

SOFIA Keywords Dictionary

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FITS Keywords Table

All FITS files submitted to the DCS for archiving must adhere to the FITS standard (v3.0, 2008 July 10)

WCS Keywords (see Array Detector Keywords section) should adhere to standard conventions (see http://fits.gsfc.nasa.gov/fits_wcs.html and <http://tdc-www.harvard.edu/wcstools/wcstools.fits.html> for discussion and references).

FITS Name: Keyword name - generally not the same as the abstract title.

Comment: Short description of keyword - suitable for FITS comment fields. Long descriptions can be found in the detailed descriptions. Comment text should include units as well.

HDU: header data unit - where the keyword can be used in the FITS file.

Representation : How the value of the keyword should be represented. In simple cases this may just be "string" or "float", but more complicated formats can be specified here (e.g. date and time)

Type: Specific FITS type - integer, float, string, or logical (boolean).

Units: Required units for keyword, if applicable.

Range: Possible keyword values, including enumerated types.

Example: Value example.

Requirement : Condition for which the keyword is required -- if blank, then the keyword is always required. Keywords marked with an asterisk (*) are required for archive ingestion: If any of these is missing, the host file must be corrected and then re-ingested.

Source: Provider and location, if blank then data provided by SI. Known pre-defined aliases for some of the MCCS HK data items are included. We recommend the SI developers assign custom aliases to the others as well for ease of reference.

Missing Data Sources: If the HK datanode is not available, or returns NotFound (or any other error), then the following values should be used to populate the corresponding FITS keyword based on the FITS keyword datatype (float, int, str, bool): FLOAT = -9999.0; INT = -9999; STRING = UNKNOWN; BOOL = defined on keyword by keyword basis. For missing RA and Dec values, use the string representation with "UNKNOWN".

Observation Keywords

Parameter	FITS Keyword	Comment	HDU	Representation	Type	Units	Range	Example	Requirement	Source
Datasource	DATASRC	Data Source	primary	[string]	[str]		enum [ASTRO, CALIBRATION, LAB, TEST, OTHER, FIRSTPOINT]	[ASTRO]	*	:
ObservationType	OBSTYPE	Observation type	any	[string]	[str]		enum [OBJECT, STANDARD_FLUX, STANDARD_TELLURIC, LAMP, FLAT, DARK, BIAS, SKY, BB, GASCELL, LASER, FOCUS_LOOP]	['OBJECT']		:
SourceType	SRCTYPE	Source type	any	[string]	[str]		enum [POINT_SOURCE, EXTENDED_SOURCE, OTHER, UNKNOWN]	['POINT_SOURCE']		:
KeywordDictionaryVersion	KWDICT	SOFIA Keyword dictionary version, DCS ICD rev.	primary	[string]	[str]		[]	['DCS_SI_01_A']		:
ObservationID	OBS_ID	SOFIA Observation Identification	any	[MMMMMM_[C]nnn]	[str]		[]	['2011-06-08_FO_F064B0187']	*	:
ImageID	IMAGEID	Image identification index	extension	[integer]	[int]		[]	[1]	Multiple images in a single file for an observation, e.g. dithering, mapping, etc...	:
ObjectName	OBJECT	Object Name	any	[string]	[str]		[]	['Orion Nebula (M42)']		:

AOTUniqueID	AOT_ID	Astronomical Observation Template Identifier	any	[string]	[str]				['AOT_FORCAST_GRISM']	If AOT in use.	:
AORUniqueID	AOR_ID	Astronomical Observation Request Identifier.	any	[string]	[str]				['02_0103_01']	If observation associated with DCS AOR	DCS : Observing Plan

Data Processing Related Keywords

Parameter	FITS Keyword	Comment	HDU	Representation	Type	Units	Range	Example	Requirement	Source
ProcessingStatus	PROCSTAT	Processing status	primary	[string]	[str]		enum [LEVEL_0, LEVEL_1, LEVEL_2, LEVEL_3, LEVEL_4]	['LEVEL_1']		SI I Pipeline :
HeaderStatus	HEADSTAT	Header status	primary	[string]	[str]		enum [ORIGINAL, UNKNOWN, CORRECTED, ERROR]	['ORIGINAL']		SI I DCS :
PipelineName	PIPELINE	Pipeline/Processing Software	primary	[string]	[str]			['FDRP v1.0.0']	LEVEL 2/3/4 Product.	Pipeline :
PipelineVersion	PIPEVERS	Pipeline Version, full tag.	primary	[string]	[str]			['FDRP_1_0_0_UT2013_4_1']	LEVEL 2/3/4 Product.	Pipeline :
ProductType	PRODTYPE	Product type.	primary	[string]	[str]			['DRIP-COADED']	LEVEL 2/3/4 Product.	Pipeline :
DCSFileRevision	FILEREV	File revision identifier.	primary	[string]	[str]			['r2']	If file changed in post-processing.	DCS only :

Mission Management Keywords

Parameter	FITS Keyword	Comment	HDU	Representation	Type	Units	Range	Example	Requirement	Source
ObservingPlanUniqueID	PLANID	Observing plan identification	primary	[string]	[str]			['81_0131']	If observation associated with an observing plan.	DCS : Observing Plan
AircraftDeployment	DEPLOY	Site deployment	primary	[string]	[str]			['DAO']		SSC : Mission Plan
MissionID	MISSION-ID	Mission ID	primary	[string]	[str]			[2011-06-08_FO_F06]	*	MCCS : session.user_environment.mission_id
FlightLeg	FLIGHTLG	Flight leg	primary	[integer]	[int]			[4]		MCCS : fltexec.leg_data.leg_seq

Origination Keywords

Parameter	FITS Keyword	Comment	HDU	Representation	Type	Units	Range	Example	Requirement	Source
Origin	ORIGIN	Origin of FITS file.	primary	[string]	[str]			['FORCAST -- Cornell Univ.']		:
Observers	OBSERVER	Observer(s)	primary	[string]	[str]			['Jane Astro']		:
FileCreator	CREATOR	File creation task (with version info).	primary	[string]	[str]			['Mauna Kea IR']		:
TelescopeOperator	OPERATOR	Telescope operator	primary	[string]	[str]			['Joe Astro']		SSC : Mission Plan
Filename	FILENAME	Name of host file	primary	[string]	[str]			['040101_077_05FL001.fits']		:

Date and Time Keywords

Parameter	FITS Keyword	Comment	HDU	Representation	Type	Units	Range	Example	Requirement	Source
CreationDate	DATE	Date of file creation	any	[yyyy-mm-ddThh:mm:ss[.sss]]	[str]		[]	['2004-01-01T13:45:45.2']		:
ObservationDate	DATE-OBS	UTC Date of exposure start	any	[yyyy-mm-ddThh:mm:ss[.sss]]	[str]		[]	['2004-01-01T12:11:10.5']	*	:
ObservationStartUTC	UTCSTART	UTC of exposure start	any	[hh:mm:ss.s]	[str]		[]	['09:30:01.00']		:
ObservationEndUTC	UTCEND	UTC of exposure end	any	[hh:mm:ss.s]	[str]		[]	['09:30:01.00']		:

Environmental Keywords

Parameter	FITS Keyword	Comment	HDU	Representation	Type	Units	Range	Example	Requirement	Source
WaterVaporZenith_Start	WVZ_STA	Water vapor, integrated to zenith, observation start.	any	[general]	[flt]	microns	gt [0.0]	[1.503]		MCCS : wvm_if.wvmdata.water_vapor
WaterVaporZenith_End	WVZ_END	Water vapor, integrated to zenith, observation end.	any	[general]	[flt]	microns	gt [0.0]	[1.634]		MCCS : wvm_if.wvmdata.water_vapor
static_air_temp	TEMP_OUT	Static air temperature outside aircraft. (For Early Science: Value=NotSet)	any	[general]	[flt]	C	[]	[-10.5]		MCCS : das.ic1080_2hz.static_air_temp \$static_air_temp
PrimaryMirrorTemperature_1	TEMPPRI1	Temperature of primary mirror	any	[general]	[flt]	C	gt [-273.0]	[-10.5]		MCCS : ta_mcp.mcp_hk_pms.pms_temp_1
PrimaryMirrorTemperature_2	TEMPPRI2	Temperature of primary mirror	any	[general]	[flt]	C	gt [-273.0]	[-10.5]		MCCS : ta_mcp.mcp_hk_pms.pms_temp_2
PrimaryMirrorTemperature_3	TEMPPRI3	Temperature of primary mirror	any	[general]	[flt]	C	gt [-273.0]	[-10.5]		MCCS : ta_mcp.mcp_hk_pms.pms_temp_3
SecondaryMirrorTemperature_1	TEMPSEC1	Temperature of secondary	any	[general]	[flt]	C	[]	[-15.2]		MCCS : ta_mcp.mcp_hk_pms.sma_temp_1

Aircraft Keywords

Parameter	FITS Keyword	Comment	HDU	Representation	Type	Units	Range	Example	Requirement	Source
Altitude_Start	ALTI_STA	Aircraft pressure altitude, start of observation.	any	[general]	[flt]	Feet	[]	[35229]		MCCS : das.ic1080_15hz.press_alt
Altitude_End	ALTI_END	Aircraft pressure altitude, end of observation.	any	[general]	[flt]	Feet	[]	[35128]		MCCS : das.ic1080_15hz.press_alt
Airspeed	AIRSPEED	True aircraft airspeed.	any	[general]	[flt]	Knots	[]	[375.0]		MCCS : das.ic1080_10hz.true_airspeed \$true_airspeed
GroundSpeed	GRDSPEED	Aircraft ground speed.	any	[general]	[flt]	Knots	[]	[350.0]		MCCS : das.ic1080_2hz.ground_speed \$ground_speed
Latitude_Start	LAT_STA	Aircraft latitude, start of observation.	any	[general]	[flt]	Degrees	[]	[35.2567]		MCCS : das.ic1080_2hz.lat_fms_1 \$latitude
Longitude_Start	LON_STA	Aircraft longitude, start of observation.	any	[general]	[flt]	Degrees	[]	[35.2567]		MCCS : das.ic1080_2hz.lon_fms_1 \$longitude
Latitude_End	LAT_END	Aircraft latitude, end of observation.	any	[general]	[flt]	Degrees	[]	[35.2567]		MCCS : das.ic1080_2hz.lat_fms_1 \$latitude
Longitude_End	LON_END	Aircraft longitude, end of observation.	any	[general]	[flt]	Degrees	[]	[35.2567]		MCCS : das.ic1080_2hz.lon_fms_1 \$longitude
Heading	HEADING	Aircraft true heading.	any	[general]	[flt]	Degrees	[]	[10.7892]		MCCS : das.ic1080_2hz.true_heading \$heading
TrackAngle	TRACKANG	Aircraft track angle.	any	[general]	[flt]	Degrees	[]	[10.7892]		MCCS : das.ic1080_2hz.true_track_angle \$track_angle

Telescope Keywords

Parameter	FITS Keyword	Comment	HDU	Representation	Type	Units	Range	Example	Requirement	Source
Telescope	TELESCOP	Telescope name	primary	[string]	[str]		[]	['SOFIA 2.5m']		:
TelescopeConfig	TELCONF	Telescope configuration	primary	[string]	[str]		[]	[]		SSC : Mission Plan
TelescopeRA	TELRA	SI Bore sight RA (J2000) - as returned by MCCA	any	[general] [hh:mm:ss.s]	[flt] [str]	Hours	interval [0,24]	[9.023456] [5:35:17.3]		MCCA : coord.pos.sibs.ra
TelescopeDec	TELDEC	SI Bore sight Dec (J2000) - as returned by MCCA	any	[general] [dd:mm:ss]	[flt] [str]	decimal degrees	interval [-90,90]	[47.345789] [-5:23:28]		MCCA : coord.pos.sibs.dec
TelescopeVPA	TELVPA	SI Bore sight VPA (ICRS J2000) - as returned by MCCA	any	[general]	[flt]	decimal degrees	interval [0,360]	[255.05]		MCCA : coord.pos.sibs.vpa
TelescopeEquinox	TELEQUI	Equinox of ERF coords (RA/Dec/VPA).	any	[general]	[str]		[]	[J2000]		MCCA : coord.pos.sibs.equinox
LastRewindUTC	LASTREW	Time of last rewind (UTC).	any	[yyyy-mm-ddThh:mm:ss.sssZ]	[str]		[]	['2012-09-13T21:30:28.317Z']		MCCA : ta_pos.time_of_last_rewind
TelescopeFocus_Start	FOCUS_ST	Telescope focus - SMA FCM t position (microns), observation start.	any	[general]	[flt]	microns	interval [-5000,5000]	[1245]		MCCA : ta_scs.fcm_status.fcm_act_t
TelescopeFocus_End	FOCUS_EN	Telescope focus - SMA FCM t position (microns), observation end.	any	[general]	[flt]	microns	interval [-5000,5000]	[1322]		MCCA : ta_scs.fcm_status.fcm_act_t
TelescopeElevation	TELEL	Telescope elevation at observation start - as returned by MCCA	any	[general]	[flt]	decimal degrees	interval [0,90]	[47.345789]		MCCA : coord.pos.sibs.el
TelescopeCrossElevation	TELXEL	Telescope cross elevation at observation start - as returned by MCCA	any	[general]	[flt]	decimal degrees	interval [-90,90]	[0.543]		MCCA : coord.pos.sibs.xel
TelescopeLineOfSight	TELLOS	Telescope LOS at observation start - as returned by MCCA	any	[general]	[flt]	decimal degrees	interval [-180,180]	[0.543]		MCCA : coord.pos.sibs.los
TascuStatus	TSC-STAT	TASCU Status at observation	any	[string (TBC)]	[str]		[]	[STAB_INERTIAL_ONGOING]		MCCA : ta_state.tsc_status

		end.								
TascuFBCStatus	FBC-STAT	FBC Status at observation end.	any	[string]	[str]		enum [FBC_OFF (1), FBC_QS (2), FBC_DY (3), FBC_ON (4)]	[FBC_ON]		MCCS : ta_tsc.tsc_mcs_hk.fbc_status
ObservationRequestRA	OBSRA	RA - requested	any	[general] [hh:mm:ss.s]	[flt] [str]	Hours	interval [0,24]	[9.0230] [5:35:17.3]		DCS : AOR
ObservationRequestDec	OBSDEC	Dec - requested	any	[general] [dd:mm:ss]	[flt] [str]	Degrees	interval [-90,90]	[47.3465] [-5:23:28]		DCS : AOR
ObservationRequestEquinox	EQUINOX	Coordinate equinox for OBSRA and OBSDEC	any	[general]	[flt]	yr	[]	[2000.0]		DCS : AOR
ZenithAngle_Start	ZA_START	Telescope zenith angle, start of observation.	any	[general]	[flt]	decimal degrees	interval [0,90]	[42.359]		MCCS : (90 - coord.pos.sibs.alt)
ZenithAngle_End	ZA_END	Telescope zenith angle, end of observation.	any	[general]	[flt]	decimal degrees	interval [0,90]	[39.285]		MCCS : (90 - coord.pos.sibs.alt)
TrackingMode	TRACMODE	SOFIA tracking mode	any	[string]	[str]		enum [OFF, CENTROID, ROF, LIMB, OFFSET,ROF+OFFSET, CENTROID+INERTIAL, ROF+INERTIAL, OFFSET+INERTIAL, ROF+OFFSET+INERTIAL]	['CENTROID']	Tracking	MCCS : ta_pos.track.state
TrackingError	TRACERR	Tracking error flag.	any	[boolean]	[log]		[]	[F]	Tracking	: ta_trc.trc_status_table.main_op_mode_id

