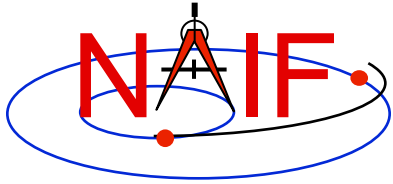


Navigation and Ancillary Information Facility

Obtaining SPICE Components Offered by NAIF and Horizons

Emphasis on Kernels

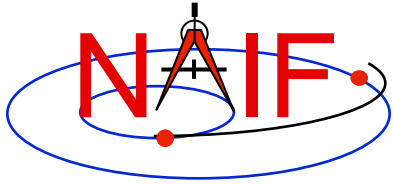
January 2012



Overview

Navigation and Ancillary Information Facility

- **Many SPICE products are available from the NAIF server**
 - These are mostly products produced at JPL by NAIF
 - Access is available using the http or ftp protocol
 - » Note: starting with “http” leads to “ftp”
 - See the next page for URLs
- **SPICE products made by other organizations are controlled by those organizations**
 - Some may be available from the NAIF server
 - Some may be available at other public servers, or on restricted servers, or not at all
 - As a general rule, NAIF has no cognizance of these products
- **Horizons is an on-line natural body ephemeris generator**



NAIF Server HTTP URLs

Navigation and Ancillary Information Facility

- **NAIF home page**

<http://naif.jpl.nasa.gov>

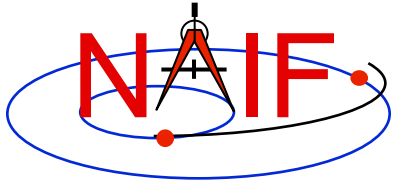
- Here you may access all official SPICE products produced by NAIF
 - kernels (generic, mission ops, PDS archived)
 - software (Toolkits and individual application programs)
 - documents
 - tutorials
 - programming lessons
 - problem solving tips
 - rules about using SPICE
 - links to useful resources

- **SPICE announcements (by NAIF)**

http://naif.jpl.nasa.gov/mailman/listinfo/spice_announce

- **SPICE discussion (by anyone)**

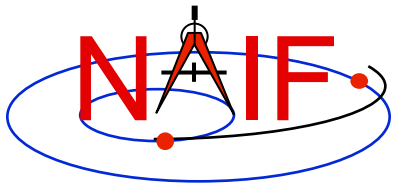
http://naif.jpl.nasa.gov/mailman/listinfo/spice_discussion



Getting SPICE Kernels

Navigation and Ancillary Information Facility

- The remaining charts discuss where to find the various categories of SPICE kernel files
 - **Operational flight project kernels**, for (mostly JPL) active flight projects
 - **PDS archived kernels**, those formally delivered to and accepted by NASA's Planetary Data System
 - **Generic kernels**, used by many flight projects and other endeavors



Obtaining Operational Flight Project Kernels - 1

Navigation and Ancillary Information Facility

Operational Flight Project Kernels

SPICE kernels for currently active missions where NAIF produces the kernels or otherwise has access to them may be obtained directly from the NAIF server using the links below. Included under this category are kernels from past missions that have not yet been archived in the PDS.

- Mars Missions
- **Outer Planet Missions**
- Comet and Asteroid Missions
- Venus Missions
- Lunar Missions
- Mercury Missions
- Earth-Sun Connection Mission
- Astrophysics Missions

Please note that kernels produced by agencies other than JPL are usually available only at those agencies, and may not be available to other than the flight project's team members. (Kernels for a few ESA-sponsored missions are mirrored at NAIF by agreement between ESA and NASA, for the convenience of U.S. participating scientists.)

1 - Select the mission class of interest

Data

The number of files for each SPICE kernel type is shown in the table below for the missions specified. An asterisk (*) indicates that one or more non-kernel files are also present; usually this is an 'aareadme' file that explains the kernel file naming convention. The count of the number of kernels is made ONLY in the primary directory; in some cases there are additional kernels in a subdirectory (for instance, older versions of kernels that have been replaced with newer versions).

