Visible & Infrared Survey Telescope for Astronomy
Project Office

Tel: +44 (0)131 668 8411
Fax: +44 (0)131 668 8412
Email: vista@roe.ac.uk,
http://www.roe.ac.uk/atc/projects/vista/

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Document Prepared By:	**Malcolm Stewart**	**Signature and Date:**	
Document Approved By:		**Signature and Date:**	
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Change Record

Issue	Date	Section(s) Affected	Description of Change/Change Request Reference/Remarks
1.0	2002-10-28	All	First issue
1.01	2004-09-15	All	Rewrite
1.02	2004-09-16		After comments from DLT
1.03	2004-09-29		Commands removed: OFFSGP, FGETAO, OFFSM2, WITOAS. New command OFFSFOC. Various clarifications and smaller changes.
1.04	2004-11-04		SETUP description New sections “Set-up POarameters” and “Data”
1.05	2004-11-08		Database section preamble, various clarifications, TEL AOx RA, DEC header data
1.1	2004-11-08		MSMODE description New TEL AO set-up parameters etc. ??? TEL ROT OFFANGE parameter SETINSD command parameters Distinction between dictionaries and on-line database
1.2	2004-11-17		Table 6 - act:control:parameters.currentIndexAvg removed OFFSXXY command removed
1.3	2005-03-23		Mark BOX2GS and OFFSADG commands as unlikely to be used (may not work!) and also INCM2ZP and SETM2ZP commands. (will not be used by Camera). Default column added for command parameters. Description of preset SETUP file moved to an appendix. Dome flatfield added to database and FITS header. SETFF and GETFF renamed to FFSEET and FFGET AO1 and AO2 renamed AOSA and AOSB. Set-up parameter TEL AO WAIT replaced by TEL AO FUSSINESS. TEL AO DWELLTIME added. ao.necessary flag added to database.
1.4	2005-05-20		All telescope movements done through preset SETUP, (offset commands not used). FFGET removed PPOS keywords removed and probeID database item Unused commands removed. New setup keywords: TEL AG CONFIRM and several TEL AO xxxx.
1.5	2005-05-30		Guide probe ID references removed, new aO parameters, FUSSINESS renamed PRIORITY
1.6	ongoing		Detail added to the description of INCM1ZP and SETM1ZP Enclosure keywords in FITS header FITS header items M2 centring/tilt changed to arcsecs FITS header items TEL AO xxx changed FITS header item TEL TH STR TEMP added Set-up parameter TEL AO PRIORITY changed to string Set-up parameter TEL AO OFFSFOC added Set-up parameter TEL AO CONFIRM added Set-up parameter TEL ENC FFREQ added

			Changes not made to database section – are any new items requried at this stage?

Table of Contents

1 Introduction

This document defines the VISTA Telescope Control System commands available to the VISTA Camera. These commands are a relatively small subset of all commands understood by all TCS modules. Also defined are TCS data used in various contexts i.e. FITS headers, set-up and online database access. Operations log data are not (currently at least) described.

2 Scope

The IR Camera, in the context of this ICD, includes the software that is architecturally part of the instrument software. Low order wavefront sensing and autoguider software, which is part of the Camera Work Package, is considered to part of the TCS.

3 Acronyms and Abbreviations

4 Applicable and Referenced Documents

4.1 Applicable

[AD01] *VLT Telescope Control System User Manual*, VLT-MAN-ESO-17230-0942, Issue 2.0, 2002-03-22.

[AD02] *Active Modes, Zernike Polynomials and Initial Look-Up Tables for the Primary Mirror*, VIS-TRE-ATC-02020-0005, Issue 1.1

4.2 Reference

[RD01] *The UT Book*, VLT-MAN-ESO-10200-1634, Issue 3.1.

[RD02] *TCS Interface Design Description*, VLT-SPE-ESO-17230-0941, Issue 1.0, 1995-11-17.

[RD03] *VLT INS Common Software for Templates User Manual*, VLT-MAN-ESO-17240-2240, Issue 4, 2004-03-31.

5 Related Information

Table 1 Other sources of information

Item	Description	Location
Module Command Definition Tables (CDT)	Definitions of commands implemented by each (TCS) module	`<module>/CDT/<module>Control.cdt`
Telescope Interface CDT	CDT for the Telescope Interface module, which handles all external commands	`vtif/CDT/vtifControl.cdt`
Routing Table	Defines which TCS process handles each external command (possibly with command name translation)	`vtif/dbl/vtifDB.class`
VLT TCS Data Dictionary	The keywords (header, set-up and ops-log) used by the VLT. All of these are available to VISTA, whether relevant or not.	`dicTCS/config/ESO-VLT-DIC.TCS`
VISTA TCS Data Dictionary	The keywords (header, set-up and ops-log) that the VISTA TCS needs in addition to the VLT's.	`dicVTCS/config/ESO-VLT-DIC.VTCS`
VLT TCS Database Definition	Defines the structure of the TCS database	`$VLTDATA/ENVIRONMENTS/wvttcs/dbl/DATABASE.db`

6 Command Interface to TCS

6.1 Commands

The following commands will be understood the VISTA's telescope Interface module vtif. Each command will appear in the vtif's Command Definition Table `vtif.cdt` and also the routing table `vtifDB.class`. Note that a few commands are sent onwards to a TCS modules control process with a different name, with this translation being defined in the routing table.

