PRESENTATION ON BICYCLE RIGGING FOR HAM RADIO AND USING APRS WHILE BICYCLING By Don Cage: for LARC: 5/21/2025

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INTRODUCTION AND HISTORY

INITIAL GOALS:

- 1. To be able to use my Ham radio during bicycle rides.
- 2. To experiment with using APRS to track my position during rides.

INITIAL SUCCESS: - ALMOST NONE.

- 1. Very poor transmission and reception unless I stopped riding and held the radio as normal.
- 2. Belt Clip mounting was the worst. (Elmer Advice antenna too close to body attenuates signal)
- 3. Clipping the radio to the bicycle (brake cables, handlebars, seat, etc.) was not much better.
- 4. Changing to a better antenna (18" DIAMOND SRH77CA) was slightly better.

MAJOR IMPROVEMENTS after YOUTUBE-UNIVERSITY:

- 1. Radio mounted to handle-bars via cell phone mount.
- 2. Separate speaker/microphone with clip mounting.
- 3. High gain antenna (24" Commet SS680SB) with proper mounting behind and above rider.
- 4. Proper APRS settings.

FINAL SUCCESS:

- 1. Very good transmission and reception. 90%+ reception rate on APRS packets.
- 2. Able to connect with Skyhub-Link repeaters above Horsetooth Res. (23 miles) and Buckhorn Mtn. (30 Miles)
- 3. Better connections with analog repeaters beyond 20 miles.

RADIO MOUNTING WITH MICROPHONE AND SPEAKER



ANTENNA MOUNTING WITH COAX WIRING





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superstore_dan (33236)

99.6% positive - Seller's other items - Contact seller

SMA Male Right Angle to SMA Male Angle Coaxial Connector Lot RG316 Coax RF Cable

More than 10 available - 1 sold

Buy It Now

Add to cart

S

US \$9.14

Quantity:

>

Condition: New 🛈

Length: 16feet-5meter



ANTENNA MOUNTING WITH COAX WIRING



Final Rig for Biking

Adapter: Seat Post to U-channel









ANTENNA MOUNTING: Hydro-Dynamic Vibration Damper

Hydro-Dynamic Vibration Damper







ANTENNA MOUNTING SUGGESTIONS 1:





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ANTENNA MOUNTING SUGGESTIONS 2:



PHONE & ANTENNA MOUNTING SUGGESTIONS 3:

See Cell Phone Holder For Bicycle



360 Universal Phone Moun... \$10.49 Walmart ★★★★☆ 5



GRAND PITSTOP Bik... \$19.99 Amazon.com ★★★★☆ 1K+



Whale Fall Hard Casing... \$23.99 Amazon.com ★★★★☆ 1K+



Bikase Elastokase -... \$34.99 Amazon.com **** 14



Bike Phone

Walmart

*****1



Silicone Mount, Easy... **Bicycle Phon...** \$6.64 \$8.10 \$11.99 LightInTheBox **Universal Bike** Phone... \$9.84 Walmart



Giant Bicycle Rear Rack bicyklez



MTB Bicycle Rear Rack Seat Post Mount Pannier ... Schwinn Deluxe Alloy Rear Bike Rack -Walmart.com

Bicycle Touring Carrier Universal Adjustable Bike ...



Bicycle Cargo Rack Lugg...



Mua Rear Bike Rack,310 LB Capacity Solid Bearings Bi... Final Result with Electromagnetic radiation pattern shown in yellow (and red).

QUESTION: Is this a Dipole Antenna?



BASIC APRS:

- WHAT IS APRS: APRS stands for the <u>Automatic Packet (position) Reporting System</u>. APRS was pioneered by <u>Bob</u> <u>Bruninga</u>, WB4APR, a U.S. Navy officer and member of the U.S. Naval Academy, who initially developed the system on an Apple II platform in 2002. He originally created APRS to track ships using the AX.25 protocol, which eventually became popular in the ham radio community. Bob's work laid the foundation for APRS, which remains a prominent protocol in amateur radio.
- 2. Packets in APRS can contain any information for example:
 - 1. GPS coordinates.
 - 2. Speed and direction
 - 3. Time
 - 4. Altitude
 - 5. Temperature
 - 6. Barometric pressure
 - 7. Text Messages, and many more
- 3. Packets are transmitted to Digipeaters along a "path" where the packet can be re-repeated <u>a finite number of times in</u> order to expand the area of coverage (but not infinitely). Digipeaters recognize the "repeat-count" in the path, and decrement that value by one, then repeats the packet. Normally this occurs 2-3 times and avoids infinite repeating.
- 4. Packets can also be received by "I-gates" which transfers the packet information to the internet where the information can be mapped or tracked on websites for example on http://aprs.fi

BASIC APRS USAGE:

TRACKING YOUR ROUTE:

Go to https://aprs.fi website, Log in, enter your APRS callsign (W0DPC-7) and search time. Any received packets will appear on the map along with packet data. Hovering over a data point will draw a line to the receiver station.



