

Note: We will be recording all Bootcamp Sessions. Anyone not wishing to be recorded should mute their video or disconnect.



GETTING STARTED WITH AMATEUR RADIO SATELLITES

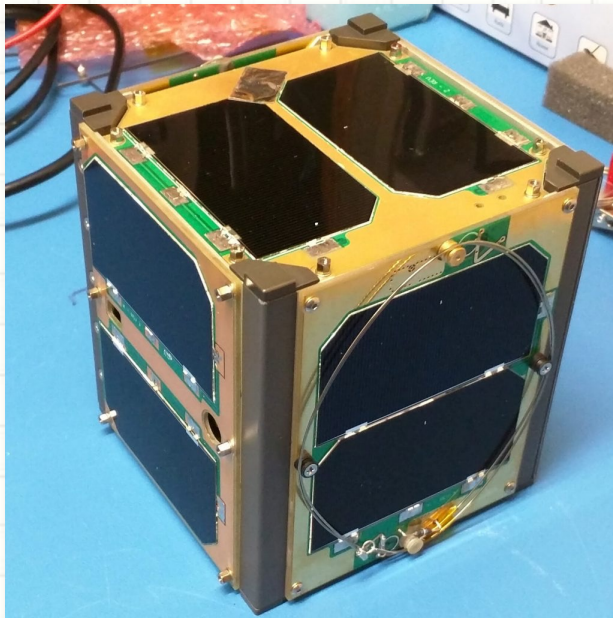
Ham Bootcamp

Spring 2024

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Amateur Satellites

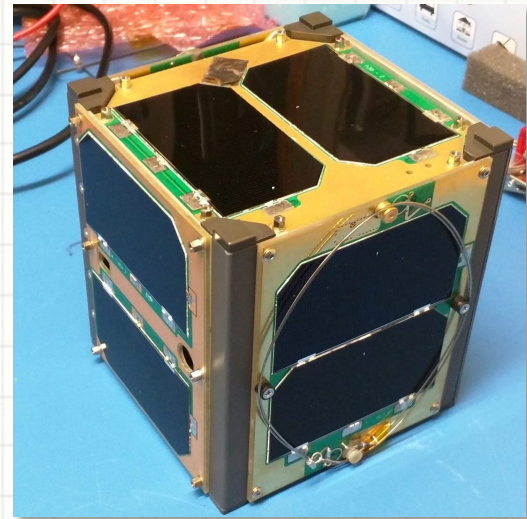
- Orbiting Satellites Carrying Amateur Radio (OSCAR)
- They are small!
- They ride share with big payloads



Types of Satellites

FM EasySats, Linear Sats, Digital Sats...

- FM Repeaters
 - “EasySats” but they are very busy!
 - That’s mostly what we will talk about
- Linear Transponders
 - Harder to work but more users possible
 - Usually use sideband (USB/LSB)
 - Best done with computer control
- APRS (digital packet)
 - Use AX.25 modulated audio over an FM channel
- Other kinds of digital



What Can I Do With Amateur Satellites?



- Learn New Skills/Ideas
- Communication
 - With other other hams (+ astronauts in space)
 - Contesting ← What we will mainly talk about
 - Extra points on field day
 - Satellite-specific awards
 - Improve weak signal skills
- Collect Data/Messages/Pictures (think Short Wave Listener)

Getting Started Summary

What Equipment Do I Need?

- Two Handheld Radios
- Handheld Yagi
- Smartphone
 - Satellite tracking app
 - Compass
- Adjust UHF frequency to correct for Doppler (use memories)
- A Voice Recorder is helpful to capture QSOs details as you make them
- Consider tent stakes to mark rise/set locations
- Consider helpers to call out directions, frequencies, write log



Radios for Satellites

Two Inexpensive HTs

- For example Baofeng BF-F8HP (many others)
- \$70^{ish} on Amazon - many others are cheaper
- Good choice with an Arrow antenna which has two feedlines - one for each radio
- A Headset with a PTT button will make operating much easier
 - Required so you can hear your own signal in the downlink
- Don't forget cables and adapters!
- Good for FM Only

