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- Screen shots
- Expert Computer Advice
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- New information about the CODSN, Mailing list!

W8KWA's
D-Star For Dummies
Version 2.3 We Found The Manual

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Table of Contents

Acknowledgments

First off I want to thank my father Chuck W8JNE for all of his help, not just in getting me into amateur radio, helping me get rigs, but also helping me proof what you are reading here. I have probably spent more time in writing and re-writing this document then quite a lot of people would think was worth it.

I don't ask for any money on this, and yes it has been offered to me. I wrote all of this simply to help others get on with D-Star. That's right folks this document is for you, ham radio operators in the surrounding Columbus area, to get you up to speed on the new mode of operation.

Introduction

Hello everyone and welcome to Version 2 of D-Star for dummies. There have been a lot of changes since the first revision went out. Some confusion, flame wars, and quite a few questions have popped up since the first revision, and some things have changed and some things where learned. This document here is called D-Star for Dummies and is designed to get you going from ground up into the world of D-Star. There are a lot of things going on and it all can be confusing. I'm have broken it down into hopefully simpler terms including some screen shots, to show you step by step what to do, and how to get there, as well as bring you somewhat up to date here in Columbus Ohio.

First off this is not the 'Everything you ever wanted to know about D-star'. That would be quite the book. This document here covers mainly rigs, at least as far as you got one now you want to make it on the air and brought up to speed with the others. I only briefly mention DV-Dongle, and DVAP showing you some of the pro's and cons of it. This is so your aware they exist, and when you hear others talking about it, you know what it is.

There are also quite a few topics that this document doesn't cover. Things like setting up and running hotspots, or setup and maintain repeaters, not to mention the 1.2 G D-star radios, or cover the Data side of D-Star (Like D-Rats). For one there are other sources on the net for that stuff, and another I can only cover DV-Dongle as that's the only one I had any real experience with, (Other than my ID-800H).

When I set out to write the first version I had an ID-800H in hand, and the first edition of the Nifty E-Z Guide to D-Star Operation, by Bernie Lafreniere, N6FN. I had quite a few problems in the book. For one he was all over the place in it, so much that it got confusing especially with his examples. It took me a while of re-reading, and

testing, to figure out just what the heck he was trying to say.

To me, when I read a "How to" guide I need things explained from my point of view. Like 'If you want to do this you need to do X,Y,Z, and put A, B, C, here. So I reworked a lot of the same topics, re-arranged a few thing so there told from one Operators point of view. Now we have two new D-Star repeaters that can be reached from the Columbus Area, the W8CMH is a full open system; just the gateway server isn't connected to the internet yet. So time to revamp and update a few things that have changed since the last revision.

Plus it seems prudent to also make a pdf of this file. Not everyone has Word 2007, and some people have trouble finding the Word Viewer, or simply don't want to download anything extra. Most people have PDF, but some people also like adding or changing a few things in a document they find out like notes etc.

Last but not least the "We found the manual," is a tongue and cheek reference to the old expression 'If all else fails read the manual,' and hams tendency to play first and then read the manual.

Please note version 2.2 contains updated information about linking and a few other functions. Including a way to check to see if you're registered on the D-Star network.

Definitions & Expressions

AMBE – This is the chip that encodes it. (3600 bits per second data stream) made by Digital Voice Systems Incorporated (Its proprietary) and about $20

Call Sign Routing – A method to send a voice 'Envelope' to another user by sending it to the gateway system to find out where that last call sign was heard and spiting it out there, or if not found where that call sign is registered at.

D-STAR - (Digital Smart Technologies for Amateur Radio) is a digital voice and data protocol specification developed as the result of research by the Japan Amateur Radio League to investigate digital technologies for amateur radio. While there are other digital on-air technologies being used by amateurs that have come from other services, D-Star is one of the first on-air and packet-based standards to be widely deployed and sold by a major radio manufacturer that is designed specifically for amateur service use.

DVAP – A device used like a mobile hotspot

DV-Dongle – A device plugged into a USB port allowing an operator to talk to other DPlus enabled gateway repeaters though a computer with a broadband connection.

Falling off the cliff – A term used to describe when someone has moved out far enough that no single can be received / sent. (This is similar to the FM Analog term of 'Falling into the static' because of the abrupt nature that this has, hence the term 'Falling off the Cliff.')

Gateway 2.0 – The software on the repeater's Gateway system that makes it all possible. It

runs on Linux, and CentOS is the Linux distribution that it recommends.

Linking – Creates a link from one repeater node to another repeater node or Reflector allowing for everyone on the node (who is registered on a gateway) to communicate with the other target.

My Call – One of the 'Magic 4 Fields' normally the operator using the rig.

Node – Often used to refer to a node or module of a Repeater stack. IE. W8CMH Node C (145.490)

Node Routing – Sends a 'Voice envelope' to a node on either the same repeater or another node on another repeater.

One Touch Reply – A function of a D-Star rig to be able to quickly answer a call sign route, or a Node rout by pressing a button putting the caller's call sign into your "Your Call" field. This way you can 'call sign route back to them.

R2D2 – A term used to describe 'Noise' in a D-Star communication. "I got a bunch of R2D2 on that" meaning that some of the signal made it through but not all of it, thus it creates a lot of robot like noise when that happens. It also happens when doubling, and if enough power to trip the repeater but not enough to get a full signal into it.

RPT1 – Normally the repeater node your calling in from (W8CMH C) for example. (It's what repeater node you're talking into)

RPT2 – Normally that repeaters Gateway, usually the call sign with a G in the 8th position.

Your Call – the most volatile field, used to direct what you want to do.

D-Star (What is it?)

History

D-Star was created by the JARL (Japanese Amateur Radio League) in 2001 after three years of research. To try and get the commercial Amateur radio manufacturers to use it, they made it an 'Open Standard'. Icom did help fund the design with equipment, but that's as far as they were involved in its creation. When it was ready Icom simply used it and began adding it to their line of radios and repeaters.

It isn't an Icom only thing, which is a very common misconception. Right now in Japan, Kenwood has two rigs that they asked Icom to make for them, and then they re-branded them as Kenwood. Kenwood is also rumored to be gearing up to offer D-Star on their rigs as well. Right now Kenwood has TMW-706S (50 Watts) and TMW-706 (20 watts), which are the ID-800H, but with frequency and power differences for the Japanese region. In fact Kenwood is already producing D-Star commercial repeaters. (http://kb9mwr.blogspot.com/2008/06/second-roll-of-d-star.html)

D-Star also stands for, Digital Smart Technologies for Amateur Radio

What is it exactly?

It sounds complex but in reality it isn't. The simplest way to say it is, "D-Star is the new FM" and that's technically true, here is an overview on how it works simplex.

In DV (Digital Voice mode) your voice goes through the Advanced Multi-Band Excitation (AMBE) chip where it is encoded digitally plus text, and any other data, then stuffs it out the Antenna as Narrow FM.

	The Following Contains Geekish info you really don't need to know
GEEK ALERT	AMBE is a "Proprietary Codec/Chip" made by Digital Voice Systems Inc. There are a few groups who are trying to make a open source compatible alternative. This is why the chip itself runs from $20. Until they do manufactures (Icom, DV-Dongle, DVAP, and hobbyist) got to buy the chip to get our devices to work. Right now it's the real difference for the 'D-Star' equipped radios and the prices on the DV-Dongle, and DVAP's.

Yes, it is all one big packet, 0's and 1's. The voice AND Data are combined in that packet.

Signal VS Quality
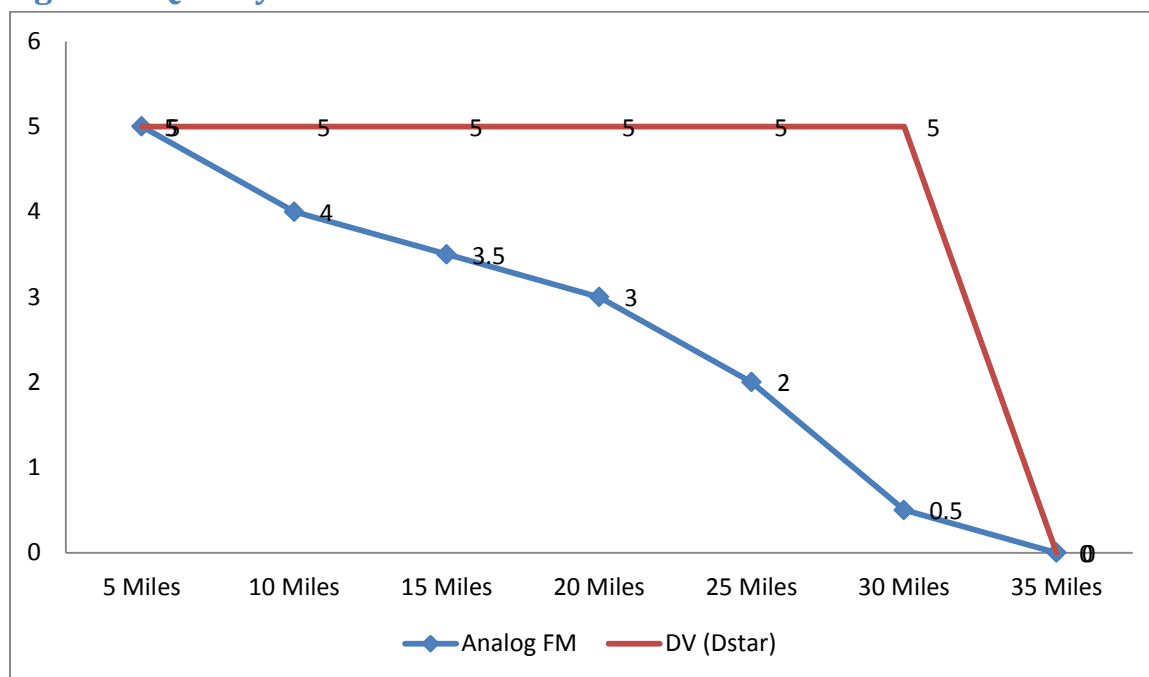
Now do I have your attention? To the Left is our S values, 5 is perfect, 1 is below the static you know something is there but can't really hear it, 2 is you can make out the words if you strain your hear for them lots of picket fencing etc.

The Data you're seeing above is representational of the comparative difference between a D-Star (DV) voice and FM Analog Voice. Don't believe me yet; let me give you a real life example.
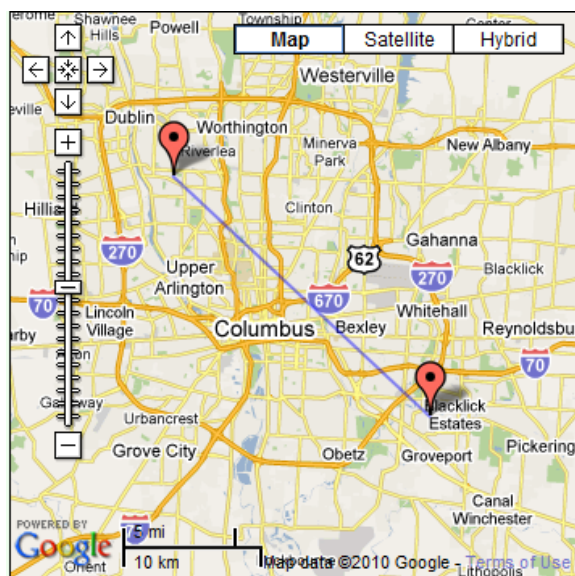
- Station 1 W8KWA
- Station 2 KD8GES

I have known Jason since right after I first got on the air. His QTH is about 16 miles from me, through Downtown Columbus. We met on the '5.49' repeater.

