



# Washington Digital Radio Enthusiasts

Getting the most of your 2<sup>nd</sup>  
generation D-STAR transceiver with  
the Spokane D-STAR repeater

OWNERS:

GLEN-K1RR & RANDY-W4LKS

BASICS

# WHAT IS D-STAR?

- Real-time digital voice encoding and decoding specifically designed for Amateur Radio.
- End-to-end digital routing of voice and data simultaneously.
- Encoded at the microphone, decoded at the speaker.
- Robust Internet based infrastructure to route voice and data streams.
- DPLUS added Many features, including linking and reflectors.

## Some FAQs

Q: How come we can't have D-STAR on the analog repeater system?

A: D-STAR is all digital. FM receivers would only hear hissing.

Q: How much bandwidth does D-STAR use?

A: Voice uses 1200 bps, Data uses 1200 bps for a total bandwidth of 2400 bps modulated over the air with FM using a 6.25 khz wide swath of the spectrum.

Q: Is D-STAR secure?

A: NO! FCC rules do not allow encryption to conceal messages. Anyone can hear what you say and see what you type.

Q: Why do the ICOM D-STAR capable transceivers cost so much?

A: Patented technology used, No real competitors until recently, it's ICOM. Other manufacturers could make a low-cost D-STAR transceiver, but none have.

Sample of D-STAR Audio

# 2<sup>ND</sup> GENERATION TRANSCEIVERS

- Transceivers with “DPLUS Features”
- ICOM radios with “To” and “From” fields in the display.
- Has DR memories

ID-31  
\$295



ID-51  
\$495



ID-5100  
\$600 to \$850



IC-7100  
\$1,275

# REPEATER HARDWARE

- 443.125 Mhz DV “B” module
- 1293.3 mhz DV “A” module
  - ICOM IC-9100
  - ICOM ID-1
- 1249.0 DD transceiver
  - ICOM ID-1 Only
  - Would be a great for emergency services!
- No 2M DV “C” module
- Gateway computer, Linux, Robust
- Site Host: SHMC/Providence