Currently the list of available commands that are made available externally is based largely on an inspection of the VLT's tif.cdt and routing table. As with the VLT, the commands that are made visible to the Camera are only a subset of those understood by the TCS modules.

Table 2 TCS commands and their arguments.

TIF Command	Module Command (if different)	VISTA-specific	Not to be Used	Description (Categories are not definitive)	Parameters (* returned)	Type	Units	Default
				Mode Switching				
GETINS				Get instrument	insId*			
SELINS				Select instrument	insId			
GETINSD				Get instrument data	* (see CDT)			
SETINSD				Set instrument data	insId	String		"Vircam"
					insMode	String		"Imaging"
					focusStation	String		"CA"
					offsetRot	Real	Degrees	
					offsetFocus	Real	mm	
					pixelSizeX	Real	arcsec/pixel	
					pixelSizeY	Real	arcsec/pixel	

TIF Command	Module Command (if different)	VISTA-specific	Not to be Used	Description (Categories are not definitive)	Parameters (* returned)	Type	Units	Default
				X offset for off-axis tracking	pointAxisOffX	Real	arcsecs	
				Y offset for off-axis tracking	pointAxisOffY	Real	arcsecs	
					detectorLcu	String		
				Not needed TBC	refX			
				Not needed TBC	refY			
				Not needed TBC	adapterFocus			
				Preset				
CLTSTP				Clear SETUP file using default values				
STOPTRK				Stop telescope movement	function	String		
SAVCSTP				Save a copy of the current setup file with given name	file	String		
SAVRSTP				Save a copy of the ready setup file with given name	file	String		
SETUP				Handle a new setup configuration, including target, guide star candidates, aO star candidates etc. See Section 6.2 for details of information in the file. SETUP should be used for every telescope pointing that includes new guide and aO stars including an offset within a tile. The arguments are optional and information is more normally passed by setting keyword/values as command line parameters.	expoId	Integer		
					file	String		
					function	String		
					noMove	Logical		
					check	Logical		
					expoId*	Integer		

TIF Command	Module Command (if different)	VISTA-specific	Not to be Used	Description (Categories are not definitive)	Parameters (* returned)	Type	Units	Default
				Active Optics				
INCM2ZP		Y	*	Increment M2 look-up table zero points.	focus	Real	nm	
					xtilt	Real	arcsecs	
					ytilt	Real	arcsecs	
					xcoma	Real	arcsecs	
					ycoma	Real	arcsecs	
SETM2ZP		Y	*	Set M2 look-up table zero points relative to those in the initial LUTs i.e. SETM2ZP <all zero> removes any zero point corrections.	focus	Real	nm	
					xtilt	Real	arcsecs	
					ytilt	Real	arcsecs	
					xcoma	Real	arcsecs	
					ycoma	Real	arcsecs	
INCM1ZP		Y		Increment M1 look-up table zero points. The coefficients are added to those currently being applied by the active optics module and so should represent the difference between the actual and expected wavefront at the position of the HOWFS measurement. The coefficients are further described in *Active Modes, Zernike Polynomials and Initial Look-Up Tables for the Primary Mirror* [AD02].	Z4	Real	nm	
					Z11	Real	nm	
					Z22	Real	nm	
					B1_2 sin	Real	nm	
					B1_2 cos	Real	nm	
					B2_1 sin	Real	nm	
					B2_1 cos	Real	nm	
					B3_1 sin	Real	nm	
					B3_1 cos	Real	nm	
					B4_1 sin	Real	nm	
					B4_1 cos	Real	nm	
					B2_2 sin	Real	nm	
					B2_2 cos	Real	nm	
					B1_2 sin	Real	nm	
					B1_2 cos	Real	nm	
					B5_1 sin	Real	nm	
					B5_1 cos	Real	nm	

TIF Command	Module Command (if different)	VISTA-specific	Not to be Used	Description (Categories are not definitive)	Parameters (* returned)	Type	Units	Default
					B6_1 sin	Real	nm	
					B6_1 cos	Real	nm	
					B3_2 sin	Real	nm	
					B3_2 cos	Real	nm	
SETM1ZP		Y		Set M1 look-up table zero points relative to those in the initial LUTs i.e. SETM2ZP <all zero> removes any zero point corrections	(as for INCM1ZP)	Real	nm	
OFFSFOC		Y		Focus offset	offset	Real	mm	

TIF Command	Module Command (if different)	VISTA-specific	Not to be Used	Description (Categories are not definitive)	Parameters (* returned)	Type	Units	Default
				Enclosure				
DMSMODE			*	Select the operational mode for dome rotation. AUTO: automatic position update SEMI: position reference calculated every second but preset only on request COMMAND: position reference calculated and preset only on request	mode	String		
WSMODE			*	Select the operational mode for the windscreen AUTO: automatic position update SEMI: position reference calculated every second but preset only on request COMMAND: position reference calculated and preset only on request	mode	String		
MSMODE		Y	*	Select the operational mode for the moonscreen AUTO: automatic position update SEMI: position reference calculated every second but preset only on request COMMAND: position reference calculated and preset only on request	mode	String		
FFSET		Y		Set the flat field illumination (0=off)	level	Integer		

Notes

(a) * in the “Not to be Used” column means that the command is not expected to be used operationally by the Camera, but is currently included partly for compatibility with VLT. Such commands should be used only after agreement and in a later version of this ICD will either be unstarred or removed.