We had tried over the years to be able to reach out and hit each other FM Simplex with no joy. Even with a 5/8 wave ground plane (30 feet in the air for him, 12 feet in the air from me) using same antenna and feed lines. (Yes both Vertical antennas)

Mod (Rig Sp)	PWR	Result
FM Simplex	50W	No Contact
FM Simplex (746Pro)	100W	No Contact
FM SSB 2M	100W	S1-S2 (At best)
DV Simplex	5W	S5

That's right you heard me, 5 watts clear signal same antenna, no noise. On really bad propagation nights it's up to 15 watts.

I know what you're thinking, too good to be true, it has to be a fluke right? Well we went on

to further test it, and others who had gotten D-Star rigs and found out that your range could go on average 30% or farther than before.

To a lot of us Hams this was the biggest selling point of DV mode of operation.

Give you another example, the old 5.49 when I got out west on I-70, right as I hit the 25 mile marker I could no longer be heard on the 5.49. When it went digital, I could make it to roughly the 35 mile marker and still be crystal clean before I 'fell off the cliff'.

This is the drawback to this mode of operation. FM analog the farther you go out, the more into the static, and picked fencing you go. With DV Mode operation, you simply fall off a cliff, one moment your signal is there the next poof you're gone.

This phenomenon is the difference between the two. DV is a form of Packet radio, so as long as the other side knows there's a packet, and can pull the data out of the packet, the whole thing is golden. When the packet is damaged enough to where it's unreadable, it simply is unreadable. Because a machines ability to detect signal in some ways is better than a human's ear in this case, it works.

Now you add on to that it uses Narrow FM, on top of that… All of you at least have your Tech License; you know that the wider the signal the more power it takes to push it. Narrow FM is HALF the size of regular Wide FM we use for standard 2 meter and 440 operation, so all of that power gets sent along a smaller size and *adds* even more distance to the signal, so those two qualities is what gives you that approximately 30% distance gain. The fact that it's encoded to packets, then transmitted, then reconverted gives you the better sound quality. That in essence is why Ham's all over the world are adding DV mode (D-star) to their ham shacks, and cars.

The Rig and things you need to know first before powering it up.

In this section we are going to talk some basic hardware stuff, and things to do before we go full tilt into the nitty gritty of D-Star.

	80D	92AD	800H	880H	2820	Kenwood TMW-706S	Kenwood TMW-706
HT	X	X					
Mobile			X	X	X	X	X
USE OPC-478UC	X	X	X	X	X	X	X
Programming Software	Buy	Free	Buy	Free			
Programming Slots			500	1000	20	500	500
• **Your Call**			99	60	60	99	99
• **Repeater Call**			54	300	60	54	54
• **Repeater List**			NA	300	NA	NA	NA
Dual VFO					Yes		
Price	Disc	$300-400	Disc	$500	$900	500	600

The above chart is a quick and dirty guide right now as far as the different D-Star rigs go. Right at the moment as I am writing this the ID-880H, seems to be the most popular out there as far as rigs go.

The reason I am bringing this up here and now, as chances are you already bought a rig, and you heard about this document and downloaded it to figure out how it all works, and there may be a very important option you probably didn't buy, especially if your old school and like to program things in manually.

The Programming Cable

I can't stress this little $40 item enough. The only rig that you can get somewhat comfortable to program through the rig itself, if you are very familiar with D-Star rigs, is the 2820 because it has the ability to basically put the 4 'Magic Fields' right up to your face, and let you change them in front of you. All of the other rigs, the 4 slots are buried under key combo sub menu's

that are a major pain in the dummy load to get to, especially on the fly.

When FM Analog was the only guy in the market, programming rigs was simple. Set it up in VFO then save to a memory slot for the repeater and move on. Well, 'the times they are a changein'. One repeater can have up to 15 or more memory slots, each dedicated to one function or another. That's just one node. Now add into it, say the B (440) node, your back up home repeater, and that third one out in Stoutsville, and you can quickly see how many memory slots get filled pretty quickly.

Why all of those memory slots? Because each memory slot is a function, and when key down does different things, from sending your voice back to you (Echo test), Checking a repeaters link status, Call sign routing, Unlinking, Node routing, etc.

On top of that almost all of the D-Star rigs use a "Memory Bank" System to make it easier on the hardware and you. Now I think you can begin to

slowly grasp why I tell people who just got their rigs, "Did you get the programming cable and software?" if the answers no, I advise them to get it.

As you get further into understanding D-Star and adapting it to how you operate, you're going to be changing a lot of things, and digging through 15 levels of menus isn't pretty. I know I got the 800H which is notorious for that. In fact a lot of hams bought this rig because it was 1st generation D-Star, and because they didn't quite grasp the how, and when they got a bit of information tried to program it into the face plate, got lost in the sub menus, even with the map. So now you know, the programming cable I would say was a necessity, cause with a few commands you can hose your rig up.

So now you know, if you haven't gotten the cable, you're going to be in for a headache till you do. There is also a little catch with that cable.

The OPC-478UC (USB programming cable) only has a 32 bit driver to it. Big deal you say? Well yes it is. It will not work with a 64 bit operating system. So if your PC has more than 4G of ram, then chances are you're running a 64 bit operating system. Yes Windows 7, Windows Vista, and even XP have 64 bit versions. ICOM has not given us any word if there even going to make a 64 bit driver.

Gateway Registration

Since Version 1 of this document several things have changed, and we have discovered a few new things. In order to get out and talk to the world, you need to be registered on a gateway. This is true for a rig, Dv-Dongle or the new Digital Voice Access Point (DVAP) or any of the other DV (D-Star) toys you either build or by that connects to a repeater.

One of the misconceptions out there is 'it's all a bunch of power hungry people who want power over the way you operate'. One of the things that happens when you register to a repeater is it fills in an 'I don't know what to do' clause in the protocol. If another ham *Call Sign routes* you, the gateway first checks the last heard lists, if it finds you, it shoves it out the last place it heard you. If it doesn't find you it asks 'Where is he registered' the software then tells itself 'he is registered on this repeater' and then stuffs it out there. The second function of registering is to allow gateway access. You want to talk on other repeaters, link, node route, talk on a linked repeater. You have to register.

If you don't register with a repeater, you can't use a hotspot, talk on a linked system (locally they hear you but across the link they don't), you won't be able to communicate to A DV-Dongle user or a DVAP user. Even they have to register before they can use it.

Also you register to one repeater, that's it. If you find yourself having to move out of state etc., you need to unregister, and register back in your new local. We are talking permanent moving, not trips etc.

What if I am not registered? What can I do and what effects can I expect.

If you aren't registered, you can still talk simplex, and kind of talk on a repeater. I say kind of cause there's a few gotcha's. Anyone using the DVAP, and DV-Dongle, or linked, will not be able to hear you, and may step on your transmission. I know you just got your rig you want to show it off and test on your local repeater. Believe me I can understand that. However, like I stated if you're not registered on a gateway or in the system, DV-Dongle, and DVAP users or any one linked on the system cannot hear you and will more than likely key down when you're trying to speak, thus doubling, and trashing both your transmission and you will trash there's. They can't hear you

Chapter: The Rig and things you need to know first before powering it up.

8

and thus don't know when you're talking but you can hear them.

If you're not registered on the gateway system, you cannot participate in linked conversations, meaning you can listen but if you key up chances are you're going to be stomping on someone else and running it for the local hams. Also you can't call sign rout, node route, or even use a hot spot. You also can't use one even if you bought a DV-Dongle or a DVAP without registering.

So how does it work?

There are two methods, both work the same. Some repeaters have a website you can go to (found on Dstarusers.org) or an email address. The website link basically takes you to a form you fill out then click submit. It basically sends a message to the repeater admin who double checks it.

The second method is sending them an email; both of these methods put it in the repeater admin's hands. From there he adds it in on his end.

What he does with that information is put it into the gateway software which synchronizes every so often so all the repeaters get the list, just the call signs. Please bear in mind you are running with Email's so sometimes, the mail may not get there, or real life pops up, or the email ends up getting caught up in a junk mail filter.

When he gets the message and adds you in, he's going to send you a conformation message saying you're in and you're good to go.

With your rig, until you get conformation, and it's in the system, you can only talk locally, even if the repeater is linked up. Think of it as a list of who can go on the gateway network. If your call sign isn't in the list, the repeater ignores it.

This isn't the fault of the Repeater Admins, but a security feature written into it by the Japanese folks who are writing the repeater/gateway software.

Check to see if you actually are registered:

There is a website http://query.ki4swy.org/index.php up by KI4SWY, there you can enter a call sign and it can look in the propagation database for it and tell if your registered, to which repeater, and also the 'last heard'. If you enter your call sign in there, and it finds it, then you know your registered and in the system. Then if you run into trouble, you know it's a settings problem, or a repeater problem. It is great for helping figure out what went wrong and to begin trouble shooting what's wrong. (Basically you can eliminate the (am I registered, has it been propagated) issue.

W8CMH

This went up on the week of the 10th, of April 2010 at the moment; the gateway is now live and fully operational.
https://w8cmh.no-ip.org/Dstar.do
k8nio@arrl.net - Email

W8BAP

Website: http://w8bap.ham-radio-op.net/
Gateway Registration URL: https://w8bap.ham-radio-op.net/Dstar.do
This only has a B node at the time of this edit, he does have the C node frequency pair set up and is working on getting the C node up and functional. Some people have difficulty reaching it as it only has a 440 node at the moment but it is fully up and operational, and wide area coverage.

Chapter: The Rig and things you need to know first before powering it up.

9

A special note about gateway registration (Please read)

When you register with a gateway, to the system you're telling the gateway system, "Hello this is my home repeater, if someone tries to reach me, and all else fails send it here."

Especially getting started and DV-Dongle users especially, you tended to pick a repeater that allowed you to do it over the net. This got you in the system and got that $299 piece of plastic to work. Remember DV-Dongles, and DVAP cannot be call sign routed to, or Node Routed to. Those are the two procedures for a traveling ham to get to you, or someone DX'ing without forming a link. Since the DV-Dongle couldn't do those anyways it didn't matter. But for your rig, yes it does, as this is the repeater that you're going to spend the most amount of time on.

It's a difficult concept to explain without really going out into technical jargon. Think of it as a 'If all else fails deliver here'.

Let's say we have Homer Simpson W1SIM, (Scary thought I know). Homer here buys the DV-Dongle, and finds a repeater in main that has an automated form to add him to the gateway. Homer's worked out all of his technical issues and he's dongling away. (not going for the pun) Now Homer buys an 880H there in Springfield from Universal Radio. He thinks 'I'm already registered, so let's rock' and he's technically able to all of the things that you can do with D-Star. Now Larry he's at the Hamvention in Dayton Ohio, he says 'Why don't I call up homer' and 'Call sign routes him'. Well homer hasn't been chatting on the local repeater for 3-4 days but his rig is listening. His call sign has fallen off the 'last heard' lists. Now Homer hangs on the 6.66 N3UK repeater in Springfield. Remember he is registered in Maine. So Larry's call back to him to tell him about the free beer, goes out to the gateway system, it says "Nope I aint seen homer, but here is his home repeater W1AW in Maine I'll stick it there!" and that call to homer about the free beer, just went to Maine, cause that's the repeater he is registered to.

