

Getting Started with PSS Toolboxes

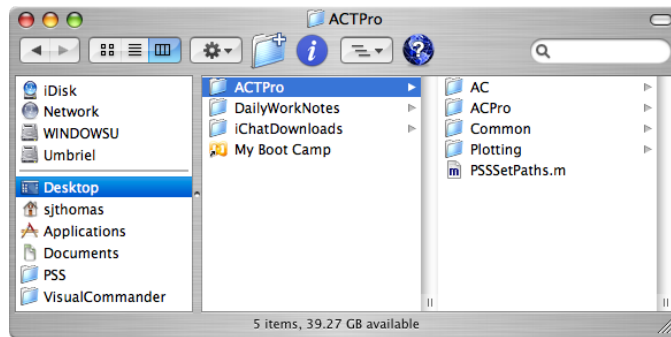
This Getting Started sheet will help you install and run your Aircraft, Spacecraft or Wind Turbine Control Toolbox. These instructions apply to full purchases or time-limited demos. Thank you from all of us at Princeton Satellite Systems (PSS) for your interest in our products!

Installation

You should have received or downloaded one or more archives containing the software. Create a folder for your new software anywhere on your computer and move the folder(s) extracted from the archives into this folder. There is no “installer” application to do the copying for you. Depending on the products you have purchased, you will receive some subset of these folders, which should be stored together on your computer:

- AC
- ACPro
- AttitudeControl
- Common
- CubeSat
- Estimation
- FormationFlying
- Imaging
- Link
- Orbit
- Plotting
- Power
- Propulsion
- SAAD
- SC
- SCPro
- SolarSail
- Thermal
- WindTurbine

For example, if you purchase the Aircraft Control Toolbox professional edition, you will download an archive with AC, ACPro, Common, and Plotting. If you purchase the Formation Flying Module, your archive would contain only FormationFlying. All PSS toolbox folders should be stored together in one new folder that you create, for example ACTPro, as shown below. A copy of the `PSSSetPaths.m` function should be stored with your folders.



All you need to do now is to set the MATLAB path to include the toolbox software. We recommend using the supplied function `PSSSetPaths` instead of MATLAB’s path utility. From the MATLAB prompt, `cd` (change the current directory) to your toolbox folder on your computer and then run `PSSSetPaths`. It will set all of the paths for the duration of the session, with the option of saving the new path for future sessions.

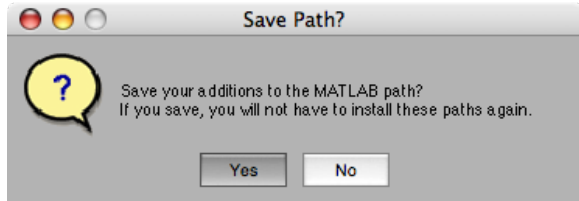
For example,

```
>> cd /Users/me/Desktop/ACTPro
```

```
/Users/me/Desktop/ACTPro
```

```
>> PSSSetPaths
```

You will then see this dialog:



if you choose not to save the path, the output message will look like this:

```
Your path has been updated, but has not been saved.  
Type "savepath" to save your changes to the path.
```

```
>>
```

Or, if you do choose to save the new path, you will get this message:

```
>> PSSSetPaths
```

```
Your path has been updated and saved.
```

```
>>
```

You can verify your new path by typing `path` to print the entire path to the command line, or you can see all of your installed products more concisely by typing `ver`. For example, if you have installed the Spacecraft Control Toolbox, when you type `ver` you will see output like this:

```
>> ver  
-----  
MATLAB Version 7.4.0.287 (R2007a)  
...  
-----  
MATLAB                               Version 7.4           (R2007a)  
Simulink                             Version 6.6           (R2007a)  
PSS Toolbox Folder AttitudeControl  Version 7.0  
PSS Toolbox Folder Common           Version 7.0  
PSS Toolbox Folder Estimation        Version 7.0  
PSS Toolbox Folder FormationFlying   Version 7.0  
PSS Toolbox Folder Link              Version 7.0  
PSS Toolbox Folder Orbit             Version 7.0  
PSS Toolbox Folder Plotting          Version 7.0  
PSS Toolbox Folder SAAD              Version 7.0  
PSS Toolbox Folder SC                Version 7.0  
PSS Toolbox Folder SCPro             Version 7.0  
PSS Toolbox Folder Sail              Version 7.0
```

Each folder from the list above will be printed separately.

