repeater \ri-ˈpē-tər\ noun

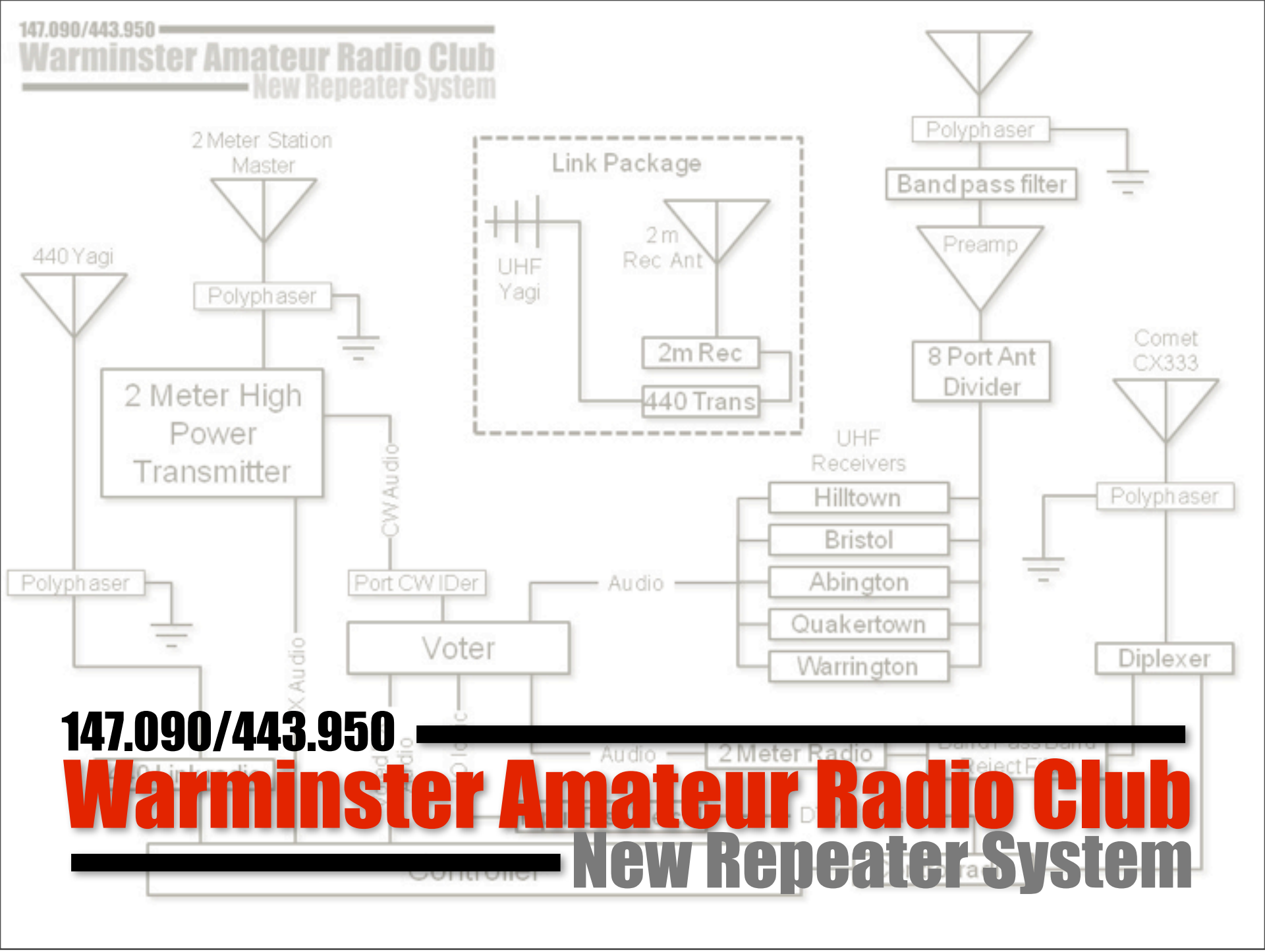
1. a person or thing that repeats

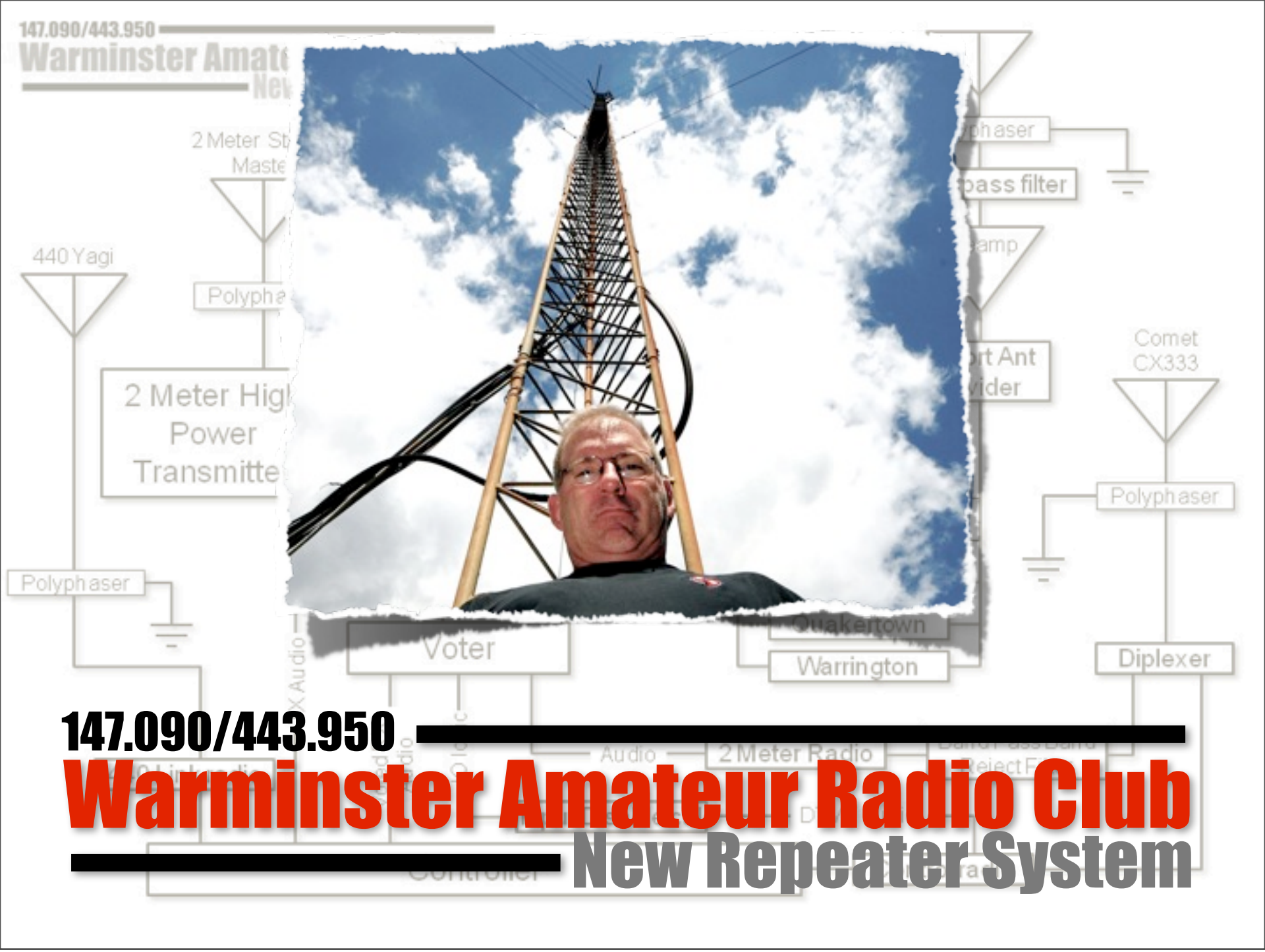
2. (Military / Firearms, Gunnery, Ordnance & Artillery) Also called repeating firearm a firearm capable of discharging several shots without reloading

3. (Miscellaneous Technologies / Horology) a timepiece having a mechanism enabling it to strike the hour or quarter-hour just past, when a spring is pressed

4. (Engineering / Electrical Engineering) Electrical engineering a device that amplifies or augments incoming electrical signals and retransmits them, thus compensating for transmission losses

5. (Transport / Nautical Terms) Also called substitute Nautical one of three signal flags hoisted with others to indicate that one of the top three is to be repeated


147.090/443.950
Warminster Amateur Radio Club
New Repeater System
2 Meter Station Master
Link Package
Polyphaser
Bandpass filter
Preamp
440 Yagi
UHF Yagi
2m Rec Ant
2m Rec
440 Trans
8 Port Ant Divider
Comet CX333
2 Meter High Power Transmitter
CW Audio
UHF Receivers
Hilltown
Bristol
Abington
Quakertown
Warrington
Polyphaser
Port CW IDer
Audio
Voter
Polyphaser
Diplexer
Audio
2 Meter Radio
Controller
147.090/443.950
Warminster Amateur Radio Club
New Repeater System


