

Introduction

MacDopplerPRO gives you a seat right in the heart of the Operations & Command Centre for every satellite in orbit. In fact up to thirty two front row seats at the same time.

With MacDopplerPRO, you get the most out of satellite tracking. With this comprehensive manual, you can now get the most out of MacDopplerPRO.

Here's what the program does:

MacDopplerPRO will read in the Keplerian elements (in either format), calculate the position and relative velocity of the satellite you are tracking and automatically adjust the Doppler shift on both transmit and receive as well as pointing your antennas.

A Track List Dialog allows you to track up to 32 satellites automatically.

Supported Satellites and modes include: MIR /ISS Packet/Voice, Simplex, Split, Repeater, AO-27, UO-14, SO-35, AO-10, AO-40, FO-20 and FO-29, and PacSats, Weather Sats, Transverter offsets for P3D, and many more. New modes are continuously added as new birds are flown !

Easy to update Keplerian Elements.

MacDopplerPRO features full predictive dead spot crossing so that a pass is never interrupted by the beam heading passing a dead spot.

A slider control allows you to sweep the VFO through the transponder range while the transmit frequency tracks the receive frequency. When you hear something interesting, MacDopplerPRO continues to track the frequency through the Doppler changes.

Requirements

MacDopplerPRO requires an Apple Macintosh II or faster (some features only supported on Power PC), +6 MB of RAM over and above the OS, (+12 mb for 3D recommended) System 8.6 or later. The Application is FAT Binary and must be registered to work beyond the 20 minute time limit. PowerPC and QuickDraw 3D required for 3D map Projections.



Acknowledgments

Design assistance and moral support: Lou McFadin W5DID.

Several Maps licensed from "The Living Earth, Inc."

Some icons courtesy of the Iconfactory <<http://www.iconfactory.com>>



Supported Equipment

Radios

YAESU	FT-736R	Transceiver with FIF-232 Level Converter or Endeavor Auto Tracker
YAESU	FT-847	Transceiver direct RS-232 or Endeavor Auto Tracker
ICOM	IC-275/IC-475	Transceiver pair with CT-17 Level Converter
ICOM	IC-970	Transceiver with CT-17 Level Converter or Endeavor Auto Tracker
ICOM	IC-820H	Transceiver with CT-17 Level Converter or Endeavor Auto Tracker
ICOM	IC-821H	Transceiver with CT-17 Level Converter or Endeavor Auto Tracker
ICOM	IC-910	Transceiver with CT-17 Level Converter
ICOM	IC-R8500	Receiver with CT-17 Level Converter
ICOM	IC-R7000	Receiver with CT-17 Level Converter
ICOM	IC-PCR1000	Receiver RS-232
Kenwood	TS-790A	Transceiver with IF-232C Level Converter or Endeavor Auto Tracker
Kenwood	TS-50	Transceiver with IF-232C Level Converter
Kenwood	TS-2000A	Transceiver
AOR	A3000A	Receiver direct RS-232

Rotor Controllers

YAESU	G-5400B	Elevation-Azimuth Dual Controller with GS-232 Computer Controller or Endeavor Auto Tracker
YAESU	G-5500	Elevation-Azimuth Dual Controller with GS-232 Computer Controller or Endeavor Auto Tracker
KLM/Mirage SARtek	Controller Controller	(azimuth only).

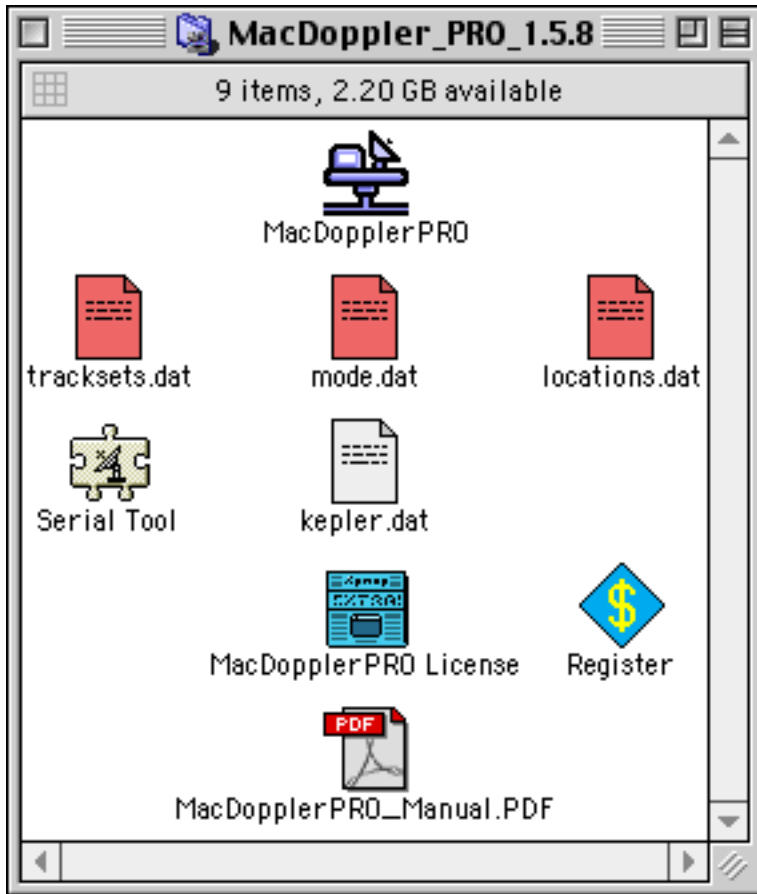
Tracker Protocols

Endeavor	Auto Tracker	Rotor only or Radio & Rotor
EasyCom		Rotor only or Radio & Rotor



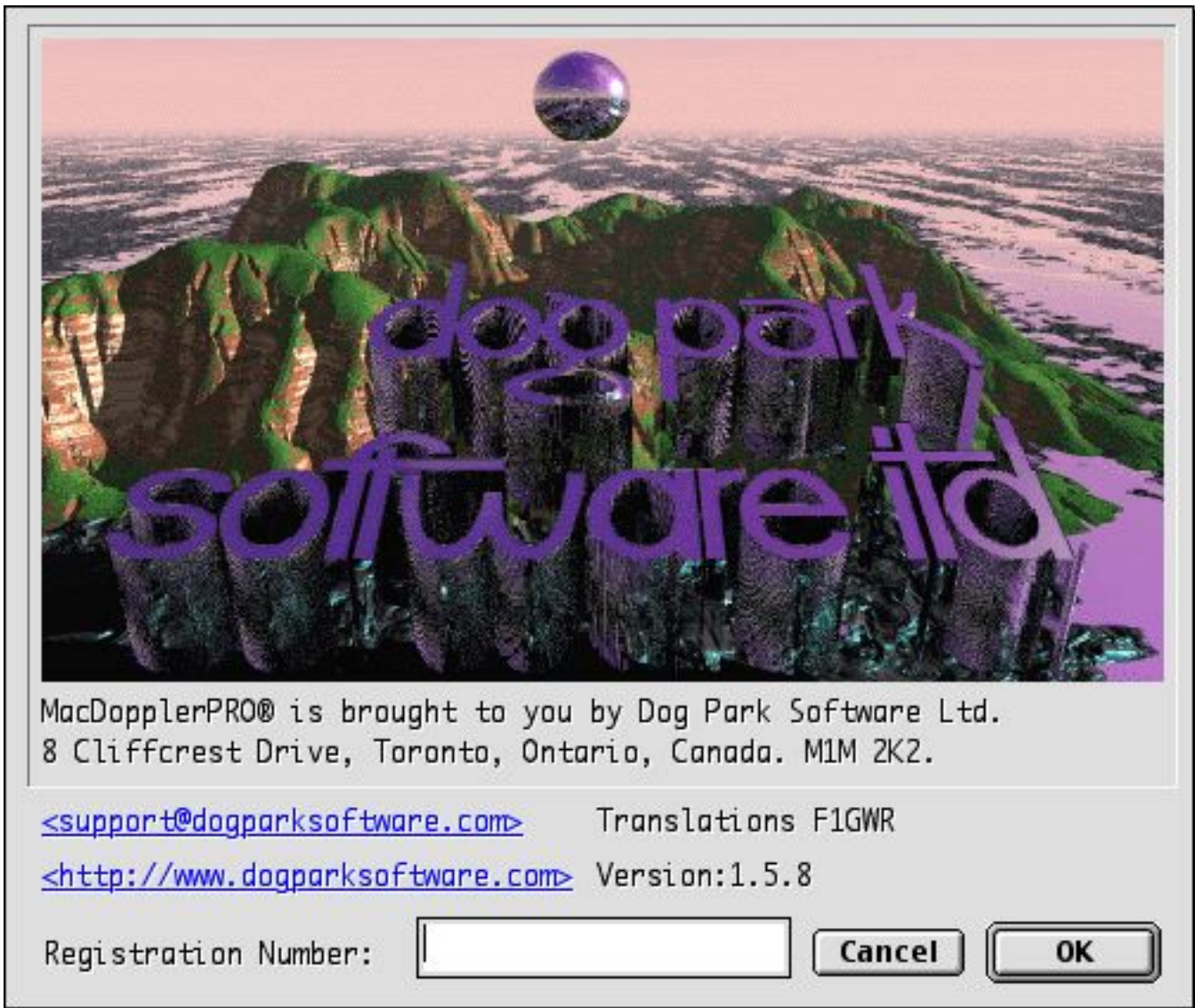
Configuration and Set Up

After you download MacDopplerPRO and unstuff the files you will see a folder something like this:



- | | |
|----------------------------|--|
| • MacDopplerPRO | The actual FAT-Binary application. |
| • kepler.dat | Keplerian elements file - can be either format |
| • locations.dat | Latitude and Longitude locations file |
| • tracksets.dat | Sets of Satellites to track |
| • mode.dat | Satellite frequencies and modes |
| • Serial Tool | Only needed if not already in your extensions folder |
| • MacDopplerPRO License | License and User Agreement - Please Read. |
| • Register | Program to register MacDopplerPRO |
| • MacDopplerPRO_Manual.PDF | This manual |

Double click on the MacDopplerPRO Icon and you will see the registration/splash screen. Simply enter the registration number that was provided by Dog Park Software Ltd. in the "Registration Number:" field.



After you enter the registration number, the Configuration Dialog will then be displayed:



Ports

MacDoppler PRO Port Configuration

Radio **Rotor**

☒ **Enabled** ☒ **Enabled**

Type: Yaesu FT-736R Type: Yaesu GS-232 (G-...

Port: Yaesu FT-736R Port: GS-232

☐ **Enabled** Second Receive Radio

Type: AOR AR-3000A

Port: AOR-3000A

5 Command delay (60ths sec.) Cancel OK

If you are using the Auto Tracker, It can be used as a rotor controller only, or you can order the Radio Control Option and use it for both, thus saving a serial port. Note that the Auto Tracker Radio Control Option does not support the same Radios that MacDoppler and MacDopplerPRO do.

