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Very Large Telescope

Paranal Science Operations

FORS Template Manual

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1 Introduction

1.1 Scope

All observations with the VLT are carried out with "observing blocks" (OBs). OBs are prepared with the phase 2 proposal preparation software P2PP. With P2PP the mode specific observation templates will be selected by the users and the parameter fields ("keywords") are set to the user specified values. The P2PP manual introduces the functionality of the P2PP software while this FORS2 Template Manual describes the FORS templates and the keywords.

A general overview of the instrument and the FIMS mask preparation for FORS is given in the following manuals:

- FORS2 FIMS Manual (ESO document VLT-MAN-ESO-13100-2308)
- FORS2 User Manual (ESO document VLT-MAN-ESO-13100-1543)

The FORS user manual and the FIMS manual can be retrieved from the FORS user pages:

`http://www.eso.org/instruments/fors`

The P2PP Manual and more informations about service mode OB preparation is available on page:

`http://www.eso.org/observing/p2pp`

1.2 Contact Information

In case of questions related to your Service Mode observations and proposal preparation please contact the User Support Department through email:

`usd-help@eso.org`

For visitor mode observation runs please contact the Paranal Science Operations Team:

`fors2@eso.org`

1.3 Changes in this edition:

- None

1.4 Acknowledgments

The earlier versions of this manual have been edited by H. Böhnhardt, G. Rupprecht, T. Szeifert and E. Jehin.

1.5 Abbreviations and Acronyms

The following abbreviations and acronyms are used in this manual:

ACQ	Acquisition
BOB	Broker of Observation Blocks
CCD	Charge Coupled Device
CS	Constrain set
ESO	European Southern Observatory
FIMS	FORS Instrumental Mask Simulator
FORS	Focal Reducer/Low Dispersion Spectrograph
HIT	HIgh-Time resolution
HIT-I	HIgh-Time resolution Imaging
HIT-S	HIgh-Time resolution Spectroscopy
HIT-MS	HIgh-Time resolution Spectroscopy with MXU masks
HR	High Resolution
IMG	Imaging
IPOL	Imaging Polarimetry
LADC	Longitudinal Atmospheric Dispersion Compensator
LSS	Long Slit Spectroscopy
MIT	More Infrared Transmission
MOS	Multi Object Spectroscopy
MXU	Mask eXchange Unit
OB	Observation Block
OD	Observation Description
OS	Observation Software
OSF	Order Separation Filter
OT	Observing Tool
PMOS	Polarimetric Multi Object Spectroscopy
P2PP	Phase 2 Proposal Preparation
RA	Right Ascension
RRM	Rapid Response Mode
SR	Standard Resolution
TCS	Telescope Control System
TP	Target Package
VLT	Very Large Telescope

2 FORS Templates

2.1 Introduction: Observation Blocks, Templates, Keywords

Observation Block (OB): Observations are described in so-called Observations Blocks (OB) containing all the necessary information to perform a single (science or calibration) observation. An OB contains a Target Package (TP), which tells the telescope where to go, an Acquisition Template (AT), which tells the system how to go, and an Observation Description (OD), which tells the system what to do once in position. The OD in turn may contain several templates, the true unit of observation. In service mode, OBs contain also a Constraint Set (CS). OBs are executed by BOB, the Broker for Observation Blocks. It sends commands to the Observation Software (OS), which then redistributes them to the instrument (ICS), detector (DCS), and telescope (TCS) control sofware. This forms the VLT Control Software (VCS).

Advance preparation of your OBs can optimize the use of the telescope by minimizing overheads. Investigators asking for service observing will have to submit a set of fully defined OBs to be executed under certain conditions, whereas visitors can prepare a few typical OBs, and will have more flexibility at the telescope to modify and adapt them to their immediate needs.

OBs are created and edited with the P2PP (Phase 2 Proposal Preparation): following the general P2PP architecture, two types of Observation Blocks can be specified:

"ObsBlocks"	night time observations, science and standard star exposures
"CalBlocks"	day time calibrations, bias, darks, screen flats, arcs

Night time "ObsBlocks" consist of the target information, a single acquisition template and the observation description (OD) with a small selection of science observation templates. The day time "CalBlocks" consist of a small selection of calibration templates (but no acquisition templates). Besides this, constraint sets (CS) and scheduling information are requested in particular for the preparation of service more observations. The target information and the constraint sets are not described below, since they are general for all instruments and their description can be found in the P2PP manual.

Observation Description (OD): this defines the sequence of setups and exposures for scientific or calibration purposes. It consists of one or more templates and the respective keywords. If several templates are included, their execution follows the sequence in the list. This sequence can be modified at the telescope through BOB, the Broker for OBs, in the sense that the execution of any individual templates can be skipped, paused or restarted.

2.2 FORS Templates: Acquisition, Science and Calibration

2.2.1 FORS Observing Modes

The FORS templates are specfic for a given observation mode (see Table 1). Each mode has a specific set of templates for the acquisition, science exposures and calibrations. In most cases the templates of different modes cannot be mixed in one observation blocks.

Fast, RRM and FIMS based observing modes: Three groups of target acquisition templates are offered: FIMS based modes which require mask preparations and the more simple fast modes. All multi-object observations in modes MOS, MXU, HIT-MS and PMOS will require the preparation of masks with fims. Occulting bar imaging and slitless spectroscopy is only supported with fims-based modes. Typically, the mask design has to be ready before starting the preparation of the OBs.

Any observation in modes IMG, IPOL, LSS, HIT-I, HIT-S and single target observations in "PMOS" mode can be done without mask preparation with fims. These are the so-called 'fast' observations. A sub-category of these are RRM templates, which are similar to fast templates, but with less user interaction due to the nature of RRM observations.

Observing Mode	**Acronym**	**Options**		
		RRM	FAST	FIMS
Direct imaging	IMG	X	X	
Imaging with occulting bars	OCC			X
Longslit spectroscopy	LSS	X	X	
Multi-object spectroscopy (movable slits)	MOS			X
Imaging polarimetry	IPOL	X	X	
Spectropolarimetry	PMOS	X	X	X
Multi-object spectroscopy (slit masks)	MXU			X
HIT imaging	HIT-I		X	
HIT spectroscopy	HIT-S		X	
HIT spectroscopy with masks	HIT-MS			X
Spectro-photometric standard stars	SPECPHOT		X	

Table 1: Observing modes of FORS2.

For faint targets we support blind offset acquisition modes for all the fast modes (this is done with the through slit templates). The astrometric requirements are similar for blind fast acquisitions and fims acquisitions. In general the OB execution won't be much faster, but the OB preparation will be!

For the acquisition and science templates fast (incl RRM) and FIMS based option are usually considered as separate observing modes of FORS. They thus have separate templates for target acquisition, science observation and day time calibrations. In general the FIMS based and fast mode templates cannot be mixed in a single OB and the few exceptions are to be discussed with the observatory staff.

2.2.2 Template Types

Three template types are used with FORS: target acquisition templates, science observation templates and day time calibration templates. The following naming convention is normally used (<mode> gives the observing mode used - see Table 1; xxx indicates the option of the respective mode - fast for fast mode, all others are FIMS based):

Acquisition Templates	FORS2_<mode>_acq_xxx
Calibration Templates	FORS2_<mode>_cal_xxx
Observation Templates	FORS2_<mode>_obs_xxx

In a few cases we still break this naming scheme like for the occulting bar imaging or deviate slightly from the scheme, but you will find a cross identification list between acquisition and science observation templates below in Tables 2 & 3

2.2.3 Template Keywords

The parameters of the templates and the respective observations are to be specified in the template specific list of keywords. The keywords correspond to functionalities (for instance setups of the instrument, telescope preset) supported by the templates. Within P2PP the keywords are designated by the names of P2PP entry fields. For any keyword an allowed range and a default value is defined. The keywords themselves are not visible from P2PP. The tables in section 3 list - separately for each OB - the keywords names, their value range and defaults together with the P2PP name as shown in the view panel of P2PP. In general only the keywords which will be in status "NODEFAULT" have to be set be the users, while the keywords already set to default values should remain at the original

template name	short description
FORS2_img_cal_coll	select collimator for calibration exposures
FORS2_img_cal_bias	bias exposure
FORS2_img_cal_dark	dark exposure
FORS2_img_acq	fast/normal imaging target acquisition
FORS2_img_acq_rrm	RRM imaging target acquisition
FORS2_img_obs_crsplit	multiple imaging exposure with offsets
FORS2_img_cal_scrflat	imaging screen flatfield
FORS2_img_cal_skyflat	sky flat with automatic exposure time calculation and offsets on the sky
FORS2_img_acq_align	FIMS based accurate imaging target acquisition
FORS2_img_occ_crsplit	imaging with occultation mask of MOS slit arms
FORS2_ipol_acq_fast	fast IPOL target acquisition
FORS2_ipol_acq_rrm	RRM (fast) IPOL target acquisition
FORS2_ipol_obs_off_fast	IPOL sequence with offset in Y rotating the retarder plate
FORS2_ipol_obs_scrflat_fast	IPOL screen flat sequence rotating the retarder plate
FORS2_hiti_acq_fast	fast HIT imaging acquisition
FORS2_hiti_slit_exp_fast	HIT imaging exposure through the slit
FORS2_hiti_obs_exp_fast	HIT imaging science exposure
FORS2_hiti_cal_Scrflat_fast	HIT imaging screen flat calibration

Table 2: A list of all acquisition, science and calibration templates for imaging modes

default value in almost all cases. Hidden parameters cannot be modified and will not appear at any place in p2pp.

2.3 Acquisition Templates

The prime goal of the acquisition templates is the positioning of user defined objects to user defined positions (eg. slits) in the focal plane of the instrument. The acquisition templates contain keywords related to the targets, the telescope and instrument setup and some mode specific options for the target acquisition sequence. The execution sequence of FORS acquisition templates has two phases: the preset to and the fine positioning of the target field. It has the following execution steps:

FORS2_lss_acq_fast	fast longslit spectroscopy target acquisition
FORS2_lss_acq_rrm	RRM (fast) longslit spectroscopy target acquisition
FORS2_lss_obs_slit_fast	through-slit longslit exposure
FORS2_lss_obs_off_fast	longslit spectroscopy with offsets along the slit
FORS2_lss_cal_daycalib	longslit spectroscopic screen flatfield and wavelength calibration
FORS2_mos_acq	FIMS based MOS target acquisition
FORS2_mos_obs_slit	MOS exposure through the slits
FORS2_mos_obs_off	MOS exposure with offset along the slit
FORS2_mos_cal_daycalib	MOS spectroscopic screen flatfield and wavelength calibration
FORS2_mxu_acq	FIMS based MXU target acquisition
FORS2_mxu_obs_slit	MXU mask exposure through the slits
FORS2_mxu_obs_off	MXU mask exposure with offsets
FORS2_mxu_cal_daycalib	MXU spectroscopic screen flatfield and wavelength calibration
FORS2_pmos_acq	FIMS based PMOS target acquisition
FORS2_pmos_obs_slit	FIMS based PMOS through-slit exposure
FORS2_pmos_obs_off	FIMS based PMOS exposure sequence with offset along the slit
FORS2_pmos_cal_daycalib	PMOS screen flatfield and wavelength calibration rotating the retarder plate
FORS2_pmos_acq_fast	fast PMOS target acquisition
FORS2_pmos_acq_rrm	RRM (fast) PMOS target acquisition
FORS2_pmos_obs_slit_fast	PMOS through-slit exposure
FORS2_pmos_obs_off_fast	PMOS exposure sequence with offset along the slit (no FIMS)
FORS2_pmos_cal_daycalib_fast	PMOS screen flatfield and wavelenth calibration rotating the retarder plate
FORS2_specphot_acq_fast	fast wide slit spectrophotometry acquisition
FORS2_specphot_obs_slit_fast	through-slit exposure for spectrophotometry
FORS2_specphot_obs_exp_fast	wide slit spectrophotometry exposure
FORS2_specphot_cal_daycalib	spectro-photometric screen flatfield and wavelength calibration
FORS2_hits_acq_fast	fast HIT spectroscopic acquisition
FORS2_hits_slit_exp_fast	HIT spectroscopy exposure through the slit
FORS2_hits_obs_exp_fast	HIT spectroscopy science exposure
FORS2_hits_cal_Scrflat	HIT Spectroscopy screen flat calibration
FORS2_hits_cal_Wave	HIT spectroscopy wavelength calibration
FORS2_hitms_acq	FIMS based HIT-MS spectroscopic acquisition
FORS2_hitms_slit_exp	HIT-MS spectroscopy exposure through the slit
FORS2_hitms_obs_exp	HIT-MS spectroscopy science exposure
FORS2_hitms_cal_Scrflat	HIT-MS Spectroscopy screen flat calibration
FORS2_hitms_cal_Wave	HIT-MS spectroscopy wavelength calibration

Table 3: A list of all acquisition, science and calibration templates for spectroscopy modes.