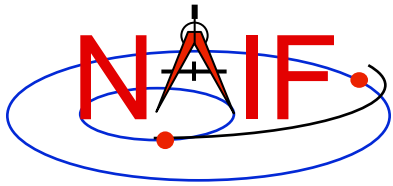
Outer Planet Missions

Mission	ck	ek	fk	ik	lsk	mk	pck	sclk	spk
VOYAGER*	0		2	4	1		0	6	4
CASSINI*	3479*	306*	23*	13*	3*		222*	92*	2404*
GALILEO*	0	0		0	2		3	1	6
PIONEER 10*									1
PIONEER 11*									1

2b - Select the kernel type to get access to all kernels of that type for that project. The number tells how many kernels of that type are available. (see next page)

2a - Select the project name to get access to all products available for that project (see next page)

- Or -

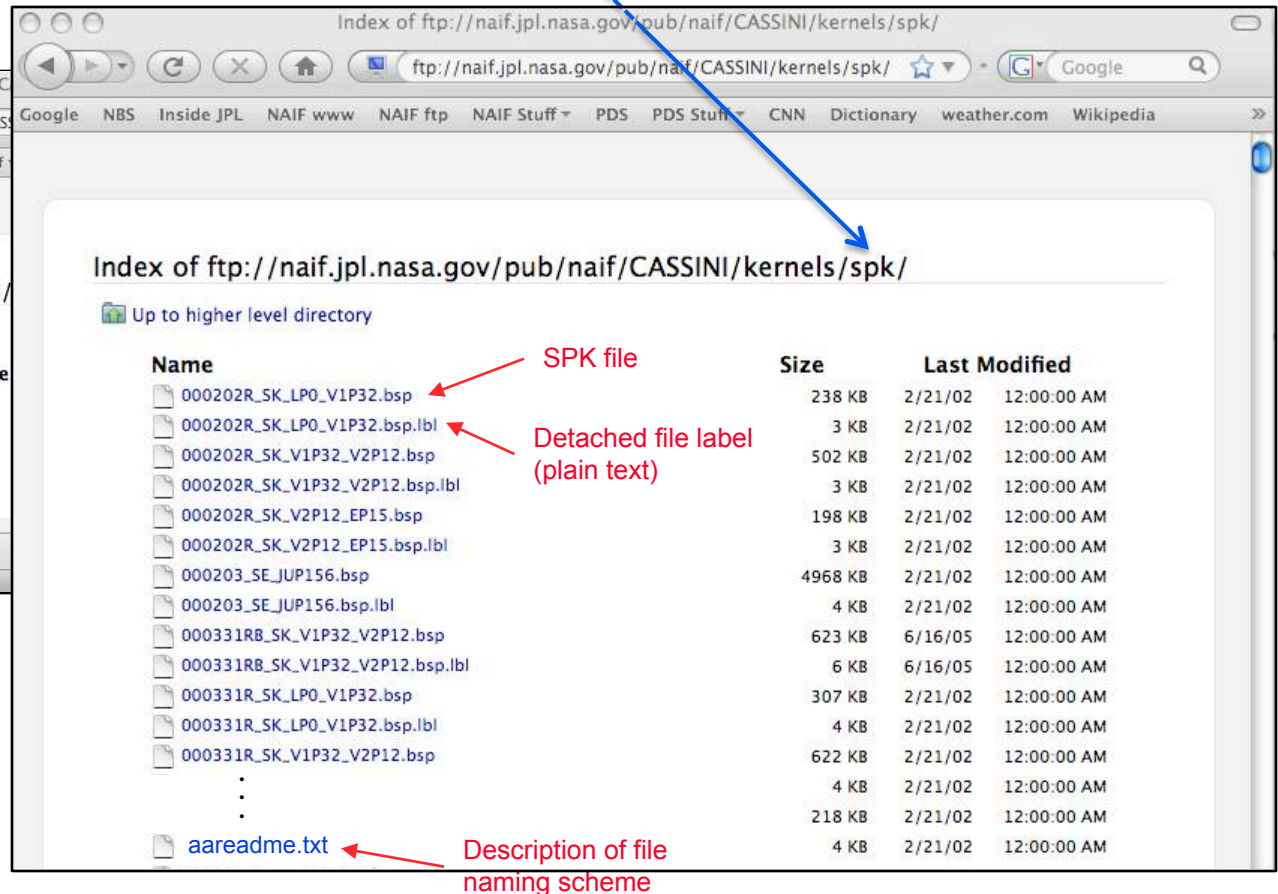
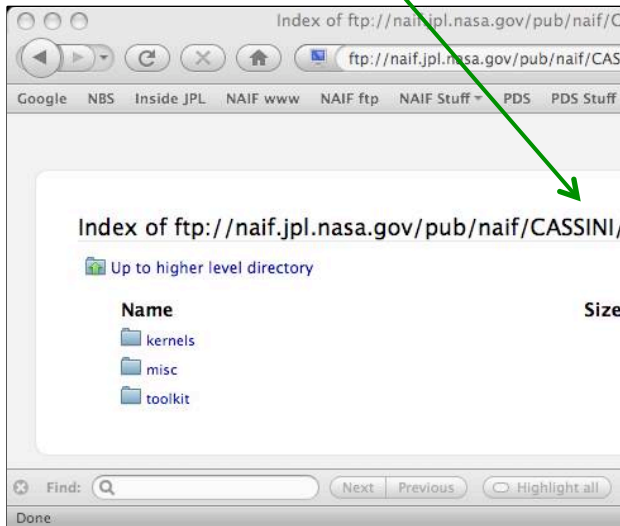