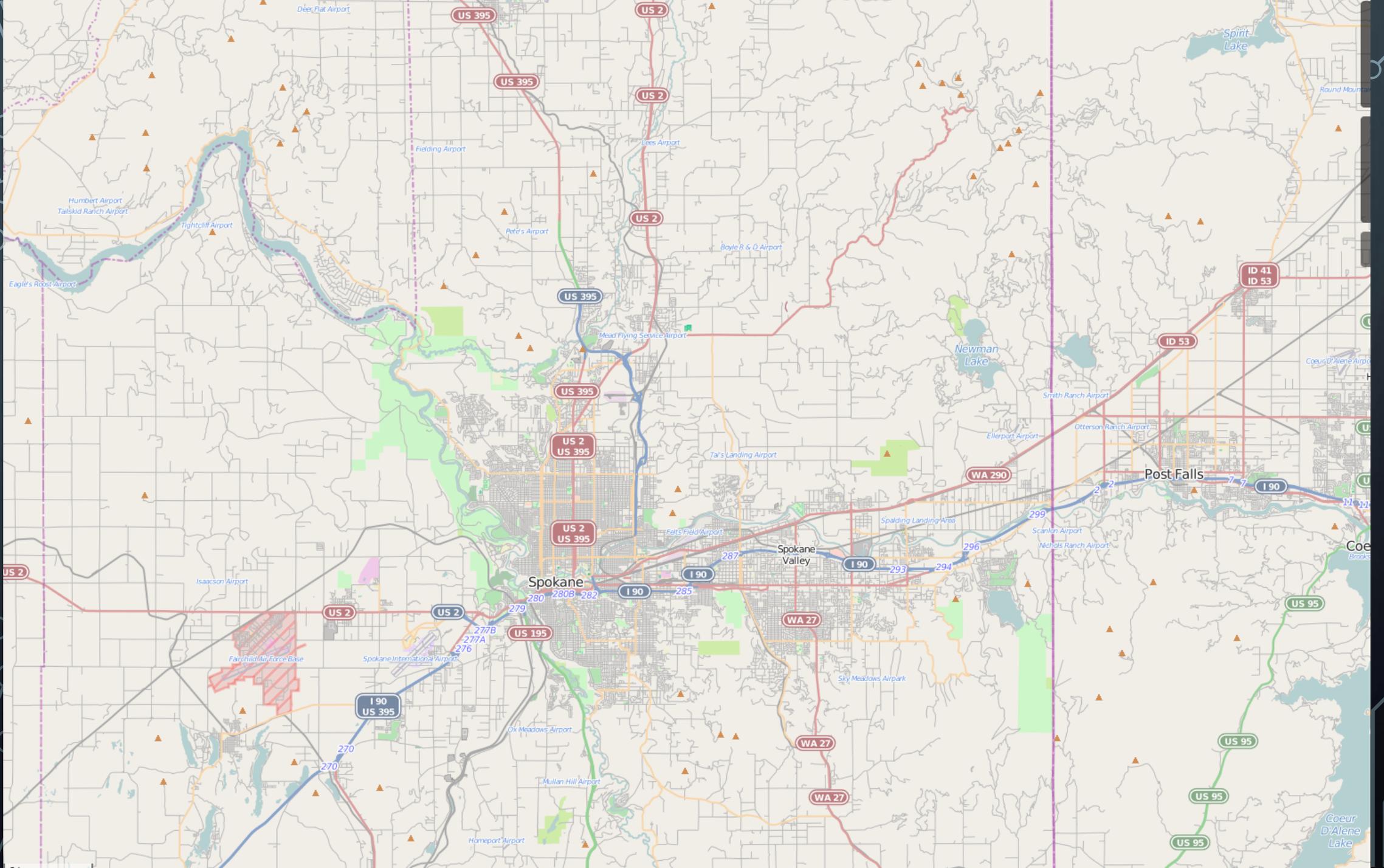
Many cavity filters

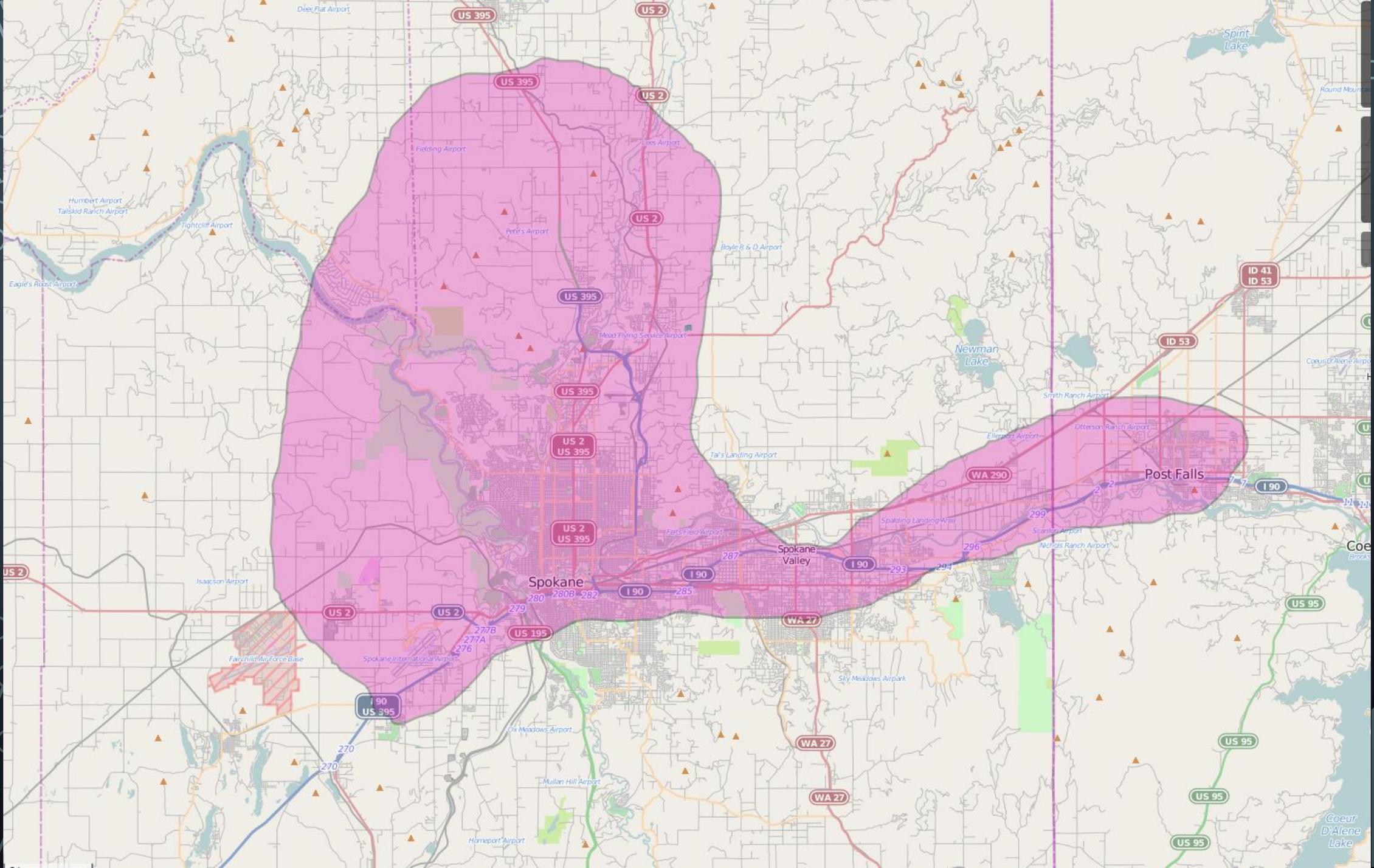


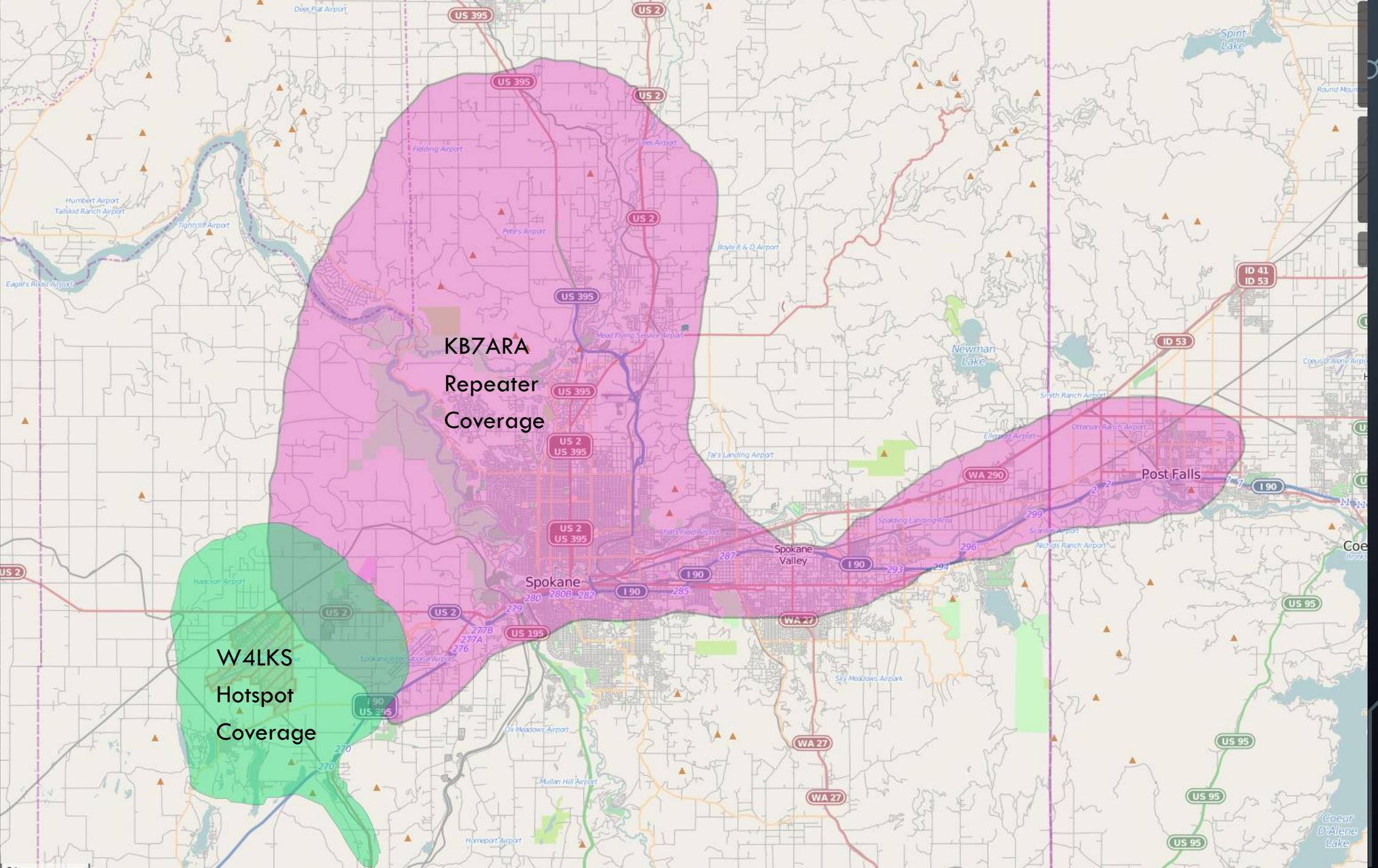
# ANTENNAS

Tom-K7TNS is touching the 1.2 ghz D-Star antenna, Directly behind him is the 440 D-Star Antenna. Both mounted on stainless steel masts.









**KB7ARA  
Repeater  
Coverage**

**W4LKS  
Hotspot  
Coverage**

# WHAT DO I NEED?

D-STAR Transceiver

Register your callsign

Good Options:

- SD Card to record QSOs and transfer files.
- Computer for programming frequencies
- RT Systems Software and cable for programming
- DVAP

**DPLUS Dashboard** | Gateway Status and Control

Registration | KB7ARA Repeater System | DPLUS version 2.2k

### Linked Gateways / Reflectors

Module	Linked to
A	REF035 C
B	REF001 C
C	unlinked
D	unlinked
E	unlinked

### Remote Users

Callsign	User Message	Last TX on	Type
W7SSK		listening	DV AP

### Last Heard

Callsign	User Message	Last TX on	Time
<b>W4LKS</b>	Randy..Spokane..2820	B	2014/09/19 15:45:47
WA7BFN	5100	B	2014/09/19 14:57:29
K7HRT	K7HRT 73	A	2014/09/19 11:13:35

Status as of 2014/09/19 21:40:29

# AUTOMATIC LINKING

## Normal Schedule:

Monday thru Saturday, 6am – 10pm Connected to WA reflector, Module C (REF035C)

