AllStarLink

Presentation by
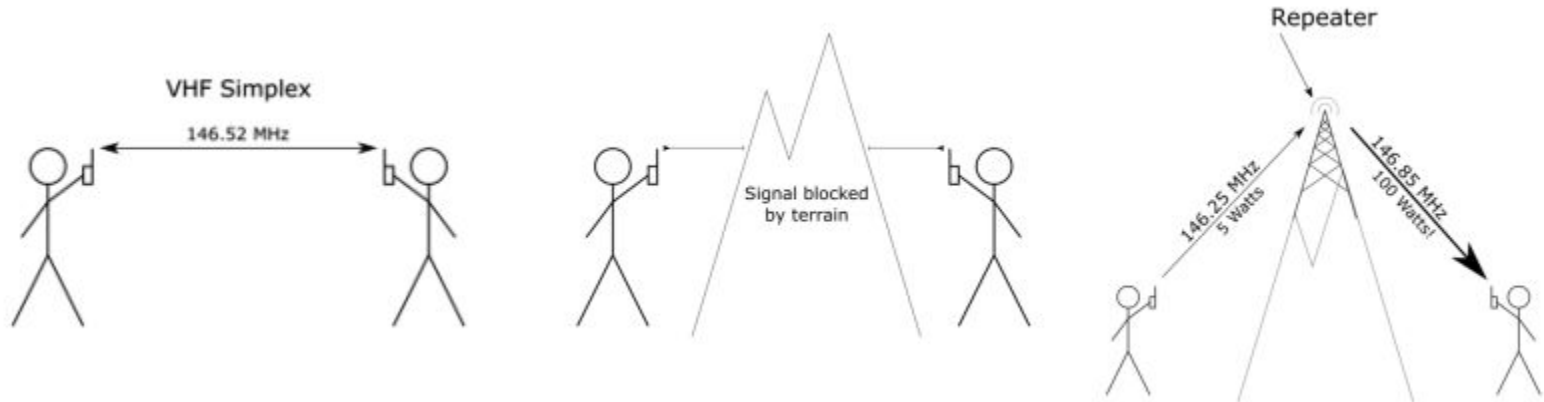