

The D-Star System

Introduction



Digital - Smart Technologies

for

Amateur Radio



Started in Japan



Japan Amateur Radio League



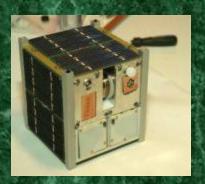
Basic Ingredients

- Need
 - Link all of Japan with digital communications
- Financial Backing
 - Japanese Government
- Support Hardware and Software
 - ICOM
 - DVSI AMBE2020TM Vocoder chip



History

- 1999 Research began
 - Funded by Japanese Government
 - Administered by JARL
- 2001 ICOM begins introducing hardware
- 2004 ID1 1.2 GHz full DD mode
- 2007 First QSO using D-Star via Satellite
- 2010 October launch of D-Star satellite
 - OUFTI-1 is a CubeSat
 - 10x10x10 cm (4")





53 Repeaters

D-STAR Repeaters in JAPAN

(2009/11/21)

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http://www.d-star.jp/ http://isotope.sist.chukyo-u.ac.jp/dstar2/

DV-438-000MHz(UE43), DD-1270, 125MHz(UEDD)
Shinetes Zone2 (Astrony; *JPOYDR G₂ IP: 100:043)

DY-100: 190MHz(MG43)

DV-100: 190MHz(MG43)

Chugriu Zone 1 (Gatemay: 「JP4YDU G; IP: 10.00.21)

DV:x39.490Meta(16543), DD:1270.125Meta(16500)

JP4YDU B DV:1291.690Meta(16512)

Ohuguku Zone2 (Gateway (JP4YDV G I P: 10.00.80)

Ohuguku Zone2 (Gateway: 「JP4YDV G j IP: 10.00.80)

• JP4YDV Chayana Kurashiki

• DV-439.30046 (JRS43), DC-1270.62588 (JRS50)

Ohugeku Zone® (Gateway: ⁷ JP4YDW G_J IP: 10.0.0.79) **9.JP4YDW** Yamagushi Saso-Oshima DV-439.470M9((DO43), DD-1270.375M94(ODDD)

Shikuku Zone I (Gataway: 「JPSYCN Gj IP: 1000.333 JA5

***JPSYCN Takamatas

***DYASTA 100MILITARS), DD:1270.375864(TADD)

Shikuku Zone (Cataway: 「JPSYCO Gj IP: 1000.77)

JPSYCO Metacyana
 DV:438-450MHz(MT43), DD:1270:175MHz(MTDD)

JPSYCO B DV:1291.670864;(MT12) Shikuku Zoned (Gateway: FJPSYCQ G J P: 10.00.105) #JPSYCQ Kaushi DV:439.470894;00433

Kyusyu Zone1 (Gataway: 「JPSYHL G J IP: 10.0.0.23)

•JPSYHL Fukuska Minami

DV:439.470MHz(FU43), DD:1270.125MHz(FUDD)
JP6YHL B DV:1291.890MHz(FU12)

Kyunyu Zone 2 (Gataway: 「JPSYHN G」 IP: 10.0.0.37)
OJPSYHN Kumamoto
DV-130.030MHz/KU431. DD:1270.125MHz/KUDDI

Kyusyu Zone3 (Gateway: FJP6YHR GJ IP: 10.0.0.111)

OJP6YHR Kumamoto Yataushiro DV:439.450MHz(KU43) No.

Okinawa Zone (Gateway: FJR6YZ Gj IP: 10.0.0.103)

OJR6YZ Okinawa Ginowan DV:438.450MHz(GW43)

Kansal Zone1 (Gateway: FJP3YHH GJ IP: 10.00.9)
JP3YHF Osaka Suminos
DV:1291.850MHz(WT12). DD:1290.825MHz(WTD0

JP3YHH Guska Hirano
 DV:439.390MHz(H43), DD:1290.125MHz(H4DD)
 JP3YHH B DV:1291.530MHz(H412)

JPSYHJ Osaka Hgashi-Osaka DV-438.010MHz0X43), DD:1290.375MHz(KDD) JPSYHJ B DV:1291.670MHz(K12)

JPSYHL Nams
DV-438-490MHz(NA43), DD-1290.125MHz(NADD)
JPSYHL B DV-1291.890MHz(NA12)

Kansai Zone2 (Gateway: 「JP3YHN G.J: IP: 100.0.13) • JP3YHN Wakayama Koya

DV:439.030MH=(KY12), DD:1290.125MH=(KYDD) IPSYHIN B DV:1291.590MH=(KY12)

Kansal Zone3 (Gateway: FJPSYCV GJ IP: 10.00.29)

• JPSYCV Wakayama Aridagawa DV:439.270Mrtz(AR43)

IPSYCV R. DV:439.270Mrtz(AR43)

