

Chapter 14

Core Data Items

To fully and accurately characterize the *IUE* dataset and facilitate future analysis, a group of “core data items” descriptive of each image was identified. These core data items (CDIs) are defined as all parameters related to the acquired images which are either necessary for image processing with the NEWSIPS system or for scientific analysis of the data. This chapter identifies and defines each CDI, indicates valid values for the CDI, the sources used to verify the CDI, and any comments relevant to the use of the CDI.

The CDIs are of two types: input and output CDIs. All input CDIs for each image are verified for accuracy before NEWSIPS processing of the image by the *IUE* Project. Images are verified at the acquiring observation station. Sources for verification of the CDIs include the original observing script at GSFC and the observing log at VILSPA, the original VICAR image label, engineering data, and handwritten records. The output CDIs are generated by the NEWSIPS processing.

14.1 The Sources for Core Data Items

There are three primary sources for the input CDIs: the VICAR image label (which contains the Event Round Robin), the GSFC observing scripts or the VILSPA observing log, and the NEWSIPS processing system. The image label is machine readable and was used as the initial source when possible. The observing scripts are more accurate and were used to verify the accuracy of the data taken from the image label. The output CDIs are determined as part of the image processing system. A detailed description of the image label contents, including the “round robin” series of sequential spacecraft commands, can be found in an article by Van Steenberg (1989).

14.2 The Core Data Items

The following is an alphabetized list of the FITS keywords for the CDIs. Each entry includes a definition and the sources used to verify the data. Where appropriate, a definition of the

valid values and any further comments are included.

The FITS keywords for aperture-dependent CDIs are alphabetized by the second letter, ignoring the “x” that represents the aperture designation (L or S) in the actual keyword. Where the FITS keywords indicate Fine Error Sensor (FES) data, an “n” represents the FES number (1 or 2).

- **ABNBADSC**

Bad Scan Flag

VALID VALUES: YES, NO

SOURCE: The number of bad scans occurring during a read was noted on the observing script.

COMMENTS: This flag is set to YES to indicate that a bad camera static pointing was found at the beginning of a camera read. In this case, the read beam was repositioned to the original static pointing. The read was not restarted until a good scan was detected. This problem occurred almost exclusively during the first 2 years of operation for the LWP camera and is only flagged for that camera. For images acquired at GSFC, the number of bad scans is included in the COMMENT BY RA. This CDI supplements this comment.

- **ABNHISTR**

History Replay Flag

VALID VALUES: YES, NO

SOURCE: Images that required a history replay were noted on the observing script.

COMMENTS: This flag is set to YES when the original image reconstruction was flawed and the image had to be recovered from the engineering history tape to obtain a good copy. Since the full image label is not available on these history tapes, the observatory spliced the full image label from the original reconstruction with the history replay version of the image. If this attempt was unsuccessful, the history tape version of the label was used which contains only the first few lines of the VICAR label. The users are warned that the VICAR label may be truncated.

- **ABNHTRWU**

Heater Warm-up Flag

VALID VALUES: YES, NO

SOURCE: The use of the heater warm-up for the LWR camera was noted on the observing scripts.

COMMENTS: This flag is set to YES when a heater warm-up (usually 4 minutes) was performed during the prep sequence for the LWR camera. The heater warm-up procedure was used to reduce the occurrence of microphonics (see Chapter 4.2) which

affected most LWR images. This flag is set only for LWR images. Note that while the occurrence of microphonics is significantly reduced with the use of the heater warm-up procedure, it is not eliminated.

- **ABNMICRO**

Microphonics Flag

VALID VALUES: YES, NO

SOURCE: NEWSIPS processing

COMMENTS: This flag is set to YES if microphonics are detected in the raw image. For images acquired at GSFC, the number and location of microphonics are noted on the observing script and in the COMMENT BY RA. This CDI supplements this comment. Only LWR images are screened for microphonics, although SWP images occasionally have microphonics.

- **ABNMINFR**

Missing Minor Frame Flag

VALID VALUES: YES, NO

SOURCE: NEWSIPS processing

COMMENTS: This flag is set to YES if missing minor frames are detected in the raw image by an automated procedure in the NEWSIPS processing. For images acquired at GSFC, the number of missing minor frames is noted on the observing script and subsequently in COMMENT BY RA. This CDI supplements this comment. The number of missing minor frames determined by NEWSIPS may differ from the number recorded by the RA.

- **ABNNOSTD**

Non-standard Read Flag

VALID VALUES: YES, NO

SOURCE: This flag was set at the time the input CDIs for the image were manually verified, using the observing script and the TO and RA comments.

COMMENTS: This flag is set to YES for images taken in a non-standard manner. An example of a non-standard condition is an image read down with the G1 grid turned off. The reason this flag is set to YES is documented in the comments.

- **ABNOTHER**

Image Abnormality Flag

VALID VALUES: YES, NO, DMU, DMU+YES

SOURCE: Various observatory sources are used to set this flag including the observing script and problems that arise during image processing. For images affected by DMU corruption, this flag is set by a raw image screening routine.

COMMENTS: This flag is set to YES for corrupted image reconstructions. It is unlikely that images with a corrupted reconstruction can be processed successfully by NEWSIPS. This flag is set to either DMU or DMU+YES if the image is affected by DMU corruption. The number of pixels at 159 DN as well as the estimated number of corrupted pixels and associated one-sigma error estimate are included in the Comments by RA.

- **ABNREAD**

Read Rate Flag

VALID VALUES: YES, NO

SOURCE: Non-standard read rates are noted on the observing script.

COMMENTS: This flag is set to YES when the image was read at a rate other than the standard 20 kb/s telemetry rate. The possible telemetry rates are: 40, 20, 10, 5, 2.5 and 1.25 kb/s. Since most calibration images were taken at 20 kb/s, only images read at that rate are well calibrated.

- **ABNUVC**

UVC Voltage Flag

VALID VALUES: YES, NO

SOURCE: Non-standard values were recorded on the observing script.

COMMENTS: This flag is set to YES when a non-standard Ultraviolet to Visible Converter (UVC) voltage was used during the exposure. The standard UVC setting for the LWP and SWP cameras is -5.0 kV, while the LWR camera has settings of either -4.5 or -5.0 kV. See also UVC-VOLT.

- **APERTURE**

Aperture Mode

VALID VALUES: LARGE, SMALL, BOTH, NA

SOURCE: The aperture is found in the round robin portion of the image label. It is determined by locating a line preceded by 'TARGET' for the image and reading the third character in the last character string in the line. The observing script also contains this information. When the image processing software identifies undocumented spectral data in either aperture, the keyword is changed to BOTH.

COMMENTS: The aperture is one of the two entrance apertures in the focal plane of the telescope. When spectral data were collected through both apertures, either intentionally or serendipitously, APERTURE will be BOTH. This will give rise to two

sets of aperture-dependent CDIs which may have different values. NA is used only for Flat-field images or Nulls.

Each spectrograph has a pair of entrance apertures consisting of a large (L) nominally 10×20 arcsecond slot with rounded ends, and a small (S) nominally 3 arcsecond diameter circle (see Chapter 2.2 for precise dimensions). The large aperture can be used for observing point-source objects, obtaining spatial information of extended sources, multiple exposures, and trailed exposures. The small aperture is unresolved and not photometrically accurate. Since the small aperture is never closed, large aperture exposures may generate a serendipitous image in the small aperture.

