

# The Dummies Guide to D-Star.V1.0©

D-Star, **D**igital **S**mart **T**echnology for **A**mateur **R**adio.

So, we know its digital, but what's smart about it?

Imagine a packet radio data signal, lots of 0's and 1's being sent via radio waves. That's only 1200 baud, maybe 9600 baud if you are lucky.

To get a voice signal of about 64000 bits into 2400, with 1200 'extra' bits for data, that's pretty smart. This extra data can also carry your callsign, GPS info and various other items, like another person's callsign or a distant repeater for instance, so you can link to them. That's even smarter.

In D-Star terminology, we no longer refer to a repeater anymore; it is a Digital Regenerative Node, as that's what it does. It is also likened by Ofcom, so from now on, we will call them 'Nodes' or 'Regens'.

So, you get your nice shiny new radio out the box, can you wire it up and use it straight away?

Well, yes and no. Like any new radio, switching it on and seeing 145.0000 and/or 433.0000 isn't a lot of help, is it?

You obviously have to change frequencies and maybe program a few of them up into memory channels.

Then come the local analogue repeaters, setting the shifts and sub audible tones for them is as any other radio.  
(Read the manual!)

## **Setting up your radio for DV the first time.**

So, you've set up your new radio more or less like your previous one, but you have a new mode, "DV" (Digital Voice) on it. What now you ask?

Well, like mentioned before, you have to put in your callsign, that makes your radio unique to you and identifies you to everyone else on the D-Star system.

If you are not yet in range of a 'Node', this will be all you will have to set. It can be found in the "Callsign" or "CS" settings on both the E92 and the 2820.

**For the E92.**

Press the 'menu' button and scroll to the top one with the dial to "Callsign".

Press the '5' key to enter the menu.

On the E92, you get this display:

**UR:CQCQCQ**

**R1:**

**R2:NOT USE\***

**MY:**

/

Simply scroll down to the MY: Field and press 5 again. M01 should show now, press 6 to edit. Simply scroll with the dial to the desired letters or numbers, move back and forward with the 4 and 6 keys. To change to letters/numbers/symbols press the 3 button, marked A/a. To clear a mistake, press 1, CLR.

When you have finished, press 5 to enter.

You can set up to 6 callsigns in the radios memory, I would recommend only using your own callsign without any /M or /P for now, as you would have to register them all later on.

This style of inputting information is used throughout on this radio, takes a bit of getting used to, but you eventually get the hang of it.

**For the 2820.**

For "CS" on the 2820, press the white function button twice (on the right between the two controls) obviously when in the "DV" mode only. CS is the left hand button along the bottom, showing "CS" on the screen above it.

You will see the following:

**YOUR:CQCQCQ**

**RPT1:**

**RPT2:Not Used**

**MY:**

Using either dial, scroll down to the MY: field. Press the dial and turn for the desired letters and numbers. Can't get the numbers? Look at the bottom of the screen, you will see A/a in the middle and 12/ on the right. Simply press the buttons below (This is called a "soft menu".) to get them. A/a is upper/lower case and 12/ are numbers and symbols, first press and second press respectively. Move along or back with the "<" and ">" keys on the soft menu to the left. "Clr" is clear.

When you are done, simply press the dial in again and you have set your callsign. Press the function key again and you are back to the main display.

This method is used to change all the other text and callsigns on the radio.

### **CQCQCQ...?**

Did you see "CQCQCQ" while putting in your callsign? This is a general 'CQ call', used by the radio to inform other people that you wish to speak with them. It is in the UR: or YOUR: fields of your radio. This is a very important setting on the radio.

If it isn't in there, as it should be by default, I suggest you put it in there now.

You may ask; "Can I put another person's callsign in the UR:/YOUR: field?" You can, but it WON'T give you a private conversation. It would be pretty pointless to do this over a simplex (back to back) pair of radios, but it wouldn't do any harm either. You will NEVER be able to have a private conversation on D-Star, sorry!

So, what now, your radio is set up, what do you do now?

If you know of someone nearby with D-Star, maybe set up a schedule with them and try your new DV mode.

If not, just try calling CQ on the channels below as you would on any other mode or frequency. (And by this I don't mean use S20/SU20, or any other normal FM channel! Transmitting digital streams over normal FM conversations is not a good thing to do, as you wouldn't with any other method of working a radio mode.

