Many follow-on software clients focused on maps with little attention to the underlying network protocol and live human-to-human connectivity both local and global.



The APRS network is primarily designed for local real-time operations, but the APRS-IS collects information from local IGates and shares the information worldwide.

2.5 APRS-IS res the information worldwide

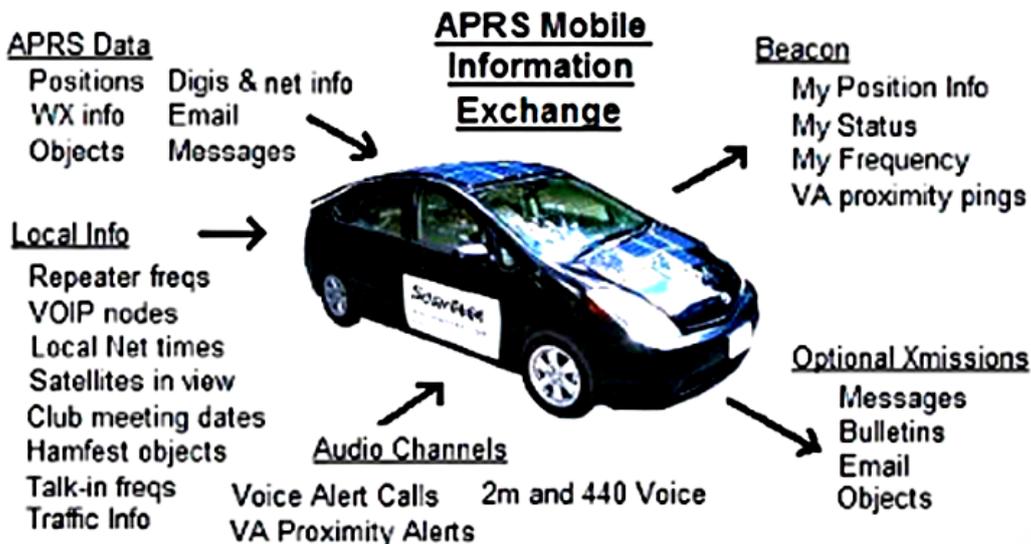
In 1997, K4HG Steve Dimse and the Mac/WinAPRS Sproul brothers tied APRS to the Internet and the APRS-IS system as shown above was born. Over the years the network has grown including several Amateur Satellites since 2001 and in 2015 even an APRS channel with global downlink coverage via the Inmarsats called Outernet. See <http://aprs.org/outnet.html>

While this was a huge success that enabled instantaneous global APRS texting connectivity worldwide, it also further enhanced the map view experience of casual APRS viewers. Looking at an APRS map was colorful but it still did not obviously convey the real-time human contact and connectivity inherent in the system. Also, it was impossible to communicate with all of the one-way trackers equipment which had no receivers. The value of two-way amateur radio communications was further being lost in favor of simple one-dimensional icons on maps. These simple icons omitted the other 8 dimensions of color attributes associated with each APRS symbol that gave additional at-a-glance real time information to viewers such as type, age, moving-or-static, object-or-station, ownership, and liver-operator or messaging capability. See <http://aprs.org/symbols.html>

2.6 APRS Handheld and Mobile Radios

To counteract this trend, we stopped using "Position" for the "P" in APRS and went back to the original "Packet" nomenclature for the "P" in APRS. Then in 1998, KENWOOD gave a landmark boost to APRS in the field and to this two-way digital communications capability by introducing the fully integrated TH-D7A/E. This TH-D7A/E put APRS in the palm of the hand of ham radio operators worldwide. Not only did it take GPS inputs, but it fully implemented the APRS messaging, bulletins and texting capabilities at both 1200 and 9600 baud.

Over the next 11 years, this first KENWOOD APRS radio was the most popular KENWOOD HT ever as APRS brought new life to packet radio. In parallel, KENWOOD also introduced the fully integrated TM-D700A/E mobile APRS radio in 2000. These APRS front-panel-display radios now brought the full APRS local situational awareness to the mobile operator as shown below. With these displays, the APRS information content delivery system was in place without any need for mobile PC's or laptops. Further, the attached GPS provided the map display and the radio display provided all the other information content.



2.7 Texting

But still, most non APRS ham radio operators just did not see any advantages beyond the maps. My frustration with the growing lack of live human content in APRS continued to fester to the breaking point at a 2006 ARRL Special Meeting at Dayton on the lack of youth in ham radio.

The gathered fathers of ARRL lamented: “Ham radio was missing the youth”. They were “too busy texting on their cell phones” and “ham radio had nothing similar to offer”. I was flabbergasted. Ham radio had had a wireless texting/email handheld device for nearly a decade since 1998 in the form of the handheld KENWOOD APRS TH-D7 A/E and yet even the amateur radio leadership was not aware of these capabilities and had never tried it.

This was frustrating. While the older hams were shunning real-time APRS digital text communications with APRS, and handheld Photo-sharing using the KENWOOD SSTV handheld, the kids of the world were just getting going with texting and Photo-sharing then Twitter on every conceivable handheld device or exchanging handheld pictures with the VC-H1.

Yet the entrenched amateur radio old timers could not see any value to APRS texting and emailing on a keypad.

Universal Ham Radio Text Messaging Initiative 2010

cell

wireless

The OLPC XO

APRS

EchoLink

DTMF

WINLINK 2000
Global Radio Email System

Send/RX anytime, anywhere, any device by callsign

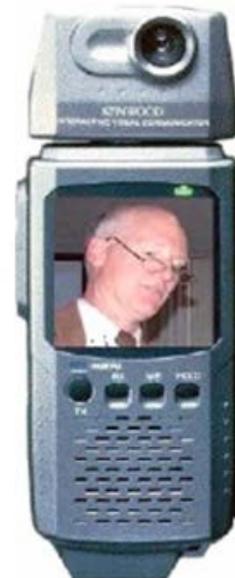
26 separate systems! APRS is a registered trademark Bob Bruninga, WB4APR

3

As mentioned in the above illustration, there are more than 26 different text systems being used in Amateur Radio (which do not talk to each other) as suggested in the image above. Fortunately, today just about every smartphone and handheld does have an application for APRS message compatibility. Our goal in APRS is to seamlessly integrate these disjointed systems so that a message-to-callsign from any device gets delivered to the callsign owner on any device that is currently turned on. Many of these systems are already connected by APRS and the APRS-Internet system (APRS-IS). Refer to <http://aprs.org/aprs-messaging.html>

2.8 Facebook on APRS

Purely as an aside, you can think back to the KENWOOD VC-H1 handheld SSTV device as an attempt (before its time) to add the visual aspect of social networking to ham radio and APRS. This was a fantastic idea. And it was fully integrated into all KENWOOD APRS radios at the time, adding real-time video to APRS digital and texting connectivity. You could think of the combination as real-time "Facebook" on APRS.



Unfortunately it was ahead of its time and the VC-H1 handheld is no longer in production, but thousands of hams have them and still use them. These SSTV handhelds along with readily available free SSTV software make a great visual adjunct to APRS which could pass through any voice channel or repeater. This was in the early 2000 time frame before anyone had camera phones. Think of the potential.

The concept was to snap an image, and send it into APRS where it was picked up by a web site that cataloged it by position, originator and a text description for viewing by anyone. This can be a tremendous asset for ham radio public service. There are a few such active links from APRS and SSTV to the web called the Automatic Picture Relay Network, or APRN.

Although most hams do not have the KENWOOD VC-H1, there has been a revolution in smart phones and now anyone anywhere can use their smart phone to send and receive SSTV images simply via the camera in the phone and an SSTV application software that can then convert the image to tones and transmit it over any of the KENWOOD handheld or mobile radios. Similarly, any such phone with the SSTV application can use the phone to decode the audio and display the SSTV image. Thus, anyone with a smart phone and a 2-way radio and a radio voice channel can still send images by amateur radio!
Refer to: <http://aprs.org/aprn.html>

2.9 APRS Voice Alert

Three things dramatically brought back human connectivity to APRS. The first factor was Voice Alert. The second was the addition of a frequency field in all APRS position packets. And the third was the emergence of VOIP Internet/ham radio linked voice.

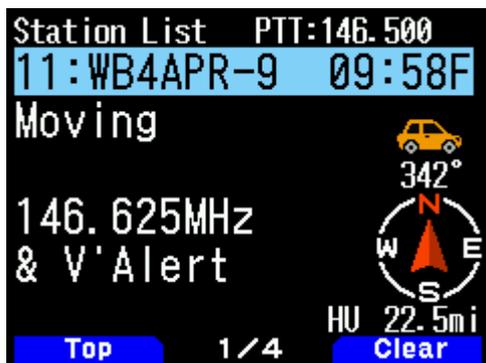
Voice alert is like a 3rd simultaneous radio channel on the KENWOOD APRS transceivers. It acts like an intercom channel for all APRS operators to be able to quickly raise another nearby APRS voice alert station by a simple direct voice call. It required no new hardware or software. It simply consists of setting CTCSS 100 Hz on the APRS data channel and keeping the speaker volume up. This way, all packet noise was completely muted, but the operator could still be called at any time with a CTCSS 100 Hz voice call. A secondary benefit to this technique was a free proximity detector. If any other Voice Alert station got within simplex range (maybe 5 miles or less in a mobile) his periodic packets would give an audible alert. These new features of APRS Voice Alert as indicated in the APRS Mobile information Exchange drawing above finally made it easy to keep the eyes on the road, but never miss the opportunity for human contact with a fellow APRS operator on the open road. Voice Alert is easiest enabled and disabled by simply storing two separate Memory channels on the national APRS frequency. One with CTCSS 100 and the other without.

2.10 Frequency Data Field and AUTO-TUNE (or QSY)

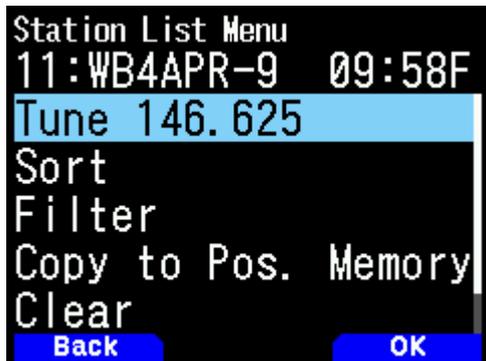
At the nearly same time as we introduced Voice Alert (2004), the Frequency field was added to the APRS position packet specification. This standardized the inclusion of a voice operating frequency in the APRS system. APRS was never intended as an end-in-itself, but as a tool to be applied to all aspects of ham radio and human contact.

Knowing other station's voice contact frequency in many cases is even more important for establishing communications than knowing position. Now every ham could announce his monitoring frequency in his APRS packet and could call others on their indicated frequency. KENWOOD was the first to leverage the value of this capability by introducing it in all of their APRS radios since 2007 (the TM-D710A/E, TH-D72A/E, TM-D710GA/E and TH-D74A/E).

These radios not only automatically include your voice band frequency in every position packet but can also then tune to someone else's, frequency by simply selecting the "Tune" menu as shown below:



In the image above, stations with frequencies embedded in position information packets are displayed on the screen. This station is the eleventh station in the list, transmits a beacon of the operation frequency of its own station, and transmits a short message informing other stations that they are also listening to voice alerts within the simplex communication range. In this screen, use the [MENU] key to recall multiple additional functions.



One is the TUNE function shown on the screen above.



As in the third image, when TUNE is selected, the radio automatically tunes to the frequency of the second band (non-data band).

2.11 Voice Repeaters and Club Info

Besides alerting others to the voice monitoring frequency of other APRS operators, the addition of the Frequency field to APRS opened up a whole new application of local information for the mobile operator. Now everywhere the APRS operator travels, he can be alerted to the recommended traveler's voice repeater in any area he was passing through. This is accomplished by not only having every digipeater beacon its position and availability, but also by beaconing this local frequency object.

These frequency objects show up in the station list of all mobile operators in range as shown below in the TM-D710A/E, TM-D710GA/E and TH-D74A/E front panels:



On the TM-D710GA/E station list as above, not only are the two stations of AB9FX nearby, but also his current VOICE operating frequency is visible.

Also, we can see that this radio is in OPERATING range of three voice repeaters that are also identifying themselves as objects on APRS as the locally recommended voice operating channels.

The TH-D74A/E on the right has two ham calls, two tactical calls and one repeater object. It is easy to find these nearby frequencies in the huge station list by first doing a SORT. This brings all the numeric objects (in this case, frequencies) to the top of the list as shown on the TM-D710GA/E on the left.

The standard for these frequency objects also includes Tone, Shift, and bandwidth for instant tuning. In addition, they can include the weekly on-air voice net times as well as the monthly club meeting dates as shown below, all in a single periodic beacon object:



Although the information appears a bit cryptic, the fact that all voice repeater objects use this same standard format makes it easy for the operator to understand the meaning. In this case, the local recommended voice repeater in this area is the 147.105 MHz (Maryland) repeater with a Tone of 107.2 Hz.

The repeater's range is 25 miles and the weekly net time is Tuesday evenings at 8 p.m. The final 8 characters (limited for backwards compatibility to TM-D700A/E) announce that the club meetings are on the 3rd Thursday of every month.

