



European Organisation for Astronomical Research in the Southern Hemisphere

Programme: GEN

Project/WP: Science Operation Software Department

IIINSTRUMENT Pipeline User Manual

Document Number: ESO-XXXXXX

Document Version: 0.1

Document Type: Manual (MAN)

Released on: 2016-05-02

Document Classification: Public

Prepared by: IIINSTRUMENT Pipeline Team

Validated by:

Approved by:

Name



IIINSTRUMENT Pipeline User Manual

Doc. Number: ESO-XXXXXX
Doc. Version: 0.1
Released on: 2016-05-02
Page: 2 of [22](#)

Authors

Name	Affiliation
N.N.	Far out in the uncharted backwaters of the unfashionable end of the western spiral arm of the Galaxy



IIIINSTRUMENT Pipeline User Manual

Doc. Number: ESO-XXXXXX
Doc. Version: 0.1
Released on: 2016-05-02
Page: 3 of [22](#)

Change Record from previous Version

Affected Section(s)	Changes/Reason/Remarks
All	First draft



Contents

1	Introduction	7
1.1	Scope	7
1.2	Acknowledgements	7
1.3	Stylistic conventions	7
1.4	Notational Conventions	7
2	Related Documents	8
2.1	Applicable Documents	8
2.2	Reference Documents	8
3	Definitions, Acronyms and Abbreviations	9
4	Overview	10
5	The IIINSTRUMENT Instrument	11
6	Quick Start	12
6.1	The IIINSTRUMENT Pipeline Recipes	12
6.2	Running the IIINSTRUMENT Pipeline Recipes	12
6.2.1	Getting Started with EsoRex	12
6.3	Data Organization	13
7	Known Issues	14
8	IIINSTRUMENT Data Description	15
8.1	Bias	15
9	Static Calibration Data	16
9.1	Line Catalog	16
10	Data Reduction	17
10.1	The IIINSTRUMENT Data Reduction Pipeline	17



11 Recipe Reference	18
11.1 iiiinstrument_mbias	18
11.1.1 Description	18
11.1.2 Input Frames	18
11.1.3 Product Frames	18
11.1.4 Quality Control Parameters	18
11.1.5 Recipe Parameters	18
12 Algorithms	20
12.1 General Algorithms	20
12.2 Recipes Algorithms	20
A Installation	21
A.1 System Requirements	21
A.2 Installing the IIINSTRUMENT Pipeline	21
A.3 Building the IIINSTRUMENT Pipeline	21
A.3.1 Build Requirements	21
B Troubleshooting	22



IIINSTRUMENT Pipeline User Manual

Doc. Number:	ESO-XXXXXX
Doc. Version:	0.1
Released on:	2016-05-02
Page:	6 of 22



1 Introduction

This template contains the basic layout of the User Manual and comments/instructions in “red” on how the different sections should be filled. They also indicate which parts are provided by ESO. These comments should be removed from the final document. If there are questions regarding the template, the instructions or the intended content of certain sections, please get in touch with your ESO contact person.

1.1 Scope

The examples on running individual pipeline recipes in this manual use the *EsoRex* command and manually created list of input files. Several interfaces to automatically organise the data, create the list of input files and execute the pipeline recipes in the proper sequence are available, see the ESO Pipeline web page <https://www.eso.org/pipelines> for details.

1.2 Acknowledgements

1.3 Stylistic conventions

Throughout this document the following stylistic conventions are used:

bold	in text sections for commands and other user input which has to be typed as shown
<i>italics</i>	in the text and example sections for parts of the user input which have to be replaced with real contents
teletype	in the text for FITS keywords, program names, file paths, and terminal output, and as the general style for examples, commands, code, etc

In example sections expected user input is indicated by a leading shell prompt.

In the text **bold** and *italics* may also be used to highlight words.

1.4 Notational Conventions

Hierarchical FITS keyword names, appearing in the document, are given using the dot–notation to improve readability. This means, that the prefix “HIERARCH ESO” is left out, and the spaces separating the keyword name constituents in the actual FITS header are replaced by a single dot.