Select the type and port of the radio you want to control, and the type and port of the rotor controller you have connected and enable them with the check box. If you are using the Endeavor Auto Tracker to control both the radio and rotor, then do not enable the Radio, but make sure you select the radio type from the Type pop-up so that MacDopplerPRO can tell the Auto Tracker which type of radio is connected.

MacDopplerPRO will automatically set the correct baud rate fro the Radio and rotor selected, but if you have your radio set to a non standard baud rate, or in the case of an ICOM a non standard address, the table below lists the settings that MacDopplerPRO expects.

The Command delay value is the number of 1/60ths of a second to wait after each command is sent to the radio for the radio cpu to complete the task. A smaller number results in better responsiveness when using the VFO slider, but may overwhelm the radio cpu. Too large a value will result in sluggish operation of the VFO.

You can use a second radio to receive. This is usefull if you are using a second radio as an IF for a downconverter.



Note: You will only need the GS-232 & 5500 setting if your GS-232 has the older version 2.0 Kenpro firmware. Otherwise use the 5400 setting for newer GS-232's

Radio Set Up

IC-970	9600 baud, default address 0x2e, SATL-R(UHF on left for FO & PacSats).
IC-820H	9600 baud, default address 0x42, SATL-R(UHF on left for FO & PacSats).
IC-821H	9600 baud, default address 0x4c, SATL-R(UHF on right for AO-10).
IC-910	9600 baud, default address 0x60, SATL-R(UHF on right for AO-10).
FT-736R	4800 baud. UHF down link for FO & PacSats,VHF down link for AO-10
FT-847	9600 baud.
TS-50	4800 baud, 2 stop bits.
TS-790	4800 baud, 2 stop bits.
TS-2000	9600 baud.
AOR3000A	9600 baud.
IC-275/IC-475	1200 baud. default address 0x10/0x14
IC-R8500	9600 baud. default address 0x4a
IC-R7000	9600 baud. default address 0x08
IC-PCR-1000	9600 baud.

Rotor Set Up

GS-232	9600 baud.
Auto Tracker	9600 baud.
EasyCom	9600 baud.
KLM/Mirage	2400 baud.
SARtek	1200 baud.

Quirks

Due to a problem with the FT-736R (see note in FT-736R manual page 36 bottom left) you may have to take MacDopplerPRO out of CAT mode, press the REV key on the FT-736R front panel, and return to CAT mode when switching between mode U/V and V/U in Full Duplex, for example: switching from FO-20 to AO-10 and back.

The SAT switch must be in one of the full duplex positions for this to work.

Alternately, you could take MacDopplerPRO out of CAT mode, use the VFO buttons to switch from U/V to V/U, and then turn CAT mode back on - this will only work if you have one VFO set to U/V and the other VFO set to V/U.

If you have other modules installed in the FT-736R, you can set the 'BetweenPasses' frequencies in 'mode.dat' to something these other modules can tune and that way allow switching from U to V and V to U automatically when the satellite changes. It does this to avoid trying to set VFO A and B to the same band.



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On the ICOM IC-820H, 821,910 & 970 you may have to push the 'M/S' button on the front panel to switch from from U/V to V/U and vice versa (eg from FO-20 to AO-10) when you first start the program. After that, the drivers will automatically switch the Main and Sub Bands accordingly. If due to a power glitch or crash, the ICOM gets out of sync - just push the 'M/S' button on the front panel to re-synchronize.

To run simplex with in-band doppler correction, you must take the Icom out of Satellite mode using the front panel func+rev/nor switches.

On the Kenwood TS-2000 you may have to push the TF-SET button to get in sync. with U/V V/U changes, but the in-band doppler works fine for ISS etc.



Site Configuration

MacDoppler PRO Site Information

Location: **Toronto** ☒ Park Rotors Between Passes

Latitude: **43.6501** north Park AZ: **0.0** degrees

Longitude: **79.3336** west Park EL: **90.0** degrees

Altitude: **200.0** metres GMT Offset: **-4** hours

Min Elev: **0.0** degrees (Date & Time Control Panel)

Grid: FN03 hp

Defaults **Cancel** **OK**

If your location is already in the locations.dat file you can select it from the Location pop-up. If not, you can enter the latitude and longitude directly into this dialog, and optionally in the locations.dat file. The locations.dat file is just a short hand way to add other locations in case you are going to operate from another place besides 'home'. In any case send your latitude and long to me and I will include them in 'locations.dat' in future releases.

Enter the Altitude of your site and the minimum elevation that you want to consider a satellite visible. For example if you enter -2 degrees it will give the antenna rotors some time to be in place before the satellite is actually above the horizon.

The time and hours from GMT are set in the Date and Time Control Panel under the Apple Menu rather than through MacDopplerPRO. To double check the time settings make sure that the 'UTC' time displayed in the top part of MacDopplerPRO agrees with a known source/clock.

The "Park Rotors Between Passes" check box when enabled will allow you to park your antennas at a specific azimuth and elevation between passes. This can be useful to reduce stress on the antennas and rotors, or to point the antennas at a terrestrial target between passes.

Your GMT Offset (time zone) is set as a System parameter by the date & time control panel device and basically tells the computer what your offset from GMT (Zulu) is. The
May 15, 2001



MacDopplerPRO User Manual and Reference

nice thing about setting/taking this from the system, is that in the most recent releases of the MacOS, Daylight-Savings-Time is automatically adjusted for.

You can improve the accuracy of your computer clock, by using 'Auto Clock' or 'Vremya' time setting programs (MacOS 8.5 has a network time setting option built in to the 'Date & Time' Control Panel). Also, borrowing a GPS to get accurate Latitude, Longitude, and Elevation readings for your site configuration can help immensely. As a final check, try one of the early evening passes of MIR and see how well your antennas agree with the visual sighting. If your computer clock is out even a few seconds, it can throw the tracking off considerably.

See <<http://www.arrl.org/locate/gridinfo.html>>

The grid square for the location entered is also automatically calculated and displayed.



File Menu

File	Edit	Options	3D	Win
Close Window			⌘W	
Configure Ports...				
Satellite				▶
Next Satellite			⌘N	
Previous Satellite			⌘-	
Keps Editor...			⌘K	
Reload Keps			⌘R	
Save Preferences			⌘S	
Do Predictions...			⌘P	
Map Snap Shot...			⌘M	
Movie...				
Export 3D MetaFile			⌘E	
Log Contact...			⌘L	
Quit			⌘Q	

Close Window

Will close the foremost window ie Map, Controls etc. Use the Windows Menu to reopen the window.



Configure Ports

Ports

MacDoppler PRO Port Configuration

Radio **Rotor**

☒ **Enabled** ☒ **Enabled**

Type: Yaesu FT-736R Type: Yaesu GS-232 (G-...

Port: Yaesu FT-736R Port: GS-232

☐ **Enabled**

Type: AOR AR-3000A Second Receive Radio

Port: AOR-3000A

5 Command delay (60ths sec.) Cancel OK

(See the previous section on Configuration and Set Up)

Satellite

This hierarchical menu will display the available satellites and the format of the text will give some hint as to the proximity of the satellite. If the text is outlined it means that AOS (Acquisition Of Signal) is within an hour. Outline + Bold means AOS within twenty minutes or already visible.

Next Satellite

If Track List is enabled (See Options Menu) then this command will select the next satellite in the Track List, otherwise it will select the next satellite in the kepler.dat file.

Previous Satellite

If Track List is enabled (See Options Menu) then this command will select the previous satellite in the Track List, otherwise it will select the previous satellite in the kepler.dat file.



Keps Editor

Keps

MacDoppler PRO

Keplerian Elements

Satellite	A0-27	Catalog #	22825
Epoch Day	7954.97939419	Orbital Decay	0.00000527
Element Set	865	Epoch Rev	36700
Inclination	98.3908	Checksum	5
Epoch RAAN	337.6298	Hours	000000111111111000000000
Eccentricity	0.0007212	Decay Date UTC (Approximate)	
Arg Perigee	282.5516	Date Overflow: after 2040	
Mean Anomaly	77.4857	Semi Major Axis	7175.68311656
Mean Motion	14.28240832	Reference Orbit	36700.21523806

Changes are for this session only, and are not saved.

CancelOK

This dialog will allow you to examine/verify the Keplerian elements for the currently selected satellite - or you can use the pop up menu to examine the Keplerian elements of any satellite in kepler.dat. It will also do a rough calculation as to when the selected satellite will become maritime mobile :)



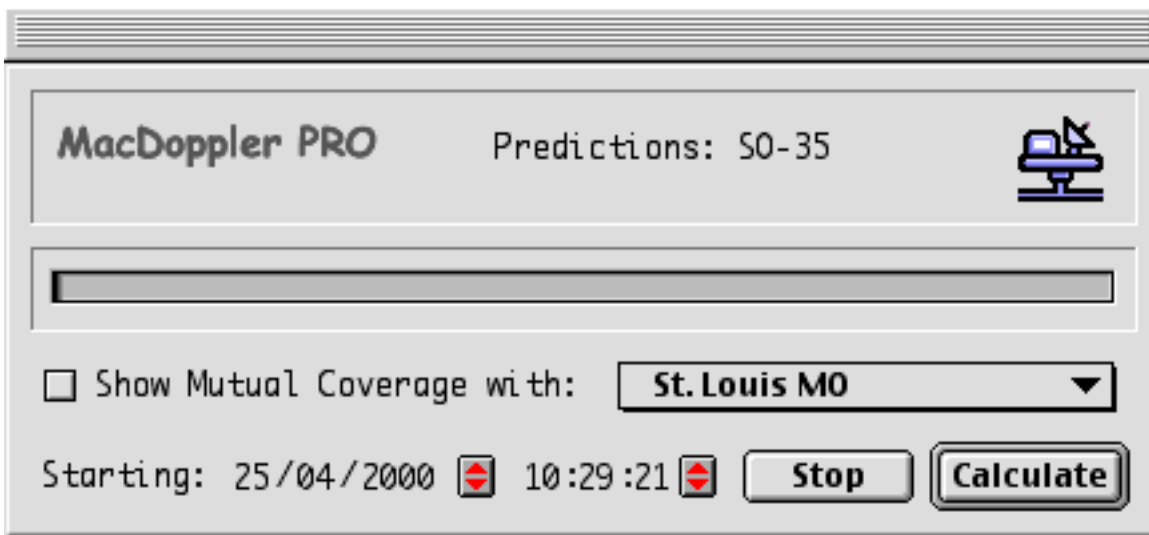
Reload Keps

If you have over edited or replaced kepler.dat, mode.dat locations.dat or tracksets.dat, this menu command will reload the changes into the program

Save Preferences

This menu command will save the current state of the program into the preferences file. This is also done automatically when you quit the program or a new satellite is chosen by the Track List software.