Sunday, 6am – 4pm Connected to WA reflector, Module C (REF035C)

Automatic reconnects at 9am, Noon, 3pm, 4:10pm

## Regular Nets:

Saturday, 7pm Pacific – Saturday Night D-STAR net, REF035C

Sunday, 5pm Pacific – International D-STAR net, REFO001C

## Before “DPLUS Features” were added

▪ = Single Space Char

MYCALL	W4LKS ▪ ▪ ▪
URCALL	CQCQCQ ▪ ▪
RPT1	KB7ARA ▪ B
RPT2	KB7ARA ▪ G

# Using “D-PLUS Features”

2<sup>nd</sup> Gen Transceivers

Separate TO and FROM memory banks

<del>URCALL</del> TO	CQCQCQ ▪ ▪
<del>RPT1</del> FROM	KB7ARA ▪ B
<del>RPT2</del>	KB7ARA ▪ G

# What Goes In The TO Field?

CQCQCQ ▪ ▪ TX to the repeater, no callsign routing

W4LKS ▪ ▪ ▪ Callsign route to W4LKS wherever he is

WR7KCR ▪ ▪ Callsign route to WR7KCR Repeater

Interrogate command ( ▪ ▪ ▪ ▪ ▪ ▪ ▪ I)

Unlink command( ▪ ▪ ▪ ▪ ▪ ▪ ▪ U)

Echo Command ( ▪ ▪ ▪ ▪ ▪ ▪ ▪ E)

Randys ID-51 settings 24Aug14.icf - CS-51

File View COM Port Clone Option Help



- ID-51
  - Memory CH
    - All
    - Bank CH
    - CALL CH
  - Program Scan Link
  - BC Radio Memory
  - DTMF Memory
  - Digital
    - Your Call Sign
    - Repeater List
      - Group Name
      - 01: Africa
      - 02: Asia
      - 03: Australia
      - 04: Canada
      - 05: Europe East
      - 06: Europe North
      - 07: Europe South
      - 08: Europe West
      - 09: Germany
      - 10: Italy
      - 11: Japan
      - 12: Latin America
      - 13: Netherlands
      - 14: Oceania
      - 15: United Kingdom
      - 16: USA Midwest
      - 17: USA Northeast
      - 18: USA Southeast
      - 19: USA West
      - 20: Simplex
      - 21:
      - 22:
      - 23:
      - 24:

Your Call Sign (Remain 145 memories)

No.	Name	Call Sign
1	Use Reflector	CQCQCQ
2	Unlink Reflector	U
3	Repeater Status	I
4	Echo Test	E
5	DVAP Status	DVAP I
6	DVAP Echo	DVAP E
7	Visibility ON	VIS ON
8	link To KB7ARA	KB7ARABL
9	link to REF001C	REF001CL
10	link to REF003C	REF003CL
11	link to REF004B	REF004BL
12	link to REF009C	REF009CL
13	link to REF010A	REF010AL
14	link to REF010B	REF010BL
15	link to REF010C	REF010CL
16	link to REF014A	REF014AL
17	link to REF014B	REF014BL
18	link to REF014C	REF014CL
19	link to REF020A	REF020AL
20	link to REF020B	REF020BL
21	link to REF022C	REF022CL
22	link to REF024C	REF024CL
23	link to REF025A	REF025AL
24	link to REF025B	REF025BL
25	link to REF025C	REF025CL



Randys ID-51 settings 24Aug14.icf - CS-51

File View COM Port Clone Option Help



- ID-51
  - Memory CH
    - All
    - Bank CH
    - CALL CH
  - Program Scan Link
  - BC Radio Memory
  - DTMF Memory
  - Digital
    - Your Call Sign
    - Repeater List
      - Group Name
      - 01: Africa
      - 02: Asia
      - 03: Australia
      - 04: Canada
      - 05: Europe East
      - 06: Europe North
      - 07: Europe Sout
      - 08: Europe Wes
      - 09: Germany
      - 10: Italy
      - 11: Japan
      - 12: Latin Americ
      - 13: Netherlands
      - 14: Oceania
      - 15: United Kingc
      - 16: USA Midwes
      - 17: USA Northe
      - 18: USA Southe
      - 19: USA West
      - 20: Simplex
      - 21: Randys**
      - 22:
      - 23:
      - 24:

**21: Randys (Remain 103 memories)**

			Call Sign		Frequency					
No.	Name	Sub Name	Repeater Call Sign	Gateway Call Sign	Operating Freq	DUP	Offset Freq	USE (FROM)	Position	Latitude
0	Randy's Hotspot	WA			441.500000		0.000000	Yes	None	,00°00.00'N
1	Randy's DVAP	WA			431.000000		0.000000	Yes	None	,00°00.00'N
2	Spokane Repeater	WA	KB7ARA	KB7ARA G	443.125000	-DUP	5.000000	Yes	None	,00°00.00'N
<b>New</b>										

# LINK COMMANDS:

...go in the TO field

KB7ARABL

If Repeater		
Repeater Call	Module	L = Link
KB7ARA	B	L

Modules:

- A = 23 cm (1.2 Ghz)
- B = 70 cm (440 Mhz)
- C = 2 m (150 Mhz)

REF035CL

If Reflector		
Repeater Call	Channel	L = Link
REF035	C	L

Channels:  
A thru E

# REFLECTORS

Data center computers with extremely high speed Internet connections.

Some popular reflectors:

REF035 Washington State Reflector – Most activity on channel C

REF001C London, world wide mega-reflector

REF030C Georgia, Wide use

# DEMONSTRATIONS

Status Interrogation:

