

# DEFINITION OF LASCO LEVEL\_1 FITS HEADER KEYWORDS

Last modified 2002/09/06 by N. Rich

The following table has 4 columns: KEYWORD, TYPE, VALUES, and DESCRIPTION.

- KEYWORD gives the name of the FITS keyword and may be up to 8 characters.
- TYPE refers to the data type and the size of the data:
  - S - String
  - I - Integer
  - R - Real
  - S\*2 is a 2-character string, whereas I\*2 is a 2-byte integer (16 bits).
- VALUES shows the range of values that the KEYWORD can take.
- DESCRIPTION gives a short description of the keyword. An asterisk (\*) indicates the value will (probably) be different than level 0.5.

For more information on usage of FITS keywords in SolarSoft, see [www.lmsal.com/solarsoft/ssw\\_standards.html](http://www.lmsal.com/solarsoft/ssw_standards.html).

KEYWORD =====	TYPE =====	VALUES =====	DESCRIPTION =====
SIMPLE	S*1	T	Conforms to FITS standard
BITPIX	I*2	16	Number of bits per pixel
NAXIS	I*2	2	Number of axes in the image
NAXIS1	I*2	Positive	Length of the first axis (columns,x)
NAXIS2	I*	Positive	Length of the second axis (rows,y)
DATE	S*23	Any	* Date of file generation in CSSDS standard format, eg 1996/05/21 17:28:48.208
FILENAME	S*30	Any	* Name of the FITS file. DLNNNNNN.fts, where D is [123] for detector, L is [45] for [quicklook,LZ] level 1, and NNNNNN is the number of the original level 0.5 image
FILEORIG	S*17	Any	Name of the raw telemetry file in the format YYMMDD_HHMMSS.img. The implied date and time are the date and time stamp of when the data were put into the telemetry stream.
DATE-OBS	S*10	Any	* Date of the start of the exposure, eg: 1996/05/20 (corrected)
TIME-OBS	S*12	Any	* Time of the start of the exposure, eg: 00:40:05.407 (corrected)
EXPTIME	R*4	Any	* Number of seconds of the exposure time (corrected)
TELESCOP	S*8	SOHO	Name of the satellite
INSTRUME	S*8	LASCO	Name of the instrument
DETECTOR	S*8	C1,C2,C3	Name of the telescope within LASCO
SUMROW	I*2	0,2,4	Number of rows being summed on the CCD

## LASCO Level 1 FITS Header Keyword Definition

KEYWORD =====	TYPE =====	VALUES =====	DESCRIPTION =====
SUMCOL	I*2	0,2,4	Number of columns being summed on the CCD
LEBXSUM	I*2	1,2,4,..	Number of columns being summed in the LEB
LEBYSUM	I*2	1,2,4,..	Number of rows being summed in the LEB
FILTER	S*8	Clear, Orange, Blue, Red, IR, Lens, FeXIV, FeX, CaXV	Position of the filter wheel
POLAR	S*8	Clear, 0Deg, +60deg, -60deg, Halpna, ND	Position of the polarizer wheel
COMPRSSN	S*2		Code indicating the steps used in compressing the data
MID_DATE	I*2	Any	* Modified Julian Date at the mid-point of the exposure (corrected)
MID_TIME	R*4	Any	* Number of seconds of the day at the mid-point of the exposure (corrected)
WAVELENG	R*8	Any	Wavelength of FP (C1) or Bandpass of filter(???) (C2 & C3)
R1COL	I*2	Any	The rectified x1 coordinate, equivalent to P1COL, as though the image had been read out with this coordinate
R1ROW	I*2	Any	Rectified P1ROW (y1)
R2COL	I*2	Any	Rectified P2COL (x2)
R2ROW	I*2	Any	Rectified P2ROW (y2)
BUNIT	S*20	MSB	Units for C2 and C3 are mean solar brightness; Units for C1 is erg/cm2/ster/A/sec
CRPIX1 (2 )	R*4	Any	* Column(Row) number of the reference pixel, which is sun center. (Middle of image is [512.5,512.5]: [NAXIS1(2)+1]/2 )
CROTA	R*4	any	Rotation angle of image about axis perpendicular to the plane of the image. Specified in degrees CCW relative to the Y direction
CRVAL1 (2 )	R*4	Any	The reference data coordinates corresponding to CRPIX1 and CRPIX2. For example, if the pixel coordinates specify the origin, then set CRVAL1 and CRVAL2 to zero.
CTYPE1 (2 )	S*8	ARCSEC	Definition of the data units - ie., the interpretation of CDELTA1 and CDELTA2. For example, if your telescope has a platescale of 2.6 arcsec per pixel, set CDELTA1 to 2.6 and set CTYPE1 to "arcsec".
CDELTA1 (2 )	R*8	Any	* The width and height of a pixel in data units, where units are specified by CTYPE1(2) (Same as PLATESCL, which is obsolete)

## LASCO Level 1 FITS Header Keyword Definition

KEYWORD =====	TYPE =====	VALUES =====	DESCRIPTION =====
XCEN	R*4	Any	East-West FOV center of image relative to sun center in CDELTA1 units, positive West. XCEN is related to the above FITS keywords by: XCEN = CRVAL1 + CDELTA1 * [(NAXIS1+1)/2 - CRPIX1] (units = arcseconds)
YCEN	R*4	Any	North-South FOV center of image relative to sun center in CDELTA2 units, positive North. YCEN is related to the above FITS keywords by: YCEN = CRVAL2 + CDELTA2 * [(NAXIS2+1)/2 - CRPIX2 ] (units = arcseconds)
DATE_OBS	S*23	Any	DATE-OBS+' '+TIME-OBS (new field, SolarSoft requirement)
RSUN	R*4	Any	Radius of sun (Arcseconds)
DATAMIN	R*4	Any	Minimum value of the image before scaling
DATAMAX	R*4	Any	Maximum value of the image before scaling
DATAZER	I*4	Any	Number of zero pixels in the image
DATASAT	I*4	Any	Number of saturated values in the image
DSATVAL	R*4	6.5e-9	Value used as saturated
DSATMIN	R*4	2.0e-13	Lower bound of scaling image
NSATMIN	I*4	Any	Number of values less than DSATMIN
DATAAVG	R*4	Any	Average value of the image before scaling
DATASIG	R*4	Any	Standard deviation in computing the average
DATAPxx	I*4	Any	Intensity of xx percentile of image, where xx = [01,10,25,75,90,95,98,99]
MISSLIST	S*80	Any	Space-delimited list of missing blocks. The numbers are the 1D subscripts of a 32x32 array representing superpixels of the array.
NMISSING	I*4	Any	Number of missing blocks (should not include occulter or corners)
COMMENT	S*80	Any	Comments. Can be repeated
COMMENT	S*80	Any	'FITS coordinate for center of full image is (512.5,512.5).'
COMMENT			Final DATE-OBS, TIME-OBS, sun center, roll angle computed from star positions, running median values
HISTORY	S*80	Any	History. Can be repeated.