Your First HT

Some Things to Consider

Terry Lines – KD5RA
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As a newly licensed technician class operator, I would like to personally welcome you to the hobby of amateur radio! Terry Lines, KD5RA

Introduction

At David Walker's request I created this material assuming your first radio as a newly licensed Tech Operator is going to be an HT (Handy Talkie).

This is actually a very reasonable assumption. Today's HTs are all very capable, versatile and generally rather affordable. There is very little a base or mobile VHF/UHF radio can do that an HT can not do. The primary difference if RF output power. A VHF/UHF mobile radio is typically rated at 50 watts, most HTs are 5 watts or less. But the HT's portability more than compensates in most applications. And the power difference is not as major an issue as the numbers would lead you to believe. VHF/UHF communication is line of site and, under good conditions, 5 watts is capable of surprisingly long range into a quality, sensitive repeater.

Introduction Simplex – Duplex

Your HT can be used to talk directly to another VHF/UHF radio using the same frequency for both receiving and transmitting. This is referred to as simplex operation. This is how we typically think or radio communication. The are two portions of the 2m amateur band where simplex communication is allowed.

Most communication on the VHF/UHF bands is done with the aid of a repeater. The function of a repeater is to extend the range of VHF/UHF communication far beyond the range which would be possible using simplex communications. When using a repeater your VHF/UHF radio transmits on one frequency (repeater input) and listens on another frequency repeater output). This is duplex communications. To prevent false triggering, most repeaters require an access tone. This additional complication requires that you configure your HT to function with the numerous repeaters in the area, (this configuration is incorrectly referred to as programming).

Introduction

HTs vary in difficulty of programming. The range is generally from difficult to very difficult.

Plan to spend a significant amount of time with the radio's manual and don't be afraid to consult an old timer. But keep in mind, all radios are different, so the old timer is going to spend some quality time with the manual for your radio in order to answer your questions. The only difference between you and the old timer is, the old timer knows what he needs to configure on your radio, he just doesn't know how it's accomplished on your model radio.

There is nothing really intuitive about programming VHF/UHF radios. This is especially true for HTs.

Radio Specifications and Features

Single Band, Dual Band or Tri-Band

RF Output Power
- Usually adjustable in several steps.

Audio output power.

Battery Capacity → Power Drain (operating time)
- Additional power options
- Power conservation modes

Size and Weight

Memory capacity
- General purpose
- Home and call frequency memories
- Band edges
- Memory banks
- Memory Labels (names)

Radio Specifications and Features

DTMF autodial memories.
    How many and how long.

Wide band receive; especially the NOAA weather channels.
Wide band receive → DC to daylight → FM, WFM, NFM, AM, SSB, CW

Some of the more expensive ICOM HTs support the DSTAR digital voice and data protocol.

Some radios meet various Mil-Std environmental standards.
    Impact resistance
    Immersion specs

Radio Specifications and Features

There is a nearly endless list of miscellaneous specifications and features.

- Priority memories and dual watch
- Voice recorders
- GPS – Global Positioning System
- APRS – Automatic Position Reporting System
- Band scopes
- Data transmission modes
- Cross band operation V/U – U/V
- VOX (voice actuated transmission)
- Paging and tone squelch

Yaesu offers some interesting emergency operation modes for hazardous situations. Emergency Automatic ID can be a lifesaver in man-down situations.

Radio Specifications and Features – Discussion

Single Band, Dual Band or Tri-Band

You could probably get by with a single band (2m) HT. The advantages of the single band HT are cost and perhaps a slight improvement in ease of use. Both ICOM and Yaesu have single band 2m HTs for less than $100. Some of the less often used features will not be present or will be limited in function, but the features really needed in a VHF HT will be available.

Dual band almost always means a radio which can operate on both 2m and 70cm bands. Both Yaesu and ICOM have dual band HTs in the $150 to $200 range. Expect more of the nice-to-have features to be available on these slightly more costly radios.

There are some HTs available which add the 220MHz band (1.25m) to the standard dual band configuration. Still others add both the 1.25m band and 6meters. For most users there is very little to be gained by adding the additional bands. But if you feel you would like the additional flexibility these radios are available at higher cost than dual band radios.

Radio Specifications and Features – Discussion

RF Output Power

Most HTs have a maximum RF power output of 5 watts or less. When working at a reasonable distance from the local repeater, 5 watts is more than adequate. But when operating indoors or around metal buildings no amount of power may be sufficient for effective communications. You must also keep in mind VHF/UHF communication is line-of-site, repeater must be able to *see* you and your HT; if you are operating in a drainage area or valley you may not be able to communicate regardless of RF output power.

The power output on virtually all HTs is adjustable downward from the maximum power setting. Typical power output settings for an HT would be 5W, 1W and 0.2W. The licensing material made mention of the fact that no more RF power should be used than is required to maintain communication. When using an HT this is more than just good advice; your HT is running from a battery with a finite amount of charge. Your HT will transmit five times longer when set to 1W than when set to 5W.

Radio Specifications and Features – Discussion

Audio output power

The power of the audio amplifier in an HT is often overlooked by new users. But your HT is of little use to you if you can't hear it! Consider 300mW (0.3W) a minimum limit for audio power. It would be far better if you could try the radio you are considering buying in a noisy environment. The radio should be capable of producing uncomfortably loud audio without distortion.

An additional consideration is using a headset-microphone or a lapel speaker-microphone as are used by police and firefighters.

Radio Specifications and Features – Discussion

Battery Capacity

When using an HT your power source is usually a battery with a capacity of 700 to 2000mAh (mill- ampere-hours). Unless you have a spare battery or an alternative power source, when the battery is discharged you are off-the-air. Purchasing an extra battery is highly recommended, but you must keep the spare battery charged and you must keep it with you.