Data Collection Keywords

Parameter	FITS Keyword	Comment	HDU	Representation	Type	Units	Range	Example	Requirement	Source
isChopping	CHOPPING	Chopping flag	primary	[boolean]	[log]		[]	[T]	If mode in use.	:
isNodding	NODDING	Nodding flag	primary	[boolean]	[log]		[]	[T]	If mode in use.	:
isDithering	DITHER	Dithering flag	primary	[boolean]	[log]		[]	[T]	If mode in use.	:
isMapping	MAPPING	Mapping flag.	primary	[boolean]	[log]		[]	[T]	If mode in use.	:
isScanning	SCANNING	Scanning flag.	primary	[boolean]	[log]		[]	[T]	If mode in use.	:

Annotation Keywords

Parameter	FITS Keyword	Comment	HDU	Representation	Type	Units	Range	Example	Requirement	Source
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Instrument Keywords

Parameter	FITS Keyword	Comment	HDU	Representation	Type	Units	Range	Example	Requirement	Source
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Instrument	INSTRUME	Instrument	primary	[string]	[str]		[]	['FLITECAM']	*	:
Datatype	DATATYPE	Data type	primary	[string]	[str]		enum [IMAGE, SPECTRAL, OTHER]	[IMAGE]		:
InstrumentConfiguration	INSTCFG	Instrument configuration	primary	[string]	[str]		[]	['IMAGING']		:
InstrumentMode	INSTMODE	Instrument observing mode	primary	[string]	[str]		[]	['C2N']		:
MCCSMode	MCCSMODE	MCCS SI Mode (MCCS_SI_04).	primary	[string]	[str]		[]	['flitecam_imaging']		MCCS : (instrument).si_config.current_mode
ExposureTime	EXPTIME	On-source exposure time	any	[general]	[flt]	s	[]	[600]		:
SpectralElement1	SPECTEL1	First spectral element in use.	any	[string]	[str]		[]	['FLT_J']	*	:
SpectralElement2	SPECTEL2	Second spectral element in use -- Set to "NONE" if no second element.	any	[string]	[str]		[]	['FOR_XG063']	*	:
InstrumentSlit	SLIT	Instrument slit in use.	any	[string]	[str]		[]	['FOR_SS24']	Spectroscopy configs: if slit in use.	:
WavelengthCentral	WAVECENT	Central wavelength of observation.	primary	[general]	[flt]	Microns	[]	[2.2]	Imaging modes only.	:
Resolution	RESOLUN	Spectral resolution of observation.	primary	[general]	[flt]		[]	[2500]	Spectroscopy modes only.	:

Array Detector Keywords

Parameter	FITS Keyword	Comment	HDU	Representation	Type	Units	Range	Example	Requirement	Source
Detector	DETECTOR	Detector name	primary	[string]	[str]		[]	['SBRC InSb']	Array instruments only.	:
DetectorSize	DETSIZE	Detector size	primary	[vector]	[str]		[]	['(1024,1024)']	Array instruments only.	:
PixelScale	PIXSCAL	Pixel scale	primary	[general]	[flt]	arcsec	[]	[0.32]	Array instruments only.	:
Subarrays	SUBARRNO	Number of subarrays used	primary	[integer]	[int]		[]	[2]	If subarrays in use.	:
SubarraySize	SUBARR%2d	Sub array size	primary	[section]	[str]		[]	['[0:255,0:255]']	If subarrays in use.	:
SiencelInstrumentBoresigtX	SIBS_X	SI Boresight (x) - as returned by MCCS	any	[integer]	[int]		[]	[255]	Array instruments only.	MCCS : coord.pos.sibs.xsi
SiencelInstrumentBoresigtY	SIBS_Y	SI Boresight (y) - as returned by MCCS	any	[integer]	[int]		[]	[255]	Array instruments only.	MCCS : coord.pos.sibs.ysi
WCS_CTYPE	CTYPEn	Axis type (8 characters)	any	[string]	[str]		[]	[RA--TAN]	Imaging only.	:
WCS_CRPIX	CRPIXn	Array location of the reference point in pixels for the n-th axis.	any	[int]	[int]		[]	[511]	Imaging only.	:
WCS_CRVAL	CRVALn	Coordinate value at reference point for the n-th axis.	any	[flt]	[flt]		[]	[82.345690]	Imaging only.	:
WCS_CDELT	CDELTn	Plate scale for the n-th axis at reference point (deg/pixel).	any	[flt]	[flt]		[]	[1.3852E-4]	Imaging only.	:
WCS_CROTA2	CROTA2	Rotation of axes in degrees.	any	[flt]	[flt]		[]	[113.45]	Imaging only.	:
WCS_RotMatrix	CDi_j	WCS Rotation Matrix elements.	any	[flt]	[flt]		[]	[1.3852E-4]	Imaging only.	:

Heterodyne Keywords

Parameter	FITS Keyword	Comment	HDU	Representation	Type	Units	Range	Example	Requirement	Source
FrontendDevice	FRONTEND	Name of frontend device.	primary	[string]	[str]		[]	['GREAT LOW 1']	Heterodyne instruments only.	:
BackendDevice	BACKEND	Name of backend device.	primary	[string]	[str]		[]	['AOS']	Heterodyne instruments only.	:
BackendBandwidth	BANDWID	Total bandwidth of heterodyne backend	primary	[general]	[flt]	MHz	[]	[300.547]	Heterodyne instruments only.	:

SystemTemperature	TSYS	System temperature.	primary	[general]	[flt]	K	[]	[10.5]	Heterodyne instruments only.	:
FrequencyResolution	FREQRES	Nominal frequency resolution -- may differ from channel spacing.	primary	[general]	[flt]	MHz	[]	[100.0]	Heterodyne instruments only.	:
ReferenceFrequency	OBSFREQ	Reference frequency.	primary	[general]	[flt]	MHz	[]	[]	Heterodyne instruments only.	:
SidebandFrequency	IMAGFREQ	Image sideband frequency.	primary	[general]	[flt]	MHz	[]	[]	Heterodyne instruments only.	:
RestFrequency	RESTFREQ	Rest frequency.	primary	[general]	[flt]	MHz	[]	[]	Heterodyne instruments only.	:
VelocityDefinition	VELDEF	Velocity Definition	primary	[string]	[str]		[]	[RADI-LSR]	Heterodyne instruments only.	:
VelocityFrame	VFRAME	Radial velocity of reference frame.	primary	[general]	[flt]	km/s	[]	[250.3]	Heterodyne instruments only.	:
RadialVelocity	RVSYS	Radial velocity.	primary	[general]	[flt]	km/s	[]	[22.3]	Heterodyne instruments only.	:

Data Structure Keywords

Parameter	FITS Keyword	Comment	HDU	Representation	Type	Units	Range	Example	Requirement	Source
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Chopping Keywords

