

D-Star First Steps

So you just got your first D-Star radio; what do you do now?

D-Star is a new technology, and some of the concepts are less than intuitive, even to the most seasoned Hams. The most critical point to keep in mind is that D-Star is digital; It's as much a computer technology as it is a radio technology. The biggest practical difference for a user is the "header" of information included in each transmission to identify the sender, the intended recipient and one or two optional repeater modules describing the path that the transmission will take.

You put your call sign in your radio by setting the "MYCALL" (MY) field. You set the destination with the "URCALL" (UR) field. Most of the time, URCALL should be set to CQCQCQ. For simplex operation, this is all you need.

Repeater operation is a little more involved. D-Star repeaters have a controller, one or more RF modules and, if connected to the Internet, a gateway module. Each module is assigned a single letter designation. In the US, generally the 1.2 GHz module is A, the 440 MHz module is B and the 2-meter module is C. The "RPT1" (R1) field describes the RF module you are using by including the call sign of the repeater in the first seven characters and the module designation in the eighth position. For the 2-meter module of the Atlanta Radio Club's main site, you set RPT1 to "W4DOC C". (That's "W4DOC", 2 blanks and a "C" for a total of 8 characters.)

The RPT2 field describes the gateway module in the same way. So, in our example, that would be "W4DOC G". ("W4DOC", 2 blanks and a "G".) While you can communicate just on the local repeater without specifying the gateway, it's recommended that you include the gateway as a standard practice.

Different radios are set up differently so you may need to refer to the owner's manual for details. You'll also have to set frequency and offset just like you do for analog repeaters. The transmission mode should be set to DV (Digital Voice) instead of FM.

There is room in the call sign field for a few extra characters, so a common practice is to include your name after a slash. In my own radio, I've set MYCALL to "KE4FOV/BERT" and that's how it displays on other radios when I transmit. A message field with about 20 characters is also transmitted every time you key up. Common practice is to use this field for information about your location, the type of radio or even your email address.

Now you've got your radio on the air and you can talk to other users on the local repeater. Great, but D-Star is just getting started.



When you transmit to a gateway connected repeater, it reports your call sign to a central database in real time. You can see the last time you or anyone else transmitted by looking at <http://www.dstarusers.org>. Even better, though, is that you can change the URCALL field to a particular call sign and the system will find the repeater last used by that ham and send the transmission to that repeater. In other words, if your friend is traveling and you don't even know where he is, the D-Star system can find him for you.

This is a great idea, but it does have some complications. If the destination repeater is in use, your transmission will be dropped without you knowing it. If it does get through, your friend will have to set up your call sign in his URCALL field on order to respond. Most radios have a button to do this for you in one step, but you must press it before someone else transmits. There are also some issues with how fast the location data is updated when a ham moves from one repeater to another.

To address some of these problems, ICOM added a feature to their version 2 gateway software allowing you to put a repeater instead of an end user's call sign in URCALL. If the first character is a slash, the transmission will be forwarded to the repeater and module specified. So, if I'm using W4DOC module C and I want to talk to someone on the Stone Mountain repeater's module B, I could put "/WX4GPBB" in URCALL. In this case all 8 characters are used. The slash is position 1; the repeater's call sign is position 2 through 7 and the module is position 8.

You still don't know if the repeater is already in use and your buddy still has to setup his radio to respond. It's getting better, but still not quite there.

ICOM also added a feature called "multicast" which "copies" transmissions to a list of up to 10 other repeater. Several of the Atlanta administrators set up such a Multicast list called "ATL". With this, you could set URCALL to "/ATL" and have your transmissions broadcast on all of the Atlanta repeaters. Problem was, many users still carried on local QSOs without using "/ATL", so you never even knew whether your transmission was actually broadcast or not. Sometimes other hams would hear you, but if they didn't set their own URCALL, you would never hear them.