FORS acquisition sequence:

1. preset of the telescope to the center field coordinates of the target field (including instrument rotator)
2. set collimator of the instrument and LADC of the telescope (RRM will only be triggered if the currently selected colimator is requested)
3. optionally start differential tracking (for instance to follow moving objects. Not in RRM.)
4. select and acquire reference star for active optics and auto guiding. Start and wait for the active optics and auto guiding (this part of the execution requires manual intervention by the telescope and instrument operator)
5. setup the instrument for the acquisition image
6. execute acquisition image of target field
7. cursor selection of the target for fine positioning (fast option), the reference star (blind, fast option) or automatic measurement of reference stars for the field alignment and calculation of the required telescope offset (FIMS based option)
8. perform telescope offset (if needed)
9. repeat steps 6 to 8 (if needed) until the field alignment satisfies the requirements for the science observations
10. stop alignment process and end acquisition sequence

Each step is descrived in detail in the next section.

2.3.1 Functionality of the Acquisition Templates

The target information is always used by the OT scheduling tool for service mode observations. Therefore, the target coordinates shall always be entered into the P2PP entry fields to ensure the proper scheduling of service mode observations.

Preset to target field: the "fast" acquisition templates will read the coordinate and equinox of the target (or the reference star in case of a "fast blind" acquisition) from the target entry fields on the bottom of the p2pp window. The offset from a reference star to the target (fast mode templates, excluding RRM) requires that the user enters the coordinates of the reference stars into the target informations on the bottom of p2pp.

All FIMS based FORS observations will read the preset information as well as the coordinates of the reference stars and slits through the FIMS p_targ file attached to the acquisition templates. Templates FORS2_img_acq and FORS2_img_acq_rrm will only preset the telescope to the field and stops after the execution of steps 1 to 4, while all other templates will continue with the fine positioning of targets on slits.

Proper motion: Independent from the fact that earlier versions of p2pp have had entry fields for proper motion and epoch — the coordinates have to be given at the actual epoch since there is no proper motion and epoch keyword in any of the FORS acquisition templates. The target coordinates are only precessed from the user define equinox to the actual epoch.

Set-up of FORS Collimator, LADC: besides the target acquisition, the acquisition templates will

also setup the FORS collimator and the LADC (transparent to the user). This is mainly done because of the long setup time of the collimator which will be done in the most economic way during telescope preset. This will have some impact for the preparation of calibration OBs (FORS_img_cal_coll template required) which will be discussed below.

Position angles and rotator offset angle: In the actual configuration of the telescope and instrument the rotator offset angle has to be specified: this is flipped in sign in respect of the position angle of the target on the sky (rot. angle = -PA). FIMS will do it automatically right, but be aware of this while using "fast" templates (see figure 1). In addition to this, a value of "9999" can be used to set the position angle to the parallactic angle. **IMPORTANT**: a rotator angle of $\pm$ 180^o must be avoided in all FIMS based mode as it will lead to an undesired flip of the mask with respect of the field.

Start of the guiding and other telescope functions will be done by the telescope operator.

Fine positioning of the target field: the pointing is interactively refined through use of one or several acquisition images. The aim is the centering of the target(s) at the desired location(s) in the focal plane (e.g. to position objects in slits for spectroscopy). For the fast option the offset is calculated from the actual target position in the acquisition image and the predefined reference position of the slit. In case of a blind offset acquisition in fast mode the offset of the reference star to the slit is calculated. We recommend to choose the reference star as close as possible to the target.

For the FIMS based acquisition modes the respective offsets are derived from the position of all user defined reference stars on the image in respect to the expected positions. The instrument rotation offset will also be calculated and corrected if at least three reference stars are selected within the fims software. The reference positions of the slits are read from the database (MOS, SPECPHOT) or from a reference image taken during day time (MXU, LSS) and kept up to date by the staff. The recommendation on reference stars in FIMS based modes is discussed in the FIMS manual. Here we only remind the users that the reference stars for any fims mode should be well distributed in the field to get the "base line" to determine the rotation offset. The distribution of reference stars should be in some way similar to the distribution of targets in the field to minimize problems with residual field distortion or residual scale offset, which will be not corrected by the software[1].

Y-position of the target in "fast" LSS and SPECPHOT mode: The target will be in the center of the field of view which will fall approximately on y-pixel 260 (unbinned) of the upper master CCD. The Y-pixel of the target (before dithering) will be given in fits keyword CRPIX2.

2.4 Science and Through Slit Templates

The FORS science templates define the procedure and the parameters for the execution of science exposures on the night sky. Science templates of a given observing mode can only be combined with the corresponding acquisition template of the same observing mode. The association of acquisition and science templates is summarized below (section 2.4.3). Several science templates with the same observing mode can be combined in the one science OB. In the case of FORS the observation templates can be grouped into science and through slit templates. The science template will deliver the science data - the through slit templates are used to verify the proper target acquisition and to execute blind offsets in the case fast mode templates.

2.4.1 Through-slit templates:

The through-slit templates allow the verification and fine adjustment of the slit positioning of the targets for spectroscopy and spectropolarimetry. They perform a setup of the instrument and take

[1]Suppose the scale offset or field distortion of the input between input image and FORS acquisition image is 0.002 and all reference stars are selected in average 1000 pixels off the position of the slits: all targets will be off by 2 pixels and most light will be lost

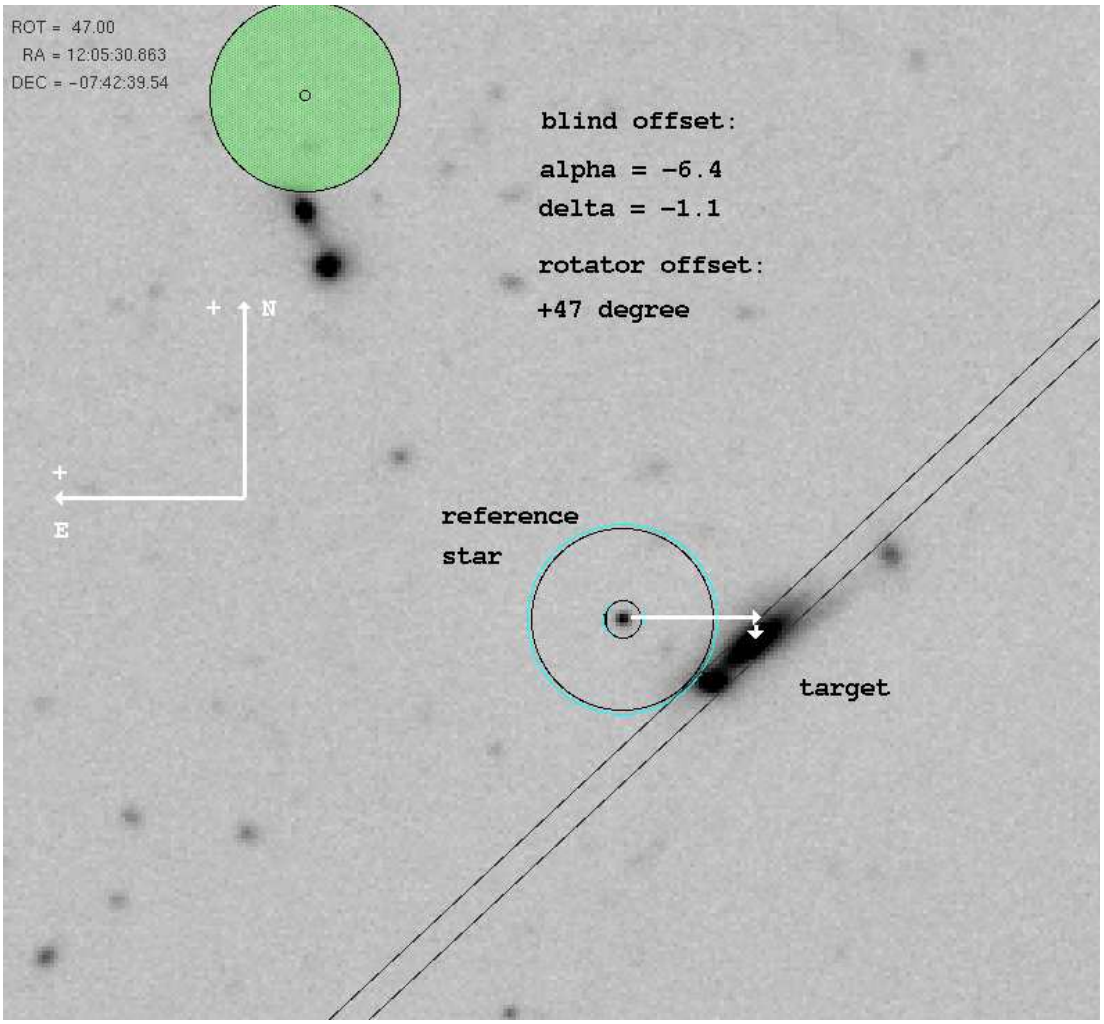

Figure 1: Fast modes and blind offsets: Offsets are defined from the reference star to the target. Rotator offset angle == minus position angle! The blind offset is executed after the fine positioning of the reference star on the slit by the through slit templates.

through-slit images which can be used to adjust the slit positioning of the targets through small telescope offsets. The use of the through slit templates is mandatory for all spectroscopic observations and for the high time resolution imaging mode.

FORS through-slit observation sequence:

1. check for telescope guiding and active optics
2. perform setup of instrument: slits plus filters, retarder plate etc. (as requested by user)
3. take through-slit exposure
4. determine object slit position and offset for fine adjustment (to be done by the observatory personal)
5. execute telescope offset and change exposure time for next acquisition cycle (if needed)
6. repeat steps 3 to 5 until slit positioning is ok
7. for fast option of LSS, PMOS, HIT-I, HIT-S: after slit positioning is accomplished, perform user defined (blind) offset from the reference star to the target (blind offset mode only)

Blind offsets: The through-slit templates for the fast mode (except SPECPHOT and RRM modes) can execute blind offsets from a brighter reference star to a faint science target at the end of the slit alignment process. The blind offsets are executed after the reference star is properly acquired in the slit, i.e. at the end of the through-slit templates. Therefore the coordinates of the reference star must be given as target information, while the blind offset from the reference star to the target must be specified as the blind offset in the through slit template. The signs of coordinate and rotation offset are indicated in figure 1. The size of offsets given on the sky - in the sense that 10" in RA is always 80 pixels (unbinned) for SR mode and 0.″125/pixel, no matter which DEC. Reference stars for blind offset acquisitions should be selected as close as possible to the target since rotation and image scale of the input coordinates and the FORS CCD coordinates are not infinitely accurate.

Blind offsets - a double save method: The final position of the target on the slit can be verified if two through slit images are add to the OB: The target acquisition is done on the reference star, the 1st through slit is done on the reference star and the blind offset executed at the end of the 1st through slit image (short integration times). The 2nd through slit is then executed with the target on the slit (long integration and offset equal zero). Here an example of the templates to be attached to an OB for the double save blind offset acquisition in long slit mode:

FORS2_lss_acq_fast	target acquisition	
FORS2_lss_obs_slit_fast	through slit image on reference star	$\Delta\alpha, \Delta\delta \neq 0$
FORS2_lss_obs_slit_fast	through slit image on the target	$\Delta\alpha, \Delta\delta = 0$
FORS2_lss_obs_off_fast	science exposures	

Blind acquisition on point sources - another save method: If the coordinates of the target and a reference star close to the target are both very well known it is fast and safe to calculate the rotator offset angle to have both the target and the reference star on the slit. The target acquisition can be then done on the reference star - without offsetting.

Two distant targets on 1 longslit: There is no possibility to adjust the instrument rotation in due time. As a consequence the fast acquisitions would require a close to perfect astrometry by the

users and a close to perfect calibration of the instrument rotator offset angle. Therefore it will be far better to select observation mode MOS in cases that angle between the targets is much larger then 1 arcminute.

2.4.2 Science exposure templates:

The science exposure templates allow the execution of science exposures like filter images and spectra of the target field. The templates perform instrument setups, telescope offsets and sequences of science exposures.

FORS science observation sequence:

1. check for telescope guiding and active optics
2. perform first telescope offset relative to start position
3. perform setup of instrument (slits, filters, grism, retarder plate etc.)
4. take NEXP exposures at the actual offset position
5. for polarimetry only: move retarder plate to next angle
6. for polarimetry only: take NEXP exposures for the actual retarder plate setup and offset position
7. for polarimetry only: repeat steps 5 and 6 until user defined list of retarder plate settings is finished
8. perform the next telescope offsets from the user defined list (relative to last position)
9. repeat steps 3 to 8 until user defined number of exposures at all NOFF offset positions and all retarder plate angles (polarimetry only) are taken
10. offset the telescope back to start position

Number and order of exposures taken in the sequence: In the science exposure sequence NEXP exposures will be taken at NOFF offset positions. Finally NEXP∗NOFF images will be taken. In the polarimetric modes the NEXP exposures will be taken at each retarder plate setting before offsetting to the next offset position. For linear polarimetry (0, 22.5, 45, 67.5 degree retarder plate angles and NEXP=3 and NOFF=2 this would end up with 24 exposures.