147.090/443.950
Warminster Amateur Radio Club
New Repeater System

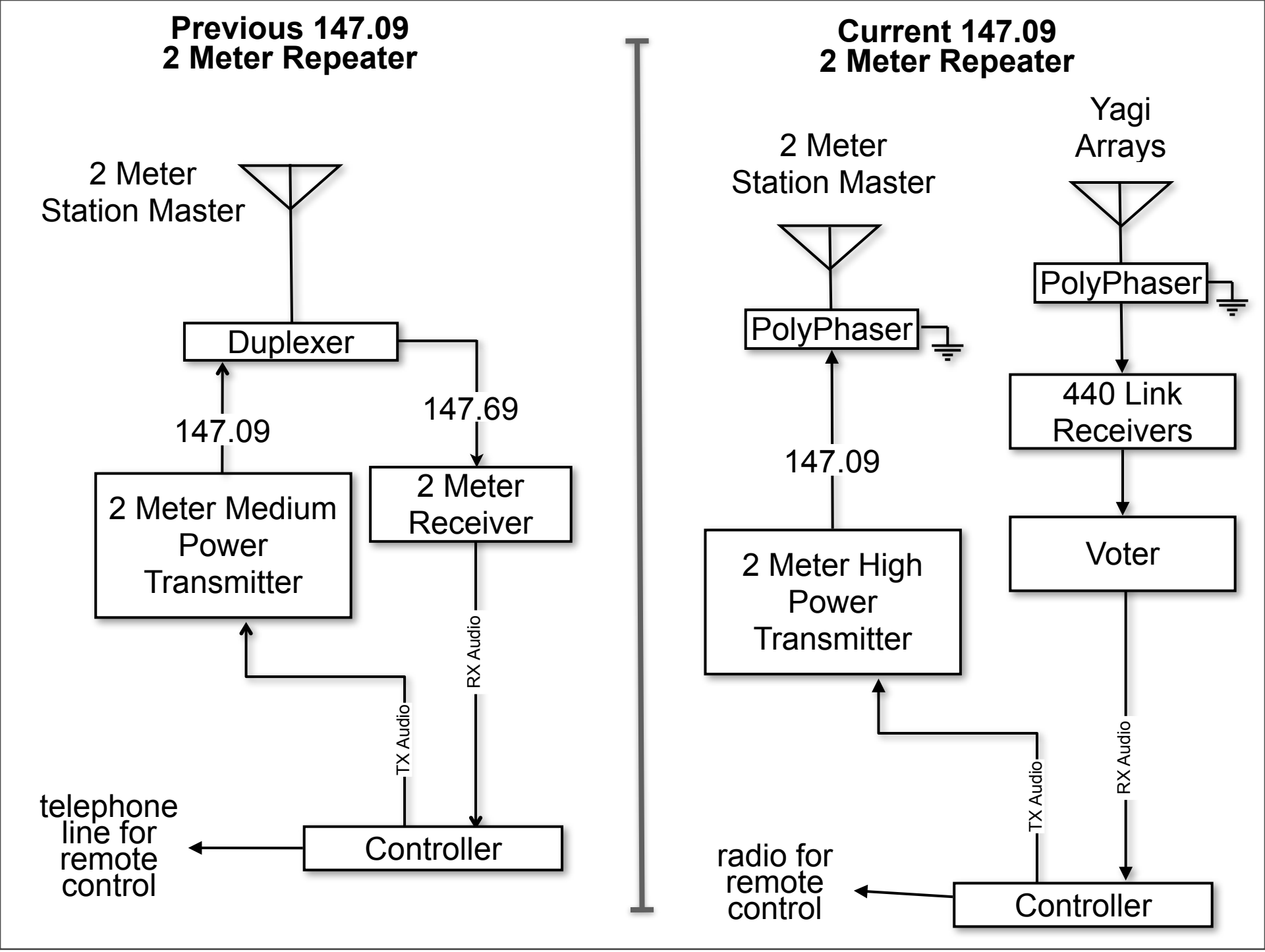
Why did this project happen

Old System

- RCA hardware was unreliable
- Hard to find parts
- Analog based system
- Limited expansion

New System

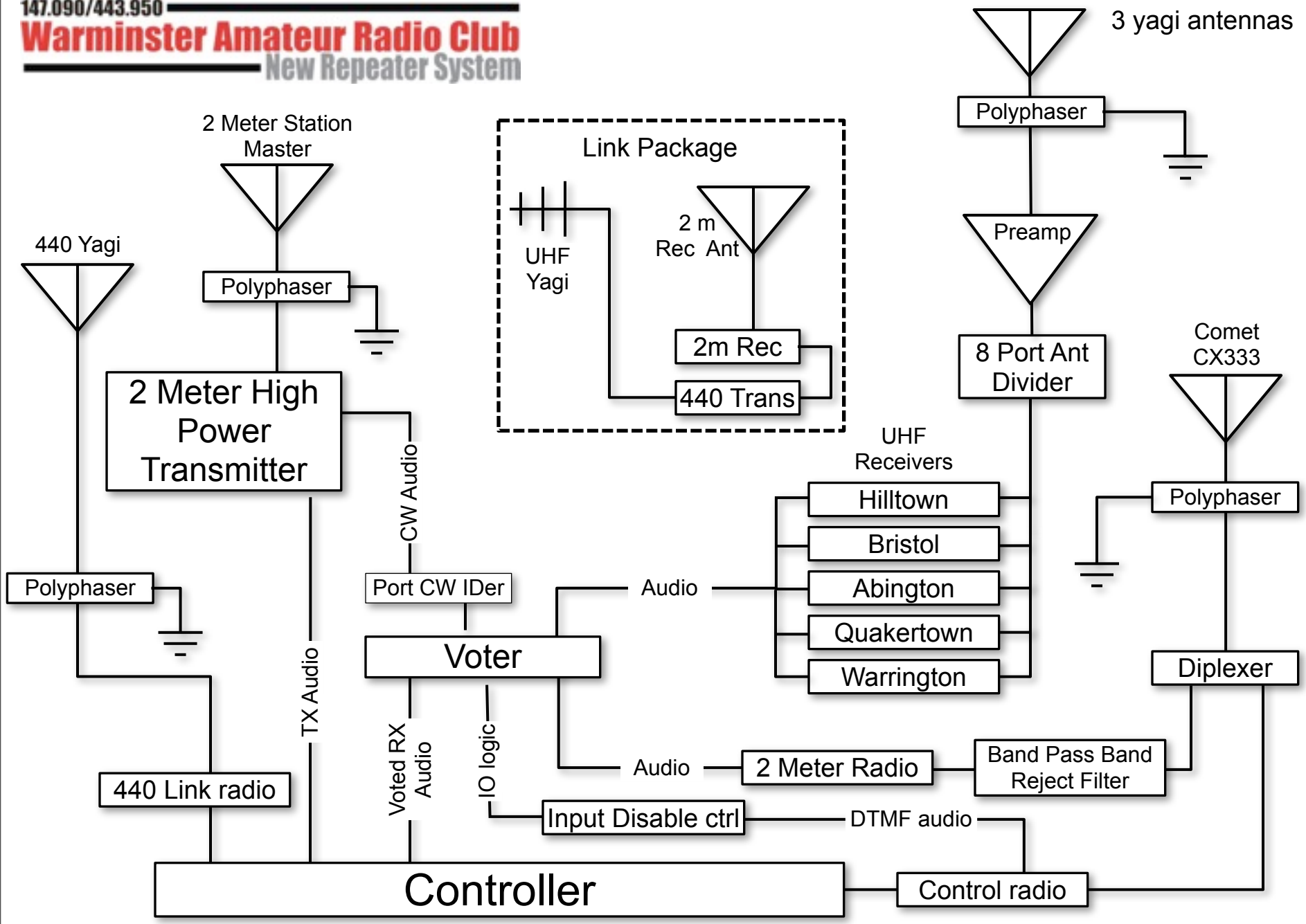
- Availability of new (used) transmitter
- New technology with reliable support
- Plug and play
- Digital and programmable radios allow more features
- Ability to easily link to other systems for emergencies


Previous 147.09
2 Meter Repeater
2 Meter
Station Master
Duplexer
147.09
147.69
2 Meter Medium
Power
Transmitter
2 Meter
Receiver
TX Audio
RX Audio
telephone
line for
remote
control
Controller
Current 147.09
2 Meter Repeater
2 Meter
Station Master
Yagi
Arrays
PolyPhaser
PolyPhaser
440 Link
Receivers
147.09
2 Meter High
Power
Transmitter
Voter
TX Audio
RX Audio
radio for
remote
control
Controller

147.090/443.950

Warminster Amateur Radio Club

New Repeater System



Friday, March 5, 2010


Quakertown
830’
Plumstead future
677’
Hilltown
770’
Warrington
520’
Main
430’
Ivyland future
530’
Eagleville future
850’
Abington
460’
Bristol
190’
WARC
Radio Locations
and Antenna Elevations

Current Sites and Radios

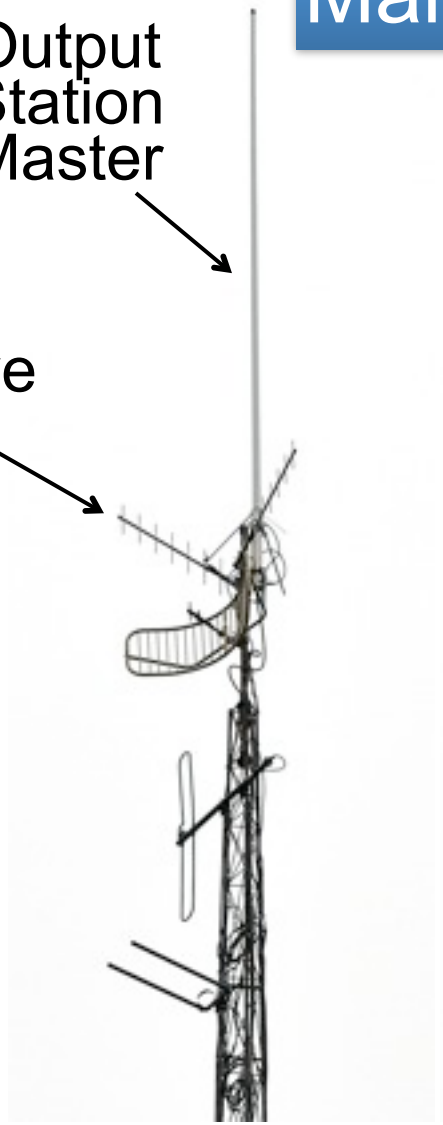
Location	Radio	Antenna		Power
		Input (VHF)	Output (UHF)	
Bristol	GE	X-50	8 el Yagi	15 W
Abington	Motorola	Station Mstr	5 el Yagi	5 W
Warminster *	Motorola	CX 333	NA	NA
Warrington	GE	X-50	3 el Yagi	200mw
Hilltown	Motorola	CX 333	6 el Yagi	5 W
Quakertown	Motorola	X-50	6 el Yagi	10 W