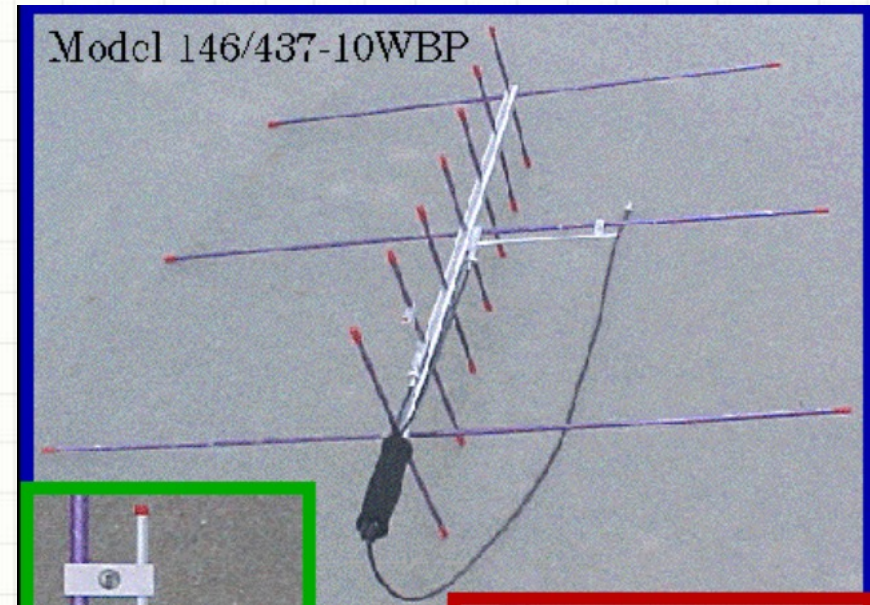


Full Duplex Radio Antenna Options
Exist but are more \$

Getting Started

Antennas (handheld)

- Handheld yagis are the most common
- Arrow Yagi Antenna
 - Notice separate 2 m elements and 70 cm elements
 - Two Yagi antennas on one boom
 - Two feedlines, one for each band
 - Must rotate to align with satellite polarity for Rx and Tx
- Tripod or some sort of support can be helpful

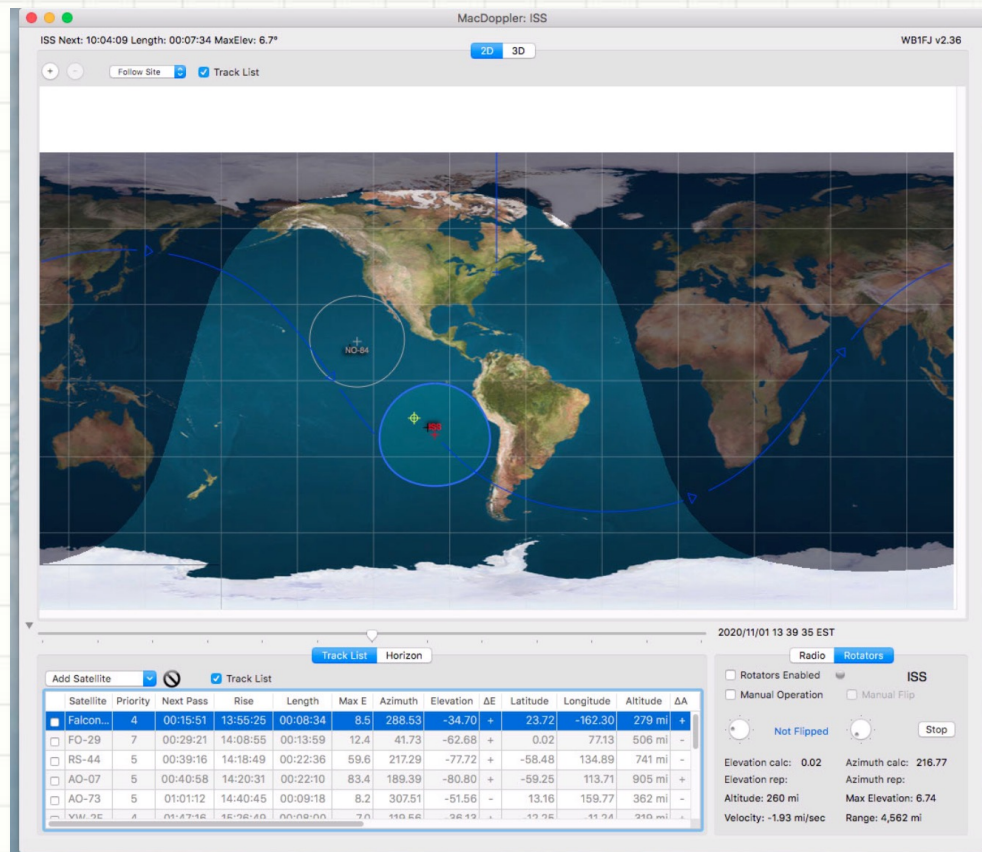


This Arrow can have an optional diplexer in handle for single feedline



Satellite Tracking Apps

- **Android:** AmsatDroid
- **Mac:** MacDoppler (\$)
- **Windows:** SatPC32 (\$)
- **Linux:** Gpredict (Free)



How do the apps know where satellites are?