Do Predictions



You can adjust the start time for the prediction run with the date and time controls. When you click the Calculate button, a one month run will begin and the progress will be displayed by the progress bar and on the date and time display. You can interrupt the run at any point by clicking the Stop button.

Mutual coverage is for when you want to know when a specific sat will be available to you and a friend in another location. For example - say you want to talk to a friend in Miami on AO-27. Use 'Miami' as your 'Show Mutual Coverage with' site and it will show when the sat is visible from both locations.

A file will be produced in the MacDopplerPRO folder with a file name of the following type: UO-14 Tue, Apr 25, 2000



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MacDopplerPRO Mutual coverage: Satellite U0-14
Starting on Tuesday, December 5, 2000 at 2:19:55 PM
For Site: Toronto and Site: New York

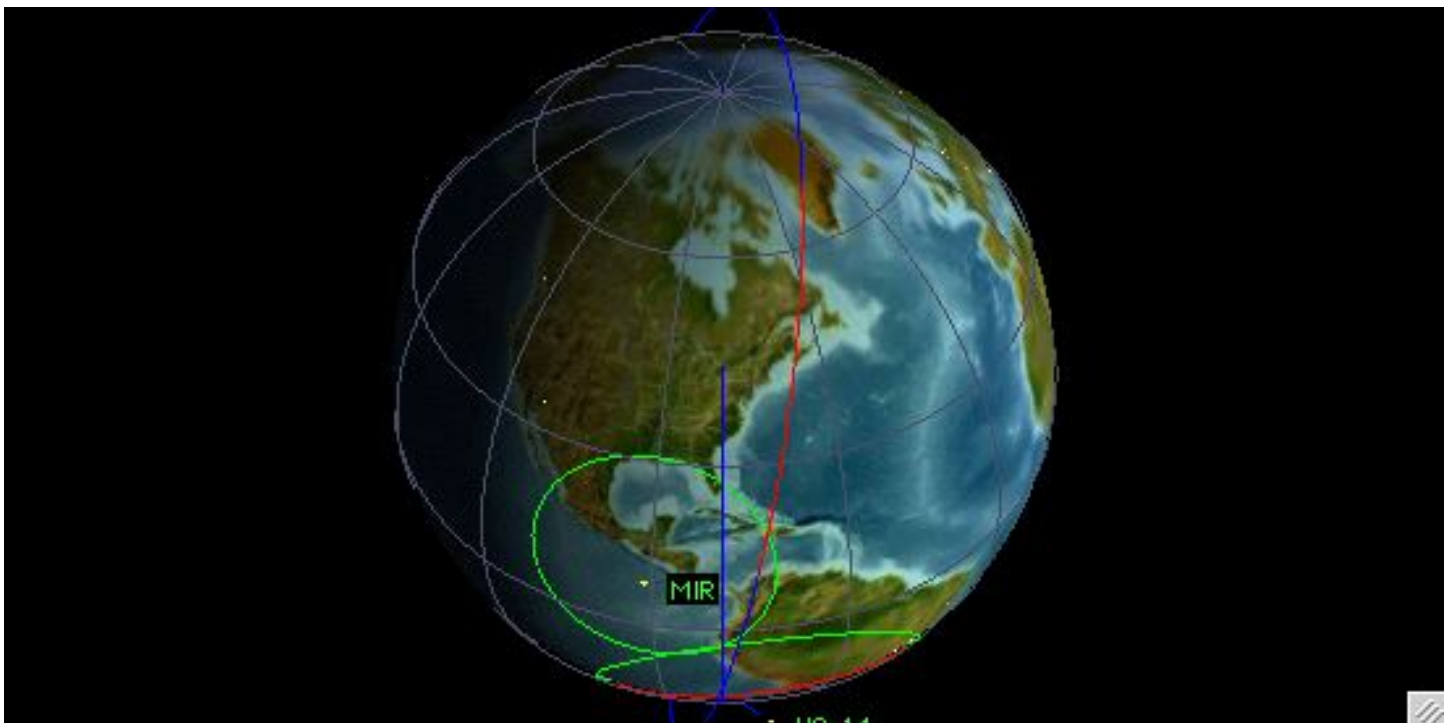
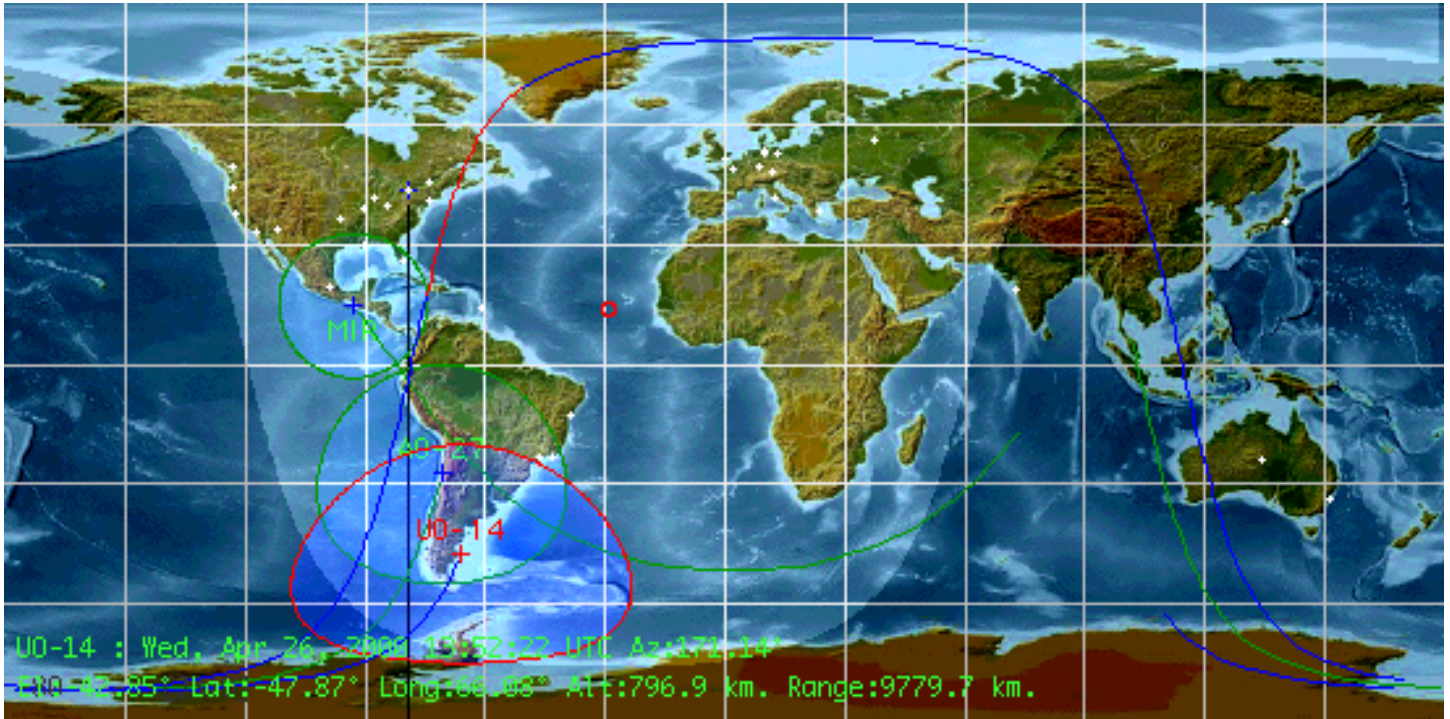
	Azim1	Elev1	Azim2	Elev2	Date	Time	Local
	-----	-----	-----	-----	-----	-----	-----
MCB:	96.8	0.0	94.8	4.5	12/5/00	7:26:27	PM
MAX:	53.1	8.2	43.1	9.5	12/5/00	7:31:32	PM
MCE:	10.5	0.3	6.0	-2.0	12/5/00	7:36:27	PM
MCB:	152.7	0.0	161.4	4.6	12/5/00	9:02:31	PM
MAX:	70.6	57.2	0.9	55.8	12/5/00	9:09:57	PM
MCE:	351.4	1.6	348.6	-2.0	12/5/00	9:16:54	PM
MCB:	206.4	0.0	219.5	0.4	12/5/00	10:43:12	PM
MAX:	268.9	18.8	281.6	11.2	12/5/00	10:49:48	PM
MCE:	327.2	2.7	327.4	-2.0	12/5/00	10:55:32	PM

Note: The Date and Times will be displayed in Local or GMT time based on the Options Menu setting for 'UTC Display'



Map Snap Shot

This menu command will create a pict file with either a 2D or 3D image of the current Map window.



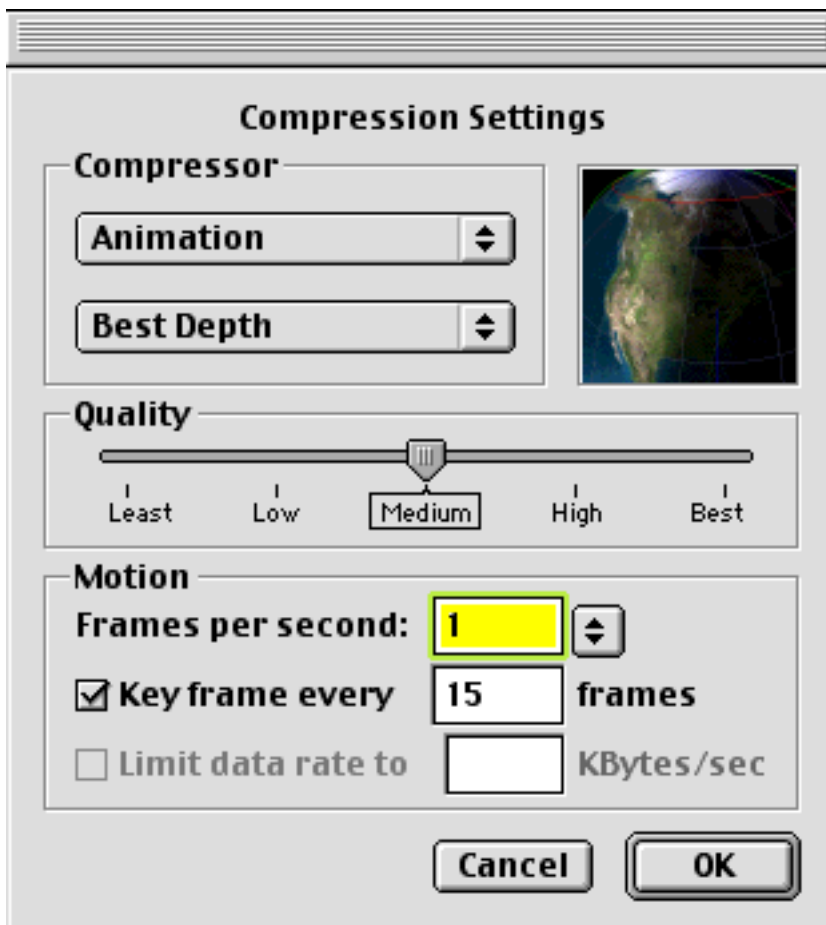


Movie...