Size and Sign of jitter offsets: All offsets for jitter images and nodding on the slit are given as telescope offsets. Jitter offsets are given in direction of alpha and delta in a sense that the target move South on the CCD if the telescope moves North on the Sky. Offsets for the nodding on the slit are given in y-direction (on the CCD) in direction along the slit, but again in terms of telescope coordinates: if the telescope is offset in +y-direction the target will move in −y-direction.

2.4.3 Association of Acquisition with Observation Templates

For each observation it is required to select the acquisition template which is associated to the type of observation description templates in the OB. As already mentioned - the through slit template is mandatory for all observations which will have to put targets on slits. In most case the fast acquisition mode should be preferred if both options are available. In PMOS mode the fast mode is available for single target observations only.

Mode	Acquisition Template	Through Slit Template	Science Template
IMA	FORS2_img_acq		FORS2_img_obs_crsplit
IMA (RRM)	FORS2_img_acq_rrm		FORS2_img_obs_crsplit
OCC (FIMS)	FORS2_img_acq_algn		FORS2_img_occ_crsplit
LSS	FORS2_lss_acq_fast	FORS2_lss_obs_slit_fast	FORS2_lss_obs_off_fast
LSS (RRM)	FORS2_lss_acq_rrm	FORS2_lss_obs_slit_fast	FORS2_lss_obs_off_fast
SPECPHOT	FORS2_specphot_acq_fast	FORS2_specphot_obs_slit_fast	FORS2_specphot_obs_exp_fast
MOS (FIMS)	FORS2_mos_acq	FORS2_mos_obs_slit	FORS2_mos_obs_off
IPOL	FORS2_ipol_acq_fast		FORS2_ipol_obs_off_fast
IPOL (RRM)	FORS2_ipol_acq_rrm		FORS2_ipol_obs_off_fast
PMOS	FORS2_pmos_acq_fast	FORS2_pmos_obs_slit_fast	FORS2_pmos_obs_off_fast
PMOS (RRM)	FORS2_pmos_acq_rrm	FORS2_pmos_obs_slit_fast	FORS2_pmos_obs_off_fast
PMOS (FIMS)	FORS2_pmos_acq	FORS2_pmos_obs_slit	FORS2_pmos_obs_off
MXU (FIMS)	FORS2_mxu_acq	FORS2_mxu_obs_slit	FORS2_mxu_obs_off
HIT-I	FORS2_hiti_acq_fast	FORS2_hiti_slit_exp_fast	FORS2_hiti_obs_exp_fast
HIT-S	FORS2_hits_acq_fast	FORS2_hits_slit_exp_fast	FORS2_hits_obs_exp_fast
HIT-MS	FORS2_hitms_acq	FORS2_hitms_slit_exp	FORS2_hitms_obs_exp

Slitless spectroscopy with FORS is treated as MOS observation with all slits open and mask preparation through FIMS.

2.5 Calibration Templates

The FORS calibration templates define the procedure and the parameters for the execution of calibration exposures. Calibration templates will be executed during daytime only, with telescope at zenith, hence there must not be an acquisition template in a calibration OB. The only exception from this rule are the sky flat calibration templates FORS2_img_cal_skyflat which are executed at twilight on the sky with the acquisition templates FORS2_img_acq.

The following types of calibration templates exist: generic templates for the CCD characterization bias and dark calibrations, templates for screen flatfield and arc exposures and the special automatic twilight flat field template. Furthermore a special template "FORS2_img_cal_coll" is provided to select the collimator at the start of a calibration OB. This template must be inserted as the first template of any daytime calibration OB. It should **never** be used in science OBs.

It is useful to point out that normally spectroscopic screen flats and arc frames for the same set-up are executed within a single template, with the suffix *daycalib*.

Bias and Dark execution sequence:

1. perform setup of CCD detector
2. take one or several exposures with the same CCD setting

Screen flat and arc execution sequence:

1. switch on calibration lamps of the instrument
2. insert MOS mask, filters, retarder plate (polarimetry only), grism in light path
3. perform setup of CCD detector
4. take a series of exposures with the same CCD setting
5. polarimetry only: move retarder plate to next position angle
6. repeat steps 4 to 5 until user defined number of exposures at all retarder plate angles (polarimetry only) are taken

Exposure times for flat field templates: The users should not change the default values for the daytime calibration frames. The observatory staff will take care to get the appropriate exposure levels.

Twilight flat execution sequence:

1. perform instrument and CCD setup
2. make a fast exposure to estimate the exposure time to reach the user specified exposure level in subsequent sky flat images
3. if exposure time within allowed range, start sky flat field exposure
4. after each sky flat measure exposure level and scale exposure time for next twilight flat to reach predefined level
5. perform telescope offset
6. repeat steps 3 - 5 until number of flatfields are taken or exposure time is too long (evening, 300s max.) or too short (morning, 0.25s min.) or template is aborted.

3 Templates Description

The following sections list in tabular form for each template:

1. the template keywords
2. the value range for the keywords
3. the default values
4. the P2PP name of the keyword entry fields
5. the selection and entry option for the keyword

The tables are sorted by observing mode. For each observing mode the acquisition, the science and the calibration templates are given (in this order).
From P2PP only items 2 - 4 from the list above are visible. The exported OB file (extension .obx) of an OB contains item 1 plus the actual value of the keyword parameters as set by the user.
Section 4 explains the P2PP entry fields in some more detail.

Keyword order: in the tables below the keywords are ordered as follows:

1. DET keywords: parameters for CCD setup and exposure time
2. SEQ keywords: Sequence keywords for series of exposures, retarder plate angles, telescope offsets etc.
3. TEL keywords: parameters for telescope preset, guiding etc
4. INS keywords: parameters for instrument setup

Selection and entry options for the keywords: different selection and entry options exist for the actual value of the keyword entered by the user in the template form:

- single value in "Range" column: keyword parameter is fixed. No user modification is possible. "F" (fixed) in column "Entry".
- list of values in "Range" column: several predefined (named) values for the keyword are possible. Selection of the actual ones for template execution is done via a pull-down menu. "P" (pull-down menu) in column "Entry".
- range of values in "Range" column: the actual value should fall within a wider range of possible values (indicated by for instance 0.25..100000.0). The actual one to be used for the template execution has to be entered by typing. "T" (type) in column "Entry".
- file name in column "Range": a file name should be attached to this entry field. This option deals with the attachment of the FIMS output files to the templates. "A" (Attach file) in column "Entry".

An empty P2PP entry field indicates that user input is required. Depending on the keyword, this input can be through file selection and attachment (for instance the FIMS output files) or through typing (for instance exposure time).
Hidden parameters: several templates contain so called hidden keywords. These keywords are needed for the proper execution of the templates, but they are not meant to be changed by the user. Therefore, they are hidden from the P2PP display, i.e. no P2PP entry field is assigned to them, but they appear in the exported version of the OB. The values of hidden keywords cannot be modified by the user.

3.1 Collimator Selection, Bias and Darks

FORS2_img_cal_coll		**Select collimator for calibration exposures**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
INS.COLL.NAID	COLL_SR+6 COLL_HR+7	COLL_SR+6	Collimator	P
Hidden parameters: none				

FORS2_img_cal_bias		**Bias exposure**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.READ.CLKIND	Table 7		CCD Read-out Setup	P
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P
SEQ.NEXPO	1..666	1	Number of Exp. per Setup	T

FORS2_img_cal_dark		**Dark exposure**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.READ.CLKIND	Table 7		CCD Read-out Setup	P
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
SEQ.NEXPO	1..666	1	Number of Exp. per Setup	T

3.2 Imaging Modes

3.2.1 Direct Imaging — IMG

FORS2_img_acq		**Fast/normal imaging target acquisition**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P
TEL.ROT.OFFANGLE	-180.0..+180.0 9999.0	0.	Rotator on Sky (= -PA on Sky) Parallactic angle	T
TEL.AG.GUIDESTAR	CATALOGUE SETUPFILE NONE	CATALOGUE	Get Guide Star from	P
TEL.GS1.ALPHA	Right Ascension	0 (i.e. 00:00:00.0)	Guide Star RA	T
TEL.GS1.DELTA	Declination	0 (i.e. 00:00:00.0)	Guide Star DEC	T
INS.COLL.NAID	COLL_SR+6 COLL_HR+7	COLL_SR+6	Collimator	P

FORS2_img_acq_rrm		**RRM imaging target acquisition**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P

FORS2_img_obs_crsplit		**Multiple imaging exposure with offsets**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
DET.READ.CLKIND	Table 7		CCD Read-out Setup	P
SEQ.CATG	SCIENCE STANDARD PRE-IMAGE	SCIENCE	Observation Category	P
SEQ.NEXPO	1..666	1	Number of Exp. per Setup&Offset	T
SEQ.NOFF	1..100	1	Number of Tel. Offsets	T
TEL.TARG.OFFSETALPHA	-999..999	0	List of Tel. Offsets in RA	T
TEL.TARG.OFFSETDELTA	-999..999	0	List of Tel. Offsets in DEC	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P

FORS2_img_cal_skyflat		**Skyflat with automatic Exposure Time calculation**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.READ.CLKIND	Table 7		CCD Read-out Setup	P
SEQ.EXPLEVEL	0..65535	30000	Skyflat Mean Count Level	T
SEQ.NEXPO	1..666	1	Number of Exp. per Setup&Offset	T
TEL.TARG.OFFSETALPHA	-999..999	10	List of Tel. Offsets in RA	T
TEL.TARG.OFFSETDELTA	-999..999	10	List of Tel. Offsets in DEC	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P

FORS2_img_cal_scrflat		**Imaging screen flatfield**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
DET.READ.CLKIND	Table 7		CCD Read-out Setup	P
SEQ.NEXPO	1..666	1	Number of Exp. per Setup	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.LAMP1.TIME	-1.0..100000	-1	Switch-on Time Lamp FlatBlue+1	T
INS.LAMP2.TIME	-1.0..100000	-1	Switch-on Time Lamp FlatBlue+2	T
INS.LAMP5.NAID	FlatBlue+3, FlatBlue+4	FlatBlue+3	External lamp	P
INS.LAMP5.TIME	-1.0..100000	0	Switch-on Time External Lamp	T
DPR.CATG	CALIB SCIENCE TEST	CALIB	Data Prod. Categ.	P

3.2.2 Imaging with Occulting Bars — OCC

FORS2_img_acq_algn		**FIMS based imaging target acquisition**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P
DET.FIELD.UIT1	0.25..100000	NODEFAULT	Exposure Time for Field Image	T
TEL.AG.GUIDESTAR	CATALOGUE SETUPFILE NONE	CATALOGUE	Get Guide Star from	P
TEL.GS1.ALPHA	Right Ascension	0 (i.e. 00:00:00.0)	Guide Star RA	T
TEL.GS1.DELTA	Declination	0 (i.e. 00:00:00.0)	Guide Star DEC	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.TARG.SETUP	p_targ file name	NODEFAULT	FIMS Target Setup File .p_targ	A

FORS2_img_occ_crsplit		**Imaging with occultation mask of MOS slitarms**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
DET.READ.CLKIND	Table 7		CCD Read-out Setup	P
SEQ.CATG	SCIENCE STANDARD PRE-IMAGE	SCIENCE	Observation Category	P
SEQ.NEXPO	1..666	1	Number of Exp. per Setup&Offset	T
SEQ.NOFF	1..100	1	Number of Tel. Offsets	T
TEL.TARG.OFFSETALPHA	-999..999	0	List of Tel. Offsets in RA	T
TEL.TARG.OFFSETDELTA	-999..999	0	List of Tel. Offsets in DEC	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.FOCF.SETUP	p_focf file name	NODEFAULT	FIMS Focal Plane Setup File .p_focf	A

3.3 Longslit Spectroscopy — LSS

FORS2_lss_acq_fast		**Fast LSS spectroscopy target acquisition**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P
TEL.ROT.OFFANGLE	-180.0..+180.0 9999.0	0.	Rotator on Sky (= -PA on Sky) Parallactic angle	T
TEL.AG.GUIDESTAR	CATALOGUE SETUPFILE NONE	CATALOGUE	Get Guide Star from	P
TEL.GS1.ALPHA	Right Ascension	0 (i.e. 00:00:00.0)	Guide Star RA	T
TEL.GS1.DELTA	Declination	0 (i.e. 00:00:00.0)	Guide Star DEC	T
INS.COLL.NAID	COLL_SR+6 COLL_HR+7	COLL_SR+6	Collimator	P
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.SLIT.NAID	Table 12	NODEFAULT	LSS Slit	P

FORS2_lss_acq_rrm		**RRM LSS spectroscopy target acquisition**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.SLIT.NAID	Table 12	NODEFAULT	LSS Slit	P
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P

FORS2_lss_obs_slit_fast		**LSS Through-slit exposure (fast mode)**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
TEL.TARG.OFFSETALPHA	-60..60	0	Blind Offset RA	T
TEL.TARG.OFFSETDELTA	-60..60	0	Blind Offset DEC	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.SLIT.NAID	Table 12	NODEFAULT	LSS Slit	P

