

# Work Satellites with your HT!

*Most hams already have the necessary equipment to work FM amateur satellites.  
This guide offers all the information you need to "work the birds."*

If you can program split frequencies in your HT (transmit on 2 meter and receive on 440), you can work amateur satellites! In satellite AO-51's main **V/U** mode, the **UPLINK** frequency (*to AO-51*) for voice is 145.920MHz\*. The **DOWNLINK** freq (*from AO-51*) is 435.300MHz.

First, you need to know **WHEN** and **WHERE** the satellite will be passing over your location. There are several commercial computer programs that will tell you. In the home office, I use **Nova for Windows**<sup>[1]</sup>. Outside, though, I use **PocketSat**<sup>[1]</sup> on my Verizon Treo 755p PDA or Palm TX. On my MacBook Pro, **MacDoppler**<sup>[1]</sup> is amazing. These programs are easily updated with satellite tracking data. But completely **free of charge** info is online at...

**<http://www.heavens-above.com>** -or- **<http://www.amsat.org>**

Plug in your longitude and latitude coordinates on these sites, and you can access amateur satellite pass information.

The one "absolute" for success is to **open up your squelch**. "Working the sats" starts off as a process of finding weak signals, so don't expect the satellite to be anywhere as strong enough to break squelch like your local repeater. Sure, it's a little noisy, but that's part of the process. Noise can also be an aid in locating the satellite because when the frequency starts to exhibit **QUIETING**, that's a sign that you are capturing the satellite!

Improve your HT's stock antenna. For BNC connectors, **Pryme's AL-800**<sup>[2]</sup> will make the difference. For SMA, the **Diamond SRH-320a** or **Smiley 270A** are good performers. Using an **Arrow** dual-band<sup>[3]</sup> Yagi is better. If you prefer to homebrew your antenna, see the Notes<sup>[4]</sup> for construction article citations.

Set up your radio to tune for the **doppler effect**. Start listening **above** the center frequency<sup>[5]</sup> - you will hear the satellite sooner and clearer. When the downlink gets scratchy or fuzzy, tune down 1KHz at a time, and reception should be clearer. With low power, only transmit when you can **clearly** hear the satellite. Follow the signal down in frequency as the pass continues.



***Don't hold your whip antenna upright.*** Held in a vertical position, your transmitted signal is hitting land-based receivers. You need to tilt your HT's antenna so that it is ***perpendicular*** to the airborne satellite. The satellite isn't on the ground (which is what HT and vertical antennas were designed for). **TILT IT** about the same amount as the satellite's **ELEVATION**. You'll quickly get the hang of it!

Ideally, we should all be working the satellites in **full duplex** mode, where we can *simultaneously* listen to the downlink as we are transmitting. Although this method is preferred, it is not mandatory: Carefully monitor the downlink, and wait for a break in the conversations to announce yourself. Many operators find using headphones helps - especially if working full duplex.

Knowing your gridsquare - and having a gridsquare map - is a quick way of identifying locations of what you will be hearing. The **ARRL** and **Icom** have gridsquare maps: Icom's is free and available at better amateur radio stores<sup>[6]</sup>.

The "**three P's**" for working amateur satellites: **p**reparation, **p**lanning, and **p**atience. Not every pass is workable with an HT — so don't go after the 10 degree passes. Pick your passes, working ones you know will give you the best chance.

When you hear others, try to find a break in the action, and announce your callsign phonetically, grid square, and op mode:

**"KILO-SIX-LIMA-CHARLIE-SIERRA, D-M - ONE-THREE, handheld."**

Some hams record their sessions for later review. Even if you don't make contacts, it helps to familiarize yourself to the callsigns, voices and personalities of the other operators.

**Check the AMSAT Web site for the AO-51 Control Team News – to make sure AO-51 is in a VHF/UHF mode to work with your HT.**

Ask questions! Find an elmer or look up the **AMSAT**<sup>[7]</sup> area coordinator for your area. Posting specific questions on the AMSAT bulletin board will also help you find answers.