(b) Y in the “VISTA Specific” column means that the command is specific to VISTA i.e. it is not used by VLT etc.

(c) Time, e.g. “at” parameter, is supplied as an ISO 8601 compliant string, e.g. “YYYY-MM-DDThh:mm:ss.uuu”. “now” is also a valid time and is the default.

6.2 Set-up Parameters

The VISTA TCS will provide the following set-up parameters. Most of the VLT’s set-up parameters are reused, but irrelevant ones are not listed. Parameters specific to VISTA are indicated by the “New” column. Further information is available in [AD01].

Table 3 Set-up parameters provided by the VISTA TCS.

Keyword	Type	Format	Description	New
TEL AG COUNT	integer	%d	Min no. of counts on guide camera detector for	
TEL AG CYCLETIME	double	%.3f	Cycle time for auto guiding (default: 0 sec., i.e. as fast as possible)	
TEL AG GUIDESTAR	string	%s	Where to find guide stars (NONE, SETUPFILE or CATALOGUE)	
TEL AG INTTIME	double	%.3f	Integration time for auto guiding (default: 0.5sec.)	
TEL AG MINMAG	double	%.1f	Minimum magnitude for suitable guide star (default: 8)	
TEL AG MAXMAG	double	%.1f	Maximum magnitude for suitable guide star (default: 16)	
TEL AG MINRAD	double	%.1f	Minimum inner search radius for suitable guide star (arcmin)	
TEL AG MAXRAD	double	%.1f	Maximum inner search radius for suitable guide star (arcmin)	
TEL AG OBJCNT	logical	%c	Object centering	
TEL AG START	logical	%c	Autoguiding active	
TEL AG CONFIRM	logical	%c	Autoguide confirmation required before starting	Y

Keyword	Type	Format	Description	New
TEL AG TAKE_ACT_POS	logical	%f	Flag if to search around actual position	
TEL AG VIGLIM	string	%s	Handling of vignetting limits	
TEL AO START	logical	%c	Perform cyclic aO if data available	
TEL AO PRIORITY	string	%s	Priority (fussiness) for active optics:- “LOW” (never pause to do aO cycle), “NORMAL” (pause to do aO cycle if no suitable measurement available) or “HIGH” (always do aO cycle after a telescope move)	Y
TEL AO CONFIRM	logical	%c	Active optics confirmation required before starting	Y
TEL AO DWELLTIME	double	%.1f	Anticipated time in s telescope is expected to dwell at each position	Y
TEL AO AOSTAR	string	%s	Where to find aO stars (NONE, SETUPFILE or CATALOGUE)	Y
TEL AO MINMAG			Minimum magnitude for suitable aO stars (default: 8)	Y
TEL AO MAXMAG			Maximum magnitude for suitable aO stars (default: 16)	Y
TEL AO MINRAD			Minimum inner search radius for suitable aO stars (arcmin)	Y
TEL AO MAXRAD			Maximum inner search radius for suitable aO stars (arcmin)	Y
TEL AO TAKE_ACT_POS			Flag if to search around actual position	Y
TEL AO OFFSFOC	double	%f	Focus offset (mm)	
TEL AOSA1 ALPHA	double	%.3f	Active Optics Star alpha	Y
TEL AOSA1 DELTA	double	%.3f	Active Optics Star delta	Y
TEL AOSA1 MAG	double	%.1f	Active Optics Star magnitude	Y
TEL AOSA2 ALPHA	double	%.3f	Active Optics Star alpha	Y
TEL AOSA2 DELTA	double	%.3f	Active Optics Star delta	Y
TEL AOSA2 MAG	double	%.1f	Active Optics Star magnitude	Y