JPSYCV B DV-1291.230MHz(AJR12)
Kanaal Zone4 ((dateway: JRSVK G) IP-10.0.0.59)

- JRSVK Kobe Nada DV-4384.100Hz(9643)

JRSVK B DV-1291.030MHz(9612)

Kansai ZoneS (Gateway: 「JP3YHT G J IP: 10.0.0.67)

• JP3YHT Sakai Minami DV-439.3108/bt/SSK43)

Kansai ZoneS (Gateway: 「JP3YHV G J IP: 100.0.71)

• JP3YHV Kyota Ukyo DV-439.3708/bt/SS43)

OJPSYHV Kyoto Ukyo DV-439.370MHz(AS43)
Kansai Zone7 (Ostewsy: 「JRSWZ GJ IP: 10.00.99)
OJRSWZ Shiga Moriyama DV-439.470MHz(MO43)

No Connection to D-STAR Network repeaters

JP3YHS Osaka Suminos DV-438.030MHz(WC43)

JP3YIA Ners Delan-ji DD:1270.125MHz(WDDD)

Hokkuido Zonel (Gateway: 「JPSYDZ G; IP: 100.027) ●JPSYDZ Sappolo Skirolski

de 7L1FFN Naovuki ISO

DV-129.480M6U(SP43), D0:1270.125M6U(SP00)

JPSYDZ B DV:1291.690M6U(SP12)

Holdwide Zone2 (Gateway: 「JPSYEA GJ IP: 10.0035)

Hobbaido Zone2 (Geterrey: 「JPSYEA G.; IP: 10.00.05)

DV-438.000M6u/HD430, DD-1270.125M6u/HD00)

Tohoku Zone 1 (Gateway: 「JPTYEL G_J IP: 100.0.17) ●JPTYEL Sendai Wakabayashi

DV:439.490861/(SW40), DD:1270.375M4/(SWDD)
JPTYEL B DV:1291.690861/(SW12)
Tohoku Zarse2 (Gatesias: FJPTYEN G) P: 100.039)

Tohoku Zone2 (Gateway: 1JPTYEM GJ IP: 100.0.39)

• JPTYEM Sendal Aoba

DV:439.070M8t/(SA43), DD:1270.125M8t/(SADD)

Kanto Zone I (Gateway: (JPI YIU G.) P: 1000.5)

OJPI YIU Takyo Chuo

DVN3440M6U(0442), D0:1290.125M6u(0400)
(-5860 ahit)

JP1 YIU B DV:1291.890M-U(HA12)
Kanto Zono 2 (Gateway: f. JP1 YIX G.; IP: 10.00.15)
JP1 YIW Tokyo Nishi-Tokyo
DV:439.210664(N843), D0:1290.825464(NDD)

JP1 YIM B DV:1291.570MHz(NE12)

JP1 YIX Tokyo Okolu
DV:1291.590MHz(OH12), DO:1290.125MHz(OHDD)

DV:439:29060(u(XO43) Kento ZoneS (Gateway: (JPTYJP G j P: 100:0.45) •JPTYJP Gunna Kita-Gunna Shinto

DVA09.050M-tu(GS40)
Kanto Zone® (Gateway: (JPTYJQ G_J IP: 10.0.047)

JPTYJQ ONba Brage DVA09.270M6tr(G40)
JPTYJQ B DV-1291.450M6tr(G10)

17.50 B DV:1291.450#H0(1512)

Karto Zone 7 (Gateway: "JPTYJR G j IP: 10.0055)

OJPTYJR Ohiba Nagareyama

DV:129.090861(sNy43)

Kento Zone® (Gateway: 「JPTYIQ G J IP: 10.00.01) #JPTYIQ Yokohama Konan DV409.210881(10040)

Kanto Zone® (Gateray: (JP1YJT G) IP: 10.0.065) ●JP1YJT Orde Yaddinata DVA34400M(s(YO43) (+5MKs shift)

Kanto Zone 1.0 (Gateway: [JR1VF G] P: 10.0.0.57)

•JR1VF Tukyo Shibuya-oliy

0V:1291.470MHz(SB12), D0:1270875MHz(SB00)

JPTYJY B DV:1291.400604(FJ12)
Karto Zone 12 (Gateway: [JPTYIK G] IP: 10.00.09)

OJPTYK Bereit Kops

DV:409.39069(J)(G43)
Kanto Zone 1.0 (Gateway: [JP1YFY G] IP: 10.00.90)

• JP1YFY Chile Funsheshi

DV634.480891(FN43) (-5891; shift)
Kanto Zone 1-4 (Gateway (-JP1YFY G) P: 10.00.101)

•JP1YJX Kanagawa Esina DV:439.050891(ED43)

DV:409.40MHz(TU40)