Most HT manuals will not tell you how long the radio will operate from the supplied battery. The manual will tell you the capacity of the battery and the current demand of the radio under various transmit and receive conditions. For example a freshly charged 1000mAh battery installed in an HT which requires 1500mA when transmitting at 5W, will transmit continuously for 40 minutes (0.67hr = 1000mAh / 1500mA). If the radio requires 50mA in standby (radio on but no signal being received) the radio will operate for approximately 20 hours (1000mAh / 50mA).

Keep in mind if your radio has been operating for a long time in standby or has been receiving a few incoming messages, the battery maybe too close to exhausted to allow you to transmit.

Most modern radios have numerous battery saver and low power modes. A quality HT will operate for a long time from a fully charged battery, but you really should have a fully charged spare battery with you. If you will potentially be involved in prolonged situations, a means of recharging batteries is very desirable. If AC power is available, the charger which came with your HT can be used. Most manufactures also offer automobile cigarette lighter chargers.

Radio Specifications and Features – Discussion

Size and Weight

Both Yaesu and ICOM have dual band HTs weighing about 5 ounces and about 6 cubic-inches in volume! This may be difficult for a new user to put into perspective, but this is a very small, very light weight radio!

These are very capable, full featured, radios but output power is limited to about 1.5 watts. Within reasonable range of the local repeater 1.5W is sufficient power. Both the ICOM IC-P7A and the Yaesu VX-3R are capable of somewhat higher power if operated from an external power source rather than the internal battery.

Other than the two radios above, expect a modern HT to be about the size of a cordless telephone or slightly smaller and weigh slightly more than a half pound.

Radio Specifications and Features – Discussion

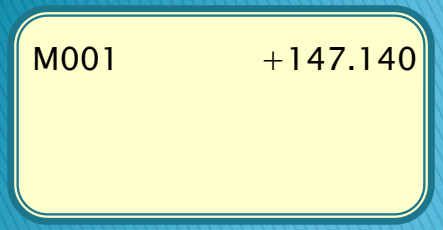
Memory capacity

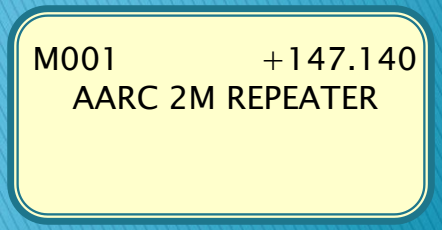
VHF/UHF communication is channelized as opposed to using a continuous span of frequencies. Think of VHF/UHF as being like the channels on a television set as opposed to the continuous tuning dial on an AM radio.

Because VHF/UHF operates on fixed channels, we need a way to store the channels of interest to us. This is true of all VHF/UHF radios, base, mobile and HTs. This is the job of the HT's memory. The number of memory channels should not be a major concern to you when selecting a radio. In my opinion, even the least expensive radio has more channel memory than you are ever likely to need.

One very handy feature associated with channel memory is the ability to label the channel memories. Most, but not all, HTs support this feature. The main specification for channel labeling is how many characters the radio will allow you to assign to each channel; more is better. For the radios I found, the number of allowed characters varied from 5 to 16. The idea of channel labels is to allow you to add a name to a channel rather than just displaying the frequency. Very handy if you have numerous channels stored in your HT.

Below are two example radio displays. One has no memory label; it simply displays the memory channel number and the frequency assigned to channel 001. The second display shows the same information but adds a user assigned 16 character channel label.





Radio Specifications and Features – Discussion

DTMF Autodial Memories

Back in olden times (before cell phones) having a phone patch on a local repeater was not only popular, it was very useful. Long before cell phones existed, amateur radio operators could place a telephone call from their car! The AARC 2m repeater still has phone patch capability, but you do need to be a club member to get access codes. Most other local repeaters also maintain phone patch capability. One important thing to remember about using a radio phone patch, your call is NOT private; anyone listening to the repeater is hearing both ends of your conversation.

Cell phones have obviously reduced the usefulness of the phone patch. Cell phones are much easier to use than a radio phone patch and allow private communication. But there may be that one-in-a-thousand chance you may wish to use a phone patch, so radio manufactures usually include DTMF (Dual Tone Multi-Frequency) memory to aid in the use of radio telephone patch. The specs of interests are how many DTMF memories are available and how many digits each memory can store.

Radio Specifications and Features – Discussion

Wide Band Receive

All of the current Yaesu and ICOM HTs I found include extended receive. Extended receive which includes 160-170MHz is, in my opinion, most useful. This band of frequencies, located just above the 2m amateur band, includes the 7 NOAA weather channels below.

162.400 162.425 162.450 162.475 162.500 162.525 162.550

Some of the HTs I found are so called DC-to-daylight radios. The DC-to-daylight designation indicates VERY wide band receive, essentially covering all assigned radio frequencies and multiple modulation types (FM, WFM, NFM, AM, SSB, CW). Yes, you could listen to you favorite television program on your HT; at least until June 2009 when the broadcasts go digital.

These very wide band receivers are compromise circuits. Don't expect these receives to operate as effectively as quality receivers designed specifically for a particular purpose. For example, the receive capability of your HT in the 14.000 to 14.350MHz band is not going to approach the performance of a mid-grade HF amateur radio transceiver. If the HT you wish to purchase has very wide band capability, great, but I would not select an HT just for the wide band feature.

All receivers you are legally permitted to purchase are not capable of receiving cell phone frequency assignments.

Radio Specifications and Features – Discussion

Mil-Std environmental and physical specifications.

Impact resistance

At some point you are probably going to drop your HT. If the HT survives the falls is going to be a function of the height of the fall, the surface the radio lands on and how ruggedly the HT was constructed. Some of the more expensive radios have light-weight metal housings designed to met or exceed military specifications for impact resistance. This isn't a guarantee the radio will survive but it certainly improves the chances.

Alternatively, soft cases are available for most HTs. The cases can be purchased from the manufacturer or from third party suppliers who specialize in such protective covers.

