A detailed overview of required FITS header keywords and FITS file structure

Version

1.2 – 28/9/2009 – JWC: Did what is described for ver 1.1, but apparently was not done. Now it is.

1.1 – 14/7/2009 – JWC: Changed kw's ”OBJECT”, ”OBSERVER”, ”IMTYPE” and ”COMMENT” to be collected to the CCD3 program (after consulting with Jeppe).

1.0 – 14/5/2009 – JWC: Document created.

Introduction

This list defines which FITS keywords are written by which software modules. The header shown here is taken from ALFOSC. The only difference from headers from other instruments is the keywords commented as ”Instrument info”.

The software modules are:

- The CCD3 program.
- The external FITS module.

When referred to as 'collected' it means searching for, retreaving and possibly temporarily storing the information. All FITS header information is physically written to the disk file by the CCD3 program.
”Configurable” means that the value should be configurable from the/a/ configuration file. ”BIAS specific” means that the current BIAS program writes or produces these values and they are not necessarily FITS standard.

Required MEF structure

In single amplifier images, the image is written in the first extention. If more than one amplifier is used, the image from each amplifier is written in a separate extention.
In cameras with more than one detector, the image from each detector is written in a separate extention.

The FITS header - explained

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SIMPLE  =                    T Standard. Collected by CCD3
BITPIX  =                   16 Standard. Collected by CCD3
NAXIS   =                    0 Standard. Collected by CCD3
EXTEND  =                    T For multi extension FITS files. Collected by CCD3
BZERO   =                32768 Standard. Collected by CCD3
BSCALE  =                    1 Standard. Collected by CCD3
ORIGIN  = 'NOTSA'                Configurable. Collected by CCD3
OBSERVAT= 'LaPalma         '     Configurable. Collected by CCD3
TELESCOP= 'NOT             '     Configurable. Collected by CCD3
INSTRUME= 'ALFOSC_FASU     '     Configurable. Collected by CCD3
DETNAME = 'EEV 2k x 2k     '     Configurable. Collected by CCD3
DATE    = '2009-04-12T16:04:13' Standard. File creation date/time. Collected by CCD3
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DATE-OBS= '2009-04-12T16:02:53' Standard. Start time of integration. Collected by CCD3
FILENAME= 'Alsd120015.fits' Collected by CCD3
OBJECT = 'bias' Collected by CCD3
OBSERVER= 'Jacob' Collected by CCD3
IMAGETYP= 'BIAS ' Describes the type of exposure. Collected by CCD3
COMMENT = 'This is a comment' Collected by CCD3
EQUINOX = 2000.0 Collected by external FITS module.
EXPTIME = 0.000 Standard. Collected by CCD3.
TM_START= 57772 BIAS specific. Indicates the start of integrations in sec. From midnight. Collected by CCD3.

TM_END = 57853 BIAS specific. Indicates the time of the end of the readout. Collected by CCD3.

GAINM = 'HIGH ' BIAS specific. Indicating hi or low gain. Not needed on new controllers?

AMPLMODE= 'A ' BIAS specific. Collected by CCD3.
CCDTEMP = -119.9 BIAS specific. Collected by CCD3.
LN2TEMP = -188.6 BIAS specific. Collected by CCD3.
P_DEWAR = 'Not available ' BIAS specific. Here missing due to a bug in the controller. Collected by CCD3.

TM-START= 57772 BIAS specific. Not needed anymore.
SHSTAT = 'CLOSED ' BIAS specific. Because the shutter is connected to the controller it is collected by CCD3.

DETXBIN = 1 BIAS specific. Detector binning in X direction. Collected by CCD3

DETYBIN = 1 BIAS specific. Detector binning in Y direction. Collected by CCD3

NWINDOWS= 1 BIAS specific. Number of readout windows (currently always 1). Collected by CCD3

DETWIN1 = '[1:2198, 1:2052]' BIAS specific. Specification of the geometry of the first (and only) readout window. 'xstart:xend, ystart:yend'. Collected by CCD3