Doh! (Ok I couldn't resist)

So what should Homer do? Homer needs to go to the Maine repeater and figure out how to get himself unregistered. Once the repeaters Admin takes him off, it has to propagate in the system, (Takes about a day), then he needs to register to N3UK repeater there in Springfield, and then that propagates.

The system doesn't have a voice mail option, and homer has to be actively listening to his home repeater and catch it and at the same time it is transmitted, there can't be someone keying down at the same moment or it gets sent to the rubbish bin and ignored by the local repeater. But well if someone offered you free beer… need I say more.

So at this point, you got your rig, and sent out your registration to your home repeater. I know we still haven't gotten to the 4 magic fields, but we will one topic builds on another here. So let's go into Memory Banks vs. Memory Slots.

Memory Banks and Memory Slots

To grasp the concept let's get some terms strait. Memory Slot is old school term. Remember your old rig, you laid out your memory information in a chart; Name, Frequency, PL tone, Offset, power etc. That is called a memory slot. Banks are list of 'mini slots' to put information in. That memory location can sometimes be put on a different memory chip all together. So Slot is 'old style repeater memory' banks are 'quick short lists'.

Confused still? Let me break it down farther. You're filling out a list where one of the fields all has the same data. So you want to make a drop down list so all you have to do is click, scroll, find it, and click to drop it into place. Now that short list is a 'Memory Bank' for our explanation.

This is where makes and models tend to vary. You normally have the following banks.

My Call – This is where you put your call sign, and other call signs of people you physically let use the rig.

Repeaters – This is where you stuff repeater nodes and the gateway call sign of the repeaters you will be accessing. (Node and gateways of repeaters you listen to)

Your Call – This is where you put the information of the stuff you're going to be doing.

Now we have this defining point set up the rest of the programming / Uses is going to make a bit more sense, so grab your programming cable and programming software and let's get started.

Find the Comport

This section takes for granted; you installed the cable and drivers already. [Note Windows 7 has the 32 bit driver built in]

The programming cable is USB > Serial > to a headphone jack. Windows will see it as a USB to Serial cable and assign it a com port. We need to know what com port it assigned it to.
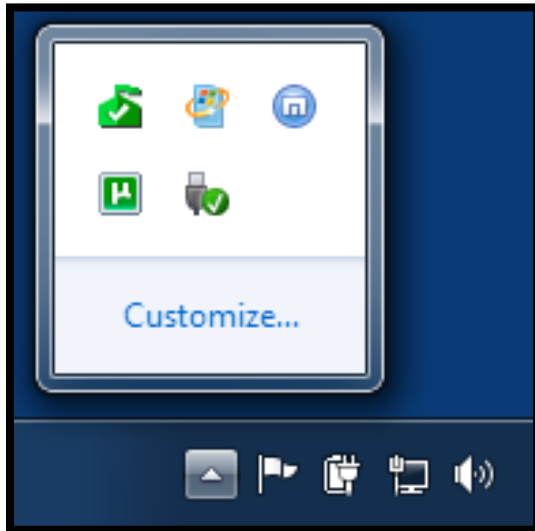
Click on the Triangle (Otherwise known as the system tray expander). See the Icon of the USB cable with a green check mark? Click there.
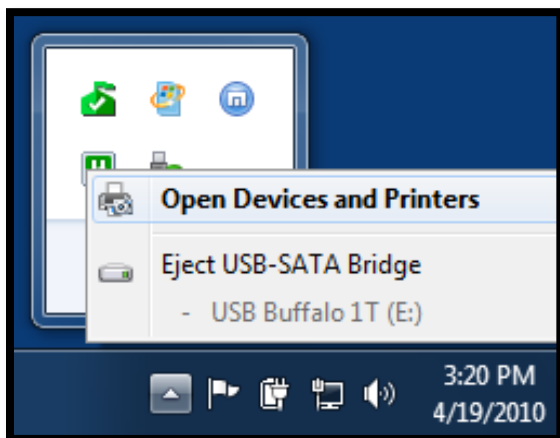
Here you see everything 'Plugged in' including my External hard drive. We want to "Open Devices and Printers" so click there.
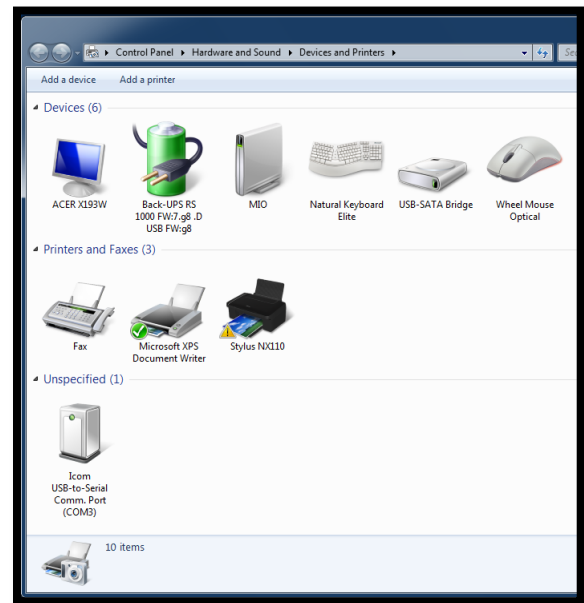
See it listed in the "unspecified" category, that's what we want, we can see its showing up on COM3. Systems may vary, as long as there's no 'flags' we are good to go. So let's move on to the next step.

Take your rig, turn it on, and stuff the cable into the right socket.

Install your programming application. Then start it.

The Programming Software

Now we know what comport the cable is registered to. At this point I'll be showing you the CS-D800 the programming software for ID-800H, my rig. The other programming software is similar but each has its quarks. Following this should get your head wrapped around the picture. So let's start the program.
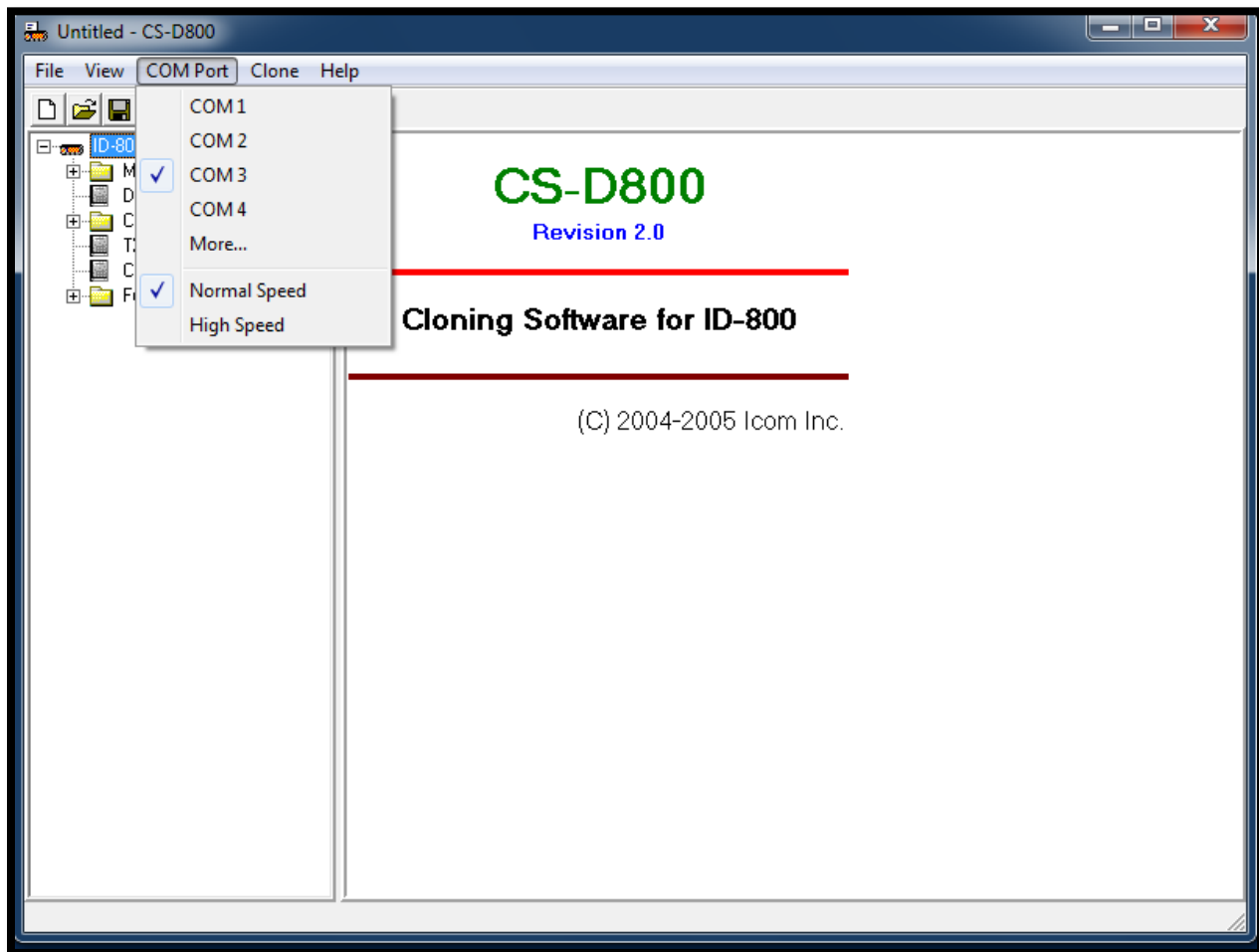
If you missed the first window and aren't sure where you connected, check the Com Port Section, make sure your right where you should be.
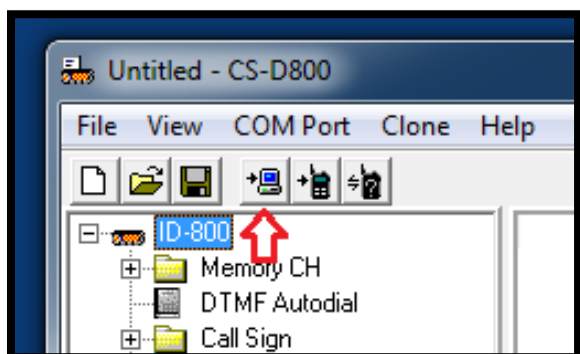
Now let's read from the rig by clicking the icon.

We will see letters on the rig and it's going to chunk right along.

Now for the most part, this setup is similar to quite a lot of rigs, and for experienced Hams should be self-explanatory, and old hat. I'm not going to bother to explain how to fill out for standard FM repeaters. I'm going to be focusing on the D-Star stuff. So like I said, one step at a time.

