

## Satellite Orbital Models ProPack

### SATELLITE ORBITAL MODELS PROPACK

Extend the functionality of the PCI ProSDK through the Satellite Orbital Models ProPack. The Satellite Orbital Models ProPack enables flexible use and automation of PCI Geomatics' robust, model-based satellite orthorectification technology.

These are rigorous models developed to compensate for distortions and produce orthorectified satellite images. These models take into account the platform position, velocity, and orientation, the sensor orientation, integration time, and field of view, the Earth representation (geoid, ellipsoid, and relief), and the output cartographic projection.

The Satellite Orbital Models ProPack support a wide range of optical, SAR, and low-resolution satellite sensors:

#### Optical Sensors

- ASTER:
  - Level 1A format (recommended)
  - 1B HDF format
- CBERS
- DMC
  - Level 0R
  - Level 1R
- EOC
- EROS Level 1A
- FORMOSAT Level 1A
- IRS Super Structure (recommended):
  - Level 0
  - Level 1
- IRS (EOSAT):
  - IRS full-scene data
  - ORBIT-ORIENTED or MAPORIENTED product
- LANDSAT 5 (Brazilian):
  - Full-scene data with level 4 or 5 processing levels
- LANDSAT 5 (EOSAT):
  - LANDSAT 5 image full-scene data
  - ORBIT-ORIENTED or MAPORIENTED product
  - SYSTEMATIC geodetic processing
- LANDSAT 5/7 (LSGOWG) Canadian CDs:
  - LANDSAT full-scene or subscene image data
  - Level-4 processing (bulk, radiometric, and along-scanline geometric corrections applied)
  - Level-5 processing (georeferenced) CD
- LANDSAT 5/7 (LSGOWG) ESA CDs:
  - Level 5 full-scene or quad-scene data
- LANDSAT 5 (NLAPS, TIFF):
  - NLAPS full-scene data with level-8 processing levels
  - TIFF full-scene data with systematic correction
- LANDSAT 7 (HDF, TIFF, FAST, NLAPS):
  - Full-scene data with 1G processing in HDF, TIFF, FAST, or NLAPS format
  - 0R or 1R is not recommended because of discontinuity on the image
- MERIS 1B format
- SPOT 1 to 3 (LGWOWG) Canadian formats, Level 1
- SPOT 1 to 4 (SPOTIMAGE)
  - Level 0
  - 1A (recommended)
  - 1B
  - Old SPOTIMAGE LGSOWG format and the new CAP-T format
- SPOT 5 (TIFF)
  - Level 1A SPOT 5 Dimap format

## Radar Sensors

- ASAR
  - 1B format
- RADARSAT:
  - SGC (SAR Georeferenced Coarse Resolution)
  - SGF (SAR Georeferenced Fine Resolution)
  - SGX (SAR Georeferenced Extra-Fine Resolution)
  - SLC (Single-Look Complex)
  - SCN (ScanSAR Narrow-Beam Product)
  - SCW (ScanSAR Wide-Beam Product)
- ERS:
  - Georeferenced level for images produced in Canada
  - PRI level produced by ESA
- JERS:
  - Georeferenced level for highest accuracy
  - OrthoEngine only works for descending-order images

## Low-Resolution Sensor

- AVHRR

## PLUGGABLE FUNCTIONS

The Satellite Orbital Models ProPack consists of core Pluggable Functions (PPFs) for computing models for optical, SAR, and low-resolution optical images (SATMODEL, RSMODEL, and AVMODEL, respectively), plus other PPFs that provide complementary operations as described below.

## Image Import

- CDASAR
  - Imports image, radiometric calibration, and satellite path data from ENVISAT ASAR data distribution files.
- CDASTER
  - Imports image and satellite path data from ASTER data distribution files in HDF format.
- CDCBERS
  - Imports image and geometric data from CBERS data products.
- CDDMC
  - Imports image and satellite path data from DMC data distribution files in TIFF format.
- CDEOSAT
  - Imports image and satellite path data from LANDSAT TM and INDIAN IRS data distribution files in EOSAT fast format.
- CDEROS
  - Imports image and satellite path data from EROS CD
- CDFORMOSAT
  - Imports image and geometric data from FORMOSAT data products.
- CDIRSS
  - Imports image and satellite path data from an IRS data distribution files in Super Structure format.
- CDJERS1
  - Imports JERS-1 SAR imagery from LGSOWG CCT format
- CDLAND7
  - Imports image and satellite path data from LANDSAT 7 data distribution files in HDF, TIFF, Fast, and NLAPS format.
- CDLANDB
  - Imports LANDSAT TM from Brazilian CEOS format
- CDLANDC
- CDMERIS
  - Imports image and satellite path data from ENVISAT MERIS data distribution files.
- CDMODIS
  - Imports image and satellite path data from MODIS data distribution files in HDF format.
- CDNLAPS
  - Imports LANDSAT TM imagery from NLAPS (NDF) format
- CDSAR
  - Imports image and satellite path data from ERS and RADARSAT data distribution files in CEOS format.
- CDSPOT
  - Imports SPOT imagery from SPOTIMAGE LGSOWG format