Documentation

The information in this sheet is also available in the Aircraft or Spacecraft Control Toolbox User's Guides. The Guides provide details on more complex toolbox features such as building CAD models and creating your own MATLAB GUI's using PSS plugins, as well as reviewing the MATLAB syntax used commonly in our toolboxes. The guides are downloadable from our website. The website also hosts an online API of all the function and demo headers.

Table 1. Free website documentation

SCT User's Guide	http://www.psatellite.com/sct/pdfs/sct_manual.pdf
Formation Flying Guide	http://www.psatellite.com/sct/pdfs/ff_manual.pdf
Solar Sail Guide	http://www.psatellite.com/sct/pdfs/sail_manual.pdf
SAAD Guide	http://www.psatellite.com/sct/pdfs/saad_manual.pdf
SCT API	http://www.psatellite.com/sct/api/sct_api.php
ACT User's Guide	http://www.psatellite.com/act/pdfs/act_manual.pdf
ACT API	http://www.psatellite.com/act/api/act_api.php
WCT User's Guide	http://www.psatellite.com/wct/pdfs/wct_manual.pdf

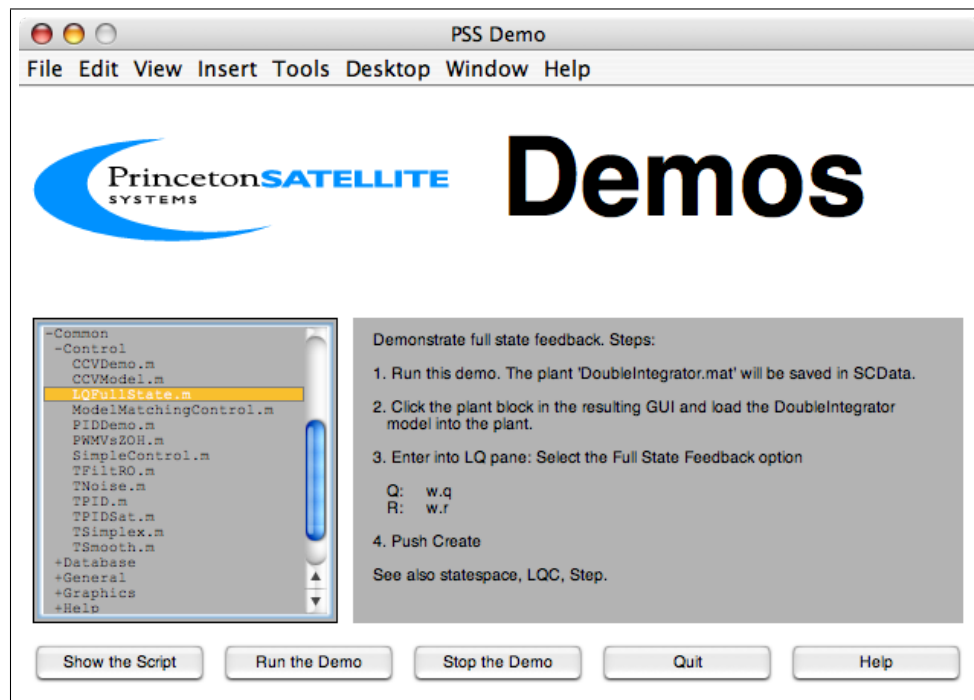
The Spacecraft Control Toolbox also comes with a theory guide that provides technical background on the functionality provided. The theory guide is downloadable from your product login page, <http://www.psatellite.com/downloads>.

Getting Started

This section introduces three interfaces you can use to get started with the toolbox: DemoPSS, FileHelp, and Finder.

Each toolbox or module has a Demos folder and a function DemoPSS.m. Never move or remove this function from any of your modules! DemoPSS.m looks for other DemoPSS functions to determine the location of all demos so it can display them in the demo GUI. Type DemoPSS at the command line, as shown, and the GUI appears:

```
>> DemoPSS
```