D-Star was, and is still, a work-in-progress. Clearly, something else was needed. Our own Robin Cutshaw, AA4RC, had a great idea and the knowledge to make it work. He created an add-on piece of software called DPLUS. DPLUS works with the gateway to manage how traffic is processed between repeaters. DPLUS on one repeater can coordinate with DPLUS on another repeater to set up a two-way link causing local traffic on each repeater to be duplicated on the other repeater. Now, at last, we know whether our transmission reached the other side because we can hear what's being broadcast on the other side. Just as important, for the end users, talking to someone else on a linked repeater is exactly the same as talking on the local repeater (URCALL set to CQCQCQ).

The command processor in DPLUS makes it possible for end users to initiate and terminate links. Again, this is done using URCALL. If I'm on W4DOC C and I want to link to module B on the Stone Mountain repeater, I set URCALL to "WX4GPBBL" and transmit briefly. In this case, the call sign of the target repeater, WX4GPB is the first 6 characters, the "B" in the seventh position indicates the 440 or "B" module and the "L" in

the eighth position is the link command to DPLUS. I should get a recorded response indicating that either the link command was successful, the remote repeater was already linked to another repeater or the local repeater was already linked. (Only one link per module at a time.)

Other commands include:

- “I” to report Information or status of the local repeater. This command plays a message to indicate the local repeater is already linked. Silence indicates not linked. This command has blanks in positions 1 through 7 and “I” is position 8 of URCALL.
- “U” to terminate a link. This command also has blanks in positions 1 through 7 and a “U” in position 8 of URCALL.
- “E” for Echo Test. This command has the local repeater’s call sign plus an “E” in position 8 of URCALL. The following transmission is recorded and then played back over the air.

Each of the DPLUS commands is sent with URCALL set up for a single transmission. Once the action has been completed, URCALL should be changed back to CQCQCQ. In other words, after linking, change URCALL back to CQCQCQ to carry on your QSO with the remote repeater and station. Then set up the unlink command, push the PTT once and set back to CQCQCQ.

It should be noted that the ability to link and unlink can be restricted to authorized users if desired by the administrator. As far as I know, all Georgia D-Star repeaters have linking opened to the public. Many other systems are also open, but not all. Some of the Alabama machines, for example, are open, but others are not.

Another capability brought to us by DPLUS is the DV-Dongle. This is a completely computer-based method of access to a D-Star repeater. Basically, it connects directly to the gateway on a repeater via DPLUS and appears to the gateway as the gateway of another repeater. While the basic concepts of D-Star configuration discussed here apply to the DV-Dongle, enough details are different that it is the subject of a different document.

Keep in mind that anytime you pass through the gateway, your call sign is authenticated. Until you have been registered with the system, on the radio, you will be limited to the local repeater and the Dongle will not be able to connect at all. Atlanta Radio Club users can register at <https://w4doc.dstargateway.org/Dstar.do>. You can find other repeater system registration pages in the repeater listing at <http://www.dstarusers.org>

In fact, <http://www.dstarusers.org> is such an integral part of D-Star that you will want to get familiar with the site.

The Home page / “Last Heard” page shows what users have been where recently. You can click on the Call sign to look up more information on that ham in QRZ.com. Clicking on the Reporting Node entry will take you to more information on that repeater, including registration information and a website associated with that repeater. You can find all US

and most world gateway connected repeaters under “Repeater Directory”. Some systems that are not yet on the Internet are also listed here.

Chances are good that, if someone is listed here with activity within the last few minutes, he’s still listening and is a good candidate for a QSO.

The screenshot shows the D-StarUsers.org website in a Microsoft Internet Explorer browser. The page title is "D-StarUsers.org Your Source for D-Star Digital Amateur Radio Information!". The main content area features a table titled "Last Heard" with the following columns: Callsign, Time Heard, Reporting Node, and location. The table lists 20 entries of recent activity. On the left side, there are navigation links for Home, Last Heard, JFindU D-Star Maps, Repeater Directory, D-Star Solutions, Watch D-Star Grow, Forums, and Joining The Network. There are also images of D-Star radios and a Google AdSense placeholder.