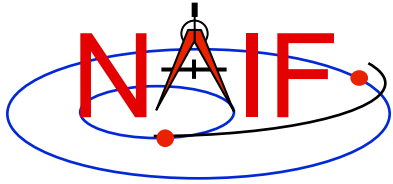
Obtaining Operational Flight Project Kernels - 2

Navigation and Ancillary Information Facility

Access to kernels and other products available for the named project

Access to kernels of the selected type for the named project

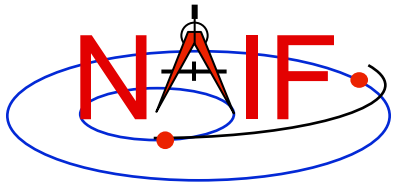




Overview: Obtaining PDS Archived Kernels

Navigation and Ancillary Information Facility

- **Two methods are available for obtaining PDS archived kernels.**
 - **Directly from the NAIF server, using your browser: recommended!**
 - » **Unless you have reason to do otherwise, download the entire archival data set using the ftp URL**
 - That way you'll get all the latest data, the associated “furnsh kernels”, and the best documentation.
 - » **If the data set is large and you need only a portion of it (based on start/stop time), use the “subsetter” link to obtain the smaller amount of data needed.**
 - **Using a web browser to access the PDS central catalog interface, typing “SPICE” and the mission name or acronym in the text search box**
 - » **NAIF suggests you use this method only if you wish to obtain one or a few kernels that fit specific search criteria**
- **Pictorial examples are shown on the next several pages**



Obtaining Archived Kernels from the NAIF Server - 1

Navigation and Ancillary Information Facility

Mission Name	Archive Overview	Volume FTP Link	Data Size (gbytes)	Start Time	Stop Time	Data Set Subsetter Link
Cassini Orbiter	aareadme.htm	cosp_1000	18.6	1996-11-06	2008-12-31	subset
Clementine	aareadme.htm	clsp_1000	0.8	1994-01-26	1994-05-07	subset
Deep Impact	aareadme.htm	disp_1000	0.5	2005-01-12	2009-01-15	subset
Deep Space 1	aareadme.htm	ds1sp_1000	0.9	1998-10-24	2003-12-31	subset
MER 1 (Opportunity)	aareadme.htm	mer1sp_1000	1.8	2003-07-07	2009-05-19	subset
MER 2 (Spirit)	aareadme.htm	mer2sp_1000	1.5	2003-06-10	2009-04-28	subset
MESSENGER	aareadme.htm	messsp_1000	12.7	2004-08-03	2008-10-20	subset
Mars Express	AAREADME.TXT	mexsp_1000	0.9	2003-06-02	2008-07-31	subset
Mars Global Surveyor	aareadme.htm	mgsp_1000	15.4	1996-11-06	2006-11-02	subset
Mars Odyssey	aareadme.htm	odsp_1000	9.0	2001-04-07	2009-03-31	subset