* Main Site

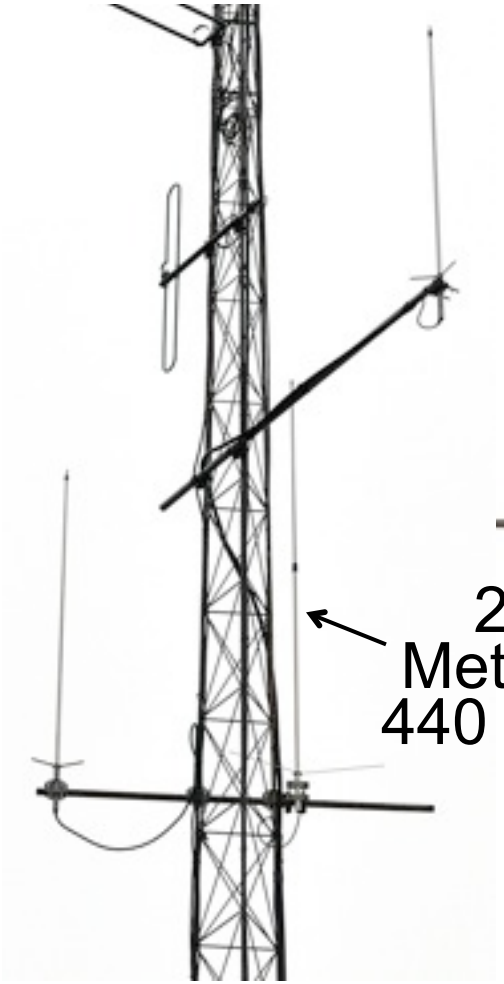
MAIN SITE

Main Site Warminster Township Building

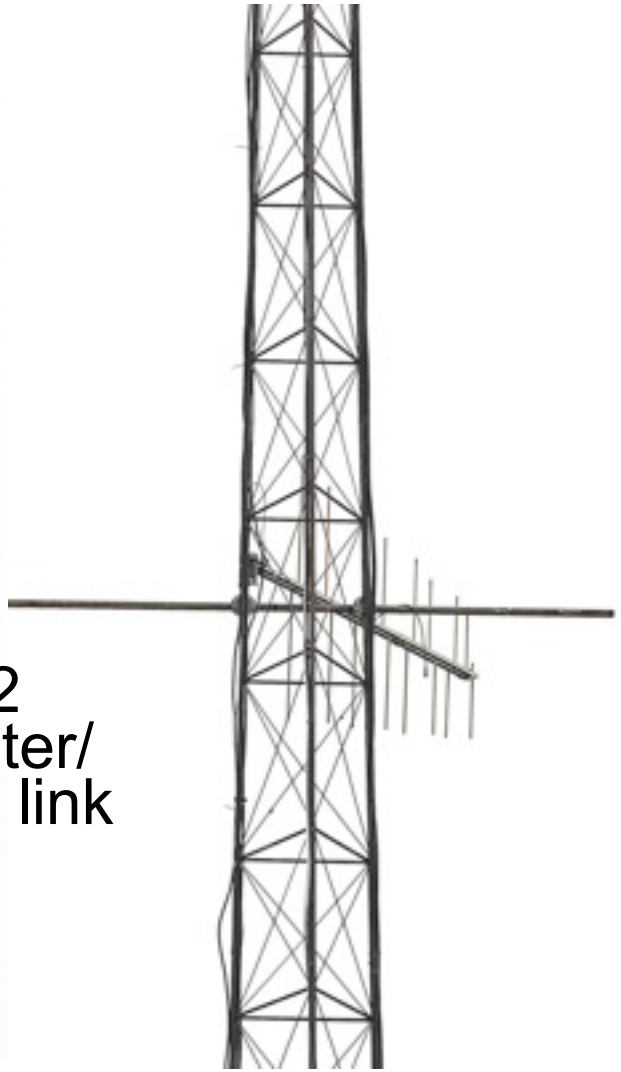
Main Site Antennas



Top
Section



Middle
Section



Lower
Section

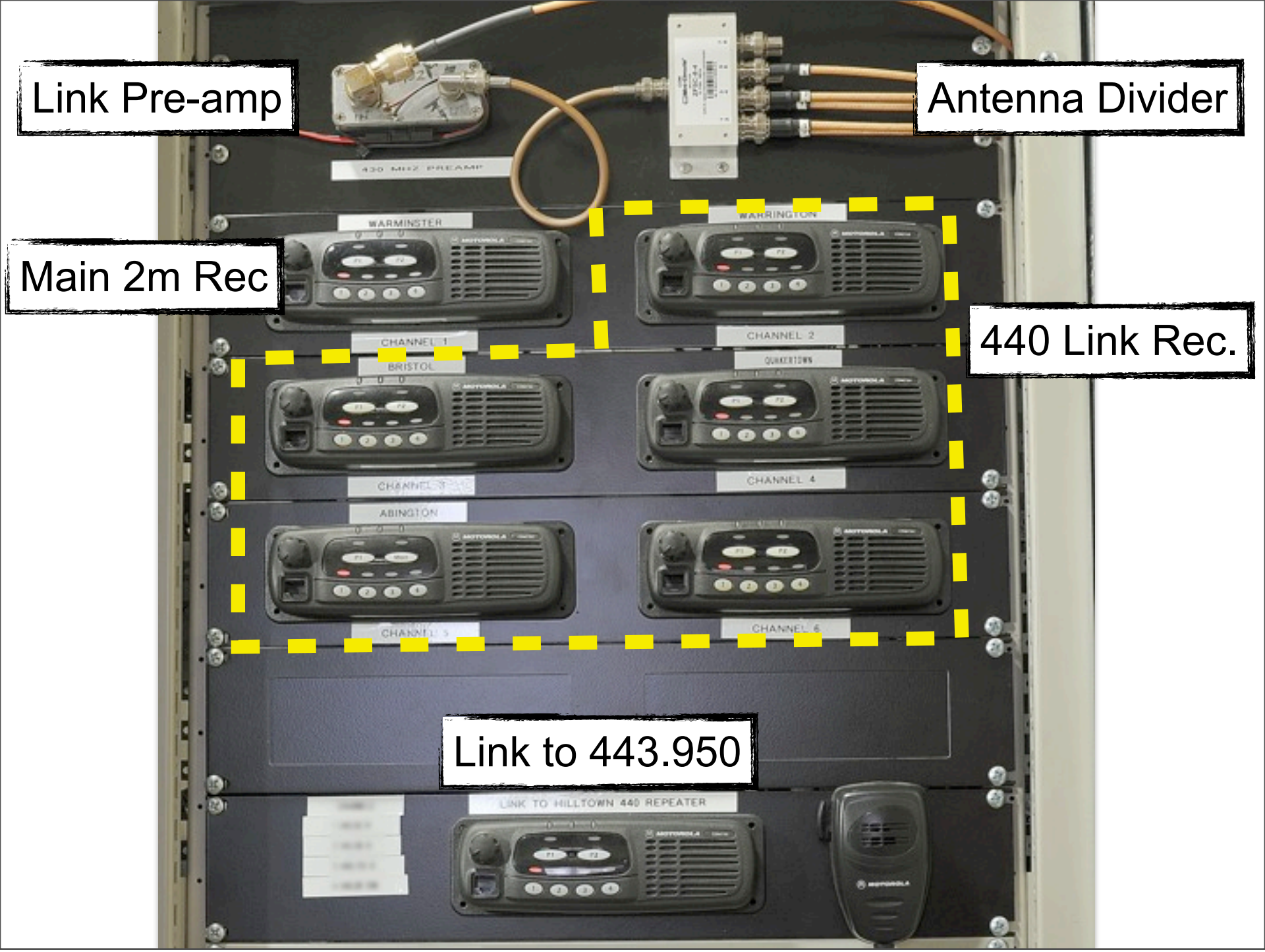
Link Receivers and Controllers (the Brains)

GE Transmitter (the Brawn)

Rack Components

Mounted in a 19” Computer Server Rack

- Motorola Remote Receivers
- Receiver Disable Panel
- Modified LDG 8 Port Voter
- Break-Out Panel
- Arcom RC-210 Controller
- Power Distribution Panel
- Duplexer (receive only)
- Iota Power Supply/Charger w 12v Gell Cell


Link Pre-amp
Antenna Divider
Main 2m Rec
440 Link Rec.
Link to 443.950
WARMINSTER
WARRINGTON
CHANNEL 1
CHANNEL 2
BRISTOL
QUAKERTOWN
CHANNEL 4
ABINGTON
CHANNEL 6
LINK TO HILLTOWN 440 REPEATER

Voter

The voter looks for the best quieting signal, and selects it to be re-transmitted, for the users to hear. If you run high power and light up all the remote receivers, the voter does not have a choice to make, or votes too much (possibly putting "holes" into your signal) causing a signal that jumps between noise and full quieting. Low power is the *KEYWORD*. From W3BXW Website

The LDG RVS-8 Voter provides signal to noise based, "real time" automatic audio switching for up to eight sites. Multiple RVS-8s can be cascaded to provide up to 64 channels of voting.