Keyword	Type	Format	Description	New
TEL AOSA3 ALPHA	double	%.3f	Active Optics Star alpha	Y
TEL AOSA3 DELTA	double	%.3f	Active Optics Star delta	Y
TEL AOSA3 MAG	double	%.1f	Active Optics Star magnitude	Y
TEL AOSA4 ALPHA	double	%.3f	Active Optics Star alpha	Y
TEL AOSA4 DELTA	double	%.3f	Active Optics Star delta	Y
TEL AOSA4 MAG	double	%.1f	Active Optics Star magnitude	Y
TEL AOSA5 ALPHA	double	%.3f	Active Optics Star alpha	Y
TEL AOSA5 DELTA	double	%.3f	Active Optics Star delta	Y
TEL AOSA5 MAG	double	%.1f	Active Optics Star magnitude	Y
TEL AOSB1 ALPHA	double	%.3f	Active Optics Star alpha	Y
TEL AOSB1 DELTA	double	%.3f	Active Optics Star delta	Y
TEL AOSB1 MAG	double	%.1f	Active Optics Star magnitude	Y
TEL AOSB2 ALPHA	double	%.3f	Active Optics Star alpha	Y
TEL AOSB2 DELTA	double	%.3f	Active Optics Star delta	Y
TEL AOSB2 MAG	double	%.1f	Active Optics Star magnitude	Y
TEL AOSB3 ALPHA	double	%.3f	Active Optics Star alpha	Y
TEL AOSB3 DELTA	double	%.3f	Active Optics Star delta	Y
TEL AOSB3 MAG	double	%.1f	Active Optics Star magnitude	Y
TEL AOSB4 ALPHA	double	%.3f	Active Optics Star alpha	Y
TEL AOSB4 DELTA	double	%.3f	Active Optics Star delta	Y
TEL AOSB4 MAG	double	%.1f	Active Optics Star magnitude	Y
TEL AOSB5 ALPHA	double	%.3f	Active Optics Star alpha	Y
TEL AOSB5 DELTA	double	%.3f	Active Optics Star delta	Y

Keyword	Type	Format	Description	New
TEL AOSB5 MAG	double	%.1f	Active Optics Star magnitude	Y
TEL GS1 ALPHA	double	%.3f	Guide Star alpha	
TEL GS1 DELTA	double	%.3f	Guide Star delta	
TEL GS1 MAG	double	%.1f	Guide Star magnitude	
TEL GS2 ALPHA	double	%.3f	Guide Star alpha	
TEL GS2 DELTA	double	%.3f	Guide Star delta	
TEL GS2 MAG	double	%.1f	Guide Star magnitude	
TEL GS3 ALPHA	double	%.3f	Guide Star alpha	
TEL GS3 DELTA	double	%.3f	Guide Star delta	
TEL GS3 MAG	double	%.1f	Guide Star magnitude	
TEL GS4 ALPHA	double	%.3f	Guide Star alpha	
TEL GS4 DELTA	double	%.3f	Guide Star delta	
TEL GS4 MAG	double	%.1f	Guide Star magnitude	
TEL GS5 ALPHA	double	%.3f	Guide Star alpha	
TEL GS5 DELTA	double	%.3f	Guide Star delta	
TEL GS5 MAG	double	%.1f	Guide Star magnitude	
TEL ROT ALTAZTRACK	logical	%c	Track rotator on alt/az instead of Alpha/Delta	
TEL ROT ENABLED	logical	%c	Rotator preset enabled	
TEL ROT OFFANGLE	double	%.3f	Rotator offset angle (the PA on the sky? – see also command SETINSD)	
TEL ROT PRSCRIT	string	%s	Azimuth and rotator preset criterion	
TEL TARG ADDVELALPHA	double	%.6f	Alpha additional tracking velocity	

Keyword	Type	Format	Description	New
TEL TARG ADDVELDELTA	double	%.6f	Delta additional tracking velocity	
TEL TARG ALPHA	double	%.3f	Alpha coordinate for the target	
TEL TARG ALT	double	%.3f	Altitude angle for fixed position target	
TEL TARG AZ	double	%.3f	Azimuth angle for fixed position target	
TEL TARG COORDTYPE	string	%s	Coordinate type (M=mean A=apparent)	
TEL TARG DELTA	double	%.3f	Delta coordinate for the target	
TEL TARG EPOCH	double	%.3f	Epoch	
TEL TARG EPOCHSYSTEM	string	%s	Epoch system (default J=Julian)	
TEL TARG EQUINOX	double	%.3f	Equinox	
TEL TARG NAME	string	%s	Name of special target position	
TEL TARG OFFSETALPHA	double	%.3f	Alpha offset for the target	
TEL TARG OFFSETDELTA	double	%.3f	Delta offset for the target	
TEL TARG PARALLAX	double	%.3f	Parallax	
TEL TARG PMA	double	%.6f	Proper Motion Alpha	
TEL TARG PMD	double	%.6f	Proper motion Delta	
TEL TARG RADVEL	double	%.3f	Radial velocity	
TEL TARG TYPE	string	%s	Type of given target i.e. COORDINATE, ALT_AZ, NAMED_POS or NO_TARGET (see [AD01])	

Keyword	Type	Format	Description	New
TEL TARG WLENGTH	double	%.3f	Wavelength (object)	
TEL ENC FFREQ	integer	%d	Required flat field level (0-7)	T

7 Data

7.1 Dictionaries

The TCS supplies data items for set-up, inclusion in the FITS headers of data files and inclusion in the operations logs. The VISTA TCS will supply the keywords defined in two data dictionaries:

