Earth Explorer CFI: Mapping of V3.7.2 functions to V4.0 functions in user applications

1. INTRODUCTION

This document gives a summary to the new features introduced in EXPCFI 4.0.

Reference	Feature Description
MODEL_ID	Possibility to customize the astronomical and geodetic models that are used by the CFI functions
OSV_COMPUTE	integrate orbit propagator and interpolator into one single function for Orbit State Vector Computation
PRECISE_PROPAGATOR	availability of numerical (so called precise) propagator

As a consequence, the following modifications to the function interfaces have been implemented:

Feature	CFI Library	Description
MODEL_ID	General	Introduction of a new type of identifier (model_id)
	- explorer_lib	Introduction of functions to manipulate the model_id
	- explorer_lib - explorer_orbit - explorer_pointing	Modification of interface of those functions that need the model_id as input / output
OSV_COMPUTE	- explorer_orbit	Since there is no more distinction between propagator and interpolator, functions dealing with propagator_id and interpolator_id have been removed
	- explorer_orbit	New functions dealing with the new OSV computation method
	- explorer_orbit	New accessories functions to extract information / configuration related to the orbit_id
PRECISE_PROPAGATOR	- explorer_data_handling	Introduction of functions dealing with precise propagator configuration
	- explorer_orbit	Introduction of functions dealing with precise propagator

The following sections give an overview on those changes (red color is used to highlight removed parameters, green color to highlight added parameters). More details can be found in the libraries Software User Manuals (SUMs) delivered with the EXPCFI v4.0.

2. EXPLORER_FILE_HANDLING

No Change w.r.t. v3.7.2

3. EXPLORER_DATA_HANDLING

3.1 Functions removed in v4.0

The following table lists those functions available in v3.7.2 that are no longer available in v4.0.

NO FUNCTION REMOVED.

3.2 Functions added in v4.0

The following table lists those functions not available in v3.7.2 that have been introduced in v4.0.

Functions added in EXPCFI explorer_data_handling v4.0	Comments

`long xd_read_precise_propag_file (`
        `char *file_name,`
        `xd_propag_precise_config *precise_conf,`
        `long ierr[XD_NUM_ERR_READ_PRECISE_PROPAG]`
`)`
	Function to read precise propagator configuration files

Table 1: Functions added in EXPCFI explorer_data_handling v4.0

3.3 Functions modified in v4.0

The following table lists those functions available both in v3.7.2 and v4.0 whose interface has been modified.

NO FUNCTION MODIFIED.

4. EXPLORER_LIB

4.1 Functions removed in v4.0

The following table lists those functions available in v3.7.2 that are no longer available in v4.0.
NO FUNCTION REMOVED.

4.2 Functions added in v4.0

The following table lists those functions not available in v3.7.2 that have been introduced in v4.0.

Functions added in EXPCFI explorer_lib v4.0	Comments

`long xl_model_init (`
`      long *mode,`
`      long models[XL_NUM_MODEL_TYPES_ENUM],`
`      xl_model_id *model_id,`
`      long ierr[XL_NUM_ERR_MODEL_INIT]`
`)`
	Added to support model_id manipulation

`long xl_model_close (`
`      xl_model_id * model_id,`
`      long ierr[]`
`)`
	Added to support model_id manipulation

`long xl_model_init_status (`
`      xl_model_id* model_id`
`)`
	Added to support model_id manipulation

`long xl_model_get_data (`
`      xl_model_id* model_id,`
`      xl_model_data* model_data`
`)`
	Added to support model_id manipulation

Table 2: Functions added in EXPCFI explorer_lib v4.0

4.3 Functions modified in v4.0

The following table lists those functions available both in v3.7.2 and v4.0 whose interface has been modified.