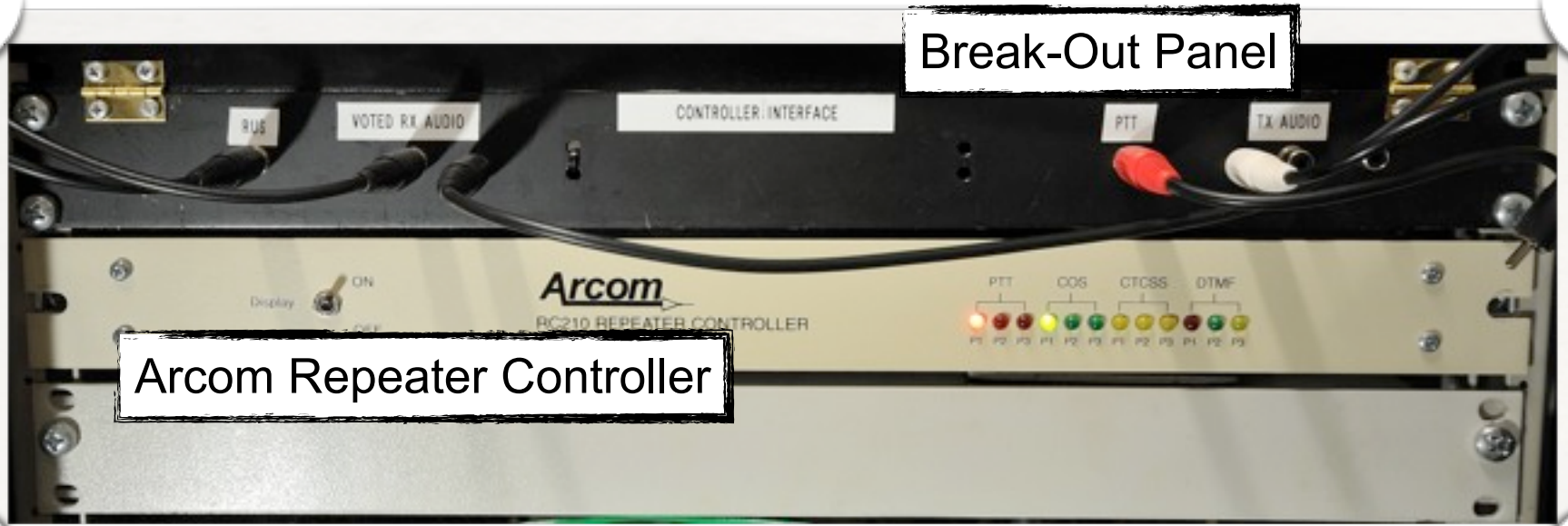
Receiver Disable Panel

Modified LDG Voter

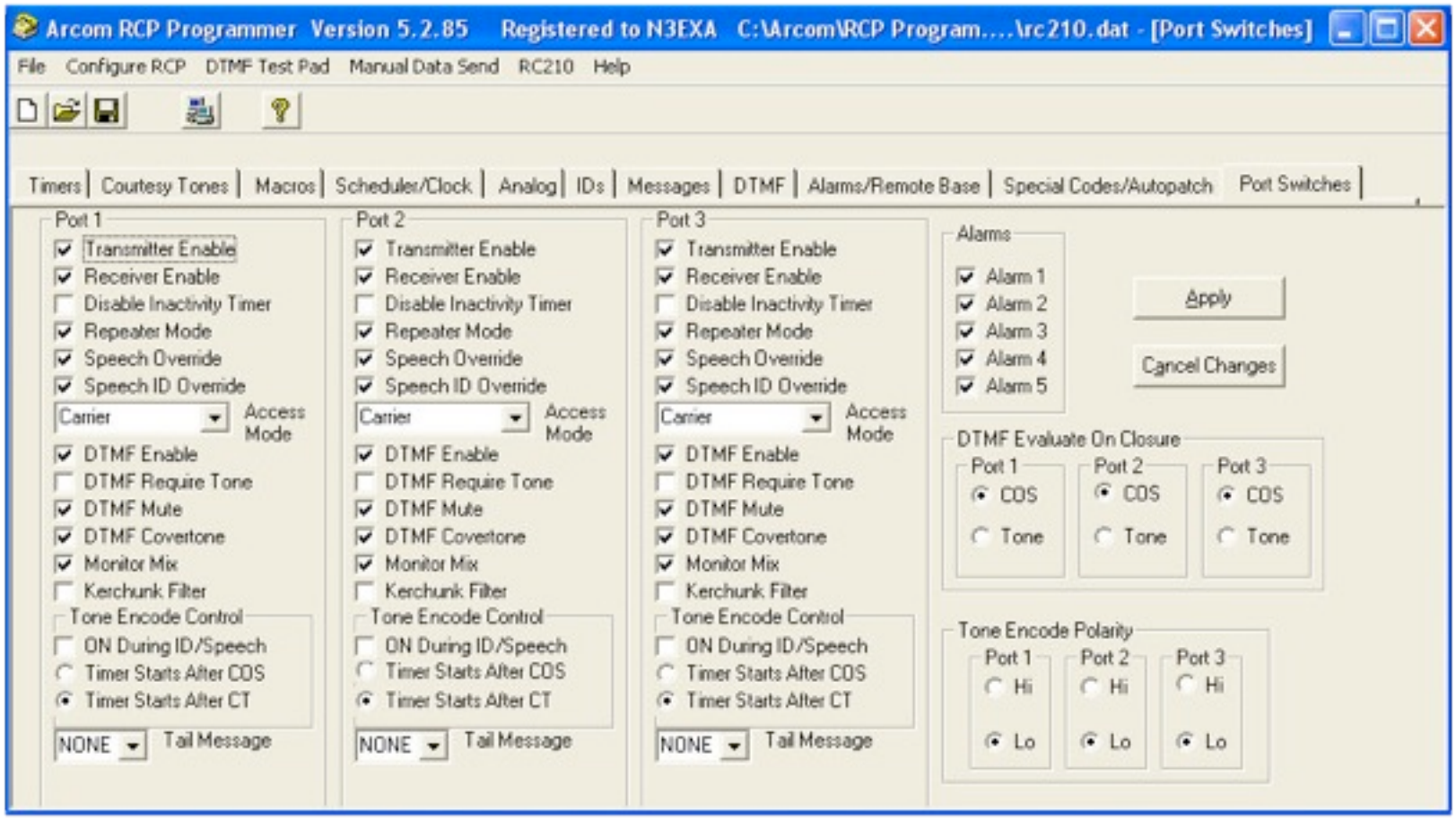
Connection Panel

Controller The "Brains" of the repeater

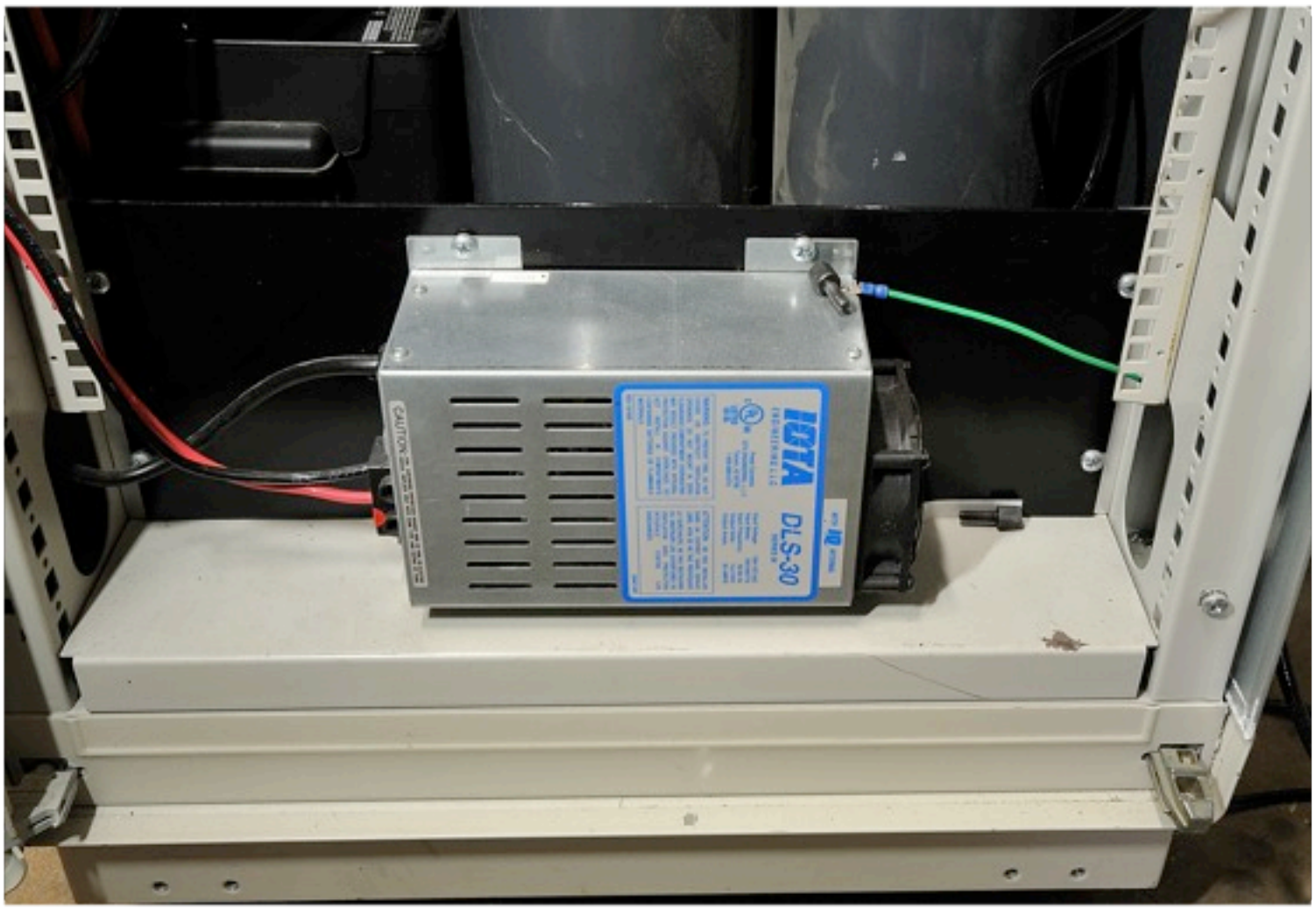
- Identifies the repeater (CW or Voice)
- Provides courtesy (go ahead) tones
- Provides timers for transmit & receive
- Provides linking capability to other radios & repeaters



Arcom Controller Software



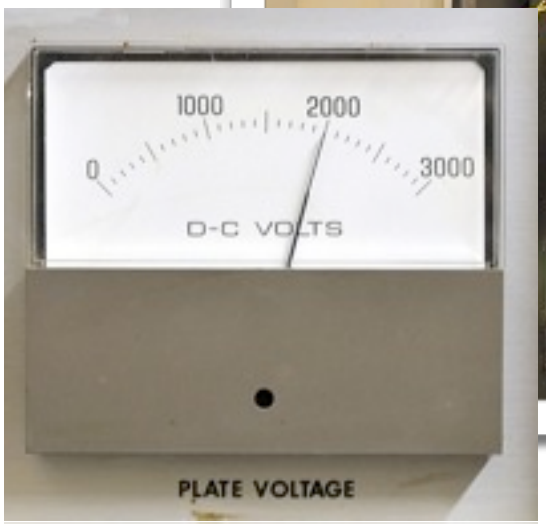
IOTA DLS-30
30 Amp Power Supply/Charger/Gell Cell