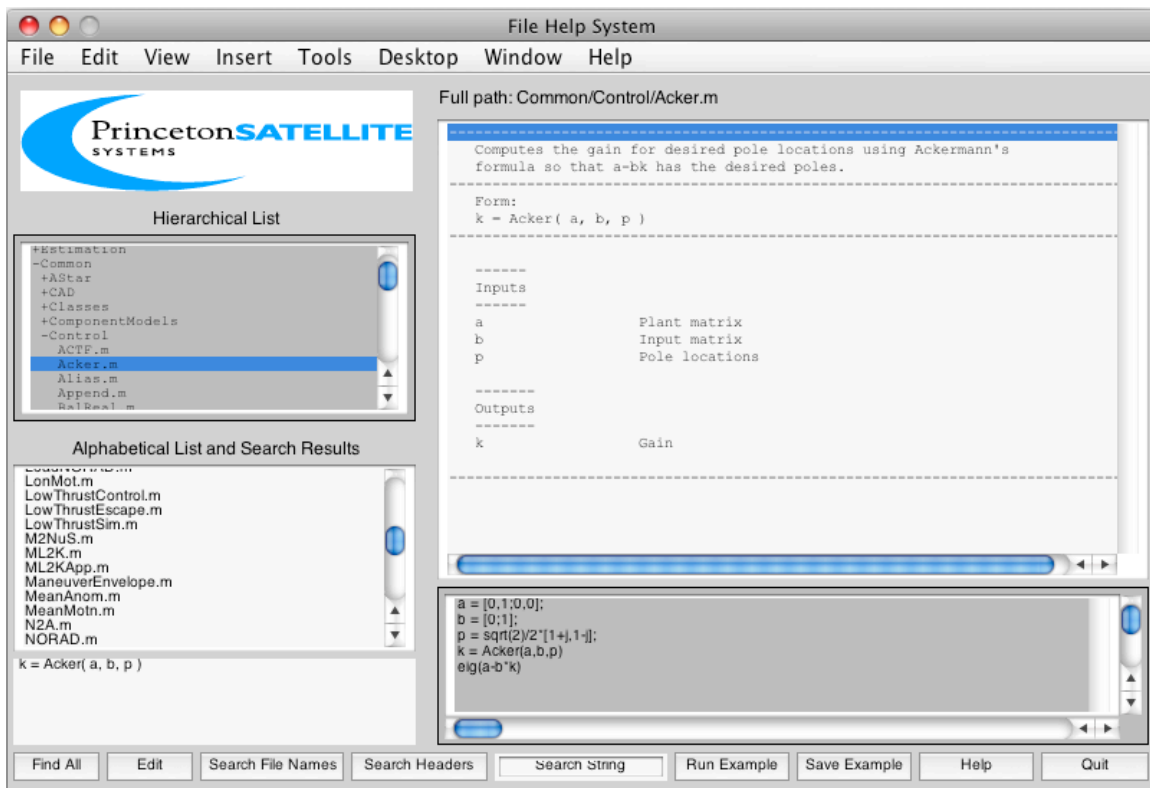
The Common/Control demos are visible in the hierarchical menu to the left. The highest level of this menu shows the folders within the toolbox, for example Common, SC, or AC. You can add your own demo scripts to the demo folders so that they can appear in the display. For each demo, you can run the demo or open the script.

Some demos you might want to try first are listed on the next page:

Script	Description	Module Folder
Common Demos		
TPIDSat	Demonstrates the effect of integrator windup and how to fix it. Uses PIDMIMO to design the controller and C2DZOH to discretize it.	Common/Control
CCVDemo	Demonstrate eigenvector assignment using a Control Configured Vehicle (CCV) model from Stevens and Lewis (1992). A CCV aircraft is one that includes feedback control as part of its design.	Common/Control
Spacecraft Control Toolbox		
BuildXYZSat	Demonstrates the CAD tools with a very simple 'XYZ' spacecraft with six panels and visualized axes.	SC/CAD
Attitude3D	Simple numerical simulation using the XYZSat spacecraft CAD model to view the controlled attitude. The dynamics are rigid body attitude (FRB) and Cartesian point mass orbit (FCartOrb).	SC/Attitude
SCTTutorial	Implements a spacecraft control tutorial.	SC/Attitude
ThreeAxisControl	Implements and simulates a spacecraft with reaction wheels and thrusters.	SCPro/ProControl
InterstellarSim	Interstellar mission simulation. The spacecraft is put into an elliptical orbit with a near-sun perigee. The right-hand-side uses a flag to apply a delta-V at perigee. The delta-V is amplified by the sun's gravity well enabling the spacecraft to quickly leave the solar system.	Orbit/OrbitMechanics
Aircraft Control Toolbox		
CASDesign	Design a simple aircraft control system consisting of a pitch rate tracking system.	AC/ACControl

Note that classroom editions of the Spacecraft Control Toolbox will not include the Orbit or SCPro modules.