EXPCFI v3.7.2	EXPCFI v4.0	Comments
```long xl_sun (xl_time_id* time_id, long *time_ref, double *time, double sun_pos[3], double sun_vel[3], long ierr[XL_NUM_ERR_SUN])```	```long xl_sun (xl_model_id *model_id, xl_time_id* time_id, long *time_ref, double *time, double sun_pos[3], double sun_vel[3], long ierr[XL_NUM_ERR_SUN])```	1 parameter(s) added - model_id needed as input
```long xl_moon (xl_time_id* time_id, long *time_ref, double *time, double moon_pos[3], double moon_vel[3], long ierr[XL_NUM_ERR_MOON])```	```long xl_moon (xl_model_id *model_id, xl_time_id* time_id, long *time_ref, double *time, double moon_pos[3], double moon_vel[3], long ierr[XL_NUM_ERR_MOON])```	1 parameter(s) added - model_id needed as input
```long xl_planet (xl_time_id* time_id, long *planet, long *time_ref, double *time, double planet_pos[3], double planet_vel[3], long ierr[XL_NUM_ERR_PLANET]```	```long xl_planet (xl_model_id *model_id, xl_time_id* time_id, long *planet, long *time_ref, double *time, double planet_pos[3], double planet_vel[3], long ierr[XL_NUM_ERR_PLANET]```	1 parameter(s) added - model_id needed as input

EXPCFI v3.7.2	EXPCFI v4.0	Comments
)	)	

`long xl_star_radec (`
 	
    `xl_time_id* time_id,`
    `long *time_ref,`
    `double *time,`
    `double *ra0,`
    `double *dec0,`
    `double *mu_ra,`
    `double *mu_dec,`
    `double *rad_vel,`
    `double *par,`
    `double *ra,`
    `double *dec,`
    `long ierr[XL_NUM_ERR_STAR]`
 	
`)`
	`long xl_star_radec (`
	    `xl_model_id *model_id,`
	    `xl_time_id* time_id,`
	    `long *time_ref,`
	    `double *time,`
	    `double *ra0,`
	    `double *dec0,`
	    `double *mu_ra,`
	    `double *mu_dec,`
	    `double *rad_vel,`
	    `double *par,`
	    `double *ra,`
	    `double *dec,`
	    `long ierr[XL_NUM_ERR_STAR]`
	
	`)`
		1 parameter(s) added
		
		- model_id needed as input

`long xl_star_catalog (`
 	
    `xl_time_id* time_id,`
    `long *time_ref,`
    `double *time,`
    `long *mode,`
    `long *catalog_in,`
    `long *catalog_out,`
    `double *ra0,`
    `double *dec0,`
    `double *mu_ra0,`
    `double *mu_dec0,`
    `double *rad_vel0,`
    `double *par0,`
    `double *ra,`
    `double *dec,`
    `long ierr[XL_NUM_ERR_STAR_CATALOG]`
	`long xl_star_catalog (`
	    `xl_model_id *model_id,`
	    `xl_time_id* time_id,`
	    `long *time_ref,`
	    `double *time,`
	    `long *mode,`
	    `long *catalog_in,`
	    `long *catalog_out,`
	    `double *ra0,`
	    `double *dec0,`
	    `double *mu_ra0,`
	    `double *mu_dec0,`
	    `double *rad_vel0,`
	    `double *par0,`
	    `double *ra,`
	    `double *dec,`
	    `long ierr[XL_NUM_ERR_STAR_CATALOG]`
		1 parameter(s) added
		
		- model_id needed as input

EXPCFI v3.7.2	EXPCFI v4.0	Comments
)	)	

`long xl_change_cart_cs (`
 	
 `    xl_time_id* time_id,`
 `    long *mode,`
 `    long *cs_in,`
 `    long *cs_out,`
 `    long *time_ref,`
 `    double *time,`
 `    double pos[3],`
 `    double vel[3],`
 `    double acc[3],`
 `    double pos_out[3],`
 `    double vel_out[3],`
 `    double acc_out[3]`
 `)`
	`long xl_change_cart_cs (`
	 `    xl_model_id *model_id,`
	 `    xl_time_id* time_id,`
	 `    long *mode,`
	 `    long *cs_in,`
	 `    long *cs_out,`
	 `    long *time_ref,`
	 `    double *time,`
	 `    double pos[3],`
	 `    double vel[3],`
	 `    double acc[3],`
	 `    double pos_out[3],`
	 `    double vel_out[3],`
	 `    double acc_out[3]`
	 `)`
		1 parameter(s) added
		
		 - model_id needed as input

`long xl_cart_to_geod (`
 	
 `    long *mode,`
 `    double *pos,`
 `    double *vel,`
 `    double *lon,`
 `    double *lat,`
 `    double *h,`
 `    double *lon_rate,`
 `    double *lat_rate,`
 `    double *h_rate`
 `)`
	`long xl_cart_to_geod (`
	 `    xl_model_id *model_id,`
	 `    long *mode,`
	 `    double *pos,`
	 `    double *vel,`
	 `    double *lon,`
	 `    double *lat,`
	 `    double *h,`
	 `    double *lon_rate,`
	 `    double *lat_rate,`
	 `    double *h_rate`
	 `)`
		1 parameter(s) added
		
		 - model_id needed as input

`long xl_geod_to_cart (`
 	
 `    long *mode,`
 `    double *lon,`
	`long xl_geod_to_cart (`
	 `    xl_model_id *model_id,`
	 `    long *mode,`
	 `    double *lon,`
		1 parameter(s) added
		
		 - model_id needed as input

EXPCFI v3.7.2	EXPCFI v4.0	Comments

``
    double *lat,
    double *h,
    double *lon_rate,
    double *lat_rate,
    double *h_rate,
    double *pos,
    double *vel
)
``
	``
	    double *lat,
	    double *h,
	    double *lon_rate,
	    double *lat_rate,
	    double *h_rate,
	    double *pos,
	    double *vel
	)
	``	

``
long xl_kepl_to_cart (
 	
    long *kepl_mode,
    double kepl_in[6],
    double pos_out[3],
    double vel_out[3],
    long ierr[XL_NUM_ERR_KEPL_CART]
)
``
	``
	long xl_kepl_to_cart (
	    xl_model_id *model_id,
	    long *kepl_mode,
	    double kepl_in[6],
	    double pos_out[3],
	    double vel_out[3],
	    long ierr[XL_NUM_ERR_KEPL_CART]
	)
	``
		1 parameter(s) added
		
		- model_id needed as input

``
long xl_cart_to_kepl (
 	
    double pos_in[3],
    double vel_in[3],
    long *kepl_mode,
    double kepl_out[6],
    long ierr[XL_NUM_ERR_CART_KEPL]
)
``
	``
	long xl_cart_to_kepl (
	    xl_model_id *model_id,
	    double pos_in[3],
	    double vel_in[3],
	    long *kepl_mode,
	    double kepl_out[6],
	    long ierr[XL_NUM_ERR_CART_KEPL]
	)
	``
		1 parameter(s) added
		
		- model_id needed as input

``
long xl_cart_to_radec (
 	
    long *mode,
    long *cs_in,
    double pos[3],
    double vel[3],
    double *ra,
    double *dec,
``
	``
	long xl_cart_to_radec (
	    xl_model_id *model_id,
	    long *mode,
	    long *cs_in,
	    double pos[3],
	    double vel[3],
	    double *ra,
	    double *dec,
	``
		1 parameter(s) added
		
		- model_id needed as input

EXPCFI v3.7.2	EXPCFI v4.0	Comments

```double *mu_ra,```
```double *mu_dec,```
```double *rad_vel,```
```double *par,```
```long ierr[XL_NUM_ERR_CART_RADEC]```
```)```
	```double *mu_ra,```
	```double *mu_dec,```
	```double *rad_vel,```
	```double *par,```
	```long ierr[XL_NUM_ERR_CART_RADEC]```
	```)```	

```long xl_radec_to_cart (```
 	
```long *mode,```
```long *cs_in,```
```double *ra,```
```double *dec,```
```double *mu_ra,```
```double *mu_dec,```
```double *rad_vel,```
```double *par,```
```double pos[3],```
```double vel[3],```
```long ierr[XL_NUM_ERR_RADEC_CART]```
```)```
	```long xl_radec_to_cart (```
	```xl_model_id *model_id,```
	```long *mode,```
	```long *cs_in,```
	```double *ra,```
	```double *dec,```
	```double *mu_ra,```
	```double *mu_dec,```
	```double *rad_vel,```
	```double *par,```
	```double pos[3],```
	```double vel[3],```
	```long ierr[XL_NUM_ERR_RADEC_CART]```
	```)```
		1 parameter(s) added
		