Immersion specs

There are also immersion specifications for radios. The most common seems to be the ability to survive for 30 minutes in three feet of water. While you may never drop your HT over-board, with the immersion tested radios you can be more confident in the event of rain, or a coffee spill.

Additional Considerations

Some radios can be cloned, backed-up, or configured from your PC, some radios can not. As previously mentioned, configuring your HT can be time consuming, being able to store the settings on a PC can be a nice feature.

For the radios which can communicate with a PC.

- Most require a special cable (optional).
- Generally, optional software is required.
- In some cases the cost can approach the price of the radio.

Some radios are available with a reduced number of keys. Yaesu in particular makes 8 and 16 key versions of their more popular HTs. For example the VX-127 is an 8 key version of the VX-177 which has 16 keys. The reduced number of keys can make the radio easier to operate but usually makes configuring the radio even more difficult.

Additional Considerations

The size of the display text can be an issue especially for older users in poor light conditions. Obviously, the larger the display text the better. Is the display backlit? Is the display backlight function easy to access in low light conditions?

Are the buttons backlit in anyway? This can be very useful in low light conditions. Is the back-light function easy to activate?

Radios which meet the Mil-Std specs for water immersion, shock, vibration, and impact may be worth considering. At some point it's likely you are going to drop your HT.

Specs and Pictures

The following page contains a table of specifications for most currently available HTs. I have highlighted several radios you may find particularly interesting. I also highlighted the specific specifications which I felt may make the radio attractive to you.

				Memories				Current Draw			Physical				
Model	XMT Bands	Rcv	Pwr	Number	Label	Pwr Supply	Batt Capacity	Rcv	Xmt	Ext Pwr	H	W	D	Wght	Price
ICOM															
IC-V85	2m	136-174MHz	7.0	107	Y-5	7.2 VDC	1700mAh	80mA	2600mA	11 VDC	4.3	2.2	1.3	12.5	179.00
IC-V82	2m	136-174MHz	7.0	200	Y-5	7.2 VDC	1100mAh	80mA	2600mA	N/A	5.4	2.1	1.4	13.8	129.00
IC-U82	70cm	400-479MHz	5.0	200	Y-5	7.2 VDC	1100mAh	80mA	2000mA	N/A	5.4	2.1	1.4	13.8	129.00
IC-V8	2m	136-174MHz	5.5	100	Y-5	7.2 VDC	1100mAh	70mA	2000mA	6-10.3 VDC	5.2	2.1	1.4	12.3	95.00
IC-92AD	2m / 70cm	500KHz - 1.0GHz	5.0	1304	Y	7.4 VDC	1620mAh	50mA	2000mA	10-16 VDC	4.4	2.3	1.4	11.5	530.00
IC-91AD	2m / 70cm	500KHz - 1.0GHz	5.0	1304	Y	7.2 VDC	1300mAh	85mA	2200mA	10-16 VDC	2.1	2.3	1.4	10.6	390.00
IC-91A	2m / 70cm	500KHz - 1.0GHz	5.0	1304	Y	7.2 VDC	1300mAh	85mA	2200mA	10-16 VDC	2.1	2.3	1.4	10.6	310.00
IC-P7A	2m / 70cm	500KHz - 1.0GHz	1.5 / 1.0	1000	Y-6	3.7 VDC	1800mAh	80mA	1500mA	12-16 VDC	3.2	1.8	1.1	5.6	170.00
IC-T7H	2m / 70cm	118-174; 400-470	6.0 / 1.0	70	N	7.2 VDC	600mAh	18mA	1600mA	4.5-16 VDC	4.9	2.2	1.4	11.0	165.00
IC-T90A	6m / 2m / 70cm	500KHz - 1.0GHz	5.0	555	Y	7.4 VDC	1300mAh	35mA	2000mA	5.5-11VDC	4.8	2.3	1.1	10.9	250.00
Yaesu															
FT-60R	2m / 70cm	108-520;700-999MHz	5.0	1000	Y-6	7.2 VDC	1400mAh	125mA	1500mA	6-16 VDC	4.3	2.3	1.2	13.5	175.00
VX-3R	2m / 70cm	500KHz - 1.0GHz	1.5	900	Y-6	3.7 VDC	1000mAh	120mA	1300mA	3.5-7 VDC	3.2	1.9	0.9	4.6	150.00
VX-6R	2m / 1.25m / 70cm	500KHz - 1.0GHz	5.0	900	Y-6	7.4 VDC	1400mAh	150mA	1600mA	6-16 VDC	3.4	2.3	1.1	9.5	230.00
VX-7R	6m / 2m / 1.25m / 70cm	500KHz - 1.0GHz	5.0	900	Y-8	7.4 VDC	1300mAh	150mA	1600mA	10-16 VDC	3.4	2.3	1.1	8.9	310.00
VX-8R	6m / 2m / 1.25m / 70cm	500KHz - 1.0GHz	5.0	1267	Y-16	7.4 VDC	1100mAh	120mA	1700mAh	10-16 VDC	3.7	2.4	0.9	8.5	370.00
VX-110	2m	140-174MHz	5.0	209	Y-7	7.2 VDC	700mAh	130mA	1300mA	6-16 VDC	4.2	2.3	1.1	11.5	149.00
VX-120	2m	136-174MHz	5.0	200	Y-6	7.2 VDC	1400mAh	125mA	1500mA	6-16 VDC	4.7	2.4	1.3	13.5	130.00
VX-150/83B	2m	140-174MHz	5.0	209	Y-7		700mAh	130mA	1300mA	6-16 VDC	4.2	2.3	1.1	11.5	95.00
VX-170	2m	136-174MHz	5.0	200	Y-6	7.2 VDC	1400mAh	125mA	1500mA	6-16 VDC	4.7	2.4	1.3	13.5	135.00
VX-127	70cm	420-470MHz	5.0	1000	Y-6	7.2 VDC	1400mAh	130mA	1800mAh	6-16 VDC	4.2	2.3	1.1	11.5	160.00
VX-177	70cm	420-470MHz	5.0	1000	Y-6	7.2 VDC	1400mAh	130mA	1800mAh	6-16 VDC	4.2	2.3	1.1	11.5	170.00
Kenwood															
TH-K2AT	2m	136-174MHz	5.0	50	Y-6	7.2 VDC	1100mAh	30mA	1800mA	10-16 VDC	4.4	2.3	1.5	11.3	140.00
TH-F6A	2m / 1.25m / 70cm	10KHz - 1.3GHz	5.0	435	Y-8	7.4 VDC	1550mAh	35mA	2000mA	5-7.5VDC	3.4	2.3	1.2	8.8	325.00
TH-D7A	2m / 70cm	118-174; 400-480MHz	5.0	200	Y-8	6.0 VDC	650mAh	45mA	1800mA	6-16 VDC	4.8	2.3	1.5	12.0	
TH-42AT	70cm	438-450MHz	2.5	40	N					6-16 VDC					320.00