Index of ftp://naif.jpl.nasa.gov/pub/naif/pds/data/co-s_j_e_v-spice-6-v1.0/cosp_1000/

[Up to higher level directory](#)

Name

- [aareadme.htm](#)
- [aareadme.lbl](#)
- [aareadme.txt](#)
- [catalog](#)
- [data](#)
- [document](#)
- [errata.txt](#)
- [extras](#)
- [index](#)
- [software](#)
- [voldesc.cat](#)

[Up to higher level directory](#)

Name

- [ck](#)
- [ek](#)
- [fk](#)
- [ik](#)
- [lsk](#)
- [pck](#)
- [sclk](#)
- [spk](#)

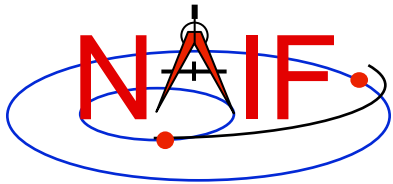
[Up to higher level directory](#)

Name

- [ckextra](#)
- [extrinfo.txt](#)
- [mk](#)
- [orbnum](#)

If you select “PDS Archive Area” on the NAIF web page you can follow a path like this one.

- You can use the ftp URL along with Unix “wget” or the FileZilla tool, or some other equivalent, to download the entire data set—**recommended, if not too large! Otherwise see the next page.**
- Or you can select specific kernels from the kernel folders, and/or “furnsh” meta- kernels and other items from the extras folder



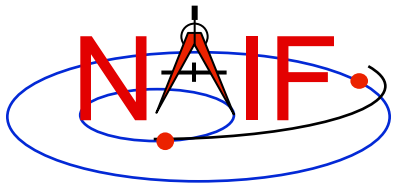
Obtaining Archived Kernels from the NAIF Server - 2

Navigation and Ancillary Information Facility

Mission Name	Archive Overview	Volume FTP Link	Data Size (gbytes)	Start Time	Stop Time	Data Set Subsetter Link
Cassini Orbiter	aareadme.htm	cosp_1000	18.6	1996-11-06	2008-12-31	subset
Clementine	aareadme.htm	clsp_1000	0.8	1994-01-26	1994-05-07	subset
Deep Impact	aareadme.htm	disp_1000	0.5	2005-01-12	2009-01-15	subset
Deep Space 1	aareadme.htm	ds1sp_1000	0.9	1998-10-24	2003-12-31	subset
MER 1 (Opportunity)	aareadme.htm	mer1sp_1000	1.8	2003-07-07	2009-05-19	subset
MER 2 (Spirit)	aareadme.htm	mer2sp_1000	1.5	2003-06-10	2009-04-28	subset
MESSENGER	aareadme.htm	messsp_1000	12.7	2004-08-03	2008-10-20	subset
Mars Express	AAREADME.TXT	mexsp_1000	0.9	2003-06-02	2008-07-31	subset
Mars Global Surveyor	aareadme.htm	mgsp_1000	15.4	1996-11-06	2006-11-02	subset
Mars Odyssey	aareadme.htm	odsp_1000	9.0	2001-04-07	2009-03-31	subset

For “large” data sets that might take a long time to download, if you really need just a subset of the data covering a limited amount of time you should use the “Subset Link” for the data set of interest.

This process will automatically select just the kernels that fall within or overlap the time bounds you specify, construct a new “FURNISH” kernel(s) containing the names of this subset of kernels (thus making it easy for you to load the subset into your program), and create a custom wget script you may use to download these files to your computer.