		- model_id needed as input

```long xl_topocentric_to_ef (```
 	
```long *mode,```
```long *derive,```
```double pos[3],```
```double vel[3],```
```double *azim,```
```double *elev,```
```double *range,```
```double *azim_d,```
```double *elev_d,```
```double *range_d,```
```double ef_dir[3],```
	```long xl_topocentric_to_ef (```
	```xl_model_id *model_id,```
	```long *mode,```
	```long *deriv,```
	```double pos[3],```
	```double vel[3],```
	```double *azim,```
	```double *elev,```
	```double *range,```
	```double *azim_d,```
	```double *elev_d,```
	```double *range_d,```
	```double ef_dir[3],```
		1 parameter(s) added
		
		- model_id needed as input

EXPCFI v3.7.2	EXPCFI v4.0	Comments

<pre>   double ef_dir_d[3],
    long ierr[XL_NUM_ERR_TOP_TO_EF]
)</pre>
	<pre> double ef_dir_d[3],
	    long ierr[XL_NUM_ERR_TOP_TO_EF]
	)</pre>	

<pre>long xl_ef_to_topocentric (
 	
    long *mode,
    long *derive,
    double pos[3],
    double vel[3],
    double ef_dif[3],
    double ef_dir_d[3],
    double *azim,
    double *elev,
    double *range,
    double *azim_d,
    double *elev_d,
    double *range_d,
    long ierr[XL_NUM_ERR_EF_TO_TOP]
)</pre>
	<pre>long xl_ef_to_topocentric (
	    xl_model_id *model_id,
	    long *mode,
	    long *deriv,
	    double pos[3],
	    double vel[3],
	    double ef_dif[3],
	    double ef_dir_d[3],
	    double *azim,
	    double *elev,
	    double *range,
	    double *azim_d,
	    double *elev_d,
	    double *range_d,
	    long ierr[XL_NUM_ERR_EF_TO_TOP]
	)</pre>
		1 parameter(s) added
		
		– model_id needed as input

<pre>long xl_geod_distance (
 	
    double *lon1,
    double *lat1,
    double *lon2,
    double *lat2,
    double *h,
    double *distance,
    double *az_1_to_2,
    double *az_2_to_1
)</pre>
	<pre>long xl_geod_distance (
	    xl_model_id *model_id,
	    double *lon1,
	    double *lat1,
	    double *lon2,
	    double *lat2,
	    double *h,
	    double *distance,
	    double *az_1_to_2,
	    double *az_2_to_1
	)</pre>
		1 parameter(s) added
		
		– model_id needed as input

<pre>long xl_position_on_orbit (</pre>	<pre>long xl_position_on_orbit (
	    xl_model_id *model_id,</pre>
		1 parameter(s) added

EXPCFI v3.7.2	EXPCFI v4.0	Comments
```xl_time_id* time_id,long *angle_type,long *time_ref,double *time,double pos[3],double vel[3],double acc[3],long *derive,double *angle,double *angle_rate,double *angle_rate_rate,long ierr[XL_NUM_ERR_POSITION_ON_ORBIT])```	```xl_time_id* time_id,long *angle_type,long *time_ref,double *time,double pos[3],double vel[3],double acc[3],long *deriv,double *angle,double *angle_rate,double *angle_rate_rate,long ierr[XL_NUM_ERR_POSITION_ON_ORBIT])```	- model_id needed as input

Table 3: Functions Modified between v3.7.2 and v4.0 in EXPCFI explorer_lib

5. EXPLORER_ORBIT

5.1 Functions removed in v4.0

The following table lists those functions available in v3.7.2 that are no longer available in v4.0.

Functions Removed from EXPCFI explorer_orbit v3.7.2	Comments

`long xo_propag_init (`
`    xo_orbit_id *orbit_id,`
`    long *propag_model,`
`    long *time_mode,`
`    long *time_ref,`
`    double *time,`
`    long *orbit,`
`    double *val_time0,`
`    double *val_time1,`
`    xo_propag_id *propag_id,`
`    long ierr[XO_NUM_ERR_PROPAG_INIT]`
`)`
	`Propag_id / interpol_id no longer supported`

`long xo_propag_close (`
`    xo_propag_id * propag_id,`
`    long ierr[XO_NUM_ERR_PROPAG_CLOSE]`
`)`
	`Propag_id / interpol_id no longer supported`

`long xo_propag_init_status (`
`    xo_propag_id *propag_id`
`)`
	`Propag_id / interpol_id no longer supported`

`long xo_propag_get_sat_id (`
`    xo_propag_id *propag_id`
`)`
	`Propag_id / interpol_id no longer supported`

Functions Removed from EXPCFI explorer_orbit v3.7.2	**Comments**
long xo_propag_get_mode (xo_propag_id *propag_id)	**Propag_id / interpol_id no longer supported**

long xo_propag_get_id_data (
     xo_propag_id* propag_id,
     xo_propag_id_data* data
)
	Propag_id / interpol_id no longer supported

xo_orbit_id xo_propag_get_orbit_id (xo_propag_id* propag_id)	**Propag_id / interpol_id no longer supported**

long xo_propag (
     xo_propag_id *propag_id,
     long *mode,
     long *time_ref,
     double *time,
     double pos_out[3],
     double vel_out[3],
     double acc_out[3],
     long ierr[XO_NUM_ERR_PROPAG]
)
	Propag_id / interpol_id no longer supported

long xo_interpol_init (
     xo_orbit_id *orbit_id,
     long *interpol_model,
     long *time_ref,
     double *val_time0,
     double *val_time1,
     xo_interpol_id *interpol_id,
     long ierr[XO_NUM_ERR_INTERPOL_INIT]
)
	Propag_id / interpol_id no longer supported

Functions Removed from EXPCFI explorer_orbit v3.7.2	Comments

`long xo_interpol_close (`
`    xo_interpol_id *interpol_id,`
`    long ierr[XO_NUM_ERR_INTERPOL_CLOSE]`
`)`
	Propag_id / interpol_id no longer supported

`long xo_interpol_init_status (` `    xo_interpol_id *interpol_id`	**Propag_id / interpol_id no longer supported**

`long xo_interpol_get_sat_id (`
`    xo_interpol_id *interpol_id`
`)`
	Propag_id / interpol_id no longer supported

`long xo_interpol_get_mode (`
`    xo_interpol_id *interpol_id`
`)`
	Propag_id / interpol_id no longer supported

`long xo_interpol_get_id_data (`
`    xo_interpol_id* interpol_id,`
`    xo_interpol_id_data* data`
`)`
	Propag_id / interpol_id no longer supported

`xo_orbit_id xo_interpol_get_orbit_id (`
`    xo_interpol_id* interpol_id`
`)`
	Propag_id / interpol_id no longer supported

`long xo_interpol (`
`    xo_interpol_id *interpol_id,`
`    long *mode,`
`    long *time_ref,`
`    double *time,`
`    double pos_out[3],`
`    double vel_out[3],`
	Propag_id / interpol_id no longer supported