Notes:

All have CTCSS / DTCS encode-decode

Most radios are available with multiple battery options. I geneally show the standard battery.

Receive current specified is generally standby as opposted to full volume.

Some dual band radios operate cross band others do not.

Take the table of comparative specifications with a grain of salt, it is entirely possible I made errors translating specs and features from the user manuals. If you find a radio of interest, confirm the features and specifications in the radio's user's manual.

ICOM

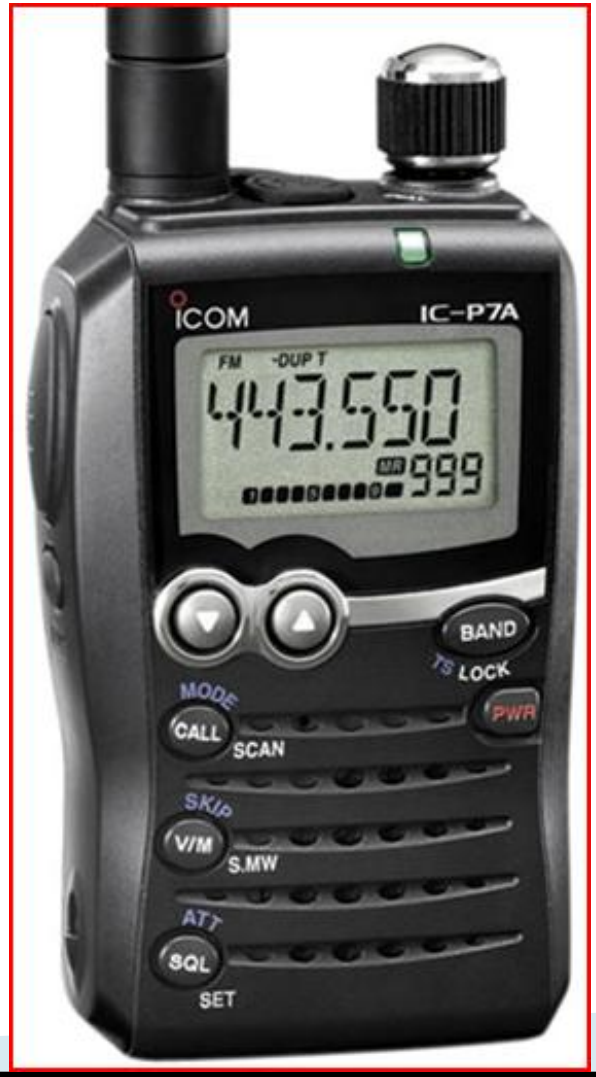
The product pictures which follow are proportionally correct, but are not actual size.