- **xBKGMODE**

Background Determination Mode (high dispersion only)

VALID VALUES: GLOBAL, LOCAL, NULL

SOURCE: This CDI is set by the high-dispersion background determination algorithm (*BCKGRD*).

COMMENTS: Indicates the background determination method used to generate the background fluxes. An output value of GLOBAL implies that the background was determined for a continuum source using the 2-pass method. A value of LOCAL denotes the use of the 1-pass background determination for non-continuum sources. A value of NULL usually indicates that a substantial portion of the image is missing due to telemetry dropouts. In this case (only), the background fluxes are set to zero.

- **CAMERA**

Detector Designation

VALID VALUES: LWP, LWR, SWP, SWR, FES1, FES2

SOURCE: The camera identification is found on line 1 byte 50 of the *IUE* VICAR image label. The camera is designated by number in the label as follows:

- 1 - Long Wavelength Prime camera (LWP)
- 2 - Long Wavelength Redundant camera (LWR)
- 3 - Short Wavelength Prime camera (SWP)
- 4 - Short Wavelength Redundant camera (SWR)
- 8 - Fine Error Sensor 1 (FES1)
- 9 - Fine Error Sensor 2 (FES2)

The camera was also noted on the observing scripts.

COMMENTS: The default cameras initially used were the LWR and SWP cameras. In October 1983, the LWP camera replaced the LWR as the primary long wavelength

camera. Only a few images were obtained with the SWR camera which has never operated to specification.

The camera number or name is noted many times in the VICAR label. At times (especially during the very early years of the *IUE* mission), the camera name and number for the image are not consistently noted in locations in the label. The camera designated in the first line of the VICAR label is taken to be the correct camera identification.

- **CC-MEDN**

Median Cross-correlation Coefficient

VALID VALUES: 0.0 to 1.0 (unitless)

SOURCE: NEWSIPS processing

COMMENTS: Median of the cross-correlation coefficients of all patches of the image for which cross correlation was successful (see Chapter 5.3).

- **CC-PERCN**

Percentage of Successful Cross Correlations

VALID VALUES: 0 to 100 %

SOURCE: NEWSIPS processing

COMMENTS: Percentage of the total number of sub-image arrays for which cross correlations were successful (see Chapter 5.3).

- **CC-STDEV**

Standard Deviation of Cross-correlation Coefficients

VALID VALUES: 0.0 to 1.0 (unitless)

SOURCE: NEWSIPS processing

COMMENTS: Standard deviation about the mean of the cross-correlation coefficients for all sub-image arrays for which cross correlation was successful (see Chapter 5.3).

- **CC-TEMPL**

Cross-correlation Template Size

VALID VALUES: 5×5 to 60×60 pixels

SOURCE: NEWSIPS processing

COMMENTS: While the template size may vary, the value of 23×23 pixels is most commonly used (see Chapter 5.2).

- **CC-WINDW**

Cross-correlation Window Size

VALID VALUES: 5×5 to 60×60 pixels

SOURCE: NEWSIPS processing

COMMENTS: While the window size is variable, the value of 29×29 pixels is the most commonly used (see Chapter 5.2).

- **xCNTRAPR**

Predicted Center of Spectrum in SI File (low dispersion only)

VALID VALUES: 1 to 80 pixels

SOURCE: NEWSIPS processing

COMMENTS: NEWSIPS processing automatically takes into account predicted spectral format shifts based on time and THDA. Therefore, this CDI will normally be constant for each camera and aperture in low dispersion. The line number is normally 51 for the large aperture and 25 for the small aperture.

- **COMMENT BY GO**

GO Comments about the Image

SOURCE: The *IUE* GO for images taken at GSFC.

COMMENTS: The GSFC *IUE* Project asked all GOs to provide pertinent comments for images acquired under their observing programs. Any responses from this survey are provided under this keyword and include such comments as: high background, poor S/N, target is brightest star in field, continuum has Mg II h/k lines of primary. If the GO responded but had no comments about an image, the phrase ‘GO had no special comments’ is placed in this keyword. Many GSFC images do not include a COMMENT BY GO.

- **COMMENT BY RA**

RA Comments about the Image

SOURCE: The GSFC observing scripts or the VILSPA observing log and the VICAR image label.