Callsign	Time Heard	Reporting Node	Location
W4VM	01/04/09 21:49:40 UTC	W4WBC C 2 Meters	South Huntsville, AL, USA
2M0DXR	01/04/09 21:49:39 UTC	GB7DG B 440 MHz	Glasgow, Scotland, UK
IK8HVO	01/04/09 21:49:39 UTC	IR8UAF B 440 MHz	Avellino , Italy
WA3PNY	01/04/09 21:49:38 UTC	W3OI C 2 Meters	Allentown, PA, USA
EA3GKX	01/04/09 21:49:37 UTC	EA3RCC B 440 MHz	Castellar/ Barcelona, Spain
KE4FOV	01/04/09 21:49:32 UTC	W4DOC C 2 Meters	Atlanta, GA, USA
KD0BIK	01/04/09 21:49:29 UTC	W0CDS B 440 MHz	Denver, CO, USA
KA4ELN	01/04/09 21:49:29 UTC	W4PL C 2 Meters	Chattanooga, TN, USA
KV4S	01/04/09 21:49:21 UTC	K4DSO C 2 Meters DVD	Birmingham, AL, USA
W8TEK	01/04/09 21:49:21 UTC	W85HI C 2 Meters	Owosso, MI, USA
WA3PNT	01/04/09 21:49:17 UTC	W7DIN B 440 MHz	Yuma, AZ, USA
M0TVG	01/04/09 21:49:16 UTC	GB7PI B 440 MHz DVD	Royston, Hertfordshire, UK
N3IYX	01/04/09 21:49:16 UTC	W3OI C 2 Meters	Allentown, PA, USA
W4UOC	01/04/09 21:49:15 UTC	KI4SBA C 2 Meters	Cumming, GA, USA
VE2TBN	01/04/09 21:49:08 UTC	VA3ODG C 2 Meters	Ottawa, Ontario, Canada
M0JAV	01/04/09 21:49:06 UTC	REF005 Dongle User DVD	London, UK
EA3FJI	01/04/09 21:49:04 UTC	EA3RCC B 440 MHz	Castellar/ Barcelona, Spain
VA2JP	01/04/09 21:49:02 UTC	VE2RMF C 2 Meters	Quebec, Canada
KE6EZB	01/04/09 21:48:59 UTC	W7DIN B 440 MHz	Yuma, AZ, USA
VA2GCT	01/04/09 21:48:51 UTC	VE2RIO B 440 MHz	Montréal, Quebec, Canada
CT2JDQ	01/04/09 21:48:45 UTC	CQ0DLR B 440 MHz	Leiria (Candeeiros), Portugal
CT1JIB D	01/04/09 21:48:41 UTC	CQ0DSA B 440 MHz DVD	Setubal, S. Arrabida, Portugal

Another very useful site is <http://www.dstarinfo.com>. Here, you will find miscellaneous information about D-Star, as well as a list of Nets and the famous D-Star Calculator.