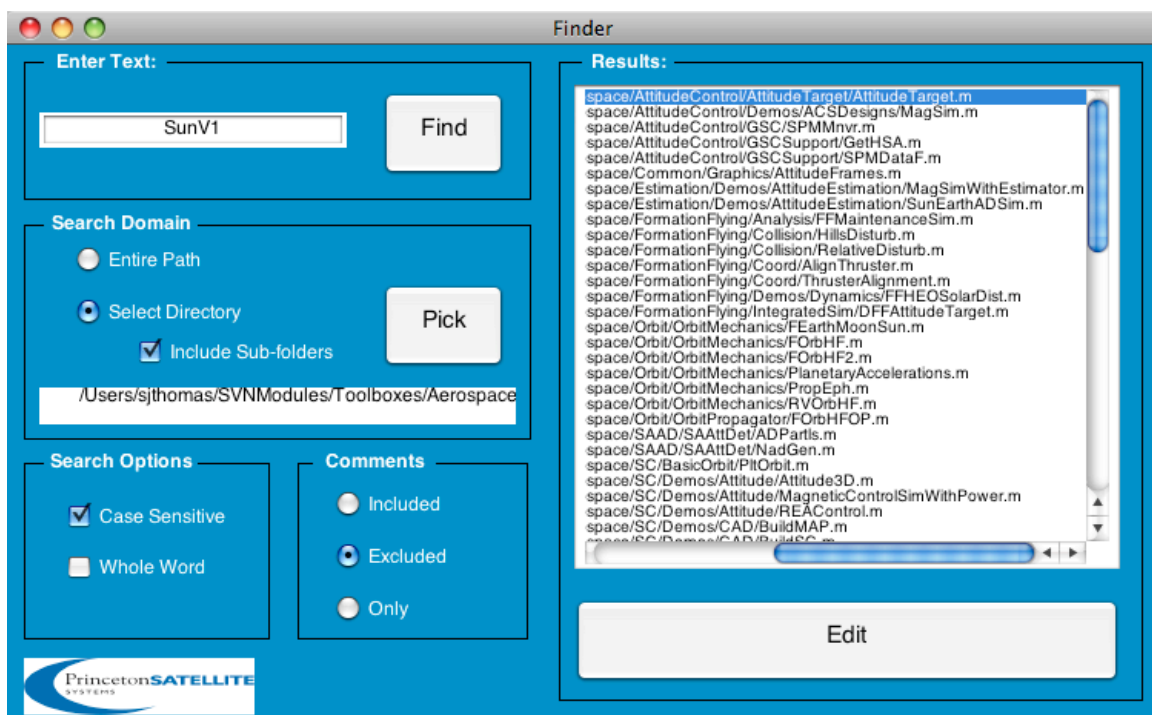
The FileHelp function provides a graphical interface to the MATLAB function headers of the toolbox. Type FileHelp to open the GUI.



You can peruse the functions by folder to get a quick sense of the product's capabilities, or search the function names and headers for keywords to find functions for a particular task. The display contains both a hierarchical and an alphabetical display on the left. When you search for functions by replacing the "Search String" text with a keyword and clicking either the Search File Names or Search Headers button, the results will be shown in the alphabetical display window. FileHelp uses a stored mat-file of the headers and searches are very fast. To return to the full display, click the Find All button. From FileHelp, you can open a selected function with the Edit button, and run and save examples using the buttons on the right.

The Finder GUI, shown below, is another handy function for searching for information in the toolbox. You can search for instances of keywords in the entire body of functions and demos, not just the help comments. You can use this function with any toolboxes, not just your PSS toolboxes, since this actively searches the files every time instead of using a parsed version of the headers the way FileHelp does. Consequently, it is a little slower to use, but you can use it with your own function libraries too.

The Finder function has options for searching the entire path or a selected directory. The Pick button brings up a file selection dialog where you can navigate to your desired directory. The search can be case sensitive and you can select whole word matching. You can search on just file help comments, or include or exclude them. For example, you can find all functions and demos that actually use the function PIDMIMO by searching with comments excluded. Once your search results are displayed in the Results window, you can open any file by clicking the Edit button.



Technical Support

We appreciate your feedback! Please let us know if you have any technical questions by writing to info@psatellite.com or by contacting one of our engineers directly.

Aircraft, Formation Flying: Joseph Mueller, jmueller@psatellite.com

Spacecraft, Solar Sail: Stephanie Thomas, sjthomas@psatellite.com

Estimation, SAAD: Mike Paluszek, map@psatellite.com

Wind Turbine: Eloisa de Castro, edecastro@psatellite.com