

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."

All cited resources - and a lot more! - available to you at ...

<http://www.work-sat.com>

If you have 2M and 70CM/440 capabilities (either "split frequencies" in one HT, or two radios), you can work FM amateur satellites! For example, for satellite SO-50's **VHF/UHF (V/U)** mode, the **UPLINK** frequency (**to** SO-50) for FM voice is 145.850 MHz*. The **DOWNLINK** freq (**from** SO-50) is 436.795 MHz*.

First, you need to know **WHEN** and **WHERE** the satellite will be passing over your location. There are several commercial computer programs^[1] that will tell you. In the home office, I use **MacDoppler**. Outside, though, I use **PocketSat** on my Palm PDA or iPod touch/iPhone. On my netbook, **Nova for Windows** and **SatPC32** are amazing. But **free of charge** info is also available online at ...

amsat.org - or - heavens-above.com

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

The one "absolute" for success is to **open up your squelch**. We are talking about "weak signals" from 500+ miles away - so don't expect the satellite to be strong enough to break squelch like your local repeater. Sure, it's a little noisy, but that's part of the process: That noise is an aid in locating the satellite. When the frequency starts exhibit **quieting**, that's a sign that you are **capturing** the satellite's signal.

Improve your HT's stock antenna (most are rated at **NEGATIVE** 2-3 db!). For BNC connectors, **Pryme's** AL-800^[2] will make the difference. For SMA, the **Diamond** SRH-320a or **Smiley** 270A are decent performers. But using an **Arrow** dual-band^[3] Yagi is better. If you prefer to homebrew your antenna^[4], go to the work-sat.com Web site's ANTENNAS page for construction article links.

Set up your radio to tune for the **Doppler effect** on the downlink. Start listening **above** the center frequency^[5] - you will **acquire** the satellite sooner and clearer. When the downlink gets scratchy or fuzzy, tune down 5KHz at a time, and reception should be clearer. 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. Very few of the ham satellites are land-based (grin), so you must **TILT** your antenna about the same amount as the satellite's **ELEVATION**. You'll quickly get the hang of it - and hear the difference! You'll have better results with a modest beam or Yagi.

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. You might find it helpful to record your sessions for later review. Even if you don't make a contact during a pass, a recording can help you recognize the callsigns and voices of other operators. Pocket recorders or smartphone apps are great for this. If working full-duplex, use an earpiece or headphones to monitor the downlink.

Knowing your grid square - and having a grid square map - is a quick way of identifying locations of what you will hear. The **ARRL** and **Icom** have grid square maps: Icom's is free and available at better ham radio stores^[6].

It just takes a little preparation and planning for working amateur satellites. Not every pass is workable with an HT — don't go after the sub-10° elevation passes as you start "working the birds." Choose your passes wisely: Working higher elevation passes will give you better results.

When you clearly hear others, listen for a break in the action, and use the ITU-approved phonetics^[7] to announce your callsign, grid square, and op mode:

"KILO-SIX-LIMA-CHARLIE-SIERRA, DELTA-MIKE - ONE-THREE, handheld."

Check work-sat.com for the satellites' home Web pages – to make sure the sat is in the mode you can work with your setup!

Ask questions! Find an elmer in your club for support, or use the Work-Sat.com YahooGroup for any questions. And join AMSAT-NA!^[8]

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Notes

Access this Web site for all citations, links, resources, and updates:

<http://www.work-sat.com>

[1] Links to Nova for Windows, PocketSat, MacDoppler, SatPC32, HamSat DROID, SATme, GoSatWatch – and more – available on the [Tracking](#) page at work-sat.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.

[3] Arrow's Model 146/437-10WBP is a dual-band cross-Yagi design, with a diplexer built into the handle, with 3 elements on 2M and 7 on 440. See it in action in the December, 2007 issue of CQ Magazine. Links to Arrow – and others – are on the [Antennas](#) page at work-sat.com.

[4] Alex Diaz' Yagi-Uda plans, AMSAT's "Cheap and Easy" sat antenna articles, a tape measure beam construction article – and LOTS more – are all on the [Antennas](#) page at work-sat.com

[5] For example, here's how I have programmed my radios for **AO-27***:

Ch #	Name	TX Freq	CTCSS	RX Freq	CTCSS
101	27 +2	145.850	None	436.805	None
102	27 +1	145.850	None	436.800	None
103	27 MID	145.850	None	436.795	None
104	27 -1	145.850	None	436.790	None
105	27 -2	145.850	None	436.785	None

And here's how I have programmed my radios 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] A .pdf copy of Icom's grid square map is available on the [Shack Aids](#) page at work-sat.com.

[7] Download the ARRL's Handy Ops Guide (FSD-220) at – you guessed it – [work-sat.com](#).

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

[*] Always consult the sats' control team pages for possible frequency changes and scheduled updates. What's your single source for links to the ops schedules for the popular FM birds?
[work-sat.com](#) !



My "**Working Amateur Satellites with your HT**" presentation has proven to be popular, and has been given to scores of clubs and hamfests in Southern California ... as well as via EchoLink and Skype conferences to clubs world-wide. *Some comments received ...*

Clint has this magnetism - you never know what to expect. He started out with interesting trivia and gave prizes to the lucky winners. He is a very motivating speaker!

Your Web site took me from zero knowledge to getting an HT and an Arrow.
And just four months later, I have qualified for VUCC on the FM birds.
A great site for the beginner on the birds. You un-mystify them.

I love the site and I greatly appreciate the information you have provided to get me going! Yours is a no-nonsense approach to working satellites and helpful documentation (tutorial). The photos really helped in understanding.

Simplicity ... the idea of working sats "sounds complicated" but that's really not the case. You keep the language simple, illustrations simple, and concept simple ... give folks the idea that any ham can do this (which they can) with the right equipment....if they follow the directions you provide.

Want a lively, hour-long satellite presentation at YOUR club?

I have given my presentation several times via Skype: I prepare and send a customized slideshow ahead of time for you to project to your club, and we use Skype over the Internet for two-way audio.

Contact me – let's schedule a presentation!

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