- Keplerian Elements downloaded from internet

This set of numbers is all you need to track each bird:

SO-50 1 27607U 02058C 20303.41730594 .00000041 00000-0 26214-4 0 9992 2 27607 064.5555
324.7826 0032786 129.0565 231.3463 14.75671885960481

Getting Started

Programming Your HT(s) For Satellites

AO-91 (U/V Mode)	Downlink (V)	Uplink (U)
Acquisition of Signal	145.960 MHz	435.240 MHz + 67.0 Hz Tone
Early in Pass		435.245 MHz + 67.0 Hz Tone
Mid Pass (TCA)		435.250 MHz + 67.0 Hz Tone
Late Pass		435.255 MHz + 67.0 Hz Tone
Loss of Signal		435.260 MHz + 67.0 Hz Tone

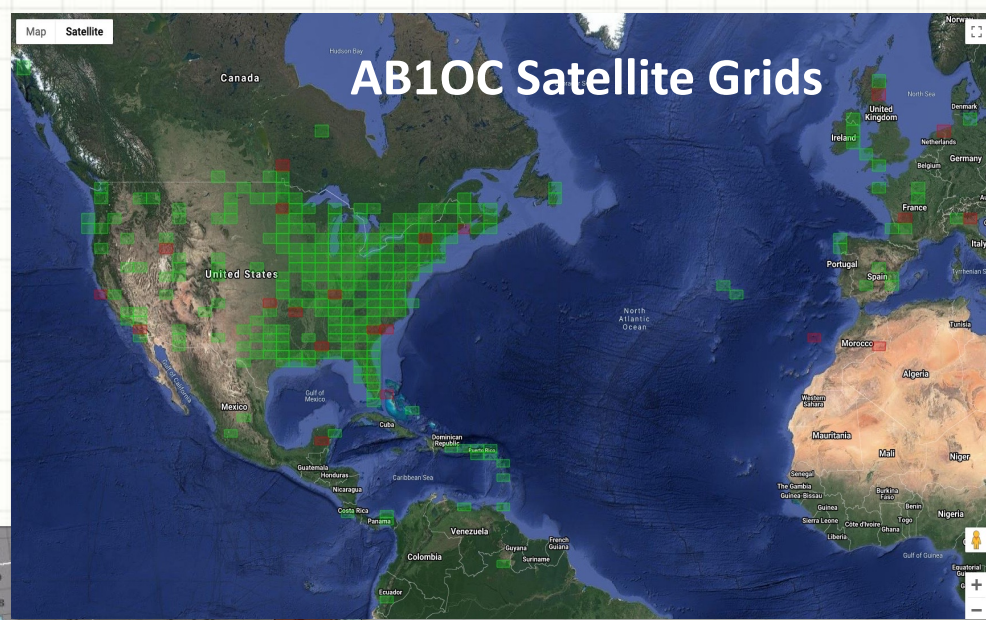
SO-50 (V/U Mode)	Downlink (U)	Uplink (V)
Activate SO-50	---	145.850 MHz + 74.4 Hz Tone
Acquisition of Signal	436.805 MHz	145.850 MHz + 67.0 Hz Tone
Early in Pass	436.800 MHz	
Mid Pass (TCA)	436.795 MHz	
Late Pass	436.790 MHz	
Loss of Signal	436.785 MHz	

Program HT(s) memories with frequencies for each FM satellite

Where Am I Located?

Maidenhead Grid Squares

- Maidenhead Grid Squares divide up the world into a combination of 2 letters + 2 digits
- Each grid is approx. 70 miles X 100 miles



- Hams try to work a station in every grid square
- Earn a VUCC Award for confirming 100+ grids

Making EasySat Contacts

Here is what it looks like!



[Video on YouTube](#)

Progressing With Satellites

A Variety of Stations are Possible

- Permanent or semi-portable
- With and without rotators
- Ground mount in the yard, portable in a parking lot, or a dedicated tower
- Circular-polarized antennas for permanent installations
- Computer control for linear satellites
- View our Tech Night for more ideas and info



Questions?

Have Fun!

