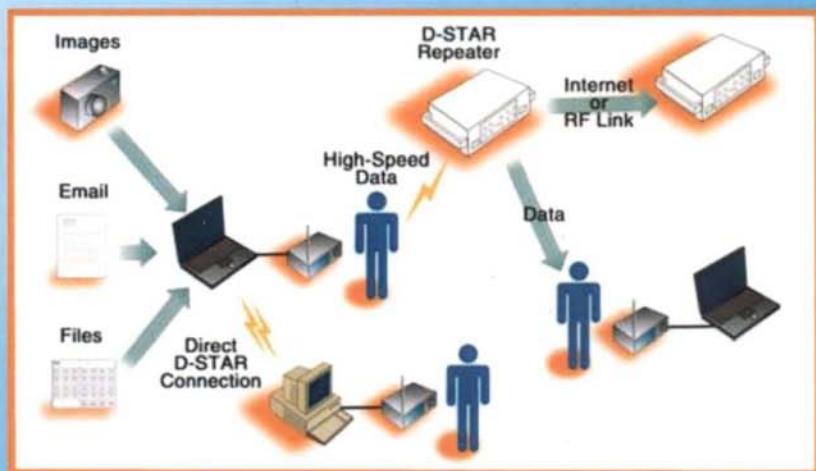


Nifty E-Z Guide to D-STAR Operation

Second Edition



D-STAR Voice and Data Operating Modes
Gateway Registration and Usage
Call Sign and Gateway Call Routing
Setting Call Sign Memories
Short Text Messaging
DV Dongle and DV Tool Operation
Locating Repeaters and Last Heard Stations
d*Chat and D-RATS Digital Software Applications

Bernie Lafreniere, N6FN

Nifty E-Z Guide to D-STAR Operation

Second Edition

By Bernie Lafreniere, N6FN

**Another guide in the
Nifty! Ham Accessories
Easy Guide Series**

Nifty! *Ham Accessories* 

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The Second Edition

The second edition, released early in 2010, updated the first edition to stay current with new D-STAR products and software upgrades:

- Added explanations and programming instructions for the newly released IC-80AD and ID-880AH Icom transceivers.
- Updated a number of D-STAR web page URLs and illustrations, which had changed since the first edition was written.
- Updated the D*RATS versions 0.2.x explanations and figures to be compatible with the entirely new 0.3.1 product release.
- Updated the Dongle DV Tool version 1.05 explanations and figures to be compatible with the all-new 2.0x product release.

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About This Guide

Using easy to understand language and illustrations, this guide describes how the D-STAR system operates and provides guidance for setting up your transceiver to be able to access D-STAR's many features and modes of operation. We will go light on theory, concentrating instead on the practical issues of getting things programmed and making voice and digital data contacts.

D-STAR is an evolving technology. Thanks to improvements made by Icom and the effort of many hams creating and maintaining programs such as Dplus, d*Chat, and D-RATS, D-STAR's communication capabilities are far improved from several years ago. The creation of the DV Dongle, which enables worldwide communication without using a radio, has added a whole new dimension to D-STAR operations.

In late 2009, when the Second Edition was created, the software running on most gateways was Icom's G2 program supplemented by Dplus version 2.2. No doubt, future enhancements will continue to provide more exciting new communication capabilities.

Lets get started!

Special Thanks To

We wish to thank all those that helped in the creation of this book. Special thanks to Icom who materially supported the project with technical help and generously allowed us to use the graphics from various Icom publications. Ray Novak, N9JA, Icom's Amateur Radio Division Manager was especially helpful in providing contacts that were of assistance in completing the project. Fred Varian, WD5ERD, with Icom Technical Support not only answered my many questions, but also reviewed a draft copy of this book.

We are also indebted to Cecil Casillas, WD6FZA, administrator and champion of the Southern California PAPA repeater system who supported the project by answering my questions and allowing me access to their excellent system of DSTAR repeaters. Without their support I would have been unable to perform the testing and experimentation necessary to verify many of the DSTAR features and procedures presented in this book.

Several other PAPA system members were also supportive of my efforts. Allen Klisky, KB6OYA answered questions and helped me run tests using digital mode operation with the d*Chat and D-RATS programs. Ted Petrina, W6SAT and Craig Davis, KM6AW both took of their valuable time to review draft copies of the book, providing me with corrections and suggestions.

Dan Smith, KK7DS, author of the D-RATS program materially aided my efforts by reviewing and providing suggestions for the expanded D-RATS Version 0.3.2 explanations in the Second Edition.

Chapter 1: **D-STAR**

Hams have a long history of applying digital technology to amateur radio communications. Starting with RTTY, a succession of other digital modes has ensued: Packet Radio, PSK, PACTOR and many others. D-STAR is the latest and perhaps most comprehensive effort to date, offering reliable digital voice and data communication all over the world.

History

After three years of research, the D-STAR protocol was published by the JARL (Japanese Amateur Relay League) in 2001. The research to investigate digital technologies for use in amateur radio was funded by the Japanese government and undertaken by a committee of Japanese radio manufacturers and interested observers. Icom, the primary promoter of this new technology, provided the equipment used for the development and testing phase of the program.

At first, adoption of the technology outside of Japan was relatively slow. However, in the last several years D-STAR repeater systems have started coming into their own. With the increasing availability of D-STAR repeater systems and gateways, the numbers of hams using these systems is showing dramatic growth.

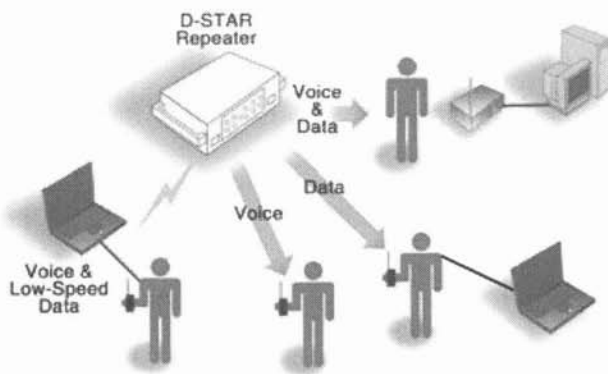
D-STAR repeaters and gateways are now available in many areas of the United States, Europe, Canada, South America and Australia. Repeaters linked to Internet Gateways provide voice and data communications all over the world.

To encourage equipment suppliers to adopt the technology, JARL published the D-STAR protocol as an “open” specification that details the over-the-air interface and repeater/gateway transport requirements for interoperability of D-STAR equipment. To date, Icom is the only manufacturer of D-STAR capable repeater systems and radios. As the technology becomes more widely adopted, other manufacturers may chose to offer equipment as well.

D-STAR Overview

D-STAR (Digital Smart Technologies for Amateur Radio) offers digital voice and slow and high-speed data communications. Slow-speed digital voice and data is transported at 4800 bps, with 3600 bps being used for voice and voice error correction, the remaining 1200 bps is used for synchronization and general use. Of this 1200 bps, about 900 bps is available for transporting data. High-speed digital data communication is transported at 128 kbps, supports Ethernet packets, and is fast enough for interactive Internet applications.

By connecting repeater sites over the Internet, forming a world-wide radio network, the D-STAR system provides state-of-the-art functionality to amateur radio repeater systems.



In D-STAR, voice communication is referred to as DV mode (digital voice) operation. Voice is converted to a digital format using an electronic chip called a CODEC, which encodes and decodes audio signals in the AMBE (Advanced Multi-Band Excitation) format.

To the critical ear the audio quality of a D-STAR voice signal may sound slightly inferior to a high quality FM signal, but is more than adequate for intelligible voice communications.

The nice thing about digital voice operation is that the quality of the signal remains crystal clear until it is lost. As long as the signal

remains above a minimum threshold, it can be decoded without degradation and will remain clear without the path noise or “picket fencing” weak signal artifacts common on traditional FM mode communications. If the signal falls below the level required for decoding, communication will drop out or become garbled, sounding a bit like the R2D2 Star Wars character.

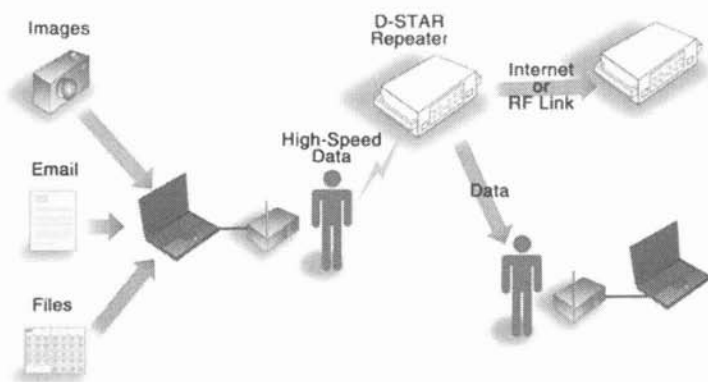
At first, operating D-STAR is a bit unnerving. After years of using conventional FM repeaters, its strange not to hear a squelch tail after releasing PTT. D-STAR repeaters drop the carrier almost immediately upon releasing PTT on the transceiver; consequently the momentary squelch tail hiss that we are accustomed to is not there. Being conditioned to delay transmission until after you hear a courtesy beep and then operating on a repeater without a beep can throw you off. Even though D-STAR repeaters don't broadcast courtesy beeps, it's still important to pause before replying, as it gives other stations a chance to break in. Not to worry though, after using D-STAR a bit that strange feeling soon goes away, being replace by the thrill of using this new mode of communication.

Interestingly, in DV mode, slow-speed 1200 bps digital data can be transmitted at the same time, and on the same frequency while you are engaged in a voice conversation. Since both voice and data are being handled digitally, they can be transmitted together on the same signal without any interference to your voice conversation.

Don't be misled by the term slow-speed, 1200 bps DV mode data is more than capable of keeping up with typing on a keyboard and for transmitting short messages and small amounts of data. Subtracting out header and message blocking overhead, DV mode data has about 900 bps available for general use and is much faster than PSK31, but slower than 9600 bps packet operation. Like packet, DV mode data is unsuitable for sending large files or “surfing the web.”

In addition to the slow-speed DV data that can be transmitted simultaneously with your voice on the 144, 440 MHz and 1.2 GHz bands, D-STAR supports a high-speed digital data rate of 128k bps on the 1.2 GHz band. Due to packet overhead and other factors, actual throughput is closer to 90k bps. Referred to as DD mode (digital data), this high-speed data capability is unique in amateur radio

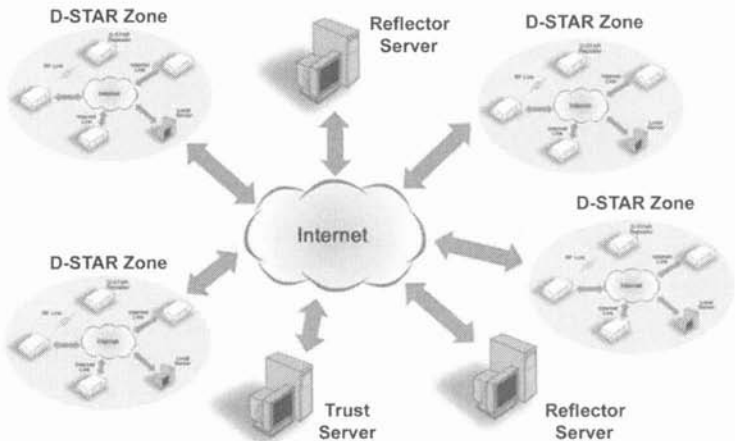
because it is fast enough to support exchanging large files, pictures and for user-interactive Internet e-mail and web browser applications.



Connecting your PC, laptop or PDA is simply a matter of connecting a cable to the radio, no external TNCs or other devices are required. For slow-speed data, depending upon the radio, either an RS-232 serial or USB cable is used. High-speed data connections are made using a standard Ethernet cable. Low-speed data capabilities are built into all VHF / UHF D-STAR transceivers currently being supplied by Icom. High-speed data is limited to radios with 1.2 GHz capabilities.

For emergency communications, one of the advantages of D-STAR's digital data capabilities is that messages can be locally transported independent of the Internet when the "lines are down".

But wait, there is more! A single repeater or a group of repeaters can be connected to the Internet via a device called a gateway and are referred to as a "Zone." Gateways use the Internet to connect to other D-STAR gateways and reflectors anywhere in the world. This allows you to communicate to hams located in areas far removed from your local repeater, somewhat similar to IRLP operation but with an interesting added capability. Whenever you key-up, your call sign is automatically transmitted via the digital transport mechanism built into the radio. When the gateway routes your call, it also stores your call sign locally and provides it to the Internet connected *Trust Server*. In this way the D-STAR system keeps track of which repeater you were last heard on.



By entering the call sign of whom you want to contact into your radio, you can make a directed call to that specific ham. The technique is referred to as *Call Sign Routing* and unlike IRLP, you don't need to know which repeater he is on. Periodically all gateways synchronize their local data with data located on the *Trust Server*. The gateway system uses that data to figure out which repeater your friend was last heard on and automatically routes your call to that repeater. *Call Sign Routing* can be thought of as being similar to how a cell phone operates. As you travel around, the cell system "knows" where you are at and directs incoming calls to the cell tower nearest to your location. D-STAR works much the same way.

With *Call Sign Routing*, after entering the call sign of the person you are trying to reach, the D-STAR system can automatically route your call to other repeaters, even if they are on a different band or in a different city. As a result, no matter which repeater your friend might have switched to, your call will be routed to where he was last heard. This solves the problem of having to make calls on all the repeaters that your friend might frequent.

D-STAR's Bits and Bytes

D-STAR DV mode (slow-speed digital and voice) transceivers produce an RF signal that is quite different than those produced by conventional FM transceivers. The voice portion of the output signal is not FM modulated; audio is directly converted to a digital data stream using a AMBE (Audio Multi Band Encoder) codec chip, in turn the AMBE voice data is combined with other digital data to form a simultaneous composite voice and digital data stream, which is then transmitted as a GMSK modulated signal.

Within the D-STAR specification, the exact format of this composite digital stream is defined as the *Common Air Interface*, or *CAI* protocol and is made up of a *Radio Header* followed by the *data* payload. The *Radio Header* consists of a series of synchronizing and control bits followed by four call signs used to route the signal to its intended destination. The data payload portion consists of alternating *Frames of Voice* and *Data* information: a frame of 72 bits of voice followed by a frame of 24 bits of data, a pattern which continuously repeats until followed by a unique termination frame of 48 bits. This pattern of alternating digital voice and data frames occurs regardless if there is voice and no data, or if there is data and no voice. Space in the payload is always reserved for the voice and data frames regardless of whether they are used or not.

For those interested in the detailed structure of the *Common Air Interface* protocol and other technical details of the D-STAR over-the-air protocol, an English copy of the JARL specification can be downloaded from www.jarl.com/d-star/shogen.pdf

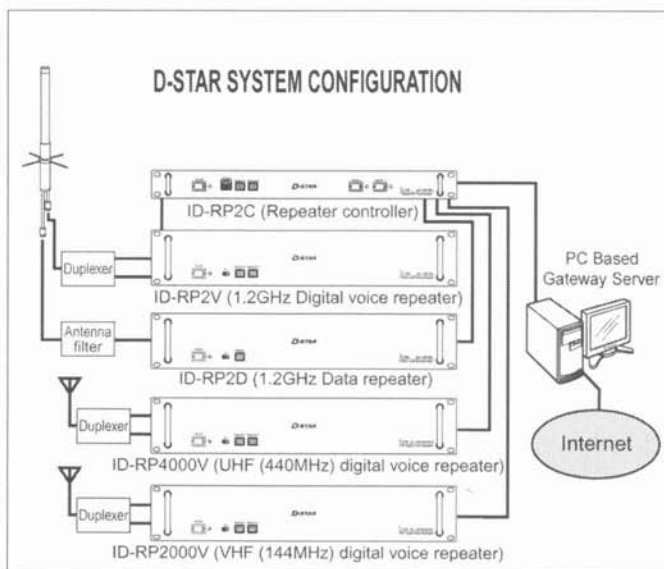
A more comprehensive look at the D-STAR over-the-air protocol is provided by Peter Loveall, AE5PL in his excellent paper titled *D-STAR Uncovered*. This paper provides additional insight and information beyond what is in the JARL specification, including a summary of Icom's enhancements to the base specification.
<http://www.aprs-is.net/downloads/DStar/DSTARUncovered.pdf>

Both of the above documents are quite technical, describing the air-link communication protocol in exacting detail and are the basis for how the system is designed. These documents are primarily of interest to those designing D-STAR compatible equipment or software.

If this bits and bytes stuff is all Greek to you, don't worry, a detailed understanding of the underlying voice and data transmission protocol is not essential for enjoying the benefits of D-STAR operation. It's really no different than driving modern automobiles, using computers or accessing the Internet, all of which rely on complex systems and do not necessitate our detailed understanding before being able to successfully operate them.

Repeater System Configuration

As shown below, a typical D-STAR repeater system consists of one or more repeater modules that are interconnected via a repeater controller, which also supports a connection to the Internet via a PC running a D-STAR compatible gateway program under the LINUX operating system.



A repeater system can be configured with repeater modules supporting digital voice on the 144 MHz, 440 MHz and 1.2 GHz bands. A given installation may include any combination of the three voice modules. Notice that if high-speed digital data is to be supported, a separate 1.2 GHz digital data repeater module is required.

A repeater system can be configured without including a PC gateway server to the Internet. Of course, the repeater system loses the capability of communicating with remote gateways and repeaters, but still provides functionality similar to that provided by conventional stand-alone FM mode repeaters.

It's common practice to refer to individual repeater modules connected to a repeater controller in a D-STAR system as *nodes*, *modules* or *ports*. For example, the four repeater modules shown in the preceding diagram can alternately be referred to as *nodes*, *modules* or *ports*. Regardless of which term is used, they all refer to a specific repeater module. The term port is derived from the practice of referring to individual repeater modules as being connected to a repeater controller's ports.

The agreed upon practice for naming these modules is to add a letter designating the individual port after the main call sign for the system. Regardless of the length of the main call sign, the port designation is always placed in the 8th character position, preceded by as many spaces as necessary to fall in the 8th position.

The “_” underline characters below are only used to illustrate the required spaces. When entering an actual call, use “real” spaces not the underline.

W6XYZ__A	DV	1.2 GHz voice repeater, Port A
W6XYZ__A	DD	1.2 GHz high-speed data repeater, Port A
W6XYZ__B	DV	440 MHz band data / voice repeater, Port B
W6XYZ__C	DV	144 MHz band data / voice repeater, Port C
W6XYZ__G		The system's Internet gateway, Port G

To avoid confusion as to which local repeater and *port* you are operating through, always indicate the *port* you are on. For example, when making a call through W6XYZ, you would announce “N6FN (using your own call sign) calling on W6XYZ port B.”

Notice that the entire repeater system is given a single call sign. Repeater call signs are restricted to a maximum of 6 characters. Individual repeater modules are identified via the port designation suffix that appears in the 8th character position. Unlike conventional repeaters, D-STAR repeater systems must have unique call signs, they cannot be an individual's call sign, otherwise *Call Sign Routing* would not be able to function.

Programming D-STAR Call Sign Parameters

Programming a transceiver to make calls (or for linking to a gateway or reflector) involves programming call signs into the four parameters of the *Call Sign Routing Register*:

- **UR CALL** Call of the station, node or reflector you are calling.
- **RPT1** Call of the local repeater node you are calling from.
- **RPT2** Call of a destination repeater or your local gateway.
- **MY CALL** Your own call sign, or call sign variations.

Different transceiver models may display slightly different abbreviations for these four parameters, but on all radios they accomplish the same thing. These parameters are programmed in different ways depending upon how you are making the call: simplex, local repeater, Repeater Node or Call Sign Routing, and Gateway or Reflector linking.

UR CALL This is either set to the call sign of the station you want to talk to, or is set to **CQCQCQ** so you can call CQ or work round-table as on a conventional FM repeater. When using a gateway, **UR CALL** either designates the call sign of the individual you are calling, or is used to control gateway linking or for accessing a reflector.

RPT1 Used to enter the call sign of the local repeater you are using. The 8th character position is special as it specifies the band and port you are operating on. You need to insert spaces as necessary to make sure that the port switch letter (A, B or C) falls in the 8th character position.

RPT2 This is the call sign of where we want our transmission to go, either to one of the other ports on the same repeater system, or to the gateway used to access the D-STAR network. Again, the 8th character position is special because it is used for the port switch designation letter: A, B, C or G.

MY CALL This is used for your own call sign, or perhaps a variation of it with a suffix indicating different radios that you might be using. The differentiating suffix is placed at the end of your call, but must not be placed in the 8th character position, which is reserved.

In this book, the *Call Sign Routing Register* refers to the current or active call sign memory that the radio uses to make D-STAR calls. As we will see in Chapter 4, depending upon the radio, there are several ways for making entries into the *Call Sign Routing Register*.

- Manually editing the current *Call Sign Routing Register*
- Copying from the **UrCall**, **Repeater** and **MyCall** memory banks
- Using the [RX-CS] key one-touch reply feature
- Recalling a memory channel that has these parameters set

Generally you would not want to be programming call signs whenever you wish to call someone. And, you certainly don't want to attempt programming call signs while driving. The normal practice is to store in advance all call and repeater node combinations you expect to use into the call sign memories within the transceiver. Once your transceiver has been programmed, it's a simple matter of recalling the correct call sequence from memory.

Local DSTAR repeater groups typically provide the information required for accessing your local repeaters. In addition, as we shall see in Chapter 6, there are several web-based resources providing call sign information for D-STAR systems all over the world.

Using D-STAR Gateways

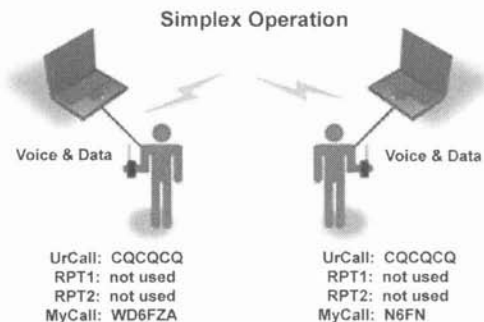
One of the key features of D-STAR is the ability to communicate with other D-STAR systems over the Internet. Indeed, connecting repeater systems via gateways is one of the most powerful aspects of D-STAR operation. Most of the enhanced capabilities of D-STAR repeater systems rely on their gateway connection.

Since so much can be done via the gateway system, the creators of D-STAR have implemented a worldwide gateway user registration system in order to prevent misuse of the resource. Users must register to be able to operate any D-STAR features that involve gateway access to the Internet. Without registration you are generally limited to simplex and local repeater operation.

Except for the "Operating Simplex" and "Local / Same Repeater Operation" sections below, you will need to register for gateway access if you wish to try any of the features described in the following sections. (Registering is covered in Chapter 3.)

Operating Simplex

D-STAR transceivers are capable of working station-to-station on simplex, just like conventional FM transceivers. One advantage of a D-STAR radio is that it's already equipped for digital communications. This can simplify situations when you want to transmit data, perhaps for emergency communications or public service events such as aid stations spread along a bike or foot race. Small files in the vicinity of 10k bytes or less can be sent via normal VHF / UHF DV digital mode. If larger file transmissions are required, two 1.2 GHz, ID-1 transceivers can transfer data directly without the use of a repeater.



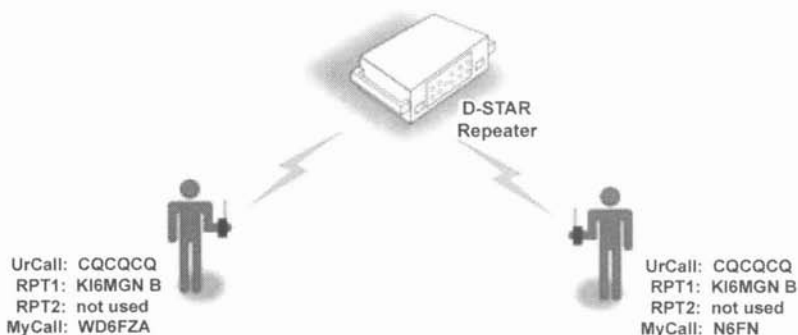
To talk to anyone on simplex without having to input their call sign, the **UrCall** field is programmed with **CQCQCQ**. Since repeaters are not used when working simplex, depending upon the radio, **RPT1** and **RPT2** are programmed as “not used” or left blank. And of course, your own call sign is used in the **MyCall** field.