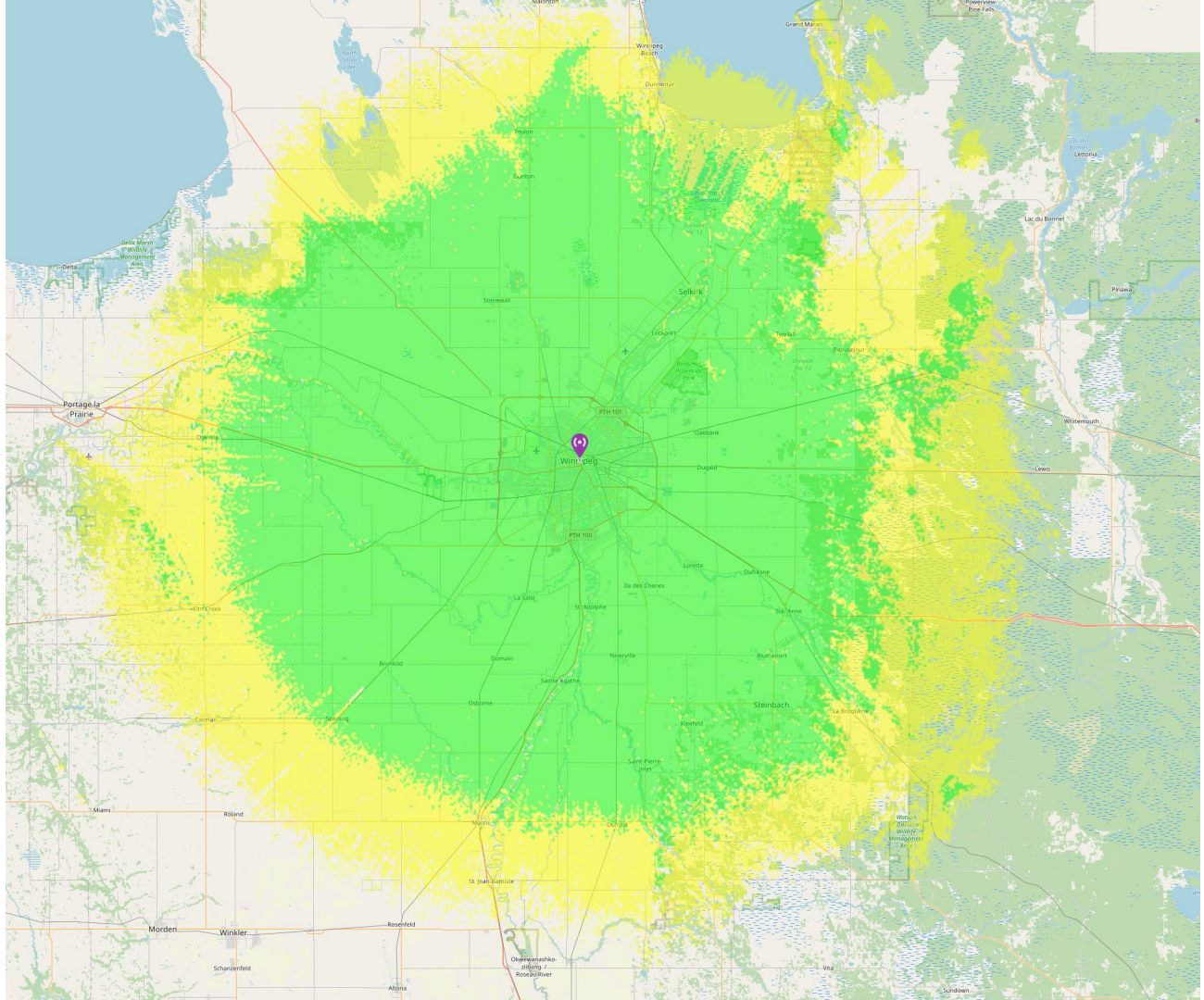
Wyatt - VE4WDZ
Dan - VE4DRK
Derek - VE4HAY