COMMENTS: These comments include additional information about the image or the verification of the CDIs for the image that did not fit into the FITS CDI keywords. Explicit information about each exposure (e.g., offset reference points for multiple exposures or exposure lengths for segmented observations) are included in these comments. Attached are examples of GSFC comments that are always in the same format. Not all the comments pertain to every image. Following the list of generalized examples are some specific examples. Note: “x” indicates data that vary and may not accurately indicate format as it might change slightly depending on the value.

```
EXP x APER x E=x,C=x,B=x
* Note: This comment incorporates the old database comments
field and was included at the request of users.

READ GAIN = HIGH

PARTIAL READ

EXPOSURE GAIN = MEDIUM FOR EXPOSURE x

EXPOSURE GAIN = MINIMUM FOR EXPOSURE x

BOTH DISPERSIONS

10 Kb/s READ

LWR xx-MINUTE HEATER WARMUP

xx MISSING MINOR FRAMES NOTED ON SCRIPT

xx BAD SCAN STARTS NOTED ON SCRIPT

EX = xxx, EY = xxx

TARGET + TFLOOD

TARGET + UVFLOOD

EXP x TRACKED ON GYROS

EXP x TRACKED ON FES

EXP x TRACKED ON GYROS AND FES

xx PREP USED

OFFSET x FROM: xxxxxxxxxxxxxxxx
OFFSET x COORDINATES: hh mm ss.s sdd hh mm
OFFSET x MAGNITUDE: xx.xxx
```

```
*****
Example of comments for a multiple exposure
```

```
*****
INFORMATION ABOUT MULTIPLE EXPOSURES FOLLOWS
EXPOSURE x INFORMATION
DATEOBS x dd/mm/yy hh:mm:ss
EXPTIME x xxxxx.xxx SEC/(EFF); xxxxx.x SEC.(COM)
OFFSET REFERENCE POINT x IS UNKNOWN
OFFSET REFERENCE POINT x X= xxxxx,Y = xxxxx
FOCUS x = xx.xx
THDASTRT x = x.xx
FPM x = x.xx
FESCOUNT x = FESMODE x = xx
```

```
R.P. USED FOR EXP x: xxxx, xxxx
```

```
*****
Specific example of comments for a blind offset exposure
```

```
*****
COMMENT BY RA: EXP 1 APER L E=255,C=210,B=47
COMMENT BY RA: 0 MISSING MINOR FRAMES NOTED ON SCRIPT
COMMENT BY RA: EXP 1 TRACKED ON FES
COMMENT BY RA: S PREP USED
COMMENT BY RA: OFFSET 1 FROM: Star-3210480
COMMENT BY RA: OFFSET 1 COORDINATES: 14 53 27.6 -32 26 06
COMMENT BY RA: OFFSET 1 MAGNITUDE: 6.200
COMMENT BY RA: OFFSET 2 FROM: Star-3111600
COMMENT BY RA: OFFSET 2 COORDINATES: 14 50 7.3 -31 34 26
COMMENT BY RA: OFFSET 2 MAGNITUDE: 8.800
```

```
*****
Specific example of comments for a multiple exposure
```

```
*****
COMMENT BY RA: EXP 1 APER L C=181,B=40
COMMENT BY RA: EXP 2 APER L C=181,B=40
COMMENT BY RA: EXP 3 APER L C=181,B=40
COMMENT BY RA: EXP 4 APER L C=181,B=40
COMMENT BY RA: 0 MISSING MINOR FRAMES NOTED ON SCRIPT
COMMENT BY RA: EXP 1 TRACKED ON FES
COMMENT BY RA: EXP 2 TRACKED ON FES
COMMENT BY RA: EXP 3 TRACKED ON FES
COMMENT BY RA: EXP 4 TRACKED ON FES
```

```

COMMENT BY RA:  S   PREP USED
COMMENT BY RA:  OFFSET 1  FROM: UNKNOWN
COMMENT BY RA:  OFFSET 1  COORDINATES: 01 09 11.3 +11 12 07
COMMENT BY RA:  OFFSET 1  MAGNITUDE: 8.800
COMMENT BY RA:  INFORMATION ABOUT MULTIPLE EXPOSURES FOLLOWS
COMMENT BY RA:  EXPOSURE 1 INFORMATION
COMMENT BY RA:  DATEOBS 1 18/11/79 03:09:32
COMMENT BY RA:  EXPTIME 1 1499.825 SEC.(EFF); 1500.0 SEC.(COM)
COMMENT BY RA:  OFFSET REFERENCE POINT 1 X =  -31, Y =  -208
COMMENT BY RA:  FOCUS 1 =  -0.64
COMMENT BY RA:  THDASTRT 1 =  6.80
COMMENT BY RA:  FPM 1 =  0.08
COMMENT BY RA:  FESCOUNT 1 =  FES-MODE 1 = B0
COMMENT BY RA:  EXPOSURE 2 INFORMATION
COMMENT BY RA:  DATEOBS 2 18/11/79 03:40:06
COMMENT BY RA:  EXPTIME 2 1499.825 SEC.(EFF); 1500.0 SEC.(COM)
COMMENT BY RA:  OFFSET REFERENCE POINT 2 X =  -18, Y =  -208
COMMENT BY RA:  FOCUS 2 =  -1.08
COMMENT BY RA:  THDASTRT 2 =  6.80
COMMENT BY RA:  FPM 2 =  0.50
COMMENT BY RA:  FESCOUNT 2 =  FES-MODE 2 = B0
COMMENT BY RA:  EXPOSURE 3 INFORMATION
COMMENT BY RA:  DATEOBS 3 18/11/79 04:10:36
COMMENT BY RA:  EXPTIME 3 1499.825 SEC.(EFF); 1500.0 SEC.(COM)
COMMENT BY RA:  OFFSET REFERENCE POINT 3 X =  -4, Y =  -208
COMMENT BY RA:  FOCUS 3 =  -1.10
COMMENT BY RA:  THDASTRT 3 =  7.20
COMMENT BY RA:  FPM 3 =  0.80
COMMENT BY RA:  FESCOUNT 3 =  FES-MODE 3 = B0
COMMENT BY RA:  EXPOSURE 4 INFORMATION
COMMENT BY RA:  DATEOBS 4 18/11/79 04:40:07
COMMENT BY RA:  EXPTIME 4 1499.825 SEC.(EFF); 1500.0 SEC.(COM)
COMMENT BY RA:  OFFSET REFERENCE POINT 4 X =  11, Y =  -208
COMMENT BY RA:  FOCUS 4 =  -1.20
COMMENT BY RA:  THDASTRT 4 =  7.20
COMMENT BY RA:  FESCOUNT 4 =  FES-MODE 4 = B0

```

```
*****
```

```
Specific example of comments for a segmented image
```

```
*****
```

```

COMMENT BY RA:  EXP 1 APER L E=5X,B=45
COMMENT BY RA:  0 MISSING MINOR FRAMES NOTED ON SCRIPT

```

```

COMMENT BY RA:      0 BAD SCAN STARTS NOTED ON SCRIPT
COMMENT BY RA:  EXP 1 TRACKED ON GYROS
COMMENT BY RA:  S   PREP USED
COMMENT BY RA:  EXPOSURE 1 SEGMENTED ( 5 EXPOSURES)
COMMENT BY RA:  SEGMENT 1 EXPOSED   899.768 SEC.(EFF);  900.0 SEC.(COM)
COMMENT BY RA:  SEGMENT 2 EXPOSED  1199.595 SEC.(EFF); 1200.0 SEC.(COM)
COMMENT BY RA:  SEGMENT 3 EXPOSED   899.768 SEC.(EFF);  900.0 SEC.(COM)
COMMENT BY RA:  SEGMENT 4 EXPOSED  1199.595 SEC.(EFF); 1200.0 SEC.(COM)
COMMENT BY RA:  SEGMENT 5 EXPOSED  1199.595 SEC.(EFF); 1200.0 SEC.(COM)

```

```

*****
Specific example of comments for a DMU corrupted image
*****
WARNING: Image affected by the 159 DN anomaly
        172 pixels with 159 DN, corrupted:    86 +29 /- 29

```

- **xDATABKG**

Estimated Background Level

VALID VALUES: 0 to 255 DN

SOURCE: NEWSIPS processing

COMMENTS: This CDI is based on an algorithm applied uniformly to all images and will often differ from the value indicated in the COMMENT BY RA. The value in the comments is based on measurements made at the the time of acquisition and is not uniform over the entire *IUE* mission.

- **xDATACNT**

Estimated Continuum Level

VALID VALUES: 0 to 255 DN

SOURCE: NEWSIPS processing

COMMENTS: This CDI is based on an algorithm applied uniformly to all images and will often differ from the value indicated in the COMMENT BY RA. The value in the comments is based on measurements made at the the time of acquisition and is not uniform over the entire *IUE* mission.

- **xDATEOBS**

Date at the Start of Observation (UT)

VALID VALUES: Dates for the life of the satellite starting at January 28, 1978.

SOURCE: The date of read is extracted from bytes 1–5 in line 10 of the image label. Time stamps found in the round robin are used to correct the read date to the start

date when needed. The start date of the observation is also found on the observing script. The start date for null images is set equal to the read date.

COMMENTS: This is an aperture-dependent keyword. For multiple and segmented exposures, only the date of observation for the first exposure is placed in the FITS keyword. The dates of observation for the remaining exposures are entered as comments.

- **xDEC**

Declination of the Observed Target (1950)

VALID VALUES: -90 to $+90$ degrees

SOURCE: For non-solar system objects, the declination stored in this field is extracted from the SIMBAD database by the Astronomical Data Center of Strasbourg (CDS) for the *IUE* Project. For targets not found in the SIMBAD database, the coordinates as designated by the GO are used, but the majority of the time, all observations of the same target have identical homogeneous coordinates regardless of the coordinates supplied by the GO. Comet coordinates for data acquired through 1989 were provided by M. Festou of Observatoire de Besancon, France and documented in ULDA, Guide 2: Comets (ESA SP 1134, May 1990). Coordinates for other solar system objects and for sky background acquisitions are duplicated for this CDI from the original coordinates supplied by the GO. *No offsets have been applied to the homogeneous coordinates of the target. The offsets are documented in the COMMENT BY RA field.* If the pointed coordinates are available for WAVECAL, Null, T-flood, and UV-flood images, they appear in this field; otherwise, this field is zero-filled.