Here we see that N6FN and WD6FZA, except for their individual call signs, have their radios set the same way and will be able to talk to anyone that is on the same simplex frequency.

Local / Same Repeater Operation

When working locally on a single D-STAR repeater module, the call sign of the local repeater module is used in **RPT1**, and depending upon the radio, **RPT2** can be marked as “not used” or left blank.

Single / Local Repeater Operation



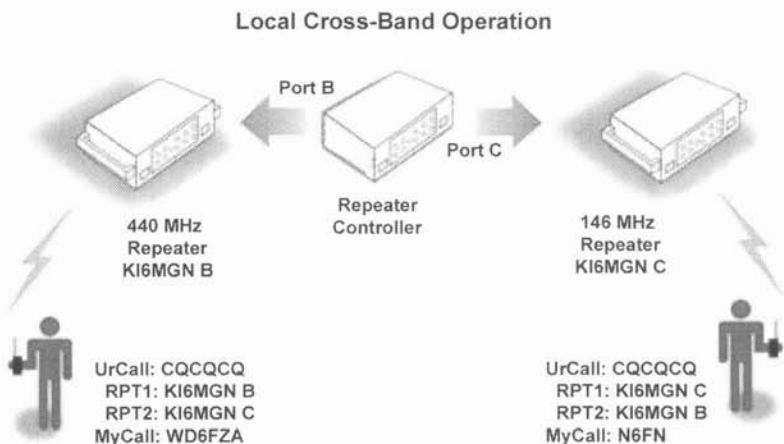
In the above example notice that the call sign for **RPT1** is KI6MGN_B, which indicates it is a 440 MHz repeater attached to port B of the controller. Using **CQCQCQ** in the **UrCall** field allows inter-communication between all users on the repeater without having to enter a specific station's call sign.

With the call signs set as shown, operation is very similar to a conventional FM repeater with everyone being able to hear each other and participate in the conversation.

Note: So that linked gateways, reflectors and DV Dongle users can hear your traffic, most D-STAR system administrators recommend that the **RPT2** field be set to your local gateway. In the case of the PAPA system KI6MGN repeater, **RPT2** would be set to KI6MGN_G.

Local Cross-band Repeater Operation

If your local repeater system has two or more modules, you can work cross-band just as if you were operating on a single repeater. In this case, **RPT1** specifies which repeater you are operating through, and **RPT2** specifies the destination repeater. The local repeater controller takes care of routing the signals between the two ports.



In this example WD6FZA is going through the KI6MGN_B, 440 MHz repeater, and N6FN is going through the KI6MGN_C 146 MHz repeater. It is important that the port switch designation (the letters B and C in this case) is programmed into the 8th character position.

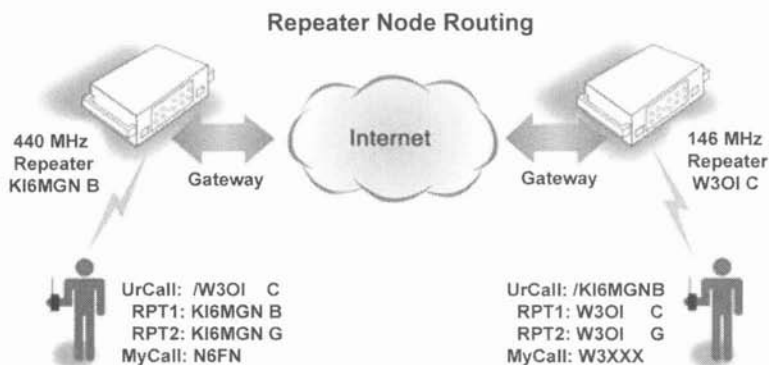
Notice that since the two stations involved are on separate repeater modules serviced by the same repeater controller, a gateway is not being used, and that the call signs they programmed into **RPT1** and **RPT2** of their radios are reversed.

When the station hearing the call, in this case N6FN, wants to respond he needs to set his radio's **RPT2** field to the radio module being used by the calling station, in this case KI6MGN_B. But keep in mind that the calling station needs to identify which module he is on so the answering station can configure his radio to the repeater module that the calling station is using.

Repeater Node Routing

Repeater Node Routing, also called “Source Routing,” “Port Linking” or a “Zone Call” allows the user to specify a specific repeater node as the destination for his transmission. This can be used to place a call to a specific ham or perhaps as a way of announcing your presence or calling CQ on a distant repeater.

Using this method a user can either send his signal to a different port on the same repeater system or to any gateway connected repeater node in the world.



To use Repeater Node Routing a “ / ” is placed in front of the destination repeater’s call sign in the **UrCall** field. The leading “ / ” character lets the controller know you are making a call to a specific repeater node and that it’s not the call sign of a person.

Note: After N6FN made his call to the W3OI___C repeater, W3XXX configured his radio using Node Routing to route his call back to N6FN’s repeater, KI6MGN_B. The “G” suffix in the 8th character position of the **RPT2** field indicates that the signal is to be routed to the gateway.

When someone answers a call made using Node Routing, they must configure their radio to route their signal back to the repeater module that the source radio is using. Therefore, as is generally the case when using D-STAR, the calling station needs to identify which repeater and port he is calling from.

A receiving station, in addition to hearing the transmitting station identify the repeater he is calling from, can also examine the *Received Call* memory on his radio. Refer to the *Received Call History* procedure in Chapter 4 for details on how to examine the *Received Call* memory.

When you are finished with your QSO on the remote repeater you need to change the **UrCall** field back to **CQCQCQ**, otherwise when making any further contacts, even on your local repeater, your voice will still be routed to and heard on the remote repeater indicated in the **UrCall** field. This is an easy mistake to make and I suppose everyone has done it at one time or another.

I supposedly know better, but here is how easy it is to make a mistake. Hearing Toshi JF1CXH, a Japanese station, calling on our local D-STAR repeater, I configured my radio for Node Routing back to his repeater by placing his local repeater call sign, /JP1YIQA into my radio's **UrCall** field. So far so good and the QSO went fine.

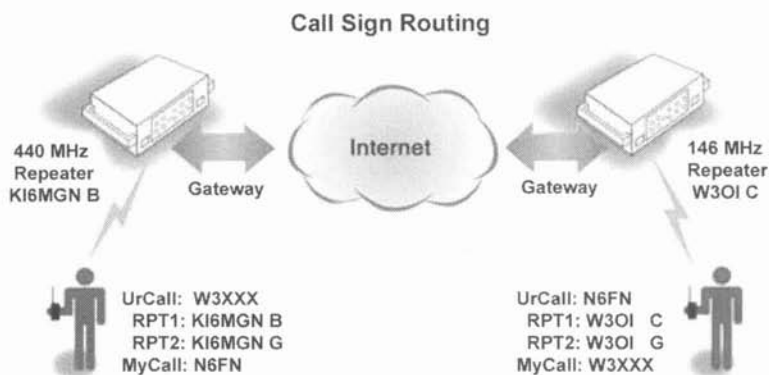
The problem "snuck in" after my QSO with Toshi in Japan ended. Just as I signed off with Toshi, I was immediately called by another station on my local repeater. Not thinking, I returned his call and we chatted a bit about making contacts to Japan and a few other topics. Only after finishing the follow-on QSO did I remember that I had neglected to switch my **UrCall** field back to **CQCQCQ**. The result was that my side of the follow-on conversation was broadcast in Japan! I was the cause of several minutes of unintended interference on their repeater. Not good!

This can happen when using any of the D-STAR modes where you are either routed to or connected to a remote repeater or reflector. Its important to remember to reconfigure your radio's **UrCall** field and if necessary also the **RPT1** and **RPT2** fields back to where they need to be to prevent "interference" on a remote repeater node. Stay alert and don't let this happen to you.

Call Sign Routing

With *Call Sign Routing*, also referred to as *User Linking*, you can make a call to a specific ham without having to know what repeater system he is on. Providing a ham has registered for gateway operation, whenever he transmits on a gateway-equipped system, the D-STAR gateway system's database is updated with the repeater system module he was last heard on.

When you make a directed call to a specific amateur's call sign, the gateway system automatically routes your call to the repeater module where that station was last heard.



In this example *Call Sign Routing* is being used by N6FN to locate and talk to W3XXX, which happens to be on the W3OI__C module at the moment. Notice that W3XXX has set his **UrCall** field to N6FN's call sign to answer his call. The other three fields were probably already set since he has recently been using the W3OI__C repeater.

Before the ham you are calling can respond, he needs to program his radio's **UrCall** register with your call. The responding station can manually enter your call into his radio (or select it if already has it in memory) or he can use the **[RX-CS]** "one-touch" key on his radio, if it has one. The more recent D-STAR capable transceivers have the one-touch capability to copy a received station's call sign to the **UrCall** field.

Using the one-touch reply [**RX-CS**] key only temporarily copies N6FN's call sign into the **UrCall** field, and will last until something else is placed into the **UrCall** field. It's not permanently saved anywhere. One-touch operation is described in the following section.

Note that both stations have set **RPT2** to their local gateway. Doing so has allowed the gateway system to rout N6FN's call to the last repeater module that W3XXX has been heard on. As a side note, it also allows Dongle users to hear both sides of the conversation.

One of the issues with *Call Sign Routing* is that the "last heard on" process can take an hour or more to update the database; therefore the user may no longer be on that repeater.

One way to partially get around the problem, so that you can immediately receive calls when away from your local repeater, is as soon as you are on another D-STAR repeater system place a call back to your local repeater. Then at least your local repeater system will immediately know what repeater you are on, and if anyone calls you from there using *Call Sign Routing*, their call will be forwarded to where you are at.

Of course, if your friend is using **CQCQCQ** in the **UrCall** field when operating on your local home repeater, you will not receive any calls directed to you unless he knows you are out of town and switches over to *Call Sign Routing* by entering your call sign into his **UrCall** field.

By the way, if out of town, what method do you use to call back to your home repeater system? You have a couple of choices: you could either use *Call Sign Routing* if you wanted to call a particular station, or if you just wanted to check in with a general call on your home repeater you could use *Repeater Node Routing*.

When you are done talking with your friend you need to change your **UrCall** field back to **CQCQCQ**, otherwise when making any further contacts, even on your local repeater, your voice will still be routed to and heard on the remote repeater where your friend was last operating.

Doubling using Repeater Node or Call Sign Routing

A point to keep in mind when using *Repeater Node* or *Call Sign Routing* is that when using these modes you do not “hear” any traffic occurring on the distant repeater module. Digital packets representing your transmissions are routed to the distant repeater; you are not actually connected or linked to the repeater. Consequently there is a possibility that your call might double with traffic occurring on the distant repeater. You will only hear transmissions from a responding station, if he has set his **UrCall** field to either your call sign or the call sign of the local repeater node you are using.

If your transmission should inadvertently double with existing traffic, the distant repeater’s controller inhibits your transmission, preventing a double, and returns an error message: **RPT?AA6AAA**, with the call sign of your local node following the question mark. When your radio receives the error message, it is scrolled on the display. If you see this message, wait a bit and try your call again.

One of the advantages of Dplus, discussed in the following chapter, is that the potential for doubling with traffic on a distant repeater can be overcome by “linking” to distant repeaters. Dplus linking is different than *Repeater* or *Node Routing*, because you hear all traffic on the distant repeater, and can thus time your calls, just as you would on a normal FM repeater.

Setting the UrCall field back to CQCQCQ

As we have seen, its important to change your radio's **UrCall** call sign routing field back to **CQCQCQ** after setting it to something else for making calls to specific stations, repeaters or sending linking commands as we will see in the next chapter.

Setting UrCall field to CQCQCQ on the IC-80AD:

1. Starting with the DV operating mode selected and a D-STAR repeater frequency being displayed on the screen.
2. While holding [▪ / UR] rotate [DIAL] to select **CQCQCQ**.

Setting UrCall field to CQCQCQ on the ID-880H:

1. Starting with the DV operating mode selected.
2. Press front panel [UR] 1sec
3. Rotate [DIAL] to select **CQCQCQ**, Press [UR] again to exit.

Setting UrCall field to CQCQCQ on the IC-91AD and IC-92AD:

1. Starting with the DV operating mode selected and a D-STAR repeater frequency being displayed on the screen.
2. Press [0/ CQ] until you hear a beep, then release.

Setting UrCall field to CQCQCQ on the IC-2820:

1. Starting with the DV operating mode selected.
2. If necessary, press [F] twice to access the DV mode function keys. (CS CD CQ R>CS etc.)
3. Press [CQ] to set the UR field to **CQCQCQ**.

To set **CQCQCQ** on other radios, refer to the Icom user manual.

One-touch Reply

The one-touch feature, available on newer model Icom transceivers that have the **[RX-CS]** key, is a handy way of responding to a call. As calls are received they are automatically stored in the *Call History* memory and are available for use by the one-touch feature. Pressing the **[RX-CS]** key sets the radio to respond to the most recent call received by copying the caller's call sign to the **UR** call field.

However, if another call is received after the one you want to respond to, you will need to select the desired call from the *Received Call History* memory as shown in step 3 below.

Be aware, that if the repeater produces a transmission after the desired call was received, one-touch may copy the repeater's gateway call sign to the **UrCall** field. If so, skip step 2 and use step 3 to select the desired call.

Important: After using the one-touch feature to make a reply, be sure to change your radio's **UrCall** field back to **CQCQCQ**.

Using One-touch on the IC-80AD, IC-91AD and IC92AD:

1. First make sure that your own call sign has been set into the **MY** call field and that **RPT1** and **RPT2** are set for *Call Sign Routing* from your local repeater.
2. (Only use Step 2 or 3) After a call has been received, press and hold the **[RX-CS]** key one second to set the *Call Sign Routing Register* to respond to the most recently received call.
3. **Or** if you want to select a call sign from a list of recently received call signs, press and hold the **[RX-CS]** key and rotate **[DIAL]** to select the desired call sign record. Recently received call signs stored in the *Call History Memory* are displayed on the screen.
4. Everything is now set; press **[PTT]** to transmit.

Using One-touch on the ID-880H:

1. First make sure that your own call sign has been set into the **MY** call field and that **RPT1** and **RPT2** are set for *Call Sign Routing* from your local repeater.
2. (Only use Step 2 or 3~5) After a call has been received, press and hold the **[RX-CS]** key one second to set *Call Sign Routing Register* to respond to the most recently received call. (Call is displayed as long as you hold the **[RX-CS]** key.
3. **Or** if you want to select a call sign from a list of recently received call signs, press **[MENU]** and rotate **[DIAL]** to select **RX CAL**. Then press **[▶]** and rotate **[DIAL]** to select the desired call sign record. Recently received call signs stored in the *Call History Memory* are displayed on the screen.
4. Press **[MW/ S.MW]** 1sec to copy to the **UR** call sign field.
5. Everything is now set; press **[PTT]** to transmit.

Using One-touch on the IC-2820:

1. First make sure that your own call sign has been set into the **MY** call field and that **RPT1** and **RPT2** are set for *Call Sign Routing* from your local repeater.
2. After a call has been received, press **[F]** twice to access the DV mode function keys. (**CS CD CQ R>CS** etc.)
3. (Only use Step 3 or 4) Press **[R>CS]** key to set the *Call Sign Routing Register* to respond to the most recently received call.
4. **Or** if you want to select a call sign from a list of recently received call signs, press the **[CD]** key and rotate **[MAIN•BAND]** to select the desired **CALLER** call sign from the **RX CALL SIGN** history memory.
5. Everything is now set; press **[PTT]** to transmit.

Automatic Call Sign Update Prevention

Icom's D-STAR radios have two menus that can enable received call signs to automatically replace call signs in the *Call Sign Routing Register*. In general you don't want this to happen, so you should verify that they are turned OFF, which is the default setting for these two menus.

The "RX Call Sign Auto Write" menu should be set to OFF to prevent having received station's call sign automatically replace your **UrCall** setting. The default setting is OFF.

The "Repeater Call Sign Auto Write" menu should be set to OFF to prevent having received station's RPT1 and RPT2 call signs automatically replace your RPT1 and RPT2 settings. The default setting is OFF.

Multicast Groups

Multicast is a feature that Icom added with the G2 version of the gateway software. Multicast allows an administrator to associate a group of repeater nodes with an alias (a name of his choosing). Using a Multicast group name allows an administrator to route transmissions between as many as 11 repeater nodes. Multicast group names of up to seven characters long always start with the character "/". When this name is referred to, it has the same effect as referencing all of the repeater nodes in the network at once.

UR CALL:	/CA1200	Multicast group name.
RPT1:	WR6BRN_C	Local module you are linking from.
RPT2:	WR6BRN_G	Gateway for local repeater module.
MY CALL:	N6XXX	Your own call sign.

While users don't have the capability of creating Multicast Groups, they can make use of the feature by placing the group name in their **UrCall** field. When a user transmits using a Multicast group name, he will be heard on all the repeater nodes in the group. The user's local gateway accomplishes this by sending a stream of data to each of the nodes in the group.

So that users on remote repeaters can respond, it is important to announce the repeater you are calling from and the Multicast Group name being used. If responding stations don't use the Group name in their **UrCall** field, they will not be heard on all the repeaters in the network.

Important: At the end of the round table or net and going back to normal operation, it is important that each station terminate multicast operation by resetting their **UrCall** field back to **CQCQCQ** or something else. Otherwise, their transmissions will still go out to the entire group of repeaters.

Identify Where You Are Calling From and Wait

Whenever making calls on a D-STAR system it is imperative that you identify the repeater and port you are calling from. Otherwise when a station hears your call he won't know if you are local or elsewhere. If you are not on his local repeater he may need to know where you are transmitting from in case he needs to change the settings in his **UrCall** and **RPT2** call sign fields.

Typically you would state the location of the repeater and which port you are on. For instance if operating on the PAPA system Mount Palomar repeater you might say that you are "using Mount Palomar KI6MGN port B."

This brings up the second point to remember when making calls over the D-STAR system. After making a call, monitor long enough for a responding station to make any radio changes necessary. Since it is likely that the responding station was otherwise preoccupied, it may take a few minutes for him to "put down" what he was doing, change his radio settings and return your call. Repeating your call once or twice (don't get carried away here like calling CQ on HF) may allow the station to make note of where you are at so he can make the required settings.

On repeaters with frequent traffic, you may also want to hold transmission a sufficient amount of time to allow a receiving station to use his "one-touch reply" key to copy your call sign information to his radio's D-STAR call sign fields. Remember, he has to hear your call, pick up his radio and then press the key. If your call is too short, by the time he is ready to press the key your signal may have been pushed down in the stack of calls in the *Call History Memory*. Remember, one-touch retrieves the most recent call from the *Call History Memory*.

Limiting Position Beacons and Data Mode Operation

Whenever multiple D-STAR repeater nodes are linked together for group, emergency or net operations, via Multicast or the Dplus linking methods described in the next chapter, automatic APRS / DPRS GPS position beacons should be turned off or be set to transmit only on PTT. Automatic beacons every few minutes will result in data being transmitted to all connected nodes, causing collisions (doubling) with other user's transmissions.

Likewise, for the same reason, consider delaying DV data mode transmission until the net is over or switch to another repeater system. While data can be sent along with a voice transmission, if automatic data transmission has been selected, it won't wait for a voice transmission to occur. It will occur anytime data is ready to be sent.

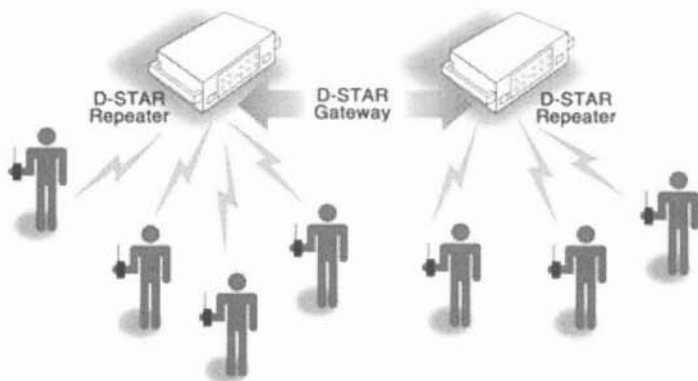
Chapter 2: **Dplus Gateway Operation**

Dplus is an auxiliary gateway operating system program used to route calls and establish links between D-STAR repeater nodes. Dplus adds features to gateway operation beyond those provided by Icom's G2 gateway software. Because of its enhanced capabilities, Dplus, written by Robin Cutshaw, AA4RC is almost universally installed on all gateways outside of Japan. If installed on your local gateway, among other things, it provides Gateway and Reflector linking capabilities as well as an Echo Test and a means of verifying link status.

As a side note, the Dplus gateway software is periodically upgraded as new features are added. While the installation and maintenance of the Dplus software is performed by your system administrators, new features, which may affect operation, could be introduced at any time. If so, your system administrator will notify you of any operational changes that may need to be made.

Dplus Gateway Linking

With Dplus installed, it's possible for a user or a system administrator to initiate a link between two repeater modules residing on different gateway systems.



Once a link has been established, all users on the two linked repeater modules can contact each other in a manner similar to conventional FM repeaters that have been linked together. When any station on one repeater transmits, all stations on the remote gateway linked repeater hear that transmission. The system takes care of routing signals back and forth and users should not use any special routing. Their **UrCall** sign configurations should be set to **CQCQCQ** and **RPT2** should be set to the call sign of their local gateway with a "G" in the 8th character position, just as if they were making local calls.

Depending upon the system in your area, you may find repeater nodes linked together temporarily or semi-permanently, either by individual users or by a system administrator.

Some systems may not allow individual users to perform linking operations. Establishing a link should not be attempted without first contacting the administrators of a D-STAR system to find out if it is allowed and to determine any procedures they want used.

Establishing a Dplus Gateway Link

Administrators can establish links via their command line control system for the gateway. If enabled on their local repeater system, users can establish a gateway link to another repeater by setting the **UrCall** field to the call of the remote repeater followed by the letter “L” in the 8th character position to signal that you wish to establish a link.

Step 1. Programming Call Signs for making the link:

For example, if you are currently located on the 2-meter module of the WR6BRN system and wanted to link to the 70cm module of the KI6MGN_B system, the *Call Sign Routing Register* would be set as follows:

UR CALL:	KI6MGNBL	Repeater module B you are linking to.
RPT1:	WR6BRN_C	Local module you are linking from.
RPT2:	WR6BRN_G	Gateway for local repeater module.
MY CALL:	N6XXX	Your own call sign.

Step 2. Key up and identify

Once you have programmed the call fields for making the link, key up and state your intention: “N6XXX, activating link to KI6MGN module B”.

Step 3. Change UrCall back to “CQCQCQ”

When you hear a voice announcement saying, “Remote System is Linked.” the link is established. Before trying to make any contacts, change your radio’s **UrCall** field back to **CQCQCQ**. If you don’t do this, the system will attempt to re-establish the link every time you transmit. While this is not catastrophic, it does burden the system with unnecessary activity.

UR CALL:	CQCQCQ	Set to communicate with any station.
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You might also hear another message: “System Currently Linked,” which means that the repeater you are trying to link to is already linked to somewhere else, or that you didn’t change your radio’s **UrCall** field back to **CQCQCQ**.