ICOM
IC-U82
MONI
FUNC
CALL
MR
CLR
TONE
P.BEEP
T.SCAN
BANK
DUP
SCAN
SKIP
OPT
PRIO
SET
H/M/L
ENT
UHF TRANSCEIVER


ICOM IC-V8
FUNC
CALL
MR
CLR
TONE
P.BEEP
T.SCAN
DUP
SCAN
SKIP
PRIO
SET
H/M/L
OPTION
ENT


ICOM
PWR
FUNC
CALL
MR
CLR
TONE
P.BEEP
T.SCAN
BANK
DUP
SCAN
SKIP
OPT
PRIO
SET
H/M/L
ENT
FM TRANSCEIVER
IC-V85


ICOM
IC-91AD
145.500
FM
448.500
DV
MENU
LOCK
PWR
MAIN
DUAL
BAND
D-STAR


ICOM
IC-P7A
FM
DUP T
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999
BAND
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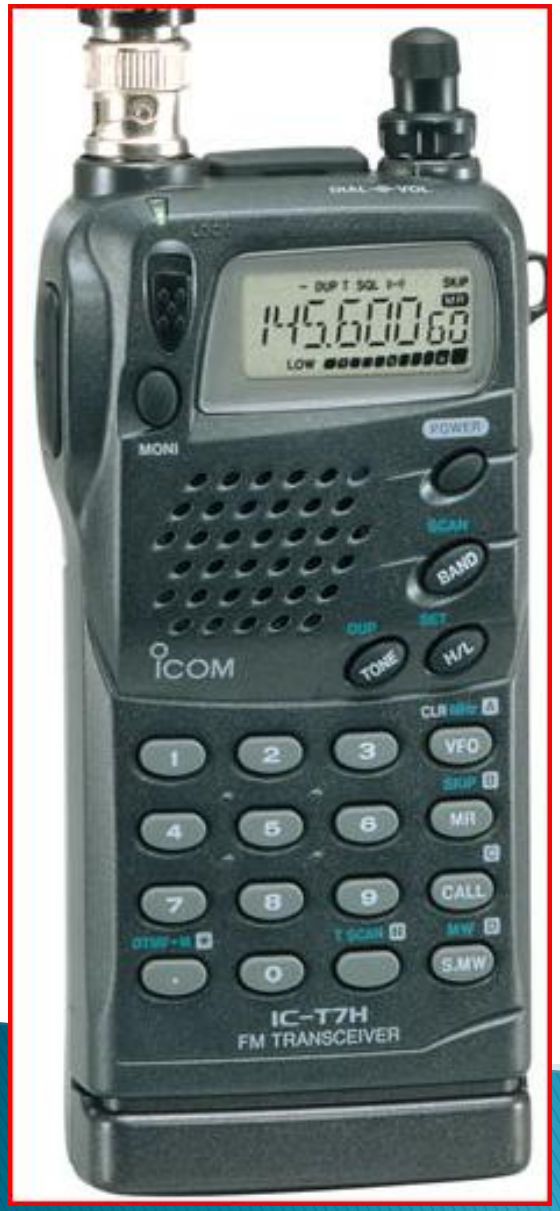
MODE
CALL
SCAN
PWR
SKIP
V/M
S.MW
ATT
SQL
SET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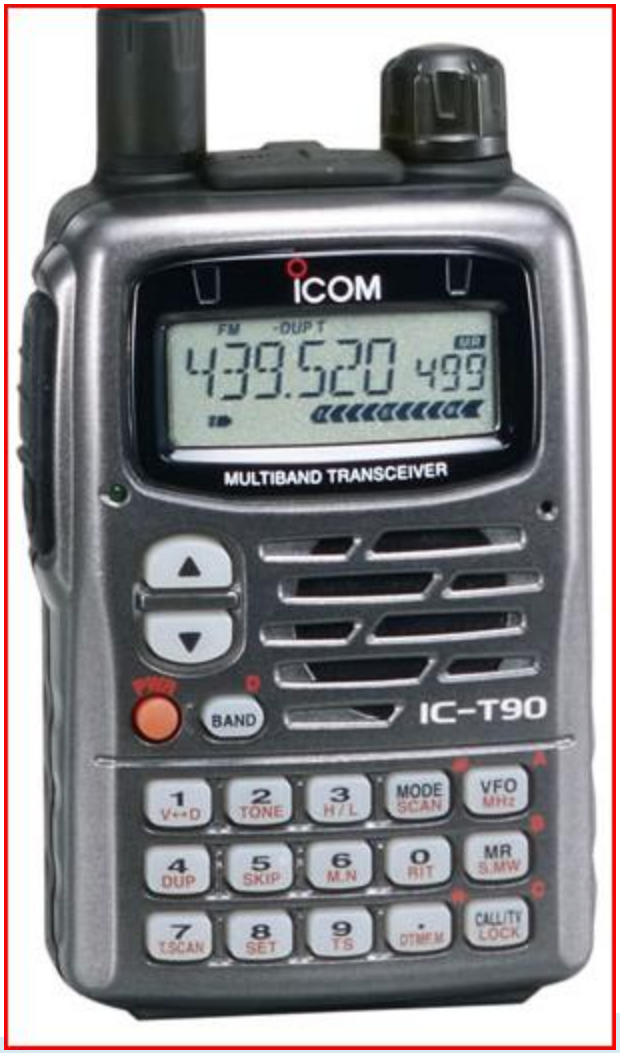
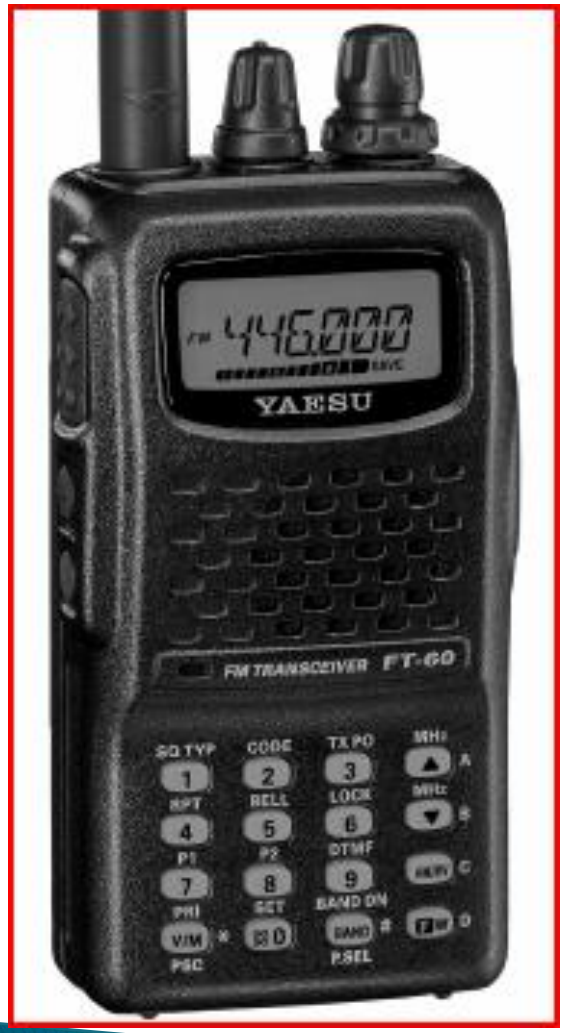
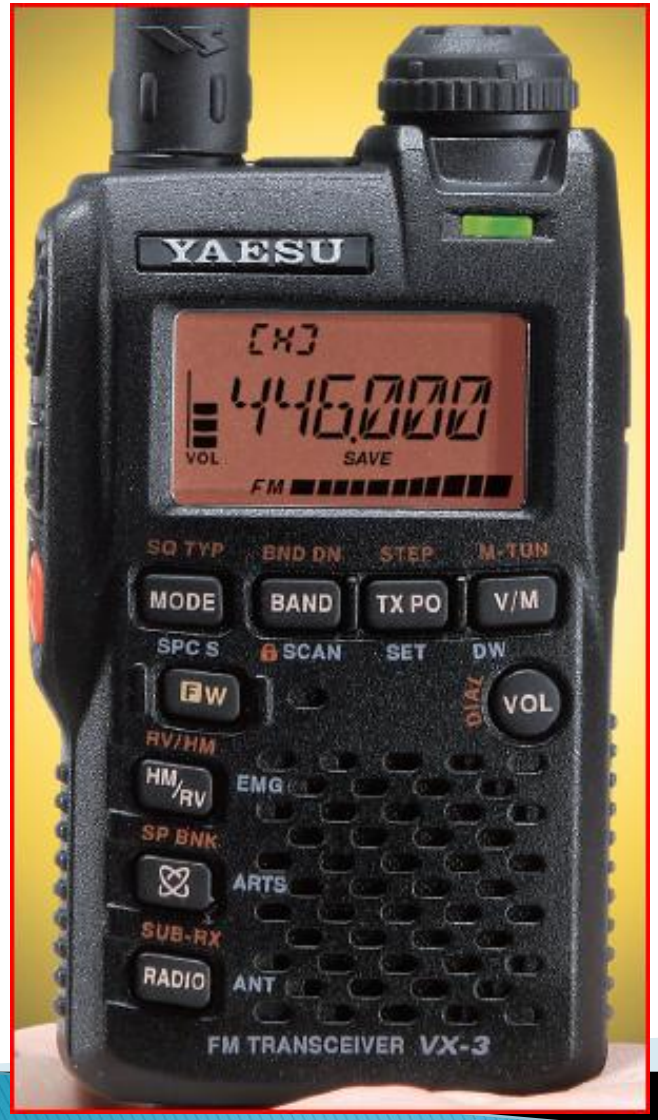
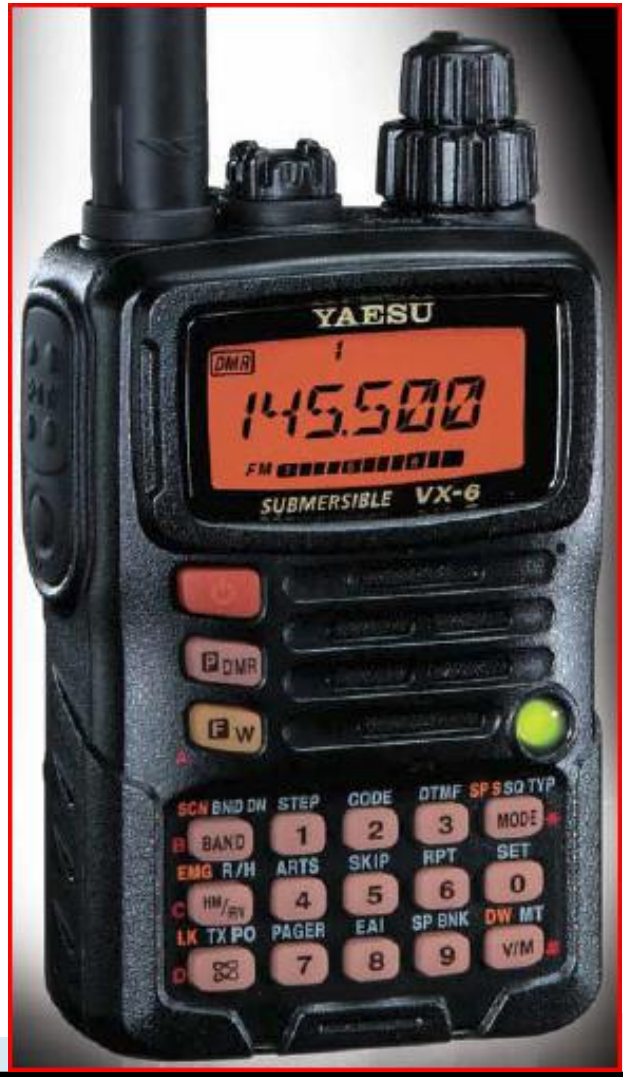
POWER
SCAN
BAND
DUP
SET
TONE
H/L
ICOM
VFO
MR
CALL
S.MW
IC-T7H
FM TRANSCEIVER