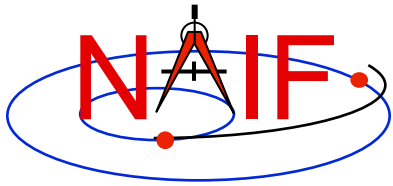
Obtaining Archived Kernels from the PDS Central Catalog - 1

Navigation and Ancillary Information Facility

1 - Enter "spice" and the project name or acronym in the data search box

2 - Click on the SPICE kernels data set returned by the search

continued on next page



Obtaining Archived Kernels from the PDS Central Catalog - 2

Navigation and Ancillary Information Facility

continued from previous page

Use the PDS browser if you wish to query for kernels meeting specific criteria.

Recommended

Click on the data set ID to see a summary of the entire data set

Click on "NAIF Online Archives" to get to the data set. From there you can download the complete data set (recommended!) or individual components.

PDS Data Set Profile

http://starbrite.jpl.nasa.gov/pds/viewDataset.jsp?d

NASA NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

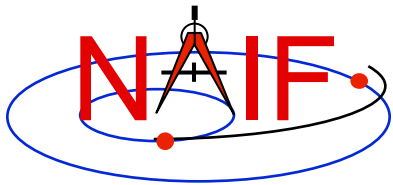
Planetary Data System

Home Data Services Tools Documents Related Sites About PDS Sitemap

Navigation and ancillary data in the form of SPICE System kernel files for the Mars Global Surveyor.

Citation	Semenov, B.V., L.S. Elson, and C.H. Acton, MARS GLOBAL SURVEYOR SPICE KERNELS V1.0, MGS-M-SPICE-6-V1.0, NASA Planetary Data System, 1998.
Access/Download Data Set	Search for Products with the Basic Browser
Data set abstract	This data set includes the complete set of Mars Global Surveyor SPICE data files ("kernel files"), which can be accessed using SPICE software. The SPICE data contains geometric and other ancillary information needed to recover the full value of science instrument data. In particular SPICE kernels provide spacecraft and planetary ephemerides, instrument mounting alignments, spacecraft orientation, spacecraft sequences of events, and data needed for relevant time conversions.
Additional Information	
Mission Information	MARS GLOBAL SURVEYOR
Dataset Information	MGS-M-SPICE-6-V1.0
Instrument Host Information	MGS
Instrument Information	SPICE
Target Information	MARS
Other Resources	NAIF Online Archives MGS Home Page

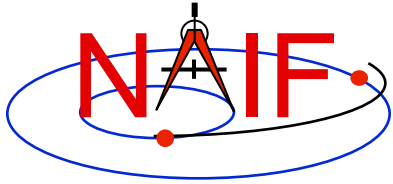
continues on next page



Obtaining Archived Kernels from the PDS Central Catalog - 3

Navigation and Ancillary Information Facility

- **Unless you have a specific reason to do otherwise you should download the complete archived SPICE data set for the mission of interest**
- **Complete SPICE data sets exist on the NAIF server fully expanded—not bundled in a Zip or tar file**
- **Use GNU wget or FileZilla or a similar utility to download the complete SPICE data set**
 - **Possible wget usage, and an example using Deep Impact**
 - » **wget -m -nH --cut-dirs=5 -nv (insert the URL of the "Volume FTP Link" for the SPICE data set here). For example:**
 - `wget -m -nH --cut-dirs=5 -nv ftp://naif.jpl.nasa.gov/pub/naif/pds/data/di-c-spice-6-v1.0/disp_1000/`
 - **FileZilla info**
 - » http://filezilla-project.org/client_features.php



Horizons

Navigation and Ancillary Information Facility

- **Horizons is an on-line ephemeris generator for natural bodies (and more)**
- **Operated by JPL's Solar System Dynamics Group**
- **Of primary interest to SPICE users is its ability to generate up-to-date SPK files for comets and asteroids**
 - **Horizons home: <http://ssd.jpl.nasa.gov/?horizons>**
 - » **Provides instructions for using the telnet interface to the SPK generation function**
 - » **The user interface takes some work to understand**