ALAPRTNM= 'Open ' Instrument info. Collected by ext. FITS module
ALAPRTID= 0 Instrument info. Collected by ext. FITS module
ALAPRPOS= 7 Instrument info. Collected by ext. FITS module
ALAPRSTP= 279150 Instrument info. Collected by ext. FITS module
ALAPRALG= 'Y ' Instrument info. Collected by ext. FITS module
ALFLTNM = 'Open ' Instrument info. Collected by ext. FITS module
ALFLTID = 0 Instrument info. Collected by ext. FITS module
ALFLTPOS= 7 Instrument info. Collected by ext. FITS module
ALFLTSTP= 281250 Instrument info. Collected by ext. FITS module
ALGRNM = 'Open_(Lyot)' Instrument info. Collected by ext. FITS module
ALGRID = 0 Instrument info. Collected by ext. FITS module

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ALGRPOS =                    7  Instrument info. Collected by ext. FITS module
ALGRSTP =               280100  Instrument info. Collected by ext. FITS module
ALGRALG = 'Y       '             Instrument info. Collected by ext. FITS module
ALFOCUS =                 1810  Instrument info. Collected by ext. FITS module
ALCENWAV= 'N/A     '             Instrument info. Collected by ext. FITS module
FAFLTNM = 'Open    '             Instrument info. Collected by ext. FITS module
FAFLTID =                    0  Instrument info. Collected by ext. FITS module
FAFLTPOS=                    0  Instrument info. Collected by ext. FITS module
FBFLTNM = 'Open    '             Instrument info. Collected by ext. FITS module
FBFLTID =                    0  Instrument info. Collected by ext. FITS module
FBFLTPOS=                    0  Instrument info. Collected by ext. FITS module
CLAMP1  =                    0  Instrument info. Collected by ext. FITS module
CLAMPNM1= ' He                  Instrument info. Collected by ext. FITS module
CLAMPID1= 'OSRAM He/10 instal. 13-11-2006' Instrument info. Collected by ext. FITS
module

CLAMP2  =                    0  Instrument info. Collected by ext. FITS module
CLAMPNM2= ' Ne     '            Instrument info. Collected by ext. FITS module
CLAMPID2= 'OSRAM Ne/10 instal. 12-02-2009' Instrument info. Collected by ext. FITS
module

CLAMP3  =                    0  Instrument info. Collected by ext. FITS module
CLAMPNM3= ' Halogen'            Instrument info. Collected by ext. FITS module
CLAMPID3= 'OSRAM 64415 w448 10W 12V' Instrument info. Collected by ext. FITS module
CLAMP4  =                    0   Instrument info. Collected by ext. FITS module
CLAMPNM4= ' ThAr Hollow Cathode' Instrument info. Collected by ext. FITS module
CLAMPID4= 'Cathodeon 3UAXTh S/N B77779' Instrument info. Collected by ext. FITS
module

CMIRROR =                    0  Instrument info. Collected by ext. FITS module
FARETARD= 'OUT     '            Instrument info. Collected by ext. FITS module
FARETANG= '-9999   '            Instrument info. Collected by ext. FITS module
ALAPRSLX=                  0.0  Instrument info. Collected by ext. FITS module
ALAPRSLY=                  0.0  Instrument info. Collected by ext. FITS module
UT      =        16.0483333333  TCS information. Collected by ext. FITS module
ST      =         4.2555555556  TCS information. Collected by ext. FITS module
RA      =        63.6218065291  TCS information. Collected by ext. FITS module
DEC     =        28.7690703302  TCS information. Collected by ext. FITS module
RADECSYS= 'FK5     '            TCS information. Collected by ext. FITS module
TELALT  =                89.93  TCS information. Collected by ext. FITS module
AZIMUTH =               119.47  TCS information. Collected by ext. FITS module
AIRMASS =         1.0000000000  TCS information. Collected by ext. FITS module
FIELD   =                29.38  TCS information. Collected by ext. FITS module
ROTPOS  =               -90.00  TCS information. Collected by ext. FITS module
CCDPROBE= 'ccd     '            TCS information. Collected by ext. FITS module
AUXPOS  =                 1198  TCS information. Collected by ext. FITS module
AUYPOS  =                 4998  TCS information. Collected by ext. FITS module
AUBXXPOS=                  255  TCS information. Collected by ext. FITS module
AUBXYPOS=                  255  TCS information. Collected by ext. FITS module
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AUSTATUS= 'off     '            TCS information. Collected by ext. FITS module
TELFOCUS=                23837  TCS information. Collected by ext. FITS module
TCSTGT  = '        '            TCS information. Collected by ext. FITS module
OBJRA   =        252.424500000  TCS information. Collected by ext. FITS module
OBJDEC  =         -15.35000000  TCS information. Collected by ext. FITS module
OBJPMRA =         0.0000000000  TCS information. Collected by ext. FITS module
OBJPMDEC=         0.0000000000  TCS information. Collected by ext. FITS module
OBJEQUIN=               1950.0  TCS information. Collected by ext. FITS module
CREATOR = 'NOT2MEF V1.5'        Configurable. Collected by CCD3
OBSGEO-X=         5327395.9638  GEO information. Collected by ext. FITS module
OBSGEO-Y=        -1719170.4876  GEO information. Collected by ext. FITS module
OBSGEO-Z=          3051490.766  GEO information. Collected by ext. FITS module
OBS_MODE= 'Imaging '            Observing mode. Collected by CCD3
DATE-AVG= '2009-04-12T16:02:52.0' Midpoint of observation. Collected by CCD3
QCRDATE = '2004-11-24'          Quality control date of rotation center. Collected by ext.
FITS module.