Parameter	FITS Keyword	Comment	HDU	Representation	Type	Units	Range	Example	Requirement	Source
ChopFrequency	CHPFREQ	Chop frequency	any	[general]	[flt]	MHz	interval [0.0, 20.0]	[15.0]	Chopping	MCCS : sma.chop.frequency
ChopProfile	CHPPROF	Chopping profile: 2 or 3 point	any	[string]	[str]		enum [2-POINT, 3-POINT]	['2-POINT']	Chopping	MCCS : sma.chop.profile
ChopSymmetry	CHPSYM	Chopping symmetry: symmetric or asymmetric	any	[string]	[str]		[]	['on-axis']	Chopping	MCCS : sma.chop_symmetry
ChopAmplitude_1	CHPAMP1	Chop amplitude 1	any	[general]	[flt]	arcsec	interval [-1125.0, 1125.0]	[300.0]	Chopping	MCCS : sma.sky_amplitude
ChopAmplitude_2	CHPAMP2	Chop amplitude 2	any	[general]	[flt]	arcsec	interval [-1125.0, 1125.0]	[300.0]	Chopping	MCCS : sma.sky_amp2
ChopCoordSys	CHPCRSYS	MCCS Coordinate system for sky tip, tilt, and angle.	any	[string]	[str]		enum [TARF, ERF]	[ERF]	Chopping	MCCS : sma.sky_coord_sys
ChopAngle	CHPANGLE	Calculated angle in the sky_coord_sys reference frame.	any	[general]	[flt]	decimal degrees	interval [-180,180]	[45.0]	Chopping	MCCS : sma.sky_angle
ChopTip	CHPTIP	Calculated tip in the sky_coord_sys reference frame.	any	[general]	[flt]	arcsec	interval [-301,301]	[15]	Chopping	MCCS : sma.sky_tip
ChopTilt	CHPTILT	Calculated tilt in the sky_coord_sys reference frame.	any	[general]	[flt]	arcsec	interval [-301,301]	[10]	Chopping	MCCS : sma.sky_tilt
ChopPhase	CHPPHASE	Chop phase	any	[int]	[int]	millisec	interval [0,1000]	[200]	Chopping	MCCS : sma.chop.phase

Nodding Keywords

Parameter	FITS Keyword	Comment	HDU	Representation	Type	Units	Range	Example	Requirement	Source
NodDwellTime	NODTIME	Nod time	any	[general]	[flt]	s	[]	[300.0]	Nodding	:
NodCycles	NODN	Nod cycles.	any	[integer]	[int]		[]	[30]	Nodding	:
NodSettleTime	NODSETL	Nod settle time	any	[general]	[flt]	s	[]	[0.0556]	Nodding	:
NodAmplitude	NODAMP	Nod amplitude on sky.	any	[general]	[flt]	arcsec	[]	[30.0]	Nodding	MCCS : (e.g. nod.amplitude)
NodBeam	NODBEAM	Current nod beam position	any	[string]	[str]		[]	['A']	Nodding	MCCS : (e.g. nod.current)
NodPattern	NODPATT	Nodding pattern, one cycle.	any	[string]	[str]		enum [ABBA, AB, CUSTOM]	['ABBA']	Nodding	:
NodStyle	NODSTYLE	Chop/nod Style.	any	[string]	[str]		enum [NMC, NPC, C2NC2, CUSTOM]	['NPC']	Nodding/Chopping	:
NodCoordSys	NODCRSYS	Coordinate system for Nod angle	any	[string]	[str]		enum [ERF, ECRF, GALRF, TARF, FPIRF, FFIRF,	['ERF']	Nodding	MCCS : (e.g.

							WFIRF, SIRF, USER]			nod.coord_sys)
NodAngle	NODANGLE	Nod angle	any	[general]	[flt]	decimal degrees	interval [-180,180]	[45.0]	Nodding	MCCS : (e.g. nod.pos_angle)

Dithering Keywords

Parameter	FITS Keyword	Comment	HDU	Representation	Type	Units	Range	Example	Requirement	Source
DitherPattern	DTHPATT	Dither pattern	any	[string]	[str]		enum [3-POINT, 5-POINT, 9-POINT, CUSTOM]	['9-POINT']	Dithering	:
DitherPositions	DTHNPOS	Number of dither positions.	any	[integer]	[int]		[]	[9]	Dithering	:
DitherPositionIndex	DTHINDEX	Dither position index.	any	[integer]	[int]		[]	[5]	Dithering	:
DitherOffset	DTHOFFS	Dither offset (arcseconds).	any	[float]	[flt]	arcsec	[]	[2.5]	Dithering	:

Mapping Keywords

Parameter	FITS Keyword	Comment	HDU	Representation	Type	Units	Range	Example	Requirement	Source
MapCoordSys	MAPCRSYS	Coordinate system for mapping/scanning.	any	[string]	[str]		enum [EQUATORIAL, GALACTIC, ECLIPTIC, USER]	['GALACTIC']	Mapping	:
MapPositionsX	MAPNXPOS	Number of map positions in X	any	[integer]	[int]		[]	[4]	Mapping	:
MapPositionsY	MAPNYPOS	Number of map positions in Y	any	[integer]	[int]		[]	[4]	Mapping	:
MapIntervalX	MAPINTX	Mapping step interval in X	primary	[general]	[flt]	arcmin	[]	[8.5]	Mapping	:
MapIntervalY	MAPINTY	Mapping step interval in Y	any	[general]	[flt]	arcmin	[]	[8.5]	Mapping	:

Scanning Keywords (Constant Velocity)

Parameter	FITS Keyword	Comment	HDU	Representation	Type	Units	Range	Example	Requirement	Source
ScanStartRA	SCNRA0	Start of scan - RA.	any	[general] [hh:mm:ss.s]	[flt] [str]	Hours	interval [0,24]	[9.0230] [5:35:17.3]	Scanning	:
ScanStartDec	SCNDEC0	Start of scan - Dec.	any	[general] [dd:mm:ss]	[flt] [str]	Degrees	interval [-90,90]	[47.3465] [-5:23:28]	Scanning	:
ScanEndRA	SCNRAF	End of scan - RA.	any	[general] [hh:mm:ss.s]	[flt] [str]	Hours	interval [0,24]	[9.0305] [5:40:32.5]	Scanning	:
ScanEndDec	SCNDECf	End of scan - Dec.	any	[general] [dd:mm:ss]	[flt] [str]	Degrees	interval [-90,90]	[47.3465] [-5:23:28]	Scanning	:
ScanRate	SCNRATE	Scan rate	any	[general]	[flt]	arcsec/s	[]	[10.0]	Scanning	:
ScanDirection	SCNDIR	Scan direction	any	[general]	[flt]	degrees	[]	[-35.5]	Scanning	:

Keyword Descriptions

Observation Keywords

Datasource

FITS Name:DATASRC

FITS Type:str

Description: Overall source/type of data: ASTRO = Astronomical observation; CALIBRATION = calibration data; LAB = Laboratory data; TEST = Test data; FIRSTPOINT = SOFIA first pointing observation; OTHER = Any other source not listed here. If datasource is set to "CALIBRATION", the host file will be made public immediately upon ingestion.

Requirement:*

ObservationType

FITS Name:OBSTYPE

FITS Type:str

Description: The type of observation such as an astronomical exposure or a particular type of calibration exposure: OBJECT = astronomical object; STANDARD = Astronomical flux standard for calibration; LAMP = Calibration lamp; FLAT = Flat-field exposure for calibration; DARK = Dark current exposure for calibration.

Requirement:

SourceType

FITS Name:SRCTYPE

FITS Type:str

Description:Source type. Maps to AOR SourceType. Needed for reduction of slit spectra, but useful for other data types as well.

Requirement:

KeywordDictionaryVersion

FITS Name:KWDICT

FITS Type:str

Description: SOFIA keyword dictionary version. Since the keyword dictionary is now a part of the DCS ICD (DCS_SI_01, this keyword should reference which version of the ICD is being used. The document rev (A, B, C, etc...) should be appended to the string 'DCS_SI_01' with an underscore (see example).