FORS2_lss_obs_off_fast		**LSS spectroscopy with offsets along the slit (fast mode)**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
DET.READ.CLKIND	Table 7		CCD Read-out Setup	P
SEQ.CATG	SCIENCE STANDARD	SCIENCE	Observation Category	P
SEQ.NEXPO	1..666	1	Number of Exp. per Setup&Offset	T
SEQ.NOFF	1..100	1	Number of Tel. Offsets in CCD Y Direction	T
TEL.TARG.OFFSETY	-999..999	0	List of Tel. Offsets in CCD Y Direction	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.GRIS.NAME	Table 11	NODEFAULT	Grism	P
INS.SLIT.NAID	Table 12	NODEFAULT	LSS Slit	P

FORS2_lss_cal_daycalib		**LSS spectroscopy screen flatfield and wavelength calibration (fast mode)**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
INS1.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS1.GRIS.NAME	Table 11	NODEFAULT	GRISM	P
INS1.LAMP1.TIME	-1..100000	-1	Switch-on Time Lamp FlatBlue+1	T
INS1.LAMP2.TIME	-1..100000	-1	Switch-on Time Lamp FlatBlue+2	T
INS1.LAMP3.TIME	-1..100000	-1	Switch-on Time Lamp FlatRed+1	T
INS1.LAMP4.TIME	-1..100000	-1	Switch-on Time Lamp FlatRed+2	T
INS1.LAMP5.NAID	FlatBlue+3 FlatBlue+4	FlatBlue+3	External Lamp	T
INS1.LAMP5.TIME	-1..100000	0	Switch-on Time External Lamp	T
INS1.LAMP6.NAID	FlatRed+3 FlatRed+4	FlatRed+3	External Lamp	T
INS1.LAMP6.TIME	-1..100000	0	Switch-on Time External Lamp	T
INS1.SLIT.NAID	Table 12	NODEFAULT	LSS slit	P
INS2.LAMP1.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp He+1	T
INS2.LAMP2.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp HgCd+2	T
INS2.LAMP3.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ar+1	T
INS2.LAMP4.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ar+2	T
INS2.LAMP5.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ne+1	T
INS2.LAMP6.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ne+2	T
DET.READ.CLKIND	Table 7	100kHz,2x2,high	CCD Read-out Setup	P
SEQ.NEXPO1	0..666	1	Number of Exp. per Setup for scrflat template	T
SEQ.NEXPO2	0..666	1	Number of Exp. per Setup for wave template	T
SEQ.TIME1	0.25..100000	NODEFAULT	Exposure Time for scrflat template	T
SEQ.TIME2	0.25..100000	NODEFAULT	Exposure Time for wave template	T
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P

3.4 Multi-Object Spectroscopy with Movable Slits - MOS

FORS2_mos_acq		**FIMS based MOS target acquisition**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.FIELD.UIT1	0.25..100000	NODEFAULT	Exp. Time for Field Image	T
TEL.AG.GUIDESTAR	CATALOGUE SETUPFILE NONE	CATALOGUE	Get Guide Star from	P
TEL.GS1.ALPHA	Right Ascension	0 (i.e. 00:00:00.0)	Guide Star RA	T
TEL.GS1.DELTA	Declination	0 (i.e. 00:00:00.0)	Guide Star DEC	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.TARG.SETUP	p_focf file name	NODEFAULT	FIMS Target Setup File .p_targ	A
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P

FORS2_mos_obs_slit		**MOS through-slit exposure (FIMS based)**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
INS.FOCF.SETUP	p_focf file name	NODEFAULT	FIMS Focal Plane setup File .p_focf	A
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P

FORS2_mos_obs_off		**MOS exposure with offset along the slit (FIMS based)**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
DET.READ.CLKIND	Table 7		CCD Read-out Setup	P
SEQ.CATG	SCIENCE STANDARD	SCIENCE	Observation Category	P
SEQ.NEXPO	1..666	1	Number of Exp. per Setup&Offset	T
SEQ.NOFF	1..100	1	Number of Tel. Offsets in CCD Y Direction	T
TEL.TARG.OFFSETY	-999..999	0	List of Tel. Offsets in CCD Y Direction	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.GRIS.NAME	Table 11	NODEFAULT	Grism	P
INS.FOCF.SETUP	p_focf file name	NODEFAULT	FIMS Focal Plane Setup File .p_focf	A

FORS2_mos_cal_daycalib		**MOS spectroscopic screen flatfield and wavelength calibration (FIMS based)**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
INS1.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS1.FOCF.SETUP			FIMS Focal Plane Setup File .p_focf	A
INS1.GRIS.NAME	Table 11	NODEFAULT	GRISM	P
INS1.LAMP1.TIME	-1..100000	-1	Switch-on Time Lamp FlatBlue+1	T
INS1.LAMP2.TIME	-1..100000	-1	Switch-on Time Lamp FlatBlue+2	T
INS1.LAMP3.TIME	-1..100000	-1	Switch-on Time Lamp FlatRed+1	T
INS1.LAMP4.TIME	-1..100000	-1	Switch-on Time Lamp FlatRed+2	T
INS1.LAMP5.NAID	FlatBlue+3 FlatBlue+4	FlatBlue+3	External Lamp	T
INS1.LAMP5.TIME	-1..100000	0	Switch-on Time External Lamp	T
INS1.LAMP6.NAID	FlatRed+3 FlatRed+4	FlatRed+3	External Lamp	T
INS1.LAMP6.TIME	-1..100000	0	Switch-on Time External Lamp	T
INS2.LAMP1.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp He+1	T
INS2.LAMP2.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp HgCd+2	T
INS2.LAMP3.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ar+1	T
INS2.LAMP4.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ar+2	T
INS2.LAMP5.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ne+1	T
INS2.LAMP6.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ne+2	T
DET.READ.CLKIND	Table 7	100kHz,2x2,high	CCD Read-out Setup	P
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P
SEQ.NEXPO1	0..666	1	Number of Exp. per Setup for scrflat template	T
SEQ.NEXPO2	0..666	1	Number of Exp. per Setup for wave template	T
SEQ.TIME1	0.25..100000		Exposure Time for scrflat template	T
SEQ.TIME2	0.25..100000		Exposure Time for wave template	T
Hidden parameters:				
Parameter	**Range**	**Default**	**Function**	**Entry**

3.5 Spectrophotometric Mode — SPECPHOT

FORS2_specphot_acq_fast	**Fast wide slit spectrophotometry acquisition**

Parameters to be specified:

Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P
SEQ.SPEC.OFFSET	0..1000 (1600)	500	MOS Slit Offset Amplitude	T
SEQ.SPEC.TARG	Table 13	MOS_center	MOS Slit Position Set To	P
TEL.ROT.OFFANGLE	-180.0..+180.0, 9999.0	0.	Rotator on Sky (= -PA on Sky) Parallactic angle	T
TEL.AG.GUIDESTAR	CATALOGUE SETUPFILE NONE	CATALOGUE	Get Guide Star from	P
TEL.GS1.ALPHA	Right Ascension	0 (i.e. 00:00:00.0)	Guide Star RA	T
TEL.GS1.DELTA	Declination	0 (i.e. 00:00:00.0)	Guide Star DEC	T
INS.COLL.NAID	COLL_SR+6 COLL_HR+7	COLL_SR+6	Collimator	P
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P

FORS2_specphot_obs_slit_fast	**Through-slit exposure for spectrophotometry**

Parameters to be specified:

Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
SEQ.SPEC.OFFSET	0..1000 (1600)	500	MOS Slit Offset Amplitude	T
SEQ.SPEC.TARG	Table 13	MOS_center	MOS Slit Position Set To	P
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.SLIT.WID	5.0	5.0	MOS Slit Width (arcsec)	T

FORS2_specphot_obs_exp_fast	**Wide slit spectrophotometry exposure**

Parameters to be specified:

Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
DET.READ.CLKIND	Table 7		CCD Read-out Setup	P
SEQ.CATG	SCIENCE STANDARD	STANDARD	Observation Category	P
SEQ.NEXPO	1..666	1	Number of Exp. per Setup&Offset	T
SEQ.SPEC.OFFSET	0..1000 (1600)	500	MOS Slit Offset Amplitude	T
SEQ.SPEC.TARG	Table 13	MOS_center	MOS Slit Position Set To	P
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.GRIS.NAME	Table 11	NODEFAULT	Grism	P
INS.SLIT.WID	5.0	5.0	MOS Slit Width (arcsec)	T

FORS2_specphot_cal_daycalib	**Spectro-photometric screen flatfield and wavelength calibration**

Parameters to be specified:

Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
INS1.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS1.GRIS.NAME	Table 11	NODEFAULT	GRISM	P
INS1.LAMP1.TIME	-1..100000	-1	Switch-on Time Lamp FlatBlue+1	T
INS1.LAMP2.TIME	-1..100000	-1	Switch-on Time Lamp FlatBlue+2	T
INS1.LAMP3.TIME	-1..100000	-1	Switch-on Time Lamp FlatRed+1	T
INS1.LAMP4.TIME	-1..100000	-1	Switch-on Time Lamp FlatRed+2	T
INS1.LAMP5.NAID	FlatBlue+3 FlatBlue+4	FlatBlue+3	External Lamp	P
INS1.LAMP5.TIME	-1..100000	0	Switch-on Time External Lamp	T
INS1.LAMP6.NAID	FlatRed+3 FlatRed+4	FlatRed+3	External Lamp	P
INS1.LAMP6.TIME	-1..100000	0	Switch-on Time External Lamp	T
INS1.SLIT.WID	1.0	1.0	MOS Specphot Slit Width (arcsec)	T
INS2.LAMP1.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp He+1	T
INS2.LAMP2.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp HgCd+2	T
INS2.LAMP3.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ar+1	T
INS2.LAMP4.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ar+2	T
INS2.LAMP5.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ne+1	T
INS2.LAMP6.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ne+2	T
INS2.SLIT.WID	1	1	MOS Specphot Slit Width (arcsec)	F
DET.READ.CLKIND	Table 7	100kHz,2x2,high	CCD Read-out Setup	P
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P
SEQ.NEXPO1	0..666	1	Number of Exp. per Setup for scrflat template	T
SEQ.NEXPO2	0..666	1	Number of Exp. per Setup for wave template	T
SEQ.SPEC.OFFSET	0..1600	500	MOS Slit Offset Amplitude	T
SEQ.SPEC.TARG	Table 13	MOS Slit Position Set To	P	
SEQ.TIME1	0.25..100000		Exposure Time for scrflat template	T
SEQ.TIME2	0.25..100000		Exposure Time for wave template	T

3.6 Imaging Polarimetry — IPOL

FORS2_ipol_acq_fast		**Fast IPOL target acquisition**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
TEL.ROT.OFFANGLE	-180.0..+180.0 9999.0	0.	Rotator on Sky (= -PA on Sky) Parallactic angle	T
TEL.AG.GUIDESTAR	CATALOGUE SETUPFILE NONE	CATALOGUE	Get Guide Star from	P
TEL.GS1.ALPHA	Right Ascension	0 (i.e. 00:00:00.0)	Guide Star RA	T
TEL.GS1.DELTA	Declination	0 (i.e. 00:00:00.0)	Guide Star DEC	T
INS.COLL.NAID	COLL_SR+6 COLL_HR+7	COLL_SR+6	Collimator	P
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P

FORS2_ipol_acq_rrm		**RRM IPOL target acquisition**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P

FORS2_ipol_obs_off_fast		**IPOL sequence with offset in Y rotating the retarder plate**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
DET.READ.CLKIND	Table 7		CCD Read-out Setup	P
SEQ.CATG	SCIENCE STANDARD	SCIENCE	Observation Category	P
SEQ.NEXPO	1..666	1	Number of Exp. per Setup&Offset	T
SEQ.NOFF	1..100	1	Number of Tel. Offsets in CCD Y Direction	T
SEQ.POL	circular linear	NODEFAULT	Polarization Type	P
SEQ.POL.ANGLES	Table 15	NODEFAULT	List of Retarder Plate Settings	P
TEL.TARG.OFFSETY	-999..999	0	List of Tel. Offsets in CCD Y Direction	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.WOLL.NAID	WOLL_34+13	WOLL_34+13	Wollaston Prism	F

3.7 Spectropolarimetry — PMOS

3.7.1 Multi-Object FIMS Based Mode

FORS2_pmos_acq		**FIMS based PMOS target acquisition**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.FIELD.UIT1	0.25..100000	NODEFAULT	Exp. Time for Field Image	T
TEL.AG.GUIDESTAR	CATALOGUE SETUPFILE NONE	CATALOGUE	Get Guide Star from	P
TEL.GS1.ALPHA	Right Ascension	0 (i.e. 00:00:00.0)	Guide Star RA	T
TEL.GS1.DELTA	Declination	0 (i.e. 00:00:00.0)	Guide Star DEC	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.TARG.SETUP	p_targ file name	NODEFAULT	FIMS Target Setup File .p_targ	A
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P

FORS2_pmos_obs_slit		**PMOS through-slit exposure (FIMS based)**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.FOCF.SETUP	p_focf file name	NODEFAULT	FIMS Focal Plane Setup File .p_focf	A