Table 4 TCS data dictionaries

Dictionary	Module	Description
ESO-VLT-DIC.TCS	dicTCS	Reused dictionary from the VLT. Irrelevant items will not be used.
ESO-VLT-DIC.VTCS	dicVTCS	Additional items required for VISTA

These dictionaries cover the three categories of data:

- FITS headers
- set-up data
- operations log data

but they do not cover

- on-line database and the “named data items” e.g. as in Table 3 of [AD01]

7.2 FITS Headers

FITS header data are supplied using two functions as described in Section 2.3.2 of [AD01]:

tifGetFitsStart FITS keywords and values at start of an exposure
tifGetFitsEnd FITS keywords and values at end of an exposure

The keywords are listed below (for full data, see the data dictionaries). “New” indicates that this is a new data item for VISTA. “Start” and “End” indicate whether the items are written by tifGetFitsStart or tifGetFitsEnd.

Table 5 Header keywords.

Keyword	Unit	Description	New	Start	End
TELESCOP		ESO Telescope Name		Y	
RA	deg	%HOURANG RA (J2000) pointing (deg)		Y	
DEC	deg	%DEGREE DEC (J2000) pointing (deg)		Y	
EQUINOX		Standard FK5 (years)		Y	
RADECSYS		Coordinate reference frame		Y	
LST	s	%TIME LST at start (sec)		Y	
UTC	s	%TIME UTC at start (sec)		Y	
TEL DID		Data dictionary for TEL		Y	
TEL ID		TCS version number		Y	
TEL DATE		TCS installation date		Y	
TEL ALT	deg	Alt angle at start (deg)		Y	
TEL AZ	deg	Az angle at start (deg) S=0,W=90		Y	
TEL GEOELEV	m	Elevation above sea level (m)		Y	
TEL GEOLAT	deg.	Tel geo latitute (+=North) (deg)		Y	

Keyword	Unit	Description	New	Start	End
TEL GEOLON	deg.	Tel geo longitude (+=East) (deg)		Y	
TEL OPER		Telescope Operator		Y	
TEL FOCU ID		Telescope focus station ID		Y	
TEL FOCU LEN	m	Focal length (m)		Y	
TEL FOCU SCALE	arcsec/m	Focal scale (arcsec/mm)		Y	
TEL FOCU VALUE	mm	M2 setting (mm)		Y	
TEL PARANG START	deg	Parallactic angle at start (deg)		Y	
TEL PARANG END	deg	Parallactic angle at end (deg)			Y
TEL AIRM START		Airmass at start		Y	
TEL AIRM END		Airmass at end			Y
TEL AMBI FWHM START	arcsec	Observatory Seeing queried from ASM		Y	
TEL AMBI PRES START	hPa	Observatory ambient air pressure queried from ASM		Y	
TEL AMBI PRES END	hPa	Observatory ambient air pressure queried from ASM			Y
TEL AMBI FWHM END	arcsec	Observatory Seeing queried from ASM			Y
TEL AMBI WINDSP	m/s	Observatory ambient wind speed queried from ASM		Y	
TEL AMBI WINDDIR	deg	Observatory ambient wind direction queried from ASM (N=0 E=90)		Y	

Keyword	Unit	Description	New	Start	End
TEL AMBI RHUM	percent	Observatory ambient relative humidity queried from ASM		Y	
TEL AMBI TEMP	C	Observatory ambient temperature queried from ASM		Y	
TEL MOON RA	deg	%HOURANG RA (J2000) (deg)		Y	
TEL MOON DEC	deg	%DEGREE DEC (J2000) (deg)		Y	
TEL TH M1 TEMP	C	M1 superficial temperature		Y	
TEL TH STR TEMP	C	Telescope structure temperature	Y	Y	
TEL TRAK STATUS		Tracking status		Y	
TEL TRAK RATEA	arcsec/sec	Tracking rate in RA (arcsec/sec)		Y	
TEL TRAK RATED	arcsec/sec	Tracking rate in DEC (arcsec/sec)		Y	
TEL DOME STATUS		Dome status		Y	
TEL ABSROT START	deg	Abs rot angle at exp start (deg)	Y	Y	
TEL ABSROT END	deg	Abs rot angle at exp end (deg)	Y		Y
TEL POSANG	deg	Rotator position angle at start	Y	Y	
TEL GUID STATUS		Status of autoguider	Y	Y	
TEL GUID RA	deg	Guide star RA J2000	Y	Y	
TEL GUID DEC	deg	Guide star DEC J2000	Y	Y	
TEL AOSA RA	deg	aO star A: RA J2000	Y	Y	
TEL AOSA DEC	deg	aO star A: DEC J2000	Y	Y	
TEL AOSB RA	deg	aO star B: RA J2000	Y	Y	
TEL AOSB DEC	deg	aO star B: DEC J2000	Y	Y	