**Clint Bradford, K6LCS**  
**AMSAT Area Coordinator**  
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**909-241-7666**

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## Notes

[1] Nova for Windows is available from Northern Lights Software Associates' Web site at [www.nlsa.com](http://www.nlsa.com). PocketSat is available from Big Fat Tail's site at [www.bigfattail.com](http://www.bigfattail.com). And MacDoppler is available at [www.dogparksoftware.com](http://www.dogparksoftware.com).

[2] The Pryme AL-800 telescopes to 34" and collapses to 10". It is packaged with a 9" rat tail - which you can use for everyday use. Use caution with this massive, heavy antenna: It has the potential of placing a lot of stress on your radio's BNC connector. Pryme claims gain figures of 3.2 dB on VHF and 5.5 dB on UHF.

[3] Arrow's Model 146/437-10WBP is a dual-band cross-Yagi design, with a duplexer built into the handle. It has three elements on 2M and 7 on 440. See it in action in the December, 2007 issue of CQ Magazine. Arrow's Web site: <http://www.arrowantennas.com>.

[4] Alex Diaz' Yagi-Uda plans are at <http://xe1mex.gq.nu/antenas/yagi.html>. The AMSAT "Cheap and Easy" series of satellite antenna articles is at...

<http://www.amsat.org/amsat-new/information/faqs/crow/>

[5] For example, here's how I have programmed my FT-60R for **AO-51**:

<b>Ch #</b>	<b>Name</b>	<b>TX Freq*</b>	<b>CTCSS</b>	<b>RX Freq</b>	<b>CTCSS</b>
101	51 -2	145.920*	<del>67.0</del>	435.310	None
102	51 -1	145.920*	<del>67.0</del>	435.305	None
<b>103</b>	<b>51 MID</b>	<b>145.920*</b>	<b><del>67.0</del></b>	<b>435.300</b>	<b>None</b>
104	51 +1	145.920*	<del>67.0</del>	435.295	None
105	51 +2	145.920*	<del>67.0</del>	435.290	None

And here's how I have programmed my FT-60R for **SO-50**:

<b>Ch #</b>	<b>Name</b>	<b>TX Freq</b>	<b>CTCSS</b>	<b>RX Freq</b>	<b>CTCSS</b>
201	50 -4	145.850	67.0	436.815	None
202	50 -3	145.850	67.0	436.810	None
203	50 -2	145.850	67.0	436.805	None
204	50 -1	145.850	67.0	436.800	None
205	50 74	145.850	74.4	436.795	None
<b>206</b>	<b>50 MID</b>	<b>145.850</b>	<b>67.0</b>	<b>436.795</b>	<b>None</b>
207	50 +1	145.850	67.0	436.790	None
208	50 +2	145.850	67.0	436.785	None
209	50 +3	145.850	67.0	436.780	None

[6] Icom's map is available as a .pdf file on Icom's Web site. Search their Knowledge Base for Article 5BUE54225A at <http://icomamerica.com> - or at <http://www.clintbradford.com>

[7] **AMSAT** *deserves your support!* Membership isn't that expensive, and members are entitled to discounts on AMSAT publications and satellite tracking software!

[\*] The uplink to the main FM repeater on AO-51 might change. Watch K6LCS' blog, AMSAT's Web site, or <http://www.amsat.org/amsat-new/echo/ControlTeam.php> for updates!



[amsat.org](http://amsat.org)



MacDoppler  
[dogparksoftware.com](http://dogparksoftware.com)



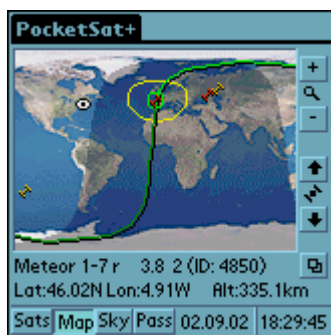
[arrowantennas.com](http://arrowantennas.com)



[heavens-above.com](http://heavens-above.com)



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[www.nlsa.com](http://www.nlsa.com)



PocketSat+ for Palm  
[www.bigfattail.com](http://www.bigfattail.com)

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