FORS2_pmos_obs_off		**PMOS exposure sequence with offset along the slit**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
DET.READ.CLKIND	Table 7		CCD Read-out Setup	P
SEQ.CATG	SCIENCE STANDARD	SCIENCE	Observation Category	P
SEQ.NEXPO	1..666	1	Number of Exp. per Setup&Offset	T
SEQ.NOFF	1..100	1	Number of Tel. Offsets in CCD Y Direction	T
SEQ.POL	circular linear	NODEFAULT	Polarization Type	P
SEQ.POL.ANGLES	Table 15	NODEFAULT	List of Retarder Plate Settings	P
TEL.TARG.OFFSETY	-999..999	0	List of Tel. Offsets in CCD Y Direction	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.FOCF.SETUP	p_focf file name	NODEFAULT	FIMS Focal Plane Setup File .p_focf	A
INS.GRIS.NAME	Table 11	NODEFAULT	Grism	P
INS.WOLL.NAID	WOLL_34+13	WOLL_34+13	Wollaston Prism	F

FORS2_pmos_cal_daycalib	**PMOS screen flatfield and wavelength calibration rotating the retarder plate**

Parameters to be specified:

Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
INS1.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS1.FOCF.SETUP		NODEFAULT	FIMS Focal Plane Setup File .p_focf	A
INS1.GRIS.NAME	Table 11	NODEFAULT	GRISM	P
INS1.LAMP1.TIME	-1..100000	-1	Switch-on Time Lamp FlatBlue+1	T
INS1.LAMP2.TIME	-1..100000	-1	Switch-on Time Lamp FlatBlue+2	T
INS1.LAMP3.TIME	-1..100000	-1	Switch-on Time Lamp FlatRed+1	T
INS1.LAMP4.TIME	-1..100000	-1	Switch-on Time Lamp FlatRed+2	T
INS1.LAMP5.NAID	FlatBlue+3 FlatBlue+4	FlatBlue+3	External Lamp	P
INS1.LAMP5.TIME	-1..100000	0	Switch-on Time External Lamp	T
INS1.LAMP6.NAID	FlatRed+3 FlatRed+4	FlatRed+3	External Lamp	P
INS1.LAMP6.TIME	-1..100000	0	Switch-on Time External Lamp	T
INS1.WOLL.NAID	WOLL_34+13	WOLL_34+13	Wollaston Prism	F
INS2.LAMP1.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp He+1	T
INS2.LAMP2.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp HgCd+2	T
INS2.LAMP3.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ar+1	T
INS2.LAMP4.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ar+2	T
INS2.LAMP5.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ne+1	T
INS2.LAMP6.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ne+2	T
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P
SEQ.NEXPO1	0..666	1	Number of Exp. per Setup for scrflat template	T
SEQ.NEXPO2	0..666	1	Number of Exp. per Setup for wave template	T
SEQ.POL	circular linear	NODEFAULT	Polarization Type	P
SEQ.POL1.ANGLES	Table 15	NODEFAULT	List of Retarder Plate Settings for Arcs	P
SEQ.POL2.ANGLES	Table 15	NODEFAULT	List of Retarder Plate Settings for Arcs	P
SEQ.TIME1	0.25..100000	NODEFAULT	Exposure Time for scrflat template	T
SEQ.TIME2	0.25..100000	NODEFAULT	Exposure Time for wave template	T
DET.READ.CLKIND	Table 7	100kHz,2x2,high	CCD Read-out Setup	P

3.7.2 Fast Mode for Single Target Observations

FORS2_pmos_acq_fast	**Fast PMOS target acquisition**

Parameters to be specified:

Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
TEL.ROT.OFFANGLE	-180.0..+180.0 9999.0	0.	Rotator on Sky (= -PA on Sky) Parallactic angle	T
TEL.AG.GUIDESTAR	CATALOGUE SETUPFILE NONE	CATALOGUE	Get Guide Star from	P
TEL.GS1.ALPHA	Right Ascension	0 (i.e. 00:00:00.0)	Guide Star RA	T
TEL.GS1.DELTA	Declination	0 (i.e. 00:00:00.0)	Guide Star DEC	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P

FORS2_pmos_acq_rrm		**RRM PMOS target acquisition**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P
SEQ.NEXPO	1..666	1	Number of Exp. per Setup	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P

FORS2_pmos_obs_slit_fast		**PMOS through-slit exposure (fast mode)**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
TEL.TARG.OFFSETALPHA	-60..60	0	Blind Offset RA	T
TEL.TARG.OFFSETDELTA	-60..60	0	Blind Offset DEC	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.SLIT.WID	0.2..30.0	NODEFAULT	MOS Slit Width (arcsec)	T

FORS2_pmos_obs_off_fast		**PMOS exposure sequence with offset along the slit**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
DET.READ.CLKIND	Table 7		CCD Read-out Setup	P
SEQ.CATG	SCIENCE STANDARD	SCIENCE	Observation Category	P
SEQ.NEXPO	1..666	1	Number of Exp. per Setup&Offset	T
SEQ.NOFF	1..100	1	Number of Tel. Offsets in CCD Y Direction	T
SEQ.POL	circular linear	NODEFAULT	Polarization Type	P
SEQ.POL.ANGLES	Table 15	NODEFAULT	List of Retarder Plate Settings	P
TEL.TARG.OFFSETY	-999..999	0	List of Tel. Offsets in CCD Y Direction	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.GRIS.NAME	Table 11	NODEFAULT	Grism	P
INS.SLIT.WID	0.2..30.0	NODEFAULT	MOS Slit Width (arcsec)	T
INS.WOLL.NAID	WOLL_34+13	WOLL_34+13	Wollaston Prism	T

FORS2_pmos_cal_daycalib_fast	**PMOS screen flatfield and wavelength calibration rotating the retarder plate**

Parameters to be specified:

Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
INS1.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS1.GRIS.NAME	Table 11	NODEFAULT	GRISM	P
INS1.LAMP1.TIME	-1..100000	-1	Switch-on Time Lamp FlatBlue+1	T
INS1.LAMP2.TIME	-1..100000	-1	Switch-on Time Lamp FlatBlue+2	T
INS1.LAMP3.TIME	-1..100000	-1	Switch-on Time Lamp FlatRed+1	T
INS1.LAMP4.TIME	-1..100000	-1	Switch-on Time Lamp FlatRed+2	T
INS1.LAMP5.NAID	FlatBlue+3 FlatBlue+4	FlatBlue+3	External Lamp	P
INS1.LAMP5.TIME	-1..100000	0	Switch-on Time External Lamp	T
INS1.LAMP6.NAID	FlatRed+3 FlatRed+4	FlatRed+3	External Lamp	P
INS1.LAMP6.TIME	-1..100000	0	Switch-on Time External Lamp	T
INS1.MOS10.WID	0.2..30	NODEFAULT	Slit Width in arcseconds	T
INS1.WOLL.NAID	WOLL_34+13	WOLL_34+13	Wollaston Prism	F
INS2.LAMP1.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp He+1	T
INS2.LAMP2.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp HgCd+2	T
INS2.LAMP3.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ar+1	T
INS2.LAMP4.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ar+2	T
INS2.LAMP5.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ne+1	T
INS2.LAMP6.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ne+2	T
DET.READ.CLKIND	Table 7	100kHz,2x2,high	CCD Read-out Setup	P
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P
SEQ.NEXPO1	0..666	1	Number of Exp. per Setup for scrflat template	T
SEQ.NEXPO2	0..666	1	Number of Exp. per Setup for wave template	T
SEQ.POL	circular linear	NODEFAULT	Polarization Type	P
SEQ.POL1.ANGLES	Table 15	NODEFAULT	List of Retarder Plate Settings for Arcs	P
SEQ.POL2.ANGLES	Table 15	NODEFAULT	List of Retarder Plate Settings for Arcs	P
SEQ.TIME1	0.25..100000	NODEFAULT	Exposure Time for scrflat template	T
SEQ.TIME2	0.25..100000	NODEFAULT	Exposure Time for wave template	T

3.8 Multi-Object Spectroscopy with masks — MXU

FORS2_mxu_acq		**FIMS based MXU target acquisition**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.FIELD.UIT1	0.25..100000	NODEFAULT	Exp. Time for Field Image	T
TEL.AG.GUIDESTAR	CATALOGUE SETUPFILE NONE	CATALOGUE	Get Guide Star from	P
TEL.GS1.ALPHA	Right Ascension	0 (i.e. 00:00:00.0)	Guide Star RA	T
TEL.GS1.DELTA	Declination	0 (i.e. 00:00:00.0)	Guide Star DEC	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.FOCF.SETUP	p_focf file name	NODEFAULT	FIMS Focal Plane Setup File .p_focf	A
INS.GBR.SETUP	p_gbr file name	NODEFAULT	FIMS MXU Mask Gerber Setup File .p_gbr	A
INS.TARG.SETUP	p_targ file name	NODEFAULT	FIMS Target Setup File .p_targ	A
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P

FORS2_mxu_obs_slit		**MXU through-slit exposure (FIMS based)**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.FOCF.SETUP	p_focf file name	NODEFAULT	FIMS Focal Plane Setup File .p_focf	A

FORS2_mxu_obs_off		**MXU mask exposure with offsets (FIMS Based)**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
DET.READ.CLKIND	Table 7		CCD Read-out Setup	P
SEQ.NEXPO	1..666	1	Number of Exp. per Setup&Offset	T
SEQ.NOFF	1..100	1	Number of Tel. Offsets in CCD Y Direction	T
TEL.TARG.OFFSETY	-999..999	0	List of Tel. Offsets in CCD Y Direction	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.FOCF.SETUP	p_focf file name	NODEFAULT	FIMS Focal Plane Setup File .p_focf	A
INS.GRIS.NAME	Table 11	NODEFAULT	Grism	P

FORS2_mxu_cal_daycalib	**MXU spectroscopic screen flatfield and wavelength calibration (FIMS based)**

Parameters to be specified:

Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
INS1.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS1.FOCF.SETUP			FIMS Focal Plane Setup File .p_focf	A
INS1.GRIS.NAME	Table 11	NODEFAULT	GRISM	P
INS1.LAMP1.TIME	-1..100000	-1	Switch-on Time Lamp FlatBlue+1	T
INS1.LAMP2.TIME	-1..100000	-1	Switch-on Time Lamp FlatBlue+2	T
INS1.LAMP3.TIME	-1..100000	-1	Switch-on Time Lamp FlatRed+1	T
INS1.LAMP4.TIME	-1..100000	-1	Switch-on Time Lamp FlatRed+2	T
INS1.LAMP5.NAID	FlatBlue+3 FlatBlue+4	FlatBlue+3	External Lamp	P
INS1.LAMP5.TIME	-1..100000	0	Switch-on Time External Lamp	T
INS1.LAMP6.NAID	FlatRed+3 FlatRed+4	FlatRed+3	External Lamp	P
INS1.LAMP6.TIME	-1..100000	0	Switch-on Time External Lamp	T
INS2.LAMP1.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp He+1	T
INS2.LAMP2.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp HgCd+2	T
INS2.LAMP3.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ar+1	T
INS2.LAMP4.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ar+2	T
INS2.LAMP5.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ne+1	T
INS2.LAMP6.TIME	-1..100000	NODEFAULT	Switch-on Time Lamp Ne+2	T
DET.READ.CLKIND	Table 7	100kHz,2x2,high	CCD Read-out Setup	P
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P
SEQ.NEXPO1	0..666	1	Number of Exp. per Setup for scrflat template	T
SEQ.NEXPO2	0..666	1	Number of Exp. per Setup for wave template	T
SEQ.TIME1	0.25..100000	NODEFAULT	Exposure Time for scrflat template	T
SEQ.TIME2	0.25..100000	NODEFAULT	Exposure Time for wave template	T

3.9 HIgh Time resolution Mode - HIT

3.9.1 Imaging - HIT-I

FORS2_hiti_acq_fast	**HIT imaging target acquisition (fast mode)**			
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P
SEQ.SPEC.OFFSET	1281	1281	MOS Slit Offset Amplitude	F
SEQ.SPEC.TARG	MOS_center-offset	MOS_center-offset	MOS Slit Position Set To	F
TEL.ROT.OFFANGLE	-180.0..+180.0 9999.0	0.	Rotator on Sky (= -PA on Sky) Parallactic angle	T
TEL.AG.GUIDESTAR	CATALOGUE SETUPFILE NONE	CATALOGUE	Get Guide Star from	P
TEL.GS1.ALPHA	Right Ascension	0 (i.e. 00:00:00.0)	Guide Star RA	T
TEL.GS1.DELTA	Declination	0 (i.e. 00:00:00.0)	Guide Star DEC	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P

FORS2_hiti_obs_slit_fast	**HIT imaging through-slit exposure (fast mode)**			
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
SEQ.SPEC.OFFSET	1281	1281	MOS Slit Offset Amplitude	F
SEQ.SPEC.TARG	MOS_center-offset	MOS_center-offset	MOS Slit Position Set To	F
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.SLIT.WID	0.2..30.0	NODEFAULT	Slit width in arcseconds	T