DV:434.300MHz(10443) (+5MHz shift)
No Connection to D-STAR network repeater

JP1YEM Online Kinemou JP1Y-E bareki Talikuba

DV-329-110MH-URG421 Tokal Zone (Gateway: 「JP2VGE &J IP: 10.0.0.7)

 JP2YGE Nagoya Atauta-ward DV:1291.890MHz(DE12), DD:1290.125MHz(DEDD)
 JP2YGG Nagoya Shows-ward

DV:1291.870MHz(RC12), DD:1290.375MHz(RCDD)
JP2YGI Nagoya Chikusa-ward

DV:439.370MHz(NU43), DD:1270.125MHz(NUDD)

JP2YGI B DV:1291.830MHz(NU12)
JP2YGK Alchi Kasugai
DV:439.380MHz(KA43), DD:1290.825MHz(KADD)

JP2YCK B DV:1291.850MHz(KA12)
No Connection to D-STAR Network repeater

JP2YDP Aichi Kouta DV:439.410Mhtz (KT43) JP2YGR Gifu DV:439.439Mhtz (GI43) JP2YGA Gifu Yaotau DV:439.350Mrb:(YA43) JP2YDS Gifu Kinkazan DV:439.490Mrb:(GK43)



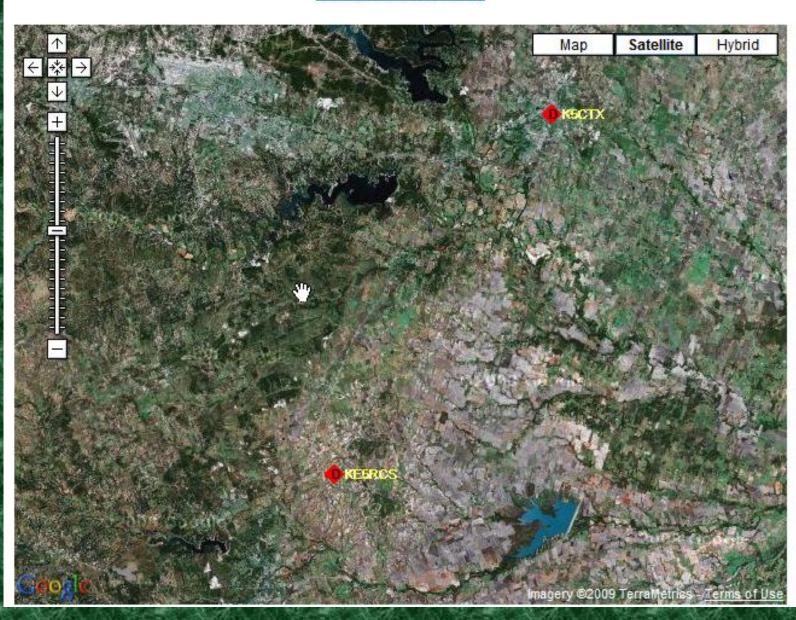
March 2010

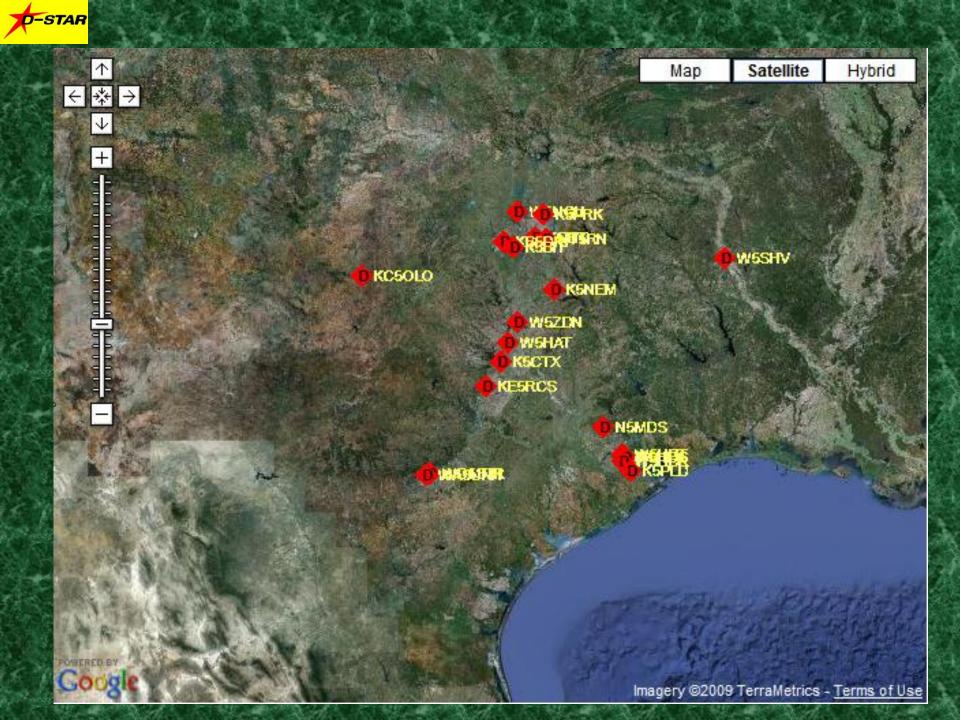
What about the rest of the world?