Step 4. Un-Link at the end of the QSO

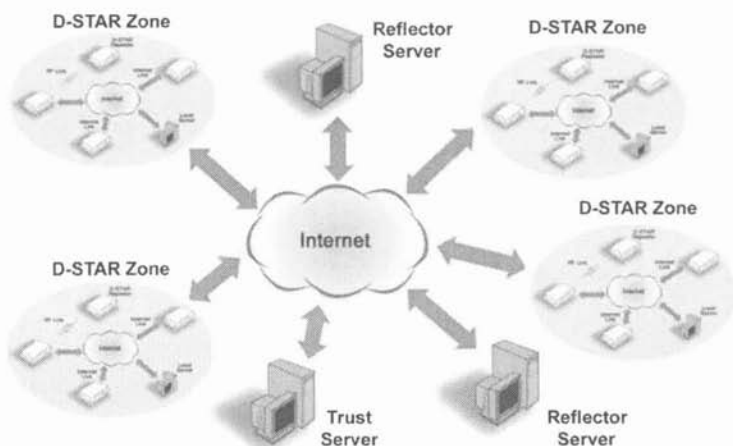
You must remember to unlink the repeaters when you are finished. As a practical matter, any station can terminate the link, it does not have to be the originator of the link. To terminate the link, set the **UrCall** field as shown below. (Seven spaces followed by the letter “U”.)

UR CALL: _____ U Place a “U” in 8th character position.

You might also hear another message: “System Not Currently Linked,” which occurs if you try and unlink, but the repeater is not currently linked. This can be used to verify that the repeater is indeed unlinked.

Dplus Reflector Linking

Gateways equipped with Dplus can use Internet connected reflectors for linking multiple repeater nodes together, permitting conversations among all users on the linked nodes. The reflector acts as a central conferencing hub, which is the key element that enables linking multiple D-STAR repeater nodes together.



Reflectors are a special type of Internet connected gateway that “reflects” DV mode voice and data back to all linked nodes. When the reflector receives a transmission from one of the linked nodes, it rebroadcasts it to all of the other linked nodes. The effect of this is that all users on all linked nodes are able to hear and talk to each other without having to change their radio’s *Call Sign Routing Register* settings. All users should leave their radios set for local repeater operation.

Reflector links are often set up for wide area nets and for emergency communications. Repeaters are generally linked and unlinked from reflectors by system administrators, however some D-STAR systems also allow their users to establish links.

If a Reflector Link has been established, users on any of the linked nodes can talk and hear each other without having to modify their radio’s **UrCall** field. The settings normally used for local repeater operation will work, providing the **RPT2** field is set to the call sign of the local gateway with “G” set in the 8th character position as shown below.

UR CALL:	CQCQCQ	Set to CQCQCQ for reflector use.
RPT1:	WR6BRN_C	Local module you are operating on.
RPT2:	WR6BRN_G	Gateway for local repeater module.
MY CALL:	N6XXX	Your own call sign.

As of late 2009 there were 26 reflectors worldwide, REF001 through REF026, and more are being added as time goes on. Each reflector has three modules, A, B and C, each of which can support the linking of different groups of repeater nodes together. A reflector’s modules can all be active at the same time and are somewhat like having three different conference rooms, each supporting their own group of linked repeater nodes.

A current list of reflectors, where they are located and a short description of what the A, B, C modules are normally used for can be found at: <http://www.dstarinfo.com/reflectors/reflectors.aspx>

A sample screen shot of this web page appears below. Only part of the page is shown here, the full page and current reflector status is available at the above URL.

Reflector	Usage	Location
REF001A		Aurora Illinois, United States
REF001B	Some Nets	Aurora Illinois, United States
REF001C	D-STAR's MegaRepeater	Aurora Illinois, United States
REF002A	<u>Southeastern US D-STAR Weather Net</u>	Nebraska, United States
REF002B	Some Nets	Nebraska, United States
REF002C	Some Nets, Atlanta Area Repeaters	Nebraska, United States
REF003A	Ad-hock & Emergency Use - Australia	Australia
REF003B	Permalink for Repeaters, including all WIA Port B Repeaters - Australia	Australia
REF003C	Australian Nets	Australia
REF004A	<u>Alternate for Southeastern US D-STAR Weather Net</u>	United States
REF004B	Texas Permalink Repeaters	United States
REF004C	Unknown	United States
REF005A	UK Nets, Permalink Repeaters	London, England
REF005B	French Language - Swiss and French users	London, England
REF005C		London, England
REF006A	Scottish Net	London, England

Clicking on a reflector's **Status** (under **Links**) will bring up a screen showing a list of repeater nodes and dongles that are currently being linked by that reflector. A sample of which is shown on the following page.

Linked Gateways

Module A	Module B	Module C
	K6MGN C	
	KF6BQK B	
	K8LCD C	
	KW6HRO A	
	K6MDD B	
	K6KQU B	
	K6IFR B	
	KT7APR B	

DV Dongle Users

Callsign
K6BK
WB8REI
KC8YQL
K6NHY
KM6AW
WA8YGR
WD6FZA
K0FNFZ
AH6KD

Depending upon your local system's usage, you might find that one or more of your local system's repeaters are linked together on a permanent or semi-permanent basis. It is common practice for some repeaters to maintain a full time link to a reflector. A transmission on any one of the repeaters is heard on all of the repeaters. If you are hearing calls from stations that are not in your local area, chances are your repeater is linked with one or more remote systems. If you think this might be the case, you can use the above-mentioned URL to check the link status of your local system.

Establishing a Reflector Link

If your local repeater system allows users to establish links, here is the procedure. The procedure is exactly the same as for Dplus linking of two repeaters, except the name of a reflector module instead of a call sign is used in the **UrCall** field,

Step 1. Programming the command for linking to a reflector:

For example, if you were currently located on the 2-meter module of the WR6BRN system and wanted to link to the REF001C reflector, the *Call Sign Routing Register* would be set as follows:

UR CALL:	REF001CL	Reflector module you are linking to.
RPT1:	WR6BRN_C	Local module you are linking from.
RPT2:	WR6BRN_G	Gateway for local repeater module.
MY CALL:	N6XXX	Your own call sign.

Step 2. Key up and identify

Once you have programmed the call fields for making the link, key up and state your intention: "N6XXX, linking to Reflector 001 module C".

Step 3. Change UrCall back to "CQCQCQ"

When the link is established, you will hear a voice announcement saying, "Remote System is Linked," you then need to change the **UrCall** field back to **CQCQCQ**. If you don't do this, the system will attempt to re-establish the link every time you transmit.

UR CALL:	CQCQCQ	Set to communicate with any station.
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Step 4. At the end of the linked session, Un-link

When the linked session is complete set the **UrCall** field as shown below to terminate the link. (Seven spaces followed by the letter U.)

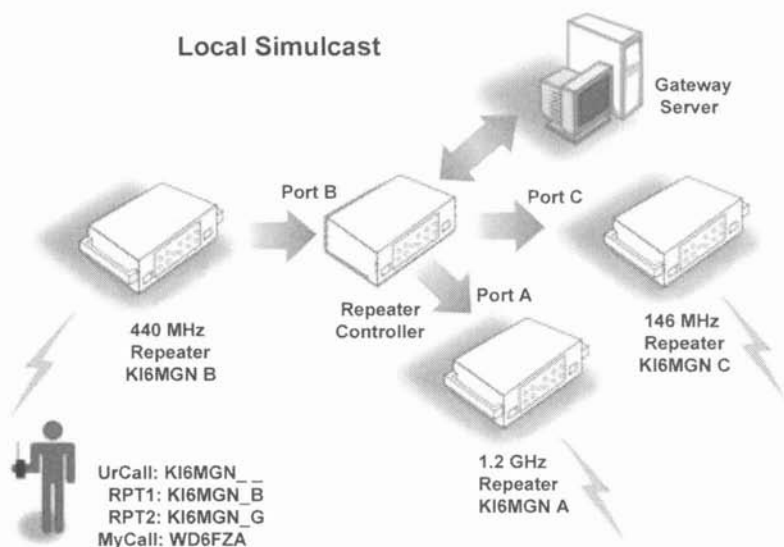
UR CALL:	_____U	Place a "U" in 8 th character position.
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If the command was accepted you will hear a voice announcing "Remote System is Un-linked."

Step 5. Change UrCall back to CQCQCQ

Local Simulcast

Local Simulcast allows you to simultaneously transmit on all the local repeater system modules attached to a given controller. In a full stack system, there would be three voice modules, one for each of the bands: 2m, 70cm and 23 cm.

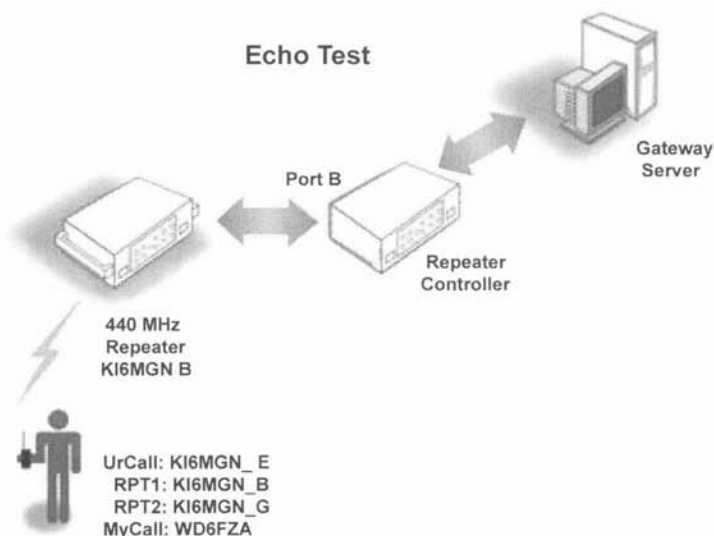


To transmit on all of a repeater system's local modules, program **UrCALL** with the gateway call sign followed by however many spaces are required to fill all 8 positions. Note that in this case, trailing spaces are important, without them the controller will not "know" that this is a simulcast request.

If other stations on the repeater system also have their radios set for simulcast, users on all of the repeater modules can talk to each other.

Echo Audio Quality Testing

Echo audio testing is a handy feature of Dplus equipped gateways. Users can make a short transmission, and after unkeying a recording of your transmission will be played back. Besides being a useful check of your audio transmit quality, it can also be used to verify that your local repeater modules and gateway are operating normally. If your system has multiple modules, you could perform a check of each of them using the Echo test. If all is working OK, each module will “hear” your transmission, digitize it and pass it to the gateway server which will delay it a bit and send it right back.



To run an Echo Test, set the **UrCall** field to the call sign of the repeater system you are on, followed by the letter “E” in the 8th character position. The other fields are set as normal for local repeater operation. In this case, **RPT1** is set to port B for testing the 440 MHz module. Other ports on your local system can be checked the same way.

Checking Repeater Link / ID Status

Dplus also comes with the ability to query the repeater to determine if it is linked or not. When the command is transmitted to the repeater, it will respond verbally with the current link status. The exact format of the vocal message may vary on different systems as the system administrator can modify the message sound file. This feature may not be available on all systems.

The link status message may communicate that the repeater module is currently unlinked, or that it is linked to a repeater or reflector.

To perform an ID / Link status check, program the repeater's call sign into the **UrCall** field with the letter "I" in the 8th character position. The remaining call fields are configured as usual for normal repeater operation as shown below.

UR CALL:	WR6BRN_I	ID / Link Status command.
RPT1:	WR6BRN_C	Local module you are operating on.
RPT2:	WR6BRN_G	Gateway for local repeater module.
MY CALL:	N6XXX	Your own call sign.

Chapter 3: Gateway User Registration

Registration is required to use the Internet D-STAR Gateway system. Once your registration is approved, the gateways will recognize your call sign and the *Trust Server* will keep track of the repeater nodes you were last heard on. Without registration you are generally limited to local repeater node operation.

Getting Registered

On most systems registration is a two-step process. The first step is providing the required registration information, which will be reviewed by a system administrator. The second step occurs when you receive notification from the administrator that your registration has been approved and you can start using the gateway system. As part of the process, the administrator may also provide you with information for becoming a member of the local repeater organization and instructions for operating the system.

Registration is a simple process, with most local D-STAR systems having provisions for doing it on-line. Contact your local system administrator to find out how they want you to register. Typically all that is required is:

- Your call sign (and perhaps a copy of your FCC license)
- Name
- Home address
- E-Mail address
- If registering on-line, a password for accessing your account

If your local system supports on-line user accounts, after approval you will be given a web page URL for you to log on and setup your personal account. Initially you will need to enter a call sign for use with your radios. If you are going to operate multiple radios which may be in use at the same time, additional call sign variants can be entered by adding a one-letter suffix, separated by a single space, to the end of your call. Your first entry need not have a suffix appended to your call sign. For example: W6XYZ_A. (the _ indicates the space.)

Call sign variants may also be desired for implementing unique *Call Sign Routing* capabilities. *Call Sign Routing* will treat each variant as a unique call sign. Additional variants are required if you will be using more than one I-D1 transceiver in the digital data mode.

For each call sign variant that you enter, the system assigns an IP address used to identify you. An IP address is a unique Internet Protocol identification number assigned to devices communicating on the network. Valid call sign suffix characters, which must be placed at the end of your call, can consist of any capital letter, (no numbers) except that they may not be placed in the 8th character position. The 8th position is reserved for the D-STAR call sign switches: A, B, C D, G, S and I. To be able to use the system you need to make an entry for at least one radio.

Note: Only register once, usually via the registration facilities provided by your local D-STAR gateway system administrators. This will allow you to have access to the entire D-STAR network. Even if you travel to other areas, the repeater gateways will still recognize your call. If you register a second time, either on the same gateway or from any other gateway system, you may confuse the system.

Registration actually occurs on your local gateway. That gateway passes your registration information onto the *Trust Server*, which in turn propagates it to all other gateways in the D-STAR System. Thus when you register on one gateway, you are automatically registered on all the gateways in the network.

Generally you should be able to either self-register or find out whom you need to contact via the Internet. Start by accessing <http://www.dstarusers.org/repeaters.php> and finding the repeater system closest to you. The list found on this page can be sorted by repeater call sign, city or state by clicking on the heading at the top of the list.

After you have found the repeater system closest to you, click on its call sign to display detailed information about the repeater. Clicking on the URL following **Gateway Registration URL:** will take you to the registration web page for that system. If this URL is not present, go to the web page following **Website:** and either look for registration information on that web page, or look for a person to contact.

Another resource is to follow the instructions found at http://www.dstargateway.org/D-Star_Registration.html This web page also has a sample registration form and instructions on how to fill it out.

If after trying the above resources, you are still unable to figure out whom to contact, try the following:

- Members in your ham radio club
 - Your nearest ham radio store
 - Your local ARRL Section Manager
- List of all Section Managers can be found at:
<http://www.arrl.org/FandES/field/org/smlist.html>

Chapter 4: **Setting Up Call Sign Memories**

In Chapters 1 and 2 we covered different methods of making calls, and the format of the *Call Sign Routing Register* fields for making those calls. Here we examine how the call sign memories of a typical radio are organized and programmed. We will use the IC-92AD as an example, and also provide programming instructions for the IC-80AD, IC-91AD, ID-880H and the IC-2820. Other Icom D-STAR radios have essentially the same functions and can be similarly programmed.

Call Sign Memories

In Chapter 1 we explained how the radio uses the *Call Sign Routing Register* to make D-STAR calls. The *Call Sign Routing Register* contains the now familiar set of parameters that are used to control and route D-STAR calls:

- **UR CALL** Call of the station, node or reflector you are calling.
- **RPT1** Call of the local repeater node you are calling from.
- **RPT2** Call of a target / destination repeater or your gateway.
- **MY CALL** Your own call sign, or call sign variations.

Depending upon the radio, there are several ways for making entries into the *Call Sign Routing Register*.

- Manually editing the current *Call Sign Routing Register*
- Copying from *UrCall*, *Repeater* and *MyCall* memory banks
- Recalling a memory channel that has these parameters set
- Using the **[RX-CS]** One-touch feature

Viewing and Editing the Call Sign Routing Register

On most radios the four call sign memories can be edited “in place.” This provides an immediate way of changing one or more of the calls when you don’t already have the desired call programmed in one of your call sign memory banks.

Once you have accessed the *Call Sign Routing Register* you can then select individual fields and edit the contents of that particular field.

Call sign editing for the IC-80AD, IC-91AD and IC-92AD:

1. Starting with the DV operating mode selected and a D-STAR repeater frequency being displayed on the screen.
2. Press [MENU], which brings up the menu list.
3. Rotate [DIAL] or use [▲] / [▼] to select **CALL SIGN** entry.
4. Press [►] to access the **CALL SIGN Routing Register**.
5. Rotate [DIAL] or use [▲] / [▼] to select the call sign field you wish to edit: **UR**, **R1**, **R2**, or **MY**.
6. Press [►] to start editing the selected call sign.
7. Use the keys as described at bottom of the screen to edit the selected call sign. (The IC-80AD lacks this feature.)
8. When editing is complete, press [5/ ←] to save call sign.
9. When call sign editing is complete, press [MENU] to return to normal operation.

Call sign editing procedure for the IC-2820:

Unlike the IC-91AD and IC-92AD transceivers, on the IC-2820 you are unable to edit the **CALL SIGN Routing Register** directly. Instead, to make changes to the **YOUR**, **RPT1**, **RPT2**, or **MY** call sign fields, you must copy call signs from the *Your Call*, *My Call* and *Repeater* call sign memories, which can be programmed or edited as desired before copying. Refer to the following section.

Call sign editing for the ID-880H:

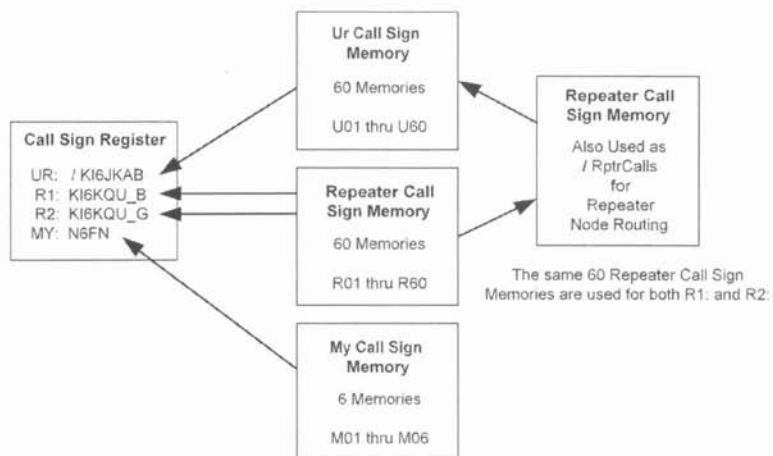
1. Starting with the **DV** operating mode selected and a D-STAR repeater frequency being displayed on the screen.
2. Press front panel [**CS**] to access the call sign registers.
3. Rotate [**DIAL**] to select the call sign field you wish to edit: **UR**, **R1**, **R2**, or **MY**.
4. Press [**►**] twice to start editing the selected call sign.
5. Rotate [**DIAL**] and use the [**◀**] / [**►**] keys as required to edit the call sign as usual for the ID-880H.
6. When finished editing, press [**↵**] to save.
7. Repeat step 3 if you wish to edit another call sign.
8. When done editing, press [**CS**] to exit and return to normal operation.

Note: When operating in **DR** mode, only the **MY** call sign field can be edited.

Copying from UrCall, Repeater and MyCall Memory Banks

First lets examine the relationship of the *UrCall*, *Repeater* and *MyCall* memory banks to the *Call Sign Routing Register*.

IC-92A Call Sign Memory Bank Organization



As we see in the diagram, previously saved entries in the *UrCall*, *Repeater* and *MyCall* memory banks can be copied to their respective fields in the *Call Sign Register*. Note that the **R1** and **R2** repeater call fields are both loaded from the same memory bank: the *Repeater Call Sign* memory.

Besides being able to be loaded from the *UrCall* memories, the **UR** field can also use entries from the *Repeater Call Sign* memory. When *Repeater Call Signs* are copied into the *UrCall* field, they are automatically preceded with the “/” character so that they are ready to be used as *Repeater Node Routing* call signs.

Copying Calls to the Call Sign Register on the IC-80AD or ID-880H:

1. Starting with the DV operating mode selected and a D-STAR repeater frequency being displayed on the screen.
2. Press [MENU], which brings up the menu list.
3. Rotate [DIAL] or use [▲] / [▼] to select **CALL-S** menu.
4. Rotate [DIAL] or use [▲] / [▼] to select the call sign field you wish to change: **UR**, **RPT1**, **RPT2**, or **MY**.
5. Press [►] to enter the memory bank for the selected field.
6. Rotate [DIAL] or use [▲] / [▼] to select one of the pre-programmed call signs in the memory.
7. Pressing [↵] copies the selected call sign to the register.

Copying Calls to Call Sign Register on IC-91AD and IC-92AD:

1. Starting with the DV operating mode selected and a D-STAR repeater frequency being displayed on the screen.
2. Press [MENU], which brings up the menu list.
3. Rotate [DIAL] or use [▲] / [▼] to select **CALL SIGN** entry.
4. Press [►] to access the **CALL SIGN Routing Register** display.
5. Rotate [DIAL] or use [▲] / [▼] to select the call sign field you wish to change: **UR**, **R1**, **R2**, or **MY**.
6. Press [►] to enter the memory bank for the selected field.
7. Rotate [DIAL] or use [▲] / [▼] to select one of the pre-programmed call signs in the memory.
8. Pressing [5/↵] copies the selected call sign to the register.

Copying Calls to the Call Sign Register on the IC-2820

1. Starting with the DV operating mode selected and a D-STAR repeater frequency being displayed on the screen.
2. Press [**F**] twice to access the DV mode function keys:
(**CS CD CQ R>CS** etc.)
3. Press [**CS**] to access the **CALL SIGN** screen.
4. Rotate [**MAIN•BAND**] to select the call sign field you wish to modify: **YOUR**, **RPT1**, **RPT2**, or **MY**.
5. Press [**MAIN•BAND**] and then rotate [**MAIN•BAND**] to select the desired call sign from memory. (Or instead, press [**CQ**] if you wish to enter **CQCQCQ** into the **YOUR** call sign field.)
6. Press [**BACK**] to save your editing and return to the **CALL SIGN** screen, where you can go back to Step 4 and update other call sign fields as required.
7. When done, to exit the **CALL SIGN** screen and return to normal operation, press [**BACK**] as required.

Programming UrCall, Repeater and MyCall Memory Banks

To simplify radio operation, the *UrCall*, *Repeater* and *MyCall* memories should be programmed with all the call signs you are likely to use. Once this is done its a simple matter of copying the desired call sign to the **CALL SIGN Routing Register** when you need it.

Programming UR and MY Call Sign Memories on IC-80AD:

(See following box for repeater, **RPT1** and **RPT2** programming)

1. Starting with the DV operating mode selected and a D-STAR repeater frequency being displayed on the screen.
2. Press [**MENU**], which brings up the menu list.
3. Rotate [**DIAL**] or use [**▲**] / [**▼**] to select **CALL-S** menu.
4. Rotate [**DIAL**] or use [**▲**] / [**▼**] to select the associated call sign field for memory you wish to edit: **UR** or **MY**.
5. Press [**►**] to enter the selected field's memory bank.
6. Rotate [**DIAL**] or use [**▲**] / [**▼**] to select an empty memory location, or a programmed call sign you wish to overwrite.
7. Press [**►**] to start programming the call sign. Enter / Edit call sign by rotating [**DIAL**] to select characters and pressing [**►**] to advance to the next character position.
8. When editing is complete, press [**5/ ←**] to save call sign.
9. Press [**MENU**] to return to normal operation.

Note: When programming your own call sign, **MY**, you can add a four character note following the “/” symbol. Refer to the following section.

Programming Repeater Call Sign Memories on IC-80AD:

(Repeater call signs are programmed into the **RPTL** memory.)