Functions Removed from EXPCFI explorer_orbit v3.7.2	Comments
| ```
    double acc_out[3],
    long ierr[XO_NUM_ERR_INTERPOL]
)
``` | |
| ```
long xo_propag_extra (
    xo_propag_id *propag_id,
    long *extra_choice,
    double model_out[XO_PROPAG_EXTRA_NUM_DEP_ELEMENTS],
    double extra_out[XO_PROPAG_EXTRA_NUM_INDEP_ELEMENTS],
    long ierr[XO_NUM_ERR_PROPAG_EXTRA]
)
``` | **Propag_id / interpol_id no longer supported** |
| ```
long xo_interpol_extra (
    xo_interpol_id *interpol_id,
    long *extra_choice,
    double model_out[XO_INTERPOL_EXTRA_NUM_DEP_ELEMENTS],
    double extra_out[XO_INTERPOL_EXTRA_NUM_INDEP_ELEMENTS],
    long ierr[XO_NUM_ERR_INTERPOL_EXTRA]
)
``` | **Propag_id / interpol_id no longer supported** |

Table 4: Functions Removed from EXPCFI explorer_orbit v3.7.2

5.2 Functions added in v4.0

The following table lists those functions not available in v3.7.2 that have been introduced in v4.0.

Functions added in EXPCFI explorer_orbit v4.0	Comments
| ```
long xo_orbit_cart_init_precise (
    long *sat_id,
    xl_model_id *model_id,
    xl_time_id *time_id,
``` | **Added to support Precise propagator**<br><br>**(it also needs the model_id as input)** |

Functions added in EXPCFI explorer_orbit v4.0	Comments

`long *time_ref,`
`double *time,`
`double pos[3],`
`double vel[3],`
`long *abs_orbit,`
`xo_propag_precise_config *propag_precise_conf,`
`double *val_time0,`
`double *val_time1,`
`xo_orbit_id *orbit_id,`
`long ierr[XO_NUM_ERR_ORBIT_CART_INIT_PRECISE]`
`)`	

`long `**`xo_orbit_init_file_precise`**` (`
`long *sat_id,`
`xl_model_id *model_id,`
`xl_time_id *time_id,`
`long *orbit_file_mode,`
`long *n_files,`
`char **orbit_file,`
`long *time_mode,`
`long *time_ref,`
`double *time0,`
`double *time1,`
`long *orbit0,`
`long *orbit1,`
`xo_propag_precise_config *propag_precise_conf,`
`double *val_time0,`
`double *val_time1,`
`xo_orbit_id *orbit_id,`
`long ierr[XO_NUM_ERR_ORBIT_INIT_FILE_PRECISE]`
`)`
	Added to support Precise propagator
	
	(it also needs the model_id as input)

`xl_model_id `**`xo_orbit_get_model_id`**` (`
`xo_orbit_id* orbit_id`
`)`
	Added to return model_id associated to orbit_id

Functions added in EXPCFI explorer_orbit v4.0	Comments

`long xo_orbit_get_osv_compute_validity (`
`    xo_orbit_id* orbit_id,`
`    xo_validity_time* val_time`
`)`
	Accessory function to access orbit_id data / configuration

`long xo_orbit_get_propag_mode (`
`    xo_orbit_id* orbit_id`
`)`
	Accessory function to access orbit_id data / configuration

`long xo_orbit_get_propag_config (`
`    xo_orbit_id* orbit_id,`
`    xo_propag_id_data* data`
`)`
	Accessory function to access orbit_id data / configuration

`long xo_orbit_get_interpol_mode (`
`    xo_orbit_id* orbit_id`
`)`
	Accessory function to access orbit_id data / configuration

`long xo_orbit_get_interpol_config (`
`    xo_orbit_id* orbit_id,`
`    xo_interpol_id_data* data`
`)`
	Accessory function to access orbit_id data / configuration

`long xo_orbit_id_clone (`
`    xo_orbit_id* in_id,`
`    xo_orbit_id* out_id`
`)`
	Accessory function to clone orbit_id

`long xo_orbit_get_precise_propag_config (`
`    xo_orbit_id* orbit_id,`
`    xo_propag_precise_config *precise_conf`
`)`
	Added to support precise propagator

Functions added in EXPCFI explorer_orbit v4.0	Comments

`long` **`xo_orbit_set_precise_propag_config`** `(`
`    xo_orbit_id* orbit_id,`
`    xo_propag_precise_config *precise_conf`
`)`
	Added to support precise propagator

`long` **`xo_osv_compute`** `(`
`    xo_orbit_id *orbit_id,`
`    long *mode,`
`    long *time_ref,`
`    double *time,`
`    double pos_out[3],`
`    double vel_out[3],`
`    double acc_out[3],`
`    long ierr[XO_NUM_ERR_OSV_COMPUTE]`
`)`
	Added to support new OSV computation method

`long` **`xo_osv_compute_extra`** `(`
`    xo_orbit_id *orbit_id,`
`    long *extra_choice,`
`    double model_out[XO_ORBIT_EXTRA_NUM_DEP_ELEMENTS],`
`    double extra_out[XO_ORBIT_EXTRA_NUM_INDEP_ELEMENTS],`
`    long ierr[XO_NUM_ERR_OSV_COMPUTE_EXTRA]`
`)`
	Added to support new OSV computation method

Table 5: Functions added in EXPCFI explorer_orbit v4.0

5.3 Functions modified in v4.0

The following table lists those functions available both in v3.7.2 and v4.0 whose interface has been modified.

EXPCFI v3.7.2	EXPCFI v4.0	Comments

`long xo_orbit_init_def (`
`    long *sat_id,`
 	
`    xl_time_id *time_id,`
`    long *time_ref,`
`    double *time0,`
`    long *orbit0,`
`    long *drift_mode,`
`    double *ascmlst_drift,`
`    double *inclination,`
`    long *irep,`
`    long *icyc,`
`    double *rlong,`
`    double *ascmlst,`
`    double *val_time0,`
`    double *val_time1,`
`    xo_orbit_id *orbit_id,`
`    long ierr[XO_NUM_ERR_ORBIT_INIT_DEF]`
`)`
	`long xo_orbit_init_def (`
	`    long *sat_id,`
	`    xl_model_id *model_id,`
	`    xl_time_id *time_id,`
	`    long *time_ref,`
	`    double *time0,`
	`    long *orbit0,`
	`    long *drift_mode,`
	`    double *ascmlst_drift,`
	`    double *inclination,`
	`    long *irep,`
	`    long *icyc,`
	`    double *rlong,`
	`    double *ascmlst,`
	`    double *val_time0,`
	`    double *val_time1,`
	`    xo_orbit_id *orbit_id,`
	`    long ierr[XO_NUM_ERR_ORBIT_INIT_DEF]`
	`)`
		1 parameter(s) added
		