To Learn More:

Check out the Nashua Area Radio Society's Tech Night Program at:

n1fd.org/tech-night

Become an Internet Subscriber (or members of NARS):

n1fd.org/join-us

Much more information, pictures and video are available on our Blog at:

stationproject.blog



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AMATEUR RADIO SATELLITE DEMO

Nashua Area Radio Society

Fall 2023

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FM "EasySat" Demo QSOs (SO-50)

Next: 00:00:00 Length: 00:08:31 Elev: 36.5 Path Loss: 50.0dB AB10C v2.24

2D 3D

☐ Follow Sat ☒ Track List



2017/05/09 11 50 13 America/New_York

Track List Horizon

Add Satellite ☒ Track List

Satellite	Pr...	Next Pass	Rise	Length	Azimuth	Elevation	ΔE	Max E	Altitude	ΔA	Range
☒ SO-50	1	00:00:00	11:50:14	00:08:32	340.95	36.28	+	69.7	387 mi	+	618 mi
☒ AO-73	5	00:02:30	11:52:41	00:05:29	349.74	-4.69	+	2.3	381 mi	+	2,160 mi
☒ ISS	2	00:09:01	11:59:14	00:06:00	307.31	-19.81	+	3.6	250 mi	-	3,326 mi
☒ UKUB...	5	00:13:58	12:04:11	00:01:26	4.82	-23.57	+	0.1	384 mi	-	3,998 mi
☒ AO-85	2	00:26:45	12:16:57	00:07:27	232.29	-55.16	+	1.6	469 mi	-	7,042 mi
☒ AO-07	2	00:39:24	12:29:35	00:14:58	165.29	-68.13	+	10.4	904 mi	-	8,302 mi
☒ EO-88	3	00:42:05	12:32:17	00:06:22	93.90	-84.06	+	4.0	307 mi	-	8,187 mi
☒ EO-79	4	00:51:15	12:41:27	00:11:36	349.79	-72.36	-	20.6	377 mi	+	7,951 mi

Radio Rotators

☒ Radio Enabled SO-50

Downlink: 436.795.00 Uplink: 145.850.00

436.802.54 **145.847.48**

0.000.00 0.000.00

☒ VFO's Locked Non-Inverting Transponder

☒ Full Doppler ☐ Beacon JFM

JFM-3

EL: **036.1**

AZ: **338.4**

SO-50

Tracking

Call Sign: Grid:

First Name: Time: UTC

Last Name: Up: MHz

Street: Down: MHz

City: Mode:

State: Satellite:

Country: **United States** Azimuth: Degrees

zip: Elevation: Degrees

email:

Comments:

My Grid: FN42er RSTS **59** RSTR **R**

Lookup Clear Log it Done

Extra

Presentations

Mobile HF

Satellite Predictions

AMSAT OSCAR Satellite Status

Linear Satellite Demo QSOs (FO-29)

Next: 00:00:00 Length: 00:10:01 Elev: 12.7 Path Loss: 152.6dB AB10C v2.24

2D 3D

☒ Follow Sat ☒ Track List



Call Sign: Grid:
First Name: Time: UTC
Last Name: Up: MHz
Street: Down: MHz
City: Mode:
State: Satellite:
Country: Azimuth: Degrees
zip: Elevation: Degrees
email:
Comments:
My Grid: FN42er RSTS 59 RSTR R
Lookup Clear Log it Done

2017/05/09 11:29:18 America/New_York

Track List Horizon

Satellite	Pr...	Next Pass	Rise	Length	Azimuth	Elevation	ΔE	Max E	Altitude	ΔA	Range
☒ FO-29	1	00:00:00	11:29:19	00:10:01	227.08	12.74	+	19.9	547 mi	-	1,456 mi
☒ SO-50	1	00:16:51	11:45:08	00:13:37	318.96	-37.32	+	69.7	396 mi	-	5,430 mi
☒ AO-73	5	00:23:23	11:52:42	00:05:29	33.08	-47.89	+	2.3	362 mi	-	6,366 mi
☒ ISS	2	00:29:57	11:59:14	00:06:00	326.27	-60.91	+	3.8	253 mi	-	7,220 mi
☒ UKUB	5	00:34:54	12:04:11	00:01:26	319.45	-59.00	+	0.1	396 mi	-	7,297 mi
☒ AO-85	2	00:49:41	12:18:57	00:07:27	118.66	-81.91	-	4.6	460 mi	+	8,304 mi
☒ AO-07	2	01:00:16	12:29:35	00:14:58	263.22	-60.89	-	10.4	907 mi	+	7,929 mi
☐ FO-88	3	01:03:01	12:32:17	00:06:22	195.82	-69.40	-	4.0	311 mi	-	6,401 mi

Radio Rotators

☒ Radio Enabled FO-29
Downlink: 435.851.70 UpLink: 145.950.00
435.857.16 145.949.67
-0.000.59 0.001.70
☒ VFO's Locked
☒ Full Doppler
JA-3
Beacon JA_SSB
Downlink Frequency Stepper

EL: 012.2
AZ: 224.0
FO-29
Tracking

Extra
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AMSAT OSCAR
Satellite Status