FORS2_hiti_obs_exp_fast	**HIT imaging exposure (fast mode)**			
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.READ.CLKIND	Table 8	HIT-OS1-1sec	CCD Read-out Setup	P
SEQ.CATG	SCIENCE STANDARD	SCIENCE	Observation Category	P
SEQ.NEXPO	1..666	1	Number of Exp. per Setup	T
SEQ.SPEC.OFFSET	1281	1281	MOS Slit Offset Amplitude	F
SEQ.SPEC.TARG	MOS_center-offset	MOS_center-offset	MOS Slit Position Set To	F
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.GRIS.NAME	none	none	Grism	P
INS.SLIT.WID	0.2..30.0	NODEFAULT	Slit width in arcseconds	T

FORS2_hiti_cal_scrflat_fast		**HIT imaging screenflat (fast mode)**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.READ.CLKIND	Table 8		CCD Read-out Setup	P
SEQ.NEXPO	1..666	1	Number of Exp. per Setup	T
SEQ.SPEC.OFFSET	0..1000 (1600)	1281	MOS Slit Offset Amplitude	F
SEQ.SPEC.TARG	MOS_center-offset	MOS_center-offset	MOS Slit Position Set To	F
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.LAMP1.TIME	-1.0..100000	-1	Switch-on Time Lamp FlatBlue+1	T
INS.LAMP2.TIME	-1.0..100000	-1	Switch-on Time Lamp FlatBlue+2	T
INS.LAMP3.TIME	-1.0..100000	-1	Switch-on Time Lamp FlatRed+1	T
INS.LAMP4.TIME	-1.0..100000	-1	Switch-on Time Lamp FlatRed+2	T
INS.LAMP5.NAID	FlatBlue+3 FlatBlue+4	FlatBlue+3	External lamp	P
INS.LAMP5.TIME	-1.0..100000	0	Switch-on Time External Lamp	T
INS.LAMP6.NAID	FlatRed+3 FlatRed+4	FlatRed+3	External lamp	P
INS.LAMP6.TIME	-1.0..100000	0	Switch-on Time External Lamp	T
INS.SLIT.WID	0.2..30.0	NODEFAULT	MOS Slit Width (arcsec)	T

3.9.2 Spectroscopy - HIT-S

FORS2_hits_acq_fast		**HIT spectroscopy target acquisition (fast mode)**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P
TEL.ROT.OFFANGLE	-180.0..+180.0 9999.0	0.	Rotator on Sky (= -PA on Sky) Parallactic angle	T
TEL.AG.GUIDESTAR	CATALOGUE SETUPFILE NONE	CATALOGUE	Get Guide Star from	P
TEL.GS1.ALPHA	Right Ascension	0 (i.e. 00:00:00.0)	Guide Star RA	T
TEL.GS1.DELTA	Declination	0 (i.e. 00:00:00.0)	Guide Star DEC	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.MASK.NAID	Table 16	NODEFAULT	HIT Mask	P

FORS2_hits_obs_slit_fast		**HIT spectroscopy through-slit exposure (fast mode)**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	NODEFAULT	Exposure Time	T
TEL.TARG.OFFSETALPHA	-60..60	0	Blind Offset RA	T
TEL.TARG.OFFSETDELTA	-60..60	0	Blind Offset DEC	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.MASK.NAID	Table 16	NODEFAULT	HIT Mask	P

FORS2_hits_obs_exp_fast		**HIT spectroscopy exposure (fast mode)**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.READ.CLKIND	Table 8	NODEFAULT	CCD Read-out Setup	P
SEQ.CATG	SCIENCE STANDARD	SCIENCE	Observation Category	P
SEQ.NEXPO	1..666	1	Number of Exp. per Setup	T
SEQ.NOFFF	1..100	1	Number of Tel. Offsets in CCD Y Direction	T
TEL.TARG.OFFSETY	-999..999	0	List of Tel. Offsets in CCD Y Direction	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.GRIS.NAME	XGRIS_600B+92 XGRIS_300I+91	NODEFAULT	Grism	P
INS.MASK.NAID	Table 16	NODEFAULT	HIT Mask	P

FORS2_hits_cal_scrflat		**HIT spectroscopy screen flatfield**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.READ.CLKIND	Table 8	NODEFAULT	CCD Read-out Setup	P
SEQ.NEXPO	1..666	1	Number of Exp. per Setup	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.GRIS.NAME	XGRIS_600B+92 XGRIS_300I+91	NODEFAULT	Grism	P
INS.LAMP1.TIME	-1.0..100000	-1	Switch-on Time Lamp FlatBlue+1	T
INS.LAMP2.TIME	-1.0..100000	-1	Switch-on Time Lamp FlatBlue+2	T
INS.LAMP3.TIME	-1.0..100000	-1	Switch-on Time Lamp FlatRed+1	T
INS.LAMP4.TIME	-1.0..100000	-1	Switch-on Time Lamp FlatRed+2	T
INS.LAMP5.NAID	FlatBlue+3 FlatBlue+4	FlatBlue+3	External lamp	P
INS.LAMP5.TIME	-1.0..100000	0	Switch-on Time External Lamp	T
INS.LAMP6.NAID	FlatRed+3 FlatRed+4	FlatRed+3	External lamp	P
INS.LAMP6.TIME	-1.0..100000	0	Switch-on Time External Lamp	T
INS.MASK.NAID	Table 16	NODEFAULT	HIT Mask	P

FORS2_hits_cal_wave		**HIT spectroscopy wavelength calibration**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.READ.CLKIND	Table 8	NODEFAULT	CCD Read-out Setup	P
SEQ.NEXPO	1..666	1	Number of Exp. per Setup	T
INS.FILT1.NAME	Table 10	NODEFAULT	Filter1 Name	P
INS.GRIS.NAME	XGRIS_600B+92 XGRIS_300I+91	NODEFAULT	Grism	P
INS.LAMP1.TIME	-1.0..100000	NODEFAULT	Switch-on Time Lamp He+1	T
INS.LAMP2.TIME	-1.0..100000	NODEFAULT	Switch-on Time Lamp HgCd+2	T
INS.LAMP3.TIME	-1.0..100000	NODEFAULT	Switch-on Time Lamp Ar+1	T
INS.LAMP4.TIME	-1.0..100000	NODEFAULT	Switch-on Time Lamp Ar+2	T
INS.LAMP5.TIME	-1.0..100000	NODEFAULT	Switch-on Time Lamp Ne+1	T
INS.LAMP6.TIME	-1.0..100000	NODEFAULT	Switch-on Time Lamp Ne+2	T
INS.MASK.NAID	Table 16	NODEFAULT	HIT Mask	P

3.9.3 Spectroscopy with masks - HIT-MS

FORS2_hitms_acq		**HIT-MS target acquisition**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.FIELD.UIT1	0..100000		Exp. Time for Field Image	T
SEQ.CCD	B R ANY	R	Required CCD: B (Blue), R (Red), ANY (Either one)	P
TEL.AG.GUIDESTAR	CATALOGUE SETUPFILE NONE	CATALOGUE	Get Guide Star from	P
TEL.GS1.ALPHA	Right Ascension	0 (i.e. 00:00:00.0)	Guide Star RA	T
TEL.GS1.DELTA	Declination	0 (i.e. 00:00:00.0)	Guide Start DEC	T
INS.FILT1.NAME	Table 10		Filter1 Name	P
INS.GBR.SETUP			FIMS MXU Mask Gerber Setup File .p_gbr	A
INS.TARG.SETUP			FIMS Target Setup File .p_targ	A

FORS2_hitms_slit_exp		**HIT-MS spectroscopy through-slit exposure**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000		Exposure Time	T
INS.FILT1.NAME	Table 10	none	Filter Name	P
INS.FOCF.SETUP			FIMS Focal Plane Setup File .p_focf	A

FORS2_hitms_obs_exp		**HIT-MS spectroscopy exposure**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.25..100000	0.1	Exposure Time	T
DET.READ.CLKIND	HIT-MS	HIT-MS	CCD Read-out Setup	F
SEQ.CATG	SCIENCE STANDARD	SCIENCE	Observation Category	P
SEQ.NOFF	1..100	1	Number of Tel. Offsets in CCD Y Direction	T
SEQ.NEXPO	1..666	1	Number of Exp. per Setup	T
TEL.TARG.OFFSETX	-999..999	0	List of Tel. Offsets in CCD X Direction	T
INS.FILT1.NAME	Table 10		Filter Name	P
INS.FOCF.SETUP			FIMS Focal Plane Setup File .p_focf	A
INS.GRIS.NAME	XGRIS_600B+92 XGRIS_300I+91		Grism	P

FORS2_hitms_cal_scrflat		**HIT-MS spectroscopy screen flatfield**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.1..100.0	0.1	Exposure Time	T
DET.READ.CLKIND	HIT-MS	HIT-MS	CCD Read-out Setup	F
SEQ.NEXPO	1..666	1	Number of Exp. per Setup	T
INS.FILT1.NAME	Table 10		Filter1 Name	P
INS.FOCF.SETUP			FIMS Focal Plane Setup File .p_focf	A
INS.GRIS.NAME	XGRIS_600B+92 XGRIS_300I+91		Grism	P
INS.LAMP1.TIME	-1..100000	-1	Switch-on Time Lamp FlatBlue+1	T
INS.LAMP2.TIME	-1..100000	-1	Switch-on Time Lamp FlatBlue+2	T
INS.LAMP3.TIME	-1..100000	-1	Switch-on Time Lamp FlatRed+1	T
INS.LAMP4.TIME	-1..100000	-1	Switch-on Time Lamp FlatRed+2	T
INS.LAMP5.NAID	FlatBlue+3 FlatBlue+4	FlatBlue+3	External Lamp	P
INS.LAMP5.TIME	-1..100000	0	Switch-on Time External Lamp	T
INS.LAMP6.NAID	FlatRed+3 FlatRed+4	FlatRed+3	External Lamp	P
INS.LAMP6.TIME	-1..100000	0	Switch-on Time External Lamp	T

FORS2_hitms_cal_wave		**HIT-MS spectroscopy wavelength calibration**		
Parameters to be specified:				
Parameter	**Range**	**Default**	**P2PP Label**	**Entry**
DET.WIN1.UIT1	0.1..100.0	0.1	Exposure Time	T
DET.READ.CLKIND	HIT-MS	HIT-MS	CCD Read-out Setup	F
SEQ.NEXPO	1..666	1	Number of Exp. per Setup	T
INS.FILT1.NAME	Table 10	none	Filter1 Name	P
INS.FOCF.SETUP			FIMS Focal Plane Setup File .p_focf	A
INS.GRIS.NAME	XGRIS_600B+92 XGRIS_300I+91		Grism	P
INS.LAMP1.TIME	-1..100000		Switch-on Time Lamp He+1	T
INS.LAMP2.TIME	-1..100000		Switch-on Time Lamp HgCd+2	T
INS.LAMP3.TIME	-1..100000		Switch-on Time Lamp Ar+1	T
INS.LAMP4.TIME	-1..100000		Switch-on Time Lamp Ar+2	T
INS.LAMP5.TIME	-1..100000		Switch-on Time Lamp Ne+1	T
INS.LAMP6.TIME	-1..100000		Switch-on Time Lamp Ne+2	T

4 Explanations of the P2PP Entry Fields

The following list contains a description of the P2PP entry fields of all FORS templates.

4.1 User defined P2PP entry fields - DET keywords:

Exposure Time: the exposure time of an individual exposure in seconds. Default is NODEFAULT (i.e. user entry is expected here). The shortest exposure time supported by the FORS shutter is 0.25s.

Exp. Time for Field Image: the exposure time of the acquisition image on the sky in seconds. Default is NODEFAULT (i.e. user entry is expected here). The shortest exposure time supported by the FORS shutter is 0.25s.

Exp. Time for Slit Image: the exposure time of the reference slit exposure on the sky in seconds. Default is NODEFAULT (i.e. user entry is expected here). The shortest exposure time supported by the FORS shutter is 0.25s.

CCD Read-out Setup: The CCD readout mode are in general set to the standard modes 200kHz,2x2,low for imaging and 100kHz,2x2,high for spectroscopy. CCD windowing is no longer offered since the upgrade to mosaics in both instruments. In addition to these standard modes a number of readout modes are supported for the HIT mode observations. These can be found in Table 8.

4.2 User defined P2PP entry fields - SEQ keywords:

Observation Category: the category of the exposure for night observations. Three options exist: SCIENCE (for scientific exposure), STANDARD (for standard star exposure) and PRE-IMAGE (for pre-imaging exposure). This parameter is used to write fits header keywords in the image file which are appropriate for automatic data reduction. The third option "PRE–IMAGE" was introduced for projects which have requested pre-images in the proposal. To simplify the fast data release all such pre-images should be prepared with the observation category set to "PRE–IMAGE". Default is SCIENCE except for the template FORS2_specphot_obs_exp_fast in which it is set to STANDARD. For calibration exposures the corresponding keywords are automatically written by the templates and no entry field needs to be set.

Number of Exp. per Setup: the number of exposures to be taken for a given instrument setup. This number of exposures will be taken at each telescope offset position and for each instrument setup (for instance for each retarder plate angle) defined in the respective template. Default is 1.