COMMENTS: The declination stored in this keyword is also known as the HOMOGENOUS DEC. The homogeneous declination is used by NEWSIPS processing whenever coordinates are required by a reduction algorithm.

- **DISPERSN**

Spectrograph Dispersion Mode

VALID VALUES: HIGH, LOW, BOTH, NA

SOURCE: The observing scripts are the most accurate source for the dispersion and were used as the primary source during image verification. The dispersion is found in the binary portion (camera snapshots) of the VICAR label in lines 86–100. Characters 22–25 are read into character format and converted to byte format, then separated into bits. If the bits 4 or 6 are equal to 1, then DISPRS='L', else DISPRS='H'. One cannot tell easily from the label if both dispersions were used during acquisition of an image.

COMMENTS: This CDI describes the dispersion mode of the spectrograph used in obtaining the image. The options are HIGH (echelle grating), LOW (single order), BOTH (for those images acquired with both dispersions superimposed) or NA (for

Flat-field images). Note that the CDI “DISPTYPE”, discussed below, records the dispersion parameter used in NEWSIPS processing.

- **DISPTYPE**

Dispersion Designated for Processing

VALID VALUES: HIGH, LOW

SOURCE: This value is determined prior to processing by the image processing staff.

COMMENTS: The value may be HIGH or LOW and may differ from the designated dispersion for images acquired with both dispersions, for images with no dispersion designated, and for certain types of engineering data (Nulls and Flat-field images). Images with DISPERSN=‘BOTH’ will be processed twice, once with DISPTYPE=‘LOW’ and once with DISPTYPE=‘HIGH’. Output files from both processings will be available in the archive.

- **EPOCH**

Epoch of the Coordinates

VALID VALUES: 1950

SOURCE: The 1950 epoch is constant for the *IUE* mission.

- **xEXPMULT**

Multiple Exposure Flag

VALID VALUES: Y-OFFSETS, X-OFFSETS, ALONG-APER, OTHER, NO

SOURCE: Exposure information is extracted from the round robin for each exposed spectrum of a multiple or a double aperture exposure. However, one cannot tell from this information alone whether the image contains multiple spectra spatially offset or time-segmented spectra superimposed (see xEXPSEGM CDI). Thus the notations made on the observing script are needed to differentiate these types of images.

COMMENTS: This flag indicates the acquisition of multiple spectra in the large aperture. Multiple exposures result in 2 or more individual spectra spatially displaced from one another. The flag is set to indicate that these spectra were displaced along the FES X-axis, the FES Y-axis, the major axis of the large aperture or another configuration. If the image does not contain multiple spectra, the flag is set to NO. Multiple spectra in the large aperture can be of the same object or of different objects. Multiple spectra may have been acquired by deliberately re-pointing the spacecraft for each separate spectrum or serendipitously, with a nearby object yielding an additional spectrum. The CDIs stored as FITS keywords are for the first exposure in the large aperture with the exception of exposure length which is the sum of all effective exposure lengths. A subset of data for subsequent large-aperture exposures is stored in the COMMENT BY RA keyword. This subset includes the start date and time of each

exposure, the length of exposure (both commanded and effective), the offset reference point, focus, THDA at the start of the exposure, radiation counts, and the FES mode and counts.

- **EXPOGAIN**

SEC Exposure Gain Mode

VALID VALUES: MAXIMUM, MEDIUM, MINIMUM

SOURCE: The exposure gain can be extracted from the VICAR label by finding the line in the round robin preceded by ‘EXPOBC’ and reading character 26. The exposure gain is also noted on the observing script if it is not the normal value of MAXIMUM.

COMMENTS: The exposure gain depends on the accelerating voltage applied in the Secondary Electron Conduction (SEC) photocathode. The maximum gain is equal to -6.1 kV, medium gain -4 kV, and minimum gain -3.2 kV. The exposure gain can have different values for each exposure of a multiple exposure image or for dual aperture images. However, since this is an extremely rare (if existing) occurrence, the exposure gain is assumed to be the same for both. This rare situation will be noted in the COMMENT BY RA.

- **xEXPSEGM**

Segmented Exposure Flag

VALID VALUES: YES, NO

SOURCE: Exposure information can be extracted from the round robin for each exposure of a segmented image. However, one cannot tell explicitly from this information alone whether the image contains multiple spectra spatially offset or time segmented spectra superimposed. Thus the notations made on the observing script are needed to differentiate these types of images.

COMMENTS: This CDI flags superimposed segmented spectra obtained by more than one commanded exposure. This situation may occur if no guide star is available for FES tracking during a long exposure and the target must be re-centered in the aperture or if the length of the exposure is greater than the maximum commandable exposure time (447 minutes). Segmented exposures result in a single spectrum, as opposed to multiple exposures described under the xEXPMULT CDI. Where available, the number of segmented exposures and the commanded and effective exposure times for each exposure are stored in the FITS keyword COMMENT BY RA.

- **xEXPTIME**

Effective Exposure Time

VALID VALUES: 0.000 to 90000.000 seconds

SOURCE: The effective exposure time is derived from the commanded exposure time. The commanded exposure time is extracted from the round robin portion of the VICAR

label by reading characters 8–13 from a line preceded by ‘EXPOBC’ into an integer variable compacted into the format mmmss (5 digits). When the TO has modified the initial commanded length of exposure, the modified commanded time is extracted from characters 16–21 of a line preceded by ‘FIN’. The commanded exposure time is also noted on the observing script.

COMMENTS: The effective exposure time is used in the absolute calibration of spectral data. Both commanded and effective exposure times are retained in the Final Archive database for images acquired at GSFC. Only the effective exposure is retained for images acquired by VILSPA.

The effective exposure time is determined from the commanded exposure time by correcting for various known instrumental properties (i.e., OBC quantization and camera rise time). Details of the exposure time corrections for both point and trailed sources can be found in Chapter 11.1.1.

For multiple exposures, the effective exposure is calculated for each exposure and the results are added together for the FITS keyword (xEXPTIME). The effective exposure time for each exposure (where known) is placed in the FITS keyword COMMENT BY RA.

For segmented exposures, the effective exposure time is calculated for each segment of the exposure and the results are then added together. The commanded and effective exposure times for each segment are recorded in the FITS keyword COMMENT BY RA.

Trailed exposure times are not based on a commanded exposure time, but on the effective trail rate, the aperture size, and the number of passes through the aperture. The effective trail rate is derived from the commanded trail rate by applying an OBC quantization correction. The determination of trailed exposure times is discussed in detail in Chapter 11.1.1.

- **xEXPTRMD**

Trail Mode Flag

VALID VALUES: X-TRAIL, Y-TRAIL, NO-TRAIL

SOURCE: The trail mode is taken from the observing script.

COMMENTS: The trail mode indicates if the target was trailed along either the FES X-axis, the FES Y-axis, or not trailed. If this flag is set, the keywords xTRAILRT and xTRAILNR indicating the trail rate and the number of passes will also be set.