My Call
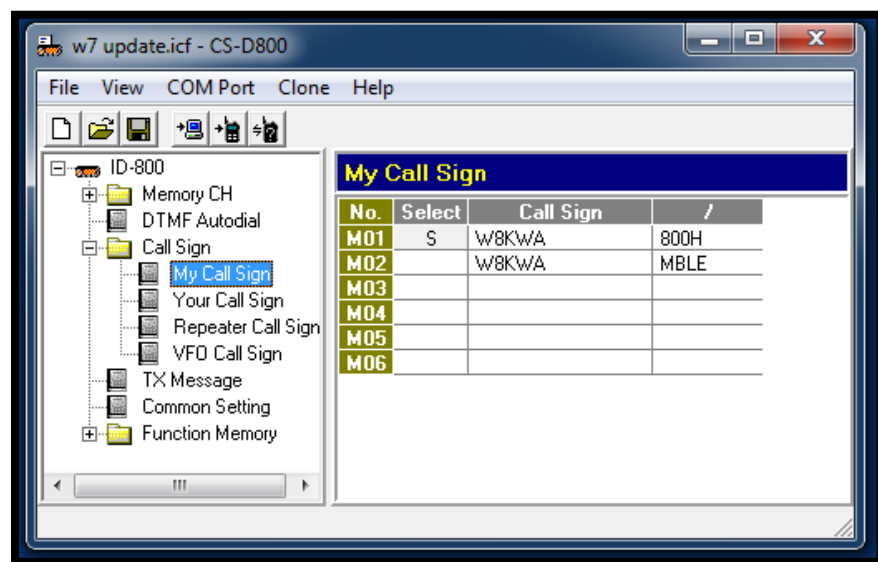
The My Call Field is the first of our 'Magical Four Fields'. It says to the D-Star world, this is my callsign. In here you put your call sign. You do not put in anything else in that Call sign field but your call sign, no -7 or –mobile or anything else but your FCC assigned call sign.

The / Field is limited to 4 characters, and we can put whatever we want to put there. The standard convention is a 4 characters showing what rig you are using to communicate.

- 800H – ID-800H
- 92AD – ID-92AD
- 2820 – 2820

You can see the pattern here. M01 is me, in this above example, M02 is me as well but notice the different slash, so if I chose to I could select to use the M02, instead so my / would be /MBLE showing I was 'mobile'. Here is where there tends to be some confusion so I'll explain a bit.

My Call essentially is you, the operator of the rig, as long as your operating this is a fixed value. If you hand the rig to Joe N8XCT, he would have to add his call sign in there so it would work for him. The other three fields change depending on what you're trying to do, but this My Call, is simply put the operator.

For most users, just filling it out like M01 is the simplest. To be honest I haven't even tried flipping it to M02, just left it as the first one. This is one of those Operator choices. The key thing to remember is it's your call sign, nothing else added, and with the / use the 4 digits for your rig model number.

The Following Contains Geekish info you really don't need to know

GEEK ALERT

The call sign is the basis for everything on D-Star, it is how people find you, and how they know who you are. The standard convention is to put your model number as the "/" 4 digit character field so when you key up, they can see what rig you're on. You can also tell who half way programmed the rig, when that field is left blank. Ah the signs of sloppy operating practices

Chapter: The Programming Software

1
5

3 of the 4 fields

As I said before the 1st magical field is the My Call field. The other three fields are, Rpt1, Rpt2, and Your Call. These three fields change depending on what you are doing. There are also some rules about how things are entered into these three fields called the magic 8th character. You're going to learn to hate this 8th character rule trust me on this one.

ID-RP2C (Repeater controller)
Gateway server
ID-RP2V (1.2GHz Digital voice module)
ID-RP2D (1.2GHz Data module)
ID-RP2000V (2m Digital voice module)
ID-RP4000V (70cm Digital voice module)
Internet
Up to 4 modules can be connected to 1 ID-RP2C
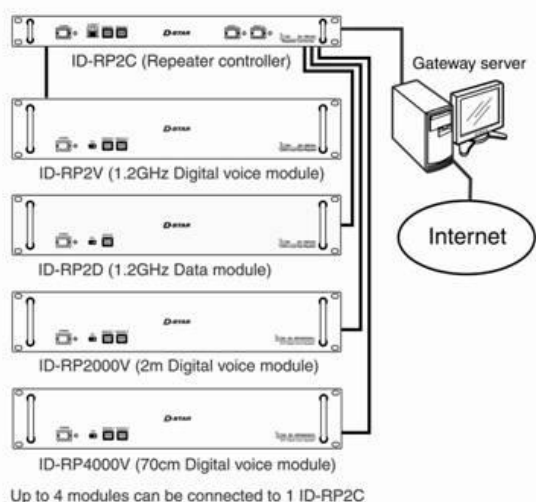
For right now ignore frequencies, PL tones and everything else. We are going to talk about the fields alone. This is the part that tends to screw everyone up. It also is the way you need to start thinking about D-Star repeaters. So let's see an A-Typical 'D-Star repeater Stack'

This is how you need to think of a repeater stack. There is a standard convention that all of them follow

Call sign A – 1.2 DV Digital Voice

Call sign A – 1.2 DD (Digital Data)

Call sign B – 440 (70cm)

Call sign C – 2 Meters

Each repeater is called a "Stack," and one call sign rules over it. Each box plugged into the controller is referred to as a 'Module' or 'Node', and then you have the Gateway which controls the whole stack. (Hence you see why the term 'Stack' is used)

Now the best way I have found to explain the 'Magic Four Fields', is like a Path. You're marking each step along the way. Here are the 4 fields set up to talk local typically.

| My Call W8KWA | RPT 1: W8CMH●●C | RPT 2: W8CMH●●G | Your Call: CQCQCQ |

First thing is the operator, me W8KWA, I'm talking to the 145.49 otherwise known as W8CMH Node C, it then is going to the gateway of the repeater W8CMH G, and CQCQCQ says, "I want to talk to everyone on Node C." The Gateway says 'Ok, I'll mark you down as being here in case anyone routed from the internet wants to talk to you to' then spits it out on Node C, and whatever else is linked up to Node C.

Right now you're asking, "What's with the Dots Charles?"

Along with the Magic 4 fields, you have the magic 8th position. Programming a rig, this can

be your pain, especially for some reason these programming applications don't use fixed Fonts. For RPT1 you need the node letter (A B or C) in that 8th character position. If not it won't work. RPT2 is where you put that repeater your coming in on, the gateway, which will always be call sign, with G in the 8th position. This is where you have to count letters, and adjust spaces. Get it wrong and it won't work, screw it

up in the 'bank' and you got to correct every memory slot it referenced. So remember that magic 8th position.

As far as the Your Call field goes, some have to have that 8th position, some don't. Yes I'll remind you of the instances. But let's move on.

The Magic is gone, not quite

For the most part "My Call" doesn't change unless you hand your rig to another person. It happens every so often, but not that often. So when it comes to working the rig, the program, and the rig keep that separate. So when you look at the memory slots on the software, you will notice it is missing. You obviously can't have more than one call sign, nor use a different call sign on a different repeater. So they simply reference it differently, meaning put it in a different part of the program.

So for the next step we will do a review however for the review we too will leave out the "my call" field. So let's say I got on W8CMH's B node. My memory slot would have the 440 frequency, any PL tones or other access information but what would my fields look like?

That's right, the first field RPT 1, put B in the 8th position, Rpt 2 stayed the same because I am reporting to the same gateway on the stack.

This form is the basic layout to 'talk to the node' or 'talk to the repeater' so for every D-Star repeater you put into your rig, you need entries in the 3 fields. RPT1 will be the Node you're calling in from, with the letter (A for 1.2G, B 440, C 2 Meters) in the 8th position. Rpt 2 will be the gateway of that repeater, with call sign, and a G in the 8th position. The *Your Call* field is CQCQCQ. This is a minim you will have for every D-Star repeater in your Memory Slots.

This also means that you have to have an entry for RPT1 & RPT2 in your "Repeater Bank" and "CQCQCQ" in your "Your Call" Bank.

I know it's a bit confusing but bear with me, this pathway is the basis for everything D-Star Related. Just remember, Rpt 1 is the "Node your calling in from" Rpt 2 is the "Gateway of the repeater you're calling in from" and the Your Call, tells the gateway what to do. Oh and remember that pesky 8th position. Nothing like having to re-edit 50 some memory slots because you didn't put enough spaces in one field. (Yes speaking from personal experience) Now can you imagine having to do that from the front face plate? Yes the programming cable is your friend.

GEEK ALERT	The Following Contains Geekish info you really don't need to know (But probably should)
	The Magic 8th position rule is there because of simple hardware programming convention. 8 bits, 8 slots is a good way to remember. It does what it does by looking at that field before and that 8th position. So when we see W8CMH●●C (where the ● is a space) the computer sees [W8CMH] and [C]. The C is the 'location' or 'instruction'. Computers as you know are extremely command sensitive and spaces, and characters count, big time.

Simplex

By now you got the very basics of how to get into a repeater (once registered) so why am I talking about Simplex here?   Simple, it uses fields too. (Collective Groan)

Nah it's the exception that annoys the rule. For every simplex frequency you enter in your fields will be this…

Rpt1	Rpt2	Your Call
		CQCQCQ

That's right, it's not a typo, this is the only time when you're RPT1 and RPT2 fields are blank. This is your Generic Simplex field layout. Since you're not coming in on a Node (RPT1) not reporting to a gateway (RPT2) there is nothing to put in there so you leave those two fields blank. You do have to put in CQCQCQ into your Call Field.

Yep we also have the exception to the Exception. All of the D-Star rigs come equipped with a 'Call Sign Squelch' Function.   This means what you expect it to. It feeds back on your 'My Call' Field.   So when activated (completely independent of memory settings), your squelch won't open unless someone puts your call sign in their "Your Call" field.   If someone keys up with CQCQCQ on the same frequency, you won't hear it. You will continue not hearing it until you either de-activate that function, or they put in your call sign into their 'Your Call' field.

This isn't much use for this unless you and your group/club/family have a rig that you constantly monitor for such things, and agree ahead of time to do so.   (Kind of like FM analog digital squelch but call sign based.)

National DV Calling Frequency

FM has it, by the ARRL Band Plan, but yet there is no "Official" calling frequency for DV. It has been pretty much narrowed down to three frequencies by the other hams. The majority or the one that looks like it is most likely to become the official one is 146.580, the same holds true around central Ohio, and the East coast. The 440 one is all over the place and there's no real clear majority at this time.

DV has been around since roughly 2001, it's only been with in the past 3-4 years where it's really begun to bloom nationwide. So DV has to duke it out with Analog FM over the band plan. See the FM Analog vs. DV section for more information about current issues.

Now let's get to the "Your Call" Field, this is where things happen.

Your Call

This field is the one that's going to be changing the most. We know that Rpt1 and Rpt2, when using a repeater is pretty much fixed. I can only come in one node and talk to the gateway etc per node/repeater.

The "Your Call" is where we get our hands dirty. We will run this down step by step.

CQCQCQ – Your basic call out

W8CMH●●E – Runs an Echo test on W8CMH. This is per repeater, so if you were on W8BAP, it would be W8BAP●●E, so on and so forth, it only works to the repeater your connected to and that repeater has the DPlus software installed, so I can't run an echo test through W8BAP from CMH. Also be advised sometimes the echo tests don't work for some reason or another. Remember the E needs to be in the 8th position or it won't work.