Requirement:

ObservationID

FITS Name:OBS_ID

FITS Type:str

Description:The unique identifier for any given data file, meant to provide ready timing and sequencing information at a glance to the user. It is created at the same time that the data file is first written, in a format common to all instruments (and thus mandated by the observatory). The OBS_ID is assigned to saved datasets only. Some test data may be taken during a flight for immediate diagnostic purposes, but not saved (e.g., a snapshot to verify pointing), in which case there would be no point in assigning an OBS_ID, but we note that the default should almost always be to save the data and thus assign this keyword. The OBS_ID number is distinct from the AOR_ID. The AOR_ID is the unique identifier for an AOR which can, in principle, generate multiple files to be saved. Each of these files would have a unique OBS_ID. The mapping from AOR_ID to OBS_ID is one-to-many, i.e., one AOR can produce multiple data files. Note that the converse is not true -- one data file cannot be the product of multiple AORs. We suggest the following as a format for the OBS_ID keyword:

MMMMMM_[C]nnn. Where: MMM = Mission ID (see MissionID) -- Data not taken as part of a SOFIA mission should set MMM to current date or some other suitable value; C = Channel identifier (optional) -- preferably a letter (B for Blue, S for short, etc...); nnn = Observation sequence number -- The sequence should be reset at mission start and advanced all the way through mission close-out (as defined by the MCCS), which should allow for capture of pre- and post-flight data -- This field will have a minimum of three digits (typical expected length), but more digits will be allowed as necessary.

Requirement:*

ImageID

FITS Name:IMAGEID

FITS Type:int

Description:The image identification when there are multiple images for an observation within the SAME file (e.g. images stored as FITS extensions).

Requirement:Multiple images in a single file for an observation, e.g. dithering, mapping, etc...

ObjectName

FITS Name:OBJECT

FITS Type:str

Description: The object name as given by the observer, or as specified by the flight plan.

Requirement:

AOTUniqueID

FITS Name:AOT_ID

FITS Type:str

Description: Unique Astronomical Observation Template (AOT) identifier as defined in DCS-SI ICD.

Requirement:If AOT in use.

AORUniqueID

FITS Name:AOR_ID

FITS Type:str

Description: Unique Astronomical Observation Request (AOR) identifier. The AOR_ID is assigned during the creation of the final version of an AOR to be used in flight planning. The value of this keyword should be equivalent to the AOR/ID tag in the AOR document. During Early Science, the AOR ID will be equivalent to the proposed observation ID and will be documented in the observing plan.

Requirement:If observation associated with DCS AOR

Data Processing Related Keywords

ProcessingStatus

FITS Name:PROCSTAT

FITS Type:str

Description: Status of any processing applied to the data, as defined in the SOFIA Project Data Management Plan: LEVEL_0 = Raw engineering data for diagnostic purposes, generally not intended for archiving; LEVEL_1 = Raw, uncalibrated science data in FITS or SDFITS format with complete header adhering to the SOFIA Keyword Dictionary; LEVEL_2 = Processed science data corrected for instrument artifacts; LEVEL_3 = Flux-calibrated science data (e.g. BUNIT keyword takes image to MJy/sr); LEVEL_4 = Higher order products.

Requirement:

HeaderStatus

FITS Name:HEADSTAT

FITS Type:str

Description: Status of FITS header data (updated during post-processing). ORIGINAL: Header values are from original raw data file and have not been modified. UNKNOWN: header values have not been reviewed/verified. CORRECTED: header values have been corrected as part of post-processing, see HISTORY records for details. ERROR: There is a problem with the header values that has not been fixed, see COMMENT records for details. SI would set HEADSTAT = 'ORIGINAL' for raw data acquired on the AC.

Requirement:

PipelineName

FITS Name:PIPELINE

FITS Type:str

Description:Name of pipeline/processing software used to generate file (e.g. "FDRP v1.0.0"). LEVEL 2/3/4 data only.

Requirement:LEVEL 2/3/4 Product.

PipelineVersion

FITS Name:PIPEVERS

FITS Type:str

Description:Full release tag for pipeline that produced the file (e.g. "FDRP_1_0_0_UT2013_4_1"). LEVEL 2/3/4 data only.

Requirement:LEVEL 2/3/4 Product.

ProductType

FITS Name:PRODTYPE

FITS Type:str

Description:Type of product produced by the processing software or pipeline, as defined in SI-DCS ICD. Should be simple identifier that the GI can use to look up in the processing handbook or ICD. ID should include an identifier for the software that was used to produce the file (e.g. "DRIP_XXX"). For example, the FORCAST product types are: DRIP-UNDISTORTED, DRIP-MERGED, DRIP-COADDED, DRIP-REDALL. Generally, the SI will not need to set this keyword for raw data.

Requirement:LEVEL 2/3/4 Product.

DCSFileRevision

FITS Name:FILEREV

FITS Type:str

Description: File revision identifier, to be inserted by archive ingestion tasks if file was modified as part of post-processing. Change details to be documented using HISTORY records at the end of the header. String value, typically a lower case 'r' (ASCII 114) immediately followed by a integer greater than zero in decimal format with no padding or leading zeros. E.g., "r1" not "r01". The SI will not need to set this keyword for raw data; included here for completeness.

Requirement:If file changed in post-processing.

Mission Management Keywords

ObservingPlanUniqueID

FITS Name:PLANID

FITS Type:str

Description: The observing plan which contains all the AORs. The value of this keyword should be equivalent to <AOR/Reference/ObservingPlan> in the AOR document.

Requirement:If observation associated with an observing plan.

AircraftDeployment

FITS Name:DEPLOY

FITS Type:str

Description: Aircraft base of operations for current instrument run.

Requirement:

MissionID**FITS Name:**MISSION-ID**FITS Type:**str**Description:** Unique mission identifier, as specified in the Mission Plan and returned by the MCCA. Current spec for mission ID includes a date stamp, instrument ID, and mission type indicators.**Requirement:*****FlightLeg****FITS Name:**FLIGHTLG**FITS Type:**int**Description:** Flight leg identifier for given mission ID.**Requirement:**

Origination Keywords

Origin**FITS Name:**ORIGIN**FITS Type:**str**Description:** Organization or institution responsible for creation of FITS file.**Requirement:****Observers****FITS Name:**OBSERVER**FITS Type:**str**Description:** Observer name(s).**Requirement:****FileCreator****FITS Name:**CREATOR**FITS Type:**str**Description:** Software task which wrote the FITS file (including version information).**Requirement:****TelescopeOperator****FITS Name:**OPERATOR**FITS Type:**str**Description:** The telescope operator for the mission. Can be obtained from list of active MCCA sessions (get list=active_session) if needed.**Requirement:****Filename****FITS Name:**FILENAME**FITS Type:**str**Description:**Name of host file. The FILENAME keyword allows for different stages in the treatment of a dataset: raw, calibrated, custom reduced, pipelined, or reduced at an intermediate stage. Files resulting from actions taken upon a given raw dataset will all have the same OBS_ID, but could have different values of the FILENAME keyword. For the FILENAME format, we recommend using OBSID as a prefix, and attach qualifiers denoting the stage of treatment and format.**Requirement:**

Date and Time Keywords

CreationDate**FITS Name:**DATE**FITS Type:**str**Description:** UTC date of file creation in date/time format (yyyy-mm-ddThh:mm:ss.ssss); see FITS standard for additional detail.**Requirement:****ObservationDate****FITS Name:**DATE-OBS**FITS Type:**str**Description:** UTC date of observation at the start of the exposure in date/time format (yyyy-mm-ddThh:mm:ss.ssss); see FITS standard for additional detail.**Requirement:*****ObservationStartUTC****FITS Name:**UTCSTART**FITS Type:**str**Description:** UTC time at the start of the exposure.**Requirement:****ObservationEndUTC****FITS Name:**UTCEND**FITS Type:**str

Description: UTC time at the end of the exposure.

Requirement:

Environmental Keywords

WaterVaporZenith_Start

FITS Name:WVZ_STA

FITS Type:flt

Description: Integrated precipitable water vapor to the zenith, running average of previous 60 seconds. Start of observation.

Requirement:

WaterVaporZenith_End

FITS Name:WVZ_END

FITS Type:flt

Description: Integrated precipitable water vapor to the zenith, running average of previous 60 seconds. End of observation.

