

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're set!

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**^[1]. Outside, though, I use **PocketSat**^[1] on my Verizon Treo 650p/755p PDA or Palm TX. On my MacBook Pro, **MacDoppler**^[1] 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^[2] will make the difference. For SMA, the **Diamond** SRH-320a or **Smiley** 270A are good performers. Using an **Arrow** dual-band^[3] Yagi is better. If you prefer to homebrew your antenna, see the Notes^[4] for construction article citations.

Set up your radio so you can tune for the **doppler effect**. Start listening **above** the center frequency^[5] - 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^[6].

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**^[7] area coordinator for your area. Posting specific questions on the AMSAT bulletin board will also help you find answers.

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Notes

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

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

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

Ch #	Name	TX Freq	CTCSS	RX Freq	CTCSS
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
206	50 MID	145.850	67.0	436.795	None
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



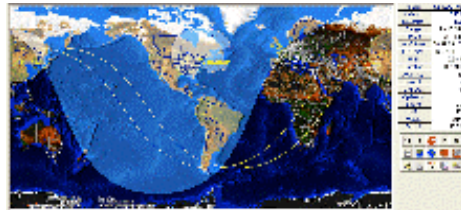
MacDoppler
dogparksoftware.com



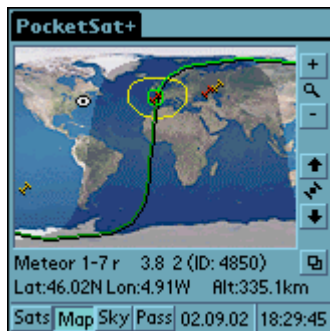
arrowantennas.com



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Nova for Windows
www.nlsa.com



PocketSat+ for Palm
www.bigfattail.com

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