Again, a press of the **[MENU]** key and then selecting **“Tune”** will instantly take the radio to this channel. For full details on this function, refer to the following website:
<http://aprs.org/localinfo.html>

2.12 Hamfest Talk-in and Objects

APRS should be a primary tool of any Hamfest talk-in station. Alongside the voice operator should be an APRS operator managing the local APRS tactical map with the locations of all the special objects associated with the Hamfest. In addition this APRS operator helps the voice operator see where the mobile check-ins that are lost are located so he can give them voice guidance to the Hamfest.

The most important APRS object is the one that shows the location of the HAMFEST and the talk-in frequency. This bright red APRS symbol stands out smartly on any APRS display including the AvMap GPS display as shown above. At first glance, this object tells you the most important information: Where it is, and when.

The HFEST-DDn standardized object name includes the DATE in the DD digits. Only the day is shown (here it is on the 26th), but this allows for 2 weeks notice to everyone in the area and anyone driving through.

The final character “n” is chosen to make the symbol unique in the global APRS system so it is not overwritten by other Hamfests on the same day somewhere else.

This makes for easy sorting of these objects. Simply go to <http://aprs.fi/hfest> * and see a list of all active Hamfest the world over!

The talk-in frequency is also listed for instant QSY with the TH-D74A/E **“Tune”** function. I was on a cross-country trip one day on a weekend and just happened to see one of these objects and was able to detour and spend an hour or two at this favorite ham radio pastime.

To see how to beacon your local Hamfest, refer to the following website:
<http://aprs.org/hamfest.html>



2.13 Voice over Internet Protocol (Vo-IP) and D-STAR

Recognizing the huge potential for linking local ham radio over Internet, an added goal of APRS since 2001 has been to facilitate the integration of Digital Voice Systems and allowing end-to-end voice contact while using APRS global messaging capability to help set up the calls. Initially, this was via the use of IRLP, EchoLink, and other VoIP systems. Now with the TH-D74A/E, this can include D-STAR.

Just like the Frequency Objects, all ham radio VoIP systems are encouraged to announce their presence on APRS. Within 10 minutes the node number, frequency, tone and other info are available to all APRS operators on their radios as shown above. Again, a simple press of the “**Tune**” function will QSY the radio for instant operation.

The long-term goal of this VoIP and Frequency capability has been to enable APRS to be used for setting up end-to-end global contacts using only a known callsign. The idea was to simply enter a callsign in a contact-request message will cause the APRS Internet system to handshake with the VoIP systems to set up the call and send the necessary QSY messages and frequency information for the radio to instantly tune and complete the call.

Think of it as a cellular system for ham radio where you dial by callsign instead of phone number. Both TM-D710GA/E and TH-D74A/E were designed to be evolved with this capability.



2.14 Digipeater Path Information

Another new information feature included in the TH-D74A/E is the digipeater path display shown here so the recipient can understand the local network and how a given packet was routed through the APRS digipeater network. This display shows the First and Last digipeaters used.

Most APRS areas encourage the use of only 2 hops or less. This means, in most cases, the full path is visible. In this image the WB3V-6 packet was first heard by the N3KTX-1 digipeater and then it was delivered to my radio by the Last hop on the KV3B-2 digipeater. This path knowledge is very valuable to the operator in understanding his local area network.



There are 4 pages of information about each station received by the TH-D74A/E and imported into the station list, and the display of this digipeater / pass is displayed on the 4th page.

2.15 Other APRS Information Resources

The information available to the mobile operator via APRS is nearly unlimited but not if no one is transmitting it. Ideally local info is only transmitted direct, with no path hops from the local digipeater and no more often than once every 10 minutes to give a chance for a new mobile to get it. If the local info has to be digipeated once, then it is a longer range and the rate should drop to every 20. If it is sent regionally via 2 hops it should only be once every 30 minutes which is still possible for a 60 MPH traveler to be within range of 2 digipeaters and get the info. There is plenty of room for additional content when properly added to the local channel. This is not spam, but real immediate information of value to the mobile or traveler. There are many examples of data sources that have been implemented in some local areas. For example,

- Traffic speeds at select choke points: refer to: <http://aprs.org/traffic.html>
- MF Mobile Satellites view: refer to: <http://aprs.org/satinfo.html>
- UI-InfoKiosk local info database: refer to: http://www.apritch.co.uk/addon_uiview32.htm
- APRS client for windows refer to: <http://aprsisce.wikidot.com/clients>

2.16 Contribution by KENWOOD to APRS

KENWOOD has developed its series of radios, TH-D7A/E, TM-D700A/E, TM-D710A/E, TH-D72A/E, TM-D710GA/E and now the new TH-D74A/E to best support the original objectives of APRS.

The real-time display of APRS information on the front panel of these radios gives the mobile operator instantaneous access to all local information being provided on the APRS channel about all surrounding ham radio activities.

There are many APRS clients and programs that have been written that sometimes have concentrated too much on the display of maps and vehicle positions while leaving out much of the original fundamentals of APRS and the efficiency of the APRS network.

The KENWOOD radios avoid such an over-simplistic approach to APRS by implementing a rich and diverse function set. The function set includes almost all of the original functions of APRS that are meant to reinforce the concept of distributing local information. The KENWOOD radios are not just Vehicle Tracking Systems, but are designed to be real-time information distribution systems for mobile operators with these features:

Position Entry

TH-D74A/E with its built in GPS solves the hassle of external connections and setup and always accurately knows your position.

For times indoors the radio has 5 position memories for pre-stored frequently-used positions.

APRS Network Fundamentals

KENWOOD fully implemented the more subtle aspects of the APRS fundamentals that assure optimum network efficiency and channel sharing among all users.

New TH-D74A/E supports the decay algorithm, proportional pathing and SmartBeaconing. These techniques provide good refresh rates for new and local information while minimizing the network impact of old and distant data.

Objects (NEW)

The KENWOOD transceivers fully appreciate the value of APRS objects and display them prominently. The object location is shown just like other stations either on the attached map display or on the front panel with distance and range.

Not only does the TH-D74A/E also include filters for easy sorting of these objects in the list, this radio is the first one to have the ADD OBJECT function so that users in the field can use only their handheld to place important objects on the map.

These objects are what give APRS the local information value to local users.

Two-Way Messaging

Unlike passive one-way tracking devices, the KENWOOD radios provide the mobile user with full two-way messaging and display.

This real-time human-to-human communications is what makes APRS so valuable in support of special events and emergencies.

Field Data Entry

In addition to making excellent field data display devices, the TH-D74A/E menus have also been designed for easy data, position and message entry.

Often overlooked is the ability to use TH-D7A/E, TM-D700A/E, TM-D710A/E and TM-D710GA/E as excellent field data entry and clipboard entry devices at many field events.

Refer to: <http://aprs.org/aprsevent.html>

Individual Information Access

The KENWOOD individual radio displays enhance the distribution of ham radio information to a large number of users by giving them individual front panel and keypad access to all of the online APRS data.

A common mistake of fixed operations with computers is the use of large display screens for large groups to see but which fails to recognize the individual needs of a given viewer and the depth of information available under each symbol on the map.

The individuality of APRS radios with individual displays spreads this data access throughout the users in the field.

Overlay Characters on all Symbols

The KENWOOD TH-D74A/E shows the overlay character of all symbols, not just the original subset of special symbols.

This provides hundreds of new symbol combinations for better APRS application to new uses.

Voice Operating Frequencies

A very important feature of the new TH-D74A/E is the recognition of the value of the voice operator frequency as a fundamental communications parameter.

Not only does the radio automatically include its own voice band frequency in every transmitted position packet, it also has special displays and features that make this information readily available. For example, the station list can be sorted to bring Frequency Objects to the top of the list in frequency order. Further, the radio can tune to these frequencies for quick QSO with a single press of the "**Tune**" menu.

EchoLink, IRLP, Winlink or D-STAR Frequencies

The TH-D74A/E "**Tune**" function not only makes rapid QSY to another station operator easy, it also facilitates quick tuning to nearby EchoLink, IRLP, Winlink or D-STAR frequencies with the push of a single key.

Future use of this capability is anticipated to automatically and seamlessly integrate callsign-to-callsign calling from RF via local, national and global ham radio VoIP and D-STAR systems.

Notes:

If all you think of when you hear the word APRS is maps and stagnant icons, then you are not using the full potential of APRS.

If all of the local information that can be of immediate value to the APRS HT or mobile operator is not showing up in your local area, then get active and get involved in supplying this content and updating all local digipeaters to supply it direct to users without multiple hops.

APRS is a communication tool, not just an automated map. Use it. But in most cases, that means entering data, not just watching it.

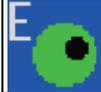
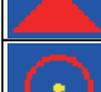
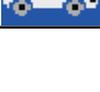
KENWOOD has provided the APRS handheld and mobile information display capability, it is up to us to provide content!

September 2017

WB4APR Bob Bruninga

2.17 List of icons that can be set / displayed on the TH-D74A/E

(The icon designs below are supervised by Mr. Bob Bruninga, WB4APR)

	Person		Fire Truck		Red Cross		EchoLink
	Bicycle		Canoe		Lighthouse		Node
	Motorcycle		Boat		Speedpost		GATEway
	Car		Sailboat		WorkZone		DF station
	Bus		Balloon		Wreck/ Obstruction		Dish Antenna
	Railroad Engine		Glider		Sheriff		PC user
	Home		Helicopter		Fire		SSTV
	Yagi@QTH		Aircraft		Sunny		ATV
	KENWOOD		Large Aircraft		Gale Flags		BBS
	Radio		Shuttle		Tornado		APRStt
	RV		Satellite		National WX Service Site		RACES
	Van		Rover		WX (Weather Station)		ARRL
	Jeep		Eyeball		Digipeater		X
	Truck		Portable (Tent)		Mic-E Repeater		Triangle
	Truck (18-wheeler)		HAM Store		QSO Repeater		Small Circle
	Police		School		Circle		Red Dot
	Ambulance		Hospital		IRLP		Big Question Mark

3 APRS

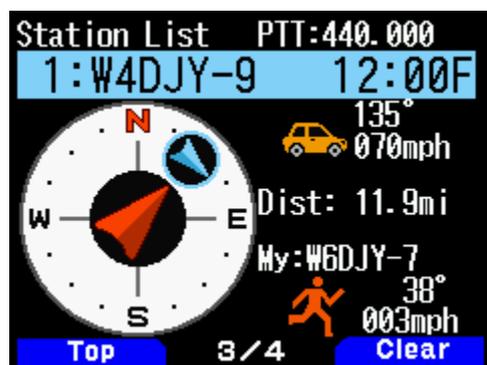
3.1 APRS Feature on the TH-D74A/E

This section will introduce you the many enhanced APRS features of this new digital portable.

3.1.1 Relative Direction Display (New Feature)

While the TH-D72A/E also comes with a feature that shows the direction in which the target station is located relative to my station, the display of this feature has been enhanced significantly on the TH-D74A/E. The direction in which my station is advancing is displayed at the center of a big compass, while the direction in which the target station is located as well as its advancing direction is shown on the circumference for easy identification. The display can also be toggled between **North Up** and **Heading Up** by pressing **[F]** key. Based on the display, it is possible to figure out whether the target station is moving toward the same advancing direction as my station.

Example: When W4DJY-9 (target station) is located at 45 degrees from my station and moving south-eastward at a speed of 70 mph.



3.1.2 Transmission of Object/Item Information (New Feature)

The TH-D74A/E supports transmission of object and item information.

"Object information" transmission of object and item information. Not possess a radio, like a hurricane or a marathon runner. These objects are characterized by a time stamp they possess.

"Item information", like a hurricane or a marathon location, these do not have a time stamp.

Object and item information are transmitted using the predefined object name and item name respectively. When data of an object or item is received, the object name or item name appears in the Callsign display area.

Live Object/ Live Item

When sending out information on an object or item, configure "Type" to **Live Object** or **Live Item** if the information is only valid for a certain period of time (e.g., period when a hurricane exists, period when a marathon race is held). (→ **Menu No. 516**)

Killed Object/ Killed Item

When the information is no longer valid, the user who has sent out the object or item information must select **Killed Object** or **Killed Item** as "Type" and send out the object data or item data.

3.1.3 Disclosing Audio Standby Frequency (QSY Feature)

APRS makes use of a wide-band data frequency, which basically cannot be used for audio communication. Therefore, disclosing the frequency that can be used for audio communication helps to facilitate the communication process. For example, during communication at remote locations such as in a mountain, announcing the frequency for audio communication via the APRS beacon makes it easier to establish communication with a nearby amateur radio station.

Let us look at how we can carry out audio communication on band A and APRS data communication on band B. In general, positional information on of one's own station is transmitted periodically as an APRS beacon in the case of band B. In this case, it is possible to embed the frequency information of a non-data band (band A in this example) in the APRS data. This is known as the QSY feature.

When sending out information such as like that of the a audio repeater and or EchoLink as QSY information, information on **Tone/ Shift/ Wide** can also be appended applied as needed in addition to the frequency information.

"**F**" is displayed when APRS received data that contains QSY information. The user at the radio station that has received the data can operate the "**Tune**" function to shift the non-data band to the VFO mode, which enables the frequency to be adjusted automatically according to the audio frequency of the other station.

