D-STAR Radios

Summary

Having covered the basics of how the D-STAR system works, we'll now review the practical side--the radio equipment. The student will review a table of comparisons between available radios. A typical piece of equipment (IC-91AD) will be configured to operate on D-STAR repeaters and some exercises for operating the D-STAR radio will be performed.

D-STAR Radios

D-STAR is an open standard owned by the JARL and available to any manufacturer. At this time, Icom is the first manufacturer to offer radios and repeaters that implement the D-STAR system of protocols. A full line of equipment is available with different sets of features and functions.

The first step in using D-STAR is to be able to choose the appropriate radio, so we will review the available equipment. **Table 1** shows the important characteristics in a table for easy comparison.

Table 1 - D-STAR Radios (as of 1 October 2006)

	Bands			DV	DD	AV	Data Interface			Power (watts)	Notes
	144	440	1.2G				RS-232	USB	Ethernet		
Mobile Radios											
ID-1			✓	✓	✓	✓		✓	✓	10	
IC-2200		✓		✓		✓	✓			65	Req's UT-118 module
ID-800	✓	✓		✓		✓	✓			55/50	
Handheld Radios											
IC-V82	✓			✓		✓	✓			7	Req's UT-118 module
IC-U82		✓		✓		✓	✓			5	Req's UT-118 module
IC-91AD	✓	✓		✓		✓	✓			5	

DV is the D-STAR digital voice and low-speed data mode
DD is the D-STAR high-speed digital data mode
AV stands for "Analog Voice", the standard FM voice mode

To determine which is the best radio for an application, the first step is to understand what the requirements are:

- Is DD mode operation required (high-speed data)? If so, the only radio supporting DD mode is the ID-1.
- Is dual-band operation required?
- Is high-power required?
- If data is to be transmitted, what data interface does the computer have?

When adding up the costs, don't forget to include the UT-118 D-STAR module if the radio requires one for digital operation.

Key items to remember when choosing the right D-STAR technology:

- High-speed data (DD mode) can only be sent on the bands above 70 cm.
- Error correction for low-speed data (DV mode) is the responsibility of the data communications programs used to exchange data.
- RS-232 interfaces for D-STAR data do not provide data flow control hardware signals, such as RTS or CTS, but XON/XOFF software flow control is provided.
- Higher power radios will result in stronger signal strengths and fewer data transmission errors.
- If data is to be transmitted while in motion, higher frequencies will result in fewer transmission errors, improving the net data exchange rate.

Configuring a D-STAR Radio

This section will lead you through the **configuration** process for the IC-91AD, Icom's latest D-STAR handheld radio. D-STAR radios may all have slightly different **labels**, keys, and sequences of operation, but under the surface they all use the same sets of D-STAR information. By studying the IC-91AD configuration process, you'll be able to quickly learn to configure other D-STAR radios.

(The IC-91AD manual can be downloaded from Icom at **http://icomamerica.com/downloads/manuals.asp**. It is a 1.66 Mbyte PDF document.)

Call Signs

The most important D-STAR information is your own call sign. The IC-91AD stores this information labeled as MY CALL SIGN.\

- Select MENU
- Select CALL SIGN
- Select MY
- Select which of the MY CALL SIGN memories (M01-M06) is to be programmed (the IC-91AD can store up to six different call signs)
- Enter up to 8 characters
- If a suffix is desired, select the "/" character and then follow it with up to 4 characters.
- Exit the MENU system

Figure 5-1 shows the result of programming "MYCALL/IC91" into the first (M01) memory

for MY CALL SIGN. You might want multiple selections for MY CALL SIGN if the radio is shared by more than one operator or if you frequently operate away from home or with a club call sign.

Figure 5-1

Along with your own call, D-STAR's ability to call other system users directly by call sign means you'll want to set up a list of commonly contacted call signs. The IC-91AD labels these calls "YOUR CALL SIGN" and can store up to 60 8-character call signs in memories U01-U60. The process of accessing and entering the data is similar to that for "MY CALL SIGN", selecting "UR" instead of "MY." **Figure 5-2** shows "STATION1" programmed into memory U01.

