# odfingest

April 16, 2023

**Abstract**

Extend the Observation Data File summary file with data extracted from the instrument housekeeping datasets. Determine the instrument mode if a Calibration Index File is available.

## 1 Instruments/Modes

| Instrument | Mode |
|---|---|
| all | all |

## 2 Use

| | |
|---|---|
| pipeline processing | yes |
| interactive analysis | yes |

## 3 Description

The Observation Data File (ODF) distributed to the guest observer contains a summary file (SF), whose structure is described in the ODF Interface Control Document [1].

The SF does not contain all the information required to process the ODF with the SAS. **odfingest** extends the SF with data extracted from the instrument housekeeping data files and the calibration database. It creates a new summary file: the SAS ODF Summary File (SOSF).

The user would subsequently set the environment variable `SAS_ODF` to point to the location of the SOSF. See the OAL documentation (see documentation of oal) for more details.

**odfingest** operates on a directory (specified with `odfdir`) containing one ODF.

The user need not have write access to the ODF directory. **odfingest** uses the parameter `outdir` to learn where to write the SOSF. If the output directory and te ODF directory are different it is useful to instruct **odfingest** to write in the SOSF the path to the ODF directory. This behavior is controlled via the parameter `writepath`, and is enabled by default.

By default **odfingest** automatically generates a "canonical" name for the SOSF, namely one that (almost) complies with the file naming convention specified in the ODF ICD [1]. The name of the canonical SOSF differs from the one given in the ODF ICD only by the suffix: `.SAS` instead of `.ASC`. (See also the examples below.)

Alternatively, the name of the SOSF can be passed to **odfingest** with the parameter `summaryfile`. For this to be effective `usecanonicalname` should be set to `no`.

*Note that specifying the name of the SOSF may render the SAS unusable. Do not make use of this functionality unless you know what you are doing.*

**odfingest** examines all the files in the ODF directory and from those it reconstructs the structure of the observation in terms of exposures. For each exposure it determines the start and stop times. These are then used to inspect the instrument housekeeping and extract the parameters described in Section 4.

The extraction of housekeeping parameters can be inhibited by setting `usehousekeeping` to `no`. This should be done only if there is a good reason for it, and again it might make parts of the SAS unable to operate correctly.

By default **odfingest** tries to determine the instrument mode during each exposure. This requires access to the Calibration Access Layer (**cal**) and a suitable Calibration Index File (see **cifbuild**). This computation is controlled with the parameter `findinstrumentmodes`. Disabling the determination of the instrument modes should not prevent any SAS task from working correctly.

Finally, it is possible to ask **odfingest** to perform a number of checks on the newly created SOSF. These checks are activated with the parameter `oalcheck`, and are:

- The SOSF can be real by the **oal**, and information can be extracted from it.
- The time correlation, attitude, and orbit files exist and they contain entries for the entire observation.

## 3.1 Examples

The examples assume the presence of an ODF in the directory `/odf/0001/0100240301` (revolution 1, observation identifier 0100240301).

1. `odfingest --odfdir=/odf/0001/0100240301 --withodfdir=yes`

   This creates the file `0001_0100240301_SCX00000SUM.SAS` in the current directory.

2. From now no set the environment variable `SAS_ODF` to be `/odf/0001/0100240301`.

3. `--outdir=/odf/summary_store`

   This creates the file `0001_0100240301_SCX00000SUM.SAS` in the directory `/odf/summary_store`.

4. `odfingest --usehousekeeping=no --findinstrumentmodes=no`

   This creates the file `0001_0100240301_SCX00000SUM.SAS` in the current directly. The SAS ODF Summary file does not contain any of the housekeeping parameter values, not does it contain the instrument modes.

## 3.2 Parameters

The list of parameters is not user configurable.

## 3.3 Instrument modes

The following is an example (for EMOS) of the instrument mode information that **odfingest** can derive with the help of the calibration data base.

```
MODE = PrimePartialW2 / Instrument configuration
CALIBRATION_MODE_1 = PrimePartialW2 / Mode used to calibrate events from CCD 1
CALIBRATION_MODE_2 = PrimeFullWindow / Mode used to calibrate events from CCD 2
CALIBRATION_MODE_3 = PrimeFullWindow / Mode used to calibrate events from CCD 3
CALIBRATION_MODE_4 = PrimeFullWindow / Mode used to calibrate events from CCD 4
CALIBRATION_MODE_5 = PrimeFullWindow / Mode used to calibrate events from CCD 5
CALIBRATION_MODE_6 = PrimeFullWindow / Mode used to calibrate events from CCD 6
CALIBRATION_MODE_7 = PrimeFullWindow / Mode used to calibrate events from CCD 7
DATA_MODE_1 = Imaging / Data mode for CCD 1
DATA_MODE_2 = Imaging / Data mode for CCD 2
DATA_MODE_3 = Imaging / Data mode for CCD 3
DATA_MODE_4 = Imaging / Data mode for CCD 4
DATA_MODE_5 = Imaging / Data mode for CCD 5
DATA_MODE_6 = Imaging / Data mode for CCD 6
DATA_MODE_7 = Imaging / Data mode for CCD 7
```

The `MODE` parameter describes the instrument configuration as determined by the **cal**.

The `CALIBRATION_MODE_n` parameters describe the CCD mode that the **cal** would use to calibrate the science data for the n-th CCD (or window, in the case of OM).

The `DATA_MODE_n` parameters indicate the data mode (determined by the **oal**) the n-th CCD was in during the exposure.

The example above says that the 7 CCDs were operated in imaging mode. The detailed configuration (this determines what calibration data and algorithms to apply) of CCD 1 correspond to the mode PrimePartialW2, while the other 6 CCDs were opearated in PrimeFullWindow mode. The overall instrument configuration for this exposure was PrimePartialW2.

The `MODE` is set to `UNDEFINED` if it cannot be cannot be determined, or if it does not make sense for a certain `DATA_MODE` (for instance there is no calibration mode associated with the RGS diagnostic images).

## 3.4 Housekeeping parameters

This section lists the names of the housekeeping parameters extracted by **odfingest**. They are grouped by instrument and type of housekeeping file. For each parameter there are up to five entries:

- The parameter name.
  Example: `FILTER_WHEEL_POSITION`.

This is the name used in the SOSF. This name should be used with the OAL routines hasIppv (see documentation of oal), getIppvString (see documentation of oal), getIppvReal (see documentation of oal).

- The DAL data type of the parameter.

  Example: `string`.

  String parameters should be retrieved with getIppvString (see documentation of oal), all numeric parameters should be retrieved with getIppvReal (see documentation of oal).

- The name of the column in the housekeeping file from which the parameter is read.

  Example: `E1257`.

  Most column names match the housekeeping parameter names in the XMM-Newton telemetry data base, but a few don't. Refer to the ODF Interface Control Document for the details [1].

- An additional filter expression (see documentation of selectlib).

  Example: `subject to HBRID == 1`.

  The filter expression is applied to the housekeeping data before the parameter value is read. This expression is used when a simple filter in time is not sufficient to uniquely identify the parameter value. This is in general true for the so-called *non periodic housekeeping data*. Again, consult [1] for the details.

- The details of the translation between housekeeping values and the values used in the SOSF.

  Example:

```
FILTER Uint16 [E1317]
This parameter is translated as follows:
Translator's name: EMOS1 Filter
0 = Closed
247 = CalThin1
267 = Thin1
514 = CalThin2
534 = Thin2
781 = CalMedium
801 = Medium
1047 = CalThick
1067 = Thick
1314 = CalOpen
1334 = Open
1580 = CalClosed
```

  The parameter `FILTER` is extracted from the housekeeping column `E1317`. Its value is translated according to a lookup table mapping housekeeping values to strings.