		- model_id needed as input

`long xo_orbit_cart_init (`
`    long *sat_id,`
 	
`    xl_time_id *time_id,`
`    long *time_ref,`
`    double *time,`
`    double pos[3],`
`    double vel[3],`
`    long *abs_orbit,`
`    double *val_time0,`
`    double *val_time1,`
`    xo_orbit_id *orbit_id,`
`    long ierr[XO_NUM_ERR_ORBIT_CART_INIT]`
`)`
	`long xo_orbit_cart_init (`
	`    long *sat_id,`
	`    xl_model_id *model_id,`
	`    xl_time_id *time_id,`
	`    long *time_ref,`
	`    double *time,`
	`    double pos[3],`
	`    double vel[3],`
	`    long *abs_orbit,`
	`    double *val_time0,`
	`    double *val_time1,`
	`    xo_orbit_id *orbit_id,`
	`    long ierr[XO_NUM_ERR_ORBIT_CART_INIT]`
	`)`
		1 parameter(s) added
		
		- model_id needed as input

EXPCFI v3.7.2	EXPCFI v4.0	Comments

`long xo_orbit_init_file (`
`    long *sat_id,`
 	
`    xl_time_id *time_id,`
`    long *orbit_file_mode,`
`    long *n_files,`
`    char **orbit_file,`
`    long *time_mode,`
`    long *time_ref,`
`    double *time0,`
`    double *time1,`
`    long *orbit0,`
`    long *orbit1,`
`    double *val_time0,`
`    double *val_time1,`
`    xo_orbit_id *orbit_id,`
`    long ierr[XO_NUM_ERR_ORBIT_INIT_FILE]`
`)`
	`long xo_orbit_init_file (`
	`    long *sat_id,`
	`    xl_model_id *model_id,`
	`    xl_time_id *time_id,`
	`    long *orbit_file_mode,`
	`    long *n_files,`
	`    char **orbit_file,`
	`    long *time_mode,`
	`    long *time_ref,`
	`    double *time0,`
	`    double *time1,`
	`    long *orbit0,`
	`    long *orbit1,`
	`    double *val_time0,`
	`    double *val_time1,`
	`    xo_orbit_id *orbit_id,`
	`    long ierr[XO_NUM_ERR_ORBIT_INIT_FILE]`
	`)`
		1 parameter(s) added
		
		- model_id needed as input

`long xo_gen_osf_create (`
`    long *sat_id,`
 	
`    xl_time_id *time_id,`
`    long *abs_orbit_number,`
`    long *cycle_number,`
`    long *phase_number,`
`    long *repeat_cycle,`
`    long *cycle_length,`
`    double *anx_long,`
`    long *drift_mode,`
`    double *inclination,`
`    double *mlst_drift,`
`    double *mlst,`
`    double *date,`
`    char *output_dir,`
	`long xo_gen_osf_create (`
	`    long *sat_id,`
	`    xl_model_id *model_id,`
	`    xl_time_id *time_id,`
	`    long *abs_orbit_number,`
	`    long *cycle_number,`
	`    long *phase_number,`
	`    long *repeat_cycle,`
	`    long *cycle_length,`
	`    double *anx_long,`
	`    long *drift_mode,`
	`    double *inclination,`
	`    double *mlst_drift,`
	`    double *mlst,`
	`    double *date,`
	`    char *output_dir,`
		1 parameter(s) added
		
		- model_id needed as input

EXPCFI v3.7.2	EXPCFI v4.0	Comments
| ```
    char *output_filename,
    char *file_class,
    long *version_number,
    char *system,
    long ierr[XO_NUM_ERR_GEN_OSF_CREATE]
)
``` | ```
    char *output_filename,
    char *file_class,
    long *version_number,
    char *system,
    long ierr[XO_NUM_ERR_GEN_OSF_CREATE]
)
``` | |
| ```
long xo_gen_osf_append_orbit_change (
    long *sat_id,


    xl_time_id *time_id,
    char *input_filename,
    long *abs_orbit_number,
    long *repeat_cycle,
    long *cycle_length,
    double *anx_long,
    long *drift_mode,
    double *inclination,
    double *mlst_drift,
    double *mlst,
    long *phase_increment,
    char *output_dir,
    char *output_filename,
    char *file_class,
    long *version_number,
    char *system,
    long ierr[]
)
``` | ```
long xo_gen_osf_append_orbit_change (
    long *sat_id,
    xl_model_id *model_id,
    xl_time_id *time_id,
    char *input_filename,
    long *abs_orbit_number,
    long *repeat_cycle,
    long *cycle_length,
    double *anx_long,
    long *drift_mode,
    double *inclination,
    double *mlst_drift,
    double *mlst,
    long *phase_increment,
    char *output_dir,
    char *output_filename,
    char *file_class,
    long *version_number,
    char *system,
    long ierr[]
)
``` | 1 parameter(s) added<br><br>- model_id needed as input |
| ```
long xo_gen_osf_change_repeat_cycle (
    long *sat_id,


    xl_time_id *time_id,
    char *input_filename,
    long *abs_orbit_number,
``` | ```
long xo_gen_osf_change_repeat_cycle (
    long *sat_id,
    xl_model_id *model_id,
    xl_time_id *time_id,
    char *input_filename,
    long *abs_orbit_number,
``` | 1 parameter(s) added<br><br>- model_id needed as input |

EXPCFI v3.7.2	EXPCFI v4.0	Comments
| ```
    long *search_direction,
    long *repeat_cycle,
    long *cycle_length,
    double *anx_long,
    long *drift_mode,
    double *inclination,
    double *mlst_drift,
    long *phase_increment,
    char *output_dir,
    char *output_filename,
    char *file_class,
    long *version_number,
    char *system,
    long ierr[]
)
``` | ```
    long *search_direction,
    long *repeat_cycle,
    long *cycle_length,
    double *anx_long,
    long *drift_mode,
    double *inclination,
    double *mlst_drift,
    long *phase_increment,
    char *output_dir,
    char *output_filename,
    char *file_class,
    long *version_number,
    char *system,
    long ierr[]
)
``` | |
| ```
long xo_gen_osf_add_drift_cycle (
    long *sat_id,

    xl_time_id *time_id,
    char *input_filename,
    long *drift_start_orbit,
    long *drift_stop_orbit,
    double *drift_stop_anx_long,
    double *max_altitude_change,
    long *phase_inc_start,
    long *phase_inc_stop,
    char *output_dir,
    char *output_filename,
    char *file_class,
    long *version_number,
    char *system,
    long ierr[]
)
``` | ```
long xo_gen_osf_add_drift_cycle (
    long *sat_id,
    xl_model_id *model_id,
    xl_time_id *time_id,
    char *input_filename,
    long *drift_start_orbit,
    long *drift_stop_orbit,
    double *drift_stop_anx_long,
    double *max_altitude_change,
    long *phase_inc_start,
    long *phase_inc_stop,
    char *output_dir,
    char *output_filename,
    char *file_class,
    long *version_number,
    char *system,
    long ierr[]
)
``` | **1 parameter(s) added**<br><br>**- model_id needed as input** |