1. Starting with the DV operating mode selected and a D-STAR repeater frequency being displayed on the screen.
2. Press [**MENU**], which brings up the menu list.
3. Rotate [**DIAL**] or use [**▲**] / [**▼**] to select **RPT-L** menu.
4. Press [**►**] and rotate [**DIAL**] to select **ADD-L** item.
5. Press [**►**] and rotate [**DIAL**] to select **CALL S**.
6. Press [**►**] to start programming the repeater call sign. Enter / Edit call sign by rotating [**DIAL**] to select characters and pressing [**►**] to advance to the next character position.
7. When editing is complete press [**5/ ←**] to save the entry.
8. Rotate [**DIAL**] or use [**▲**] / [**▼**] to select **ADD W** item.
9. Press [**5/ ←**] to save call to the repeater list.
10. After **ADD W OK?** Appears, press [**5/ ←**] again to complete.
11. Press [**MENU**] to return to normal operation.

Note1: There are 300 memory locations in the **RPTL** (repeater list) however, call signs are added and retrieved by name or call sign, without specifying the location in memory.

Note2: You can enter as separate call sign entries, call signs for all the modules that exist on a given repeater system. For example: **KI6MGN A**, **KI6MGN B**, **KI6MGN C**, **KI6MGN G**.

Programming MY and UR Call Sign Memories on ID-880H:

(See following box for repeater, RPT1 and RPT2 programming)

1. Starting with the **DV** operating mode selected and a D-STAR repeater frequency being displayed on the screen.
2. Press [**MENU**], which brings up the menu list.
3. Rotate [**DIAL**] to select **CALL-S** menu.
4. Press [**►**] and rotate [**DIAL**] to select **MY** call sign memory.
5. Press [**►**] and rotate [**DIAL**] to select one of **MY1 ~ MY1**.
6. Press [**►**] to start programming the call sign.
7. Enter / Edit call sign by rotating [**DIAL**] to select characters and pressing [**►**] to advance to the next character position.
8. When **MY** call editing is complete, press [**↵**] to save.
9. Rotate [**DIAL**] to select the **UR** call sign memory.
10. Rotate [**DIAL**] to select an empty memory location, or a programmed call sign you wish to overwrite: **U01 ~ U60**.
11. Press [**►**] to start programming the call sign.
12. Enter / Edit call sign by rotating [**DIAL**] to select characters and pressing [**►**] to advance to the next character position.
13. When **UR** call editing is complete, press [**↵**] to save.
14. Press [**MENU**] to return to normal operation.

Note: When programming your own call sign, **MY**, you can add a four character note following the “ / ” symbol. Refer to the following section.

Programming Repeater Call Sign Memories on ID-880H:

(Repeater call signs are programmed into the **RPTL** memory.)

1. Starting with the DV operating mode selected and a D-STAR repeater frequency being displayed on the screen.
2. Press [**MENU**], which brings up the menu list.
3. Rotate [**DIAL**] to select **RPT-L** menu.
4. Press [**►**] and rotate [**DIAL**] to select **ADD-L** item.
5. Press [**►**] and rotate [**DIAL**] to select **CALL S**.
6. Press [**►**] to start programming the repeater call sign. Enter / Edit call sign by rotating [**DIAL**] to select characters and pressing [**►**] to advance to the next character position.
7. When editing is complete press [**↵**] to save the entry.
8. Rotate [**DIAL**] to select **ADD W** item.
9. Press [**↵**] to save call to the repeater list.
10. After **ADD W OK?** Appears, press [**↵**] again to complete.
11. Press [**MENU**] to return to normal operation.

Note1: There are 300 memory locations in the **RPTL** (repeater list), however, call signs are added and retrieved by name or call sign, without specifying the location in memory.

Note2: You can enter as separate call sign entries, call signs for all the modules that exist on a given repeater system. For example: **KI6MGN A**, **KI6MGN B**, **KI6MGN C**, **KI6MGN G**.

Programming Call Sign Memories on IC-91AD and IC-92AD:

1. Starting with the DV operating mode selected and a D-STAR repeater frequency being displayed on the screen.
2. Press [**MENU**], which brings up the menu list.
3. Rotate [**DIAL**] or use [**▲**] / [**▼**] to select **CALL SIGN** entry.
4. Press [**►**] to access the **CALL SIGN Routing Register** display.
5. Rotate [**DIAL**] or use [**▲**] / [**▼**] to select the associated call sign field for memory you wish to edit: **UR**, **R1**, **R2**, or **MY**.
6. Press [**►**] to enter the selected field's memory bank.
7. Rotate [**DIAL**] or use [**▲**] / [**▼**] to select an empty memory location, or a programmed call sign you wish to overwrite.
8. Press [**►**] to start programming the call sign.
9. Use the keys as described at bottom of the screen to enter the desired call sign.
10. When editing is complete, press [**5/ ←**] to save call sign.

Note: When programming your own call sign, **MY**, you can add a four character note following the “/” symbol. Refer to the following section.

Programming Call Sign Memories on the IC-2820

1. Starting with the DV operating mode selected.
2. Press [**F**] to access the function keys
3. Press [**MENU**] to select the **MENU** screen.
4. Rotate [**MAIN•BAND**] to select **CALL SIGN MEMORY**.
5. Press [**MAIN•BAND**] and then rotate [**MAIN•BAND**] to select the call sign memory you wish to modify:
 - a) **YOUR CALL SIGN MEMORY**
 - b) **RPT CALL SIGN MEMORY**
 - c) **MY CALL SIGN MEMORY**
6. Press [**MAIN•BAND**] and then rotate [**MAIN•BAND**] to select a call sign you want to edit, or an empty memory channel you wish to program.
7. Press [**MAIN•BAND**] to start editing. Use the key functions at the bottom of screen to enter or edit the call sign.
 - a) Press [**ABC**] to select between lower and upper case
 - b) Press [**12/**] to select between numbers and symbols
 - c) Rotate [**MAIN•BAND**] to select characters
 - d) Use [**<**] and [**>**] keys to move entry position cursor
 - e) Press [**CLR**] to clear selected characters
 - f) Press [**CLR**] 1 sec to clear all characters after the cursor
 - g) Press [**GW**] to turn the gateway setting on and off.
8. Press [**MAIN•BAND**] to save the programmed call sign.
9. To exit the **CALL SIGN MEMORY** screen and return to normal operation, press [**BACK**] as required.

Note: When programming your own call sign, **MY**, you can add a four character note following the “ / ” symbol. Refer to the following section for suggestions on using the note.

Programming Your Own Call Sign

Use the preceding procedure to program your own call into the *My Call Sign Memory*, which has space for saving up to six call sign variations. If you “registered” any call sign variations when you registered for gateway usage, you may want to program those same variations into the *My Call Sign Memory* bank.

In addition to programming your call sign, you also have the option of programming a four-character “note” which will appear after your call sign. When your call sign is displayed on a receiving station’s radio, it is followed by the “/” symbol and your four-character note.

As it is only used for informational purposes, this note is free form; it can be anything you wish to communicate. The catch is that its only four characters long. A lot of hams use it to indicate the model of radio they are using: IC80, IC91, IC92, 2820 and so on. Others, with short names enter their name: Bob, John, Eric, etc. Use your imagination; maybe you can come up with something unusual. Of course, you also have the option of leaving it blank.

Recalling Call Sign Fields from a Frequency Memory

Three of the *Call Sign Routing Register* fields (**UrCall**, **RPT1** and **RPT2**) can be set as a group when recalling a memory channel which has been programmed with a DV mode repeater frequency. For repeaters that you intend to operate on, this is by far the best method to use. Once programmed, operation is simple, you just recall the desired repeater frequency from memory and everything is automatically set.

Programming a memory channel with a DV mode repeater frequency is no different than programming a conventional repeater frequency to memory. Just as with conventional repeater frequency programming, the repeater frequency, mode of operation, in this case DV mode, the power level, and repeater offset are all saved to memory. In DV mode however, the current **UrCall**, **RPT1** and **RPT2** fields of the *Call Sign Routing Register* are also saved to memory. By setting the call sign fields as required for the desired repeater mode of operation, before saving the frequency setup to memory, it is all saved at the same time to a single memory channel.

With a little thought and planning you can get quite clever with this. All the D-STAR modes that you might use on different repeaters can be programmed in advance. Indeed, many local repeater groups can provide you with a “cheat sheet” containing all the standard combinations you might use with their repeaters. Some groups, or your local ham supply store, might be able to either “clone” your radio, or give you a file that can be loaded from a PC with all the standard frequencies and modes already setup. If a file is provided for use with radio programming software, it will be radio specific, so you will need a version of the file that is for your particular radio model.

Organizing D-STAR Repeater Calling Modes in Memory

If you are going to program and organize your own DV mode memory channels, it may be instructive to see how the PAPA system organizes radio memories for accessing their system of D-STAR repeaters. In Southern California we are fortunate to have the PAPA repeater system. With its network of six different D-STAR repeater

systems, it provides wide-area coverage over several different counties. With the large number of repeaters in their system, they have worked out a fairly nice system for programming their user's radios.

The PAPA system administrators provide their users with an Icom compatible data file for programming their radios with a standardized set of repeater access configurations. Because of differences in the radios provided by Icom, different .icf formatted files must be used for each model of radio. The IC-80, IC-91, IC-92, IC-800, IC-2820 etc, all require different .icf files. The PAPA system administrators have a number of different .icf files, called "Code Plugs" to support different radios.

In addition to providing the programs in the Icom .icf file format that can be downloaded to the radio using Icom's RS programming software, they also provide an Excel spreadsheet compatible .csv file format (comma separated value). Using the .csv format, users can not only print out and examine how repeaters are accessed either locally or via gateways, but with a little work can convert the data to be compatible with other radios or software programs.

If you have access to an .icf file from one radio and want to convert the file to be compatible with a different model radio, a handy conversion program called *D-StarCom* is located at <http://dstarcom.ae7q.net/> Full instructions and explanation of the file format is also found at the same URL.

At the time this is being written, the standard PAPA system Code Plug contains 79 entries, which go into 79 consecutive frequency memories in the radio. Rather than show all the file entries the PAPA system uses for programming memory channels, the principle of how its organized can be understood by examining just the *Call Sign Routing Register* variations that are used to implement various D-STAR system access modes from one local repeater system.

The PAPA system identifies its different D-STAR repeater systems using "D" numbers. The numbers range from D1 to D16 with some gaps in the numbering sequence.

The chart below illustrates *Call Sign Routing Register* variations for implementing local repeater operation, echo testing, info request, and several repeater node call configurations to other repeaters within the PAPA system. The comments describe the D-STAR calling / routing methods used when operating from local modules B and C of the D10 repeater. Using this as an example, you can easily create similar configurations for operating on your local system.

Name	UrCall	RPT1	RPT2	Comment
D10B CQ	CQCQCQ	KI6MGN B	KI6MGN G	Local operation on module B, with gateway enabled
D10B ECHO	KI6MGN E	KI6MGN B	KI6MGN G	Audio echo test on module B
D10B INFO	KI6MGN I	KI6MGN B	KI6MGN G	Link status request, module B
D10B> D1	/KI6JKAB	KI6MGN B	KI6MGN G	Repeater node call to KI6JKA module B
D10B> D4	/KF6BQKB	KI6MGN B	KI6MGN G	Repeater node call to KF6BQK module B
D10B>11A	/KW6HROA	KI6MGN B	KI6MGN G	Repeater node call to KW6HRO module A
D10B>11B	/KW6HROB	KI6MGN B	KI6MGN G	Repeater node call to KW6HRO module B
D10B>15B	/KI6KQUB	KI6MGN B	KI6MGN G	Repeater node call to KI6KQU module B
D10B>D10C	/KI6MGN C	KI6MGN B	KI6MGN G	Repeater node call to module C of the local repeater
D10C CQ	CQCQCQ	KI6MGN C	KI6MGN G	Local operation on module C, with gateway enabled
D10C ECHO	KI6MGN E	KI6MGN C	KI6MGN G	Audio echo test on module C
D10C INFO	KI6MGN I	KI6MGN C	KI6MGN G	Link status request, module C
D10C> D1	/KI6JKAB	KI6MGN C	KI6MGN G	Repeater node call to KI6JKA module B
D10C> D4	/KF6BQKB	KI6MGN C	KI6MGN G	Repeater node call to KF6BQK module B
D10C>11A	/KW6HROA	KI6MGN C	KI6MGN G	Repeater node call to KW6HRO module A
D10C>11B	/KW6HROB	KI6MGN C	KI6MGN G	Repeater node call to KW6HRO module B
D10C>15B	/KI6KQUB	KI6MGN C	KI6MGN G	Repeater node call to KI6KQU module B

Note that the Name column in the above chart is the name that is programmed in the memory channel. These are the names that will be displayed on the radio's LCD when performing memory recall operations. The names chosen should help you recall what the individual memory channels are used for. In the case of the PAPA system repeaters, you can see that the "Dnn" designations combined with the > symbol indicate the operation to be performed and which repeater modules are involved.

When creating your own set of repeater access memories, by using a similar format you could add node routing to distant repeaters, simulcast and multicast operation, and even repeater and reflector linking operations. Operating different D-STAR modes is greatly simplified when your favorite repeaters and D-STAR modes of operation are saved to memory. Another big plus, once you have verified that they work, they can eliminate errors that otherwise are prone to happen when programming things on the fly.

Received Call History

As calls are received, the radio saves the call signs being used by the station making the call in the *Received Call* memory. This memory has the capacity for storing 20 of the most recently received calls, numbered **RX01** through **RX20**, with **RX01** being the most recent. As new calls are received, older ones are pushed off the bottom (discarded) since they would be numbered beyond **RX20**.

If you need to double-check the call sign of a recent call, the *Received Call* memory can be quite useful. Many times you may only partially hear a person's call sign, or have trouble understanding what the person said. This is especially true when making contacts with foreign countries, where to our ears the person has an accent, which may make it difficult to clearly understand what was said. By checking the *Received Call* memory we can see what the call was.

Examining Calls in the Received Call Memory

The *Received Call* memory stores the person's call sign, the **CALLER**, and also the **RPT1** and **RPT2** call signs that were used.

Examining Received Call Memory on the IC-91AD and IC-92AD:

1. Starting with the DV operating mode selected and a D-STAR repeater frequency being displayed on the screen.
2. Press **[MENU]**, which brings up the menu list.
3. Rotate **[DIAL]** or use **[▲] / [▼]** to select **RX CALL S** entry.
(On the IC-80AD select **RX CAL**)
4. Press **[▶]** to enter the Received Call Memory. You will see the **RX01** memory number and the call sign of the most recently received call, the **CALLER**.
5. Rotate **[DIAL]** or use **[▲] / [▼]** to select a call record.
6. Press **[▶]** and then rotate **[DIAL]** or use **[▲] / [▼]** to view the station's **CALLER**, **RXRPT1** and **RXRPT2** call signs.
7. After examining the call signs, press **[MENU]** to exit the memory record and return to normal operation.

Examining the Received Call Memory on the IC-80AD and ID-880H

1. Starting with the DV operating mode selected.
2. Press **[MENU]**, which brings up the menu selection mode.
3. Rotate **[DIAL]** or use **[▲]** / **[▼]** to select **RX CALL S** entry.
4. Press **[▶]** to enter the Received Call Memory. You will see the **01** memory number and the call sign of the most recently received call, the **CALLER**.
5. Rotate **[DIAL]** or use **[▲]** / **[▼]** to view other call records.
6. To view the station's **CALLERs NOTE**, **RXRPT1** and **RXRPT2** call signs, repeatedly press **[←]** as required.
7. After examining the call signs, press **[MENU]** to exit the memory record and return to normal operation.

Examining the Received Call Memory on the IC-2820

1. Starting with the DV operating mode selected.
2. Press **[F]** twice to access the DV mode function keys: (**CS CD CQ R>CS** etc.)
3. Press **[CD]** to display the **RX CALL SIGN** screen. You will see the **RX01** memory number and the call sign of the most recently received call, the **CALLER**.
4. Rotate **[MAIN•BAND]** to select a call record: **RX-01 ~ RX-20**.
5. Press **[MAIN•BAND]** to view the record's **CALLER**, **CALLED** and **RXRPT1** and **RXRPT2** call signs.
6. To exit or view another record press **[BACK]**.
7. After examining and making note of the call signs, press **[BACK]** as required to exit and return to normal operation.

When examining *Received Call* records, you may notice that when **RPT1** and **RPT2** are saved they are reversed, placing the gateway call sign in **RPT1**. The following table indicates how calls are saved in the *Received Call* memory.

Calls as used to make the call	Calls as saved in the Received Call Memory	Comment
UrCall: CQCQCQ	CALLER: WD6FZA	
RPT1: KI6KQU_B	RXRPT1: KI6KQU_G	Gateway is in the RPT1 position
RPT2: KI6KQU_G	RXRPT2: KI6KQU_B	
MY: WD6FZA		

Note: Be aware, if you are not going to use one-touch as the method of replying, and instead will be using *Repeater Node* or *Call Sign Routing* to program your own local repeater module in the **RPT1** position, your local gateway call sign is programmed in the **RPT2** position (not the caller's local module or gateway from the Received Call memory).

For *Call Sign Routing* place the caller's call sign in the **UrCall** field, which does not require any call sign editing, use the call sign as it was received. The one-touch function can do this for you, if necessary refer to Chapter 1 for one-touch operation.

Repeater Node Routing requires editing the call sign to insert the “ / ” character in front of the caller's local module call sign, which is **RXRPT2** in the *Received Call Memory*.

The procedure in the next section allows you to copy call signs from the *Received Call Memory* to either the *UrCall* or *Repeater* memory banks, where they can later be used for copying to the *Call Sign Routing Register*.

Copying Calls from the Received Call Memory

If desired, you can copy calls that were automatically recorded in the temporary *Received Call Memory* to either the *UrCall* or *Repeater* Memory banks. This can be useful if you heard a call that you want to save for later use.

Copying Calls from the Received Call Memory on the IC-80AD and ID-880H:

1. Starting with the DV operating mode selected and a D-STAR repeater frequency being displayed on the screen.
2. Press **[MENU]**, which brings up the menu selection mode.
3. Rotate **[DIAL]** to select the **RX CAL** entry.
4. Press **[▶]** to access the received call memory bank.
5. Rotate **[DIAL]** or use **[▲]** / **[▼]** to select the call record you want to copy from, numbered **01** through **20**.
6. Repeatedly press **[↵]** to select the call sign you wish to copy, either: **CALLER**, **RXRPT1** or **RXRPT2**.
7. Press **[▶]** to enter the copy mode.
8. Rotate **[DIAL]** or use **[▲]** / **[▼]** and select one of the following to specify the memory channel to be programmed.
 - **C ALL** Copies Caller to **UR**, and **RPT1/RPT2** to **RPTL** list
 - **C Urxx** Copies Caller to selected **UR** channel **1~60**.
 - **C R-L** Copies **RPT1/RPT2** to the **RPTL** repeater list.
 - **CLEAR** Clears selected record from Rx Call Memory.
9. Press **[↵]** to complete the copy or clearing operation.
10. Press **[MENU]** to exit and return to normal operation.

Copying Calls from the Received Call Memory on the IC-91AD and IC-92AD:

1. Starting with the DV operating mode selected and a D-STAR repeater frequency being displayed on the screen.
2. Press [**MENU**], which brings up the menu list.
3. Rotate [**DIAL**] to select the **RX CALL S** entry.
4. Press [**►**] to access the **RX CALL SIGN** memory bank.
5. Rotate [**DIAL**] or use [**▲**] / [**▼**] to select the call record you want to copy from, numbered **RX01** through **RX20**.
6. Press [**►**] and then rotate [**DIAL**] to skip over **ALL** and select the call sign you wish to copy, either: **CALLER**, **RXRPT1** or **RXRPT2**.
7. Press [**►**] to enter the copy mode.
8. Rotate [**DIAL**] or use [**▲**] / [**▼**] to select the **LIST SEL** entry to be able to select the memory channel to be programmed.
9. Press [**►**] and then select the memory location you wish to copy into. (Select an empty channel or over write a programmed channel as desired.)
10. Press [**►**] to save to the selected location.
11. Press [**MENU**] to exit and return to normal operation.

Copying Calls from the Received Call Memory on the IC-2820:

1. Starting with the DV operating mode selected.
2. Press [**F**] to access the function keys
3. Press [**MENU**] to select the **MENU** screen.
4. Rotate [**MAIN•BAND**] to select **RX CALL SIGN** screen, then press [**MAIN•BAND**].
5. Rotate [**MAIN•BAND**] to select the call record you want to copy from, numbered **RX01** through **RX20**.
6. Press [**MAIN•BAND**] and then rotate [**MAIN•BAND**] to skip over **ALL** and select the call sign you wish to copy from, either: **CALLER**, **RXRPT1** or **RXRPT2**.
7. Press [**MAIN•BAND**] and rotate [**MAIN•BAND**] to select the **LIST SEL** entry to be able to select the memory channel to be programmed.
8. Press [**MAIN•BAND**] and then rotate [**MAIN•BAND**] to select the memory location you wish to copy into. (Select an empty channel or over write a programmed channel as desired.)
9. Press [**MAIN•BAND**] to save to the selected location.
10. Press [**BACK**] 3 times to exit and return to normal operation.

Chapter 5: DV Short Text Messaging

You can configure your transceiver to send a short message whenever you transmit. These messages are transmitted along with your voice every time you transmit, and will show up in the *RX Message* buffer of other user's radios. Typically up to five messages, each a maximum of 20 characters in length, can be programmed into the radio. Before transmitting you select which one of the five you wish to transmit.

The messages are free form and can be used to convey a variety of information. It's too bad they are only 20 characters long, as it can be a challenge to figure out how to fit what you want to say using only 20 characters.

Some common uses:

- Radio configuration
- Your name and location
- Your full name (first and last)
- Special announcements
- Radio settings to use for answering your call
- Reflector you are using
- Your web page or email address

Providing instructions on how users should set their radio to make a return call back to you is an interesting use for short status messaging. I found several Japanese stations using this technique. Their short status messages were formatted similar to this: "Set Ur to /JP1XXX," and I've seen others with the message "Use One Touch Button." Even if you don't use this technique yourself, it's worth remembering if you hear a call and are unsure of how to call back. They might be telling you via short messaging.

Programming DV Short Messages

Programming messages into the radio is relatively straightforward. I like using lower-case characters to help make run together words or abbreviations understandable without having to insert a space. For

instance, here is what I have programmed in one of my memories: “Bernie SanDiego NoCo”. This comes to exactly 20 characters and would not have fit had I used spaces. NoCo stands for North County and may not be obvious, but SanDiego is quite understandable.

Unfortunately there is a drawback to using lower-case characters. Radios such as the IC-80AD, ID-800H, ID-880H, and IC-V82 can only display upper-case characters, so a message received on those radios may not display as intended.

Programming and Transmitting Short Messages on the IC-80AD and ID-880H:

1. Starting with the DV operating mode selected and a D-STAR repeater frequency being displayed on the screen.
2. Press **[MENU]** to bring up the menu selection mode.
3. Rotate **[DIAL]** or use **[▲]** / **[▼]** to select **MESSAG**.
4. Press **[▶]** and rotate **[DIAL]** to select **TX MSG**.
5. Press **[▶]** to enter the message entry / editing screen.
6. Rotate **[DIAL]** or use **[▲]** / **[▼]** to select one of the five memory channels **TM1~TM5** or **OFF**. (Note: **OFF** is used to disable message transmissions.)
7. Press **[▶]** to start programming the message. Enter / Edit your message by rotating **[DIAL]** to select characters and pressing **[▶]** to advance to the next character position.
8. When editing is complete, press **[←]** to save the message.
9. Before returning to normal operation, rotate **[DIAL]** or use **[▲]** / **[▼]** to select the message memory, **TM1~TM5** you wish to transmit, or select **OFF** if you wish to disable message transmission.
10. Press **[◀]** to return to the **TX MSG** screen.
11. Press **[MENU]** to exit and return to normal operation.

Note: If enabled, the message is transmitted every time you press **[PTT]**.