Keyword	Unit	Description	New	Start	End
TEL AO M1 DATE	date	Date/time of most recent update to M1	Y	Y	
TEL AO M2 DATE	date	Date/time of most recent update to M2	Y	Y	
TEL AO LOWFS DATE	date	Date/time of most recent successful LOWFS measurement	Y	Y	
TEL AO LOWFS ALT	deg	Telescope altitude of most recent successful LOWFS measurement	Y	Y	
TEL AO LOWFS NCOEFFS		No. of coefficients updated after most recent successful LOWFS measurement, e.g.1 (focus only), 3 (... + centring), 5 (... + tilt)	Y	Y	
TEL ENC FLATFIELD	integer	Illumination level on dome flat field (0=all off, 7=all on)	Y	Y	
TEL ENC MOONSCR	float	Moon screen position: 0.0 parked, 1.0 fully deployed	Y	Y	
TEL ENC WINDSCR	float	Wind screen position: 0.0 parked, 1.0 fully deployed	Y	Y	
TEL ENC VENT1	float	State of vent 1: 0.0 fully closed, 1.0 fully open	Y	Y	
TEL ENC VENT2	float	State of vent 2: 0.0 fully closed, 1.0 fully open	Y	Y	
TEL ENC VENT3	float	State of vent 3: 0.0 fully closed, 1.0 fully open	Y	Y	
TEL M2 ACENTRE	arcsecs	M2 centring (rotation about centre of curvature) alpha	Y	Y	
TEL M2 BCENTRE	arcsecs	M2 centring (rotation about centre of curvature) beta	Y	Y	
TEL M2 Z	mm	M2 focus (z)		Y	
TEL M2 ATILT	arcsecs	m2 tilt (rotation about coma neutral point) alpha	Y	Y	
TEL M2 BTILT	arcsecs	M2 tilt (rotation about coma neutral point) beta	Y	Y	

Keyword	Unit	Description	New	Start	End

7.3 On-line Database

Items in the TCS database are made available to the Camera by scanning them the instrument environment's database. These items are listed below (Table 6) – note that they are not defined in the data dictionaries. Most of these are as in the VLT, although a few new ones are defined specifically for VISTA. These items are generally accessed via the tplTCS library [RD03], part of the INS software.

Values are defined in various places, e.g.

- within the INS:
- within various modules: <module>Defines.h
- within the TCS:
  - tif/src/tifTcsScanSetup.tcl. This set up the scan links from the TCS database to the instrument's copy.
  - tif/config/tifTCStoISS.scan (also in $INTROOT/config/)
  - tif/dbl/tifTCS_PUBLIC.class (also in $INTROOT/dbl/ and copied to wvcam/dbl/DATABASE.db). This defines what is in the instrument's copy of the TCS database.
- within the INS
  - wvcam/dbl/tifTCS_PUBLIC.class (copied from the TCS)
  - tplTCS.tcl

If existing functions within tplTcs are reused, this lack of any clear definition is not a real problem. However if new functions are required for VISTA, the relevant database items will be defined here.

Items not anticipated as being used on VISTA (based on SMB's email of 2005-02-24) are marked, but will not be removed from the ICD until it's clear that this is best.

Table 6 Data items scanned into the instrument environment from the TCS environment

Instrument Data Item :Appl_data:TCS:	TCS Data Item :Appl_data:TCS:	Description (see also [AD01])	Not Used	New	Scan Method
tcsState.tcsState	msw.state				On change
tcsState.tcsSubstate	msw.substate				On change
tcsState.track	trk.trackingState				On change
tcsState.focus	msw:foc.currentFocus				On change
tcsState.domeStatus	tif:data.domeStatus		*		On change
times.lst	trk:data:times.lst				Polled
times.utc	trk:data:times.utc				Polled
coord.ha	trk:data:position:actPos.HA				Polled
coord.ra	trk:data:position:actPos.RA				Polled
coord.dec	trk:data:position:actPos.dec				Polled
coord.ra2000	trk:data:position:actPos.RA2000		*		Polled
coord.dec2000	trk:data:position:actPos.dec2000		*		Polled
coord.ra2000deg	trk:data:position:actPos.RA2000Deg		*		Polled
coord.dec2000deg	trk:data:position:actPos.dec2000Deg		*		Polled
coord.alt	trk:data:position:actPos.alt				Polled
coord.az	trk:data:position:actPos.az				Polled
coord.altRef	tif:data.altRef				Polled
coord.azRef	tif:data.azRef				Polled
coord.prltic	tif:data.parallactic				Polled
track.airmass	LCU:alt:trk:intCoord.airMass		*		Polled
track.dvelra	trk:data:setup.addVelAlpha		*		Polled