Number of Exp. per Setup&Offset: the number of exposures to be taken at a given instrument and telescope setting. This number of exposures will be taken at each telescope offset position and for each instrument setup (for instance for each retarder plate angle) defined in the respective template. Default is 1.

Number of Tel. Offsets: number of offsets in right ascension and declination on the sky. This parameter corresponds to the entry fields **List of Tel. Offsets in RA/DEC**. If no telescope offset is foreseen, this parameter should be set to 1 and the list of offset values should contain 0. Default is 1.

Number of Tel. Offsets in CCD Y Direction: number of offsets along Y pixel direction of the CCD. This parameter corresponds to the entry field **List of Tel. Offsets in CCD Y Direction** Default is 1.

Skyflat Mean Count Level: the mean ADU level for the sky flat exposures. This parameter is used by template FORS2_img_cal_skyflat to calculate automatically the optimum exposure time for the sky flat exposures. Default is 30000 ADU.

MOS Slit Position Set To: the focal field position of the MOS slits used in the respective "SPECPHOT" templates for spectro-photometric standard star observations. Different named po-

sitions exist (see table 13) defining the slit/target position in the focal area. Default is "MOS_center" which gives the position of the center of the MOS field (X $\sim$ 1040 pixels in binning 2). "MOS_center+/-offset" allows to position the target to an arbitrary offset position in X direction. The offset from the MOS center in pixels is given in entry field "MOS slit offset amplitude". Using predefined named positions for the LSS slits, the MOS slits can also be positioned to the X position of a user selected longslit.

MOS Slit Offset Amplitude: CCD offset position (in pixels) of the slit/target from the MOS field center as used for spectro-photometric standard stars. This entry field has effect only if "MOS_center+/-offset" is chosen for the entry field "MOS Slit Position Set To" in the respective SPECPHOT templates. Default is 500 pixels.

Polarization Type: the retarder plate mosaic to be used for the polarimetry exposures. Two mosaics are available: $\lambda/2$ plate mosaic for linear polarimetry (entry option = linear) and $\lambda/4$ plate mosaic for circular polarimetry (entry option = circular). The desired mosaic is selected from a pull-down menu. Default is NODEFAULT (i.e. user entry is expected here).

List of Retarder Plate Settings: the list of positions for the setting of the retarder plate angles. The positions are chosen from a pull-down list (see table 15). Prefix "lin" indicates linear, prefix "cir" circular polarimetry. The options of the list are named positions, i.e. they are specific for the polarimetry mode (circular polarimetry needs to have position angle with prefix "cir", linear polarimetry those with prefix "lin"). Default is NODEFAULT (i.e. user entry is expected here).

4.3 User defined P2PP entry fields - TEL keywords:

Rotator on Sky (= -PA on Sky): the angle of the telescope rotator on the sky. The angle is measured in deg North over West, i.e. it has the opposite sign of the position angle as measured on the sky. The values can range from -180 to 180 deg. Default is 0 deg.

Additional Velocity RA: the velocity of the non-sidereal tracking/auto guiding in right ascension (for instance for moving objects). The value is given in arcsec/s on the sky. Default is 0 arcsec/s.

Additional Velocity DEC: the velocity of the non-sidereal/auto guiding tracking in declination (for instance for moving objects). The value is given in arcsec/s on the sky. Default is 0 arcsec/s.

Get Guide Star from: source from which the coordinates for the guide star are taken. It is actually not recommended to use any other option then the default value. Three options exist:

- CATALOGUE: the guide star coordinates are selected from a guide star catalog installed at the telescope (HST Guide Star and USNO catalogs). This is the default and most frequently used option.
- SETUPFILE: the coordinates are read from the subsequent entry fields of the acquisition template. This option may be used if the user wants to specify a certain guide star to be used and it allows also to give guide stars not found in the catalogs of the telescope. Note: the guide star should be of brightness 11-13mag. The outer radius for the guide star selection area is 7.4 arcmin from the field center, the inner one is defined by the field size of the collimator used.
- NONE: this options is used if no guide star shall be used, for instance during twilight periods when it will be difficult to find one since the sky is too bright. In that case the telescope tracks with sidereal track rate.

Guide Star RA: the right ascension of the user selected guide star in hh mm ss. Equinox is J2000, default is 0 = 00 00 00.000.

Guide Star DEC: the declination of the user selected guide star in dd mm ss. Equinox is J2000, default is 0 = 00 00 00.000.

List of Tel. Offsets in RA: a list of telescope right ascension (RA) offsets in arcsec which will be executed step by step during the jitter sequence. The first offset step is performed before the start of the first exposure. The offsets are executed sequentially and relative to the last telescope position. The offset values are separated by spaces. The number of offsets done during the jitter sequence is defined by the entry field **Number of offsets**. If the number of offset values in the list is smaller than **Number of offsets**, the list of offset values will be repeated until the number of offsets is equal to the requested **Number of offset**. This parameter corresponds to entry field **number of offsets**. Default is 0 arcsec.

List of Tel. Offsets in DEC: a list of telescope declination (DEC) offsets in arcsec which will be executed step by step during the jitter sequence. The first offset step is performed before the start of the first exposure. The offsets are executed sequentially and relative to the last telescope position. The offset values are separated by spaces. The number of offsets done during the jitter sequence is defined by the entry field **Number of offsets**. If the number of offset values in the list is smaller than **Number of offsets**, the list of offset values will be repeated until the number of offsets is equal to the requested **Number of offsets**. This parameter corresponds to entry field **number of offsets**. Default is 0 arcsec.

List of Tel. Offsets in CCD Y Direction: list of telescope offsets along the slit. The offsets are given in arcsec. Default is 0 arcsec. The list can contain more or less values than the number of offsets indicates. If more, only the requested number of offsets are executed (starting with the first one). If less, the y offset list is repeated until the requested number of offsets are executed. The telescope offsets are executed relative to the last position and before the start of the exposure (series). Positive/negative offset values move the object in positive/negative Y direction on the CCD. At the end of the exposure sequence the telescope returns to the start position. This parameter corresponds to entry field **number of offsets in the y pixel direction**.

Blind Offset RA: telescope offset (in arcsec) in right ascension for a blind offset. The offset will be executed only of $\neq 0$. The offset from the reference star to the target must be entered here. The default value is 0 arcsec.

Blind Offset DEC: telescope offset (in arcsec) in declination for a blind offset. The offset will be executed only of $\neq 0$. The offset from the reference star to the target must be entered here. The default is 0 arcsec.

4.4 User defined P2PP entry fields - INS keywords:

LSS Slit: the longslit to be used for the spectrum exposure. The slit selection is done from a pull-down menu. For the available longslit see list in section 4.6.7. Default is NODEFAULT (i.e. user entry is expected here).

MOS Slit Width (arcsec): the width of the MOS slits (in arcsec) in the SPECPHOT, PMOS and HIT-I fast templates (for spectro-photometric standard stars the default value is set to 5 arcsecs).

FIMS Target Setup File .p_targ: the content of the **FIMS** target setup file p_targ for the field acquisition. This file gives the center field coordinates and rotator angle for the telescope preset, the reference target coordinates and the collimator to be used. For MXU it also contains the MXU mask ID. This file is generated by FIMS and is attached to the acquisition template within P2PP. Since MXU p_targ files are very long, only the name of the p_targ file appears in the P2PP entry field, while its content is hidden (but still present). The default content of this entry field is NODEFAULT (i.e. user entry is expected here).

FIMS MXU Mask Gerber Setup File .p_gbr: the content of the p_gbr file from FIMS which contains the information for punching the MXU mask. This file is generated by FIMS and is attached to the acquisition template within P2PP. Since MXU p_gbr files are very long, only the name of the p_gbr file appears in the p2pp entry field, while its content is hidden (but still present). The default content of this entry field is NODEFAULT (i.e. user entry is expected here).

FIMS Focal Plane Setup File .p_focf: the FIMS file (extension p_focf) with the user defined configuration of the FORS focal field during the exposure. This file is generated by FIMS and is attached to the template within P2PP. Since MXU p_focf files are very long, only the name of the p_focf file appears in the p2pp entry field, while its content is hidden (but still present). The default content of this entry field is NODEFAULT (i.e. user entry is expected here).

Collimator: selection of the instrument collimator to be moved into the light path for the calibration. Two options exist: COLL_SR for the standard resolution collimator (default) and COLL_HR for the high resolution collimator.

Wollaston Prism: the use of the Wollaston prism is mandatory for polarimetry observations. Default and only setting: WOLL_34+13.

Grism: the grism to be inserted for the exposure. For the available grism see list in section 4.6.6. Default is NODEFAULT (i.e. user entry is expected here).

Filter1 Name: filter to be selected from the filter pull-down menu (see section 4.6.5). Since P2PP is an off-line preparation tool, it is not connected to the real database of the operational instrument, so that it cannot verify the feasibility of the filter selection or if an interference filter is actually installed in the instrument. Therefore, in visitor mode, a filter request has to be filled in at the site in order to make sure that the proper filters are mounted for the observations. For service mode, the observatory staff take care of this request considering by determining the likely observations of the coming night. The broad band filters will be at any time in place at the position given by the standard instrument configuration.

4.4.1 Internal arc lamps:

The values are still to be defined by the users according to the recommended values in chapter 4 of the user manual. Most users won't have to send calibration OBs since the observatory staff perform this task for all standard observation modes (- the calibration plan). As a general hint: Ne lamps are bad for spectral resolution of much less than 1000! HgCd and He are to be used for all observations at wavelengths shorter then 600nm.

Switch-on Time Lamp He+1: the switch-on time of lamp He+1 in seconds. Default is NODEFAULT (i.e. user entry is expected here). (-1 to be used to switch on the lamp continuously during the shutter open time)

Switch-on Time Lamp HgCd+2: the switch-on time of lamp HgCd+2 in seconds. Default is NODEFAULT (i.e. user entry is expected here). (-1 to be used to switch on the lamp continuously during the shutter open time)

Switch-on Time Lamp Ar+1 is on: the switch-on time of lamp Ar+1 in seconds. Default is NODEFAULT (i.e. user entry is expected here). (-1 to be used to switch on the lamp continuously during the shutter open time)

Switch-on Time Lamp Ar+2 is on: the switch-on time of lamp Ar+2 in seconds. Default is NODEFAULT (i.e. user entry is expected here). (-1 to be used to switch on the lamp continuously during the shutter open time)

Switch-on Time Lamp Ne+1 is on: the switch-on time of lamp Ne+1 in seconds. Default is NODEFAULT (i.e. user entry is expected here). (-1 to be used to switch on the lamp continuously during the shutter open time)

Switch-on Time Lamp Ne+2 is on: the switch-on time of lamp Ne+2 in seconds. Default is NODEFAULT (i.e. user entry is expected here). (-1 to be used to switch on the lamp continuously during the shutter open time)

4.4.2 Internal flat field lamps:

The default values should not be changed by the users as they have been optimized by the observatory staff.

Switch-on Time Lamp FlatBlue+1: the switch-on time of lamp FlatBlue+1 in seconds. Default is -1; permanently switched on. (-1 to be used to switch on the lamp continuously during the shutter open time)

Switch-on Time Lamp FlatBlue+2: the switch-on time of lamp FlatBlue+1 in seconds. Default is -1; permanently switched on. (-1 to be used to switch on the lamp continuously during the shutter open time)

Switch-on Time Lamp FlatRed+1: the switch-on time of lamp FlatRed+1 in seconds. Default is -1; permanently switched on. (-1 to be used to switch on the lamp continuously during the shutter open time)

Switch-on Time Lamp FlatRed+2: the switch-on time of lamp FlatRed+2 in seconds. Default is -1; permanently switched on. (-1 to be used to switch on the lamp continuously during the shutter open time)

4.4.3 External flat field lamps of the new calibration units:

The default values should not be changed by the users since the values are kept updated by the observatory staff.

External Lamp: Selection of the external lamps - only one of the two external lamps can be used at a given time. Two of the external lamps FlatBlue+4 and FlatRed+4 will be projected in focus onto the fiber bundle (high flux) and the two other lamps (FlatBlue+3 and FlatRed+3) off-focus with lower flux level. By default the off-focus lamps FlatBlue+3 and FlatRed+3 (i.e. low flux level) are selected.

Switch-on Time External Lamp: the switch-on time of lamp FlatBlue+3 or FlatBlue+4 in seconds. Default is 0 (i.e. the lamp is off).

Switch-on Time External Lamp: the switch-on time of lamp FlatRed+3 or FlatRed+4 in seconds. Default is 0 (i.e. the lamp is off).

4.5 Hidden P2PP parameters:

CCD Windowing Flag: CCD windowing option. This option is hidden and should not be used except for technical purposes.

CCD Window X Start: start pixel in X direction for the CCD window read-out. Default is pixel 1.

CCD Window Y Start: start pixel in Y direction for the CCD window read-out. Default is pixel 1 except for SPECPHOT templates (default = 450).

CCD Window X Size: number of pixels of the CCD read-out window in X direction. Default is 1 pixel except for SPECPHOT templates (default = 2048.)