EXPCFI v3.7.2	EXPCFI v4.0	Comments
```long xo_gen_pof (long *sat_id, xl_time_id* time_id, long *time_mode, long *time_ref, double *start_time, double *stop_time, long *start_orbit, long *stop_orbit, double *osv_location, long *ref_filetype, char *reference_file, long *pof_filetype, char *output_dir, char *pof_filename, char *file_class, long *version_number, char *fh_system, long ierr[])```	```long xo_gen_pof (long *sat_id, xl_model_id* model_id, xl_time_id* time_id, long *time_mode, long *time_ref, double *start_time, double *stop_time, long *start_orbit, long *stop_orbit, double *osv_location, long *ref_filetype, char *reference_file, char *precise_conf_file, long *pof_filetype, char *output_dir, char *pof_filename, char *file_class, long *version_number, char *fh_system, long ierr[])```	**2 parameter(s) added** **- model_id needed as input** **- precise propagator configuration needed ad input**
```long xo_gen_rof (long *sat_id, xl_time_id* time_id, long *time_mode, long *time_ref, double *start_time, double *stop_time, long *start_orbit, long *stop_orbit, double *osv_interval, long *osv_precise,```	```long xo_gen_rof (long *sat_id, xl_model_id* model_id, xl_time_id* time_id, long *time_mode, long *time_ref, double *start_time, double *stop_time, long *start_orbit, long *stop_orbit, double *osv_interval, long *osv_precise,```	**2 parameter(s) added** **- model_id needed as input** **- precise propagator configuration needed ad input**

EXPCFI v3.7.2	EXPCFI v4.0	Comments
``` long *ref_filetype, char *reference_file, long *rof_filetype, char *output_dir, char *rof_filename, char *file_class, long *version_number, char *fh_system, long ierr[]) ```	``` long *ref_filetype, char *reference_file, char *precise_conf_file, long *rof_filetype, char *output_dir, char *rof_filename, char *file_class, long *version_number, char *fh_system, long ierr[]) ```	
```long xo_gen_rof_prototype (long *sat_id, xl_time_id *time_id, long *propag_model, long *time_ref, double *time0, long *orbit0, long *time_mode, double *start_time, long *start_orbit, double *stop_time, long *stop_orbit, long *drift_mode, double *ascmlst_drift, double *inclination, long *irep, long *icyc, double *rlong, double *ascmlst, double *osv_interval, long *rof_filetype, char *output_dir, ```	```long xo_gen_rof_prototype (long *sat_id, xl_model_id *model_id, xl_time_id *time_id, long *propag_model, long *time_ref, double *time0, long *orbit0, long *time_mode, double *start_time, long *start_orbit, double *stop_time, long *stop_orbit, long *drift_mode, double *ascmlst_drift, double *inclination, long *irep, long *icyc, double *rlong, double *ascmlst, double *osv_interval, long *rof_filetype, char *output_dir, ```	1 parameter(s) added - model_id needed as input