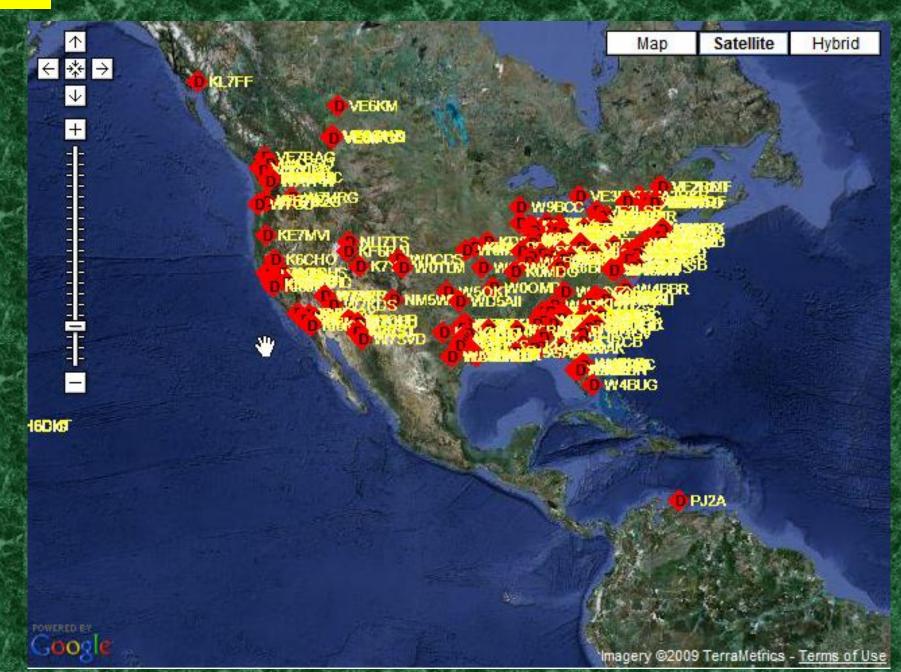
jFindu Locator Site

Recent Activity Map

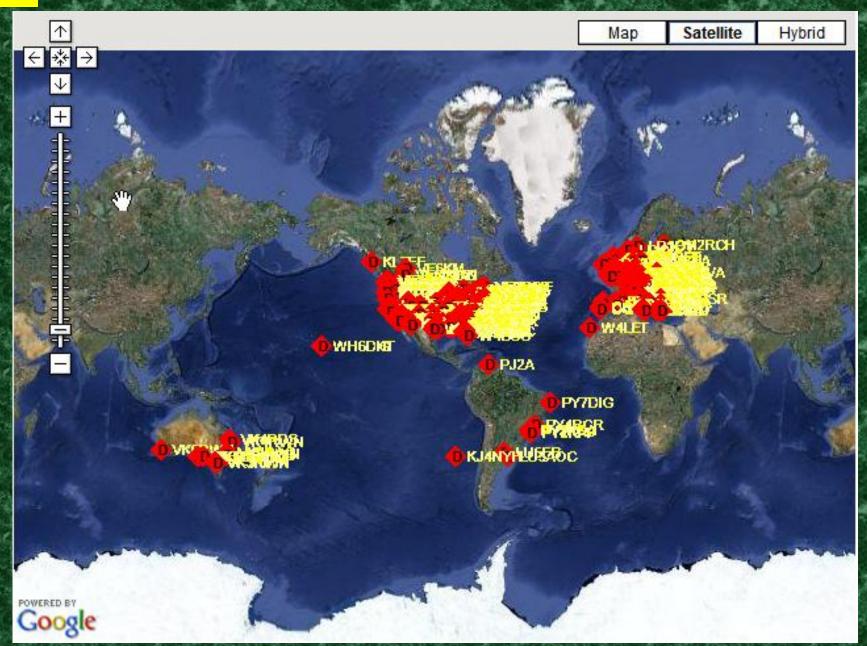






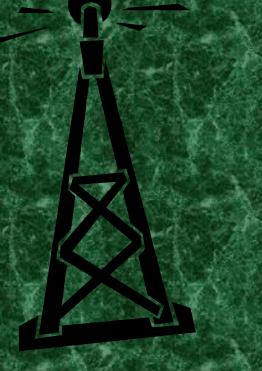








World Wide Right now!



Click on the tower



Plenty of Information



www.dstarusers.org



More Information



www.dstarinfo.com



Why D-STAR?