BASIC APRS USAGE:

TRACKING YOUR ROUTE on https://aprs.fi :

- 1. Your route will appear as a blue line with red dots where the APRS packets were received and mapped.
- 2. Raw data can be downloaded in different file formats.
- 3. Programs are available to interpret the raw data for mapping etc.



Route Map

Raw Data native format



Raw Data text format

2024-05-03 09:59:34 MDT: W0DPC-7>EABSTR,WIDE1-1,WIDE2-1,qAR,W0UPS-15:`q*1q%b/`"E\$}_0 type: location format: mice srccallsign: W0DPC-7 dstcallsign: EABSTR latitude: 40.2236666666667 longitude: -105.069 ° course: 109 9 speed: 14.816 km/h altitude: 1560 m symboltable: , symbolcode: b mbits: 222 posresolution: 18.52 m posambiguity: 0 comment: `_0 2024-05-03 10:00:04 MDT: W0DPC-7>EABSSX,WIDE1-1,WIDE2-1,qAR,W0UPS-15:`q\#1{;b/`"D{}_0 type: location format: mice srccallsign: W0DPC-7 dstcallsign: EABSSX latitude: 40.223 ° longitude: -105.06783333333 ' course: 131 ° speed: 16.668 km/h altitude: 1556 m symboltable: / symbolcode: b mbits: 222 posresolution: 18.52 m posambiguity: 0 comment: ` 0

BASIC APRS SETTINGS: https://tinyurl.com/BikingWithAPRS

- 1. Setting your Call-sign SSID: This describes what kind of entity you are. i.e. car, bike, radio, weather station, etc.
 - 1. Mine is W0DPC 7: The -7 is for a hand-held (bicycle), -9 for car/truck, (there 13 others)

the SSID (Secondary Station Identifier) of which there are 16 types, including one with no SSID. Generally, the SSIDs shown in the table below are used in APRS.

SSID	Description	SSID	Description
NIL	Fixed stations that can exchange mes- sages	-8	Marine mobile stations, land mobile sta- tions
-1	1200 bps narrow-to-middle band digipe- ater	-9	Using the FTM-400XD etc. for mobile applications
-2	9600 bps digipeater	-10	I-Gate station, Internet connection station
-3	1200 bps broadband digipeater	-11	Balloons, aircraft, spacecraft, etc.
-4	Digipeater, mobile station, meteorological station, etc.	-12	1-way tracker station (messages cannot be exchanged)
-5	Operation station using mobile devices (smartphones etc.)	-13	Meteorological station (weather station)
-6	Operation station for satellite communica- tions, events, etc.	-14	Tracking mobile stations
-7	Use of FT3D etc. in handy terminals	-15	Digipeater, mobile station, meteorological station, etc.

APRS SETTINGS cont.

2. Setting your GPS signal:

- 1. Turn On
- 2. Set Time and Resolution "Ambiguity".
- 3. Set your position (current GPS coords, or some other stationary location)
- 3. Setting APRS Baud Rate (Off, 1200, 9600: 1200 is normal) This enables the APRS function
- 4. Setting the Symbol for your station (car, truck, pedestrian, etc. 48 to choose from) Symbol appears on the APRS.FI map.



APRS SETTINGS cont.

- 5. Setting the transmission frequency (Band-B 144.390 MHz) North America only. Simplex
- 6. Setting APRS Beacon transmission rates and methods: Manual, Automatic, Smart-Beaconing.
 - 1. Manual = 1 shot transmission.
 - 2. Automatic = Transmission every 30 seconds to 60 minutes. (Mine set to every 30 seconds for biking)
 - 3. Smart Beaconing = Transmission rate based on your speed (High, Med, Low).
 - 1. Smart Beaconing has many options and variables within the High, Med, Low categories.
 - 2. High is for highway speeds
 - 3. Medium is for city car speeds
 - 4. Low is for bike and pedestrian speeds
 - 5. Stopping and cornering are also used as transmission points
- 7. Setting the Text Transmission Delay time (0-1 sec) Important for repeater connections. This is not always noted as an important setting. Longer is better, at least 500ms seems to work well.
- 8. Setting the digipeater route or "Path". This is a complicated setting controlling how many times the packet will be repeated, and to which specific repeaters. See link on last page.
- 9. Further Settings: There are MANY more settings available. My radio has 28 settings under the APRS menu. Those described above should get you going with basic/default settings.

OTHER APRS FUNCTIONALITY: Receiving Beacons

Receiving beacons

• Displaying beacons in the APRS pop-up screen

A "ping pong" audio alarm will sound when a beacon is received on the Band B frequency, and the APRS pop-up screen will be displayed.

The contents displayed in the "APRS POP-UP SCREEN" and the "APRS STATION LIST DETAIL SCREEN" to be explained next are basically the same.