IC-7100



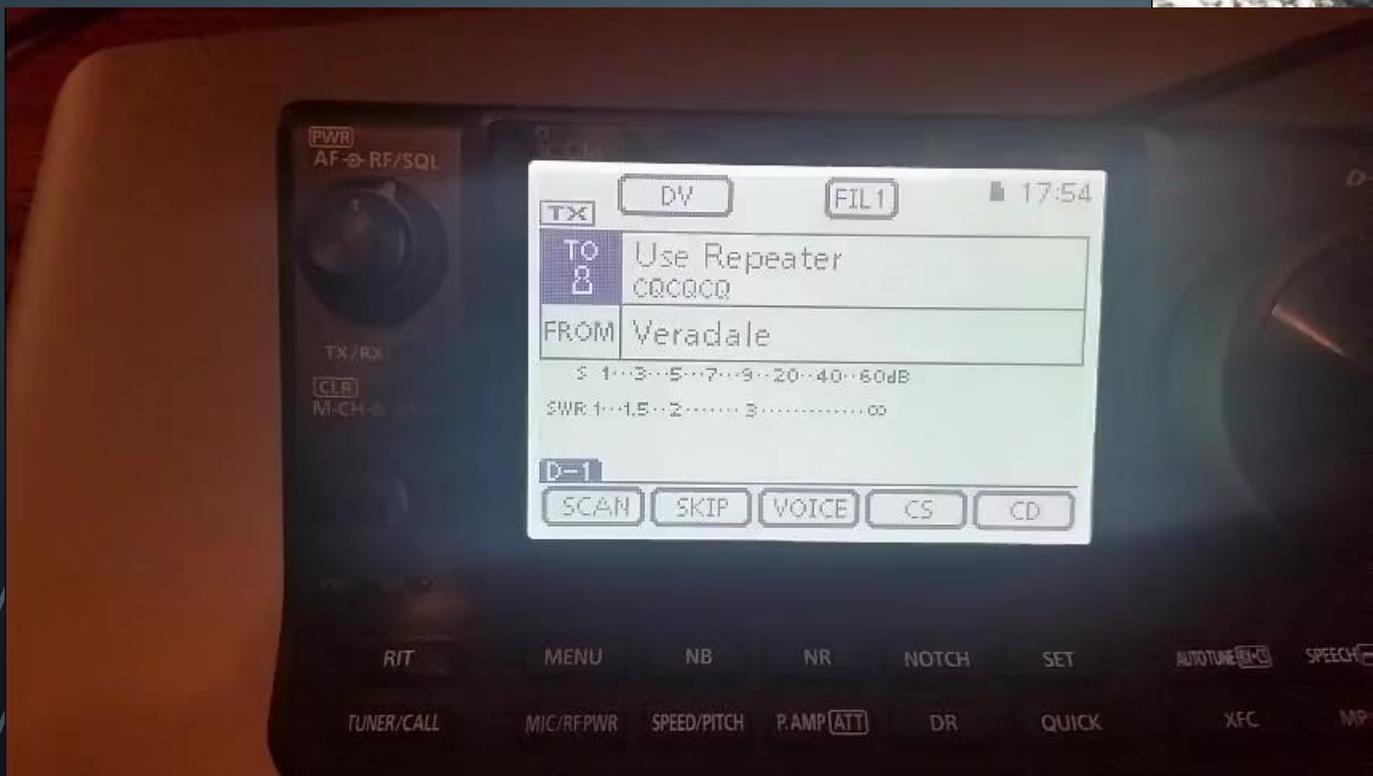
ID-51

TO	.....
FROM	KB7ARA · B
(RPT2)	KB7ARA · G

# DEMONSTRATIONS

Echo Test:

IC-7100



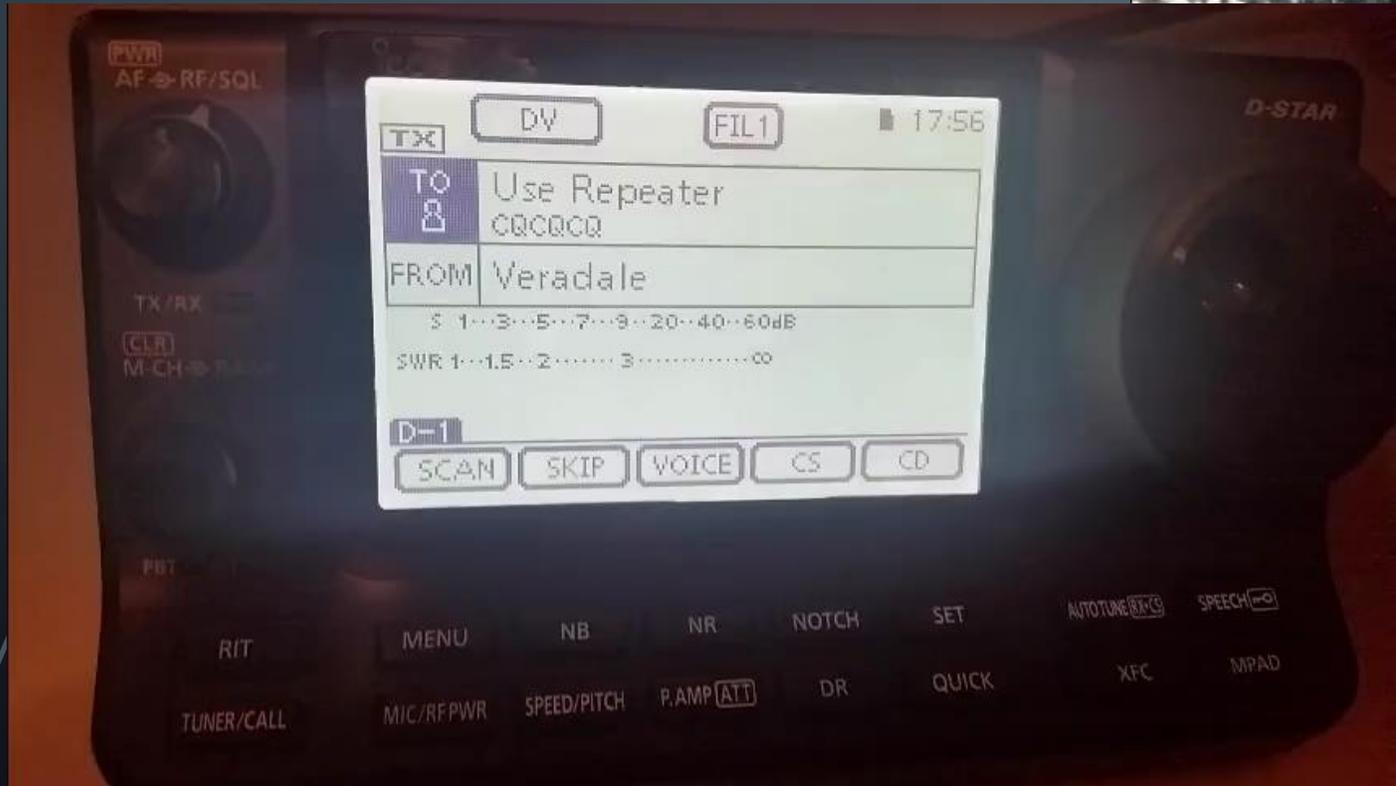
ID-51

<b>TO</b>	• • • • • • • E
<b>FROM</b>	KB7ARA • B
<b>(RPT2)</b>	KB7ARA • G

# DEMONSTRATIONS

Unlink From Reflector:

IC-7100



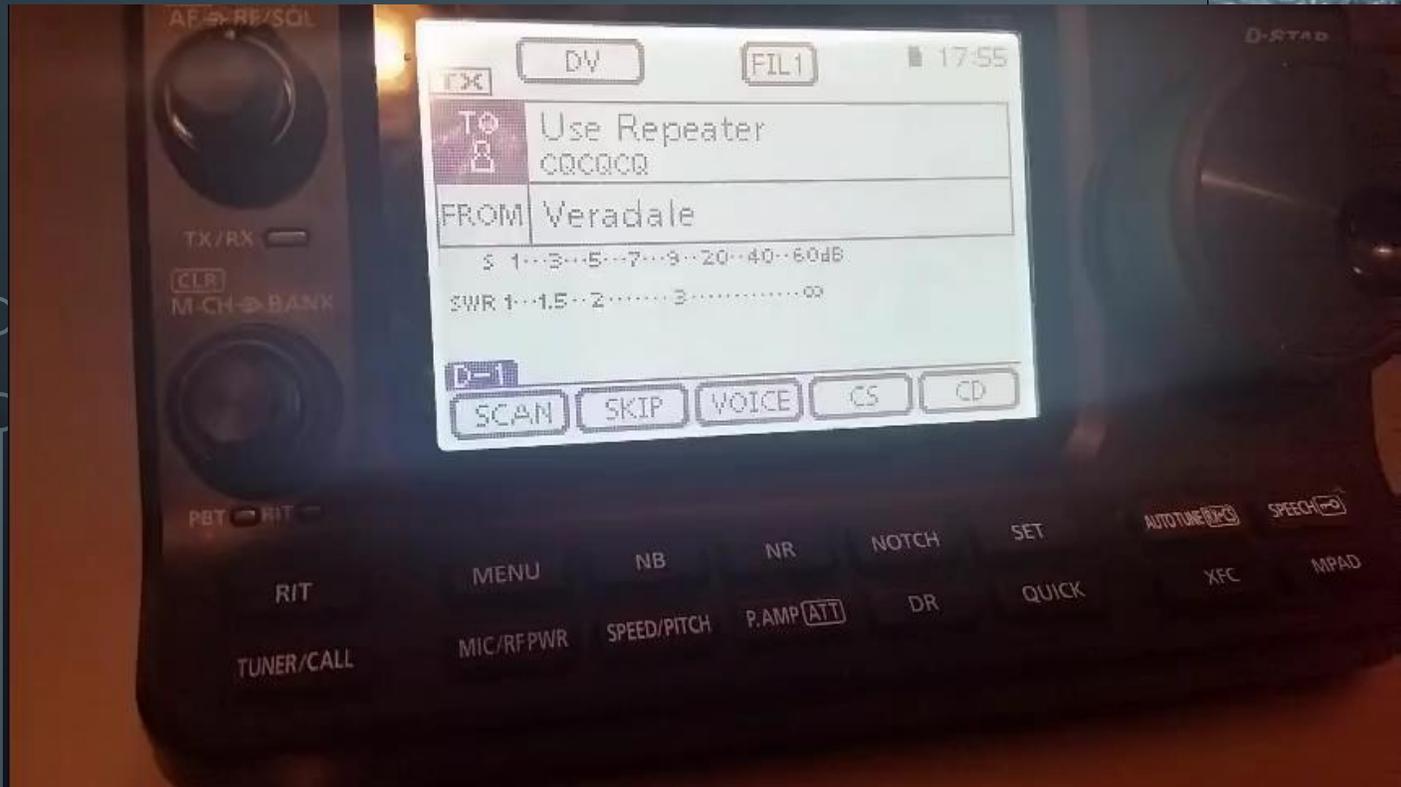
ID-51

TO	.....U
FROM	KB7ARA · B
(RPT2)	KB7ARA · G

# DEMONSTRATIONS

Link to Reflector:

IC-7100



ID-51

<b>TO</b>	REF035CL
<b>FROM</b>	KB7ARA ▪ ▪
<b>(RPT2)</b>	KB7ARA ▪ G

# DEMONSTRATIONS

Link to Reflector REF001C:



# DEMONSTRATIONS

Callsign Routing:



# DASHBOARD

Status in real-time

<https://kb7ara.dstargateway.org>

The screenshot shows a web browser window with the address bar displaying <https://kb7ara.dstargateway.org>. The page title is "DPLUS Dashboard | Gateway Status and Control". Below the title, there is a navigation bar with "Registration", "KB7ARA Repeater System", and "DPLUS version 2.2k".

### Linked Gateways / Reflectors

Module	Linked to
A	unlinked
B	unlinked
C	unlinked
D	unlinked
E	unlinked

### Remote Users

Callsign	User Message	Last TX on	Type
W7SSK	Don in Mukilteo, WA	B	DV AP

### Last Heard

Callsign	User Message	Last TX on	Time
K7EHT	ID-51 \$	B	2014/07/23 20:36:13
<b>W7SSK</b>	Don in Mukilteo, WA	B	2014/07/23 20:03:51
WA7BFN	5100	B	2014/07/23 17:52:35
K7HRT	K7HRT 73	A	2014/07/23 15:58:49

Status as of 2014/07/23 22:41:08

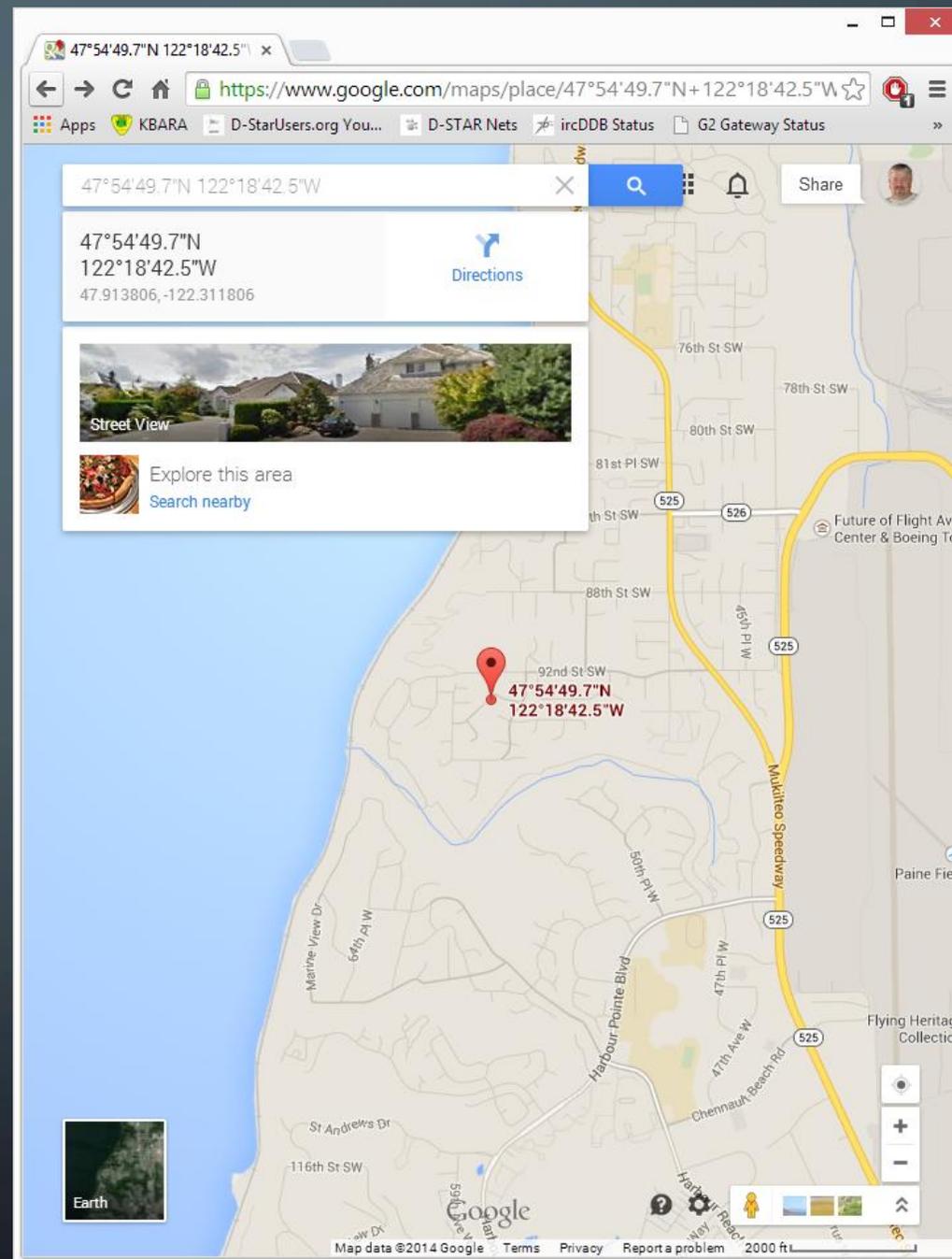
# APRS LOCATION

If user has DV-A mode turned on

Turn on GPS-A mode (DV-A mode) to report your Lat/Long each time you key up.

The KB7ARA repeater will also report your Lat/Long info to aprs.fi within seconds.