- Pure Digital
 - Clarity
 - Scanners
 - DV Voice and text message 2.4 Kbps (V=950 bps)
 - DD High Speed Data at 128 Kbps
- 10 GHz Linking of repeaters
- Reflectors



Why D-STAR?

- Gateway Linking
 - Internet
 - Repeater routing
 - Call sign routing



Why D-STAR?

- D-Rats
 - EmComm Oriented
 - Files
 - Images ICS 210
 - Email BBS-centric
 - GPS



Building a D-STAR

Repeater



Putting it together! First we need a repeater



2 m – Digital Voice

\$1399.95



...or two



70 cm – Digital Voice

\$1399.95



...or even three



23 cm – Digital Voice

\$1559.99



...then we add a



Controller

\$1459.95



... and do not forget



High Speed Digital Data 128 Kbps - 23 cm

\$1112.99



Photo	Item	Your Price
The same and the s	ID-RP 2C Repeater Controller Handles up to four RF modules.	\$1459.99
	ID-RP 2D 23cm (1.2 GHz) Data Module Access point with a data rate of 128kbps.	\$1112.99
Deran Statement	ID-RP 2V 23cm (1.2 GHz) Voice Module	\$1559.99
Detan William	ID-RP4000V 70cm (440 MHz) Voice Module	\$1399.99
Deran Interest	ID-RP2000V 2 Meter Voice Module	\$1399.99
	RSRP2 G2 DSTAR Gateway Software	\$ 359.95

\$7,292.90 +



...and a



Gateway

\$750.00



Now all you need is...

- Location
- Antennas
 - 2m
 - 70m
 - 23m
- Duplexers
- Preamps
- Power (including backup)
- Internet Access
- Administration

Frequencies



Walburg, TX 250'

2 m 70 cm 23 cm







"Support your local D-Star repeater group"