2 Related Documents

2.1 Applicable Documents

[AD01] ESO-XXXXXX 1.0 TBD

2.2 Reference Documents

[RD01] ESO-XXXXXX IIINSTRUMENT User Manual



3 Definitions, Acronyms and Abbreviations

CalibDB	Calibration Database
CPL	Common Pipeline Library
CCD	Charge Coupled Device
DFS	Data Flow System
DRS	Data Reduction System
ESO	European Southern Observatory
EsoRex	ESO Recipe Execution Tool
FITS	Flexible Image Transport System
FOV	Field Of View
GUI	Graphical User Interface
LSF	Line Spread Function
IIINSTRUMENT	IIINSTRUMENT
OB	Observation Block
pixel	picture element (of a raster image)
PSF	Point Spread Function
QC	Quality Control
SDP	Science Data Product
SOF	Set Of Frames
TBD	To be defined
TBC	To be confirmed
VLT	Very Large Telescope
WCS	World Coordinate System



4 Overview

Document overview and purpose goes here



Figure 5.1: Graphical representations of IIINSTRUMENT.

5 The IIINSTRUMENT Instrument

Instrument overview, description of instrument modes, etc.



6 Quick Start

Cookbook-like description of pipeline recipes and their usage

6.1 The IIINSTRUMENT Pipeline Recipes

Overview and/or summary of available pipeline recipes, i.e. list of available pipelines and a brief (one-liner) description of its purpose.

6.2 Running the IIINSTRUMENT Pipeline Recipes

6.2.1 Getting Started with EsoRex

Basic description of EsoRex. Contents will partially be provided by ESO, example follows.

EsoRex is a command-line tool which can be used to execute the recipes of all standard VLT/VLTI instrument pipelines. With *EsoRex* in your path, the general structure of an *EsoRex* command line is

```
1> esorex [esorex options] [recipe [recipe options] [sof [sof]...]]
```

where options appearing before the recipe name are options for *EsoRex* itself, and options given after the recipe name are options which affect the recipe.

All available *EsoRex* options can be listed with the command

```
1> esorex --help
```

and the full list of available parameters of a specific recipe can be obtained with the command

```
1> esorex --help <recipe name>
```

The output of this command shows as parameter values the current setting, i.e. all modifications from a configuration file or the command line are already applied.

The listing of all recipes known to *EsoRex* can be obtained with the command

```
1> esorex --recipes
```

The last arguments of an *EsoRex* command are the so-called *set-of-frames*. A *set-of-frames* is a simple text file which contains a list of input data files for the recipe. Each input file is followed by a unique identifier (frame classification or frame tag), indicating the contents of this file. The input files have to be given as an absolute path, however *EsoRex* allows the use of environment variables so that a common directory prefix can be abbreviated. Individual lines may be commented out by putting the hash character (#) in the first column. An example of a *set-of-frames* is shown in the following:



```
1> cat bias.sof
/data/iiinstrument/raw/IIINSTRUMENT.2019-03-29T09:48:53.153.fits BIAS
$RAW_DATA/IIINSTRUMENT.2019-03-29T09:50:36.645.fits BIAS
$RAW_DATA/IIINSTRUMENT.2019-03-29T09:52:16.513.fits BIAS
$RAW_DATA/IIINSTRUMENT.2019-03-29T09:53:47.996.fits BIAS
#$RAW_DATA/IIINSTRUMENT.2019-03-29T09:55:04.515.fits BIAS
```

These *set-of-frames* files will have to be created by the user using a text editor, for instance. Which classification has to be used with which recipe will be shown in section [6.3](#)

Finally, if more than one *set-of-frames* is given on the command-line *EsoRex* concatenates them into a single *set-of-frames*.

6.3 Data Organization

Outline of how to organize IIINSTRUMENT data, i.e. how to get to a correct SOF file, which classification tags are accepted by the recipes and how they are defined in terms of header keywords.