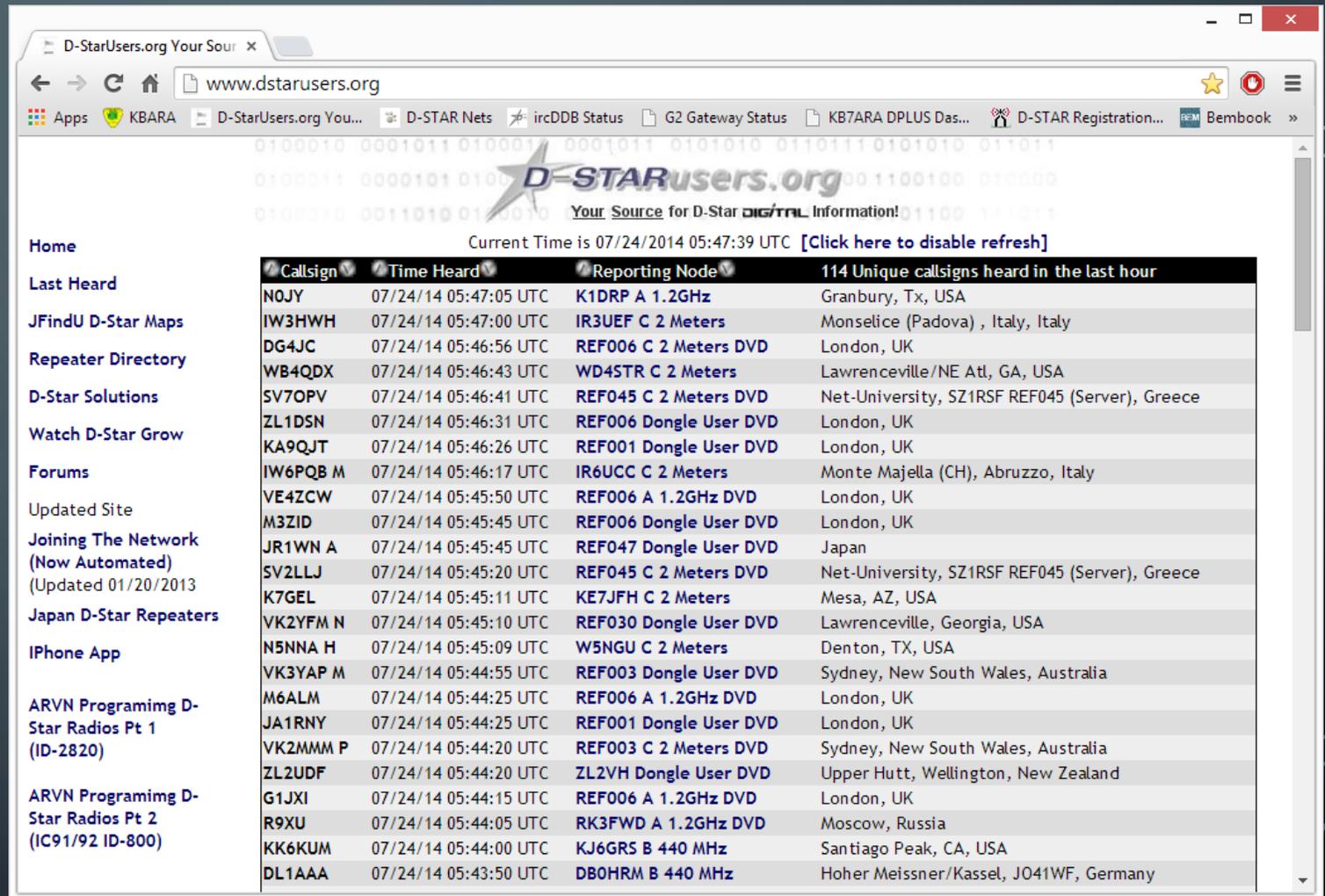
Turn APRS Beconing on – Get yelled at.



# LAST HEARD LISTS

<http://www.dstarusers.org>

Key up with “VIS ■ ■ ■ ON” in TO field  
to turn on reporting for IRCDDb  
last-heard lists.



The screenshot shows the D-StarUsers.org website interface. At the top, there's a navigation bar with the site logo and a current time display: "Current Time is 07/24/2014 05:47:39 UTC [Click here to disable refresh]". Below the navigation bar, there's a sidebar with various links like "Home", "Last Heard", "JFindU D-Star Maps", "Repeater Directory", "D-Star Solutions", "Watch D-Star Grow", "Forums", "Updated Site", "Joining The Network (Now Automated)", "Japan D-Star Repeaters", "iPhone App", "ARVN Programing D-Star Radios Pt 1 (ID-2820)", and "ARVN Programing D-Star Radios Pt 2 (IC91/92 ID-800)". The main content area displays a table titled "114 Unique callsigns heard in the last hour".

Callsign	Time Heard	Reporting Node	Location
NOJY	07/24/14 05:47:05 UTC	K1DRP A 1.2GHz	Granbury, Tx, USA
IW3HWH	07/24/14 05:47:00 UTC	IR3UEF C 2 Meters	Monselice (Padova) , Italy, Italy
DG4JC	07/24/14 05:46:56 UTC	REF006 C 2 Meters DVD	London, UK
WB4QDX	07/24/14 05:46:43 UTC	WD45TR C 2 Meters	Lawrenceville/NE Atl, GA, USA
SV7OPV	07/24/14 05:46:41 UTC	REF045 C 2 Meters DVD	Net-University, SZ1RSF REF045 (Server), Greece
ZL1DSN	07/24/14 05:46:31 UTC	REF006 Dongle User DVD	London, UK
KA9QJT	07/24/14 05:46:26 UTC	REF001 Dongle User DVD	London, UK
IW6PQB M	07/24/14 05:46:17 UTC	IR6UCC C 2 Meters	Monte Majella (CH), Abruzzo, Italy
VE4ZCW	07/24/14 05:45:50 UTC	REF006 A 1.2GHz DVD	London, UK
M3ZID	07/24/14 05:45:45 UTC	REF006 Dongle User DVD	London, UK
JR1WN A	07/24/14 05:45:45 UTC	REF047 Dongle User DVD	Japan
SV2LLJ	07/24/14 05:45:20 UTC	REF045 C 2 Meters DVD	Net-University, SZ1RSF REF045 (Server), Greece
K7GEL	07/24/14 05:45:11 UTC	KE7JFH C 2 Meters	Mesa, AZ, USA
VK2YFM N	07/24/14 05:45:10 UTC	REF030 Dongle User DVD	Lawrenceville, Georgia, USA
N5NNA H	07/24/14 05:45:09 UTC	W5NGU C 2 Meters	Denton, TX, USA
VK3YAP M	07/24/14 05:44:55 UTC	REF003 Dongle User DVD	Sydney, New South Wales, Australia
M6ALM	07/24/14 05:44:25 UTC	REF006 A 1.2GHz DVD	London, UK
JA1RNY	07/24/14 05:44:25 UTC	REF001 Dongle User DVD	London, UK
VK2MMM P	07/24/14 05:44:20 UTC	REF003 C 2 Meters DVD	Sydney, New South Wales, Australia
ZL2UDF	07/24/14 05:44:20 UTC	ZL2VH Dongle User DVD	Upper Hutt, Wellington, New Zealand
G1JXI	07/24/14 05:44:15 UTC	REF006 A 1.2GHz DVD	London, UK
R9XU	07/24/14 05:44:05 UTC	RK3FWD A 1.2GHz DVD	Moscow, Russia
KK6KUM	07/24/14 05:44:00 UTC	KJ6GRS B 440 MHz	Santiago Peak, CA, USA
DL1AAA	07/24/14 05:43:50 UTC	DB0HRM B 440 MHz	Hoher Meissner/Kassel, JO41WF, Germany

# REGISTER YOUR CALLSIGN

[http://www.dstargateway.org/D-Star\\_Registration.html](http://www.dstargateway.org/D-Star_Registration.html)

The screenshot shows a web browser window with the title "D-STAR Gateway System". The address bar contains the URL <https://kb7ara.dstargateway.org/TopMenu.do;jsessionid=1B95EA04515640A1>. The browser's tab bar shows several open tabs: "Apps", "KBARA", "D-StarUsers.org You...", "D-STAR Nets", "ircDDB Status", and "G2 Gateway Status".