HOTERA

Heart of Texas Emergency Repeater Association



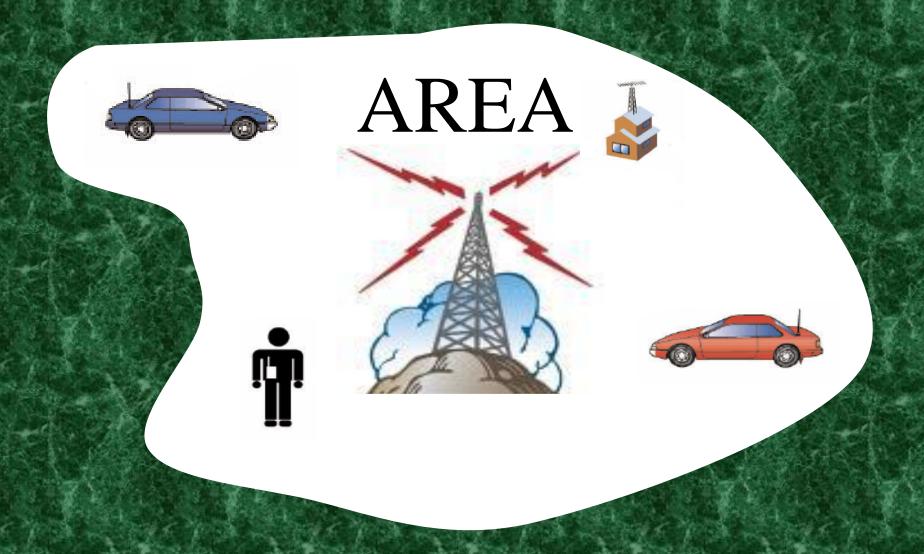
Click on the antenna



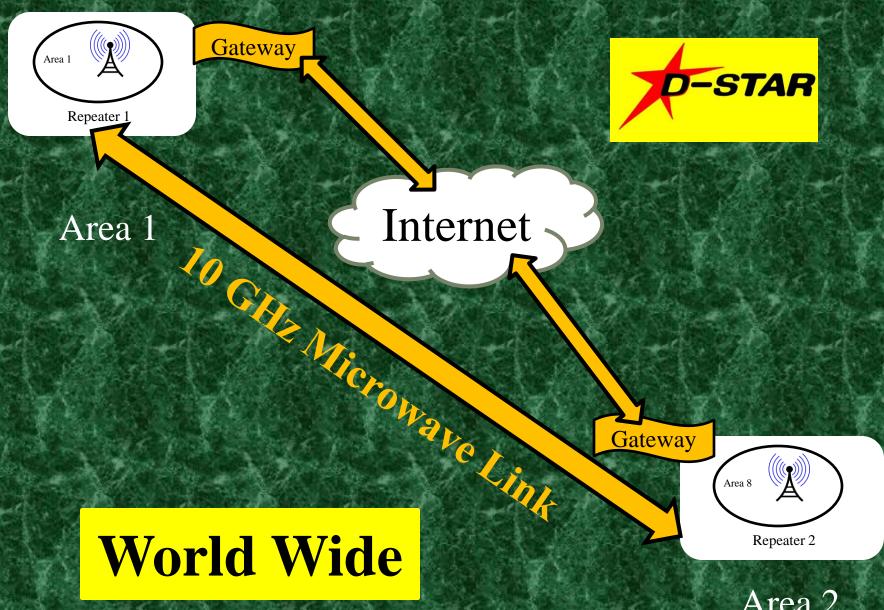
Implementing D-STAR



Local Communications



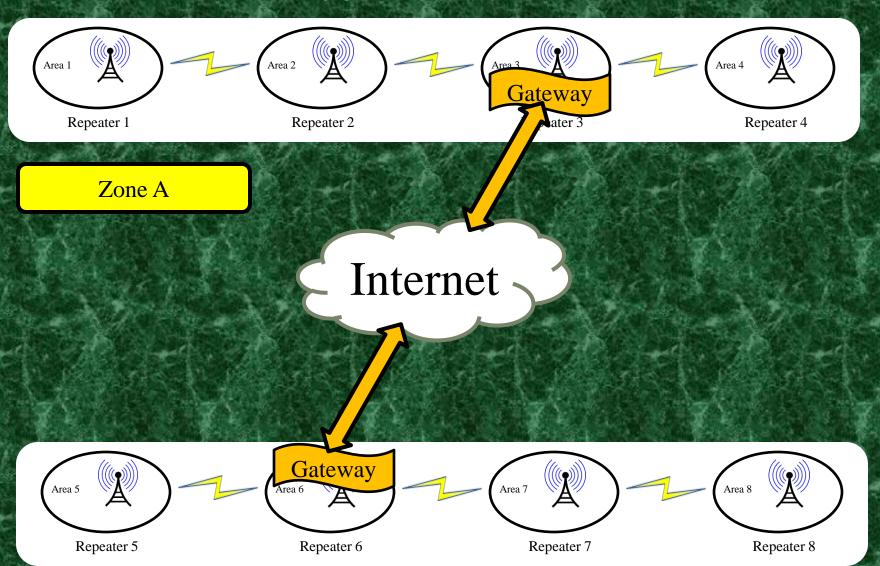




Area 2



10 GHz Microwave Link



Zone B

10 GHz Microwave Link



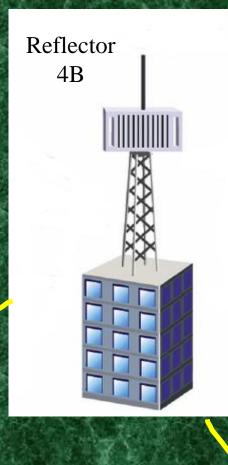
Reflectors

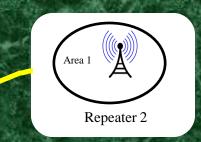
- Conference Hub PC Server
 - Multiple D-STAR repeater nodes
 - Connected VIA Gateways
 - Dongle Users

- World Wide Net held in 2008
 - 28 D-STAR Nodes (repeaters)
 - 18 Dongle Users
 - And it worked "Flawlessly"

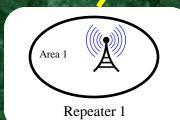


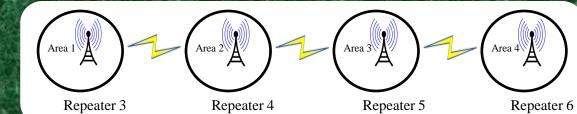
Multiple Connections













Radios and Dongles



ICOM ID - 1



- 1200 MHz
- Digital Voice 4.8 Kbps
- Digital Data 128 Kbps

\$999.95



ICOM ID - 2820H



- DUAL Band
 - 2 M
 - 70 cm
- GPS
- Digital Voice 2.4 Kbps
- Digital Messages

\$549.95 <u>284.95</u> D-STAR \$834.90



ICOM ID - 880H



- 1052 Memory Channels
- DUAL Band
 - 2 M
 - 70 cm
- Digital Voice 2.4 Kbps
- Digital Messages
- Software

\$549.95



ICOM ID - 80AD



- 1052 Memory Channels
- DUAL Band
 - 2 M
 - 70 cm
- Digital Voice 2.4 Kbps
- Digital Messages
- Software

\$419.95 - Radio \$199.95 - GPS Mic



DV Dongle



- D-Plus
- Robin Cutshaw, AA4RC
- PC USB
- Gateways & Reflectors

\$200.00 \$250.00



Applications



How can I use D-STAR?