Sending out QSY information in this way by this method easy and very certain way of shifting the other station to the audio communication channel.

3.1.4 Disclosing D-STAR Standby Information with the QSY Feature (New Feature)

The TH-D74A/E also allows disclosure of the D-STAR standby information using the QSY feature.

Operating the "**Tune**" function of the station that has received the D-STAR standby information enables the information of the station to be adjusted automatically according to the D-STAR configuration information of the transmitting station.

For example, during D-STAR audio communication on band A and APRS data communication on band B, the frequency of a non-data band (band A in this example) and the D-STAR access repeater Callsign can be embedded in the APRS data and transmitted as a beacon.

If the **DR mode** of D-STAR is configured, APRS data that is embedded with the access repeater Callsign of one's own station will be transmitted. By operating the "**Tune**" function of the station that has received this APRS data, the non-data band switches to the **DR mode** and enters the gateway CQ state, and the access repeater Callsign of the receiving station is configured to **TO Call**.

If the **DV mode** of D-STAR is configured, the repeater Callsign is not embedded in the APRS data as a repeater is not used (the frequency information is embedded). The user at the radio station that has received the APRS data can operate the "**Tune**" function to shift the non-data band to the **DV mode**, which enables the VFO frequency to be adjusted automatically according to the standby frequency of the other station.

3.1.5 Restricting QSY Information (New Feature)

This is a new QSY feature for the receiving end. It is used to restrict the “**Tune**” operation to only data within a specified distance range from one's own station.

For example, if the receiving station in the **FM mode** or **DV mode** is located at a remote location that is unable to receive radio signals directly, the “**Tune**” operation would be meaningless.

In this case, a distance range can be configured to restrict tuning of these receiving stations. (→ **Menu No. 523**)

3.1.6 Beacon Transmission from a Fixed Position During GPS Track Logging

For models up to until the TH-D72A/E, GPS information is always used when GPS is turned on for APRS beacon transmission. This can be inconvenient in cases where a station wants to enable track logging but does not want to reveal its position to other stations.

On the TH-D74A/E, the positional information selected in the menu is used for the beacon. The options available are: “**GPS**” and “**My Position 1**” to “**My Position 5**”. A station is able to turn on GPS to obtain the track log while configuring its own position to “**My Position 1**”, for example. (→ **Menu No. 401**)

3.1.7 Registering the Beacon of My Station that is Digipeated in the Station List

For models up to the TH-D72A/E, the beacon of my station that is digipeated is not registered in the APRS station list.

However, it is now registered on the TH-D74A/E. This allows a station to check the APRS information that is being transmitted from an objective viewpoint.

3.2 What is a KISS modem?

3.2.1 What is KISS?

KISS is the abbreviation for “Keep It Simple, Stupid”. This was proposed by K3MC and KA9Q at the “ARRL 6th Computer Networking Conference” in 1987. It is a simple modem with protocol control (AX.25 protocol) removed from the TNC (Terminal Node Controller).

Using a simple modem, it is equipped with a function to prevent interference/collision during communication by other stations, as well as functions to add a Frame Check Sequence (FCS) to the transmission data provided and a flag data that indicates the packet frame delimiter. 8 types of serial communication commands are available as an interface with PCs.

3.2.2 TH-D74A/E Specifications

The TH-D74A/E supports packet speeds of 1200 bps and 9600 bps. The modulation schemes used are AFSK for 1200 bps and GMSK for 9600 bps. The transmit and receive buffer size is 3 kB and 4 kB respectively.

3.2.3 List of Corresponding Commands

Command	Command Name	Functional Description	Configurable Range	Default Value (Value when KISS mode is On)
00	Data Frame	Transmits data that is configured immediately after the command.	-	-
01	TXDELAY	For configuring the time interval from the point when PTT is turned on until when data transmission starts. Units of 10 ms	0 to 120 (78 h)	Varies with the TH-D74A/E Menu No. 508 (TX Delay) configuration.
02	P	For configuring the probability of P-persistent CSMA.	0 to 255 (FFh)	128(80h)
03	SlotTime	For configuring the random number generation time interval of P-persistent CSMA. Units of 10 ms	0 to 250 (FAh)	10(0Ah)
04	TXtall	For configuring the duration for maintaining the transmission state after FCS (CRC) is transmitted. Units of 10 ms	0 to 255 (FFh)	3
05	FullDuplex	For selecting full-duplex or half-duplex communication.	0: Half-duplex communication Value other than 0: Full-duplex communication	0
06	SetHardware	Switches the packet speed.	0 or 35 (23 h) : 1200 bps 5 (05 h) or 38 (26 h) : 9600 bps	Varies with the TH-D74A/E Menu No. 505 (Data Speed) configuration.
FF	Return	Exits the KISS mode.	-	-

3.3 KISS Mode

An IGate station and or digipeater station can be operated using a PC that is installed with the APRS software and with the KISS mode of the TH-D74A/E.

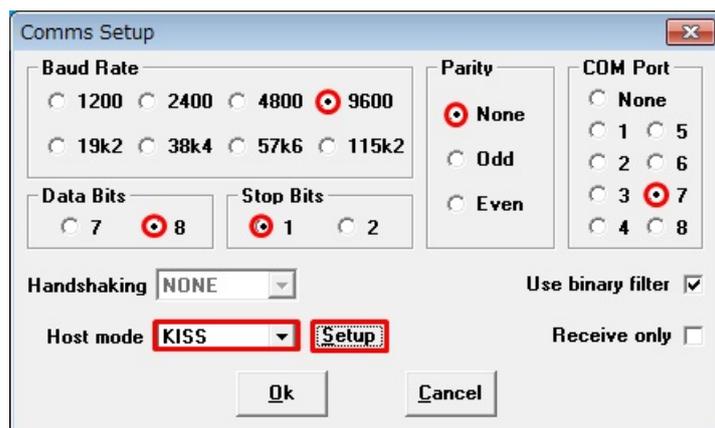
3.3.1 Operation of Digipeater via Combination of the TH-D74A/E and UI-View32

The TH-D74A/E can be combined with the UI-View32 to form a digipeater.

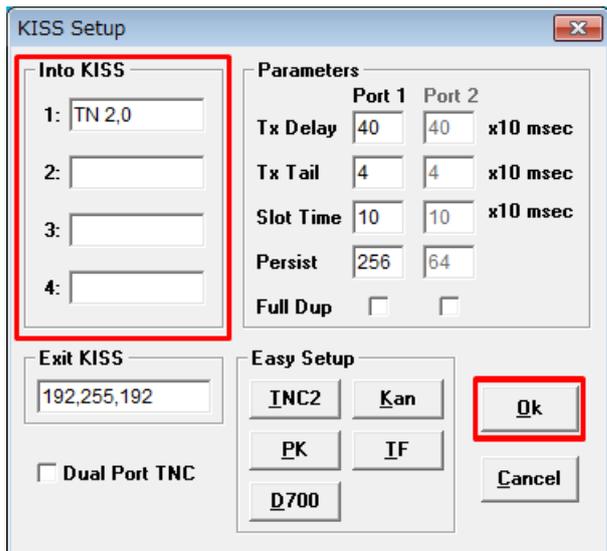
1. Press **[F] [LIST]** in sequence to set the **KISS** mode to OFF.
Check to ensure that "**KISS12**" or "**KISS96**" is not displayed.
The "**KISS12**" or "**KISS96**" icon is illuminated when the TH-D74A/E is in the KISS mode.
2. Meanwhile, on the UI-View32, open the Comms Setup window from the Setup pull-down menu.
3. In the Comms Setup window, configure the PC terminal requirements of the TH-D74A/E in UI-View32 as follows.

Baud Rate: 9600 bps (either one); Data Bits: 8; Stop Bits: 1; Parity: None

COM Port: COM port number on the PC in use that is assigned as the virtual COM port by the TH-D74A/E.



4. From the Host mode drop-down list, select "**KISS**", followed by clicking the "**Setup**" button.
5. The KISS Setup window appears.
Configure as follows in Into KISS: 1: TN 2,0; 2: Blank; 3: Blank; 4: Blank. Next, click the "**OK**" button to close the KISS Setup window.



6. Click the “OK” button in the **Comms Setup** window to close the **Comms Setup** window. A command is sent from UI-View32 to the built-in TNC of the TH-D74A/E, and the built-in TNC shifts to the KISS mode.

The “**KISS12**” or “**KISS96**” icon lights up when the KISS mode of the TH-D74A/E is turned on. While in the KISS mode, configurations related to APRS of the TH-D74A/E unit (**Menu Nos. 500 to 580**) will not be applied to the operations.

For details on the other configurations of the UI-View32, please refer to the descriptions in the Help file.

4 ENJOYING D-STAR (by DON ARNOLD, W6GPS)



4.1 Encounter with D-STAR

I have been a Ham since the early 1970s, so I loved talking HF and Local repeater operations. Several places I lived in had antenna restrictions, but somehow I would be able to hide an antenna or just work worldwide HF in the car. I did do a little D-STAR around 2010. It was ok, but limited to where a repeater was and had limited access to the D-STAR network. So I set it aside.

When the KENWOOD TH-D74A/E was released August 2016, I tried my D-STAR experience again. Now, instead of having to depend on D-STAR repeaters, mobile Access Points along with mobile Hotspots opened up a broader more accessible D-STAR experience. In the first 4 hours on the air with my new KENWOOD TH-D74A/E, I worked 15 new countries that I thought I would never get.

I find the majority of D-STAR activity is with a Hotspot and D-STAR Access Point. Examples of the Access Point are DV Mega, openSPOT, and the popular DVAP. In the first QSO's I have had with the TH-D74A/E, people remarked about the audio quality. The TH-D74A/E has DSP processing before and after the AMBE encoder. You can customize both mic audio and receiver audio with the built in graphic equalizers.

My advice to the first time user of the TH-D74A/E is to learn a few features at a time. You can get overwhelmed with this featured enriched handheld transceiver. Please check out some of my TH-D74A/E instruction videos at <https://www.youtube.com/user/w6gps>.

I have simple setup video instructions there.

4.2 Enjoy with D-STAR

You will have to get yourself registered first on the D-STAR network server. Go to http://www.dstargateway.org/D-Star_Registration.html and register.

The TH-D74A/E's DR mode for D-STAR means Digital Repeater. It is a series of commands to tell the D-STAR network what to do from your radio.

So, for me in Chattanooga, State of Tennessee (TN) in USA, to get to my repeater, I hold down the bottom key on the multi-scroll key[▼] for 2 seconds to use the "Repeater Select" menu, so I can locate Chattanooga [W4PL B] module.

When I select this, the frequency (443.15 MHz) is selected along with the repeater name "Chattanooga". So I am getting ready to tell the [W4PL B] module what to do.

I hold in the multi-scroll key[▲] for 2 seconds and I get a list on the "Destination Select" Menu. If I want a local CQ (only Chattanooga Area) I select the "Local CQ". And talk local Chattanooga.

This would be output to the [W4PL B] module and I would be transmitting to the local area.

The "Gateway CQ" in the "Destination Select" Menu would mean I wanted my signal sent to another repeater like [K6VO C] module. This way I can talk to my California friends.

Another option is I can input a callsign for the "Individual Call" (Callsign routing) in the "Repeater Select" Menu. Both of these transmissions are possible, but not 100 percent dependable.



Gateway CQ



Individual Call

The best way to get on the D-STAR is to use the "Reflector" menus.

If your local repeater allows it, you can transmit to the repeater a command to link to a reflector.

For example: to link to reflector 30 C you would select link to a reflector, hit [ENT] key, and use the encoder dial in "REF030CL" and press [PTT] for about 1 second.

This command is sent to the D-STAR network and your repeater is linked to the reflector 30C. You should get a response from the repeater that is "linked to 30 C"



Setting the reflector's number/module



Response from the repeater

Once you confirm this, you have to go back into the "**Reflector**" Menu and select "**Use Reflector**". A command of "**CQCQCQ**" will be sent and you can talk on 30C.

When your QSO is finished, it is good practice to unlink from the reflector, so go back and select "**Unlink Reflector**" to use the unlink command "_____U".

4.3 D-STAR Reflector operation

So here is the simple sequence: Select your repeater and listen. If you want to link the repeater to a reflector then input the reflector name, press **[PTT]** for about 1 second. Listen for acknowledgement, then select "**Use Reflector**".

Sound easy? I hope so. DR mode is the simplest and most efficient way to change radio commands.

It gets even better if you get your own repeater! You mean I need to put-up a tower and antenna? No I am referring to the Access Point, also known as Hotspot. People use the term Hotspot referring to a small low power device connected to a wired internet connection or mobile Hotspot Wi-Fi over a mobile cellular network.

I have both. For my wired network connection, I use an openSPOT. It is self-contained lower power simple D-STAR enabled device that is very easy to use.

So in simple terms I program the openSPOT with VoIP communications a simplex frequency according to Amateur band recommendations for low power simplex operations. With this, I can talk to my lower power Access Point and tell it what reflectors to go to. I love reflectors as they have more people operating and you can have nice QSOs.

If you have to move your QSO you can tell the Access Point to go to another reflector by selecting a new reflector via input using the encoder.