Instrument Data Item :Appl_data:TCS:	TCS Data Item :Appl_data:TCS:	Description (see also [AD01])	Not Used	New	Scan Method
track.dveldec	trk:data:setup.addVelDelta		*		Polled
track.rotAngle	trk:data:position:actPos.rotDeg				Polled
track.rotPosAngle	trk:data:position:actPos.rotOnSky	Rotator PA on sky		Y	Polled
track.remtime	trk:data:position:actPos.remTrack				Polled
track.remlimit	trk:data:setup.remTrkTimeLimit				Polled
track.trackingLost	tif:events.trackingLost				On change
track.remTimeLow	tif:events.remTimeLow				On change
guide.status	agws.substate				On change
guide.ra	agws:control:guideStar.alpha				On change
guide.dec	agws:control:guideStar.delta				On change
guide.probeX	tif:data.probeX		*		Polled
guide.probeY	tif:data.probeY		*		Polled
guide.probeRa	tif:data.probeRA		*		Polled
guide.probeDec	tif:data.probeDEC		*		Polled
guide.probeInPos	tif:data.probeInPos				Polled
guide.ccdOnSky	tif:data.ccdOnSky		*		Polled
guide.guidingLost	tif:events.guidingLost				On change
m2.focuValue	tif:data.focuValue				On change
info.telescop	tif:data.telescope		*		On change
info.version	version		*		On change
info.installed	installed		*		On change
info.oper	tif:data.operator		*		On change
info.foculenCA	tif:data.foculenCA				On change
info.focuscaleCA	tif:data.focuscaleCA				On change

Instrument Data Item :Appl_data:TCS:	TCS Data Item :Appl_data:TCS:	Description (see also [AD01])	Not Used	New	Scan Method
site.longi	trk:data:siteConstants.longitude		*		On change
site.lati	trk:data:siteConstants.latitude		*		On change
site.level	trk:data:siteConstants.height		*		On change
ao.m1Corrected	act:control:parameters.m1Corrected				On change
ao.m2Corrected	act:control:parameters.m2Corrected				On change
ao.commandState	act:control.command				On change
ao.targetSettings	act:control:parameters.targetsSettings				On change
ao.necessary	TBD	Set if a necessary aO cycle in progress that should not be aborted		*	On change
asm.seeing	tcsmon:control:environment.seeing		*		Polled
asm.windspeed	tcsmon:control:environment.windspeed		*		Polled
asm.winddir	tcsmon:control:environment.winddir		*		Polled
asm.pressure	tcsmon:control:environment.pressure		*		Polled
asm.humidity	tcsmon:control:environment.humidity				Polled
asm.temperature	tcsmon:control:environment.temperature				Polled
asm.lapseRate	tcsmon:control:environment.lapseRate		*		Polled
moon.RA	tcsmon:control:moonCalc:moon.RA		*		Polled
moon.dec	tcsmon:control:moonCalc:moon.dec		*		Polled
flatfieldLevel	TBD	Illumination level on dome flat screen.		Y	Polled
TBD	TBD	M1 temperature		Y	Polled
TBD	TBD	Telescope temperature		Y	Polled

Appendix A - Preset Set-up File

The specification of the VLT (and therefore VISTA) SETUP command includes a set-up file, which can contain any item of class "setup" in the TCS data dictionary (see Section 6.2). This file is not normally written explicitly – the INS software usually sets keywords/values as command line parameters with the SETUP command. However a typical file is described here for completeness.