## 3.5 Parameters for EMOS 1

```
----------------------------------
HK file type: PeriodicHousekeeping
[22 parameters]
----------------------------------
FILTER_WHEEL string [E1257]
FILTER_WHEEL_POSITION Uint16 [E1317]
```

```
FILTER Uint16 [E1317]
This parameter is translated as follows:
Translator's name: EMOS1 Filter
0 = Closed
247 = CalThin1
267 = Thin1
514 = CalThin2
534 = Thin2
781 = CalMedium
801 = Medium
1047 = CalThick
1067 = Thick
1314 = CalOpen
1334 = Open
1580 = CalClosed

CLOCK_RESET_TIME_COARSE Int32 [E1573]
CLOCK_RESET_TIME_FINE Uint16 [EU573]
CLOCK_WRAP_AROUND Uint16 [E1044]
MEAN_TEMPERATURE Real32 [E1311]

GAIN_CCD_1 string [E1113]
This parameter is translated as follows:
Translator's name: EMOS Read Out Gain
CHAIN/1ONOD0 = LOW
CHAIN/1ONOD1 = LOW
CHAINNORNOD0 = NORMAL
CHAINNORNOD1 = NORMAL

GAIN_CCD_2 string [E1201]
This parameter is translated as follows:
Translator's name: EMOS Read Out Gain
CHAIN/1ONOD0 = LOW
CHAIN/1ONOD1 = LOW
CHAINNORNOD0 = NORMAL
CHAINNORNOD1 = NORMAL

GAIN_CCD_3 string [E1302]
This parameter is translated as follows:
Translator's name: EMOS Read Out Gain
CHAIN/1ONOD0 = LOW
CHAIN/1ONOD1 = LOW
CHAINNORNOD0 = NORMAL
CHAINNORNOD1 = NORMAL

GAIN_CCD_4 string [E1248]
This parameter is translated as follows:
Translator's name: EMOS Read Out Gain
CHAIN/1ONOD0 = LOW
CHAIN/1ONOD1 = LOW
CHAINNORNOD0 = NORMAL
CHAINNORNOD1 = NORMAL

GAIN_CCD_5 string [E1201]
```

```
This parameter is translated as follows:
Translator's name: EMOS Read Out Gain
CHAIN/10NOD0 = LOW
CHAIN/10NOD1 = LOW
CHAINNORNOD0 = NORMAL
CHAINNORNOD1 = NORMAL

GAIN_CCD_6 string [E1302]
This parameter is translated as follows:
Translator's name: EMOS Read Out Gain
CHAIN/10NOD0 = LOW
CHAIN/10NOD1 = LOW
CHAINNORNOD0 = NORMAL
CHAINNORNOD1 = NORMAL

GAIN_CCD_7 string [E1248]
This parameter is translated as follows:
Translator's name: EMOS Read Out Gain
CHAIN/10NOD0 = LOW
CHAIN/10NOD1 = LOW
CHAINNORNOD0 = NORMAL
CHAINNORNOD1 = NORMAL

EDU_0_LOW_THR_1 Uint16 [E1398]
EDU_0_LOW_THR_2 Uint16 [E1399]
EDU_1_LOW_THR_1 Uint16 [E1400]
EDU_1_LOW_THR_2 Uint16 [E1401]
EDU_2_LOW_THR_1 Uint16 [E1402]
EDU_2_LOW_THR_2 Uint16 [E1403]
EDU_3_LOW_THR_1 Uint16 [E1404]
EDU_3_LOW_THR_2 Uint16 [E1405]
EDU_4_LOW_THR_1 Uint16 [E1406]
EDU_4_LOW_THR_2 Uint16 [E1407]
EDU_5_LOW_THR_1 Uint16 [E1408]
EDU_5_LOW_THR_2 Uint16 [E1409]
EDU_6_LOW_THR_1 Uint16 [E1410]
EDU_6_LOW_THR_2 Uint16 [E1411]
EDU_7_LOW_THR_1 Uint16 [E1412]
EDU_7_LOW_THR_2 Uint16 [E1413]
-------------------------------------------------------
HK file type: HBRConfigurationNonPeriodicHousekeeping
[16 parameters]
-------------------------------------------------------
HBR_0_ACTIVATION_STATUS Int8 [HBRACTIV subject to HBRID == 1]
HBR_0_PROCESSING_MODE Uint16 [HBRPROC subject to HBRID == 1]
HBR_1_ACTIVATION_STATUS Int8 [HBRACTIV subject to HBRID == 2]
HBR_1_PROCESSING_MODE Uint16 [HBRPROC subject to HBRID == 2]
HBR_2_ACTIVATION_STATUS Int8 [HBRACTIV subject to HBRID == 3]
HBR_2_PROCESSING_MODE Uint16 [HBRPROC subject to HBRID == 3]
HBR_3_ACTIVATION_STATUS Int8 [HBRACTIV subject to HBRID == 4]
HBR_3_PROCESSING_MODE Uint16 [HBRPROC subject to HBRID == 4]
HBR_4_ACTIVATION_STATUS Int8 [HBRACTIV subject to HBRID == 5]
HBR_4_PROCESSING_MODE Uint16 [HBRPROC subject to HBRID == 5]
HBR_5_ACTIVATION_STATUS Int8 [HBRACTIV subject to HBRID == 6]
```

```
HBR_5_PROCESSING_MODE Uint16 [HBRPROC subject to HBRID == 6]
HBR_6_ACTIVATION_STATUS Int8 [HBRACTIV subject to HBRID == 7]
HBR_6_PROCESSING_MODE Uint16 [HBRPROC subject to HBRID == 7]
HBR_7_ACTIVATION_STATUS Int8 [HBRACTIV subject to HBRID == 8]
HBR_7_PROCESSING_MODE Uint16 [HBRPROC subject to HBRID == 8]
-------------------------------------------------------
HK file type: HBRThresholdValuesNonPeriodicHousekeeping
[24 parameters]
-------------------------------------------------------
HBR_PATTERN_REFERENCE_0 Uint16 [PATTERN subject to HBRID == 1]
HBR_LOW_THR_0 Uint16 [LTHRESH subject to HBRID == 1]
HBR_HIG_THR_0 Uint16 [UTHRESH subject to HBRID == 1]
HBR_PATTERN_REFERENCE_1 Uint16 [PATTERN subject to HBRID == 2]
HBR_LOW_THR_1 Uint16 [LTHRESH subject to HBRID == 2]
HBR_HIG_THR_1 Uint16 [UTHRESH subject to HBRID == 2]
HBR_PATTERN_REFERENCE_2 Uint16 [PATTERN subject to HBRID == 3]
HBR_LOW_THR_2 Uint16 [LTHRESH subject to HBRID == 3]
HBR_HIG_THR_2 Uint16 [UTHRESH subject to HBRID == 3]
HBR_PATTERN_REFERENCE_3 Uint16 [PATTERN subject to HBRID == 4]
HBR_LOW_THR_3 Uint16 [LTHRESH subject to HBRID == 4]
HBR_HIG_THR_3 Uint16 [UTHRESH subject to HBRID == 4]
HBR_PATTERN_REFERENCE_4 Uint16 [PATTERN subject to HBRID == 5]
HBR_LOW_THR_4 Uint16 [LTHRESH subject to HBRID == 5]
HBR_HIG_THR_4 Uint16 [UTHRESH subject to HBRID == 5]
HBR_PATTERN_REFERENCE_5 Uint16 [PATTERN subject to HBRID == 6]
HBR_LOW_THR_5 Uint16 [LTHRESH subject to HBRID == 6]
HBR_HIG_THR_5 Uint16 [UTHRESH subject to HBRID == 6]
HBR_PATTERN_REFERENCE_6 Uint16 [PATTERN subject to HBRID == 7]
HBR_LOW_THR_6 Uint16 [LTHRESH subject to HBRID == 7]
HBR_HIG_THR_6 Uint16 [UTHRESH subject to HBRID == 7]
HBR_PATTERN_REFERENCE_7 Uint16 [PATTERN subject to HBRID == 8]
HBR_LOW_THR_7 Uint16 [LTHRESH subject to HBRID == 8]
HBR_HIG_THR_7 Uint16 [UTHRESH subject to HBRID == 8]
```