Application 2

Short data message (DV mode)



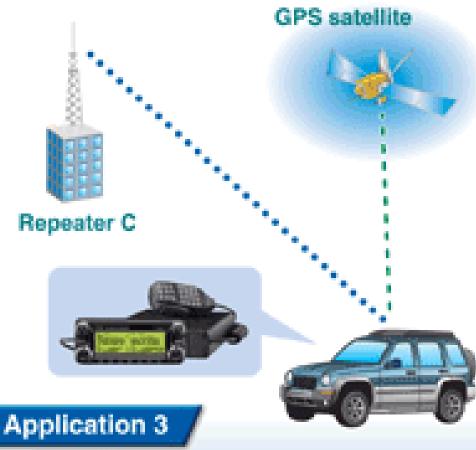


Repeater B



Call sign identification and short data messages are available.

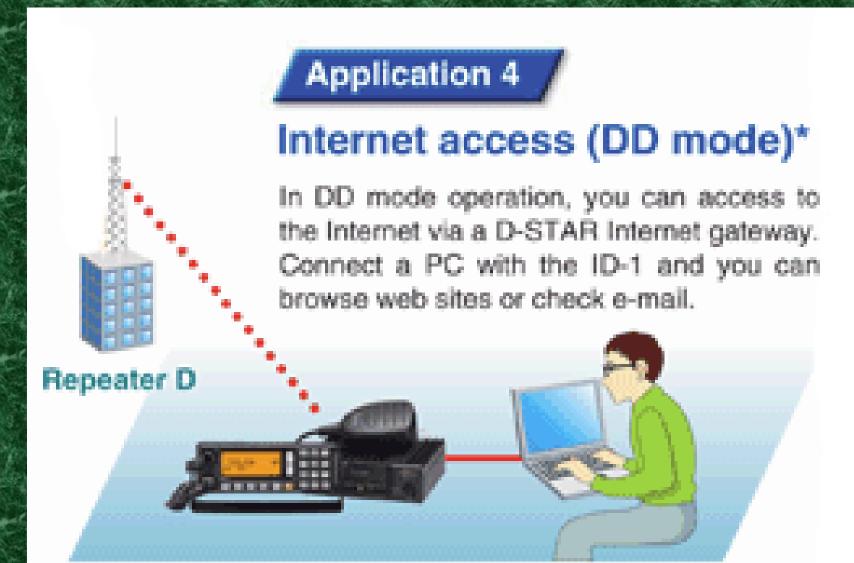




GPS tracking (DV mode)

With a GPS receiver, you can send your current position information to another radio.







Application 5

IP camera (DD mode)

You can transmit live images in DD mode and watch real-time images from a remote location.

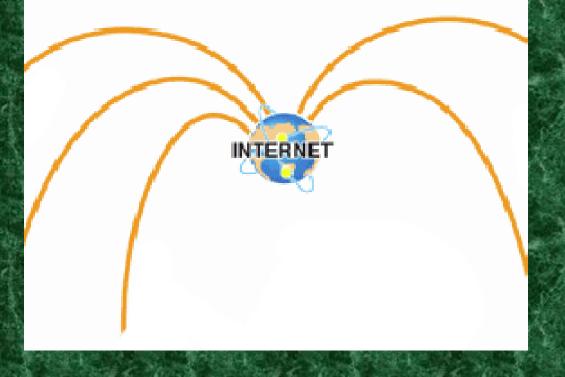
Repeater E



Add the Internet

Internet connection*

The Internet gateway allows linking of D-STAR repeater sites over the Internet. You can uplink to your local repeater and downlink from a remote repeater, even from a foreign country!



Application 1

Digital voice (DV mode)

Analog audio is modulated to a digital signal and transmitted in the digital mode signal by the D-STAR radio.





Internet connection*

The Internet gateway allows linking of D-STAR repeater sites over the Internet. You can uplink to your local repeater and downlink from a remote repeater, even from a foreign country!

INTERNET

Application 5

IP camera (DD mode)

You can transmit live images in DD mode and watch real-time images from a remote location.





Application 2

Short data message (DV mode)







Call sign identification and short data messages are available.

GPS satellite

Repeater C





Application 3

GPS tracking (DV mode)

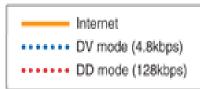
With a GPS receiver, you can send your current position information to another radio.

Application 4

Internet access (DD mode)*

In DD mode operation, you can access to the Internet via a D-STAR Internet gateway. Connect a PC with the ID-1 and you can browse web sites or check e-mail.





^{*} Some restrictions may apply depending on specific countries' regulations.



Software

- ICOM Gateway
- D-Plus Linking AA4RC
- D-RATS files, documents, images, email, chat, GPS
- D-PRS APRS
- D-Chat
- DVTool Dongle
- Programming for Radios 80AD/880H



Let's get down into the details!



Operation

- Basics
 - FM Select Frequency and PTT
 - DV Mode (Digital Voice) All users and repeaters must be registered with the D-STAR system
 - DV Mode it is best that the radio is preprogrammed by the user based on call signs



Who / What has a "Call Sign"?