Programming and Transmitting Short Messages on the IC-91AD and IC-92AD:

1. Starting with the DV operating mode selected and a D-STAR repeater frequency being displayed on the screen.
2. Press **[MENU]**, which brings up the menu list.
3. Rotate **[DIAL]** or use **[▲]** / **[▼]** to select **MESSAGE / POS.**
4. Press **[▶]** to access the **MESSAGE / POSITION** screen.
5. Rotate **[DIAL]** or use **[▲]** / **[▼]** to select **TX MESSAGE.**
6. Press **[▶]** to go to the **TX MESSAGE** editing screen.
7. Rotate **[DIAL]** or use **[▲]** / **[▼]** to select one of the five memory channels **Ch01~Ch05** or **OFF**. (Note: **OFF** is used to disable message transmissions.)
8. Press **[▶]** to start programming your message.
9. Use the keys as described at bottom of the screen to enter your message text.
10. When editing is complete, press **[5/ ←]** to save the message and return to the **TX MESSAGE** screen.
11. Before returning to normal operation, rotate **[DIAL]** or use **[▲]** / **[▼]** to select the message channel **Ch01~Ch05** you wish to transmit, or select **OFF** if you wish to disable message transmission.
12. Press **[MENU]** to exit and return to normal operation.

Note: If enabled, the message is transmitted every time you press **[PTT]**.

Programming Short Messages on the IC-2820:

1. Starting with the DV operating mode selected.
2. Press [F] to access the function keys
3. Press [MENU] to select the **MENU** screen.
4. Rotate [MAIN•BAND] to select **DV MESSAGE** screen, then press [MAIN•BAND].
5. Rotate [MAIN•BAND] to select **TX MESSAGE MEMORY**.
6. Press [MAIN•BAND] and then rotate [MAIN•BAND] to select one of the five TX memory channels **01~05**.
7. Press [MAIN•BAND] to start programming your message.
8. Use the key functions at the bottom of screen to enter or edit your message.
 - a) Press [ABC] to select between lower and upper case
 - b) Press [1/] to select between numbers and symbols
 - c) Rotate [MAIN•BAND] to select characters
 - d) Use [<] and [>] keys to move entry position cursor
 - e) Press [CLR] to clear selected characters
 - f) Press [CLR] 1 sec to clear all characters after the cursor
9. When message is complete, press [MAIN•BAND] to save it.
10. To exit the **TX MESSAGE MEMORY** screen and return to normal operation, press [BACK] as required.

Transmitting Short Messages on the IC-2820:

1. Starting with the DV operating mode selected.
2. Press [F] to access the function keys
3. Press [MSG] to select the **MESSAGE** screen.
4. Rotate [MAIN•BAND] to select **TX MESSAGE** screen, then press [MAIN•BAND].
5. Rotate [MAIN•BAND] to select the channel to be transmitted **Ch01 ~ CH05**, or select **OFF** to disable message transmission.
6. Press [BACK] as required to return to normal operation.

Note: If enabled, the message is transmitted every time you press [PTT].

Reviewing Received Short Messages

Only the last message received can be viewed. This can present a problem, because it can be overwritten if another message happens to arrive before you have a chance to view the message.

Reviewing Received Short Messages on the IC-80AD and IC-880H:

1. Starting with the DV operating mode selected and a D-STAR repeater frequency being displayed on the screen.
2. Press **[MENU]** to bring up the menu selection mode.
3. Rotate **[DIAL]** or use **[▲]** / **[▼]** to select **MESSAG**.
4. Press **[▶]** and rotate **[DIAL]** to select **RX MSG**.
5. Repeatedly press **[←]** to view whole received message.
6. Press **[MENU]** to exit and return to normal operation.

Reviewing Received Short Messages on the IC-91AD and IC-92AD:

1. Starting with the DV operating mode selected and a D-STAR repeater frequency being displayed on the screen.
2. Press **[MENU]**, which brings up the menu list.
3. Rotate **[DIAL]** or use **[▲]** / **[▼]** to select **MESSAGE / POS**.
4. Press **[▶]** to access the **MESSAGE / POSITION** screen.
5. Rotate **[DIAL]** or use **[▲]** / **[▼]** to select the **RX MESSAGE**.
6. Press **[▶]** to view the **RX MESSAGE** screen.
7. Rotate **[DIAL]** or use **[▲]** / **[▼]** to toggle between viewing the received **MESSAGE** or the **CALLER**'s call sign.
8. Press **[5/ ←]** to return to the **RX MESSAGE** screen.
9. Press **[MENU]** to exit and return to normal operation.

Reviewing Received Status Messages on the IC-2820:

1. Starting with the DV operating mode selected.
2. Press **[F]** to access the function keys
3. Press **[MENU]** to select the **MENU** screen.
4. Rotate **[MAIN•BAND]** to select **DV MESSAGE** screen, then press **[MAIN•BAND]**.
5. Rotate **[MAIN•BAND]** to select **RX MESSAGE**.
6. Press **[MAIN•BAND]** to view the **RX MESSAGE** screen.
7. Press **[BACK]** 3 times to exit and return to normal operation.

Chapter 6: Internet Resources

Amateur radio is fortunate to have enterprising programmers whom have authored a number of innovative and useful D-STAR web page programs. Lets examine a couple of the most popular ones: *D-STAR Calculator* and *jFindu*.

D-STAR Routing and Linking Calculator

To assist amateurs with programming the call routing parameters for their radios, Ed Woodrich, WA4YIH has developed an easy to use program, *D-STAR Calculator*. The program operates on-line via the Internet and uses pull-down menus to make repeater and routing selections.

You start out by selecting the local repeater and module that you are using to get to the gateway. Next you select the D-STAR call routing mode that will be used to route the call. Finally the remote repeater module you want your signal to come out of is selected. After all this information has been selected, the calculator displays the settings you need to program into your radio for making the call.

This program really simplifies finding repeaters and programming the *Call Sign Routing Register*; anybody can do it!

Operating the D-STAR Calculator Program

This program contains a full list of repeaters and reflectors that are available for use worldwide. US repeaters are listed by state and city. If you want to make a call to a foreign country, a pull-down list makes it easy to determine which repeaters are available by country, province and city.

D-STAR Calculator can be found at the following URL:
<http://www.dstarinfo.com/Calculator/>

In the sample screen shot below, after I selected my local repeater using the *Source Repeater* pull-down menu, the program displayed a list of repeater modules that are available on the selected repeater. In this case there was only one *Source Module* displayed, so I selected it.

The screenshot shows a software interface with several fields and a dropdown menu. The 'Source Repeater' field is set to 'United States, California San Diego KI6KQU Gateway'. Below it, the 'Source Module' field is set to 'DV B 447.8400 -5.0000'. The 'Function' dropdown menu is open, showing a list of options: 'Source Route', 'Local Repeater', 'Local Repeater with Gateway', 'Echo Test', 'Repeater Status', 'Source Route' (highlighted), 'Specific User', 'Link to Repeater', 'Link to Reflector', 'Unlink Repeater', and 'High-Speed Data'. The 'Destination Repeater' field is partially visible and set to 'ay'. The 'Destination Module' field is empty.

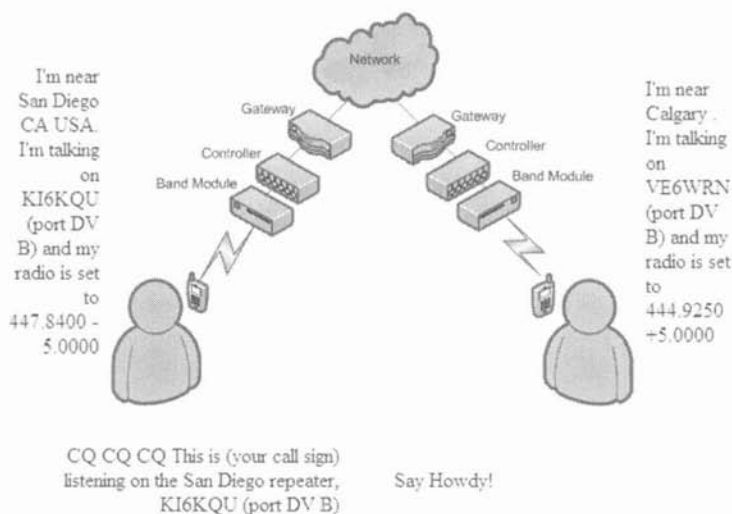
Source Repeater	United States, California San Diego KI6KQU Gateway
Source Module	DV B 447.8400 -5.0000
Function	Source Route
Destination Repeater	ay
Destination Module	

As shown above, I then selected the D-STAR routing / linking *Function* that I wanted to use from a list of available functions. The list includes all the routing and linking modes that were discussed in Chapters 1 and 2 plus one more, *High-Speed Data*. In this example I selected *Source Route* as the mode of routing I wanted to use.

Below the shaded box, the program displays a call routing diagram. At the sides and bottom are sample scripts suggesting how to identify when making the call. Besides giving their location and the repeater module they are using, the scripts show the two hams exchanging repeater frequency and offset information. Typically when operating on D-STAR, exchanging repeater frequencies is unnecessary.

```

Programming for talking on KI6KQU (port DV B) to
VE6WRN (port DV B)
YOUR: /VE6WRNB
RPT1: KI6KQU=B
RPT2: KI6KQU=G
Set Radio To: 447.8400 MHz Offset -
              5.0000 MHz
              "*" represents a space
              Help!
  
```



As you can see, the program is simple to use and by making a few list driven selections you are provided with all the parameters necessary for programming your radio to make the call.

jFindu Repeater Locator and Last Heard Lists

Another useful function is to be able to find out when, and on what repeater a station was last heard. By clicking on the **Last Heard Lists** link found at: <http://www.jfindu.net> home page you can find out. In the example below, I have input WD6FZA and clicked the “Include D-STAR last heard?” box.

jFindu Locator Site

[Home](#) > Last Heard Lists

Enter callsign (no SSID) or object name: Include D-STAR last heard? ☒
or enter a 3-8 character prefix:

The result is displayed as shown below. If the person has been using APRS, a status line for that mode is also displayed.

WD6FZA Last Heard on DSTAR

Station	Last Heard	Repeater
WD6FZA	3h47m43s	KI6KQU B(DV)

Another useful *jFindu* function is to find out where a repeater is located, what modules it has and who has been using it recently. This information as well as recent D-STAR D-PRS / APRS activity can be determined by accessing <http://www.jfindu.net> and clicking on the **D-STAR Activity** link and when the next page displays, clicking on **D-STAR Repeaters**.

The **D-STAR Repeaters** link brings up a page showing a world map, which will gradually populate itself with the call signs of all D-STAR repeaters. These call signs are geographically located on a satellite-view world map. Like many on-line maps, you can zoom in and scroll around to see repeater installation density in different parts of

the world. If you zoom in far enough you can see where repeaters are located near a city or on mountain ranges.

More importantly however, is the matrix of active repeater D-STAR call signs that is below the map. Click on a repeater call sign of interest to see detailed information about that repeater, as in this screen shot for the VE6WRN repeater located near Calgary Canada.

Locate VE6WRN Repeaters

- A Range: 20nm 1.2 Voice 1287.5000 -20 Mhz
AD Range: 15nm 1.2 Data 1247.500 Mhz
B Range: 30nm 440 Voice 444.925 +5.00 Mhz
C Range: 30nm 2m Voice 146.805 -0.600 Mhz

Recently Heard DV Stations

Station	LastHeard	Repeater
<u>VY0AB</u>	6d22h56m4s	<u>VE6WRN A</u>
<u>VE6WRN</u>	17h31m34s	<u>VE6WRN B</u>
<u>VE6BGZ</u>	4d4h35m12s	<u>VE6WRN B</u>
<u>G4HCI</u>	21d1h50m4s	<u>VE6WRN B</u>
<u>VE6BGZ M</u>	19h13m22s	<u>VE6WRN C</u>
<u>VE6CPK</u>	19h13m42s	<u>VE6WRN C</u>
<u>VE6AMC</u>	22h30m38s	<u>VE6WRN C</u>
<u>VE6BGZ P</u>	4d1h48m13s	<u>VE6WRN C</u>
<u>VE6BNF</u>	5d16h31m	<u>VE6WRN C</u>
<u>VE6DJJ</u>	6d3h50m52s	<u>VE6WRN C</u>
<u>VE6CPT</u>	17d12h13m28s	<u>VE6WRN C</u>

The screen above shows the available modules on this repeater, including their frequency and offset. Below that, sorted by module, is a list of stations that have been using the repeater, including how long it's been since they were last heard.

If you happen to pull up this screen for your own local repeater, you will be able to track recent traffic as you are hearing it on your radio, after a delay of a few moments. For instance, if you make a transmission, your own call sign will eventually appear in the list.

D-STAR Users.org Last Heard List

The D-STAR users.org web site has a very useful tool that lists all stations recently heard on the D-STAR network, an example of which is shown on the facing page.

Found at <http://dstarusers.org/lastheard.php> the tool provides a time stamped history of the call sign of the station making the call, the repeater node that he is using and its location. Very useful for seeing where there is traffic that you might want to listen to and perhaps make a contact with.

The listings shown on the page will automatically update every few minutes, providing a “close to” real time history of what is happening anywhere in the worldwide D-STAR network.

By clicking on the header, the list can be sorted by **Callsign**, **Time Heard** or by the **Reporting Node**.

Current Time is 11/23/2009 23:39:35 UTC [\[Click here to disable refresh\]](#)

Callsign	Time Heard	Reporting Node	165 Unique callsigns heard in the last hour
PU2TRG	11/23/09 23:39:28 UTC	PY2KCA C 2 Meters	Americana, Sao Paulo, Brazil
PU4DNP	11/23/09 23:39:27 UTC	LD4VF Dongle User DVD	Orre, Norway
AE0MW	11/23/09 23:39:27 UTC	KD0IAN Dongle User DVD	Des Moines, IA, USA
K4HC	11/23/09 23:39:20 UTC	W4GSO B 440 MHz	Greensboro, NC, USA
KA9SCF	11/23/09 23:39:15 UTC	WA9ORC B 440 MHz	Chicago, IL, USA
WB9JPH	11/23/09 23:39:11 UTC	K9PAQ C 2 Meters	Richfield, WI, USA
KF5DDP	11/23/09 23:39:10 UTC	W4LET B 440 MHz	MEMPHIS, TN, USA
AJ4BT	11/23/09 23:39:10 UTC	W4GSO B 440 MHz	Greensboro, NC, USA
WB9WLS	11/23/09 23:39:07 UTC	WA9ORC B 440 MHz	Chicago, IL, USA
AJ4G	11/23/09 23:38:59 UTC	WA4YZY B 440 MHz	Middlesboro, Kentucky, USA
LU1FKR	11/23/09 23:38:48 UTC	LU5FB C 2 Meters	Rosario, Santa Fe, Argentina
EI8DJ	11/23/09 23:38:32 UTC	GB7CD C 2 Meters DVD	Cardiff, Wales, UK
PY4HC	11/23/09 23:38:30 UTC	PY4RCR C 2 Meters	Belo Horizonte, MG, Brazil
VA2INF	11/23/09 23:38:28 UTC	VA2RKB C 2 Meters	Saint-Calixte, Quebec, Canada
IZ0GQT	11/23/09 23:37:47 UTC	IR5UBH B 440 MHz	Amiata, Tuscany, Italy

NJ6N's Gateway Usage Monitor

Brian Roode, NJ6N, who is also the author of d*Chat, has created a comprehensive tool for monitoring D-STAR activity that is occurring anywhere in the world. His *D-STAR Usage Monitor*, found at <http://nj6n.com/dplusmon/> summarizes call routing information for any transmissions going through the gateway system.

Using his tool, an example of which can be seen in screen shot on the facing page, we can determine the following information about calls being made through the gateway system:

- Time and date that the call is being made,
- Call sign of the reporting / originating gateway,
- Location of the originating gateway,
- The call (MyCall and “/note”) of the originating station,
- The station’s DV Short Message, if he is transmitting one,
- How the station’s UrCall, RPT1 & RPT2 call signs were set.

This information periodically updates, providing a history of activity that has recently occurred. There can be a lag of several minutes or more depending upon gateway and network loading, latency of Brian’s web server and your own web browser and other factors.

Notice that when a Reflector is being used, all gateways linked to that Reflector are shown. In the sample screen shot there is a long list of gateways shown as being linked to reflector REF001C. While this is not unusual for REF001C, D-STAR’s Mega Repeater, the linked gateway list for other reflectors is generally much shorter.

Clicking on the station’s call sign, under the **MyCall** heading, accesses his call sign information at the QRZ.com web page. Very convenient!

Likewise, clicking on a gateway’s **Location** will bring up the gateway’s informational web page, providing the sponsoring group has one.

D-STAR Usage Monitor						
Date Mon Nov 23 13:55:34 PST 2009	Reporting Gateway	Location	MyCall	UrCall	RPT1	RPT2
2009-11-23 13:56:15 Pacific	K1HRO	Salem, NH USA	WA1WOK H (IC92)	CQCQCQ	K1HRO C	K1HRO G
Reflected To:		K1HRO (1)				
2009-11-23 13:56:09 Pacific	CQ0DLX	Lisbon Portugal	CT2IUL (P)	CQCQCQ	CQ0DLX B	CQ0DLX G
2009-11-23 13:56:05 Pacific	REF001 C		KI4SBT (ROB) Robert W Hoppe	CQCQCQ	REF001 C	WX4GPB G
Reflected To:		W00MD VE3RPT KE5WFB W4HFH K8LCD W4LET VE3LSR W8SHI WD5AII W5NGU WD4STR W2DGL K8BIG VE3RXR K2DIG NJ2DG W8BI KJ4LNJ K0MDG K0HAM PY2KCA PY7DIG PY2KPP SZ1SV SV2F PY2KPE PY4RCR WS4VA KE7MVI KF6RAL K7RST K6ACS WA7FW W6YYY NE4SC W5SHV KJ4MMC WA6IRC WX4GPB W8RNL W6DHS (41)				
2009-11-23 13:55:46 Pacific	PY2KCA	Americana, Sao Paulo Brazil	M0MET (DNGL)	CQCQCQ	REF001 G	REF001 C
Reflected To:		PY4RCR W6DHS PY2KPE SV2F SZ1SV PY2KPP PY7DIG W8RNL W00MD W8SHI KE5WFB WD5AII K8LCD W8BI NJ2DG WX4GPB K2DIG W2DGL K8BIG WD4STR W5NGU REF001 G VE3RPT VE3LSR W4HFH KE7MVI KF6RAL K6ACS WA7FW NE4SC W5SHV W4DOC WA6IRC WS4VA W6YYY K0HAM K0MDG KJ4MMC KJ4LNJ W4LET K7RST				

4854790 -> 4854940

Chapter 7: Radio Programming Software

If you are going to be programming a lot of repeater frequencies and D-STAR access call signs into your radio, you should definitely consider purchasing programming software for your radio. Not only is it much easier to do, you might be able to import programming files from others that can significantly simplify setting up your radio.

Another plus for programming software is that once you have your radio setup, a copy of your radio's frequency memories and setup menus can be saved to your computer. This can be a lifesaver should you need to reload your radio for any reason.

Besides the software itself, an interface cable for connecting between the radio and your computer is required. Most of the time, a standard RS-232 PC serial port is used on the computer side. However, on the radio side, the connector is often unique to the radio. Frequently the required cable comes with the purchase of the programming software.

Icom's Programming Software

Icom provides programming software (frequently called cloning software) for their radios. The following list identifies the software packages used with Icom's D-STAR radios. Most of these come with a cable, but some do not.

- | | |
|-----------|------------------------------------|
| • IC-80AD | CS-80/880 (free software download) |
| • IC-91AD | RS-91 |
| • IC-92AD | RS-92 |
| • IC-V82 | CS-V82 |
| • IC-2820 | CS-2820 |
| • IC-2200 | CS-2200 |
| • IC-D800 | CS-D800 |
| • ID-880H | CS-80/880 (free software download) |

RT System's Programming Software

RT-Systems also provides radio-programming software for radios of all types. Their software kits generally come with the required cable. Here are the RT part numbers for the software kits used with Icom's D-STAR radios

- | | |
|-----------|----------|
| • IC-80AD | WCS-80 |
| • IC-91AD | WCS-91 |
| • IC-92AD | WCS-92 |
| • IC-2820 | WCS-2820 |
| • IC-2200 | WCS-2200 |
| • IC-D800 | WCS-D800 |
| • ID-880H | WCS-D880 |

I have not used any of RT System's software for D-STAR radios, but have used their programs for several conventional transceivers. The software I've used was reliable and did the job. Their software is geared towards programming your radio and does not include the "virtual radio" features discussed below.

Icom's RS-91 and RS-92 Programming Software

Most all programs provide similar programming functionality; some of them go a step beyond. Here we will review the features of Icom's RS-92 (Remote Control) software application as an example of what can be done with one of the more enhanced programming packages.

Unlike most other programming software packages, the RS-91 and RS-92 software packages have the capability of actually controlling the radio via a "virtual radio" looking screen. Using this "virtual radio" is quite similar to using a remote front panel; the connected radio responds just as if you were pushing directly on the radio's front panel buttons. In general, radio-programming software packages do not have this "virtual radio" capability; it is limited to Icom's RS, Remote Control series of software. Icom's CS series Cloning Software is more typical of what is usually available for programming radios.

When the RS-92 program is started, it comes up with the “virtual radio” screen. The first thing you need to do is click on the **Option** pull-down menu and select the PC COM port that you will be using. The program will read the radio’s current settings, which takes a second or two, then the “virtual screen” will display the same information that is being displayed on the radio’s screen. While the computer is reading the balance of your radio’s settings (called synchronizing), the (O) button near the top of the display will be red; synchronization is complete when it turns black.



To examine or edit the radio’s memory, wait for the synchronization to complete (O button turns black) and click on the **View** pull-down and select **Edit Memory Channel** and the **Memory CH** screen pops up. At the left side of the screen, a series of folders and sub-folders are displayed in typical Windows format. These folders contain all of the memories, setup menus and other parameters that can be programmed on the radio.

The frequency memory channels are partitioned into two folders **A Band** and **B Band**, within these two folders the memory channels are displayed in 100 channel increments. Only the **B Band** can be used for DV mode operation. The two screenshots below shows a selection of memories from the first group of memories in the **B Band** / **ALL** folder. These screenshots are segments of a wider display as seen on a PC.

