

# Data Product File Formats

## File Format Summary

Most of the JWST science data files are images or tables in [FITS format](#) (FITS 4.0 Standard), often with multiple extensions (MEF), while others are in some form of structured ASCII. Table 1 contains a short summary of the data product types that may be included with each data set along with the semantic content of the various data products, including some that are produced outside the science calibration pipeline.

| Product type        | Format                 | Description                                                                                                                                                                                                                                                                                                                                                     |
|---------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Science data        | FITS MEF images        | Science data products for imaging, spectroscopy, coronagraphy, and (early stages of) time-series observations. The image extensions contain multi-dimensional science pixel arrays, concomitant data quality flags, and variance arrays. See the article on <a href="#">Science Products</a> for details of the organization of information within these files. |
|                     | FITS binary table      | Extracted spectra are stored as tables, and include fields for spectral coordinates, flux, and concomitant quality information. <a href="#">AMI</a> fringe parameters are also stored as binary tables of coefficients.                                                                                                                                         |
|                     | ECSV                   | Source catalogs, as well as time-series observation ( <a href="#">TSO</a> ) light curves are stored in an ASCII <i>enhanced character-separated variable</i> format.                                                                                                                                                                                            |
|                     | ASDF                   | Metadata for images or spectra are stored in ASDF format, but are packaged as BYTE arrays in a FITS extension of type BINTABLE.                                                                                                                                                                                                                                 |
| Guide-star data     | FITS MEF images        | Data products from associated guide-star activities: identification, acquisition, tracking and guiding. The image extensions are analogous to those for science data.                                                                                                                                                                                           |
| Associations        | ECSV                   | A collection of metadata for all exposures that match a combination of attributes, including instrument, program ID, and observation, from which associations are generated within a given observing program.                                                                                                                                                   |
|                     | JSON                   | Enumeration of relationships between different levels of science data products, and related calibration reference products, that were used during the course of calibration pipeline processing.                                                                                                                                                                |
| WSS                 | FITS                   | Wavefront-sensing Optical Path Difference (OPD) images that describe the state of the mirror segment alignments for a particular epoch. The OPD files can be used with a tool such as <a href="#">WebbPsf</a> to determine the estimated PSFs for any given instrument aperture.                                                                                |
| Engineering data    | CSV                    | Engineering data are provided in the form of a time series of values for a given telemetry point, in CSV format, with one series per file.                                                                                                                                                                                                                      |
| CAL reference files | ASDF, ECSV, FITS, JSON | Static reference files used in calibration processing come in various formats.                                                                                                                                                                                                                                                                                  |
| Previews            | JPEG or PNG            | Preview and thumbnail images for presenting data products in the Portal.                                                                                                                                                                                                                                                                                        |

## For Further Reading...

The on-line documentation in JDox and in the calibration documentation (CAL) is very detailed and comprehensive.

- [JWST Data File Naming Conventions](#) (JDox)
- [JWST File Naming Schemes](#) (CAL)
- [Data Product Types](#) (CAL)
- [Science Products](#) (CAL)