## 3.6 Parameters for EMOS 2

The list is the same as for EMOS 1. The housekeeping column names are of the form `Knnnn` instead of `Ennnn`.

```
FILTER Uint16 [K1317]
This parameter is translated as follows:
Translator's name: EMOS2 Filter
0 = Closed
246 = CalThin1
266 = Thin1
513 = CalThin2
533 = Thin2
779 = CalMedium
799 = Medium
1046 = CalThick
1066 = Thick
1312 = CalOpen
```

```
1332 = Open
1580 = CalClosed
```

### 3.7 Parameters for RGS 1

```
---------------------------------------
HK file type: FullPeriodicHousekeeping
[1 parameters]
---------------------------------------
PACKING_SCHEME string [G7303]
-----------------------------------------
HK file type: DPPNonPeriodicHousekeeping1
[36 parameters]
-----------------------------------------
CCD_1_ACCEPT_THR_C Uint16 [ATHRESHC subject to CCDID == 1]
CCD_1_ACCEPT_THR_D Uint16 [ATHRESHD subject to CCDID == 1]
CCD_1_UPPER_THR_C Uint16 [UTHRESHC subject to CCDID == 1]
CCD_1_UPPER_THR_D Uint16 [UTHRESHD subject to CCDID == 1]
CCD_2_ACCEPT_THR_C Uint16 [ATHRESHC subject to CCDID == 2]
CCD_2_ACCEPT_THR_D Uint16 [ATHRESHD subject to CCDID == 2]
CCD_2_UPPER_THR_C Uint16 [UTHRESHC subject to CCDID == 2]
CCD_2_UPPER_THR_D Uint16 [UTHRESHD subject to CCDID == 2]
CCD_3_ACCEPT_THR_C Uint16 [ATHRESHC subject to CCDID == 3]
CCD_3_ACCEPT_THR_D Uint16 [ATHRESHD subject to CCDID == 3]
CCD_3_UPPER_THR_C Uint16 [UTHRESHC subject to CCDID == 3]
CCD_3_UPPER_THR_D Uint16 [UTHRESHD subject to CCDID == 3]
CCD_4_ACCEPT_THR_C Uint16 [ATHRESHC subject to CCDID == 4]
CCD_4_ACCEPT_THR_D Uint16 [ATHRESHD subject to CCDID == 4]
CCD_4_UPPER_THR_C Uint16 [UTHRESHC subject to CCDID == 4]
CCD_4_UPPER_THR_D Uint16 [UTHRESHD subject to CCDID == 4]
CCD_5_ACCEPT_THR_C Uint16 [ATHRESHC subject to CCDID == 5]
CCD_5_ACCEPT_THR_D Uint16 [ATHRESHD subject to CCDID == 5]
CCD_5_UPPER_THR_C Uint16 [UTHRESHC subject to CCDID == 5]
CCD_5_UPPER_THR_D Uint16 [UTHRESHD subject to CCDID == 5]
CCD_6_ACCEPT_THR_C Uint16 [ATHRESHC subject to CCDID == 6]
CCD_6_ACCEPT_THR_D Uint16 [ATHRESHD subject to CCDID == 6]
CCD_6_UPPER_THR_C Uint16 [UTHRESHC subject to CCDID == 6]
CCD_6_UPPER_THR_D Uint16 [UTHRESHD subject to CCDID == 6]
CCD_7_ACCEPT_THR_C Uint16 [ATHRESHC subject to CCDID == 7]
CCD_7_ACCEPT_THR_D Uint16 [ATHRESHD subject to CCDID == 7]
CCD_7_UPPER_THR_C Uint16 [UTHRESHC subject to CCDID == 7]
CCD_7_UPPER_THR_D Uint16 [UTHRESHD subject to CCDID == 7]
CCD_8_ACCEPT_THR_C Uint16 [ATHRESHC subject to CCDID == 8]
CCD_8_ACCEPT_THR_D Uint16 [ATHRESHD subject to CCDID == 8]
CCD_8_UPPER_THR_C Uint16 [UTHRESHC subject to CCDID == 8]
CCD_8_UPPER_THR_D Uint16 [UTHRESHD subject to CCDID == 8]
CCD_9_ACCEPT_THR_C Uint16 [ATHRESHC subject to CCDID == 9]
CCD_9_ACCEPT_THR_D Uint16 [ATHRESHD subject to CCDID == 9]
CCD_9_UPPER_THR_C Uint16 [UTHRESHC subject to CCDID == 9]
CCD_9_UPPER_THR_D Uint16 [UTHRESHD subject to CCDID == 9]
-----------------------------------------
HK file type: DPPNonPeriodicHousekeeping2
```

```
[73 parameters]
-----------------------------------------
NUMBER_OF_SLOTS Uint16 [CCDSNUM]
CCD_INDEX_1 Int8 [RDOUTSEQ subject to #ROW == 1]
CCD_1_OCB Int8 [OCBMODE subject to #ROW == 1]
CCD_1_NODES Int8 [READOUT subject to #ROW == 1]
CCD_1_REJECT_THR_C Uint16 [REJTHRC subject to #ROW == 1]
CCD_1_REJECT_THR_D Uint16 [REJTHRD subject to #ROW == 1]
CCD_1_CSG_PATTERN Int8 [CSGPATT subject to #ROW == 1]
CCD_INDEX_2 Int8 [RDOUTSEQ subject to #ROW == 2]
CCD_2_OCB Int8 [OCBMODE subject to #ROW == 2]
CCD_2_NODES Int8 [READOUT subject to #ROW == 2]
CCD_2_REJECT_THR_C Uint16 [REJTHRC subject to #ROW == 2]
CCD_2_REJECT_THR_D Uint16 [REJTHRD subject to #ROW == 2]
CCD_2_CSG_PATTERN Int8 [CSGPATT subject to #ROW == 2]
CCD_INDEX_3 Int8 [RDOUTSEQ subject to #ROW == 3]
CCD_3_OCB Int8 [OCBMODE subject to #ROW == 3]
CCD_3_NODES Int8 [READOUT subject to #ROW == 3]
CCD_3_REJECT_THR_C Uint16 [REJTHRC subject to #ROW == 3]
CCD_3_REJECT_THR_D Uint16 [REJTHRD subject to #ROW == 3]
CCD_3_CSG_PATTERN Int8 [CSGPATT subject to #ROW == 3]
CCD_INDEX_4 Int8 [RDOUTSEQ subject to #ROW == 4]
CCD_4_OCB Int8 [OCBMODE subject to #ROW == 4]
CCD_4_NODES Int8 [READOUT subject to #ROW == 4]
CCD_4_REJECT_THR_C Uint16 [REJTHRC subject to #ROW == 4]
CCD_4_REJECT_THR_D Uint16 [REJTHRD subject to #ROW == 4]
CCD_4_CSG_PATTERN Int8 [CSGPATT subject to #ROW == 4]
CCD_INDEX_5 Int8 [RDOUTSEQ subject to #ROW == 5]
CCD_5_OCB Int8 [OCBMODE subject to #ROW == 5]
CCD_5_NODES Int8 [READOUT subject to #ROW == 5]
CCD_5_REJECT_THR_C Uint16 [REJTHRC subject to #ROW == 5]
CCD_5_REJECT_THR_D Uint16 [REJTHRD subject to #ROW == 5]
CCD_5_CSG_PATTERN Int8 [CSGPATT subject to #ROW == 5]
CCD_INDEX_6 Int8 [RDOUTSEQ subject to #ROW == 6]
CCD_6_OCB Int8 [OCBMODE subject to #ROW == 6]
CCD_6_NODES Int8 [READOUT subject to #ROW == 6]
CCD_6_REJECT_THR_C Uint16 [REJTHRC subject to #ROW == 6]
CCD_6_REJECT_THR_D Uint16 [REJTHRD subject to #ROW == 6]
CCD_6_CSG_PATTERN Int8 [CSGPATT subject to #ROW == 6]
CCD_INDEX_7 Int8 [RDOUTSEQ subject to #ROW == 7]
CCD_7_OCB Int8 [OCBMODE subject to #ROW == 7]
CCD_7_NODES Int8 [READOUT subject to #ROW == 7]
CCD_7_REJECT_THR_C Uint16 [REJTHRC subject to #ROW == 7]
CCD_7_REJECT_THR_D Uint16 [REJTHRD subject to #ROW == 7]
CCD_7_CSG_PATTERN Int8 [CSGPATT subject to #ROW == 7]
CCD_INDEX_8 Int8 [RDOUTSEQ subject to #ROW == 8]
CCD_8_OCB Int8 [OCBMODE subject to #ROW == 8]
CCD_8_NODES Int8 [READOUT subject to #ROW == 8]
CCD_8_REJECT_THR_C Uint16 [REJTHRC subject to #ROW == 8]
CCD_8_REJECT_THR_D Uint16 [REJTHRD subject to #ROW == 8]
CCD_8_CSG_PATTERN Int8 [CSGPATT subject to #ROW == 8]
CCD_INDEX_9 Int8 [RDOUTSEQ subject to #ROW == 9]
CCD_9_OCB Int8 [OCBMODE subject to #ROW == 9]
CCD_9_NODES Int8 [READOUT subject to #ROW == 9]
```

```
CCD_9_REJECT_THR_C Uint16 [REJTHRC subject to #ROW == 9]
CCD_9_REJECT_THR_D Uint16 [REJTHRD subject to #ROW == 9]
CCD_9_CSG_PATTERN Int8 [CSGPATT subject to #ROW == 9]
CCD_INDEX_10 Int8 [RDOUTSEQ subject to #ROW == 10]
CCD_10_OCB Int8 [OCBMODE subject to #ROW == 10]
CCD_10_NODES Int8 [READOUT subject to #ROW == 10]
CCD_10_REJECT_THR_C Uint16 [REJTHRC subject to #ROW == 10]
CCD_10_REJECT_THR_D Uint16 [REJTHRD subject to #ROW == 10]
CCD_10_CSG_PATTERN Int8 [CSGPATT subject to #ROW == 10]
CCD_INDEX_11 Int8 [RDOUTSEQ subject to #ROW == 11]
CCD_11_OCB Int8 [OCBMODE subject to #ROW == 11]
CCD_11_NODES Int8 [READOUT subject to #ROW == 11]
CCD_11_REJECT_THR_C Uint16 [REJTHRC subject to #ROW == 11]
CCD_11_REJECT_THR_D Uint16 [REJTHRD subject to #ROW == 11]
CCD_11_CSG_PATTERN Int8 [CSGPATT subject to #ROW == 11]
CCD_INDEX_12 Int8 [RDOUTSEQ subject to #ROW == 12]
CCD_12_OCB Int8 [OCBMODE subject to #ROW == 12]
CCD_12_NODES Int8 [READOUT subject to #ROW == 12]
CCD_12_REJECT_THR_C Uint16 [REJTHRC subject to #ROW == 12]
CCD_12_REJECT_THR_D Uint16 [REJTHRD subject to #ROW == 12]
CCD_12_CSG_PATTERN Int8 [CSGPATT subject to #ROW == 12]
```