Requirement:

static_air_temp

FITS Name:TEMP_OUT

FITS Type:flt

Description:Static air temperature, as returned by the MCCS at start of observation.

Requirement:

PrimaryMirrorTemperature_1

FITS Name:TEMPPRI1

FITS Type:flt

Description: Primary mirror temp #1, at start of observation.

Requirement:

PrimaryMirrorTemperature_2

FITS Name:TEMPPRI2

FITS Type:flt

Description: Primary mirror temp #2, at start of observation.

Requirement:

PrimaryMirrorTemperature_3

FITS Name:TEMPPRI3

FITS Type:flt

Description: Primary mirror temp #3, at start of observation.

Requirement:

SecondaryMirrorTemperature_1

FITS Name:TEMPSEC1

FITS Type:flt

Description: Temperature of secondary mirror, at start of observation.

Requirement:

Aircraft Keywords

Altitude_Start

FITS Name:ALTI_STA

FITS Type:flt

Description:Aircraft altitude from mean sea level according to MCCS (baro corrected), at start of observation.

Requirement:

Altitude_End

FITS Name:ALTI_END

FITS Type:flt

Description:Aircraft altitude from mean sea level according to MCCS (baro corrected), at end of observation.

Requirement:

Airspeed

FITS Name:AIRSPEED

FITS Type:flt

Description:True aircraft airspeed, as returned by the MCCS at start of observation.

Requirement:

GroundSpeed

FITS Name:GRDSPEED

FITS Type:flt

Description:Current ground speed of aircraft, as returned by the MCCS at start of observation.

Requirement:

Latitude Start

FITS Name:LAT_STA

FITS Type:flt

Description:Current aircraft latitude, as returned by the MCCS at start of observation.

Requirement:

Longitude Start

FITS Name:LON_STA

FITS Type:flt

Description:Current aircraft longitude, as returned by the MCCS at start of observation. W is negative, E is positive, from prime meridian.

Requirement:

Latitude End

FITS Name:LAT_END

FITS Type:flt

Description:Current aircraft latitude, as returned by the MCCS at end of observation.

Requirement:

Longitude End

FITS Name:LON_END

FITS Type:flt

Description:Current aircraft longitude, as returned by the MCCS at end of observation. W is negative, E is positive, from prime meridian.

Requirement:

Heading

FITS Name:HEADING

FITS Type:flt

Description:True aircraft heading, as returned by the MCCS at start of observation.

Requirement:

TrackAngle

FITS Name:TRACKANG

FITS Type:flt

Description:Aircraft track angle, as returned by the MCCS at start of observation.

Requirement:

Telescope Keywords

Telescope

FITS Name:TELESCOP

FITS Type:str

Description: Telescope used for the observation. Usually SOFIA but can also be telescope an another observatory.

Requirement:

TelescopeConfig

FITS Name:TELCONF

FITS Type:str

Description: Telescope configuration. The configuration defines the mirrors, correctors, light paths, etc... On SOFIA, this should be controlled by the MCCS.

Requirement:

TelescopeRA

FITS Name:TELRA

FITS Type:flt

Description:Right ascension of SI boresight (SIBS), as returned by the telescope control system (J2000). Representation may be either decimal hours or HH:MM:SS.s.

Requirement:

TelescopeDec

FITS Name:TELDEC

FITS Type:flt

Description: Declination of SI boresight, as returned by the telescope control system (J2000). Representation may be either decimal degrees or DD:MM:SS.

Requirement:

TelescopeVPA

FITS Name:TELVPA

FITS Type:flt

Description: Vertical Position Angle (VPA) of SI boresight, as returned by the telescope control system in ICRS (J2000) -- Is this really VPA or ROF? -- TBC.

Requirement:**TelescopeEquinox****FITS Name:**TELEQUI**FITS Type:**str**Description:** Equinox of returned RA/Dec/VPA.**Requirement:****LastRewindUTC****FITS Name:**LASTREW**FITS Type:**str**Description:** UTC time of last telescope rewind.**Requirement:****TelescopeFocus_Start****FITS Name:**FOCUS_ST**FITS Type:**flt**Description:**Telescope focus: Measured position of the FCM focus mechanism in the T direction -- as returned by the MCCS (microns) at observation start.**Requirement:****TelescopeFocus_End****FITS Name:**FOCUS_EN**FITS Type:**flt**Description:**Telescope focus: Measured position of the FCM focus mechanism in the T direction -- as returned by the MCCS (microns) at observation end.**Requirement:****TelescopeElevation****FITS Name:**TELEL**FITS Type:**flt**Description:** Telescope elevation in the cavity reference frame. At start of observation.**Requirement:****TelescopeCrossElevation****FITS Name:**TELXEL**FITS Type:**flt**Description:** Telescope cross elevation in the cavity reference frame. At start of observation.**Requirement:****TelescopeLineOfSight****FITS Name:**TELLOS**FITS Type:**flt**Description:** Telescope line of sight angle in the cavity reference frame. At start of observation.**Requirement:****TascuStatus****FITS Name:**TSC-STAT**FITS Type:**str**Description:** State of the TASCU system at the end of the current observation as returned by the MCCS. See specification in MCCS_SI_04.**Requirement:****TascuFBCStatus****FITS Name:**FBC-STAT**FITS Type:**str**Description:** State of the flexible body compensation system at the end of the current observation as returned by the MCCS. See specification in MCCS_SI_04.**Requirement:****ObservationRequestRA****FITS Name:**OBSRA**FITS Type:**flt**Description:**Requested right ascension for the observation before any manual "tweaking", either from the instrument control software, an AOR, or the flight executor. This may be different from the actual object coordinates and/or telescope coordinates. Representation may be either decimal hours or HH:MM:SS.s. Reference frame can be specified in the comment field (ICRS recommended) and equinox specified using the Equinox keyword.**Requirement:****ObservationRequestDec****FITS Name:**OBSDEC**FITS Type:**flt**Description:**Requested declination for the observation before any manual "tweaking", either from the instrument control software, an AOR, or the flight

executor. This may be different from the actual object coordinates and/or telescope coordinates. Representation may be either decimal degrees or DD:MM:SS. Reference frame can be specified in comment field (ICRS recommended) and equinox specified using the Equinox keyword.

Requirement:

ObservationRequestEquinox

FITS Name:EQUINOX

FITS Type:flt

Description: Equinox for ObservationRA and ObservationDec. Does not apply to TelescopeRA/Dec which are fixed to ICRS (J2000). See FITS standard for additional detail. If not specified, equinox is assumed to be year 2000.

Requirement:

ZenithAngle_Start

FITS Name:ZA_START

FITS Type:flt

Description: Zenith angle of telescope pointing at start of acquisition. Use telescope elevation to calculate ZA.

Requirement:

ZenithAngle_End

FITS Name:ZA_END

FITS Type:flt

Description: Zenith angle of telescope pointing at end of acquisition. Use telescope elevation to calculate ZA.

Requirement:

TrackingMode

FITS Name:TRACMODE

FITS Type:str

Description: SOFIA Tracking mode (last commanded). See MCCR_SI_04 for description of states and modes.

Requirement:Tracking

TrackingError

FITS Name:TRACERR

FITS Type:log

Description:Flag to indicate if there was a tracking error during the observation. Ideally the SI software would monitor the tracking mode (ta_trc.trc_status_table.main_op_mode_id) for any error/abnormalities. If an error does occur, the TRACERR would then be set to T. (

Requirement:Tracking

Data Collection Keywords

isChopping

FITS Name:CHOPPING

FITS Type:log

Description: Chopping flag

Requirement:If mode in use.

isNodding

FITS Name:NODDING

FITS Type:log

Description: Nodding flag -- this should be set if the SI is executing a repeated nod pattern, for example (ABBA)(ABBA), etc...