END                             Standard. Collected by CCD3
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End of primary HDU. Now follows the header of the first extension.

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XTENSION= 'IMAGE   '            Standard. Collected by CCD3
BITPIX  =                   16  Standard. Collected by CCD3
NAXIS   =                    2  Standard. Collected by CCD3
NAXIS1  =                 2198  Standard. Collected by CCD3
NAXIS2  =                 2052  Standard. Collected by CCD3
PCOUNT  =                    0  Standard. Collected by CCD3
GCOUNT  =                    1  Standard. Collected by CCD3
BZERO   =                32768  Standard. Collected by CCD3
BSCALE  =                    1  Standard. Collected by CCD3
BUNIT   = 'count   '            Standard. Collected by CCD3
INHERIT =                    T  Standard. Collected by CCD3
CTYPE1  = 'RA---TAN'            WCS information. Collected by ext. FITS module
CTYPE2  = 'DEC—TAN'             WCS information. Collected by ext. FITS module
CRVAL1  =        63.6218065291  WCS information. Collected by ext. FITS module
CRVAL2  =        28.7690703302  WCS information. Collected by ext. FITS module
CUNIT1  = 'deg     '            WCS information. Collected by ext. FITS module
CUNIT2  = 'deg     '            WCS information. Collected by ext. FITS module
CRPIX1  =                1085.  WCS information. Collected by ext. FITS module
CRPIX2  =                 997.  WCS information. Collected by ext. FITS module
CD1_1   = -2.50941701906739E-05 WCS information. Collected by ext. FITS module
CD1_2   = -4.45713486720056E-05 WCS information. Collected by ext. FITS module
CD2_1   = -4.45713486720056E-05 WCS information. Collected by ext. FITS module
CD2_2   = 2.50941701906739E-05  WCS information. Collected by ext. FITS module
EXTNAME = 'im1     '            Standard. Collected by CCD3
IMAGEID =                    1  Standard. Collected by CCD3
CCDNAME = 'CCD8    '            Detector information. Configurable. Collected by CCD3
CCDSUM  = '1 1     '            Detector binning. Collected by CCD3
DARK    =                   0.  QC info. Collected by ext. FITS module
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QCDDATE = 'UNDEFINED'                  QC info. Collected by ext. FITS module
RDNOISE =                    5.3       QC info. Collected by ext. FITS module
GAIN    =                  0.736       QC info. Collected by ext. FITS module
BIASSEC = '[3:52,1:2052]               BIAS (overscan) section. Configurable. Collected by
CCD3

END                                    Standard. Collected by CCD3
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References

”Information on NOT FITS files”
(http://www.not.iac.es/instruments/FITS-header)

”FITS observation files at the NOT”
(http://www.not.iac.es/instruments/development/fitsV0.6.pdf)

”NOT Data Aquisition System – Requirements and Development plan”, Jacob Clasen and Thomas Augusteijn, 2008.

”FITS documentation”
(http://fits.gsfc.nasa.gov/fits_documentation.html)