This way you can have more control of your reflectors instead tying up a local repeater. Now I have saved the best for last, mobile Access Point or mobile Hotspot. I use the DVAP (Digital Voice Access Point) from Internet Labs and a small Raspberry Pi Zero W. (DVAP is low power transmission 10 mW)

We refer to the Raspberry Pi as a Pi with is a very small computer, to which the DVAP, a simple Access Point that the TH-D74A/E transmits to and controls. The Pi and DVAP are connected wirelessly to a mobile Hotspot that gets to the internet via cellular mobile phone network. This whole system is about the size of 2 packs of chewing gum.

So what is the coolness of this system?

I can work coast to coast on low power in my car. In fact, I can work the world from my HT (Handheld Transceiver) in the car or from a hotel room with this simple setup. As long as I have mobile cellular service.

I can have access to the world of D-STAR network.



SharkRF openSPOT



Lower Red case is DVAP, the upper is Raspberry Pi Zero W

I know it is hard to visualize this, but go to my videos at <https://www.youtube.com/user/w6gps>,

There you can see all this in action. In all my 40 years as a ham I have had even more excitement using the KENWOOD TH-D74A/E on the D-STAR network. I have meet many new hams worldwide without enduring SSB noise.

For you veteran D-STAR users try not to make more things complicated. It is easy with the TH-D74A/E. For my new D-STAR KENWOOD's TH-D74A/E users, take your time and get on the air.

While you're waiting for verification and registration on the D-STAR radio, get familiar with the many different features of the TH-D74A/E. If you're an owner of the TH-D72A/E or TH-F6A/F7E this radio will be very familiar.

4.4 About the TH-D74A/E

You have a very powerful 5-watt amateur radio device the KENWOOD TH-D74A/E. I view as 4 radios in one.

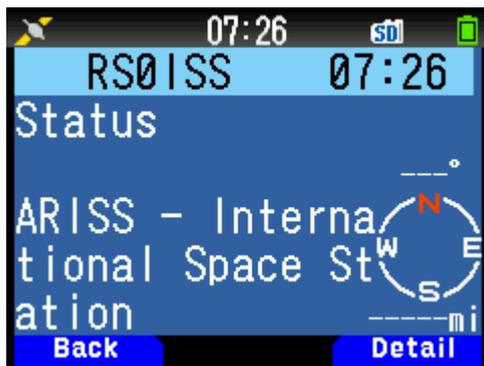
An SSB/Broadcast receiver, digital D-STAR transceiver, FM analog transceiver, and powerful standalone APRS communicator.



Simultaneous reception of D-STAR and HF SSB



FM radio mode



A packet sent from ISS



My position packet digipeated by ISS

I have listened to SSB on the ham bands and broadcast stations around the world.

I have made friends communicating on the Worldwide D-STAR network.

I have even made an APRS contact to the ISS (International Space Station).

I hope I have motivated you to see how much enjoyment you can have with your KENWOOD TH-D74A/E.

September 2017.
W6GPS Don Arnold

5 D-STAR

5.1 Basic Operation

Note: For communication (gateway communication) via the Internet, it is necessary to register the Callsign with the "D-STAR Management Server" such as US Trust Server. (There are other systems as well, they have their own registration process.).

5.1.1 Start with Configuring the Callsign of One's Own Station

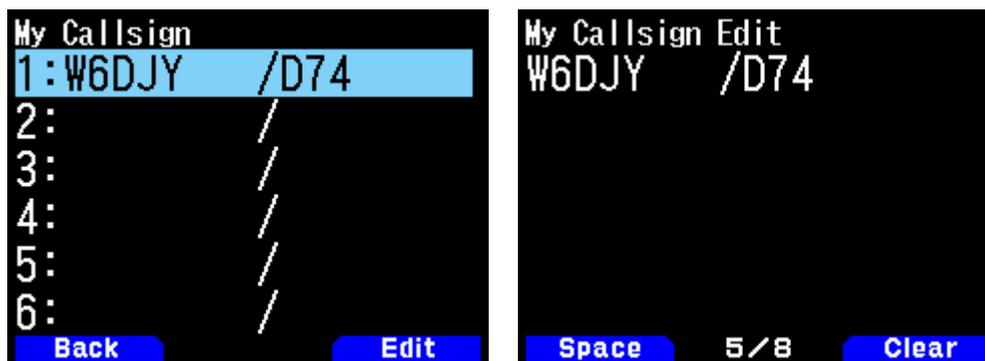
To enable transmission via D-STAR, users first need to configure the Callsign of one's own station.

Note: Transmission in the DV/DR mode is not possible until configuration is complete.

Call up **Menu No. 610**

Select the number to register Callsign, and press **[A/B]**

Enter the Callsign



Press **[ENT]**

The Callsign of one's own station is configured.

5.2 Communication Using D-STAR

5.2.1 Difference between the DV and DR Modes

The DV mode is used to carry out simplex communication where two transceivers communicate with each other directly without using a repeater. The DR mode is used when a communication is carried out via a repeater. (For repeater lists that are preset or edited in advance, it is possible to select and communicate in the DR mode.) It is possible to toggle between the DV and DR modes from the Digital Function Menu.

5.2.2 Using the Digital Function Menu

1. Press **[MODE]** to switch to the **DR mode**
2. Press **[F] [MODE]** in sequence
The Digital Function Menu is displayed.



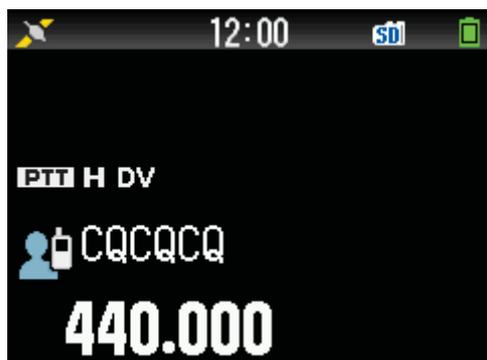
DR Mode



DV Mode

3. Select **"DV/DR Select"** and press **[A/B]**
Doing so toggles between the DV mode and DR mode.

5.2.3 Carrying out Simplex Communication



<K Type>



<E Type>

1. Configure the frequency using the **[▲/▼]** or **[ENC]** control
2. Press **[MODE]** to switch to the DR mode.
If the TH-D74A/E is in the DV mode, go to Step 4.
3. Switch to the DV mode in the Digital Function Menu
4. In the Digital Function Menu, select **"Select Target"**
The Destination Select screen appears.
5. Select **"Local CQ"** and press **[ENT]**
"TO" is now configured as **"CQCQCQ"**.
6. Press **[PTT]** to start transmission

5.3 Communicating Using a Repeater

5.3.1 Local Area Call

Local Area Call (Local CQ) this is a method of communication that uses only one D-STAR repeater. It is similar to the conventional method of communication using FM repeaters. By configuring "TO" as "Local CQ" while in a state where radio signals are able to reach the access repeater selected in "FROM", a local CQ can be configured by pressing [PTT].

5.3.1.1 Configuring the access repeater ([FROM])

1. Press [MODE] to switch to the DR mode
2. Press and hold [▼]
The Repeater Select screen appears.
3. Select "Repeater List" and press [ENT]
The **World Region/Country/Group** Select screen appears.
4. Select the regional group you are located, and press [ENT] to display the Repeater List.
5. Select a nearby repeater from the repeater callsign, repeater names or state/prefecture names.
Pressing [▶] displays the detailed information of the selected repeater.
Pressing [ENT] configures "FROM" to the selected repeater.



6. Configuring the Local CQ [TO]
7. Press and hold [▲], and the Destination Select screen appears.
8. Select "Local CQ" and press [ENT], "TO" is now configured as "CQCQCQ".

5.3.1.2 Checking whether radio signals reach the repeater (kerchunk)

1. Press [PTT] for about 1 second and transmit
2. Check the response
If a response is received from the repeater within 3 seconds and <  > appears on the pop-up screen, it means the radio signals have reached the repeater you are using and radio signals are properly transmitted from the repeater that is being accessed. However, if there is access from another station within 3 seconds, a pop-up screen showing the response from the repeater will not appear.
3. Press [PTT] to start transmission and make calls such as a CQ call

5.3.2 Gateway Call

By configuring "TO" to the repeater of the area to communicate with, followed by pressing PTT, it is possible to establish communication with the stations that are able to access the repeaters of the area.

The access repeater configured in "FROM" is connected via the Internet with the area repeater configured in "TO", thus enabling calls to be made to an area where radio signals cannot be received directly.

As with a Local Area Call, configure "FROM" as the repeater that is directly accessible, followed by configuring [TO] for the target according to the steps below.

1. Press and hold [▲]

The Destination Select screen appears.

2. Select "Gateway CQ" and press [ENT]

The **World Region/Country/Group** Select screen appears.

3. Select the regional group that corresponds to the repeater to connect to, and press [ENT]

The Repeater List appears.

4. Select the repeater to connect to

Pressing [▶] displays the detailed information of the selected repeater.

Pressing [ENT] configures "TO" to the selected repeater.

Check whether connection to the area repeater configured in "TO" can be established.

As with a Local Area Call, perform kerchunk to check whether connection can be established.

5.3.3 Response to Gateway Communication

When there is a call with a specified Gateway CQ or Callsign in the DR mode, a call back to the calling station is made by configuring the Callsign of the calling station in [TO] of the caller.

5.3.3.1 Manual configuration

1. After transmission to the receiving station is complete, press and hold [ENT]

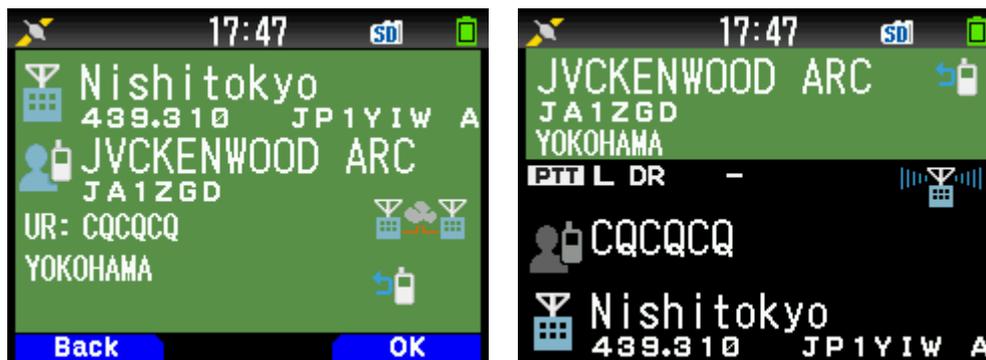
2. Select the Callsign of the calling station on the Call History Select screen, and press [ENT] The Callsign is configured in "TO" and the gateway communication route is automatically selected.

5.3.3.2 Automatic configuration (Direct Reply function)

On the TH-D74A/E, when transmission by the calling station is complete and while the reception interrupt screen appears, the transmission configuration for the receiving station automatically changes to "Individual", and the receiving station can make a call back to the calling station simply by pressing [PTT].

When direct reply is possible during reception, a "Direct Reply" icon will appear in the interrupt screen. When this icon is displayed, pressing [PTT] enables automatic transmission in the callback configuration.

 "Direct Reply" icon



When both APRS and D-STAR are running concurrently, the Direct Reply feature functions when the D-STAR is the operating band. When the details of the APRS Station List are displayed, the Callsign of the receiving D-STAR station is displayed in one line (top most line) above the interrupt area. When the Direct Reply feature is running, a "*" symbol is displayed beside the Callsign.

5.4 Configuration for Reflector Node

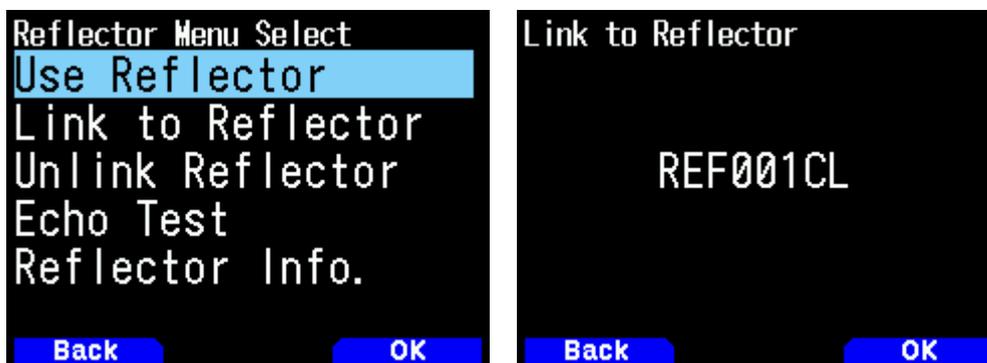
5.4.1 What is a Reflector?

A reflector is a server that is connected to the Internet. Audio packets that are transmitted via the Internet are duplicated and relayed at the same time to other connected devices in a manner that resembles a reflector. By connecting to a reflector via devices such as a D-STAR repeater that has dplus (software) installed in the gateway system, or a DV (Digital Voice) node device for connecting a reflector (Access Point), it is possible to communicate with stations at a remote location.

(We do not provide support for node devices used for reflector connection.)