If this doesn't work, try calling on the local analogue repeater and ask if anyone else has a D-Star or DV radio. (Digital Voice.)

The simplex calling channels in the UK are currently:

2M: 144.6125  
70cm: 438.6125

These were agreed at the first D-Star meeting, in Bedford, March 1st, 2008.

In the unlikely event that someone is on there, just move up or down 25KHz, staying on a 12.5KHz channel, the 25KHz channels on 2M do sometimes get used by FM operators either side.

## **Ok, nobody wants to talk to you and you think you have a node nearby, what's the score?**

If you hear a lot of noise and beeps, try listening on the DV mode (if you haven't already) and it should burst in to life.

When you do hear something, obviously you can't just transmit when the people have stopped talking. You have to put in a shift, as with an analogue repeater, along with a few extra settings for the DV mode.

Don't worry; these extra settings are exactly the same as putting in your callsign.

At the moment, 2M ones are the same as the analogue ones, -600KHz. All of the 70cm ones are a -9MHz split; the outputs are on 439.450-439.9125MHz at present.

If you have Internet access, look here for any available node:

<http://www.ukrepeater.net/channels/d-star.htm>

Check here for new ones:

<http://www.ukrepeater.net/vetting.html>

Nodes are being added all the time, so if you are unlucky now, you may be getting one soon.

## **Ready to go on a Regen Node?**

As previously mentioned, some extra settings have to be entered into the radio, before it will work correctly. All digital modes have to have some form of user intervention; they won't just work out of the box normally.

Remember when putting in your callsign, you saw "RPT1" and "RPT2", or "R1" and "R2" ?

These are settings regarding the regen node, OK, I know they look like Repeater 1 and 2, but that's Icoms short sightedness, not ours!

Either way, they need to be set to what you want to talk through.

Say, for instance you are in range of GB7AU on UHF. You put that callsign into both settings?

Almost. Except that R1/RPT1 has to have a module letter after the callsign, a module being the frequency of the repeater, as some are dual band and have 2

modules. You still have to tell the system, even though you are transmitting on one band.

Module "A" is 23cm's. (1200MHz, None in the UK yet.)

Module "B" is 70cm's. (440MHz, most popular.)

Module "C" is 2Meters. (145MHz, a few about.)

So, we have a module on "B" and a callsign of GB7AU. This means that we put in R1/RPT1;

**R1:GB7AU~~B** The ~ signifies a space, making the "B" land in the 8th and last position in the field.

or:

**RPT1:GB7AU~~B**

Use the same method as you did to put in your callsign above. Hopefully you will be getting the hang of it now.

If GB7AU is connected to the Gateway, or if you are not sure, the simplest and best practice is to assume it is, or may be one day, by putting a "G" in the 8th (the last position) in R2/RPT2.

I strongly urge everyone to do this, as one day you might be suddenly connected to the Gateway and not know it, but you will not be heard outside of your local regen node! Very confusing for you.

**R2:GB7AU~~G**

Or

**RPT2:GB7AU~~G**

Making a complete setup of:

**UR:CQCQCQ** General calling.

**R1:GB7AU~~B** B is in the 8th place and signifies UHF.

**R2:GB7AU~~G** G is in the 8th place and signifies Gateway.

**MY:G7EBY** Your callsign.

/

Or

**YOUR:CQCQCQ** General calling.

**RPT1:GB7AU~~B** B is in the 8th place and signifies UHF.

**RPT2:GB7AU~~G** G is in the 8th place and signifies Gateway.

**MY:G7EBY**      Your callsign.

It is worth saving all this into a memory channel away from all the analogue stuff, depending on how many channels you have used, putting all the DV ones into the next memory bank of 100 for example.

You are now ready to go! Wait for a space and call in "(your callsign) listening on GB7AU.." Normally a few 'beeps' or a 'beep' will be heard when the stations have stopped talking, this comes from the radio, not the regen node and can be turned down or off in the menu. It is good practice to try and leave 3-4 seconds before replying to someone, giving the system time to reset for the next station. If you jump in too quick, you will not be heard and/or knock the other station out of the conversation.

Obviously, you can change the regen nodes callsign to suit your own local one, some, but not all will display it after a station has stopped talking, and you will see the stations callsign too at the bottom left of the screen, sometimes with a message.