Introduction to VHF and UHF Radio

- VHF Radio (30MHz - 300MHz) and UHF Radio (300MHz - 1GHz) provides reliable line-of-sight communication.

- Moderate obstruction to the signal path such as buildings and trees does not block reception.

- Larger obstructions such as multiple buildings or differences in elevation will block signal propagation.

What Is A Repeater?

- A repeater is a radio transceiver capable of full-duplex operation. Signals received are retransmitted at a known frequency offset.

- By locating a repeater at a high elevation with low obstruction, stations can communicate through the repeater that would otherwise be blocked.

VHF Simplex
146.52 MHz

Signal blocked by terrain

Repeater

146.25 MHz
5 Watts

146.85 MHz
100 Watts!

Beyond Single Repeater Coverage

Increasing repeater coverage is a problem of diminishing returns.

Getting higher than the tallest building, or building a taller tower is not usually viable.

A more effective method is to add another repeater and double your coverage area.

But how do we link more than one repeater together?

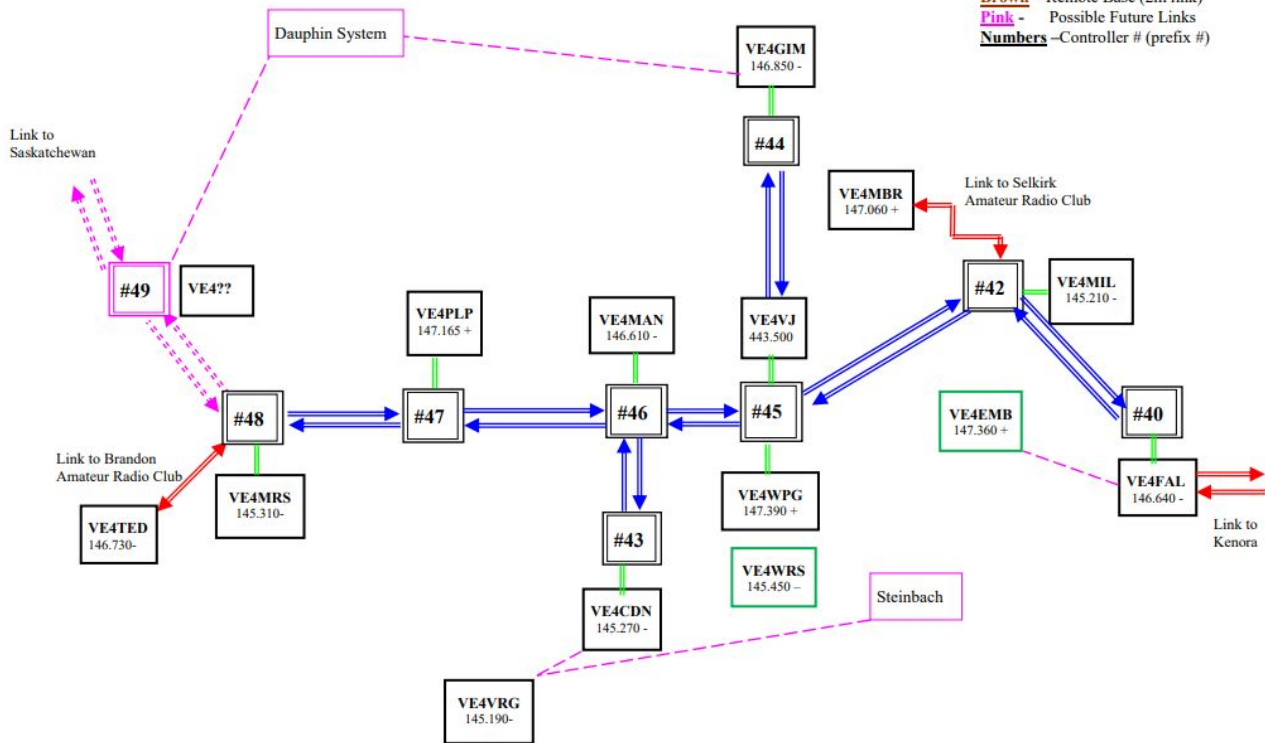# Repeater Linking In The 1980's

- The old Manitoba Repeater Society initially only had a couple of standalone repeaters.

- When the linking system finally started out, it was a Hub and Spoke system operating simplex.

- VE4VJ, on UHF was the hub, and all the VHF repeaters would connect to it on UHF.

- Typically hams did not use UHF for connection to the repeater system. Everything was on VHF.

Repeater Linking In The 1990's

- Manitoba Repeater Society linking system was upgraded and more repeaters were linked.

- The linking system was changed from a Hub and Spoke to a backbone network of UHF links

- The the controllers were upgraded to allow for multiple ports (radios) to be connected at each repeater site.

- Repeater sites and their UHF links provided the backbone of the linking network.

Manitoba Repeater Society – System Network Diagram

Dauphin System

VE4GIM
146.850 -

#44

Link to Saskatchewan

VE4MBR
147.060 +

Link to Selkirk
Amateur Radio Club

#49   VE4??