- **xFESnBK**

FES Background Counts

VALID VALUES: 0 to 28672 FES counts

SOURCE: The FES background counts are taken from the observing script.

COMMENTS: This value records the intensity of scattered light from the FES anomaly and is only listed for data acquired since January 1991.

- **xFESnCN**

FES Target Counts

VALID VALUES: 0 to 28672 FES counts

SOURCE: The FES counts may be extracted from the round robin of the VICAR label by reading the first integer field of a line preceded by 'FES CTS' or 'FESCT'.

- **xFESnMD**

FES Tracking Mode for the Target

VALID VALUES: F, S, O, U, FO, FU, SO, BO

SOURCE: The FES mode is extracted from the round robin of the VICAR label and is stored in the second and third integer fields in the line preceded by 'FES CTS' or 'FESCT'. The mode is also noted on all observing scripts.

COMMENTS: The track mode of the Fine Error Sensor (FES) with the target at the reference point. Fast (F) or Slow (S) track - Overlap (O) or Underlap (U), or Blind Offset (BO). If the track mode is missing, the corresponding CDI will be left blank.

- **FLARE**

LWR Flare Flag (high dispersion only)

VALID VALUES: YES, NO

SOURCE: The LWR flare flag is set by the *BCKGRD* module.

COMMENTS: This flag is set to YES when a flare is detected in an LWR image by the *BCKGRD* module.

- **xFLUXAVE**

Average Extracted FN (low dispersion only)

VALID VALUES: -1024 to +1024

SOURCE: NEWSIPS processing

COMMENTS: The average FN of the spectral data determined in the spectral extraction procedure (*SWET*). The average FN value is used to determine which fit will be used: an empirical or a default profile fit. See Chapter 9 for a detailed discussion of *SWET*.

- **xFOCUS**

Camera Focus

VALID VALUES: -25.0 to +25.0

SOURCE: The focus step is calculated by extracting three temperatures from the spacecraft snapshots, converting them from raw telemetry units to engineering units, and inserting these numbers into a formula. The focus value is also recorded on the observing scripts by the TO.

COMMENTS: The focus step is the value measured at the beginning of the exposure. This value is a linear function of three telescope temperatures. Typical values range from -10 to $+5$.

- **xFPM**

Flux Particle Monitor Voltage

VALID VALUES: 0.0 to 4.0 Volts

SOURCE: This value was recorded on the observing script at the start of each exposure.

COMMENTS: A measurement of solar radiation (both direct and from the Van Allen belts) at the beginning of the exposure. The background radiation fluxes were detected as an output voltage from a Geiger counter which had a threshold of 960 keV for electrons and 15 MeV for protons. The Flux Particle Monitor (FPM) malfunctioned in May 1991 and was turned off in October 1991. Therefore, only images taken prior to May 1991 have valid radiation values. The rate at which the background level accumulates on the most sensitive part of a detector is an exponential function of FPM, and is given by:

$$DN/hour = A \times 10^{FPM}$$

where A is 1.35 for the LWP, 0.73 for the SWP, and 1.00 for the LWR.

- **xGSTARnC**

FES Guide Star Counts

VALID VALUES: 0 to 28672 FES counts

SOURCE: This value was recorded on the observing script.

COMMENTS: The guide star counts are measured with either FES1 or FES2.

- **xGSTARnM**

FES Tracking Mode for the Guide Star

VALID VALUES: FO,FU,SO,F,S,NO

SOURCE: This value is recorded on the observing script.

COMMENTS: Similar to the FES tracking mode of the target.

- **xGSTARnX**

FES Guide Star X-coordinate

VALID VALUES: −2016 to +2047 FES Units

SOURCE: This value is extracted from the round robin portion of the VICAR label and is the first integer value of a line preceded by ‘GDE’. The value is also found on the observing script.

COMMENTS: This entry can refer to either FES1 or FES2.

- **xGSTARnY**

FES Guide Star Y-coordinate

VALID VALUES: −2016 to +2047 FES Units

SOURCE: This value is extracted from the round robin portion of the VICAR label and is the second integer value of a line preceded by ‘GDE’. The value is also found on the observing script.

COMMENTS: This entry can refer to either FES1 or FES2.

- **xHELCORR**

Heliocentric Time Correction to the Midpoint of Observation

VALID VALUES: < 1.0 days

SOURCE: NEWSIPS processing

COMMENTS: The heliocentric time correction is computed during processing for the midpoint of observation (xJD-MID) such that $JD_{corr} = xJD-MID + HELCORR$. This may be important for some variable targets.

- **IMAGE NUMBER**

Camera Image Sequence Number

VALID VALUES: ≥ 500

SOURCE: The image number is found on line 1 bytes 52–56 on the image label. This number is also found on the second line but is not always accurate, as it is hand entered by the TO. In addition, the image number is found on the observing script.

COMMENTS: Camera-dependent sequential image number was assigned to an image at acquisition starting at 1000. Images that were inadvertently assigned duplicate image numbers at the time of observation have been reassigned numbers starting at 500 for each camera.

- **ITF**

The Intensity Transfer Function Used in Image Processing

VALID VALUES: LWP92R94A, LWR83R94A (ITF A), LWR83R96A (ITF B), SWP85R92A

SOURCE: NEWSIPS processing

COMMENTS: Indication is given for the camera, last 2 digits of the year of acquisition, last 2 digits of the year of construction, and an alphabetic character representing the sequence of construction within the year. The “R” character denotes “release”.

- **xIUECLAS**

IUE Object Class

00 SUN	51 LONG PERIOD VARIABLE STARS
01 EARTH	52 IRREGULAR VARIABLES
02 MOON	53 REGULAR VARIABLES
03 PLANET	54 DWARF NOVAE
04 PLANETARY SATELLITE	55 CLASSICAL NOVAE
05 MINOR PLANET	56 SUPERNOVAE
06 COMET	57 SYMBIOTIC STARS
07 INTERPLANETARY MEDIUM	58 T TAURI
08 GIANT RED SPOT	59 X-RAY
09	60 SHELL STAR
10 W C	61 ETA CARINAE
11 WN	62 PULSAR
12 MAIN SEQUENCE O	63 NOVA-LIKE
13 SUPERGIANT O	64 OTHER
14 OE	65 MISIDENTIFIED TARGETS
15 OF	66 INTERACTING BINARIES
16 SD O	67
17 WD O	68
18	69 HERBIG-HARO OBJECTS
19 OTHER STRONG SOURCES	70 PLANETARY NEBULA + CENTRAL STAR
20 B0-B2 V-IV	71 PLANETARY NEBULA - CENTRAL STAR
21 B3-B5 V-IV	72 H II REGION
22 B6-B9.5 V-IV	73 REFLECTION NEBULA
23 B0-B2 III-I	74 DARK CLOUD (ABSORPTION SPECTRUM)
24 B3-B5 III-I	75 SUPERNOVA REMNANT
25 B6-B9.5 III-I	76 RING NEBULA (SHOCK IONIZED)
26 BE	77
27 BP	78
28 SDB	79
29 WDB	80 SPIRAL GALAXY
30 A0-A3 V-IV	81 ELLIPTICAL GALAXY
31 A4-A9 V-IV	82 IRREGULAR GALAXY
32 A0-A3 III-I	83 GLOBULAR CLUSTER
33 A4-A9 III-I	84 SEYFERT GALAXY
34 AE	85 QUASAR