- CDSPOT5
  - Imports image and satellite path data from SPOT DIMAP format CD.
- CDSPOTC
  - Imports image and satellite path data from SPOT CCT Format

## Image Preparation

- CDSAT
  - Reads imagery and orbital segments and creates PIX file. Supported formats are:
    - LANDSAT TM/INDIAN IRS imagery from an EOSAT fast-format CD
    - JERS-1 SAR imagery from a LGSOWG CCT-format CD
    - SPOT imagery from a SPOTIMAGE LGSOWG-format CD
    - LANDSAT TM imagery from a LGSOWG CCT-format CD
    - SPOT imagery from a LGSOWG-format CD produced in CCT format
    - IRS imagery from an IRS Super Structure-format CD
    - LANDSAT TM imagery from a NLAPS (NDF)-format CD
- CDSH
  - Reads an LGSOWG source header from CD and prints out a report.
- ORBITRD
  - Copies orbit data from a text file to an orbit segment in a PCIDSK.
- ORBITWR
  - Copies orbit data from an orbit segment in a PCIDSK file to a text file.
- STITCH
  - Merges orbit-adjacent IKONOS, QuickBird, ASTER or SPOT images into a single image that has valid ephemeris data.

## Ground Control Point (GCP) and Tie Point (TP) Management

- GCPEXPORT
  - Exports ground control points from a project file into a GCP segment in a PCIDSK file.
- GCPIMPORT
  - Imports GCP data from a GCP segment in a PCIDSK file into an OrthoEngine project file.
- GCPREAD
  - Imports ground control point data from a text file into a GCP segment in a PCIDSK file.
- GCPWRIT
  - Exports ground control point data from a GCP segment in a PCIDSK file to a text file.
- GCPPRO
  - Converts input ground control points (GCPs) to the specified output units.
- GCPELEV
  - Obtains elevations for GCPs from a DEM.
- TPIMPORT
  - Imports tie point data from a text file into an OrthoEngine project file.
- TPEXPORT
  - Exports tie point data from an OrthoEngine project file to a text file.

## Digital Elevation Model (DEM) Creation

- VDEMINT
  - Generates a raster DEM from elevation data in vector layers and observes 2D breakline constraints.

## DEM and Vector Elevation Reference Transfer

- DEMZREF
  - Transforms raster DEM elevation values from mean sea level to ellipsoidal.
- VECZREF
  - Transforms 3D vector elevation values from mean sea level to ellipsoidal.

## Image Adjustment and Correction

- AVMODEL
  - Generates geometric models for AVHRR images.
- CPMMSEG
  - Copies a math model segment.
- OEMODEL
  - Evaluates a block adjustment for a set of images in a project file and generates math model segments for each image.
- ORTHO
  - Generates orthorectified images from a block adjustment and DEM.
- RSMODEL
  - Generate satellite models using Radar specific model method
- SATMODEL
  - Generate satellite models using rigorous satellite model method.

## Image Management

- IMERGE
  - Merges multiple geocoded rasters into a single file.
- REPROJ
  - Reprojects images, bitmap segments and vector layers to a specified projection.
- CLIP
  - Clips layers based on a user defined clip region.
- TILE
  - Creates multiple subset tiles from a single file.
- PYRAMID
  - Builds an image pyramid for one or more image layers in a data file.

## Image Calibration

- CORNRD
  - Reads corner-reflector data from a JPL POLCAL text file and writes it to a new corner-reflector text segment,
- CORNREP
  - Generates a report of the POLCAL corner-reflector data contained in the text segment created by CORNRD.

- HOTSPOT
  - Performs second-order hot spot correction on image data.
- SOLNORM
  - Solar normalization.

## Project File Management

- CRPROJ
  - Creates an OrthoEngine-type project file to store orbital, image and model metadata.
- GCPREP
  - Generates a GCP accuracy report based on the current block bundle adjustment.
- MERGEROJ
  - Merges two or more OrthoEngine-type project files.
- SUBPROJ
  - Creates a subset of an existing OrthoEngine project file based on a list of selected images, a bounding box, or both.

### For more information, contact

PCI Geomatics  
50 West Wilmot Street  
Richmond Hill, ON L4B 1M5  
Canada

**Phone:** 1 905 764 0614

**Fax:** 1 905 764 9604

**Email:** [info@pcigeomatics.com](mailto:info@pcigeomatics.com)

**Web:** [www.pcigeomatics.com](http://www.pcigeomatics.com)