VE4MIL
145.210 -

#42

VE4PLP
147.165 +

VE4MAN
146.610 -

VE4VJ
443.500

#40

#48   #47   #46   #45

VE4EMB
147.360 +

Link to Brandon
Amateur Radio Club

VE4MRS
145.310-

VE4WPG
147.390 +

VE4FAL
146.640 -

VE4TED
146.730-

#43

Link to Kenora

VE4WRS
145.450 –

Steinbach

VE4CDN
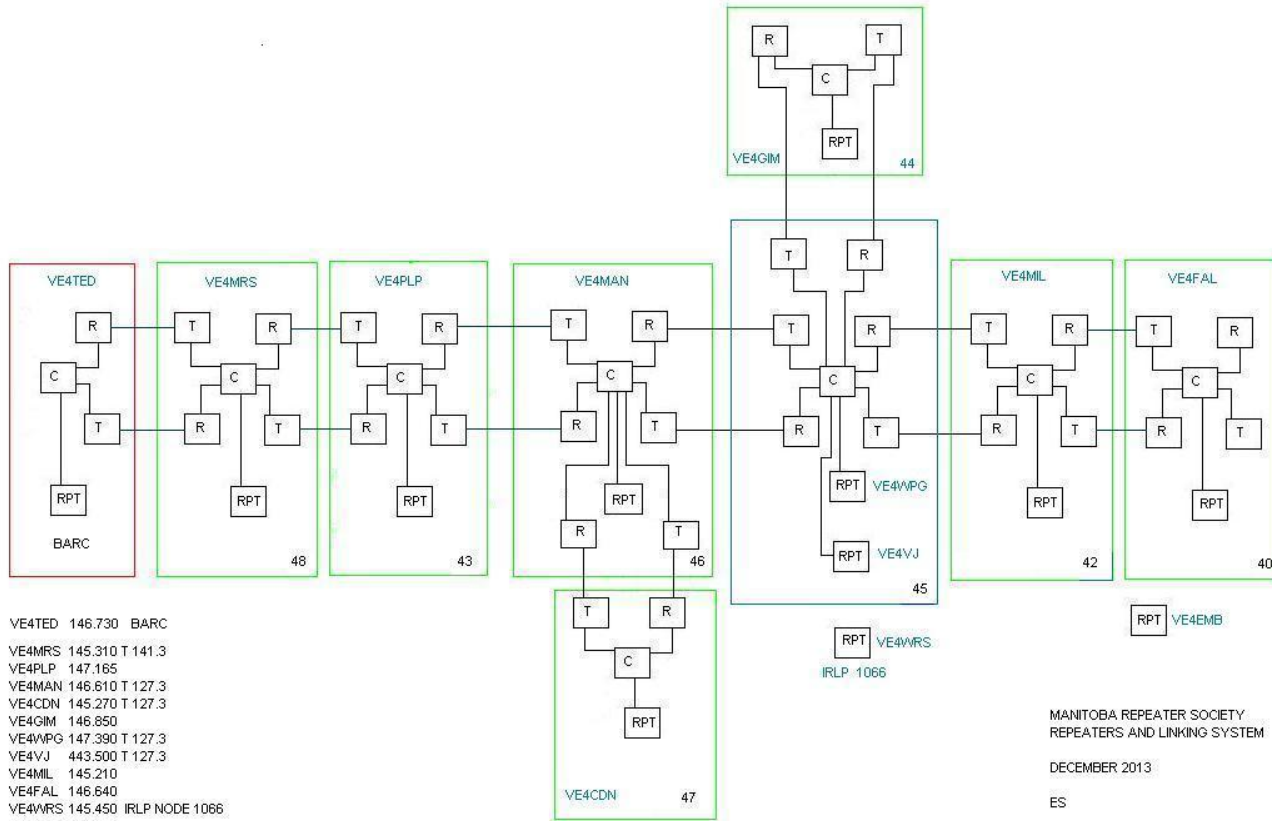145.270 -

VE4VRG
145.190-

Not to Scale, but does follow from East to West & North to South

Challenges Facing The UHF Backbone System

- This backbone system worked fine until a link radio died along the backbone, which would sever the connection on either side of this failure. Each link required a separate receiver/transmitter pair.

- One end of the network could not talk to the end of the network.

- For a period of time this was acceptable until the equipment and radios that made up the backbone just became too old and unreliable.

- Next was the controllers being old and failing.

- Then tower claiming access became restricted to professionals with the associated professional fees.