35 AM	86 RADIO GALAXY
36 AP	87 BL LACERTAE OBJECT
37 WDA	88 EMISSION LINE GALAXY (NON-SEYFERT)
38 HORIZONTAL BRANCH STARS	89
39 COMPOSITE SPECTRAL TYPE	90 INTERGALACTIC MEDIUM
40 F0-F2	91
41 F3-F9	92
42 FP	93
43 LATE-TYPE DEGENERATES	94
44 G V-IV	95
45 G III-I	96
46 K V-IV	97
47 K III-I	98 WAVELENGTH CALIBRATION LAMP
48 M V-IV	99 NULLS AND FLAT FIELDS
49 M III-I	
50 R, N, OR S TYPES	

VALID VALUES: 0 to 99 (unitless)

SOURCE: The object class was designated by the GO as part of the proposal target list. This designation is found in bytes 54–56 of line 36 of the VICAR label. The GO also designated the object class on the observing scripts. If the designations differed, the object class on the scripts was used.

COMMENTS: *IUE* Project staff *did not* standardize the object classes. Object classes were changed from the GO designation only when the designation was obviously wrong (e.g., sky around Jupiter designated as planetary nebula) or when a new classification was created (e.g., Herbig-Haro objects). *Therefore, a single target observed multiple times may have several different object class identifications in the database.*

- **LAMP**

Flood Lamp Flag

VALID VALUES: TFLOOD, CALUV, NONE

SOURCE: This information is extracted from the round robin portion of the VICAR label by locating a line preceded by the ‘EXPOBC’ command and reading the characters in bytes 29 through 31. This information is also noted on the observing script.

COMMENTS: This keyword indicates if one of the on-board lamps was activated at any time after the camera prep and before the read. If no lamp was activated then this keyword is set to NONE. This keyword does not indicate the use of the Platinum-Neon (Pt-Ne) Wavelength Calibration (WAVECAL) lamps, because they produce spectral data and are handled as science data. The lamp types are as follows:

TFLOOD: Tungsten Flood lamps normally used in the camera preparation sequence. However, they are also used in conjunction with the WAVECAL lamps to illuminate the reseau marks needed for the geometric correction and to raise the DN level of the fainter emission lines. In addition, they are occasionally exposed in conjunction with stellar images for test purposes to enhance the background.

CALUV: Ultraviolet (mercury discharge) Flood lamps that produce a monochromatic output at 2537Å. They are primarily utilized in generating the ITF images used for the photometric correction process.

- **xLAPSTAT**

Large Aperture Status Flag

VALID VALUES: CLOSED, OPEN

SOURCE: The status of the large aperture is recorded in the binary camera snapshots portion (lines 86–100) of the VICAR label. Characters 22–25 are read into character format and converted to byte format, then separated into bits. If the bits 7 and 8 are both equal to 0, then the large aperture was open, otherwise it was closed. This information was also recorded on the observing script.

COMMENTS: This CDI describes whether the spectrograph large aperture was closed (C) or open (O) during the observation. Because opening and closing the large aperture may shift the reference point for centering objects in the aperture, the large aperture generally remains open. The small aperture is always open. The large aperture is typically only closed during wavelength calibration exposures and during high-dispersion observations of targets where light from a nearby source in the large aperture might contaminate the small-aperture spectrum.

- **MEANRAT**

Ratio of Mean Flux in SI File to Mean Flux in LI File

VALID VALUES: $-\infty$ to $+\infty$ (unitless)

SOURCE: NEWSIPS processing

COMMENTS: This CDI can give an indication of how well the flux was conserved in the resampling step. If the mean flux value in the LI image is near zero, however, the ratio is unreliable.

- **xJD-MID**

Mid-Point Date and Time of the Observation

VALID VALUES: 2443534.0 to end of *IUE* mission

SOURCE: NEWSIPS processing

COMMENTS: This value is stored as a Julian Date. In the case of multiple or segmented exposures, xJD-MID is calculated by adding half the total exposure time

to the starting Julian Date of the observations. This may not coincide with the true mid-point of the observations as it does not take into account the operational overhead involved (e.g., setup time for obtaining multiple exposures).

- **xJD-OBS**

Starting Date and Time of Observation

VALID VALUES: 2443534.0 to end of *IUE* mission

SOURCE: NEWSIPS processing

COMMENTS: This value is stored as a Julian Date. In the case of multiple exposures in the large aperture, the Julian Date is calculated only for the first exposure.

- **xOBJECT**

Homogeneous Target Identifier

SOURCE: The Homogeneous Target Identifier was, in most cases, provided by CDS for the *IUE* Project. CDS used the original target designation from the GO for each image in the *IUE* archive to cross-match with the SIMBAD database, thus identifying all images of a particular target, regardless of the nomenclature used by the GO. CDS then assigned a homogeneous target ID according to the following priority list:

HD, BD, CD, CPD, V*, WD, GD, NGC, IC, PK, SK, AzV, LIN, LHA, DEM, MRK, PG, QSO, ABCG, NOVA, SN, LS, PHL, FEIG, ROSS, 3C, X, PKS.

When none of these identifiers existed for a target, usually the first identifier listed by SIMBAD was adopted. SK, AxV, LIN, LHA, and DEM were later transformed to MC. LS, PHL, FEIG, ROSS, 3C, X, PKS, and a few other catalogs were later transformed to AOO LS, etc. to facilitate searches for “any other object”. The homogeneous target IDs for a few images were supplied or modified by VILSPA and GSFC for accuracy during the final check.

COMMENTS: This item consists of three sections. The first four characters of the field are a catalog identifier, most of which are standard astronomical catalog abbreviations. The catalog designation ZZ stands for solar system objects and the designation ‘IUE’ is used for images acquired for *IUE* engineering and calibration purposes. The next 12 characters identify the object. The final 12 characters are the optional complementary ID, used to give additional or more specific identification of the target. Some examples of complementary IDs include a nearby object for a sky background exposure or an area of a nebula or planet.

- **xOFFSET**

Global Spectral Format Offset (high dispersion only)

VALID VALUES: no limits exist

SOURCE: NEWSIPS processing.

COMMENTS: Indicates the “global average” shift in pixels calculated to achieve spatial registration of the orders in high dispersion. In most cases, this global offset is further refined to account for differential shifts of individual orders before being actually applied to the image. See Chapter 4.9 for details concerning the high-dispersion order registration process.

- **ORBANOMA**

Mean Anomaly of the Orbit

VALID VALUES: 0 to 359.999999 degrees

SOURCE: GSFC Flight Dynamics Predictions.

- **ORBASCEN**

Right Ascension of Ascending Node of the Orbit

VALID VALUES: 0 to 359.999999 degrees

SOURCE: GSFC Flight Dynamics Predictions.

COMMENTS: Typical values range from 98 – 208 degrees.

- **ORBECEN**

Orbit Eccentricity

VALID VALUES: 0 to 1 (unitless)

SOURCE: GSFC Flight Dynamics Predictions.