- •Individual Hams W5HMN
- D-STAR repeaters KE5RCSxy
- D-STAR gateways W5TITxxy
- D-STAR tools K5CTXxxy

•Reflectors are special - REFxxxyz



What do I need to know to communicate using DV?

- DV Simplex is the easiest CQ
- Repeater Use -
 - The call sign of the repeater (or HAM)
 - Your own call sign
 - The call sign of the first repeater
 - The call sign of the gateway

URCALL

MYCALL

RPT1

RPT2



What else do I need to know?

The D of the repeaters to be used in DV mode

23 cm	XXXXXXA	Echo	XXXXXXX
70 cm	XXXXXXX	Status	XXXXXXX
2 m	xxxxxxxC	Link	XXXXXXX
	XXXXXXXXG	Unlink	xxxxxxxU

Repeater / XXXXXXX (URCALL)



DV Mode





W5HMN

Anyone

In Memory

 $\overline{\text{URCALL}} = \overline{\text{CQCQCQ}}$

RPT1 = N/A

RPT2 = N/A

 $\overline{MYCALL} = W5HMN$

PTT

Who can hear?

Anyone on frequency!

In digital mode

Local Simplex



DV Mode







W5HMN

KE5RCS 70cm

In Memory

URCALL = CQCQCQ

RPT1

= KE5RCS B

RPT2

= N/A

 $\overline{MYCALL} = W5HMN$



KE5RCS B

In digital mode

Anyone

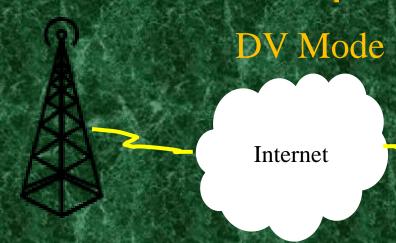
Who can hear?

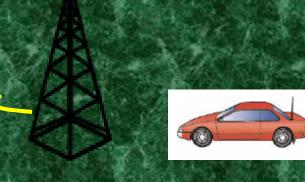
Anyone monitoring

Using a Repeater









K1LGJ KE5RCS 70cm

In Memory

URCALL = KV5V

RPT1 = KE5RCS B

RPT2 = KE5RCS G

MYCALL = K1LGJ

PTT

?

KV5V

Who can hear?

Anyone monitoring KE5RCS B & ?

In digital mode

Call Sign Routing











K1LGJ KE5RCS 2m

In Memory

 $\overline{\text{URCALL}} = /\text{K5CTX B}$

RPT1

= KE5RCS C

RPT2 = KE5RCS G

 $\overline{MYCALL} = K1LGJ$

K5CTX 70cm W5HMN

Who can hear?

Anyone monitoring

KE5RCS C K5CTX B

PTT

/ Repeater Routing













AH2H

In Memory

URCALL = REF005CL

RPT1

= KE5RCS C

RPT2

= KE5RCS G

MYCALL = AH2H

PTT

Who can hear?

Anyone monitoring **KE5RCS C** REF005C

Reflector - Linking













WA1KMA KE5RCS C

In Memory

URCALL = W5TSN

RPT1 = KE5RCS C

RPT2 = N/A

MYCALL = WA1KMA

PTT

W5TSN

Who can hear?

Anyone monitoring KE5RCS C REF005C

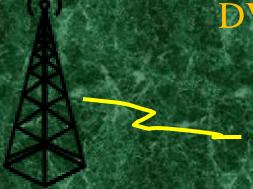
Local Area Call

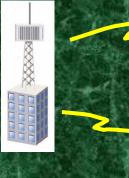














WA1KMA KE5RCS C

REF004B

In Memory

 $\overline{URCALL} = \overline{U}$

RPT1 = KE5RCS C

RPT2 = KE5RCS G

MYCALL = WA1KMA

PTT

Who can hear?

N/A

Reflector - Unlinking

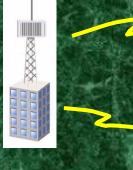














WA1KMA KE5RCS C REF004B

In Memory

URCALL = KE5RCS I

RPT1 = KE5RCS C

RPT2 = KE5RCS G

MYCALL = WA1KMA

Who can hear?

N/A

PTT

Status - Inquiry



Which ones will work?

URCALL=
RPT1 =
RPT2 =
MYCALL=

WA1KMA KE5RCS B KE5RCS G KD4HNX

1

KE5RCS B REF005AL KE5RCS G W5HMN CQCQCQ N/A KE5RCS G W5TSN

2

W5TSN KE5RCS B KE5RCS C WA1KMA CQCQCQ W4DOC C KE5RCS G AH2H

3

/K5CTX U KE5RCS G K1LGJ

4

5

6





DEMOs

•DONGLE

•ICOM 91AD (HT)