Transmitter

GE Master II

High Power Base station
Running 225 watts output



Transmitter Components

Power Amp
Single Ceramic
4CX250B Tube

Local Receiver
not used at this time

Power Supply

Transmitter Components

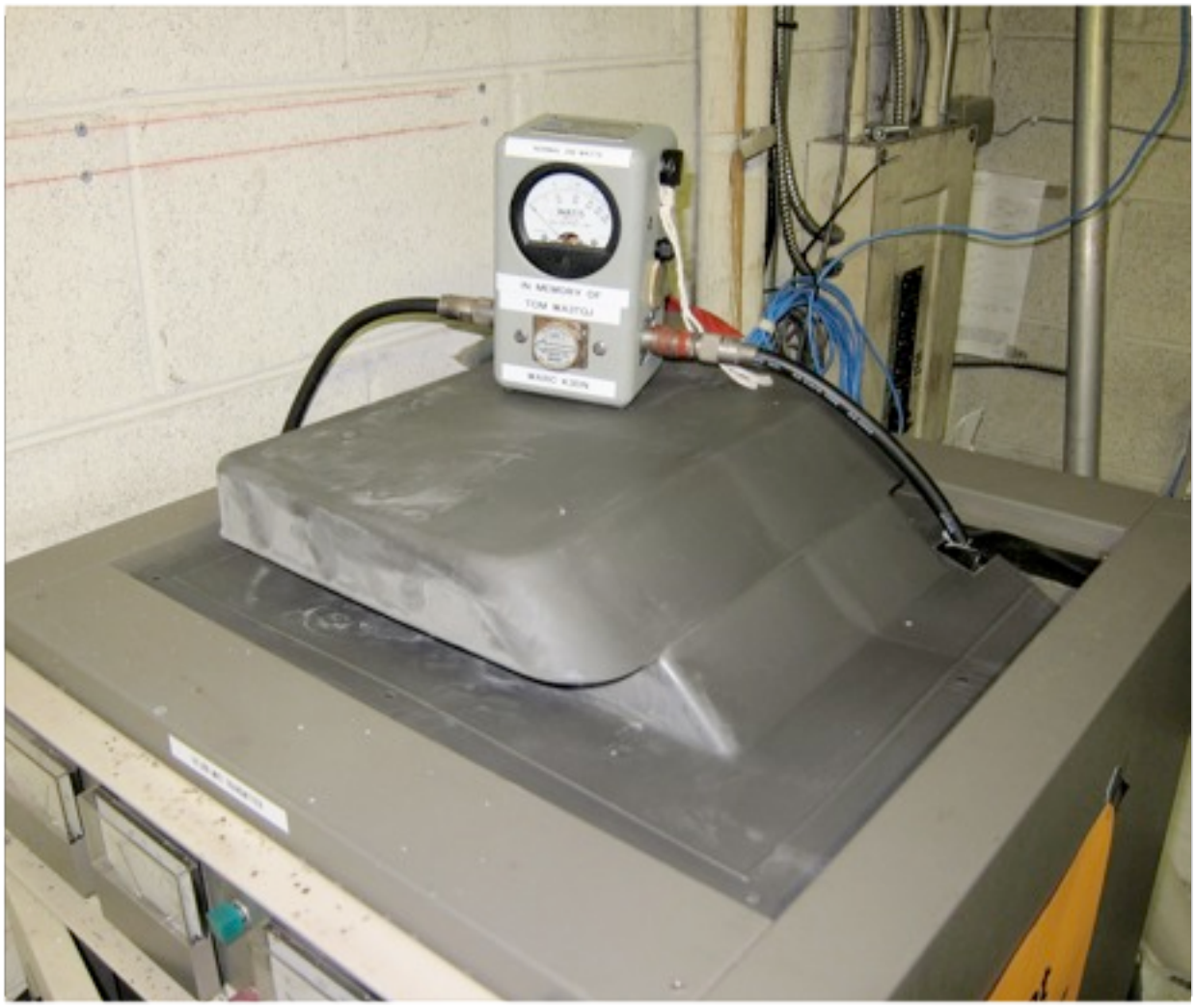
Power Amp
Single Ceramic
4CX250B Tube

Local Receiver
not used at this time

Power Supply

Added large fan for additional cooling which only runs when the transmitter is keyed

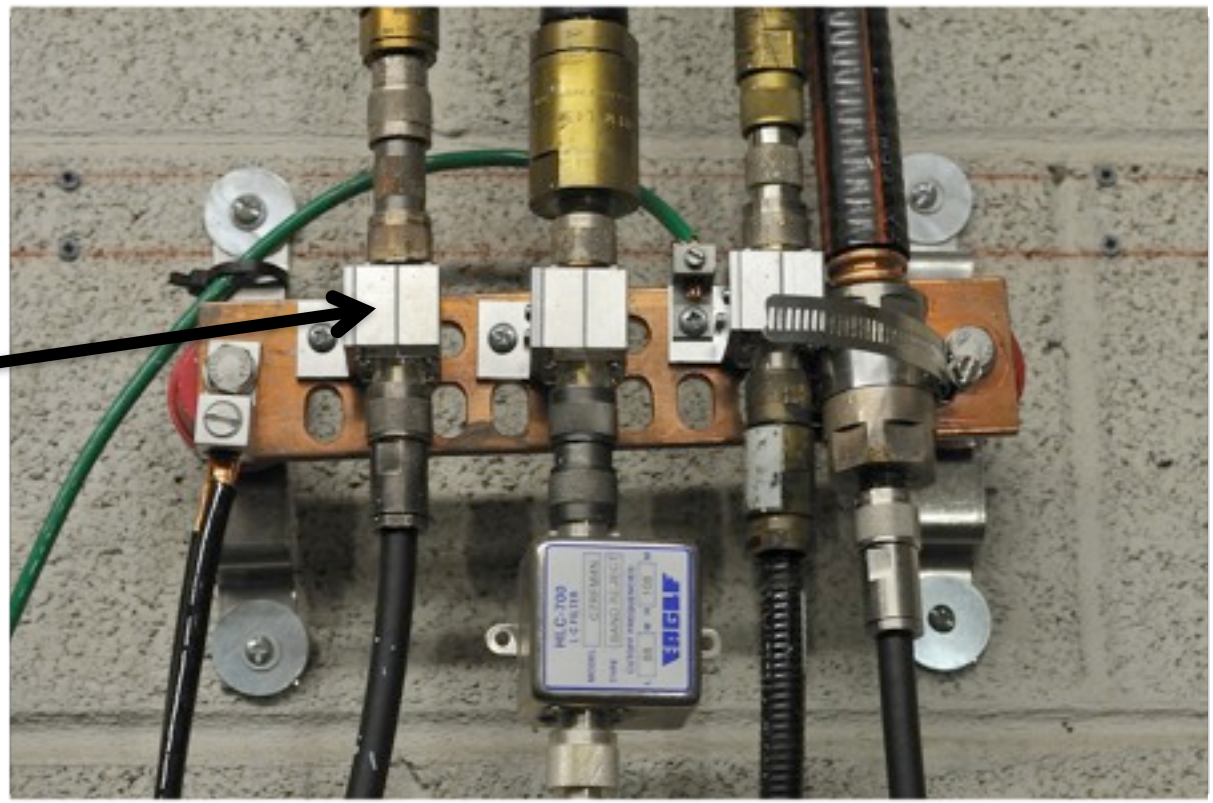
Added protective cover for fan
(Home Depot Roof Vent)



Feed Line

Most repeaters do NOT use standard coaxial cable. Standard coax has too much loss! Repeaters use “hard line” which is much more efficient and more durable than standard coax