This will allow you to create a QuickTime Movie.

First, a Dialog will prompt you for a location to store the movie...

Then, a QuickTime settings dialog will allow you to make changes to the frame rate compressor type, quality etc...



You can record the movie in real time or fast forward, 2D or 3D.

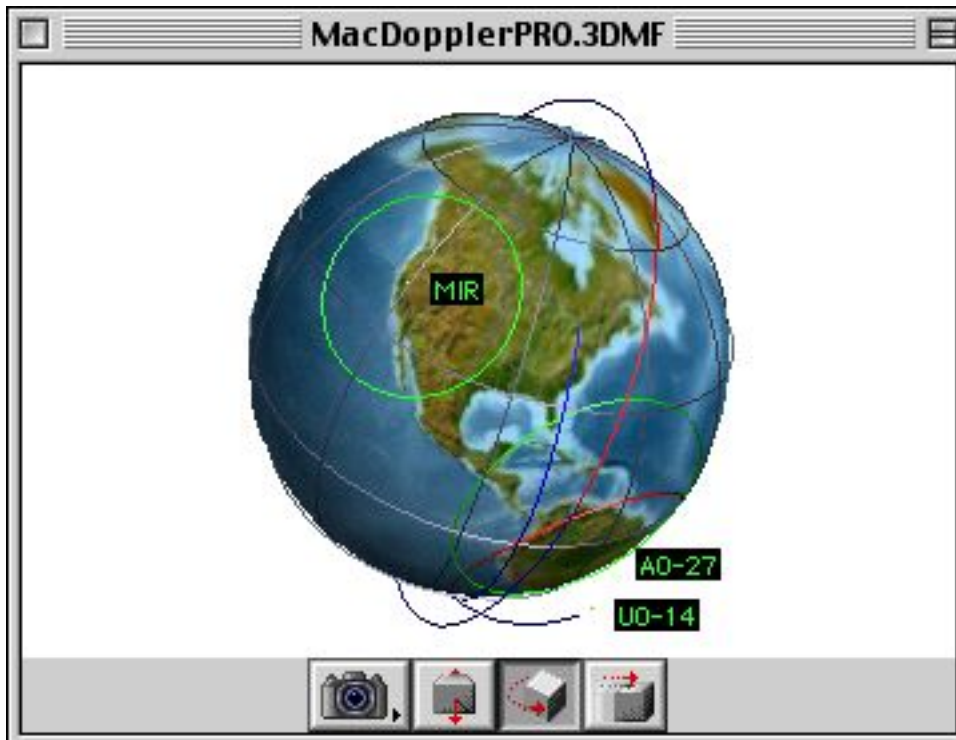
Select "Movie" again under the File Menu to stop recording.

(Thanks to Mark A. Poncelet of the Center for Aerospace Technology at Weber State University for the idea).



Export 3D Metafile

This will export a 3D Meta File which can be displayed and manipulated with SimpleText or imported into 3D programs like Geo3D.





Log Contact



The dialog box is titled "Log Contact" and contains a section for "Contact Information". It features a grid of input fields for various contact details. The fields are organized into two columns. The left column includes fields for Call Sign, First Name, Last Name, Street, City, State, Country, zip, email, and Comments. The right column includes fields for Grid, UTC, Up, Down, Mode, Satellite, Azimuth, and Elevation. Some fields have units or additional information next to them, such as "hz" for frequency and "J FM" for mode. At the bottom, there is a "My Grid:" label followed by a text field containing "FN03 jq". Below this, there are four buttons: "QRZ internet", "QRZ CD-ROM", "Cancel", and "OK".

MacDoppler PRO		Contact Information	
Call Sign	wlaw	Grid	
First Name		UTC	12/3/00 14:10:52
Last Name	ARRL HEADQUARTERS	Up	145.975.621 hz
Street	225 MAIN ST	Down	435.065.150 hz
City	NEWINGTON	Mode	J FM
State	CT	Satellite	UO-14
Country		Azimuth	102.12
zip	06111	Elevation	14.44
email			
Comments	EFDate:91064 EXDate:01057 PCall:K1ZZ		

My Grid: FN03 jq

QRZ internet QRZ CD-ROM Cancel OK

This dialog allows you to enter the QSO information with certain fields automatically entered by MacDopplerPRO. The data is saved to a tab-delimited text file that can be used with Excel, AppleWorks, or imported into a logging program or database. Optionally you can perform an Internet QRZ look up for the call sign entered or a QRZ CD lookup if you have the QRZ CD-ROM mounted on your desktop. The grid square for your site location is also automatically calculated and displayed.

Quit

Saves the preferences, closes any open serial ports and quits the application



Options Menu

Options	3D	Windows	Help
HamPage			
Full Doppler Tuning			
✓ Speech			
✓ Sounds			
Reduce Load in Back Ground			
Fast Forward			⌘F
✓ Display UTC			
Debug Log			
✓ Use Track List			⌘U
Edit Track List...			⌘T
✓ Display Track List Satellites			⌘D
✓ Use Track List for Horizon			⌘H
Site Info...			⌘I
✓ Southern DeadSpot			
✓ Show DeadSpot Crossing			
✓ Ground Coverage Circle			⌘G
✓ Ground Track			
Ground Track Length			▶
MapStyles			▶
✓ Grid Lines			
Map Update Speed			▶
✓ Sunlight			
✓ City Lights			
Zoom Map In			⌘]
Zoom Map Out			⌘[



HamPage

This feature is not available in the retail version of MacDopplerPRO.

Full Doppler Tuning

In accordance with common practice, in mode JA, the up link (lower) frequency is pegged and the Doppler correction for both transmit and receive is applied to the receive (down link) frequency. Conversely, in mode B the down link (lower) frequency is pegged and the Doppler correction for both transmit and receive is applied to the transmit (up link) frequency. You may also select 'Full Doppler Tuning' to select Doppler adjustments to be made for both the up link and the down link even when in Mode JA or Mode B - this keeps the frequencies stable with respect to the transponder and no drifting through the transponder will occur. This is useful for QSO's with more than two geographical locations - but of course, all operators engaged in the QSO must be using the same method. (See 'A Recommendation for Doppler Tuning' by Ron Parson, W5RKN, AMSAT Journal, Volume 19, #2 p 18. 1996). 'Full Doppler Tuning' is the norm for the FM birds (AO-27, UO-14 etc.) and the PacSats, so you don't have to select it from the menu when using MODE_J_FM or MODE_B_FM.

Speech

This toggles the Speech advisories on and off.

Sounds

This toggles the Sound advisories on and off.

Reduce Load in Back Ground

This menu option reduces processor load (especially 3D) when in background.

Fast Forward

This temporarily turns off the display of secondary satellites and shows the predicted path of the selected satellite in fast forward motion simulation. (10 times faster than real time, 60 times faster if the option key is depressed and 100 times faster than real time if the shift key is also pressed).



Display UTC

This toggles the display of times between UTC and local in both the Control and the Track List windows, as well as the Predictions files.

Debug Log

Selecting this menu option (it defaults to 'Off') will cause everything that comes back from the radio and rotor interfaces to be saved to a file. This is can be used with the Auto Tracker, or an EasyCom controller for example, to debug problems.



Use Track List

This toggles the use of the Track List on and off. When on, MacDopplerPRO will automatically switch to the next visible satellite that you have chosen with the Track List Editor.

Edit Track List

Satellite		Priority	Satellite		Priority
Sat 1	UO-22	3	Sat 17	None	3
Sat 2	KO-23	3	Sat 18	None	3
Sat 3	KO-25	3	Sat 19	None	3
Sat 4	TO-31	3	Sat 20	None	3
Sat 5	FO-20	3	Sat 21	None	3
Sat 6	FO-29	3	Sat 22	None	3
Sat 7	AO-27	3	Sat 23	None	3
Sat 8	SO-35	3	Sat 24	None	3
Sat 9	UO-14	3	Sat 25	None	3
Sat 10	AO-10	3	Sat 26	None	3
Sat 11	NOAA-12	3	Sat 27	None	3
Sat 12	NOAA-14	3	Sat 28	None	3
Sat 13	NOAA-15	3	Sat 29	None	3
Sat 14	NOAA-16	3	Sat 30	None	3
Sat 15	None	3	Sat 31	None	3
Sat 16	None	3	Sat 32	None	3

Use Track Set: ALL Clear Cancel OK

This dialog allows you to choose which satellites you would like to track automatically. You may also assign priorities to each satellite so that if two or more



satellites are both visible at the same time, preference will be given to the satellite with the higher (lower number) priority.

You can use the Clear button to remove all satellites from the list.

The “Track Set” pop up allows you to predefine several Track Sets by editing tracksets.dat.

Display Track List Satellites

This toggles off the display of the satellites which though not visible are in the Track List.

Use Track List for Horizon

This determines the source of satellites for the Horizon Window: either the satellites in the Track List, or all the satellites in kepler.dat.



Site Info

MacDoppler PRO Site Information

Location: **Toronto** ☒ Park Rotors Between Passes

Latitude: **43.6501** north Park AZ: **0.0** degrees

Longitude: **79.3336** west Park EL: **90.0** degrees

Altitude: **200.0** metres GMT Offset: **-4** hours

Min Elev: **0.0** degrees (Date & Time Control Panel)

Grid: FN03 hp

Defaults **Cancel** **OK**

(See the previous section on Site Configuration)

Southern Deadspot

This toggles between a Northern or a Southern Deadspot - depending on how your antenna rotors are set up. MacDopplerPRO features full predictive dead spot crossing so that a pass is never interrupted by the beam heading passing a southern dead spot.

Show DeadSpot Crossing

If selected (check mark) this menu command causes a line on the Map window to be drawn from your location to the North pole for a Northern Deadspot or to the South pole for a Southern Deadspot. The line is normally blue but will switch to red if MacDopplerPRO senses an upcoming DeadSpot crossing.



Ground Coverage Circle

This toggles the display of ground coverage circles for both 2D and 3D map window projections.

Ground Track

This toggles the Ground Track Display on and off (2D and 3D).

Ground Track Length

This hierarchical menu selects the number of orbits that the ground track (2D) and Sky Track (3D) will predict, from 0.5 to 10 and 24 hours.



Map Styles

This hierarchical menu selects which bitmap and colors to use for both 2D and 3D map window projections.

Grid Lines

This toggles the display of latitudinal and longitudinal grid lines in both the 2D and 3D map window projections.

Map Update Speed

This hierarchical menu selects which update interval (from every 20 seconds to constant) to use for both 2D and 3D map window projections.