5.4.2 Reflector Menu on the TH-D74A/E

By adding a simplex node device's frequency information in the repeater list, the Reflector Menu Select can be used as well as a D-STAR repeater.

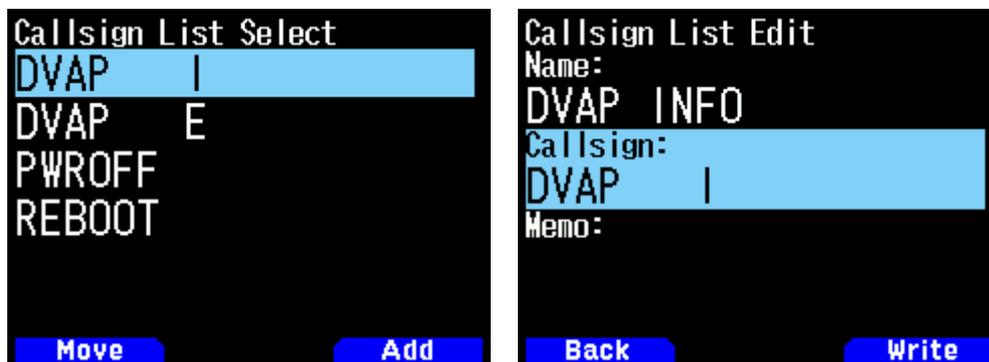


When adding a simplex frequency of the node device for reflector connection to the repeater list, input the string "DIRECT" both for "Callsign" and "Gateway" entry fields in the MCP-D74 Memory Control Program or Menu No. 210 of the TH-D74A/E.



5.4.3 Selecting "Reflector" during Destination Select

Various reflector commands can be configured in "Reflector Menu Select". If other reflector commands are needed, add the command in place of the Callsign to the Callsign list in the MCP-D74 Memory Control Program or Menu No. 220 of the TH-D74A/E. On the Destination Select screen, select "Individual" and configure the registered command in "TO".



5.4.4 When using Memory Channels for a simplex node device

The memory channels can be edited as follows to enable access to the node device for reflector connection.

1. Read the configurations from the transceiver using the MCP-D74, followed by clicking "Memory Channel" to add a frequency for the node device for reflector connection.
2. Click "Display Item (Y)" and select the "Mode" and "URCALL" checkboxes.
3. Set "Mode" to "DV".
4. Create multiple memory channels with the same frequency, and configure the different commands such as "CQCQCQ" and "REFXXXXL" in "URCALL". If character strings other than "DIRECT" need to be entered into "RPT1" and "RPT2" to enable control of the reflector device, click "Display Item (Y)" and select the "RPT1" and "RPT2" checkboxes accordingly, and configure "Mode" to "DR".

Memory Channel												
Memory Group All												
No.	Name	Receive					Transmit			Digital		
		Frequency [MHz]	Step [kHz]	Mode	Shift	Offset [MHz]	Frequency [MHz]	Group	Lockout	URCALL	RPT1	RPT2
000	USE REFLECTOR	438.750	10.0	DV	Simplex	5.00		0: REFLEC	<input type="checkbox"/>	CQCQCQ	DIRECT	DIRECT
001	INFO DVMEGA	438.750	10.0	DV	Simplex	5.00		0: REFLEC	<input type="checkbox"/>	I	DIRECT	DIRECT
002	INFO DVAP	438.750	10.0	DV	Simplex	5.00		0: REFLEC	<input type="checkbox"/>	DVAP I	DIRECT	DIRECT
003	REF001CL	438.750	10.0	DV	Simplex	5.00		0: REFLEC	<input type="checkbox"/>	REF001CL	DIRECT	DIRECT
004	REF008DL	438.750	10.0	DV	Simplex	5.00		0: REFLEC	<input type="checkbox"/>	REF008DL	DIRECT	DIRECT
005	REF030CL	438.750	10.0	DV	Simplex	5.00		0: REFLEC	<input type="checkbox"/>	REF030CL	DIRECT	DIRECT
006								0: REFLEC	<input type="checkbox"/>			
007								0: REFLEC	<input type="checkbox"/>			
008								0: REFLEC	<input type="checkbox"/>			
009								0: REFLEC	<input type="checkbox"/>			
010	UNLINK REFLECTOR	438.750	10.0	DV	Simplex	5.00		0: REFLEC	<input type="checkbox"/>	CQCQCQ	DIRECT	DIRECT
011	ECHO DVMEGA	438.750	10.0	DV	Simplex	5.00		0: REFLEC	<input type="checkbox"/>	E	DIRECT	DIRECT
012	ECHO DVAP	438.750	10.0	DV	Simplex	5.00		0: REFLEC	<input type="checkbox"/>	DVAP E	DIRECT	DIRECT
013	SHUTDOWN DVMEGA	438.750	5.0	DR	Simplex	5.00		0: REFLEC	<input type="checkbox"/>	PWROFF	CONTRL	JAIYKX G
014	REBOOT DVMEGA	438.750	5.0	DR	Simplex	5.00		0: REFLEC	<input type="checkbox"/>	REBOOT	CONTRL	JAIYKX G
015								0: REFLEC	<input type="checkbox"/>			

5. Write back the data edited in the MCP-D74 to the transceiver.
6. By switching the memory channel instead of the Reflector Menu in the DR mode, it is possible to select the command to be sent to the reflector configured in "URCALL".



5.5 How to Update the Repeater list

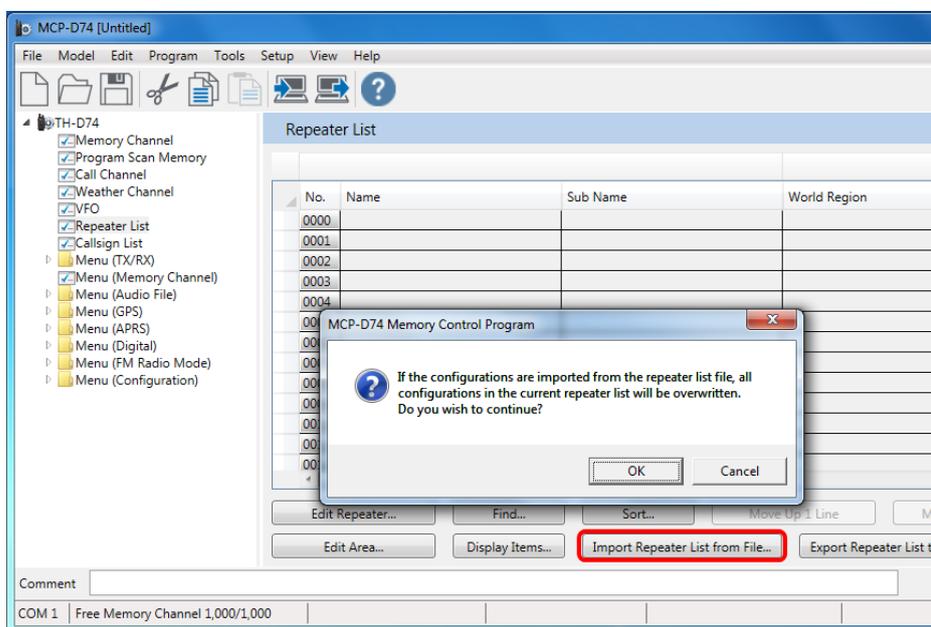
The repeater list can be imported to your TH-D74A/E by using MCP-D74 or a microSD memory card.

Please download the Repeater List file "**D74_yyyymmdd_E.tsv**" ("yyyymmdd" is the numerical release date) from the following KENWOOD website in advance.

http://www.kenwood.com/i/products/info/amateur/software_download.html

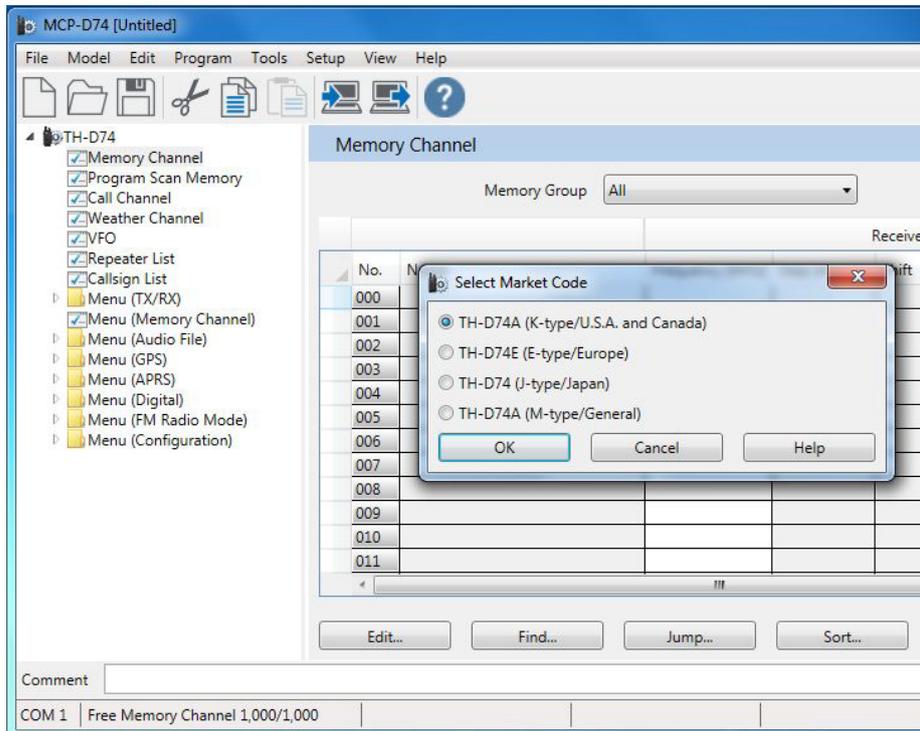
5.5.1 By using MCP-D74

1. Connect the TH-D74A/E and the PC via a Micro-USB cable.
2. Start the MCP-D74.
3. Read data from the TH-D74A/E.
4. Click **[Repeater List]**, **[Import Repeater List from File...]**, and click **[OK]**



5. Select the downloaded Repeater List file "**D74_yyyymmdd_E.tsv**".

6. Click the check box of "**TH-D74A (K-type/U.S.A. and Canada)**", or "**TH-D74E (E-type/Europe)**" and click **[OK]**.



7. The D-STAR Repeater List which is mainly focused on North America or Europe will be imported to the MCP-D74.

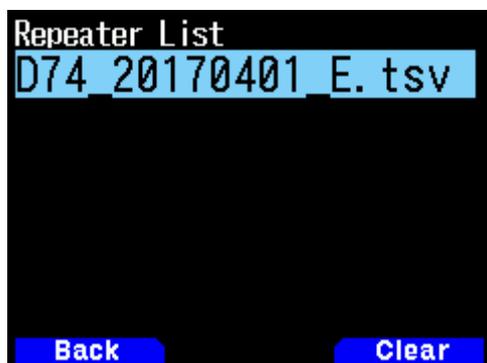
8. Write data back to the TH-D74A/E from the MCP-D74. Then the TH-D74A/E's Repeater List will be updated.

5.5.2 By using a microSD card

1. Install a microSD card to the TH-D74A/E.
2. Access the TH-D74A/E's **Menu No.980** (USB function) and set the transceiver to Mass Storage mode.
3. Connect the TH-D74A/E and the PC via a Micro-USB cable.
4. Copy the downloaded Repeater List file "**D74_yyyymmdd_E.tsv**" to the microSD card folder **[KENWOOD]-[TH-D74]-[SETTINGS]-[RPT_LIST]**.
5. Remove the TH-D74A/E from the PC.
6. Access **Menu No. 812** (Import - Repeater List only) and press **[ENT]**.



7. Select the copied Repeater List File and press **[ENT]**.



8. Select "**Data for TH-D74A**" or "**Data for TH-D74E**" and press [ENT] or [A/B] [OK].



9. The Repeater List which is mainly focused on North America (when selected "**Data for TH-D74A**") or Europe (when selected "**Data for TH-D74E**") will be imported from the microSD card to the TH-D74A/E.

10 Press [A/B] [OK] to restart the TH-D74A/E. Then the TH-D74A/E's Repeater List will be updated.

6 Settings & Controls

6.1 Extending the Battery Life

The TH-D74A/E is equipped with a wide variety of hardware devices. You can minimize battery power consumption by turning off features that are not used or adjust the setting to reduce power consumption.

6.1.1 **Disable GPS**

The built-in GPS receiver is enabled by default. The user may turn off the GPS if not needed.

(→ **Menu No. 400**)

Note: Purchase of this tray default the transceiver is shipped with the GPS enabled this will allow the radio to update the clock after a GPS.

6.1.2 **Disable Bluetooth**

To conserve power consumption if not need to turn off Bluetooth. (→ **Menu No. 930**)

6.1.3 **Backlight Adjustment**

The LCD and keypad backlight consume a great deal of power if left on all the time. Battery life may be enhanced by using the following backlight adjustments.

• Set Backlight Control to “**Auto**” or “**Auto (DC-IN)**”.