The main content area of the page is titled "D-STAR Gateway System (KB7ARA)" in blue text, with "REVISION 1.0" in the top right corner. Below the title is a section titled "The agreement document" containing a text box with the following text:

Welcome to the KB7ARA D-Star repeater in Spokane, WA. Your registration here is allowed and controlled by your local repeater owners, Randy-W4LKS and Glen-AF7JB. Abuse of this system may cause your D-Star registration to be revoked. Please send an email message to [randy@hvacware.net](mailto:randy@hvacware.net) and/or [af7jb@kbara.org](mailto:af7jb@kbara.org) to remind us to approve your registration request. Thanks! Randy & Glen

Below the agreement is a "Do you agree?" section with two radio buttons: "YES:" (selected) and "NO:". This is followed by a section titled "Enter your personal information!" with the following fields:

- CallSign :  Equal to or less than 7 characters.
- Name :
- E-mail :  Make sure you use a valid e-mail address.
- Password :  8 to 16 characters.
- Password confirm :

At the bottom of the form are two buttons: "OK" and "Cancel".

# REGISTER YOUR CALLSIGN

[http://www.dstargateway.org/D-Star\\_Registration.html](http://www.dstargateway.org/D-Star_Registration.html)

D-STAR Gateway System - Windows Internet Explorer

https://w4doc.dstargateway.org/PersonalInfoInit.do Certificate Error

File Edit View Favorites Tools Help

Google Go 0 blocked Check AutoLink Settings

D-STAR Gateway System Page Tgols

**D-STAR** D-STAR Gateway System (W4DOC) REVISION 1.0

Login : W5BJV Logout

User Information GW Information Terminal Information **Personal Information**

Please, edit after making a left check box on.

Name : Marcel Pitini

E-mail : w5bjv@arrl.net

Password : \_\_\_\_\_

Password Confirm : \_\_\_\_\_

If the station has multiple radios, Target CS are distinguished by initial(last character) of a space or a capital english letter.  
Definition character as follows..... (G)is a gateway, (S)is a local server.  
Usually RPT(Repeater) isn't checked, initial AreaRPT CS is the port A of ZoneRPT CS.  
If RPT is checked, AreaRPT CS is the same as Target CS.

	Initial	RPT	local IP	pcname	Del
<input type="checkbox"/> 1: W5BJV	<input type="checkbox"/>	<input type="checkbox"/>	10.220.101.184	_____	
<input type="checkbox"/> 2: W5BJV	<input type="checkbox"/>	<input type="checkbox"/>	10.220.101.185	_____	
<input type="checkbox"/> 3: W5BJV	<input type="checkbox"/>	<input type="checkbox"/>	10.220.101.186	_____	
<input type="checkbox"/> 4: W5BJV	<input type="checkbox"/>	<input type="checkbox"/>	10.220.101.187	_____	
<input type="checkbox"/> 5: W5BJV	<input type="checkbox"/>	<input type="checkbox"/>	10.220.101.188	_____	
<input type="checkbox"/> 6: W5BJV	<input type="checkbox"/>	<input type="checkbox"/>	10.220.101.189	_____	
<input type="checkbox"/> 7: W5BJV	<input type="checkbox"/>	<input type="checkbox"/>	10.220.101.190	_____	
<input type="checkbox"/> 8: W5BJV	<input type="checkbox"/>	<input type="checkbox"/>	10.220.101.191	_____	

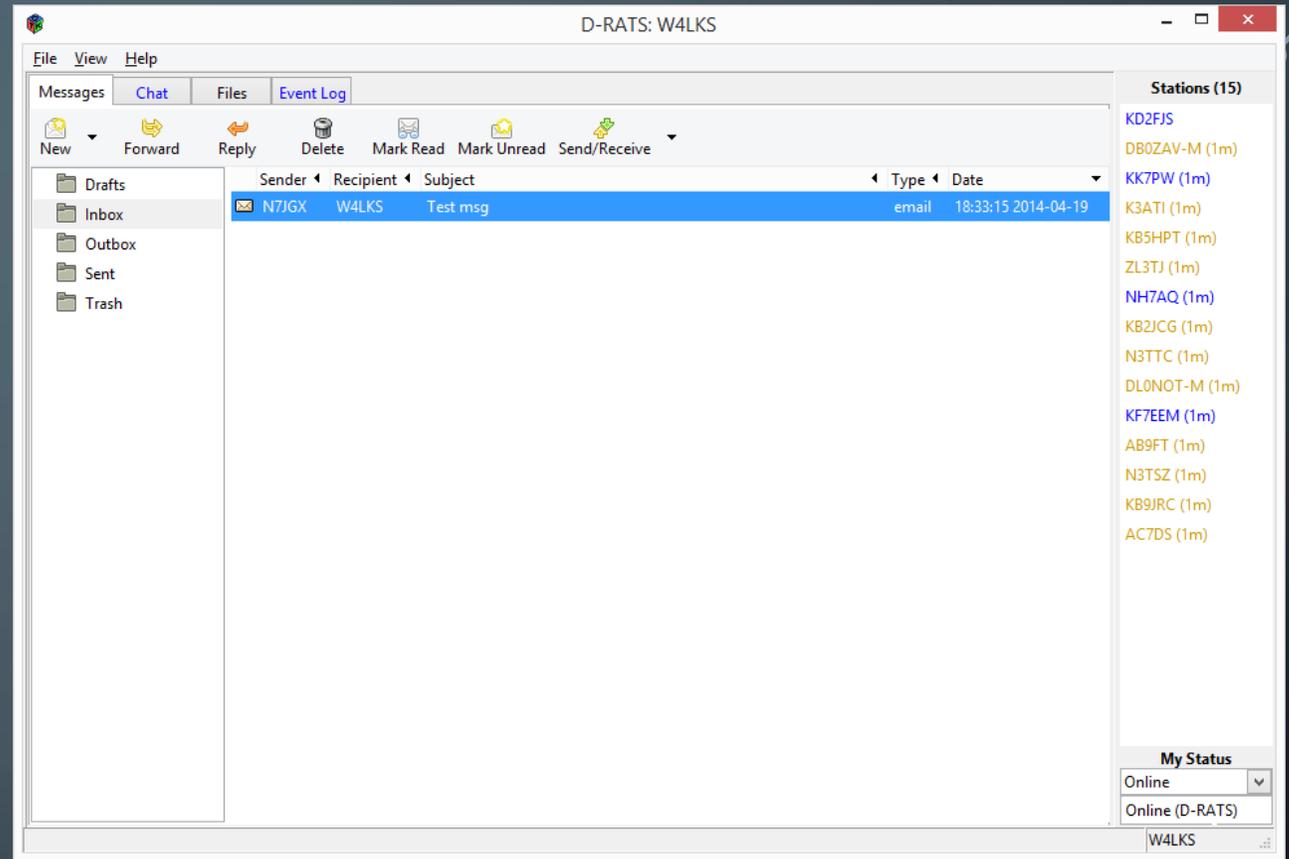
Check item and change a set value.  
Click the Update button.