W8CMH●●I – Returns information on Link Status. Again this is repeater specific and depending on the "I" (I as in Info) being in the 8th position. If it's connected to another repeater, or reflector it will either tell you or show you on your screen. (Good to use to check before you do any serious rag chewing because someone else may have accidently left it linked.)

●●●●●●●U – Unlinks all links. It is a simple command universal. The U is in the 8th position.

All you have to do is key down for a moment, and it will unlink everything.

REF01CL – Links to reflector 01C. Key down for a second, and then switch your Call back to CQ to talk, if the repeater allows linking it will link you to the reflector. Notice the L in the 8th position, which tells the repeater that it's a link command. Remember to switch this back to CQCQCQ in order to talk. When done, UNLINK IT.

W8BAP●CL – Links to W8BAP Node C Self explanatory. It works similar to the REF01CL command but instead of linking to the reflector, links to a specific node. To activate just key up for a few seconds, then shift to your CQCQCQ, have your rag chew, then UNLINK IT.

/W8BAP●C – Node Routes to W8DIG Node C. This is different than a link command, this is ROUTING, When you key down with this in your 'Your call' field, it sends just your speech to the destination node, in this case 'W8BAP node C' Remember the 8th position. See routing section for more info. You don't have to unlink this one.

W8JNE – Call sign routes to W8JNE

Got all of that? No well don't worry we will break it down subject by subject.

The Basic Your Call's, for any repeater

First you had your CQ line, remember its CQ three times. This is the slot you listen and talk to for 'normal' operations. But you should have three more.

W8CMH●●I

The format is, [Call sign] and [I] as in info in the 8th position. This when keyed down asked the gateway, "Hey are you linked to anything". And if the gateway is operational it will return to you either via audio, or on the screen of your rig, if it is linked up to anything. You use this command to basically see if a link is active and in use. (More on this in the linking section)

W8CMH●●E

The format is, [Call sign] and [E] as in echo in the 8th Position. When key down you speak into the microphone, and your voice should come back to you. Again this is if the gate way is operational. If you don't hear anything back, then perhaps the gateway server is down. Or the repeater does not have DPlus installed.

For these two commands, they only work on the repeater you're working on, you can't be on W8CMH and run an echo test on W8BAP. (Why would you) To be honest I don't know what would happen, and it's pretty rude to do, so don't dwell on it.

●●●●●●●U

The Format is, 7 blank spaces, and in the 8th you put a U. This is the Unlink Command; it takes down all links to the repeater. (If you linked a repeater, unlink it, don't leave it up because it won't come down unless the net connection stops, or someone else unlinks it) because of others leaving links up and walking away, a few repeater owners have disabled linking, just for that reason. It is an OS thing with the Gateway Software, there is no timer. So if you're unsure

if anyone locally is using the link that seems to be there ask. If no one speaks up, take it down.

In my rig, I put these 4 slots for every repeater because nothings worse than to stumble on an open repeater, key up and get the west coast reflector when you're expecting to just talk locally. When you're done using these commands, flip back to your CQ, slot, or you're going to feel silly very quickly.

Call Sign Routing

This is probably one of the coolest options on the D-Star repeater. Ever been on a trip and wanted to talk to a friend back home, over the air. Well that's what call sign routing does. You set up your fields for that local repeater as per normal. Then you put in your friends call sign, in the "Your call" field. If he is on a repeater's last heard list and still there, when you key up with his call sign in "Your call" field, then it's going to get routed to him there. Also if he is listening on the repeater that he is registered to, then he is going to hear it. To talk back to you, he simply changes his "Your Call" field to your call sign, and away you two go. When you're done, just switch back to CQCQCQ

Also if you hear someone call sign routing to you, use the one touch reply feature on your radio. (See the One Touch Reply Section for more information.) You can also use that function if you hear someone call sign routing on your repeater to talk to that person (the person calling).

W8JNE   The format is [Call Sign]. Sends your voice to W8JNE, by either a listing on the last heard list or

if that fails to the repeater he registered with.

Node Routing

Simple concept, route your voice to a repeaters specific Node

/W8BAP●B   The Format Is, [/(Call sign)] and the Node letter in the 8th Position

This works the same way Call sign routing does, the person on the other end has to change their Your call field to point to your node. Remember when you do, to announce what repeater you're calling from so they can change theirs to get back to you.

"This is W8KWA calling from W8CMH Node C Node routing to W8BAP node C, this W8KWA calling from W8CMH Node C"

Notice I said where I was calling from twice, just in case they missed it the first time. It also gives them more time to activate their "One touch reply"

When you're done with the QSO, change your "Your call" field back to CQCQCQ.

Linking

When it comes to D-Star repeater operations, this is probably the most heated argument topic out there. Some D-Star repeaters allow you to create a link, others do not. The reasons vary from 'other users kept forgetting to take the link down' 'other users kept linking it up to the reflector and leaving it there,' to an owner just wanting it for local use.

The old adage "When you play in someone's house, respect their rules, you didn't pay for their house so you have no real say on how they run their house" Comes to mind.

Some repeaters do allow linking. W8CMH's Gateway does at this current time. Linking is very similar to Echolink, and IRLP where you connect the two repeaters together and anyone who are registered on a gateway, and "plugged' into their local repeater node, can chat back and forth without no real change in settings on their rigs. That simple.

Your voice goes into the node, talks to the gateway, gateway says hey node C is linked to node C on this other repeater, or node C is linked to reflector 001c, I'll pass it there too. And any traffic on the other side is also passed back and comes out the node that its linked to.

Now this can be a lot of fun, but it can also be extremely misused. You remember your technician's exam. Every repeater has a control operator. That's they guy who's call sign is on the repeater. If something goes on, on his repeater, the FCC will go after him. So if two hams connected to N4LL in Florida, and Joe here left the link up from W8CMH C to N4LL's node C, and two guys on the other end start talking about which adult dance club has the hottest stripers and which ones put out, or let's just say their topic of conversation falls over the legal definition of "Offensive". Then that conversation comes right out W8CMH, and if an OO (Official Observer) hears it, W8CMH (Or rather K8NIO) is the one who's going to get the ticket on it as well as the offenders. It's one thing if it's just you who loses your license, but imagine dumping over ten grand in a repeater as well, and then getting your license yanked because Joe left the link up. Well you might take that risk, but there are a few repeater owners who don't want to take that risk.

It also can be said it's a lot of fun connecting up to reflector 001 C, and talking to people from Great Britain, Scotland, Japan, Germany, Australia, and other places you never heard of, all from your local repeater. So remember, linking is not a right, it's a privilege and clean up after yourself.

How To

REF001CL

Format [Target] spaces to fill [X] x being the target node and [L] in the 8th position, L for link, pretty simple.

Example

Your: W8CMH●CL

This is the link command to link to W8CMH Node C. C is in the 7th space, L is in the 8th space. If you have a shorter one say w1ix then its W1IX●●CL Notice 2 spaces.

Remember to ask first locally if any one minds if you link first. Then switch to the memory slot with this in the "Your Call Field" Key up and say "[Call sign] Linking to [target]" the command goes with it. You will get told wither it succeeded or failed by either Audio or screen. **REMEMBER TO USE THE UNLINK COMMAND WHEN YOU ARE DONE.**

Troubleshooting

Why can't the other guys on the link hear me?

Remember a few things first. If you recall how I listed the magic 4 fields and technically you can get away with leaving rpt2 blank. Well here is where those folks get frustrated.

In order to use and participate in the discussion of a linked repeater, all users must have these fields filled correctly.

- Rpt1 is filled with the repeater call sign, and the node in the 8th position, with spaces filling it up like so.
- Rpt2 is filled with the current repeaters call sign and the G in the 8th position. THIS IS A MUST.
- Your field is filled with CQCQCQ.

If you aren't being heard check the following:

1. Are you registered? Double check http://query.ki4swy.org/index.php and do a search on your call sign. If it comes up then you know you're registered.
2. Rpt1 field is correctly set. It's the repeaters call sign, and spaces till the 8th position. In the 8th position is the Letter of the Node your trying to access. C, B, or A. Double check remember C is 2 meters, B is 440, and A is 1.2G. If there is an error in the spacing, you won't be heard on the other side.
3. Rpt2 field is set correctly. The format is the repeaters call sign, and a G in the 8th position. Double check those spaces.
4. Your call field must be CQCQCQ.

If any of these 4 items is off, then you're not going to be heard. You wouldn't be the first ham to miss a space in the field.

An extra step if you have the DV Dongle, use the 2.0 beta 4 (windows). Connect to the node your testing. See the second window. If it says hears (your call) on (repeater node) on a one line entry in the black window and you have double checked your registry that you are registered, and then you KNOW it is either your RPT1 or RPT2 entries that are screwed up. If your fields are set up correctly, you're going to see a bunch of lines. Think of it as a nice litmus test to see if everything is working.

Why can't I link this repeater to...?

Things to double check
1. Are you registered? Check out http://query.ki4swy.org/index.php to be 100% sure
2. Are your 4 fields correct. Double check your spacing in rpt1, rpt2. Remember rpt1 the node letter HAS to be in the 8th position, and rpt2 has to have the G in the 8th position or it will not work.
3. Check your "YourCall" field for that space, remember target node is 7th position, L is 8th position, there are no / marks.

Now if you checked those three things then the reason it's not connecting can be

1. Too many users on the target system that are eating up the bandwidth. DV-dongle, Dvap, and repeaters take up roughly the same amount of bandwidth to connect up with.

2. Internet Congestion between the repeaters
3. Does the remote system have DPlus installed, if not, then you won't hit it. (double check with a DV-Dongle)

4. Does the system allow linking? Some repeaters don't allow incoming or outgoing or both. Some repeater stacks even shut down at certain times of day as well.

Programming your Rig, Part 2

By now you should have a rough idea about the fields, and how they work together to either make or break your D-Star experience. The next part is how we stuff all that goodness into our rigs in some kind of system.

Repeater Call Sign Bank
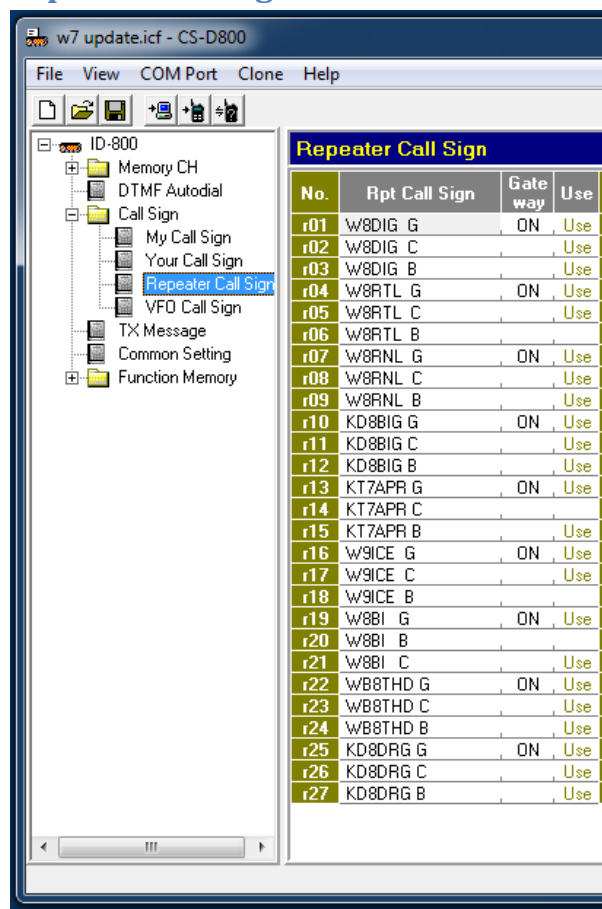
First let us set up the repeater bank. This "Quick sheet" or bank is what my software pulls from to

put in to RPT 1 and RPT2. You can see after a certain amount of time I got a system I worked out. I list the gateway first, then the nodes, you can do whatever order you want, but the Gateway needs to be in there. What I did, is go to Dstaruser.org, got a list for the Ohio Repeaters, who had what nodes, and what frequencies, then just put them in.