Requirement:If mode in use.

isDithering

FITS Name:DITHER

FITS Type:log

Description: Dithering flag

Requirement:If mode in use.

isMapping

FITS Name:MAPPING

FITS Type:log

Description: Mapping flag.

Requirement:If mode in use.

isScanning

FITS Name:SCANNING

FITS Type:log

Description: Scanning flag.

Requirement:If mode in use.

Annotation Keywords

Instrument Keywords

Instrument

FITS Name: INSTRUME

FITS Type: str

Description: Instrument name, as specified in the SI-DCS ICD.

Requirement:*

Datatype

FITS Name: DATATYPE

FITS Type: str

Description: Type of observation data: Image, Spectral, or Other.

Requirement:

InstrumentConfiguration

FITS Name: INSTCFG

FITS Type: str

Description: Instrument configuration - simple description, as specified in the SI-DCS ICD. e.g. IMAGING, GRISM, SPECTROSCOPY, etc...

Requirement:

InstrumentMode

FITS Name: INSTMODE

FITS Type: str

Description: Instrument observing mode - simple description, as specified in the SI-DCS ICD. e.g. C2D, MAPPING, etc...

Requirement:

MCCSMode

FITS Name: MCCSMODE

FITS Type: str

Description: SI mode as defined in the MCCS_SI_04.

Requirement:

ExposureTime

FITS Name: EXPTIME

FITS Type: flt

Description: Total effective on-source exposure time of the observation. This is the total time during which photons from the object of interest are collected by the detector. It includes any shutter corrections (which may not apply for most (all?) SOFIA instruments), and nodding/chopping corrections, and should match the algorithm(s) supplied for any time estimation tools (e.g. SITE). For FITS, EXPTIME should be used instead of the FITS specification EXPOSURE.

ExposureTime should be specified for all images in a data file.

Requirement:

SpectralElement1

FITS Name: SPECTEL1

FITS Type: str

Description: First spectral element (filter, grism, etc...) as specified in SI-DCS ICD. Need only contain the unique identifier from the SI-DCS ICD; more detailed filter/grism/mixer can be stored in instrument-specific keywords.

Requirement:*

SpectralElement2

FITS Name: SPECTEL2

FITS Type: str

Description: Second spectral element (filter, grism, etc...) as specified in SI-DCS ICD. Need only contain the unique identifier from the SI-DCS ICD; more detailed filter/grism/mixer can be stored in instrument-specific keywords. Set to "NONE" if no second element in use.

Requirement:*

InstrumentSlit

FITS Name: SLIT

FITS Type: str

Description: Slit identifier, as specified in the SI-DCS ICD. Need only contain the unique identifier; more detailed info can be stored in instrument-specific keywords.

Requirement: Spectroscopy configs: if slit in use.

WavelengthCentral

FITS Name: WAVECENT

FITS Type: flt

Description: Central wavelength of observation for imaging modes. This is a rough figure only, intended to be used for archive searches across all SOFIA instruments.

Requirement: Imaging modes only.

Resolution

FITS Name:RESOLUN

FITS Type:flt

Description:Approximate spectral resolution of observation for spectroscopy modes, expressed as $R = c/\Delta V = \lambda/\Delta\lambda$. This is a rough figure only, intended to be used for archive searches across all SOFIA instruments.

Requirement:Spectroscopy modes only.

Array Detector Keywords

Detector

FITS Name:DETECTOR

FITS Type:str

Description: Detector name.

Requirement:Array instruments only.

DetectorSize

FITS Name:DETSIZE

FITS Type:str

Description:Unbinned detector size in pixels.

Requirement:Array instruments only.

PixelScale

FITS Name:PIXSCAL

FITS Type:flt

Description: Projected pixel scale on the sky.

Requirement:Array instruments only.

Subarrays

FITS Name:SUBARRNO

FITS Type:int

Description: Number of sub arrays used in data acquisition. Full array assumed if absent.

Requirement:If subarrays in use.

SubarraySize

FITS Name:SUBARR%2d

FITS Type:str

Description: The log unbinned size of the n-th subarray in section notation.

Requirement:If subarrays in use.

SiencelInstrumentBoresigtX

FITS Name:SIBS_X

FITS Type:int

Description:Location of SI boresight in pixel space -- x_si.

Requirement:Array instruments only.

SiencelInstrumentBoresigtY

FITS Name:SIBS_Y

FITS Type:int

Description:Location of SI boresight in pixel space -- y_si.

Requirement:Array instruments only.

WCS_CTYPE

FITS Name:CTYPEn

FITS Type:str

Description:WCS: Coordinate type and projection for n-th axis. See list of supported projections at <http://tdc-www.harvard.edu/wcstools/wcstools.fits.html>.

Requirement:Imaging only.

WCS_CRPIX

FITS Name:CRPIXn

FITS Type:int

Description:WCS: pixel coordinates of the reference point of the n-th axis to which the projection and the rotation refer.

Requirement:Imaging only.

WCS_CRVAL

FITS Name:CRVALn

FITS Type:flt

Description:WCS: reference pixel coordinate for n-th axis as right ascension and declination or longitude and latitude in decimal degrees. FITS Comment field should include estimate of uncertainty in absolute pointing (See TBD Document).

Requirement:Imaging only.

WCS_CDELT

FITS Name:CDELTn

FITS Type:flt

Description:WCS: Plate scale in degrees per pixel for the n-th axis at the reference pixel. Either the CDi_j *or* the CDELT/CROTA keywords should be used, but not both. FITS comment field should include estimate of uncertainty based on known distortion or other optical effects.

Requirement:Imaging only.

WCS CROTA2

FITS Name:CROTA2

FITS Type:flt

Description:WCS: Rotation of axes in degrees. WCS FITS convention is to use CROTA2. Either the CDi_j *or* the CDELT/CROTA keywords should be used, but not both. FITS comment field should include estimate of uncertainty in TA rotation of field (see TBD Document).

Requirement:Imaging only.

WCS RotMatrix

FITS Name:CDi_j

FITS Type:flt

Description:WCS: Rotation matrix for WCS -- CD1_1, CD1_2, CD2_1, and CD2_2. Either the CDi_j *or* the CDELT/CROTA keywords should be used, but not both. FITS comment field should include estimate of uncertainty for each matrix element.

Requirement:Imaging only.

Heterodyne Keywords

FrontendDevice

FITS Name:FRONTEND

FITS Type:str

Description:Name of frontend device.

Requirement:Heterodyne instruments only.

BackendDevice

FITS Name:BACKEND

FITS Type:str

Description:Name of backend device.

Requirement:Heterodyne instruments only.

BackendBandwidth

FITS Name:BANDWID

FITS Type:flt

Description:Total bandwidth of heterodyne backend (Hz).

Requirement:Heterodyne instruments only.

SystemTemperature

FITS Name:TSYS

FITS Type:flt

Description:Heterodyne system temperature.

Requirement:Heterodyne instruments only.

FrequencyResolution

FITS Name:FREQRES

FITS Type:flt

Description:Nominal frequency resolution -- may differ from channel spacing.

Requirement:Heterodyne instruments only.

ReferenceFrequency

FITS Name:OBSFREQ

FITS Type:flt

Description:The observed frequency (Hz) at the reference pixel of the frequency-like axis.

Requirement:Heterodyne instruments only.

SidebandFrequency

FITS Name:IMAGFREQ

FITS Type:flt

Description:The image sideband freq (Hz) corresponding to ReferenceFrequency.

Requirement:Heterodyne instruments only.

RestFrequency

FITS Name:RESTFREQ

FITS Type:flt

Description:Rest frequency.

Requirement:Heterodyne instruments only.