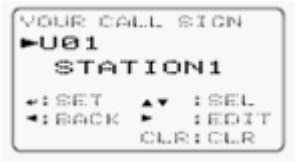

Figure 5-2

The D-STAR repeater call signs are part of establishing a D-STAR connection, so the IC-91AD can also store 60 8-character call signs for repeaters in memories R01-R60. These are labeled "RPT1/2 CALL SIGN". **Figure 5-3** shows "RPT1AA G" programmed into memory R01. You can store several variations of repeater call signs to make local calls ("RPT1AA") or zone calls ("/RPT1AA") through the same repeater without having to manually edit the call sign each time.

Figure 5-3

Useful Functions

D-STAR radios can also take advantage of the information contained in each packet to provide handy functions, such as automatically loading received call signs and repeater routing. Each of these IC-91AD functions can be enabled or disabled as part of the radio configuration. Other radios may provide a different set of configuration options.

- AUTO REPLY - a method of replying with a pre-recorded voice message
- BREAK IN - allows you to enter a conversation if the stations are using CALL SIGN SQUELCH (see next item)
- CALL SIGN SQUELCH - mutes the receiver output audio unless packets addressed to MY CALL SIGN are received
- EMR - enables full audio output whenever an EMR call is received
- RX CALL SIGN AUTO WRITE - temporarily acquires and stores the call sign of the calling station
- RPT CALL SIGN AUTO WRITE - temporarily acquires and stores the call sign of

the repeaters used by the calling station

Operating a D-STAR Radio

As you have seen, configuring your radio to take advantage of the information stored in the D-STAR packets can make operating much simpler. Assuming that it's configured to use these "smart call" features, here's how to use the IC-91AD for common tasks.

Frequency Selection

There is nothing special about frequency selection on D-STAR radios--in VFO mode, just turn the VFO knob! You can store frequencies (including repeater offsets) in memory channels for later recall just on an analog radio.

Monitoring

The squelch function of digital radios does not function the same way as for an analog radio. DV mode offers the option of **CSS (Call Sign Squelch)** in which the radio remains silent until D-STAR packets are received containing the specified call sign. Selecting "no squelch" means that you will hear every signal that can be decoded from D-STAR packets. You can then monitor all conversations on the channel--there are no private contacts!

Calling CQ

First, select your simplex or repeater frequency as described above. Then select either of these two methods:

- Store "CQCQCQ" in one of the memories from U01 to U60 and retrieve it.
- Press and hold the "0 CQ" key to load "CQCQCQ" into YOUR CALL SIGN.

By setting YOUR CALL SIGN to "CQCQCQ" you can make transmissions that are not intended for a specific station, such as announcements, test transmissions, or soliciting a contact.

Getting an Answer

When you get an answer, the display of the radio will show you the call sign of the station calling and you can also view the repeater or repeaters used in the D-STAR network.

- Store the caller's call sign in YOUR CALL SIGN by pressing the CALL/RX>CS key. This also stores the R1 and R2 (if present) call signs.
- Talk to the calling station as you would normally.

Your radio will also have functions to transfer the temporarily saved station and repeater call signs to long-term memory channels.

Text Messaging

D-STAR also supports the exchange of short text messages, similar to Internet Messaging (IM) or a mobile phone's Short Messaging Service (SMS). The IC-91AD allows the operator to make up messages or store and retrieve them from message memories. (The IC-91AD has 6 message channels, CH01-CH06, of 20 characters each.)

- Select MENU
- Select MESSAGE / POSITION
- Select TX MESSAGE
- Select which of the message memories (CH01-CH06) is to be programmed or edited
- A stored message may be edited at this point
- To store the message, press the "5" key to store the message.
- The message will then be included in the header of the D-STAR packet on all transmissions under text messaging is turned OFF.

Figure 5-4 shows the IC-91AD ready for an operator to input text characters for text message memory CH01.

Figure 5-4

Data Transmission

This paragraph discusses sending low-speed data in the DV mode. There are two methods; PTT and AUTO. (The transmission mode is a configurable item that is selected via the menu system.)

- PTT mode does not transmit until the PTT switch is closed on the radio or at the microphone jack (either by a microphone or an external circuit). While PTT is closed, the radio transmits whatever data it receives.
- AUTO mode transmits data as it is sent to the data interface.

The communications software used to generate and receive data should be set to:

- Specified by the radio - this is the speed of the data between the software host and the radio, not across the D-STAR link!
- 8 data bits
- 1 stop bit
- No parity bit
- Software flow control - XON/XOFF between the radio and computer

Click the "Review" button to review the topics covered in this lesson. When you are ready, click "Next" to continue...