Polyphaser Lightning Protection

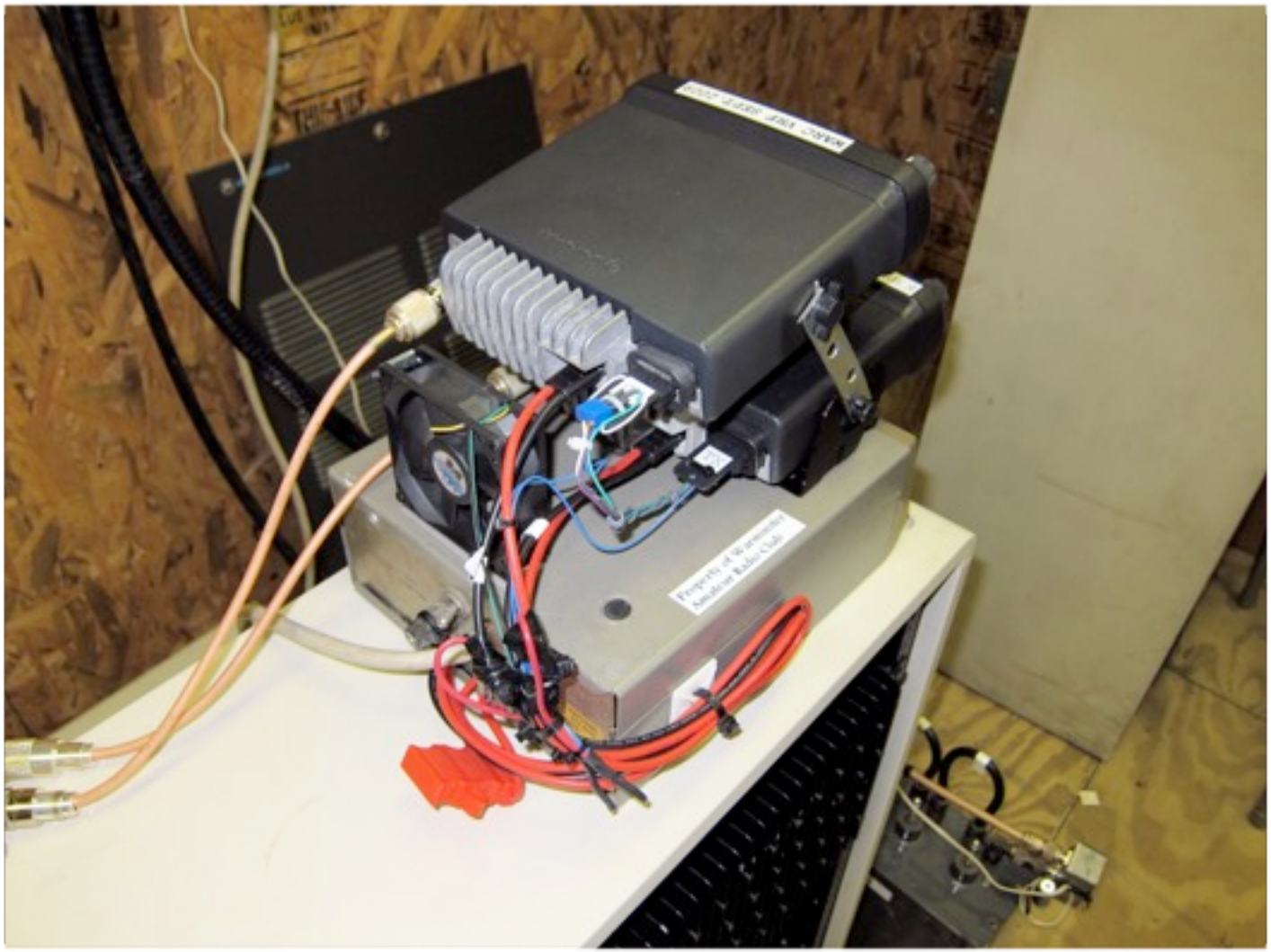


REMOTE INPUTS

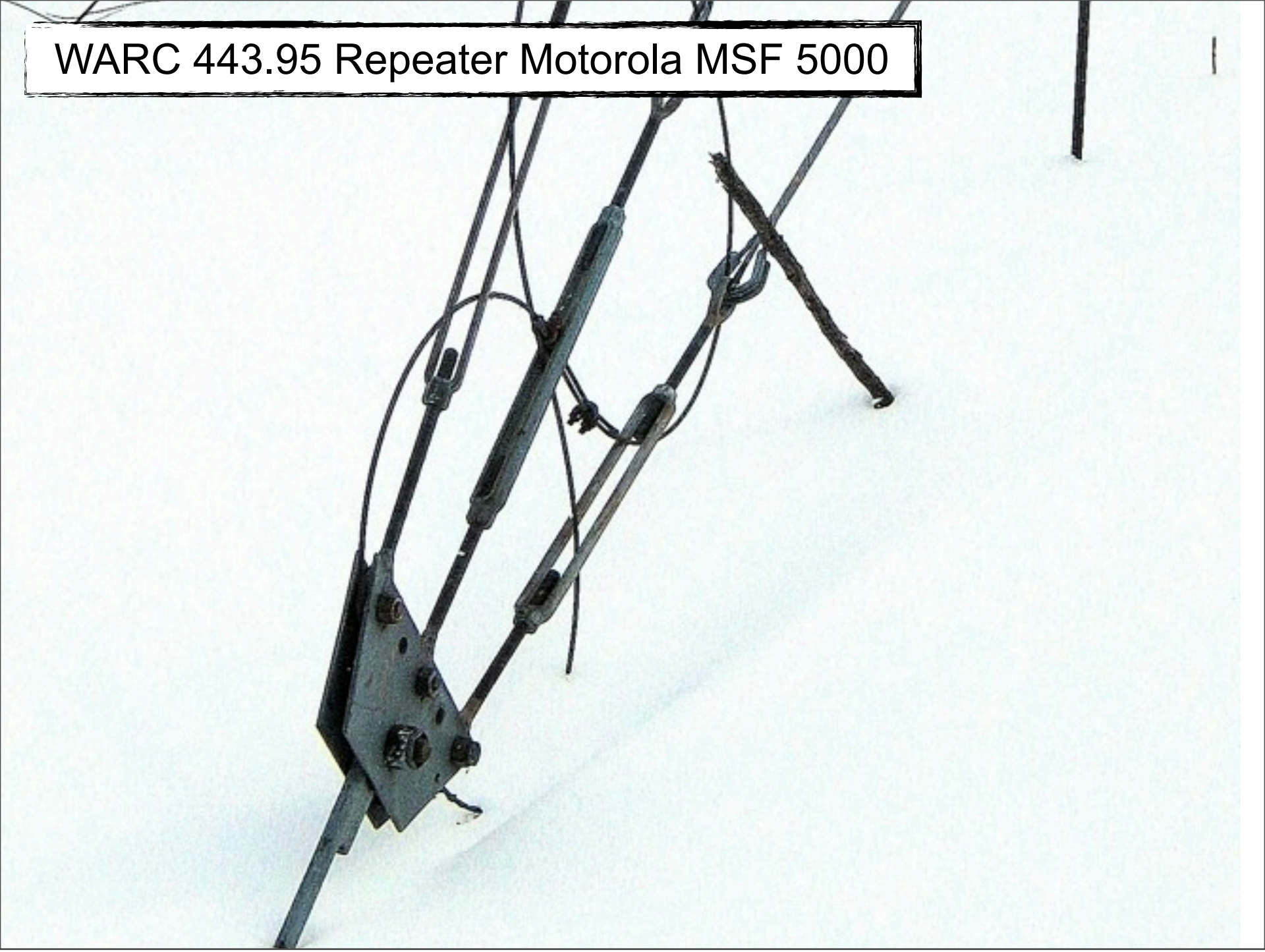
Hilltown Remote Link Package

Consists of a Motorola CDM 750 on 147.690 for receive and a CDM 750 on 440 link frequency to transmit back to the repeater site