EXPCFI v3.7.2	EXPCFI v4.0	Comments
``` char *rof_filename, char *file_class, long *version_number, char *fh_system, long ierr[1]) ```	``` char *rof_filename, char *file_class, long *version_number, char *fh_system, long ierr[1]) ```	
``` long xo_gen_dnf (long *sat_id, xl_time_id *time_id, long *time_mode, long *time_ref, double *start_time, double *stop_time, long *start_orbit, long *stop_orbit, double *osv_interval, long *osv_precise, long *ref_filetype, char *reference_file, char * control_file, long *dnf_filetype, char *output_dir, char *dnf_filename, char *file_class, long *version_number, char *fh_system, long ierr[]) ```	``` long xo_gen_dnf (long *sat_id, xl_model_id *model_id, xl_time_id *time_id, long *time_mode, long *time_ref, double *start_time, double *stop_time, long *start_orbit, long *stop_orbit, double *osv_interval, long *osv_precise, long *ref_filetype, char *reference_file, char * control_file, char *precise_conf_file, long *dnf_filetype, char *output_dir, char *dnf_filename, char *file_class, long *version_number, char *fh_system, long ierr[]) ```	**2 parameter(s) added** **- model_id needed as input** **- precise propagator configuration needed ad input**
``` long xo_check_osf (long *sat_id, ```	``` long xo_check_osf (long *sat_id, xl_model_id *model_id, ```	**1 parameter(s) added**

EXPCFI v3.7.2	EXPCFI v4.0	Comments

<pre>   xl_time_id *time_id,
    char *osf_file,
    long *transition_number,
    double thr[XO_NUM_CHECK_PARAMS],
    double diffs[XO_NUM_CHECK_PARAMS],
    long ierr[XO_NUM_ERR_CHECK_OSF]
)</pre>
	<pre> xl_time_id *time_id,
	    char *osf_file,
	    long *transition_number,
	    double thr[XO_NUM_CHECK_PARAMS],
	    double diffs[XO_NUM_CHECK_PARAMS],
	    long ierr[XO_NUM_ERR_CHECK_OSF]
	)</pre>
		– model_id needed as input

<pre>long xo_check_oef (
    long *sat_id,
 	
    xl_time_id *time_id,
    long *time_mode,
    long *time_ref,
    double *start_time,
    double *stop_time,
    long *start_orbit,
    long *stop_orbit,
    char *oef_file,
    double thr[XO_NUM_CHECK_PARAMS],
    double max_diffs[XO_NUM_CHECK_PARAMS],
    double rms[XO_NUM_CHECK_PARAMS],
    long ierr[XO_NUM_ERR_CHECK_OEF]
)</pre>
	<pre>long xo_check_oef (
	    long *sat_id,
	    xl_model_id *model_id,
	    xl_time_id *time_id,
	    long *time_mode,
	    long *time_ref,
	    double *start_time,
	    double *stop_time,
	    long *start_orbit,
	    long *stop_orbit,
	    char *oef_file,
	    double thr[XO_NUM_CHECK_PARAMS],
	    double max_diffs[XO_NUM_CHECK_PARAMS],
	    double rms[XO_NUM_CHECK_PARAMS],
	    long ierr[XO_NUM_ERR_CHECK_OEF]
	)</pre>
		1 parameter(s) added
		
		– model_id needed as input

Table 6: Functions Modified between v3.7.2 and v4.0 in EXPCFI explorer_orbit

6. EXPLORER_POINTING

6.1 Functions removed in v4.0

The following table lists those functions available in v3.7.2 that are no longer available in v4.0.

NO FUNCTION REMOVED.

6.2 Functions added in v4.0

The following table lists those functions not available in v3.7.2 that have been introduced in v4.0.

Functions added in EXPCFI explorer_pointing v4.0	Comments

`xl_model_id xp_attitude_get_model_id (`
`      xp_attitude_id *attitude_id`
`)`
	Added to support attitude_id manipulation

Table 7: Functions Added in EXPCFI explorer_pointing v4.0

6.3 Functions modified in v4.0

The following table lists those functions available both in v3.7.2 and v4.0 whose interface has been modified.

EXPCFI v3.7.2	EXPCFI v4.0	Comments

`long xp_change_frame (`
`      long *sat_id,`
 	
`      xl_time_id *time_id,`
`      xp_sat_nom_trans_id *sat_nom_trans_id,`
`      xp_sat_trans_id *sat_trans_id,`
`      xp_instr_trans_id *instr_trans_id,`
`      long *mode_flag,`
`      long *frame_flag_in,`
`      long *frame_id_in,`
`      long *frame_flag_out,`
`      long *frame_id_out,`
`      long *time_ref,`
`      double *time,`
	`long xp_change_frame (`
	`      long *sat_id,`
	`      xl_model_id *model_id,`
	`      xl_time_id *time_id,`
	`      xp_sat_nom_trans_id *sat_nom_trans_id,`
	`      xp_sat_trans_id *sat_trans_id,`
	`      xp_instr_trans_id *instr_trans_id,`
	`      long *mode_flag,`
	`      long *frame_flag_in,`
	`      long *frame_id_in,`
	`      long *frame_flag_out,`
	`      long *frame_id_out,`
	`      long *time_ref,`
	`      double *time,`
		`1 parameter(s) added`
		
		`- model_id needed as input`

EXPCFI v3.7.2	EXPCFI v4.0	Comments
| ```
    double *pos,
    double *vel,
    double *acc,
    long *deriv,
    double *vec_in,
    double *vec_rate_in,
    double *vec_rate_rate_in,
    double *vec_out,
    double *vec_rate_out,
    double *vec_rate_rate_out,
    long ierr[XP_NUM_ERR_CHANGE_FRAME]
)
``` | ```
    double *pos,
    double *vel,
    double *acc,
    long *deriv,
    double *vec_in,
    double *vec_rate_in,
    double *vec_rate_rate_in,
    double *vec_out,
    double *vec_rate_out,
    double *vec_rate_rate_out,
    long ierr[XP_NUM_ERR_CHANGE_FRAME]
)
``` | |
| ```
long xp_attitude_compute (

    xl_time_id *time_id,
    xp_sat_nom_trans_id *sat_nom_trans_id,
    xp_sat_trans_id *sat_trans_id,
    xp_instr_trans_id *instr_trans_id,
    xp_attitude_id *attitude_id,
    long *time_ref,
    double *time,
    double *pos,
    double *vel,
    double *acc,
    long *target_frame,
    long ierr[XP_NUM_ERR_ATTITUDE_COMPUTE]
)
``` | ```
long xp_attitude_compute (
    xl_model_id *model_id,
    xl_time_id *time_id,
    xp_sat_nom_trans_id *sat_nom_trans_id,
    xp_sat_trans_id *sat_trans_id,
    xp_instr_trans_id *instr_trans_id,
    xp_attitude_id *attitude_id,
    long *time_ref,
    double *time,
    double *pos,
    double *vel,
    double *acc,
    long *target_frame,
    long ierr[XP_NUM_ERR_ATTITUDE_COMPUTE]
)
``` | **1 parameter(s) added**<br><br>**– model_id needed as input** |
| ```
long xp_attitude_user_set (

    xl_time_id *time_id,
    xp_attitude_id *attitude_id,
    long *time_ref,
    double *time,
``` | ```
long xp_attitude_user_set (
    xl_model_id *model_id,
    xl_time_id *time_id,
    xp_attitude_id *attitude_id,
    long *time_ref,
    double *time,
``` | **1 parameter(s) added**<br><br>**– model_id needed as input** |

EXPCFI v3.7.2	EXPCFI v4.0	Comments
| ```
    double *pos,
    double *vel,
    double *acc,
    long *target_frame,
    double matrix[3][3],
    double matrix_rate[3][3],
    double matrix_rate_rate[3][3],
    double offset[3],
    long ierr[XP_NUM_ERR_ATTITUDE_USER_SET]
)
``` | ```
    double *pos,
    double *vel,
    double *acc,
    long *target_frame,
    double matrix[3][3],
    double matrix_rate[3][3],
    double matrix_rate_rate[3][3],
    double offset[3],
    long ierr[XP_NUM_ERR_ATTITUDE_USER_SET]
)
``` | |
| ```
long xp_dem_compute (

    xp_dem_id *dem_id,
    double *lon,
    double *lat,
    double *alt,
    long ierr[XP_NUM_ERR_DEM_COMPUTE]
)
``` | ```
long xp_dem_compute (
    xl_model_id *model_id,
    xp_dem_id *dem_id,
    double *lon,
    double *lat,
    double *alt,
    long ierr[XP_NUM_ERR_DEM_COMPUTE]
)
``` | 1 parameter(s) added

- model_id needed as input |

Table 8: Functions Modified between v3.7.2 and v4.0 in EXPCFI explorer_pointing

7. EXPLORER_VISIBILITY

No change w.r.t v3.7.2.

8. ADDITIONAL REMARKS

8.1 MODEL_ID

It has to be noted that, starting from v4.0, the interfaces have been adapted in order to support different models. However, in the specific version v4.0 only the default model is used and supported. In addition, the default model_id is used also in case the model_id itself is not initialised.
In other words, the following piece of code in which the model id is initialized:

```
xl_model_id  model_id  = {NULL};

/* init the model_id */
mode = XL_MODEL_DEFAULT;
status = xl_model_init (&mode, models,&model_id,ierr);