When the transceiver is running on battery power, you can select “**Auto**” or “**Auto (DC-IN)**” to turn on the backlight by operating the panel key. The backlight will turn off automatically after the time interval configured in “**Backlight Timer**” has elapsed. (→ **Menu No. 900**)

• Shorten the time interval configured in the Backlight Timer. (→ **Menu No. 901**)

• Reduce the brightness of the backlight (LCD Brightness). (→ **Menu No. 902**)

6.1.4 **Utilize the Battery Saver feature**

The Battery Saver feature turns the receiver circuit on and off intermittently when no signal is received and no key is pressed for an interval of five (5) seconds. The interval for the receiver circuit to remain off while in the Battery Saver mode may be adjusted in the menu. Setting the off time to a longer duration helps to conserve battery power. However, note that the beginning of the received audio may be truncated if the off time is too long. (→ **Menu No. 920**)

Note 1: When the **DV/DR mode** is set to ON, the off duration of the receiver circuit will be automatically fixed at 200 ms.

Note 2: The Battery Saver feature is disabled when the **APRS** or **KISS mode** is set to ON.

6.1.5 **Disable Busy Indicator**

When a radio signal is received, the Busy indicator (**green LED**) lights up. Turning off the Busy indicator will help to reduce battery consumption. (→ **Menu No. 181**)

Note: It is recommended that the Busy indicator setting in **Menu No. 181** be set to “**OFF**” especially during FM radio broadcast when radio signals are received continuously.

6.1.6 Enable Single Band mode

Set to the Single Band mode when there is no need to run two bands at the same time.
(→ [F]–[DUAL])

6.1.7 Adjust Volume Balance

When the transceiver is running in the **APRS** or **KISS mode**, adjust the volume of the band used in the mode. (→ **Menu No. 910**)

6.1.8 Utilize Auto Power Off

The Auto Power Off feature prevents the battery power from draining when the power of the transceiver is left on accidentally. In the factory setting, the power of the transceiver is turned off automatically when there is no key operation for an interval of 30 minutes.
(→ **Menu No. 921**)

6.2 Silent APRS and Packet Communications (Voice Alert)

The TH-D74A/E is capable of receiving radio signals of two different frequencies at the same time. For example, if band A is used for APRS communication and band B for voice communication, data bursts sound may be emitted when receiving packets for band A.

6.2.1 Volume Balance

The TH-D74A/E has only one volume control, but it is equipped with a function for adjusting the balance between the volume of band A and band B. (→ **Menu No. 910**)

6.2.2 Voice Alert

The Voice Alert feature makes use of CTCSS. The CTCSS used for Voice Alert is referred to as voice alert frequency. Audio is from the speaker only when signals with the matched CTCSS coincides with the voice alert frequency are received.

For example, when calling a party to arrange a meeting time and place, it would be necessary to press the [PTT] key repeatedly as the caller would not know whether the signals have reached the receiver successfully. With the Voice Alert feature, the caller is able to wait until the voice call is established without having to press the [PTT] key.

First of all, the speaker sound is muted when both users turn on the Voice Alert feature. Next, when APRS beacon is turned on and both users move away from each other, the sound received from the beacon is from the speaker when both users move to a distance where signals can be received directly. In other words, when the sound received from the beacon is heard, this means a voice call can be established.

6.3 Screen Capture of Radio Display

6.3.1 Screen Capture

The TH-D74A/E comes with a Screen Capture feature that is commonly found on smartphones. By assigning the Screen Capture feature to any of the keys on the optional SMC-34 Speaker Microphone with Programmable Function Keys and Volume Control, a screenshot can be captured by pressing programmed key (**PF1/PF2/PF3**), and the captured image will be saved to the microSD card. (→ **Menu No. 942/ 943/ 944**)

The screenshot is saved as a 24-bit color bitmap image with a resolution of 240x180 pixels and a size of 128 KB. The image is saved at the location below inside the microSD card.

\KENWOOD\TH-D74\CAPTURE

6.4 Viewing microSD Card on PC

To view the files saved in the microSD card of an electronic device on a PC, it is necessary to unmount the microSD card, remove it from the device, insert it into an SD card adapter or USB adapter, followed by connecting the adapter to a PC for it to be recognized as a removable disk.

6.4.1 Mass Storage feature

With the TH-D74A/E, connecting it to a PC with a USB cable, the microSD card can be used as a removable disk. To make use of this feature, it is necessary to configure the USB function of the TH-D74A/E to "**Mass Storage**". (→ **Menu No. 980**)

Configure the USB Function to "**Mass Storage**" in the menu, followed by connecting the transceiver to the PC using a Micro-USB cable.

Note: The Mass Storage feature of the TH-D74A/E is only supported on Microsoft Windows systems. Although the microSD card may also be recognized on a Linux OS, the file size cannot be displayed correctly.

6.5 Adjustment of RX Audio Quality

Different users have different sound quality preferences. The TH-D74A/E comes with an Audio Equalizer feature that allows users to adjust the sound quality according to their preference.

6.5.1 DSP audio sound processing

The DSP (digital signal processor) on the TH-D74A/E ensures that all transceiver audio signals are properly processed. Audio signals in the analog FM mode are also converted temporarily to digital signals by an A/D converter, after which sound processing is applied within the DSP and the signals are restored to analog signals by a D/A converter and output from the speaker.

6.5.2 RX Equalizer

The RX Equalizer feature is made possible by processing of all received audio signals by the DSP as described above. The audio frequency band of the RX Equalizer is divided into five (5) different bands, each of which can be adjusted within the range of -9 dB to +9 dB. User can therefore adjust the frequency properties of the audio signal to their preference. (→ **Menu No. 913**)

The equalizer can be set to ON or OFF. (→ **Menu No. 911**)

Frequency Band [kHz]	Variable Range [dB]
0.4	-9 ~ ±0 ~ +9
0.8	-9 ~ ±0 ~ +9
1.6	-9 ~ ±0 ~ +9
3.2	-9 ~ ±0 ~ +9
6.4	-9 ~ ±0 ~ +9

6.6 Adjustment of TX Audio Quality

Similar to the received, the TX audio sound input from the microphone is also processed by the DSP, thus enabling adjustment using the TX Equalizer.

6.6.1 TX Equalizer

The audio frequency band of the TX Equalizer is divided into four (4) different bands, each of which can be adjusted within the range of -9 dB to +3 dB. (→ **Menu No. 912**)

Users can choose whether to apply the properties of the preset equalizer to analog FM, digital (D-STAR) or both. (→ **Menu No. 911**)

Frequency Band [kHz]	Variable Range [dB]
0.4	-9 ~ ±0 ~ +3
0.8	-9 ~ ±0 ~ +3
1.6	-9 ~ ±0 ~ +3
3.2	-9 ~ ±0 ~ +3

6.7 Wide-band and Multi-mode Reception

The TH-D74A/E is capable of receiving signals between the bandwidths of 0.1 MHz to 523.995 MHz.

Although a wide bandwidth range has already been achieved on the predecessor model, TH-F6A/F7E, many enhancements have been made and new features are introduced on the TH-D74A/E.

Wide-band reception is only possible on band B (lower half in the display).
(Band A is only limited to amateur bands including 144 MHz, 220 MHz^{*1} and 430 MHz.

^{*1} The 220 MHz band is only available to USA and Canada market.

6.7.1 Receiving Frequency Range & Demodulation Mode

The default frequency and demodulation mode of each of band A and band B on the TH-D74A/E are shown below.

[TH-D74A]

Operating Band	Frequency Band	Frequency Range [MHz]	Step [kHz]	Demodulation Mode
Band A	144 MHz	136 ~ 174	5	FM
	220 MHz	216 ~ 260	20	FM
	430 MHz	410 ~ 470	25	FM
Band B	LF/ MF	0.1 ~ 0.520	5	AM
		0.520 ~ 1.710	10	
	HF	1.710 ~ 3.5	0.1 (FINE Mode ON)	CW
		3.5 ~ 4.0		LSB
		4.0 ~ 7.0		AM
		7.0 ~ 7.3		LSB
		7.3 ~ 10.1		AM
		10.1 ~ 10.15		CW
		10.15 ~ 14.0		AM
		14.0 ~ 14.35		USB
		14.35 ~ 18.068		AM
		18.068 ~ 18.168		USB
		18.168 ~ 21.0		AM
		21.0 ~ 21.45		USB
		21.45 ~ 24.89		AM
		24.89 ~ 24.99		USB
		24.99 ~ 28.0		AM
	28.0 ~ 29.7	USB		
	50 MHz	29.7 ~ 51	25	FM
		51 ~ 54	10	
		54 ~ 76	5	
	FM Radio	76 ~ 108	100	WFM
	118 MHz	108 ~ 136	12.5	AM
	144 MHz	136 ~ 144	5	FM
		144 ~ 148		
		148 ~ 174		
	VHF	174 ~ 216	50	FM
	220 & 300 MHz	216 ~ 220	12.5	AM
		220 ~ 225	20	AM
		225 ~ 410	12.5	AM
	430 MHz	410 ~ 420	12.5	FM
		420 ~ 450	25	
450 ~ 470		12.5		
UHF	470 ~ 524	50	FM	

* The transmission frequencies supported are:

VHF: 144.000 to 147.995 [MHz]; 220 MHz: 222.000 to 224.995 [MHz];

UHF: 430.000 to 449.995 [MHz].

[TH-D74E]

Operating Band	Frequency Band	Frequency Range [MHz]	Step [kHz]	Demodulation Mode
Band A	144 MHz	136 ~ 174	12.5	FM
	430 MHz	410 ~ 470	25	FM
Band B	LF/ MF	0.1 ~ 0.520	5	AM
		0.520 ~ 1.710	9	
	HF	1.710 ~ 3.5	0.1 (FINE Mode ON)	CW
		3.5 ~ 4.0		LSB
		4.0 ~ 7.0		AM
		7.0 ~ 7.3		LSB
		7.3 ~ 10.1		AM
		10.1 ~ 10.15		CW
		10.15 ~ 14.0		AM
		14.0 ~ 14.35		USB
		14.35 ~ 18.068		AM
		18.068 ~ 18.168		USB
		18.168 ~ 21.0		AM
		21.0 ~ 21.45		USB
		21.45 ~ 24.89		AM
		24.89 ~ 24.99		USB
	24.99 ~ 28.0	AM		
	28.0 ~ 29.7	USB		
	50 MHz	29.7 ~ 51	5	FM
		51 ~ 54	10	
		54 ~ 76	5	
	FM Radio	76 ~ 108	50	WFM
	118 MHz	108 ~ 136	12.5	AM
	144 MHz	136 ~ 144	5	FM
		144 ~ 146	12.5	
		146 ~ 174	5	
	VHF	174 ~ 230	50	FM
	220 & 300 MHz	230 ~ 410	12.5	AM
	430 MHz	410 ~ 430	12.5	FM
		430 ~ 440	25	
		440 ~ 470	12.5	
	UHF	470 ~ 524	50	FM

* The transmission frequencies supported are: 144.000 to 145.995 [MHz];
UHF: 430.000 to 439.995 [MHz].

6.8 Mode

In the SSB, CW and AM modes, the 10.8 kHz IF signal obtained after the 3rd Mixer is inputted the DSP, and IF filter. Detection is carried out during digital signal processing. The design of the IF filter and detection is adapted to the handheld transceivers based on the design of our HF transceivers.

6.8.1 SSB

In the SSB mode (LSB, USB), the high-cut frequency can be adjusted in the receiving filter configuration. A high-cut frequency can be selected from **2.2 kHz/ 2.4 kHz/ 2.6 kHz/ 2.8 kHz/ 3.0 kHz**. The low-cut frequency is fixed at 200 [Hz]. Changing the high-cut frequency switches in the IF band pass filter (BPF).

For example, if the high-cut frequency is configured to **2.4 kHz**, the passband of the IF filter becomes **2.2 kHz**. (→ **Menu No. 120**)

6.8.2 CW

In the CW mode, the passband (Band Width) can be adjusted in the receiving filter configuration. The passband can be selected from **0.3 kHz/ 0.5 kHz/ 1.0 kHz/ 1.5 kHz/ 2.0 kHz**. Changing the passband switches the IF filter (BPF). (→ **Menu No. 121**)

In addition to the receiving filter, there are also configurations including pitch frequency and CW reverse. Pitch frequency refers to the frequency for playing back the Morse signals received as demodulated audio signals when the carrier coincides exactly with the receiving frequency.

A pitch frequency can be selected from **400 Hz/ 500 Hz/ 600 Hz/ 700 Hz/ 800 Hz/ 900 Hz / 1000 Hz**. (→ **Menu No. 170**)

CW reverse is a configuration for determining whether to carry out detection in the CW mode as LSB or USB. CW reverse can be selected from **Normal / Reverse**. USB is chosen in the Normal mode and LSB in the Reverse mode. (→ **Menu No. 171**)

6.8.3 AM

In the AM mode, the high-cut frequency can be adjusted in the receiving filter configuration. A high-cut frequency can be selected from **3.0 kHz/ 4.5 kHz/ 6.0 kHz/ 7.5 kHz**.

The low-cut frequency is fixed at **200 Hz**. Changing the high-cut frequency switches the IF filter (BPF). The passband of the IF filter in the AM mode is double that of the high-cut frequency.