## 3.8 Parameters for RGS 2

The list is the same as for RGS 1. The housekeeping column names are of the form `Lnnnn` instead of `Gnnnn`.

## 3.9 Parameters for EPN

```
Parameters for EPN
-------------------------------------------------------
HK file type: HBRConfigurationNonPeriodicHousekeeping
[4 parameters]
-------------------------------------------------------
HBR_0_ACTIVATION_STATUS Uint16 [HBRPROC subject to HBRID == 1]
HBR_1_ACTIVATION_STATUS Uint16 [HBRPROC subject to HBRID == 2]
HBR_2_ACTIVATION_STATUS Uint16 [HBRPROC subject to HBRID == 3]
HBR_3_ACTIVATION_STATUS Uint16 [HBRPROC subject to HBRID == 4]
--------------------------------------
HK file type: MainPeriodicHousekeeping
[19 parameters]
--------------------------------------
CAMEX_GAIN_CCD1 string [F1227]
CAMEX_GAIN_CCD2 string [F1226]
CAMEX_GAIN_CCD3 string [F1225]
CAMEX_GAIN_CCD4 string [F1234]
CAMEX_GAIN_CCD5 string [F1233]
CAMEX_GAIN_CCD6 string [F1232]
CAMEX_GAIN_CCD7 string [F1241]
CAMEX_GAIN_CCD8 string [F1240]
CAMEX_GAIN_CCD9 string [F1239]
```

```
CAMEX_GAIN_CCD10 string [F1248]
CAMEX_GAIN_CCD11 string [F1247]
CAMEX_GAIN_CCD12 string [F1246]
FILTER string [F1118 subject to F1119 == "STOPPED"]
This parameter is translated as follows:
Translator's name: EPN Filter Wheel
CLOSE = Closed
FILTC-MEDIUM = Medium
FILTRA-THIN1 = Thin1
FILTRB-THIN = Thin2
FILTRB-THIN2 = Thin2
FILTRD-THICK = Thick
NO STOP POS = CalibrationPosition
NO STOP POS. = CalibrationPosition
OPEN = Open

FILTER_WHEEL_POSITION Real32 [F1122 subject to F1119 == "STOPPED"]
FILTER_POTENTIOMETER Real32 [F1122]
This parameter is translated as follows:
Translator's name: EPN Filter
(-12.35,-7.85) = CalOpen
(-7.85,-3.35) = Open
(48.25,52.75) = CalClosed
(52.75,57.25) = Closed
(108.4,112.9) = CalThin1
(112.9,117.4) = Thin1
(168.65,173.15) = CalThin2
(173.15,177.65) = Thin2
(228.85,233.35) = CalMedium
(233.35,237.85) = Medium
(288.65,293.15) = CalThick
(293.15,297.65) = Thick

FRAME_TIME_PARAMETER Int8 [F1294]
CLOCK_RESET_TIME_COARSE Int32 [F1030]
CLOCK_RESET_TIME_FINE Uint16 [FU036]
CLOCK_WRAP_AROUND Uint16 [F1052]
-------------------------------------------
HK file type: AdditionalPeriodicHousekeeping
[16 parameters]
-------------------------------------------
LOWER_THRESHOLD_Q0_CCD0 Uint16 [F1515]
LOWER_THRESHOLD_Q0_CCD1 Uint16 [F1516]
LOWER_THRESHOLD_Q0_CCD2 Uint16 [F1517]
LOWER_THRESHOLD_Q1_CCD0 Uint16 [F1615]
LOWER_THRESHOLD_Q1_CCD1 Uint16 [F1616]
LOWER_THRESHOLD_Q1_CCD2 Uint16 [F1617]
LOWER_THRESHOLD_Q2_CCD0 Uint16 [F1715]
LOWER_THRESHOLD_Q2_CCD1 Uint16 [F1716]
LOWER_THRESHOLD_Q2_CCD2 Uint16 [F1717]
LOWER_THRESHOLD_Q3_CCD0 Uint16 [F1815]
LOWER_THRESHOLD_Q3_CCD1 Uint16 [F1816]
LOWER_THRESHOLD_Q3_CCD2 Uint16 [F1817]
CMCORR_Q0 Uint16 [F1525]
```

```
CMCORR_Q1 Uint16 [F1625]
CMCORR_Q2 Uint16 [F1725]
CMCORR_Q3 Uint16 [F1825]
QUADRANT_UNDERSAMPLING_Q0 Int8 [F1534]
QUADRANT_UNDERSAMPLING_Q1 Int8 [F1634]
QUADRANT_UNDERSAMPLING_Q2 Int8 [F1734]
QUADRANT_UNDERSAMPLING_Q3 Int8 [F1834]
A1_CMLINE_PIXSET String [F1628]
A1_CMLINE_CCD Int8 [F1629]
A1_CMLINE_NUMB Int8 [F1630]
```