Update

Done Internet 100%

# D-RATS Messaging

- Messaging app for use with D-STAR
- Supported by the KB7ARA gateway
- Makes use of the 1200 bps data stream that accompanies every D-STAR transmission.
- Excellent for Emergency Communications



# D-RATS Chat

The screenshot shows a chat window titled "D-RATS: W4LKS". The interface includes a menu bar (File, View, Help), tabs for Messages, Chat, Files, and Event Log, and a toolbar with icons for Add Filter, Remove Filter, Join Channel, and Open Private Chat. The main chat area displays a series of messages, each starting with a timestamp and a call sign, followed by a status report. The messages are as follows:

- Copyright 2010 Dan Smith (KK7DS)
- [2014-09-21 17:18:33] AC7DS: Now Unattended: Dave, Tucson, AZ - DM42oc (Port RAT)
- [17:18:34] KB9JRC: Now Unattended: Online (D-RATS) (Port RAT)
- [17:18:34] N3TSZ: Now Unattended: Patrick in Cheltenham, PA (Port WA7FW)
- [17:18:35] KB5HPT: Now Unattended: KB5HPT. Lew, El Paso, TX, DM61sv (Port WA7FW)
- [17:18:36] N3TTC: Now Unattended: Online (D-RATS) (Port RAT)
- [17:18:36] DL0NOT-M: Now Unattended: QRA de DL0NOT-EmComm-Mobile-MailDrop- QTH Karben JO40jf QRV (Port RAT)
- [17:18:36] KF7EEM: Now Online: Online (D-RATS) (Port RAT)
- [17:18:36] AB9FT: Now Unattended: Online (D-RATS) (Port RAT)
- [17:18:37] ZL3TJ: Now Unattended: Online (D-RATS) (Port RAT)
- [17:18:37] NH7AQ: Now Online: Online (D-RATS) (Port RAT)
- [17:18:37] KB2JCG: Now Unattended: Online (D-RATS) (Port RAT)
- [17:18:37] KD2FJS: Now Unattended: Online (D-RATS) (Port RAT)
- [17:18:38] K3ATI: Now Unattended: Smitty, Forest City, Pa. FN21gp (Port RAT)
- [17:18:39] KK7PW: Now Online: Online (D-RATS) (Port RAT)
- [17:18:40] DB0ZAV-M: Now Unattended: [QRA DB0ZAV WinMor/PacTor WinLink RMS - QTH Karben JO40jf QRV] (Port RAT)
- [17:19:26] KD2FJS: Now Online: Online (D-RATS) (Port RAT)
- [17:21:23] WX1DER: Now Online: Online (D-RATS) (Port RAT)

At the bottom of the chat area, there is a text input field containing "Main [WA7FW] [RAT]", a "RAT" dropdown menu, and a "Send" button. Below the input field are checkboxes for "Quick Messages" and "QSTs". A status bar at the very bottom of the window reads "Station WX1DER is now Online: Online (D-RATS)".

On the right side of the window, there is a "Stations (16)" list showing the following call signs and their last activity times:

- WX1DER
- KD2FJS (2m)
- DB0ZAV-M (3m)
- KK7PW (3m)
- K3ATI (3m)
- KB5HPT (3m)
- ZL3TJ (3m)
- NH7AQ (3m)
- KB2JCG (3m)
- N3TTC (3m)
- DL0NOT-M (3m)
- KF7EEM (3m)
- AB9FT (3m)
- N3TSZ (3m)
- KB9JRC (3m)
- AC7DS (3m)

At the bottom right, there is a "My Status" section with a dropdown menu set to "Online" and "Online (D-RATS)". The window title bar shows "W4LKS" and standard window controls.

# Emergency Communications Capability

- Repeater/gateway on UPS + Generator emergency backup power
- SHMC/Providence hardened Internet connection
- SHMC/Providence full support
- File Transfer and messaging at 1200 bps using any 2<sup>nd</sup> Gen transceiver and D-RATS.
- 3600 bps using Anniversary Edition of ID-51
- Repeater supports 128 kbps DD on 1.2 ghz for use with ID-1 DV/DD Transceiver



# OTHER D-STAR ACCESS METHODS

## DV Dongle

- Has AMBE Chip
- Turns computer into D-STAR transceiver
- Requires NO D-STAR Radio

## DV Access Point (DVAP)

- No AMBE chip
- Makes a mini D-STAR Simplex hotspot
- Still requires a D-STAR Radio

From Internet Labs – Robin Cutshaw-AA4RC



\$200



\$270

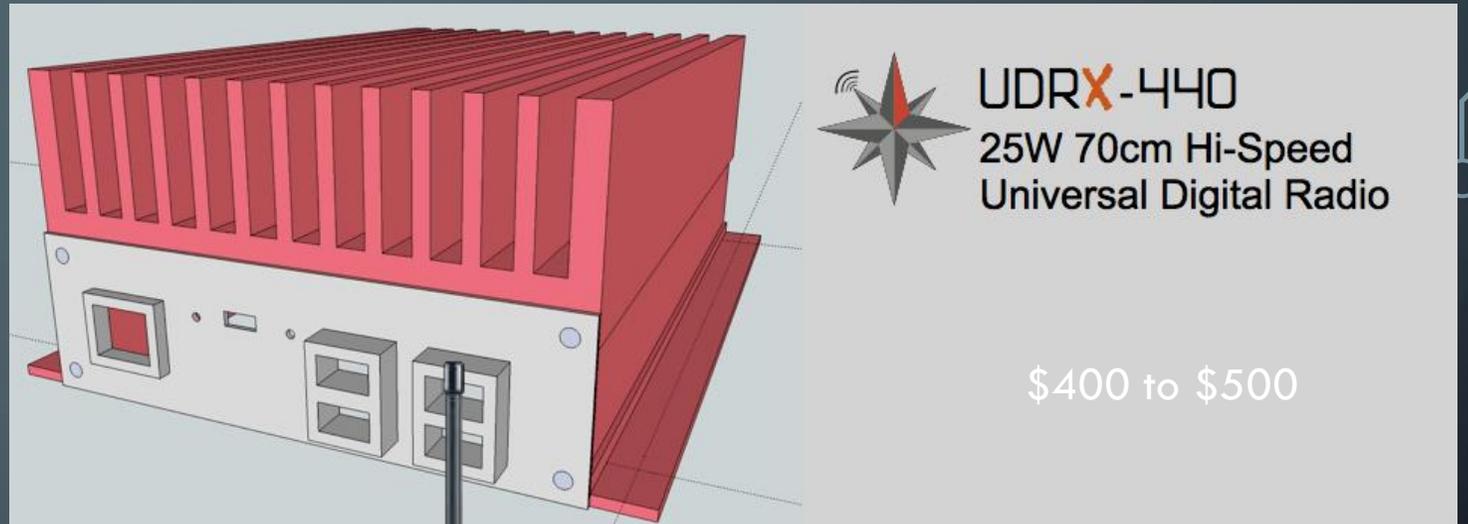
# FORTHCOMING

NW Digital Radio

<http://nwdigitalradio.com/>

Connect Systems

[CS7000@yahogroups.com](mailto:CS7000@yahogroups.com)



\$400 to \$500



\$250



# THE END

Washington Digital Radio Enthusiasts