For example, when the high-cut frequency is configured to **4.5 kHz**, the passband of the IF filter becomes **9 kHz**. (→ **Menu No. 122**)

6.8.4 IF Signal Output, Detection Signal Output

In addition to the received audio signals, the TH-D74A/E is also able to output IF signals or detection signals to the built-in speaker, external speaker jack or USB audio. When the IF signal is selected in the "Detect Out Select" menu, IF signals for the SSB or AM mode are converted into IF signals with a center frequency of 12 kHz and output. When detection signal is selected, the signal before the De-Emphasis filter output in the FM mode, while the signal after the detection is output in the SSB, CW and AM modes. When IF signal or detection signal is selected, the RX Equalizer will not be applied to the audio output.

Operation of the "**Detect Out Select**" Menu, output of IF signals and output of detection signals work when the transceiver is in the Single Band mode and the operating band is band B. (→ **Menu No. 102**)

Note: There are some restrictions on the operation and behavior during output of IF or detection signals. For more details, please refer to the user manual.

6.8.5 Fine Mode, Step

When the reception mode is SSW, AM or CW, using the “**FINE mode**” enables tuning in finer step frequencies.

The step frequency of the “**FINE mode**” can be selected from **20 Hz/ 100 Hz/ 200 Hz/ 1000 Hz**.

The smallest step frequency, which was **33 Hz** on the TH-F6A/F7E, has been narrowed down to **20 Hz** on the TH-D74A/E to enable tuning for greater listening comfort.

6.8.6 FM Radio

There are two (2) methods of FM radio reception. One of them is to select the frequency of band B in the FM radio band, while the other is to set the FM Radio mode to on in **Menu No. 700**.

By turning on the FM Radio mode, it is possible to receive FM radio signals while APRS and D-STAR are running.

When radio signals are received on band A or band B, the display switches to the normal frequency screen to receive the signals, while the FM radio is temporarily muted. After communication is finished in this state and no signal is received on band A or band B for a time interval specified in the menu, the display returns to the FM radio broadcast reception screen. (→ **Menu No. 701**)

The frequency range of FM radio is from 76.0 MHz to 107.9 MHz, which supports reception of supplementary FM (wide FM) broadcasts.



FM Radio mode

The FM Radio icon lights up when the FM Radio mode is turned on, enabling the transceiver to be used exclusively as an FM radio.

- The direct frequency input mode is used exclusively for the FM radio function in this mode, which simplifies the input of the radio frequency.
- There are 10 special memory channels for FM radio that also support registration of memory names.
- The **[M/V]** key is used to toggle between the “**VFO mode**” and “**MR mode**”.
- To start scanning, press the **[Seek]** key. When an FM station is found, “**<< Tuned >>**” is displayed and scanning stops.
- When receiving FM radio signals at a location where reception is unstable, lengthening the “**Auto Mute RET. Time**” helps to reduce switching between the normal frequency mode and the FM Radio mode. (→ **Menu No. 701**)

6.9 Memory Channels

6.9.1 Using the Memory Groups

The TH-D74A/E offers 30 memory groups from "**GRP-0 to GRP-29**".

Each memory group can be assigned with a group name of not more than 16 characters.

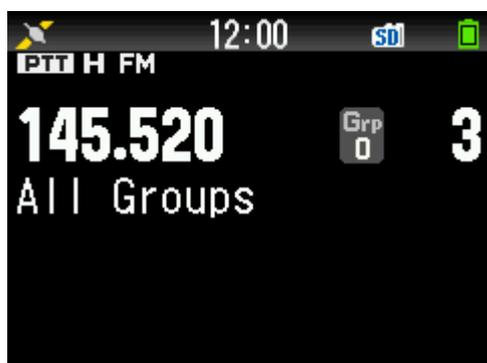
When a new memory is registered, a default memory group number will be registered to the memory channel as follows according to the channel number that users register the group numbers again according to the intended use.

To do so, press the **[ENT] [MENU]** keys while in the Memory Channel mode to enter the Memory Channel List Menu, followed by selecting **[Edit] - [Group]** to change the group of the selected channel.

Memory Channel No.	Memory Group	Group Name	Example of Registered Name
0 to 99	Group 0	GRP-0	AMA 144
100 to 199	Group 1	GRP-1	AMA 430
200 to 299	Group 2	GRP-2	D-STAR
300 to 399	Group 3	GRP-3	•
400 to 499	Group 4	GRP-4	•
500 to 599	Group 5	GRP-5	Aviation radio
600 to 699	Group 6	GRP-6	AM radio
700 to 799	Group 7	GRP-7	•
800 to 899	Group 8	GRP-8	•
900 to 999	Group 9	GRP-9	•

Pressing the **[MR]** key switches to the Memory Channel mode and activates the "**All Groups**" state in which all the groups will be recalled at the same time. The default setting is "All Groups". To change the memory groups to recall, press and hold the "**◀**" or "**▶**" key while in the Memory Channel mode.

The new memory group will be displayed for two (2) seconds when a change has been made, after which only the Memory Channel registered in the memory group can be recalled.



ALL Groups
(All memories can be recalled)



Group-0
(Only memories registered in the displayed group can be recalled)

6.9.2 Group Link Scan

Pressing and holding down the **[MHz]** key starts Group Link Scan.

Group Link Scan is a feature for scanning only the memory groups registered in the group link via **Menu No. 203**.

For example, to scan only the amateur radio bands 144 MHz and 430 MHz in the registered name examples given above, both **"GRP-0"** and **"GRP-1"** need to be registered in group link.

6.9.3 Program Scan Memory

There are 50 sets (100 channels) of program scan memories for specifying the scan range. Each program scan memory comprises a set of two (2) channels, each corresponding to the lower and upper frequency limits respectively.

For example, to scan between the range of 145.500 to 145.900 MHz, register 145.500 MHz to channel number **"L49"** and 145.900 MHz to **"U49"**.

When the frequency enters the program scan range in the VFO mode, the program scan number that is currently applied will be displayed.



Indicates the range of Program Scan No. 49.

6.10 Bluetooth

The TH-D74A/E comes equipped with the Bluetooth feature that enables wireless connection with other external devices.

The Bluetooth specification is Bluetooth 3.0, Class 2. The following 2 profiles are supported.

- HSP (Head Set Profile): Bluetooth communications with an audio device such as a headset.
- SPP (Serial Port Profile): Serial communications over Bluetooth link.

6.10.1 Supported Bluetooth Profile Description

HSP (Head Set Profile)

By connecting the TH-D74A/E to a Bluetooth-compatible headset device, the microphone and earphone of the headset can be used for making voice calls.

PTT on the transceiver unit or speaker microphone is used to start transmission. (Transmission cannot be made directly from the Bluetooth headset except for VOX operation. Push-to-talk is not available via the Bluetooth headset.) To adjust the volume level when a Bluetooth device is connected, do so using the volume control of the headset. The sensitivity of the microphone can be adjusted in **Menu No. 112**.

Note: Audio sound cannot be output from the USB or SP port when a Bluetooth headset is connected. HFP (Hands-Free Profile) is not supported.

SPP (Serial Port Profile)

By pairing the TH-D74A/E with a PC and assigning a virtual serial port, it is possible to carry out serial communication with the PC wirelessly. Doing so enables wireless operation of APRS software programs such as UI-View32 and MCP-D74. Also, serial communication with a PC is possible while a Bluetooth headset is being connected.

During virtual serial communication via Bluetooth, configuration of the baud rate is not necessary to ensure communication at the optimal speed. If it is necessary to configure the baud rate in the PC application program in use, simply make a random selection from the options given. (Select any one of the options.)



Bluetooth ON (Bluetooth icon appears)



Bluetooth (connected) icon lights up

Bluetooth devices that are currently connected will appear in **Menu No. 933**.

6.11 USB Usage

6.11.1 Virtual COM Port

The TH-D74A/E supports the USB Communications Device Class (CDC), which enables it to communicate with a PC as a virtual COM port. To make use of the USB virtual COM port, a special driver needs to be installed. The driver may be downloaded from the following website

http://www.kenwood.com/i/products/info/amateur/thd74_vcp_e.html

When using the virtual serial communication via USB, configuration of the baud rate is not necessary. If it is necessary to configure the baud rate for the PC application program in use, simply make a random selection from the options given. The user may select any one of the options.

The abovementioned USB feature on the TH-D74A/E enables data loading and writing by the MCP-D74 at a much faster speed Than over Bluetooth.

6.11.2 USB Audio

The USB Audio feature on the TH-D74A/E supports only audio output.

- The output format supported is 48 kHz, 16-bit and monaural audio.
- USB Audio outputs the same audio sound as the speaker output.
- The output level of USB Audio can be adjusted in **Menu No. 918**.
- Audio sound is output from the USB even when a speaker microphone or earphone is connected.
- When a Bluetooth headset is connected, USB Audio becomes a port used exclusively for input and output of the Bluetooth headset.

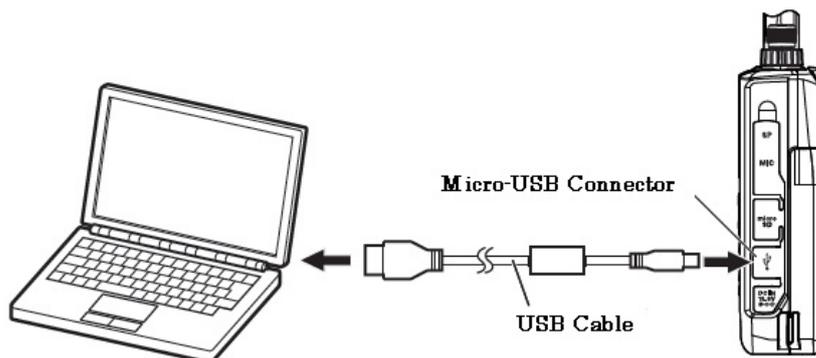
		Audio Output Destination			
		Built-in SP	Speaker Microphone	USB	Bluetooth
Connected Device	Nil	X	n/a	X	n/a
	Speaker Microphone	n/a	X	X	n/a
	Bluetooth	n/a	n/a	n/a	X
	USB Audio	X	X	X	n/a

6.11.3 USB Mass Storage Class

This feature is supported on digital cameras and the TH-D74A/E, it allows access to the different settings as well as the microSD memory card on the TH-D74A/E from a PC using the MCP-D74 Memory Control Program by connecting the PC to the USB port.

There is no need to remove the memory card from this transceiver. To connect the TH-D74A/E with a PC, it is necessary to install a virtual COM port driver on the PC in advance.

To make use of this feature, change the USB device selection option in **Menu No. 980** to **"Mass Storage"**.



6.12 microSD Card Usage

6.12.1 Recording Data

The TH-D74A/E is compatible with the microSD and microSDHC standards. It supports microSDHC cards with a capacity of up to 32 GB.

The following types of information can be recorded to a microSD card.

Type	Description	Maximum No. of Files	File Format
Transmitted/Received Audio Recording	Records the communication of data transmitted and received.	255	wav 16 kHz/ 16-bit/ monaural
GPS Tracking Log	Records the GPS tracking data.	255	nme
QSO Log	Records the update history.	4000 ^(*)	tsv (tab-delimited text)
Repeater List	D-STAR repeater list	---	tsv (tab-delimited text)
Callsign List	Callsign list for D-STAR	---	tsv (tab-delimited text)
Captured Image	Screenshot image	---	bmp 240 x 180/ 24-bit
Transceiver Configuration	Information such as the configuration of the transceiver features, as well as memory channels and voice messages.	---	d74 (binary format)

^{*}1: Firmware V1.05 and later versions (255 files for V1.04 and earlier versions)

6.12.2 GPS Receiver for Prolonged GPS Logging

Disabling the radio communications feature of the TH-D74A/E allows it to be used for an extended period of time.

To do so, configure the "Operating Mode" for GPS to "GPS Receiver". (→ Menu No. 403)

The transceiver feature is disabled in the GPS Receiver mode, but the FM radio feature remains usable. (→Menu No. 700)

6.12.3 Saving Configuration Data to microSD Card

The configuration or programming data of the TH-D74A/E can be saved to a microSD card. Export of configuration data (→ Menu No. 800)

- When upgrading the firmware version, it is recommended that the data be saved to the microSD card.
- The data format is the same as that of the MCP-D74 software.
- To change the configuration on the TH-D74A/E, it is possible to save the new configuration data to the microSD card in advance, followed by applying it using the configuration data import feature. (→ Menu No. 810)

6.12.4 Position Memory Usage (GPS)

The TH-D74A/E allows users to register the positional information of their favorite locations in the Position Memory.

The Position Memory feature stores information including the latitude, longitude, altitude, time of registration, name and icon. Up to 100 sets of information can be stored in the Position Memory. All contents except the time of registration can also be edited.

You can copy information on the current location, APRS station list and My Position to the Position Memory.