VE4GIM

R   T
C
RPT

44

VE4TED
R
C
T
RPT
BARC

VE4MRS
T   R
C
R   T
RPT
48

VE4PLP
T   R
C
R   T
RPT
43

VE4MAN
T   R
C
R   T
RPT
R   T
46

VE4CDN
T   R
C
RPT
47

T   R
T   R
C
R   T
RPT   VE4WPG
RPT   VE4VJ
45

RPT   VE4WRS
IRLP 1066

VE4MIL
T   R
C
R   T
RPT
42

VE4FAL
T   R
C
R   T
RPT
40

RPT   VE4EMB

VE4TED 146.730   BARC

VE4MRS 145.310 T 141.3
VE4PLP   147.165
VE4MAN 146.610 T 127.3
VE4CDN 145.270 T 127.3
VE4GIM   146.850
VE4WPG 147.390 T 127.3
VE4VJ   443.500 T 127.3
VE4MIL   145.210
VE4FAL   146.640
VE4WRS 145.450 IRLP NODE 1066
VE4EMB 147.360

MANITOBA REPEATER SOCIETY
REPEATERS AND LINKING SYSTEM

DECEMBER 2013

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Alternatives To A UHF Backbone

- By the late 2000's the commercial world was already switching away from RF linking to dedicated copper lines or internet linking.

- Many newer formats for amateur radio are available on the market, D-Star, DMR, Fusion, etc. All require proprietary hardware/encoders. None will interoperate natively with another.

- All digital ham radios use the internet to link their repeaters.

Modernizing Analogue Repeaters With IP Linking

- MRS (now RAM) decided to modernize the analogue repeaters with IP linking until a fully suitable new standard is adopted.

- This strategy allows all members to keep using their current radios while the repeater system is modernized to use the new links.

- Rather than replace multi-port controllers at over $2000/site, small Single Board Computers (SBC's) running Linux and Asterisk based software are used to replace the functionality of the existing controllers, and add IP linking capability.

Advantages Of IP Based Linking

- An IP based link has substantially less hardware required than a UHF link. An IP link eliminates the need for 2 UHF radios, a duplexer, heliax transmission line, antennas, and the professional tower climber to service it.
(x2 for the other side of the link)

- IP linking and "The Internet" is the world's largest redundant backbone. Sites can have multiple redundant IP connections reducing/eliminating path failure.

- IP connections allow full remote configuration capabilities. Functions can be enabled or changed remotely.

Evolution Of Analogue IP Linking

- IRLP (Internet Radio Linking Project) was the first mainstream option for linking analogue radios over the internet. It is a closed system that does not interoperate.

- Echolink followed IRLP but was more open is allowing connections.

- AllStarLink was released in the late 2010's. Based on Asterisk, open-source VoIP software. All of the connection standards are open and can be utilized by other software developers.

Adoption of AllStarLink

- MRS (now RAM) decided to use AllStarLink to connect our repeaters over IP linking.

- Many sites now have HSMM (high-speed multi media) PTP wireless links providing IP connectivity between the repeater sites, maintained by the HSMM/VA4WAN group (now part of RAM).

- LES.net is a local ham and owns a VoIP and Internet provider in Winnipeg. LES.net provides internet uplink to the HSMM network, and hosts part the amateur IP Address space.

- Other sites have connections donated by local WISP's (Wireless ISPs)

The AllStar Network

- Repeater sites coordinate their connections through the AllStar registry system. A site owner has to prove their amateur radio status to register.

- Each site is assigned a unique node number that identifies it to the rest of the network.

- Nodes can connect directly to each other. When multiple nodes want to connect with each other, a hub and spoke topology is recommended.

- The number of nodes on a hub is limited only by IP bandwidth and the CPU resources of the hub servers.

- Hubs can be linked together creating an interconnected system of hubs and spokes.

RAM's AllStar Nodes

- RAM has 3 hub nodes running on a server hosted in a datacenter in Winnipeg.