### 3.10 Parameters for OM

```
---------------------------------
HK file type: PeriodicHousekeeping
[3 parameters]
---------------------------------
EXPOSURE_DURATION Uint16 [H5440]
FILTER_WHEEL_POSITION Int16 [H5265]
FILTER Int16 [H5265]
FLOOD_LED_BIAS Real32 [H5195]
This parameter is translated as follows:
Translator's name: OM Filter
0 = White
200 = Grism2
400 = UVW1
600 = UVM2
800 = UVW2
1000 = Grism1
1200 = Blocked
1400 = V
1600 = Magnifier
1800 = U
2000 = B
2100 = BarredU
2200 = PositionLost
```

## 4 Parameters

This section documents the parameters recognized by this task (if any).

| **Parameter** | Mand | Type | Default | Constraints |
|---|---|---|---|---|
| **odfdir** | no | f | . | |

Directory where the ODF files are to be looked for.

| withodfdir | no | b | no | yes \| no |
|---|---|---|---|---|

Look for the ODF files in odfdir? Otherwise use `SAS_ODF`.

| outdir | no | f | . | |
|---|---|---|---|---|

Directory where the summary file should be written.

| summaryfile | no | f | 0000_0000000000_SCX00SUM.SAS | |
|---|---|---|---|---|

Name of the summary file. For this to work `usecanonicalname` must be set to `no`.

| usecanonicalname | no | b | yes | yes \| no |
|---|---|---|---|---|

utogenerate the summary name based on the ODF identifier?

| writepath | no | b | yes | yes \| no |
|---|---|---|---|---|

Write path to ODF in the summary file? This appears as `PATH` in the summary file.

| findinstrumentmodes | no | b | yes | yes \| no |
|---|---|---|---|---|

Determine the instrument modes?

| usehousekeeping | no | b | yes | yes \| no |
|---|---|---|---|---|

Extract instrument parameters from housekeeping data?

| oalcheck | no | b | no | yes\|no |
|---|---|---|---|---|

Check via the ODF Access Layer that the ODF is complete?

# 5 Errors

This section documents warnings and errors generated by this task (if any). Note that warnings and errors can also be generated in the SAS infrastructure libraries, in which case they would not be documented here. Refer to the index of all errors and warnings available in the HTML version of the SAS documentation.

## 5.1 User-level errors and warnings

**MissingData** *(warning)*
**odfingest** cannot find some piece of information. This is not a problem for the users, but it may be a problem for the pipeline. For instance, if the PROPOSAL information record is missing the user can add a fake one to the SOSF without this having any effect on the data reduction.
*corrective action:* Continue.

**HousekeepingParameterMissing** *(warning)*
For a certain exposure in the ODF one of the parameters was not found in the housekeeping data. This can be caused by:

- The time interval corresponding to the given exposure is not fully contained in the time span covered by the housekeeping data.
- The constraint above is met, but the further filtering of the housekeeping data with the filtering expression (see 3.4) yields an empty dataset.

*corrective action:* The parameter is ignored. A warning is written to the SOSF. For example: WARNING: FILTER_WHEEL not found __FILTER_WHEEL__ = 0

**InconsistentDataMode** *(warning)*
The task has encountered a situation where the same CCD appears to be in more than one data mode. This can point to one of the following:

- The central CCD of the EMOS camera is being readout of two nodes. This generates two separate files in the ODF, and these two files appear to have been taken with different configurations.
- Data from two different modes is found to be in the same exposure. For instance: `PNU00201IME.FIT` and `PNU00201ODI.FIT` are found in the same ODF.

The latter condition has actually been observed, although it is understood that it should not happen. If it does please report this to the XMM-Newton Science Operations Centre.
*corrective action:* All operations related to the determination of the CCD data mode, calibration mode, and instrument configuration will be disabled for the current exposure. In the summary file: `MODE = UNDEFINED`, and `CALIBRATION_MODE` and `DATA_MODE` entries are not present.

**InconsistentCalibrationMode** *(warning)*
The task has encountered a situation where the same CCD appears to be in more than one configuration. This is the configuration as expected by the **cal**.
*corrective action:* All operations related to the determination of the CCD data mode, calibration mode, and instrument configuration will be disabled for the current exposure. In the summary file: `MODE = UNDEFINED`, and `CALIBRATION_MODE` and `DATA_MODE` entries are not present.

**NewHousekeepingValue** *(warning)*
One housekeeping parameter that was supposed to remain constant during the current exposure was instead found to have changed value. This may mean that the exposure start/stop times determined by **odfingest** are incorrect.
*corrective action:* The parameter is ignored. A warning is written in the SOSF. See the warning `HousekeepingParameterMissing`.

**TranslationNotAvailable** *(warning)*
It is not possible to translate a housekeeping parameter value. **For the developer**. If the translator is a map {key,value}, this warning means that the translator does not contain a key corresponding to the parameter value. If the translator is a map {{min,max},value}, the warning indicates that the housekeeping parameter value is not contained in any of the available {min,max} ranges.
*corrective action:* Do not translate. A warning is written in the SOSF. See the warning `HousekeepingParameterMiss`

**UnknownInstrumentMode** *(warning)*
It is not possible to determine the instrument mode from the list of available CCD calibration modes. This indicates one of the following:

- **EMOS**: the current exposure is found to contain more than two distinct calibration modes.
- **EMOS**: the current exposure does not contain a calibration mode entry for CCD 1.
- **RGS, EPN, OM**: the current exposure is found to contain more than one distinct calibration mode.

*corrective action:* In the summary file: `MODE = UNDEFINED`.

**UnknownCalibrationMode** *(warning)*
For the current exposure the Calibration Access Layer is unable to uniquely determine the calibration mode. In the summary file: `MODE = UNDEFINED`, and `CALIBRATION_MODE` and `DATA_MODE` entries are not present. This points to a problem in the data itself or in the CCF in use.
*corrective action:* All operations related to the determination of the CCD data mode, calibration mode, and instrument configuration will be disabled for the current exposure.

**MissingOdfComponent** *(warning)*
The ODF component mentioned in the warning does not exist. This may prevent the SAS from processing the observation successfully.
*corrective action:* Ignore the problem. If the missing component is an housekeeping file the corresponding parameters will not be written to the SOSF.

**InconsistentTimeRange** *(warning)*
The time range covered by the ODF constituent mentioned in the warning does not fully contain the observation span. Processing some of the exposures may fail because data are not available.
*corrective action:* None.