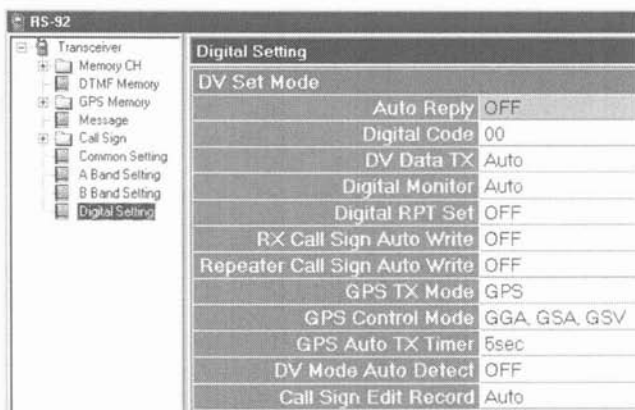
Memory CH								
		Frequency						
CH	Select	Freq	DUP	Offset Freq	TS	Mode	Name	Skip
13		445 86000	-DUP	5 00000	12.5k	DV	D-10B	
14		145 58500	-DUP	0 80000	15k	DV	D-10C	
15		445 98000	-DUP	5 00000	12.5k	DV	D-11	
16		447 84000	-DUP	5 00000	12.5k	DV	D-15	
17		448 70000	-DUP	5 00000	12.5k	DV	D-16	Skip
18		447 20000	-DUP	5 00000	12.5k	DV	D1 CQ	Skip
19		447 20000	-DUP	5 00000	12.5k	DV	D1 ECHO	Skip
20		447 20000	-DUP	5 00000	12.5k	DV	D1 > D4	Skip
21		447 20000	-DUP	5 00000	12.5k	DV	D1 > D10B	Skip
22		447 20000	-DUP	5 00000	12.5k	DV	D1 > D10C	Skip
23		447 20000	-DUP	5 00000	12.5k	DV	D1 > D11	Skip
24		447 20000	-DUP	5 00000	12.5k	DV	D1 > D15B	Skip
25		447 20000	-DUP	5 00000	12.5k	DV	D1 > D16	Skip

Memory CH										
		SQL/DTCSS				Digital		Call Sign		
CH	Repeater Tone	TSQ Freq	DTCSS	DTCSS Polarity	DSQL	Code	Your	RPT1	RPT2	
13	88.5	88.5	005	BOTH N		00	CQCCQ	KI6MGN B	KI6MGN G	
14	88.5	88.5	005	BOTH N		00	CQCCQ	KI6MGN C	KI6KQU G	
15	88.5	88.5	005	BOTH N		00	CQCCQ	KW6HRO B	KW6HRO B	
16	88.5	88.5	005	BOTH N		00	CQCCQ	KI6KQU B	KI6KQU G	
17	88.5	88.5	005	BOTH N		00	CQCCQ	WR6BRN B	WR6BRN G	
18	88.5	88.5	005	BOTH N		00	CQCCQ	KI6JKA B	KI6JKA G	
19	88.5	88.5	005	BOTH N		00	KI6JKA E	KI6JKA B	KI6JKA G	
20	88.5	88.5	005	BOTH N		00	KF6BQKB	KI6JKA B	KI6JKA G	
21	88.5	88.5	005	BOTH N		00	KI6MGNB	KI6JKA B	KI6JKA G	
22	88.5	88.5	005	BOTH N		00	KI6MGNC	KI6JKA B	KI6JKA G	
23	88.5	88.5	005	BOTH N		00	KW6HROB	KI6JKA B	KI6JKA G	
24	88.5	88.5	005	BOTH N		00	KI6KQUB	KI6JKA B	KI6JKA G	
25	88.5	88.5	005	BOTH N		00	WR6BRNB	KI6JKA B	KI6JKA G	

The above screenshots show the contents for memory channels 13 through 25, which have been programmed for D-STAR operation. The upper one shows the repeater frequency settings, tuning step size, operating mode and the name / label given to this memory channel. The lower screenshot shows the D-STAR call sign routing parameters set for each of these memory channels.

Editing a memory channel, is a simple matter of clicking in one of the cells, and making whatever changes you want, similar to making entries on a spreadsheet. Some of the cells have a pull-down selection menu, which is displayed if you hit Enter on the keyboard. Pull-down selections are used for parameters that have several standard settings, such as: Duplex, Tuning Step Size, Operating Mode, etc.

You can select setup menus or other memories to be viewed or edited by either clicking on the file folders shown at the left of the screen or by using the **View** pull-down selection menu. The following screen shows the **DV Set Mode** menu settings, which are one of the sub groups found under the **Digital Setting** group of menu settings.



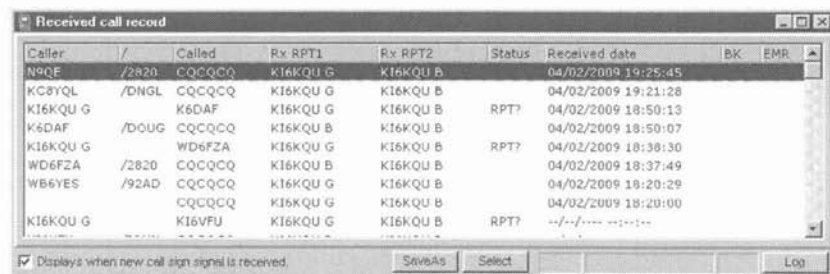
RS-92	
Transceiver	Digital Setting
Memory CH	DV Set Mode
DTMF Memory	Auto Reply OFF
GPS Memory	Digital Code 00
Message	DV Data TX Auto
Call Sign	Digital Monitor Auto
Common Setting	Digital RPT Set OFF
A Band Setting	RX Call Sign Auto Write OFF
B Band Setting	Repeater Call Sign Auto Write OFF
Digital Setting	GPS TX Mode GPS
	GPS Control Mode GGA, GSA, GSV
	GPS Auto TX Timer 5sec
	DV Mode Auto Detect OFF
	Call Sign Edit Record Auto

Like most PC applications, the **File** pull-down on the “virtual radio” window allows you to save your settings to the PC and download files containing memories and configuration settings to the radio.

D-STAR Operation Using the RS-92 Software

One of the great benefits of using the RS-91 and RS-92 software is that you can actually operate the radio via screens on your PC. This can be a whole new D-STAR operating experience.

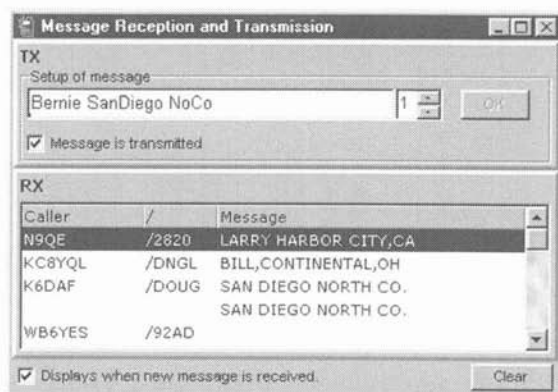
While monitoring activity on a repeater, received call signs and the caller's D-STAR call sign routing parameters are dynamically displayed in the **Received call record** as calls are received. These entries are the same ones that are found in the *Received Call Sign History* found on the radio, but without having to go into the radio's menu system to see them. Because the **Received Call Record** displayed on the PC shows all of a caller's data on a single line, with multiple lines showing prior received calls, its much more convenient than accessing the same data via the radio's keypad and small screen.



Caller	/	Called	Rx RPT1	Rx RPT2	Status	Received date	BK	EMR
N9QE	/2820	CQCQCQ	KI6KQU G	KI6KQU B		04/02/2009 19:25:45		
KC8YQL	/DNGL	CQCQCQ	KI6KQU G	KI6KQU B		04/02/2009 19:21:28		
KI6KQU G		K6DAF	KI6KQU G	KI6KQU B	RPT?	04/02/2009 18:50:13		
K6DAF	/DOUG	CQCQCQ	KI6KQU B	KI6KQU B		04/02/2009 18:50:07		
KI6KQU G		WD6FZA	KI6KQU G	KI6KQU B	RPT?	04/02/2009 18:38:30		
WD6FZA	/2820	CQCQCQ	KI6KQU B	KI6KQU B		04/02/2009 18:37:49		
WB6YES	/92AD	CQCQCQ	KI6KQU G	KI6KQU B		04/02/2009 18:20:29		
		CQCQCQ	KI6KQU G	KI6KQU B		04/02/2009 18:20:00		
KI6KQU G		KI6VFU	KI6KQU G	KI6KQU B	RPT?	--/--/---- --:--:--		

☒ Displays when new call sign signal is received. SaveAs Select Log

Likewise, as seen below, the short messages of stations being monitored are displayed as calls are received. A big advantage of the RS-92's **Message Reception and Transmission** window is that while the radio is limited to saving only the last received message, this screen displays a list of prior calls in addition to the most current.



Message Reception and Transmission

TX
 Setup of message
 Bernie SanDiego NoCo 1 OK
☒ Message is transmitted

RX

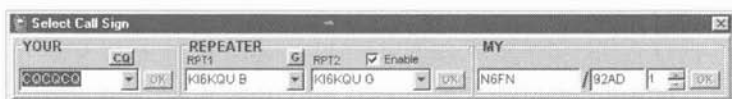
Caller	/	Message
N9QE	/2820	LARRY HARBOR CITY, CA
KC8YQL	/DNGL	BILL, CONTINENTAL, OH
K6DAF	/DOUG	SAN DIEGO NORTH CO.
		SAN DIEGO NORTH CO.
WB6YES	/92AD	

☒ Displays when new message is received. Clear

Received messages are displayed in the lower half of the window. The upper section lets you format and select short messages of your own. You can have up to five of these, and the one currently showing is the one that will be transmitted.

In the lower left corner of these two windows is a box that can be checked to have the window pop-up whenever a new record is received. Depending upon what you are trying to do, having these windows popping up can be annoying. If so, just unclick the **Displays when new message is received** box.

Another useful screen that facilitates D-STAR operation is the **Select Call Sign** window. This handy screen lets you conveniently configure the *Call Sign Routing Registers*.



When operating from a station where you can use a PC, the control and status windows described above can all be placed on the PC's desktop and monitored while operating. It's quite informative to see the data displayed as calls are received, especially when contacting hams in foreign countries.

Chapter 8: DV Mode Slow-speed Data

Icom's D-STAR compatible VHF and UHF transceivers come factory ready for 1200 bps data communication. All you need is an RS-232 or USB interface cable for connection to a PC, some data communication software and you're in business. In general you can use the same cable that is used to program your radio.

Cables for different model transceivers are available from Icom, or you can make your own. Information for fabricating your own data cables can be found at http://epaares.org/dstar/icom_cables.htm.

DV mode digital data can be sent simultaneously with voice transmission. As explained in Chapter 1, the basic D-STAR digital packet structure has space reserved for data and voice in the same packet. DV mode transmission consists of a continuous stream of digital packets for as long as you are transmitting. Even when you are not transmitting data, the packet structure still includes space for the data. Voice and data transmission on the same signal are inseparable, even though one or the other may not be used. As a result, voice communication is not adversely impacted if data is being sent at the same time. Conversely, data throughput does not increase when not transmitting voice.

Data transmission through the D-STAR system is software and protocol independent. To software applications, the PC's data path to the originating transceiver, through the repeater's gateway to the Internet and on to similar equipment at the other end, appears just like a cable. Even though the data path is complex, software running on a PC is not involved with any of the packet formation or routing issues. All of that is handled by the transceiver and the gateway. The PC's software only sees a stream of data bytes, stripped of all packet header and routing information.

Since the entire data transport pathway, as complex as it is, appears no different than a cable to software applications, existing terminal emulation or data transport programs can be used without modification. Familiar programs such as *Hyper Terminal*, found on

most PC's, and *ProComm*, a long time favorite for modem communication, can readily be used. The catch is that the user at the other end has to either use the same program, or one that is at least compatible with the data that is being sent by the originating program.

D-STAR Oriented Data Communication Software

Of course, hams are never satisfied with just making do with what is readily available. Several have developed D-STAR data communication software applications that seek to improve performance and capability beyond programs originally developed for old-style modem communications. While there are a number of D-STAR data communication programs out there, the two most popular seem to be *d*Chat* and *D-RATS*.

*d*Chat* (D-STAR Chat) is a simple to use Windows based keyboard-to-keyboard communication application. Keyboard-to-keyboard communication on D-STAR is somewhat similar to using RTTY or PSK31, except text data is transmitted a line at a time. This is probably the program to use if you want to experiment with keyboard-to-keyboard communication with a friend or two.

D-RATS on the other hand, while still capable of keyboard-to-keyboard communication, sports a much more extensive list of features such as: file transfers, GPS position reporting, mapping, message filtering, email reception and forwarding, and even a method for creating and using forms. Several premade forms can be used for sending eMail, radiograms and other purposes. Also included are several sample forms for supporting EMCOMM incident communications. Existing forms can be edited to suit your purposes, or you can create your own. *D-RATS* is a multi-platform application that can run on Windows, Linux/UNIX and MacOS X operating systems.

In addition to using radios to transfer data over RF links, D-RATS is capable of transferring email and other data between RF links and the Internet, thus providing a bridge between radio and Internet communications. An additional capability, added in Ver 0.3.0 is the ability to save and work with maps downloaded from the Internet.

Radio / PC Configuration for Low-speed data Operation

Setup for low-speed data operation is relatively simple. Other than configuring the PC communication software application that will be used, there are three things to be concerned about on the radio:

- Serial port settings
- Selection of Automatic or PTT triggered data transmission
- Disabling GPS transmission

Configuring Serial Ports

The serial port data rate for some Icom transceivers is fixed; for others it can be set via a setup menu. This chart identifies serial port data rate setting capability by radio model.

Radio Model	Fixed Data Rate	Use Menu to Set
IC-2820	9600 bps	na
IC-80AD	na	4800 / 9600 bps
IC-91AD	38.4 kbps	na
IC-92AD	38.4 kbps	na
IC-V/U82	na	9600 bps
IC-2200H	na	9600 bps
ID-800H	na	9600 bps
ID-880H	na	4800 / 9600 bps

The PC's serial port must be set to match the radio's serial port parameters as follows:

- Baud Rate Set as per the above chart
- Data 8 bit
- Parity none
- Stop bits 1 bit
- Flow control Xon / Xoff

Typically the PC's serial port parameters are set using the PC's communication software application.

Automatic / PTT Data Transmission Selection

On all D-STAR compatible Icom radios, except for the IC-V/U82 there is a menu for selecting either Automatic or PTT triggered data transmission. PTT is typically the radio's default condition, and limits data transmission to when the microphone's PTT key is pressed. When set to Auto, the radio will start transmitting data whenever it shows up from the PC's communication software application. (The IC-V/U82 is fixed to operate in the Auto mode.)

Typically when transmitting data, the radio should be set to automatically initiate transmission whenever data is received from the PC. But you need to keep in mind that when operating over a repeater, especially if you are linked to a reflector, that the PC will send data whenever it has it. Sending GPS position data or operating other "beacon" modes can be a problem, because it can collide with other user's transmissions. In the case of sending GPS position data, the PTT menu option should be selected to prevent continuous "pinging" of the repeater.

The procedures for selecting either Auto or PTT data transmission for the IC-80AD, IC-91AD, IC-92AD, ID-880H and the IC-2820 are shown below. Consult the Icom user manual for the IC-2200H and the ID-800H.

Automatic / PTT Selection on the IC-91AD and IC-92AD:

1. Starting with the DV operating mode selected and a D-STAR repeater frequency being displayed on the screen.
2. Press [MENU], which brings up the menu list.
3. Rotate [DIAL] or use [▲] / [▼] to select **DV SET MODE**.
4. Press [►] to the **DV SET MODE** menu.
5. Rotate [DIAL] or use [▲] / [▼] to select **DV DATA TX**.
6. Press [►] to the **DV DATA TX** option setting screen.
7. Rotate [DIAL] or use [▲] / [▼] to select either **PTT** or **AUTO**.
8. Press [MENU] to exit and return to normal operation.

Automatic / PTT Selection on the IC-80AD and ID-880H:

1. Starting with the DV operating mode selected.
2. Press [**MENU**], which brings up the menu selection mode.
3. Rotate [**DIAL**] or use [**▲**] / [**▼**] to select **DV SET** menu.
4. Press [**►**] and rotate [**DIAL**] to select **DATATX** submenu.
5. Press [**►**] to enter the submenu.
6. Rotate [**DIAL**] or use [**▲**] / [**▼**] to select **AUTO** or **PTT**.
7. Press [**MENU**] to return to normal operation.

Automatic / PTT Selection on the IC-2820:

1. Starting with the DV operating mode selected.
2. Press [**F**] to access the function keys
3. Press [**MENU**] to select the **MENU** screen.
4. Rotate [**MAIN•BAND**] to select **DV SET MODE** screen, then press [**MAIN•BAND**].
5. Rotate [**MAIN•BAND**] to select **DV DATA TX**, then press [**MAIN•BAND**].
6. Rotate [**MAIN•BAND**] to select either **PTT** or **AUTO**.
7. Press [**BACK**] 3 times to exit and return to normal operation.

Disabling GPS Mode Transmission

To be able to transmit slow-speed data with the IC-80AD, IC-91AD, IC-92AD, ID-800H and IC-2820 transceivers its first necessary to turn off GPS mode operation, otherwise the radio will not transmit data. For other radios, consult the Icom user manual to see if GPS needs to be turned off.

Disabling GPS Transmission on the IC-80AD and ID-880H:

1. Starting with the DV operating mode selected.
2. Press **[MENU]**, which brings up the menu selection mode.
3. Rotate **[DIAL]** or use **[▲]** / **[▼]** to select **GPS** menu.
4. Press **[▶]** and rotate **[DIAL]** to select **GPS-TX** submenu.
5. Press **[▶]** to enter the submenu.
6. Rotate **[DIAL]** or use **[▲]** / **[▼]** to select **OFF**.
7. Press **[MENU]** to return to normal operation.

Disabling GPS Transmission on the IC-91AD and IC-92AD:

1. Starting with the DV operating mode selected and a D-STAR repeater frequency being displayed on the screen.
2. Press **[MENU]**, which brings up the menu list.
3. Rotate **[DIAL]** or use **[▲]** / **[▼]** to select **DV SET MODE**.
4. Press **[▶]** to the **DV SET MODE** menu.
5. Rotate **[DIAL]** or use **[▲]** / **[▼]** to select **GPS TX MODE**.
(On the IC-91AD select **GPS MODE**)
6. Press **[▶]** to the **GPS TX Mode** option setting screen.
7. Rotate **[DIAL]** or use **[▲]** / **[▼]** to select **DISABLE** or **OFF**.
8. Press **[MENU]** to exit and return to normal operation.

Disabling GPS Transmission on the IC-2820:

1. Starting with the DV operating mode selected.
2. Press [F] to access the function keys
3. Press [MENU] to select the **MENU** screen.
4. Rotate [MAIN•BAND] to select **DV GPS** screen, then press [MAIN•BAND].
5. Rotate [MAIN•BAND] to select **GPS AUTO TX**, then press [MAIN•BAND].
6. Rotate [MAIN•BAND] to select **OFF**.
7. Press [BACK] 3 times to exit and return to normal operation.

d*Chat Application Installation and Setup

*d*Chat*, written and maintained by Brian Roode, NJ6N can be downloaded from his web page http://nj6n.com/dstar/dstar_chat.html

Installation is simple and straightforward following the instructions found on the web page. I downloaded the program to my computer by clicking on the link in step 3 of his instructions, which seemed like the simpler of several options presented. The program downloaded is a .zip file that you can extract to some convenient location. It installs much like any other Windows application, placing a **dChat2** program entry in your computer's **Start, All Programs** list.

Start the program by clicking on **dChat2** in the **All Programs** list. When the **dChat nj6n** window comes up, click on **Settings** at the top of the screen to display the **Settings** window. Here you can enter your **Call Sign** and set the **Communications Port Settings** by selecting the COM port that is connected to your radio and it's baud rate. Set the baud rate to one that is supported by your radio.

Settings

Call Sign Communication Port Settings

MYCALL COM1 38400 txColor rxColor

☒ Show QST ☒ Show GPS ☒ RxBeep Logo Font

☐ Send Periodic QST Timestamp TxDelay

30 Minutes ☐ tx ☒ rx 1500 ms

☒ Buffer ☐ Show ASCII ☐ Filter Duplicate

QST Message

Visit the SOARA D-STAR Web site at www.soara.org/dstar!

Quick Send Text Messages

Message 1

Message 2

Message 3

Message 4

Message 5

Message 6

Message 7

South Orange Amateur Radio Association
www.soara.org

Custom Banner Message

Close Save

The **txColor** and **rxColor** buttons are used to set the color for text that appears in the text box on the main screen. I selected red for transmit and blue for receive. The **Font** button selects the font style for text that is displayed.

The **Settings** screen contains two areas for pre-formatting messages that you want to send. In the **QST Message** area, text that is to be broadcast on a periodic basis can be programmed. If you want to broadcast QST messages, set the **Minutes** pull-down to a suitable time between broadcasts. In the screen above, its been set to once every 30 minutes, and then check the **Send Periodic QST** box. Since this will periodically ping the repeater, you want to be careful about using this.

The **Quick Send Text Messages** area allows you to program up to seven different messages that can later be easily recalled and transmitted. These are intended for messages that you might use on a

regular basis. These could be for sending a CQ, instructions on how to reply to your call, station identification, equipment setup and so on. Once programmed, these messages can easily be transmitted from the main screen at the click of a button.

The **Custom Banner Message** box lets you customize the banner / header that appears at the top of the main **dChat** screen. Here you could enter your own call sign, club identification, special event identification or anything else you might think of. This is “window dressing” and does not get transmitted.

The **Logo** button is more “window dressing” and lets you select a .jpg image of your own to replace the logo displayed in the upper right corner of the **Settings** and main **dChat** screens.

When the **Show GPS** box is checked, incoming GPS / DPRS messages will be displayed. If too many incoming GPS messages get to be a problem, uncheck the box to filter them out.

The **Filter Duplicate** box lets you filter out received duplicate messages based upon the last two lines of received data.

Normally the **Buffer** box is left checked, but if you need to see non line-terminated data (text run together without line breaks), such as might be received from D-RATS, uncheck this box.

Normally the **Show ASCII** box is left unchecked. If checked the ASCII code representing the character will be displayed in parenthesis following each character. This might be used for troubleshooting or other purposes.

The **TxDelay** box is used to set the maximum random delay that is used between each line that is sent. A random delay is inserted to help avoid collisions (simultaneous transmissions with other stations). Normally the default setting of 1500 ms should be fine.

When you are finished with the Settings screen, be sure to click the **Save** button at the bottom to save you work. To go back to the main **dChat** screen, click on the **Settings** button.

d*Chat Program Operation

Before running the program, make sure the following items have been set on your radio. If necessary, refer to the above sections for information on setting these parameters.

- If required for your radio, set the radio's serial port settings.
- Select Automatic data transmission
- If required for your radio, disable GPS transmission

Once installed and setup, *d*Chat* is relatively simple to operate. When started, the program displays the following screen.



First, making sure your radio is connected and tuned to a D-STAR repeater or DV mode simplex frequency, clicking on the **Connect** button should result in a **COMx opened** port status being displayed just to the left of the Recall button. (COM3 opened is shown above)

Transmitting consists of sending some text either by typing in the **Text to Send** box, or by clicking on one of the messages in the **Quick Send** box, which copies the message to the **Text to Send** box.

When the data in the **Text to Send** box is ready to be sent, click on the **Send** button or hit the Enter key on your computer's keyboard. Data is transmitted a line at a time.

If the text you sent is immediately echoed back, and the **NO DIALTONE** error message is displayed, it was not actually transmitted and you may not have selected the correct COM port or baud rate on the PC.

If you wish to re-send the last line sent, press the **Recall** button.

If your text box starts to get cluttered, it can be cleared by clicking on the **Clear** button.

Pre-formatted small messages can also be broadcast by selecting **Send Bulletin**, under the **File** pull-down menu. This feature cannot be used for file transfers. Instead, it is a way of pre-formatting small multi-line messages for transmission. Messages sent this way show up in other users text window, just like any other messages.

D-RATS Application Installation

D-RATS, written and maintained by Dan Smith, KK7DS has more features, and consequently is more complex to use than *d*Chat*. Dan actively encourages user input, periodically providing new releases implementing changes requested by *D-RATS* users. The current version can be downloaded from <http://d-rats.com>

The descriptions and screen shots in this book were made using *D-RATS* Version 0.3.2 beta. The latest version user manual and other operational information can be found under the **Documentation** section located on the *D-RATS* home page, <http://d-rats.com>

Installation instructions and downloads are provided for the Windows, MacOS X and Linux operating systems. Installation is simple and straightforward following the instructions found under **Downloads** section of the web page. Select a download suitable for your system type and download the file to a convenient location.

By the way, if *D-RATS* sounds like a strange name for a program, think about what RATS spells backwards. Dan has sense of humor!

Setting up the D-RATS Program

To setup the program, start the *D-RATS* application, either directly from the file it was placed in, or via the **Start > All Programs** method used on Windows machines.

From the **D-RATS** opening screen select **File > Preferences**, which displays the **Config** screen as shown below. Refer to the *User Manual* found under the *Documentation* section of the *D-RATS* webpage, to configure the various fields found on this screen.

To get started with basic operation you only need to configure the: **Preferences**, **Paths**, **GPS**, and **Radio** sections. The default settings for the other sections will be adequate initially. You can always come back and configure them as you gain experience with the program. One that you may want to experiment with later are the three **Email** settings which configure the program for retrieving and sending email via the Internet from remote locations which lack a local Internet connection.