- Displaying beacons in the APRS STATION LIST detail screen
- 1 Touch [F MW] \rightarrow [S.LIST].

The APRS STATION LIST screen will be displayed.

- 2 Rotate the DIAL knob, to select the beacon whose details you want to review.
- **3** Press the **[DISP]** key to display the details screen. Turn the DIAL to scroll the screen.
- 4 Press the [BACK] key.

Returns the screen to the APRS STATION LIST screen.

STATION	LIST ⊙
JQ1YBG- 9	15:36
JA6YPC- 7	12:34
JH1YPC-13	04:56
JQ1YBF -9	12/27
JQ1YBG-14	11/18
REPLY	
	STATION JQ1YBG- 9 JA6YPC- 7 JH1YPC-13 JQ1YBF -9 JQ1YBG-14 REPLY

OTHER APRS FUNCTIONALITY: Weather Stations

Explanation of the detail screen display in a W or w (weather report: meteorological station) APRS STATION LIST and description of operations

Turn the DIAL in the APRS STATION LIST screen to select the "**W**" (Weather report) or "**w**" (Weather report Compressed type) station and press the **[DISP]** key to display the W or w (Weather report) detailed screen. Turn the DIAL to scroll the screen.



OTHER APRS FUNCTIONALITY: Position (P) Stations

 Explanation of the detail screen display in a P (Position: Fixed station) APRS STATION LIST and description of operations

Turn the DIAL in the APRS STATION LIST screen to select the "**P**" station and press the **[DISP]** key to display the P (Position) detailed screen. Detailed information known as the PHG code may be included in the position information.

Turn the DIAL to scroll the screen.

	1 Character	The station list characters will be displayed.		
	②Compass	(position):		
		The direction of the partner station as seen from your own		
D P JA1ZRL-9		station will be displayed.		
2 - V FIXED 05/24-0 82 7km 09:36-8	③Call sign:	The reception call sign will be displayed.		
	④Partner state	ation information:		
W Height 22m (10)		The fixed station information (FIXED) will be displayed.		
Gain 6dB-11	⑤Distance:	Distance with the partner station will be displayed.		
A-DIF 97	6 Message of	lisplay:		
		When a beacon containing STATUS TEXT is received, the		
		" " mark is displayed.		
4	⑦Date:	The date the beacon was received (MM/DD) will be		
A		displayed.		
Turn the DIAL	⑧Time:	The time the beacon was received (HH:MM) will be		
•	-	displayed.		
	Iransmiss	ion power:		
		The transmission power of the partner station will be		
Gain 6dB	-	displayed.		
A-Dir 97°	10 Antenna ground height:			
¹⁰ P-Rate 4 -13		The antenna ground height of the other station will be		
F 139°44.96'	.	displayed.		
COMMENT TEXT 1	(1)Antenna g	gain: The antenna gain of the partner station will be		
	<u></u>	displayed.		
	12Antenna d	irection: The antenna direction of the partner station will		
f f	a - .	be displayed.		
(18) (19) (20)	13 Transmiss	ion count: The transmission count of the partner station will be displayed.		
al atitude: The N (north latitude) or S (south latitude) of the current position will be displayed (DDMM MM or DDMMSS)				

The N (north latitude) or S (south latitude) of the current position will be displayed (DDMM.MM or DDMMSS).
 (bLongitude: The E (east longitude) or W (west longitude) of the current position will be displayed (DDMM.MM or DDMMSS).
 (bCOMMENT TEXT: The comments information will be displayed.

- ⑦Symbol: The symbol of the radio station will be displayed.
- (B[I ►]: Each time the icon is touched, the function of the DIAL changes.
- (9 [REPLY]: Touch this icon to display the reply message text input screen.
- 20 ++ : Touch this icon to display the function expansion key screen. Touch this when replying to a message or when displaying RAW data etc.

HELPFUL LINKS:

https://tinyurl.com/BikingWithAPRS Setup APRS on the FT3DR or FT2DR - The Ultimate guide Introduction to APRS the Automated Packet Reporting System - Ham Radio Q&A Ham Radio Bicycle Mobile: Using APRS to track a marathon - Ham Radio Q&A The Beginner's Guide to APRS: Automatic Packet Reporting System http://aprs.org/fix14439.html Special Interest Nets - Colorado Repeater Association

Special Interest Nets

There are many Nets on the CRA repeater systems, covering a wide range of topics. Unless otherwise noted, the nets meet on the *CRA VHF Link System* repeaters of 147.225 in Westcreek, 145.460 in Boulder, and 145.160 in Colorado Springs.

Every **Sunday** evening the **APRS Net** is at 7 PM and the **Rocky Mountain Monitoring Net** is at 8 PM. If you are interested in Automated Position Reporting via amateur radio, or in topics related to scanning, radios and general communications monitoring, those nets are for you.