**noOMExposurePair** *(warning)*
OM Exposure does not have correct EXP_START EXP_END pairs, using exposure time end for Actual End Time.
*corrective action:* None.

**ZeroExposureLength** *(warning)*
Detected a dataset with zero duration. This indicates that this exposure is unlikely to processable by the SAS.
*corrective action:* None.

**NoOdfFound** *(error)*
The summary file is not written.**odfingest** did not find any ODF constituent in the directory pointed to by `odfdir`.

**IncorrectNumberOfDatasets** *(error)*
The task expected to find one and only one ODF component matching a certain instrument/data mode pair. Both the file name pattern and the number of components found is reported.

**InvalidRevolutionIdentifier** *(error)*
The revolution identifier of one of the ODF constituents found in the ODF directory is not an integer.

**MultipleObservations** *(error)*
The ODF directory appears to contain ODF constituents belonging to more than one observation.

**OdfSummaryFileNotFound** *(error)*
The ODF summary file matching the pattern `*_SCX00000SUM.ASC` was not found. This is part of every well-formed ODF.

**MultipleObservations** *(error)*
ODF constituents from more that one ODF were identified in the ODF directory.

**NotATimeSortedTable** *(error)*
The `TIME` of one of the housekeeping datasets is not sorted in ascending order.

**FileIo** *(error)*
**odfingest** was unable to successfully write the summary file. Possible reasons: disk full, wrong permissions.

### 5.2 Internal errors

**UnknownInstrument** *(error)*
This is an internal error and it should not occurr. Please report it.

**UnknownInstrumentMode** *(error)*
This is an internal error and it should not occurr. Please report it.

**NoIppvExtractorAvailable** *(error)*
This is an internal error and it should not occurr. Please report it.

**UnknownDataType** *(error)*
This is an internal error and it should not occurr. Please report it.

**UnsupportedHousekeepingParameterType** *(error)*
This is an internal error and it should not occurr. Please report it.

**NotImplementedHere** *(error)*
This is an internal error and it should not occurr. Please report it.

**WrongDerivedType** *(error)*
This is an internal error and it should not occurr. Please report it.

## 6 Input Files

**odfingest** requires access to a complete ODF. ODF components must comply with the ODF file naming convention.

The only ODF component that is required to be present is the ODF summary file. If this cannot be found **odfingest** terminates in error.

All instrument data files found in the ODF directory are analyzed to determine the structure of the observation in terms of active instrument and exposures. If any instrument science file is found, then all the corresponding housekeeping files must be present.

## 7 Output Files

**odfingest** writes a SAS ODF Summary File.

The structure of the SOSF is described in the following section. Additionally:

- indicates a commnent.
- an optional `PATH` statement specifies the directory where the ODF components can be found.

## 7.1 Summary File specification from ODF ICD 2.4

***Note**: this section needs editing. For the time being it is taken verbatim from version 2.4 of the ODF ICD.*

Each ODF will contain an observation summary file and each SDF will contain a slew summary file. An observation/ slew summary file is an ASCII file which consists of a number of records. The following record types are present:

- Observation/ Slew Record
- File Details Record
- Instrument Details Records
- Proposal Summary Record
- Data Quality Record

All records will consist of an integer multiple of 80 character lines and are terminated with an additional linefeed (ASCII 0A hex) character. All lines will be space (ASCII 32) filled. In all of the subsequent tables 'An' specifies n characters and 'nX' specifies n spaces.

**7.1.0.1 Observation/ Slew Record** The observation/ slew record is the first record of the file and it will have the following structure.

Table 1: Observation Summary File: Observation Record

| Line No. | Offset | Type | Description | Note |
|---|---|---|---|---|
| 1 | 0 | A11, 69X | 'OBSERVATION' 'SLEW ' | Note 1 |
| 2 | 0 | A10, 1X | Observation Id. | Note 2 |
| 2 | 11 | A69 | Comment | Note 3 |
| 3 | 0 | A4, 1X | Orbit/ Revolution No. | Note 4 |
| 3 | 5 | A75 | Comment | Note 3 |
| 4 | 0 | A20,1X | Scheduled Start Time | Note 5 |
| 4 | 21 | A59 | Comment | Note 3 |
| 5 | 0 | A20,1X | Scheduled End Time | Note 5 |
| 5 | 21 | A59 | Comment | Note 3 |

1. Identifies the record as an Observation or a Slew Record
2. The syntax is ppppppooll (Section **??**) for an observation and TBD for a slew.
3. All comments will have the syntax ' / text'
4. The syntax is rrrr (Section **??**)
5. yyyy-mm-ddThh:mm:ss

**7.1.0.2 File Details Record** The file details record is the second record of the file and it will have the following structure.

Table 2: File Details Record

| Line No. | Offset | Type | Description | Note |
|---|---|---|---|---|
| 1 | 0 | A5, 75X | 'FILES' | Note 1 |
| 2 | 0 | I3, 1X | Number of files | Note 2 |
| 2 | 4 | A76 | Comment | Note 3 |
| 3 | 0 | A31, 1X | File name | Note 4 |
| 3 | 28 | A48 | Comment | Note 3 |
| ... | ... | ... | ... | ... |
| nnn+2 | 0 | A31, 1X | File name | Note 4 |
| nnn+2 | 28 | A48 | Comment | Note 3 |

1. Identifies the record as a File Details Record
2. The syntax is nnn. Identifies the number of files associated with the observation including the summary file.
3. All comments will have the syntax ' / text'
4. The syntax is RRRR_PPPPPPOOLL_IIUEEECCMMF.ZZZ (Section **??**)

**7.1.0.3 Instrument Details Record** There will be 6 instrument details records, one for each instrument, following the file details record. An instrument details record will have the following structure. After each instrument details record there will be n exposure records, where n is the number of exposures during the observation for that instrument.

Table 3: Instrument Details Record

| Line No. | Offset | Type | Description | Note |
|---|---|---|---|---|
| 1 | 0 | A10, 70X | 'INSTRUMENT' | Note 1 |
| 2 | 0 | A2, 1X | Instrument Id. | Note 2 |
| 2 | 3 | A77 | Comment | Note 3 |
| 3 | 0 | A1, 1X | Instrument Active Flag | Note 4 |
| 3 | 2 | A78 | Comment | Note 3 |
| 4 | 0 | A4,1X | Number of exposures | Note 5 |
| 4 | 5 | A75 | Comment | Note 3 |

1. Identifies the record as an Instrument Details Record
2. The syntax is ii (Section **??**)and can have the values OM, R1, R2, M1, M2 or PN.
3. All comments will have the syntax ' / text'
4. Y/N flag indicating whether the instrument was active during the observation.
5. The number of exposures associated with this instrument. If the instrument was inactive then this value is zero and no exposure records follow.

**7.1.0.4 Exposure Record** After each instrument details record there will be n exposure records, where n is the number of exposures performed during the observation for that instrument. Following each exposure record will be an instrument specific configuration record.