The screenshot shows the 'Config' window with the 'Preferences' section selected in the left sidebar. The main area contains the following settings:

- Callsign:** N6FN
- Name:** Bernie Lafreniere
- Sign-on Message:** ☒ Enabled Online (D-RATS)
- Sign-off Message:** ☒ Enabled Going offline (D-RATS)
- Units:** Imperial
- Show time in UTC:** ☐ Enabled
- Ping reply:** Escondido, CA, D-RATS Ver 3.2.b4
- Language:** English
- Private default:** ☐ Enabled
- Blink tray on:**
 - Incoming Messages: ☒ Enabled
 - New Chat Messages: ☒ Enabled
 - Incoming Files: ☒ Enabled
 - Received Events: ☐ Enabled

At the bottom right are 'Save' and 'Cancel' buttons.

Configuring D-RATS Preferences

In addition to using the *Configuration* section of the on-line *User Manual*, the following might be helpful.

Config Preferences Section:

Under **Preferences**, enter your **Callsign** and **Name**. When entering your call sign, make sure that there are no trailing white spaces. When the **Sign-on** and **Sign-off Message** boxes are checked, short messages are automatically transmitted, whenever you open and close the *D-RATS* program. Uncheck the boxes if you don't want these messages transmitted every time you start the program.

On the same screen you will also see the **Ping reply** box. When another D-RATS user issues a **Ping Station** command, either to a specific station or to all stations via the **Ping All Stations** command, all online D-RATS stations will automatically respond with an answer. This is where you program your reply to a ping. Typically this might be your location, a greeting, equipment setup or anything else you desire.

The **Blink tray on** feature enables a D-RATS icon in your computer's Task Bar to blink when different types of messages or files are received. Check the boxes of any events for which you want to enable the D-RATS icon to blink. This can be helpful when you either have other windows open or have been away from the terminal and wish to be alerted to the fact that new data has arrived.

Config File Folder Path Preferences:

If you intend to perform file transfers, under the **Preferences** section click on **Paths** to set a file folder to which incoming files will be downloaded. In addition to supporting downloaded files, this directory can also be used for uploading or sharing files. Shared files can be directly accessed by other users. You will notice that you can also select a folder for where maps will be stored. It is recommended that you not change the default location of the maps folder.

The **Form Logo Path** is used to store any logo bitmaps that you wish to use with forms. These are not transmitted as part of a form, but instead are used locally as inserts to forms.

If you wish to change the default **Paths**, clicking on the grey "dotted" button, enables pointing and clicking to where you want to locate the folders.

Config GPS Preferences:

Also under **Preferences**, by clicking on **GPS** you can set a fixed **Latitude**, **Longitude** and **Altitude** or enable an attached GPS unit. If you don't attach a GPS, providing you are connected to the Internet, you can easily lookup and set the Latitude and Longitude by clicking on the **Lookup** button and entering an address, zip code or an intersection. If connecting an **External GPS** to your computer, check the **Use External GPS** box to enable it and select the COM port and baud rate to be used.

Config Appearance and Chat Preferences:

Initially, you can use the default settings for **Appearance** and **Chat** under the **Preferences** section. After gaining experience with the program, you can come back and fine-tune these to your own liking.

Config Sound File Preferences:

The **Sounds** configuration page allows you to produce different sounds, depending upon the event, by specifying the location and file name of .wav sound files. If you don't have any sound files of your own, you can search your computer system for any files with the .wav file type. On Windows systems, quite a few sound files can be found in the C:\i386 directory/folder. I selected the following files from my system's i386 directory:

- Chat activity ding.wav
- Message activity ringin.wav
- File Activity TestSnd.wav

Config Message Forwarding Preferences:

With the **Messages** configuration page you can enable automatic forwarding of messages placed in the *Outbox* to the prescribed recipient of the message. In D-STAR fashion, these messages can be sent to the node where the recipient station was last heard, or according to "static message-routing" rules. The automatic messaging forwarding feature can be handy when setting up unattended link stations.

The **Queue flush interval** sets how often the Outbox is scanned for outgoing messages. For performance reasons, it's recommended that this not be set too often. For most purposes, setting this for several minutes should be sufficient.

Config Radio Parameters:

Click on the **Radio** section to set the computer's **Serial Port** and baud rate setting. Using this screen, D-RATS can be configured to work with multiple radios and even the *Ratflector* (which allows D-RATS operation over the Internet without using a radio). Entries are made and edited using the **Add**, **Edit** and **Delete** buttons on the bottom of the screen. For each radio you intend to use, create an entry, setting the COM port and baud rate to match the rate being used on your radio.

Config the DV Dongle Parameter:

An interesting alternative to using a radio for transferring D-RATS messages and files over the D-STAR network is to select the **Dongle** port type in the **Add a port** window which comes up when you click on **Add**. As of this writing this is still experimental, but if you use a

DV Dongle as your D-STAR network connection medium for D-RATS operation, you should only connect through Reflector 15, Module C. Otherwise you may disrupt communication for other D-STAR users. For more information, refer to the **Using D-RATS for Transmitting and Receiving Data** section in the following DV-Dongle chapter.

Config Transfer Parameters:

The **Transfer** settings window initially can be left at their default settings. If you later experience trouble getting file transfers to complete properly, you might try using smaller **Block size** settings and reducing the number of **Pipeline blocks**.

When data is being transferred reliably, larger block sizes and pipeline numbers will result in faster throughput. But, if there are a lot of retries and retransmissions due to band conditions or whatever, reducing the block size and reducing or eliminating pipeline operation may result in more satisfactory operation.

Enabling File Transfers:

Enabling **Remote file transfers** allows other stations to download files from the folder specified in the **File Transfer Path** set earlier.

Config Network Parameters:

The first two network configuration screens **TCP Gateway** and **TCP Forwarding** are advanced methods of forwarding and retrieving TCP / Internet traffic over the radio, most users will not need these.

If you intend to send or retrieve e-mail from the Internet, the three **Email** settings are used to configure your email accounts. Most of these parameters should be familiar to those that have setup email accounts on their personal computers. Refer to the on-line D-RATS *User Manual* and the **Internet Email** article available in the **HowTos** section of the **Documentation** link found on the main D-RATS web page, www.d-rats.com.

Use the Ratflector for D-RATS Experimentation

Accessed via the Internet, the *Ratflector* allows you to test and experiment with all of D-RATS modes of operation. Instead of routing data out a COM port to a radio, it can be sent over the Internet. Other than that, it essentially works just as if it were an RF connection to the D-STAR network. You can do just about everything that you would normally do over the air, but in this case the data packets are transferred via the Internet. Since usage is generally the same as operating over a radio, you still need to configure the D-RATS preferences as described in the prior section.

Using the *Ratflector*, you could exchange data with a friend, or use two computers side-by-side to simulate two stations intercommunicating. Using two computers, one as the sending station and the other as the receiving station, is a really powerful learning tool.

Dan, KK7DS is the provider of the *Ratflector* and encourages people to get on and use it as a learning tool. The convenience of using your existing Internet connection makes it easy to run tests and ask questions of users that may be connected. If asked, other users are generally happy to oblige with requests to try File and Message transfers and other modes of operation.

It's very simple to setup, and I highly recommend learning how to use D-RATS using the *Ratflector* before trying to make contacts via a radio. It takes one layer of complexity out of the equation. Information on **Connecting to the Ratflector** is available in the **HowTos** section of the **Documentation** link found on the main D-RATS web page, www.d-rats.com.

Configuring Radios for D-RATS Operation

Before running the program, make sure the following items have been set on your radio. If necessary, refer to the sections earlier in this chapter for information on setting these parameters.

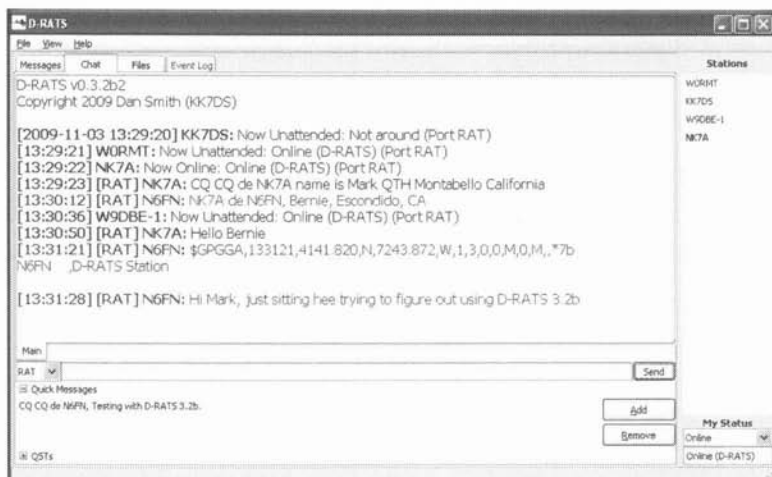
- If required for your radio, set the radio's serial port settings.
- Select Automatic data transmission
- If required for your radio, disable GPS transmissions

The following table, from the D-RATS web page *User Manual*, summarizes the required menu settings for various D-STAR radios.

Radio	Rate	Radio settings required for D-RATS to function
IC-80AD	9600	DATATX = AUTO, GPS-TX = OFF, GPS.ATX = OFF
IC-U82	9600	ATX = ATXON, SPD = SPD96
IC-V82	9600	ATX = ATXON, SPD = SPD96
IC-91AD	38400	DV DATA TX = AUTO, GPS TX = DISABLED, GPS AUTO TX = OFF
IC-92AD	38400	DV DATA TX = AUTO, GPS TX = DISABLED, GPS AUTO TX = OFF
IC-2200	9600	ATX = ATXON, SPD = SPD96
IC-2820	9600	DV DATA TX = AUTO, GPS TX = DISABLED, GPS AUTO TX = OFF
ID-800H	9600	DVT = DVTAT, SPD = SPD96
ID-880H	9600	DATATX = AUTO, GPS-TX = OFF, GPS.ATX = OFF
ID-1	19200	DV DATA TX = AUTO, Cannot use PC application

D-RATS Chat Operation

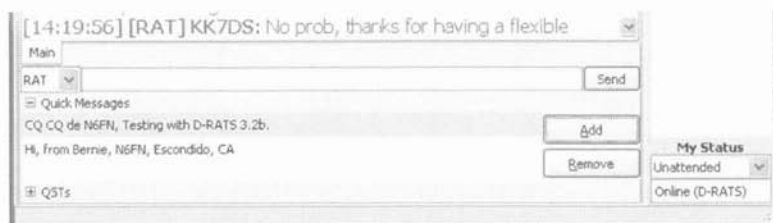
Selecting the **Chat** tab of the main D-RATS window allows you to receive and transmit messages. Anything typed in the send box will be sent as an entire line, either by clicking on the **Send** button or by pressing the **Enter** key on your computer. Unlike PSK31 or other programs, text is not sent character-by-character as you type; it's sent a line-at-a-time. Sending text a line-at-a-time improves throughput by dramatically reducing the number of packets sent over the D-STAR network.



If you have multiple ports enabled on the **Preferences > Radio** screen, perhaps D-RATS via an Internet **Network** connection and a radio or two, use the pull down menu button at the left of the chat text entry box to specify which port to send the text data to.

If you wish to clear the upper text window, click on the **View** pull-down menu and select **Clear**. Even after clearing the upper chat window, you can retrieve older data by clicking on the **View** pull-down menu and selecting **Log**.

To pre-format short messages that you might use on a regular basis, click on the **Quick Messages** button, which allows you to view and select already formatted messages. Here you can also enter and delete messages. **Quick Messages** are transmitted by double-clicking on the message you want to send.



Ping Stations Operation:

To determine if any other stations are online, you can send a ping command, and any connected D-RATS stations will respond with the reply that was set in their station's configuration setup **Ping reply** box.

By right clicking anywhere in the **Stations** windows on the right, you can select **Ping All Stations** to determine who is on line and their current **Online / Unattended** status. Hovering your mouse cursor over a station's call sign will display their current online status and when last heard.

You can set your own **Online / Unattended** status by using the pull-down selection button under the **My Status** heading.

You can also ping individual stations by using by right clicking on the station's call sign in the **Stations** window. Also by right clicking on the station's call sign, you can: **Test Connectivity**, **Request Position** and **Send file**. **Test Connectivity** sends a number of test packets to determine the data transmission / reception link quality to that station.

Configuring and Sending D-RATS QST Broadcasts

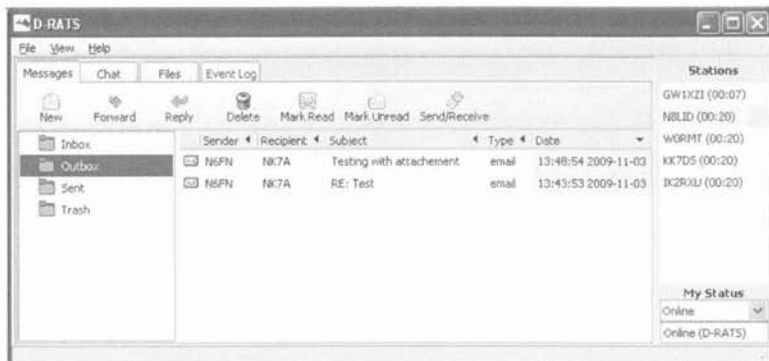
QST message broadcasts can automatically be transmitted on a periodic basis. To pre-format QST Messages, click on the **QSTs** button at the bottom of the Chat screen. Here you can **Add**, **Edit** and **Remove** QST messages. Click **Add** to create a new message type and set the delay between message broadcasts.



Checking the **ON** box selects the QST Message to be transmitted at the selected time intervals. While the QST Message is being displayed in the **QST** window, you will see it counting down the transmission timer. If you wish, the message can be immediately sent by double clicking it, handy for bypassing the full time period when testing.

Exchanging eMail and Forms

Selecting the **Messages** tab of the main D-RATS window allows you to receive and transmit eMail messages and a variety of other forms.



In addition to sending and receiving email and forms, the program can also serve as an email forwarding mechanism to RF nodes not connected to the Internet. This enables remote D-STAR nodes to be able to send and receive emails with either Internet or RF node connected destinations.

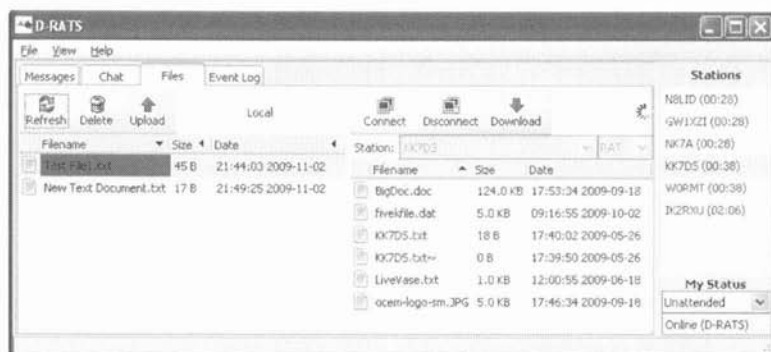
To create an email, click on **New** and then select **email** from the list of pre-formatted forms. The **Email Message** form comes up where you can compose your email, and add attachments you may wish to send. (Keep attachments small, preferably under 1 Kbytes.)

After saving the email, it goes to the **Outbox**, and can be manually sent by highlighting the document and clicking on the **Forward** button. This same button is also used to forward received messages to other Internet or RF node connected destinations. Alternatively, **Send/Receive** can be used, which sends all emails in the **Outbox** if Automatic Forwarding is enabled in the **Config Messages** screen.

For further details on the configuration and use of email and form capabilities, refer to the on-line D-RATS *User Manual* and the **Internet Email** article available in the **HowTos** section of the **Documentation** link found on the main D-RATS web page, www.d-rats.com.

Transferring Files with D-RATS

The **Files** tab allows you to send and download files.



Files shown on the left side of the window are located in the **File Transfer Path** folder that you specified when configuring your **Paths Preferences**. You place files in this folder using the standard methods of moving files on your Windows or other system. Remember that D-STAR's low-speed DV mode only supports a transfer rate of about 900 bps, and you should keep file sizes small.

Sending a File:

To send a file, select a recipient from the **Station** drop-down list. If you are using more than one port (perhaps the *ratreflector* and your radio), select the port you wish to transmit on. Click / highlight the file you wish to send and click on the **Upload** button.

Downloading a File:

To download a file, select a station's call sign from the **Station** drop-down list. Select the port you wish to download through. Click on **Connect**, which will display the list of files in the target station's **File Transfer Path** folder. Click on the desired file name (on the right side of the screen) and then click on the **Download** button. File transfer progress is shown along the bottom edge of the window.

When the download is complete, click on the **Disconnect** button. As you can see, you should never place files containing "private or confidential" information in your **File Transfer Path** folder; this is a publicly accessible file exchange folder.

File Transfer Problems

If text and quick messaging are working fine, but you are having difficulty transferring files, you might try performing a **Connectivity Test** to assess the condition of the radio link. Unlike DV Voice, which has error correction built into the protocol, DV low-speed data mode has no error correction mechanism. Thus it is important to have a high quality radio connection for file transfers to be successful.

To test the reliability of a connection, right-click on the desired station in the **Stations** window and select **Test Connectivity**. Here you can experiment with **Multiple fixed-size packets** and **Gradually increasing packet sizes**, to try and determine an optimum packet size. Click **Forward** and either accept the default parameters, or modify to suit, then click **Forward** again and then press the large **Start** button to run the test.

Data Block Transfer Problems: Best throughput performance will be had with larger block sizes. If you are having trouble completing file transfers, a high block size may prevent you from getting blocks through. Reducing the block size reduces the odds of incurring errors within each block, which may reduce file transfer difficulties.

To change the default block size, under the **File** pull-down menu select **Preferences** and then **Radio > Transfers**, on the **Config** screen. The program default block size is 512, which is relatively large. To see if smaller block sizes can alleviate block transfer problems, you might try block sizes of 256 or 128. Like wise, you might try reducing or eliminating **Pipeline** blocks.

Mixing File Transfers with voice: This is from the D-RATS web page. "Because of the effect timing has on the ability to detect failed or missing blocks and retry, interrupting a file transfer may cause problems. Talking on the digital voice side while doing a file transfer can cause the transfer to time out. Try to avoid talking while sending a file if possible."

Other D-RATS Capabilities

The above sections describe the main features and functionality of the D-RATS application. However, there are additional features that advanced users may find of interest. Further information on these can be found under the **HowTos** section of the **Documentation** link found on the main D-RATS web page, www.d-rats.com

TCP Forwarding: From the D-RATS web page: "D-RATS has generic TCP forwarding support. This means you can pipe some TCP traffic across the radio to a remote station. This may be useful for bridging SMTP traffic to a remote location or for doing POP3 for remote mailbox access. In it's native form, this will be rather slow, given that most of the protocols likely to be used in this fashion are very chatty and depend on a lot of back-and-forth handshaking to complete. While you should be prepared for this, the functionality should still be useful."

D-RATS Repeater / Ratflector Operation: D-RATS also has a repeater program, which can be used as a repeater with multiple radios, or as a network proxy (instead of or in addition to the repeater function). The **D-RATS Repeater** program is downloaded along with the main D-RATS application and is found in the same program group.

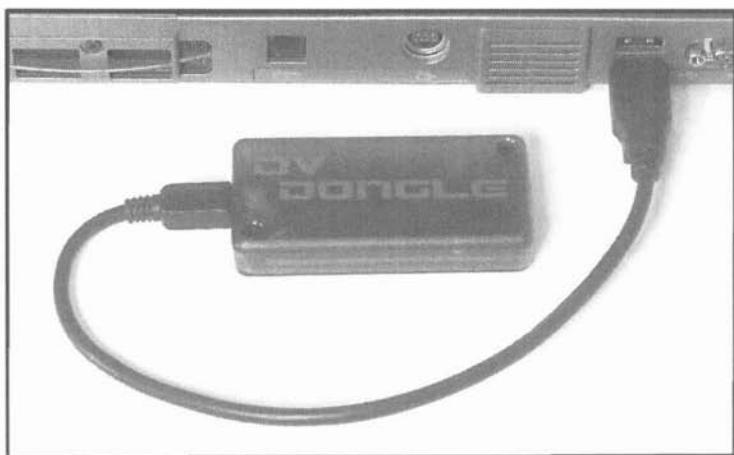
Connecting D-RATS to a DPRS Interface: Two separate pieces of software, *D-RATS* and *DPRS Interface* developed by Pete Loveall AE5PL, can be configured to operate simultaneously across a D-STAR radio's low speed DV channel. DPRS Interface is designed to pass GPS-A DPRS messages received from a D-STAR radio's low speed DV channel and pass them on to the APRS-IS network where it is combined with APRS and DPRS traffic world-wide.

Mapping Capability: A separate **D-RATS Map Downloader** program, found in the D-RATS program group, is capable of downloading and locally caching map segments from the Internet. These maps can then be used to make measurements, track multiple stations or other assets using GPS, and includes support for dynamic sources such as NBDC Bouy and NWIS River Status.

Chapter 9: DV Dongle, D-STAR Adapter

Besides being a solution for hams that don't have local access to a gateway equipped D-STAR repeater, the DV Dongle is fantastic for quickly and easily connecting to gateways and reflectors all over the world. It's especially suited for situations when you are out of town and want to get back into your local repeater.

Developed by Robin Cutshaw, AA4RC and Moe Wheatley, AE4JY, the DV-Dongle provides an alternative method for participating in D-STAR communications without using a radio.



Housed in a small semi-transparent blue plastic enclosure, the Dongle connects to your computer's USB port via a short interface cable. Since world-wide D-STAR communications are facilitated by sending digitized voice packets over the Internet, the only thing a PC needs to be able to participate in D-STAR communications is some suitable software and a means of encoding and decoding D-STAR's digital voice streams. Taking advantage of a PC's high speed USB 2.0 data port, circuitry inside the Dongle uses an AMBE digital voice CODEC to encode and decode voice data streams to the D-STAR protocol. Robin Cutshaw's, *DV Tool* software then takes care of transporting these data streams back-and-forth over the Internet to remote gateways and reflectors.

Computer System Requirements

The DV Dongle application needs a relatively fast computer to run properly. It's recommended that you have a 2 GHz or faster machine, and turn off any compute intensive applications to prevent data overruns between your computer and the Dongle. The Dongle's red LED flashes whenever overruns occur. I first tried installing on an older 1 GHz system, and performance was unsatisfactory. Operation on my Intel Dual Core 1.6 GHz laptop is quite usable, however.

Note: As of version 2.0x, Robin, AA4RC, has rewritten the application to run natively on the supported operating systems, instead of running Java as in the 1.x versions. This significantly increased performance, and the application may now be able to run on systems where it had previously been marginal running Java.

In addition to a fast computer, you also need a high speed Internet connection. Dial-ups will not work. The Internet service that comes bundled with my cable TV subscription worked fine.

If you don't already have one, you will need a headset and microphone that is compatible with the audio jacks on your computer, typically 3.5mm (1/8") audio jacks. There are a lot of inferior quality headset / mic products being sold for the mass-consumer PC market; for optimum voice reception and transmission you will want to get a higher quality unit. Most of the cheap units have small ear cuffs that don't block out ambient noise and quickly become uncomfortable to wear.

If an **Audio System Event** window pops up when inserting the microphone into the PC's microphone jack, select **Microphone** from the options presented, otherwise you may experience degraded or no audio recording.

Installing the DV Dongle Software on Your Computer

After purchasing a Dongle, the latest full release version of the *DV Tool* software is downloaded from the DV Dongle web page.

http://dvdongle.com/DV_Dongle/Home.html Beta test versions can be downloaded from <http://www.opendstar.org/tools/>

On the DV-Dongle Home page, clicking on the **Installation** tab accesses installation instructions and sample screen shots. Here you will find different software downloads targeted for the Microsoft Windows, Mac OS X Leopard, and Linux operating systems.

Note that on Windows systems, inserting the Dongle will bring up the *Found New Hardware Wizard* to assist you with installing the required USB drivers. Installation of USB Drivers on Microsoft Windows is a two-step process, bringing up the *Found New Hardware Wizard* two times. Make sure you complete both installs.