Sunlight

This toggles the display of the Sun's coverage circle in either 2D or 3D map window projections.

City Lights

This toggles the display of the locations in locations.dat in both the 2D and 3D map window projections.

Zoom Map In

This will zoom in the 2D and 3D map window projections. The 2D projection is limited to 2 zoom levels.

Zoom Map Out

This will zoom out the 2D and 3D map window projections. The 2D projection is limited to 2 zoom levels.



3D Options Menu

3D	Windows	Help
✓	3D Projection	⌘9
✓	Eye Above Sat View	⌘8
✓	High Resolution	⌘7
✓	Hardware Renderer	⌘6
	Night Light	⌘5
	Spin Drift	⌘0
✓	Sky Track	
✓	Beam Width Display	

3D Projection

This toggles between 2D and 3D map window projections, but is only enabled on PowerPC computers, since QuickDraw 3D is only available on PPC's.

Eye Above Sat View

3D only - toggles between a camera viewpoint above the satellite or above the site location.

High Resolution

3D only - toggles between high and low resolution 3D texture maps. The low resolution setting will save memory and CPU cycles. The High Resolution option increases the 3D texture map resolution and the 3D rendering resolution. This improves the look in 3D but uses a lot more memory and CPU resources.

Hardware Renderer

3D only - toggles the 3D hardware rendering engine (if available) on and off. The Hardware Renderer option can greatly speed up 3D rendering - (very noticeable when you 'spin' the world with the mouse pointer), but on some 3D platforms (ie. the early iMacs) the hardware renderer may distort some of the graphics (ie ground tracks and coverage circles) or fail to load high resolution texture maps.



Night Light

3D only - toggles artificial night lighting on and off. This can be useful when your location is in darkness.

Spin Drift

3D only - toggles a gradual spin drift of the camera about the polar axis.

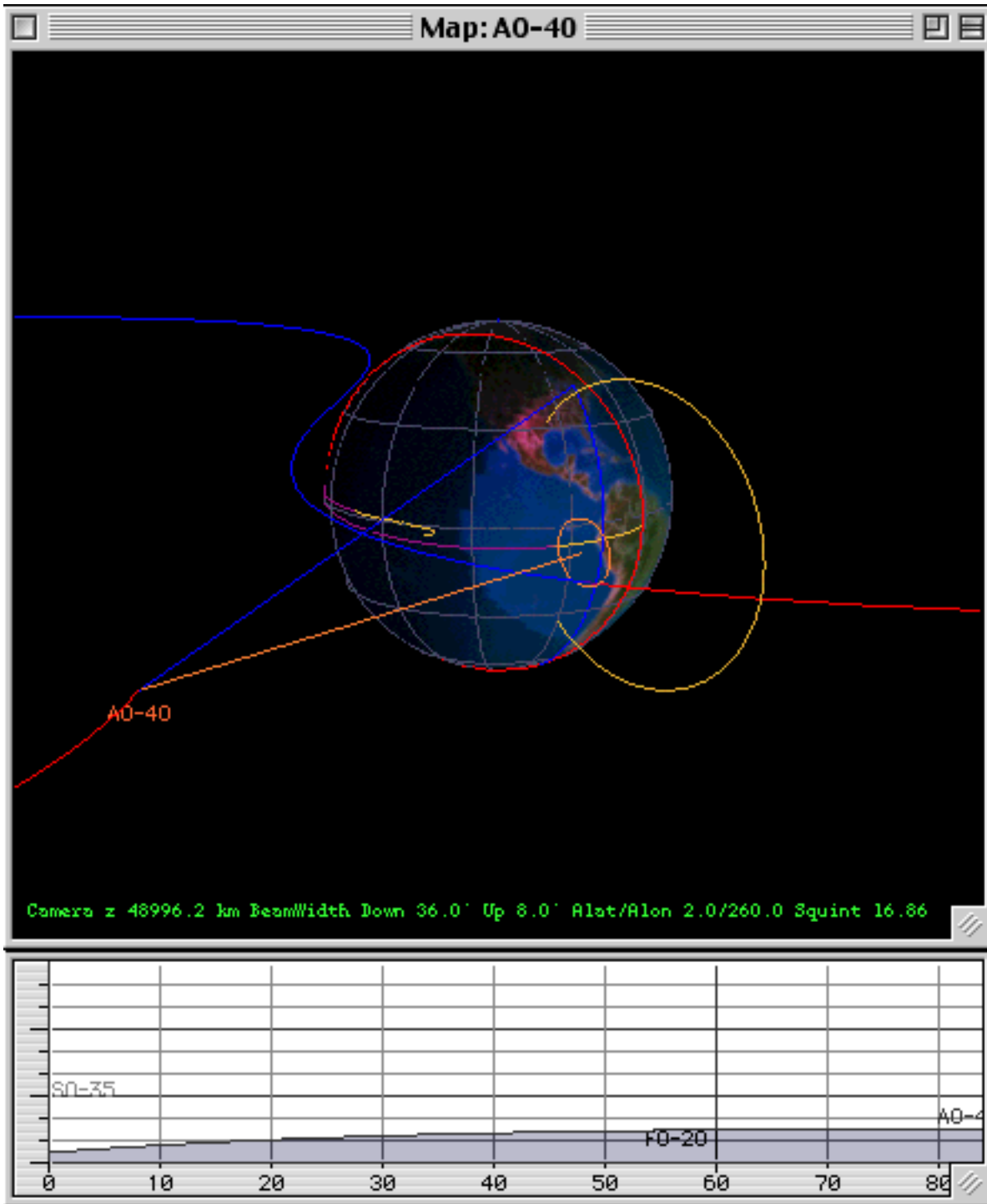
Sky Track

This toggles the Sky Track Display on and off (3D only).



Beam Width Display

This toggles the Beam Width Display on and off (3D only).
The Beam Width values are stored in mode.dat

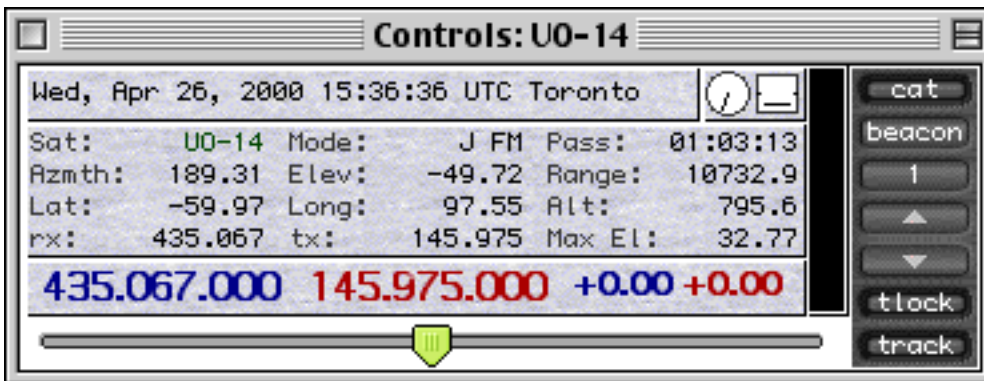




Windows Menus



Controls Window



Sat	Current satellite name from kepler.dat
Azmuth	Current azimuth in degrees (Red when satellite is visible)
Lat	Current sub-satellite latitude in degrees
rx	Down link frequency, before Doppler correction
Mode	Mode eg. J FM, B etc (from mode.dat)
Elev	Current elevation in degrees (When satellite is visible: Red when rising, Blue when setting)
Long	Current sub-satellite longitude in degrees
tx	Up link frequency, before Doppler correction
Pass	Time to satellite visibility (AOS) or elapsed when visible (Red when visible)
Range	Range from site to satellite in kilometers (Red when decreasing, Blue when increasing)
Alt	Current satellite altitude in kilometers (Red when decreasing, Blue when increasing)
Max El	Maximum elevation in degrees of next pass



Buttons



Turns the Radio Control system on and off



Switches to/from the beacon frequency in mode.dat for that satellite.



Switches amongst the 16 frequencies and modes for that satellite.
(use with shift key to decrease mode number).
(can also use 'Right/Left Arrows' on keyboard)



(Up Arrow) Move rx up 100 Hz
(use with shift key to make it 1kHz)
(use with command key to make it 10Hz)
(use the option key to make it tx frequency instead of rx frequency)
(can also use 'Up Arrow' on keyboard)



(Down Arrow) Move rx down 100 Hz
(use with shift key to make it 1kHz)
(use with command key to make it 10Hz)
(use the option key to make it tx frequency instead of rx frequency)
(can also use 'Down Arrow' on keyboard)



Tuning Lock: when 'on' or depressed (default), adjusting the tx frequency automatically adjusts the rx frequency (either inverting or non-inverting based on the cmode, and adjusting the rx frequency automatically adjusts the tx frequency (either inverting or non-inverting based on the cmode. When 'Off' transmit and receive frequencies can be adjusted independently.



Turns the use of the Track List on and off.



The slider will scan quickly through about + or - 50 kHz. Transmit frequency will track received when 'TLock' is active. (use the option key to make it tx frequency instead of rx frequency when TLock 'Off') - MacOS 8 only, or MacOS 7.1 + with Appearance Manager installed. If you hold the Option key down, the slider will adjust the PCR-1000 squelch level. (+ Shift key controls volume).

The 'S' meter is only supported on the YAESU FT-736R, the TS-2000, the PCR-1000 and the AOR-3000A (it 'lights up' with blue segments). With the ICOM Drivers, the 'S' meter shows activity on the serial link.