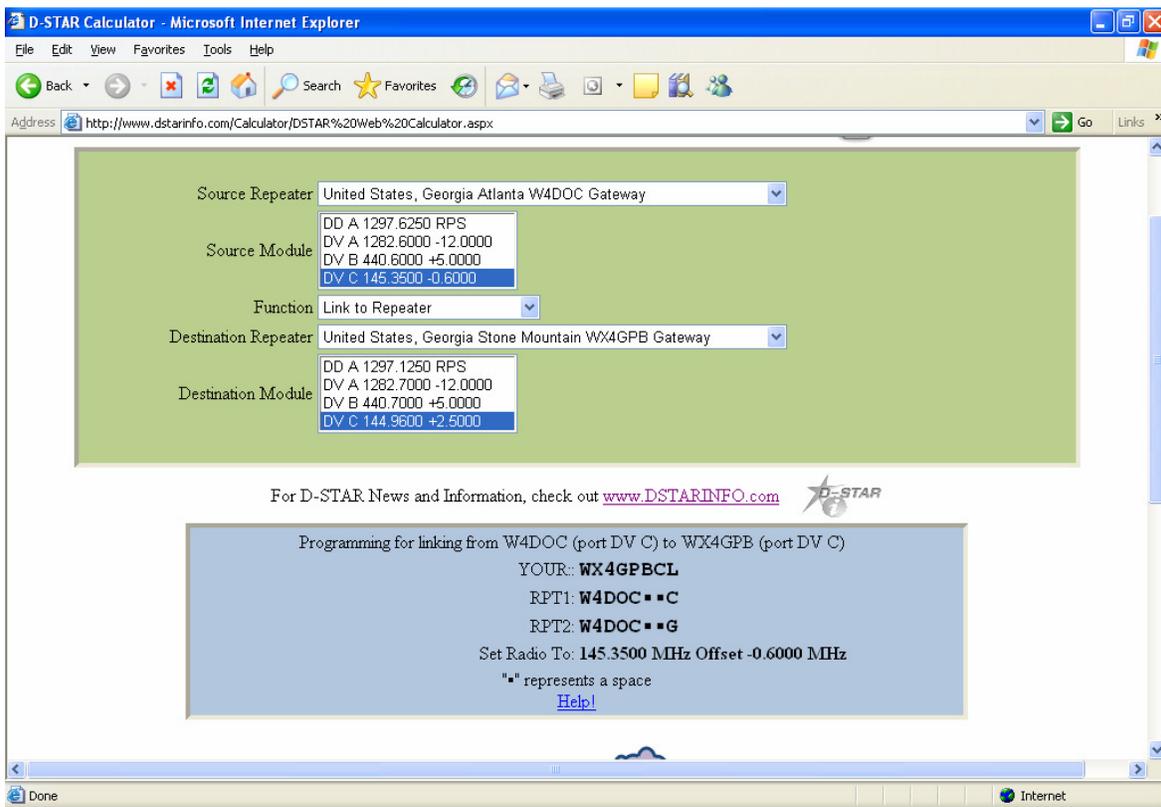
The Net listing shows when and where various D-Star Nets are held. Most Nets are held using a Reflector. D-Star Reflectors work just like IRLP Reflectors. Essentially, multiple repeaters (or DV-Dongles) are linked to a reflector and port number (or module) and the reflector repeats the data out to each of the links. This way many repeaters can be connected together and the net can cover a very large geographic area (like a phone bridge).

For example, the Southeastern D-Star Weather Net is held on reflector REF002 A every Sunday night at 9:00 PM ET. Upwards of 30 repeaters are connected when a user on each one transmits a URCALL with “REF002AL”.

Also note that many D-Star Nets use what is referred to as the “Quick Key” method of net check-in. Since D-Star transmits your call sign digitally every time you key up, and this meets the FCC’s requirement for station identification, there is no need to identify by voice. The Net Control Operator sees your call sign on his display whenever you key up.

He records that as a check-in and will contact you later for whatever comments are appropriate based on the format of the net.

The D-Star Calculator is the other must see thing on <http://www.dstarinfo.com>. It lets you select information from drop-down menus and shows you exactly what to put in your radio to do what you need. Not only does this help you “get it done”, but it is also a great learning tool. Thanks go to Ed Woodrick – WA4YIH for this great tool.



Copyright 2008 Ed Woodrick WA4YIH. Image used with permission.

I hope this information is useful to you. I hope to be adding additional documents to help new users get familiar with other aspects of D-Star and perhaps other technologies as well.

Please send comments and suggestions to KE4FOV@Bruner.us

Bert Bruner
January 6, 2009
Atlanta Radio Club