My 800h programming software has a quark to it, see the gate way "on" column, it drops a G into the 8th position. (Too bad they couldn't have made it G,A,B,C and solved my space dilemma. Just by looking at it, it is hard to tell how many spaces you put in there or how many characters a line makes up so you have to count them. Too little, and it won't work, two much and it will clip off. This is one of those areas you bay extremely close attention to and watch those spaces.

You will also note the "Use" Colum. If you have your memory slots fill out, it's simply a flag that tells you which ones you have used. Hence if you see a blank, which simply means you have not used it yet in the memory slots.

Your Call Bank

No.	Call Sign	Use	No.	Call Sign	Use
U01	CQCQCQ	Use	U51	/W8DIG C	
U02	U	Use	U52	/W8DIG B	Use
U03	W8DIG C		U53	/KD8DRGC	Use
U04	W8DIG B		U54	/KD8DRGB	Use
U05	W8DIG A		U55	/KT7APRB	Use
U06	W8DIG I	Use	U56	/W8BI C	Use
U07	W8DIG E	Use	U57	/W8THDC	Use
U08	W8CMH I	Use	U58	/W8THDB	Use
U09	W8CMH E	Use	U59	/K8BIG B	Use
U10			U60	/K8BIG C	Use
U11			U61	/W8RNL C	Use
U12			U62	/W8RNL B	Use
U13			U63	/W8RTL C	Use
U14			U64	/W4CLL C	Use
U15			U65	/W8BAP B	
U16			U66		
U17			U67		
U18			U68		
U19			U69		
U20			U70		
U21			U71		
U22			U72		
U23			U73		
U24			U74		
U25			U75		
U26			U76		
U27			U77		
U28			U78	REF001CL	Use
U29			U79	W8BAPBL	Use
U30			U80	W8DIGCL	Use
U31			U81	W8DIGBL	Use
U32			U82		
U33			U83		
U34			U84		
U35			U85		
U36			U86		
U37			U87		
U38			U88		
U39			U89		
U40			U90		
U41			U91		
U42			U92	N8CXI	Use
U43			U93	WG8I	Use
U44			U94	KD8BZF	Use
U45			U95	KC8ZYB	Use
U46			U96	KD8GES	Use
U47			U97	W8KHW	Use

Next is the Your Call Sign bank.

This is where you put your "Your Call" fields. Again you can see a System starting.

U01: CQCQCQ

U02: ●●●●●●●U

The next set is for the I's and E's of the repeaters I'm setting up for.

The next set of call signs or rather commands is for the Node Routing use in the memory slots.

The next set of call signs or commands is for the things I want to create a link to. This is where I tend to put link commands for the reflector and other repeater systems.

And finally at the bottom, this is where I put my Call sign list for call sign routing. I left enough space to grow on either side and keep them organized. Remember you're going to be putting a lot of slots in for one repeater. So if you got a system that means you can fill in the blanks faster.

Also of note is the "Use" field again. It is the same thing as the repeater banks. All it shows is if I have used it in one of the memory slots.

Memory Slots
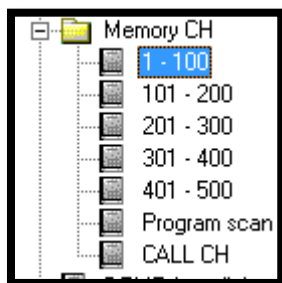
Decision time, how to set up the banks, in version 1 I suggested the first bank for standard FM. Since my home repeater went digital, I put the first bank as Local D-Star repeaters. My Second Bank is FM Repeaters + Simplex. This leaves me 3 banks of slots, for trips etc. It's my organization system, you're free to incorporate your own. The key thing is to remember to leave space in case you need to add that quick command, and of course keep organized so you can operate efficiently.

CH	Operating Freq	DUP	Offset Freq	TS	RF Power	Mode	Tone	Tone Freq	TSQL Freq	DTCS	DTCS Polarity	DSQL	Code	Your	Rpt1	Rpt2	Name ON/OFF	Name	Skip
1	145.490000	-DUP	0.600000	5k	Low	DV		88.5	88.5	023	Both N		0	U01: CQCQCQ	r31: W8CMH C	r30: W8CMH G	ON	W8CMH	
2	145.490000	-DUP	0.600000	5k	Low	DV		88.5	88.5	023	Both N			U08: W8CMH I	r31: W8CMH C	r30: W8CMH G	ON	CMH-I	Skip
3	145.490000	-DUP	0.600000	5k	Low	DV		88.5	88.5	023	Both N			U09: W8CMH E	r31: W8CMH C	r30: W8CMH G	ON	CMH-E	Skip
4	145.490000	-DUP	0.600000	5k	Low	DV		88.5	88.5	023	Both N			U02: U	r31: W8CMH C	r30: W8CMH G	ON	CMH UL	Skip
5	145.490000	-DUP	0.600000	5k	Low	DV		88.5	88.5	023	Both N			U78: REF001CL	r31: W8CMH C	r30: W8CMH G	ON	L:01C	Skip
6	145.490000	-DUP	0.600000	5k	Low	DV		88.5	88.5	023	Both N			U79: W8BAPBL	r31: W8CMH C	r30: W8CMH G	ON	L:BAPB	Skip
7	145.490000	-DUP	0.600000	5k	Low	DV		88.5	88.5	023	Both N			U80: W8DIGBL	r31: W8CMH C	r30: W8CMH G	ON	L:DIGC	Skip
8	145.490000	-DUP	0.600000	5k	Low	DV		88.5	88.5	023	Both N			U81: W8DIGBL	r31: W8CMH C	r30: W8CMH G	ON	L:DIGB	Skip
9	145.490000	-DUP	0.600000	5k	Low	DV		88.5	88.5	023	Both N			U78: REF001CL	r31: W8CMH C	r30: W8CMH G	ON	REF01C	Skip
10	145.490000	-DUP	0.600000	5k	Low	DV		88.5	88.5	023	Both N			U93: WG8I	r31: W8CMH C	r30: W8CMH G	ON	*WG8I	Skip
11	145.490000	-DUP	0.600000	5k	Low	DV		88.5	88.5	023	Both N			U94: KD8BZF	r31: W8CMH C	r30: W8CMH G	ON	*D8BZF	Skip
12	145.490000	-DUP	0.600000	5k	Low	DV		88.5	88.5	023	Both N			U95: KC8ZYB	r31: W8CMH C	r30: W8CMH G	ON	*C8ZYB	Skip
13	145.490000	-DUP	0.600000	5k	Low	DV		88.5	88.5	023	Both N			U96: KD8GES	r31: W8CMH C	r30: W8CMH G	ON	*D8GES	Skip
14	145.490000	-DUP	0.600000	5k	Low	DV		88.5	88.5	023	Both N			U97: W8KHW	r31: W8CMH C	r30: W8CMH G	ON	*W8KHW	Skip
15	145.490000	-DUP	0.600000	5k	Low	DV		88.5	88.5	023	Both N			U98: W8OLO	r31: W8CMH C	r30: W8CMH G	ON	*W8OLO	Skip
16	145.490000	-DUP	0.600000	5k	Low	DV		88.5	88.5	023	Both N			U99: W8JNE	r31: W8CMH C	r30: W8CMH G	ON	*W8JNE	Skip
17	145.490000	-DUP	0.600000	5k	Low	DV		88.5	88.5	023	Both N			U92: N8CXI	r31: W8CMH C	r30: W8CMH G	ON	*N8CXI	Skip
18																			
19																			
20	442.800000	+DUP	5.000000	12.5k	High	DV		88.5	88.5	023	Both N			U--: CQCQCQ	r32: W8CMH B	r30: W8CMH G	ON	4CMHCQ	
21	442.800000	+DUP	5.000000	12.5k	High	DV		88.5	88.5	023	Both N			U09: W8CMH E	r32: W8CMH B	r30: W8CMH G	ON	4 ECH	Skip
22	442.800000	+DUP	5.000000	12.5k	High	DV		88.5	88.5	023	Both N			U06: W8DIG I	r32: W8CMH B	r30: W8CMH G	ON	4 INFO	Skip
23	442.800000	+DUP	5.000000	12.5k	High	DV		88.5	88.5	023	Both N			U02: U	r32: W8CMH B	r30: W8CMH G	ON	4CMHUL	Skip
24	442.800000	+DUP	5.000000	12.5k	High	DV		88.5	88.5	023	Both N			U78: REF001CL	r32: W8CMH B	r30: W8CMH G	ON	4 ECH	Skip
25	442.800000	+DUP	5.000000	12.5k	High	DV		88.5	88.5	023	Both N			r31: /W8CMH C	r32: W8CMH B	r30: W8CMH G	ON	CMH B	Skip
26																			
27																			
28																			
29																			
30	146.580000		0.600000	5k	High	DV		88.5	88.5	023	Both N			U--: CQCQCQ			ON	NF2MDV	
31	145.550000		0.600000	5k	High	DV		88.5	88.5	023	Both N			U--: CQCQCQ			ON	W1IX C	
32	441.050000		5.000000	12.5k	High	DV		88.5	88.5	023	Both N			U--: CQCQCQ			ON	W1IX B	
33																			

Look at that, the first 17 slots are used for one repeater alone. You can see the pattern forming here. Also notice the skip function. This prevents the rig in scanning mode, from scanning the same frequency 17 times; it only needs to scan it once. So I rag chew on 1. This is where I listen. If I need to echo test, I shift to 3, key up speak, and when done back to one. If I want to call sign route to Garrett, N8CXI I just turn it to 17, key up and speak, when done with the QSO, back to 1. I want to make that link to the reflector, I turn it to 2, to check it, if ok then 8, key and say I was trying to connect to ref 01 c, then back to 1, to talk, when done over to 4, key up to unlink. At this point you should see where all that came before was leading to.

The name section is one of the hang up's on the 800h. 6 Character max, so I had to figure out a system to remember where I was and what I was doing. Also note number 30, that's the National Calling Frequency 2 meters for Digital voice.

With D-Star you're going to get to know that programming software very well, and its not standardized, each one has their own quarks.

Now you got a basic idea how to get the stuff, stuffed into your rig. Follow the above and you should be well on your way. If you're like me, you probably are going to stuff this in the rig, then get on the air, but I advise you to read the "DV/D-Star Proper Operating Practices", section. It covers the new way of saying things over D-Star. Next up some odd bits of info you should know about but may never use.