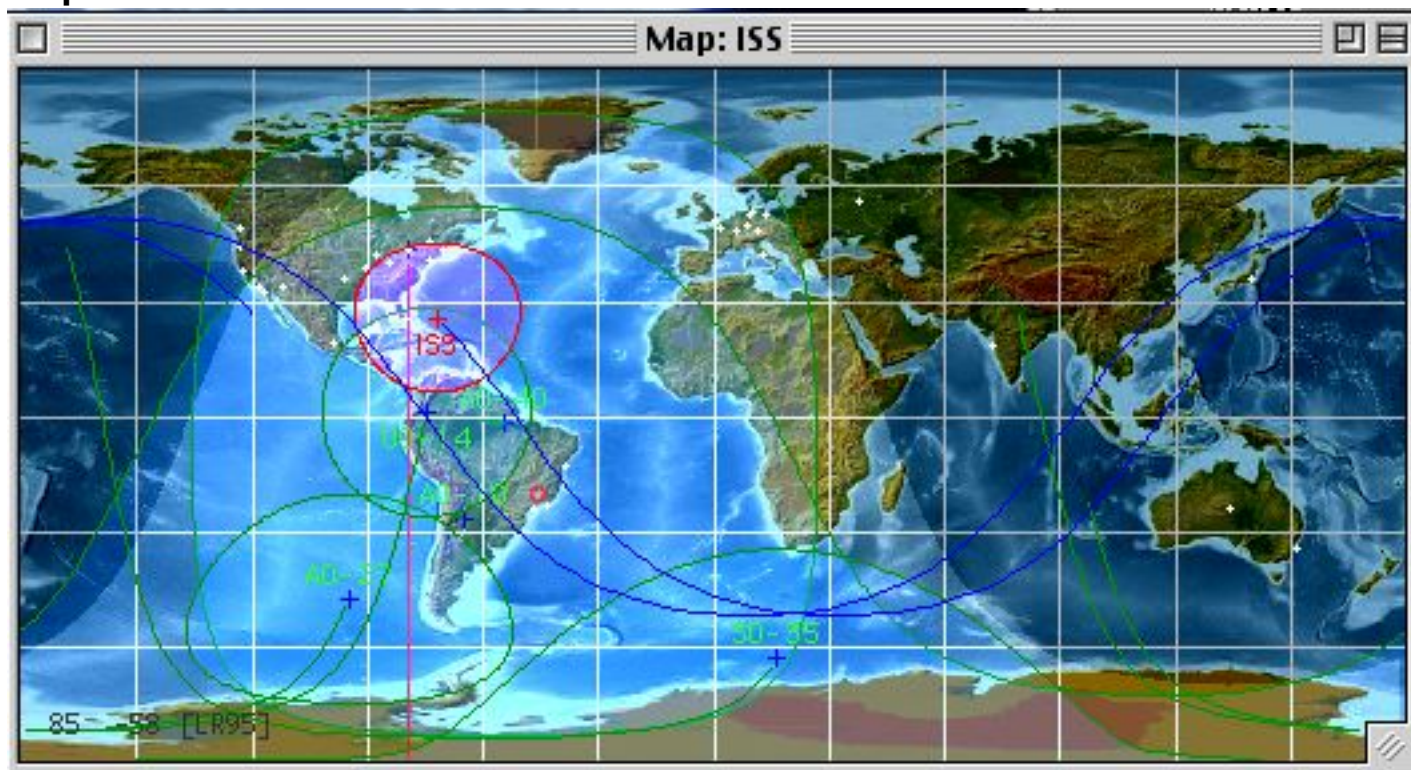
Tuning

In accordance with common practice, in mode JA, the up link (lower) frequency is pegged and the Doppler correction for both transmit and receive is applied to the receive (down link) frequency. Conversely, in mode B the down link (lower) frequency is pegged and the Doppler correction for both transmit and receive is applied to the transmit (up link) frequency. You may also select 'Full Doppler Tuning' from the Options menu (it defaults to 'Off') to select Doppler adjustments to be made for both the up link and the down link even when in Mode JA or Mode B - this keeps the frequencies stable with respect to the transponder and no drifting through the transponder will occur. This is useful for QSO's with more than two geographical locations - but of course, all operators engaged in the QSO must be using the same method. (See 'A Recommendation for Doppler Tuning' by Ron Parson, W5RKN, AMSAT Journal, Volume 19, #2 p 18. 1996). 'Full Doppler Tuning' is the norm for AO-27 and the PacSats, so you don't have to select it from the menu when using `MODE_J_FM`.

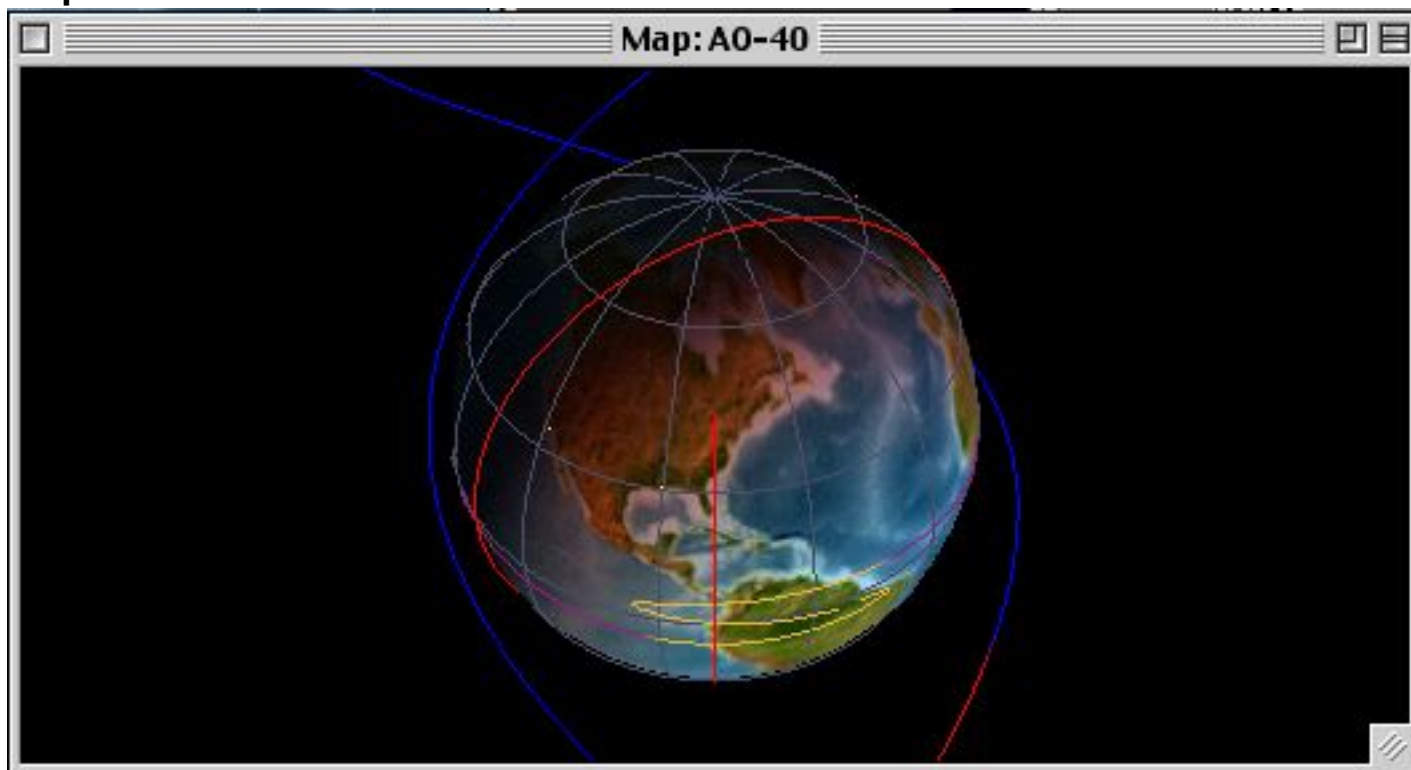
If the up link/down link frequency numbers in mode.dat are slightly off simply disengage the 'TLock' button by clicking on it. This will allow you to make fine adjustments to the up link and down link frequencies independent of one another. Several clicks on the up or down buttons are usually all that is required. Reengage the 'TLock' button and the change you have made will track throughout that channel. These off sets are remembered in the preferences, but are sensitive to Satellite order in the Keplerian elements If you want to make the change permanent, simply edit the 8 pairs of up link/down link frequencies in Mode.dat.



Map Window 2D



Map Window 3D





The High Resolution option increases the 3D texture map resolution and the 3D rendering resolution. This improves the look in 3D but uses a lot more memory and CPU resources. The Hardware Renderer option can greatly speed up 3D rendering - (very noticeable when you 'spin' the world with the mouse pointer), but on some 3D platforms (ie. the early iMacs) the hardware renderer may distort some of the graphics (ie ground tracks and coverage circles) or fail to load high resolution texture maps.

Spinning the Camera

To spin the camera about the earth, hold the mouse button down on the 3D map while dragging left to right (x-axis) for east-west (latitudinal) continuous spin and up and down (y-axis) for continuous north-south (longitudinal) spin.

It doesn't matter where you place the pointer on the 3D map, only which direction(s) you drag it in after holding down the mouse button. The mouse pointer will turn into a cross hair and trail to assist in orientation.

- Holding down the Option key while you drag the mouse disables background activity and makes for a smoother spin.
- Holding down the Shift key turns the continuous spin into a shift.
- Holding down the Command key results in the y-axis drag performing a zoom instead of a north-south spin. (x-axis drag still results in an east-west spin).
- Holding down the Caps Lock key will freeze the spin when you stop dragging the mouse, until you release the Caps Lock key.



Track List Window

Track List: F0-29											
Sat	Pri	Pass	AOS Time	MaxEI	Length	Azimuth	Elev	Δ	Lat	Long	Alt
A0-27	2	00:00:00	19:10:59	17.2	00:06:30	59.78	17.19	-	49.56	59.32	796.4
F0-29	3	00:07:21	19:18:40	1.8	00:06:10	17.09	-11.19	+	77.73	1.53	1134.9
U0-22	3	00:09:19	19:20:27	24.9	00:13:39	181.40	-23.78	+	-15.38	80.49	763.2
U0-14	1	00:16:33	19:27:42	10.8	00:11:08	140.06	-36.79	+	-26.46	34.08	792.8
F0-20	3	00:56:34	20:07:44	10.7	00:13:39	253.05	-69.14	-	-42.41	206.42	1339.6
ISS	3	01:45:54	20:57:09	0.7	00:02:49	172.75	-25.37	+	-13.13	73.00	388.5
A0-10	3	04:25:46	23:37:06	53.5	10:32:39	41.47	-52.99	+	-7.80	286.38	30251.5
A0-40	5	11:02:35	06:13:56	18.8	04:34:27	24.42	-42.77	+	4.72	278.14	58964.7

Track List Window Headings

The track list window displays the satellites in the current track list sorted automatically in the order of upcoming visibility. The data displayed are:

Sat Satellite Name from kepler.dat.

Pri User assigned priority.

Pass Time till AOS or elapsed while visible.

AOSTime Local or UTC time of next pass (Set in Options Menu: UTC Display).

MaxEI Maximum elevation during next pass in degrees.

Length Length of upcoming pass, or remaining time while visible. (hh:mm:ss).

Azimuth Current azimuth in degrees.

Elevation Current elevation in degrees.

Δ A + sign indicates that the satellite's elevation is increasing.

Lat Current latitude of sub-satellite point in degrees.

Long Current longitude of sub-satellite point in degrees.

Alt Current altitude of satellite in kilometers.