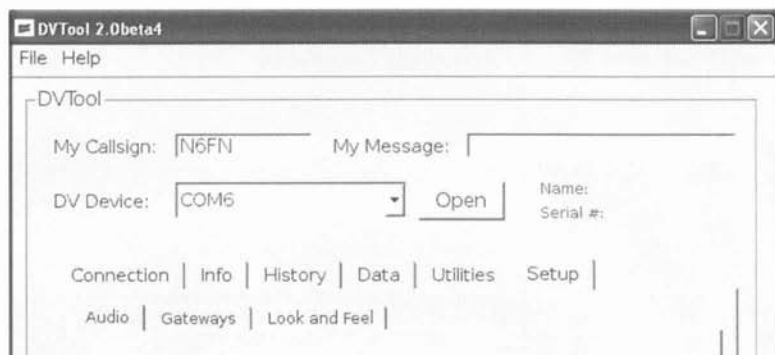
After installing the USB driver, you can download the *DV Tool* software application to a suitable place on your computer. I downloaded it to a *DVTool* sub-folder I created in the my *Program Files* directory.

After downloading the file to whatever location you prefer, the application is started by double-clicking or opening the *DVTool-2.xx.exe* file. Rather than having to open the folder whenever you want to run the program, you might want to put a shortcut to the program on your desktop or in the PC's START menu.

On Windows, to place a short cut on the desktop, right click on the *DVTool-2.xx.exe* file and select **Send to Desktop** from the pull-down window that pops up. To insert a shortcut into the **START, All Programs** menu, drag the *DVTool-2.xx.exe* file to the **START** button; wait until the **All Programs** option shows, and then drop/place the shortcut where you want it to appear in the list of programs.

Selecting the DV Tool COM port and Audio Devices

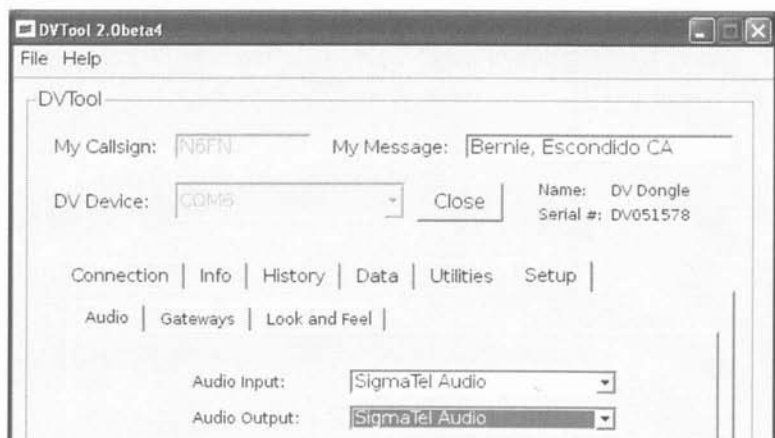
On the DV Dongle home web page; select the **Using the DV Dongle** tab to access the *DVTool* operating instructions. Before starting the program, make sure the DV dongle is plugged in. Upon starting the program verify that the serial port showing in the **DV Device** window is correct. If not, select the correct one from the pull-down list.



Enter your **Callsign**, and if desired a short 20 character or less **Message**. This message capability is the same as found on Icom's D-STAR radios and will be transmitted along with your voice every time you transmit.

Next verify that the **Audio Input** and **Audio Output** devices selected are the ones you want to use, by selecting the **Setup > Audio** tabs. If unsure, leave the default settings for now, you can come back to this and try other settings while doing audio loop back testing.

Click on **Open** to establish communication with the DV Dongle hardware. If all is well, you should see the **Name** and **Serial #** fields filled in as shown below. If communication was not established, you may have the wrong COM port selected. Try a different setting.

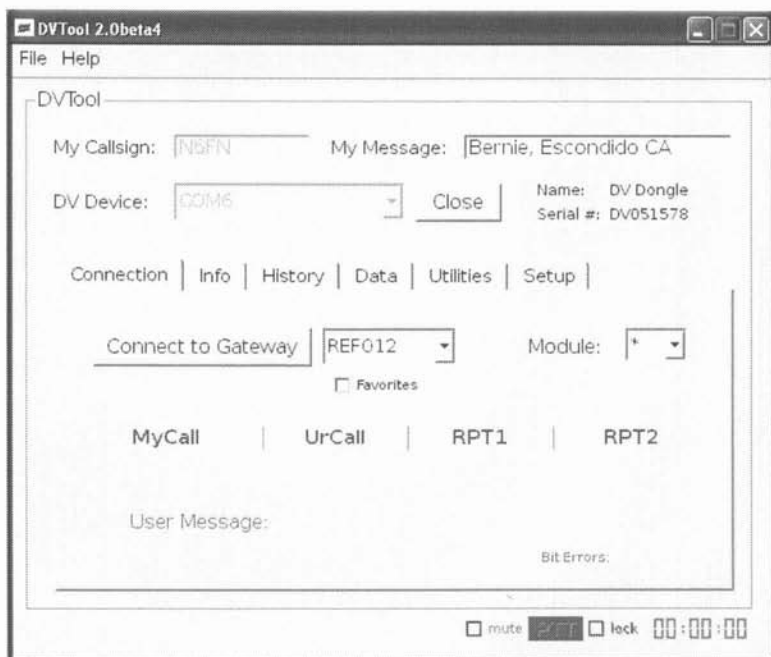


Setting the Headset and Microphone Audio Levels

Open your computer system's Volume Control settings window, usually accessed by right clicking on the speaker icon found in the system tray, at the bottom right of the computer screen.

Before setting the record level, you should first set the headset volume level for comfortable monitoring of other D-STAR station's transmissions. Once that is set, you can then set your microphone recording level to match received D-STAR signal audio levels. To do this we need to monitor some D-STAR activity.

Click on the **Connection** tab and select a D-STAR gateway with some traffic. This could be your local repeater gateway, a reflector, or a distant repeater. Next select the repeater's **Module**. If just looking for traffic, you can select the asterisk * to be able to hear traffic on any of the modules. If you have not already done so, enter your own call sign in the **Callsign** box. By the way, even though you don't transmit, your call sign will be picked up by the D-STAR system and displayed as monitoring the selected repeater or reflector.



Once the call sign of the repeater or reflector to be monitored has been set, and your own call sign has been entered, click on the **Connect to Gateway** button to begin monitoring. If you don't hear any traffic on the selected repeater, you can access the last heard list at <http://dstarusers.org/lastheard.php> to find repeaters with activity.

Monitor a few stations, adjusting the volume control for a comfortable listening level. As with conventional FM repeaters, you may notice volume level differences between received stations. If necessary, select a compromise volume setting that allows all stations to be comfortably heard.

Once your listening volume has been set, press the **Disconnect** button to disconnect from the D-STAR system so that the microphone recording level can be set. On a Windows machine, to access your computer's microphone level control, select **Properties** under the **Options** pull-down of the **Volume Control** window. This brings up the **Properties** window where you can select the **Recording** button, which in-turn displays the **Recording Control** window. If multiple recording devices are displayed in the, enable the **Microphone** setting.

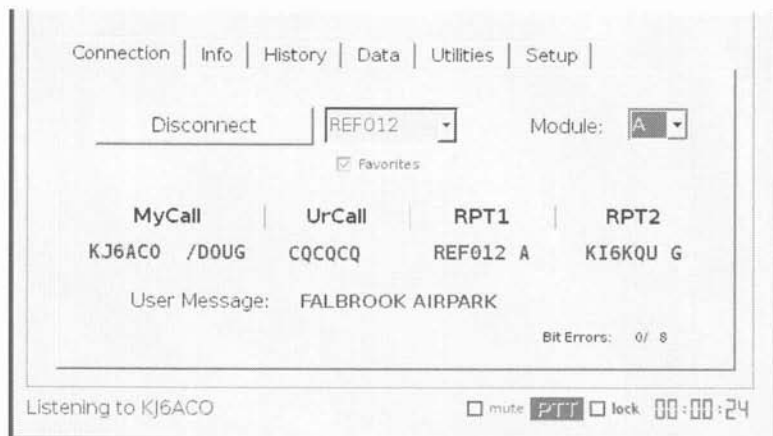
Click on the **Setup > Audio** tabs and then click on the **Test Audio Using Soundcard Only** button. While listening to your own voice, adjust the **Microphone** level control to match the listening level set earlier.

If you want to verify hear how your digitized voice will sound over the D-STAR network and verify the performance of the DV Dongle, press **Stop Soundcard Test**, and then click on the **Test Audio Using DV Dongle** button. Here it will be a bit easier to monitor your own voice, as it is delayed by a few seconds.

DV Dongle Operation

In setting the volume levels, we have already covered how to monitor a D-STAR node. To transmit, just press and hold the **PTT** button. If it is grayed out preventing transmission, and the asterisk * has been selected as the **Module**, you need to select a valid module, either A, B or C. The **PTT** button can also be grayed out preventing transmission if you are not registered for gateway transmission.

Be aware, that at least on Version of the *DV Tool* software that I was running, it was possible to select a module that is not physically present at the repeater site. In that case, I don't know where your transmission actually goes.



The **lock** function box can be selected if you wish to change the **PTT** button to operate as a toggle for transmit and receive. When set, clicking **PTT** once enables transmission, clicking a second time returns to receive.

You may notice, that some repeater nodes do not appear in the **Connect to Gateway** selection box. This can be for a variety of reasons, as only gateways that are currently running the required DV Dongle access software and have their IP ports properly forwarded will be displayed.

Besides being able to select gateways via the pull-down menu, you may find it faster to type in a desired gateway's call sign. By clicking on the **Connect to Gateway** box and quickly typing you can enter first couple of characters of a desired repeater's call sign, which selects the first call that matches the portion you entered, a fast way to specify a connection.

To further simplify selecting gateways, you can create a list of favorites by accessing the **Setup > Gateways** tabs. Once created, your list can be used on the **Connection** tab by clicking the **Favorites** box.

Gateway Information Tab

Clicking on the **Info** tab window's **Get Gateway Info** button retrieves a variety of information about the currently connected Gateway. In the screen shot below, all repeaters linked to Reflector 21 are shown at the left. Dongles currently connected to the repeaters and to the reflector are shown in the middle. A list of stations most recently heard on this reflector is shown to the right.

Connection | Info | History | Data | Utilities | Setup |

REF021 software version: 1.21 Date: 2009/11/06 21:37:51 UTC0

Linked Repeater: DV Dongles: Last Heard:

MODULE	A	A:	B	A:	A:	B	A:	B
GB7CD	B	A:	GB7WB	A:	G4SZM	10:49:12		
GB7DB	B	A:	GB3WE	A:	G0ELO	10:01:45		
MODULE B		N6FN		A:	M0RHV	08:00:24		
GB7GL	B			A:	M30PW	07:05:07		
GB7SY	B			A:	G6WZA	06:15:26		
				A:	G6GVH	03:01:57		

Get Gateway Info

☐ mute **PTT** ☐ lock 00:00:00

Recently Heard Station's History Tab

The **History** tab window records and time-stamps all stations heard on the current connection. This data can also be saved to a file.

Connection | Info | History | Data | Utilities | Setup |

Time	MyCall		UrCall	Rpt1	Rpt2
11/06 11:35:10	KJ6CDA	2820	CQCQCQ	REF012 A	KI6MGN C
11/06 11:38:04	KJ6CDA	2820	CQCQCQ	REF012 A	KI6MGN C
11/06 11:38:23	KJ6ACO	DOUG	CQCQCQ	REF012 A	KI6MGN C
11/06 11:39:41	K1GR	D800	CQCQCQ	REF012 A	KI6KQU G
11/06 11:40:22	KJ6CDA	2820	CQCQCQ	REF012 A	KI6JKA G
11/06 11:40:47	KJ6ACO	DOUG	CQCQCQ	REF012 A	KI6KQU G

Save file Browse ☐ gray dups Clear

☐ mute **PTT** ☐ lock 00:00:00

Connecting to Repeaters Linked to a Reflector

If you connect to a repeater that is currently linked to a reflector, only stations directly connected to the same repeater will be able to hear you. To be able to communicate with stations on other repeaters linked to the reflector, you need to disconnect from the repeater and connect to the reflector that the repeater is linked to. Then you will be able to communicate with any station or repeater linked to that reflector.

Receiving and Transmitting Data

In the upper section of the **Data** tab window, text data that is both received and transmitted is captured. Data is transported via D-STARs low-speed data transmission mechanism at about 900 bps.

In the screen shot below we see that both KJ6CDA and AF6BY are beaconing GPS data along with their voice transmissions. The appearance of GPS data can take several different forms, depending upon what users have selected to use as a GPS format sentence. Information on different GPS sentence formats can be found at <http://aprs.gids.nl/nmea/>

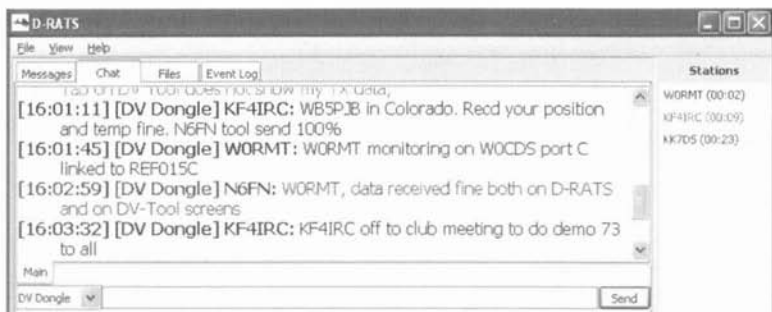


Any kind of text data can be received and transmitted, not just GPS. You can transmit messages by simply typing in the send box and clicking on **Send**. Alternatively you can **Send file** and **Save files**.

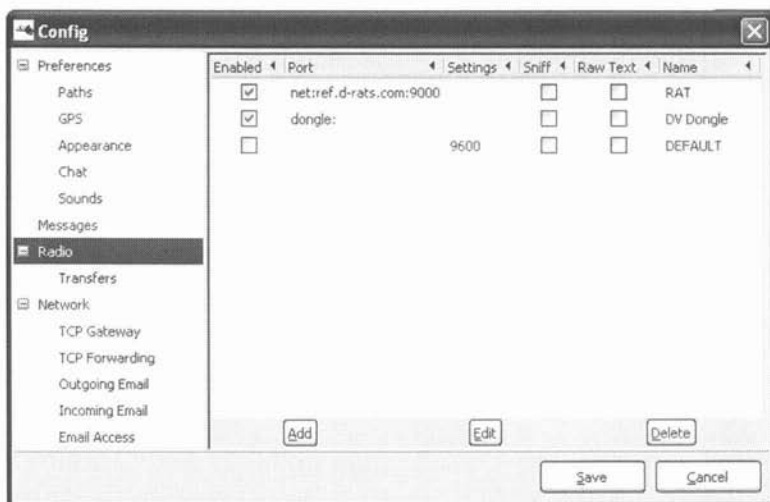
Using D-RATS for Transmitting and Receiving Data

While the ability to transport data via D-RATS through the DV-Dongle port was still experimental with the beta version of software I was using, and not completely bug free, I was able to exchange text data with other stations.

The following screen shots of D-RATS and DV-Tool are two views of the exact same data exchange session. The same data shows in both screens, albeit displayed differently. During these exchanges, others and I alternately exchanged short messages, either directly from the D-RATS Chat screen or via the DV-Tool's **Send** box.



I didn't have to do anything special. Apparently, the author of D-RATS, Dan Smith – KK7DS and the author of DV-Tool, Robin Cutshaw – AA4RC must have collaborated in making this work. Assuming you have D-RATS installed and running, all you need do is configure the D-RATS **Radio Preferences** by adding a **dongle** port as shown below.



Once a D-RATS DV-Dongle port has been configured as shown above, it's a simple matter of selecting the Dongle port to the left of the **Send** box, in the D-RATS **Chat** screen. After that, its fairly simple, you just use the programs as intended.

As of this writing there is a caution: you should only connect through Reflector 15, Module C. Otherwise you may disrupt communication for other D-STAR users.

Dongle LED Status Indicators

Four LED indicators, visible through the semi-transparent plastic case communicate the DV Dongle's operational status. A blue LED flashes whenever data is being transmitted from the computer and a flashing yellow LED indicates that data is being transmitted back to

the computer. A slowly pulsing green LED indicates that the device is idle. More importantly for assessing performance, the red LED indicates either data overruns or under runs between the computer and the Dongle. Occasional overruns aren't too bad, but frequent flashing of the red LED indicates a slow computer. Shutting down other programs may help; otherwise you will need a faster system.

Installation Problems

A variety of problems can prevent DV Dongle operation. One of them is that firewalls protecting your computer, network or router may prevent the program from communicating over the Internet. Other problems may arise with getting volume controls set, or being able to record from the microphone.

If you are having difficulty, the *Yahoo DV Dongle* group found at <http://groups.yahoo.com/group/DVDongle> may be able to provide assistance. With hundreds of postings covering just about any type of problem you can imagine, you should be able to find one that matches your problem. If you can't find a solution in the threads that are already posted, you might try registering and asking a question of your own.

Appendix A: **D-STAR Web Pages**

Here are additional D-STAR web pages that you might find useful.

D-STAR Users, Source for D-STAR Information

<http://dstarusers.org/lastheard.php> has last heard lists, D-STAR repeater directory, gateway registration links and links to D-STAR accessory hardware and software and more.

D-STAR Information, FAQ's and More

<http://www.dstarinfo.com> D-STAR news, applications, links, nets, reflectors and more.

K5TIT The Texas Interconnect Team

<http://www.k5tit.org/> Repeater group in Texas, lots of useful information.

Instructions for Making Icom Radio Interface Cables

http://epaares.org/dstar/icom_cables.htm GPS interface and PC programming cable-wiring diagrams for home made cables.

WY1U's D-STAR Repeater and Reflector Finder

<http://home.comcast.net/~timmik/dstarsearch.html> good for locating repeaters in different parts of the world.

APRS-IS / DPRS Information

<http://www.aprs-is.net/> operating information, APRS-IS activity, APRS / DPRS conversion, software, specifications and more.

Enabling GPS Position Reporting through D-STAR

<http://www.nj6n.com/dstar/> translating Icom GPS data to be compatible with APRS. Includes sample APRS radio setup guides.

Yahoo D-STAR Forum / Group

http://groups.yahoo.com/group/dstar_digital/ International D-STAR discussion group, problem solving, and other topics

Icom Tech Support Knowledge Base

<http://www.icomamerica.com/en/support/kb/Default.aspx>

Select the following pull-downs for all D-STAR articles.

Product Line: Amateur

Product Class: D-STAR

Model: General

Balance of fields leave blank, Press **Search**

d*Chat Communications Software Home Page

http://nj6n.com/dstar/dstar_chat.html Feature list, software download, installation instructions.

D-RATS Communications Software Home Page

<http://d-rats.com/> Feature list, screenshots, software download, installation instructions, user forum, FAQs.

D-StarCom Icom .icf Radio File Conversion Utility

<http://dstarcom.ae7q.net/> Program for converting Icom .icf files from one radio type to another.

jFindu Home Page

<http://www.jfindu.net> Last heard lists, D-STAR Repeater and DPRS activity, D-STAR repeater locator map and more.

DV Dongle Home Page

http://dvdongle.com/DV_Dongle/Home.html Technical info, Installation instructions, Software screenshots, FAQs

DV Dongle Yahoo Support Group

<http://groups.yahoo.com/group/DVDongle> DV Dongle discussion and support.

RT System's Programming Software

<http://www.rtsystemsinc.com/index.cfm> RT System's home page. Radio programming software and cables.

Appendix B: Error Code Listings

If the *Call Sign Registers* are not programmed correctly, or other problem situations are detected, either by local or “distant” repeater controllers, error codes can be returned to the transmitting radio. Error codes appear as text messages, which scroll across the radio’s display.

The error codes shown below may not be a complete list of possible error codes, and they may be displayed somewhat differently depending upon the model of radio being used.

Error Code	Repeater Mode	Possible Cause
UR?AA1AAA (Local Repeater Node call sign)	Local Repeater, or Different Repeater in same Zone	No answer from other station, normal opera.
		MY call sign not programmed
	Through Gateway	UR call sign not programmed
		No answer from other station, normal oper.
RPT?AA1AAA (Local Repeater Node call sign)	Local Repeater, or Different Repeater in same Zone	Wrong callsign programmed in RPT2
		Suffix “G” not added to RPT2 callsign
	Through Gateway	Wrong callsign programmed in RPT1 or
		Wrong callsign programmed in RPT2
RPT?BB1BBB (Other Station’s Repeater Node call sign)	Different Repeater in same Zone or Through Gateway	RPT2 is busy
RPT?AA1AA_G (Repeater’s Gateway call sign)	Through Gateway	MY call sign not programmed
		MY call sign is incorrect
		MY call sign is not registered on server
		UR call sign not programmed
		UR call sign is incorrect
		UR call sign is not registered on server
		“I” is not 1 st character of UR callsign when using Repeater Node Routing

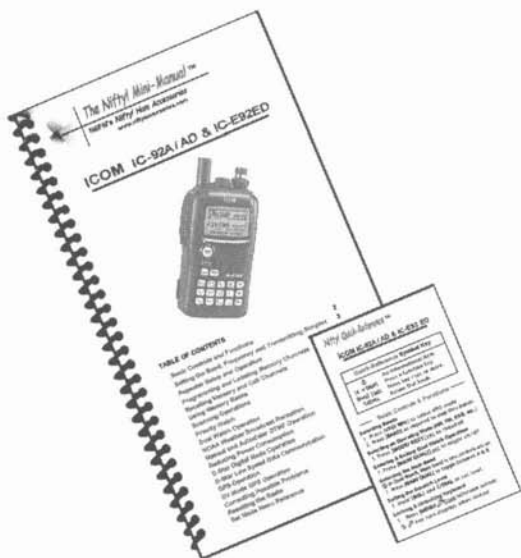
Appendix C: Icom Radio Setup Guides

Nifty Ham Accessories produces laminated guides for almost all Kenwood, Icom and Yaesu radios sold since the year 2000.

Nifty setup and programming guides are available from most ham radio retailers and also directly from Nifty Ham Accessories.



Nifty! Quick Reference Guides Available for all recent Models



Condensed and simplified step-by-step operating instructions for all menus and modes of operation.



Reference Guides

IC-T2H	IC-91A / AD	IC-718
IC-T7H	IC-92A / AD	ID-880H
IC-Q7A	IC-207H	IC-746PRO
IC-P7A	IC-208H	IC-756PRO
IC-V8	IC-910H	IC-756PRO(II)
IC-R20	IC-2100H	IC-756PRO(III)
IC-T22 / 42A	IC-2200H	IC-7000
IC-W32A	IC-2720H	IC-7200
IC-T81A	IC-2820H	IC-7600
IC-V85	IC-703 (P)	IC-7700
IC-T90	IC-706MKII	IC-7800
IC-80AD	IC-706MKII(G)	IC-V8000

Nifty!  *Ham Accessories*

760-781-5522 www.niftyaccessories.com

Join the ranks of D-STAR Operators!

Nifty Ham Accessories is well known for its series of guides simplifying amateur radio transceiver operation. Using the same approach for simple, clear-cut explanation, the author, Bernie Lafreniere, N6FN has produced a book that clearly describes the many D-STAR operating modes, enhanced features and popular programs that are core to the D-STAR communications experience.

After describing how D-STAR repeater systems are configured and inter-communicate via the Internet, the nuts-and-bolts of how to program D-STAR transceivers is covered in detail. The book helps you understand how to program your radio to take advantage of call routing and linking within your local repeater system and through Internet gateways to anywhere in the world.

Additional chapters are devoted to accessory software applications and adaptors that can be used to take full advantage of D-STAR's capabilities.

Nifty! Ham Accessories
www.niftyaccessories.com

IS N 978-1442141988



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