Hilltown Remote Link Package

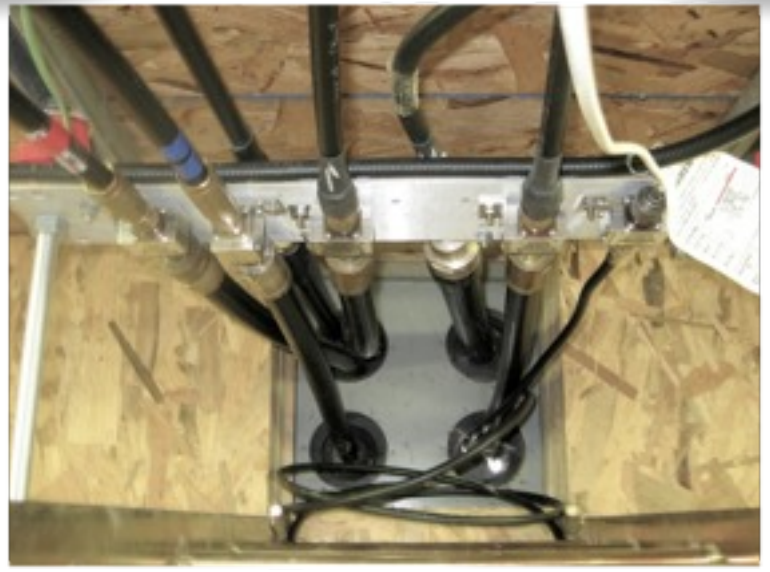


WARC 443.95 Repeater Motorola MSF 5000

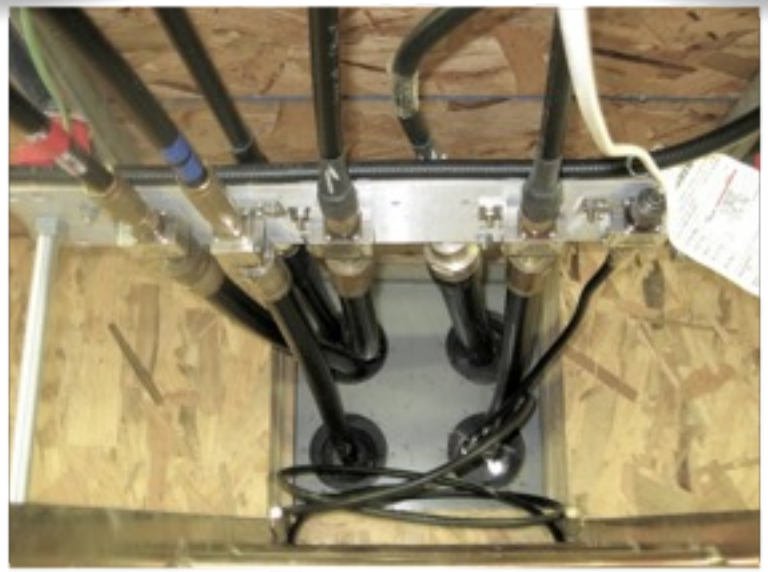


WARC 443.95 Repeater Motorola MSF 5000

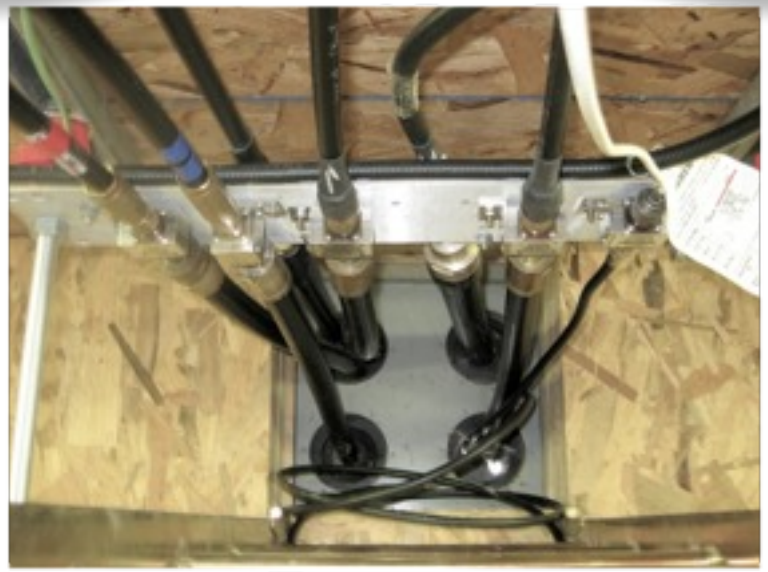
WARC 443.95 Repeater Motorola MSF 5000



WARC 443.95 Repeater Motorola MSF 5000



WARC 443.95 Repeater Motorola MSF 5000



Abington Hospital Link Location

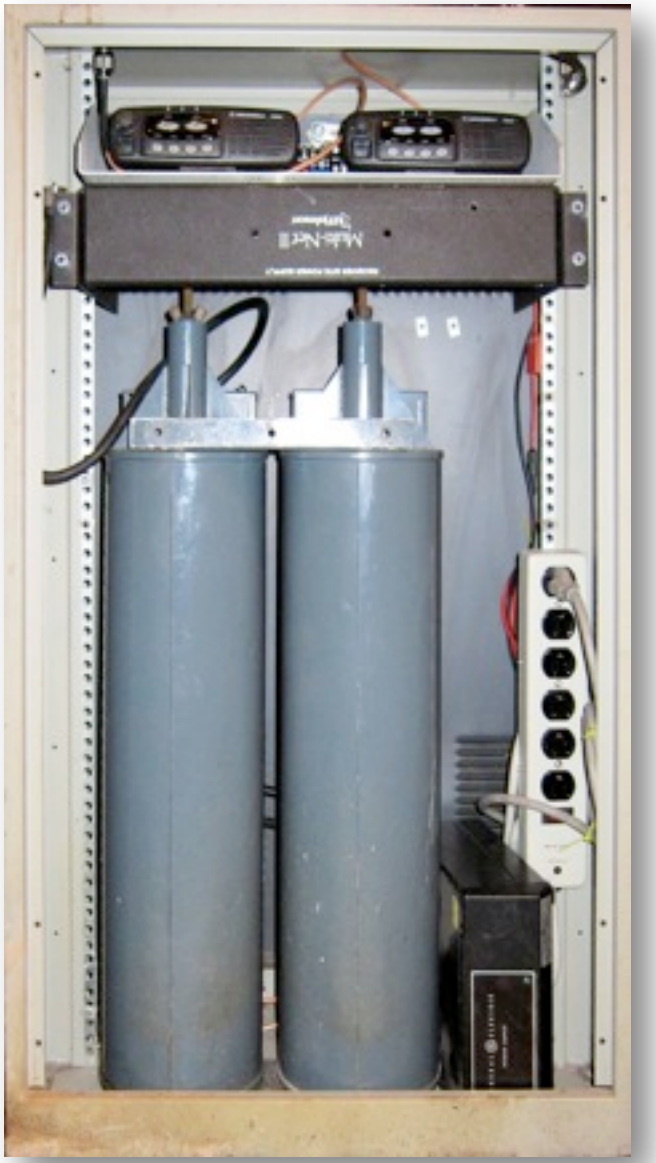
Abington Hospital Link Hardware

Showing 1960s era GE
Hybrid Radio Before Update

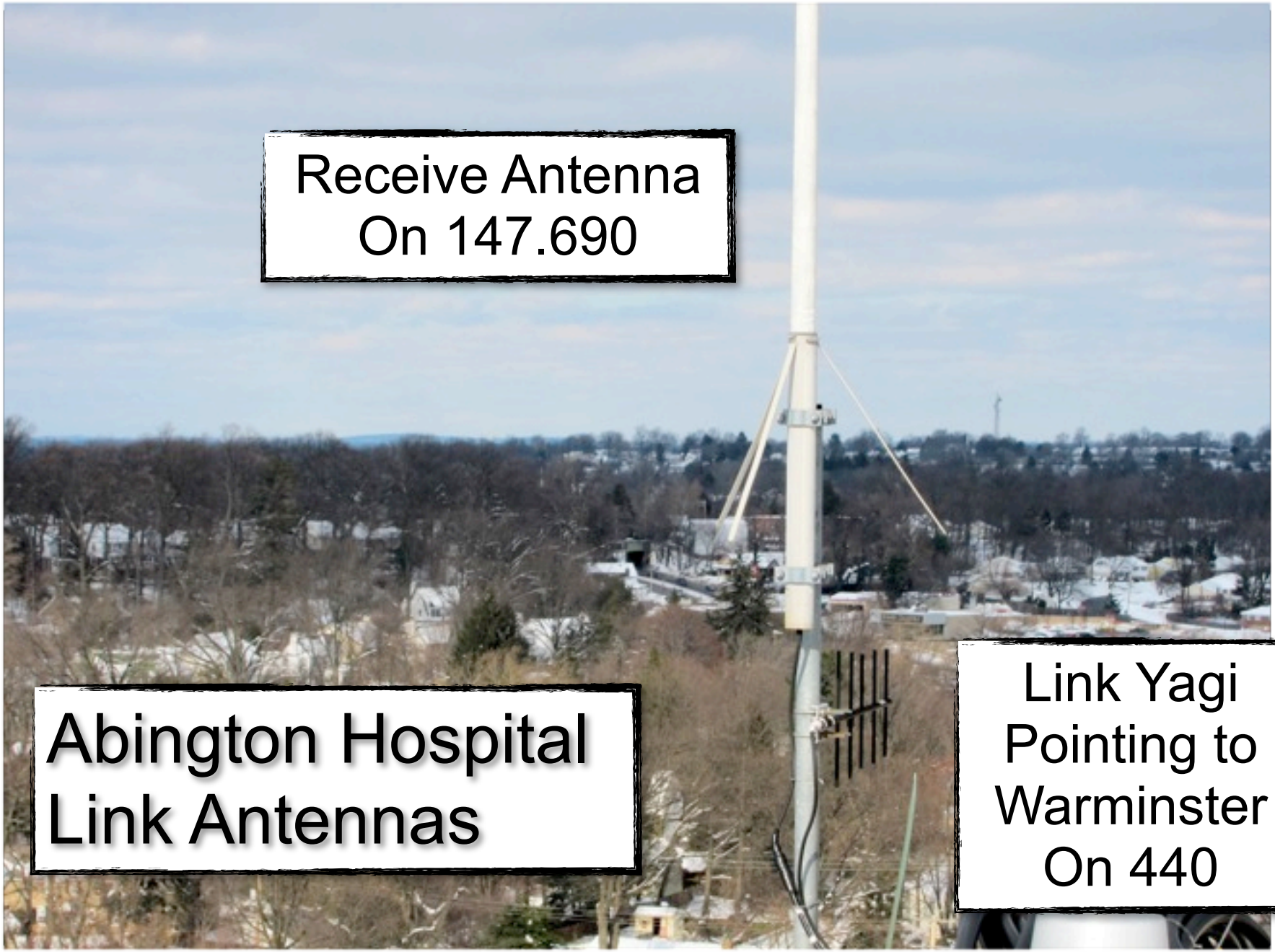
Abington Hospital Link Hardware

Showing 1960s era GE
Hybrid Radio Before Update

Showing 2 Motorola CDM
750s After Update

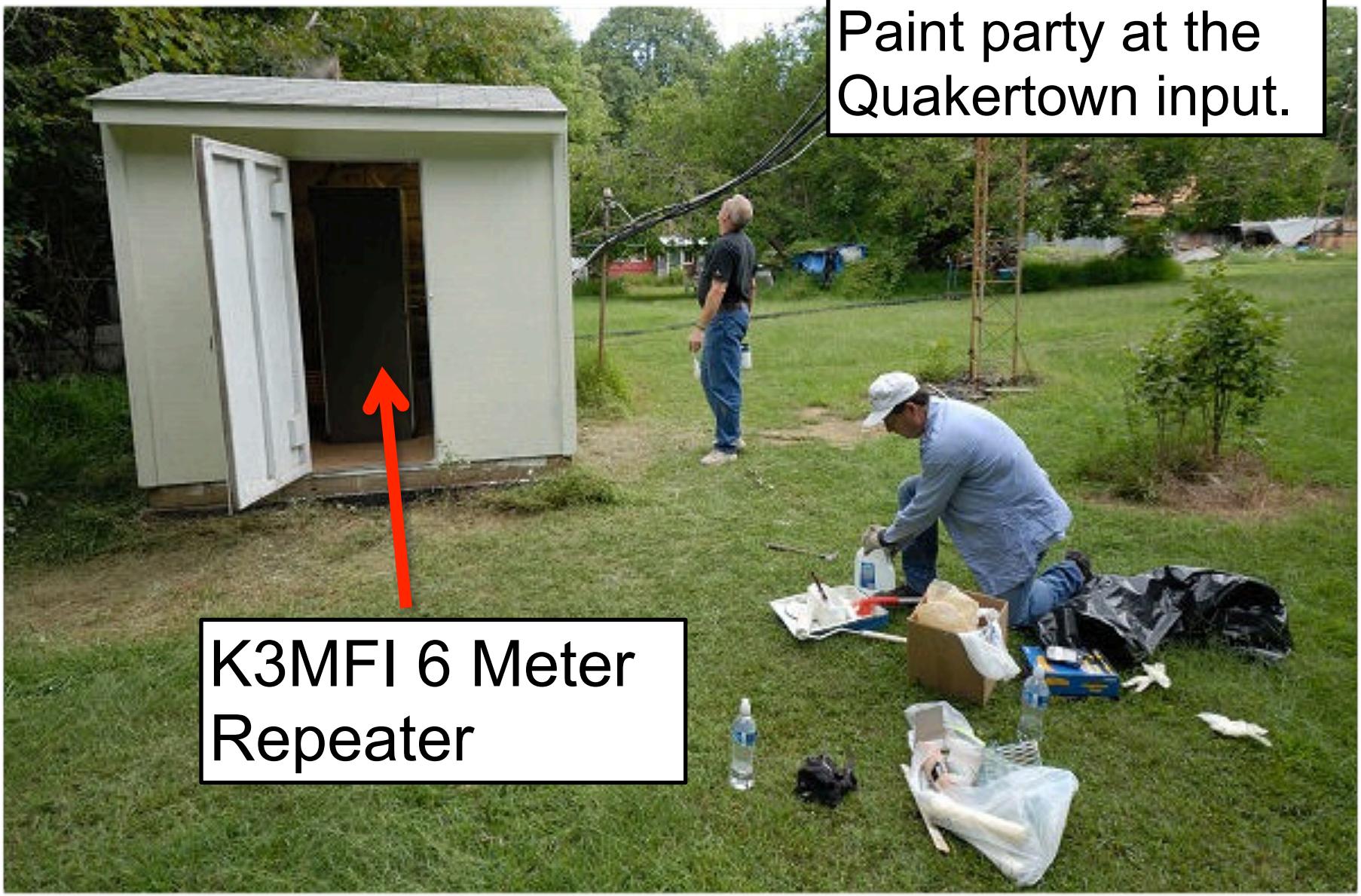


Philadelphia Skyline from Roof of Abington


Receive Antenna
On 147.690
Abington Hospital
Link Antennas
Link Yagi
Pointing to
Warminster
On 440


N3EXA
Skunk Works

COM3010 - Communications Service Monitor


Paint party at the Quakertown input.
K3MFI 6 Meter Repeater

Antennas for
Quakertown Input,
K3MFI 6m Repeater,
WI3Z APRS digipeater

Rohn 45
140 foot height

REPEATER COORDINATION

What is repeater coordination?

The Area Repeater Coordination Council of EPA/SNJ, Inc. ("ARCC, Inc.") performs the following functions:

1. Coordinate non-commercial amateur radio repeater users involved in channelized operation in the Eastern Pennsylvania and Southern & Northwestern New Jersey.