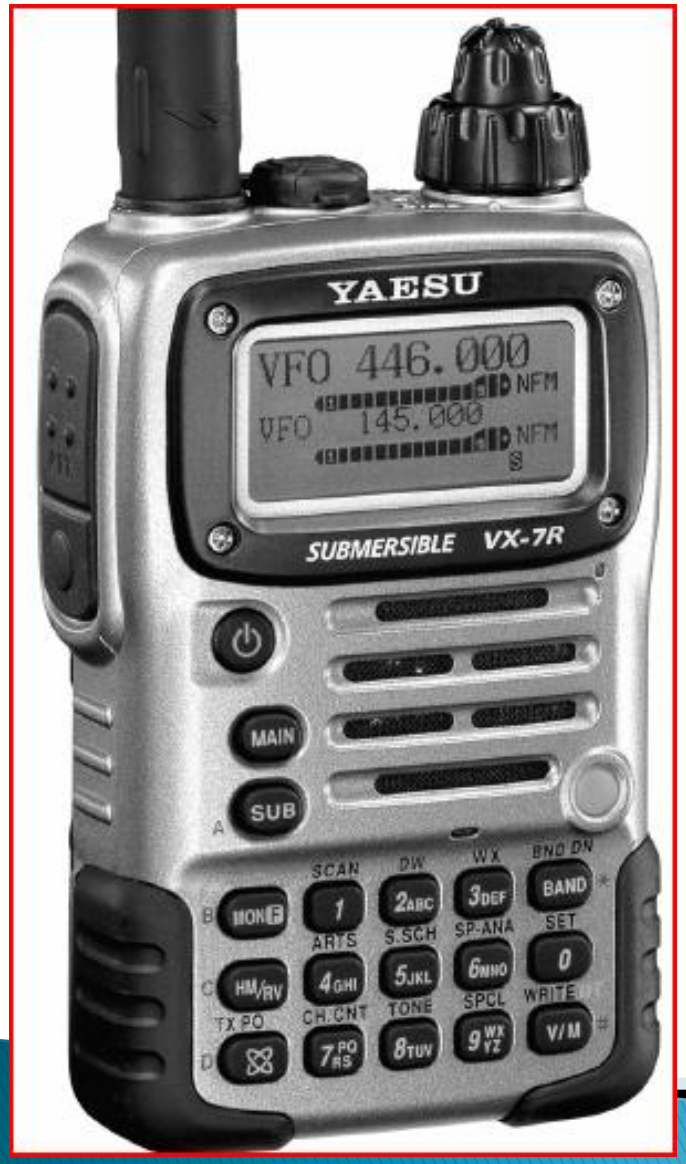

ICOM
FM -DUP T
439.520 499
MULTIBAND TRANSCEIVER
BAND
IC-T90
MODE SCAN
VFO MHz
MR S.MW
CALL/LOCK

Yaesu


YAESU
FM TRANSCEIVER FT-60


YAESU
SAVE
SQ TYP
BND DN
STEP
M-TUN
MODE
BAND
TX PO
V/M
SPC S
SCAN
SET
DW
VOL
RV/HM
EMG
SP BNK
ARTS
SUB-RX
RADIO
ANT
FM TRANSCEIVER VX-3


YAESU
SUBMERSIBLE VX-6


YAESU
VFO 446.000
NFM
VFO 145.000
NFM
SUBMERSIBLE VX-7R
MAIN
SUB
SCAN
DW
WX
BND DN
MONI
BAND
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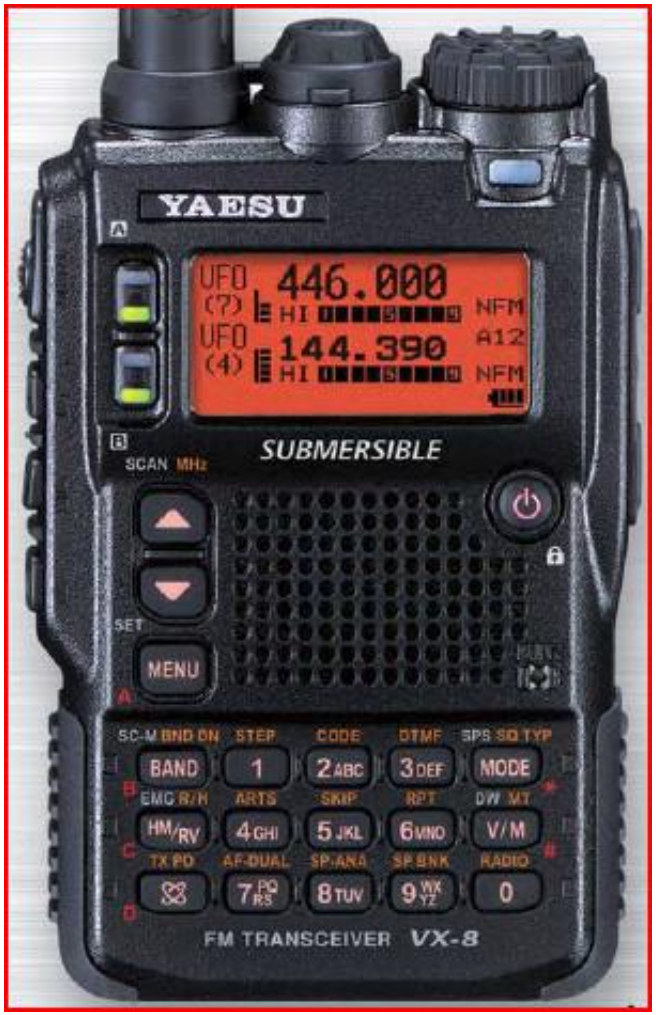
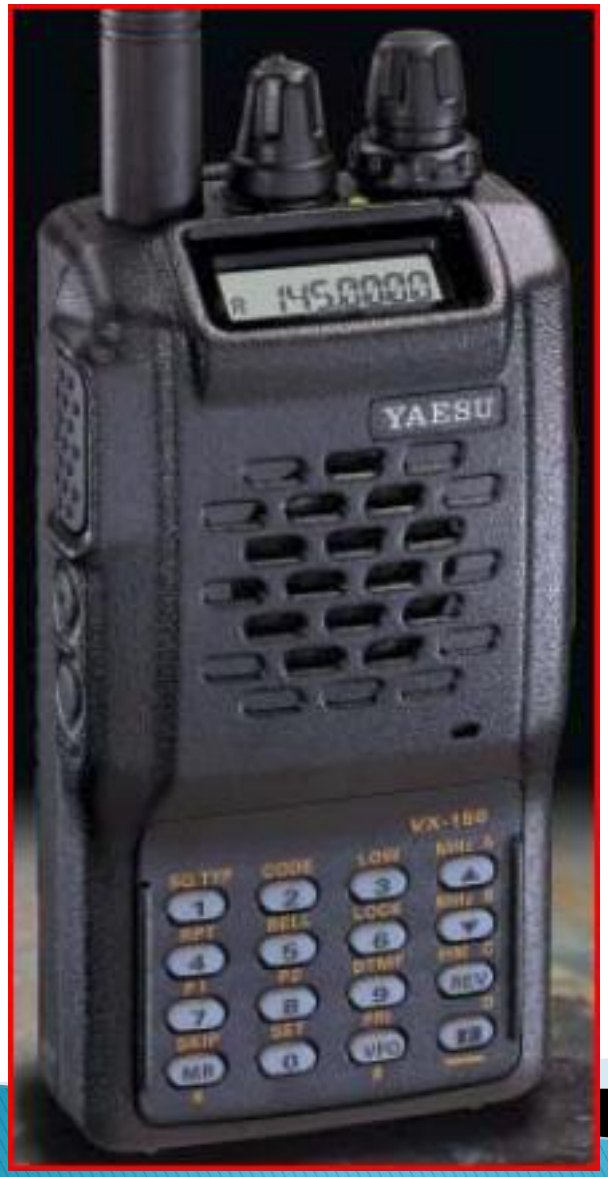
SP-ANA
SET
HM/RV
TONE
SPCL
WRITE
TX PO
CH.CNT
V/M