It is assumed that a SETUP will be performed for each offset position, 6 of which fill in the tiling pattern. Unlike the VLT, each VISTA offset will require a new guide star (and two aO stars). In this sense a VISTA offset is implemented like a VLT preset and a VISTA jitter or microstep is implemented like a VLT offset.

```
#*********************************************************************
#   NAME
#
#   SYNOPSIS
#
#   DESCRIPTION
#    This is a sample default setup file for VISTA's preset.
#    Other keywords may be added. This is adapted from prsDefaultSetup.arg.
#
#   FILES
#
#   ENVIRONMENT
#
#   RETURN VALUES
#
#   CAUTIONS
#
#   EXAMPLES
#
```

```
#   SEE ALSO
#
#   BUGS
#
#------------------------------------------------------------------------
#
# Target type definition: one of the following values as in prsDefines.h
#        prsTARG_STR_NONE        “NO_TARGET”
#        prsTARG_STR_ALAZ        “ALT_AZ”
#        prsTARG_STR_COOR        “COORDINATE”
#        prsTARG_STR_NAME        “NAMED_POS”
TEL.TARG.TYPE     “NO_TARGET”; # Type of given target (prsDefines.h)

#   a – Coordinates given in setup file
TEL.TARG.ALPHA            0.0; # Alpha coordinate for the target
TEL.TARG.DELTA            1.0; # Delta coordinate for the target
TEL.TARG.EPOCH         2000.0; # Epoch
TEL.TARG.EPOCHSYSTEM      “J”; # Epoch system (default J=Julian)
TEL.TARG.EQUINOX       2000.0; # Equinox
TEL.TARG.PMA              0.0; # Proper motion Alpha
TEL.TARG.PMD              0.0; # Proper motion Delta
TEL.TARG.RADVEL           0.0; # Radial velocity
TEL.TARG.PARALLAX         0.0; # Parallax
TEL.TARG.COORDTYPE        “M”; # Coordinate type (M=mean A=apparent)

#   b – Absolute position
TEL.TARG.ALT              0.0; # Altitude angle for fixed position target
TEL.TARG.AZ               0.0; # Azimuth angle for fixed position target

#   c – Special named position
TEL.TARG.NAME              “”; # Name of special target position
```

```
#   e – General target parameters
TEL.TARG.WLENGTH         2200; # Wavelength (object)
TEL.TARG.OFFSETALPHA      0.0; # Alpha offset for the target
TEL.TARG.OFFSETDELTA      0.0; # Delta offset for the target
TEL.TARG.ADDVELALPHA      0.0; # Alpha additional tracking velocity
TEL.TARG.ADDVELDELTA      0.0; # Delta additional tracking velocity

# Instrument rotator
TEL.ROT.PRSCRIT            “”; # Azimuth and rotator preset criterion
TEL.ROT.OFFANGLE          0.0; # Rotator offset angle
TEL.ROT.ENABLED           “T”; # Rotator preset enabled
TEL.ROT.ALTAZTRACK        “F”; # Track rotator on alt/az instead of Alpha/Delta

# Autoguiding General
TEL.AG.TYPE           “GUIDE”; # Autoguiding (NONE, GUIDE)
TEL.AG.START              “F”; #

TEL.AG.GUIDESTAR  “CATALOGUE”; # Where to find guide stars (NONE, SETUPFILE, CATALOGUE)
TEL.AG.MINMAG              12; # Minimum magnitude for suitable guide star
TEL.AG.MAXMAG              16; # Maximum magnitude for suitable guide star

# Guide star coordinates
TEL.GS1.ALPHA             0.0; # RA
TEL.GS1.DELTA             0.0; # Dec
TEL.GS1.MAG               0.0; # Magnitude

TEL.GS2.ALPHA             0.0; #
TEL.GS2.DELTA             0.0; #
TEL.GS2.MAG               0.0; #

TEL.GS3.ALPHA             0.0; #
TEL.GS3.DELTA             0.0; #
```

```
TEL.GS3.MAG                0.0; #

TEL.GS4.ALPHA              0.0; #
TEL.GS4.DELTA              0.0; #
TEL.GS4.MAG                0.0; #

TEL.GS5.ALPHA              0.0; #
TEL.GS5.DELTA              0.0; #
TEL.GS5.MAG                0.0; #

#Active optics stars – General
TEL.AOS.AOSTAR   “CATALOGUE”;     # Where to find aO stars (NONE, SETUPFILE, CATALOGUE)
TEL.AOS.MINMAG      12;           # Minimum magnitude for suitable aO star
TEL.AOS.MAXMAG      16;           # Maximum magnitude for suitable aO star

# Active optics star coordinates for Wavefront Sensor A
TEL.AOSA1.ALPHA      0.0;
TEL.AOSA1.DELTA      0.0;
TEL.AOSA1.MAG        0.0;

TEL.AOSA2.ALPHA      0.0;
TEL.AOSA2.DELTA      0.0;
TEL.AOSA2.MAG        0.0;

TEL.AOSA3.ALPHA      0.0;
TEL.AOSA3.DELTA      0.0;
TEL.AOSA3.MAG        0.0;

TEL.AOSA4.ALPHA      0.0;
TEL.AOSA4.DELTA      0.0;
TEL.AOSA4.MAG        0.0;
```

```
TEL.AOSA5.ALPHA      0.0;
TEL.AOSA5.DELTA      0.0;
TEL.AOSA5.MAG        0.0;

# Active optics star coordinates for Wavefront Sensor B
TEL.AOSB1.ALPHA      0.0;
TEL.AOSB1.DELTA      0.0;
TEL.AOSB1.MAG        0.0;

TEL.AOSB2.ALPHA      0.0;
TEL.AOSB2.DELTA      0.0;
TEL.AOSB2.MAG        0.0;

TEL.AOSB3.ALPHA      0.0;
TEL.AOSB3.DELTA      0.0;
TEL.AOSB3.MAG        0.0;

TEL.AOSB4.ALPHA      0.0;
TEL.AOSB4.DELTA      0.0;
TEL.AOSB4.MAG        0.0;

TEL.AOSB5.ALPHA      0.0;
TEL.AOSB5.DELTA      0.0;
TEL.AOSB5.MAG        0.0;

# Various options
TEL.AG.OBJCNT        “F”; # Move probe to centre star on it before starting autoguiding
TEL.AO.START         “F”; # Start active optics.
TEL.AO.WAIT          “F”; # If active optics started, T: wait for one cycle to complete, A: auto
```

Appendix B – Deleted from Document

TEL AO FTIME	s	Time (UTC) of most recent successful aO cycle for focus	Y		Y
TEL AO FALT	deg	Altitude of most recent successful aO cycle for focus	Y		Y
TEL AO CTIME	s	Time (UTC) of most recent successful aO cycle for centring	Y		Y
TEL AO CALT	deg	Altitude of most recent successful aO cycle for centring	Y		Y
TEL AO TTIME	s	Time (UTC) of most recent successful aO cycle for tilt	Y		Y
TEL AO TALT	deg	Altitude of most recent successful aO cycle for tilt	Y		Y

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