VelocityDefinition**FITS Name:**VELDEF**FITS Type:**str**Description:** The velocity definition and frame (8 characters). The first 4 characters describe the velocity definition. Possible definitions include: RADI (radio); OPTI (optical); RELA (relativistic). The second 4 characters describe the reference frame (e.g. ``-LSR", ``-HEL", ``-OBS"). If the frequency-like axis gives a frame, then the frame in VELDEF only applies to any velocities given as columns or keywords (virtual columns).**Requirement:**Heterodyne instruments only.**VelocityFrame****FITS Name:**VFRAME**FITS Type:**flt**Description:** The radial velocity of the reference frame wrt the observer. $V_{\text{frame}} - V_{\text{telescope}}$.**Requirement:**Heterodyne instruments only.**RadialVelocity****FITS Name:**RVSYS**FITS Type:**flt**Description:** The radial velocity, $V_{\text{source}} - V_{\text{telescope}}$.**Requirement:**Heterodyne instruments only.

Data Structure Keywords

Chopping Keywords

ChopFrequency**FITS Name:**CHPFREQ**FITS Type:**flt**Description:** Measured TCM chop frequency**Requirement:**Chopping**ChopProfile****FITS Name:**CHPPROF**FITS Type:**str**Description:**Indicates whether 2 or 3 point chopping profile is being used. For 3-point chopping, the center position usually contains the object of interest. MCCS returns '0' for 2 point and '1' for 3-point.**Requirement:**Chopping**ChopSymmetry****FITS Name:**CHPSYM**FITS Type:**str**Description:**Indicates whether symmetric or asymmetric chopping is being used.**Requirement:**Chopping**ChopAmplitude_1****FITS Name:**CHPAMP1**FITS Type:**flt**Description:** Calculated amplitude on the sky. MCCS calculates the amplitude on the sky based on actual SMA data.**Requirement:**Chopping**ChopAmplitude_2****FITS Name:**CHPAMP2**FITS Type:**flt**Description:** Calculated second amplitude on the sky. MCCS calculates the amplitude on the sky based on actual SMA data.**Requirement:**Chopping**ChopCoordSys****FITS Name:**CHPCRSYS**FITS Type:**str**Description:** Reference frame for which MCCS computes SMA parameters. MCCS calculates sky_tip, sky_tilt, and sky_angle differently depending on which reference frame was last used in the sma.chop command. This value defaults to TARF if sma.chop has not been sent previously.**Requirement:**Chopping**ChopAngle****FITS Name:**CHPANGLE**FITS Type:**flt**Description:** Calculated angle in the sky_coord_sys reference frame. MCCS calculates the angle in the sky_coord_sys reference frame based on actual SMA data. The angle is the orientation of the chop throw with up equals zero.**Requirement:**Chopping**ChopTip**

FITS Name:CHPTIP

FITS Type:flt

Description: Calculated tip in the sky_coord_sys reference frame. MCCS calculates the tip in the sky_coord_sys reference frame based on actual SMA data.

Requirement:Chopping

ChopTilt

FITS Name:CHPTILT

FITS Type:flt

Description: Calculated tilt in the sky_coord_sys reference frame. MCCS calculates the tilt in the sky_coord_sys reference frame based on actual SMA data.

Requirement:Chopping

ChopPhase

FITS Name:CHPPHASE

FITS Type:int

Description: Chopper phase as defined by MCCS. Time delay between the synch signal and the start of the setpoint which has the positive tilt increment with respect to the commanded offset.

Requirement:Chopping

Nodding Keywords

NodDwellTime

FITS Name:NODTIME

FITS Type:flt

Description: Total time per nod position (dwell time) -- not including nod slew time and nod settle time (see NodSettleTime).

Requirement:Nodding

NodCycles

FITS Name:NODN

FITS Type:int

Description: Number of nod cycles.

Requirement:Nodding

NodSettleTime

FITS Name:NODSETL

FITS Type:flt

Description:Time required for telescope to settle after nod slew is complete. Amount of time to wait between when telescope arrives at nod destination and when to begin integrating.

Requirement:Nodding

NodAmplitude

FITS Name:NODAMP

FITS Type:flt

Description: Nod amplitude on sky.

Requirement:Nodding

NodBeam

FITS Name:NODBEAM

FITS Type:str

Description: Current nod beam position.

Requirement:Nodding

NodPattern

FITS Name:NODPATT

FITS Type:str

Description: Pointing sequence pattern for one nod cycle (there could be many nod cycles in an observation). Beam A is usually assumed to contain the object of interest.

Requirement:Nodding

NodStyle

FITS Name:NODSTYLE

FITS Type:str

Description:Nodding style for coordinated chopping/nodding. e.g. nod-matched-chop, nod-perpendicular-chop, etc...

Requirement:Nodding/Chopping

NodCoordSys

FITS Name:NODCRSYS

FITS Type:str

Description: Coordinate system in which nod positions (NODPOSX,Y) and rotations are defined.

Requirement:Nodding

NodAngle**FITS Name:**NODANGLE**FITS Type:**flt**Description:** Nod angle, clockwise from y axis defined by NODCRSYS.**Requirement:**Nodding**Dithering Keywords****DitherPattern****FITS Name:**DTHPATT**FITS Type:**str**Description:** Approximate shape of dither pattern.**Requirement:**Dithering**DitherPositions****FITS Name:**DTHNPOS**FITS Type:**int**Description:** Number of dither positions.**Requirement:**Dithering**DitherPositionIndex****FITS Name:**DTHINDEX**FITS Type:**int**Description:** Dither position index.**Requirement:**Dithering**DitherOffset****FITS Name:**DTHOFFS**FITS Type:**flt**Description:** Specified dither offset for each subsequent frame, in arcseconds.**Requirement:**Dithering**Mapping Keywords****MapCoordSys****FITS Name:**MAPCRSYS**FITS Type:**str**Description:** Coordinate system in which ES map positions are defined. OBSRA/DEC are assumed to describe position of Map Center.**Requirement:**Mapping**MapPositionsX****FITS Name:**MAPNXPOS**FITS Type:**int**Description:** Number of map positions in X coordinate as defined by MAPCRSYS.**Requirement:**Mapping**MapPositionsY****FITS Name:**MAPNYPOS**FITS Type:**int**Description:** Number of map positions in Y coordinate as defined by MAPCRSYS.**Requirement:**Mapping**MapIntervalX****FITS Name:**MAPINTX**FITS Type:**flt**Description:** Mapping step interval in X coordinate as defined by MAPCRSYS. OBSRA/DEC are assumed to describe position of Map Center.**Requirement:**Mapping**MapIntervalY****FITS Name:**MAPINTY**FITS Type:**flt**Description:** Mapping step interval in Y coordinate as defined by MAPCRSYS. OBSRA/DEC are assumed to describe position of Map Center.**Requirement:**Mapping**Scanning Keywords (Constant Velocity)****ScanStartRA****FITS Name:**SCNRA0**FITS Type:**flt

Description:Start of scan - RA, coordinate system specified in keyword comment filed and EQUINOX.

Requirement:Scanning

ScanStartDec

FITS Name:SCNDEC0

FITS Type:flt

Description: Start of scan - Dec , coordinate system specified in keyword comment filed and EQUINOX.

Requirement:Scanning

ScanEndRA

FITS Name:SCNRAF

FITS Type:flt

Description:End of scan - RA, coordinate system specified in keyword comment filed and EQUINOX.

Requirement:Scanning

ScanEndDec

FITS Name:SCNDECf

FITS Type:flt

Description: End of scan - Dec, coordinate system specified in keyword comment filed and EQUINOX.

Requirement:Scanning

ScanRate

FITS Name:SCNRATE

FITS Type:flt

Description: Commanded slew rate in arcsec/sec along path.

Requirement:Scanning

ScanDirection

FITS Name:SCNDIR

FITS Type:flt

Description: Angle on sky in some coordinate system to scan from ScanStartRA/Dec, alternative specification to ScanEndRA/Dec.

Requirement:Scanning