COMMENTS: Typical values range from 0.13 – 0.24

- **ORBEPOCH**

Date of the Orbital Elements (UT)

VALID VALUES: February 22, 1978 to end of *IUE* mission

SOURCE: GSFC Flight Dynamics Predictions.

COMMENTS: The appropriate set of orbital elements for an image is determined using the date of exposure and the orbital elements epoch. Images are assigned the set of orbital elements that have the nearest preceding date. The only exception is for images taken after a Delta V, which are assigned the set of orbital elements with the nearest succeeding date.

- **ORBINCLI**

Inclination of the Orbit

VALID VALUES: –90 to +90 degrees

SOURCE: GSFC Flight Dynamics Predictions.

COMMENTS: Typical values range from 28 – 35 degrees.

- **ORBSAXIS**

Semi-major Axis of the Orbit

VALID VALUES: 0 to ∞ kilometers

SOURCE: GSFC Flight Dynamics Predictions.

COMMENTS: Typical values range from 42150 – 42180 kilometers.

- **PGM-ID**

Observer Program ID

SOURCE: The program ID is stored on line 36 of the VICAR label in the first 5 characters. The program ID is also noted on the observing script.

COMMENTS: An alphanumeric code that identifies the observing program for which the observation was made. The program ID contains 5 characters. For NASA-approved programs of the first year, the first two letters identify the type of observing program and the last three are the initials of the principal investigator. After the first year of operation, the first two letters identify the type of observing program, the third letter represents the year, and the last two letters are the initials of the principal investigator. The program IDs for NASA discretionary programs begin with the letters OD. The last three characters are a sequential number and a letter. For ESA- and SERC-approved programs the program IDs are generally two letters followed by three numbers where the first letter designates the year. Program IDs are also assigned for images obtained for project-related programs such as calibration monitoring and camera testing.

- **POSANGLE**

Spacecraft Position Angle

VALID VALUES: 0.0 to 359.999999 degrees

SOURCE: For images acquired at GSFC, the position angle of the large aperture is calculated from the roll angle coordinates. The roll angle is entered during verification of the CDIs from the observing script. For images acquired at VILSPA, the position angle is computed from the coordinates and exposure start time.

COMMENTS: The position angle in the plane of the sky is defined such that 0 degrees points north and 90 degrees points east. The position angle is related to the spacecraft roll angle by:

$$\textit{Position Angle} = \textit{Aperture Orientation Angle} - \textit{Spacecraft Roll Angle}$$

where the aperture orientation angles are defined with respect to the reference vector and increase counterclockwise from the reference vector. Note that the roll angle has been retained in the GSFC database for images read at GSFC.

- **xRA**

Right Ascension of the Observed Target

VALID VALUES: 0 to 359.999999 degrees

SOURCE: For non-solar system objects, the right ascension stored in this field is extracted from the SIMBAD database by the CDS for the *IUE* Project. For targets not found in the SIMBAD database, the coordinates as designated by the GO are used, but the majority of the time, all observations of the same target have identical homogeneous coordinates regardless of the coordinates supplied by the GO. Comet coordinates for data acquired through 1989 were provided by M. Festou of Observatoire de Besancon, France and documented in ULDA, Guide 2: Comets (ESA SP 1134, May 1990). Coordinates for other solar system objects and for sky background acquisitions are duplicated for this CDI from the original coordinates supplied by the GO. *No offsets have been applied to the homogeneous coordinates of the target. The offsets are documented in the COMMENT BY RA field.* If the pointed coordinates are available for WAVECAL, Null, T-flood, and UV-flood images, they appear in this field; otherwise, this field is zero-filled.

COMMENTS: The right ascension stored in this keyword is also designated the HOMOGENOUS RA. The homogeneous right ascension is used by NEWSIPS processing whenever coordinates are required by a reduction algorithm.

- **xRADVELO**

Heliocentric Radial Velocity Correction for (high dispersion only)

VALID VALUES: -34 to +34 kilometers per second

SOURCE: NEWSIPS processing

COMMENTS: Net radial velocity correction for high-dispersion data taking into account the motions of *IUE* and the Earth.

- **READGAIN**

Read Gain Mode

VALID VALUES: HIGH, LOW

SOURCE: This value can be found in the event round robin portion of the VICAR image label and on the observing script.

COMMENTS: This CDI is the gain of the camera head amplifier in the readout section of the SEC tube. Low gain is the standard mode and is the default where not noted explicitly on the observing script.

- **READMODE**

Image Read Flag

VALID VALUES: FULL, PARTIAL

SOURCE: This value can be found in the round robin portion of the image label and on the observing script.

COMMENTS: This keyword indicates if the image was read fully or partially. Partial reads are images for which only the part of the detector containing the spectrum was read. Full read is the standard read.

- **SHFTMAX**

Maximum Shift Between Image and ITF

VALID VALUES: 0 to 10.0 pixels

SOURCE: NEWSIPS processing

COMMENTS: Maximum of the magnitudes of the displacement vectors determined for the patches of the image used for cross correlation.

- **SHFTMEAN**

Mean Shift Between Image and ITF

VALID VALUES: 0 to 10.0 pixels

SOURCE: NEWSIPS processing

COMMENTS: Average of the magnitudes of the displacement vectors determined for the patches of the image used for cross correlation.

- **SERENDAP**

Serendipitous Image Flag (low dispersion only)

VALID VALUES: LARGE, SMALL

SOURCE: NEWSIPS processing

COMMENTS: This keyword is set equal to the aperture for which a serendipitous exposure is detected by the NEWSIPS software. This CDI only has a value when unexpected spectral data are detected in the NEWSIPS processing. If the presence of a serendipitous exposure, either in the other aperture or another camera, was indicated on the observing script, this CDI will be left blank.

- **STATION**

Observing Station Flag

VALID VALUES: GSFC, VILSPA

SOURCE: The observing station is found in character 49 of the first line of the VICAR label. This is an integer value where 1 equals GSFC and 2 equals VILSPA. The observing station is also documented on observing scripts and in Telescope Operation Control Center records.

COMMENTS: This flag indicates the observing station which read the image down from the satellite. For collaborative images (i.e., images initiated at one ground station and read down at the other), the station where the image was read is the designated observing station. The only time the observing station is not the one where the image was read is at times of equipment failure.

- **STDEV RAT**

Standard Deviation Ratio

VALID VALUES: $-\infty$ to $+\infty$ (unitless)

SOURCE: NEWSIPS processing

COMMENTS: The ratio of the standard deviation about the mean of the flux in the SI file to the standard deviation about the mean of the flux in the LI file. This CDI can give an indication of how well the noise characteristics in the LI image were preserved in the resampling step. If the standard deviation about the mean of the flux in the LI image is near zero, the ratio is unreliable.

- **xTARGDEC**

GO-designated Target Declination

VALID VALUES: -90.0 to $+90.0$ degrees

SOURCE: The GO defines the declination for the target as part of the target list submitted with the proposal. This declination is stored in line 37, bytes 8 through 14 of the VICAR label as degrees, minutes and seconds. The DEC is also recorded on the observing script. If the DEC from the VICAR label differs from that recorded on the observing script, the DEC from the script is used.

COMMENTS: The GO-designated declination is used for preliminary positioning of the spacecraft.