2. Collect, store and disseminate appropriate technical knowledge.

3. Promote amateur radio operation as a public service.

Welcome to ARCC

Area Repeater Coordination Council
Eastern Pennsylvania and Southern New Jersey

Who We Are

General Information

ARCC Mailing Address ARCC P.O. Box 244 Plumsteadville, PA 18949		
The ARCC PA / SNJ Coordinated Repeater Database January 15, 2010 Listed by Location	Listed by Frequency	File Downloads
New Coordination Activity Recent ARCC Coordination Actions - January 10, 2010 Pending ARCC Coordination Actions - January 14, 2010 ARCC 2 Meter Repeater Coordination Waiting List - January 10, 2010		
Contact Information		
ARCC Newsletter	ARCC Constitution & Bylaws	ARCC History
ARCC Membership Application Form		
ARCC Questionnaire - Tell us what you think!		
Check out the ARCC WebLog page		

Area Repeater Info Available online

Bucks					
. . Almont	53.2300	–	K3MFI	W Rockhill 6	o (t=4B=146.2) R A
. . Bensalem	444.2000	+	W3BXW	BEARS	o (t=3B=131.8) L RB WX (ca) R A O
. . Chalfont	223.9000	–	W3DBZ		o (t=1B=107.2) e
. . Doylestown	145.3500	–	WA3EPA	RACES/WRC	o (t=3B=131.8) WX (ca) e R
. . Fairless Hills	147.3000	+	W3BXW	BEARS	o (t=3B=131.8) L RB WX e R A O
. . Fairless Hills	447.1250	–	WA3BXW	BEARS	o (t=DPL) L RB WX (ca) R A O
. . Fairless Hills	53.0300	–	W3BXW	BEARS	o (t=3B=131.8) RB WX (ca) R A O
. . Feasterville	146.9700	–	K3ZFD	PARA Group	o L
. . Feasterville	223.8000	–	N3SP		o (t=3B=131.8)
. . Feasterville	224.9800	–	WB3BLG	PARA Group	o
. . Feasterville	443.3000	+	K3ZFD		o (t=3B=131.8) L
. . Hilltown	145.3300	–	K3ESJ	HiPointRA	o (t=3B=131.8) (ca) e
. . Hilltown	147.3900	+	K3ESJ	CBRA	o (t=1Z=100.0) (ca) e
. . Hilltown	224.5800	–	W3CCX	Packrats	o t e
. . Morrisville	447.4750	–	WR3B	NERA	o (t=1A=103.5) L e
. . Perkasie	145.3100	–	W3AI	RF HILL	o (t=3B=131.8) (ca) e
. . Plumstead	449.7250	–	N3EXA	UpperBucksRC	o (t=4Z=136.5) e R A
. . Plumsteadville	447.9750	–	KB3AJF		o (t=3B=131.8) (ca) e
. . Quakertown	146.8800	–	WA3IPP	PARA/LVARK	o (t=3B=131.8)
. . Quakertown	224.4000	–	W3PS	METRO-COMM	o (t=5A=156.7) L WX (ca) e LiTZ
. . Quakertown	443.2000	+	WA3KEY	BLURA	o (t=2A=114.8) (ca) e
. . Quakertown	444.7500	+	N3BKN		o t RB (ca) e R O
. . Richboro	146.7900	–	N3TS	LBRA	o (t=3B=131.8) e
. . Southampton	145.2500	–	W3SK	PWA	o (t=3B=131.8) (ca) R A
. . Southampton	448.2250	–	W3SK	PWA	o (t=3B=131.8) R A
. . Springtown	442.9500	+	W3BXW	BEARS	o (t=3B=131.8) L RB WX (ca) e R A O
. . Warminster	147.0900	+	K3DN	WARC	o (t=3B=131.8) L (ca) e R A
. . Warminster	223.7600	–	K3NAL	NAWC ARC	o (t=7Z=186.2) L a e
. . Warminster	443.9500	+	K3DN	WARC	o (t=3B=131.8) (ca) e R A
. . Warminster	53.3700	–	K3MFI	WarmSix	o (t=3B=131.8) (ca)
. . Warrington	147.0000	+	WA3ZID		o e

Area Repeater Info Available online

Bucks					
. . Almont	53.2300	–	K3MFI	W Rockhill 6	o (t=4B=146.2) R A
. . Bensalem	444.2000	+	W3BXW	BEARS	o (t=3B=131.8) L RB WX (ca) R A O
. . Chalfont	223.9000	–	W3DBZ		o (t=1B=107.2) e
. . Doylestown	145.3500	–	WA3EPA	RACES/WRC	o (t=3B=131.8) WX (ca) e R
. . Fairless Hills	147.3000	+	W3BXW	BEARS	o (t=3B=131.8) L RB WX e R A O
. . Fairless Hills	447.1250	–	WA3BXW	BEARS	o (t=DPL) L RB WX (ca) R A O
. . Fairless Hills	53.0300	–	W3BXW	BEARS	o (t=3B=131.8) RB WX (ca) R A O
. . Feast					
. . Feast					
. . Feast					
. . Feast					
. . Hillto					
. . Hillto					
. . Hillto					
. . Morrisville	447.4750	–	WR3B	NERA	o (t=1A=103.5) L e
. . Perkasie	145.3100	–	W3AI	RF HILL	o (t=3B=131.8) (ca) e
. . Plumstead	449.7250	–	N3EXA	UpperBucksRC	o (t=4Z=136.5) e R A
. . Plumsteadville	447.9750	–	KB3AJF		o (t=3B=131.8) (ca) e
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. . Richboro	146.7900	–	N3TS	LBRA	o (t=3B=131.8) e
. . Southampton	145.2500	–	W3SK	PWA	o (t=3B=131.8) (ca) R A
. . Southampton	448.2250	–	W3SK	PWA	o (t=3B=131.8) R A
. . Springtown	442.9500	+	W3BXW	BEARS	o (t=3B=131.8) L RB WX (ca) e R A O
. . Warminster	147.0900	+	K3DN	WARC	o (t=3B=131.8) L (ca) e R A
. . Warminster	223.7600	–	K3NAL	NAWC ARC	o (t=7Z=186.2) L a e
. . Warminster	443.9500	+	K3DN	WARC	o (t=3B=131.8) (ca) e R A
. . Warminster	53.3700	–	K3MFI	WarmSix	o (t=3B=131.8) (ca)
. . Warrington	147.0000	+	WA3ZID		o e

www.arcc-inc.org

Area Repeater Coordination Council of EPA/SNJ, Inc.

Certificate of Coordination

K3DN Repeater

This certificate serves as proof that the following repeater has met the qualifications for frequency coordination as set forth by ARCC, Incorporated. This coordination has been approved based on the exact parameters detailed herein. These parameters may not be altered unless an application to modify this coordination has been submitted and approved prior to any such changes being implemented. Any alterations to this operation for which such a coordination modification has not been previously approved will result in termination of this coordination. The coordinated system parameters are as follows:

Transmitter Callsign:	**K3DN**	Ground Elevation:	**330' AMSL**
Output Frequency:	**147.0900 MHz**	Center of Radiation:	**430' AMSL / 50' HAAT**
Input Frequency:	**147.6900 MHz**	Transmitter Power:	**225W TPO / 590W EIRP**
Transmitter City:	**Warminster**	Antenna Pattern:	**Omnidirectional**
Transmitter County:	**Bucks**	Antenna Parameters:	**Gain=7.39dBi**
Transmitter State:	**Pennsylvania**	Antenna Polarization:	**Vertical**
Transmitter Latitude:	**N 40° 12' 18"**	Receiver Access Mode:	**Tone Squelch 3B**
Transmitter Longitude:	**W 75° 6' 26"**	Special Conditions:	

This coordination is issued to Warminster Amateur Radio Club (K3DN) and is effective as of May 29, 2006. This coordination is valid for the life of the operation provided it remains in compliance with current ARCC policies, procedures, Constitution, and By-Laws. No other party shall have rights or claims to this coordination. This coordination may not be bought, sold, or transferred, and any such attempted action will result in termination of this coordination.

Area Repeater Coordination Council of EPA/SNJ, Inc.

Certificate of Coordination

K3DN Repeater

This certifies that the following system has met the qualifications for frequency coordination set forth by ARCC, Incorporated. This coordination is issued based on the following system parameters:

Transmitter Callsign:	**K3DN**	Effective Isotropic Radiated Power:	**334 watts**
Output Frequency:	**443.95 MHz**	Elevation Above Sea Level:	**810 feet**
Input Frequency:	**448.95 MHz**	Height Above Average Terrain:	**400 feet**
Transmitter City:	**Perkasie**	Transmitter Antenna Pattern:	**Omnidirectional**
Transmitter County:	**Bucks**	Transmitter Antenna Polarization:	**Vertical**
Transmitter State:	**Pennsylvania**	Transmitter Site Latitude:	**40°** [redacted] **north**
Access Mode:	**PL 3B**	Transmitter Site Longitude:	**75°** [redacted] **west**

This coordination is issued to Warminster Amateur Radio Club (K3DN) and is effective as of the 1st day of October, 1998. This coordination is valid for the life of the operation provided it remains in compliance with current ARCC policies as detailed in the ARCC Constitution and By-Laws as published in the ARCC Coordination Handbook. Proposed changes to any of the above parameters must be submitted to, and approved by, ARCC prior to the change for review and approval in order to maintain coordination. Coordinations may not be bought, sold, or transferred.

Area Repeater Coordination Council of EPA/SNJ, Inc.

Certificate of Coordination

K3DN Auxiliary Link

This certificate serves as proof that the following auxiliary link has met the qualifications for frequency coordination as set forth by ARCC, Incorporated. This coordination has been approved based on the exact parameters detailed herein. These parameters may not be altered unless an application to modify this coordination has been submitted and approved prior to any such changes being implemented. Any alterations to this operation for which such a coordination modification has not been previously approved will result in termination of this coordination. The coordinated system parameters are as follows:

Transmitter Callsign:	**K3DN**	Ground Elevation:	**20' AMSL**
Output Frequency:	[redacted]	Center of Radiation:	**190' AMSL / 128' HAAT**
Input Frequency:	**147.6900 MHz**	Transmitter Power:	**5W TPO / 63W EIRP**
Transmitter City:	**Bristol**	Antenna Pattern:	**Cardiod/Unidirectional**
Transmitter County:	**Bucks**	Antenna Parameters:	**Gain=12.14dBi Az=245 BW=55 F/B=20 dB**
Transmitter State:	**Pennsylvania**	Antenna Polarization:	**Vertical**
Transmitter Latitude:	**N 40° 5' 54"**	Receiver Access Mode:	**Tone Squelch 3B**
Transmitter Longitude:	**W 74° 51' 27"**	Special Conditions:	

This coordination is issued to Warminster ARC (K3DN) and is effective as of June 26, 2005. This coordination is valid for the life of the operation provided it remains in compliance with current ARCC policies, procedures, Constitution, and By-Laws. No other party shall have rights or claims to this coordination. This coordination may not be bought, sold, or transferred, and any such attempted action will result in termination of this coordination.

Repeater Etiquette

•Leave a small time gap before transmitting (or replying) – Use the repeater's courtesy beeps!

•If more than two operators are on the repeater, indicate which operator is to continue the conversation

•Keep PTT time short – The repeater has timers that will disable the repeater if PTT time is too long (typically 2 minutes)

•Identify yourself using your FULL call sign at the beginning and end of your time on the repeater and every 10 minutes.

Future Upgrades and Wish List

1. Total remote control of controller
2. Echo Link
3. Additional remote sites
4. Terrain mapping of entire system
5. Bridge backup emergency power for transmitter
6. Remote voter data readout

CREDITS

Without the help from the following people and organizations, this project wouldn't have been possible

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