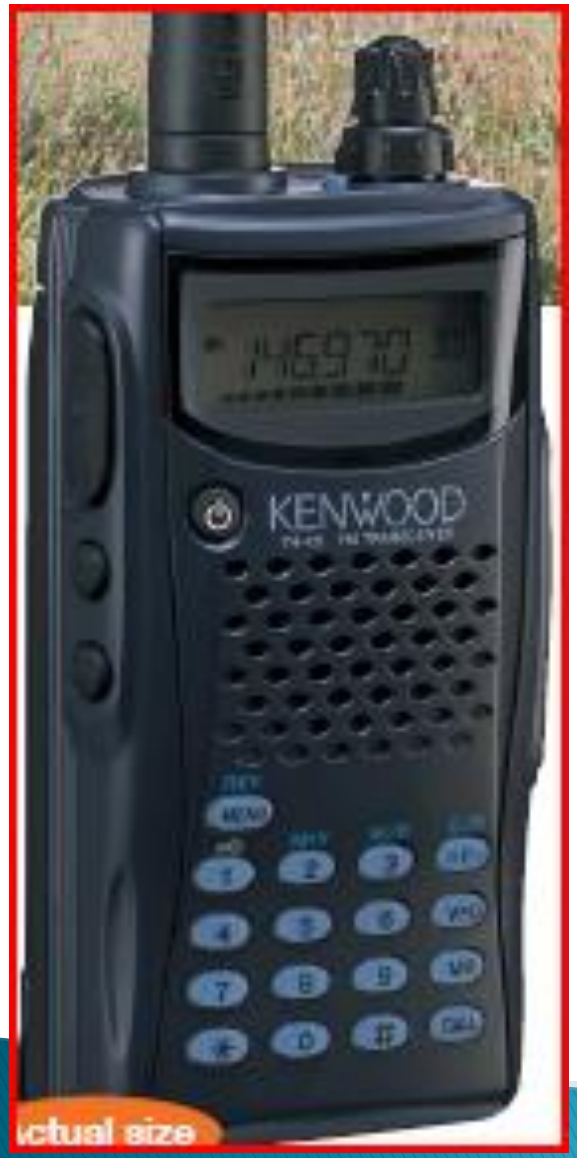

YAESU
VFO 446.000
(?) HI NFM
VFO 144.390
(4) HI NFM
A12
SUBMERSIBLE
SCAN MHz
SET
MENU
SC-M BND DN
STEP
CODE
DTMF
SPS SQ TYP
BAND
MODE
EMG R/H
ARTS
SKIP
RPT
DW MT
HM/RV
V/M
TX PO
AF-DUAL
SP-ANA
SP BNK
RADIO
FM TRANSCEIVER VX-8

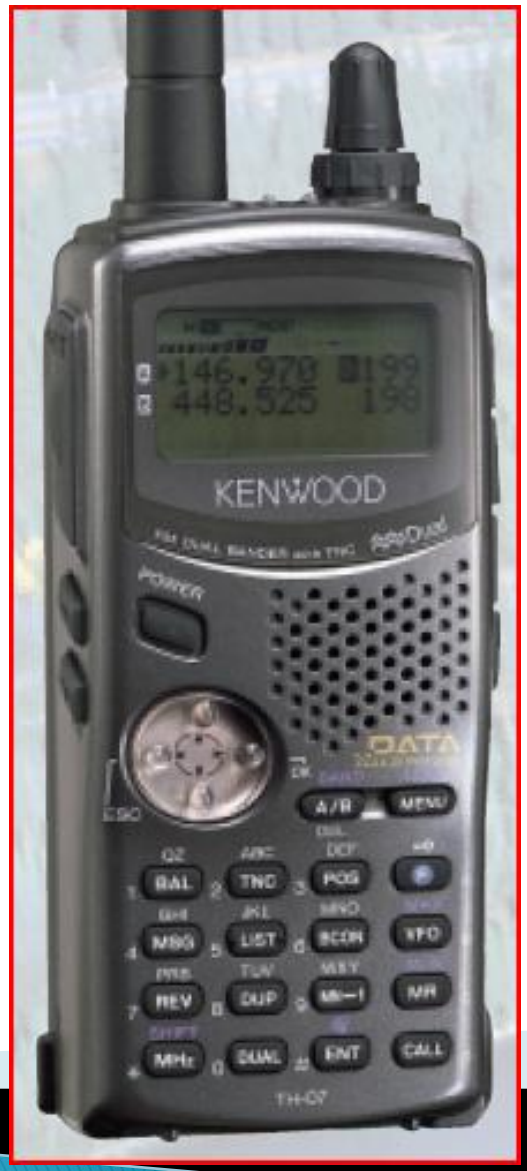

YAESU
-A-
145.000
SAVE
VX-120
WX
LOW
SET
REV
HOME
MHz
MR
SKIP
VFO
PRI
MHz
YAESU
-A-
145.000
SAVE
VX-170


YAESU
-A-
433.000
SAVE
VX-177
SQTTP
CODE
LOW
MHz
APT
BELL
LOCK
MHz
P1
P2
DTMF
HOME
SKIP
SET
PRI
REV
MR
VFO
YAESU
-A-
433.0000
SAVE
VX-127
EMG
SET
LOW
LOCK
REV
HOME
MHz
MR
SKIP
VFO
PRI
MHz


YAESU

Kenwood


KENWOOD
actual size


KENWOOD
146.970
448.525
POWER
DATA
A/B
MENU
BAL
TNC
POS
MSG
LIST
SCAN
VFO
REV
DUP
MR
MHz
DUAL
ENT
CALL
TH-D7

End