Multicast

This is one of those rarely used type of things. By now you got an idea what node routing is, and call sign routing. Multicast runs along those same lines.

It is something that repeater owners set up on their end. Think of it as 'Node routing' to a 'set list'

Let's give a hypothetical example. Let's say repeaters W8CMH, W8DIG, W8BAP decide to create a multicast group called COLS. To use it, change your "Your Call" field to "/COLS". When you key up, that packet of your voice goes to the gate way and says 'I'm destined for "/COLS" and the gate way says ok, you go out on W8CMH C, W8BAP B, W8DIG B. So your voice goes out those three packets. People on those nodes/repeaters hear your voice packet. If they know about the multicast group, they use their memory settings to turn it to "/COLS" and they reply back, thus everyone who has the "/COLS" and on those nodes can talk to each other. That's all there is to it. To my knowledge none of the Columbus repeaters have a multiclass group set up.

Zones

Zones sounds like a great buzzword and Icom usually spends about a page or two trying to explain it. Personally I think they go overkill in that part. One of the big questions people ask is "What's a Zone" and "How do I use it".

Simply put a "Zone" is a set of "Linked repeaters", confused? Remember the old 5.19. You had repeaters in Toledo, Cleveland, Columbus, Cincinnati, and other locations. They were all linked up like a big party line. Congrats your 90% there in working out a zone. Yep linked repeaters. Icom went overboard trying to explain it. So let's make up a hypothetical situation. 5 repeaters strung from Cleveland to Cincinnati on I-71. All of the B-nodes are linked to each other. Now in your repeater you would have 5 memory slots, one for each repeater set up just like you would talk locally. Start on repeater 1 in Cleveland, drive south, when you fell off the cliff from repeater 1, you changed to repeater two, and hopefully it's in range, when you passed out of that, then repeater 3 here in Columbus. Since all of the 'Linked' repeaters are close, Icom likes to refer to them as Zones. They also call the area a single repeater stack can reach, a "Zone" which even makes it more confusing. But essentially that's all there referring to. Simply put a few repeaters that link to each other close together in order to have a party line and to drive from one end of it to another.

Why they just couldn't call them 'Linked Repeaters' is beyond me.

One Touch Reply

This one even had me stumped for a while as to exactly what it did. Most Icom rigs have them. What they do varies rig to rig. So I'll give you the basics.

Say you have a call from KC8VWO who is node routing from W8BAP Node B into W8CMH node C. You can guess the 4 fields he is transmitting.

My Call	Rpt1	Rpt2	Your Call
KC8VWO	W8BAP B	W8BAP G	/W8CMH C

On most rigs it stores the last transmission into a 'Volatile' memory, the 880h, can store up to 10. But the last one that came first is the one by default it grabs. So here I am on W8CMH, he's node routing in. I activate my one touch reply button. (My BK / Tone / T-scan) by holding it while two short then two long beeps are heard. My rig then goes and grabs the 'My Call' field of the last caller, and then drops it into the 'Your Call' field to call sign route back. Some rigs will actually grab RPT1 value and use that, it's one of those look it up in your own manuals.

So he calls I press and hold my button and my rig then sets up the 4 call fields like…

My Call	Rpt1	Rpt2	Your Call
W8KWA	W8CMH C	W8CMH G	KC8VWO

Hence my call goes out, through the gateway, to the repeater node KC8VWO called from and everyone there on that node can hear me. They just have to either node route me, or hit their one touch reply.

During this operation, people listing to W8CMH can hear him, and me. KC8VWO can't hear the others on W8CMH C, unless they either one touch reply him, put his call in their 'your call' field or node route to where he is at. Pretty simple. Just double check your manual, to make sure you know how your rig is going to manipulate the fields for this. The 800h just has the one option but the 880h has two options etc.

When you're done with this, rock the memory slots back to CQCQCQ to speak locally.

This feature has been verified to work.

Busy Lockout

What is it?

Busy lock out function is an extra step to help prevent doubling. It is actually a good idea that many hams have been wondering 'why didn't anyone think of this before.

"The Busy lockout function inhibits the transmission while receiving a signal on the selected frequency to prevent interference to other stations." – Icom Manual.

What does it do?

Take two hams, ham A and Ham B, there in a group QSO. Both key down exactly at the same time, as hams we know this is doubling. The odds of it happening at exactly at the same time are slim. Most of the time we get into old habits, and key down wanting to add our two cents into it, and we end up doubling over another. Most of the time there is a half second delay, we normally don't realize this, perhaps he keyed down and didn't say anything for half a second and we aren't staring at the screen. That's where this function comes in. When you key down your rig asks itself, is anyone transmitting? (see the if the busy indicator is on) If no, then out your signal goes as per normal. If it detects a signal then it sends your voice into the bit bucket (dev null/trash can), then gives you a warning. On the 880h, 800h you get 5 rapid fire beeps, believe me you will notice it. Your rig won't send anything out thus preventing you from doubling. With the 92AD, you get a single beep, and the VFO remains open even with you pressing the key down.

How Do I know if it is turned on or not?

Well the litmus test is try to double, wait a half a second at least after someone has keyed down, and try transmitting, if you can then it's not turned on. Or open your squelch till the busy indicator thinks there's a signal and try to key down.

What happens if two people who have busy lockout turned on key down exactly at the same time?

You double.

So why should I turn it on then?

More often or not doubling happens not at the exact same time. (most of the time). This is an extra layer of protection. In Nets when they call for stations, it also helps smooth out call ins, it also helps you out. On CODSN (Central Ohio D-Star Net) we ask you use it.

	How To on 800H
Specific Radio instructions	You need to have the firmware update or this function isn't installed. Unless the 800 is older than 2005, you should aready have it updated from the factory. If it isn't there, then you need to update the firmware to get it. (A kind of litmus test) **First step** is to get into Initial setup mode. Press and hold [SET LOCK] and press power for 1 second. If you did this right "BEP ON" will be on the screen. **Second Step** is Press [Set-lock] to scroll through the menu, should be the first one, if not press the same button and scroll through the menu items. The menu item you're looking for is BCL, set it to on by turning the dial to "On" and turn it off, then turn it back on again. Test by intentionally trying to double. If it beeps at you and doesn't transmit, you're golden.

Text Sent

You have roughly 3 fields in full operation.

My Call – This your call sign only (you know about this one)

/ or The slash field – field, this is a 4 character text field independent. Convention (what others do normally) is to use those 4 characters to state what rig your running. I'm on an ID-800H, so my "Slash field" is normally 800H. If you run an ID-880H, then its 880H, if someone's on a "Dongle" then the dongle automatically puts DNGL, if you're on a DVAP, which DVAP automatically puts in DVAP. This performs two functions, one it tells others what rig model you're on. The second if you need help then tada, the person who is helping thus knows what rig you are on and will be easier for them to help you with specifics.

Auto Insert Text – This is a 20 character field, many rigs actually have a 'bank' of them you can select on the fly. (See your manual for how to.) You need to first check to make sure the function is turned ON, then which 'field' in the 'bank' you have selected. The Standard convention, (the way everyone does it) is [Name, Location, Country].

Please Note: The Slash field, and Auto insert text field doesn't change the functionality, and is independent of the rest of the settings.

This insures that for me, when I key down, everyone else sees on the screen,

W8KWA   /800H

Charles, Cols OH USA

Thus a person sees my call sign, knows I'm on an 800H, my handle or name is Charles, and I'm in Columbus Ohio USA, all without me having to utter it over the air. For most rigs it is a set it once and forget it, but if you are feeling creative, for special events you can put other information in it like Happy solstice, happy Samhain, happy new year, etc. I have seen people put things in there like "Jesus Loves You!" and other things some find offensive. (I personally found it offensive as I'm not Christian). Also try to avoid special characters, yes it may look neat on your end, but on the other end it may come out looking odd.

Final check list for your rig

Registered
Are you registered?

My Call
Is it filled out properly only using your Call sign (you didn't add to it) <Slash field doesn't count>

Busy Lockout
Check to see if you turned this function on, it's a set it once and forget it as it helps prevent doubling.

DV National Calling Frequency
Check to make sure you have this listed in there (146.580 2M), at the very least, it can make it easier to 'quickly switch to simplex' or to monitor simplex frequency.

Auto Text Insert
Is it turned on?

Is the right field selected?

Slash field
Is it filled out properly?

Old D-Star Vs. New D-Star, the Confusion

When you read other books there is a lot of confusion. You have the raw basic Gateway software from Icom, then you have Dplus enabled repeaters. Most of the repeaters you're going to encounter will have DPlus and will be connected up to the internet. Because of this the document is structured the way it is. Yes I know you can put another node of the same repeater stack into your repeater 2 field and cross band your QSO. The problem there is that you're not reporting to the gateway, since you're not, people on DVAP, DV-dongles, and linked repeaters won't be able to hear you. So I prescribed if you wanted to cross band you put the gateway call sign in Rpt2 and node route, with putting the /W8CMH●C in the Your call field, your transmission goes to the same place, and the others can hear it. This method works on both "DPlus" systems and Non DPlus Systems. But if you start with the (put the call sign in rpt2) you stomp on people linking, dangling, and Dvaping into the repeater. It's one of those 'technically it will work but its bad operating practice.'

So since you're mostly going to run into DPlus enabled systems, I have shown you the procedures to do things that won't stomp on someone else, and the best way I have found to go about doing things that allows others to participate. If you want to learn about how to do the other methods, feel free to pick up other books on D-Star and read up on them. Basically the method's I prescribed in this document is the current methods that doesn't stomp on as many toes.

DV/D Star Operating Practices

"Oh I know how to do it (ZAP)" - The Lost Tech

With a new mode comes a new way of doing things, not just on the technical side but on the speaking side as well. Since D-Star refers to repeaters by Call signs and Nodes, so do we. In the FM Analog world it was the '549'. In the D-Star world it's "W8CMH Node C"

The 'why' should be bluntly obvious, you could be linked to a reflector, you could be routing, and telling the other person in another state that you're on the 5.49, will bring up the obvious question, "Which 5.49 do you mean?"

The next one to go over is the "W8KWA Listening" when you're calling a CQ of sorts to see if anyone's listing on 2 meters. Now it's "W8KWA on W8CMH Node C" you add to it, "Monitoring" "Listening" or "Calling CQ". This lets everyone know, who you are, and if it's linked up, where you're calling from, what repeater and node. You may be talking on a linked system, or someone just put up a link, or it may be plugged into the reflector. It is just good practice.

'Be proud of your call sign, state it often and clearly'. Whelp this is probably the biggest change operational wise other than referring to repeaters by call signs instead of frequency. Every time you Key Down, out goes your call sign on the screen. Now legally speaking FCC requires you to give your call sign out every 10 minutes. You do that with every transmission. But the finer points of FCC rules say you have to give it audibly at the beginning, and at the end. Guess what, we get to toss that 10 minute rule out the window. But we still have to give it audibly at the beginning and at the end.