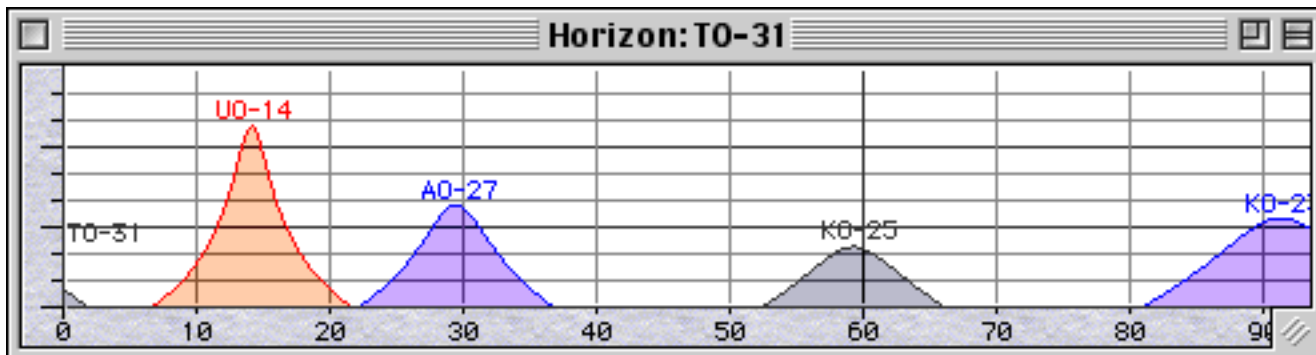


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Δ	A + sign indicates that the satellite's altitude is increasing.
Range	Current range from satellite to site location in kilometers (not shown above - drag the bottom right corner to expand/contract the Track List Window).
Phase	in ticks (0-255), specifies the mean angle of the Satellite on an orbit ellipse at a particular time, assuming a constant mean motion throughout the orbit. It is the angle which describes the position of the Satellite relative to perigee. At perigee, the Mean Anomaly is zero, it increases to 180 degrees at apogee (128 ticks), then back to perigee at 360 degrees (255 ticks). For circular orbits, the Phase is the angle between perigee and the current satellite position.
MAXETime	Local or UTC time of Satellite's maximum elevation. (hh:mm:ss).
LOS Time	Local or UTC time of Satellite LOS. (hh:mm:ss).
Velocity	of the Satellite relative to the site in km/sec.



Horizon Window



The Horizon window displays a plot of satellites sorted automatically in the order of upcoming visibility. The time in minutes to AOS, Max Elevation and LOS are plotted on the X axis, and the Maximum Elevation in degrees is plotted on the Y Axis.

The option “Use Track List for Horizon” determines the source of satellites for the Horizon Window: either the satellites in the Track List, or all the satellites in kepler.dat.

(Thanks to Steve Dimse and Bob Bruninga for the idea).



Configuration Files

(Simple Text editable)

kepler.dat: Can be either format Keplerian elements.

2-Line:

DECODE 2-LINE ELSETS WITH THE FOLLOWING KEY:

```
1 AAAAAU 00 0 0 BBBB.BBBBBBBB .CCCCCCC 00000-0 00000-0 0 DDDZ
2 AAAAA EEE.EEEE FFF.FFFF GGGGGG HHH.HHHH III.IIII JJ.JJJJJJJKKKKKZ
KEY: A-CATALOGNUM B-EPOCHTIME C-DECAY D-ELSETNUM E-INCLINATION F-RAAN
G-ECCENTRICITY H-ARGPERIGEE I-MNANOM J-MNMOTION K-ORBITNUM Z-CHECKSUM
```

TO ALL RADIO AMATEURS BT

AO-10

```
1 14129U 83058B 00111.71281053 -.00000031 00000-0 10000-3 0 6414
2 14129 26.9588 335.1191 6024509 45.1315 350.4214 2.05869894126745
```

Note: To allow skipping over email headers in kepler.dat, the first satellite in the list must be of the format "AO-10" or UO-14" rather than "MIR" or "ISS". That is to say two alphabetic characters, followed by a dash, with a total line length less than 24.

Or:

```
HR AMSAT ORBITAL ELEMENTS FOR OSCAR SATELLITES
FROM WA5QGD FORT WORTH,TX April 21, 2000
SEND SUBSCRIBE/UNSUBSCRIBE TO majordomo@amsat.org ONLY
BID: ORB00112.0
TO ALL RADIO AMATEURS BT
```

Satellite: AO-10

Catalog number: 14129

Epoch time: 00111.71281053

Element set: 641

Inclination: 26.9588 deg

RA of node: 335.1191 deg

Eccentricity: 0.6024509

Arg of perigee: 45.1315 deg

Mean anomaly: 350.4214 deg

Mean motion: 2.05869894 rev/day

Decay rate: -3.1e-07 rev/day^2

Epoch rev: 12674

Checksum: 271



locations.dat: will hold up to 128 locations with the entries in the following format:

```
Location:      Toronto (maximum 20 characters)
Latitude:      +43.6501
Longitude:     +79.3336
```

If you know your exact decimal latitude and long - just put it in there. Otherwise, If you have a friend with a GPS who is willing to drop by your QTH and give you an exact reading of latitude, long and elevation - so much the better. As a last resort you can get your approximate latitude and long from the internet. You can also just edit the latitude and long fields in the 'Site' dialog manually. The locations.dat file is just a short hand way to add other locations in case you are going to operate from another place besides 'home'. In any case send your latitude and long to me and I will include them in 'locations.dat' in future releases. Your time zone is set as a System parameter by the date & time control panel device and basically tells the computer what your offset from GMT (Zulu) is. The nice thing about setting/taking this from the system, is that in the most recent releases of the MacOS, Daylight-Savings-Time is automatically adjusted for.



mode.dat: This file holds the frequency and mode combination for the satellites you are interested in. You can enter up to sixteen frequency and mode combinations as well as 16 beacon frequencies and 16 CTCSS Tones (encode and decode).

```
Satellite: A0-10
Uplink:    435.11720 435.10720 435.09720 435.08720 435.07720 435.06720 435.05720 435.04720
Downlink:  145.88570 145.89570 145.90570 145.91570 145.92570 145.93570 145.94570 145.95570
CMode:     B_SSB    B_SSB    B_SSB    B_SSB    B_SSB    B_SSB    B_SSB    B_SSB
Beacon:    145.80770 145.80780 145.80790 145.80800 145.80810 145.80820 145.80830 145.80840
Tone:      0        0        0        0        0        0        0        0
CTone:     0        0        0        0        0        0        0        0
TxVrtrUp:  0        0        0        0        0        0        0        0
TxVrtrDn:  0        0        0        0        0        0        0        0
TrackHours:111111111111111111111111
Beam:      15      15      15      15      15      15
```

// Modes: Can be the following labels or numbers (eg. either "4" or "B_SSB")

```
//
// REPEATER      1    // MIR Safex
// J_FM          2    // A0-27, S0-35, 9600 baud FSK FM : K0-23, K0-25, U0-22
// JA_SSB        3    // F0-20, F0-29
// B_SSB         4    // A0-10
// A_SSB         5    // RS-16
// SIMP_FM       6    // D0-17 dove, MIR Simplex
// JA_CW         7    // F0-20, F0-29 CW
// B_CW          8    // A0-10 CW
// A_CW          9    // RS-16 CW
// B_FM         10    // S0-35 B FM
// JD_MIX        11    // A0-16 etc
// WIDE_FM       12    // Weather Sats
```

Tone: & CTone: See the YAESU FT-736R Operating Manual, page 45. or the Kenwood TS-2000 Instruction Manual page 33 for Tone and CTCSS Tone index numbers.

The ICOM IC-820,821 Radios do not support in-band Doppler correction and therefore Cmodes 1 and 6 work only for receive. These Cmodes are supported on the YAESU FT-736R, Kenwood TS-2000 and the FT-847.

TrackHours:

These 24 characters represent the 24 hours of the day in local time. A '1' signifies that the satellite is active during this hour and is eligible for tracking. A '0' indicates that the satellite is inactive for this hour and if it's predicted AOS is within this hour the satellite will be ignored for that pass, and will show as light grey in the Track List.



Tracksets.dat

This file allows you to collect sets of satellites that you can enter into the Track List as a group:

```
//  
// Sets of satellites to add to the TrackList - trackset.dat  
//  
// Please email suggested changes/improvements to <tracksets@dogparksoftware.com>  
//  
//  
//      Title      List of Satellites (Maximum 32 entries for each set)  
//      -----  
TrackSet: FM      A0-27 U0-14  
TrackSet: FM&ISS&P3 A0-27 U0-14 ISS A0-40 A0-10  
TrackSet: Phase3   A0-10 A0-40  
TrackSet: FujiSats F0-20 F0-29  
TrackSet: PacSats  U0-22 K0-23 K0-25 T0-31  
TrackSet: PacSat&FM U0-22 K0-23 K0-25 T0-31 A0-27 U0-14  
TrackSet: PacSat&Fuji U0-22 K0-23 K0-25 T0-31 F0-20 F0-29  
TrackSet: RussianWX MET-3/5 RESURS OKEAN-0  
TrackSet: NOAA     NOAA-12 NOAA-14 NOAA-15 NOAA-16  
TrackSet: All       A0-10 A0-40 A0-27 U0-14 F0-20 F0-29 ISS U0-22 K0-23 K0-25 T0-31
```



Registration (Amateur Use)

Commercial Users please contact Dog Park Software Ltd.

\$65.00 USD AMSAT Members

\$75.00 USD AMSAT Non Members

Radio Amateur Satellite Corporation (AMSAT-NA)

Attn: Martha Saragovitz,
850 Sligo Ave.,
Silver Spring MD,
20910-4703 USA.

Voice: (301) 589-6062 Fax: (301) 608-3410

martha@amsat.org

<http://www.amsat.org/amsat/catalog/software.html>

Register Online <<http://order.kagi.com/?XOB>>

Support

D o g P a r k S o f t w a r e L t d .