CCD Window Y Size: number of pixels of the CCD read-out window in Y direction. Default is 1 pixel except for SPECPHOT templates (default = 1000.)

Automatic Target Preset: this parameter decides on the (non-)execution of the telescope preset only in right ascension and declination. It has two values: T for true, F for False. If set to T, the telescope preset will be executed, if set to F, it will not be executed. For a full telescope preset including right ascension, declination and rotator this flag should be T. Default is T.

Acquisition Method: the acquisition method used during the fine positioning of the target field in the focal plane of the instrument. Two options exist:

- Interactive: this option allows the operator to interact with the control system during the alignment process in order to guide the acquisition sequence. The operator interaction typically comprises: confirmation of the alignment offset, repetition of the alignment sequence if needed, selection of reference stars if the automatic selection, executed after each alignment image is taken, fails. Default and recommended mode for the field alignment is interactive.
- Automatic: this options executes the alignment process completely automatically without any operator interaction. A single alignment iteration will be executed. This option is faster than the interactive mode, but requires that the alignment process is safe and successful (for instance it was verified interactively before). It is not recommended to be used for normal acquisitions.

Preset LADC: the LADC setup for the exposure to be chosen from the list in section in table 4. The LADC is set for air mass of the mid exposure time of the template. Default is COORD.

P2PP entry	LADC setting
COORD	setting according to coordinates and elevation of mid-exposure time (default)
ACTUAL	setting according to coordinates and elevation of actual time of template start
ZENITH	setting for zenith position, LADC closed
ABSPOS	user defined explicit setting of LADC, to be entered through the telescope control console (it cannot be specified through P2PP)
NONE	no LADC setting done, LADC stays in current position

Table 4: The LADC settings in P2PP.

Filter2 Name: combinations of two filters are not supported. To purchase a edge cutoff interference filter is the more economical choice.

4.6 Pull-Down Menus

Within P2PP the various templates (acquisition, science, calibration) make use of a set of pull-down menus to define the parameter setups of the CCD, LADC, filter, grism, MOS (for spectrophotometry) and longslit, for the individual instrument/telescope configurations. The following sections describe the content of the pull-down menus.

4.6.1 Telescope Parameters

The telescope software supports different options for the selection of guide stars – see table 5. This parameter is selected in the P2PP entry field "Get Guide Star from".

P2PP entry	Guide star selection option
CATALOGUE	Select guide star from a telescope catalog
SETUPFILE	Guide star RA and DEC are given in special P2PP entry fields
NONE	No guide star is to be selected

Table 5: Guide star selection parameter for FORS2 in P2PP. Further information is given in section 4.

4.6.2 Exposure Types

The FORS instruments produce 4 type of exposures: science exposures, standard star exposures, pre-imaging exposures and calibration exposures. The 4 image types differ in some fits keyword parameters to support data organizers of reduction pipelines. Table 6 lists the P2PP parameters to select science, standard star and pre-imaging exposures. The exposure type for calibrations is implicitly defined by the template ("cal" in template name).

P2PP entry	Exposure type
SCIENCE	science exposure
STANDARD	standard star exposure
PRE–IMAGE	pre-images – to trigger a fast data release in service mode

Table 6: Exposure types of FORS2 in P2PP. Note (1): calibration exposures are defined through the template type – "cal" in template name.

4.6.3 CCD Readout Modes

The normal CCD setup modes for FORS2 are listed in table 7.

Blue (E2V)	
P2PP entry	CCD mode
100kHz,2x2,high	fast, 2x2 binned, 2-port mode (spectroscopy)
200kHz,2x2,low	very fast, 2x2 binned, 2-port mode (imaging)
100kHz,1x1,high	unbinned mode for spectroscopic observations
200kHz,1x1,low	unbinned imaging mode (for special applications only, for example IPOL on bright sources)
Red (MIT)	
P2PP entry	CCD mode
100kHz,2x2,high	fast, 2x2 binned, 2-port mode (spectroscopy)
200kHz,2x2,low	very fast, 2x2 binned, 2-port mode (imaging)
200kHz,1x1,low	very fast, unbinned, 2-port mode (for special applications only)

Table 7: CCD modes supported by FORS2 in P2PP. The default modes are highlighted.

The CCD clocking modes listed in table 8 can be selected for both the imaging and spectroscopy modes of the HIT mode (HIT-I and HIT-S), but are not applicable for the HIT-MS mode.

P2PP entry	Time taken to clock entire frame
HIT-OS1-1sec	1
HIT-OS2-4sec	4
HIT-OS3-16sec	16
HIT-OS4-64sec	64
HIT-OS5-256sec	256

Table 8: The HIT clocking speeds in P2PP

4.6.4 Collimator selection

The collimator selection menu has two choices for each instrument – see table 9.

P2PP name	Collimator
COLL_SR+6	Standard resolution collimator
COLL_HR+7	High resolution collimator

Table 9: FORS2 collimators in P2PP.

4.6.5 Filter selection

The filter pull-down menu offers the filters listed in table 10. If not part of the instrument standard configuration (see FORS2 User's Manual) the respective filters have to be requested for installation into the instrument via a special filter setup request form (visitor mode observations only).

4.6.6 Grism selection

The grisms listed in table 11 can be selected for longslit (LSS), multi-object (MOS), mask mode (MXU) as well as for spectrophotometry (specphot) and for spectropolarimetry (PMOS). The user is reminded that for PMOS, MXU and MOS modes with FORS2 only the standard resolution collimator (SR) is supported.

4.6.7 Longslit selection

The longslits listed in table 12 can be selected for longslit (LSS) spectroscopy with both the SR and HR collimators.

4.6.8 MOS slit position selection for spectrophotometry

Table 13 contains the list of options for predefined x-positions of the MOS slits during the execution of the spectrophotometric templates (SPECPHOT type). The positions correspond to the pre-defined positions of the MOS slits in the field of view. This can be optionally the x-position of the subsequent longslits or any other user defined x-offset in units of pixels on the CCD. The slit width is pre-defined to 5 arcsec.

4.6.9 Retarder plate angle for circular and linear polarimetry

The polarimetry modes IPOL and PMOS use named positions for the setup of the rotation angle for the linear and circular retarder plate. The selection options for the polarimetry modes are given in table 14. Table 15 lists the available options. The number in the named positions gives the retarder plate angle, "lin" and "cir" denote the polarization type (linear and circular). The named positions appear in a pull-down field which is used to select the retarder plate angle for polarimetry exposures. They can be added to a list of angle settings to be executed with the instrument.

4.6.10 HIT-S mask selection

The available masks for the spectroscopy modes of the HIT mode. These give you a square aperture of the slit width given in Table 16.

P2PP name	Filter type
GG375+80	Order sorting filter GG375
GG435+81	Order sorting filter GG435
OG590+32	Order sorting filter OG590
FILT_465_250+82	Special order sorting filter
R_SPECIAL+76	Bessel/Special R filter
I_BESS+77	Bessel I filter
u_HIGH+112	High through-put special u filter
g_HIGH+113	High through-put special g filter
v_HIGH+114	High through-put special v filter
b_HIGH+115	High through-put special b filter
u_GUNN+38	Gunn u filter
v_GUNN+39	Gunn v filter
g_GUNN+40	Gunn g filter
r_GUNN+41	Gunn r filter
z_GUNN+78	Gunn z filter
OII+44	O II filter
OII/4000+45	O II filter red-shifted by 4000 km/s
OII/8000+46	O II filter red-shifted by 8000 km/
HeII+47	He II filter
HeII/3000+48	He II filter red-shifted by 3000 km/s
HeII/6500+49	He II filter red-shifted by 6500 km/s
OIII+50	O III filter
OIII/3000+51	O III filter red-shifted by 3000 km/
OIII/6000+52	O III filter red-shifted by 6000 km/
HeI+53	He I filter
HeI/2500+54	He I filter red-shifted by 2500 km/s
HeI/5000+55	He I filter red-shifted by 5000 km/s
OI+56	O I filter
OI/2500+57	O I filter red-shifted by 2500 km/s
OI/4500+58	O I filter red-shifted by 4500 km/s
H_Alpha+83	H Alpha filter
H_Alpha/2500+60	H Alpha filter red-shifted by 2500 km/s
H_Alpha/4500+61	H Alpha filter red-shifted by 4500 km/s
SII+62	S II filter
SII/2000+63	S II filter red-shifted by 2000 km/s
SII/4500+64	S II filter red-shifted by 4500 km/s
SIII+65	S III filter
SIII/1500+66	S III filter red-shifted by 1500 km/s
SIII/3000+67	S III filter red-shifted by 3000 km/s
FILT_485_37+68	night sky suppression filter
FILT_691_55+69	night sky suppression filter
FILT_815_13+70	night sky suppression filter
FILT_834_48+71	night sky suppression filter
FILT_530_25+84	Munich intermediate-band filter
FILT_500_5+85	Munich O III filter
FILT_503_5+86	Munich O III filter red-shifted by 1800 km/s
z_SPECIAL+43	Special z-band filter (width 20nm)
FILT_917_6+88	Special z-band filter (width 6nm)

Table 10: FORS2 filters in P2PP. Not all filters are installed in the instrument at any time.

P2PP name
normal grisms
GRIS_1400V+18
GRIS_1200R+93
GRIS_1028z+29
GRIS_600B+22
GRIS_600V+94
GRIS_600RI+19
GRIS_600I+25
GRIS_600z+23
GRIS_300V+10
GRIS_300I+21
GRIS_150I+27
GRIS_1200B+97

Table 11: FORS2 grisms in P2PP.

P2PP entry	Longslit
lSlit0_3arcsec	0.3 arcsec wide longslit
lSlit0_4arcsec	0.4 arcsec wide longslit
lSlit0_5arcsec	0.5 arcsec wide longslit
lSlit0_7arcsec	0.7 arcsec wide longslit
lSlit1_0arcsec	1.0 arcsec wide longslit
lSlit1_3arcsec	1.3 arcsec wide longslit
lSlit1_6arcsec	1.6 arcsec wide longslit
lSlit2_0arcsec	2.0 arcsec wide longslit
lSlit2_5arcsec	2.5 arcsec wide longslit

Table 12: The FORS2 longslits in P2PP

P2PP entry	predefined MOS slit position
LSS_0.3_arcsec	MOS slits at position of 0.3 arcsec longslit
LSS_0.4_arcsec	MOS slits at position of 0.4 arcsec longslit
LSS_0.5_arcsec	MOS slits at position of 0.5 arcsec longslit
LSS_0.7_arcsec	MOS slits at position of 0.7 arcsec longslit
LSS_1.0_arcsec	MOS slits at position of 1.0 arcsec longslit
LSS_1.3_arcsec	MOS slits at position of 1.3 arcsec longslit
LSS_1.6_arcsec	MOS slits at position of 1.7 arcsec longslit
LSS_2.0_arcsec	MOS slits at position of 2.0 arcsec longslit
LSS_2.5_arcsec	MOS slits at position of 2.5 arcsec longslit
P2PP entry	user defined MOS slit position
MOS_center	MOS slits in center of MOS area
MOS_center+offset	MOS slits at positive X pixel offset from MOS center
MOS_center-offset	MOS slits at negative X pixel offset from MOS center

Table 13: The FORS MOS slits in P2PP used by SPECPHOT templates

P2PP entry	Polarimetry mode
linear	Linear polarimetry
circular	Circular polarimetry

Table 14: Polarimetry options in P2PP.

P2PP entry	Longslit
clear list	empty list
cir-45	circular polarimetry, retarder at -45 deg
cir45	circular polarimetry, retarder at +45 deg
cir135	circular polarimetry, retarder at 135 deg
cir225	circular polarimetry, retarder at 225 deg
lin0	linear polarimetry, retarder at 0 deg
lin22.5	linear polarimetry, retarder at 22.5 deg
lin45	linear polarimetry, retarder at 45 deg
lin67.5	linear polarimetry, retarder at 67.5 deg
lin90	linear polarimetry, retarder at 90 deg
lin112.5	linear polarimetry, retarder at 112.5 deg
lin135	linear polarimetry, retarder at 135 deg
lin157.5	linear polarimetry, retarder at 157.5 deg
lin180	linear polarimetry, retarder at 180 deg
lin202.5	linear polarimetry, retarder at 202.5 deg
lin225	linear polarimetry, retarder at 225 deg
lin247.5	linear polarimetry, retarder at 247.5 deg
lin270	linear polarimetry, retarder at 270 deg
lin292.5	linear polarimetry, retarder at 292.5 deg
lin315.	linear polarimetry, retarder at 315 deg
lin337.5	linear polarimetry, retarder at 337.5 deg

Table 15: The retarder plate angles in P2PP - the recommended default angles for the circular and linear polarimetry are highlighted

P2PP entry	Slit width
HITS_0_5+900015	0.5 arcsec
HITS_0_7+900016	0.7 arcsec
HITS_1_0+900017	1.0 arcsec
HITS_1_3+900018	1.3 arcsec
HITS_1_6+900019	1.6 arcsec
HITS_2_0+900020	2.0 arcsec
HITS_5_0+900021	5.0 arcsec

Table 16: The HIT masks in P2PP