I will talk about this "Gateway" shortly.

### **Settings for the other Regen Nodes.**

Say we have Harold, M3OPW on GB7MM, a 2M regen node (Module C):

For the E92:

**UR:CQCQCQ**      General calling.  
**R1:GB7MM~~C**    C is in the 8th place and signifies VHF.  
**R2:GB7MM~~G**    G is in the 8th place and signifies Gateway.  
**MY:M3OPW**      Your callsign.  
/

And the 2820:

**YOUR:CQCQCQ**    General calling.  
**RPT1:GB7MM~~C** C is in the 8th place and signifies VHF.  
**RPT2:GB7MM~~G** G is in the 8th place and signifies Gateway.  
**MY:M3OPW**      Your callsign.

Harold saves this in memory 100.

Note, the "~" means a space. Always put G on R2 or RPT2 so others can hear you elsewhere, just in case.

## **The Gateway.**

A Gateway. What on earth is that you ask. Well, like letting a field of animals out of a gate, into the outside world and into another field, quite similar. Each field is a regen node, without a Gateway, they are all trapped. Putting a Gateway on the local node gives it access to other nodes with gateways. (It works both ways.) Simple!

So why do we want to do that? Well, quite simply there are enough analogue repeaters around that provide 'local' coverage only, so that's where they come in really. Some are 'linked' via Echolink nodes or IRLP. Similar sort of thing. For mobile working, this can be quite useful, if set up before you go on your journey. Those that have used them will understand quite well. If they set them up themselves to go where they wanted is another question. It's all very fiddly and very awkward when driving. Just pressing a '73' on a node of this type can be quite frustrating, and dangerous! Knowing the codes and everything else is quite annoying, especially if you travel a lot like me.

Basically, the D-Star Gateway is a universally accepted system. The ability to just press a button and talk to someone anywhere in range of a regen node when you want is now here.

### **Using the system to link specific nodes or callsigns.**

OK, so Harold wants to talk to me on GB7MM, his local regen node. I am near GB7AU and have either been talking on there or made my presence known by keying up for a second.

How does he do it? If he knows I am near GB7AU, it's quite simple. All he has to do is put in the UR: or YOUR: field is /GB7AU B. (One space.)

If GB7MM is not already connected to anywhere else, he will hear a voice prompt saying: "Remote system linked." Then GB7MM and GB7AU will be connected together.

We should be able to talk like normal then. Obviously, I can do it the other way around if I want to.

After link conformation, he has to go back to channel 100, GB7MM+CQCQCQ otherwise the system will try to link every time.

To set up a new memory channel for making the link, he has to go to the main GB7MM+CQCQCQ (100) channel and modify it:

**YOUR:/GB7AU B** Calling GB7AU module B (UHF) and L for Link.  
**RPT1:GB7MM~~C** C is in the 8th place and signifies VHF.  
**RPT2:GB7MM~~G** G is in the 8th place and signifies Gateway.  
**MY:M3OPW** Your callsign.

He saves this in memory 101.

If he hears: "Link currently established." Then he will have to unlink GB7MM with an unlink command in the UR:/YOUR: field, with 7 spaces and a "U". He should then hear: "Remote system unlinked."

**YOUR: U** Unlink whatever's linked. (7 spaces then U.)  
**RPT1:GB7MM~~C** C is in the 8th place and signifies VHF.  
**RPT2:GB7MM~~G** G is in the 8th place and signifies Gateway.  
**MY:M3OPW** Your callsign.

Harold saves this in memory 102 and keys the mic for about 1 second.

He then goes back to memory 101 and press the PTT for about 1 second. He should get conformation that he's linked and now he should be able to speak through both regen nodes like they were one.

Now he has to go back to memory 100 (GB7MM with CQCQCQ in YOUR:) to talk normally, otherwise the system will try to re-link every time.

Basically, he needs to set up a different memory for each of these. Sounds pretty wasteful, but until Icom (or whoever) produces the next generation of radios, hopefully this will be made simpler. For now, we are stuck with this system. It's still a lot better than what else is out there.

So, say Harold wants to talk to me, but doesn't know where I am, all he has to do is put my callsign in the UR/YOUR field.