- 478790 - Manitoba Hub connects rural repeaters outside the city of Winnipeg.

- 478791 - Winnipeg Hub connects repeaters within the city of Winnipeg.

- 478792 - Remote Hub connects external users such as Echolink, hams with their own nodes and other AllStar hubs.

- Hubs are normally connected together, linking all the Winnipeg and rural repeaters together. Hubs can be disconnected to quickly separate the repeaters into their separate hub groups.

Node 478790

VE4MRS MBHUB: Winnipeg, Manitoba

Click here for the Bubble Chart

Node	Callsign	Frequency	CTCSS	Location
478791	VE4MRS	Winnipeg Hub	CSQ	MBHUB: Winnipeg, Manitoba
478792	VE4MRS	MBX HUB	CSQ	MBHUB: Winnipeg, Manitoba
503610	VE4SEL	147.060+	127.3	VE4SEL - Selkirk, Manitoba
503614	VE4MIL	145.210-	127.3	VE4MIL -Milner Ridge, Manitoba
503611	VE4EMB	147.360+	127.3	VE4EMB - Hadashville, Manitoba
503613	VE4HS	146.880	127.3	VE4HS - Bruxelles, Manitoba

Statistics

Actual Uptime	8d 12hr 55m 11s
Keyups	2744
Transmit Time	9hr 30m 41s
Timeouts	0
Commands Executed	3

Node 478791

VE4MRS MBHUB: Winnipeg, Manitoba

Click here for the Bubble Chart

Node	Callsign	Frequency	CTCSS	Location
45596	VE4TMP	147.090+	127.3	Winnipeg, Manitoba
478790	VE4MRS	Manitoba Hub	CSQ	MBHUB: Winnipeg, Manitoba
496132	VE4CNR	146.760-	127.3	VE4CNR - Winnipeg, Manitoba
503616	VE4WRS	145.450-	127.3	VE4WRS - Winnipeg, Manitoba

Statistics

Actual Uptime	5d 19hr 56m 42s
Keyups	1816
Transmit Time	6hr 22m 22s
Timeouts	0
Commands Executed	5

Node 478792

VE4MRS MBHUB: Winnipeg, Manitoba

Click here for the Bubble Chart

Node	Callsign	Frequency	CTCSS	Location
45427	VE4DRK	446.100	127.3	VE4DRK - Winnipeg, MB, CANADA
45597	VE4WDZ	446.230Rx/147.510Tx	127.3	Winnipeg
478790	VE4MRS	Manitoba Hub	CSQ	MBHUB: Winnipeg, Manitoba
503619	VE4KIL	444.500	123.0	Killarney, Manitoba
57666	VA4SMC			Winnipeg, MB
59186	VE4DRC-2			winnipeg, manitoba

Statistics

Actual Uptime	8d 12hr 56m 20s
Keyups	2607
Transmit Time	8hr 51m 9s
Timeouts	0
Commands Executed	0

Node 65597 446.230Be147.510Tx
VE4WDZ Winnipeg
-97.199135 49.884480

Node 17666
VA4SNC Winnipeg, MB
-97.13482 49.895064

Node 45427 446.100
VE4DRK VE4DRK - Winnipeg, MB. CANADA
-97.078191 49.836889

Node 19198
VE4DRC 2 winnipeg, manitoba
-97.069909 49.824766

Node 103018 145.450
VE4MRS VE4MRS - Winnipeg, Manitoba
-97.154419 49.86482

Node 478792 MRS HUB
VE4MRS MRSUB- Winnipeg, Manitoba
-97.1366 49.895

Node 103019 444.500
VE4KEL Kilarney, Manitoba
-99.664869 49.171984

Node 496132 146.760
VE4CNR VE4CNR - Winnipeg, Manitoba
-97.051751 49.886558

Node 478791 Winnipeg Hub
VE4MRS MRSUB- Winnipeg, Manitoba
-97.1366 49.895

Node 478790 Manitoba Hub
VE4MRS MRSUB- Winnipeg, Manitoba
-97.1366 49.895

Node 103013 146.880
VE4BN VE4BN - Brandon, Manitoba
-98.018191 49.887473

Node 45586 147.090+
VE4TNP Winnipeg, Manitoba
-97.282245 49.879276

Node 503611 147.360+
VE4MNB VE4MNB Radarlville, Manitoba
-95.80151 49.674651

Node 503610 147.360+
VE4SEL VE4SEL - Selkirk, Manitoba
-96.872664 50.143731

Node 5210918
(Not in Database)