Table 4: Exposure Record

| Line No. | Offset | Type | Description | Note |
|---|---|---|---|---|
| 1 | 0 | A8, 72X | 'EXPOSURE' | Note 1 |
| 2 | 0 | A4, 1X | Exposure Counter | Note 2 |
| 2 | 5 | A75 | Comment | Note 3 |
| 3 | 0 | A1, 1X | Exposure Scheduled Flag | Note 4 |
| 3 | 2 | A78 | Comment | Note 3 |
| 4 | 0 | A11, 1X | Exposure Type | Note 5 |
| 4 | 12 | A68 | Comment | Note 3 |
| 5 | 0 | A10,1X | Commanded Exposure Id. | Note 6 |
| 5 | 11 | A69 | Comment | Note 3 |
| 6 | 0 | A15,1X | Proposal Exposure Id. | Note 7 |
| 6 | 16 | A64 | Comment | Note 3 |
| 7 | 0 | A19,1X | Scheduled Start Time | Note 8, 9 |
| 7 | 20 | A60 | Comment | Note 3 |
| 8 | 0 | A19,1X | Scheduled End Time | Note 8, 9 |
| 8 | 20 | A60 | Comment | Note 3 |
| 9 | 0 | A19,1X | Actual Start Time | Note 8, 10 |
| 9 | 20 | A60 | Comment | Note 3 |
| 10 | 0 | A19,1X | Actual End Time | Note 8, 10 |
| 10 | 20 | A60 | Comment | Note 3 |

1. Identifies the record as an Exposure Record.
2. A sequential counter of the exposures for that instrument.
3. All comments will have the syntax ' / text'.
4. Y/N flag indicating whether the exposure was scheduled or not. An 'N' will indicate that the exposure was not scheduled and resulted from a change request.
5. The type of the exposure ('SCIENCE'/ 'CALIBRATION') . The field will indicate whether the exposure is a science exposure requested by the GO or a calibration exposure inserted by SOC personnel
6. The mission planning exposure identifier
7. The syntax is ppppppoolliieee (Section **??**).
8. UTC time with the format yyyy-mm-ddThh:mm:ss.
9. The scheduled start and end time of the exposure assigned during scheduling.
10. The start and end time of the exposure as calculated by the XSCS (see description of DATE-OBS and DATE-END in Section **??** and elsewhere).

**7.1.0.5 EPIC MOS Configuration Record** After each exposure record there will be an instrument configuration record. If the exposure record describes an EPIC MOS exposure then the instrument configuration record will be an EPIC MOS Configuration Record. The record will detail the instrument configuration in terms of the instrument programmable parameter values obtained from the proposal information. This is the information contained within the proposal database which defines the exposure.

Table 5: EPIC MOS Configuration Record

| Line No. | Offset | Type | Description | Note |
|---|---|---|---|---|
| 1 | 0 | A22, 58X | 'CONFIGURATION EPIC MOS' | Note 1 |
| 2 | 0 | A4 , 76X | No of programmable parameters | Note 2 |
| 3 | 0 | A80 | IPP1 name value comment | Note 3 |
| ... | ... | ... | ... | |
| n+2 | 0 | A80 | IPPn name value comment | Note 3 |

1. Identifies the record as an EPIC MOS Configuration Record
2. Identifies the number of lines (number of instrument programmable parameters) to follow
3. The syntax of these lines should be identical to the syntax of a FITS card image (keyword = value / comment) [3, 2]

**7.1.0.6 EPIC p-n Configuration Record** After each exposure record there will be an instrument configuration record. If the exposure record describes an EPIC p-n exposure then the instrument configuration record will be an EPIC p-n Configuration Record. The record will detail the instrument configuration in terms of the instrument programmable parameter values obtained from the proposal information. This is the information contained within the proposal database which defines the exposure.

Table 6: EPIC p-n Configuration Record

| Line No. | Offset | Type | Description | Note |
|---|---|---|---|---|
| 1 | 0 | A21, 59X | 'CONFIGURATION EPIC PN' | Note 1 |
| 2 | 0 | A4 , 76X | No of programmable parameters | Note 2 |
| 3 | 0 | A80 | IPP1 name value comment | Note 3 |
| ... | ... | ... | ... | |
| m+2 | 0 | A80 | IPPm name value comment | Note 3 |

1. Identifies the record as an EPIC p-n Configuration Record.
2. Identifies the number of lines (number of instrument programmable parameters) to follow
3. The syntax of these lines should be identical to the syntax of a FITS card image (keyword = value / comment) [3, 2]

**7.1.0.7 EPIC Radiation Monitor Configuration Record** *Section deleted.*

**7.1.0.8 RGS Configuration Record** After each exposure record there will be an instrument configuration record. If the exposure record describes an RGS exposure then the instrument configuration record will be an RGS Configuration Record. The record will detail the instrument configuration in terms of the instrument programmable parameter values obtained from the proposal information. This is the information contained within the proposal database which defines the exposure.

Table 7: RGS Configuration Record

| Line No. | Offset | Type | Description | Note |
|---|---|---|---|---|
| 1 | 0 | A17, 63X | 'CONFIGURATION RGS' | Note 1 |
| 2 | 0 | A4 , 76X | No of programmable parameters | Note 2 |
| 3 | 0 | A80 | IPP1 name value comment | Note 3 |
| ... | ... | ... | ... | |
| q+2 | 0 | A80 | IPPq name value comment | Note 3 |

1. Identifies the record as an RGS Configuration Record.
2. Identifies the number of lines (number of instrument programmable parameters) to follow
3. The syntax of these lines should be identical to the syntax of a FITS card image (keyword = value / comment) [3, 2]

**7.1.0.9 OM Configuration Record** After each exposure record there will be an instrument configuration record. If the exposure record describes an OM exposure then the instrument configuration record will be an OM Configuration Record. The record will detail the instrument configuration in terms of the instrument programmable parameter values obtained from the proposal information. This is the information contained within the proposal database which defines the exposure.

Table 8: OM Configuration Record

| Line No. | Offset | Type | Description | Note |
|---|---|---|---|---|
| 1 | 0 | A16, 64X | 'CONFIGURATION OM' | Note 1 |
| 2 | 0 | A4 , 76X | No of programmable parameters | Note 2 |
| 3 | 0 | A80 | IPP1 name value comment | Note 3 |
| ... | ... | ... | ... | |
| q+2 | 0 | A80 | IPPq name value comment | Note 3 |

1. Identifies the record as an OM Configuration Record.
2. Identifies the number of lines (number of instrument programmable parameters) to follow
3. The syntax of these lines should be identical to the syntax of a FITS card image (keyword = value / comment) [3, 2]

**7.1.0.10 Proposal Summary Record** The proposal summary record follows the very last configuration record and contains a summary of the proposal information asssociated with the observation. This is the information contained within the proposal database regarding the proposal submitter and the general observation details.

Only the first line of the proposal summary record will be present in the slew summary file.