Don Agro
8 Cliffcrest Drive,
Toronto, Ontario.
Canada M1M 2K2

Office: (416) 261-7977
Fax: (416) 261-4733
email: support@dogparksoftware.com
www: <http://www.dogparksoftware.com>



Revision History

- v1.0.0 01/Aug/99 First Release. Track up to 16 Satellites simultaneously.
Separate windows for Map, Controls and Track List.
Added 'locations.dat' for quick location changes: can store up to 128 locations.
New Frequency Display in the Controls window.
Reformatted Track List display.
Keep Track List sorted in order of next pass.
Remember Maximum Elevation through out pass.
New grey buttons.
'S' meter shows serial link activity on ICOM radios.
Full 3D projection model of earth (PowerPC Only)
Realistic Solar lighting model.
Ability to 'spin' the camera position about the earth.
View the earth from above site location or above Satellite.
- v1.0.1 02/Aug/99 Fixed mouse-down in 2D map crash.
- v1.0.2 03/Aug/99 Error Alerts added for missing SpeechLib and QuickDraw 3D.
Option-UpArrow bug fixed.
Frequency offset display bug fixed.
- v1.0.3 08/Aug/99 Added SARtek Driver.
Better Update efficiency.
Display the GMT Delta in the Site Dialog.
- v1.0.4 08/Aug/99 Site Info bug fixed.
- v1.0.5 18/Aug/99 Set fill light (blue) to come from the direction of the Moon.
Added Texture Mapped Moon model.
Added more zoom levels to 3D.
Added Predictions starting from any arbitrary date.
Speeded up the prediction calculations.
Added Hi-Res Geo-Political Boundaries Map.
Added 3D Camera 'Spin Drift' Option.
- v1.0.6 02/Sep/99 Add closed hand cursor to 3D map drag.
Better handling of QuickDraw3D memory leaks: Close serial ports and Quit.
Finer mouse control over spin.
Switched from Phong to Lambert shader.
Lo-res 'Cyan' map changed to Hi-res 'Indigo'
Moon surface texture added.
- v1.0.7 10/Sep/99 Added Hi-res 'Fiesta' map
Fixed Track List change-monitor-depth bug.
Better resolution for Track List Satellites' calculations.
Added Threaded Multitasking so that Maps & Track List will continue to update while dialogs are displayed - including satellite predictions.
Added Show Mutual Coverage option to Predictions.
Added Location Name Display to Controls Window.
- v1.0.8 6/Sep/99 Added Icom IC-970 Driver
Automatically switch the radio between U/V and V/U
- v1.0.9 29/Sep/99 Fixed bug where sat missing from keps would confuse tracklist.
Better handling of low memory conditions (missing buttons).
Added Hexadecimal output to radio & rotor debug logs.
- v1.1.0 03/Oct/99 Missing Buttons (when switching Map styles) bug fixed.
Speech bug fixed.
Added 'tracksets.dat' for quickly adding sets of satellites to the Track List.
- v1.1.1 05/Oct/99 Resource Map bug fixed.
- v1.1.2 18/Oct/99 Rebuilt with CodeWarrior PRO 5.2
Closing Map Window now saves on system resource use.



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- v1.1.3 21/Oct/99 Fix for multiple monitors.
Increased stack size of Map thread to 256k.
Closing the TrackList or Controls windows frees up resources.
Missing buttons fixed for the last time. (no really - I mean it this time, honest, it's absolutely, positively fixed this time)
- v1.1.4 30/Oct/99 Tuned up for MacOS 9.
- v1.1.5 30/Nov/99 Added (+/-) Ascending/Descending to Track List Display.
Changed Predictions to 31 days (can cancel at any time).
'HamPage' disabled in retail version.
Added extra (hz) digit to uplink&downlink frequency display.
Support FT-847 through the Endeavour AutoTracker.
Added 3D Hardware Renderer support option (you may want to disable 'HiRez Texture Maps' for some cards).
Option Key disables calculation when 'spinning' the camera.
- v1.1.6 06/Dec/99 Improved 3D skytrack polyline.
Brightened moon light.
Added City Lights option (from 'locations.dat').
Added the Option to change update speed.
- v1.1.7 26/Dec/99 Bug with elapsed pass time when update speed is not 1 second.
Fix Grow Icon draw in background.
Added 180 degree elevation max init to AutoTracker driver.
Added CMode 11 (MODE_JD_MIX) for AO-16 etc.
Change Track List 'Pass'(Time To AOS) to 'AOS'(AOS Time Local)
(The control window continues to show 'Pass'(Time To AOS)
- v1.1.8 01/Jan/00 Fix for Y2K Norad keps format.
- v1.1.9 09/Jan/00 MW CodeWarrior PRO 5.3.
Controls window frequency update bug for AutoTracker.
- v1.2.0 17/Jan/00 Added announce snd.
Shift key + mouse down in 3D'moves' the world without spinning.
Added a seperate menu option to turn sounds on and off.
Allow 24 character Satellite Names in the Keps.
- v1.3 22/Feb/00 Sounds option was stuck 'on' at start.
Update VFO doppler display even if no radio connected.
Add AutoTracker version 4.0 firmware support: (internal jumper selects G-5400 vs G-5500).
Fix bug with AutoTracker deadspot flip when parking disabled.
Added new Geo-Political Map.
Allow City Lights Locations display in 2D map projection.
Added option to turn Lat & Long Lines display on and off.
Added Lines of latitude and Longitude display to 3D projection.
Both 'Pass Time' (Local) and 'Time to AOS' in Track List.
- v1.3.1 13/Mar/00 AutoTracker Radio & Rotor Mode-A fix.
Night Light Option added.
- v1.4.0 11/Apr/00 Fix for 2line kep error on 68k machines.
Added Satellite Prioritization to Track List.
Mode A fixed (changed to USB Up, USB Down).
Added 3D Metafile Export.
Better control over Map Update Speed.
Improved TrackList satellite switch speed.
More accurate 3D ground coverage circles.
Added 'Pass Length' field to Track List display.
Improved 'Fast Forward'.
Better performance and memory footprint for 3D Low Resolution
- v1.5.1 01/May/00 New Maps from "The Living Earth, Inc."
Automatic Grid Square Locator calculation in the 'Site Info'



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- Dialog and to the 2D projection map display.
QSO Logging to a tab delimited Excel text file added.
Satellite Prioritization 'flip-flop' bug fixed.
Added QRZ Internet Call Sign Lookup.
Decay Date Calculation added to Keps editor.
User Manual and Reference.
Mouseover indication added to Controls Window buttons.
- v1.5.2 24/Jun/00 Fix for Log record end-of-line.
New Threads for Rotor Control and Auxillary Calculations for smoother threading.
Preserve Log Record contents over calls to QRZ Lookup.
Added Option to toggle the display of times between UTC and local in both the Control and the TrackList windows, as well as the Predictions files.
- v1.5.3 29/Jul/00 Fix for bug in reading locations.dat.
- v1.5.4 12/Aug/00 Added Support for GetSatList, and GetSatInfo AppleEvents.
Selecting a satellite from the TrackList window now turns off tracking to facillitate switching to the selected satellite.
Horizon window added to show all upcoming satellite passes on a time line...
(Thanks to Steve Dimse and Bob Bruninga for the idea).
BackGround resource saver now used only for slower machines.
- v1.5.5 15/Aug/00 Fix for 68k Horizon Window bug.
- v1.5.6 15/Sep/00 Added Site minimum Elevation red line to Horizon Window.
Added MAXETime and LOSTime to Track List Window.
Successful Track List Edit Dialog turns Track List on.
Trap massive QD3D errors and quit.
Added Option to reduce processor load (especially 3D) when in background.
A Full Screen 3D Map mode has been added: Holding the Option key while clicking in the map window zoom box will display the 3D map projection in FullScreen mode. Re-Sizing the window or switching to 2D will cancel Full Screen Mode.
A Track Hours entry has been added to mode.dat so that satellites such as AO-27 can be ignored during the hours they are not active.
Pseudo-Keps for the Moon built in.
- v1.5.7 18/Sep/00 Bugfix.
- v1.5.8 19/Oct/00 Rebuild with CodeWarrior PRO 6.
Wide FM mode added to the AOR-3000A , ICOM R-8500 & ICOM R-7000 drivers.
The "CAT" button now releases the serial ports toother programs when disengaged.
Dim Track-Hour-Disabled satellites on the 3D Map.
Better placement of 3D Map Satellite Labels.
Changed 3D city lights from line to ellipsoid.
Added a cursor reference cross to 3D Map spin.
Camera spin mouse x & y made orthogonal with lines of latitude and longitude (more intuitive).
At any point during a spin... Option key suspends other threads,
Shift key changes 'spin' to 'static rotate'.
Clicks in inactive windows just bring the windows to the front, they no longer register as a content clicks.
- v1.5.9 23/Nov/00 Fully tested for Phase3D (AO-40).
A 3D Ground Track has been added to the existing Sky Track.
Better parsing of TLE files.
Track List increased from 16 to 32 Satellites.
Preferred Memory Partition increased from 6mb to 12mb.
An option has been added to select the number of orbits that the Ground Track or Sky Track will predict, from 0.5 to 10.
The control Window Altitude and Range values are now coloured Red when decreasing and Blue when increasing.
Options add to turn Ground Track, Sky Track display on and off.



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- v1.6.0 11/Dec/00 Added QRZ CD-ROM Call Sign Lookup (Coutesy James Nedbalek).
Added Kenwood TS-790A Driver. (Note: all users adjust your Configure Ports Dialog).
Added Kenwood TS-2000 Driver. (Note: all users adjust your Configure Ports Dialog).
Added Mean Anomaly (Phase) and Velocity to the Track List display.
Improved 3D zoom. You can now zoom the 3D map by holding the Command key while dragging the mouse over the map.
Maximum Modes increased from 8 to 16 in mode.dat.
Labels as well as numbers accepted for cModes in mode.dat
Optimized (faster) calculations.
3D Options have their own menu.
Added Beam Width Illumination to the 3D Projection.
Caps Lock freezes a camera spin until you release it.
Camera distance to earth's surface in kilometers displayed on 3D Projection.
- v1.6.1 14/Jan/01 A Command delay value has been added to the Port Configuration Dialog.
Added "Living Earth GPB" map.
Added Mode T SSB and CW for RS-12/13.
Added "Beam Width Display" 3D Option.
Added "BeamUp:" and "BeamDwn:" beam widths to mode.dat and 3D display.
Added satellite antenna "bore sight" line in Beam Width Display from satellite to earth.
Added "Suint Angle" calculation to "Beam Width Display" 3D Option.
Tested on MacOS 9.1.
- v1.6.2 02/Feb/01 Kenwood TS-2000 driver enhancements.
- v1.6.3 18/Feb/01 Fix for Predictions Dialog where Molnya orbits (AO-10,40) show AOS late into the pass. Thanks to Shoichi Jim Nakashima (7K4iiN) for pointing this one out.
Kenwood TS-2000 driver enhancements.
Added Icom IC-910 Driver. (Note: all users adjust your Configure Ports Dialog).
New HiRez DEM Map.
CTCSS Tone (Encode & Decode) added to FM modes for FT-736R, FT-847 & TS-2000.
- v1.6.4 22/Apr/01 Added Driver for Icom PCR-1000
Added QuickTime Movie creation capability (Thanks to Mark A. Poncelet of the Center for Aerospace Technology at Weber State University for the idea).
Improved Moon Calculations.
The TrackList now displays Δ Elevation (+/-) as well as Δ Altitude (+/-).
Improved Satellite Viewpoint 3D Option.
AntiAliasing added to all lines in 3D.
Added "Orbit" number to Track List Display.
- v1.6.5 23/Apr/01 3D Window Resizing bug fixed.
- v1.6.6 26/Apr/01 AO-40 prediction bug fixed.
Unregistered run time increased to 20 minutes.
Fix for Missing SpeechLib Crash.
- v1.6.7 15/May/01 The Option Key and the VFO slider sets the PCR-1000's squelch level (+ shift controls volume).
Added an option for a second receive radio port.
Added driver for Kenwood TS-50.



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