/* init the orbit id  - model_id is an input */
status = xo_orbit_init_file(&sat_id, &model_id,&time_id,
                            &orbit_mode, &n_files, input_files,
                            &time_init_mode, &time_ref,
                            &time0, &time1, &orbit_start, &orbit_stop,
                            &orb_valtime0, &orb_valtime1,
                            &orbit_id,
                            ierr);
```

Is equivalent to the next one in which the model_id is left un-initialized:

```
xl_model_id  model_id  = {NULL};

/* leave the model_id un-initialized */
/* init the orbit id  - model_id is an input */
status = xo_orbit_init_file(&sat_id, &model_id,&time_id,
                            &orbit_mode, &n_files, input_files,
                            &time_init_mode, &time_ref,
                            &time0, &time1, &orbit_start, &orbit_stop,
                            &orb_valtime0, &orb_valtime1,
                            &orbit_id,
                            ierr);
```

8.2 <u>OSV COMPUTE</u>

The calling sequence for OSV computation has been simplified w.r.t. v3.7.2.

With v3.7.2 the user is supposed to:

- Initialize the orbit ID;
- Discriminate, depending on the orbit ID initialisation method, whether the orbit can be either propagated or interpolated;
- If the orbit can be propagated:
  - o Initialise the propagator id with xo_propag_init;
  - o Propagate (one or more times) the orbit at a given time with xo_propag;
  - o Close the propagator with xo_propag_close.
- If the orbit can be interpolated:
  - o Initialise the interpol_id with xo_interpol_init;
  - o Interpolate (one or more times) the orbit at a given time with xo_interpol;
  - o Close the propagator with xo_interpol_close.
- Close the orbit id

With v4.0 the user is supposed to:

- Initialize the orbit ID (the EXPCFI SW internally automatically determines the propagation / interpolation method);
- Compute (one or more times) an Orbit State Vector at a given time with xo_osv_compute;
- Close the orbit_id.

Note that the only difference between orbit ID initalization in v3.7.2 and v4.0 is that the one in v4.0 requires also the model_id as input.
The equivalence between v3.7.2 and v4.0 is described in the following table in case of orbit ID initialisation from file:

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V3.7.2	V4.0

```
/* init Orbit ID */
status = xo_orbit_init_file(
                &sat_id, &time_id,&orbit_mode,
                &n_files, input_files,
                &time_init_mode, &time_ref,
                &time0, &time1, &orbit_start, &orbit_stop,
                &orb_valtime0, &orb_valtime1,
                &orbit_id, ierr);
```

```
/* init Orbit ID */
status = xo_orbit_init_file(
    &sat_id, &model_id, &time_id,
    &orbit_mode, &n_files, input_files,
    &time_init_mode, &time_ref,
    &time0, &time1,&orbit_start,
    &orbit_stop, &orb_valtime0,
    &orb_valtime1, &orbit_id,ierr);
```

PROPAGATOR CASE   **INTERPOLATOR CASE**

```
/* init propag ID */
status = xo_propag_init(
    &orbit_id, &propag_model,
    &time_mode, &time_ref,
    &propag_time, &propag_orbit,
    &pro_valtime0, &pro_valtime1,
    &propag_id, ierr);


/*
propag at time = requested time
*/
time = REQUESTED_TIME;
status = xo_propag(
                &propag_id,
                &propag_mode,
                &time_ref, &time,
/*OUTPUT OSV */ pos, vel, acc,
                ierr);


/*close propag id */
status =  xo_propag_close(
                &propag_id, ierr);
```

```
/* init interpol ID */
status = xo_interpol_init(
 &orbit_id, &interpol_model,
 &time_ref, &val_time0,
 &val_time1, &interpol_id, ierr);



/*
interpol at time = requested time
*/
time = REQUESTED_TIME;
status = xo_interpol(
                &interpol_id,
                &interpol_model,
                &time_ref, &time,
/*OUTPUT OSV */ pos, vel, acc,
                ierr);


/*close interpol id */
status = xo_interpol_close(
                &interpol_id, ierr);
```

```
/*
Get OSV at time = requested time
*/
time = REQUESTED_TIME;
status = xo_osv_compute(
                &orbit_id, &propag_mode,
                &time_ref, &time,
/*OUTPUT OSV */ pos, vel, acc,
                ierr);
```

```
    /* close orbit ID */
    status = xo_orbit_close(&orbit_id, ierr);
```

```
/* close orbit ID */
status = xo_orbit_close(&orbit_id,ierr);
```

9. PRECISE PROPAGATOR

In case the user wants to use the precise (numerical) propagator, the dedicated functions xo_orbit_init_file_precise / xo_orbit_cart_init_precise have to be used. They need as additional input parameter the precise propagator configuration, that is stored in a structure (**xo_propag_precise_config**). This structure can be initialised by assigning values to the structure fields or reading a configuration file.
The following table compares Mean Keplerian propagator, precise propagator with structure initialization, precise propagator with configuration file.
Note that the method to compute the OSV is the same (**xo_osv_compute**) in all three cases.

Mean Keplerian Orbit Propagator	Precise propagator Structure initialisation	Precise propagator Configuration from file
```/* init Orbit ID */status = xo_orbit_init_file(&sat_id, &model_id, &time_id, &orbit_mode, &n_files, input_files, &time_init_mode, &time_ref, &time0, &time1,&orbit_start, &orbit_stop, &orb_valtime0, &orb_valtime1, &orbit_id,ierr);```	```xo_propag_precise_config precise_conf;/* init the struct values */precise_conf.gravity_flag = …;precise_conf.thirdbody_flag = …;precise_conf.atmos_flag = …;…/* init Orbit ID */status = xo_orbit_init_file_precise(&sat_id, &model_id, &time_id, &orbit_mode, &n_files, input_files, &time_init_mode, &time_ref, &time0, &time1,&orbit_start, precise_conf, &orbit_stop, &orb_valtime0, &orb_valtime1, &orbit_id,ierr);```	```xo_propag_precise_config precise_conf;char file_name[] = "PRECISE_CONF_FILENAME";status = xd_read_precise_propag_file (file_name, &precise_conf, ierr);/* init Orbit ID */status = xo_orbit_init_file_precise(&sat_id, &model_id, &time_id, &orbit_mode, &n_files, input_files, &time_init_mode, &time_ref, &time0, &time1,&orbit_start, precise_conf, &orbit_stop, &orb_valtime0, &orb_valtime1, &orbit_id,ierr);```
```/* Get OSV at time = requested time */time = REQUESTED_TIME;status = xo_osv_compute(&orbit_id, &propag_mode, &time_ref, &time,/*OUTPUT OSV */ pos, vel, acc, ierr);/* close orbit ID */status = xo_orbit_close(&orbit_id,ierr);```		