Table 9: Proposal Summary Record

| Line No. | Offset | Type | Description | Note |
|---|---|---|---|---|
| 1 | 0 | A8, 72X | 'PROPOSAL' | Note 1 |
| 2 | 0 | A5, 1X | Title | Note 2 |
| 2 | 6 | A20, 1X | First name | Note 2 |
| 2 | 26 | A20, 33X | Surname | Note 2 |
| 3 | 0 | A30, 50X | Institute | Note 3 |
| 4 | 0 | A30, 50X | Mailing address Line 1 | Note 3 |
| 5 | 0 | A30, 50X | Mailing address Line 2 | Note 3 |
| 6 | 0 | A20, 60X | Mailing address town/ city | Note 3 |
| 7 | 0 | A10, 70X | Mailing address state | Note 3 |
| 8 | 0 | A20, 60X | Mailing address country | Note 3 |
| 9 | 0 | A10, 70X | Mailing address zip/post code | Note 3 |
| 10 | 0 | A80 | E-mail address | Note 4 |
| 11 | 0 | A2, 1X | Announcement of Opportunity | Note 5 |
| 11 | 3 | A77 | Comment | Note 6 |
| 12 | 0 | A2, 1X | Science Type | Note 7 |
| 12 | 3 | A77 | Comment | Note 6 |
| 13 | 0 | A20, 1X | Target name | Note 8 |
| 13 | 21 | A59 | Comment | Note 6 |
| 14 | 0 | F10.7, 1X | Target right ascension | Note 9 |
| 14 | 11 | A69 | Comment | Note 6 |
| 15 | 0 | F11.7, 1X | Target declination | Note 9 |
| 15 | 12 | A68 | Comment | Note 6 |
| 16 | 0 | A6, 1X | Observation Duration | Note 10 |
| 16 | 7 | A73 | Comment | Note 6 |
| 17 | 0 | A80 | Alternative names | Note 11 |
| 18 | 0 | F10.7, 1X | Boresight RA | Note 13 |
| 18 | 11 | A69 | Comment | Note 6 |
| 19 | 0 | F11.7, 1X | Boresight declination | Note 13 |
| 19 | 12 | A68 | Comment | Note 6 |
| 20 | 0 | A3, 1X | Position angle constraint (lower) | Note 14 |
| 20 | 4 | A76 | Comment | Note 6 |
| 21 | 0 | A3, 1X | Position angle constraint (upper) | Note 14 |
| 21 | 4 | A76 | Comment | Note 6 |
| 22 | 0 | A1, 1X | Position angle origin reference | Note 14 |
| 22 | 2 | A78 | Comment | Note 6 |
| 23 | 0 | A1, 1X | EPIC MOS 1 priority | Note 15 |
| 23 | 2 | A78 | Comment | Note 6 |
| 24 | 0 | A1, 1X | EPIC MOS 2 priority | Note 15 |
| 24 | 2 | A78 | Comment | Note 6 |
| 25 | 0 | A1, 1X | EPIC p-n priority | Note 15 |

*continued on next page*

| *continued from previous page* | | | | |
|---|---|---|---|---|
| Line No. | Offset | Type | Description | Note |
| 25 | 2 | A78 | Comment | Note 6 |
| 26 | 0 | A1, 1X | RGS-1 priority | Note 15 |
| 26 | 2 | A78 | Comment | Note 6 |
| 27 | 0 | A1, 1X | RGS-2 priority | Note 15 |
| 27 | 2 | A78 | Comment | Note 6 |
| 28 | 0 | A1, 1X | OM priority | Note 15 |
| 28 | 2 | A78 | Comment | Note 6 |

1. Identifies the record as a Proposal Summary Record.
2. Name of the PGO.
3. Postal address of the PGO
4. E-mail address of the PGO
5. AO for which the observation was submitted
6. All comments will have the syntax ' / text'.
7. GO identified science type of the observation
8. Name of the observed target
9. Right ascension (hours) and declination (degrees) of the target
10. Estimated duration of the observation in seconds
11. Alternative names for the target.
12. *Item Deleted.*
13. Spacecraft boresight right ascension (hours) and declination (degrees)
14. spacecraft position angle details.
15. Instrument Priority (1-6 or 0 if inactive).

**7.1.0.11 Data Quality Record** Finally there will be a data quality record for each instrument exposure and one for the spacecraft data. The following data quality information will be stored stored in the summary file:

- Number of packets that failed reception
- Number of event report
- Number of errors not resulting from user input
- Number of telemetry drops
- Total duration of these telemetry drops
- Number of OOLs

These items will be stored on a per exposure basis for each instrument and on a per observation basis for the spacecraft telemetry.

Table 10: Data Quality Record

| Line No. | Offset | Type | Description | Note |
|---|---|---|---|---|
| 1 | 0 | A12, 58X | 'DATA QUALITY' | Note 1 |
| 2 | 0 | A2, 1X | Instrument Id. | Note 2 |
| 2 | 3 | A77 | Comment | Note 3 |
| 3 | 0 | A13, 1X | Exposure Id | Note 4 |
| 3 | 5 | A66 | Comment | Note 3 |
| 4 | 0 | A4,1X | Number of packets failing reception | Note 5 |
| 4 | 5 | A75 | Comment | Note 3 |
| 5 | 0 | A4,1X | Number of event reports | Note 6 |
| 5 | 5 | A75 | Comment | Note 3 |
| 6 | 0 | A4,1X | Number PMS errors | Note 7 |
| 6 | 5 | A75 | Comment | Note 3 |
| 7 | 0 | A4,1X | Number of telemetry drops | Note 8 |
| 7 | 5 | A75 | Comment | Note 3 |
| 8 | 0 | A4,1X | Total duration of telemetry drops | Note 9 |
| 8 | 5 | A75 | Comment | Note 3 |
| 9 | 0 | A4,1X | Number of out of limits | Note 10 |
| 9 | 5 | A75 | Comment | Note 3 |
| 10 | 0 | A1,1X | Unscheduled/ scheduled/ not applicable flag | Note 11 |
| 10 | 3 | A78 | Comment | Note 3 |

1. Identifies the record as a Data Quality Record.
2. The syntax is ii (Section **??**).
3. All comments will have the syntax ' / text'.
4. The syntax is ppppppoolliieee (Section **??**).
5. Number of telemetry packets associated with the instrument/ spacecraft that failed reception during the period.
6. Number of event reports produced by the instrument/ spacecraft during the period.
7. Number of errors detected by the automatic telemetry processor for the instrument/ spacecraft during the period.
8. Number of drops in the instrument/ spacecraft telemetry during the period.
9. Total duration of the telemetry drops in the instrument/ spacecraft telemetry during the period.
10. Number of out of limits detected in the instrument/ spacecraft telemetry during the period.
11. Flag (S, U or X) indicating whether the exposure was scheduled (S) or unscheduled (U) and set to 'X' when it is not applicable (for the spacecraft data quality records).

# 8 Algorithm

```
+ scan odfdir for file matching scheduled and unscheduled
  science files: ????_??????????_??S????????.FIT
                 ????_??????????_??U????????.FIT
```

```
+ use DATE-OBS DATE-END from these files to deduce observation
  and exposure boundaries.

+ scan odfdir for othr ODF components that must be listed in the
  SAS summary file: ????_??????????_??X????????.FIT
                    ????_??????????_??????????.ASC

+ open SAS summary file

+ if writepath=yes
     write PATH = odfdir in the SAS summary file

+ write the observation record. Start/End time are the min/max of
  all the DATE-OBS/END.

+ write the file details record. List all the files found during the
  two passes through odfdir.

+ for each instrument

  - write the instrument details record:
    . the instrument is active if one or more exposures were found
    . write the number of exposures identified for this instrument

  - for each exposure of this instrument

    . write the exposure sub-record:
      . the actual exposure start/end are the min/max of all the DATE-OBS/END
        read from the science files in the exposure. The scheduled
        start/end times are made the same as the actual start/end times.
      . write the proposal exposure id.
      . write the commanded exposure id (this is the same as the above).


    . write the instrument configuration sub-record:
      . write the number of IPPVs for this instrument
      . get the IPPVs from the housekeeping files and write the to
        the SAS summary file.

+ identify the ODF summary file and copy its content from the
  proposal record onward into the SAS summary file.
```

# 9 Comments

- the names and data type of the parameters are missing.
- the names of the housekeeping parameters used to extract the instrument parameters are missing.

# References

[1] ESA. XMM Interface Control Document: Observation and Slew Data Files (XSCS to SSC) (SciSIM to SOCSIM). Technical Report XMM-SOC-ICD-0004-SSD Issue 2.5, ESA/SSD, June 2000. Found at the URL: `ftp://astro.estec.esa.nl/pub/XMM/documents/odf_icd.ps.gz`.

[2] NASA/GSFC Astrophysics Data Facility. A user's guide for the flexible image transport system (FITS). Technical Report Version 4.0, NASA/GSFC, April 1997.

[3] NASA/Science Office of Standards and Technology. Definition of the Flexible Image Transport System (FITS). Technical Report NOST 100-1.1, NASA/NOST, September 1995.