GEEK ALERT

The Following Contains Geekish info you really don't need to know (But probably should)

Now as most of you 1st generation folks (the people that I hand this to, to proof or to help) after I got my shiny tech license, one month later I got an OO QSL card saying "Identify every 10 minutes". Now I could have sworn I did it. Now it's part of the protocol, and well as long as I'm in DV mode I don't have to worry about that little OO note again, I just have to remember to do it audibly when I'm in FM Analog and the rest of the modes. (I mark this as the 2nd best reason to add D-star, after the Sound, signal reach being top. [But that's just me personally])

The next item is one you already know about. Leave a space after each transmission... you know the drill, for one big important reason, that you probably didn't think about. If you key up too quickly, the repeater will screw up the packets, and all of your speech will come out R2D2 (Noise) so leave a 2-3 second space at least, or at the very least use the busy lockout function.

Finally one you tend to notice the new folks doing. Just because when you key down it automatically sends out your call sign, that doesn't mean you will get recognized to join in a QSO or calling CQ. It is still considered Kerdunking the repeater. People in the QSO or listening will assume you sat on your microphone. So you want to join in a QSO, Audibly state your FULL call sign, not just your suffix, or "Dear gods in heaven forbid you ever say break," but use your full call sign. (If you

don't know how to properly and legally use the term "break", hand in your license, you're

done.)

FM Analog Vs. DV Issues

Keep in mind when dealing with just about any issue, they tend to form into two groups "Old school/It is good enough" and "New School/Keep up with the times old man". When it comes to implementing new technology, this is where worlds collide.

Freq	Description
144.00-144.05	EME (CW)
144.05-144.10	General CW and weak signals
144.10-144.20	EME and weak-signal SSB
144.200	National calling frequency
144.200-144.275	General SSB operation
144.275-144.300	Propagation beacons
144.30-144.50	New OSCAR subband
144.50-144.60	Linear translator inputs
144.60-144.90	FM repeater inputs
144.90-145.10	Weak signal and FM simplex (145.01,03,05,07,09 are widely used for packet)
145.10-145.20	Linear translator outputs
145.20-145.50	FM repeater outputs
145.50-145.80	Miscellaneous and experimental modes
145.80-146.00	OSCAR subband
146.01-146.37	Repeater inputs
146.40-146.58	Simplex
146.52	National Simplex Calling Frequency
146.61-146.97	Repeater outputs
147.00-147.39	Repeater outputs
147.42-147.57	Simplex
147.60-147.99	Repeater inputs

There has been quite the heated debate on where DV or D-Star fits in. Technically it is Packet, Technically it is a repeater, and technically it is also FM. Most fall into the 'it goes where FM' goes since at its very basic it is a Frequency Modulated Signal. I'm not going to debate it here but simply stating the majority of what I seen and what I have grasped as their reasoning for it.

Some have even attempted to argue, (Mostly uninformed D-Star hating Trolls) that it goes into the Experimental modes. But the definition of what the plan list is for those that haven't been published yet, and DV (D-Star) has been a standard since 2001.

So DV has to duke it out with FM Analog in the same plan. That's where the repeaters are getting put in, just like regular FM Analog gets put in. That is where we hit the second big issue, Repeater Pairs.

There is two parts to this issue, remember DV mode takes up one half of the space that FM analog takes, so as a rule of thumb, you can take out one FM Analog and put in two D-Star repeaters. Right now there are a lot of them going up. We in Columbus know we got a few ourselves, and several are "Paper Repeaters". That means they exist only on paper. The 5.11, and 5.19 are prime examples of 'Paper repeaters'. Because they exist on paper, their pairs aren't free to put up a repeater on. Simply put, on paper we are full. Every time someone wants to put in a D-Star repeater they run into that.

Either some frequency coordinators don't care, or they have a 'hand shake deal' etc with the paper repeater owners, even though there has been no equipment running there in years. Right now W8BAP in Stoutsvill is running into that problem, he has a 2 meter module, but because

of so many 'paper repeaters' in the area, he can't put it up for fear that one of these paper repeater owners may use that as an excuse to file litigation, as we know from our exams, the 'coordinated repeater' wins out. It's also expensive to get a repeater set up with the antenna price, the trimming, and the coils that have to be made out for a repeater. W8BAP isn't the only one discovering this. It is happening all over the place. You see a repeater with only a B node; chances are there in the same predicament. Too many paper repeaters, no open pairs.

(Note that of this edit, BAP has a frequency for the node C and it will be up and announced "Soon")

Because of a lot of misinformation and guess work there are a lot of opponents to D-Star/DV out there. Some base this on the fact they see others moving to D-Star, and can't afford to buy a new rig, or they bought one, couldn't figure it out, thus it must be crap, some just flat out hate change. Others are the end result of the old grapevine game, that by the time information got to them it was extremely distorted that they pass on the 'Icom secretly controls the death star and will be signing up tickets for ham radio.' By the time it gets to the guy who was curious about it he ends up getting told the strangest things.

My personal favorite was "D-Star allows everyone to track where you are at all times". He went on about Icom being in league with the "Bush administration" to keep tabs on people.

This is what he told me with a straight face (or rather voice) that someone had told to him.

Let's face it, we ham's love gossip, but when we pass on information half heard while we were doing something else, it just tweaks the snot out of information.

When the 145.49 went digital while I was away in Virginia for my Certs, (which I got thanks,) I found out through the grapevine, that the COTN (Central Ohio Traffic Net) which the 5.49 was the 4th in line back up repeater, had some difficulty with their 7.24, and started to freak out about the 5.49 going digital. A whole lot of half-baked ideas flew out then from conspiracy theories, bribes, Icom only, you name the misconception and it went flying. So anyone listening to the COTN, over heard that, and didn't know any different, is now most likely past on the same information to others and probably added a twist of their own.

This flurry of misinformation, can be expected, especially by hams, like I said we love to gossip. After you have finished reading this and understanding this document, at least you can help stop out the misinformation and get some correct information into other's hands.

D-Star or DV, isn't going away, it's something that ARRL, their band plan, and the Frequency Coordinators are going to have to deal with. Give us 20 years, and I would be surprised if you could buy a 2 meter 440 rig without DV. People said the same thing about PL tones 20 years ago. Change happens.

DV-Dongle & DVAP

The Catch

With these two items there are some things you need to grasp first before deciding on buying one of them. First off they don't plug into 'Every Repeater'. The target repeater must have internet access, and have the D-Plus, program installed as well. It will also connect to the reflectors. What it cannot do is pretty much everything else. It simply lets you talk to a D-Plus enabled repeater's node. You can't call sign route, or be routed to, you can't node route, or be routed to, you can't link or be linked to. All it lets you do is plug into a repeater node, or a reflector that is 'D-Plus enabled' and has an active gate way to the internet. That's it.

DV-Dongle $199.95

DV-Dongle is a device that has the Chip in it that converts Audio into Digital signals. Its different than the chips in your soundcard. It runs about $199.95 at HRO. It's a blue box you stick into your USB 2.0 Port. You then need the device driver, Java and a program called DV Tool. It runs on Linux, Windows, and Mac. Just a warning, there's a squirrely bug in it, that the DVTool program won't run unless your system has a headset and microphone plugged into it.

You get all of this hooked up, and with a broadband connection you can connect to any D-Star repeater that has the 'D-Plus' Software installed, and their gateway connected to the internet, and you can get on the reflectors. That's it. You also have to be registered to a gateway.

I have used the program and there are a few quarks to it, like you key down wait a second, then speak, when you're done, leave a second then let loose of the key. It has a tendency to clip the beginning and end for about a second. (It takes up about 30K of bandwidth when in use) If you have a wireless laptop, then you need an "Excellent Connection" and dedicating all the bandwidth to it or your speech will come out in pieces.

** Update, there is a beta of the new version that doesn't require Java and adds more options at http://www.opendstar.org/tools/ the current version as of today is DVTool-2.0beta4.exe (yes there is a Linux version of it. You do need .net framework in windows to run it.

DVAP $249

This is pretty new to the market. It works as a hotspot. Basically it works similar to a DV-Dongle except you don't use a head set and mic, you use a D-Star radio. It has a 10mW (that's milli watt) radio inside that works on a simplex frequency. So if you want to use your D-Star radio, but no repeaters around you can use this to get you out similar to a DV Dongle. So all of

the limitations with DV-Dongle, just you can use a D-Star radio to go in and out.

"The DV-AP is 2M transceiver with a 10 mW maximum output; an integrated GMSK modem; and a USB 2.0 interface. Using a PC connected to the internet a licensed amateur radio operator can use a D-STAR equipped radio to access the global D-STAR network and connect to voice gateways and reflectors around the world. The DV-AP gives a Local Access Point to use a D-STAR equipped handheld radio to access the D-STAR network even in places where there is no local D-STAR repeater."

If you want more information on these, Google is your friend; you can get both at HRO (Ham Radio Outlet) neither of these is made by Icom.

There are other projects out there for D-star, like D-Rats etc., so you're on your own with

that, but you will hear these two items talked about a lot, so I thought I should give a short explanation about them.

Further Resources

http://www.dstarusers.org/ - The place you can see 'Last Heard' plus the current directory of D-Star repeaters.

Nifty E-Z Guide to D-STAR Operation – A book about D-Star, there's a new version out of March 2010, I used the previous version to learn about all of this stuff.

http://query.ki4swy.org/index.php - The place to double check what's in the gateway system.

The Central Ohio D-Star Net

http://sites.google.com/site/codsnet/

A few years back, there was a small D-Star net, it had about 3-4 people who regularly checked in, and it went silent about 1-2 years ago. Since the reassurance of D-Star users here in Columbus, the idea has re-surfaced. Also since then I seemed to be tagged with the Dubious Nickname of the "D-star Expert". Well I am far from an expert, and there are a few others more knowledgeable about the subject than I am. But I seem to be the most active of them locally.

The net his held is on Thursday nights at 8PM on the W8CMH Node C repeater. This net has a threefold purpose.

1. To discuss topics related to D-Star
2. To inform and assist new D-Star Users
3. To have some fun

Thursday night was chosen because there were no active nets at the time. We had thought about a weekend evening but a lot of D-Star users check into "Connie's Net" on reflector 1C on Sundays, Saturdays has always been a bad night for nets, and Friday nights don't work out as well due to people getting home to their families, and family things on Friday night. So Thursday was set in. Also 8pm, gives 45 minutes for those who are part of the COTN, to

do their evening message handling and then come over to our net at 8pm.

Each evening will have a topic or a news item including status of the local repeaters. Then it's a round table discussing the topic, then a second round of discussion of any topic. Another idea was to also do an ARRL News line, or the ARnews line, thus we get it in digital sound. Hopefully someone will volunteer to do this duty. We can play it after the net. As of today there have been no volunteers.

Right now W8CMH is connected to the gateway, so feel free to link your repeater up to it and connect with a DV dongle or Dvap and join in the fun.

Also note we have a mailing list for D-Star news, Rag chewing and assistance. http://groups.google.com/group/codsn all are welcome to join.

D-Star Club

Jason (KD8GES) kd8ges@gmail.com along with others, are trying to start up a D-Star Amateur Radio club with users from around Franklin County. Funding the club will help offset some of the local D-Star repeaters setup and operating costs, which does cost more than the average repeater. Some of the things they want to do are to set up workshops, and field events. Please contact Jason for more information regarding this topic.