- **xTARGET**

GO-designated Target Name

SOURCE: The object name is located in bytes 39-46 of the line 36 of the VICAR label. The object name is also located on the observing script.

COMMENTS: The object name found in the VICAR label was supplied by the GO on the proposal target list. The GO may use a different target name on the observing script. GOs were encouraged to use the Henry Draper catalog designations for stars in this field, where appropriate.

- **xTARGRA**

GO-designated Target Right Ascension

VALID VALUES: 0 to 359.999999 degrees

SOURCE: The GO defines the right ascension for the target as part of the target list submitted with the proposal. This right ascension is stored in line 37, bytes 1 through 7 of the VICAR label in hour, minute, second format. The RA is also recorded on the observing script. If the RA from the VICAR label differs from that recorded on the observing script, the RA from the script is used.

COMMENTS: The GO-designated right ascension is used for preliminary positioning of the spacecraft.

- **xTHDAEND**

Camera Head Amplifier Temperature at Exposure End

VALID VALUES: -5.0 to $+57.640$ degrees Celsius

SOURCE: This value is found in the camera snapshot section of the binary section (lines 86–100) of the VICAR label and is not noted on the observing script. If the camera snapshot portion of the label is corrupted, the THDA is estimated using the THDA values from images taken before and after this image.

For images acquired before June 7, 1979 (day 158), THDA values cannot be obtained from the label. Thus THDAs for each camera at one hour intervals were digitized from the telemetry page snaps. Images were assigned the THDA value nearest in time to the end of the exposure for this time period.

COMMENTS: Temperatures generally range from 4.0 to 20.0 degrees Celsius. Average temperatures are typically about 9 degrees Celsius for the SWP and LWP cameras and 13 degrees Celsius for the LWR camera. This value cannot be verified against independent sources. The importance of THDA as a predictor of image quality was not established until the early 1980s.

- **THDAREAD**

Camera Head Amplifier Temperature at Read Start

VALID VALUES: -5.0 to $+57.640$ degrees Celsius

SOURCE: This value is found in the camera snapshots section of the binary section (lines 86–100) of the VICAR label and is not noted on the observing script. If the camera snapshots portion of the label is corrupted, the THDA is estimated using the THDA values from images taken before and after this image.

For images acquired before June 7, 1979 (day 158), THDA values for each camera at one hour intervals were digitized from the telemetry page snaps. Images were assigned the THDA value nearest in time to their read time.

COMMENTS: Temperatures generally range from 4.0 to 20.0 degrees Celsius. Average temperatures are typically about 9 degrees Celsius for the SWP and LWP cameras and 13 degrees Celsius for the LWR camera. This value cannot be verified against independent sources. The importance of THDA as a predictor of image quality was not established until the early 1980s.

- **xTHDASTR**

Camera Head Amplifier Temperature at Exposure Start

VALID VALUES: -5.0 to +57.640 degrees Celsius

SOURCE: This value is found in the camera snapshots section of the binary section (lines 86–100) of the VICAR label and is also noted on the observing script.

For images acquired before June 7, 1979 (day 158), THDA values for each camera at one hour intervals were digitized from the telemetry page snaps. Images were assigned the THDA value nearest in time to the start of the exposure.

COMMENTS: Temperatures generally range from 4.0 to 20.0 degrees Celsius. Average temperatures are typically about 9 degrees Celsius for the SWP and LWP cameras and 13 degrees Celsius for the LWR camera. This value cannot be verified against independent sources. The importance of THDA as a predictor of image quality was not established until the early 1980s.

- **TILTCORR**

Tilt Correction Flag

VALID VALUES: YES, NO

SOURCE: NEWSIPS module

COMMENTS: The tilt correction is only applied to large-aperture, low-dispersion extended-source data, when appropriate, and multiple exposures taken along the major-axis of the aperture.

- **xTIMEOBS**

Time (hour, minute and second) at Exposure Start (UT)

VALID VALUES: 00:00:00 to 23:59:59

SOURCE: The time of observation may be found in the image label by locating a line in the round robin preceded by 'EXPOBC', reading the characters 1–6 with format hhmss and subtracting 6 seconds from it. However, when the exposure time has been modified, the time is extracted from the first 6 characters in the round robin line preceded by 'FIN'. This information is also found on the observing script.

COMMENTS: For multiple or segmented exposures in the large aperture the start time of the first exposure will be stored in the keyword. Subsequent exposure values will be stored in the COMMENT BY RA.

- **xTRAILNR**

Number of Passes in a Trailed Observation

VALID VALUES: 1 to 9 (unitless)

SOURCE: The number of passes (iterations) is extracted from the round robin portion of the VICAR label by locating a line preceded by 'ITER' and reading the one digit integer. This information is also recorded on the observing script.

COMMENTS: The number of passes is needed to determine the trailed exposure time.

- **xTRAILRT**

Effective Trail Rate

VALID VALUES: 0.03 to 120.0 arcseconds per second

SOURCE: The effective trail rate is a calculated value using the commanded trail rate and allowing for OBC quantization. The commanded trail rate can be extracted from the round robin portion of the VICAR label by locating a line preceded by 'TRAIL' and reading the real number value at the end of the line. The commanded trail rate is also noted on the script. See Chapter 11.1.1 for details on calculating an effective trail rate from the commanded trail rate.

COMMENTS: The effective trail rate is needed to determine the effective exposure time for trailed data.

- **UVC-VOLT**

UVC Voltage Setting

VALID VALUES: -5.0 to 0.0 kV

SOURCE: The UVC voltage is found in the VICAR label by locating a line in the round robin preceded by 'FIN' and reading the integer value that follows the U field in that line. If a non-standard UVC voltage was commanded, this value would be noted on the script. The normal UVC voltage is -5.0 kV (see also ABNUVC).

COMMENTS: After mid-1983 the LWR camera was routinely read at -4.5 kV to reduce the negative effect of the flare on the detector.

- **xXTRCNTR**

Line Number in SI File at which the Peak Cross-dispersion Profile Flux was Found (low dispersion only)

VALID VALUES: 1.0 to 80.0 pixels

SOURCE: NEWSIPS processing

- **xXTRASYM**

Asymmetrical Extraction Profile (low dispersion only)

VALID VALUES: YES, NO

SOURCE: NEWSIPS processing

COMMENTS: A flag indicating if the peak of the cross-dispersion flux was found to be more than 2 pixels (two lines in the low-dispersion resampled image) away from the centroid of the profile.

- **xXTRMODE**

Processing Extraction Mode

VALID VALUES: POINT, EXTENDED

SOURCE: NEWSIPS processing

COMMENTS: The extraction mode in NEWSIPS processing is based entirely on the automated determination of spectral width and may differ from the original request by the acquiring GO on the observing script. As a result, the NEWSIPS spectral data may differ significantly from the original processing.

- **xXTRPROF**

Weighted Slit Extraction Profile (low dispersion only)

VALID VALUES: EMPIRICAL, DEFAULT POINT, UNIFORM

SOURCE: NEWSIPS processing

COMMENTS: If an empirical determination of the spectral cross-dispersion profile is not possible, a standard default profile is assumed. The standard default profile for point sources is a model based on standard-star images and for extended sources, a uniform boxcar weighting.