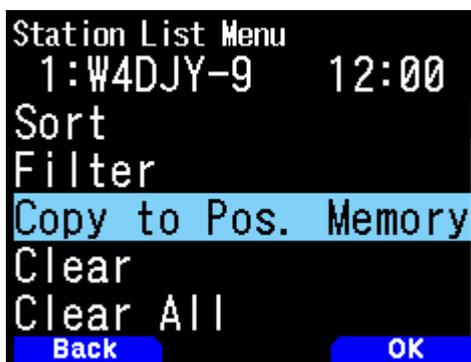
<Ways to Utilize Position Memory>

- Applying the Position Memory information to My Position and sending Position Memory information as object and item
- Target point

To register a Position Memory, press and hold the [MARK] key. Registration is not possible if GPS positioning information is not available. When GPS positioning data is available, pressing and holding the [MARK] key registers the positional information of the current location to the Position Memory. Let us look at the steps to register the APRS station list information to the Position Memory. The procedure is as follows.



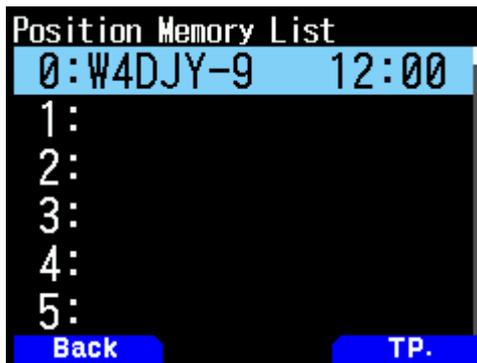
Station List Screen



Press [MENU] to display the list menu (and select Copy to Pos. Memory)

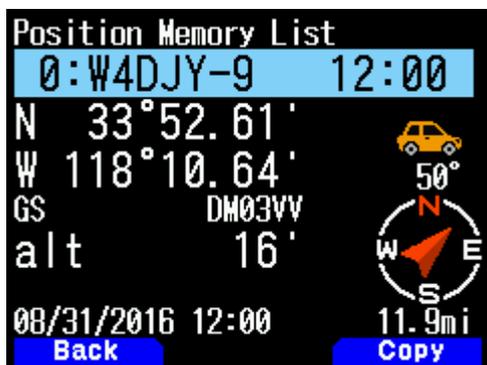


Select the Position Memory number to copy the information to Memory list



After copying, check the Position

Press [MENU] key to display the list menu (and select "Copy to Pos. Memory")



Position Memory List (Details) Screen

Example: Items that are moved when registering information from a station list to the Position Memory list.

Station List		Position Memory List
Callsign	→	Position Name
Radio Station Icon	→	Icon (same as APRS)
Latitude	→	Latitude
Longitude	→	Longitude
Altitude	→	Altitude
Time Received	→	Time of Registration
Status Text	×	
Weather Data	×	
Transmission Power	×	
Antenna Height	×	
Antenna Gain	×	
Position Comment	×	
Packet Relay Route	×	

Example: Items that are copied when registering information from My Position to the Position Memory list.

My Position		Position Memory List
Name	→	Position Name
	×	Icon (same as APRS)
Latitude	→	Latitude
Longitude	→	Longitude
Altitude	→	Altitude
	×	Time of Registration

Example: Items that are copied when registering information from the Position Memory to My Position.

Position Memory List		My Position
Position Name	→	Name
Icon (same as APRS)	×	---
Latitude	→	Latitude
Longitude	→	Longitude
Altitude	→	Altitude
Time of Registration	×	

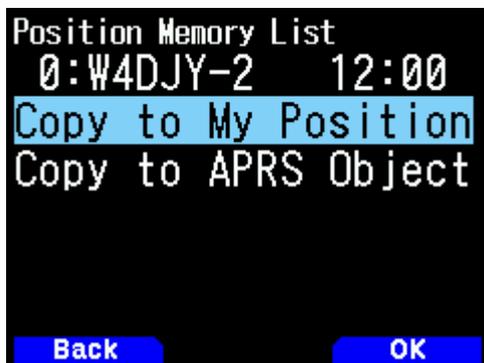
Example: Items that are copied when registering information from the Position Memory to Object.

Position Memory List		Object
Position Name	→	Name
Icon (same as APRS)	→	Icon (same as APRS)
Latitude	→	Latitude
Longitude	→	Longitude
Altitude	×	
Time of Registration	×	

6.12.5 Position Memory Registration

Positional information that has been registered can be copied easily to **"My Position"** or **"Object"**.

Display the screen containing the details of the Position Memory to copy.



Press the **[A/B]** key to select the destination to copy to.

Select **"My Position"** or **"APRS Object"** as the destination, and press the **[A/B]** key.

Select one of the options from **"My Position 1"** to **"My Position 5"** or **"Object 1"** to **"Object 3"**, and press the **[A/B]** key to copy the information.

Note: Copying positional information to APRS Object is available from the firmware Version 1.06 or later. The latest firmware can be downloaded from the following KENWOOD website.

http://www.kenwood.com/i/products/info/amateur/software_download.html

7 Appendix

7.1 Exterior views

The pictures below are the TH-D74A, and TH-D74E.

The TH-D74A is equipped with a Triband Antenna (144/ 220/ 430 MHz band).



TH-D74A

TH-D74E

7.2 TH-D74A/E Specifications

GENERAL	
Frequency Range	Band-A (TH-D74A)TX: 144 - 148, 222 - 225, 430 - 450 MHz RX: 136 - 174, 216 - 260, 410 - 470 MHz (TH-D74E)TX: 144 - 146, 430 - 440 MHz RX: 136 - 174, 410 - 470 MHz Band-B RX: 0.1 - 76, 76 - 108 (WFM), 108 - 524 MHz
Mode	TX F3E, F2D, F1D, F7W RX F3E, F2D, F1D, F7W, J3E, A3E, A1A
Operating Temp. Range with Incd. KNB-75L	-20 °C ~ +60 °C (-4°F ~ +140°F) -10 °C ~ +50 °C (+14°F ~ +122°F)
Frequency Stability	+/- 2.0 ppm
Antenna Impedance	50 Ω
Operating Voltage	DC-IN DC 11.0 - 15.9 V (STD: DC 13.8 V) BATT DC 6.0 - 9.6 V (STD: DC 7.4 V)
Current Consumption (TYP.)	TX EXT.PS 13.8 V / Battery:7.4 V H M L EL DC-IN 1.4 A 0.9 A 0.6 A 0.4 A BATT 2.0 A 1.3 A 0.8 A 0.5 A
Current Consumption (TYP.)	RX SINGLE 260 mA (Rated Power) 135 mA (SQ Close) 48 mA (Avg. Save on) DUAL 310 mA (Rated Power) 185 mA (SQ Close) 50 mA (Avg. Save on) GPS logger mode 115 mA
Battery Life	Approx. Single, Save on, Rate 6:6:48 sec, GPS off H M L EL KNB-75L (1,800 mAh) 6 hours 8 hours 12 hours 15 hours KNB-74L (1,100 mAh) 4 hours 5 hours 7 hours 9 hours KBP-9 (Alkaline AAAx6) ----- 3.5 hours ----- Approx. 10 % shorter when GPS is ON
Dimensions (W x H x D)	Projections not included with KNB-75L 56.0 x 119.8 x 33.9 mm 2.20 x 4.72 x 1.33 in with KNB-74L 56.0 x 119.8 x 29.3 mm 2.20 x 4.72 x 1.15 in with KBP-9 56.0 x 119.8 x 36.0 mm 2.20 x 4.72 x 1.42 in
Weight (net)	Body only 202 g 7.13 oz with KNB-75L 345 g 12.2 oz (w/ Antenna, Belt Clip, KNB-75L) with KNB-74L 315 g 11.1 oz (w/ Antenna, Belt Clip, KNB-74L) with KBP-9 360 g 12.7 oz (w/ Antenna, Belt Clip, KBP-9)
TRANSMITTER	
RF Power Output	EXT.PS 13.8 V / Battery:7.4 V H M L EL 5 W 2 W 0.5 W 0.05 W
Modulation	FM Reactance Modulation DV GMSK Reactance Modulation
Modulation Deviation	FM +/-5.0kHz NFM +/-2.5kHz
Spurious Emissions	HI / MID -60 dBc or less L -50 dBc or less EL -40 dBc or less
Microphone Impedance	2 kΩ
GPS	
TTF (Cold start)	Approx. 40 sec
TTF (Hot start)	Approx. 5 sec.
Horizontal Accuracy	10 m or less
Receive sensitivity	Approx. -141 dBm (Acquisition) Ta = 25 °C, Open sky

Except for sensitivity, these specifications are guaranteed for Amateur Bands only. JVCKENWOOD follows a policy of continuous advancement in development. For this reason, specifications may be changed without notice.

*Alterations may be made without notice to improve the ratings or the design of the transceiver.

*The photographic and printing processes may cause the coloration of the transceiver to appear different from that of the actual transceiver.

Concerning the received frequency display, an unmodulated signal may be received. This is according to the set intrinsic frequency form.

Unmodulated signals may be received depending on the relation of display of reception frequency. This is due to the set specific frequency configuration.

19.2 MHz x n (n = multiple)

Near times 11.06 MHz

Around 224.25 MHz reception.

V x U reception (VRX + 57.15 MHz) x 4 - (URX - 58.05 MHz) x 2 = ±57.15 MHz, ±58.05 MHz
(VRX + 57.15 MHz) x 6 - (URX - 58.05 MHz) x 3 = ±57.15 MHz, ±58.05 MHz
(VRX + 57.15 MHz) x 8 - (URX - 58.05 MHz) x 4 = ±57.15 MHz, ±58.05 MHz
(VRX + 57.15 MHz) x 9 - (URX - 58.05 MHz) x 5 = ±57.15 MHz, ±58.05 MHz

U x V reception (URX - 57.15 MHz) x 2 - (VRX + 58.05 MHz) x 4 = ±57.15 MHz, ±58.05 MHz
(URX - 57.15 MHz) x 3 - (VRX + 58.05 MHz) x 6 = ±57.15 MHz, ±58.05 MHz
(URX - 57.15 MHz) x 4 - (VRX + 58.05 MHz) x 8 = ±57.15 MHz, ±58.05 MHz
(URX - 57.15 MHz) x 5 - (VRX + 58.05 MHz) x 9 = ±57.15 MHz, ±58.05 MHz

RECEIVER		Band-A	Band-B
Circuitry	Double Super Heterodyne (F3E, F2D, F1D, F7W) Triple Super Heterodyne (J3E, A3E, A1A)		
IF Frequency	1st IF 2nd IF 3rd IF	57.15 MHz 450 kHz	58.05 MHz 450 kHz 10.8 kHz
Sensitivity (TYP.)	J3E, A3E, A1A		
Amateur Band	FM 12dB SINAD (FM/ NFM)	144 MHz 0.18/ 0.22 uV (TH-D74A) 220/ 430 MHz 0.18/ 0.22 uV 430 MHz 0.18/ 0.22 uV	0.19/ 0.24 uV 0.20/ 0.25 uV 0.20/ 0.25 uV
	DV	PN9/GMSK 4.8kbps, BER 1% (TH-D74A) 144 MHz 0.22 uV (TH-D74E) 144 MHz 0.20 uV (TH-D74A) 220 MHz 0.22 uV 430 MHz 0.22 uV	0.22 uV 0.22 uV 0.24 uV 0.22 uV
	SSB	10 dB S/N	0.16 uV
	AM	10 dB S/N	0.50 uV
	AM	10 dB S/N	4 uV
	AM	0.3 - 0.52 MHz 0.52 - 1.8 MHz 1.8 - 54 MHz 54 - 76 MHz 118 - 174 MHz 200 - 250 MHz 382 - 412 MHz 415 - 524 MHz	1.59 uV 0.63 uV 1.12 uV 0.50 uV 0.63 uV 1.12 uV 1.12 uV
RECEIVER		Band-A	Band-B
	FM 12dB SINAD	28 - 54 MHz 54 - 76 MHz 118 - 144 MHz 0.36 uV 148 - 175 MHz 200 - 222 MHz 225 - 250 MHz 382 - 400 MHz 400 - 412 MHz 0.36 uV 415 - 430 MHz 0.36 uV 450 - 490 MHz 0.36 uV 490 - 524 MHz	0.32 uV 0.56 uV 0.36 uV 0.36 uV 0.36 uV 0.50 uV 0.36 uV 0.36 uV 0.36 uV 0.36 uV 0.63 uV 0.63 uV
	SSB	10 dB S/N	0.40 uV 0.79 uV 0.16 uV 0.20 uV 0.16 uV 1.59 uV 2.00 uV
	FM BC Band WFM	30 dB S/N	0.16 uV 0.16 uV
Spurious Rejection		144MHz 50 dB or more 430MHz 50 dB or more	45 dB or more 40 dB or more
IF Rejection		60 dB or more	55 dB or more
Channel Selectivity	-6 dB 12 kHz or more -50 dB 30 kHz or less		
Audio Output	7.4 V, 10% Dist.	400 mW or more / 8 Ω	
Bluetooth			
Version, Class	Version 3.0, Class 2		
Output Power	-6 < Pav < 4 dBm		
Modulation Characteristics	140 ≤ af 1avg ≤ 175 kHz		
Initial Carrier Frequency	-75 ≤ fo ≤ +75 kHz		
Carrier Frequency Drift	±25 kHz (One Slot packet) ±40 kHz (Three Slot Packet) ±40 kHz (Five Slot Packet)		

KENWOOD

TH-D74A/E

Operating Tips

December 1, 2017

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