**YOUR:G7EBY** Calling G7EBY anywhere on the system.  
**RPT1:GB7MM~~C** C is in the 8th place and signifies VHF.  
**RPT2:GB7MM~~G** G is in the 8th place and signifies Gateway.  
**MY:M3OPW** Your callsign.

This will route him directly at me, wherever I am on the system, as long as I've transmitted into a regen node and made my presence known, so the system knows where I am.

I can press the 'one touch reply' on the radio and it will temporally store the route he has come from in my UR/YOUR field. On the E92, this is the bottom right

button; RX-CS, on the 2820, it's in the middle on the soft menu.

He stays on this channel until he wants to break off, or I go out of range. I just change up or down a channel and back to the local nodes CQCQCQ channel to reset the route. I could save this setting on another memory channel, but as I travel all over the place; it would be a waste of memory's!

There are plans afoot to give us more intelligence as to what is connected to where, but so far the only way to guarantee a successful link is to unlink first (memory 102 above) and then re-link it wherever you want.

Quite simple so far, isn't it?

## **Reflectors.**

Something that makes radio waves go in a certain direction. True, but in D-Star (and other systems like Echolink and IRLP) it means lots of Nodes being connected together in one big system at once, so in effect, all going in the same direction to one place.

Sounds complicated?

Imagine lots of fields again, all spread out around a central gate area, in a circle. Everyone is connected to the central area, via a gateway, has access to any other gateway in this system, all at once. These are called Reflectors. There are 2 we use in the UK, namely REF005A and REF006A.

Rather than connect to a specific regen node, you connect to these instead. Here in the UK we normally connect all our nodes to Reflector 5 Alpha, REF005A.

I expect you are guessing that you have to transmit this code to enable the local regen node to connect to them.

Almost correct!

Obviously a little more user intervention is required though. A simple "L" at the end is all that is needed to "Link" the local regen node to the Reflector.

**YOUR:REF005AL** Linking to Reflector 5A. L is the link command.

**RPT1:GB7MM~~C** C is in the 8th place and signifies VHF.

**RPT2:GB7MM~~G** G is in the 8th place and signifies Gateway.

**MY:M3OPW** Your callsign.

You may hear other stations from all over the country, even from other parts of the world! We occasionally get USA, VK's, even Japanese stations connecting

up via Reflector 5A.

Each Reflector has 3 ports on it, A B and C.

There are a total of 6 reflectors, each with 3 ports on them, shown here:

<b>Reflector</b>	<b>Location</b>	<b>Notes</b>
REF001:	USA	
REF002:	USA	
REF003:	Australia	
REF004:	USA	
REF005:	London	Port A is preferred for the UK conference, Port B is preferred for French language.
REF006:	London	Port B is preferred for German language.

You are more than welcome to play around with the reflectors, link up different ones after using the unlink (7 spaces+U) command in UR/YOUR, but remember to put the system back to how you found it! If you are unsure, Reflector 5A is a good bet.

Like I said, there are plans to try and make the system more intelligent, so we know where our regen nodes are connected, but at the moment, we'll have to live with the current system. Just unlink and relink if you're not sure.

Also, remember to go back to the CQCQCQ memory channel for the regen node after you have successfully linked it somewhere.

**And, Always leave a gap of about 3-4 seconds before speaking to make sure nobody elsewhere is already talking.**

At the moment, we have full use of the system described above. Do not abuse it

and we shall continue to have that.

Hopefully, someone will produce a more in depth guide to the GPS system on these radios. Having not currently used it on either radios, I cannot give any help so far.

The Wyre Forest Repeater Group has some information about setting up the GPS for data and tracking, with a D-PRS calculator.

<http://www.wfrg.net/WFRG%20GB7WF.htm>

(Look near the bottom.)

All I know is that if you do use these systems, make sure they Beacon only when you transmit, IE on the setting PTT. The disruption to the D-Star system so far has been quite bad, so either turn them off or set them up to PTT ONLY.

For activity on the D-Star network, see here: <http://www.dstarusers.org/>

For Reflector 5 activity, look here: <http://www.ukit.org.uk/ref005.html>

Darren and Declans Dplus reflector guide is here:

[http://www.ukit.org.uk/documents/UKIT\\_dplus\\_Reflector\\_User\\_Guide\\_V1\\_1.pdf](http://www.ukit.org.uk/documents/UKIT_dplus_Reflector_User_Guide_V1_1.pdf)

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G7EBY.

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