Node 1997
(Not in Database)

Node 503614 145.210
VE4MEL VE4MEL - Milner Ridge, Manitoba
-96.222785 50.149341

Node 1998
(Not in Database)

AllStarLink [surrounding node 478792] status of 2024-02-09 15:33:31

Rural Repeaters

- RAM currently has AllStar repeaters in Selkirk, Milner Ridge, and Hadashville, and Gimli.

- RAM is working to add IP linking and internet connectivity at other rural sites by partnering with WISPs and other local organizations. Gimli still requires an IP link.

- Where an IP link is not currently feasible, some sites are using UHF links connected to an AllStar node as a stop gap measure.

- Falcon Lake is hotlinked to Milner's AllStar node with a UHF link.

- Starbuck (VE4MAN) has an active UHF link to VE4TMP allstar node, and Morris (VE4CDN) is being worked on to use UHF links to connect to the VE4TMP node.

Rural Repeaters

- RAM has invited other Manitoba repeater owners to connect their repeaters to the MB Hub.

- Brandon ARC has connected their Brandon (VE4CTY) and Buxelles (VE4HS) repeaters to the hub, with RAM providing the assistance.

- Dauphin ARC is working on connecting their downtown repeater to AllStar.

- RAM is working with Prairie Mobile to connect their Mountain Road repeater (VE4RAG) to AllStar.

- RAM is working with Bruce VE4KQ to assist with the installation of Allstar systems in Killarney VE4KIL and Austin VE4ARM

Winnipeg Repeaters

- RAM currently has 3 AllStar repeaters in Winnipeg.

- VE4CNR - West Transcona

- VE4WRS - South Osborne

- VE4TMP (soon VA4STC) - Sturgeon Creek

- VE4WPG/VJ on the Richardson building cannot be reliably connected to the AllStar network. Building operators are not open to any additional roof-top equipment necessary to provide a reliable IP link. RAM has no active lease agreement and could lose this site at any time.

- New sites for WPG and VJ are in progress to add UHF/VHF repeaters to the AllStar system.

AllStar Controls

- AllStar uses DTMF command codes similar to previous hardware controllers.

- DTMF codes are customizable in software. Custom commands can be made to run any software that you want to program.

- Macros can run multiple DTMF commands at once to simplify repetitive operations.

Basic Commands

- *1<node_num> - Disconnect the given node number from the node you are transmitting to.

- *3<node_num> - Connect the node you are transmitting on to the given node number.

- *70 - Report the current connections of the node you are transmitting to.

- *813<node_num> - Persistently connect to a given node number.

- *4<node_num> - Start remote command session with a remote node.

RAM Macro Codes

- RAM is working on programming macros into the repeaters to return the hubs to a standard state.

- Current macros being planned

  - *560 - Disconnect the Winnipeg and Manitoba hubs but leave all associated repeaters connected to their respective hubs

  - *561 - Connect the Winnipeg and Manitoba hubs together and all repeaters that are normally connected to the hub.

Additional AllStar Information

- https://allstarlink.org - Homepage for the AllStarLink Project

- https://allstarlink.org/nodelist - See a full list of nodes registered with AllStar

- https://stats.allstarlink.org/stats/478790 - MB Hub Status

- https://stats.allstarlink.org/stats/478791 - WPG Hub Status

- https://stats.allstarlink.org/stats/478792 - Remote Hub Status

Questions?