7 Known Issues

*Know issues, problems and limitations related to the **current release** of the pipeline (if possible with a work-around) go here.*



8 IIINSTRUMENT Data Description

Description of the different raw frames processed by the pipeline, including data classification and association keywords (cf. example)

8.1 Bias

Frame tag: BIAS

Processed by: `iiinstrument_mbias`

Classification Keywords	Association Keywords	Remarks
DPR.CATG = CALIB DPR.TYPE = BIAS	DET.CHIP.ID SEQ.ARM DET.READ.CURID	Detector chip identification Spectrograph identification Detector read-out mode

An example is shown in Table 8.1.



9 Static Calibration Data

Description of the different static data files needed (line catalog for instance), including data classification and association keywords (cf. example).

9.1 Line Catalog

Frame Tag: LINE_CATALOG

Classification keywords: PRO.CATG = LINE_CATALOG

Column Name	Column Type	Description
Lambda	float	Line wavelength nm
Flux	float	Relative line flux
Ion	string	Ion from which the line originates
Quality	int	Quality flag (0: undetected line, 1: etc.)
Comment	string	Optional column for further remarks

Table 9.1: A line catalog

An example is shown in Table 9.1.



Figure 10.1: The IIINSTRUMENT “Assocoation Map” showing the required and optional input for each recipe.

10 Data Reduction

Description and of the data reduction process from raw files to the final product, including walk-through of a standard data reduction session.

10.1 The IIINSTRUMENT Date Reduction Pipeline

The IIINSTRUMENT association map is shown in Figure 10.1.



11 Recipe Reference

Recipe reference with detailed description of input frames, parameters products and provided QC information (see example below).

11.1 iiinstrument_mbias

11.1.1 Description

11.1.2 Input Frames

Frame Tag	Type	Count	Description
BIAS	raw	3 (min)	Raw bias
BAD_PIXEL_TABLE	calib	1 (opt)	Table of a priori known bad pixel locations

11.1.3 Product Frames

Default File Name	Frame Tag	Description
master_bias.fits	MASTER_BIAS	Master bias frame
bad_pixel_mask.fits	BAD_PIXEL_MASK	Bad pixel mask

11.1.4 Quality Control Parameters

QC.BIAS.MASTER.AVG	Average pixel value of the master bias frame
QC.BIAS.MASTER.MED	Median pixel value of the master bias frame
QC.BIAS.MASTER.RMS	RMS of the master bias frame

11.1.5 Recipe Parameters

Parameter	Type	Values	Description
stack-method	string	average, median, ksigma	Stacking method
clip-low	double	3.	Low sigma threshold for <i>ksigma</i> pixel rejection method

continued on next page



IIIINSTRUMENT Pipeline User Manual

Doc. Number: ESO-XXXXXX
Doc. Version: 0.1
Released on: 2016-05-02
Page: 19 of [22](#)

continued from previous page			
Parameter	Type	Values	Description
clip-high	double	3.	High sigma threshold for <i>ksigma</i> pixel rejection method



12 Algorithms

The first part contains the detailed discussion and the mathematical description of the used algorithms. The second part contains the recipe algorithm, i.e. a high-level description of the recipe flow-chart and how it changes for different parameter settings.

12.1 General Algorithms

12.2 Recipes Algorithms



A Installation

ESO pipelines can be installed via several methods, depending on your OS, most of which facilitate easy installation, upgrade and removal. Please see the *ESO Data Reduction Pipelines and Workflow Systems* page (<https://www.eso.org/pipelines>).

Installation instructions for the different package types offered by ESO and build instructions for experienced users. This part will be filled by ESO to a large extent.

A.1 System Requirements

A.2 Installing the IIINSTRUMENT Pipeline

A.3 Building the IIINSTRUMENT Pipeline

A.3.1 Build Requirements



B Troubleshooting

Hints on diagnosing problems and possible work-arounds or debug settings.